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Mobile App Information

Download the APEC 2024 mobile app to access the latest event updates and details, including session and speaker information. The app is accessible through Google Play (Android) and Apple Store (iOS devices) by searching **'Eventscribe'**, downloading, then searching **'APEC 2024'**. Log in using your email and Registration Confirmation Number.

Stay Connected

APEC Social Media Information

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APEC: Applied Power Electronics Conference

APEC: Applied Power Electronics Conference

WiFi Information

WiFi Network: APEC2024

WiFi Password: LongBeach24 *(case sensitive)*

Email apec@apec-conf.org

Website https://www.apec-conf.org

PROGRAM KEY

Presentations will be available through the APEC mobile app and through the digital download located on the APEC website.

PLENARY SESSION

The APEC Plenary Session is a long-standing tradition of addressing topics of immediate and long-term interest to the practicing power electronic professional. The on-trend topics featured during the plenary session are brought to you by specially invited, distinguished professionals followed by an interactive Q&A session.

TECHNICAL SESSIONS

The APEC Technical Program features lecture and dialogue presentations from authors of peer-reviewed papers that cover all areas of technical interest for the practicing power electronics professional. The rigorous review process ensures that only the most innovative technical solutions are highlighted to provide the highest quality possible. The technical program includes **lecture presentations** of broad appeal and **dialogue sessions** which provide an opportunity to discuss the topic in detail with the author.

INDUSTRY SESSIONS

Industry Sessions present information on current topics in power electronics from industry sources and run in parallel with the Technical Sessions tracks. Speakers are invited to make a presentation only, without having to submit a formal paper for proceedings. This allows APEC to present information on current topics in power electronics from sources that would not otherwise be present at a technical conference. While many of these sessions are technical in nature, some will cover business-oriented topics, which hold interest not only for those in technical roles but for professionals who support the power electronics industry.

PROFESSIONAL EDUCATION SESSIONS

APEC Professional Education Seminars focus on the practical aspects and theoretical foundation of power conversion. They offer in-depth discussions of important and complex topics in system and circuit designs, about active and passive components, and popular applications in power electronics. The seminars are given by leading authorities from the industry, academia and research communities, and they expertly combine practical applications with theory. These tutorials are designed to further educate the working professionals and students in power electronics.

RAP SESSIONS

The APEC RAP Sessions feature several exciting and contentious topics. RAP Sessions allow for a lively dialogue among attendees and presenters. They are structured around pivotal questions designed to spark debate, ensuring a representation of diverse perspectives. Audience members are asked to weigh in with their insights, challenge the experts, and steer the conversation with their own questions. RAP Sessions are presented live during the conference and free for all registrants to attend.

EXHIBITOR PRESENTATIONS

APEC 2024 Exhibitor Presentations present a current challenge to the power electronics industry, a brief review of how this challenge has been addressed in the past, and then how that company's products or services offer a solution better than previously existing solutions. These presentations provide a more in-depth look at the latest products and services offered by suppliers to the power electronics industry.

FOREWORD

APEC 2024

Welcome to the Beach!

In the early days of the twentieth century, a little over a hundred years ago, Long Beach was the terminus of the Pacific Electric Railway where southern California residents would take the train to enjoy a day at the shore. They would stay till evening and stroll along the plank boards and enjoy the "walk beneath 1000 lights". Now, with the commencement of the 39th annual IEEE Applied Power Electronics Conference and Exposition, we light up with power conversion solutions for the next century!

Each year, APEC provides extensive educational opportunities with 6 dynamic Plenary talks, Professional Education Seminars, Technical papers presented in lecture and dialog sessions, application-oriented Industry Sessions, insightful and entertaining RAP Sessions, and many Exposition and Exhibitor Presentations. It is no wonder that APEC has been branded the Premier Event in Applied Power Electronics.

The Exposition this year eclipses all that have come before with more square footage and almost 300 companies and organizations exhibiting. The combined conference and expo elements form one of the best professional networking opportunities anywhere available. So make new connections, renew old ones, and discuss the latest ideas together with your peers. Don't miss the Monday Welcome Reception or the Wednesday Evening Social event when we will walk beneath 1000 lights among arcade games and spend "a Night at the Pike".

In the time I have been engaged helping to prepare for APEC, I have been humbled at the dedication, passion and knowledge of colleagues who work tirelessly each year to make it all happen. The all-volunteer Organizing and Steering Committees, the technical track and session chairs, Industry Session Chairs, and reviewers all deserve our praise. Thanks also to members and leaders of the three sponsoring groups: Power Sources Manufacturers Association (PSMA), the IEEE Power Electronics Society (PELS) and Industry Applications Society (IAS). Finally, let me thank our professional conference management company Meeting Management Services (MMS) in their first year of our partnership together.

So let us together enjoy the history of this area and our time at the beach this week. Maybe go on a whale watching tour! But let's use the opportunity to help solve the power conversion problems of our times. And to all attendees, exhibitors, and volunteers: thank you for your ongoing contributions to and support of our global power conversion community and our annual gathering at APEC.

Sincerely,

Tim McDonald
General Chair
2024 IEEE Applied Power Electronics Conference and Exposition

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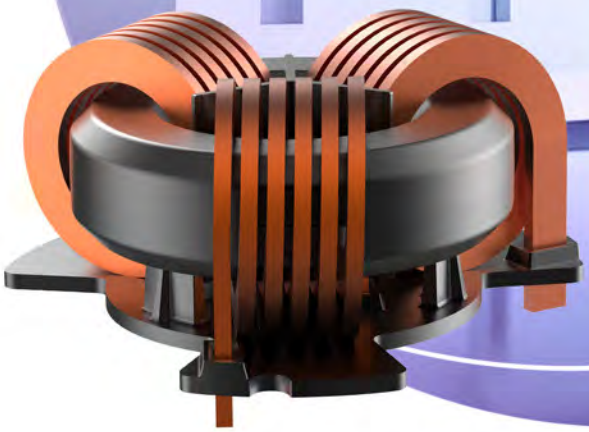

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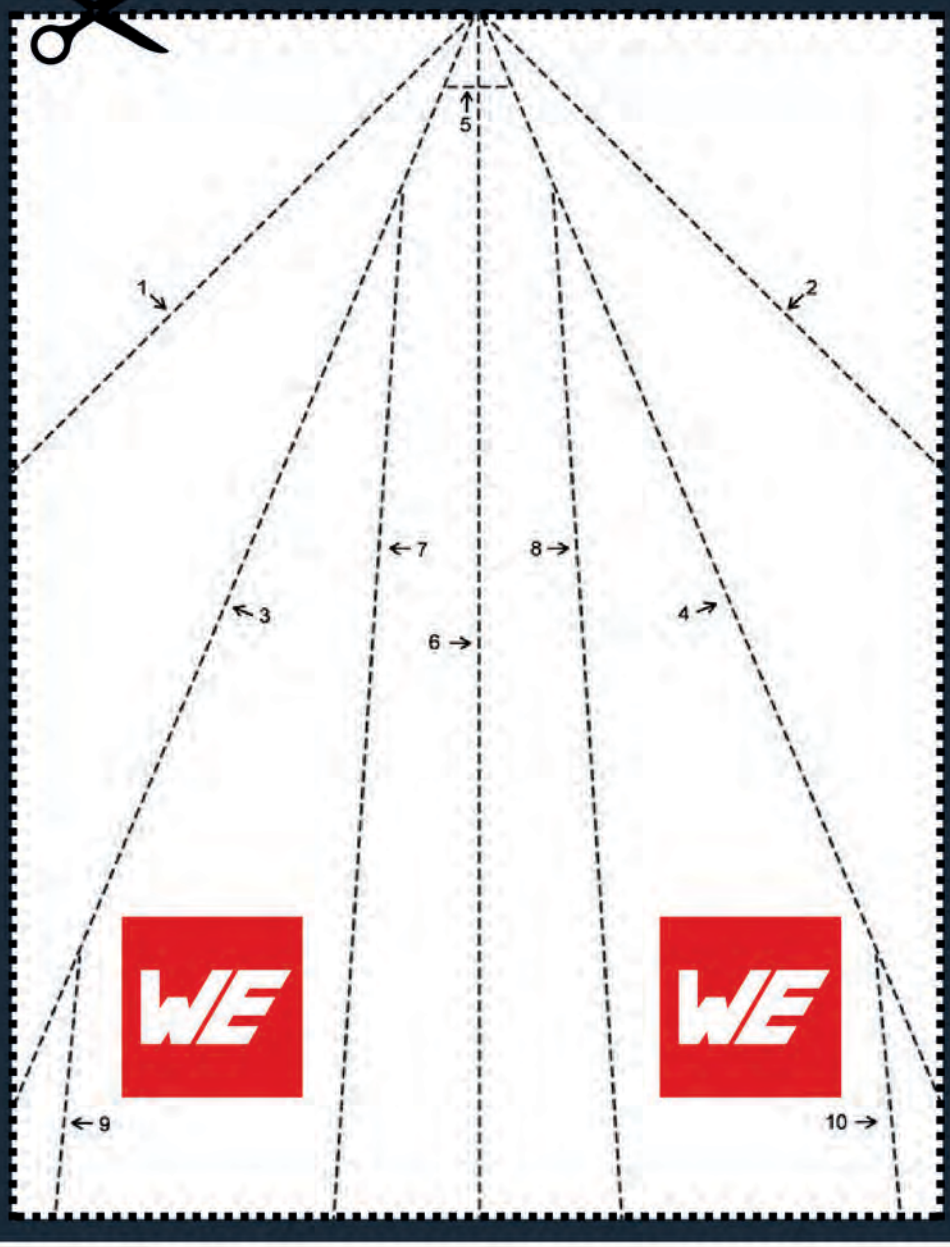

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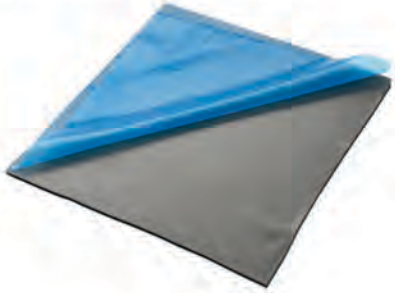

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2024 IEEE WILLIAM E. NEWELL POWER ELECTRONICS AWARD

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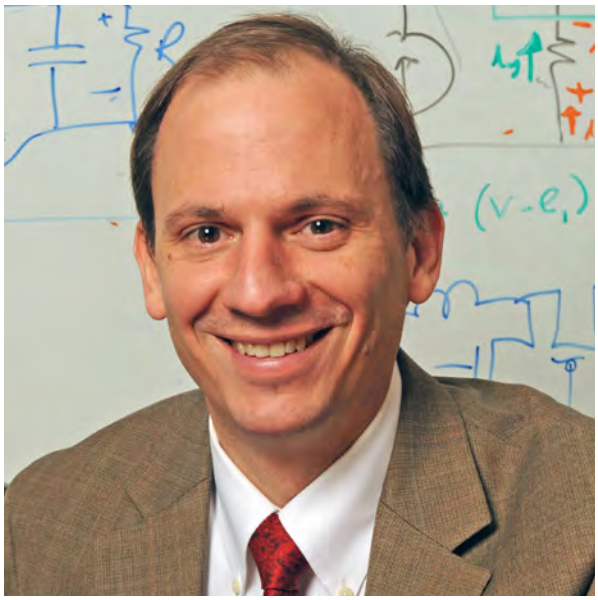
DAVID J. PERREAULT



The award presentation will take place during the Opening & Plenary Session on Monday, February 26, beginning at 1:00 PM.

For contributions to the development of very-high-frequency power converters.

ABOUT DAVID J. PERREAULT

David Perreault received his B.S. degree from Boston University and S.M. and Ph.D. degrees from the Massachusetts Institute of Technology, all in Electrical Engineering. He is presently the Ford Professor of Engineering at MIT. His research interests include design, manufacturing, and control techniques for power electronic systems and components, and in their use in a wide range of applications. Dr. Perreault is a Member of the U.S. National Academy of Engineering, a Fellow of the IEEE and the recipient of many awards including the IEEE R. David Middlebrook Achievement Award for his work in power electronics. He is co-author of sixteen IEEE prize papers in the area, and of the textbook "Principles of Power Electronics, 2nd Edition" (Cambridge University Press, 2023). Dr. Perreault also co-founded startup companies Eta Devices (acquired by Nokia in 2016) and Eta Wireless (acquired by Murata in 2021).

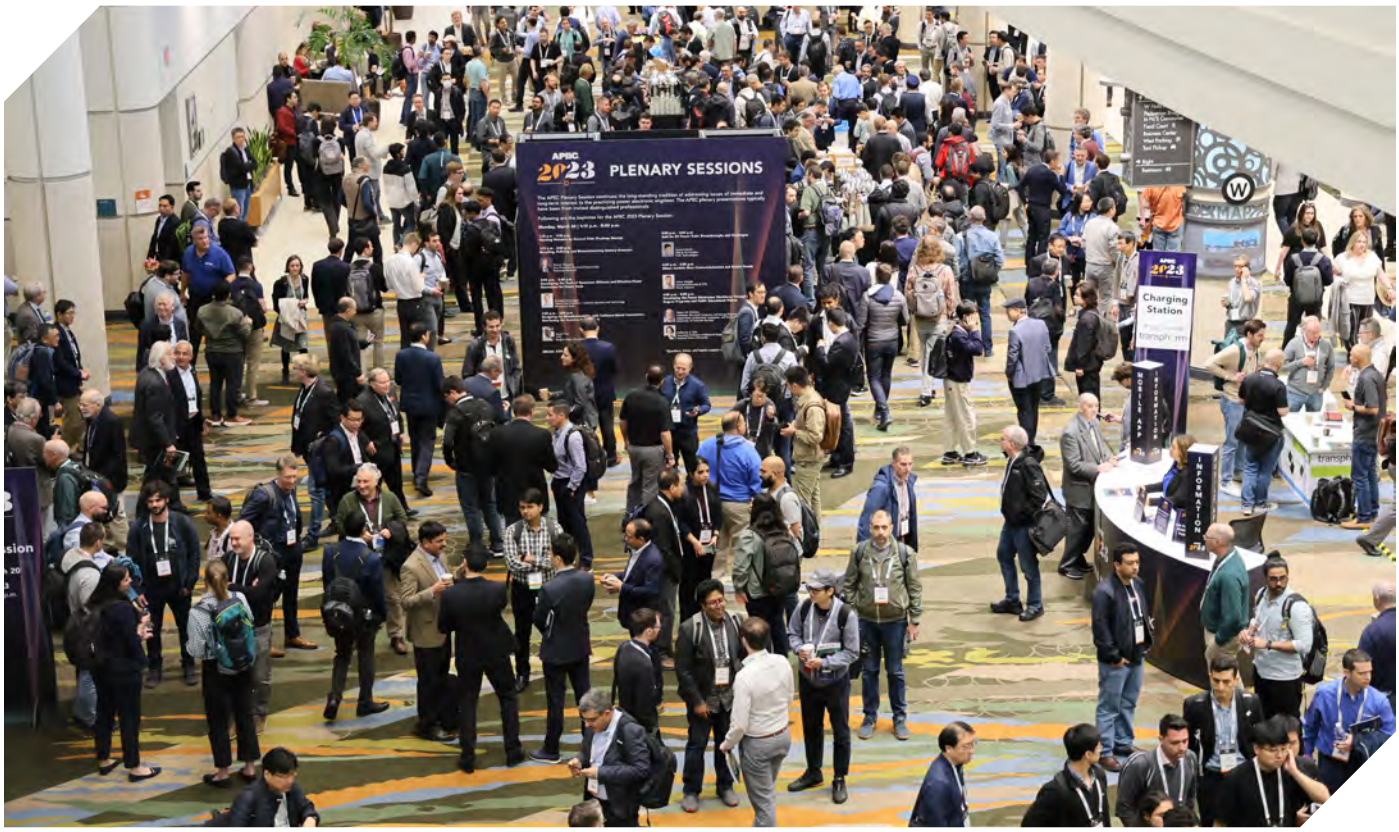
ABOUT THE WILLIAM E. NEWELL POWER ELECTRONICS AWARD

The IEEE William E. Newell Power Electronics Award was established in 2005. It was established in memory of William E. Newell of the Westinghouse Research and Development Center in Pittsburgh, Pennsylvania. This award is presented to an individual for outstanding contributions to power electronics. Recipient selection is administered through the Technical Field Awards Council of the IEEE Awards Board.

CONFERENCE-AT-A-GLANCE

	Saturday, February 24	Sunday, February 25	Monday, February 26	Tuesday, February 27	Wednesday, February 28	Thursday, February 29
Plenary Session			✓			
RAP Sessions				✓		
Technical Lecture Sessions*				✓	✓	✓
Technical Dialogue Sessions*						✓
Industry Sessions*				✓	✓	✓
Professional Education Seminars*		✓	✓			
Exhibitor Presentations				✓	✓	
Expo Hall Open			✓	✓	✓	
Sponsor Meetings	✓	✓	✓	✓	✓	✓

**Paid Registration Required*



SCHEDULE-AT-A-GLANCE

SATURDAY, FEBRUARY 24

4:00 PM – 7:00 PM	**Registration Open**	Promenade Lobby

SUNDAY, FEBRUARY 25

8:00 AM – 5:00 PM	**Registration Open**	Promenade Lobby
8:00 AM – 5:00 PM	**Speaker Ready Room Open**	Room 204
8:00 AM – 9:00 AM	**Professional Education Seminars** **Speaker Breakfast** ***(speakers only)***	Room 204
9:30 AM – 1:00 PM	**Professional Education Seminars** ***(concurrent sessions)***	Various – see pages 30-32 for specific locations
1:00 PM – 2:30 PM	**Lunch on Own**	
2:30 PM – 6:00 PM	**Professional Education Seminars** ***(concurrent sessions)***	Various – see pages 33-35 for specific locations

MONDAY, FEBRUARY 26

7:00 AM – 1:30 PM	**Speaker Ready Room Open**	Room 204
7:00 AM – 7:00 PM	**Registration Open**	Promenade Lobby
7:00 AM – 8:00 AM	**Professional Education Seminars** **Speaker Breakfast** ***(speakers only)***	Room 204
8:00 AM – 3:00 PM	**Spouse/Guest Hospitality Room Open**	Hyatt Regency Hotel, Beacon Rotunda, 4th Floor
8:00 AM – 9:30 AM	**Spouse/Guest Breakfast**	Hyatt Regency Hotel, Beacon Rotunda, 4th Floor
8:30 AM – 12:00 PM	**Professional Education Seminars** ***(concurrent sessions)***	Various – see pages 36-37 for specific locations
12:00 PM – 1:00 PM	**Lunch on Own**	
1:00 PM – 1:20 PM	**Opening Welcome &** **Newell Award Presentation**	Grand Ballroom AB
1:20 PM – 5:00 PM	**Plenary Session**	Grand Ballroom AB
5:00 PM – 8:00 PM	**Expo Hall Open**	Expo Hall ABC
5:00 PM – 8:00 PM	**Welcome Reception, *hosted by Infineon***	Expo Hall ABC
5:00 PM – 8:00 PM	**FIRST® Robotics Event**	Expo Hall ABC
7:30 PM – 9:30 PM	**MicroMouse Contest**	Expo Hall ABC

SCHEDULE-AT-A-GLANCE

TUESDAY, FEBRUARY 27

7:00 AM – 8:00 AM	**Technical and Industry Session Speaker Breakfast** ***(speakers only)***	Seaside Ballroom AB
7:00 AM – 5:00 PM	**Speaker Ready Room Open**	Room 204
7:30 AM – 3:00 PM	**Spouse/Guest Hospitality Room Open**	Hyatt Regency Hotel – Beacon Rotunda, 4th Floor
8:00 AM – 3:00 PM	**Registration Open**	Promenade Lobby
8:30 AM – 10:10 AM	**Technical Sessions** ***(concurrent sessions)***	Various – see pages 42-48 for specific locations
8:30 AM – 10:10 AM	**Industry Sessions** ***(concurrent sessions)***	Various – see pages 49-51 for specific locations
8:50 AM – 5:30 PM*	**Spouse/Guest: Catalina Island Tour** ***(pre-registration required)***	Meet at Hyatt Regency Hotel, Lobby – Transportation leaves at 8:50 AM
9:00 AM – 4:30 PM	**Expo Hall Open**	Expo Hall ABC
10:10 AM – 10:40 AM	**Break**	Promenade Foyer
10:40 AM – 11:55 AM	**Industry Sessions** ***(concurrent sessions)***	Various – see pages 49-51 for specific locations
10:40 AM – 12:00 PM	**Technical Sessions** ***(concurrent sessions)***	Various – see pages 42-48 for specific locations
12:00 PM – 1:30 PM	**Lunch**	Expo Hall ABC
1:30 PM – 4:15 PM	**Exhibitor Presentations** ***(concurrent sessions)***	Various – see pages 52-58 for specific locations
1:30 PM – 5:00 PM	**Student Job Fair**	Hyatt Regency Hotel – Regency Ballroom ABC
4:15 PM	**Raffle in Expo**	APEC HUB in Expo Hall ABC
4:30 PM – 6:00 PM	**RAP Sessions**	Various – see page 59 for specific locations
6:30 PM – 8:30 PM	**PELS Mentorship Roundtable** ***(pre-registration required)***	102AB
7:00 PM – 9:00 PM	**IAS/PELS/PSMA Young Professionals Networking Reception**	Café Sevilla – see page 22 for more information

SCHEDULE-AT-A-GLANCE

WEDNESDAY, FEBRUARY 28

7:00 AM – 8:00 AM	**Technical and Industry Session Speaker Breakfast** ***(speakers only)***	Seaside Ballroom AB
7:00 AM – 5:30 PM	**Speaker Ready Room Open**	Room 204
8:00 AM – 9:00 AM	**PELS Women in Engineering (WIE) Breakfast: Elevated Engineer, Emotional Intelligence**	Hyatt Regency Hotel, Regency Ballroom DEF
8:00 AM – 2:00 PM	**Registration Open**	Promenade Lobby
8:00 AM – 3:00 PM	**Spouse/Guest Hospitality Room Open**	Hyatt Regency Hotel, Beacon Rotunda, 4th Floor
8:30 AM – 10:10 AM	**Technical Sessions** ***(concurrent sessions)***	Various – see pages 60-66 for specific locations
8:30 AM – 10:10 AM	**Industry Sessions** ***(concurrent sessions)***	Various – see pages 73-75 for specific locations
9:00 AM – 2:30 PM	**Expo Hall Open**	Expo Hall ABC
10:10 AM – 10:40 AM	**Break**	
10:40 AM – 12:00 PM	**Technical Sessions** ***(concurrent sessions)***	Various – see pages 60-66 for specific locations
10:40 AM – 11:55 AM	**Industry Sessions** ***(concurrent sessions)***	Various – see pages 73-75 for specific locations
11:00 AM – 3:30 PM*	**Spouse/Guest: Whale Watching Tour** ***(pre-registration required)***	Meet at Hyatt Regency Hotel, Lobby – Transportation leaves at 11:00 AM
11:45 AM – 1:30 PM	**Lunch**	Expo Hall ABC
12:00 PM – 1:15 PM	**Exhibitor Presentations** ***(concurrent sessions)***	Various – see pages 79-81 for specific locations
1:15 PM	**Raffle in Expo Hall**	APEC HUB in Expo Hall ABC
1:30 PM – 3:10 PM	**Technical Sessions** ***(concurrent sessions)***	Various – see pages 66-72 for specific locations
1:30 PM – 3:10 PM	**Industry Sessions** ***(concurrent sessions)***	Various – see pages 76-78 for specific locations
3:10 PM – 3:40 PM	**Break**	Promenade Foyer
3:40 PM – 5:00 PM	**Technical Sessions** ***(concurrent sessions)***	Various – see pages 66-72 for specific locations
3:40 PM – 4:55 PM	**Industry Sessions** ***(concurrent sessions)***	Various – see page s 76-78 for specific locations
6:00 PM – 9:00 PM	**Wednesday Night Social** ***(ticketed event)***	Pacific Ballroom

**expected return times to Hyatt Regency Hotel*

SCHEDULE-AT-A-GLANCE

THURSDAY, FEBRUARY 29

7:00 AM – 8:00 AM	**Dialogue, Technical and Industry Session Speaker Breakfast (speakers only)**	Seaside Ballroom AB
7:00 AM – 2:00 PM	**Speaker Ready Room Open**	Room 204
8:00 AM – 12:00 PM	**Registration Open**	Promenade Lobby
8:00 AM – 3:00 PM	**Spouse/Guest Hospitality Room Open**	Hyatt Regeny Hotel, Beacon Rotunda, 4th Floor
8:30 AM – 10:10 AM	**Technical Sessions** ***(concurrent sessions)***	Various – see pages 83-88 for specific locations
8:30 AM – 10:10 AM	**Industry Sessions** ***(concurrent sessions)***	Various – see pages 93-95 for specific locations
10:10 AM – 10:40 AM	**Break**	Promenade Lobby
10:40 AM – 11:10 AM	**Technical Sessions** ***(concurrent sessions)***	Various – see pages 83-88 for specific locations
10:40 AM – 11:20AM	**Industry Sessions** ***(concurrent sessions)***	Various – see pages 93-95 for specific locations
11:30 AM – 1:30 PM	**Lunch in the Dialogue Sessions**	Grand Ballroom AB
11:30 AM – 1:30 PM	**Dialogue Sessions**	Grand Ballroom AB
1:30 PM – 3:10 PM	**Technical Sessions** ***(concurrent sessions)***	Various – see pages 89-92 for specific locations
1:30 PM – 3:10 PM	**Industry Sessions** ***(concurrent sessions)***	Various – see pages 95-96 for specific locations

GENERAL INFORMATION

ABOUT LONG BEACH

Long Beach is a waterfront playground located right in the heart of Southern California. Here you can experience it all: a deep-sea adventure at the Aquarium of the Pacific, whale watching on the water, shopping in one of the city's many unique districts, a tour of coastal breweries, a vibrant foodie scene, and so much more.

LUNCH INFORMATION

Lunch will be available at the following dates, times and locations:

Tuesday, February 27 | 12:00 PM – 1:30 PM
EXPO HALL

Wednesday, February 28 | 11:45 AM – 1:30 PM
EXPO HALL

Thursday, February 29 | 11:30 AM – 1:30 PM
DIALOGUE SESSIONS, GRAND BALLROOM AB

ACCESSIBILITY

The Long Beach Convention and Entertainment Center and APEC strive to provide an accessible event for all. The convention center is designed with wheelchair ramps, automatic doors, passenger elevators and handicap accessible restroom facilities. All passenger elevators are clearly marked. Please visit the registration desk for additional accessibility questions and information.

CONFERENCE REGISTRATION

All attendees must be registered for the conference. For registration or general conference questions, please visit APEC Registration in the **Promenade Lobby**.

	Technical Sessions	Industry Sessions	Professional Education Seminars	Plenary Sessions	Expo Hall	Wednesday Night Social	RAP Sessions	Exhibitor Presentations
Full Conference	✓	✓	✓	✓	✓	✓	✓	✓
Technical or Industry Sessions Only	✓	✓		✓	✓	✓	✓	✓
Professional Education Seminars Only			✓	✓	✓		✓	✓
Exhibit Hall Only				✓	✓		✓	✓
Spouse/Guest Pass				✓	✓		✓	✓
Press Pass	✓	✓	✓	✓	✓	✓	✓	✓

Registration Hours

Saturday, February 24 | 4:00 PM – 7:00 PM
Sunday, February 25 | 8:00 AM – 5:00 PM
Monday, February 26 | 7:00 AM – 7:00 PM
Tuesday, February 27 | 8:00 AM – 3:00 PM
Wednesday, February 28 | 8:00 AM – 2:00 PM
Thursday, February 29 | 8:00 AM – 12:00 PM

APEC 2024

EXHIBIT HALL INFORMATION

Expo Hall Hours

Monday, February 26 | 5:00 PM – 8:00 PM

Tuesday, February 27 | 9:00 AM – 4:30 PM

Wednesday, February 28 | 9:00 AM – 2:30 PM

Expo Hall Raffle

Attendees are invited to participate in our APEC Raffle, located inside the APEC Hub. Multiple prizes will be raffled off on Tuesday, February 27 at 4:15 PM and Wednesday, February 28 at 1:15 PM. Raffle tickets are attached to your registration badge and can be dropped off at the APEC Hub. ***Attendees must be present to win.***

Expo Hall Admission Requirements

Entry is granted to persons 21 years or older with a valid APEC registration.

SWAG Giveaway

All attendees with a Full Conference registration are invited to select a SWAG item of their choice from inside the APEC Hub. Please visit the SWAG stand inside the APEC Hub and cash in the voucher attached to your registration badge.

IMPORTANT RULES, NOTICES, AND CONFERENCE POLICIES

Badges Required for Admission

Badges are required for admission to all APEC events and activities. Badges are obtained by registering with the conference. APEC reserves the right to deny admission to any APEC event or activity to any person not showing an appropriate badge for that activity or event.

Recording and Photography

Attendee Recording/Photography: Video and audio recording may be conducted in the Expo Hall area, and public areas of APEC, but nowhere else except with written permission from the Conference Chair. Still photography at APEC is permitted, but with limitations. The general principle is that people may be photographed but photographing presentations and other content is prohibited by all attendees except for the professional APEC photographer. For more details, please see Show Management.

APEC Photography for Marketing Purposes: By registering for APEC 2024, you agree that any photos taken of you while at the conference by our professional photographer may be used by APEC in the future.

Showcasing/Suitcasing Policy

Please note that while all meeting attendees are invited to the showcase, any attendee who is observed to be soliciting business in the aisles or other public spaces, in another company's booth, or in violation of any portion of the Exhibition Policy, will be asked to leave immediately. Additional penalties may be applied. Please report any violations you may observe to Show Management. Show Management recognizes that suitcasing may also take the form of commercial activity conducted from a hotel guest room or hospitality suite; a restaurant, club, or any other public place of assembly. For the purposes of this policy, suitcasing violations may occur at venues other than the Expo Hall floor and at other events. Show Management must be informed of any hospitality suites, and expressed consent must be received prior to the event.

Recruitment Policy

IEEE Policy #10 .1 .25 requires a publicly stated policy concerning recruiting at IEEE sponsored conferences. Consequently, recruiters and recruiting advertisements will not be permitted in the

GENERAL INFORMATION

APEC hotel space, meeting facilities or Exposition Hall. Also, ads or postings seeking positions are not permitted.

APEC reserves the right to remove without notice any materials in violation of this policy.

APEC does allow for the facilitation of a student job fair that is organized by the conference. Only students registered for the conference may participate. Only companies that have registered for the student job fair and paid any required participation fees may recruit at the job fair.

Distribution of Commercial Material at APEC

Rules for Non-Exhibitors: Distribution of commercial material in the APEC 2024 venue space(s) (including directly to the hotel rooms of APEC participants), meeting space and Expo Hall by people or organizations not participating in the Exposition is prohibited. APEC reserves the right to remove without notice any materials not in compliance with this policy.

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SPEAKER READY ROOM

The Speaker Ready Room, located in Room 204, is to be utilized by all speakers to prepare for their presentations. PLEASE NOTE: If you changed your presentation after the deadline, you must bring your newest presentation to the Speaker Ready Room as soon as you arrive to switch it out. You can also do this directly after the instructional PowerPoint is presented during the Speaker Breakfast.

> Sunday, February 25 | 8:00 AM – 5:00 PM

> Monday, February 26 | 7:00 AM – 1:30 PM

> Tuesday, February 27 | 7:00 AM – 5:00 PM

> Wednesday, February 28 | 7:00 AM – 5:30 PM

> Thursday, February 29 | 7:00 AM – 2:00 PM

SPEAKER BREAKFAST

All Professional Education Seminar, Technical, and Industry Session Speakers must attend the Speaker Breakfast, on the morning of their presentation to receive instructions from their Session Chairs.

Remember, if you changed your presentation, you must visit the Speaker Ready Room immediately after the Speaker Breakfast.

Please note: Exhibitor Presentation speakers are not required to attend any speaker breakfasts.

Professional Education Seminar Speaker Breakfast

Note: breakfast will take place in Room 204

> Sunday, February 25 | 8:00 AM

> Monday, February 26 | 7:00 AM

Technical Session Lecture and Industry Session Speaker Breakfast

Note: breakfast will take place in Seaside Ballroom AB

> Tuesday, February 27 | 7:00 AM

> Wednesday, February 28 | 7:00 AM

> Thursday, February 29 | 7:00 AM

Technical Session Dialogue Speaker Breakfast

Note: breakfast will take place in Seaside Ballroom AB

> Thursday, February 29 | 7:00 AM

SPOUSE AND GUEST HOSPITALITY PROGRAMMING

The APEC 2024 Spouse and Guest Co-chairs are excited for APEC to return to Long Beach, California. The week starts off with a welcome breakfast and continues with two exciting outdoor adventures planned for those who wish to explore some unique sights of the California coast.

Spouse and Guest Hospitality Room

HYATT REGENCY HOTEL, BEACON ROTUNDA

The spouses and guests of registered APEC attendees are invited to the APEC Spouse and Guest Hospitality room to meet up with old and new friends, make plans, catch up with each other, or just hang out and relax. A light breakfast with coffee and tea will be served each day when the room opens.

Open Times

> Monday, February 26 | 8:00 AM – 3:00 PM

> Tuesday, February 27 | 7:30 AM – 3:00 PM

> Wednesday, February 28 | 8:00 AM – 3:00 PM

> Thursday, February 29 | 8:00 AM – 3:00 PM

Monday Morning Meet and Greet

Monday, February 26 | 8:00 AM – 9:30 AM
HYATT REGENCY HOTEL, BEACON ROTUNDA

The APEC Spouse and Guest Co-Chairs encourage you to join us to kick off the week's spouse and guest activities. A speaker from the Long Beach convention and visitor's bureau will give an introduction to Long Beach and describe the nearby attractions and activities. This is a great opportunity to get oriented to the Long Beach area, plan your week, and get your questions about the area answered.

Catalina Island Tour

Tuesday, February 27 |
8:50 AM – 5:00 PM
**Transportation leaves from the Hyatt Regency at 8:50 AM; Ferry departs for the Island at 9:50 AM. The return boat departs at 3:55 PM. The boat ride is (1) hour.*

Take a day trip to Catalina Island just off the coast of Long Beach. Visitors can leave all the hustle and bustle behind and return to a slower pace of life, the island life. Whether it's your first visit or tenth, Catalina Island's rich history and unique charm keeps people coming back time and again. Upon arrival, there is a guided walking tour to get acquainted with the island for the first hour. After the guided walking tour, you can take adventurous excursions (at your own cost and discretion), check out the shopping and restaurant scene or just relax!

APEC will be providing transportation from the main entrance of the Hyatt Regency to the ferry dock. Meet at the main entrance of the Hyatt Regency at 8:50 AM (one hour before the ferry's scheduled departure time).

The APEC tour group is booked on the ferry scheduled to depart at 9:50 AM.

(pre-registration required)

Whale Watching

Wednesday, February 28 |
11:00 AM – 3:00 PM
**Transportation leaves from the Hyatt Regency at 11:00 AM; Boat departs at 12:00 PM.*

Join APEC and Harbor Breeze Cruises for a 2.5-hour whale watching boat tour in the waters off Southern California on Wednesday, February 28. Whether you're hoping to catch a glimpse of the majestic humpback whale as it breaches the water's surface or want to spot the massive blue whale, Harbor Breeze can turn your dream into a reality.

APEC will be providing transportation from the main entrance of the Hyatt Regency to the Harbor Breeze dock. Meet at the main entrance of the Hyatt Regency at 11:00 AM (one hour before the ferry's scheduled departure time). Upon the cruise's return, transportation will be provided back to the Hyatt Regency.

(pre-registration required)

SPECIAL EVENTS

MONDAY, FEBRUARY 26

FIRST® ROBOTICS EVENT

Monday, February 26 | 5:00 PM – 8:00 PM
EXPO HALL

FIRST® (For Inspiration and Recognition of Science and Technology) is a global not-for-profit organization that prepares young people for the future through a suite of inclusive, team-based robotics programs for ages 4-18 (PreK-12) that can be facilitated in school or in structured afterschool programs. Boosted by a global support system, teams operate under a signature set of FIRST® Core Values to conduct research, fundraise, design, build, and showcase their achievements during annual challenges. With over $80 million in scholarships available to our students, the mission of FIRST® is to inspire young people to be science and technology leaders and innovators by engaging them in exciting mentor-based programs that build science, engineering, and technology skills, that inspire innovation, and that foster well-rounded life capabilities including self-confidence, communication, and leadership.

MICROMOUSE CONTEST

Monday, February 26 | 7:30 PM-9:30 PM
EXPO HALL

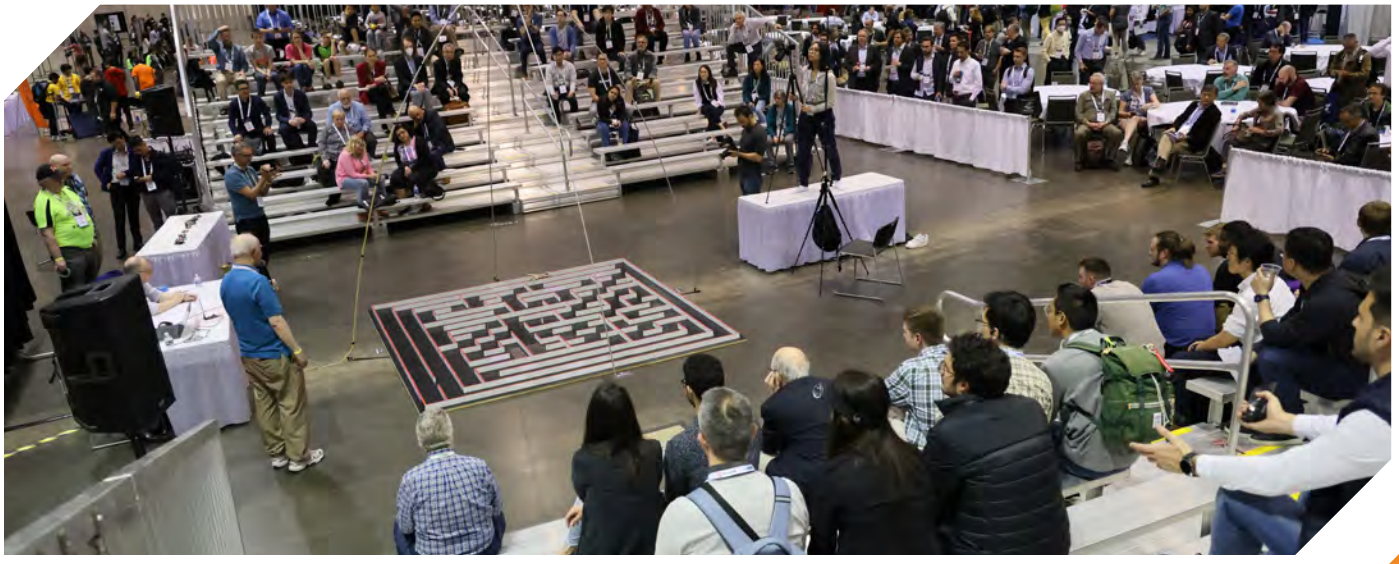
Enter the annual APEC MicroMouse contest or join us as a spectator for this exciting event. Participants design, build, and program robotic mice and compete to see who can navigate their way through the maze in the shortest time. The rules for the contest use a scoring system with a penalty for the time taken to map and run the maze, and a bonus for not touching the mouse. They are similar to those used at the IEEE World Final held in London in 1987 except that the touch penalty has been reduced from 10 seconds to 2 seconds. The time for each contestant has also been reduced from 15 to 7 minutes. Within this time limit, the MicroMouse may make up to five runs.

Trophies and cash prizes will be awarded in the following categories based on score:

> **1st Place | $500**
> **2nd Place | $250**
> **3rd Place | $125**
> **Fastest Run** *(based on run time)* **| $150**

Trophies and cash prizes will be awarded to students in the following categories:

> **Best Student** *(based on score)* **| $500**



TUESDAY, FEBRUARY 27

STUDENT JOB FAIR

Tuesday, February 27 | 1:30 PM – 5:00 PM
HYATT REGENCY HOTEL, REGENCY BALLROOM AB

APEC is honored to present our second career fair at APEC 2024. It will be a relaxed and pleasant opportunity for companies and graduating students to meet. Participating companies will be there to connect with potential new employees! Only students registered for the conference may participate. Both graduating undergrad and graduate students are welcome.

Thank you to Generac, exclusive Student Job Fair Partner

GENERAC®

PELS MENTORSHIP ROUNDTABLES

Tuesday, February 27 | 6:30 PM – 8:30 PM
ROOM 102AB

Since 2017, the PELS Mentorship Roundtable event has been facilitating access to distinguished leaders in power electronics research and industry. Covering non-technical topics essential for professional growth, the Roundtable is an intimate setting comprised of the mentor who leads the topical discussion and a small group of mentees. The Roundtable event is open to all engineers at any stage of their career.

YOUNG PROFESSIONALS NETWORKING RECEPTION: *Eat, Drink, and Talk with the Pros*

Tuesday, February 27 | 7:00 PM – 9:00 PM
CAFE SEVILLA
140 PINE AVENUE, LONG BEACH, CA 90802

The Young Professionals (YP) Networking Reception is an opportunity to network with both other young professionals as well as highly-experienced professionals from both industry and academia. In this casual setting, YPs will have the opportunity to build connections with their peers, while chatting with, and getting valuable career advice from, established and well-regarded power electronics professionals, all with the added bonus of enjoying drinks and food provided included with attendance.

There is no fee but pre-registration is required.

WEDNESDAY, FEBRUARY 28

PELS WIE BREAKFAST: *Elevated Engineer: Emotional Intelligence*

Wednesday, February 28 | 8:00 AM – 9:00 AM
HYATT REGENCY HOTEL, REGENCY BALLROOM DEF

The new Elevated Engineer series, hosted by PELS WIE and DEI, will bring professional development training to conference attendees who are looking to not only excel in their technical careers, but also grow their leadership and management skills. This breakfast event will focus on Emotional Intelligence – a critical skill to help you build relationships, resolve conflicts, and succeed during stressful situations. Join to gain practical tools and valuable insights on how to level-up your leadership abilities. ***This event is welcome to all. Registration is free!***

WEDNESDAY NIGHT SOCIAL

Wednesday, February 28 | 6:00 PM – 9:00 PM
PACIFIC BALLROOM

On Wednesday night, APEC 2024 social event "A Night At The Pike" will transport you back to the glorious days of the early 1900s, where The Pike was visited for its amusements and delights! The social event will feature the sights and sounds of The Pike with an arcade, carnival games to test your skills, delicious food, and more. You will not want to miss this chance to relax, take a break from the conference, and socialize with other APEC attendees in such a fun experience.

This social event is included for all full conference and technical/industry session attendees with their registration. Attendees can purchase social event tickets for guests at the conference help desk for $125 during registration hours. Tickets are not sold at the door and cannot be replaced or reprinted.

SPONSOR MEETINGS

PSMA MEETINGS

MONDAY, FEBRUARY 26

8:00 AM – 11:30 AM	**PSMA Annual Meeting**	Hyatt Regency Hotel, Beacon AB
12:00 PM – 1:00 PM	**PSMA Board of Directors Meeting**	Hyatt Regency Hotel, Beacon AB

TUESDAY, FEBRUARY 27

8:00 AM – 10:00 AM	**PSMA Capacitator Committee Meeting**	Hyatt Regency Hotel, Beacon A
8:00 AM – 10:00 AM	**PSMA Energy Harvesting Committee Meeting**	Hyatt Regency Hotel, Beacon B
8:30 AM – 11:55 AM	**PSMA Sponsored Industry Session: Magnetics IS01**	Grand Ballroom B
8:30 AM – 11:55 AM	**PSMA Sponsored Industry Session: Transportation IS04**	201A
10:00 AM – 12:00 PM	**PSMA Energy Storage Committee Meeting**	Hyatt Regency Hotel, Beacon A
12:00 PM – 2:00 PM	**PSMA Packaging Committee Meeting**	Hyatt Regency Hotel, Beacon A

SPONSOR MEETINGS

TUESDAY, FEBRUARY 27 *(continued)*

12:00 PM – 2:00 PM	**PSMA Energy Management Committee Meeting**	Hyatt Regency Hotel, Beacon B
2:00 PM – 4:00 PM	**PSMA Semiconductor Committee Meeting**	Hyatt Regency Hotel, Beacon A
2:00 PM – 4:00 PM	**PSMA Transportation Committee Meeting**	Hyatt Regency Hotel, Beacon B

WEDNESDAY, FEBRUARY 28

8:00 AM – 10:00 AM	**APEC Student Attendance Support**	Hyatt Regency Hotel, Beacon A
8:30 AM – 11:55 AM	**PSMA Sponsored Industry Session: Energy Storage IS08**	202AB
8:30 AM – 11:55 AM	**PSMA Sponsored Industry Session: Packaging IS10**	201A
8:30 AM – 11:55 AM	**PSMA Sponsored Industry Session: Performance IS11**	201B
8:30 AM – 11:55 AM	**PSMA Sponsored Industry Session: Magnetics IS12**	203C
10:00 AM – 12:00 PM	**PSMA Reliability Committee Meeting**	Hyatt Regency Hotel, Beacon A
12:00 PM – 2:00 PM	**PSMA Magnetics Committee Meeting**	Hyatt Regency Hotel, Beacon A
12:00 PM – 2:00 PM	**PSMA Industry Education Committee Meeting**	Hyatt Regency Hotel, Beacon B
1:30 PM – 4:55 PM	**PSMA Sponsored Industry Session: Energy Harvesting IS14**	202AB
1:30 PM – 4:55 PM	**PSMA Sponsored Industry Session: Semiconductor IS15**	203AB
2:00 PM – 4:00 PM	**PSMA Marketing Committee Meeting**	Hyatt Regency Hotel, Beacon A
2:00 PM – 4:00 PM	**PSMA Power Technology Roadmap Commitee Meeting**	Hyatt Regency Hotel, Beacon B

THURSDAY, FEBRUARY 29

8:30 AM – 11:20 AM	**PSMA Sponsored Industry Session: Integration IS21**	203AB
8:30 AM – 11:20 AM	**PSMA Sponsored Industry Session: Reliability IS22**	201A

SPONSOR MEETINGS

IEEE PELS MEETINGS

SUNDAY, FEBRUARY 25

8:00 AM – 5:00 PM	International Future Energy Challenge (IFEC) Information Session	Hyatt Regency Hotel, Seaview B
8:00 AM – 2:00 PM	ETTC Meeting	Hyatt Regency Hotel, Seaview C
8:00 AM – 12:00 PM	EBL Meeting/Session	Hyatt Regency Hotel, Seaview A
3:00 PM – 4:00 PM	ITRW 2.0	Hyatt Regency Hotel, Seaview C

MONDAY, FEBRUARY 26

8:00 AM – 9:00 AM	Standards: Solid State Transformer (P3105)	Hyatt Regency Hotel, Seaview B
8:00 AM – 9:30 AM	Asian Power Electronics Coordinate Committee	Hyatt Regency Hotel, Seaview C
8:30 AM – 9:00 AM	Membership Committee Breakfast	Hyatt Regency Hotel, Seaview A
9:00 AM – 12:00 PM	PELS VP of Membership Meeting	Hyatt Regency Hotel, Seaview A
9:00 AM – 10:00 AM	TC 8: Electronic Power Grid Systems	Hyatt Regency Hotel, Seaview B
9:30 AM – 11:30 AM	TC 1: Control and Modelling of Power Electronics	Hyatt Regency Hotel, Seaview C
10:00 AM – 11:00 AM	eGrid Steering Committee	Hyatt Regency Hotel, Seaview B
11:00 AM – 12:00 PM	TC 12: Energy Access and Off-Grid Systems	Hyatt Regency Hotel, Seaview B
11:30 AM – 1:00 PM	PELS TC3: Electrical Machines, Drives and Automation	Hyatt Regency Hotel, Seaview C
12:00 PM – 1:00 PM	EBL and Energy Access Special Session	Hyatt Regency Hotel, Seaview B
12:00 PM – 1:00 PM	PELS Chapter Chair Forum Luncheon	Hyatt Regency Hotel, Seaview A

TUESDAY, FEBRUARY 27

8:00 AM – 9:30 AM	PELS & CPSS Meeting	Hyatt Regency Hotel, Seaview A
8:00 AM – 9:30 AM	PELS TC7: Critical Power and Energy Storage Systems	Hyatt Regency Hotel, Seaview B
9:00 AM – 11:00 AM	JESTPE	Hyatt Regency Hotel, Seaview C

SPONSOR MEETINGS

TUESDAY, FEBRUARY 27

9:30 AM – 11:00 AM	**PELS TC2: Power Components, Integration, and Power ICs**	Hyatt Regency Hotel, Seaview B
9:30 AM – 11:00 AM	**WIE Committee Meeting**	Hyatt Regency Hotel, Seaview A
11:00 AM – 1:00 PM	**VP of Industry and Standards/Industry Advisory Board Meeting**	Hyatt Regency Hotel, Seaview B
11:00 AM – 12:30 PM	**TC 10: Design Methodologies**	Hyatt Regency Hotel, Seaview A
11:00 AM – 12:00 PM	**Nominations Committee** ***(members only)***	Hyatt Regency Hotel, Seaview C
12:00 PM – 2:30 PM	**VP Global Intersociety Relations Education & Digital Media Scholarship & Fellowship Committee**	Hyatt Regency Hotel, Seaview C
12:30 PM – 2:00 PM	**TC 9: Wireless Power Transfer Systems**	Hyatt Regency Hotel, Seaview A
1:00 PM – 2:00 PM	**PEDG Steering Committee Meeting**	Hyatt Regency Hotel, Seaview B
2:00 PM – 3:30 PM	**PELS TC5: Sustainable Energy Systems**	Hyatt Regency Hotel, Seaview B
2:00 PM – 3:30 PM	**Mentorship Committee**	Hyatt Regency Hotel, Seaview A
2:30 PM – 3:30 PM	**ECCE Europe Steering Committee**	Hyatt Regency Hotel, Seaview C
3:30 PM – 5:00 PM	**TC 6: Emerging Power Electronic Technologies**	Hyatt Regency Hotel, Seaview A
3:30 PM – 5:00 PM	**TTE Editorial Board Meeting**	Hyatt Regency Hotel, Seaview B
3:30 PM – 5:00 PM	**Region 1-3 Chapter Chairs**	Hyatt Regency Hotel, Seaview C
5:00 PM – 6:00 PM	**TC 11: Aerospace Power**	Hyatt Regency Hotel, Seaview A
5:00 PM – 6:30 PM	**TC 4: Electrified Transportation Systems**	Hyatt Regency Hotel, Seaview B
5:15 PM – 6:30 PM	**SOBRAEP & PELS Meeting**	Hyatt Regency Hotel, Seaview C
6:30 PM – 8:30 PM	**PELS Mentorship Roundtables** ***(registration required)***	Long Beach Convention Center, 102AB
7:00 PM – 9:00 PM	**PELS/IAS/PSMA Young Professionals Reception**	Offsite – Cafe Sevilla

SPONSOR MEETINGS

WEDNESDAY, FEBRUARY 28

8:00 AM – 9:00 AM	**PELS Women in Engineering (WIE) Breakfast: Elevated Engineer, Emotional Intelligence**	Hyatt Regency Hotel, Regency Ballroom DEF
8:00 AM – 9:00 AM	**SPEC Steering Committee**	Hyatt Regency Hotel, Seaview C
9:00 AM – 10:30 AM	**ECCE Asia Coordination Committee Meeting**	Hyatt Regency Hotel, Seaview B
9:00 AM – 11:00 AM	**PELS VP of Products Committee Meeting**	Hyatt Regency Hotel, Seaview A
9:00 AM – 12:00 PM	**PELS VP of Technical Operations Committee Meeting**	Hyatt Regency Hotel, Seaview C
10:30 AM – 12:00 PM	**DE&I Committee Meeting**	Hyatt Regency Hotel, Seaview B
11:00 AM – 12:00 PM	**Editor's Open Discussion**	Hyatt Regency Hotel, Seaview A
12:00 PM – 1:30 PM	**PELS Publications Awards Luncheon**	Hyatt Regency Hotel, Regency Ballroom DEF
1:00 PM – 2:00 PM	**PELS Members' Congress**	Hyatt Regency Hotel, Seaview B
1:00 PM – 2:30 PM	**FEPPCON Steering Committee**	Hyatt Regency Hotel, Seaview A
1:00 PM – 5:00 PM	**PELS VP of Conferences Committee Meeting**	Hyatt Regency Hotel, Seaview C
1:30 PM – 3:30 PM	**TPEL Editorial Board Meeting**	Hyatt Regency Hotel, Regency Ballroom DEF
2:00 PM – 3:00 PM	**PELS Day 2024 Planning Committee**	Hyatt Regency Hotel, Seaview B
2:30 PM – 4:00 PM	**New Adcom Member Orientation**	Hyatt Regency Hotel, Seaview A
3:00 PM – 4:00 PM	**Publicity Committee Meeting**	Hyatt Regency Hotel, Seaview B
4:30 PM – 5:30 PM	**IEEE PELS MagNet Challenge 2023 Award Ceremony**	Hyatt Regency Hotel, Regency Ballroom DEF

THURSDAY, FEBRUARY 29

11:00 AM – 5:30 PM	**PELS Administrative Committee Meeting**	Hyatt Regency Hotel, Seaview AB

SESSION REVIEWERS

Thank You
TO ALL OUR 2024 TECHNICAL TRACK CHAIRS!

- Adam Skorek
- Ali Khajehoddin
- Ali Safayet
- Arijit Banerjee
- Ayman Fayed
- Cahit Gezgin
- Dinesh Kumar
- Dong Cao
- Dorin Neacsu
- Ed Herbert
- Erdem Asa
- Fei Gao
- Fei Yang
- George Slama
- Gerry Moschopoulos
- Haoyu Wang
- Harish Krishnamoorthy
- Hengzhao Yang
- Jaber Abu Qahouq
- James Victory
- Jeff Nilles
- Jim Marinos
- Jonathan Kimball
- Khorshed Alam
- Liming Liu
- Manuel Arias Perez De Azpeitia
- Matt Wilkowski
- Matt Woongkul Lee
- Mehdi Farasat
- Mehdi Narimani
- Minjie Chen
- Mohammed Agamy
- Olivier Trescases
- Raghav Khanna
- Rakib Islam
- Rasoul Hosseini
- Seungdeog Choi
- Sombuddha Chakraborty
- Suman Debnath
- Tao Yang
- Teifu Zhao
- Xiaonan Lu
- Xin Zhang
- Ziaur Rahman

PROFESSIONAL EDUCATION SEMINARS

APEC Professional Education Seminars focus on the practical aspects and theoretical foundation of power conversion. They offer in-depth discussions of important and complex topics in system and circuit designs, about active and passive components, and popular applications in power electronics. The seminars are given by leading authorities from the industry, academia and research communities, and they expertly combine practical applications with theory. These tutorials are designed to further educate the working professionals and students in power electronics.

SESSION 1

9:30 AM – 1:00 PM

S01: Advanced Power Electronics for Smart Battery Testing, Analysis, and Digital Twin-Based Battery Management Systems

ROOM 102AB

TRACK: Systems

Sheldon Williamson, Akash Samanta, *Ontario Tech University*

David Theuerkauf, *AVL Test Systems, Inc.*

Batteries play a pivotal role in ensuring the long-term technical and commercial success of e-mobility. Their dynamic characteristics necessitate rigorous testing and analysis to ensure battery safety, reliability, and performance. Testing and analysis not only underpin innovation, but also contribute to the sustainability of battery technology and its applications. Keeping this in mind, this professional education seminar will comprehensively address a wide array of testing techniques, standards, and market-available products. Notably, battery degradation is pronounced during low-temperature fast charging. Thus, few health-conscious fast charging methods and associated power electronics will be discussed. Given the intricate and sensitive nature of LIB behavior under varying conditions, implementing intelligent safety frameworks and smart battery management systems (BMS) becomes paramount. Here, a detailed discussion on the functionalities of BMS and associated power electronics converters will be discussed. For effective BMS operation, detailed information of battery states and aging profiles are indispensable. Recent strides in cloud computing, digital twin technology, artificial intelligence and machine learning-based state estimators hold substantial promise in addressing these challenges. Hence, the latest progress and emerging trends in these domains, including thermal management control and the IoT will be discussed, catering to researchers and development engineers alike.

SESSION 2

9:30 AM – 1:00 PM

S02: Modern Magnetic Technologies for Very High Efficiency and Power Density

ROOM 104B

TRACK: EMI & Magnetics

Ionel Dan Jitaru, *Rompower Energy Systems Inc.*

The tremendous progress in semiconductor technology moved the spotlight for efficiency quest towards magnetics. The progress in magnetic technology has been limited, though novel magnetic solutions were developed and used in some recent applications. The seminar will focus on the latest magnetic technologies capable of pushing efficiency to a very high level. A study of the loss mechanism in magnetics and ways to improve it, together with novel magnetic structures will be presented.

The seminar will present in detail all the parasitic elements in magnetics, the loss mechanism associated with it and solutions in addressing them. The following items will be analyzed:

- Leakage Inductance and methods of control and reduction.
- Stray Inductance and its effects.
- Parasitic capacitances and method of reduction.
- Gap effect and techniques to reduce it.
- EMI suppression in transformers.
- Loss due to the "end effect" and methods of reduction.

This section will also be highlighted with design examples in application wherein the power conversion efficiency reached 99%. The presentation will include the "multi-legged" magnetic technology, which is the latest magnetic technology today, referred also as "ultra-planar" magnetic. Other forms of distributed magnetic structures will be presented, some of them in power converters with the highest power density and lowest profile on the market.

SESSION 3

9:30 AM – 1:00 PM

S03: Optimal LLC Converter Design: From First Harmonic Approximation through Design Oriented Analysis

ROOM 104A

TRACK: Design

Mladen Ivankovic, *Infineon Technologies*

The training provides practical approach based on Design Oriented Analysis to develop a high performance LLC tank configuration in relation to your design targets, and selects the right components and optimizes their values, based on a power loss budgeting plan.

Design is the reverse of Analysis: one starts with specification, which is answer to the analysis, and one has to work the analysis backwards to find starting point, which is the circuit configuration and the element values. LLC converter FHA model was used to develop circuit equations that are simple yet physically insightful. Boundary condition investigation using vectors is the core of this method. Discovery of the orthogonality between inverse gain vector of the LLC and serial equivalent load vector leads to the very simple and close form equations for the LLC components. They enable seamless flow and exchange between analysis and design. Having in mind limitations of FHA model, it was necessary to bring exact solution from time domain and compare them with FHA results. It was done by using simplified LT spice simulation. Comparison resulted with generation of the ROT (Rules of thumb) for LLC design. The topic will be treated in depth on intermediate level.

SESSION 4

9:30 AM – 1:00 PM

S04: Compact Control Loops for Switched-Inductor DC-DC Power Supplies

ROOM 103AB

TRACK: High Power Density

Gabriel Alfonso Rincón-Mora, *Georgia Institute of Technology*

Switched-inductor DC–DC power supplies are pervasive in consumer electronics. This is because they deliver a large fraction of the power they draw with an output voltage that is largely independent of the load and the input. Keeping the output voltage steady this way is the responsibility of the feedback controller. This talk uses insight and intuition to show how pulse-width-modulated (PWM), hysteretic, and timed peak/valley loops switch the inductor, offset the voltage they control, and respond to load dumps and input variations. The presentation then shows how summing comparators operate and how they can contract, offset, and compensate these control loops (for reduced offset and stable operating conditions). Some of the topics discussed include negative feedback, frequency response, bandwidth, response time, sub-harmonic oscillations, and voltage- and current-mode control. While some of the concepts discussed can be found in literature, they are often abstract, algebraic, incomplete, and spread over several sources. This presentation, on the other hand, is concise, comprehensive, and full of insight. With this background and understanding, designing and implementing compact feedback controllers for switched-inductor power supplies is more straightforward. This tutorial is intended for entry, intermediate, and advanced technologists in the field of power electronics.

SESSION 5

9:30 AM – 1:00 PM

S05: Power Electronics Technologies for Data Center Energy Saving and Decarbonization

ROOM 101AB

TRACK: Applications

Yenan Chen, PhD, Dehong Xu, *Zhejiang University*

The world's data centers currently consume about 480 to 660 TWh of electricity annually, accounting for 1.7% to 2.2% of the world's electricity generation. Traditional power delivery architectures in data centers are bulky and inefficient. About 40% of the data center energy consumption comes from the losses in power conversion. Such high energy consumption and the related carbon emission have raised public concerns about their economic and environmental impact.

There is a long path to convert electricity from the utility grid to the onboard CPUs, including multiple AC-DC, DC-AC, DC-DC stages from 10 kVac to ~ 1Vdc. This tutorial will introduce the current status of ICT industry on both digital and energy aspects, provide an overview of the state-of-the-art of power supply architecture and topology in data centers, and discuss the key principles on designing and implementing these power electronics technologies for data center energy saving and decarbonization.

Three topics will be discussed: zero-voltage-switching (ZVS) three-phase/single-phase AC-DC/DCAC/ BTB converters as grid interface, Super-UPS/Multicell MIMO energy router for renewable integration, and 48-V voltage regulator modules (VRM) for high current CPU and

GPU. The ZVS AC-DC/DC-AC/BTB converters aim to solve the switching loss issue and improve the efficiency and power density of the grid interface of data centers. Based on the resonant dc link concept, a family of three-phase/single-phase ZVS AC-DC/DC-AC/BTB converters and a unified modulation strategy (Edge Aligned-PWM) will be introduced. The engineering challenges, practical details of this approach, and the impact of wide band-gap (WBG) devices tech will be discussed.

The second topic introduces two architectures for renewable integration in data center: the Super-UPS and Multicell MIMO (Multi-Input Multi-Output) energy router. Super-UPS is the evolution of UPS by adding natural gas, PV and Hydrogen fuel cell to the DC bus by multiple bi-directional DC-DC converters and DC-AC converters. This architecture not only reduce the carbon emission but also increases the system reliability significantly. Multicell MIMO energy router is a modular design in which a large number of cells are coupled by a single magnetic core. The conversion stages are reduced whereas the power flow control is more complicated compared to the Super-UPS with DC bus. The operation principle and the comparison of two architectures will be presented in detail in this tutorial.

The 48V architecture is now becoming the mainstream choice for powering the high current microprocessors in data centers. Meanwhile the power consumption and transient current of microprocessor is also increasing with the improvement of performance. The 48-V VRM aims to address the challenge of very high voltage conversion ratio for high performance microprocessors. A family of hybrid switched-capacitor topologies leveraging the low voltage device, the high energy density of capacitor, and precise regulation of inductor will be introduced. The magnetic design and fast dynamic control will also be introduced.

SESSION 6

9:30 AM – 1:00 PM

S06: Advanced Power-Electronics Control for Practicing Engineers

ROOM 104C

TRACK: Control

Sudip Mazumder, *University of Illinois*

Debanjan Chatterjee, PhD, *ABB Corporate Research*

This tutorial provides a fundamentally different perspective to multi-scale control of switching power electronic systems along with plurality of practical experimental results and is expected to be of great interest to the power electronic system engineers, professionals, educators, and students. Many new materials are planned for this tutorial with several recent developments. The tutorial will start with basics for engineers, professionals, researchers, and students and gradually working its way through to intricacies in advanced control concepts, realizations, and practical implementations for advance control realizations on new topologies and control platforms.

The first part of the tutorial will primarily focus on switching sequence-based control for power electronics systems. By enabling integration of modulation and control, switching sequence-based control precludes the need for ad-hoc offline modulation synthesis. In other words, an optimal switching sequence for the power converter is generated dynamically without the need for prior determination of any modulation scheme (which generates a pre-determined switching sequence) in typical conventional approaches.

The tutorial will provide the mechanism to carry out switching sequence-based control and model predictive control syntheses and demonstrate the differences between the two optimal control schemes. Several device, converter, and network level implementations (e.g., microinverter, solar inverter, pulsed-power systems, microgrid, parallel inverters, multilevel converter, aircraft power system) of the switching sequence-based control will be provided encompassing author's multiple years of project experience encompassing leading advanced defense and energy industries.

Finally, the tutorial will focus on switching transition control. The primary objective of this control is to demonstrate how key power electronic system parameters including dv/dt and di/dt stress, switching loss, and electromagnetic noise emission can be controlled dynamically by modulating the dynamics of the power semiconductor devices. Both electrical and newly developed optical control mechanisms to achieve switching transition control will be demonstrated.

This tutorial is intended for a wide spectrum of researchers, industry professional, educators, and students reflecting the typical distribution of APEC 2024 audience. The tutorial will start with basics of modern controls outlined above, leading up to the elucidation of the novel mechanisms, followed by multiple applications to show the utility of the advanced controls and how practicing engineers and researchers can benefit of them.

SESSION 7

2:30 PM – 6:00 PM

S07: DC Fault Protection: Current Status, Fundamental Challenges, and Future Outlook

ROOM 102AB

TRACK: Systems

John Shen, *Simon Fraser University*

DC power is attractive for electric vessels. However, DC circuit breakers (DCCBs) must be provided for LVDC (<1kV), MVDC (<40kV), and HVDC (100's kV) power systems. A wide range of DCCB technologies have been investigated for different applications.

Presently, solid-state circuit breakers (SSCBs) can quickly interrupt a DC fault current within tens of microseconds but suffer from high conduction losses and weight and cost penalties associated with the cooling and semiconductor components, especially for high power applications. The most distinct advantage of semiconductor switches is their capability of switching current during fault interruption while the most distinct disadvantage is their nonnegligible on-resistance when conducting current. Unfortunately, they are used in SSCBs in the worst way possible—continuously dissipating power except during infrequent fault interruption. Numerous hybrid circuit breaker (HCB) schemes have been proposed to offer an on-state resistance 2-3 orders of magnitude lower than that of SSCBs. All the HCBs are of parallel type, in which an electronic path is in parallel with a main mechanical switch. The fault current in the mechanical switch is initially commutated to the electronic path to create artificial current zero crossings in various forms to aid the opening of the mechanical switch. The electronic path will then be interrupted with varistors (MOV) clamping the transient voltage surge and absorbing the residual electromagnetic energy. However, these HCB solutions offer only a moderate fault response time of several milliseconds. This may be too slow to limit the fast-rising fault current in low-impedance DC power networks. The most distinct disadvantage of all the HCBs is the relatively long opening time of the mechanical switch to achieve a sufficiently wide gap for sustaining the DC voltage, during which the fault current continues to rise through the electronic path.

This two-hour tutorial will provide a review and performance comparison on the state of the art DCCB solutions in a systematic way. It will cover several case studies of various types of DC circuit breakers. This talk will also hightlight the fundamental challenges faced by the DCCB technologies and shed some light on future research directions.

SESSION 8

2:30 PM – 6:00 PM

S08: EMC Workshop for Power Supply Designers

ROOM 104C

TRACK: EMI & Magnetics

Jared Quenzer, *Würth Elektronik*

This seminar is for the target audience of power supply designers with entry level or intermediate knowledge on EMC. The seminar includes a portable conducted emissions test setup that utilizes low voltage (<60VDC) to demonstrate fundamental EMC troubleshooting in a practical way by using a lecture style that includes first the explanation of theory, then the simulation, then a live test to prove empirically how the theory holds true on a real design. The test board separates out common mode and differential mode noise so that the exact source of the EMI can be understood more fully and therefore a better solution can be implemented. It is common to see engineers using a guess and check method by just grabbing whatever components are available nearby, testing and then deciding what the next step is based on the test results.

Although this iterative method sometimes works, as engineers, we should strive to better understand the underlying phenomena to be able to implement a more precise solution and resolve EMC issues with less time and effort. The seminar will accomplish this by focusing on practical tips and tricks.

SESSION 9

2:30 PM – 6:00 PM

S09: Three-Level Neutral-Point-Clamped Converters When Two Levels are not Enough

ROOM 101AB

TRACK: Design

Sergio Busquets-Monge, *Universitat Politècnica de Catalunya*

Ariya Sangwongwanich, Mateja Novak, *Aalborg University*

Nowadays, with the increasing electrification in transportation and demand on high-efficient and reliable energy conversion from the renewable energy sources like wind and solar energy, the understanding of multi-level topologies, which can satisfy these demands, is of a great importance to both academia researchers and industry.

This seminar will provide the participants with the knowledge of basic concepts and control design challenges for three-level neutral point converters (NPC) in different applications. It will start with basic operating principles of the topology (NPC, T-type and ANPC) and their control challenges such as neutral point voltage balancing and thermal stress distribution. Then, two different control approaches will be presented: carrier-based PWM techniques and model predictive control techniques. For each control technique, basic concept and step-by-step implementation guideline will be provided, followed by more application-oriented examples and implementation challenges.

An approach to analyze the reliability of power electronics converters will also be introduced, which includes thermal stress modelling, lifetime prediction, and reliability evaluation. It will be demonstrated that control algorithm selection has a major impact on the reliability of semiconductor devices and DClink capacitors in NPC converters.

The seminar is intended both for academia researchers and industry, who do not have previous knowledge about the NPC topology (basic operating principles will be explained), and for those who are familiar with the topology and would like to learn more about ongoing research directions and novel control solutions.

SESSION 10

2:30 PM – 6:00 PM

S10: Direct to Chip (DtC) DC-DC Converters for AI Chips

ROOM 104A

TRACK: High Power Density

José A. Cobos, PhD, *Universidad Politécnica de Madrid*

High performance computing chips, as those used in AI and data centers require high performance dc-dc power converters. A first challenge is to supply low voltages 0.5-1.2V with AVS (adaptive voltage scaling), high current (up to 15,000A) and very demanding load steps (up to 5,000A/us). A second challenge is a high and variable voltage gain to generate a tight supply voltage from a 48Vdc bus. Low losses (peak efficiency >97%) and high surface current density (>1A/mm2) complete these high performance requirements.

Proposed "SURFACE power delivery" is an extension of the "VERTICAL power delivery" trend that is replacing "LATERAL power delivery" in high current applications to reduce copper losses in the power delivery path.

Three novel concepts are described in this talk: a) "extended duty cycle" (60-95%) in both primary and secondary power switches; b) "segmented winding transformer, SWT" and c) "edge dynamics". These three concepts are implemented in a novel "Direct Power Converter with High Voltage inside, DPx-HV".

SESSION 11

2:30 PM – 6:00 PM

S11: The Complete Guide to PCB Layout for HV GaN Power Stages

ROOM 104B

TRACK: Applications

Eric Persson, *Infineon Technologies*

Following the top-rated 2022 APEC seminar on PCB layout, this fully updated seminar covers additional topologies, and focuses more on the process of understanding where transient currents flow, and how to best route them for a wide variety of topologies and applications.

GaN transistors have an extremely high gain-bandwidth product, which can make circuit layout and routing more challenging than any other transistor technology. Whether you plan to use discrete GaN transistors with external gate drivers, or package-integrated driver+transistor, these layout and routing fundamentals apply just the same. The only difference is that the layout and routing inside the package is pre-defined for integrated GaN.

Understanding and using these techniques will help you to minimize ringing and overshoot on the Bus and gate signals, and achieve cleaner, lower-noise switching. In addition, low loop-inductance generally reduces radiated EM fields, helping to improve on-board EMC issues as well as lower conducted and radiated emissions.

The main focus of this seminar is on transistors in the 650 V class, at power levels from 50 W to 20 kW. The intended audience is students and practicing power engineers working with GaN transistors.

SESSION 12

2:30 PM – 6:00 PM

S12: State Space Based Control As an Alternative to Conventional Loop Design

ROOM 103AB

TRACK: Control

Dorin Neacșu, *Technical University of Iasi*

Due to the impressive technology improvement in semiconductor and packaging technologies, the R&D effort moves towards controller implementation. While conventional feedback control design methods in frequency domain are well mastered in industry, this seminar demonstrates a major leap forward with the use of State Space based design. This time-domain modern control is usually perceived as an advanced control or research topic due to its inherent mathematical support. This seminar has the merit of scaling down the advanced concept for making it easier for either analog or digital implementation. Comparative to other design methods, the State Space based design reduces IC's external component count, guarantees controllability, and provides an easier optimization. Instead of the conventional loop tuning, a formula calculates gains instantly. It is physically equivalent with a voltage/current cascaded control. When applied to multi-phase dc/dc converters with phase dropping, the phase dropping does not change dynamic performance for any phase count. An in-depth presentation of the method's actual simplicity, with both digital and analog examples, opens this topic to any audience.

SESSION 13

8:30 AM – 12:00 PM

S13: Solid State Transformer: Topologies, Use Cases, Design Considerations, and Challenges

ROOM 102AB

TRACK: Systems

Ilknur Colak, *Schneider Electric*

Solid State Transformers (SST) are highly attractive both in industry and academia as they provide interface between medium-voltage AC (or DC) grids and low-voltage AC (or DC) grids and bring the benefits of modularity, flexibility, scalability, smaller footprint, less weight, bidirectional power flow and high-power quality to the units at the grid connection. Back in the 1990s they were attractive in the industry mainly to reduce weight and volume of the AC/DC converters in the rail applications. However, the interest in SST decreased due to its complex design and lower efficiency compared to conventional transformers.

In the last two decades the increasing DC applications in the area of Electric Mobility, Renewable Energy, Smart Grids, Datacenters and DC Microgrids brought back the interest to SST systems. Various topologies and control methods were proposed, and several demonstrators have been developed since then.

In this tutorial an SST overview will be shared with the audience and design criteria will be explained.

SESSION 14

8:30 AM – 12:00 PM

S14: EMI/EMC Debugging with Oscilloscopes

ROOM 103AB

TRACK: EMI & Magnetics

Arturo Mediano, PhD, *University of Zaragoza*

Electromagnetic Interference (EMI) debugging in electronics including localizing intermittent failures can be frustrating without an appropriate strategy.

This seminar covers the fundamentals of practical EMI/EMC design and troubleshooting of electronic circuits, using state-of-the-art scopes to analyze your circuits in both time and frequency domains.

The use of voltage, current, and near-field probes, Line Impedance Stabilization Network (LISN), and antennas, will be reviewed combined with some tips for best practice with state of the art oscilloscopes.

A practical demo using a product including a DC/DC converter and digital electronics will be used to demonstrate the effectiveness of these techniques.

Because of the practical orientation, the seminar will be interesting for electronic designers, especially for power electronic engineers who need to solve EMI/EMC problems every day in their labs to comply with Electromagnetic Compatibility (EMC) regulations.

This seminar covers the fundamentals for troubleshooting an electronic design with electromagnetic interferences (EMI), or Electromagnetic Compatibility (EMC) problems using state of the art oscilloscopes. Attendees will discover how to localize, characterize, and solve radiated and conducted emission problems in a very understandable and practical style.

The seminar will use an electronic prototype for a product failing conducted and radiated emissions as a guiding thread for the explanations trying to make changes in the design until the requirements of the regulations are met. Workshop attendees can see the development of the experiments thanks to a camera and oscilloscope connected to the instructor's computer.

SESSION 15

8:30 AM – 12:00 PM

S15: PV Inverter Design – Topologies, Control and System Considerations

ROOM 101AB

TRACK: Design

Arnab Acharya, Raja Ayyanar, PhD, *Arizona State University*

Dhaval Dalal, *ACP Technologies*

The proliferation of renewable energy in all parts of the modern grid have led to a tremendous growth in the power electronics related content and activities in the recent years. While many of the topologies used for PV inverters have a lot in common with the traditional ac-dc or dc-dc power conversion, there are many unique aspects of the PV inverter design that mainstream power converter designers are less familiar with.

The motivation for this seminar is to demystify the design aspects of the PV inverters in a structured manner. A brief inverter architecture overview kicks off the seminar, followed by introduction to PV panel electrical characteristics. Next, each stage of the PV inverter is fully explained in terms of system requirements, power stage implementations and control methodology – power pole concept and cycle-by-cycle averaging (CCA) are employed to simplify and standardize the operating modes analysis. Specific requirements pertinent to the PV inverter design such as MPPT, grid synchronization and islanding detection are addressed. Finally, advanced topics, including 3-phase inverter design and grid-forming inverters are covered in detail.

SESSION 16

8:30 AM – 12:00 PM

S16: Technologies for Achieving Ultra-High Efficiency and Ultra-High Power Density DC-DC Power Converters

ROOM 104A

TRACK: High Power Density

Yan-Fei Liu, *Queen's University*

Don Tan, *E2 Systems*

This seminar discusses the challenges in achieving ultra-high efficiency, such as 99%, and ultra-high power density, such as 2kW/in3. Most of the seminar focuses on 48V to 12V converters although the concepts are broadly applicable for a wide range of voltage levels. After a review of the fundamental sources of losses in DC-DC converters and how to minimize them, the seminar provides in-depth evaluation on the most efficient and high density topologies presented in literature thus far. The key concepts for achieving higher than 99% efficiency at a power density of more than 2kW/in3 are: easily paralleled "modular" designs for lower conduction loss, multi-level structures for lower voltage stress, low switching frequency for lower switching losses, full duty ratio operation for maximum utilization of power switches, and new circuit topologies for significant reduction of the size for inductors. At the end, the seminar will propose and discuss a new power architecture for 48V to 0.7V (down to 0.3V), 2,000A (or higher), application that will achieve extremely high efficiency (40V-0.7V), extremely small size, and current sharing, expandable, fast dynamic response, etc.

SESSION 17

8:30 AM – 12:00 PM

S17: High-Power GaN Devices and Applications

ROOM 104B

TRACK: Applications

Davide Bisi, PhD, Philip Zuk, Tushar Dhayagude, *Transphorm*

GaN devices enable smaller, lighter, and more efficient power systems. GaN has not only entered low-power applications, such as cellphone and laptop chargers, but is also being used and evaluated for several other, high-power applications, including power supplies, data centers, energy harvesting, on-board chargers, and motor drives. In this seminar, we describe the latest high-power GaN technologies and discuss the opportunities for high-power applications. The first part focuses on devices: we compare e-mode and cascode architectures and discuss strategies to achieve high current (up to 150 A for a single chip) and high voltage rating (up to 1200 V). We analyze switching transients and discuss good practices to drive GaN devices fast and reliably. You will learn about GaN reliability, including qualification standards, lifetime tests, and short-circuit capability. The second part focuses on applications: we review high-power hard-switching and soft-switching topologies and provide design recommendations to make the most out of high-power GaN devices. The seminar concludes with a discussion on market challenges and opportunities for GaN adoption in high-power applications.

SESSION 18

8:30 AM – 12:00 PM

S18: Practical Implementation of Mixed-Signal Controllers for Conventional and Emerging High-Frequency Dc-Dc SMPS

ROOM 104C

TRACK: Control

Aleksandar Prodić, *University of Toronto*

The seminar will cover design and implementation of digital and mixed-signal controllers for HF dc-dc SMPS, processing power from a fraction to few hundred watts and operating at switching frequencies up to tens of MHz. The SMPS of interest form power management systems (PoMS) of virtually all electronic devices today, including space and cost constrained applications.

The targeted audience are engineers with power electronics and control background. It is expected that both novice in the area and those with years of experience will benefit from the seminar.

The seminar will start with a concise review of modern PoMS, looking at conventional and emerging converter topologies, the roles and requirements of controllers, and at control methods. Benefits and challenges associated with digital and mixed-signal control will also be addressed.

Then, an in-depth coverage of design and implementation of fully-digital voltage and current-programmed mode controllers, as well as of mixed-signal solutions, for conventional, i.e. 2-level buck and boost topologies will be given. Also, high-performance controllers will be presented.

Next we will look at new challenges of controlling emerging flying capacitor topologies (multi-level and series capacitor converters) and show solutions for the same, utilizing design principles previously shown, in the in-depth analysis.

PLENARY SESSION

The APEC Plenary Session is a long-standing tradition of addressing topics of immediate and long-term interest to the practicing power electronic professional. The on-trend topics featured during the plenary session are brought to you by specially invited, distinguished professionals followed by an interactive Q&A.

GRAND BALLROOM AB

1:00 PM – 1:10 PM

Opening Welcome Message

SPEAKER:

Tim McDonald
APEC 2024 General Chair

1:10 PM – 1:20 PM

Presentation of the 2024 IEEE William E. Newell Power Electronics Field Award to David Perreault

PRESENTER:

Kevin Peterson
IEEE Division II Director

1:20 PM – 1:30 PM

Plenary Introduction

SPEAKER:

Tony O'Gorman
APEC 2024 Program Chair

1:30 PM – 2:00 PM

Surgical Energy: Connecting Power Electronics to Patients – Literally!

SPEAKER:

Daniel Friedrichs
Senior Principal Engineer
Minnetronix Medical

Medical applications of power electronics may seem limited to AC/DC and housekeeping power supplies, but an entire class of medical devices exist where power converter outputs are directly connected to patients to achieve different therapeutic effects and improve lives. These include thermally-based therapies (such as ablation and electrosurgery) and electric field-based therapies (such as pulsed field ablation and electro-chemotherapy). Dr. Friedrichs will share examples of clinical therapies dependent on power conversion that include correcting heart arrythmias, ablating tumors, delivering vaccines, and treating genetic disorders. Additionally, this plenary will discuss the unique power electronics challenges that exist in this space, along with future opportunities for power electronics suppliers and designers to accelerate their impact on healthcare.

Daniel Friedrichs leads development of surgical energy systems for Minnetronix Medical, a development and manufacturing partner to the medical device industry. He has specialized in medical power electronics for 15 years and holds over 35 patents related to medical applications of power converters. Dr. Friedrichs has a Ph.D. in Electrical Engineering from the University of Colorado Boulder, is a licensed Professional Engineer, and is a Senior Member of IEEE.

2:00 PM – 2:30 PM

Opportunities, Progress and Challenges in High-Frequency Power Conversion

SPEAKER:

David Perreault
Ford Professor of Engineering
Massachusetts Institute of Technology

Advances in the performance of power electronics – including their size, efficiency and control bandwidth – are essential to reducing energy consumption and increasing functionality in myriad applications. Increases in switching frequency into the high-frequency (HF, 3-30 MHz) range and beyond offers the potential to reduce energy storage requirements, achieve higher bandwidth and greater miniaturization, and advance applications. At the same time, there are numerous challenges to design at HF, including in devices and passive components, circuits, controls and packaging. This talk will explore opportunities, challenges and progress in the design of HF power electronics. Examples will be provided illustrating high-performance HF power components and systems and their application.

David Perreault received the B.S. degree from Boston University and the S.M. and Ph.D. degrees from the Massachusetts Institute of Technology, all in Electrical Engineering. He is presently the Ford Professor of Engineering at MIT. His research interests include design, manufacturing, and control techniques for power electronic systems and components, and in their use in a wide range of applications. Dr. Perreault is a Member of the U.S. National Academy of Engineering, a Fellow of the IEEE and the recipient of many awards including the IEEE R. David Middlebrook Achievement Award for his work in power electronics. He is co-author of sixteen IEEE prize papers in the area, and of the textbook "Principles of Power Electronics, 2nd Edition" (Cambridge University Press, 2023). Dr. Perreault also co-founded startup companies Eta Devices (acquired by Nokia in 2016) and Eta Wireless (acquired by Murata in 2021).

2:30 PM – 3:00 PM

Innovating for Sustainability and Profitability: How innovations in efficiency enable us to do good for the environment while doing well as a business

SPEAKER:

Balu Balakrishnan
Chairman and CEO
Power Integrations

Fundamental microelectronics innovations such as high voltage GaN and developments in power converter topology and implementation, are key weapons in the world's push for decarbonization and energy sustainability. Together, they deliver excellent efficiency, eliminate many parts from system bills of materials, minimize power sub-system volume, heatsinking requirements and enclosure size and weight. The environmental benefits of smaller physical size, reduced complexity and minimal heat dissipation ripple through the supply and use chain from primary mineral sourcing to shipping costs to end user electricity bills. Even so, when sustainability is considered at a business level, there's often a question of whether or not you can run a growth-oriented and profitable enterprise while providing products with an environmental focus. This presentation discusses the critical role of efficiency in sustainability and how our innovations allow us to do good for the environment while doing well as a business.

Balu Balakrishnan joined Power Integrations in 1989, serving in a variety of roles before becoming president and COO in April 2001. He was named CEO and appointed to the company's board of directors in January 2002. He was named chairman of the board in 2023. Mr. Balakrishnan has more than 40 years of engineering, marketing and management experience in the semiconductor industry, including product-line management responsibility at National Semiconductor Corporation. He is the chief inventor of several key Power Integrations products and technologies and holds more than 200 U.S. patents. He has received the Discover Award for Technological Innovation as well as a TechAmerica Innovator Award, both in recognition of the environmental benefits of EcoSmart technology.

3:00 PM – 3:30 PM

BREAK

**speakers, times, and topics subject to change.*

3:30 PM – 4:00 PM

The Drive for Silicon Carbide – A Look Back and the Road Ahead

SPEAKER:

Gregg Lowe
CEO
Wolfspeed

Discover the transformative journey of Silicon Carbide (SiC) from a nascent idea to a pivotal component in power electronics, most evident today in electric vehicles (EVs). This conversation traces the 35-year evolution of American ingenuity, emphasizing SiCs's role in revolutionizing power management for mid- to high-powered applications and its vital contribution to the transition from internal combustion engines to EVs. Lowe will delve into the challenges and breakthroughs that have marked silicon carbide's progress. Attendees will gain insights into the future of silicon carbide in power electronics, exploring its potential to drive sustainable and efficient power solutions in the evolving landscape of energy and transportation.

Gregg Lowe joined Wolfspeed in September 2017 as president and chief executive officer (CEO) and has transformed it into the world's only pure play, vertically integrated silicon carbide company. Under his tenure, Wolfspeed is leading the rapid expansion of the silicon carbide market by committing over $8B toward expanding operations. Prior to Wolfspeed, Lowe served as president and CEO of Freescale Semiconductor, where he led the successful merger with NXP Semiconductors N.V. to create a high-performance, mixed-signal semiconductor industry leader. Gregg also had 28-year career at Texas Instruments, which included executive roles as senior vice president and leader of the analog business. Gregg holds a Bachelor of Science in Electrical Engineering and an Honorary Doctorate of Engineering from the Rose-Hulman Institute of Technology and is a graduate of The Stanford Executive Program (SEP) at Stanford University.

4:00 PM – 4:30 PM

Fusion Energy is Coming: The Key Role of Power Electronics to Commercial Fusion

SPEAKERS:

AJ Kantor
Chief of Staff
Zap Energy

Matthew C. Thompson
Vice President of Systems Engineering
Zap Energy

Fusion energy offers the potential for abundant, on-demand, carbon-free power. But for the past seven decades, fusion has largely been a scientific R&D effort restricted to national labs and universities. In recent years, however, things have begun to shift as private investors have begun backing an array of companies with plans for commercializing fusion — to the tune of $6 billion to date. Zap Energy is one such team, developing an approach to fusion called the sheared-flow-stabilized Z pinch. Zap's technology avoids the enormous, costly, and complex magnets and lasers of other fusion concepts, but does require several first-of-a-kind systems – including 1MA scale, high-average-power repetitive pulsed power units based on durable solid-state switches. In this keynote Zap's VP of Systems Engineering Matthew C. Thompson and Chief of Staff AJ Kantor will describe the electrical power handling requirements of fusion systems in general, the fusion industry landscape, what makes Zap's approach unique, and why power electronics are a critical technology for it to succeed.

AJ Kantor has devoted her career to building bold and challenging technical projects — at Tesla, supporting critical raw material supply chain strategy, internal systems development, a downstream supply chain program, global battery line builds, and the Tesla battery cell program. From there she moved to venture capital, where she focused on hard tech investing and participated on the boards of companies from incubation-stage through IPO. Her experience in large scale, time-bound R&D and technical programs along with her deep exposure to company building at all stages has brought her to Zap Energy, where she is working to bring the same degree of rigor and innovation to the field of fusion power.

Matthew C. Thompson leads a 45-person division at Zap Energy tasked with developing fusion power plant technologies including repetitive pulsed power, liquid metal walls, and durable electrodes. Dr. Thompson received his BS in physics from Stanford Univ., and his MS and PhD in experimental plasma physics are from UCLA. He has worked at Lawrence Livermore National Laboratory, TAE Technologies, and BAE Systems. Dr. Thompson is a Fellow of the American Physical Society (APS), past Chair of the APS Forum on Industrial and Applied Physics, and a past Chair of the APS Committee on Careers and Professional Development. He has mentored numerous students, co-founded a major mentoring program called IMPact, and writes about career issues for physical scientists, including in a published book on the subject.

4:30 PM – 5:00 PM

The Future of AI Requires Efficient Power Delivery inside the Processor

SPEAKER:
Francesco Carobolante
Director Corporate Strategy & Ventures
Intel Corporation

The development of IVRs (Integrated Voltage Regulators) has been an effort now lasting for over 20 years, but never before it has become such an important focus as it is today. AI processors are approaching currents of 1,000 A and heterogeneous integration is bringing a variety of demanding loads, from traditional logic and memory to optical interfaces, inside the package. As already recognized by many thought leaders, energy efficiency is the ultimate metric to achieve the vision of sustainable advanced computing, which will support the next societal and economic transformation. Co-development of all sub-systems to minimize "Joules/Flop" is the new Moore's Law to enter the Petaflop era, and power management is one of the most critical enablers to achieve the objective.

Francesco Carobolante explores solutions to advance technology leadership and competitiveness as a Director of Corporate Strategy & Ventures at Intel,. In his previous positions as VP Engineering at Qualcomm and Sr Director at Fairchild and STMicroelectronics, he developed many industry "firsts" in power management, WPT, signal processing, RF, digital audio and many others. Carobolante holds MSEE degrees from University of Padova and UCLA and has authored over 90 issued patents; he is Sr. Member of IEEE, co-chair of IEEE Future Networks Energy Efficiency Working Group, Member of IEEE Heterogeneous Integration Roadmap, and Member of the Steering and Technical Committees for several IEEE PELS and PSMA initiatives, including PwrSoC and EnerHarv.

TECHNICAL LECTURES *as of January 26, 2024*

The APEC Technical Program features lecture and dialogue presentations from authors of peer-reviewed papers that cover all areas of technical interest for the practicing power electronics professional. The rigorous review process ensures that only the most innovative technical solutions are highlighted to provide the highest quality possible. The technical program includes lecture presentations of broad appeal and dialogue sessions which provide an opportunity to discuss the topic in detail with the author.

8:30 AM – 12:00 PM

T01: AC-DC Converters I

ROOM 101A

SESSION CHAIRS

Xin Zan, *University of Maryland*

John Lam, *York University*

8:30 AM

T01.1: Grid Voltage Sensorless Control of 3.2kW Bridgeless Totem-Pole PFC Converter with Pre-Estimation and Seamless Mode-Transition

Inhwi Hwang, M.S., *Seoul National University/ University of Michigan- Ann Arbor(Current)*

Power Factor Correction, CCM, DCM, CRM/BCM Control, Bridgeless

AUTHORS: Inhwi Hwang, Jaekeun Lee, Shenghui Cui

8:50 AM

T01.2: Decoupled Current Balancing of a Digitally Controlled Interleaved Totem-Pole PFC Converter with High Computational Efficiency

Téo Robert, ME, *CEA*

Power Factor Correction, CCM, DCM, CRM/BCM Control, Bridgeless

AUTHORS: Téo Robert, Romain Monthéard, Valentin Combet, Mathieu Gavelle

9:10 AM

T01.3: A Totem-Pole PFC with Re-Rush Current Control, Accurate E-Metering, Low iTHD and High Power Density

Bosheng Sun, MS, *Texas Instruments*

Power Factor Correction, CCM, DCM, CRM/BCM Control, Bridgeless

AUTHORS: Bosheng Sun, Sheng-Yang Yu, Ted Huh

9:30 AM

T01.4: Ultra Low-Profile Flying Capacitor 7-Level 3kW PFC with Optimized High Frequency Layout and Active Balancing Using 100V GaN

Oscar Lorenz, MSc, *Infineon Technologies*

Power Factor Correction, CCM, DCM, CRM/BCM Control, Bridgeless

AUTHORS: Oscar Lorenz, Juan Sanchez

9:50 AM

T01.5: A Multi-Level AC or DC-DC Converter Using Self-Bypassable Fixed Transfer Ratio Modules

Ravisekhar Raju, *Fastwatt*

Single-Phase and Three-Phase Input

AUTHORS: Ravisekhar Raju, Jesse Leonard

10:40 AM

T01.6: Wide Output Range Soft-Switched Single-Stage Dual Active Bridge Type AC-DC Boost PFC Converter

Himanshu Bhusan Sandhibigraha, *Indian Institute of Science, Bengaluru*

Power Factor Correction, CCM, DCM, CRM/BCM Control, Bridgeless

AUTHORS: Himanshu Bhusan Sandhibigraha, Vishnu Mahadeva Iyer

11:00 AM

T01.7: Study of SEPIC and Ćuk Converters Working as Automatic Power Factor Corrector When Operating in Unusual Discontinuous Conduction Modes

Duberney Murillo-Yarce, PhD, *Universidad de Oviedo*

Power Factor Correction, CCM, DCM, CRM/BCM Control, Bridgeless

AUTHORS: Duberney Murillo-Yarce, Juan Rodríguez, Felipe Loose, Marta Hernando, Javier Sebastian

11:20 AM

T01.8: Miniaturization of AC-Adapter Realized by Primary Voltage-Clamper with Mid-Voltage (150V) AHB Converter

Shuichiro Motoori, ME, *ROHM Co., Ltd*

External AC-DC Adapters

AUTHORS: Shuichiro Motoori, Toshiyuki Zaitsu, Akihiro Kawano, Keita Tokumaru, Kimihiro Nishijima

11:40 AM

T01.9: An Optimization Method for Planar Transformer Winding Losses in GaN Based Multi-Output Flyback Converter

xiucheng huang, PhD, *Navitas Semiconductor*

Single-Phase and Three-Phase Input

AUTHORS: Teng Tian, Weijing Du, Bin Li, Xiucheng Huang, Jason Zhang

8:30 AM – 12:00 PM

T02: Resonant DC DC Converters

GRAND BALLROOM A

SESSION CHAIRS

Olivier Trescases, *UofToronto*

Mladen Ivankovic, *Infineon Technologies*

8:30 AM

T02.1: **A 60 A Switched Tank Converter with Buck-Boost Sigma Regulation for 48 V Bus Down-Conversion**

Simone Zaffin, *Politecnico di Milano*

Resonant Converters

AUTHORS: Simone Zaffin, Alessandro Dago, Mauro Leoncini, Alessandro Gasparini, Osvaldo Zambetti, Salvatore Levantino, Massimo Ghioni

8:50 AM

T02.2: **A Novel High-Frequency Isolated Resonant Gate Driver for LLC-DCX**

Ziyan Zhou, *Southeast University*

Resonant Converters

AUTHORS: Ziyan Zhou, Qiang Luo, Yuefei Sun, Yufan Wang, Qinsong Qian, Weifeng Sun

9:10 AM

T02.3: **Design of a High Current, 1 MHz, 5 kW Partial Power Processing Converter with Hybrid Flex PCB for 80 C Ambient Automotive Conditions**

Minh Ngo, *Virginia Polytechnic Institute and State University*

Resonant Converters

AUTHORS: Minh Ngo, Yuliang Cao, Dong Dong, Rolando Burgos, John Noon, Heath Kouns

9:30 AM

T02.4: **A 260-A/48-V Bus Hybrid Resonant Converter with Large Conversion Ratio for Future Data Centers**

Alessandro Dago, PhD, *Politecnico di Milano*

Resonant Converters

AUTHORS: Alessandro Dago, Mattia Balutto, Stefano Saggini, Mauro Leoncini, Salvatore Levantino, Massimo Ghioni

9:50 AM

T02.5: **A 15x Matrix Autotransformer Switched-Capacitor DC-DC Converter for Datacenter Application**

Dong Cao, PhD, *University of Dayton*

Resonant Converters

AUTHORS: Maohang Qiu, Zhongshu Sun, Xiaoyan Liu, Haoran Meng, Vafa Marzang, Dong Cao

10:40 AM

T02.6: **A High Density 400 W DC/DC Power Module with Integrated Planar Transformer and Half Bridge GaN IC**

Bin Li, *Navitas Semiconductor*

Resonant Converters

AUTHORS: Bin Li, Xiucheng Huang, Jason Zhang

11:00 AM

T02.7: **Design Method of Impedance Transformation Network for Robust Resonant Power Converters with Wide Load Impedance Variation**

Junhyeong Lee, *Seoul National University*

Resonant Converters

AUTHORS: Junhyeong Lee, Sunghyuk Choi, Euihoon Chung, Jung-Ik Ha

11:20 AM

T02.8: **Thermal Balancing of Multiphase Resonant Converters Controlled by Phase Shift**

Rosario Casanueva, Resonant Converters

AUTHORS: Christian Branas, Rosario Casanueva, Alberto Pigazo, Francisco J. Azcondo, Francisco J. Díaz, Paula Lamo

11:40 AM

T02.9: **Design and Implementation of Cascoded Dual-Half-Bridge Resonant Converter with GaN E-HEMT for High Input Voltage Applications**

Kuo-Fu Liao, *National Cheng Kung University*

Resonant Converters

AUTHORS: Cheng-Ying Ho, Tsorng-Juu Liang, Kai-Hui Chen, Kuo-Fu Liao

8:30 AM – 12:00 PM

T03: Motor Drives

ROOM 101B

SESSION CHAIRS

Ziaur Rahman, *Booz Allen Hamilton*

Rakib Islam, *American Axle and Manufacturing*

8:30 AM

T03.1: **Synchronous Overmodulation for Reduced Number of Switchings with Unit Voltage Gain Including Six-Step Operation**

Cheolmin Hwang, *Seoul National University*

AC, DC, BLDC Motor Drives

AUTHORS: Cheolmin Hwang, Gyu Cheol Lim, Seongwon Lee, Jong-Joo Moon, Kyu-Sung Park, Jung-Ik Ha

8:50 AM

T03.2: **A Fast Approach for Full Electrical Parameters Identification in Auto-Tuned Induction Machines Drives Systems**

Mojataba Ayaz Khoshhava, *École de technologie supérieure (ETS)*

AC, DC, BLDC Motor Drives

AUTHORS: Mojataba Ayaz Khoshhava, Hamidreza Mosaddegh-Hesar, Mostafa Abarzadeh, Simon Caron, Kamal Al-Haddad

9:10 AM

T03.3: **Investigation of Cable Length Influence on EMI Spectrum in a WBG-Based Drive System**

Yalda Azadeh, PhD Candidate, *Stony Brook University*

AC, DC, BLDC Motor Drives

AUTHORS: Yalda Azadeh, Abdul Basit Mirza, Fang Luo

9:30 AM

T03.4: **A Smooth Pulse Number Transition Technique of Synchronized PWM for IPMSM Sensorless Control**

Do-Young Gil, MS, *Dankook University*

AC, DC, BLDC Motor Drives

AUTHORS: Doyoung Gil, Joonseok Kim, June-Seok Lee

9:50 AM

T03.5: **Vector Control of AC Motor in Six-Step Operation Based on Variable DC-Link Voltage**

Jisun Ham, *Seoul National University*

AC, DC, BLDC Motor Drives

AUTHORS: Jisun Ham, Hwigon Kim, Junyeol Maeng, Shenghui Cui

10:40 AM

T03.6: **Investigation of Motor Winding Overvoltages in Integrated WBG-Based Motor Drive Systems**

Yalda Azadeh, PhD Candidate, *Stony Brook University*

AC, DC, BLDC Motor Drives

AUTHORS: Yalda Azadeh, Abdul Basit Mirza, Fang Luo

11:00 AM

T03.7: **A Dual-Buck-Structured Transformerless Inverter with a Common Ground**

Bang Nguyen, *Los Alamos National Laboratory*

Single- and Multi-Phase Inverters

AUTHORS: Truong-Duy Duong, Minh-Khai Nguyen, Bang H. L. Nguyen, Caisheng Wang

11:20 AM

T03.8: **Efficiency and EMI Analysis of WBG-Based Multilevel Inverters for 800 V Electric Vehicle Traction Systems**

Avinash Dornala, *Michigan State University*

AC, DC, BLDC Motor Drives

AUTHORS: Avinash Dornala, Kangbeen Lee, Mostafa Fereydoonian, Ali Halawa, Mikayla Benson, Woongkul Lee

8:30 AM – 12:00 PM

T04: Design Techniques for Wide Bandgap Power Modules

ROOM 104A

SESSION CHAIRS

Justin Henspeter, *IBM*

Lei Wang, *Lei Technical Consulting*

8:30 AM

T04.1: **A 200V Monolithic GaN Dynamic Floating Voltage Level Shifter with Nanosecond Propagation Delays and Noise-Immune Slewing Control**

Fei Zhou, *The University of Texas at Dallas*

Power Modules / High Density Design

AUTHORS: Fei Zhou, Dongsheng Brian Ma

8:50 AM

T04.2: **A 400W, 250kHz (2kW Peak) Integrated GaN Half Bridge Power Module in a Non-Isolated Buck Converter**

Sourish S. Sinha, PhD, *North Carolina State University*

Power Electronics Packaging

AUTHORS: Sourish S. Sinha, Pouria Zaghari, Jong E. Ryu, Douglas C. Hopkins

9:10 AM

T04.3: **A Gallium Nitride Integrated Power Module with Ultra-Low Parasitic Inductances and Thermal Resistance**

Zezheng Dong, PhD, *ZJU-Hangzhou Global Scientific and Technological Innovation Center*

Power Modules / High Density Design

AUTHORS: Zezheng Dong, Jinxu Yang, Yinxiang Fan, Haidong Yan, Xinke Wu

9:30 AM

T04.4: **Power Module Design with Chip-Level Series-Connected SiC MOSFETs**

Tobias Ubostad, M.Sc., *Norwegian University of Science and Technology*

Power Modules / High Density Design

AUTHORS: Tobias Ubostad, Dimosthenis Peftitsis

9:50 AM

T04.5: **A Full SiC MOSFET DCDC Boost Power Module Using 2 kV SiC MOSFET for 1500V String Solar Inverter Applications**

Yusi Liu, PhD, *ON Semiconductor*

Power Modules / High Density Design

AUTHORS: Yusi Liu

10:40 AM

T04.6: **A Novel Double-Sided Cooling 3L-ANPC SiC MOSFET Power Module with Interleaved Layout**

Laili Wang, PhD, *Xi'an Jiaotong University*

Power Electronics Packaging

AUTHORS: Tianjian Wang, Yongmei Gan, Haoyuan Jin, Laili Wang, Yuwei Wu, Yuchen Wang

11:00 AM

T04.7: **GaN FET with Integrated Current Sense Without Supply**

Yinglai Xia, PhD, *Infineon Technologies*

Power Modules / High Density Design

AUTHORS: Yinglai Xia, Luke Milner, Zhemin Zhang

11:20 AM

T04.8: **Development of Pressure Contact Technology for Multi-Chip SiC Modules with Low Parasitics**

Lei Wang, PhD, *University of Twente*

Power Modules / High Density Design

AUTHORS: Lei Wang, Wenbo Wang, Gert Rietveld, Raymond J. E. Hueting

11:40 AM

T04.9: **SiC Engineered Substrate: Increasing SiC MOSFETs Current Density from Device to Module Level**

Eric Guiot, PhD, *Soitec*

Power Modules / High Density Design

AUTHORS: Eric Guiot, Frédéric Allibert, Jürgen Leib, Tom Becker, Alexis Drouin, Walter Schwarzenbach

8:30 AM – 12:00 PM

T05: Control of Power Electronic Converters I

ROOM 102AB

SESSION CHAIR

Xiaonan Lu, *Purdue University*

8:30 AM

T05.1: **Optimized Switching States-Based Model Predictive Control for Grid-Connected Three-Level ANPC Inverter**

Euntaek Nam, BSE, *Pohang University of Science and Technology*

Control of Power Electronic Converters

AUTHORS: Euntaek Nam, Suyong Chae

8:50 AM

T05.2: **Non-Smooth H∞ Impedance Shaping for DC Catenary Stability Enhancement in Railway Converter**

Santiago Cobreces, PhD, *Universidad de Alcalá*

Control of Power Electronic Converters

AUTHORS: Francisco Huerta, Santiago Cóbreces, José Manuel Del Toro, Emilio José Bueno

9:10 AM

T05.3: **Nonlinear Optimization-Based Power-Voltage Control of Grid-Connected Converter in Weak Grid**

Gayoung Park, MS, *Seoul National University*

Control of Power Electronic Converters

AUTHORS: Gayoung Park, Jaeyeon Park, Shenghui Cui, Seung-Ki Sul

9:30 AM

T05.4: **Smooth Switching Dual-Mode Control Method Based on Kalman Filter for Grid-Connected Inverter**

Weimin Wu, *Shanghai Maritime University*

Current-Mode and Voltage-Mode Control

AUTHORS: Yanqi Cheng, Weimin Wu, Mohamed Orabi, Koutroulis Eftychios, Henry Shu-Hung Chung, Frede Blaabjerg

9:50 AM

T05.5: **A Novel Circulating Current Suppression Control Utilizing Negative Insertion in MMC**

Swamy Jakkula, PhD, *Indian Insititute of Technology Bombay*

Control of Power Electronic Converters

AUTHORS: Swamy Jakkula, Nallamatti Poornachandra Rao, Anshuman Shukla

10:40 AM

T05.6: **Model Predictive Control Driven Transformer Coupled Parallel Hybrid Si IGBT/SiC MOSFET Converter**

Ning Li, *The University of Edinburgh*

Control of Power Electronic Converters

AUTHORS: Ning Li, Stephen Finney, Paul Judge

11:00 AM

T05.7: **Enhanced Fault Ride-Through of Grid-Forming Converter with Extra Internal Voltage Source Rotation**

Junyeol Maeng, *Seoul National University*

Control of Power Electronic Converters

AUTHORS: Junyeol Maeng, Shenghui Cui

11:20 AM

T05.8: **Active Current Sharing and Source Management Methods on Fuel Cell/Battery Hybrid System for Drones with High Power Density**

Dong Hwan Kim, PhD cource, *Sunkyunkwan University*

Control of Power Electronic Converters

AUTHORS: Dong Hwan Kim, Jong-Hun Lim, Je-Yeong Lim, Byoung Kuk Lee

8:30 AM – 12:00 PM

T06: Wireless Power Transfer: Applications

ROOM 103AB

SESSION CHAIRS

Reza Tavakoli, *Rivian*

Huber Jonas, *ETH, Zurich*

8:30 AM

T06.1: **Design and Development of Hybrid Current Sensors for Wide-Bandgap Power Electronics Applications**

Ali Parsa Sirat, PhD, *EWMFG/University of North Carolina at Charlotte*

Non-contact Sensors for Power Electronics

AUTHORS: Ali Parsa Sirat, Hossein Niakan, James Gafford, Babak Parkhideh

8:50 AM

T06.2: **A Pulsed 6.78 MHz Inductive Wireless Power Transfer System for Quantum Cascade Lasers**

Shukai Wang, *Princeton University*

Wireless Charging

AUTHORS: Shukai Wang, Richard Brun Jr., Claire Gmachl, Minjie Chen

9:10 AM

T06.4: **A High Frequency Inductive Power Transfer System for Low-Power Applications in Fresh Water**

Xianzao Li, MS, *Imperial College London*

Power for IoT

AUTHORS: Xianzao Li, Mayue Shi, Paul D. Mitcheson, Eric Yeatman

9:30 AM

T06.5: **A Novel Lightweight Wireless Charging System for UAV Applications**

Stefano Saggini, PhD, *Università di Udine DPIA*

Wireless Charging

AUTHORS: Federico Iob, Giulia Segatti, Tryggvi Stefánsson, Friðfinnur Þrastarson, Fabio Gelati, Gianmmaria Bernacchia, Stefano Saggini

9:50 AM

T06.6: **A Novel Wireless Power Transfer System for Capsule Endoscopes**

Heng Zhang, *The University of Hong Kong*

Wireless Charging

AUTHORS: Heng Zhang, Liangxi He, Chi-Kwan Lee

10:40 AM

T06.7: **Design of a Rotational Misalignment Resistant Three-Phase Wireless Power Transfer Coil for AUVs**

Yuming Chen, *Texas A&M University*

Wireless Charging

AUTHORS: Yuming Chen, Hamid Toliyat

11:00 AM

T06.8: **A Communication-Less Wireless Battery Charger Based on Variable Inductor**

Yihao Wu, *The University of Texas at Austin*

Wireless Charging

AUTHORS: Yihao Wu, Chenmin Deng, Soham Roy, Alex Hanson

11:20 AM

T06.9: **Magnetic Characteristics Analysis and Compensation Network Design with Various Power Transfer Pads for Interoperable Wireless EV Charging**

Hyeonu Jo, *Sungkyunkwan University*

Wireless Charging

AUTHORS: Hyeonu Jo, Ju-A Lee, Dong Hyeon Sim, Won-Jin Son, Byoung Kuk Lee

8:30 AM – 12:00 PM

T07: Power Electronics for Renewable Energy System Applications

ROOM 104B

SESSION CHAIRS

Xiwen Xu, *Tesla*

Kuldeep Singh, *University of Nottingham*

8:30 AM

T07.1: **A New Single-Active-Switch Non-Isolated Dual-Output Step-Up Converter**

Abdulaziz Alkhaldi, PhD, *Queen's University Belfast*

Photovoltaic (PV) Inverters and Micro Inverters

AUTHORS: Abdulaziz Alkhaldi, Ahmad Elkhateb, David Laverty

8:50 AM

T07.2: **Bridge-Type Hybrid HVDC Circuit Breaker with Reduced Semiconductor Devices**
Shinnosuke Hamajima, MA, *Toshiba Infrastructure Systems & Solutions Corporation*
Wind Energy Conversion Systems
AUTHORS: Shinnosuke Hamajima, Yushi Koyama, Takahiro Ishiguro

9:10 AM

T07.3: **A Modified Middle Point Clamped (MMPC) DC-DC Converter for All-DC Wind Generation Systems**
Awais Karni, PhD, *North Dakota State University*
Wind Energy Conversion Systems
AUTHORS: Awais Karni, Omid Beik, Mahdi Homaeinezhad

9:30 AM

T07.4: **Cascaded H-Bridge Converter Integrated with Split Batteries and with Multilevel AC Output for Household Applications**
Madhat Alimawi, MA, *University of Twente*
Energy Storage Systems
AUTHORS: Madhat Alimawi, Reyhaneh Eskandari, Prasanth Venugopal, Thiago Batista Soeiro

9:50 AM

T07.5: **Design of a 15kW High-Efficiency and High Power Density Bidirectional TCM Buck/Boost Converter**
Zhengming Hou, *Virginia Polytechnic Institute and State University*
Bi-directional Power Converters
AUTHORS: Zhengming Hou, Dong Jiao, Bryan Gutierrez, Jih-Sheng Lai, Po-Li Chen

10:40 AM

T07.6: **Single-Stage Bidirectional Inertia-Less Isolated DC/AC Converter**
Satish Belkhode, PhD, *Georgia Institute of Technology*
Bi-directional Power Converters
AUTHORS: Satish Belkhode, Navami Prabhu, Joseph Benzaquen, Deepak Divan

11:00 AM

T07.7: **Non Isolated Multi Port Inverter with Reduced Common Mode Leakage Current and Minimum Phase Property**
Simanta Kumar Samal, *National Institute of Technology Jamshedpur*
Photovoltaic (PV) Inverters and Micro Inverters
AUTHORS: Simanta Kumar Samal, Rajat Kumar Keshari, Rajeev Kumar Singh, Ranjit Mahanty

11:20 AM

T07.8: **A Two-Stage Four-Switch Buck-Boost Integrated Dual-Active-Bridge Converter with Wide Range Soft-Switching and Minimized Backflow Power**
Ruizhi Wei, *University of Alberta*
Bi-directional Power Converters
AUTHORS: Ruizhi Wei, Xuesong Wu, Li Ding, Yunwei Li

11:40 AM

T07.9: **A New Dual-Purpose Flyback-Based DC–DC/AC Converter with Dynamic Voltage Gain**
Maysam Abbasi, PhD, *University of Technology Sydney*
Photovoltaic (PV) Inverters and Micro Inverters
AUTHORS: Maysam Abbasi, Naser Vosoughi Kurdkandi, Ehsan Abbasi, Li Li, Ricardo P. Aguilera, Dylan Lu, Fei Wang

8:30 AM – 12:00 PM

T08: Magnetics Modeling & Simulation

ROOM 104C

SESSION CHAIRS

George Slama, *Würth Elektronik*

Matt Wilkowski, *Enachip Inc.*

8:30 AM

T08.1: **Multi-Material Power Magnetics Modeling with a Modular and Scalable Machine Learning Framework**
Edward Deleu, *Princeton University*
Magnetics modeling and simulations
AUTHORS: Edward Deleu, Haoran Li, Joe Li, Wonju Lee, Thomas Guillod, Charles R. Sullivan, Shukai Wang, Minjie Chen

8:50 AM

T08.2: **Direct In-Situ Measurement of Magnetic Core Loss Under Rectangular Voltage Excitation in Power Electronic Circuits**
Lifang Yi, PhD, *Florida State University*
Magnetics modeling and simulations
AUTHORS: Lifang Yi, Jinyeong Moon

9:10 AM

T08.3: **Characterization and Impact of Large-Signal Dielectric Properties in MnZn Ferrites**
Thomas Guillod, Dr., *Dartmouth College*
Magnetics modeling and simulations
AUTHORS: Thomas Guillod, William V. R. Roberts, Charles R. Sullivan

9:30 AM

T08.4: Investigating the Mutual Impact of Waveform, Temperature, and DC-Bias on Magnetic Core Loss Using Neural Network Models

Joe Li, *Princeton University*

Magnetics modeling and simulations

AUTHORS: Joe Li, Edward Deleu, Wonju Lee, Haoran Li, Minjie Chen, Shukai Wang

9:50 AM

T08.5: A Physics-Based Circuit Model for Nonlinear Magnetic Material Characteristics

Saurav Dulal, *The University of Tennessee, Knoxville (UTK)*

Magnetics modeling and simulations

AUTHORS: Saurav Dulal, Sadia Binte Sohid, Han Cui, Gong Gu, Daniel J. Costinett, Leon M. Tolbert

10:40 AM

T08.6: A Simple Power Loss Evaluation Method for High-Frequency Transformers Based on Surface Temperature Measurement Within Wide Operation Range

Zheyuan Yi, BE, *Tsinghua University*

High-frequency Magnetics

AUTHORS: Zheyuan Yi, Zengyang Liu, Kai Sun, Bowen Su

11:00 AM

T08.7: Integrating Equation-Based Methods with Random Forest Regression for Improved Accuracy of Magnetic Core Loss Modeling

Bailey Sauter, *University of Colorado Boulder*

Magnetics modeling and simulations

AUTHORS: Bailey Sauter, Skye Reese, Shivangi Sinha, John Haddon, Thomas Byrd, Dragan Maksimović

11:20 AM

T08.8: Emulation of Plasma Load Reactances by Saturation Control of Low-Permeability Inductors

Mike Ranjram, *Arizona State University*

Magnetics Applications

AUTHORS: Darshan Tagare, Sanghyeon Park, Mike Ranjram

11:40 AM

T08.9: High-Performance High-Power Inductor Design for High-Frequency Applications

Mansi Vipul Joisher, *Massachusetts Institute of Technology*

High-frequency Magnetics

AUTHORS: Mansi Joisher, Roderick Bayliss III, Mike Ranjram, Rachel S. Yang, Alexander Jurkov, David J. Perreault

INDUSTRY SESSIONS *as of January 26, 2024*

Industry Sessions present information on current topics in power electronics from industry sources and run in parallel with the Technical Sessions tracks. Speakers are invited to make a presentation only, without having to submit a formal paper for proceedings. This allows APEC to present information on current topics in power electronics from sources that would not otherwise be present at a technical conference. While many of these sessions are technical in nature, some will cover business-oriented topics, which hold interest not only for those in technical roles but for professionals who support the power electronics industry.

8:30 AM – 11:55 AM

IS01: Modelling and Simulation of Magnetics – Closing the Loop

GRAND BALLROOM B

SESSION CHAIRS

George Slama, *PSMA Magnetics Committee*

Ed Herbert, *PSMA*

8:30 AM

IS01.1 **Magnetics Material Data for Simulation Tools**
Minjie Chen, PhD, *Princeton University*

8:55 AM

IS01.2 **Impedance Over Wide frequencRanges for EMI Filtering**
Fang Luo, PhD, *Stony Brook University*

9:20 AM

IS01.3 **2D vs 3D Finite Element Analysis of Magnetic Components? How to decide!**
Mark Christini, MSc, PE, *Ansys*

9:45 AM

IS01.4 **Modelling Magnetics in Circuit Simulation Tools**
Tom Wilson, *SIMPLIS Technologies*

10:40 AM

IS01.5 **Measurement and Characterization of Magnetic Fields with Near Field Probes**
Arturo Mediano, PhD, *University of Zaragoza*

11:05 AM

IS01.6 **Leakage Inductance and Coupling**
Bryce L. Hesterman, MSEE, *Utah State University*

11:30 AM

IS01.7 **Thermal Modelling of Magnetic Components**
Juris Vencels, MSc, *TRAFOLO*

8:30 AM – 11:55 AM

IS02: WBG Applications

ROOM 202AB

SESSION CHAIRS

Reza Sharifi, *Texas Instruments*

Sam Abdel-Rahman, *Infineon Technologies*

8:30 AM

IS02.1 **Design of an Ultra-High-Density 2 kW GaN-Based LV Motor Drive**
Edward A. Jones, PhD, *Infineon Technologies*

8:55 AM

IS02.2 **Capacitor Reliability Analysis in Full SiC Bidirectional Converters for EV Charging Application**
Andrea Bianchi, MA, *ABB*

9:20 AM

IS02.3 **Accelerate Your Design Using a Flexible 25 kW Silicon Carbide (SiC) Three-Phase Inverter for Motor Drives and Industrial Applications**
Christopher D. New, PhD, *Wolfspeed*

9:45 AM

IS02.4 **Maximize the Potential of GaN HEMT with Integration**
Kennith Kin Leong, Ph. D, *Infineon Technologies*

10:40 AM

IS02.5 **Comparison of Silicon MOSFET vs GaN for 48V Input Intermediate Bus Conversion Based on Multiphase Buck Controllers**
Teng Xu, *Renesas Electronics*

11:05 AM

IS02.6 **A SiC-based 60kW LLC Converter with Novel Transformer Design for Improving Voltage Balance**
Chen Wei, *Wolfspeed*

11:30 AM

IS02.7 **Ultra-High Frequency (10 MHz) Buck Converter with GaN HEMT for Mobile Phone Application**
Shuilin Tian, PhD, *Innoscience America INC*

8:30 AM – 11:55 AM

IS03: Gate Driver Applications

ROOM 203AB

SESSION CHAIRS

Emanuel Eni, *Infineon Technologies*

Sasikala Thangam, *Texas Instruments*

8:30 AM

IS03.1 ASIL-D Ready Automotive Compliant Plug & Play High Performance Gate Driver
Mike Cramer, Dipl. -Ing., *Power Integrations*

8:55 AM

IS03.2 Choosing Suitable Gate Driver Protection Approach for High Power Systems
Sasikala Thangam, *Texas Instruments*

9:20 AM

IS03.3 Isolated Gate Driver and Bias Supply Selection Based On Application
Andy Robles, *Texas Instruments*

9:45 AM

IS03.4 Unique Challenges and Considerations for Half-Bridge Gate Driver in Bidirectional DC-DC Converters
Pankaj Pandey, Masters in Circuit Design, *Texas Instruments*

10:40 AM

IS03.5 The Advantage of Programmable Current Source Gate Drivers in SiC Switching Applications
Long Nguyen, MS, *Skyworks Solutions, Inc.*

11:05 AM

IS03.6 Selecting the Right Gate Driver IC for Your Application
Emanuel Eni, Phd, *Infineon Technologies*

11:30 AM

IS03.7 Benefits of Reduced Common-Mode Capacitance in Isolated Gate Drive Channels
Bernard Keogh, *Allegro Microsystems*

8:30 AM – 11:55 AM

IS04: Addressing Major Challenges on the Roadmap to Transportation Electrification

ROOM 201A

SESSION CHAIRS

Fernando Salcedo, *US Department of Energy*

Fred Weber, *Wired & Wireless Technologies*

8:30 AM

IS04.1 Vehicle Use Cases and How They Drive Transportation Electrification Solutions
Chris Whaling, MA, *Synthesis Partners, LLC*

8:55 AM

IS04.2 Bi-directional Charging and V2X will Affect the Future of Charging
Ky Sealy, ME, *Witricity Corporation*

9:20 AM

IS04.3 Self-Resonant PCB Coil Designs for High Power Wireless Charging at Scale
John M. Wolgemuth, PE, *InductEV*

9:45 AM

IS04.4 Current and Next-Gen GaN and SiC Power Modules for On-board Vehicle Power Systems
Burak Ozpineci, PhD, *Oak Ridge National Laboratory*

10:40 AM

IS04.5 Scalable Power Electronics to Enable Extreme Fast Charging (XFC) with Integrated Battery Energy Storage (BES)
Jonathan W. Kimball, PhD, *Missouri University of Science and Technology*

11:05 AM

IS04.6 Next-Gen Technologies Impact on Accelerating Off-Road Industry Electrification
Brij N. Singh, PhD, *John Deere*

11:30 AM

IS04.7 Design Considerations for Advanced Magnets for High-Power EV Charging and On-board Powertrain Systems
Lukas K. Mueller, M. Sc., *Micrometals Inc.*

8:30 AM – 11:55 AM

IS05: Motor Drive Applications

ROOM 201B

SESSION CHAIRS

Lei Han, *Infineon*

Nathan Croft, *Atlas Magnetics, Co.*

8:30 AM

IS05.1 **Using Precision E-Motor Emulation to Speed up Inverter Software Development and Release**
Matthew Hortop, MSEE, *AVL Test Systems, Inc.*

8:55 AM

IS05.2 **Reducing System Cost with GaN HEMTs in Motor Drive Applications**
Alfred Hesener, MSEE, *Navitas Semiconductor*

9:20 AM

IS05.3 **Motor Drive Compensation System for a Passive Valley-Fill Power Factor Correction Stage**
Juan Paolo Quismundo, MSc, *Power Integrations*

9:45 AM

IS05.4 **Space Vector Modulation for Long Cable Application**
Diogo B. Candido, *WEG Automation – Brazil*

10:40 AM

IS05.5 **Radiated Emissions from Cables in Power Converters**
Albert W. Dunford, *Altair Engineering*

11:05 AM

IS05.6 **A Sensorless Constant Airflow Control Algorithm for Centrifugal Fan Applications Based on a 3-phase PMSM Motor Drive**
Lei Han, *Infineon Technologies*

11:30 AM

IS05.7 **Full System Transient Simulation of a BLDC Motor, Mechanical System, Inverter Circuit, Gate Drive, and Control Logic in LTSpice**
Daniel Ertl, MS, *Milwaukee Tool*

8:30 AM – 11:55 AM

IS06: Design of Power Supplies & Battery Chargers

ROOM 203C

SESSION CHAIRS

Elisabetta Mahmutovic, *Texas Instruments*

Armando Mesa, *onsemi*

8:30 AM

IS06.1 **Parallel Boost Converter Operation with 1kW Output Power, 180-264 Vac Input**
Richard Hester, *Power Integrations*

8:55 AM

IS06.2 **Centralized Remote Drivers, from Horticulture to Commercial Lighting, It is Still the "Make Sense Solution"**
Frank Cirolia, BSEE, *Advanced Energy*

9:20 AM

IS06.3 **240W USB PD EPR Stacked Power Supply for Residential DC-DC Bus Architecture**
Sudhakarababu Chakkirala, PhD, *Power Integrations Inc*

9:45 AM

IS06.4 **Design of High Efficiency Battery Chargers Using Hybrid-Flyback Topology**
Markus Schmid, PhD, *Infineon Technologies AG*

10:40 AM

IS06.5 **E-Scooter Battery Charger with Wide Range CV and CC Operation Modes**
Bala Sudhakar Singamameni, M.Tech, *Power Integrations*

11:05 AM

IS06.6 **Power Supply Implications of the New USB Power Delivery 3.2**
Deric Waters, PhD, *Texas Instruments*

11:30 AM

IS06.7 **Integrating Component Selection into the Early Design Phase to Optimize Power Converter Performance**
Shishir Rai, MS, *DiscoverEE Inc.*

EXHIBITOR PRESENTATIONS *as of January 26, 2024*

APEC 2024 Exhibitor Presentations present a current challenge to the power electronics industry, a brief review of how this challenge has been addressed in the past, and then how that company's products or services offer a solution better than previously existing solutions. These presentations provide a more in-depth look at the latest products and services offered by suppliers to the power electronics industry.

PRESENTATION #1

1:30 PM – 2:00 PM

Infineon EiceDRIVERTM Gate Driver ICs for High-Voltage GIT and Schottky-Gate GaN HEMTs

EXHIBITOR PRESENTATION THEATER 1

PRESENTED BY:

Gustavo Andres Finamor, *Infineon*

Infineon EiceDRIVERTM Gate Driver ICs for High-Voltage GIT and Schottky-Gate GaN HEMTs are designed to meet the stringent driving requirements, involving specific gate voltages and interface circuitry. Our leading portfolio offers High-Speed Gate Driver ICs that provide customers with excellent robustness operation and increased system design flexibility – toward improved power density and efficiency across multiple applications.

1:30 PM – 2:00 PM

Please check the mobile app for more information

EXHIBITOR PRESENTATION THEATER 2

PRESENTED BY:

Mouser

1:30 PM – 2:00 PM

Achieve High Efficiency and Excellent Output Regulation in Multi-Output Power Supply Designs Without DC-DC Converters

EXHIBITOR PRESENTATION THEATER 3

PRESENTED BY:

Han Cui, *Power Integrations*

Designers no longer need to choose between high efficiency and excellent output regulation – even at light loads – when designing their multi-output flybacks.

Power Integrations will introduce a novel single-stage multi-output flyback approach that provides high efficiency and excellent output regulation across multiple outputs. Each output can be accurately regulated to better than 3% across load and line while keeping efficiency above 90% across line and load. The role of Zero Voltage Switching to further enhance efficiency, and pulse-sharing to eliminate audible noise will also be explored.

1:30 PM – 2:00 PM

Power Module Package-Attach Materials Technology

ROOM 101A

PRESENTED BY:

Joseph Hertline, *Indium*

Explore new innovations and trends in power module package-attach materials technology including a novel Pb-free alloy that enables lower processing temperatures in preform soldering compared to SAC alloys. This alloy prevents warpage in package-cooler attach scenarios without sacrificing reliability like traditional bismuth-containing low-temperature alloys. We will also discuss sintering applications and thermal interface material trends.

1:30 PM – 2:00 PM

Efficient Process to Address the PDN Problem When Powering Microprocessors with High di/dt Loads

ROOM 101B

PRESENTED BY:

Ronald Wong and Andrija Stupar, *Simplis*

Delivering a tightly regulated voltage to the next generation of microprocessors with extremely high di/dt loads is a severe challenge. We present a straightforward procedure to evaluate the effect of a printed circuit board layout on the system performance of microprocessors powered by Voltage Regulator Modules. Using the combined strengths of both the SIMPLIS and SIMetrix simulation engines, we demonstrate how to characterize the extracted Power Distribution Network (PDN) and create a reduced-order equivalent circuit of the PDN to be used to accurately predict the system performance of microprocessors powered by Voltage Regulator Modules. In addition, we highlight some new features of SIMetrix/SIMPLIS 9.2 including an

improved estimate of transformer leakage inductance for our Magnetics Design Module and our new Python interface to SIMetrix/SIMPLIS with an example of how it can be used to customize measurements and reports in our Design Verification Module.

1:30 PM – 2:00 PM

Testing Bi-Directional Power Electronics

ROOM 103 AB

PRESENTED BY:

Dana Deel, *Chroma*

This seminar addresses some testing methodologies for bi-directional power electronics. Bi-directional power products have special concerns for power conversion efficiency, weight and heat reduction, and grid-tied regulatory compliance to fit today's demanding market. By combining energy efficient regenerative testing equipment in conjunction with comprehensive test strategies, you can minimize product risks and enhance quality assurance of your Bi-Directional Power products.

Topics we will explore in this presentation are:

- Brief Overview of Bi-Directional Power Electronics Uses
- The Need for Regenerative Test Equipment
- Efficiency & Regulation Tests
- Threshold & Fault Tests
- Compliance Tests

Conclusions: Who Should Attend This Presentation: Designers of Bi-Directional Power systems, Test & Product Engineers, Technical Managers, Product Managers

1:30 PM – 2:00 PM

ELCRES™ HTV150A Films for High Voltage DC-Link Capacitors offer Reduced Dissipation Losses at Higher Temperatures

ROOM 201A

PRESENTED BY:

Dr. Adel Bastawros, *SABIC*

High efficiency electric vehicles demand efficient AC-DC inverters operating at high voltages and temperatures reaching 150°C. SABIC's ELCRES™ HTV150A films are high-heat dielectric films for capacitors operating at up to 150°C. As operating temperature and frequency increase, dissipation losses in these films are reduced. This advantageous behavior is opposite to how typical high heat polymer films respond to increasing temperature and frequency. For example, Dissipation Factor Df for HTV150A films is about 0.0047 at room temperature at 100kHz. Df drops to 0.0027 when temperature increases to 150°C at the same frequency of 100kHz. For PEN films the values are 0.0074 and 0.0115, respectively. The higher losses for PEN at high temperatures limit its use to about 125°C to avoid excessive heat generation in the capacitor. Reduced losses in the dielectric film can lead to overall reduction in heat generation in the capacitors, which in turn leads to overall efficiency gain in the inverter module. Capacitors built with 3µm and 5µm metalized films pass standard electrical and life tests at 150°C for 2000 hours, as well as damp heat aging tests for 1000 hours, with low capacitance change and stable insulation resistance. Performance data and examples of metallization and capacitor building will be discussed.

1:30 PM – 2:00 PM

1. High Efficiency, High Power Conversion for USB Extended Power Range Applications

ROOM 201B

PRESENTED BY:

Jason Ngai and Tatsuya Kubo, *Murata*

1. USB Power Delivery (PD) has extended the input voltage range up to 48V with current up to 5A. This will facilitate the proliferation of USB_PD to applications beyond mobile communications and computing. However, the high voltage input must be efficiently converted down to the battery charging circuit. This presentation describes trends in USB and proposes a compact, high efficiency conversion solution based on charge pump, capacitor divider technology.

1:30 PM – 2:00 PM

Tower's Power Management Technology Offerings for a Sustainable World

ROOM 202AB

PRESENTED BY:

Erez Sarig, *Tower Semiconductor*

The growing demand for advanced BCD technology supporting sustainable energy drives development of new platforms that enable high power efficiency with high power density solution for wide range of applications including electric vehicles, industrial green energy, consumer battery operated devices among others. This presentation will provide the insights to the market demand and the foundry solutions Tower provides to address these trends from product level down to transistor level. The audience will gain knowledge on the product market fit, and the preferred technologies Tower can offer to leverage power and energy companies' products.

PRESENTATION #2

2:15 PM – 2:45 PM

Charge-up Your Vehicle with Automotive CoolSiC™ MOSFETs from Infineon

EXHIBITOR PRESENTATION THEATER 1

PRESENTED BY:

Deepak Veereddy, *Infineon*

During this session, Infineon will introduce the most recent additions to the CoolSiC™ MOSFETs for Automotive Onboard-chargers and HV/LV DCDC-Converters, and explain how Infineon´s combination of SiC technology and top-side-cooled packages are a game-changer, delivering highest performance, robustness and ease-of-use for disruptive cost-effective systems. Infineon´s CoolSiC™ MOSFETs for Automotive applications deliver the perfect balance between performance and reliability, to be considered for your next design.

2:15 PM – 2:45 PM

The SuperGaN Difference: Advantages of Normally-Off d-Mode GaN Power Semiconductors

EXHIBITOR PRESENTATION THEATER 2

PRESENTED BY:

Jenny Cortez, *Transphorm*

To meet the diverse demands of broad-spectrum power systems, the market requires a GaN solution that is as robust and reliable as it is cost-effective and high performant. Responding to this demand, Transphorm's SuperGaN platform is purpose-built to deliver on the distinct needs of low to high power systems. From unparalleled robustness and reliability to differentiated versatility via package variations and easy drivability, SuperGaN FETs are the first GaN devices publicly confirmed in end products ranging from power adapters through to solar microinverters. Join Transphorm for an overview of its normally-off d-mode GaN technology and learn how the platform's fundamental physics future-proof the technology while allowing it to unleash the inherent advantages GaN has to offer.

2:15 PM – 2:45 PM

Bringing AC to DC Power Conversion to the 21st Century: Siliconizing power to eliminate the challenges in AC to DC power conversion

EXHIBITOR PRESENTATION THEATER 3

PRESENTED BY:

Thar Casey, CEO of AmberSemi, *AmberSemi*

AC to DC conversion has been designed the same way for ~40 years. Large investments have been made on the DC side. AC conversion has been left stagnant, creating the same challenges of form factor, heat generation, efficiency, and component supply continuity. Almost all AC to DC applications have the same process of Rectification, Filtering, and stepping down voltages. While the process works, they require several components and generate too much heat.

The components themselves have a lot of challenges for continuity of supply. The circuits are comprised of electromechanical components that, by their material composition, have a lot of wear and tear in the harsh environments of AC/DC conversion.

These high conducting components also strongly contribute to the heat generation, which accelerates wear and tear, impacting the reliability. Protection functions are critical in these applications to account for the harsh environment of AC/DC conversion applications.

Finding a way to create higher level of silicon integration would solve these industry issues.

2:15 PM – 2:45 PM

Enhanced Efficiency: Discover TDK's breakthrough in flat-wire coupled inductor technology

ROOM 101A

PRESENTED BY:

Patrick Davis, *TDK Corporation*

Enhanced Efficiency: Discover TDK's breakthrough in flat-wire coupled inductor technology

TDK will present their innovative ERUC23 inductor series featuring the integration of two windings in a single component. Ideally suited for dual-phase interleaved topologies, these coupled inductors are specifically suited for hybrid converters (e.g., 48 V to 12 V), buck, boost, and buck-boost applications. Inductive coupling reduces the ripple current which lowers the switching losses of the power transistors and improves overall system efficiency. There is also the benefit of low loss ferrite core material and optimized coupled coil construction.

Learn more how this device has been integrated by ST IC reference designs is the ideal solutions for 48V to 12V conversion.

2:15 PM – 2:45 PM

Advanced Energy Hyperscale, Enterprise, Networking and Board Mounted Product Portfolio. In Hyperscale, More Specifically, Our OCP Compliant Power Solutions to Address Critical AI Workloads

ROOM 101B

PRESENTED BY:

Harry Soin, *Advanced Energy*

Advanced Energy has a rich legacy of innovation and technical expertise. It offers a wide range of power products and has a global team of technical professions to address most complex power delivery challenges faced by our customers around the world. This presentation will deep dive into our Hyperscale, Enterprise, Networking and board mounted product Portfolio. In Hyperscale, more specifically, our OCP compliant power solutions to address critical AI workloads. For Enterprise and Networking, we will show case our state of the art and industry leading M-CRPS, CRPS front end power solutions and our Titanium and platinum efficiency families. In the board mounted space, we will highlight our Hyperscale solution, high density low voltage and high current applications and our products for power amplifier in communication applications.

2:15 PM – 2:45 PM

Mersen / Microchip 500kVA 1.7kV SiC Power Stack

ROOM 103 AB

PRESENTED BY:

Dr. Philippe Roussel, *Mersen*

Mersen will introduce its latest SiC power stack evaluation kit based upon Microchip 1.7kV SiC MOSFET module, rated 350kVA DC-AC and 500kVA DC-DC. Ultra low-inductance capacitor-busbar connection technique will result in 50kHz switching frequency capability.

2:15 PM – 2:45 PM

Combining Multiphysics Simulation and Automated Design Exploration to Optimize Performance and Cost of Your Motor Drives

ROOM 201A

PRESENTED BY:

Albert Dunford , *Altair*

There are many design decisions for a motor drive power converter that can impact the performance and operating cost of your complete motor drive system. Understanding the interaction of a particular device, switching speed, PWM algorithm, deadtime, etc. with the motor losses, noise & vibration, control response requires a systematic and automated approach. One of the main challenges is simulation time, a full FEA simulation of the motor along with the power converter will simply take too long. A reduced fidelity FEA model can provide the necessary insight for a broad understanding then enabling key points of interest for full FEA analysis using the same drive waveforms that were used by the lower fidelity model. With a more complete understanding of the efficiency of the system at desired working points or drive cycles we can better calculate the trade-off between initial costs and operating costs. This will allow designers to properly justify more expensive and more efficient components or to properly justify why the added expense just isn't worth it. This session will go over strategies, insights, and workflows combining a power electronics simulation tool, low frequency electromagnetic FEA, and an automated design of experiments/data analytics tool.

2:15 PM – 2:45 PM

A GAN halfbridge current sensor

ROOM 201B

PRESENTED BY:

Ken Henderson, *Cleverscope*

We discuss a current sensor with < 200pH insertion inductance, 1-2 mOhm series resistance, high CMRR, high Bandwidth and isolated for use on the high side in a GAN bridge. We have built the current sensor as part of our CS1202 isolated power probe.

2:15 PM – 2:45 PM

Please check the mobile app for more information

ROOM 202 AB

PRESENTED BY:

SK Siltron

PRESENTATION #3

3:00 PM – 3:30 PM

Advancements in EMC Filter and Component Selection Tool

EXHIBITOR PRESENTATION THEATER 1

PRESENTED BY:

George Slama, *Würth Elektronik*

Würth Elektronik's online design tool REDEXPERT is continuously being expanded and improved to keep pace with advances in technology. This seminar will introduce and show how to use the new EMI Filter Designer tool, the new high frequency Current Transformer Selector tool, and

the new MagI3C Power Module Designer tool. Additionally, we will give hints on using the Inductor Selector Tool to quickly narrow down the selection of the most optimal inductor with the lowest losses for your DC-DC converter. As a bonus attendees will also receive a copy of the new DC-DC Converter Handbook.

3:00 PM – 3:30 PM

An Advanced Gate Driver for a High-Power Inverter Based on Hybrid Switch SiC+IGBT Technology.

EXHIBITOR PRESENTATION THEATER 2

PRESENTED BY:

Gianni Vitale, *STMicroelectronics*

SiC technology in high power inverters is now broadly adopted. The key benefits of SiC technology are better efficiency, higher power density, and lower overall system cost for applications where the investment in the efficiency gain results in cost savings for other parts of the system. Application examples include battery-operated systems, such as Electronic Vehicles (EVs), where the efficiency gain leads to a battery size reduction, compensating for the additional cost of adopting SiC technology and resulting in an overall reduction in the system cost.

However, as SiC technology represents one of the most expensive parts in a high-power inverter system, there is a lot of focus to cost optimize power systems solutions by using alternatives such as Si based IGBTs.

This presentation will focus on an implementation of a hybrid switch concept for high power inverters combining both IGBT and SiC technology to achieve a better cost-efficiency compromise thanks to the optimized gate driver designed for a hybrid switch in High-Power Motor Control Inverters.

3:00 PM – 3:30 PM

TRCDRIVE pack™, A Compact High-Power SiC Module for Electric Vehicle Propulsion Systems

EXHIBITOR PRESENTATION THEATER 3

PRESENTED BY:

Ming Su, *ROHM*

Global trends in the electrification of transportation vehicles have created opportunities for semiconductor power modules with high power capability, superior energy efficiency, manufacturing friendliness and small volume. Built with ROHM's advanced SiC MOSFET technology, the TRCDRIVE packTM power modules exhibit attractive electrical and thermal performance, improved durability, a wide range of current capability and versatile assembly options compared to conventional case-type module products. Join us and learn about the efficient and design friendly module solution for high power inverter systems.

3:00 PM – 3:30 PM

Challenges and Solutions for the Precise Dynamic & Static Characterization and Reliability Test of Silicon Carbide Power Semiconductor Device

ROOM 101A

PRESENTED BY:

Saijun MAO, *UniSiC Technology*

The dynamic & static characteristics and challenges for silicon carbide power semiconductor devices will be introduced firstly. Key technologies for the precise dynamic and static characterization of silicon carbide power semiconductor devices will be discussed in details. Then key technologies for reliability test of silicon carbide power semiconductor devices will be introduced. Finally, total solutions for the precise dynamic & static characterization and reliability test will be given.

3:00 PM – 3:30 PM

DCM™ and eMPack® – Advanced and Scalable Power Module Platforms for EV Traction Inverters

ROOM 101B

PRESENTED BY:

Henry Chen, *Semikron Danfoss*

Semikron Danfoss offers two complementary power module platforms for traction inverter applications – namely DCM™ and eMPack®. Both platforms feature advanced packaging technologies to meet the harsh operating requirements of EVs, as well as full scalability in voltage class, power rating, and device technology. Moreover, being totally chip-independent in these power modules provides our customers with more flexibility in device selections, and mitigates the chip shortage risks. Our global production footprints in the US, Europe, and China allow us to stay close to the local customers, and best serve the top three EV markets.

3:00 PM – 3:30 PM

How ICeGaN™ Technology can Address the Datacentre Challenges that Digitalisation Brings

ROOM 103 AB

PRESENTED BY:

Andrea Bricconi, Peter Di Maso, *Cambridge GaN Devices*

As datacentres expand to meet demand of ever-growing need of connectivity and computation, efficiency, density, and reliability become paramount for power solutions. In this talk, discover how ICeGaN™ technology, recognised for its ease of use and robustness, is meeting the tightening requirements in datacentres.

3:00 PM – 3:30 PM

Reducing Costs and Increasing Reliability with Wafer Level Burn-in

ROOM 201A

PRESENTED BY:

Thomas Trexler, *Aehr*

Aehr Test System's FOX solutions provide the economic benefit of wafer level test and burn-in for the Silicon Carbide and Gallium Nitride markets based on its proven ability to cost-effectively implement target burn-in and stabilization requirements including 100% traceability that every device on the wafer is properly burned in.

3:00 PM – 3:30 PM

Double Pulse Testing for Evaluation of Power Devices

ROOM 201B

PRESENTED BY:

Jim Honea, *Nexperia*

Double-pulse testing is an ideal way to analyze and characterize the performance and behavior of semiconductor switches, in principle. In practice, it can be very difficult to achieve meaningful results when testing very fast switches. In addition to the normal challenges of designing a high-speed circuit, the double pulse test adds its own problems in the form of perturbations due to sensor insertion. In this talk we present tips and tools for successful double-pulse measurement of the latest high-speed Si, GaN, and SiC switches.

3:00 PM – 3:30 PM

Integration of Accurate Soft-Switching Losses Simulation in PLECS Model – Part 1

ROOM 202AB

PRESENTED BY:

Didier Balocco, *Onsemi*

The session will briefly review onsemi SPICE modeling state of the art. Then, the various switching transitions for a power conversion application will be detailed. We will analyze step by step current and voltage for a switching device during the various transitions. A transition between on-state to off-state or vice-versa can be Hard, Soft or a combination of Soft and Hard. Some basic topologies' switching transition will also be described. We will conclude and create table that shows how the 6 transitions can be organized depending on the current flow for the turn-on and turn-off.

PRESENTATION #4

3:45 PM – 4:15 PM

The New Generation of SiC and Superjunction Discrete MOSFET from Infineon Enable the Most Effective Top Performance PSU Design

EXHIBITOR PRESENTATION THEATER 1

PRESENTED BY:

Deepak Veereddy, *Infineon*

Infineon is introducing in the market the next generation of 650V / 750V CoolSiC MOSFETs and 600V CoolMOS Superjunction MOSFETs. The conjunct use of these new high performing technologies can help engineers to increase energy efficiency and power density in systems like SMPS and EV charging stations, while reducing their costs. CoolSiC and CoolMOS MOSFET portfolios are the largest in the market, supporting an effective one stop shop opportunity to fulfill the most demanding power system requirements.

3:45 PM – 4:15 PM

Go Further, Go Faster, Go More Comfortably: The Enabling Power of Silicon Carbide in Electric Vehicle Applications

EXHIBITOR PRESENTATION THEATER 2

PRESENTED BY:

Lauren Kegley, Ph.D., *Wolfspeed*

As the worldwide adoption of electric vehicles (EVs) continues to accelerate, it is important to understand the enabling role that silicon carbide semiconductor devices can play throughout an EV's architecture. Empowered by recent innovations, EV designers are able to integrate silicon carbide devices in more places – from traction inverters and on-board chargers to emerging applications like HVAC compressors and auxiliary power systems – to help drivers go further, go faster, and go more comfortably. Learn more about how silicon carbide technology can bring efficient and effective solutions to help meet the performance expectations and everyday needs of EV consumers.

3:45 PM – 4:15 PM

E-Fuse It, or Lose It.

EXHIBITOR PRESENTATION THEATER 3

PRESENTED BY:

Steven Chenetz, *Microchip*

E-Fuse, enabled by mSiC™ MOSFETs, provides a faster, more reliable method for protecting high-voltage distribution systems. Microchip's E-Fuse solutions can clear faults 100 – 500 times faster than traditional mechanical approaches. Fast response time limits peak fault current and can prevent a fault event from becoming a catastrophic failure. Learn how E-Fuse benefits high- voltage applications, such as Energy Storage Systems (ESS), EV fast chargers, eVTOL and wherever power protection is needed.

Speaker: Steven Chenetz | Senior Staff Strategic Applications Engineer | Silicon Carbide BU

Steven Chenetz is a Strategic Applications Engineer for Silicon Carbide Power Products at Microchip Technology, Inc. He is responsible for providing engineering solutions, troubleshooting technical issues, analyzing customer requirements, and providing product training and demonstrations. Steven has 40 years of experience in the field of switching power converters and the development and testing of discrete power devices. He holds a BSEE from Rensselaer Polytechnic Institute and an MSEE from Northeastern University.

3:45 PM – 4:15 PM

Safety First: Efficient Probing Techniques for High Power Devices and Circuits

ROOM 101A

PRESENTED BY:

John Tucker; Chris Loberg, *Tektronix*

Rapid advancements in wide bandgap semiconductor technologies such as Silicon Carbide and Gallium Nitride, have resulted in new energy efficiency solutions for the Electrification of Everything. However, while these developments bring higher voltages and currents, they also raise serious safety concerns. Researchers and engineers must prioritize safety when probing and testing components and circuits that output voltages as high as 5kV and currents upwards of hundreds of amps. Choosing the right probes and connector types, properly enclosing devices under test in safety fixtures with automatic safety interlocks and wearing the proper safety protective gear are essential to ensure your safety. As the world develops new high-power technologies to electrify the world, it is critical that safety measures are prioritized to prevent accidents and ensure the safety of everyone involved.

This session, presented by Tektronix, will address best practice techniques to ensure safety and improve power integrity results when probing and testing energized higher power devices and circuits. Whether you're an engineer, technician, or scientist, this session will give you practical advice and insights that you can apply immediately in your work. You'll also have a chance to ask questions and interact with our expert presenters.

3:45 PM – 4:15 PM

"Electrify Our World" with Next-gen GaNFast and GeneSiC Power.

ROOM 101B

PRESENTED BY:

Dan Kinzer, *Navitas*

Next-gen gallium nitride (GaN) power ICs and silicon carbide (SiC) power FETs accelerate our transition away from fossil fuels to renewable sources of electricity and fully-electrified end uses. From mobile ultra-fast chargers to AI data centers, solar inverters and MW charging for long-haul EV trucking, GaN and SiC take over from legacy silicon chips, with higher efficiency, power density, reliability and lower system cost.

3:45 PM – 4:15 PM

The Challenges of Powering IoT Devices

ROOM 103 AB

PRESENTED BY:

Sanjiv Pathak, *Nisshinbo*

As climate change challenges increase and the demand for energy keeps growing, energy harvesting systems and wireless power for sensors for the Internet of Things will become more prevalent. A wide variety of industries such as consumer, retail, transportation, home automation, healthcare, manufacturing, and sports can all benefit from energy harvesting. We will discuss Nisshinbo's Environmental Sensing Board and our applicable power management ICs, with respect to applications like Electronic Shelf Labeling, Environmental Alert and Wireless Power Transfer.

3:45 PM – 4:15 PM

Please check the mobile app for more information

ROOM 201A

PRESENTED BY:

Marel Power Solutions

3:45 PM – 4:15 PM

Please check the mobile app for more information

ROOM 201B

PRESENTED BY:

Apex Microtechnology

RAP SESSIONS

The APEC RAP Sessions feature several exciting and contentious topics. RAP Sessions allow for a lively dialogue among attendees and presenters. They are structured around pivotal questions designed to spark debate, ensuring a representation of diverse perspectives. Audience members are asked to weigh in with their insights, challenge the experts, and steer the conversation with their own questions. RAP Sessions are presented live during the conference and free for all registrants to attend.

4:30 PM – 6:00 PM

RAP SESSION 1:
Charging Infrastructure Expansion vs Powertrain Technology Advancement: Which should we prioritize for EV adoption?

ROOM 104A

CHAIR:
Maurizio Di Paolo Emilio, *AspenCore*

PANELISTS:
- **Shri Joshi,** *Infineon*
- **Gopal Mitra,** *OmniOn Power*
- **Babak Fahimi,** *University of Texas Dallas*
- **Garrett Walker,** *Texas Instruments*

This RAP session brings together top-tier experts from the electric vehicle industry and academic research. Our panel will dive into the balance between expanding charging networks to ease range concerns and advancing powertrain tech for efficiency and performance gains. Explore the impact of policies and collaborations between industry and research on reshaping the EV landscape. Join the panel of professionals from academia and industry for an engaging discussion regarding EVs and infrastructure.

4:30 PM – 6:00 PM

RAP SESSION 2:
Advanced Power Converters vs. Intelligent Control Systems: Which approach is better for reliability?

ROOM 104B

CHAIR:
Frede Blaabjerg, *Aalborg University*

PANELISTS:
- **Norbert Hanigovszki,** *Danfoss Power Electronics*
- **Marija Ilic,** *MIT*
- **Pedro Rodriguez Cortes,** *Luxembourg Institute of Science and Technology*
- **Ilknur Colak,** *Schneider Elecric*

Power converters are seeing more demands from customers – eg. dynamic performance, precision, easy to install and operate in complex systems, scalable, high reliability, and low cost. The constant technology development in power electronic components, faster control loops, more processor power, AI, Machine learning, control methods bring a wide range of opportunities for intelligent control systems. This RAP session will discuss the possibilities, trends, and challenges to answer which direction we should move to achieve the highest system reliability. Join the RAP session having leading capacities from industry and universities in an interactive debate.

4:30 PM – 6:00 PM

RAP SESSION 3:
Patents: Prudent Investments with Future Potential or Inefficient Capital Allocation?

ROOM 104C

CHAIR:
Brian Rosenbloom, *Rothwell Figg*

PANELISTS:
- **Patrick Chapman,** *Mainspring Energy*
- **Johann Walter Kolar,** *ETH*
- **Grant Pitel,** *Magna-Power*
- **Jeewika Ranaweera,** *Chair IEEE Future Directions*

This RAP session will answer your questions regarding how best to protect your innovations and other valuable intellectual property (IP). Is seeking a patent always the best approach? Are you better off with other forms of protection or no protection at all? What are the benefits of seeking patent protection and are they worth the costs? Is trade-secret protection an option? This RAP session provides answers to these questions from a variety of viewpoints. Come join this panel of experts in what should be a lively and informative debate.

8:30 AM – 12:00 PM

T09: Bi-directional DC DC Converter

GRAND BALLROOM A

SESSION CHAIRS

Khurram Afridi, *Cornell University*

Enver Candan, *IBM*

8:30 AM

T09.1: Resonant Commutation Technique for Scalable Electronic-Embedded Transformer DCX with Bidirectional Switch

Yuliang Cao, PhD, *Virginia Polytechnic Institute and State University*

Bidirectional DC/DC converters

AUTHORS: Yuliang Cao, Khai Ngo, Dong Dong

8:50 AM

T09.2: Generalized Instantaneous Dual Flux Control for Three-Phase Dual-Active Bridge Converter

Jonghun Yun, *Seoul National University*

Bidirectional DC/DC converters

AUTHORS: Jonghun Yun, Shenghui Cui, Seung-Ki Sul

9:10 AM

T09.3: Enhanced Triple Phase Shift Modulation Strategy for ANPC-DAB Converter to Extend Soft Switching Range

Hui Cao, PhD, *university of Arkansas*

Bidirectional DC/DC converters

AUTHORS: Hui Cao, Nan Lin, Peyman Darvish, Yushi Yang, Zhenqi Wang, Yue Zhao

9:30 AM

T09.4: Enhancing Resilience of DAB Converters with Fault-Tolerant Approach

Utkal Ranjan Muduli, PhD, *Khalifa University*

Bidirectional DC/DC converters

AUTHORS: Piyali Pal, Majid Poshtan, Abdul R. Beig, Ranjan Kumar Behera, Khalifa Al Hosani, Utkal Ranjan Muduli

9:50 AM

T09.5: Localization of Open-Circuit Faults in GaN-Based Three-Phase Dual Active Bridge Converters with Reduced Sensing Requirements

Satyam Sa, *University of Toronto*

Bidirectional DC/DC converters

AUTHORS: Satyam Sa, Yi Han, Seyed Amir Assadi, Mohammad Shawkat Zaman, Olivier Trescases

10:40 AM

T09.6: A Variable Frequency Modulation Strategy for Current-Fed Dual-Active-Bridge Converter to Expand ZVS Range

Cong Li, *Xi'an Jiaotong University*

Bidirectional DC/DC converters

AUTHORS: Cong Li, Xipei Yu, Yunfei Li, Hengkai Dang, Jinjun Liu, Sixing Du

11:00 AM

T09.7: Circulating Power and Winding Current Minimization in a Triple Active Bridge DC-DC Converter with Optimized Leakage Inductance Design

Md Didarul Alam, *North Carolina State University*

Bidirectional DC/DC converters

AUTHORS: Md Didarul Alam, Mohammad Mahinur Rahman, Iqbal Husain, Srdjan Lukic

11:20 AM

T09.8: A Partial-Power-Processed CLLC-Dab DC/DC Transformer with Voltage Self-Balancing Capability for Bipolar LVDC Distribution Systems

Ruizhi Wei, *University of Alberta*

Resonant Converters

AUTHORS: Ruizhi Wei, Rui Liu, Li Ding, Yunwei Li

11:40 AM

T09.9: Three-Phase Interleaved Bidirectional LLC Resonant Converter with Vertically Integrated Magnetics

Junyang Bao, BS, *Huazhong University of Science and Technology*

Resonant Converters

AUTHORS: Junyang Bao, Yong Li, Shanxu Duan, Bangyin Liu

8:30 AM – 12:00 PM

T10: Solid-state Transformers

ROOM 103AB

SESSION CHAIRS

Sudip Mazumder, *University of Illinois-Chicago*

Jonathan Kimball, *Sandia National Laboratories*

8:30 AM

T10.1: A Single Stage Dual Active Half-Bridge Single Phase Solid-State Transformer with Wide Input-Range

Burkhard Ulrich, *Reutlingen University*

Solid-State Transformers

AUTHORS: Burkhard Ulrich, Fabian Ohler, Fabian Schenzle, Tobias Walter

8:50 AM

T10.2: Single-Stage Isolated Three-Port AC-DC-DC Converter with Asymmetrical Modulation

Tengfei Sun, MA, *Nanyang Technological University*

Bidirectional Grid Interface Converters

AUTHORS: Tengfei Sun, Ziheng Xiao, Zhou He, Yi Tang

9:10 AM

T10.3: Isolated Three-Phase AC-AC Converter with Phase Shift Modulation

Jacob Mueller, *Sandia National Laboratories*

Solid-State Transformers

AUTHORS: Jacob Mueller, Jack Flicker, Andrew Dow, Luciano Garcia Rodríguez, Felipe Palacios

9:30 AM

T10.4: Design of Asynchronous Microgrid Power Conditioning System with Gen-3 10 kV SiC MOSFETs for MV Grid Interconnection

Nithin Kolli, *North Carolina State University*

Bidirectional Grid Interface Converters

AUTHORS: Nithin Kolli, Sanket Parashar, Raj Kumar Kokkonda, Subhashish Bhattacharya, Victor Veliadis

9:50 AM

T10.5: A Five-Level AC/DC Converter for MV Solid-State Transformer

Yipeng Ren, PhD, *Zhejiang University*

Solid-State Transformers

AUTHORS: Yipeng Ren, Haoyuan Weng, Xin Wu, Dehong Xu

10:40 AM

T10.6: AC Solid-State Transformer Using DC-DC Converters and Without Added Rectifier and Inverter Stages

Ravisekhar Raju, *Fastwatt*

Solid-State Transformers

AUTHORS: Ravisekhar Raju, Jesse Leonard

11:00 AM

T10.7: Optimization of DC-Link Capacitance for Single-Phase ISOP SST Considering the Second Harmonic Pulsating Power in LLC Converter

Tianyu Wei, *Power Electronics Laboratory, EPFL*

Solid-State Transformers

AUTHORS: Tianyu Wei, Andrea Cervone, Drazen Dujic

11:20 AM

T10.8: A 100 kW, 405 kHz HFT for Power Electronic Building Blocks (PEBBs) with a Compact MV Electrical Insulation Design

Sharifa Sharfeldden, MS, *Virginia Tech, Center for Power Electronics*

Solid-State Transformers

AUTHORS: Sharifa Sharfeldden, Taha Moaz, Narayanan Rajagopal, Marie Lawson, Christina Dimarino

8:30 AM – 12:00 PM

T11: Inverters

ROOM 101A

SESSION CHAIRS

Matt Woongkul Lee, *Michigan State University*

Ali Safayet, *Halla Mechatronics.*

8:30 AM

T11.1: Comparative Experimental Evaluation of a Three-Phase ARCP Inverter with a Single Shared Inductor Using SiC MOSFETs and Si IGBTs

Thomas Lehmeier, MS, *Friedrich-Alexander-Universität Erlangen-Nürnberg*

Single- and Multi-Phase Inverters

AUTHORS: Thomas Lehmeier, Adrian Amler, Yan Zhou, Martin März

8:50 AM

T11.2: PCB-Integrated Pickup-Coil for Overcurrent Detection in High-Current, Paralleled GaN HEMTs

Dominik Koch, MA, *University of Stuttgart*

Sensor Integration

AUTHORS: Dominik Koch, Tobias Fink, Jeremy Nuzzo, Kevin Muñoz Barón, Ingmar Kallfass

9:10 AM

T11.3: A 7-Level Interleaved Hybrid Active Neutral Point Clamped Converter for High-Frequency Low-Inductance Motors

Arjit Bali, MS, *University of Illinois Urbana-Champaign*

Single- and Multi-Phase Inverters

AUTHORS: Arjit Bali, Xiaolong Zhang, Anubhav Bose, Kiruba Haran, Andrew Stillwell

9:30 AM

T11.4: Soft Switching ARCP Inverter Using Series Connected SiC MOSFETs for Medium Voltage Motor Drive Applications

Raj Kumar Kokkonda, MS, *North Carolina State University*

Single- and Multi-Phase Inverters

AUTHORS: Raj Kumar Kokkonda, Subhashish Bhattacharya

9:50 AM

T11.5: Zero Sequence and Ground Current Analysis of Dual Source Open-End Winding PMSM Drive System

Gyu Cheol Lim, *Seoul National University*

Single- and Multi-Phase Inverters

AUTHORS: Gyu Cheol Lim, Junhyuk Yang, Cheolmin Hwang, Jung-Ik Ha

10:40 AM

T11.6: Overshoot Dynamics in Parallel Connectivity Enabled Multilevel Converters: Generalized Analytic Expression and Impact Analysis

Jinshui Zhang, *Duke University*

Single- and Multi-Phase Inverters

AUTHORS: Jinshui Zhang, Majed Munefi, Angel Peterchev, Stefan Goetz

11:00 AM

T11.7: Analysis and Mitigation of Voltage Overshoot in Auxiliary Switches of a Si-IGBT ARCP Inverter

Weiqiang Chen, PhD, *ABB*

Single- and Multi-Phase Inverters

AUTHORS: Weiqiang Chen, Eddy Aeloiza, Veli-Matti Leppanen, Tero Viitanen

11:20 AM

T11.8: 1 kW 6.78 MHz Push-Pull 2 Amplifier for Induction Heating

Calvin H. Lin, *Stanford University*

Single- and Multi-Phase Inverters

AUTHORS: Calvin Lin, Zhechi Ye, Eric Stolt, Juan Rivas-Davila

11:40 AM

T11.9: Two Switches Common Grounded Transformerless Step-Up and Step-Down Inverter

Ion Dos Santos, MSc, *Federal University of Santa Catarina*

Single- and Multi-Phase Inverters

AUTHORS: Ion Dos Santos, Telles Brunelli Lazzarin

8:30 AM – 12:00 PM

T12: Converter & Components Modeling & Simulation

ROOM 101B

SESSION CHAIRS

Kasunaidu Vechalapu, *Infineon Technologies Americas Corp.*

Bridget O'Gorman, *PSMA*

8:30 AM

T12.1: Derivation and Analysis of New Small-Signal Model for Active Clamp Forward Converter

Dongheon Lee, MA, *Kyungpook National University, Korea*

Circuits and Systems

AUTHORS: Dongheon Lee, Yonghan Kang, Byungcho Choi, Honnyong Cha

8:50 AM

T12.2: Accurate Data-Driven Losses Modeling for SiC-Based Converters

Francesco Porpora, *University of Cassino and Southern Lazio*

Circuits and Systems

AUTHORS: Francesco Porpora, Daniele Marciano, Franco Pio Caruso, Mauro Di Monaco, Giuseppe Tomasso

9:10 AM

T12.3: High-Frequency Equivalent Circuit of a Ferrite Common Mode Choke Considering DC Superimposition Characteristics

Katsuya Nomura, PhD, *Kwansei Gakuin University*

Device and Component Modeling

AUTHORS: Katsuya Nomura, Shuhei Chizuwa, Takashi Masuzawa

9:30 AM

T12.4: Optimizing DC Inductor Design with Air Gap for Triangular Excitation: A Reinforcement Learning Approach

Fanghao Tian, PhD, *KU Leuven-EnergyVille*

Rapid Prototyping

AUTHORS: Fanghao Tian, Hans Wouters, Xiaobing Shen, Wilmar Martinez

9:50 AM

T12.5: Small-Signal Modeling of Multi-Phase Trans-Inductor Voltage Regulator Modules in Datacenter Applications

Chenxi Li, *ShanghaiTech University*

Circuits and Systems

AUTHORS: Chenxi Li, Liang Wang, Minfan Fu, Haoyu Wang

10:40 AM

T12.6: Investigation of Parasitic Capacitance Models for Planar Transformers: Accuracy and Impedance Prediction

Quang-Huy Nguyen, BE, *EVSELab Co.Ltd., Hanoi University of Science and Technology*

Parasitics

AUTHORS: Quang-Huy Nguyen, Minh-Quang Ngo, Duy-Dinh Nguyen, Nhat-Truong Phan, Tat-Thang Le

11:00 AM

T12.7: **Modelling the Effect of the DC Link Decoupling Capacitor of a Commutation Power Loop Using a Thevenin-Based Frequency Domain Approach**

Ayooluwa A. Ajiboye, *University of Maryland*

Device and Component Modeling

AUTHORS: Ayooluwa Ajiboye, Ayodhya Somiruwan Gamwari, Rakesh Resalayyan, Alireza Khaligh

11:20 AM

T12.8: **Aging Modeling and Simulation of the Gate Switching Instability Degradation in SiC MOSFETs**

Juan Ramon García-Meré, M.Sc. in Telecommunication Engineering, *Universidad de Oviedo*

Device and Component Modeling

AUTHORS: Juan Ramon García-Meré, Alexis A. Gómez, Jaume Roig-Guitart, Juan Rodríguez, Alberto Rodríguez

8:30 AM – 12:00 PM

T13: Control of Power Electronic Converters II

ROOM 104B

SESSION CHAIRS

Jaber Abu Qahouq, *The University of Alabama (UA)*

Seungdeog Choi, *Mississippi State University*

8:30 AM

T13.1: **Fast Transient DC-Bus Dynamics in GaN-Based PFCs: Dual-Loop Geometric Control**

Rahil Samani, MSc, *University of Calgary*

Control of Power Electronic Converters

AUTHORS: Rahil Samani, Ignacio Galiano Zurbriggen, Matteo Sposito, Ignacio Santana

8:50 AM

T13.2: **Experimental Validation of a Control Strategy Enhancing the Dynamic Performance of Current-Fed Triple-Active-Bridge DC-DC Converters**

Paul Kowalewski, MA, *RWTH Aachen*

Control of Power Electronic Converters

AUTHORS: Paul Kowalewski, Adrian Tissen, André Thönnessen, Niklas Fritz, Rik W. De Doncker

9:10 AM

T13.3: **Dual Active Bridge Simultaneous Input Admittance Passivity Shaping and Reference Tracking Using Low Order H-Infinity Control**

Juan José Pérez, MA, *Universidad de Alcalá*

Control of Power Electronic Converters

AUTHORS: Juan José Pérez, Daniel Santamargarita, David Molinero, Robert Griñó, Francisco Huerta, Daniel Pizarro, Santiago Cóbreces

9:30 AM

T13.4: **A Power Supply and High-Voltage Blocking Sensing Circuit for High Voltage Synchronous Rectifier**

Song Ding, *Southeast University*

Sensor and Sensor-less Control

AUTHORS: Song Ding, Chunyan Nie, Minggang Chen, Ziyan Zhou, Lanxin Gu, Qinsong Qian

9:50 AM

T13.5: **Small-Signal Modeling of Multiphase V^2 Constant On-Time Control with Phase Overlapping**

Sundaramoorthy Sridhar, *Virginia Polytechnic Institute and State University*

Current-Mode and Voltage-Mode Control

AUTHORS: Sundaramoorthy Sridhar, Qiang Li

10:40 AM

T13.6: **Simple and Robust Carrier-Based PWM Technique for Single-Stage Three-Phase Rectifier Indirect Matrix Converter**

Mikayla Benson, MS, *Michigan State University*

Control of Power Electronic Converters

AUTHORS: Mikayla Benson, Avinash Dornala, Marya Andleeb, Kangbeen Lee, Woongkul Lee

11:00 AM

T13.7: **High-Bandwidth Control of a 21 kW Unfolding-Based AC-DC Converter Using Extra Element Theorem and Current Emulation Technique**

Aditya Zade, *Utah State University*

Control of Power Electronic Converters

AUTHORS: Aditya Zade, Shubhangi Gurudiwan, Mahmoud Mansour, Bryce Hesterman, Dragan Maksimović, Regan Zane

11:20 AM

T13.8: **Optimal Trajectory Control for a Fully Soft Switching Single-Stage Isolated Three Phase AC to DC Series Resonant Converter**

Yusuf Kosesoy, *Eindhoven University of Technology*

Control of Power Electronic Converters

AUTHORS: Yusuf Kosesoy, Jan Schellekens, Henk Huisman

11:40 AM

T13.9: **Cumulative Charge Balanced Single-Inductor Dual-Output Converter for Improved Transient and Cross Regulation**

Hareesh A V, *Samsung Semiconductor India Research*

Control of Power Electronic Converters

AUTHORS: Hareesh A V, Pradipta Patra, Manish Parmar, Nelson Chen

8:30 AM – 12:00 PM

T14: Gan Devices

ROOM 104C

SESSION CHAIRS

Jason Neely, *Sandia*

Gregory Pickrell, *Sandia*

8:30 AM

T14.1: Applications of Power Supply for RF Discharge in Low-Temperature Plasma Sterilization

Xi-Ming Duan, *National Tsing Hua University*

GaN HEMTs

AUTHORS: Tsai-Fu Wu, Xi-Ming Duan, Chi-Pin Wu, Wei-Che Hsu

8:50 AM

T14.2: A Gate Driver with a Low-Voltage GaN HEMT for False Turn-on Suppression and Gate Reliability Enhancement of SiC MOSFETs

Ji Shu, PhD, *HKUST*

GaN HEMTs

AUTHORS: Ji Shu, Jiahui Sun, Zheyang Zheng, Kevin Jing Chen

9:10 AM

T14.3: Evaluation of GaN HEMT dv/dt Immunity and dv/dt Induced False Turn-on Energy Loss

Nirmana Perera, PhD, *Cambridge GaN Devices*

GaN HEMTs

AUTHORS: Nirmana Perera, Kaspars Ledins, Sheung Wai Fung, Loizos Efthymiou, Kalparupa Mukherjee, John Findlay, Peter Comiskey

9:30 AM

T14.4: Vertical GaN Transistor with Quasi-Monolithically Integrated HEMT Gate Driver and Sense-CAVET for Current Monitoring

Michael Basler, PhD, *Fraunhofer Institute for Applied Solid State Physics IAF*

GaN HEMTs

AUTHORS: Michael Basler, Philipp Döring, Stefan Mönch, Richard Reiner, Rachid Driad, Michael Mikulla, Rüdiger Quay

9:50 AM

T14.5: Fast Overcurrent Protection for Direct Drive Cascode GaN HEMT Semiconductors Based on Industrial Gate Drivers

Simone Giuffrida, *Politecnico di Torino*

GaN HEMTs

AUTHORS: Enrico Vico, Fausto Stella, Simone Giuffrida, Radu Bojoi

10:40 AM

T14.6: Unclamped-Inductive-Switching Based Output Capacitance Loss Characterization with Extended Test Capability

Qihao Song, *Virginia Tech*

GaN HEMTs

AUTHORS: Qihao Song, Qiang Li, Yuhao Zhang

11:00 AM

T14.7: Experimental Characterization of Dynamic COSS Losses in 600V GaN HEMTs Based on a Novel and Simple Calorimetric Method

Alessandro Pevere, PhD, *Infineon Technologies*

GaN HEMTs

AUTHORS: Stefano de Filippis, Matthias J. Kasper, Alex Pacini, José Miguel Sanz-Alcaine, Gerald Deboy

11:20 AM

T14.8: Exceptional Gate Overvoltage Robustness in P-Gate GaN HEMT with Integrated Circuit Interface

Bixuan Wang, *CPES / Virginia Tech*

GaN HEMTs

AUTHORS: Bixuan Wang, Qihao Song, Kalparupa Mukherjee, Loizos Efthymiou, Daniel Popa, Giorgia Longobardi, Florin Udrea, Yuhao Zhang

11:40 AM

T14.9: Evaluation of Monolithic AC GaN Switch in a Vienna Rectifier for UPS

Qinghong Yu, PhD, *Schneider Electric*

GaN HEMTs

AUTHORS: Qinghong Yu, Damir Klikic, Vincent Aulagnier, Eric Persson, John Cerce

8:30 AM – 12:00 PM

T15: Power Electronics for Hybrid & Electric Cars

ROOM 102AB

SESSION CHAIRS

Rasoul Hosseini, *General Motors*

Zhengda Zhang, *TESLA*

8:30 AM

T15.1: High Fidelity Modeling Based High Power Density Three Phase Coupled Inductor Design for EV Applications

Shahid Aziz Khan, *University of Michigan*

Power Electronics for Hybrid and Electric Cars

AUTHORS: Shahid Aziz Khan, Mengqi Wang, Shivam Chaturvedi, Ducdung Le

8:50 AM

T15.2: **Experimental Evaluation of Submodule Losses in Battery-Integrated MMCs with NLM and PSPWM**
Arvind Balachandran, Msc, *Linköping University*
Power Electronics for Hybrid and Electric Cars
AUTHORS: Arvind Balachandran, Tomas Jonsson, Lars Eriksson

9:10 AM

T15.3: **Discharge Profile-Based On-State Voltage Acquisition for Power Semiconductors in EV Traction Inverters**
Xing Wei, *Aalborg University*
Power Electronics for Hybrid and Electric Cars
AUTHORS: Xing Wei, Zhaoxin Wang, Bo Yao, Jiahong Liu, Yingzhou Peng, Huai Wang

9:30 AM

T15.4: **Synchronous Rectification for a Two-Transformer Active-Clamp Forward-Flyback Converter to Remove Voltage Spikes**
Seokwon Kim, MD, *Chung-Ang university*
Power Electronics for Hybrid and Electric Cars
AUTHORS: Seokwon Kim, Hanhim Sung, Dae-Woo Lee, Tae-Jong Ha, Jun-Young Lee, Jong-Won Shin

9:50 AM

T15.5: **Two-Phase Interleaved DC Charging Method of Integrated Charger for Efficiency Enhancement**
Junhyuk Yang, *Seoul National University*
Power Electronics for Hybrid and Electric Cars
AUTHORS: Junhyuk Yang, Gyu Cheol Lim, Cheolmin Hwang, Jung-Ik Ha

10:40 AM

T15.6: **Digital Closed Loop Control of a Three Port Series Resonant Converter for Electric Vehicles**
Kyle Kozielski, BEng, *McMaster University*
Power Electronics for Hybrid and Electric Cars
AUTHORS: Kyle Kozielski, Guvanthi Abeysinghe Mudiyanselage, Rachit Pradhan, Giorgio Pietrini, Ashish Solanki, Parthasarathy Nayak, Mehdi Narimani, Ali Emadi

11:00 AM

T15.7: **Effects of Regenerative Braking on Hybrid Battery Balancing**
Alvin Huynh, *Ontario Tech University*
Vehicular Power Electronic Circuits and Systems
AUTHORS: Alvin Huynh, Akash Samanta, Sheldon Williamson

11:20 AM

T15.8: **Comparative Evaluation of SiC/GaN/Si-Based Drive-Train Inverters for Light Electric-Vehicles**
Sai Srinivas Manohar, MSc, *National University of Singapore*
Power Electronics for Hybrid and Electric Cars
AUTHORS: Jaydeep Saha, Sai Srinivas Manohar, Prasanth Sundararajan, Sanjib Kumar Panda

11:40 AM

T15.9: **Experimental Verification of 500kW Resonant Switched-Capacitor Converter for Electric Trucks and Electric Aircraft Application**
Xiaoyan Liu, *University of Dayton*
Power Electronics for Aerospace
AUTHORS: Xiaoyan Liu, Maohang Qiu, Kevin Hobbs, Ahmed Dahneem, Haoran Meng, Dong Cao

8:30 AM – 12:00 PM

T16: Magnetic Applications I

ROOM 104A

SESSION CHAIRS

George Slama, *Würth Elektronik*

Matt Wilkowski, *Enachip Inc.*

8:30 AM

T16.1: **Low-Profile Fractional Planar Transformer Based on a Novel Infinite-Shape PCB Winding for 5kW Dual Active Bridge Converter**
Amin Khakparvaryazdi, PhD, *University of Alberta*
High-frequency Magnetics
AUTHORS: Amin KhakparvarYazdi, Sayed Ali Khajehoddin

8:50 AM

T16.2: **Evaluation and Comparison of Discrete Magnetics and Integrated Magnetics for High Power LLC Converters**
Feng Jin, *CPES / Virginia Tech*
Magnetics Applications
AUTHORS: Feng Jin, Zheqing Li, Tianlong Yuan, Chunyang Zhao, Qiang Li

9:10 AM

T16.3: **Analysis and Design Trade-Offs of a Multi-Winding High-Frequency Transformer for a Battery Charger**
Neha Rajput, *Indian Institute of Science, Bengaluru*
High-frequency Magnetics
AUTHORS: Neha Rajput, Himanshu Bhusan Sandhibigraha, Vishnu Mahadeva Iyer

9:30 AM

T16.4: **Design and Performance Comparison of Multi-Frequency Inductors for Megahertz Wireless Power Transfer**

Rachel S. Yang, *Massachusetts Institute of Technology*

High-frequency Magnetics

AUTHORS: Rachel S. Yang, Ioannis Nikiforidis, Nunzio Pucci, Mansi Joisher, Prateek Wagle, Paul D. Mitcheson, David J. Perreault

9:50 AM

T16.5: **A 10kW/200kHz PCB-Winding Transformer with High Insulation Voltage for Solid-State Transformer Applications**

Chen Chen, *The University of Texas at Austin*

Magnetics Applications

AUTHORS: Chen Chen, Zhicheng Guo, Alex Q. Huang

10:40 AM

T16.6: **All-in-One Magnetic Structure for PSFB Converter with Current Doubler Rectifier**

Huu-Phuc Kieu, *SeoulTech*

High-frequency Magnetics

AUTHORS: Huu-Phuc Kieu, Dinh Bao-Hung Nguyen, Donghyuk Lee, Sewan Choi

11:00 AM

T16.7: **Embedded Gate Driver Tansformer for Use with Medium Voltage SIC MOSFETS**

James E. Quilici, MSEE, *Shennan Circuits America*

Magnetics Applications

AUTHORS: James Quilici, Ping Lu

11:20 AM

T16.8: **Double Sided Conduction in N:1 Transformers**

Alyssa Brown, *University of Texas at Austin*

High-frequency Magnetics

AUTHORS: Alyssa Brown, Michael Solomentsev, Champers Fu, Odinaka Okeke, Alex Hanson

1:30 PM – 5:00 PM

T17: POL & Multiphase DC DC Converters

GRAND BALLROOM A

SESSION CHAIRS

Sombuddha Chakraborty, *Texas Instruments*

Olivier Trescases, *UofToronto*

1:30 PM

T17.1: **A 1500-A/48-V-to-1-V Switching Bus Converter for Next-Generation Ultra-High-Power Microprocessors**

Yicheng Zhu, MS, *University of California Berkeley*

Point-of-Load (PoL) and Multi-Phase Converters

AUTHORS: Yicheng Zhu, Jiarui Zou, Robert Pilawa-Podgurski

1:50 PM

T17.2: **Analysis of Parasitic Stored Energy Loss and PCB Layout Optimization for 48V-to-1V Series-Capacitor Buck**

Xinmiao Xu, *Virginia Tech*

Point-of-Load (PoL) and Multi-Phase Converters

AUTHORS: Xinmiao Xu, Qiang Li

2:10 PM

T17.3: **Vertical Power Delivery for 1000 Amps Machine Learning ASICs**

Houle Gan, *Google LLC*

Voltage Regulator Modules (VRM)

AUTHORS: Houle Gan, Shuai Jiang, Sue Teng, Shin Yamamoto, Venkata Chivukula, Bill Edwards, Chee Chung, Jason Chen, Mushafik Mohideen, Gregory Sizikov, Xin Li

2:30 PM

T17.4: **A 2400 W/in³ 1.8 V Bus Converter Enabling Vertical Power Delivery for Next-Generation Processors**

Pranav Raj Prakash, MS, *CPES / Virginia Tech*

Voltage Regulator Modules (VRM)

AUTHORS: Pranav Raj Prakash, Ahmed Nabih, Yan Liang, Sudhir Kudva, Mostafa Mosa, Thomas Gray, Qiang Li

2:50 PM

T17.5: **Ultra-Low-Profile Twisted Core Inductor for Vertical Power Delivery Voltage Regulator**

Adhistira Madhyasta Naradhipa, *Virginia Polytechnic Institute and State University*

Voltage Regulator Modules (VRM)

AUTHORS: Adhistira Madhyasta Naradhipa, Feiyang Zhu, Qiang Li

3:40 PM

T17.6: **500A Stacked Direct Power Converter with Standard PCB Transformer**

José A. Cobos, *Differential Power S.L.*

Point-of-Load (PoL) and Multi-Phase Converters

AUTHORS: José A. Cobos, Pablo Mazariegos, Alejandro Figueroa, Alejandro Castro, Álvaro Cobos

4:00 PM

T17.7: Efficiency Impact of Phase Firing Order in Dual-Sided Power Entry with Trans-Inductor Voltage Regulators (TLVR)

Pavan Kumar, PhD, *Intel Corporation*

Point-of-Load (PoL) and Multi-Phase Converters

AUTHORS: Pavan Kumar, Justin Tippetts, Satya Sai Deepak Naidu, Paul Brusco

4:20 PM

T17.8: A Novel Concept of Injected Coupled Inductors

Alexandr Ikriannikov, PhD, *Analog Devices*

Point-of-Load (PoL) and Multi-Phase Converters

AUTHORS: Alexandr Ikriannikov, Laszlo Lipcsei

4:40 PM

T17.9: A 97% Peak Efficiency 12V to 1V 500A Multi-Phase Direct Power Converter for High Current Applications

Alejandro Castro, MS, *Differential Power S.L.*

Resonant Converters

AUTHORS: Alejandro Castro, Pablo Mazariegos, Alejandro Figueroa, Álvaro Cobos, José A. Cobos

1:30 PM – 5:00 PM

T18: Protection & Control for Utility Interface & UPS

ROOM 103AB

SESSION CHAIRS

Ravisekhar Raju, *FastWatt LLC*

Jacob Mueller, *Missouri University of Science and Technology*

1:30 PM

T18.1: Machine Learning Based Inter-Turn Short Circuit Detection for Three-Phase Power Transformers with Primary Side Currents

Yujia Cui, MS, *Rockwell Automation Inc.*

Power Generation, Transmission and Distribution

AUTHORS: Yujia Cui, Kadir Liano, Zhijun Liu, Zhuo Liu, Hao Yang, Haihui Lu, Zhongyuan Cheng, Navid Zargari, Jiangang Hu, Ranga Tallam, Bijan Sayyarrodsari

1:50 PM

T18.2: Open-Circuit Switch Fault Diagnosis in Single-Phase CHMC with Switching Duty Ratio-Based Estimated Grid Current

Hyeon Woo Oh, MS, *Dankook University*

Solid-State Transformers

AUTHORS: Hyeon-Woo Oh, Dongho Choi, Jeong-Yul Bang, June-Seok Lee

2:10 PM

T18.3: Modeling and Experiments of a Nonlinear Inductor-Based Fault Current Commutation Strategy for a Hybrid DC Circuit Breaker

Qichen Yang, PhD, *Florida State University*

Power Generation, Transmission and Distribution

AUTHORS: Qichen Yang, Michael Steurer, Sihun Song, Matthew Pickles, John Hauer, Matthew Bosworth, Nash Bonaventura, Yuchen He, Michael Coleman, Karl Schoder, Yanjun Shi, Lukas Graber

2:30 PM

T18.4: Mixed Duty-Ratio and Frequency Modulation Control for a Soft-Switched Inversion Stage of a High-Power-Density Online Uninterruptible Power Supply (UPS)

Maida Farooq, *Cornell University*

Power Quality, UPS, Filters

AUTHORS: Maida Farooq, Khurram Afridi

2:50 PM

T18.5: Optimal Design of Supercapacitor Stacks for Size-Critical Applications

Arkadeb Sengupta, M.Tech., *Kiel University*

UPS

AUTHORS: Arkadeb Sengupta, Thiago Pereira, Marco Liserre

3:40 PM

T18.6: Stability Analysis of MMC Considering Internal Dynamics Based on Equivalent Impedance Model

Hongyi Chen, PhD Student, *Zhejiang University*

Power Generation, Transmission and Distribution

AUTHORS: Hongyi Chen, Heya Yang, Zhizhan Tang, Rujing Zhang, Xin Xiang, Wuhua Li

4:00 PM

T18.7: A Practical and Unique Control Technique to Enhance Efficiency of Dual-Stage DC-AC Power Inverter

Fabrizio Di Franco, *STMicroelectronics*

UPS

AUTHORS: Akshat Jain, Ranajay Mallik

4:20 PM

T18.8: 13.8 kV, 1MW Resonant Direct AC Medium Voltage Single Stage Solar PV Inverter

Adel Nasiri, PhD, *University of South Carolina*

Distributed Energy Systems

AUTHORS: Parthkumar Bhuvela, Hooman Taghavi, Adel Nasiri

4:40 PM

T18.9: Three-Phase Single-Stage Bidirectional Isolated AC-AC Converter with Reduced Count of Switches
Gerry Moschopoulos, *Western University*
Solid-State Transformers
AUTHORS: Asad Hameed, Gerry Moschopoulos

1:30 PM – 5:00 PM

T19: High Performance Drives

ROOM 104C

SESSION CHAIRS

Ali Safayet, *Halla Mechatronics.*

Anup Anurag, *Danfoss*

1:30 PM

T19.1: A 14-Level FCML Inverter for Electric Vehicles with Optimal Capacitors Achieving 175 kW/kg and 380 kW/L Power Density
Logan Horowitz, *UC Berkeley*
High Performance Drives
AUTHORS: Logan Horowitz, Robert Pilawa-Podgurski

1:50 PM

T19.2: Common-Mode EMI Noise Analysis of Neutral-Point-Less (NPL) Multilevel X-Type Inverter
Kangbeen Lee, M.E, *Michigan State University*
High Performance Drives
AUTHORS: Kangbeen Lee, Mikayla Benson, Xiaofeng Dong, Jinyeong Moon, Woongkul Lee

2:10 PM

T19.3: Comprehensive Comparative Analysis: VSI-Based vs. CSI-Based Motor Drive Systems with Sinusoidal Output Voltage
Feida Chen, MS, *University of Wisconsin-Madison*
High Performance Drives
AUTHORS: Feida Chen, Sangwhee Lee, Thomas Jahns, Bulent Sarlioglu

2:30 PM

T19.4: Direct Flux-and-Torque Vector Control with Active Torque Ripple Minimization
Gianmario Pellegrino, *Politecnico di Torino*
High Performance Drives
AUTHORS: Andrei Bojoi, Paolo Pescetto, Fausto Stella, Simone Ferrari, Gianmario Pellegrino

2:50 PM

T19.5: Virtual Reduced-Order Plant-Based Speed Sensorless Control for AC Motor Drives with Output LC Filter
Cheng Xue, PhD, *University of Alberta*
High Performance Drives
AUTHORS: Cheng Xue, Xuesong Wu, Yunwei Li

3:40 PM

T19.6: Multi-Rate Finite Control Set Model Predictive Control with Reduced Circulating Currents for Parallel Dual-Converter-Fed PMSM Drive
Xuesong Wu, *university of Alberta*
High Performance Drives
AUTHORS: Xuesong Wu, Cheng Xue, Yunwei Li

4:00 PM

T19.7: Design and Implementation of a dv/dt Filter for Motor Overvoltage Mitigation in SiC-Based Adjustable Speed Drives
Wenzhi Zhou, PhD, *The University of Bristol*
High Performance Drives
AUTHORS: Wenzhi Zhou, Zhaobo Zhang, Xibo Yuan, Mohamed Diab

4:20 PM

T19.8: Enhancing Low-Speed Torque Profile in a Self-Commutated 12-Pulse CSI Fed Multi-Phase Induction Machine Using a Novel PWM Scheme
Pratyush Pandey, *Indian Institute of Technology Madras, India*
High Performance Drives
AUTHORS: Pratyush Pandey, Harikrishnan P, Kamalesh Hatua

4:40 PM

T19.9: Semiconductor Power Losses Reduction Using Tandem Diodes Concepts for Motor Drives Applications
Tiago Jappe, Dr, *Vincotech*
High Performance Drives
AUTHORS: Tiago Jappe, Matthias Tauer, Zoltán Major

1:30 PM – 5:00 PM

T20: Sic Devices

ROOM 104A

SESSION CHAIRS

Lee Gill, *Sandia*

Riya Paul, *Virginia Tech*

1:30 PM

T20.1: Deep Investigation on SiC MOSFET Degradation Under Gate Switching Stress and Application Switching Stress

Alexis A. Gómez, MSc, *University of Oviedo*

SiC MOSFETs and BJTs

AUTHORS: Alexis A. Gómez, Juan Ramon García-Meré, Alberto Rodríguez, Juan Rodríguez, Carlos Jimenez, Jaume Roig-Guitart

1:50 PM

T20.2: Current Balancing of Parallel High Current SiC Half Bridge Modules Using Delay Based Active Gate Driving with Inter-Device Inductances

Mason Parker, MEng, *University Of Edinburgh*

SiC MOSFETs and BJTs

AUTHORS: Mason Parker, Sebastian Neira, Philip Waite, Edward Horsley, Stephen Finney, Paul Judge

2:10 PM

T20.3: Surge Current Handling Capability of SiC Fets

Larry Xueqing Li, PhD, *Qorvo, Inc.*

SiC MOSFETs and BJTs

AUTHORS: Larry Xueqing Li, Pete Losee, Anup Bhalla

2:30 PM

T20.4: Design of 10 kV SiC MOSFET Power Module Based MW-Level Modular Multilevel Converter Phase-Leg

Ruirui Chen, PhD, *University of Tennessee*

SiC MOSFETs and BJTs

AUTHORS: Ruirui Chen, Dingrui Li, Min Lin, Mohamed Al Sager, Zihan Gao, Fred Wang, Hua Kevin Bai, Leon M. Tolbert

2:50 PM

T20.5: Electro-Thermal Trade-Off for AC-Current Injection & Series-Clamping-Diodes Based Rds-On Estimation Circuit

Furkan Karakaya, PhD Student, *University of Illinois Urbana-Champaign*

SiC MOSFETs and BJTs

AUTHORS: Furkan Karakaya, Anuj Maheshwari, Arijit Banerjee, John Donnal

3:40 PM

T20.6: Gate-Source-Dependent Soft- and Hard-Switching Losses of 1200V SiC MOSFETs Utilizing Heatsinkless Calorimetric Measurements Based on Optical Sensors

Ruben Schnitzler, MA, *University of Stuttgart*

SiC MOSFETs and BJTs

AUTHORS: Ruben Schnitzler, Dominik Koch, Mathias C. J. Weiser, Julian Weimer, Ingmar Kallfass

4:00 PM

T20.7: Online Monitoring Method for SiC MOSFET Gate Oxide Degradation Based on Gate Voltage Filtering

Jiahong Liu, PhD, *Aalborg University*

SiC MOSFETs and BJTs

AUTHORS: Jiahong Liu, Bo Yao, Xing Wei, Yichi Zhang, Huai Wang

4:20 PM

T20.8: Energy-Based Method to Estimate the Partial Hard Turn-on Loss of Complementary SiC MOSFET from Experiment

Kaushik Basu, PhD, *Indian Institute of Sciences*

SiC MOSFETs and BJTs

AUTHORS: Manish Mandal, Bharath Kumar M, Malingu G, Shamibrota Kishore Roy, Kaushik Basu

4:40 PM

T20.9: Measurement of Circuit Parasitics of a 200kW SiC Based Stack

Kaushik Basu, PhD, *Indian Institute of Sciences*

SiC MOSFETs and BJTs

AUTHORS: Surjakanta Mazumder, Manish Mandal, Bharath Kumar M, Malingu G, Shamibrota Kishore Roy, Kaushik Basu

1:30 PM – 5:00 PM

T21: Gate Drive Circuits

ROOM 104B

SESSION CHAIRS

Kang Wei, *Texas Instruments*

Seungdeog Choi, *Mississippi State University*

1:30 PM

T21.1: Variable Gate Current Range Digital Gate Driver IC Always Providing 6-Bit Controllability in Various IGBTs

Haoxi Zhou, Master, *The University of Tokyo*

Gate Drive Circuits

AUTHORS: Haoxi Zhou, Toshiaki Inuma, Dibo Zhang, Katsuhiro Hata, Makoto Takamiya

1:50 PM

T21.2: **A Digital Gate Driver IC with a Digitally Adjustable DESAT and Parameter Adjustment Method for False Detection Prevention and Short-Circuit Protection of 1200V 180A SiC Module**

Koutaro Miyazaki, PhD, *Toshiba Research & Development Center*

Gate Drive Circuits

AUTHORS: Koutaro Miyazaki, Shusuke Kawai, Takeshi Ueno, Hiroaki Ishihara

2:10 PM

T21.3: **Closed Loop Digital Design of Active Gate Driver Based Power Converter**

Manish Kumar, PhD, *Cardiff University and Toshiba Europe Ltd*

Gate Drive Circuits

AUTHORS: Manish Kumar, Zhengyang Feng, Sheng Wang, Magnus Sandell, Wenlong Ming

2:30 PM

T21.4: **A Quad-Slope 70V GaN Gate Driver with Integrated Three-Mode Level Shifter for Enhanced Negative Voltage Tolerance, dV/dt Detection and Double-Edge Self-Triggered Delay Compensation**

Tianqi Liu, PhD, *University of Macau*

Gate Drive Circuits

AUTHORS: Tianqi Liu, Qiang Gao, Rui P. Martins, Yan Lu

2:50 PM

T21.5: **5-MHz Operation of a DC 565-V SiC-MOSFET Half-Bridge Inverter by Reducing Thermal Resistance of General-Purpose Gate Drivers**

Koji Orikawa, PhD, *Hokkaido University*

Gate Drive Circuits

AUTHORS: Koji Orikawa, Sota Asano, Satoshi Ogasawara

3:40 PM

T21.6: **Application of a Short-Circuit Protection by Using Gate Charge Characteristic to Three Parallel Connected IGBT Modules**

Takeshi Horiguchi, PhD, *Mitsubishi Electric Corporation*

Gate Drive Circuits

AUTHORS: Takeshi Horiguchi, Kosuke Horino, Yasushige Mukunoki, Kenji Oda, Masahiro Kinoshita, Masahiko Tsukakoshi

4:00 PM

T21.7: **Impact of Operational Parameters on dVDS/dt of SiC MOSFET and a Scheme for Gate Driver Resistance Selection to Limit dVDS/dt**

Aditya Aman, Doctoral Student, *IIT Bombay*

Gate Drive Circuits

AUTHORS: Aditya Aman, Abhishek Chanekar, Sandeep Anand, Anant Agarwal

1:30 PM – 5:00 PM

T22: Wireless Power Transfer: Topology

ROOM 102AB

SESSION CHAIRS

Jungwon Choi, *University of Washington*

Regan Zane, *Utah State University*

1:30 PM

T22.1: **Drone Charging Stations on Telecom Towers with Series-Stacked Capacitive Differential Wireless Power Transfer**

Mian Liao, MA, *Princeton University*

Wireless Charging

AUTHORS: Mian Liao, Tanuj Sen, Youssef Elasser, Hashim Al Hassan, Andrew Pigney, Edward Knapp, Minjie Chen

1:50 PM

T22.2: **Accurate Switch-Current Reading by Utilizing PCB-Embedded Differential Rogowski Coils**

Ali Parsa Sirat, PhD, *EWMFG/University of North Carolina at Charlotte*

Non-contact Sensors for Power Electronics

AUTHORS: Ali Parsa Sirat, Jiale Zhou, Hossein Niakan, Babak Parkhideh

2:10 PM

T22.3: **A Single-Stage Reconfigurable Wireless Charger for 400-V and 800-V Electric Vehicle Battery Voltages**

Deepak Ronanki, PhD, *Indian Institute of Technology Madras*

Wireless Charging

AUTHORS: Guru Prasad Reddy Vaddemani, Harish Karneddi, Deepak Ronanki

2:30 PM

T22.4: **A High-Power-Density Reduced-Fringing-Field Multi-MHz Capacitive Wireless Power Transfer System**

Syed Saeed Rashid, *Cornell University*

Wireless Charging

AUTHORS: Syed Saeed Rashid, Dheeraj Etta, Matteo Ciabattoni, Sounak Maji, Francesco Monticone, Khurram Afridi

2:50 PM

T22.5: **A Family of Balance Circuits for Inductive Power Transfer Systems to Reduce Common Mode Noise**

Guoao Li, PhD, *Zhejiang University*

Wireless Charging

AUTHORS: Guoao Li, Ying Mei, Wanying Weng, Yizhen Lin, Jiande Wu, Xiangning He

3:40 PM

T22.6: A Novel Hybrid Magnetic Core Design Method for Weight Reduction of Wireless Power Transfer Systems

Yaohua Li, MA, *Nanyang Technological University*

Wireless Charging

AUTHORS: Yaohua Li, Sicheng Wang, Yue Wu, Yongbin Jiang, Xuhui Zhu, Ziheng Xiao, Zhou He, Yi Tang

4:00 PM

T22.7: A Variable Compensation Rectifier with Enhanced Compensation Capability for Coupling Variations in Wireless Power Transfer Systems

Asif Mushtaq Bhat, *Indian Institute of Technology Delhi*

Wireless Charging

AUTHORS: Asif Mushtaq Bhat, Sreyam Sinha

4:20 PM

T22.8: Comparative Evaluation of Voltage- and Current-Impressed Inductive Power Transfer to Multiple Stainless-Steel-Enclosed Moving Receivers

Junzhong Xu, PhD, *Power Electronic Systems Lab ETH Zurich*

Wireless Charging

AUTHORS: Junzhong Xu, Spasoje Mirić, Markus Blickenstorfer, Marco Hitz, Johann W. Kolar, Jonas Emanuel Huber

4:40 PM

T22.9: Electric Vehicle Battery Charger Based on a Three-Phase to Single-Phase Matrix Converter for Inductive Power Transfer

Nikola Mirković, *Universidad Politécnica de Madrid*

Wireless Charging

AUTHORS: Nikola Mirković, Djordje Stojić, Alberto Delgado Exposito, Pedro Alou Cervera, Miroslav Vasić

1:30 PM – 5:00 PM

T23: Renewable Energy Technologies

ROOM 103AB

SESSION CHAIRS

Weiqiang Chen, *ABB*

Chunui Liu, *Rivian*

1:30 PM

T23.1: A Transferable Deep Learning Network for IGBT Open-Circuit Fault Diagnosis in Three-Phase Inverters

Yongjie Liu, PhD, *Aalborg University*

Photovoltaic (PV) Inverters and Micro Inverters

AUTHORS: Yongjie Liu, Ariya Sangwongwanich, Yi Zhang, Shuyu Ou, Huai Wang

1:50 PM

T23.2: Experimental Study Based Switching Sequence for Reduction of Peak Voltage Transients in GaN-Based 3L-ANPC Inverter

Subhransu Satpathy, *NC State University*

Photovoltaic (PV) Inverters and Micro Inverters

AUTHORS: Subhransu Satpathy, Partha Pratim Das, Subhashish Bhattacharya, Victor Veliadis

2:10 PM

T23.3: A LnC2n-2 Network-Based Paralleled Dual Buck-Boost Non-Isolated Multi-Output Hybrid Converter with Reduced Leakage Current

Rajeev Kumar Singh, Ph. D., *Indian Institute of Technology (BHU)*

Photovoltaic (PV) Inverters and Micro Inverters

AUTHORS: Rajat Kumar Keshari, Prakhar Nema, Simanta Kumar Samal, Rajeev Kumar Singh

2:30 PM

T23.4: Control-Sync: A Method for Grid-Forming Inverters

Fahmid Sadeque, PhD, *Kansas State University*

Microgrid Systems

AUTHORS: Fahmid Sadeque, Mehmetcan Gursoy, Fariba Fateh, Behrooz Mirafzal

2:50 PM

T23.5: An Active Voltage Quadrupler Rectifier Based Multidirectional Three-Port Converter in 800V Micro-Grids

Yuchong Peng, MA, *ShanghaiTech University*

Bi-directional Power Converters

AUTHORS: Yuchong Peng, Bo Xue, Liang Wang, Haoyu Wang

3:40 PM

T23.6: Simplified Fixed Frequency Phase Shift Modulation for a Novel Single-Stage Single Phase Series-Resonant AC-DC Converter

Huanghaohe Zou, *The University of Texas at Austin*

Bi-directional Power Converters

AUTHORS: Huanghaohe Zou, Mafu Zhang, Saleh Farzamkia, Alex Q. Huang

4:00 PM

T23.7: Carrier-Based Modulation Scheme Plus Neutral-Point Current Control for Balancing Neutral-Point Voltage of Three-Phase Four-Leg Three-Level Inverter Over Entire Power Factor

Yuhao Wang, N/A, *School of Electronics and Electrical Engineering,Huazhong University of Science and Technology*

Photovoltaic (PV) Inverters and Micro Inverters

AUTHORS: Yuhao Wang, Li Zhang, Tianxiang Yin, Lei Lin, Xiaojie Shi

4:20 PM

T23.8: An Electrolytic Capacitor Less Non-Isolated Microinverter with Integrated Battery Storage System for Residential Applications

Fahad M. Alhuwaishel, *College of Technological Studies*

Photovoltaic (PV) Inverters and Micro Inverters

AUTHORS: Fahad M. Alhuwaishel, Prasad Enjeti

4:40 PM

T23.9: Cyber-Secure and Safe Operation of Solar Photovoltaic Power Distribution Systems

Jaewon Kim, PhD, *Massachusetts Institute of Technology*

Photovoltaic (PV) Inverters and Micro Inverters

AUTHORS: Jaewon Kim, Hasan Ibrahim, Shaozhe Wang, Akshay Mete, Le Xie, Prasad Enjeti, P. R. Kumar

1:30 PM – 5:00 PM

T24: Charging Systems

ROOM 101B

SESSION CHAIRS

Harish Krishnamoorthy, *University of Houston*

Sheldon Williamson, *Ontario Tech University*

1:30 PM

T24.1: A Single-Phase Integrated Onboard Charger with a Wide Voltage Range for Plug-In Electric Vehicles

Deepak Ronanki, PhD, *Indian Institute of Technology Madras*

Charging Systems

AUTHORS: Harish Karneddi, Deepak Ronanki

1:50 PM

T24.2: Design and Control of a New Single-Stage Wireless Charger with Interoperable Power Level Capability

Deepak Ronanki, PhD, *Indian Institute of Technology Madras*

Charging Systems

AUTHORS: Guru Prasad Reddy Vaddemani, Deepak Ronanki, Apparao Dekka, Abdul R. Beig

2:10 PM

T24.3: A 22-kW On-Board Charger (OBC) with an Integrated Planar Inductor and Transformer

Tianlong Yuan, *CPES / Virginia Tech*

Charging Systems

AUTHORS: Tianlong Yuan, Feng Jin, Qiang Li

2:30 PM

T24.4: Optimized EV On-Board Charging Power Converter Using Hybrid DCX-DAB Topology

Óscar Lucía, Prof., *Universidad de Zaragoza*

Charging Systems

AUTHORS: Héctor Sarnago, Óscar Lucía

2:50 PM

T24.5: A Gray-Box Stability Analysis Mechanism for Power Electronic Converters

Rui Kong, MA, *Aalborg University*

Vehicular Power Electronic Circuits and Systems

AUTHORS: Rui Kong, Subham Sahoo, Yubo Song, Frede Blaabjerg

3:40 PM

T24.6: Common-Mode Current Prediction in a Non-Isolated Onboard EV Fast Charger

Chatumal Perera, PhD, *Celestica*

Charging Systems

AUTHORS: Amirhossein Nazeri, Chatumal Perera, Peter Lehn

4:00 PM

T24.7: An Improved Dual-Mode Fast Charger for Supercapacitors

Hengzhao Yang, *Shanghai Tech University*

Charging Systems

AUTHORS: Yang Chen, Hengzhao Yang

4:20 PM

T24.8: Rapid Parameterization of Lithium-Ion Batteries Using Frequency Window Identification Technique for On-Board Charge Control and Battery Management

Latha Anekal, *Ontario Tech University*

Vehicular Power Electronic Circuits and Systems

AUTHORS: Latha Anekal, Akash Samanta, Sheldon Williamson

4:40 PM

T24.9: A Novel Electric Vehicle Charging Station Based on Parallel Hybrid Converter and DAB with Ability to Simultaneously Work in STATCOM Mode

Nikhil Patil, *Indian Institute of Technology, Bombay*

Charging Systems

AUTHORS: Nikhil Patil, Ibhanchand Rath, Anshuman Shukla

8:30 AM – 11:55 AM

IS07: Power Electronics for High Performance Computing: New Opportunities and Challenges Since 2022

GRAND BALLROOM B

SESSION CHAIRS

Minjie Chen, *Princeton University*

Robert Pilawa-Podgurski, *University of California Berkeley*

8:30 AM

IS07.1 **Power Electronics for High Performance Computing: An Overview**
Minjie Chen, PhD, *Princeton University*

8:55 AM

IS07.2 **Recent Advances in IVR Solutions for High Power Microprocessors**
Kaladhar Radhakrishnan, PhD, *Intel Corporation*

9:20 AM

IS07.3 **Challenges to Enabling Vertical Power Delivery in High-Power GPU Applications**
Sudhir Kudva, PhD, *Nvidia*

9:45 AM

IS07.4 **Next TLVR Innovations: Topologies, Magnetics and Control**
Shuai Jiang, PhD, *Google LLC*

10:40 AM

IS07.5 **The Role of Passive Integration in Future VR Solutions**
Jeffrey Morroni, PhD, *Kilby Labs for Texas Instruments*

11:05 AM

IS07.6 **Power Delivery for High-Speed Die to Die Interconnects and Future 3D-ICs**
Shenggao Li, PhD, *TSMC*

11:30 AM

IS07.7 **Quantitative Methods for Evaluating Performance of Hybrid Switched-Capacitor DC-DC Converters**
Robert Pilawa-Podgurski, *UC Berkeley*

8:30 AM – 11:55 AM

IS08: Energy Storage and Integration to Energy Systems

ROOM 202AB

SESSION CHAIRS

Lingxiao Xue, *PSMA*

Victor Boyadzhyan, *Arseco Laboratories*

8:30 AM

IS08.1 **Practical Use of Hydrogen and Hydrogen Carriers for Energy Storage**
Daniel Parker, IEEE, CSA, TAPPI, *Kontak, Inc.*

8:55 AM

IS08.2 **Stationary Battery Energy Storage Systems: A Booming Power Electronic Market**
Milan Rosina, PhD, *Yole Intelligence*

9:20 AM

IS08.3 **Exploring Cybersecurity Issues in Energy Systems**
Shuo Wang, PhD, *University of Florida*

9:45 AM

IS08.4 **Grid Supportive Loads**
Yeongrack Son, PhD, *National Renewable Energy Laboratory*

10:40 AM

IS08.5 **State of Battery Health Battery Management System**
Oindrilla Dutta, *Sandia National Labs*

11:05 AM

IS08.6 **DC Homes, DC Microgrids**
Nihal Kularatna, DSc, *The University of Waikato*

11:30 AM

IS08.7 **Driving Technology Advancements in Energy Storage Systems**
Henrik Mannesson, MsEE, *Texas Instruments*

8:30 AM – 11:55 AM

IS09: GaN Auxiliary & Automotive Solutions

ROOM 203AB

SESSION CHAIRS

Joseph Khayat, *Texas Instruments*

Rahul Joshi, *Power Integrations*

8:30 AM

IS09.1 **Performance and Cost Comparison of Auxiliary Power Supply Topologies for Server Power Supply Units**
John Gomez, *Texas Instruments*

8:55 AM

IS09.2 **High-Efficiency High-Power-Density GaN-Based 3.5kW 800V/400V to 14V Auxiliary Power Module (APM)**
Yang Jiao, PhD, *Infineon Technologies AG*

9:20 AM

IS09.3 **Integrated Smart GaN IC for Auxiliary Power Supply in Automotive Applications**
Filippo Scrimizzi, MA, *STMicroelectronics*

9:45 AM

IS09.4 **Ultra-Wide Input Voltage (40 VDC – 1000 VDC) Flyback Design for Automotive Applications**
John Mardy Rongavilla, BS, *Power Integrations*

10:40 AM

IS09.5 **Powering Automotive Processors: Meeting High Current (>100A) Demands and the Transition to a 48V Bus**
Pradeep Shenoy, PhD, *Texas Instruments*

11:05 AM

IS09.6 **250 W, 400 V Input GaN-Based Active Clamp Flyback Converter for Automotive Battery Elimination**
Felix Budde, MSc, *Power Integrations*

11:30 AM

IS09.7 **Design Review of Wide Vin 300W Off-Battery Converter for Powering Automotive Processors**
Hrag Kasparian, *Texas Instruments*

8:30 AM – 11:55 AM

IS10: Advances in 3D-Packaging Technology for Power Electronics

ROOM 201A

SESSION CHAIRS

John Bultitude, *KEMET Electronics Inc.*

Brian Narveson, *Narveson Innovative Consulting*

8:30 AM

IS10.1 **Common Mode Noise and Minimizing Emissions through Packaging Technology**
Douglas C. Hopkins, PhD, *North Carolina State University*

8:55 AM

IS10.2 **Packaging for IoT device Energy Harvesting Solutions – Roadmap And Considerations**
Brian Zahnstecher, ME, *PowerRox LLC*

9:20 AM

IS10.3 **Efficiency improvements for power conversion units by means of PCB embedding technology for fast switching devices like SiC and GaN**
Thomas Gottwald, Dipl. Ing. (FH), *Schweizer Electronic AG, Germany*

9:45 AM

IS10.4 **Innovation and Collaboration in Power Module Packaging and HVM in the Fast Changing World**
Thomas Yung-Lin Wang, *Advanced Semiconductor Engineering, Inc.*

10:40 AM

IS10.5 **On-Shoring Power Packaging**
Charles Woychik, PkhD, *NHanced Semiconductors, Inc.*

11:05 AM

IS10.6 **Chiplets and Integration in Power Distribution Networks**
Siddarth Ravichandran, *Chipletz, Austin, TX, USA*

11:30 AM

IS10.7 **AI-Driven Reliability of Solar Power Inverters**
Patrick McCluskey, PhD, *University of Maryland, College Park*

8:30 AM – 11:55 AM

IS11: Si, SiC and GaN Performance Switches and Their Role in the Application

ROOM 201B

SESSION CHAIRS

Nare Gabrielyan, *Cambridge GaN Devices*

Davide Giacomini, *Infineon Technologies*

8:30 AM

IS11.1 **Efficient and Compact Power Conversions Made Possible with GaN Technology**
Denis Marcon, PhD, *Innoscience*

8:55 AM

IS11.2 **How to Achieve Accurate System Level Simulation of Silicon-Carbide Power Electronic Applications**
Didier Balocco, PhD, *onsemi*

9:20 AM

IS11.3 **Si, SiC & GaN: their role and performance in SMPS applications**
Francesco Di Domenico, *Infineon Technologies*

9:45 AM

IS11.4 **Enhance Circuit Protection with Silicon Carbide Technology**
Ehab Tarmoom, *Microchip Technology*

10:40 AM

IS11.5 **Ultra-fast switching – the Fastest Power FETs in the Solar System**
John Glaser, PhD, *Efficient Power Conversion Corporation*

11:05 AM

IS11.6 **SiC Drives the Industrial Motion Revolution**
Anuj S. Narain, MSEE, *Wolfspeed*

11:30 AM

IS11.7 **High-frequency Soft-switching Is Hard, but SiC FETs Simplify Design Effort**
Mike Zhu, MS, *Qorvo*

8:30 AM – 11:55 AM

IS12: EMI & Magnetics

ROOM 203C

SESSION CHAIRS

George Slama, *Würth Elektronik*

Ed Herbert, *PSMA*

8:30 AM

IS12.1 **EMI Comparison of Isolated Bias Supply Topologies**
Pradeep Shenoy, PhD, *Texas Instruments*

8:55 AM

IS12.2 **Common-Mode EMI of Valley Switched Flyback Converters**
Ron Israel Nueda, *Power Integrations*

9:20 AM

IS12.3 **A Common-Mode Active EMI Filter Circuit for a Three-Phase Automotive On-Board Charger**
Ben Chan, MS, *Texas Instruments*

9:45 AM

IS12.4 **Differential-Mode Inductance Integration with Common-Mode EMI Filter**
David Meneses Herrera, PhD, *Infineon Technologies Nordic*

10:40 AM

IS12.5 **Multigap Toroidal Transformer and Inductors for Overcoming Fringing Losses in HF Resonant Converters**
Pau Colomer, *PRAX*

11:05 AM

IS12.6 **Challenges in Design and Validation of High-Ppower High-Ffrequency Magnetics for Power Electronics in Commercial Vehicles and Distributed Generation**
Dakshina Murthy Bellur, PhD, *Cummins Inc.*

11:30 AM

IS12.7 **Magnetics at Extreme Conditions**
Victor W. Quinn, MS, BS, *Exxelia*

1:30 PM – 4:55 PM

IS13: Datacenter & Telecommunication Applications

GRAND BALLROOM B

SESSION CHAIRS

Harry Soin, *AEI*

Richard Chung, *STMicroelectronics*

1:30 PM

IS13.1 **Liquid Immersion Cooling for Datacenter Server SMPS**
Ashish Ekbote, MSEE, *Infineon Technologies*

1:55 PM

IS13.2 **In-Package DC-DC Conversion Simplifies and Improves the Performance of Deep Submicron Ai/xPU Power Domains**
Trey A. Roessig, PhD, *Empower Semiconductor*

2:20 PM

IS13.3 **500 kHz High Density 3 kW GaN Rectifier for Server and Telecom Applications**
David Meneses Herrera, PhD, *Infineon Technologies Nordic*

2:45 PM

IS13.4 **Achieve Robust Power Path Protection in High-Power High-density Servers Using eFuses**
Abhinay Patil, BE, *Texas Instruments*

3:40 PM

IS13.5 **Stackable Integrated Buck Regulator for Point – of – Load Applications**
Min Chen, PhD, *Infineon Technologies AG*

4:05 PM

IS13.6 **The Challenges of 12V Input for Dual Entry Power Design and the Future of 48V HVDC in Data Center**
Patt Chang, MA, *Intel*

4:30 PM

IS13.7 **High Power Dense and Ultra-Flat AC-DC Power Supplies with Hold-up Time Requirement**
Alessandro Pevere, PhD, *Infineon Technologies*

1:30 PM – 4:55 PM

IS14: Powering the IoT with Energy Harvesting and Wireless Power Transfer, with Functional Demos

ROOM 202AB

SESSION CHAIRS

Mike Hayes, *Tyndall National Institute*

Brian Zahnstecher, *PowerRox*

1:30 PM

IS14.1 **Tyndall Energy Harvesting Platforms: eSIP, Testbed & Battery Life Simulation Model**
Eoin Ahern, *Tyndall National Institute*

1:55 PM

IS14.2 **Energy Harvesting Integrated Circuits for Thermoelectric Generators**
Hanh-Phuc Le, *University of California-San Diego*

2:20 PM

IS14.3 **Scalable Multimodal Power Harvesting in Laminates and Flex Substrates with Advanced Packaging**
Pulugurtha Markondeyaraj, PhD, *Florida International University*

2:45 PM

IS14.4 **Application of PV-based Energy Harvesting with Charge Storage Backup to Wireless Vibration Sensor for Condition Monitoring**
Ed Spence, *The Machine Instrumentation Group*

3:40 PM

IS14.5 **Configurable Physical Computing with Energy Harvesting**
Jennifer Hasler, PhD, *Georgia Institute of Technology*

4:05 PM

IS14.6 **Your Batteries Are Dead: Indoor solar power for electronics**
Joshua Wright, *Ambient Photonics*

4:30 PM

IS14.7 **See the Power IoT in Action! Live, Functional Demos of Solutions**
Lorandt Foelkel, MEng, *Würth Elektronik*

1:30 PM – 4:55 PM

IS15: How Test Catches Up with WBG Power Devices?

ROOM 203AB

SESSION CHAIRS

Jaume Roig Guitart, *onsemi*

Stephanie Butler, *WattsButler LLC*

1:30 PM

IS15.1 **An Overview of Software Based Dynamic RdsON Measurement During Double Pulse Test for Wide Bandgap Devices**
Niranjan Hegde, MTech, *Tektronix India Pvt. Ltd.*

1:55 PM

IS15.2 **Why Are High Definition Oscilloscopes and Probes Important for WBG Device Measurement Accuracy?**
William Kaunds, *Teledyne LeCroy*

2:20 PM

IS15.3 **Challenges in Dynamic Reliability Testing of WBG Power Semiconductors – and How To Overcome Them**
Frank Heidemann, Dipl-Ing, *NI*

2:45 PM

IS15.4 **High Slew Rate (10 A/ns) Current Measurement with Low-inductance PCB Embedded Sensor**
Dan Hicks, MSEE, *STAr-Edge Technologies*

3:40 PM

IS15.5 **Characterizing In Circuit Switch Device Performance**
Ken Henderson, ME, *Cleverscope*

4:05 PM

IS15.6 **Essential Distinctions in DC Characterization of SiC MOSFETs Including Its Effects On Ruggedness and Reliability**
Sara Kuzmanoska, Master of Eng., Automotive Electronics, *onsemi*

4:30 PM

IS15.7 **Understanding Bandwidth Requirements When Measuring Switching Characteristics**
Michael Zimmermann, *Keysight Technologies*

1:30 PM – 4:55 PM

IS16: WBG & Silicon Power Devices

ROOM 201A

SESSION CHAIRS

Anuj Narain, *Wolfspeed*

Kamal Varadarajan, *Power Integrations*

1:30 PM

IS16.1 **Increasing SiC Power Devices Current Density up to 30% Through 150 & 200mm Semiconductor Substrate Engineering**
Eric Guiot, PhD, *Soitec*

1:55 PM

IS16.2 **GaN Four Quadrant Switch Technology for Microinverters and Motor-Drives**
Geetak Gupta, PhD, *Transphorm Inc.*

2:20 PM

IS16.3 **1250V GaN Enables Extension of Flyback Switcher ICs to High Voltage, High-Reliability Applications**
Kamal Varadarajan, PhD, *Power Integrations*

2:45 PM

IS16.4 **Experimental Investigation on Transient Operation in Low-Voltage GaN FET Parallel Connection**
Marco Palma, MSCee MBA, *Efficient Power Conversion*

3:40 PM

IS16.5 **Spurious Turn-on Investigation on 750 V SiC MOSFET**
Nico Fontana, MSc, *Infineon Technologies*

4:05 PM

IS16.6 **SiC MOSFETs Miller Ratio Impact on Parasitic Turn-on in Half Bridge Converter**
Antonia Lanzafame, MD, *STMicroelectronics*

4:30 PM

IS16.7 **Importance of Gate Current for Solid-State Relays Used with Unclamped Inductive Loads**
Wolfgang Frank, Dr.-Ing., *Infineon Technologies*

1:30 PM – 4:55 PM

IS17: Topologies in Consumer Applications

ROOM 201B

SESSION CHAIRS

Francesco Di Domenico, *Infineon Technologies*

Alessandro Pevere, *Infineon Technologies*

1:30 PM

IS17.1 **Deep-Dive into Switch Node Negative Transients in a Half-Bridge Design for High Voltage Applications**
Leslie Marquez Arroyo, MSEE, *Texas Instruments*

1:55 PM

IS17.2 **Boost PFCs in DCM Mode with Integrated Gallium Nitride Switch: Parallel vs. Semi-Bridgeless Configurations**
Sudhakarababu Chakkirala, PhD, *Power Integrations Inc*

2:20 PM

IS17.3 **High Power Density 120W Adapter Design Using GaN Boost PFC and Active Clamp Flyback**
Brian King, *Texas Instruments*

2:45 PM

IS17.4 **Eliminating Audible Noise from Subharmonic Frequencies in a Multi-Output Flyback**
Han Cui, MSC, *Power Integrations*

3:40 PM

IS17.5 **Adaptive Intelligent Power Sharing Multiport Power Supplies – SZPL3002A**
Hubertus Notohamiprodjo, *Silanna Semiconductor*

4:05 PM

IS17.6 **Optimization of Asymmetric Half-Bridge Flyback Design with Dedicated GaN Device**
Wenhung Huang, *Texas Instruments*

4:30 PM

IS17.7 **Flyback Zero Voltage Switching Using Adaptive Synchronous Rectifier On-Time**
Karl Moore, MEng, *Power Integrations*

1:30 PM – 4:55 PM

IS18: Cyber-Resilience of Solid-State Transformer Based Substations and EV Chargers

ROOM 203C

SESSION CHAIRS

Sudip Mazumder, *University of Illinois at Chicago*

Rambabu Adapa, *Electric Power Research Institute*

1:30 PM

IS18.1 **State of Existing and Emerging Technology on SST Based Substations and Cyber Challenges**
Sudip K. Mazumder, PhD, *University of Illinois Chicago*

1:55 PM

IS18.2 **Medium Voltage Input SST Based DC Fast Charging System**
Rudy Wang, PhD, *Delta Electronics (Americas) Ltd*

2:20 PM

IS18.3 **Potential Cybersecurity Certification and Challenges for SSTs: Lessons Learned from DER Inverter Cybersecurity**
Taesic Kim, PhD, *Texas A&M University-Kingsville*

2:45 PM

IS18.4 **Cyber-Resilience at Aggregator Gateway and Utility Control Center**
Manimaran Govindarasu, *Iowa State University*

3:40 PM

IS18.5 **SST Design Considerations in Regard to Substation Cybersecurity**
George Mantov, MS, *Solid State Power LLC*

4:05 PM

IS18.6 **Hardware Design Challenges of SST Based Substation for Cybersecurity at the Physical Layer**
Xiaoqing Song, *University of Arkansas*

4:30 PM

IS18.7 **Control Architecture and Cyber Vulnerability of SST Systems**
Mohammad Shadmand, PhD, *University of illinois Chicago*

PRESENTATION #5

12:00 PM – 12:30 PM

Source-down Package Solutions for Power MOSFETs

EXHIBITOR PRESENTATION THEATER 1

PRESENTED BY:

Matthias Trattler, *Infineon*

Infineon's source-down packages with their lowest RDS(on) per footprint area and outstanding thermal performance enable BOM-cost reduction, simplify thermal management and improve power density and efficiency. Available in a bottom-side and dual-side cooled variant, combined with Infineon's latest MOSFET technology, the source-down packages are game changers in various applications including drives, solar, SMPS, telecom, and server applications.

12:00 PM – 12:30 PM

To Power Density And Beyond: Breaking through barriers to achieve the highest power density

EXHIBITOR PRESENTATION THEATER 2

PRESENTED BY:

Robert Taylor, *Texas Instruments*

The trend toward higher power density is clear. Space is limited in power-supply designs, and engineers face constant pressure to do more with less, requiring them to push the limits of density and efficiency beyond what was previously possible. But what limits designers from increasing power density today? Typically, it's converter power losses and thermal performance. Higher power levels in smaller form factors are now possible because of innovations in packaging, integration and system level techniques. Automotive and data center applications will be covered with a focus on integrated GaN devices , isolated DC/DC bias supplies and system solutions.

12:00 PM – 12:30 PM

DOE-OE's $2.25M SiC Packaging Prize: How Your Packaging Prototype Could Win Big

EXHIBITOR PRESENTATION THEATER 3

PRESENTED BY:

Alec Schulberg, *American-Made Challenges*

Do you have what it takes to design the next breakthrough in SiC packaging?

The three-phase $2.25 million Silicon Carbide (SiC) Packaging Prize—launched by the U.S. Department of Energy's Office of Electricity—was established to develop and expand upon state-of-the-art semiconductor packaging designs. SiC power modules, though prime candidates for high-performance electronics, are often limited by traditional packaging techniques. To enable grid-based applications, SiC power modules must support higher voltage and higher current ratings.

Join us for an overview of the prize to learn more about the importance of this research and how you can play a part in moving the industry beyond its current state. Plus, hear more on other prizes opportunities from the Office of Electricity and the American-Made prize program.

12:00 PM – 12:30 PM

High Voltage GaN HEMT (EcoGaN) and SiP Solution for Power Systems

ROOM 101A

PRESENTED BY:

Kengo Ohmori, *ROHM*

In recent years, due to the rising demand for server systems in response to the growing number of IoT devices, improving power conversion efficiency and reducing size have become important social issues that require further advancements in the power device sector. As GaN devices generally provide higher switching characteristics and lower ON resistance than silicon devices, they are expected to contribute to lower power consumption of various power supplies and greater miniaturization of peripheral components.

Along with mass-producing industry-leading SiC devices and feature-rich silicon devices, ROHM developed 650V GaN HEMTs featuring market-leading performance that contributes to higher efficiency and smaller size in a wider range of power supply systems. ROHM also established control IC technology for maximizing GaN performance.

12:00 PM – 12:30 PM

Please check the mobile app for more information

ROOM 101B

PRESENTED BY:

Teledyne Lecroy

12:00 PM – 12:30 PM

Advantages of Magnetics' Nanocrystalline Cores: Manufacturing, Applications, and Characteristics

ROOM 103 AB

PRESENTED BY:

Chris Turocy, *Magnetics*

Nanocrystalline tape is a relatively novel soft magnetic material that allows for smaller cores and improved performance, most often in common mode chokes and current transformers. Magnetics offers a range of anneal properties, permeabilities, cases, and finishes, plus the technical expertise to find the best solution for a given application. This session will address commonly asked questions about the product line, provide a comparison to MnZn ferrite cores of similar size, and review the basic manufacturing process, magnetic characteristics, and design advantages of nanocrystalline cores.

12:00 PM – 12:30 PM

The Safest, Simplest and Most Efficient SiC : Analog Devices' Smart Power Switch

ROOM 201A

PRESENTED BY:

JD Morris, *Analog Devices, Inc*

Analog Devices is introducing Silicon Carbide Smart Power Switches for high voltage power conversion applications. The integration and telemetry offered by this solution are key to meeting customer safety and reliability needs while simultaneously providing significantly reduced complexity and size with maximized efficiency. In addition, these innovative devices address the need for extended power switch lifetime driven by emerging use cases such as V2x automotive chargers. Learn about how ADI is enabling our customers to meet their targets for smallest size and highest efficiency solutions in high safety power conversion applications.

PRESENTATION #6

12:45 PM – 1:15 PM

Please check the mobile app for more information

EXHIBITOR PRESENTATION THEATER 1

PRESENTED BY:

Giovanbattista Mattiussi, *Infineon*

12:45 PM – 1:15 PM

QSPICE™: Level-Up on the Next Generation of SPICE Circuit Simulation

EXHIBITOR PRESENTATION THEATER 2

PRESENTED BY:

Mike Engelhardt, QSPICE Creator, *Qorvo*

Qorvo has introduced the industry's latest and best free simulation tool, QSPICE.

Mike Engelhardt, creator of the QSPICE™ simulator, has leveraged his experience authoring thousands of mixed-mode simulation models to develop a reliable power and analog simulation tool with unparalleled speed and accuracy, along with the ability to incorporate massive amounts of digital logic.

During this session, Mike E will introduce the audience to QSPICE and do a detailed review of a model of a modern SMPS controller, illustrating why QSPICE is the compelling choice for SMPS modeling. You are encouraged to ask questions based on your own simulation needs.

Expect a collaborative session between the audience and speaker, and the audience with each other.

This design tool is licensed for commercial and educational use by everyone, is free to download and use, and comes with no feature limitations.

12:45 PM – 1:15 PM

Introduction and Advantages of GaN Substrate / GaN epi on GaN Substrate at Sumitomo Chemical

EXHIBITOR PRESENTATION THEATER 3

PRESENTED BY:

Takuya Sairai, *Sumitomo Chemical Co.*

GaN power devices have excellent potential to reduce switching losses and realize lower power consumption. Sumitomo Chemical, with more than 20 years of experience, provides its excellent industrial-proof GaN substrates, and high-purity GaN epi with a unique Quartz-Free (QF) HVPE technology to many customers. Sumitomo Chemical continues to innovate and provide large diameter, low dislocation GaN substrates and GaN epi to power device manufacturers.

12:45 PM – 1:15 PM

Ultra-Thin NFC And Wireless Power Coils Targeting Wearables & Other Challenging Applications

ROOM 101A

PRESENTED BY:

Chris Burket, *TDK Corporation*

TDK will introduce a new, highly precise, copper electro-plating patterning technology that allows for antenna [coil] thicknesses down to the 3 um level. These, combined with new, non-ferrite magnetic shielding materials in the 25-200 um range, yield complete antenna assemblies as thin as 35 um. The innovative electro-plating technology also allows for adjustable thickness and the flexibility to adjust per each application's current requirements. These antenna assemblies target NFC charging, Qi [WPC], AirFuel (6.78 MHz) or other proprietary wireless power technologies where thickness, rather thinness, is at a premium.

12:45 PM – 1:15 PM

Integration of Accurate Soft-Switching Losses Simulation in PLECS Model – Part 2

ROOM 101B

PRESENTED BY:

Didier Balocco , *Onsemi*

First, we will rapidly describe the state of the art for switching losses measurement : the Double Pulse Tester. Then, we will analyze how to measure or simulate losses during all possible transitions (Hard-, Soft- and Partial-Soft-switching transitions). A new Losses Transition Tester will be introduced, and its operation will be described. Finally, new losses PLECS model implementation with onsemi Self-Service PLECS Model Generator will be explained, and an example will be shown.

12:45 PM – 1:15 PM

Quality is the Foundation of SemiQ

ROOM 103 AB

PRESENTED BY:

Chip Brakeville, *SemiQ*

Our testing regimen has been developed over many years and we test every single device, from gate level burn-in to full functionality and screen out any device that doesn't not pass. Every single device we sell has been triple checked for quality and reliability. There may be products that are fully functional and that would pass the quality tests of other manufacturers, but we will reject them because we believe that the extra testing gives our customers that extra assurance.

12:45 PM – 1:15 PM

Using the AVL Universal Inverter to test Simulink-based Control Designs with your Full-Scale Electric Motors via Speedgoat Test Systems

ROOM 201A

PRESENTED BY:

Carlos Villegas – Speedgoat
Andreas Ficsor – AVL, *Speedgoat*

Prototype control designs for electric motors without having to worry about coding details, sensor interfaces, protocols, nor PWM techniques. Use field-oriented control (FOC), direct torque control (DTC), PID autotuning, or reinforcement learning techniques to tune, calibrate, and test controls with motor drives and all associated sensors. With the Universal Inverter form AVL you can start validating your motor control designs with your full scale electric motor even before your final inverter is available. In this session, we will also present how to test Simulink-based control designs for a permanent magnet synchronous motor (PMSM) using the AVL Universal Inverter and Speedgoat real-time systems.

8:30 AM – 11:10 AM

T25: Hybrid Switched Capacitor DC DC

ROOM 202C

SESSION CHAIRS

Cahit Gezgin, *Infineon*

Luke Jenkins, *IBM*

8:30 AM

T25.1: A 94.7% Efficiency Direct-Step-Down Switched-Tank-Based 48V to 1V-3.3V Hybrid Converter with Constant-Resonant-Time Closed-Loop Control

Si Yuan Sim, MS, *Iowa State University*

Point-of-Load (PoL) and Multi-Phase Converters

AUTHORS: Si Yuan Sim, Xin Zhang, Junmin Jiang, Kang Wei, Cheng Huang

8:50 AM

T25.2: A Six-Level Multi-Inductor Hybrid Converter with the Hexagonal Layout to Improve the Current Balancing

Qi Liu, PhD, *University of Toronto*

Point-of-Load (PoL) and Multi-Phase Converters

AUTHORS: Qi Liu, Jingyuan Liang, Sherman Tang, Shao Chen, Jiange Han, Qinsong Qian, Wai Tung Ng

9:10 AM

T25.3: Current-Sourced Hybrid Switched-Capacitor Converter for Data Center Power Delivery

Aria Delmar, *University of Illinois Urbana Champaign*

Point-of-Load (PoL) and Multi-Phase Converters

AUTHORS: Aria Delmar, Andrew Stillwell

9:30 AM

T25.4: Multilevel Series-Capacitor Buck Converter

Gianluca Roberts, *University of Toronto*

Point-of-Load (PoL) and Multi-Phase Converters

AUTHORS: Gianluca Roberts, Aleksandar Prodić

9:50 AM

T25.5: Always-Dual-Path Hybrid DC-DC Converter with Soft Charging for High Efficiency with Reduced Passive Components

Katsuhiro Hata, PhD, *The University of Tokyo*

Voltage Regulator Modules (VRM)

AUTHORS: Katsuhiro Hata, Shinsaku Tanaka, Toru Ashikaga, Yasuhiro Rikiishi

10:30 AM

T25.6: Hybrid-Switched-Capacitor VRM with Zero-Voltage-Switching Intermediate Voltage Rails

Shuyu Zhang, *Stanford University*

Voltage Regulator Modules (VRM)

AUTHORS: Shuyu Zhang, Huaqiao Liu, Yenan Chen

10:50 AM

T25.7: A Gallium Nitride-Based 48V-to-1V Point-of-Load (PoL) Converter for Aerospace Telecommunications and Computing Applications

Nathan Miles Ellis, PhD, *University of California Berkeley*

Point-of-Load (PoL) and Multi-Phase Converters

AUTHORS: Nathan Ellis, Yicheng Zhu, Robert Pilawa-Podgurski

8:30 AM – 11:10 AM

T26: DC DC Converter Applications

ROOM 102AB

SESSION CHAIRS

Wai Tung Ng, *UofToronto*

Zobair Roohani, *Infineon*

8:30 AM

T26.1: Coupled Inductor Design Methodology for Optimization of Boost Extending Topology

Vikas Kumar Rathore, *Ben-Gurion University of the Negev*

Hard- and Soft-Switched

AUTHORS: Vikas Kumar Rathore, Michael Evzelman, Mor Mordechai Peretz

8:50 AM

T26.2: High Step-Up Ratio Interleaved Boost L-LLC Resonant Converter with PWM and PFM Control for Wide Input and Output Voltage Range

Yu Zuo, MEng, *KU Leuven*

Resonant Converters

AUTHORS: Yu Zuo, Diego Bernal Cobaleda, Xiaobing Shen, Wilmar Martinez

9:10 AM

T26.3: Modular Soft-Switched PV Converter with an Efficiency Optimization Scheme for High Frequency Linking Power Balancers

Kajanan Kanathipan, *York University*

Resonant Converters

AUTHORS: Kajanan Kanathipan, John Lam

9:30 AM

T26.4: High Power/High Temperature Fluid Water Induction Heating System Based on SiC-MOSFET High Frequency Single-Ended Resonant Inverter

Taku Nakamoto, MD, *KOBEuniversity*

Resonant Converters

AUTHORS: Taku Nakamoto, Tomokazu Mishima, Hideki Omori, Shuhei Otani, Kyouhei Ogawa

9:50 AM

T26.5: A Practical Auxiliary Circuit for Voltage Fluctuation Reduction in Multi-Core CPU Power Supplies

Yijie Qian, PhD candidate, *Southeast University*

Voltage Regulator Modules (VRM)

AUTHORS: Yijie Qian, Shen Xu, Xinru Wang, Weifeng Sun

8:30 AM – 11:10 AM

T27: Topologies & Passives for Utility Interface

ROOM 104C

SESSION CHAIRS

Khurram Afridi, *Cornell University*

Javad Khodabakhsh, *Qualcomm*

8:30 AM

T27.1: Influence of Voltage Dependency of Capacitors on a 3-Phase Common Mode Feedforward Current Sense Current Injection Active EMI Filter

Stefan Haensel, MA, *Siemens AG*

Power Quality, UPS, Filters

AUTHORS: Stefan Haensel, Stephan Frei

8:50 AM

T27.2: Analysis and Mitigation of Background Harmonics Effect on Small-AC-Signal Injection Based Decentralized Secondary Voltage Control for Parallel Inverters in Islanded Microgrids

Yidong Shi, PhD, *Xi'an Jiaotong University*

Distributed Energy Systems

AUTHORS: Yidong Shi, Zeng Liu, Xiaochen Wu, Jiazhi Wang, Jinjun Liu

9:10 AM

T27.3: Balancing Control of Cluster Energy in Star-Connected Multilevel Power Conversion System Using Zigzag Transformer

Yeongung Kim, *Kyungpook National University*

Power Quality, UPS, Filters

AUTHORS: Yeongung Kim, Shenghui Cui, Jae-Jung Jung

9:30 AM

T27.4: Transformer-Less Split-Phase Neutral Grounded Inverter

Snehal Bagawade, Ph.D, *GVA Lighting*

Distributed Energy Systems

AUTHORS: Snehal Bagawade, Luis Zubieta

9:50 AM

T27.5: On-Board AC Charging Topology Integrated with Electric Vehicle Motor Drive System

Yilmaz Sozer, PhD, *University of Akron*

Bidirectional Grid Interface Converters

AUTHORS: Md Khalid Bin Azam, Aquib Ahmed, Mohammad Muntasir Islam, Afsana Dristy, Ashraf Siddiquee, Yilmaz Sozer, John Kisacikoglu

10:30 AM

T27.6: Design and Optimization with Litz Wire Version of PCB in Solid-State Transformer

Zheqing Li, PhD, *CPES / Virginia Tech*

Solid-State Transformers

AUTHORS: Zheqing Li, Feng Jin, Xin Lou, Yi-Hsun Hsieh, Qiang Li, Fred C. Lee

10:50 AM

T27.7: Passive Filter for 3-Level Three-Phase AC-AC Converter with Unshielded Motor Cable

Gopal Mondal, *Siemens AG*

Power Quality, UPS, Filters

AUTHORS: Gopal Mondal, Sebastian Nielebock

8:30 AM – 11:10 AM

T28: Design Techniques for Noise & EMI Reduction

ROOM 104A

SESSION CHAIRS

Veda Galigekere, *Oak Ridge National Laboratory*

Abey Mathew, *IBM*

8:30 AM

T28.1: Investigation on Noise Caused by Vgs and Near Field Coupling on Gate Drivers PCBs for Medium Voltage SiC-Based Converters

He Song, *CPES / Virginia Tech*

Thermal and EMC Management

AUTHORS: He Song, Dushan Boroyevich

8:50 AM

T28.2: SiC Power Module Design with a Low-Permittivity Material to Reduce Common-Mode Noise

Sihoon Choi, *Nagoya University*

Power Modules / High Density Design

AUTHORS: Sihoon Choi, Jiyoon Choi, Jong-Won Shin, Yonezawa Yu, Jun Imaoka, Masayoshi Yamamoto

9:10 AM

T28.3: **Common-Mode Noise Reduction for Bridgeless Flyback PFC Rectifier with Balance Technique**
Sihoon Choi, *Nagoya University*
Thermal and EMC Management
AUTHORS: Sihoon Choi, Yikun Yin, Jong-Won Shin, Jun Imaoka, Masayoshi Yamamoto

9:30 AM

T28.4: **A Survey of CM EMI Modeling and Reduction Technique of Transformer for Isolated Converters**
Qinghui Huang, *University of Florida*
Thermal and EMC Management
AUTHORS: Qinghui Huang, Yirui Yang, Yanwen Lai, Zhedong Ma, Shuo Wang

9:50 AM

T28.5: **Discussion on Gate Driver CM Noise and its Minimization Using Wheatstone Bridge Structure with Integrated Rogowski Sensor**
He Song, *CPES / Virginia Tech*
Thermal and EMC Management
AUTHORS: He Song, Vladimir Mitrovic, Dushan Boroyevich

10:30 AM

T28.6: **A Novel Technique to Measure Parasitic Capacitances Affecting CM Noise Emissions**
Tyler McGrew, MS, *Center for Power Electronics Systems, Virginia Tech*
Thermal and EMC Management
AUTHORS: Tyler McGrew, Shuo Wang, Qiang Li

10:50 AM

T28.7: **Reducing EMI Filter Size and Losses with a Novel Piezoelectric Interference-Suppression Component**
Florian Hubert, *University of Freiburg*
Thermal and EMC Management
AUTHORS: Florian Hubert, Manfred Wich, Thomas Duerbaum, Stefan J. Rupitsch

8:30 AM – 11:10 AM

T29: Practical Design Considerations for Power Modules

ROOM 101A

SESSION CHAIRS

Yusi Liu, *On Semiconductor*

Vidhi Patel, *ABB*

8:30 AM

T29.1: **New Snap-Off Free 1200 V Diode Technology with Active Rear-Side Structure for Enhanced System Performance**
Christian R. Müller, PhD, *Infineon Technologies AG*
Power Modules / High Density Design
AUTHORS: Christian Müller, Alexander Philippou, Benedikt Stoib, Javier Acuna, Yizheng Zhou

8:50 AM

T29.2: **Designing of a >1kV Medium-Voltage Line Impedance Stabilization Network**
Seungdeog Choi, *Mississippi State University*
Thermal and EMC Management
AUTHORS: Tahmid Ibne Mannan, Ashik Amin, Seungdeog Choi, Mostak Mohammad

9:10 AM

T29.3: **Volume Minimization of Current Type ACC with Rogowski Coil**
Atsutoshi Okura, PhD, *Nagaoka University of Technology*
Thermal and EMC Management
AUTHORS: Atsutoshi Okura, Rintaro Kusui, Kodai Nishikawa, Masamichi Yamaguchi, Hiroki Watanabe, Jun-Ichi Itoh

9:30 AM

T29.4: **Flip-Chip Low Inductive and EMC Optimized PCB Power Module**
Pierre-Olivier Jeannin, PhD, *G2Elab, Université Grenoble Alpes*
Power Modules / High Density Design
AUTHORS: Fatme Abed Ali, Pierre-Olivier Jeannin, Yvan Avenas, Pierre Lefranc

9:50 AM

T29.5: **Modeling and Analysis of Multi-Layer High-Voltage Power Modules Design Using Generalized Multiport Network**
Yu Chen, PhD, *Center for Power Electronics Systems (CPES), Virginia Tech*
Power Electronics Packaging
AUTHORS: Yu Chen, Narayanan Rajagopal, Christina Dimarino

10:30 AM

T29.6: **Breaking Barriers: Unleashing the Potential of High-Efficiency 500 W 4-to-1 IBC Through Innovative 3D-PCB Design and Power Inlay Semiconductor Technology**

Juan Sanchez, MsC, *Infineon Technologies*

Power Modules / High Density Design

AUTHORS: Eslam Abdelhamid, Christian Rainer, Juan Sanchez

10:50 AM

T29.7: **A Novel Fast-Acting Solid-State DC Circuit Breaker Using Low Requirement IGBT**

Taihang He, *State Key Laboratory of Advanced Electromagnetic Engineering and Technology*

Quality and System Reliability

AUTHORS: Taihang He, Qinshu Lu, Huiyao Mi, Shanxu Duan

8:30 AM – 11:10 AM

T30: Device Modeling & Simulation

ROOM 103AB

SESSION CHAIRS

Bing Lu, *Indian Institute of Science*

Boyi Zhang, *Texas Instruments*

8:30 AM

T30.1: **Nonlinear Losses and Material Limits of Piezoelectric Resonators for DC-DC Converters**

Eric Stolt, *Stanford University*

Device and Component Modeling

AUTHORS: Clarissa Daniel, Eric Stolt, Weston Braun, Ruochen Lu, Juan Rivas-Davila

8:50 AM

T30.2: **Multi-Step Least Squares Algorithm for Thermal Characterization Based on Mission Profile**

Karthik Debbadi, MSc., *Fraunhofer Institute for Silicon Technology ISIT*

Device and Component Modeling

AUTHORS: Martin Votava, Karthik Debbadi, Yoann Pascal, Marco Liserre

9:10 AM

T30.3: **Embedding-Encoded Artificial Neural Network Model for MOSFET Preselection: Integrating Analytic Loss Models with Dynamic Characteristics from Datasheets**

Fanghao Tian, PhD, *KU Leuven-EnergyVille*

Device and Component Modeling

AUTHORS: Fanghao Tian, Shirong Li, Xiaobo Ning, Diego Bernal Cobaleda, Wilmar Martinez

9:30 AM

T30.4: **PCB-Embedded Helical Coils' Return Path Utilization for Bidirectional Switch-Current Sensing**

Ali Parsa Sirat, PhD, *EWMFG/University of North Carolina at Charlotte*

Parasitics

AUTHORS: Ali Parsa Sirat, Jiale Zhou, Hossein Niakan, Babak Parkhideh

9:50 AM

T30.5: **A Passive Balancing Method for Dynamic Current Sharing of Paralleled SiC MOSFETs with Kelvin-Source Connection**

Che-Wei Chang, *Virginia Polytechnic Institute and State University*

Circuits and Systems

AUTHORS: Che-Wei Chang, Matthias Spieler, Rolando Burgos, Ayman El-Refaie, Dong Dong

10:30 AM

T30.6: **A Compact Three-Phase Multi-Stage EMI Filter with Compensated Parasitic-Component Effects**

Shin-Yu Chen, MS, *Texas Instruments*

Parasitics

AUTHORS: Shin-Yu Chen, Ripun Phukan, Tonglei Wang, Rolando Burgos, Dong Dong, Gopal Mondal, Henrik Krupp, Sebastian Nielebock

10:50 AM

T30.7: **Frequency-Tuning Matching Network for Load-Varying Applications**

Zhechi Ye, *Stanford University*

Circuits and Systems

AUTHORS: Zhechi Ye, Kawin Surakitbovorn, Calvin Lin, Juan Rivas-Davila

8:30 AM – 11:10 AM

T31: Renewable Energy System Control

ROOM 104B

SESSION CHAIRS

Tao Yang, *University of Nottingham*

Yangfeng Wang, *Monolithic Power Systems*

8:30 AM

T31.1: Constant Current and Constant Voltage Hybrid Bidirectional String-to-Cell Equalizer Based on C2L3 Resonant Topology

Yilin Wang, *Shanghaitech University*

Energy Storage Systems

AUTHORS: Yilin Wang, Yiqing Lu, Haoyu Wang

8:50 AM

T31.2: Distributed Fixed-Time Secondary Control for DC Microgrids

Junwei Chai, PhD, *Hong Kong Polytechnic University*

Microgrid Systems

AUTHORS: Junwei Chai, Minghao Wang, Zhao Xu

9:10 AM

T31.3: Impedance Reshaping of GFM Converters with Selective Resistive Behaviour for Small-Signal Stability Enhancement

Chirag Ramgopal Shah, *Norwegian University of Science and Technology*

Grid-Tied Systems

AUTHORS: Chirag Ramgopal Shah, Marta Molinas, Roy Nilsen, Mohmmad Amin

9:30 AM

T31.4: Impedance Profile Prediction for Grid-Connected VSCs Based on Feature Extraction

Yang Wu, PhD, *Aalborg University*

Grid-Tied Systems

AUTHORS: Yang Wu, Heng Wu, Li Cheng, Jianyu Zhou, Zichao Zhou, Minjie Chen, Xiongfei Wang

9:50 AM

T31.5: A Leader-Follower Control for Negative-Sequence Current Sharing Among Grid-Forming Sources in Islanded Microgrids

Dingrui Li, *ABB Inc.*

Microgrid Systems

AUTHORS: Dingrui Li, Chengwen Zhang, Yu Su, Fred Wang, Leon M. Tolbert

10:30 AM

T31.6: Optimal Control of Flexible Transfer Converter for Synchronization of Microgrid with Utility Grid

Ronghui An, PhD, *Xi'an Jiaotong University*

Microgrid Systems

AUTHORS: Ronghui An, Zhaoqi Song, Jinjun Liu, Zeng Liu, Ziwen Zhao, Zhiheng Huang, Cao Zhan

10:50 AM

T31.7: Instant Startup and Grid Synchronization of Inverter Based Resources

Yuchen He, *Florida State University*

Grid-Tied Systems

AUTHORS: Yuchen He, Yuan Li, Bokang Zhou, Jinli Zhu, Ahmad Fares Abdelhadi, Hector Akuta, Fang Peng

8:30 AM – 11:10 AM

T32: Power Applications, Heating, AC

ROOM 101B

SESSION CHAIRS

Jeff Nilles, *Alpha & Omega Semiconductor*

Juan Rodriguez, *Univ of Oviedo*

8:30 AM

T32.1: Effective Audible Noise Reduction Scheme Using Sideband Harmonic Suppression for Domestic Induction Heating Cooktops

Man Jae Kwon, *Sungkyunkwan University*

AC-DC-AC Applications and Matrix Converters

AUTHORS: Man Jae Kwon, Seung Hyun Kang, Yun Seong Hwang, Hyeon Soo Kim, Byoung Kuk Lee

8:50 AM

T32.2: Single-Ended Direct AC-AC Converter for Domestic Induction Heating Based on a Bidirectional GaN-FET

Pablo Guillén, PhD, *Universidad de Zaragoza*

AC-DC-AC Applications and Matrix Converters

AUTHORS: Pablo Guillén, Héctor Sarnago, José Miguel Burdío, Óscar Lucía

9:10 AM

T32.3: A Versatile Arbitrary Waveform Generator for Large-Signal Induction Heating Load Characterization

Óscar Lucía, Prof., *Universidad de Zaragoza*

AC-DC-AC Applications and Matrix Converters

AUTHORS: Ignacio Álvarez-Gariburo, Héctor Sarnago, Óscar Lucía

9:30 AM

T32.4: Dynamic DC-Bus Voltage Control of Induction Hardening System Under Load Temperatures from Ambient to Beyond Curie Point

Amaiur Mendi-Altube, *Ikerlan*

AC-DC-AC Applications and Matrix Converters

AUTHORS: Amaiur Mendi-Altube, Irma Villar, Claudio Carretero, Jesús Acero

9:50 AM

T32.5: ZVS Modulation Strategy for Constant High Frequency Four-Switch Buck-Boost Converters Used in Envelope Tracking Power Supplies

Juan Ramon García-Meré, M.Sc. in Telecommunication Engineering, *Universidad de Oviedo*

Network and Telecommunication Power Electronics

AUTHORS: Juan Ramon García-Meré, Juan Rodríguez, Javier Sebastian

10:30 AM

T32.6: Surge Voltage Stress and Modulation Techniques in Variable Frequency Drives: A Comparative Study of Matrix Converter and Two-Level VSI Topologies

Luca Rovere, PhD, *The Thinking Pod Innovations*

AC-DC-AC Applications and Matrix Converters

AUTHORS: Luca Rovere, Liliana de Lillo, Lee Empringham

10:50 AM

T32.7: A Linear Irradiance Control Power Supply for Dielectric Barrier Discharge Excimer Ultraviolet Lamps

Chunguang Ren, PhD, *Taiyuan University of Technology*

Lamp Ballasts and LED Lighting

AUTHORS: Zhuoning Ding, Chunguang Ren, Ming Xu, Julu Sun, Juanjuan Sun, Weilong Yang, Xinqi Li

1:30 PM – 3:10 PM

T33: AC-DC Battery Charger Converters

ROOM 104A

SESSION CHAIRS

Jin Moon, *Florida State University*

Yunting Liu, *Indian Institute of Science*

1:30 PM

T33.1: Wide Operating Range Single-Stage Bidirectional Impedance Control Network-Based Onboard Electric Vehicle Charger

Firehiwot Gurara, *Cornell University*

Bidirectional AC/DC converters

AUTHORS: Firehiwot Gurara, Dheeraj Etta, Khurram Afridi

1:50 PM

T33.2: A New Bridge-Less AC-DC Stacked-Switches Structured Bi-Directional On-Board High Voltage EV Charger with Minimal Storage Capacitances

Siamak Derakhshan, MSc, *York University*

Bidirectional AC/DC converters

AUTHORS: Siamak Derakhshan, John Lam

2:10 PM

T33.3: Dual Transformer-Based Single-Stage Converter for EV Fast Charger with Flat Efficiency Characteristics

Million Gerado Geda, *Seoultech*

Bidirectional AC/DC converters

AUTHORS: Million Gerado Geda, Huigyeong Song, Do Ba Phu, Bumsoo Cho, Sunju Kim, Sewan Choi

2:30 PM

T33.4: T-Type Converter with Zero Common-Mode Voltage Modulation for Potential Transformer-Less EV Charger Application

Regis Nibaruta, MSc, *University of Twente*

Single-Phase and Three-Phase Input

AUTHORS: Regis Nibaruta, Sohaib Qazi, Anand Krishnamurthy Iyer, Prasanth Venugopal, Volodymyr Havryliuk, Thiago Batista Soeiro

2:50 PM

T33.5: Isolated Active Front-End with Integrated Bidirectional GaN Switches for Battery Chargers

Matteo Vazzoler, MD, *University of Padova*

Single-Phase and Three-Phase Input

AUTHORS: Matteo Vazzoler, Tommaso Caldognetto, Davide Biadene, Andrea Petucco, Paolo Mattavelli

1:30 PM – 3:10 PM

T34: Soft Switching DC DC Converters

ROOM 104C

SESSION CHAIRS

Xin Zhang, *IBM*

Bing Lu, *Texas Instruments*

1:30 PM

T34.1: Rotation Control of Synchronize Rectifier to Improve Thermal Performance of LLC Converter Under Boost Mode Operation

Feng Jin, *CPES / Virginia Tech*

Resonant Converters

AUTHORS: Feng Jin, Chunyang Zhao, Tianlong Yuan, Qiang Li

1:50 PM

T34.2: Practical Design Methodology for a High Efficiency LLC Converter

Sheng-Yang Yu, PhD, *Texas Instruments*

Resonant Converters

AUTHORS: Brent McDonald, Sheng-Yang Yu, Carlos Rodriguez

2:10 PM

T34.3: A Simple and Efficient Sigma DC-DC Converter and its Optimal Design

Chunguang Ren, PhD, *Taiyuan University of Technology*

Hard- and Soft-Switched

AUTHORS: Shan Zhao, Chunguang Ren, Ming Xu, Julu Sun, Juanjuan Sun, Jukui Wei, Xinqi Li

2:30 PM

T34.4: Integrated Planar Magnetics Optimization for Δ– Δ LLC Converter with Wide Output Voltage Range

Mehmet Onur Gulbahce, PhD, *Istanbul Technical University*

Resonant Converters

AUTHORS: Abdulsamed Lordoglu, Mehmet Onur Gulbahce, Serkan Dusmez

2:50 PM

T34.5: High Voltage DC-DC Converters with High Power Density Using Single ZVT Soft Switching Cell in Electric Vehicle Application

Seung Hyun Kang, *Sungkyunkwan University*

Hard- and Soft-Switched

AUTHORS: Seung Hyun Kang, Yun Seong Hwang, Man Jae Kwon, Hyeon Soo Kim, Byoung Kuk Lee

1:30 PM – 3:10 PM

T35: Si Devices

ROOM 102AB

SESSION CHAIRS

Yuhao Zhang, *Virginia Tech*

Helen Cui, *UTK*

1:30 PM

T35.1: System Design of a HV/LV DC-DC Converter with the Evaluation of GaN and Si Chip-Embedding

Robert J. Valascho, *Infineon*

Power Silicon MOSFETs, BJTs, IGBTs

AUTHORS: Ahmed Eldistawy, Marcelo Lobo Heldwein, Mark Nils Muenzer, Peter Weiss, Sam Chan, Giampiero Ciammetti

1:50 PM

T35.2: Next Step in Power MOSFET Evolution Boosts Application Efficiency

Kapil S. Kelkar, PhD, *Infineon Technologies Americas Corp.*

Power Silicon MOSFETs, BJTs, IGBTs

AUTHORS: Ralf Siemieniec, Simone Mazzer, Elvir Kahrimanovic, David Laforet, Michael Hutzler, Elias Pree, Laszlo Juhasz, Alessandro Ferrara, Kapil Kelkar

2:10 PM

T35.3: Evaluation of Current, Delay, and Temperature Influence and Diode Selection on the Switching Behavior of a SiC/Si Hybrid Switch

Adrian Amler, M.Sc., *Friedrich-Alexander-Universität Erlangen-Nürnberg*

Power Silicon MOSFETs, BJTs, IGBTs

AUTHORS: Adrian Amler, Thomas Heckel, Daniel Ruppert, Cornelius Rettner, Martin März

2:30 PM

T35.4: A New Calorimetric Method for Switching Loss Measurement of Power Devices

Paolo Mattavelli, Prof, *University of Padova*

Power Silicon MOSFETs, BJTs, IGBTs

AUTHORS: Leopoldo Rossetto, Davide Biadene, Paolo Mattavelli, Nicola Zanatta, Giorgio Spiazzi

2:50 PM

T35.5: Comparison of GaN and Si Devices in a 50 MHz Class Φ2 Converter

Zhechi Ye, *Stanford University*

Power Silicon MOSFETs, BJTs, IGBTs

AUTHORS: Zhechi Ye, Calvin Lin, Juan Rivas-Davila

1:30 PM – 3:10 PM

T36: Energy Storage Management

ROOM 104B

SESSION CHAIRS

Marium Rasheed, *Canoo*

Rakesh Ramachandran, *University of Nottingham*

1:30 PM

T36.1: State of Health Estimation and Remaining Useful Lifetime Prediction of Battery Based on the Real Dynamic Forklift Profile

Xingjun Li, MA, *Aalborg University*

Energy Storage Systems

AUTHORS: Xingjun Li, Dan Yu, Søren Byg Vilsen, Daniel-Ioan Store

1:50 PM

T36.2: State of Charge Estimation Based on Thermal Modeling Compensation Considering Capacity Variation by Internal Temperature Effects of LiFePO4 Battery

Jong-Hun Lim, *Sungkyunkwan University*

Energy Storage Systems

AUTHORS: Jong-Hun Lim, Go Woon Heo, Je-Yeong Lim, Dong Hwan Kim, Bumsu Jun, Byoung Kuk Lee

2:10 PM

T36.3: A Novel Balancing Algorithm for Lithium Battery Strings Using Bidirectional Charge Circulation

Nguyen-Anh Nguyen, *University of Ulsan*

Energy Storage Systems

AUTHORS: Nguyen-Anh Nguyen, Phuong-Ha La, Sung-Jin Choi

2:30 PM

T36.4: Accurate Co-Estimation Methods for Second-Life Battery Management Systems (BMS-2): Integrating State and Parameter Estimations

Xiaofan Cui, *University of California, Los Angeles*

Energy Storage Systems

AUTHORS: Xiaofan Cui, Zexiang Liu

2:50 PM

T36.5: Soft Switched Hybrid Energy Storage Module for Power and Energy Management of a DC Bus

Ilya Zeltser, PhD, *Rafael Advanced Defense Systems Ltd*

Energy Storage Systems

AUTHORS: Ilya Zeltser, Michael Evzelman, Daniel Beniaminson, Mor Mordechai Peretz

1:30 PM – 3:10 PM

T37: Power Electronics for Aerospace

ROOM 202C

SESSION CHAIRS

Dong Cao, *University*

Tao Yang, *University of Nottingham*

1:30 PM

T37.1: Carrier-Based Space-Vector Coordinate-Shifted DPWM Strategy for Three-Level T-Type NPC Inverters in Electric Aircraft Propulsion Applications

Hui Cao, PhD, *University of Arkansas*

Power Electronics for Aerospace

AUTHORS: Feng Guo, Zhuxuan Ma, Fei Diao, Hui Cao, Yue Zhao

1:50 PM

T37.2: Tape Wound Magnesil vs. Air Core Magnetics: High Temperature DC-DC Power Conversion

Ayan Mallik, PhD, *Arizona State University*

Power Electronics for Aerospace

AUTHORS: Nitish Jolly, Ayan Mallik, Chris Darmody, Akin Akturk

2:10 PM

T37.3: GaN Based Active Clamp Flyback Auxiliary Power Supply for Cryogenic Power Electronics Conversion

Samuel Defaz, PhD, *Stony Brook University*

Power Electronics for Aerospace

AUTHORS: Samuel Defaz, Mustafeez Hassan, Fang Luo

2:30 PM

T37.4: Small Signal Modelling of Hybrid Frequency and Phase-Shift Control Full-Bridge LLC Converter Using Extended Describing Function Method

Ayan Mallik, PhD, *Arizona State University*

Power Electronics for Aerospace

AUTHORS: Naveed Ishraq, Ayan Mallik, Saikat Dey

1:30 PM – 3:10 PM

T38: Reliability & Thermal Performance of Power Modules & Components

ROOM 103AB

SESSION CHAIRS

Kasunaidu Vechalapu, *Infineon Technologies Americas Corp.*

Lee Gill, *Sandia*

1:30 PM

T38.1: Design of a Cylindrical Jet Impingement Cooling System for High-Power Common-Mode Choke in Aerospace Applications

Sam Hemming, *McMaster Automotive Resource Centre*

Thermal and EMC Management

AUTHORS: Sam Hemming, Di Wang, Mohamed Hefny, Sreejith Chakkalakkal, Giorgio Pietrini, Armen Baronian, Piranavan Suntharalingam, Mikhail Goykhman, Ali Emadi

1:50 PM

T38.2: A Compact Vertically Stacked Converter Module with Thermal Balancing and High-Power Dissipation Capability

Jingyuan Liang, *University of Toronto*

Power Modules / High Density Design

AUTHORS: Jingyuan Liang, Qi Liu, Tiantian Liu, Wai Tung Ng

2:10 PM

T38.3: Thermal Modeling of E-Mode GaN HEMTs Under Wide-Range Thermal Cycling Tests

Harish S. Krishnamoorthy, PhD, *University of Houston*

Thermal and EMC Management

AUTHORS: Hussain Sayed, Harish S. Krishnamoorthy

2:30 PM

T38.4: SymCool™ B-TRAN™ Power Module Design Considerations and Characterization

Mouzhi Dong, MA, *Ideal Power Inc.*

Power Modules / High Density Design

AUTHORS: Mouzhi Dong, Mudit Khanna, Ruiyang Yu, Yifan Jiang, Joseph Templeton, Jiankang Bu, Jeffrey Knapp, Daniel Brdar

2:50 PM

T38.5: Low Temperature Pb-Free Solder Preform Technology for Molded Power Module Package Attach Designed for Improved Thermomechanical Performance

Ryan W. Mayberry, *Indium Corporation*

Thermal and EMC Management

AUTHORS: Joseph Hertline, Ryan Mayberry, James McCoy

1:30 PM – 3:10 PM

T39: Digital Controllers & Control Ics

ROOM 101A

SESSION CHAIRS

Dorin Neacsu, *Technical University of Iasi*

Mohamed Orabi, *Aswan University*

1:30 PM

T39.1: A Wide Input Voltage Range Buck Converter with Constant-Charge PFM Control

Paolo Melillo, PhD, *Politecnico Di Milano*

Control ICs

AUTHORS: Paolo Melillo, Lorenzo Cremonesi, Mauro Leoncini, Alessandro Gasparini, Salvatore Levantino, Massimo Ghioni

1:50 PM

T39.2: Online Digital PID Control Tuning in Voltage-Mode Boost Converters for Shaping the Output Impedance

Santanu Kapat, PhD, *Indian Institute of Technology (IIT) Kharagpur*

Digital Control

AUTHORS: Dipayan Chatterjee, Santanu Kapat, Indra Narayan Kar

2:10 PM

T39.3: Performance Comparison of Direct Digital Control and DQ-Based Control for a Three-Phase Three-Wire Inverter with LCL Filter Considering Inductance Attenuation

Chien-Chih Hung, *National Tsing Hua University*

Control of Power Electronic Converters

AUTHORS: Tsai-Fu Wu, Chien-Chih Hung, Anumeha Kumari, Jui-Yang Chiu, Li-Xin Chen

2:30 PM

T39.4: Sensorless Current Balancing Control for Interleaved Boost 3X Converter

Hung-Chi Chen, PhD, *National Yang Ming Chiao Tung University*

Sensor and Sensor-less Control

AUTHORS: Hung-Chi Chen, Yu-Te Lin, Chien-Hsu Chen, Chung-Yi Li

2:50 PM

T39.5: A Master-Slave Distributed Power Management Architecture for Dynamic Voltage and Frequency Scaling (DVFS) for Low Power Microprocessor

Yen-Ming Chen, PhD, *Nation Taiwan University*

Control ICs

AUTHORS: Yen-Ming Chen, Yu-Lin Chao, Ching-Jan Chen

1:30 PM – 3:10 PM

T40: Wireless Power Transfer: Modeling & Control

ROOM 101B

SESSION CHAIRS

Khurram Afridi, *Cornell University*

Praveen Kumar, *Oak Ridge National Laboratory*

1:30 PM

T40.1: Power Loss Investigation of Pavement Materials in Roadway Inductive Charging System

Zilong Zheng, Wireless charging

AUTHORS: Zilong Zheng, Yao Wang, Xiao Chen, Shuyan Zhao, Shervin Salehi Rad, Hua Zhang, Hao Wang, Fei Lu

1:50 PM

T40.2: Misalignment Estimation in a Three-Phase Transverse-Pole DWPT System

Vatan Mehar, *Purdue University*

Wireless Charging

AUTHORS: Vatan Mehar, Aaron D. Brovont, Steven D. Pekarek, Dionysios Aliprantis

2:10 PM

T40.3: Loss Modeling and System Optimization of Smartwatch Wireless Charging Application

Qi Tian, PhD, *Google LLC*

Wireless Charging

AUTHORS: Qi Tian, Liang Jia, Gordon Liao, Tressa Scott, Srikanth Lakshmikanthan

2:30 PM

T40.4: Dual-PWM Control of Inductive Power Transfer Systems for High Efficiency Over Wide Load Ranges

Yihao Wu, *The University of Texas at Austin*

Wireless Charging

AUTHORS: Yihao Wu, Chenmin Deng, Mafu Zhang, Soham Roy, Alex Hanson

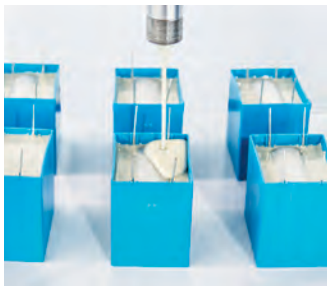
2:50 PM

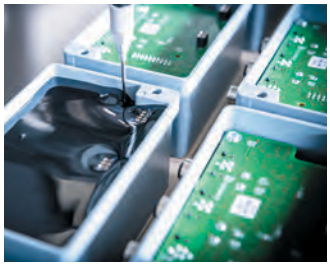
T40.5: Thermal Analysis of a 100 kW Polyphase Wireless Power Transfer System

Emrullah Aydin, PhD, *Oak Ridge National Laboratory*

Wireless Charging

AUTHORS: Emrullah Aydin, Himel Barua, Ahmet Aktas, Mostak Mohammad, Omar C. Onar, Burak Ozpineci





8:30 AM – 11:20 AM

IS19: SiC & Package Innovations in Power Modules

ROOM 103C

SESSION CHAIRS

Ajay Hari, *onsemi*

Stephen Oliver, *Navitas Semiconductor*

8:30 AM

IS19.1 **New Concept of Cooled and Compact Fuse by Direct Integration into Power Modules**
Laurent Milliere, PhD, *Mersen*

8:55 AM

IS19.2 **Thermal Performance Evaluation of Dual-Side Cooling SiC MOSFET Power Modules with Integrated Electromagnetic-Thermal Methodology for Busbar Heating Analysis**
Ludovica Longo, ENG, *STMicroelectronics*

9:20 AM

IS19.3 **Practical Applications for SiC Power Module SPICE Models**
Brian Deboi, PhD, *Wolfspeed*

9:45 AM

IS19.4 **Sensitivity Analysis to Maximize Performance in SiC Power Modules Connected in Parallel**
Antonia Lanzafame, MD, *STMicroelectronics*

10:30 AM

IS19.5 **Understanding the Impact of PCB Design on Silicon Carbide (SiC) Power Module Ampacity**
Dereje Woldegiorgis, PhD, *Wolfspeed Inc*

10:55 AM

IS19.6 **Evaluation of an Industry Standard Package Optimized for 600A SiC Mosfets**
Michael Rogers, *Mitsubishi Electric US Inc.*

8:30 AM – 11:20 AM

IS20: The Electrification of Everything: Opportunities for Power Electronics

ROOM 202AB

SESSION CHAIRS

Simon Price, *Exawatt-CRU*

Victor Veliadis, *PowerAmerica/North Carolina State University*

8:30 AM

IS20.1 **Electrifying Everything: The Pillars of Decarbonization Through Electrification**
Simon Price, *Exawatt-CRU*

8:55 AM

IS20.2 **How PowerAmerica is Accelerating Electrification**
Victor V. Veliadis, PhD, *PowerAmerica/North Carolina State University*

9:20 AM

IS20.3 **Using SiC in Off-Highway Applications**
Brij N. Singh, PhD, *John Deere*

9:45 AM

IS20.4 **Heating, Renewables and Industrial Drives – Opportunities for Power Electronics**
Mette Nordstrom, *Danfoss & Semikron Danfoss*

10:30 AM

IS20.5 **Power Electronics and Energy Storage Enabling the Grid of the Future**
Peter Friedrichs, PhD, *Infineon Technologies*

10:55 AM

IS20.6 **Off the Highway, in the Sky and on the Water: Further Opportunities for Power Electronics in E-Mobility**
Guy Moxey, MSc, *Wolfspeed*

8:30 AM – 11:20 AM

IS21: WBG Integration to Enhance Power Density and Differentiate Your End Products

ROOM 203AB

SESSION CHAIRS

Renee Yawger, *Efficient Power Conversion Corporation (EPC)*

Peter Di Maso, *Cambridge GaN Devices*

8:30 AM

IS21.1 **eGaN Integrated Circuits as a Building Block for Motor Drive Inverters**
Marco Palma, MSCee MBA, *Efficient Power Conversion*

8:55 AM

IS21.2 **GaN Half-Bridge Power IC and AHB/Totem-Pole Topologies Enable 240W, 150cc, PD3.1 Solution with 95.5% Efficiency**
Tom Ribarich, *Navitas Semiconductor*

9:20 AM

IS21.3 **Get Ready! The True Monolithic AC Bi-Directional GaN Switch Has Arrived**
Kennith Kin Leong, Ph. D, *Infineon Technologies*

9:45 AM

IS21.4 **Monolithic Integration Addresses Design Challenges with GaN Power Devices**
Di Chen, M.A.Sc, *Cambridge GaN Devices*

10:30 AM

IS21.5 **Source Side and In-line Lossless Current Sensing Using GaN Monolithic Integration**
Heemal Parimoo, MSc., *GaNPower International*

10:55 AM

IS21.6 **Advances in Integrated GaN for High Power Applications**
Dima Novo, *VisIC*

8:30 AM – 11:20 AM

IS22: Reliability of WBG Power Devices

ROOM 201A

SESSION CHAIRS

Emanuel Eni, *Infineon Technologies*

Karthick Murukesan, *Power Integration*

8:30 AM

IS22.1 **Update on Long Term Stability of SiC Power Transistors**
Peter Friedrichs, PhD, *Infineon Technologies AG*

8:55 AM

IS22.2 **Beyond the Datasheet – WBG Test and Validation**
Adam Anders, MSEE, *Wolfspeed*

9:20 AM

IS22.3 **Shaping the Future of Quality and Reliability for WBG Power Devices: JEDEC JC-70 and IEC Recent Developments**
Jaume Roig Guitart, PhD, *onsemi*

9:45 AM

IS22.4 **Reliability of Large Scale GaN Devices for Invertor Applications**
Kurt V. Smith, PhD, *VisIC Technologies*

10:30 AM

IS22.5 **Using Test-to-Fail Methodology to Accurately Project Lifetime of GaN HEMTs in Common DC-DC Converter Topologies**
Shengke Zhang, PhD, *Efficient Power Conversion*

10:55 AM

IS22.6 **15-mΩ GaN Device with 5-µs Short-Circuit Withstand Time**
Davide Bisi, PhD, *Transphorm*

8:30 AM – 11:20 AM

IS23: Component Packaging, Protection & Safety

ROOM 201B

SESSION CHAIRS

Doug Hopkins, *North Carolina State University*

Markondeyaraj Pulugurtha, *Florida International University*

8:30 AM

IS23.1 **Circuit for Disabling Inrush Shorting Protection Relay During Light/No-load Condition**
Richard Hester, *Power Integrations*

8:55 AM

IS23.2 **Thermoelectrical Analysis and Performance: A Comparative Study Between Modular and Discrete Approaches**
Domenico Nardo, MD, *STMicroelectronics*

9:20 AM

IS23.3 **Package Safety Isolation Testing for Integrated Power Devices**
Thomas Anthony Ferrer Capobianco, *Power Integrations*

9:45 AM

IS23.4 **Achieving Thermal Shock Reliability Enhancement Against Thick Cu Substrate in Die Attach with a High Thermal Conductive Foil**
Oji Sato, MEng, *ROHM Co., Ltd*

10:30 AM

IS23.5 **Demystifying Creepage and Clearance Distance for High-Voltage End Equipment**
Thomas LaBella, PhD, *Texas Instruments*

10:55 AM

IS23.6 **A Supercapacitor-based Surge Protection Technique Satisfying UL 1449 3rd Edition Tests**
Nihal Kularatna, DSc, *The University of Waikato*

8:30 AM – 11:20 AM

IS24: Topics in High Voltage Components and Systems

ROOM 203C

SESSION CHAIRS

Conor Quinn, *Advanced Energy Industries*

Fang Luo, *Stony Brook University*

8:30 AM

IS24.1 **Electronics in Electroporation: High-Voltage Pulsed Outputs in Medical Applications**
Robert T. Ryan, PhD in Power Electronics, *Advanced Energy*

8:55 AM

IS24.2 **Challenges and Opportunities for Aircraft Electrification**
Satish Prabhakaran, PhD, *GE Research*

9:20 AM

IS24.3 **Circuit and Field Simulations in HVPS Practice**
Alex Pokryvailo, PhD, *Spellman High Voltage*

9:45 AM

IS24.4 **Partial Discharge Detection and Aging Testing/ Modeling in WBG Based PWM Converters**
Fang Luo, PhD, *Stony Brook University*

10:30 AM

IS24.5 **Electrical insulation considerations of Compact High Voltage Assemblies**
Antonios Tzimas, PhD, *Advanced Energy*

10:55 AM

IS24.6 **Design Challenges of High Voltage Semiconductor Power Modules**
Jim L. Roemer, *Powerex Inc.*

1:30 PM – 3:10 PM

IS25: Power Solutions for AI Data Center Applications

ROOM 103C

SESSION CHAIRS

Stefano Saggini, *Università di Udine DPIA*

Paolo Mattavelli, *University of Padova*

1:30 PM

IS25.1 **Surface Power Delivery, the Future of High-Performance Computing**
José A. Cobos, PhD, *Universidad Politécnica de Madrid*

1:55 PM

IS25.2 **Hybrid Switched Capacitor Topologies for 48 V Data Center Applications**
Roberto Rizzolatti, PhD, *Infineon Technologies Austria AG*

2:20 PM

IS25.3 **Vertical Power Flow Enabled Ultra-Flat VR Module Combining Top Efficiency with Excellent Rth**
Kennith Kin Leong, Ph. D, *Infineon Technologies*

2:45 PM

IS25.4 **Lower Voltage IBC, Opportunities and Benefits**
Stefano Saggini, PhD, *Università di Udine DPIA*

1:30 PM – 3:10 PM

IS26: WBG Market Trends

ROOM 202AB

SESSION CHAIRS

Elena Barbarini, *System Plus Consulting*

Adam Anders, *Wolfspeed*

1:30 PM

IS26.1 **SiC Power Devices Are on a Roll: Technology and Cost Overview from Wafer to Packaging**
Amine Allouche, MSc, Eng, *Yole SystemPlus*

1:55 PM

IS26.2 **A New Rising Market for SiC: EV DC Charging Infrastructure**
Milan Rosina, PhD, *Yole Intelligence*

2:20 PM

IS26.3 **Reaching Maturity: How Will GaN Development Impact SiC Market Penetration?**
Callum J. Middleton, PhD, *Omdia*

2:45 PM

IS26.4 **GaN Device Market for Automotive & Mobility: In-depth Analysis of a $504M Business Opportunity by 2028**
Taha Ayari, PhD, *Yole Group*

1:30 PM – 3:10 PM

IS27: Emerging Applications for Power Electronics

ROOM 203AB

SESSION CHAIRS

Ada Cheng, *AdaClock*

Llew Vaughan-Edmunds, *Navitas Semiconductor*

1:30 PM

IS27.1 **Emergence of Artificial Intelligence Requires GaN DC-DCs Highest Performance, Efficiency, and Density**
Andrea Gorgerino, *EPC*

1:55 PM

IS27.2 **Edge Computing Satellites and Their Demands for Advanced Power Processing**
Wibawa Chou, *IR HiRel, An Infineon Technologies Company*

2:20 PM

IS27.3 **High-Voltage SiC Optimized for Megawatt Charging in EV Long-haul Trucking**
Stephen Oliver, MBA, *Navitas Semiconductor*

2:45 PM

IS27.4 **Energy Resilience: Energy Storage Systems (ESS) & Vehicle to Home (V2H)**
Ali Husain, PhD, *N/A*

1:30 PM – 3:10 PM

IS28: Capacitor Trends and Solutions for Emerging Power Applications

ROOM 201A

SESSION CHAIRS

Andrew Mikulski, *KEMET*

Frank Puhane, *Würth Elektronik*

1:30 PM

IS28.1 **Considerations for MLCCs in OBC & Resonant Applications**
Hunter Hayes, PhD, *KEMET Electronics Corporation*

1:55 PM

IS28.2 **Latest Generation of EMI Suppression (Film) Capacitors for xEV Systems. New Simulation Model in C.L.A.R.A.: Capacitors Bank**
David Olalla, BEng, *TDK Electronics AG*

2:20 PM

IS28.3 **Supercapacitor Assisted Converter and Protection Applications for Renewable Energy Systems**
Nihal Kularatna, DSc, *The University of Waikato*

2:45 PM

IS28.4 **Advanced Metallized Film and Aluminium Polymer Electrolytic Capacitor Technologies – News from SDU Labs**
Thomas Ebel, PhD, *University of Southern Denmark*

1:30 PM – 3:10 PM

IS29: Application Specific Measurements

ROOM 201B

SESSION CHAIRS

Bridget O'Gorman, *PESC Inc*

Diego Raffo, *Infineon Technologies*

1:30 PM

IS29.1 **Challenges in High Voltage Burn-in Test of Power MOSFETs**
Vernon Rogers, *Aehr Test Systems*

1:55 PM

IS29.2 **Insulation Specifications and Testing of Isolated Gate Drivers: A Comprehensive Overview**
Ahmed Nabih, PhD, *Texas Instruments*

2:20 PM

IS29.3 **The Real-Time Solution to Test and Debug Solar Grid-Tied Inverter Designs with Grid Feed Capability Used in Efficient Renewable Energy Applications**
Vivek Shivaram, *Tektronix*

2:45 PM

IS29.4 **Standardizing Gate Driver UVLO Across the Industry – Thresholds and Accuracy**
Aiyappa Byrajanda Naniappa, *Texas Instruments*

1:30 PM – 3:10 PM

IS30: Reliability, Anticipating & Preventing Failures Before They Occur

ROOM 203C

SESSION CHAIRS

Crystal Yannarella, *L3Harris*

Eric Swenson, *IBM*

1:30 PM

IS30.1 **Predictive Failure Analysis**
Elias Khoury, MS in Controls, *L3Harris*

1:55 PM

IS30.2 **Advancing Thermoelectric**
Uttam Ghoshal, PhD, *Sheetak Inc*

2:20 PM

IS30.3 **Reliability in Medical Power Supplies for Critical Healthcare Applications**
Hafiz Khalid, *XP Power*

2:45 PM

IS30.4 **Material Considerations for Next Generation EV Inverter Architectures**
Dongkai Shangguan

TECHNICAL DIALOGUE SESSIONS

The APEC Technical Program features lecture and dialogue presentations from authors of peer-reviewed papers that cover all areas of technical interest for the practicing power electronics professional. The rigorous review process ensures that only the most innovative technical solutions are highlighted to provide the highest quality possible. The technical program includes lecture presentations of broad appeal and dialogue sessions which provide an opportunity to discuss the topic in detail with the author.

11:30 AM – 1:30 PM

D01: AC-DC Converters II

GRAND BALLROOM AB

SESSION CHAIRS

Xiaofan Cui, *UCLA*

Xin Zan, *University of Maryland*

D01.1 Performance Analysis of SEPIC Bridgeless with Simplified Control Strategy in AC-DC Conversion System for More Electric Aircraft
Luiz Carlos Gomes Freitas, *Universidade Federal de Uberlândia*
Embedded AC-DC Power Supplies
AUTHORS: Thiago Gotlib Neves, Vítor Fonseca Barbosa, Antônio Oliveira C Neto, Gustavo Brito de Lima, Danillo Borges Rodrigues, Luiz Carlos Gomes Freitas

D01.2 Cycle-by-Cycle Reverse Current Limiting in Actively Clamped Flyback Converters with Noncomplementary Control
Claudio Adragna, *STMicroelectronics*
External AC-DC Adapters
AUTHORS: Claudio Adragna, Emanuele De Bartolomeo, Francesco Ferrazza

D01.3 Three-Phase Single-Stage Multiport Bidirectional AC-DC Converter with Reduced Power Conversion Stages
Gerry Moschopoulos, *Western University*
Bidirectional AC/DC converters
AUTHORS: Asad Hameed, Gerry Moschopoulos

D01.4 A 3700 W Ultra Low Profile Single-Phase Multi-Level Totem-Pole PFC
Enis Baris Bulut, *Trakya University*
Power Factor Correction, CCM, DCM, CRM/BCM Control, Bridgeless
AUTHORS: Enis Baris Bulut, Serkan Dusmez

D01.5 New Single-Stage Single-Phase Isolated Bidirectional AC-DC PFC Converter
Mafu Zhang, *UT Austin, Semiconductor Power Electronic Center*
Bidirectional AC/DC converters
AUTHORS: Mafu Zhang, Huanghaohe Zou, Saleh Farzamkia, Zibo Chen, Alex Q. Huang

D01.6 A GaN Based Totem Pole Bridgeless Power Factor Correction Circuit
Harsha Ademane, *ST Microelectronics*
Power Factor Correction, CCM, DCM, CRM/BCM Control, Bridgeless
AUTHORS: Harsha Ademane, Rosario Attanasio, Gianni Vitale

D01.7 Three-Level Flying-Capacitor-Based 100 W USB-C PD GaN Charger in Aircraft Applications
Tianyu Zhao, *Virginia Tech*
External AC-DC Adapters
AUTHORS: Tianyu Zhao, Jiewen Hu, Rolando Burgos, Bo Wen, Andrew McLean, Rodrigo Mattos

D01.8 A Modulation Method to Realize Soft Switching for Three-Phase Matrix AC-DC Converter
Zhicheng Zhu, *Shanghai Jiao Tong University*
Bidirectional AC/DC converters
AUTHORS: Zhicheng Zhu, Yu Zhang, Rui Li

D01.9 Optimal Zero-Current Distortion Compensation Method for Vienna Rectifier to Improve Dynamic Characteristic at Driving Start-Point
Juyeon Lee, *Dankook University*
Bidirectional AC/DC converters
AUTHORS: Juyeon Lee, June-Seok Lee

D01.10 Circulating Current Suppression in Parallel Connected ANPC Converters Using Advanced PWM Switching Patterns
Wael Telmesani, *University of Alberta*
Bidirectional AC/DC converters
AUTHORS: Wael Telmesani, Saeed Wdaan, John Salmon

11:30 AM – 1:30 PM

D02: High-power DC-DC Converters

GRAND BALLROOM AB

SESSION CHAIRS

Jiangang Hu
Justin Henspeter

D02.1 Characterization of Cycling Current in Pumpback Test for Loss Assessment of DAB Converter
Xiaobo Dong, *Xi'an Jiaotong University*
Bidirectional DC/DC Converters
AUTHORS: Xiaobo Dong, Haoyuan Jin, Ang Li, Shanzhe Li, Yilong Yao, Laili Wang, Kai Gao

D02.2 Design Methodology of Bidirectional LLC Resonant Converter
Cheol-Hee Jo, *Chonnam National University*
Resonant Converters
AUTHORS: Cheol-Hee Jo, Guangyao Li, Junchen Xie, Jung-Hoon Ahn, Dong-Hee Kim

D02.3 Optimized Dual Transformer Wiring Method for High Efficiency Operation of a 25kW LLC Converter
Dong Hyeon Sim, *Sungkyunkwan University*
Resonant Converters
AUTHORS: Dong Hyeon Sim, Chae-Lyn Kim, Hyeonu Jo, Ju-A Lee, Byoung Kuk Lee

D02.4 A Resonant Tank Design for LLC Resonant Converter Considering Leakage Inductance of Current Doubler Rectifier
Koki Mori, *Nagasaki University*
Resonant Converters
AUTHORS: Koki Mori, Akito Tabata, Haruki Kanto, Yoichi Ishizuka

D02.5 Compact Hardware Implementation of Power Factor Control for LLC Converter with Event-Driven-Timer Based Digital Controller
Toshiyuki Zaitsu, *ROHM Co., Ltd*
Resonant Converters
AUTHORS: Toshiyuki Zaitsu, Yuto Yoshimura, Kazuhiro Umetani, Masataka Ishihara, Eiji Hiraki, Kazuhiro Horii

D02.6 Optimal Modulation of Three-Phase Dual Active Bridge Using Multidimensional Ripple Correlation and Artificial Neural Networks
Daniel Santamargarita, *University of Alcalá*
Bidirectional DC/DC Converters
AUTHORS: David Molinero, Daniel Santamargarita, Juan José Pérez, Emilio José Bueno, Miroslav Vasić

D02.8 Two-Phase LLC Converter with Common LC Branch for Inherent Current-Sharing and Phase-Shedding Ability
Ubaid Ahmad, *Universitat Rovira i Virgili*
Point-of-Load (PoL) and Multi-Phase Converters
AUTHORS: Ubaid Ahmad, Roberto Giral, Carlos Olalla

D02.9 DC-Bias Elimination in High-Frequency Dual Active Bridge DC/DC Converters Through Single-Sided Measurements
Patrick Lenzen, *TU Dortmund University*
Bidirectional DC/DC Converters
AUTHORS: Patrick Lenzen, Martin Pfost

D02.10 Modeling of Secondary LLC Resonant Converter Based on Full Frequency Range Extended Describing Function Method
Debin Zhang, *Shanghai Institute of Space Power-Sources(SISP)*
Resonant Converters
AUTHORS: Honglin Lu, Debin Zhang, Chengzhi Qu, Jiaqi Li, Chenhao Wu, Guangrui Zhou

D02.11 Capacitive Based Isolated Resonant Switched Capacitor Solid State DC Transformer
Catalin Muntean, *Polytechnic University of Madrid*
Resonant Converters
AUTHORS: Catalin Muntean, Miguel Astudillo Martínez, Diego Serrano, Miroslav Vasić

D02.12 Practical Current Derivation Method for a Highly Accurate Variable Switching Frequency ZVS Regulation in TCM Operated Bidirectional Buck/Boost Converters
Bryan Gutierrez, *Virginia Polytechnic Institute and State University*
Bidirectional DC/DC Converters
AUTHORS: Bryan Gutierrez, Zhengming Hou, Dong Jiao, Jih-Sheng Lai

D02.13 A ZVS Implementation Method of a Current-Fed Dual Active Bridge Converter Within the Full Load Range
Qing Gu, *Key Laboratory of Control of Power Transmission and conversion, Shanghai Jiao Tong University–Ministry of Education*
Hard- and Soft-Switched
AUTHORS: Qing Gu, Bao Chang Xie, Rui Li, Zhicheng Zhu, Yu Zhang

D02.15 Current Stress Optimization of HNPC-DAB Converter with a Novel Modulation Scheme Using Four Control Degrees of Freedom
Nikhil Patil, *Indian Institute of Technology, Bombay*
Bidirectional DC/DC Converters
AUTHORS: Nikhil Patil, Anshuman Shukla

D02.16 Identifying Suitable PSFB Topology for HVLV Auxiliary Power Supply (APS) Application in EVs
Veera Bharath Gandluru, *Wolfspeed*
Hard- and Soft-Switched
AUTHORS: Veera Bharath Gandluru, Komal Autkar, Yuequan Hu

D02.17 Design Optimization of a Wide Voltage Range LLC Resonant Converter with Topology Morphing
Guvanthi Abeysinghe Mudiyanselage, *McMaster Automotive Resource Centre*
Resonant Converters
AUTHORS: Guvanthi Abeysinghe Mudiyanselage, Kyle Kozielski, Ali Emadi

D02.18 A Novel Open Circuit Fault Detection and Diagnosis Method for Dual-Active Bridges Under Parasitic Coupling
Ali Bazzi, *University of Connecticut / American University of Beirut*
Bidirectional DC/DC Converters
AUTHORS: Muhammed Ali Gultekin, Uiliam Kutrolli, Ali Bazzi

D02.19 Highly Power Dense MVDC to LVDC Conversion for Fast EV Charging Applications Based on NSwitch-Leg MAB Converter
Ankam Karthik, *Indian Institute of Technology Bombay*
Bidirectional DC/DC Converters
AUTHORS: Ankam Karthik, Suman Mandal, Anshuman Shukla

D02.20 ZVS Boundary Assessment for T-type-Based Dual Active Bridge Series Resonant Converters Using State-Plane Analysis
Shubhangi Gurudiwan, *Utah State University*
Resonant Converters
AUTHORS: Shubhangi Gurudiwan, Aditya Zade, Rees Hatch, Hongjie Wang, Regan Zane

D02.21 Cost-Effective Piggyback Forward Based DC-DC Converter
Oleksandr Matiushkin, *Tallinn University of Technology*
Hard- and Soft-Switched
AUTHORS: Oleksandr Matiushkin, Oleksandr Husev, Hossein Afshari, Dmitri Vinnikov, Ryszard Strzelecki

D02.22 DC Short Circuit Fault Analysis of a Triple Active Bridge Converter for Fault Ride-Through Capability
Shubham Dhiman, *North Carolina State University*
Bidirectional DC/DC Converters
AUTHORS: Shubham Dhiman, Shrivatsal Sharma, Osamah Aljumah, Subhashish Bhattacharya

11:30 AM – 1:30 PM

D03: Low-power DC-DC Converters

GRAND BALLROOM AB

SESSION CHAIR

Abhiman A Hande

D03.1 A Conduction-Loss-Conscious 4-Level Power Converter with Tri-Path Synchronous Rectification for High Step-Down DC-DC Conversion
Jin Woong Kwak, *The University of Texas at Dallas*
Point-of-Load (PoL) and Multi-Phase Converters
AUTHORS: Jin Woong Kwak, D. Brian Ma

D03.3 An Improved High-Frequency Single-Stage AC LED Driver with Soft Switching Operation and No Input Electrolytic Capacitor
Ramin Rahimzadeh Khorasani, *Pennsylvania State University*
Hard- and Soft-Switched
AUTHORS: Ramin Rahimzadeh Khorasani, Nilanjan Ray Chaudhuri

D03.4 A Merged Backside Series/Parallel Hybrid Piezoelectric-Resonator-Based DC-DC Converter
Wen-Chin Brian Liu, *University of California, San Diego*
Resonant Converters
AUTHORS: Wen-Chin Brian Liu, Patrick Mercier

D03.5 Power Amplifiers with Reactance Steering Network for Efficient Driving of Variable Impedance Inductively Coupled Plasma Coils
Tanuj Sen, *Princeton University*
Resonant Converters
AUTHORS: Tanuj Sen, Mian Liao, Youssef Elasser, Minjie Chen

D03.6 A Ramp Integrating Capacitor Current Constant On-Time (RICCCOT) Controlled Buck Converter with High Noise Immunity in DCM
Yu-Lin Chao, *National Taiwan University*
Voltage Regulator Modules (VRM)
AUTHORS: Yu-Lin Chao, Chieh-Ju Tsai, Yen-Ming Chen, Ching-Jan Chen

D03.7 SRC-Based Two-Cell Li-Ion Battery Buck Converter for De-Ripple Power Operation
Zixuan Xu, *Hong Kong Polytechnic University*
Point-of-Load (PoL) and Multi-Phase Converters
AUTHORS: Zixuan Xu, Minghao Wang, Zhao Xu

D03.8 A Novel Technique for Real-Time Optimal Efficiency Tracking in Integrated DC-DC Converters
Simone Scaduto, *STMicroelectronics*
Point-of-Load (PoL) and Multi-Phase Converters
AUTHORS: Federico Iob, Stefano Saggini, Carmelo A. Santagati, Simone Scaduto, Agatino A. Alessandro

D03.9 Power Electronics Building Block with Distributed TCM Modulator
Jörg Haarer, *University of Stuttgart*
Resonant Converters
AUTHORS: Jörg Haarer, Luis Koppenhöfer, Philipp Marx, Philipp Ziegler, Jörg Roth-Stielow

D03.10 Power and Signal Dual Modulation with QR-ZVS DC/DC Converters Using GaN-HEMTs
Abdelmoumin Allioua, *Technical University Darmstadt*
Resonant Converters
AUTHORS: Abdelmoumin Allioua, Gerd Griepentrog

D03.11 Low-Profile Direct Power Converter: 350A/48V-1V with Planar Matrix Transformer Using Standard PCB and Commercial Cores
Alejandro Figueroa, *Differential Power S.L.*
Point-of-Load (PoL) and Multi-Phase Converters
AUTHORS: Alejandro Figueroa, Pablo Mazariegos, Javier Goicoechea, Alejandro Castro, José A. Cobos

D03.12 Isolated and Regulated Ultra-Flat DC-DC Power Converter for Extremely Wide Input Voltage Range (15V-150V) and High Gain
Pablo Mazariegos, *Differential Power S.L.*
Voltage Regulator Modules (VRM)
AUTHORS: Pablo Mazariegos, Cristina Martos, Javier Goicoechea, José Jiménez, José A. Cobos

D03.14 An Accurate Temperature-Based Method for Fast Switching Loss Extraction of WBG Device
Qiuzhe Yang, *Virginia Tech*
Hard- and Soft-Switched
AUTHORS: Qiuzhe Yang, Feng Jin, Qiang Li

D03.15 A Relook at the ZVS of Power MOSFETs and an Improved Modeling Approach for ZVS Analysis in Power Converters
Vishnu Mahadeva Iyer, *Indian Institute of Science*
Hard- and Soft-Switched
AUTHORS: Aabid Ahmad Dar, Vishnu Mahadeva Iyer

D03.16 Overview of High-Power Density Voltage Regulator Solutions for XPU Applications
Behzad Vafakhah, *Intel Corporation*
Voltage Regulator Modules (VRM)
AUTHORS: Behzad Vafakhah, Peter Li, Olga Skyberg, Michael J Keller

D03.17 Wide-Input Voltage Range Two-Stages Auxiliary Power Supply for Medium Voltage Applications
Marcio L Magri Kimpara, *Oak Ridge National Laboratory*
Resonant Converters
AUTHORS: Marcio Magri Kimpara, Rajendra Prasad Kandula, Jonathan Harter, Christian Boone

D03.18 PCB Layout Design Impact on Three Level Buck Converters for USB3.1 PD Application
Abhishek Bhandari, *Alpha and Omega Semiconductor*
Bidirectional DC/DC Converters
AUTHORS: Abhishek Bhandari, Hui Ye

D03.20 Design of a Digitally Controlled Four-Switch Buck-Boost Converter with Smooth Mode Transition
Burak Caykenarı, *Aselsan*
Bidirectional DC/DC Converters
AUTHORS: Burak Çaykenarı, Bünyamin Tamyürek

D03.21 Parasitic Inductance Impact of a High-Turn-Ratio Half Bridge Active Clamped Converter for More-Electric Aircraft Applications
Yiren Zhu, *University of Nottingham*
Bidirectional DC/DC Converters
AUTHORS: Yiren Zhu, Yang Tao, Zhenyu Wang, Xingyu Yan, Serhiy Bozhko, Patrick Wheeler

D03.22 LLC Type Resonant Converter Adopting Peak Current Shaving with Third Harmonics Injection for Wide Output Voltage Range Application
Dong Jiao, *Virginia Polytechnic Institute and State University*
Resonant Converters
AUTHORS: Dong Jiao, Zhengming Hou, Jih-Sheng Lai

11:30 AM – 1:30 PM

D04: Utility-interface Converters

GRAND BALLROOM AB

SESSION CHAIRS

Drazen Dujic, *École Polytechnique Fédérale de Lausanne*

Maja Harfman Todorovic, *Menlo Microsystems*

D04.1 Optimal Design of Distributed Network Based on Power Quality to Minimize the Flicker of Wind Turbines
Abolfazl Ghaffari, *Graduate University of Advanced Technology, Kerman, Iran*
Distributed Energy Systems
AUTHORS: Abolfazl Ghaffari, Alireza Askarzadeh, Roohollah Fadaeinedjad, Gerry Moschopoulos

D04.2 An Asymmetric Perturbation Signal for Enhanced Perturbation Injection Capabilities of a Grid-Connected Converter
Jules Mace, *Ecole Polytechnique Federale de Lausanne*
Bidirectional grid interface converters
AUTHORS: Jules Mace, Andrea Cervone, Drazen Dujic

D04.3 **Adaptive Virtual Impedance for Reactive Current Control During Fault Conditions in Grid-Forming Inverters**
Mohammad Bani Shamseh, *TMEIC*
Distributed Energy Systems
AUTHORS: Mohammad Bani Shamseh, Haiqing Li

D04.4 **Stability Analysis of Second-Order Harmonic Active Filters for Input-Series/Output-Parallel Solid State Transformers**
Andrea Cervone, *École Polytechnique Fédérale de Lausanne (EPFL)*
Solid-State Transformers
AUTHORS: Andrea Cervone, Tianyu Wei, Drazen Dujic

D04.5 **Harmonic Current Compensation for LCL Filtered Shunt Active Power Filter**
Deokyong Woo, *Hanyang University*
Power Quality, UPS, Filters
AUTHORS: Deokyong Woo, Sungmin Kim

D04.6 **A Simplified Control Technique for High Power Factor Corrected Line-Interactive Ups with Tri-Port Transformer**
Kazuhide Domoto, *Nishimu Electronics Industries Co.,Ltd.*
UPS
AUTHORS: Kazuhide Domoto, Toshiro Hirose, Takuma Endo, Yoichi Ishizuka

D04.7 **Capacitor Voltage-Balancing Method of Three-Phase Four-Wire T-Type Inverter Based Active Power Filter**
Tengfei Sun, *Nanyang Technological University*
Power Quality, UPS, Filters
AUTHORS: Lei Zhang, Haoxin Yang, Ziheng Xiao, Zhigang Yao, Fei Deng, Tengfei Sun, Yi Tang

D04.8 **Design of a Modular Multilevel DC/DC Converter to Solid-State Transformer in a Green Hydrogen System**
Samuel Soares Queiroz, *Eindhoven University of Technology*
Solid-State Transformers
AUTHORS: Samuel Soares Queiroz, Levy Costa

D04.10 **Effect of Grid Current QSG on Harmonic Current Content in Single-Phase Grid-Connected Inverter**
Somenath Banerjee, *Indian Institute of Technology*
Power Quality, UPS, Filters
AUTHORS: Somenath Banerjee, Sonam Acharya, Santanu Mishra

D04.11 **Cyber Resiliency of a Solid-State Power Substation**
Sudip Mazumder, *University of Illinois Chicago*
Solid-State Transformers
AUTHORS: Shantanu Gupta, Mateo Daniel Roig Greidanus, Silvanus D'Silva, Souradeep Bhattacharya, Sudip Mazumder, Mohammad Shadmand, Manimaran Govindarasu, Taesic Kim, Juan Balda, Xiaoqing Song, Rambabu Adapa, Mohammad Shahidehpour

D04.12 **Protection Circuit for DC Short Fault and Soft-Reclosing Operation for Protective Coordination Algorithm**
Junhee Yoon, *Hanyang university*
Power Generation, Transmission and
AUTHORS: Junhee Yoon, Sungmin Kim

11:30 AM – 1:30 PM

D05: Motor Drives & Inverters

GRAND BALLROOM AB

SESSION CHAIRS

Jin Moon, *Florida State University*

Matt Woongkul Lee, *Michigan State University*

D05.1 **Robust Online Diagnosis of Inverter Open-Circuit Switching Faults for Robotic Joints with BLDC Motors**
Mohamed Y. Metwly, *University of Kentucky*
AC, DC, BLDC Motor Drives
AUTHORS: Mohamed Y. Metwly, Landon Clark, Biyun Xie, JiangBiao He

D05.2 **Hybrid Modulation Method for Single Phase Full Bridge CRM Inverter to Improve Reactive Power Capability**
Xingyu Chen, *CPES / Virginia Tech*
Single- and Multi-Phase Inverters
AUTHORS: Xingyu Chen, Qiang Li

D05.3 **Online CEMF Estimation for Permanent Magnet Synchronous Motor**
Bing Li, *Rockwell Automation*
AC, DC, BLDC Motor Drives
AUTHORS: Bing Li, Jiangang Hu

D05.4 **Regenerative Active Front End Based Motor-Drive Systems for Servo Press Applications**
Ahmed Sayed-Ahmed, *Rockwell Automation*
AC, DC, BLDC Motor Drives
AUTHORS: Ahmed Sayed-Ahmed, Emmanuel Arthur

D05.5 Fast-Response FCS-MPC for Coordinated Control of Permanent Magnet Direct-Drive Motors in Humanoid Robotic Arm Shoulders
Chao Gong, *University of Alberta*
Actuators
AUTHORS: Chao Gong, Brian Seibel, Cheng Xue, Xiaodong Zhang, Yaofei Han, Yunwei Li

D05.6 Frequency-Dependent Impedance Variation in Multilevel Converters with Parallel Connectivity
Jinshui Zhang, *Duke University*
Single- and Multi-Phase Inverters
AUTHORS: Jinshui Zhang, Angel Peterchev, Stefan Goetz

D05.7 Low THD Current Control of Nonlinear Load Characteristics Using a Single Phase Dual Zeta Inverter
Kai Franck, *Kaiserslautern University of Applied Sciences*
Single- and Multi-Phase Inverters
AUTHORS: Kai Franck, Benjamin Zacher, Simon Holzmann, Max Wagner, Christian Schumann

D05.8 Multisampling Model Predictive Control for PMSM Drives with Improved Tracking Performance and High Bandwidth
Cheng Xue, *University of Alberta*
High Performance Drives
AUTHORS: Cheng Xue, Xuesong Wu, Yunwei Li

D05.9 Speed-Increasing Type Reluctance Vernier Machine
Kimio Hijikata, *Tokyo City University*
AC, DC, BLDC Motor Drives
AUTHORS: Kimio Hijikata, Jin Kushida, Riku Horikawa

D05.10 Efficiency Enhancement and Current Stress Reduction in ARCP Inverter Through Switching Sequence Dependent Control Strategy
Mingi Oh, *NC state university*
Single- and Multi-Phase Inverters
AUTHORS: Mingi Oh, Iqbal Husain

D05.11 Broken Rotor Bar Detection in AC Induction Motors Using Cascaded Flux-Current State Observer
Woongkul Lee, *Michigan State University*
AC, DC, BLDC Motor Drives
AUTHORS: Jin A Choi, Jae Suk Lee, Yeonwoo Kim, Sehwan Kim, Woongkul Lee

D05.12 MPC-Based Fault-Tolerant Control of Asymmetrical Six-Phase PMSM Motor With Robust Voltage Vector Calibration
Yixiao Luo, *Huazhong University of Science and Technology*
High Performance Drives
AUTHORS: Yixiao Luo, Kai Yang, Jincheng Yu, Li Zhang, Xinhong Zou

D05.13 Regenerative dV/dt Filter Topology for Motor Drives
Yilmaz Sozer, *University of Akron*
High Performance Drives
AUTHORS: Md Ehsanul Haque, Yilmaz Sozer, Ashraf Siddiquee

D05.14 Mitigation of Uneven Overvoltage Distribution in Motor Windings Fed by SiC-Based Drives Using a GaN-Based Adaptive Surge Impedance Method
Milad Sadoughi, *Kansas State University*
AC, DC, BLDC Motor Drives
AUTHORS: Milad Sadoughi, Arya Sadasivan, Fariba Fateh, JiangBiao He, Behrooz Mirafzal

D05.15 A Rotor Flux Observer for SPMSM Sensorless Drive Based on Linear Regression Model
Jongwon Choi, *Hannam University*
AC, DC, BLDC Motor Drives
AUTHORS: Jongwon Choi, Taeyeon Lee, Yoonjae Kim

D05.16 A TMR-Based Integrated Current Sensing Solution for WBG Power Modules
Sama Salehi Vala, *Stony Brook University*
Sensor Integration
AUTHORS: Sama Salehi Vala, Abdul Basit Mirza, Fang Luo

D05.17 Comparison of Flux-Weakening Control Methods for Wound Field Synchronous Motor
Han-Vit Kim, *Dankook University*
AC, DC, BLDC Motor Drives
AUTHORS: Han-Vit Kim, Do-Hyeon Kim, June-Seok Lee

11:30 AM – 1:30 PM

D06: Devices & Components

GRAND BALLROOM AB

SESSION CHAIR

Hengzhao Yang, *ShanghaiTech University*

D06.2 Overshoot Prevention in Monolithic GaN by Ultra-Low ESL Gate Loop Design Using Chip-Scale Capacitors and Gate Driver Pull-Up Path Tuning Technique
Niklas Deneke, *Institute of Microelectronic Systems, Leibniz University Hannover*
GaN HEMTs
AUTHORS: Niklas Deneke, Bernhard Wicht

D06.3 Triangular and Rectangular Power Pulses in Automotive MOSFETs Applications for Thermally Unstable Linear Mode
Christian Radici, *Nexperia*
Power Silicon MOSFETs, BJTs, IGBTs
AUTHORS: Christian Radici, Vijayakrishna Satyamsetti, Philip Ellis, Peter Vines, Wayne Lawson

D06.4 Modeling the Effect of Gate-Drain Parasitic Capacitance of a SiC MOSFET in a Half-Bridge During the Soft Turn-Off and Hard Turn-on Transition
Ayooluwa Ajiboye, *University of Maryland*
SiC MOSFETs and BJTs
AUTHORS: Ayodhya Somiruwan Gamwari, Ayooluwa Ajiboye, Rakesh Resalayyan, Alireza Khaligh

D06.5 Gan and SiC Based 500kHz Resonant Bidirectional DC/DC Design for 800V OBCM Application
Minli Jia, *Navitas*
GaN HEMTs
AUTHORS: Minli Jia, Hao Sun, Jingxian Cai, Haisong Zhang, Zhen Zhou, Jinlong Chen

D06.7 Design and Implementation of GaN-HEMT-Based Inverter-Coil Integrated Module for Free Zone Induction Heating System
Sang Min Park, *Korea Electronics Technology Institute (KETI)*
GaN HEMTs
AUTHORS: Sang Min Park, Hyoung-Kyu Yang, Byoung Jo Hyon, Joon Sung Park, Jin-Hong Kim, Byoung Kuk Lee

D06.10 Remaining Useful Life Prediction of Aluminum Electrolytic Capacitor with a Strain-Based Health Indicator
Bo Yao, *Aalborg university*
Capacitors, Supercapacitors
AUTHORS: Bo Yao, Xing Wei, Yichi Zhang, Zhihao Lin, Haoran Wang, Huai Wang

D06.11 Impact of Bond Wire Degradation on Thermal Estimation and Temperature Coefficient of IGBT Modules in Power Cycling Test
Yichi Zhang, *Aalborg University*
Power Silicon MOSFETs, BJTs, IGBTs
AUTHORS: Yichi Zhang, Yi Zhang, Bo Yao, Huai Wang

D06.12 A Multi-Metrics in Situ Aging Detector for SiC Power MOSFET Modules with Full Driver-Integration Capability
Shuofeng Zhao, *National Renewable Energy Laboratory*
SiC MOSFETs and BJTs
AUTHORS: Shuofeng Zhao, Faisal Khan

D06.13 An Experimental Technique for Detecting False Turn-on of SiC MOSFETs
Kaushik Basu, *Indian Institute of Sciences*
SiC MOSFETs and BJTs
AUTHORS: Manish Mandal, Shamibrota Kishore Roy, Kaushik Basu

D06.14 Single Event Upset in Depletion-Mode Gallium Oxide MOSFETs at the Breakdown Region
Abu Shahir Md Khalid Hasan, *University of Arkansas*
Power Silicon MOSFETs, BJTs, IGBTs
AUTHORS: Abu Shahir Md Khalid Hasan, Md Maksudul Hossain, Pedram Chavoshipour Heris, H. Alan Mantooth

D06.15 Switching Cell Design for Medium Voltage Flying Capacitor Converter with 10 kV SiC MOSFET
Ruirui Chen, *University of Tennessee*
SiC MOSFETs and BJTs
AUTHORS: Ruirui Chen, Dingrui Li, Min Lin, Mohamed Al Sager, Zihan Gao, Fred Wang, Hua Kevin Bai, Leon M. Tolbert

D06.16 FET Junction Temperature Monitoring Using Novel On-Chip Solution
Ramandeep Narwal, *North Carolina State University*
SiC MOSFETs and BJTs
AUTHORS: Ramandeep Narwal, Aditi Agarwal, Tzu-Hsuan Cheng, B. Jayant Baliga, Subhashish Bhattacharya, Douglas C. Hopkins

11:30 AM – 1:30 PM

D07: Power Converter Design, Packaging & Integration

GRAND BALLROOM AB

SESSION CHAIR

Dakai Wang, *University of Québec at Trois-Rivières*

D07.1 Power Control and Sensing Method of kW Range Class E Power Amplifier
Kyungmin Lee, *Samsung electronics*
Quality and System Reliability
AUTHORS: Kyungmin Lee, Seogyong Jeong, Jihoon Kim, Young-Ho Ryu

D07.2 Low Inductance Package with Multi-Layer PCB Wiring for Double-Sided Direct Oil-Cooling Inverter
Kyota Asai, *Hitachi, Ltd.*
Power Modules / High Density Design
AUTHORS: Kyota Asai, Takeshi Tokuyama, Takahiro Araki, Akihiro Namba, Ti Chen, Shintaro Tanaka

D07.3 A Screening Method for Improving Transient Current Sharing of Paralleled SiC MOSFETs Based on Spectral Clustering
Junhui Yang, *Xi'an Jiaotong University*
Power Electronics Packaging
AUTHORS: Junhui Yang, Yongmei Gan, Hongchang Cui, Yan Nie, Wenbo Fan, Laili Wang, Kai Gao

D07.4 Operation Point Based Optimization of Switching Losses with Current-Source Gate Driver for SiC-Based Power Modules
Muhammad Muneeb Alam, *Robert Bosch GmbH*
Power Modules / High Density Design
AUTHORS: Muhammad Muneeb Alam, Saad Khalid, Ngoc Ho Tran

D07.5 Design of Zero Overvoltage Switching Tailored Power Electronics
Nico Schmied, *Fraunhofer Institut IISB*
Power Modules / High Density Design
AUTHORS: Nico Schmied, Stefan Matlok, Martin März

D07.6 A ΔIIN Self-Canceled SEPIC Power Converter for EMI CISPR 25 Compliance
Zhenda Fu, *The University of Texas at Dallas*
Thermal and EMC Management
AUTHORS: Zhenda Fu, Lixiong Du, Jin Woong Kwak, D. Brian Ma

D07.7 Common-Mode Noise Reduction in Full-Bridge LLC Resonant Converter with Split Primary Winding Transformer
Binghui He, *Queen's University*
Thermal and EMC Management
AUTHORS: Binghui He, Yang Chen, Xiang Yu, Yan-Fei Liu

D07.8 Parasitic Inductance Network Modeling Method for Power Module Inner Wirings Based on Inductance Matrix Measurement
Kotaro Kobashi, *Okayama University*
Power Modules / High Density Design
AUTHORS: Kotaro Kobashi, Kazuhiro Umetani, Masataka Ishihara, Hiroto Sakai

D07.9 Difference in Differential and Common Mode Currents of Output and Input Cables in Three-Phase Variable Speed Drive System for Evaluating Radiated EMI
Tuvshinbayar Bandi, *Kyushu Institute of Technology*
Thermal and EMC Management
AUTHORS: Tuvshinbayar Bandi, Fumiya Odera, Shinya Ohtsuka

D07.10 Simultaneous Measurement System of Differential Mode and Common Mode Currents Without Influence for Radiated EMI in Three-Phase Variable Speed Drive System
Fumiya Odera, *Yaskawa Electric Corporation*
Thermal and EMC Management
AUTHORS: Fumiya Odera, Tuvshinbayar Bandi, Shinya Ohtsuka

D07.11 A High-Reliability SiC-Based Power Module with High-Temperature Co-Fired Ceramic Interposer for High-Temperature Applications
Baihan Liu, *Huazhong University of Science and Technology*
Power Modules / High Density Design
AUTHORS: Baihan Liu, Jianwei Lv, Yiyang Yan, Mengyao Du, Yifan Zhang, Cai Chen, Jiaxin Liu, Yong Kang, Chenjiang Yu, Min Wang

D07.13 A Comprehensive Study on Electric Field Coupling Effects of Medium-Voltage SiC Power Module and Optimization Design
Peiyuan Sun, *Xi'an Jiaotong University*
Power Electronics Packaging
AUTHORS: Peiyuan Sun, Laili Wang, Tianshu Yuan, Dingkun Ma, Liangjun Ma, Lei Li, Jiacheng Guo, Xiaobo Dong, Kai Gao

D07.14 Cost Effective 3D Printed Heatsink for Fast Prototyping of WBG Power Converters
Stefano Savio, *Politecnico di Torino*
Thermal and EMC Management
AUTHORS: Fausto Stella, Stefano Savio, Enrico Vico, Radu Bojoi, Eric Armando

D07.15 Methods for Increasing the Partial Discharge Inception Voltage of Power Module Substrates Using Guard Ring Structures
Yuan Gao, *Aalborg University*
Power Electronics Packaging
AUTHORS: Yuan Gao, Christian Uhrenfeldt, Stig Munk-Nielsen, Thore Stig Aunsborg

D07.16 A Jet Impingement Cooling Method to Mitigate the Inherent Uneven Temperature of Multi-Chips in Power Modules
Hongchang Cui, *Xi'an Jiaotong University*
Thermal and EMC Management
AUTHORS: Hongchang Cui, Laili Wang, Haoyuan Jin, Hang Kong, Feng Wang, Xiaobo Dong, Zizhen Cheng, Kai Gao

D07.19 A Compact Power Stage Design for 10-kV SiC Device-Based Converters with Heatsink Electric Field Shaping
Zihan Gao, *The University of Tennessee*
Power Modules / High Density Design
AUTHORS: Zihan Gao, Ruirui Chen, Hua Kevin Bai, Leon M. Tolbert, Fred Wang

D07.20 Common-Mode Voltage in Three-Level T-Type Inverter: Modeling, Analysis, and Compensation
Vefa Karakaşlı, *Technische Universität Darmstadt*
Thermal and EMC Management
AUTHORS: Vefa Karakaşlı, Adeel Jamal, Gerd Griepentrog, Omid Safdarzadeh

D07.21 Machine Learning-Based Surrogate Models for Finned Heatsink Optimization
Ziheng Wang, *Aalborg University*
Thermal and EMC Management
AUTHORS: Ziheng Wang, Yi Zhang, Huai Wang

D07.22 An Improved Thermal Matrix Model of a Forced-Cooled Heat Sink Considering Uneven Cooling Conditions
Linhao Ren, *Huazhong University of Science and Technology*
Thermal and EMC Management
AUTHORS: Linhao Ren, Yiyang Yan, Jiaxin Liu, Suhang Wei, Cai Chen, Yong Kang, Chenjiang Yu, Min Wang

11:30 AM – 1:30 PM

D08: Modeling & Simulation

GRAND BALLROOM AB

SESSION CHAIRS

Suman Debnath, *ORNL*

Jin Wang

D08.1 A Nested Deep Learning Framework for the Steady-State Modeling of Power Converters in Time Domain
Fanfan Lin, *Zhejiang University*
Circuits and Systems
AUTHORS: Xinze Li, Fanfan Lin, Xin Zhang, Hao Ma

D08.2 Modelling of a Planar Omnidirectional Wireless Power Transfer System
Xipei Yu, *Center for Power Electronics Systems*
Circuits and Systems
AUTHORS: Xipei Yu, Junjie Feng, Liyan Zhu, Qiang Li

D08.3 Real-Time Electro-Thermal Simulations for Power Electronic Converters
Kerry Sado, *University of South Carolina*
Circuits and Systems
AUTHORS: Kerry Sado, Jarrett Peskar, Sebastian Ionita, Jack Hannum, Austin Downey, Kristen Booth

D08.4 Modeling of Complex Power Delivery Networks Driven by Non-Linear Voltage Regulators
Pavan Kumar, *Intel Corporation*
Circuits and Systems
AUTHORS: Rishik Bazaz, Jonathan Rosenfeld, Daniel Garcia Mora, Ernesto Neri, Ian Wilkinson, Pavan Kumar

D08.5 Optimal Driving Strategies for GaN HEMT: A Numerical Non-Linear Datasheet-Based Model
Daniel Ríos Linares, *ETSII / Universidad Politécnica de Madrid*
Device and Component Modeling
AUTHORS: Daniel Ríos Linares, Miguel Astudillo Martínez, Miroslav Vasić

D08.6 Large-Signal Characterization of Piezoelectric Resonators for Power Conversion
Amanda Jackson, *Massachusetts Institute of Technology*
Device and Component Modeling
AUTHORS: Amanda Jackson, Jason Perreault, Jeffrey Lang, David J. Perreault

D08.7 Modeling and Analysis of Partial Power Concept for Data Center Application
Pinhe Wang, *Technical University of Denmark*
Circuits and Systems
AUTHORS: Di Wu, Pinhe Wang, Yanda Lyu, Asier Romero Arruti, Ziwei Ouyang, Michael A. E. Andersen

D08.8 Symmetrical Termination Structure for Matrix Transformer in High Power Density Applications
Kexin Zhao, *Xi'an Jiaotong University*
Parasitics
AUTHORS: Kexin Zhao, Kangping Wang, Yuhang Xu, Suchen Dong, Changtao Chen

D08.9 Small Signal Analysis of High-Gain Transformer-Less Hybrid Boost Extender Converter Based on State-Space Modeling
Michael Evzelman, *Ben-Gurion University of the Negev*
Circuits and Systems
AUTHORS: Daniel Beniaminson, Michael Evzelman, Alon Kuperman, Mor Mordechai Peretz

D08.10 Modeling Framework to Compare High Voltage Vertical GaN PN and Merged PN-Schottky Diodes
Samuel Atwimah, *University of Toledo*
Device and Component Modeling
AUTHORS: Samuel Atwimah, Tolen Nelson, Prakash Pandey, Aidan Fox, Daniel Georgiev, Alan Jacobs, Andrew Koehler, Karl Hobart, Travis Anderson, Raghav Khanna

D08.11 Analytical Determination of Unipolar Diode Losses in Power Switching and Perspective for Ultra-Wide Bandgap Semiconductors
Joshua Piel, *Sensors Directorate, Air Force Research Laboratory*
Device and Component Modeling
AUTHORS: Nolan Hendricks, Joshua Piel, Ahmad Islam, Andrew Green

D08.12 A Comprehensive Study of Machine Learning Algorithms for GPU Based Real-Time Monitoring and Lifetime Prediction of IGBTs
Seungdeog Choi, *Mississippi State University*
Device and Component Modeling
AUTHORS: Md Moniruzzaman, Ahmed H. Okilly, Seungdeog Choi, Jeihoon Baek, Tahmid Ibne Mannan, Zeenat Islam

11:30 AM – 1:30 PM

D09: Control I

GRAND BALLROOM AB

SESSION CHAIR

Dorin Neacsu, *Technical University of Iasi*

D09.1 DC-Bias Current Detection and Mitigation for a Three-Phase Transformer-Connected Converter Through DC-Link Measurement
Kaveh Pouresmaeil, *Eindhoven University of Technology*
Control of Power Electronic Converters
AUTHORS: Kaveh Pouresmaeil, Maurice Roes, Nico Baars, Korneel Wijnands

D09.2 An Optimized Sensorless Synchronous Rectification Method for LLC Resonant Converter in Wide Output Voltage Range
Won-Yong Jang, *Yonsei University*
Control of Power Electronic Converters
AUTHORS: Won-Yong Jang, Issac Kim, Jihyeon Yun, Jung-Wook Park

D09.3 Enhancing Stability of Dual Active Bridge Converters with a Long Input Cable
Paolo Sbabo, *University of Padova*
Control of Power Electronic Converters
AUTHORS: Paolo Sbabo, Lazar Stojanović, Paolo Mattavelli, Giorgio Spiazzi

D09.4 A New Hybrid Control for Zero Voltage Switching Based on High Frequency Partial Power Buck-Boost Converter
Pinhe Wang, *Technical University of Denmark*
Control of Power Electronic Converters
AUTHORS: Di Wu, Yanda Lyu, Pinhe Wang, Asier Romero Arruti, Ziwei Ouyang, Michael A. E. Andersen

D09.5 A Multi-Segment PWM Scheme for Enhanced Hybrid Active NPC H-Bridge Converter
Satish Belkhode, *Georgia Institute of Technology*
Control of Power Electronic Converters
AUTHORS: Satish Belkhode, Anshuman Shukla, Suryanarayana Doolla

D09.6 The Output Voltage Estimator for Primary-Side Regulated Active-Clamp Forward Converter
Junho Shin, *Chung-Ang university*
Control of Power Electronic Converters
AUTHORS: Junho Shin, Jong-Won Shin

D09.7 Harmonic Suppression Strategy of Grid-Connected Current Based on Energy-Shaping Control
Hongpeng Liu, *Harbin Institute of Technology*
Control of Power Electronic Converters
AUTHORS: Jiahui Qiu, Bingyi Jin, Qiang Li, Wei Zhang, Hongpeng Liu

D09.8 Dynamic Phasor Modeling and Analysis of Sequence Decomposed Grid-Forming Control Under Unbalanced Faults
Siye Cen, *North Carolina State University*
Control of Power Electronic Converters
AUTHORS: Siye Cen, Ma Awal, Iqbal Husain

D09.9 A Variable Duty Cycle PFM Control Method for LLC Resonant Converter
Tianhao Tan, *Southeast University*
Control of Power Electronic Converters
AUTHORS: Tianhao Tan, Jingyi Zhou, Qinsong Qian

D09.11 A Fault Tolerant Control Strategy for Three-Level T-Type Inverter in LVRT/HVRT Operation
Xianzhe Pang, *Shandong University*
Control of Power Electronic Converters
AUTHORS: Xianzhe Pang, Shumei Chi, Qicai Ren, Alian Chen

D09.12 Coordinate Control of NP Voltage Balance in Two-Stage Three-Level DC-AC Converters
Zhou He, *Huazhong University of Science and Technology*
Control of Power Electronic Converters
AUTHORS: Zhou He, Hongfa Ding, Ziqi Zhang, Jiayang Wu, Dandi Zhang, YingZhe Liu, Ziheng Xiao, Zhigang Yao, Yi Tang

D09.13 Source Current Feedback Based Virtual Impedance Control for Three Phase Interleaved DC-DC Converter
Shivam Chaturvedi, *University of Michigan Dearborn*
Control of Power Electronic Converters
AUTHORS: Shivam Chaturvedi, Shahid Aziz Khan, Ducdung Le, Mengqi Wang

D09.14 Achieving Fast Dynamic Response in Hybrid PWM Inverters Using a Low-Computational State Trajectory Prediction Algorithm Incorporating with Reduced-Order Switching Surfaces
Shun-Cheung Ryan YEUNG, *City University of Hong Kong*
Control of Power Electronic Converters
AUTHORS: Jacky Chun-Tak Lai, Ryan Shun-Cheung Yeung, Henry Shu-Hung Chung

11:30 AM – 1:30 PM

D10: Control II

GRAND BALLROOM AB

SESSION CHAIR

Xiaonan Lu, *Purdue University*

D10.1 A Non-Isolated and Cost-Effective Hybrid Driving Solution for High Voltage GaN HEMTs
Antonello Laneve, *Infineon Technologies*
Gate Drive Circuits
AUTHORS: Antonello Laneve, Alex Rossi, Diogo Varajao

D10.2 Innovative Solid-State Isolators with Overcurrent and Over-Temperature Protection for Solid-State Relays
Wolfgang Frank, *Infineon Technologies*
Control ICs
AUTHOR: Wolfgang Frank

D10.3 Improved I-f Start-Up Method for the Refrigerant Load of the e-Compressor
Hyunwoo Lee, *Hyundai-wia*
Sensor and Sensor-less Control
AUTHORS: Hyunwoo Lee, Youngeun Oh, Jongwon Choi

D10.4 A Dynamic Sampling Method to Achieve Noise-Free Sampling for High-Frequency Converters
Zhou He, *Huazhong University of Science and Technology*
Digital Control
AUTHORS: Zhou He, Hongfa Ding, Ziqi Zhang, Jiayang Wu, Dandi Zhang, Jiannan Shao, Ziheng Xiao, Zhigang Yao, Yi Tang

D10.5 A 3-Level Active Gate Driver Network for SiC MOSFETs to Minimize Overshoot and Switching Losses
Vin Loong Choo, *TU Dortmund University*
Gate Drive Circuits
AUTHORS: Vin Loong Choo, Martin Pfost

D10.6 Design and Optimization of High Performance Gate Driver for Medium-Voltage SiC Power Modules
Lei Li, *Xi'an Jiaotong University*
Gate Drive Circuits
AUTHORS: Lei Li, Yongmei Gan, Tianshu Yuan, Dingkun Ma, Yan Nie, Peiyuan Sun, Xiaobo Dong, Kai Gao, Laili Wang

D10.7 MIMO Analysis of Port-Coupling Induced Destabilization of Interlinking DC-DC Converters
Ruzica Cvetanovic, *University of Padua*
Control of Power Electronic Converters
AUTHORS: Ruzica Cvetanovic, Ivan Petric, Paolo Mattavelli, Simone Buso

D10.8 Feedback Modelling of Passively Balanced Flying Capacitor Multilevel Converters
Daniel Zhou, *Princeton University*
Control of Power Electronic Converters
AUTHORS: Daniel Zhou, Minjie Chen

D10.9 On the Use of DualReLU ANN for Approximating Explicit Model Predictive Control for Buck Converters
Yangxiao Xiang, *City University of Hong Kong*
Control of Power Electronic Converters
AUTHORS: Yangxiao Xiang, Henry Shu-Hung Chung, Hongjian Lin

D10.11 Control Structure for Improving Performance of Interleaved Current-Fed Switched Inverter
Sonam Acharya, *Indian Institute of Technology, Delhi*
Control of Power Electronic Converters
AUTHORS: Sonam Acharya, Somenath Banerjee, Santanu Mishra

D10.12 Multi-Objective Design Optimization for Highbandwidth Printed-Circuit-Board Shielded Rogowski Coils
Xingyue Tian, *University of Tennessee Knoxville*
Sensor and Sensor-less Control
AUTHORS: Xingyue Tian, Sadia Binte Sohid, Han Cui, Fred Wang, Jason Swaim, Michael Zimmermann

D10.13 Stability-Oriented Prediction Horizons Design of Generalized Predictive Control for DC/DC Boost Converter
Yuan Li, *Aalborg University*
Control of Power Electronic Converters
AUTHORS: Yuan Li, Subham Sahoo, Sergio Vazquez, Yichao Zhang, Tomislav Dragičević, Frede Blaabjerg

D10.15 A Digital Dithering Phase Shift Modulator for Enhanced Resolution
Burkhard Ulrich, *Reutlingen University*
Digital Control
AUTHORS: Burkhard Ulrich

11:30 AM – 1:30 PM

D11: Wireless Power Transfer

GRAND BALLROOM AB

SESSION CHAIRS

Sheldon Williamson, *Ontario Tech University*

D11.1 Load Detection Circuit for Hybrid Induction Cooker of Inductive Heating and Wireless Power Transfer
Kyungmin Lee, *Samsung electronics*
Wireless Charging
AUTHORS: Kyungmin Lee, Sangwook Lee, Young-Ho Ryu

D11.2 Optimized Folded Coil Designs for Wireless Charging Chambers with Even Distribution of Magnetic Flux Density
Yun Yang, *Nanyang Technological University*
Wireless Charging
AUTHORS: Kaiyuan Wang, Rui Liang, Jinqiu Gao, Jiayang Wu, Yi Tang, Yun Yang

D11.3 Design of a 27.12MHz Ultra-Compact High-Performance Capacitive Wireless Power Transfer System Using Stacked Inverter Architecture
Yuetao Hou, *Cornell University*
Wireless Charging
AUTHORS: Yuetao Hou, Khurram Afridi

D11.4 A Privacy Leakage Issue in Qi-Compatible Cellphone Wireless Charging by Stray Magnetic Field Sniffing
Yirui Yang, *Shanghai Jiao Tong University*
Wireless Charging
AUTHORS: Yirui Yang, Zihao Zhan, Honggang Yu, Qinghui Huang, Shuo Wang

D11.5 Improving Magnetic Energy Harvesting via Desaturation with Reverse Voltage
Min Gao, *Florida State University*
Energy harvesting (PWT)
AUTHORS: Min Gao, Lifang Yi, Jinyeong Moon

D11.6 A Simple and Reconfigurable IPT System for E-Scooter Charging with High-Misalignment Tolerant and Constant Current/Voltage Output
Guangyao Li, *Chonnam National University*
Wireless Charging
AUTHORS: Guangyao Li, Cheol-Hee Jo, Junchen Xie, Dong-Hee Kim

D11.7 A Compact Microwave Rectifier Circuit with Improved Harmonic Control Structure for Wireless Power Transmission
Jianying Ding, *Nanjing University of Aeronautics and Astronautics*
Wireless Charging
AUTHORS: Jianying Ding, Ke Jin, Xing Li, Weiyang Zhou, Yali Jing, Jiang Zhu

D11.8 Design of a 11kW Three-Phase Inductive Power Transfer System Based on DD²Q Coil Structure
Nikola Mirković, *Universidad Politécnica de Madrid*
Wireless Charging
AUTHORS: Nikola Mirković, Alberto Delgado Exposito, Pedro Alou Cervera, Miroslav Vasić

D11.9 Study on a Fully Integrated Coil Based on the LCCL-S Compensation Topology for Wireless Electric Vehicles Charging Systems
Junchen Xie, *Chonnam National University*
Wireless Charging
AUTHORS: Junchen Xie, Guangyao Li, Cheol-Hee Jo, Geun Wan Koo, Dong-Hee Kim

D11.10 Optimal Design of a Harmonic Controlled Power Amplifier Based on Impedance Decoupling for WPT Application
Jianying Ding, *Nanjing University of Aeronautics and Astronautics*
Wireless Charging
AUTHORS: Jiang Zhu, Ke Jin, Chen Yang, Weiyang Zhou, Jing Gao, Jianying Ding

D11.11 Modeling and Analysis of Duty Cycle Mode Voltage Ringings in Wireless Power Transfer Systems
Haoquan Zhang, *Google LLC*
Wireless Charging
AUTHORS: Haoquan Zhang, Liang Jia, Yanchao Li, Srikanth Lakshmikanthan

D11.12 Comprehensive Comparative Analysis of Circular, Rectangular, and Hexagonal Coils for Wireless Charging of e-Mobility
Jeonggi Son, *Ontario Tech University*
Wireless Charging
AUTHORS: Jeonggi Son, Niranjan Shrestha, Sheldon Williamson

D11.13 A Unified and Precise Mathematical Model for Combining Circular and Square Coils in Wireless Power Transfer Systems
Yue Wu, *Xi'an Jiaotong University*
Wireless Charging
AUTHORS: Yue Wu, Yongbin Jiang, Yaohua Li, Sicheng Wang, Chang Wang, Huajia Wang, Xiaohua Wang, Yi Tang

D11.14 High-Performance Multi-MHz Capacitive Wireless Power Transfer System Utilizing Magnetic-Core Coupled Inductors
Dheeraj Etta, *Cornell University*
Wireless Charging
AUTHORS: Dheeraj Etta, Rabail Makhdoom, Sounak Maji, Syed Saeed Rashid, Khurram Afridi

D11.15 Parity-Time-Symmetry-Based WPT Systems with Homogenous Transmitter Coils for Drone Applications
Jiasheng Huang, *Technical University of Denmark*
Wireless Charging
AUTHORS: Ziliang Wu, Jiasheng Huang, Pinhe Wang, Ziwei Ouyang, Michael A. E. Andersen

11:30 AM – 1:30 PM

D12: Renewable Energy Systems

GRAND BALLROOM AB

SESSION CHAIRS

Haoyu Wang, *ShanghaiTech University*

Ruoyu Hou, *Power Integration*

D12.2 Demonstration of 5kV/150A Series-Type Hybrid Circuit Breaker (S-HCB) Using a High-Tempurature Superconducter (HTS) Counter Voltage Injection Transformer
Triston Cooper, *Illinois Institute of Technology (IIT)*
Microgrid Systems
AUTHORS: Triston Cooper, Mahmoud Alashi, Nikolai Shatalov, Zheng Shen, Ian Brown, Yuengfeng Zhou

D12.4 Addressing Reactive Power Sharing in Parallel Inverter Islanded Microgrid Through Deep Reinforcement Learning
Oroghene Oboreh-Snapps, *Missouri University of Science and Technology*
Microgrid Systems
AUTHORS: Oroghene Oboreh-Snapps, Sophia A. Strathman, Jonathan Saelens, Arnold Fernandes, Jonathan Kimball

D12.5 Converter-Based Microgrid Platform Development for Inverter Based Resource Control Parameters Testing
Nattapat Praisuwanna, *University of Tennessee Knoxville*
Microgrid Systems
AUTHORS: Nattapat Praisuwanna, Jingxin Wang, Leon M. Tolbert, Buxin She, Fangxing Li

D12.6 Converter Design and Control Strategy for PEM Water Electrolyzer to Increase Hydrogen Generation Using Hardware-in-the-Loop Simulation

Chang-Yeol Oh, *Korea Electrotechnology Research Institute*

Fuel Cells

AUTHORS: Kiryong Kim, Jae-Hoon Kim, Jong-Pil Lee, Tae-Jin Kim, Chang-Yeol Oh

D12.7 Supercapacitor-Buffered DC-Operable Refrigerators for DC Homes

Nirashi Polwaththa Gallage, *University of Waikato*

Energy Storage Systems

AUTHORS: Nirashi Polwaththa Gallage, Don Charles Themiya Sirimanne, Nihal Kularatna, Alistair Steyn-Ross, Dulsha Kularatna-Abeywardana

D12.8 Equivalent Circuit Model Analysis for Data-Driven Oriented Diagnosis of High-Level CO in HT-PEMFC with EIS

Dan Yu, *Aalborg University*

Fuel Cells

AUTHORS: Dan Yu, Xingjun Li, Samuel Simon Araya, Simon Lennart Sahlin, Vincenzo Liso

D12.9 Energy-Storage-Device-Enabled Adaptable Fast/Slow Synchronization Control Structure for Dual-Port Grid-Forming Voltage-Source Converters

Shuo Zhang, *University of Nebraska-Lincoln*

Microgrid Systems

AUTHORS: Shuo Zhang, Wei Qiao, Jun Wang, Liyan Qu

D12.11 Preliminary Experiments Quantifying the Arcing Process in a DC Circuit Breaker Development Project

Chamara Thilanka Dassanayake Dassanayake Mudiyanselage, *University of Waikato*

Microgrid Systems

AUTHORS: Chamara Dassanayake, Nihal Kularatna, Alistair Steyn-Ross, Nicoloy Gurusinghe, Kosala Gunawardane

D12.12 Multi-Objective Minimization of Life-Cycle Environmental Impacts of Three-Phase AC-DC Converter Building Blocks

David Menzi, *ETH Zurich*

Bi-directional Power Converters

AUTHORS: Luc Imperiali, David Menzi, Johann W. Kolar, Jonas Emanuel Huber

D12.13 Optimal Design and Operation of Long-Distance Deep-Water HVAC Transmission for Offshore WECS Integration with FPSO Unit

Lenon Schmitz, *Federal University of Santa Catarina*

Wind Energy Conversion Systems

AUTHORS: Lenon Schmitz, Francisco José Viglus, Jéssika Melo de Andrade, Matheus Schramm Dall Asta, Marcelo Lobo Heldwein, Telles Brunelli Lazzarin

D12.14 High Step-Up Three-Port Converter with Coupled-Inductor and Voltage Lift for Sustainable Energy Systems

Kuo-Fu Liao, *National Cheng Kung University*

Energy Storage Systems

AUTHORS: Kuo-Fu Liao, Tsorng-Juu Liang, Kai-Hui Chen, Jih-Sheng Lai

D12.15 A Supercapacitor Assisted Technique for Reducing Losses in the Input Loop of an Inverter System for Solar PV Applications

Chamila Anuradha Naligama, *University of Waikato*

Photovoltaic (PV) Inverters and Micro Inverters

AUTHORS: Chamila Anuradha Naligama, Nihal Kularatna, Alistair Steyn-Ross

D12.16 High–Conversion Ratio Modular Series-Capacitor Boost for PV Systems with MPPT Control

Eli Hamo, *Ben-Gurion University of the Negev*

Photovoltaic (PV) Inverters and Micro Inverters

AUTHORS: Eli Hamo, Martin Mellincovsky, Mor Mordechai Peretz

D12.17 Novel Battery Model Employing Variable Capacitor for Effective Description of SOC Behavior

Ngoc-Thao Pham, *University of Ulsan*

Energy Storage Systems

AUTHORS: Ngoc-Thao Pham, Jonghoon Kim, Sung-Jin Choi

D12.19 Design of a Cooling System in a Medium Voltage MMC

Min Lin, *The University of Tennessee*

Grid-Tied Systems

AUTHORS: Min Lin, Ruirui Chen, Dingrui Li, Leon M. Tolbert, Fred Wang, Hua Kevin Bai

D12.20 A Hybrid Technique for Minimizing Ripple in DC Nanogrids

Sally Sajadian, *Lafayette College*

Microgrid Systems

AUTHORS: Sam Fowler, Sally Sajadian

D12.21 Dual-Loop Geometric Control of Stator Flux for Improved LVRT Response in DFIG-Based Wind Turbine Systems

Jacqueline Dubreuil, *University of Calgary*

Wind Energy Conversion Systems

AUTHORS: Jacqueline Dubreuil, Ignacio Galiano Zurbriggen, Jeff Pieper

D12.22 Direct Power Control of Back to Back Modular Multilevel Converter with Advanced Grid Support Functions for Grid Forming Application

Vikram Roy Chowdhury, *National Renewable Energy Laboratory*

Microgrid Systems

AUTHORS: Vikram Roy Chowdhury, Barry Mather

D12.23 Operation of Grid Forming Converters as Self Excited Induction Generators Under Non-Ideal Loading Conditions
Vikram Roy Chowdhury, *National Renewable Energy Laboratory*
Photovoltaic (PV) Inverters and Micro Inverters
AUTHORS: Vikram Roy Chowdhury, Barry Mather

D12.24 An Asymmetric Nine-Level Single-Phase Current Source Inverter Topology
Kfir Jack Dagan, *Ariel University*
Photovoltaic (PV) Inverters and Micro Inverters
AUTHORS: Mias Fakher Aldin, Kfir Jack Dagan

11:30 AM – 1:30 PM

D13: Transportation Power Electronics

GRAND BALLROOM AB

SESSION CHAIRS

Dong Cao, *University*

Rasoul Hosseini, *General Motors*

D13.1 Inrush Current Load Regulation for Small Mobility Application
Shahid Aziz Khan, *University of Michigan*
Vehicular Power Electronic Circuits and Systems
AUTHORS: Shahid Aziz Khan, Mengqi Wang, Shivam Chaturvedi, Ducdung Le

D13.2 A Bidirectional 400-12 V DC-DC Converter with Improved Dynamics and Integrated Transformer for EV Applications
Óscar Lucía, *Universidad de Zaragoza*
Power Electronics for Hybrid and Electric Cars
AUTHORS: Héctor Sarnago, Óscar Lucía

D13.3 Coordination of RB-IGCT-Based Solid-State Circuit Breakers for High-di/dt Faults in DC EV Microgrids
Govind Chavan, *ABB*
Vehicular Power Electronic Circuits and Systems
AUTHORS: Govind Chavan, Chunmeng Xu, Abhinav Patni, Steven Englebretson, Pietro Cairoli

D13.4 A Reconfigurable Topology for Integration of Removable Batteries in an Electric Powertrain with 400 V and 800 V Compatibility
Duberney Murillo-Yarce, *Universidad de Oviedo*
Power Electronics for Hybrid and Electric Cars
AUTHORS: Duberney Murillo-Yarce, Gabriel D. Colvero, Diego G. Lamar, Alberto Rodríguez, Aitor Vazquez

D13.5 Solid-State Circuit Breaker for Aircraft High Voltage DC Network
Thanh Long Le, *Safran TECH*
Power Electronics for Aerospace
AUTHORS: Thanh Long Le, Stéphane Azzopardi, Philippe Lasserre, Arnaud Bruder, Bruno Lefebvre, Toni Youssef, Thierry Lebey

D13.7 Towards System-Friendly Solid-State Circuit Breaker for Electrified Aircraft Propulsion
Dehao Qin, *Clemson University*
Power Electronics for Aerospace
AUTHORS: Dehao Qin, Zheyu Zhang, Shimul Dam, Ching-Hsiang Yang, Zhou Dong, Cheng Wan, Hua Kevin Bai, Fred Wang

D13.8 Optimizing a Full-Bridge Capacitor-Clamped LLC Resonant Converter for EV Charging Considering the Effect of Leakage Inductance of the Auxiliary Transformer
Jiayang Wu, *The University of Hong Kong*
Charging Systems
AUTHORS: Jiayang Wu, Sinan Li, Junming Zeng, Siew-Chong Tan, Shu Yuen Ron Hui

D13.9 Resonant MIMO Converter for Future High-Voltage DC Grids in More Electric Aircraft Applications
Diego Bernal Cobaleda, *KU Leuven – Energy Ville*
Power Electronics for Aerospace
AUTHORS: Diego Bernal Cobaleda, Fanghao Tian, Yu Zuo, Wilmar Martinez

D13.10 Zero-Leakage-Current Zero-Common-Mode Modulation for Neutral-Point Connected Three-Phase Non-Isolated On-Board Chargers
Alessandro Pevere, *Infineon Technologies*
Power Electronics for Hybrid and Electric Cars
AUTHORS: Alessandro Pevere, Matthias J. Kasper, Alex Pacini, Gerald Deboy, Roberto Petrella, Narendar Rao

D13.11 Design and Analysis of a High Current GaN Based PCB for Dual Active Bridge Converter for Electric Aircraft Applications
Abdul Muneeb, *Stony Brook University*
Power Electronics for Aerospace
AUTHORS: Abdul Muneeb, Mustafeez Hassan, Ali Anwar, Fang Luo

D13.12 Characterizations and Converter Design Using the Latest 6.5 kV Silicon Carbide MOSFETs
Xinyuan Du, *University of Arkansas*
Power Electronics for Aerospace
AUTHORS: Xinyuan Du, Zhuxuan Ma, Mengxuan Jiang, Ahmed Ismail, Yue Zhao

D13.13 Modeling of Rail Transit Earth Current Distribution at Neutral Point of AC Grounding Transformer
Yuchen He, *Florida State University*
Vehicular Power Electronic Circuits and Systems
AUTHORS: Jinli Zhu, Yuchen He, Bokang Zhou, Yuan Li

D13.15 Magnetic Integrated High Frequency Transformer Based Dual Active Bridge for Multifunctional Onboard EV Charger
Nagamalleswararao Kamarajugadda, *Indian Institute of Technology Bombay*
Vehicular Power Electronic Circuits and Systems
AUTHORS: Nagamalleswararao Kamarajugadda, Amarkumar A Kushwaha, Baylon G. Fernandes, Kishore Chatterjee

D13.16 A Hybrid Si-SiC Flyback Converter for Auxiliary Power Supplies in DC Ship Grids
Sohaib Qazi, *University of Twente*
Vehicular Power Electronic Circuits and Systems
AUTHORS: Sohaib Qazi, Lucas de Oliveira Baumann, Ki-Bum Park, Francisco Canales, Thiago Batista Soeiro

11:30 AM – 1:30 PM

D14: Harvest, AC & HF Power Applications, & Power Quality

GRAND BALLROOM AB

SESSION CHAIRS

Ali Safayet, *Halla Mechatronics.*

Jeff Nilles, *Alpha & Omega Semiconductor*

D14.1 Low-Power Solid-State Transformers to Replace Line-Frequency Class 2 Transformers
Allen Nguyen, *Dartmouth*
AC-DC-AC Applications and Matrix Converters
AUTHORS: Allen Nguyen, Charles R. Sullivan

D14.2 Power Quality Impact of Residential LED Lighting Systems with Integrated TRIAC-Based Dimmer
Jeet Panchal, *Virginia Tech*
Lamp Ballasts and LED Lighting
AUTHORS: Jeet Panchal, Lakshmi Ravi, Boran Fan, Dong Dong, Rolando Burgos

D14.3 High-Voltage Nanosecond Pulse Generator Using Series-Stacked Enhancement-Mode GaN Transistors
Pablo Briz, *University of Zaragoza/I3A*
Network and Telecommunication Power Electronics
AUTHORS: Pablo Briz, Héctor Sarnago, José Miguel Burdío, Óscar Lucía

D14.4 High Power Factor Soft Switched Synchronous Buck with GaN SiP and Advanced HPF QR Controller
Jai Aditya Chaudhary, *STMicroelectronics*
Lamp Ballasts and LED Lighting
AUTHORS: Jai Aditya Chaudhary, Rosario Attanasio, Gianni Vitale

D14.5 Building Fabric Power Converters for Wearable Energy Harvesting Applications
Selin Bagci, *National Taiwan University*
Energy Harvesting (PEA)
AUTHORS: Selin Bagci, Katherine Kim

11:30 AM – 1:30 PM

D15: High Frequency Magnetics

GRAND BALLROOM AB

SESSION CHAIRS

George Slama, *Würth Elektronik*

Matt Wilkowski, *Enachip Inc.*

D15.1 PCB-Based Inductor Design for 1-kW, 1-MHz Buck Converter
Aqarib Hussain, *University of South Carolina*
High-frequency Magnetics
AUTHORS: Aqarib Hussain, Daniel Perez, Dejana Cucak, Kristen Booth

D15.2 Splitting Conductors of Coils on PCB for AC-Resistance Reduction
Shunsaku Nomoto, *Nagaoka University of Technology*
High-frequency Magnetics
AUTHORS: Shunsaku Nomoto, Shinjiro Shimura, Keisuke Kusaka, Takashi Takada

D15.3 Decreasing Parasitic Capacitances of Planar Transformers in High-Frequency Operation
Sujeong Lee, *Chung-Ang University*
High-frequency Magnetics
AUTHORS: Sujeong Lee, Jong-Won Shin

D15.4 Interleaved PCB Winding Planar Transformer for Electric Vehicle Charging CLLC Converters
Hans Wouters, *KU Leuven – EnergyVille*
Magnetics Applications
AUTHORS: Hans Wouters, Hassan Pervaiz, Tim Geboers, Yu Zuo, Wei-Ren Lin, Wilmar Martinez

11:30 AM – 1:30 PM

D16: Magnetic Design & Optimization

GRAND BALLROOM AB

SESSION CHAIRS

George Slama, *Würth Elektronik*

Edward Herbert, *PSMA*

D16.3 Research on Vibration and Acoustic Noise Emission of Nanocrystalline Inductors Based on Multi-Physics Coupling Analysis
Mengyao Du, *Huazhong University of Science and Technology*
Magnetics Applications
AUTHORS: Mengyao Du, Baihan Liu, Jiajia Guan, Wenzhe Xu, Shuangxi Zhu, Cai Chen, Jiaxin Liu, Yong Kang, Min Wang, Chenjiang Yu

D16.4 **A Multilevel Converter Testbench for High-Frequency Power Magnetics Characterization**
Neha Rajput, *Indian Institute of Science, Bengaluru*
High-frequency Magnetics
AUTHORS: Neha Rajput, Vishnu Mahadeva Iyer

11:30 AM – 1:30 PM

D17: Magnetic Applications II

GRAND BALLROOM AB

SESSION CHAIRS

Matt Wilkowski, *Enachip Inc.*

Edward Herbert, *PSMA*

D17.1 **Integrated Magnetic Design for High Power Density Converter**
Pinhe Wang, *Technical University of Denmark*
Magnetics Applications
AUTHORS: Pinhe Wang, Asier Romero Arruti, Jiasheng Huang, Tiberiu Gabriel Zsurzsan, Michael A. E. Andersen, Ziwei Ouyang

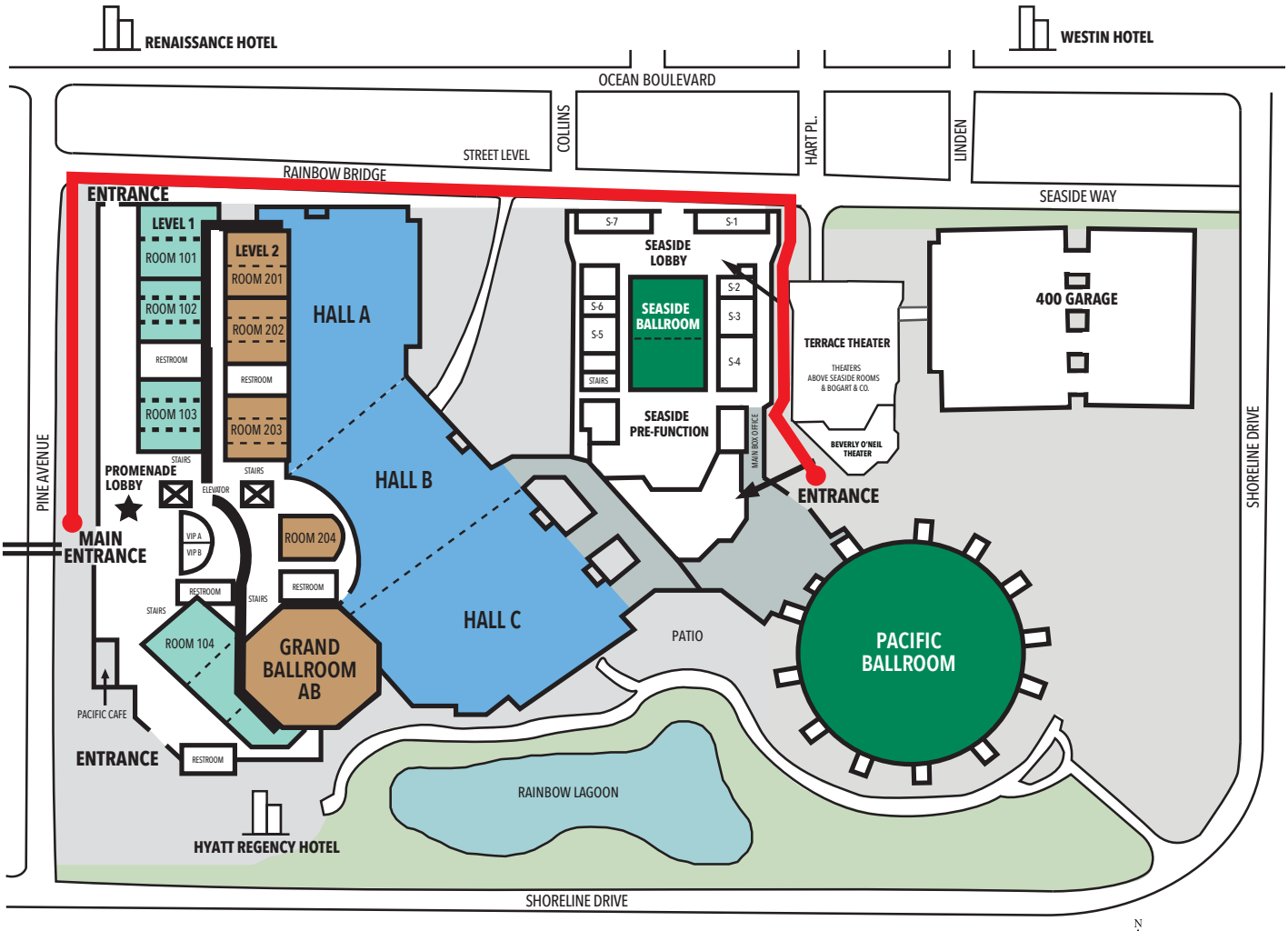
D17.2 **Enhanced Area Product Method for High-Frequency Inductors and Transformers**
Reanna Orzechowski, *Columbia University*
High-frequency Magnetics
AUTHORS: Reanna Orzechowski, Matthew Jahnes, Matthias Preindl

D17.3 **Analysis of Eddy Currents and Thermal Modeling of Planar Magnetic Components with Metal Housing**
Atsushi Hasenuma, *Nagoya University*
Magnetics Applications
AUTHORS: Atsushi Hasenuma, Jun Imaoka, Masayoshi Yamamoto, Tatsuya Miyazaki, Yuta Okawauchi, Akihiro Kawano

D17.4 **Derivation of an Optimal Winding Configuration for Minimizing the Effect of Winding Capacitances in a Two-Winding High-Frequency Transformer**
Annoy Das, *Indian Institute of Technology Bombay*
High-frequency Magnetics
AUTHORS: Annoy Kumar Das, Baylon G. Fernandes

NOTES

CONVENTION CENTER FLOOR PLAN



CONVENTION & ENTERTAINMENT CENTER
CAMPUS MAP

GROUND LEVEL:

HALL ABC: Expo Hall, FIRST Robotics, Micromouse

LEVEL 1:

★ **PROMENADE LOBBY:** APEC Registration

ROOMS 101AB, 102AB,103AB: Professional Education Seminars, Technical Sessions & Exhibitor Presentations

ROOM 103C: Press Room

ROOM 104ABC: PSMA Workshops, Technical Sessions, RAP Sessions

LEVEL 2:

ROOMS 201AB, 202AB, 203ABC: Industry Sessions & Exhibitor Presentations

ROOM 204: Speaker Ready Room

GRAND BALLROOM AB: Plenary, Dialogue Sessions

GRAND BALLROOM A: Technical Sessions

GRAND BALLROOM B: Industry Sessions

SEASIDE AND PACIFIC BALLROOMS:

SEASIDE BALLROOM: Speaker Breakfast

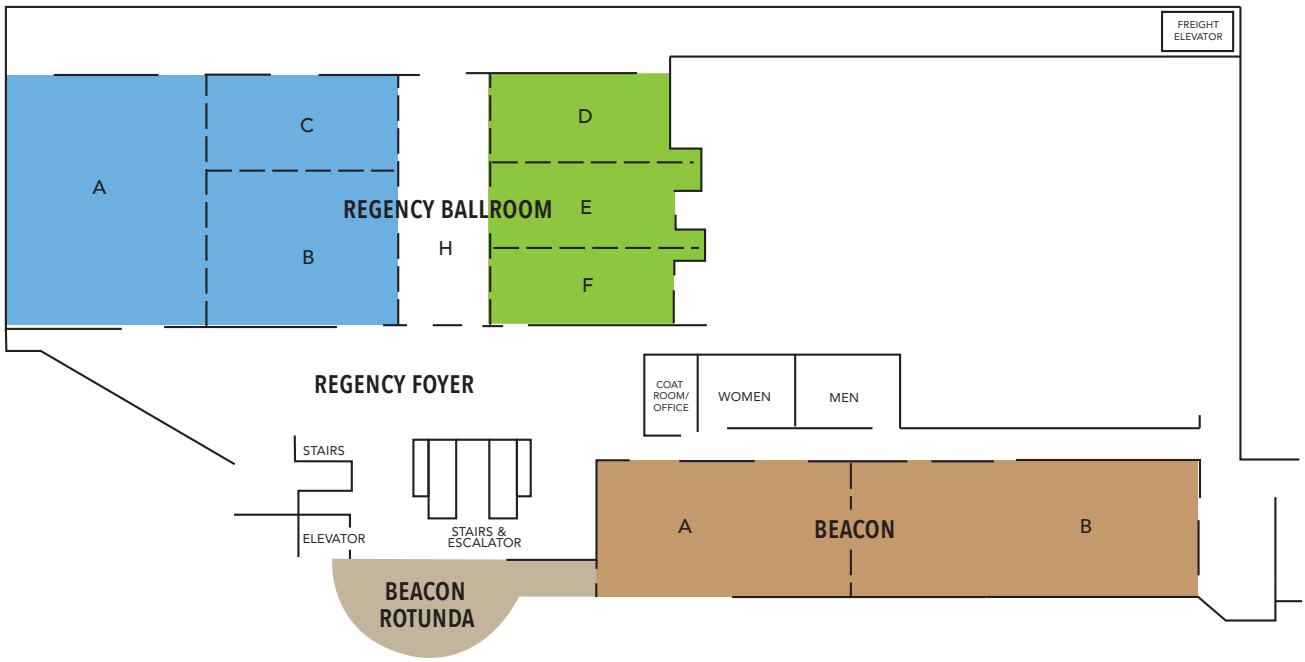
PACIFIC BALLROOM: Wednesday Night Social

This line indicates the walking path you must follow to access the Seaside Ballroom and Pacific Ballroom from the Promenade Lobby. (Approximately 7 minute outdoor walk.) *There are escalators/elevators available along the path in place of the large outdoor staircase.*

HYATT REGENCY HOTEL FLOOR PLAN

Lower Level (First Floor)

- **HARBOR ROOMS ABC:** PELS Meeting Space
- **SHORELINE ROOMS AB:** IAS Meeting Space
- **SEAVIEW ROOMS ABC:** PELS Meeting Space

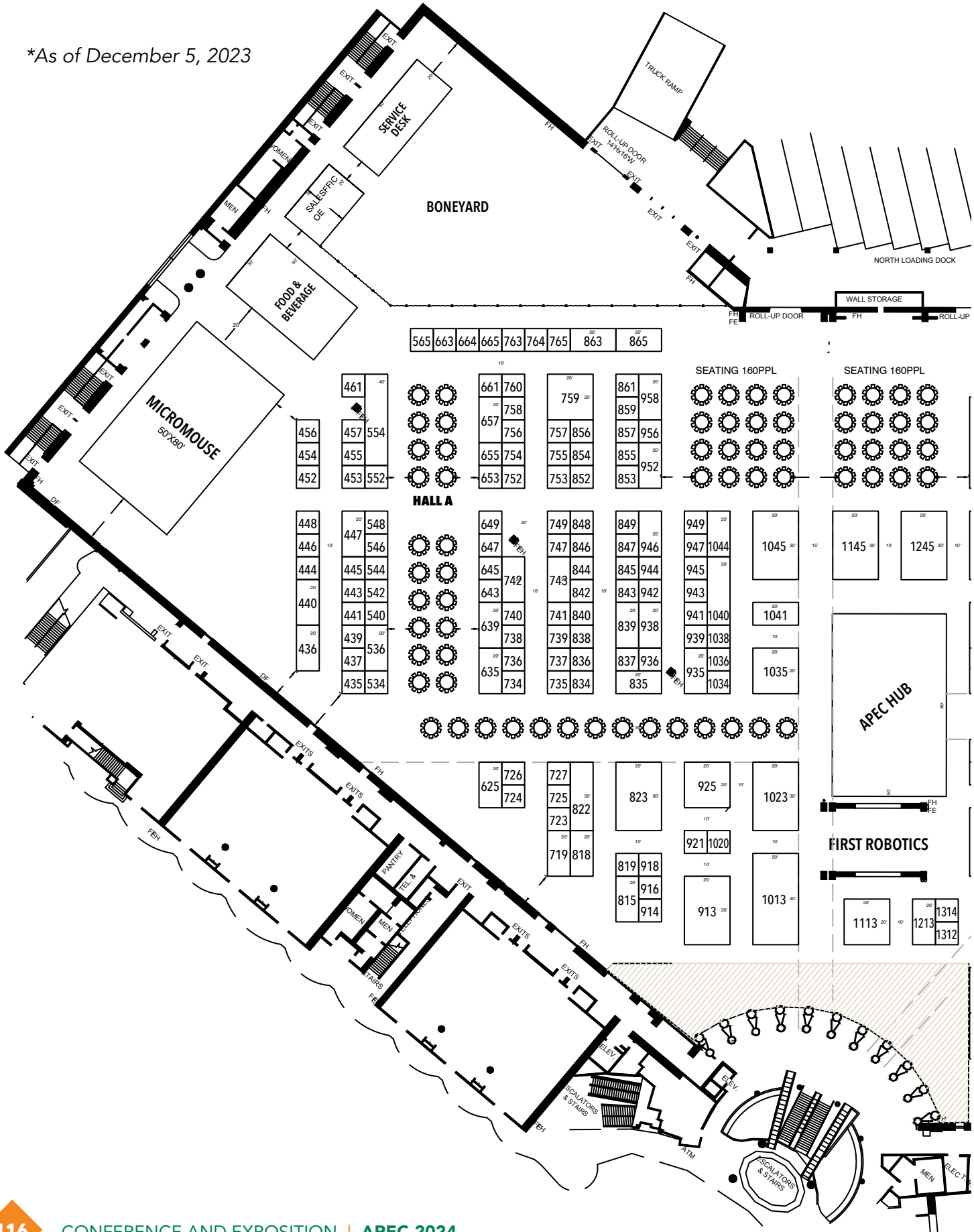


Upper Level (Fourth Floor)

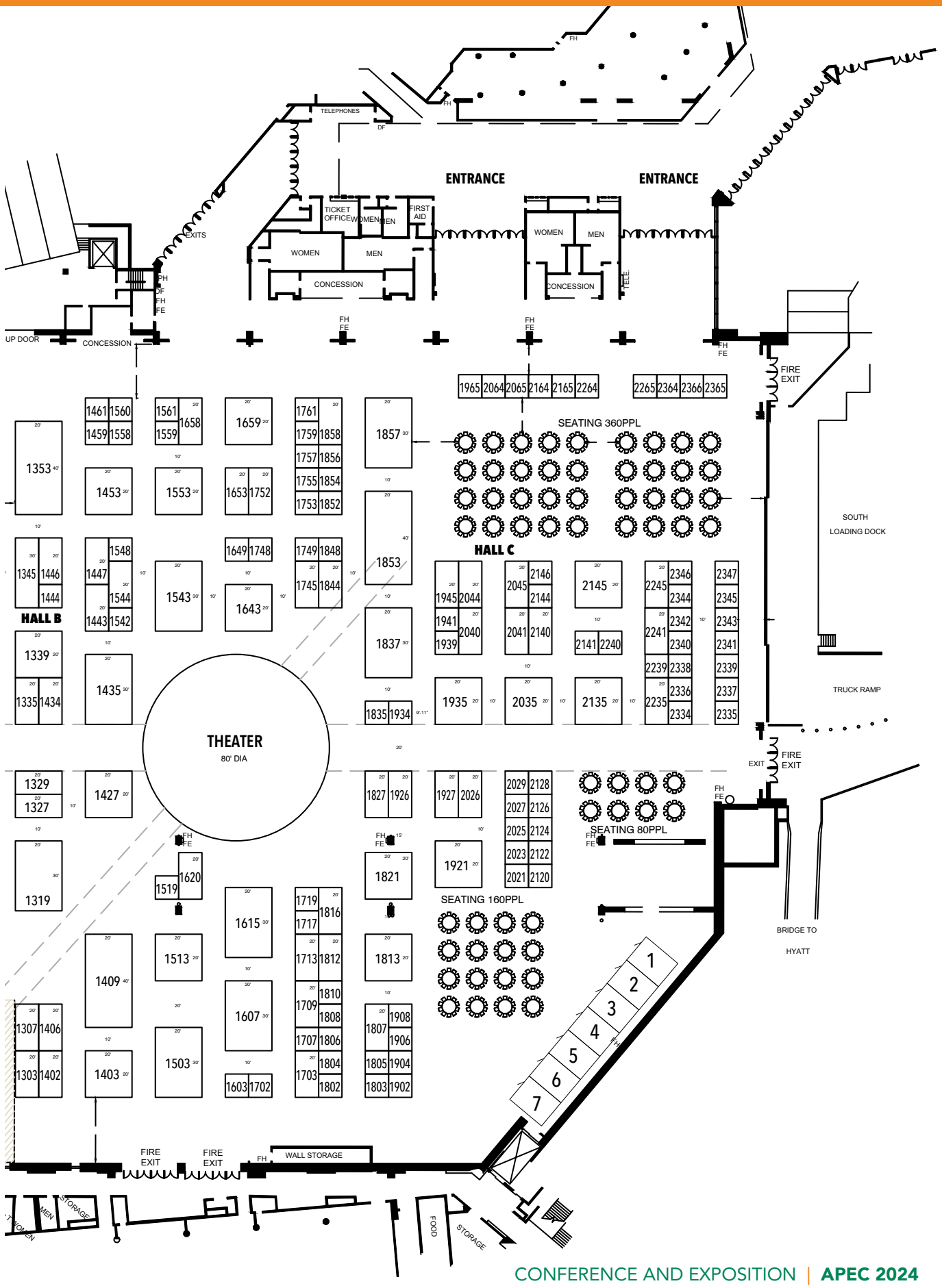
- **REGENCY BALLROOM ABC:** Student Job Fair
- **REGENCY BALLROOM DEF:** PELS Meeting Space
- **BEACON ROTUNDA:** Spouse & Guest Hospitality
- **BEACON BALLROOM AB:** PSMA Meeting Space

EXPO HALL FLOOR PLAN

*As of December 5, 2023



EXPO HALL FLOOR PLAN



EXHIBITOR LISTING *as of February 2, 2024*

EXHIBITOR	BOOTH #
AC Power Corp.	1752
ACME Electronics Corporation	1561
Acopian Power Supplies.	1327
Advanced Energy Industries, Inc.	842
Advanced Test Equipment Corp.	643
Advantech Corporation	854
AE Techron	2122
Aehr Test Systems	1702
Aishi Capacitors	837
Aismalibar North America	552
Alberko Heatsink Online	845
Alpha and Omega Semiconductor.	1345
Altair	741
AmberSemi.	639
AmePower – Contract Manufacturing	1759
American Made Challenges, NREL	1806
AMETHERM, INC	852
Analog Devices, Inc.	1409
Anbon Semi	2337
Apex Microtechnology	749
ATM MATERIAL.CO.LTD	443
AVL	2264
Axiom Test Equipment	1603
B&K Precision	1020
Batten & Allen	760
BH Electronics	855
Boschman-Advanced Packaging Technology.	1559
Bourns, Inc.	759
BRIGHTWORKS TECHNOLOGY, INC.	1461
CalRamic Technologies, LLC	847
Cambridge GaN Devices	1553
Capxon Electronic Technology Co., Ltd.	764
Center for Power Electronics Systems	921
Central Semiconductor.	1807
Centrotherm International AG	947
Chang Sung Corporation	435
Chroma.	2135
Cincinnati Sub-Zero	844
Cleverscope	1761
CODACA ELECTRONIC.	445
Coil Winding Specialist, Inc.	1939
Coilcraft, Inc.	946
Conquer Electronics Co., Ltd.	859
CoolCAD Electronics	455

EXHIBITOR	BOOTH #
Core Electronics	546
Cornell Dubilier Electronics	1827
Cramer Magnetics	916
Datatronics Inc.	661
Dean Technology, Inc.	1753
Delta Electronics (Americas) Ltd.	2364
DEMAK Group	758
DEWESoft LLC	1927
DigiKey	1821
DIOTEC Semiconductor America.	1908
dSPACE Inc.	1038
Ducati Energia SPA.	2341
E&B TECHNOLOGY CO., LTD	1854
EA Elektro-Automatik	1643
EBG Resistors	1852
Efab International Technology Co., Ltd.	457
EFC/Wesco	1717
Efficient Power Conversion Corporation (EPC)	1045
EGSTON Power Electronics	726
ELANTAS PDG, Inc.	861
Electro Ceramic Industries	444
Electro Technik	742
Electrocube, Inc.	2023
Electronic Concepts, Inc.	1307
Electronicon Kondensatoren GmbH.	952
Elektrisola Inc.	1548
Elna Magnetics	1748
Empower Semiconductor	2044
EXATRON, INC.	2029
EXXELIA USA	938
Fair-Rite Products	1444
Ferroxcube	1312
Focused Test, Inc.	1856
Fuji Electric Corp. of America.	1113
GaNPower International Inc.	1805
GE Aerospace.	653
GMW Associates	834
Goldenbamboo Electronics (Zhuhai) Co.,Ltd	461
Good-Ark Semiconductor	753
HMI.	1653
Hengdian Group DMEGC Magnetics Co., Ltd.	734
Heraeus Electronics	1406
Hesse Mechatronics	815
Hioki USA Corp.	1745

EXHIBITOR LISTING

EXHIBITOR	BOOTH #
Hitachi America Ltd.	542
Holy Stone International	725
Hotland International Corp (ShenZhen) Co., Ltd	1749
HVM Technology, inc.	2025
HVR Advanced Power Components	846
IAS (IEEE Industry Applications Society)	1234
IBS Electronics, Inc.	1904
ICE Components, Inc.	1314
Ideal Power	1810
iDRC	738
Indium Corporation	752
Infineon + GaN Systems	1319
Infineon Technologies Americas Corp	1013
Innoscience Technology Co., Ltd.	1543
Innovative Thermal Solutions, Inc.	765
iNRCORE, LLC	2045
INSTEK America Corp	943
Inter Outstanding Electronics Inc (IOE)	941
ITECH ELECTRONICS	1659
ITELCOND SRL	2141
ITG Electronics, Inc.	819
IWATSU ELECTRIC CO.,LTD.	2120
Jianghai America Inc	939
Johanson Dielectrics, Inc	2128
Jovil Universal LLC	945
Kendeil srl	856
Kepco Power	1542
Keysight Technologies	1935
Kikusui America, Inc.	1713
Knowles Precision Devices	536
KOKI Solder America Inc.	857
KYOCERA AVX	1513
LEM USA, Inc.	1658
LinkCom Manufacturing Co., Ltd	2164
Lodestone Pacific	835
Magna-Power Electronics	1303
Magnetics	1034
Magnetika, Inc.	757
Mainstream Engineering Corporation	454
Malico Inc.	548
Manutech Assembly, Inc.	2027
Marel Power Solutions	2343
Max Echo Technology Corp	655
MaxLinear Corporation	1402
Menlo Microsystems, Inc.	1709

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Mentech	1339
Mersen	1427
Methode Electronics	649
MH&W International Corp	2338
Microchip Technology, Inc.	1853
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Mission Power	439
Mitsubishi Electric US, Inc.	1435
Monolithic Power Systems	554
Mouser Electronics	1213
Murata	823
NAC Semi	2035
NAMICS Technologies Inc.	453
Nanjing New Conda Magnetic Industrial Co. LTD.	2336
National Magnetics Group	1941
Navitas Semiconductor	1353
New England Wire Technologies	1044
Newtons4th Ltd.	958
Nexperia	1505
Nichicon (America) Corp	818
Ningguo Yuhua Electrical Products Co.,Ltd	747
Nisshinbo Micro Devices	736
NORWE Inc.	664
NTT Advanced Technology Corporation	647
Ohmite Manufacturing	1447
OMICRON Lab	2140
onsemi	1035
OPAL-RT TECHNOLOGIES	743
Oxford Instruments Plasma Technology	2124
P. Leo & Co., Ltd.	848
Pacific Power Source	2026
Pacific Sowa Corporation; C/O Epson Atmix Corporat	914
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PELS (IEEE Power Electronics Society)	1234
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PIN SHINE INDUSTRIAL CO., LTD	737
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Plexim	1519
PMC	2065

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PMK	2021
PolyCharge America, Inc.	2334
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Power Management Integration Center (PMIC)	540
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POWERSYS INC.	2366
Prax Power	2240
Premier Magnetics	1816
Protavic America	735
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PSMA.	1234
Pulsiv Limited	1835
Qorvo	1857
Quantic Capacitors Group	1446
Reed Semiconductor Inc.	1808
REGATRON	663
REMTEC, Inc.	1802
Resonac America, Inc.	440
RFMW	1459
Richardson RFPD	740
Rico Products Inc.	763
Rohde & Schwarz USA, Inc.	1926
ROHM Semiconductor	913
Rubadue Wire	1945
SABIC	727
Sager Electronics	447
Samwha USA Inc.	1040
SANAN Semiconductor (dba Luminus Devices, Inc.)	1921
SanRex Corporation	1443
Semikron Danfoss	925
SemiQ	2245
Sentec E&E Co., Ltd.	1848
Shanghai Bridge Electronic Technology Co., Ltd	754
ShenZhen HuaXingAn Electronics CO.,LTD	2265
Shenzhen Liron	853
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Shenzhen Sunlord Electronics Co., Ltd.	436
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Soitec	1757
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Speedgoat	956
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Star Technology	446
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Tagore Technology	936
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TOPLINE CORPORATION	565
Toshiba America Electronic Components, Inc.	863
Tower Semiconductor	625
Transfer Multisort Elektronik Sp. Z o.o.	1812
Transphorm	1813
TransSiP, Inc.	1934
Tran-Tec	1707
Triad Magnetics	865
TSC International	1906
TT Electronics	719
Tyndall National Institute	756
Typhoon HIL, Inc.	534
UniSiC Technology (Shanghai) Co., Ltd.	2344
UNISONIC TECHNOLOGIES CO., LTD.	2365

EXHIBITOR LISTING

EXHIBITOR	BOOTH #
United Chemi-Con, Inc.	1434
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Vacuumschmelze GmbH & Co., KG	665
VBOM Co.,Ltd	944
Vincotech GmbH	1620
Vinpower, Inc.	437
Vishay Intertechnology	1607
VisIC Technologies	1844
Vitrek-High Voltage Test & Measurement	1804
Voltage Multipliers, Inc.	849
Wakefield Thermal	839
Well Ascent Electronic (Ganzhou) Co., Ltd.	456
West Coast Magnetics	2040
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Wurth Electronics ICS, Inc.	657
Würth Elektronik	1837
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X-FAB Global Services GmbH	1719
Xiamen Faratronic Co. Ltd.	2346
Yageo Group	2146
Yamato Scientific Co., Ltd.	2339
Yokogawa	840
YOLE Group	1558
ZES ZIMMER Electronic Systems GmbH	544
ZHONGSHAN COMPETENT AUTOMATION EQUIPMENT CO.,LTD	645
ZHUHAI WEIHAN WIRE CO., LTD.	2239

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EMERALD

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DIAMOND

Mentech

Mentech designs and manufactures inductors & transformers --- including planar, and integrates them into adapters, chargers and open-frame power supplies. Our New Energy Magnetic Components comprise customs for Solar (inverter transformers, inductors, chokes), and EV (charge stack, OBC, BMS transformers and inductors) renowned for quality and reliability.

Frequently our large engineering team brings their expertise to customize designs that we produce in high-volume with highest quality and competitive cost.

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Würth Elektronik

Würth Elektronik offers sophisticated electronic components for a multitude of applications in all industrial sectors. For us, it's not the individual component that's most important – it's finding the solutions to problems. We're the reliable partner for our customers. With Würth Elektronik, customers realize electronic visions – we're on board from start to finish.

Products include inductors, ferrites, chokes, LEDs, capacitors, crystals, resistors, sensors, transformers and wireless charging coils. Board-to-Board, Wire-to-Board, Terminal Blocks, and Input/Output connectors.

PLATINUM

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Power Integrations

Power Integrations, Inc. is a leading innovator in semiconductor technologies for high-voltage power conversion. The company's products are key building blocks in the clean-power ecosystem, enabling the generation of renewable energy as well as the efficient transmission and consumption of power in applications ranging from milliwatts to megawatts. For more information, please visit www.power.com.

STMicroelectronics

STMicroelectronics is a global semiconductor leader mastering the semiconductor supply chain with state-of-the-art manufacturing facilities. An IDM, we work with customers and partners to address their challenges and opportunities. We're a leader in Analog and Power technologies and enable smarter mobility, more efficient power and energy management, and the wide-scale deployment of cloud-connected autonomous things. ST targets carbon neutrality on scope 1 and 2 and partially scope 3 by 2027. Learn more at www.st.com.

Wolfspeed, Inc.

Wolfspeed (NYSE: WOLF) leads the market in the worldwide adoption of silicon carbide and GaN technologies. We provide industry-leading solutions for efficient energy consumption and a sustainable future. Wolfspeed's product families include silicon carbide materials, power devices and RF devices targeted for various applications such as electric vehicles, fast charging, 5G, renewable energy and storage, and aerospace and defense. We unleash the power of possibilities through hard work, collaboration and a passion for innovation. Learn more at www.wolfspeed.com.

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GOLD

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SK Siltron

At SK siltron css, we provide the global compound semiconductor industry with a reliable source of leading-edge, production-proven, high-crystal, quality silicon carbide (SiC) wafers and epitaxy services.

Drawing on decades of experience, our SiC technology and manufacturing expertise extends from crystal growth through wafer fabrication and epitaxy. We focus our R&D efforts on finding environmentally friendly solutions using renewable energy and sustainable manufacturing practices. Our latest-generation, wide-bandgap semiconductor materials are designed to help customers meet global demands for improved environmental sustainability, increased electricity demand and higher energy efficiency. We do not make devices or compete with our customers.

We look forward to putting our materials expertise, application knowledge and processing experience to work for you.

Texas Instruments

Texas Instruments is a global semiconductor company that designs, manufactures, tests and sells analog and embedded processing chips. As your partner in power management, we are in constant pursuit of pushing the limits of power: developing new process, packaging and circuit-design technologies to deliver the best devices for your application.

SILVER

AmberSemi

AmberSemi's is a young Silicon Valley company with a mission to transform electical product power management architecture globally, from outdated 1950's-era technnologies to smaller, safer, and smarter semiconductor solutions – siliconized AC to DC power conversion, arc-free electricity control, protection and sensing. A 2nd electrical revolution, powered by AmberSemi.

American-Made Challenges

The American-Made program is your fast track to the clean energy revolution. Funded by the U.S. Department of Energy, we incentivize innovation through prizes, training, teaming, and mentoring, connecting the nation's entrepreneurs and innovators to America's national labs and the private sector. Bring your ideas and creative solutions to compete in American-Made prizes, or help others succeed in building new businesses and technical solutions. As an innovator, partner, or Network member, you can make a difference.

DEMAK Group

Demak is a leading group manufacturing Dispensing Equipment and PU/Epoxy Resin Systems for diverse industrial applications. Their resins cover potting, encapsulating, vacuum casting, gluing, bonding, gasketing, and coating of industrial components. Offering 360° support, Demak combines mechanical and chemical expertise in resin dispensing projects. With established subsidiaries in the USA, Brazil, Germany and new emerging branches, the group provides global customer support, including technical service, spare parts, and sales, solidifying its presence and assistance worldwide.

ROHM Semiconductor

ROHM Semiconductor, industry leader in system LSI, power solutions, and module products, leverages the latest semiconductor technologies and utilizes a streamlined, vertically integrated in-house production system to ensure unmatched quality while providing the versatility to respond to a wide range of application needs in automotive, industrial, consumer and IoT markets.

MEET OUR 2024 PARTNERS!

Samwha USA Inc.

Samwha is one of the leading global manufacturers of passive components. Samwha offers a full range of aluminum electrolytic capacitors, polymer hybrid capacitors, MLCCs, DC link capacitors, disc ceramic capacitors, ferrite cores, inductors, and more.

Samwha's wide range of capacitors can be used in various applications, including consumer electronics, automotive, industrial equipment, telecommunications, and more.

Sumitomo Chemical Co., Ltd.

Sumitomo Chemical is a leading chemical company with expertise in various industries. We provide advanced semiconductor materials such as GaN substrates and GaN / GaAs epitaxial wafers for wireless communications, optoelectronics, and power electronics applications.

Transphorm

Transphorm is a global semiconductor company wholly-focused on delivering the highest quality, highest reliability gallium nitride (GaN) devices for high voltage power conversion applications and the leader in the design and manufacturing of JEDEC- qualified GaN FETs.

West Cost Magnetics

West Coast Magnetics designs best-in-class transformers and inductors and provides maz`nufacturing services for electronic products with high engineering content. Our active R&D has resulted in new patented technology and innovative designs for power and RF magnetic components in many applications. We will continually redefine what is possible with magnetic technology. Our manufacturing facilities are in Stockton, California (ITAR Registered), and in Tecate, Mexico.

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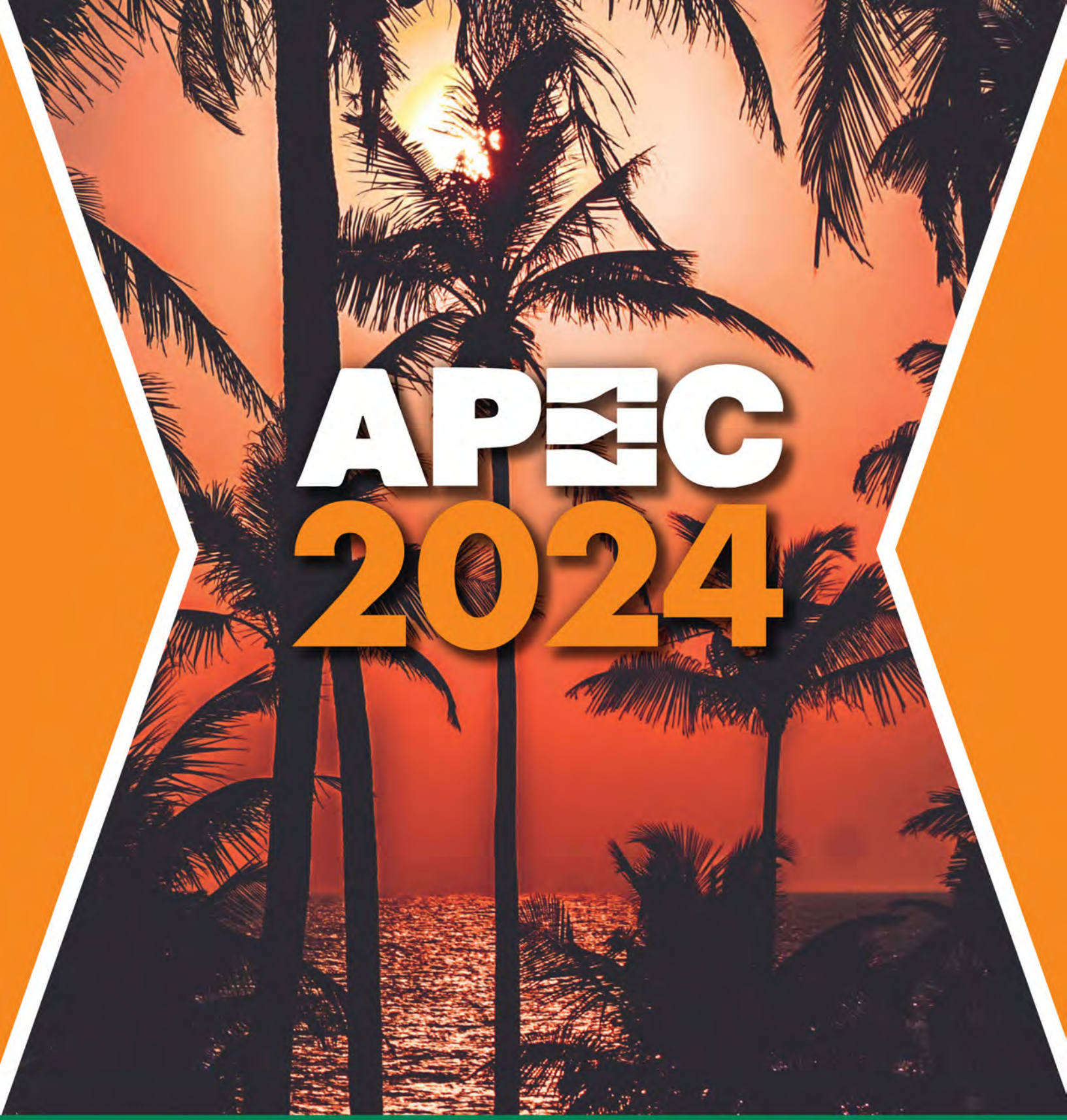

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