2024 IEEE INTERNATIONAL SYMPOSIUM ON ELECTROMAGNETIC COMPATIBILITY, SIGNAL & POWER INTEGRITY

WWW.EMC2024.ORG

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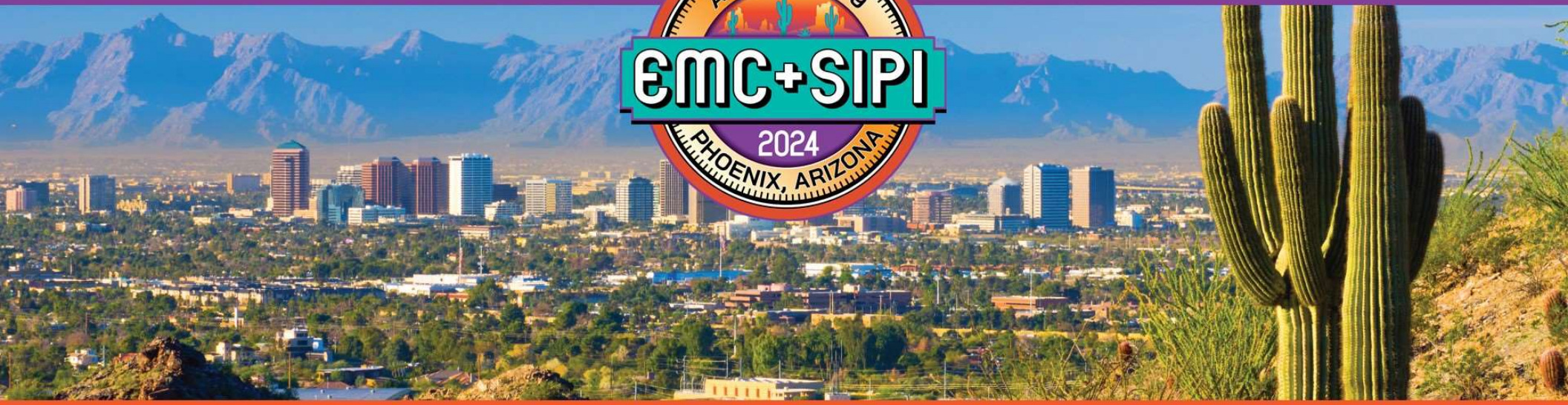


IEEE EMC Society TC-8

Technical Committee on Aerospace EMC

Welcome!

This is the annual meeting of the Institute of Electrical and Electronics Engineers (**IEEE**) Electromagnetic Compatibility (**EMC**) Society Technical Committee on Aeronautics & Space EMC (**TC8**) Meeting on Tuesday, August 6st, 2024, in Phoenix, Arizona.

Our official website is https://www.emcs.org/tc8-aeronautics-and-space-emc.html

Find us on LinkedIn at https://www.linkedin.com/groups/8685221

All members and interested parties are welcome!

Meet the Current Officers

Chair: **Jen Dimov**, Jacobs Technology / NASA GSFC

Vice-Chair: **Jim Lukash**, Lockheed Martin Space

Secretary: **Manny Soriano**, Anduril Industries

Officers At Large: Nika Amralah (Raymond EMC), Carlos Aviles (USAF), Michael Bojazi (Lockheed Martin Space), Paul Bremner (Robust Physics), Nick Davis (Merc Aerospace), Annabelle Epplin (Blue Origin), Balaji Gollapalli (IEEE), Harry Hodes (NASA JSC), Elya Joffe (IEEE), Randy Jost (IEEE), Charles Jullien (Safran Group), Patrick Koch (University of Twente), Flynn Lawrence (Lockheed Martin Space), Leonardo Malburg (University of Twente), John McCloskey (NASA GSFC), Nathan Moyer (Mica Mountain Engineering), Pablo Narvaez (NASA JPL), Daren Nerad (Wisk Aero), Ray Perez (NASA JPL), Melissa Schwager (NASA MSFC), Cheyne Scoby (Rivian), Bob Scully (NASA Langley), Adrian Sun (Aerospace Corp), Gabe Vazquez Ramos (NASA KSC), Derek Walton (LF Research), Stephanie Zajac (NASA APL)

Agenda

- Welcome & Virtual Meeting Mechanics
- Scope of TC-8 (charter, roles & responsibilities)
- Roundtable Introductions
- Officer Elections
- News & Activities
- Long-Range Planning / Future Years
- Old Business
- New Business / Roundtable Discussion

Welcome to this Hybrid-Virtual Meeting!

- Modern problems, modern technological solutions
- Secretary will monitor meeting chat for raised hands, questions, and any technical issues
- Please send an email to secretary (mmssoriano@gmail.com) so we can get an accurate attendee count & introductions:
  - Include both your NAME and your ORGANIZATIONAL AFFILIATION

Charter Review

- This committee is concerned with EMI/EMC issues in **aircraft**, **spacecraft** & **space launch vehicles**, robotic and crewed
  - The aerospace environment provides unique challenges in the design, development, test and operation of space systems to avoid EMI and achieve EMC
  - Aeronautics & Space EMC covers a wide range of topics on the part, board, box, system, multi-system, planetary and interplanetary levels
  - The harshness of the atmospheric, launch and space environments necessitates a broader view of EMC issues than traditional terrestrial projects, often leading to creative methods and solutions that can benefit our society's efforts elsewhere on Earth

Scope of TC8

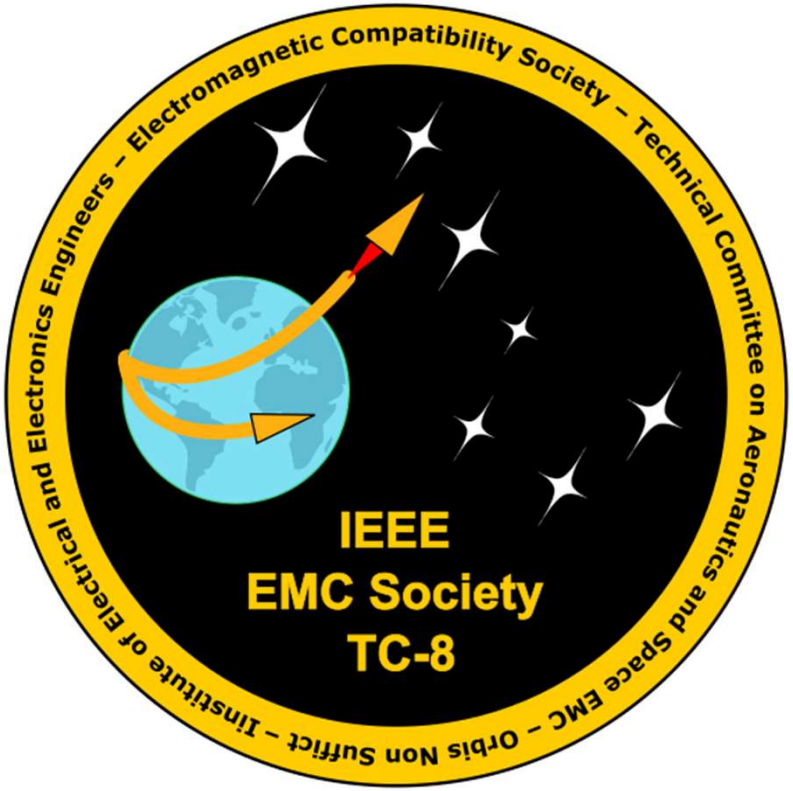
- This committee serves as a **resource** for the Board of Directors of the EMC society on all matters associated with **Aeronautics and Space EMC**
- This committee helps recruit **authors for papers,** poster papers at the annual symposium as well as articles for our society's journal and newsletter
- This committee initiates and/or contributes to **standards activity** in our technical area
- This committee helps to organize **special sessions** of invited papers and workshops for the annual symposium
- This committee provides subject matter experts to **review papers** submitted for publication at the annual symposium
- This committee provides subject matter experts for **discussion panel sessions** at the annual symposium
- Monitors and informs the larger membership of **new developments** in our technical area

Diversity & GOLD (Graduates of the Last Decade)

- TC-8 has been a groundbreaker on this and will continue to try to be
  - Officer-at-Large program
  - Diverse membership and leadership
  - Openness to new ideas
- TC-8 remains committed to encouraging and supporting the participation of all its members of all backgrounds
  - Unique voices strengthen the Society and the greater IEEE community
  - If you need support, advice, or help of any kind, we're here for you!

Roundtable Introductions

- Everyone is welcome!
- Tell us your name and organizational affiliation



Elections – Voting Officers

- 2024 is a voting officer election year!
- **ALL THREE** officer roles (Chair, Vice-Chair, Secretary) are up for re-election this year and need filling
- Voting procedure:
  - Take nominations (self or other)
  - Nominees may make a brief statement
  - All present vote for one of the nominees or abstain

Elections – Officers At Large

- Officers at Large may be nominated (or self-nominate) every year
- There is no limitation on the number
  - "Officers at large" participate in officers meetings in a non-voting capacity
  - Great opportunity to learn about the roles of the officer slots if you have interest without making a large commitment of time (Leadership Training)
  - Intended to allow people to learn about and "Test Drive" the functions of committee leadership with no actual responsibilities
  - Also excellent role for people to more fully participate w/o commitment

2024 News – The Symposium

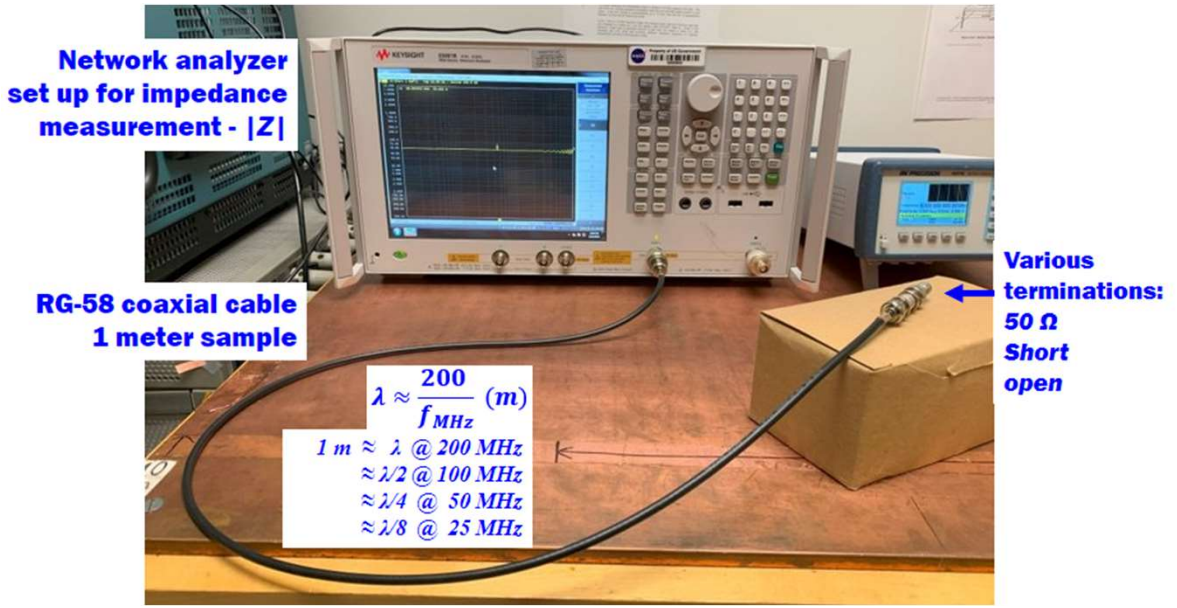
TC-8/EdCom Joint Sponsored Workshop	Fundamentals	Monday 8:30 AM – 5:30PM
TC-8 Paper Session	TC-8 Technical Papers	Tuesday 3:30 PM – 5:00 PM
TC-8 Sponsored Demonstration	Transmission Lines	Wednesday 10:00 AM – 12:00 PM
TC-8/TC-9 Joint Sponsored Special Session	Stochastic Engineering	Thursday 10:30 AM – 4:00 PM

2024 – Fundamentals

- TC-8 has been closely involved in running this for years
- It is overwhelmingly popular (thanks John!)

2024 – Demonstrations

- GSFC regularly puts on standing-room-only demonstrations
- This year our topic is transmission lines

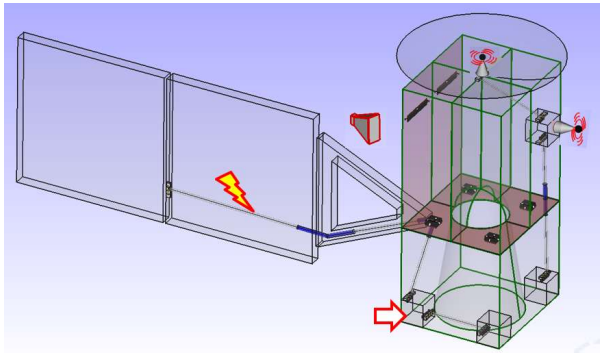


2024 – Special Session
Why is Stochastic EM important to TC-8 ?

Semi-empirical 1970s
IEMCAP, SEMCAP

NASA-HDBK-4002B
NASA SSP 30243 Rev E

Statistical Wave Physics enables ***New, Faster*** **EMC System Model**



Statistical **Mean** field ≡ **Energy U**
Mean U from simple **Power Balance solution**
Cable CE ↔ Field RE Coupling ≡ wave Power Transmsission $|S_{21}|^2$
Uncertainty **Margins** ≡ Variance about Mean; predictable PDF

Sweet spot *between*
Emprical and Numercial

Numerical, full wave
EM field codes

FDTD, MOM, FEM

Stochastic EM Methods; Special Session Papers

Methods rapidly evolving …
May be useful to TC-8 problems!

1970s Uncertainty Quantification (Monte Carlo)
Statistical Energy Analysis (vibro-acoustics)

1980s Random Matrix theory, GoE
1990s Reverberation Chamber statistsics theory

2000s Polynomial Chaos theory

2010s Stochastic Power Flow modeling
Random Coupling model

2020s Stochastic Greens Function model

	Paper Title	Authors
1	**Statistics of Electromagnetic Fields within Wire-Coupled, Nested Reverberant Enclosures**	M. Sowell, K. Shea, C. Hager **Navy NSWC** Dahlgren, USA
2	**On the Formulation of Stochastic Green's Function Method for Aperture Coupled Enclosures**	S. Luo, S. Lin, Y. Shao, Z. Peng **U. Ill. Urbana-Champaign**, USA
3	**Experimental Validation of Cavity Field Statistics when Q factor or Excitation Level are Uncertain**	P. Bremner, R. Afra, et al **RobustPhysics** San Diego, USA
4	**Statistical Analysis of Electromagnetic Coupling to Printed Circuit Boards**	S. Xia, V. Khilkevich, D. Beetner **Missouri Univ. Sci. & Tech**, USA
5	**Statistical Modeling of Distributed Ports [PCBs] in Resonant Cavities**	E. Dohme, T. Hussey, et al **Sandia National Labs**, USA
6	**Extended Resistance Matrix Formulation for Radiation Coupling of a Multi-Conductor Transmission Line**	W. Dai, P. Bremner **RobustPhysics** San Diego, USA
7	**Statistical Comparison of Time- and Frequency-Domain Measurements for Cylindrical Cavities**	S. Mostafa, J. West, C. Bunting **Oklahoma State Univ**, USA
8	**Chassis-Integrated Mode Stirring for Statistical Shielding Effectiveness Characterization**	J. Wallace, E. Dohme **Sandia National Labs**, USA

2024 News – Outside the Symposium

- MIL-STD-461H is in draft review
  - Go read it! Provide comments!
- Jim Lukash: AIAA-S-121A joint standard proposal committee
  - 47% of OALs participated in this effort
- Charles Jullien: report from HV subcommittee

2024 News – HV Subcommittee Report

- Activity this year:
  - Validation announcement to the team – 24/08/2023
  - Several meetings: 07/12/2023 - 07/03/2024 – 08/07/2024
  - Setting-up a GoogleDrive (Thanks Manny!!)
  - Strategy defined by the team:
    - Identify the challenges divided in different categories (System/sub-system,EMC component, material modeling, test equipment, standard,…)
    - Discuss the solutions/mitigation provided and the developments in the standards
    - Propose WS/Special Sessions on uncovered subjects.
  - Participation of some members at Power Electronics for Aerospace Applications (PEASA) 2024 EMC Workshop Proposal in October on Power electronics and EMC topic in aeronautic (possibility of discussing with various experts in the field and validating the identified topics of interest)
- For next time:
  - Identify topics of interest and proposal Special Session/Workshop for 2025:
    - IEEE EMC+SIPI 2025
    - EMC Europe 2025

Lack of presence of the space community to exchange good practices/solutions → if you are interested join us!!

IEEE Workshop on Power Electronics for Aerospace Applications

Electromagnetic Compatibility

2024 Activities in other Conferences

PEASA 2024 EMC Workshop

Registration Website:

- PEASA stands for Power Electronics for **Aerospace Applications**
- Keynote, tutorial, panel, technical talks and poster sessions
- Location: GE Aerospace Research, Niskayuna, NY, USA
- Date: October 16 (Wed) ~ 17 (Thu), 2024
- Website: https://cvent.me/x199o2

Committee:

1. **Conference chair:** Cong Li
2. **Conference co-chair:** Shuo Wang
3. **Tutorial chair:** Michael Schutten
4. **Finance chair:** Mark Scott
5. **Panel chair:** Charles Jullien
6. **Poster chair:** Niek Moonen
7. **Poster co-chair:** Dehong Liu
8. **Sponsorship & exhibition chair:** Hang Dai
9. **Workshop manager:** Tara Burke
10. **Additional members:** Michael Garrett, Katherine Sheets, Sierra Meloan, Tao Yang, Jin Wang, Frank Leferink

Topics:

1. **System EMC solutions**: architecture, layout, etc.
2. **Sub-system EMC solutions**: converter, cable, machine, etc.
3. **Component EMC solutions**: passive/active filters, PWM strategies, shield and connector, etc.
4. **Material EMC solutions**: magnetics, shielding material, hybrid material, etc.
5. **EMC modeling**: System/Component, FEA$^{\Delta}$/behavior, etc.
6. **EMC test equipment**: EMI Receiver, CT^{+}, Antenna, EMC Chamber, etc.
7. **Industrial EMC standard development**: DO-160, MIL-STD-461, IEEE, SAE, ASTM, EUROCAE, etc.
8. **Regulations**: certifications, etc.

Future Planning

Room to volunteer!

IEEE EMCS TC8 FIVE-YEAR PLAN						
Activity	2024 (THIS YEAR)	2025 (NEXT YEAR)	2026	2027	2028	2029
	Phoenix, AZ	Raleigh, NC	Dallas, TX	TBD	TBD	TBD
TC Meeting @ Symposium	X	X	X	X	X	X
Technical Topic Session	**X**	**X**	**X**	**X**	**X**	**X**
Special Session	X	X				
Workshop Sponsored	X					
Demonstrations	X					
Other Activity	X	X				
SC Charter Review	X	X	X	X	X	X
Leadership Succession	X		X		X	
Leadership Training	X	X	X	X	X	X

New Business

- 2025 Aerospace session track (POC: Jim Lukash, emiguy@gmail.com)
- 2025 joint workshop with TC-11 (Nanotechnology & Advanced Materials) (POC: Marina Koledintseva, koledintseva@gmail.com)
- Continuity committee for replacement module standard (POC: John LaSalle, john.lasalle@ieee.org)
- Proposed Johnson Space Center EMC standard (POC: Harry Hodes, harry.h.hodes@nasa.gov)
- Added post-meeting: We are collecting questions for EMC Engineer Certification exam (target 40 questions from TC-8) (POC: Todd Hubing, hubing@learnemc.com)

Adjourn

- Next in-person meeting will be in August 2025
- Thanks for joining us and we hope to see you again in Raleigh!

Contact the 2024 officers at
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Contact the **2025** officers at
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