



23 July 2019

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Minutes

Committee: TC-2; Electromagnetic Compatibility (EMC) Measurements
Place: New Orleans Earnest N. Morial Convention Center, New Orleans, LA
Date: 23 July 2019 (Tuesday)
Time: 7:00 to 8:30 AM
Room: Room 337
Continental breakfast available

1.0 Call to Order/Introductions

Don Heirman opened the meeting at 7:09AM and asked for introductions. Each participant introduced themselves.

David Arnett (M)	Ed Hare (M)	Petra-Marian Nicolae (M)
Christine Blair (V)	Don Heirman (M)	Nick Orphanos (V)
Joshua Brehm (V)	Dave Inman (M)	Ghery Pettit (M)
Colin Brench (M)	Randy Jost (M)	Shirish Shah (M)
Carlo Carobbi (M)	Jeff Klingler (M)	Abtin Spantman (M)
Tom Fagan (M)	Huadong Li (M)	Ahalya Srikanth (V)
Carl Hager (M)	Monrad Monsen (M)	
Matt Halligan (M)	Ross Myrehn (V)	

M = Member
V = Visitor

1.1 Quorum Check: TC2 Meeting Quorum shall be 20% of the membership. Ballots for new officers shall have minimum voting participation of 50% and may include email ballots in the participation count.

~~16-17~~ / ~~23-24~~ = ~~69~~70.68% attendance

We have a quorum.

1.2 Charter

The committee reviews the adequacy of measurement procedures and measurement instrumentation specifications for radiated and conducted emission and immunity tests. Also discussed is the rationale for product emission limits and immunity test levels including performance requirements. The committee also supports EMC standards and procedures that deal with measurements and their uncertainty and how they are interpreted and applied.

2.0 Approval of Minutes from IEEE EMC TC-2 meeting (31 Jul 2018) in Long Beach at the IEEE EMC+SIPI 2018 Symposium.
Minutes approved.

3.0 TC2 Election Announcement

Our last TC2 election was held by email 16-27 August 2017. The next elections will be held summer 2020 with the officer term transition occurring 1 January 2021. Emails will be sent to our membership announcing self-nominations and then the voting period. Members are asked to consider placing their name on the ballot for one of these offices: chairman, vice-chairman and secretary.

4.0 Privacy

Personal data will be handled in accordance with the IEEE Privacy Policy which can be found at: <https://www.ieee.org/security-privacy.html>. The TC2 minutes will have list attendee names unless you contact the TC2 secretary to ask for your name to not be mentioned. The information you provide in the sign-in roster (including email and company) will be used by the chapter officers for TC2 related notifications/communications.

5.0 Committee Membership Status

5.1 Removal of non-active participants from membership roster.

Membership indicates that you have attended the TC-2 committee meeting at least two (2) or more times in the last four (4) years; candidates are shown as attending a single meeting on or after 2015 and no other. By committee rules, these candidates are not members of TC-2 unless they attend a second face-to-face symposium meeting within a four year period.

All attendees will initial the sign-in roster. After the New Orleans TC-2 meeting, those that have not attended a face-to-face TC-2 meeting since 2016 will no longer a TC-2 member but will remain on the list for one additional year (2020) to receive meeting announcements. Those that have not attended a face-to-face TC-2 meeting since 2015 are removed from the list. Any of those that are dropped from the membership list can rejoin TC-2 by attending the requisite number of face to face meetings in the time frame noted above.

6.0 Current Symposium Activity, July 2019

6.1 Symposium paper review status (top paper, top TC-2 paper, Round 2 reviewing, etc).

Number of papers reviewed 23
Number of reviewers just under 100

Round 1

Number of papers accepted with no change 1 (4.3%)
Number of papers accepted with suggested changes 9 (39.1%)
Number of papers rejected 7 (30.4 %)

Round 2

Number of additional papers accepted 6 (26.1%)

There were 9 abstract papers reviewed: 2 rejected and 7 accepted

6.2 Symposium Sessions sponsored by TC2 as shown in the final program. TC2 is to be congratulated for sponsoring or participating in the **dozen** sessions/tutorials now listed.

- 8:30AM-12:00PM, Monday: “The Role of the IEC Advisory Committee on EMC (ACEC) in Coordinating IEC EMC Activities” tutorial, Don Heirman (Chair)
- 10:30AM-12:00PM, Tuesday (Room 255-257): “Radiated Emissions Measurements” technical session, Monrad Monsen and H.R. (Bob) Hofmann (Co-Chairs)
- 1:30PM-5:30PM, Tuesday (Room 244): “Device Characterization-1” technical session, Monrad Monsen and Tom Braxton (Co-Chairs)
- 1:30PM-5:30PM, Tuesday (Room 252-254): “Automotive EMC” technical session, Keith Frazier and Liu Niu (Co-Chairs)
- 1:30PM-5:30PM, Tuesday (Room 245): “Novel EMC Measurements” technical session, Monrad Monsen and H.R. (Bob) Hofmann (Co-Chairs)
- 8:30AM-10:00AM, Wednesday (Room 244): “Device Characterization-2” technical session, Doug-Hyun Kim and Gang Feng (Co-Chairs)
- 8:30AM-10:00AM, Wednesday (Room 255-257): “Field Measurements” technical session, Don Heirman and Monrad Monsen (Co-Chairs)
- 1:30PM-5:30PM, Wednesday (Room 255-257): “Basic EMC Measurements” technical session, Don Heirman (Chair)
- 8:30AM-12:00PM, Thursday (Room 243): “Emerging Wireless Technologies” technical session, Zhiping Yang and Lie Liu (Co-Chairs)
- 8:30AM-12:00PM, Thursday (Room 255-257): “EMC Standards Measurements” technical session, Don Heirman and Ghery Pettit (Co-Chairs)
- 2:30PM-5:30PM, Thursday (Room 255-257): “Reverberation Chambers” technical session, Vingnesh Rajamani and Tom Braxton (Co-Chairs)
- 1:30PM-5:30AM, Friday (Room 244): “Estimating Work Level in EMC Mitigation” tutorial, Tom Braxton and William Sanchez (Co-Chairs)

7.0 Standards Sponsorship Support Review

Below is an excerpt of information from the full matrix from the EMC Society site.

Here is the part that standards play in Technical Committee activity. It is from the EMC Society Bylaws and in particular clause 10.3 which states:

10.3 Functions:

Each Technical Committee shall promote activities in its field of interest and shall provide expert knowledge and assistance to:

- a. Receive, generate, and review technical papers within its scope in cooperation with the Transactions Editor and/or the Technical Papers Committee.
- b. Organize and host sessions at meetings of the IEEE at all levels and at meetings of other organizations with which the Society is desirous of cooperating, in accordance with the rules in effect at such meetings.
- c. Arrange for publishing pertinent papers in IEEE publications.
- d. Generate and develop appropriate standards in its field for processing by the IEEE Standards Committee, through the Society's Standards Committee and in accordance with IEEE policies.
- e. Evaluate "state of the art" in the area of committee interest.

Clause 10.3 d above is directly applicable to TC2 (EMC Measurements).

This table shows via the short title and highlighted in yellow those EMCS standards which directly involve measurements and hence TC2 interest. Note that by far the number of standards devoted to measurements is the vast majority.

IEEE Standard	Title	Standard Expiration Date	Status	Chair and Sponsor Contact	PAR	Notes
Std.139-1988	Recommended Practice for the Measurement of RF Emission from ISM Equipment on User's Premises (More information)	Expires: 12/31/2022	Current Standard	Past Chair: Daniel Weinberg Sponsor contact: Ed Hare	No active PAR	No maintenance underway.
Std. 187-2003 Project 187	Standard Measurement Methods of Emissions from FM and Television Broadcast Receivers in the Frequency Range of 9 kHz to 40 GHz (More information)	Expires: 12/31/2028	Current Standard	Past Chair: David Traver Sponsor contact: Ed Hare	No active PAR	No maintenance underway.
Std. 299-2006	Standard Method for Measuring the Effectiveness of Shielding Enclosures (ANSI Recognized) (More information)	Expires: 12/31/2022	Current standard	Past Co-Chair: Dale Svetanoff Past Co-Chair: Maria Sarto Sponsor contact: Ed Hare	No active PAR	No maintenance underway.
Std. 299.1-2013	Standard Method for Measuring the Shielding Effectiveness of Enclosures and Boxes Having Dimensions Between 0.1 and 2m	Expires: 12/31/2023	Current Standard	Past Chair: Maria Sarto Sponsor contact: Ed Hare	No active PAR	No maintenance underway.

	(More information)					
Project 370	Electrical Characterization of Printed Circuit Board and Related Interconnects at Frequencies up to 50 GHz (More information)	New project	Draft approve to send to ballot 7 April 2019	Chair: Xiaoning Ye Vice Chair: Sam Connor Vice Chair: Brice Achkir Secretary: Alistair Duffy	IEEE PAR Expires: 12/31/2019	Being sent to ballot.
Std. 377-1980	Recommended Practice on the Measurement of Spurious Emissions from Land-Mobile Comm. Transmitters (ANSI Recognized) (More information)	Expired: 12/31/2018	Admin withdrawn	Sponsor contact: Ed Hare	No active PAR	Needs revision. SDECom formed a study group to look for best ways to update standard.
Project 473	Recommended Practice for an Electromagnetic Site Survey (10 kHz to 40 GHz) (More information)	New project	Revision in progress	Chair: Chad Kiger Vice Chair: Secretary:	IEEE PAR Expires: 12/31/2020	Parallel development w C63.24
Std. 475-2000	Measurement Procedure for Field Disturbance Sensors, 300 MHz to 40 GHz (ANSI Recognized) (More information)	Expires: 12/31/2022	Current standard	Past Chair: Hugh Denny Sponsor contact: Ed Hare	No active PAR	No maintenance underway, but there is interest in having the frequency range extended below 300 MHz. A Chair and participation is being sought.
Std. 1128-1998	Recommended Practice for RF Absorber Evaluation in the Range of 30 MHz to 5 GHz (More information)	Expires: 12/31/2022	Current standard Revision in progress	Chair: Zhong Chen Sponsor contact: Ed Hare	IEEE PAR Expires: 12/31/2021	Range being extended to 40 GHz. Cosponsored by Antennas and Propagation Society
Std. 1302-2008 Project 1302	Guide for the Electromagnetic Characterization of Conductive Gaskets in the Frequency Range of DC to 40 GHz (More information)	Expire: 12/31/2018	Draft approve to send to ballot 7 April 2019	Chair: Johan Catrysse Vice Chair: Gary Fennical Davy Pissoot Secretary: Yoeri Arien	IEEE PAR Expires: 12/31/2018	Approved by SDECom to send to MEC and ballot
Std. 1309-2013	Standard for Calibration of Electromagnetic Field Sensors and Probes,	Expires: 12/31/2023	Current Standard	Past Chair: Zhong Chen Sponsor contact: Ed Hare	No active PAR	No maintenance underway.

	Excluding Antennas, from 9 kHz to 40 GHz (More information)					
Std. 1560-2013	Methods of Measurement of Radio Frequency Interference Filter Suppression Capability in the Range of 100 Hz to 10 GHz (More information)	Expires: 12/31/2023	Current standard	Past Chair: Kermit Phipps Sponsor contact: Ed Hare	No active PAR	No maintenance underway.
Std. 1597.1-2008 Project 1597.1	Standard for validation of CEM Computer Modeling (CEM) and Simulation (More information)	Expires: 12/31/2018	Current standard Revision in progress	Chair: Alistair Duffy Vice Chair: Secretary:	IEEE PAR Expires: 12/31/2019	Work in progress. Last-minute input received by WG. The Standard is administratively withdrawn and revisions are behind schedule. Needs increased priority and oversight.
Std. 1597.2-2010	Recommended Practice for Computational Electromagnetics (CEM) Computer Modeling and Simulation Applications (More information)	Expires: 12/31/2020	Current standard	Past Chair: Andy Drozd Sponsor contact: Ed Hare	No active PAR	No maintenance underway.
P1613 Std. 1613-2009	Standard for Environmental and Testing Requirements for Devices with Communications Functions in Electric Transmission and Distribution Facilities.	Expires 12/31/2019	Current standard Being revised	Chair: John Tengden	IEEE PAR Expires 12/31/2020	Co sponsored with Power and Energy
Std. 1642-2015	Recommended Practice for Protecting Public Accessible Computer Systems from Intentional EMI (More information)	Expires: 12/31/2025	Current Standard	Past Chair: Bill Radasky Sponsor contact: Ed Hare	No active PAR	No maintenance underway.
Std. 1688-2015	Standard for Module Electromagnetic Interference (EMI) Testing (More information)	Expires: 12/31/2025	Current Standard	Past Chair: Fred Heather Sponsor contact: Ed Hare	No active PAR	No maintenance underway.
Project 1848	Techniques & Measures to Manage Risks With Regard to	New project	Drafting in progress	Chair: Keith Armstrong Vice Chair:	IEEE PAR Approved: 2/5/2016	In final comment resolution. Report needed.

	Electromagnetic Disturbances (More information)			Alistair Duffy Secretary: Niklas Briest	Expires: 12/31/2020	
Project 1897	Resolution of Power-Line Gap-Noise Reports (More information)	New project	Drafting in progress	Chair: Mike Gruber Vice Chair: Brian Cramer Secretary: Jerry Ramie	IEEE PAR Approved: 9/22/2016 Expires: 12/31/2020	Work in progress on target
Project 2425	Standard for Electromagnetic Compatibility Testing of Electrical and Instrumentation and Control Equipment at Nuclear Power Generating Stations and Other Nuclear Facilities (More information)	New project	Drafting in progress	Chair: Suresh Channarasappa Vice Chair: Secretary:	IEEE PAR Approved: 5/12/2016 Expires: 12/31/2020	Sponsor: Nuclear Power Engineering Committee (PE/NPE) Co-sponsor: EMS Society SDECom WG met in May. Work in progress, Report needed.
Project 2665	Recommended Practice for Statistical Process Control for EMC Test Laboratories (More information)	New Project	Drafting in progress	Chair: Kimball Williams Vice Chair: Secretary:	IEEE PAR Approved 12/6/2017 Expires: 12/31/2021	Work in progress on target
Project 2710	Electromagnetic Shielding Performance of Enclosures for Portable Electronic Devices (More information)	New project	Drafting in progress	Chair: Alistair Duffy Vice Chair: Secretary:	IEEE PAR Approved: 2/5/2016 Expires: 12/31/2020	Work in progress, but market changes are resulting in need for additional text and techniques.
Project 2715	Guide for the Characterization of the Shielding Effectiveness of Planar Materials (More information)	New project	Drafting in progress	Chair: Alpesh Bhoje Vice Chair: Davy Pisssoort Secretary: Yoeri Arien	IEEE PAR Approved: 6/30/2016 Expires: 12/31/2020	Work in progress on target Round robin testing in progress.
Project 2716	Guide for the Characterization of the Effectiveness of Printed Circuit Board Level Shielding (More information)	New project	Drafting in progress	Chair: Davy Pisssoort Vice Chair: Andy Marvin Secretary: Yoeri Arien	IEEE PAR Approved: 6/30/2016 Expires: 12/31/2020	Work in progress on target. Round robin testing in progress.
Project 2717	Passive Intermodulation Test Methods for Wireless Systems in Low Noise Environments (More information)	New project	Drafting in progress	Chair: Yihong Qi Vice Chair: Secretary:	IEEE PAR Approved: 2/17/2017 Expires: 12/31/2021	Work in progress, on target.
Project 2718	Guide for Near Field Characterization of Unintentional Stochastic Radiators	New project	Drafting in progress	Chair: Dave Thomas Vice Chair: Secretary:	IEEE PAR Approved: 2/17/2017 Expires:	Work in progress on target.

	(More information)				12/31/2021	
C37.90 Series	C37.90.1 -Surge protection C37.90.2 -Protective Relays C37.90.3 – ESD for protective relays	Existing standards. Revisions underway.	Various	Various	N/A	EMC Society seeking cosponsorship of these standards as they come up for revision.

See http://standards.ieee.org/findstds/standard/electromagnetic_compatibility.html for a list of other EMC-related standards

8.0 iNARTE Exam Question Review Activity

Update needed as present information is that the questions were reviewed by 2 to 3 experts and not individual TCs.

Tom Fagan reported that the new iNARTE spectrum management program had submitted their questions and answers to iNARTE and that the first spectrum management certification test was this week.

ACTION ITEM 2019-01: Don Heirman will contact iNARTE to figure out the process for TC-2 to review EMC measurement related questions.

9.0 Future Symposium Activity

9.1 Future topics for IEEE conferences in Reno, Nevada, USA, on 27-31 July 2020.

- Steve Ferguson plans to submit a proposal for a tutorial paper on two typical measurement approaches given in MIL-STD-461 CS101 that give results that differ by as much as 10dB. He proposes an alternative method that shortens the test time and yields more stable results without regard to the hardware selected.
ACTION ITEM 2019-2: Monrad [Monsen](#) will circulate the PAR.

9.2 Technical Program Responsibilities and session chair reminders

If you would like to be on the paper review committee, please let Don know what your areas of expertise are so he can consider sending appropriate papers to you for review. We assign at least three people to review each paper.

9.3 2020 Paper Review Deadlines (Reno)

Preliminary full paper manuscript is due by 13 January 2020.

Acceptance notification will be issued by 24 February 2020.

Final paper is due 27 April 2020.

9.4 Paper reviewers

TC2 members are welcome to be paper reviewers. Don has a reviewer list from the past. But there is always need for reviewers that are needed for paper topics for which there is no reviewer particularly expert in that subject. Contact Don for more information.

[Send Monrad and Don your resume along with your subject matter strengths/expertise so -we can identify the best papers for you to review. Don expressed a desire to add five new reviewers- to the list for Reno.](#)

9.5 Need session chairs and co-chairs

TC2 will not know the number of sessions until papers are accepted for Reno.

9.6 New membership

We are always looking for more members that engage in the activities noted above.

Ed Hager recommended that we contact people that are out-of-college (good for resume) and presenters in EMC measurement topics to join TC-2.

~~9.7~~ New areas of interest

9.7

In discussion, suggestions included adding more presentations on military standards, shielding effectiveness, and calibration of test instrumentation. Don wants to organize a tutorial on setting up measurement equipment instrumentation. Ghery Pettit offered to assist Don with drawings using his Visio software.

ACTION ITEM 2019-3: Monrad Monsen will contact Darryl Ray to add these topics to the EMC Symposium 2020 Call for Papers.

ACTION ITEM 2019-4: Don Heirman will organize tutorial on setting up measurement equipment instrumentation.

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10.0 Any other business?

- 10.1 Huadong Li proposes a new PAR (standard development) for measurement of cable/connector assembly. He asks for joint sponsorship from TC-2 and TC-4 (Electromagnetic Interference Control).

11.0 Action Items

- 11.1 ACTION ITEM 2018-1: Monrad will send a request for the resume and biography to the TC2 distribution list emphasizing the subject matter areas that each will be confident reviewing. Deadline is 30 September 2018.
23 July 2019: Monrad sent email on 31 July 2018. Received three added volunteer responses. {CLOSED}
- 11.2 ACTION ITEM 2018-2: Session on what we look for in good papers and what are best practices for papers. The TC2 officers (Don) will take this to the TAC meeting on Friday.
23 July 2019: No traction in the TAC meeting on this issue, but they concurred with the paper option. Perhaps with a paper published in 2019, we might setup a WebEx session for reviewer team prior to our TC2 Reno meeting in 2020. {OPEN}
- 11.3 ACTION ITEM 2018-3: Don will put together a paper with some of the highlights addressing what we look for in a paper.
23 July 2019: Don commits to work on this action for next time. {OPEN}
- 11.4 ACTION ITEM 2018-4: Detectors for EMC high power immunity threats combined session between TC2 (EMC Measurements) and TC5 (High Power Electromagnetics). Frank Sabath will coordinate this combined forum between TC2 and TC5.
23 July 2019: Frank was unable to come to New Orleans and did not provide an update. {OPEN}
- 11.5 ACTION ITEM 2018-5: Ghery Pettit will coordinate an “ask the experts” session for the EMC Symposium in 2020.
23 July 2019: Ghery will work on identifying experts to support the “ask the experts” session during this New Orleans symposium. {OPEN}

12.0 Set meeting and agenda for next meeting(s)

- 12.1 Reno, Nevada USA , Tuesday, July 28, 2020

13.0 Adjournment

Don adjourned the meeting at 8:58AM.

Monrad L. Monsen
Secretary, IEEE EMC TC-2 (EMC Measurements)