



27 July 2021

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Minutes

Committee: TC-2; Electromagnetic Compatibility (EMC) Measurements
 Place: Virtual on Webex
 Date: 27 July 2021 (Tuesday)
 Time: 9:00 to 10:00 AM Central Daylight Time

1.0 Call to Order/Introductions

Tom Fagan (Chair) opened the meeting at 9:00AM Central. In attendance were:

Dave Arnett (M)	Val Loretto (V)	Ahalya Srikanth (M)
Tom Fagan (M)	Dave Inman (M)	Nathan Moyer (V)
Bob Hofmann (M)	Fred Heather (V)	Nick Orphanos (M)
Monrad Monsen (M)	Ross Carlton (M)	Sarah Seguin (V)
Ghery Pettit (M)	Joseph Crossin (V)	

M = Member
 V = Visitor

1.1 Quorum Check: TC-2 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.

9/23 or 39% of membership attended. We have 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 (7 Aug 2020) at the IEEE EMC+SIPI 2010 Virtual Symposium.

The 2020 TC-2 minutes received unanimous approval.

3.0 TC-2 Election Announcement

Our last TC-2 election was held by email from 3rd-29th September 2020, and the members have elected the following officers: Tom Fagan as new chair, Monrad Monsen as new vice-chair, and Ghery Pettit and Ahalya Srikanth as secretaries. Our next election will be held in summer of 2023 with the next officer transition occurring on 1 January 2024.

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 TC-2 minutes will have list attendee names unless you contact the TC-2 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 TC-2 related notifications/communications.

Note: Because this meeting is entirely virtual, the secretary (Ahalya) will note the attendance from the Webex participants list. First-time attendees are encouraged to send the secretary an email (srikanth.ahalya@ieee.org) your name, company and email address so you will be on the distribution list for future TC-2 email news and meeting announcements.

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 2018 and no other. By committee rules, these candidates are not members of TC-2 unless they attend a second TC-2 meeting within a four year period.

All attendees will initial the sign-in roster. After the August 2021 virtual TC-2 meeting, those that have not attended a TC-2 meeting since 2018 will no longer a TC-2 member but will remain on the list for one additional year (2022) to receive meeting announcements. Those that have not attended a TC-2 meeting since 2017 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 TC-2 meetings in the time frame noted above.

6.0 Current Symposium Activity (IEEE EMC+SIPI/EMC Europe 2021), August 2021

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

6.1.1 FULL PAPERS

- 1st round number submitted: 43
- Accepted: 35
- Rejected: 8

6.1.2 ABSTRACT REVIEW PAPERS

- 1st round number submitted: 9
- Withdrawn: 3
- Actually presented (not withdrawn): 6

6.2 Symposium Sessions sponsored by TC-2 as shown in the final program. TC-2 is to be congratulated for sponsoring or participating in the **Eleven** sessions/tutorials listed below.

- 11:00AM-1:00PM, Tuesday (8/3/2021): “Basic EMC Measurements” tutorial session, 4 presentations, Monrad Monsen (Chair), Thomas J. Fagan (Co-chair).
- 11:00AM-1:00PM, Thursday (8/5/2021): “Power systems” technical session, 3 presentations, Monrad Monsen (Chair).
- 11:00AM-1:00PM, Thursday (8/5/2021): “Automotive” technical session, 3 presentations, Ahalya Srikanth (Chair).
- 11:00AM-1:00PM, Tuesday (8/10/2021): “Emissions” technical session, 4 presentations, Thomas J. Fagan (Chair).
- 11:00AM-1:00PM, Tuesday (8/10/2021): “Calibration” technical session, 4 presentations, Ahalya Srikanth (Chair), Ghery Pettit (Co-chair).
- 1:30PM-3:30PM, Tuesday (8/10/2021): “Cables and LISN” technical session, 2 presentations, Ross Carlton (Chair).
- 11:00AM-1:00PM, Wednesday (8/11/2021): “Reverberation” technical session, 4 presentations, Carl Hager (Chair).
- 1:30PM-3:30PM, Wednesday (8/11/2021): “Antennas and Analysis” technical session, 4 presentations, Thomas J. Fagan (Chair).
- 1:30PM-3:30PM, Wednesday (8/11/2021): “Chambers” technical session, 4 presentations, Sarah Seguin (Chair).
- 1:30PM-3:30PM, Thursday (8/12/2021): “Immunity” technical session, 3 presentations, Monrad Monsen (Chair).
- 11:00AM-1:00PM, Friday (8/13/2021): “Shielding” technical session, 4 presentations, Monrad Monsen (Chair).

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 TC-2 (EMC Measurements).

This table shows via the short title and highlighted in yellow those EMCS standards which directly involve measurements and hence TC-2 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	Tech Comm	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	TC-2	No maintenance underway. SDECom will consider revision (minor or major) 2020 Symposium meeting.
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	TC-2	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. SDECom will consider revision (minor or major) at Feb 8, 2020 meeting.
Std. 299.1-2013	Standard Method for Measuring the Shielding Effectiveness of Enclosures and Boxes Having Dimensions Between 0.1 and 2m (More information)	Expires: 12/31/2023	Current Standard	Past Chair: Maria Sarto Sponsor contact: Ed Hare	No active PAR		No maintenance underway. SDECom will consider revision (minor or major) 2020 Symposium meeting.

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: 12/31/2020		In comment resolution in 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)	Expired: 12/31/2006 New project	Revision in progress	Chair: Chad Kiger Vice Chair: Secretary:	IEEE PAR Expires: 12/31/2020	TC3	Parallel development w C63.24. Project has been reassigned to TC3.
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: 12/31/2029	Current standard	Past Chair: Johan Catrysse Vice Chair: Gary Fennical Davy Pissoort Secretary: Yoeri Arien	No active PAR		Published November 7, 2019 No maintenance underway.
Std. 1309-2013	Standard for Calibration of Electromagnetic Field Sensors and Probes, Excluding Antennas, from 9 kHz to 40 GHz (More information)	Expires: 12/31/2023	Current Standard	Past Chair: Zhong Chen Sponsor contact: Ed Hare	No active PAR		No maintenance underway.
Std. 1560-2013	Methods of Measurement of Radio Frequency Interference Filter Suppression Capability in the Range of 100 Hz to	Expires: 12/31/2023	Current standard	Past Chair: Kermit Phipps Sponsor contact: Ed Hare	No active PAR		No maintenance underway.

	10 GHz (More information)						
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		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 Electromagnetic Disturbances (More information)	New project	Drafting in progress	Chair: Keith Armstrong Vice Chair: Alistair Duffy Secretary: Niklas Briest	IEEE PAR Approved: 2/5/2016 Expires: 12/31/2020		In comment resolution in ballot.
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	New project	Drafting in progress	Chair: Suresh Channarasa ppa Vice Chair:	IEEE PAR Approved: 5/12/2016 Expires: 12/31/2020		Sponsor: Nuclear Power Engineering Committee (PE/NPE) Co-sponsor:

	Control Equipment at Nuclear Power Generating Stations and Other Nuclear Facilities (More information)			Secretary:			EMS Society,SDECom 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 Bhobe Vice Chair: Davy Pissoort Secretary: Yoeri Arien	IEEE PAR Approved: 6/30/2016 Expires: 12/31/2020		Work in progress on target Round robin testing in progress.
<u>Project 2716</u>	Guide for Characterization of the Effectiveness of Printed Circuit Board Level Shielding (More information)	New project	Drafting in progress	Chair: Davy Pissoort 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: Leo Liu 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 (More information)	New project	Drafting in progress	Chair: Dave Thomas Vice Chair: Secretary:	IEEE PAR Approved: 2/17/2017 Expires: 12/31/2021		Work in progress on target.
P2838	Standard for Aircraft Component Lightning Strike Direct Effects Qualification	New project	Drafting in progress	Chair: Fred Heather Vice Chair: Secretar7:	IEEE PAR Approved: 11/7/2019 Expires: 12/31/2023		Work in progress on target
Project 2855	Recommended Practice for the Electromagnetic Characterization of Cable/Connector Assembly Shielding Effectiveness in Frequency Range of Direct Current to 40 GHz	New project	Working Group getting organized	Chair: Huadong Li Vice Chair: Secretary:	IEEE PAR Approved: 3/5/2020 Expires: 12/31/2024		Work in progress on target.

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 co-sponsorship of these standards as they come up for revision.
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See https://ieeesdecom.s3.us-east-2.amazonaws.com/Standards_Matrix.html for the latest updates.

Action Item 2020-1: Tom Fagan will assess TC-2 membership interest in setting up teams to review existing untouched-for-years IEEE standards to assess their validity or whether they are subjects now addressed in other standards. He will work with Ed Hare on the details.

8.0 iNARTE Exam Question Review Activity

The iNARTE exam has gone to a 3rd party for creation and test question review, so no assistance has been asked for in recent years from TC-2. We have not heard any status on how close they are to completing the exam setup and re-engage the professional certification program.

9.0 Future Symposium Activity

9.1 Future topics and call for special sessions for the IEEE EMC+SIPI 2022 symposium in Spokane, WA, USA on 1-5 August 2022. Special topic areas include:

- Automotive
- Intentional EMI and Cybersecurity
- Wireless (co-site EMI, 5G)
- Robotics
- Model Based Engineering

Special Session Proposal Schedule

- deadline December 15, 2021

Special Session Papers

- deadline January 17, 2022

9.2 Technical Program Responsibilities and session chair reminders

We will not know how many sessions we will have at each symposium until the paper reviews are completed.

9.3 2022 Paper Review Deadlines (Online)

Proposed papers (full papers) due by January 17, 2022.

Acceptance or accept conditioned on changes will be issued by Feb 21, 2022.

Abstract review paper due March 7, 2022.

Revised full paper due Mar 21, 2022.

Final decision notification is May 2, 2022.

Final paper (adding author names, etc.) is due May 16, 2022.

9.4 Paper reviewers

TC-2 members are welcome to be paper reviewers. Don's reviewer list from the past is not available, so Tom and Monrad are creating a replacement list. Please send Monrad and Tom your resume along with your subject matter strengths/expertise so we can identify the best papers for you to review. Those who did last year do not need to resubmit because Monrad still has this data.

9.5 New membership

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

9.6 New areas of interest

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.

10.0 Any other business?

11.0 Action Items

11.1 ACTION ITEM 2018-2: Session on what we look for in good papers and what are best practices for papers. The TC-2 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 TC-2 Reno meeting in 2020.

7 Aug 2020: TC-2 has brought this request to the TAC. If there is any progress, it will be tracked there and not TC-2. {CLOSED}

11.2 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.

7 Aug 2020: Monrad reports that he worked with TAC to create Abstract templates, and in the process reviewed the other paper templates. They include content format and expectations. This will suffice. {CLOSED}

11.3 ACTION ITEM 2018-4: Detectors for EMC high power immunity threats combined session between TC-2 (EMC Measurements) and TC5 (High Power Electromagnetics). Frank Sabath will coordinate this combined forum between TC-2 and TC5.

23 July 2019: Frank was unable to come to New Orleans and did not provide an update.

7 Aug 2020: {CLOSED}

11.4 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.

7 Aug 2020: {CLOSED}

11.5 ACTION ITEM 2019-1: Don Heirman will contact iNARTE to figure out the process for TC-2 to review EMC measurement related questions.

7 Aug 2020: Ed Hare conforms that TC/SC input is no longer needed for iNARTE. {CLOSED}

11.6 ACTION ITEM 2019-2: Monrad Monsen will circulate the PAR.

The author submitted the PAR separately. They do not need to go through TCs and SCs but can go directly to the Standards Committee. {CLOSED}

12.0 Set meeting and agenda for next meeting(s)

12.1 Possible next meeting in February 2022 (Date to be confirmed).

12.2 Spokane, Washington, USA , August 1-5, 2022 (meeting date to be confirmed)

13.0 Adjournment

Meeting was adjourned at 10:00AM Central.

Ahalya Srikanth

Secretary, IEEE EMC TC-2 (EMC Measurements)