Accredited Standards Committee C63®

Electromagnetic Compatibility

Subcommittee 5: Immunity Testing and Measurements

Chair: Ed Hare Vice Chair: Steve Whitesell Secretary: Jerry Ramie

May 2, 2018; 1:00 PM – 3:00 PM - EDT
IEEE Headquarters
Piscataway, NJ

Approved Minutes

1. Call to Order: Chair - The Chair called the meeting to order at 1:00PM-EDT.

1.1 Announcements: Chair's remarks - Welcome to the meeting!

1.2 Meeting logistics announcements: Host

1.3 Introductions: Secretary – roll call (record attending members with their affiliations and guests separately below) **Report any roster errors to the ASC-C63® Secretary** (insert SC5 membership roster from the website as shown below)

Subcommittee 5 Membership Roster (Members in attendance are shown)

Name	Role within SC	Affiliation
Berger, Stephen	Member	TEM Consulting
	Member	Elite Electronic Engineering
Griffin, Andy	Member	Cisco Systems
Hare, Ed	Chair	ARRL
Heirman, Don	Member	Don HEIRMAN Consultants
Hoolihan, Dan	Member	Hoolihan EMC Consulting
Lombardi, Rick	Member	Visteon Corporation
Long, Randy	Member	ANSI-ASQ National Accreditation Board dba L-A-B
Ramie, Jerry	Secretary	ARC Technical Resources, Inc.
Schaefer, Dave	Member	TUV SÜD America
Silberberg, Jeffrey L	Member	FDA Center for Devices & Radiological Health
Whitesell, Steve	Vice Chair	Whitesell Consulting
	Member	Spectrum EMC

Guests and Observers: (non-voting) Janet O'Neil. Henry Benitez, Balaji Ayyaswamy, Doug Kramer, Richard Worley, Harry Hodes, Ross Carlton, Michael Duncanson, Marcus Shellman, Chris Dilay, John Norgard,

1.4 Quorum: (50% of roster + 1) constitutes a quorum. (rounding down) (**Calculation**: 13 roster members / 2 = 6.5 + 1 = 7.5 (therefore 7 people are required for a quorum) **Was quorum achieved? (Yes)** (11 members attended)

2. Approval of the Agenda: Secretary - The Agenda was approved by acclamation.

2.1 Approval of the previous Minutes - 20180306 Minutes of the previous meeting - The previous Minutes were shown in a line-by-line manner and approved by acclamation.

2.2 Review of the patent slides - The patent slides were shown and no patent issues were raised.

3. Review of Subcommittee Membership: Secretary - See roster on website. **Report any errors to the ASC-C63® Secretary**

3.1 Review of Membership Guidelines – any members at risk?

Subcommittees:
For an individual to remain a voting member of a Subcommittee, active participation in Subcommittee meetings and regular responses to Subcommittee email votes is required. Should a member fail to attend at least one of three consecutive scheduled meetings (in person or remotely via web conference (when used)) or respond to at least one of every two consecutive Subcommittee email votes, their membership in that Subcommittee may be at risk.

Note: Abstentions shall be treated the same as a "yes" or "no" vote regarding the requirement to respond to email votes.

Member Attendance Log:

SC5 Members	Nov 2014	May 2015	Nov 2015	May 2016	Nov-16	May-17	Nov-17	2018Jan	20180306
Stephen Berger	X			x			x		
Craig Fanning					x		x	x	a
Andy Griffin	X	x	W	x	x				a
Ed Hare	X	X	X	x	x	x	x	x	
Don Heirman	X	X	X	x	x	x	x	x	x
Dan Hoolihan	X	X	X	x	x		x		
Rick Lombardi		W	W	x	x	x	x		x
Randy Long			X	x	x		x		
Jerry Ramie	X	X	X	x	x	x	x	x	x
David Schaefer	X	X	W		x				x
Jeff Silberberg	X	X	X	x	x	x	x	x	x
Steve Whitesell	X	X	X	x	x	x	x	x	x
Dave Zimmerman		X	W	x	x	x	x	x	x

Members at risk? These members are at risk: **None** (send letter to each member at risk)

3.2 Consideration of new members? Application for C63® Subcommittee Membership

Ross Carlton Application and Resume - The application and resume were shown. Ed moved, seconded by R. Long to approve. The application was approved unanimously. AI-59: Jerry to add Ross Carlton to the SC5 roster. Heirman moved, seconded by Silberberg, to approve the Membership Roster. Ross abstained. The membership roster was approved unanimously.

4. Approval of Scope and Duties: Chair - **(Spring meeting only)** (Report approval or any changes to the Main Committee)

Scope

Subcommittee 5 is responsible for developing and maintaining new and existing ANSI ASC C63® standards for immunity testing techniques and associated instrumentation as requested by the Main Committee ANSI ASC C63®.

Mr. Heirman moved, seconded by Mr. Silberberg, to approve of the scope and duties as modified above. (**Duties** are maintaining the Standards under the control of SC5.) The motion carried. AI-58: Jerry to update SC5 landing page to show the amended Scope in Item 4. (above)

4.1 Election of Officers (as required)

5. Working Group reports - Chair - More information about each standard is available on the Standards Status Matrix page of the C63® web site. This information will be reviewed for accuracy at each Subcommittee meeting.

5.1 C63.9 – Office Equipment Immunity - Heirman (recent minutes) Verify accuracy of document status matrix content and report any errors to the ASC-C63® Secretary.

C63.9-2014 Learn more	Office equipment immunity	SC 5	Heirman, Don	C63.9 PINS	PINS approved to revise 2008 edition including the 2014 reaffirmation.

C63.9: C63.9-2008 American National Standard for RF Immunity of Audio Office Equipment to General Use Transmitting Devices with Transmitter Power Levels up to 8 Watts

Contact: Heirman, Don
Scope: This standard provides recommended test methods and limits for assuring the RF immunity of office equipment to general use transmitters with transmitter power up to 8 watts
Status: Reaffirmed in 2014. Revision currently underway to update references, add coverage for interference threats from newer technologies such as LTE, consider latest test instrumentation and techniques, and clarify alternative test methods.
Purchase: IEEE Store. To purchase individual standards, go to the IEEE store and search on the standard number.

Is this information correct? (Yes)

The C63.9 roster was shown:

C63.9 (Immunity of Audio Office Equipment) Working Group Roster

Name	Role in WG	Affiliation
Heirman, Don	Chair	Don HEIRMAN Consultants
Griffin, Andy	Vice Chair	Cisco Systems
Ramie, Jerry	Secretary	ARC Technical Resources, Inc.
Berger, Stephen	Member	TEM Consulting
Carlton, Ross	Member	ETS - Lindgren
Evans, Jeff	Member	Intel
Hare, Ed	Member	ARRL
Harrington, Tim	Member	FCC Laboratory
Sigouin, Dan	Member	DHS-EMC

We began our work by reviewing old comments on the previous version from Cisco. There was interest in going beyond analog equipment and interference sources. Ross Carlton reviewed the previous document and re-arranged material into a more logical sequence, separating normative from informative content in his submission.

4.2a Ross Carlton markup:

The red font represents his proposed changes. Much of the strikethroughs shown below was to delete the material from where it is now and move it to a better location in the standard. The point being that it was not simply deleting material as the action item was to rearrange text into normative text and informative material likely to be placed in an informative annex.

P C63.9/D0.01, March 2018
Draft Standard for RF Immunity of Audio Office Equipment to General Use Transmitting Devices with Transmitter Power Levels up to 8 Watts

When using the alternate near-field illumination method described in Clause 9, illuminate the EUT at 10 V/m then, in the frequency ranges specified in Table 1, with the defined modulation illuminate the EUT with a 30 V/m field.

~~a radiating antenna or probe is moved over a surface 25.0±1.0 mm[13] from a plane defined by the surface of the EUT and attached cables, exposing it to the required modulation and field strength. Typically, for reasons of test time, a coarse scan is first performed. The coarse scan uses larger physical step sizes and frequency increments. It may use higher exposure levels to help identify RF sensitive areas. Following the coarse scan, a final scan is performed of sensitive areas identified in the coarse scan. The final scan will use smaller physical steps and frequency increments to correctly assess a product's RF immunity.~~

Annex A provides the minimum requirements of this standard, which is that a product demonstrates a

Harry noted that IEC61000-4-3 shows two ways of verifying field uniformity. Two methods are clearly allowed. Don noted that we will show two ways of performing the testing in C63.9.

5.2 C63.15 – Immunity Measurement & Instrumentation - Heirman (WG report)

Verify accuracy of document status matrix content and report any errors to the ASC-C63® Secretary.

C63.15-2017 Learn more	Immunity Measurement & Instrumentation	SC 5	Heirman, Don	C63.15 PINS	Published 2017 Working group disbanded

C63.15: C63.15-2017 American National Standard Recommended Practice for the Immunity Measurement of Electrical and Electronic Equipment

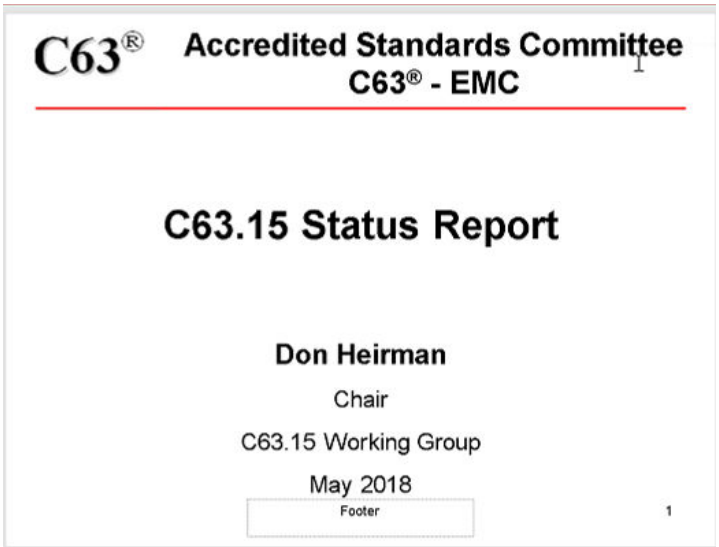
Contact: Heirman, Don (Working Group Chair)

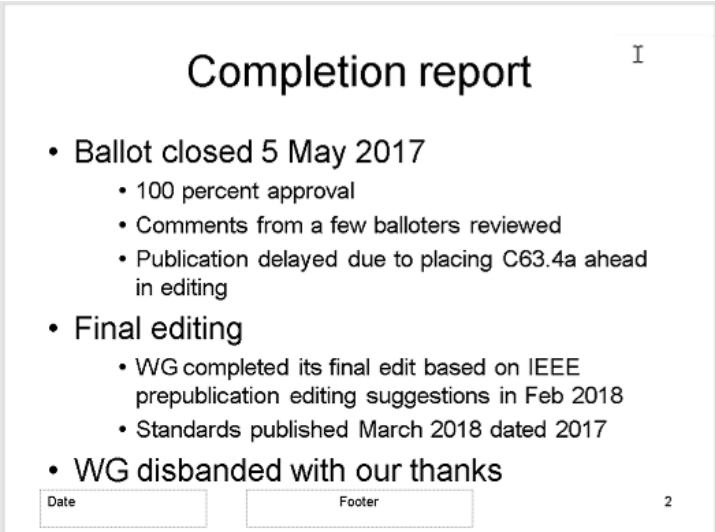
Scope: This immunity measurement and measurement instrumentation recommended practice document complements the emission measurement procedures specified in ANSI C63.4 noting that C63.15 is a recommendation while C63.4 is a standard. The immunity methods are of use to manufacturers who want to produce a reliable product working in the customer location RF environment to reduce customer complaints. This document generally covers the frequency range of 30 Hz to 10 GHz. The test instrumentation needed to replicate the RF environment is also identified that will support the immunity testing.

Status: Published in 2017. Working group disbanded.

Purchase: IEEE Store. To purchase individual standards, go to the IEEE store and search on the standard number.

Is this information correct? (Yes)





There was a discussion of moving this C63.15 material over to SC3 for Harmonization with other International Standards. AI-60: Jerry to place a discussion of moving some C63.15 content to SC3 for harmonization on our next SC5 meeting Agenda.

5.3 C63.16 – ESD Test Methodology - Whitesell (WG disbanded) Verify accuracy of document status matrix content and report any errors to the ASC-C63® Secretary.

C63.16-2016 Learn more	ESD Test Methodology	SC 5	Whitesell, Steve	No active PINS	Current. (published 5/10/16) Working group disbanded

C63.16: C63.16-1993 American National Standard Guide for Electrostatic Discharge Test Methodologies and Criteria for Electronic Equipment

Contact: Whitesell, Steve (Working Group Chair)
Scope: This guide provides electrostatic discharge (ESD) test considerations that a manufacturer should use in assessing the expected ESD effects on products in a wide range of environments and customer use. The focus is well beyond that used to simply show that a product complies with a local, regional, or international standard or regulation. The guide includes unique new material on testing of charged peripherals being connected to a system and system components being placed in a docking station. It also includes information on the use of preliminary investigatory testing to identify test points, methods for visually documenting the location of those test points, and the use of a stepped approach in ratcheting

up the test voltage to determine failure thresholds. The annexes include test plan and data sheet examples along with more background on air and contact discharge for those who want to further understand the differences in these methods.
Status: Current. Guide was published 10 May 2016. Working group disbanded.
Purchase: IEEE Store. To purchase individual standards, go to the IEEE store and search on the standard number.

Is this information correct? (Yes)

Steve Whitesell, Mike Cibulka and Rich Worley reviewed this content for recommendations to IEC 61000-4-2. It was viewed as informative material for an Annex. A second version of the document was sent out to the Members of SC5 with a proposed change for their comments. Recent email attached this content:

Proposed Change to Sub-Clause 7.2.1 of IEC 61000-4-2

7.2.1 **Test requirements**

The following requirements apply to tests performed in laboratories under environmental reference conditions outlined in 8.1.

A ground reference plane (GRP) shall be provided on the floor of the laboratory. It shall be a metallic sheet (copper or aluminum) of 0,25 mm minimum thickness; other metallic materials may be used but they shall have at least 0,65 mm minimum thickness.

The ground reference plane (GRP) shall project beyond the EUT for floor-standing equipment, ~~or~~ and beyond the horizontal coupling plane ~~(when applicable)~~for table-top equipment, by at least 0,5 m on all sides, and shall be connected to the protective grounding system.

Main text submission:

- any specific conditions necessary to enable the test to be performed;
- performance level defined by the manufacturer, requestor or purchaser;
- performance criterion specified in the generic, product or product-family standard;
- any effects on the EUT observed during or after the application of the test disturbance, and the duration for which these effects persist;
- the rationale for the pass/fail decision (based on the performance criterion specified in the generic, product or product-family standard, or agreed between the manufacturer and the purchaser);
- any specific conditions of use, for example cable length or type, shielding or grounding, or EUT operating conditions, which are required to achieve compliance;
- climatic conditions;
- drawing and/or pictures of the test setup and EUT arrangement~~.~~;
- diagrams or photographs indicating the discharge points;
- number of discharges per discharge point.

Rationale: To improve repeatability of test results, it is important to document the location of the points

Additional text for body text:

However, in a very dry environment with synthetic materials, higher voltages than 15 kV occur.

In the case of testing equipment with insulating surfaces, the air discharge method with voltages up to 15 kV may be used.

The equipment manufacturer may not know or be able to control the ESD environment in which the equipment will be used, making the identification of the most realistic installation and environmental conditions as discussed above nearly impossible to determine. In such cases it may be helpful to start at the lowest test voltage and incrementally increase test levels in 2 kV steps until the maximum desired test level is reached to expose the equipment to the full range of waveform amplitudes and frequency content. For example, lower voltage air discharges tend to have faster current rise times due to their shorter arc lengths. Some products have a tendency to exhibit susceptibility responses when exposed to some ESD voltages but not others [King[1]]. When conducting contact discharge testing as discussed in A.6 instead of air discharge testing, it

[1] King, W. M., "Systems response to electrostatic discharge: Applications of impulse waveform research toward understanding product performance," Proceedings of the 1987 EOS/ESD Symposium, pp. 110–114, Sept. 1987.

Selection of test points:

A.5 Selection of test points

The test points to be considered may, for example, include the following locations as applicable:

- points on metallic sections of a cabinet, whether grounded or ~~which are~~ electrically isolated from ground, including metal plated decorative bezels, badges, labels, and nameplates;
- any point in the control or keyboard area and any other point of man-machine communication, such as switches, knobs, buttons, indicators, LEDs, slots, grilles, connector hoods and other operator-accessible areas~~.~~;
- areas on insulated enclosures that are nearest to conductive portions of the enclosed circuitry;
- other points that are likely to be touched by the human body, such as any surface of a portable product, or by another charged surface, especially near enclosure seams and apertures;
- additional mechanical connections, such as metal sleeves that mate with studs in base units in EUTs that are designed to be docked (e.g., laptops, personal music players, phones);
- connector pins if they are likely to be handled or touched in the EUT's intended environment, such as exposed battery or battery-charger contacts, signal pins on USB connectors, or docking contacts on portable devices.

Investigatory testing is used for guidance in the selection of test points. Because the frequency content delivered in air discharge changes both with arc length and test voltage, gradually-increasing voltage levels should be applied during investigatory testing. Beginning the investigation at lower test levels reduces the chance of EUT damage and increases the likelihood that upsets are noted.

Air discharge investigation on accessible nonconductive parts of the EUT is performed first, followed by contact discharge investigation on conductive and accessible parts of the EUT and the edges of the VCP and HCP. This is accomplished by setting the ESD generator alternately to air and contact discharge modes and 20 discharges per second so upsets can be noted quickly. The object of this testing is to indicate susceptible areas of the EUT so that more detailed testing can be performed in those areas.

The voltage is set to a lower level (e.g., 2 kV) and the air discharge tip is oriented perpendicular to the nonconductive areas of the product being investigated and scanned at various separation distances to identify candidate test points. If no upsets are noted at the initial test voltage, the voltage is increased to the next level (e.g., 4 kV) and the investigation continues.

Contact discharge investigation on conductive parts of the EUT is evaluated similarly, starting at a

Two new annexes were suggested:

Annex G
(informative)

Unique ESD test procedures

G.1 General

This annex identifies unique ESD test procedures applicable to the mating of charged devices with uncharged devices. Charged peripheral testing is designed to simulate the effects of a charged auxiliary device being mated to the EUT and includes direct pin injection, connector shell contact discharge testing, and charged peripheral insertion. Charged EUT testing is designed to simulate a charged EUT being mated to a grounded peripheral or associated equipment.

An ESD simulator with a faster rise time tip (~25 ns) is recommended for some of the tests in the following sub clauses.

G.2 Charged peripheral and associated equipment testing

There were two simulator tips discussed (below and above 15kV)

G.2.3.1 Connector shell contact discharge test setup

For connector shell contact discharge testing, the EUT should be configured with minimal cabling, connecting only that cabling required for operating and verifying the functionality of the device. The EUT should be connected to mains ground during the test to allow bleed-off of ESD charge. The connection to mains ground should be accomplished through attachment of a 3-wire ac adapter/power supply, or through the use of an attached mains grounded peripheral (monitor, printer, etc.).

G.2.3.2 Connector shell contact discharge test procedure

An ESD simulator with a fast rise time ~~discharge tip and~~ contact discharge tip is recommended for connector shell contact discharge testing. Twenty discharges of each polarity should be applied at the required voltage with the contact discharges applied directly to the connector shell of the port under test.

Refer to Figure G.2 for performance of typical connector shell contact discharge testing.

Charged peripheral testing was discussed:

etc. Maximum test levels of ±4 kV are recommended. The test levels are typically higher than those used for direct pin injection testing (G.2.2.3).

G.2.4 Charged peripheral insertion

G.2.4.1 Charged peripheral insertion test setup

For charged peripheral insertion testing, the EUT should be configured with minimal cabling, connecting only that cabling required for operating and verifying the functionality of the device. The EUT should be connected to mains ground during the test to allow bleed-off of ESD charge. The connection to mains ground should be accomplished through attachment of a 3-wire ac adapter/power supply, or through the use of an attached mains grounded peripheral (monitor, printer, etc.).

G.2.4.2 Charged peripheral insertion test procedure

An ESD simulator with an air discharge tip is recommended for charged peripheral insertion testing. To avoid the charge being dissipated through the operator, the charged device should be properly insulated at the point where the operator grasps the device. Polyimide tape or other similar insulation is suitable for this purpose. Additionally, it is recommended that the operator wear a high-voltage insulating (rubber) glove during performance of the test.

Annex H was proposed:

Annex H
(informative)

Additional considerations for consistency of results and ease of testing

H.1 Approach speed for air discharge testing

The speed of approach of the discharge electrode is a critical factor in the rise time and amplitude of the ESD event for air discharge testing. A constant speed of approach in the range of 0.1 m/s to 0.5 m/s that is repeatable from test to test is desired. However, this is not easily achievable or practically verifiable unless a mechanical transport device is used. An alternative to using such a transport device is to start at a fixed separation distance of 20 cm to 40 cm from the device (but at the same separation distance each time). From this starting distance, the tester moves the ESD simulator toward the device using an approach rate that is as linear as possible, traversing the distance in approximately 1 s. The simulator should not be stopped when the arc occurs, but rather should be allowed to follow through until the electrode touches the surface of the device (without causing mechanical damage).

H.2 Alternative air discharge electrodes for use above 16 kV

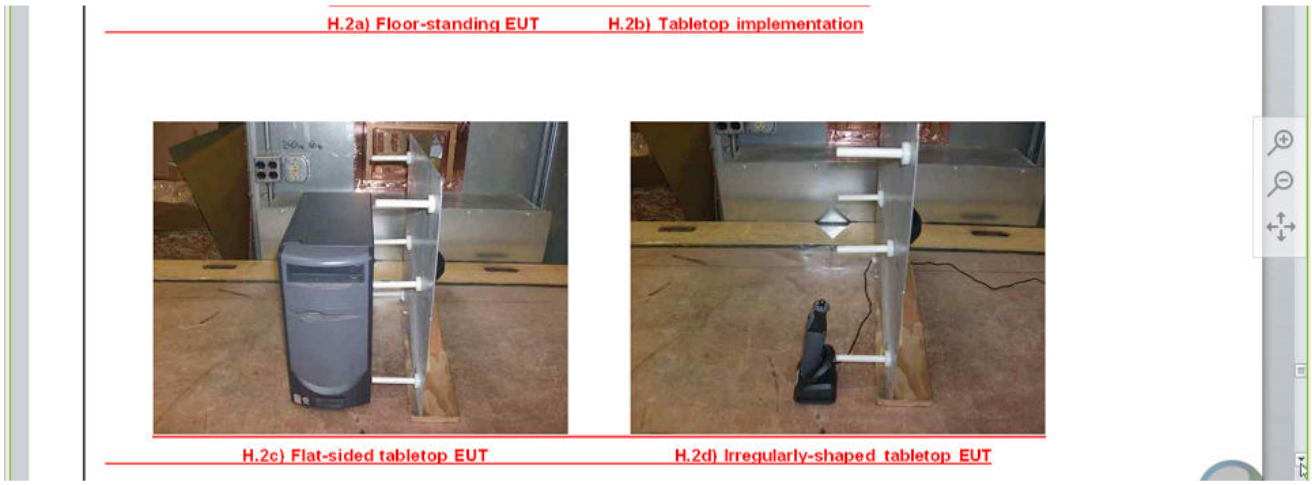
Some ESD simulators are capable of providing discharges at up to 30 kV (special "x" values in Table 1). The same sharply pointed tip geometry is used for contact discharge testing at these higher voltages. However, a third tip geometry with a larger (25–30 mm) dome-shaped or spherical end similar to those shown in Figure H.1 is often used for air discharge testing at voltages above 16 kV to reduce the amount of leakage charge from the tip prior to the main discharge event. The specific details regarding the dimensions of these electrodes are manufacturer specific.

Figure H.1 – Example electrodes for high voltage (>16 kV) air discharges
(see discussion in text concerning dimensions)

All of this material will be filtered by the US-TAG, which will decide what/if to contribute to the IEC as informative information. For testing up to 30kV, Harry suggested that ***"This will be most effective at very low RH, from 2 to 5%."***

H.3 Practical implementation of Vertical Coupling Plane (VCP)

A practical implementation of a VCP consists of a rigid metal plate with nonconductive 10 cm long spacers mounted on one side and a nonconductive handle on the other side. One such VCP is shown being held against the side of a floor-standing EUT in Figure H.2a). A similar implementation is shown in Figure H.2b) with the handle fitted over a wedge-shaped wooden support for testing tabletop equipment. Examples of this latter implementation being used with flat-sided and irregularly-shaped EUTs are shown in Figure H.2c) and Figure H.2d).



Mike Cibulka will report back from his US-TAG after his submission. Mr. Whitesell moved that we provide this to SC3 for International harmonization. Mr. Heirman seconded. The motion passed unanimously.

5.4 C63.24 – On-Site Generic Immunity testing - Heirman (WG report) Verify accuracy of document status matrix content and report any errors to the ASC-C63® Secretary.

C63.24-draft Learn more	On-Site Generic Immunity testing	SC 5	Heirman, Don	C63.24 PINS	New recommended practice restarted (joint task with IEEE 473); new PINS needed

C63.24-draft: American National Standard Recommended Practice for In-Situ RF Immunity Evaluation of Products, Instrumentation, and Control Systems in High Reliability Installations

Contact: Heirman, Don (Working Group Chair)
Scope: This recommended practice provides an in-situ EMC immunity qualification test for products, instrumentation, and control systems in their installed environment. The standard will focus on installation environments that require a high level of confidence that these products and systems have a high level of EMC immunity. This project will provide a generic method for evaluating the RF immunity of electronic products, instrumentation, and control systems, as and where installed or operated. A particular focus is on immunity to RF sources that may enter the environment, intentionally or unintentionally or be integrated into the operating environment. The characteristics of RF sources in the environment will be used to establish the levels and test methods.
Status: New recommended practice. Consideration being given to working as a joint project with the revision of EMC Society standard IEEE 473 on RF site survey measurement. PINS will need revision.
Purchase: Not yet available for sale.

Is this information correct? (Yes)

C63®

Accredited Standards Committee C63® - EMC

C63.24 (In-situ/on-site immunity measurements) Status

Don Heirman

Chair

C63.24 Working Group

May 2018

IEEE-P473 covers site surveys, while C63.24 covers In-situ or on-site immunity measurements. These two are complimentary Standards. The Joint Working Group with C63.24 and IEEE-473 was formed with Chad Kiger. We looked at what might be common. The C63.24 roster was shown:

C63.24 WG members

Name	Role in WG	Affiliation
Heirman, Don	Chair	Don HEIRMAN Consultants
Schaefer, Dave	Vice Chair	TUV SÜD America
Ramie, Jerry	Secretary	ARC Technical Resources, Inc. (non-voting)
Fanning, Craig	Member	Elite Electronic Engineering
Hare, Ed	Member	ARRL
Harrington, Tim	Member	FCC
Kiger, Chad	Member	AMS Corporation
Lombardi, Rick	Member	Visteon Corporation / SAE Primary
Silberberg, Jeffrey L	Member	FDA Center for Devices & Radiological Health
Terrien, Mark	Member	Keysight Technologies
Walton, Derek	Member	LF Research
Whitesell, Steve	Member	Whitesell Consulting
Zimmerman, Dave	Member	Spectrum EMC, LLC

IEEE 473 Liaison Members

IEEE-473 Liaison Members		
Name	Role in WG	Affiliation
Benitez, Henry	Member	Electromagnetic Investigations
Crane, Zach	Member	AMS Corporation
Duffy, Alistair	Member	De Montfort University
Dyberg, Karen	Member	Raytheon
Hiltz, Greg	Member	Dept. of National Defense, Canada
Hoffman, Mike	Member	Exelon
McRae, Kingsley	Member	EMC Society Australia
Sze, Kin	Member	Dept. of National Defense, Canada
Williams, Kimball	Member	IEEE - EMC Society

25 April Webinar

- Progress:
  - Reviewed draft of "common test site setups" for C63.24 in performing on-site/in-situ immunity measurements and in P473 for performing site surveys
  - Draft was inserted into both standards
  - Discussions ensued.
  - In the meantime, both working groups continue to update their respective standards

Filename: C63.24-2012 - rev 1-7 - In-Situ Immunity Testing-rev1.docx

Harry mentioned that this document could be useful for military installations, such as command centers. Don noted that this document applies inside and outside buildings and ship-board. IEEE-473 also has even more content relative to the military. Clause 5 was shown:

5. Preparation for testing

5.1 General

General

Site measurements can be performed in many locations each with the potential for nearby or surrounding objects that can affect the measurements, it is imperative to record exactly where it was performed and then the results of the measurement itself. The degree of the effect is dependent upon the frequency of radiated electric or electromagnetic field, the area of nearby conductive material, and the proximity of such material to the measurement location. Conductive material such as metal or salt water (for outdoor and seaside measurements) has the greatest effect on electromagnetic fields. Reflection, scattering, and diffraction are primary mechanisms by which field measurements are disturbed. Other features of the measurement site that generally affect the measurement is the surface where the measurement is made. For outdoor measurements, this may be earth with unknown composition and for inside buildings, it is the floor with unknown or very limited construction and material makeup.

Measurement Information

It is important to document what is the extent of the work to be performed. This is generally called the test plan. The plan should include:

- The purpose of the test, e.g. determining the EM levels where user equipment may be or is installed indoors and where a new building will be erected in an open space.
- Test location using GPS for outdoor sites and building floor plans for indoor sites.
- Test procedure such as measuring the conducted and radiated EM sources
- Test instrumentation to measure the conducted and radiated EM sources
- Point of contact to coordinate the work, especially for making measurements inside a privately-owned building

Measurement Setup outside buildings

In such a map or measurement location drawing, obstacles for measurements made *outside buildings in open areas* should include

1) Weather conditions including temperature, gusty wind, and precipitation that might affect radiated emission results.
2) Terrain and soil conditions, e.g. wet/dry earth, frozen soil, tall grass, and flatness of the test area.
3) Above ground structures, such as buildings (note type of construction—brick, cinder block, reinforced concrete, etc.), metallic fences, and broadcast and cellular phone antennas
4) Suspended cables, such as power, telephone, and those used for cable television (note the number of cables, routing, location of drop wires, power-line ratings, and the type, number, and location of supporting structures)
5) Underground conduits for water, power, gas, oil, etc (this has to be found by contacting these utilities as they are not generally visible)
6) Other major obstacles associated with the terrain, including foliage (note density)
7) Proximity to roads and highways close in to the measurement site.

Photographs should be taken to document major features of the region surrounding the measurement site.

Measurement Setup inside buildings:

1) Surrounding walls and type of walls (sheetrock, conductive material, etc.), ceiling (conductive or sheet rook/ceiling panels/suspended ceiling, etc.) and floor (carpeted, type of material, raised, etc.)

2) Opening to the outside of the room, especially those on the perimeter of the building (windows, doors, etc.)

3) Locations of conductive support columns

4) Penetrations into the room for electrical (lighting and power), HVAC (note where the metallic ducts are), and plumbing

5) Furniture insides room is partially occupied (focus on metallic desks, filing cabinets, computer network equipment, etc.)

Photographs should also be taken to document major features of the region surrounding the measurement site.

6. Other Old Business: Chair

6.1 Written reports - Written reports of this Subcommittee meeting shall be presented by the Subcommittee Chair at the Main Committee meeting. These reports shall be made using the PowerPoint template. Prior to the Main Committee meeting, the SC5 report and approved previous meeting minutes shall be provided to the projectionist for showing on the screen at the Main meeting. The Presentation and any written report shall also be sent by the Subcommittee Chair to the ASC-C63® Newsletter editor.

6.2 Coordination with SC2 for definitions - Before any Working Group draft can be submitted to Subcommittee for approval, the document must be provided to the SC2 Chair for evaluation and coordination of the definitions used.

6.3 Coordination with SC3 for harmonization - Before any Working Group draft can be submitted to the Subcommittee for approval, the document must be provided to the SC3 Chair for evaluation and coordination of any harmonization effort.

7. New Business: Chair - none

8. C63.org website use and updates: Secretary - We normally post documents to the SC5 protected area. If any SC or WG needs help with this posting, a Technical Secretary is available to assist.

9. Review of the Action Items: Secretary

9.1 Review of Action Items from this meeting: The Action Items from this meeting were shown and agreed upon.

9.2 Review of Action Items from previous meeting: The consolidated Action Item table from the previous meeting Minutes are shown below:

Consolidated Action Items from 03/06/18 Meeting of SC5

Action Item #	Subject	Responsible Person(s)	Status	Delivery Date	Comments
AI-40:	Steve to offer such an amended version of IEC 61000-4-2, with C63.16 content inserted, for submission to TC77B from SC3.	Steve Whitesell	Closed	5/2/18	We need suggested text submitted in WORD version of 61000-4-2
AI-56:	Jerry to implement new Status Matrix C63.15 text changes above in **red.**	Jerry Ramie	Closed	5/2/18	Posted 3/6
AI-57:	Jerry to close C63.15 working group roster on SC5 roster page.	Jerry Ramie	Closed	5/2/18	Posted 3/6

10. Time and place of next meeting: Chair - Week after Thanksgiving in Boulder. (travel on Sunday after Thanksgiving)

11. Closing remarks and Adjournment: Chair - The Chair thanked the Members for their contributions and adjourned the meeting at 2:58PM-EDT

********** End of Meeting **********

Consolidated Action Items from 5/2/18 Meeting of SC5

Action Item #	Subject	Responsible Person(s)	Status	Delivery Date	Comments
AI-58:	Jerry to update SC5 landing page to show the amended Scope in Item 4	Jerry Ramie	Closed	Next meeting	Sent to Shannon 6/2
AI-59:	Jerry to add Ross Carlton to the SC5 roster.	Jerry Ramie	Closed	Next meeting	Added 6/2
AI-60:	Jerry to place a discussion of moving some C63.15 content to SC3 for harmonization on our next SC5 meeting Agenda	Jerry Ramie	Open	Next meeting	