



# ICES

## International Committee on Electromagnetic Safety

### *APPROVED MINUTES*

#### IEEE/ICES TC95 Subcommittee 2

#### Terminology, Units of Measurements, and Hazard Communications

1000 – 1200 h EST (US East Coast time) (1500 – 1700 UTC) see times below

Wednesday, 12 January 2022

#### 1. Call to Order

- The meeting was called to order at 10:02 EST by R. Tell. D. Haes recorded the minutes. R. Tell began the meeting with a slide containing “Food for Thought” on the topic of “Predicting thermal discomfort with the ASHRAE model.” The “Take Home” is that it is difficult to satisfy everyone all of the time.

#### 2. Welcome and Introduction

- See **Appendix A** for presentation by the Chairs. Attendees were asked to “sign-in” using the chat feature of the meeting platform. See **Appendix B for attendees and Appendix C** for a copy of the chat log. **There was a high of 46 attendees at the meeting.**

#### 3. IEEE Patent and Copyright requirements

- IEEE SA’s copyright policy is described in Clause 7 of the IEEE SA Standards Board Bylaws and Clause 6.1 of the IEEE SA Standards Board Operations Manual; ***Any material submitted during standards development, whether verbal, recorded, or in written form, is a Contribution and shall comply with the IEEE SA Copyright Policy.***
- The foregoing [copyright policy] information was provided and that the copyright slides were shown (or provided beforehand).

4. Approval of Agenda: The *DRAFT AGENDA* circulated via e-mail by R. Tell to the members prior to the meeting was reviewed and approved, although belated in timing (J. Bushberg/D. Maxson) (See slide pack, **Appendix A**).

5. Approval of the Minutes from the June 30, 2021, online meeting

<https://drive.google.com/drive/folders/1OCEEzFguDts2zQO4ROpMqZUTkD8XZrp?usp=sharing>

The Minutes from the June 30, 2021, online meeting, previously made available via e-mail (see link above), were reviewed and approved with one spelling correction. (C-K. Chou/D. Maxson). (**APPROVED MINUTES are posted on the ICES / SC2 website**).

6. Meeting topics: See **Appendix A** for presentation by the Chairs. Any **ACTION ITEMS**, specific comments and / or questions were recorded under each of the associated outlined topics corresponding to the slides.

- Lack of response from OSHA on RF inspections on rooftops
  - It is clear that "inspection" does not include performing actual work in terms of making RF field measurements.
  - D. Maxson suggested the issue is more with the distraction and may be dependent on the physical conditions. His suggestion is the need for fall protection would be determined during the initial hazard assessment, which SHOULD be done.
  - J. Bushberg reminded the group that OSHA's aim is to focus on what is not anticipated.
  - R. Curtis suggested contacting the local (e.g., the host building) Safety Officer for rooftop sites.
  - J. Bushberg and D. Haes effected a discussion of OSHA's general industry §1910 and §1926 construction standards in the Appendix C chat log.
- Progress on revision of C95.7-2014
  - Revised draft distributed to SC2 for review and voting in December 2020 with a total of 770 (537 editorial and 233 technical) comments received.
  - The Document received enough votes for APPROVAL, nonetheless ALL the comments were addressed in writing during 2021 with improved draft completed December 2021.
  - The revised draft distributed to SC2 on January 9, 2022.
- Discussion of revision draft by meeting attendees
  - D. Maxson mentioned it is critical to remain within the narrow scope of C95.1 and yet NOT overlook potential EME hazards not covered by the exposure standard.

- J. Bushberg suggested the same approach could be used with OSHA's fall protection.
- P. Zollman mentioned that the title does not relate to concomitant EME hazards.
- J. Bushberg complimented the current revision as it did NOT simply opine about the hazards, or list the applicable standards, but provided sufficient detail.
- C-K. Chou notified the group that if the document is ready for TC95 balloting, there is a 30-day notice requirement for the balloting group.
- R. Tell mentioned that the document is undergoing final review for technical and grammatical corrections. Adhering to the IEEE Style Manual as suggested by several is important and the IEEE SA mandatory editorial review will help clean up any issues that may remain at time of submittal.

● **\*\*\* ACTION ITEM \*\*\*: R. Tell to determine the approximate time requirements for the volunteer(s) to finish the final review of the document.**

- *The EWG is grateful to those who submitted the many comments. The EWG treated each comment with respect and made every effort to accommodate each comment as best possible, sometimes agonizing over just the best way and expending lots of time. Carefully examining each comment helped us make C95.7 better and more useful.*

7. Technical presentation (See slides, **Appendix D**).

- Management of Effective and Efficient RF Safety Compliance Using Accurate Power Measurement and Other System Monitoring.
- Bob Tarsio, President; Broadcast Devices, Inc.; Westchester Industrial Complex, 3199 Albany Post Road, Suite 122, Buchanan, NY 10511. [bob@broadcast-devices.com](mailto:bob@broadcast-devices.com)

8. Request for suggestions on topics for future technical presentations

- R. Weller suggested RADAR systems.
- D. Tech suggested Smart antenna systems (i.e., beam forming).
- R. Curtis suggested the updated status of the FCC's exposure limits.

9. New business

- D. Haes mentioned the information in the chat log concerning OSHA's fall protection standards.

10. Time and place of next meeting

- C-K. Chou mentioned the ADCOM is considering holding the next ICES meeting in conjunction with BioEM 2022, June 19-24, in Nagoya, Japan. This is a “hybrid” event in a hybrid format, allowing both on-site and online participation.
- More details will be available at the TC95 meeting to be held January 20, 8-11 EST (Chair: C-K. Chou).

## **II. Adjourn**

- The meeting was adjourned at 12:00 noon EST (K. Fisher / C-K. Chou).

### ***ATTACHED APPENDICES***

- APPENDIX A: R. Tell SC2 Meeting presentation 01/12/2022.
- APPENDIX B: Attendees SC2 Meeting online via WebEx 01/12/2022.
- APPENDIX C: Chat Log, SC2 Meeting 01/12/2022.
- APPENDIX D: *Management of Effective and Efficient RF Safety Compliance Using Accurate Power Measurement and Other System Monitoring* by Bob Tarsio.

## ATTACHMENT A



## Sign In Please

*Use the “chat” feature to let us know you are here.*

- If you are an SC2 member, a name will be fine.
- If you are an Observer, or if this is your first time attending, please let us know your full name, affiliation, and email address. WELCOME!
- For those attending via telephone, our secretary will reach out to you and gather the necessary information.

IEEE SC2 online meeting (1-12-2022)



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## Welcome to the IEEE TC95-SC2 Meeting 12 January 2022

### Subcommittee on Terminology, Units of Measurements, and Hazard Communications

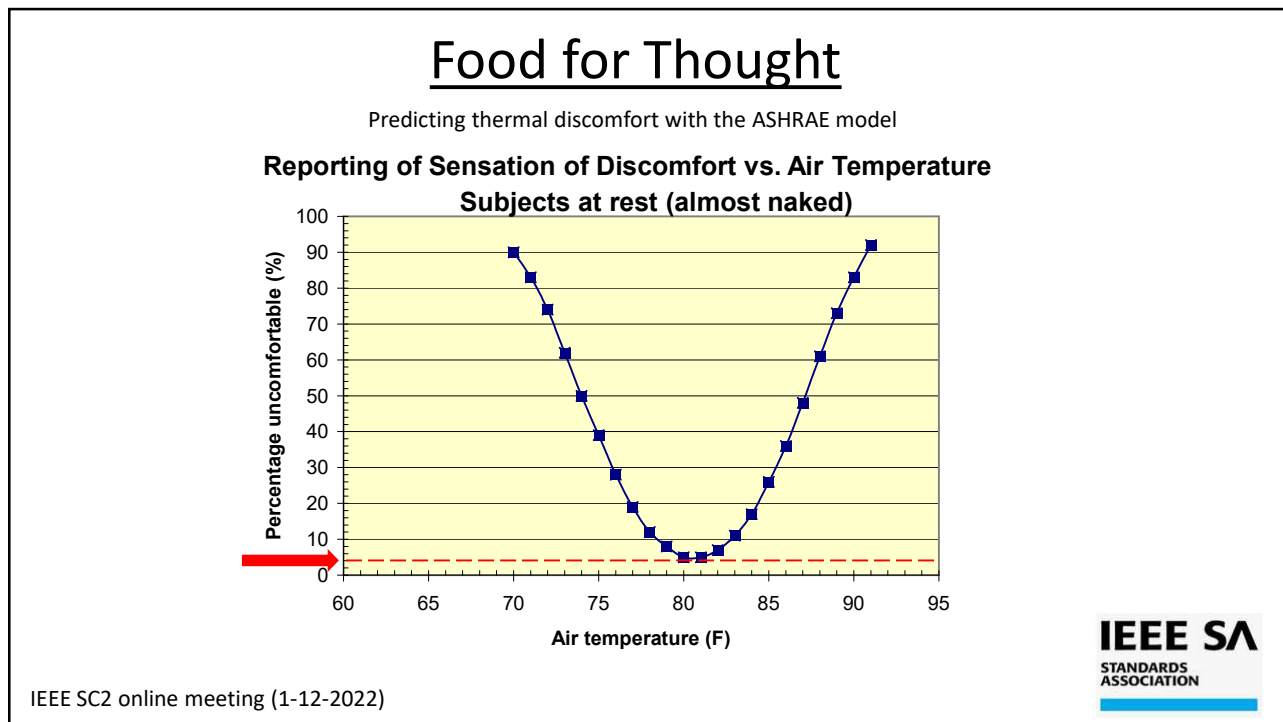
A subcommittee within the International Committee on  
Electromagnetic Safety

Under the auspices of the IEEE Standards Association

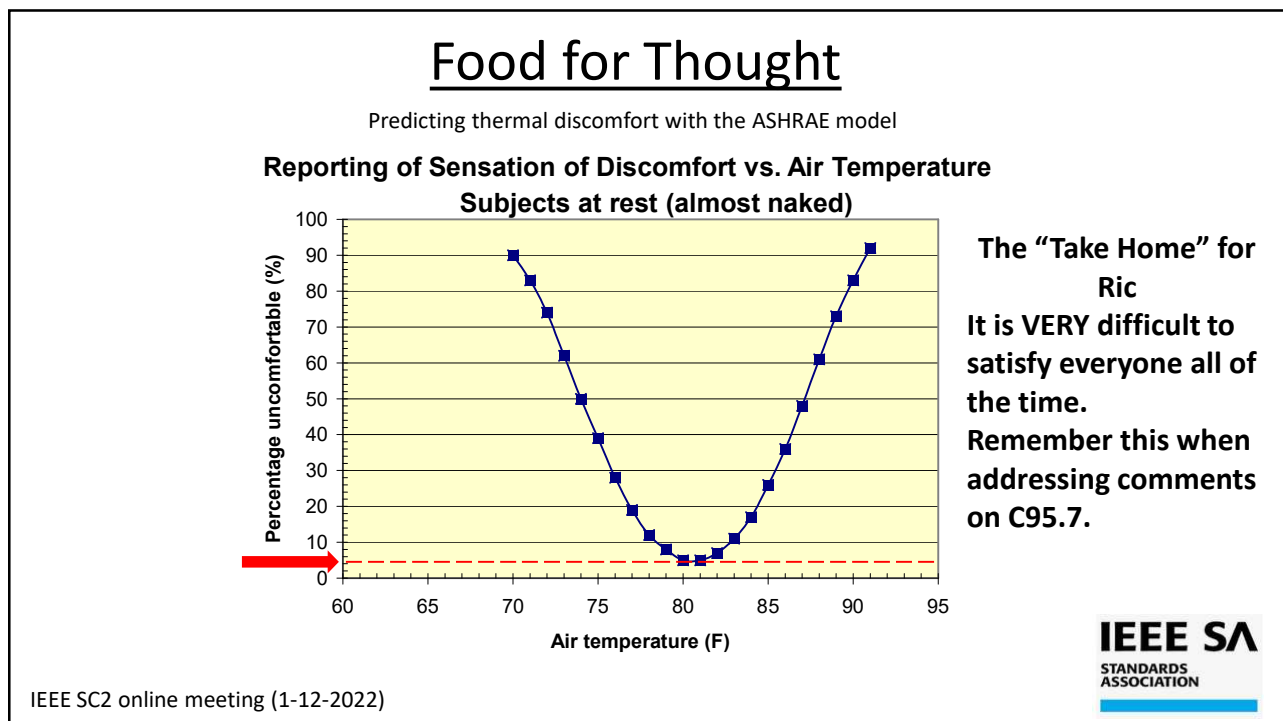
IEEE SC2 online meeting (1-12-2022)



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- IEEE International Committee on Electromagnetic Safety (ICES) SSC-39: Chair, Jafar Kesvari
- Technical Committee 95 (TC95): Chair, C-K Chou
- Subcommittee 2 (SC2) - Terminology, Units of Measurements, and Hazard Communications:
  - Chair, Ric Tell (rtell@radhaz.com)
  - Vice Chair/Secretary, Don Haes (donald\_haes\_chp@comcast.net)

IEEE SC2 online meeting (1-12-2022)



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## What is ICES SC2?

### SC2 has the name


**Subcommittee 2 on Terminology, Units of Measurement, and Hazard Communications**

**Consists of approximately 73 “signed up” members but many “lurkers”**

### SC2 is the development group for

- **IEEE Std C95.2-2018 IEEE Standard for Radio-Frequency Energy and Current Flow Symbols**
- **IEEE Std C95.7-2014 IEEE Recommended Practice for Radio Frequency Safety Programs, 3 kHz to 300 GHz [currently being revised]**

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# ICES

International Committee on Electromagnetic Safety

**Draft Agenda**

**IEEE/ICES TC95 Subcommittee 2**  
**Terminology, Units of Measurements, and Hazard Communications**  
**1000 – 1200 h EST (US East Coast time) (1500 – 1700 UTC) see times below**  
**Wednesday, 12 January 2022**  
**CLICK THIS LINK TO JOIN THE MEETING**  
<https://ieeesa.webex.com/ieeesa/j.php?MTID=m1efdc6de36172f662baab79b6badfa1b>


1. Call to Order	Tell
2. Welcome and Introduction	Tell
3. IEEE Patent and Copyright requirements	Tell
4. Approval of Agenda	Tell
5. Approval of the Minutes from the June 30, 2021, online meeting <a href="https://drive.google.com/drive/folders/1OCEEzFguDts2zQO4ROpMqZU-TkD8XZrp?usp=sharing">https://drive.google.com/drive/folders/1OCEEzFguDts2zQO4ROpMqZU-TkD8XZrp?usp=sharing</a>	Tell
6. Meeting topics:	Tell
▪ Lack of response from OSHA on RF inspections on rooftops	Tell
▪ Progress on revision of C95.7-2014	SC2 EWG
▪ Discussion of revision draft by meeting attendees	All
7. Technical presentation	Tarsio
8. Request for suggestions on topics for future technical presentations	All
9. New business	All
10. Time and place of next meeting	Tell
11. Adjourn	Tell

IEEE SC2 online meeting (1-12-2022)


**Refer to IEEE SA Patent Policy at link below**

*Participants have a duty to inform the IEEE of holders of essential patent claims if they or their affiliations hold such claims. Check the web link at: <https://standards.ieee.org/content/dam/ieee-standards/standards/web/documents/other/patents.pdf> for more details. If anyone in this meeting is personally aware of any patent claims that are potentially essential to implementation of the proposed standard(s) under consideration by this group and that are not already the subject of an Accepted Letter of Assurance, please speak to the committee chair today.*

*Participants also have a duty to comply with the IEEE policy on copyright for published documents. Details at <https://standards.ieee.org/ipr/copyright-materials.html>*



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IEEE SC2 online meeting (1-12-2022)

**Refer to IEEE SA Copyright Slide link provided with Meeting Packet**

*At the beginning of each standards development meeting the chair or a designee is to:*

- Show the SA [Copyright slides \(or provide them beforehand\)](#)
- Advise the standards development group participants that:
  - IEEE SA's copyright policy is described in Clause 7 of the IEEE SA Standards Board Bylaws and Clause 6.1 of the IEEE SA Standards Board Operations Manual;
  - Any material submitted during standards development, whether verbal, recorded, or in written form, is a Contribution and shall comply with the IEEE SA Copyright Policy;
- Instruct the Secretary to record in the minutes of the relevant meeting: That the foregoing information was provided and that the copyright slides were shown (or provided beforehand).

Details at <https://standards.ieee.org/content/dam/ieee-standards/standards/web/documents/other/ieee-sa-copyright-policy-2019.pdf>



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## A Disappointment from OSHA

Request for interpretation of OSHA 1926.500(a)(1) with regard to fall protection requirements when performing rooftop RF field measurements.

January 3, 2019 Letter to Scott Ketcham, Directorate of Construction

June 15, 2020 Request from OSHA to set up teleconference

June 17, 2020 Teleconference with OSHA (2 technical people and 2 OSHA attorneys)

My take-away, as the bottom line, from our discussion is that the performance of rooftop surveys/measurements of radiofrequency (RF) fields for assessing potential exposure of personnel who may access the rooftop for various purposes on an unprotected roof (e.g., one not having a sufficient height parapet around the edge) would NOT be considered "inspection". Further, with the diversion of attention associated with carrying and using an instrument, observing readings, recording of readings, positioning of the probe, etc., normal OSHA fall protection requirements would apply. This is what I suspected from study of the earlier OSHA letter of interpretation but our discussion helped clarify any misunderstanding that I may have had. It became clear that "inspection" does not include performing actual work in terms of making measurements.

**We look forward to receiving a letter regarding my request for interpretation and being able to help convey this important safety factor to many others who do this kind of work.**

Request for follow up with letter every 6 months.

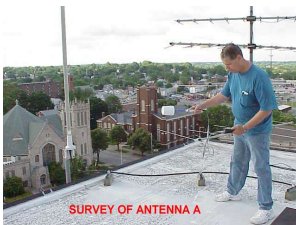
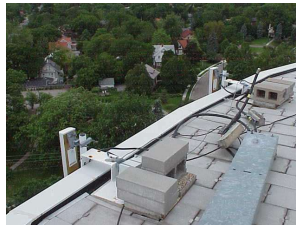
**No response. I now consider this IEEE correspondence with OSHA closed as of January 2022.**



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## Why the roof edge issue is significant



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## Status of the SC2 Approved Revision of C95.7-2014

An IEEE SC2 Editorial Working Group (EWG) was formed 2019 consisting of R Tell, D Maxson, D Haes, B Curtis, B Johnson, K Fisher and R Mathur



R Tell



D Maxson



D Haes



B Curtis



B Johnson



K Fisher



R Mathur

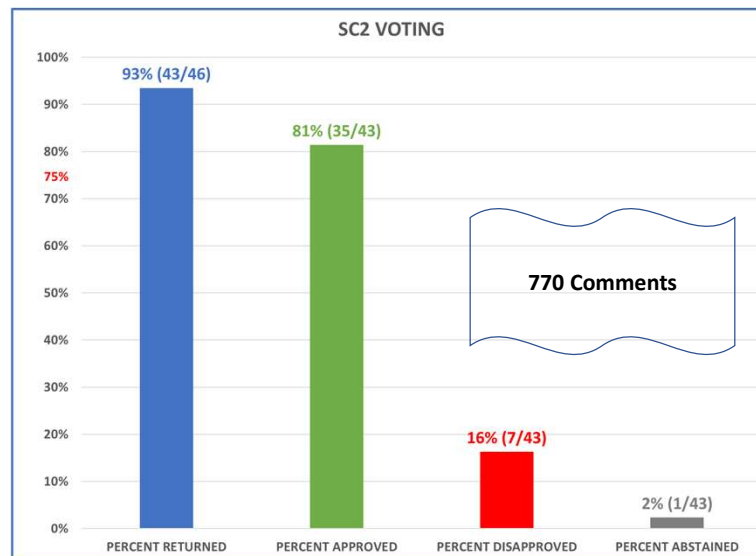
- Revised draft distributed to SC2 for review and voting in December 2020
- Total comments received: 770 (537 editorial and 233 technical)
- Document APPROVED for progressing to TC95
- Comments addressed during 2021 with improved draft completed December 2021
- Revised draft distributed to SC2 on January 9, 2022



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## The Revised C95.7 Draft is Approved



IEEE SC2 online meeting (1-12-2022)

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## Issues the EWG addressed

- Made it look like a standard: Put the “shalls” up front (this is what you have to do to comply)
- Structured the process of developing a safety program in line with industrial hygiene best practice such as adding a hazard assessment phase, etc.
- Developed clearer concepts and nomenclature for classification of exposure environments building on previous improvements
- Clarified the difference between awareness education and safety training
- Integrating the new C95.1 including among other things, the merging of LF with RF
- Worked on how to include concomitant hazards with the appropriate balance of inclusion without going past our area of responsibility
- In addressing the many comments, the EWG found that restructuring the flow and reducing the size helped to make the product more comprehensible and coherent

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## A general concept that we had to keep reminding ourselves of:

C95.7 is based on compliance to a selected safety level standard; it is not based on health effects. Often, discussions would get off track as we thought about the lack of any health effect at a given exposure -- forgetting that the venue for discussing thresholds of health effects is in setting safety level standards such as C95.1, not C95.7. This same concept resulted in comments which were hard to resolve.

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## **A constant realization of the EWG**

It is one thing to come up with an exposure standard (like C95.1), based on numbers and studies. It's another to craft a way to incorporate those numbers in a plan based on the requirements of all (or many) standards.

IEEE SC2 online meeting (1-12-2022)

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## **A couple of final comments**

- The EWG is grateful to those who submitted the many comments. The EWG treated each comment with respect and made every effort to accommodate each comment as best possible, sometimes agonizing over just the best way and expending lots of time. Carefully examining each comment helped us make C95.7 better and more useful.
- Adhering to the IEEE Style Manual as suggested by several is important and the IEEE SA mandatory editorial review will help clean up any issues that may remain at time of submittal.

IEEE SC2 online meeting (1-12-2022)

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## Going forward

- Transmittal of draft to TC95 for balloting
- Addressing comments that may be received from balloting at the TC95 level
- Submittal to IEEE SA for review and balloting
- Addressing comments received from SA balloting

## Questions?



IEEE SC2 online meeting (1-12-2022)

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## Technical Presentation

### Management of Effective and Efficient RF Safety Compliance Using Accurate Power Measurement and Other System Monitoring



**Bob Tarsio, President**  
**Broadcast Devices, Inc.**  
**Westchester Industrial Complex**  
**3199 Albany Post Road, Suite 122**  
**Buchanan, NY 10511**  
**bob@broadcast-devices.com**



IEEE SC2 online meeting (1-12-2022)

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## Thank you Bob!

- |   |      |
|---|------|
| 8. Request for suggestions on topics for future technical presentations | All  |
| 9. New business   | All  |
| 10. Time and place of next meeting                                      | Tell |
| 11. Adjourn   | Tell |

IEEE SC2 online meeting (1-12-2022)



# ATTACHMENT B

DH	Don Haes Me	GM	Gulmira Mustapaeva	RM	Raj Mathur
	Ric Tell Host	JF	James Futch	RA	Robert Acacio
AD	Amnon Duvdevany	JB	Jerrold Bushberg	RC	Robert Cleveland
AT	Art Thansandote	JO	John M. Osepchuk	RJ	Robert Johnson
B	Ben	KF	Kevin Fisher		Robert Kavet
BC	Bob Curtis	KG	Kevin Graf	RW	Robert Weller
BT	Bob Tarsio	KB	Klaus Bender	RG	Romeo Gallamoza
CB	Chris Brumage	KF	Kyle Fisher	TH	tim harrington
CC	Chrys Chrysanthou	MD	Martin Doczkat	XZ	Xun Zhao
CC	C-K. Chou	MW	Marv Wessel	YI	Yujuan Zhao Intel
CK	Cory Kihlstrom		Marv Ziskin	ZE	Zak Elliott
DA	Damian A.	MB	Matt Butcher		
DT	Darang Tech	MD	Matthew Davis		
DS	Dr. David H. Sliney	M	Maxson		
EK	Efthymios Karabetsos	PR	Patricia Roder		
GN	Giordano Pugliese, APHC NRD	PZ	Peter Zollman		
GC	Greg Coons				
GL	Greg Lapin				

**IEEE/ICES TC95 Subcommittee 2**  
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## CHAT LOG

from Don Haes to everyone: 9:49 AM

Donald Haes, Vice-Chair/Secretary SC2

from Don Haes to everyone: 9:50 AM

If you are an SC2 member, a name will be fine.

If you are an Observer, or if this is your first time attending, please let us know your full name, affiliation, and email address. WELCOME!

For those attending via telephone, our secretary will reach out to you and gather the necessary information.

from Don Haes to everyone: 9:50 AM

Use the “chat” feature to let us know you are here.

from Klaus Bender (privately): 9:52 AM

Klaus Bender is here, recently joined SC2, yesterday

from Xun Zhao to everyone: 9:54 AM

Xun Zhao: Hello everyone!

from Kevin Graf to everyone: 9:54 AM

Kevin Graf, FCC

from Romeo Gallamoza to everyone: 9:54 AM

Romeo Gallamoza

from C-K. Chou to everyone: 9:55 AM

C-K. Chou, retired consultant

from Matt Butcher to everyone: 9:55 AM

Matt Butcher, Sublight

from Robert Cleveland to everyone: 9:56 AM

Robert Cleveland here

from Greg Lapin to everyone: 9:57 AM

Greg Lapin is here

from Robert Kavet to everyone: 9:57 AM

Rob Kavet, Good Morning

from Cory Kihlstrom to everyone: 9:57 AM

Cory Kihlstrom

from Kyle Fisher to everyone: 9:57 AM

Kyle Fisher

from Gulmira Mustapaeva to everyone: 9:57 AM

Gulmira Mustapaeva FCC

from Maxson to everyone: 9:58 AM

David Maxson signing in

from Auke Visser to everyone: 9:58 AM

Auke Visser

from Zak Elliott to everyone: 9:59 AM

Zak Elliott - US Army

from Raj Mathur to everyone: 9:59 AM

Raj Mathur

from Marv Wessel to everyone: 9:59 AM

Marv Wessel

from Art Thansandote to everyone: 9:59 AM

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**CHAT LOG**

Hello everyone.

from Efthymios Karabetos to everyone: 9:59 AM

Efthymios Karabetos, Greek Atomic Energy Commission, efthymios.karabetos@eeae.gr

from giuseppe vecchi to everyone: 9:59 AM

Hi everyone, Giuseppe Vecchi

from Greg Coons to everyone: 10:00 AM

Greg Coons, FCC's EB Columbia Field Office, Greg.Coons@fcc.gov

from Bill bailey to everyone: 10:00 AM

Bill Bailey joined

from Yujuan Zhao Intel to everyone: 10:00 AM

this is Yujuan Zhao from Intel

from Amnon Duvdevany to everyone: 10:01 AM

Amnon Duvdevany

from Darang Tech to everyone: 10:01 AM

Darang Tech,

from Bob Tarsio to everyone: 10:01 AM

Bob Tarsio - BDI

from Klaus Bender to everyone: 10:01 AM

Klaus Bender

from Robert Acacio to everyone: 10:01 AM

Robert Acacio FCC

from Darang Tech to everyone: 10:01 AM

Good morning

from Peter Zollman to everyone: 10:01 AM

Peter Zollman here

from James Futch to everyone: 10:02 AM

James Futch here.

to Ben (privately): 10:09 AM

Hi Ben, would you please lmk your last name? Thanks Don

to Damian A. (privately): 10:09 AM

Hi Damian, would you please lmk your last name? Thanks Don

from Damian A. (privately): 10:10 AM

Last name is Ariza

from Peter Zollman (privately): 10:12 AM

Some BS - Ric didn't get the agenda approved....

to Peter Zollman (privately): 10:13 AM

LOL, I'll snag him

from Ben (privately): 10:14 AM

Benjamin Cotts, Exponent Inc. bcotts@exponent.com (sorry, I thought I had done this in signing in)

from Peter Zollman (privately): 10:15 AM

I propose accept agenda....

from Robert Weller to everyone: 10:31 AM

Sorry I'm late. Please add me to the attendance list.

to Robert Weller (privately): 10:32 AM

Welcome

from Robert Weller (privately): 10:33 AM

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**CHAT LOG**

Thanks. I was apparently using the wrong meeting invitation.

from Darang Tech to everyone: 10:37 AM

Would someone please confirm what the fall protection clearance is? 6 feet or 10 feet?

from Don Haes to everyone: 10:40 AM

Two OSHA standards can apply – 29 CFR 1910, which governs “general industry” safety standards and 29 CFR 1926, which governs construction sites specifically.

from Don Haes to everyone: 10:41 AM

The general industry 1910 standards state that an “employer must ensure that each employee on a walking-working surface with an unprotected side or edge that is 4 feet (1.2 m) or more above a lower level is protected from falling” while the 1926 construction standards specify that “each employee on a walking/working surface 6 feet (1.8 m) or more above a lower level where leading edges are under construction, but who is not engaged in the leading edge work, shall be protected from falling by a guardrail system.”

from Darang Tech to everyone: 10:48 AM

Thank you, Don.

from giuseppe vecchi to everyone: 10:53 AM

sorry to leave during this discussion, but I have a conflicting meeting I cannot skip- Giuseppe

from Jerrold Bushberg to everyone: 11:09 AM

Hi Don: construction standards specify that “each employee on a walking/working surface 6 feet (1.8 m) or more above a lower level where leading edges are under construction, but who is not engaged in the leading edge work, shall be protected from falling by a guardrail system.”

from Jerrold Bushberg to everyone: 11:11 AM

If the purpose of the measurements were to determine if physical or indiative barriers are required, OSHA would still consider that part of the roof as "under construction" and there 6' rule could be sucessfully appiled if needed

from Don Haes to everyone: 11:18 AM

Thanks for the clarification Jerry.

to Bob Tarsio (privately): 11:33 AM

Thanks for the presentation Bob; be sure to send me (pdf version OK) a copy for inclusion in the minutes. LMK if you need my email address. Thanks Don

from Darang Tech to everyone: 11:54 AM

Thank you Jerry.

from Matt Butcher to everyone: 11:56 AM

Thanks Ric et al for a great meeting. I have to jump to another call.

from Cory Kihlstrom to everyone: 11:59 AM

Thank you. I also have to jump to another call.

from Jerrold Bushberg to everyone: 11:59 AM

Thanks Ric & Don

from Jerrold Bushberg to everyone: 11:59 AM

Tanks Ric & Don Great meeting

from Maxson to everyone: 12:01 PM

OSHA also allows warning line systems on rooftops:

from Maxson to everyone: 12:02 PM

1926.502(f)

"Warning line systems." Warning line systems [See 1926.501(b)(10)] and their use shall comply with the following provisions:

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**CHAT LOG**

1926.502(f)(1)

The warning line shall be erected around all sides of the roof work area.

1926.502(f)(1)(i)

When mechanical equipment is not being used, the warning line shall be erected not less than 6 feet (1.8 m) from the roof edge.

1926.502(f)(1)(ii)

When mechanical equipment is being used, the warning line shall be erected not less than 6 feet (1.8 m) from the roof edge which is parallel to the direction of mechanical equipment operation, and not less than 10 feet (3.1 m) from the roof edge which is perpendicular to the direction of mechanical equipment operation.

# RF MONITORING AS PART OF AN OVERALL RF SAFETY SITE PLAN

Presenter: Bob Tarsio – President of Broadcast Devices, Inc.



## RF Sites today present challenges to compliance with RF Safety Rules

Two areas of concern include public and occupational exposure

This presentation will concentrate occupational exposure and how to develop an RF safety program which includes RF monitoring and safety devices.

Our firm Broadcast Devices, Inc. has been engaged in the business of manufacturing and providing accurate RF power measurement, antenna protection devices and status monitoring for RF sites.

This presentation will show how this technology in addition to a well developed measurement program can work together to provide a plan to keep personnel safe and provide a level of protection to equipment.



## FIRST STEPS IN AN RF SAFETY PROGRAM:

1. Develop a measurement program to determine the actual RF levels present in operational areas normally encountered by occupational personnel
2. Based on the above develop an operational plan that may include reduced operating RF levels that provide the RF generator with reduced power operation and at the same time provide a safe operating environment for occupational personnel
3. Develop a monitoring system that provides accurate assessment of operational conditions at a given site. At the same time provide status and alarm conditions such that can be used to safeguard against unsafe entry to high RF level areas. This information can be provided in a number of forms to be described.

### Three areas of consideration for adding instrumentation to an RF Safety Plan:

RF Power Monitoring – Accurate Power Indication can provide operational conditions that may provide RF operation while at the same time provide a safe operating condition –  
*Flexibility for the site operator, tower crews and maintenance personnel*

RF Status Indication – Basic indication of operational conditions – RF Presence or safe condition indicators for quick identification of which antennas are active and which are not

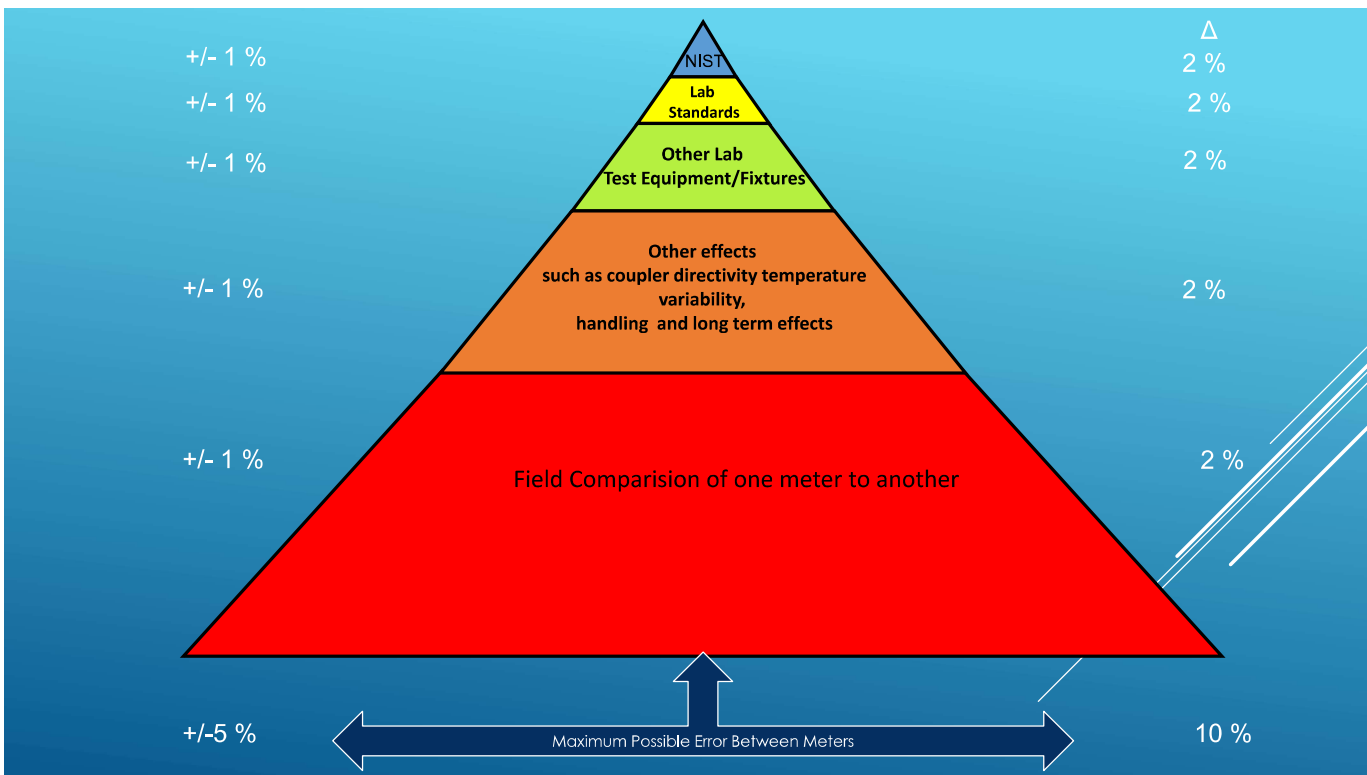
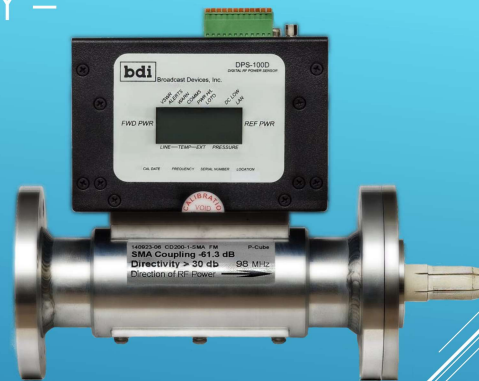
RF Alarm Indication - Provide closures for light indication or sonic alarms to indicate imminent entry to an area that is unsafe to enter.

Logging of Events - System can provide logging of RF events and send periodic emails of RF events including, VSWR Trip, RF On/Off with time-date stamp and other status events including Lock Out Tag Out status

# RF POWER MEASUREMENT ACCURACY – CONFIDENCE

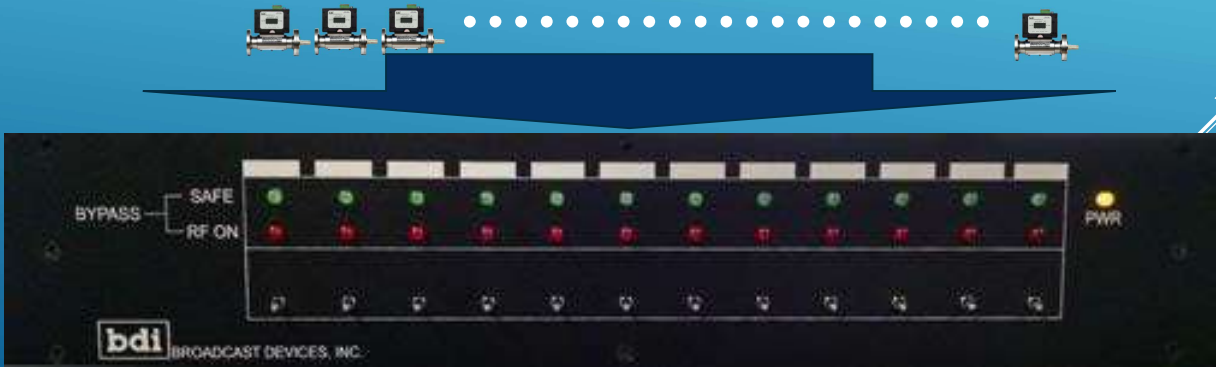
## BDI'S DPS-100D SERIES TRUE RMS POWER MONITORS

MODELS AVAILABLE FROM:  
 N TYPE, DIN, EIA 7/8" 1-5/8" 4-1/16"  
 6-1/8", 9" AND WAVEGUIDE SIZES TO  
 4 GHZ OTHER FREQUENCY RANGES FROM  
 200KHZ TO 4 GHZ IN SEGMENTS



# STATUS MONITORING – SIMPLE PANEL INDICATIONS CAN PROVIDE A WEALTH OF INFORMATION

Multiple meters reporting from various locations provide a quick indication of RF Presence



## Typical Preventive Actions an RF Safety Monitoring System For Loss Prevention

Faults

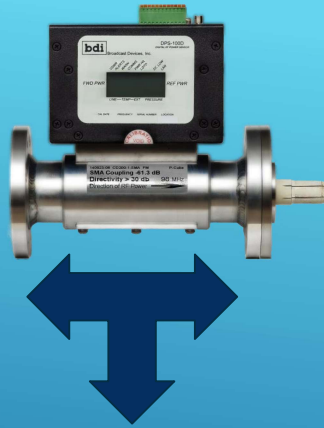
Warnings



# REPORTING:



Aural and Visual



Frequency:	494.310	MHZ
Forward Power	0.00W	Reflected Power 0.00W
VSWR	1.00:1	
Internal Temp:	97°F	External Temp: -58°F
Pressure:	OPSI	
Test Points	RF Status	Control
<input checked="" type="checkbox"/> External Temperature = 97°F	<input checked="" type="checkbox"/> RF INPUT 1	Transmitter
<input checked="" type="checkbox"/> External Temperature = 50°F	<input checked="" type="checkbox"/> RF INPUT 2	SWR
<input checked="" type="checkbox"/> Pressure = 20PSI	<input checked="" type="checkbox"/> RF INPUT 3	3-Stroke 0
<input checked="" type="checkbox"/> Forward Power = 0.000W	<input checked="" type="checkbox"/> RF INPUT 4	
<input checked="" type="checkbox"/> VSWR = 1.00	<input checked="" type="checkbox"/> RF INPUT 6 - LOTO	

Real Time Display



Email Reporting and Logging



Consolidated Visual Display of RF Conditions



## A BDI installed system at the Empire State Building -NYC

System Reporting of 19 FM Radio Stations

Accurate Real time RF Power Measurement for 19 stations across 3 antennas

RF Safe Status for all stations

RF Switch Control and Position status for all stations providing active antenna status

Complete local and remote monitoring of all antenna ports

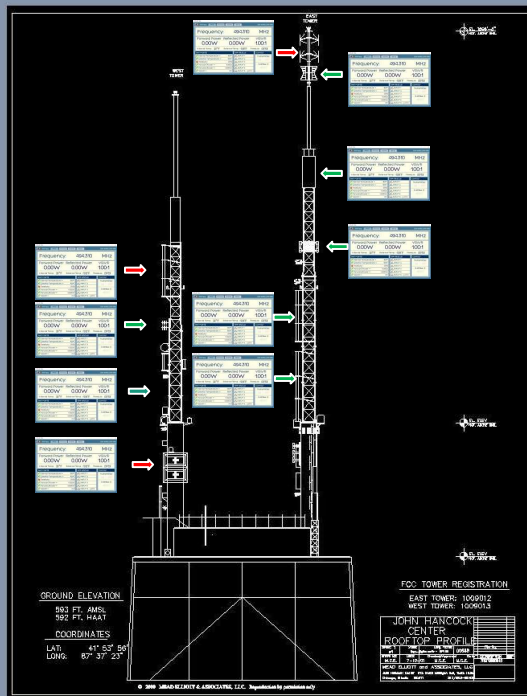
BDL\_NOC

bdi + Add Station +

Main Antenna Upper Bay		Main Antenna Lower Bay		Main Combiner Out	
0000 W Forward Power	0000 W Reflected Power	0000 W Forward Power	0000 W Reflected Power	0000 W Forward Power	0000 W Reflected Power
Auxiliary 1 Antenna		Auxiliary 2 Antenna			
0000 W Forward Power	0000 W Reflected Power	0000 W Forward Power	0000 W Reflected Power		
WBLS FM 107.5		WBAI FM 99.5			
0000 W Forward Power	0000 W Reflected Power	0000 W Forward Power	0000 W Reflected Power		
WLTW FM 106.7		WRKS FM 98.7			
0000 W Forward Power	0000 W Reflected Power	0000 W Forward Power	0000 W Reflected Power		
WQXR FM 105.9		WSKG FM 97.9			
0000 W Forward Power	0000 W Reflected Power	0000 W Forward Power	0000 W Reflected Power		
WWPR FM 105.1		WQHT FM 97.1			
0000 W Forward Power	0000 W Reflected Power	0000 W Forward Power	0000 W Reflected Power		
WAXQ FM 104.3		WLAX FM 96.3			
0000 W Forward Power	0000 W Reflected Power	0000 W Forward Power	0000 W Reflected Power		
WKTU FM 103.5		WPLJ FM 95.5			
0000 W Forward Power	0000 W Reflected Power	0000 W Forward Power	0000 W Reflected Power		
WFSH FM 102.7		WNYC FM 93.9			
0000 W Forward Power	0000 W Reflected Power	0000 W Forward Power	0000 W Reflected Power		
WFAN FM 101.9		WPAT FM 93.1			
0000 W Forward Power	0000 W Reflected Power	0000 W Forward Power	0000 W Reflected Power		
WCBS FM 101.1		WNYL FM 92.3			
0000 W Forward Power	0000 W Reflected Power	0000 W Forward Power	0000 W Reflected Power		
WHTZ FM 100.3		Station Name			
0000 W Forward Power	0000 W Reflected Power	0000 W Forward Power	0000 W Reflected Power		

Network Operations Monitor Rev:2.0.20

Basic Monitoring of all stations and antennas with alarm reporting



## TO SUMMARIZE:

RF Safety Starts with numerical and/or calculated fields to determine safety level

RF Monitoring/Status can be added to give a complete dynamic picture of real time operations

RF Monitoring systems has built in FAILSAFE properties for assurance that info and status are real and current

Record Keeping available for operations at a given site along with status reporting via email

**Thank you for your attention and time!**

**[www.broadcast-devices.com](http://www.broadcast-devices.com)**

**(914)-737-5032**