Summary of ICES TC34 Activities

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Outline

• ICES TC34 Report
  – TC34 Reorganization
  – IEEE 1528.1 – 1528.4 Dual Logo with IEC

• ICES TC34 SC1 Activities
  – Measurement standard
    • IEEE 1528-2003

• ICES TC34 SC2 Activities
  – Computational standards
    • IEEE 1528.1: Finite-Difference Time-Domain methods
    • IEEE 1528.2: Vehicle-mounted antennas
    • IEEE 1528.3: Wireless Handsets
    • IEEE 1528.4: Finite Element Method
Liaison with International Groups:
ICNIRP, WHO, IEC, NATO...

Liaison with National Groups:
NCRP, ACGIH, US Fed. Agencies, Canada, China, Ireland...

Exposure Standards
TC-95
SC-1: Meas. Techniques and Instr.
SC-3: Safety Levels; 0-3 kHz
SC-4: Safety Levels; 3 kHz - 300 GHz
SC-5: Electro-Explosive Devices

Product Standards
TC-34
SC-1
SC-2
SC-3

Environmental Standards?
TC-XX
SC-1: Marine Radar
SC-2: Wireless Telecom Devices
SC-3: RF-Protective Clothing

IEEE SASB
ICES (AdCom)
(SCC-39)

Management, Oversight, Fundraising, etc.

ICES (IEEE SCC39)
ICES – TC34 Reorganization

Product Standards

Recommended Practice for Determining the Peak Spatial-Average Specific Absorption Rate (SAR) in the Human Body from Wireless Communications Devices, 30 MHz - 6 GHz

WG-1: General Requirements for using the Finite Difference Time Domain (FDTD) Method for SAR Calculations
WG-2: Specific Requirements for Finite Difference Time Domain (FDTD) Modeling of Vehicle Mounted Antennas
WG-3: Specific Requirements for Finite Difference Time Domain (FDTD) Modeling of Mobile Phones/Personal Wireless Devices
WG-4: Requirements for Using the Finite-Element Method for SAR Calculations
Who sets standards for Wireless Communications Devices?

**RF Assessment Standards**
- Define how to assess products for compliance with exposure standards
- Two international organizations
  - IEEE ICES TC34
  - IEC International Electrotechnical Commission TC 106

**IEEE IEC Dual Logo**
- Formal liaison between two groups for standards development
- Effort to develop 1528.1 – 1528.4 as IEEE-IEC dual logo standard
IEEE P1528-2003™
IEEE Recommended Practice for Determining the Peak Spatial-Average Specific Absorption Rate (SAR) in the Human Head from Wireless Communications Devices: Measurement Techniques

Mark Douglas
Chair TC34/SC1
1. Standard **P1528.1**: “IEEE P1528.1™/D1.0 Draft Recommended Practice for Determining the Peak Spatial-Average Specific Absorption Rate (SAR) in the Human Body from Wireless Communications Devices, 30 MHz - 6 GHz: **General Requirements** for using the Finite Difference Time Domain (FDTD) Method for SAR Calculations”

2. Standard **P1528.2**: “IEEE P1528.2™/D1.0 Draft Recommended Practice for Determining the Peak Spatial-Average Specific Absorption Rate (SAR) in the Human Body from Wireless Communications Devices, 30 MHz - 6 GHz: Specific Requirements for Finite Difference Time Domain (FDTD) Modeling of **Vehicle Mounted Antennas**”

3. Standard **P1528.3**: “IEEE P1528.3™/D1.0 Draft Recommended Practice for Determining the Peak Spatial-Average Specific Absorption Rate (SAR) in the Human Body from Wireless Communications Devices, 30 MHz - 6 GHz: Specific Requirements for Finite Difference Time Domain (FDTD) **Modeling of Mobile Phones/Personal Wireless Devices**”

4. Standard **P1528.4**: “IEEE P1528.4™/D1.0 Recommended Practice for Determining the Peak Spatial Average Specific Absorption Rate (SAR) in the Human Body from Wireless Communications Devices, 30 MHz - 6 GHz: Requirements for Using the **Finite-Element Method for SAR Calculations**, specifically involving Vehicle Mounted Antennas and Personal Wireless Devices”

**IEEE ICES TC34 SC2**
IEEE P1528.1™/D1.00
Draft Recommended Practice for Determining the Peak Spatial-Average Specific Absorption Rate (SAR) in the Human Body from Wireless Communications Devices, 30 MHz - 6 GHz: General Requirements for using the Finite Difference Time Domain (FDTD) Method for SAR Calculations

Andreas Christ
Chair of the Working Group 1
IEEE P1528.2™/D1.0
Draft Recommended Practice for Determining the Peak Spatial-Average Specific Absorption Rate (SAR) in the Human Body from Wireless Communications Devices, 30 MHz - 6 GHz: Specific Requirements for Finite Difference Time Domain (FDTD) Modeling of Vehicle Mounted Antennas

Giorgi Bit-Babik
Chair of the Working Group 2
Introduction

Relatively high power mobile radios are commonly used by government or community services to enable independent and reliable communications.

Example of mobile radio with trunk mount antenna

Antenna model and CAD based numerical model of the vehicle
Objectives

Develop effective and repeatable procedures for computational evaluation of human body exposure to RF energy emitted by vehicle mount antennas

Develop and standardize reasonably conservative and representative exposure test configurations

Minimize uncertainties of exposure evaluation related to limited accuracy of computational tools and account for physical model approximations
Exposure from mobile radios

Typical source: VHF or UHF mobile radios with trunk or roof mount antennas
Compliance test configurations

Bystander Exposure

Passenger Exposure
Test configuration

Antenna and CAD based numerical model of the car

Human body model

Characteristics
5 mm resolution in X-Y-Z
23 tissues
Broadband dielectric property description
Bystander and passenger Exposure
Typical Vehicle Mount Antennas

- **UHF λ/4 monopole**
- **VHF λ/4 monopole**

- **Embedded matching network**
- **Gain UHF antennas**
Validation of numerical antenna models
(near field measurements)

DASY system

Probe at all time tilted at 45 degree from vertical position to minimize interaction with antenna and ground plane

Antenna under test

Scan grid

45°
UHF Gain Antenna – 400 MHz

FDTD Simulation

DASY4

HAE6011A
VHF \( \frac{1}{4} \) monopole – 150 MHz

E-field

H-field

FDTD Simulation

FDTD Simulation

VHF \( \frac{1}{4} \) monopole
Minimizing the uncertainties of exposure evaluation

Plane wave @ 150 MHz with four different direction

Right-side

Front

Back

Left-side

1-g SAR distribution at 150 MHz in sagittal plane for back, front and side incidence
Computational exposure evaluation enables otherwise unpractical compliance assessment of mobile radio products with respect to RF exposure limits.

Well defined and standardized numerical procedures are critical for consistent and repeatable numerical SAR computations.

Several studies are underway to quantify the variability of computed SAR values and develop uncertainties budget for numerical exposure evaluation in standardized test configurations.

Expected completion of the draft by the end of 2009.
IEEE P1528.3™/D1.0
IEEE P1528.3™/D1.0 Draft Recommended Practice for Determining the Peak Spatial-Average Specific Absorption Rate (SAR) in the Human Body from Wireless Communications Devices, 30 MHz - 6 GHz: Specific Requirements for Finite Difference Time Domain (FDTD) Modeling of Mobile Phones/Personal Wireless Devices

Martin Siegbahn
Chair of the Working Group 3
IEEE P1528.4™/D1.0
P1528.4™/D1.0 Recommended Practice for Determining the Peak Spatial Average Specific Absorption Rate (SAR) in the Human Body from Wireless Communications Devices, 30 MHz - 6 GHz: Requirements for Using the Finite-Element Method for SAR Calculations, specifically involving Vehicle Mounted Antennas and Personal Wireless Devices

Martin Vogel
Chair of the Working Group 4
Recommended Practice 1528.4 will cover the same ground as 1528.1 (general), 1528.2 (vehicle-mounted antennas) and 1528.3 (mobile phones and personal wireless devices) combined, but using the finite-element method rather than FD-TD.

Recommended Practice 1528.4 will be very similar to the other ones, since a device should not fail with one method and pass with the other.
Activities 1528.4

General participation in discussions and action items in SC2, e.g. SAR averaging for 1528.1, SAM healing, etc.

Participation in vehicle-mounted antenna simulations for 1528.2 (comparisons for models without passengers or bystanders)

E-field result of vehicle-mounted antenna simulation at 450 MHz
Activities 1528.4

Participation in SAR simulations with generic phone model and SAM head for 1528.3

Draft recommended practice 1528.4 is “in sync” with the other three.
IEEE TC95 / SC1
Howard Bassen

Draft Recommended Practice for Measurements and Computations of Human Exposure to Electric and Magnetic Fields, 0 Hz to 100 kHz C95.3.1

1. draft was finished on January 9, 2009

2. On Jan 12, the draft standard was sent to subcommittee members for balloting. Balloting closed on Jan 30

3. Balloting results:

   Approve 8
   Approve With Comments 11
   Disapprove 2
   Abstain 2

4. On February 5, 2009 SC1 held a meeting at the FDA headquarters in White Oak Maryland to review and prepare responses to the comments and address other issues raised. During and after this meeting the draft standard was extensively edited and prepared for a recirculation balloting by the subcommittee. This balloting will take place in June.

5. Once the recirculation balloting process is completed a sponsor ballot will be held. The announcement for this was issued and over 70 persons have registered for this.
Thank you.