RF Exposure Procedures

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Overview

- Hall Effect/G-Sensors for convertible laptops
- RF Exposure Test Setup Photographs
- FCC Rules, FCC KDB Publications, Standards Documents
- Standards Update – IEC/IEEE 62209-1528: 2020

Hall Effect and Gravity Sensor Guidance

- **Guidance Update:** Hall Effect and G-Sensor based power reduction for convertible laptops can now apply PAG reuse procedure per section III of FCC KDB Publication 388624 D02
- **New Guidance Details:**
  - Previously approved power reduction for convertible laptop utilizing Hall effect or G-Sensor PAG required.
  - Applicable only for convertible laptops whose screen rotates around 1 axis, from 0 to 360 degrees, in a clamshell style, from closed mode, to open mode, to tent mode, and finally to tablet mode.
  - Actual screen lid angles where power reduction triggering occurs and amount of power reduction may differ in later applications but the same sensor mechanism hardware as the original PAG must be used.
  - Both the original and later applications must apply the Hall Effect and Gravity Sensor Guidance from slide 10 in the RF Exposure Procedures Presentation from the November 2019 TCB Workshop in determining lid angle where power reduction triggering occurs.

RF Exposure Test Setup Photographs

- Significant variation in RF Exposure Test Setup Photographs among different applications
  - Some contain many photographs. Others contain only a few.
  - Significant variation in quality and/or labeling of photographs
- Discrepancies even among equipment classes within the same application
- Currently no FCC KDB Publication dictating number, type of photographs that are needed

RF Exposure Test Setup Photographs

- Please apply the following recommended guidance. Please note however that it is non-binding. Certain form factors/implementations may require more/less/different types of test setup photographs
- General Guidance: Applies to both SAR and Power Density Test Setup Photographs
  - **All photographs** should be captioned with the test configuration, test position, and test distance they depict.
    - Examples: Head, Right Touch, 0 mm
      Body-Worn, Back, 15 mm
  - **There should be no photographs that are unlabeled**
  - Ideally, all photographs should have a unique number
    - Examples: Photograph 1: Body, Bottom Edge, 10 mm
      Photo A1: Head, Left Tilt, 0 mm
  - Each unique test position should be represented at least once if applicable
    - Examples: Right Touch, Right Tilt, Left Touch, Left Tilt, Front Surface, Back Surface, Top Edge, Bottom Edge, Right Edge, Left Edge
  - No need to repeat photographs for same test configuration, test position, test distance for different wireless mode
    - Example: Head, Right Touch, 0 mm: Only one photograph needed for this test configuration/position. Don't need a separate Right Touch Photo for GSM, WCDMA, LTE, etc.

FCC Rules, FCC KDB Publications, Standards Documents

- With regards to RF Exposure testing in the United States, priority should be given to the Code of Federal Regulations (FCC Rules)
- FCC OET Laboratory interpretation of the Rules and testing requirements are reflected in FCC KDB Publications
- Certain elements of standards documents are incorporated into FCC KDB Publications. Precedence should be given to FCC KDB Publications and guidance.
- KDB Inquires address specific issues/questions about the guidance
- FCC KDB Publications and FCC responses to KDB Inquiries are staff guidance and are not binding on the Commission and will not prevent the Commission from making a different decision in any matter that comes to its attention for resolution. FCC KDB Publications and FCC responses to KDB Inquiries do not necessarily represent the only acceptable methods for demonstrating compliance.

Standards Update IEC/IEEE 62209-1528: 2020

- New IEC/IEEE 62209-1528 Standard release in 2020. There are significant differences between IEEE 1528-2013 standard and 2020 standard
- FCC OET Lab comparing 2020 standard to currently accepted revision (IEEE 1528:2013)
- Draft FCC KDB Publication 865664 D01 SAR Measurement incorporating some changes currently being worked on
  - Expected Draft Publication Date: Fall 2021

Standards Update IEC/IEEE 62209-1528: 2020

- Page 15 of the 2020 standard lists the major differences between the two standards.
- This presentation will address five of those differences:
  - Extension of the frequency range down to 4 MHz and up to 10 GHz
  - Testing of devices with proximity sensors
  - Application of specific phantoms
  - Fast SAR testing procedures, Vector Based Measurement Systems (VBMS)
  - Time-Averaged SAR
- Guidance on following slides is preliminary. Further guidance will be available at the Fall 2021 TCB Workshop

Extension of Frequency Range down to 4 MHz and up to 10 GHz

- 2013 Standard: Frequency range 300 MHz to 6 GHz
- 2020 Standard: Frequency range 4 MHz to 10 GHz
- FCC OET Lab Guidance:
  - SAR testing between 4 MHz and 100 MHz
    - With advent of broadband tissue liquids and confined loop antenna validation sources, SAR testing between 4 MHz -100 MHz has become more common in the past few years
    - FCC OET Lab has allowed SAR testing in this frequency range on a case-by-case basis. No significant issues identified.
    - Moving forward SAR measurement should be the preferred method for demonstrating compliance in this frequency range. KDB Inquiry will still be required for the time being
  - SAR testing between 6 GHz and 10 GHz
    - Currently, SAR testing is applicable only up to 6 GHz
    - Interim testing procedures for 6 – 7 GHz involving SAR, incident power density, absorbed power density are being developed
    - See April 2021 RF Exposure Policies presentation for more information

Proximity Sensors

- 2013 Standard: No mention of proximity sensors
- 2020 Standard: Section 7.7
- FCC OET Lab Guidance:
  - Current FCC OET Guidance on proximity sensors can be found in section 6, FCC KDB Pub 616217 D04
    - This guidance was originally written for tablet form factors. However, proximity sensors are becoming ubiquitous in many other form factors, including most smartphones.
  - Proximity sensor guidance in 2020 Standard is similar to FCC OET guidance however there are some slight differences
  - Moving Forward continue to apply FCC OET guidance on proximity sensors for the time being. Further guidance will be available at the Fall 2021 TCB Workshop

Time-Averaged SAR (TAS)

- 2013 Standard: No mention of TAS
- 2020 Standard: Sections 3.54, 7.4.4.3, 7.6
- FCC OET Lab Guidance:
  - New methods and versions of TAS are emerging frequently
  - Continued work ongoing in IEC/IEEE standards committees
  - Due to rapidly evolving nature of this technology, there is no significant new guidance to present since last workshop.
  - Moving Forward follow existing guidance that was presented at previous workshops.

Application of specific phantoms

- 2013 Standard: Section 5.25, D.4
- 2020 Standard: Annex I, Annex K
- FCC OET Lab Guidance:
  - Hand phantoms:
    - Current FCC guidance does not accept use of Hand phantom during Head SAR tests
    - Computation and experimental studies from 2020 stands reveal inconsistent results.
      - 2020 Standard recommends further study. No adoption of hand phantom for Head SAR test at this time

Application of specific phantoms (continued)

- FCC OET Lab Guidance (continued):
  - Smart watches, VR goggles, and other wearable devices have become more commonplace in the past few years. We will continue to monitor use of the currently accepted SAM and flat phantoms with these form factors and use conditions.
    - Head Stand and Face Down phantoms for testing of these devices has been accepted on case-by-case basis via laboratory KDB Inquiry. Probe trajectory plots and PAG have been required.
    - For wrist worn devices, current FCC guidance recommends using flat phantom or curved neck region of Head phantom.
      - Other options, such as use of a wrist phantom, can be considered on a case-by-case basis via KDB Inquiry
  - Moving Forward FCC OET Lab will continue to accept use of Head Stand, Face Down, and Wrist phantoms on case-by-case basis. KDB Inquiry (with probe trajectory plots) and PAG will be required. Use of hand phantom during Head SAR tests will continue to not be accepted

Fast SAR/Vector Measurement Based Systems (VMBS)

- 2013 Standard: No mention of VMBS
- 2020 Standard: Section 7.9.2, Annex A.4, Annex C
- FCC OET Lab Guidance:
  - Continued work ongoing in IEC/IEEE standards committees and working groups
  - FCC currently reviewing data provided by independent testing laboratories utilizing VMBS
    - Most likely more information utilizing VMBS from test system manufacturers, testing laboratories, and regulatory agencies is needed
  - Moving Forward guidance from previous FCC presentations at TCB Workshop is still applicable
    - Allowed for pre-scan test reduction measurements for 2G/3G technology
    - Final tests to demonstrate compliance should be done on a traditional SAR measurement system

Questions?

Thank You!