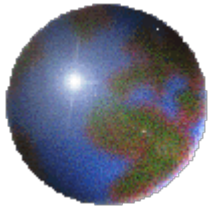
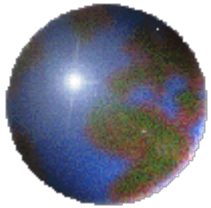


MIC MRA International Workshop 2015



FCC SAR Policies and Procedures

Changes, additions and modifications over the past year

KDB 447498 D01

General RF Exposure Guidance v05r02

- To understand FCC policies and procedures, we must begin with this specific Knowledge Database document
  - “This guidance document serves as an entry point for the RF exposure guidance described in the collection of published RF exposure KDB procedures.”
- Most Recent Edition: Feb 07, 2014

How to find

- KDB 447498
- https://apps.fcc.gov/oetcf/kdb/forms/FTSSearchResultPage.cfm?switch=P&id=20676
- FCC Knowledge Database
- https://apps.fcc.gov/oetcf/kdb/index.cfm

Product Related

- Mobile and Portable Devices (KDB 447498),
- Handset & Accessories (KDB 648474),
- Laptop/Notebook/Netbook & Tablet (KDB 616217),
- USB Dongles (KDB 447498),
- UMPC Mini-Tablets (KDB 941225),
- Occupational PTT Two-Way Radios (KDB 643646)

Wireless Technologies

- 3GPP/3GPP2 Technologies (KDB 941225),
- 802.11 (KDB 248227),
- WiMax (KDB 615223),
- Wireless Routers (KDB 941225),
- Wireless Power Transfer Applications (KDB 680106)

Test Methodologies

- SAR Measurement and Reporting Requirements (KDB 865664)
  - Measurement systems validated per procedures in KDB 865664 (D01). Information must include validation dates, measurement frequencies, SAR probes, calibrated signal type and tissue dielectric parameters.
  - System verification required for probe calibration. Separate system verifications required for head and body tissue-equivalent media, multiple SAR probes used with single or multiple systems and multiple probe calibration points used for different frequency bands etc.

Test Methodologies (cont'd)

- SAR measurement variability and measurement uncertainty analysis results should be included.
- Z-axis plots may be required. These address certain specific concerns such as reflections inside the tissue equivilent media. When Z-axis plots are included, results must be extrapolated to the phantom surface.
- When requested, additional SAR system validation information may be required; for example, due to SAR probe linearity concerns.

Alternate Test Methodologies

- Numerical SAR simulation reports.
  - Written into FCC rules.
  - Usually based on FDTD simulations or other acceptable numerical modeling techniques.
  - Typically computational techniques are limited to situations where ‘traditional’ SAR measurement techniques are impossible.
  - Any test positions where traditional measurements can be performed will be required to confirm model.

Sensor Array SAR Systems

(Fast SAR; Art-Fi)

- (K. Chan April 2014 TCB workshop)

- Next generation SAR measurement systems based on sensor arrays embedded in the SAM or flat phantom
- SAR is “estimated” according to fields calculated by near-field transformation according to specific implementations and assumptions.
- Each measurement typically requires only a few seconds or less.

Sensor Array SAR Systems (cont'd)

- System implementation and specific details are necessary to begin considering applicable KDB procedures.
  a) determine the applicability of individual systems for device testing
  b) establish SAR system validation and verification procedures
  c) verify the validity and accuracy of results for individual device testing

Potential Problems

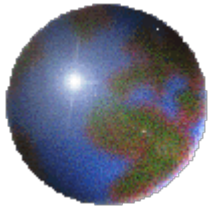
- How to Validate? FCC currently requires a separate head/body tissue-equivilent media. Array systems rely on a universal “soup”. How stable are it’s characteristics?
- How to calibrate? Current probes can be packed up and air-shipped anywhere to original manufacturers on a yearly basis. Array systems will require the same yearly calibration, but of a much bigger, heavier volume *(guess: 50kg?)*

Potential Problems (cont'd)

- Establishing Confidence: FCC is likely to require much system comparison testing between new array measurement systems and 'traditional' SAR measurement techniques before common use is recognized.
  - IEC 62209-3 established 01/2014 but may take several years to finalize procedures and standards.
- For now, such systems can only be considered for SAR screening purposes for supporting complex SAR testing requirements.

Conclusions

- USA SAR limits are the toughest worldwide (1.6W/kg peak per gram vs 2.0W/kg average over 10 gram). Different head and body media are required by law.
- 'Traditional' SAR testing techniques will be valid for quite a number more years
- 'Array' SAR system adoption is driven by the desire for faster SAR measurement techniques. Much work still needs to be done
  - *Will computational SAR modeling techniques replace physical measurements next decade?*



Thank You

William H. Graff

william_graff@micomlabs.com

MiCom Labs

www.micomlabs.com