# FCC SAR TEST REPORT

| | | |
|---|---|---|
| APPLICANT | : | Amazon.com Services LLC |
| EQUIPMENT | : | Electronic Display Device |
| Model Name | : | SA568B |
| FCC ID | : | 2A4DH-5688 |
| STANDARD | : | FCC 47 CFR Part 2 (2.1093) |

We, Sporton International Inc. (Kunshan), would like to declare that the tested sample has been evaluated in accordance with the test procedures given in 47 CFR Part 2.1093 and FCC KDB and has been in compliance with the applicable technical standards.

The test results in this report apply exclusively to the tested model / sample. Without written approval of Sporton International Inc. (Kunshan), the test report shall not be reproduced except in full.

Approved by: Si Zhang

*Sporton International Inc. (Kunshan)*
*No. 1098, Pengxi North Road, Kunshan Economic Development Zone Jiangsu Province 215300*
*People's Republic of China*

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# History of this test report

| Report No. | Version | Description | Issued Date |
|---|---|---|---|
| FA391903-04 | Rev. 01 | Initial issue of report | Jun. 05, 2024 |
| FA391903-04 | Rev. 02 | Updated model name and related data. | Jul. 02, 2024 |
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# 1. Statement of Compliance

The maximum results of Specific Absorption Rate (SAR) found during testing for **Amazon.com Services LLC, Electronic Display Device, SA568B,** are as follows.

| Highest Standalone 1g SAR Summary | | | | |
|---|---|---|---|---|
| Equipment Class | Frequency Band | | Body (Separation 0mm) 1g SAR (W/kg) | Highest Simultaneous Transmission 1g SAR (W/kg) |
| DTS | WLAN | 2.4GHz WLAN | 0.17 | |
| NII | | 5GHz WLAN | 0.14 | 0.46 |
| DSS | Bluetooth | Bluetooth | **0.32** | 0.46 |
| Date of Testing: | | 2024/2/28 and 2024/6/1 ~ 2024/6/2 | | |

Remark: This is a variant report for SA568B. The change note could be referred to Product Equality Declaration which is exhibit separately. According to the change, all the other test results are leveraged from the original report which can be referred to Sporton Report Number FA391903-02.

| Declaration of Conformity: |
|---|
| The test results with all measurement uncertainty excluded are presented in accordance with the regulation limits or requirements declared by manufacturers. |
| Comments and Explanations: |
| The declared of product specification for EUT presented in the report are provided by the manufacturer, and the manufacturer takes all the responsibilities for the accuracy of product specification. |

This device is in compliance with Specific Absorption Rate (SAR) for general population/uncontrolled exposure limits (1.6 W/kg for Partial-Body 1g SAR) specified in FCC 47 CFR part 2 (2.1093) and ANSI/IEEE C95.1-1992, and had been tested in accordance with the measurement methods and procedures specified in IEEE 1528-2013 and FCC KDB publications.

## 2. Administration Data

Sporton International Inc. (Kunshan) is accredited to ISO/IEC 17025:2017 by American Association for Laboratory Accreditation with Certificate Number 5145.02.

| Testing Laboratory | | | |
|---|---|---|---|
| Test Firm | Sporton International Inc. (Kunshan) | | |
| Test Site Location | No. 1098, Pengxi North Road, Kunshan Economic Development Zone<br>Jiangsu Province 215300 People's Republic of China<br>TEL : +86-512-57900158 | | |
| Test Site No. | Sporton Site No. | FCC Designation No. | FCC Test Firm Registration No. |
| | SAR07-KS | CN1257 | 314309 |

| Applicant | |
|---|---|
| Company Name | Amazon.com Services LLC |
| Address | 410 Terry Avenue N Seattle, WA 98109-5210 United States |

# 3. Data Reuse Approach

## 3.1 Introduction Section

This application re-uses data collected on a similar device, FCC ID: 2A4DH-5698 (reference model) and FCC ID: 2A4DH-5688 (variant model). Due to the same design are identical between parent model and variant model, SAR data reuse is requested and spot check data in this report is used to justify the SAR data reuse.

Per KDB 484596 D01 v02r03, the deviation of variant model 1g SAR spot check result was no larger than 3 dB, the WLAN/BT max SAR summary was always choosing the higher SAR between parent model and variant model.

The applicant should take full responsibility that the test data as referenced in this report represent compliance for this FCC ID: 2A4DH-5688

## 3.2 Model Difference Information

The **main** difference between FCC ID: 2A4DH-5698 and FCC ID: 2A4DH-5688 is as below:

- Removed WPT.

other differences and all the details of similarity and difference can be found in the confidential documents (SA568B_Operational Description of Product Equality Declaration).

## 3.3 Reference detail Section

| Rule Part | Equipment Class | Wireless Technology | Frequency Band (MHz) | FCC ID (Reference) | Type Grant/ Permissive Change | Reference Title | FCC ID Filling (Variant) | Test on the variant |
|---|---|---|---|---|---|---|---|---|
| Part 2.1093 | DTS | WiFi | 2400~2483.5 | 2A4DH-5698 | Original Grant | FA391903-01 | 2A4DH-5688 | Spot check |
| | NII | Wi-Fi | 5150 ~ 5250<br>5250 ~ 5350<br>5470 ~ 5725<br>5725 ~ 5850 | 2A4DH-5698 | Original Grant | FA391903-01 | 2A4DH-5688 | Spot check |
| | DSS | Bluetooth | 2400~2483.5 | 2A4DH-5698 | Original Grant | FA391903-01 | 2A4DH-5688 | Spot check |

# 4. Guidance Applied

The Specific Absorption Rate (SAR) testing specification, method, and procedure for this device is in accordance with the following standards:

- FCC 47 CFR Part 2 (2.1093)
- ANSI/IEEE C95.1-1992
- IEEE 1528-2013
- FCC KDB 865664 D01 SAR Measurement 100 MHz to 6 GHz v01r04
- FCC KDB 865664 D02 SAR Reporting v01r02
- FCC KDB 248227 D01 802.11 Wi-Fi SAR v02r02
- FCC KDB 616217 D04 SAR for laptop and tablets v01r02
- FCC KDB 484596 D01 Referencing Test Data v02r03
- FCC KDB 447498 D04 Interim General RF Exposure Guidance v01

# 5. Equipment Under Test (EUT) Information

## 5.1 General Information

| Product Feature & Specification | |
|---|---|
| **Equipment Name** | Electronic Display Device |
| **Model Name** | SA568B |
| **FCC ID** | 2A4DH-5688 |
| **S/N** | Sample2:GN433X0434960046 |
| **Wireless Technology and Frequency Range** | WLAN 2.4GHz Band: 2412 MHz ~ 2472 MHz<br>WLAN 5.2GHz Band: 5180 MHz ~ 5240 MHz<br>WLAN 5.3GHz Band: 5260 MHz ~ 5320 MHz<br>WLAN 5.5GHz Band: 5500 MHz ~ 5720 MHz<br>WLAN 5.8GHz Band: 5745 MHz ~ 5825 MHz<br>Bluetooth: 2402 MHz ~ 2480 MHz |
| **Mode** | WLAN 2.4GHz 802.11b/g/n HT20<br>WLAN 5GHz 802.11a/n HT20/HT40<br>WLAN 5GHz 802.11ac VHT20/VHT40/VHT80<br>Bluetooth BR/EDR/LE |
| **Remark:**<br>1. This device has no voice function.<br>2. 802.11n-HT40 is not supported in 2.4GHz WLAN.<br>3. There are has two batteries under test, for battery 1/2 only suppliers are different, so only battery 1 was chosen to perform full SAR testing. | |

# 6. RF Exposure Limits

## 6.1 Uncontrolled Environment

Uncontrolled Environments are defined as locations where there is the exposure of individuals who have no knowledge or control of their exposure. The general population/uncontrolled exposure limits are applicable to situations in which the general public may be exposed or in which persons who are exposed as a consequence of their employment may not be made fully aware of the potential for exposure or cannot exercise control over their exposure. Members of the general public would come under this category when exposure is not employment-related; for example, in the case of a wireless transmitter that exposes persons in its vicinity.

## 6.2 Controlled Environment

Controlled Environments are defined as locations where there is exposure that may be incurred by persons who are aware of the potential for exposure, (i.e. as a result of employment or occupation). In general, occupational/controlled exposure limits are applicable to situations in which persons are exposed as a consequence of their employment, who have been made fully aware of the potential for exposure and can exercise control over their exposure. The exposure category is also applicable when the exposure is of a transient nature due to incidental passage through a location where the exposure levels may be higher than the general population/uncontrolled limits, but the exposed person is fully aware of the potential for exposure and can exercise control over his or her exposure by leaving the area or by some other appropriate means.

**Limits for Occupational/Controlled Exposure (W/kg)**

| Whole-Body | Partial-Body | Hands, Wrists, Feet and Ankles |
|---|---|---|
| 0.4 | 8.0 | 20.0 |

**Limits for General Population/Uncontrolled Exposure (W/kg)**

| Whole-Body | Partial-Body | Hands, Wrists, Feet and Ankles |
|---|---|---|
| 0.08 | 1.6 | 4.0 |

Whole-Body SAR is averaged over the entire body, partial-body SAR is averaged over any 1gram of tissue defined as a tissue volume in the shape of a cube. SAR for hands, wrists, feet and ankles is averaged over any 10 grams of tissue defined as a tissue volume in the shape of a cube.

# 7. Specific Absorption Rate (SAR)

## 7.1 Introduction

SAR is related to the rate at which energy is absorbed per unit mass in an object exposed to a radio field. The SAR distribution in a biological body is complicated and is usually carried out by experimental techniques or numerical modeling. The standard recommends limits for two tiers of groups, occupational/controlled and general population/uncontrolled, based on a person's awareness and ability to exercise control over his or her exposure. In general, occupational/controlled exposure limits are higher than the limits for general population/uncontrolled.

## 7.2 SAR Definition

The SAR definition is the time derivative (rate) of the incremental energy (dW) absorbed by (dissipated in) an incremental mass (dm) contained in a volume element (dv) of a given density (ρ). The equation description is as below:

$$\mathbf{SAR} = \frac{\mathbf{d}}{\mathbf{dt}}\left(\frac{\mathbf{dW}}{\mathbf{dm}}\right) = \frac{\mathbf{d}}{\mathbf{dt}}\left(\frac{\mathbf{dW}}{\boldsymbol{\rho}\mathbf{dv}}\right)$$

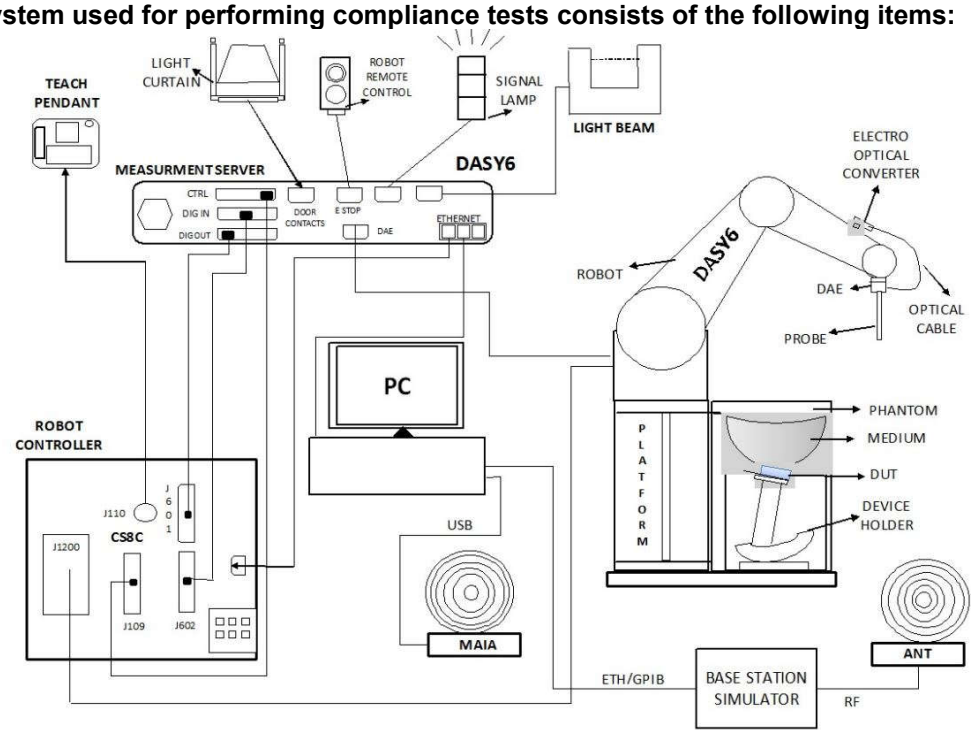
SAR is expressed in units of Watts per kilogram (W/kg)

$$\mathbf{SAR} = \frac{\boldsymbol{\sigma}|\mathbf{E}|^2}{\boldsymbol{\rho}}$$

Where: σ is the conductivity of the tissue, ρ is the mass density of the tissue and E is the RMS electrical field strength.

# 8. System Description and Setup

**The DASY system used for performing compliance tests consists of the following items:**




- A standard high precision 6-axis robot with controller, teach pendant and software. An arm extension for accommodating the data acquisition electronics (DAE).
- An isotropic Field probe optimized and calibrated for the targeted measurement.
- A data acquisition electronics (DAE) which performs the signal amplification, signal multiplexing, AD-conversion, offset measurements, mechanical surface detection, collision detection, etc. The unit is battery powered with standard or rechargeable batteries. The signal is optically transmitted to the EOC.
- The Electro-optical converter (EOC) performs the conversion from optical to electrical signals for the digital communication to the DAE. To use optical surface detection, a special version of the EOC is required. The EOC signal is transmitted to the measurement server.
- The function of the measurement server is to perform the time critical tasks such as signal filtering, control of the robot operation and fast movement interrupts.
- The Light Beam used is for probe alignment. This improves the (absolute) accuracy of the probe positioning.
- A computer running Windows 10 and the DASY6 software.
- Remote control and teach pendant as well as additional circuitry for robot safety such as warning lamps, etc.
- The phantom, the device holder and other accessories according to the targeted measurement.

## 8.1 E-Field Probe

The SAR measurement is conducted with the dosimetric probe (manufactured by SPEAG).The probe is specially designed and calibrated for use in liquid with high permittivity. The dosimetric probe has special calibration in liquid at different frequency. This probe has a built in optical surface detection system to prevent from collision with phantom.

**<EX3DV4 Probe>**

| | |
|---|---|
| **Construction** | Symmetric design with triangular core<br>Built-in shielding against static charges<br>PEEK enclosure material (resistant to organic solvents, e.g., DGBE) |
| **Frequency** | 4 MHz – >10 GHz<br>Linearity: ±0.2 dB (30 MHz – 10 GHz) |
| **Directivity** | ±0.3 dB in TSL (rotation around probe axis)<br>±0.5 dB in TSL (rotation normal to probe axis) |
| **Dynamic Range** | 10 µW/g – >100 mW/g<br>Linearity: ±0.2 dB (noise: typically <1 µW/g) |
| **Dimensions** | Overall length: 337 mm (tip: 20 mm)<br>Tip diameter: 2.5 mm (body: 12 mm)<br>Typical distance from probe tip to dipole centers: 1 mm |

## 8.2 Data Acquisition Electronics (DAE)

The data acquisition electronics (DAE) consists of a highly sensitive electrometer-grade preamplifier with auto-zeroing, a channel and gain-switching multiplexer, a fast 16 bit AD-converter and a command decoder and control logic unit. Transmission to the measurement server is accomplished through an optical downlink for data and status information as well as an optical uplink for commands and the clock.

The input impedance of the DAE is 200 MOhm; the inputs are symmetrical and floating. Common mode rejection is above 80 dB.

**Photo of DAE**

## 8.3 Phantom

**<SAM Twin Phantom>**

| | |
|---|---|
| **Shell Thickness** | 2 ± 0.2 mm;<br>Center ear point: 6 ± 0.2 mm |
| **Filling Volume** | Approx. 25 liters |
| **Dimensions** | Length: 1000 mm; Width: 500 mm; Height: adjustable feet |
| **Measurement Areas** | Left Hand, Right Hand, Flat Phantom |

The bottom plate contains three pair of bolts for locking the device holder. The device holder positions are adjusted to the standard measurement positions in the three sections. A white cover is provided to tap the phantom during off-periods to prevent water evaporation and changes in the liquid parameters. On the phantom top, three reference markers are provided to identify the phantom position with respect to the robot.

**<ELI Phantom>**

| | |
|---|---|
| **Shell Thickness** | 2 ± 0.2 mm (sagging: <1%) |
| **Filling Volume** | Approx. 30 liters |
| **Dimensions** | Major ellipse axis: 600 mm<br>Minor axis: 400 mm |

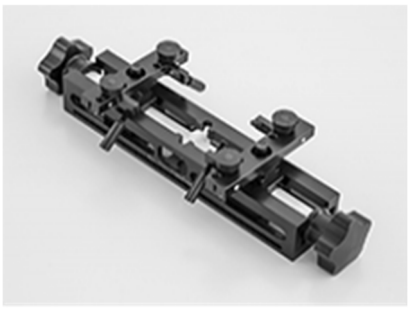
The ELI phantom is intended for compliance testing of handheld and body-mounted wireless devices in the frequency range of 30 MHz to 6 GHz. ELI4 is fully compatible with standard and all known tissue simulating liquids.

## 8.4 Device Holder

**<Mounting Device for Hand-Held Transmitter>**

In combination with the Twin SAM V5.0/V5.0c or ELI phantoms, the Mounting Device for Hand-Held Transmitters enables rotation of the mounted transmitter device to specified spherical coordinates. At the heads, the rotation axis is at the ear opening. Transmitter devices can be easily and accurately positioned according to IEC 62209-1, IEEE 1528, FCC, or other specifications. The device holder can be locked for positioning at different phantom sections (left head, right head, flat). And upgrade kit to Mounting Device to enable easy mounting of wider devices like big smart-phones, e-books, small tablets, etc. It holds devices with width up to 140 mm.

Mounting Device for Hand-Held Transmitters



Mounting Device Adaptor for Wide-Phones

**<Mounting Device for Laptops and other Body-Worn Transmitters>**

The extension is lightweight and made of POM, acrylic glass and foam. It fits easily on the upper part of the mounting device in place of the phone positioned. The extension is fully compatible with the SAM Twin and ELI phantoms.

Mounting Device for Laptops

# 9. Measurement Procedures

The measurement procedures are as follows:

<Conducted power measurement>

(a) For WWAN power measurement, use base station simulator to configure EUT WWAN transmission in conducted connection with RF cable, at maximum power in each supported wireless interface and frequency band.
(b) Read the WWAN RF power level from the base station simulator.
(c) For WLAN/BT power measurement, use engineering software to configure EUT WLAN/BT continuously transmission, at maximum RF power in each supported wireless interface and frequency band
(d) Connect EUT RF port through RF cable to the power meter, and measure WLAN/BT output power

<SAR measurement>

(a) Use base station simulator to configure EUT WWAN transmission in radiated connection, and engineering software to configure EUT WLAN/BT continuously transmission, at maximum RF power, in the highest power channel.
(b) Place the EUT in the positions as Appendix D demonstrates.
(c) Set scan area, grid size and other setting on the DASY software.
(d) Measure SAR results for the highest power channel on each testing position.
(e) Find out the largest SAR result on these testing positions of each band
(f) Measure SAR results for other channels in worst SAR testing position if the reported SAR of highest power channel is larger than 0.8 W/kg

According to the test standard, the recommended procedure for assessing the peak spatial-average SAR value consists of the following steps:

(a) Power reference measurement
(b) Area scan
(c) Zoom scan
(d) Power drift measurement

## 9.1 Spatial Peak SAR Evaluation

The procedure for spatial peak SAR evaluation has been implemented according to the test standard. It can be conducted for 1g and 10g, as well as for user-specific masses. The DASY software includes all numerical procedures necessary to evaluate the spatial peak SAR value.

The base for the evaluation is a "cube" measurement. The measured volume must include the 1g and 10g cubes with the highest averaged SAR values. For that purpose, the center of the measured volume is aligned to the interpolated peak SAR value of a previously performed area scan.

The entire evaluation of the spatial peak values is performed within the post-processing engine (SEMCAD). The system always gives the maximum values for the 1g and 10g cubes. The algorithm to find the cube with highest averaged SAR is divided into the following stages:

(a) Extraction of the measured data (grid and values) from the Zoom Scan
(b) Calculation of the SAR value at every measurement point based on all stored data (A/D values and measurement parameters)
(c) Generation of a high-resolution mesh within the measured volume
(d) Interpolation of all measured values form the measurement grid to the high-resolution grid
(e) Extrapolation of the entire 3-D field distribution to the phantom surface over the distance from sensor to surface
(f) Calculation of the averaged SAR within masses of 1g and 10g

## 9.2 Power Reference Measurement

The Power Reference Measurement and Power Drift Measurements are for monitoring the power drift of the device under test in the batch process. The minimum distance of probe sensors to surface determines the closest measurement point to phantom surface. This distance cannot be smaller than the distance of sensor calibration points to probe tip as defined in the probe properties.

## 9.3 Area Scan

The area scan is used as a fast scan in two dimensions to find the area of high field values, before doing a fine measurement around the hot spot. The sophisticated interpolation routines implemented in DASY software can find the maximum found in the scanned area, within a range of the global maximum. The range (in dB0 is specified in the standards for compliance testing. For example, a 2 dB range is required in IEEE standard 1528 and IEC 62209 standards, whereby 3 dB is a requirement when compliance is assessed in accordance with the ARIB standard (Japan), if only one zoom scan follows the area scan, then only the absolute maximum will be taken as reference. For cases where multiple maximums are detected, the number of zoom scans has to be increased accordingly.

Area scan parameters extracted from FCC KDB 865664 D01v01r04 SAR measurement 100 MHz to 6 GHz.

| | ≤ 3 GHz | > 3 GHz |
|---|---|---|
| Maximum distance from closest measurement point (geometric center of probe sensors) to phantom surface | 5 ± 1 mm | ½·δ·ln(2) ± 0.5 mm |
| Maximum probe angle from probe axis to phantom surface normal at the measurement location | 30° ± 1° | 20° ± 1° |
| Maximum area scan spatial resolution: $\Delta x_{Area}$, $\Delta y_{Area}$ | ≤ 2 GHz: ≤ 15 mm<br>2 – 3 GHz: ≤ 12 mm | 3 – 4 GHz: ≤ 12 mm<br>4 – 6 GHz: ≤ 10 mm |
| | When the x or y dimension of the test device, in the measurement plane orientation, is smaller than the above, the measurement resolution must be ≤ the corresponding x or y dimension of the test device with at least one measurement point on the test device. | |

## 9.4 Zoom Scan

Zoom scans are used assess the peak spatial SAR values within a cubic averaging volume containing 1 gram and 10 gram of simulated tissue. The zoom scan measures points (refer to table below) within a cube shoes base faces are centered on the maxima found in a preceding area scan job within the same procedure. When the measurement is done, the zoom scan evaluates the averaged SAR for 1 gram and 10 gram and displays these values next to the job's label.

Zoom scan parameters extracted from FCC KDB 865664 D01v01r04 SAR measurement 100 MHz to 6 GHz.

| | | | ≤ 3 GHz | > 3 GHz |
|---|---|---|---|---|
| Maximum zoom scan spatial resolution: $\Delta x_{Zoom}$, $\Delta y_{Zoom}$ | | | ≤ 2 GHz: ≤ 8 mm<br>2 – 3 GHz: ≤ 5 mm* | 3 – 4 GHz: ≤ 5 mm*<br>4 – 6 GHz: ≤ 4 mm* |
| Maximum zoom scan spatial resolution, normal to phantom surface | uniform grid: $\Delta z_{Zoom}(n)$ | | ≤ 5 mm | 3 – 4 GHz: ≤ 4 mm<br>4 – 5 GHz: ≤ 3 mm<br>5 – 6 GHz: ≤ 2 mm |
| | graded grid | $\Delta z_{Zoom}(1)$: between 1st two points closest to phantom surface | ≤ 4 mm | 3 – 4 GHz: ≤ 3 mm<br>4 – 5 GHz: ≤ 2.5 mm<br>5 – 6 GHz: ≤ 2 mm |
| | | $\Delta z_{Zoom}(n>1)$: between subsequent points | ≤ 1.5·$\Delta z_{Zoom}(n-1)$ | |
| Minimum zoom scan volume | x, y, z | | ≥ 30 mm | 3 – 4 GHz: ≥ 28 mm<br>4 – 5 GHz: ≥ 25 mm<br>5 – 6 GHz: ≥ 22 mm |

Note: δ is the penetration depth of a plane-wave at normal incidence to the tissue medium; see draft standard IEEE P1528-2011 for details.

* When zoom scan is required and the *reported* SAR from the *area scan based 1-g SAR estimation* procedures of KDB 447498 is ≤ 1.4 W/kg, ≤ 8 mm, ≤ 7 mm and ≤ 5 mm zoom scan resolution may be applied, respectively, for 2 GHz to 3 GHz, 3 GHz to 4 GHz and 4 GHz to 6 GHz.

## 9.5 Volume Scan Procedures

The volume scan is used for assess overlapping SAR distributions for antennas transmitting in different frequency bands. It is equivalent to an oversized zoom scan used in standalone measurements. The measurement volume will be used to enclose all the simultaneous transmitting antennas. For antennas transmitting simultaneously in different frequency bands, the volume scan is measured separately in each frequency band. In order to sum correctly to compute the 1g aggregate SAR, the EUT remain in the same test position for all measurements and all volume scan use the same spatial resolution and grid spacing. When all volume scan were completed, the software, SEMCAD postprocessor can combine and subsequently superpose these measurement data to calculating the multiband SAR.

## 9.6 Power Drift Monitoring

All SAR testing is under the EUT install full charged battery and transmit maximum output power. In DASY measurement software, the power reference measurement and power drift measurement procedures are used for monitoring the power drift of EUT during SAR test. Both these procedures measure the field at a specified reference position before and after the SAR testing. The software will calculate the field difference in dB. If the power drifts more than 5%, the SAR will be retested.

# 10. Test Equipment List

| Manufacturer | Name of Equipment | Type/Model | Serial Number | Calibration | |
|---|---|---|---|---|---|
| | | | | Last Cal. | Due Date |
| SPEAG | 2450MHz System Validation Kit | D2450V2 | 1040 | 2023/4/25 | 2024/4/24 |
| SPEAG | 2450MHz System Validation Kit | D2450V2 | 1095 | 2024/2/8 | 2025/2/7 |
| SPEAG | 5000MHz System Validation Kit | D5GHzV2 | 1113 | 2022/9/23 | 2025/9/22 |
| SPEAG | Data Acquisition Electronics | DAE4 | 1649 | 2023/4/24 | 2024/4/23 |
| SPEAG | Data Acquisition Electronics | DAE4 | 1691 | 2024/4/19 | 2025/4/18 |
| SPEAG | Dosimetric E-Field Probe | EX3DV4 | 7706 | 2024/1/24 | 2025/1/23 |
| SPEAG | SAM Twin Phantom | SAM Twin | TP-2024 | NCR | NCR |
| SPEAG | SAM Twin Phantom | SAM Twin | TP-2022 | NCR | NCR |
| SPEAG | Phone Positioner | N/A | N/A | NCR | NCR |
| Agilent | ENA Series Network Analyzer | E5071C | MY46111157 | 2023/7/5 | 2024/7/4 |
| SPEAG | Dielectric Probe Kit | DAK-3.5 | 1144 | 2023/8/17 | 2024/8/16 |
| Anritsu | Vector Signal Generator | MG3710A | 6201682672 | 2024/1/2 | 2025/1/1 |
| Rohde & Schwarz | Power Meter | NRVD | 102081 | 2023/7/5 | 2024/7/4 |
| Rohde & Schwarz | Power Sensor | NRV-Z5 | 100538 | 2023/7/5 | 2024/7/4 |
| Rohde & Schwarz | Power Sensor | NRV-Z5 | 100539 | 2023/7/5 | 2024/7/4 |
| R&S | BLUETOOTH TESTER | CBT | 101246 | 2023/5/15 | 2024/5/14 |
| R&S | BLUETOOTH TESTER | CBT | 100641 | 2024/1/2 | 2025/1/1 |
| Rohde & Schwarz | Spectrum Analyzer | FSV7 | 101631 | 2023/10/11 | 2024/10/10 |
| TES | DIGITAC THERMOMETER | 1310 | 220305411 | 2023/7/8 | 2024/7/7 |
| Testo | Thermo-Hygrometer | 608-H1 | 1241332126 | 2023/7/10 | 2024/7/9 |
| ARRA | Power Divider | A3200-2 | N/A | Note 1 | |
| MCL | Attenuation1 | BW-S10W5+ | N/A | Note 1 | |
| MCL | Attenuation2 | BW-S10W5+ | N/A | Note 1 | |
| MCL | Attenuation3 | BW-S10W5+ | N/A | Note 1 | |
| BONN | POWER AMPLIFIER | BLMA 0830-3 | 087193A | Note 1 | |
| BONN | POWER AMPLIFIER | BLMA 2060-2 | 087193B | Note 1 | |
| Agilent | Dual Directional Coupler | 778D | 20500 | Note 1 | |
| Agilent | Dual Directional Coupler | 11691D | MY48151020 | Note 1 | |

**Note:**

1. Prior to system verification and validation, the path loss from the signal generator to the system check source and the power meter, which includes the amplifier, cable, attenuator and directional coupler, was measured by the network analyzer. The reading of the power meter was offset by the path loss difference between the path to the power meter and the path to the system check source to monitor the actual power level fed to the system check source.
2. Referring to KDB 865664 D01v01r04, the dipole calibration interval can be extended to 3 years with justification. The dipoles are also not physically damaged, or repaired during the interval.
3. The justification data of dipole can be found in appendix C. The return loss is < -20dB, within 20% of prior calibration, the impedance is within 5 ohm of prior calibration.

# 11. System Verification

## 11.1 Tissue Simulating Liquids

For the measurement of the field distribution inside the SAM phantom with DASY, the phantom must be filled with around 25 liters of homogeneous body tissue simulating liquid. For body SAR testing, the liquid height from the center of the flat phantom to the liquid top surface is larger than 15 cm, which is shown in Fig. 11.1.

**Fig 11.1 Photo of Liquid Height for Body SAR**

## 11.2 Tissue Verification

The following tissue formulations are provided for reference only as some of the parameters have not been thoroughly verified. The composition of ingredients may be modified accordingly to achieve the desired target tissue parameters required for routine SAR evaluation.

| Frequency (MHz) | Water (%) | Sugar (%) | Cellulose (%) | Salt (%) | Preventol (%) | DGBE (%) | Conductivity (σ) | Permittivity (εr) |
|---|---|---|---|---|---|---|---|---|
| For Head | | | | | | | | |
| 2450 | 55.0 | 0 | 0 | 0 | 0 | 45.0 | 1.80 | 39.2 |

Simulating Liquid for 5GHz, Manufactured by SPEAG

| Ingredients | (% by weight) |
|---|---|
| Water | 64~78% |
| Mineral oil | 11~18% |
| Emulsifiers | 9~15% |
| Additives and Salt | 2~3% |

**<Tissue Dielectric Parameter Check Results>**

| Frequency (MHz) | Tissue Type | Liquid Temp. (°C) | Conductivity (σ) | Permittivity ($\varepsilon_r$) | Conductivity Target (σ) | Permittivity Target ($\varepsilon_r$) | Delta (σ) (%) | Delta ($\varepsilon_r$) (%) | Limit (%) | Date |
|---|---|---|---|---|---|---|---|---|---|---|
| 2450 | Head | 22.6 | 1.86 | 38.4 | 1.80 | 39.20 | 3.33 | -2.04 | ±5 | 2024/2/28 |
| 5250 | Head | 22.9 | 4.57 | 35.5 | 4.71 | 35.90 | -2.97 | -1.11 | ±5 | 2024/2/28 |
| 5600 | Head | 22.8 | 4.95 | 34.8 | 5.07 | 35.50 | -2.37 | -1.97 | ±5 | 2024/2/28 |
| 5750 | Head | 22.7 | 5.13 | 34.6 | 5.22 | 35.40 | -1.72 | -2.26 | ±5 | 2024/2/28 |
| 2450 | Head | 22.7 | 1.83 | 37.5 | 1.80 | 39.20 | 1.67 | -4.34 | ±5 | 2024/6/1 |
| 5250 | Head | 22.6 | 4.60 | 35.9 | 4.71 | 35.90 | -2.34 | 0.00 | ±5 | 2024/6/2 |
| 5600 | Head | 22.6 | 5.00 | 35.3 | 5.07 | 35.50 | -1.38 | -0.56 | ±5 | 2024/6/2 |
| 5750 | Head | 22.6 | 5.17 | 35.1 | 5.22 | 35.40 | -0.96 | -0.85 | ±5 | 2024/6/2 |

## *11.3 System Performance Check Results*

Comparing to the original SAR value provided by SPEAG, the verification data should be within its specification of 10 %. Below table shows the target SAR and measured SAR after normalized to 1W input power. The table below indicates the system performance check can meet the variation criterion and the plots can be referred to Appendix A of this report.

| Date | Frequency (MHz) | Tissue Type | Input Power (mW) | Dipole S/N | Probe S/N | DAE S/N | Measured 1g SAR (W/kg) | Targeted 1g SAR (W/kg) | Normalized 1g SAR (W/kg) | Deviation (%) |
|---|---|---|---|---|---|---|---|---|---|---|
| 2024/2/28 | 2450 | Head | 50 | 1040 | 7706 | 1649 | 2.64 | 52.70 | 52.8 | 0.19 |
| 2024/2/28 | 5250 | Head | 50 | 1113 | 7706 | 1649 | 3.89 | 81.50 | 77.8 | -4.54 |
| 2024/2/28 | 5600 | Head | 50 | 1113 | 7706 | 1649 | 4.44 | 82.60 | 88.8 | 7.51 |
| 2024/2/28 | 5750 | Head | 50 | 1113 | 7706 | 1649 | 4.17 | 80.80 | 83.4 | 3.22 |
| 2024/6/1 | 2450 | Head | 50 | 1095 | 7706 | 1691 | 2.77 | 52.60 | 55.4 | 5.32 |
| 2024/6/2 | 5250 | Head | 50 | 1113 | 7706 | 1691 | 3.90 | 81.50 | 78 | -4.29 |
| 2024/6/2 | 5600 | Head | 50 | 1113 | 7706 | 1691 | 4.36 | 82.60 | 87.2 | 5.57 |
| 2024/6/2 | 5750 | Head | 50 | 1113 | 7706 | 1691 | 3.84 | 80.80 | 76.8 | -4.95 |

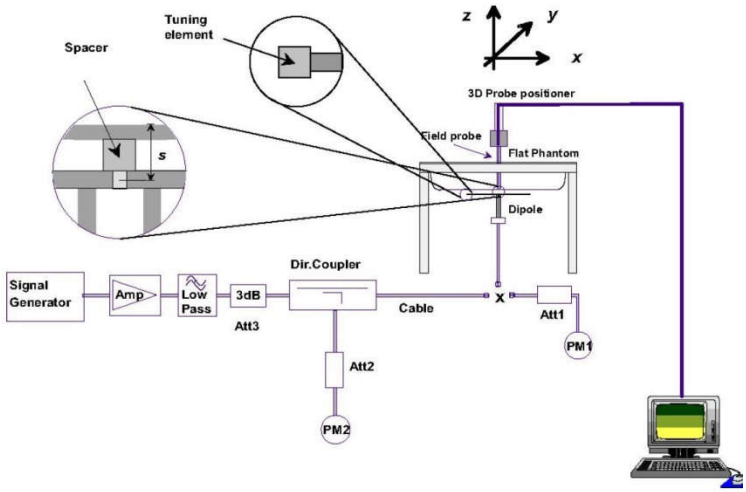



Fig 8.3.1 System Performance Check Setup

Fig 8.3.2 Setup Photo

# 12. RF Exposure Positions

## 12.1 SAR Testing for Tablet

This device can be used also in full sized tablet exposure conditions, due to its size. Per FCC KDB 616217, the back surface and edges of the tablet should be tested for SAR compliance with the tablet touching the phantom. The SAR exclusion threshold in KDB 447498 D04v01 can be applied to determine SAR test exclusion for adjacent edge configurations. The closest distance from the antenna to an adjacent tablet edge is used to determine if SAR testing is required for the adjacent edges, with the adjacent edge positioned against the phantom and the edge containing the antenna positioned perpendicular to the phantom.

**<EUT Setup Photos>**

Please refer to the test setup photos.

# 13. Spot check Verification for Conducted RF Output Power (Unit: dBm)

**General Note:** Conducted power test against the variant project based on the worst-case SAR condition from the original project was performed in this filing to demonstrate the test data from original project remains representative for the variant project. Summary for power spot check for each rule entry and technology is listed as below:

## <WLAN Conducted Power>

| Ant 1 | | | | | | |
|---|---|---|---|---|---|---|
| 2.4GHz WLAN | Mode | Channel | Frequency (MHz) | Average power (dBm) | Tune-Up Limit | Duty Cycle % |
| | 802.11b 1Mbps | 11 | 2462 | 16.21 | 17.00 | 100 |

| Ant 2 | | | | | | |
|---|---|---|---|---|---|---|
| 5.3GHz WLAN | Mode | Channel | Frequency (MHz) | Average power (dBm) | Tune-Up Limit | Duty Cycle % |
| | 802.11n-HT40 MCS0 | 54 | 5270 | 14.78 | 15.00 | 100 |

| Ant 2 | | | | | | |
|---|---|---|---|---|---|---|
| 5.5GHz WLAN | Mode | Channel | Frequency (MHz) | Average power (dBm) | Tune-Up Limit | Duty Cycle % |
| | 802.11n-HT40 MCS0 | 126 | 5630 | 14.56 | 15.00 | 100 |

| Ant 2 | | | | | | |
|---|---|---|---|---|---|---|
| 5.8GHz WLAN | Mode | Channel | Frequency (MHz) | Average power (dBm) | Tune-Up Limit | Duty Cycle % |
| | 802.11n-HT40 MCS0 | 159 | 5795 | 14.54 | 15.00 | 100 |

## <Bluetooth Conducted Power>

| Mode | Channel | Frequency (MHz) | Average power (dBm) |
|---|---|---|---|
| | | | 1Mbps |
| Bluetooth BR/EDR | CH 39 | 2441 | 6.94 |
| Tune-up Limit | | | 7.00 |

# 14. Antenna Location

The detailed antenna location information can refer to SAR Test Setup Photos.

# 15. Spot Check SAR Test Results

**Spot Check General Note:**

1. According to section 3.3, spot check conducted power test against the variant project based on the worst-case SAR condition from the original project was performed in this filing to demonstrate the test data from original project remains representative for the variant project. Detail Conducted power measurement referred to section 13.
2. SAR spot check verification on the worst cases from the original model was performed to demonstrate the test data from original model remains representative for the variant model.
3. Per KDB 484596 D01 v02r03, the variant filings must demonstrate that the referenced test data remain valid for the variant device by including spot-check measurements that meet the following criteria:
   a. Spot-check measurements shall be made in correspondence to the worst-case scenario reported in the reference device filing, i.e., for those conditions that are the closest to non-compliance
   b. Spot-check measurements, while being always compliant with the applicable rule part(s) for the test under consideration, may show a deviation ddB from the reference data no larger than 3 dB:

      $$d_{dB} = | VdB – RdB | \leq 3\ dB \quad (1)$$

      where between VdB, the variant spot-check level in dB, and RdB is the corresponding measurement level in dB for the reference model.
4. The Spot check results showed that deviation of the SAR results did not exceed 3 dB, therefore referring to the guidance in the KDB inquiry, SAR data reuse is justified.
5. 1st as parent model, 2nd as variant model.

## 15.1 Body SAR

| Plot No. | Band | Mode | Test Position | Gap (mm) | Antenna | Ch. | Freq. (MHz) | Sample | Average Power (dBm) | Tune-Up Limit (dBm) | Tune-up Scaling Factor | Duty Cycle % | Final Max Duty Cycle % | Duty Cycle Scaling Factor | Power Drift (dB) | Measured 1g SAR (W/kg) | Reported 1g SAR (W/kg) | Deviation (%) | Deviation $d_{dB}$(dB) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | WLAN2.4GHz | 802.11b 1Mbps | Bottom Face | 0mm | Ant 1 | 11 | 2462 | 1 | 16.68 | 17.00 | 1.076 | 100 | 5.18 | 0.052 | -0.05 | 3.050 | 0.171 | -1% | 0.03 |
| 01 | WLAN2.4GHz | 802.11b 1Mbps | Bottom Face | 0mm | Ant 1 | 11 | 2462 | 2 | 16.21 | 17.00 | 1.199 | 100 | 5.18 | 0.052 | 0.07 | 2.730 | **0.170** | | |
| | Bluetooth | 1Mbps | Bottom Face | 0mm | Ant 1 | 39 | 2441 | 1 | 6.94 | 7.00 | 1.014 | 76.74 | 83.3 | 1.085 | -0.07 | 0.253 | 0.278 | 15% | 0.60 |
| 02 | Bluetooth | 1Mbps | Bottom Face | 0mm | Ant 1 | 39 | 2441 | 2 | 6.94 | 7.00 | 1.014 | 76.74 | 83.3 | 1.085 | -0.03 | 0.290 | **0.319** | | |
| | WLAN5.3GHz | 802.11n-HT40 MCS0 | Edge 3 | 0mm | Ant 2 | 54 | 5270 | 1 | 14.83 | 15.00 | 1.040 | 100 | 4.84 | 0.048 | -0.03 | 1.860 | 0.093 | 16% | 0.65 |
| 03 | WLAN5.3GHz | 802.11n-HT40 MCS0 | Edge 3 | 0mm | Ant 2 | 54 | 5270 | 2 | 14.78 | 15.00 | 1.052 | 100 | 4.84 | 0.048 | -0.13 | 2.130 | **0.108** | | |
| | WLAN5.5GHz | 802.11n-HT40 MCS0 | Edge 3 | 0mm | Ant 2 | 126 | 5630 | 1 | 14.82 | 15.00 | 1.042 | 100 | 4.84 | 0.048 | -0.05 | 2.710 | 0.136 | -2% | 0.10 |
| 04 | WLAN5.5GHz | 802.11n-HT40 MCS0 | Edge 3 | 0mm | Ant 2 | 126 | 5630 | 2 | 14.56 | 15.00 | 1.107 | 100 | 4.84 | 0.048 | -0.09 | 2.510 | **0.133** | | |
| | WLAN5.8GHz | 802.11n-HT40 MCS0 | Edge 3 | 0mm | Ant 2 | 159 | 5795 | 1 | 14.61 | 15.00 | 1.094 | 100 | 4.84 | 0.048 | 0.04 | 2.670 | 0.140 | -12% | 0.56 |
| 05 | WLAN5.8GHz | 802.11n-HT40 MCS0 | Edge 3 | 0mm | Ant 2 | 159 | 5795 | 2 | 14.54 | 15.00 | 1.112 | 100 | 4.84 | 0.048 | 0.12 | 2.310 | **0.123** | | |

## 15.2 Repeated SAR Measurement

**<1g>**

| Plot No. | Band | Mode | Test Position | Gap (mm) | Antenna | Ch. | Freq. (MHz) | Average Power (dBm) | Tune-Up Limit (dBm) | Tune-up Scaling Factor | Duty Cycle % | Final Max Duty Cycle % | Duty Cycle Scaling Factor | Power Drift (dB) | Measured 1g SAR (W/kg) | Ratio | Reported 1g SAR (W/kg) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1st | WLAN2.4GHz | 802.11b 1Mbps | Bottom Face | 0mm | Ant 1 | 11 | 2462 | 16.21 | 17.00 | 1.199 | 100 | 5.18 | 0.052 | 0.07 | 2.730 | 1 | 0.170 |
| 2nd | WLAN2.4GHz | 802.11b 1Mbps | Bottom Face | 0mm | Ant 1 | 11 | 2462 | 16.21 | 17.00 | 1.199 | 100 | 5.18 | 0.052 | 0.11 | 2.550 | 1.071 | 0.159 |
| 1st | WLAN5.3GHz | 802.11n-HT40 MCS0 | Edge 3 | 0mm | Ant 2 | 54 | 5270 | 14.78 | 15.00 | 1.052 | 100 | 4.84 | 0.048 | -0.13 | 2.130 | 1 | 0.108 |
| 2nd | WLAN5.3GHz | 802.11n-HT40 MCS0 | Edge 3 | 0mm | Ant 2 | 54 | 5270 | 14.78 | 15.00 | 1.052 | 100 | 4.84 | 0.048 | 0.08 | 2.010 | 1.060 | 0.101 |
| 1st | WLAN5.5GHz | 802.11n-HT40 MCS0 | Edge 3 | 0mm | Ant 2 | 126 | 5630 | 14.56 | 15.00 | 1.107 | 100 | 4.84 | 0.048 | -0.09 | 2.510 | 1 | 0.133 |
| 2nd | WLAN5.5GHz | 802.11n-HT40 MCS0 | Edge 3 | 0mm | Ant 2 | 126 | 5630 | 14.56 | 15.00 | 1.107 | 100 | 4.84 | 0.048 | 0.09 | 2.370 | 1.059 | 0.126 |
| 1st | WLAN5.8GHz | 802.11n-HT40 MCS0 | Edge 3 | 0mm | Ant 2 | 159 | 5795 | 14.54 | 15.00 | 1.112 | 100 | 4.84 | 0.048 | 0.12 | 2.310 | 1 | 0.123 |
| 2nd | WLAN5.8GHz | 802.11n-HT40 MCS0 | Edge 3 | 0mm | Ant 2 | 159 | 5795 | 14.54 | 15.00 | 1.112 | 100 | 4.84 | 0.048 | -0.05 | 2.240 | 1.031 | 0.120 |

**General Note:**

1. Per KDB 865664 D01v01r04, for each frequency band, repeated SAR measurement is required only when the measured SAR is ≥0.8W/kg.
2. Per KDB 865664 D01v01r04, if the ratio among the repeated measurement is ≤ 1.2 and the measured SAR <1.45W/kg, only one repeated measurement is required.
3. The ratio is the difference in percentage between original and repeated *measured SAR*.
4. All measurement SAR result is scaled-up to account for tune-up tolerance and is compliant.

# 16. Simultaneous Transmission Analysis

| NO. | Simultaneous Transmission Configurations | Electronic Display Device |
|---|---|---|
| | | Body |
| 1. | WLAN5GHz + Bluetooth | Yes |

**General Note:**

1. EUT will choose either 2.4GHz WLAN or 5GHz WLAN according to the network signal condition; therefore, 2.4GHz WLAN and 5GHz WLAN will not operate simultaneously at any moment.
2. 2.4GHz WLAN and Bluetooth share the same antenna, and cannot transmit simultaneously.
3. Above table listed transmitting simultaneous state is supported only for this device.
4. According to the EUT characteristic, WLAN 5GHz and Bluetooth can transmit simultaneously.
5. Per KDB 447498 D04v01, simultaneous transmission SAR is compliant if,
   i) 1g Scalar SAR summation < 1.6W/kg.
   ii) SPLSR = (SAR1 + SAR2)^1.5 / (min. separation distance, mm), and the peak separation distance is determined from the square root of [(x1-x2)2 + (y1-y2)2 + (z1-z2)2], where (x1, y1, z1) and (x2, y2, z2) are the coordinates of the extrapolated peak SAR locations in the zoom scan.
   iii) If SPLSR ≤ 0.04 for 1g SAR, simultaneously transmission SAR measurement is not necessary.
   iv) Simultaneously transmission SAR measurement, and the reported multi-band 1g SAR < 1.6W/kg.

**Conclusion:**

1. The Spot check results showed that Deviation of the SAR results did not exceed 3dB, SAR data reuse is justified.
2. Simultaneous transmission analysis for all bands and all position are based on maximum SAR results chosen between the original filing and Spot check Verification Data

## 16.1 Body Exposure Conditions

| Exposure Position | 1 | 2 | 1+2 |
|---|---|---|---|
| | WLAN5GHz | Bluetooth | Summed |
| | 1g SAR (W/kg) | 1g SAR (W/kg) | 1g SAR (W/kg) |
| Bottom Face | 0.091 | 0.319 | 0.41 |
| Edge 3 | 0.140 | 0.319 | **0.46** |

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# 17. Uncertainty Assessment

Per KDB 865664 D01 SAR measurement 100MHz to 6GHz, when the highest measured 1-g SAR within a frequency band is < 1.5 W/kg and the measured 10-g SAR within a frequency band is < 3.75 W/kg. The expanded SAR measurement uncertainty must be ≤ 30%, for a confidence interval of k = 2. If these conditions are met, extensive SAR measurement uncertainty analysis described in IEEE Std 1528-2013 is not required in SAR reports submitted for equipment approval. For this device, the highest measured 1-g SAR is less 1.5W/kg. Therefore, the measurement uncertainty table is not required in this report.

# 18. References


[1] FCC 47 CFR Part 2 “Frequency Allocations and Radio Treaty Matters; General Rules and Regulations”

[2] ANSI/IEEE Std. C95.1-1992, “IEEE Standard for Safety Levels with Respect to Human Exposure to Radio Frequency Electromagnetic Fields, 3 kHz to 300 GHz”, September 1992

[3] IEEE Std. 1528-2013, “IEEE Recommended Practice for Determining the Peak Spatial-Average Specific Absorption Rate (SAR) in the Human Head from Wireless Communications Devices: Measurement Techniques”, Sep 2013

[4] SPEAG DASY System Handbook

[5] FCC KDB 865664 D01 v01r04, "SAR Measurement Requirements for 100 MHz to 6 GHz", Aug 2015.

[6] FCC KDB 865664 D02 v01r02, “RF Exposure Compliance Reporting and Documentation Considerations” Oct 2015.

[7] FCC KDB 248227 D01 v02r02, “SAR Guidance for IEEE 802.11 (WiFi) Transmitters”, Oct 2015.

[8] FCC KDB 616217 D04 v01r02, “SAR Evaluation Considerations for Laptop, Notebook, Netbook and Tablet Computers”, Oct 2015

[9] FCC KDB 447498 D04 v01, “Mobile and Portable Device RF Exposure Procedures and Equipment Authorization Policies”, Nov 2021

[10] FCC KDB 484596 D01 v02r03, “Test Reductions Via Data Referencing”, Mar. 2024


------THE END------