# SAR EVALUATION REPORT

**FCC 47 CFR § 2.1093**
**IEEE Std. 1528-2013**

For
**INFINITY GAME BOARD**

**FCC ID: 2APXHIGB5G**
**Model: IGB-I-301202**

**Report Number: 4791327949.2-SAR-1**

**Issued Date: June 23, 2024**

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Revision History

| Rev. | Issue Date | Revisions | Revised By |
|---|---|---|---|
| V0 | June 23, 2024 | Initial Issue | \ |

Note:

1.This test report is only published to and used by the applicant, and it is not for evidence purpose in China.

2. The measurement result for the sample received is <Pass> according to < IEEE Std. 1528> when < Simple Acceptance> decision rule is applied.

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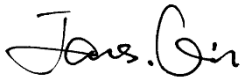
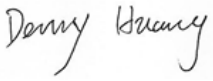
# 1. Attestation of Test Results

| | | |
|---|---|---|
| Applicant Name | WF Tastemakers Trading Limited | |
| Address | Unit 05 and unit 06, 6th Floor, Greenfield Tower Concordia Plaza, 1 Science Museum Road, TST East, Hong Kong | |
| Manufacturer | WF Tastemakers Trading Limited | |
| Address | Unit 05 and unit 06, 6th Floor, Greenfield Tower Concordia Plaza, 1 Science Museum Road, TST East, Hong Kong | |
| EUT Name | INFINITY GAME BOARD | |
| Model | IGB-I-301202 | |
| Sample Received Date | May 15, 2024 | |
| Sample Status | Normal | |
| Sample ID | 7326655 | |
| Date of Tested | May 15, 2024 to June 12, 2024 | |
| Applicable Standards | FCC 47 CFR § 2.1093<br>IEEE Std. 1528-2013<br>KDB publication | |
| **SAR Limits (W/Kg)** | | |
| Exposure Category | Peak spatial-average<br>(1g of tissue) | Extremities (hands, wrists, ankles, etc.)<br>(10g of tissue) |
| General population / Uncontrolled exposure | 1.6 | 4 |
| Occupational / Controlled exposure | 8 | 20 |
| **The Highest Reported SAR (W/kg)** | | |
| **RF Exposure Conditions** | **Equipment Class** | |
| | **DTS** | **NII** |
| Body (1-g) | 0.173 | 0.717 |
| Simultaneous Transmission (1-g) | \ | |
| Test Results | Pass | |
| Prepared By:<br>  <br>James Qin<br>Project Engineer | Reviewed By:<br>  <br>Denny Huang<br>Senior Project Engineer | Approved By:<br>  <br>Stephen Guo<br>Laboratory Manager |

# 2. Test Specification, Methods and Procedures

The tests documented in this report were performed in accordance with IEEE Std.1528-2013, the following FCC Published RF exposure KDB procedures:

- 248227 D01 802.11 Wi-Fi SAR
- 447498 D04 Interim General RF Exposure Guidance
- 690783 D01 SAR Listings on Grants
- 865664 D01 SAR measurement 100 MHz to 6 GHz
- 865664 D02 RF Exposure Reporting
- 616217 D04 SAR for laptop and tablets

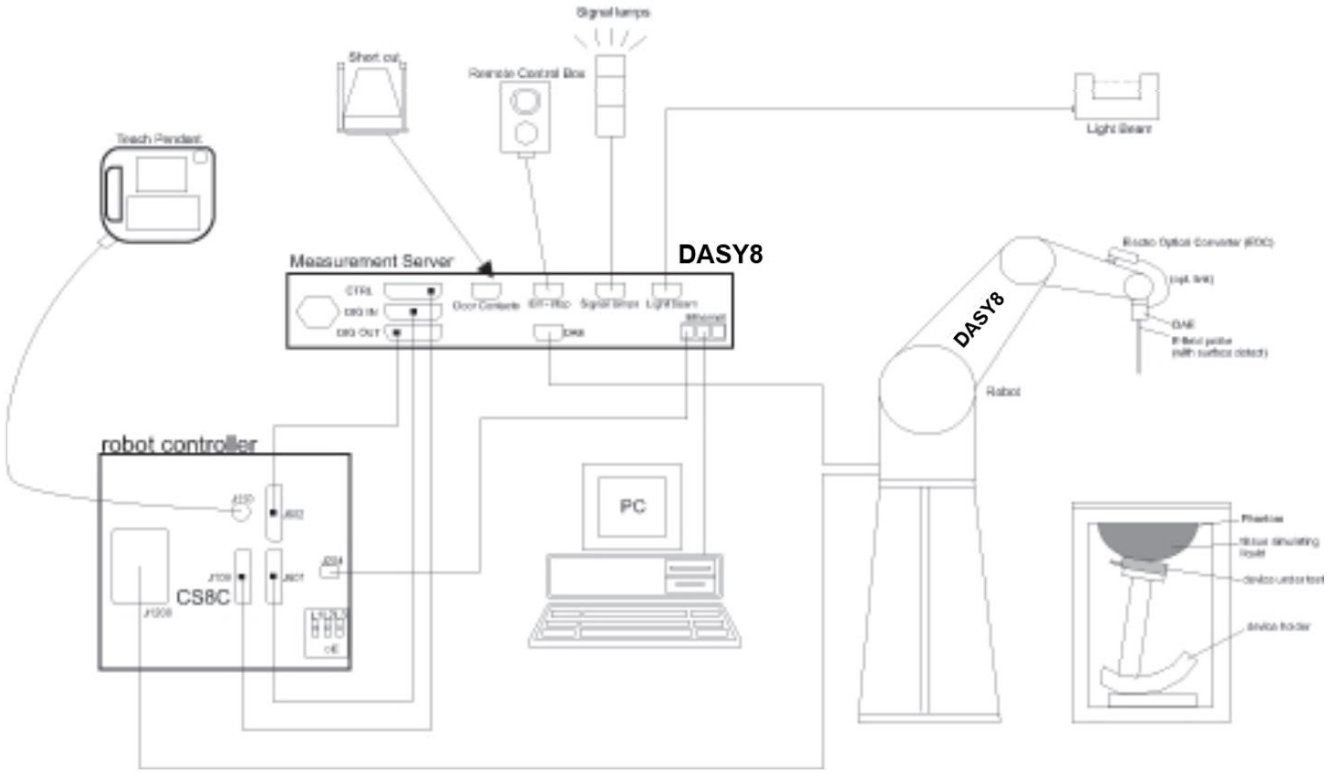
# 3. Facilities and Accreditation

| | |
|---|---|
| Test Location | UL Verification Services (Guangzhou) Co., Ltd. Song Shan Lake Branch. |
| Address | Building 10, Innovation Technology Park, Song Shan Lake Hi-tech Development Zone, Dongguan, 523808, China |
| Accreditation Certificate | **A2LA (Certificate No.: 4102.01)**<br>UL Verification Services (Guangzhou) Co., Ltd. Song Shan Lake Branch has been assessed and proved to be in compliance with A2LA.<br>**FCC (FCC Recognized No.: CN1187)**<br>UL Verification Services (Guangzhou) Co., Ltd. Song Shan Lake Branch has been recognized to perform compliance testing on equipment subject to the Commission's Declaration of Conformity (DoC) and Certification rules<br>**IC (Company No.: 21320)**<br>UL Verification Services (Guangzhou) Co., Ltd. Song Shan Lake Branch has been registered and fully described in a report filed with Industry Canada. The Company Number is 21320.<br>**VCCI (Registration No.: G-20192, C-20153, T-20155 and R-20202)**<br>UL Verification Services (Guangzhou) Co., Ltd. Song Shan Lake Branch. has been assessed and proved to be in compliance with VCCI, the Membership No. is 3793.<br>Facility Name:<br>Chamber D, the VCCI registration No. is G-20192 and R-20202<br>Shielding Room B, the VCCI registration No. is C-20153 and T-20155 |
| Description | All measurement facilities use to collect the measurement data are located at Building 10, Innovation Technology Park, Song Shan Lake Hi-tech Development Zone, Dongguan, 523808, China |

# 4. SAR Measurement System & Test Equipment

## 4.1. SAR Measurement System

**The DASY5 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 Win10 and the DASY8 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.

## 4.2. SAR Scan Procedures

**Step 1: 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. The minimum distance of probe sensors to surface is 2.1 mm. This distance cannot be smaller than the distance of sensor calibration points to probe tip as defined in the probe properties.

**Step 2: 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 locations even in relatively coarse grids. When an Area Scan has measured all reachable points, it computes the field maximal found in the scanned area, within a range of the global maximum. The range (in Db) 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 KDB 865664 D01 v01r04 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 mm ± 1 mm | ½·δ·ln(2) mm ± 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. | |

**Step 3: Zoom Scan**

Zoom Scans are used to assess the peak spatial SAR values within a cubic averaging volume containing 1 g and 10 g of simulated tissue. The Zoom Scan measures points (refer to table below) within a cube whose 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 g and 10 g and displays these values next to the job's label.

Zoom Scan Parameters extracted from KDB 865664 D01 v01r04 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·$\Delta z_{Zoom}(n-1)$ mm | |
| 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: $\delta$ is the penetration depth of a plane-wave at normal incidence to the tissue medium; see IEEE Std 1528-2013 for details.

* When zoom scan is required and the *reported* SAR from the *area scan based 1-g SAR estimation* procedures of KDB Publication 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.

**Step 4: Power drift measurement**

The Power Drift Measurement measures the field at the same location as the most recent power reference measurement within the same procedure, and with the same settings. The Power Drift Measurement gives the field difference in Db from the reading conducted within the last Power Reference Measurement. This allows a user to monitor the power drift of the device under test within a batch process. The measurement procedure is the same as Step 1.

**Step 5: Z-Scan (FCC only)**

The Z Scan measures points along a vertical straight line. The line runs along the Z-axis of a one-dimensional grid. In order to get a reasonable extrapolation the extrapolated distance should not be greater than the step size in Z-direction.

## 4.3. Test Equipment

The measuring equipment used to perform the tests documented in this report has been calibrated in accordance with the manufacturers' recommendations, and is traceable to recognized national standards.

| Name of equipment | Manufacturer | Type/Model | Serial No. | Cal. Due Date |
|---|---|---|---|---|
| ENA Network Analyzer | Keysight | E5080A | MY55100583 | 2024.10.11 |
| Dielectric Probe kit | SPEAG | SM DAK 040 SA | 1155 | 2025.02.27 |
| DC power supply | Keysight | E36103A | MY55350020 | 2024.10.11 |
| Signal Generator | Rohde & Schwarz | SME06 | 837633\001 | 2024.08.06 |
| BI-Directional Coupler | KRYTAR | 1850 | 54733 | 2024.10.11 |
| Peak and Average Power Sensor | Keysight | E9325A | MY62220002 | 2024.10.11 |
| Peak and Average Power Sensor | Keysight | E9325A | MY62220003 | 2024.10.11 |
| Dual Channel PK Power Meter | Keysight | N1912A | MY55416024 | 2024.10.11 |
| Amplifier | CORAD TECHNOLOGY LTD | AMF-4D-00400600-50-30P | 1983561 | NCR |
| Dosimetric E-Field Probe | SPEAG | EX3DV4 | 7733 | 2025.02.20 |
| Data Acquisition Electronic | SPEAG | DAE4 | 1739 | 2025.01.22 |
| Dipole Kit 2450 MHz | SPEAG | D2450V2 | 977 | 2024.12.16 |
| Dipole Kit 5 GHz | SPEAG | D5GHzV2 | 1231 | 2024.12.15 |
| Software | SPEAG | DASY8 | N/A | NCR |
| Thermometer | / | GX-138 | 150709653 | 2024.10.18 |
| Thermometer | VICTOR | ITHX-SD-5 | 18470005 | 2024.10.18 |

**Note:**

1) Per KDB865664D01 v01r04 requirements for dipole calibration, the test laboratory has adopted three-year extended calibration interval. Each measured dipole is expected to evaluate with the following criteria at least on annual interval in Appendix C.

a) There is no physical damage on the dipole;

b) System check with specific dipole is within 10% of calibrated value;

c) The most recent return-loss result, measured at least annually, deviates by no more than 20% from the previous measurement.

d) The most recent measurement of the real or imaginary parts of the impedance, measured at least annually is within 5Ω from the previous measurement.

2) Network analyzer probe calibration against air, distilled water and a shorting block performed before measuring liquid parameters.

# 5. Measurement Uncertainty

Per KDB 865664 D01 SAR Measurement 100 MHz to 6 GHz, when the highest measured 1-g SAR within a frequency band is < 1.5 W/kg, the extensive SAR measurement uncertainty analysis described in IEEE Std. 1528-2013 is not required in SAR reports submitted for equipment approval. The equivalent ratio (1.5/1.6) is applied to extremity and occupational exposure conditions.

# 6. Device Under Test (DUT) Information

## 6.1. DUT Description

| | |
|---|---|
| The DUT is a game board with 2.4/5 GHz WiFi radio. | |
| Dimension | Overall (Length x Width x Height): 467 mm x 287 mm x 57 mm |

## 6.2. Wireless Technology

| Wireless technology | Frequency band |
|---|---|
| Wi-Fi | 2.4 GHz |
| Wi-Fi | 5 GHz |

## 6.3. Antenna Gain

| Frequency band | Gain (dBi) |
|---|---|
| 2.4 GHz | 1.68 |
| 5 GHz | 1.95 |

# 7. Conducted Output Power Measurement and tune-up tolerance

## 7.1. Power measurement result of 2.4GHz Wi-Fi.

| Test Mode | Antenna | Frequency[MHz] | Result[dBm] | Max tune up |
|---|---|---|---|---|
| 11B | Ant1 | 2412 | 8.56 | 9 |
| | | 2437 | 7.76 | |
| | | 2462 | 7.74 | |
| 11G | Ant1 | 2412 | | 8.5 |
| | | 2437 | | |
| | | 2462 | | |
| 11N20 SISO | Ant1 | 2412 | | 7.5 |
| | | 2437 | | |
| | | 2462 | | |

Note:

1. As per KDB 447498) at the maximum rated output power and within the tune-up tolerance range specified for the product, but not more than 2 dB lower than the maximum tune-up tolerance limit.

## 7.2. Power measurement result of 5GHz Wi-Fi.

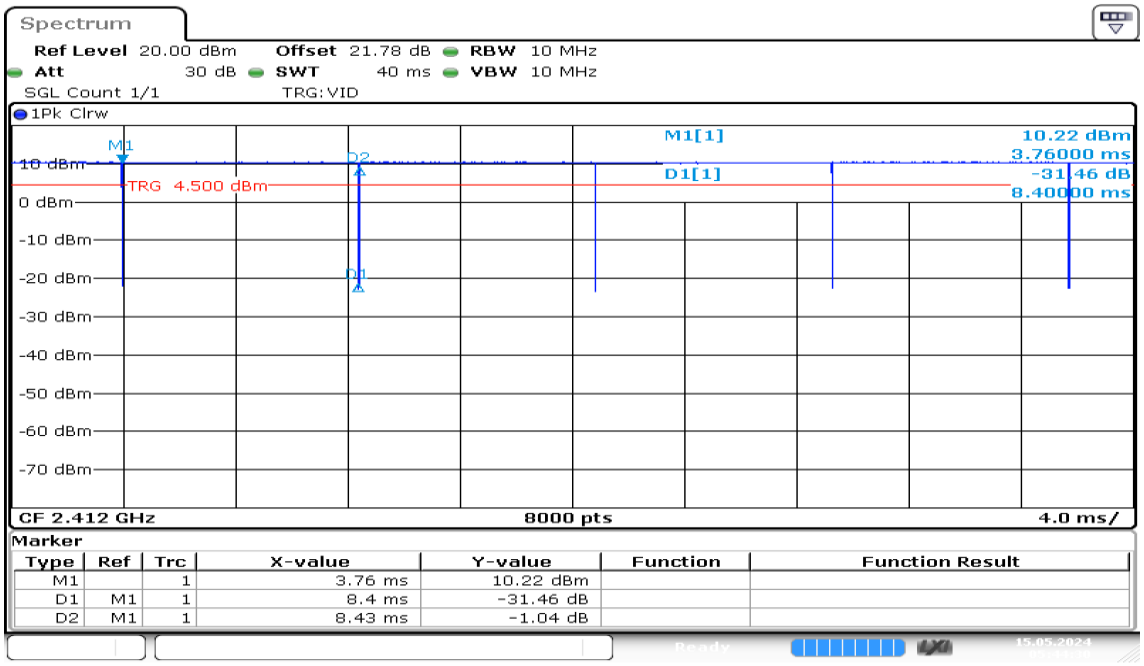
| Test Mode | Antenna | Frequency[MHz] | Power [dBm] | Max tune up |
|---|---|---|---|---|
| 11A | Ant1 | 5180 | 11.92 | 12 |
| | | 5200 | 11.33 | |
| | | 5240 | 11.37 | |
| | | 5745 | 10.35 | 11 |
| | | 5785 | 10.30 | |
| | | 5825 | 10.46 | |
| 11N40SISO | Ant1 | 5190 | | 11 |
| | | 5230 | | |
| | | 5755 | | 10.5 |
| | | 5795 | | |
| 11AC40SISO | Ant1 | 5190 | | 11 |
| | | 5230 | | |
| | | 5755 | | 10.5 |
| | | 5795 | | |
| 11AC80SISO | Ant1 | 5210 | | 11 |
| | | 5775 | | 10 |

Note:

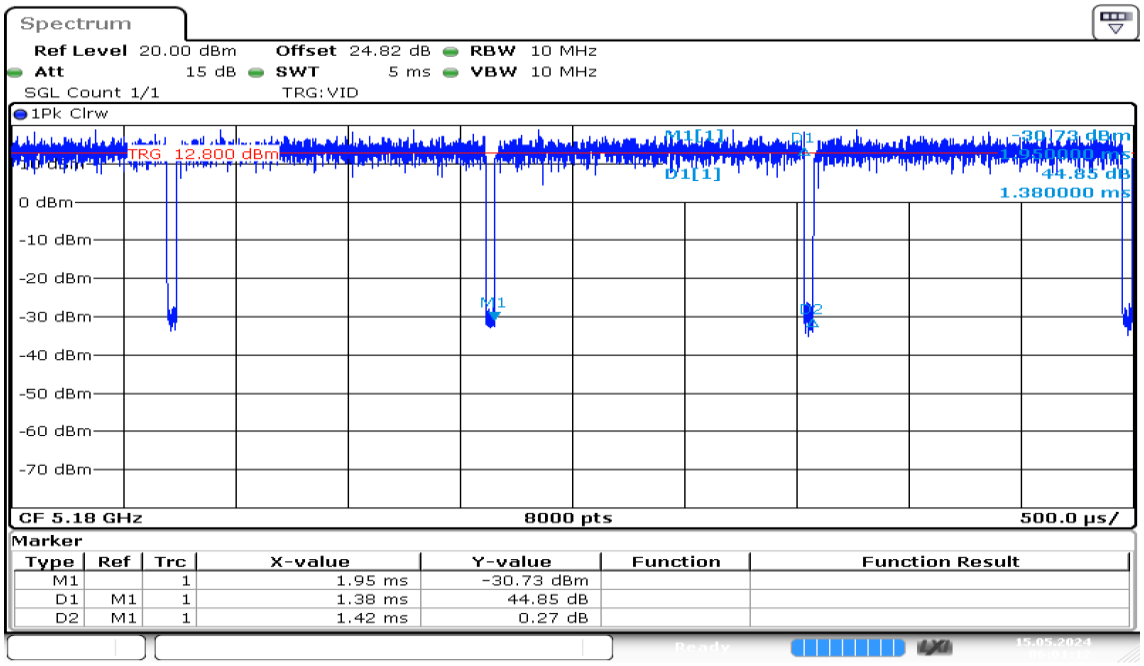
1. Note: The EUT does not support 802.11n HT20 and 11ac VHT20 modes.
2. As per KDB 447498) at the maximum rated output power and within the tune-up tolerance range specified for the product, but not more than 2 dB lower than the maximum tune-up tolerance limit.

## 7.3. Duty cycle:

| Test Mode | Channel | Transmission Duration [ms] | Transmission Period [ms] | Duty Cycle [%] |
|---|---|---|---|---|
| 11B | 2412 | 8.4 | 8.43 | 99.64 |
| 11A | 5180 | 1.38 | 1.42 | 97.18 |




Date: 15.MAY.2024 05:44:31

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# 8. Test Configuration

## 8.1. Wi-Fi Test Configuration

For Wi-Fi SAR testing, a communication link is set up with the testing software for Wi-Fi mode test. During the test, at each test frequency channel, the EUT is operated at the RF continuous emission mode. The test procedures in KDB 248227D01 are applied.

### 8.1.1. Initial Test Position Procedure

For exposure condition with multiple test position, such as handsets operating next to the ear, devices with hotspot mode or UMPC mini-tablet, procedures for initial test position can be applied. Using the transmission mode determined by the DSSS procedure or initial test configuration, area scans are measured for all position in an exposure condition. The test position with the highest extrapolated (peak) SAR is used as the initial test position. When reported SAR for the initial test position is ≤ 0.4W/kg, no additional testing for the remaining test position is required. Otherwise, SAR is evaluated at the subsequent highest peak SAR position until the reported SAR result is ≤ 0.8W/kg or all test position are measured. For all positions/configurations tested using the initial test position and subsequent test positions, when the reported SAR is > 0.8 W/kg, SAR is measured for these test positions/configurations on the subsequent next highest measured output power channel(s) until the reported SAR is ≤ 1.2 W/kg or all required channels are tested.

### 8.1.2. Initial Test Configuration Procedure

An initial test configuration is determined for OFDM transmission modes according to the channel bandwidth, modulation and data rate combination(s) with the highest maximum output power specified for production units in each standalone and aggregated frequency band. SAR is measured using the highest measured maximum output power channel. For configurations with the same specified or measured maximum output power, additional transmission mode and test channel selection procedures are required (see section 5.3.2 of KDB 248227D01). SAR test reduction of subsequent highest output test channels is based on the reported SAR of the initial test configuration.

For next to the ear, hotspot mode and UMC mini-tablet exposure configurations where multiple test positions are required, the initial test position procedure is applied to minimize the number of test positions required for SAR measurement using the initial test configuration transmission mode. For fixed exposure conditions that do not have multiple SAR test positions, SAR is measured in the transmission mode determined by the initial test configuration.

When the reported SAR of the initial test configuration is > 0.8 W/kg, SAR measurement is required for the subsequent next highest measured output power channel(s) in the initial test configuration until the reported SAR is ≤ 1.2 W/kg or all required channels are tested.

### 8.1.3. Sub Test Configuration Procedure

SAR measurement requirements for the remaining 802.11 transmission mode configurations that have not been tested in the initial test configuration are determined separately for each standalone and aggregated frequency band, in each exposure condition, according to the maximum output power specified for production units.

When the highest reported SAR for the initial test configuration, according to the initial test position or fixed exposure position requirements, is adjusted by the ratio of the subsequent test configuration to initial test configuration specified maximum output power and the adjusted SAR is ≤ 1.2 W/kg, SAR is not required for that subsequent test configuration.

### 8.1.4. 2.4GHz Wi-Fi SAR Test Procedures

Separate SAR procedures are applied to DSSS and OFDM configurations in the 2.4 GHz band to simplify DSSS test requirements. For 802.11b DSSS SAR measurements, DSSS SAR procedure applies to fixed exposure test position and initial test position procedure applies to multiple exposure test positions.

#### A) 802.11b DSSS SAR Test Requirements

SAR is measured for 2.4 GHz 802.11b DSSS using either a fixed test position or, when applicable, the initial test position procedure. SAR test reduction is determined according to the following:

1) When the reported SAR of the highest measured maximum output power channel (section 3.1 of KDB 248227D01) for the exposure configuration is ≤ 0.8 W/kg, no further SAR testing is required for 802.11b DSSS in that exposure configuration.
2) When the reported SAR is > 0.8 W/kg, SAR is required for that exposure configuration using the next highest measured output power channel. When any reported SAR is > 1.2 W/kg, SAR is required for the third channel; i.e., all channels require testing.

#### B) 2.4GHz 802.11g/n OFDM SAR Test Exclusion Requirements

When SAR measurement is required for 2.4 GHz 802.11g/n OFDM configurations, the measurement and test reduction procedures for OFDM are applied (section 5.3 of KDB 248227D01). SAR is not required for the following 2.4 GHz OFDM conditions.

1) When KDB Publication 447498 SAR test exclusion applies to the OFDM configuration.
2) When the highest reported SAR for DSSS is adjusted by the ratio of OFDM to DSSS specified maximum output power and the adjusted SAR is ≤ 1.2 W/kg.

#### C) SAR Test Requirements for OFDM configurations

When SAR measurement is required for 802.11 g/n OFDM configurations, each standalone and frequency aggregated band is considered separately for SAR test reduction. In applying the initial test configuration and subsequent test configuration procedures, the 802.11 transmission configuration with the highest specified maximum output power and the channel within a test configuration with the highest measured maximum output power should be clearly distinguished to apply the procedures.

## 8.1.5. 5GHz Wi-Fi SAR Test Procedures

**U-NII-1 and U-NII-2A Bands**

For devices that operate in only one of the U-NII-1 and U-NII-2A bands, the normally required SAR procedures for OFDM configurations are applied. For devices that operate in both U-NII bands using the same transmitter and antenna(s), SAR test reduction is determined according to the following:

1) When the same maximum output power is specified for both bands, begin SAR measurement in U-NII-2A band by applying the OFDM SAR requirements. If the highest reported SAR for a test configuration is ≤ 1.2 W/kg, SAR is not required for U-NII-1 band for that configuration (802.11 mode and exposure condition); otherwise, both bands are tested independently for SAR.
2) When different maximum output power is specified for the bands, begin SAR measurement in the band with higher specified maximum output power. The highest reported SAR for the tested configuration is adjusted by the ratio of lower to higher specified maximum output power for the two bands. When the adjusted SAR is ≤ 1.2 W/kg, SAR is not required for the band with lower maximum output power in that test configuration; otherwise, both bands are tested independently for SAR.
3) The two U-NII bands may be aggregated to support a 160 MHz channel on channel number 50. Without additional testing, the maximum output power for this is limited to the lower of the maximum output power certified for the two bands. When SAR measurement is required for at least one of the bands and the highest reported SAR adjusted by the ratio of specified maximum output power of aggregated to standalone band is > 1.2 W/kg, SAR is required for the 160 MHz channel. This procedure does not apply to an aggregated band with maximum output higher than the standalone band(s); the aggregated band must be tested independently for SAR. SAR is not required when the 160 MHz channel is operating at a reduced maximum power and also qualifies for SAR test exclusion.

**U-NII-2C and U-NII-3 Bands**

The frequency range covered by these bands is 380 MHz (5.47 – 5.85 GHz), which requires a minimum of at least two SAR probe calibration frequency points to support SAR measurements. when Terminal Doppler Weather Radar (TDWR) restriction applies, all channels that operate at 5.60 – 5.65 GHz must be included to apply the SAR test reduction and measurement procedures.

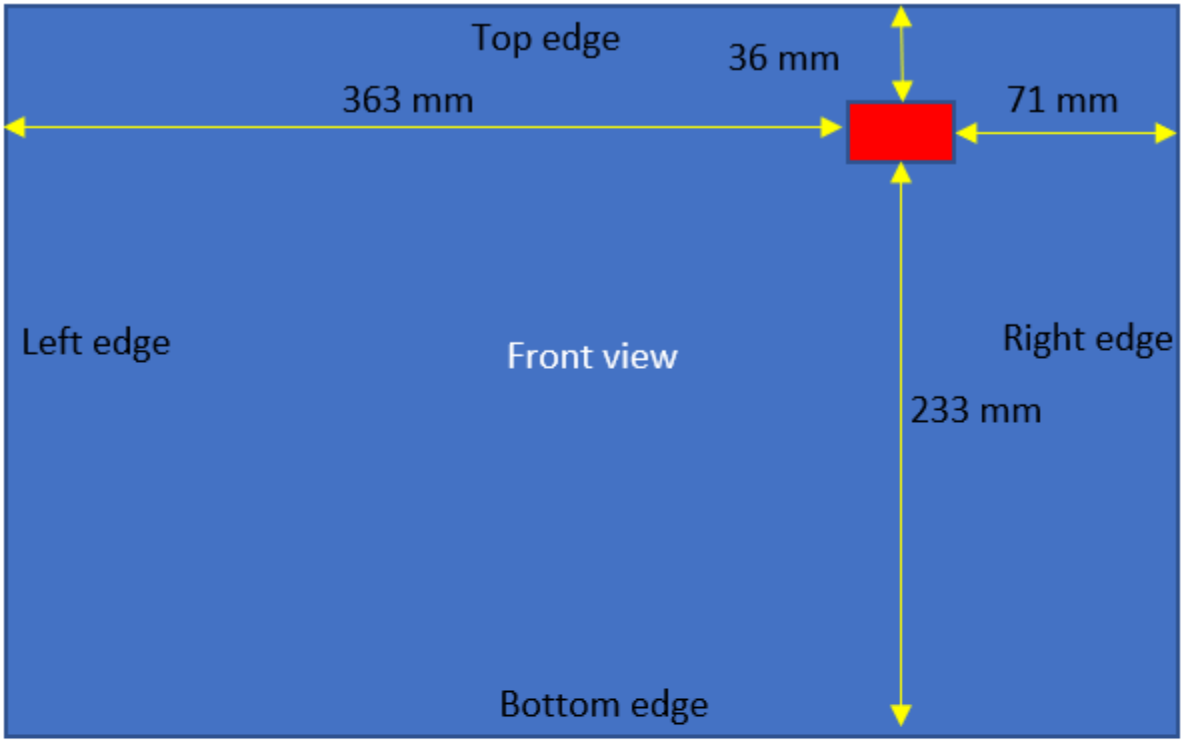
When the same transmitter and antenna(s) are used for U-NII-2C band and U-NII-3 band or 5.8 GHz band of §15.247, the bands may be aggregated to enable additional channels with 20, 40 or 80 MHz bandwidth to span across the band gap, as illustrated in Appendix B. The maximum output power for the additional band gap channels is limited to the lower of those certified for the bands. Unless band gap channels are permanently disabled, they must be considered for SAR testing. The frequency range covered by these bands is 380 MHz (5.47 – 5.85 GHz), which requires a minimum of at least two SAR probe calibration frequency points to support SAR measurements. To maintain SAR measurement accuracy and to facilitate test reduction, the channels in U-NII-2C band above 5.65 GHz may be grouped with the 5.8 GHz channels in U-NII-3 or §15.247 band to enable two SAR probe calibration frequency points to cover the bands, including the band gap channels. When band gap channels are supported and the bands are not aggregated for SAR testing, band gap channels must be considered independently in each band according to the normally required OFDM SAR measurement and probe calibration frequency points requirements.

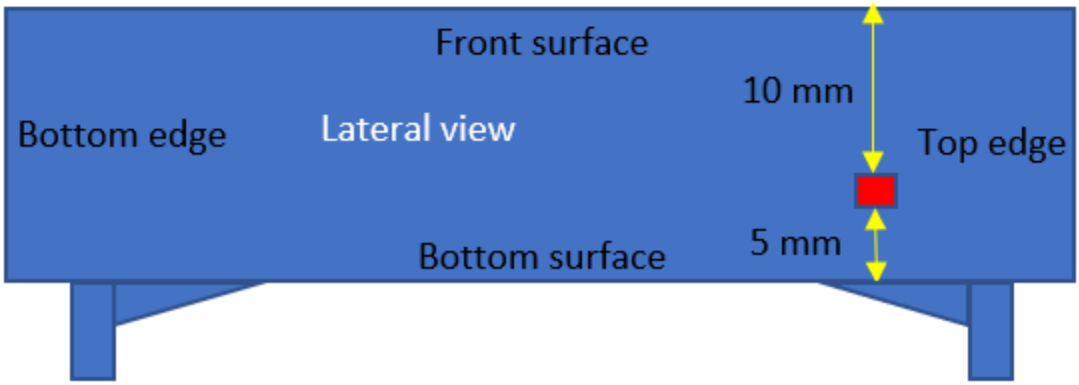
### 8.1.6. OFDM Transmission Mode and SAR Test Channel Selection

When the same maximum output power was specified for multiple OFDM transmission mode configurations in a frequency band or aggregated band, SAR is measured using the configuration with the largest channel bandwidth, lowest order modulation and lowest data rate. When the maximum output power of a channel is the same for equivalent OFDM configurations; for example, 802.11a, 802.11n and 802.11ac or 802.11g and 802.11n with the same channel bandwidth, modulation and data rate etc., the lower order 802.11 mode i.e., 802.11a, then 802.11n and 802.11ac or 802.11g then 802.11n, is used for SAR measurement. When the maximum output power are the same for multiple test channels, either according to the default or additional power measurement requirements, SAR is measured using the channel closest to the middle of the frequency band or aggregated band. When there are multiple channels with the same maximum output power, SAR is measured using the higher number channel.

## 9. RF Exposure Conditions

Refer to the diagram of the device below for the specific details of the antenna to surface and edge distance.




Note:

1. The figure in red indicates the antenna.

Per FCC KDB 616217 D04
The overall diagonal dimension of the display section of a tablet is > 20cm, the bottom surface and edges of the tablet should be selected for SAR evaluation at a 0mm separation distance, Exposures from antennas through the front surface of the display section of a full-size tablet, away from the edges, are generally limited to the user's hands. Exposures to hands for typical consumer transmitters used in tablets are not expected to exceed the extremity SAR limit; therefore, SAR evaluation for the front surface of tablet display screens are generally not necessary, except for tablets that are designed to require continuous operations with the hand(s) next to the antenna(s)

Per FCC KDB 447498 D04:
Exemptions from an environmental assessment showing compliance to SAR limits in § 1.1310 are derived based on frequency, power, and separation distance of the RF source. These exemptions are assessed through a formula that defines the thresholds for either available maximum time-averaged power or maximum time-averaged ERP, whichever is greater.
If the ERP of a device is not easily determined, such as for a portable device with a small form factor, the applicant may use the available maximum time-averaged power exclusively if the device antenna or radiating structure does not exceed an electrical length of λ/4.
As for devices with antennas of length greater than λ/4 where the gain is not well defined, but always less than that of a half-wave dipole (length λ/2), the available maximum time-averaged power generated by the device may be used in place of the maximum time-averaged ERP, where that value is not known.
The separation distance is the smallest distance from any part of the antenna or radiating structure for all persons, during operation at the applicable ERP. In the case of mobile or portable devices, the separation distance is from the outer housing of the device where it is closest to the antenna.
The exemption formula of § 1.1307(b)(3)(i)(B) shall only be used at separation distances from 0.5 cm to 40 cm and at frequencies from 0.3 GHz to 6 GHz (inclusive). This formula applies for single fixed, mobile, and portable RF sources with available maximum time-averaged power or effective radiated power (ERP), whichever is greater, of less than or equal to the power threshold in mW, here referred to as P1.1307(dcm , fGHz) and expressed as

$$P_{1.1307}\left(d_{cm}, f_{GHz}\right) := \begin{cases} ERP_{20cm}\left(f_{GHz}\right) \cdot \left(d_{cm}/20\right)^{x\left(f_{GHz}\right)} & d_{cm} < 20 \\ ERP_{20cm}\left(f_{GHz}\right) & d_{cm} \geq 20 \end{cases} \quad \text{(A.2.1)},$$

where $d_{cm}$ is the distance in *cm*, $f_{GHz}$ is the frequency in GHz, and Formula (A.2.2) is the same as in Formula (A.1.1), repeated here for convenience)

$$ERP_{20cm}\left(f_{GHz}\right) := \begin{cases} 2040 \cdot f_{GHz} & f_{GHz} < 1.5 \\ 3060 & 1.5 < f_{GHz} \leq 6 \end{cases} \quad \text{(A.2.2)},$$

and

$$x\left(f_{GHz}\right) := -\log_{10}\left(\frac{60}{ERP_{20cm}\left(f_{GHz}\right) \cdot \sqrt{f_{GHz}}}\right) \quad \text{(A.2.3)}$$

SAR test exemptions are constant at separation distances between 20 cm and 40 cm to avoid discontinuities in the threshold when transitioning between SAR-based and MPE-based exemption criteria at 40 cm, considering the importance of reflections. [31]

Examples for computed values are shown in Table A.2.1, for illustration only.

When 10-g extremity SAR applies, SAR test exemptions may be considered by applying a factor of 2.5 to the SAR-based exemption thresholds.

Table A.2.1—Example Power Thresholds (mW)

| Frequency (MHz) | Distance (mm) | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | 5 | 10 | 15 | 20 | 25 | 30 | 35 | 40 | 45 | 50 |
| | 300 | 39 | 65 | 88 | 110 | 129 | 148 | 166 | 184 | 201 | 217 |
| | 450 | 22 | 44 | 67 | 89 | 112 | 135 | 158 | 180 | 203 | 226 |
| | 835 | 9 | 25 | 44 | 66 | 90 | 116 | 145 | 175 | 207 | 240 |
| | 1900 | 3 | 12 | 26 | 44 | 66 | 92 | 122 | 157 | 195 | 236 |
| | 2450 | 3 | 10 | 22 | 38 | 59 | 83 | 111 | 143 | 179 | 219 |
| | 3600 | 2 | 8 | 18 | 32 | 49 | 71 | 96 | 125 | 158 | 195 |
| | 5800 | 1 | 6 | 14 | 25 | 40 | 58 | 80 | 106 | 136 | 169 |

3. The test separation distances required for a device to demonstrate SAR or MPE compliance must be sufficiently conservative to support the operational separation distances required by the device and its antennas and radiating structures. For devices such as tablets and transmitters embedded in keyboard sections of laptop computers that are typically used in close proximity to users, the test separation distance is determined by the smallest distance between the outer surface of the device and the user. For larger devices, as the antenna operational separation distance increases to where the SAR characteristics of the device and its antennas are not directly influenced by the user, such as antennas along the top and upper side edges of laptop computer displays or opposite and adjacent edges of tablets, the test separation distance is normally determined by the closest separation between the antenna and the user.

## 9.1. SAR exclusion analysis

For 2.4GHz Wi-Fi 1-g SAR (antenna to surface or edge separation distance less than 20cm)

| Position | Frequency (MHz) | Power (dBm) | Gain (dBi) | Power (mW) | Separation Distance (mm) | Calculation Result | SAR Test |
|---|---|---|---|---|---|---|---|
| Bottom surface | 2450 | 9.0 | 1.68 | 11.69 | 5.00 | 3 | Required |
| Right edge | 2450 | 9.0 | 1.68 | 11.69 | 71.00 | 427 | Excluded |
| Top edge | 2450 | 9.0 | 1.68 | 11.69 | 36.00 | 117 | Excluded |

For 2.4GHz Wi-Fi 1-g SAR (antenna to surface or edge separation distance greater than 20cm and less than 40cm)

| Position | Frequency (MHz) | Power (dBm) | Gain (dBi) | Power (mW) | Separation Distance (mm) | Calculation Result | SAR Test |
|---|---|---|---|---|---|---|---|
| Left edge | 2450 | 9.0 | 1.68 | 11.69 | 363.00 | 3060 | Excluded |
| Bottom edge | 2450 | 9.0 | 1.68 | 11.69 | 233.00 | 3060 | Excluded |

For 5GHz Wi-Fi 1-g SAR (antenna to surface or edge separation distance less than 20cm)

| Position | Frequency (MHz) | Power (dBm) | Gain (dBi) | Power (mW) | Separation Distance (mm) | Calculation Result | SAR Test |
|---|---|---|---|---|---|---|---|
| Bottom surface | 5250 | 12.0 | 1.95 | 24.83 | 5.00 | 1 | Required |
| Right edge | 5250 | 12.0 | 1.95 | 24.83 | 71.00 | 360 | Excluded |
| Top edge | 5250 | 12.0 | 1.95 | 24.83 | 36.00 | 88 | Excluded |
| Bottom surface | 5800 | 11.0 | 1.95 | 19.72 | 5.00 | 1 | Required |
| Right edge | 5800 | 11.0 | 1.95 | 19.72 | 71.00 | 352 | Excluded |
| Top edge | 5800 | 11.0 | 1.95 | 19.72 | 36.00 | 85 | Excluded |

For 5GHz Wi-Fi 1-g SAR (antenna to surface or edge separation distance greater than 20cm and less than 40cm)

| Position | Frequency (MHz) | Power (dBm) | Gain (dBi) | Power (mW) | Separation Distance (mm) | Calculation Result | SAR Test |
|---|---|---|---|---|---|---|---|
| Left edge | 5250 | 12.0 | 1.95 | 24.83 | 363.00 | 3060 | Excluded |
| Bottom edge | 5250 | 12.0 | 1.95 | 24.83 | 233.00 | 3060 | Excluded |
| Left edge | 5800 | 11.0 | 1.95 | 19.72 | 363.00 | 3060 | Excluded |
| Bottom edge | 5800 | 11.0 | 1.95 | 19.72 | 363.00 | 3060 | Excluded |

Note:

1. Because the power in mW is less than the calculation result, so SAR evaluation for corresponding position is not required.
2. as per 616217 D04, SAR evaluation for front surface is not required, so front surface is exempted from exclusion analysis.

# 10. Dielectric Property Measurements & System Check

## 10.1. Dielectric Property Measurements

The temperature of the tissue-equivalent medium used during measurement must also be within 18°C to 25°C and within ± 2°C of the temperature when the tissue parameters are characterized.
The dielectric parameters must be measured before the tissue-equivalent medium is used in a series of SAR measurements. The parameters should be re-measured after each 3 – 4 days of use; or earlier if the dielectric parameters can become out of tolerance; for example, when the parameters are marginal at the beginning of the measurement series.
Tissue dielectric parameters were measured at the low, middle and high frequency of each operating frequency range of the test device.

**Tissue Dielectric Parameters**

FCC KDB 865664 D01 v01r04 SAR Measurement 100 MHz to 6 GHz

| Target Frequency (MHz) | Head | | Body | |
|---|---|---|---|---|
| | $\varepsilon_r$ | σ (S/m) | $\varepsilon_r$ | σ (S/m) |
| 150 | 52.3 | 0.76 | 61.9 | 0.80 |
| 300 | 45.3 | 0.87 | 58.2 | 0.92 |
| 450 | 43.5 | 0.87 | 56.7 | 0.94 |
| 835 | 41.5 | 0.90 | 55.2 | 0.97 |
| 900 | 41.5 | 0.97 | 55.0 | 1.05 |
| 915 | 41.5 | 0.98 | 55.0 | 1.06 |
| 1450 | 40.5 | 1.20 | 54.0 | 1.30 |
| 1610 | 40.3 | 1.29 | 53.8 | 1.40 |
| 1800 – 2000 | 40.0 | 1.40 | 53.3 | 1.52 |
| 2450 | 39.2 | 1.80 | 52.7 | 1.95 |
| 3000 | 38.5 | 2.40 | 52.0 | 2.73 |
| 5000 | 36.2 | 4.45 | 49.3 | 5.07 |
| 5100 | 36.1 | 4.55 | 49.1 | 5.18 |
| 5200 | 36.0 | 4.66 | 49.0 | 5.30 |
| 5300 | 35.9 | 4.76 | 48.9 | 5.42 |
| 5400 | 35.8 | 4.86 | 48.7 | 5.53 |
| 5500 | 35.6 | 4.96 | 48.6 | 5.65 |
| 5600 | 35.5 | 5.07 | 48.5 | 5.77 |
| 5700 | 35.4 | 5.17 | 48.3 | 5.88 |
| 5800 | 35.3 | 5.27 | 48.2 | 6.00 |

**IEEE Std 1528-2013**
**Refer to Table 3 within the IEEE Std 1528-2013Dielectric Property Measurements Results:**

| Liquid | Freq. | Liquid Parameters | | | | Deviation(%) | | Limit (%) | Temp. (℃) | Test Date |
|---|---|---|---|---|---|---|---|---|---|---|
| | | Measured | | Target | | | | | | |
| | | $\varepsilon_r$ | σ | $\varepsilon_r$ | σ | $\varepsilon_r$ | σ | | | |
| Head 2450 | 2360 | 40.22 | 1.75 | 39.36 | 1.72 | 2.18 | 1.74 | ±5 | 22.3 | 12-Jun-2024 |
| | 2450 | 40.10 | 1.86 | 39.20 | 1.80 | 2.30 | 3.33 | | | |
| | 2540 | 39.50 | 1.91 | 39.09 | 1.90 | 1.05 | 0.53 | | | |
| Head 5250 | 5160 | 35.30 | 4.51 | 36.03 | 4.61 | -2.03 | -2.17 | ±5 | 22.3 | 12-Jun-2024 |
| | 5250 | 35.20 | 4.60 | 35.93 | 4.71 | -2.03 | -2.34 | | | |
| | 5340 | 35.10 | 4.69 | 35.83 | 4.80 | -2.04 | -2.29 | | | |
| Head 5750 | 5660 | 36.10 | 5.16 | 35.46 | 5.13 | 1.80 | 0.58 | ±5 | 22.3 | 12-Jun-2024 |
| | 5750 | 36.20 | 5.23 | 35.36 | 5.22 | 2.38 | 0.19 | | | |
| | 5840 | 35.90 | 5.34 | 35.27 | 5.30 | 1.79 | 0.75 | | | |

## 10.2. System Check

SAR system verification is required to confirm measurement accuracy, according to the tissue dielectric media, probe calibration points and other system operating parameters required for measuring the SAR of a test device. The system verification must be performed for each frequency band and within the valid range of each probe calibration point required for testing the device. The same SAR probe(s) and tissue-equivalent media combinations used with each specific SAR system for system verification must be used for device testing. When multiple probe calibration points are required to cover substantially large transmission bands, independent system verifications are required for each probe calibration point. A system verification must be performed before each series of SAR measurements using the same probe calibration point and tissue-equivalent medium. Additional system verification should be considered according to the conditions of the tissue-equivalent medium and measured tissue dielectric parameters, typically every three to four days when the liquid parameters are re-measured or sooner when marginal liquid parameters are used at the beginning of a series of measurements.

**System Performance Check Measurement Conditions:**

- The measurements were performed in the flat section of the TWIN SAM or ELI phantom, shell thickness: 2.0 ±0.2 mm (bottom plate) filled with Body or Head simulating liquid of the following parameters.
- The depth of tissue-equivalent liquid in a phantom must be ≥ 15.0 cm for SAR measurements ≤ 3 GHz and ≥ 10.0 cm for measurements > 3 GHz.
- The DASY system with an E-Field Probe was used for the measurements.
- The dipole was mounted on the small tripod so that the dipole feed point was positioned below the center marking of the flat phantom section and the dipole was oriented parallel to the body axis (the long side of the phantom). The standard measuring distance was 10mm (above 1GHZ) and 15mm (below 1GHz) from dipole center to the simulating liquid surface.
- For area scan, standard grid spacing for head measurements is 15 mm in x- and y- dimension(≤2GHz), 12 mm in x- and y-dimension(2-4 GHz) and 10mm in x- and y- dimension(4-6GHz).
- For zoom scan, Δ $x_{zoom}$, Δ $y_{zoom}$≤ 2GHz - ≤8mm, 2-4GHz - ≤5 mm and 4-6 GHz-≤4mm; Δ $z_{zoom}$ ≤3GHz - ≤5 mm, 3-4 GHz- ≤4mm and 4-6GHz-≤2mm.
- Distance between probe sensors and phantom surface was set to 3 mm except for 5 GHz band. For 5GHz band, Distance between probe sensors and phantom surface was set to 2.5 mm
- The dipole input power (forward power) was set to 100 mW or 250 mW depend on the certificate of the dipoles.
- The results are normalized to 1 W input power.

**System Check Results**

The 1-g and 10-g SAR measured with a reference dipole, using the required tissue-equivalent medium at the test frequency, must be within 10% of the manufacturer calibrated dipole SAR target.

| T.S. Liquid | | Measured Results | | Target (Ref. value) | Delta (%) | Limit (%) | Temp. (℃) | Test Date |
|---|---|---|---|---|---|---|---|---|
| | | Zoom Scan (W/Kg) | Normalize to 1W (W/Kg) | | | | | |
| Head 2450 | 1-g | 5.040 | 50.40 | 54.60 | -7.69 | ±10 | 22.3 | June 12, 2024 |
| | 10-g | 2.330 | 23.30 | 24.20 | -3.72 | | | |
| Head 5250 | 1-g | 7.230 | 72.30 | 77.90 | -7.19 | ±10 | 22.3 | June 12, 2024 |
| | 10-g | 2.150 | 21.50 | 22.60 | -4.87 | | | |
| Head 5750 | 1-g | 7.920 | 79.20 | 78.30 | 1.15 | ±10 | 22.3 | June 12, 2024 |
| | 10-g | 2.310 | 23.10 | 22.40 | 3.13 | | | |

# 11. Measured and Reported (Scaled) SAR Results

As per KDB 447498 D04), When SAR or MPE is measured at or scaled to the maximum tune-up tolerance limit, the results are referred to as reported.

**Scaled SAR calculation formula:**
Scaled SAR = Tune-up in mW / Conducted power in mW * 100 / (Duty cycle (if available)) * SAR value

**SAR Test Reduction criteria are as follows:**

**KDB 447498 D04 General RF Exposure Guidance:**
A）Per KDB447498 D04, all SAR measurement results are scaled to the maximum tune-up tolerance limit to demonstrate SAR compliance.
B）Testing of other required channels within the operating mode of a frequency band is not required when the reported 1-g or 10-g SAR for the mid-band or highest output power channel is:

- ≤ 0.8 W/kg or 2.0 W/kg, for 1-g or 10-g respectively, when the transmission band is ≤ 100 MHz.
- ≤ 0.6 W/kg or 1.5 W/kg, for 1-g or 10-g respectively, when the transmission band is between 100 MHz and 200 MHz.
- ≤ 0.4 W/kg or 1.0 W/kg, for 1-g or 10-g respectively, when the transmission band is ≥ 200 MHz.

**Per KDB865664 D01 v01r04:**
For each frequency band, repeated SAR measurement is required only when the measured SAR is ≥0.8W/Kg; if the deviation among the repeated measurement is ≤ 20%, and the measured SAR <1.45W/Kg, only one repeated measurement is required.

Note:
The same procedure is applied to extremity SAR evaluation, and the corresponding limitation is 2.5 times of 1-g SAR.

## 11.1. SAR Test Results of 2.4GHz Wi-Fi.

| Test Position (Body 0mm) | Test Mode | Channel/ Frequency | Power (dBm) | | Measured SAR Value | Power Drift | Duty Cycle (%) | Scaled (W/Kg) |
|---|---|---|---|---|---|---|---|---|
| | | | Tune-up | Meas. | 1-g (W/Kg) | | | |
| Bottom Surface | 11b | 1/2412 | 9.0 | 8.56 | 0.156 | -0.01 | 99.64 | 0.173 |

## 11.2. SAR Test Results of 5GHz Wi-Fi.

| Test Position (Body 0mm) | Test Mode | Channel/ Frequency | Power (dBm) | | Measured SAR Value | Power Drift | Duty Cycle (%) | Scaled (W/Kg) |
|---|---|---|---|---|---|---|---|---|
| | | | Tune-up | Meas. | 1-g (W/Kg) | | | |
| **U-NII-1** | | | | | | | | |
| Bottom Surface | 11a | 36/5180 | 12.0 | 11.92 | 0.219 | -0.08 | 97.18 | 0.230 |
| **U-NII-3** | | | | | | | | |
| Bottom Surface | 11a | 165/5825 | 11.0 | 10.46 | 0.615 | 0.15 | 97.18 | 0.717 |

## 12. Simultaneous Transmission SAR Analysis

Simultaneous transmission is not supported.

## Appendixes

**Refer to separated files for the following appendixes.**

**4791327949.2-SAR-1_App A Photo**

**4791327949.2-SAR-1_App B System Check Plots**

**4791327949.2-SAR-1_App C Highest Test Plots**

**4791327949.2-SAR-1_App D Cal. Certificates**

---------End of Report---------