# SAR EVALUATION REPORT

**IEEE Std 1528-2013**

*For*
**BLUETOOTH EARBUD**

**FCC ID: BCGA2048**
**Model Name: A2048**

**Report Number: 12742033-S2V2**
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| V1 | 4/16/2019 | Initial Issue | -- |
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# 1. Attestation of Test Results

| | | | | |
|---|---|---|---|---|
| Applicant Name | APPLE INC. | | | |
| FCC ID | BCGA2048 | | | |
| Model Name | A2048 | | | |
| Exposure Category | General Population/Uncontrolled Exposure | | | |
| Applicable Standards | FCC 47 CFR § 2.1093<br>Published RF exposure KDB procedures<br>IEEE Std 1528-2013 | | | |
| Exposure Category | SAR Limits (W/Kg) | | | |
| | Peak spatial-average(1g of tissue) | | Extremities (hands, wrists, ankles, etc.) (10g of tissue) | |
| General population/Uncontrolled exposure | 1.6 | | 4 | |
| RF Exposure Conditions | Equipment Class - Highest Reported SAR (W/kg) | | | |
| | PCE | DTS | NII | DSS |
| Head | N/A | N/A | N/A | 0.037 |
| Body | N/A | N/A | N/A | 0.637 |
| Date Tested | 3/21/2019 to 3/22/2019 | | | |
| Test Results | Pass | | | |

UL Verification Services Inc. tested the above equipment in accordance with the requirements set forth in the above standards. The test results show that the equipment tested is capable of demonstrating compliance with the requirements as documented in this report.

The results documented in this report apply only to the tested sample, under the conditions and modes of operation as described herein. It is the manufacturer's responsibility to assure that additional production units of this model are manufactured with identical electrical and mechanical components. All samples tested were in good operating condition throughout the entire test program. Measurement Uncertainties are published for informational purposes only and were not taken into account unless noted otherwise.

This document may not be altered or revised in any way unless done so by UL Verification Services Inc. and all revisions are duly noted in the revisions section. Any alteration of this document not carried out by UL Verification Services Inc. will constitute fraud and shall nullify the document. This report must not be used by the client to claim product certification, approval, or endorsement by NVLAP, NIST, any agency of the Federal Government, or any agency of the U.S. government.

| Approved & Released By: | Prepared By: |
|---|---|
|  |  |
| Devin Chang<br>Senior Test Engineer<br>UL Verification Services Inc. | Chakrit Thammanavarat<br>Senior Test Engineer<br>UL Verification Services Inc. |

# 2. Test Specification, Methods and Procedures

The tests documented in this report were performed in accordance with FCC 47 CFR § 2.1093, IEEE STD 1528-2013, the following FCC Published RF exposure KDB procedures:

- 447498 D01 General RF Exposure Guidance v06
- 447498 D03 Supplement C Cross-Reference v01
- 865664 D01 SAR measurement 100 MHz to 6 GHz v01r04
- 865664 D02 RF Exposure Reporting v01r02

In addition to the above, the following information was used:

- TCB workshop October 2016; RF Exposure Procedures (Bluetooth Duty Factor)
- TCB workshop October 2016; RF Exposure Procedures (DUT Holder Perturbations)

# 3. Facilities and Accreditation

The test sites and measurement facilities used to collect data are located at

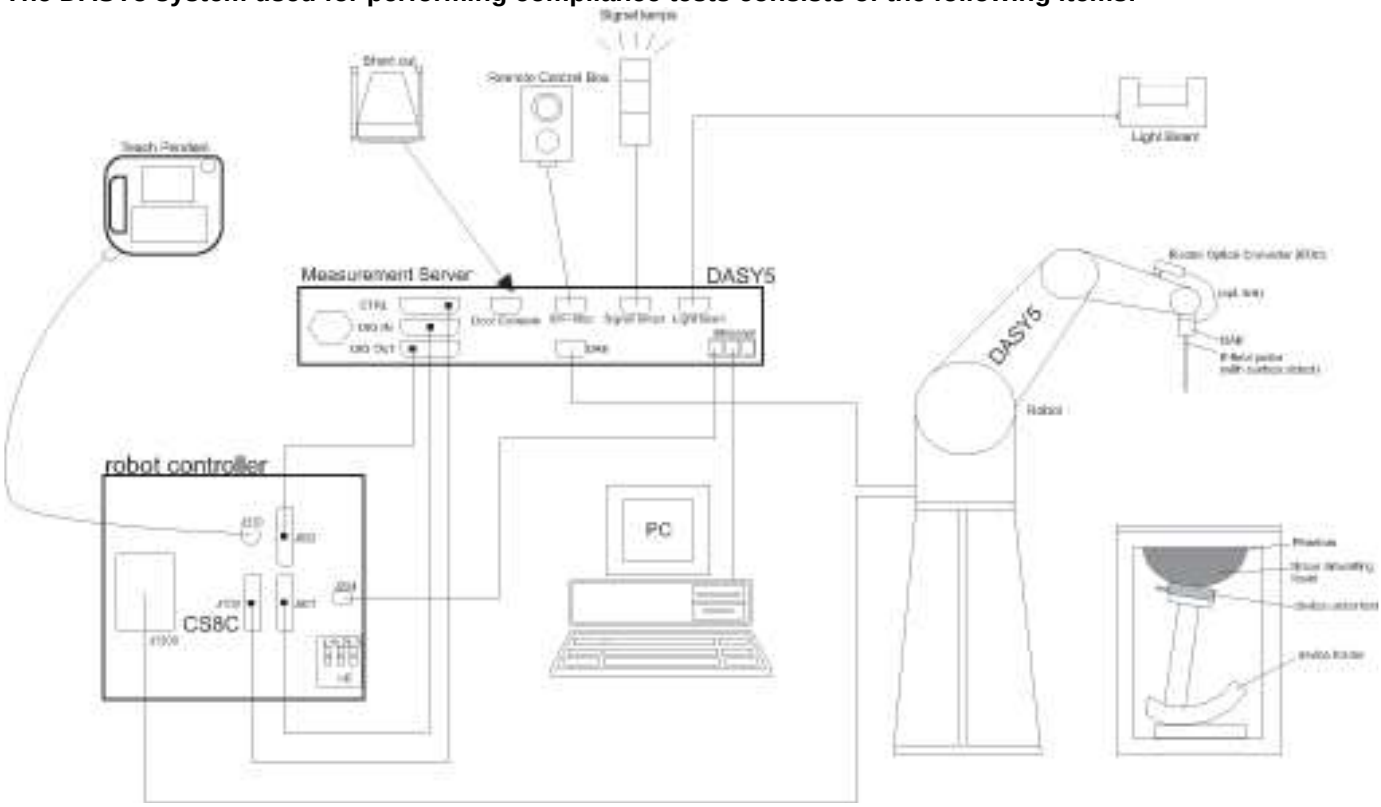
| 47173 Benicia Street | 47266 Benicia Street |
|---|---|
| SAR Lab A | SAR Lab 1 |
| SAR Lab B | SAR Lab 2 |
| SAR Lab C | SAR Lab 3 |
| SAR Lab D | SAR Lab 4 |
| SAR Lab E | SAR Lab 5 |
| SAR Lab F | |
| SAR Lab G | |
| SAR Lab H | |

UL Verification Services Inc. is accredited by NVLAP, Laboratory Code 200065-0.

# 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 WinXP or Win7 and the DASY5 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 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 | $\frac{1}{2}\cdot\delta\cdot\ln(2) \pm 0.5$ 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 SAR Measurement 100 MHz to 6 GHz

<table>
<tr><td colspan="3"></td><td>≤ 3 GHz</td><td>> 3 GHz</td></tr>
<tr><td colspan="3">Maximum zoom scan spatial resolution: $\Delta x_{Zoom}$, $\Delta y_{Zoom}$</td><td>≤ 2 GHz: ≤ 8 mm<br>2 – 3 GHz: ≤ 5 mm*</td><td>3 – 4 GHz: ≤ 5 mm*<br>4 – 6 GHz: ≤ 4 mm*</td></tr>
<tr><td rowspan="3">Maximum zoom scan spatial resolution, normal to phantom surface</td><td colspan="2">uniform grid: $\Delta z_{Zoom}(n)$</td><td>≤ 5 mm</td><td>3 – 4 GHz: ≤ 4 mm<br>4 – 5 GHz: ≤ 3 mm<br>5 – 6 GHz: ≤ 2 mm</td></tr>
<tr><td rowspan="2">graded grid</td><td>$\Delta z_{Zoom}(1)$: between 1st two points closest to phantom surface</td><td>≤ 4 mm</td><td>3 – 4 GHz: ≤ 3 mm<br>4 – 5 GHz: ≤ 2.5 mm<br>5 – 6 GHz: ≤ 2 mm</td></tr>
<tr><td>$\Delta z_{Zoom}(n>1)$: between subsequent points</td><td colspan="2">≤ 1.5·$\Delta z_{Zoom}(n-1)$</td></tr>
<tr><td>Minimum zoom scan volume</td><td colspan="2">x, y, z</td><td>≥ 30 mm</td><td>3 – 4 GHz: ≥ 28 mm<br>4 – 5 GHz: ≥ 25 mm<br>5 – 6 GHz: ≥ 22 mm</td></tr>
<tr><td colspan="5">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.<br>* When zoom scan is required and the <u>reported</u> 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.</td></tr>
</table>

**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.

## 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.

**Dielectric Property Measurements**

| Name of Equipment | Manufacturer | Type/Model | Serial No. | Cal. Due Date |
|---|---|---|---|---|
| Network Analyzer | R&S | ZNLE6 | PRE0181650 | 7/16/2019 |
| Dielectric Probe kit | SPEAG | DAK-3.5 | 1082 | 9/11/2019 |
| Shorting block | SPEAG | DAK-3.5 Short | SM DAK 200 DA | 9/11/2019 |
| Thermometer | Traceable Calibration Control Co. | 15-1078-179 | 150378159 | 6/6/2019 |

**System Check**

| Name of Equipment | Manufacturer | Type/Model | Serial No. | Cal. Due Date |
|---|---|---|---|---|
| Signal Generator | Rhode & Schwarz | SMB100A | 180970-zC | 2/13/2020 |
| Power Sensor | Rhode & Schwarz | NRP18A | 100994-RE | 2/15/2020 |

**Lab Equipment**

| Name of Equipment | Manufacturer | Type/Model | Serial No. | Cal. Due Date |
|---|---|---|---|---|
| E-Field Probe (SAR Lab 2) | SPEAG | EX3DV4 | 3686 | 8/28/2019 |
| E-Field Probe (SAR Lab 4) | SPEAG | EX3DV4 | 7356 | 4/24/2019 |
| Data Acquisition Electronics (SAR Lab 2) | SPEAG | DAE4 | 1545 | 4/13/2019 |
| Data Acquisition Electronics (SAR Lab 4) | SPEAG | DAE4 | 1547 | 5/3/2019 |
| System Validation Dipole | SPEAG | D2450V2 | 748 | 2/16/2020 |
| Thermometer | Fisherbrand | 281 482-1714 | 181062309 | 2/21/2020 |

**Other**

| Name of Equipment | Manufacturer | Type/Model | Serial No. | Cal. Due Date |
|---|---|---|---|---|
| Power Meter | Agilent | N1912A | MY55196015 | 1/29/2020 |
| Power Sensor | Agilent | N1921A | MY52270022 | 2/6/2020 |

# 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 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.

Therefore, the measurement uncertainty is not required.

# 6. Device Under Test (DUT) Information

## 6.1. DUT Description

| | |
|---|---|
| A2048 is a Bluetooth earbud for the Right ear. It has an integrated battery, microphone and antenna. It can charge via side contacts located on the earbuds with the contacts in the charging case. | |
| Device Dimension | Overall (Length x Width x Depth): 56.0 mm x 27.8 mm x 37 mm |
| Battery Options | The rechargeable battery is not user accessible. |

## 6.2. Wireless Technologies

| Wireless technologies | Frequency bands | Operating mode | Duty Cycle used for SAR testing |
|---|---|---|---|
| Bluetooth | 2.4 GHz | BR, EDR, LE | 76.53% (DH5) |

## 6.3. Maximum Output Power from Tune-up Procedure

KDB 447498 sec.4.1.(3) 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

| RF Operating mode | Max. RF Output Power (dBm) |
|---|---|
| Bluetooth | **12.50** |
| Bluetooth EDR | **10.00** |
| Bluetooth LE | **5.00** |

# 7. RF Exposure Conditions (Test Configurations)

Refer to Appendix A for the specific details of the antenna-to-antenna and antenna-to-edge(s) distances.

| Wireless technologies | RF Exposure Conditions | DUT-to-User Separation | Test Position | Antenna-to-edge/surface | SAR Required | Note |
|---|---|---|---|---|---|---|
| Bluetooth | Head | 0 mm | Right Touch | < 25mm | Yes | |
| | Body | | Right Flat | < 25mm | Yes | |

# 8. Dielectric Property Measurements & System Check

## 8.1. 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.

The dielectric constant (εr) and conductivity (σ) of typical tissue-equivalent media recipes are expected to be within ± 5% of the required target values; but for SAR measurement systems that have implemented the SAR error compensation algorithms documented in IEEE Std 1528-2013, to automatically compensate the measured SAR results for deviations between the measured and required tissue dielectric parameters, the tolerance for εr and σ may be relaxed to ± 10%. This is limited to frequencies ≤ 3 GHz.

### Tissue Dielectric Parameters

FCC KDB 865664 D01 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 1528-2013

### Dielectric Property Measurements Results:

| SAR Lab | Date | Band (MHz) | Tissue Type | Frequency (MHz) | Relative Permittivity (εr) | | | Conductivity (σ) | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | Measured | Target | Delta ±5 % | Measured | Target | Delta ±5 % |
| 2 | 3/21/2019 | 2450 | Head | 2450 | 39.80 | 39.20 | 1.53 | 1.79 | 1.80 | -0.72 |
| | | | | 2400 | 39.86 | 39.30 | 1.43 | 1.75 | 1.75 | -0.27 |
| | | | | 2480 | 39.80 | 39.16 | 1.63 | 1.81 | 1.83 | -1.44 |
| 4 | 3/21/2019 | 2450 | Body | 2450 | 50.92 | 52.70 | -3.38 | 1.99 | 1.95 | 2.21 |
| | | | | 2400 | 50.98 | 52.77 | -3.40 | 1.95 | 1.90 | 2.69 |
| | | | | 2480 | 50.91 | 52.66 | -3.33 | 2.02 | 1.99 | 1.20 |

## 8.2. 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 10 mm (above 1 GHz) and 15 mm (below 1 GHz) from dipole center to the simulating liquid surface.
- The coarse grid with a grid spacing of 15 mm was aligned with the dipole.
  For 5 GHz band - The coarse grid with a grid spacing of 10 mm was aligned with the dipole.
- Special 7x7x7 (below 3 GHz) and/or 8x8x7 (above 3 GHz) fine cube was chosen for the cube.
- Distance between probe sensors and phantom surface was set to 3 mm.
  For 5 GHz band - Distance between probe sensors and phantom surface was set to 2.5 mm
- The dipole input power (forward power) was 100 mW.
- 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. Refer to Appendix B for the SAR System Check Plots.

| SAR Lab | Date | Tissue Type | Dipole Type_Serial # | Dipole Cal. Due Data | Measured Results for 1g SAR | | | | Measured Results for 10g SAR | | | | Plot No. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | Zoom Scan to 100 mW | Normalize to 1 W | Target (Ref. Value) | Delta ±10 % | Zoom Scan to 100 mW | Normalize to 1 W | Target (Ref. Value) | Delta ±10 % | |
| 2 | 3/21/2019 | Head | D2450V2 SN:748 | 2/16/2020 | 5.480 | 54.80 | 52.00 | 5.38 | 2.470 | 24.70 | 24.20 | 2.07 | 1,2 |
| 4 | 3/21/2019 | Body | D2450V2 SN:748 | 2/16/2020 | 5.370 | 53.70 | 50.30 | 6.76 | 2.470 | 24.70 | 23.60 | 4.66 | 3,4 |

# 9. Conducted Output Power Measurements

## 9.1. Bluetooth

**Bluetooth Measured Results**

From October 2016 TCB workshop, Power and SAR were measured with the device connected to a call box with hopping disabled using DH5 modulation. The duty cycle value from the device is taken from the Duty Cycle plot below.

SAR measurement is not required for the EDR and LE. When the secondary mode is ≤ ¼ dB higher than the primary mode.

| Band | Mode | Ch # | Freq. (MHz) | Average Power (dBm) | | |
|---|---|---|---|---|---|---|
| | | | | Meas Pwr | Tune-up | SAR Test (Yes/No) |
| 2.4 GHz | GFSK | 0 | 2402 | 12.00 | 12.50 | Yes |
| | | 39 | 2441 | 11.90 | 12.50 | |
| | | 78 | 2480 | 11.80 | 12.50 | |

**Duty Factor Measured Results**

| Mode | Type | T on (ms) | Period (ms) | Duty Cycle | Crest Factor (1/duty cycle) |
|---|---|---|---|---|---|
| GFSK | DH5 | 2.87 | 3.75 | 76.53% | 1.31 |

**Note(s):**

Duty Cycle = (T on / period) * 100%

## Duty Cycle plots

GFSK

# 10. Measured and Reported (Scaled) SAR Results

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

- Reported SAR(W/kg) for WWAN and Bluetooth = Measured SAR *Tune-up Scaling Factor
- Reported SAR(W/kg) for Wi-Fi = Measured SAR * Tune-up scaling factor * Duty Cycle scaling factor
- Duty Cycle scaling factor = 1 / Duty cycle (%)

**KDB 447498 D01 General RF Exposure Guidance:**

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

## 10.1. Bluetooth

| RF Exposure Conditions | Mode | Dist. (mm) | Test Position | Ch #. | Freq. (MHz) | Power (dBm) | | 1-g SAR (W/kg) | | 10-g SAR (W/kg) | | Plot No. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | Tune-up Limit | Meas. | Meas. | Scaled | Meas. | Scaled | |
| Head | GFSK | 0 | Right Touch | 0 | 2402 | 12.50 | 12.00 | 0.033 | 0.037 | 0.017 | 0.019 | 1 |
| Body | | | Right Flat | 0 | 2402 | 12.50 | 12.00 | 0.568 | 0.637 | 0.186 | 0.209 | 2 |

**Notes:**

SAR Testing was performed on the Flat Phantom for normal use for Head. Additional SAR Testing was performed on the location closest to the Antenna (Rear of the Device) of similar configuration to demonstrate compliance. This was reported as the highest SAR.

# 11. SAR Measurement Variability

In accordance with published RF Exposure KDB 865664 D01 SAR measurement 100 MHz to 6 GHz. These additional measurements are repeated after the completion of all measurements requiring the same head or body tissue-equivalent medium in a frequency band. The test device should be returned to ambient conditions (normal room temperature) with the battery fully charged before it is re-mounted on the device holder for the repeated measurement(s) to minimize any unexpected variations in the repeated results.

1) Repeated measurement is not required when the original highest measured SAR is <0.8 or 2 W/kg (1-g or 10-g respectively); steps 2) through 4) do not apply.
2) When the original highest measured SAR is ≥ 0.8 or 2 W/kg (1-g or 10-g respectively), repeat that measurement once.
3) Perform a second repeated measurement only if the ratio of largest to smallest SAR for the original and first repeated measurements is > 1.20 or 3 (1-g or 10-g respectively) or when the original or repeated measurement is ≥ 1.45 or 3.6 W/kg (~ 10% from the 1-g or 10-g respective SAR limit).
4) Perform a third repeated measurement only if the original, first, or second repeated measurement is ≥ 1.5 or 3.75 W/kg (1-g or 10-g respectively) and the ratio of largest to smallest SAR for the original, first and second repeated measurements is > 1.20 or 3 (1-g or 10-g respectively).

**Conclusion:**

Repeated measurement is not required since the original highest measured SAR is <0.8 W/kg (1-g) .

# 12. Simultaneous Transmission SAR Analysis

N/A

# Appendixes

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

**Appendix A: SAR Setup Photos**

**Appendix B: SAR System Check Plots**

**Appendix C: SAR Highest Test Plots**

**Appendix D: SAR Tissue Ingredients**

**Appendix E: SAR Probe Certificates**

**Appendix F: SAR Dipole Certificates**

**END OF REPORT**