# FCC SAR Test Report

## FCC ID: 2AN9R-M610L

| | | |
|---|---|---|
| **Project No.** | : | 2410C002 |
| **Equipment** | : | LTE Module |
| **Brand Name** | : | Fibocom |
| **Test Model** | : | FM101-GL |
| **Series Model** | : | N/A |
| **Date of Receipt** | : | Oct. 09, 2024 |
| **Date of Test** | : | Oct. 11, 2024 ~ Dec. 22, 2024 |
| **Issued Date** | : | Jan. 20, 2025 |
| **Report Version** | : | R00 |
| **Test Sample** | : | Engineering Sample No.: SSL2024100967. |
| **Standard(s)** | : | Please refer to page 2. |
| **Applicant** | : | Fujian Centerm Information Co .,Ltd. |
| **Address** | : | #21 - #22 Buildings,No.618,Jinshan Road,Jinshan Industrial Park,Cangshan District,Fuzhou City,Fujian Province,China |
| **Manufacturer** | : | Fibocom Wireless Inc. |
| **Address** | : | 1101, Tower A, Building 6, Shenzhen International Innovation Valley, Dashi 1st Rd, Nanshan, Shenzhen, China |

The above equipment has been tested and found compliance with the requirement of the relative standards by BTL Inc.

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| | | |
|---|---|---|
| **Standard(s)** | : | **IEEE Std C95.1:2019** IEEE Standard for Safety Levels with Respect to Human Exposure to Electric, Magnetic, and Electromagnetic Fields, 0 kHz to 300 GHz<br><br>**IEC/IEEE 62209-1528:2020** Measurement procedure for the assessment of specific absorption rate of human exposure to radio frequency fields from hand-held and body-mounted wireless communication devices - Part 1528: Human models, instrumentation, and procedures (Frequency range of 4 MHz to 10 GHz)<br><br>The following reference test guidance is not within the scope of accreditation of A2LA:<br>**KDB447498 D04** Interim General RF Exposure Guidance v01<br>**KDB865664 D01** SAR measurement 100 MHz to 6 GHz v01r04<br>**KDB865664 D02** SAR Reporting v01r02<br>**KDB248227 D01** 802.11 Wi-Fi SAR v02r02<br>**KDB941225 D05** SAR for LTE Devices v02r05<br>**KDB941225 D06** Hot Spot SAR v02r01 |

**Declaration**
**BTL** represents to the client that testing is done in accordance with standard procedures as applicable and that test instruments used has been calibrated with standards traceable to international standard(s) and/or national standard(s).
**BTL**'s reports apply only to the specific samples tested under conditions. It is manufacture's responsibility to ensure that additional production units of this model are manufactured with the identical electrical and mechanical components. BTL assumes no responsibility for the data provided by the customer, any statements, inferences or generalizations drawn by the customer or others from the reports issued by BTL.
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**BTL**'s laboratory quality assurance procedures are in compliance with the ISO/IEC 17025: 2017 requirements, and accredited by the conformity assessment authorities listed in this test report.
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The information, data and test plan are provided by manufacturer which may affect the validity of results, so it is manufacturer's responsibility to ensure that the apparatus meets the essential requirements of applied standards and in all the possible configurations as representative of its intended use.
**Limitation**
For the use of the authority's logo is limited unless the Test Standard(s)/Scope(s)/Item(s) mentioned in this test report is (are) included in the conformity assessment authorities acceptance respective.
Please note that the measurement uncertainty is provided for informational purpose only and are not use in determining the Pass/Fail results.

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## REPORT ISSUED HISTORY

| Report No. | Version | Description | Issued Date | Note |
|---|---|---|---|---|
| BTL-FCC SAR-1-2410C002 | R00 | Original Report. | Jan. 20, 2025 | Valid |

# 1. GENERAL INFORMATION

## 1.1 STATEMENT OF COMPLIANCE

| Mode | Highest Reported Body-worn SAR-1g (W/kg) |
|---|---|
| LTE B2 | 0.906 |
| LTE B4 | 0.973 |
| LTE B5 | 0.887 |
| LTE B7 | 0.932 |
| LTE B12 | 1.035 |
| LTE B13 | 1.135 |
| LTE B14 | 1.067 |
| LTE B17 | 0.986 |
| LTE B25 | 0.941 |
| LTE B26 | 1.033 |
| LTE B30 | 0.978 |
| LTE B38 | 0.995 |
| LTE B41 | 0.998 |
| LTE B66 | 0.995 |
| LTE B71 | 0.988 |
| 2.4G WLAN | 0.221 |
| 5.2G WLAN | 0.493 |
| 5.3G WLAN | 0.491 |
| 5.6G WLAN | 0.617 |
| 5.8G WLAN | 0.615 |
| Bluetooth | 0.002 |

Note:
1) The device is in compliance with Specific Absorption Rate (SAR) for general population uncontrolled exposure limits according to the FCC rule §2.1093, the ANSI C95.1:1992/IEEE C95.1:1991, the NCRP Report Number 86 for uncontrolled environment and had been tested in accordance with the measurement methods and procedures specified in IEC/IEEE 62209-1528:2020.

## 1.2 LABORATORY ENVIRONMENT

| | |
|---|---|
| Temperature | Min. = 20ºC, Max. = 24ºC |
| Relative humidity | Min. = 30%, Max. = 70% |
| Ground system resistance | < 0.5Ω |
| Ambient noise is checked and found very low and in compliance with requirement of standards.<br>Reflection of surrounding objects is minimized and in compliance with requirement of standards. | |

### 1.3 GENERAL DESCRIPTION OF EUT

| | | |
|---|---|---|
| Equipment | LTE Module | |
| Brand Name | Fibocom | |
| Test Model | FM101-GL | |
| Series Model | N/A | |
| Model Difference(s) | N/A | |
| Modulation | LTE(QPSK/16QAM), WiFi(DSSS/OFDM/OFDMA), BT(GFSK/π/4-DQPSK/8-DPSK) | |
| Operation Frequency Range(s) | Band | TX (MHz) |
| | LTE B2 | 1850~1910 |
| | LTE B4 | 1710~1755 |
| | LTE B5 | 824~849 |
| | LTE B7 | 2500~2570 |
| | LTE B12 | 699~716 |
| | LTE B13 | 777~787 |
| | LTE B14 | 788~798 |
| | LTE B17 | 704~716 |
| | LTE B25 | 1850~1915 |
| | LTE B26 | 814~849 |
| | LTE B30 | 2305~2315 |
| | LTE B38 | 2570~2620 |
| | LTE B41 | 2500~2690 |
| | LTE B66 | 1710~1780 |
| | LTE B71 | 663~698 |
| | Bluetooth | 2400~2483.5 |
| | 2.4G WLAN | 2400~2483.5 |
| | 5.2G WLAN | 5150~5250 |
| | 5.3G WLAN | 5250~5350 |
| | 5.6G WLAN | 5470~5725 |
| | 5.8G WLAN | 5725~5850 |
| Power Class | 3, tested with power control “all Max” (LTE B2/4/5/7/12/13/14/17/25/26/30/38/41/66/71) | |
| Test Channels (low-mid-high) | 18700-18900-19100 (LTE B2 BW=20MHz) | |
| | 20050-20175-20300 (LTE B4 BW=20MHz) | |
| | 20450-20525-20600 (LTE B5 BW=10MHz) | |
| | 20850-21100-21350 (LTE B7 BW=20MHz) | |
| | 23060-23095-23130 (LTE B12 BW=10MHz) | |
| | 23230 (LTE B13 BW=10MHz) | |
| | 23330 (LTE B14 BW=10MHz) | |
| | 23780-23790-23800 (LTE B17 BW=10MHz) | |
| | 26140-26365-26590 (LTE B25 BW=20MHz) | |
| | 26765-26865-26965 (LTE B26 BW=15MHz) | |
| | 27710 (LTE B30 BW=10MHz) | |
| | 37850-38000-38150 (LTE B38 BW=20MHz) | |
| | 39750-40620-41490 (LTE B41 BW=20MHz) | |
| | 132072-132322-132572 (LTE B66 BW=20MHz) | |
| | 133222-133322-133372 (LTE B71 BW=20MHz) | |

| Test Channels (low-mid-high) | | | | | |
|---|---|---|---|---|---|
| | 0-39-78 (BT) | | | | |
| | 0-19-39 (BLE) | | | | |
| | 1-6-11 (2.4G WiFi 802.11b/g/n HT20/ax HE20) | | | | |
| | 3-6-9 (2.4G WiFi 802.11n HT40/ax HE40) | | | | |
| | 5G WiFi | 5.2G | 5.3G | 5.6G | 5.8G |
| | 802.11a/n HT20/ ac VHT20/ ax HE20 | 36-40-44-48 | 52-56-60-64 | 100-104-108-112-116-120-124-128-132-136-140 | 149-153-157-161-165 |
| | 802.11n HT40/ ac VHT40/ ax HE40 | 38-46 | 54-62 | 102-110-118-126-134 | 142-151-159 |
| | 802.11ac VHT80/ ax HE80 | 42 | 58 | 106-122 | 138-155 |
| | 802.11ac VHT160/ ax HE160 | / | 50 | 114 | / |

| Antenna Information For LTE | Brand | Ant. Part number | Type | Band | Gain (dBi) |
|---|---|---|---|---|---|
| | WNC Wistron NeWeb Corp. | 81EAB415.G01 | PIFA | LTE Band 2 | 0.55 |
| | | | | LTE Band 4 | 0.88 |
| | | | | LTE Band 5 | -0.95 |
| | | | | LTE Band 7 | 2.95 |
| | | | | LTE Band 12 | -0.34 |
| | | | | LTE Band 13 | -0.30 |
| | | | | LTE Band 14 | -0.51 |
| | | | | LTE Band 17 | -0.34 |
| | | | | LTE Band 25 | 0.74 |
| | | | | LTE Band 26 | -0.51 |
| | | | | LTE Band 30 | 0.74 |
| | | | | LTE Band 38 | 2.99 |
| | | | | LTE Band 41 | 2.99 |
| | | | | LTE Band 66 | 0.88 |
| | | | | LTE Band 71 | -0.34 |

| Antenna Information For WiFi | Ant. | Manufacturer | Ant. Part number | Type | Frequency Range (MHz) | Gain (dBi) |
|---|---|---|---|---|---|---|
| | Main Ant | Wistron NeWeb Corp. | DQ6615GAY00 (81EAA615.GAY) | PIFA | 2400-2483.5 | 1.35 |
| | | | | | 5150-5250 | 2.34 |
| | | | | | 5250-5350 | 2.34 |
| | | | | | 5470-5725 | 2.52 |
| | | | | | 5725-5850 | 1.69 |
| | Aux Ant | Wistron NeWeb Corp. | DQ6615GAY00 (81EAA615.GAY) | PIFA | 2400-2483.5 | 1.16 |
| | | | | | 5150-5250 | 1.58 |
| | | | | | 5250-5350 | 1.58 |
| | | | | | 5470-5725 | 2.37 |
| | | | | | 5725-5850 | 2.37 |

**Other Information**

| Battery Information | | |
|---|---|---|
| | Model Name | QTA-CB1 |
| | Power Rating | DC 7.7V, 5781mAh |
| | Manufacturer | Zhuhai CosMX Power JinWan Subsidiary Co., Ltd. |

Note:
1. Implementation in the following platform
Model name: Centerm Chromebook M610, Centerm Enterprise Chromebook M610, Chromebook M610, M610, M610 Plus, M***, M61***, M********, OM***, OM******** (“*” may be alphanumeric characters, blank or other characters, which represent Operating system or user serial number. such changes do not concern those factors (such as hardware and the external structure) which might impact the security or electromagnetic compatibility of the device.)
Product name: 1) Notebook Computer
2) Chromebook
3) Thin Client
4) Portable cloud computer
5) Notebook PC
Brand name: N/A
Model Difference(s): The specific model differences are: the appearance color of the product is not the same, the sales area is different, and the others are the same, which does not affect EMC and safety.
Hardware Version: V1.0
Firmware Version: Chrome OS 64bit

2. The WWAN SAR value is for FM101-GL Module Card (FCC ID: 2AN9R-M610L).
And the WLAN SAR value is for AX201NGW Module Card (FCC ID: 2AN9R-M610).

3. The antenna gain is provided by the manufacturer.

### 1.4 MAIN TEST INSTRUMENTS

| Item | Equipment | Manufacturer | Model | Serial No. | Cal. Date | Cal. Interval |
|---|---|---|---|---|---|---|
| 1 | Data Acquisition Electronics | Speag | DAE4 | 1390 | Nov. 14, 2024 | 1 Year |
| 2 | Data Acquisition Electronics | Speag | DAE4 | 1717 | Apr. 18, 2024 | 1 Year |
| 3 | E-field Probe | Speag | EX3DV4 | 3809 | Dec. 18, 2023 | 1 Year |
| 4 | E-field Probe | Speag | EX3DV4 | 7693 | Nov. 20, 2024 | 1 Year |
| 5 | System Validation Dipole | Speag | D750V3 | 1095 | Sep. 16, 2024 | 3 Years |
| 6 | System Validation Dipole | Speag | D835V2 | 4d160 | Apr. 25, 2024 | 3 Years |
| 7 | System Validation Dipole | Speag | D1750V2 | 1101 | Apr. 25, 2024 | 3 Years |
| 8 | System Validation Dipole | Speag | D1900V2 | 5d179 | Apr. 25, 2024 | 3 Years |
| 9 | System Validation Dipole | Speag | D2300V2 | 1033 | Sep. 13, 2024 | 3 Years |
| 10 | System Validation Dipole | Speag | D2450V2 | 919 | Apr. 22, 2024 | 3 Years |
| 11 | System Validation Dipole | Speag | D2600V2 | 1067 | Apr. 22, 2024 | 3 Years |
| 12 | System Validation Dipole | Speag | D5GHzV2 | 1160 | Apr. 25, 2024 | 3 Years |
| 13 | ELI Phantom | Speag | ELI Phantom V5.0 | 1222 | N/A | N/A |
| 14 | Radio Communication Analyer | Anritsu | MT8821C | 6261915479 | Jun. 29, 2024 | 1 Year |
| 15 | Wideband Radio Communication Tester | R&S | CMW500 | 165848 | Jan. 20, 2024 | 1 Year |
| 16 | Power Amplifier | Mini-Circuits | ZHL-42W+ | QA1333003 | Jun. 29, 2024 | 1 Year |
| 17 | Power Amplifier | Mini-Circuits | ZVE-8G+ | 520701341 | Jan. 20, 2024 | 1 Year |
| 18 | DC Source metter | Iteck | IT6154 | 006104126768201001 | Jun. 29, 2024 | 1 Year |
| 19 | Vector Network Analyzer | Agilent | E5071C | MY46102965 | Jan. 20, 2024 | 1 Year |
| 20 | Signal Generator | Keysight | N5173B | MY59101420 | Jan. 20, 2024 | 1 Year |
| 21 | Smart Power Sensor | R&S | NRP18S | 101333 | Jun. 01, 2024 | 1 Year |
| 22 | Smart Power Sensor | R&S | NRP-Z21 | 102209 | Jan. 20, 2024 | 1 Year |
| 23 | 3.5mm Economy Calibration Kit | Agilent | 85052D | MY43252246 | Nov. 04, 2024 | 1 Year |
| 24 | Dielectric Assessment Kit | Speag | DAK-3.5 | 1226 | Jan. 24, 2022 | 3 Years |
| 25 | Directional Coupler | Woken | TS-PCC0M-05 | 0107090019 | Jan. 20, 2024 | 1 Year |
| 26 | Coupler | Woken | 0110A05601O-10 | COM5BNW1A2 | Jan. 20, 2024 | 1 Year |

Remark:
1. “N/A” denotes no model name, serial No. or calibration specified.
2.
1) Per KDB865664 D01 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 short block performed before measuring liquid parameters.

# 2. RF EMISSIONS MEASUREMENT

## 2.1 TEST FACILITY

The test facilities used to collect the test data in this report is SAR room at the location of Room 108, Building 2, No.1, Yile Road, Songshan Lake Zone, Dongguan City, Guangdong, People’s Republic of China.
BTL's Registration Number for FCC: 747969.
BTL's Designation Number for FCC: CN1377.

## 2.2 MEASUREMENT UNCERTAINTY

**Uncertainty Budget for Frequency range of 300 MHz to 3 GHz**

| Symbol | Input quantity *Xi* (source of uncertainty) | Unc. Value | Prob. Dist. | Div. | ci (1g) | ci (10g) | Std.Unc. (1g) (±%) | Std.Unc. (10g) (±%) |
|---|---|---|---|---|---|---|---|---|
| **Measurement system errors** | | | | | | | | |
| ***CF*** | Probe calibration(±%) | 12.0 | N | 2 | 1 | 1 | 6.0 | 6.0 |
| $CF_{drift}$ | Probe calibration drift(±%) | 1.7 | R | $\sqrt{3}$ | 1 | 1 | 1.0 | 1.0 |
| ***LIN*** | Probe linearity and detection limit(±%) | 4.7 | R | $\sqrt{3}$ | 1 | 1 | 2.7 | 2.7 |
| ***BBS*** | Broadband signal(±%) | 3.0 | R | $\sqrt{3}$ | 1 | 1 | 1.7 | 1.7 |
| ***ISO*** | Probe isotropy(±%) | 7.6 | R | $\sqrt{3}$ | 1 | 1 | 4.4 | 4.4 |
| ***DAE*** | Other probe and data acquisition errors(±%) | 0.7 | N | 1 | 1 | 1 | 0.7 | 0.7 |
| ***AMB*** | RF ambient and noise(±%) | 1.8 | N | 1 | 1 | 1 | 1.8 | 1.8 |
| $\Delta_{xyz}$ | Probe positioning errors(±mm) | 0.006 | N | 1 | 0.14 | 0.14 | 0.08 | 0.08 |
| ***DAT*** | Data processing errors(±%) | 1.2 | N | 1 | 1 | 1 | 1.2 | 1.2 |
| **Phantom and device (DUT or validation antenna) errors** | | | | | | | | |
| $LIQ(\sigma)$ | Conductivity (meas.)(±%) | 2.5 | N | 1 | 0.78 | 0.71 | 2.0 | 1.8 |
| $LIQ(T_c)$ | Conductivity (temp.)(±%) | 3.3 | R | $\sqrt{3}$ | 0.78 | 0.71 | 1.5 | 1.4 |
| ***EPS*** | Phantom Permittivity(±%) | 14 | R | $\sqrt{3}$ | 0 | 0 | 0.0 | 0.0 |
| ***DIS*** | Distance DUT - TSL(±%) | 2 | N | 1 | 2 | 2 | 4.0 | 4.0 |
| $D_{xyz}$ | Device Positioning(±%) | 0.6 | N | 1 | 1 | 1 | 0.6 | 0.6 |
| ***H*** | Device Holder(±%) | 2 | N | 1 | 1 | 1 | 2.0 | 2.0 |
| ***MOD*** | DUT Modulationm(±%) | 2.4 | R | $\sqrt{3}$ | 1 | 1 | 1.4 | 1.4 |
| ***TAS*** | Time-average SAR(±%) | 1.7 | R | $\sqrt{3}$ | 1 | 1 | 1.0 | 1.0 |
| $RF_{drift}$ | DUT drift(±%) | 1.5 | N | 1 | 1 | 1 | 1.5 | 1.5 |
| ***VAL*** | Val Antenna Unc.(±%) | 0 | N | 1 | 1 | 1 | 0.0 | 0.0 |
| $P_{in}$ | Unc. Input Power(±%) | 0 | N | 1 | 1 | 1 | 0.0 | 0.0 |
| **Corrections to the SAR result** | | | | | | | | |
| $C(\varepsilon',\sigma)$ | Deviation to Target(±%) | 1.9 | N | 1 | 1 | 0.84 | 1.9 | 1.6 |
| $C(R)$ | SAR scaling(±%) | 0 | R | $\sqrt{3}$ | 1 | 1 | 0.0 | 0.0 |
| $u(\Delta SAR)$ | Combined uncertainty | | | | | | 10.3 | 10.2 |
| | Coverage Factor for 95% | | | | | | k=2 | k=2 |
| ***U*** | Expanded uncertainty | | | | | *U* = | 20.7 | 20.5 |
| a Other probability distributions and divisors may be used if they better represent available knowledge of the quantities concerned. | | | | | | | | |

**Uncertainty Budget for Frequency range of 3 GHz to 6 GHz**

| Symbol | Input quantity *Xi* (source of uncertainty) | Unc. Value | Prob. Dist. | Div. | ci (1g) | ci (10g) | Std.Unc. (1g) (±%) | Std.Unc. (10g) (±%) |
|---|---|---|---|---|---|---|---|---|
| **Measurement system errors** | | | | | | | | |
| ***CF*** | Probe calibration(±%) | 14.0 | N | 2 | 1 | 1 | 7.0 | 7.0 |
| $CF_{drift}$ | Probe calibration drift(±%) | 1.7 | R | $\sqrt{3}$ | 1 | 1 | 1.0 | 1.0 |
| ***LIN*** | Probe linearity and detection limit(±%) | 4.7 | R | $\sqrt{3}$ | 1 | 1 | 2.7 | 2.7 |
| ***BBS*** | Broadband signal(±%) | 2.6 | R | $\sqrt{3}$ | 1 | 1 | 1.5 | 1.5 |
| ***ISO*** | Probe isotropy(±%) | 7.6 | R | $\sqrt{3}$ | 1 | 1 | 4.4 | 4.4 |
| ***DAE*** | Other probe and data acquisition errors(±%) | 1.2 | N | 1 | 1 | 1 | 1.2 | 1.2 |
| ***AMB*** | RF ambient and noise(±%) | 1.8 | N | 1 | 1 | 1 | 1.8 | 1.8 |
| $\Delta_{xyz}$ | Probe positioning errors(±mm) | 0.005 | N | 1 | 0.29 | 0.29 | 0.15 | 0.15 |
| ***DAT*** | Data processing errors(±%) | 2.3 | N | 1 | 1 | 1 | 2.3 | 2.3 |
| **Phantom and device (DUT or validation antenna) errors** | | | | | | | | |
| $LIQ(\sigma)$ | Conductivity (meas.)(±%) | 2.5 | N | 1 | 0.78 | 0.71 | 2.0 | 1.8 |
| $LIQ(T_c)$ | Conductivity (temp.)(±%) | 3.4 | R | $\sqrt{3}$ | 0.78 | 0.71 | 1.5 | 1.4 |
| ***EPS*** | Phantom Permittivity(±%) | 14 | R | $\sqrt{3}$ | 0.25 | 0.25 | 2.0 | 2.0 |
| ***DIS*** | Distance DUT - TSL(±%) | 2 | N | 1 | 2 | 2 | 4.0 | 4.0 |
| $D_{xyz}$ | Device Positioning(±%) | 0.5 | N | 1 | 1 | 1 | 0.5 | 0.5 |
| ***H*** | Device Holder(±%) | 1.9 | N | 1 | 1 | 1 | 1.9 | 1.9 |
| ***MOD*** | DUT Modulationm(±%) | 2.4 | R | $\sqrt{3}$ | 1 | 1 | 1.4 | 1.4 |
| ***TAS*** | Time-average SAR(±%) | 1.7 | R | $\sqrt{3}$ | 1 | 1 | 1.0 | 1.0 |
| $RF_{drift}$ | DUT drift(±%) | 0.8 | N | 1 | 1 | 1 | 0.8 | 0.8 |
| ***VAL*** | Val Antenna Unc.(±%) | 0 | N | 1 | 1 | 1 | 0.0 | 0.0 |
| $P_{in}$ | Unc. Input Power(±%) | 0 | N | 1 | 1 | 1 | 0.0 | 0.0 |
| **Corrections to the SAR result** | | | | | | | | |
| $C(\varepsilon',\sigma)$ | Deviation to Target(±%) | 1.9 | N | 1 | 1 | 0.84 | 1.9 | 1.6 |
| $C(R)$ | SAR scaling(±%) | 0 | R | $\sqrt{3}$ | 1 | 1 | 0.0 | 0.0 |
| $u(\Delta SAR)$ | Combined uncertainty | | | | | | 11.2 | 11.1 |
| | Coverage Factor for 95% | | | | | | k=2 | k=2 |
| ***U*** | Expanded uncertainty | | | | | *U* = | 22.5 | 22.3 |
| a Other probability distributions and divisors may be used if they better represent available knowledge of the quantities concerned. | | | | | | | | |

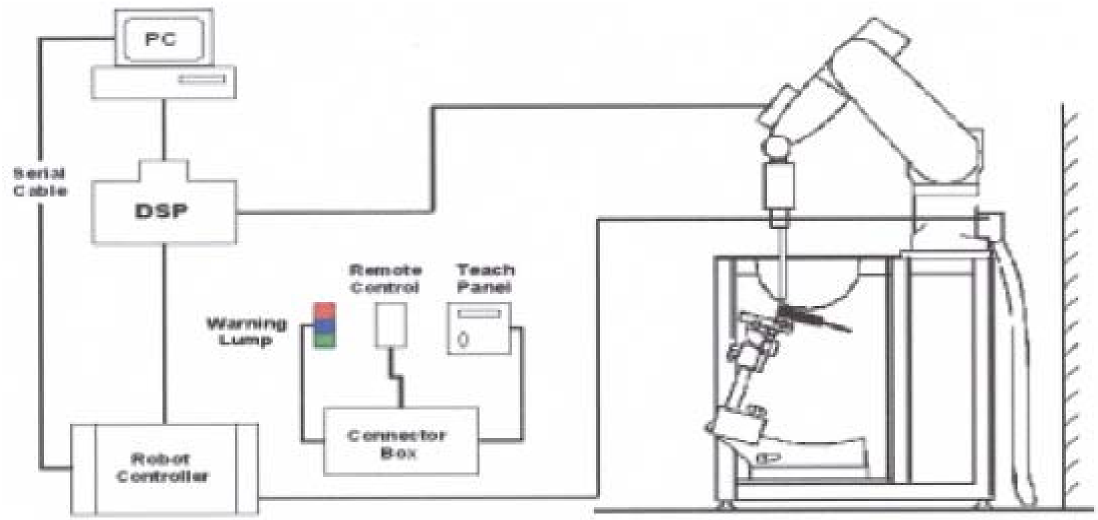
# 3. SAR MEASUREMENTS SYSTEM CONFIGURATION

## 3.1 SAR MEASUREMENT SET-UP

The DASY5 system for performing compliance tests consists of the following items:

1. A standard high precision 6-axis robot (Stäubli RX family) with controller and software. An arm extension for accommodating the data acquisition electronics (DAE).
2. A dosimetric probe, i.e. an isotropic E-field probe optimized and calibrated for usage in tissue simulating liquid. The probe is equipped with an optical surface detector system.
3. A data acquisition electronic (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.
4. A unit to operate the optical surface detector which is connected to the EOC.
5. The Electro-Optical Coupler (EOC) performs the conversion from the optical into a digital electric signal of the DAE. The EOC is connected to the DASY5 measurement server.
6. TheDASY5 measurement server, which performs all real-time data evaluation for field measurements and surface detection, controls robot movements and handles safety operation. A computer operating Windows 7
7. DASY5 software and SEMCAD data evaluation software.
8. Remote control with teach panel and additional circuitry for robot safety such as warning lamps, etc.
9. The generic twin phantom enabling the testing of left-hand and right-hand usage.
10. The device holder for handheld mobile phones.
11. Tissue simulating liquid mixed according to the given recipes.
12. System validation dipoles allowing to validate the proper functioning of the system.

### 3.1.1 TEST SETUP LAYOUT



### 3.2 DASY5 E-FIELD PROBE SYSTEM

The SAR measurements were conducted with the dosimetric probe EX3DV4 (manufactured by SPEAG), designed in the classical triangular configuration and optimized for dosimetric evaluation.

#### 3.2.1 PROBE SPECIFICATION

EX3DV4

| | |
|---|---|
| Construction | Symmetrical design with triangular core Interleaved sensors Built-in shielding against static charges PEEK enclosure material (resistant to organic solvents, e.g., DGBE) |
| Calibration | ISO/IEC 17025 calibration service available |
| Frequency | 10 MHz to 6 GHz<br>Linearity: ± 0.2 dB (30 MHz to 6 GHz) |
| Directivity | ± 0.3 dB in HSL (rotation around probe axis)<br>± 0.5 dB in tissue material (rotation normal to probe axis) |
| Dynamic Range | 10 μW/g to > 100 mW/g<br>Linearity:± 0.2dB |
| Dimensions | Overall length: 330 mm (Tip: 20 mm)<br>Tip diameter: 2.5 mm (Body: 12 mm) Distance from probe tip to dipole centers: 1.0 mm |

**E-field Probe**

### 3.2.2 E-FIELD PROBE CALIBRATION

Each probe is calibrated according to a dosimetric assessment procedure with accuracy better than ±10%. The spherical isotropy was evaluated and found to be better than ± 0.25dB. The sensitivity parameters (NormX, NormY, NormZ), the diode compression parameter (DCP) and the conversion factor (ConvF) of the probe are tested.

The free space E-field from amplified probe outputs is determined in a test chamber. This is performed in a TEM cell for frequencies bellow 1 GHz, and in a wave guide above 1 GHz for free space. For the free space calibration, the probe is placed in the volumetric center of the cavity and at the proper orientation with the field. The probe is then rotated 360 degrees.

E-field temperature correlation calibration is performed in a flat phantom filled with the appropriate simulated brain tissue. The measured free space E-field in the medium correlates to temperature rise in a dielectric medium. For temperature correlation calibration a RF transparent thermistor-based temperature probe is used in conjunction with the E-field probe.

$$\mathbf{SAR} = \mathbf{C}\frac{\Delta T}{\Delta t}$$

Where: $\Delta t$ = Exposure time (30 seconds),

C = Heat capacity of tissue (brain or muscle),

$\Delta T$ = Temperature increase due to RF exposure.

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

Where: $\sigma$ = Simulated tissue conductivity,

$\rho$ = Tissue density (kg/m3).

### 3.2.3 OTHER TEST EQUIPMENT

#### 3.2.3.1. Device Holder for Transmitters

**Construction:** Simple but effective and easy-to-use extension for Mounting Device that facilitates the testing of larger devices (e.g., laptops, cameras, etc.) It is light weight and fits easily on the upper part of the Mounting Device in place of the phone positioner. The extension is fully compatible with the Twin SAM, ELI and SAM v6.0 Phantoms.
**Material:** POM, Acrylic glass, Foam

#### 3.2.3.2 Phantom

<table>
<tr><td>Model</td><td>ELI Phantom</td><td rowspan="6"></td></tr>
<tr><td>Construction</td><td>Phantom for compliance testing of handheld and body-mounted wireless devices in the frequency range of 30 MHz to 6 GHz. ELI is fully compatible with the IEC 62209-2 standard and all known tissue simulating liquids. ELI has been optimized regarding its performance and can be integrated into our standard phantom tables. A cover prevents evaporation of the liquid. Reference markings on the phantom allow installation of the complete setup, including all predefined phantom positions and measurement grids, by teaching three points. The phantom is compatible with all SPEAG dosimetric probes and dipoles.</td></tr>
<tr><td>Shell Thickness</td><td>2±0.1 mm</td></tr>
<tr><td>Filling Volume</td><td>Approx. 30 liters</td></tr>
<tr><td>Dimensions</td><td>Length: 600 mm; Width: 190mm<br>Height: adjustable feet</td></tr>
<tr><td>Available</td><td>Special</td></tr>
</table>

### 3.2.4 SCANNING PROCEDURE

The DASY5 installation includes predefined files with recommended procedures for measurements and validation. They are read-only document files and destined as fully defined but unmeasured masks. All test positions (head or body-worn) are tested with the same configuration of test steps differing only in the grid definition for the different test positions.

The “reference” and “drift” measurements are located at the beginning and end of the batch process. They measure the field drift at one single point in the liquid over the complete procedure. The indicated drift is mainly the variation of the DUT’s output power and should vary max. ± 5 %.

The “surface check” measurement tests the optical surface detection system of the DASY5 system by repeatedly detecting the surface with the optical and mechanical surface detector and comparing the results. The output gives the detecting heights of both systems, the difference between the two systems and the standard deviation of the detection repeatability. Air bubbles or refraction in the liquid due to separation of the sugar-water mixture gives poor repeatability (above ± 0.1mm). To prevent wrong results tests are only executed when the liquid is free of air bubbles. The difference between the optical surface detection and the actual surface depends on the probe and is specified with each probe. (It does not depend on the surface reflectivity or the probe angle to the surface within ± 30°.)

- Area Scan

The “area scan” measures the SAR above the DUT or verification dipole on a parallel plane to the surface. It is used to locate the approximate location of the peak SAR with 2D spline interpolation. The robot performs a stepped movement along one grid axis while the local electrical field strength is measured by the probe. The probe is touching the surface of the SAM during acquisition of measurement values. The standard scan uses large grid spacing for faster measurement. 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). If a finer resolution is needed, the grid spacing can be reduced. Grid spacing and orientation have no influence on the SAR result. For special applications where the standard scan method does not find the peak SAR within the grid, e.g. mobile phones with flip cover, the grid can be adapted in orientation.

- Zoom Scan

A “zoom scan” measures the field in a volume around the 2D peak SAR value acquired in the previous “coarse” scan. This is a fine grid with maximum scan spatial resolution: $\Delta x_{zoom}$, $\Delta y_{zoom}$≤2GHz -≤8mm, 2-4GHz -≤5 mm and 4-6 GHz-≤4mm; $\Delta z_{zoom}$≤3GHz -≤5 mm, 3-4 GHz-≤4mm and 4-6GHz-≤2mm where the robot additionally moves the probe along the z-axis away from the bottom of the Phantom. DASY is also able to perform repeated zoom scans if more than 1 peak is found during area scan. In this document, the evaluated peak 1g and 10g averaged SAR values are shown in the 2D-graphics in Appendix B. Test results relevant for the specified standard (see chapter 1.4.) are shown in table form in chapter 7.2.

A Z-axis scan measures the total SAR value at the x-and y-position of the maximum SAR value found during the cube scan. The probe is moved away in z-direction from the bottom of the SAM phantom in 2 mm steps. This measurement shows the continuity of the liquid and can - depending in the field strength – also show the liquid depth.

The following table summarizes the area scan and zoom scan resolutions per FCC KDB 865664D01:

| Frequency | Maximun Area Scan resolution ($\Delta x_{area}$, $\Delta y_{area}$) | Maximun Zoom Scan spatial resolution ($\Delta x_{Zoom}$, $\Delta y_{Zoom}$) | Maximun Zoom Scan spatial resolution | | | Minimum zoom scan volume (x,y,z) |
|---|---|---|---|---|---|---|
| | | | Uniform Grid | Graded Grad | | |
| | | | $\Delta z_{Zoom}(n)$ | $\Delta z_{Zoom}(1)$* | $\Delta z_{Zoom}(n>1)$* | |
| ≤2GHz | ≤15mm | ≤8mm | ≤5mm | ≤4mm | ≤1.5*$\Delta z_{Zoom}(n-1)$ | ≥30mm |
| 2-3GHz | ≤12mm | ≤5mm | ≤5mm | ≤4mm | ≤1.5*$\Delta z_{Zoom}(n-1)$ | ≥30mm |
| 3-4GHz | ≤12mm | ≤5mm | ≤4mm | ≤3mm | ≤1.5*$\Delta z_{Zoom}(n-1)$ | ≥28mm |
| 4-5GHz | ≤10mm | ≤4mm | ≤3mm | ≤2.5mm | ≤1.5*$\Delta z_{Zoom}(n-1)$ | ≥25mm |
| 5-6GHz | ≤10mm | ≤4mm | ≤2mm | ≤2mm | ≤1.5*$\Delta z_{Zoom}(n-1)$ | ≥22mm |

### 3.2.5 SPATIAL PEAK SAR EVALUATION

The spatial peak SAR - value for 1 and 10 g is evaluated after the Cube measurements have been done. The basis of the evaluation are the SAR values measured at the points of the fine cube grid consisting of 5 x 5 x 7 points (with 8mm horizontal resolution) or 7 x 7 x 7 points (with 5mm horizontal resolution) or 8 x 8 x 7 points (with 4mm horizontal resolution). The algorithm that finds the maximal averaged volume is separated into three different stages.

- The data between the dipole center of the probe and the surface of the phantom are extrapolated. This data cannot be measured since the center of the dipole is 2.7 mm away from the tip of the probe and the distance between the surface and the lowest measuring point is about 1 mm (see probe calibration sheet). The extrapolated data from a cube measurement can be visualized by selecting “Graph Evaluated”.
- The maximum interpolated value is searched with a straight-forward algorithm. Around this maximum the SAR - values averaged over the spatial volumes (1g or 10 g) are computed using the 3d-spline interpolation algorithm. If the volume cannot be evaluated (i.e., if a part of the grid was cut off by the boundary of the measurement area) the evaluation will be started on the corners of the bottom plane of the cube.
- All neighboring volumes are evaluated until no neighboring volume with a higher average value is found.

**Extrapolation**

The extrapolation is based on a least square algorithm [W. Gander, Computer mathematic, p.168-180]. Through the points in the first 3 cm along the z-axis, polynomials of order four are calculated. These polynomials are then used to evaluate the points between the surface and the probe tip. The points, calculated from the surface, have a distance of 1 mm from each other.

**Interpolation**

The interpolation of the points is done with a 3d-Spline. The 3d-Spline is composed of three one-dimensional splines with the "Not a knot"-condition [W. Gander, Computer mathematic, p.141-150] (x, y and z -direction) [Numerical Recipes in C, Second Edition, p.123ff ].

**Volume Averaging**

At First the size of the cube is calculated. Then the volume is integrated with the trapezoidal algorithm. 8000 points (20x20x20) are interpolated to calculate the average.

**Advanced Extrapolation**

DASY5 uses the advanced extrapolation option which is able to compensate boundary effects on E-field probes.

### 3.2.6 DATA STORAGE AND EVALUATION

#### 3.2.6.1 Data Storage

The DASY5 software stores the acquired data from the data acquisition electronics as raw data (in microvolt readings from the probe sensors), together with all necessary software parameters for the data evaluation (probe calibration data, liquid parameters and device frequency and modulation data) in measurement files with the extension “DAE”. The software evaluates the desired unit and format for output each time the data is visualized or exported. This allows verification of the complete software setup even after the measurement and allows correction of incorrect parameter settings. For example, if a measurement has been performed with a wrong crest factor parameter in the device setup, the parameter can be corrected afterwards and the data can be re-evaluated.

The measured data can be visualized or exported in different units or formats, depending on the selected probe type ([V/m], [A/m], [°C], [mW/g], [mW/cm²], [dBrel], etc.). Some of these units are not available in certain situations or show meaningless results, e.g., a SAR output in a lossless media will always be zero. Raw data can also be exported to perform the evaluation with other software packages.

### 3.2.7 DATA EVALUATION BY SEMCAD

The SEMCAD software automatically executes the following procedures to calculate the field units from the microvolt readings at the probe connector. The parameters used in the evaluation are stored in the configuration modules of the software:

| | | |
|---|---|---|
| Probe parameters: | Sensitivity | $Norm_i$, $a_{i0}$, $a_{i1}$, $a_{i2}$ |
| | Conversion factor | $ConvF_i$ |
| | Diode compression point | $Dcp_i$ |
| Device parameters: | Frequency | f |
| | Crest factor | cf |
| Media parameters: | Conductivity | |
| | Density | |

These parameters must be set correctly in the software. They can be found in the component documents or they can be imported into the software from the configuration files issued for the DASY5 components. In the direct measuring mode of the multi meter option, the parameters of the actual system setup are used. In the scan visualization and export modes, the parameters stored in the corresponding document files are used.

The first step of the evaluation is a linearization of the filtered input signal to account for the compression characteristics of the detector diode. The compensation depends on the input signal, the diode type and the DC-transmission factor from the diode to the evaluation electronics.

If the exciting field is pulsed, the crest factor of the signal must be known to correctly compensate for peak power. The formula for each channel can be given as:

$$V_i = U_i + U_i^2 \cdot cf / dcp_i$$

| | | |
|---|---|---|
| With | $V_i$ = compensated signal of channel i | ( i = x, y, z ) |
| | $U_i$ = input signal of channel i | ( i = x, y, z ) |
| | cf = crest factor of exciting field | (DASY parameter) |
| | $dcp_i$ = diode compression point | (DASY parameter) |

From the compensated input signals the primary field data for each channel can be evaluated:

E-field probes: $E_i = ( V_i \, / \, Norm_i \cdot ConvF )^{1/2}$

H-field probes: $H_i = ( V_i )^{1/2} \cdot ( a_{i0} + a_{i1} f + a_{i2} f^2 ) / f$

With $V_i$ = compensated signal of channel i ( i = x, y, z )

$Norm_i$ = sensor sensitivity of channel i ( i = x, y, z )

[mV/(V/m)$^2$] for E-field Probes

ConvF = sensitivity enhancement in solution

aij = sensor sensitivity factors for H-field probes

f = carrier frequency [GHz]

$E_i$ = electric field strength of channel i in V/m

$H_i$ = magnetic field strength of channel i in A/m

The RSS value of the field components gives the total field strength (Hermitian magnitude):

$$E_{tot} = (E_X^2 + E_Y^2 + E_Z^2)^{1/2}$$

The primary field data are used to calculate the derived field units.

$$SAR = (E_{tot})^2 \cdot \boldsymbol{\sigma} / (\boldsymbol{\rho} \cdot 1000)$$

With SAR = local specific absorption rate in mW/g

$E_{tot}$ = total field strength in V/m

= conductivity in [mho/m] or [Siemens/m]

= equivalent tissue density in g/cm$^3$

Note that the density is normally set to 1 (or 1.06), to account for actual brain density rather than the density of the simulation liquid. The power flow density is calculated assuming the excitation field to be a free space field.

$$P_{pwe} = E_{tot}^2 / 3770 \text{ or } P_{pwe} = H_{tot}^2 \cdot 37.7$$

With $P_{pwe}$ = equivalent power density of a plane wave in mW/cm$^2$

$E_{tot}$ = total field strength in V/m

$H_{tot}$ = total magnetic field strength in A/m

# 4. SYSTEM VERIFICATION PROCEDURE

## 4.1 TISSUE VERIFICATION

The simulating liquids should be checked at the beginning of a series of SAR measurements to determine of the dielectic parameter are within the tolerances of the specified target values. The measured conductivity and relative permittivity should be within ± 5% of the target values.

The following materials are used for producing the tissue-equivalent materials.

| Tissue Type | Bactericide | DGBE | HEC | NaCl | Sucrose | Triton X-100 | Water | Diethylene Glycol Mono-hexylether |
|---|---|---|---|---|---|---|---|---|
| Head 750 | 0.2 | - | 0.2 | 1.5 | 56.0 | - | 42.1 | - |
| Head 835 | 0.2 | - | 0.2 | 1.5 | 57.0 | - | 41.1 | - |
| Head 1750 | - | 47.0 | - | 0.4 | - | - | 52.6 | - |
| Head 1900 | - | 44.5 | - | 0.2 | - | - | 55.3 | - |
| Head 2300 | - | 44.9 | - | 0.1 | - | - | 55.0 | - |
| Head 2450 | - | 45.0 | - | 0.1 | - | - | 54.9 | - |
| Head 2600 | - | 45.1 | - | 0.1 | - | - | 54.8 | - |
| Head 5G | - | - | - | - | - | 17.2 | 65.5 | 17.3 |

Salt: 99+% Pure Sodium Chloride; Sugar: 98+% Pure Sucrose; Water: De-ionized, 16M + resistivity
HEC: Hydroxyethyl Cellulose; DGBE: 99+% Di(ethylene glycol) butyl ether,[2-(2-butoxyethoxy)ethanol]
Triton X-100(ultra pure): Polyethylene glycol mono [4-(1,1,3,3-tetramethylbutyl)phenyl]ether

| Tissue Verification | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| Tissue Type | Frequency (MHz) | Liquid Temp. (℃) | Conductivity (σ) | Permittivity (εr) | Targeted Conductivity (σ) | Targeted Permittivity (εr) | Deviation Conductivity (σ) (%) | Deviation Permittivity (εr) (%) | Date |
| Head | 750 | 22.0 | 0.898 | 42.987 | 0.89 | 41.9 | 0.90 | 2.59 | Dec. 21, 2024 |
| Head | 835 | 22.0 | 0.926 | 42.311 | 0.90 | 41.5 | 2.89 | 1.95 | Dec. 21, 2024 |
| Head | 1750 | 22.7 | 1.345 | 39.590 | 1.37 | 40.1 | -1.82 | -1.27 | Dec. 20, 2024 |
| Head | 1900 | 22.7 | 1.336 | 41.001 | 1.40 | 40.0 | -4.57 | 2.50 | Dec. 20, 2024 |
| Head | 2300 | 22.3 | 1.657 | 40.491 | 1.67 | 39.5 | -0.78 | 2.51 | Dec. 22, 2024 |
| Head | 2450 | 22.1 | 1.786 | 39.691 | 1.80 | 39.2 | -0.78 | 1.25 | Nov. 09, 2024 |
| Head | 2600 | 22.3 | 1.994 | 39.420 | 1.96 | 39.0 | 1.73 | 1.08 | Dec. 22, 2024 |
| Head | 5250 | 22.4 | 4.719 | 35.442 | 4.71 | 36.0 | 0.19 | -1.41 | Nov. 11, 2024 |
| Head | 5600 | 22.4 | 5.106 | 34.743 | 5.07 | 35.5 | 0.71 | -2.13 | Nov. 11, 2024 |
| Head | 5750 | 22.4 | 5.296 | 34.340 | 5.22 | 35.4 | 1.46 | -2.86 | Nov. 11, 2024 |

Note:
1) The dielectric parameters of the tissue-equivalent liquid should be measured under similar ambient conditions and within 2 °C of the conditions expected during the SAR evaluation to satisfy protocol requirements.
2) KDB 865664 was ensured to be applied for probe calibration frequencies greater than or equal to 50MHz of the EUT frequencies.
3) The above measured tissue parameters were used in the DASY software to perform interpolation via the DASY software to determine actual dielectric parameters at the test frequencies. The SAR test plots may slightly differ from the table above since the DASY rounds to three significant digits.

## 4.2 SYSTEM CHECK

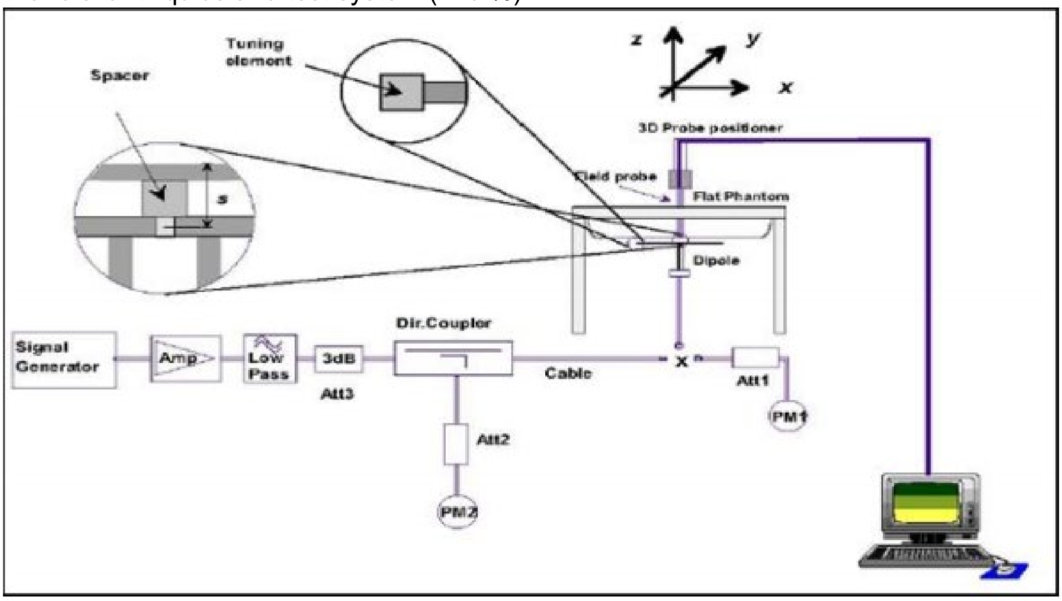
The system check is performed for verifying the accuracy of the complete measurement system and performance of the software. The system check is performed with tissue equivalent material according to IEEE P1528 (described above). The following table shows system check results for all frequency bands and tissue liquids used during the tests.

| System Check | Date | Frequency (MHz) | Targeted SAR 1g (W/kg) | Measured SAR 1g (W/kg) | normalized SAR 1g (W/kg) | Deviation 1g (%) | Dipole S/N |
|---|---|---|---|---|---|---|---|
| Head | Dec. 21, 2024 | 750 | 8.59 | 2.10 | 8.40 | -2.21 | 1132 |
| Head | Dec. 21, 2024 | 835 | 9.52 | 2.48 | 9.92 | 4.20 | 4d160 |
| Head | Dec. 20, 2024 | 1750 | 36.40 | 9.14 | 36.56 | 0.44 | 1101 |
| Head | Dec. 20, 2024 | 1900 | 39.60 | 9.57 | 38.28 | -3.33 | 5d179 |
| Head | Dec. 22, 2024 | 2300 | 49.10 | 12.30 | 49.20 | 0.20 | 1092 |
| Head | Nov. 09, 2024 | 2450 | 52.10 | 12.90 | 51.60 | -0.96 | 919 |
| Head | Dec. 22, 2024 | 2600 | 56.90 | 13.60 | 54.40 | -4.39 | 1067 |
| Head | Nov. 11, 2024 | 5250 | 78.00 | 7.83 | 78.30 | 0.38 | 1160 |
| Head | Nov. 11, 2024 | 5600 | 80.60 | 8.09 | 80.90 | 0.37 | 1160 |
| Head | Nov. 11, 2024 | 5750 | 76.50 | 7.35 | 73.50 | -3.92 | 1160 |

## 4.3 SYSTEM CHECK PROCEDURE

The system check is performed by using a system check dipole which is positioned parallel to the planar part of the SAM phantom at the reference point. The distance of the dipole to the SAM phantom is determined by a plexiglass spacer. The dipole is connected to the signal source consisting of signal generator and amplifier via a directional coupler, N-connector cable and adaption to SMA. It is fed with a power of 250mW (below 3GHz) or 100mW (3-6GHz). To adjust this power a power meter is used.
The power sensor is connected to the cable before the system check to measure the power at this point and do adjustments at the signal generator. At the outputs of the directional coupler both return loss as well as forward power are controlled during the system check to make sure that emitted power at the dipole is kept constant. This can also be checked by the power drift measurement after the test.

System check results have to be equal or near the values determined during dipole calibration (target SAR in table above) with the relevant liquids and test system (±10 %).



# 5. SAR MEASUREMENT VARIABILITY AND UNCERTAINTY

## 5.1 SAR MEASUREMENT VARIABILITY

Per KDB865664 D01 SAR measurement 100 MHz to 6 GHz, SAR measurement variability must be assessed for each frequency band, which is determined by the SAR probe calibration point and tissue-equivalent medium used for the device measurements. The 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 < 0.80 W/kg; steps 2) through 4) do not apply.
2) When the original highest measured SAR is ≥ 0.80 W/kg, 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 when the original or repeated measurement is ≥ 1.45 W/kg (~ 10% from the 1-g SAR limit).
4) Perform a third repeated measurement only if the original, first or second repeated measurement is ≥ 1.5 W/kg and the ratio of largest to smallest SAR for the original, first and second repeated measurements is > 1.20.

The same procedures should be adapted for measurements according to extremity and occupational exposure limits by applying a factor of 2.5 for extremity exposure and a factor of 5 for occupational exposure to the corresponding SAR thresholds.

The detailed repeated measurement results are shown in Section 7.2.

# 6. OPERATIONAL CONDITIONS DURING TEST

## 6.1 GENERAL DESCRIPTION OF TEST PROCEDURES

Connection to the EUT is established via air interface with Anritsu MT8821C & R&S CMW500, and the EUT is set to maximum output power by Anritsu MT8821C & R&S CMW500. The EUT battery must be fully charged and checked periodically during the test to ascertain uniform power output. The antenna connected to the output of the base station simulator shall be placed at least 50cm away from the EUT. The signal transmitted by the simulator to the antenna feeding point shall be lower than the output power level of the EUT by at least 30dB.

## 6.2 SAR TEST CONFIGURATION

### 6.2.1 LTE TEST CONFIGURATION

SAR for LTE band exposure configurations is measured according to the procedures of KDB 941225 D05 SAR for LTE Devices. The CMW500 Wide Band Radio Communication Tester was used for LTE output power measurements and SAR testing. Closed loop power control was used so the UE transmits with maximum output power during SAR testing. SAR test were performed with the same number of RB and RB offsets transmitting on all TTI frames (Maximum TTI).

**1. Spectrum Plots for RB configurations**

A properly configured base station simulator was used for LTE output power measurements and SAR testing. Therefore, spectrum plots for RB configurations were not required to be included in this report.

**2. MPR**

When MPR is implemented permanently within the UE, regardless of network requirements, only those RB configurations allowed by 3GPP for the channel bandwidth and modulation. Combinations may be tested with MPR active. Configurations with RB allocations less than the RB thresholds required by 3GPP must be tested without MPR.

The allowed Maximum Power Reduction (MPR) for the maximum output power due to higher order modulation and transmit bandwidth configuration (resource blocks) is specified in Table 6.2.3-1 of the 3GPP TS36.101:

**Table 6.2.3-1: Maximum Power Reduction (MPR) for Power Class 3**

| Modulation | Channel bandwidth / Transmission bandwidth ($N_{RB}$) | | | | | | MPR (dB) |
|---|---|---|---|---|---|---|---|
| | 1.4 MHz | 3.0 MHz | 5 MHz | 10 MHz | 15 MHz | 20 MHz | |
| QPSK | > 5 | > 4 | > 8 | > 12 | > 16 | > 18 | ≤ 1 |
| 16 QAM | ≤ 5 | ≤ 4 | ≤ 8 | ≤ 12 | ≤ 16 | ≤ 18 | ≤ 1 |
| 16 QAM | > 5 | > 4 | > 8 | > 12 | > 16 | > 18 | ≤ 2 |

**3. A-MPR**

A-MPR (Additional MPR) has been disabled for all SAR tests by using Network Signalling Value of “NS_01” on the base station simulator.

**4. LTE procedures for SAR testing**

**A) Largest channel bandwidth standalone SAR test requirements**

i) QPSK with 1 RB allocation

Start with the largest channel bandwidth and measure SAR for QPSK with 1 RB allocation, using the RB offset and required test channel combination with the highest maximum output power for RB offsets at the upper edge, middle and lower edge of each required test channel. When the reported SAR is ≤ 0.8 W/kg, testing of the remaining RB offset configurations and required test channels is not required for 1 RB allocation; otherwise, SAR is required for the remaining required test channels and only for the RB offset configuration with the highest output power for that channel. When the reported SAR of a required test channel is > 1.45 W/kg, SAR is required for all three RB offset configurations for that required test channel.

ii) QPSK with 50% RB allocation

The procedures required for 1 RB allocation in i) are applied to measure the SAR for QPSK with 50% RB allocation.

iii) QPSK with 100% RB allocation

For QPSK with 100% RB allocation, SAR is not required when the highest maximum output power for 100 % RB allocation is less than the highest maximum output power in 50% and 1 RB allocations and the highest reported SAR for 1 RB and 50% RB allocation in i) and ii) are ≤ 0.8 W/kg. Otherwise, SAR is measured for the highest output power channel and if the reported SAR is > 1.45 W/kg, the remaining required test channels must also be tested.

iv) Higher order modulations

For each modulation besides QPSK; e.g., 16-QAM, 64-QAM, apply the QPSK procedures in above sections to determine the QAM configurations that may need SAR measurement. For each configuration identified as required for testing, SAR is required only when the highest maximum output power for the configuration in the higher order modulation is > ½ dB higher than the same configuration in QPSK or when the reported SAR for the QPSK configuration is > 1.45 W/kg.

**B) Other channel bandwidth standalone SAR test requirements**

For the other channel bandwidths used by the device in a frequency band, apply all the procedures required for the largest channel bandwidth in section A) to determine the channels and RB configurations that need SAR testing and only measure SAR when the highest maximum output power of a configuration requiring testing in the smaller channel bandwidth is > ½ dB higher than the equivalent channel configurations in the largest channel bandwidth configuration or the reported SAR of a configuration for the largest channel bandwidth is > 1.45 W/kg.

**LTE (TDD) Test Configuration**

According to KDB 941225 D05 SAR for LTE Devices V02r05, for Time-Division Duplex (TDD) systems, SAR must be tested using a fixed periodic duty factor according to the highest transmission duty factor implemented for the device and supported by the defined 3GPP LTE TDD configurations.
TDD LTE B38/41/71 supports 3GPP TS 36 for Time-Division Duplex (TDD) systems, SAR must be tested using a fixed periodic duty factor according to the highest transmission duty factor implemented for the device and supported by the defined 3GPP LTE TDD configurations.
TDD LTE B38/41/71 supports 3GPP TS 36.211 section 4.2 for Type 2 Frame Structure and Table 4.2-2 for uplink-downlink configurations and Table 4.2-1 for Special subframe configurations.

**Figure 4.2-1: Frame structure type 2**

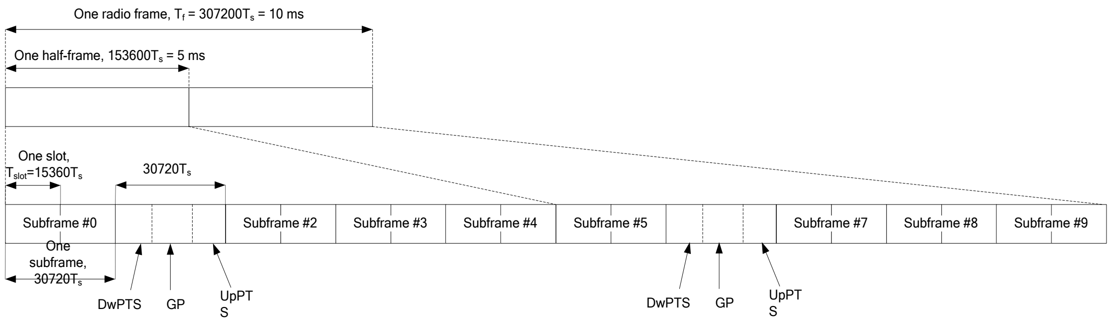



**Table 4.2-1: Configuration of special subframe (lengths of DwPTS/GP/UpPTS)**

<table>
<tr><th rowspan="3">Special subframe configuration</th><th colspan="3">Normal cyclic prefix in downlink</th><th colspan="3">Extended cyclic prefix in downlink</th></tr>
<tr><th>DwPTS</th><th colspan="2">UpPTS</th><th>DwPTS</th><th colspan="2">UpPTS</th></tr>
<tr><th></th><th>Normal cyclic prefix in uplink</th><th>Extended cyclic prefix in uplink</th><th></th><th>Normal cyclic prefix in uplink</th><th>Extended cyclic prefix in uplink</th></tr>
<tr><td>0</td><td>$6592 \cdot T_s$</td><td rowspan="5">$2192 \cdot T_s$</td><td rowspan="5">$2560 \cdot T_s$</td><td>$7680 \cdot T_s$</td><td rowspan="4">$2192 \cdot T_s$</td><td rowspan="4">$2560 \cdot T_s$</td></tr>
<tr><td>1</td><td>$19760 \cdot T_s$</td><td>$20480 \cdot T_s$</td></tr>
<tr><td>2</td><td>$21952 \cdot T_s$</td><td>$23040 \cdot T_s$</td></tr>
<tr><td>3</td><td>$24144 \cdot T_s$</td><td>$25600 \cdot T_s$</td></tr>
<tr><td>4</td><td>$26336 \cdot T_s$</td><td>$7680 \cdot T_s$</td><td rowspan="4">$4384 \cdot T_s$</td><td rowspan="4">$5120 \cdot T_s$</td></tr>
<tr><td>5</td><td>$6592 \cdot T_s$</td><td rowspan="5">$4384 \cdot T_s$</td><td rowspan="5">$5120 \cdot T_s$</td><td>$20480 \cdot T_s$</td></tr>
<tr><td>6</td><td>$19760 \cdot T_s$</td><td>$23040 \cdot T_s$</td></tr>
<tr><td>7</td><td>$21952 \cdot T_s$</td><td>$12800 \cdot T_s$</td></tr>
<tr><td>8</td><td>$24144 \cdot T_s$</td><td>-</td><td>-</td><td>-</td></tr>
<tr><td>9</td><td>$13168 \cdot T_s$</td><td>-</td><td>-</td><td>-</td></tr>
</table>

**Table 4.2-2: Uplink-downlink configurations**

| Uplink-downlink configuration | Downlink-to-Uplink Switch-point periodicity | Subframe number | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 |
| 0 | 5 ms | D | S | U | U | U | D | S | U | U | U |
| 1 | 5 ms | D | S | U | U | D | D | S | U | U | D |
| 2 | 5 ms | D | S | U | D | D | D | S | U | D | D |
| 3 | 10 ms | D | S | U | U | U | D | D | D | D | D |
| 4 | 10 ms | D | S | U | U | D | D | D | D | D | D |
| 5 | 10 ms | D | S | U | D | D | D | D | D | D | D |
| 6 | 5 ms | D | S | U | U | U | D | S | U | U | D |

According to Figure 4.2-1, one radio frame is configured by 10 subframes, which consist of Uplink-subframe, Downlink-subframe and Special subframe. For TDD-LTE, the Duty Cycle should be calculated on Uplink-subframes and Special subframes, due to Special subframe containing both Uplink transmissions. So for one radio frame, Duty Cycle can be calculated with formula as below. The count of Uplink subframes are according to Table 4.2-2:

Duty cycle =(30720Ts*Ups+Uplink Component*Specials)/(307200Ts)

About the uplink component of Special subframes, we can figure out by Table 4.2-1:

Uplink Component=UpPTS

In conclusion, for the TDD LTE B38/41/71, Duty Cycle can be calculated with formula as below. All these sets are ok when we test, or we can set as below.

Duty cycle =[(30720Ts*Ups)+ UpPTS *Specials]/(307200Ts)

And we can get different Duty cycles under different configurations:

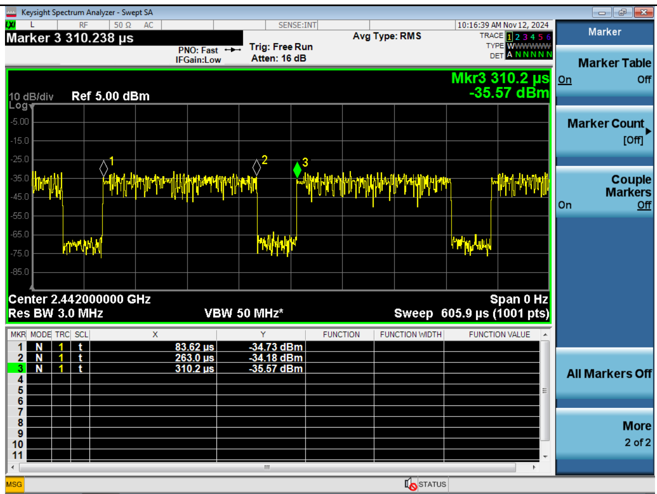
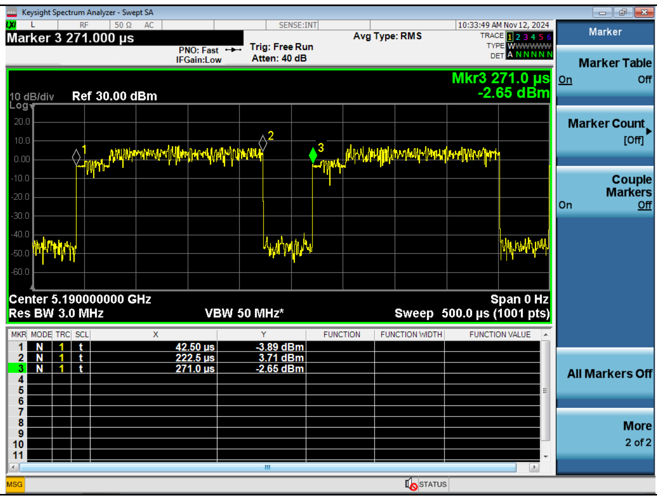
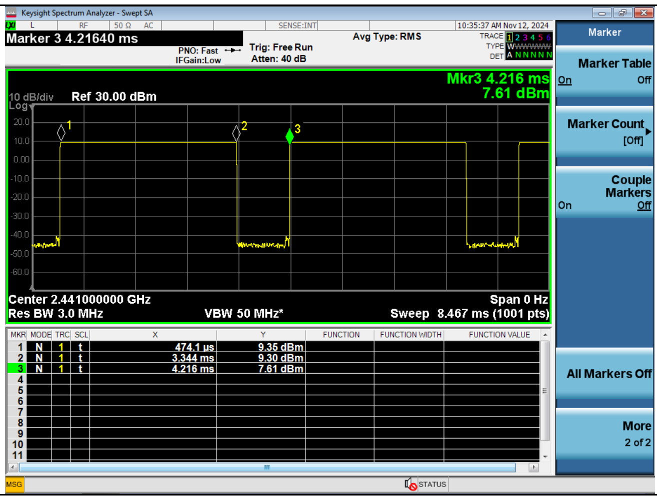
| Uplink-downlink configuration | Subframe number | | | Configuration of special subframe | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | Normal cyclic prefix in downlink | | | | Extended cyclic prefix in downlink | | | |
| | | | | Normal cyclic prefix in uplink | | Extended cyclic prefix in uplink | | Normal cyclic prefix in uplink | | Extended cyclic prefix in uplink | |
| | D | S | U | configuration 0-4 | configuration 5-9 | configuration 0-4 | configuration 5-9 | configuration 0-3 | configuration 4-7 | configuration 0-3 | configuration |
| 0 | 2 | 2 | 6 | 61.43% | 62.85% | 61.67% | 63.33% | 61.43% | 62.85% | 61.67% | 63.33% |
| 1 | 4 | 2 | 4 | 41.43% | 42.85% | 41.67% | 43.33% | 41.43% | 42.85% | 41.67% | 43.33% |
| 2 | 6 | 2 | 2 | 21.43% | 22.85% | 21.67% | 23.33% | 21.43% | 22.85% | 21.67% | 23.33% |
| 3 | 6 | 1 | 3 | 30.71% | 31.43% | 30.83% | 31.67% | 30.71% | 31.43% | 30.83% | 31.67% |
| 4 | 7 | 1 | 2 | 20.71% | 21.43% | 20.83% | 21.67% | 20.71% | 21.43% | 20.83% | 21.67% |
| 5 | 8 | 1 | 1 | 10.71% | 11.43% | 10.83% | 11.67% | 10.71% | 11.43% | 10.83% | 11.67% |
| 6 | 3 | 2 | 5 | 51.43% | 52.85% | 51.67% | 53.33% | 51.43% | 52.85% | 51.67% | 53.33% |

For TDD LTE, SAR should be tested with the highest transmission duty factor (63.33%) using Uplink-downlink configuration 0 and Special subframe configuration 7 for Frame structure type 2.

### 6.2.2 WIFI TEST CONFIGURATION

For BT / WLAN SAR testing, BT / WLAN engineering testing software installed on the DUT can provide continuous transmitting RF signal.

For WiFi SAR testing, a communication link is set up with the test mode software for WiFi mode test. During the test, at the each test frequency channel, the EUT is operated at the RF continuous emission mode. The RF signal utilized in SAR measurement has 100% duty cycle and its crest factor is 1. The test procedures in KDB 248227 D01 are applied.

| Duty Cycle | Duty Cycle |
|---|---|
| WiFi 2.4G | WiFi 5G |
| 79.17% | 78.77% |
|   |   |
| Duty Cycle | |
| BT | |
| 76.70% | |
|   | |

#### 6.1.4.1 2.4G SAR Test Requirements

**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 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.

**2.4 GHz 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. 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.

**SAR Test Requirements for OFDM configurations**

When SAR measurement is required for 2.4 GHz 802.11g/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.

#### 6.1.4.2 5G SAR Test Requirements

✧ **U-NII-1 and U-NII-2A Band**

For devices that operate in both U-NII-1 and U-NII-2A bands, 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. 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.

✧ **U-NII-2C, 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, the channels at 5.60 – 5.65 GHz in U-NII-2C band must be disabled with acceptable mechanisms and documented in the equipment certification.
Unless band gap channels are permanently disabled, they must be considered for SAR testing.
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.11 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.

#### 6.1.4.3 OFDM transmission mode and SAR test channel selection

For the 2.4GHz and 5GHz bands, 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 is 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.

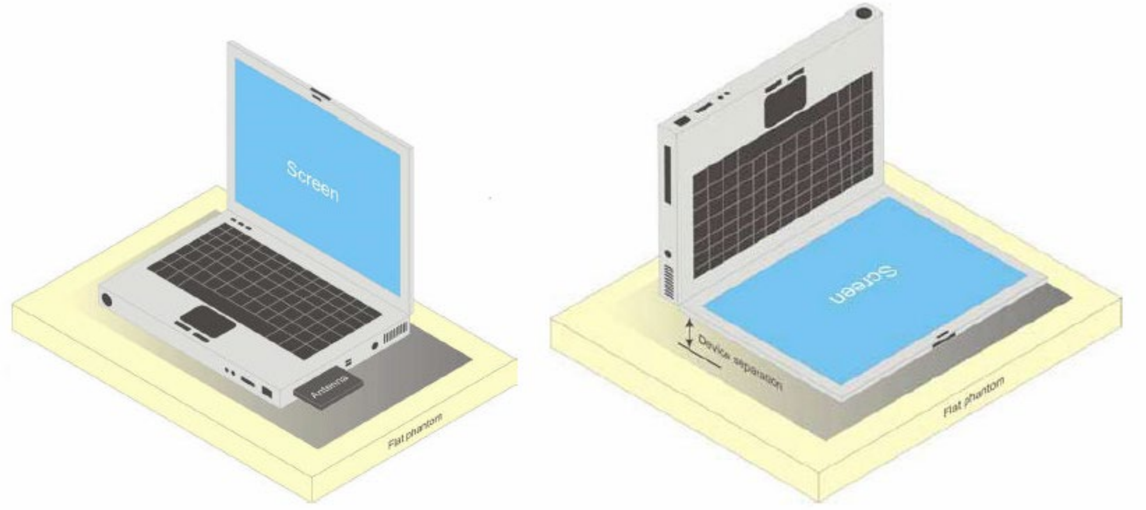
#### 6.1.4.4 Initial test configuration procedure

For OFDM, in both 2.4GHz and 5GHz bands, an initial test configuration is determined for each frequency band and aggregated band, according to the transmission mode with the highest maximum output power specified for SAR measurements. When the same maximum output power is specified for multiple OFDM transmission mode configurations in a frequency band or aggregated band, SAR is measured using the configuration(s) with the largest channel bandwidth, lowest order modulation, and lowest data rate. If the average RF output powers of the highest identical transmission modes are within 0.25 dB of each other, mid channel of the transmission mode with highest average RF output powers is the initial test channel. Otherwise, the channel of the transmission mode with the highest average RF output power will be the initial test configuration.
When the reported SAR is ≤ 0.8 W/kg, no additional measurements on other test channels are required. Otherwise, SAR is evaluated using the subsequent highest average RF output channel until the reported SAR result is ≤ 1.2 W/kg or all channels are measured. When there are multiple untested channels having the same subsequent highest average RF output power, the channel with higher frequency from the lowest 802.11 mode is considered for SAR measurement.

## 6.3 TEST POSITION

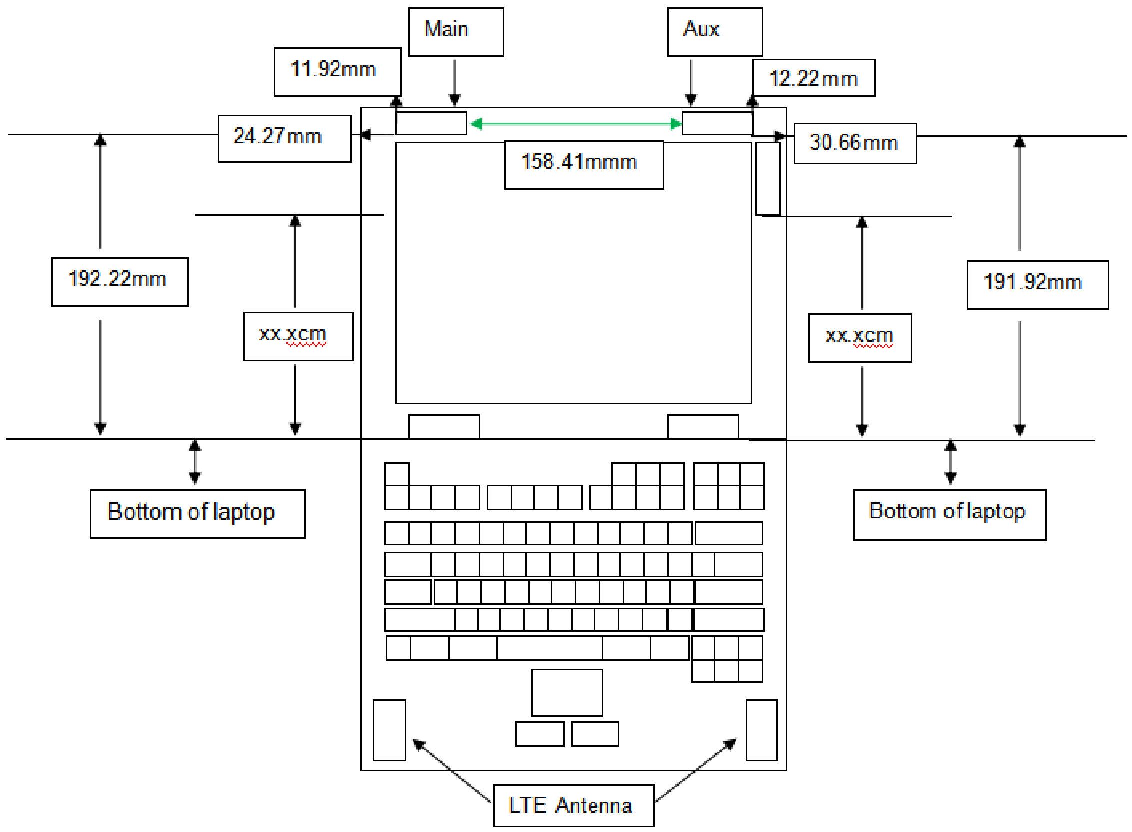
### 6.3.1 NOTEBOOK MODE

This DUT was tested in 2 different positions. They are back of keyboard and back of screen as illustrated below:




a) Portable computer with back of keyboard and back of screen.

The location of the antenna inside EUT is as below:




The SAR measurement positions of each band are as below:

| Antenna | Back of Keyboard | Back of Screen |
|---|---|---|
| Main Ant | Yes | Yes |
| Aux Ant | Yes | Yes |

## 6.4 POWER REDUCTION BY PROXIMITY SENSING

A proximity sensor for power reduction is implemented in this device to address RF exposure compliance when the cellular antenna is positioned close to the user's body. The sensor's mechanical structure is designed to fit within the enclosure design used in this device and also extended around the edge and top of the antenna element in order to optimize sensitivity in these orientations. This design combines the antenna printed directly on a plastic part and proximity sensor FPC (Flexible Printed Circuit) bonded together into one piece. According to KDB 616217 D04 SAR for laptop and tablets v01r02)

### 6.4.1 PROCEDURES FOR DETERMINING PROXIMITY SENSOR TRIGGERING DISTANCES

The following procedures should be applied to determine proximity sensor triggering distances for the back surface and individual edges of a tablet. Conducted power is monitored qualitatively to identify the general triggering characteristics and recorded quantitatively, versus spacing, as required by the procedures. Unless there is built-in test software that reports the triggering conditions and enables the power levels to be confirmed separately, monitoring of conducted power during the triggering tests typically requires internal access to the antenna ports inside the tablet, which may interfere with the triggering tests.

1. The relevant transmitter should be set to operate at its normal maximum output power.

2. The entire back surface or edge of the tablet is positioned below a flat phantom filled with the required tissue-equivalent medium, and positioned at least 20 mm further than the distance that triggers power reduction.

3. It should be ensured that the cables required for power measurements are not interfering with the proximity sensor. Cable losses should be properly compensated to report the measured power results.

4. The back surface or edge is moved toward the phantom in 3 mm steps until the sensor triggers.

5. The back surface or edge is then moved back (further away) from the phantom by at least 5 mm or until maximum output power is returned to the normal maximum level.

6. The back surface or edge is again moved toward the phantom, but in 1 mm steps, until it is at least 5 mm past the triggering point or touching the phantom. If 1 mm resolution is not suitable for the sensor triggering sensitivity, a KDB inquiry should be submitted to determine alternative test configurations.

7. If the tablet is not touching the phantom, it is moved in 3 mm steps until it touches the phantom to confirm that the sensor remains triggered and the maximum power stays reduced.

8. The process is then reversed by moving the tablet away from the phantom according to steps 4) to 7), to determine triggering release, until it is at least 10 mm beyond the point that triggers the return of normal maximum power.

9. The measured output power within ± 5 mm of the triggering points, or until the tablet is touching the phantom, for movements to and from the phantom should be tabulated in the SAR report.

10. If the sensor design and implementation allow additional variations for triggering distance tolerances, multiple samples should be tested to determine the most conservative distance required for SAR evaluation.

11. To ensure all production units are compliant, it is generally necessary to reduce the triggering distance determined from the triggering tests by 1 mm, or more if it is necessary, and use the smallest distance for movements to and from the phantom, minus 1 mm, as the sensor triggering distance for determining the SAR measurement distance.

### 6.4.2 PROCEDURES FOR DETERMINING ANTENNA AND PROXIMITY SENSOR COVERAGE

The sensing regions are usually limited to areas near the sensor element. If a sensor is spatially offset from the antenna(s), it is necessary to verify sensor triggering for conditions where the antenna is next to the user but the sensor is laterally further away to ensure sensor coverage is sufficient for reducing the power to maintain compliance. The following are used to determine if additional SAR measurements may be necessary due to sensor and antenna offset. 25 These procedures do not apply and are not required for configurations where the antenna and sensor are collocated and the peak SAR location is overlapping with the sensor.

1. The back surface or edge of the tablet is positioned at a test separation distance less than or equal to the distance required for back surface or edge triggering, with both the antenna and sensor pad located at least 20 mm laterally outside the edge (boundary) of the phantom, along the direction of maximum antenna and sensor offset. For the back surface, if the direction of maximum offset is not aligned with the tablet coordinates (physical edges) the tablet test position would not be aligned with the phantom coordinates (orientations). Each applicable tablet edge should be positioned perpendicularly to the phantom to determine sensor coverage. For antennas and/or sensors located near the corner of a tablet, both adjacent edges must be considered.

2. The similar sequence of steps applied to determine sensor triggering distance in section 6.2 are used to verify back surface and edge sensor coverage by moving the tablet (sensor and antenna) horizontally toward the phantom while maintaining the same vertical separation between the back surface or edge and the phantom.

3. After the exact location where triggering of power reduction is determined, with respect to the sensor and antenna, the tablet movement should be continued, in 3 mm increments, until both the sensor and antenna(s) are fully under the phantom and at least 20 mm inside the phantom edge.

4. The process is then repeated from the opposite direction, starting at the other end of the maximum antenna and sensor offset, by rotating the tablet 180° along the vertical axis.

5. The triggering points should be documented graphically, with the antenna and sensor clearly identified, along with all relevant dimensions.

If the subsequently measured peak SAR location for the antenna is not between the triggering points, established by the sensor coverage tests from opposite ends of the antenna and sensor, additional SAR tests may be required for conditions where only part of the back surface or edge of a tablet corresponding to the antenna is in proximity to the user and the sensor may not be triggering as desired. A KDB inquiry must be submitted by the test lab to determine if additional tests are required and the proper test configurations to use for testing. This may include situations where the sensor coverage region is too small for the antenna, the sensor is located too far away from the antenna, the sensor location is insufficient to cover multiple antennas or the antenna is at the corner of a tablet etc.

### 6.4.3 PROXIMITY SENSOR STATUS TABLE OF TRIGGER DISTANCE

As per the KDB 616217 D04 SAR for laptop and tablets v01r02, section 6.2, the following procedure is used to determine the triggering distances.

Proximity Sensor Status Table when DUT is moving towards the phantom

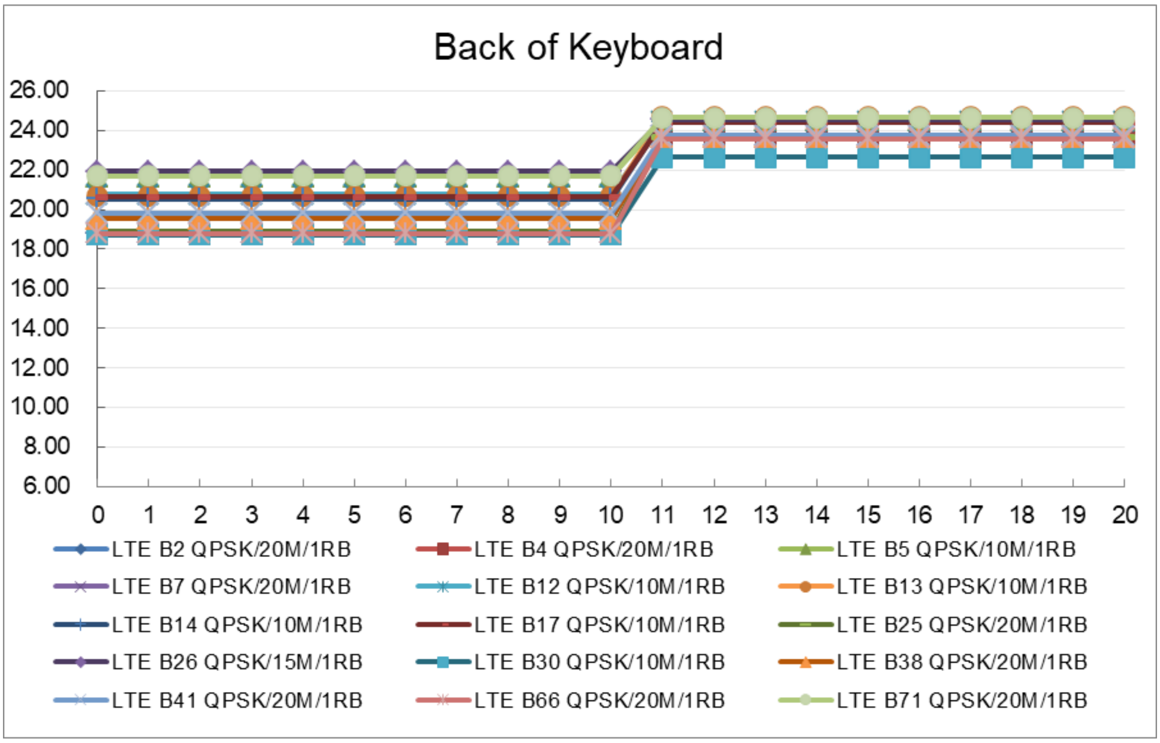
| Distance to the DUT (mm) | Proximity Sensor Status - Bottom |
|---|---|
| 0 | ON |
| 1 | ON |
| 2 | ON |
| 3 | ON |
| 4 | ON |
| 5 | ON |
| 6 | ON |
| 7 | ON |
| 8 | ON |
| 9 | ON |
| 10 | ON |
| 11 | OFF |
| 12 | OFF |
| 13 | OFF |
| 14 | OFF |
| 15 | OFF |
| 16 | OFF |
| 17 | OFF |
| 18 | OFF |
| 19 | OFF |
| 20 | OFF |

### 6.4.4 POWER REDUCTION PER AIR-INTERFACE

The following graphs show the power level and the distance from the DUT to the flat phantom for the Rear, Edge1 and Bottom Mode Surface.

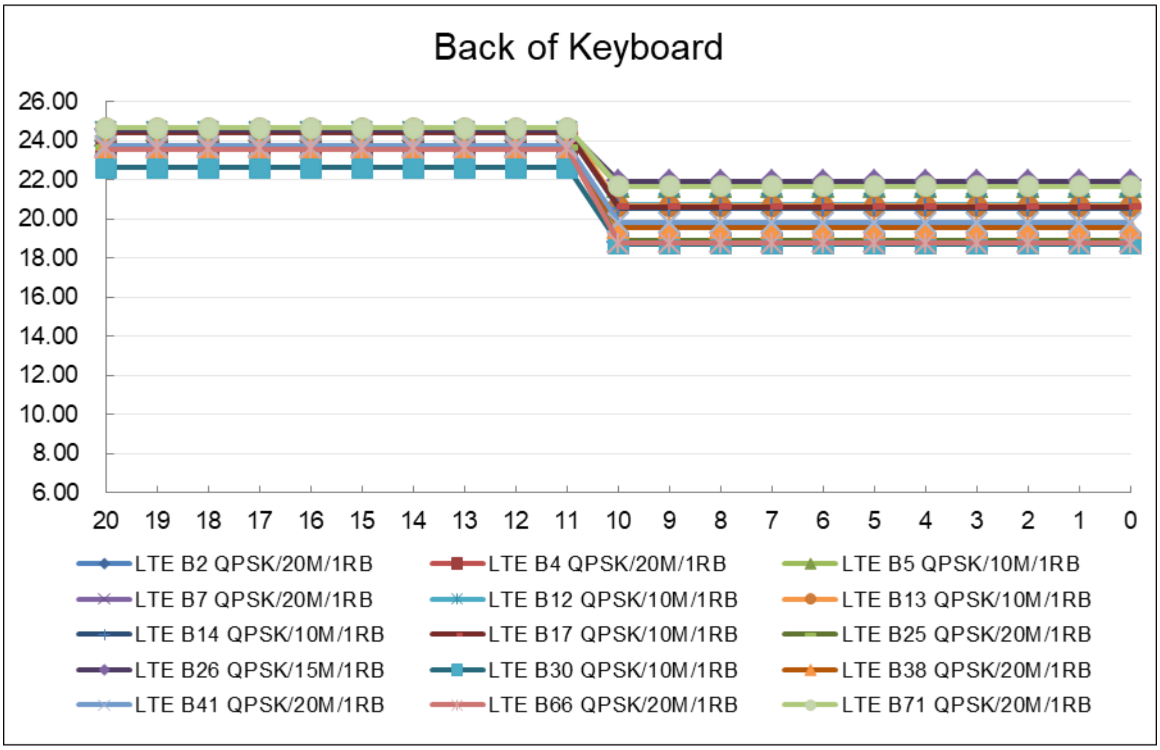
1) Back of Keyboard (moving away from the phantom)

| mode | | distance(mm) | | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Back of Keyboard | | | | | | | | | | | | | | | | | | | | |
| | | Sensor on | | | | | | | | | | | Sensor off | | | | | | | | | |
| | | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 |
| LTE B2 | QPSK/20M/1RB | 18.78 | 18.78 | 18.78 | 18.78 | 18.78 | 18.78 | 18.78 | 18.78 | 18.78 | 18.78 | 18.78 | 23.74 | 23.74 | 23.74 | 23.74 | 23.74 | 23.74 | 23.74 | 23.74 | 23.74 | 23.74 |
| LTE B4 | QPSK/20M/1RB | 18.75 | 18.75 | 18.75 | 18.75 | 18.75 | 18.75 | 18.75 | 18.75 | 18.75 | 18.75 | 18.75 | 23.57 | 23.57 | 23.57 | 23.57 | 23.57 | 23.57 | 23.57 | 23.57 | 23.57 | 23.57 |
| LTE B5 | QPSK/10M/1RB | 21.66 | 21.66 | 21.66 | 21.66 | 21.66 | 21.66 | 21.66 | 21.66 | 21.66 | 21.66 | 21.66 | 24.51 | 24.51 | 24.51 | 24.51 | 24.51 | 24.51 | 24.51 | 24.51 | 24.51 | 24.51 |
| LTE B7 | QPSK/20M/1RB | 18.82 | 18.82 | 18.82 | 18.82 | 18.82 | 18.82 | 18.82 | 18.82 | 18.82 | 18.82 | 18.82 | 23.70 | 23.70 | 23.70 | 23.70 | 23.70 | 23.70 | 23.70 | 23.70 | 23.70 | 23.70 |
| LTE B12 | QPSK/10M/1RB | 20.76 | 20.76 | 20.76 | 20.76 | 20.76 | 20.76 | 20.76 | 20.76 | 20.76 | 20.76 | 20.76 | 24.42 | 24.42 | 24.42 | 24.42 | 24.42 | 24.42 | 24.42 | 24.42 | 24.42 | 24.42 |
| LTE B13 | QPSK/10M/1RB | 20.65 | 20.65 | 20.65 | 20.65 | 20.65 | 20.65 | 20.65 | 20.65 | 20.65 | 20.65 | 20.65 | 24.67 | 24.67 | 24.67 | 24.67 | 24.67 | 24.67 | 24.67 | 24.67 | 24.67 | 24.67 |
| LTE B14 | QPSK/10M/1RB | 20.53 | 20.53 | 20.53 | 20.53 | 20.53 | 20.53 | 20.53 | 20.53 | 20.53 | 20.53 | 20.53 | 24.45 | 24.45 | 24.45 | 24.45 | 24.45 | 24.45 | 24.45 | 24.45 | 24.45 | 24.45 |
| LTE B17 | QPSK/10M/1RB | 20.63 | 20.63 | 20.63 | 20.63 | 20.63 | 20.63 | 20.63 | 20.63 | 20.63 | 20.63 | 20.63 | 24.39 | 24.39 | 24.39 | 24.39 | 24.39 | 24.39 | 24.39 | 24.39 | 24.39 | 24.39 |
| LTE B25 | QPSK/20M/1RB | 18.91 | 18.91 | 18.91 | 18.91 | 18.91 | 18.91 | 18.91 | 18.91 | 18.91 | 18.91 | 18.91 | 23.65 | 23.65 | 23.65 | 23.65 | 23.65 | 23.65 | 23.65 | 23.65 | 23.65 | 23.65 |
| LTE B26 | QPSK/15M/1RB | 21.93 | 21.93 | 21.93 | 21.93 | 21.93 | 21.93 | 21.93 | 21.93 | 21.93 | 21.93 | 21.93 | 24.56 | 24.56 | 24.56 | 24.56 | 24.56 | 24.56 | 24.56 | 24.56 | 24.56 | 24.56 |
| LTE B30 | QPSK/10M/1RB | 18.71 | 18.71 | 18.71 | 18.71 | 18.71 | 18.71 | 18.71 | 18.71 | 18.71 | 18.71 | 18.71 | 22.63 | 22.63 | 22.63 | 22.63 | 22.63 | 22.63 | 22.63 | 22.63 | 22.63 | 22.63 |
| LTE B38 | QPSK/20M/1RB | 19.54 | 19.54 | 19.54 | 19.54 | 19.54 | 19.54 | 19.54 | 19.54 | 19.54 | 19.54 | 19.54 | 23.68 | 23.68 | 23.68 | 23.68 | 23.68 | 23.68 | 23.68 | 23.68 | 23.68 | 23.68 |
| LTE B41 | QPSK/20M/1RB | 19.82 | 19.82 | 19.82 | 19.82 | 19.82 | 19.82 | 19.82 | 19.82 | 19.82 | 19.82 | 19.82 | 23.74 | 23.74 | 23.74 | 23.74 | 23.74 | 23.74 | 23.74 | 23.74 | 23.74 | 23.74 |
| LTE B66 | QPSK/20M/1RB | 18.77 | 18.77 | 18.77 | 18.77 | 18.77 | 18.77 | 18.77 | 18.77 | 18.77 | 18.77 | 18.77 | 23.58 | 23.58 | 23.58 | 23.58 | 23.58 | 23.58 | 23.58 | 23.58 | 23.58 | 23.58 |
| LTE B71 | QPSK/20M/1RB | 21.69 | 21.69 | 21.69 | 21.69 | 21.69 | 21.69 | 21.69 | 21.69 | 21.69 | 21.69 | 21.69 | 24.65 | 24.65 | 24.65 | 24.65 | 24.65 | 24.65 | 24.65 | 24.65 | 24.65 | 24.65 |



2) Back of Keyboard (moving toward from the phantom)

| mode | | distance(mm) | | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Back of Keyboard | | | | | | | | | | | | | | | | | | | | |
| | | Sensor off | | | | | | | | | | Sensor on | | | | | | | | | | |
| | | 20 | 19 | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| LTE B2 | QPSK/20M/1RB | 23.74 | 23.74 | 23.74 | 23.74 | 23.74 | 23.74 | 23.74 | 23.74 | 23.74 | 23.74 | 18.78 | 18.78 | 18.78 | 18.78 | 18.78 | 18.78 | 18.78 | 18.78 | 18.78 | 18.78 | 18.78 |
| LTE B4 | QPSK/20M/1RB | 23.57 | 23.57 | 23.57 | 23.57 | 23.57 | 23.57 | 23.57 | 23.57 | 23.57 | 23.57 | 18.75 | 18.75 | 18.75 | 18.75 | 18.75 | 18.75 | 18.75 | 18.75 | 18.75 | 18.75 | 18.75 |
| LTE B5 | QPSK/10M/1RB | 24.51 | 24.51 | 24.51 | 24.51 | 24.51 | 24.51 | 24.51 | 24.51 | 24.51 | 24.51 | 21.66 | 21.66 | 21.66 | 21.66 | 21.66 | 21.66 | 21.66 | 21.66 | 21.66 | 21.66 | 21.66 |
| LTE B7 | QPSK/20M/1RB | 23.70 | 23.70 | 23.70 | 23.70 | 23.70 | 23.70 | 23.70 | 23.70 | 23.70 | 23.70 | 18.82 | 18.82 | 18.82 | 18.82 | 18.82 | 18.82 | 18.82 | 18.82 | 18.82 | 18.82 | 18.82 |
| LTE B12 | QPSK/10M/1RB | 24.42 | 24.42 | 24.42 | 24.42 | 24.42 | 24.42 | 24.42 | 24.42 | 24.42 | 24.42 | 20.76 | 20.76 | 20.76 | 20.76 | 20.76 | 20.76 | 20.76 | 20.76 | 20.76 | 20.76 | 20.76 |
| LTE B13 | QPSK/10M/1RB | 24.67 | 24.67 | 24.67 | 24.67 | 24.67 | 24.67 | 24.67 | 24.67 | 24.67 | 24.67 | 20.65 | 20.65 | 20.65 | 20.65 | 20.65 | 20.65 | 20.65 | 20.65 | 20.65 | 20.65 | 20.65 |
| LTE B14 | QPSK/10M/1RB | 24.45 | 24.45 | 24.45 | 24.45 | 24.45 | 24.45 | 24.45 | 24.45 | 24.45 | 24.45 | 20.53 | 20.53 | 20.53 | 20.53 | 20.53 | 20.53 | 20.53 | 20.53 | 20.53 | 20.53 | 20.53 |
| LTE B17 | QPSK/10M/1RB | 24.39 | 24.39 | 24.39 | 24.39 | 24.39 | 24.39 | 24.39 | 24.39 | 24.39 | 24.39 | 20.63 | 20.63 | 20.63 | 20.63 | 20.63 | 20.63 | 20.63 | 20.63 | 20.63 | 20.63 | 20.63 |
| LTE B25 | QPSK/20M/1RB | 23.65 | 23.65 | 23.65 | 23.65 | 23.65 | 23.65 | 23.65 | 23.65 | 23.65 | 23.65 | 18.91 | 18.91 | 18.91 | 18.91 | 18.91 | 18.91 | 18.91 | 18.91 | 18.91 | 18.91 | 18.91 |
| LTE B26 | QPSK/15M/1RB | 24.56 | 24.56 | 24.56 | 24.56 | 24.56 | 24.56 | 24.56 | 24.56 | 24.56 | 24.56 | 21.93 | 21.93 | 21.93 | 21.93 | 21.93 | 21.93 | 21.93 | 21.93 | 21.93 | 21.93 | 21.93 |
| LTE B30 | QPSK/10M/1RB | 22.63 | 22.63 | 22.63 | 22.63 | 22.63 | 22.63 | 22.63 | 22.63 | 22.63 | 22.63 | 18.71 | 18.71 | 18.71 | 18.71 | 18.71 | 18.71 | 18.71 | 18.71 | 18.71 | 18.71 | 18.71 |
| LTE B38 | QPSK/20M/1RB | 23.68 | 23.68 | 23.68 | 23.68 | 23.68 | 23.68 | 23.68 | 23.68 | 23.68 | 23.68 | 19.54 | 19.54 | 19.54 | 19.54 | 19.54 | 19.54 | 19.54 | 19.54 | 19.54 | 19.54 | 19.54 |
| LTE B41 | QPSK/20M/1RB | 23.74 | 23.74 | 23.74 | 23.74 | 23.74 | 23.74 | 23.74 | 23.74 | 23.74 | 23.74 | 19.82 | 19.82 | 19.82 | 19.82 | 19.82 | 19.82 | 19.82 | 19.82 | 19.82 | 19.82 | 19.82 |
| LTE B66 | QPSK/20M/1RB | 23.58 | 23.58 | 23.58 | 23.58 | 23.58 | 23.58 | 23.58 | 23.58 | 23.58 | 23.58 | 18.77 | 18.77 | 18.77 | 18.77 | 18.77 | 18.77 | 18.77 | 18.77 | 18.77 | 18.77 | 18.77 |
| LTE B71 | QPSK/20M/1RB | 24.65 | 24.65 | 24.65 | 24.65 | 24.65 | 24.65 | 24.65 | 24.65 | 24.65 | 24.65 | 21.69 | 21.69 | 21.69 | 21.69 | 21.69 | 21.69 | 21.69 | 21.69 | 21.69 | 21.69 | 21.69 |



# 7. TEST RESULT

## 7.1 CONDUCTED POWER RESULTS

The conducted power measurement results please refer to Appendix E.

## 7.2 SAR TEST RESULTS

**General Notes:**
1) Per KDB447498 D04, all measurement SAR results are scaled to the maximum tune-up tolerance limit to demonstrate compliant.
2) Per KDB447498 D04, 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. When the maximum output power variation across the required test channels is > ½ dB, instead of the middle channel, the highest output power channel must be used.
3) Per KDB865664 D01, 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.
4) Per KDB941225 D06, the DUT Dimension is bigger than 9 cm x 5 cm, so 10mm is chosen as the test separation distance for Hotspot mode. When the antenna-to-edge distance is greater than 2.5cm, such position does not need to be tested.
5) Per KDB648474 D04, SAR is evaluated without a headset connected to the device. When the standalone reported body-worn SAR is ≤1.2 W/kg, no additional SAR evaluations using a headset are required.
6) Per KDB865664 D02, SAR plot is only required for the highest measured SAR in each exposure configuration, wireless mode and frequency band combination; Plots are also required when the measured SAR is > 1.5 W/kg, or > 7.0 W/kg for occupational exposure. The published RF exposure KDB procedures may require additional plots; for example, to support SAR to peak location separation ratio test exclusion and/or volume scan post-processing.

**LTE notes:**
1) The LTE test configurations are determined according to KDB941225 D05 SAR for LTE Devices. The general test procedures used for SAR testing can be found in Section 7.1.3.
2) A-MPR was disabled for all SAR test by setting NS_01 on the base station simulator. SAR tests were performed with the same number of RB and RB offsets transmitting on all TTI frames (maximum TTI).

**WLAN Notes:**
1) For exposure conditions with multiple test positions, such as handset operating next to the ear, devices with hotspot mode, 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 positions in an exposure condition. The test position with the highest extrapolated (peak) SAR is used as the initial test position. When the reported SAR of the initial test position is ≤ 0.4 W/kg, further SAR measurement is not required for the other (remaining) test positions. Otherwise, SAR is evaluated at the subsequent highest peak SAR position until the reported SAR result is ≤ 0.8 W/kg or all test positions are measured.
2) Justification for test configurations for WLAN per KDB Publication 248227 for 2.4GHz WIFI single transmission chain operations, the highest measured maximum output power Channel for DSSS was selected for SAR measurement. SAR for OFDM modes (2.4GHz 802.11g/n) was not required due to the maximum allowed powers and the highest reported DSSS SAR. See Section 7.1.5 for more information.
3) Justification for test configurations for WLAN per KDB Publication 248227 for 5GHz WIFI single transmission chain operations, the initial test configuration was selected according to the transmission mode with the highest maximum allowed power. Other transmission modes were not investigated since the highest reported SAR for initial test configuration adjusted by the ratio of maximum output powers is less than 1.2W/kg. See Section 7.1.5 for more information.

### 7.2.1 SAR MEASUREMENT RESULT OF BODY-WORN

1. Body-worn SAR test results of LTE

| Test No. | Band | Mode | Channel | RB | offset | Test Position | Separation Distance (mm) | Sensor sate | Maximum Tune-up (dBm) | Conducted Power (dBm) | Power Drift (dB) | SAR 1g (W/kg) | SAR 10g (W/kg) | Reported 1g SAR (W/kg) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| L01 | LTE B2 | QPSK20M | 18700 | 1 | 50 | Back of Screen | 25 | on | 19 | 18.78 | 0 | <0.001 | <0.001 | <0.001 |
| L02 | LTE B2 | QPSK20M | 18700 | 1 | 50 | Back of Keyboard | 0 | on | 19 | 18.78 | -0.06 | 0.826 | 0.478 | 0.869 |
| L03 | LTE B2 | QPSK20M | 18900 | 1 | 50 | Back of Keyboard | 0 | on | 19 | 18.73 | -0.16 | 0.769 | 0.445 | 0.818 |
| L04 | LTE B2 | QPSK20M | 19100 | 1 | 50 | Back of Keyboard | 0 | on | 19 | 18.71 | -0.07 | 0.749 | 0.436 | 0.801 |
| L05 | LTE B2 | QPSK20M | 18700 | 50 | 25 | Back of Keyboard | 0 | on | 19 | 18.64 | 0.03 | **0.834** | **0.483** | **0.906** |
| L06 | LTE B2 | QPSK20M | 19100 | 100 | 0 | Back of Keyboard | 0 | on | 19 | 18.59 | -0.18 | 0.749 | 0.435 | 0.823 |
| L07 | LTE B2 | QPSK20M | 18700 | 1 | 50 | Back of Keyboard | 9 | off | 24 | 23.74 | -0.16 | 0.714 | 0.443 | 0.758 |
| L08 | LTE B2 | QPSK20M | 18700 | 50 | 0 | Back of Keyboard | 9 | off | 23 | 22.61 | -0.18 | 0.568 | 0.351 | 0.621 |
| L09 | LTE B2 | QPSK20M | 18700 | 50 | 25 | Back of Keyboard (Repeated) | 0 | on | 19 | 18.64 | 0.01 | 0.809 | 0.465 | 0.879 |
| L10 | LTE B4 | QPSK20M | 20175 | 1 | 50 | Back of Screen | 25 | on | 19 | 18.75 | 0 | <0.001 | <0.001 | <0.001 |
| L11 | LTE B4 | QPSK20M | 20175 | 1 | 50 | Back of Keyboard | 0 | on | 19 | 18.75 | 0 | 0.841 | 0.479 | 0.891 |
| L12 | LTE B4 | QPSK20M | 20050 | 1 | 50 | Back of Keyboard | 0 | on | 19 | 18.67 | -0.13 | 0.763 | 0.432 | 0.823 |
| L13 | LTE B4 | QPSK20M | 20300 | 1 | 50 | Back of Keyboard | 0 | on | 19 | 18.67 | -0.05 | 0.835 | 0.474 | 0.901 |
| L14 | LTE B4 | QPSK20M | 20175 | 50 | 25 | Back of Keyboard | 0 | on | 19 | 18.58 | 0.19 | 0.852 | 0.483 | 0.939 |
| L15 | LTE B4 | QPSK20M | 20300 | 100 | 0 | Back of Keyboard | 0 | on | 19 | 18.6 | 0 | **0.887** | **0.503** | **0.973** |
| L16 | LTE B4 | QPSK20M | 20175 | 1 | 50 | Back of Keyboard | 9 | off | 24 | 23.57 | -0.18 | 0.651 | 0.392 | 0.719 |
| L17 | LTE B4 | QPSK20M | 20175 | 50 | 25 | Back of Keyboard | 9 | off | 23 | 22.57 | 0 | 0.528 | 0.318 | 0.583 |
| L18 | LTE B4 | QPSK20M | 20300 | 100 | 0 | Back of Keyboard (Repeated) | 0 | on | 19 | 18.6 | 0.01 | 0.868 | 0.497 | 0.952 |
| L19 | LTE B5 | QPSK10M | 20600 | 1 | 0 | Back of Screen | 25 | on | 22 | 21.66 | 0 | <0.001 | <0.001 | <0.001 |
| L20 | LTE B5 | QPSK10M | 20600 | 1 | 0 | Back of Keyboard | 0 | on | 22 | 21.66 | -0.16 | 0.709 | 0.44 | 0.767 |
| L21 | LTE B5 | QPSK10M | 20450 | 1 | 0 | Back of Keyboard | 0 | on | 22 | 21.33 | 0.07 | **0.76** | **0.468** | **0.887** |
| L22 | LTE B5 | QPSK10M | 20525 | 1 | 0 | Back of Keyboard | 0 | on | 22 | 21.62 | 0.02 | 0.724 | 0.446 | 0.790 |
| L23 | LTE B5 | QPSK10M | 20525 | 25 | 12 | Back of Keyboard | 0 | on | 22 | 21.35 | 0.08 | 0.719 | 0.443 | 0.835 |
| L24 | LTE B5 | QPSK10M | 20600 | 50 | 0 | Back of Keyboard | 0 | on | 22 | 21.15 | -0.13 | 0.677 | 0.419 | 0.823 |
| L25 | LTE B5 | QPSK10M | 20600 | 1 | 0 | Back of Keyboard | 9 | off | 25 | 24.51 | 0.04 | 0.544 | 0.344 | 0.609 |
| L26 | LTE B5 | QPSK10M | 20525 | 25 | 12 | Back of Keyboard | 9 | off | 24 | 23.52 | 0.19 | 0.443 | 0.28 | 0.495 |
| L27 | LTE B5 | QPSK10M | 20450 | 1 | 0 | Back of Keyboard (Repeated) | 0 | on | 22 | 21.33 | 0 | 0.751 | 0.462 | 0.876 |
| L28 | LTE B7 | QPKS20M | 21350 | 1 | 50 | Back of Screen | 25 | on | 19 | 18.82 | -0.03 | <0.001 | <0.001 | <0.001 |
| L29 | LTE B7 | QPKS20M | 21350 | 1 | 50 | Back of Keyboard | 0 | on | 19 | 18.82 | 0 | 0.755 | 0.415 | 0.787 |
| L30 | LTE B7 | QPKS20M | 20850 | 1 | 50 | Back of Keyboard | 0 | on | 19 | 18.8 | -0.03 | 0.736 | 0.412 | 0.771 |
| L31 | LTE B7 | QPKS20M | 21100 | 1 | 50 | Back of Keyboard | 0 | on | 19 | 18.76 | 0.06 | 0.731 | 0.414 | 0.773 |
| L32 | LTE B7 | QPKS20M | 21100 | 50 | 25 | Back of Keyboard | 0 | on | 19 | 18.46 | 0.03 | **0.823** | **0.438** | **0.932** |
| L33 | LTE B7 | QPKS20M | 21100 | 100 | 0 | Back of Keyboard | 0 | on | 19 | 18.44 | 0.06 | 0.763 | 0.417 | 0.868 |
| L34 | LTE B7 | QPKS20M | 21350 | 1 | 50 | Back of Keyboard | 9 | off | 24 | 23.7 | -0.05 | 0.604 | 0.331 | 0.647 |
| L35 | LTE B7 | QPKS20M | 21100 | 50 | 25 | Back of Keyboard | 9 | off | 23 | 22.7 | 0.12 | 0.465 | 0.255 | 0.498 |
| L36 | LTE B7 | QPKS20M | 21100 | 50 | 25 | Back of Keyboard (Repeated) | 0 | on | 19 | 18.46 | 0.03 | 0.809 | 0.43 | 0.916 |

| Test No. | Band | Mode | Channel | RB | offset | Test Position | Separation Distance (mm) | Sensor sate | Maximum Tune-up (dBm) | Conducted Power (dBm) | Power Drift (dB) | SAR 1g (W/kg) | SAR 10g (W/kg) | Reported 1g SAR (W/kg) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| L37 | LTE B12 | QPSK10M | 23130 | 1 | 24 | Back of Screen | 25 | on | 21 | 20.76 | -0.02 | <0.001 | <0.001 | <0.001 |
| L38 | LTE B12 | QPSK10M | 23130 | 1 | 24 | Back of Keyboard | 0 | on | 21 | 20.76 | 0.1 | 0.925 | 0.561 | 0.978 |
| L39 | LTE B12 | QPSK10M | 23060 | 1 | 24 | Back of Keyboard | 0 | on | 21 | 20.7 | -0.05 | **0.966** | **0.591** | **1.035** |
| L40 | LTE B12 | QPSK10M | 23095 | 1 | 24 | Back of Keyboard | 0 | on | 21 | 20.66 | -0.11 | 0.948 | 0.585 | 1.025 |
| L41 | LTE B12 | QPSK10M | 23060 | 25 | 12 | Back of Keyboard | 0 | on | 21 | 20.37 | 0.19 | 0.863 | 0.537 | 0.998 |
| L42 | LTE B12 | QPSK10M | 23060 | 50 | 0 | Back of Keyboard | 0 | on | 21 | 20.31 | -0.06 | 0.85 | 0.533 | 0.996 |
| L43 | LTE B12 | QPSK10M | 23130 | 1 | 24 | Back of Keyboard | 9 | off | 25 | 24.42 | -0.08 | 0.811 | 0.526 | 0.927 |
| L44 | LTE B12 | QPSK10M | 23060 | 25 | 12 | Back of Keyboard | 9 | off | 24 | 23.45 | 0.02 | 0.641 | 0.416 | 0.728 |
| L45 | LTE B12 | QPSK10M | 23060 | 1 | 24 | Back of Keyboard (Repeated) | 0 | on | 21 | 20.7 | -0.01 | 0.937 | 0.582 | 1.004 |
| L46 | LTE B13 | QPSK10M | 23230 | 1 | 0 | Back of Screen | 25 | on | 21 | 20.65 | -0.02 | <0.001 | <0.001 | <0.001 |
| L47 | LTE B13 | QPSK10M | 23230 | 1 | 0 | Back of Keyboard | 0 | on | 21 | 20.65 | -0.1 | 0.988 | 0.6 | 1.071 |
| L48 | LTE B13 | QPSK10M | 23230 | 25 | 0 | Back of Keyboard | 0 | on | 21 | 20.42 | 0.01 | **0.993** | **0.607** | **1.135** |
| L49 | LTE B13 | QPSK10M | 23230 | 50 | 0 | Back of Keyboard | 0 | on | 21 | 20.41 | 0.1 | 0.954 | 0.587 | 1.093 |
| L50 | LTE B13 | QPSK10M | 23230 | 1 | 0 | Back of Keyboard | 9 | off | 25 | 24.67 | -0.01 | 0.881 | 0.565 | 0.951 |
| L51 | LTE B13 | QPSK10M | 23230 | 25 | 0 | Back of Keyboard | 9 | off | 24 | 23.53 | 0.08 | 0.851 | 0.544 | 0.948 |
| L52 | LTE B13 | QPSK10M | 23230 | 25 | 0 | Back of Keyboard (Repeated) | 0 | on | 21 | 20.42 | -0.01 | 0.985 | 0.597 | 1.126 |
| L53 | LTE B14 | QPSK10M | 23330 | 1 | 0 | Back of Screen | 25 | on | 21 | 20.53 | -0.12 | <0.001 | <0.001 | <0.001 |
| L54 | LTE B14 | QPSK10M | 23330 | 1 | 0 | Back of Keyboard | 0 | on | 21 | 20.53 | 0.01 | 0.898 | 0.553 | 1.001 |
| L55 | LTE B14 | QPSK10M | 23330 | 25 | 0 | Back of Keyboard | 0 | on | 21 | 20.39 | 0.16 | **0.927** | **0.57** | **1.067** |
| L56 | LTE B14 | QPSK10M | 23330 | 50 | 0 | Back of Keyboard | 0 | on | 21 | 20.32 | -0.04 | 0.883 | 0.542 | 1.033 |
| L57 | LTE B14 | QPSK10M | 23330 | 1 | 0 | Back of Keyboard | 9 | off | 25 | 24.45 | 0.18 | 0.731 | 0.467 | 0.830 |
| L58 | LTE B14 | QPSK10M | 23330 | 25 | 0 | Back of Keyboard | 9 | off | 24 | 23.43 | -0.08 | 0.603 | 0.385 | 0.688 |
| L59 | LTE B14 | QPSK10M | 23330 | 25 | 0 | Back of Keyboard (Repeated) | 0 | on | 21 | 20.39 | 0.05 | 0.911 | 0.563 | 1.048 |
| L60 | LTE B17 | QPSK10M | 23790 | 1 | 24 | Back of Screen | 25 | on | 21 | 20.63 | 0.02 | <0.001 | <0.001 | <0.001 |
| L61 | LTE B17 | QPSK10M | 23790 | 1 | 24 | Back of Keyboard | 0 | on | 21 | 20.63 | 0.03 | 0.807 | 0.491 | 0.879 |
| L62 | LTE B17 | QPSK10M | 23780 | 1 | 24 | Back of Keyboard | 0 | on | 21 | 20.56 | 0.04 | 0.805 | 0.49 | 0.891 |
| L63 | LTE B17 | QPSK10M | 23800 | 1 | 24 | Back of Keyboard | 0 | on | 21 | 20.55 | 0.14 | 0.798 | 0.486 | 0.885 |
| L64 | LTE B17 | QPSK10M | 23790 | 25 | 25 | Back of Keyboard | 0 | on | 21 | 20.28 | 0.1 | 0.815 | 0.495 | 0.962 |
| L65 | LTE B17 | QPSK10M | 23780 | 50 | 0 | Back of Keyboard | 0 | on | 21 | 20.19 | -0.05 | **0.818** | **0.498** | **0.986** |
| L66 | LTE B17 | QPSK10M | 23800 | 1 | 24 | Back of Keyboard | 9 | off | 25 | 24.39 | -0.01 | 0.651 | 0.416 | 0.749 |
| L67 | LTE B17 | QPSK10M | 23790 | 25 | 25 | Back of Keyboard | 9 | off | 24 | 23.43 | 0.19 | 0.516 | 0.33 | 0.588 |
| L68 | LTE B17 | QPSK10M | 23780 | 50 | 0 | Back of Keyboard (Repeated) | 0 | on | 21 | 20.19 | 0 | 0.802 | 0.49 | 0.966 |
| L69 | LTE B25 | QPSK20M | 26365 | 1 | 0 | Back of Screen | 25 | on | 19 | 18.91 | 0 | <0.001 | <0.001 | <0.001 |
| L70 | LTE B25 | QPSK20M | 26365 | 1 | 0 | Back of Keyboard | 0 | on | 19 | 18.91 | 0.09 | 0.784 | 0.395 | 0.800 |
| L71 | LTE B25 | QPSK20M | 26590 | 1 | 0 | Back of Keyboard | 0 | on | 19 | 18.82 | 0.18 | 0.799 | 0.407 | 0.833 |
| L72 | LTE B25 | QPSK20M | 26140 | 1 | 0 | Back of Keyboard | 0 | on | 19 | 18.63 | -0.14 | 0.746 | 0.385 | 0.812 |
| L73 | LTE B25 | QPSK20M | 26140 | 50 | 25 | Back of Keyboard | 0 | on | 19 | 18.42 | 0.02 | **0.823** | **0.475** | **0.941** |
| L74 | LTE B25 | QPSK20M | 26365 | 100 | 0 | Back of Keyboard | 0 | on | 19 | 18.38 | -0.15 | 0.771 | 0.39 | 0.889 |
| L75 | LTE B25 | QPSK20M | 26365 | 1 | 0 | Back of Keyboard | 9 | off | 24 | 23.65 | -0.16 | 0.668 | 0.377 | 0.724 |
| L76 | LTE B25 | QPSK20M | 26140 | 52 | 25 | Back of Keyboard | 9 | off | 23 | 22.8 | -0.15 | 0.552 | 0.336 | 0.578 |
| L77 | LTE B25 | QPSK20M | 26140 | 50 | 25 | Back of Keyboard (Repeated) | 0 | on | 19 | 18.42 | 0.08 | 0.815 | 0.463 | 0.931 |

| Test No. | Band | Mode | Channel | RB | offset | Test Position | Separation Distance (mm) | Sensor sate | Maximum Tune-up (dBm) | Conducted Power (dBm) | Power Drift (dB) | SAR 1g (W/kg) | SAR 10g (W/kg) | Reported 1g SAR (W/kg) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| L78 | LTE B26 | QPSK15M | 26965 | 1 | 37 | Back of Screen | 25 | on | 22 | 21.93 | -0.04 | <0.001 | <0.001 | <0.001 |
| L79 | LTE B26 | QPSK15M | 26965 | 1 | 37 | Back of Keyboard | 0 | on | 22 | 21.93 | 0.16 | 0.829 | 0.511 | 0.842 |
| L80 | LTE B26 | QPSK15M | 26765 | 1 | 37 | Back of Keyboard | 0 | on | 22 | 21.75 | -0.07 | 0.856 | 0.527 | 0.907 |
| L81 | LTE B26 | QPSK15M | 26865 | 1 | 37 | Back of Keyboard | 0 | on | 22 | 21.85 | 0.01 | 0.842 | 0.517 | 0.872 |
| L82 | LTE B26 | QPSK15M | 26765 | 36 | 39 | Back of Keyboard | 0 | on | 22 | 21.27 | 0 | **0.873** | **0.538** | **1.033** |
| L83 | LTE B26 | QPSK15M | 26765 | 75 | 0 | Back of Keyboard | 0 | on | 22 | 21.22 | -0.17 | 0.856 | 0.526 | 1.024 |
| L84 | LTE B26 | QPSK15M | 26965 | 1 | 37 | Back of Keyboard | 9 | off | 25 | 24.56 | 0.14 | 0.613 | 0.423 | 0.678 |
| L85 | LTE B26 | QPSK15M | 26765 | 36 | 39 | Back of Keyboard | 9 | off | 24 | 23.65 | 0.16 | 0.509 | 0.351 | 0.552 |
| L86 | LTE B26 | QPSK15M | 26765 | 36 | 39 | Back of Keyboard (Repeated) | 0 | on | 22 | 21.27 | 0.05 | 0.866 | 0.529 | 1.025 |
| L87 | LTE B30 | QPSK10M | 27710 | 1 | 49 | Back of Screen | 25 | on | 19 | 18.71 | -0.16 | <0.001 | <0.001 | <0.001 |
| L88 | LTE B30 | QPSK10M | 27710 | 1 | 49 | Back of Keyboard | 0 | on | 19 | 18.71 | -0.01 | 0.816 | 0.414 | 0.872 |
| L89 | LTE B30 | QPSK10M | 27710 | 25 | 25 | Back of Keyboard | 0 | on | 19 | 18.34 | 0 | **0.84** | **0.422** | **0.978** |
| L90 | LTE B30 | QPSK10M | 27710 | 50 | 0 | Back of Keyboard | 0 | on | 19 | 18.3 | -0.01 | 0.825 | 0.415 | 0.969 |
| L91 | LTE B30 | QPSK10M | 27710 | 1 | 49 | Back of Keyboard | 9 | off | 23 | 22.63 | 0.15 | 0.561 | 0.296 | 0.611 |
| L92 | LTE B30 | QPSK10M | 27710 | 25 | 25 | Back of Keyboard | 9 | off | 22 | 21.62 | 0.15 | 0.457 | 0.241 | 0.499 |
| L93 | LTE B30 | QPSK10M | 27710 | 25 | 25 | Back of Keyboard (Repeated) | 0 | on | 19 | 18.34 | 0.02 | 0.829 | 0.417 | 0.965 |
| L94 | LTE B38 | QPSK20M | 37850 | 1 | 0 | Back of Screen | 25 | on | 20 | 19.54 | 0.14 | <0.001 | <0.001 | <0.001 |
| L95 | LTE B38 | QPSK20M | 37850 | 1 | 0 | Back of Keyboard | 0 | on | 20 | 19.54 | -0.08 | 0.844 | 0.442 | 0.938 |
| L96 | LTE B38 | QPSK20M | 38000 | 1 | 0 | Back of Keyboard | 0 | on | 20 | 19.5 | 0.08 | 0.836 | 0.435 | 0.938 |
| L97 | LTE B38 | QPSK20M | 38150 | 1 | 0 | Back of Keyboard | 0 | on | 20 | 19.52 | -0.11 | 0.852 | 0.44 | 0.952 |
| L98 | LTE B38 | QPSK20M | 37850 | 50 | 0 | Back of Keyboard | 0 | on | 20 | 19.38 | -0.17 | 0.844 | 0.443 | 0.974 |
| L99 | LTE B38 | QPSK20M | 38150 | 100 | 0 | Back of Keyboard | 0 | on | 20 | 19.39 | 0.01 | **0.865** | **0.45** | **0.995** |
| L100 | LTE B38 | QPSK20M | 37850 | 1 | 0 | Back of Keyboard | 9 | off | 24 | 23.68 | -0.07 | 0.681 | 0.373 | 0.733 |
| L101 | LTE B38 | QPSK20M | 37850 | 50 | 0 | Back of Keyboard | 9 | off | 23 | 22.62 | -0.16 | 0.548 | 0.299 | 0.598 |
| L102 | LTE B38 | QPSK20M | 38150 | 100 | 0 | Back of Keyboard (Repeated) | 0 | on | 20 | 19.39 | 0 | 0.858 | 0.442 | 0.987 |
| L103 | LTE B41 | QPSK20M | 41490 | 1 | 0 | Back of Screen | 25 | on | 20 | 19.82 | -0.01 | <0.001 | <0.001 | <0.001 |
| L104 | LTE B41 | QPSK20M | 41490 | 1 | 0 | Back of Keyboard | 0 | on | 20 | 19.82 | -0.04 | 0.926 | 0.473 | 0.965 |
| L105 | LTE B41 | QPSK20M | 39750 | 1 | 0 | Back of Keyboard | 0 | on | 20 | 19.77 | 0 | 0.737 | 0.392 | 0.777 |
| L106 | LTE B41 | QPSK20M | 40620 | 1 | 0 | Back of Keyboard | 0 | on | 20 | 19.63 | -0.14 | 0.795 | 0.408 | 0.866 |
| L107 | LTE B41 | QPSK20M | 41490 | 50 | 25 | Back of Keyboard | 0 | on | 20 | 19.76 | 0.08 | 0.888 | 0.459 | 0.938 |
| L108 | LTE B41 | QPSK20M | 41490 | 100 | 0 | Back of Keyboard | 0 | on | 20 | 19.75 | 0.05 | **0.942** | **0.48** | **0.998** |
| L109 | LTE B41 | QPSK20M | 41490 | 1 | 0 | Back of Keyboard | 9 | off | 24 | 23.74 | 0.12 | 0.806 | 0.427 | 0.856 |
| L110 | LTE B41 | QPSK20M | 41490 | 50 | 50 | Back of Keyboard | 9 | off | 23 | 22.78 | 0.13 | 0.638 | 0.338 | 0.671 |
| L111 | LTE B41 | QPSK20M | 41490 | 100 | 0 | Back of Keyboard (Repeated) | 0 | on | 20 | 19.75 | -0.01 | 0.925 | 0.471 | 0.980 |
| L112 | LTE B66 | QPSK20M | 132572 | 1 | 50 | Back of Screen | 25 | on | 19 | 18.77 | 0 | <0.001 | <0.001 | <0.001 |
| L113 | LTE B66 | QPSK20M | 132572 | 1 | 50 | Back of Keyboard | 0 | on | 19 | 18.77 | 0.01 | 0.892 | 0.514 | 0.941 |
| L114 | LTE B66 | QPSK20M | 132072 | 1 | 50 | Back of Keyboard | 0 | on | 19 | 18.58 | 0.15 | 0.732 | 0.415 | 0.806 |
| L115 | LTE B66 | QPSK20M | 132322 | 1 | 50 | Back of Keyboard | 0 | on | 19 | 18.47 | -0.02 | 0.875 | 0.494 | 0.989 |
| L116 | LTE B66 | QPSK20M | 132572 | 50 | 0 | Back of Keyboard | 0 | on | 19 | 18.59 | 0.1 | 0.875 | 0.498 | 0.962 |
| L117 | LTE B66 | QPSK20M | 132572 | 100 | 0 | Back of Keyboard | 0 | on | 19 | 18.57 | 0 | **0.901** | **0.51** | **0.995** |
| L118 | LTE B66 | QPSK20M | 132572 | 1 | 50 | Back of Keyboard | 9 | off | 24 | 23.58 | -0.19 | 0.693 | 0.411 | 0.763 |
| L119 | LTE B66 | QPSK20M | 132572 | 50 | 0 | Back of Keyboard | 9 | off | 23 | 22.47 | -0.19 | 0.538 | 0.318 | 0.608 |
| L120 | LTE B66 | QPSK20M | 132572 | 100 | 0 | Back of Keyboard (Repeated) | 0 | on | 19 | 18.57 | 0 | 0.875 | 0.496 | 0.966 |

| Test No. | Band | Mode | Channel | RB | offset | Test Position | Separation Distance (mm) | Sensor sate | Maximum Tune-up (dBm) | Conducted Power (dBm) | Power Drift (dB) | SAR 1g (W/kg) | SAR 10g (W/kg) | Reported 1g SAR (W/kg) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| L121 | LTE B71 | QPSK20M | 133222 | 1 | 0 | Back of Screen | 25 | on | 22 | 21.69 | -0.09 | <0.001 | <0.001 | <0.001 |
| L122 | LTE B71 | QPSK20M | 133222 | 1 | 0 | Back of Keyboard | 0 | on | 22 | 21.69 | 0 | 0.75 | 0.455 | 0.805 |
| L123 | LTE B71 | QPSK20M | 133322 | 1 | 0 | Back of Keyboard | 0 | on | 22 | 21.34 | 0.19 | 0.828 | 0.502 | 0.964 |
| L124 | LTE B71 | QPSK20M | 133372 | 1 | 0 | Back of Keyboard | 0 | on | 22 | 21.64 | -0.18 | 0.89 | 0.539 | 0.967 |
| L125 | LTE B71 | QPSK20M | 133222 | 50 | 25 | Back of Keyboard | 0 | on | 22 | 21.57 | 0.02 | **0.895** | **0.542** | **0.988** |
| L126 | LTE B71 | QPSK20M | 133222 | 100 | 0 | Back of Keyboard | 0 | on | 22 | 21.46 | -0.1 | 0.87 | 0.526 | 0.985 |
| L127 | LTE B71 | QPSK20M | 133222 | 1 | 0 | Back of Keyboard | 9 | off | 25 | 24.65 | 0.01 | 0.482 | 0.306 | 0.522 |
| L128 | LTE B71 | QPSK20M | 133222 | 50 | 25 | Back of Keyboard | 9 | off | 24 | 23.68 | 0.04 | 0.439 | 0.280 | 0.473 |
| L129 | LTE B71 | QPSK20M | 133222 | 50 | 25 | Back of Keyboard (Repeated) | 0 | on | 22 | 21.57 | 0 | 0.882 | 0.536 | 0.974 |

Note: The value with boldface is the maximum SAR Value of each test band.

2. Body-worn SAR test results of WiFi 2.4G

| Test No. | Band | Channel | Test Position | Separation Distance (mm) | Ant | Data Rate | Duty Cycle (%) | Maximum Tune-up (dBm) | Conducted Power (dBm) | Power Drift (dB) | SAR 1g (W/kg) | SAR 10g (W/kg) | Reported 1g SAR (W/kg) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| W01 | 802.11g | 6 | Back of Screen | 25 | AUX | 6 | 79.17 | 21.00 | 19.55 | -0.07 | **0.097** | **0.041** | **0.172** |
| W02 | 802.11g | 6 | Back of Keyboard | 0 | AUX | 6 | 79.17 | 21.00 | 19.55 | 0 | 0.001 | 0.001 | 0.002 |
| W03 | 802.11g | 1 | Back of Screen | 25 | AUX | 6 | 79.17 | 17.00 | 16.49 | 0.19 | 0.029 | 0.016 | 0.042 |
| W04 | 802.11g | 11 | Back of Screen | 25 | AUX | 6 | 79.17 | 17.50 | 17.02 | 0.01 | 0.035 | 0.021 | 0.050 |
| W05 | 802.11g | 6 | Back of Screen | 25 | MAIN | 6 | 79.17 | 21.00 | 19.32 | -0.06 | **0.119** | **0.070** | **0.221** |
| W06 | 802.11g | 6 | Back of Keyboard | 0 | MAIN | 6 | 79.17 | 21.00 | 19.32 | 0 | 0.001 | 0.000 | 0.002 |
| W07 | 802.11g | 1 | Back of Screen | 25 | MAIN | 6 | 79.17 | 17.00 | 16.64 | 0.06 | 0.032 | 0.019 | 0.043 |
| W08 | 802.11g | 11 | Back of Screen | 25 | MAIN | 6 | 79.17 | 17.50 | 16.54 | -0.15 | 0.079 | 0.046 | 0.125 |
| W09 | 802.11n HT40 | 6 | Back of Screen | 25 | MIMO | HT8 | 79.17 | 21.00 | 20.56 | -0.02 | **0.087** | **0.051** | **0.121** |
| W10 | 802.11n HT40 | 6 | Back of Keyboard | 0 | MIMO | HT8 | 79.17 | 21.00 | 20.56 | 0 | <0.001 | <0.001 | <0.001 |
| W11 | 802.11n HT40 | 3 | Back of Screen | 25 | MIMO | HT8 | 79.17 | 19.50 | 18.55 | 0.08 | 0.054 | 0.032 | 0.084 |
| W12 | 802.11n HT40 | 9 | Back of Screen | 25 | MIMO | HT8 | 79.17 | 19.00 | 18.69 | -0.04 | 0.049 | 0.029 | 0.067 |

Note: The value with boldface is the maximum SAR Value of each test band.

3. Body-worn SAR test results of BT

| Test No. | Band | Channel | Test Position | Separation Distance (mm) | Ant | Data Rate | Duty Cycle (%) | Maximum Tune-up (dBm) | Conducted Power (dBm) | Power Drift (dB) | SAR 1g (W/kg) | SAR 10g (W/kg) | Reported 1g SAR (W/kg) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| B01 | BT DH5 | 78 | Back of Screen | 25 | AUX | DH5 | 76.70 | 10.00 | 9.81 | -0.02 | 0.0010 | 0.0003 | 0.001 |
| B02 | BT DH5 | 78 | Back of Keyboard | 0 | AUX | DH5 | 76.70 | 10.00 | 9.81 | 0 | 0.0012 | 0.0001 | 0.002 |
| B03 | BT DH5 | 0 | Back of Keyboard | 0 | AUX | DH5 | 76.70 | 10.00 | 8.70 | 0 | 0.0014 | 0.0001 | 0.002 |
| B04 | BT DH5 | 39 | Back of Keyboard | 0 | AUX | DH5 | 76.70 | 10.00 | 9.27 | 0 | **0.0014** | **0.0003** | **0.002** |

Note: The value with boldface is the maximum SAR Value of each test band.

4. Body-worn SAR test results of WiFi 5G

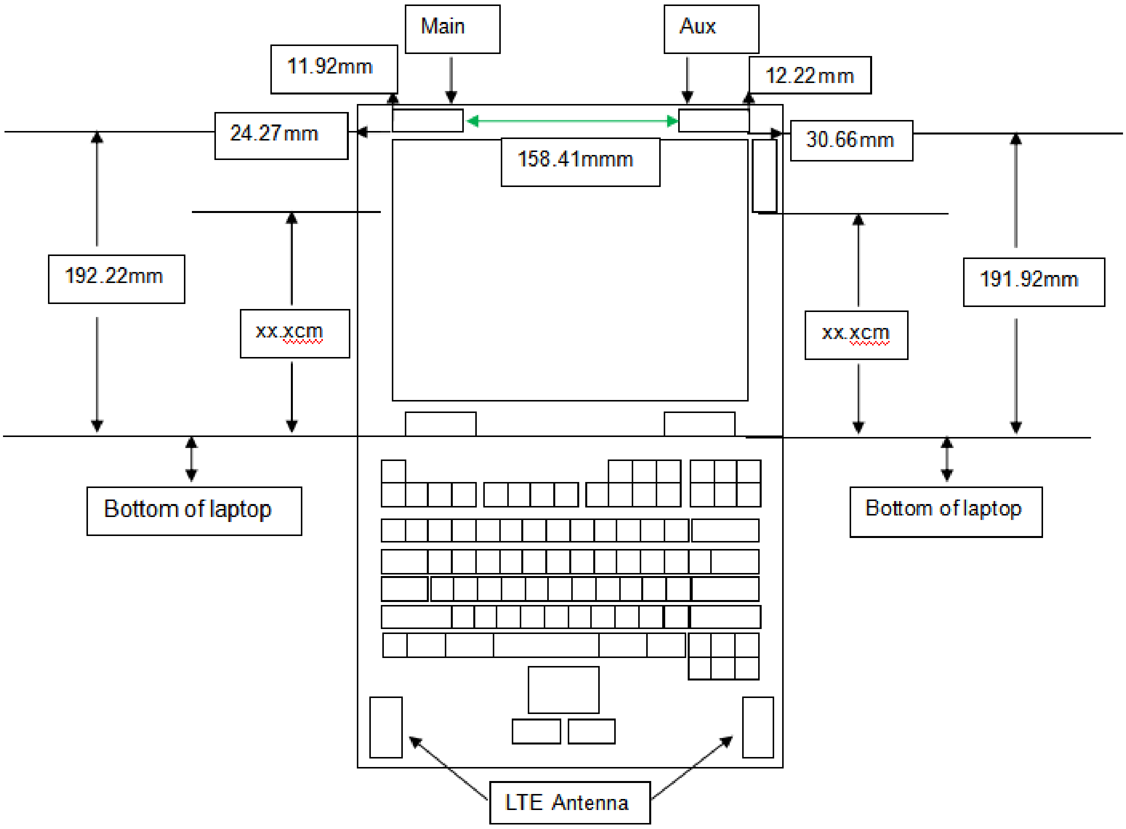
| Test No. | Band | Channel | Test Position | Separation Distance (mm) | Ant | Data Rate | Duty Cycle (%) | Maximum Tune-up (dBm) | Conducted Power (dBm) | Power Drift (dB) | SAR 1g (W/kg) | SAR 10g (W/kg) | Reported 1g SAR (W/kg) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| W13 | 802.11n HT40 | 46 | Back of Screen | 25 | AUX | HT0 | 78.77 | 18.50 | 18.04 | 0 | 0.231 | 0.107 | 0.326 |
| W14 | 802.11n HT40 | 46 | Back of Keyboard | 0 | AUX | HT0 | 78.77 | 18.50 | 18.04 | 0 | 0.0044 | 0.0019 | 0.006 |
| W15 | 802.11n HT40 | 38 | Back of Screen | 25 | AUX | HT0 | 78.77 | 18.00 | 17.91 | -0.02 | **0.275** | **0.126** | **0.356** |
| W16 | 802.11n HT40 | 46 | Back of Screen | 25 | MAIN | HT0 | 78.77 | 18.50 | 17.90 | 0.08 | 0.321 | 0.147 | 0.468 |
| W17 | 802.11n HT40 | 46 | Back of Keyboard | 0 | MAIN | HT0 | 78.77 | 18.50 | 17.90 | 0 | 0.0051 | 0.004 | 0.007 |
| W18 | 802.11n HT40 | 38 | Back of Screen | 25 | MAIN | HT0 | 78.77 | 18.50 | 17.87 | 0 | **0.336** | **0.153** | **0.493** |
| W19 | 802.11n HT20 | 48 | Back of Screen | 25 | MIMO | HT8 | 78.77 | 21.00 | 20.60 | -0.03 | 0.292 | 0.136 | 0.406 |
| W20 | 802.11n HT20 | 48 | Back of Keyboard | 0 | MIMO | HT8 | 78.77 | 21.00 | 20.60 | 0 | 0.0046 | 0.0026 | 0.006 |
| W21 | 802.11n HT20 | 40 | Back of Screen | 25 | MIMO | HT8 | 78.77 | 20.50 | 20.06 | 0 | **0.311** | **0.141** | **0.437** |
| W22 | 802.11n HT20 | 44 | Back of Screen | 25 | MIMO | HT8 | 78.77 | 20.50 | 20.12 | 0 | 0.289 | 0.133 | 0.400 |
| W23 | 802.11n HT20 | 60 | Back of Screen | 25 | AUX | HT0 | 78.77 | 18.50 | 17.77 | 0 | **0.287** | **0.128** | **0.431** |
| W24 | 802.11n HT20 | 60 | Back of Keyboard | 0 | AUX | HT0 | 78.77 | 18.50 | 17.77 | 0 | <0.001 | <0.001 | <0.001 |
| W25 | 802.11n HT20 | 52 | Back of Screen | 25 | AUX | HT0 | 78.77 | 18.50 | 17.70 | 0 | 0.207 | 0.0938 | 0.316 |
| W26 | 802.11n HT20 | 56 | Back of Screen | 25 | AUX | HT0 | 78.77 | 18.50 | 17.62 | -0.08 | 0.24 | 0.11 | 0.373 |
| W27 | 802.11n HT20 | 52 | Back of Screen | 25 | MAIN | HT0 | 78.77 | 18.50 | 17.76 | -0.02 | 0.318 | 0.143 | 0.479 |
| W28 | 802.11n HT20 | 52 | Back of Keyboard | 0 | MAIN | HT0 | 78.77 | 18.50 | 17.76 | 0 | <0.001 | <0.001 | <0.001 |
| W29 | 802.11n HT20 | 56 | Back of Screen | 25 | MAIN | HT0 | 78.77 | 18.50 | 17.62 | 0 | 0.307 | 0.144 | 0.477 |
| W30 | 802.11n HT20 | 60 | Back of Screen | 25 | MAIN | HT0 | 78.77 | 18.50 | 17.57 | -0.04 | **0.309** | **0.143** | **0.486** |
| W31 | 802.11n HT20 | 60 | Back of Screen | 25 | MIMO | HT8 | 78.77 | 21.00 | 20.40 | 0 | **0.337** | **0.158** | **0.491** |
| W32 | 802.11n HT20 | 60 | Back of Keyboard | 0 | MIMO | HT8 | 78.77 | 21.00 | 20.40 | 0 | <0.001 | <0.001 | <0.001 |
| W33 | 802.11n HT20 | 52 | Back of Screen | 25 | MIMO | HT8 | 78.77 | 21.00 | 20.33 | -0.05 | 0.305 | 0.144 | 0.452 |
| W34 | 802.11n HT20 | 56 | Back of Screen | 25 | MIMO | HT8 | 78.77 | 21.00 | 20.31 | 0 | 0.298 | 0.133 | 0.443 |
| W35 | 802.11n HT40 | 110 | Back of Screen | 25 | AUX | HT0 | 78.77 | 18.50 | 18.02 | 0 | 0.254 | 0.11 | 0.360 |
| W36 | 802.11n HT40 | 110 | Back of Keyboard | 0 | AUX | HT0 | 78.77 | 18.50 | 18.02 | 0 | <0.001 | <0.001 | <0.001 |
| W37 | 802.11n HT40 | 118 | Back of Screen | 25 | AUX | HT0 | 78.77 | 18.50 | 17.94 | -0.05 | 0.255 | 0.116 | 0.368 |
| W38 | 802.11n HT40 | 134 | Back of Screen | 25 | AUX | HT0 | 78.77 | 18.50 | 17.92 | 0.17 | **0.391** | **0.181** | **0.567** |
| W39 | 802.11n HT40 | 134 | Back of Screen | 25 | MAIN | HT0 | 78.77 | 18.50 | 18.12 | 0.07 | 0.439 | 0.191 | 0.608 |
| W40 | 802.11n HT40 | 134 | Back of Keyboard | 0 | MAIN | HT0 | 78.77 | 18.50 | 18.12 | 0 | <0.001 | <0.001 | <0.001 |
| W41 | 802.11n HT40 | 110 | Back of Screen | 25 | MAIN | HT0 | 78.77 | 18.50 | 18.07 | 0 | 0.424 | 0.186 | 0.594 |
| W42 | 802.11n HT40 | 118 | Back of Screen | 25 | MAIN | HT0 | 78.77 | 18.50 | 18.05 | -0.02 | **0.438** | **0.194** | **0.617** |
| W43 | 802.11n HT20 | 112 | Back of Screen | 25 | MIMO | HT8 | 78.77 | 21.50 | 21.25 | 0.02 | 0.442 | 0.206 | 0.594 |
| W44 | 802.11n HT20 | 112 | Back of Keyboard | 0 | MIMO | HT8 | 78.77 | 21.50 | 21.25 | 0 | <0.001 | <0.001 | <0.001 |
| W45 | 802.11n HT20 | 116 | Back of Screen | 25 | MIMO | HT8 | 78.77 | 21.50 | 21.22 | 0.06 | **0.453** | **0.208** | **0.613** |
| W46 | 802.11n HT20 | 108 | Back of Screen | 25 | MIMO | HT8 | 78.77 | 21.50 | 21.09 | -0.01 | 0.437 | 0.197 | 0.610 |
| W47 | 802.11n HT40 | 151 | Back of Screen | 25 | AUX | HT0 | 78.77 | 18.50 | 17.89 | 0 | 0.319 | 0.142 | 0.466 |
| W48 | 802.11n HT40 | 151 | Back of Keyboard | 0 | AUX | HT0 | 78.77 | 18.50 | 17.89 | 0 | <0.001 | <0.001 | <0.001 |
| W49 | 802.11n HT40 | 142 | Back of Screen | 25 | AUX | HT0 | 78.77 | 18.50 | 17.87 | 0.06 | 0.307 | 0.138 | 0.451 |
| W50 | 802.11n HT40 | 159 | Back of Screen | 25 | AUX | HT0 | 78.77 | 18.50 | 17.73 | -0.08 | **0.356** | **0.159** | **0.540** |
| W51 | 802.11n HT40 | 142 | Back of Screen | 25 | MAIN | HT0 | 78.77 | 18.50 | 18.11 | 0 | 0.426 | 0.189 | 0.592 |
| W52 | 802.11n HT40 | 142 | Back of Keyboard | 0 | MAIN | HT0 | 78.77 | 18.50 | 18.11 | 0 | <0.001 | <0.001 | <0.001 |
| W53 | 802.11n HT40 | 151 | Back of Screen | 25 | MAIN | HT0 | 78.77 | 18.50 | 18.08 | 0 | 0.426 | 0.189 | 0.596 |
| W54 | 802.11n HT40 | 159 | Back of Screen | 25 | MAIN | HT0 | 78.77 | 18.50 | 18.02 | 0 | **0.434** | **0.192** | **0.615** |
| W55 | 802.11n HT40 | 142 | Back of Screen | 25 | MIMO | HT8 | 78.77 | 21.00 | 20.77 | -0.05 | 0.438 | 0.193 | 0.586 |
| W56 | 802.11n HT40 | 142 | Back of Keyboard | 0 | MIMO | HT8 | 78.77 | 21.00 | 20.77 | 0 | <0.001 | <0.001 | <0.001 |
| W57 | 802.11n HT40 | 151 | Back of Screen | 25 | MIMO | HT8 | 78.77 | 21.00 | 20.68 | 0 | 0.422 | 0.187 | 0.577 |
| W58 | 802.11n HT40 | 159 | Back of Screen | 25 | MIMO | HT8 | 78.77 | 21.00 | 20.67 | -0.06 | **0.445** | **0.197** | **0.610** |

Note: The value with boldface is the maximum SAR Value of each test band.

### 7.3 MULTIPLE TRANSMITTER EVALUATION

The following tables list information which is relevant for the decision if a simultaneous transmit evaluation is necessary according to FCC KDB 447498D01 General RF Exposure Guidance v06.

The location of the antenna inside EUT is as below:



### 7.3.1 SIMULTANEOUS TRANSMISSION CONDITIONS

Per FCC KDB 447498 D01, SAR compliance for simultaneous transmission must be considered when the maximum duration of overlapping transmissions, including network hand-offs, is greater than 30 seconds. This device contains multiple transmitters that may operate simultaneously, and therefore requires a simultaneous transmission analysis.

The Simultaneous Transmission Possibilities of this device are as below:

| NO. | Simultaneous Tx Combination | Body-worn |
|---|---|---|
| 1 | LTE Ant+WIFI 2.4G Main Ant | Yes |
| 2 | LTE Ant+WIFI 5.2G Main Ant | Yes |
| 3 | LTE Ant+WIFI 5.3G Main Ant | Yes |
| 4 | LTE Ant+WIFI 5.6G Main Ant | Yes |
| 5 | LTE Ant+WIFI 5.8G Main Ant | Yes |
| 6 | LTE Ant+WIFI 2.4G Aux Ant | Yes |
| 7 | LTE Ant+WIFI 5.2G Aux Ant | Yes |
| 8 | LTE Ant+WIFI 5.3G Aux Ant | Yes |
| 9 | LTE Ant+WIFI 5.6G Aux Ant | Yes |
| 10 | LTE Ant+WIFI 5.8G Aux Ant | Yes |
| 11 | LTE Ant+BT Aux Ant | Yes |
| 12 | LTE Ant+WIFI 2.4G MIMO | Yes |
| 13 | LTE Ant+WIFI 5G MIMO | Yes |

Note: Only the Aux Ant supports BT function.

### 7.3.2 SAR SUMMATION SCENARIO

1. About LTE and WIFI (Main) antenna

| Test Position / $SAR_{1g}$(W/Kg) | Back of Screen | Back of Keyboard |
|---|---|---|
| LTE B2 | <0.001 | 0.906 |
| LTE B4 | <0.001 | 0.973 |
| LTE B5 | <0.001 | 0.887 |
| LTE B7 | <0.001 | 0.932 |
| LTE B12 | <0.001 | 1.035 |
| LTE B13 | <0.001 | 1.135 |
| LTE B14 | <0.001 | 1.067 |
| LTE B17 | <0.001 | 0.986 |
| LTE B25 | <0.001 | 0.941 |
| LTE B26 | <0.001 | 1.033 |
| LTE B30 | <0.001 | 0.978 |
| LTE B38 | <0.001 | 0.995 |
| LTE B41 | <0.001 | 0.998 |
| LTE B66 | <0.001 | 0.995 |
| LTE B71 | <0.001 | 0.988 |
| WiFi 2.4G | 0.221 | 0.002 |
| WiFi 5.2G | 0.493 | 0.007 |
| WiFi 5.3G | 0.486 | <0.001 |
| WiFi 5.6G | 0.617 | <0.001 |
| WiFi 5.8G | 0.615 | <0.001 |
| MAX $\sum SAR_{1g}$ | **0.617** | **1.142** |

Note: MAX. $\sum SAR_{1g}$ = 1.142 W/Kg <1.6 W/Kg, so the SAR to peak location separation ratio should not be considered.

2. About LTE and WIFI/BT (Aux) antenna

| Test Position / $SAR_{1g}$(W/Kg) | Back of Screen | Back of Keyboard |
|---|---|---|
| LTE B2 | <0.001 | 0.906 |
| LTE B4 | <0.001 | 0.973 |
| LTE B5 | <0.001 | 0.887 |
| LTE B7 | <0.001 | 0.932 |
| LTE B12 | <0.001 | 1.035 |
| LTE B13 | <0.001 | 1.135 |
| LTE B14 | <0.001 | 1.067 |
| LTE B17 | <0.001 | 0.986 |
| LTE B25 | <0.001 | 0.941 |
| LTE B26 | <0.001 | 1.033 |
| LTE B30 | <0.001 | 0.978 |
| LTE B38 | <0.001 | 0.995 |
| LTE B41 | <0.001 | 0.998 |
| LTE B66 | <0.001 | 0.995 |
| LTE B71 | <0.001 | 0.988 |
| WiFi 2.4G | 0.172 | 0.002 |
| WiFi 5.2G | 0.356 | 0.006 |
| WiFi 5.3G | 0.431 | <0.001 |
| WiFi 5.6G | 0.567 | <0.001 |
| WiFi 5.8G | 0.540 | <0.001 |
| BT | **0.001** | **0.002** |
| MAX $\sum SAR_{1g}$ | **0.567** | **1.141** |

Note: MAX. $\sum SAR_{1g}$ = 1.141 W/Kg <1.6 W/Kg, so the SAR to peak location separation ratio should not be considered.

3. About LTE and WIFI/BT (MIMO) antenna

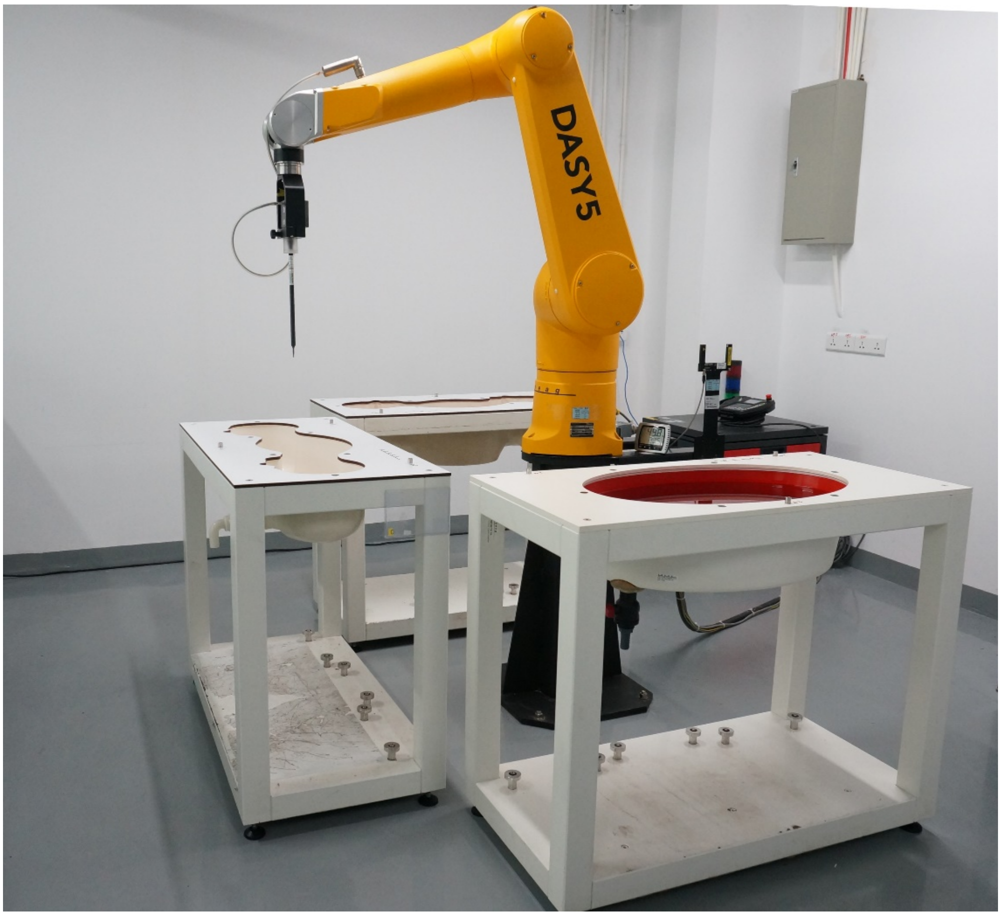
| Test Position / $SAR_{1g}$(W/Kg) | Back of Screen | Back of Keyboard |
|---|---|---|
| LTE B2 | <0.001 | 0.906 |
| LTE B4 | <0.001 | 0.973 |
| LTE B5 | <0.001 | 0.887 |
| LTE B7 | <0.001 | 0.932 |
| LTE B12 | <0.001 | 1.035 |
| LTE B13 | <0.001 | 1.135 |
| LTE B14 | <0.001 | 1.067 |
| LTE B17 | <0.001 | 0.986 |
| LTE B25 | <0.001 | 0.941 |
| LTE B26 | <0.001 | 1.033 |
| LTE B30 | <0.001 | 0.978 |
| LTE B38 | <0.001 | 0.995 |
| LTE B41 | <0.001 | 0.998 |
| LTE B66 | <0.001 | 0.995 |
| LTE B71 | <0.001 | 0.988 |
| WiFi 2.4G | 0.121 | <0.001 |
| WiFi 5.2G | 0.437 | 0.006 |
| WiFi 5.3G | 0.491 | <0.001 |
| WiFi 5.6G | 0.613 | <0.001 |
| WiFi 5.8G | 0.610 | <0.001 |
| MAX $\sum SAR_{1g}$ | **0.613** | **1.141** |

Note: MAX. $\sum SAR_{1g}$ = 1.141 W/Kg <1.6 W/Kg, so the SAR to peak location separation ratio should not be considered.

# APPENDIX

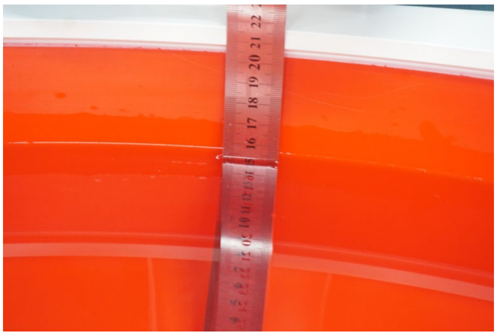
## 1. TEST LAYOUT

**Specific Absorption Rate Test Layout**

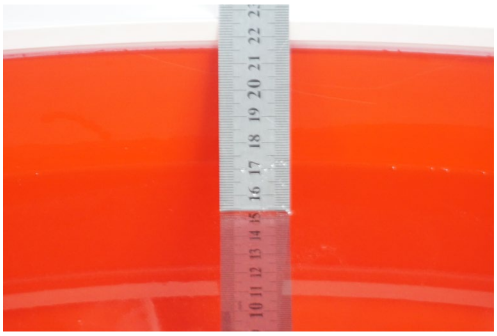


**Liquid depth in the flat Phantom (≥15cm depth)**

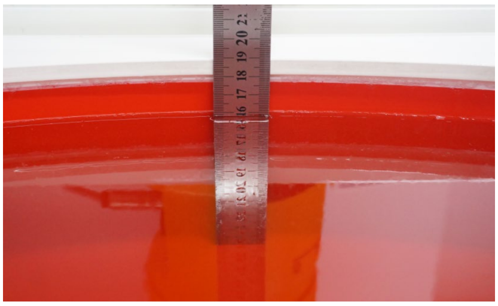
Body_695MHz-925MHz_15.3cm



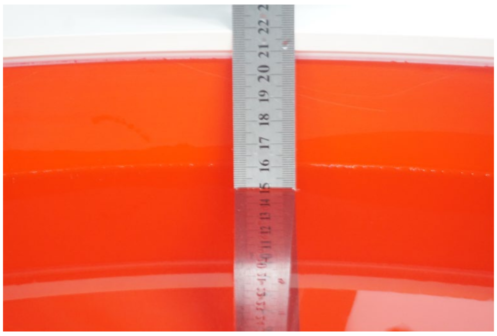
Body_1700MHz-1900MHz_15.4cm



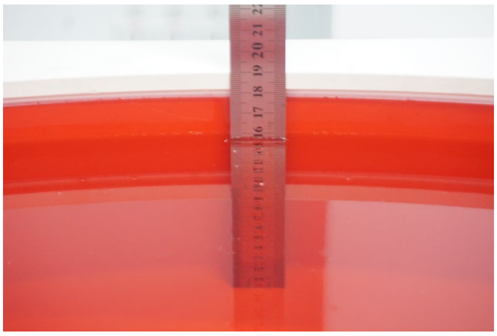
Body_1900MHz-2300MHz _15.9cm



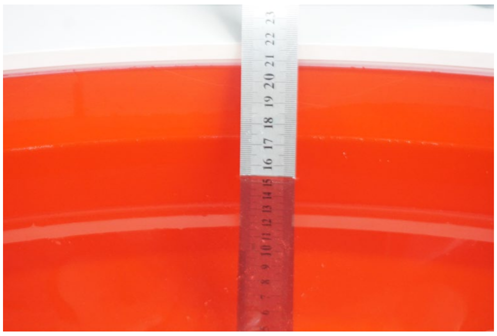
Body_2300MHz-2700MHz_15.1cm



Body_3300MHz-4200MHz_15.8cm



Body_4500MHz-6000MHz_15.5cm



## Appendix A. SAR Plots of System Verification

**(Pls See BTL-FCC SAR-1-2410C002_Appendix A.)**

## Appendix B. SAR Plots of SAR Measurement

**(Pls See BTL-FCC SAR-1-2410C002_Appendix B.)**

## Appendix C. Calibration Certificate

**(Pls See BTL-FCC SAR-1-2410C002_Appendix C.)**

## Appendix D. Photographs of the Test Set-Up

**(Pls See BTL-FCC SAR-1-2410C002_Appendix D.)**

## Appendix E. Conducted power measurement result

**(Pls See BTL-FCC SAR-1-2410C002_Appendix E.)**

**End of Test Report**