# FCC SAR TEST REPORT

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|---|---|---|
| **FCC ID** | : | **ZMOL850GL** |
| **Equipment** | : | **LTE module** |
| **Brand Name** | : | **Fibocom** |
| **Model Name** | : | **L850-GL** |
| **Applicant** | : | **Fibocom Wireless Inc.<br>5/F, Tower A, Technology Building II, 1057#<br>Nanhai Blvd, Shenzhen, 518067 China.** |
| **Standard** | : | **FCC 47 CFR Part 2 (2.1093)** |

**The product was installed into Notebook Computer (Brand Name HP, Model Name: HSN-I39C) during test.**

**The product was received on Jul. 21, 2020 and testing was started from Aug. 10, 2020 and completed on Aug. 13, 2020. We, SPORTON INTERNATIONAL INC., would like to declare that the tested sample provide by manufacturer and the test data has been evaluated in accordance with the test procedures given in 47 CFR Part 2.1093 and FCC KDB and has been pass the FCC requirement.**

**The test results in this report apply exclusively to the tested model / sample. Without written approval of SPORTON INTERNATIONAL INC. EMC & Wireless Communications Laboratory, the test report shall not be reproduced except in full.**

**Approved by: Cona Huang / Deputy Manager**

***SPORTON INTERNATIONAL INC. EMC & Wireless Communications Laboratory***
*No. 52, Huaya 1st Rd., Guishan Dist., Taoyuan City, Taiwan (R.O.C.)*

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# History of this test report

| Report No. | Version | Description | Issued Date |
|---|---|---|---|
| FA071625-08 | 01 | Initial issue of report | Sep. 10, 2020 |
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# 1. Statement of Compliance

The maximum results of Specific Absorption Rate (SAR) found during testing for **Fibocom Wireless Inc., LTE module, L850-GL**, are as follows.

| Equipment Class | Frequency Band | | Highest SAR Summary Body (Separation 0mm) 1g SAR (W/kg) | Highest Simultaneous Transmission 1g SAR (W/kg) |
|---|---|---|---|---|
| Licensed | WCDMA | WCDMA II | 0.08 | 1.03 |
| | | WCDMA IV | 0.04 | |
| | | WCDMA V | 0.02 | |
| | LTE | LTE Band 2 | 0.05 | |
| | | LTE Band 7 | 0.01 | |
| | | LTE Band 12 / 17 | 0.02 | |
| | | LTE Band 13 | 0.03 | |
| | | LTE Band 5 / 26 | 0.02 | |
| | | LTE Band 30 | 0.00 | |
| | | LTE Band 38 / 41 | 0.01 | |
| | | LTE Band 4 / 66 | 0.06 | |
| Date of Testing: | | | 2020/8/10 ~ 2020/8/13 | |

Sporton Lab is accredited to ISO 17025 by Taiwan Accreditation Foundation (TAF code: 1190) and the FCC designation No. TW1190 under the FCC 2.948(e) by Mutual Recognition Agreement (MRA) in FCC test.This device is in compliance with Specific Absorption Rate (SAR) for general population/uncontrolled exposure limits (1.6 W/kg) specified in FCC 47 CFR part 2 (2.1093) and ANSI/IEEE C95.1-1992, and had been tested in accordance with the measurement methods and procedures specified in IEEE 1528-2013 and FCC KDB publications.

**Reviewed by: Jason Wang**
**Report Producer: Daisy Peng**

# 2. Guidance Applied

The Specific Absorption Rate (SAR) testing specification, method, and procedure for this device is in accordance with the following standards, if the KDB standards were not list within TAF approval, because it is include in the FCC KDB 447498.

- FCC 47 CFR Part 2 (2.1093)
- ANSI/IEEE C95.1-1992
- IEEE 1528-2013
- FCC KDB 865664 D01 SAR Measurement 100 MHz to 6 GHz v01r04
- FCC KDB 865664 D02 SAR Reporting v01r02
- FCC KDB 447498 D01 General RF Exposure Guidance v06
- FCC KDB 248227 D01 802.11 Wi-Fi SAR v02r02
- FCC KDB 616217 D04 SAR for laptop and tablets v01r02
- FCC KDB 941225 D01 3G SAR Procedures v03r01
- FCC KDB 941225 D05 SAR for LTE Devices v02r05
- FCC KDB 941225 D05A Rel.10 LTE SAR Test Guidance v01r02

# 3. Equipment Under Test (EUT) Information

## 3.1 General Information

| Product Feature & Specification | |
|---|---|
| Equipment Name | LTE module |
| Brand Name | Fibocom |
| Model Name | L850-GL |
| FCC ID | ZMOL850GL |
| Wireless Technology and Frequency Range | WCDMA Band II: 1850 MHz ~ 1910 MHz<br>WCDMA Band IV: 1710 MHz ~ 1755 MHz<br>WCDMA Band V: 824 MHz ~ 849 MHz<br>LTE Band 2: 1850 MHz ~ 1910 MHz<br>LTE Band 4: 1710 MHz ~ 1755 MHz<br>LTE Band 5: 824 MHz ~ 849 MHz<br>LTE Band 7: 2500 MHz ~ 2570 MHz<br>LTE Band 12: 699 MHz ~ 716 MHz<br>LTE Band 13: 777 MHz ~ 787 MHz<br>LTE Band 17: 704 MHz ~ 716 MHz<br>LTE Band 26: 814 MHz ~ 849 MHz<br>LTE Band 30: 2305 MHz ~ 2315 MHz<br>LTE Band 38: 2570 MHz ~ 2620 MHz<br>LTE Band 41: 2496 MHz ~ 2690 MHz<br>LTE Band 66: 1710 MHz ~ 1780 MHz |
| Mode | RMC 12.2Kbps<br>HSDPA<br>HSUPA<br>DC-HSDPA<br>LTE: QPSK, 16QAM |
| EUT Stage | Production Unit |

| WWAN Antenna Information | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| Vendor | Hong-Bo | | | | | | | | |
| Antenna | PIFA | | | | | | | | |
| Part Number | 6036B0278901<br>(260-27452)<br>Tx1/Rx1 | | | | | | | | |
| Frequency | B5/B26<br>uplink<br>824-849 MHz | B2<br>downlink+uplink<br>1850-1910MHz | B12/B17<br>uplink<br>704-716MHz | B13<br>down link<br>746-756MHz | B13<br>uplink<br>777-787MHz | B4/B66<br>uplink<br>1710-1755MHz | B7<br>uplink<br>2500-2570MHz | B38/B41<br>uplink+downlink<br>2570-2620MHz | B30<br>uplink+downlink<br>2300-2400MHz |
| Gain (dBi) | 1.04 | -0.42 | 0.66 | 0.29 | 0.64 | 0.54 | -1.15 | -1.64 | 2.01 |

| WWAN Antenna Information | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Vendor | Hong-Bo | | | | | | | |
| Antenna | PIFA | | | | | | | |
| Part Number | 6036B0279701<br>(260-27453)<br>Tx2/Rx2 | | | | | | | |
| Frequency | B5/B26<br>downlink<br>869-894MHz | B2<br>downlink<br>1930-1990MHz | B12/B17<br>downlink<br>734-746MHz | B13<br>downlink<br>746-756MHz | B4/B66<br>Downlink<br>2110-2155MHz | B7<br>downlink<br>2620-2690MHz | B38/B41<br>uplink+downlink<br>2570-2620MHz | B30<br>uplink+downlink<br>2300-2400MHz |
| Gain (dBi) | -3.09 | -0.59 | -1.42 | 0.11 | 1.21 | -1.47 | -1.19 | 1.01 |

| Host Information | |
|---|---|
| **Brand Name** | HP |
| **Model Name** | HSN-I39C |
| **Integrated WLAN Module** | Brand Name: Intel<br>Model Name: AX200NGW |
| **Wireless Technology and Frequency Range** | WLAN 2.4GHz Band: 2400 MHz ~ 2483.5 MHz<br>WLAN 5.2GHz Band: 5150 MHz ~ 5250 MHz<br>WLAN 5.3GHz Band: 5250 MHz ~ 5350 MHz<br>WLAN 5.6GHz Band: 5470 MHz ~ 5725 MHz<br>WLAN 5.8GHz Band: 5725 MHz ~ 5825 MHz<br>Bluetooth: 2400 MHz ~ 2483.5 MHz |
| **Mode** | WLAN: 802.11a/b/g/n/ac/ax HT20/HT40/VHT20/VHT40/VHT80/VHT160/HE20/HE40/HE80/HE160<br>Bluetooth BR/EDR/LE/HS |
| **Remark:**<br>1. The Intel AX200NGW WLAN/BT module is also integrated in this host, the 2.4GHz/5 GHz WLAN and Bluetooth SAR results are referenced from the report of FCC ID: B94-AX200NGWP (SAR Report No. FA071625-02), and these SAR results are also used to perform simultaneous transmission analysis. | |

## 3.2 General LTE SAR Test and Reporting Considerations

<table>
<tr><th colspan="2">Summarized necessary items addressed in KDB 941225 D05 v02r05</th></tr>
<tr><td>FCC ID</td><td>ZMOL850GL</td></tr>
<tr><td>Equipment Name</td><td>LTE module</td></tr>
<tr><td>Operating Frequency Range of each LTE transmission band</td><td>LTE Band 2: 1850 MHz ~ 1910 MHz<br>LTE Band 4: 1710 MHz ~ 1755 MHz<br>LTE Band 5: 824 MHz ~ 849 MHz<br>LTE Band 7: 2500 MHz ~ 2570 MHz<br>LTE Band 12: 699 MHz ~ 716 MHz<br>LTE Band 13: 777 MHz ~ 787 MHz<br>LTE Band 17: 704 MHz ~ 716 MHz<br>LTE Band 26: 814 MHz ~ 849 MHz<br>LTE Band 30: 2305 MHz ~ 2315 MHz<br>LTE Band 38: 2570 MHz ~ 2620 MHz<br>LTE Band 41: 2496 MHz ~ 2690 MHz<br>LTE Band 66: 1710 MHz ~ 1780 MHz</td></tr>
<tr><td>Channel Bandwidth</td><td>LTE Band 02:1.4MHz, 3MHz, 5MHz, 10MHz, 15MHz, 20MHz<br>LTE Band 04:1.4MHz, 3MHz, 5MHz, 10MHz, 15MHz, 20MHz<br>LTE Band 05:1.4MHz, 3MHz, 5MHz, 10MHz<br>LTE Band 07: 5MHz, 10MHz, 15MHz, 20MHz<br>LTE Band 12:1.4MHz, 3MHz, 5MHz, 10MHz<br>LTE Band 13: 5MHz, 10MHz<br>LTE Band 17: 5MHz, 10MHz<br>LTE Band 26:1.4MHz, 3MHz, 5MHz, 10MHz, 15MHz<br>LTE Band 30: 5MHz, 10MHz<br>LTE Band 38: 5MHz, 10MHz, 15MHz, 20MHz<br>LTE Band 41: 5MHz, 10MHz, 15MHz, 20MHz<br>LTE Band 66:1.4MHz, 3MHz, 5MHz, 10MHz, 15MHz, 20MHz</td></tr>
<tr><td>uplink modulations used</td><td>QPSK / 16QAM</td></tr>
<tr><td>LTE Voice / Data requirements</td><td>Data only</td></tr>
<tr><td>LTE MPR permanently built-in by design</td><td>
Table 6.2.3-1: Maximum Power Reduction (MPR) for Power Class 1, 2 and 3
<table>
<tr><th rowspan="2">Modulation</th><th colspan="6">Channel bandwidth / Transmission bandwidth ($N_{RB}$)</th><th rowspan="2">MPR (dB)</th></tr>
<tr><th>1.4 MHz</th><th>3.0 MHz</th><th>5 MHz</th><th>10 MHz</th><th>15 MHz</th><th>20 MHz</th></tr>
<tr><td>QPSK</td><td>> 5</td><td>> 4</td><td>> 8</td><td>> 12</td><td>> 16</td><td>> 18</td><td>≤ 1</td></tr>
<tr><td>16 QAM</td><td>≤ 5</td><td>≤ 4</td><td>≤ 8</td><td>≤ 12</td><td>≤ 16</td><td>≤ 18</td><td>≤ 1</td></tr>
<tr><td>16 QAM</td><td>> 5</td><td>> 4</td><td>> 8</td><td>> 12</td><td>> 16</td><td>> 18</td><td>≤ 2</td></tr>
<tr><td>64 QAM</td><td>≤ 5</td><td>≤ 4</td><td>≤ 8</td><td>≤ 12</td><td>≤ 16</td><td>≤ 18</td><td>≤ 2</td></tr>
<tr><td>64 QAM</td><td>> 5</td><td>> 4</td><td>> 8</td><td>> 12</td><td>> 16</td><td>> 18</td><td>≤ 3</td></tr>
<tr><td>256 QAM</td><td colspan="6">≥ 1</td><td>≤ 5</td></tr>
</table>
</td></tr>
<tr><td>LTE A-MPR</td><td>In the base station simulator configuration, Network Setting value is set to NS_01 to disable A-MPR during SAR testing and the LTE SAR tests was transmitting on all TTI frames (Maximum TTI)</td></tr>
<tr><td>Spectrum plots for RB configuration</td><td>A properly configured base station simulator was used for the SAR and power measurement; therefore, spectrum plots for each RB allocation and offset configuration are not included in the SAR report.</td></tr>
<tr><td>LTE Carrier Aggregation Combinations</td><td>Inter-Band and Intra-Band possible combinations and the detail power measurement please referred to section 10.</td></tr>
<tr><td>LTE Carrier Aggregation Additional Information</td><td>This device supports maximum of 3 carriers in the downlink. Additional following LTE Release features are not supported: Relay, HetNet, Enhanced MIMO, eICI, WiFi Offloading, MDH, eMBMA, Cross-Carrier Scheduling, Enhanced SC-FDMA.</td></tr>
</table>

| Transmission (H, M, L) channel numbers and frequencies in each LTE band | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| LTE Band 2 | | | | | | | | | | | | |
| | Bandwidth 1.4 MHz | | Bandwidth 3 MHz | | Bandwidth 5 MHz | | Bandwidth 10 MHz | | Bandwidth 15 MHz | | Bandwidth 20 MHz | |
| | Ch. # | Freq. (MHz) | Ch. # | Freq. (MHz) | Ch. # | Freq. (MHz) | Ch. # | Freq. (MHz) | Ch. # | Freq. (MHz) | Ch. # | Freq. (MHz) |
| L | 18607 | 1850.7 | 18615 | 1851.5 | 18625 | 1852.5 | 18650 | 1855 | 18675 | 1857.5 | 18700 | 1860 |
| M | 18900 | 1880 | 18900 | 1880 | 18900 | 1880 | 18900 | 1880 | 18900 | 1880 | 18900 | 1880 |
| H | 19193 | 1909.3 | 19185 | 1908.5 | 19175 | 1907.5 | 19150 | 1905 | 19125 | 1902.5 | 19100 | 1900 |
| LTE Band 4 | | | | | | | | | | | | |
| | Bandwidth 1.4 MHz | | Bandwidth 3 MHz | | Bandwidth 5 MHz | | Bandwidth 10 MHz | | Bandwidth 15 MHz | | Bandwidth 20 MHz | |
| | Ch. # | Freq. (MHz) | Ch. # | Freq. (MHz) | Ch. # | Freq. (MHz) | Ch. # | Freq. (MHz) | Ch. # | Freq. (MHz) | Ch. # | Freq. (MHz) |
| L | 19957 | 1710.7 | 19965 | 1711.5 | 19975 | 1712.5 | 20000 | 1715 | 20025 | 1717.5 | 20050 | 1720 |
| M | 20175 | 1732.5 | 20175 | 1732.5 | 20175 | 1732.5 | 20175 | 1732.5 | 20175 | 1732.5 | 20175 | 1732.5 |
| H | 20393 | 1754.3 | 20385 | 1753.5 | 20375 | 1752.5 | 20350 | 1750 | 20325 | 1747.5 | 20300 | 1745 |
| LTE Band 5 | | | | | | | | |
| | Bandwidth 1.4 MHz | | Bandwidth 3 MHz | | Bandwidth 5 MHz | | Bandwidth 10 MHz | |
| | Ch. # | Freq. (MHz) | Ch. # | Freq. (MHz) | Ch. # | Freq. (MHz) | Ch. # | Freq. (MHz) |
| L | 20407 | 824.7 | 20415 | 825.5 | 20425 | 826.5 | 20450 | 829 |
| M | 20525 | 836.5 | 20525 | 836.5 | 20525 | 836.5 | 20525 | 836.5 |
| H | 20643 | 848.3 | 20635 | 847.5 | 20625 | 846.5 | 20600 | 844 |
| LTE Band 7 | | | | | | | | |
| | Bandwidth 5 MHz | | Bandwidth 10 MHz | | Bandwidth 15 MHz | | Bandwidth 20 MHz | |
| | Ch. # | Freq. (MHz) | Ch. # | Freq. (MHz) | Ch. # | Freq. (MHz) | Ch. # | Freq. (MHz) |
| L | 20775 | 2502.5 | 20800 | 2505 | 20825 | 2507.5 | 20850 | 2510 |
| M | 21100 | 2535 | 21100 | 2535 | 21100 | 2535 | 21100 | 2535 |
| H | 21425 | 2567.5 | 21400 | 2565 | 21375 | 2562.5 | 21350 | 2560 |
| LTE Band 12 | | | | | | | | |
| | Bandwidth 1.4 MHz | | Bandwidth 3 MHz | | Bandwidth 5 MHz | | Bandwidth 10 MHz | |
| | Ch. # | Freq. (MHz) | Ch. # | Freq. (MHz) | Ch. # | Freq. (MHz) | Ch. # | Freq. (MHz) |
| L | 23017 | 699.7 | 23025 | 700.5 | 23035 | 701.5 | 23060 | 704 |
| M | 23095 | 707.5 | 23095 | 707.5 | 23095 | 707.5 | 23095 | 707.5 |
| H | 23173 | 715.3 | 23165 | 714.5 | 23155 | 713.5 | 23130 | 711 |
| LTE Band 13 | | | | |
| | Bandwidth 5 MHz | | Bandwidth 10 MHz | |
| | Channel # | Freq.(MHz) | Channel # | Freq.(MHz) |
| L | 23205 | 779.5 | 23230 | 782 |
| M | 23230 | 782 | | |
| H | 23255 | 784.5 | | |
| LTE Band 17 | | | | |
| | Bandwidth 5 MHz | | Bandwidth 10 MHz | |
| | Channel # | Freq.(MHz) | Channel # | Freq. (MHz) |
| L | 23755 | 706.5 | 23780 | 709 |
| M | 23790 | 710 | 23790 | 710 |
| H | 23825 | 713.5 | 23800 | 711 |
| LTE Band 26 | | | | | | | | | | |
| | Bandwidth 1.4 MHz | | Bandwidth 3 MHz | | Bandwidth 5 MHz | | Bandwidth 10 MHz | | Bandwidth 15 MHz | |
| | Ch. # | Freq. (MHz) | Ch. # | Freq. (MHz) | Ch. # | Freq. (MHz) | Ch. # | Freq. (MHz) | Ch. # | Freq. (MHz) |
| L | 26697 | 814.7 | 26705 | 815.5 | 26715 | 816.5 | 26740 | 819 | 26765 | 821.5 |
| M | 26865 | 831.5 | 26865 | 831.5 | 26865 | 831.5 | 26865 | 831.5 | 26865 | 831.5 |
| H | 27033 | 848.3 | 27025 | 847.5 | 27015 | 846.5 | 26990 | 844 | 26965 | 841.5 |
| LTE Band 30 | | | | |
| | Bandwidth 5 MHz | | Bandwidth 10 MHz | |
| | Channel # | Freq.(MHz) | Channel # | Freq.(MHz) |
| L | 27685 | 2307.5 | 27710 | 2310 |
| M | 27710 | 2310 | | |
| H | 27735 | 2312.5 | | |

| LTE Band 38 | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | Bandwidth 5 MHz | | Bandwidth 10 MHz | | Bandwidth 15 MHz | | Bandwidth 20 MHz | |
| | Ch. # | Freq. (MHz) | Ch. # | Freq. (MHz) | Ch. # | Freq. (MHz) | Ch. # | Freq. (MHz) |
| L | 37775 | 2572.5 | 37800 | 2575 | 37825 | 2577.5 | 37850 | 2580 |
| M | 38000 | 2595 | 38000 | 2595 | 38000 | 2595 | 38000 | 2595 |
| H | 38225 | 2617.5 | 38200 | 2615 | 38175 | 2612.5 | 38150 | 2610 |

| LTE Band 41 | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | Bandwidth 5 MHz | | Bandwidth 10 MHz | | Bandwidth 15 MHz | | Bandwidth 20 MHz | |
| | Ch. # | Freq. (MHz) | Ch. # | Freq. (MHz) | Ch. # | Freq. (MHz) | Ch. # | Freq. (MHz) |
| L | 39675 | 2498.5 | 39700 | 2501 | 39725 | 2503.5 | 39750 | 2506 |
| L M | 40148 | 2545.8 | 40160 | 2547 | 40173 | 2548.3 | 40185 | 2549.5 |
| M | 40620 | 2593 | 40620 | 2593 | 40620 | 2593 | 40620 | 2593 |
| H M | 41093 | 2640.3 | 41080 | 2639 | 41068 | 2637.8 | 41055 | 2636.5 |
| H | 41565 | 2687.5 | 41540 | 2685 | 41515 | 2682.5 | 41490 | 2680 |

| LTE Band 66 | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Bandwidth 1.4 MHz | | Bandwidth 3 MHz | | Bandwidth 5 MHz | | Bandwidth 10 MHz | | Bandwidth 15 MHz | | Bandwidth 20 MHz | |
| | Ch. # | Freq. (MHz) | Ch. # | Freq. (MHz) | Ch. # | Freq. (MHz) | Ch. # | Freq. (MHz) | Ch. # | Freq. (MHz) | Ch. # | Freq. (MHz) |
| L | 131979 | 1710.7 | 131987 | 1711.5 | 131997 | 1712.5 | 132022 | 1715 | 132047 | 1717.5 | 132072 | 1720 |
| M | 132322 | 1745 | 132322 | 1745 | 132322 | 1745 | 132322 | 1745 | 132322 | 1745 | 132322 | 1745 |
| H | 132665 | 1779.3 | 132657 | 1778.5 | 132647 | 1777.5 | 132622 | 1775 | 132597 | 1772.5 | 132572 | 1770 |

# 4. RF Exposure Limits

## 4.1 Uncontrolled Environment

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

## 4.2 Controlled Environment

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

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

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

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

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

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

# 5. Specific Absorption Rate (SAR)

## 5.1 Introduction

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

## 5.2 SAR Definition

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

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

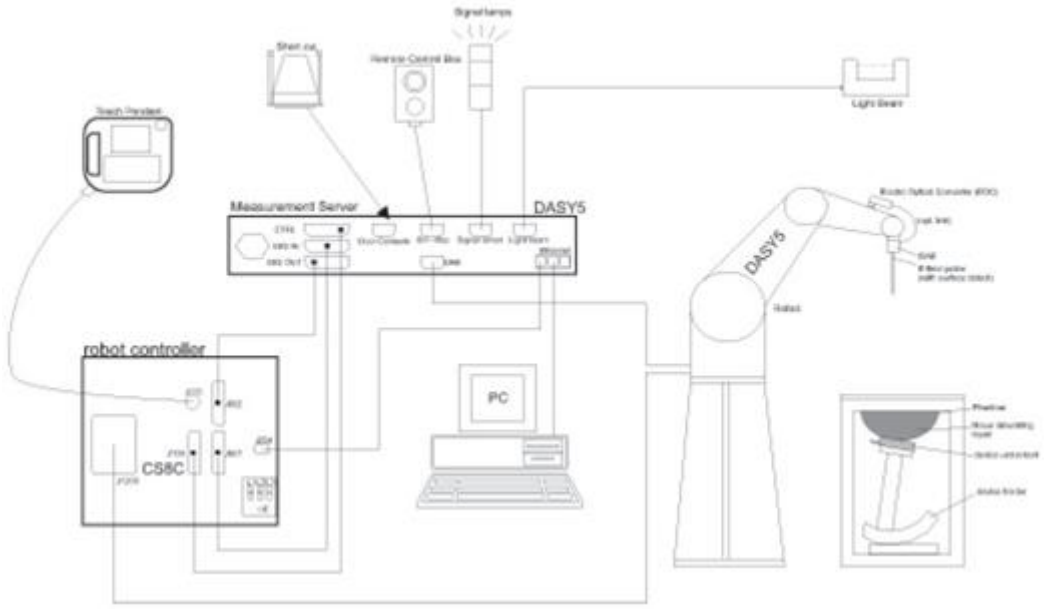
SAR is expressed in units of Watts per kilogram (W/kg)

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

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

# 6. System Description and Setup

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




- A standard high precision 6-axis robot with controller, teach pendant and software. An arm extension for accommodating the data acquisition electronics (DAE).
- An isotropic Field probe optimized and calibrated for the targeted measurement.
- A data acquisition electronics (DAE) which performs the signal amplification, signal multiplexing, AD-conversion, offset measurements, mechanical surface detection, collision detection, etc. The unit is battery powered with standard or rechargeable batteries. The signal is optically transmitted to the EOC.
- The Electro-optical converter (EOC) performs the conversion from optical to electrical signals for the digital communication to the DAE. To use optical surface detection, a special version of the EOC is required. The EOC signal is transmitted to the measurement server.
- The function of the measurement server is to perform the time critical tasks such as signal filtering, control of the robot operation and fast movement interrupts.
- The Light Beam used is for probe alignment. This improves the (absolute) accuracy of the probe positioning.
- A computer running WinXP or Win7 and the DASY5 software.
- Remote control and teach pendant as well as additional circuitry for robot safety such as warning lamps, etc.
- The phantom, the device holder and other accessories according to the targeted measurement.

## 6.1 Test Side Location

Sporton Lab and below test site location are accredited to ISO 17025 by Taiwan Accreditation Foundation (TAF code: 1190 and 0007) and the FCC designation No. TW1190 and TW0007 under the FCC 2.948(e) by Mutual Recognition Agreement (MRA) in FCC test.

| Test Site | SPORTON INTERNATIONAL INC. EMC & Wireless Communications Laboratory | | | |
|---|---|---|---|---|
| Test Site Location | TW1190<br>No. 52, Huaya 1st Rd., Guishan Dist., Taoyuan City 333, CHINESE TAIPEI | | TW0007<br>No. 58, Aly. 75, Ln. 564, Wehnua 3rd, Rd., Guishan Dist., Taoyuan City, CHINESE TAIPEI | |
| Test Site No. | SAR01-HY | SAR03-HY | SAR08-HY | SAR09-HY |
| | SAR04-HY | SAR05-HY | SAR11-HY | SAR12-HY |
| | SAR06-HY | SAR10-HY | | |

## 6.2 E-Field Probe

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

**<ES3DV3 Probe>**

| | | |
|---|---|---|
| **Construction** | Symmetric design with triangular core<br>Interleaved sensors<br>Built-in shielding against static charges<br>PEEK enclosure material (resistant to organic solvents, e.g., DGBE) |  |
| **Frequency** | 10 MHz – 4 GHz;<br>Linearity: ±0.2 dB (30 MHz – 4 GHz) | |
| **Directivity** | ±0.2 dB in TSL (rotation around probe axis)<br>±0.3 dB in TSL (rotation normal to probe axis) | |
| **Dynamic Range** | 5 µW/g – >100 mW/g;<br>Linearity: ±0.2 dB | |
| **Dimensions** | Overall length: 337 mm (tip: 20 mm)<br>Tip diameter: 3.9 mm (body: 12 mm)<br>Distance from probe tip to dipole centers: 3.0 mm | |

**<EX3DV4 Probe>**

| | | |
|---|---|---|
| **Construction** | Symmetric design with triangular core<br>Built-in shielding against static charges<br>PEEK enclosure material (resistant to organic solvents, e.g., DGBE) |  |
| **Frequency** | 10 MHz – >6 GHz<br>Linearity: ±0.2 dB (30 MHz – 6 GHz) | |
| **Directivity** | ±0.3 dB in TSL (rotation around probe axis)<br>±0.5 dB in TSL (rotation normal to probe axis) | |
| **Dynamic Range** | 10 µW/g – >100 mW/g<br>Linearity: ±0.2 dB (noise: typically <1 µW/g) | |
| **Dimensions** | Overall length: 337 mm (tip: 20 mm)<br>Tip diameter: 2.5 mm (body: 12 mm)<br>Typical distance from probe tip to dipole centers: 1 mm | |

## 6.3 Data Acquisition Electronics (DAE)

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

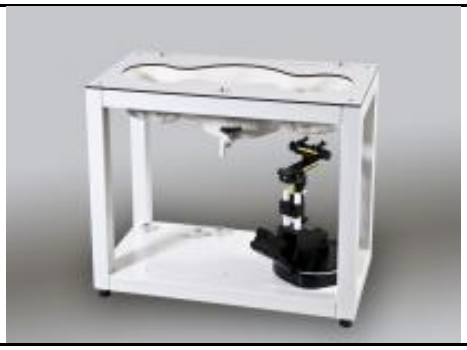
The input impedance of the DAE is 200 MOhm; the inputs are symmetrical and floating. Common mode rejection is above 80 dB.

**Fig 5.1 Photo of DAE**

## 6.4 Phantom

**<SAM Twin Phantom>**

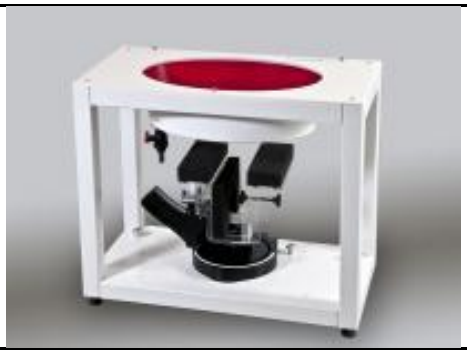
| | |
|---|---|
| **Shell Thickness** | 2 ± 0.2 mm;<br>Center ear point: 6 ± 0.2 mm |
| **Filling Volume** | Approx. 25 liters |
| **Dimensions** | Length: 1000 mm; Width: 500 mm; Height: adjustable feet |
| **Measurement Areas** | Left Hand, Right Hand, Flat Phantom |



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

**<ELI Phantom>**

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



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

## 6.5 Device Holder

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

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

Mounting Device for Hand-Held Transmitters

Mounting Device Adaptor for Wide-Phones

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

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

Mounting Device for Laptops

# 7. Measurement Procedures

The measurement procedures are as follows:

<Conducted power measurement>

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

<SAR measurement>

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

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

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

## 7.1 Spatial Peak SAR Evaluation

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

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

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

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

## 7.2 Power Reference Measurement

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

## 7.3 Area Scan

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

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

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

## 7.4 Zoom Scan

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

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

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

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

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

## 7.5 Volume Scan Procedures

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

## 7.6 Power Drift Monitoring

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

# 8. Test Equipment List

| Manufacturer | Name of Equipment | Type/Model | Serial Number | Calibration | |
|---|---|---|---|---|---|
| | | | | Last Cal. | Due Date |
| SPEAG | 750MHz System Validation Kit(2) | D750V3 | 1107 | Mar. 08, 2019 | Mar. 06, 2021 |
| SPEAG | 835MHz System Validation Kit | D835V2 | 4d167 | Nov. 25, 2019 | Nov. 24, 2020 |
| SPEAG | 1750MHz System Validation Kit(2) | D1750V2 | 1112 | Mar. 07, 2019 | Mar. 05, 2021 |
| SPEAG | 1900MHz System Validation Kit(2) | D1900V2 | 5d041 | Sep. 11, 2018 | Sep. 09, 2020 |
| SPEAG | 2300MHz System Validation Kit(2) | D2300V2 | 1006 | Jan. 28, 2019 | Jan. 26, 2021 |
| SPEAG | 2600MHz System Validation Kit(2) | D2600V2 | 1008 | Aug. 31, 2018 | Aug. 29, 2020 |
| SPEAG | Data Acquisition Electronics | DAE3 | 577 | Sep. 17, 2019 | Sep. 16, 2020 |
| SPEAG | Data Acquisition Electronics | DAE4 | 1311 | Aug. 27, 2019 | Aug. 26, 2020 |
| SPEAG | Data Acquisition Electronics | DAE4 | 1399 | Feb. 18, 2020 | Feb. 17, 2021 |
| SPEAG | Dosimetric E-Field Probe | ES3DV3 | 3270 | Sep. 25, 2019 | Sep. 24, 2020 |
| SPEAG | Dosimetric E-Field Probe | EX3DV4 | 3931 | Sep. 26, 2019 | Sep. 25, 2020 |
| SPEAG | Dosimetric E-Field Probe | EX3DV4 | 7590 | Apr. 14, 2020 | Apr. 13, 2021 |
| RCPTWN | Thermometer | HTC-1 | TM685-1 | Nov. 12, 2019 | Nov. 11, 2020 |
| RCPTWN | Thermometer | HTC-1 | TM560-2 | Nov. 12, 2019 | Nov. 11, 2020 |
| Anritsu | Radio Communication Analyzer | MT8821C | 6201341950 | Oct. 31, 2019 | Oct. 30, 2020 |
| Agilent | Wireless Communication Test Set | E5515C | MY50267236 | Mar. 18, 2020 | Mar. 17, 2021 |
| SPEAG | Device Holder | N/A | N/A | N/A | N/A |
| Anritsu | Signal Generator | MG3710A | 6201502524 | Nov. 20, 2019 | Nov. 19, 2020 |
| Agilent | ENA Network Analyzer | E5071C | MY46104758 | Sep. 06, 2019 | Sep. 05, 2020 |
| SPEAG | Dielectric Probe Kit | DAK-3.5 | 1126 | Sep. 18, 2019 | Sep. 17, 2020 |
| LINE SEIKI | Digital Thermometer | DTM3000-spezial | 2942 | Nov. 18, 2019 | Nov. 17, 2020 |
| Anritsu | Power Meter | ML2495A | 932001 | Oct. 03, 2019 | Oct. 02, 2020 |
| Anritsu | Power Sensor | MA2411B | 846202 | Oct. 03, 2019 | Oct. 02, 2020 |
| Anritsu | Power Meter | ML2495A | 1218006 | Oct. 14, 2019 | Oct. 13, 2020 |
| Anritsu | Power Sensor | MA2411B | 1207363 | Oct. 14, 2019 | Oct. 13, 2020 |
| Agilent | Spectrum Analyzer | E4408B | MY44211028 | Aug. 27, 2019 | Aug. 26, 2020 |
| Anritsu | Spectrum Analyzer | N9010A | MY53470118 | Mar. 12, 2020 | Mar. 11, 2021 |
| Mini-Circuits | Power Amplifier | ZVE-8G+ | 6418 | Oct. 16, 2019 | Oct. 15, 2020 |
| Mini-Circuits | Power Amplifier | ZHL-42W+ | 715701915 | May. 07, 2020 | May. 06, 2021 |
| ATM | Dual Directional Coupler | C122H-10 | P610410z-02 | Note 1 | |
| Woken | Attenuator 1 | WK0602-XX | N/A | Note 1 | |
| PE | Attenuator 2 | PE7005-10 | N/A | Note 1 | |
| PE | Attenuator 3 | PE7005- 3 | N/A | Note 1 | |

**General Note:**

1. Prior to system verification and validation, the path loss from the signal generator to the system check source and the power meter, which includes the amplifier, cable, attenuator and directional coupler, was measured by the network analyzer. The reading of the power meter was offset by the path loss difference between the path to the power meter and the path to the system check source to monitor the actual power level fed to the system check source.
2. The dipole calibration interval can be extended to 3 years with justification according to KDB 865664 D01. The dipoles are also not physically damaged, or repaired during the interval. The justification data in appendix C can be found which the return loss is < -20dB, within 20% of prior calibration, the impedance is within 5 ohm of prior calibration for each dipole.

# 9. System Verification

## 9.1 Tissue Simulating Liquids

For the measurement of the field distribution inside the SAM phantom with DASY, the phantom must be filled with around 25 liters of homogeneous body tissue simulating liquid. For head SAR testing, the liquid height from the ear reference point (ERP) of the phantom to the liquid top surface is larger than 15 cm, which is shown in Fig. 10.1. For body SAR testing, the liquid height from the center of the flat phantom to the liquid top surface is larger than 15 cm, which is shown in Fig. 10.2.

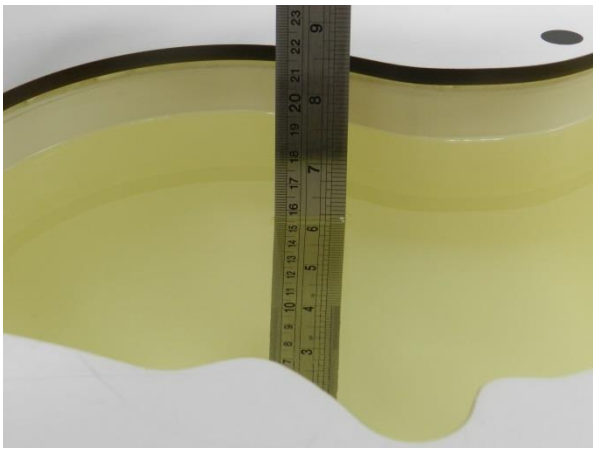


**Fig 10.1Photo of Liquid Height for Head SAR**

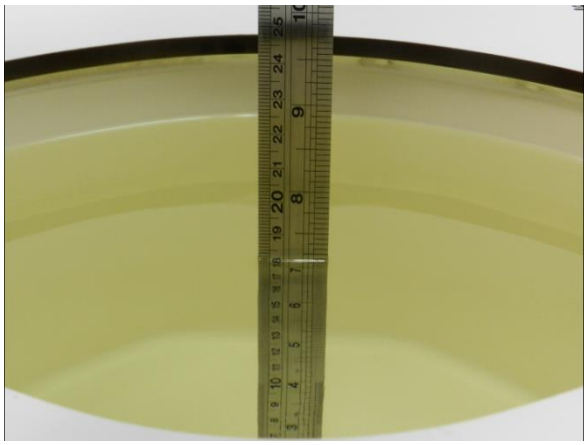


**Fig 10.2 Photo of Liquid Height for Body SAR**

## 9.2 Tissue Verification

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

| Frequency (MHz) | Water (%) | Sugar (%) | Cellulose (%) | Salt (%) | Preventol (%) | DGBE (%) | Conductivity (σ) | Permittivity (εr) |
|---|---|---|---|---|---|---|---|---|
| 750 | 41.1 | 57.0 | 0.2 | 1.4 | 0.2 | 0 | 0.89 | 41.9 |
| 835 | 40.3 | 57.9 | 0.2 | 1.4 | 0.2 | 0 | 0.90 | 41.5 |
| 900 | 40.3 | 57.9 | 0.2 | 1.4 | 0.2 | 0 | 0.97 | 41.5 |
| 1800, 1900, 2000 | 55.2 | 0 | 0 | 0.3 | 0 | 44.5 | 1.40 | 40.0 |
| 2450 | 55.0 | 0 | 0 | 0 | 0 | 45.0 | 1.80 | 39.2 |
| 2600 | 54.8 | 0 | 0 | 0.1 | 0 | 45.1 | 1.96 | 39.0 |

Simulating Liquid for 5GHz, Manufactured by SPEAG

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

### <Tissue Dielectric Parameter Check Results>

| Frequency (MHz) | Liquid Temp. (℃) | Conductivity (σ) | Permittivity ($\varepsilon_r$) | Conductivity Target (σ) | Permittivity Target ($\varepsilon_r$) | Delta (σ) (%) | Delta ($\varepsilon_r$) (%) | Limit (%) | Date |
|---|---|---|---|---|---|---|---|---|---|
| 750 | 22.2 | 0.901 | 40.799 | 0.89 | 41.90 | 1.24 | -2.63 | ±5 | 2020/8/10 |
| 750 | 22.6 | 0.894 | 41.420 | 0.89 | 41.90 | 0.45 | -1.15 | ±5 | 2020/8/11 |
| 835 | 22.2 | 0.911 | 43.339 | 0.90 | 41.50 | 1.22 | 4.43 | ±5 | 2020/8/10 |
| 835 | 22.2 | 0.904 | 41.357 | 0.90 | 41.50 | 0.44 | -0.34 | ±5 | 2020/8/10 |
| 835 | 22.6 | 0.922 | 41.333 | 0.90 | 41.50 | 2.44 | -0.40 | ±5 | 2020/8/11 |
| 835 | 22.3 | 0.922 | 41.320 | 0.90 | 41.50 | 2.44 | -0.43 | ±5 | 2020/8/13 |
| 1750 | 22.2 | 1.361 | 41.632 | 1.37 | 40.10 | -0.66 | 3.82 | ±5 | 2020/8/10 |
| 1750 | 22.2 | 1.353 | 39.076 | 1.37 | 40.10 | -1.24 | -2.55 | ±5 | 2020/8/10 |
| 1750 | 22.6 | 1.370 | 41.311 | 1.37 | 40.10 | 0.00 | 3.02 | ±5 | 2020/8/11 |
| 1900 | 22.2 | 1.432 | 38.495 | 1.40 | 40.00 | 2.29 | -3.76 | ±5 | 2020/8/10 |
| 1900 | 22.2 | 1.421 | 40.853 | 1.40 | 40.00 | 1.50 | 2.13 | ±5 | 2020/8/10 |
| 1900 | 22.6 | 1.431 | 39.390 | 1.40 | 40.00 | 2.21 | -1.53 | ±5 | 2020/8/11 |
| 2300 | 22.4 | 1.664 | 39.234 | 1.67 | 39.50 | -0.36 | -0.67 | ±5 | 2020/8/11 |
| 2300 | 22.6 | 1.648 | 40.006 | 1.67 | 39.50 | -1.32 | 1.28 | ±5 | 2020/8/11 |
| 2600 | 22.4 | 1.893 | 38.865 | 1.96 | 39.00 | -3.42 | -0.35 | ±5 | 2020/8/10 |
| 2600 | 22.4 | 1.980 | 38.109 | 1.96 | 39.00 | 1.02 | -2.28 | ±5 | 2020/8/11 |
| 2600 | 22.6 | 1.987 | 38.808 | 1.96 | 39.00 | 1.38 | -0.49 | ±5 | 2020/8/11 |
| 2600 | 22.3 | 1.989 | 37.761 | 1.96 | 39.00 | 1.48 | -3.18 | ±5 | 2020/8/12 |

## 9.3 System Performance Check Results

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

| Date | Frequency (MHz) | Input Power (mW) | Dipole S/N | Probe S/N | DAE S/N | Measured 1g SAR (W/kg) | Targeted 1g SAR (W/kg) | Normalized 1g SAR (W/kg) | Deviation (%) |
|---|---|---|---|---|---|---|---|---|---|
| 2020/8/10 | 750 | 250 | D750V3-1107 | EX3DV4 - SN3931 | DAE4 Sn1311 | 2.03 | 8.32 | 8.12 | -2.40 |
| 2020/8/11 | 750 | 250 | D750V3-1107 | ES3DV3 - SN3270 | DAE4 Sn1399 | 2.06 | 8.32 | 8.24 | -0.96 |
| 2020/8/10 | 835 | 250 | D835V2-4d167 | EX3DV4 - SN3931 | DAE4 Sn1311 | 2.40 | 9.55 | 9.6 | 0.52 |
| 2020/8/10 | 835 | 250 | D835V2-4d167 | EX3DV4 - SN7590 | DAE3 Sn577 | 2.21 | 9.55 | 8.84 | -7.43 |
| 2020/8/11 | 835 | 250 | D835V2-4d167 | ES3DV3 - SN3270 | DAE4 Sn1399 | 2.36 | 9.55 | 9.44 | -1.15 |
| 2020/8/13 | 835 | 250 | D835V2-4d167 | EX3DV4 - SN7590 | DAE3 Sn577 | 2.49 | 9.55 | 9.96 | 4.29 |
| 2020/8/10 | 1750 | 250 | D1750V2-1112 | EX3DV4 - SN3931 | DAE4 Sn1311 | 9.34 | 36.70 | 37.36 | 1.80 |
| 2020/8/10 | 1750 | 250 | D1750V2-1112 | EX3DV4 - SN7590 | DAE3 Sn577 | 9.67 | 36.70 | 38.68 | 5.40 |
| 2020/8/11 | 1750 | 250 | D1750V2-1112 | ES3DV3 - SN3270 | DAE4 Sn1399 | 9.40 | 36.70 | 37.6 | 2.45 |
| 2020/8/10 | 1900 | 250 | D1900V2-5d041 | EX3DV4 - SN3931 | DAE4 Sn1311 | 10.20 | 40.20 | 40.8 | 1.49 |
| 2020/8/10 | 1900 | 250 | D1900V2-5d041 | EX3DV4 - SN7590 | DAE3 Sn577 | 10.70 | 40.20 | 42.8 | 6.47 |
| 2020/8/11 | 1900 | 250 | D1900V2-5d041 | ES3DV3 - SN3270 | DAE4 Sn1399 | 10.30 | 40.20 | 41.2 | 2.49 |
| 2020/8/11 | 2300 | 250 | D2300V2-1006 | EX3DV4 - SN3931 | DAE4 Sn1311 | 11.40 | 48.70 | 45.6 | -6.37 |
| 2020/8/11 | 2300 | 250 | D2300V2-1006 | EX3DV4 - SN7590 | DAE3 Sn577 | 12.40 | 48.70 | 49.6 | 1.85 |
| 2020/8/10 | 2600 | 250 | D2600V2-1008 | EX3DV4 - SN7590 | DAE3 Sn577 | 14.30 | 56.40 | 57.2 | 1.42 |
| 2020/8/11 | 2600 | 250 | D2600V2-1008 | EX3DV4 - SN3931 | DAE4 Sn1311 | 14.50 | 56.40 | 58 | 2.84 |
| 2020/8/11 | 2600 | 250 | D2600V2-1008 | ES3DV3 - SN3270 | DAE4 Sn1399 | 14.00 | 56.40 | 56 | -0.71 |
| 2020/8/12 | 2600 | 250 | D2600V2-1008 | EX3DV4 - SN7590 | DAE3 Sn577 | 15.00 | 56.40 | 60 | 6.38 |

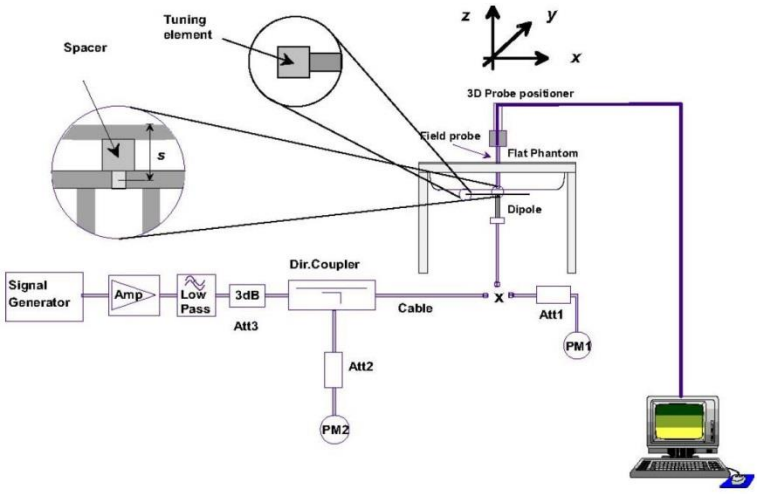



Fig 8.3.1 System Performance Check Setup

Fig 8.3.2 Setup Photo

# 10. UMTS/LTE Output Power (Unit: dBm)

**<WCDMA Conducted Power>**

1. The following tests were conducted according to the test requirements outlines in 3GPP TS 34.121 specification.
2. The procedures in KDB 941225 D01v03r01 are applied for 3GPP Rel. 6 HSPA to configure the device in the required sub-test mode(s) to determine SAR test exclusion.
3. For DC-HSDPA, the device was configured according to the H-Set 12, Fixed Reference Channel (FRC) configuration in Table C.8.1.12 of 3GPP TS 34.121-1, with the primary and the secondary serving HS-DSCH Cell enabled during the power measurement.

A summary of these settings are illustrated below:

**HSDPA Setup Configuration:**

a. The EUT was connected to Base Station Agilent E5515C referred to the Setup Configuration.
b. The RF path losses were compensated into the measurements.
c. A call was established between EUT and Base Station with following setting:
   i. Set Gain Factors ($\beta_c$ and $\beta_d$) and parameters were set according to each
   ii. Specific sub-test in the following table, C10.1.4, quoted from the TS 34.121
   iii. Set RMC 12.2Kbps + HSDPA mode.
   iv. Set Cell Power = -86 dBm
   v. Set HS-DSCH Configuration Type to FRC (H-set 1, QPSK)
   vi. Select HSDPA Uplink Parameters
   vii. Set Delta ACK, Delta NACK and Delta CQI = 8
   viii. Set Ack-Nack Repetition Factor to 3
   ix. Set CQI Feedback Cycle (k) to 4 ms
   x. Set CQI Repetition Factor to 2
   xi. Power Ctrl Mode = All Up bits
d. The transmitted maximum output power was recorded.

**Table C.10.1.4: β values for transmitter characteristics tests with HS-DPCCH**

| Sub-test | $\beta_c$ | $\beta_d$ | $\beta_d$ (SF) | $\beta_c/\beta_d$ | $\beta_{HS}$ (Note1, Note 2) | CM (dB) (Note 3) | MPR (dB) (Note 3) |
|---|---|---|---|---|---|---|---|
| 1 | 2/15 | 15/15 | 64 | 2/15 | 4/15 | 0.0 | 0.0 |
| 2 | 12/15 (Note 4) | 15/15 (Note 4) | 64 | 12/15 (Note 4) | 24/15 | 1.0 | 0.0 |
| 3 | 15/15 | 8/15 | 64 | 15/8 | 30/15 | 1.5 | 0.5 |
| 4 | 15/15 | 4/15 | 64 | 15/4 | 30/15 | 1.5 | 0.5 |

Note 1: $\Delta_{ACK}$, $\Delta_{NACK}$ and $\Delta_{CQI}$ = 30/15 with $\beta_{hs}$ = 30/15 * $\beta_c$.

Note 2: For the HS-DPCCH power mask requirement test in clause 5.2C, 5.7A, and the Error Vector Magnitude (EVM) with HS-DPCCH test in clause 5.13.1A, and HSDPA EVM with phase discontinuity in clause 5.13.1AA, $\Delta_{ACK}$ and $\Delta_{NACK}$ = 30/15 with $\beta_{hs}$ = 30/15 * $\beta_c$, and $\Delta_{CQI}$ = 24/15 with $\beta_{hs}$ = 24/15 * $\beta_c$.

Note 3: CM = 1 for $\beta_c/\beta_d$ =12/15, $\beta_{hs}/\beta_c$=24/15. For all other combinations of DPDCH, DPCCH and HS-DPCCH the MPR is based on the relative CM difference. This is applicable for only UEs that support HSDPA in release 6 and later releases.

Note 4: For subtest 2 the $\beta_c/\beta_d$ ratio of 12/15 for the TFC during the measurement period (TF1, TF0) is achieved by setting the signalled gain factors for the reference TFC (TF1, TF1) to $\beta_c$ = 11/15 and $\beta_d$ = 15/15.

**Setup Configuration**

**HSUPA Setup Configuration:**

a. The EUT was connected to Base Station Agilent E5515C referred to the Setup Configuration.
b. The RF path losses were compensated into the measurements.
c. A call was established between EUT and Base Station with following setting * :
   i. Call Configs = 5.2B, 5.9B, 5.10B, and 5.13.2B with QPSK
   ii. Set the Gain Factors ($\beta_c$ and $\beta_d$) and parameters (AG Index) were set according to each specific sub-test in the following table, C11.1.3, quoted from the TS 34.121
   iii. Set Cell Power = -86 dBm
   iv. Set Channel Type = 12.2k + HSPA
   v. Set UE Target Power
   vi. Power Ctrl Mode= Alternating bits
   vii. Set and observe the E-TFCI
   viii. Confirm that E-TFCI is equal to the target E-TFCI of 75 for sub-test 1, and other subtest's E-TFCI
d. The transmitted maximum output power was recorded.

**Table C.11.1.3: β values for transmitter characteristics tests with HS-DPCCH and E-DCH**

| Sub-test | $\beta_c$ | $\beta_d$ | $\beta_d$ (SF) | $\beta_c/\beta_d$ | $\beta_{HS}$ (Note1) | $\beta_{ec}$ | $\beta_{ed}$ (Note 4) (Note 5) | $\beta_{ed}$ (SF) | $\beta_{ed}$ (Codes) | CM (dB) (Note 2) | MPR (dB) (Note 2) (Note 6) | AG Index (Note 5) | E-TFCI |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 11/15 (Note 3) | 15/15 (Note 3) | 64 | 11/15 (Note 3) | 22/15 | 209/225 | 1309/225 | 4 | 1 | 1.0 | 0.0 | 20 | 75 |
| 2 | 6/15 | 15/15 | 64 | 6/15 | 12/15 | 12/15 | 94/75 | 4 | 1 | 3.0 | 2.0 | 12 | 67 |
| 3 | 15/15 | 9/15 | 64 | 15/9 | 30/15 | 30/15 | $\beta_{ed}1$: 47/15<br>$\beta_{ed}2$: 47/15 | 4<br>4 | 2 | 2.0 | 1.0 | 15 | 92 |
| 4 | 2/15 | 15/15 | 64 | 2/15 | 4/15 | 2/15 | 56/75 | 4 | 1 | 3.0 | 2.0 | 17 | 71 |
| 5 | 15/15 | 0 | - | - | 5/15 | 5/15 | 47/15 | 4 | 1 | 1.0 | 0.0 | 12 | 67 |

Note 1: For sub-test 1 to 4, $\Delta_{ACK}$, $\Delta_{NACK}$ and $\Delta_{CQI}$ = 30/15 with $\beta_{hs}$ = 30/15 * $\beta_c$. For sub-test 5, $\Delta_{ACK}$, $\Delta_{NACK}$ and $\Delta_{CQI}$ = 5/15 with $\beta_{hs}$ = 5/15 * $\beta_c$.

Note 2: CM = 1 for $\beta_c/\beta_d$ =12/15, $\beta_{hs}/\beta_c$=24/15. For all other combinations of DPDCH, DPCCH, HS- DPCCH, E-DPDCH and E-DPCCH the MPR is based on the relative CM difference.

Note 3: For subtest 1 the $\beta_c/\beta_d$ ratio of 11/15 for the TFC during the measurement period (TF1, TF0) is achieved by setting the signalled gain factors for the reference TFC (TF1, TF1) to $\beta_c$ = 10/15 and $\beta_d$ = 15/15.

Note 4: In case of testing by UE using E-DPDCH Physical Layer category 1, Sub-test 3 is omitted according to TS25.306 Table 5.1g.

Note 5: $\beta_{ed}$ can not be set directly; it is set by Absolute Grant Value.

Note 6: For subtests 2, 3 and 4, UE may perform E-DPDCH power scaling at max power which could results in slightly smaller MPR values.

**Setup Configuration**

**DC-HSDPA 3GPP release 8 Setup Configuration:**

a. The EUT was connected to Base Station Agilent E5515C referred to the Setup Configuration below
b. The RF path losses were compensated into the measurements.
c. A call was established between EUT and Base Station with following setting:
   i. Set RMC 12.2Kbps + HSDPA mode.
   ii. Set Cell Power = -25 dBm
   iii. Set HS-DSCH Configuration Type to FRC (H-set 12, QPSK)
   iv. Select HSDPA Uplink Parameters
   v. Set Gain Factors ($\beta_c$ and $\beta_d$) and parameters were set according to each Specific sub-test in the following table, C10.1.4, quoted from the TS 34.121
      a). Subtest 1: $\beta_c/\beta_d$=2/15
      b). Subtest 2: $\beta_c/\beta_d$=12/15
      c). Subtest 3: $\beta_c/\beta_d$=15/8
      d). Subtest 4: $\beta_c/\beta_d$=15/4
   vi. Set Delta ACK, Delta NACK and Delta CQI = 8
   vii. Set Ack-Nack Repetition Factor to 3
   viii. Set CQI Feedback Cycle (k) to 4 ms
   ix. Set CQI Repetition Factor to 2
   x. Power Ctrl Mode = All Up bits
d. The transmitted maximum output power was recorded.

The following tests were conducted according to the test requirements outlines in 3GPP TS 34.121 specification.
A summary of these settings are illustrated below:

C.8.1.12 Fixed Reference Channel Definition H-Set 12

**Table C.8.1.12: Fixed Reference Channel H-Set 12**

| Parameter | Unit | Value |
|---|---|---|
| Nominal Avg. Inf. Bit Rate | kbps | 60 |
| Inter-TTI Distance | TTI's | 1 |
| Number of HARQ Processes | Proces ses | 6 |
| Information Bit Payload ( $N_{INF}$ ) | Bits | 120 |
| Number Code Blocks | Blocks | 1 |
| Binary Channel Bits Per TTI | Bits | 960 |
| Total Available SML's in UE | SML's | 19200 |
| Number of SML's per HARQ Proc. | SML's | 3200 |
| Coding Rate | | 0.15 |
| Number of Physical Channel Codes | Codes | 1 |
| Modulation | | QPSK |
| Note 1: The RMC is intended to be used for DC-HSDPA mode and both cells shall transmit with identical parameters as listed in the table. | | |
| Note 2: Maximum number of transmission is limited to 1, i.e., retransmission is not allowed. The redundancy and constellation version 0 shall be used. | | |

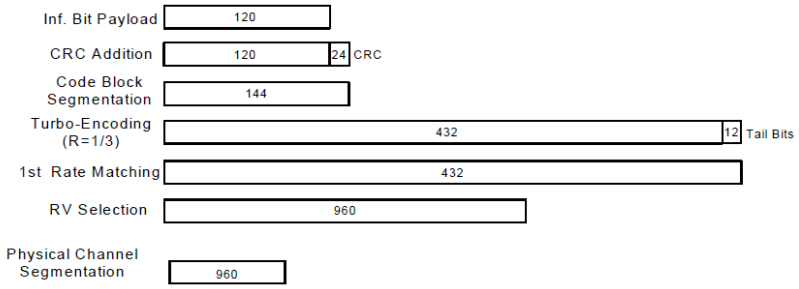



**Figure C.8.19: Coding rate for Fixed reference Channel H-Set 12 (QPSK)**

**Setup Configuration**

**<WCDMA Conducted Power>**

**General Note:**

1. Per KDB 941225 D01v03r01, for SAR testing is measured using a 12.2 kbps RMC with TPC bits configured to all "1's".
2. Per KDB 941225 D01v03r01, RMC 12.2kbps setting is used to evaluate SAR. The maximum output power and tune-up tolerance specified for production units in HSDPA / HSUPA / DC-HSDPA is ≤ ¼ dB higher than RMC 12.2Kbps or when the highest reported SAR of the RMC12.2Kbps is scaled by the ratio of specified maximum output power and tune-up tolerance of HSDPA / HSUPA / DC-HSDPA to RMC12.2Kbps and the adjusted SAR is ≤ 1.2 W/kg, SAR measurement is not required for HSDPA / HSUPA / DC-HSDPA, and according to the following RF output power, the output power results of the secondary modes (HSUPA, HSDPA, DC-HSDPA) are less than ¼ dB higher than the primary modes; therefore, SAR measurement is not required for HSDPA / HSUPA / DC-HSDPA.

| Band | | WCDMA II | | | Tune-up Limit (dBm) | WCDMA IV | | | Tune-up Limit (dBm) | WCDMA V | | | Tune-up Limit (dBm) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| TX Channel | | 9262 | 9400 | 9538 | | 1312 | 1413 | 1513 | | 4132 | 4182 | 4233 | |
| Rx Channel | | 9662 | 9800 | 9938 | | 1537 | 1638 | 1738 | | 4357 | 4407 | 4458 | |
| Frequency (MHz) | | 1852.4 | 1880 | 1907.6 | | 1712.4 | 1732.6 | 1752.6 | | 826.4 | 836.4 | 846.6 | |
| 3GPP Rel 99 | RMC 12.2Kbps | 24.32 | 24.43 | 24.47 | 24.50 | 24.30 | 24.37 | 24.45 | 24.50 | 24.28 | 24.43 | 24.47 | 24.50 |
| 3GPP Rel 6 | HSDPA Subtest-1 | 24.30 | 24.34 | 24.43 | 24.50 | 24.22 | 24.33 | 24.41 | 24.50 | 24.25 | 24.31 | 24.34 | 24.50 |
| 3GPP Rel 6 | HSDPA Subtest-2 | 24.24 | 24.33 | 24.37 | 24.50 | 24.19 | 24.23 | 24.31 | 24.50 | 24.15 | 24.26 | 24.31 | 24.50 |
| 3GPP Rel 6 | HSDPA Subtest-3 | 23.75 | 23.84 | 23.95 | 24.00 | 23.72 | 23.82 | 23.92 | 24.00 | 23.66 | 23.82 | 23.88 | 24.00 |
| 3GPP Rel 6 | HSDPA Subtest-4 | 23.66 | 23.79 | 23.90 | 24.00 | 23.62 | 23.78 | 23.90 | 24.00 | 23.65 | 23.73 | 23.87 | 24.00 |
| 3GPP Rel 8 | DC-HSDPA Subtest-1 | 24.22 | 24.30 | 24.36 | 24.50 | 24.15 | 24.26 | 24.30 | 24.50 | 24.22 | 24.22 | 24.26 | 24.50 |
| 3GPP Rel 8 | DC-HSDPA Subtest-2 | 24.17 | 24.29 | 24.30 | 24.50 | 24.12 | 24.26 | 24.23 | 24.50 | 24.08 | 24.23 | 24.23 | 24.50 |
| 3GPP Rel 8 | DC-HSDPA Subtest-3 | 23.69 | 23.79 | 23.88 | 24.00 | 23.61 | 23.72 | 23.78 | 24.00 | 23.66 | 23.77 | 23.84 | 24.00 |
| 3GPP Rel 8 | DC-HSDPA Subtest-4 | 23.66 | 23.75 | 23.80 | 24.00 | 23.57 | 23.67 | 23.77 | 24.00 | 23.63 | 23.69 | 23.70 | 24.00 |
| 3GPP Rel 6 | HSUPA Subtest-1 | 24.15 | 24.21 | 24.30 | 24.50 | 24.14 | 24.15 | 24.22 | 24.50 | 24.10 | 24.15 | 24.26 | 24.50 |
| 3GPP Rel 6 | HSUPA Subtest-2 | 22.30 | 22.26 | 22.43 | 22.50 | 22.30 | 22.20 | 22.33 | 22.50 | 22.21 | 22.26 | 22.39 | 22.50 |
| 3GPP Rel 6 | HSUPA Subtest-3 | 23.16 | 23.27 | 23.44 | 23.50 | 23.07 | 23.23 | 23.42 | 23.50 | 23.15 | 23.17 | 23.34 | 23.50 |
| 3GPP Rel 6 | HSUPA Subtest-4 | 22.27 | 22.32 | 22.39 | 22.50 | 22.19 | 22.31 | 22.39 | 22.50 | 22.27 | 22.29 | 22.29 | 22.50 |
| 3GPP Rel 6 | HSUPA Subtest-5 | 24.19 | 24.24 | 24.29 | 24.50 | 24.11 | 24.20 | 24.27 | 24.50 | 24.12 | 24.24 | 24.19 | 24.50 |

## <LTE Conducted Power>

**General Note:**

1. Anritsu MT8820C base station simulator was used to setup the connection with EUT; the frequency band, channel bandwidth, RB allocation configuration, modulation type are set in the base station simulator to configure EUT transmitting at maximum power and at different configurations which are requested to be reported to FCC, for conducted power measurement and SAR testing.
2. Per KDB 941225 D05v02r05, when a properly configured base station simulator is used for the SAR and power measurements, spectrum plots for each RB allocation and offset configuration is not required.
3. Per KDB 941225 D05v02r05, 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.
4. Per KDB 941225 D05v02r05, 50% RB allocation for QPSK SAR testing follows 1RB QPSK allocation procedure.
5. Per KDB 941225 D05v02r05, 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 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.
6. Per KDB 941225 D05v02r05, 16QAM output power for each RB allocation configuration is > not ½ dB higher than the same configuration in QPSK and the reported SAR for the QPSK configuration is ≤ 1.45 W/kg; Per KDB 941225 D05v02r05, 16QAM SAR testing is not required.
7. Per KDB 941225 D05v02r05, Smaller bandwidth output power for each RB allocation configuration is > not ½ dB higher than the same configuration in the largest supported bandwidth, and the reported SAR for the largest supported bandwidth is ≤ 1.45 W/kg; Per KDB 941225 D05v02r05, smaller bandwidth SAR testing is not required.
8. For LTE B4/B5/B12/B17/B26/B38 the maximum bandwidth does not support three non-overlapping channels, per KDB 941225 D05v02r05, when a device supports overlapping channel assignment in a channel bandwidth configuration, the middle channel of the group of overlapping channels should be selected for testing.
9. LTE band 4/5/17/38 SAR test was covered by Band 66/26/12/41; according to April 2015 TCB workshop, SAR test for overlapping LTE bands can be reduced if
    a. the maximum output power, including tolerance, for the smaller band is ≤ the larger band to qualify for the SAR test exclusion
    b. the channel bandwidth and other operating parameters for the smaller band are fully supported by the larger band

**<LTE Band 2>**

| BW [MHz] | Modulation | RB Size | RB Offset | Power Low Ch. / Freq. | Power Middle Ch. / Freq. | Power High Ch. / Freq. | Tune-up limit (dBm) | MPR (dB) |
|---|---|---|---|---|---|---|---|---|
| Channel | | | | 18700 | 18900 | 19100 | | |
| Frequency (MHz) | | | | 1860 | 1880 | 1900 | | |
| 20 | QPSK | 1 | 0 | 23.67 | 23.86 | 23.95 | 24 | 0 |
| 20 | QPSK | 1 | 49 | 23.52 | 23.80 | 23.93 | | |
| 20 | QPSK | 1 | 99 | 23.60 | 23.76 | 23.92 | | |
| 20 | QPSK | 50 | 0 | 22.48 | 22.74 | 22.84 | 23 | 1 |
| 20 | QPSK | 50 | 24 | 22.42 | 22.77 | 22.91 | | |
| 20 | QPSK | 50 | 50 | 22.44 | 22.73 | 22.86 | | |
| 20 | QPSK | 100 | 0 | 22.50 | 22.89 | 22.99 | | |
| 20 | 16QAM | 1 | 0 | 22.86 | 22.91 | 22.93 | 23 | 1 |
| 20 | 16QAM | 1 | 49 | 22.56 | 22.75 | 22.88 | | |
| 20 | 16QAM | 1 | 99 | 22.75 | 22.83 | 22.96 | | |
| 20 | 16QAM | 50 | 0 | 21.47 | 21.85 | 21.85 | 22 | 2 |
| 20 | 16QAM | 50 | 24 | 21.49 | 21.87 | 21.93 | | |
| 20 | 16QAM | 50 | 50 | 21.52 | 21.83 | 21.86 | | |
| 20 | 16QAM | 100 | 0 | 21.59 | 21.97 | 21.96 | | |
| Channel | | | | 18675 | 18900 | 19125 | Tune-up limit (dBm) | MPR (dB) |
| Frequency (MHz) | | | | 1857.5 | 1880 | 1902.5 | | |
| 15 | QPSK | 1 | 0 | 23.50 | 23.60 | 23.82 | 24 | 0 |
| 15 | QPSK | 1 | 37 | 23.41 | 23.73 | 23.73 | | |
| 15 | QPSK | 1 | 74 | 23.43 | 23.61 | 23.74 | | |
| 15 | QPSK | 36 | 0 | 22.31 | 22.64 | 22.66 | 23 | 1 |
| 15 | QPSK | 36 | 20 | 22.30 | 22.63 | 22.76 | | |
| 15 | QPSK | 36 | 39 | 22.32 | 22.59 | 22.74 | | |
| 15 | QPSK | 75 | 0 | 22.37 | 22.79 | 22.82 | | |
| 15 | 16QAM | 1 | 0 | 22.72 | 22.81 | 22.78 | 23 | 1 |
| 15 | 16QAM | 1 | 37 | 22.39 | 22.65 | 22.75 | | |
| 15 | 16QAM | 1 | 74 | 22.60 | 22.72 | 22.82 | | |
| 15 | 16QAM | 36 | 0 | 21.37 | 21.74 | 21.66 | 22 | 2 |
| 15 | 16QAM | 36 | 20 | 21.38 | 21.69 | 21.81 | | |
| 15 | 16QAM | 36 | 39 | 21.38 | 21.73 | 21.73 | | |
| 15 | 16QAM | 75 | 0 | 21.44 | 21.83 | 21.83 | | |
| Channel | | | | 18650 | 18900 | 19150 | Tune-up limit (dBm) | MPR (dB) |
| Frequency (MHz) | | | | 1855 | 1880 | 1905 | | |
| 10 | QPSK | 1 | 0 | 23.30 | 23.47 | 23.67 | 24 | 0 |
| 10 | QPSK | 1 | 25 | 23.22 | 23.61 | 23.63 | | |
| 10 | QPSK | 1 | 49 | 23.27 | 23.46 | 23.55 | | |
| 10 | QPSK | 25 | 0 | 22.19 | 22.54 | 22.54 | 23 | 1 |
| 10 | QPSK | 25 | 12 | 22.20 | 22.53 | 22.65 | | |
| 10 | QPSK | 25 | 25 | 22.21 | 22.43 | 22.62 | | |
| 10 | QPSK | 50 | 0 | 22.26 | 22.67 | 22.64 | | |
| 10 | 16QAM | 1 | 0 | 22.61 | 22.66 | 22.68 | 23 | 1 |
| 10 | 16QAM | 1 | 25 | 22.28 | 22.49 | 22.60 | | |
| 10 | 16QAM | 1 | 49 | 22.49 | 22.52 | 22.70 | | |
| 10 | 16QAM | 25 | 0 | 21.24 | 21.62 | 21.54 | 22 | 2 |
| 10 | 16QAM | 25 | 12 | 21.27 | 21.55 | 21.66 | | |
| 10 | 16QAM | 25 | 25 | 21.20 | 21.60 | 21.57 | | |
| 10 | 16QAM | 50 | 0 | 21.34 | 21.67 | 21.63 | | |
| Channel | | | | 18625 | 18900 | 19175 | Tune-up limit (dBm) | MPR (dB) |
| Frequency (MHz) | | | | 1852.5 | 1880 | 1907.5 | | |
| 5 | QPSK | 1 | 0 | 23.12 | 23.30 | 23.55 | 24 | 0 |
| 5 | QPSK | 1 | 12 | 23.05 | 23.42 | 23.53 | | |
| 5 | QPSK | 1 | 24 | 23.12 | 23.35 | 23.35 | | |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| 5 | QPSK | 12 | 0 | 22.09 | 22.34 | 22.43 | 23 | 1 |
| 5 | QPSK | 12 | 7 | 22.09 | 22.35 | 22.46 | | |
| 5 | QPSK | 12 | 13 | 22.11 | 22.32 | 22.48 | | |
| 5 | QPSK | 25 | 0 | 22.12 | 22.54 | 22.49 | | |
| 5 | 16QAM | 1 | 0 | 22.43 | 22.46 | 22.48 | 23 | 1 |
| 5 | 16QAM | 1 | 12 | 22.12 | 22.29 | 22.48 | | |
| 5 | 16QAM | 1 | 24 | 22.31 | 22.38 | 22.55 | | |
| 5 | 16QAM | 12 | 0 | 21.10 | 21.50 | 21.42 | 22 | 2 |
| 5 | 16QAM | 12 | 7 | 21.08 | 21.40 | 21.53 | | |
| 5 | 16QAM | 12 | 13 | 21.06 | 21.50 | 21.45 | | |
| 5 | 16QAM | 25 | 0 | 21.22 | 21.51 | 21.53 | | |
| Channel | | | | 18615 | 18900 | 19185 | Tune-up limit (dBm) | MPR (dB) |
| Frequency (MHz) | | | | 1851.5 | 1880 | 1908.5 | | |
| 3 | QPSK | 1 | 0 | 22.97 | 23.12 | 23.36 | 24 | 0 |
| 3 | QPSK | 1 | 8 | 22.96 | 23.29 | 23.41 | | |
| 3 | QPSK | 1 | 14 | 23.00 | 23.22 | 23.20 | | |
| 3 | QPSK | 8 | 0 | 21.99 | 22.17 | 22.23 | 23 | 1 |
| 3 | QPSK | 8 | 4 | 21.91 | 22.20 | 22.32 | | |
| 3 | QPSK | 8 | 7 | 21.96 | 22.22 | 22.33 | | |
| 3 | QPSK | 15 | 0 | 21.93 | 22.36 | 22.38 | | |
| 3 | 16QAM | 1 | 0 | 22.32 | 22.30 | 22.28 | 23 | 1 |
| 3 | 16QAM | 1 | 8 | 22.01 | 22.10 | 22.37 | | |
| 3 | 16QAM | 1 | 14 | 22.12 | 22.28 | 22.41 | | |
| 3 | 16QAM | 8 | 0 | 20.90 | 21.35 | 21.30 | 22 | 2 |
| 3 | 16QAM | 8 | 4 | 20.95 | 21.22 | 21.39 | | |
| 3 | 16QAM | 8 | 7 | 20.89 | 21.35 | 21.34 | | |
| 3 | 16QAM | 15 | 0 | 21.05 | 21.32 | 21.35 | | |
| Channel | | | | 18607 | 18900 | 19193 | Tune-up limit (dBm) | MPR (dB) |
| Frequency (MHz) | | | | 1850.7 | 1880 | 1909.3 | | |
| 1.4 | QPSK | 1 | 0 | 22.86 | 22.85 | 23.10 | 24 | 0 |
| 1.4 | QPSK | 1 | 3 | 22.75 | 23.06 | 23.18 | | |
| 1.4 | QPSK | 1 | 5 | 22.92 | 23.06 | 23.21 | | |
| 1.4 | QPSK | 3 | 0 | 22.77 | 22.77 | 23.03 | | |
| 1.4 | QPSK | 3 | 1 | 22.72 | 23.06 | 23.16 | | |
| 1.4 | QPSK | 3 | 3 | 22.88 | 22.99 | 23.12 | | |
| 1.4 | QPSK | 6 | 0 | 21.74 | 21.97 | 21.95 | 23 | 1 |
| 1.4 | 16QAM | 1 | 0 | 21.92 | 22.00 | 22.12 | 23 | 1 |
| 1.4 | 16QAM | 1 | 3 | 21.90 | 21.89 | 22.10 | | |
| 1.4 | 16QAM | 1 | 5 | 21.89 | 22.06 | 22.33 | | |
| 1.4 | 16QAM | 3 | 0 | 22.08 | 22.10 | 22.21 | | |
| 1.4 | 16QAM | 3 | 1 | 21.81 | 22.22 | 22.31 | | |
| 1.4 | 16QAM | 3 | 3 | 21.96 | 22.18 | 22.23 | | |
| 1.4 | 16QAM | 6 | 0 | 21.03 | 21.18 | 21.30 | 22 | 2 |

**<LTE Band 4>**

| BW [MHz] | Modulation | RB Size | RB Offset | Power Low Ch. / Freq. | Power Middle Ch. / Freq. | Power High Ch. / Freq. | Tune-up limit (dBm) | MPR (dB) |
|---|---|---|---|---|---|---|---|---|
| Channel | | | | 20050 | 20175 | 20300 | | |
| Frequency (MHz) | | | | 1720 | 1732.5 | 1745 | | |
| 20 | QPSK | 1 | 0 | 23.98 | 23.93 | 23.73 | 24 | 0 |
| 20 | QPSK | 1 | 49 | 23.75 | 23.65 | 23.58 | | |
| 20 | QPSK | 1 | 99 | 23.68 | 23.59 | 23.57 | | |
| 20 | QPSK | 50 | 0 | 22.90 | 22.66 | 22.62 | 23 | 1 |
| 20 | QPSK | 50 | 24 | 22.95 | 22.59 | 22.53 | | |
| 20 | QPSK | 50 | 50 | 22.80 | 22.54 | 22.51 | | |
| 20 | QPSK | 100 | 0 | 23.00 | 22.70 | 22.70 | | |
| 20 | 16QAM | 1 | 0 | 22.85 | 22.96 | 22.92 | 23 | 1 |
| 20 | 16QAM | 1 | 49 | 22.97 | 22.95 | 22.74 | | |
| 20 | 16QAM | 1 | 99 | 22.85 | 22.79 | 22.75 | | |
| 20 | 16QAM | 50 | 0 | 21.94 | 21.76 | 21.72 | 22 | 2 |
| 20 | 16QAM | 50 | 24 | 21.98 | 21.69 | 21.63 | | |
| 20 | 16QAM | 50 | 50 | 21.84 | 21.63 | 21.50 | | |
| 20 | 16QAM | 100 | 0 | 21.88 | 21.79 | 21.70 | | |
| Channel | | | | 20025 | 20175 | 20325 | Tune-up limit (dBm) | MPR (dB) |
| Frequency (MHz) | | | | 1717.5 | 1732.5 | 1747.5 | | |
| 15 | QPSK | 1 | 0 | 23.60 | 23.76 | 23.54 | 24 | 0 |
| 15 | QPSK | 1 | 37 | 23.84 | 23.45 | 23.39 | | |
| 15 | QPSK | 1 | 74 | 23.54 | 23.39 | 23.46 | | |
| 15 | QPSK | 36 | 0 | 22.70 | 22.50 | 22.47 | 23 | 1 |
| 15 | QPSK | 36 | 20 | 22.81 | 22.47 | 22.33 | | |
| 15 | QPSK | 36 | 39 | 22.64 | 22.37 | 22.32 | | |
| 15 | QPSK | 75 | 0 | 22.90 | 22.53 | 22.56 | | |
| 15 | 16QAM | 1 | 0 | 22.65 | 22.98 | 22.78 | 23 | 1 |
| 15 | 16QAM | 1 | 37 | 22.90 | 22.82 | 22.60 | | |
| 15 | 16QAM | 1 | 74 | 22.70 | 22.62 | 22.57 | | |
| 15 | 16QAM | 36 | 0 | 21.80 | 21.61 | 21.55 | 22 | 2 |
| 15 | 16QAM | 36 | 20 | 21.80 | 21.59 | 21.46 | | |
| 15 | 16QAM | 36 | 39 | 21.65 | 21.48 | 21.33 | | |
| 15 | 16QAM | 75 | 0 | 21.84 | 21.65 | 21.52 | | |
| Channel | | | | 20000 | 20175 | 20350 | Tune-up limit (dBm) | MPR (dB) |
| Frequency (MHz) | | | | 1715 | 1732.5 | 1750 | | |
| 10 | QPSK | 1 | 0 | 23.45 | 23.62 | 23.36 | 24 | 0 |
| 10 | QPSK | 1 | 25 | 23.68 | 23.29 | 23.28 | | |
| 10 | QPSK | 1 | 49 | 23.42 | 23.27 | 23.31 | | |
| 10 | QPSK | 25 | 0 | 22.54 | 22.30 | 22.37 | 23 | 1 |
| 10 | QPSK | 25 | 12 | 22.64 | 22.37 | 22.18 | | |
| 10 | QPSK | 25 | 25 | 22.54 | 22.22 | 22.19 | | |
| 10 | QPSK | 50 | 0 | 22.70 | 22.40 | 22.38 | | |
| 10 | 16QAM | 1 | 0 | 22.47 | 22.80 | 22.60 | 23 | 1 |
| 10 | 16QAM | 1 | 25 | 22.78 | 22.66 | 22.44 | | |
| 10 | 16QAM | 1 | 49 | 22.51 | 22.48 | 22.45 | | |
| 10 | 16QAM | 25 | 0 | 21.70 | 21.46 | 21.40 | 22 | 2 |
| 10 | 16QAM | 25 | 12 | 21.66 | 21.40 | 21.30 | | |
| 10 | 16QAM | 25 | 25 | 21.47 | 21.37 | 21.22 | | |
| 10 | 16QAM | 50 | 0 | 21.71 | 21.52 | 21.36 | | |
| Channel | | | | 19975 | 20175 | 20375 | Tune-up limit (dBm) | MPR (dB) |
| Frequency (MHz) | | | | 1712.5 | 1732.5 | 1752.5 | | |
| 5 | QPSK | 1 | 0 | 23.30 | 23.43 | 23.25 | 24 | 0 |
| 5 | QPSK | 1 | 12 | 23.57 | 23.17 | 23.08 | | |
| 5 | QPSK | 1 | 24 | 23.24 | 23.12 | 23.12 | | |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| 5 | QPSK | 12 | 0 | 22.36 | 22.14 | 22.21 | 23 | 1 |
| 5 | QPSK | 12 | 7 | 22.47 | 22.24 | 22.05 | | |
| 5 | QPSK | 12 | 13 | 22.39 | 22.06 | 21.97 | | |
| 5 | QPSK | 25 | 0 | 22.54 | 22.25 | 22.19 | | |
| 5 | 16QAM | 1 | 0 | 22.29 | 22.67 | 22.50 | 23 | 1 |
| 5 | 16QAM | 1 | 12 | 22.59 | 22.55 | 22.33 | | |
| 5 | 16QAM | 1 | 24 | 22.35 | 22.36 | 22.31 | | |
| 5 | 16QAM | 12 | 0 | 21.51 | 21.27 | 21.27 | 22 | 2 |
| 5 | 16QAM | 12 | 7 | 21.50 | 21.25 | 21.13 | | |
| 5 | 16QAM | 12 | 13 | 21.30 | 21.19 | 21.11 | | |
| 5 | 16QAM | 25 | 0 | 21.52 | 21.36 | 21.20 | | |
| Channel | | | | 19965 | 20175 | 20385 | Tune-up limit (dBm) | MPR (dB) |
| Frequency (MHz) | | | | 1711.5 | 1732.5 | 1753.5 | | |
| 3 | QPSK | 1 | 0 | 23.20 | 23.29 | 23.12 | 24 | 0 |
| 3 | QPSK | 1 | 8 | 23.38 | 23.04 | 22.93 | | |
| 3 | QPSK | 1 | 14 | 23.13 | 23.02 | 22.96 | | |
| 3 | QPSK | 8 | 0 | 22.23 | 21.99 | 22.01 | 23 | 1 |
| 3 | QPSK | 8 | 4 | 22.34 | 22.10 | 21.85 | | |
| 3 | QPSK | 8 | 7 | 22.27 | 21.89 | 21.84 | | |
| 3 | QPSK | 15 | 0 | 22.43 | 22.07 | 22.07 | | |
| 3 | 16QAM | 1 | 0 | 22.10 | 22.55 | 22.36 | 23 | 1 |
| 3 | 16QAM | 1 | 8 | 22.41 | 22.41 | 22.14 | | |
| 3 | 16QAM | 1 | 14 | 22.20 | 22.17 | 22.17 | | |
| 3 | 16QAM | 8 | 0 | 21.31 | 21.12 | 21.08 | 22 | 2 |
| 3 | 16QAM | 8 | 4 | 21.36 | 21.05 | 20.96 | | |
| 3 | 16QAM | 8 | 7 | 21.18 | 21.06 | 20.99 | | |
| 3 | 16QAM | 15 | 0 | 21.38 | 21.22 | 21.09 | | |
| Channel | | | | 19957 | 20175 | 20393 | Tune-up limit (dBm) | MPR (dB) |
| Frequency (MHz) | | | | 1710.7 | 1732.5 | 1754.3 | | |
| 1.4 | QPSK | 1 | 0 | 23.09 | 23.15 | 22.95 | 24 | 0 |
| 1.4 | QPSK | 1 | 3 | 23.19 | 22.84 | 22.78 | | |
| 1.4 | QPSK | 1 | 5 | 23.02 | 22.87 | 22.80 | | |
| 1.4 | QPSK | 3 | 0 | 22.99 | 23.12 | 22.93 | | |
| 1.4 | QPSK | 3 | 1 | 23.19 | 22.81 | 22.70 | | |
| 1.4 | QPSK | 3 | 3 | 22.97 | 22.81 | 22.73 | | |
| 1.4 | QPSK | 6 | 0 | 22.23 | 21.96 | 21.93 | 23 | 1 |
| 1.4 | 16QAM | 1 | 0 | 21.92 | 22.37 | 22.21 | 23 | 1 |
| 1.4 | 16QAM | 1 | 3 | 22.25 | 22.25 | 21.97 | | |
| 1.4 | 16QAM | 1 | 5 | 22.01 | 22.00 | 21.98 | | |
| 1.4 | 16QAM | 3 | 0 | 21.84 | 22.33 | 22.19 | | |
| 1.4 | 16QAM | 3 | 1 | 22.16 | 22.21 | 21.94 | | |
| 1.4 | 16QAM | 3 | 3 | 21.94 | 21.96 | 21.92 | | |
| 1.4 | 16QAM | 6 | 0 | 21.20 | 21.06 | 20.91 | 22 | 2 |

**<LTE Band 5>**

| BW [MHz] | Modulation | RB Size | RB Offset | Power Low Ch. / Freq. | Power Middle Ch. / Freq. | Power High Ch. / Freq. | Tune-up limit (dBm) | MPR (dB) |
|---|---|---|---|---|---|---|---|---|
| Channel | | | | 20450 | 20525 | 20600 | | |
| Frequency (MHz) | | | | 829 | 836.5 | 844 | | |
| 10 | QPSK | 1 | 0 | 22.87 | 23.03 | 23.17 | 24 | 0 |
| 10 | QPSK | 1 | 25 | 22.93 | 23.04 | 23.15 | | |
| 10 | QPSK | 1 | 49 | 23.00 | 23.12 | 23.07 | | |
| 10 | QPSK | 25 | 0 | 21.92 | 22.07 | 22.22 | 23 | 1 |
| 10 | QPSK | 25 | 12 | 21.98 | 22.06 | 22.19 | | |
| 10 | QPSK | 25 | 25 | 22.02 | 22.16 | 22.10 | | |
| 10 | QPSK | 50 | 0 | 22.01 | 22.07 | 22.28 | | |
| 10 | 16QAM | 1 | 0 | 22.14 | 22.27 | 22.38 | 23 | 1 |
| 10 | 16QAM | 1 | 25 | 22.14 | 22.31 | 22.34 | | |
| 10 | 16QAM | 1 | 49 | 22.24 | 22.34 | 22.32 | | |
| 10 | 16QAM | 25 | 0 | 20.97 | 21.15 | 21.28 | 22 | 2 |
| 10 | 16QAM | 25 | 12 | 21.03 | 21.14 | 21.26 | | |
| 10 | 16QAM | 25 | 25 | 21.12 | 21.24 | 21.14 | | |
| 10 | 16QAM | 50 | 0 | 21.11 | 21.14 | 21.39 | | |
| Channel | | | | 20425 | 20525 | 20625 | Tune-up limit (dBm) | MPR (dB) |
| Frequency (MHz) | | | | 826.5 | 836.5 | 846.5 | | |
| 5 | QPSK | 1 | 0 | 22.77 | 22.92 | 22.99 | 24 | 0 |
| 5 | QPSK | 1 | 12 | 22.82 | 22.93 | 22.95 | | |
| 5 | QPSK | 1 | 24 | 22.81 | 22.92 | 22.92 | | |
| 5 | QPSK | 12 | 0 | 21.78 | 21.93 | 22.04 | 23 | 1 |
| 5 | QPSK | 12 | 7 | 21.86 | 21.92 | 22.08 | | |
| 5 | QPSK | 12 | 13 | 21.85 | 22.00 | 21.90 | | |
| 5 | QPSK | 25 | 0 | 21.84 | 21.95 | 22.14 | | |
| 5 | 16QAM | 1 | 0 | 22.01 | 22.16 | 22.25 | 23 | 1 |
| 5 | 16QAM | 1 | 12 | 21.98 | 22.21 | 22.21 | | |
| 5 | 16QAM | 1 | 24 | 22.13 | 22.23 | 22.16 | | |
| 5 | 16QAM | 12 | 0 | 20.81 | 20.95 | 21.16 | 22 | 2 |
| 5 | 16QAM | 12 | 7 | 20.84 | 21.03 | 21.13 | | |
| 5 | 16QAM | 12 | 13 | 20.92 | 21.14 | 21.03 | | |
| 5 | 16QAM | 25 | 0 | 20.98 | 21.04 | 21.23 | | |
| Channel | | | | 20415 | 20525 | 20635 | Tune-up limit (dBm) | MPR (dB) |
| Frequency (MHz) | | | | 825.5 | 836.5 | 847.5 | | |
| 3 | QPSK | 1 | 0 | 22.60 | 22.82 | 22.89 | 24 | 0 |
| 3 | QPSK | 1 | 8 | 22.67 | 22.78 | 22.77 | | |
| 3 | QPSK | 1 | 14 | 22.69 | 22.82 | 22.74 | | |
| 3 | QPSK | 8 | 0 | 21.67 | 21.75 | 21.89 | 23 | 1 |
| 3 | QPSK | 8 | 4 | 21.71 | 21.76 | 21.91 | | |
| 3 | QPSK | 8 | 7 | 21.73 | 21.83 | 21.73 | | |
| 3 | QPSK | 15 | 0 | 21.72 | 21.80 | 22.02 | | |
| 3 | 16QAM | 1 | 0 | 21.90 | 22.03 | 22.05 | 23 | 1 |
| 3 | 16QAM | 1 | 8 | 21.88 | 22.10 | 22.02 | | |
| 3 | 16QAM | 1 | 14 | 22.01 | 22.06 | 21.97 | | |
| 3 | 16QAM | 8 | 0 | 20.63 | 20.79 | 21.01 | 22 | 2 |
| 3 | 16QAM | 8 | 4 | 20.69 | 20.87 | 20.99 | | |
| 3 | 16QAM | 8 | 7 | 20.77 | 21.01 | 20.83 | | |
| 3 | 16QAM | 15 | 0 | 20.81 | 20.91 | 21.05 | | |
| Channel | | | | 20407 | 20525 | 20643 | Tune-up limit (dBm) | MPR (dB) |
| Frequency (MHz) | | | | 824.7 | 836.5 | 848.3 | | |
| 1.4 | QPSK | 1 | 0 | 22.46 | 22.67 | 22.69 | 24 | 0 |
| 1.4 | QPSK | 1 | 3 | 22.47 | 22.58 | 22.63 | | |
| 1.4 | QPSK | 1 | 5 | 22.53 | 22.70 | 22.61 | | |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| 1.4 | QPSK | 3 | 0 | 22.36 | 22.57 | 22.60 | | |
| 1.4 | QPSK | 3 | 1 | 22.43 | 22.57 | 22.56 | | |
| 1.4 | QPSK | 3 | 3 | 22.53 | 22.64 | 22.58 | | |
| 1.4 | QPSK | 6 | 0 | 21.55 | 21.61 | 21.82 | 23 | 1 |
| 1.4 | 16QAM | 1 | 0 | 21.72 | 21.91 | 21.94 | | |
| 1.4 | 16QAM | 1 | 3 | 21.75 | 21.95 | 21.82 | | |
| 1.4 | 16QAM | 1 | 5 | 21.85 | 21.92 | 21.86 | 23 | 1 |
| 1.4 | 16QAM | 3 | 0 | 21.70 | 21.81 | 21.85 | | |
| 1.4 | 16QAM | 3 | 1 | 21.72 | 21.90 | 21.81 | | |
| 1.4 | 16QAM | 3 | 3 | 21.80 | 21.87 | 21.81 | | |
| 1.4 | 16QAM | 6 | 0 | 20.67 | 20.74 | 20.94 | 22 | 2 |

**<LTE Band 7>**

| BW [MHz] | Modulation | RB Size | RB Offset | Power Low Ch. / Freq. | Power Middle Ch. / Freq. | Power High Ch. / Freq. | Tune-up limit (dBm) | MPR (dB) |
|---|---|---|---|---|---|---|---|---|
| Channel | | | | 20850 | 21100 | 21350 | | |
| Frequency (MHz) | | | | 2510 | 2535 | 2560 | | |
| 20 | QPSK | 1 | 0 | 23.98 | 23.96 | 23.93 | 24 | 0 |
| 20 | QPSK | 1 | 49 | 23.92 | 23.96 | 23.93 | | |
| 20 | QPSK | 1 | 99 | 23.91 | 23.92 | 23.93 | | |
| 20 | QPSK | 50 | 0 | 22.86 | 22.73 | 22.55 | 23 | 1 |
| 20 | QPSK | 50 | 24 | 22.88 | 22.73 | 22.59 | | |
| 20 | QPSK | 50 | 50 | 22.81 | 22.70 | 22.74 | | |
| 20 | QPSK | 100 | 0 | 22.96 | 22.84 | 22.72 | | |
| 20 | 16QAM | 1 | 0 | 22.86 | 22.99 | 22.76 | 23 | 1 |
| 20 | 16QAM | 1 | 49 | 22.91 | 22.88 | 22.70 | | |
| 20 | 16QAM | 1 | 99 | 22.96 | 22.83 | 22.87 | | |
| 20 | 16QAM | 50 | 0 | 21.68 | 21.80 | 21.62 | 22 | 2 |
| 20 | 16QAM | 50 | 24 | 21.85 | 21.75 | 21.70 | | |
| 20 | 16QAM | 50 | 50 | 21.69 | 21.66 | 21.78 | | |
| 20 | 16QAM | 100 | 0 | 21.99 | 21.93 | 21.79 | | |
| Channel | | | | 20825 | 21100 | 21375 | Tune-up limit (dBm) | MPR (dB) |
| Frequency (MHz) | | | | 2507.5 | 2535 | 2562.5 | | |
| 15 | QPSK | 1 | 0 | 23.88 | 23.79 | 23.79 | 24 | 0 |
| 15 | QPSK | 1 | 37 | 23.74 | 23.86 | 23.82 | | |
| 15 | QPSK | 1 | 74 | 23.86 | 23.82 | 23.77 | | |
| 15 | QPSK | 36 | 0 | 22.73 | 22.61 | 22.43 | 23 | 1 |
| 15 | QPSK | 36 | 20 | 22.73 | 22.56 | 22.43 | | |
| 15 | QPSK | 36 | 39 | 22.64 | 22.55 | 22.63 | | |
| 15 | QPSK | 75 | 0 | 22.81 | 22.72 | 22.53 | | |
| 15 | 16QAM | 1 | 0 | 22.67 | 22.83 | 22.65 | 23 | 1 |
| 15 | 16QAM | 1 | 37 | 22.76 | 22.74 | 22.51 | | |
| 15 | 16QAM | 1 | 74 | 22.84 | 22.64 | 22.72 | | |
| 15 | 16QAM | 36 | 0 | 21.58 | 21.69 | 21.43 | 22 | 2 |
| 15 | 16QAM | 36 | 20 | 21.65 | 21.59 | 21.56 | | |
| 15 | 16QAM | 36 | 39 | 21.52 | 21.48 | 21.68 | | |
| 15 | 16QAM | 75 | 0 | 21.85 | 21.79 | 21.65 | | |
| Channel | | | | 20800 | 21100 | 21400 | Tune-up limit (dBm) | MPR (dB) |
| Frequency (MHz) | | | | 2505 | 2535 | 2565 | | |
| 10 | QPSK | 1 | 0 | 23.78 | 23.59 | 23.65 | 24 | 0 |
| 10 | QPSK | 1 | 25 | 23.63 | 23.71 | 23.64 | | |
| 10 | QPSK | 1 | 49 | 23.75 | 23.66 | 23.63 | | |
| 10 | QPSK | 25 | 0 | 22.54 | 22.44 | 22.25 | 23 | 1 |
| 10 | QPSK | 25 | 12 | 22.58 | 22.45 | 22.29 | | |
| 10 | QPSK | 25 | 25 | 22.52 | 22.40 | 22.48 | | |
| 10 | QPSK | 50 | 0 | 22.69 | 22.53 | 22.33 | | |
| 10 | 16QAM | 1 | 0 | 22.47 | 22.71 | 22.53 | 23 | 1 |
| 10 | 16QAM | 1 | 25 | 22.63 | 22.64 | 22.38 | | |
| 10 | 16QAM | 1 | 49 | 22.64 | 22.49 | 22.62 | | |
| 10 | 16QAM | 25 | 0 | 21.43 | 21.50 | 21.29 | 22 | 2 |
| 10 | 16QAM | 25 | 12 | 21.53 | 21.47 | 21.41 | | |
| 10 | 16QAM | 25 | 25 | 21.32 | 21.30 | 21.48 | | |
| 10 | 16QAM | 50 | 0 | 21.69 | 21.63 | 21.49 | | |
| Channel | | | | 20775 | 21100 | 21425 | Tune-up limit (dBm) | MPR (dB) |
| Frequency (MHz) | | | | 2502.5 | 2535 | 2567.5 | | |
| 5 | QPSK | 1 | 0 | 23.63 | 23.41 | 23.49 | 24 | 0 |
| 5 | QPSK | 1 | 12 | 23.45 | 23.54 | 23.46 | | |
| 5 | QPSK | 1 | 24 | 23.58 | 23.53 | 23.48 | | |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| 5 | QPSK | 12 | 0 | 22.38 | 22.26 | 22.15 | 23 | 1 |
| 5 | QPSK | 12 | 7 | 22.46 | 22.25 | 22.19 | | |
| 5 | QPSK | 12 | 13 | 22.34 | 22.30 | 22.30 | | |
| 5 | QPSK | 25 | 0 | 22.59 | 22.43 | 22.15 | | |
| 5 | 16QAM | 1 | 0 | 22.32 | 22.54 | 22.33 | 23 | 1 |
| 5 | 16QAM | 1 | 12 | 22.53 | 22.47 | 22.22 | | |
| 5 | 16QAM | 1 | 24 | 22.46 | 22.30 | 22.47 | | |
| 5 | 16QAM | 12 | 0 | 21.32 | 21.39 | 21.15 | 22 | 2 |
| 5 | 16QAM | 12 | 7 | 21.34 | 21.32 | 21.22 | | |
| 5 | 16QAM | 12 | 13 | 21.21 | 21.16 | 21.28 | | |
| 5 | 16QAM | 25 | 0 | 21.55 | 21.52 | 21.32 | | |

**<LTE Band 12>**

| BW [MHz] | Modulation | RB Size | RB Offset | Power Low Ch. / Freq. | Power Middle Ch. / Freq. | Power High Ch. / Freq. | Tune-up limit (dBm) | MPR (dB) |
|---|---|---|---|---|---|---|---|---|
| Channel | | | | 23060 | 23095 | 23130 | | |
| Frequency (MHz) | | | | 704 | 707.5 | 711 | | |
| 10 | QPSK | 1 | 0 | 23.05 | 23.24 | 22.97 | 24 | 0 |
| 10 | QPSK | 1 | 25 | 23.06 | 23.02 | 23.08 | | |
| 10 | QPSK | 1 | 49 | 23.11 | 23.12 | 23.08 | | |
| 10 | QPSK | 25 | 0 | 22.28 | 22.17 | 22.00 | 23 | 1 |
| 10 | QPSK | 25 | 12 | 22.14 | 22.10 | 22.12 | | |
| 10 | QPSK | 25 | 25 | 22.20 | 22.15 | 22.14 | | |
| 10 | QPSK | 50 | 0 | 22.15 | 22.16 | 22.28 | | |
| 10 | 16QAM | 1 | 0 | 22.41 | 22.43 | 22.19 | 23 | 1 |
| 10 | 16QAM | 1 | 25 | 22.44 | 22.23 | 22.34 | | |
| 10 | 16QAM | 1 | 49 | 22.44 | 22.45 | 22.36 | | |
| 10 | 16QAM | 25 | 0 | 21.40 | 21.11 | 21.11 | 22 | 2 |
| 10 | 16QAM | 25 | 12 | 21.28 | 21.14 | 21.22 | | |
| 10 | 16QAM | 25 | 25 | 21.29 | 21.21 | 21.25 | | |
| 10 | 16QAM | 50 | 0 | 21.22 | 21.21 | 21.37 | | |
| Channel | | | | 23035 | 23095 | 23155 | Tune-up limit (dBm) | MPR (dB) |
| Frequency (MHz) | | | | 701.5 | 707.5 | 713.5 | | |
| 5 | QPSK | 1 | 0 | 22.92 | 23.01 | 22.84 | 24 | 0 |
| 5 | QPSK | 1 | 12 | 22.92 | 22.91 | 22.94 | | |
| 5 | QPSK | 1 | 24 | 22.99 | 23.07 | 22.91 | | |
| 5 | QPSK | 12 | 0 | 22.14 | 21.93 | 21.84 | 23 | 1 |
| 5 | QPSK | 12 | 7 | 21.99 | 22.00 | 21.94 | | |
| 5 | QPSK | 12 | 13 | 22.08 | 22.07 | 22.02 | | |
| 5 | QPSK | 25 | 0 | 22.03 | 22.00 | 22.14 | | |
| 5 | 16QAM | 1 | 0 | 22.30 | 22.30 | 22.07 | 23 | 1 |
| 5 | 16QAM | 1 | 12 | 22.31 | 22.05 | 22.21 | | |
| 5 | 16QAM | 1 | 24 | 22.26 | 22.28 | 22.24 | | |
| 5 | 16QAM | 12 | 0 | 21.25 | 20.99 | 20.95 | 22 | 2 |
| 5 | 16QAM | 12 | 7 | 21.15 | 21.01 | 21.09 | | |
| 5 | 16QAM | 12 | 13 | 21.16 | 21.05 | 21.10 | | |
| 5 | 16QAM | 25 | 0 | 21.04 | 21.02 | 21.25 | | |
| Channel | | | | 23025 | 23095 | 23165 | Tune-up limit (dBm) | MPR (dB) |
| Frequency (MHz) | | | | 700.5 | 707.5 | 714.5 | | |
| 3 | QPSK | 1 | 0 | 22.78 | 22.89 | 22.67 | 24 | 0 |
| 3 | QPSK | 1 | 8 | 22.82 | 22.78 | 22.79 | | |
| 3 | QPSK | 1 | 14 | 22.79 | 22.93 | 22.77 | | |
| 3 | QPSK | 8 | 0 | 21.95 | 21.77 | 21.70 | 23 | 1 |
| 3 | QPSK | 8 | 4 | 21.88 | 21.87 | 21.74 | | |
| 3 | QPSK | 8 | 7 | 21.97 | 21.93 | 21.86 | | |
| 3 | QPSK | 15 | 0 | 21.93 | 21.84 | 21.95 | | |
| 3 | 16QAM | 1 | 0 | 22.11 | 22.16 | 21.97 | 23 | 1 |
| 3 | 16QAM | 1 | 8 | 22.15 | 21.94 | 22.10 | | |
| 3 | 16QAM | 1 | 14 | 22.14 | 22.13 | 22.09 | | |
| 3 | 16QAM | 8 | 0 | 21.10 | 20.87 | 20.78 | 22 | 2 |
| 3 | 16QAM | 8 | 4 | 21.02 | 20.84 | 20.99 | | |
| 3 | 16QAM | 8 | 7 | 21.04 | 20.91 | 20.96 | | |
| 3 | 16QAM | 15 | 0 | 20.84 | 20.85 | 21.06 | | |
| Channel | | | | 23017 | 23095 | 23173 | Tune-up limit (dBm) | MPR (dB) |
| Frequency (MHz) | | | | 699.7 | 707.5 | 715.3 | | |
| 1.4 | QPSK | 1 | 0 | 22.61 | 22.73 | 22.52 | 24 | 0 |
| 1.4 | QPSK | 1 | 3 | 22.64 | 22.67 | 22.61 | | |
| 1.4 | QPSK | 1 | 5 | 22.67 | 22.69 | 22.59 | | |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| 1.4 | QPSK | 3 | 0 | 22.54 | 22.69 | 22.44 | | |
| 1.4 | QPSK | 3 | 1 | 22.57 | 22.61 | 22.57 | | |
| 1.4 | QPSK | 3 | 3 | 22.62 | 22.61 | 22.49 | | |
| 1.4 | QPSK | 6 | 0 | 21.74 | 21.74 | 21.82 | 23 | 1 |
| 1.4 | 16QAM | 1 | 0 | 21.99 | 21.97 | 21.80 | | |
| 1.4 | 16QAM | 1 | 3 | 21.96 | 21.84 | 21.91 | | |
| 1.4 | 16QAM | 1 | 5 | 21.92 | 21.93 | 21.97 | 23 | 1 |
| 1.4 | 16QAM | 3 | 0 | 21.97 | 21.97 | 21.80 | | |
| 1.4 | 16QAM | 3 | 1 | 21.94 | 21.79 | 21.89 | | |
| 1.4 | 16QAM | 3 | 3 | 21.94 | 21.85 | 21.88 | | |
| 1.4 | 16QAM | 6 | 0 | 20.71 | 20.69 | 20.81 | 22 | 2 |

**<LTE Band 13>**

| BW [MHz] | Modulation | RB Size | RB Offset | Power Low Ch. / Freq. | Power Middle Ch. / Freq. | Power High Ch. / Freq. | Tune-up limit (dBm) | MPR (dB) |
|---|---|---|---|---|---|---|---|---|
| Channel | | | | | 23230 | | | |
| Frequency (MHz) | | | | | 782 | | | |
| 10 | QPSK | 1 | 0 | | 23.13 | | 24 | 0 |
| 10 | QPSK | 1 | 25 | | 23.07 | | | |
| 10 | QPSK | 1 | 49 | | 23.11 | | | |
| 10 | QPSK | 25 | 0 | | 22.06 | | 23 | 1 |
| 10 | QPSK | 25 | 12 | | 22.06 | | | |
| 10 | QPSK | 25 | 25 | | 22.17 | | | |
| 10 | QPSK | 50 | 0 | | 22.27 | | | |
| 10 | 16QAM | 1 | 0 | | 22.34 | | 23 | 1 |
| 10 | 16QAM | 1 | 25 | | 22.28 | | | |
| 10 | 16QAM | 1 | 49 | | 22.45 | | | |
| 10 | 16QAM | 25 | 0 | | 21.08 | | 22 | 2 |
| 10 | 16QAM | 25 | 12 | | 21.11 | | | |
| 10 | 16QAM | 25 | 25 | | 21.23 | | | |
| 10 | 16QAM | 50 | 0 | | 21.33 | | | |
| Channel | | | | 23205 | 23230 | 23255 | Tune-up limit (dBm) | MPR (dB) |
| Frequency (MHz) | | | | 779.5 | 782 | 784.5 | | |
| 5 | QPSK | 1 | 0 | 22.88 | 22.99 | 22.84 | 24 | 0 |
| 5 | QPSK | 1 | 12 | 22.88 | 22.90 | 22.92 | | |
| 5 | QPSK | 1 | 24 | 22.91 | 23.06 | 22.97 | | |
| 5 | QPSK | 12 | 0 | 22.11 | 21.93 | 21.80 | 23 | 1 |
| 5 | QPSK | 12 | 7 | 21.97 | 21.97 | 22.02 | | |
| 5 | QPSK | 12 | 13 | 22.08 | 22.04 | 22.01 | | |
| 5 | QPSK | 25 | 0 | 22.00 | 21.98 | 22.11 | | |
| 5 | 16QAM | 1 | 0 | 22.28 | 22.26 | 22.04 | 23 | 1 |
| 5 | 16QAM | 1 | 12 | 22.26 | 22.03 | 22.22 | | |
| 5 | 16QAM | 1 | 24 | 22.33 | 22.27 | 22.25 | | |
| 5 | 16QAM | 12 | 0 | 21.28 | 20.91 | 20.96 | 22 | 2 |
| 5 | 16QAM | 12 | 7 | 21.16 | 20.97 | 21.12 | | |
| 5 | 16QAM | 12 | 13 | 21.10 | 21.02 | 21.14 | | |
| 5 | 16QAM | 25 | 0 | 21.05 | 21.05 | 21.26 | | |

**<LTE Band 17>**

| BW [MHz] | Modulation | RB Size | RB Offset | Power Low Ch. / Freq. | Power Middle Ch. / Freq. | Power High Ch. / Freq. | Tune-up limit (dBm) | MPR (dB) |
|---|---|---|---|---|---|---|---|---|
| Channel | | | | 23780 | 23790 | 23800 | | |
| Frequency (MHz) | | | | 709 | 710 | 711 | | |
| 10 | QPSK | 1 | 0 | 23.21 | 23.12 | 23.01 | 24 | 0 |
| 10 | QPSK | 1 | 25 | 23.02 | 23.09 | 23.12 | | |
| 10 | QPSK | 1 | 49 | 23.20 | 23.18 | 23.09 | | |
| 10 | QPSK | 25 | 0 | 22.07 | 22.00 | 21.99 | 23 | 1 |
| 10 | QPSK | 25 | 12 | 22.06 | 22.05 | 22.10 | | |
| 10 | QPSK | 25 | 25 | 22.26 | 22.21 | 22.12 | | |
| 10 | QPSK | 50 | 0 | 22.22 | 22.22 | 22.26 | | |
| 10 | 16QAM | 1 | 0 | 22.28 | 22.17 | 22.21 | 23 | 1 |
| 10 | 16QAM | 1 | 25 | 22.32 | 22.27 | 22.34 | | |
| 10 | 16QAM | 1 | 49 | 22.51 | 22.39 | 22.37 | | |
| 10 | 16QAM | 25 | 0 | 21.15 | 21.13 | 21.10 | 22 | 2 |
| 10 | 16QAM | 25 | 12 | 21.14 | 21.18 | 21.21 | | |
| 10 | 16QAM | 25 | 25 | 21.35 | 21.30 | 21.24 | | |
| 10 | 16QAM | 50 | 0 | 21.31 | 21.32 | 21.33 | | |
| Channel | | | | 23755 | 23790 | 23825 | Tune-up limit (dBm) | MPR (dB) |
| Frequency (MHz) | | | | 706.5 | 710 | 713.5 | | |
| 5 | QPSK | 1 | 0 | 22.79 | 22.79 | 22.90 | 24 | 0 |
| 5 | QPSK | 1 | 12 | 22.85 | 22.98 | 23.00 | | |
| 5 | QPSK | 1 | 24 | 23.09 | 23.00 | 22.98 | | |
| 5 | QPSK | 12 | 0 | 21.93 | 21.90 | 21.88 | 23 | 1 |
| 5 | QPSK | 12 | 7 | 21.91 | 21.89 | 21.94 | | |
| 5 | QPSK | 12 | 13 | 22.15 | 22.11 | 22.00 | | |
| 5 | QPSK | 25 | 0 | 22.02 | 22.11 | 22.15 | | |
| 5 | 16QAM | 1 | 0 | 22.17 | 21.98 | 22.10 | 23 | 1 |
| 5 | 16QAM | 1 | 12 | 22.20 | 22.14 | 22.17 | | |
| 5 | 16QAM | 1 | 24 | 22.37 | 22.19 | 22.22 | | |
| 5 | 16QAM | 12 | 0 | 21.02 | 21.01 | 20.90 | 22 | 2 |
| 5 | 16QAM | 12 | 7 | 20.98 | 20.99 | 21.01 | | |
| 5 | 16QAM | 12 | 13 | 21.15 | 21.18 | 21.10 | | |
| 5 | 16QAM | 25 | 0 | 21.15 | 21.22 | 21.21 | | |

**<LTE Band 26>**

| BW [MHz] | Modulation | RB Size | RB Offset | Power Low Ch. / Freq. | Power Middle Ch. / Freq. | Power High Ch. / Freq. | Tune-up limit (dBm) | MPR (dB) |
|---|---|---|---|---|---|---|---|---|
| Channel | | | | 26765 | 26865 | 26965 | | |
| Frequency (MHz) | | | | 821.5 | 831.5 | 841.5 | | |
| 15 | QPSK | 1 | 0 | 22.81 | 22.98 | 23.13 | 24 | 0 |
| 15 | QPSK | 1 | 37 | 22.63 | 22.88 | 23.01 | | |
| 15 | QPSK | 1 | 74 | 22.63 | 22.85 | 22.99 | | |
| 15 | QPSK | 36 | 0 | 21.73 | 21.89 | 22.11 | 23 | 1 |
| 15 | QPSK | 36 | 20 | 21.72 | 21.97 | 22.21 | | |
| 15 | QPSK | 36 | 39 | 21.87 | 21.95 | 22.15 | | |
| 15 | QPSK | 75 | 0 | 21.96 | 22.07 | 22.39 | | |
| 15 | 16QAM | 1 | 0 | 21.89 | 22.05 | 22.33 | 23 | 1 |
| 15 | 16QAM | 1 | 37 | 21.90 | 22.17 | 22.39 | | |
| 15 | 16QAM | 1 | 74 | 22.08 | 22.26 | 22.26 | | |
| 15 | 16QAM | 36 | 0 | 20.80 | 20.93 | 21.18 | 22 | 2 |
| 15 | 16QAM | 36 | 20 | 20.82 | 21.03 | 21.28 | | |
| 15 | 16QAM | 36 | 39 | 20.94 | 21.07 | 21.18 | | |
| 15 | 16QAM | 75 | 0 | 21.16 | 21.17 | 21.45 | | |
| Channel | | | | 26740 | 26865 | 26990 | Tune-up limit (dBm) | MPR (dB) |
| Frequency (MHz) | | | | 819 | 831.5 | 844 | | |
| 10 | QPSK | 1 | 0 | 22.53 | 22.64 | 22.86 | 24 | 0 |
| 10 | QPSK | 1 | 25 | 22.51 | 22.74 | 22.99 | | |
| 10 | QPSK | 1 | 49 | 22.65 | 22.87 | 22.80 | | |
| 10 | QPSK | 25 | 0 | 21.56 | 21.76 | 22.01 | 23 | 1 |
| 10 | QPSK | 25 | 12 | 21.57 | 21.77 | 22.02 | | |
| 10 | QPSK | 25 | 25 | 21.77 | 21.88 | 22.04 | | |
| 10 | QPSK | 50 | 0 | 21.84 | 21.95 | 22.20 | | |
| 10 | 16QAM | 1 | 0 | 21.78 | 21.95 | 22.17 | 23 | 1 |
| 10 | 16QAM | 1 | 25 | 21.77 | 22.03 | 22.24 | | |
| 10 | 16QAM | 1 | 49 | 21.88 | 22.15 | 22.16 | | |
| 10 | 16QAM | 25 | 0 | 20.63 | 20.80 | 21.03 | 22 | 2 |
| 10 | 16QAM | 25 | 12 | 20.69 | 20.90 | 21.13 | | |
| 10 | 16QAM | 25 | 25 | 20.81 | 20.89 | 21.03 | | |
| 10 | 16QAM | 50 | 0 | 21.05 | 21.07 | 21.25 | | |
| Channel | | | | 26715 | 26865 | 27015 | Tune-up limit (dBm) | MPR (dB) |
| Frequency (MHz) | | | | 816.5 | 831.5 | 846.5 | | |
| 5 | QPSK | 1 | 0 | 22.43 | 22.52 | 22.75 | 24 | 0 |
| 5 | QPSK | 1 | 12 | 22.38 | 22.60 | 22.87 | | |
| 5 | QPSK | 1 | 24 | 22.46 | 22.73 | 22.61 | | |
| 5 | QPSK | 12 | 0 | 21.45 | 21.60 | 21.84 | 23 | 1 |
| 5 | QPSK | 12 | 7 | 21.47 | 21.63 | 21.84 | | |
| 5 | QPSK | 12 | 13 | 21.62 | 21.72 | 21.90 | | |
| 5 | QPSK | 25 | 0 | 21.69 | 21.80 | 22.01 | | |
| 5 | 16QAM | 1 | 0 | 21.62 | 21.82 | 22.06 | 23 | 1 |
| 5 | 16QAM | 1 | 12 | 21.64 | 21.84 | 22.12 | | |
| 5 | 16QAM | 1 | 24 | 21.75 | 22.01 | 21.96 | | |
| 5 | 16QAM | 12 | 0 | 20.53 | 20.62 | 20.84 | 22 | 2 |
| 5 | 16QAM | 12 | 7 | 20.53 | 20.73 | 21.02 | | |
| 5 | 16QAM | 12 | 13 | 20.64 | 20.70 | 20.85 | | |
| 5 | 16QAM | 25 | 0 | 20.86 | 20.87 | 21.06 | | |
| Channel | | | | 26705 | 26865 | 27025 | Tune-up limit (dBm) | MPR (dB) |
| Frequency (MHz) | | | | 815.5 | 831.5 | 847.5 | | |
| 3 | QPSK | 1 | 0 | 22.30 | 22.35 | 22.55 | 24 | 0 |
| 3 | QPSK | 1 | 8 | 22.22 | 22.41 | 22.71 | | |
| 3 | QPSK | 1 | 14 | 22.30 | 22.61 | 22.43 | | |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| 3 | QPSK | 8 | 0 | 21.33 | 21.48 | 21.73 | 23 | 1 |
| 3 | QPSK | 8 | 4 | 21.36 | 21.48 | 21.68 | | |
| 3 | QPSK | 8 | 7 | 21.43 | 21.57 | 21.78 | | |
| 3 | QPSK | 15 | 0 | 21.55 | 21.62 | 21.90 | | |
| 3 | 16QAM | 1 | 0 | 21.51 | 21.65 | 21.96 | 23 | 1 |
| 3 | 16QAM | 1 | 8 | 21.51 | 21.64 | 21.97 | | |
| 3 | 16QAM | 1 | 14 | 21.62 | 21.83 | 21.76 | | |
| 3 | 16QAM | 8 | 0 | 20.35 | 20.43 | 20.67 | 22 | 2 |
| 3 | 16QAM | 8 | 4 | 20.39 | 20.56 | 20.83 | | |
| 3 | 16QAM | 8 | 7 | 20.45 | 20.60 | 20.72 | | |
| 3 | 16QAM | 15 | 0 | 20.73 | 20.76 | 20.96 | | |
| Channel | | | | 26697 | 26865 | 27033 | Tune-up limit (dBm) | MPR (dB) |
| Frequency (MHz) | | | | 814.7 | 831.5 | 848.3 | | |
| 1.4 | QPSK | 1 | 0 | 22.13 | 22.18 | 22.35 | 24 | 0 |
| 1.4 | QPSK | 1 | 3 | 22.03 | 22.26 | 22.52 | | |
| 1.4 | QPSK | 1 | 5 | 22.14 | 22.48 | 22.30 | | |
| 1.4 | QPSK | 3 | 0 | 22.03 | 22.17 | 22.30 | | |
| 1.4 | QPSK | 3 | 1 | 22.17 | 22.24 | 22.47 | | |
| 1.4 | QPSK | 3 | 3 | 22.07 | 22.48 | 22.25 | | |
| 1.4 | QPSK | 6 | 0 | 21.35 | 21.44 | 21.77 | 23 | 1 |
| 1.4 | 16QAM | 1 | 0 | 21.36 | 21.53 | 21.76 | 23 | 1 |
| 1.4 | 16QAM | 1 | 3 | 21.33 | 21.54 | 21.80 | | |
| 1.4 | 16QAM | 1 | 5 | 21.46 | 21.67 | 21.61 | | |
| 1.4 | 16QAM | 3 | 0 | 21.29 | 21.43 | 21.66 | | |
| 1.4 | 16QAM | 3 | 1 | 21.33 | 21.45 | 21.76 | | |
| 1.4 | 16QAM | 3 | 3 | 21.45 | 21.66 | 21.61 | | |
| 1.4 | 16QAM | 6 | 0 | 20.60 | 20.63 | 20.80 | 22 | 2 |

**<LTE Band 30>**

| BW [MHz] | Modulation | RB Size | RB Offset | Power Low Ch. / Freq. | Power Middle Ch. / Freq. | Power High Ch. / Freq. | Tune-up limit (dBm) | MPR (dB) |
|---|---|---|---|---|---|---|---|---|
| Channel | | | | | 27710 | | | |
| Frequency (MHz) | | | | | 2310 | | | |
| 10 | QPSK | 1 | 0 | | 23.70 | | 24 | 0 |
| 10 | QPSK | 1 | 25 | | 23.37 | | | |
| 10 | QPSK | 1 | 49 | | 23.35 | | | |
| 10 | QPSK | 25 | 0 | | 22.47 | | 23 | 1 |
| 10 | QPSK | 25 | 12 | | 22.41 | | | |
| 10 | QPSK | 25 | 25 | | 22.41 | | | |
| 10 | QPSK | 50 | 0 | | 22.36 | | | |
| 10 | 16QAM | 1 | 0 | | 22.64 | | 23 | 1 |
| 10 | 16QAM | 1 | 25 | | 22.57 | | | |
| 10 | 16QAM | 1 | 49 | | 22.64 | | | |
| 10 | 16QAM | 25 | 0 | | 21.48 | | 22 | 2 |
| 10 | 16QAM | 25 | 12 | | 21.43 | | | |
| 10 | 16QAM | 25 | 25 | | 21.45 | | | |
| 10 | 16QAM | 50 | 0 | | 21.43 | | | |
| Channel | | | | 27685 | 27710 | 27735 | Tune-up limit (dBm) | MPR (dB) |
| Frequency (MHz) | | | | 2307.5 | 2310 | 2312.5 | | |
| 5 | QPSK | 1 | 0 | 23.21 | 23.28 | 23.55 | 24 | 0 |
| 5 | QPSK | 1 | 12 | 23.32 | 23.40 | 23.52 | | |
| 5 | QPSK | 1 | 24 | 23.34 | 23.49 | 23.59 | | |
| 5 | QPSK | 12 | 0 | 22.33 | 22.43 | 22.68 | 23 | 1 |
| 5 | QPSK | 12 | 7 | 22.34 | 22.52 | 22.80 | | |
| 5 | QPSK | 12 | 13 | 22.47 | 22.52 | 22.74 | | |
| 5 | QPSK | 25 | 0 | 22.37 | 22.57 | 22.86 | | |
| 5 | 16QAM | 1 | 0 | 22.49 | 22.61 | 22.83 | 23 | 1 |
| 5 | 16QAM | 1 | 12 | 22.47 | 22.74 | 22.97 | | |
| 5 | 16QAM | 1 | 24 | 22.59 | 22.76 | 22.86 | | |
| 5 | 16QAM | 12 | 0 | 21.37 | 21.44 | 21.69 | 22 | 2 |
| 5 | 16QAM | 12 | 7 | 21.35 | 21.62 | 21.83 | | |
| 5 | 16QAM | 12 | 13 | 21.46 | 21.63 | 21.78 | | |
| 5 | 16QAM | 25 | 0 | 21.69 | 21.72 | 22.00 | | |

**<LTE Band 66>**

| BW [MHz] | Modulation | RB Size | RB Offset | Power Low Ch. / Freq. | Power Middle Ch. / Freq. | Power High Ch. / Freq. | Tune-up limit (dBm) | MPR (dB) |
|---|---|---|---|---|---|---|---|---|
| Channel | | | | 132072 | 132322 | 132572 | | |
| Frequency (MHz) | | | | 1720 | 1745 | 1770 | | |
| 20 | QPSK | 1 | 0 | 23.82 | 23.72 | 23.70 | 24 | 0 |
| 20 | QPSK | 1 | 49 | 23.61 | 23.59 | 23.48 | | |
| 20 | QPSK | 1 | 99 | 23.63 | 23.65 | 23.50 | | |
| 20 | QPSK | 50 | 0 | 22.90 | 22.75 | 22.65 | 23 | 1 |
| 20 | QPSK | 50 | 24 | 22.84 | 22.66 | 22.70 | | |
| 20 | QPSK | 50 | 50 | 22.82 | 22.57 | 22.42 | | |
| 20 | QPSK | 100 | 0 | 22.98 | 22.79 | 22.59 | | |
| 20 | 16QAM | 1 | 0 | 22.96 | 22.99 | 22.96 | 23 | 1 |
| 20 | 16QAM | 1 | 49 | 22.98 | 22.87 | 22.58 | | |
| 20 | 16QAM | 1 | 99 | 22.95 | 22.91 | 22.77 | | |
| 20 | 16QAM | 50 | 0 | 21.86 | 21.76 | 21.47 | 22 | 2 |
| 20 | 16QAM | 50 | 24 | 21.88 | 21.65 | 21.42 | | |
| 20 | 16QAM | 50 | 50 | 21.78 | 21.48 | 21.41 | | |
| 20 | 16QAM | 100 | 0 | 21.86 | 21.78 | 21.56 | | |
| Channel | | | | 132047 | 132322 | 132597 | Tune-up limit (dBm) | MPR (dB) |
| Frequency (MHz) | | | | 1717.5 | 1745 | 1772.5 | | |
| 15 | QPSK | 1 | 0 | 23.62 | 23.59 | 23.51 | 24 | 0 |
| 15 | QPSK | 1 | 37 | 23.78 | 23.44 | 23.32 | | |
| 15 | QPSK | 1 | 74 | 23.47 | 23.55 | 23.35 | | |
| 15 | QPSK | 36 | 0 | 22.71 | 22.62 | 22.33 | 23 | 1 |
| 15 | QPSK | 36 | 20 | 22.76 | 22.50 | 22.45 | | |
| 15 | QPSK | 36 | 39 | 22.62 | 22.34 | 22.34 | | |
| 15 | QPSK | 75 | 0 | 22.86 | 22.61 | 22.47 | | |
| 15 | 16QAM | 1 | 0 | 22.88 | 22.93 | 22.83 | 23 | 1 |
| 15 | 16QAM | 1 | 37 | 22.81 | 22.70 | 22.57 | | |
| 15 | 16QAM | 1 | 74 | 22.75 | 22.75 | 22.59 | | |
| 15 | 16QAM | 36 | 0 | 21.66 | 21.58 | 21.37 | 22 | 2 |
| 15 | 16QAM | 36 | 20 | 21.80 | 21.49 | 21.35 | | |
| 15 | 16QAM | 36 | 39 | 21.67 | 21.35 | 21.33 | | |
| 15 | 16QAM | 75 | 0 | 21.76 | 21.60 | 21.43 | | |
| Channel | | | | 132022 | 132322 | 132622 | Tune-up limit (dBm) | MPR (dB) |
| Frequency (MHz) | | | | 1715 | 1745 | 1775 | | |
| 10 | QPSK | 1 | 0 | 23.50 | 23.48 | 23.39 | 24 | 0 |
| 10 | QPSK | 1 | 25 | 23.64 | 23.26 | 23.19 | | |
| 10 | QPSK | 1 | 49 | 23.29 | 23.39 | 23.18 | | |
| 10 | QPSK | 25 | 0 | 22.55 | 22.42 | 22.20 | 23 | 1 |
| 10 | QPSK | 25 | 12 | 22.66 | 22.32 | 22.26 | | |
| 10 | QPSK | 25 | 25 | 22.45 | 22.17 | 22.24 | | |
| 10 | QPSK | 50 | 0 | 22.67 | 22.47 | 22.31 | | |
| 10 | 16QAM | 1 | 0 | 22.78 | 22.82 | 22.66 | 23 | 1 |
| 10 | 16QAM | 1 | 25 | 22.62 | 22.52 | 22.45 | | |
| 10 | 16QAM | 1 | 49 | 22.62 | 22.55 | 22.39 | | |
| 10 | 16QAM | 25 | 0 | 21.54 | 21.41 | 21.22 | 22 | 2 |
| 10 | 16QAM | 25 | 12 | 21.60 | 21.29 | 21.21 | | |
| 10 | 16QAM | 25 | 25 | 21.53 | 21.19 | 21.16 | | |
| 10 | 16QAM | 50 | 0 | 21.65 | 21.45 | 21.32 | | |
| Channel | | | | 131997 | 132322 | 132647 | Tune-up limit (dBm) | MPR (dB) |
| Frequency (MHz) | | | | 1712.5 | 1745 | 1777.5 | | |
| 5 | QPSK | 1 | 0 | 23.39 | 23.35 | 23.26 | 24 | 0 |
| 5 | QPSK | 1 | 12 | 23.49 | 23.08 | 23.09 | | |
| 5 | QPSK | 1 | 24 | 23.12 | 23.29 | 23.07 | | |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| 5 | QPSK | 12 | 0 | 22.41 | 22.24 | 22.10 | 23 | 1 |
| 5 | QPSK | 12 | 7 | 22.46 | 22.15 | 22.08 | | |
| 5 | QPSK | 12 | 13 | 22.31 | 22.02 | 22.06 | | |
| 5 | QPSK | 25 | 0 | 22.49 | 22.29 | 22.14 | | |
| 5 | 16QAM | 1 | 0 | 22.67 | 22.63 | 22.56 | 23 | 1 |
| 5 | 16QAM | 1 | 12 | 22.51 | 22.33 | 22.25 | | |
| 5 | 16QAM | 1 | 24 | 22.42 | 22.44 | 22.20 | | |
| 5 | 16QAM | 12 | 0 | 21.39 | 21.24 | 21.02 | 22 | 2 |
| 5 | 16QAM | 12 | 7 | 21.41 | 21.17 | 21.06 | | |
| 5 | 16QAM | 12 | 13 | 21.42 | 21.03 | 21.02 | | |
| 5 | 16QAM | 25 | 0 | 21.52 | 21.31 | 21.22 | | |
| Channel | | | | 131987 | 132322 | 132657 | Tune-up limit (dBm) | MPR (dB) |
| Frequency (MHz) | | | | 1711.5 | 1745 | 1778.5 | | |
| 3 | QPSK | 1 | 0 | 23.29 | 23.16 | 23.06 | 24 | 0 |
| 3 | QPSK | 1 | 8 | 23.32 | 22.96 | 22.98 | | |
| 3 | QPSK | 1 | 14 | 22.92 | 23.09 | 22.92 | | |
| 3 | QPSK | 8 | 0 | 22.23 | 22.10 | 21.94 | 23 | 1 |
| 3 | QPSK | 8 | 4 | 22.32 | 21.98 | 21.92 | | |
| 3 | QPSK | 8 | 7 | 22.18 | 21.83 | 21.95 | | |
| 3 | QPSK | 15 | 0 | 22.35 | 22.13 | 22.00 | | |
| 3 | 16QAM | 1 | 0 | 22.52 | 22.45 | 22.46 | 23 | 1 |
| 3 | 16QAM | 1 | 8 | 22.33 | 22.22 | 22.13 | | |
| 3 | 16QAM | 1 | 14 | 22.27 | 22.31 | 22.06 | | |
| 3 | 16QAM | 8 | 0 | 21.19 | 21.04 | 20.88 | 22 | 2 |
| 3 | 16QAM | 8 | 4 | 21.22 | 20.97 | 20.91 | | |
| 3 | 16QAM | 8 | 7 | 21.22 | 20.85 | 20.82 | | |
| 3 | 16QAM | 15 | 0 | 21.40 | 21.17 | 21.02 | | |
| Channel | | | | 131979 | 132322 | 132665 | Tune-up limit (dBm) | MPR (dB) |
| Frequency (MHz) | | | | 1710.7 | 1745 | 1779.3 | | |
| 1.4 | QPSK | 1 | 0 | 23.15 | 22.98 | 22.89 | 24 | 0 |
| 1.4 | QPSK | 1 | 3 | 23.14 | 22.84 | 22.78 | | |
| 1.4 | QPSK | 1 | 5 | 22.82 | 22.97 | 22.82 | | |
| 1.4 | QPSK | 3 | 0 | 22.05 | 22.03 | 22.01 | | |
| 1.4 | QPSK | 3 | 1 | 22.12 | 22.07 | 22.03 | | |
| 1.4 | QPSK | 3 | 3 | 22.06 | 22.01 | 22.03 | | |
| 1.4 | QPSK | 6 | 0 | 22.18 | 21.93 | 21.87 | 23 | 1 |
| 1.4 | 16QAM | 1 | 0 | 22.36 | 22.31 | 22.30 | 23 | 1 |
| 1.4 | 16QAM | 1 | 3 | 22.21 | 22.04 | 22.01 | | |
| 1.4 | 16QAM | 1 | 5 | 22.15 | 22.18 | 21.86 | | |
| 1.4 | 16QAM | 3 | 0 | 21.03 | 21.06 | 21.00 | | |
| 1.4 | 16QAM | 3 | 1 | 21.06 | 21.03 | 21.01 | | |
| 1.4 | 16QAM | 3 | 3 | 21.08 | 21.06 | 21.03 | | |
| 1.4 | 16QAM | 6 | 0 | 21.29 | 21.00 | 20.91 | 22 | 2 |

**<TDD LTE SAR Measurement>**

TDD LTE configuration setup for SAR measurement

SAR was tested with a fixed periodic duty factor according to the highest transmission duty factor implemented for the device and supported by 3GPP.

a. 3GPP TS 36.211 section 4.2 for Type 2 Frame Structure and Table 4.2-2 for uplink-downlink configurations
b. "special subframe S" contains both uplink and downlink transmissions, it has been taken into consideration to determine the transmission duty factor according to the worst case uplink and downlink cyclic prefix requirements for UpPTS
c. Establishing connections with base station simulators ensure a consistent means for testing SAR and recommended for evaluating SAR. The Anritsu MT8820C (firmware: #22.52#004) was used for LTE output power measurements and SAR testing.

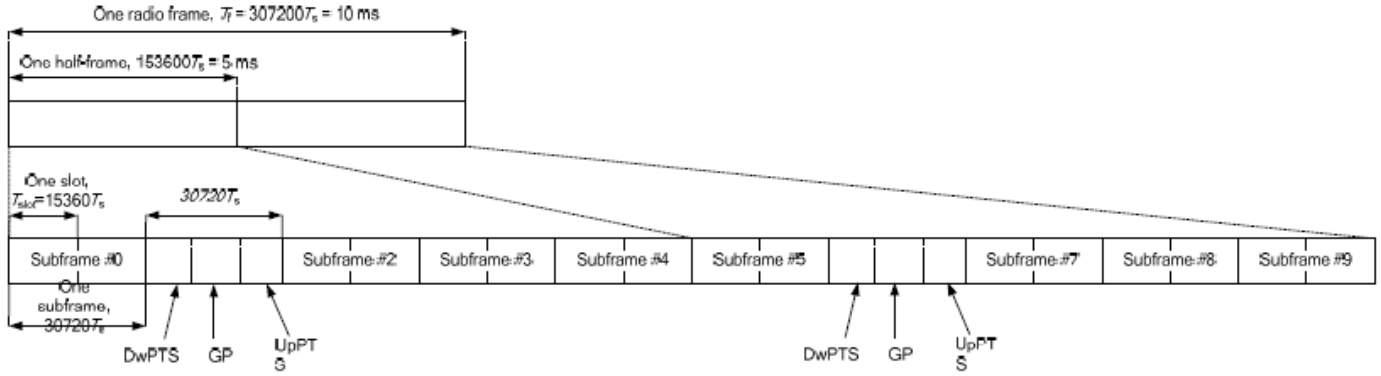



**Figure 4.2-1: Frame structure type 2 (for 5 ms switch-point periodicity).**

**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 |

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

| Special subframe configuration | Normal cyclic prefix in downlink | | | Extended cyclic prefix in downlink | | |
|---|---|---|---|---|---|---|
| | DwPTS | UpPTS | | DwPTS | UpPTS | |
| | | Normal cyclic prefix in uplink | Extended cyclic prefix in uplink | | Normal cyclic prefix in uplink | Extended cyclic prefix in uplink |
| 0 | $6592 \cdot T_s$ | $2192 \cdot T_s$ | $2560 \cdot T_s$ | $7680 \cdot T_s$ | $2192 \cdot T_s$ | $2560 \cdot T_s$ |
| 1 | $19760 \cdot T_s$ | | | $20480 \cdot T_s$ | | |
| 2 | $21952 \cdot T_s$ | | | $23040 \cdot T_s$ | | |
| 3 | $24144 \cdot T_s$ | | | $25600 \cdot T_s$ | | |
| 4 | $26336 \cdot T_s$ | | | $7680 \cdot T_s$ | $4384 \cdot T_s$ | $5120 \cdot T_s$ |
| 5 | $6592 \cdot T_s$ | $4384 \cdot T_s$ | $5120 \cdot T_s$ | $20480 \cdot T_s$ | | |
| 6 | $19760 \cdot T_s$ | | | $23040 \cdot T_s$ | | |
| 7 | $21952 \cdot T_s$ | | | $12800 \cdot T_s$ | | |
| 8 | $24144 \cdot T_s$ | | | - | - | - |
| 9 | $13168 \cdot T_s$ | | | - | - | - |

| Special subframe (30720·$T_s$): Normal cyclic prefix in downlink (UpPTS) | | | |
|---|---|---|---|
| | **Special subframe configuration** | **Normal cyclic prefix in uplink** | **Extended cyclic prefix in uplink** |
| **Uplink duty factor in one special subframe** | **0~4** | 7.13% | 8.33% |
| | **5~9** | 14.3% | 16.7% |

| Special subframe(30720·$T_s$): Extended cyclic prefix in downlink (UpPTS) | | | |
|---|---|---|---|
| | **Special subframe configuration** | **Normal cyclic prefix in uplink** | **Extended cyclic prefix in uplink** |
| **Uplink duty factor in one special subframe** | **0~3** | 7.13% | 8.33% |
| | **4~7** | 14.3% | 16.7% |

The highest duty factor is resulted from:

i. Uplink-downlink configuration: 0. In a half-frame consisted of 5 subfames, uplink operation is in 3 uplink subframes and 1 special subframe.

ii. special subframe configuration: 5-9 for normal cyclic prefix in downlink, 4-7 for extended cyclic prefix in downlink

iii. for special subframe with extended cyclic prefix in uplink, the total uplink duty factor in one half-frame is: (3+0.167)/5 = 63.3%

iv. for special subframe with normal cyclic prefix in uplink, the total uplink duty factor in one half-frame is: (3+0.143)/5 = 62.9%

v. For TDD LTE SAR measurement, the duty cycle 1:1.59 (62.9 %) was used perform testing and considering the theoretical duty cycle of 63.3% for extended cyclic prefix in the uplink, and the theoretical duty cycle of 62.9% for normal cyclic prefix in uplink, a scaling factor of extended cyclic prefix 63.3%/62.9% = 1.006 is applied to scale-up the measured SAR result. The scaled TDD LTE SAR = measured SAR (W/kg)* Tune-up Scaling Factor* scaling factor for extended cyclic prefix.

**<LTE Band 38>**

| BW [MHz] | Modulation | RB Size | RB Offset | Power Low Ch. / Freq. | Power Middle Ch. / Freq. | Power High Ch. / Freq. | Tune-up limit (dBm) | MPR (dB) |
|---|---|---|---|---|---|---|---|---|
| Channel | | | | 37850 | 38000 | 38150 | | |
| Frequency (MHz) | | | | 2580 | 2595 | 2610 | | |
| 20 | QPSK | 1 | 0 | 23.99 | 24.00 | 23.98 | 24 | 0 |
| 20 | QPSK | 1 | 49 | 23.95 | 23.88 | 23.85 | | |
| 20 | QPSK | 1 | 99 | 23.87 | 23.85 | 23.86 | | |
| 20 | QPSK | 50 | 0 | 22.92 | 22.94 | 22.90 | 23 | 1 |
| 20 | QPSK | 50 | 24 | 22.88 | 22.86 | 22.85 | | |
| 20 | QPSK | 50 | 50 | 22.86 | 22.84 | 22.83 | | |
| 20 | QPSK | 100 | 0 | 22.90 | 22.93 | 22.87 | | |
| 20 | 16QAM | 1 | 0 | 22.95 | 23.00 | 22.97 | 23 | 1 |
| 20 | 16QAM | 1 | 49 | 22.94 | 22.98 | 22.97 | | |
| 20 | 16QAM | 1 | 99 | 23.00 | 22.96 | 22.96 | | |
| 20 | 16QAM | 50 | 0 | 21.96 | 22.00 | 21.99 | 22 | 2 |
| 20 | 16QAM | 50 | 24 | 21.95 | 21.96 | 21.93 | | |
| 20 | 16QAM | 50 | 50 | 22.00 | 21.93 | 21.92 | | |
| 20 | 16QAM | 100 | 0 | 21.95 | 21.91 | 21.87 | | |
| Channel | | | | 37825 | 38000 | 38175 | Tune-up limit (dBm) | MPR (dB) |
| Frequency (MHz) | | | | 2577.5 | 2595 | 2612.5 | | |
| 15 | QPSK | 1 | 0 | 23.94 | 23.92 | 23.91 | 24 | 0 |
| 15 | QPSK | 1 | 37 | 23.86 | 23.81 | 23.78 | | |
| 15 | QPSK | 1 | 74 | 23.87 | 23.82 | 23.78 | | |
| 15 | QPSK | 36 | 0 | 22.92 | 22.92 | 22.85 | 23 | 1 |
| 15 | QPSK | 36 | 20 | 22.88 | 22.85 | 22.80 | | |
| 15 | QPSK | 36 | 39 | 22.77 | 22.75 | 22.81 | | |
| 15 | QPSK | 75 | 0 | 22.84 | 22.81 | 22.81 | | |
| 15 | 16QAM | 1 | 0 | 22.92 | 22.95 | 22.92 | 23 | 1 |
| 15 | 16QAM | 1 | 37 | 22.87 | 22.94 | 22.97 | | |
| 15 | 16QAM | 1 | 74 | 22.99 | 22.88 | 22.95 | | |
| 15 | 16QAM | 36 | 0 | 21.95 | 21.99 | 21.92 | 22 | 2 |
| 15 | 16QAM | 36 | 20 | 21.92 | 21.96 | 21.83 | | |
| 15 | 16QAM | 36 | 39 | 21.98 | 21.87 | 21.91 | | |
| 15 | 16QAM | 75 | 0 | 21.95 | 21.86 | 21.81 | | |
| Channel | | | | 37800 | 38000 | 38200 | Tune-up limit (dBm) | MPR (dB) |
| Frequency (MHz) | | | | 2575 | 2595 | 2615 | | |
| 10 | QPSK | 1 | 0 | 23.89 | 23.91 | 23.93 | 24 | 0 |
| 10 | QPSK | 1 | 25 | 23.87 | 23.85 | 23.84 | | |
| 10 | QPSK | 1 | 49 | 23.87 | 23.82 | 23.80 | | |
| 10 | QPSK | 25 | 0 | 22.91 | 22.91 | 22.89 | 23 | 1 |
| 10 | QPSK | 25 | 12 | 22.86 | 22.76 | 22.78 | | |
| 10 | QPSK | 25 | 25 | 22.85 | 22.83 | 22.75 | | |
| 10 | QPSK | 50 | 0 | 22.88 | 22.86 | 22.81 | | |
| 10 | 16QAM | 1 | 0 | 22.90 | 22.94 | 22.87 | 23 | 1 |
| 10 | 16QAM | 1 | 25 | 22.93 | 22.90 | 22.90 | | |
| 10 | 16QAM | 1 | 49 | 22.95 | 22.96 | 22.89 | | |
| 10 | 16QAM | 25 | 0 | 21.86 | 21.90 | 21.98 | 22 | 2 |
| 10 | 16QAM | 25 | 12 | 21.92 | 21.96 | 21.89 | | |
| 10 | 16QAM | 25 | 25 | 21.91 | 21.92 | 21.87 | | |
| 10 | 16QAM | 50 | 0 | 21.93 | 21.86 | 21.85 | | |
| Channel | | | | 37775 | 38000 | 38225 | Tune-up limit (dBm) | MPR (dB) |
| Frequency (MHz) | | | | 2572.5 | 2595 | 2617.5 | | |
| 5 | QPSK | 1 | 0 | 23.94 | 23.95 | 23.96 | 24 | 0 |
| 5 | QPSK | 1 | 12 | 23.85 | 23.79 | 23.85 | | |
| 5 | QPSK | 1 | 24 | 23.80 | 23.79 | 23.79 | | |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| 5 | QPSK | 12 | 0 | 22.87 | 22.92 | 22.83 | 23 | 1 |
| 5 | QPSK | 12 | 7 | 22.84 | 22.81 | 22.75 | | |
| 5 | QPSK | 12 | 13 | 22.84 | 22.82 | 22.75 | | |
| 5 | QPSK | 25 | 0 | 22.80 | 22.89 | 22.86 | | |
| 5 | 16QAM | 1 | 0 | 22.88 | 22.98 | 22.95 | 23 | 1 |
| 5 | 16QAM | 1 | 12 | 22.85 | 22.98 | 22.96 | | |
| 5 | 16QAM | 1 | 24 | 22.99 | 22.93 | 22.93 | | |
| 5 | 16QAM | 12 | 0 | 21.92 | 21.90 | 21.93 | 22 | 2 |
| 5 | 16QAM | 12 | 7 | 21.93 | 21.96 | 21.87 | | |
| 5 | 16QAM | 12 | 13 | 21.96 | 21.88 | 21.84 | | |
| 5 | 16QAM | 25 | 0 | 21.94 | 21.91 | 21.83 | | |

**<LTE Band 41>**

| BW [MHz] | Modulation | RB Size | RB Offset | Power Low Ch. / Freq. | Power Low Middle Ch. / Freq. | Power Middle Ch. / Freq. | Power High Middle Ch. / Freq. | Power High Ch. / Freq. | Tune-up limit (dBm) | MPR (dB) |
|---|---|---|---|---|---|---|---|---|---|---|
| Channel | | | | 39750 | 40185 | 40620 | 41055 | 41490 | | |
| Frequency (MHz) | | | | 2506 | 2549.5 | 2593 | 2636.5 | 2680 | | |
| 20 | QPSK | 1 | 0 | 23.86 | 23.91 | 23.99 | 23.98 | 23.94 | 24 | 0 |
| 20 | QPSK | 1 | 49 | 23.85 | 23.89 | 23.95 | 23.97 | 23.89 | | |
| 20 | QPSK | 1 | 99 | 23.79 | 23.90 | 23.84 | 23.96 | 23.85 | | |
| 20 | QPSK | 50 | 0 | 22.54 | 22.84 | 22.86 | 22.65 | 22.67 | 23 | 1 |
| 20 | QPSK | 50 | 24 | 22.46 | 22.73 | 22.66 | 22.59 | 22.65 | | |
| 20 | QPSK | 50 | 50 | 22.51 | 22.75 | 22.58 | 22.61 | 22.63 | | |
| 20 | QPSK | 100 | 0 | 22.58 | 22.76 | 22.79 | 22.62 | 22.71 | | |
| 20 | 16QAM | 1 | 0 | 22.39 | 22.69 | 22.70 | 22.68 | 22.69 | 23 | 1 |
| 20 | 16QAM | 1 | 49 | 22.50 | 22.67 | 22.69 | 22.67 | 22.68 | | |
| 20 | 16QAM | 1 | 99 | 22.63 | 22.66 | 22.59 | 22.65 | 22.70 | | |
| 20 | 16QAM | 50 | 0 | 21.57 | 21.84 | 21.89 | 21.62 | 21.75 | 22 | 2 |
| 20 | 16QAM | 50 | 24 | 21.58 | 21.90 | 21.81 | 21.70 | 21.74 | | |
| 20 | 16QAM | 50 | 50 | 21.61 | 21.91 | 21.72 | 21.73 | 21.76 | | |
| 20 | 16QAM | 100 | 0 | 21.57 | 21.83 | 21.75 | 21.64 | 21.74 | | |
| Channel | | | | 39725 | 40173 | 40620 | 41068 | 41515 | Tune-up limit (dBm) | MPR (dB) |
| Frequency (MHz) | | | | 2503.5 | 2548.3 | 2593 | 2637.8 | 2682.5 | | |
| 15 | QPSK | 1 | 0 | 23.71 | 23.91 | 23.91 | 23.88 | 23.87 | 24 | 0 |
| 15 | QPSK | 1 | 37 | 23.83 | 23.82 | 23.78 | 23.82 | 23.84 | | |
| 15 | QPSK | 1 | 74 | 23.63 | 23.82 | 23.81 | 23.88 | 23.76 | | |
| 15 | QPSK | 36 | 0 | 22.49 | 22.77 | 22.81 | 22.49 | 22.65 | 23 | 1 |
| 15 | QPSK | 36 | 20 | 22.32 | 22.65 | 22.49 | 22.47 | 22.65 | | |
| 15 | QPSK | 36 | 39 | 22.39 | 22.59 | 22.46 | 22.57 | 22.56 | | |
| 15 | QPSK | 75 | 0 | 22.56 | 22.68 | 22.61 | 22.61 | 22.53 | | |
| 15 | 16QAM | 1 | 0 | 22.28 | 22.58 | 22.62 | 22.66 | 22.50 | 23 | 1 |
| 15 | 16QAM | 1 | 37 | 22.45 | 22.50 | 22.53 | 22.55 | 22.66 | | |
| 15 | 16QAM | 1 | 74 | 22.48 | 22.49 | 22.58 | 22.49 | 22.70 | | |
| 15 | 16QAM | 36 | 0 | 21.47 | 21.83 | 21.76 | 21.48 | 21.63 | 22 | 2 |
| 15 | 16QAM | 36 | 20 | 21.50 | 21.86 | 21.61 | 21.69 | 21.68 | | |
| 15 | 16QAM | 36 | 39 | 21.41 | 21.82 | 21.61 | 21.53 | 21.76 | | |
| 15 | 16QAM | 75 | 0 | 21.39 | 21.74 | 21.74 | 21.55 | 21.72 | | |
| Channel | | | | 39700 | 40160 | 40620 | 41080 | 41540 | Tune-up limit (dBm) | MPR (dB) |
| Frequency (MHz) | | | | 2501 | 2547 | 2593 | 2639 | 2685 | | |
| 10 | QPSK | 1 | 0 | 23.83 | 23.77 | 23.84 | 23.87 | 23.78 | 24 | 0 |
| 10 | QPSK | 1 | 25 | 23.73 | 23.75 | 23.81 | 23.92 | 23.89 | | |
| 10 | QPSK | 1 | 49 | 23.77 | 23.89 | 23.75 | 23.76 | 23.80 | | |
| 10 | QPSK | 25 | 0 | 22.47 | 22.78 | 22.68 | 22.64 | 22.56 | 23 | 1 |
| 10 | QPSK | 25 | 12 | 22.44 | 22.56 | 22.46 | 22.42 | 22.54 | | |
| 10 | QPSK | 25 | 25 | 22.36 | 22.68 | 22.38 | 22.50 | 22.63 | | |
| 10 | QPSK | 50 | 0 | 22.51 | 22.62 | 22.65 | 22.60 | 22.60 | | |
| 10 | 16QAM | 1 | 0 | 22.20 | 22.64 | 22.70 | 22.60 | 22.66 | 23 | 1 |
| 10 | 16QAM | 1 | 25 | 22.35 | 22.65 | 22.55 | 22.67 | 22.59 | | |
| 10 | 16QAM | 1 | 49 | 22.58 | 22.50 | 22.56 | 22.63 | 22.50 | | |
| 10 | 16QAM | 25 | 0 | 21.42 | 21.72 | 21.73 | 21.46 | 21.56 | 22 | 2 |
| 10 | 16QAM | 25 | 12 | 21.50 | 21.78 | 21.78 | 21.55 | 21.73 | | |
| 10 | 16QAM | 25 | 25 | 21.56 | 21.84 | 21.62 | 21.63 | 21.70 | | |
| 10 | 16QAM | 50 | 0 | 21.37 | 21.76 | 21.65 | 21.59 | 21.61 | | |
| Channel | | | | 39675 | 40148 | 40620 | 41093 | 41565 | Tune-up limit (dBm) | MPR (dB) |
| Frequency (MHz) | | | | 2498.5 | 2545.8 | 2593 | 2640.30 | 2687.5 | | |
| 5 | QPSK | 1 | 0 | 23.66 | 23.89 | 23.79 | 23.81 | 23.94 | 24 | 0 |

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| 5 | QPSK | 1 | 12 | 23.69 | 23.84 | 23.77 | 23.90 | 23.74 | | |
| 5 | QPSK | 1 | 24 | 23.63 | 23.78 | 23.73 | 23.82 | 23.77 | | |
| 5 | QPSK | 12 | 0 | 22.43 | 22.70 | 22.86 | 22.47 | 22.55 | 23 | 1 |
| 5 | QPSK | 12 | 7 | 22.37 | 22.57 | 22.49 | 22.59 | 22.48 | | |
| 5 | QPSK | 12 | 13 | 22.46 | 22.62 | 22.58 | 22.61 | 22.47 | | |
| 5 | QPSK | 25 | 0 | 22.52 | 22.66 | 22.62 | 22.54 | 22.63 | | |
| 5 | 16QAM | 1 | 0 | 22.37 | 22.49 | 22.70 | 22.56 | 22.55 | 23 | 1 |
| 5 | 16QAM | 1 | 12 | 22.36 | 22.64 | 22.50 | 22.49 | 22.51 | | |
| 5 | 16QAM | 1 | 24 | 22.50 | 22.46 | 22.44 | 22.57 | 22.54 | | |
| 5 | 16QAM | 12 | 0 | 21.46 | 21.73 | 21.81 | 21.51 | 21.61 | 22 | 2 |
| 5 | 16QAM | 12 | 7 | 21.56 | 21.70 | 21.68 | 21.57 | 21.66 | | |
| 5 | 16QAM | 12 | 13 | 21.46 | 21.81 | 21.62 | 21.59 | 21.69 | | |
| 5 | 16QAM | 25 | 0 | 21.38 | 21.72 | 21.63 | 21.58 | 21.71 | | |

## <LTE Carrier Aggregation combinations>

**General Note:**

1. This device supports Carrier Aggregation on downlink only for inter and intra band, Uplink CA is not supported. For the device supports combination bands and configurations are according to 3GPP.
2. In applying the existing power measurement procedure of KDB 941225 D05A for DL CA SAR test exclusion, only the subset with the largest number of combinations of the frequency band and CCs in each row need consideration, and that configurations require power measurement should be highlighted in the below table.

| 2CC Downlink Carrier Aggregation | | | | 3CC Downlink Carrier Aggregation | | | |
|---|---|---|---|---|---|---|---|
| Number | Combination | Restriction | Covered by Measurement Superset | Number | Combination | Restriction | Covered by Measurement Superset |
| 1 | CA_2A-4A | | 3CC-49 | 44 | CA_2A-2A-5A | | 3CC-49 |
| 2 | CA_2A-5A | | 3CC-49 | 45 | CA_2A-2A-13A | | 3CC-50 |
| 3 | CA_2A-12A | | 3CC-53 | 46 | CA_2A_66B | | 3CC-52 |
| 4 | CA_2A-13A | | 3CC-45 | 47 | CA_2A_66C | | 3CC-52 |
| 5 | CA_2A-17A | | | 48 | CA_2C-5A | | 3CC-49 |
| 6 | CA_2A-29A | | 3CC-55 | 49 | CA_2A-4A-5A | | |
| 7 | CA_2A-30A | | 3CC-55 | 50 | CA_2A-4A-13A | | |
| 8 | CA_2A-66A | | 3CC-46 | 51 | CA_2A-5A-30A | | |
| 9 | CA_4A-2A | | 3CC-58 | 52 | CA_2A-5A-66A | | |
| 10 | CA_4A_5A | | 3CC-56 | 53 | CA_2A-12A-30A | | |
| 11 | CA_4A_12A | | 3CC-61 | 54 | CA_2A_13A_66A | | |
| 12 | CA_4A_13A | | 3CC-57 | 55 | CA_2A_29A_30A | | |
| 13 | CA_4A_17A | | | 56 | CA_4A_4A_5A | | 3CC-49 |
| 14 | CA_4A_29A | | 3CC-62 | 57 | CA_4A_4A_13A | | 3CC-50 |
| 15 | CA_4A_30A | | 3CC-62 | 58 | CA_4A-2A-5A | | 3CC-49 |
| 16 | CA_5A_2A | | 3CC-63 | 59 | CA_4A-2A-13A | | 3CC-50 |
| 17 | CA_5A_4A | | 3CC-64 | 60 | CA_4A_5A_30A | | |
| 18 | CA_5A_7A | | | 61 | CA_4A_12A_30A | | |
| 19 | CA_5A_30A | | 3CC-69 | 62 | CA_4A_29A_30A | | |
| 20 | CA_5A_66A | | 3CC-67 | 63 | CA_5A-2A-2A | | 3CC-49 |
| 21 | CA_7A_5A | | 2CC-18 | 64 | CA_5A_4A_4A | | 3CC-49 |
| 22 | CA_12A-2A | | 3CC-71 | 65 | CA_5A_66A_66A | | 3CC-52 |
| 23 | CA_12A_4A | | 3CC-72 | 66 | CA_5A_66B | | 3CC-52 |
| 24 | CA_12A_30A | | 3CC-72 | 67 | CA_5A_66C | | 3CC-52 |
| 25 | CA_13A-2A | | 3CC-73 | 68 | CA_5A-2A-4A | | 3CC-49 |
| 26 | CA_13A_4A | | 3CC-74 | 69 | CA_5A-2A-30A | | 3CC-51 |
| 27 | CA_13A_66A | | 3CC-76 | 70 | CA_5A_4A_30A | | 3CC-60 |
| 28 | CA_17A-2A | | 2CC-5 | 71 | CA_12A-2A-30A | | 3CC-53 |
| 29 | CA_17A_4A | | 2CC-13 | 72 | CA_12A_4A_30A | | 3CC-61 |
| 30 | CA_30A-2A | | 3CC-55 | 73 | CA_13A-2A-2A | | 3CC-50 |
| 31 | CA_30A_4A | | 3CC-62 | 74 | CA_13A_4A_4A | | 3CC-59 |
| 32 | CA_30A_5A | | 3CC-69 | 75 | CA_13A_66A_66A | | 3CC-54 |
| 33 | CA_30A_12A | | 3CC-83 | 76 | CA_13A_66B | | 3CC-54 |
| 34 | CA_30A_29A | | 3CC-82 | 77 | CA_13A_66C | | 3CC-54 |
| 35 | CA_66A-2A | | 3CC-87 | 78 | CA_13A-2A-4A | | 3CC-50 |
| 36 | CA_66A_5A | | 3CC-88 | 79 | CA_13A_2A_66A | | 3CC-54 |
| 37 | CA_66A_13A | | 3CC-89 | 80 | CA_30A-2A-5A | | 3CC-51 |
| 38 | CA_2C | | | 81 | CA_30A-2A-12A | | 3CC-61 |
| 39 | CA_2A_2A | | | 82 | CA_30A_2A_29A | | 3CC-55 |
| 40 | CA_4A_4A | | | 83 | CA_30A_4A_12A | | 3CC-61 |
| 41 | CA_7B | | | 84 | CA_30A_4A_29A | | 3CC-62 |
| 42 | CA_7C | | | 85 | CA_66A_66A_5A | | 3CC-66 |
| 43 | CA_7A_7A | | | 86 | CA_66A_66A_13A | | 3CC-76 |
| 95 | CA_41C | | | 87 | CA_66B_2A | | 3CC-52 |
| 96 | CA_41A_41A | | | 88 | CA_66B_5A | | 3CC-52 |
| | | | | 89 | CA_66B_13A | | 3CC-54 |
| | | | | 90 | CA_66C_2A | | 3CC-52 |
| | | | | 91 | CA_66C_5A | | 3CC-52 |
| | | | | 92 | CA_66C_13A | | 3CC-54 |
| | | | | 93 | CA_66A_2A_13A | | 3CC-54 |
| | | | | 94 | CA_66D | | |

**<Power verification when LTE Carrier Aggregation Active>**

**General Note:**

i. According to KDB941225 D05A v01r02, Uplink maximum output power measurement with downlink carrier aggregation active should be measured, using the highest output channel measured without downlink carrier aggregation, to confirm that uplink maximum output power with downlink carrier aggregation active remains within the specified tune-up tolerance limits and not more than ¼ dB higher than the maximum output measured without downlink carrier aggregation active.

ii. Uplink maximum output power with downlink carrier aggregation active does not show more than ¼ dB higher than the maximum output power without downlink carrier aggregation active, therefore SAR evaluation with downlink carrier aggregation active can be excluded.

iii. The device supports downlink two carrier aggregation. For power measurement were control and acknowledge data is sent on uplink channels that operate identical to specifications when downlink carrier aggregation is inactive.

iv. Selected highest measured power when downlink carrier aggregation is inactive for conducted power comparison with downlink carrier aggregation is active, to confirm that when downlink carrier aggregation is active uplink maximum output power remains within the specified tune-up tolerance limits and not more than ¼ dB higher than the maximum output power measured when downlink carrier aggregation inactive.

v. For non-contiguous intra-band CA, the SCC selected to provide maximum separation from the PCC and must remain fully within the downlink transmission band.

vi. For Intra-band, contiguous CA, the downlink channels selected to perform the uplink power measurement must satisfy 3GPP channel spacing (5.4.1A of 3GPP TS 36.521 or equivalent) and channel bandwidth (5.4.2A) requirements.

$$\text{Nominal channel spacing} = \left\lfloor \frac{BW_{Channel(1)} + BW_{Channel(2)} - 0.1\left|BW_{Channel(1)} - BW_{Channel(2)}\right|}{0.6} \right\rfloor 0.3 \ \ [\text{MHz}]$$

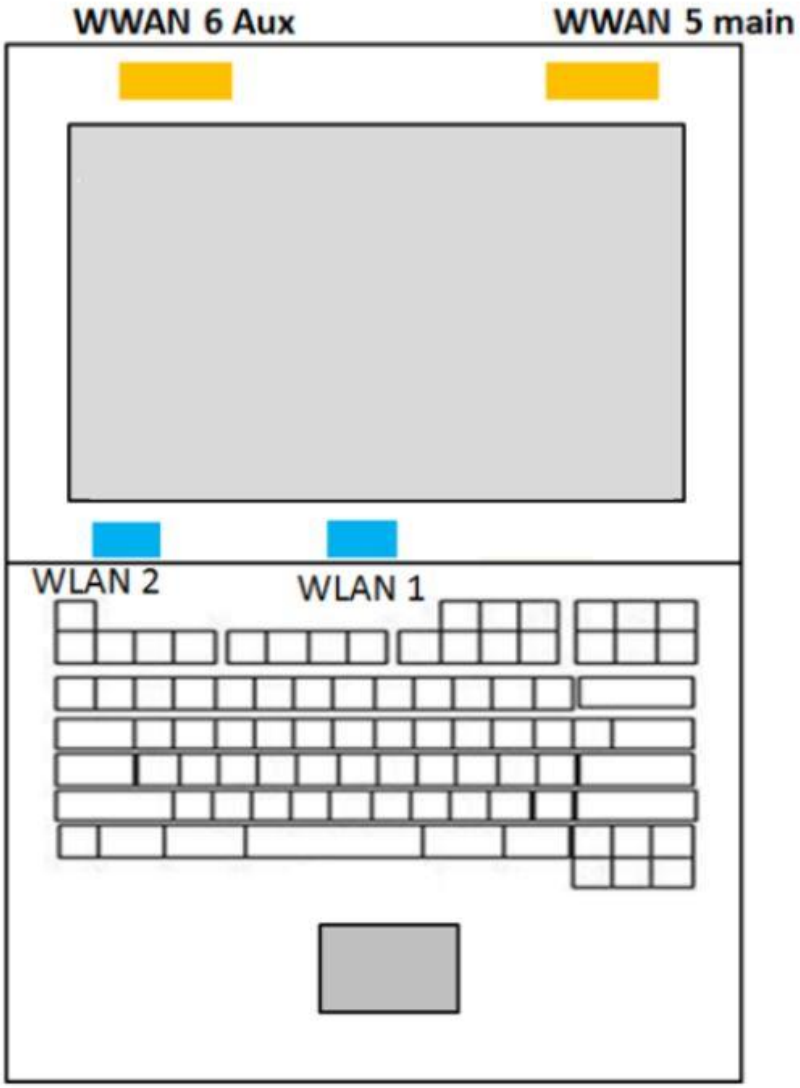
**<Two Carrier power verification>**

| Configure | | CA Configuration (BCS) | PCC | | | | | | | SCC | | | | Power | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | LTE Band | BW (MHz) | UL Freq. (MHz) | UL Channel | Mod. | UL# RB | UL RB Offset | LTE Band | BW (MHz) | DL Freq. (MHz) | DL Channel | With CA Tx.Power (dBm) | W/O CA Tx.Power (dBm) |
| Inter-Band | | 2A-17A | 2 | 10 | 1905 | 19150 | QPSK | 1 | 0 | 17 | 10 | 740 | 5790 | 23.56 | 23.67 |
| | | 4A-17A | 4 | 10 | 1715 | 20000 | QPSK | 1 | 25 | 17 | 10 | 740 | 5790 | 23.48 | 23.68 |
| | | 5A-7A | 5 | 10 | 844 | 20600 | QPSK | 1 | 0 | 7 | 20 | 2655 | 3100 | 23.15 | 23.17 |
| Intra-Band | Non-Contiguous | 2A-2A | 2 | 20 | 1900 | 19100 | QPSK | 1 | 0 | 2 | 5 | 1932.5 | 625 | 23.95 | 23.95 |
| | | 4A-4A | 4 | 20 | 1720 | 20050 | QPSK | 1 | 0 | 4 | 5 | 2152.5 | 2375 | 23.83 | 23.98 |
| | | 7A-7A | 7 | 20 | 2510 | 20850 | QPSK | 1 | 0 | 7 | 5 | 2687.5 | 3425 | 23.89 | 23.98 |
| | | 41A-41A | 41 | 20 | 2593 | 40620 | QPSK | 1 | 0 | 41 | 5 | 2687.5 | 41565 | 23.94 | 23.99 |
| | Contiguous | 2C | 2 | 20 | 1900 | 19100 | QPSK | 1 | 0 | 2 | 20 | 1960.2 | 902 | 23.51 | 23.67 |
| | | 7B | 7 | 15 | 2507.5 | 20825 | QPSK | 1 | 0 | 7 | 5 | 2636.8 | 2918 | 23.85 | 23.88 |
| | | 7C | 7 | 20 | 2510 | 20850 | QPSK | 1 | 0 | 7 | 20 | 2649.8 | 3048 | 23.95 | 23.98 |
| | | 41C | 41 | 20 | 2593 | 40620 | QPSK | 1 | 0 | 41 | 20 | 2573.5 | 40422 | 23.84 | 23.99 |

**<Three Carrier power verification>**

| Configure | | CA Configuration (BCS) | PCC | | | | | | | SCC | | | | SCC2 | | | | Power | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | LTE Band | BW (MHz) | UL Freq. (MHz) | UL Channel | Mod. | UL# RB | UL RB Offset | LTE Band | BW (MHz) | DL Freq. (MHz) | DL Channel | LTE Band | BW (MHz) | DL Freq. (MHz) | DL Channel | With CA Tx.Power (dBm) | W/O CA Tx.Power (dBm) |
| Inter-Band | | 2C-5A | 2 | 20 | 1900 | 19100 | QPSK | 1 | 0 | 2 | 20 | 1960.2 | 902 | 5 | 10 | 881.5 | 2525 | 23.65 | 23.67 |
| | | 2A-66C | 2 | 20 | 1900 | 19100 | QPSK | 1 | 0 | 66 | 20 | 2155 | 66886 | 66 | 20 | 2174.8 | 67084 | 23.48 | 23.67 |
| | | 5A-66C | 5 | 10 | 844 | 20600 | QPSK | 1 | 0 | 66 | 20 | 2155 | 66886 | 66 | 20 | 2174.8 | 67084 | 23.09 | 23.17 |
| | | 13A-66C | 13 | 10 | 782 | 23230 | QPSK | 1 | 0 | 66 | 20 | 2155 | 66886 | 66 | 20 | 2174.8 | 67084 | 23.12 | 23.13 |
| Inter-Band | | 2A-4A-5A | 2 | 20 | 1900 | 19100 | QPSK | 1 | 0 | 4 | 20 | 2132.5 | 2175 | 5 | 10 | 881.5 | 2525 | 23.52 | 23.67 |
| | | 2A-4A-13A | 2 | 20 | 1900 | 19100 | QPSK | 1 | 0 | 4 | 20 | 2132.5 | 2175 | 13 | 10 | 751 | 5230 | 23.50 | 23.67 |
| | | 2A-5A-30A | 2 | 20 | 1900 | 19100 | QPSK | 1 | 0 | 5 | 10 | 881.5 | 2525 | 30 | 10 | 2355 | 9820 | 23.65 | 23.67 |
| | | 2A-5A-66A | 2 | 20 | 1900 | 19100 | QPSK | 1 | 0 | 5 | 10 | 881.5 | 2525 | 66 | 20 | 2155 | 66886 | 23.63 | 23.67 |
| | | 2A-12A-30A | 2 | 20 | 1900 | 19100 | QPSK | 1 | 0 | 12 | 10 | 737.5 | 5095 | 30 | 10 | 2355 | 9820 | 23.67 | 23.67 |
| | | 2A-13A-66A | 2 | 20 | 1900 | 19100 | QPSK | 1 | 0 | 12 | 10 | 737.5 | 5095 | 66 | 20 | 2155 | 66886 | 23.47 | 23.67 |
| | | 2A-29A-30A | 2 | 20 | 1900 | 19100 | QPSK | 1 | 0 | 29 | 10 | 722.5 | 9715 | 30 | 10 | 2355 | 9820 | 23.50 | 23.67 |
| | | 4A-5A-30A | 4 | 20 | 1720 | 20050 | QPSK | 1 | 0 | 5 | 10 | 881.5 | 2525 | 30 | 10 | 2355 | 9820 | 23.88 | 23.98 |
| | | 4A-12A-30A | 4 | 20 | 1720 | 20050 | QPSK | 1 | 0 | 12 | 10 | 737.5 | 5095 | 30 | 10 | 2355 | 9820 | 23.80 | 23.98 |
| Intra-Band | Contiguous | 66D | 66 | 20 | 1720 | 132072 | QPSK | 1 | 0 | 66 | 20 | 2139.8 | 66734 | 66 | 20 | 2159.6 | 66932 | 23.80 | 23.82 |

## 11. Antenna Location



# 12. SAR Test Results

**General Note:**

1. Per KDB 447498 D01v06, the reported SAR is the measured SAR value adjusted for maximum tune-up tolerance.
   a. Tune-up scaling Factor = tune-up limit power (mW) / EUT RF power (mW), where tune-up limit is the maximum rated power among all production units.
   b. For SAR testing of WLAN signal with non-100% duty cycle, the measured SAR is scaled-up by the duty cycle scaling factor which is equal to "1/(duty cycle)"
   c. For WWAN: Reported SAR(W/kg)= Measured SAR(W/kg)*Tune-up Scaling Factor
   d. For TDD LTE SAR measurement, the duty cycle 1:1.59 (62.9 %) was used perform testing and considering the theoretical duty cycle of 63.3% for extended cyclic prefix in the uplink, and the theoretical duty cycle of 62.9% for normal cyclic prefix in uplink, a scaling factor of extended cyclic prefix 63.3%/62.9% = 1.006 is applied to scale-up the measured SAR result. The Reported TDD LTE SAR = measured SAR (W/kg)* Tune-up Scaling Factor* scaling factor for extended cyclic prefix.
2. Per KDB 447498 D01v06, for each exposure position, testing of other required channels within the operating mode of a frequency band is not required when the *reported* 1-g or 10-g SAR for the mid-band or highest output power channel is:
   - ≤ 0.8 W/kg or 2.0 W/kg, for 1-g or 10-g respectively, when the transmission band is ≤ 100 MHz
   - ≤ 0.6 W/kg or 1.5 W/kg, for 1-g or 10-g respectively, when the transmission band is between 100 MHz and 200 MHz
   - ≤ 0.4 W/kg or 1.0 W/kg, for 1-g or 10-g respectively, when the transmission band is ≥ 200 MHz
3. Per KDB 865664 D01v01r04, for each frequency band, repeated SAR measurement is required only when the measured SAR is ≥0.8W/kg.

**UMTS Note:**

1. Per KDB 941225 D01v03r01, for SAR testing is measured using a 12.2 kbps RMC with TPC bits configured to all “1’s”.
2. Per KDB 941225 D01v03r01, RMC 12.2kbps setting is used to evaluate SAR. The maximum output power and tune-up tolerance specified for production units in HSDPA / HSUPA / DC-HSDPA is ≤ ¼ dB higher than RMC 12.2Kbps or when the highest reported SAR of the RMC12.2Kbps is scaled by the ratio of specified maximum output power and tune-up tolerance of HSDPA / HSUPA / DC-HSDPA to RMC12.2Kbps and the adjusted SAR is ≤ 1.2 W/kg, SAR measurement is not required for HSDPA / HSUPA / DC-HSDPA, and according to the following RF output power, the output power results of the secondary modes (HSUPA, HSDPA, DC-HSDPA) are less than ¼ dB higher than the primary modes; therefore, SAR measurement is not required for HSDPA / HSUPA / DC-HSDPA.

**LTE Note:**

1. Per KDB 941225 D05v02r05, 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.
2. Per KDB 941225 D05v02r05, 50% RB allocation for QPSK SAR testing follows 1RB QPSK allocation procedure.
3. Per KDB 941225 D05v02r05, 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 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.
4. Per KDB 941225 D05v02r05, 16QAM output power for each RB allocation configuration is > not ½ dB higher than the same configuration in QPSK and the reported SAR for the QPSK configuration is ≤ 1.45 W/kg; Per KDB 941225 D05v02r05, 16QAM SAR testing is not required.
5. Per KDB 941225 D05v02r05, Smaller bandwidth output power for each RB allocation configuration is > not ½ dB higher than the same configuration in the largest supported bandwidth, and the reported SAR for the largest supported bandwidth is ≤ 1.45 W/kg; Per KDB 941225 D05v02r05, smaller bandwidth SAR testing is not required.
6. For LTE B4/B5/B12/B17/B26/B38 the maximum bandwidth does not support three non-overlapping channels, per KDB 941225 D05v02r05, when a device supports overlapping channel assignment in a channel bandwidth configuration, the middle channel of the group of overlapping channels should be selected for testing.
7. LTE band 4/5/17/38 SAR test was covered by Band 66/26/12/41; according to TCB workshop, SAR test for overlapping LTE bands can be reduced if
   a. The maximum output power, including tolerance, for the smaller band is ≤ the larger band to qualify for the SAR test exclusion.
   b. The channel bandwidth and other operating parameters for the smaller band are fully supported by the larger band.

## 12.1 Body SAR

### <WCDMA SAR>

| Plot No. | Band | Mode | Test Position | Gap (mm) | Ch. | Freq. (MHz) | Average Power (dBm) | Tune-Up Limit (dBm) | Tune-up Scaling Factor | Power Drift (dB) | Measured 1g SAR (W/kg) | Reported 1g SAR (W/kg) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 01 | WCDMA II | RMC 12.2Kbps | Bottom of Laptop | 0mm | 9538 | 1907.6 | 24.47 | 24.50 | 1.007 | 0.18 | 0.074 | 0.075 |
| 02 | WCDMA IV | RMC 12.2Kbps | Bottom of Laptop | 0mm | 1513 | 1752.6 | 24.45 | 24.50 | 1.012 | -0.04 | 0.043 | 0.043 |
| 03 | WCDMA V | RMC 12.2Kbps | Bottom of Laptop | 0mm | 4233 | 846.6 | 24.47 | 24.50 | 1.007 | 0 | 0.022 | 0.022 |

### <FDD LTE SAR>

| Plot No. | Band | BW (MHz) | Modulation | RB Size | RB offset | Test Position | Gap (mm) | Ch. | Freq. (MHz) | Average Power (dBm) | Tune-Up Limit (dBm) | Tune-up Scaling Factor | Power Drift (dB) | Measured 1g SAR (W/kg) | Reported 1g SAR (W/kg) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 04 | LTE Band 2 | 20M | QPSK | 1 | 0 | Bottom of Laptop | 0mm | 19100 | 1900 | 23.95 | 24.00 | 1.012 | 0.06 | 0.051 | 0.052 |
| | LTE Band 2 | 20M | QPSK | 50 | 24 | Bottom of Laptop | 0mm | 19100 | 1900 | 22.91 | 23.00 | 1.021 | 0.03 | 0.038 | 0.039 |
| 05 | LTE Band 7 | 20M | QPSK | 1 | 0 | Bottom of Laptop | 0mm | 20850 | 2510 | 23.98 | 24.00 | 1.005 | -0.1 | 0.005 | 0.005 |
| | LTE Band 7 | 20M | QPSK | 50 | 24 | Bottom of Laptop | 0mm | 20850 | 2510 | 22.88 | 23.00 | 1.028 | 0.14 | 0.004 | 0.005 |
| 06 | LTE Band 12 | 10M | QPSK | 1 | 0 | Bottom of Laptop | 0mm | 23095 | 707.5 | 23.24 | 24.00 | 1.191 | -0.14 | 0.015 | 0.018 |
| | LTE Band 12 | 10M | QPSK | 25 | 0 | Bottom of Laptop | 0mm | 23095 | 707.5 | 22.17 | 23.00 | 1.211 | 0.09 | 0.007 | 0.008 |
| 07 | LTE Band 13 | 10M | QPSK | 1 | 0 | Bottom of Laptop | 0mm | 23230 | 782 | 23.13 | 24.00 | 1.222 | -0.03 | 0.021 | 0.026 |
| | LTE Band 13 | 10M | QPSK | 25 | 25 | Bottom of Laptop | 0mm | 23230 | 782 | 22.17 | 23.00 | 1.211 | 0.02 | 0.015 | 0.018 |
| 08 | LTE Band 26 | 15M | QPSK | 1 | 0 | Bottom of Laptop | 0mm | 26865 | 831.5 | 22.98 | 24.00 | 1.265 | -0.03 | 0.014 | 0.018 |
| | LTE Band 26 | 15M | QPSK | 36 | 20 | Bottom of Laptop | 0mm | 26865 | 831.5 | 21.97 | 23.00 | 1.268 | -0.13 | 0.005 | 0.006 |
| 09 | LTE Band 30 | 10M | QPSK | 1 | 0 | Bottom of Laptop | 0mm | 27710 | 2310 | 23.70 | 24.00 | 1.072 | 0.14 | 0.001 | 0.001 |
| | LTE Band 30 | 10M | QPSK | 25 | 0 | Bottom of Laptop | 0mm | 27710 | 2310 | 22.47 | 23.00 | 1.130 | -0.06 | 0.001 | 0.001 |
| 10 | LTE Band 66 | 20M | QPSK | 1 | 0 | Bottom of Laptop | 0mm | 132072 | 1720 | 23.82 | 24.00 | 1.042 | -0.11 | 0.061 | 0.064 |
| | LTE Band 66 | 20M | QPSK | 50 | 0 | Bottom of Laptop | 0mm | 132072 | 1720 | 22.90 | 23.00 | 1.023 | -0.11 | 0.048 | 0.049 |

### <TDD LTE SAR>

| Plot No. | Band | BW (MHz) | Modulation | RB Size | RB offset | Test Position | Gap (mm) | Ch. | Freq. (MHz) | Average Power (dBm) | Tune-Up Limit (dBm) | Tune-up Scaling Factor | Duty Cycle % | Duty Cycle Scaling Factor | Power Drift (dB) | Measured 1g SAR (W/kg) | Reported 1g SAR (W/kg) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 11 | LTE Band 41 | 20M | QPSK | 1 | 0 | Bottom of Laptop | 0mm | 40620 | 2593 | 23.99 | 24.00 | 1.002 | 62.9 | 1.006 | -0.06 | 0.005 | 0.005 |
| | LTE Band 41 | 20M | QPSK | 50 | 0 | Bottom of Laptop | 0mm | 40620 | 2593 | 22.86 | 23.00 | 1.033 | 62.9 | 1.006 | 0.08 | 0.003 | 0.003 |

# 13. Simultaneous Transmission Analysis

| NO. | Simultaneous Transmission Configurations | Body |
|---|---|---|
| 1. | WWAN + 2.4GHz WLAN ANT 1 + 2.4GHz WLAN ANT 2 | Yes |
| 2. | WWAN + 2.4GHz WLAN ANT 2+ Bluetooth ANT 1 | Yes |
| 3. | WWAN + 5.GHz WLAN ANT 1 + 5GHz WLAN ANT 2 + Bluetooth ANT 1 | Yes |

**General Note:**

1. For SAR testing was performed on single antenna RF power in SISO mode is larger or equal to the single antenna RF power in MIMO mode, and for RF exposure assessment of MIMO mode simultaneous transmission exclusion analysis was performed with SAR test results of each antenna in SISO mode.
2. WLAN and Bluetooth share the same antenna, and cannot transmit simultaneously.
3. All licensed modes share the same antenna 1 part and cannot transmit simultaneously
4. The Scaled SAR summation is calculated based on the same configuration and test position.
5. Per KDB 447498 D01v06, simultaneous transmission SAR is compliant if,
   i) Scalar SAR summation < 1.6W/kg.
   ii) SPLSR = (SAR1 + SAR2)^1.5 / (min. separation distance, mm), and the peak separation distance is determined from the square root of [(x1-x2)2 + (y1-y2)2 + (z1-z2)2], where (x1, y1, z1) and (x2, y2, z2) are the coordinates of the extrapolated peak SAR locations in the zoom scan.
   iii) If SPLSR ≤ 0.04, simultaneously transmission SAR measurement is not necessary.
   iv) Simultaneously transmission SAR measurement, and the reported multi-band SAR < 1.6W/kg.
   v) The SPLSR calculated results please refer to section 13.3.

## 13.1 Body Exposure Conditions

| WWAN Band | Exposure Position | 0 | 1 | 2 | 3 | 4 | 5 | 0+1+2 Summed 1g SAR (W/kg) | 0+2+5 Summed 1g SAR (W/kg) | 0+3+4+5 Summed 1g SAR (W/kg) | SPLSR | Case No |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | WWAN | 2.4GHz WLAN Ant 1 | 2.4GHz WLAN Ant 2 | 5GHz WLAN Ant 1 | 5GHz WLAN Ant 2 | Bluetooth Ant 1 | | | | | |
| | | 1g SAR (W/kg) | 1g SAR (W/kg) | 1g SAR (W/kg) | 1g SAR (W/kg) | 1g SAR (W/kg) | 1g SAR (W/kg) | | | | | |
| WCDMA II | Bottom of Laptop at 0mm | 0.075 | 0.253 | 0.701 | 0.960 | 0.935 | 0.002 | **1.029** | **0.778** | **1.972** | **0.02** | **Case 1** |
| WCDMA IV | Bottom of Laptop at 0mm | 0.043 | 0.253 | 0.701 | 0.960 | 0.935 | 0.002 | **0.997** | **0.746** | **1.940** | **0.02** | **Case 2** |
| WCDMA V | Bottom of Laptop at 0mm | 0.022 | 0.253 | 0.701 | 0.960 | 0.935 | 0.002 | **0.976** | **0.725** | **1.919** | **0.02** | **Case 3** |
| LTE Band 2 | Bottom of Laptop at 0mm | 0.052 | 0.253 | 0.701 | 0.960 | 0.935 | 0.002 | **1.006** | **0.755** | **1.949** | **0.02** | **Case 4** |
| LTE Band 7 | Bottom of Laptop at 0mm | 0.005 | 0.253 | 0.701 | 0.960 | 0.935 | 0.002 | **0.959** | **0.708** | **1.902** | **0.02** | **Case 5** |
| LTE Band 12 | Bottom of Laptop at 0mm | 0.018 | 0.253 | 0.701 | 0.960 | 0.935 | 0.002 | **0.972** | **0.721** | **1.915** | **0.02** | **Case 6** |
| LTE Band 13 | Bottom of Laptop at 0mm | 0.026 | 0.253 | 0.701 | 0.960 | 0.935 | 0.002 | **0.980** | **0.729** | **1.923** | **0.02** | **Case 7** |
| LTE Band 26 | Bottom of Laptop at 0mm | 0.018 | 0.253 | 0.701 | 0.960 | 0.935 | 0.002 | **0.972** | **0.721** | **1.915** | **0.02** | **Case 8** |
| LTE Band 30 | Bottom of Laptop at 0mm | 0.001 | 0.253 | 0.701 | 0.960 | 0.935 | 0.002 | **0.955** | **0.704** | **1.898** | **0.02** | **Case 9** |
| LTE Band 41 | Bottom of Laptop at 0mm | 0.005 | 0.253 | 0.701 | 0.960 | 0.935 | 0.002 | **0.959** | **0.708** | **1.902** | **0.02** | **Case 10** |
| LTE Band 66 | Bottom of Laptop at 0mm | 0.064 | 0.253 | 0.701 | 0.960 | 0.935 | 0.002 | **1.018** | **0.767** | **1.961** | **0.02** | **Case 11** |

## 13.2 SPLSR Evaluation and Analysis

**General Note:**

1. SPLSR = $(SAR_1 + SAR_2)^{1.5}$ / (*min. separation distance, mm*). If SPLSR ≤ 0.04, simultaneously transmission SAR measurement is not necessary
2. The detail hotspot point for each transmitter in each exposure condition are showing as below figure and the minimum 3D distance for each sum combination is used for SPLSR analysis.

| | Band | Position | SAR (W/kg) | Gap | SAR peak location (mm) | | | 3D distance (mm) | Summed SAR (W/kg) | SPLSR Results | Simultaneous SAR |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | (mm) | X | Y | Z | | | | |
| Case 1 | WCDMA II | Bottom of Laptop | 0.075 | 0 | 105.4 | 111.1 | 2.04 | 85.1 | 1.04 | 0.01 | Not required |
| | WLAN5GHz_Ant 1 | | 0.96 | 0 | 105.2 | 26 | 0.9 | | | | |
| | WCDMA II | Bottom of Laptop | 0.075 | 0 | 105.4 | 111.1 | 2.04 | 220.0 | 1.01 | 0.00 | Not required |
| | WLAN5GHz_Ant 2 | | 0.935 | 0 | 0.81 | -82.4 | 0.81 | | | | |
| | WCDMA II | Bottom of Laptop | 0.075 | 0 | 105.4 | 111.1 | 2.04 | 125.8 | 0.08 | 0.00 | Not required |
| | Bluetooth_Ant 1 | | 0.002 | 0 | 137 | -8 | 27.5 | | | | |
| | WLAN5GHz_Ant 1 | Bottom of Laptop | 0.96 | 0 | 105.2 | 26 | 0.9 | 150.5 | 1.90 | 0.02 | Not required |
| | WLAN5GHz_Ant 2 | | 0.935 | 0 | 0.81 | -82.4 | 0.81 | | | | |
| | WLAN5GHz_Ant 1 | Bottom of Laptop | 0.96 | 0 | 105.2 | 26 | 0.9 | 53.6 | 0.96 | 0.02 | Not required |
| | Bluetooth_Ant 1 | | 0.002 | 0 | 137 | -8 | 27.5 | | | | |
| | WLAN5GHz_Ant 2 | Bottom of Laptop | 0.935 | 0 | 0.81 | -82.4 | 0.81 | 157.5 | 0.94 | 0.01 | Not required |
| | Bluetooth_Ant 1 | | 0.002 | 0 | 137 | -8 | 27.5 | | | | |

| | Band | Position | SAR (W/kg) | Gap | SAR peak location (mm) | | | 3D distance (mm) | Summed SAR (W/kg) | SPLSR Results | Simultaneous SAR |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | (mm) | X | Y | Z | | | | |
| Case 2 | WCDMA IV | Bottom of Laptop | 0.043 | 0 | 98 | 92.9 | 1.87 | 67.3 | 1.00 | 0.01 | Not required |
| | WLAN5GHz_Ant 1 | | 0.96 | 0 | 105.2 | 26 | 0.9 | | | | |
| | WCDMA IV | Bottom of Laptop | 0.043 | 0 | 98 | 92.9 | 1.87 | 200.4 | 0.98 | 0.00 | Not required |
| | WLAN5GHz_Ant 2 | | 0.935 | 0 | 0.81 | -82.4 | 0.81 | | | | |
| | WCDMA IV | Bottom of Laptop | 0.043 | 0 | 98 | 92.9 | 1.87 | 111.2 | 0.05 | 0.00 | Not required |
| | Bluetooth_Ant 1 | | 0.002 | 0 | 137 | -8 | 27.5 | | | | |
| | WLAN5GHz_Ant 1 | Bottom of Laptop | 0.96 | 0 | 105.2 | 26 | 0.9 | 150.5 | 1.90 | 0.02 | Not required |
| | WLAN5GHz_Ant 2 | | 0.935 | 0 | 0.81 | -82.4 | 0.81 | | | | |
| | WLAN5GHz_Ant 1 | Bottom of Laptop | 0.96 | 0 | 105.2 | 26 | 0.9 | 53.6 | 0.96 | 0.02 | Not required |
| | Bluetooth_Ant 1 | | 0.002 | 0 | 137 | -8 | 27.5 | | | | |
| | WLAN5GHz_Ant 2 | Bottom of Laptop | 0.935 | 0 | 0.81 | -82.4 | 0.81 | 157.5 | 0.94 | 0.01 | Not required |
| | Bluetooth_Ant 1 | | 0.002 | 0 | 137 | -8 | 27.5 | | | | |

| | Band | Position | SAR (W/kg) | Gap | SAR peak location (cm) | | | 3D distance (mm) | Summed SAR (W/kg) | SPLSR Results | Simultaneous SAR |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | (mm) | X | Y | Z | | | | |
| Case 3 | WCDMA V | Bottom of Laptop | 0.022 | 0 | 110 | 106.4 | 2.05 | 80.6 | 0.98 | 0.01 | Not required |
| | WLAN5GHz_Ant 1 | | 0.96 | 0 | 105.2 | 26 | 0.9 | | | | |
| | WCDMA V | Bottom of Laptop | 0.022 | 0 | 110 | 106.4 | 2.05 | 218.1 | 0.96 | 0.00 | Not required |
| | WLAN5GHz_Ant 2 | | 0.935 | 0 | 0.81 | -82.4 | 0.81 | | | | |
| | WCDMA V | Bottom of Laptop | 0.022 | 0 | 110 | 106.4 | 2.05 | 120.3 | 0.02 | 0.00 | Not required |
| | Bluetooth_Ant 1 | | 0.002 | 0 | 137 | -8 | 27.5 | | | | |
| | WLAN5GHz_Ant 1 | Bottom of Laptop | 0.96 | 0 | 105.2 | 26 | 0.9 | 150.5 | 1.90 | 0.02 | Not required |
| | WLAN5GHz_Ant 2 | | 0.935 | 0 | 0.81 | -82.4 | 0.81 | | | | |
| | WLAN5GHz_Ant 1 | Bottom of Laptop | 0.96 | 0 | 105.2 | 26 | 0.9 | 53.6 | 0.96 | 0.02 | Not required |
| | Bluetooth_Ant 1 | | 0.002 | 0 | 137 | -8 | 27.5 | | | | |
| | WLAN5GHz_Ant 2 | Bottom of Laptop | 0.935 | 0 | 0.81 | -82.4 | 0.81 | 157.5 | 0.94 | 0.01 | Not required |
| | Bluetooth_Ant 1 | | 0.002 | 0 | 137 | -8 | 27.5 | | | | |

| | Band | Position | SAR (W/kg) | Gap (mm) | SAR peak location (mm) X | Y | Z | 3D distance (mm) | Summed SAR (W/kg) | SPLSR Results | Simultaneous SAR |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Case 4 | LTE Band 2 | Bottom of Laptop | 0.052 | 0 | 105.5 | 110.9 | 1.9 | 84.9 | 1.01 | 0.01 | Not required |
| | WLAN5GHz_Ant 1 | | 0.96 | 0 | 105.2 | 26 | 0.9 | | | | |
| | LTE Band 2 | Bottom of Laptop | 0.052 | 0 | 105.5 | 110.9 | 1.9 | 219.8 | 0.99 | 0.00 | Not required |
| | WLAN5GHz_Ant 2 | | 0.935 | 0 | 0.81 | -82.4 | 0.81 | | | | |
| | LTE Band 2 | Bottom of Laptop | 0.052 | 0 | 105.5 | 110.9 | 1.9 | 125.6 | 0.05 | 0.00 | Not required |
| | Bluetooth_Ant 1 | | 0.002 | 0 | 137 | -8 | 27.5 | | | | |
| | WLAN5GHz_Ant 1 | Bottom of Laptop | 0.96 | 0 | 105.2 | 26 | 0.9 | 150.5 | 1.90 | 0.02 | Not required |
| | WLAN5GHz_Ant 2 | | 0.935 | 0 | 0.81 | -82.4 | 0.81 | | | | |
| | WLAN5GHz_Ant 1 | Bottom of Laptop | 0.96 | 0 | 105.2 | 26 | 0.9 | 53.6 | 0.96 | 0.02 | Not required |
| | Bluetooth_Ant 1 | | 0.002 | 0 | 137 | -8 | 27.5 | | | | |
| | WLAN5GHz_Ant 2 | Bottom of Laptop | 0.935 | 0 | 0.81 | -82.4 | 0.81 | 157.5 | 0.94 | 0.01 | Not required |
| | Bluetooth_Ant 1 | | 0.002 | 0 | 137 | -8 | 27.5 | | | | |

| | Band | Position | SAR (W/kg) | Gap (mm) | SAR peak location (mm) X | Y | Z | 3D distance (mm) | Summed SAR (W/kg) | SPLSR Results | Simultaneous SAR |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Case 5 | LTE Band 7 | Bottom of Laptop | 0.005 | 0 | 95.8 | 103.8 | 0.93 | 78.4 | 0.97 | 0.01 | Not required |
| | WLAN5GHz_Ant 1 | | 0.96 | 0 | 105.2 | 26 | 0.9 | | | | |
| | LTE Band 7 | Bottom of Laptop | 0.005 | 0 | 95.8 | 103.8 | 0.93 | 209.0 | 0.94 | 0.00 | Not required |
| | WLAN5GHz_Ant 2 | | 0.935 | 0 | 0.81 | -82.4 | 0.81 | | | | |
| | LTE Band 7 | Bottom of Laptop | 0.005 | 0 | 95.8 | 103.8 | 0.93 | 122.1 | 0.01 | 0.00 | Not required |
| | Bluetooth_Ant 1 | | 0.002 | 0 | 137 | -8 | 27.5 | | | | |
| | WLAN5GHz_Ant 1 | Bottom of Laptop | 0.96 | 0 | 105.2 | 26 | 0.9 | 150.5 | 1.90 | 0.02 | Not required |
| | WLAN5GHz_Ant 2 | | 0.935 | 0 | 0.81 | -82.4 | 0.81 | | | | |
| | WLAN5GHz_Ant 1 | Bottom of Laptop | 0.96 | 0 | 105.2 | 26 | 0.9 | 53.6 | 0.96 | 0.02 | Not required |
| | Bluetooth_Ant 1 | | 0.002 | 0 | 137 | -8 | 27.5 | | | | |
| | WLAN5GHz_Ant 2 | Bottom of Laptop | 0.935 | 0 | 0.81 | -82.4 | 0.81 | 157.5 | 0.94 | 0.01 | Not required |
| | Bluetooth_Ant 1 | | 0.002 | 0 | 137 | -8 | 27.5 | | | | |

| | Band | Position | SAR (W/kg) | Gap (mm) | SAR peak location (cm) X | Y | Z | 3D distance (mm) | Summed SAR (W/kg) | SPLSR Results | Simultaneous SAR |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Case 6 | LTE Band 12 | Bottom of Laptop | 0.018 | 0 | 109.8 | 111.1 | 1.98 | 85.2 | 0.98 | 0.01 | Not required |
| | WLAN5GHz_Ant 1 | | 0.96 | 0 | 105.2 | 26 | 0.9 | | | | |
| | LTE Band 12 | Bottom of Laptop | 0.018 | 0 | 109.8 | 111.1 | 1.98 | 222.1 | 0.95 | 0.00 | Not required |
| | WLAN5GHz_Ant 2 | | 0.935 | 0 | 0.81 | -82.4 | 0.81 | | | | |
| | LTE Band 12 | Bottom of Laptop | 0.018 | 0 | 109.8 | 111.1 | 1.98 | 124.8 | 0.02 | 0.00 | Not required |
| | Bluetooth_Ant 1 | | 0.002 | 0 | 137 | -8 | 27.5 | | | | |
| | WLAN5GHz_Ant 1 | Bottom of Laptop | 0.96 | 0 | 105.2 | 26 | 0.9 | 150.5 | 1.90 | 0.02 | Not required |
| | WLAN5GHz_Ant 2 | | 0.935 | 0 | 0.81 | -82.4 | 0.81 | | | | |
| | WLAN5GHz_Ant 1 | Bottom of Laptop | 0.96 | 0 | 105.2 | 26 | 0.9 | 53.6 | 0.96 | 0.02 | Not required |
| | Bluetooth_Ant 1 | | 0.002 | 0 | 137 | -8 | 27.5 | | | | |
| | WLAN5GHz_Ant 2 | Bottom of Laptop | 0.935 | 0 | 0.81 | -82.4 | 0.81 | 157.5 | 0.94 | 0.01 | Not required |
| | Bluetooth_Ant 1 | | 0.002 | 0 | 137 | -8 | 27.5 | | | | |

| | Band | Position | SAR (W/kg) | Gap (mm) | SAR peak location (mm) X | Y | Z | 3D distance (mm) | Summed SAR (W/kg) | SPLSR Results | Simultaneous SAR |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Case 7 | LTE Band 13 | Bottom of Laptop | 0.026 | 0 | 110 | 106.4 | 2.05 | 80.6 | 0.99 | 0.01 | Not required |
| | WLAN5GHz_Ant 1 | | 0.96 | 0 | 105.2 | 26 | 0.9 | | | | |
| | LTE Band 13 | Bottom of Laptop | 0.026 | 0 | 110 | 106.4 | 2.05 | 218.1 | 0.96 | 0.00 | Not required |
| | WLAN5GHz_Ant 2 | | 0.935 | 0 | 0.81 | -82.4 | 0.81 | | | | |
| | LTE Band 13 | Bottom of Laptop | 0.026 | 0 | 110 | 106.4 | 2.05 | 120.3 | 0.03 | 0.00 | Not required |
| | Bluetooth_Ant 1 | | 0.002 | 0 | 137 | -8 | 27.5 | | | | |
| | WLAN5GHz_Ant 1 | Bottom of Laptop | 0.96 | 0 | 105.2 | 26 | 0.9 | 150.5 | 1.90 | 0.02 | Not required |
| | WLAN5GHz_Ant 2 | | 0.935 | 0 | 0.81 | -82.4 | 0.81 | | | | |
| | WLAN5GHz_Ant 1 | Bottom of Laptop | 0.96 | 0 | 105.2 | 26 | 0.9 | 53.6 | 0.96 | 0.02 | Not required |
| | Bluetooth_Ant 1 | | 0.002 | 0 | 137 | -8 | 27.5 | | | | |
| | WLAN5GHz_Ant 2 | Bottom of Laptop | 0.935 | 0 | 0.81 | -82.4 | 0.81 | 157.5 | 0.94 | 0.01 | Not required |
| | Bluetooth_Ant 1 | | 0.002 | 0 | 137 | -8 | 27.5 | | | | |

| | Band | Position | SAR (W/kg) | Gap (mm) | SAR peak location (mm) X | Y | Z | 3D distance (mm) | Summed SAR (W/kg) | SPLSR Results | Simultaneous SAR |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Case 8 | LTE Band 26 | Bottom of Laptop | 0.018 | 0 | 90.1 | 116.7 | 0.81 | 91.9 | 0.98 | 0.01 | Not required |
| | WLAN5GHz_Ant 1 | | 0.96 | 0 | 105.2 | 26 | 0.9 | | | | |
| | LTE Band 26 | Bottom of Laptop | 0.018 | 0 | 90.1 | 116.7 | 0.81 | 218.2 | 0.95 | 0.00 | Not required |
| | WLAN5GHz_Ant 2 | | 0.935 | 0 | 0.81 | -82.4 | 0.81 | | | | |
| | LTE Band 26 | Bottom of Laptop | 0.018 | 0 | 90.1 | 116.7 | 0.81 | 135.9 | 0.02 | 0.00 | Not required |
| | Bluetooth_Ant 1 | | 0.002 | 0 | 137 | -8 | 27.5 | | | | |
| | WLAN5GHz_Ant 1 | Bottom of Laptop | 0.96 | 0 | 105.2 | 26 | 0.9 | 150.5 | 1.90 | 0.02 | Not required |
| | WLAN5GHz_Ant 2 | | 0.935 | 0 | 0.81 | -82.4 | 0.81 | | | | |
| | WLAN5GHz_Ant 1 | Bottom of Laptop | 0.96 | 0 | 105.2 | 26 | 0.9 | 53.6 | 0.96 | 0.02 | Not required |
| | Bluetooth_Ant 1 | | 0.002 | 0 | 137 | -8 | 27.5 | | | | |
| | WLAN5GHz_Ant 2 | Bottom of Laptop | 0.935 | 0 | 0.81 | -82.4 | 0.81 | 157.5 | 0.94 | 0.01 | Not required |
| | Bluetooth_Ant 1 | | 0.002 | 0 | 137 | -8 | 27.5 | | | | |

| | Band | Position | SAR (W/kg) | Gap (mm) | SAR peak location (mm) X | Y | Z | 3D distance (mm) | Summed SAR (W/kg) | SPLSR Results | Simultaneous SAR |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Case 9 | LTE Band 30 | Bottom of Laptop | 0.001 | 0 | 95.8 | 118.8 | 1.04 | 93.3 | 0.96 | 0.01 | Not required |
| | WLAN5GHz_Ant 1 | | 0.96 | 0 | 105.2 | 26 | 0.9 | | | | |
| | LTE Band 30 | Bottom of Laptop | 0.001 | 0 | 95.8 | 118.8 | 1.04 | 222.5 | 0.94 | 0.00 | Not required |
| | WLAN5GHz_Ant 2 | | 0.935 | 0 | 0.81 | -82.4 | 0.81 | | | | |
| | LTE Band 30 | Bottom of Laptop | 0.001 | 0 | 95.8 | 118.8 | 1.04 | 135.9 | 0.00 | 0.00 | Not required |
| | Bluetooth_Ant 1 | | 0.002 | 0 | 137 | -8 | 27.5 | | | | |
| | WLAN5GHz_Ant 1 | Bottom of Laptop | 0.96 | 0 | 105.2 | 26 | 0.9 | 150.5 | 1.90 | 0.02 | Not required |
| | WLAN5GHz_Ant 2 | | 0.935 | 0 | 0.81 | -82.4 | 0.81 | | | | |
| | WLAN5GHz_Ant 1 | Bottom of Laptop | 0.96 | 0 | 105.2 | 26 | 0.9 | 53.6 | 0.96 | 0.02 | Not required |
| | Bluetooth_Ant 1 | | 0.002 | 0 | 137 | -8 | 27.5 | | | | |
| | WLAN5GHz_Ant 2 | Bottom of Laptop | 0.935 | 0 | 0.81 | -82.4 | 0.81 | 157.5 | 0.94 | 0.01 | Not required |
| | Bluetooth_Ant 1 | | 0.002 | 0 | 137 | -8 | 27.5 | | | | |

| | Band | Position | SAR (W/kg) | Gap (mm) | SAR peak location (mm) X | Y | Z | 3D distance (mm) | Summed SAR (W/kg) | SPLSR Results | Simultaneous SAR |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Case 10 | LTE Band 41 | Bottom of Laptop | 0.005 | 0 | 105.6 | 99.4 | 1.2 | 73.4 | 0.97 | 0.01 | Not required |
| | WLAN5GHz_Ant 1 | | 0.96 | 0 | 105.2 | 26 | 0.9 | | | | |
| | LTE Band 41 | Bottom of Laptop | 0.005 | 0 | 105.6 | 99.4 | 1.2 | 209.8 | 0.94 | 0.00 | Not required |
| | WLAN5GHz_Ant 2 | | 0.935 | 0 | 0.81 | -82.4 | 0.81 | | | | |
| | LTE Band 41 | Bottom of Laptop | 0.005 | 0 | 105.6 | 99.4 | 1.2 | 114.9 | 0.01 | 0.00 | Not required |
| | Bluetooth_Ant 1 | | 0.002 | 0 | 137 | -8 | 27.5 | | | | |
| | WLAN5GHz_Ant 1 | Bottom of Laptop | 0.96 | 0 | 105.2 | 26 | 0.9 | 150.5 | 1.90 | 0.02 | Not required |
| | WLAN5GHz_Ant 2 | | 0.935 | 0 | 0.81 | -82.4 | 0.81 | | | | |
| | WLAN5GHz_Ant 1 | Bottom of Laptop | 0.96 | 0 | 105.2 | 26 | 0.9 | 53.6 | 0.96 | 0.02 | Not required |
| | Bluetooth_Ant 1 | | 0.002 | 0 | 137 | -8 | 27.5 | | | | |
| | WLAN5GHz_Ant 2 | Bottom of Laptop | 0.935 | 0 | 0.81 | -82.4 | 0.81 | 157.5 | 0.94 | 0.01 | Not required |
| | Bluetooth_Ant 1 | | 0.002 | 0 | 137 | -8 | 27.5 | | | | |

| | Band | Position | SAR (W/kg) | Gap (mm) | SAR peak location (cm) X | Y | Z | 3D distance (mm) | Summed SAR (W/kg) | SPLSR Results | Simultaneous SAR |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Case 11 | LTE Band 66 | Bottom of Laptop | 0.064 | 0 | 107.2 | 109.9 | 1.09 | 83.9 | 1.02 | 0.01 | Not required |
| | WLAN5GHz_Ant 1 | | 0.96 | 0 | 105.2 | 26 | 0.9 | | | | |
| | LTE Band 66 | Bottom of Laptop | 0.064 | 0 | 107.2 | 109.9 | 1.09 | 219.8 | 1.00 | 0.00 | Not required |
| | WLAN5GHz_Ant 2 | | 0.935 | 0 | 0.81 | -82.4 | 0.81 | | | | |
| | LTE Band 66 | Bottom of Laptop | 0.064 | 0 | 107.2 | 109.9 | 1.09 | 124.4 | 0.07 | 0.00 | Not required |
| | Bluetooth_Ant 1 | | 0.002 | 0 | 137 | -8 | 27.5 | | | | |
| | WLAN5GHz_Ant 1 | Bottom of Laptop | 0.96 | 0 | 105.2 | 26 | 0.9 | 150.5 | 1.90 | 0.02 | Not required |
| | WLAN5GHz_Ant 2 | | 0.935 | 0 | 0.81 | -82.4 | 0.81 | | | | |
| | WLAN5GHz_Ant 1 | Bottom of Laptop | 0.96 | 0 | 105.2 | 26 | 0.9 | 53.6 | 0.96 | 0.02 | Not required |
| | Bluetooth_Ant 1 | | 0.002 | 0 | 137 | -8 | 27.5 | | | | |
| | WLAN5GHz_Ant 2 | Bottom of Laptop | 0.935 | 0 | 0.81 | -82.4 | 0.81 | 157.5 | 0.94 | 0.01 | Not required |
| | Bluetooth_Ant 1 | | 0.002 | 0 | 137 | -8 | 27.5 | | | | |

**Test Engineer：** Jack Yang

# 14. Uncertainty Assessment

Per KDB 865664 D01 SAR measurement 100MHz to 6GHz, when the highest measured 1-g SAR within a frequency band is < 1.5 W/kg and the measured 10-g SAR within a frequency band is < 3.75 W/kg. The expanded SAR measurement uncertainty must be ≤ 30%, for a confidence interval of k = 2. If these conditions are met, extensive SAR measurement uncertainty analysis described in IEEE Std 1528-2013 is not required in SAR reports submitted for equipment approval. For this device, the highest measured 1-g SAR is less 1.5W/kg. Therefore, the measurement uncertainty table is not required in this report.
Declaration of Conformity:
The test results with all measurement uncertainty excluded is presented in accordance with the regulation limits or requirements declared by manufacturers.
Comments and Explanations:
The declared of product specification for EUT presented in the report are provided by the manufacturer, and the manufacturer takes all the responsibilities for the accuracy of product specification.

# 15. References


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

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

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

[4] SPEAG DASY System Handbook

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

[6] FCC KDB 447498 D01 v06, “Mobile and Portable Device RF Exposure Procedures and Equipment Authorization Policies”, Oct 2015

[7] FCC KDB 941225 D01 v03r01, “3G SAR MEAUREMENT PROCEDURES”, Oct 2015

[8] FCC KDB 941225 D05 v02r05, “SAR Evaluation Considerations for LTE Devices”, Dec 2015

[9] FCC KDB 941225 D05A v01r02, “Rel. 10 LTE SAR Test Guidance and KDB Inquiries”, Oct 2015

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

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

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