



# SAR TEST REPORT

**Applicant** ZTE Corporation  
**FCC ID** SRQ-BLADEVULTRA  
**Product** LTE/WCDMA/GSM (GPRS)  
Multi-Mode Digital Mobile Phone  
**Model** BLADE V Ultra  
**Marketing** BLADE V Ultra  
**Report No.** R1809A0434-S1  
**Issue Date** November 6, 2018

TA Technology (Shanghai) Co., Ltd. tested the above equipment in accordance with the requirements in **IEEE 1528-2013, ANSI C95.1: 1992/IEEE C95.1: 1991**. The test results show that the equipment tested is capable of demonstrating compliance with the requirements as documented in this report.

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# 1 Test Laboratory

## 1.1 Notes of the Test Report

This report shall not be reproduced in full or partial, without the written approval of **TA technology (shanghai) co., Ltd.** The results documented in this report apply only to the tested sample, under the conditions and modes of operation as described herein .Measurement Uncertainties were not taken into account and are published for informational purposes only. This report is written to support regulatory compliance of the applicable standards stated above.

## 1.2 Test facility

### **CNAS (accreditation number:L2264)**

TA Technology (Shanghai) Co., Ltd. has obtained the accreditation of China National Accreditation Service for Conformity Assessment (CNAS).

### **FCC (Designation number: CN1179, Test Firm Registration Number: 446626)**

TA Technology (Shanghai) Co., Ltd. has been listed on the US Federal Communications Commission list of test facilities recognized to perform electromagnetic emissions measurements.

### **IC (recognition number is 8510A)**

TA Technology (Shanghai) Co., Ltd. has been listed by industry Canada to perform electromagnetic emission measurement.

### **VCCI (recognition number is C-4595, T-2154, R-4113, G-10766)**

TA Technology (Shanghai) Co., Ltd. has been listed by industry Japan to perform electromagnetic emission measurement.

### **A2LA (Certificate Number: 3857.01)**

TA Technology (Shanghai) Co., Ltd. has been listed by American Association for Laboratory Accreditation to perform electromagnetic emission measurement.



### 1.3 Testing Location

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### 1.4 Laboratory Environment

|   |                           |
|---|---------------------------|
| Temperature   | Min. = 18°C, Max. = 25 °C |
| Relative humidity   | Min. = 30%, Max. = 70%    |
| Ground system resistance  | < 0.5 $\Omega$            |
| Ambient noise is checked and found very low and in compliance with requirement of standards.<br>Reflection of surrounding objects is minimized and in compliance with requirement of standards. |                           |

## 2 Statement of Compliance

The maximum results of Specific Absorption Rate (SAR) found during testing for the EUT are as follows:

Table 2.1: Highest Reported SAR

| Mode             | Highest Reported SAR (W/kg)        |                                       |                                     |
|------------------|------------------------------------|---------------------------------------|-------------------------------------|
|                  | 1g SAR Head                        | 1g SAR Body-worn<br>(Separation 10mm) | 1g SAR Hotspot<br>(Separation 10mm) |
| GSM 850          | 0.231                              | 0.493                                 | 1.097                               |
| GSM 1900         | 0.098                              | 0.550                                 | 0.779                               |
| WCDMA Band II    | 0.178                              | 1.102                                 | 1.102                               |
| WCDMA Band V     | 0.213                              | 0.441                                 | 0.441                               |
| LTE FDD 2        | 0.182                              | <b>1.184</b>                          | <b>1.184</b>                        |
| LTE FDD 4        | 0.174                              | 0.654                                 | 0.654                               |
| LTE FDD 5        | 0.174                              | 0.467                                 | 0.467                               |
| LTE FDD 7        | 0.131                              | 0.418                                 | 0.418                               |
| Wi-Fi (2.4G)     | <b>1.326</b>                       | 0.790                                 | 0.790                               |
| BT               | 0.043                              | /                                     | /                                   |
| Date of Testing: | October 18, 2018~ October 29, 2018 |                                       |                                     |

Table 2.2: Highest Simultaneous Transmission SAR

| Exposure Configuration  | 1g SAR Head | 1g SAR Body-worn<br>(Separation 10mm) | 1g SAR Hotspot<br>(Separation 10mm) |
|---|-------------|---------------------------------------|-------------------------------------|
| Highest Simultaneous Transmission SAR (W/kg)  | 1.523       | 1.420                                 | 1.569                               |
| Note: 1. The detail for simultaneous transmission consideration is described in chapter 10.4. |             |                                       |                                     |

### 3 Description of Equipment under Test

#### Client Information

|                             |  |
|-----------------------------|--|
| <b>Applicant</b>            | ZTE Corporation  |
| <b>Applicant address</b>    | ZTE Plaza, Keji Road South, Hi-Tech, Industrial Park, Nanshan District, Shenzhen, Guangdong, 518057, P.R.China |
| <b>Manufacturer</b>         | ZTE Corporation  |
| <b>Manufacturer address</b> | ZTE Plaza, Keji Road South, Hi-Tech, Industrial Park, Nanshan District, Shenzhen, Guangdong, 518057, P.R.China |

#### General Technologies

|                      |   |
|----------------------|---|
| Application Purpose: | Original Grant  |
| EUT Stage            | Identical Prototype   |
| Model:               | BLADE V Ultra   |
| IMEI:                | 868867040002217   |
| Hardware Version:    | uxjA  |
| Software Version:    | TEL_MX_BLADE_V_UltraV1.0  |
| Antenna Type:        | Internal Antenna  |
| Device Class:        | B   |
| Wi-Fi Hotspot        | Wi-Fi 2.4G  |
| Power Class:         | GSM 850:4<br>GSM 1900:1<br>UMTS Band II /V:3<br>LTE FDD 2/4/5/7:3                               |
| Power Level          | GSM 850:level 5<br>GSM 1900:level 0<br>UMTS Band II /V:all up bits<br>LTE FDD 2/4/5/7:max power |
| EUT Accessory        |   |
| Adapter              | Manufacturer: Salcomp (Shenzhen) Co., Ltd.<br>Model: STC-A5915A-Z                               |
| Battery              | Manufacturer: HARBIN COSLIGHT POWER CO LTD<br>Model: Li3940T44P8h937238                         |
| Earphone             | Manufacturer: Shen zhen FDC Electronic Co.,Ltd.<br>Model: DEM-66                                |
| USB Cable            | 99cm Cable, Shielded  |

**Wireless Technology and Frequency Range**

| Wireless Technology  |  | Modulation                                    | Operating mode   | Tx (MHz)    |
|--|--|---|--|-------------|
| GSM  | 850  | Voice(GMSK)<br>GPRS(GMSK)<br>EGPRS(GMSK,8PSK) | <input type="checkbox"/> Multi-slot Class:8-1UP<br><input type="checkbox"/> Multi-slot Class:10-2UP<br><input checked="" type="checkbox"/> Multi-slot Class:12-4UP<br><input type="checkbox"/> Multi-slot Class:33-4UP | 824 ~ 849   |
|  | 1900   |   |  | 1850 ~ 1910 |
|  | Does this device support DTM (Dual Transfer Mode)? <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No |   |  |             |
| UMTS   | Band II  | QPSK  | HSDPA UE Category:24<br>HSUPA UE Category:6  | 1850 ~ 1910 |
|  | Band V   |   |  | 824 ~ 849   |
| LTE  | FDD 2  | QPSK, 16QAM                                   | Rel.10   | 1850 ~ 1910 |
|  | FDD 4  |   |  | 1710 ~ 1755 |
|  | FDD 5  |   |  | 824 ~ 849   |
|  | FDD 7  |   |  | 2500 ~ 2570 |
|  | Does this device support Carrier Aggregation (CA) <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No  |   |  |             |
| Does this device support SV-LTE (1xRTT-LTE)? <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No |  |   |  |             |
| BT   | 2.4G   | Version 4.2 LE                                |  | 2402 ~2480  |
| Wi-Fi  | 2.4G   | DSSS,OFDM                                     | 802.11b/g/n HT20   | 2412 ~ 2462 |
|  | Does this device support MIMO <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No                      |   |  |             |





## 4 Test Specification, Methods and Procedures

The tests documented in this report were performed in accordance with FCC 47 CFR § 2.1093, IEEE 1528- 2013, ANSI C95.1: 1992/IEEE C95.1: 1991, the following FCC Published RF exposure KDB procedures:

248227 D01 802.11 Wi-Fi SAR v02r02  
447498 D01 General RF Exposure Guidance v06  
648474 D04 Handset SAR v01r03  
865664 D01 SAR measurement 100 MHz to 6 GHz v01r04  
865664 D02 RF Exposure Reporting v01r02  
941225 D01 3G SAR Procedures v03r01  
941225 D05 SAR for LTE Devices v02r05  
941225 D06 Hotspot Mode v02r01  
941225 D05A LTE Rel.10 KDB Inquiry Sheet v01r02  
690783 D01 SAR Listings on Grants v01r03

## 5 Operational Conditions during Test

### 5.1 Test Positions

#### 5.1.1 Against Phantom Head

Measurements were made in “cheek” and “tilt” positions on both the left hand and right hand sides of the phantom.

The positions used in the measurements were according to IEEE 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".

#### 5.1.2 Body Worn Configuration

Body-worn operating configurations should be tested with the belt-clips and holsters attached to the device and positioned against a flat phantom in normal use configurations.

Body-worn operating configurations are tested with the belt-clips and holsters attached to the device and positioned against a flat phantom in a normal use configuration. Per FCC KDB Publication 648474 D04, Body-worn accessory exposure is typically related to voice mode operations when handsets are carried in body-worn accessories. The body-worn accessory procedures in FCC KDB Publication 447498 D01 should be used to test for body-worn accessory SAR compliance, without a headset connected to it. This enables the test results for such configuration to be compatible with that required for hotspot mode when the body-worn accessory test separation distance is greater than or equal to that required for hotspot mode, when applicable. When the reported SAR for a body-worn accessory, measured without a headset connected to the handset, is  $> 1.2$  W/kg, the highest reported SAR configuration for that wireless mode and frequency band should be repeated for that body-worn accessory with a headset attached to the handset.

Accessories for Body-worn operation configurations are divided into two categories: those that do not contain metallic components and those that do contain metallic components. When multiple accessories that do not contain metallic components are supplied with the device, the device is tested with only the accessory that dictates the closest spacing to the body. Then multiple accessories that contain metallic components are tested with the device with each accessory. If multiple accessories share an identical metallic component (i.e. the same metallic belt-clip used with different holsters with no other metallic components) only the accessory that dictates the closest spacing to the body is tested.

Body-worn accessories may not always be supplied or available as options for some devices intended to be authorized for body-worn use. In this case, a test configuration with a separation distance between the back of the device and the flat phantom is used. Test position spacing was documented. Transmitters that are designed to operate in front of a person's face, as in push-to-talk configurations, are tested for SAR compliance with the front of the device positioned to face the flat phantom in head fluid. For devices that are carried next to the body such as a shoulder, waist or chest-worn transmitters, SAR compliance is tested with the accessories, including headsets and microphones, attached to the device and positioned against a flat phantom in a normal use configuration.

### 5.1.3 Phablet SAR test considerations

For smart phones, with a display diagonal dimension  $> 15.0$  cm or an overall diagonal dimension  $> 16.0$  cm, that can provide similar mobile web access and multimedia support found in mini-tablets or UMPC mini-tablets and support voice calls next to the ear, unless it is confirmed otherwise through KDB inquiries, the following phablet procedures should be applied to evaluate SAR compliance for each applicable wireless modes and frequency band. Devices marketed as phablets, regardless of form factors and operating characteristics must be tested as a phablet to determine SAR compliance.

- a) The normally required head and body-worn accessory SAR test procedures for handsets, including hotspot mode, must be applied.
- b) The UMPC mini-tablet procedures must also be applied to test the SAR of all surfaces and edges with an antenna located at  $\leq 25$  mm from that surface or edge, in direct contact with a flat phantom, for product specific 10-g SAR according to the body-equivalent tissue dielectric parameters in KDB Publication 865664 D01 to address interactive hand use exposure conditions. The 1-g SAR at 5 mm for UMPC mini-tablets is not required. When hotspot mode applies, 10-g extremity SAR is required only for the surfaces and edges with hotspot mode 1-g reported SAR  $> 1.2$  W/kg; however, when power reduction applies to hotspot mode the measured SAR must be scaled to the maximum output power, including tolerance, allowed for phablet modes to compare with the 1.2 W/kg SAR test reduction threshold. The normal tablet procedures in KDB Publication 616217 are required when the overall diagonal dimension of the device is  $> 20.0$  cm. Hotspot mode SAR is not required when normal tablet procedures are applied. Extremity 10-g SAR is also not required for the front (top) surface of larger form factor full size tablets. The more conservative normal tablet SAR results can be used to support phablet mode 10-g extremity SAR.
- c) The simultaneous transmission operating configurations applicable to voice and data transmissions for both phone and mini-tablet modes must be taken into consideration separately for 1-g and 10-g SAR to determine the simultaneous transmission SAR test exclusion and measurement requirements for the relevant wireless modes and exposure conditions.

## 5.2 Measurement Variability

Per FCC KDB Publication 865664 D01, SAR measurement variability was assessed for each frequency band, which was determined by the SAR probe calibration point and tissue-equivalent medium used for the device measurements. When both head and body tissue-equivalent media were required for SAR measurements in a frequency band, the variability measurement procedures were applied to the tissue medium with the highest measured SAR, using the highest measured SAR configuration for that tissue-equivalent medium. These additional measurements were repeated after the completion of all measurements requiring the same head or body tissue-equivalent medium in a frequency band. The test device was returned to ambient conditions (normal room temperature) with the battery fully charged before it was re-mounted on the device holder for the repeated measurement(s) to minimize any unexpected variations in the repeated results.

SAR Measurement Variability was assessed using the following procedures for each frequency band:

- 1) When the original highest measured SAR is  $\geq 0.80$  W/kg, the measurement was repeated once.
- 2) A second repeated measurement was performed only if the ratio of largest to smallest SAR for the original and first repeated measurements was  $> 1.20$  or when the original or repeated measurement was  $\geq 1.45$  W/kg ( $\sim 10\%$  from the 1-g SAR limit).
- 3) A third repeated measurement was performed only if the original, first or second repeated measurement was  $\geq 1.5$  W/kg and the ratio of largest to smallest SAR for the original, first and second repeated measurements is  $> 1.20$ .
- 4) Repeated measurements are not required when the original highest measured SAR is  $< 0.80$  W/kg

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

## 5.3 Test Configuration

### 5.3.1 GSM Test Configuration

According to specification 3GPP TS 51.010, the maximum power of the GSM can do the power reduction for the multi-slot. The allowed power reduction in the multi-slot configuration is as following:

Output power of reductions:

**Table 5.1: The allowed power reduction in the multi-slot configuration**

| Number of timeslots in uplink assignment | Permissible nominal reduction of maximum output power,(dB) |
|--|--|
| 1  | 0  |
| 2  | 0 to 3,0   |
| 3  | 1,8 to 4,8   |
| 4  | 3,0 to 6,0   |

SAR test reduction for GPRS and EDGE modes is determined by the source-based time-averaged output power specified for production units, including tune-up tolerance. The data mode with highest specified time-averaged output power should be tested for SAR compliance in the applicable exposure conditions. For modes with the same specified maximum output power and tolerance, the higher number time-slot configuration should be tested. GSM voice and GPRS data use GMSK, which is a constant amplitude modulation with minimal peak to average power difference within the time-slot burst. For EDGE, GMSK is used for MCS 1 – MCS 4 and 8-PSK is used for MCS 5 – MCS 9; where 8-PSK has an inherently higher peak-to-average power ratio. The GMSK and 8-PSK EDGE configurations are considered separately for SAR compliance. The GMSK EDGE configurations are grouped with GPRS and considered with respect to time-averaged maximum output power to determine compliance. The 3G SAR test reduction procedure is applied to 8-PSK EDGE with GMSK GPRS/EDGE as the primary mode.

### 5.3.2 UMTS Test Configuration

#### 5.2.2.1 3G SAR Test Reduction Procedure

The default test configuration is to measure SAR with an established radio link between the EUT and a communication test set using a 12.2 kbps RMC (reference measurement channel) configured in Test Loop Mode 1. SAR is selectively confirmed for other physical channel configurations modes according to output power, exposure conditions and device operating capabilities. Maximum output power is verified by applying the applicable versions of 3GPP TS 34.121.

#### 5.2.2.2 Head SAR

SAR for next to the ear head exposure is measured using a 12.2 kbps RMC with TPC bits configured to all "1's". The 3G SAR test reduction procedure is applied to AMR configurations with 12.2 kbps RMC as the primary mode. Otherwise, SAR is measured for 12.2 kbps AMR in 3.4 kbps SRB (signaling radio bearer) using the highest SAR configuration in 12.2 kbps RMC for head exposure.

### 5.2.2.3 Body-worn accessory SAR

SAR for body-worn accessory configurations is measured using a 12.2 kbps RMC with TPC bits configured to all “1’s”. The 3G SAR test reduction procedure is applied to other spreading codes and multiple DPDCHn configurations supported by the EUT with 12.2 kbps RMC as the primary mode. Otherwise, SAR is measured using an applicable RMC configuration with the corresponding spreading code or DPDCHn, for the highest reported body-worn accessory exposure SAR configuration in 12.2 kbps RMC. When more than 2 DPDCHn are supported by the EUT, it may be necessary to configure additional DPDCHn using FTM (Factory Test Mode) or other chipset based test approaches with parameters similar to those used in 384 kbps and 768 kbps RMC

### 5.2.2.4 Release 5 HSDPA Test Configuration

The 3G SAR test reduction procedure is applied to HSDPA body-worn accessory configurations with 12.2 kbps RMC as the primary mode. Otherwise, SAR is measured for HSDPA using the HSDPA body SAR procedures in the “Release 5 HSDPA Data Devices” section of this document, for the highest SAR body-worn accessory exposure configuration in 12.2 kbps RMC. EUT with both HSDPA and HSUPA are tested according to Release 6 HSPA test procedures.

HSDPA should be configured according to the UE category of a test device. The number of HSDSCH/ HS-PDSCHs, HARQ processes, minimum inter-TTI interval, transport block sizes and RV coding sequence are defined by the H-set. To maintain a consistent test configuration and stable transmission conditions, QPSK is used in the H-set for SAR testing. HS-DPCCH should be configured with a CQI feedback cycle of 4 ms with a CQI repetition factor of 2 to maintain a constant rate of active CQI slots. DPCCH and DPDCH gain factors( $\beta_c$ ,  $\beta_d$ ), and HS-DPCCH power offset parameters ( $\Delta_{ACK}$ ,  $\Delta_{NACK}$ ,  $\Delta_{CQI}$ ) should be set according to values indicated in the Table below. The CQI value is determined by the UE category, transport block size, number of HS-PDSCHs and modulation used in the H-set.

**Table 5.2: Subtests for UMTS Release 5 HSDPA**

| Sub-set | $\beta_c$         | $\beta_d$         | $\beta_d$<br>(SF) | $\beta_c/\beta_d$ | $\beta_{hs}$<br>(note 1, note 2) | CM(dB)<br>(note 3) | MPR(dB) |
|---------|-------------------|-------------------|-------------------|-------------------|----------------------------------|--------------------|---------|
| 1       | 2/15              | 15/15             | 64                | 2/15              | 4/15                             | 0.0                | 0.0     |
| 2       | 12/15<br>(note 4) | 15/15<br>(note 4) | 64                | 12/15<br>(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     |

Note1:  $\Delta_{ACK}$ ,  $\Delta_{NACK}$  and  $\Delta_{CQI} = 8 \Leftrightarrow A_{hs} = \beta_{hs}/\beta_c = 30/15 \Leftrightarrow \beta_{hs} = 30/15 * \beta_c$   
 Note2: CM=1 for  $\beta_c/\beta_d = 12/15$ ,  $\beta_{hs}/\beta_c = 24/15$ .  
 Note3: 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 signaled gain factors for the reference TFC (TFC1,TF1) to  $\beta_c=11/15$  and  $\beta_d=15/15$ .

### 5.2.2.5 Release 6 HSUPA Test Configuration

The 3G SAR test reduction procedure is applied to HSPA (HSUPA/HSDPA with RMC) body-worn

accessory configurations with 12.2 kbps RMC as the primary mode. Otherwise, SAR is measured for HSPA using the HSPA body SAR procedures in the “Release 6 HSPA Data Devices” section of this document, for the highest body-worn accessory exposure SAR configuration in 12.2 kbps RMC. When VOIP is applicable for next to the ear head exposure in HSPA, the 3G SAR test reduction procedure is applied to HSPA with 12.2 kbps RMC as the primary mode; otherwise, the same HSPA configuration used for body-worn accessory measurements is tested for next to the ear head exposure.

Due to inner loop power control requirements in HSPA, a communication test set is required for output power and SAR tests. The 12.2 kbps RMC, FRC H-set 1 and E-DCH configurations for HSPA are configured according to the  $\beta$  values indicated in Table 2 and other applicable procedures described in the ‘WCDMA EUT and ‘Release 5 HSDPA Data Devices’ sections of this document

**Table 5.3: Sub-Test 5 Setup for Release 6 HSUPA**

| Sub-set | $\beta_c$            | $\beta_d$            | $\beta_d$ (SF) | $\beta_c/\beta_d$    | $\beta_{hs}^{(1)}$ | $\beta_{ec}$ | $\beta_{ed}$                               | $\beta_{ed}$ (SF) | $\beta_{ed}$ (codes) | CM <sup>(2)</sup> (dB) | MPR (dB) | AG <sup>(4)</sup> Index | E-TFCI |
|---------|----------------------|----------------------|----------------|----------------------|--------------------|--------------|--|-------------------|----------------------|------------------------|----------|-------------------------|--------|
| 1       | 11/15 <sup>(3)</sup> | 15/15 <sup>(3)</sup> | 64             | 11/15 <sup>(3)</sup> | 22/15              | 209/225      | 1039/225                                   | 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        | $\beta_{ed1}$ 47/15<br>$\beta_{ed2}$ 47/15 | 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 <sup>(4)</sup> | 15/15 <sup>(4)</sup> | 64             | 15/15 <sup>(4)</sup> | 30/15              | 24/15        | 134/15                                     | 4                 | 1                    | 1.0                    | 0.0      | 21                      | 81     |

Note 1:  $\Delta_{ACK}$ ,  $\Delta_{NACK}$  and  $\Delta_{CQI} = 8 \Leftrightarrow A_{hs} = \beta_{hs}/\beta_c = 30/15 \Leftrightarrow \beta_{hs} = 30/15 * \beta_c$ .

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 signaled gain factors for the reference TFC (TF1, TF1) to  $\beta_c = 10/15$  and  $\beta_d = 15/15$ .

Note 4: For subtest 5 the  $\beta_c/\beta_d$  ratio of 15/15 for the TFC during the measurement period (TF1, TF0) is achieved by setting the signaled gain factors for the reference TFC (TF1, TF1) to  $\beta_c = 14/15$  and  $\beta_d = 15/15$ .

Note 5: Testing UE using E-DPDCH Physical Layer category 1 Sub-test 3 is not required according to TS 25.306 Figure 5.1g.

Note 6:  $\beta_{ed}$  can not be set directly; it is set by Absolute Grant Value.

**Table 5.4: HSUPA UE category**

| UE E-DCH Category | Maximum E-DCH Codes Transmitted | Number of HARQ Processes | E-DCH TTI (ms) | Minimum Spreading Factor | Maximum E-DCH Transport Block Bits | Max Rate (Mbps) |
|-------------------|---------------------------------|--------------------------|----------------|--------------------------|------------------------------------|-----------------|
| 1                 | 1                               | 4                        | 10             | 4                        | 7110                               | 0.7296          |
| 2                 | 2                               | 8                        | 2              | 4                        | 2798                               | 1.4592          |
|                   | 2                               | 4                        | 10             | 4                        | 14484                              |                 |
| 3                 | 2                               | 4                        | 10             | 4                        | 14484                              | 1.4592          |



|   |   |   |    |               |       |        |
|---|---|---|----|---------------|-------|--------|
| 4   | 2 | 8 | 2  | 2             | 5772  | 2.9185 |
|   | 2 | 4 | 10 | 2             | 20000 | 2.00   |
| 5   | 2 | 4 | 10 | 2             | 20000 | 2.00   |
| 6<br>(No DPDCH)   | 4 | 8 | 2  | 2 SF2 & 2 SF4 | 11484 | 5.76   |
|   | 4 | 4 | 10 |               | 20000 | 2.00   |
| 7<br>(No DPDCH)   | 4 | 8 | 2  | 2 SF2 & 2 SF4 | 22996 | ?      |
|   | 4 | 4 | 10 |               | 20000 | ?      |
| NOTE: When 4 codes are transmitted in parallel, two codes shall be transmitted with SF2 and two with SF4.<br>UE Categories 1 to 6 supports QPSK only. UE Category 7 supports QPSK and 16QAM. (TS25.306-7.3.0) |   |   |    |               |       |        |

### 5.2.2.6 HSPA and DC-HSDPA Test Configuration

SAR test exclusion may apply to 3GPP Rel. 6 HSPA and Rel. 8 DC-HSDPA. When SAR measurement is required for HSPA or DC-HSDPA, a KDB inquiry is required to confirm that the wireless mode configurations in the test setup have remained stable throughout the SAR measurements. Without prior KDB confirmation to determine the SAR results are acceptable, a PAG is required for equipment approval.

SAR test exclusion for HSPA and DC-HSDPA is determined according to the following:

- 1) The HSPA procedures are applied to configure 3GPP Rel. 6 HSPA devices in the required sub-test mode(s) to determine SAR test exclusion.
- 2) SAR is required for Rel. 8 DC-HSDPA when SAR is required for Rel. 5 HSDPA; otherwise, the 3G SAR test reduction procedure is applied to DC-HSDPA with 12.2 kbps RMC as the primary mode. Power is measured for DC-HSDPA according to the H-Set 12, FRC configuration in Table C.8.1.12 of 3GPP TS 34.121-1 to determine SAR test reduction. A primary and a secondary serving HS-DSCH Cell are required to perform the power measurement and for the results to be acceptable.
- 3) Regardless of whether a PBA is required, the following information must be verified and included in the SAR report for devices supporting HSPA or DC-HSDPA:
  - a) The output power measurement results and applicable release version(s) of 3GPP TS 34.121.
  - i) Power measurement difficulties due to test equipment setup or availability must be resolved between the grantee and its test lab.
  - b) The power measurement results are in agreement with the individual device implementation and specifications. When Enhanced MPR (E-MPR) applies, the normal MPR targets may be modified according to the Cubic Metric (CM) measured by the device, which must be taken into consideration.
  - c) The UE category, operating parameters, such as the  $\beta$  and  $\Delta$  values used to configure the device for testing, power setback procedures described in 3GPP TS 34.121 for the power measurements, and HSPA channel conditions (active and stable) for the entire duration of the measurement according to the required E-TFCI and AG index values.
- 4) When SAR measurement is required, the test configurations, procedures and power measurement results must be clearly described to confirm that the required test parameters are used, including E-TFCI and AG index stability and output power conditions.

**Table 5.5: HS-DSCH UE category**



Table 5.1a: FDD HS-DSCH physical layer categories

| HS-DSCH category      | Maximum number of HS-DSCH codes received | Minimum inter-TTI interval | Maximum number of bits of an HS-DSCH transport block received within an HS-DSCH TTI<br>NOTE 1 | Total number of soft channel bits | Supported modulations without MIMO operation or dual cell operation | Supported modulations with MIMO operation and without dual cell operation | Supported modulations with dual cell operation     |
|-----------------------|--|----------------------------|---|-----------------------------------|---|---|--|
| Category 1            | 5  | 3                          | 7298  | 19200                             | QPSK, 16QAM   | Not applicable (MIMO not supported)                                       | Not applicable (dual cell operation not supported) |
| Category 2            | 5  | 3                          | 7298  | 28800                             |   |   |  |
| Category 3            | 5  | 2                          | 7298  | 28800                             |   |   |  |
| Category 4            | 5  | 2                          | 7298  | 38400                             |   |   |  |
| Category 5            | 5  | 1                          | 7298  | 57600                             |   |   |  |
| Category 6            | 5  | 1                          | 7298  | 67200                             |   |   |  |
| Category 7            | 10                                       | 1                          | 14411   | 115200                            |   |   |  |
| Category 8            | 10                                       | 1                          | 14411   | 134400                            |   |   |  |
| Category 9            | 15                                       | 1                          | 20251   | 172800                            |   |   |  |
| Category 10           | 15                                       | 1                          | 27952   | 172800                            |   |   |  |
| Category 11           | 5  | 2                          | 3630  | 14400                             | QPSK  | Not applicable (dual cell operation not supported)                        |  |
| Category 12           | 5  | 1                          | 3630  | 28800                             | QPSK, 16QAM, 64QAM  |   |  |
| Category 13           | 15                                       | 1                          | 35280   | 259200                            |   |   |  |
| Category 14           | 15                                       | 1                          | 42192   | 259200                            | QPSK, 16QAM   |   |  |
| Category 15           | 15                                       | 1                          | 23370   | 345600                            |   |   |  |
| Category 16           | 15                                       | 1                          | 27952   | 345600                            | QPSK, 16QAM   |   |  |
| Category 17<br>NOTE 2 | 15                                       | 1                          | 35280   | 259200                            | QPSK, 16QAM, 64QAM  |   | -  |
|                       |  |                            | 23370   | 345600                            | -   |   | QPSK, 16QAM  |
| Category 18<br>NOTE 3 | 15                                       | 1                          | 42192   | 259200                            | QPSK, 16QAM, 64QAM  |   | -  |
|                       |  |                            | 27952   | 345600                            | -   |   | QPSK, 16QAM  |
| Category 19           | 15                                       | 1                          | 35280   | 518400                            | QPSK, 16QAM, 64QAM  |   |  |
| Category 20           | 15                                       | 1                          | 42192   | 518400                            | QPSK, 16QAM, 64QAM  |   |  |
| Category 21           | 15                                       | 1                          | 23370   | 345600                            | -   | -   | QPSK, 16QAM  |
| Category 22           | 15                                       | 1                          | 27952   | 345600                            |   |   |  |
| Category 23           | 15                                       | 1                          | 35280   | 518400                            |   |   |  |
| Category 24           | 15                                       | 1                          | 42192   | 518400                            |   |   |  |

### 5.3.3 LTE Test Configuration

LTE modes were tested according to FCC KDB 941225 D05 publication. Please see notes after the tabulated SAR data for required test configurations. Establishing connections with base station simulators ensure a consistent means for testing SAR and are recommended for evaluating SAR [4]. The R&S CMW500 was used for LTE output power measurements and SAR testing. Max power control was used so the UE transmits with maximum output power during SAR testing. SAR must be measured with the maximum TTI (transmit time interval) supported by the device in each LTE configuration.

#### A) Spectrum Plots for RB Configurations

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

#### B) MPR

MPR is permanently implemented for this device by the manufacturer. The specific manufacturer target MPR is indicated alongside the SAR results. MPR is enabled for this device, according to 3GPP TS36.101 Section 6.2.3 – 6.2.5 under Table 6.2.3-1.

### **C)A-MPR**

A-MPR (Additional MPR) has been disabled for all SAR tests by setting NS=01 on the base station simulator.

### **D) Largest channel bandwidth standalone SAR test requirements**

#### 1) QPSK with 1 RB allocation

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

#### 2) QPSK with 50% RB allocation

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

#### 3) QPSK with 100% RB allocation

For QPSK with 100% RB allocation, SAR is not required when the highest maximum output power for 100 % RB allocation is less than the highest maximum output power in 50% and 1 RB allocations and the highest reported SAR for 1 RB and 50% RB allocation in 1) and 2) are  $\leq 0.8$  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) Higher order modulations

For each modulation besides QPSK; e.g., 16-QAM, 64-QAM, apply the QPSK procedures in above sections to determine the QAM configurations that may need SAR measurement. For each configuration identified as required for testing, SAR is required only when the highest maximum output power for the configuration in the higher order modulation is  $> \frac{1}{2}$  dB higher than the same configuration in QPSK or when the reported SAR for the QPSK configuration is  $> 1.45$  W/kg.

### **E) Other channel bandwidth standalone SAR test requirements**

For the other channel bandwidths used by the device in a frequency band, apply all the procedures required for the largest channel bandwidth in section A) to determine the channels and RB configurations that need SAR testing and only measure SAR when the highest maximum output power of a configuration requiring testing in the smaller channel bandwidth is  $> \frac{1}{2}$  dB higher than the equivalent channel configurations in the largest channel bandwidth configuration or the *reported* SAR of a configuration for the largest channel bandwidth is  $> 1.45$  W/kg.

### 5.3.4 Wi-Fi Test Configuration

SAR test reduction for 802.11 Wi-Fi transmission mode configurations are considered separately for DSSS and OFDM. An initial test position is determined to reduce the number of tests required for certain exposure configurations with multiple test positions. An initial test configuration is determined for each frequency band and aggregated band according to maximum output power, channel bandwidth, wireless mode configurations and other operating parameters to streamline the measurement requirements. For 2.4 GHz DSSS, either the initial test position or DSSS procedure is applied to reduce the number of SAR tests; these are mutually exclusive. For OFDM, an initial test position is only applicable to next to the ear, UMPC mini-tablet and hotspot mode configurations, which is tested using the initial test configuration to facilitate test reduction. For other exposure conditions with a fixed test position, SAR test reduction is determined using only the initial test configuration.

The multiple test positions require SAR measurements in head, hotspot mode or UMPC mini-tablet configurations may be reduced according to the highest reported SAR determined using the *initial test position(s)* by applying the DSSS or OFDM SAR measurement procedures in the required wireless mode test configuration(s). The *initial test position(s)* is measured using the highest measured maximum output power channel in the required wireless mode test configuration(s). When the *reported SAR* for the *initial test position* is:

- $\leq 0.4$  W/kg, further SAR measurement is not required for the other test positions in that exposure configuration and wireless mode combination within the frequency band or aggregated band. DSSS and OFDM configurations are considered separately according to the required SAR procedures.
- 0.4 W/kg, SAR is repeated using the same wireless mode test configuration tested in the *initial test position* to measure the subsequent next closet/smallest test separation distance and maximum coupling test position, on the highest maximum output power channel, until the *reported SAR* is  $\leq 0.8$  W/kg or all required test positions are tested.
  - ◇ For subsequent test positions with equivalent test separation distance or when exposure is dominated by coupling conditions, the position for maximum coupling condition should be tested.
  - ◇ When it is unclear, all equivalent conditions must be tested.
- For all positions/configurations tested using the *initial test position* and subsequent test positions, when the *reported SAR* is  $> 0.8$  W/kg, measure the SAR for these positions/configurations on the subsequent next highest measured output power channel(s) until the *reported SAR* is  $\leq 1.2$  W/kg or all required test channels are considered.
  - ◇ The additional power measurements required for this step should be limited to those necessary for identifying subsequent highest output power channels to apply the test reduction.

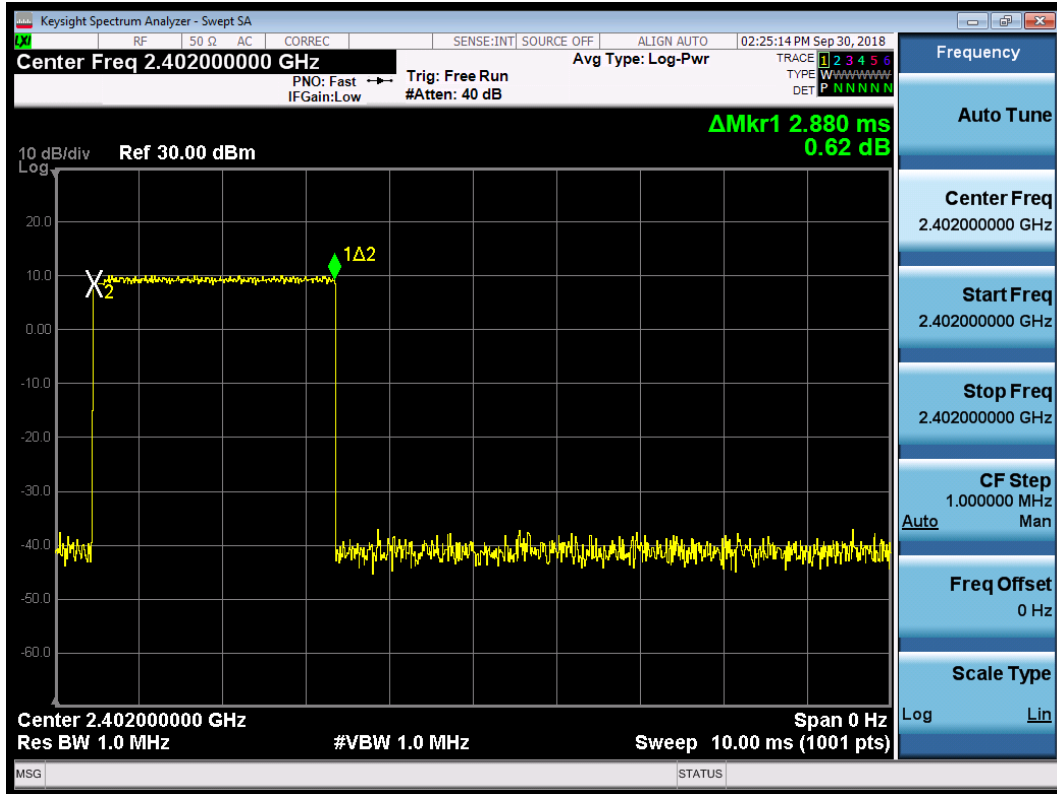
To determine the initial test position, Area Scans were performed to determine the position with the Maximum Value of SAR (measured). The position that produced the highest Maximum Value of SAR is considered the worst case position; thus used as the initial test position.

A Wi-Fi device must be configured to transmit continuously at the required data rate, channel bandwidth and signal modulation, using the highest transmission duty factor supported by the test mode tools for SAR measurement.

### 5.3.5 BT Test Configuration

For BT SAR testing, BT engineering testing software installed on the EUT can provide continuous transmitting RF signal with maximum output power. And the CBT control the EUT operating with hopping off and data rate set for 3DH5.

The SAR measurement takes full account of the BT duty cycle and is reflected in the report, and the duty factor of the device is as follow:

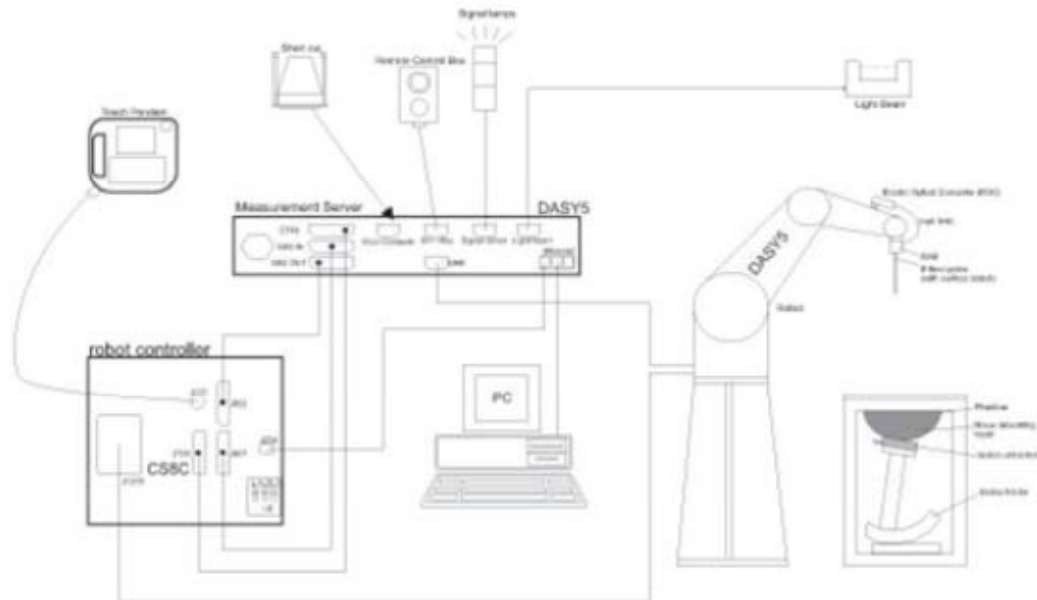


Note: Duty factor= Ton (ms)/ T(on+off) (ms)=2.880/3.760=76.6%

## 6 SAR Measurements System Configuration

### 6.1 SAR Measurement Set-up

The DASY system 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 DASY 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.

## 6.2 DASY5 E-field Probe System

The SAR measurements were conducted with the dosimetric probe ES3DV3 /EX3DV4 (manufactured by SPEAG), designed in the classical triangular configuration and optimized for dosimetric evaluation.

### ES3DV3 Probe Specification

|               |  |
|---------------|--|
| Construction  | Symmetrical 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) |
| Calibration   | ISO/IEC 17025 calibration service available  |
| Frequency     | 10 MHz to 4 GHz<br>Linearity: $\pm 0.2$ dB<br>(30 MHz to 4 GHz)  |
| Directivity   | $\pm 0.2$ dB in HSL (rotation around probe axis) $\pm 0.3$ dB in tissue material (rotation normal to probe axis)   |
| Dynamic Range | 5 $\mu$ W/g to > 100 mW/g Linearity: $\pm 0.2$ dB  |
| Dimensions    | Overall length: 330 mm (Tip: 20 mm) Tip diameter: 3.9 mm (Body: 12 mm) Distance from probe tip to dipole centers: 2.0 mm   |
| Application   | General dosimetry up to 4 GHz<br>Dosimetry in strong gradient fields<br>Compliance tests of mobile phones  |



### EX3DV4 Probe Specification

|              |   |
|--------------|---|
| Construction | Symmetrical design with triangular core<br>Built-in shielding against static charges<br>PEEK enclosure material (resistant to organic solvents, e.g., DGBE) |
| Calibration  | ISO/IEC 17025 calibration service available   |
| Frequency    | 10 MHz to > 6 GHz<br>Linearity: $\pm 0.2$ dB<br>(30 MHz to 6 GHz)   |
| Directivity  | $\pm 0.3$ dB in HSL (rotation around probe  |



|               |  |
|---------------|--|
|               | axis) ± 0.5 dB in tissue material (rotation normal to probe axis)  |
| Dynamic Range | 10 μW/g to > 100 mW/g Linearity: ± 0.2dB (noise: typically < 1 μW/g)   |
| Dimensions    | Overall length: 330 mm (Tip: 20 mm) Tip diameter: 2.5 mm (Body: 12 mm)<br>Typical distance from probe tip to dipole centers: 1 mm  |
| Application   | High precision dosimetric measurements in any exposure Scenario (e.g., very strong gradient fields). Only probe which enables compliance testing for frequencies up to 6 GHz with precision of better 30%. |



**E-field Probe Calibration**

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

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

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

$$SAR=C\Delta T/\Delta t$$

Where: Δt = Exposure time (30 seconds),  
 C = Heat capacity of tissue (brain or muscle),  
 ΔT = Temperature increase due to RF exposure.

Or

$$SAR=|E|^2\sigma/\rho$$

Where: σ = Simulated tissue conductivity,  
 ρ = Tissue density (kg/m<sup>3</sup>).

### 6.3 SAR Measurement Procedure

#### 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.

#### 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 dB) is specified in the standards for compliance testing. For example, a 2 dB range is required in IEEE standard 1528 and IEC 62209 standards, whereby 3 dB is a requirement when compliance is assessed in accordance with the ARIB standard (Japan), if only one zoom scan follows the area scan, then only the absolute maximum will be taken as reference. For cases where multiple maximums are detected, the number of zoom scans has to be increased accordingly.

Area scan parameters extracted from FCC KDB 865664 D01 SAR measurement 100 MHz to 6 GHz.

|  | ≤3 GHz  | > 3 GHz  |
|--|---|--|
| Maximum distance from closest measurement point (geometric center of probe sensors) to phantom surface | 5 ± 1 mm  | $\frac{1}{2} \cdot \delta \cdot \ln(2) \pm 0.5 \text{ mm}$ |
| Maximum probe angle from probe axis to phantom surface normal at the measurement location              | 30° ± 1°  | 20° ± 1°   |
| Maximum area scan spatial resolution:<br>ΔxArea, ΔyArea  | ≤ 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. |  |



### Zoom Scan

Zoom scans are used to 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 whose base faces are centered on the maxima found in a preceding area scan job within the same procedure. When the measurement is done, the zoom scan evaluates the averaged SAR for 1 gram and 10 gram and displays these values next to the job's label.

Zoom scan parameters extracted from FCC KDB 865664 D01 SAR measurement 100 MHz to 6 GHz.

|   |                                    |  | ≤3GHz                          | > 3 GHz   |
|---|------------------------------------|--|--------------------------------|---|
| Maximum zoom scan spatial resolution: $\Delta x_{zoom} \Delta y_{zoom}$   |                                    |  | ≤2GHz: ≤8mm<br>2 – 3GHz: ≤5mm* | 3 – 4GHz: ≤5mm*<br>4 – 6GHz: ≤4mm*                    |
| Maximum zoom scan spatial resolution, normal to phantom surface   | Uniform grid: $\Delta z_{zoom}(n)$ |  | ≤5mm                           | 3 – 4GHz: ≤4mm<br>4 – 5GHz: ≤3mm<br>5 – 6GHz: ≤2mm    |
|   | Graded grid                        | $\Delta z_{zoom}(1)$ : between 1 <sup>st</sup> two points closest to phantom surface | ≤4mm                           | 3 – 4GHz: ≤3mm<br>4 – 5GHz: ≤2.5mm<br>5 – 6GHz: ≤2mm  |
|   |                                    | $\Delta z_{zoom}(n > 1)$ : between subsequent points                                 | ≤1.5 • $\Delta z_{zoom}(n-1)$  |   |
| Minimum zoom scan volume  | X, y, z                            |  | ≥30mm                          | 3 – 4GHz: ≥28mm<br>4 – 5GHz: ≥25mm<br>5 – 6GHz: ≥22mm |
| <p>Note: <math>\delta</math> is the penetration depth of a plane-wave at normal incidence to the tissue medium; see draft standard IEEE P1528-2011 for details.</p> <p>* When zoom scan is required and the <u>reported</u> SAR from the <i>area scan based 1-g SAR estimation</i> procedures of KDB 447498 is ≤ 1.4W/kg, ≤8mm, ≤7mm and ≤5mm zoom scan resolution may be applied, respectively, for 2GHz to 3GHz, 3GHz to 4GHz and 4GHz to 6GHz.</p> |                                    |  |                                |   |

### 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.

### 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.

## 7 Main Test Equipment

| Name of Equipment                   | Manufacturer    | Type/Model | Serial Number | Last Cal.  | Cal. Due Date |
|-------------------------------------|-----------------|------------|---------------|------------|---------------|
| Network analyzer                    | Agilent         | E5071B     | MY42404014    | 2018-05-20 | 2019-05-19    |
| Dielectric Probe Kit                | HP              | 85070E     | US44020115    | 2018-05-20 | 2019-05-19    |
| Power meter                         | Agilent         | E4417A     | GB41291714    | 2018-05-21 | 2019-05-20    |
| Power sensor                        | Agilent         | N8481H     | MY50350004    | 2018-05-21 | 2019-05-20    |
| Power sensor                        | Agilent         | E9327A     | US40441622    | 2018-05-20 | 2019-05-19    |
| Dual directional coupler            | Agilent         | 778D-012   | 50519         | 2018-05-21 | 2019-05-20    |
| Dual directional coupler            | Agilent         | 777D       | 50146         | 2018-05-20 | 2019-05-19    |
| Amplifier                           | INDEXSAR        | IXA-020    | 0401          | 2018-05-20 | 2019-05-19    |
| Wideband radio communication tester | R&S             | CMW 500    | 113645        | 2018-05-20 | 2019-05-19    |
| BT Base Station Simulator           | R&S             | CBT        | 100271        | 2018-05-14 | 2019-05-13    |
| Dosimetric E-Field Probe            | SPEAG           | ES3DV3     | 3089          | 2018-03-28 | 2019-03-27    |
| E-field Probe                       | SPEAG           | EX3DV4     | 3677          | 2018-05-29 | 2019-05-28    |
| Data Acquisition Electronics        | SPEAG           | DAE4       | 662           | 2018-5-11  | 2019-5-10     |
| DAE                                 | SPEAG           | DAE4       | 1317          | 2018-03-23 | 2019-03-22    |
| System Validation Dipole            | SPEAG           | D835V2     | 4d092         | 2018-06-20 | 2020-06-19    |
| System Validation Dipole            | SPEAG           | D1800V2    | 2d150         | 2018-05-23 | 2020-05-22    |
| System Validation Dipole            | SPEAG           | D1900V2    | 5d018         | 2018-06-21 | 2020-06-22    |
| System Validation Dipole            | SPEAG           | D2600V2    | 1058          | 2018-06-29 | 2020-06-28    |
| Validation Kit 2450MHz              | SPEAG           | D2450V2    | 786           | 2017-08-29 | 2020-08-28    |
| Temperature Probe                   | Tianjin jinming | JM222      | AA1009129     | 2018-05-17 | 2019-05-16    |
| Hygrothermograph                    | Anymetr         | NT-311     | 20150731      | 2018-05-17 | 2019-05-16    |

## 8 Tissue Dielectric Parameter Measurements & System Verification

### 8.1 Tissue Verification

The temperature of the tissue-equivalent medium used during measurement must also be within 18°C to 25°C and within ± 2°C of the temperature when the tissue parameters are characterized. The dielectric parameters must be measured before the tissue-equivalent medium is used in a series of SAR measurements. The parameters should be re-measured after each 3 – 4 days of use; or earlier if the dielectric parameters can become out of tolerance.

#### Target values

| Frequency (MHz) | Water (%) | Salt (%) | Sugar (%) | Glycol (%) | Preventol (%) | Cellulose (%) | $\epsilon_r$ | $\sigma$ (s/m) |      |
|-----------------|-----------|----------|-----------|------------|---------------|---------------|--------------|----------------|------|
| Head            | 835       | 41.45    | 1.45      | 56         | 0             | 0.1           | 1.0          | 41.5           | 0.90 |
|                 | 1800      | 55.24    | 0.31      | 0          | 44.45         | 0             | 0            | 40.0           | 1.40 |
|                 | 1900      | 55.242   | 0.306     | 0          | 44.452        | 0             | 0            | 40.0           | 1.40 |
|                 | 2450      | 62.7     | 0.5       | 0          | 36.8          | 0             | 0            | 39.2           | 1.80 |
|                 | 2600      | 55.242   | 0.306     | 0          | 44.452        | 0             | 0            | 39.0           | 1.96 |
| Body            | 835       | 52.5     | 1.4       | 45         | 0             | 0.1           | 1.0          | 55.2           | 0.97 |
|                 | 1800      | 69.91    | 0.12      | 0          | 29.97         | 0             | 0            | 53.3           | 1.52 |
|                 | 1900      | 69.91    | 0.13      | 0          | 29.96         | 0             | 0            | 53.3           | 1.52 |
|                 | 2450      | 73.2     | 0.1       | 0          | 26.7          | 0             | 0            | 52.7           | 1.95 |
|                 | 2600      | 72.6     | 0.1       | 0          | 27.3          | 0             | 0            | 52.5           | 2.16 |

#### Measurements results

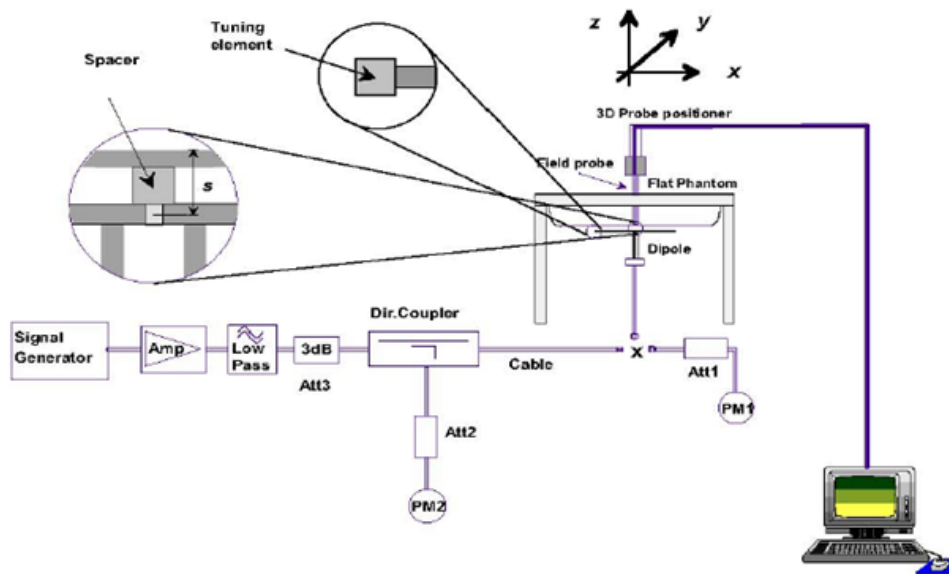
| Frequency (MHz) | Test Date | Temp °C    | Measured Dielectric Parameters |                | Target Dielectric Parameters |                | Limit (Within ±5%)   |                  |      |
|-----------------|-----------|------------|--------------------------------|----------------|------------------------------|----------------|----------------------|------------------|------|
|                 |           |            | $\epsilon_r$                   | $\sigma$ (s/m) | $\epsilon_r$                 | $\sigma$ (s/m) | Dev $\epsilon_r$ (%) | Dev $\sigma$ (%) |      |
| 835             | Head      | 10/27/2018 | 21.5                           | 42.9           | 0.92                         | 41.5           | 0.90                 | 3.37             | 2.22 |
|                 | Body      | 10/18/2018 | 21.5                           | 55.6           | 0.98                         | 55.2           | 0.97                 | 0.72             | 1.03 |
| 1800            | Head      | 10/26/2018 | 21.5                           | 41.0           | 1.44                         | 40.0           | 1.40                 | 2.50             | 2.86 |
|                 | Body      | 10/22/2018 | 21.5                           | 52.3           | 1.58                         | 53.3           | 1.52                 | -1.88            | 3.95 |
| 1900            | Head      | 10/28/2018 | 21.5                           | 40.6           | 1.43                         | 40.0           | 1.40                 | 1.50             | 2.14 |
|                 | Body      | 10/19/2018 | 21.5                           | 54.5           | 1.55                         | 53.3           | 1.52                 | 2.25             | 1.97 |
| 2450            | Head      | 10/29/2018 | 21.5                           | 39.7           | 1.85                         | 39.2           | 1.80                 | 1.28             | 2.78 |
|                 | Body      | 10/29/2018 | 21.5                           | 51.1           | 1.97                         | 52.7           | 1.95                 | -3.04            | 1.03 |
| 2600            | Head      | 10/26/2018 | 21.5                           | 38.3           | 2.05                         | 39.0           | 1.96                 | -1.79            | 4.59 |
|                 | Body      | 10/25/2018 | 21.5                           | 52.4           | 2.20                         | 52.5           | 2.16                 | -0.19            | 1.85 |

Note: The depth of tissue-equivalent liquid in a phantom must be ≥ 15.0 cm for SAR measurements ≤ 3 GHz and ≥ 10.0 cm for measurements > 3 GHz.

## 8.2 System Performance Check

The manufacturer calibrates the probes annually. Dielectric parameters of the tissue simulates were measured using the dielectric probe kit and the network analyzer. A system check measurement for every day was made following the determination of the dielectric parameters of the Tissue simulates, using the dipole validation kit. The dipole antenna was placed under the flat section of the twin SAM phantom.

System check is performed regularly on all frequency bands where tests are performed with the DASY system.



Picture 1 System Performance Check setup



Picture 2 Setup Photo

### Justification for Extended SAR Dipole Calibrations

Usage of SAR dipoles calibrated less than 3 years ago but more than 1 year ago were confirmed in maintaining return loss (< - 20 dB, within 20% of prior calibration) and impedance (within 5 ohm from prior calibration) requirements per extended calibrations in KDB 865664 D01:

| Dipole                        |        | Date of Measurement | Return Loss(dB) | Δ %  | Impedance (Ω) | ΔΩ    |
|-------------------------------|--------|---------------------|-----------------|------|---------------|-------|
| Dipole<br>D1750V2<br>SN: 1033 | Head   | 1/10/2017           | -40.3           | /    | 49.8          | /     |
|                               | Liquid | 1/9/2018            | -40.0           | 0.7% | 49.9          | 0.1Ω  |
|                               | Body   | 1/10/2017           | -35.0           | /    | 44.7          | /     |
|                               | Liquid | 1/9/2018            | -34.7           | 0.9% | 44.9          | -0.2Ω |

### System Check results

| Frequency (MHz) | Test Date | Temp °C    | 250mW/100mW Measured SAR <sub>1g</sub> (W/kg) | 1W Normalized SAR <sub>1g</sub> (W/kg) | 1W Target SAR <sub>1g</sub> (W/kg) | Δ % (Limit ±10%) |       |
|-----------------|-----------|------------|---|--|------------------------------------|------------------|-------|
| 835             | Head      | 10/27/2018 | 21.5  | 0.96                                   | 9.64                               | 9.40             | 2.55  |
|                 | Body      | 10/18/2018 | 21.5  | 0.93                                   | 9.27                               | 9.68             | -4.24 |
| 1750            | Head      | 10/26/2018 | 21.5  | 3.93                                   | 39.30                              | 39.90            | -1.50 |
|                 | Body      | 10/22/2018 | 21.5  | 4.14                                   | 41.40                              | 39.90            | 3.76  |
| 1900            | Head      | 10/28/2018 | 21.5  | 4.22                                   | 42.20                              | 40.10            | 5.24  |
|                 | Body      | 10/19/2018 | 21.5  | 4.14                                   | 41.40                              | 39.50            | 4.81  |
| 2450            | Head      | 10/29/2018 | 21.5  | 13.70                                  | 54.80                              | 52.60            | 4.18  |
|                 | Body      | 10/29/2018 | 21.5  | 12.50                                  | 50.00                              | 50.80            | -1.57 |
| 2600            | Head      | 10/26/2018 | 21.5  | 5.40                                   | 54.00                              | 55.80            | -3.23 |
|                 | Body      | 10/25/2018 | 21.5  | 5.47                                   | 54.70                              | 54.40            | 0.55  |

Note: Target Values used derive from the calibration certificate Data Storage and Evaluation.

## 9 Normal and Maximum Output Power

KDB 447498 D01 at the maximum rated output power and within the tune-up tolerance range specified for the product, but not more than 2 dB lower than the maximum tune-up tolerance limit.

### 9.1 GSM Mode

| GSM 850                  |            | Burst-Averaged output power(dBm) |                       |               |                | Division | Frame-Averaged output power(dBm) |                       |               |                |
|--------------------------|------------|----------------------------------|-----------------------|---------------|----------------|----------|----------------------------------|-----------------------|---------------|----------------|
|                          |            | Tune-up                          | Channel/Frenqucy(MHz) |               |                |          | Tune-up                          | Channel/Frenqucy(MHz) |               |                |
|                          |            | MAX                              | 128<br>/824.2         | 190<br>/836.6 | 251<br>/848.8  | Factors  | MAX                              | 128<br>/824.2         | 190<br>/836.6 | 251<br>/848.8  |
| GSM                      | CS         | 33.50                            | 33.21                 | 33.24         | 33.19          | 9.03     | 24.47                            | 24.18                 | 24.21         | 24.16          |
| GPRS/<br>EGPRS<br>(GMSK) | 1 Tx Slot  | 33.50                            | 33.25                 | 33.28         | 33.15          | 9.03     | 24.47                            | 24.22                 | 24.25         | 24.12          |
|                          | 2 Tx Slots | 32.50                            | 32.12                 | 32.28         | 32.21          | 6.02     | 26.48                            | 26.10                 | 26.26         | 26.19          |
|                          | 3 Tx Slots | 31.50                            | 30.76                 | 30.94         | 30.87          | 4.26     | 27.24                            | 26.50                 | 26.68         | 26.61          |
|                          | 4 Tx Slots | 30.50                            | 30.26                 | 30.41         | 30.27          | 3.01     | <b>27.49</b>                     | <b>27.25</b>          | <b>27.40</b>  | <b>27.26</b>   |
| EGPRS<br>(8PSK)          | 1 Tx Slot  | 27.50                            | 26.43                 | 26.62         | 26.53          | 9.03     | 18.47                            | 17.40                 | 17.59         | 17.50          |
|                          | 2 Tx Slots | 26.50                            | 25.74                 | 25.90         | 25.85          | 6.02     | 20.48                            | 19.72                 | 19.88         | 19.83          |
|                          | 3 Tx Slots | 25.50                            | 25.09                 | 25.49         | 25.29          | 4.26     | 21.24                            | 20.83                 | 21.23         | 21.03          |
|                          | 4 Tx Slots | 24.50                            | 24.06                 | 23.88         | 24.12          | 3.01     | 21.49                            | 21.05                 | 20.87         | 21.11          |
| GSM 1900                 |            | Burst-Averaged output power(dBm) |                       |               |                | Division | Frame-Averaged output power(dBm) |                       |               |                |
|                          |            | Tune-up                          | Channel/Frenqucy(MHz) |               |                |          | Tune-up                          | Channel/Frenqucy(MHz) |               |                |
|                          |            | MAX                              | 512<br>/1850.2        | 661<br>/1880  | 810<br>/1909.8 | Factors  | MAX                              | 512<br>/1850.2        | 661<br>/1880  | 810<br>/1909.8 |
| GSM                      | CS         | 30.50                            | 29.50                 | 29.75         | 30.06          | 9.03     | 21.47                            | 20.47                 | 20.72         | 21.03          |
| GPRS/<br>EGPRS<br>(GMSK) | 1 Tx Slot  | 30.50                            | 29.59                 | 29.81         | 30.09          | 9.03     | 21.47                            | 20.56                 | 20.78         | 21.06          |
|                          | 2 Tx Slots | 29.50                            | 28.72                 | 28.50         | 28.83          | 6.02     | 23.48                            | 22.70                 | 22.48         | 22.81          |
|                          | 3 Tx Slots | 27.50                            | 26.80                 | 26.82         | 26.70          | 4.26     | 23.24                            | 22.54                 | 22.56         | 22.44          |
|                          | 4 Tx Slots | 26.50                            | 25.68                 | 25.68         | 25.52          | 3.01     | <b>23.49</b>                     | <b>22.67</b>          | <b>22.67</b>  | <b>22.51</b>   |
| EGPRS<br>(8PSK)          | 1 Tx Slot  | 26.50                            | 25.45                 | 25.42         | 25.73          | 9.03     | 17.47                            | 16.42                 | 16.39         | 16.70          |
|                          | 2 Tx Slots | 26.00                            | 25.42                 | 25.03         | 25.62          | 6.02     | 19.98                            | 19.40                 | 19.01         | 19.60          |
|                          | 3 Tx Slots | 25.00                            | 24.34                 | 24.72         | 24.54          | 4.26     | 20.74                            | 20.08                 | 20.46         | 20.28          |
|                          | 4 Tx Slots | 25.00                            | 24.41                 | 24.83         | 24.58          | 3.01     | 21.99                            | 21.40                 | 21.82         | 21.57          |

Notes: The worst-case configuration and mode for SAR testing is determined to be as follows:  
 1. Standalone: GSM 850 GMSK (GPRS) mode with 4 time slots for Max power, GSM 1900 GMSK (GPRS) mode with 4 time slots for Max power, based on the output power measurements above.

## 9.2 WCDMA Mode

The following tests were completed according to the test requirements outlined in the 3GPP TS34.121 specification.

| WCDMA          |          | Band II(dBm) |       |        |         | Band IV(dBm) |        |        |         |
|----------------|----------|--------------|-------|--------|---------|--------------|--------|--------|---------|
| Tx Channel     |          | 9262         | 9400  | 9538   | Tune-up | 1312         | 1413   | 1513   | Tune-u  |
| Frequency(MHz) |          | 1852.4       | 1880  | 1907.6 | Limit   | 1712.4       | 1732.6 | 1752.6 | p Limit |
| RMC            | 12.2kbps | 23.27        | 23.41 | 23.25  | 23.50   | 23.58        | 23.38  | 23.50  | 24.00   |
| AMR            | 12.2kbps | 23.20        | 23.36 | 23.17  | 23.50   | 23.48        | 23.29  | 23.37  | 24.00   |
| HSDPA          | Sub 1    | 22.23        | 22.33 | 22.19  | 22.50   | 22.50        | 22.30  | 22.42  | 23.00   |
|                | Sub 2    | 22.22        | 22.35 | 22.16  | 22.50   | 22.49        | 22.29  | 22.41  | 23.00   |
|                | Sub 3    | 21.69        | 21.85 | 21.68  | 22.00   | 21.98        | 21.78  | 21.90  | 22.50   |
|                | Sub 4    | 21.70        | 21.86 | 21.66  | 22.00   | 21.97        | 21.77  | 21.89  | 22.50   |
| HSUPA          | Sub 1    | 22.19        | 22.32 | 22.14  | 22.50   | 22.46        | 22.26  | 22.38  | 23.00   |
|                | Sub 2    | 21.18        | 21.30 | 21.13  | 21.50   | 21.45        | 21.25  | 21.37  | 22.00   |
|                | Sub 3    | 21.65        | 21.78 | 21.62  | 22.00   | 21.93        | 21.74  | 21.86  | 22.50   |
|                | Sub 4    | 21.11        | 21.27 | 21.10  | 21.50   | 21.42        | 21.23  | 21.35  | 22.00   |
|                | Sub 5    | 22.12        | 22.25 | 22.08  | 22.50   | 22.41        | 22.22  | 22.34  | 23.00   |
| DC-HSDPA       | Sub 1    | 22.11        | 22.27 | 22.09  | 22.50   | 22.42        | 22.24  | 22.34  | 23.00   |
|                | Sub 2    | 22.10        | 22.26 | 22.08  | 22.50   | 22.41        | 22.23  | 22.33  | 23.00   |
|                | Sub 3    | 21.68        | 21.75 | 21.59  | 22.00   | 21.99        | 21.72  | 21.84  | 22.50   |
|                | Sub 4    | 21.67        | 21.74 | 21.58  | 22.00   | 21.98        | 21.71  | 21.83  | 22.50   |

Note: 1.Per KDB 941225 D01, SAR for each exposure is measured using a 12.2 kbps RMC with TPC bits configured to all "1's"

### 9.3 LTE Mode

UE Power Class: 3 (23 +/- 2dBm). The allowed Maximum Power Reduction (MPR) for the maximum output power due to higher order modulation and transmit bandwidth configuration (resource blocks) is specified in Table 6.2.3-1 of the 3GPP TS36.101.

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

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

| LTE FDD Band 2 |            |         |           | Conducted Power(dBm)    |            |              | Tune-up Limit |
|----------------|------------|---------|-----------|-------------------------|------------|--------------|---------------|
| Bandwidth      | Modulation | RB size | RB offset | Channel/Frequency (MHz) |            |              |               |
|                |            |         |           | 18607/1850.7            | 18900/1880 | 19193/1909.3 |               |
| 1.4MHz         | QPSK       | 1       | 0         | 23.63                   | 23.67      | 23.44        | 23.75         |
|                |            | 1       | 2         | 23.41                   | 23.53      | 23.47        | 23.75         |
|                |            | 1       | 5         | 23.36                   | 22.99      | 23.06        | 23.75         |
|                |            | 3       | 0         | 23.46                   | 23.33      | 23.27        | 23.75         |
|                |            | 3       | 2         | 23.37                   | 23.40      | 23.27        | 23.75         |
|                |            | 3       | 3         | 23.42                   | 23.10      | 23.13        | 23.75         |
|                |            | 6       | 0         | 22.39                   | 22.39      | 22.34        | 22.75         |
|                | 16QAM      | 1       | 0         | 23.04                   | 23.22      | 23.07        | 23.50         |
|                |            | 1       | 2         | 23.02                   | 23.03      | 23.04        | 23.50         |
|                |            | 1       | 5         | 22.73                   | 22.55      | 22.58        | 23.50         |
|                |            | 3       | 0         | 22.41                   | 22.31      | 22.31        | 23.50         |
|                |            | 3       | 2         | 22.40                   | 22.37      | 22.33        | 23.50         |
|                |            | 3       | 3         | 22.33                   | 22.19      | 22.17        | 23.50         |
|                |            | 6       | 0         | 21.45                   | 21.44      | 21.43        | 22.50         |
| Bandwidth      | Modulation | RB size | RB offset | Channel/Frequency (MHz) |            |              | Tune-up Limit |
|                |            |         |           | 18615/1851.5            | 18900/1880 | 19185/1908.5 |               |
| 3MHz           | QPSK       | 1       | 0         | 23.65                   | 23.71      | 23.47        | 23.75         |
|                |            | 1       | 7         | 23.44                   | 23.58      | 23.51        | 23.75         |
|                |            | 1       | 14        | 23.39                   | 23.04      | 23.10        | 23.75         |
|                |            | 8       | 0         | 22.56                   | 22.45      | 22.40        | 22.75         |
|                |            | 8       | 4         | 22.49                   | 22.50      | 22.39        | 22.75         |
|                |            | 8       | 7         | 22.52                   | 22.21      | 22.23        | 22.75         |
|                |            | 15      | 0         | 22.42                   | 22.43      | 22.37        | 22.75         |
|                | 16QAM      | 1       | 0         | 23.07                   | 23.24      | 23.10        | 23.50         |
|                |            | 1       | 7         | 23.05                   | 23.08      | 23.08        | 23.50         |
|                |            | 1       | 14        | 22.75                   | 22.59      | 22.61        | 23.50         |





| Bandwidth | Modulation | RB size | RB offset | Channel/Frequency (MHz) |            |              | Tune-up Limit |
|-----------|------------|---------|-----------|-------------------------|------------|--------------|---------------|
|           |            |         |           | 18625/1852.5            | 18900/1880 | 19175/1907.5 |               |
|           |            | 8       | 0         | 21.52                   | 21.44      | 21.43        | 22.50         |
|           |            | 8       | 4         | 21.51                   | 21.50      | 21.45        | 22.50         |
|           |            | 8       | 7         | 21.43                   | 21.31      | 21.30        | 22.50         |
|           |            | 15      | 0         | 21.48                   | 21.48      | 21.46        | 22.50         |
| 5MHz      | QPSK       | 1       | 0         | 23.62                   | 23.69      | 23.43        | 23.75         |
|           |            | 1       | 13        | 23.42                   | 23.54      | 23.48        | 23.75         |
|           |            | 1       | 24        | 23.36                   | 22.99      | 23.06        | 23.75         |
|           |            | 12      | 0         | 22.53                   | 22.40      | 22.36        | 22.75         |
|           |            | 12      | 6         | 22.47                   | 22.46      | 22.34        | 22.75         |
|           |            | 12      | 13        | 22.50                   | 22.19      | 22.19        | 22.75         |
|           |            | 25      | 0         | 22.40                   | 22.42      | 22.35        | 22.75         |
|           | 16QAM      | 1       | 0         | 23.04                   | 23.20      | 23.07        | 23.50         |
|           |            | 1       | 13        | 23.02                   | 23.06      | 23.05        | 23.50         |
|           |            | 1       | 24        | 22.72                   | 22.57      | 22.57        | 23.50         |
|           |            | 12      | 0         | 21.50                   | 21.40      | 21.40        | 22.50         |
|           |            | 12      | 6         | 21.48                   | 21.45      | 21.41        | 22.50         |
|           |            | 12      | 13        | 21.40                   | 21.26      | 21.26        | 22.50         |
|           |            | 25      | 0         | 21.46                   | 21.44      | 21.41        | 22.50         |
| Bandwidth | Modulation | RB size | RB offset | Channel/Frequency (MHz) |            |              | Tune-up Limit |
|           |            |         |           | 18650/1855              | 18900/1880 | 19150/1905   |               |
| 10MHz     | QPSK       | 1       | 0         | 23.64                   | 23.68      | 23.46        | 23.75         |
|           |            | 1       | 25        | 23.45                   | 23.59      | 23.52        | 23.75         |
|           |            | 1       | 49        | 23.38                   | 23.03      | 23.09        | 23.75         |
|           |            | 25      | 0         | 22.56                   | 22.45      | 22.40        | 22.75         |
|           |            | 25      | 13        | 22.50                   | 22.51      | 22.38        | 22.75         |
|           |            | 25      | 25        | 22.52                   | 22.23      | 22.24        | 22.75         |
|           |            | 50      | 0         | 22.48                   | 22.44      | 22.39        | 22.75         |
|           | 16QAM      | 1       | 0         | 23.06                   | 23.23      | 23.09        | 23.50         |
|           |            | 1       | 25        | 23.05                   | 23.10      | 23.08        | 23.50         |
|           |            | 1       | 49        | 22.75                   | 22.59      | 22.60        | 23.50         |
|           |            | 25      | 0         | 21.53                   | 21.45      | 21.44        | 22.50         |
|           |            | 25      | 13        | 21.50                   | 21.49      | 21.44        | 22.50         |
|           |            | 25      | 25        | 21.43                   | 21.31      | 21.30        | 22.50         |
|           |            | 50      | 0         | 21.49                   | 21.49      | 21.45        | 22.50         |
| Bandwidth | Modulation | RB size | RB offset | Channel/Frequency (MHz) |            |              | Tune-up Limit |
|           |            |         |           | 18675/1857.5            | 18900/1880 | 19125/1902.5 |               |
| 15MHz     | QPSK       | 1       | 0         | 23.63                   | 23.71      | 23.44        | 23.75         |
|           |            | 1       | 38        | 23.43                   | 23.58      | 23.49        | 23.75         |
|           |            | 1       | 74        | 23.35                   | 22.98      | 23.05        | 23.75         |
|           |            | 36      | 0         | 22.54                   | 22.41      | 22.37        | 22.75         |
|           |            | 36      | 18        | 22.47                   | 22.46      | 22.34        | 22.75         |



| Bandwidth | Modulation | RB size | RB offset | Channel/Frequency (MHz) |            |            | Tune-up Limit |
|-----------|------------|---------|-----------|-------------------------|------------|------------|---------------|
|           |            |         |           | 18700/1860              | 18900/1880 | 19100/1900 |               |
| 20MHz     | 16QAM      | 36      | 39        | 22.49                   | 22.20      | 22.20      | 22.75         |
|           |            | 75      | 0         | 22.46                   | 22.40      | 22.34      | 22.75         |
|           |            | 1       | 0         | 23.01                   | 23.21      | 23.07      | 23.50         |
|           |            | 1       | 38        | 23.03                   | 23.07      | 23.06      | 23.50         |
|           |            | 1       | 74        | 22.72                   | 22.55      | 22.57      | 23.50         |
|           |            | 36      | 0         | 21.50                   | 21.43      | 21.41      | 22.50         |
|           |            | 36      | 18        | 21.47                   | 21.44      | 21.40      | 22.50         |
|           |            | 36      | 39        | 21.41                   | 21.27      | 21.27      | 22.50         |
|           |            | 75      | 0         | 21.46                   | 21.44      | 21.41      | 22.50         |
|           | QPSK       | 1       | 0         | 23.60                   | 23.72      | 23.41      | 23.75         |
|           |            | 1       | 50        | 23.42                   | 23.54      | 23.47      | 23.75         |
|           |            | 1       | 99        | 23.33                   | 22.97      | 23.02      | 23.75         |
|           |            | 50      | 0         | 22.51                   | 22.36      | 22.33      | 22.75         |
|           |            | 50      | 25        | 22.45                   | 22.42      | 22.31      | 22.75         |
|           |            | 50      | 50        | 22.46                   | 22.15      | 22.16      | 22.75         |
|           |            | 100     | 0         | 22.43                   | 22.35      | 22.30      | 22.75         |
| 16QAM     |            | 1       | 0         | 23.11                   | 23.17      | 23.02      | 23.50         |
|           |            | 1       | 50        | 22.99                   | 23.05      | 23.02      | 23.50         |
|           | 1          | 99      | 22.70     | 22.52                   | 22.55      | 23.50      |               |
|           | 50         | 0       | 21.47     | 21.39                   | 21.38      | 22.50      |               |
|           | 50         | 25      | 21.44     | 21.42                   | 21.37      | 22.50      |               |
|           | 50         | 50      | 21.38     | 21.22                   | 21.23      | 22.50      |               |
|           | 100        | 0       | 21.44     | 21.40                   | 21.38      | 22.50      |               |

| LTE FDD Band 4 |            |         |           | Conducted Power(dBm)    |              |              | Tune-up Limit |
|----------------|------------|---------|-----------|-------------------------|--------------|--------------|---------------|
| Bandwidth      | Modulation | RB size | RB offset | Channel/Frequency (MHz) |              |              |               |
|                |            |         |           | 19957/1710.7            | 20175/1732.5 | 20393/1754.3 |               |
| 1.4MHz         | QPSK       | 1       | 0         | 23.55                   | 23.67        | 23.52        | 24.00         |
|                |            | 1       | 2         | 23.73                   | 23.49        | 23.53        | 24.00         |
|                |            | 1       | 5         | 23.39                   | 23.29        | 23.31        | 24.00         |
|                |            | 3       | 0         | 23.50                   | 23.49        | 23.41        | 24.00         |
|                |            | 3       | 2         | 23.55                   | 23.46        | 23.49        | 24.00         |
|                |            | 3       | 3         | 23.37                   | 23.36        | 23.34        | 24.00         |
|                |            | 6       | 0         | 22.50                   | 22.57        | 22.56        | 23.00         |
|                | 16QAM      | 1       | 0         | 23.04                   | 23.07        | 23.01        | 23.50         |
|                |            | 1       | 2         | 23.02                   | 22.85        | 22.91        | 23.50         |
|                |            | 1       | 5         | 22.86                   | 22.81        | 22.81        | 23.50         |
|                |            | 3       | 0         | 22.47                   | 22.43        | 22.42        | 23.50         |
|                |            | 3       | 2         | 22.56                   | 22.47        | 22.51        | 23.50         |
|                |            | 3       | 3         | 22.40                   | 22.42        | 22.37        | 23.50         |



| Bandwidth  | Modulation | RB size    | RB offset | Channel/Frequency (MHz) |                         |              | Tune-up Limit |               |       |       |
|------------|------------|------------|-----------|-------------------------|-------------------------|--------------|---------------|---------------|-------|-------|
|            |            |            |           | 6                       | 0                       | 21.45        |               | 21.47         | 21.48 | 22.50 |
|            |            |            |           | 19965/1711.5            | 20175/1732.5            | 20385/1753.5 |               |               |       |       |
| 3MHz       | QPSK       | 1          | 0         | 23.57                   | 23.71                   | 23.55        | 24.00         |               |       |       |
|            |            | 1          | 7         | 23.76                   | 23.54                   | 23.57        | 24.00         |               |       |       |
|            |            | 1          | 14        | 23.42                   | 23.34                   | 23.35        | 24.00         |               |       |       |
|            |            | 8          | 0         | 22.60                   | 22.61                   | 22.54        | 23.00         |               |       |       |
|            |            | 8          | 4         | 22.67                   | 22.56                   | 22.61        | 23.00         |               |       |       |
|            |            | 8          | 7         | 22.47                   | 22.47                   | 22.44        | 23.00         |               |       |       |
|            |            | 15         | 0         | 22.53                   | 22.61                   | 22.59        | 23.00         |               |       |       |
|            | 16QAM      | 1          | 0         | 23.07                   | 23.09                   | 23.04        | 23.50         |               |       |       |
|            |            | 1          | 7         | 23.05                   | 22.90                   | 22.95        | 23.50         |               |       |       |
|            |            | 1          | 14        | 22.88                   | 22.85                   | 22.84        | 23.50         |               |       |       |
|            |            | 8          | 0         | 21.58                   | 21.56                   | 21.54        | 22.50         |               |       |       |
|            |            | 8          | 4         | 21.67                   | 21.60                   | 21.63        | 22.50         |               |       |       |
|            |            | 8          | 7         | 21.50                   | 21.54                   | 21.50        | 22.50         |               |       |       |
|            |            | 15         | 0         | 21.48                   | 21.51                   | 21.51        | 22.50         |               |       |       |
| Bandwidth  | Modulation | RB size    | RB offset | Channel/Frequency (MHz) |                         |              | Tune-up Limit |               |       |       |
|            |            |            |           | 19975/1712.5            | 20175/1732.5            | 20375/1752.5 |               |               |       |       |
|            |            |            |           | 1                       | 0                       | 23.54        |               | 23.69         | 23.51 | 24.00 |
| 5MHz       | QPSK       | 1          | 13        | 23.74                   | 23.50                   | 23.54        | 24.00         |               |       |       |
|            |            | 1          | 24        | 23.39                   | 23.29                   | 23.31        | 24.00         |               |       |       |
|            |            | 12         | 0         | 22.57                   | 22.56                   | 22.50        | 23.00         |               |       |       |
|            |            | 12         | 6         | 22.65                   | 22.52                   | 22.56        | 23.00         |               |       |       |
|            |            | 12         | 13        | 22.45                   | 22.45                   | 22.40        | 23.00         |               |       |       |
|            |            | 25         | 0         | 22.51                   | 22.60                   | 22.57        | 23.00         |               |       |       |
|            |            | 16QAM      | 1         | 0                       | 23.04                   | 23.05        | 23.01         | 23.50         |       |       |
|            | 1          |            | 13        | 23.02                   | 22.88                   | 22.92        | 23.50         |               |       |       |
|            | 1          |            | 24        | 22.85                   | 22.83                   | 22.80        | 23.50         |               |       |       |
|            | 12         |            | 0         | 21.56                   | 21.52                   | 21.51        | 22.50         |               |       |       |
|            | 12         |            | 6         | 21.64                   | 21.55                   | 21.59        | 22.50         |               |       |       |
|            | 12         |            | 13        | 21.47                   | 21.49                   | 21.46        | 22.50         |               |       |       |
|            | 25         |            | 0         | 21.46                   | 21.47                   | 21.46        | 22.50         |               |       |       |
|            | Bandwidth  | Modulation | RB size   | RB offset               | Channel/Frequency (MHz) |              |               | Tune-up Limit |       |       |
| 20000/1715 |            |            |           |                         | 20175/1732.5            | 20350/1750   |               |               |       |       |
| 1          |            |            |           |                         | 0                       | 23.56        | 23.70         |               | 23.54 | 24.00 |
| 10MHz      | QPSK       | 1          | 25        | 23.77                   | 23.55                   | 23.58        | 24.00         |               |       |       |
|            |            | 1          | 49        | 23.41                   | 23.33                   | 23.34        | 24.00         |               |       |       |
|            |            | 25         | 0         | 22.60                   | 22.61                   | 22.54        | 23.00         |               |       |       |
|            |            | 25         | 13        | 22.68                   | 22.57                   | 22.60        | 23.00         |               |       |       |
|            |            | 25         | 25        | 22.47                   | 22.49                   | 22.45        | 23.00         |               |       |       |
|            |            | 50         | 0         | 22.59                   | 22.62                   | 22.61        | 23.00         |               |       |       |
|            |            | 16QAM      | 1         | 0                       | 23.06                   | 23.08        | 23.03         | 23.50         |       |       |



|           |            | 1       | 25        | 23.05                   | 22.92        | 22.95        | 23.50         |
|-----------|------------|---------|-----------|-------------------------|--------------|--------------|---------------|
|           |            | 1       | 49        | 22.88                   | 22.85        | 22.83        | 23.50         |
|           |            | 25      | 0         | 21.59                   | 21.57        | 21.55        | 22.50         |
|           |            | 25      | 13        | 21.66                   | 21.59        | 21.62        | 22.50         |
|           |            | 25      | 25        | 21.50                   | 21.54        | 21.50        | 22.50         |
|           |            | 50      | 0         | 21.49                   | 21.52        | 21.50        | 22.50         |
| Bandwidth | Modulation | RB size | RB offset | Channel/Frequency (MHz) |              |              | Tune-up Limit |
|           |            |         |           | 20025/1717.5            | 20175/1732.5 | 20325/1747.5 |               |
| 15MHz     | QPSK       | 1       | 0         | 23.55                   | 23.66        | 23.52        | 24.00         |
|           |            | 1       | 38        | 23.75                   | 23.54        | 23.55        | 24.00         |
|           |            | 1       | 74        | 23.38                   | 23.28        | 23.30        | 24.00         |
|           |            | 36      | 0         | 22.58                   | 22.57        | 22.51        | 23.00         |
|           |            | 36      | 18        | 22.65                   | 22.52        | 22.56        | 23.00         |
|           |            | 36      | 39        | 22.44                   | 22.46        | 22.41        | 23.00         |
|           |            | 75      | 0         | 22.57                   | 22.58        | 22.56        | 23.00         |
|           | 16QAM      | 1       | 0         | 23.01                   | 23.06        | 23.01        | 23.50         |
|           |            | 1       | 38        | 23.03                   | 22.89        | 22.93        | 23.50         |
|           |            | 1       | 74        | 22.85                   | 22.81        | 22.80        | 23.50         |
|           |            | 36      | 0         | 21.56                   | 21.55        | 21.52        | 22.50         |
|           |            | 36      | 18        | 21.63                   | 21.54        | 21.58        | 22.50         |
|           |            | 36      | 39        | 21.48                   | 21.50        | 21.47        | 22.50         |
|           |            | 75      | 0         | 21.46                   | 21.47        | 21.46        | 22.50         |
| Bandwidth | Modulation | RB size | RB offset | Channel/Frequency (MHz) |              |              | Tune-up Limit |
|           |            |         |           | 20050/1720              | 20175/1732.5 | 20300/1745   |               |
| 20MHz     | QPSK       | 1       | 0         | 23.52                   | 23.62        | 23.49        | 24.00         |
|           |            | 1       | 50        | 23.74                   | 23.50        | 23.53        | 24.00         |
|           |            | 1       | 99        | 23.36                   | 23.27        | 23.27        | 24.00         |
|           |            | 50      | 0         | 22.55                   | 22.52        | 22.47        | 23.00         |
|           |            | 50      | 25        | 22.63                   | 22.48        | 22.53        | 23.00         |
|           |            | 50      | 50        | 22.41                   | 22.41        | 22.37        | 23.00         |
|           |            | 100     | 0         | 22.54                   | 22.53        | 22.52        | 23.00         |
|           | 16QAM      | 1       | 0         | 22.97                   | 23.02        | 22.96        | 23.50         |
|           |            | 1       | 50        | 22.99                   | 22.87        | 22.89        | 23.50         |
|           |            | 1       | 99        | 22.83                   | 22.78        | 22.78        | 23.50         |
|           |            | 50      | 0         | 21.53                   | 21.51        | 21.49        | 22.50         |
|           |            | 50      | 25        | 21.60                   | 21.52        | 21.55        | 22.50         |
|           |            | 50      | 50        | 21.45                   | 21.45        | 21.43        | 22.50         |
|           |            | 100     | 0         | 21.44                   | 21.43        | 21.43        | 22.50         |

| LTE FDD Band 5 |            |         |           | Conducted Power(dBm)    |             |             | Tune-up Limit |
|----------------|------------|---------|-----------|-------------------------|-------------|-------------|---------------|
| Bandwidth      | Modulation | RB size | RB offset | Channel/Frequency (MHz) |             |             |               |
|                |            |         |           | 20407/824.7             | 20525/836.5 | 20643/848.3 |               |



| 1.4MHz    | QPSK       | 1       | 0         | 23.58                   | 23.50       | 23.54       | 24.00         |
|-----------|------------|---------|-----------|-------------------------|-------------|-------------|---------------|
|           |            | 1       | 2         | 23.27                   | 23.32       | 23.23       | 24.00         |
|           |            | 1       | 5         | 23.81                   | 23.52       | 23.70       | 24.00         |
|           |            | 3       | 0         | 23.46                   | 23.31       | 23.48       | 24.00         |
|           |            | 3       | 2         | 23.32                   | 23.35       | 23.36       | 24.00         |
|           |            | 3       | 3         | 23.47                   | 23.31       | 23.39       | 24.00         |
|           | 6          | 0       | 22.44     | 22.48                   | 22.60       | 23.00       |               |
|           | 16QAM      | 1       | 0         | 22.71                   | 22.80       | 22.83       | 23.50         |
|           |            | 1       | 2         | 22.69                   | 22.66       | 22.65       | 23.50         |
|           |            | 1       | 5         | 22.89                   | 22.85       | 22.83       | 23.50         |
|           |            | 3       | 0         | 22.45                   | 22.34       | 22.45       | 23.50         |
|           |            | 3       | 2         | 22.48                   | 22.45       | 22.48       | 23.50         |
|           |            | 3       | 3         | 22.61                   | 22.55       | 22.55       | 23.50         |
| 6         | 0          | 21.52   | 21.53     | 21.60                   | 22.50       |             |               |
| Bandwidth | Modulation | RB size | RB offset | Channel/Frequency (MHz) |             |             | Tune-up Limit |
|           |            |         |           | 20415/825.5             | 20525/836.5 | 20635/847.5 |               |
| 3MHz      | QPSK       | 1       | 0         | 23.59                   | 23.53       | 23.56       | 24.00         |
|           |            | 1       | 7         | 23.31                   | 23.38       | 23.28       | 24.00         |
|           |            | 1       | 14        | 23.83                   | 23.56       | 23.73       | 24.00         |
|           |            | 8       | 0         | 22.56                   | 22.43       | 22.61       | 23.00         |
|           |            | 8       | 4         | 22.45                   | 22.46       | 22.47       | 23.00         |
|           |            | 8       | 7         | 22.57                   | 22.44       | 22.50       | 23.00         |
|           | 15         | 0       | 22.53     | 22.53                   | 22.65       | 23.00       |               |
|           | 16QAM      | 1       | 0         | 22.73                   | 22.81       | 22.85       | 23.50         |
|           |            | 1       | 7         | 22.72                   | 22.73       | 22.69       | 23.50         |
|           |            | 1       | 14        | 22.91                   | 22.89       | 22.85       | 23.50         |
|           |            | 8       | 0         | 21.57                   | 21.48       | 21.58       | 22.50         |
|           |            | 8       | 4         | 21.58                   | 21.57       | 21.59       | 22.50         |
|           |            | 8       | 7         | 21.71                   | 21.67       | 21.68       | 22.50         |
| 15        | 0          | 21.56   | 21.58     | 21.62                   | 22.50       |             |               |
| Bandwidth | Modulation | RB size | RB offset | Channel/Frequency (MHz) |             |             | Tune-up Limit |
|           |            |         |           | 20425/826.5             | 20525/836.5 | 20625/846.5 |               |
| 5MHz      | QPSK       | 1       | 0         | 23.58                   | 23.49       | 23.54       | 24.00         |
|           |            | 1       | 13        | 23.29                   | 23.37       | 23.25       | 24.00         |
|           |            | 1       | 24        | 23.80                   | 23.51       | 23.69       | 24.00         |
|           |            | 12      | 0         | 22.54                   | 22.39       | 22.58       | 23.00         |
|           |            | 12      | 6         | 22.42                   | 22.41       | 22.43       | 23.00         |
|           |            | 12      | 13        | 22.54                   | 22.41       | 22.46       | 23.00         |
|           | 25         | 0       | 22.51     | 22.49                   | 22.60       | 23.00       |               |
|           | 16QAM      | 1       | 0         | 22.68                   | 22.79       | 22.83       | 23.50         |
|           |            | 1       | 13        | 22.70                   | 22.70       | 22.67       | 23.50         |
|           |            | 1       | 24        | 22.88                   | 22.85       | 22.82       | 23.50         |
|           |            | 12      | 0         | 21.54                   | 21.46       | 21.55       | 22.50         |



| Bandwidth | Modulation | RB size | RB offset | Channel/Frequency (MHz) |             |           | Tune-up Limit |
|-----------|------------|---------|-----------|-------------------------|-------------|-----------|---------------|
|           |            |         |           | 20450/829               | 20525/836.5 | 20600/844 |               |
| 10MHz     | QPSK       | 12      | 6         | 21.55                   | 21.52       | 21.55     | 22.50         |
|           |            | 12      | 13        | 21.69                   | 21.63       | 21.65     | 22.50         |
|           |            | 25      | 0         | 21.53                   | 21.53       | 21.58     | 22.50         |
|           |            | 1       | 0         | 23.55                   | 23.45       | 23.51     | 24.00         |
|           |            | 1       | 25        | 23.28                   | 23.33       | 23.23     | 24.00         |
|           |            | 1       | 49        | 23.78                   | 23.50       | 23.66     | 24.00         |
|           |            | 25      | 0         | 22.51                   | 22.34       | 22.54     | 23.00         |
|           | 16QAM      | 25      | 13        | 22.40                   | 22.37       | 22.40     | 23.00         |
|           |            | 25      | 25        | 22.51                   | 22.36       | 22.42     | 23.00         |
|           |            | 50      | 0         | 22.48                   | 22.44       | 22.56     | 23.00         |
|           |            | 1       | 0         | 22.80                   | 22.75       | 22.78     | 23.50         |
|           |            | 1       | 25        | 22.66                   | 22.68       | 22.63     | 23.50         |
|           |            | 1       | 49        | 22.86                   | 22.82       | 22.80     | 23.50         |
|           |            | 25      | 0         | 21.51                   | 21.42       | 21.52     | 22.50         |
|           |            | 25      | 13        | 21.52                   | 21.50       | 21.52     | 22.50         |
| 25        | 25         | 21.66   | 21.58     | 21.61                   | 22.50       |           |               |
| 50        | 0          | 21.51   | 21.49     | 21.55                   | 22.50       |           |               |

| LTE FDD Band 7 |            |            |            | Conducted Power(dBm)    |            |              | Tune-up Limit |
|----------------|------------|------------|------------|-------------------------|------------|--------------|---------------|
| Bandwidth      | Modulation | RB size    | RB offset  | Channel/Frequency (MHz) |            |              |               |
|                |            |            |            | 20775/2502.5            | 21100/2535 | 21425/2567.5 |               |
| 5MHz           | QPSK       | 1          | 0          | 23.59                   | 23.26      | 23.05        | 24.00         |
|                |            | 1          | 13         | 23.11                   | 23.16      | 23.19        | 24.00         |
|                |            | 1          | 24         | 23.32                   | 23.06      | 23.15        | 24.00         |
|                |            | 12         | 0          | 22.61                   | 22.21      | 22.33        | 23.00         |
|                |            | 12         | 6          | 22.51                   | 22.18      | 22.15        | 23.00         |
|                |            | 12         | 13         | 22.35                   | 22.19      | 22.30        | 23.00         |
|                |            | 25         | 0          | 22.20                   | 22.17      | 22.30        | 23.00         |
|                | 16QAM      | 1          | 0          | 22.56                   | 22.64      | 22.58        | 23.50         |
|                |            | 1          | 13         | 22.54                   | 22.54      | 22.57        | 23.50         |
|                |            | 1          | 24         | 22.84                   | 22.74      | 22.75        | 23.50         |
|                |            | 12         | 0          | 21.42                   | 21.19      | 21.27        | 22.50         |
|                |            | 12         | 6          | 21.42                   | 21.23      | 21.23        | 22.50         |
|                |            | 12         | 13         | 21.26                   | 21.20      | 21.25        | 22.50         |
|                |            | 25         | 0          | 21.30                   | 21.25      | 21.32        | 22.50         |
|                |            | 20800/2505 | 21100/2535 | 21400/2565              |            |              |               |
| 10MHz          | QPSK       | 1          | 0          | 23.61                   | 23.27      | 23.08        | 24.00         |
|                |            | 1          | 25         | 23.14                   | 23.21      | 23.23        | 24.00         |
|                |            | 1          | 49         | 23.34                   | 23.10      | 23.18        | 24.00         |



|           |            | 25      | 0         | 22.64                   | 22.26      | 22.37        | 23.00         |
|-----------|------------|---------|-----------|-------------------------|------------|--------------|---------------|
|           |            | 25      | 13        | 22.54                   | 22.23      | 22.19        | 23.00         |
|           |            | 25      | 25        | 22.37                   | 22.23      | 22.35        | 23.00         |
|           |            | 50      | 0         | 22.28                   | 22.19      | 22.34        | 23.00         |
|           | 16QAM      | 1       | 0         | 22.58                   | 22.67      | 22.60        | 23.50         |
|           |            | 1       | 25        | 22.57                   | 22.58      | 22.60        | 23.50         |
|           |            | 1       | 49        | 22.87                   | 22.76      | 22.78        | 23.50         |
|           |            | 25      | 0         | 21.45                   | 21.24      | 21.31        | 22.50         |
|           |            | 25      | 13        | 21.44                   | 21.27      | 21.26        | 22.50         |
|           |            | 25      | 25        | 21.29                   | 21.25      | 21.29        | 22.50         |
| 50        | 0          | 21.33   | 21.30     | 21.36                   | 22.50      |              |               |
| Bandwidth | Modulation | RB size | RB offset | Channel/Frequency (MHz) |            |              | Tune-up Limit |
|           |            |         |           | 20825/2507.5            | 21100/2535 | 21375/2562.5 |               |
| 15MHz     | QPSK       | 1       | 0         | 23.60                   | 23.23      | 23.06        | 24.00         |
|           |            | 1       | 38        | 23.12                   | 23.20      | 23.20        | 24.00         |
|           |            | 1       | 74        | 23.31                   | 23.05      | 23.14        | 24.00         |
|           |            | 36      | 0         | 22.62                   | 22.22      | 22.34        | 23.00         |
|           |            | 36      | 18        | 22.51                   | 22.18      | 22.15        | 23.00         |
|           |            | 36      | 39        | 22.34                   | 22.20      | 22.31        | 23.00         |
|           |            | 75      | 0         | 22.26                   | 22.15      | 22.29        | 23.00         |
|           | 16QAM      | 1       | 0         | 22.53                   | 22.65      | 22.58        | 23.50         |
|           |            | 1       | 38        | 22.55                   | 22.55      | 22.58        | 23.50         |
|           |            | 1       | 74        | 22.84                   | 22.72      | 22.75        | 23.50         |
|           |            | 36      | 0         | 21.42                   | 21.22      | 21.28        | 22.50         |
|           |            | 36      | 18        | 21.41                   | 21.22      | 21.22        | 22.50         |
|           |            | 36      | 39        | 21.27                   | 21.21      | 21.26        | 22.50         |
|           |            | 75      | 0         | 21.30                   | 21.25      | 21.32        | 22.50         |
| Bandwidth | Modulation | RB size | RB offset | Channel/Frequency (MHz) |            |              | Tune-up Limit |
|           |            |         |           | 20850/2510              | 21100/2535 | 21350/2560   |               |
| 20MHz     | QPSK       | 1       | 0         | 23.57                   | 23.19      | 23.03        | 24.00         |
|           |            | 1       | 50        | 23.11                   | 23.16      | 23.18        | 24.00         |
|           |            | 1       | 99        | 23.29                   | 23.04      | 23.11        | 24.00         |
|           |            | 50      | 0         | 22.59                   | 22.17      | 22.30        | 23.00         |
|           |            | 50      | 25        | 22.49                   | 22.14      | 22.12        | 23.00         |
|           |            | 50      | 50        | 22.31                   | 22.15      | 22.27        | 23.00         |
|           |            | 100     | 0         | 22.23                   | 22.10      | 22.25        | 23.00         |
|           | 16QAM      | 1       | 0         | 22.80                   | 22.61      | 22.53        | 23.50         |
|           |            | 1       | 50        | 22.51                   | 22.53      | 22.54        | 23.50         |
|           |            | 1       | 99        | 22.82                   | 22.69      | 22.73        | 23.50         |
|           |            | 50      | 0         | 21.39                   | 21.18      | 21.25        | 22.50         |
|           |            | 50      | 25        | 21.38                   | 21.20      | 21.19        | 22.50         |
|           |            | 50      | 50        | 21.24                   | 21.16      | 21.22        | 22.50         |
|           |            | 100     | 0         | 21.28                   | 21.21      | 21.29        | 22.50         |

### 9.4 WLAN Mode

| Wi-Fi 2.4G<br>Mode     | Channel<br>/Frequency(MHz) | Maximum Output Power (dBm) |       |              |
|------------------------|----------------------------|----------------------------|-------|--------------|
|                        |                            | Tune-up                    | Meas. | TP Set Level |
| 802.11b<br>(1M)        | 1/2412                     | 15.50                      | 15.22 | 13.5         |
|                        | 6/2437                     | 15.50                      | 14.84 | 13.5         |
|                        | 11/2462                    | 15.50                      | 15.30 | 13.5         |
| 802.11g<br>(6M)        | 1/2412                     | 10.00                      | 9.21  | 6            |
|                        | 6/2437                     | 10.00                      | 7.93  | 6            |
|                        | 11/2462                    | 10.00                      | 8.05  | 6            |
| 802.11n-HT20<br>(MCS0) | 1/2412                     | 10.00                      | 9.22  | 6            |
|                        | 6/2437                     | 10.00                      | 8.04  | 6            |
|                        | 11/2462                    | 10.00                      | 7.97  | 6            |

Note: Initial test configuration is 802.11b mode, since the highest maximum output power.

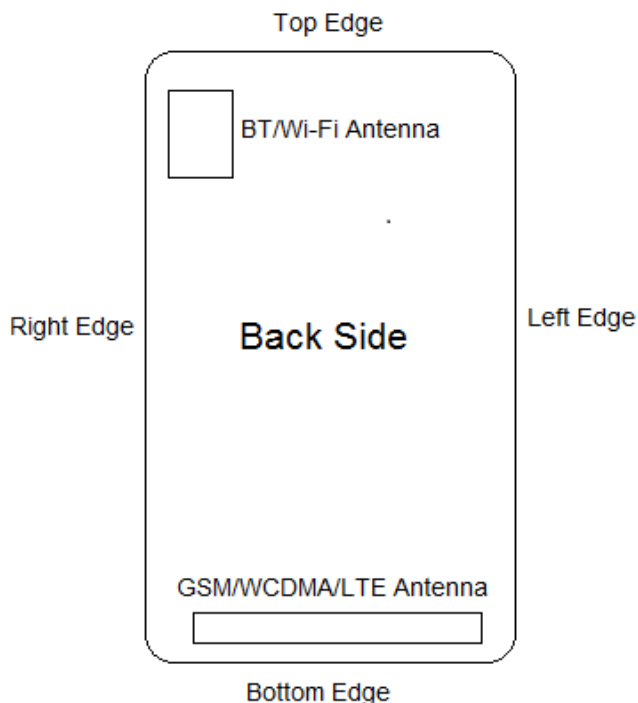


## 9.5 Bluetooth Mode

| BT            | Conducted Power(dBm)   |                |                | Tune-up Limit (dBm) |
|---------------|------------------------|----------------|----------------|---------------------|
|               | Channel/Frequency(MHz) |                |                |                     |
|               | Ch 0/2402 MHz          | Ch 39/2441 MHz | Ch 78/2480 MHz |                     |
| GFSK          | 9.40                   | 8.44           | 8.00           | 10.50               |
| $\pi/4$ DQPSK | 10.19                  | 9.14           | 8.81           | 10.50               |
| 8DPSK         | 10.31                  | 9.30           | 8.94           | 10.50               |
| BLE           | Ch 0/2402 MHz          | Ch 19/2440 MHz | Ch 39/2480 MHz | Tune-up Limit (dBm) |
| GFSK          | 0.72                   | -0.24          | -0.19          | 1.50                |

# 10 Measured and Reported (Scaled) SAR Results

## 10.1 EUT Antenna Locations



| Overall (Length x Width): 165 mm x 83 mm          |           |            |           |            |          |             |
|---|-----------|------------|-----------|------------|----------|-------------|
| 8Overall Diagonal: 178 mm/Display Diagonal: 152mm |           |            |           |            |          |             |
| Distance of the Antenna to the EUT surface/edge   |           |            |           |            |          |             |
| Antenna   | Back Side | Front side | Left Edge | Right Edge | Top Edge | Bottom Edge |
| GSM/WCDMA/LTE Antenna                             | <25mm     | <25mm      | <25mm     | <25mm      | >25mm    | <25mm       |
| BT/Wi-Fi Antenna                                  | <25mm     | <25mm      | >25mm     | <25mm      | <25mm    | >25mm       |
| Hotspot mode, Positions for SAR tests             |           |            |           |            |          |             |
| Mode  | Back Side | Front side | Left Edge | Right Edge | Top Edge | Bottom Edge |
| GSM/WCDMA/LTE Antenna                             | Yes       | Yes        | Yes       | Yes        | N/A      | Yes         |
| BT/Wi-Fi Antenna                                  | Yes       | Yes        | N/A       | Yes        | Yes      | N/A         |

Note: 1. Per KDB 941225 D06, when the overall device length and width are  $\geq 9\text{cm} \times 5\text{cm}$ , the test distance is 10mm. SAR must be measured for all sides and surfaces with a transmitting antenna located within 25mm from that surface or edge.

2. For smart phones with an overall diagonal dimension is 178mm. Per KDB 648474 D04, for smart phones with a display diagonal dimension  $> 15.0\text{ cm}$  or an overall diagonal dimension  $> 16.0\text{ cm}$ , 10-g extremity SAR must be tested as a phablet to determine SAR compliance. For Phablet, Since hotspot mode 1-g *reported* SAR  $< 1.2\text{ W/kg}$ , 10-g extremity SAR is no required.

3. Per FCC KDB 447498 D01,

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:

a)  $\leq 0.8\text{ W/kg}$  or  $2.0\text{ W/kg}$ , for 1-g or 10-g respectively, when the transmission band is  $\leq 100\text{MHz}$

b)  $\leq 0.6\text{ W/kg}$  or  $1.5\text{ W/kg}$ , for 1-g or 10-g respectively, when the transmission band is between 100 MHz and



200 MHz.

c)  $\leq 0.4$  W/kg or 1.0 W/kg, for 1-g or 10-g respectively, when the transmission band is  $\geq 200$  MHz.

4. When the original highest measured SAR is  $\geq 0.80$  W/kg, the measurement was repeated once.

5. Per FCC KDB Publication 648474 D04, SAR was evaluated without a headset connected to the device. Since the reported SAR was  $\leq 1.2$  W/kg, no additional SAR evaluations using a headset cable were required.

## 10.2 Standalone SAR test exclusion considerations

Per KDB 447498 D01, the 1-g and 10-g SAR test exclusion thresholds for 100 MHz to 6 GHz at test separation distances  $\leq 50$  mm are determined by:

$[(\text{max. power of channel, including tune-up tolerance, mW})/(\text{min. test separation distance, mm})] \cdot [\sqrt{f(\text{GHz})}] \leq 3.0$  for 1-g SAR and  $\leq 7.5$  for 10-g extremity SAR

- $f(\text{GHz})$  is the RF channel transmit frequency in GHz
- Power and distance are rounded to the nearest mW and mm before calculation
- The result is rounded to one decimal place for comparison

Per KDB 447498 D01, when the minimum test separation distance is  $< 5$  mm, a distance of 5 mm is applied to determine SAR test exclusion.

| Bluetooth | Distance (mm) | MAX Power (dBm) | Frequency (MHz) | Ratio | Evaluation |
|-----------|---------------|-----------------|-----------------|-------|------------|
| Head      | 5             | 10.50           | 2480            | 3.53  | Yes        |
| Body-worn | 10            | 10.50           | 2480            | 1.77  | No         |
| Hotspot   | 10            | 10.50           | 2480            | 1.77  | No         |



## 10.3 Measured SAR Results

Table 1: GSM 850

| Test Position  | Cover Type | Time slot | Duty Cycle | Channel | Tune-up (dBm) | Measured power (dBm) | Limit of SAR 1.6 W/kg (mW/g) |                  |                |              | Plot No. |
|--|------------|-----------|------------|---------|---------------|----------------------|------------------------------|------------------|----------------|--------------|----------|
|  |            |           |            |         |               |                      | Measured SAR1g               | Power Drift (dB) | Scaling Factor | Report SAR1g |          |
| <b>Head SAR</b>  |            |           |            |         |               |                      |                              |                  |                |              |          |
| Right Cheek  | standard   | GSM       | 1:1        | 190     | 33.5          | 33.24                | 0.218                        | 0.03             | 1.06           | 0.231        | P01      |
| Right Tilt   | standard   | GSM       | 1:1        | 190     | 33.5          | 33.24                | 0.110                        | 0.09             | 1.06           | 0.117        | /        |
| Left Cheek   | standard   | GSM       | 1:1        | 190     | 33.5          | 33.24                | 0.186                        | -0.14            | 1.06           | 0.197        | /        |
| Left Tilt  | standard   | GSM       | 1:1        | 190     | 33.5          | 33.24                | 0.096                        | 0.13             | 1.06           | 0.102        | /        |
| <b>Body-worn (Distance 10mm)</b>   |            |           |            |         |               |                      |                              |                  |                |              |          |
| Front Side   | standard   | GSM       | 1:1        | 190     | 33.5          | 33.24                | 0.137                        | -0.06            | 1.06           | 0.145        | /        |
| Back Side  | standard   | GSM       | 1:1        | 190     | 33.5          | 33.24                | 0.464                        | -0.09            | 1.06           | 0.493        | P20      |
| <b>Hotspot (Distance 10mm)</b>   |            |           |            |         |               |                      |                              |                  |                |              |          |
| Front Side   | standard   | 4Txslots  | 1:1        | 190     | 30.5          | 30.41                | 0.238                        | -0.02            | 1.02           | 0.243        | /        |
| Back Side  | standard   | 4Txslots  | 1:1        | 190     | 30.5          | 30.41                | 0.869                        | -0.08            | 1.02           | 0.887        | /        |
| Left Edge  | standard   | 4Txslots  | 1:1        | 190     | 30.5          | 30.41                | 0.159                        | -0.01            | 1.02           | 0.162        | /        |
| Right Edge   | standard   | 4Txslots  | 1:1        | 190     | 30.5          | 30.41                | 0.299                        | -0.08            | 1.02           | 0.305        | /        |
| Top Edge   | N/A        | N/A       | N/A        | N/A     | N/A           | N/A                  | N/A                          | N/A              | N/A            | N/A          | N/A      |
| Bottom Edge  | standard   | 4Txslots  | 1:1        | 190     | 30.5          | 30.41                | 0.263                        | -0.08            | 1.02           | 0.269        | /        |
| Back Side  | standard   | 4Txslots  | 1:1        | 128     | 30.5          | 30.26                | 0.839                        | -0.07            | 1.06           | 0.887        | /        |
| Back Side  | standard   | 4Txslots  | 1:1        | 251     | 30.5          | 30.27                | 1.040                        | -0.09            | 1.05           | 1.097        | P11      |
| Back Side  | Repeated   | 4Txslots  | 1:1        | 251     | 30.5          | 30.27                | 1.010                        | -0.01            | 1.05           | 1.065        | /        |
| <p>Note: 1. The value with blue color is the maximum SAR Value of each test band.</p> <p>2. When multiple slots are used, SAR should be tested to account for the maximum source-based time-averaged output power.</p> |            |           |            |         |               |                      |                              |                  |                |              |          |

| Measurement Variability   |         |                                       |   |       |
|---|---------|---------------------------------------|---|-------|
| Test Position   | Channel | MAX Measured SAR <sub>1g</sub> (W/kg) | 1 <sup>st</sup> Repeated SAR <sub>1g</sub> (W/kg) | Ratio |
| Back Side   | 251     | 1.040                                 | 1.010   | 1.03  |
| <p>Note: 1) A second repeated measurement was performed only if the ratio of largest to smallest SAR for the original and first repeated measurements was &gt; 1.20 or when the original or repeated measurement was ≥ 1.45 W/kg (~ 10% from the 1-g SAR limit).</p> <p>2) A third repeated measurement was performed only if the original, first or second repeated measurement was ≥ 1.5 W/kg and the ratio of largest to smallest SAR for the original, first and second repeated measurements is &gt; 1.20.</p> |         |                                       |   |       |



Table 2: GSM 1900

| Test Position  | Cover Type | Time slot | Duty Cycle | Channel | Tune-up (dBm) | Measured power (dBm) | Limit of SAR 1.6 W/kg (mW/g) |                  |                |              | Plot No. |
|--|------------|-----------|------------|---------|---------------|----------------------|------------------------------|------------------|----------------|--------------|----------|
|  |            |           |            |         |               |                      | Measured SAR1g               | Power Drift (dB) | Scaling Factor | Report SAR1g |          |
| <b>Head SAR</b>  |            |           |            |         |               |                      |                              |                  |                |              |          |
| Right Cheek  | standard   | GSM       | 1:1        | 810     | 30.5          | 30.06                | 0.089                        | 0.08             | 1.11           | 0.098        | P02      |
| Right Tilt   | standard   | GSM       | 1:1        | 810     | 30.5          | 30.06                | 0.038                        | -0.02            | 1.11           | 0.042        | /        |
| Left Cheek   | standard   | GSM       | 1:1        | 810     | 30.5          | 30.06                | 0.052                        | -0.07            | 1.11           | 0.058        | /        |
| Left Tilt  | standard   | GSM       | 1:1        | 810     | 30.5          | 30.06                | 0.057                        | -0.07            | 1.11           | 0.063        | /        |
| <b>Body-worn (Distance 10mm)</b>   |            |           |            |         |               |                      |                              |                  |                |              |          |
| Front Side   | standard   | GSM       | 1:1        | 810     | 30.5          | 30.06                | 0.227                        | -0.06            | 1.11           | 0.251        | /        |
| Back Side  | standard   | GSM       | 1:1        | 810     | 30.5          | 30.06                | 0.497                        | -0.19            | 1.11           | 0.550        | P21      |
| <b>Hotspot (Distance 10mm)</b>   |            |           |            |         |               |                      |                              |                  |                |              |          |
| Front Side   | standard   | 4Txslots  | 1:1        | 661     | 26.5          | 25.68                | 0.300                        | 0.04             | 1.21           | 0.362        | /        |
| Back Side  | standard   | 4Txslots  | 1:1        | 661     | 26.5          | 25.68                | 0.645                        | -0.08            | 1.21           | 0.779        | P12      |
| Left Edge  | standard   | 4Txslots  | 1:1        | 661     | 26.5          | 25.68                | 0.053                        | -0.04            | 1.21           | 0.064        | /        |
| Right Edge   | standard   | 4Txslots  | 1:1        | 661     | 26.5          | 25.68                | 0.085                        | -0.06            | 1.21           | 0.103        | /        |
| Top Edge   | N/A        | N/A       | N/A        | N/A     | N/A           | N/A                  | N/A                          | N/A              | N/A            | N/A          | N/A      |
| Bottom Edge  | standard   | 4Txslots  | 1:1        | 661     | 26.5          | 25.68                | 0.570                        | -0.05            | 1.21           | 0.688        | /        |
| <p>Note: 1.The value with blue color is the maximum SAR Value of each test band.</p> <p>2.When multiple slots are used, SAR should be tested to account for the maximum source-based time-averaged output power.</p> |            |           |            |         |               |                      |                              |                  |                |              |          |



Table 3: UMTS Band II

| Test Position                                  | Cover Type | Channel Type | Duty Cycle | Channel | Tune-up (dBm) | Measured power (dBm) | Limit of SAR 1.6 W/kg (mW/g) |                  |                |              | Plot No. |
|--|------------|--------------|------------|---------|---------------|----------------------|------------------------------|------------------|----------------|--------------|----------|
|  |            |              |            |         |               |                      | Measured SAR1g               | Power Drift (dB) | Scaling Factor | Report SAR1g |          |
| <b>Head SAR</b>                                |            |              |            |         |               |                      |                              |                  |                |              |          |
| Right Cheek                                    | standard   | RMC 12.2K    | 1:1        | 9400    | 23.5          | 23.41                | 0.174                        | 0.07             | 1.02           | 0.178        | P03      |
| Right Tilt                                     | standard   | RMC 12.2K    | 1:1        | 9400    | 23.5          | 23.41                | 0.077                        | -0.03            | 1.02           | 0.079        | /        |
| Left Cheek                                     | standard   | RMC 12.2K    | 1:1        | 9400    | 23.5          | 23.41                | 0.115                        | -0.09            | 1.02           | 0.117        | /        |
| Left Tilt                                      | standard   | RMC 12.2K    | 1:1        | 9400    | 23.5          | 23.41                | 0.123                        | -0.08            | 1.02           | 0.126        | /        |
| <b>Body-worn &amp; Hotspot (Distance 10mm)</b> |            |              |            |         |               |                      |                              |                  |                |              |          |
| Front Side                                     | standard   | RMC 12.2K    | 1:1        | 9400    | 23.5          | 23.41                | 0.449                        | -0.03            | 1.02           | 0.458        | /        |
| Back Side                                      | standard   | RMC 12.2K    | 1:1        | 9400    | 23.5          | 23.41                | 0.915                        | 0.12             | 1.02           | 0.934        | /        |
| Left Edge                                      | standard   | RMC 12.2K    | 1:1        | 9400    | 23.5          | 23.41                | 0.071                        | -0.03            | 1.02           | 0.072        | /        |
| Right Edge                                     | standard   | RMC 12.2K    | 1:1        | 9400    | 23.5          | 23.41                | 0.129                        | -0.07            | 1.02           | 0.132        | /        |
| Top Edge                                       | N/A        | N/A          | N/A        | N/A     | N/A           | N/A                  | N/A                          | N/A              | N/A            | N/A          | N/A      |
| Bottom Edge                                    | standard   | RMC 12.2K    | 1:1        | 9400    | 23.5          | 23.41                | 0.688                        | -0.05            | 1.02           | 0.702        | /        |
| Back Side                                      | standard   | RMC 12.2K    | 1:1        | 9262    | 23.5          | 23.27                | 0.750                        | 0.03             | 1.05           | 0.791        | /        |
| Back Side                                      | standard   | RMC 12.2K    | 1:1        | 9538    | 23.5          | 23.25                | 1.040                        | -0.02            | 1.06           | 1.102        | P13      |
| Back Side                                      | Repeated   | RMC 12.2K    | 1:1        | 9538    | 23.5          | 23.25                | 1.010                        | 0.03             | 1.06           | 1.070        | /        |

Note: 1. The value with blue color is the maximum SAR Value of each test band.

2. When the maximum output power and tune-up tolerance specified for production units in a secondary mode is  $\leq \frac{1}{4}$  dB higher than the primary mode or when the highest reported SAR of the primary mode is scaled by the ratio of specified maximum output power and tune-up tolerance of secondary to primary mode and the adjusted SAR is  $\leq 1.2$  W/kg, SAR measurement is not required for the secondary mode.

| Measurement Variability |         |                                       |   |       |
|-------------------------|---------|---------------------------------------|---|-------|
| Test Position           | Channel | MAX Measured SAR <sub>1g</sub> (W/kg) | 1 <sup>st</sup> Repeated SAR <sub>1g</sub> (W/kg) | Ratio |
| Back Side               | 9538    | 1.040                                 | 1.010   | 1.03  |

Note: 1) A second repeated measurement was performed only if the ratio of largest to smallest SAR for the original and first repeated measurements was  $> 1.20$  or when the original or repeated measurement was  $\geq 1.45$  W/kg (~ 10% from the 1-g SAR limit).  
2) A third repeated measurement was performed only if the original, first or second repeated measurement was  $\geq 1.5$  W/kg and the ratio of largest to smallest SAR for the original, first and second repeated measurements is  $> 1.20$ .



Table 4: UMTS Band V

| Test Position  | Cover Type | Channel Type | Duty Cycle | Channel | Tune-up (dBm) | Measured power (dBm) | Limit of SAR 1.6 W/kg (mW/g) |                  |                |              | Plot No. |
|--|------------|--------------|------------|---------|---------------|----------------------|------------------------------|------------------|----------------|--------------|----------|
|  |            |              |            |         |               |                      | Measured SAR1g               | Power Drift (dB) | Scaling Factor | Report SAR1g |          |
| <b>Head SAR</b>  |            |              |            |         |               |                      |                              |                  |                |              |          |
| Right Cheek  | standard   | RMC 12.2K    | 1:1        | 4132    | 24.0          | 23.58                | 0.193                        | 0.02             | 1.10           | 0.213        | P04      |
| Right Tilt   | standard   | RMC 12.2K    | 1:1        | 4132    | 24.0          | 23.58                | 0.082                        | 0.01             | 1.10           | 0.090        | /        |
| Left Cheek   | standard   | RMC 12.2K    | 1:1        | 4132    | 24.0          | 23.58                | 0.133                        | 0.07             | 1.10           | 0.147        | /        |
| Left Tilt  | standard   | RMC 12.2K    | 1:1        | 4132    | 24.0          | 23.58                | 0.069                        | -0.04            | 1.10           | 0.076        | /        |
| <b>Body-worn &amp; Hotspot (Distance 10mm)</b>   |            |              |            |         |               |                      |                              |                  |                |              |          |
| Front Side   | standard   | RMC 12.2K    | 1:1        | 4132    | 24.0          | 23.58                | 0.125                        | -0.08            | 1.10           | 0.138        | /        |
| Back Side  | standard   | RMC 12.2K    | 1:1        | 4132    | 24.0          | 23.58                | 0.400                        | -0.06            | 1.10           | 0.441        | P14      |
| Left Edge  | standard   | RMC 12.2K    | 1:1        | 4132    | 24.0          | 23.58                | 0.094                        | -0.09            | 1.10           | 0.104        | /        |
| Right Edge   | standard   | RMC 12.2K    | 1:1        | 4132    | 24.0          | 23.58                | 0.165                        | -0.03            | 1.10           | 0.182        | /        |
| Top Edge   | N/A        | N/A          | N/A        | N/A     | N/A           | N/A                  | N/A                          | N/A              | N/A            | N/A          | N/A      |
| Bottom Edge  | standard   | RMC 12.2K    | 1:1        | 4132    | 24.0          | 23.58                | 0.129                        | -0.05            | 1.10           | 0.142        | /        |
| <p>Note: 1. The value with blue color is the maximum SAR Value of each test band.</p> <p>2. When the maximum output power and tune-up tolerance specified for production units in a secondary mode is <math>\leq \frac{1}{4}</math> dB higher than the primary mode or when the highest reported SAR of the primary mode is scaled by the ratio of specified maximum output power and tune-up tolerance of secondary to primary mode and the adjusted SAR is <math>\leq 1.2</math> W/kg, SAR measurement is not required for the secondary mode.</p> |            |              |            |         |               |                      |                              |                  |                |              |          |





**Table 5: LTE Band 2**

| Test Position                                  | Cover Type | Duty Cycle | RB allocation | RB offset | Channel | Tune-up (dBm) | Measured power (dBm) | Limit of SAR 1.6 W/kg (mW/g) |                  |                |                          | Plot No. |
|--|------------|------------|---------------|-----------|---------|---------------|----------------------|------------------------------|------------------|----------------|--------------------------|----------|
|  |            |            |               |           |         |               |                      | Measured SAR <sub>1g</sub>   | Power Drift (dB) | Scaling Factor | Report SAR <sub>1g</sub> |          |
| <b>Head SAR (QPSK)</b>                         |            |            |               |           |         |               |                      |                              |                  |                |                          |          |
| Right Cheek                                    | standard   | 1:1        | 1             | 0         | 18900   | 23.75         | 23.72                | 0.181                        | 0.04             | 1.01           | 0.182                    | P05      |
| Right Tilt                                     | standard   | 1:1        | 1             | 0         | 18900   | 23.75         | 23.72                | 0.085                        | -0.06            | 1.01           | 0.086                    | /        |
| Left Cheek                                     | standard   | 1:1        | 1             | 0         | 18900   | 23.75         | 23.72                | 0.109                        | -0.04            | 1.01           | 0.110                    | /        |
| Left Tilt                                      | standard   | 1:1        | 1             | 0         | 18900   | 23.75         | 23.72                | 0.117                        | -0.06            | 1.01           | 0.118                    | /        |
| Right Cheek                                    | standard   | 1:1        | 50%           | 0         | 18700   | 22.75         | 22.51                | 0.142                        | -0.11            | 1.06           | 0.150                    | /        |
| Right Tilt                                     | standard   | 1:1        | 50%           | 0         | 18700   | 22.75         | 22.51                | 0.066                        | -0.03            | 1.06           | 0.070                    | /        |
| Left Cheek                                     | standard   | 1:1        | 50%           | 0         | 18700   | 22.75         | 22.51                | 0.082                        | -0.04            | 1.06           | 0.087                    | /        |
| Left Tilt                                      | standard   | 1:1        | 50%           | 0         | 18700   | 22.75         | 22.51                | 0.090                        | -0.07            | 1.06           | 0.095                    | /        |
| <b>Body-worn &amp; Hotspot (Distance 10mm)</b> |            |            |               |           |         |               |                      |                              |                  |                |                          |          |
| Front Side                                     | standard   | 1:1        | 1             | 0         | 18900   | 23.75         | 23.72                | 0.475                        | -0.12            | 1.01           | 0.478                    | /        |
| Back Side                                      | standard   | 1:1        | 1             | 0         | 18900   | 23.75         | 23.72                | 0.915                        | 0.06             | 1.01           | 0.921                    | /        |
| Left Edge                                      | standard   | 1:1        | 1             | 0         | 18900   | 23.75         | 23.72                | 0.074                        | -0.05            | 1.01           | 0.075                    | /        |
| Right Edge                                     | standard   | 1:1        | 1             | 0         | 18900   | 23.75         | 23.72                | 0.145                        | -0.08            | 1.01           | 0.146                    | /        |
| Top Edge                                       | N/A        | N/A        | N/A           | N/A       | N/A     | N/A           | N/A                  | N/A                          | N/A              | N/A            | N/A                      | N/A      |
| Bottom Edge                                    | standard   | 1:1        | 1             | 0         | 18900   | 23.75         | 23.72                | 0.700                        | -0.09            | 1.01           | 0.705                    | /        |
| Front Side                                     | standard   | 1:1        | 50%           | 0         | 18700   | 22.75         | 22.51                | 0.357                        | -0.05            | 1.06           | 0.377                    | /        |
| Back Side                                      | standard   | 1:1        | 50%           | 0         | 18700   | 22.75         | 22.51                | 0.705                        | 0.02             | 1.06           | 0.745                    | /        |
| Left Edge                                      | standard   | 1:1        | 50%           | 0         | 18700   | 22.75         | 22.51                | 0.066                        | -0.02            | 1.06           | 0.070                    | /        |
| Right Edge                                     | standard   | 1:1        | 50%           | 0         | 18700   | 22.75         | 22.51                | 0.112                        | -0.07            | 1.06           | 0.118                    | /        |
| Top Edge                                       | N/A        | N/A        | N/A           | N/A       | N/A     | N/A           | N/A                  | N/A                          | N/A              | N/A            | N/A                      | N/A      |
| Bottom Edge                                    | standard   | 1:1        | 50%           | 0         | 18700   | 22.75         | 22.51                | 0.538                        | -0.03            | 1.06           | 0.569                    | /        |
| Back Side                                      | standard   | 1:1        | 100%          | 0         | 18700   | 22.75         | 22.43                | 0.715                        | 0.05             | 1.08           | 0.770                    | /        |
| Back Side                                      | standard   | 1:1        | 1             | 0         | 18700   | 23.75         | 23.60                | 0.879                        | -0.09            | 1.04           | 0.910                    | /        |
| Back Side                                      | standard   | 1:1        | 1             | 50        | 19100   | 23.75         | 23.47                | 1.110                        | 0.06             | 1.07           | 1.184                    | P15      |
| Back Side                                      | Repeated   | 1:1        | 1             | 50        | 19100   | 23.75         | 23.47                | 1.100                        | 0.01             | 1.07           | 1.173                    | /        |

Note: 1. The value with blue color is the maximum SAR Value of each test band.

2. For QPSK with 100% RB allocation, SAR is required when and the highest reported SAR for 1 RB and 50% RB allocation in are  $\geq 0.8$  W/kg.

**Measurement Variability**

| Test Position | Channel | MAX Measured SAR <sub>1g</sub> (W/kg) | 1 <sup>st</sup> Repeated SAR <sub>1g</sub> (W/kg) | Ratio |
|---------------|---------|---------------------------------------|---|-------|
| Back Side     | 19100   | 1.110                                 | 1.100   | 1.01  |

Note: 1) A second repeated measurement was performed only if the ratio of largest to smallest SAR for the original and first repeated measurements was  $> 1.20$  or when the original or repeated measurement was  $\geq 1.45$  W/kg (~ 10% from the 1-g SAR limit).

2) A third repeated measurement was performed only if the original, first or second repeated measurement was  $\geq 1.5$  W/kg and the ratio of largest to smallest SAR for the original, first and second repeated measurements is  $> 1.20$ .



Table 6: LTE Band 4

| Test Position   | Cover Type | Duty Cycle | RB allocation | RB offset | Channel | Tune-up (dBm) | Measured power (dBm) | Limit of SAR 1.6 W/kg (mW/g) |                  |                |              | Plot No. |
|---|------------|------------|---------------|-----------|---------|---------------|----------------------|------------------------------|------------------|----------------|--------------|----------|
|   |            |            |               |           |         |               |                      | Measured SAR1g               | Power Drift (dB) | Scaling Factor | Report SAR1g |          |
| <b>Head SAR (QPSK)</b>  |            |            |               |           |         |               |                      |                              |                  |                |              |          |
| Right Cheek   | standard   | 1:1        | 1             | 50        | 20050   | 24.0          | 23.74                | 0.164                        | -0.10            | 1.06           | 0.174        | P06      |
| Right Tilt  | standard   | 1:1        | 1             | 50        | 20050   | 24.0          | 23.74                | 0.069                        | -0.05            | 1.06           | 0.073        | /        |
| Left Cheek  | standard   | 1:1        | 1             | 50        | 20050   | 24.0          | 23.74                | 0.121                        | -0.04            | 1.06           | 0.128        | /        |
| Left Tilt   | standard   | 1:1        | 1             | 50        | 20050   | 24.0          | 23.74                | 0.092                        | -0.04            | 1.06           | 0.098        | /        |
| Right Cheek   | standard   | 1:1        | 50%           | 25        | 20050   | 23.0          | 22.63                | 0.132                        | -0.18            | 1.09           | 0.144        | /        |
| Right Tilt  | standard   | 1:1        | 50%           | 25        | 20050   | 23.0          | 22.63                | 0.055                        | -0.05            | 1.09           | 0.060        | /        |
| Left Cheek  | standard   | 1:1        | 50%           | 25        | 20050   | 23.0          | 22.63                | 0.097                        | -0.03            | 1.09           | 0.106        | /        |
| Left Tilt   | standard   | 1:1        | 50%           | 25        | 20050   | 23.0          | 22.63                | 0.074                        | -0.06            | 1.09           | 0.081        | /        |
| <b>Body-worn &amp; Hotspot SAR (Distance 10mm)</b>  |            |            |               |           |         |               |                      |                              |                  |                |              |          |
| Front Side  | standard   | 1:1        | 1             | 50        | 20050   | 24.0          | 23.74                | 0.382                        | -0.08            | 1.06           | 0.406        | /        |
| Back Side   | standard   | 1:1        | 1             | 50        | 20050   | 24.0          | 23.74                | 0.616                        | 0.07             | 1.06           | 0.654        | P16      |
| Left Edge   | standard   | 1:1        | 1             | 50        | 20050   | 24.0          | 23.74                | 0.120                        | -0.06            | 1.06           | 0.127        | /        |
| Right Edge  | standard   | 1:1        | 1             | 50        | 20050   | 24.0          | 23.74                | 0.178                        | -0.06            | 1.06           | 0.189        | /        |
| Top Edge  | N/A        | N/A        | N/A           | N/A       | N/A     | N/A           | N/A                  | N/A                          | N/A              | N/A            | N/A          | N/A      |
| Bottom Edge   | standard   | 1:1        | 1             | 50        | 20050   | 24.0          | 23.74                | 0.414                        | -0.04            | 1.06           | 0.440        | /        |
| Front Side  | standard   | 1:1        | 50%           | 25        | 20050   | 23.0          | 22.63                | 0.305                        | -0.07            | 1.09           | 0.332        | /        |
| Back Side   | standard   | 1:1        | 50%           | 25        | 20050   | 23.0          | 22.63                | 0.484                        | 0.19             | 1.09           | 0.527        | /        |
| Left Edge   | standard   | 1:1        | 50%           | 25        | 20050   | 23.0          | 22.63                | 0.099                        | -0.07            | 1.09           | 0.108        | /        |
| Right Edge  | standard   | 1:1        | 50%           | 25        | 20050   | 23.0          | 22.63                | 0.140                        | -0.06            | 1.09           | 0.152        | /        |
| Top Edge  | N/A        | N/A        | N/A           | N/A       | N/A     | N/A           | N/A                  | N/A                          | N/A              | N/A            | N/A          | N/A      |
| Bottom Edge   | standard   | 1:1        | 50%           | 25        | 20050   | 23.0          | 22.63                | 0.329                        | -0.02            | 1.09           | 0.358        | /        |
| <p>Note: 1. The value with blue color is the maximum SAR Value of each test band.</p> <p>2. For QPSK with 100% RB allocation, SAR is required when and the highest reported SAR for 1 RB and 50% RB allocation in are <math>\geq 0.8</math> W/kg.</p> |            |            |               |           |         |               |                      |                              |                  |                |              |          |



Table 7: LTE Band 5

| Test Position   | Cover Type | Duty Cycle | RB allocation | RB offset | Channel | Tune-up (dBm) | Measured power (dBm) | Limit of SAR 1.6 W/kg (mW/g) |                  |                |              | Plot No. |
|---|------------|------------|---------------|-----------|---------|---------------|----------------------|------------------------------|------------------|----------------|--------------|----------|
|   |            |            |               |           |         |               |                      | Measured SAR1g               | Power Drift (dB) | Scaling Factor | Report SAR1g |          |
| <b>Head SAR (QPSK)</b>  |            |            |               |           |         |               |                      |                              |                  |                |              |          |
| Right Cheek   | standard   | 1:1        | 1             | 49        | 20450   | 24.0          | 23.78                | 0.165                        | 0.04             | 1.05           | 0.174        | P07      |
| Right Tilt  | standard   | 1:1        | 1             | 49        | 20450   | 24.0          | 23.78                | 0.089                        | -0.06            | 1.05           | 0.094        | /        |
| Left Cheek  | standard   | 1:1        | 1             | 49        | 20450   | 24.0          | 23.78                | 0.135                        | 0.04             | 1.05           | 0.142        | /        |
| Left Tilt   | standard   | 1:1        | 1             | 49        | 20450   | 24.0          | 23.78                | 0.070                        | -0.06            | 1.05           | 0.074        | /        |
| Right Cheek   | standard   | 1:1        | 25%           | 0         | 20600   | 23.0          | 22.54                | 0.128                        | 0.03             | 1.11           | 0.142        | /        |
| Right Tilt  | standard   | 1:1        | 25%           | 0         | 20600   | 23.0          | 22.54                | 0.071                        | 0.09             | 1.11           | 0.079        | /        |
| Left Cheek  | standard   | 1:1        | 25%           | 0         | 20600   | 23.0          | 22.54                | 0.111                        | -0.04            | 1.11           | 0.123        | /        |
| Left Tilt   | standard   | 1:1        | 25%           | 0         | 20600   | 23.0          | 22.54                | 0.056                        | -0.04            | 1.11           | 0.062        | /        |
| <b>Body-worn &amp; Hotspot SAR (Distance 10mm)</b>  |            |            |               |           |         |               |                      |                              |                  |                |              |          |
| Front Side  | standard   | 1:1        | 1             | 49        | 20450   | 24.0          | 23.78                | 0.122                        | -0.06            | 1.05           | 0.128        | /        |
| Back Side   | standard   | 1:1        | 1             | 49        | 20450   | 24.0          | 23.78                | 0.444                        | -0.08            | 1.05           | 0.467        | P17      |
| Left Edge   | standard   | 1:1        | 1             | 49        | 20450   | 24.0          | 23.78                | 0.096                        | -0.05            | 1.05           | 0.101        | /        |
| Right Edge  | standard   | 1:1        | 1             | 49        | 20450   | 24.0          | 23.78                | 0.169                        | -0.08            | 1.05           | 0.178        | /        |
| Top Edge  | N/A        | N/A        | N/A           | N/A       | N/A     | N/A           | N/A                  | N/A                          | N/A              | N/A            | N/A          | N/A      |
| Bottom Edge   | standard   | 1:1        | 1             | 49        | 20450   | 24.0          | 23.78                | 0.143                        | -0.07            | 1.05           | 0.150        | /        |
| Front Side  | standard   | 1:1        | 25%           | 0         | 20600   | 23.0          | 22.54                | 0.090                        | -0.07            | 1.11           | 0.100        | /        |
| Back Side   | standard   | 1:1        | 25%           | 0         | 20600   | 23.0          | 22.54                | 0.354                        | -0.09            | 1.11           | 0.394        | /        |
| Left Edge   | standard   | 1:1        | 25%           | 0         | 20600   | 23.0          | 22.54                | 0.071                        | -0.13            | 1.11           | 0.079        | /        |
| Right Edge  | standard   | 1:1        | 25%           | 0         | 20600   | 23.0          | 22.54                | 0.127                        | -0.06            | 1.11           | 0.141        | /        |
| Top Edge  | N/A        | N/A        | N/A           | N/A       | N/A     | N/A           | N/A                  | N/A                          | N/A              | N/A            | N/A          | N/A      |
| Bottom Edge   | standard   | 1:1        | 25%           | 0         | 20600   | 23.0          | 22.54                | 0.112                        | -0.08            | 1.11           | 0.125        | /        |
| Note: 1. The value with blue color is the maximum SAR Value of each test band.  |            |            |               |           |         |               |                      |                              |                  |                |              |          |
| 2. For QPSK with 100% RB allocation, SAR is required when and the highest reported SAR for 1 RB and 50% RB allocation in are $\geq 0.8$ W/kg. |            |            |               |           |         |               |                      |                              |                  |                |              |          |



Table 8: LTE Band 7

| Test Position   | Cover Type | Duty Cycle | RB allocation | RB offset | Channel | Tune-up (dBm) | Measured power (dBm) | Limit of SAR 1.6 W/kg (mW/g) |                  |                |              | Plot No. |
|---|------------|------------|---------------|-----------|---------|---------------|----------------------|------------------------------|------------------|----------------|--------------|----------|
|   |            |            |               |           |         |               |                      | Measured SAR1g               | Power Drift (dB) | Scaling Factor | Report SAR1g |          |
| <b>Head SAR (QPSK)</b>  |            |            |               |           |         |               |                      |                              |                  |                |              |          |
| Right Cheek   | standard   | 1:1        | 1             | 0         | 20850   | 24.0          | 23.57                | 0.110                        | -0.02            | 1.10           | 0.121        | /        |
| Right Tilt  | standard   | 1:1        | 1             | 0         | 20850   | 24.0          | 23.57                | 0.119                        | -0.09            | 1.10           | 0.131        | P08      |
| Left Cheek  | standard   | 1:1        | 1             | 0         | 20850   | 24.0          | 23.57                | 0.052                        | 0.04             | 1.10           | 0.057        | /        |
| Left Tilt   | standard   | 1:1        | 1             | 0         | 20850   | 24.0          | 23.57                | 0.044                        | 0.20             | 1.10           | 0.049        | /        |
| Right Cheek   | standard   | 1:1        | 50%           | 0         | 20850   | 23.0          | 22.59                | 0.089                        | 0.09             | 1.10           | 0.098        | /        |
| Right Tilt  | standard   | 1:1        | 50%           | 0         | 20850   | 23.0          | 22.59                | 0.028                        | -0.07            | 1.10           | 0.031        | /        |
| Left Cheek  | standard   | 1:1        | 50%           | 0         | 20850   | 23.0          | 22.59                | 0.041                        | 0.02             | 1.10           | 0.045        | /        |
| Left Tilt   | standard   | 1:1        | 50%           | 0         | 20850   | 23.0          | 22.59                | 0.034                        | -0.11            | 1.10           | 0.037        | /        |
| <b>Body-worn &amp; Hotspot SAR (Distance 10mm)</b>  |            |            |               |           |         |               |                      |                              |                  |                |              |          |
| Front Side  | standard   | 1:1        | 1             | 0         | 20850   | 24.0          | 23.57                | 0.289                        | 0.05             | 1.10           | 0.319        | /        |
| Back Side   | standard   | 1:1        | 1             | 0         | 20850   | 24.0          | 23.57                | 0.379                        | 0.02             | 1.10           | 0.418        | P18      |
| Left Edge   | standard   | 1:1        | 1             | 0         | 20850   | 24.0          | 23.57                | 0.026                        | -0.03            | 1.10           | 0.029        | /        |
| Right Edge  | standard   | 1:1        | 1             | 0         | 20850   | 24.0          | 23.57                | 0.117                        | -0.02            | 1.10           | 0.129        | /        |
| Top Edge  | N/A        | N/A        | N/A           | N/A       | N/A     | N/A           | N/A                  | N/A                          | N/A              | N/A            | N/A          | N/A      |
| Bottom Edge   | standard   | 1:1        | 1             | 0         | 20850   | 24.0          | 23.57                | 0.296                        | -0.01            | 1.10           | 0.327        | /        |
| Front Side  | standard   | 1:1        | 50%           | 0         | 20850   | 23.0          | 22.59                | 0.270                        | 0.03             | 1.10           | 0.297        | /        |
| Back Side   | standard   | 1:1        | 50%           | 0         | 20850   | 23.0          | 22.59                | 0.310                        | 0.02             | 1.10           | 0.341        | /        |
| Left Edge   | standard   | 1:1        | 50%           | 0         | 20850   | 23.0          | 22.59                | 0.022                        | -0.04            | 1.10           | 0.024        | /        |
| Right Edge  | standard   | 1:1        | 50%           | 0         | 20850   | 23.0          | 22.59                | 0.097                        | -0.05            | 1.10           | 0.107        | /        |
| Top Edge  | N/A        | N/A        | N/A           | N/A       | N/A     | N/A           | N/A                  | N/A                          | N/A              | N/A            | N/A          | N/A      |
| Bottom Edge   | standard   | 1:1        | 50%           | 0         | 20850   | 23.0          | 22.59                | 0.249                        | -0.09            | 1.10           | 0.274        | /        |
| <p>Note: 1. The value with blue color is the maximum SAR Value of each test band.</p> <p>2. For QPSK with 100% RB allocation, SAR is required when and the highest reported SAR for 1 RB and 50% RB allocation in are <math>\geq 0.8</math> W/kg.</p> |            |            |               |           |         |               |                      |                              |                  |                |              |          |



**Table 9: Wi-Fi (2.4G)**

| Test Position                                      | Cover Type | Mode 802.11b | Duty Cycle | Channel | Tune-up (dBm) | Measured power (dBm) | Limit of SAR 1.6 W/kg (mW/g) |                  |                         |                |               | Plot No. |
|--|------------|--------------|------------|---------|---------------|----------------------|------------------------------|------------------|-------------------------|----------------|---------------|----------|
|  |            |              |            |         |               |                      | Power Drift (dB)             | Area Scan SAR 1g | Zoom Scan SAR 1g (W/kg) | Scaling Factor | Report SAR 1g |          |
| <b>Head SAR</b>                                    |            |              |            |         |               |                      |                              |                  |                         |                |               |          |
| Right Cheek  | standard   | DSSS         | 97.90%     | 11      | 15.50         | 15.30                | -0.050                       | 0.672            | 0.744                   | 1.07           | 0.796         | /        |
| Right Tilt   | standard   | DSSS         | 97.90%     | 11      | 15.50         | 15.30                | -0.120                       | 0.316            | 0.327                   | 1.07           | 0.350         | /        |
| Left Cheek   | standard   | DSSS         | 97.90%     | 1       | 15.50         | 15.22                | -0.027                       | 1.050            | 1.080                   | 1.09           | 1.176         | /        |
|  | standard   | DSSS         | 97.90%     | 6       | 15.50         | 14.84                | -0.030                       | 1.110            | 1.040                   | 1.19           | 1.236         | /        |
|  | standard   | DSSS         | 97.90%     | 11      | 15.50         | 15.30                | 0.070                        | 1.170            | 1.240                   | 1.07           | 1.326         | P09      |
| Left Tilt  | standard   | DSSS         | 97.90%     | 11      | 15.50         | 15.30                | 0.090                        | 0.637            | 0.641                   | 1.07           | 0.686         | /        |
| Left Cheek   | Repeated   | DSSS         | 97.90%     | 11      | 15.50         | 15.30                | 0.106                        | 1.140            | 1.210                   | 1.07           | 1.294         | /        |
| <b>Body-worn &amp; Hotspot SAR (Distance 10mm)</b> |            |              |            |         |               |                      |                              |                  |                         |                |               |          |
| Front Side   | standard   | DSSS         | 97.90%     | 11      | 15.50         | 15.30                | 0.040                        | 0.306            | 0.324                   | 1.07           | 0.347         | /        |
| Back Side  | standard   | DSSS         | 97.90%     | 11      | 15.50         | 15.30                | -0.035                       | 0.725            | 0.739                   | 1.07           | 0.790         | P19      |
| Left Edge  | standard   | DSSS         | 97.90%     | 11      | 15.50         | 15.30                | 0.090                        | 0.033            | 0.035                   | 1.07           | 0.037         | /        |
| Right Edge   | standard   | DSSS         | 97.90%     | 11      | 15.50         | 15.30                | 0.050                        | 0.182            | 0.178                   | 1.07           | 0.190         | /        |
| Top Edge   | standard   | DSSS         | 97.90%     | 11      | 15.50         | 15.30                | -0.150                       | 0.189            | 0.197                   | 1.07           | 0.211         | /        |
| Bottom Edge  | N/A        | N/A          | N/A        | N/A     | N/A           | N/A                  | N/A                          | N/A              | N/A                     | N/A            | N/A           | N/A      |

Note: 1. The value with blue color is the maximum SAR Value of each test band.

**Measurement Variability**

| Test Position | Channel/ Frequency (MHz) | MAX Measured SAR <sub>1g</sub> (W/kg) | 1 <sup>st</sup> Repeated SAR <sub>1g</sub> (W/kg) | Ratio |
|---------------|--------------------------|---------------------------------------|---|-------|
| Left Cheek    | 11/2462                  | 1.240                                 | 1.210   | 1.02  |

Note: 1) A second repeated measurement was performed only if the ratio of largest to smallest SAR for the original and first repeated measurements was > 1.20 or when the original or repeated measurement was ≥ 1.45 W/kg (~ 10% from the 1-g SAR limit).

2) A third repeated measurement was performed only if the original, first or second repeated measurement was ≥ 1.5 W/kg and the ratio of largest to smallest SAR for the original, first and second repeated measurements is > 1.20.

**MAX Adjusted SAR**

| Mode         | Test Position | Channel/ Frequency(MHz) | MAX Reported SAR <sub>1g</sub> (W/kg) | 802.11b Tune-up limit (dBm) | Tune-up limit (dBm) | Scaling Factor | Adjusted SAR <sub>1g</sub> (W/kg) |
|--------------|---------------|-------------------------|---------------------------------------|-----------------------------|---------------------|----------------|-----------------------------------|
| 802.11g      | Left Cheek    | 11/2462                 | 1.326                                 | 15.50                       | 10.00               | 0.29           | 0.385                             |
| 802.11n HT20 | Left Cheek    | 11/2462                 | 1.326                                 | 15.50                       | 10.00               | 0.29           | 0.385                             |

Note:

SAR is not required for OFDM when the highest reported SAR for DSSS is adjusted by the ratio of OFDM to DSSS specified maximum output power and the adjusted SAR is ≤ 1.2 W/kg.

**Table 10: BT**

| Test Position   | Cover Type | Mode  | Duty Cycle | Channel | Tune-up dBm | Measured power (dBm) | Limit of SAR 1.6 W/kg (mW/g) |                  |                |               | Plot No. |
|-----------------|------------|-------|------------|---------|-------------|----------------------|------------------------------|------------------|----------------|---------------|----------|
|                 |            |       |            |         |             |                      | Zoom Scan SAR 1g             | Power Drift (dB) | Scaling Factor | Report SAR 1g |          |
| <b>Head SAR</b> |            |       |            |         |             |                      |                              |                  |                |               |          |
| Right Cheek     | standard   | 8DPSK | 76.6%      | 0       | 10.50       | 10.31                | 0.015                        | 0.091            | 1.04           | 0.016         | /        |
| Right Tilt      | standard   | 8DPSK | 76.6%      | 0       | 10.50       | 10.31                | 0.017                        | 0.187            | 1.04           | 0.018         | /        |
| Left Cheek      | standard   | 8DPSK | 76.6%      | 0       | 10.50       | 10.31                | 0.036                        | -0.064           | 1.04           | 0.037         | /        |
| Left Tilt       | standard   | 8DPSK | 76.6%      | 0       | 10.50       | 10.31                | 0.041                        | 0.098            | 1.04           | 0.043         | P10      |

Note: 1. The value with blue color is the maximum SAR Value of each test band.

| Band      | Configuration | Frequency (MHz) | Maximum Power (dBm) | Separation Distance (mm) | Estimated SAR (W/kg) |
|-----------|---------------|-----------------|---------------------|--------------------------|----------------------|
| Bluetooth | Body-worn     | 2480            | 10.50               | 10                       | 0.236                |
|           | Hotspot       | 2480            | 10.50               | 10                       | 0.236                |

For simultaneous transmission analysis, Bluetooth SAR is estimated per KDB 447498 D01 based on the formula below.

$(\text{max. power of channel, including tune-up tolerance, mW}) / (\text{min. test separation distance, mm}) \cdot [\sqrt{f(\text{GHz})}]^x \text{ W/kg}$   
for test separation distances  $\leq 50 \text{ mm}$ ; where  $x = 7.5$  for 1-g SAR, and  $x = 18.75$  for 10-g SAR.

## 10.4 Simultaneous Transmission Analysis

| Simultaneous Transmission Configurations | Head | Body-worn | Hotspot |
|--|------|-----------|---------|
| GSM(Voice) + Bluetooth                   | Yes  | Yes       | N/A     |
| GPRS/EDGE(Data) + Bluetooth              | N/A  | Yes       | Yes     |
| WCDMA + Bluetooth                        | Yes  | Yes       | N/A     |
| LTE + Bluetooth                          | Yes  | Yes       | Yes     |
| GSM(Voice) + Wi-Fi-2.4GHz                | Yes  | Yes       | N/A     |
| GPRS/EDGE(Data) + Wi-Fi-2.4GHz           | N/A  | Yes       | Yes     |
| WCDMA + Wi-Fi-2.4GHz                     | Yes  | Yes       | N/A     |
| LTE + Wi-Fi-2.4GHz                       | Yes  | Yes       | Yes     |
| Wi-Fi-2.4GHz + Bluetooth                 | N/A  | N/A       | N/A     |

### General Note:

1. The Scaled SAR summation is calculated based on the same configuration and test position.
2. Per KDB 447498 D01, simultaneous transmission SAR is compliant if,
  - i) Scalar SAR summation  $< 1.6\text{W/kg}$ , simultaneously transmission SAR measurement is not necessary.
  - ii)  $\text{SPLSR} = (\text{SAR1} + \text{SAR2})^{1.5} / (\text{min. separation distance, mm})$ , 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  $\text{SPLSR} \leq 0.04$ , simultaneously transmission SAR measurement is not necessary.

**The maximum SAR<sub>1g</sub> Value for GSM/WCDMA/LTE Antenna**

| SAR <sub>1g</sub> (W/kg) |             | GSM   | GSM   | WCDMA   | WCDMA  | LTE   | LTE   | LTE   | LTE   | MAX.              |
|--------------------------|-------------|-------|-------|---------|--------|-------|-------|-------|-------|-------------------|
| Test Position            |             | 850   | 1900  | Band II | Band V | FDD 2 | FDD 4 | FDD 5 | FDD 7 | SAR <sub>1g</sub> |
| Right Cheek              |             | 0.231 | 0.098 | 0.178   | 0.213  | 0.182 | 0.174 | 0.174 | 0.121 | 0.231             |
| Right Tilt               |             | 0.117 | 0.042 | 0.079   | 0.090  | 0.086 | 0.073 | 0.094 | 0.131 | 0.131             |
| Left Cheek               |             | 0.197 | 0.058 | 0.117   | 0.147  | 0.110 | 0.128 | 0.142 | 0.057 | 0.197             |
| Left Tilt                |             | 0.102 | 0.063 | 0.126   | 0.076  | 0.118 | 0.098 | 0.074 | 0.049 | 0.126             |
| Body worn                | Front Side  | 0.145 | 0.251 | 0.458   | 0.138  | 0.478 | 0.406 | 0.128 | 0.319 | 0.478             |
|                          | Back Side   | 0.493 | 0.550 | 1.102   | 0.441  | 1.184 | 0.654 | 0.467 | 0.418 | 1.184             |
| Hotspot                  | Front Side  | 0.243 | 0.362 | 0.458   | 0.138  | 0.478 | 0.406 | 0.128 | 0.319 | 0.478             |
|                          | Back Side   | 1.097 | 0.779 | 1.102   | 0.441  | 1.184 | 0.654 | 0.467 | 0.418 | 1.184             |
|                          | Left Edge   | 0.162 | 0.064 | 0.072   | 0.104  | 0.075 | 0.127 | 0.101 | 0.029 | 0.162             |
|                          | Right Edge  | 0.305 | 0.103 | 0.132   | 0.182  | 0.146 | 0.189 | 0.178 | 0.129 | 0.305             |
|                          | Top Edge    | N/A   | N/A   | N/A     | N/A    | N/A   | N/A   | N/A   | N/A   | N/A               |
|                          | Bottom Edge | 0.269 | 0.688 | 0.702   | 0.142  | 0.705 | 0.440 | 0.150 | 0.327 | 0.705             |



**About BT and GSM/WCDMA/LTE Antenna**

| SAR <sub>1g/10g</sub> (W/kg) |             | GSM/WCDMA/LTE Antenna | BT    | MAX. ΣSAR <sub>1g/10g</sub> |
|------------------------------|-------------|-----------------------|-------|-----------------------------|
| Right Cheek                  |             | 0.231                 | 0.016 | 0.247                       |
| Right Tilt                   |             | 0.131                 | 0.018 | 0.149                       |
| Left Cheek                   |             | 0.197                 | 0.037 | 0.234                       |
| Left Tilt                    |             | 0.126                 | 0.043 | 0.169                       |
| Body worn                    | Front Side  | 0.478                 | 0.236 | 0.714                       |
|                              | Back Side   | 1.184                 | 0.236 | 1.420                       |
| Hotspot                      | Front Side  | 0.478                 | 0.236 | 0.714                       |
|                              | Back Side   | 1.184                 | 0.236 | 1.420                       |
|                              | Left Edge   | 0.162                 | 0.236 | 0.398                       |
|                              | Right Edge  | 0.305                 | 0.236 | 0.541                       |
|                              | Top Edge    | N/A                   | 0.236 | 0.236                       |
|                              | Bottom Edge | 0.705                 | 0.236 | 0.941                       |

Note: 1.The value with blue color is the maximum ΣSAR<sub>1g</sub> Value.  
 2.MAX. ΣSAR<sub>1g/10g</sub> =Unlicensed SAR<sub>MAX</sub> +Licensed SAR<sub>MAX</sub>

MAX. ΣSAR<sub>1g</sub> =1.420W/kg<1.6W/kg, so the Simultaneous transimition SAR with volum scan are not required for BT and GSM/WCDMA/LTE Antenna.

**About Wi-Fi and GSM/WCDMA/LTE Antenna**

| SAR <sub>1g</sub> (W/kg) |             | GSM/WCDMA/LTE Antenna | Wi-Fi 2.4G | MAX. ΣSAR <sub>1g</sub> |
|--------------------------|-------------|-----------------------|------------|-------------------------|
| Right Cheek              |             | 0.231                 | 0.796      | 1.027                   |
| Right Tilt               |             | 0.131                 | 0.350      | 0.481                   |
| Left Cheek               |             | 0.197                 | 1.326      | 1.523                   |
| Left Tilt                |             | 0.126                 | 0.686      | 0.812                   |
| Body worn                | Front Side  | 0.478                 | 0.347      | 0.825                   |
|                          | Back Side   | 1.184                 | 0.790      | 1.974                   |
| Hotspot                  | Front Side  | 0.478                 | 0.347      | 0.825                   |
|                          | Back Side   | 1.184                 | 0.790      | 1.974                   |
|                          | Left Edge   | 0.162                 | 0.037      | 0.199                   |
|                          | Right Edge  | 0.305                 | 0.190      | 0.495                   |
|                          | Top Edge    | N/A                   | 0.211      | 0.211                   |
|                          | Bottom Edge | 0.705                 | N/A        | 0.705                   |

Note: 1.The value with blue color is the maximum ΣSAR<sub>1g</sub> Value.  
 2.MAX. ΣSAR<sub>1g/10g</sub> =Unlicensed SAR<sub>MAX</sub> +Licensed SAR<sub>MAX</sub>

MAX. ΣSAR<sub>1g</sub> =1.974W/kg>1.6W/kg, so the SAR to peak location separation ratio should be considered



| Reported SAR <sub>10g</sub> (W/kg)<br>Test Position | GSM<br>850 | GSM<br>1900 | WCDMA<br>Band II | WCDMA<br>Band V | LTE<br>FDD 2 | LTE<br>FDD 4 | LTE<br>FDD 5 | LTE<br>FDD 7 | Wi-Fi<br>2.4G | MAX.<br>ΣSAR <sub>1g</sub> |
|---|------------|-------------|------------------|-----------------|--------------|--------------|--------------|--------------|---------------|----------------------------|
| Back Side<br>(Hotspot)                              | 1.097      | /           | /                | /               | /            | /            | /            | /            | 0.790         | 1.887                      |
|   | /          | 0.779       | /                | /               | /            | /            | /            | /            | 0.790         | 1.569                      |
|   | /          | /           | 1.102            | /               | /            | /            | /            | /            | 0.790         | 1.892                      |
|   | /          | /           | /                | 0.441           | /            | /            | /            | /            | 0.790         | 1.231                      |
|   | /          | /           | /                | /               | 1.184        | /            | /            | /            | 0.790         | 1.974                      |
|   | /          | /           | /                | /               | /            | 0.654        | /            | /            | 0.790         | 1.444                      |
|   | /          | /           | /                | /               | /            | /            | 0.467        | /            | 0.790         | 1.257                      |
|   | /          | /           | /                | /               | /            | /            | /            | 0.418        | 0.790         | 1.208                      |
| Back Side<br>(Body worn)                            | 0.493      | /           | /                | /               | /            | /            | /            | /            | 0.790         | 1.283                      |
|   |            | 0.550       | /                | /               | /            | /            | /            | /            | 0.790         | 1.340                      |

Note: 1. The value with blue color is the SAR<sub>1g</sub>>1.6 W/kg.

2. When the MAX. Σ SAR<sub>10g</sub>>4 W/kg in a position, Ratio need consideration in this position.

(SAR<sub>Max</sub> =1.887W/Kg)

The position SAR<sub>GSM850</sub> is (x<sub>1</sub>=-26.51, y<sub>1</sub>= -64.99, z<sub>1</sub>=-205.2),

The position SAR<sub>WIFI 2.4G</sub> is (x<sub>2</sub>= -46.5, y<sub>2</sub>=21.5, z<sub>2</sub>= -205.3)

so the distance is 88.770mm.

PSLS=Peak SAR Location Separation

Ratio =[(Reported SAR<sub>Max.GSM/UMTS/LTE</sub>) 1.097W/kg +(Reported SAR<sub>Max.WIFI</sub>) 0.790W/kg]<sup>3/2</sup> /PSLS  
=0.029 ≤0.04

(SAR<sub>Max</sub> =1.892W/Kg)

The position SAR<sub>WCDMA Band II</sub> is (x<sub>1</sub>= -33.97, y<sub>1</sub>= -76.53, z<sub>1</sub>= -205.5),

The position SAR<sub>WIFI 2.4G</sub> is (x<sub>2</sub>= -46.5, y<sub>2</sub>=21.5, z<sub>2</sub>= -205.3)

so the distance is 98.828mm.

PSLS=Peak SAR Location Separation

Ratio =[(Reported SAR<sub>Max.GSM/UMTS/LTE</sub>) 1.102W/kg +(Reported SAR<sub>Max.WIFI</sub>) 0.790W/kg]<sup>3/2</sup> / PSLS  
=0.026 <0.04

(SAR<sub>Max</sub> =1.974W/Kg)

The position SAR<sub>LTE Band II</sub> is (x<sub>1</sub>= -38.47, y<sub>1</sub>=-73.52, z<sub>1</sub>= -205.6),

The position SAR<sub>WIFI 2.4G</sub> is (x<sub>2</sub>= -46.5, y<sub>2</sub>=21.5, z<sub>2</sub>= -205.3)

so the distance is 95.359mm.

PSLS=Peak SAR Location Separation

Ratio =[(Reported SAR<sub>Max.GSM/UMTS/LTE</sub>) 1.184W/kg +(Reported SAR<sub>Max.WIFI</sub>) 0.790W/kg]<sup>3/2</sup> / PSLS  
=0.029 <0.04

so the Simultaneous transimition SAR with volum scan are not required for Wi-Fi and GSM/WCDMA/LTE Antenna.

MAX. ΣSAR<sub>1g</sub> =1.523W/kg<1.6W/kg, so the Simultaneous transimition SAR with volum scan are not required for Wi-Fi and GSM/WCDMA/LTE Antenna.



## 11 Measurement Uncertainty

Per KDB 865664 D01 SAR Measurement 100 MHz to 6 GHz, when the highest measured 1-g SAR within a frequency band is  $< 1.5$  W/kg, the extensive SAR measurement uncertainty analysis described in IEEE Std 1528- 2013 is not required in SAR reports submitted for equipment approval.



**ANNEX A: Test Layout**

**ANNEX B: System Check Results**

**ANNEX C: Highest Graph Results**

**ANNEX D: Calibration Certificate**