



FCC ID: QYLWP7601BC03

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Rev.: 00

## FCC TEST REPORT

For

Body Worn Camera

Trade Name: Getac

Model: BC-03

Issued to

**Getac Technology Corp.**

**5F, Building A2, No.209, Sec.1, Nangang Rd., Nangang Dist., Taipei City 11568,  
Taiwan.**

Issued by

**Compliance Certification Services Inc.**

**No.11, Wugong 6th Rd., Wugu Dist.,**

**New Taipei City 24891,**

**Taiwan. (R.O.C.)**

**Issued Date: 2019/05/15**



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### Revision History

| Rev. | Issue Date | Revisions     | Effect Page | Revised By   |
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**1 Certificate of Compliance (SAR Evaluation)**

**Applicant** Getac Technology Corp  
5F, Building A, No.209, Sec.1, Nangang Rd., Nangang Dist., Taipei City 11568, Taiwan.

**Equipment Under Test:** Body Worn Camera

**Trade Name:** Getac

**Model Number:** BC-03

**Date of Test:** April 29 ~ May 6, 2019

**Device Category:** Portable Devices

**Exposure Category:** General Population/Uncontrolled Exposure

| Applicable Standards |                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
|----------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| FCC                  | <ul style="list-style-type: none"> <li>● IEEE 1528 2013</li> <li>● KDB 865664 D01 SAR Measurement 100 MHz to 6 GHz v01r04</li> <li>● KDB 865664 D02 RF Exposure Reporting v01r02</li> <li>● KDB 447498 D01 General RF Exposure Guidance v06</li> <li>● KDB 616217 D04 SAR for laptop and tablets v01r02</li> <li>● KDB 248227 D01 SAR Measurement Guidance for 802.11 Transmitters v02r02</li> <li>● KDB 941225 D05 SAR for LTE Device v02r05</li> </ul> |
| Limit                |                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
| 1.6 W/kg             |                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
| Test Result          |                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
| Pass                 |                                                                                                                                                                                                                                                                                                                                                                                                                                                          |

The test results in this report apply only to the tested sample of the stated device/equipment. Other similar device/equipment will not necessarily produce the same results due to production tolerance and measurement uncertainties.

Approved by:

Tested by:




Alex Wu  
Section Manager  
Compliance Certification Services Inc.

Stella Chang  
SAR Engineer  
Compliance Certification Services Inc.

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## 2 Description of Equipment Under Test

|                                             |                                                              |                     |         |
|---------------------------------------------|--------------------------------------------------------------|---------------------|---------|
| Product                                     | Body Worn Camera                                             |                     |         |
| Trade Name                                  | Getac                                                        |                     |         |
| Model Number                                | BC-03                                                        |                     |         |
| WWAN Module                                 | Sierra                                                       | Model:              | WP7601  |
| Transmitter                                 | LTE                                                          |                     |         |
| Modulation Technique                        | Operating Mode                                               | TX Freq Range (MHz) |         |
|                                             | LTE Band 4                                                   | 1710 ~ 1755         |         |
|                                             | LTE Band 13                                                  | 777 ~ 787           |         |
| WWAN Antenna Specification                  | Brand name                                                   | Getac               |         |
|                                             | Type                                                         | PIFA                |         |
| Collocated Transmitter                      | AMPAK                                                        | Model:              | AP-6255 |
|                                             | Wi-Fi & Bluetooth                                            |                     |         |
| Collocated Transmitter Modulation Technique | Bluetooth:GFSK for 1Mbps;π/4-DQPSK for 2Mbps;8DPSK for 3Mbps |                     |         |
|                                             | 802.11a: Orthogonal Frequency Division Multiplexing (OFDM)   |                     |         |
|                                             | 802.11b: Direct Sequence Spread Spectrum(DSSS)               |                     |         |
|                                             | 802.11g: Orthogonal Frequency Division Multiplexing (OFDM)   |                     |         |
|                                             | 802.11ac: Orthogonal Frequency Division Multiplexing (OFDM)  |                     |         |
|                                             | 802.11n: Orthogonal Frequency Division Multiplexing (OFDM)   |                     |         |
| WLAN Antenna Specification                  | Brand name                                                   | Getac               |         |
|                                             | Type                                                         | PIFA                |         |
| Rechargeable Li-polymer Battery—alternate   | Brand : Getac<br>Model : BP151P3450P<br>Rating : 3.6V/13Wh   |                     |         |

**Note:**

1. The sample selected for test was prototype that representative to production product and was provided by manufacturer.

## 2.1 Summary of Highest SAR Values

Results for highest reported SAR values for each frequency band and mode

| Technology/Band | Test configuration | Mode    | Highest Reported 1g-SAR (W/kg) |
|-----------------|--------------------|---------|--------------------------------|
| LTE band 4      | Edge 2             | QPSK    | 1.183                          |
| LTE band 13     | Edge 2             | QPSK    | 0.263                          |
| WiFi 2.4 GHz    | Edge 2             | 802.11b | 0.225                          |
| WiFi 5.5 GHz    | Edge 1             | 802.11a | 0.241                          |

Result for highest Simultaneous Transmission SAR values

| Technology/Band         | Test configuration | Mode | Sum of Highest Reported 1g-SAR (W/kg) |
|-------------------------|--------------------|------|---------------------------------------|
| LTE band 4+WiFi 2.4 GHz | Edge 2             | QPSK | 1.408                                 |

### 3 Requirements for Compliance Testing Defined

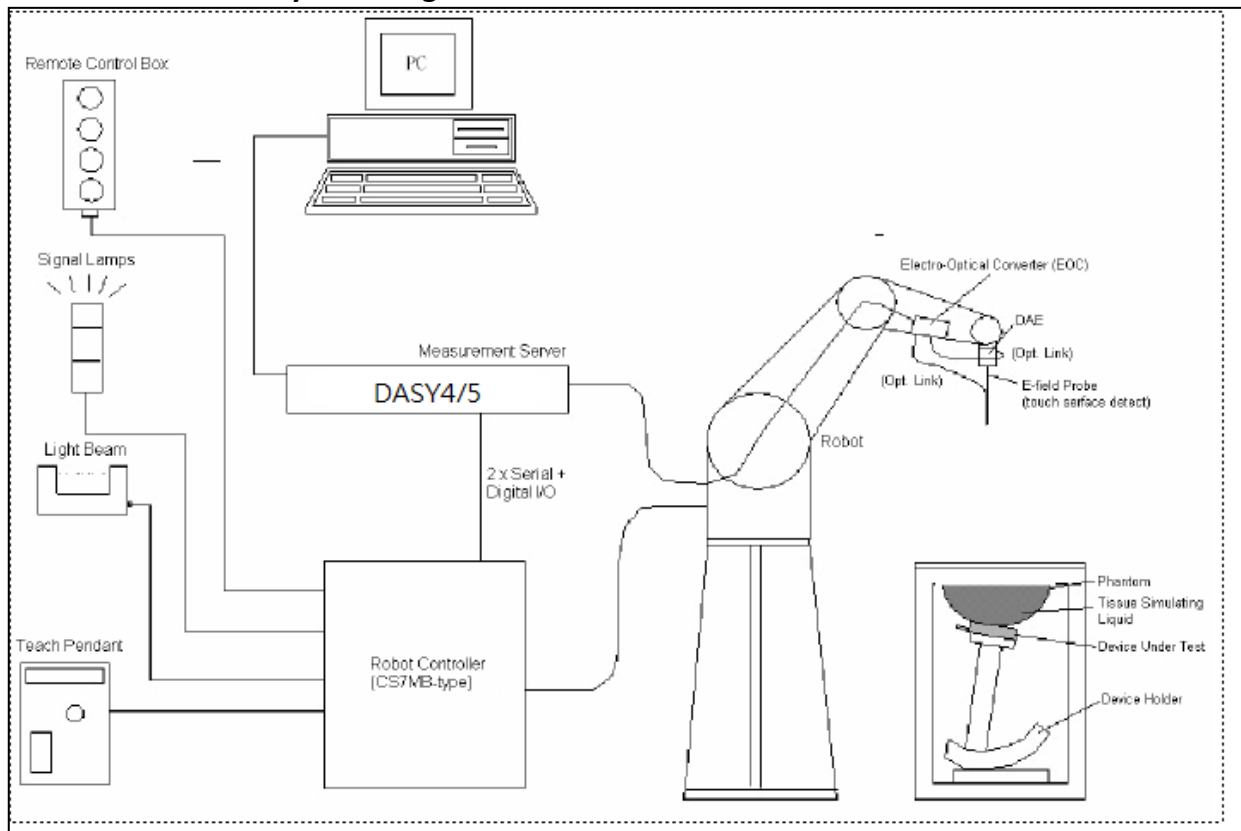
#### 3.1 Requirements for Compliance Testing Defined by the FCC

The US Federal Communications Commission has released the report and order "Guidelines for Evaluating the Environmental Effects of RF Radiation", ET Docket No. 93-62 in August 1996 [1]. The order requires routine SAR evaluation prior to equipment authorization of portable transmitter devices, including portable telephones. For consumer products, the applicable limit is 1.6 W/kg for an uncontrolled environment and 8.0 mW/g for an occupational/controlled environment as recommended by the FCC 47 CFR §2.1093 and IEEE Std 1528-2013.

## 4 Dosimetric Assessment System

These measurements were performed with the automated near-field scanning system DASY5 from Schmid & Partner Engineering AG (SPEAG). The system is based on a high precision robot (working range greater than 0.9 m) which positions the probes with a positional repeatability of better than  $\pm 0.02$  mm. Special E- and H-field probes have been developed for measurements close to material discontinuity, the sensors of which are directly loaded with a Schottky diode and connected via highly resistive lines to the data acquisition unit. The SAR measurements were conducted with the dosimetric probe EX3DV4-SN:7466 (manufactured by SPEAG), designed in the classical triangular configuration and optimized for dosimetric evaluation. The probe has been calibrated according to the procedure with accuracy of better than  $\pm 10\%$ . The spherical isotropy was evaluated with the procedure and found to be better than  $\pm 0.25$  dB. The phantom used was the SAM Twin Phantom as described in FCC supplement C, IEEE 1528 2013.

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**4.1 Measurement System Diagram**

**The DASY4/5 system for performing compliance tests consists of the following items:**

- A standard high precision 6-axis robot (Stäubli RX family) with controller, teach pendant and software. An arm extension for accommodating the data acquisition electronics (DAE).
- A dosimetric probe, i.e., an isotropic E-field probe optimized and calibrated for usage in tissue simulating liquid. The probe is equipped with an optical surface detector system.
- 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 between optical and electrical of the signals for the digital communication to the DAE and for the analog signal from the optical surface detection. The EOC is connected 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.
- A probe alignment unit which improves the (absolute) accuracy of the probe positioning.
- A computer operating Windows 7 or Windows XP.
- DASY4 software version: 4.7, Build 80. DASY5 software version: 52.8.8.1222.
- Remote control with teach pendant and additional circuitry for robot safety such as warning lamps, etc.
- The SAM twin phantom enabling testing left-hand and right-hand usage.
- The device holder for handheld mobile phones.
- Tissue simulating liquid mixed according to the given recipes.
- Validation dipole kits allowing validating the proper functioning of the system.

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## 4.2 System Components

### DASY4/DASY5 Measurement Server



The DASY4/DASY5 measurement server is based on a PC/104 CPU board with a 166MHz low-power Pentium, 32MB chip disk and 64MB RAM. The necessary circuits for communication with either the DAE3 electronic box as well as the 16-bit AD-converter system for optical detection and digital I/O interface are contained on the DASY4/DASY5 I/O-board, which is directly connected to the PC/104 bus of the CPU board.

The measurement server performs all real-time data evaluation for field measurements and surface detection, controls robot movements and handles safety operation.



The PC-operating system cannot interfere with these time critical processes. All connections are supervised by a watchdog, and disconnection of any of the cables to the measurement server will automatically disarm the robot and disable all program-controlled robot movements. Furthermore, the measurement server is equipped with two expansion slots which are reserved for future applications. Please note that the expansion slots do not have a standardized pinout and therefore only the expansion cards provided by SPEAG can be inserted. Expansion cards from any other supplier could seriously damage the measurement server. Calibration: No calibration required.

### Data Acquisition Electronics (DAE)



The data acquisition electronics (DAE4) consists of a highly sensitive electrometer grade preamplifier with auto-zeroing, a channel and gain-switching multiplexer, a fast 16 bit AD converter and a command decoder and control logic unit. Transmission to the measurement server is accomplished through an optical downlink for data and status information as well as an optical uplink for commands and the clock. The mechanical probe mounting device includes two different sensor systems for frontal and sideways probe contacts. They are used for mechanical surface detection and probe collision detection. The input impedance of the DAE4 box is 200MOhm; the inputs are symmetrical and floating. Common mode rejection is above 80 dB.

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**EX3DV4 Isotropic E-Field Probe for Dosimetric Measurements**

**Construction:** Symmetrical design with triangular core  
Built-in shielding against static charges  
PEEK enclosure material (resistant to organic solvents, e.g., DGBE)

**Calibration:** Basic Broad Band Calibration in air: 10-3000 MHz.  
Conversion Factors (CF) for HSL 900 and HSL 1800  
CF-Calibration for other liquids and frequencies upon request.

**Frequency:** 10 MHz to > 6 GHz; Linearity:  $\pm 0.2$  dB (30 MHz to 3 GHz)

**Directivity:**  $\pm 0.3$  dB in HSL (rotation around probe axis)  
 $\pm 0.5$  dB in HSL (rotation normal to probe axis)

**Dynamic Range:** 10  $\mu$ W/g to > 100 mW/g; Linearity:  $\pm 0.2$  dB  
(noise: typically < 1  $\mu$ W/g)



**Dimensions:** Overall length: 330 mm (Tip: 20 mm)  
Tip diameter: 2.5 mm (Body: 12 mm)  
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%.

**SAM Phantom (V4.0)**

**Construction:** The shell corresponds to the specifications of the Specific Anthropomorphic Mannequin (SAM) phantom defined in IEEE 1528 2013, CENELEC 50361 and IEC 62209. It enables the dosimetric evaluation of left and right hand phone usage as well as body mounted usage at the flat phantom region. A cover prevents evaporation of the liquid. Reference markings on the phantom allow the complete setup of all predefined phantom positions and measurement grids by manually teaching three points with the robot.

**Shell Thickness:**  $2 \pm 0.2$  mm

**Filling Volume:** Approx. 25 liters

**Dimensions:** Height: 810mm; Length: 1000mm; Width: 500mm

**SAM Phantom (ELI4)**

**Construction:** Phantom for compliance testing of handheld and body-mounted wireless devices in the frequency range of 30 MHz to 6 GHz. ELI4 is fully compatible with the latest draft of the standard IEC 62209 Part II and all known tissue simulating liquids. ELI4 has been optimized regarding its performance and can be integrated into our standard phantom tables. A cover prevents evaporation of the liquid. Reference markings on the phantom allow installation of the complete setup, including all predefined phantom positions and measurement grids, by teaching three points. The phantom is supported by software version DASY4/DASY5 and higher and is compatible with all SPEAG dosimetric probes and dipoles

**Shell Thickness:**  $2.0 \pm 0.2$  mm (sagging: <1%)

**Filling Volume:** Approx. 25 liters

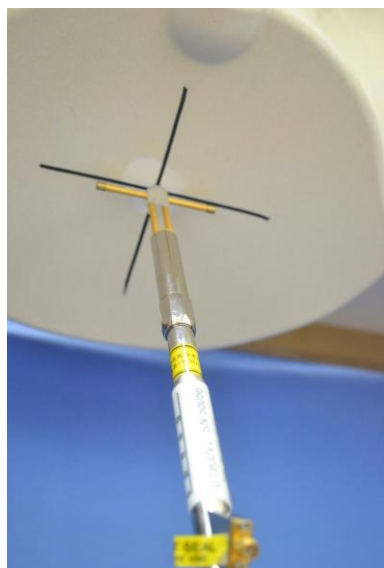
**Dimensions:** Major ellipse axis: 600 mm  
Minor axis: 400 mm 500mm

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**Device Holder for SAM Twin Phantom**

**Construction:** In combination with the Twin SAM Phantom V4.0 or Twin SAM, the Mounting Device (made from POM) enables the rotation of the mounted transmitter in spherical coordinates, whereby the rotation point is the ear opening. The devices can be easily and accurately positioned according to IEC, IEEE, CENELEC, FCC or other specifications. The device holder can be locked at different phantom locations (left head, right head, and flat phantom).

**System Validation Kits for SAM Phantom (V4.0)**

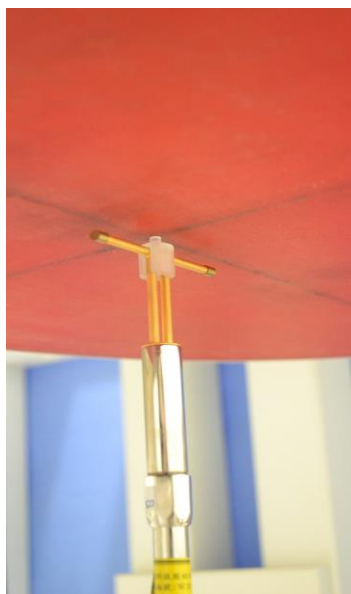
**Construction:** Symmetrical dipole with 1/4 balun Enables measurement of feedpoint impedance with NWA Matched for use near flat phantoms filled with brain simulating solutions Includes distance holder and tripod adaptor.

**Frequency:** 750, 835, 1750, 1900, 2450 MHz

**Return loss:** > 20 dB at specified validation position

**Power capability:** > 100 W ( $f < 1\text{GHz}$ ); > 40 W ( $f > 1\text{GHz}$ )

**Dimensions:**  
D750V3: dipole length: 178 mm; overall height: 330 mm  
D1750V2: dipole length: 75.2 mm; overall height: 301.5 mm  
D2450V2: dipole length: 51.5 mm; overall height: 290 mm  
D5GHzV2: dipole length: 20.6 mm; overall height: 300 mm

**System Validation Kits for ELI4 phantom**

**Construction:** Symmetrical dipole with 1/4 balun Enables measurement of feedpoint impedance with NWA Matched for use near flat phantoms filled with brain simulating solutions Includes distance holder and tripod adaptor.

**Frequency:** 750 1750, 2450, 5300, 5600, 5800 MHz

**Return loss:** > 20 dB at specified validation position

**Power capability:** > 100 W ( $f < 1\text{GHz}$ ); > 40 W ( $f > 1\text{GHz}$ )

**Dimensions:**  
D750V3: dipole length: 178 mm; overall height: 330 mm  
D1750V2: dipole length: 72.5 mm; overall height: 300 mm  
D2450V2: dipole length: 51.5 mm; overall height: 290 mm  
D5GHzV2: dipole length: 20.6 mm; overall height: 300 mm

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## 5 Evaluation Procedures

### Data Evaluation

The DASY4/DASY5 post processing software (SEMCAD) automatically executes the following procedures to calculate the field units from the microvolt readings at the probe connector. The parameters used in the evaluation are stored in the configuration modules of the software:

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

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

The first step of the evaluation is a linearization of the filtered input signal to account for the compression characteristics of the detector diode. The compensation depends on the input signal, the diode type and the DC-transmission factor from the diode to the evaluation electronics. If the exciting field is pulsed, the crest factor of the signal must be known to correctly compensate for peak power. The formula for each channel can be given as:

$$V_i = U_i + U_i^2 \cdot \frac{cf}{dcp_i}$$

|      |         |                                   |                  |
|------|---------|-----------------------------------|------------------|
| with | $V_i$   | = Compensated signal of channel i | (i = x, y, z)    |
|      | $U_i$   | = Input signal of channel i       | (i = x, y, z)    |
|      | $cf$    | = Crest factor of exciting field  | (DASY parameter) |
|      | $dcp_i$ | = Diode compression point         | (DASY parameter) |

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

E-field probes:

$$E_i = \sqrt{\frac{V_i}{Norm_i \cdot ConvF}}$$

H-field probes:

$$H_i = \sqrt{V_i} \cdot \frac{a_{i10} + a_{i11} f + a_{i12} f^2}{f}$$

|      |          |                                   |               |
|------|----------|-----------------------------------|---------------|
| with | $V_i$    | = Compensated signal of channel i | (i = x, y, z) |
|      | $Norm_i$ | = Sensor sensitivity of channel i | (i = x, y, z) |

$\mu V/(V/m)^2$  for E0field Probes

|          |                                                 |
|----------|-------------------------------------------------|
| $ConvF$  | = Sensitivity enhancement in solution           |
| $a_{ij}$ | = Sensor sensitivity factors for H-field probes |
| $f$      | = Carrier frequency (GHz)                       |
| $E_i$    | = Electric field strength of channel i in V/m   |
| $H_i$    | = Magnetic field strength of channel i in A/m   |

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

$$E_{tot} = \sqrt{E_x^2 + E_y^2 + E_z^2}$$

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

$$SAR = E_{tot}^2 \cdot \frac{\sigma}{\rho \cdot 1000}$$

with

$SAR$  = local specific absorption rate in W/kg

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

$\sigma$  = conductivity in [mho/m] or [Siemens/m]

$\rho$  = equivalent tissue density in g/cm<sup>3</sup>

Note that the density is normally set to 1 (or 1.06), to account for actual brain density rather than the density of the simulation liquid.

The power flow density is calculated assuming the excitation field as a free space field.

$$P_{pwe} = \frac{E_{tot}^2}{377} \quad \text{or} \quad P_{pwe} = H_{tot}^2 \cdot 37.7$$

with

$P_{pwe}$  = Equivalent power density of a plane wave in mW/cm<sup>2</sup>

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

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

## 6 SAR Measurement Procedures

### 6.1 Normal SAR Test Procedure

- Power Reference Measurement

The reference and drift jobs are useful jobs for monitoring the power drift of the device under test in the batch process. Both jobs measure the field at a specified reference position, at a selectable distance from the phantom surface. The reference position can be either the selected section's grid reference point or a user point in this section. The reference job projects the selected point onto the phantom surface, orients the probe perpendicularly to the surface, and approaches the surface using the selected detection method.

- 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 finer measurement around the hot spot. The sophisticated interpolation routines implemented in DASY4/DASY5 software can find the maximum locations even in relatively coarse grids. The scan area is defined by an editable grid. This grid is anchored at the grid reference point of the selected section in the phantom. When the area scan's property sheet is brought-up, the grid resolution has to less than 15 mm by 15 mm at frequency  $\leq 2$ GHz; the grid resolution has to less than 12mm by 12 mm at frequency between 2GHz to 4GHz; grid resolution has to less than 10 mm by 10 mm at frequency between 4GHz to 6GHz.

According to KDB 865664 D01 SAR measurement 100 MHz to 6 GHz v01

|                                                                                                        | $\leq 3$ GHz                                                                                                                                                                                                                                                           | $> 3$ GHz                                          |
|--------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------|
| Maximum distance from closest measurement point (geometric center of probe sensors) to phantom surface | $5 \pm 1$ mm                                                                                                                                                                                                                                                           | $\frac{1}{2} \cdot \delta \cdot \ln(2) \pm 0.5$ mm |
| Maximum probe angle from probe axis to phantom surface normal at the measurement location              | $30^\circ \pm 1^\circ$                                                                                                                                                                                                                                                 | $20^\circ \pm 1^\circ$                             |
| Maximum area scan spatial resolution: $\Delta x_{\text{Zoom}}$ , $\Delta y_{\text{Zoom}}$              | $\leq 2$ GHz: $\leq 15$ mm<br>2 – 3 GHz: $\leq 12$ mm                                                                                                                                                                                                                  | 3 – 4 GHz: $\leq 12$ mm<br>4 – 6 GHz: $\leq 10$ 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 $\leq$ the corresponding x or y dimension of the test device with at least one measurement point on the test device. |                                                    |

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### • Zoom Scan

Zoom scans are used to assess the peak spatial SAR values within a cubic averaging volume containing 1 g and 10 g of simulated tissue. The default zoom scan measures points in accordance with the frequency can be divided into three parts. (1)The zoom scan volume was set to 5x5x7 points at frequency  $\leq 2$ GHz. (2) The zoom scan volume was set to 7x7x7 points at frequency between 2GHz to 4GHz (3) The zoom scan volume was set to 7x7x12 points at frequency between 4GHz to 6GHz. The measures points within a cube whose base faces are centered around the maximum found in a preceding area scan job within the same procedure. If the preceding Area Scan job indicates more than one maximum, the number of Zoom Scans has to be enlarged accordingly.

According to KDB 865664 D01 SAR measurement 100 MHz to 6 GHz v01

|                                                                                        |                                           |                                                                                           | $\leq 3$ GHz                                                                  | $> 3$ GHz                                                                    |
|----------------------------------------------------------------------------------------|-------------------------------------------|-------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------|------------------------------------------------------------------------------|
| Maximum zoom scan spatial resolution: $\Delta x_{\text{Zoom}}, \Delta y_{\text{Zoom}}$ |                                           |                                                                                           | $\leq 2$ GHz: $\leq 8$ mm<br>2 – 3 GHz: $\leq 5$ mm                           | 3 – 4 GHz: $\leq 5$ mm<br>4 – 6 GHz: $\leq 4$ mm                             |
| Maximum zoom scan spatial resolution, normal to phantom surface                        | Uniform grid: $\Delta z_{\text{Zoom}}(n)$ |                                                                                           | $\leq 5$ mm                                                                   | 3 – 4 GHz: $\leq 4$ mm<br>4 – 5 GHz: $\leq 3$ mm<br>5 – 6 GHz: $\leq 2$ mm   |
|                                                                                        | graded grid                               | $\Delta z_{\text{Zoom}}(1)$ :between 1 <sup>st</sup> two points losest to phantom surface | $\leq 4$ mm                                                                   | 3 – 4 GHz: $\leq 3$ mm<br>4 – 5 GHz: $\leq 2.5$ mm<br>5 – 6 GHz: $\leq 2$ mm |
|                                                                                        |                                           | $\Delta z_{\text{Zoom}}(n>1)$ : between subsequent points                                 | $\leq 1.5 \cdot \Delta z_{\text{Zoom}}(n-1)$                                  |                                                                              |
| Maximum zoom scan volume                                                               | x, y, z                                   | $\geq 30$ mm                                                                              | 3 – 4 GHz: $\geq 28$ mm<br>4 – 5 GHz: $\geq 25$ mm<br>5 – 6 GHz: $\geq 22$ mm |                                                                              |

### • Power Drift Measurement

The drift job measures the field at the same location as the most recent reference job within the same procedure, and with the same settings. The drift measurement gives the field difference in dB from the reading conducted within the last reference measurement. Several drift measurements are possible for one reference measurement. This allows a user to monitor the power drift of the device under test within a batch process. In the properties of the Drift job, the user can specify a limit for the drift and have DASY4/DASY5 software stop the measurements if this limit is exceeded.

### • Z-Scan

The Z Scan job measures points along a vertical straight line. The line runs along the Z-axis of a one-dimensional grid. A user can anchor the grid to the current probe location. As with any other grids, the local Z-axis of the anchor location establishes the Z-axis of the grid.

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## 7 Measurement Uncertainty

According to KDB 865664 D01 SAR Measurement 100 MHz to 6 GHz section 2.8.2, SAR measurement uncertainty analysis is required in SAR reports only when the highest measured SAR in a frequency band is  $\geq 1.5$  W/kg for 1-g SAR, the extensive SAR measurement uncertainty analysis described in IEEE Std 1528-2013 is not required in SAR reports submitted for equipment approval.

## 8 Device Under Test

### 8.1 Wireless Technologies

| Wireless technologies | Tx Frequency Bands | Operating mode                                                                                                        | Duty Cycle used for testing |
|-----------------------|--------------------|-----------------------------------------------------------------------------------------------------------------------|-----------------------------|
| LTE                   | Band 4<br>Band 13  | QPSK<br>16QAM                                                                                                         | 100%                        |
| Wi-Fi                 | 2.4 / 5GHz Band    | 802.11b<br>802.11g<br>802.11n(HT20)<br>802.11n(HT40)<br>802.11a<br>802.11a(HT20)<br>802.11a (HT40)<br>802.11a (VHT80) | 100%                        |
| Bluetooth             | 2.4GHz             | 2.1<br>4.0                                                                                                            | NA                          |

## 8.2 Maximum Tune-up Power

P-sensor off

| Tolerance (dB): $\pm 1$ |      | RF Output Power (dBm) |                    |
|-------------------------|------|-----------------------|--------------------|
| Band                    | Mode | Target                | Max. tune-up power |
| LTE Band 4              | QPSK | 22.0                  | 23.0               |
| LTE Band 13             | QPSK | 22.0                  | 23.0               |

P-sensor on

| Tolerance (dB): $\pm 1$ |      | RF Output Power (dBm) |                    |
|-------------------------|------|-----------------------|--------------------|
| Band                    | Mode | Target                | Max. tune-up power |
| LTE Band 4              | QPSK | 16.0                  | 17.0               |

| Tolerance (dB): $\pm$ | 1.5            | RF Output Power (dBm)   |                    |
|-----------------------|----------------|-------------------------|--------------------|
| Band (GHz)            | Mode           | Target                  | Max. tune-up power |
| 2.4                   | 802.11b        | 16.00                   | 17.50              |
|                       | 802.11g        | 15.00                   | 16.50              |
|                       | 802.11n HT20   | 12.00                   | 13.50              |
| Tolerance (dB): $\pm$ | 1.5            | RF Output Power (dBm)   |                    |
| Band (GHz)            | Mode           | Target                  | Max. tune-up power |
| 5.2<br>(UNII-1)       | 802.11a        | 8.00                    | 9.50               |
|                       | 802.11n HT20   | 4.00                    | 5.50               |
|                       | 802.11n HT40   | 4.00                    | 5.50               |
|                       | 802.11ac VHT80 | 4.00                    | 5.50               |
| 5.3<br>(UNII-2A)      | 802.11a        | 8.00                    | 9.50               |
|                       | 802.11n HT20   | 4.00                    | 5.50               |
|                       | 802.11n HT40   | 4.00                    | 5.50               |
|                       | 802.11ac VHT80 | 4.00                    | 5.50               |
| 5.5<br>(UNII-2C)      | 802.11a        | 10.00                   | 11.50              |
|                       | 802.11n HT20   | 5.00                    | 6.50               |
|                       | 802.11n HT40   | 6.00                    | 7.50               |
|                       | 802.11ac VHT80 | 6.00                    | 7.50               |
| 5.8<br>(UNII-3)       | 802.11a        | 10.00                   | 11.50              |
|                       | 802.11n HT20   | 5.00                    | 6.50               |
|                       | 802.11n HT40   | 6.00                    | 7.50               |
|                       | 802.11ac VHT80 | 6.00                    | 7.50               |
| Mode                  |                | Max. tune-up power(dBm) |                    |
| Bluetooth             |                | 6.0                     |                    |
| Bluetooth LE          |                | 6.0                     |                    |

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### 8.3 Simultaneous Transmission

| RF Exposure Condition | Transmit Configurations                                                                                                                                                                                      |
|-----------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| WWAN + Wi-Fi          | <b>LTE + Wi-Fi / BT</b><br>LTE Band 4/13 + BT (Chain 0)<br>LTE Band 4/13+ 2.4GHz (Chain 0)<br>LTE Band 4/13+ 5GHz (Chain 0)<br><b>Wi-Fi</b><br>2.4GHz(Chain 0)<br>5GHz(Chain 0)<br><b>BT</b><br>BT (Chain 0) |

**Note(s):**

1. For WWAN mode only Chain 0 can be used as transmitting and Chain 1 only be used as receiving.

## 9 General LTE SAR Test and Reporting Considerations

KDB 941225 D05 SAR for LTE Devices V02

| Item | Description                                                       | Information |                   |                  |                  |                  |                  |
|------|-------------------------------------------------------------------|-------------|-------------------|------------------|------------------|------------------|------------------|
| 1    | Frequency range,<br>Channel Bandwidth,<br>Numbers and Frequencies | Band 4      | Channel Bandwidth |                  |                  |                  |                  |
|      |                                                                   |             | 1.4MHz            | 3MHz             | 5MHz             | 10MHz            | 15MHz            |
|      |                                                                   | Low         | 19957/<br>1710.7  | 19965/<br>1711.5 | 19975/<br>1712.5 | 20000/<br>1715   | 20025/<br>1717.5 |
|      |                                                                   | Mid         | 20175/<br>1732.5  | 20175/<br>1732.5 | 20175/<br>1732.5 | 20175/<br>1732.5 | 20175/<br>1732.5 |
|      |                                                                   | High        | 20392/<br>1754.2  | 20384/<br>1753.4 | 20375/<br>1752.5 | 20350/<br>1750   | 20325/<br>1747.5 |
|      |                                                                   | Band 13     | Channel Bandwidth |                  |                  |                  |                  |
|      |                                                                   |             | 1.4MHz            | 3MHz             | 5MHz             | 10MHz            | 15MHz            |
|      |                                                                   | Low         |                   |                  | 23205/<br>779.5  |                  |                  |
|      |                                                                   | Mid         |                   |                  | 23230/<br>782    | 23230/<br>782    |                  |
|      |                                                                   | High        |                   |                  | 23255/<br>784.5  |                  |                  |

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KDB 941225 D05 SAR for LTE Devices V02 (Continued)

| Item       | Description                                                     | Information                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |            |                                                         |        |        |          |  |  |          |         |         |       |        |        |        |      |     |     |     |      |      |      |     |        |     |     |     |      |      |      |     |        |     |     |     |      |      |      |     |
|------------|-----------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------|---------------------------------------------------------|--------|--------|----------|--|--|----------|---------|---------|-------|--------|--------|--------|------|-----|-----|-----|------|------|------|-----|--------|-----|-----|-----|------|------|------|-----|--------|-----|-----|-----|------|------|------|-----|
| 2          | Descriptions of the LTE transmitter and antenna implementation; | A single antenna is used for LTE Transmit and Receive.<br>A Secondary antenna is used for LTE Receive Only.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |            |                                                         |        |        |          |  |  |          |         |         |       |        |        |        |      |     |     |     |      |      |      |     |        |     |     |     |      |      |      |     |        |     |     |     |      |      |      |     |
| 3          | Maximum power reduction (MPR)                                   | <p>As per 3GPP 36.101 v9.11.0 (2012-03), Release 9</p> <p><b>Table 6.2.3-1: Maximum Power Reduction (MPR) for Power Class 3</b></p> <table><tr><th rowspan="2">Modulation</th><th colspan="6">Channel bandwidth / Transmission bandwidth (<math>N_{RB}</math>)</th><th rowspan="2">MPR (dB)</th></tr><tr><th>1.4 MHz</th><th>3.0 MHz</th><th>5 MHz</th><th>10 MHz</th><th>15 MHz</th><th>20 MHz</th></tr><tr><td>QPSK</td><td>&gt; 5</td><td>&gt; 4</td><td>&gt; 8</td><td>&gt; 12</td><td>&gt; 16</td><td>&gt; 18</td><td>≤ 1</td></tr><tr><td>16 QAM</td><td>≤ 5</td><td>≤ 4</td><td>≤ 8</td><td>≤ 12</td><td>≤ 16</td><td>≤ 18</td><td>≤ 1</td></tr><tr><td>16 QAM</td><td>&gt; 5</td><td>&gt; 4</td><td>&gt; 8</td><td>&gt; 12</td><td>&gt; 16</td><td>&gt; 18</td><td>≤ 2</td></tr></table> <p>MPR is permanently built-in by design</p> <p>A-MPR was disabled</p> | Modulation | Channel bandwidth / Transmission bandwidth ( $N_{RB}$ ) |        |        |          |  |  | MPR (dB) | 1.4 MHz | 3.0 MHz | 5 MHz | 10 MHz | 15 MHz | 20 MHz | QPSK | > 5 | > 4 | > 8 | > 12 | > 16 | > 18 | ≤ 1 | 16 QAM | ≤ 5 | ≤ 4 | ≤ 8 | ≤ 12 | ≤ 16 | ≤ 18 | ≤ 1 | 16 QAM | > 5 | > 4 | > 8 | > 12 | > 16 | > 18 | ≤ 2 |
| Modulation | Channel bandwidth / Transmission bandwidth ( $N_{RB}$ )         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |            |                                                         |        |        | MPR (dB) |  |  |          |         |         |       |        |        |        |      |     |     |     |      |      |      |     |        |     |     |     |      |      |      |     |        |     |     |     |      |      |      |     |
|            | 1.4 MHz                                                         | 3.0 MHz                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | 5 MHz      | 10 MHz                                                  | 15 MHz | 20 MHz |          |  |  |          |         |         |       |        |        |        |      |     |     |     |      |      |      |     |        |     |     |     |      |      |      |     |        |     |     |     |      |      |      |     |
| QPSK       | > 5                                                             | > 4                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | > 8        | > 12                                                    | > 16   | > 18   | ≤ 1      |  |  |          |         |         |       |        |        |        |      |     |     |     |      |      |      |     |        |     |     |     |      |      |      |     |        |     |     |     |      |      |      |     |
| 16 QAM     | ≤ 5                                                             | ≤ 4                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | ≤ 8        | ≤ 12                                                    | ≤ 16   | ≤ 18   | ≤ 1      |  |  |          |         |         |       |        |        |        |      |     |     |     |      |      |      |     |        |     |     |     |      |      |      |     |        |     |     |     |      |      |      |     |
| 16 QAM     | > 5                                                             | > 4                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | > 8        | > 12                                                    | > 16   | > 18   | ≤ 2      |  |  |          |         |         |       |        |        |        |      |     |     |     |      |      |      |     |        |     |     |     |      |      |      |     |        |     |     |     |      |      |      |     |
| 4          | Power Reduction                                                 | Yes                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |            |                                                         |        |        |          |  |  |          |         |         |       |        |        |        |      |     |     |     |      |      |      |     |        |     |     |     |      |      |      |     |        |     |     |     |      |      |      |     |

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## 10 Power Reduction by Proximity Sensing

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

### 10.1 Procedures for determining proximity sensor triggering distances

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

- (1) The relevant transmitter should be set to operate at its normal maximum output power.
- (2) The entire back surface or edge of the tablet is positioned below a flat phantom filled with the required tissue-equivalent medium, and positioned at least 20 mm further than the distance that triggers power reduction.
- (3) It should be ensured that the cables required for power measurements are not interfering with the proximity sensor. Cable losses should be properly compensated to report the measured power results.
- (4) The back surface or edge is moved toward the phantom in 3 mm steps until the sensor triggers.
- (5) The back surface or edge is then moved back (further away) from the phantom by at least 5 mm or until maximum output power is returned to the normal maximum level.
- (6) The back surface or edge is again moved toward the phantom, but in 1 mm steps, until it is at least 5 mm past the triggering point or touching the phantom. If 1 mm resolution is not suitable for the sensor triggering sensitivity, a KDB inquiry should be submitted to determine alternative test configurations.
- (7) If the tablet is not touching the phantom, it is moved in 3 mm steps until it touches the phantom to confirm that the sensor remains triggered and the maximum power stays reduced.
- (8) The process is then reversed by moving the tablet away from the phantom according to steps 4) to 7), to determine triggering release, until it is at least 10 mm beyond the point that triggers the return of normal maximum power.
- (9) The measured output power within  $\pm 5$  mm of the triggering points, or until the tablet is touching the phantom, for movements to and from the phantom should be tabulated in the SAR report.
- (10) If the sensor design and implementation allow additional variations for triggering distance tolerances, multiple samples should be tested to determine the most conservative distance required for SAR evaluation.
- (11) To ensure all production units are compliant, it is generally necessary to reduce the triggering distance determined from the triggering tests by 1 mm, or more if it is necessary, and use the smallest distance for movements to and from the phantom, minus 1 mm, as the sensor triggering distance for determining the SAR measurement distance.

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## 10.2 Procedures for determining antenna and proximity sensor coverage

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

- (1) The back surface or edge of the tablet is positioned at a test separation distance less than or equal to the distance required for back surface or edge triggering, with both the antenna and sensor pad located at least 20 mm laterally outside the edge (boundary) of the phantom, along the direction of maximum antenna and sensor offset. For the back surface, if the direction of maximum offset is not aligned with the tablet coordinates (physical edges) the tablet test position would not be aligned with the phantom coordinates (orientations). Each applicable tablet edge should be positioned perpendicularly to the phantom to determine sensor coverage. For antennas and/or sensors located near the corner of a tablet, both adjacent edges must be considered.
- (2) The similar sequence of steps applied to determine sensor triggering distance in section 6.2 are used to verify back surface and edge sensor coverage by moving the tablet (sensor and antenna) horizontally toward the phantom while maintaining the same vertical separation between the back surface or edge and the phantom.
- (3) After the exact location where triggering of power reduction is determined, with respect to the sensor and antenna, the tablet movement should be continued, in 3 mm increments, until both the sensor and antenna(s) are fully under the phantom and at least 20 mm inside the phantom edge.
- (4) The process is then repeated from the opposite direction, starting at the other end of the maximum antenna and sensor offset, by rotating the tablet 180° along the vertical axis.
- (5) The triggering points should be documented graphically, with the antenna and sensor clearly identified, along with all relevant dimensions.
- (6) If the subsequently measured peak SAR location for the antenna is not between the triggering points, established by the sensor coverage tests from opposite ends of the antenna and sensor, additional SAR tests may be required for conditions where only part of the back surface or edge of a tablet corresponding to the antenna is in proximity to the user and the sensor may not be triggering as desired. A KDB inquiry must be submitted by the test lab to determine if additional tests are required and the proper test configurations to use for testing. This may include situations where the sensor coverage region is too small for the antenna, the sensor is located too far away from the antenna, the sensor location is insufficient to cover multiple antennas or the antenna is at the corner of a tablet etc.

### 10.3 Proximity Sensor Status Table of trigger distance

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

Proximity Sensor Status Table when DUT is moving towards the phantom

| Distance to the DUT (mm) | Proximity Sensor Status – Rear Surface | Proximity Sensor Status – Top-Edge |
|--------------------------|----------------------------------------|------------------------------------|
| 30                       | OFF                                    | OFF                                |
| 27                       | OFF                                    | OFF                                |
| 25                       | OFF                                    | OFF                                |
| 24                       | OFF                                    | OFF                                |
| 23                       | OFF                                    | OFF                                |
| 22                       | OFF                                    | OFF                                |
| 21                       | OFF                                    | OFF                                |
| 20                       | OFF                                    | OFF                                |
| 19                       | OFF                                    | OFF                                |
| 18                       | OFF                                    | OFF                                |
| 17                       | OFF                                    | OFF                                |
| 16                       | OFF                                    | ON                                 |
| 15                       | OFF                                    | ON                                 |
| 14                       | OFF                                    | ON                                 |
| 13                       | OFF                                    | ON                                 |
| 12                       | OFF                                    | ON                                 |
| 11                       | OFF                                    | ON                                 |
| 10                       | OFF                                    | ON                                 |
| 9                        | OFF                                    | ON                                 |
| 8                        | OFF                                    | ON                                 |
| 7                        | OFF                                    | ON                                 |
| 6                        | OFF                                    | ON                                 |
| 5                        | OFF                                    | ON                                 |
| 4                        | OFF                                    | ON                                 |
| 3                        | OFF                                    | ON                                 |
| 2                        | OFF                                    | ON                                 |
| 1                        | OFF                                    | ON                                 |
| 0                        | OFF                                    | ON                                 |

Edge Power Back-off

Rear Power Back-off

Body Phantom

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Proximity Sensor Status Table when DUT is moving away from the phantom

| Distance to the DUT (mm) | Proximity Sensor Status – Rear Surface | Proximity Sensor Status – Top-Edge |
|--------------------------|----------------------------------------|------------------------------------|
| 0                        | OFF                                    | ON                                 |
| 1                        | OFF                                    | ON                                 |
| 2                        | OFF                                    | ON                                 |
| 3                        | OFF                                    | ON                                 |
| 4                        | OFF                                    | ON                                 |
| 5                        | OFF                                    | ON                                 |
| 6                        | OFF                                    | ON                                 |
| 7                        | OFF                                    | ON                                 |
| 8                        | OFF                                    | ON                                 |
| 9                        | OFF                                    | ON                                 |
| 10                       | OFF                                    | ON                                 |
| 11                       | OFF                                    | ON                                 |
| 12                       | OFF                                    | ON                                 |
| 13                       | OFF                                    | ON                                 |
| 14                       | OFF                                    | ON                                 |
| 15                       | OFF                                    | ON                                 |
| 16                       | OFF                                    | ON                                 |
| 17                       | OFF                                    | OFF                                |
| 18                       | OFF                                    | OFF                                |
| 19                       | OFF                                    | OFF                                |
| 20                       | OFF                                    | OFF                                |
| 21                       | OFF                                    | OFF                                |
| 22                       | OFF                                    | OFF                                |
| 23                       | OFF                                    | OFF                                |
| 24                       | OFF                                    | OFF                                |
| 25                       | OFF                                    | OFF                                |
| 27                       | OFF                                    | OFF                                |
| 30                       | OFF                                    | OFF                                |

Body Phantom

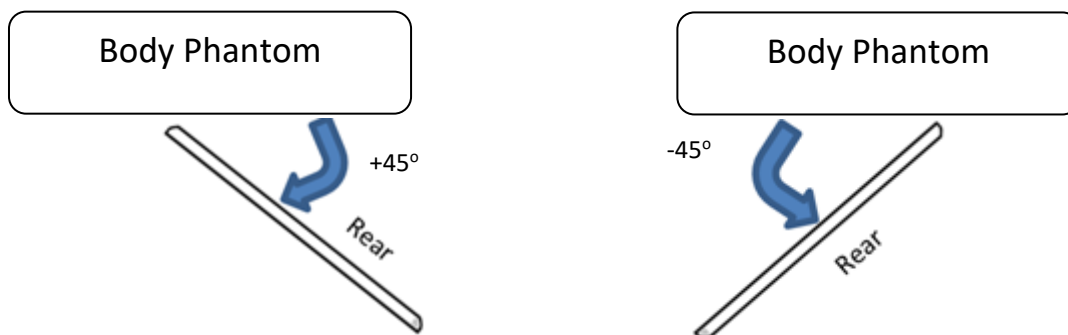
Rear Power  
Back-off

Edge Power  
Back-off

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#### 10.4 Tilt angle influences to proximity sensor triggering

As per the KDB 616217 D04 SAR for laptop and tablets v01r02, section 6.4, the following procedure is used to determine the tilt angle influences to proximity sensor triggering.

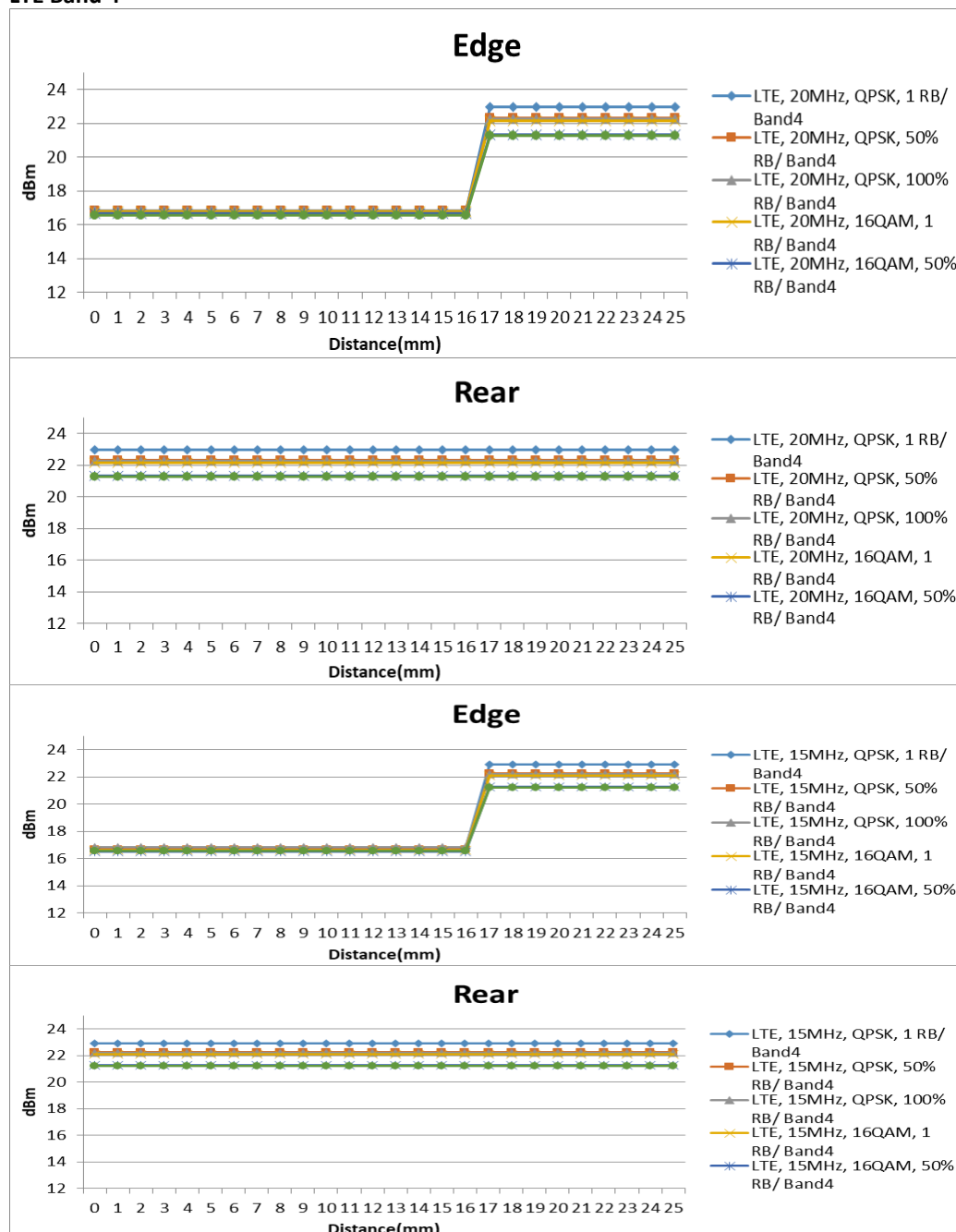


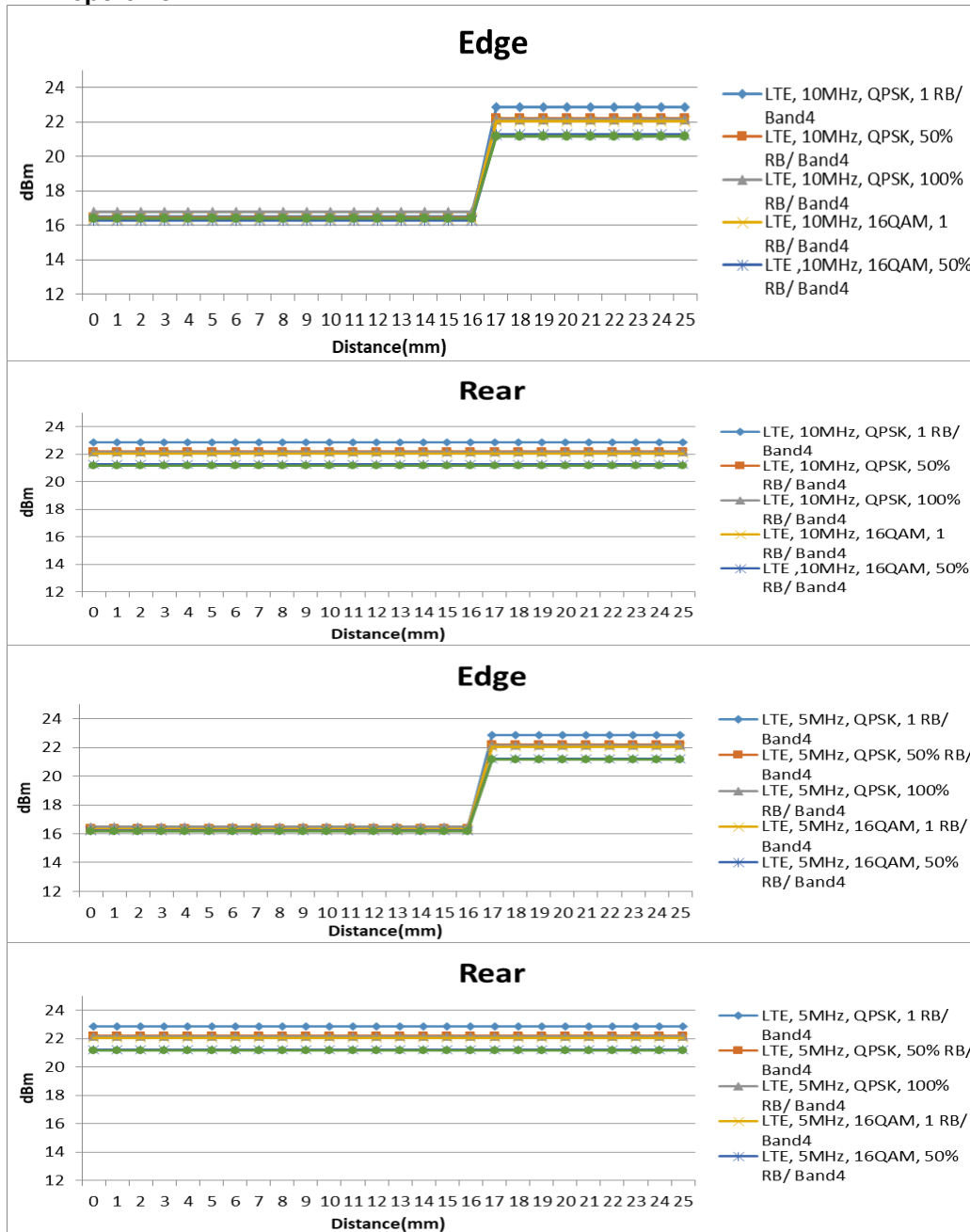
| Distance to the DUT (mm) | Proximity Sensor Status 0° to +45° | Proximity Sensor Status 0° to -45° |
|--------------------------|------------------------------------|------------------------------------|
| 16                       | ON                                 | ON                                 |
| 15                       | ON                                 | ON                                 |
| 14                       | ON                                 | ON                                 |
| 13                       | ON                                 | ON                                 |
| 12                       | ON                                 | ON                                 |
| 11                       | ON                                 | ON                                 |
| 10                       | ON                                 | ON                                 |
| 9                        | ON                                 | ON                                 |
| 8                        | ON                                 | ON                                 |
| 7                        | ON                                 | ON                                 |
| 6                        | ON                                 | ON                                 |
| 5                        | ON                                 | ON                                 |
| 4                        | ON                                 | ON                                 |
| 3                        | ON                                 | ON                                 |
| 2                        | ON                                 | ON                                 |
| 1                        | ON                                 | ON                                 |
| 0                        | ON                                 | ON                                 |

## 10.5 Power Reduction per Air-interface

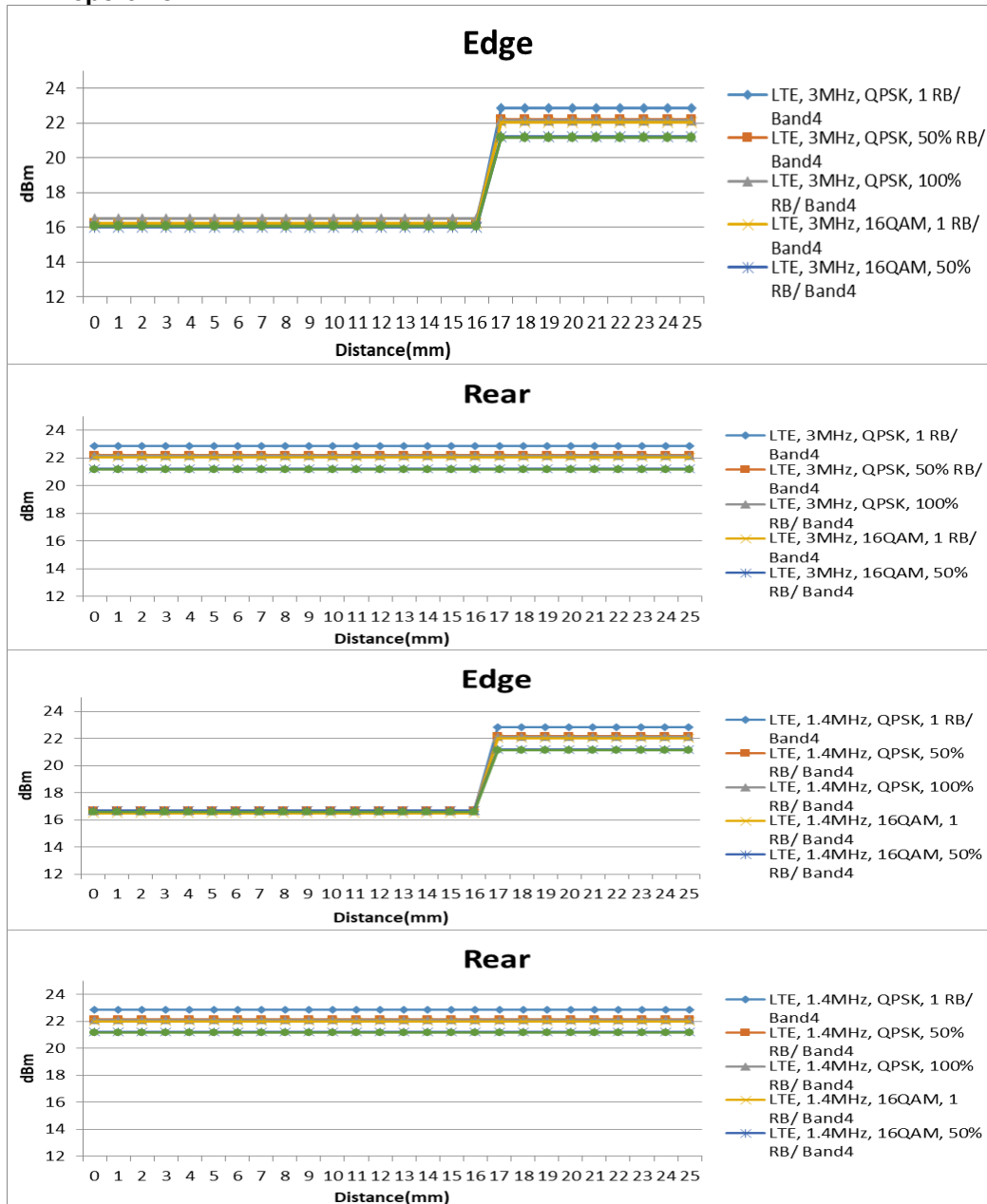
The following graphs show the power level and the distance from the DUT to the flat phantom for the Top-Edge and Rear Surface.

### LTE Band 4





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## 10.6 Proximity Sensor Coverage Area

According to KDB 616217 D04, Proximity Sensor Coverage Area of not request when the antenna and sensor are collocated and the peak SAR location is overlapping with the sensor.

## 11 RF Output Power Measurement

### Output power table

#### 11.1 LTE

The following tests were conducted according to the test requirements outlined in section 6.2 of the 3GPP TS36.101 specification.

UE Power Class: 3 (22 +/- 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 (RB) |         |       |        |        |        | MPR (dB) |
|------------|-------------------------------------------------|---------|-------|--------|--------|--------|----------|
|            | 1.4 MHz                                         | 3.0 MHz | 5 MHz | 10 MHz | 15 MHz | 20 MHz |          |
| QPSK       | > 5                                             | > 4     | > 8   | > 12   | > 16   | > 18   | ≤ 1      |
| 16 QAM     | ≤ 5                                             | ≤ 4     | ≤ 8   | ≤ 12   | ≤ 16   | ≤ 18   | ≤ 1      |
| 16 QAM     | > 5                                             | > 4     | > 8   | > 12   | > 16   | > 18   | ≤ 2      |

The allowed A-MPR values specified below in Table 6.2.4.-1 of 3GPP TS36.101 are in addition to the allowed MPR requirements. All the measurements below were performed with A-MPR disabled, by using Network Signaling Value of "NS\_01".

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**Table 6.2.4-1: Additional Maximum Power Reduction (A-MPR)**

| Network Signalling value | Requirements (sub-clause) | E-UTRA Band              | Channel bandwidth (MHz) | Resources Blocks ( $N_{RB}$ ) | A-MPR (dB)    |
|--------------------------|---------------------------|--------------------------|-------------------------|-------------------------------|---------------|
| NS_01                    | 6.6.2.1.1                 | Table 5.5-1              | 1.4, 3, 5, 10, 15, 20   | Table 5.6-1                   | NA            |
| NS_03                    | 6.6.2.2.1                 | 2, 4, 10, 23, 25, 35, 36 | 3                       | >5                            | $\leq 1$      |
|                          |                           |                          | 5                       | >6                            | $\leq 1$      |
|                          |                           |                          | 10                      | >6                            | $\leq 1$      |
|                          |                           |                          | 15                      | >8                            | $\leq 1$      |
|                          |                           |                          | 20                      | >10                           | $\leq 1$      |
| NS_04                    | 6.6.2.2.2                 | 41                       | 5                       | >6                            | $\leq 1$      |
|                          |                           |                          | 10, 15, 20              | See Table 6.2.4-4             |               |
| NS_05                    | 6.6.3.3.1                 | 1                        | 10, 15, 20              | $\geq 50$                     | $\leq 1$      |
| NS_06                    | 6.6.2.2.3                 | 12, 13, 14, 17           | 1.4, 3, 5, 10           | Table 5.6-1                   | n/a           |
| NS_07                    | 6.6.2.2.3<br>6.6.3.3.2    | 13                       | 10                      | Table 6.2.4-2                 | Table 6.2.4-2 |
| NS_08                    | 6.6.3.3.3                 | 19                       | 10, 15                  | > 44                          | $\leq 3$      |
| NS_09                    | 6.6.3.3.4                 | 21                       | 10, 15                  | > 40                          | $\leq 1$      |
|                          |                           |                          |                         | > 55                          | $\leq 2$      |
| NS_10                    |                           | 20                       | 15, 20                  | Table 6.2.4-3                 | Table 6.2.4-3 |
| NS_11                    | 6.6.2.2.1                 | 23 <sup>1</sup>          | 1.4, 3, 5, 10           | Table 6.2.4-5                 | Table 6.2.4-5 |
| ..                       |                           |                          |                         |                               |               |
| NS_32                    | -                         | -                        | -                       | -                             | -             |

Note 1: Applies to the lower block of Band 23, i.e. a carrier placed in the 2000-2010 MHz region.

## 11.1.1 LTE Band 4

## Output power table

| Band | BW<br>(MHz) | Channel | Frequency<br>(MHz) | Mode  | UL RB<br>Allocation | UL RB<br>Start | MPR | Average power(dBm)    |                      |
|------|-------------|---------|--------------------|-------|---------------------|----------------|-----|-----------------------|----------------------|
|      |             |         |                    |       |                     |                |     | W/o Power<br>back-off | W/ Power<br>back-off |
| 4    | 1.4         | 19957   | 1710.7             | QPSK  | 1                   | 0              | 0   | 22.67                 | 16.46                |
|      |             |         |                    |       | 1                   | 2              | 0   | 22.60                 | 16.56                |
|      |             |         |                    |       | 1                   | 5              | 0   | 22.58                 | 16.48                |
|      |             |         |                    |       | 3                   | 0              | 1   | 21.71                 | 16.43                |
|      |             |         |                    |       | 3                   | 1              | 1   | 21.69                 | 16.53                |
|      |             |         |                    |       | 3                   | 2              | 1   | 21.79                 | 16.42                |
|      |             |         |                    |       | 6                   | 0              | 1   | 21.68                 | 16.45                |
|      |             |         |                    | 16QAM | 1                   | 0              | 1   | 21.67                 | 16.31                |
|      |             |         |                    |       | 1                   | 2              | 1   | 21.61                 | 16.40                |
|      |             |         |                    |       | 1                   | 5              | 1   | 21.58                 | 16.18                |
|      |             |         |                    |       | 3                   | 0              | 2   | 20.68                 | 16.47                |
|      |             |         |                    |       | 3                   | 1              | 2   | 20.66                 | 16.54                |
|      |             |         |                    |       | 3                   | 2              | 2   | 20.76                 | 16.53                |
|      |             |         |                    |       | 6                   | 0              | 2   | 20.69                 | 16.41                |
|      |             | 20175   | 1732.5             | QPSK  | 1                   | 0              | 0   | 22.17                 | 16.70                |
|      |             |         |                    |       | 1                   | 2              | 0   | 22.20                 | 16.77                |
|      |             |         |                    |       | 1                   | 5              | 0   | 22.18                 | 16.72                |
|      |             |         |                    |       | 3                   | 0              | 1   | 21.45                 | 16.67                |
|      |             |         |                    |       | 3                   | 1              | 1   | 21.39                 | 16.73                |
|      |             |         |                    |       | 3                   | 2              | 1   | 21.29                 | 16.71                |
|      |             |         |                    |       | 6                   | 0              | 1   | 21.41                 | 16.68                |
|      |             |         |                    | 16QAM | 1                   | 0              | 1   | 21.40                 | 16.49                |
|      |             |         |                    |       | 1                   | 2              | 1   | 21.26                 | 16.61                |
|      |             |         |                    |       | 1                   | 5              | 1   | 21.30                 | 16.57                |
|      |             |         |                    |       | 3                   | 0              | 2   | 20.26                 | 16.72                |
|      |             |         |                    |       | 3                   | 1              | 2   | 20.32                 | 16.70                |
|      |             |         |                    |       | 3                   | 2              | 2   | 20.36                 | 16.63                |
|      |             |         |                    |       | 6                   | 0              | 2   | 20.33                 | 16.62                |
|      |             | 20392   | 1754.2             | QPSK  | 1                   | 0              | 0   | 22.83                 | 16.65                |
|      |             |         |                    |       | 1                   | 2              | 0   | 22.78                 | 16.80                |
|      |             |         |                    |       | 1                   | 5              | 0   | 22.87                 | 16.69                |
|      |             |         |                    |       | 3                   | 0              | 1   | 22.17                 | 16.67                |
|      |             |         |                    |       | 3                   | 1              | 1   | 22.07                 | 16.69                |
|      |             |         |                    |       | 3                   | 2              | 1   | 22.04                 | 16.73                |
|      |             |         |                    |       | 6                   | 0              | 1   | 22.11                 | 16.65                |
|      |             |         |                    | 16QAM | 1                   | 0              | 1   | 22.00                 | 16.49                |
|      |             |         |                    |       | 1                   | 2              | 1   | 22.06                 | 16.58                |
|      |             |         |                    |       | 1                   | 5              | 1   | 22.01                 | 16.39                |
|      |             |         |                    |       | 3                   | 0              | 2   | 21.20                 | 16.69                |
|      |             |         |                    |       | 3                   | 1              | 2   | 21.06                 | 16.72                |
|      |             |         |                    |       | 3                   | 2              | 2   | 21.15                 | 16.66                |
|      |             |         |                    |       | 6                   | 0              | 2   | 21.13                 | 16.60                |

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| Band | BW (MHz) | Channel | Frequency (MHz) | Mode  | UL RB Allocation | UL RB Start | MPR | Average power(dBm) |                   |
|------|----------|---------|-----------------|-------|------------------|-------------|-----|--------------------|-------------------|
|      |          |         |                 |       |                  |             |     | W/o Power back-off | W/ Power back-off |
| 4    | 3        | 19965   | 1711.5          | QPSK  | 1                | 0           | 0   | 22.68              | 15.98             |
|      |          |         |                 |       | 1                | 7           | 0   | 22.61              | 16.06             |
|      |          |         |                 |       | 1                | 14          | 0   | 22.59              | 16.15             |
|      |          |         |                 |       | 8                | 0           | 1   | 21.72              | 16.06             |
|      |          |         |                 |       | 8                | 4           | 1   | 21.70              | 16.00             |
|      |          |         |                 |       | 8                | 7           | 1   | 21.80              | 16.28             |
|      |          |         |                 |       | 15               | 0           | 1   | 21.69              | 16.10             |
|      |          |         |                 | 16QAM | 1                | 0           | 1   | 21.68              | 15.77             |
|      |          |         |                 |       | 1                | 7           | 1   | 21.62              | 16.27             |
|      |          |         |                 |       | 1                | 14          | 1   | 21.59              | 15.69             |
|      |          |         |                 |       | 8                | 0           | 2   | 20.69              | 16.26             |
|      |          |         |                 |       | 8                | 4           | 2   | 20.67              | 16.22             |
|      |          |         |                 |       | 8                | 7           | 2   | 20.77              | 16.12             |
|      |          |         |                 |       | 15               | 0           | 2   | 20.70              | 16.05             |
|      |          | 20175   | 1732.5          | QPSK  | 1                | 0           | 0   | 22.18              | 16.21             |
|      |          |         |                 |       | 1                | 7           | 0   | 22.21              | 15.93             |
|      |          |         |                 |       | 1                | 14          | 0   | 22.19              | 16.12             |
|      |          |         |                 |       | 8                | 0           | 1   | 21.46              | 16.18             |
|      |          |         |                 |       | 8                | 4           | 1   | 21.40              | 16.26             |
|      |          |         |                 |       | 8                | 7           | 1   | 21.30              | 15.92             |
|      |          |         |                 |       | 15               | 0           | 1   | 21.42              | 15.94             |
|      |          |         |                 | 16QAM | 1                | 0           | 1   | 21.41              | 15.89             |
|      |          |         |                 |       | 1                | 7           | 1   | 21.27              | 15.99             |
|      |          |         |                 |       | 1                | 14          | 1   | 21.31              | 15.90             |
|      |          |         |                 |       | 8                | 0           | 2   | 20.27              | 16.35             |
|      |          |         |                 |       | 8                | 4           | 2   | 20.33              | 16.31             |
|      |          |         |                 |       | 8                | 7           | 2   | 20.37              | 16.07             |
|      |          |         |                 |       | 15               | 0           | 2   | 20.34              | 16.21             |
|      |          | 20384   | 1753.4          | QPSK  | 1                | 0           | 0   | 22.84              | 16.23             |
|      |          |         |                 |       | 1                | 7           | 0   | 22.79              | 16.25             |
|      |          |         |                 |       | 1                | 14          | 0   | 22.88              | 16.56             |
|      |          |         |                 |       | 8                | 0           | 1   | 22.18              | 16.22             |
|      |          |         |                 |       | 8                | 4           | 1   | 22.08              | 15.94             |
|      |          |         |                 |       | 8                | 7           | 1   | 22.05              | 15.93             |
|      |          |         |                 |       | 15               | 0           | 1   | 22.12              | 16.50             |
|      |          |         |                 | 16QAM | 1                | 0           | 1   | 22.01              | 16.21             |
|      |          |         |                 |       | 1                | 7           | 1   | 22.07              | 16.11             |
|      |          |         |                 |       | 1                | 14          | 1   | 22.02              | 16.17             |
|      |          |         |                 |       | 8                | 0           | 2   | 21.21              | 16.03             |
|      |          |         |                 |       | 8                | 4           | 2   | 21.07              | 15.83             |
|      |          |         |                 |       | 8                | 7           | 2   | 21.16              | 16.22             |
|      |          |         |                 |       | 15               | 0           | 2   | 21.14              | 16.06             |

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| Band | BW (MHz) | Channel | Frequency (MHz) | Mode  | UL RB Allocation | UL RB Start | MPR | Average power(dBm) |                   |
|------|----------|---------|-----------------|-------|------------------|-------------|-----|--------------------|-------------------|
|      |          |         |                 |       |                  |             |     | W/o Power back-off | W/ Power back-off |
| 4    | 5        | 19975   | 1712.5          | QPSK  | 1                | 0           | 0   | 22.70              | 16.05             |
|      |          |         |                 |       | 1                | 12          | 0   | 22.63              | 16.26             |
|      |          |         |                 |       | 1                | 24          | 0   | 22.61              | 16.25             |
|      |          |         |                 |       | 12               | 0           | 1   | 21.74              | 16.27             |
|      |          |         |                 |       | 12               | 6           | 1   | 21.72              | 16.15             |
|      |          |         |                 |       | 12               | 11          | 1   | 21.82              | 16.46             |
|      |          |         |                 |       | 25               | 0           | 1   | 21.71              | 16.18             |
|      |          |         |                 | 16QAM | 1                | 0           | 1   | 21.70              | 15.82             |
|      |          |         |                 |       | 1                | 12          | 1   | 21.64              | 16.30             |
|      |          |         |                 |       | 1                | 24          | 1   | 21.61              | 15.89             |
|      |          |         |                 |       | 12               | 0           | 2   | 20.71              | 16.40             |
|      |          |         |                 |       | 12               | 6           | 2   | 20.69              | 16.28             |
|      |          |         |                 |       | 12               | 11          | 2   | 20.79              | 16.17             |
|      |          |         |                 |       | 25               | 0           | 2   | 20.72              | 16.21             |
|      |          | 20175   | 1732.5          | QPSK  | 1                | 0           | 0   | 22.19              | 16.39             |
|      |          |         |                 |       | 1                | 12          | 0   | 22.22              | 16.11             |
|      |          |         |                 |       | 1                | 24          | 0   | 22.20              | 16.14             |
|      |          |         |                 |       | 12               | 0           | 1   | 21.47              | 16.30             |
|      |          |         |                 |       | 12               | 6           | 1   | 21.41              | 16.37             |
|      |          |         |                 |       | 12               | 11          | 1   | 21.31              | 16.08             |
|      |          |         |                 |       | 25               | 0           | 1   | 21.43              | 16.15             |
|      |          |         |                 | 16QAM | 1                | 0           | 1   | 21.42              | 15.98             |
|      |          |         |                 |       | 1                | 12          | 1   | 21.28              | 16.20             |
|      |          |         |                 |       | 1                | 24          | 1   | 21.32              | 15.97             |
|      |          |         |                 |       | 12               | 0           | 2   | 20.28              | 16.49             |
|      |          |         |                 |       | 12               | 6           | 2   | 20.34              | 16.39             |
|      |          |         |                 |       | 12               | 11          | 2   | 20.38              | 16.17             |
|      |          |         |                 |       | 25               | 0           | 2   | 20.35              | 16.42             |
|      |          | 20375   | 1752.5          | QPSK  | 1                | 0           | 0   | 22.85              | 16.40             |
|      |          |         |                 |       | 1                | 12          | 0   | 22.80              | 16.31             |
|      |          |         |                 |       | 1                | 24          | 0   | 22.89              | 16.44             |
|      |          |         |                 |       | 12               | 0           | 1   | 22.19              | 16.36             |
|      |          |         |                 |       | 12               | 6           | 1   | 22.09              | 16.02             |
|      |          |         |                 |       | 12               | 11          | 1   | 22.06              | 16.13             |
|      |          |         |                 |       | 25               | 0           | 1   | 22.13              | 16.47             |
|      |          |         |                 | 16QAM | 1                | 0           | 1   | 22.02              | 16.33             |
|      |          |         |                 |       | 1                | 12          | 1   | 22.08              | 16.27             |
|      |          |         |                 |       | 1                | 24          | 1   | 22.03              | 16.21             |
|      |          |         |                 |       | 12               | 0           | 2   | 21.22              | 16.24             |
|      |          |         |                 |       | 12               | 6           | 2   | 21.08              | 16.01             |
|      |          |         |                 |       | 12               | 11          | 2   | 21.17              | 16.28             |
|      |          |         |                 |       | 25               | 0           | 2   | 21.15              | 16.19             |

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| Band | BW<br>(MHz) | Channel | Frequency<br>(MHz) | Mode  | UL RB<br>Allocation | UL RB<br>Start | MPR   | Average power(dBm)    |                      |
|------|-------------|---------|--------------------|-------|---------------------|----------------|-------|-----------------------|----------------------|
|      |             |         |                    |       |                     |                |       | W/o Power<br>back-off | W/ Power<br>back-off |
| 4    | 10          | 20000   | 1715.0             | QPSK  | 1                   | 0              | 0     | 22.71                 | 16.21                |
|      |             |         |                    |       | 1                   | 24             | 0     | 22.64                 | 16.36                |
|      |             |         |                    |       | 1                   | 49             | 0     | 22.62                 | 16.41                |
|      |             |         |                    |       | 25                  | 0              | 1     | 21.75                 | 16.29                |
|      |             |         |                    |       | 25                  | 12             | 1     | 21.73                 | 16.34                |
|      |             |         |                    |       | 25                  | 24             | 1     | 21.83                 | 16.49                |
|      |             |         |                    | 50    | 0                   | 1              | 21.72 | 16.29                 |                      |
|      |             |         |                    | 16QAM | 1                   | 0              | 1     | 21.71                 | 15.96                |
|      |             |         |                    |       | 1                   | 24             | 1     | 21.65                 | 16.45                |
|      |             |         |                    |       | 1                   | 49             | 1     | 21.62                 | 16.02                |
|      |             |         |                    |       | 25                  | 0              | 2     | 20.72                 | 16.48                |
|      |             |         |                    |       | 25                  | 12             | 2     | 20.70                 | 16.34                |
|      |             |         |                    |       | 25                  | 24             | 2     | 20.80                 | 16.27                |
|      |             | 50      | 0                  | 2     | 20.73               | 16.30          |       |                       |                      |
|      |             | 20175   | 1732.5             | QPSK  | 1                   | 0              | 0     | 22.21                 | 16.50                |
|      |             |         |                    |       | 1                   | 24             | 0     | 22.24                 | 16.27                |
|      |             |         |                    |       | 1                   | 49             | 0     | 22.22                 | 16.25                |
|      |             |         |                    |       | 25                  | 0              | 1     | 21.49                 | 16.49                |
|      |             |         |                    |       | 25                  | 12             | 1     | 21.43                 | 16.42                |
|      |             |         |                    |       | 25                  | 24             | 1     | 21.33                 | 16.27                |
|      |             |         |                    | 50    | 0                   | 1              | 21.45 | 16.33                 |                      |
|      |             |         |                    | 16QAM | 1                   | 0              | 1     | 21.44                 | 16.08                |
|      |             |         |                    |       | 1                   | 24             | 1     | 21.30                 | 16.29                |
|      |             |         |                    |       | 1                   | 49             | 1     | 21.34                 | 16.10                |
|      |             |         |                    |       | 25                  | 0              | 2     | 20.30                 | 16.50                |
|      |             |         |                    |       | 25                  | 12             | 2     | 20.36                 | 16.42                |
|      |             |         |                    |       | 25                  | 24             | 2     | 20.40                 | 16.34                |
|      |             | 50      | 0                  |       | 2                   | 20.37          | 16.46 |                       |                      |
|      |             | 20350   | 1750.0             | QPSK  | 1                   | 0              | 0     | 22.88                 | 16.47                |
|      |             |         |                    |       | 1                   | 24             | 0     | 22.83                 | 16.37                |
|      |             |         |                    |       | 1                   | 49             | 0     | 22.92                 | 16.47                |
|      |             |         |                    |       | 25                  | 0              | 1     | 22.22                 | 16.44                |
|      |             |         |                    |       | 25                  | 12             | 1     | 22.12                 | 16.23                |
|      |             |         |                    |       | 25                  | 24             | 1     | 22.09                 | 16.32                |
|      |             |         |                    | 50    | 0                   | 1              | 22.16 | 16.79                 |                      |
|      |             |         |                    | 16QAM | 1                   | 0              | 1     | 22.05                 | 16.39                |
|      |             |         |                    |       | 1                   | 24             | 1     | 22.11                 | 16.45                |
|      |             |         |                    |       | 1                   | 49             | 1     | 22.06                 | 16.42                |
|      |             |         |                    |       | 25                  | 0              | 2     | 21.25                 | 16.26                |
|      |             |         |                    |       | 25                  | 12             | 2     | 21.11                 | 16.20                |
|      |             |         |                    |       | 25                  | 24             | 2     | 21.20                 | 16.35                |
|      |             | 50      | 0                  |       | 2                   | 21.18          | 16.37 |                       |                      |

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| Band | BW<br>(MHz) | Channel | Frequency<br>(MHz) | Mode  | UL RB<br>Allocation | UL RB<br>Start | MPR | Average power(dBm)    |                      |
|------|-------------|---------|--------------------|-------|---------------------|----------------|-----|-----------------------|----------------------|
|      |             |         |                    |       |                     |                |     | W/o Power<br>back-off | W/ Power<br>back-off |
| 4    | 15          | 20025   | 1717.5             | QPSK  | 1                   | 0              | 0   | 22.74                 | 16.42                |
|      |             |         |                    |       | 1                   | 37             | 0   | 22.67                 | 16.52                |
|      |             |         |                    |       | 1                   | 74             | 0   | 22.65                 | 16.43                |
|      |             |         |                    |       | 36                  | 0              | 1   | 21.78                 | 16.36                |
|      |             |         |                    |       | 36                  | 18             | 1   | 21.76                 | 16.48                |
|      |             |         |                    |       | 36                  | 35             | 1   | 21.86                 | 16.61                |
|      |             |         |                    |       | 75                  | 0              | 1   | 21.75                 | 16.48                |
|      |             |         |                    | 16QAM | 1                   | 0              | 1   | 21.74                 | 16.15                |
|      |             |         |                    |       | 1                   | 37             | 1   | 21.68                 | 16.51                |
|      |             |         |                    |       | 1                   | 74             | 1   | 21.65                 | 16.17                |
|      |             |         |                    |       | 36                  | 0              | 2   | 20.75                 | 16.53                |
|      |             |         |                    |       | 36                  | 18             | 2   | 20.73                 | 16.38                |
|      |             |         |                    |       | 36                  | 35             | 2   | 20.83                 | 16.48                |
|      |             |         |                    |       | 75                  | 0              | 2   | 20.76                 | 16.35                |
|      |             | 20175   | 1732.5             | QPSK  | 1                   | 0              | 0   | 22.23                 | 16.65                |
|      |             |         |                    |       | 1                   | 37             | 0   | 22.26                 | 16.45                |
|      |             |         |                    |       | 1                   | 74             | 0   | 22.24                 | 16.33                |
|      |             |         |                    |       | 36                  | 0              | 1   | 21.51                 | 16.59                |
|      |             |         |                    |       | 36                  | 18             | 1   | 21.45                 | 16.52                |
|      |             |         |                    |       | 36                  | 35             | 1   | 21.35                 | 16.45                |
|      |             |         |                    |       | 75                  | 0              | 1   | 21.47                 | 16.54                |
|      |             |         |                    | 16QAM | 1                   | 0              | 1   | 21.46                 | 16.26                |
|      |             |         |                    |       | 1                   | 37             | 1   | 21.32                 | 16.50                |
|      |             |         |                    |       | 1                   | 74             | 1   | 21.36                 | 16.15                |
|      |             |         |                    |       | 36                  | 0              | 2   | 20.32                 | 16.68                |
|      |             |         |                    |       | 36                  | 18             | 2   | 20.38                 | 16.56                |
|      |             |         |                    |       | 36                  | 35             | 2   | 20.42                 | 16.46                |
|      |             |         |                    |       | 75                  | 0              | 2   | 20.39                 | 16.50                |
|      |             | 20325   | 1747.5             | QPSK  | 1                   | 0              | 0   | 22.90                 | 16.69                |
|      |             |         |                    |       | 1                   | 37             | 0   | 22.85                 | 16.61                |
|      |             |         |                    |       | 1                   | 74             | 0   | 22.94                 | 16.85                |
|      |             |         |                    |       | 36                  | 0              | 1   | 22.24                 | 16.66                |
|      |             |         |                    |       | 36                  | 18             | 1   | 22.14                 | 16.44                |
|      |             |         |                    |       | 36                  | 35             | 1   | 22.11                 | 16.38                |
|      |             |         |                    |       | 75                  | 0              | 1   | 22.18                 | 16.82                |
|      |             |         |                    | 16QAM | 1                   | 0              | 1   | 22.07                 | 16.59                |
|      |             |         |                    |       | 1                   | 37             | 1   | 22.13                 | 16.62                |
|      |             |         |                    |       | 1                   | 74             | 1   | 22.08                 | 16.47                |
|      |             |         |                    |       | 36                  | 0              | 2   | 21.27                 | 16.47                |
|      |             |         |                    |       | 36                  | 18             | 2   | 21.13                 | 16.38                |
|      |             |         |                    |       | 36                  | 35             | 2   | 21.22                 | 16.47                |
|      |             |         |                    |       | 75                  | 0              | 2   | 21.20                 | 16.53                |

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| Band | BW (MHz) | Channel | Frequency (MHz) | Mode  | UL RB Allocation | UL RB Start | MPR | Average power(dBm) |                   |
|------|----------|---------|-----------------|-------|------------------|-------------|-----|--------------------|-------------------|
|      |          |         |                 |       |                  |             |     | W/o Power back-off | W/ Power back-off |
| 4    | 20       | 20050   | 1720.0          | QPSK  | 1                | 0           | 0   | 22.82              | 16.58             |
|      |          |         |                 |       | 1                | 49          | 0   | 22.75              | 16.60             |
|      |          |         |                 |       | 1                | 99          | 0   | 22.73              | 16.62             |
|      |          |         |                 |       | 50               | 0           | 1   | 21.86              | 16.54             |
|      |          |         |                 |       | 50               | 24          | 1   | 21.84              | 16.51             |
|      |          |         |                 |       | 50               | 49          | 1   | 21.94              | 16.63             |
|      |          |         |                 |       | 100              | 0           | 1   | 21.83              | 16.51             |
|      |          |         |                 | 16QAM | 1                | 0           | 1   | 21.82              | 16.36             |
|      |          |         |                 |       | 1                | 49          | 1   | 21.76              | 16.61             |
|      |          |         |                 |       | 1                | 99          | 1   | 21.73              | 16.37             |
|      |          |         |                 |       | 50               | 0           | 2   | 20.83              | 16.55             |
|      |          |         |                 |       | 50               | 24          | 2   | 20.81              | 16.55             |
|      |          |         |                 |       | 50               | 49          | 2   | 20.91              | 16.61             |
|      |          |         |                 |       | 100              | 0           | 2   | 20.84              | 16.54             |
|      |          | 20175   | 1732.5          | QPSK  | 1                | 0           | 0   | 22.29              | 16.69             |
|      |          |         |                 |       | 1                | 49          | 0   | 22.32              | 16.62             |
|      |          |         |                 |       | 1                | 99          | 0   | 22.30              | 16.51             |
|      |          |         |                 |       | 50               | 0           | 1   | 21.57              | 16.78             |
|      |          |         |                 |       | 50               | 24          | 1   | 21.51              | 16.66             |
|      |          |         |                 |       | 50               | 49          | 1   | 21.41              | 16.61             |
|      |          |         |                 |       | 100              | 0           | 1   | 21.53              | 16.65             |
|      |          |         |                 | 16QAM | 1                | 0           | 1   | 21.52              | 16.44             |
|      |          |         |                 |       | 1                | 49          | 1   | 21.38              | 16.62             |
|      |          |         |                 |       | 1                | 99          | 1   | 21.42              | 16.33             |
|      |          |         |                 |       | 50               | 0           | 2   | 20.38              | 16.73             |
|      |          |         |                 |       | 50               | 24          | 2   | 20.44              | 16.71             |
|      |          |         |                 |       | 50               | 49          | 2   | 20.48              | 16.59             |
|      |          |         |                 |       | 100              | 0           | 2   | 20.45              | 16.63             |
|      |          | 20300   | 1745.0          | QPSK  | 1                | 0           | 0   | 22.95              | 16.83             |
|      |          |         |                 |       | 1                | 49          | 0   | 22.90              | 16.71             |
|      |          |         |                 |       | 1                | 99          | 0   | 22.99              | 16.95             |
|      |          |         |                 |       | 50               | 0           | 1   | 22.29              | 16.84             |
|      |          |         |                 |       | 50               | 24          | 1   | 22.19              | 16.52             |
|      |          |         |                 |       | 50               | 49          | 1   | 22.16              | 16.55             |
|      |          |         |                 |       | 100              | 0           | 1   | 22.23              | 16.85             |
|      |          |         |                 | 16QAM | 1                | 0           | 1   | 22.12              | 16.77             |
|      |          |         |                 |       | 1                | 49          | 1   | 22.18              | 16.71             |
|      |          |         |                 |       | 1                | 99          | 1   | 22.13              | 16.62             |
|      |          |         |                 |       | 50               | 0           | 2   | 21.32              | 16.66             |
|      |          |         |                 |       | 50               | 24          | 2   | 21.18              | 16.52             |
|      |          |         |                 |       | 50               | 49          | 2   | 21.27              | 16.53             |
|      |          |         |                 |       | 100              | 0           | 2   | 21.25              | 16.56             |

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## 11.1.2 LTE Band 13

Output power table

| Band | BW (MHz) | Channel | Frequency (MHz) | Mode  | UL RB Allocation | UL RB Start | MPR | Average power(dBm) |                   |
|------|----------|---------|-----------------|-------|------------------|-------------|-----|--------------------|-------------------|
|      |          |         |                 |       |                  |             |     | W/o Power back-off | W/ Power back-off |
| 13   | 5        | 23205   | 779.5           | QPSK  | 1                | 0           | 0   | 22.69              |                   |
|      |          |         |                 |       | 1                | 12          | 0   | 22.68              |                   |
|      |          |         |                 |       | 1                | 24          | 0   | 22.65              |                   |
|      |          |         |                 |       | 12               | 0           | 1   | 21.86              |                   |
|      |          |         |                 |       | 12               | 6           | 1   | 21.82              |                   |
|      |          |         |                 |       | 12               | 11          | 1   | 21.76              |                   |
|      |          |         |                 | 16QAM | 25               | 0           | 1   | 21.75              |                   |
|      |          |         |                 |       | 1                | 0           | 1   | 21.81              |                   |
|      |          |         |                 |       | 1                | 12          | 1   | 21.77              |                   |
|      |          |         |                 |       | 1                | 24          | 1   | 21.88              |                   |
|      |          |         |                 |       | 12               | 0           | 2   | 20.72              |                   |
|      |          |         |                 |       | 12               | 6           | 2   | 20.69              |                   |
|      |          |         |                 |       | 12               | 11          | 2   | 20.66              |                   |
|      |          |         |                 |       | 25               | 0           | 2   | 20.69              |                   |
|      |          | 23230   | 782.0           | QPSK  | 1                | 0           | 0   | 22.66              |                   |
|      |          |         |                 |       | 1                | 12          | 0   | 22.67              |                   |
|      |          |         |                 |       | 1                | 24          | 0   | 22.63              |                   |
|      |          |         |                 |       | 12               | 0           | 1   | 21.84              |                   |
|      |          |         |                 |       | 12               | 6           | 1   | 21.80              |                   |
|      |          |         |                 |       | 12               | 11          | 1   | 21.74              |                   |
|      |          |         |                 | 16QAM | 25               | 0           | 1   | 21.73              |                   |
|      |          |         |                 |       | 1                | 0           | 1   | 21.79              |                   |
|      |          |         |                 |       | 1                | 12          | 1   | 21.75              |                   |
|      |          |         |                 |       | 1                | 24          | 1   | 21.86              |                   |
|      |          |         |                 |       | 12               | 0           | 2   | 20.70              |                   |
|      |          |         |                 |       | 12               | 6           | 2   | 20.67              |                   |
|      |          |         |                 |       | 12               | 11          | 2   | 20.64              |                   |
|      |          |         |                 |       | 25               | 0           | 2   | 20.67              |                   |
|      |          | 23255   | 784.5           | QPSK  | 1                | 0           | 0   | 22.73              |                   |
|      |          |         |                 |       | 1                | 12          | 0   | 22.72              |                   |
|      |          |         |                 |       | 1                | 24          | 0   | 22.69              |                   |
|      |          |         |                 |       | 12               | 0           | 1   | 21.90              |                   |
|      |          |         |                 |       | 12               | 6           | 1   | 21.86              |                   |
|      |          |         |                 |       | 12               | 11          | 1   | 21.80              |                   |
|      |          |         |                 | 16QAM | 25               | 0           | 1   | 21.79              |                   |
|      |          |         |                 |       | 1                | 0           | 1   | 21.85              |                   |
|      |          |         |                 |       | 1                | 12          | 1   | 21.81              |                   |
|      |          |         |                 |       | 1                | 24          | 1   | 21.92              |                   |
|      |          |         |                 |       | 12               | 0           | 2   | 20.76              |                   |
|      |          |         |                 |       | 12               | 6           | 2   | 20.73              |                   |
|      |          |         |                 |       | 12               | 11          | 2   | 20.70              |                   |
|      |          |         |                 |       | 25               | 0           | 2   | 20.73              |                   |

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| Band | BW<br>(MHz) | Channel | Frequency<br>(MHz) | Mode  | UL RB<br>Allocation | UL RB<br>Start | MPR | Average power(dBm)    |                      |
|------|-------------|---------|--------------------|-------|---------------------|----------------|-----|-----------------------|----------------------|
|      |             |         |                    |       |                     |                |     | W/o Power<br>back-off | W/ Power<br>back-off |
| 13   | 10          | 23230   | 782.0              | QPSK  | 1                   | 0              | 0   | 22.75                 |                      |
|      |             |         |                    |       | 1                   | 24             | 0   | 22.74                 |                      |
|      |             |         |                    |       | 1                   | 49             | 0   | 22.71                 |                      |
|      |             |         |                    |       | 25                  | 0              | 1   | 21.92                 |                      |
|      |             |         |                    |       | 25                  | 12             | 1   | 21.88                 |                      |
|      |             |         |                    |       | 25                  | 24             | 1   | 21.82                 |                      |
|      |             |         |                    |       | 50                  | 0              | 1   | 21.81                 |                      |
|      |             |         |                    | 16QAM | 1                   | 0              | 1   | 21.87                 |                      |
|      |             |         |                    |       | 1                   | 24             | 1   | 21.83                 |                      |
|      |             |         |                    |       | 1                   | 49             | 1   | 21.94                 |                      |
|      |             |         |                    |       | 25                  | 0              | 2   | 20.78                 |                      |
|      |             |         |                    |       | 25                  | 12             | 2   | 20.75                 |                      |
|      |             |         |                    |       | 25                  | 24             | 2   | 20.72                 |                      |
|      |             |         |                    |       | 50                  | 0              | 2   | 20.75                 |                      |

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## 11.2 Wi-Fi (2.4GHz Band)

| Band (GHz) | Mode         | Data rate (Mbps) | Ch # | Freq. (MHz) | Avg. Pwr (dBm) |     |      | Maximum Tune-up Pwr (dBm) |     |      | SAR Test (Yes/No) | Note |
|------------|--------------|------------------|------|-------------|----------------|-----|------|---------------------------|-----|------|-------------------|------|
|            |              |                  |      |             | Main           | Aux | MIMO | Main                      | Aux | MIMO |                   |      |
| 2.4        | 802.11b      | 1                | 1    | 2412        | 16.34          |     |      | 17.50                     |     |      | Yes               |      |
|            |              |                  | 6    | 2437        | 16.77          |     |      | 17.50                     |     |      |                   |      |
|            |              |                  | 11   | 2462        | 17.15          |     |      | 17.50                     |     |      |                   |      |
|            | 802.11g      | 6                | 1    | 2412        | No Required    |     |      | 16.50                     |     |      | No                | 1    |
|            |              |                  | 6    | 2437        |                |     |      | 16.50                     |     |      |                   |      |
|            |              |                  | 11   | 2462        |                |     |      | 16.50                     |     |      |                   |      |
|            | 802.11n HT20 | MCS0             | 1    | 2412        | No Required    |     |      | 13.50                     |     |      | No                | 1    |
|            |              |                  | 6    | 2437        |                |     |      | 13.50                     |     |      |                   |      |
|            |              |                  | 11   | 2462        |                |     |      | 13.50                     |     |      |                   |      |

### Note(s):

- Output Power and SAR is not required for 802.11 g/n HT20/n HT40 channels 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  $\leq 1.2$  W/kg.

### 11.3 Wi-Fi (5GHz Band)

| Band (GHz)        | Mode             | Data rate (Mbps) | Ch #  | Freq. (MHz) | Avg. Pwr (dBm) |     |      | Maximum Tune-up Pwr (dBm) |     |      | SAR Test (Yes/No) | Note |
|-------------------|------------------|------------------|-------|-------------|----------------|-----|------|---------------------------|-----|------|-------------------|------|
|                   |                  |                  |       |             | Main           | Aux | MIMO | Main                      | Aux | MIMO |                   |      |
| 5.2<br>(U-NII 1)  | 802.11a          | 6                | 36-48 | 5180-5240   | Not Required   |     |      | 9.50                      |     |      | No                | 1    |
|                   | 802.11n (HT20)   | MCS0             | 36-48 | 5180-5240   |                |     |      | 5.50                      |     |      | No                | 1    |
|                   | 802.11n (HT40)   | MCS0             | 38-46 | 5190-5230   |                |     |      | 5.50                      |     |      | No                | 1    |
|                   | 802.11ac (VHT80) | VHT0             | 42    | 5210        |                |     |      | 5.50                      |     |      | No                | 1    |
| 5.3<br>(U-NII 2A) | 802.11a          | 6                | 52    | 5260        | 7.18           |     |      | 9.50                      |     |      | Yes               |      |
|                   |                  | 6                | 56    | 5280        | 7.58           |     |      | 9.50                      |     |      | Yes               |      |
|                   |                  | 6                | 60    | 5300        | 7.86           |     |      | 9.50                      |     |      | Yes               |      |
|                   |                  | 6                | 64    | 5320        | 8.13           |     |      | 9.50                      |     |      | Yes               |      |
|                   | 802.11n (HT20)   | MCS0             | 52-64 | 5260-5320   | Not Required   |     |      | 5.50                      |     |      | No                | 2    |
|                   | 802.11n (HT40)   | MCS0             | 54-62 | 5270-5310   |                |     |      | 5.50                      |     |      | No                | 2    |
|                   | 802.11ac (VHT80) | VHT0             | 58    | 5290        |                |     |      | 5.50                      |     |      | No                | 2    |

#### Note(s):

- When the specified maximum output power is the same for both UNII band I and UNII band 2A, begin SAR measurement in UNII band 2A; and if the highest reported SAR for UNII band 2A is
  - $\leq 1.2$  W/kg, SAR is not required for UNII band I.
  - $> 1.2$  W/kg, both bands should be tested independently for SAR.
- Output Power and SAR measurement is not required for 802.11n HT20/n HT40/802.11ac channels when the specified maximum tune-up powers are less or same with 802.11a.

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| Band (GHz)        | Mode             | Data rate (Mbps) | Ch #    | Freq. (MHz) | Avg. Pwr (dBm) |     |      | Maximum Tune-up Pwr (dBm) |     |      | SAR Test (Yes/No) | Note |
|-------------------|------------------|------------------|---------|-------------|----------------|-----|------|---------------------------|-----|------|-------------------|------|
|                   |                  |                  |         |             | Main           | Aux | MIMO | Main                      | Aux | MIMO |                   |      |
| 5.5<br>(U-NII-2C) | 802.11a          | 6                | 100     | 5500        | 9.05           |     |      | 11.50                     |     |      | Yes               |      |
|                   | 802.11a          | 6                | 104     | 5520        | 9.37           |     |      | 11.50                     |     |      | Yes               |      |
|                   | 802.11a          | 6                | 108     | 5540        | 9.65           |     |      | 11.50                     |     |      | Yes               |      |
|                   | 802.11a          | 6                | 112     | 5560        | 9.85           |     |      | 11.50                     |     |      | Yes               |      |
|                   | 802.11a          | 6                | 116     | 5580        | 9.90           |     |      | 11.50                     |     |      | Yes               |      |
|                   | 802.11a          | 6                | 120     | 5600        | 10.10          |     |      | 11.50                     |     |      | Yes               |      |
|                   | 802.11a          | 6                | 124     | 5620        | 10.13          |     |      | 11.50                     |     |      | Yes               |      |
|                   | 802.11a          | 6                | 128     | 5640        | 9.96           |     |      | 11.50                     |     |      | Yes               |      |
|                   | 802.11a          | 6                | 132     | 5660        | 9.98           |     |      | 11.50                     |     |      | Yes               |      |
|                   | 802.11a          | 6                | 136     | 5680        | 9.85           |     |      | 11.50                     |     |      | Yes               |      |
|                   | 802.11a          | 6                | 140     | 5700        | 9.76           |     |      | 11.50                     |     |      | Yes               |      |
|                   | 802.11n (HT20)   | MCS0             | 100-144 | 5500-5720   | Not Required   |     |      | 6.50                      |     |      | No                | 1    |
|                   | 802.11n (HT40)   | MCS0             | 102-142 | 5510-5710   |                |     |      | 7.50                      |     |      | No                | 1    |
|                   | 802.11ac (VHT80) | VHT0             | 106-138 | 5530-5690   |                |     |      | 7.50                      |     |      | No                | 1    |

## Note(s):

- Output Power and SAR measurement is not required for 802.11n HT20/n HT40/802.11ac channels when the specified maximum tune-up powers are less or same with 802.11n HT20/HT40/802.11ac and the measured SAR is  $\leq 1.2$  W/Kg.
- Output Power and SAR measurement is not required for / 802.11n HT20/n HT40 /802.11ac channels when the specified maximum tune-up powers are less or same with 802.11 a.

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| Band (GHz)    | Mode             | Data rate (Mbps) | Ch #    | Freq. (MHz) | Avg. Pwr (dBm) |     |      | Maximum Tune-up Pwr (dBm) |     |      | SAR Test (Yes/No) | Note |
|---------------|------------------|------------------|---------|-------------|----------------|-----|------|---------------------------|-----|------|-------------------|------|
|               |                  |                  |         |             | Main           | Aux | MIMO | Main                      | Aux | MIMO |                   |      |
| 5.8 (U-NII-3) | 802.11a          | 6                | 149     | 5745        | 9.21           |     |      | 11.50                     |     |      | Yes               |      |
|               |                  | 6                | 153     | 5765        | 9.25           |     |      | 11.50                     |     |      | Yes               |      |
|               |                  | 6                | 157     | 5785        | 9.27           |     |      | 11.50                     |     |      | Yes               |      |
|               |                  | 6                | 161     | 5805        | 9.22           |     |      | 11.50                     |     |      | Yes               |      |
|               |                  | 6                | 165     | 5825        | 9.17           |     |      | 11.50                     |     |      | Yes               |      |
|               | 802.11n (HT20)   | MCS0             | 149-165 | 5745-5825   | Not Required   |     |      | 6.50                      |     |      | No                | 1    |
|               | 802.11n (HT40)   | MCS0             | 151-159 | 5755-5795   |                |     |      | 6.50                      |     |      | No                | 1    |
|               | 802.11ac (VHT80) | VHT0             | 155     | 5775        |                |     |      | 6.50                      |     |      | No                | 1    |

## Note(s):

- Output Power and SAR measurement is not required for 802.11n HT20/n HT40/802.11ac channels when the specified maximum tune-up powers are less or same with 802.11n HT20/HT40/802.11ac and the measured SAR is  $\leq 1.2$  W/Kg.
- Output Power and SAR measurement is not required for / 802.11n HT20/n HT40 /802.11ac channels when the specified maximum tune-up powers are less or same with 802.11 a.

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#### 11.4 Bluetooth

| Modulation | Channel No. | Frequency(MHz) | Avg.<br>power(dBm) |
|------------|-------------|----------------|--------------------|
| DH5        | Low         | 2402           | 4.9                |
|            | Middle      | 2441           | 5.7                |
|            | High        | 2480           | 5.8                |
| 3DH5       | Low         | 2402           | -0.7               |
|            | Middle      | 2441           | -0.3               |
|            | High        | 2480           | 0.0                |
| BLE        | Low         | 2402           | 4.3                |
|            | Middle      | 2440           | 5.4                |
|            | High        | 2480           | 5.7                |

Per exclusion calculations in Section 12, SAR testing for Bluetooth is not required.

## 12 Summary of SAR Test Exclusion Configurations

### 12.1 Standalone SAR Test Exclusion Calculations

Since the Dedicated Host Approach is applied, the standalone SAR test exclusion procedure in KDB 447498 section 4.3.1 is applied in conjunction with KDB 616217 section 4.3 to determine the minimum test separation distance:

1. According to KDB 447498 Section 4.1 5) if the antenna is at close proximity to user then the outer surface of the DUT should be treated as the radiating surface. The test separation distance is then determined by the smallest distance between the outer surface of the device and the user. For the purposes of this report close proximity has been defined as closer than 50 mm. For antennas <50 mm from the rear or edge the separation distance used for the estimated SAR calculations is 0 mm.
2. When the minimum test separation distance is < 5mm, a distance of 5mm is applied to determine SAR test exclusion.
3. When the separation distance from the antenna to an adjacent edge is > 5 mm, the actual antenna-to-edge separation distance is applied to determine SAR test exclusion.
4. If the antenna to DUT adjacent edge or bottom separation distance >50mm the actual antenna to user separation distance is used to determine SAR exclusion and estimated SAR value.

Refer to Appendix for the specific details on the antenna-to-antenna and antenna-to-edge distances used for test exclusion calculations.

### 12.1.1 SAR Exclusion Calculations for Wi Fi Antenna < 50mm from the User

According to KDB 447498 v06 r02 in section 4.3.1, if the calculated threshold value is > 3 then SAR testing is required.

#### For WWAN

Full Power, Proximity Sensor Off.

| Antenna | Band        | Frequency (MHz) | Output Power |     | Separation Distances(mm) |       |       |       |       | Calculated Threshold Value |       |       |       |       |
|---------|-------------|-----------------|--------------|-----|--------------------------|-------|-------|-------|-------|----------------------------|-------|-------|-------|-------|
|         |             |                 | dBm          | mW  | Rear                     | Edge1 | Edge2 | Edge3 | Edge4 | Rear                       | Edge1 | Edge2 | Edge3 | Edge4 |
|         | LTE Band 4  | 1720.0          | 23.0         | 200 | 10.00                    | 6.00  | 1.00  | 7.00  | 70.00 | 26.23                      | 43.72 | 262.3 | 37.47 | 3.75  |
|         | LTE Band 13 | 782.0           | 23.0         | 200 | 10.00                    | 6.00  | 1.00  | 7.00  | 70.00 | 17.69                      | 29.48 | 176.9 | 25.27 | 2.53  |

Power back off, Proximity Sensor On.

| Antenna | Band       | Frequency (MHz) | Output Power |    | Separation Distances(mm) |       |       |       |       | Calculated Threshold Value |       |       |       |       |
|---------|------------|-----------------|--------------|----|--------------------------|-------|-------|-------|-------|----------------------------|-------|-------|-------|-------|
|         |            |                 | dBm          | mW | Rear                     | Edge1 | Edge2 | Edge3 | Edge4 | Rear                       | Edge1 | Edge2 | Edge3 | Edge4 |
|         | LTE Band 4 | 1720.0          | 17.0         | 50 | 10.00                    | 6.00  | 1.00  | 7.00  | 70.00 | 6.56                       | 10.93 | 65.57 | 9.37  | 0.94  |

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**For WLAN**

| Antenna    | Band               | Frequency (MHz) | Output Power |    | Separation Distances(mm) |       |       |       |       | Calculated Threshold Value |       |       |       |       |
|------------|--------------------|-----------------|--------------|----|--------------------------|-------|-------|-------|-------|----------------------------|-------|-------|-------|-------|
|            |                    |                 | dBm          | mW | Rear                     | Edge1 | Edge2 | Edge3 | Edge4 | Rear                       | Edge1 | Edge2 | Edge3 | Edge4 |
| Wi-Fi Main | 2.4GHz             | 2437            | 17.5         | 56 | 10.00                    | 6.31  | 10.27 | 61.45 | 52.33 | 8.74                       | 13.85 | 8.51  | >50mm | >50mm |
| Wi-Fi Main | 5.3GHz<br>U-NII-2A | 5320            | 9.5          | 9  | 10.00                    | 6.31  | 10.27 | 61.45 | 52.33 | 2.08                       | 3.29  | 2.02  | >50mm | >50mm |
| Wi-Fi Main | 5.5GHz<br>U-NII-2C | 5500            | 11.5         | 14 | 10.00                    | 6.31  | 10.27 | 61.45 | 52.33 | 3.28                       | 5.20  | 3.20  | >50mm | >50mm |
| Wi-Fi Main | 5.8GHz<br>U-NII-3  | 5785            | 11.5         | 14 | 10.00                    | 6.31  | 10.27 | 61.45 | 52.33 | 3.37                       | 5.34  | 3.28  | >50mm | >50mm |
| Wi-Fi Main | BLE                | 2440            | 6.0          | 4  | 10.00                    | 6.31  | 10.27 | 61.45 | 52.33 | 0.62                       | 0.99  | 0.61  | >50mm | >50mm |

Note: Bluetooth Calculated Threshold Value not > 3, then SAR testing not required.

### 12.1.2 SAR Exclusion Calculations for Wi-Fi Antenna > 50mm from the User

According to KDB 447498 v06 r02, if the calculated Power threshold is less than the output power then SAR testing is required.

#### For WWAN

Full Power, Proximity Sensor Off.

| Antenna | Band        | Frequency (MHz) | Output Power |     | Separation Distances(mm) |       |       |       |       | Calculated Threshold Value |       |       |       |        |
|---------|-------------|-----------------|--------------|-----|--------------------------|-------|-------|-------|-------|----------------------------|-------|-------|-------|--------|
|         |             |                 | dBm          | mW  | Rear                     | Edge1 | Edge2 | Edge3 | Edge4 | Rear                       | Edge1 | Edge2 | Edge3 | Edge4  |
|         | LTE Band 4  | 1720.0          | 23.0         | 200 | 10                       | 6     | 1     | 7     | 70    | <50mm                      | <50mm | <50mm | <50mm | 314.37 |
|         | LTE Band 13 | 782.0           | 23.0         | 200 | 10                       | 6     | 1     | 7     | 70    | <50mm                      | <50mm | <50mm | <50mm | 369.62 |

Power back off, Proximity Sensor On.

| Antenna | Band       | Frequency (MHz) | Output Power |     | Separation Distances(mm) |       |       |       |       | Calculated Threshold Value |       |       |       |        |
|---------|------------|-----------------|--------------|-----|--------------------------|-------|-------|-------|-------|----------------------------|-------|-------|-------|--------|
|         |            |                 | dBm          | mW  | Rear                     | Edge1 | Edge2 | Edge3 | Edge4 | Rear                       | Edge1 | Edge2 | Edge3 | Edge4  |
|         | LTE Band 4 | 1720.0          | 20.0         | 100 | 10                       | 6     | 1     | 7     | 70    | <50mm                      | <50mm | <50mm | <50mm | 314.37 |

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**For WLAN**

| Antenna    | Band               | Frequency (MHz) | Output Power |    | Separation Distances(mm) |       |       |       |       | Calculated Threshold Value |       |       |        |        |
|------------|--------------------|-----------------|--------------|----|--------------------------|-------|-------|-------|-------|----------------------------|-------|-------|--------|--------|
|            |                    |                 | dBm          | mW | Rear                     | Edge1 | Edge2 | Edge3 | Edge4 | Rear                       | Edge1 | Edge2 | Edge3  | Edge4  |
| Wi-Fi Main | 2.4GHz             | 2437            | 17.5         | 56 | 10                       | 6.31  | 10.27 | 61.45 | 52.33 | <50mm                      | <50mm | <50mm | 210.59 | 119.39 |
| Wi-Fi Main | 5.3GHz<br>U-NII-2A | 5320            | 9.5          | 9  | 10                       | 6.31  | 10.27 | 61.45 | 52.33 | <50mm                      | <50mm | <50mm | 179.53 | 88.33  |
| Wi-Fi Main | 5.5GHz<br>U-NII-2C | 5500            | 11.5         | 14 | 10                       | 6.31  | 10.27 | 61.45 | 52.33 | <50mm                      | <50mm | <50mm | 178.46 | 87.26  |
| Wi-Fi Main | 5.8GHz<br>U-NII-3  | 5785            | 11.5         | 14 | 10                       | 6.31  | 10.27 | 61.45 | 52.33 | <50mm                      | <50mm | <50mm | 176.86 | 85.66  |
| Wi-Fi Main | BLE                | 2440            | 6.0          | 4  | 10                       | 6.31  | 10.27 | 61.45 | 52.33 | <50mm                      | <50mm | <50mm | 210.53 | 119.33 |

Note. Bluetooth Calculated Threshold Value not > 3, then SAR testing not required.

### 12.1.3 SAR Required Test Configuration

#### For WWAN

Full Power, Proximity Sensor Off

| Test Configurations | Rear | Edge1 | Edge2 | Edge3 | Edge4 |
|---------------------|------|-------|-------|-------|-------|
| LTE Band 4          | Yes  | Yes   | Yes   | Yes   | Yes   |
| LTE Band 13         | Yes  | Yes   | Yes   | Yes   | No    |
| Wi-Fi 2.4GHz        | Yes  | Yes   | Yes   | No    | No    |
| Bluetooth           | No   | No    | No    | No    | No    |

Note(s):

1. Yes = SAR is required.
2. No = SAR is not required.

Power back off, Proximity Sensor On

| Test Configurations | Rear | Edge1 | Edge2 | Edge3 | Edge4 |
|---------------------|------|-------|-------|-------|-------|
| LTE Band 4          | Yes  | Yes   | Yes   | Yes   | No    |
| LTE Band 13         | Yes  | Yes   | Yes   | Yes   | No    |

Note(s):

1. Yes = SAR is required.
2. No = SAR is not required.

## 13 Exposure Limit

### (A). Limits for Occupational/Controlled Exposure (W/kg)

| <u>Whole-Body</u> | <u>Partial-Body</u> | <u>Hands, Wrists, Feet and Ankles</u> |
|-------------------|---------------------|---------------------------------------|
| 0.4               | 8.0                 | 2.0                                   |

### (B). Limits for General Population/Uncontrolled Exposure (W/kg)

| <u>Whole-Body</u> | <u>Partial-Body</u> | <u>Hands, Wrists, Feet and Ankles</u> |
|-------------------|---------------------|---------------------------------------|
| 0.08              | 1.6                 | 4.0                                   |

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

#### Population/Uncontrolled Environments:

are defined as locations where there is the exposure of individuals who have no knowledge or control of their exposure.

#### Occupational/Controlled Environments:

are defined as locations where there is exposure that may be incurred by people who are aware of the potential for exposure, (i.e. as a result of employment or occupation).

|                                                                                                                                                                                                                                                   |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <p style="text-align: center;"><b>NOTE</b></p> <p style="text-align: center;"><b>GENERAL POPULATION/UNCONTROLLED EXPOSURE</b></p> <p style="text-align: center;"><b>PARTIAL BODY LIMIT</b></p> <p style="text-align: center;"><b>1.6 W/kg</b></p> |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|

## 14 Tissue Dielectric Properties

### 14.1 Test Liquid Confirmation

#### Simulating Liquids Parameter Check

The simulating liquids should be checked at the beginning of a series of SAR measurements to determine if the dielectric parameters are within the tolerances of the specified target values

The relative permittivity and conductivity of the tissue material should be within  $\pm 5\%$  of the values given in the table below. 5% may not be easily achieved at certain frequencies.

The head tissue dielectric parameters recommended by the IEEE SCC-34/SC-2 in IEEE 1528 2013 have been incorporated in the following table. These head parameters are derived from planar layer models simulating the highest expected SAR for the dielectric properties and tissue thickness variations in a human head. Other head and body tissue parameters that have not been specified in IEEE 1528 2013 are derived from the tissue dielectric parameters computed from the 4-Cole-Cole equations and extrapolated according to the head parameters specified in IEEE 1528 2013

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

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**14.2 Typical Composition of Ingredients for Liquid Tissue Phantoms**

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

| Ingredients<br>(% by weight) | Frequency (MHz) |       |       |      |       |       |       |      |      |      |
|------------------------------|-----------------|-------|-------|------|-------|-------|-------|------|------|------|
|                              | 450             |       | 835   |      | 915   |       | 1900  |      | 2450 |      |
| Tissue Type                  | Head            | Body  | Head  | Body | Head  | Body  | Head  | Body | Head | Body |
| Water                        | 38.56           | 51.16 | 41.45 | 52.4 | 41.05 | 56.0  | 54.9  | 40.4 | 62.7 | 73.2 |
| Salt (NaCl)                  | 3.95            | 1.49  | 1.45  | 1.4  | 1.35  | 0.76  | 0.18  | 0.5  | 0.5  | 0.04 |
| Sugar                        | 56.32           | 46.78 | 56.0  | 45.0 | 56.5  | 41.76 | 0.0   | 58.0 | 0.0  | 0.0  |
| HEC                          | 0.98            | 0.52  | 1.0   | 1.0  | 1.0   | 1.21  | 0.0   | 1.0  | 0.0  | 0.0  |
| Bactericide                  | 0.19            | 0.05  | 0.1   | 0.1  | 0.1   | 0.27  | 0.0   | 0.1  | 0.0  | 0.0  |
| Triton X-100                 | 0.0             | 0.0   | 0.0   | 0.0  | 0.0   | 0.0   | 0.0   | 0.0  | 36.8 | 0.0  |
| DGBE                         | 0.0             | 0.0   | 0.0   | 0.0  | 0.0   | 0.0   | 44.92 | 0.0  | 0.0  | 26.7 |
| Dielectric Constant          | 43.42           | 58.0  | 42.54 | 56.1 | 42.0  | 56.8  | 39.9  | 54.0 | 39.8 | 52.5 |
| Conductivity (S/m)           | 0.85            | 0.83  | 0.91  | 0.95 | 1.0   | 1.07  | 1.42  | 1.45 | 1.88 | 1.78 |

alt: 99+% Pure Sodium Chloride

Sugar: 98+% Pure Sucrose

Water: De-ionized, 16 MΩ<sup>+</sup> resistivity

HEC: Hydroxy thyl Cellulose

DGBE: 99+% Di(ethylene glycol) butyl ether, [2-(2-butoxyethoxy)ethanol]

Triton X-100 (ultra-pure): Polyethylene glycol mono [4-(1, 1, 3, 3-tetramethylbutyl)phenyl]ether

**Simulating Liquids for 5 GHz, Manufactured by SPEAG**

| Ingredients        | (% by weight) |
|--------------------|---------------|
| Water              | 78            |
| Mineral oil        | 11            |
| Emulsifiers        | 9             |
| Additives and Salt | 2             |

### 14.3 Simulating Liquids Parameter Check Results

| Tissue Type | Measurement Date | Measured Frequency (MHz) | Target Dielectric Constant, $\epsilon_r$ | Target Conductivity, $\sigma$ (S/m) | Measured Dielectric Constant, $\epsilon_r$ | Measured $e''$ | Measured Conductivity, $\sigma$ (S/m) | % dev $\epsilon_r$ | % dev $\sigma$ |
|-------------|------------------|--------------------------|------------------------------------------|-------------------------------------|--------------------------------------------|----------------|---------------------------------------|--------------------|----------------|
| Body        | Apr, 29. 2019    | 750.00                   | 55.531                                   | 0.963                               | 57.440                                     | 23.29          | 0.972                                 | -3.44%             | -0.90%         |
|             |                  | 782.00                   | 55.406                                   | 0.966                               | 57.150                                     | 23.12          | 1.006                                 | -3.15%             | -4.15%         |
|             | Apr, 30. 2019    | 1745.00                  | 53.445                                   | 1.485                               | 51.507                                     | 14.77          | 1.434                                 | 3.63%              | 3.45%          |
|             |                  | 1750.00                  | 53.432                                   | 1.488                               | 51.480                                     | 14.76          | 1.437                                 | 3.65%              | 3.45%          |

| Tissue Type | Measurement Date | Measured Frequency (MHz) | Target Dielectric Constant, $\epsilon_r$ | Target Conductivity, $\sigma$ (S/m) | Measured Dielectric Constant, $\epsilon_r$ | Measured $e''$ | Measured Conductivity, $\sigma$ (S/m) | % dev $\epsilon_r$ | % dev $\sigma$ |
|-------------|------------------|--------------------------|------------------------------------------|-------------------------------------|--------------------------------------------|----------------|---------------------------------------|--------------------|----------------|
| Body        | May, 06. 2019    | 2412.00                  | 52.751                                   | 1.914                               | 53.788                                     | 14.46          | 1.940                                 | -1.97%             | -1.37%         |
|             |                  | 2437.00                  | 52.717                                   | 1.938                               | 53.690                                     | 14.54          | 1.971                                 | -1.85%             | -1.72%         |
|             |                  | 2450.00                  | 52.700                                   | 1.950                               | 53.668                                     | 14.61          | 1.991                                 | -1.84%             | -2.10%         |
|             |                  | 2462.00                  | 52.684                                   | 1.961                               | 53.645                                     | 14.63          | 2.004                                 | -1.82%             | -2.17%         |
|             |                  | 5300.00                  | 48.879                                   | 5.416                               | 49.056                                     | 18.06          | 5.323                                 | -0.36%             | 1.72%          |
|             |                  | 5320.00                  | 48.851                                   | 5.439                               | 48.939                                     | 18.09          | 5.353                                 | -0.18%             | 1.59%          |
|             |                  | 5500.00                  | 48.607                                   | 5.650                               | 48.420                                     | 18.46          | 5.650                                 | 0.39%              | -0.01%         |
|             |                  | 5600.00                  | 48.471                                   | 5.766                               | 48.093                                     | 18.64          | 5.806                                 | 0.78%              | -0.69%         |
|             |                  | 5620.00                  | 48.444                                   | 5.790                               | 47.995                                     | 18.68          | 5.839                                 | 0.93%              | -0.85%         |
|             |                  | 5700.00                  | 48.336                                   | 5.883                               | 47.733                                     | 18.83          | 5.971                                 | 1.25%              | -1.49%         |
|             |                  | 5785.00                  | 48.220                                   | 5.982                               | 47.409                                     | 19.00          | 6.114                                 | 1.68%              | -2.20%         |
|             |                  | 5800.00                  | 48.200                                   | 6.000                               | 47.392                                     | 19.04          | 6.143                                 | 1.68%              | -2.38%         |

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## 15 Measurement Uncertainty

According to KDB 865664 D01 SAR Measurement 100 MHz to 6 GHz section 2.8.2, SAR measurement uncertainty analysis is required in SAR reports only when the highest measured SAR in a frequency band is  $\geq 1.5$  W/kg for 1-g SAR, the extensive SAR measurement uncertainty analysis described in IEEE Std 1528-2013 is not required in SAR reports submitted for equipment approval.

## 16 System Performance Check

The system performance check is performed prior to any usage of the system in order to guarantee reproducible results. The system performance check verifies that the system operates within its specifications. The system performance check results are tabulated below. And also the corresponding SAR plot is attached as well in the SAR plots files.

### System Performance Check Measurement Conditions

- The measurements were performed in the flat section of the SAM twin phantom filled with Body simulating liquid of the following parameters.
- The depth of tissue-equivalent liquid in a phantom must be  $\geq 15.0$  cm
- The DASY5 system with an E-field probe EX3DV4 SN: 7466 was used for the measurements.
- The dipole was mounted on the small tripod so that the dipole feed point was positioned below the center marking of the flat phantom section and the dipole was oriented parallel to the body axis (the long side of the phantom). The standard measuring distance was 15 mm (below 1 GHz) and 10 mm (above 1 GHz) from dipole center to the simulating liquid surface.
- The coarse grid with a grid spacing of 10mm was aligned with the dipole.
- Special 7x7x7 fine cube was chosen for cube integration ( $dx=dy=5$  mm,  $dz=5$  mm).
- Distance between probe sensors and phantom surface was set to 3.0 mm.
- The dipole input power (forward power) was  $100\text{ mW} \pm 3\%$ .
- The results are normalized to 1 W input power.

### Reference SAR Values for System Performance Check

The reference SAR values can be obtained from the calibration certificate of system validation dipoles

| System Dipole | Serial No. | Cal. Date  | Freq. (MHz) | Target SAR Values (W/kg) |       |       |
|---------------|------------|------------|-------------|--------------------------|-------|-------|
|               |            |            |             | 1g/10g                   | Head  | Body  |
| D750V3        | 1015       | 2018/8/23  | 750         | 1g                       | 8.23  | 8.62  |
|               |            |            |             | 10g                      | 5.34  | 5.71  |
| D1750V2       | 1008       | 2018/8/30  | 1750        | 1g                       | 36.50 | 37.00 |
|               |            |            |             | 10g                      | 19.30 | 19.80 |
| D2450V2       | 869        | 2018/06/19 | 2450        | 1g                       | 52.3  | 50.5  |
|               |            |            |             | 10g                      | 24.8  | 24.0  |
| D5GHzV2       | 1040       | 2018/06/28 | 5300        | 1g                       | 82.2  | 76.4  |
|               |            |            |             | 10g                      | 23.6  | 21.4  |
| D5GHzV2       | 1040       | 2018/06/28 | 5600        | 1g                       | 85.3  | 81.5  |
|               |            |            |             | 10g                      | 24.5  | 22.7  |
| D5GHzV2       | 1040       | 2018/06/28 | 5800        | 1g                       | 80.6  | 77.3  |
|               |            |            |             | 10g                      | 23.0  | 21.3  |

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## 16.1 System Performance Check Results

| Date      | System Dipole |            |        | Parameters | Target | Measured | Deviation[%] | Limited[%] |
|-----------|---------------|------------|--------|------------|--------|----------|--------------|------------|
|           | Type          | Serial No. | Liquid |            |        |          |              |            |
| 2019/4/29 | D750V3        | 1015       | Body   | 1g SAR:    | 8.62   | 8.32     | -3.48        | ± 10       |
|           |               |            |        | 10g SAR:   | 5.71   | 5.56     | -2.63        | ± 10       |
| 2019/4/30 | D1750V2       | 1008       | Body   | 1g SAR:    | 37.00  | 36.08    | -2.49        | ± 10       |
|           |               |            |        | 10g SAR:   | 19.80  | 18.72    | -5.45        | ± 10       |
| 2019/5/6  | D2450V2       | 869        | Body   | 1g SAR:    | 50.50  | 53.20    | 5.35         | ± 10       |
|           |               |            |        | 10g SAR:   | 24.00  | 25.68    | 7.00         | ± 10       |
| 2019/5/6  | D5GHzV2       | 1040       | Body   | 1g SAR:    | 76.40  | 75.40    | -1.31        | ± 10       |
|           |               |            |        | 10g SAR:   | 21.40  | 21.10    | -1.40        | ± 10       |
| 2019/5/6  | D5GHzV2       | 1040       | Body   | 1g SAR:    | 81.50  | 80.50    | -1.23        | ± 10       |
|           |               |            |        | 10g SAR:   | 22.70  | 22.40    | -1.32        | ± 10       |
| 2019/5/6  | D5GHzV2       | 1040       | Body   | 1g SAR:    | 77.30  | 74.80    | -3.23        | ± 10       |
|           |               |            |        | 10g SAR:   | 21.30  | 20.80    | -2.35        | ± 10       |

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## 17 SAR Measurements Results

### LTE Band 4 (20MHz Bandwidth):

| Power back off (On/Off) | Mode | Test Position | Channel | Freq. (MHz) | Dist. (mm) | UL RB Allocation | UL RB Start | Power (dBm)   |          | Measured 1g SAR (W/kg) | Reported SAR(W/kg) | Note |
|-------------------------|------|---------------|---------|-------------|------------|------------------|-------------|---------------|----------|------------------------|--------------------|------|
|                         |      |               |         |             |            |                  |             | Tune up limit | Measured |                        |                    |      |
| On                      | QPSK | Edge 2        | 20300   | 1745.0      | 5          | 1                | 99          | 17.00         | 16.95    | 1.080                  | 1.093              |      |
|                         |      |               | 20300   | 1745.0      |            | 50               | 0           | 17.00         | 16.84    | 1.140                  | 1.183              |      |
|                         |      |               | 20300   | 1745.0      |            | 100              | 0           | 17.00         | 16.85    | 1.140                  | 1.180              |      |
|                         |      |               | 20300   | 1745.0      |            | 50               | 0           | 17.00         | 16.84    | 1.130                  | 1.172              |      |
| Off                     | QPSK | Edge1         | 20300   | 1745.0      | 5          | 1                | 99          | 23.00         | 22.99    | 0.040                  | 0.040              |      |
|                         |      |               | 20300   | 1745.0      |            | 50               | 0           | 23.00         | 22.29    | 0.033                  | 0.039              |      |
|                         |      | Edge 2        | 20300   | 1745.0      | 15         | 1                | 99          | 23.00         | 22.99    | 1.050                  | 1.052              |      |
|                         |      |               | 20300   | 1745.0      |            | 50               | 0           | 23.00         | 22.29    | 0.723                  | 0.851              |      |
|                         |      |               | 20300   | 1745.0      |            | 100              | 0           | 23.00         | 22.23    | 0.623                  | 0.744              |      |
|                         |      | Edge3         | 20300   | 1745.0      | 5          | 1                | 99          | 23.00         | 22.99    | 1.080                  | 1.082              |      |
|                         |      |               | 20300   | 1745.0      |            | 50               | 0           | 23.00         | 22.29    | 0.303                  | 0.304              |      |
|                         |      | Edge4         | 20300   | 1745.0      | 5          | 1                | 99          | 23.00         | 22.99    | 0.243                  | 0.286              |      |
|                         |      |               | 20300   | 1745.0      |            | 50               | 0           | 23.00         | 22.29    | 0.130                  | 0.130              |      |
|                         |      | Rear          | 20300   | 1745.0      | 5          | 1                | 99          | 23.00         | 22.99    | 0.112                  | 0.132              |      |
|                         |      |               | 20300   | 1745.0      |            | 50               | 0           | 23.00         | 22.29    | 0.377                  | 0.378              |      |
|                         |      |               |         |             |            |                  |             |               |          | 0.307                  | 0.362              |      |

#### Note(s):

- 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. (Per KDB 941225 D05 v02r05)
- The highest reported SAR for 1 RB and 50% RB allocation are  $\geq 0.8$  W/kg, SAR is required of 100% RB. Testing for the remaining required channels is not needed because the reported SAR for 100% RB Allocation  $< 1.45$  W/kg. (Per KDB 941225 D05 v02r05)
- Repeated measurements are required only when the measured SAR is  $\geq 0.80$  W/kg. If the measured SAR values are  $< 1.45$  W/kg with  $\leq 20\%$  variation, only one repeated measurement is required to reaffirm that the results are not expected to have substantial variations, which may introduce significant compliance concerns. (Per KDB 865664 D01 SAR measurement 100 MHz to 6 GHz v01r04)
  - Original SAR = 1.180 W/kg, therefore two times repeat SAR is required.
  - Repeat SAR = 1.172 W/kg  $< 1.45$ W/kg  
SAR variation= 0.67 %  $< 20\%$
  - Original SAR = 1.052 W/kg, therefore two times repeat SAR is required.
  - Repeat SAR = 1.082 W/kg  $< 1.45$ W/kg  
SAR variation= -2.85 %  $< 20\%$

**LTE Band 13 (10MHz Bandwidth):**

| Power back off (On/Off) | Mode | Test Position | Channel | Freq. (MHz) | Dist. (mm) | UL RB Allocation | UL RB Start | Power (dBm)   |          | Measured 1g SAR (W/kg) | Reported SAR(W/kg) | Note |
|-------------------------|------|---------------|---------|-------------|------------|------------------|-------------|---------------|----------|------------------------|--------------------|------|
|                         |      |               |         |             |            |                  |             | Tune up limit | Measured |                        |                    |      |
| Off                     | QPSK | Edge1         | 23230   | 782.0       | 5          | 1                | 0           | 23.00         | 22.75    | 0.031                  | 0.033              |      |
|                         |      |               | 23230   | 782.0       |            | 25               | 0           | 23.00         | 21.92    | 0.019                  | 0.024              |      |
|                         |      | Edge2         | 23230   | 782.0       | 5          | 1                | 0           | 23.00         | 22.75    | 0.238                  | 0.252              |      |
|                         |      |               | 23230   | 782.0       |            | 25               | 0           | 23.00         | 21.92    | 0.205                  | 0.263              |      |
|                         |      | Edge3         | 23230   | 782.0       | 5          | 1                | 0           | 23.00         | 22.75    | 0.030                  | 0.032              |      |
|                         |      |               | 23230   | 782.0       |            | 25               | 0           | 23.00         | 21.92    | 0.022                  | 0.028              |      |
|                         |      | Edge4         | 23230   | 782.0       | 5          | 1                | 0           | 23.00         | 22.75    | 0.018                  | 0.019              |      |
|                         |      |               | 23230   | 782.0       |            | 25               | 0           | 23.00         | 21.92    | 0.015                  | 0.019              |      |
|                         |      | Rear          | 23230   | 782.0       | 5          | 1                | 0           | 23.00         | 22.75    | 0.113                  | 0.120              |      |
|                         |      |               | 23230   | 782.0       |            | 25               | 0           | 23.00         | 21.92    | 0.097                  | 0.124              |      |

**Note(s):**

1. 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. (Per KDB 941225 D05 v02r05)
2. The highest reported SAR for 1 RB and 50% RB allocation are  $\geq 0.8$  W/kg, SAR is required of 100% RB. Testing for the remaining required channels is not needed because the reported SAR for 100% RB Allocation  $< 1.45$  W/kg. (Per KDB 941225 D05 v02r05)
3. Repeated measurements are required only when the measured SAR is  $\geq 0.80$  W/kg. If the measured SAR values are  $< 1.45$  W/kg with  $\leq 20\%$  variation, only one repeated measurement is required to reaffirm that the results are not expected to have substantial variations, which may introduce significant compliance concerns. (Per KDB 865664 D01 SAR measurement 100 MHz to 6 GHz v01r04)

Wi-Fi (2.4GHz Band):

| Test Mode | Band (GHz) | Mode    | Dist. (mm) | Test Position | Ch# | Freq. (MHz) | Chain | Power (dBm)   |       | Area Scan 1g SAR (W/kg) | Zoom Scan 1g SAR (W/kg) | Reported SAR (W/kg) | Note | Plot No. |
|-----------|------------|---------|------------|---------------|-----|-------------|-------|---------------|-------|-------------------------|-------------------------|---------------------|------|----------|
|           |            |         |            |               |     |             |       | Tune up limit | Meas. |                         |                         |                     |      |          |
|           | 2.4GHz     | 802.11b | 5          | Edge 1        | 11  | 2462        | 0     | 17.50         | 17.15 | 0.040                   | 0.039                   | 0.042               |      |          |
|           |            |         | 5          | Edge 2        | 11  | 2462        | 0     | 17.50         | 17.15 | 0.123                   | 0.133                   | 0.144               |      |          |
|           |            |         | 5          | Edge 2        | 1   | 2412        | 0     | 17.50         | 16.34 | 0.167                   | 0.172                   | 0.225               |      |          |
|           |            |         | 5          | Edge 2        | 6   | 2437        | 0     | 17.50         | 16.77 | 0.160                   | 0.167                   | 0.198               |      |          |
|           |            |         | 5          | Edge 3        | 11  | 2462        | 0     | 17.50         | 17.15 | 0.065                   | 0.064                   | 0.069               |      |          |
|           |            |         | 5          | Edge 4        | 11  | 2462        | 0     | 17.50         | 17.15 | 0.004                   | 0.002                   | 0.003               |      |          |
|           |            |         | 5          | Rear          | 11  | 2462        | 0     | 17.50         | 17.15 | 0.041                   | 0.042                   | 0.046               |      |          |

Note(s):

1. According to Notice 2016-DRS001, based on the IEEE 1528 and IEC 62209 requirements, the high, mid and low channels for the configuration with the highest SAR value must be tested regardless of the SAR value measured.

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Wi-Fi (5GHz Band):

| Test Mode | Band (GHz)     | Mode    | Dist. (mm) | Test Position | Ch# | Freq. (MHz) | Chain | Power (dBm)   |       | Area Scan 1g SAR (W/Kg) | Meas. 1g SAR (W/kg) | Reported SAR (W/kg) | Note | Plot No. |
|-----------|----------------|---------|------------|---------------|-----|-------------|-------|---------------|-------|-------------------------|---------------------|---------------------|------|----------|
|           |                |         |            |               |     |             |       | Tune up limit | Meas. |                         |                     |                     |      |          |
| Tablet    | 5.3 (U-NII-2A) | 802.11a | 5          | Edge 1        | 64  | 5320        | 0     | 9.5           | 8.13  | 0.059                   | 0.065               | 0.089               |      |          |
|           |                |         | 5          | Edge 2        | 64  | 5320        | 0     | 9.5           | 8.13  | 0.078                   | 0.085               | 0.116               |      |          |
|           |                |         | 5          | Edge 3        | 64  | 5320        | 0     | 9.5           | 8.13  | 0.010                   | 0.011               | 0.015               |      |          |
|           |                |         | 5          | Edge 4        | 64  | 5320        | 0     | 9.5           | 8.13  | 0.015                   | 0.016               | 0.022               |      |          |
|           |                |         | 5          | Rear          | 64  | 5320        | 0     | 9.5           | 8.13  | 0.034                   | 0.033               | 0.045               |      |          |
|           | 5.5 (U-NII-2C) | 802.11a | 5          | Edge 1        | 100 | 5500        | 0     | 11.5          | 9.05  | 0.134                   | 0.137               | 0.241               |      |          |
|           |                |         | 5          | Edge 1        | 124 | 5620        | 0     | 11.5          | 10.13 | 0.089                   | 0.089               | 0.122               |      |          |
|           |                |         | 5          | Edge 1        | 140 | 5700        | 0     | 11.5          | 9.76  | 0.072                   | 0.065               | 0.096               |      |          |
|           |                |         | 5          | Edge 2        | 124 | 5620        | 0     | 11.5          | 10.13 | 0.073                   | 0.080               | 0.110               |      |          |
|           |                |         | 5          | Edge 3        | 124 | 5620        | 0     | 11.5          | 10.13 | 0.016                   | 0.016               | 0.022               |      |          |
|           |                |         | 5          | Edge 4        | 124 | 5620        | 0     | 11.5          | 10.13 | 0.015                   | 0.015               | 0.021               |      |          |
|           |                |         | 5          | Rear          | 124 | 5620        | 0     | 11.5          | 10.13 | 0.031                   | 0.023               | 0.032               |      |          |
|           | 5.8 (U-NII-3)  | 802.11a | 5          | Edge 1        | 157 | 5785        | 0     | 11.5          | 9.27  | 0.051                   | 0.044               | 0.074               |      |          |
|           |                |         | 5          | Edge 2        | 157 | 5785        | 0     | 11.5          | 9.27  | 0.040                   | 0.042               | 0.070               |      |          |
|           |                |         | 5          | Edge 3        | 157 | 5785        | 0     | 11.5          | 9.27  | 0.009                   | 0.013               | 0.021               |      |          |
|           |                |         | 5          | Edge 4        | 157 | 5785        | 0     | 11.5          | 9.27  | 0.011                   | 0.012               | 0.021               |      |          |
|           |                |         | 5          | Rear          | 157 | 5785        | 0     | 11.5          | 9.27  | 0.014                   | 0.011               | 0.019               |      |          |

## Note(s):

1. According to Notice 2016-DRS001, based on the IEEE 1528 and IEC 62209 requirements, the high, mid and low channels for the configuration with the highest SAR value must be tested regardless of the SAR value measured.

## 18 Simultaneous Transmission SAR Analysis

### 18.1 Sum of the SAR for Simultaneous Transmission Analysis

#### 18.1.1 Sum of the SAR for WLAN & WWAN

##### LTE Band IV+2.4G Band

| Test Position | Simultaneous Transmission Scenario |                         | 1+2 Summed 1g SAR(W/kg) | SPLSR (Yes/No) |
|---------------|------------------------------------|-------------------------|-------------------------|----------------|
|               | 1                                  | 2                       |                         |                |
|               | LTE Band IV                        | Wi-Fi Main 2.4 GHz Band |                         |                |
| Edge 2        | 1.183                              | 0.225                   | 1.408                   | No             |

##### Note(s):

As the Sum of the SAR is less than 1.6W/Kg, so SPLSR is not required.

##### LTE Band IV+5G Band

| Test Position | Simultaneous Transmission Scenario |                       | 1+2 Summed 1g SAR(W/kg) | SPLSR (Yes/No) |
|---------------|------------------------------------|-----------------------|-------------------------|----------------|
|               | 1                                  | 2                     |                         |                |
|               | LTE Band IV                        | Wi-Fi Main 5 GHz Band |                         |                |
| Edge 2        | 1.183                              | 0.085                 | 1.268                   | No             |

##### Note(s):

As the Sum of the SAR is less than 1.6W/Kg, so SPLSR is not required.

##### LTE Band XXIII +2.4G Band

| Test Position | Simultaneous Transmission Scenario |                         | 1+2 Summed 1g SAR(W/kg) | SPLSR (Yes/No) |
|---------------|------------------------------------|-------------------------|-------------------------|----------------|
|               | 1                                  | 2                       |                         |                |
|               | LTE Band XXIII                     | Wi-Fi Main 2.4 GHz Band |                         |                |
| Edge 2        | 0.263                              | 0.225                   | 0.488                   | No             |

##### Note(s):

As the Sum of the SAR is less than 1.6W/Kg, so SPLSR is not required.

##### LTE Band XXIII +5G Band

| Test Position | Simultaneous Transmission Scenario |                       | 1+2 Summed 1g SAR(W/kg) | SPLSR (Yes/No) |
|---------------|------------------------------------|-----------------------|-------------------------|----------------|
|               | 1                                  | 2                     |                         |                |
|               | LTE Band XXIII                     | Wi-Fi Main 5 GHz Band |                         |                |
| Edge 2        | 0.263                              | 0.085                 | 0.348                   | No             |

##### Note(s):

As the Sum of the SAR is less than 1.6W/Kg, so SPLSR is not required.

## 19 Equipment List & Calibration Status

| Name of Equipment                  | Manufacturer    | Type/Model  | Serial Number   | Calibration Cycle(year) | Calibration Due |
|------------------------------------|-----------------|-------------|-----------------|-------------------------|-----------------|
| Wireless Communication Test Set    | Agilent         | E5515C 8960 | MY48361017      | 1                       | 2019/08/20      |
| Radio Communication Analyzer       | Anritsu         | MT8820C     | 6201240043      | 1                       | 2019/07/11      |
| S-Parameter Network Analyzer       | Agilent         | E5071C      | MY46316981      | 1                       | 2019/01/09      |
| Electronic Probe kit               | Hewlett Packard | 85070D      | N/A             | N/A                     | N/A             |
| Power Meter                        | Agilent         | E4416A      | GB41291611      | 1                       | 2019/08/19      |
| Power Sensor                       | Agilent         | 8481H       | MY41091956      | 1                       | 2019/08/19      |
| Data Acquisition Electronics (DAE) | SPEAG           | DAE4        | 1336            | 1                       | 2019/08/05      |
| Dosimetric E-Field Probe           | SPEAG           | EX3DV4      | 7466            | 1                       | 2020/02/03      |
| 750MHz System Validation Dipole    | SPEAG           | D750V       | 1015            | 1                       | 2019/08/22      |
| 1750MHz System Validation Dipole   | SPEAG           | D1750V2     | 1008            | 1                       | 2019/08/29      |
| 2450 MHz System Validation Dipole  | SPEAG           | D2450V2     | 869             | 1                       | 2019/06/18      |
| 5000 MHz System Validation Dipole  | SPEAG           | D5GHzV2     | 1023            | 1                       | 2019/06/27      |
| Robot                              | Staubli         | RX90L       | F02/5T69A1/A/01 | N/A                     | N/A             |
| Amplifier                          | Mini-Circuit    | ZVE-8G      | 665500309       | N/A                     | N/A             |
| Amplifier                          | Mini-Circuit    | ZHL-1724HLN | D072602#2       | N/A                     | N/A             |
| Thermometer                        | Comet           | S3120       | 12932714        | 1                       | 2020/02/27      |
| Signal Generator                   | Aglient         | 83630B      | 3844A01022      | 1                       | 2020/05/27      |
| Directional Couplers               | Aglient         | 87301D      | MY44350252      | 1                       | 2019/07/23      |

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## 20 Facilities

All measurement facilities used to collect the measurement data are located at

- ☐ No. 81-1, Lane 210, Bade Rd. 2, Luchu Hsiang, Taoyuan Hsien, Taiwan, R.O.C.
- ☒ No.11, Wugong 6th Rd., Wugu Dist., New Taipei City 24891, Taiwan. (R.O.C.)
- ☐ No. 199, Chunghsen Road, Hsintien City, Taipei Hsien, Taiwan, R.O.C.

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## 22 Attachments

| Exhibit | Content                          |
|---------|----------------------------------|
| 1       | System Performance Check Plots   |
| 2       | SAR Test Data Plots              |
| 3       | SAR Equipment calibration report |
| 4       | T181223W03-SF PHOTOS             |

END OF REPORT

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