**Shenzhen CTA Testing Technology Co., Ltd.**

Room 106, Building 1, Yibaolai Industrial Park, Qiaotou Community, Fuhai Street, Bao'an District, Shenzhen, China

# TEST REPORT

| | | |
|---|---|---|
| **Report Reference No.....:** | **CTA24051303501** | |
| **FCC ID .....:** | **2AYD5-I24P01** | |
| Compiled by ( position+printed name+signature)..: | File administrators Zoey Cao | Zoey Cao |
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| Approved by ( position+printed name+signature)..: | RF Manager Eric Wang | Eric Wang |
| Date of issue.....: | May 22, 2024 | |
| **Testing Laboratory Name** .....: | **Shenzhen CTA Testing Technology Co., Ltd.** | |
| Address .....: | Room 106, Building 1, Yibaolai Industrial Park, Qiaotou Community, Fuhai Street, Bao'an District, Shenzhen, China | |
| **Applicant's name**.....: | **Imin Technology Pte Ltd** | |
| Address .....: | 11 Bishan Street 21, #03-05 Bosch Building, Singapore 573943 | |
| **Test specification** .....: | | |
| Standard.....: | **IEC 62209-2:2010; IEEE 1528:2013; FCC 47 CFR Part 2.1093; ANSI/IEEE C95.1:2005; Reference FCC KDB 447498; KDB 248227; KDB 616217; KDB 941225; KDB 865664** | |

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| | |
|---|---|
| **Test item description.....:** | **Mobile Data Terminal, Mobile Computer, Handheld Data Terminal, Wireless Handheld Terminal** |
| Trade Mark .....: | iMIN |
| Manufacturer .....: | Imin Technology Pte Ltd |
| Model/Type reference.....: | I24P01 |
| Listed Models .....: | N/A |
| Rating .....: | DC 3.87V From battery and DC 11V From external circuit |
| Result .....: | **PASS** |

# T E S T  R E P O R T

| | | |
|---|---|---|
| Equipment under Test | : | Mobile Data Terminal, Mobile Computer, Handheld Data Terminal, Wireless Handheld Terminal |
| Model /Type | : | I24P01 |
| Listed Models | : | N/A |
| Applicant | : | **Imin Technology Pte Ltd** |
| Address | : | 11 Bishan Street 21, #03-05 Bosch Building, Singapore 573943 |
| Manufacturer | : | **Imin Technology Pte Ltd** |
| Address | : | 11 Bishan Street 21, #03-05 Bosch Building, Singapore 573943 |

| | |
|---|---|
| **Test Result**: | **PASS** |

The test report merely corresponds to the test sample.

It is not permitted to copy extracts of these test result without the written permission of the test laboratory.

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# Version

| Version No. | Date | Description |
|---|---|---|
| R00 | May 22, 2024 | Original |
| | | |
| | | |
| | | |
| | | |
| | | |

# 1 Statement of Compliance

## <Highest SAR Summary>

This device is in compliance with Specific Absorption Rate (SAR) for general population/uncontrolled exposure limits (1.6 W/kg) specified in FCC 47 CFR part 2 (2.1093) and ANSI/IEEE C95.1-2005, and had been tested in accordance with the measurement methods and procedures specified in IEEE 1528-2013 The maximum results of Specific Absorption Rate (SAR) found during testing are as follows.

## <Highest SAR Summary>

| Frequency Band | Highest Reported 1g-SAR(W/Kg) Body-Worn (0mm) | Simultaneous Reported SAR (W/Kg) |
|---|---|---|
| GSM 850 | 0.724 | Body:1.029 |
| PCS1900 | 0.407 | |
| WCDMA Band II | 0.459 | |
| WCDMA Band V | 0.399 | |
| LTE Band 5 | 0.414 | |
| LTE Band 7 | 0.757 | |
| LTE Band 12/ LTE Band 17 | 0.298 | |
| LTE Band 14 | 0.307 | |
| LTE Band 25/ LTE Band 2 | 0.482 | |
| LTE Band 26 Lower Band | 0.420 | |
| LTE Band 26 Higher Band | 0.351 | |
| LTE Band 66/ LTE Band 4 | 0.426 | |
| LTE Band 41 | 0.216 | |
| WLAN2.4G | 0.214 | |
| WLAN5.2G/WLAN5.3G | 0.167 | |
| WLAN5.6G | 0.272 | |
| WLAN5.8G | 0.195 | |
| BT | 0.142 | |
| **SAR Test Limit (W/Kg)** | **1.60** | |
| **Test Result** | **PASS** | |

Note 1: LTE band 2, LTE band 4, LTE Band 17, SAR was covered by LTE band 25, LTE Band 66, LTE Band 12; according to April 2015 TCB workshop, SAR test for overlapping LTE bands can be reduced if a. the maximum output power, including tolerance, for the smaller band is ≤ the larger band to qualify for the SAR test exclusion. b. the channel bandwidth and other operating parameters for the smaller band are fully supported by the larger band.

Note 2: This device has NFC operations, the NFC antenna is integrated into the device for this model, therefore. all SAR teswere performed with the device which already incorporates the NFC antenna. A diagram showing the location of theantenna can be found in the operational description. According to FCC KDB publication 447498 D01v06transmitters are consider to be operating simultaneously when there is overlapping transmission, with the exceptionof transmission during network hand-offs with maximum hand-off duration less than 30 seconds.

# 2 General Information

## 2.1 General Remarks

| | | |
|---|---|---|
| Date of receipt of test sample | : | May 13, 2024 |
| | | |
| Testing commenced on | : | May 14, 2024 |
| | | |
| Testing concluded on | : | May 21, 2024 |

## 2.2 Description of Equipment Under Test (EUT)

| | |
|---|---|
| Product Name: | Mobile Data Terminal, Mobile Computer, Handheld Data Terminal, Wireless Handheld Terminal |
| Model/Type reference: | I24P01 |
| Power supply: | DC 3.87V From battery and DC 11V From external circuit |
| Testing sample ID: | CTA240513035-1# (Engineer sample)<br>CTA240513035-2# (Normal sample) |
| Hardware version: | V1.0 |
| Software version: | V1.0 |
| Tx Frequency: | SRD:<br>BT:2402~2480MHz<br>2.4G WIFI: 2412~2462MHz<br>5.2G WIFI:5180~5240MHz<br>5.3 G WIFI:5260~5320MHz<br>5.6 G WIFI:5500~5700MHz<br>5.8G WIFI:5745~5825MHz<br>NFC:13.56MHz<br>GSM:<br>GSM850 TX: 824.2~848.8MHz<br>PCS1900 TX: 1850.2~1909.8MHz<br>WCDMA:<br>Band 2: TX: 1852.4~1907.6MHz<br>Band 5: TX: 826.40~846.60MHz<br>LTE:<br>FDD Band 2: TX: 1850~1910MHz<br>FDD Band 4: TX: 1710~1755MHz<br>FDD Band 5: TX: 824~849MHz<br>FDD Band 7: TX: 2500~2570MHz<br>FDD Band 12: TX: 699~716MHz<br>FDD Band 14: TX: 788~798MHz<br>FDD Band 17: TX: 704~716MHz<br>FDD Band 25: TX: 1850~1915MHz |

| | |
|---|---|
| | FDD Band 26: TX: 814~824MHz, 824~849MHz<br>FDD Band 66: TX: 1710~1780MHz<br>TDD Band 41: TX: 2496 ~2690MHz |
| Type of Modulation: | BT: GFSK, Π/4DQPSK, 8DPSK<br>2.4G WIFI: BPSK, QPSK,16QAM,64QAM<br>5G WIFI: BPSK, QPSK,16QAM,64QAM, 256QAM<br>NFC: ASK<br>GSM: GMSK, 8PSK<br>WCDMA: QPSK,16QAM<br>LTE: QPSK,16QAM |
| Category of device: | Portable device |

**Remark:**

1. The above DUT's information was declared by manufacturer. Please refer to the specifications or user's manual for more detailed description.
2. There are two versions of this product (version A and version B), version A with fingerprint identification on the back, version B without fingerprint identification, Version A with fingerprint identification cannot effect device thickness, SAR report full test at Version A and sport check worst case at Version B, only recorded worst case at Version A.

## 2.3 Device Category and SAR Limits

This device belongs to portable device category because its radiating structure is allowed to be used within 20 centimeters of the body of the user. Limit for General Population/Uncontrolled exposure should be applied for this device, it is 1.6 W/kg as averaged over any 1 gram of tissue.

## 2.4 Applied Standard

The Specific Absorption Rate (SAR) testing specification, method, and procedure for this device is in accordance with the following standards:

- FCC 47 CFR Part 2 (2.1093:2013)
- ANSI/IEEE C95.1:2005
- IEEE Std 1528:2013
- KDB 865664 D01 SAR Measurement 100 MHz to 6 GHz v01r04
- KDB 865664 D02 RF Exposure Reporting v01r02
- KDB 447498 D01 General RF Exposure Guidance v06
- KDB 248227 D01 802 11 Wi-Fi SAR v02r02
- KDB 941225 D01 3G SAR Procedures v03r01
- KDB 941225 D06 Hotspot SARv02r01
- KDB 648474 D04 Handset SAR v01r03

## 2.5 Test Facility

**FCC-Registration No.: 517856 Designation Number: CN1318**

Shenzhen CTA Testing Technology Co., Ltd. has been listed on the US Federal Communications Commission list of test facilities recognized to perform electromagnetic emissions measurements.

**A2LA-Lab Cert. No.: 6534.01**

Shenzhen CTA Testing Technology Co., Ltd. has been listed by American Association for Laboratory Accreditation to perform electromagnetic emission measurement.

**ISED#: 27890 CAB identifier: CN0127**

Shenzhen CTA Testing Technology Co., Ltd. has been listed by Innovation, Science and Economic Development Canada to perform electromagnetic emission measurement.

The 3m-Semi anechoic test site fulfils CISPR 16-1-4 according to ANSI C63.10 and CISPR 16-1-4:2010.

## 2.6 Environment of Test Site

| Items | Required | Actual |
|---|---|---|
| **Temperature (℃)** | 18-25 | 22~23 |
| **Humidity (%RH)** | 30-70 | 55~65 |

## 2.7 Test Configuration

The device was controlled by using a base station emulator. Communication between the device and the emulator was established by air link. The distance between the EUT and the antenna of the emulator is larger than 50 cm and the output power radiated from the emulator antenna is at least 30 dB smaller than the output power of EUT. The EUT was set from the emulator to radiate maximum output power during all tests. For WLAN SAR testing, WLAN engineering testing software installed on the EUT can provide continuous transmitting RF signal.

# 3 Specific Absorption Rate (SAR)

## 3.1 Introduction

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

## 3.2 SAR Definition

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

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

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

SAR measurement can be either related to the temperature elevation in tissue by

$$\mathbf{SAR} = \mathbf{C}\left(\frac{\boldsymbol{\delta}\mathbf{T}}{\boldsymbol{\delta}\mathbf{t}}\right)$$

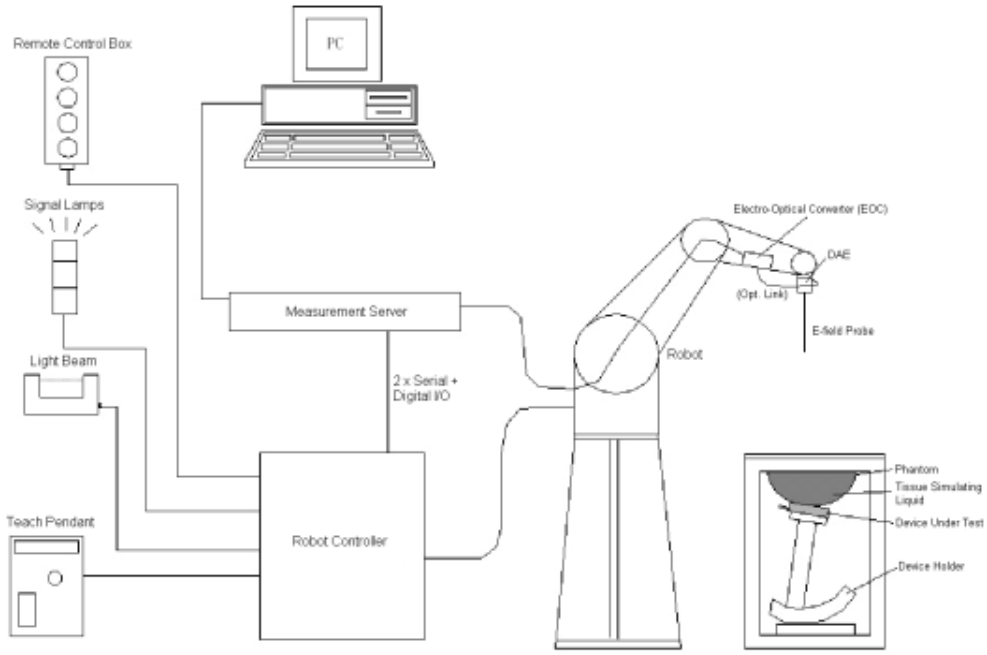
Where: C is the specific head capacity, δT is the temperature rise and δt is the exposure duration, or related to the electrical field in the tissue by

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

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

However, for evaluating SAR of low power transmitter, electrical field measurement is typically applied.

# 4 SAR Measurement System




**DASY System Configurations**

The DASY system for performance compliance tests is illustrated above graphically. This system consists of the following items:

- A standard high precision 6-axis robot with controller, a teach pendant and software
- A data acquisition electronic (DAE) attached to the robot arm extension
- A dosimetric probe equipped with an optical surface detector system
- The electro-optical converter (EOC) performs the conversion between optical and electrical signals
- A measurement server performs the time critical tasks such as signal filtering, control of the robot operation and fast movement interrupts.
- A probe alignment unit which improves the accuracy of the probe positioning
- A computer operating Windows XP
- DASY software
- Remove control with teach pendant and additional circuitry for robot safety such as warming lamps, etc.
- The SAM twin phantom
- A device holder
- Tissue simulating liquid
- Dipole for evaluating the proper functioning of the system

components are described in details in the following sub-sections.

## 4.1 E-Field Probe

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

### ➢ E-Field Probe Specification

**<EX3DV4 Probe>**

| | | |
|---|---|---|
| **Construction** | Symmetrical design with triangular core<br>Built-in shielding against static charges<br>PEEK enclosure material (resistant to organic solvents, e.g., DGBE) | <br>**Photo of EX3DV4** |
| **Frequency** | 10 MHz to 6 GHz; Linearity: ± 0.2 dB | |
| **Directivity** | ± 0.3 dB in HSL (rotation around probe axis)<br>± 0.5 dB in tissue material (rotation normal to probe axis) | |
| **Dynamic Range** | 10 µW/g to 100 W/kg; Linearity: ± 0.2 dB (noise: typically< 1 µW/g) | |
| **Dimensions** | Overall length: 330 mm (Tip: 20 mm)<br>Tip diameter: 2.5 mm (Body: 12 mm)<br>Typical distance from probe tip to dipole centers: 1 mm | |

### ➢ E-Field Probe Calibration

Each probe needs to be calibrated according to a dosimetric assessment procedure with accuracy better than ± 10%. The spherical isotropy shall be evaluated and within ± 0.25dB. The sensitivity parameters (NormX, NormY, and NormZ), the diode compression parameter (DCP) and the conversion factor (ConvF) of the probe are tested. The calibration data can be referred to appendix C of this report.

## 4.2 Data Acquisition Electronics (DAE)

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

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

**Photo of DAE**

## 4.3 Robot

The SPEAG DASY system uses the high precision robots (DASY5: TX60XL) type from Stäubli SA (France). For the 6-axis controllersystem, the robot controller version (DASY5: CS8c) from Stäubli is used. The Stäublirobot series have many features that are important for our application:

- High precision (repeatability ±0.035 mm)
- High reliability (industrial design)
- Jerk-free straight movements
- Low ELF interference (the closed metallic construction shields against motor control fields)

**Photo of DASY5**

## 4.4 Measurement Server

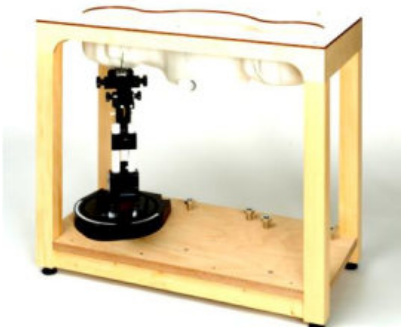
The measurement server is based on a PC/104 CPU board with CPU (DASY5: 400 MHz, Intel Celeron), chipdisk (DASY5: 128 MB), RAM (DASY5: 128 MB). The necessary circuits for communication with the DAE electronic box, as well as the 16 bit AD converter system for optical detection and digital I/O interface are contained on the DASY I/O board, which is directly connected to the PC/104 bus of the CPU board.

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

**Photo of Server for DASY5**

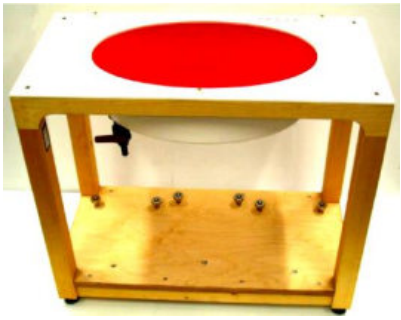
## 4.5 Phantom

**<SAM Twin Phantom>**

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

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

**<ELI4 Phantom>**

| | | |
|---|---|---|
| **Shell Thickness** | 2 ± 0.2 mm (sagging: <1%) |  <br>**Photo of ELI4 Phantom** |
| **Filling Volume** | Approx. 30 liters | |
| **Dimensions** | Major ellipse axis: 600 mm<br>Minor axis:400 mm | |

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

## 4.6 Device Holder

The SAR in the phantom is approximately inversely proportional to the square of the distance between the source and the liquid surface. For a source at 5 mm distance, a positioning uncertainty of ±0.5mm would produce a SAR uncertainty of ± 20%. Accurate device positioning is therefore crucial for accurate and repeatable measurements. The positions in which the devices must be measured are defined by the standards.

The DASY device holder is designed to cope with different positions given in the standard. It has two scales for the device rotation (with respect to the body axis) and the device inclination (with respect to the line between the ear reference points). The rotation center for both scales is the ear reference

point (ERP).Thus the device needs no repositioning when changing the angles.

The DASY device holder is constructed of low-loss POM material having the following dielectric parameters: relative permittivity ε = 3 and loss tangent δ = 0.02. The amount of dielectric material has been reduced in the closest vicinity of the device, since measurements have suggested that the influence of the clamp on the test results could thus be lowered.

**Device Holder**

## 4.7 Data Storage and Evaluation

- Data Storage

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

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

- Data Evaluation

  The DASY 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 | σ |
| | - Density | ρ |

These parameters must be set correctly in the software. They can be found in the component documents or they can be imported into the software from the configuration files issued for the 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：

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

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

H-field Probes： $\mathbf{H_i} = \sqrt{\mathbf{V_i}} \cdot \frac{\mathbf{a_{i0}+a_{i1}f+a_{i2}f^2}}{\mathbf{f}}$

with $V_i$ = compensated signal of channel i,(i= x, y, z)
$Norm_i$= sensor sensitivity of channel i, (i= x, y, z), μV/(V/m)$^2$ for E-field 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 iin V/m
$H_i$= magnetic field strength of channel iin A/m

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

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

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

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

with SAR = local specific absorption rate in W/kg

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

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

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

Note that the density is set to 1, to account for actual head tissue density rather than the density of the tissue simulating liquid.

# 5 Test Equipment List

| Manufacturer | Name of Equipment | Type/Model | Serial Number | Calibration | |
|---|---|---|---|---|---|
| | | | | Last Cal. | Due Date |
| SPEAG | 750MHz System Validation Kit | D750V3 | 1194 | Feb. 17,2023 | Feb. 16,2026 |
| SPEAG | 835MHz System Validation Kit | D835V2 | 484 | Aug. 25,2023 | Aug. 24,2026 |
| SPEAG | 1800MHz System Validation Kit | D1800V2 | 2d158 | Dec. 17,2021 | Dec. 16,2024 |
| SPEAG | 1900MHz System Validation Kit | D1900V2 | 5d002 | Aug. 25,2023 | Aug. 24,2026 |
| SPEAG | 2450MHz System Validation Kit | D2450V2 | 745 | Aug. 28,2023 | Aug. 27,2026 |
| SPEAG | 2600MHz System Validation Kit | D2600V2 | 1073 | Feb. 17,2023 | Feb. 16,2026 |
| SPEAG | 5GHz System Validation Kit | D5GHzV2 | 1301 | Feb.16, 2023 | Feb.15, 2026 |
| Rohde & Schwarz | UNIVERSAL RADIO COMMUNICATION TESTER | CMW500 | 1201.0002K50-104209-JC | Nov.05, 2023 | Nov.04, 2024 |
| SPEAG | Data Acquisition Electronics | DAE3 | 428 | Aug.30,2023 | Aug.29,2024 |
| SPEAG | Dosimetric E-Field Probe | EX3DV4 | 7380 | June 21,2023 | June 20,2024 |
| Agilent | ENA Series Network Analyzer | E5071C | MY46317418 | Oct.25, 2023 | Oct.24, 2024 |
| SPEAG | DAK | DAK-3.5 | 1226 | NCR | NCR |
| SPEAG | SAM Twin Phantom | QD000P40CD | 1802 | NCR | NCR |
| SPEAG | ELI Phantom | QDOVA004AA | 2058 | NCR | NCR |
| AR | Amplifier | ZHL-42W | QA1118004 | NCR | NCR |
| Agilent | Power Meter | N1914A | MY50001102 | Oct.25, 2023 | Oct.24, 2024 |
| Agilent | Power Sensor | N8481H | MY51240001 | Oct.25, 2023 | Oct.24, 2024 |
| R&S | Spectrum Analyzer | N9020A | MY51170037 | Oct.25, 2023 | Oct.24, 2024 |
| Agilent | Signal Generation | N5182A | MY48180656 | Oct.25, 2023 | Oct.24, 2024 |
| Worken | Directional Coupler | 0110A05601O-10 | COM5BNW1A2 | Oct.25, 2023 | Oct.24, 2024 |

**Note:**

1. The calibration certificate of DASY can be referred to appendix D of this report.
2. The dipole calibration interval can be extended to 3 years with justification. The dipoles are also not physically damaged, or repaired during the interval.
3. The Insertion Loss calibration of Dual Directional Coupler and Attenuator were characterized via the network analyzer and compensated during system check.
4. The dielectric probe kit was calibrated via the network analyzer, with the specified procedure (calibrated in pure water) and calibration kit (standard) short circuit, before the dielectric measurement. The specific procedure and calibration kit are provided by Agilent.
5. In system check we need to monitor the level on the power meter, and adjust the power amplifier level to have precise power level to the dipole; the measured SAR will be normalized to 1W input power according to the ratio of 1W to the input power to the dipole. For system check, the calibration of the power amplifier is deemed not critically required for correct measurement; the power meter is critical and we do have calibration for it

# 6 Tissue Simulating Liquids

For the measurement of the field distribution inside the SAM phantom with DASY, the phantom must be filled with around 25 liters of homogeneous body tissue simulating liquid. For head SAR testing, the liquid height from the ear reference point (ERP) of the phantom to the liquid top surface is larger than 15 cm, which is shown in Fig. 6.1. For body SAR testing, the liquid height from the center of the flat phantom to the liquid top surface is larger than 15 cm, which is shown as followed:

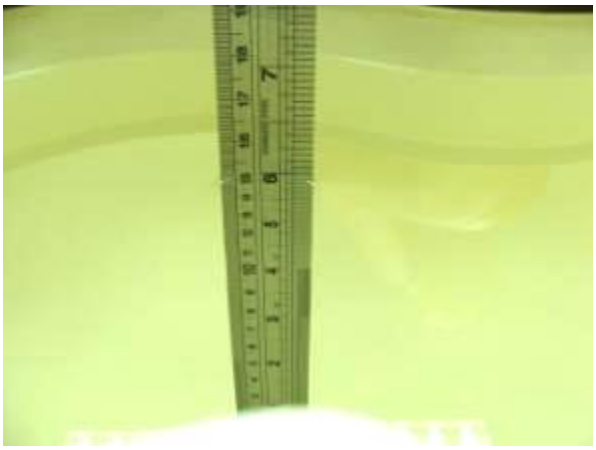


**Photo of Liquid Height for Head SAR**

The following table shows the measuring results for simulating liquid.

| Measured Frequency (MHz) | Target Tissue | | Measured Tissue | | | | Liquid Temp. | Test Data |
|---|---|---|---|---|---|---|---|---|
| | εr | σ | εr | Dev. (%) | σ | Dev. (%) | | |
| 750 | 41.9 | 0.89 | 41.728 | -0.41% | 0.912 | 2.44% | 22.7 | 05/14/2024 |
| 835 | 41.5 | 0.90 | 40.591 | -2.19% | 0.875 | -2.79% | 22.5 | 05/15/2024 |
| 1750 | 40.1 | 1.37 | 38.949 | -2.87% | 1.355 | -1.08% | 22.5 | 05/16/2024 |
| 1900 | 40.0 | 1.40 | 38.832 | -2.92% | 1.429 | 2.08% | 22.7 | 05/17/2024 |
| 2450 | 39.2 | 1.80 | 38.561 | -1.63% | 1.787 | -0.73% | 22.5 | 05/20/2024 |
| 2600 | 39.0 | 1.96 | 38.282 | -1.84% | 1.932 | -1.42% | 22.3 | 05/18/2024 |
| 5250 | 35.9 | 4.71 | 34.916 | -2.74% | 4.616 | -2.00% | 22.3 | 05/21/2024 |
| 5600 | 35.5 | 5.07 | 35.805 | 0.86% | 5.182 | 2.21% | 22.8 | 05/21/2024 |
| 5750 | 35.4 | 5.22 | 36.115 | 2.02% | 5.169 | -0.97% | 22.5 | 05/21/2024 |

# 7 System Verification Procedures

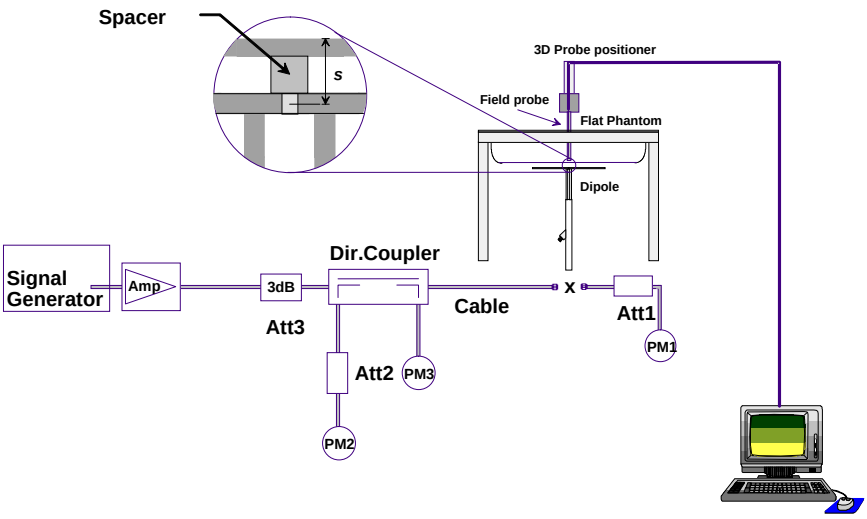
Each DASY system is equipped with one or more system validation kits. These units, together with the predefined measurement procedures within the DASY software, enable the user to conduct the system performance check and system validation. System validation kit includes a dipole, tripod holder to fix it underneath the flat phantom and a corresponding distance holder.

- **Purpose of System Performance check**

  The system performance check verifies that the system operates within its specifications. System and operator errors can be detected and corrected. It is recommended that the system performance check be performed prior to any usage of the system in order to guarantee reproducible results. The system performance check uses normal SAR measurements in a simplified setup with a well characterized source. This setup was selected to give a high sensitivity to all parameters that might fail or vary over time. The system check does not intend to replace the calibration of the components, but indicates situations where the system uncertainty is exceeded due to drift or failure.

- **System Setup**

  In the simplified setup for system evaluation, the EUT is replaced by a calibrated dipole and the power source is replaced by a continuous wave that comes from a signal generator. The calibrated dipole must be placed beneath the flat phantom section of the SAM twin phantom with the correct distance holder. The distance holder should touch the phantom surface with a light pressure at the reference marking and be oriented parallel to the long side of the phantom. The equipment setup is shown below:




**System Setup for System Evaluation**

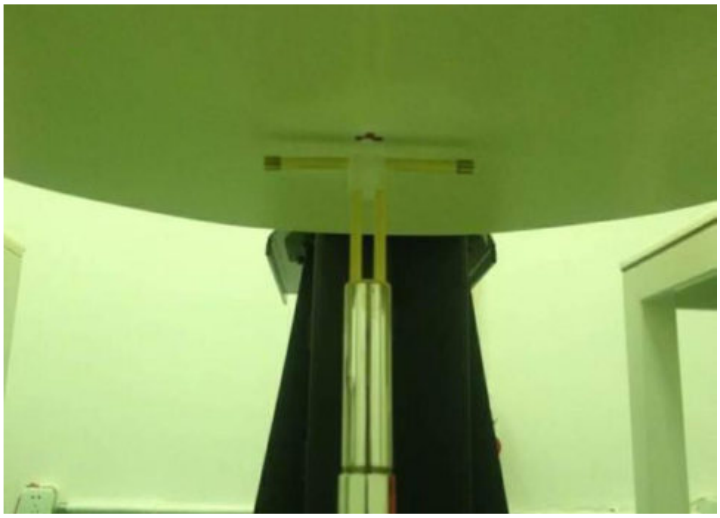


**Photo of Dipole Setup**

- **Validation Results**

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

| Date | Frequency (MHz) | Power fed onto reference dipole (mW) | Targeted SAR 1g (W/kg) | Measured SAR1g (W/kg) | Normalized SAR (W/kg) | Deviation (%) |
|---|---|---|---|---|---|---|
| 05/14/2024 | 750 | 250 | 8.57 | 2.09 | 8.37 | -2.33% |
| 05/15/2024 | 835 | 250 | 9.68 | 2.34 | 9.36 | -3.31% |
| 05/16/2024 | 1750 | 250 | 39.2 | 9.47 | 37.88 | -3.37% |
| 05/17/2024 | 1900 | 250 | 40.1 | 9.98 | 39.90 | -0.50% |
| 05/20/2024 | 2450 | 250 | 52.7 | 12.97 | 51.86 | -1.59% |
| 05/18/2024 | 2600 | 250 | 56.8 | 13.88 | 55.52 | -2.25% |
| 05/21/2024 | 5250 | 100 | 77.7 | 7.64 | 76.40 | -1.67% |
| 05/21/2024 | 5600 | 100 | 81.6 | 7.88 | 78.80 | -3.43% |
| 05/21/2024 | 5750 | 100 | 78.0 | 7.61 | 76.10 | -2.44% |

# 8 EUT Testing Position

## 8.1 Handset Reference Points

- The vertical centreline passes through two points on the front side of the handset – the midpoint of the width $w_t$ of the handset at the level of the acoustic output, and the midpoint of the width $w_b$ of the bottom of the handset.
- The horizontal line is perpendicular to the vertical centreline and passes the center of the acoustic output.
- The horizontal line is also tangential to the handset at point A.
- The two lines intersect at point A. Note that for many handsets, point A coincides with the center of the acoustic output; however, the acoustic output may be located elsewhere on the horizontal line. Also note that the vertical centreline is not necessarily parallel to the front face of the handset, especially for clamshell handsets, handsets with flip covers, and other irregularly shaped handsets.

**Fig.8-1 Illustration for Front, Back and Side of SAM Phantom**

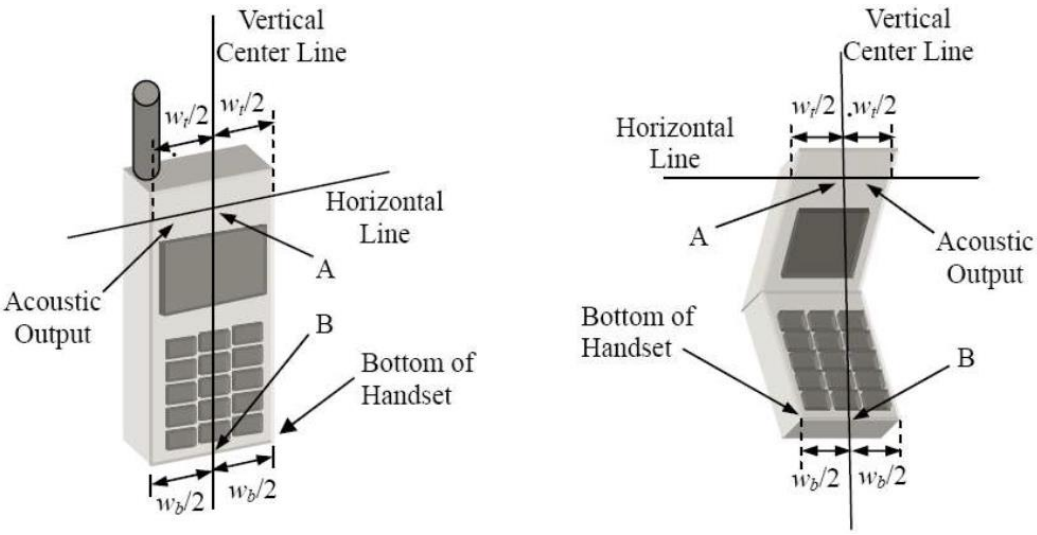



**Fig.8-2 Illustration for Handset Vertical and Horizontal Reference Lines**

## 8.2 Positioning for Cheek / Touch

- To position the device with the vertical center line of the body of the device and the horizontal line crossing the center piece in a plane parallel to the sagittal plane of the phantom. While maintaining the device in this plane, align the vertical center line with the reference plane containing the three ear and mouth reference point (M: Mouth, RE: Right Ear and LE: Left Ear) and align the center of the ear piece with the line RE-LE.
- To move the device towards the phantom with the ear piece aligned with the line LE-RE until the phone touched the ear. While maintaining the device in the reference plane and maintaining the phone contact with the ear, move the bottom of the phone until any point on the front side is in contact with the cheek of the phantom or until contact with the ear is lost (see below figure)

**Fig.8-3 Illustration for Cheek Position**

## 8.3 Positioning for Ear / 15º Tilt

- To position the device in the “cheek” position described above.
- While maintaining the device the reference plane described above and pivoting against the ear, moves it outward away from the mouth by an angle of 15 degrees or until contact with the ear is lost (see figurebelow).

**Fig.8-4 Illustration for Tilted Position**

## 8.4 Body Worn Accessory Configurations

- To position the device parallel to the phantom surface with either keypad up or down.
- To adjust the device parallel to the flat phantom
- To adjust the distance between the device surface and the flat phantom to 10 mm or holster surface and the flat phantom to 0 mm.

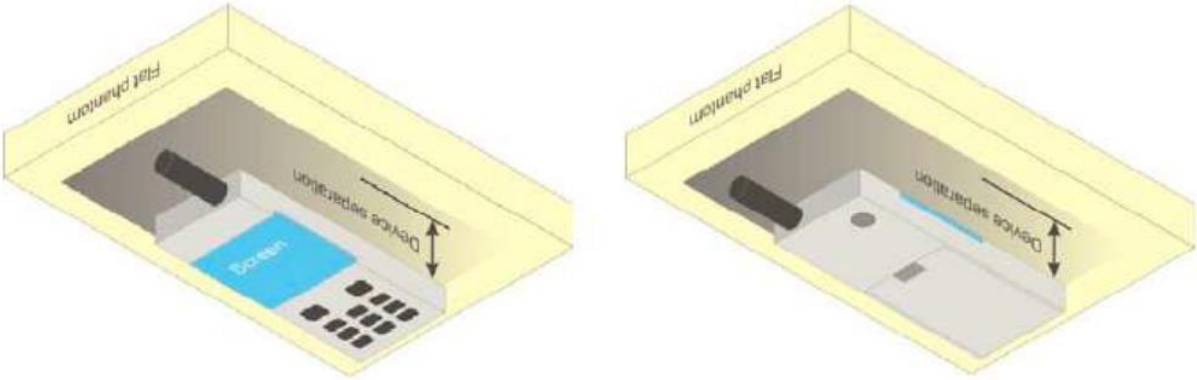



**Fig.8-5 Illustration for Body Worn Position**

## 8.5 Wireless Router (Hotspot) Configurations

Wireless Router (Hotspot) Configurations Some battery-operated handsets have the capability to transmit and receive internet connectivity through simultaneous transmission of WIFI in conjunction with a separate licensed transmitter. The FCC has provided guidance in KDB Publication 941225 D06 where SAR test considerations for handsets (L x W ≥ 9 cm x 5 cm) are based on a composite test separation distance of 10 mm from the front, back and edges of the device with antennas 2.5 cm or closer to the edge of the device, determined from general mixed use conditions for this type of devices. Since the hotspot SAR results may overlap with the body-worn accessory SAR requirements, the more conservative configurations can be considered, thus excluding some body-worn accessory SAR tests.

When the user enables the personal wireless router functions for the handset, actual operations include simultaneous transmission of both the WIFI transmitter and another licensed transmitter. Both transmitters often do not transmit at the same transmitting frequency and thus cannot be evaluated for SAR under actual use conditions. Therefore, SAR must be evaluated for each frequency transmission and mode separately and summed with the WIFI transmitter according to KDB 648474 publication procedures. The “Portable Hotspot” feature on the handset was NOT activated, to ensure the SAR measurements were evaluated for a single transmission frequency RF signal.

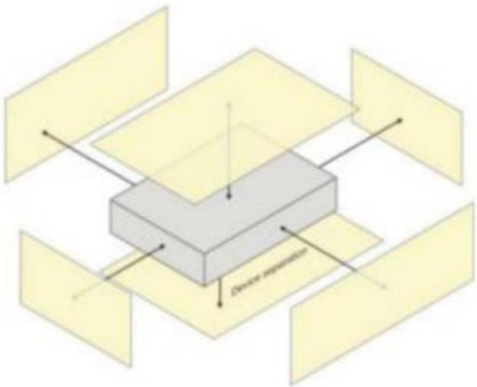


**Fig.8-6 Illustration for Hotspot Position**

# 9 Measurement Procedures

The measurement procedures are as follows:

(a) Use base station simulator (if applicable) or engineering software to transmit RF power continuously (continuous Tx) in the middle channel.
(b) Keep EUT to radiate maximum output power or 100% duty factor (if applicable)
(c) Measure output power through RF cable and power meter.
(d) Place the EUT in the positions as setup photos demonstrates.
(e) Set scan area, grid size and other setting on the DASY software.
(f) Measure SAR transmitting at the middle channel for all applicable exposure positions.
(g) Identify the exposure position and device configuration resulting the highest SAR
(h) Measure SAR at the lowest and highest channels at the worst exposure position and device configuration if applicable.

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

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

## 9.1 Spatial Peak SAR Evaluation

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

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

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

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

## 9.2 Power Reference Measurement

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

## 9.3 Area Scan Procedures

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

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

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

## 9.4 Zoom Scan Procedures

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

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

| | | | ≤ 3 GHz | > 3 GHz |
|---|---|---|---|---|
| Maximum distance from closest measurement point (geometric center of probe sensors) to phantom surface | | | 5 mm ± 1 mm | ½·$\delta$·ln(2) mm ± 0.5 mm |
| Maximum probe angle from probe axis to phantom surface normal at the measurement location | | | 30° ± 1° | 20° ± 1° |
| Maximum area scan spatial resolution: $\Delta x_{Area}$, $\Delta y_{Area}$ | | | ≤ 2 GHz: ≤ 15 mm<br>2 – 3 GHz: ≤ 12 mm | 3 – 4 GHz: ≤ 12 mm<br>4 – 6 GHz: ≤ 10 mm |
| | | | When the x or y dimension of the test device, in the measurement plane orientation, is smaller than the above, the measurement resolution must be ≤ the corresponding x or y dimension of the test device with at least one measurement point on the test device. | |
| Maximum zoom scan spatial resolution: $\Delta x_{Zoom}$, $\Delta y_{Zoom}$ | | | ≤ 2 GHz: ≤ 8 mm<br>2 – 3 GHz: ≤ 5 mm* | 3 – 4 GHz: ≤ 5 mm*<br>4 – 6 GHz: ≤ 4 mm* |
| Maximum zoom scan spatial resolution, normal to phantom surface | uniform grid: $\Delta z_{Zoom}(n)$ | | ≤ 5 mm | 3 – 4 GHz: ≤ 4 mm<br>4 – 5 GHz: ≤ 3 mm<br>5 – 6 GHz: ≤ 2 mm |
| | graded grid | $\Delta z_{Zoom}(1)$: between 1st two points closest to phantom surface | ≤ 4 mm | 3 – 4 GHz: ≤ 3 mm<br>4 – 5 GHz: ≤ 2.5 mm<br>5 – 6 GHz: ≤ 2 mm |
| | | $\Delta z_{Zoom}(n>1)$: between subsequent points | ≤ 1.5·$\Delta z_{Zoom}(n-1)$ mm | |
| Minimum zoom scan volume | x, y, z | | ≥ 30 mm | 3 – 4 GHz: ≥ 28 mm<br>4 – 5 GHz: ≥ 25 mm<br>5 – 6 GHz: ≥ 22 mm |

Note: $\delta$ is the penetration depth of a plane-wave at normal incidence to the tissue medium; see IEEE Std 1528-2013 for details.

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

## 9.5 Volume Scan Procedures

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

## 9.6 Power Drift Monitoring

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

# 10 TEST CONDITIONS AND RESULTS

## 10.1 Conducted Power

**<GSM Conducted power>**

| Band GSM850 | Burst Average Power (dBm) | | | | Frame-Average Power (dBm) | | |
|---|---|---|---|---|---|---|---|
| TX Channel | Tune-up limit (dBm) | 128 | 190 | 251 | 128 | 190 | 251 |
| Frequency (MHz) | | 824.2 | 836.6 | 848.8 | 824.2 | 836.6 | 848.6 |
| GSM | 33.00 | **32.58** | 32.23 | 32.56 | 23.55 | 23.20 | 23.53 |
| GPRS (GMSK, 1 Tx slot) | 33.00 | 32.35 | 32.32 | 32.24 | 23.32 | 23.29 | 23.21 |
| GPRS (GMSK, 2 Tx slots) | 32.00 | 31.18 | 31.15 | 31.29 | 25.16 | 25.13 | 25.27 |
| GPRS (GMSK, 3 Tx slots) | 32.00 | 31.29 | 31.30 | 31.30 | 27.03 | 27.04 | 27.04 |
| GPRS (GMSK, 4 Tx slots) | 32.00 | 31.14 | 31.19 | 31.13 | 28.13 | **28.18** | 28.12 |
| EGPRS (8PSK, 1 Tx slot) | 32.00 | 31.31 | 31.16 | 31.31 | 22.28 | 22.13 | 22.28 |
| EGPRS (8PSK, 2 Tx slot) | 32.00 | 31.16 | 31.12 | 31.28 | 25.14 | 25.10 | 25.26 |
| EGPRS (8PSK, 3 Tx slot) | 32.00 | 31.27 | 31.11 | 31.31 | 27.01 | 26.85 | 27.05 |
| EGPRS (8PSK, 1 Tx slot) | 32.00 | 31.12 | 31.21 | 31.12 | 28.11 | **28.20** | 28.11 |
| Band PCS1900 | Burst Average Power (dBm) | | | | Frame-Average Power (dBm) | | |
| TX Channel | Tune-up limit (dBm) | 512 | 661 | 810 | 512 | 661 | 810 |
| Frequency (MHz) | | 1850.2 | 1880.0 | 1909.8 | 1850.2 | 1880.0 | 1909.8 |
| GSM | 31.00 | **30.54** | 30.34 | 30.28 | 21.51 | 21.31 | 21.25 |
| GPRS (GMSK, 1 Tx slot) | 31.00 | 30.31 | 30.20 | 30.21 | 21.28 | 21.17 | 21.18 |
| GPRS (GMSK, 2 Tx slots) | 30.00 | 29.52 | 29.49 | 29.54 | 23.50 | 23.47 | 23.52 |
| GPRS (GMSK, 3 Tx slots) | 30.00 | 29.44 | 29.42 | 29.54 | 25.18 | 25.16 | 25.28 |
| GPRS (GMSK, 4 Tx slots) | 30.00 | 29.54 | 29.57 | 29.53 | 26.53 | **26.56** | 26.52 |
| EGPRS (8PSK, 1 Tx slot) | 30.00 | 29.42 | 29.42 | 29.55 | 20.39 | 20.39 | 20.52 |
| EGPRS (8PSK, 2 Tx slot) | 30.00 | 29.53 | 29.49 | 29.50 | 23.51 | 23.47 | 23.48 |
| EGPRS (8PSK, 3 Tx slot) | 30.00 | 29.53 | 29.51 | 29.53 | 25.27 | 25.25 | 25.27 |
| EGPRS (8PSK, 1 Tx slot) | 30.00 | 29.57 | 29.57 | 29.59 | 26.56 | 26.56 | **26.58** |

Remark: The frame-averaged power is linearly scaled the maximum burst averaged power over 8 time slots.

The calculated method are shown as below:

Frame-averaged power = Maximum burst averaged power (1 Tx Slot) – 9.03 dB

Frame-averaged power = Maximum burst averaged power (2 Tx Slots) – 6.02 dB

Frame-averaged power = Maximum burst averaged power (3 Tx Slots) - 4.26 dB

Frame-averaged power = Maximum burst averaged power (4 Tx Slots) – 3.01 dB

**Note:**

1. Per KDB 447498 D01, the maximum output power channel is used for SAR testing and for further SAR test reduction
2. For Data mode SAR testing, GPRS and EDGE should be evaluated, therefore the EUT was set in corresponding TX

slots due to its highest frame-average power.

**<WCDMA Conducted Power>**

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

**HSDPA Setup Configuration:**

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

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

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

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

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

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

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

**Setup Configuration**

**HSUPA Setup Configuration:**

a. The EUT was connected to Base Station Agilent E5515C referred to the Setup Configuration.

b. The RF path losses were compensated into the measurements.

c. A call was established between EUT and Base Station with following setting * :

   i. Call Configs = 5.2B, 5.9B, 5.10B, and 5.13.2B with QPSK

   ii. Set the Gain Factors ($\beta_c$ and $\beta_d$) and parameters (AG Index) were set according to each specific sub-test in the following table, C11.1.3, quoted from the TS 34.121

   iii. Set Cell Power = -86 dBm

   iv. Set Channel Type = 12.2k + HSPA

   v. Set UE Target Power

   vi. Power Ctrl Mode= Alternating bits

   vii. Set and observe the E-TFCI

   viii. Confirm that E-TFCI is equal to the target E-TFCI of 75 for sub-test 1, and other subtest's E-TFCI

d. The transmitted maximum output power was recorded.

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

| Sub-test | $\beta_c$ | $\beta_d$ | $\beta_d$ *(SF)* | $\beta_c/\beta_d$ | $\beta_{HS}$ *(Note1)* | $\beta_{ec}$ | $\beta_{ed}$ *(Note 5)* *(Note 6)* | $\beta_{ed}$ *(SF)* | $\beta_{ed}$ *(Codes)* | CM *(dB)* *(Note 2)* | MPR *(dB)* *(Note 2)* | *AG Index* *(Note 6)* | *E-TFCI* |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 11/15 *(Note 3)* | 15/15 *(Note 3)* | 64 | 11/15 *(Note 3)* | 22/15 | 209/225 | 1309/225 | 4 | 1 | 1.0 | 0.0 | 20 | 75 |
| 2 | 6/15 | 15/15 | 64 | 6/15 | 12/15 | 12/15 | 94/75 | 4 | 1 | 3.0 | 2.0 | 12 | 67 |
| 3 | 15/15 | 9/15 | 64 | 15/9 | 30/15 | 30/15 | $\beta_{ed}1$: 47/15<br>$\beta_{ed}2$: 47/15 | 4<br>4 | 2 | 2.0 | 1.0 | 15 | 92 |
| 4 | 2/15 | 15/15 | 64 | 2/15 | 4/15 | 2/15 | 56/75 | 4 | 1 | 3.0 | 2.0 | 17 | 71 |
| 5 | 15/15 *(Note 4)* | 15/15 *(Note 4)* | 64 | 15/15 *(Note 4)* | 30/15 | 24/15 | 134/15 | 4 | 1 | 1.0 | 0.0 | 21 | 81 |

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

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

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

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

Note 5: In case of testing by UE using E-DPDCH Physical Layer category 1, Sub-test 3 is omitted according to TS25.306 Table 5.1g.

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

**Setup Configuration**

**<WCDMA Conducted Power>**

| WCDMA | Band II (dBm) | | | | Band V (dBm) | | | |
|---|---|---|---|---|---|---|---|---|
| TX Channel | Tune-up limit (dBm) | 9262 | 9400 | 9538 | Tune-up limit (dBm) | 4132 | 4183 | 4233 |
| Frequency (MHz) | | 1852.4 | 1880.0 | 1907.6 | | 826.4 | 836.6 | 846.6 |
| RMC 12.2Kbps | 24.00 | 23.08 | **23.42** | 23.34 | 24.00 | 23.45 | 23.22 | **23.48** |
| RMC AMR | 24.00 | 22.75 | 23.01 | 22.88 | 24.00 | 23.14 | 22.90 | 23.16 |
| HSDPA Subtest-1 | 23.00 | 22.37 | 22.38 | 22.34 | 23.00 | 22.43 | 22.46 | 22.38 |
| HSDPA Subtest-2 | 23.00 | 22.24 | 22.29 | 22.32 | 23.00 | 22.45 | 22.33 | 22.38 |
| HSDPA Subtest-3 | 23.00 | 22.37 | 22.29 | 22.30 | 23.00 | 22.35 | 22.41 | 22.47 |
| HSDPA Subtest-4 | 23.00 | 22.36 | 22.24 | 22.39 | 23.00 | 22.33 | 22.41 | 22.31 |
| HSUPA Subtest-1 | 23.00 | 22.36 | 22.35 | 22.36 | 23.00 | 22.38 | 22.36 | 22.34 |
| HSUPA Subtest-2 | 23.00 | 22.30 | 22.22 | 22.28 | 23.00 | 22.41 | 22.36 | 22.33 |
| HSUPA Subtest-3 | 23.00 | 22.25 | 22.21 | 22.22 | 23.00 | 22.31 | 22.35 | 22.31 |
| HSUPA Subtest-4 | 23.00 | 22.23 | 22.33 | 22.36 | 23.00 | 22.49 | 22.42 | 22.42 |
| HSUPA Subtest-5 | 23.00 | 22.21 | 22.24 | 22.31 | 23.00 | 22.37 | 22.49 | 22.32 |

**General Note**

1. Per KDB 941225 D01 v02, RMC 12.2kbps setting is used to evaluate SAR as primary mode. When the maximum output power and tune-up tolerance specified for production units in a secondary mode is ≤ ¼ dB higher than the primary mode or when the highest reported SAR of the primary mode is scaled by the ratio of specified maximum output power and tune-up tolerance of secondary to primary mode and the adjusted SAR is ≤ 1.2 W/kg, SAR measurement is not required for the secondary mode.
2. It is expected by the manufacturer that MPR for some HSDPA/HSUPA subtests may differ from the specification of 3GPP, according to the chipset implementation in this model. The implementation and expected deviation are detailed in tune-up procedure exhibit.

**<LTE Conducted Power>**

| LTE Band 2 | | | | | | | |
|---|---|---|---|---|---|---|---|
| BW (MHz) | Modulation | RB Size | RB Offset | Channel/Frequency (MHz) | | | Tune-up limit (dBm) |
| | | | | 18700 | 18900 | 19100 | |
| | | | | 1860 | 1880 | 1900 | |
| 20 | QPSK | 1 | 0 | 22.67 | 22.75 | 22.85 | 24 |
| 20 | QPSK | 1 | 49 | 23.10 | 22.92 | **23.14** | |
| 20 | QPSK | 1 | 99 | 22.86 | 22.95 | 22.84 | |
| 20 | QPSK | 50 | 0 | 21.87 | 21.69 | 22.18 | 23 |
| 20 | QPSK | 50 | 24 | 21.89 | 21.70 | 22.15 | |
| 20 | QPSK | 50 | 50 | 21.93 | 22.00 | **22.27** | |
| 20 | QPSK | 100 | 0 | 21.92 | 21.88 | **22.20** | 23 |
| 20 | 16QAM | 1 | 0 | 21.70 | 21.89 | 21.94 | 23 |
| 20 | 16QAM | 1 | 49 | 22.15 | 22.08 | **22.21** | |
| 20 | 16QAM | 1 | 99 | 21.89 | 22.13 | 21.91 | |
| 20 | 16QAM | 50 | 0 | 20.90 | 20.68 | 21.18 | 22 |
| 20 | 16QAM | 50 | 24 | 20.89 | 20.67 | 21.19 | |
| 20 | 16QAM | 50 | 50 | 20.94 | 21.03 | **21.26** | |
| 20 | 16QAM | 100 | 0 | 20.91 | 20.80 | **21.17** | 22 |
| BW (MHz) | Modulation | RB Size | RB Offset | Channel/Frequency (MHz) | | | Tune-up limit (dBm) |
| | | | | 18675 | 18900 | 19125 | |
| | | | | 1857.5 | 1880 | 1902.5 | |
| 15 | QPSK | 1 | 0 | 22.68 | 22.77 | 23.10 | 24 |
| 15 | QPSK | 1 | 37 | 23.07 | 22.86 | **23.19** | |
| 15 | QPSK | 1 | 74 | 22.87 | 22.90 | 23.00 | |
| 15 | QPSK | 36 | 0 | 21.96 | 21.86 | 22.12 | 23 |
| 15 | QPSK | 36 | 20 | 21.96 | 21.85 | 22.13 | |
| 15 | QPSK | 36 | 39 | 21.96 | 21.84 | **22.18** | |
| 15 | QPSK | 75 | 0 | 21.95 | 21.83 | **22.15** | 23 |
| 15 | 16QAM | 1 | 0 | 21.91 | 22.01 | 21.97 | 23 |
| 15 | 16QAM | 1 | 37 | 22.19 | 22.14 | 22.08 | |
| 15 | 16QAM | 1 | 74 | 22.12 | **22.23** | 21.89 | |
| 15 | 16QAM | 36 | 0 | 21.96 | 21.85 | 22.13 | 23 |
| 15 | 16QAM | 36 | 20 | 21.95 | 21.85 | **22.17** | |
| 15 | 16QAM | 36 | 39 | 21.95 | 21.83 | **22.17** | |
| 15 | 16QAM | 75 | 0 | 20.87 | 20.83 | **21.12** | 22 |

| BW (MHz) | Modulation | RB Size | RB Offset | Channel/Frequency (MHz) | | | Tune-up limit (dBm) |
|---|---|---|---|---|---|---|---|
| | | | | 18650 | 18900 | 19150 | |
| | | | | 1855 | 1880 | 1905 | |
| 10 | QPSK | 1 | 0 | 22.79 | 22.81 | **23.17** | 24 |
| 10 | QPSK | 1 | 25 | 22.99 | 22.89 | 23.15 | |
| 10 | QPSK | 1 | 49 | 23.01 | 22.94 | 23.09 | |
| 10 | QPSK | 25 | 0 | 21.79 | 21.69 | 21.96 | 23 |
| 10 | QPSK | 25 | 12 | 21.85 | 21.69 | 21.95 | |
| 10 | QPSK | 25 | 25 | 21.93 | 21.92 | **22.10** | |
| 10 | QPSK | 50 | 0 | 21.90 | 21.82 | **22.08** | 23 |
| 10 | 16QAM | 1 | 0 | 21.99 | 21.93 | 22.03 | 23 |
| 10 | 16QAM | 1 | 25 | 22.16 | 22.03 | 22.04 | |
| 10 | 16QAM | 1 | 49 | **22.18** | 22.08 | 21.94 | |
| 10 | 16QAM | 25 | 0 | 20.84 | 20.72 | 20.96 | 22 |
| 10 | 16QAM | 25 | 12 | 20.83 | 20.72 | 21.01 | |
| 10 | 16QAM | 25 | 25 | 20.99 | 20.93 | **21.16** | |
| 10 | 16QAM | 50 | 0 | 20.94 | 20.81 | **21.06** | 22 |

| BW (MHz) | Modulation | RB Size | RB Offset | Channel/Frequency (MHz) | | | Tune-up limit (dBm) |
|---|---|---|---|---|---|---|---|
| | | | | 18625 | 18900 | 19175 | |
| | | | | 1852.5 | 1880 | 1907.5 | |
| 5 | QPSK | 1 | 0 | 22.80 | 22.81 | 23.06 | 24 |
| 5 | QPSK | 1 | 12 | 23.01 | 22.94 | **23.15** | |
| 5 | QPSK | 1 | 24 | 22.88 | 22.85 | 23.02 | |
| 5 | QPSK | 12 | 0 | 21.77 | 21.73 | 21.92 | 23 |
| 5 | QPSK | 12 | 7 | 21.73 | 21.77 | 21.92 | |
| 5 | QPSK | 12 | 13 | 21.86 | 21.86 | **21.97** | |
| 5 | QPSK | 25 | 0 | 21.79 | 21.88 | **21.96** | 23 |
| 5 | 16QAM | 1 | 0 | 21.76 | 21.97 | 21.98 | 23 |
| 5 | 16QAM | 1 | 12 | 21.94 | 22.11 | **22.14** | |
| 5 | 16QAM | 1 | 24 | 21.91 | 22.02 | 21.97 | |
| 5 | 16QAM | 12 | 0 | 20.72 | 20.76 | 20.93 | 22 |
| 5 | 16QAM | 12 | 7 | 20.75 | 20.77 | 20.93 | |
| 5 | 16QAM | 12 | 13 | 20.85 | 20.88 | **21.00** | |
| 5 | 16QAM | 25 | 0 | 20.85 | 20.81 | **20.99** | 22 |

| BW (MHz) | Modulation | RB Size | RB Offset | Channel/Frequency (MHz) | | | Tune-up limit (dBm) |
|---|---|---|---|---|---|---|---|
| | | | | 18615 | 18900 | 19185 | |
| | | | | 1851.5 | 1880 | 1908.5 | |
| 3 | QPSK | 1 | 0 | 22.43 | 22.52 | 22.79 | 23 |
| 3 | QPSK | 1 | 8 | 22.55 | 22.65 | **22.81** | |
| 3 | QPSK | 1 | 14 | 22.51 | 22.55 | 22.72 | |
| 3 | QPSK | 8 | 0 | 21.64 | 21.65 | **21.89** | 22 |
| 3 | QPSK | 8 | 4 | 21.66 | 21.66 | **21.89** | 22 |
| 3 | QPSK | 8 | 7 | 21.77 | 21.68 | 21.88 | |
| 3 | QPSK | 15 | 0 | 21.69 | 21.68 | **21.89** | |
| 3 | 16QAM | 1 | 0 | 21.64 | 21.66 | 21.57 | 22 |
| 3 | 16QAM | 1 | 8 | **21.73** | 21.72 | 21.68 | |
| 3 | 16QAM | 1 | 14 | 21.70 | 21.64 | 21.53 | |
| 3 | 16QAM | 8 | 0 | 20.70 | 20.67 | 20.87 | 21 |
| 3 | 16QAM | 8 | 4 | 20.71 | 20.70 | 20.89 | |
| 3 | 16QAM | 8 | 7 | 20.76 | 20.69 | **20.91** | |
| 3 | 16QAM | 15 | 0 | 20.72 | 20.61 | **20.78** | 21 |

| BW (MHz) | Modulation | RB Size | RB Offset | Channel/Frequency(MHz) | | | Tune-up limit (dBm) |
|---|---|---|---|---|---|---|---|
| | | | | 18607 | 18900 | 19193 | |
| | | | | 1850.7 | 1880 | 1909.3 | |
| 1.4 | QPSK | 1 | 0 | 22.53 | 22.58 | **22.78** | 23 |
| 1.4 | QPSK | 1 | 3 | 22.51 | 22.73 | 22.75 | |
| 1.4 | QPSK | 1 | 5 | 22.49 | 22.69 | 22.77 | |
| 1.4 | QPSK | 3 | 0 | 22.62 | 22.76 | 22.87 | 23 |
| 1.4 | QPSK | 3 | 1 | 22.59 | 22.75 | **22.88** | |
| 1.4 | QPSK | 3 | 3 | 22.60 | 22.71 | 22.86 | |
| 1.4 | QPSK | 6 | 0 | 21.65 | 21.76 | **21.96** | 22 |
| 1.4 | 16QAM | 1 | 0 | 21.60 | 21.52 | 21.87 | 22 |
| 1.4 | 16QAM | 1 | 3 | 21.68 | 21.62 | **21.91** | |
| 1.4 | 16QAM | 1 | 5 | 21.60 | 21.54 | 21.83 | |
| 1.4 | 16QAM | 3 | 0 | 21.55 | 21.57 | **21.79** | 22 |
| 1.4 | 16QAM | 3 | 1 | 21.50 | 21.55 | 21.77 | |
| 1.4 | 16QAM | 3 | 3 | 21.47 | 21.52 | 21.74 | |
| 1.4 | 16QAM | 6 | 0 | 20.68 | 20.81 | **20.97** | 21 |

| LTE Band 4 | | | | | | | |
|---|---|---|---|---|---|---|---|
| BW (MHz) | Modulation | RB Size | RB Offset | Channel/Frequency (MHz) | | | Tune-up limit (dBm) |
| | | | | 20050 | 20175 | 20300 | |
| | | | | 1720 | 1747.5 | 1775 | |
| 20 | QPSK | 1 | 0 | **23.00** | 22.53 | 22.56 | 23.5 |
| 20 | QPSK | 1 | 49 | 22.93 | 22.54 | 22.54 | |
| 20 | QPSK | 1 | 99 | 22.95 | 22.51 | 22.53 | |
| 20 | QPSK | 50 | 0 | 22.87 | 22.54 | 22.68 | 23.0 |
| 20 | QPSK | 50 | 24 | **22.91** | 22.55 | 22.66 | |
| 20 | QPSK | 50 | 50 | 22.79 | 22.50 | 22.70 | |
| 20 | QPSK | 100 | 0 | **22.08** | 21.67 | 21.75 | 23.0 |
| 20 | 16QAM | 1 | 0 | 22.10 | 21.40 | 21.71 | 23.0 |
| 20 | 16QAM | 1 | 49 | **22.12** | 21.42 | 21.74 | |
| 20 | 16QAM | 1 | 99 | 22.09 | 21.35 | 21.63 | |
| 20 | 16QAM | 50 | 0 | 21.93 | 21.36 | 21.60 | 22.0 |
| 20 | 16QAM | 50 | 24 | **21.94** | 21.40 | 21.59 | |
| 20 | 16QAM | 50 | 50 | 21.93 | 21.35 | 21.57 | |
| 20 | 16QAM | 100 | 0 | **21.21** | 20.68 | 20.83 | 22.0 |
| BW (MHz) | Modulation | RB Size | RB Offset | Channel/Frequency(MHz) | | | Tune-up limit (dBm) |
| | | | | 20025 | 20175 | 20325 | |
| | | | | 1717.5 | 1747.5 | 1777.5 | |
| 15 | QPSK | 1 | 0 | 22.80 | 22.43 | 22.44 | 23.5 |
| 15 | QPSK | 1 | 37 | **23.02** | 22.48 | 22.61 | |
| 15 | QPSK | 1 | 74 | 22.85 | 22.39 | 22.40 | |
| 15 | QPSK | 36 | 0 | 22.01 | 21.55 | 21.65 | 23.0 |
| 15 | QPSK | 36 | 20 | **22.07** | 21.58 | 21.70 | |
| 15 | QPSK | 36 | 39 | 22.04 | 21.56 | 21.75 | |
| 15 | QPSK | 75 | 0 | **22.07** | 21.57 | 21.68 | 23.0 |
| 15 | 16QAM | 1 | 0 | 22.02 | 21.54 | 21.63 | 23.0 |
| 15 | 16QAM | 1 | 37 | **22.12** | 21.57 | 21.73 | |
| 15 | 16QAM | 1 | 74 | 22.00 | 21.45 | 21.57 | |
| 15 | 16QAM | 36 | 0 | 21.12 | 20.58 | 20.73 | 22.0 |
| 15 | 16QAM | 36 | 20 | **21.14** | 20.61 | 20.75 | |
| 15 | 16QAM | 36 | 39 | **21.14** | 20.61 | 20.74 | |
| 15 | 16QAM | 75 | 0 | **21.12** | 20.50 | 20.75 | 22.0 |

| BW (MHz) | Modulation | RB Size | RB Offset | Channel/Frequency(MHz) | | | Tune-up limit (dBm) |
|---|---|---|---|---|---|---|---|
| | | | | 20000 | 20175 | 20350 | |
| | | | | 1715 | 1747.5 | 1780 | |
| 10 | QPSK | 1 | 0 | 23.18 | 22.72 | 22.79 | 23.5 |
| 10 | QPSK | 1 | 25 | **23.33** | 22.83 | 22.89 | |
| 10 | QPSK | 1 | 49 | 23.17 | 22.68 | 22.76 | |
| 10 | QPSK | 25 | 0 | 22.10 | 21.63 | 21.76 | 23.0 |
| 10 | QPSK | 25 | 12 | 22.11 | 21.68 | 21.77 | |
| 10 | QPSK | 25 | 25 | **22.21** | 21.68 | 21.77 | |
| 10 | QPSK | 50 | 0 | **22.10** | 21.65 | 21.80 | 23.0 |
| 10 | 16QAM | 1 | 0 | 22.13 | 21.94 | 21.75 | 23.0 |
| 10 | 16QAM | 1 | 25 | **22.32** | 21.96 | 21.87 | |
| 10 | 16QAM | 1 | 49 | 22.19 | 21.80 | 21.77 | |
| 10 | 16QAM | 25 | 0 | 21.11 | 20.67 | 20.75 | 22.0 |
| 10 | 16QAM | 25 | 12 | 21.10 | 20.64 | 20.79 | |
| 10 | 16QAM | 25 | 25 | **21.15** | 20.73 | 20.79 | |
| 10 | 16QAM | 50 | 0 | **21.23** | 20.70 | 20.82 | 22.0 |

| BW (MHz) | Modulation | RB Size | RB Offset | Channel/Frequency(MHz) | | | Tune-up limit (dBm) |
|---|---|---|---|---|---|---|---|
| | | | | 19975 | 20175 | 20375 | |
| | | | | 1712.5 | 1747.5 | 1782.5 | |
| 5 | QPSK | 1 | 0 | 23.11 | 22.84 | 22.66 | 23.5 |
| 5 | QPSK | 1 | 12 | **23.20** | 22.77 | 22.82 | |
| 5 | QPSK | 1 | 24 | 23.09 | 22.69 | 22.78 | |
| 5 | QPSK | 12 | 0 | 22.03 | 21.62 | 21.69 | 23.0 |
| 5 | QPSK | 12 | 7 | 22.02 | 21.64 | 21.68 | |
| 5 | QPSK | 12 | 13 | **22.10** | 21.70 | 21.73 | |
| 5 | QPSK | 25 | 0 | **22.07** | 21.67 | 21.74 | 23.0 |
| 5 | 16QAM | 1 | 0 | 22.25 | 21.72 | 21.85 | 23.0 |
| 5 | 16QAM | 1 | 12 | **22.32** | 21.60 | 21.96 | |
| 5 | 16QAM | 1 | 24 | 22.26 | 21.56 | 21.90 | |
| 5 | 16QAM | 12 | 0 | 21.04 | 20.68 | 20.70 | 22.0 |
| 5 | 16QAM | 12 | 7 | 21.09 | 20.74 | 20.68 | |
| 5 | 16QAM | 12 | 13 | **21.13** | 20.78 | 20.79 | |
| 5 | 16QAM | 25 | 0 | **21.07** | 20.69 | 20.75 | 22.0 |

| BW (MHz) | Modulation | RB Size | RB Offset | Channel/Frequency(MHz) | | | Tune-up limit (dBm) |
|---|---|---|---|---|---|---|---|
| | | | | 19665 | 20175 | 20385 | |
| | | | | 1711.5 | 1747.5 | 1783.5 | |
| 3 | QPSK | 1 | 0 | 20.05 | 19.98 | 19.68 | 21.0 |
| 3 | QPSK | 1 | 8 | **20.13** | 20.06 | 19.75 | |
| 3 | QPSK | 1 | 14 | 20.11 | 19.74 | 19.63 | |
| 3 | QPSK | 8 | 0 | 19.08 | 19.08 | 18.77 | 20.0 |
| 3 | QPSK | 8 | 4 | 19.09 | 19.08 | 18.77 | |
| 3 | QPSK | 8 | 7 | **19.10** | **19.10** | 18.77 | |
| 3 | QPSK | 15 | 0 | 19.06 | **19.10** | 18.79 | 20.0 |
| 3 | 16QAM | 1 | 0 | 19.13 | **19.35** | 18.81 | 20.0 |
| 3 | 16QAM | 1 | 8 | 19.33 | 19.31 | 18.86 | |
| 3 | 16QAM | 1 | 14 | 19.29 | 19.07 | 18.77 | |
| 3 | 16QAM | 8 | 0 | **19.13** | 19.10 | 18.75 | 20.0 |
| 3 | 16QAM | 8 | 4 | 19.12 | 19.12 | 18.75 | |
| 3 | 16QAM | 8 | 7 | 19.07 | 19.09 | 18.78 | |
| 3 | 16QAM | 15 | 0 | **18.10** | **18.10** | 17.73 | 19.0 |
| BW (MHz) | Modulation | RB Size | RB Offset | Channel/Frequency(MHz) | | | Tune-up limit (dBm) |
| | | | | 19957 | 20175 | 20393 | |
| | | | | 1710.7 | 1747.5 | 1784.3 | |
| 1.4 | QPSK | 1 | 0 | 19.90 | 19.92 | 19.73 | 21.0 |
| 1.4 | QPSK | 1 | 3 | **20.39** | 20.31 | 19.87 | |
| 1.4 | QPSK | 1 | 5 | 19.99 | 19.57 | 19.57 | |
| 1.4 | QPSK | 3 | 0 | 19.01 | **19.31** | 18.80 | 20.0 |
| 1.4 | QPSK | 3 | 1 | 19.00 | 19.30 | 18.77 | |
| 1.4 | QPSK | 3 | 3 | 19.09 | 18.79 | 18.74 | |
| 1.4 | QPSK | 6 | 0 | 19.06 | **19.18** | 18.76 | 20.0 |
| 1.4 | 16QAM | 1 | 0 | 18.91 | 19.15 | 18.70 | 20.0 |
| 1.4 | 16QAM | 1 | 3 | **19.42** | 19.40 | 18.95 | |
| 1.4 | 16QAM | 1 | 5 | 19.00 | 18.80 | 18.54 | |
| 1.4 | 16QAM | 3 | 0 | 17.98 | **18.32** | 17.78 | 20.0 |
| 1.4 | 16QAM | 3 | 1 | 18.00 | **18.32** | 17.79 | |
| 1.4 | 16QAM | 3 | 3 | 18.15 | 17.85 | 17.74 | |
| 1.4 | 16QAM | 6 | 0 | 18.04 | **18.12** | 17.74 | 19.0 |

| LTE Band 5 | | | | | | | |
|---|---|---|---|---|---|---|---|
| BW (MHz) | Modulation | RB Size | RB Offset | Channel/Frequency(MHz) | | | Tune-up limit (dBm) |
| | | | | 20450 | 20525 | 20600 | |
| | | | | 829 | 836.5 | 844 | |
| 10 | QPSK | 1 | 0 | 24.61 | 24.57 | 24.60 | 25.0 |
| 10 | QPSK | 1 | 25 | 24.68 | 24.55 | 24.66 | |
| 10 | QPSK | 1 | 49 | 24.53 | 24.64 | **24.75** | |
| 10 | QPSK | 25 | 0 | 23.53 | 23.41 | 23.66 | 24.0 |
| 10 | QPSK | 25 | 12 | 23.57 | 23.36 | 23.64 | |
| 10 | QPSK | 25 | 25 | 23.54 | 23.52 | **23.75** | |
| 10 | QPSK | 50 | 0 | 23.58 | 23.49 | **23.71** | 24.0 |
| 10 | 16QAM | 1 | 0 | 23.76 | 23.68 | 23.68 | 24.0 |
| 10 | 16QAM | 1 | 25 | 23.79 | 23.68 | 23.75 | |
| 10 | 16QAM | 1 | 49 | 23.67 | 23.70 | **23.87** | |
| 10 | 16QAM | 25 | 0 | 22.56 | 22.45 | 22.61 | 23.0 |
| 10 | 16QAM | 25 | 12 | 22.59 | 22.45 | 22.62 | |
| 10 | 16QAM | 25 | 25 | 22.60 | 22.54 | **22.68** | |
| 10 | 16QAM | 50 | 0 | 22.59 | 22.47 | **22.67** | 23.0 |
| BW (MHz) | Modulation | RB Size | RB Offset | Channel/Frequency(MHz) | | | Tune-up limit (dBm) |
| | | | | 20425 | 20525 | 20625 | |
| | | | | 826.5 | 836.5 | 846.5 | |
| 5 | QPSK | 1 | 0 | 24.65 | 24.51 | 24.66 | 25.0 |
| 5 | QPSK | 1 | 12 | 24.75 | 24.61 | **24.83** | |
| 5 | QPSK | 1 | 24 | 24.55 | 24.52 | 24.79 | |
| 5 | QPSK | 12 | 0 | 23.54 | 23.45 | 23.66 | 24.0 |
| 5 | QPSK | 12 | 7 | 23.58 | 23.48 | 23.65 | |
| 5 | QPSK | 12 | 13 | 23.52 | 23.54 | **23.80** | |
| 5 | QPSK | 25 | 0 | 23.56 | 23.50 | **23.78** | 24.0 |
| 5 | 16QAM | 1 | 0 | 23.58 | 23.64 | 23.53 | 24.0 |
| 5 | 16QAM | 1 | 12 | 23.68 | 23.79 | **23.99** | |
| 5 | 16QAM | 1 | 24 | 23.55 | 23.69 | 23.89 | |
| 5 | 16QAM | 12 | 0 | 22.56 | 22.44 | 22.64 | 23.0 |
| 5 | 16QAM | 12 | 7 | 22.57 | 22.46 | 22.66 | |
| 5 | 16QAM | 12 | 13 | 22.54 | 22.46 | **22.77** | |
| 5 | 16QAM | 25 | 0 | 22.64 | 22.47 | **22.70** | 23.0 |

| BW (MHz) | Modulation | RB Size | RB Offset | Channel/Frequency(MHz) | | | Tune-up limit (dBm) |
|---|---|---|---|---|---|---|---|
| | | | | 20415 | 20525 | 20635 | |
| | | | | 825.5 | 836.5 | 844 | |
| 3 | QPSK | 1 | 0 | 24.34 | 24.16 | 24.36 | 25.0 |
| 3 | QPSK | 1 | 8 | 24.41 | 24.30 | **24.45** | |
| 3 | QPSK | 1 | 14 | 24.34 | 24.19 | 24.42 | |
| 3 | QPSK | 8 | 0 | 23.49 | 23.34 | 23.54 | 24.0 |
| 3 | QPSK | 8 | 4 | 23.49 | 23.33 | 23.57 | |
| 3 | QPSK | 8 | 7 | 23.51 | 23.37 | **23.65** | |
| 3 | QPSK | 15 | 0 | 23.44 | 23.36 | **23.61** | 24.0 |
| 3 | 16QAM | 1 | 0 | 23.40 | 23.31 | 23.48 | 24.0 |
| 3 | 16QAM | 1 | 8 | 23.48 | 23.42 | **23.60** | |
| 3 | 16QAM | 1 | 14 | 23.38 | 23.22 | 23.48 | |
| 3 | 16QAM | 8 | 0 | 22.56 | 22.34 | 22.57 | 23.0 |
| 3 | 16QAM | 8 | 4 | 22.57 | 22.31 | 22.58 | |
| 3 | 16QAM | 8 | 7 | 22.54 | 22.40 | **22.65** | |
| 3 | 16QAM | 15 | 0 | 22.48 | 22.28 | **22.59** | 23.0 |
| BW (MHz) | Modulation | RB Size | RB Offset | Channel/Frequency(MHz) | | | Tune-up limit (dBm) |
| | | | | 20407 | 20525 | 20643 | |
| | | | | 824.7 | 836.5 | 848.3 | |
| 1.4 | QPSK | 1 | 0 | 24.50 | 24.32 | 24.53 | 25.0 |
| 1.4 | QPSK | 1 | 3 | 24.50 | 24.37 | **24.66** | |
| 1.4 | QPSK | 1 | 5 | 24.51 | 24.34 | 24.65 | |
| 1.4 | QPSK | 3 | 0 | 24.51 | 24.38 | **24.60** | 25.0 |
| 1.4 | QPSK | 3 | 1 | 24.53 | 24.37 | **24.60** | |
| 1.4 | QPSK | 3 | 3 | 24.49 | 24.40 | **24.60** | |
| 1.4 | QPSK | 6 | 0 | 23.62 | 23.47 | **23.70** | 24.0 |
| 1.4 | 16QAM | 1 | 0 | 23.47 | 23.16 | 23.53 | 24.0 |
| 1.4 | 16QAM | 1 | 3 | 23.56 | 23.26 | **23.65** | |
| 1.4 | 16QAM | 1 | 5 | 23.50 | 23.18 | 23.57 | |
| 1.4 | 16QAM | 3 | 0 | 23.35 | 23.18 | **23.44** | 24.0 |
| 1.4 | 16QAM | 3 | 1 | 23.37 | 23.19 | 23.43 | |
| 1.4 | 16QAM | 3 | 3 | 23.31 | 23.18 | **23.44** | |
| 1.4 | 16QAM | 6 | 0 | 22.64 | 22.45 | **22.73** | 23.0 |

| LTE Band 7 | | | | | | | |
|---|---|---|---|---|---|---|---|
| BW (MHz) | Modulation | RB Size | RB Offset | Channel/Frequency(MHz) | | | Tune-up limit (dBm) |
| | | | | 20850 | 21100 | 21350 | |
| | | | | 2510 | 2535 | 2560 | |
| 20 | QPSK | 1 | 0 | 22.60 | 22.79 | 22.52 | 24.0 |
| 20 | QPSK | 1 | 49 | 22.86 | **23.02** | 22.75 | |
| 20 | QPSK | 1 | 99 | 22.85 | 22.81 | 22.59 | |
| 20 | QPSK | 50 | 0 | 21.73 | 21.77 | 21.71 | 22.0 |
| 20 | QPSK | 50 | 24 | 21.75 | 21.74 | 21.67 | |
| 20 | QPSK | 50 | 50 | 21.83 | 21.80 | **21.93** | |
| 20 | QPSK | 100 | 0 | 21.71 | **21.81** | 21.79 | 22.0 |
| 20 | 16QAM | 1 | 0 | 21.65 | 21.92 | 21.87 | 23.0 |
| 20 | 16QAM | 1 | 49 | 21.88 | **22.17** | 21.83 | |
| 20 | 16QAM | 1 | 99 | 21.83 | 21.92 | 21.72 | |
| 20 | 16QAM | 50 | 0 | 20.68 | 20.80 | 20.77 | 22.0 |
| 20 | 16QAM | 50 | 24 | 20.72 | 20.83 | 20.73 | |
| 20 | 16QAM | 50 | 50 | 20.80 | 20.84 | **20.99** | |
| 20 | 16QAM | 100 | 0 | 20.76 | 20.80 | **20.81** | 22.0 |
| BW (MHz) | Modulation | RB Size | RB Offset | Channel/Frequency(MHz) | | | Tune-up limit (dBm) |
| | | | | 20825 | 21100 | 21375 | |
| | | | | 2507.5 | 2535 | 2562.5 | |
| 15 | QPSK | 1 | 0 | 22.61 | 22.79 | 22.74 | 24.0 |
| 15 | QPSK | 1 | 37 | 22.81 | **22.85** | **22.85** | |
| 15 | QPSK | 1 | 74 | 22.71 | 22.74 | 22.75 | |
| 15 | QPSK | 36 | 0 | 21.75 | 21.86 | 21.74 | 22.0 |
| 15 | QPSK | 36 | 20 | 21.75 | **21.87** | 21.72 | |
| 15 | QPSK | 36 | 39 | 21.77 | 21.86 | 21.72 | |
| 15 | QPSK | 75 | 0 | 21.78 | **21.85** | 21.76 | 22.0 |
| 15 | 16QAM | 1 | 0 | 21.80 | 22.08 | 21.58 | 23.0 |
| 15 | 16QAM | 1 | 37 | 22.01 | **22.20** | 21.71 | |
| 15 | 16QAM | 1 | 74 | 21.91 | 22.06 | 21.62 | |
| 15 | 16QAM | 36 | 0 | 21.75 | **21.87** | 21.71 | 22.0 |
| 15 | 16QAM | 36 | 20 | 21.75 | 21.84 | 21.72 | |
| 15 | 16QAM | 36 | 39 | 21.74 | 21.85 | 21.74 | |
| 15 | 16QAM | 75 | 0 | 20.66 | **20.85** | 20.74 | 22.0 |

| BW (MHz) | Modulation | RB Size | RB Offset | Channel/Frequency(MHz) | | | Tune-up limit (dBm) |
|---|---|---|---|---|---|---|---|
| | | | | 20800 | 21100 | 21400 | |
| | | | | 2505 | 2535 | 2565 | |
| 10 | QPSK | 1 | 0 | 22.68 | 22.87 | 22.77 | 24.0 |
| 10 | QPSK | 1 | 25 | 22.73 | **22.89** | 22.77 | |
| 10 | QPSK | 1 | 49 | 22.71 | 22.83 | 22.80 | |
| 10 | QPSK | 25 | 0 | 21.69 | **21.86** | 21.65 | 22.0 |
| 10 | QPSK | 25 | 12 | 21.66 | 21.83 | 21.62 | |
| 10 | QPSK | 25 | 25 | 21.72 | 21.85 | 21.79 | |
| 10 | QPSK | 50 | 0 | 21.76 | **21.87** | 21.75 | 22.0 |
| 10 | 16QAM | 1 | 0 | 21.88 | 22.04 | 21.66 | 23.0 |
| 10 | 16QAM | 1 | 25 | 21.88 | **22.10** | 21.64 | |
| 10 | 16QAM | 1 | 49 | 21.95 | 22.07 | 21.69 | |
| 10 | 16QAM | 25 | 0 | 20.78 | 20.91 | 20.75 | 22.0 |
| 10 | 16QAM | 25 | 12 | 20.72 | 20.91 | 20.76 | |
| 10 | 16QAM | 25 | 25 | 20.77 | **20.92** | 20.90 | |
| 10 | 16QAM | 50 | 0 | 20.75 | **20.95** | 20.76 | 22.0 |
| BW (MHz) | Modulation | RB Size | RB Offset | Channel/Frequency(MHz) | | | Tune-up limit (dBm) |
| | | | | 20775 | 21100 | 21425 | |
| | | | | 2502.5 | 2535 | 2567.5 | |
| 5 | QPSK | 1 | 0 | 22.70 | 22.82 | 22.74 | 24.0 |
| 5 | QPSK | 1 | 12 | 22.78 | **22.88** | 22.84 | |
| 5 | QPSK | 1 | 24 | 22.67 | 22.77 | 22.71 | |
| 5 | QPSK | 12 | 0 | 21.64 | **21.78** | 21.65 | 22.0 |
| 5 | QPSK | 12 | 7 | 21.63 | 21.76 | 21.63 | |
| 5 | QPSK | 12 | 13 | 21.71 | 21.77 | 21.69 | |
| 5 | QPSK | 25 | 0 | 21.67 | **21.79** | 21.67 | 22.0 |
| 5 | 16QAM | 1 | 0 | 21.69 | 22.04 | 21.70 | 23.0 |
| 5 | 16QAM | 1 | 12 | 21.79 | **22.12** | 21.81 | |
| 5 | 16QAM | 1 | 24 | 21.71 | 21.98 | 21.78 | |
| 5 | 16QAM | 12 | 0 | 20.63 | 20.83 | 20.74 | 22.0 |
| 5 | 16QAM | 12 | 7 | 20.66 | 20.83 | 20.67 | |
| 5 | 16QAM | 12 | 13 | 20.67 | **20.85** | 20.72 | |
| 5 | 16QAM | 25 | 0 | 20.70 | **20.85** | 20.77 | 22.0 |

| LTE Band 12 | | | | | | | |
|---|---|---|---|---|---|---|---|
| BW (MHz) | Modulation | RB Size | RB Offset | Channel/Frequency(MHz) | | | Tune-up limit (dBm) |
| | | | | 23060 | 23095 | 23130 | |
| | | | | 704 | 707.5 | 711 | |
| 10 | QPSK | 1 | 0 | 24.39 | 24.36 | 24.50 | 25.0 |
| 10 | QPSK | 1 | 25 | 24.42 | 24.54 | 24.61 | |
| 10 | QPSK | 1 | 49 | 24.52 | 24.54 | **24.67** | |
| 10 | QPSK | 25 | 0 | 23.26 | 23.35 | 23.39 | 24.0 |
| 10 | QPSK | 25 | 12 | 23.32 | 23.48 | 23.44 | |
| 10 | QPSK | 25 | 25 | 23.40 | **23.55** | 23.45 | |
| 10 | QPSK | 50 | 0 | 23.42 | **23.55** | 23.44 | 24.0 |
| 10 | 16QAM | 1 | 0 | 23.54 | 23.60 | 23.44 | 24.0 |
| 10 | 16QAM | 1 | 25 | 23.66 | **23.78** | 23.54 | |
| 10 | 16QAM | 1 | 49 | 23.71 | 23.73 | 23.55 | |
| 10 | 16QAM | 25 | 0 | 22.34 | 22.43 | 22.43 | 23.0 |
| 10 | 16QAM | 25 | 12 | 22.32 | 22.47 | 22.50 | |
| 10 | 16QAM | 25 | 25 | 22.42 | **22.60** | 22.53 | |
| 10 | 16QAM | 50 | 0 | 22.43 | **22.53** | 22.46 | 23.0 |
| BW (MHz) | Modulation | RB Size | RB Offset | Channel/Frequency(MHz) | | | Tune-up limit (dBm) |
| | | | | 23035 | 23095 | 23155 | |
| | | | | 701.5 | 707.5 | 713.5 | |
| 5 | QPSK | 1 | 0 | 24.41 | 24.43 | 24.55 | 25.0 |
| 5 | QPSK | 1 | 12 | 24.54 | 24.59 | **24.67** | |
| 5 | QPSK | 1 | 24 | 24.41 | 24.54 | 24.59 | |
| 5 | QPSK | 12 | 0 | 23.34 | 23.46 | 23.51 | 24.0 |
| 5 | QPSK | 12 | 7 | 23.28 | 23.54 | **23.61** | |
| 5 | QPSK | 12 | 13 | 23.47 | 23.58 | 23.51 | |
| 5 | QPSK | 25 | 0 | 23.38 | **23.59** | **23.59** | 24.0 |
| 5 | 16QAM | 1 | 0 | 23.43 | 23.69 | 23.56 | 24.0 |
| 5 | 16QAM | 1 | 12 | 23.57 | **23.86** | 23.74 | |
| 5 | 16QAM | 1 | 24 | 23.53 | 23.78 | 23.69 | |
| 5 | 16QAM | 12 | 0 | 22.29 | 22.48 | 22.57 | 23.0 |
| 5 | 16QAM | 12 | 7 | 22.26 | 22.53 | 22.58 | |
| 5 | 16QAM | 12 | 13 | 22.35 | **22.59** | 22.51 | |
| 5 | 16QAM | 25 | 0 | 22.37 | 22.54 | **22.60** | 23.0 |

| BW (MHz) | Modulation | RB Size | RB Offset | Channel/Frequency(MHz) | | | Tune-up limit (dBm) |
|---|---|---|---|---|---|---|---|
| | | | | 23025 | 23095 | 23165 | |
| | | | | 700.5 | 707.5 | 714.5 | |
| 3 | QPSK | 1 | 0 | 24.08 | 24.16 | 24.28 | 25.0 |
| 3 | QPSK | 1 | 8 | 24.16 | 24.29 | **24.45** | |
| 3 | QPSK | 1 | 14 | 24.10 | 24.22 | 24.35 | |
| 3 | QPSK | 8 | 0 | 23.23 | 23.35 | **23.58** | 24.0 |
| 3 | QPSK | 8 | 4 | 23.25 | 23.35 | 23.49 | |
| 3 | QPSK | 8 | 7 | 23.32 | 23.43 | 23.54 | |
| 3 | QPSK | 15 | 0 | 23.29 | 23.42 | **23.55** | 24.0 |
| 3 | 16QAM | 1 | 0 | 23.29 | 23.37 | 23.17 | 24.0 |
| 3 | 16QAM | 1 | 8 | 23.32 | **23.47** | 23.28 | |
| 3 | 16QAM | 1 | 14 | 23.23 | 23.37 | 23.20 | |
| 3 | 16QAM | 8 | 0 | 22.32 | 22.38 | 22.52 | 23.0 |
| 3 | 16QAM | 8 | 4 | 22.29 | 22.43 | 22.50 | |
| 3 | 16QAM | 8 | 7 | 22.35 | 22.45 | **22.53** | |
| 3 | 16QAM | 15 | 0 | 22.32 | 22.37 | **22.42** | 23.0 |

| BW (MHz) | Modulation | RB Size | RB Offset | Channel/Frequency(MHz) | | | Tune-up limit (dBm) |
|---|---|---|---|---|---|---|---|
| | | | | 23017 | 23095 | 23173 | |
| | | | | 699.7 | 707.5 | 715.3 | |
| 1.4 | QPSK | 1 | 0 | 24.27 | **24.34** | 24.33 | 25.0 |
| 1.4 | QPSK | 1 | 3 | 24.28 | **24.34** | 24.30 | |
| 1.4 | QPSK | 1 | 5 | 24.24 | 24.32 | 24.30 | |
| 1.4 | QPSK | 3 | 0 | 24.29 | 24.39 | **24.41** | 24.0 |
| 1.4 | QPSK | 3 | 1 | 24.29 | 24.39 | 24.40 | |
| 1.4 | QPSK | 3 | 3 | 24.34 | 24.40 | 24.40 | |
| 1.4 | QPSK | 6 | 0 | 23.34 | 23.47 | **23.52** | 24.0 |
| 1.4 | 16QAM | 1 | 0 | 23.48 | 23.30 | 23.56 | 24.0 |
| 1.4 | 16QAM | 1 | 3 | 23.45 | 23.33 | **23.64** | |
| 1.4 | 16QAM | 1 | 5 | 23.45 | 23.25 | 23.57 | |
| 1.4 | 16QAM | 3 | 0 | 23.24 | 23.25 | 23.37 | 24.0 |
| 1.4 | 16QAM | 3 | 1 | 23.24 | 23.27 | **23.40** | |
| 1.4 | 16QAM | 3 | 3 | 23.23 | 23.27 | 23.31 | |
| 1.4 | 16QAM | 6 | 0 | 22.28 | 22.53 | **22.60** | 23.0 |

| LTE Band 14 | | | | | | | |
|---|---|---|---|---|---|---|---|
| BW (MHz) | Modulation | RB Size | RB Offset | Channel/Frequency(MHz) | | | Tune-up limit (dBm) |
| | | | | | 23330 | | |
| | | | | | 793 | | |
| 10 | QPSK | 1 | 0 | | 24.52 | | 25.0 |
| 10 | QPSK | 1 | 25 | | **24.54** | | |
| 10 | QPSK | 1 | 49 | | 24.47 | | |
| 10 | QPSK | 25 | 0 | | **23.54** | | 24.0 |
| 10 | QPSK | 25 | 12 | | 23.45 | | |
| 10 | QPSK | 25 | 25 | | 23.40 | | |
| 10 | QPSK | 50 | 0 | | **23.47** | | 24.0 |
| 10 | 16QAM | 1 | 0 | | 23.70 | | 24.0 |
| 10 | 16QAM | 1 | 25 | | **23.71** | | |
| 10 | 16QAM | 1 | 49 | | 23.60 | | |
| 10 | 16QAM | 25 | 0 | | **22.58** | | 23.0 |
| 10 | 16QAM | 25 | 12 | | 22.54 | | |
| 10 | 16QAM | 25 | 25 | | 22.45 | | |
| 10 | 16QAM | 50 | 0 | | **22.46** | | 23.0 |
| BW (MHz) | Modulation | RB Size | RB Offset | Channel/Frequency(MHz) | | | Tune-up limit (dBm) |
| | | | | 23305 | 23330 | 23355 | |
| | | | | 790.5 | 793 | 795.5 | |
| 5 | QPSK | 1 | 0 | 24.57 | 24.60 | 24.56 | 25.0 |
| 5 | QPSK | 1 | 12 | **24.68** | 24.65 | 24.63 | |
| 5 | QPSK | 1 | 24 | 24.50 | 24.46 | 24.50 | |
| 5 | QPSK | 12 | 0 | **23.61** | 23.47 | 23.46 | 24.0 |
| 5 | QPSK | 12 | 7 | 23.59 | 23.47 | 23.43 | |
| 5 | QPSK | 12 | 13 | 23.53 | 23.44 | 23.29 | |
| 5 | QPSK | 25 | 0 | **23.63** | 23.52 | 23.42 | 24.0 |
| 5 | 16QAM | 1 | 0 | 23.56 | 23.74 | 23.52 | 24.0 |
| 5 | 16QAM | 1 | 12 | 23.74 | **23.84** | 23.62 | |
| 5 | 16QAM | 1 | 24 | 23.52 | 23.65 | 23.48 | |
| 5 | 16QAM | 12 | 0 | **22.60** | 22.57 | 22.50 | 23.0 |
| 5 | 16QAM | 12 | 7 | 22.58 | 22.56 | 22.50 | |
| 5 | 16QAM | 12 | 13 | 22.51 | 22.58 | 22.34 | |
| 5 | 16QAM | 25 | 0 | **22.71** | 22.59 | 22.52 | 23.0 |

| LTE Band 17 | | | | | | | |
|---|---|---|---|---|---|---|---|
| BW (MHz) | Modulation | RB Size | RB Offset | Channel/Frequency(MHz) | | | Tune-up limit (dBm) |
| | | | | 23780 | 23790 | 23800 | |
| | | | | 709 | 710 | 711 | |
| 10 | QPSK | 1 | 0 | 24.39 | 24.45 | 24.57 | 25.0 |
| 10 | QPSK | 1 | 25 | 24.57 | 24.57 | 24.65 | |
| 10 | QPSK | 1 | 49 | 24.62 | 24.62 | **24.73** | |
| 10 | QPSK | 25 | 0 | 23.46 | 23.45 | 23.46 | 24.0 |
| 10 | QPSK | 25 | 12 | 23.42 | 23.42 | 23.45 | |
| 10 | QPSK | 25 | 25 | 23.48 | 23.49 | **23.51** | |
| 10 | QPSK | 50 | 0 | **23.53** | 23.49 | 23.46 | 24.0 |
| 10 | 16QAM | 1 | 0 | 23.65 | 23.64 | 23.42 | 24.0 |
| 10 | 16QAM | 1 | 25 | 23.75 | **23.85** | 23.56 | |
| 10 | 16QAM | 1 | 49 | 23.77 | 23.84 | 23.61 | |
| 10 | 16QAM | 25 | 0 | 22.45 | 22.44 | 22.51 | 23.0 |
| 10 | 16QAM | 25 | 12 | 22.46 | 22.50 | 22.46 | |
| 10 | 16QAM | 25 | 25 | 22.53 | 22.50 | **22.54** | |
| 10 | 16QAM | 50 | 0 | 22.45 | **22.50** | 22.41 | 23.0 |
| BW (MHz) | Modulation | RB Size | RB Offset | Channel/Frequency(MHz) | | | Tune-up limit (dBm) |
| | | | | 23755 | 23790 | 23825 | |
| | | | | 706.5 | 710 | 713.5 | |
| 5 | QPSK | 1 | 0 | 24.41 | 24.47 | 24.54 | 25.0 |
| 5 | QPSK | 1 | 12 | 24.60 | 24.63 | **24.76** | |
| 5 | QPSK | 1 | 24 | 24.51 | 24.54 | 24.63 | |
| 5 | QPSK | 12 | 0 | 23.51 | 23.46 | 23.60 | 24.0 |
| 5 | QPSK | 12 | 7 | 23.48 | 23.44 | **23.63** | |
| 5 | QPSK | 12 | 13 | 23.54 | 23.48 | 23.48 | |
| 5 | QPSK | 25 | 0 | 23.60 | 23.47 | **23.61** | 24.0 |
| 5 | 16QAM | 1 | 0 | 23.51 | 23.75 | 23.56 | 24.0 |
| 5 | 16QAM | 1 | 12 | 23.73 | **23.85** | 23.79 | |
| 5 | 16QAM | 1 | 24 | 23.67 | 23.72 | 23.69 | |
| 5 | 16QAM | 12 | 0 | 22.45 | 22.44 | **22.63** | 23.0 |
| 5 | 16QAM | 12 | 7 | 22.48 | 22.46 | **22.63** | |
| 5 | 16QAM | 12 | 13 | 22.49 | 22.52 | 22.58 | |
| 5 | 16QAM | 25 | 0 | 22.55 | 22.52 | **22.65** | 23.0 |

| LTE Band 25 | | | | | | | |
|---|---|---|---|---|---|---|---|
| BW (MHz) | Modulation | RB Size | RB Offset | Channel/Frequency(MHz) | | | Tune-up limit (dBm) |
| | | | | 26140 | 26365 | 26590 | |
| | | | | 1860 | 1882.5 | 1905 | |
| 20 | QPSK | 1 | 0 | 23.03 | 22.91 | 23.15 | 24.0 |
| 20 | QPSK | 1 | 49 | **23.45** | 23.20 | 23.30 | |
| 20 | QPSK | 1 | 99 | 23.13 | 23.31 | 22.98 | |
| 20 | QPSK | 50 | 0 | 22.16 | 21.90 | 22.28 | 23.0 |
| 20 | QPSK | 50 | 24 | 22.17 | 21.96 | **22.29** | |
| 20 | QPSK | 50 | 50 | 22.27 | 22.28 | 22.23 | |
| 20 | QPSK | 100 | 0 | 22.19 | 22.10 | **22.28** | 23.0 |
| 20 | 16QAM | 1 | 0 | 22.00 | 22.14 | 22.25 | 23.0 |
| 20 | 16QAM | 1 | 49 | 22.45 | 22.43 | 22.40 | |
| 20 | 16QAM | 1 | 99 | 22.21 | **22.51** | 22.15 | |
| 20 | 16QAM | 50 | 0 | 21.20 | 20.97 | 21.33 | 22.0 |
| 20 | 16QAM | 50 | 24 | 21.23 | 20.95 | **21.34** | |
| 20 | 16QAM | 50 | 50 | 21.32 | 21.30 | 21.30 | |
| 20 | 16QAM | 100 | 0 | 21.22 | 21.13 | **21.26** | 22.0 |
| BW (MHz) | Modulation | RB Size | RB Offset | Channel/Frequency(MHz) | | | Tune-up limit (dBm) |
| | | | | 26115 | 26365 | 26615 | |
| | | | | 1857.5 | 1882.5 | 1907.5 | |
| 15 | QPSK | 1 | 0 | 22.92 | 22.93 | **23.39** | 24.0 |
| 15 | QPSK | 1 | 37 | 23.30 | 23.12 | 23.34 | |
| 15 | QPSK | 1 | 74 | 23.19 | 23.23 | 23.21 | |
| 15 | QPSK | 36 | 0 | 22.11 | 22.04 | 22.13 | 23.0 |
| 15 | QPSK | 36 | 20 | **22.15** | 22.05 | 22.12 | |
| 15 | QPSK | 36 | 39 | 22.10 | 22.07 | 22.13 | |
| 15 | QPSK | 75 | 0 | **22.14** | 22.02 | 22.10 | 23.0 |
| 15 | 16QAM | 1 | 0 | 22.15 | 22.27 | 22.22 | 23.0 |
| 15 | 16QAM | 1 | 37 | 22.51 | 22.46 | 22.21 | |
| 15 | 16QAM | 1 | 74 | 22.44 | **22.58** | 22.09 | |
| 15 | 16QAM | 36 | 0 | 22.12 | 22.02 | 22.11 | 23.0 |
| 15 | 16QAM | 36 | 20 | **22.13** | 22.03 | 22.10 | |
| 15 | 16QAM | 36 | 39 | 22.11 | 22.02 | 22.12 | |
| 15 | 16QAM | 75 | 0 | **21.16** | 21.09 | 21.10 | 22.0 |

| BW (MHz) | Modulation | RB Size | RB Offset | Channel/Frequency(MHz) | | | Tune-up limit (dBm) |
|---|---|---|---|---|---|---|---|
| | | | | 26090 | 26365 | 26640 | |
| | | | | 1855 | 1882.5 | 1910 | |
| 10 | QPSK | 1 | 0 | 23.00 | 23.04 | **23.31** | 24.0 |
| 10 | QPSK | 1 | 25 | 23.18 | 23.11 | 23.28 | |
| 10 | QPSK | 1 | 49 | 23.21 | 23.23 | 23.21 | |
| 10 | QPSK | 25 | 0 | 22.03 | 21.92 | 22.09 | 23.0 |
| 10 | QPSK | 25 | 12 | 22.07 | 21.93 | 22.13 | |
| 10 | QPSK | 25 | 25 | 22.18 | **22.20** | 22.04 | |
| 10 | QPSK | 50 | 0 | **22.20** | 22.09 | 22.08 | 23.0 |
| 10 | 16QAM | 1 | 0 | 22.18 | 22.25 | 22.15 | 23.0 |
| 10 | 16QAM | 1 | 25 | 22.45 | 22.36 | 22.20 | |
| 10 | 16QAM | 1 | 49 | **22.49** | 22.45 | 22.09 | |
| 10 | 16QAM | 25 | 0 | 21.07 | 21.03 | 21.16 | 22.0 |
| 10 | 16QAM | 25 | 12 | 21.10 | 20.96 | 21.12 | |
| 10 | 16QAM | 25 | 25 | 21.20 | **21.24** | 21.11 | |
| 10 | 16QAM | 50 | 0 | **21.18** | 21.15 | 21.10 | 22.0 |

| BW (MHz) | Modulation | RB Size | RB Offset | Channel/Frequency(MHz) | | | Tune-up limit (dBm) |
|---|---|---|---|---|---|---|---|
| | | | | 26065 | 26365 | 26665 | |
| | | | | 1852.5 | 1882.5 | 1912.5 | |
| 5 | QPSK | 1 | 0 | 22.97 | 23.06 | 23.30 | 24.0 |
| 5 | QPSK | 1 | 12 | 23.16 | 23.23 | **23.40** | |
| 5 | QPSK | 1 | 24 | 23.15 | 23.12 | 23.22 | |
| 5 | QPSK | 12 | 0 | 21.97 | 21.99 | **22.23** | 23.0 |
| 5 | QPSK | 12 | 7 | 22.04 | 22.00 | 22.22 | |
| 5 | QPSK | 12 | 13 | 22.06 | 22.13 | 22.10 | |
| 5 | QPSK | 25 | 0 | 22.08 | 22.17 | **22.23** | 23.0 |
| 5 | 16QAM | 1 | 0 | 22.03 | 22.26 | 22.27 | 23.0 |
| 5 | 16QAM | 1 | 12 | 22.31 | **22.48** | 22.43 | |
| 5 | 16QAM | 1 | 24 | 22.21 | 22.41 | 22.22 | |
| 5 | 16QAM | 12 | 0 | 21.04 | 21.07 | **21.33** | 22.0 |
| 5 | 16QAM | 12 | 7 | 21.00 | 21.08 | 21.25 | |
| 5 | 16QAM | 12 | 13 | 21.12 | 21.20 | 21.16 | |
| 5 | 16QAM | 25 | 0 | 21.17 | 21.13 | **21.29** | 22.0 |

| BW (MHz) | Modulation | RB Size | RB Offset | Channel/Frequency(MHz) | | | Tune-up limit (dBm) |
|---|---|---|---|---|---|---|---|
| | | | | 26055 | 26365 | 26675 | |
| | | | | 1851.5 | 1882.5 | 1913.5 | |
| 3 | QPSK | 1 | 0 | 22.63 | 22.75 | 22.97 | 24.0 |
| 3 | QPSK | 1 | 8 | 22.81 | 22.85 | **22.99** | |
| 3 | QPSK | 1 | 14 | 22.71 | 22.84 | 22.93 | |
| 3 | QPSK | 8 | 0 | 21.82 | 21.91 | **22.11** | 23.0 |
| 3 | QPSK | 8 | 4 | 21.82 | 21.92 | 22.09 | |
| 3 | QPSK | 8 | 7 | 21.97 | 21.98 | 22.08 | |
| 3 | QPSK | 15 | 0 | 21.97 | 22.02 | **22.09** | 23.0 |
| 3 | 16QAM | 1 | 0 | 21.84 | 21.94 | 21.73 | 23.0 |
| 3 | 16QAM | 1 | 8 | 22.01 | **22.04** | 21.88 | |
| 3 | 16QAM | 1 | 14 | 21.90 | 21.96 | 21.75 | |
| 3 | 16QAM | 8 | 0 | 20.96 | 20.97 | **21.13** | 22.0 |
| 3 | 16QAM | 8 | 4 | 20.95 | 20.99 | 21.10 | |
| 3 | 16QAM | 8 | 7 | 21.01 | 21.00 | 21.10 | |
| 3 | 16QAM | 15 | 0 | 21.00 | 20.94 | **21.05** | 22.0 |

| BW (MHz) | Modulation | RB Size | RB Offset | Channel/Frequency(MHz) | | | Tune-up limit (dBm) |
|---|---|---|---|---|---|---|---|
| | | | | 26047 | 26365 | 26683 | |
| | | | | 1850.7 | 1882.5 | 1914.3 | |
| 1.4 | QPSK | 1 | 0 | 22.78 | 22.90 | 23.02 | 24.0 |
| 1.4 | QPSK | 1 | 3 | 22.78 | 22.93 | **23.03** | |
| 1.4 | QPSK | 1 | 5 | 22.75 | 22.94 | 23.00 | |
| 1.4 | QPSK | 3 | 0 | 22.96 | 22.99 | 23.09 | 24.0 |
| 1.4 | QPSK | 3 | 1 | 22.94 | 23.02 | 23.08 | |
| 1.4 | QPSK | 3 | 3 | 22.94 | 23.04 | **23.11** | |
| 1.4 | QPSK | 6 | 0 | 21.93 | **22.05** | **22.05** | 23.0 |
| 1.4 | 16QAM | 1 | 0 | 22.07 | 22.07 | 21.89 | 23.0 |
| 1.4 | 16QAM | 1 | 3 | 22.13 | **22.15** | 21.92 | |
| 1.4 | 16QAM | 1 | 5 | 22.07 | 22.14 | 21.87 | |
| 1.4 | 16QAM | 3 | 0 | 21.87 | 21.93 | 21.92 | 22.0 |
| 1.4 | 16QAM | 3 | 1 | 21.87 | **21.99** | 21.95 | |
| 1.4 | 16QAM | 3 | 3 | 21.86 | 21.91 | 21.96 | |
| 1.4 | 16QAM | 6 | 0 | 21.05 | 21.00 | **21.14** | 22.0 |

| LTE Band 26(814MHz-824MHz) | | | | | | | |
|---|---|---|---|---|---|---|---|
| BW (MHz) | Modulation | RB Size | RB Offset | Channel/Frequency(MHz) | | | Tune-up limit (dBm) |
| | | | | | 26740 | | |
| | | | | | 819 | | |
| 10 | QPSK | 1 | 0 | | 22.59 | | 23.0 |
| 10 | QPSK | 1 | 25 | | 22.70 | | |
| 10 | QPSK | 1 | 49 | | **22.80** | | |
| 10 | QPSK | 25 | 0 | | 21.58 | | 22.0 |
| 10 | QPSK | 25 | 12 | | 21.58 | | |
| 10 | QPSK | 25 | 25 | | **21.80** | | |
| 10 | QPSK | 50 | 0 | | **21.63** | | 22.0 |
| 10 | 16QAM | 1 | 0 | | 21.72 | | 22.0 |
| 10 | 16QAM | 1 | 25 | | 21.81 | | |
| 10 | 16QAM | 1 | 49 | | **21.98** | | |
| 10 | 16QAM | 25 | 0 | | 20.57 | | 21.0 |
| 10 | 16QAM | 25 | 12 | | 20.56 | | |
| 10 | 16QAM | 25 | 25 | | **20.77** | | |
| 10 | 16QAM | 50 | 0 | | **20.70** | | 21.0 |
| BW (MHz) | Modulation | RB Size | RB Offset | Channel/Frequency(MHz) | | | Tune-up limit (dBm) |
| | | | | 26715 | 26740 | 26765 | |
| | | | | 816.5 | 819 | 821.5 | |
| 5 | QPSK | 1 | 0 | 22.58 | 22.63 | 22.72 | 23.0 |
| 5 | QPSK | 1 | 12 | 22.78 | 22.83 | **22.94** | |
| 5 | QPSK | 1 | 24 | 22.65 | 22.80 | 22.85 | |
| 5 | QPSK | 12 | 0 | 21.49 | 21.60 | 21.72 | 22.0 |
| 5 | QPSK | 12 | 7 | 21.53 | 21.57 | 21.72 | |
| 5 | QPSK | 12 | 13 | 21.63 | 21.80 | **21.82** | |
| 5 | QPSK | 25 | 0 | 21.64 | 21.69 | **21.79** | 22.0 |
| 5 | 16QAM | 1 | 0 | 21.51 | 21.81 | 21.68 | 22.0 |
| 5 | 16QAM | 1 | 12 | 21.80 | **21.99** | **21.99** | |
| 5 | 16QAM | 1 | 24 | 21.65 | 21.97 | 21.84 | |
| 5 | 16QAM | 12 | 0 | 20.48 | 20.56 | 20.64 | 21.0 |
| 5 | 16QAM | 12 | 7 | 20.43 | 20.61 | 20.71 | |
| 5 | 16QAM | 12 | 13 | 20.68 | 20.76 | **20.78** | |
| 5 | 16QAM | 25 | 0 | 20.60 | 20.68 | **20.80** | 21.0 |

| BW (MHz) | Modulation | RB Size | RB Offset | Channel/Frequency(MHz) | | | Tune-up limit (dBm) |
|---|---|---|---|---|---|---|---|
| | | | | 26705 | 26740 | 26775 | |
| | | | | 815.5 | 819 | 822.5 | |
| 3 | QPSK | 1 | 0 | 22.20 | 22.38 | 22.52 | 23.0 |
| 3 | QPSK | 1 | 8 | 22.49 | 22.48 | **22.63** | |
| 3 | QPSK | 1 | 14 | 22.40 | 22.56 | 22.52 | |
| 3 | QPSK | 8 | 0 | 21.48 | 21.53 | 21.72 | 22.0 |
| 3 | QPSK | 8 | 4 | 21.49 | 21.50 | **21.81** | |
| 3 | QPSK | 8 | 7 | 21.56 | 21.63 | 21.70 | |
| 3 | QPSK | 15 | 0 | 21.49 | 21.58 | **21.78** | 22.0 |
| 3 | 16QAM | 1 | 0 | 21.33 | 21.51 | 21.38 | 22.0 |
| 3 | 16QAM | 1 | 8 | 21.55 | 21.59 | 21.61 | |
| 3 | 16QAM | 1 | 14 | 21.48 | **21.65** | 21.42 | |
| 3 | 16QAM | 8 | 0 | 20.53 | 20.52 | **20.76** | 21.0 |
| 3 | 16QAM | 8 | 4 | 20.50 | 20.54 | 20.69 | |
| 3 | 16QAM | 8 | 7 | 20.55 | 20.64 | 20.71 | |
| 3 | 16QAM | 15 | 0 | 20.47 | 20.51 | **20.62** | 21.0 |

| BW (MHz) | Modulation | RB Size | RB Offset | Channel/Frequency(MHz) | | | Tune-up limit (dBm) |
|---|---|---|---|---|---|---|---|
| | | | | 26697 | 26740 | 26783 | |
| | | | | 814.7 | 819 | 823.3 | |
| 1.4 | QPSK | 1 | 0 | 22.35 | 22.55 | **22.67** | 23.0 |
| 1.4 | QPSK | 1 | 3 | 22.43 | 22.46 | 22.63 | |
| 1.4 | QPSK | 1 | 5 | 22.46 | 22.51 | 22.65 | |
| 1.4 | QPSK | 3 | 0 | 22.44 | 22.56 | **22.66** | 23.0 |
| 1.4 | QPSK | 3 | 1 | 22.46 | 22.54 | **22.66** | |
| 1.4 | QPSK | 3 | 3 | 22.53 | 22.62 | 22.65 | |
| 1.4 | QPSK | 6 | 0 | 21.58 | 21.71 | **21.82** | 22.0 |
| 1.4 | 16QAM | 1 | 0 | 21.55 | 21.39 | 21.79 | 22.0 |
| 1.4 | 16QAM | 1 | 3 | 21.57 | 21.42 | **21.83** | |
| 1.4 | 16QAM | 1 | 5 | 21.58 | 21.42 | 21.76 | |
| 1.4 | 16QAM | 3 | 0 | 21.34 | 21.34 | 21.59 | 22.0 |
| 1.4 | 16QAM | 3 | 1 | 21.34 | 21.40 | **21.60** | |
| 1.4 | 16QAM | 3 | 3 | 21.36 | 21.39 | 21.56 | |
| 1.4 | 16QAM | 6 | 0 | 20.48 | 20.68 | **20.84** | 21.0 |

| LTE Band 26(824MHz-849MHz) | | | | | | | |
|---|---|---|---|---|---|---|---|
| BW (MHz) | Modulation | RB Size | RB Offset | Channel/Frequency(MHz) | | | Tune-up limit (dBm) |
| | | | | 26865 | 26915 | 26965 | |
| | | | | 831.5 | 836.5 | 841.5 | |
| 15 | QPSK | 1 | 0 | **22.64** | 22.35 | 22.34 | 23.0 |
| 15 | QPSK | 1 | 37 | 22.38 | 22.55 | 22.54 | |
| 15 | QPSK | 1 | 74 | 22.51 | 22.31 | 22.36 | |
| 15 | QPSK | 36 | 0 | 21.52 | 21.43 | 21.43 | 22.0 |
| 15 | QPSK | 36 | 20 | 21.52 | 21.42 | 21.40 | |
| 15 | QPSK | 36 | 39 | **21.58** | 21.41 | 21.42 | |
| 15 | QPSK | 75 | 0 | **21.49** | 21.41 | 21.40 | 22.0 |
| 15 | 16QAM | 1 | 0 | 21.73 | 21.63 | 21.46 | 22.0 |
| 15 | 16QAM | 1 | 37 | 21.58 | **21.83** | 21.69 | |
| 15 | 16QAM | 1 | 74 | 21.70 | 21.60 | 21.54 | |
| 15 | 16QAM | 36 | 0 | 21.47 | 21.41 | 21.45 | 22.0 |
| 15 | 16QAM | 36 | 20 | 21.44 | 21.41 | 21.44 | |
| 15 | 16QAM | 36 | 39 | **21.50** | 21.41 | 21.43 | |
| 15 | 16QAM | 75 | 0 | **20.43** | **20.43** | 20.39 | 21.0 |
| BW (MHz) | Modulation | RB Size | RB Offset | Channel/Frequency(MHz) | | | Tune-up limit (dBm) |
| | | | | 26840 | 26915 | 26990 | |
| | | | | 829 | 836.5 | 844 | |
| 10 | QPSK | 1 | 0 | **22.60** | 22.30 | 22.55 | 23.0 |
| 10 | QPSK | 1 | 25 | 22.46 | 22.49 | 22.36 | |
| 10 | QPSK | 1 | 49 | 22.35 | 22.51 | 22.41 | |
| 10 | QPSK | 25 | 0 | **21.56** | 21.35 | 21.55 | 22.0 |
| 10 | QPSK | 25 | 12 | 21.55 | 21.35 | 21.51 | |
| 10 | QPSK | 25 | 25 | 21.39 | 21.54 | 21.31 | |
| 10 | QPSK | 50 | 0 | **21.50** | 21.41 | 21.46 | 22.0 |
| 10 | 16QAM | 1 | 0 | **21.82** | 21.49 | 21.68 | 22.0 |
| 10 | 16QAM | 1 | 25 | 21.64 | 21.67 | 21.49 | |
| 10 | 16QAM | 1 | 49 | 21.50 | 21.68 | 21.58 | |
| 10 | 16QAM | 25 | 0 | 20.54 | 20.37 | 20.53 | 21.0 |
| 10 | 16QAM | 25 | 12 | **20.59** | 20.36 | 20.57 | |
| 10 | 16QAM | 25 | 25 | 20.32 | 20.54 | 20.30 | |
| 10 | 16QAM | 50 | 0 | 20.39 | 20.42 | **20.46** | 21.0 |

| BW (MHz) | Modulation | RB Size | RB Offset | Channel/Frequency(MHz) | | | Tune-up limit (dBm) |
|---|---|---|---|---|---|---|---|
| | | | | 26815 | 26915 | 27015 | |
| | | | | 826.5 | 836.5 | 846.5 | |
| 5 | QPSK | 1 | 0 | 22.66 | 22.39 | 22.37 | 23.0 |
| 5 | QPSK | 1 | 12 | **22.70** | 22.56 | 22.44 | |
| 5 | QPSK | 1 | 24 | 22.44 | 22.56 | 22.38 | |
| 5 | QPSK | 12 | 0 | 21.64 | 21.37 | 21.28 | 22.0 |
| 5 | QPSK | 12 | 7 | **21.67** | 21.39 | 21.29 | |
| 5 | QPSK | 12 | 13 | 21.53 | 21.53 | 21.43 | |
| 5 | QPSK | 25 | 0 | **21.65** | 21.46 | 21.39 | 22.0 |
| 5 | 16QAM | 1 | 0 | 21.64 | 21.56 | 21.26 | 22.0 |
| 5 | 16QAM | 1 | 12 | 21.73 | **21.82** | 21.45 | |
| 5 | 16QAM | 1 | 24 | 21.45 | 21.72 | 21.40 | |
| 5 | 16QAM | 12 | 0 | **20.66** | 20.35 | 20.30 | 21.0 |
| 5 | 16QAM | 12 | 7 | 20.58 | 20.37 | 20.30 | |
| 5 | 16QAM | 12 | 13 | 20.49 | 20.51 | 20.40 | |
| 5 | 16QAM | 25 | 0 | **20.65** | 20.46 | 20.37 | 21.0 |

| BW (MHz) | Modulation | RB Size | RB Offset | Channel/Frequency(MHz) | | | Tune-up limit (dBm) |
|---|---|---|---|---|---|---|---|
| | | | | 26805 | 26915 | 27025 | |
| | | | | 825.5 | 836.5 | 847.5 | |
| 3 | QPSK | 1 | 0 | 22.32 | 22.11 | 21.95 | 23.0 |
| 3 | QPSK | 1 | 8 | **22.36** | 22.21 | 22.12 | |
| 3 | QPSK | 1 | 14 | 22.31 | 22.21 | 22.10 | |
| 3 | QPSK | 8 | 0 | **21.57** | 21.29 | 21.20 | 22.0 |
| 3 | QPSK | 8 | 4 | 21.53 | 21.30 | 21.17 | |
| 3 | QPSK | 8 | 7 | 21.56 | 21.37 | 21.30 | |
| 3 | QPSK | 15 | 0 | **21.61** | 21.39 | 21.27 | 22.0 |
| 3 | 16QAM | 1 | 0 | 21.49 | 21.31 | 21.11 | 22.0 |
| 3 | 16QAM | 1 | 8 | **21.51** | 21.35 | 21.27 | |
| 3 | 16QAM | 1 | 14 | 21.39 | 21.34 | 21.22 | |
| 3 | 16QAM | 8 | 0 | 20.61 | 20.28 | 20.21 | 21.0 |
| 3 | 16QAM | 8 | 4 | **20.65** | 20.35 | 20.20 | |
| 3 | 16QAM | 8 | 7 | 20.58 | 20.37 | 20.32 | |
| 3 | 16QAM | 15 | 0 | **20.57** | 20.31 | 20.22 | 21.0 |

| BW (MHz) | Modulation | RB Size | RB Offset | Channel/Frequency(MHz) | | | Tune-up limit (dBm) |
|---|---|---|---|---|---|---|---|
| | | | | 26797 | 26915 | 27033 | |
| | | | | 824.7 | 836.5 | 848.3 | |
| 1.4 | QPSK | 1 | 0 | **22.55** | 22.30 | 22.21 | 23.0 |
| 1.4 | QPSK | 1 | 3 | 22.50 | 22.32 | 22.20 | |
| 1.4 | QPSK | 1 | 5 | 22.52 | 22.28 | 22.23 | |
| 1.4 | QPSK | 3 | 0 | **22.57** | 22.28 | 22.25 | 23.0 |
| 1.4 | QPSK | 3 | 1 | 22.56 | 22.29 | 22.25 | |
| 1.4 | QPSK | 3 | 3 | 22.53 | 22.35 | 22.27 | |
| 1.4 | QPSK | 6 | 0 | **21.65** | 21.47 | 21.42 | 22.0 |
| 1.4 | 16QAM | 1 | 0 | 21.46 | 21.41 | 21.31 | 22.0 |
| 1.4 | 16QAM | 1 | 3 | 21.45 | **21.52** | 21.40 | |
| 1.4 | 16QAM | 1 | 5 | 21.44 | 21.43 | 21.36 | |
| 1.4 | 16QAM | 3 | 0 | 21.43 | 21.22 | 21.23 | 22.0 |
| 1.4 | 16QAM | 3 | 1 | **21.49** | 21.21 | 21.19 | |
| 1.4 | 16QAM | 3 | 3 | 21.35 | 21.23 | 21.18 | |
| 1.4 | 16QAM | 6 | 0 | **20.72** | 20.52 | 20.46 | 21.0 |

| LTE Band 66 | | | | | | | |
|---|---|---|---|---|---|---|---|
| BW (MHz) | Modulation | RB Size | RB Offset | Channel/Frequency(MHz) | | | Tune-up limit (dBm) |
| | | | | 132072 | 132322 | 132572 | |
| | | | | 1720 | 1745 | 1770 | |
| 20 | QPSK | 1 | 0 | 23.11 | 22.48 | 22.55 | 24.0 |
| 20 | QPSK | 1 | 49 | **23.29** | 23.00 | 22.58 | |
| 20 | QPSK | 1 | 99 | 22.78 | 22.92 | 22.74 | |
| 20 | QPSK | 50 | 0 | 22.12 | 21.50 | 21.55 | 23.0 |
| 20 | QPSK | 50 | 24 | **22.14** | 21.52 | 21.53 | |
| 20 | QPSK | 50 | 50 | 21.96 | 21.91 | 21.46 | |
| 20 | QPSK | 100 | 0 | **22.03** | 21.73 | 21.47 | 23.0 |
| 20 | 16QAM | 1 | 0 | 22.09 | 21.37 | 21.51 | 23.0 |
| 20 | 16QAM | 1 | 49 | **22.26** | 21.94 | 21.57 | |
| 20 | 16QAM | 1 | 99 | 21.79 | 21.87 | 21.74 | |
| 20 | 16QAM | 50 | 0 | **21.14** | 20.50 | 20.55 | 22.0 |
| 20 | 16QAM | 50 | 24 | 21.12 | 20.52 | 20.56 | |
| 20 | 16QAM | 50 | 50 | 20.95 | 20.84 | 20.46 | |
| 20 | 16QAM | 100 | 0 | **21.05** | 20.70 | 20.48 | 22.0 |
| BW (MHz) | Modulation | RB Size | RB Offset | Channel/Frequency(MHz) | | | Tune-up limit (dBm) |
| | | | | 132047 | 132322 | 132597 | |
| | | | | 1717.5 | 1745 | 1772.5 | |
| 15 | QPSK | 1 | 0 | 23.10 | 22.54 | 22.38 | 24.0 |
| 15 | QPSK | 1 | 37 | **23.24** | 22.87 | 22.53 | |
| 15 | QPSK | 1 | 74 | 22.95 | 22.89 | 22.66 | |
| 15 | QPSK | 36 | 0 | **22.15** | 21.75 | 21.49 | 23.0 |
| 15 | QPSK | 36 | 20 | 22.10 | 21.74 | 21.48 | |
| 15 | QPSK | 36 | 39 | 22.13 | 21.73 | 21.48 | |
| 15 | QPSK | 75 | 0 | **22.11** | 21.77 | 21.49 | 23.0 |
| 15 | 16QAM | 1 | 0 | 22.23 | 21.58 | 21.51 | 23.0 |
| 15 | 16QAM | 1 | 37 | **22.36** | 21.97 | 21.64 | |
| 15 | 16QAM | 1 | 74 | 22.08 | 21.96 | 21.85 | |
| 15 | 16QAM | 36 | 0 | 22.11 | 21.74 | 21.49 | 23.0 |
| 15 | 16QAM | 36 | 20 | 22.09 | 21.78 | 21.50 | |
| 15 | 16QAM | 36 | 39 | **22.13** | 21.75 | 21.51 | |
| 15 | 16QAM | 75 | 0 | **21.09** | 20.70 | 20.46 | 22.0 |

| BW (MHz) | Modulation | RB Size | RB Offset | Channel/Frequency(MHz) | | | Tune-up limit (dBm) |
|---|---|---|---|---|---|---|---|
| | | | | 132022 | 132322 | 132622 | |
| | | | | 1715 | 1745 | 1775 | |
| 10 | QPSK | 1 | 0 | 23.11 | 22.58 | 22.38 | 24.0 |
| 10 | QPSK | 1 | 25 | **23.23** | 22.80 | 22.55 | |
| 10 | QPSK | 1 | 49 | 23.16 | 22.90 | 22.75 | |
| 10 | QPSK | 25 | 0 | 22.07 | 21.59 | 21.41 | 23.0 |
| 10 | QPSK | 25 | 12 | 22.09 | 21.58 | 21.42 | |
| 10 | QPSK | 25 | 25 | **22.15** | 21.83 | 21.55 | |
| 10 | QPSK | 50 | 0 | **22.13** | 21.69 | 21.46 | 23.0 |
| 10 | 16QAM | 1 | 0 | 22.29 | 21.69 | 21.57 | 23.0 |
| 10 | 16QAM | 1 | 25 | **22.34** | 21.92 | 21.70 | |
| 10 | 16QAM | 1 | 49 | 22.30 | 22.01 | 21.87 | |
| 10 | 16QAM | 25 | 0 | 21.06 | 20.57 | 20.44 | 22.0 |
| 10 | 16QAM | 25 | 12 | 21.09 | 20.59 | 20.44 | |
| 10 | 16QAM | 25 | 25 | **21.14** | 20.81 | 20.56 | |
| 10 | 16QAM | 50 | 0 | **21.10** | 20.66 | 20.44 | 22.0 |

| BW (MHz) | Modulation | RB Size | RB Offset | Channel/Frequency(MHz) | | | Tune-up limit (dBm) |
|---|---|---|---|---|---|---|---|
| | | | | 131997 | 132322 | 132647 | |
| | | | | 1712.5 | 1745 | 1777.5 | |
| 5 | QPSK | 1 | 0 | 23.14 | 22.67 | 22.47 | 24.0 |
| 5 | QPSK | 1 | 12 | **23.28** | 22.89 | 22.66 | |
| 5 | QPSK | 1 | 24 | 23.17 | 22.75 | 22.66 | |
| 5 | QPSK | 12 | 0 | 22.07 | 21.63 | 21.50 | 23.0 |
| 5 | QPSK | 12 | 7 | 22.11 | 21.64 | 21.50 | |
| 5 | QPSK | 12 | 13 | **22.15** | 21.70 | 21.61 | |
| 5 | QPSK | 25 | 0 | **22.13** | 21.67 | 21.53 | 23.0 |
| 5 | 16QAM | 1 | 0 | 22.08 | 21.59 | 21.41 | 23.0 |
| 5 | 16QAM | 1 | 12 | **22.30** | 21.81 | 21.64 | |
| 5 | 16QAM | 1 | 24 | 22.15 | 21.76 | 21.66 | |
| 5 | 16QAM | 12 | 0 | 21.10 | 20.54 | 20.48 | 22.0 |
| 5 | 16QAM | 12 | 7 | 21.09 | 20.60 | 20.45 | |
| 5 | 16QAM | 12 | 13 | **21.12** | 20.67 | 20.52 | |
| 5 | 16QAM | 25 | 0 | **21.15** | 20.71 | 20.54 | 22.0 |

| BW (MHz) | Modulation | RB Size | RB Offset | Channel/Frequency(MHz) | | | Tune-up limit (dBm) |
|---|---|---|---|---|---|---|---|
| | | | | 131987 | 132322 | 132657 | |
| | | | | 1711.5 | 1745 | 1778.5 | |
| 3 | QPSK | 1 | 0 | 22.81 | 22.35 | 22.18 | 24.0 |
| 3 | QPSK | 1 | 8 | **22.91** | 22.52 | 22.42 | |
| 3 | QPSK | 1 | 14 | 22.87 | 22.43 | 22.35 | |
| 3 | QPSK | 8 | 0 | 22.00 | 21.57 | 21.45 | 23.0 |
| 3 | QPSK | 8 | 4 | 22.01 | 21.54 | 21.45 | |
| 3 | QPSK | 8 | 7 | **22.06** | 21.63 | 21.51 | |
| 3 | QPSK | 15 | 0 | **22.05** | 21.60 | 21.46 | 23.0 |
| 3 | 16QAM | 1 | 0 | 21.96 | 21.45 | 21.35 | 23.0 |
| 3 | 16QAM | 1 | 8 | **22.04** | 21.59 | 21.58 | |
| 3 | 16QAM | 1 | 14 | 21.99 | 21.56 | 21.52 | |
| 3 | 16QAM | 8 | 0 | **21.10** | 20.60 | 20.49 | 22.0 |
| 3 | 16QAM | 8 | 4 | 21.06 | 20.63 | 20.51 | |
| 3 | 16QAM | 8 | 7 | 21.07 | 20.65 | 20.52 | |
| 3 | 16QAM | 15 | 0 | **21.04** | 20.61 | 20.45 | 22.0 |

| BW (MHz) | Modulation | RB Size | RB Offset | Channel/Frequency(MHz) | | | Tune-up limit (dBm) |
|---|---|---|---|---|---|---|---|
| | | | | 131979 | 132322 | 132665 | |
| | | | | 1710.7 | 1745 | 1779.3 | |
| 1.4 | QPSK | 1 | 0 | **23.02** | 22.53 | 22.44 | 24.0 |
| 1.4 | QPSK | 1 | 3 | 22.99 | 22.54 | 22.44 | |
| 1.4 | QPSK | 1 | 5 | 23.00 | 22.50 | 22.46 | |
| 1.4 | QPSK | 3 | 0 | 22.98 | 22.58 | 22.45 | 24.0 |
| 1.4 | QPSK | 3 | 1 | 22.99 | 22.55 | 22.49 | |
| 1.4 | QPSK | 3 | 3 | **23.06** | 22.54 | 22.46 | |
| 1.4 | QPSK | 6 | 0 | **22.12** | 21.68 | 21.63 | 23.0 |
| 1.4 | 16QAM | 1 | 0 | 22.06 | 21.55 | 21.54 | 23.0 |
| 1.4 | 16QAM | 1 | 3 | **22.12** | 21.65 | 21.55 | |
| 1.4 | 16QAM | 1 | 5 | 22.07 | 21.60 | 21.53 | |
| 1.4 | 16QAM | 3 | 0 | 21.87 | 21.41 | 21.31 | 22.0 |
| 1.4 | 16QAM | 3 | 1 | **21.89** | 21.40 | 21.31 | |
| 1.4 | 16QAM | 3 | 3 | 21.86 | 21.41 | 21.31 | |
| 1.4 | 16QAM | 6 | 0 | **21.02** | 20.70 | 20.62 | 22.0 |

| LTE Band 41 | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| BW (MHz) | Modulation | RB Size | RB Offset | Channel/Frequency(MHz) | | | | | Tune-up limit (dBm) |
| | | | | 39750 | 40185 | 40620 | 41055 | 41490 | |
| | | | | 2506 | 2549.5 | 2593 | 2636.5 | 2680 | |
| 20 | QPSK | 1 | 0 | 22.26 | 22.28 | 22.39 | 22.74 | 23.11 | 24.0 |
| 20 | QPSK | 1 | 49 | 23.59 | 23.61 | **23.63** | 23.44 | 23.29 | |
| 20 | QPSK | 1 | 99 | 23.45 | 23.41 | 23.52 | 23.12 | 22.78 | |
| 20 | QPSK | 50 | 0 | 22.36 | 22.28 | 22.39 | 22.18 | 22.12 | 23.0 |
| 20 | QPSK | 50 | 24 | 22.38 | 22.37 | 22.39 | 22.26 | 22.14 | |
| 20 | QPSK | 50 | 50 | 22.49 | 22.49 | **22.51** | 22.23 | 21.96 | |
| 20 | QPSK | 100 | 0 | **22.44** | 22.41 | 22.42 | 22.21 | 22.03 | 23.0 |
| 20 | 16QAM | 1 | 0 | 21.34 | 21.10 | 20.99 | 21.49 | 22.09 | 23.0 |
| 20 | 16QAM | 1 | 49 | **22.64** | 22.39 | 22.22 | 22.22 | 22.26 | |
| 20 | 16QAM | 1 | 99 | 22.54 | 22.30 | 22.07 | 21.86 | 21.79 | |
| 20 | 16QAM | 50 | 0 | 21.33 | 21.28 | 21.4 | 21.23 | 21.14 | 22.0 |
| 20 | 16QAM | 50 | 24 | 21.37 | 21.34 | 21.38 | 21.24 | 21.12 | |
| 20 | 16QAM | 50 | 50 | 21.46 | 21.40 | **21.51** | 21.14 | 20.95 | |
| 20 | 16QAM | 100 | 0 | 21.4 | 21.38 | **21.42** | 21.17 | 21.05 | 22.0 |
| BW (MHz) | Modulation | RB Size | RB Offset | Channel/Frequency(MHz) | | | | | Tune-up limit (dBm) |
| | | | | 39725 | 40173 | 40620 | 41068 | 41515 | |
| | | | | 2503.5 | 2548.5 | 2593 | 2637.8 | 2682.5 | |
| 15 | QPSK | 1 | 0 | 23.35 | 23.38 | 23.59 | 23.39 | 23.37 | 24.0 |
| 15 | QPSK | 1 | 37 | 23.54 | 23.60 | **23.69** | 23.60 | 23.53 | |
| 15 | QPSK | 1 | 74 | 23.42 | 23.52 | 23.63 | 23.51 | 23.40 | |
| 15 | QPSK | 36 | 0 | 22.5 | 22.50 | 22.54 | 22.51 | 22.54 | 23.0 |
| 15 | QPSK | 36 | 20 | 22.51 | 22.53 | **22.58** | 22.52 | 22.55 | |
| 15 | QPSK | 36 | 39 | 22.53 | 22.51 | 22.56 | 22.54 | 22.53 | |
| 15 | QPSK | 75 | 0 | 22.51 | 22.47 | **22.55** | 22.49 | 22.52 | 23.0 |
| 15 | 16QAM | 1 | 0 | 22.5 | 22.44 | 22.42 | 22.54 | 22.68 | 23.0 |
| 15 | 16QAM | 1 | 37 | 22.72 | 22.61 | 22.55 | 22.61 | **22.83** | |
| 15 | 16QAM | 1 | 74 | 22.66 | 22.49 | 22.48 | 22.54 | 22.7 | |
| 15 | 16QAM | 36 | 0 | 22.51 | 22.48 | 22.57 | 22.49 | 22.54 | 22.0 |
| 15 | 16QAM | 36 | 20 | 22.5 | 22.48 | **22.58** | 22.48 | 22.53 | |
| 15 | 16QAM | 36 | 39 | 22.5 | 22.52 | 22.55 | 22.49 | 22.54 | |
| 15 | 16QAM | 75 | 0 | 21.43 | 21.42 | **21.48** | 21.44 | 21.47 | 22.0 |

| BW (MHz) | Modulation | RB Size | RB Offset | Channel/Frequency(MHz) | | | | | Tune-up limit (dBm) |
|---|---|---|---|---|---|---|---|---|---|
| | | | | 39700 | 40160 | 40620 | 41080 | 41540 | |
| | | | | 2501 | 2547 | 2593 | 2639 | 2685 | |
| 10 | QPSK | 1 | 0 | 23.38 | 23.39 | 23.47 | 23.35 | 23.42 | 24.0 |
| 10 | QPSK | 1 | 25 | 23.45 | 23.43 | **23.54** | 23.43 | 23.46 | |
| 10 | QPSK | 1 | 49 | 23.48 | 23.42 | 23.49 | 23.37 | 23.41 | |
| 10 | QPSK | 25 | 0 | 22.32 | 22.32 | 22.37 | 22.38 | 22.41 | 23.0 |
| 10 | QPSK | 25 | 12 | 22.33 | 22.30 | 22.37 | 22.30 | **22.43** | |
| 10 | QPSK | 25 | 25 | 22.35 | 22.32 | 22.42 | 22.38 | 22.40 | |
| 10 | QPSK | 50 | 0 | 22.31 | 22.30 | 22.43 | 22.44 | **22.45** | 23.0 |
| 10 | 16QAM | 1 | 0 | 22.49 | 22.34 | 22.25 | 22.41 | **22.72** | 23.0 |
| 10 | 16QAM | 1 | 25 | 22.60 | 22.40 | 22.31 | 22.41 | 22.70 | |
| 10 | 16QAM | 1 | 49 | 22.69 | 22.47 | 22.33 | 22.45 | 22.70 | |
| 10 | 16QAM | 25 | 0 | 21.32 | 21.30 | 21.34 | 21.37 | **21.49** | 22.0 |
| 10 | 16QAM | 25 | 12 | 21.35 | 21.34 | 21.35 | 21.34 | 21.48 | |
| 10 | 16QAM | 25 | 25 | 21.38 | 21.30 | 21.38 | 21.39 | 21.48 | |
| 10 | 16QAM | 50 | 0 | 21.28 | 21.23 | 21.35 | 21.34 | **21.46** | 22.0 |
| BW (MHz) | Modulation | RB Size | RB Offset | Channel/Frequency(MHz) | | | | | Tune-up limit (dBm) |
| | | | | 39675 | 40148 | 40620 | 41093 | 51565 | |
| | | | | 2498.5 | 2545.8 | 2593 | 2640.3 | 2687.5 | |
| 5 | QPSK | 1 | 0 | 23.27 | 23.30 | 23.34 | 23.26 | 23.31 | 24.0 |
| 5 | QPSK | 1 | 12 | 23.39 | 23.37 | **23.48** | 23.37 | 23.42 | |
| 5 | QPSK | 1 | 24 | 23.19 | 23.20 | 23.38 | 23.37 | 23.38 | |
| 5 | QPSK | 12 | 0 | 22.22 | 22.26 | 22.31 | 22.29 | 22.36 | 23.0 |
| 5 | QPSK | 12 | 7 | 22.23 | 22.21 | 22.27 | 22.26 | **22.37** | |
| 5 | QPSK | 12 | 13 | 22.22 | 22.26 | **22.37** | 22.31 | 22.32 | |
| 5 | QPSK | 25 | 0 | 22.26 | 22.27 | **22.34** | 22.26 | 22.32 | 23.0 |
| 5 | 16QAM | 1 | 0 | 22.40 | 22.33 | 22.41 | 22.44 | 22.58 | 23.0 |
| 5 | 16QAM | 1 | 12 | 22.51 | 22.44 | 22.53 | 22.52 | **22.71** | |
| 5 | 16QAM | 1 | 24 | 22.42 | 22.39 | 22.40 | 22.48 | 22.61 | |
| 5 | 16QAM | 12 | 0 | 21.16 | 21.11 | 21.21 | 21.16 | 21.24 | 22.0 |
| 5 | 16QAM | 12 | 7 | 21.24 | 21.14 | 21.21 | 21.22 | **21.29** | |
| 5 | 16QAM | 12 | 13 | 21.26 | 21.26 | 21.28 | 21.22 | 21.28 | |
| 5 | 16QAM | 25 | 0 | 21.20 | 21.23 | 21.31 | 21.31 | **21.37** | 22.0 |

**<WLAN 2.4GHz Conducted Power>**

| Mode | Channel | Frequency (MHz) | Conducted Peak Output Power(dBm) | Conducted Average Output Power(dBm) | Tune-up limit (dBm) |
|---|---|---|---|---|---|
| 802.11b | 1 | 2412 | 19.52 | 16.31 | 17.0 |
| | 6 | 2437 | 19.97 | **16.75** | 17.0 |
| | 11 | 2462 | 19.95 | 16.70 | 17.0 |
| 802.11g | 1 | 2412 | 18.43 | 14.22 | 15.0 |
| | 6 | 2437 | 18.89 | 14.56 | 15.0 |
| | 11 | 2462 | 18.91 | 14.60 | 15.0 |
| 802.11n(HT20) | 1 | 2412 | 18.41 | 13.18 | 14.0 |
| | 6 | 2437 | 18.83 | 13.47 | 14.0 |
| | 11 | 2462 | 18.88 | 13.51 | 14.0 |

**<WLAN 5.2GHz Conducted Power>**

| Type | Channel | Frequency (MHz) | Conducted Average Output Power(dBm) | Tune-up limit (dBm) |
|---|---|---|---|---|
| 802.11a | 36 | 5180 | 10.75 | 12.0 |
| | 40 | 5200 | 11.70 | 12.0 |
| | 48 | 5240 | 12.48 | 13.0 |
| 802.11n(HT20) | 36 | 5180 | 11.24 | 12.0 |
| | 40 | 5200 | 11.75 | 12.0 |
| | 48 | 5240 | **12.53** | 13.0 |
| 802.11n(HT40) | 38 | 5190 | 11.53 | 12.0 |
| | 46 | 5230 | 12.29 | 13.0 |
| 802.11ac(HT20) | 36 | 5180 | 10.77 | 12.0 |
| | 40 | 5200 | 11.89 | 12.0 |
| | 48 | 5240 | 12.42 | 13.0 |
| 802.11ac(HT40) | 38 | 5190 | 11.57 | 12.0 |
| | 46 | 5230 | 12.23 | 13.0 |
| 802.11ac(HT80) | 42 | 5210 | 11.50 | 12.0 |

**<WLAN 5.3GHz Conducted Power>**

| Type | Channel | Frequency (MHz) | Conducted Average Output Power(dBm) | Tune-up limit (dBm) |
|---|---|---|---|---|
| 802.11a | 52 | 5260 | **10.81** | 11.0 |
| | 56 | 5280 | 8.53 | 10.0 |
| | 64 | 5320 | 9.06 | 10.0 |
| 802.11n(HT20) | 52 | 5260 | 8.24 | 10.0 |
| | 56 | 5280 | 8.42 | 10.0 |
| | 64 | 5320 | 8.88 | 10.0 |
| 802.11n(HT40) | 54 | 5270 | 8.23 | 10.0 |
| | 62 | 5310 | 8.76 | 10.0 |
| 802.11ac(HT20) | 52 | 5260 | 8.18 | 10.0 |
| | 56 | 5280 | 8.29 | 10.0 |
| | 64 | 5320 | 9.35 | 10.0 |
| 802.11ac(HT40) | 54 | 5270 | 8.15 | 10.0 |
| | 62 | 5310 | 9.23 | 10.0 |
| 802.11ac(HT80) | 58 | 5290 | 8.29 | 10.0 |

**<WLAN 5.6GHz Conducted Power>**

| Type | Channel | Frequency (MHz) | Conducted Average Output Power(dBm) | Tune-up limit (dBm) |
|---|---|---|---|---|
| 802.11a | 100 | 5500 | 10.33 | 12.0 |
| | 120 | 5600 | 11.79 | 12.0 |
| | 140 | 5700 | 11.29 | 12.0 |
| 802.11n(HT20) | 100 | 5500 | 9.80 | 12.0 |
| | 120 | 5600 | 11.95 | 12.0 |
| | 140 | 5700 | 11.77 | 12.0 |
| 802.11n(HT40) | 102 | 5510 | 10.36 | 12.0 |
| | 118 | 5590 | 11.75 | 12.0 |
| | 134 | 5670 | 12.56 | 12.0 |
| 802.11ac(HT20) | 100 | 5500 | 9.98 | 12.0 |
| | 120 | 5600 | **12.58** | 13.0 |
| | 140 | 5700 | 12.05 | 13.0 |
| 802.11ac(HT40) | 102 | 5510 | 10.90 | 12.0 |
| | 118 | 5590 | 12.23 | 13.0 |
| | 134 | 5670 | 12.64 | 13.0 |
| 802.11ac(HT80) | 106 | 5530 | 10.61 | 12.0 |
| | 122 | 5610 | 11.93 | 12.0 |

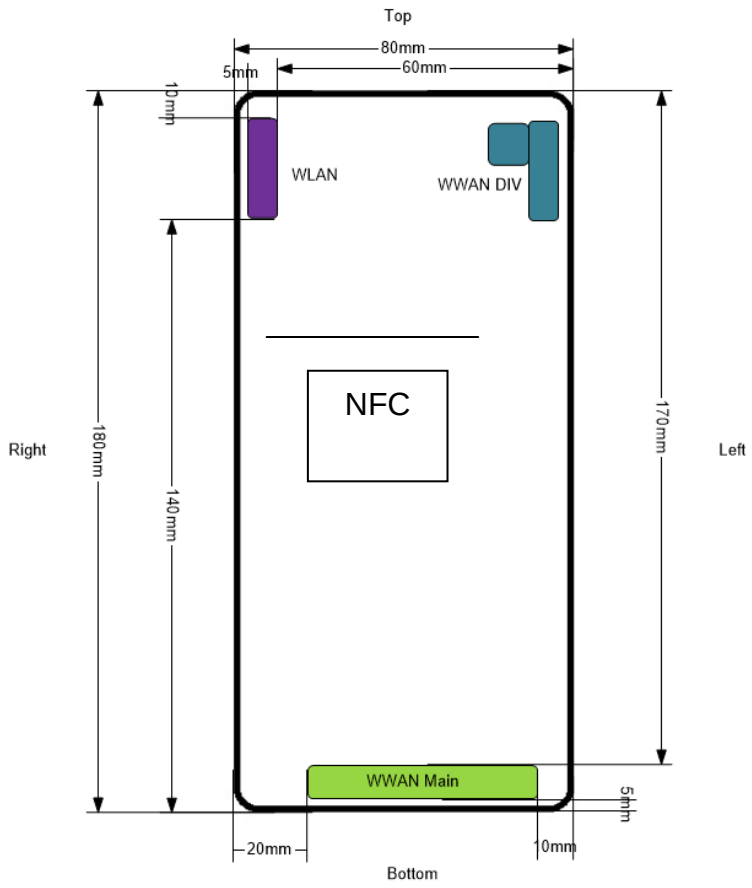
**<WLAN 5.8GHz Conducted Power>**

| Type | Channel | Frequency (MHz) | Conducted Average Output Power(dBm) | Tune-up limit (dBm) |
|---|---|---|---|---|
| 802.11a | 149 | 5745 | 10.52 | 12.0 |
| | 157 | 5785 | 11.68 | 12.0 |
| | 165 | 5825 | **12.36** | 13.0 |
| 802.11n(HT20) | 149 | 5745 | 10.20 | 12.0 |
| | 157 | 5785 | 11.36 | 12.0 |
| | 165 | 5825 | 12.14 | 13.0 |
| 802.11n(HT40) | 151 | 5755 | 10.33 | 12.0 |
| | 159 | 5795 | 11.16 | 12.0 |
| 802.11ac(HT20) | 149 | 5745 | 9.69 | 12.0 |
| | 157 | 5785 | 11.33 | 12.0 |
| | 165 | 5825 | 11.99 | 13.0 |
| 802.11ac(HT40) | 151 | 5755 | 9.73 | 12.0 |
| | 159 | 5795 | 11.22 | 12.0 |
| 802.11ac(HT80) | 155 | 5775 | 10.09 | 12.0 |

**<Bluetooth Conducted Power>**

| Mode | Channel | Frequency (MHz) | Conducted Average Output Power(dBm) | Tune-up limit (dBm) |
|---|---|---|---|---|
| GFSK | 0 | 2402 | 13.93 | 15.0 |
| | 39 | 2441 | 14.08 | 15.0 |
| | 78 | 2480 | **14.97** | 15.0 |
| π/4DQPSK | 0 | 2402 | 13.03 | 15.0 |
| | 39 | 2441 | 13.28 | 15.0 |
| | 78 | 2480 | 14.19 | 15.0 |
| 8DPSK | 0 | 2402 | 12.97 | 15.0 |
| | 39 | 2441 | 13.20 | 15.0 |
| | 78 | 2480 | 14.07 | 15.0 |
| BLE 1M | 0 | 2402 | -3.03 | -2.0 |
| | 19 | 2440 | -2.07 | -2.0 |
| | 39 | 2480 | -2.97 | -2.0 |

## 10.2 Transmit Antennas and SAR Measurement Position




| Distance of The Antenna to the EUT surface and edge | | | | | | |
|---|---|---|---|---|---|---|
| **Antennas** | **Front** | **Back** | **Top Side** | **Bottom Side** | **Left Side** | **Right Side** |
| **WWAN** | 10mm | 2mm | 170mm | 5 mm | 10 mm | 20mm |
| **WLAN** | 10mm | 2mm | 10mm | 140mm | 60mm | 5mm |

| Positions for SAR tests; Body-wron mode | | | | | | |
|---|---|---|---|---|---|---|
| **Antennas** | **Front** | **Back** | **Top Side** | **Bottom Side** | **Left Side** | **Right Side** |
| **WWAN** | Yes | Yes | No | Yes | Yes | Yes |
| **WLAN** | Yes | Yes | Yes | No | No | Yes |

**Note:**

1). According to the KDB941225 D06 Hot Spot SAR v02, the edges with less than 2.5 cm distance to the antennas need to be tested for SAR.

## 10.3 SAR Test Exclusion and Estimated SAR

**SAR Test Exclusion Considerations**

Per KDB 447498 D01v06, the 1-g and 10-g SAR test exclusion thresholds for 100 MHz to 6 GHz at test separation distances ≤ 50 mm are determined by:

[(max. power of channel, including tune-up tolerance, mW)/(min. test separation distance, mm)] ·[√f(GHz)] ≤ 3.0 for 1-g SAR and ≤ 7.5 for 10-g extremity SAR

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

Per KDB 447498 D01v06, at 100 MHz to 6 GHz and for test separation distances > 50 mm, the SAR test exclusion threshold is determined according to the following:

a) [Threshold at 50mm)+(test separation distance-50mm)*(f(MHz)/150)]mW, at 100MHz to 1500MHz

b) [Threshold at 50mm)+(test separation distance-50mm)*10]mW at > 1500MHz and ≤ 6GHz

Per KDB 447498 D01v06,At frequencies below 100 MHz, the following may be considered for SAR test exclusion.

a) The power threshold at the corresponding test separation distance at 100 MHz in step 2) is multiplied by [1+log(100/f(MHz))] for test separation distances > 50 mm and < 200 mm

b) The power threshold determined by the equation in a) for 50 mm and 100 MHz is multiplied by ½ for test separation distances ≤ 50 mm

**Estimated SAR**

Per KDB447498 requires when the standalone SAR test exclusion of section 4.3.1 is applied to an antenna that transmits simultaneously with other antennas, the standalone SAR must be estimated according to the following to determine simultaneous transmission SAR test exclusion;

● (max. power of channel, including tune-up tolerance, mW)/(min. test separation distance, mm)] • [ √ f(GHz)/x] W/kg for test separation distances ≤ 50 mm;

where x = 7.5 for 1-g SAR, and x = 18.75 for 10-g SAR.

● 0.4 W/kg for 1-g SAR and 1.0 W/kg for 10-g SAR, when the test separation distances is > 50 mm

The below table, exemption limits for routine evaluation based on frequency and separation distance was according to SAR-based Exemption – §1.1307(b)(3)(i)(B).

**For BT/WIFI**

| Standalone SAR Test Exclusion and Estimated SAR | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| Wireless Interface | Frequency (MHz) | Configuration | Max. Power With tune-up | | Distance (mm) | Calculation Result | SAR Exclusion Thresholds | Standalone SAR Exclusion | Estimated SAR (W/Kg) |
| | | | dBm | mW | | | | | |
| WIFI2.4G | 2450 | Body | 17.0 | 50.119 | 0 | 7.8 | 3 | No | N/A |
| WIFI5.2G | 5200 | Body | 13.0 | 19.953 | 0 | 4.5 | 3 | No | N/A |
| WIFI5.3G | 5300 | Body | 11.0 | 12.589 | 0 | 2.9 | 3 | Yes | 0.386 |
| WIFI5.6G | 5580 | Body | 13.0 | 19.953 | 0 | 4.7 | 3 | No | N/A |
| WIFI5.5 G | 5785 | Body | 13.0 | 19.953 | 0 | 4.8 | 3 | No | N/A |
| Bluetooth | 2450 | Body | 15.0 | 31.623 | 0 | 4.9 | 3 | No | N/A |

*Remark:*

1. Maximum average power including tune-up tolerance;
2. When the minimum test separation distance is < 5 mm, a distance of 5 mm is applied to determine SAR test exclusion
3. when the distance is < 50 mm exclusion threshold is "Ratio", when the distance is > 50 mm exclusion threshold is "mW".

## 10.4 SAR Test Results Summary

### General Note:

1 Per KDB 447498 D01v06, the reported SAR is the measured SAR value adjusted for maximum tune-up tolerance.

a) Tune-up scaling Factor = tune-up limit power (mW) / EUT RF power (mW), where tune-up limit is the maximum rated power among all production units.

b) For SAR testing of WLAN signal with non-100% duty cycle, the measured SAR is scaled-up by the duty cycle scaling factor which is equal to "1/(duty cycle)"

c) For WLAN/Bluetooth: Reported SAR(W/kg) = Measured SAR(W/kg)* Duty Cycle scaling factor * Tune-up scaling factor

2 Per KDB 447498 D01v06, for each exposure position, testing of other required channels within the operating mode of a frequency band is not required when the reported 1-g or 10-g SAR for the mid-band or highest output power channel is:

- ≤ 0.8 W/kg or 2.0 W/kg, for 1-g or 10-g respectively, when the transmission band is ≤ 100 MHz
- ≤ 0.6 W/kg or 1.5 W/kg, for 1-g or 10-g respectively, when the transmission band is between 100 MHz and 200 MHz
- ≤ 0.4 W/kg or 1.0 W/kg, for 1-g or 10-g respectively, when the transmission band is ≥ 200 MHz

3 Per KDB 865664 D01v01r04, for each frequency band, repeated SAR measurement is required only when the measured SAR is ≥0.8W/kg.

## SAR Results

## <Body SAR>

### SAR Values [GSM 850]

| Plot No. | Mode | Test Position | Ch. | Freq. (MHz) | Average Power (dBm) | Tune-Up Limit (dBm) | Scaling Factor | Power Drift (dB) | Measured $SAR_{1g}$ (W/kg) | Reported $SAR_{1g}$ (W/kg) |
|---|---|---|---|---|---|---|---|---|---|---|
| Measured / Reported SAR numbers-Body& hotspot open distance 0mm | | | | | | | | | | |
| | GPRS 4Tx slots | Front Side | 190 | 836.6 | 31.19 | 32.00 | 1.205 | 0.07 | 0.523 | 0.630 |
| #1 | GPRS 4Tx slots | Back Side | 190 | 836.6 | 31.19 | 32.00 | 1.205 | -0.11 | **0.601** | **0.724** |
| | GPRS 4Tx slots | Left Edge | 190 | 836.6 | 31.19 | 32.00 | 1.205 | 0.05 | 0.498 | 0.600 |
| | GPRS 4Tx slots | Right Edge | 190 | 836.6 | 31.19 | 32.00 | 1.205 | -0.03 | 0.336 | 0.405 |
| | GPRS 4Tx slots | Bottom Edge | 190 | 836.6 | 31.19 | 32.00 | 1.205 | 0.05 | 0.591 | 0.712 |
| | EGPRS 4Tx slots | Back Side | 190 | 836.6 | 31.21 | 32.00 | 1.199 | 0.09 | 0.554 | 0.665 |

### SAR Values [PCS 1900]

| Plot No. | Mode | Test Position | Ch. | Freq. (MHz) | Average Power (dBm) | Tune-Up Limit (dBm) | Scaling Factor | Power Drift (dB) | Measured $SAR_{1g}$ (W/kg) | Reported $SAR_{1g}$ (W/kg) |
|---|---|---|---|---|---|---|---|---|---|---|
| Measured / Reported SAR numbers-Body& hotspot open distance 0mm | | | | | | | | | | |
| | GPRS 4Tx slots | Front Side | 661 | 1880.0 | 29.57 | 30.00 | 1.104 | -0.03 | 0.294 | 0.325 |
| #2 | GPRS 4Tx slots | Back Side | 661 | 1880.0 | 29.57 | 30.00 | 1.104 | 0.11 | **0.369** | **0.407** |
| | GPRS 4Tx slots | Left Edge | 661 | 1880.0 | 29.57 | 30.00 | 1.104 | 0.05 | 0.266 | 0.294 |
| | GPRS 4Tx slots | Right Edge | 661 | 1880.0 | 29.57 | 30.00 | 1.104 | -0.07 | 0.103 | 0.114 |
| | GPRS 4Tx slots | Bottom Edge | 661 | 1880.0 | 29.57 | 30.00 | 1.104 | 0.03 | 0.360 | 0.397 |
| | EGPRS 4Tx slots | Back Side | 810 | 1909.8 | 29.59 | 30.00 | 1.099 | -0.10 | 0.327 | 0.359 |

### SAR Values [WCDMA II]

| Plot No. | Mode | Test Position | Ch. | Freq. (MHz) | Average Power (dBm) | Tune-Up Limit (dBm) | Scaling Factor | Power Drift (dB) | Measured $SAR_{1g}$ (W/kg) | Reported $SAR_{1g}$ (W/kg) |
|---|---|---|---|---|---|---|---|---|---|---|
| Measured / Reported SAR numbers-Body& hotspot open distance 0mm | | | | | | | | | | |
| | RMC 12.2Kbps | Front Side | 9400 | 1880.0 | 23.42 | 24.00 | 1.143 | 0.07 | 0.329 | 0.376 |
| #3 | RMC 12.2Kbps | Back Side | 9400 | 1880.0 | 23.42 | 24.00 | 1.143 | 0.05 | **0.402** | **0.459** |
| | RMC 12.2Kbps | Left Edge | 9400 | 1880.0 | 23.42 | 24.00 | 1.143 | -0.03 | 0.296 | 0.338 |
| | RMC 12.2Kbps | Right Edge | 9400 | 1880.0 | 23.42 | 24.00 | 1.143 | 0.07 | 0.135 | 0.154 |
| | RMC 12.2Kbps | Bottom Edge | 9400 | 1880.0 | 23.42 | 24.00 | 1.143 | -0.10 | 0.391 | 0.447 |

**SAR Values [WCDMA V]**

| Plot No. | Mode | Test Position | Ch. | Freq. (MHz) | Average Power (dBm) | Tune-Up Limit (dBm) | Scaling Factor | Power Drift (dB) | Measured $SAR_{1g}$ (W/kg) | Reported $SAR_{1g}$ (W/kg) |
|---|---|---|---|---|---|---|---|---|---|---|
| **Measured / Reported SAR numbers-Body& hotspot open distance 0mm** | | | | | | | | | | |
| | RMC 12.2Kbps | Front Side | 4233 | 846.6 | 23.48 | 24.00 | 1.127 | -0.05 | 0.272 | 0.307 |
| #4 | RMC 12.2Kbps | Back Side | 4233 | 846.6 | 23.48 | 24.00 | 1.127 | -0.07 | **0.354** | **0.399** |
| | RMC 12.2Kbps | Left Edge | 4233 | 846.6 | 23.48 | 24.00 | 1.127 | -0.07 | 0.248 | 0.280 |
| | RMC 12.2Kbps | Right Edge | 4233 | 846.6 | 23.48 | 24.00 | 1.127 | -0.11 | 0.090 | 0.101 |
| | RMC 12.2Kbps | Bottom Edge | 4233 | 846.6 | 23.48 | 24.00 | 1.127 | 0.03 | 0.344 | 0.388 |

**SAR Values [LTE Band 5]**

| Plot No. | Mode | Test Position | Ch. | Freq. (MHz) | Average Power (dBm) | Tune-Up Limit (dBm) | Scaling Factor | Power Drift (dB) | Measured $SAR_{1g}$ (W/kg) | Reported $SAR_{1g}$ (W/kg) |
|---|---|---|---|---|---|---|---|---|---|---|
| **Measured / Reported SAR numbers-Body& hotspot open distance 0mm** | | | | | | | | | | |
| | 10MHz/1RB#49 | Front Side | 20600 | 844 | 24.75 | 25.0 | 1.059 | -0.10 | 0.310 | 0.328 |
| #5 | 10MHz/1RB#49 | Back Side | 20600 | 844 | 24.75 | 25.0 | 1.059 | 0.11 | **0.391** | **0.414** |
| | 10MHz/1RB#49 | Left Edge | 20600 | 844 | 24.75 | 25.0 | 1.059 | 0.03 | 0.287 | 0.304 |
| | 10MHz/1RB#49 | Right Edge | 20600 | 844 | 24.75 | 25.0 | 1.059 | 0.07 | 0.122 | 0.129 |
| | 10MHz/1RB#49 | Bottom Edge | 20600 | 844 | 24.75 | 25.0 | 1.059 | 0.09 | 0.383 | 0.406 |
| | 10MHz/25RB#25 | Front Side | 20600 | 844 | 23.75 | 24.0 | 1.059 | 0.14 | 0.302 | 0.320 |
| | 10MHz/25RB#25 | Back Side | 20600 | 844 | 23.75 | 24.0 | 1.059 | 0.05 | 0.385 | 0.408 |
| | 10MHz/25RB#25 | Left Edge | 20600 | 844 | 23.75 | 24.0 | 1.059 | 0.09 | 0.277 | 0.293 |
| | 10MHz/25RB#25 | Right Edge | 20600 | 844 | 23.75 | 24.0 | 1.059 | 0.01 | 0.124 | 0.131 |
| | 10MHz/25RB#25 | Bottom Edge | 20600 | 844 | 23.75 | 24.0 | 1.059 | -0.05 | 0.374 | 0.396 |

**SAR Values [LTE Band 7]**

| Plot No. | Mode | Test Position | Ch. | Freq. (MHz) | Average Power (dBm) | Tune-Up Limit (dBm) | Scaling Factor | Power Drift (dB) | Measured $SAR_{1g}$ (W/kg) | Reported $SAR_{1g}$ (W/kg) |
|---|---|---|---|---|---|---|---|---|---|---|
| **Measured / Reported SAR numbers-Body& hotspot open distance 0mm** | | | | | | | | | | |
| | 20MHz/1RB#49 | Front Side | 21100 | 2535 | 23.02 | 24.0 | 1.253 | 0.04 | 0.524 | 0.657 |
| #6 | 20MHz/1RB#49 | Back Side | 21100 | 2535 | 23.02 | 24.0 | 1.253 | 0.11 | **0.604** | **0.757** |
| | 20MHz/1RB#49 | Left Edge | 21100 | 2535 | 23.02 | 24.0 | 1.253 | -0.03 | 0.501 | 0.628 |
| | 20MHz/1RB#49 | Right Edge | 21100 | 2535 | 23.02 | 24.0 | 1.253 | -0.05 | 0.342 | 0.429 |
| | 20MHz/1RB#49 | Bottom Edge | 21100 | 2535 | 23.02 | 24.0 | 1.253 | -0.11 | 0.591 | 0.741 |
| | 20MHz/50RB#50 | Front Side | 21350 | 2560 | 21.93 | 22.0 | 1.016 | 0.07 | 0.506 | 0.514 |
| | 20MHz/50RB#50 | Back Side | 21350 | 2560 | 21.93 | 22.0 | 1.016 | 0.09 | 0.587 | 0.597 |
| | 20MHz/50RB#50 | Left Edge | 21350 | 2560 | 21.93 | 22.0 | 1.016 | -0.10 | 0.487 | 0.495 |
| | 20MHz/50RB#50 | Right Edge | 21350 | 2560 | 21.93 | 22.0 | 1.016 | -0.04 | 0.317 | 0.322 |
| | 20MHz/50RB#50 | Bottom Edge | 21350 | 2560 | 21.93 | 22.0 | 1.016 | -0.05 | 0.580 | 0.589 |

**SAR Values [LTE Band 12]**

| Plot No. | Mode | Test Position | Ch. | Freq. (MHz) | Average Power (dBm) | Tune-Up Limit (dBm) | Scaling Factor | Power Drift (dB) | Measured $SAR_{1g}$ (W/kg) | Reported $SAR_{1g}$ (W/kg) |
|---|---|---|---|---|---|---|---|---|---|---|
| **Measured / Reported SAR numbers-Body& hotspot open distance 0mm** | | | | | | | | | | |
| | 20MHz/1RB#49 | Front Side | 23130 | 711 | 24.67 | 25.0 | 1.079 | 0.07 | 0.197 | 0.213 |
| #7 | 20MHz/1RB#49 | Back Side | 23130 | 711 | 24.67 | 25.0 | 1.079 | -0.10 | **0.276** | **0.298** |
| | 20MHz/1RB#49 | Left Edge | 23130 | 711 | 24.67 | 25.0 | 1.079 | -0.06 | 0.172 | 0.186 |
| | 20MHz/1RB#49 | Right Edge | 23130 | 711 | 24.67 | 25.0 | 1.079 | -0.08 | 0.087 | 0.094 |
| | 20MHz/1RB#49 | Bottom Edge | 23130 | 711 | 24.67 | 25.0 | 1.079 | 0.05 | 0.261 | 0.282 |
| | 20MHz/50RB#50 | Front Side | 23095 | 707.5 | 23.55 | 24.0 | 1.109 | -0.05 | 0.185 | 0.205 |
| | 20MHz/50RB#50 | Back Side | 23095 | 707.5 | 23.55 | 24.0 | 1.109 | 0.09 | 0.265 | 0.294 |
| | 20MHz/50RB#50 | Left Edge | 23095 | 707.5 | 23.55 | 24.0 | 1.109 | -0.10 | 0.158 | 0.175 |
| | 20MHz/50RB#50 | Right Edge | 23095 | 707.5 | 23.55 | 24.0 | 1.109 | -0.13 | 0.014 | 0.016 |
| | 20MHz/50RB#50 | Bottom Edge | 23095 | 707.5 | 23.55 | 24.0 | 1.109 | -0.05 | 0.257 | 0.285 |

**SAR Values [LTE Band 14]**

| Plot No. | Mode | Test Position | Ch. | Freq. (MHz) | Average Power (dBm) | Tune-Up Limit (dBm) | Scaling Factor | Power Drift (dB) | Measured $SAR_{1g}$ (W/kg) | Reported $SAR_{1g}$ (W/kg) |
|---|---|---|---|---|---|---|---|---|---|---|
| **Measured / Reported SAR numbers-Body& hotspot open distance 0mm** | | | | | | | | | | |
| | 10MHz/1RB#25 | Front Side | 23330 | 793 | 24.54 | 25.0 | 1.112 | -0.03 | 0.203 | 0.226 |
| #8 | 10MHz/1RB#25 | Back Side | 23330 | 793 | 24.54 | 25.0 | 1.112 | -0.04 | **0.276** | **0.307** |
| | 10MHz/1RB#25 | Left Edge | 23330 | 793 | 24.54 | 25.0 | 1.112 | -0.05 | 0.171 | 0.190 |
| | 10MHz/1RB#25 | Right Edge | 23330 | 793 | 24.54 | 25.0 | 1.112 | -0.10 | 0.025 | 0.028 |
| | 10MHz/1RB#25 | Bottom Edge | 23330 | 793 | 24.54 | 25.0 | 1.112 | -0.07 | 0.264 | 0.293 |
| | 10MHz/25RB#0 | Front Side | 23330 | 793 | 23.54 | 24.0 | 1.112 | 0.05 | 0.173 | 0.192 |
| | 10MHz/25RB#0 | Back Side | 23330 | 793 | 23.54 | 24.0 | 1.112 | -0.07 | 0.250 | 0.278 |
| | 10MHz/25RB#0 | Left Edge | 23330 | 793 | 23.54 | 24.0 | 1.112 | -0.04 | 0.148 | 0.165 |
| | 10MHz/25RB#0 | Right Edge | 23330 | 793 | 23.54 | 24.0 | 1.112 | -0.10 | 0.014 | 0.016 |
| | 10MHz/25RB#0 | Bottom Edge | 23330 | 793 | 23.54 | 24.0 | 1.112 | -0.11 | 0.240 | 0.267 |

**SAR Values [LTE Band 25]**

| Plot No. | Mode | Test Position | Ch. | Freq. (MHz) | Average Power (dBm) | Tune-Up Limit (dBm) | Scaling Factor | Power Drift (dB) | Measured $SAR_{1g}$ (W/kg) | Reported $SAR_{1g}$ (W/kg) |
|---|---|---|---|---|---|---|---|---|---|---|
| **Measured / Reported SAR numbers-Body& hotspot open distance 0mm** | | | | | | | | | | |
| | 20MHz/1RB#49 | Front Side | 26140 | 1860 | 23.45 | 24.0 | 1.135 | 0.05 | 0.343 | 0.389 |
| #9 | 20MHz/1RB#49 | Back Side | 26140 | 1860 | 23.45 | 24.0 | 1.135 | -0.09 | **0.425** | **0.482** |
| | 20MHz/1RB#49 | Left Edge | 26140 | 1860 | 23.45 | 24.0 | 1.135 | -0.07 | 0.327 | 0.371 |
| | 20MHz/1RB#49 | Right Edge | 26140 | 1860 | 23.45 | 24.0 | 1.135 | 0.10 | 0.162 | 0.184 |
| | 20MHz/1RB#49 | Bottom Edge | 26140 | 1860 | 23.45 | 24.0 | 1.135 | 0.03 | 0.417 | 0.473 |
| | 20MHz/50RB#24 | Front Side | 26590 | 1905 | 22.29 | 23.0 | 1.178 | 0.08 | 0.329 | 0.387 |
| | 20MHz/50RB#24 | Back Side | 26590 | 1905 | 22.29 | 23.0 | 1.178 | -0.03 | 0.405 | 0.477 |
| | 20MHz/50RB#24 | Left Edge | 26590 | 1905 | 22.29 | 23.0 | 1.178 | 0.04 | 0.307 | 0.362 |
| | 20MHz/50RB#24 | Bottom Edge | 26590 | 1905 | 22.29 | 23.0 | 1.178 | -0.07 | 0.142 | 0.167 |
| | 20MHz/50RB#24 | Right Edge | 26590 | 1905 | 22.29 | 23.0 | 1.178 | -0.11 | 0.398 | 0.469 |

## SAR Values [LTE Band 26 Lower Band]

| Plot No. | Mode | Test Position | Ch. | Freq. (MHz) | Average Power (dBm) | Tune-Up Limit (dBm) | Scaling Factor | Power Drift (dB) | Measured $SAR_{1g}$ (W/kg) | Reported $SAR_{1g}$ (W/kg) |
|---|---|---|---|---|---|---|---|---|---|---|
| **Measured / Reported SAR numbers-Body& hotspot open distance 0mm** | | | | | | | | | | |
| | 10MHz/1RB#49 | Front Side | 26740 | 819 | 22.80 | 23.0 | 1.047 | -0.11 | 0.326 | 0.341 |
| #10 | 10MHz/1RB#49 | Back Side | 26740 | 819 | 22.80 | 23.0 | 1.047 | -0.07 | **0.401** | **0.420** |
| | 10MHz/1RB#49 | Left Edge | 26740 | 819 | 22.80 | 23.0 | 1.047 | -0.05 | 0.296 | 0.310 |
| | 10MHz/1RB#49 | Right Edge | 26740 | 819 | 22.80 | 23.0 | 1.047 | -0.07 | 0.138 | 0.145 |
| | 10MHz/1RB#49 | Bottom Edge | 26740 | 819 | 22.80 | 23.0 | 1.047 | 0.11 | 0.386 | 0.404 |
| | 10MHz/25RB#25 | Front Side | 26740 | 819 | 21.80 | 22.0 | 1.047 | 0.03 | 0.313 | 0.328 |
| | 10MHz/25RB#25 | Back Side | 26740 | 819 | 21.80 | 22.0 | 1.047 | -0.14 | 0.393 | 0.412 |
| | 10MHz/25RB#25 | Left Edge | 26740 | 819 | 21.80 | 22.0 | 1.047 | -0.05 | 0.291 | 0.305 |
| | 10MHz/25RB#25 | Right Edge | 26740 | 819 | 21.80 | 22.0 | 1.047 | 0.03 | 0.129 | 0.135 |
| | 10MHz/25RB#25 | Bottom Edge | 26740 | 819 | 21.80 | 22.0 | 1.047 | -0.09 | 0.385 | 0.403 |

## SAR Values [LTE Band 26 Higher Band]

| Plot No. | Mode | Test Position | Ch. | Freq. (MHz) | Average Power (dBm) | Tune-Up Limit (dBm) | Scaling Factor | Power Drift (dB) | Measured $SAR_{1g}$ (W/kg) | Reported $SAR_{1g}$ (W/kg) |
|---|---|---|---|---|---|---|---|---|---|---|
| **Measured / Reported SAR numbers-Body& hotspot open distance 0mm** | | | | | | | | | | |
| | 15MHz/1RB#0 | Front Side | 26865 | 831.5 | 22.64 | 23.0 | 1.086 | -0.05 | 0.240 | 0.261 |
| #11 | 15MHz/1RB#0 | Back Side | 26865 | 831.5 | 22.64 | 23.0 | 1.086 | -0.04 | **0.323** | **0.351** |
| | 15MHz/1RB#0 | Left Edge | 26865 | 831.5 | 22.64 | 23.0 | 1.086 | -0.03 | 0.219 | 0.238 |
| | 15MHz/1RB#0 | Right Edge | 26865 | 831.5 | 22.64 | 23.0 | 1.086 | -0.07 | 0.059 | 0.064 |
| | 15MHz/1RB#0 | Bottom Edge | 26865 | 831.5 | 22.64 | 23.0 | 1.086 | 0.03 | 0.314 | 0.341 |
| | 15MHz/36RB#39 | Front Side | 26865 | 831.5 | 21.58 | 22.0 | 1.102 | 0.10 | 0.217 | 0.239 |
| | 15MHz/36RB#39 | Back Side | 26865 | 831.5 | 21.58 | 22.0 | 1.102 | -0.03 | 0.298 | 0.328 |
| | 15MHz/36RB#39 | Left Edge | 26865 | 831.5 | 21.58 | 22.0 | 1.102 | -0.07 | 0.190 | 0.209 |
| | 15MHz/36RB#39 | Right Edge | 26865 | 831.5 | 21.58 | 22.0 | 1.102 | -0.12 | 0.028 | 0.031 |
| | 15MHz/36RB#39 | Bottom Edge | 26865 | 831.5 | 21.58 | 22.0 | 1.102 | 0.07 | 0.288 | 0.317 |

## SAR Values [LTE Band 66]

| Plot No. | Mode | Test Position | Ch. | Freq. (MHz) | Average Power (dBm) | Tune-Up Limit (dBm) | Scaling Factor | Power Drift (dB) | Measured $SAR_{1g}$ (W/kg) | Reported $SAR_{1g}$ (W/kg) |
|---|---|---|---|---|---|---|---|---|---|---|
| **Measured / Reported SAR numbers-Body& hotspot open distance 0mm** | | | | | | | | | | |
| | 20MHz/1RB#49 | Front Side | 132072 | 1720 | 23.29 | 24.0 | 1.178 | -0.07 | 0.288 | 0.339 |
| #12 | 20MHz/1RB#49 | Back Side | 132072 | 1720 | 23.29 | 24.0 | 1.178 | 0.03 | **0.362** | **0.426** |
| | 20MHz/1RB#49 | Left Edge | 132072 | 1720 | 23.29 | 24.0 | 1.178 | -0.05 | 0.256 | 0.301 |
| | 20MHz/1RB#49 | Right Edge | 132072 | 1720 | 23.29 | 24.0 | 1.178 | -0.10 | 0.093 | 0.110 |
| | 20MHz/1RB#49 | Bottom Edge | 132072 | 1720 | 23.29 | 24.0 | 1.178 | -0.07 | 0.355 | 0.418 |
| | 20MHz/50RB#24 | Front Side | 132072 | 1720 | 22.14 | 23.0 | 1.219 | 0.05 | 0.269 | 0.328 |
| | 20MHz/50RB#24 | Back Side | 132072 | 1720 | 22.14 | 23.0 | 1.219 | -0.07 | 0.342 | 0.417 |
| | 20MHz/50RB#24 | Left Edge | 132072 | 1720 | 22.14 | 23.0 | 1.219 | -0.11 | 0.237 | 0.289 |
| | 20MHz/50RB#24 | Right Edge | 132072 | 1720 | 22.14 | 23.0 | 1.219 | -0.03 | 0.080 | 0.098 |
| | 20MHz/50RB#24 | Bottom Edge | 132072 | 1720 | 22.14 | 23.0 | 1.219 | 0.07 | 0.334 | 0.407 |

## SAR Values [LTE Band 41]

| Plot No. | Mode | Test Position | Ch. | Freq. (MHz) | Average Power (dBm) | Tune-Up Limit (dBm) | Scaling Factor | Power Drift (dB) | Measured $SAR_{1g}$ (W/kg) | Reported $SAR_{1g}$ (W/kg) |
|---|---|---|---|---|---|---|---|---|---|---|
| **Measured / Reported SAR numbers-Body& hotspot open distance 0mm** | | | | | | | | | | |
| | 20MHz/1RB#49 | Front Side | 40620 | 2593 | 23.63 | 24.0 | 1.089 | -0.03 | 0.119 | 0.130 |
| #13 | 20MHz/1RB#49 | Back Side | 40620 | 2593 | 23.63 | 24.0 | 1.089 | 0.04 | **0.198** | **0.216** |
| | 20MHz/1RB#49 | Left Edge | 40620 | 2593 | 23.63 | 24.0 | 1.089 | 0.05 | 0.096 | 0.105 |
| | 20MHz/1RB#49 | Right Edge | 40620 | 2593 | 23.63 | 24.0 | 1.089 | 0.07 | 0.011 | 0.012 |
| | 20MHz/1RB#49 | Bottom Edge | 40620 | 2593 | 23.63 | 24.0 | 1.089 | -0.08 | 0.183 | 0.199 |
| | 20MHz/50RB#50 | Front Side | 40620 | 2593 | 22.51 | 23.0 | 1.119 | 0.07 | 0.093 | 0.104 |
| | 20MHz/50RB#50 | Back Side | 40620 | 2593 | 22.51 | 23.0 | 1.119 | -0.09 | 0.176 | 0.197 |
| | 20MHz/50RB#50 | Left Edge | 40620 | 2593 | 22.51 | 23.0 | 1.119 | 0.10 | 0.074 | 0.083 |
| | 20MHz/50RB#50 | Right Edge | 40620 | 2593 | 22.51 | 23.0 | 1.119 | -0.04 | 0.009 | 0.010 |
| | 20MHz/50RB#50 | Bottom Edge | 40620 | 2593 | 22.51 | 23.0 | 1.119 | -0.03 | 0.169 | 0.189 |

**SAR Values [WIFI 2.4G]**

| Plot No. | Mode | Test Position | Ch. | Freq. (MHz) | Average Power (dBm) | Tune-Up Limit (dBm) | Scaling Factor | Power Drift (dB) | Measured $SAR_{1g}$ (W/kg) | Reported $SAR_{1g}$ (W/kg) |
|---|---|---|---|---|---|---|---|---|---|---|
| **Measured / Reported SAR numbers-Body& hotspot open distance 0mm** | | | | | | | | | | |
| | 802.11b | Front Side | 06 | 2437 | 16.75 | 17.0 | 1.250 | -0.07 | 0.178 | 0.189 |
| #14 | 802.11b | Back Side | 06 | 2437 | 16.75 | 17.0 | 1.250 | 0.05 | **0.202** | **0.214** |
| | 802.11b | Right Edge | 06 | 2437 | 16.75 | 17.0 | 1.250 | 0.10 | 0.180 | 0.191 |
| | 802.11b | Top Edge | 06 | 2437 | 16.75 | 17.0 | 1.250 | 0.10 | 0.165 | 0.175 |

**SAR Values [WIFI 5.2G]**

| Plot No. | Mode | Test Position | Ch. | Freq. (MHz) | Average Power (dBm) | Tune-Up Limit (dBm) | Scaling Factor | Power Drift (dB) | Measured $SAR_{1g}$ (W/kg) | Reported $SAR_{1g}$ (W/kg) |
|---|---|---|---|---|---|---|---|---|---|---|
| **Measured / Reported SAR numbers-Body& hotspot open distance 0mm** | | | | | | | | | | |
| | 802.11n(HT20) | Front Side | 48 | 5240 | 12.53 | 13.0 | 1.114 | -0.07 | 0.139 | 0.155 |
| #15 | 802.11n(HT20) | Back Side | 48 | 5240 | 12.53 | 13.0 | 1.114 | 0.03 | **0.150** | **0.167** |
| | 802.11n(HT20) | Right Edge | 48 | 5240 | 12.53 | 13.0 | 1.114 | 0.10 | 0.141 | 0.157 |
| | 802.11n(HT20) | Top Edge | 48 | 5240 | 12.53 | 13.0 | 1.114 | -0.13 | 0.130 | 0.145 |

**SAR Values [WIFI 5.6G]**

| Plot No. | Mode | Test Position | Ch. | Freq. (MHz) | Average Power (dBm) | Tune-Up Limit (dBm) | Scaling Factor | Power Drift (dB) | Measured $SAR_{1g}$ (W/kg) | Reported $SAR_{1g}$ (W/kg) |
|---|---|---|---|---|---|---|---|---|---|---|
| **Measured / Reported SAR numbers-Body& hotspot open distance 0mm** | | | | | | | | | | |
| | 802.11ac (HT20) | Front Side | 120 | 5600 | 12.58 | 13.0 | 1.102 | -0.07 | 0.235 | 0.259 |
| #16 | 802.11ac (HT20) | Back Side | 120 | 5600 | 12.58 | 13.0 | 1.102 | 0.05 | **0.247** | **0.272** |
| | 802.11ac(HT20) | Right Edge | 120 | 5600 | 12.58 | 13.0 | 1.102 | 0.03 | 0.235 | 0.259 |
| | 802.11ac(HT20) | Top Edge | 120 | 5600 | 12.58 | 13.0 | 1.102 | -0.10 | 0.229 | 0.252 |

**SAR Values [WIFI 5.8G]**

| Plot No. | Mode | Test Position | Ch. | Freq. (MHz) | Average Power (dBm) | Tune-Up Limit (dBm) | Scaling Factor | Power Drift (dB) | Measured $SAR_{1g}$ (W/kg) | Reported $SAR_{1g}$ (W/kg) |
|---|---|---|---|---|---|---|---|---|---|---|
| **Measured / Reported SAR numbers-Body& hotspot open distance 0mm** | | | | | | | | | | |
| | 802.11a | Front Side | 165 | 5825 | 12.36 | 13.0 | 1.159 | -0.04 | 0.156 | 0.181 |
| #17 | 802.11a | Back Side | 165 | 5825 | 12.36 | 13.0 | 1.159 | 0.09 | **0.168** | **0.195** |
| | 802.11a | Right Edge | 165 | 5825 | 12.36 | 13.0 | 1.159 | 0.11 | 0.162 | 0.188 |
| | 802.11a | Top Edge | 165 | 5825 | 12.36 | 13.0 | 1.159 | -0.09 | 0.141 | 0.163 |

**SAR Values [BT]**

| Plot No. | Mode | Test Position | Ch. | Freq. (MHz) | Average Power (dBm) | Tune-Up Limit (dBm) | Scaling Factor | Power Drift (dB) | Measured $SAR_{1g}$ (W/kg) | Reported $SAR_{1g}$ (W/kg) |
|---|---|---|---|---|---|---|---|---|---|---|
| **Measured / Reported SAR numbers-Body& hotspot open distance 0mm** | | | | | | | | | | |
| | GFSK DH5 | Front Side | 78 | 2480 | 14.97 | 15.0 | 1.007 | -0.12 | 0.133 | 0.133 |
| #18 | GFSK DH5 | Back Side | 78 | 2480 | 14.97 | 15.0 | 1.007 | 0.07 | **0.142** | **0.142** |
| | GFSK DH5 | Right Edge | 78 | 2480 | 14.97 | 15.0 | 1.007 | 0.10 | 0.139 | 0.139 |
| | GFSK DH5 | Top Edge | 78 | 2480 | 14.97 | 15.0 | 1.007 | 0.04 | 0.118 | 0.118 |

## 10.5 SAR Measurement Variability

SAR measurement variability must be assessed for each frequency band, which is determined by the SAR probe calibration point and tissue-equivalent medium used for the device measurements. When both head and body tissue-equivalent media are required for SAR measurements in a frequency band, the variability measurement procedures should be applied to the tissue medium with the highest measured SAR, using the highest measured SAR configuration for that tissue-equivalent medium. The following procedures are applied to determine if repeated measurements are required.

1 Repeated measurement is not required when the original highest measured SAR is < 0.80 W/kg; steps 2) through 4) do not apply.

2 When the original highest measured SAR is ≥ 0.80 W/kg, repeat that measurement once.

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

4 Perform a third repeated measurement only if the original, first or second repeated measurement is ≥ 1.5 W/kg and the ratio of largest to smallest SAR for the original, first and second repeated measurements is > 1.20.

**SAR Measurement Variability**

| Band | Mode | Test Position | Ch. | Spacing (mm) | Original SAR (W/kg) | First Repeated SAR (W/kg) | The Ratio | Second Repeated SAR (W/kg) |
|---|---|---|---|---|---|---|---|---|
| / | / | / | / | / | / | / | / | / |

## 10.6 Simultaneous Transmission Analysis

Per FCC KD B447498 D01, simultaneous transmission SAR test exclusion may be applied when the sum of the 1-g SAR for all the transmitting antenna in a specific a physical test configuration is ≤1.6 W/Kg. When the sum is greater than the SAR limit, SAR test exclusion is determined by the SAR to peak location separation ratio.

$$\text{Ratio}=\frac{(\text{SAR}_1+\text{SAR}_2)^{1.5}}{(\text{peak location separation,mm})}<0.04$$

The following procedures adopted from "FCC SAR Considerations for Cell Phones with Multiple Transmitters" are applicable to handsets with built-in unlicensed transmitters such as 802.11 a/b/g/n and Bluetooth devices which may simultaneously transmit with the licensed transmitter.

Application Simultaneous Transmission information:

| No. | Simultaneous Transmission Configurations | Portable Handset |
|---|---|---|
| | | Body-worn |
| 1 | WWAN (2/3/4G) + WLAN 2.4GHz | Yes |
| 2 | WWAN (2/3/4G) + WLAN 5GHz | Yes |
| 3 | WWAN (2/3/4G) + Bluetooth | Yes |

Note 1: WLAN2.4G and BT share the same antenna and cannot transmitting at the same time.

Note 2: This device has NFC operations, the NFC antenna is integrated into the device for this model, therefore. all SAR teswere performed with the device which already incorporates the NFC antenna. A diagram showing the location of theantenna can be found in the operational description. According to FCC KDB publication 447498 D01v06transmitters are consider to be operating simultaneously when there is overlapping transmission, with the exceptionof transmission during network hand-offs with maximum hand-off duration less than 30 seconds.

### 10.8.2 Evaluation of Simultaneous SAR

**Body-worn and hotspot Simultaneous transmission SAR for WLAN/BT and GSM/WCDMA/LTE**

| Exposure Position | 1 | 2 | 3 | 4 | 1+2 Summed 1g SAR (W/kg) | 1+3 Summed 1g SAR (W/kg) | 1+4 Summed 1g SAR (W/kg) | SPLSR |
|---|---|---|---|---|---|---|---|---|
| | MAX. WWAN Reported SAR | MAX. WLAN2.4G Reported SAR | MAX. WLAN 5G Reported SAR | Bluetooth | | | | |
| | 1g SAR (W/kg) | 1g SAR (W/kg) | 1g SAR (W/kg) | 1g SAR (W/kg) | | | | |
| Front Side | 0.657 | 0.189 | 0.259 | 0.133 | 0.846 | 0.916 | 0.790 | N/A |
| Back Side | 0.757 | 0.214 | 0.272 | 0.142 | 0.971 | **1.029** | 0.899 | N/A |
| Left Edge | 0.628 | N/A | N/A | N/A | 0.628 | 0.628 | 0.628 | N/A |
| Right Edge | 0.429 | 0.191 | 0.259 | 0.139 | 0.620 | 0.688 | 0.568 | N/A |
| Top Side | N/A | 0.175 | 0.252 | 0.118 | 0.175 | 0.252 | 0.118 | N/A |
| Bottom Edge | 0.741 | N/A | N/A | N/A | 0.741 | 0.741 | 0.741 | N/A |

MAX. $\Sigma SAR_{1g}$ =**1.234** W/kg<1.6 W/kg, so the Simultaneous transmission SAR with volume scan are not required.

# 11 Measurement Uncertainty

| NO | Source | Uncert. ai（%） | Prob. Dist. | Div. k | ci (1g) | ci (10g) | Stand.Uncert. ui (1g) | Stand.Uncert. ui (10g) | $V_{eff}$ |
|---|---|---|---|---|---|---|---|---|---|
| 1 | Repeat | 0. 4 | N | 1 | 1 | 1 | 0. 4 | 0. 4 | 9 |
| **Instrument** | | | | | | | | | |
| 2 | Probe calibration | 7 | N | 2 | 1 | 1 | 3.5 | 3.5 | ∞ |
| 3 | Axial isotropy | 4.7 | R | √3 | 0.7 | 0.7 | 1.9 | 1.9 | ∞ |
| 4 | Hemispherical isotropy | 9.4 | R | √3 | 0.7 | 0.7 | 3.9 | 3.9 | ∞ |
| 5 | Boundary effect | 1.0 | R | √3 | 1 | 1 | 0.6 | 0.6 | ∞ |
| 6 | Linearity | 4.7 | R | √3 | 1 | 1 | 2.7 | 2.7 | ∞ |
| 7 | Detection limits | 1.0 | R | √3 | 1 | 1 | 0.6 | 0.6 | ∞ |
| 8 | Readout electronics | 0.3 | N | 1 | 1 | 1 | 0.3 | 0.3 | ∞ |
| 9 | Response time | 0.8 | R | √3 | 1 | 1 | 0.5 | 0.5 | ∞ |
| 10 | Integration time | 2.6 | R | √3 | 1 | 1 | 1.5 | 1.5 | ∞ |
| 11 | Ambient noise | 3.0 | R | √3 | 1 | 1 | 1.7 | 1.7 | ∞ |
| 12 | Ambient reflections | 3.0 | R | √3 | 1 | 1 | 1.7 | 1.7 | ∞ |
| 13 | Probe positioner mech. restrictions | 0.4 | R | √3 | 1 | 1 | 0.2 | 0.2 | ∞ |
| 14 | Probe positioning with respect to phantom shell | 2.9 | R | √3 | 1 | 1 | 1.7 | 1.7 | ∞ |
| 15 | Max.SAR evaluation | 1.0 | R | √3 | 1 | 1 | 0.6 | 0.6 | ∞ |

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| **Test sample related** | | | | | | | | | |
| 16 | Device positioning | 3.8 | N | 1 | 1 | 1 | 3.8 | 3.8 | 99 |
| 17 | Device holder | 5.1 | N | 1 | 1 | 1 | 5.1 | 5.1 | 5 |
| 18 | Drift of output power | 5.0 | R | $\sqrt{3}$ | 1 | 1 | 2.9 | 2.9 | ∞ |
| **Phantom and set-up** | | | | | | | | | |
| 19 | Phantom uncertainty | 4.0 | R | $\sqrt{3}$ | 1 | 1 | 2.3 | 2.3 | ∞ |
| 20 | Liquid conductivity (target) | 5.0 | R | $\sqrt{3}$ | 0.64 | 0.43 | 1.8 | 1.2 | ∞ |
| 21 | Liquid conductivity (meas) | 2.5 | N | 1 | 0.64 | 0.43 | 1.6 | 1.2 | ∞ |
| 22 | Liquid Permittivity (target) | 5.0 | R | $\sqrt{3}$ | 0.6 | 0.49 | 1.7 | 1.5 | ∞ |
| 23 | Liquid Permittivity (meas) | 2.5 | N | 1 | 0.6 | 0.49 | 1.5 | 1.2 | ∞ |
| **Combined standard** | | | RSS | $U_C = \sqrt{\sum_{i=1}^{n} C_i^2 U_i^2}$ | | | 11.4% | 11.3% | 236 |
| **Expanded uncertainty(P=95%)** | | $U = k U_C$ ; k=2 | | | | | **22.8%** | **22.6%** | |

# Appendix A. EUT Photos and Test Setup Photos

| | |
|---|---|
| | |
| Front Side (0mm) | Back Side (0mm) |
| | |
| Right Side (0mm) | Left Side (0mm) |
| | |
| Top Side (0mm) | Bottom Side (0mm) |

# Appendix B. Plots of SAR System Check

## 750MHz System Check

Date: 05/14/2024

**DUT: Dipole 750 MHz; Type: D750V3; Serial: 1194**

Communication System: CW; Frequency: 750 MHz; Duty Cycle: 1:1

Medium parameters used (interpolated): f = 750 MHz; σ = 0.912 S/m; $\varepsilon_r$ = 41728; ρ = 1000 kg/m$^3$

Phantom section: Flat Section

**DASY5 Configuration:**

- •Probe: EX3DV4 – SN7380; ConvF(10.02, 10.02, 10.02); Calibrated: June 21, 2023;
- •Sensor-Surface: 4mm (Mechanical Surface Detection)
- •Electronics: DAE3 Sn428; Calibrated: Aug.30,2023;
- •Phantom: SAM 1; Type: SAM;
- •Measurement SW: DASY52, Version 52.8 (2); SEMCAD X Version 14.6.10 (7164)

**Area Scan (61x61x1):** Interpolated grid: dx=1.500 mm, dy=1.500 mm

Maximum value of SAR (interpolated) = 3.61 W/kg

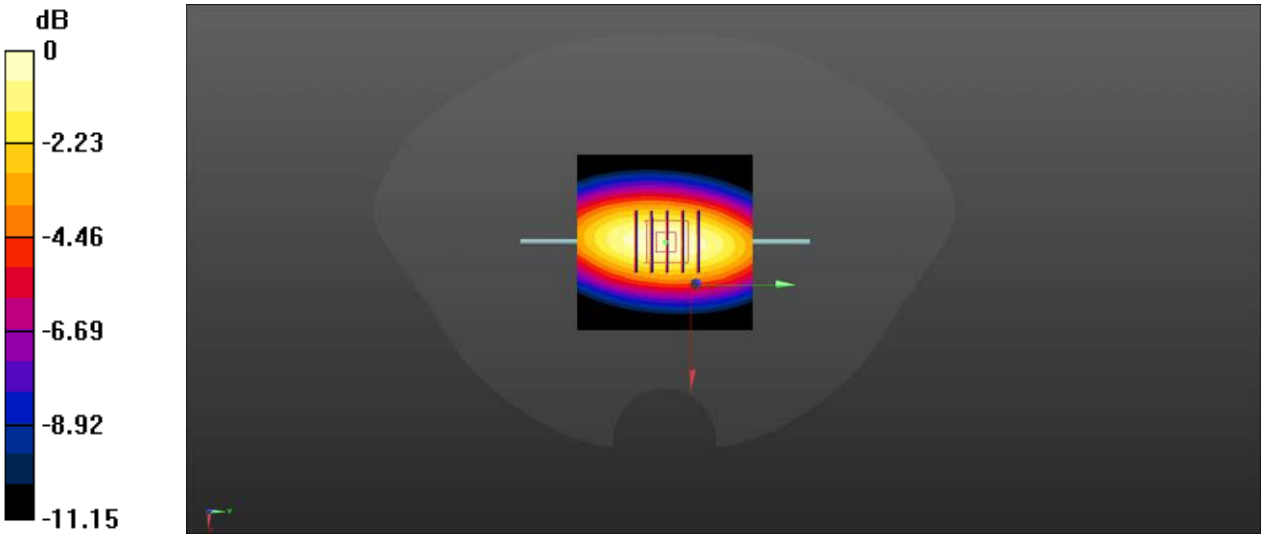
**Zoom Scan (5x5x7)/Cube 0:** Measurement grid: dx=8mm, dy=8mm, dz=5mm

Reference Value = 59.96 V/m; Power Drift = -0.05 dB

Peak SAR (extrapolated) = 4.15 W/kg

**SAR(1 g) = 2.09 W/kg; SAR(10 g) = 1.47 W/kg**

Maximum value of SAR (measured) = 3.46 W/kg




0 dB = 3.46 W/kg

System Performance Check 750MHz 250mW

## 835MHz System Check

Date: 05/15/2024

**DUT: Dipole 835 MHz; Type: D835V2; Serial: 484**

Communication System: CW; Frequency: 835 MHz;Duty Cycle: 1:1

Medium parameters used (interpolated): f = 835 MHz; σ = 0.875 S/m; $\varepsilon_r$ = 40.591; ρ = 1000 kg/m$^3$

Phantom section: Flat Section

**DASY5 Configuration:**

- •Probe: EX3DV4 – SN7380; ConvF(9.62, 9.62, 9.62); Calibrated: June 21, 2023;
- •Sensor-Surface: 4mm (Mechanical Surface Detection)
- •Electronics: DAE3 Sn428; Calibrated: Aug.30,2023;
- •Phantom: SAM 1; Type: SAM;
- •Measurement SW: DASY52, Version 52.8 (2); SEMCAD X Version 14.6.10 (7164)

**Area Scan (61x61x1):** Interpolated grid: dx=1.500 mm, dy=1.500 mm

Maximum value of SAR (interpolated) = 3.47 W/kg

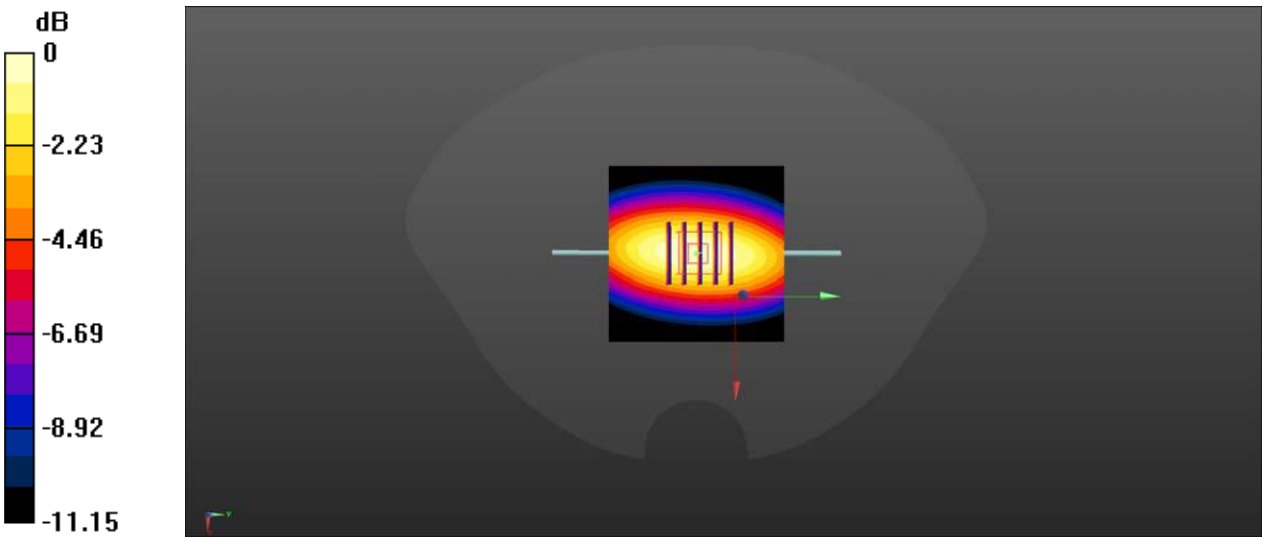
**Zoom Scan (5x5x7)/Cube 0:** Measurement grid: dx=8mm, dy=8mm, dz=5mm

Reference Value = 61.03 V/m; Power Drift = -0.10 dB

Peak SAR (extrapolated) = 5.12 W/kg

**SAR(1 g) = 2.34 W/kg; SAR(10 g) = 1.57 W/kg**

Maximum value of SAR (measured) = 4.31 W/kg




0 dB = 4.31 W/kg

System Performance Check 835MHz 250mW

## 1750 MHz System Check

Date: 05/16/2024

**DUT: Dipole 1800 MHz; Type: D1800V2; Serial: 2d158**

Communication System: CW; Frequency: 1750 MHz;Duty Cycle: 1:1

Medium parameters used (interpolated): f = 1750 MHz; $\sigma$ = 1.355 S/m; $\varepsilon_r$ = 38.949; $\rho$ = 1000 kg/m$^3$

Phantom section: Flat Section

**DASY5 Configuration:**

- •Probe: EX3DV4 – SN7380; ConvF(8.35, 8.35, 8.35); Calibrated: June 21, 2023;
- •Sensor-Surface: 4mm (Mechanical Surface Detection)
- •Electronics: DAE3 Sn428; Calibrated: Aug.30,2023;
- •Phantom: SAM 1; Type: SAM;
- •Measurement SW: DASY52, Version 52.8 (2); SEMCAD X Version 14.6.10 (7164)

**Area Scan (61x61x1):** Interpolated grid: dx=1.500 mm, dy=1.500 mm

Maximum value of SAR (interpolated) = 14.5 W/kg

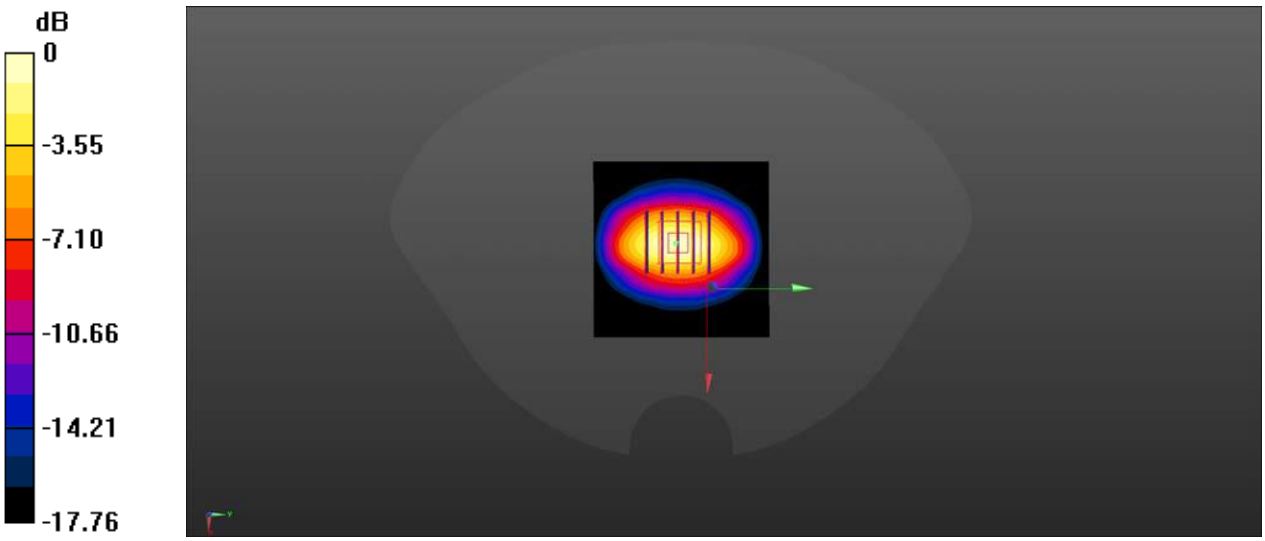
**Zoom Scan (5x5x7)/Cube 0:** Measurement grid: dx=8mm, dy=8mm, dz=5mm

Reference Value = 90.77 V/m; Power Drift = -0.11 dB

Peak SAR (extrapolated) = 17.7 W/kg

**SAR(1 g) = 9.47 W/kg; SAR(10 g) = 4.82 W/kg**

Maximum value of SAR (measured) = 13.82 W/kg




0 dB = 13.82 W/kg

System Performance Check 1750MHz 250mW

## 1900MHz System Check

Date: 05/17/2024

**DUT: Dipole 1900 MHz; Type: D1900V2; Serial: 5d002**

Communication System: CW; Frequency: 1900 MHz;Duty Cycle: 1:1

Medium parameters used (interpolated): f = 1900 MHz; σ = 1.429 S/m; εr =38.832; ρ = 1000 kg/m3

Phantom section: Flat Section

**DASY5 Configuration:**

- •Probe: EX3DV4 – SN7380; ConvF(8.05, 8.05, 8.05); Calibrated: June 21, 2023;
- •Sensor-Surface: 4mm (Mechanical Surface Detection)
- •Electronics: DAE3 Sn428; Calibrated: Aug.30,2023;
- •Phantom: SAM 1; Type: SAM;
- •Measurement SW: DASY52, Version 52.8 (2); SEMCAD X Version 14.6.10 (7164)

**Area Scan (61x61x1):** Interpolated grid: dx=1.500 mm, dy=1.500 mm

Maximum value of SAR (interpolated) = 18.6 W/kg

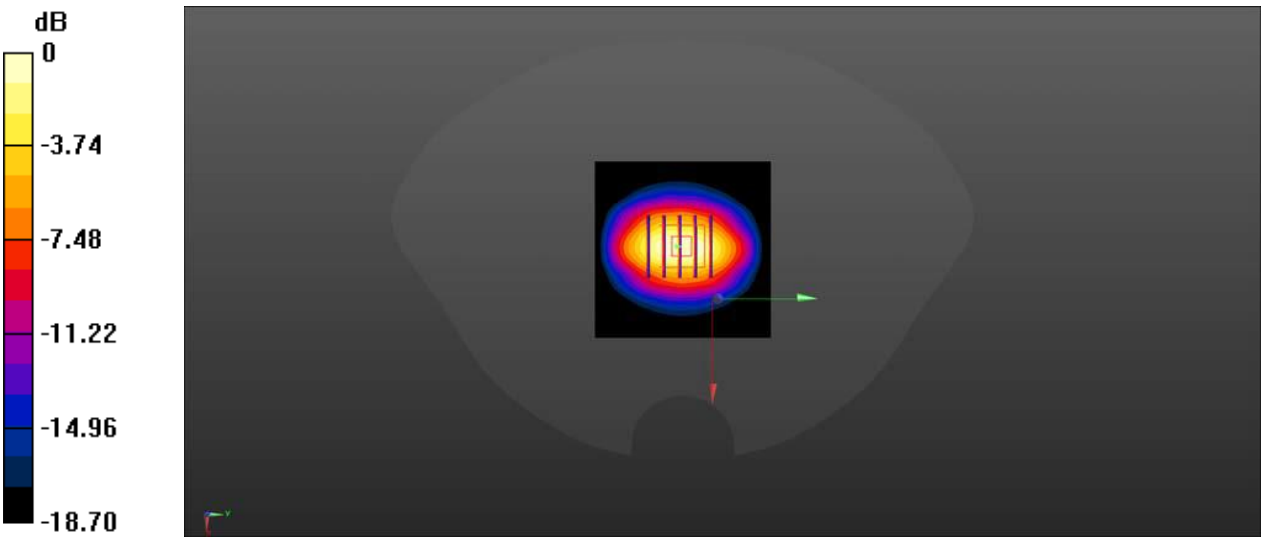
**Zoom Scan (5x5x7)/Cube 0:** Measurement grid: dx=8mm, dy=8mm, dz=5mm

Reference Value = 100.5 V/m; Power Drift = -0.19 dB

Peak SAR (extrapolated) = 23.0 W/kg

**SAR(1 g) = 9.98 W/kg; SAR(10 g) = 5.45 W/kg**

Maximum value of SAR (measured) = 17.9 W/kg




0 dB = 17.9 W/kg

System Performance Check 1900MHz 250mW

## 2450MHz System Check

Date: 05/20/2024

**DUT: Dipole 2450 MHz; Type: D2450V2; Serial: 745**

Date: 05/17/2024

Communication System: CW; Frequency: 2450 MHz;Duty Cycle: 1:1

Medium parameters used (interpolated): f = 2450 MHz; σ = 1.787 S/m; εr = 38.561; ρ = 1000 kg/m3

Phantom section: Flat Section

**DASY5 Configuration:**

- •Probe: EX3DV4 – SN7380; ConvF(7.50, 7.50, 7.50); Calibrated: June 21, 2023;
- •Sensor-Surface: 4mm (Mechanical Surface Detection)
- •Electronics: DAE3 Sn428; Calibrated: Aug.30,2023;
- •Phantom: SAM 1; Type: SAM;
- •Measurement SW: DASY52, Version 52.8 (2); SEMCAD X Version 14.6.10 (7164)

**Area Scan (61x61x1):** Interpolated grid: dx=1.200 mm, dy=1.200 mm

Maximum value of SAR (interpolated) = 19.1 W/kg

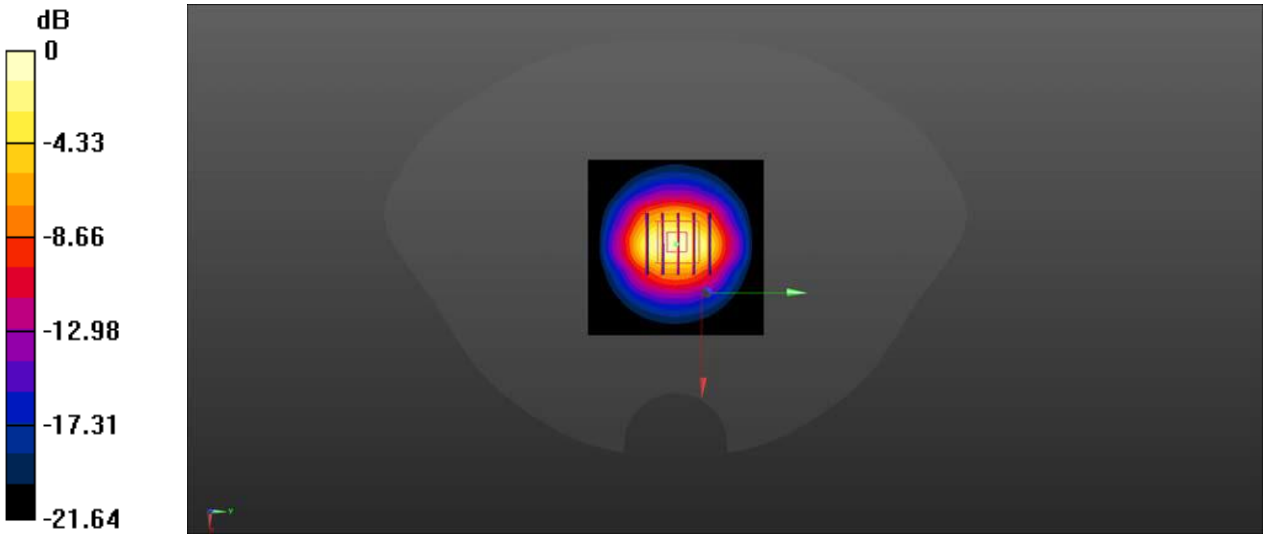
**Zoom Scan (5x5x7)/Cube 0:** Measurement grid: dx=8mm, dy=8mm, dz=5mm

Reference Value = 101.24 V/m; Power Drift = 0.03 dB

Peak SAR (extrapolated) = 30.02 W/kg

**SAR(1 g) = 12.97 W/kg; SAR(10 g) = 6.12 W/kg**

Maximum value of SAR (measured) = 22.7 W/kg




0 dB = 22.7 W/kg

System Performance Check 2450MHz 250mW

## 2600MHz System Check

Date: 05/18/2024

**DUT: Dipole 2600 MHz; Type: D2600V2; Serial: 1073**

Communication System: CW; Frequency: 2600 MHz;Duty Cycle: 1:1

Medium parameters used (interpolated): f = 2600 MHz; σ = 1.932 S/m; εr = 38.282; ρ = 1000 kg/m3

Phantom section: Flat Section

**DASY5 Configuration:**

- •Probe: EX3DV4 – SN7380; ConvF(7.35, 7.35, 7.35); Calibrated: June 21, 2023;
- •Sensor-Surface: 4mm (Mechanical Surface Detection)
- •Electronics: DAE3 Sn428; Calibrated: Aug.30,2023;
- •Phantom: SAM 1; Type: SAM;
- •Measurement SW: DASY52, Version 52.8 (2); SEMCAD X Version 14.6.10 (7164)

**Area Scan (71x81x1):** Interpolated grid: dx=1.500 mm, dy=1.500 mm

Maximum value of SAR (interpolated) = 11.0 W/kg

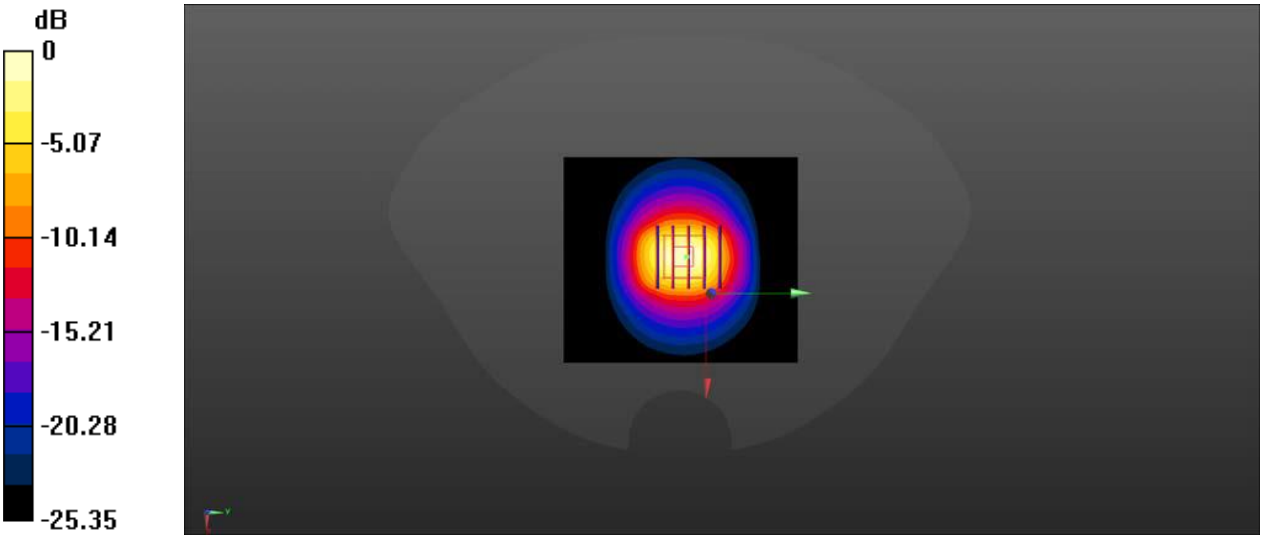
**Zoom Scan (5x5x7)/Cube 0:** Measurement grid: dx=8mm, dy=8mm, dz=5mm

Reference Value = 71.36 V/m; Power Drift = 0.11 dB

Peak SAR (extrapolated) = 21.57 W/kg

**SAR(1 g) = 13.88 W/kg; SAR(10 g) = 6.25 W/kg**

Maximum value of SAR (measured) = 10.6 W/kg




0 dB = 10.6W/kg

System Performance Check 2600MHz 250mW

## 5250MHz System Check

Date: 05/21/2024

**DUT: Dipole 5GHz; Type: D5GHzV2; Serial: 1301**

Communication System: CW; Frequency: 5250 MHz;Duty Cycle: 1:1

Medium parameters used (interpolated): f = 5250 MHz; σ = 4.616 S/m; εr = 34.916; ρ = 1000 kg/m3

Phantom section: Flat Section

**DASY5 Configuration:**

- •Probe: EX3DV4 – SN7380; ConvF(5.45, 5.45, 5.45); Calibrated: June 21, 2023;
- •Sensor-Surface: 4mm (Mechanical Surface Detection)
- •Electronics: DAE3 Sn428; Calibrated: Aug.30,2023;
- •Phantom: SAM 1; Type: SAM;
- •Measurement SW: DASY52, Version 52.8 (2); SEMCAD X Version 14.6.10 (7164)

**Area Scan (101x101x1):** Interpolated grid: dx=1.000 mm, dy=1.000 mm

Maximum value of SAR (interpolated) = 7.85 W/kg

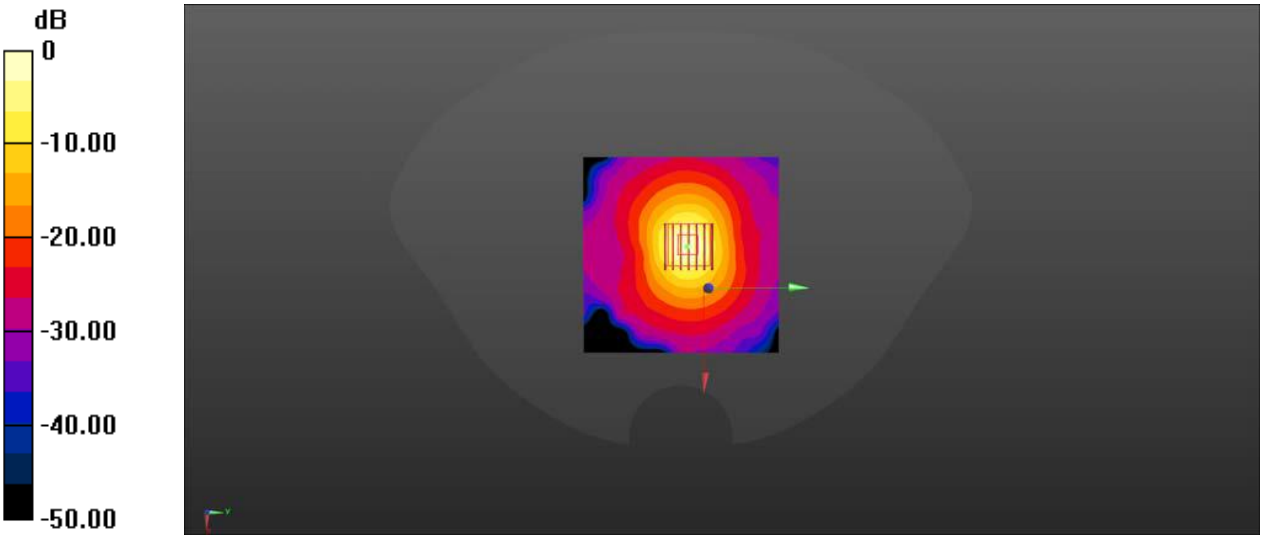
**Zoom Scan (7x7x12)/Cube 0:** Measurement grid: dx=4mm, dy=4mm, dz=2mm

Reference Value = 25.65 V/m; Power Drift = 0.09 dB

Peak SAR (extrapolated) = 17.23 W/kg

**SAR(1 g) = 7.64 W/kg; SAR(10 g) = 2.15 W/kg**

Maximum value of SAR (measured) = 8.45 W/kg




0 dB = 8.45 W/kg

System Performance Check 5250MHz 100mW

## 5600MHz System Check

Date: 05/21/2024

**DUT: Dipole 5GHz; Type: D5GHzV2; Serial: 1301**

Communication System: CW; Frequency: 5600 MHz;Duty Cycle: 1:1

Medium parameters used (interpolated): f = 5600 MHz; σ = 5.182 S/m; εr = 35.805; ρ = 1000 kg/m3

Phantom section: Flat Section

**DASY5 Configuration:**

- •Probe: EX3DV4 – SN7380; ConvF(4.86, 4.86, 4.86); Calibrated: June 21, 2023;
- •Sensor-Surface: 4mm (Mechanical Surface Detection)
- •Electronics: DAE3 Sn428; Calibrated: Aug.30,2023;
- •Phantom: SAM 1; Type: SAM;
- •Measurement SW: DASY52, Version 52.8 (2); SEMCAD X Version 14.6.10 (7164)

**Area Scan (101x101x1):** Interpolated grid: dx=1.000 mm, dy=1.000 mm

Maximum value of SAR (interpolated) = 23.6 W/kg

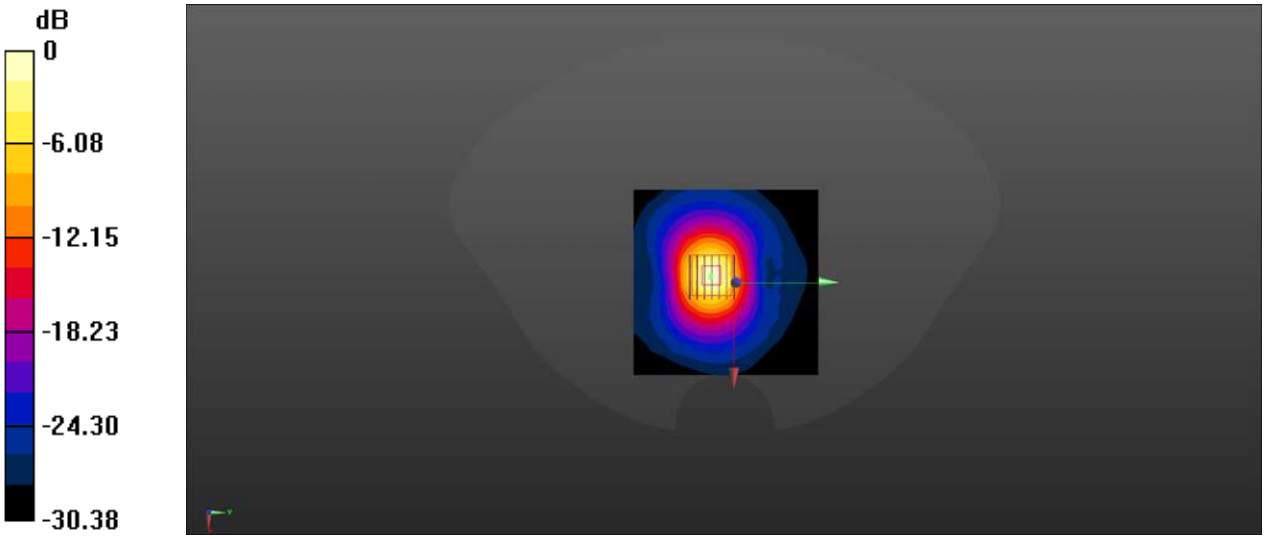
**Zoom Scan (7x7x13)/Cube 0:** Measurement grid: dx=4mm, dy=4mm, dz=2mm

Reference Value = 33.65 V/m; Power Drift = -0.03 dB

Peak SAR (extrapolated) = 44.1 W/kg

**SAR(1 g) = 7.88 W/kg; SAR(10 g) = 2.33 W/kg**

Maximum value of SAR (measured) = 23.3 W/kg




0 dB = 23.3 W/kg

System Performance Check 5600MHz 100mW

## 5750MHz System Check

Date: 05/21/2024

**DUT: Dipole 5GHz; Type: D5GHzV2; Serial: 1301**

Communication System: CW; Frequency: 5750 MHz;Duty Cycle: 1:1

Medium parameters used (interpolated): f = 5750 MHz; σ = 5.169 S/m; εr = 36.115; ρ = 1000 kg/m3

Phantom section: Flat Section

**DASY5 Configuration:**

- •Probe: EX3DV4 – SN7380; ConvF(4.96, 4.96, 4.96); Calibrated: June 21, 2023;
- •Sensor-Surface: 4mm (Mechanical Surface Detection)
- •Electronics: DAE3 Sn428; Calibrated: Aug.30,2023;
- •Phantom: SAM 1; Type: SAM;
- •Measurement SW: DASY52, Version 52.8 (2); SEMCAD X Version 14.6.10 (7164)

**Area Scan (101x101x1):** Interpolated grid: dx=1.000 mm, dy=1.000 mm

Maximum value of SAR (interpolated) = 11.1W/kg

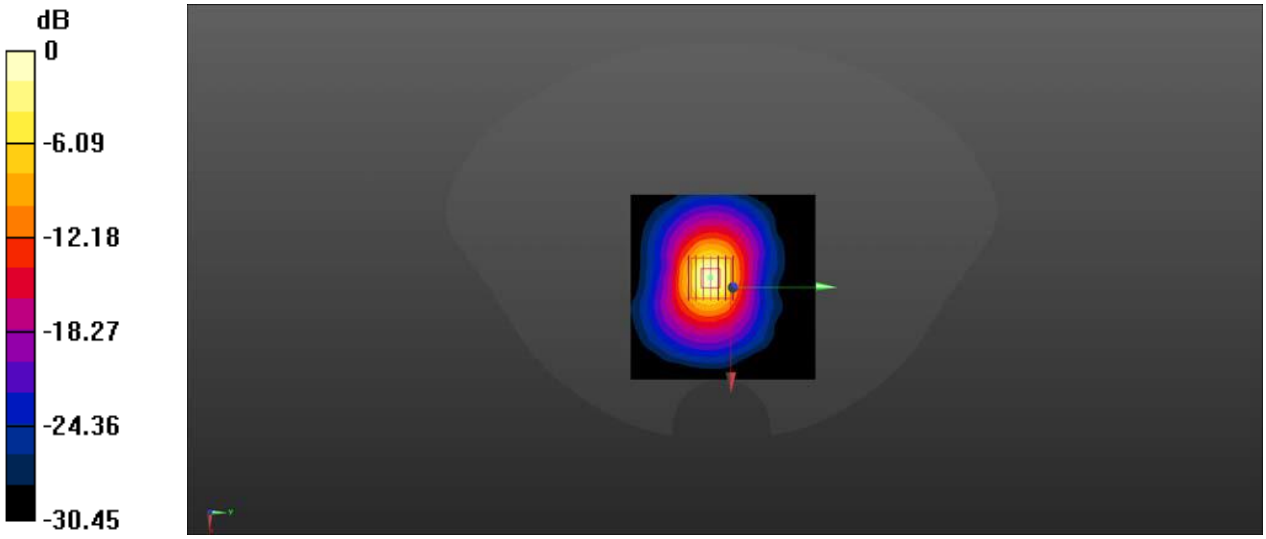
**Zoom Scan (7x7x13)/Cube 0:** Measurement grid: dx=4mm, dy=4mm, dz=2mm

Reference Value = 23.41 V/m; Power Drift = 0.01 dB

Peak SAR (extrapolated) = 24.54 W/kg

**SAR(1 g) = 7.61 W/kg; SAR(10 g) = 2.12 W/kg**

Maximum value of SAR (measured) = 12.5 W/kg




0 dB = 12.5 W/kg

System Performance Check 5750MHz 100mW

# Appendix C. Plots of SAR Test Data

**#1**

Date: 05/15/2024

**GPRS850_4Tx slots _Back Side_CH190_10mm**

Communication System: UID 0, GSM (0); Frequency: 836.6 MHz;Duty Cycle: 1:1

Medium parameters used (interpolated): f = 836.6 MHz; $\sigma$ = 0.915 S/m; $\varepsilon_r$ = 42.264; $\rho$ = 1000 kg/m$^3$

Phantom section: Flat Section

**DASY5 Configuration:**

- Probe: EX3DV4 - SN7380; ConvF(9.62, 9.62, 9.62); Calibrated: June 21, 2023
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn428; Calibrated: Aug.30,2023;
- Phantom: SAM 1; Type: SAM;
- Measurement SW: DASY52, Version 52.8 (2); SEMCAD X Version 14.6.10 (7164)

**Area Scan (71x121x1):** Interpolated grid: dx=1.500 mm, dy=1.500 mm

Maximum value of SAR (interpolated) = 0.731 W/Kg

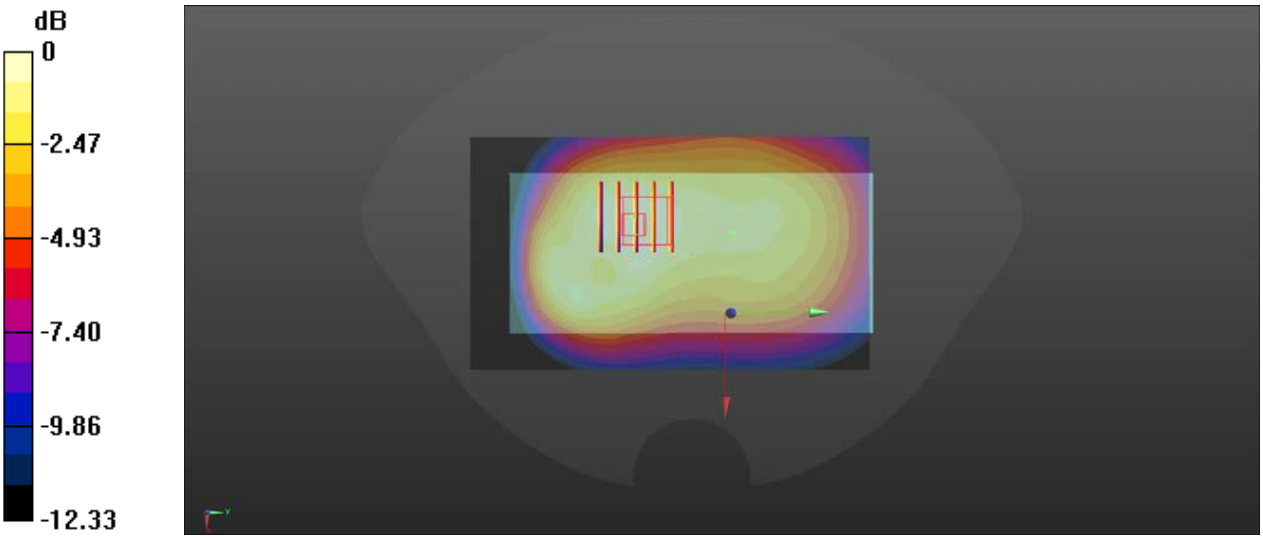
**Zoom Scan (5x5x7)/Cube 0:** Measurement grid: dx=8mm, dy=8mm, dz=5mm

Reference Value = 22.47 V/m; Power Drift = -0.11 dB

Peak SAR (extrapolated) = 0.796 W/kg

**SAR(1 g) = 0.601 W/Kg; SAR(10 g) = 0.438 W/Kg**

Maximum value of SAR (measured) = 0.705 W/Kg



**#1.**

Date: 05/17/2024

**GPRS 1900_4Tx slots_Back Side_10mm_CH661**

Communication System: UID 0, GSM (0); Frequency: 1880.0 MHz;Duty Cycle: 1:1

Medium parameters used: f = 1880.0 MHz; σ = 1.429 S/m; εr =39.104; ρ = 1000 kg/m3

Phantom section: Flat Section

**DASY5 Configuration:**

- Probe: EX3DV4 - SN7380; ConvF(8.05, 8.05, 8.05); Calibrated: June 21, 2023
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn428; Calibrated: Aug.30,2023;
- Phantom: SAM 1; Type: SAM;
- Measurement SW: DASY52, Version 52.8 (2); SEMCAD X Version 14.6.10 (7164)

**Area Scan (71x91x1):** Interpolated grid: dx=1.500 mm, dy=1.500 mm

Maximum value of SAR (interpolated) = 0.584 W/Kg

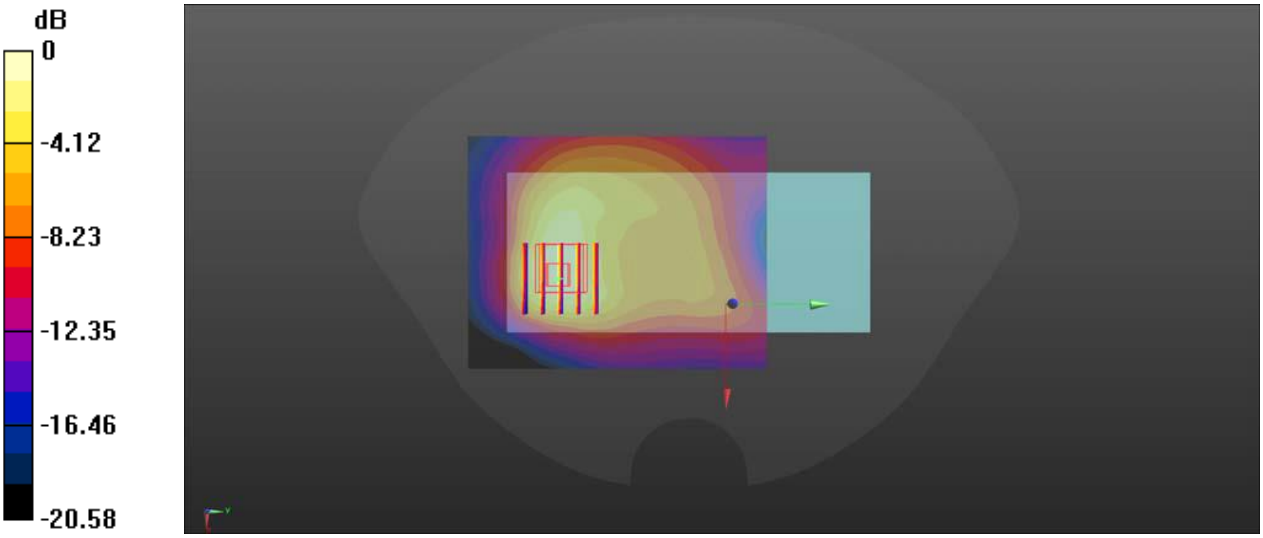
**Zoom Scan (5x5x7)/Cube 0:** Measurement grid: dx=8mm, dy=8mm, dz=5mm

Reference Value = 10.85 V/m; Power Drift = 0.11 dB

Peak SAR (extrapolated) = 0.798 W/kg

**SAR(1 g) = 0.369 W/Kg; SAR(10 g) = 0.211 W/Kg**

Maximum value of SAR (measured) = 0.541 W/Kg



**#2.**

Date: 05/17/2024

**WCDMA II_RMC 12.2Kbps_Back Side_10mm_Ch9400**

Communication System: UID 0, Generic WCDMA (0); Frequency: 1880.0 MHz; Duty Cycle: 1:1

Medium parameters used (interpolated): f = 1880.0 MHz; σ = 1.426 S/m; $\varepsilon_r$ = 39.504; ρ = 1000 kg/m$^3$

Phantom section: Flat Section

**DASY5 Configuration:**

- Probe: EX3DV4 - SN7380; ConvF(8.05, 8.05, 8.05); Calibrated: June 21, 2023
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn428; Calibrated: Aug.30,2023;
- Phantom: SAM 1; Type: SAM;
- Measurement SW: DASY52, Version 52.8 (2); SEMCAD X Version 14.6.10 (7164)

**Area Scan (71x91x1):** Interpolated grid: dx=1.500 mm, dy=1.500 mm

Maximum value of SAR (interpolated) = 0.601 W/Kg

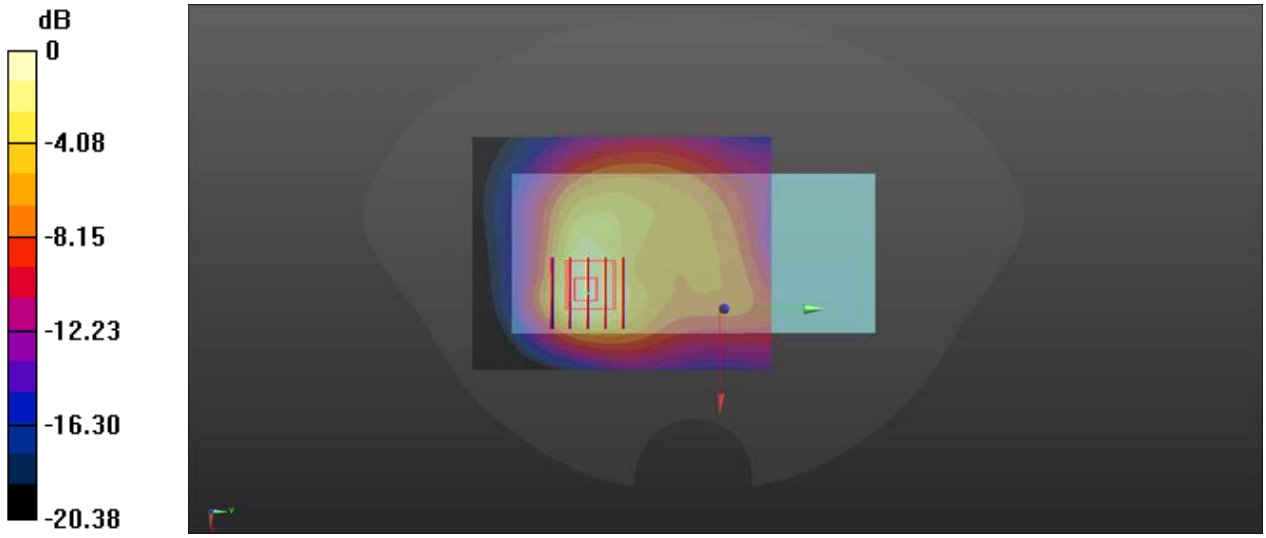
**Zoom Scan (5x5x7)/Cube 0**: Measurement grid: dx=8mm, dy=8mm, dz=5mm

Reference Value = 9.421 V/m; Power Drift = 0.05 dB

Peak SAR (extrapolated) = 0.738 W/kg

**SAR(1 g) = 0.402 W/Kg; SAR(10 g) = 0.221 W/Kg**

Maximum value of SAR (measured) = 0.548 W/Kg



**#3.**

Date: 05/15/2024

**WCDMA V_RMC 12.2Kbps_Back Side_10mm_Ch4233**

Communication System: UID 0, Generic WCDMA (0); Frequency: 846.6 MHz; Duty Cycle: 1:1

Medium parameters used (interpolated): f = 846.6 MHz; σ = 0.887 S/m; εr = 42.247; ρ = 1000 kg/m$^3$

Phantom section: Flat Section

**DASY5 Configuration:**

- Probe: EX3DV4 - SN7380; ConvF(9.62, 9.62, 9.62); Calibrated: June 21, 2023
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn428; Calibrated: Aug.30,2023;
- Phantom: SAM 1; Type: SAM;
- Measurement SW: DASY52, Version 52.8 (2); SEMCAD X Version 14.6.10 (7164)

**Area Scan (71x91x1):** Interpolated grid: dx=1.500 mm, dy=1.500 mm

Maximum value of SAR (interpolated) = 0.401 W/Kg

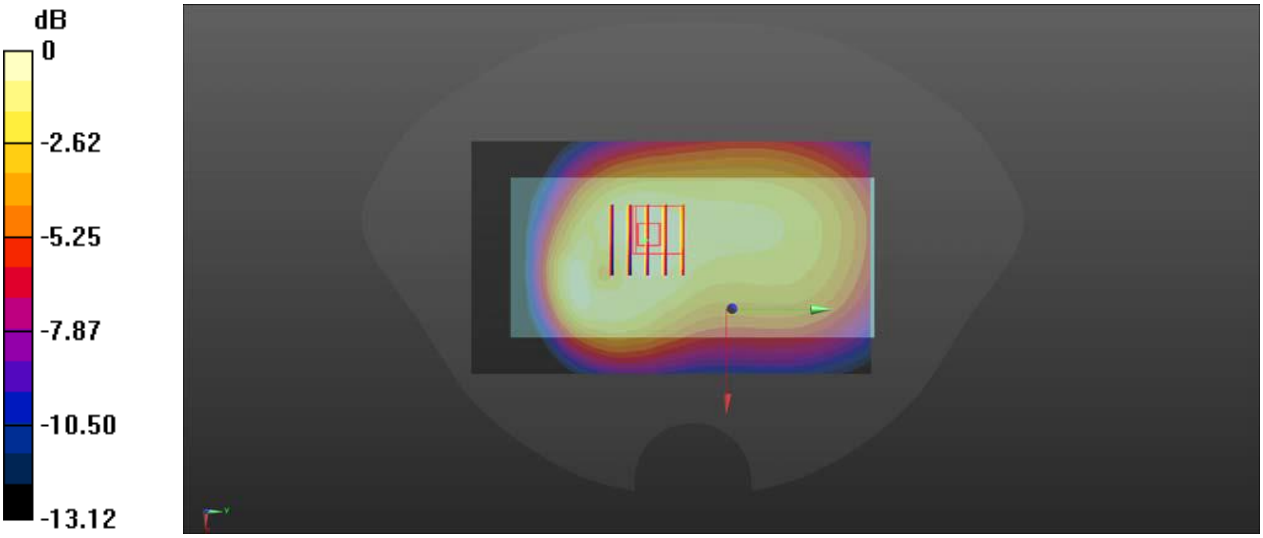
**Zoom Scan (5x5x7)/Cube 0**: Measurement grid: dx=8mm, dy=8mm, dz=5mm

Reference Value = 17.56 V/m; Power Drift = -0.07 dB

Peak SAR (extrapolated) = 0.451 W/Kg

**SAR(1 g) = 0.354 W/Kg; SAR(10 g) = 0.232 W/Kg**

Maximum value of SAR (measured) = 0.396 W/Kg



**#4.**

Date: 05/15/2024

**LTE Band 5_10M_QPSK_1RB#49_Back Side_10mm_Ch20600**

Communication System: UID 0, Generic LTE (0); Frequency: 844.0 MHz; Duty Cycle: 1:1

Medium parameters used (interpolated): f = 844.0 MHz; σ = 0.889 S/m; εr = 40.496; ρ = 1000 kg/m$^3$

Phantom section: Flat Section

**DASY5 Configuration:**

- Probe: EX3DV4 - SN7380; ConvF(9.62, 9.62, 9.62); Calibrated: June 21, 2023
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn428; Calibrated: Aug.30,2023;
- Phantom: SAM 1; Type: SAM;
- Measurement SW: DASY52, Version 52.8 (2); SEMCAD X Version 14.6.10 (7164)

**Area Scan (71x121x1):** Interpolated grid: dx=1.500 mm, dy=1.500 mm

Maximum value of SAR (interpolated) = 0.462 W/Kg

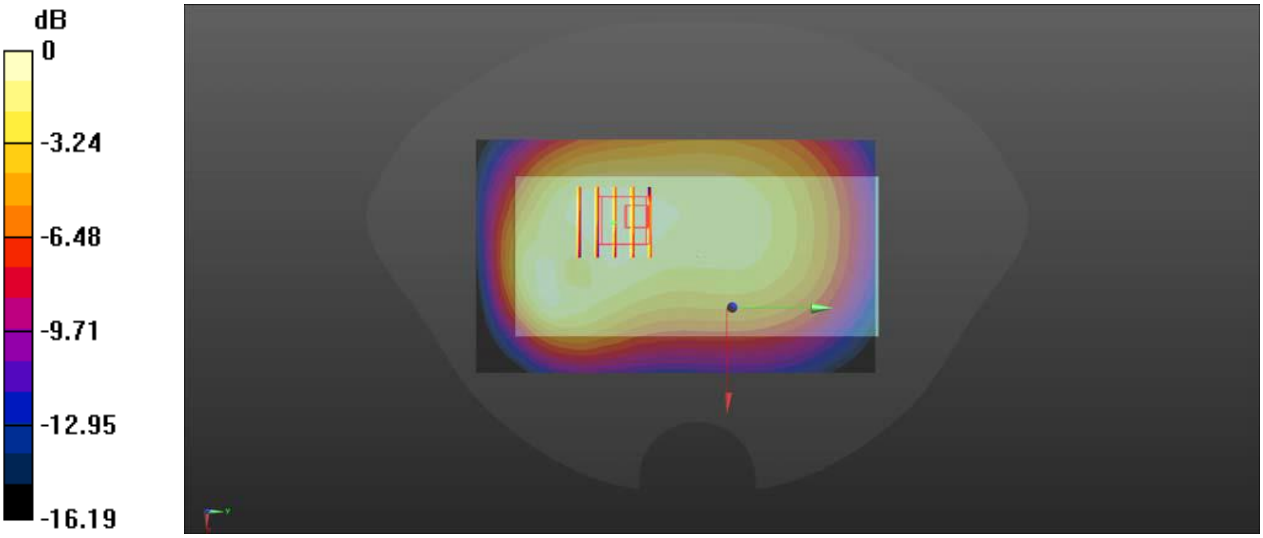
**Zoom Scan (5x5x7)/Cube 0**: Measurement grid: dx=8mm, dy=8mm, dz=5mm

Reference Value = 17.59 V/m; Power Drift = 0.11 dB

Peak SAR (extrapolated) = 0.554 W/kg

**SAR(1 g) = 0.391 W/Kg; SAR(10 g) = 0.271 W/Kg**

Maximum value of SAR (measured) = 0.435 W/Kg



**#5.**

Date: 05/18/2024

**LTE Band 7_20M_QPSK_1RB#49_Back Side_10mm_Ch21100**

Communication System: UID 0, Generic LTE (0); Frequency: 2535.0 MHz; Duty Cycle: 1:1

Medium parameters used (interpolated): f = 2535.0 MHz; σ = 1.961 S/m; εr = 39.023; ρ = 1000 kg/m$^3$

Phantom section: Flat Section

**DASY5 Configuration:**

- Probe: EX3DV4 - SN7380; ConvF(7.35, 7.35, 7.35); Calibrated: June 21, 2023
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn428; Calibrated: Aug.30,2023;
- Phantom: SAM 1; Type: SAM;
- Measurement SW: DASY52, Version 52.8 (2); SEMCAD X Version 14.6.10 (7164)

**Area Scan (81x111x1):** Interpolated grid: dx=1.200 mm, dy=1.200 mm

Maximum value of SAR (interpolated) = 0.874 W/Kg

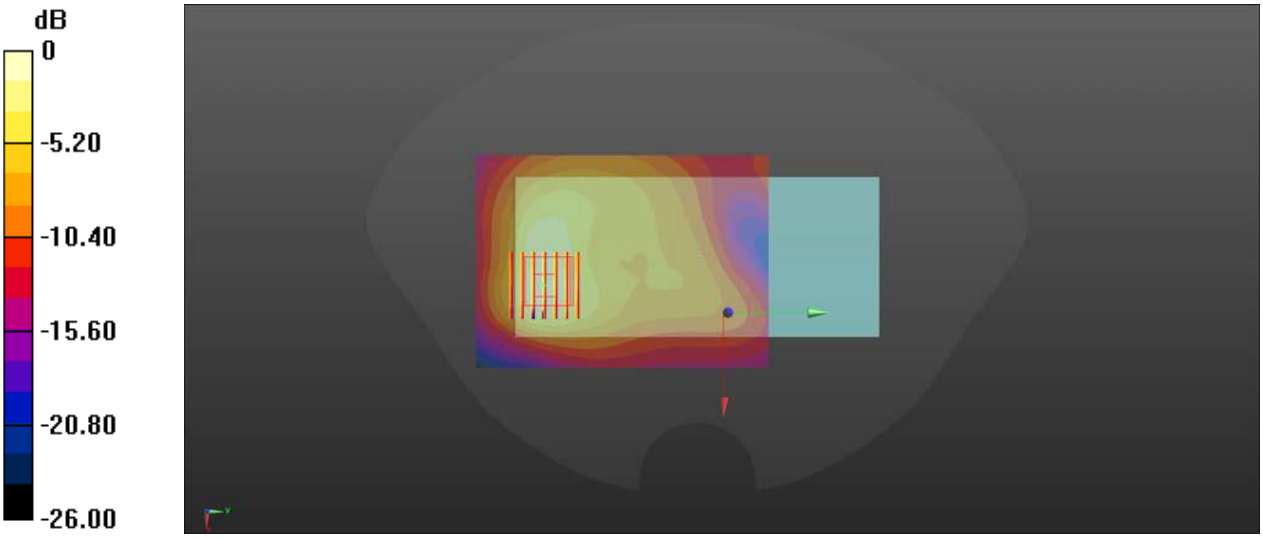
**Zoom Scan (7x7x7)/Cube 0**: Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 7.335 V/m; Power Drift = 0.11 dB

Peak SAR (extrapolated) = 1.19 W/kg

**SAR(1 g) = 0.604 W/kg; SAR(10 g) = 0.329 W/kg**

Maximum value of SAR (measured) = 0.855 W/Kg



**#6.**

Date: 05/14/2024

**LTE Band 12_20M_QPSK_1RB#49_Back Side_10mm_Ch23130**

Communication System: UID 0, Generic LTE (0); Frequency: 711.0 MHz; Duty Cycle: 1:1

Medium parameters used (interpolated): f = 711.0 MHz; σ = 0.878 S/m; εr = 41.691; ρ = 1000 kg/m$^3$

Phantom section: Flat Section

**DASY5 Configuration:**

- Probe: EX3DV4 - SN7380; ConvF(10.02, 10.02, 10.02); Calibrated: June 21, 2023
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn428; Calibrated: Aug.30,2023;
- Phantom: SAM 1; Type: SAM;
- Measurement SW: DASY52, Version 52.8 (2); SEMCAD X Version 14.6.10 (7164)

**Area Scan (71x121x1):** Interpolated grid: dx=1.500 mm, dy=1.500 mm

Maximum value of SAR (interpolated) = 0.411 W/kg

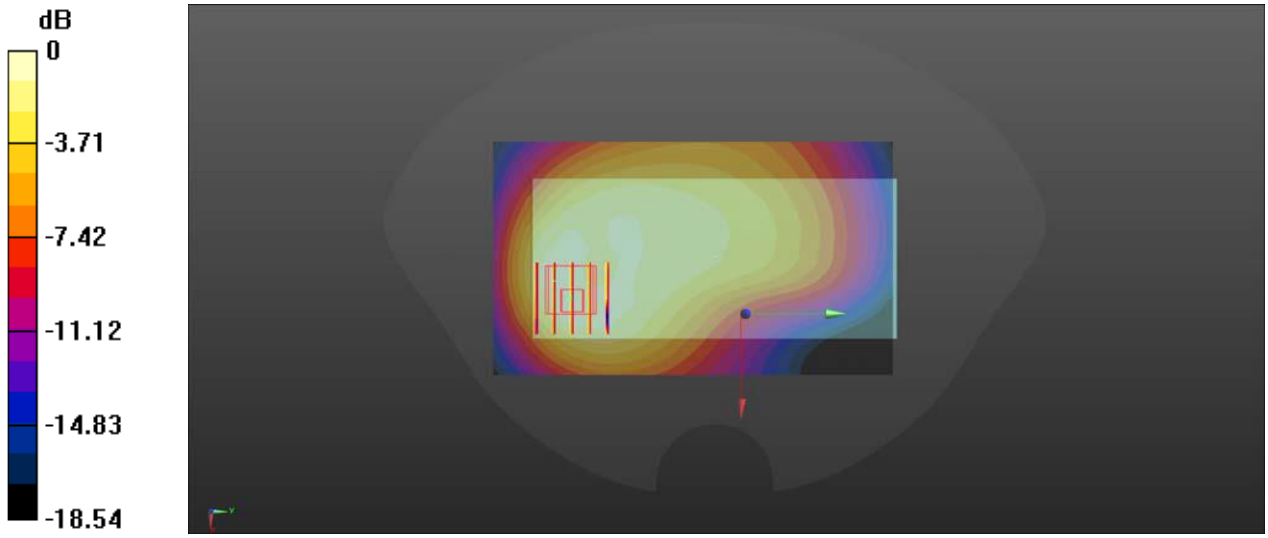
**Zoom Scan (5x5x7)/Cube 0**: Measurement grid: dx=8mm, dy=8mm, dz=5mm

Reference Value = 15.65 V/m; Power Drift = -0.10 dB

Peak SAR (extrapolated) = 1.09 W/kg

**SAR(1 g) = 0.276 W/kg; SAR(10 g) = 0.173 W/kg**

Maximum value of SAR (measured) = 0.371 W/Kg



**#7.**

Date: 05/14/2024

**LTE Band 14_10M_QPSK_1RB#25_Back Side_10mm_Ch23330**

Communication System: UID 0, Generic LTE (0); Frequency: 793.0 MHz; Duty Cycle: 1:1

Medium parameters used (interpolated): f = 793.0 MHz; σ = 0.878 S/m; εr = 41.691; ρ = 1000 kg/m$^3$

Phantom section: Flat Section

**DASY5 Configuration:**

- Probe: EX3DV4 - SN7380; ConvF(10.02, 10.02, 10.02); Calibrated: June 21, 2023
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn428; Calibrated: Aug.30,2023;
- Phantom: SAM 1; Type: SAM;
- Measurement SW: DASY52, Version 52.8 (2); SEMCAD X Version 14.6.10 (7164)

**Area Scan (71x121x1):** Interpolated grid: dx=1.500 mm, dy=1.500 mm

Maximum value of SAR (interpolated) = 0.398 W/kg

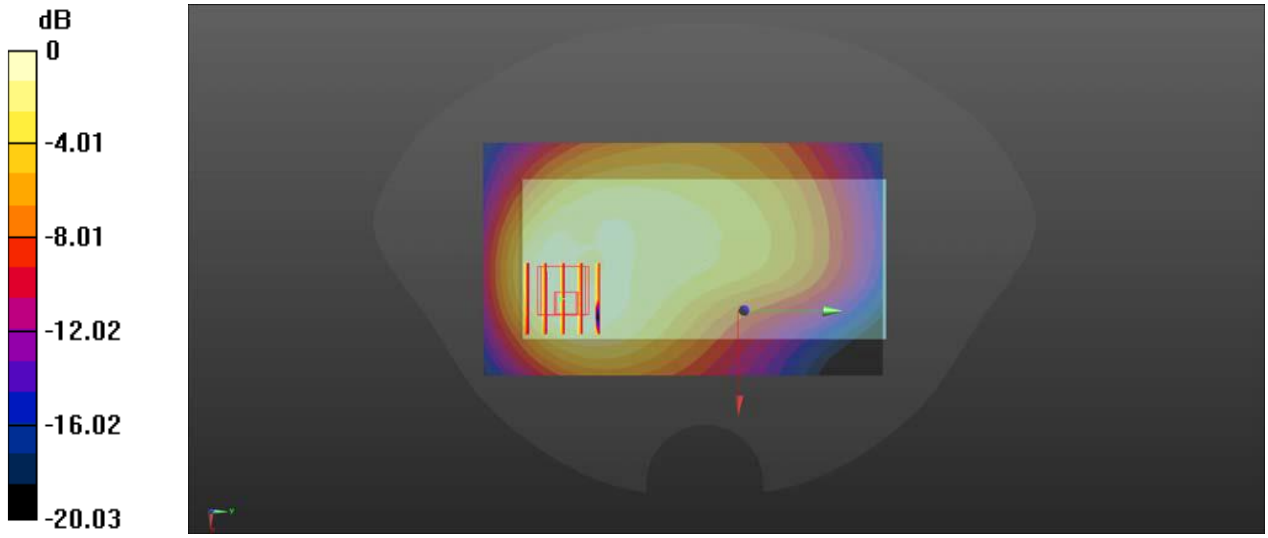
**Zoom Scan (5x5x7)/Cube 0**: Measurement grid: dx=8mm, dy=8mm, dz=5mm

Reference Value = 14.36 V/m; Power Drift = -0.04 dB

Peak SAR (extrapolated) = 0.910 W/kg

**SAR(1 g) = 0.276 W/kg; SAR(10 g) = 0.173 W/kg**

Maximum value of SAR (measured) = 0.371 W/Kg



**#8.**

Date: 05/17/2024

**LTE Band 25_20M_QPSK_1RB#49_Back Side_10mm_Ch26140**

Communication System: UID 0, Generic LTE (0); Frequency: 1860.0 MHz;Duty Cycle: 1:1

Medium parameters used (interpolated): f = 1860.0 MHz; σ = 1.391 S/m; εr = 39.392; ρ = 1000 kg/m$^3$

Phantom section: Flat Section

**DASY5 Configuration:**

- Probe: EX3DV4 - SN7380; ConvF(8.05, 8.05, 8.05); Calibrated: June 21, 2023
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn428; Calibrated: Aug.30,2023;
- Phantom: SAM 1; Type: SAM;
- Measurement SW: DASY52, Version 52.8 (2); SEMCAD X Version 14.6.10 (7164)

**Area Scan (71x91x1):** Interpolated grid: dx=1.500 mm, dy=1.500 mm

Maximum value of SAR (interpolated) = 0.641 W/Kg

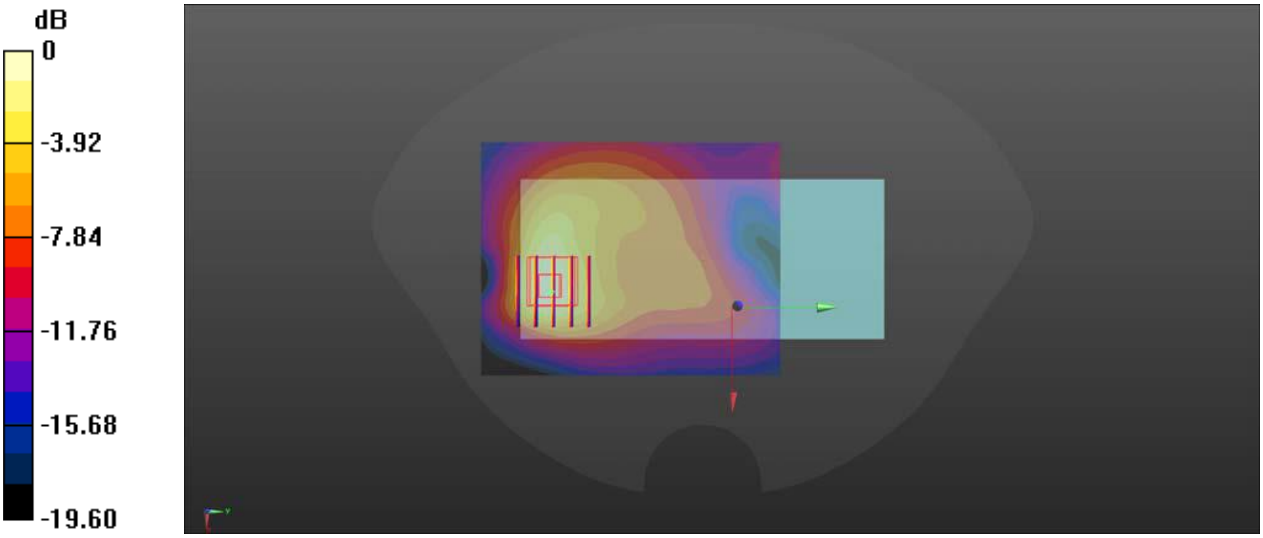
**Zoom Scan (5x5x7)/Cube 0**: Measurement grid: dx=8mm, dy=8mm, dz=5mm

Reference Value = 7.254 V/m; Power Drift = -0.09 dB

Peak SAR (extrapolated) = 0.774 W/kg

**SAR(1 g) = 0.425 W/Kg; SAR(10 g) = 0.241 W/Kg**

Maximum value of SAR (measured) = 0.614 W/Kg



**#9.**

Date: 05/15/2024

**LTE Band 26 lower band_10M_QPSK_1RB#49_Back Side_10mm_Ch26740**

Communication System: UID 0, Generic LTE (0); Frequency: 819.0 MHz; Duty Cycle: 1:1

Medium parameters used (interpolated): f = 819.0 MHz; σ = 0.886 S/m; εr = 41.685; ρ = 1000 kg/m$^3$

Phantom section: Flat Section

**DASY5 Configuration:**

- Probe: EX3DV4 - SN7380; ConvF(9.62, 9.62, 9.62); Calibrated: June 21, 2023
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn428; Calibrated: Aug.30,2023;
- Phantom: SAM 1; Type: SAM;
- Measurement SW: DASY52, Version 52.8 (2); SEMCAD X Version 14.6.10 (7164)

**Area Scan (71x91x1):** Interpolated grid: dx=1.500 mm, dy=1.500 mm

Maximum value of SAR (interpolated) = 0.504 W/Kg

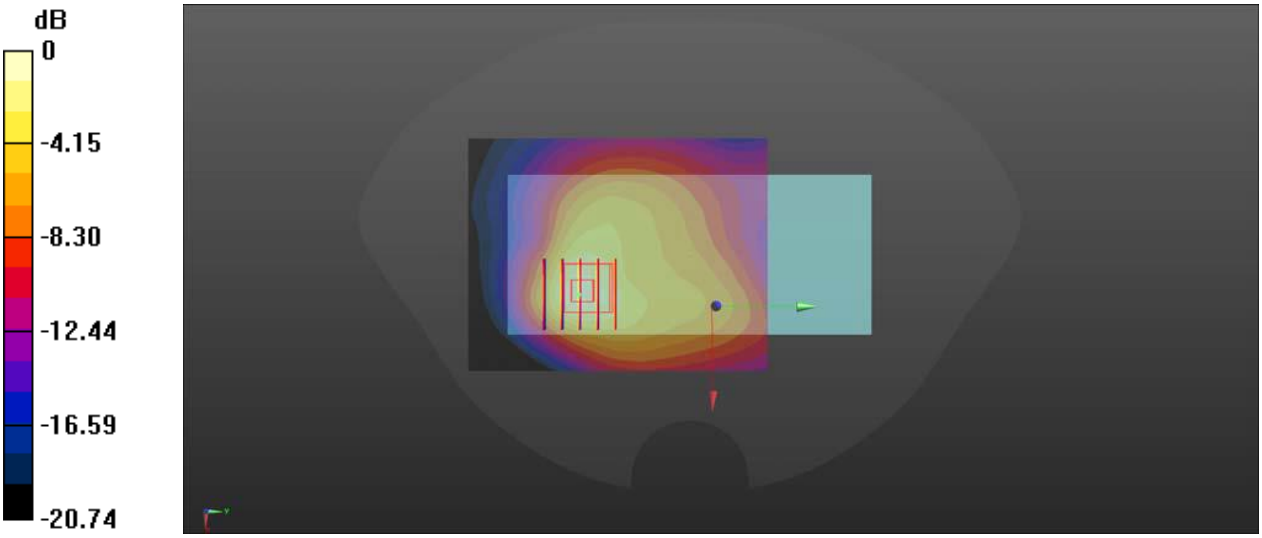
**Zoom Scan (5x5x7)/Cube 0**: Measurement grid: dx=8mm, dy=8mm, dz=5mm

Reference Value = 8.005 V/m; Power Drift = -0.07 dB

Peak SAR (extrapolated) = 0.612 W/kg

**SAR(1 g) = 0.401 W/Kg; SAR(10 g) = 0.254 W/Kg**

Maximum value of SAR (measured) = 0.485 W/Kg



**#10.**

Date: 05/15/2024

**LTE Band 26 Higher band_15M_QPSK_1RB#0_Back Side_10mm_Ch26865**

Communication System: UID 0, Generic LTE (0); Frequency: 831.5 MHz; Duty Cycle: 1:1

Medium parameters used (interpolated): f = 831.5 MHz; σ = 0.908 S/m; εr = 41.728; ρ = 1000 kg/m$^3$

Phantom section: Flat Section

**DASY5 Configuration:**

- Probe: EX3DV4 - SN7380; ConvF(9.62, 9.62, 9.62); Calibrated: June 21, 2023
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn428; Calibrated: Aug.30,2023;
- Phantom: SAM 1; Type: SAM;
- Measurement SW: DASY52, Version 52.8 (2); SEMCAD X Version 14.6.10 (7164)

**Area Scan (71x121x1):** Interpolated grid: dx=1.500 mm, dy=1.500 mm

Maximum value of SAR (interpolated) = 0.398 W/Kg

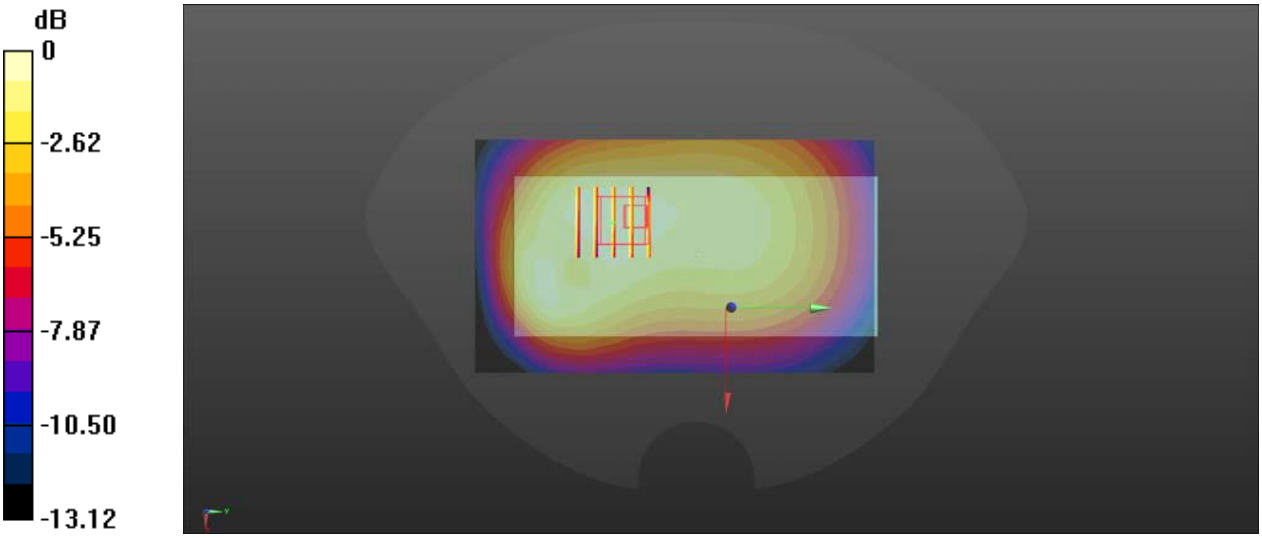
**Zoom Scan (5x5x7)/Cube 0**: Measurement grid: dx=8mm, dy=8mm, dz=5mm

Reference Value = 16.98 V/m; Power Drift = -0.04 dB

Peak SAR (extrapolated) = 0.536 W/kg

**SAR(1 g) = 0.323 W/Kg; SAR(10 g) = 0.204 W/Kg**

Maximum value of SAR (measured) = 0.414 W/Kg



## #11.

Date: 05/16/2024

**LTE Band 66_20M_QPSK_1RB#49_Back Side_10mm_Ch132072**

Communication System: UID 0, Generic LTE (0); Frequency: 1720.0 MHz; Duty Cycle: 1:1

Medium parameters used (interpolated): f = 1720.0 MHz; σ = 1.366 S/m; εr = 40.112; ρ = 1000 kg/m$^3$

Phantom section: Flat Section

**DASY5 Configuration:**

- Probe: EX3DV4 - SN7380; ConvF(8.35, 8.35, 8.35); Calibrated: June 21, 2023
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn428; Calibrated: Aug.30,2023;
- Phantom: SAM 1; Type: SAM;
- Measurement SW: DASY52, Version 52.8 (2); SEMCAD X Version 14.6.10 (7164)

**Area Scan (71x91x1):** Interpolated grid: dx=1.500 mm, dy=1.500 mm

Maximum value of SAR (interpolated) = 0.510 W/Kg

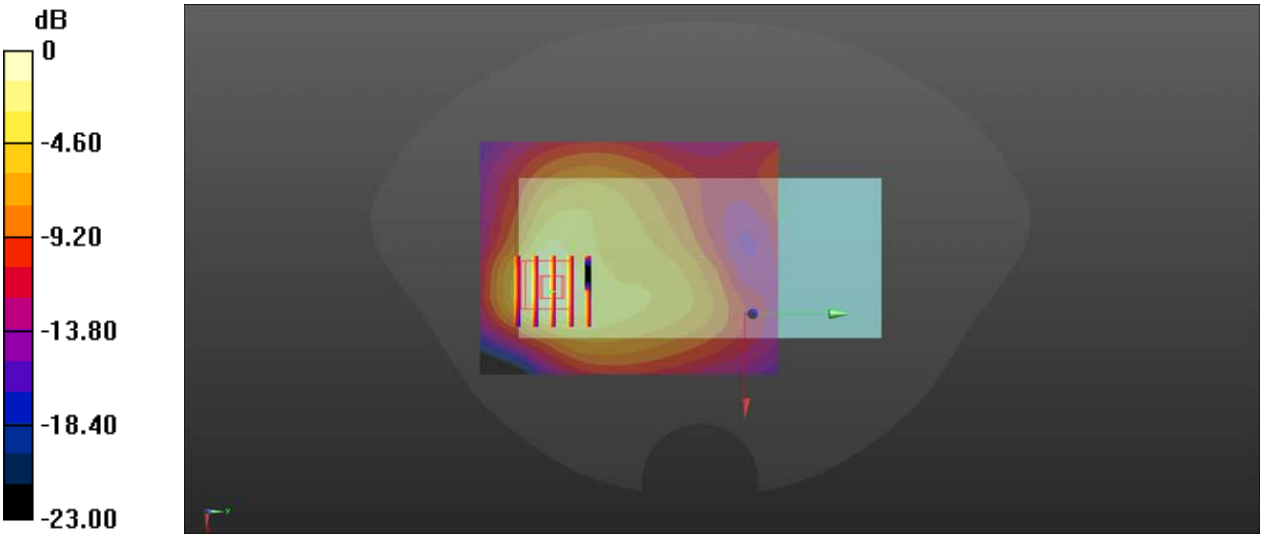
**Zoom Scan (5x5x7)/Cube 0**: Measurement grid: dx=8mm, dy=8mm, dz=5mm

Reference Value = 6.032 V/m; Power Drift = 0.03 dB

Peak SAR (extrapolated) = 0.715 W/kg

**SAR(1 g) = 0.362 W/Kg; SAR(10 g) = 0.189 W/Kg**

Maximum value of SAR (measured) = 0.495 W/Kg



## #12.

Date: 05/18/2024

**LTE Band 41_20M_QPSK_1RB#49_Back Side_10mm_Ch40620**

Communication System: UID 0, Generic LTE (0); Frequency: 2593.0 MHz; Duty Cycle: 1:1

Medium parameters used (interpolated): f = 2593.0 MHz; σ = 2.013 S/m; εr = 39.335; ρ = 1000 kg/m$^3$

Phantom section: Flat Section

**DASY5 Configuration:**

- Probe: EX3DV4 - SN7380; ConvF(7.35, 7.35, 7.35); Calibrated: June 21, 2023
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn428; Calibrated: Aug.30,2023;
- Phantom: SAM 1; Type: SAM;
- Measurement SW: DASY52, Version 52.8 (2); SEMCAD X Version 14.6.10 (7164)

**Area Scan (81x111x1):** Interpolated grid: dx=1.200 mm, dy=1.200 mm

Maximum value of SAR (interpolated) = 0.295 W/Kg

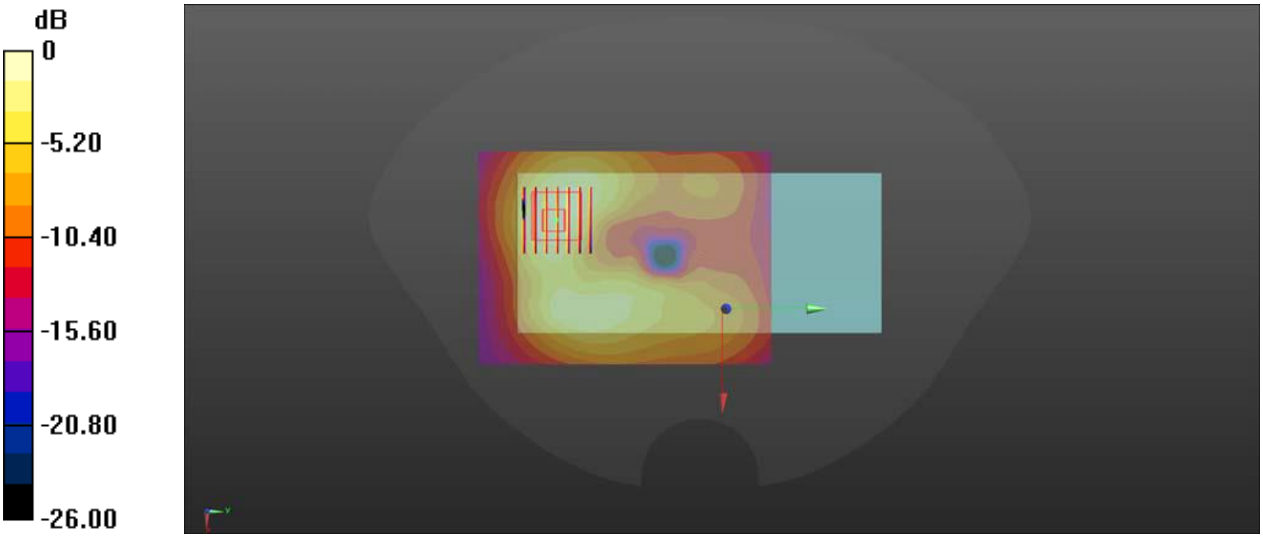
**Zoom Scan (7x7x7)/Cube 0**: Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 2.658 V/m; Power Drift = 0.04 dB

Peak SAR (extrapolated) = 0.364 W/kg

**SAR(1 g) = 0.198 W/Kg; SAR(10 g) = 0.100 W/Kg**

Maximum value of SAR (measured) = 0.284 W/Kg



**#13.**

Date: 05/20/2024

**WLAN2.4GHz_802.11b 1Mbps_Back Side_10mm_Ch06**

Communication System: UID 0, Generic WIFI(0); Frequency: 2437 MHz;Duty Cycle: 1:1

Medium parameters used (interpolated): f = 2437 MHz; σ = 1.715 S/m; εr = 40.207; ρ = 1000 kg/m3

Phantom section: Flat Section

**DASY5 Configuration:**

- Probe: EX3DV4 - SN7380; ConvF(7.50, 7.50, 7.50); Calibrated: June 21, 2023
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn428; Calibrated: Aug.30,2023;
- Phantom: SAM 1; Type: SAM;
- Measurement SW: DASY52, Version 52.8 (2); SEMCAD X Version 14.6.10 (7164)

**Area Scan (91x91x1):** Interpolated grid: dx=1.200 mm, dy=1.200 mm

Maximum value of SAR (interpolated) = 0.286 W/Kg

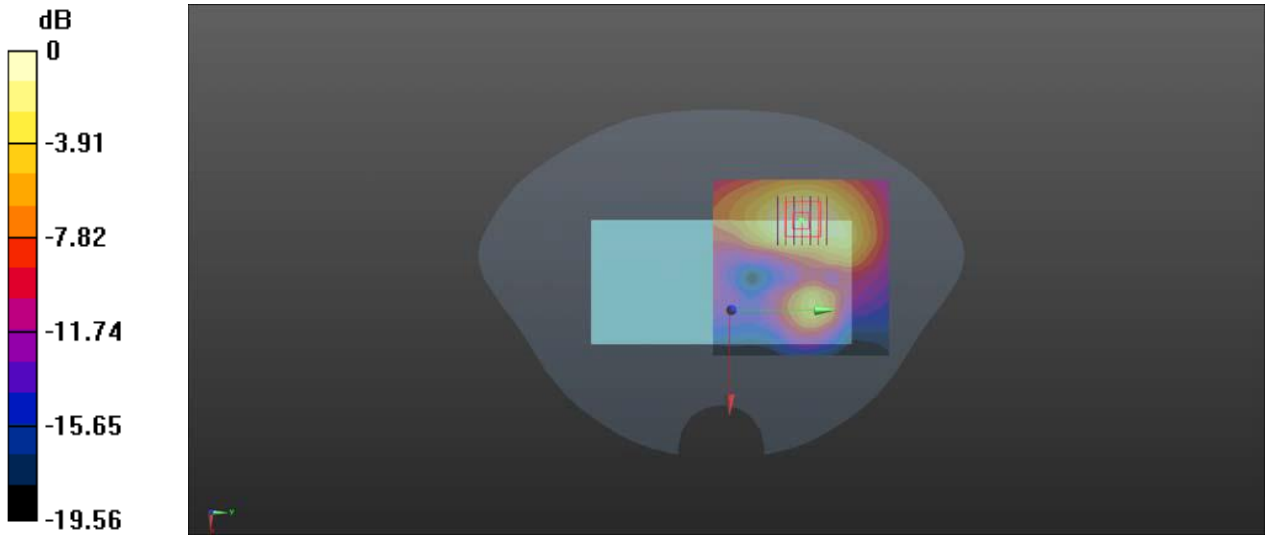
**Zoom Scan (7x7x7)/Cube 0:** Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 2.877 V/m; Power Drift = 0.05 dB

Peak SAR (extrapolated) = 0.374 W/kg

**SAR(1 g) = 0.202 W/Kg; SAR(10 g) = 0.110 W/Kg**

Maximum value of SAR (measured) = 0.287 W/Kg



**#14.**

Date: 05/21/2024

**WLAN5.2GHz_802.11n(HT20) MCS0_Back Side_10mm_Ch48**

Communication System: UID 0, Generic WIFI(0); Frequency: 5240 MHz;Duty Cycle: 1:1

Medium parameters used (interpolated): f = 5240 MHz; σ = 4.569 S/m; εr = 36.45; ρ = 1000 kg/m3

Phantom section: Flat Section

**DASY5 Configuration:**

- Probe: EX3DV4 - SN7380; ConvF(5.45, 5.45, 5.45); Calibrated: June 21, 2023
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn428; Calibrated: Aug.30,2023;
- Phantom: SAM 1; Type: SAM;
- Measurement SW: DASY52, Version 52.8 (2); SEMCAD X Version 14.6.10 (7164)

**Area Scan (101x101x1):** Interpolated grid: dx=1.000 mm, dy=1.000 mm

Maximum value of SAR (interpolated) = 0.285 W/Kg

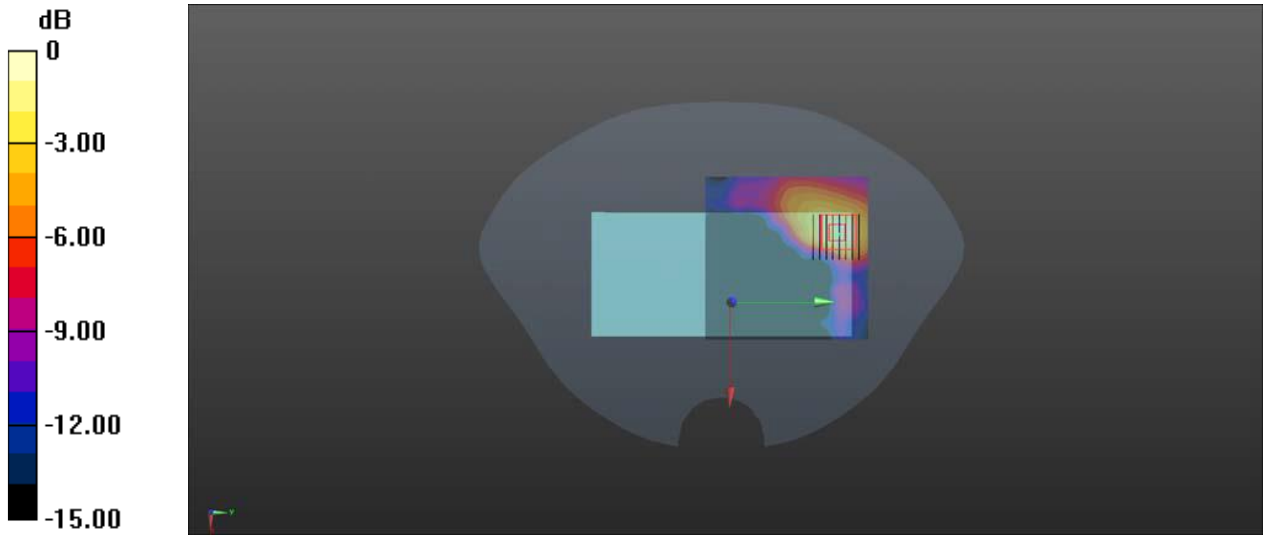
**Zoom Scan (8x8x15)/Cube 0:** Measurement grid: dx=4mm, dy=4mm, dz=2mm

Reference Value = 0.869 V/m; Power Drift = 0.03 dB

Peak SAR (extrapolated) = 0.534 W/kg

**SAR(1 g) = 0.150 W/Kg; SAR(10 g) = 0.057 W/Kg**

Maximum value of SAR (measured) = 0.277 W/Kg



**#15.**

Date: 05/21/2024

**WLAN5.6GHz_802.11ac(HT20) MCS0_Back Side_10mm_Ch120**

Communication System: UID 0, Generic WIFI(0); Frequency: 5600 MHz;Duty Cycle: 1:1

Medium parameters used (interpolated): f = 5600 MHz; σ = 5.076 S/m; εr = 35.722; ρ = 1000 kg/m3

Phantom section: Flat Section

**DASY5 Configuration:**

- Probe: EX3DV4 - SN7380; ConvF(4.86, 4.86, 4.86); Calibrated: June 21, 2023
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn428; Calibrated: Aug.30,2023;
- Phantom: SAM 1; Type: SAM;
- Measurement SW: DASY52, Version 52.8 (2); SEMCAD X Version 14.6.10 (7164)

**Area Scan (101x121x1):** Interpolated grid: dx=1.000 mm, dy=1.000 mm

Maximum value of SAR (interpolated) = 0.459 W/Kg

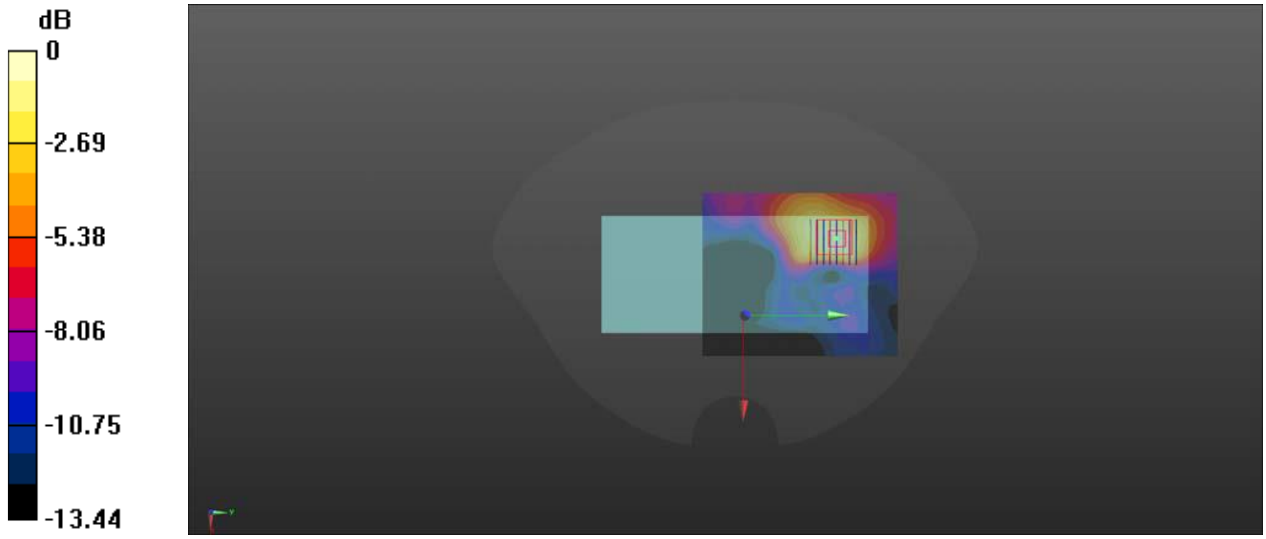
**Zoom Scan (8x8x15)/Cube 0:** Measurement grid: dx=4mm, dy=4mm, dz=2mm

Reference Value = 1.385 V/m; Power Drift = 0.05 dB

Peak SAR (extrapolated) = 0.801 W/kg

**SAR(1 g) = 0.247 W/Kg; SAR(10 g) = 0.112 W/Kg**

Maximum value of SAR (measured) = 0.431 W/Kg



**#16.**

Date: 05/21/2024

**WLAN5.8GHz_802.11a 6Mbps_Back Side_10mm_Ch165**

Communication System: UID 0, Generic WIFI(0); Frequency: 5825 MHz;Duty Cycle: 1:1

Medium parameters used (interpolated): f = 5825 MHz; σ = 5.985 S/m; εr = 48.710; ρ = 1000 kg/m3

Phantom section: Flat Section

**DASY5 Configuration:**

- Probe: EX3DV4 - SN7380; ConvF(4.96, 4.96, 4.96); Calibrated: June 21, 2023
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn428; Calibrated: Aug.30,2023;
- Phantom: SAM 1; Type: SAM;
- Measurement SW: DASY52, Version 52.8 (2); SEMCAD X Version 14.6.10 (7164)

**Area Scan (101x121x1):** Interpolated grid: dx=1.000 mm, dy=1.000 mm

Maximum value of SAR (interpolated) = 0.357 W/Kg

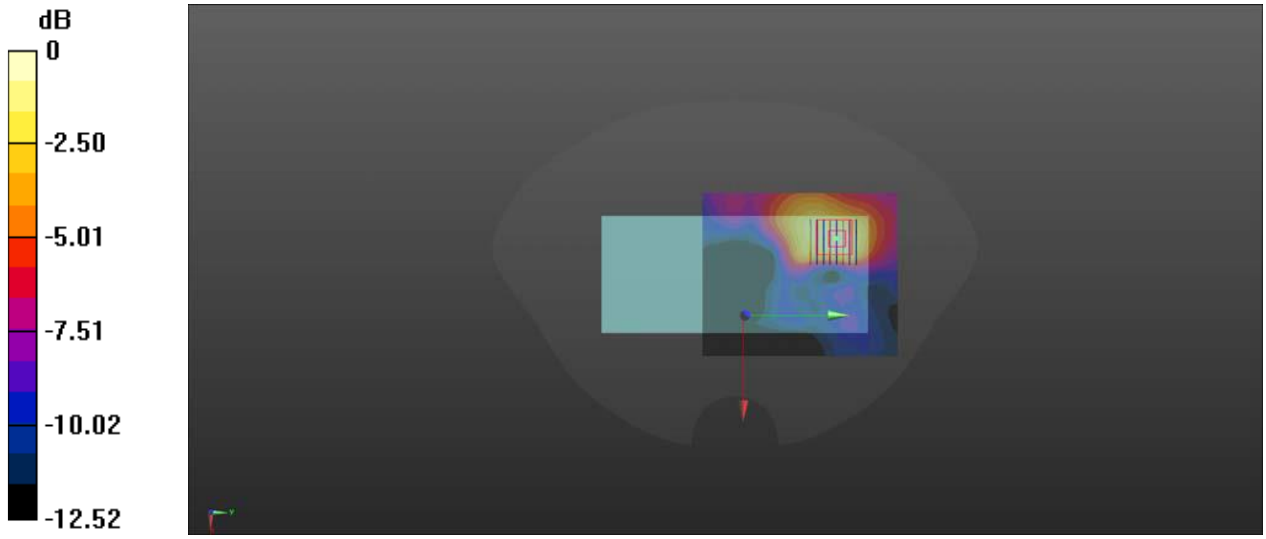
**Zoom Scan (8x8x15)/Cube 0:** Measurement grid: dx=4mm, dy=4mm, dz=2mm

Reference Value = 0.874 V/m; Power Drift = 0.09 dB

Peak SAR (extrapolated) = 0.614 W/kg

**SAR(1 g) = 0.168 W/Kg; SAR(10 g) = 0.078 W/Kg**

Maximum value of SAR (measured) = 0.305 W/Kg



**#17.**

Date: 03/20/2024

**Bluetooth_DH5_Back Side_10mm_Ch78**

Communication System: UID 0, Generic Bluetooth (0); Frequency: 2480 MHz; Duty Cycle: 1:1

Medium parameters used (interpolated): f = 2480 MHz; σ = 1.715 S/m; εr = 40.207; ρ = 1000 kg/m3

Phantom section: Flat Section

**DASY5 Configuration:**

- Probe: EX3DV4 - SN7380; ConvF (7.50, 7.50, 7.50); Calibrated: June 21, 2023
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn428; Calibrated: Aug.30,2023;
- Phantom: SAM 1; Type: SAM;
- Measurement SW: DASY52, Version 52.8 (2); SEMCAD X Version 14.6.10 (7164)

**Area Scan (81x111x1):** Interpolated grid: dx=1.200 mm, dy=1.200 mm

Maximum value of SAR (interpolated) = 0.0274 W/Kg

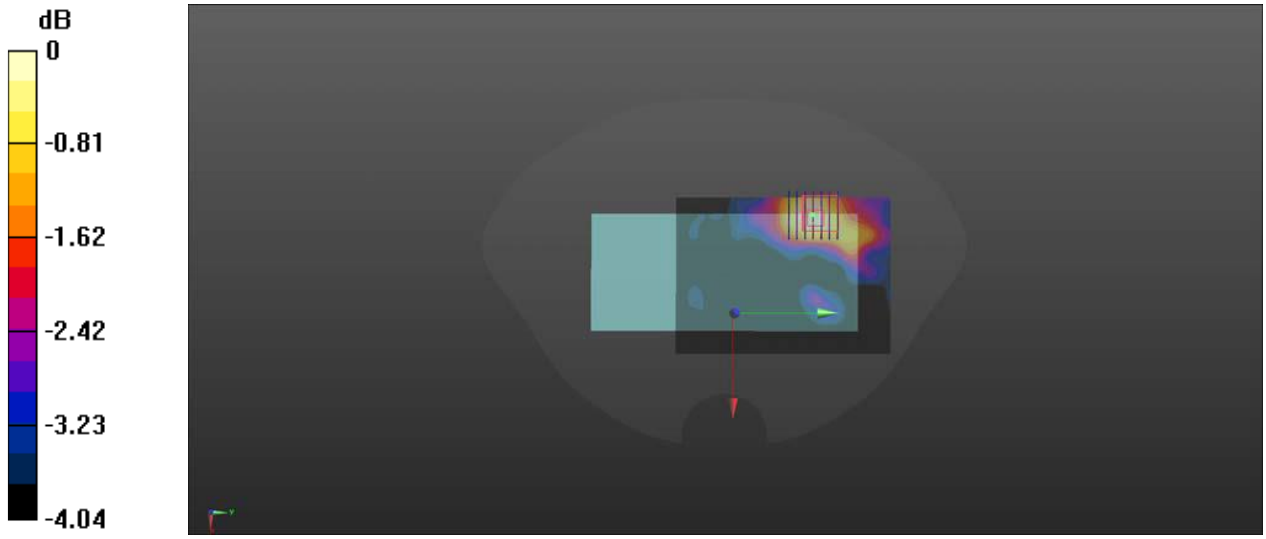
**Zoom Scan (7x7x7)/Cube 0:** Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 0.4587 V/m; Power Drift = 0.07 dB

Peak SAR (extrapolated) = 0.065 W/kg

**SAR(1 g) = 0.042 W/Kg; SAR(10 g) = 0.024 W/Kg**

Maximum value of SAR (measured) = 0.0357 W/Kg



# Appendix D. DASY System Calibration Certificate

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Client ruixiang Certificate No: J23Z60276

## CALIBRATION CERTIFICATE

| | |
|---|---|
| Object | EX3DV4 - SN : 7380 |
| Calibration Procedure(s) | FF-Z11-004-02<br>Calibration Procedures for Dosimetric E-field Probes |
| Calibration date: | June 21, 2023 |

This calibration Certificate documents the traceability to national standards, which realize the physical units of measurements(SI). The measurements and the uncertainties with confidence probability are given on the following pages and are part of the certificate.

All calibrations have been conducted in the closed laboratory facility: environment temperature(22±3)℃ and humidity<70%.

Calibration Equipment used (M&TE critical for calibration)

| Primary Standards | ID # | Cal Date(Calibrated by, Certificate No.) | Scheduled Calibration |
|---|---|---|---|
| Power Meter NRP2 | 101919 | 12-Jun-23(CTTL, No.J23X05435) | Jun-24 |
| Power sensor NRP-Z91 | 101547 | 12-Jun-23(CTTL, No.J23X05435) | Jun-24 |
| Power sensor NRP-Z91 | 101548 | 12-Jun-23(CTTL, No.J23X05435) | Jun-24 |
| Reference 10dBAttenuator | 18N50W-10dB | 19-Jan-23(CTTL, No.J23X00212) | Jan-25 |
| Reference 20dBAttenuator | 18N50W-20dB | 19-Jan-23(CTTL, No.J23X00211) | Jan-25 |
| Reference Probe EX3DV4 | SN 7517 | 27-Jan-23(SPEAG, No.EX-7517_Jan23) | Jan-24 |
| DAE4 | SN 1555 | 25-Aug-22(SPEAG, No.DAE4-1555_Aug22) | Aug-23 |
| **Secondary Standards** | **ID #** | **Cal Date(Calibrated by, Certificate No.)** | **Scheduled Calibration** |
| SignalGenerator MG3700A | 6201052605 | 12-Jun-23(CTTL, No.J23X05434) | Jun-24 |
| Network Analyzer E5071C | MY46110673 | 10-Jan-23(CTTL, No.J23X00104) | Jan-24 |
| Reference 10dBAttenuator | BT0520 | 11-May-23(CTTL, No.J23X04061) | May-25 |
| Reference 20dBAttenuator | BT0267 | 11-May-23(CTTL, No.J23X04062) | May-25 |
| OCP DAK-3.5 | SN 1040 | 18-Jan-23(SPEAG, No.OCP-DAK3.5-1040_Jan23) | Jan-24 |

| | Name | Function | Signature |
|---|---|---|---|
| Calibrated by: | Yu Zongying | SAR Test Engineer | |
| Reviewed by: | Lin Hao | SAR Test Engineer | |
| Approved by: | Qi Dianyuan | SAR Project Leader | |

Issued: June 27, 2023

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**Glossary:**

| | |
|---|---|
| TSL | tissue simulating liquid |
| NORMx,y,z | sensitivity in free space |
| ConvF | sensitivity in TSL / NORMx,y,z |
| DCP | diode compression point |
| CF | crest factor (1/duty_cycle) of the RF signal |
| A,B,C,D | modulation dependent linearization parameters |
| Polarization Φ | Φ rotation around probe axis |
| Polarization θ | θ rotation around an axis that is in the plane normal to probe axis (at measurement center), i θ=0 is normal to probe axis |
| Connector Angle | information used in DASY system to align probe sensor X to the robot coordinate system |

**Calibration is Performed According to the Following Standards:**

a) IEEE Std 1528-2013, "IEEE Recommended Practice for Determining the Peak Spatial-Averaged Specific Absorption Rate (SAR) in the Human Head from Wireless Communications Devices: Measurement Techniques", June 2013

b) IEC 62209-1, "Measurement procedure for the assessment of Specific Absorption Rate (SAR) from hand-held and body-mounted devices used next to the ear (frequency range of 300 MHz to 6 GHz)", July 2016

c) IEC 62209-2, "Procedure to determine the Specific Absorption Rate (SAR) for wireless communication devices used in close proximity to the human body (frequency range of 30 MHz to 6 GHz)", March 2010

d) KDB 865664, "SAR Measurement Requirements for 100 MHz to 6 GHz"

**Methods Applied and Interpretation of Parameters:**

- *NORMx,y,z:* Assessed for E-field polarization θ=0 (f≤900MHz in TEM-cell; f>1800MHz: waveguide). NORMx,y,z are only intermediate values, i.e., the uncertainties of NORMx,y,z does not effect the $E^2$-field uncertainty inside TSL (see below ConvF).
- *NORM(f)x,y,z = NORMx,y,z* frequency_response* (see Frequency Response Chart). This linearization is implemented in DASY4 software versions later than 4.2. The uncertainty of the frequency response is included in the stated uncertainty of ConvF.
- *DCPx,y,z:* DCP are numerical linearization parameters assessed based on the data of power sweep (no uncertainty required). DCP does not depend on frequency nor media.
- PAR: PAR is the Peak to Average Ratio that is not calibrated but determined based on the signal characteristics.
- *Ax,y,z; Bx,y,z; Cx,y,z;VRx,y,z*:A,B,C are numerical linearization parameters assessed based on the data of power sweep for specific modulation signal. The parameters do not depend on frequency nor media. VR is the maximum calibration range expressed in RMS voltage across the diode.
- *ConvF and Boundary Effect Parameters:* Assessed in flat phantom using E-field (or Temperature Transfer Standard for f≤800MHz) and inside waveguide using analytical field distributions based on power measurements for f >800MHz. The same setups are used for assessment of the parameters applied for boundary compensation (alpha, depth) of which typical uncertainty valued are given. These parameters are used in DASY4 software to improve probe accuracy close to the boundary. The sensitivity in TSL corresponds to NORMx,y,z* ConvF whereby the uncertainty corresponds to that given for ConvF. A frequency dependent ConvF is used in DASY version 4.4 and higher which allows extending the validity from±50MHz to±100MHz.
- *Spherical isotropy (3D deviation from isotropy):* in a field of low gradients realized using a flat phantom exposed by a patch antenna.
- *Sensor Offset:* The sensor offset corresponds to the offset of virtual measurement center from the probe tip (on probe axis). No tolerance required.
- *Connector Angle:* The angle is assessed using the information gained by determining the *NORMx* (no uncertainty required).

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# DASY/EASY – Parameters of Probe: EX3DV4 – SN:7380

## Basic Calibration Parameters

| | Sensor X | Sensor Y | Sensor Z | Unc (*k*=2) |
|---|---|---|---|---|
| Norm(μV/(V/m)²)[A] | 0.44 | 0.35 | 0.41 | ±10.0% |
| DCP(mV)[B] | 100.5 | 101.6 | 100.6 | |

## Modulation Calibration Parameters

| UID | Communication System Name | | A dB | B dB√μV | C | D dB | VR mV | Unc[E] (*k*=2) |
|---|---|---|---|---|---|---|---|---|
| 0 | CW | X | 0.0 | 0.0 | 1.0 | 0.00 | 161.9 | ±2.2% |
| | | Y | 0.0 | 0.0 | 1.0 | | 139.0 | |
| | | Z | 0.0 | 0.0 | 1.0 | | 149.3 | |

The reported uncertainty of measurement is stated as the standard uncertainty of Measurement multiplied by the coverage factor *k*=2, which for a normal distribution Corresponds to a coverage probability of approximately 95%.

[A] The uncertainties of Norm X, Y, Z do not affect the $E^2$-field uncertainty inside TSL (see Page 4).
[B] Numerical linearization parameter: uncertainty not required.
[E] Uncertainly is determined using the max. deviation from linear response applying rectangular distribution and is expressed for the square of the field value.

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# DASY/EASY – Parameters of Probe: EX3DV4 – SN:7380

## Calibration Parameter Determined in Head Tissue Simulating Media

| f [MHz][C] | Relative Permittivity[F] | Conductivity (S/m)[F] | ConvF X | ConvF Y | ConvF Z | Alpha[G] | Depth[G] (mm) | Unct. (k=2) |
|---|---|---|---|---|---|---|---|---|
| 750 | 41.9 | 0.89 | 10.02 | 10.02 | 10.02 | 0.17 | 1.27 | ±12.7% |
| 835 | 41.5 | 0.90 | 9.62 | 9.62 | 9.62 | 0.18 | 1.30 | ±12.7% |
| 1750 | 40.1 | 1.37 | 8.35 | 8.35 | 8.35 | 0.28 | 1.02 | ±12.7% |
| 1900 | 40.0 | 1.40 | 8.05 | 8.05 | 8.05 | 0.24 | 1.11 | ±12.7% |
| 2100 | 39.8 | 1.49 | 8.00 | 8.00 | 8.00 | 0.24 | 1.11 | ±12.7% |
| 2300 | 39.5 | 1.67 | 7.75 | 7.75 | 7.75 | 0.65 | 0.67 | ±12.7% |
| 2450 | 39.2 | 1.80 | 7.50 | 7.50 | 7.50 | 0.65 | 0.69 | ±12.7% |
| 2600 | 39.0 | 1.96 | 7.35 | 7.35 | 7.35 | 0.47 | 0.85 | ±12.7% |
| 3500 | 37.9 | 2.91 | 6.85 | 6.85 | 6.85 | 0.41 | 1.03 | ±13.9% |
| 3700 | 37.7 | 3.12 | 6.69 | 6.69 | 6.69 | 0.43 | 1.03 | ±13.9% |
| 3900 | 37.5 | 3.32 | 6.58 | 6.58 | 6.58 | 0.30 | 1.50 | ±13.9% |
| 4100 | 37.2 | 3.53 | 6.62 | 6.62 | 6.62 | 0.35 | 1.25 | ±13.9% |
| 4200 | 37.1 | 3.63 | 6.52 | 6.52 | 6.52 | 0.30 | 1.45 | ±13.9% |
| 4400 | 36.9 | 3.84 | 6.44 | 6.44 | 6.44 | 0.30 | 1.50 | ±13.9% |
| 4600 | 36.7 | 4.04 | 6.41 | 6.41 | 6.41 | 0.35 | 1.48 | ±13.9% |
| 4800 | 36.4 | 4.25 | 6.36 | 6.36 | 6.36 | 0.35 | 1.50 | ±13.9% |
| 4950 | 36.3 | 4.40 | 5.95 | 5.95 | 5.95 | 0.35 | 1.55 | ±13.9% |
| 5250 | 35.9 | 4.71 | 5.45 | 5.45 | 5.45 | 0.40 | 1.55 | ±13.9% |
| 5600 | 35.5 | 5.07 | 4.86 | 4.86 | 4.86 | 0.45 | 1.40 | ±13.9% |
| 5750 | 35.4 | 5.22 | 4.96 | 4.96 | 4.96 | 0.45 | 1.40 | ±13.9% |

[C] Frequency validity above 300 MHz of ±100MHz only applies for DASY v4.4 and higher (Page 2), else it is restricted to ±50MHz. The uncertainty is the RSS of ConvF uncertainty at calibration frequency and the uncertainty for the indicated frequency band. Frequency validity below 300 MHz is ± 10, 25, 40, 50 and 70 MHz for ConvF assessments at 30, 64, 128, 150 and 220 MHz respectively. Above 5 GHz frequency validity can be extended to ± 110 MHz.

[F] At frequency up to 6 GHz, the validity of tissue parameters (ε and σ) can be relaxed to ±10% if liquid compensation formula is applied to measured SAR values. The uncertainty is the RSS of the ConvF uncertainty for indicated target tissue parameters.

[G] Alpha/Depth are determined during calibration. SPEAG warrants that the remaining deviation due to the boundary effect after compensation is always less than ± 1% for frequencies below 3 GHz and below ± 2% for the frequencies between 3-6 GHz at any distance larger than half the probe tip diameter from the boundary.

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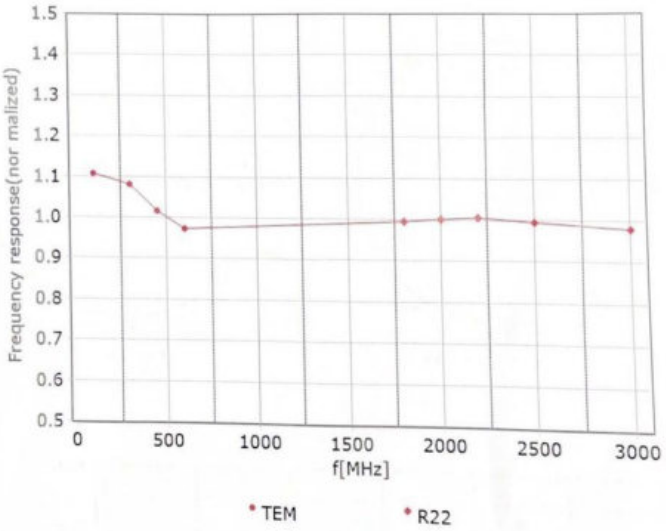
## Frequency Response of E-Field
### (TEM-Cell: ifi110 EXX, Waveguide: R22)




**Uncertainty of Frequency Response of E-field: ±7.4% (*k*=2)**

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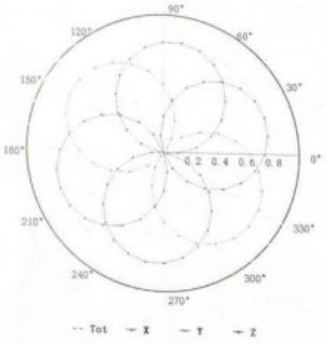
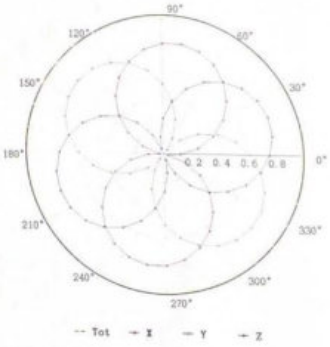
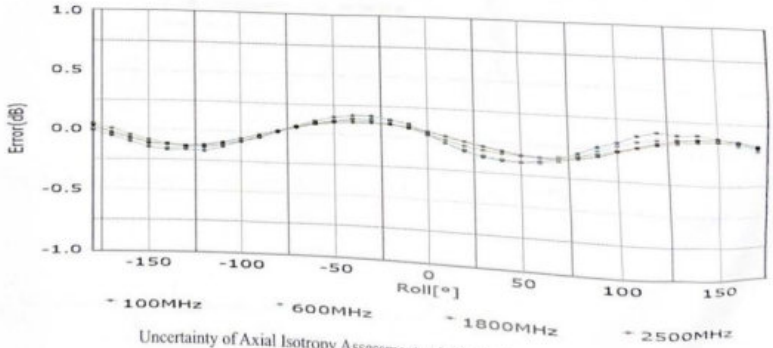
## Receiving Pattern (Φ), θ=0°

**f=600 MHz, TEM**




**f=1800 MHz, R22**




Uncertainty of Axial Isotropy Assessment: ±1.2% (*k*=2)

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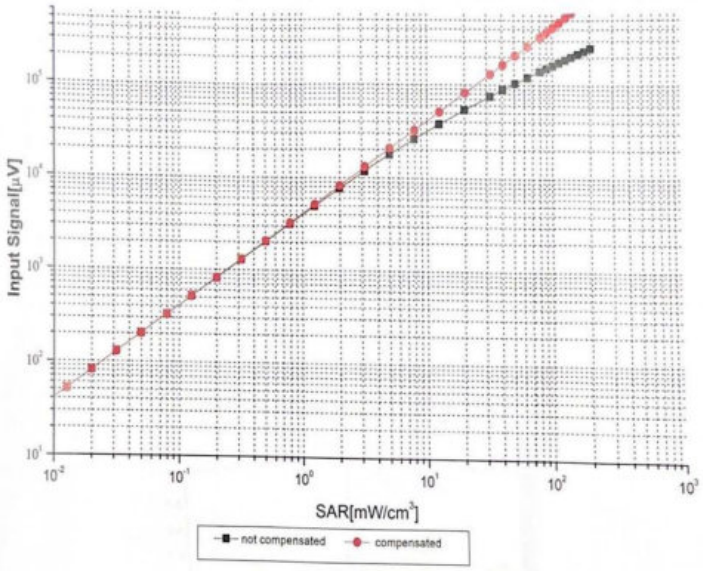
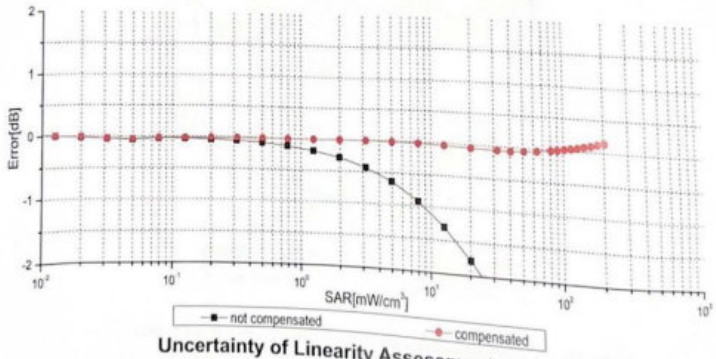
## Dynamic Range f($SAR_{head}$)
## (TEM cell, f = 900 MHz)




**Uncertainty of Linearity Assessment: ±0.9% (*k*=2)**

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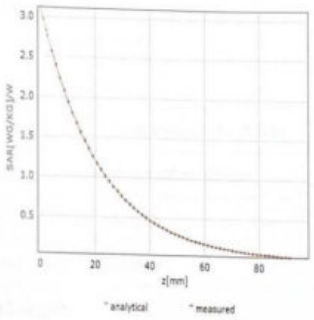
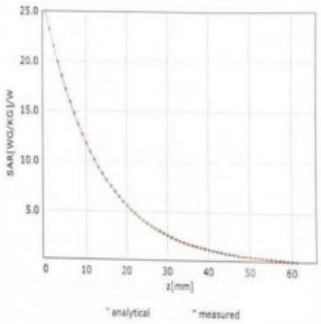
## Conversion Factor Assessment

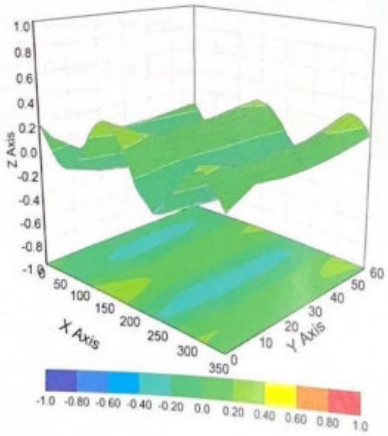
f=750 MHz,WGLS R9(H_convF)




f=1750 MHz,WGLS R22(H_convF)




## Deviation from Isotropy in Liquid




Uncertainty of Spherical Isotropy Assessment: ±3.2% (*k*=2)

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## DASY/EASY – Parameters of Probe: EX3DV4 – SN:7380

### Other Probe Parameters

| | |
|---|---|
| Sensor Arrangement | Triangular |
| Connector Angle (°) | 83.7 |
| Mechanical Surface Detection Mode | enabled |
| Optical Surface Detection Mode | disable |
| Probe Overall Length | 337mm |
| Probe Body Diameter | 10mm |
| Tip Length | 9mm |
| Tip Diameter | 2.5mm |
| Probe Tip to Sensor X Calibration Point | 1mm |
| Probe Tip to Sensor Y Calibration Point | 1mm |
| Probe Tip to Sensor Z Calibration Point | 1mm |
| Recommended Measurement Distance from Surface | 1.4mm |

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CALIBRATION
CNAS L0570

Client : CTA Certificate No: J23Z60391

# CALIBRATION CERTIFICATE

| | |
|---|---|
| Object | DAE3 - SN: 428 |
| Calibration Procedure(s) | FF-Z11-002-01<br>Calibration Procedure for the Data Acquisition Electronics (DAEx) |
| Calibration date: | August 30, 2023 |

This calibration Certificate documents the traceability to national standards, which realize the physical units of measurements(SI). The measurements and the uncertainties with confidence probability are given on the following pages and are part of the certificate.

All calibrations have been conducted in the closed laboratory facility: environment temperature(22±3)°C and humidity<70%.

Calibration Equipment used (M&TE critical for calibration)

| Primary Standards | ID # | Cal Date(Calibrated by, Certificate No.) | Scheduled Calibration |
|---|---|---|---|
| Process Calibrator 753 | 1971018 | 12-Jun-23 (CTTL, No.J23X05436) | Jun-24 |

| | Name | Function | Signature |
|---|---|---|---|
| Calibrated by: | Yu Zongying | SAR Test Engineer | |
| Reviewed by: | Lin Hao | SAR Test Engineer | |
| Approved by: | Qi Dianyuan | SAR Project Leader | |

Issued: September 06, 2023

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**Glossary:**

| | |
|---|---|
| DAE | data acquisition electronics |
| Connector angle | information used in DASY system to align probe sensor X to the robot coordinate system. |

**Methods Applied and Interpretation of Parameters:**

- *DC Voltage Measurement*: Calibration Factor assessed for use in DASY system by comparison with a calibrated instrument traceable to national standards. The figure given corresponds to the full scale range of the voltmeter in the respective range.
- *Connector angle*: The angle of the connector is assessed measuring the angle mechanically by a tool inserted. Uncertainty is not required.
- The report provide only calibration results for DAE, it does not contain other performance test results.

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## DC Voltage Measurement

A/D - Converter Resolution nominal
High Range: 1LSB = 6.1μV , full range = -100...+300 mV
Low Range: 1LSB = 61nV , full range = -1.....+3mV
DASY measurement parameters: Auto Zero Time: 3 sec; Measuring time: 3 sec

| Calibration Factors | X | Y | Z |
|---|---|---|---|
| High Range | 404.468 ± 0.15% (k=2) | 404.804 ± 0.15% (k=2) | 404.579 ± 0.15% (k=2) |
| Low Range | 3.95934 ± 0.7% (k=2) | 3.95437 ± 0.7% (k=2) | 3.91875 ± 0.7% (k=2) |

## Connector Angle

| | |
|---|---|
| **Connector Angle** to be used in DASY system | 258.5° ± 1 ° |

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Client ATC Certificate No: Z23-60083

# CALIBRATION CERTIFICATE

| | |
|---|---|
| Object | D750V3 - SN: 1194 |
| Calibration Procedure(s) | FF-Z11-003-01<br>Calibration Procedures for dipole validation kits |
| Calibration date: | February 17, 2023 |

This calibration Certificate documents the traceability to national standards, which realize the physical units of measurements (SI). The measurements and the uncertainties with confidence probability are given on the following pages and are part of the certificate.

All calibrations have been conducted in the closed laboratory facility: environment temperature (22±3)°C and humidity<70%.

Calibration Equipment used (M&TE critical for calibration)

| Primary Standards | ID # | Cal Date (Calibrated by, Certificate No.) | Scheduled Calibration |
|---|---|---|---|
| Power Meter NRP2 | 106276 | 10-May-22 (CTTL, No.J22X03103) | May-23 |
| Power sensor NRP6A | 101369 | 10-May-22 (CTTL, No.J22X03103) | May-23 |
| Reference Probe EX3DV4 | SN 7464 | 19-Jan-23 (CTTL-SPEAG,No.Z22-60565) | Jan-24 |
| DAE4 | SN 1556 | 11-Jan-23(CTTL-SPEAG,No.Z23-60034) | Jan-24 |
| **Secondary Standards** | **ID #** | **Cal Date (Calibrated by, Certificate No.)** | **Scheduled Calibration** |
| Signal Generator E4438C | MY49070393 | 17-May-23 (CTTL, No.J22X03157) | May-24 |
| NetworkAnalyzer E5071C | MY46110673 | 10-Jan-23 (CTTL, No. J23X00104) | Jan-24 |

| | Name | Function | Signature |
|---|---|---|---|
| Calibrated by: | Zhao Jing | SAR Test Engineer | |
| Reviewed by: | Lin Hao | SAR Test Engineer | |
| Approved by: | Qi Dianyuan | SAR Project Leader | |

Issued: February 24, 2023

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**Glossary:**

| | |
|---|---|
| TSL | tissue simulating liquid |
| ConvF | sensitivity in TSL / NORMx,y,z |
| N/A | not applicable or not measured |

**Calibration is Performed According to the Following Standards:**

a) IEC/IEEE 62209-1528, "Measurement Procedure for The Assessment of Specific Absorption Rate of Human Exposure to Radio Frequency Fields from Hand-held and Body-mounted Wireless Communication Devices- Part 1528: Human Models, Instrumentation and Procedures (Frequency range of 4 MHz to 10 GHz)", October 2020

b) KDB 865664, "SAR Measurement Requirements for 100 MHz to 6 GHz"

**Additional Documentation:**

c) DASY4/5 System Handbook

**Methods Applied and Interpretation of Parameters:**

- *Measurement Conditions:* Further details are available from the Validation Report at the end of the certificate. All figures stated in the certificate are valid at the frequency indicated.
- *Antenna Parameters with TSL:* The dipole is mounted with the spacer to position its feed point exactly below the center marking of the flat phantom section, with the arms oriented parallel to the body axis.
- *Feed Point Impedance and Return Loss:* These parameters are measured with the dipole positioned under the liquid filled phantom. The impedance stated is transformed from the measurement at the SMA connector to the feed point. The Return Loss ensures low reflected power. No uncertainty required.
- *Electrical Delay:* One-way delay between the SMA connector and the antenna feed point. No uncertainty required.
- *SAR measured:* SAR measured at the stated antenna input power.
- *SAR normalized:* SAR as measured, normalized to an input power of 1 W at the antenna connector.
- *SAR for nominal TSL parameters:* The measured TSL parameters are used to calculate the nominal SAR result.

The reported uncertainty of measurement is stated as the standard uncertainty of Measurement multiplied by the coverage factor k=2, which for a normal distribution Corresponds to a coverage probability of approximately 95%.

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## Measurement Conditions

DASY system configuration, as far as not given on page 1.

| | | |
|---|---|---|
| **DASY Version** | DASY52 | V52.10.4 |
| **Extrapolation** | Advanced Extrapolation | |
| **Phantom** | Triple Flat Phantom 5.1C | |
| **Distance Dipole Center - TSL** | 15 mm | with Spacer |
| **Zoom Scan Resolution** | dx, dy, dz = 5 mm | |
| **Frequency** | 750 MHz ± 1 MHz | |

## Head TSL parameters

The following parameters and calculations were applied.

| | **Temperature** | **Permittivity** | **Conductivity** |
|---|---|---|---|
| **Nominal Head TSL parameters** | 22.0 °C | 42.0 | 0.90 mho/m |
| **Measured Head TSL parameters** | (22.0 ± 0.2) °C | 41.2 ± 6 % | 0.89 mho/m ± 6 % |
| **Head TSL temperature change during test** | <1.0 °C | ---- | ---- |

## SAR result with Head TSL

| **SAR averaged over 1 $cm^3$ (1 g) of Head TSL** | Condition | |
|---|---|---|
| SAR measured | 250 mW input power | 2.14 W/kg |
| SAR for nominal Head TSL parameters | normalized to 1W | **8.57 W/kg ± 18.8 % (*k*=2)** |
| **SAR averaged over 10 $cm^3$ (10 g) of Head TSL** | Condition | |
| SAR measured | 250 mW input power | 1.40 W/kg |
| SAR for nominal Head TSL parameters | normalized to 1W | **5.61 W/kg ± 18.7 % (*k*=2)** |

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## Appendix (Additional assessments outside the scope of CNAS L0570)

### Antenna Parameters with Head TSL

| | |
|---|---|
| Impedance, transformed to feed point | 50.8Ω- 3.54jΩ |
| Return Loss | - 28.9dB |

### General Antenna Parameters and Design

| | |
|---|---|
| Electrical Delay (one direction) | 0.979 ns |

After long term use with 100W radiated power, only a slight warming of the dipole near the feed-point can be measured.

The dipole is made of standard semirigid coaxial cable. The center conductor of the feeding line is directly connected to the second arm of the dipole. The antenna is therefore short-circuited for DC-signals. On some of the dipoles, small end caps are added to the dipole arms in order to improve matching when loaded according to the position as explained in the "Measurement Conditions" paragraph. The SAR data are not affected by this change. The overall dipole length is still according to the Standard.
No excessive force must be applied to the dipole arms, because they might bend or the soldered connections near the feed-point may be damaged.

### Additional EUT Data

| | |
|---|---|
| Manufactured by | SPEAG |

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**DASY5 Validation Report for Head TSL** Date: 2023-02-17

Test Laboratory: CTTL, Beijing, China

**DUT: Dipole 750 MHz; Type: D750V3; Serial: D750V3 - SN: 1194**

Communication System: UID 0, CW; Frequency: 750 MHz

Medium parameters used: f = 750 MHz; $\sigma$ = 0.885 S/m; $\varepsilon_r$ = 41.2; $\rho$ = 1000 kg/m$^3$

Phantom section: Right Section

Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2007)

DASY5 Configuration:

- Probe: EX3DV4 - SN7464; ConvF(10.26, 10.26, 10.26) @ 750 MHz; Calibrated: 2023-01-19
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1556; Calibrated: 2023-01-11
- Phantom: MFP_V5.1C (20deg probe tilt); Type: QD 000 P51 Cx; Serial: 1062
- DASY52 52.10.4(1535); SEMCAD X 14.6.14(7501)

**Dipole Calibration**/Zoom Scan (7x7x7) (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 50.59 V/m; Power Drift = -0.04 dB

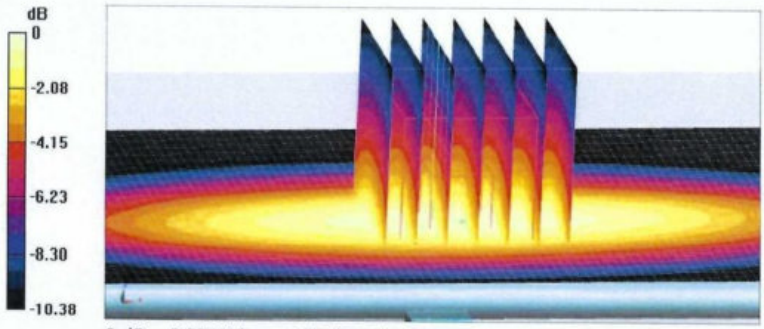
Peak SAR (extrapolated) = 3.42 W/kg

**SAR(1 g) = 2.14 W/kg; SAR(10 g) = 1.4 W/kg**

Smallest distance from peaks to all points 3 dB below = 20 mm

Ratio of SAR at M2 to SAR at M1 = 62.9%

Maximum value of SAR (measured) = 2.93 W/kg




0 dB = 2.93 W/kg = 4.67 dBW/kg

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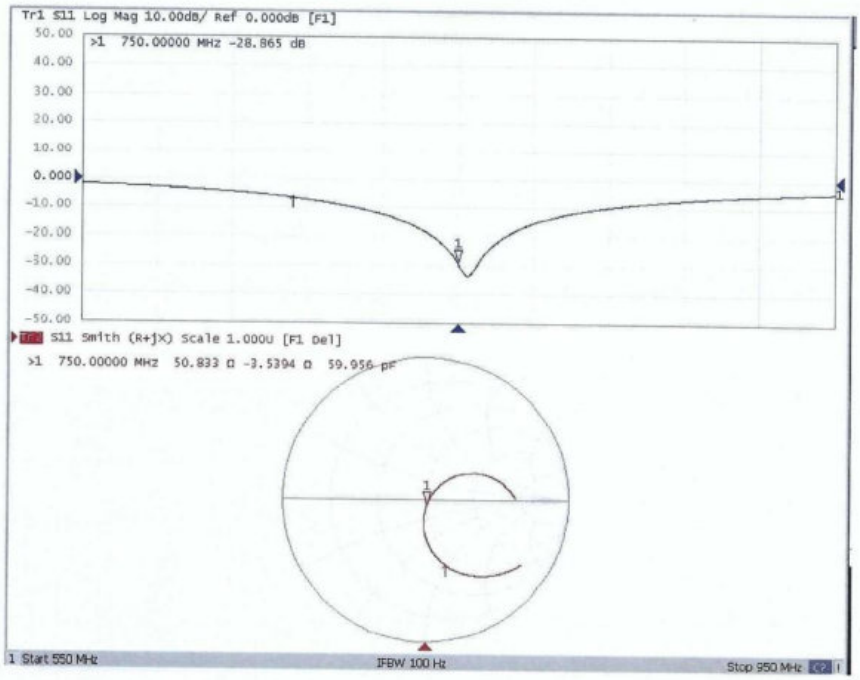
## Impedance Measurement Plot for Head TSL



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Client CTA Certificate No: J23Z60387

# CALIBRATION CERTIFICATE

| | |
|---|---|
| Object | D835V2 - SN: 484 |
| Calibration Procedure(s) | FF-Z11-003-01<br>Calibration Procedures for dipole validation kits |
| Calibration date: | August 25, 2023 |

This calibration Certificate documents the traceability to national standards, which realize the physical units of measurements (SI). The measurements and the uncertainties with confidence probability are given on the following pages and are part of the certificate.

All calibrations have been conducted in the closed laboratory facility: environment temperature (22±3)°C and humidity<70%.

Calibration Equipment used (M&TE critical for calibration)

| Primary Standards | ID # | Cal Date (Calibrated by, Certificate No.) | Scheduled Calibration |
|---|---|---|---|
| Power Meter NRP2 | 106277 | 22-Sep-22 (CTTL, No.J22X09561) | Sep-23 |
| Power sensor NRP8S | 104291 | 22-Sep-22 (CTTL, No.J22X09561) | Sep-23 |
| Reference Probe EX3DV4 | SN 3617 | 31-Mar-23(CTTL-SPEAG,No.Z23-60161) | Mar-24 |
| DAE4 | SN 1556 | 11-Jan-23(CTTL-SPEAG,No.Z23-60034) | Jan-24 |
| **Secondary Standards** | **ID #** | **Cal Date (Calibrated by, Certificate No.)** | **Scheduled Calibration** |
| Signal Generator E4438C | MY49071430 | 05-Jan-23 (CTTL, No. J23X00107) | Jan-24 |
| NetworkAnalyzer E5071C | MY46110673 | 10-Jan-23 (CTTL, No. J23X00104) | Jan-24 |

| | Name | Function | Signature |
|---|---|---|---|
| Calibrated by: | Zhao Jing | SAR Test Engineer | |
| Reviewed by: | Lin Hao | SAR Test Engineer | |
| Approved by: | Qi Dianyuan | SAR Project Leader | |

Issued: September 1, 2023

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**Glossary:**

| | |
|---|---|
| TSL | tissue simulating liquid |
| ConvF | sensitivity in TSL / NORMx,y,z |
| N/A | not applicable or not measured |

**Calibration is Performed According to the Following Standards:**

a) IEC/IEEE 62209-1528, "Measurement Procedure for The Assessment of Specific Absorption Rate of Human Exposure to Radio Frequency Fields from Hand-held and Body-mounted Wireless Communication Devices- Part 1528: Human Models, Instrumentation and Procedures (Frequency range of 4 MHz to 10 GHz)", October 2020

b) KDB 865664, "SAR Measurement Requirements for 100 MHz to 6 GHz"

**Additional Documentation:**

c) DASY4/5 System Handbook

**Methods Applied and Interpretation of Parameters:**

- *Measurement Conditions:* Further details are available from the Validation Report at the end of the certificate. All figures stated in the certificate are valid at the frequency indicated.
- *Antenna Parameters with TSL:* The dipole is mounted with the spacer to position its feed point exactly below the center marking of the flat phantom section, with the arms oriented parallel to the body axis.
- *Feed Point Impedance and Return Loss:* These parameters are measured with the dipole positioned under the liquid filled phantom. The impedance stated is transformed from the measurement at the SMA connector to the feed point. The Return Loss ensures low reflected power. No uncertainty required.
- *Electrical Delay:* One-way delay between the SMA connector and the antenna feed point. No uncertainty required.
- *SAR measured:* SAR measured at the stated antenna input power.
- *SAR normalized:* SAR as measured, normalized to an input power of 1 W at the antenna connector.
- *SAR for nominal TSL parameters:* The measured TSL parameters are used to calculate the nominal SAR result.

The reported uncertainty of measurement is stated as the standard uncertainty of Measurement multiplied by the coverage factor k=2, which for a normal distribution Corresponds to a coverage probability of approximately 95%.

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## Measurement Conditions

DASY system configuration, as far as not given on page 1.

| | | |
|---|---|---|
| **DASY Version** | DASY52 | V52.10.4 |
| **Extrapolation** | Advanced Extrapolation | |
| **Phantom** | Triple Flat Phantom 5.1C | |
| **Distance Dipole Center - TSL** | 15 mm | with Spacer |
| **Zoom Scan Resolution** | dx, dy, dz = 5 mm | |
| **Frequency** | 835 MHz ± 1 MHz | |

## Head TSL parameters

The following parameters and calculations were applied.

| | **Temperature** | **Permittivity** | **Conductivity** |
|---|---|---|---|
| **Nominal Head TSL parameters** | 22.0 °C | 41.5 | 0.90 mho/m |
| **Measured Head TSL parameters** | (22.0 ± 0.2) °C | 42.1 ± 6 % | 0.90 mho/m ± 6 % |
| **Head TSL temperature change during test** | <1.0 °C | — | — |

## SAR result with Head TSL

| **SAR averaged over 1 $cm^3$ (1 g) of Head TSL** | Condition | |
|---|---|---|
| SAR measured | 250 mW input power | 2.42 W/kg |
| SAR for nominal Head TSL parameters | normalized to 1W | **9.68 W/kg ± 18.8 % (*k*=2)** |
| **SAR averaged over 10 $cm^3$ (10 g) of Head TSL** | Condition | |
| SAR measured | 250 mW input power | 1.56 W/kg |
| SAR for nominal Head TSL parameters | normalized to 1W | **6.24 W/kg ± 18.7 % (*k*=2)** |

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## Appendix (Additional assessments outside the scope of CNAS L0570)

### Antenna Parameters with Head TSL

| | |
|---|---|
| Impedance, transformed to feed point | 49.8Ω- 2.74jΩ |
| Return Loss | - 31.2dB |

### General Antenna Parameters and Design

| | |
|---|---|
| Electrical Delay (one direction) | 1.299 ns |

After long term use with 100W radiated power, only a slight warming of the dipole near the feed-point can be measured.

The dipole is made of standard semirigid coaxial cable. The center conductor of the feeding line is directly connected to the second arm of the dipole. The antenna is therefore short-circuited for DC-signals. On some of the dipoles, small end caps are added to the dipole arms in order to improve matching when loaded according to the position as explained in the "Measurement Conditions" paragraph. The SAR data are not affected by this change. The overall dipole length is still according to the Standard.
No excessive force must be applied to the dipole arms, because they might bend or the soldered connections near the feed-point may be damaged.

### Additional EUT Data

| | |
|---|---|
| Manufactured by | SPEAG |

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**DASY5 Validation Report for Head TSL** Date: 2023-08-25

Test Laboratory: CTTL, Beijing, China

**DUT: Dipole 835 MHz; Type: D835V2; Serial: D835V2 - SN: 484**

Communication System: UID 0, CW; Frequency: 835 MHz

Medium parameters used: f = 835 MHz; $\sigma$ = 0.904 S/m; $\varepsilon_r$ = 42.11; $\rho$ = 1000 kg/m$^3$

Phantom section: Right Section

Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2007)

DASY5 Configuration:

- Probe: EX3DV4 - SN3617; ConvF(10.1, 10.1, 10.1) @ 835 MHz; Calibrated: 2023-03-31
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1556; Calibrated: 2023-01-11
- Phantom: MFP_V5.1C (20deg probe tilt); Type: QD 000 P51 Cx; Serial: 1062
- DASY52 52.10.4(1535); SEMCAD X 14.6.14(7501)

**Dipole Calibration**/Zoom Scan (7x7x7) (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 57.93 V/m; Power Drift = -0.01 dB

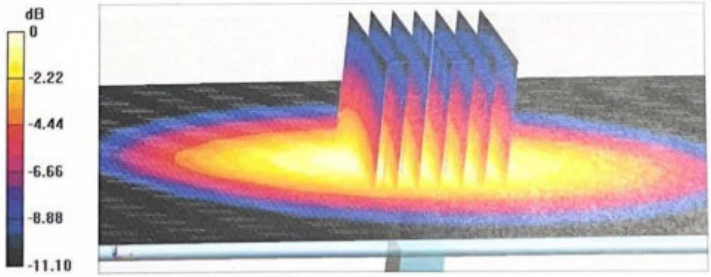
Peak SAR (extrapolated) = 3.92 W/kg

**SAR(1 g) = 2.42 W/kg; SAR(10 g) = 1.56 W/kg**

Smallest distance from peaks to all points 3 dB below = 16.3 mm

Ratio of SAR at M2 to SAR at M1 = 62.1%

Maximum value of SAR (measured) = 3.36 W/kg




0 dB = 3.36 W/kg = 5.26 dBW/kg

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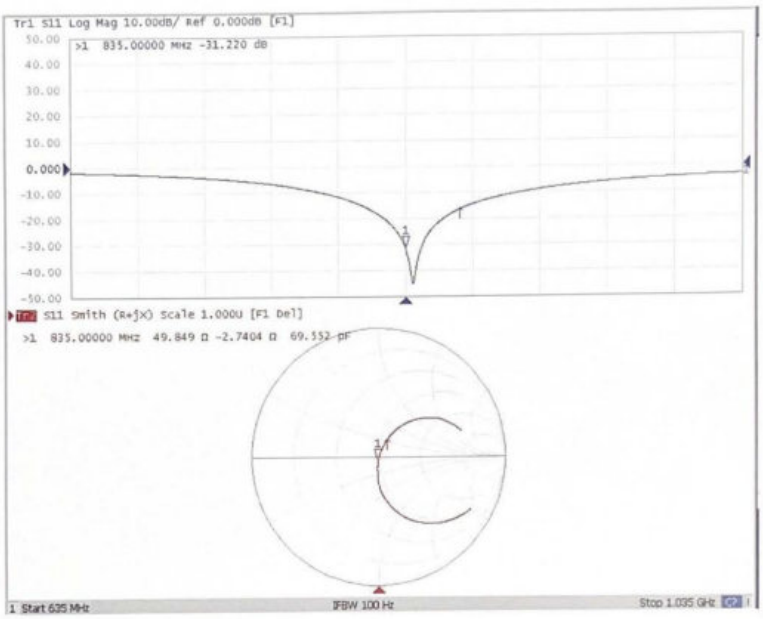
## Impedance Measurement Plot for Head TSL



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Client **Morlab** **Certificate No: Z21-60475**

# CALIBRATION CERTIFICATE

| | |
|---|---|
| Object | D1800V2 - SN: 2d158 |
| Calibration Procedure(s) | FF-Z11-003-01<br>Calibration Procedures for dipole validation kits |
| Calibration date: | December 17, 2021 |

This calibration Certificate documents the traceability to national standards, which realize the physical units of measurements (SI). The measurements and the uncertainties with confidence probability are given on the following pages and are part of the certificate.

All calibrations have been conducted in the closed laboratory facility: environment temperature (22±3)°C and humidity<70%.

Calibration Equipment used (M&TE critical for calibration)

| Primary Standards | ID # | Cal Date(Calibrated by, Certificate No.) | Scheduled Calibration |
|---|---|---|---|
| Power Meter NRP2 | 106277 | 24-Sep-21 (CTTL, No.J21X08326) | Sep-22 |
| Power sensor NRP8S | 104291 | 24-Sep-21 (CTTL, No.J21X08326) | Sep-22 |
| ReferenceProbe EX3DV4 | SN 7307 | 26-May-21(SPEAG,No.EX3-7307_May21) | May-22 |
| DAE4 | SN 1556 | 15-Jan-21(SPEAG,No.DAE4-1556_Jan21) | Jan-22 |
| **Secondary Standards** | **ID #** | **Cal Date(Calibrated by, Certificate No.)** | **Scheduled Calibration** |
| Signal Generator E4438C | MY49071430 | 01-Feb-21 (CTTL, No.J21X00593) | Jan-22 |
| NetworkAnalyzer E5071C | MY46110673 | 14-Jan-21 (CTTL, No.J21X00232) | Jan-22 |

| | Name | Function | Signature |
|---|---|---|---|
| Calibrated by: | Zhao Jing | SAR Test Engineer | |
| Reviewed by: | Lin Hao | SAR Test Engineer | |
| Approved by: | Qi Dianyuan | SAR Project Leader | |

Issued: December 27, 2021

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**lossary:**

| | |
|---|---|
| TSL | tissue simulating liquid |
| ConvF | sensitivity in TSL / NORMx,y,z |
| N/A | not applicable or not measured |

**Calibration is Performed According to the Following Standards:**

a) IEEE Std 1528-2013, "IEEE Recommended Practice for Determining the Peak Spatial-Averaged Specific Absorption Rate (SAR) in the Human Head from Wireless Communications Devices: Measurement Techniques", June 2013
b) IEC 62209-1, "Measurement procedure for assessment of specific absorption rate of human exposure to radio frequency fields from hand-held and body-mounted wireless communication devices- Part 1: Device used next to the ear (Frequency range of 300MHz to 6GHz)", July 2016
c) IEC 62209-2, "Procedure to measure the Specific Absorption Rate (SAR) For wireless communication devices used in close proximity to the human body (frequency range of 30MHz to 6GHz)", March 2010
d) KDB865664, SAR Measurement Requirements for 100 MHz to 6 GHz

**Additional Documentation:**

e) DASY4/5 System Handbook

**Methods Applied and Interpretation of Parameters:**

- *Measurement Conditions:* Further details are available from the Validation Report at the end of the certificate. All figures stated in the certificate are valid at the frequency indicated.
- *Antenna Parameters with TSL:* The dipole is mounted with the spacer to position its feed point exactly below the center marking of the flat phantom section, with the arms oriented parallel to the body axis.
- *Feed Point Impedance and Return Loss:* These parameters are measured with the dipole positioned under the liquid filled phantom. The impedance stated is transformed from the measurement at the SMA connector to the feed point. The Return Loss ensures low reflected power. No uncertainty required.
- *Electrical Delay:* One-way delay between the SMA connector and the antenna feed point. No uncertainty required.
- *SAR measured:* SAR measured at the stated antenna input power.
- *SAR normalized:* SAR as measured, normalized to an input power of 1 W at the antenna connector.
- *SAR for nominal TSL parameters:* The measured TSL parameters are used to calculate the nominal SAR result.

The reported uncertainty of measurement is stated as the standard uncertainty of Measurement multiplied by the coverage factor k=2, which for a normal distribution Corresponds to a coverage probability of approximately 95%.

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## Measurement Conditions

DASY system configuration, as far as not given on page 1.

| | | |
|---|---|---|
| **DASY Version** | DASY52 | V52.10.4 |
| **Extrapolation** | Advanced Extrapolation | |
| **Phantom** | Triple Flat Phantom 5.1C | |
| **Distance Dipole Center - TSL** | 10 mm | with Spacer |
| **Zoom Scan Resolution** | dx, dy, dz = 5 mm | |
| **Frequency** | 1800 MHz ± 1 MHz | |

## Head TSL parameters

The following parameters and calculations were applied.

| | **Temperature** | **Permittivity** | **Conductivity** |
|---|---|---|---|
| **Nominal Head TSL parameters** | 22.0 °C | 40.0 | 1.40 mho/m |
| **Measured Head TSL parameters** | (22.0 ± 0.2) °C | 40.8 ± 6 % | 1.38 mho/m ± 6 % |
| **Head TSL temperature change during test** | <1.0 °C | ---- | ---- |

## SAR result with Head TSL

| **SAR averaged over 1 $cm^3$ (1 g) of Head TSL** | Condition | |
|---|---|---|
| SAR measured | 250 mW input power | 9.67 W/kg |
| SAR for nominal Head TSL parameters | normalized to 1W | **39.2 W/kg ± 18.8 % (*k*=2)** |
| **SAR averaged over 10 $cm^3$ (10 g) of Head TSL** | Condition | |
| SAR measured | 250 mW input power | 4.98 W/kg |
| SAR for nominal Head TSL parameters | normalized to 1W | **20.1 W/kg ± 18.7 % (*k*=2)** |

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## Appendix (Additional assessments outside the scope of CNAS L0570)

### Antenna Parameters with Head TSL

| | |
|---|---|
| Impedance, transformed to feed point | 49.7Ω- 3.22jΩ |
| Return Loss | - 29.8dB |

### General Antenna Parameters and Design

| | |
|---|---|
| Electrical Delay (one direction) | 1.121 ns |

After long term use with 100W radiated power, only a slight warming of the dipole near the feedpoint can be measured.

The dipole is made of standard semirigid coaxial cable. The center conductor of the feeding line is directly connected to the second arm of the dipole. The antenna is therefore short-circuited for DC-signals. On some of the dipoles, small end caps are added to the dipole arms in order to improve matching when loaded according to the position as explained in the "Measurement Conditions" paragraph. The SAR data are not affected by this change. The overall dipole length is still according to the Standard.
No excessive force must be applied to the dipole arms, because they might bend or the soldered connections near the feedpoint may be damaged.

### Additional EUT Data

| | |
|---|---|
| Manufactured by | SPEAG |

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**DASY5 Validation Report for Head TSL** Date: 2021-11-17

Test Laboratory: CTTL, Beijing, China

**DUT: Dipole 1800 MHz; Type: D1800V2; Serial: D1800V2 - SN: 2d158**

Communication System: UID 0, CW; Frequency: 1800 MHz; Duty Cycle: 1:1

Medium parameters used: f = 1800 MHz; $\sigma$ = 1.378 S/m; $\varepsilon_r$ = 40.8; $\rho$ = 1000 kg/m$^3$

Phantom section: Right Section

Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2007)

DASY5 Configuration:

- Probe: EX3DV4 - SN7307; ConvF(8.34, 8.34, 8.34) @ 1800 MHz; Calibrated: 2021-05-26
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1556; Calibrated: 2021-01-15
- Phantom: MFP_V5.1C (20deg probe tilt); Type: QD 000 P51 Cx; Serial: 1062
- DASY52 52.10.4(1535); SEMCAD X 14.6.14(7501)

**System Performance Check/Zoom Scan (7x7x7) (7x7x7)/Cube 0:** Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 102.1 V/m; Power Drift = -0.02 dB

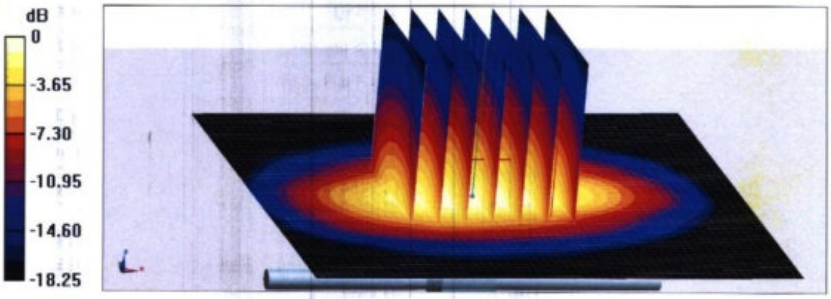
Peak SAR (extrapolated) = 18.9 W/kg

**SAR(1 g) = 9.67 W/kg; SAR(10 g) = 4.98 W/kg**

Smallest distance from peaks to all points 3 dB below = 10.2 mm

Ratio of SAR at M2 to SAR at M1 = 51.3%

Maximum value of SAR (measured) = 15.5 W/kg




**0 dB = 15.5 W/kg = 11.90 dBW/kg**