# FCC SAR Test Report

## FCC ID: X4YTRNTY3G

| | | |
|---|---|---|
| **Project No.** | : | 1510C002 |
| **Equipment** | : | 3G/4G TRINITY PORTABLE SIM-BASED WI-FI HOTSPOT |
| **Model Name** | : | ARNPR3G5U1 |
| **Applicant** | : | NEXXT SOLUTIONS |
| **Address** | : | 3505 N.W 107TH AVE,MIAMI,FL,33178 |

| | | |
|---|---|---|
| **Date of Receipt** | : | Oct. 08, 2015 |
| **Date of Test** | : | Oct. 22, 2015 ~ Oct. 28, 2015 |
| **Issued Date** | : | Nov. 03, 2015 |
| **Tested by** | : | BTL Inc. |

**PREPARED BY** :

(Super Jiang/ Technical Engineer)

**APPROVED BY** : (Steven Lu / Technical Manager)


**BTL INC.**

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Testing Laboratory 2640

## Declaration

**BTL** represents to the client that testing is done in accordance with standard procedures as applicable and that test instruments used has been calibrated with the standards traceable to National Measurement Laboratory (**NML**), or National Institute of Standards and Technology (**NIST**) .

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**BTL**'s laboratory quality assurance procedures are in compliance with the **ISO Guide17025** requirements, and accredited by the conformity assessment authorities listed in this test report.

## Limitation

For the use of the authority's logo is limited unless the Test Standard(s)/Scope(s)/Item(s) mentioned in this test report is (are) included in the conformity assessment authorities acceptance respective.

BTL

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## REPORT ISSUED HISTORY

| Issued No. | Description | Issued Date |
|---|---|---|
| BTL-FCC-SAR-1510C002 | Original Issue. | Nov. 03, 2015 |

## 1. GENERAL SUMMARY

| | |
|---|---|
| Equipment | 3G/4G TRINITY PORTABLE SIM-BASED WI-FI HOTSPOT |
| Model Name | ARNPR3G5U1 |
| Brand Name | NEXXT |
| Manufacturer | NEXXT SOLUTIONS |
| Address | 3505 N.W 107TH AVE,MIAMI,FL,33178 |
| Standard(s) | **FCC 47CFR §2.1093** Radio frequency Radiation Exposure Evaluation: Portable Devices<br><br>**ANSI Std C95.1-1992**Safety Levels with Respect to Human Exposure to Radio Frequency Electromagnetic Fields, 3 kHz – 300 GHz.( IEEE Std C95.1-1991)<br><br>**IEEE Std 1528-2013**Recommended Practice for Determining the Peak Spatial-Average Specific Absorption Rate (SAR) in the Human Head from Wireless Communications Devices: Measurement Techniques<br><br>**KDB941225 D01** 3G SAR Procedures v03r01<br>**KDB941225 D06** Hotspot Mode V02r01<br>**KDB447498 D01** General RF Exposure Guidance v06<br>**KDB248227 D01** 802. 11 Wi-Fi SAR v02r02<br>**KDB865664 D01** SAR measurement 100 MHz to 6 GHz v01r04<br>**KDB865664 D02** SAR Reporting v01r02<br>**KDB690783 D01** SAR Listings on Grants v01r03 |

The above equipment has been tested and found compliance with the requirement of the relative standards by BTL Inc.
The test data, data evaluation, and equipment configuration contained in our test report (Ref No. BTL-FCC-SAR-1510C002) were obtained utilizing the test procedures, test instruments, test sites that has been accredited by the Authority of TAF according to the ISO-17025 quality assessment standard and technical standard(s).

# 2. RF EMISSIONS MEASUREMENT

## 2.1 TEST FACILITY

The test facilities used to collect the test data in this report is **SAR room** at the location of No.3,Jinshagang 1st Road, ShiXia, Dalang Town,Dong Guan, China.523792

## 2.2 MEASUREMENT UNCERTAINTY

Note: Per KDB865664 D01 SAR Measurement 100 MHz to 6 GHz v01r03,when the highest measured 1-g SAR within a frequency band is < 1.5 W/kg, the extensive SAR measurement uncertainty analysis described in IEEE Std 1528-2013 is not required in SAR reports submitted for equipment approval. The equivalent ratio (1.5/1.6) is applied to extremity and occupational exposure conditions.

# 3. GENERAL INFORMATION

## 3.1 STATEMENT OF COMPLIANCE

| Equipment Class | Mode | Highest Body (10mm) SAR-1g(W/kg) |
|---|---|---|
| PCE | GSM850 | 1.24 |
| | GSM1900 | 0.76 |
| | WCDMA Band II | 0.67 |
| | WCDMA Band V | 1.24 |
| DTS | 2.4G WLAN | 0.32 |
| **The highest simultaneous SAR value is 1.56 W/kg per KDB690783 D01** | | |

Note:

The device is in compliance with Specific Absorption Rate（SAR）for general population/ uncontrolled exposure limits according to the FCC rule §2.1093, the ANSI/IEEE C95.1:1992, the NCRP Report Number 86 for uncontrolled environment, and had been tested in accordance with the measurement methods and procedures specified in IEEE Std 1528-2013.

### 3.1.1 GENERAL DESCRIPTION OF EUT

<table>
<tr><td>Equipment</td><td colspan="3">3G/4G TRINITY PORTABLE SIM-BASED WI-FI HOTSPOT</td></tr>
<tr><td>Model Name</td><td colspan="3">ARNPR3G5U1</td></tr>
<tr><td>IMEI Code</td><td colspan="3">355189036558775</td></tr>
<tr><td>S/N</td><td colspan="3">30123071100159</td></tr>
<tr><td>Modulation</td><td colspan="3">GSM(GMSK/8PSK),WCDMA(QPSK),WiFi(DSSS/OFDM)</td></tr>
<tr><td rowspan="6">Operation Frequency Range(s)</td><td>Band</td><td>TX (MHz)</td><td>RX (MHz)</td></tr>
<tr><td>GSM850</td><td>824-849</td><td>869-894</td></tr>
<tr><td>GSM1900</td><td>1850-1910</td><td>1930-1990</td></tr>
<tr><td>WCDMA Band V</td><td>824-849</td><td>869-894</td></tr>
<tr><td>WCDMA Band II</td><td>1850-1910</td><td>1930-1990</td></tr>
<tr><td>WIFI</td><td colspan="2">2412 ~2462</td></tr>
<tr><td rowspan="3">GPRS/EDGE Multislot Class(12)</td><td colspan="2">Max Number of Timeslots in Uplink:</td><td>4</td></tr>
<tr><td colspan="2">Max Number of Timeslots in Downlink:</td><td>4</td></tr>
<tr><td colspan="2">Max Total Timeslot:</td><td>5</td></tr>
<tr><td>GSM Device class</td><td colspan="3">Class B</td></tr>
<tr><td>HSDPA UE Category</td><td colspan="3">14</td></tr>
<tr><td>HSUPA UE Category</td><td colspan="3">7</td></tr>
<tr><td rowspan="3">Power Class:</td><td colspan="3">4,tested with power level 5(GSM850)</td></tr>
<tr><td colspan="3">1,tested with power level 0(GSM1900)</td></tr>
<tr><td colspan="3">3, tested with power control “all 1”(WCDMA Band II/ V)</td></tr>
<tr><td rowspan="6">Test Channels (low-mid-high):</td><td colspan="3">128-190-251 (GSM850)</td></tr>
<tr><td colspan="3">512-661-810 (GSM1900)</td></tr>
<tr><td colspan="3">9262-9400-9538(WCDMA Band II)</td></tr>
<tr><td colspan="3">4132-4182-4233 (WCDMA Band V)</td></tr>
<tr><td colspan="3">1-6 -11 (2.4G WIFI 802.11b/g/n HT20)</td></tr>
<tr><td colspan="3">3-6 - 9 (2.4G WIFI 802.11n HT40)</td></tr>
<tr><td rowspan="3">Antenna Gain</td><td colspan="3">2.4G WiFi: 0.58 dBi</td></tr>
<tr><td colspan="3">GSM850/ WCDMA Band V: -1.66dBi</td></tr>
<tr><td colspan="3">GSM1900/ WCDMA Band II: -0.94dBi</td></tr>
<tr><td colspan="4">Other Information</td></tr>
<tr><td rowspan="5">Battery</td><td>Brand</td><td colspan="2">N/A</td></tr>
<tr><td>Model</td><td colspan="2">BM301</td></tr>
<tr><td>Capacitance</td><td colspan="2">2000mAh</td></tr>
<tr><td>Rated Voltage</td><td colspan="2">3.7V/7.4Wh</td></tr>
<tr><td>Manufacturer</td><td colspan="2">ShenZhen Jiete Energy Technology Co.,Ltd</td></tr>
</table>

### 3.2 LABORATORY ENVIRONMENT

<table>
<tr><td>Temperature</td><td>Min. = 18ºC, Max. = 25ºC</td></tr>
<tr><td>Relative humidity</td><td>Min. = 30%, Max. = 70%</td></tr>
<tr><td>Ground system resistance</td><td>< 0.5Ω</td></tr>
<tr><td colspan="2">Ambient noise is checked and found very low and in compliance with requirement of standards.<br>Reflection of surrounding objects is minimized and in compliance with requirement of standards.</td></tr>
</table>

## 3.3 MAIN TEST INSTRUMENTS

| Item | Equipment | Manufacturer | Model | Serial No. | Cal. Date | Cal. Interval |
|---|---|---|---|---|---|---|
| 1 | Data Acquisition Electronics | Speag | DAE4 | 905 | July. 16, 2015 | 1 Year |
| 2 | E-field Probe | Speag | EX3DV4 | 3932 | Jan. 30, 2015 | 1 Year |
| 3 | System Validation Dipole | Speag | D835V2 | 4d199 | Aug. 12, 2015 | 1 Year |
| 4 | System Validation Dipole | Speag | D1900V2 | 5d142 | Jun. 23, 2015 | 1 Year |
| 5 | System Validation Dipole | Speag | D2450V2 | 869 | Jun. 19, 2015 | 1 Year |
| 6 | Twin Sam Phantom | Speag | Twin Sam Phantom V5.0 | 1784 | N.A | N.A |
| 7 | 8960 Series 10 Wireless Com Test set | Agilent | E5515E | MY52112163 | Sep. 09, 2015 | 1 Year |
| 8 | Power Amplifier | Speag | ZHL-42W+ | QA1333003 | Mar. 09, 2015 | 1 Year |
| 9 | Power Amplifier | Speag | ZVE-8G | 520701341 | Mar. 09, 2015 | 1 Year |
| 10 | ENA Network Analyzer | Agilent | E5071C | MY46102965 | Mar. 29, 2015 | 1 Year |
| 11 | MXG Analog Signal Generator | Agilent | N5181A | MY49060710 | Nov. 02, 2015 | 1 Year |
| 12 | P-series power meter | Agilent | N1911A | MY45100473 | Mar. 29, 2015 | 1 Year |
| 13 | wideband power sensor | Agilent | N1921A | MY51100041 | Mar. 29, 2015 | 1 Year |
| 14 | Power Meter | Anritsu | ML2487A | 6K00004714 | Mar. 16, 2015 | 1 Year |
| 15 | Power Meter Sensor | Anritsu | MA2491A | 34138 | Mar. 16, 2015 | 1 Year |
| 16 | Dielectric Assessment Kit | Speag | DAK-3.5 | 1226 | Aug. 04, 2015 | 1 Year |
| 17 | Low pass filter | Mini-Circuits | SLP-2950+ | M108294 | Mar. 29, 2015 | 1 Year |
| 18 | Attenuator | Mini-Circuits | VAT-10+ | 31317-1 | Mar. 29, 2015 | 1 Year |
| 19 | Attenuator | Mini-Circuits | VAT-10+ | 31317-2 | Mar. 29, 2015 | 1 Year |
| 20 | Attenuator | MEB | 300-affn-03 | 314 | Mar. 29, 2015 | 1 Year |
| 21 | Dual directional coupler | Agilent | 777D | 50208 | Mar. 29, 2015 | 1 Year |

Remark: " N/A" denotes no model name, serial No. or calibration specified.
All calibration period of equipment list is one year.

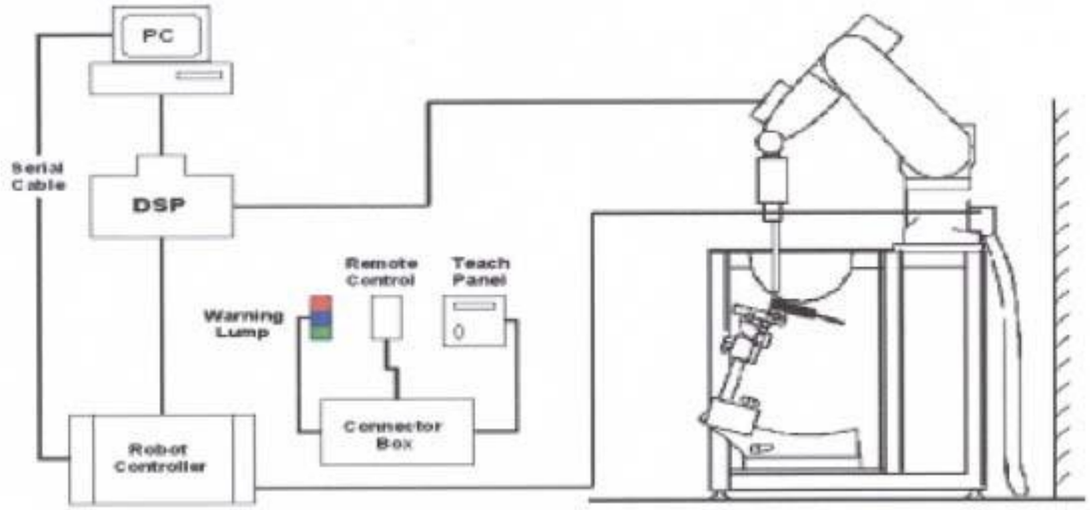
# 4.SAR MEASUREMENTS SYSTEM CONFIGURATION

## 4.1SAR MEASUREMENT SET-UP

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

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

### 4.1.1Test Setup Layout



## 4.2DASY5E-FIELDPROBESYSTEM

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

### 4.2.1EX3DV4 PROBE SPECIFICATION

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

| | |
|---|---|
|  |  |

**EX3DV4 E-field Probe**

### 4.2.2E-FIELD PROBE CALIBRATION

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

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

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

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

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

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

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

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

Where: σ = Simulated tissue conductivity,

ρ = Tissue density (kg/m3).

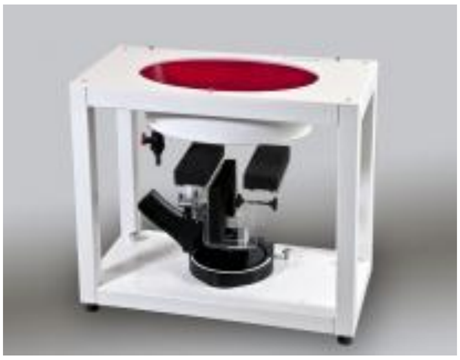
### 4.2.3OTHER TEST EQUIPMENT

#### 4.2.3.1. Device Holder for Transmitters

**Construction:** Simple but effective and easy-to-use extension for Mounting Device that facilitates the testing of larger devices (e.g., laptops, cameras, etc.) It is light weight and fits easily on the upper part of the Mounting Device in place of the phone positioner. The extension is fully compatible with the Twin SAM, ELI4and SAM v6.0Phantoms.
**Material:** POM, Acrylic glass, Foam

#### 4.2.3.2 Phantom

| | |
|---|---|
| Model | ELI4 Phantom |
| Construction | Phantom for compliance testing of handheld and body-mounted wireless devices in the frequency range of 30 MHz to 6 GHz. ELI is fully compatible with the IEC 62209-2 standard and all known tissue simulating liquids. ELI has been optimized regarding its performance and can be integrated into our standard phantom tables. A cover prevents evaporation of the liquid. Reference markings on the phantom allow installation of the complete setup, including all predefined phantom positions and measurement grids, by teaching three points. The phantom is compatible with all SPEAG dosimetric probes and dipoles. |
| Shell Thickness | 2±0.1 mm |
| Filling Volume | Approx. 30 liters |
| Dimensions | Length: 600 mm ; Width: 190mm<br>Height: adjustable feet |
| Aailable | Special |



| | |
|---|---|
| Model | Twin SAM |
| Construction | The shell corresponds to the specifications of the Specific Anthropomorphic Mannequin (SAM) phantom defined in IEEE 1528 and IEC 62209-1. It enables the dosimetric evaluation of left and right hand phone usage as well as body mounted usage at the flat phantom region. A cover prevents evaporation of the liquid. Reference markings on the phantom allow the complete setup of all predefined phantom positions and measurement grids by teaching three points with the robot. |
| Shell Thickness | 2 ± 0.2 mm |
| Filling Volume | Approx. 25 liters |
| Dimensions | Length:1000mm; Width: 500mm<br>Height: adjustable feet |
| Aailable | Special |

### 4.2.4SCANNING PROCEDURE

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

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

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

- Area Scan

The “area scan” measures the SAR above the DUT or verification dipole on a parallel plane to the surface. It is used to locate the approximate location of the peak SAR with 2D spline interpolation. The robot performs a stepped movement along one grid axis while the local electrical field strength is measured by the probe. The probe is touching the surface of the SAM during acquisition of measurement values. The standard scan uses large grid spacing for faster measurement.
Standard grid spacing for head measurements is 15 mm in x- and y- dimension(≤2GHz)，12 mm in x- and y- dimension(2-4 GHz) and 10mm in x- and y- dimension(4-6GHz). If a finer resolution is needed, the grid spacing can be reduced. Grid spacing and orientation have no influence on the SAR result. For special applications where the standard scan method does not find the peak SAR within the grid, e.g. mobile phones with flip cover, the grid can be adapted in orientation.

- Zoom Scan

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

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

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

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

### 4.2.5SPATIAL PEAK SAR EVALUATION

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

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

**Extrapolation**

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

**Interpolation**

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

**Volume Averaging**

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

**Advanced Extrapolation**

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

### 4.2.6DATA STORAGE AND EVALUATION

#### 4.2.5.1Data Storage

The DASY5 software stores the acquired data from the data acquisition electronics as raw data (in microvolt readings from the probe sensors), together with all necessary software parameters for the data evaluation (probe calibration data, liquid parameters and device frequency and modulation data) in measurement files with the extension ".DAE4". The software evaluates the desired unit and format for output each time the data is visualized or exported. This allows verification of the complete software setup even after the measurement and allows correction of incorrect parameter settings. For example, if a measurement has been performed with a wrong crest factor parameter in the device setup, the parameter can be corrected afterwards and the data can be re-evaluated.

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

### 4.4.2 Data Evaluation by SEMCAD

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

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

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

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

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

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

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

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

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

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

With
- $V_i$ = compensated signal of channel i ( i = x, y, z )
- $Norm_i$ = sensor sensitivity of channel i ( i = x, y, z ) $[mV/(V/m)^2]$ for E-field Probes
- ConvF = sensitivity enhancement in solution
- aij = sensor sensitivity factors for H-field probes
- f = carrier frequency [GHz]
- $E_i$ = electric field strength of channel i in V/m
- $H_i$ = magnetic field strength of channel i in A/m

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

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

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

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

With
- SAR = local specific absorption rate in mW/g
- $E_{tot}$ = total field strength in V/m
- = conductivity in [mho/m] or [Siemens/m]
- = equivalent tissue density in $g/cm^3$

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

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

With
- $P_{pwe}$ = equivalent power density of a plane wave in $mW/cm^2$
- $E_{tot}$ = total field strength in V/m
- $H_{tot}$ = total magnetic field strength in A/m

# 5. SYSTEM VERIFICATION PROCEDURE

## 5.1 TISSUE VERIFICATION

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

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

| Tissue Type | Bactericide | DGBE | HEC | NaCl | Sucrose | Triton X-100 | Water | Diethylene Glycol Mono-hexylether |
|---|---|---|---|---|---|---|---|---|
| Body 835 | 0.2 | - | 0.2 | 0.9 | 48.5 | - | 50.2 | - |
| Body 1900 | - | 29.5 | - | 0.3 | - | - | 70.2 | - |
| Body 2450 | - | 31.4 | - | 0.1 | - | - | 68.5 | - |

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

| Tissue Verification | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| Tissue Type | Frequency (MHz) | Liquid Temp. (℃) | Conductivity (σ) | Permittivity (εr) | Targeted Conductivity (σ) | Targeted Permittivity (εr) | Deviation Conductivity (σ) (%) | Deviation Permittivity (εr) (%) | Date |
| Body | 835 | 22.2 | 0.961 | 54.914 | 0.97 | 55.2 | -0.93 | -0.52 | Oct. 22, 2015 |
| Body | 835 | 22.5 | 0.981 | 55.142 | 0.97 | 55.2 | 1.13 | -0.11 | Oct. 28, 2015 |
| Body | 1900 | 22.5 | 1.534 | 53.020 | 1.52 | 53.3 | 0.92 | -0.53 | Oct. 22, 2015 |
| Body | 2450 | 22.5 | 1.982 | 51.150 | 1.95 | 52.7 | 1.64 | -2.94 | Oct. 23, 2015 |

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

## 5.2 SYSTEM CHECK

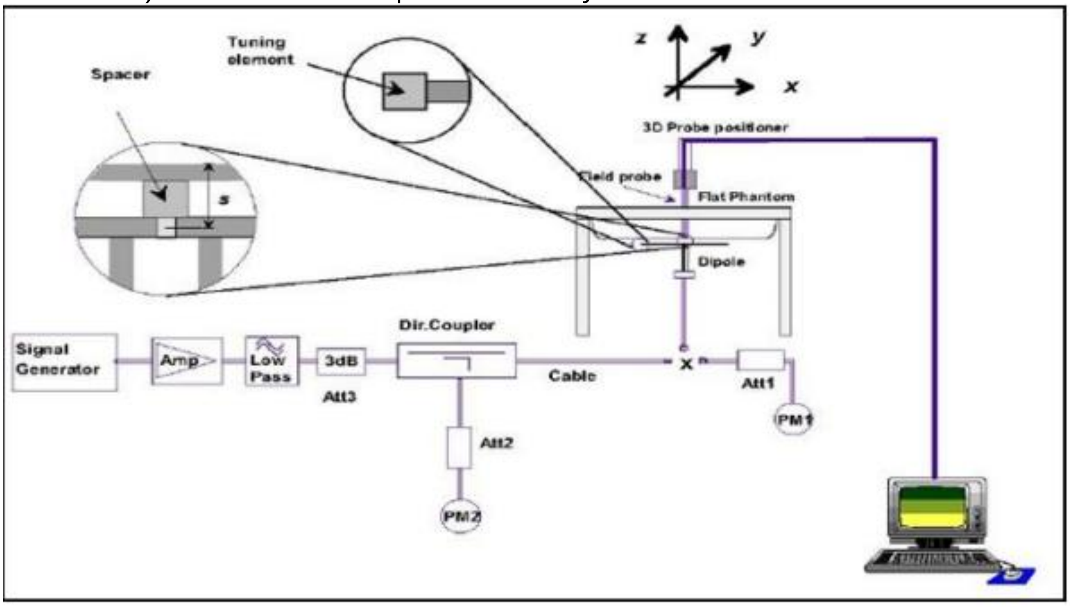
The system check is performed for verifying the accuracy of the complete measurement system and performance of the software. The system check is performed with tissue equivalent material according to IEEE P1528 (described above). The following table shows system check results for all frequency bands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

| System Check | Date | Frequency (MHz) | Targeted SAR (W/kg) | Measured SAR (W/kg) | normalized SAR (W/kg) | Deviation (%) | Dipole S/N |
|---|---|---|---|---|---|---|---|
| Body | Oct. 22, 2015 | 835 | 9.43 | 2.35 | 9.40 | -0.32 | 4d199 |
| Body | Oct. 28, 2015 | 835 | 9.43 | 2.38 | 9.52 | 0.95 | 4d199 |
| Body | Oct. 22, 2015 | 1900 | 40.90 | 9.99 | 39.96 | -2.30 | 5d142 |
| Body | Oct. 23, 2015 | 2450 | 52.40 | 12.85 | 51.40 | -1.91 | 869 |

## 5.3 SYSTEM CHECK PROCEDURE

The system check is performed by using a system check dipole which is positioned parallel to the planar part of the SAM phantom at the reference point. The distance of the dipole to the SAM phantom is determined by a plexiglass spacer. The dipole is connected to the signal source consisting of signal generator and amplifier via a directional coupler, N-connector cable and adaption to SMA. It is fed with a power of 250 mW(below 5GHz) or 100mW(above 5GHz). To adjust this power a power meter is used. The power sensor is connected to the cable before the system check to measure the power at this point and do adjustments at the signal generator. At the outputs of the directional coupler both return loss as well as forward power are controlled during the system check to make sure that emitted power at the dipole is kept constant. This can also be checked by the power drift measurement after the test.

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



# 6.SAR MEASUREMENT VARIABILITY AND UNCERTAINTY

## 6.1SAR MEASUREMENT VARIABILITY

Per KDB865664 D01 SAR measurement 100 MHz to 6 GHz v01r04, SAR measurement variability must be assessed for each frequency band, which is determined by the SAR probe calibration point and tissue-equivalent medium used for the device measurements. The additional measurements are repeated after the completion of all measurements requiring the same head or body tissue-equivalent medium in a frequency band. The test device should be returned to ambient conditions (normal room temperature) with the battery fully charged before it is re-mounted on the device holder for the repeated measurement(s) to minimize any unexpected variations in the repeated results.

1) Repeated measurement is not required when the original highest measured SAR is < 0.80 W/kg; steps 2) through 4) do not apply.
2) When the original highest measured SAR is ⩾ 0.80 W/kg, repeat that measurement once.
3) Perform a second repeated measurement only if the ratio of largest to smallest SAR for the original and first repeated measurements is > 1.20 or when the original or repeated measurement is⩾ 1.45 W/kg (~ 10% from the 1-g SAR limit).
4) Perform a third repeated measurement only if the original, first or second repeated measurement is ⩾1.5 W/kg and the ratio of largest to smallest SAR for the original, first and second repeated measurements is > 1.20.

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

The detailed repeated measurement results are shown in Section 8.2.

## 6.2SAR MEASUREMENT UNCERTAINTY

Per KDB865664 D01 SAR Measurement 100 MHz to 6 GHz v01r04,when the highest measured 1-g SAR within a frequency band is < 1.5 W/kg, the extensive SAR measurement uncertainty analysis.

# 7. OPERATIONAL CONDITIONS DURING TEST

## 7.1 SAR TEST CONFIGURATION

### 7.1.1 GSM TEST CONFIGURATION

SAR tests for GSM850 and GSM1900, a communication link is set up with a base station by air link. Using Agilent 8960, the power lever is set to “5”and “0” in SAR of GSM850 and GSM1900. The tests in the band of GSM850 and GSM1900 are performed in the mode of GPRS/EGPRS function. Since the GPRS class is 12 for this EUT, it has at most 4 timeslots in uplink and at most 4 timeslots in downlink, the maximum total timeslot is 5. The EGPRS class is 12 for this EUT, it has at most 4 timeslots in uplink, and at most 4 timeslots in downlink, the maximum total timeslot is 5.

When SAR tests for EGPRS mode is necessary, GMSK modulation should be used to minimize SAR measurement error due to higher peak-to-average power (PAR) ratios inherent in 8-PSK.

According to specification 3GPP TS 51.010, the maximum power of the GSM can do the power reduction for the multi-slot.

The allowed power reduction in the multi-slot configuration is as following:

| Number of timeslots in uplink assignment | | Reduction of maximum output power (dB) | |
|---|---|---|---|
| Band | Time Slots | GPRS (GMSK) | EDGE (8PSK ) |
| GSM850 | 1 TX slot | 0 | 0 |
| | 2 TX slots | 2.5 | 4 |
| | 3 TX slots | 4 | 6 |
| | 4 TX slots | 5 | 6.5 |
| GSM1900 | 1 TX slot | 0 | 0 |
| | 2 TX slots | 0.5 | 1 |
| | 3 TX slots | 2 | 3.5 |
| | 4 TX slots | 2.5 | 4.5 |

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### 7.1.2 UMTS TEST CONFIGURATION

1. Output Power Verification

Maximum output power is verified on the High, Middle and Low channels according to the procedures description in section 5.2 of 3GPP TS 34.121,using the appropriate RMC or AMR with TPC(transmit power control) set to all "1s" for WCDMA/HSDPA or applying the required inner loop power control procedure to maintain maximum output power while HSUPA is active. Result for all applicable physical channel configurations(DPCCH,DPDCHn and spreading codes, HSDPA, HSPA)
Should be tabulated in the SAR report .All configuration that are not supported by the DUT or cannot be measured due to technical or equipment limitation should be clearly identified.

2. WCDMA

(1).Head SAR Measurements
SAR for Head exposure configurations in voice mode is measured using a 12.2 kbps RMC with TPC bits configured to all "1s". SAR in AMR configurations is not required when the maximum average output of each RF channel for 12.2 kbps AMR is less than ¼ dB higher than that measured in 12.2 kbps RMC. Otherwise SAR is measured on the maximum output channel in 12.2 kbps AMR with 3.4kbps SRB(signalling radio bearer) using the exposure configuration that results in the highest SAR in12.2kbps RMC for that RF channel.

(2).Body SAR Measurements
SAR for body exposure configurations is measured using the 12.2 kbps RMC with the TPC bits configured to all "1s". SAR for other spreading codes and multiple DPDCHn, when supported by the EUT, are not required when the maximum average outputs of each RF channel, for each spreading code and DPDCHn configuration, are less than ¼ dB higher than those measured in 12.2 kbps RMC.

3. HSDPA

SAR for body exposure configurations is measured according to the "Body SAR Measurements"" procedures of 3G device. In addition, body SAR is also measured for HSDPA when the maximum average outputs of each RF channel with HSDPA active is at ¼ dB higher than that measured without HSDPA using 12.2kbps RMC or the maximum SAR 12.2kbps RMC is above 75% of the SAR limit. Body SAR for HSDPA is measured using an FRC with H-Set 1 in Sub-test 1 and a 12.2kbps RMC configured in Test Loop Mode 1, using the highest body SAR configuration in 12.2 kbps RMC without HSDPA.
HSDPA should be configured according to UE category of a test device. The number of HS-DSCH/HS-PDSCHs, HAPRQ processes, minimum inter-TTI interval, transport block sizes and RV coding sequence are defined by the H-set. To maintain a consistent test configuration and stable transmission condition, QPSK is used in the H-set for SAR testing. HS-DPCCH should be configured with a CQI feedback cycle of 4ms with a CQI repetition factor of 2 to maintain a constant rate of active CQI slots. The $\beta_c$ and$\beta_d$ gain factors for DPCCH and DPDCH were set according to the values in the below table,$\beta_{hs}$ for HS-DPCCH is set automatically to the correct value when Δ ACK,Δ NACK, Δ CQI = 8. The variation of the$\beta_c$ /$\beta_d$ ratio causes a power reduction at sub-tests 2 - 4.

| Sub-test | $\beta_c$ | $\beta_d$ | $\beta_d$ (SF) | $\beta_c$ /$\beta_d$ | $\beta_{hs}$ (1) | CM(dB)(2) | MPR (dB) |
|---|---|---|---|---|---|---|---|
| 1 | 2/15 | 15/15 | 64 | 2/15 | 4/15 | 0.0 | 0 |
| 2 | 12/15(3) | 15/15(3) | 64 | 12/15(3) | 24/15 | 1.0 | 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: ΔACK, ΔNACK and ΔCQI = 8 $A_{hs} = \beta_{hs}/\beta_c = 30/15$ $\beta_{hs} = 30/15 * \beta_c$
Note 2 : CM=1 for $\beta_c/\beta_d$= 12/15, $\beta_{hs}/\beta_c = 24/15$. For all other combinations of DPDCH,DPCCH 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 3 : 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 $\beta_d = 15/15$

The measurements were performed with a Fixed Reference Channel (FRC) and H-Set 1 QPSK.

Settings of required H-Set 1 QPSK acc. to 3GPP 34.121

| Parameter | Value |
|---|---|
| Nominal average inf. bit rate | 534 kbit/s |
| Inter-TTI Distance | 3 TTI‟s |
| Number of HARQ Processes | 2 Processes |
| Information Bit Payload | 3202 Bits |
| MAC-d PDU size | 336 Bits |
| Number Code Blocks | 1 Block |
| Binary Channel Bits Per TTI | 4800 Bits |
| Total Available SMLs in UE | 19200 SMLs |
| Number of SMLs per HARQ Process | 9600 SMLs |
| Coding Rate | 0.67 |
| Number of Physical Channel Codes | 5 |

HSDPA UE category

| HS-DSCH Category | Maximum HS-DSCH Codes Received | Minimum Inter-TTI Interval | Maximum HS-DSCH Transport Block Bits/HS-DSCH TTI | Total Soft Channel Bits |
|---|---|---|---|---|
| 1 | 5 | 3 | 7298 | 19200 |
| 2 | 5 | 3 | 7298 | 28800 |
| 3 | 5 | 2 | 7298 | 28800 |
| 4 | 5 | 2 | 7298 | 38400 |
| 5 | 5 | 1 | 7298 | 57600 |
| 6 | 5 | 1 | 7298 | 67200 |
| 7 | 10 | 1 | 14411 | 115200 |
| 8 | 10 | 1 | 14411 | 134400 |
| 9 | 15 | 1 | 25251 | 172800 |
| 10 | 15 | 1 | 27952 | 172800 |
| 11 | 5 | 2 | 3630 | 14400 |
| 12 | 5 | 1 | 3630 | 28800 |
| 13 | 15 | 1 | 34800 | 259200 |
| 14 | 15 | 1 | 42196 | 259200 |
| 15 | 15 | 1 | 23370 | 345600 |
| 16 | 15 | 1 | 27952 | 345600 |

4. HSUPA

SAR for Body exposure configurations is measured according to the “Body SAR Measurements” procedures of 3G device. 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 primary mode and the adjusted SAR is ≤ 1.2W/kg, SAR measurement is not required for the secondary mode.

Per KDB941225 D01v03r01, the 3G SAR test reduction procedures is applied to HSPA (HSUPA/HSDPA with RMC) body configurations with 12.2 kbps RMC as the primary mode. Otherwise, SAR is measured for HSPA using the HSPA body SAR procedures for the highest reported body exposure SAR configuration in 12.2 kbps RMC.

Due to inner loop power control requirements in HSUPA, a commercial communication test set should be used for the output power and SAR tests. The 12.2 kbps RMC, FRC H-set 1 and E-DCH configurations for HSDPA should be configured according to the values indicated below as well as other applicable procedures described in the “WCDMA Handset“ and „Release 5 HSDPA Data Device” sections of 3G device.

Subtests for UMTS Release 6 HSUPA

| Sub-test | $\beta_c$ | $\beta_d$ | $\beta_d$ (SF) | $\beta_c/\beta_d$ | $\beta_{hs}$ (1) | $\beta_{ec}$ | $\beta_{ed}$ | $\beta_{ec}$ (SF) | $\beta_{ed}$ (code) | CM (2) (dB) | MPR (dB) | AG (4) Index | E-TFCI |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 11/15 (3) | 15/15 (3) | 64 | 11/15 (3) | 22/15 | 209/225 | 1039/225 | 4 | 1 | 1.0 | 0.0 | 20 | 75 |
| 2 | 6/15 | 15/15 | 64 | 6/15 | 12/15 | 12/15 | 94/75 | 4 | 1 | 3.0 | 2.0 | 12 | 67 |
| 3 | 15/15 | 9/15 | 64 | 15/9 | 30/15 | 30/15 | $\beta_{ed1}$:47/15<br>$\beta_{ed2}$:47/15 | 4 | 2 | 2.0 | 1.0 | 15 | 92 |
| 4 | 2/15 | 15/15 | 64 | 2/15 | 4/15 | 2/15 | 56/75 | 4 | 1 | 3.0 | 2.0 | 17 | 71 |
| 5 | 15/15 (4) | 15/15 (4) | 64 | 15/15 (4) | 30/15 | 24/15 | 134/15 | 4 | 1 | 1.0 | 0.0 | 21 | 81 |

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

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

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

HSUPA UE category

| UE E-DCH Category | Maximum E-DCH Codes Transmitted | Number of HARQ Processes | E-DCH TTI(ms) | Minimum Speading Factor | Maximum E-DCH Transport Block Bits | Max Rate (Mbps) |
|---|---|---|---|---|---|---|
| 1 | 1 | 4 | 10 | 4 | 7110 | 0.7296 |
| 2 | 2 | 8 | 2 | 4 | 2798 | 1.4592 |
| | 2 | 4 | 10 | 4 | 14484 | |
| 3 | 2 | 4 | 10 | 4 | 14484 | 1.4592 |
| 4 | 2 | 8 | 2 | 2 | 5772 | 2.9185 |
| | 2 | 4 | 10 | 2 | 20000 | 2.00 |
| 5 | 2 | 4 | 10 | 2 | 20000 | 2.00 |
| 6 (No DPDCH) | 4 | 8 | 10 | 2SF2&2SF4 | 11484 | 5.76 |
| | 4 | 4 | 2 | | 20000 | 2.00 |
| 7 (No DPDCH) | 4 | 8 | 2 | 2SF2&2SF4 | 22996 | ? |
| | 4 | 4 | 10 | | 20000 | ? |

NOTE: When 4 codes are transmitted in parallel, two codes shall be transmitted with SF2 and two with SF4.UE categories 1 to 6 support QPSK only. UE category 7 supports QPSK and 16QAM.(TS25.306-7.3.0).

### 7.1.4 WIFI TEST CONFIGURATION

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

| Mode | 802.11b | 802.11g | 802.11n (20M/40M) |
|---|---|---|---|
| Duty cycle | 100% | | |
| Crest factor | 1 | | |

#### 7.1.4.1 2.4G SAR TEST REQUIREMENTS

✧ **802.11b DSSS SAR Test Requirements**

SAR is measured for 2.4 GHz 802.11b DSSS using either a fixed test position or, when applicable, the initial test position procedure. SAR test reduction is determined according to the following:

1) When the reported SAR of the highest measured maximum output power channel for the exposure configuration is ≤ 0.8 W/kg, no further SAR testing is required for 802.11b DSSS in that exposure configuration.
2) When the reported SAR is > 0.8 W/kg, SAR is required for that exposure configuration using the next highest measured output power channel. When any reported SAR is > 1.2 W/kg, SAR is required for the third channel; i.e., all channels require testing.

✧ **2.4 GHz 802.11g/n OFDM SAR Test Exclusion Requirements**

When SAR measurement is required for 2.4 GHz 802.11g/n OFDM configurations, the measurement and test reduction procedures for OFDM are applied. SAR is not required for the following 2.4 GHz OFDM conditions.

1) When KDB Publication 447498 SAR test exclusion applies to the OFDM configuration.
2) When the highest reported SAR for DSSS is adjusted by the ratio of OFDM to DSSS specified maximum output power and the adjusted SAR is ≤ 1.2 W/kg.

## 7.2 TEST POSITION

According to KDB 941225 D06v02r01, 3G/4G TRINITY PORTABLE SIM-BASED WI-FI HOTSPOT is tested for SAR compliance in body configurations described in the following subsections.

### 7.2.1 Hotspot Mode Exposure conditons

A test separation of 10mm is required.SAR must be measured for all sides and surfaces with a transmitting antenna located within 25mm from that surface or edge, for the data modes, wireless technologies and frequency bands supporting hotspot mode. The standalone SAR results in each device test orientation must be analyzed for the applicable hotspot mode simultaneous transmission configurations to determine SAR test exclusion and volume scan requirements. The simultaneous transmission configurations must be clearly described in the SAR report to support the analyses or test results. When the device form factor is smaller than 9cm X 5cm, unless a test separation distance of 5 mm or less is used a KDB inquiry is required to determine the acceptable test distance.

The location of the antennas is shown as below picture:

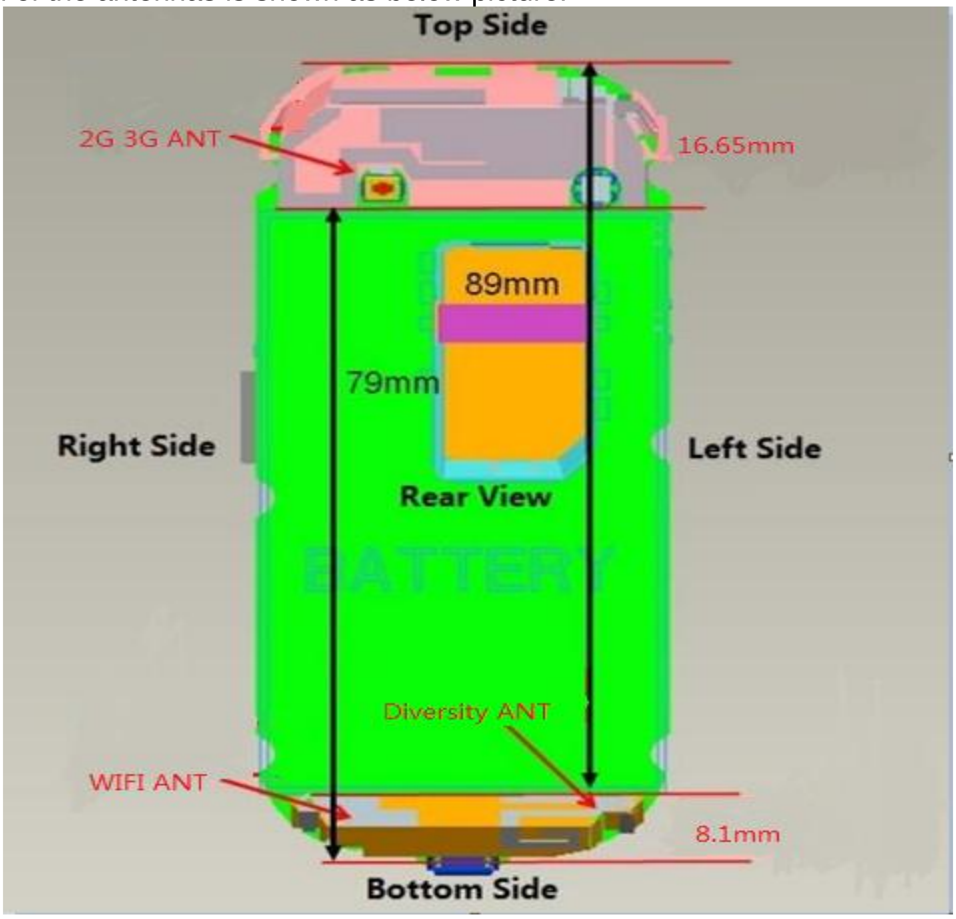


**Table 7.2.1 Hotspot Side For SAR Testing**

| Mode | Front Side | Rear Side | Left Side | Right Side | Top Side | Bottom Side |
|---|---|---|---|---|---|---|
| GSM850/1900 | YES | YES | YES | YES | YES | NO |
| WCDMA Band II/ V | YES | YES | YES | YES | YES | NO |
| 2.4GWiFi | YES | YES | YES | YES | NO | YES |

## 8. POWER TEST RESULT

### 8.1CONDUCTED POWER MEASUREMENTS OF GSM850

| GSM850 | | Tune-up | Max Burst Average Power (dBm) | | | Tune-up | Max Frame Average Power (dBm) | | |
|---|---|---|---|---|---|---|---|---|---|
| | | | 128CH | 190CH | 251CH | | 128CH | 190CH | 251CH |
| | | | 824.2MHz | 836.6MHz | 848.8MHz | | 824.2MHz | 836.6MHz | 848.8MHz |
| GPRS/ EDGE (GMSK) | 1 Tx Slot | **32.00** | 31.81 | 31.83 | 31.82 | **22.81** | 22.62 | 22.64 | 22.63 |
| | 2 Tx Slot | **29.50** | 28.94 | 28.91 | 28.91 | **23.37** | 22.81 | 22.78 | 22.78 |
| | 3 Tx Slot | **28.00** | 27.24 | 27.23 | 27.22 | **23.58** | 22.82 | 22.81 | 22.80 |
| | 4 Tx Slot | **27.00** | 26.70 | 26.72 | 26.70 | **23.82** | 23.52 | **23.54** | 23.52 |
| EDGE (8PSK) | 1 Tx Slot | **27.50** | 27.12 | 27.04 | 26.96 | **18.31** | 17.93 | 17.85 | 17.77 |
| | 2 Tx Slot | **23.50** | 23.03 | 23.01 | 22.73 | **17.37** | 16.90 | 16.88 | 16.60 |
| | 3 Tx Slot | **21.50** | 21.25 | 21.18 | 21.02 | **17.08** | 16.83 | 16.76 | 16.60 |
| | 4 Tx Slot | **21.00** | 20.54 | 20.53 | 20.50 | **17.82** | 17.36 | 17.35 | 17.32 |

Note:
1) The conducted power of GSM850 is measured with RMS detector.
2) Frame-averaged output power was calculated from the measured burst-averaged output power by converting the slot powers into linear units and calculating the energy over 8 time slots.
3) Per KDB941225 D01v03r01, the bolded GPRS 4Tx mode was selected for SAR testing according to the highest frame –averaged output power table.

## 8.2CONDUCTED POWER MEASUREMENTS OF GSM1900

| GSM1900 | | Tune-up | Max Burst Average Power (dBm) | | | Tune-up | Max Frame Average Power (dBm) | | |
|---|---|---|---|---|---|---|---|---|---|
| | | | 512CH | 661CH | 810CH | | 512CH | 661CH | 810CH |
| | | | 1850.2MHz | 1880MHz | 1909.8MHz | | 1850.2MHz | 1880MHz | 1909.8MHz |
| GPRS /EDGE (GMSK) | 1 Tx Slot | **29.00** | 28.59 | 28.70 | 28.64 | **19.81** | 19.40 | 19.51 | 19.45 |
| | 2 Tx Slots | **28.50** | 28.01 | 28.14 | 28.10 | **22.37** | 21.88 | 22.01 | 21.97 |
| | 3 Tx Slots | **27.00** | 26.65 | 26.77 | 26.76 | **22.58** | 22.23 | 22.35 | 22.34 |
| | 4 Tx Slots | **26.50** | 25.83 | 25.96 | 25.96 | **23.32** | 22.65 | **22.78** | 22.78 |
| EDGE (8PSK) | 1 Tx Slot | **26.50** | 25.89 | 25.92 | 25.95 | **17.31** | 16.70 | 16.73 | 16.76 |
| | 2 Tx Slots | **25.50** | 24.72 | 24.78 | 24.70 | **19.37** | 18.59 | 18.65 | 18.57 |
| | 3 Tx Slots | **23.00** | 22.58 | 22.45 | 22.38 | **18.58** | 18.16 | 18.03 | 17.96 |
| | 4 Tx Slots | **22.00** | 21.32 | 21.36 | 21.16 | **18.82** | 18.14 | 18.18 | 17.98 |

Note:
1) The conducted power of GSM1900 is measured with RMS detector.
2) Frame-averaged output power was calculated from the measured burst-averaged output power by converting the slot powers into linear units and calculating the energy over 8 time slots.
3) Per KDB941225 D01v03r01, the bolded GPRS 4Tx mode was selected for SAR testing according to the highest frame –averaged output power table.

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## 8.3CONDUCTED POWER MEASUREMENTS OF WCDMA1900 Band II

| WCDMA1900 (Band II) | | Tune-up | SAR Conducted Power (dBm) | | |
|---|---|---|---|---|---|
| | | | 9262CH | 9400CH | 9538CH |
| | | | 1852.4 | 1880 | 1907.6 |
| WCDMA | 12.2kbps RMC | **23.00** | 22.89 | 22.55 | 22.39 |
| | 64kbps RMC | **23.00** | 22.87 | 22.52 | 22.33 |
| | 144kbps RMC | **23.00** | 22.88 | 22.50 | 22.34 |
| | 384kbps RMC | **23.00** | 22.87 | 22.51 | 22.35 |
| HSDPA | Subtest 1 | **22.00** | 21.95 | 21.67 | 21.58 |
| | Subtest 2 | **22.00** | 21.88 | 21.63 | 21.53 |
| | Subtest 3 | **22.00** | 21.42 | 21.20 | 21.07 |
| | Subtest 4 | **22.00** | 21.42 | 21.19 | 21.04 |
| HSUPA | Subtest 1 | **20.50** | 19.89 | 19.65 | 19.55 |
| | Subtest 2 | **20.50** | 19.30 | 19.06 | 18.94 |
| | Subtest 3 | **20.50** | 20.37 | 20.11 | 19.95 |
| | Subtest 4 | **20.50** | 19.81 | 19.59 | 18.86 |
| | Subtest 5 | **20.50** | 19.91 | 19.58 | 19.40 |
| HSPA+ | Subtest 1 | **22.00** | 21.89 | 21.61 | 21.39 |
| | Subtest 2 | **22.00** | 21.88 | 21.59 | 21.40 |
| | Subtest 3 | **22.00** | 21.92 | 21.56 | 21.42 |
| | Subtest 4 | **22.00** | 21.92 | 21.56 | 21.42 |
| HSPA+ | Subtest-1（UL 16 QAM） | **20.50** | 20.37 | 20.10 | 20.05 |

Note:
1) The conducted power of UMTS Band II is measured with RMS detector.
2)Note: Per KDB941225 D01v03r01, 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.

## 8.4CONDUCTED POWER MEASUREMENTS OF WCDMA850 Band V

| WCDMA 850 (Band V) | | Tune-up | SAR Conducted Power (dBm) | | |
|---|---|---|---|---|---|
| | | | 4132CH | 4182CH | 4233CH |
| | | | 826.4 | 836.4 | 846.6 |
| WCDMA | 12.2kbps RMC | **23.00** | 22.95 | 22.61 | 22.71 |
| | 64kbps RMC | **23.00** | 22.92 | 22.59 | 22.69 |
| | 144kbps RMC | **23.00** | 22.93 | 22.60 | 22.70 |
| | 384kbps RMC | **23.00** | 22.91 | 22.58 | 22.70 |
| HSDPA | Subtest 1 | **22.00** | 21.97 | 21.76 | 21.87 |
| | Subtest 2 | **22.00** | 21.89 | 21.73 | 21.85 |
| | Subtest 3 | **22.00** | 21.54 | 21.25 | 21.40 |
| | Subtest 4 | **22.00** | 21.53 | 21.24 | 21.37 |
| HSUPA | Subtest 1 | **20.50** | 19.95 | 19.96 | 19.80 |
| | Subtest 2 | **20.50** | 19.45 | 19.20 | 19.30 |
| | Subtest 3 | **20.50** | 20.49 | 20.20 | 19.28 |
| | Subtest 4 | **20.50** | 18.93 | 19.72 | 18.78 |
| | Subtest 5 | **20.50** | 19.99 | 19.67 | 19.84 |
| DC-HSDPA | Subtest 1 | **22.00** | 21.97 | 21.68 | 21.78 |
| | Subtest 2 | **22.00** | 21.89 | 21.69 | 21.78 |
| | Subtest 3 | **22.00** | 21.96 | 21.68 | 21.77 |
| | Subtest 4 | **22.00** | 21.94 | 21.69 | 21.78 |
| HSPA+ | Subtest-1（UL 16 QAM） | **20.50** | 20.48 | 20.22 | 20.40 |

Note:
1) The conducted power of UMTS Band V is measured with RMS detector.
2)Note: Per KDB941225 D01v03r01, 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.

## 8.5 CONDUCTED POWER MEASUREMENTS OF WiFi 2.4G

| Mode | 802.11b | | | |
|---|---|---|---|---|
| Channel | Tune-up | 1 | 6 | 11 |
| Frequency | | 2412 | 2437 | 2462 |
| 1M | 17.00 | 16.98 | 16.95 | 16.85 |
| 2M | 17.00 | 16.42 | 16.59 | 16.24 |
| 5.5M | 17.00 | 16.41 | 16.51 | 16.19 |
| 11M | 17.00 | 16.39 | 16.36 | 16.02 |
| Power Setting | x | 22.00 | 22.00 | 21.00 |

| Mode | 802.11g | | | |
|---|---|---|---|---|
| Channel | Tune-up | 1 | 6 | 11 |
| Frequency | | 2412 | 2437 | 2462 |
| 6M | 15.00 | 11.83 | 14.92 | 12.56 |
| 9M | 15.00 | 11.65 | 14.54 | 12.19 |
| 12M | 15.00 | 11.54 | 14.32 | 12.11 |
| 18M | 15.00 | 11.20 | 14.23 | 11.76 |
| 24M | 15.00 | 11.07 | 14.07 | 11.62 |
| 36M | 15.00 | 10.79 | 13.78 | 11.32 |
| 48M | 15.00 | 10.60 | 13.58 | 11.13 |
| 54M | 15.00 | 10.33 | 13.47 | 11.02 |
| Power Setting | x | 17.00 | 20.00 | 17.00 |

| Mode | 802.11n HT20 | | | |
|---|---|---|---|---|
| Channel | Tune-up | 1 | 6 | 11 |
| Frequency | | 2412 | 2437 | 2462 |
| MCS0 | 14.00 | 11.77 | 13.93 | 13.96 |
| MCS1 | 14.00 | 11.30 | 13.39 | 13.04 |
| MCS2 | 14.00 | 11.21 | 13.15 | 12.92 |
| MCS3 | 14.00 | 11.05 | 13.09 | 12.62 |
| MCS4 | 14.00 | 10.82 | 12.62 | 12.38 |
| MCS5 | 14.00 | 10.34 | 12.39 | 12.17 |
| MCS6 | 14.00 | 10.25 | 12.36 | 12.04 |
| MCS7 | 14.00 | 10.13 | 12.27 | 11.93 |
| Power Setting | x | 17.00 | 19.00 | 18.00 |

| Mode | 802.11n HT40 | | | |
|---|---|---|---|---|
| Channel | Tune-up | 3 | 6 | 9 |
| Frequency | | 2422 | 2437 | 2452 |
| MCS0 | 14.00 | 10.31 | 12.33 | 10.67 |
| MCS1 | 14.00 | 9.89 | 11.84 | 10.26 |
| MCS2 | 14.00 | 9.42 | 11.58 | 10.01 |
| MCS3 | 14.00 | 9.23 | 11.17 | 9.67 |
| MCS4 | 14.00 | 8.85 | 10.63 | 9.24 |
| MCS5 | 14.00 | 8.52 | 10.47 | 8.79 |
| MCS6 | 14.00 | 8.17 | 10.32 | 8.53 |
| MCS7 | 14.00 | 8.08 | 10.03 | 8.47 |
| Power Setting | x | 16.00 | 18.00 | 16.00 |

Note:

1) The Average conducted power of WiFi is measured with RMS detector.

2) Per KDB248227, for WiFi 2.4GHz, the highest measured maximum output power Channel for DSSS modes(802.11b)was selected for SAR measurement.SAR for OFDM modes(2.4GHz 802.11g/n) was not required When the highest reported SAR for DSSS is adjusted by the ratio of OFDM modes(802.11g/n)to DSSS modes(802.11b)specified maximum output power and the adjusted SAR is ≤ 1.2 W/kg.

## 9．SAR TEST RESULTS

**General Notes:**

1) Per KDB447498 D01v06, all measurement SAR results are scaled to the maximum tune-up tolerance limit to demonstrate compliant.

2) Per KDB447498 D01v06, testing of other required channels within the operating mode of a frequency band is not required when the reported 1-g or 10-g SAR for the mid-band or highest output power channel is:⩽0.8 W/kg or 2.0 W/kg, for 1-g or 10-g respectively, when the transmission band is⩽100 MHz. When the maximum output power variation across the required test channels is > ½ dB, instead of the middle channel, the highest output power channel must be used.

3) Per KDB865664 D01v01r04,for each frequency band, repeated SAR measurement is required only when the measured SAR is ⩾0.8W/Kg; if the deviation among the repeated measurement is ⩽20%,and the measured SAR <1.45W/Kg, only one repeated measurement is required.

4) Per KDB865664 D02v01r02, SAR plot is only required for the highest measured SAR in each exposure configuration, wireless mode and frequency band combination; Plots are also required when the measured SAR is > 1.5 W/kg, or > 7.0 W/kg for occupational exposure. The published RF exposure KDB procedures may require additional plots; for example, to support SAR to peak location separation ratio test exclusion and/or volume scan post-processing.

**GSM Notes:**

1) Per KDB941225 D01v03r01, SAR test reduction for GPRS and EDGE modes is determined by the source-based time-averaged output power specified for production units, including tune-up tolerance. The data mode with highest specified time-averaged output power should be tested for SAR compliance in the applicable exposure conditions. For modes with the same specified maximum output power and tolerance, the higher number time-slot configuration should be tested.

**WCDMA Notes:**

Per KDB941225 D01v03r01, 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.

**WLAN Notes:**

1. For exposure conditions with multiple test positions, such as handset operating next to the ear, devices with hotspot mode, procedures for initial test position can be applied. Using the transmission mode determined by the DSSS procedure or initial test configuration, area scans are measured for all positions in an exposure condition. The test position with the highest extrapolated(peak)SAR is used as the initial test position. When the reported SAR of the initial test position is ≤ 0.4 W/kg, further SAR measurement is not required for the other (remaining) test positions. Otherwise, SAR is evaluated at the subsequent highest peak SAR position until the reported SAR result is ≤ 0.8 W/kg or all test positions are measured.
2. Justification for test configurations for WLAN per KDB Publication 248227 for 2.4GHZ WIFI single transmission chain operations, the highest measured maximum output power Channel for DSSS was selected for SAR measurement.SAR for OFDM modes(2.4GHz 802.11g/n) was not required due to the maximum allowed powers and the highest reported DSSS SAR. See Section 7.1.4 for more information.
3. Justification for test configurations for WLAN per KDB Publication 248227 for 5GHZ WIFI single transmission chain operations, the initial test configuration was selected according to the transmission mode with the highest maximum allowed power. Other transmission mode were not investigated since the highest reported SAR for initial test configuration adjusted by the ratio of maximum output powers is less than1.2W/kg. See Section 7.1.4 for more information.

## 9.1 SAR MEASUREMENT RESULT

SAR test results of GSM&WCDMA

| Test No. | Band | Mode | CH | Test Position | Separation Distance( cm) | Tune up | Measured | Drift(dB) | SAR Value (W/kg)1-g | Reported SAR |
|---|---|---|---|---|---|---|---|---|---|---|
| T01 | GSM850 | GPRS4TX | 190 | Front Face | 1 | 27 | 26.72 | -0.05 | 0.737 | 0.79 |
| T02 | GSM850 | GPRS4TX | 190 | Rear Face | 1 | 27 | 26.72 | -0.02 | 1.110 | 1.18 |
| T03 | GSM850 | GPRS4TX | 190 | Left Side | 1 | 27 | 26.72 | -0.04 | 0.492 | 0.52 |
| T04 | GSM850 | GPRS4TX | 190 | Right Side | 1 | 27 | 26.72 | -0.01 | 0.647 | 0.69 |
| T05 | GSM850 | GPRS4TX | 190 | Top Side | 1 | 27 | 26.72 | -0.03 | 0.097 | 0.10 |
| T06 | GSM850 | GPRS4TX | 128 | Rear Face | 1 | 27 | 26.7 | -0.06 | 0.891 | 0.95 |
| T07 | GSM850 | GPRS4TX | 251 | Rear Face | 1 | 27 | 26.7 | -0.02 | **1.160** | 1.24 |
| T08 | GSM850 | GPRS4TX | 190 | Rear Face | 1 | 27 | 26.72 | -0.09 | 1.090 | 1.16 |
| T09 | GSM850 | GPRS4TX | 128 | Rear Face | 1 | 27 | 26.7 | -0.07 | 0.829 | 0.89 |
| T10 | GSM850 | GPRS4TX | 251 | Rear Face | 1 | 27 | 26.7 | -0.09 | 1.120 | 1.20 |
| T11 | GSM1900 | GPRS 4TX | 661 | Front Face | 1 | 26.5 | 25.96 | -0.07 | 0.430 | 0.49 |
| T12 | GSM1900 | GPRS 4TX | 661 | Rear Face | 1 | 26.5 | 25.96 | -0.08 | **0.667** | 0.76 |
| T13 | GSM1900 | GPRS 4TX | 661 | Left Side | 1 | 26.5 | 25.96 | -0.02 | 0.127 | 0.14 |
| T14 | GSM1900 | GPRS 4TX | 661 | Right Side | 1 | 26.5 | 25.96 | -0.06 | 0.226 | 0.26 |
| T15 | GSM1900 | GPRS 4TX | 661 | Top Side | 1 | 26.5 | 25.96 | -0.04 | 0.397 | 0.45 |
| T16 | WCDMA Band II | RMC12.2K | 9400 | Front Face | 1 | 23 | 22.55 | -0.07 | 0.465 | 0.52 |
| T17 | WCDMA Band II | RMC12.2K | 9400 | Rear Face | 1 | 23 | 22.55 | -0.05 | **0.602** | 0.67 |
| T18 | WCDMA Band II | RMC12.2K | 9400 | Left Side | 1 | 23 | 22.55 | -0.07 | 0.141 | 0.16 |
| T19 | WCDMA Band II | RMC12.2K | 9400 | Right Side | 1 | 23 | 22.55 | -0.04 | 0.199 | 0.22 |
| T20 | WCDMA Band II | RMC12.2K | 9400 | Top Side | 1 | 23 | 22.55 | -0.07 | 0.371 | 0.41 |
| T21 | WCDMA Band V | RMC12.2K | 4182 | Front Face | 1 | 23 | 22.61 | -0.03 | **1.130** | 1.24 |
| T22 | WCDMA Band V | RMC12.2K | 4182 | Rear Face | 1 | 23 | 22.61 | -0.02 | 1.090 | 1.19 |
| T23 | WCDMA Band V | RMC12.2K | 4182 | Left Side | 1 | 23 | 22.61 | -0.07 | 0.722 | 0.79 |
| T24 | WCDMA Band V | RMC12.2K | 4182 | Right Side | 1 | 23 | 22.61 | -0.01 | 0.795 | 0.87 |
| T25 | WCDMA Band V | RMC12.2K | 4182 | Top Side | 1 | 23 | 22.61 | -0.06 | 0.102 | 0.11 |
| T26 | WCDMA Band V | RMC12.2K | 4132 | Front Face | 1 | 23 | 22.95 | -0.06 | 0.730 | 0.74 |
| T27 | WCDMA Band V | RMC12.2K | 4233 | Front Face | 1 | 23 | 22.71 | -0.08 | 0.868 | 0.93 |
| T28 | WCDMA Band V | RMC12.2K | 4132 | Rear Face | 1 | 23 | 22.95 | -0.05 | 1.030 | 1.04 |
| T29 | WCDMA Band V | RMC12.2K | 4233 | Rear Face | 1 | 23 | 22.71 | -0.04 | 1.040 | 1.11 |
| T30 | WCDMA Band V | RMC12.2K | 4132 | Right Side | 1 | 23 | 22.95 | -0.09 | 0.623 | 0.63 |
| T31 | WCDMA Band V | RMC12.2K | 4233 | Right Side | 1 | 23 | 22.71 | -0.06 | 0.708 | 0.76 |
| T32 | WCDMA Band V | RMC12.2K | 4182 | Front Face | 1 | 23 | 22.61 | -0.07 | 1.060 | 1.16 |
| T33 | WCDMA Band V | RMC12.2K | 4182 | Rear Face | 1 | 23 | 22.61 | -0.03 | 1.030 | 1.13 |
| T34 | WCDMA Band V | RMC12.2K | 4132 | Rear Face | 1 | 23 | 22.95 | -0.01 | 1.030 | 1.04 |
| T35 | WCDMA Band V | RMC12.2K | 4233 | Front Face | 1 | 23 | 22.71 | -0.06 | 0.847 | 0.91 |
| T36 | WCDMA Band V | RMC12.2K | 4233 | Rear Face | 1 | 23 | 22.71 | -0.02 | 1.060 | 1.13 |

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

SAR test results of WIFI

| Test No. | Band | CH | Test Position | Separation Distance(cm) | Power Setting | Tune up | Measured | Drift(dB) | Peak SAR of Area scan (W/kg)1-g | SAR Value (W/kg)1-g | Reported SAR |
|---|---|---|---|---|---|---|---|---|---|---|---|
| T41 | 802.11b | 1 | Front Face | 1 | 22 | 17 | 16.98 | -0.05 | 0.305 | - | - |
| T42 | 802.11b | 1 | Rear Face | 1 | 22 | 17 | 16.98 | -0.02 | 0.324 | **0.316** | 0.32 |
| T43 | 802.11b | 1 | Left Side | 1 | 22 | 17 | 16.98 | -0.01 | 0.094 | - | - |
| T44 | 802.11b | 1 | Right Side | 1 | 22 | 17 | 16.98 | -0.05 | 0.145 | - | - |
| T45 | 802.11b | 1 | Bottom Side | 1 | 22 | 17 | 16.98 | -0.06 | 0.104 | - | - |

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

## 10. SIMULTANEOUS TRANSMISSION CONDITIONS

About 2.4G WiFi and GSM/WCDMA antenna

| Exposure Condition | Mode | 2G/3G SAR(W/Kg) | 2.4G WLAN SAR(W/Kg) | ∑SAR1g |
|---|---|---|---|---|
| Body | GSM850 | 1.24 | 0.32 | 1.56 |
| | GSM1900 | 0.76 | 0.32 | 1.08 |
| | WCDMA Band II | 0.67 | 0.32 | 0.99 |
| | WCDMA Band V | 1.24 | 0.32 | 1.56 |

MAX. $\sum SAR_{1g}$=1.56W/Kg<1.6 W/Kg,so the SAR to peak location separation ratio should not be considered.

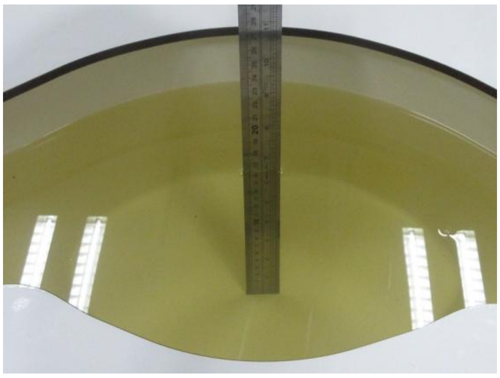
# APPENDIX

## 1. Test Layout

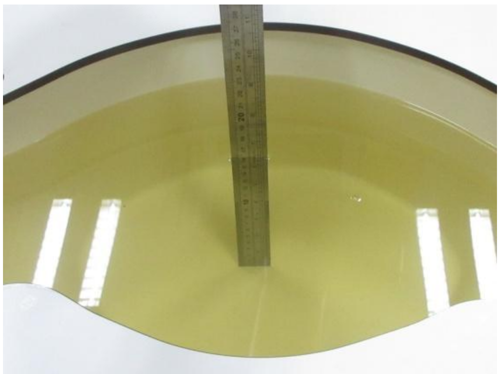
**Specific Absorption Rate Test Layout**


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

Body(700MHz~920MHz)



Body(1700MHz~2700MHz)



# Appendix A. SAR Plots of System Verification

The plots for system verification with largest deviation for each SAR system combination are shown as follows.

Test Laboratory: BTL Inc. Date: 10/22/2015

**System Check_B835_1022**

**DUT: Dipole 835 MHz D835V2SN:4d199;**

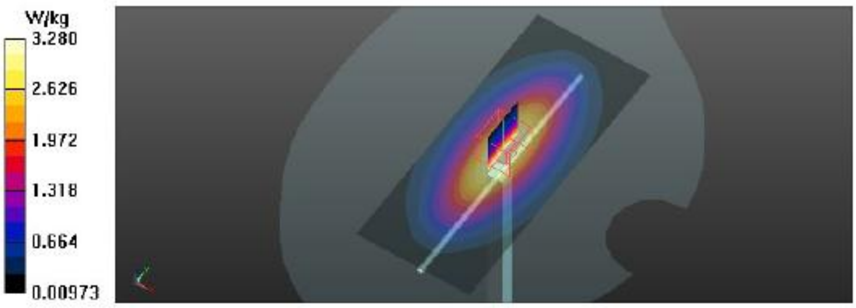
Communication System: UID 0, CW (0); Frequency: 835 MHz; Duty Cycle: 1:1
Medium parameters used: f = 835 MHz; $\sigma$ = 0.961 S/m; $\varepsilon_r$ = 54.914; $\rho$ = 1000 kg/m$^3$
Ambient Temperature : 23.3 ℃; Liquid Temperature : 22.2 ℃

DASY Configuration:

- Probe: EX3DV4 - SN3932; ConvF(10.19, 10.19, 10.19); Calibrated: 01/30/2015;
- Sensor-Surface: 2mm (Mechanical Surface Detection), z = -9.0, 31.0
- Electronics: DAE4 Sn905; Calibrated: 07/16/2015
- Phantom: SAM Front; Type: Twin SAM; Serial: 1784
- DASY52 52.8.8(1222); SEMCAD X 14.6.10(7331)

**Area Scan (5x12x1):** Interpolated grid: dx=15 mm, dy=15 mm
Maximum value of SAR (interpolated) = 3.28 W/kg

**Zoom Scan (5x5x7)/Cube 0:** Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 58.99 V/m; Power Drift = 0.09 dB
Peak SAR (extrapolated) = 4.00 W/kg
**SAR(1 g) = 2.35 W/kg; SAR(10 g) = 1.56 W/kg**
Maximum value of SAR (measured) = 3.40 W/kg



Test Laboratory: BTL Inc. Date: 10/28/2015

**System Check_B835_1028**

**DUT: Dipole 835 MHz D835V2SN:4d199;**

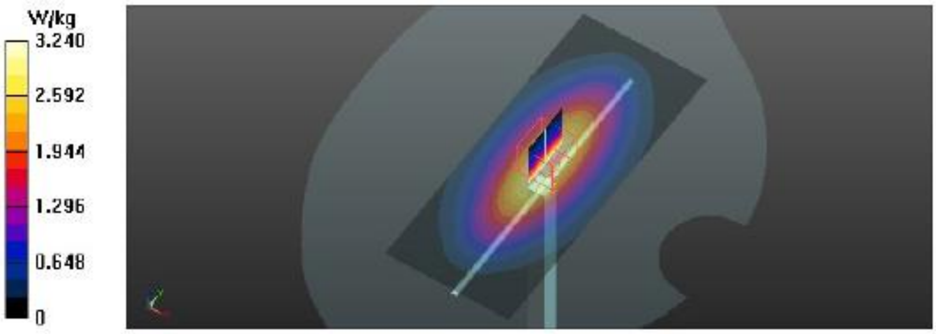
Communication System: UID 0, CW (0); Frequency: 835 MHz; Duty Cycle: 1:1
Medium parameters used: f = 835 MHz; $\sigma$ = 0.981 S/m; $\varepsilon_r$ = 55.142; $\rho$ = 1000 kg/m$^3$
Ambient Temperature：23.4 ℃; Liquid Temperature：22.5 ℃

DASY Configuration:

- Probe: EX3DV4 - SN3932; ConvF(10.19, 10.19, 10.19); Calibrated: 01/30/2015;
- Sensor-Surface: 2mm (Mechanical Surface Detection), z = -9.0, 31.0
- Electronics: DAE4 Sn905; Calibrated: 07/16/2015
- Phantom: SAM Front; Type: Twin SAM; Serial: 1784
- DASY52 52.8.8(1222); SEMCAD X 14.6.10(7331)

**Area Scan (5x12x1):** Interpolated grid: dx=15 mm, dy=15 mm
Maximum value of SAR (interpolated) = 3.24 W/kg

**Zoom Scan (5x5x7)/Cube 0:** Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 59.45 V/m; Power Drift = 0.08 dB
Peak SAR (extrapolated) = 3.86 W/kg
**SAR(1 g) = 2.38 W/kg; SAR(10 g) = 1.48 W/kg**
Maximum value of SAR (measured) = 3.34 W/kg



Test Laboratory: BTL Inc. Date: 10/22/2015

## System Check_B1900_1022

**DUT: Dipole 1900 MHz; Type: D1900V2; SN: 5d142;**

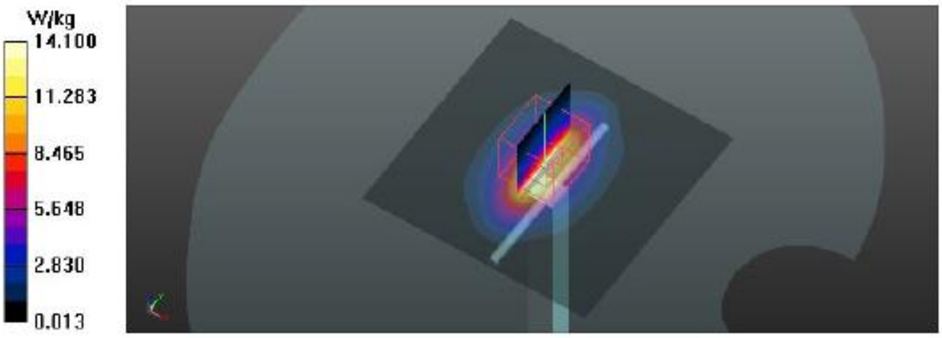
Communication System: UID 0, CW; Frequency: 1900 MHz; Duty Cycle: 1:1
Medium parameters used: f = 1900 MHz; $\sigma$ = 1.534 S/m; $\varepsilon_r$ = 53.02; $\rho$ = 1000 kg/m$^3$
Ambient Temperature：23.2 ℃; Liquid Temperature：22.5 ℃

DASY Configuration:

- Probe: EX3DV4 - SN3932; ConvF(7.86, 7.86, 7.86); Calibrated: 01/30/2015;
- Sensor-Surface: 2mm (Mechanical Surface Detection), z = 1.0, 31.0
- Electronics: DAE4 Sn905; Calibrated: 07/16/2015
- Phantom: SAM Front; Type: Twin SAM; Serial: 1784
- DASY52 52.8.8(1222); SEMCAD X 14.6.10(7331)

**Area Scan (6x6x1):** Interpolated grid: dx=15 mm, dy=15 mm
Maximum value of SAR (interpolated) = 14.1 W/kg

**Zoom Scan (5x5x7)/Cube 0:** Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 97.61 V/m; Power Drift = 0.04 dB
Peak SAR (extrapolated) = 17.9 W/kg
**SAR(1 g) = 9.99 W/kg; SAR(10 g) = 5.37 W/kg**
Maximum value of SAR (measured) = 14.2 W/kg



Test Laboratory: BTL Inc. Date: 10/23/2015

**System Check_B2450_1022**

**DUT: Dipole 2450 MHz; Type: D2450V2; SN: 869;**

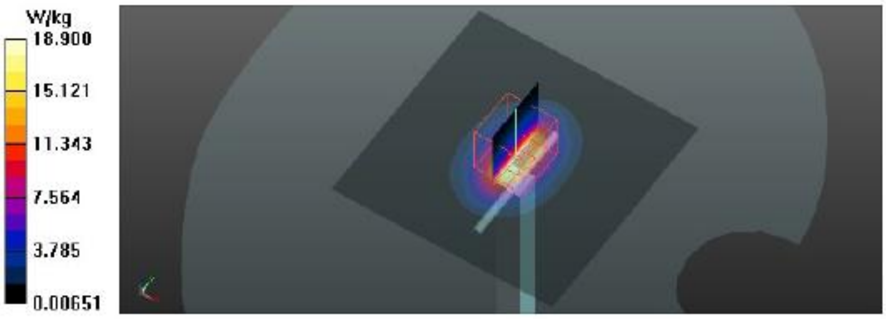
Communication System: UID 0, CW; Frequency: 2450 MHz; Duty Cycle: 1:1
Medium parameters used: f = 2450 MHz; $\sigma$ = 1.982 S/m; $\varepsilon_r$ = 51.15; $\rho$ = 1000 kg/m$^3$
Ambient Temperature : 23.5 ℃; Liquid Temperature : 22.5 ℃

DASY Configuration:

- Probe: EX3DV4 - SN3932; ConvF(7.6, 7.6, 7.6); Calibrated: 01/30/2015;
- Sensor-Surface: 2mm (Mechanical Surface Detection), z = 1.0, 31.0
- Electronics: DAE4 Sn905; Calibrated: 07/16/2015
- Phantom: SAM Front; Type: Twin SAM; Serial: 1784
- DASY52 52.8.8(1222); SEMCAD X 14.6.10(7331)

**Area Scan (8x8x1):** Interpolated grid: dx=12 mm, dy=12 mm
Maximum value of SAR (interpolated) = 18.9 W/kg

**Zoom Scan (5x5x7)/Cube 0:** Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 100.7 V/m; Power Drift = 0.01 dB
Peak SAR (extrapolated) = 25.0 W/kg
**SAR(1 g) = 12.85 W/kg; SAR(10 g) = 5.87 W/kg**
Maximum value of SAR (measured) = 19.0 W/kg



# Appendix B. SAR Plots of SAR Measurement

The SAR plots for highest measured SAR in each exposure configuration, wireless mode and frequency band combination are shown as follows.

Test Laboratory: BTL Inc.　　　　　　　　Date: 10/28/2015

**T07_GSM 850_GPRS 4TX_CH251_Rear Face_1cm**

**DUT: 1510C002;**

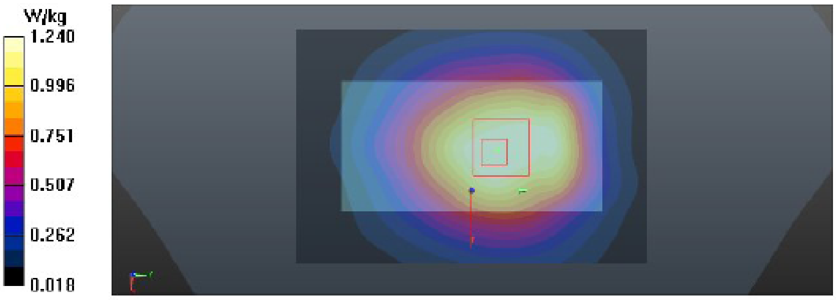
Communication System: UID 0, GPRS 4TX (0); Frequency: 848.8 MHz; Duty Cycle: 1:2
Medium parameters used: f = 849 MHz; $\sigma$ = 1.015 S/m; $\varepsilon_r$ = 57.042; $\rho$ = 1000 kg/m$^3$
Ambient Temperature：23.4 ℃; Liquid Temperature：22.5 ℃

DASY Configuration:

- Probe: EX3DV4 - SN3932; ConvF(10.19, 10.19, 10.19); Calibrated: 01/30/2015;
- Sensor-Surface: 4mm (Mechanical Surface Detection), z = 1.0, 31.0
- Electronics: DAE4 Sn905; Calibrated: 07/16/2015
- Phantom: SAM Front; Type: Twin SAM; Serial: 1784
- DASY52 52.8.8(1222); SEMCAD X 14.6.10(7331)

**Area Scan (6x9x1):** Interpolated grid: dx=15 mm, dy=15 mm
Maximum value of SAR (interpolated) = 1.24 W/kg

**Zoom Scan (5x5x7)/Cube 0:** Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 33.96 V/m; Power Drift = -0.02 dB
Peak SAR (extrapolated) = 1.38 W/kg
**SAR(1 g) = 1.16 W/kg; SAR(10 g) = 0.895 W/kg**
Maximum value of SAR (measured) = 1.21 W/kg



Test Laboratory: BTL Inc. Date: 10/22/2015

**T12_GSM 1900_GPRS 4TX_CH661_Rear Face_1cm**

**DUT: 1510C002;**

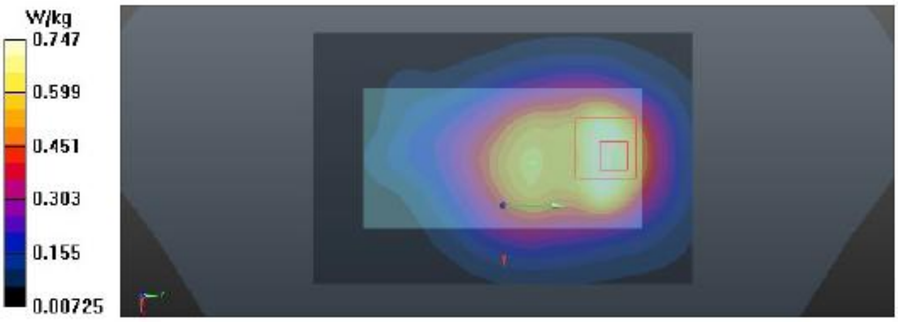
Communication System: UID 0, GPRS 4TX (0); Frequency: 1880 MHz; Duty Cycle: 1:2
Medium parameters used: f = 1880 MHz; $\sigma$ = 1.525 S/m; $\varepsilon_r$ = 53.814; $\rho$ = 1000 kg/m$^3$
Ambient Temperature : 23.2 ℃; Liquid Temperature : 22.5 ℃

DASY Configuration:

- Probe: EX3DV4 - SN3932; ConvF(7.86, 7.86, 7.86); Calibrated: 01/30/2015;
- Sensor-Surface: 4mm (Mechanical Surface Detection), z = 1.0, 31.0
- Electronics: DAE4 Sn905; Calibrated: 07/16/2015
- Phantom: SAM Front; Type: Twin SAM; Serial: 1784
- DASY52 52.8.8(1222); SEMCAD X 14.6.10(7331)

**Area Scan (6x9x1):** Interpolated grid: dx=15 mm, dy=15 mm
Maximum value of SAR (interpolated) = 0.747 W/kg

**Zoom Scan (5x5x7)/Cube 0:** Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 18.30 V/m; Power Drift = -0.08 dB
Peak SAR (extrapolated) = 1.00 W/kg
**SAR(1 g) = 0.667 W/kg; SAR(10 g) = 0.415 W/kg**
Maximum value of SAR (measured) = 0.697 W/kg



Test Laboratory: BTL Inc. Date: 10/22/2015

**T17_WCDMA II_RMC12.2K_CH9262_Rear Face_1cm**

**DUT: 1510C002;**

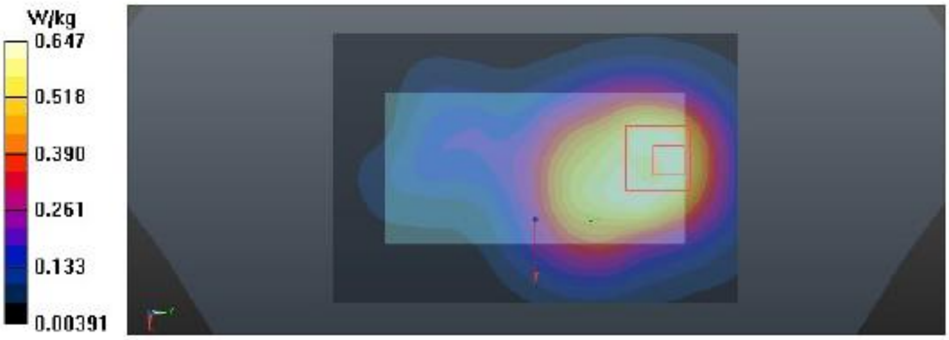
Communication System: UID 0, UMTS-FDD(WCDMA) (0); Frequency: 1880 MHz; Duty Cycle: 1:1
Medium parameters used: f = 1880 MHz; $\sigma$ = 1.525 S/m; $\varepsilon_r$ = 53.814; $\rho$ = 1000 kg/$m^3$
Ambient Temperature：23.2 ℃; Liquid Temperature：22.5 ℃

DASY Configuration:

- Probe: EX3DV4 - SN3932; ConvF(7.86, 7.86, 7.86); Calibrated: 01/30/2015;
- Sensor-Surface: 4mm (Mechanical Surface Detection), z = 1.0, 31.0
- Electronics: DAE4 Sn905; Calibrated: 07/16/2015
- Phantom: SAM Front; Type: Twin SAM; Serial: 1784
- DASY52 52.8.8(1222); SEMCAD X 14.6.10(7331)

**Area Scan (6x9x1):** Interpolated grid: dx=15 mm, dy=15 mm
Maximum value of SAR (interpolated) = 0.647 W/kg

**Zoom Scan (5x5x7)/Cube 0:** Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 13.90 V/m; Power Drift = -0.05 dB
Peak SAR (extrapolated) = 0.895 W/kg
**SAR(1 g) = 0.602 W/kg; SAR(10 g) = 0.386 W/kg**
Maximum value of SAR (measured) = 0.643 W/kg



Test Laboratory: BTL Inc. Date: 10/22/2015

**T21_WCDMA V_RMC12.2K_CH4182_Front Face_1cm**

**DUT: 1510C002;**

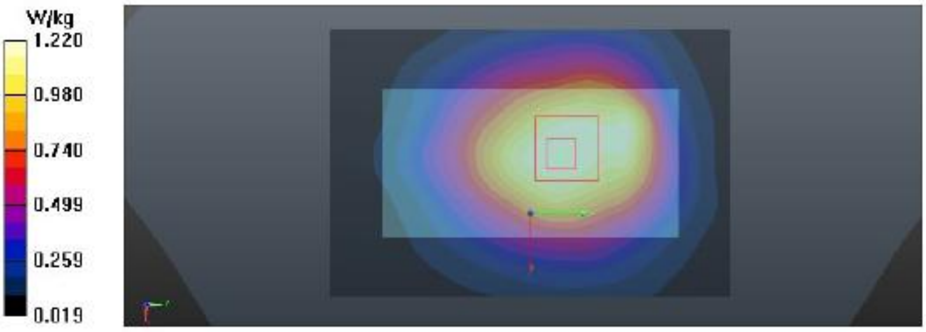
Communication System: UID 0, UMTS-FDD(WCDMA) (0); Frequency: 836.6 MHz; Duty Cycle: 1:1
Medium parameters used: f = 837 MHz; $\sigma$ = 1.003 S/m; $\varepsilon_r$ = 57.161; $\rho$ = 1000 kg/m$^3$
Ambient Temperature : 23.3 ℃; Liquid Temperature : 22.2 ℃

DASY Configuration:

- Probe: EX3DV4 - SN3932; ConvF(10.19, 10.19, 10.19); Calibrated: 01/30/2015;
- Sensor-Surface: 4mm (Mechanical Surface Detection), z = 1.0, 31.0
- Electronics: DAE4 Sn905; Calibrated: 07/16/2015
- Phantom: SAM Right; Type: Twin SAM; Serial: 1896
- DASY52 52.8.8(1222); SEMCAD X 14.6.10(7331)

**Area Scan (6x9x1):** Interpolated grid: dx=15 mm, dy=15 mm
Maximum value of SAR (interpolated) = 1.22 W/kg

**Zoom Scan (5x5x7)/Cube 0:** Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 33.61 V/m; Power Drift = -0.03 dB
Peak SAR (extrapolated) = 1.34 W/kg
**SAR(1 g) = 1.13 W/kg; SAR(10 g) = 0.876 W/kg**
Maximum value of SAR (measured) = 1.19 W/kg



Test Laboratory: BTL Inc. Date: 10/23/2015

**T42_802.11b_CH1_Rear Face_1cm**

**DUT: 1510C002;**

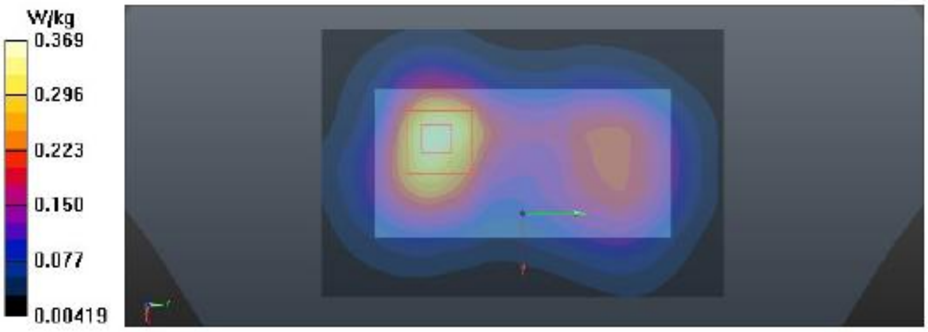
Communication System: UID 0, IEEE 802.11b WiFi 2.4GHz (DSSS,1Mbps) (0); Frequency: 2412 MHz; Duty Cycle: 1:1
Medium parameters used: f = 2412 MHz; $\sigma$ = 1.94 S/m; $\varepsilon_r$ = 51.367; $\rho$ = 1000 kg/m$^3$
Ambient Temperature : 23.5 ℃; Liquid Temperature : 22.5 ℃

DASY Configuration:

- Probe: EX3DV4 - SN3932; ConvF(7.6, 7.6, 7.6); Calibrated: 01/30/2015;
- Sensor-Surface: 4mm (Mechanical Surface Detection), z = 1.0, 31.0
- Electronics: DAE4 Sn905; Calibrated: 07/16/2015
- Phantom: SAM Front; Type: Twin SAM; Serial: 1784
- DASY52 52.8.8(1222); SEMCAD X 14.6.10(7331)

**Area Scan (8x12x1):** Interpolated grid: dx=12 mm, dy=12 mm
Maximum value of SAR (interpolated) = 0.369 W/kg

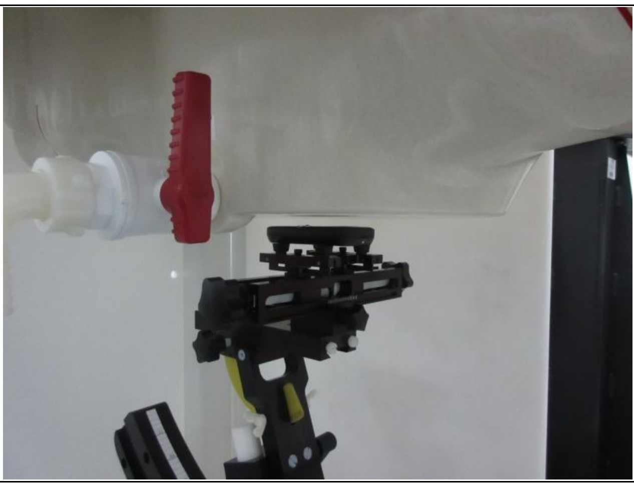
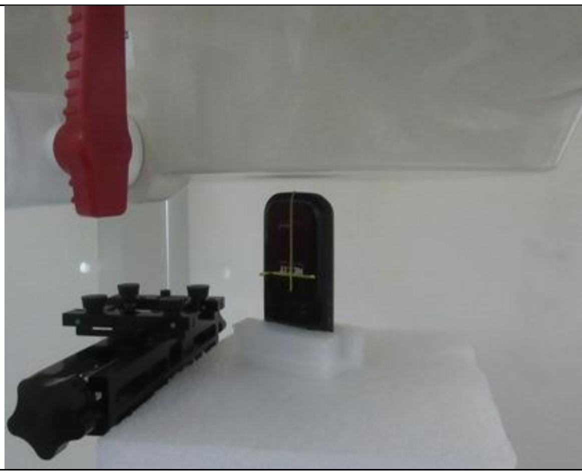
**Zoom Scan (5x5x7)/Cube 0:** Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 7.925 V/m; Power Drift = -0.02 dB
Peak SAR (extrapolated) = 0.536 W/kg
**SAR(1 g) = 0.316 W/kg; SAR(10 g) = 0.177 W/kg**
Maximum value of SAR (measured) = 0.350 W/kg



## Appendix C. Calibration Certificate for Probe and Dipole

The SPEAG calibration certificates are shown as follows.

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

| Photo 1: Front Face_10mm | Photo 2: Rear Face_10mm |
| --- | --- |
|  |  |
| Photo 3: Left Side_10mm | Photo 4: Right Side_10mm |
|  |  |
| Photo 5: Top Side_10mm | Photo 6: Bottom Side_10mm |
|  |  |