

FCC SAR Test Report

Report No. : SA111221C21A
Applicant : HTC Corporation
Address : 23, XINGHUA RD., TAOYUAN 330, TAIWAN, R.O.C.
Product : Smartphone
FCC ID : NM8PJ53100
Brand : HTC
Model No. : PJ53100
Standards : FCC 47 CFR Part 2 (2.1093) / IEEE C95.1:1991 / IEEE 1528:2003
FCC OET Bulletin 65 Supplement C (Edition 01-01)
KDB 248227 D01 v01r02 / KDB 648474 D01 v01r05 / KDB 680106 D01 v01
KDB 941225 D01 v02 / KDB 941225 D05 v01 / KDB 941225 D06 v01
Date of Testing : Feb. 04, 2012 ~ Mar. 07, 2012

CERTIFICATION: The above equipment have been tested by **Bureau Veritas Consumer Products Services (H.K.) Ltd., Taoyuan Branch - Taiwan HwaYa Lab**, and found compliance with the requirement of the above standards. The test record, data evaluation & Equipment Under Test (EUT) configurations represented herein are true and accurate accounts of the measurements of the sample's SAR characteristics under the conditions specified in this report.

This report is prepared for FCC class II permissive change. This report is issued as a supplementary report of BV ADT report no.: SA111221C21. The differences compared with original report is adding an inductive charging battery cover.

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Release Control Record

| Issue No. | Reason for Change | Date Issued |
|-----------|-------------------|---------------|
| R01 | Original release | Mar. 05, 2012 |
| | | |

1. Summary of Maximum SAR Value

| Mode / Band | Test Position | SAR-1g (W/kg) |
|--------------|----------------------------|---------------|
| CDMA2000 BC0 | Head | 0.481 |
| | Body (Hotspot, 1 cm Gap) | 0.687 |
| | Body (Body Worn, 1 cm Gap) | 0.687 |
| CDMA2000 BC1 | Head | 0.645 |
| | Body (Hotspot, 1 cm Gap) | 0.460 |
| | Body (Body Worn, 1 cm Gap) | 0.460 |
| LTE Band 13 | Head | 0.760 |
| | Body (Hotspot, 1 cm Gap) | 0.396 |
| | Body (Body Worn, 1 cm Gap) | 0.351 |
| WLAN 2.4GHz | Head | 0.121 |
| | Body (Hotspot, 1 cm Gap) | 0.083 |
| | Body (Body Worn, 1 cm Gap) | 0.083 |
| WLAN 5GHz | Head | 0.130 |
| | Body (Hotspot, 1 cm Gap) | 0.229 |
| | Body (Body Worn, 1 cm Gap) | 0.162 |
| Bluetooth | Head | N/A |
| | Body (Hotspot, 1 cm Gap) | N/A |
| | Body (Body Worn, 1 cm Gap) | N/A |

Note:

The SAR limit (**1.6 W/kg**) for general population/uncontrolled exposure is specified in FCC 47 CFR part 2 (2.1093) and ANSI/IEEE C95.1-1991.

2. Description of Equipment Under Test

| | |
|--|---|
| DUT Type | Smartphone |
| FCC ID | NM8PJ53100 |
| Brand Name | HTC |
| Model Name | PJ53100 |
| Tx Frequency Bands (Unit: MHz) | CDMA2000 BC0 : 824 ~ 849 CDMA2000 BC1 : 1850 ~ 1910 LTE Band 13 : 777 ~ 787 WLAN : 2400 ~ 2483.5, 5150 ~ 5350, 5470 ~ 5725, 5725 ~ 5825 Bluetooth : 2400 ~ 2483.5 |
| Uplink Modulations | CDMA2000 : QPSK LTE : QPSK, 16QAM 802.11b : DSSS 802.11a/g/n : OFDM Bluetooth : GFSK |
| LTE Supports Channel Bandwidth | LTE Band 13 : 5 MHz, 10 MHz |
| Maximum AVG Conducted Power (Unit: dBm) | CDMA2000 BC 0 : 24.79 CDMA2000 BC 1 : 24.72 LTE Band 13 : 25.49 802.11b : 18.25 802.11g : 13.24 802.11n HT20 (2.4GHz) : 12.18 802.11a : 13.28 802.11n HT20 (5GHz) : 10.31 802.11n HT40 (5GHz) : 10.78 Bluetooth : 0.65 |
| Antenna Type | Fixed Internal Antenna |
| DUT Stage | Production Unit |

Note:

1. This report is prepared for FCC class II permissive change. This report is issued as a supplementary report of BV ADT report no.: SA111221C21. The differences compared with original report is adding an inductive charging battery cover.
2. The above EUT information is declared by manufacturer and for more detailed features description please refers to the manufacturer's specifications or User's Manual.

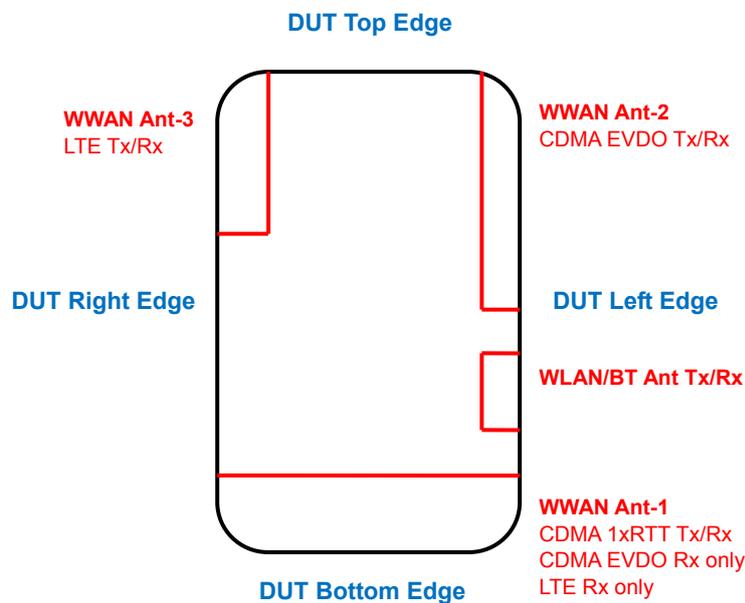
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This device supports voice/data wireless communication technologies included CDMA2000 1xRTT/1xEVDO, LTE, WLAN and Bluetooth. The data mode of 1xEVDO, LTE and WLAN support VOIP capability through 3rd party apps software. The details are listed as below.

Table 2.1 EUT Technology Support

| Mode | WWAN Technology | Frequency Band |
|-------------|-----------------|---------------------|
| Voice | CDMA2000 1xRTT | BC 0, BC 1 |
| VOIP / Data | CDMA2000 1xEVDO | BC 0, BC 1 |
| VOIP / Data | LTE | Band 13 : 777 ~ 787 |
| VOIP / Data | 802.11a/b/g/n | 2.4 GHz / 5 GHz |
| Data | Bluetooth | 2.4 GHz |

This device has three WWAN antennas and one WLAN/BT antenna design. The capabilities of antenna are listed as below.



This device supports WiFi hotspot function, so body SAR was tested under 1 cm for the surfaces / slide edges where a transmitting antenna is within 2.5 cm from the edge. Hotspot SAR test mode for these antennas are as below.

CDMA 1xRTT : Front Face, Rear Face, Left Side, Right Side, Bottom Side

CDMA 1xEVDO : Front Face, Rear Face, Left Side, Top Side

LTE : Front Face, Rear Face, Right Side, Top Side

WLAN : Front Face, Rear Face, Left Side

Confirming the LTE transmitter follows 3GPP standards, is category 3, BW 5MHz and 10MHz, band 13, and supports QPSK / 16QAM modulations. Tested per 3GPP 36.521 maximum transmit procedures for both QPSK / 16QAM.



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LTE Maximum Power Reduction in accordance with 3GPP 36.101: Power Reduction in accordance to 3GPP is active all times during LTE operation.

| Modulation | Channel bandwidth / Transmission bandwidth configuration (RB) | | 3GPP Requirement (dB) | MPR Setting (dB) |
|------------|---|-----------|-----------------------|------------------|
| | BW 5 MHz | BW 10 MHz | | |
| QPSK | > 8 | > 12 | <= 1 | 1 |
| 16QAM | <= 8 | <= 12 | <= 1 | 1 |
| 16QAM | > 8 | > 12 | <= 2 | 2 |

Note: MPR is according to the standard and implemented in the circuit (mandatory).

In addition, the device is compliant with A-MPR requirements defined in 36.101 section 6.2.4 that may be required to meet 3GPP Adjacent Channel Leakage Ratio (“ACLR”) requirements. A-MPR was disabled for all FCC compliance testing.

A simultaneous CDMA 1xRTT voice and CDMA 1xEVDO data connection is referred to as “SVDO” while a simultaneous CDMA 1xRTT voice and LTE data connection is referred to as “SVLTE”. The transmitters are independent in respect to the RF chains as each transmitter has dedicated RF circuitry (PA, RF filtering) and a unique transmit antenna. The device also contains an additional antenna associated with receiver diversity or unlicensed transmitters. The LTE Uplink MIMO configuration is 1x2 (1 Uplink antenna and 2 Downlink antennas).

Although the RF circuits are independent for both transmitters, the chipset solution incorporated SVDO/SVLTE implementation does include electrical connections between the voice and data transmitters such that the device can coordinate the transmit power of both transmitters. That said the transmitters operate independently in the sense that they independently support voice or data connection without interaction between the modems or signaling from the WWAN network.



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Table 2.2 Simultaneous Transmission Possibilities

| Simultaneous TX Combination | Configuration | Head SAR | Body SAR |
|-----------------------------|---|----------|--------------------------------|
| 1 | RTT BC0 Voice + EVDO BC0 Data + WLAN/BT | Yes | Body-Worn: Yes Hotspot: Yes |
| 2 | RTT BC0 Voice + EVDO BC1 Data + WLAN/BT | Yes | Body-Worn: Yes Hotspot: Yes |
| 3 | RTT BC0 Voice + LTE 13 Data + WLAN/BT | Yes | Body-Worn: Yes Hotspot: Yes |
| 4 | RTT BC1 Voice + EVDO BC0 Data + WLAN/BT | Yes | Body-Worn: Yes Hotspot: Yes |
| 5 | RTT BC1 Voice + EVDO BC1 Data + WLAN/BT | Yes | Body-Worn: Yes Hotspot: Yes |
| 6 | RTT BC1 Voice + LTE 13 Data + WLAN/BT | Yes | Body-Worn: Yes Hotspot: Yes |
| 7 | RTT BC0 Voice + EVDO BC0 Data | Yes | Body-Worn: Yes Hotspot: No |
| 8 | RTT BC0 Voice + EVDO BC1 Data | Yes | Body-Worn: Yes Hotspot: No |
| 9 | RTT BC0 Voice + LTE 13 Data | Yes | Body-Worn: Yes Hotspot: No |
| 10 | RTT BC1 Voice + EVDO BC0 Data | Yes | Body-Worn: Yes Hotspot: No |
| 11 | RTT BC1 Voice + EVDO BC1 Data | Yes | Body-Worn: Yes Hotspot: No |
| 12 | RTT BC1 Voice + LTE 13 Data | Yes | Body-Worn: Yes Hotspot: No |
| 13 | RTT BC0 Voice + WLAN/BT | Yes | Body-Worn: Yes Hotspot: No |
| 14 | RTT BC1 Voice + WLAN/BT | Yes | Body-Worn: Yes Hotspot: No |
| 15 | EVDO BC0 Data + WLAN/BT | Yes | Body-Worn: Yes Hotspot: Yes |
| 16 | EVDO BC1 Data + WLAN/BT | Yes | Body-Worn: Yes Hotspot: Yes |
| 17 | LTE 13 Data + WLAN/BT | Yes | Body-Worn: Yes Hotspot: Yes |

1. In the SVDO modes, CDMA 1xRTT and EVDO can transmit at maximum power level simultaneously.
2. In the SVLTE modes, CDMA 1xRTT and LTE can transmit at maximum power level simultaneously.

SAR measurements were tested under maximum power level for CDMA 1xRTT/EVDO, LTE, and WLAN technologies.

The WLAN and BT cannot transmit simultaneously, so there is no co-location test requirement for WLAN and BT.

3. SAR Measurement System

3.1 Definition of Specific Absorption Rate (SAR)

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.

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:

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

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

SAR measurement can be related to the electrical field in the tissue by

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

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

3.2 SPEAG DASY System

DASY system consists of high precision robot, probe alignment sensor, phantom, robot controller, controlled measurement server and near-field probe. The robot includes six axes that can move to the precision position of the DASY4/5 software defined. The DASY software can define the area that is detected by the probe. The robot is connected to controlled box. Controlled measurement server is connected to the controlled robot box. The DAE includes amplifier, signal multiplexing, AD converter, offset measurement and surface detection. It is connected to the Electro-optical coupler (ECO). The ECO performs the conversion from the optical into digital electric signal of the DAE and transfers data to the PC.

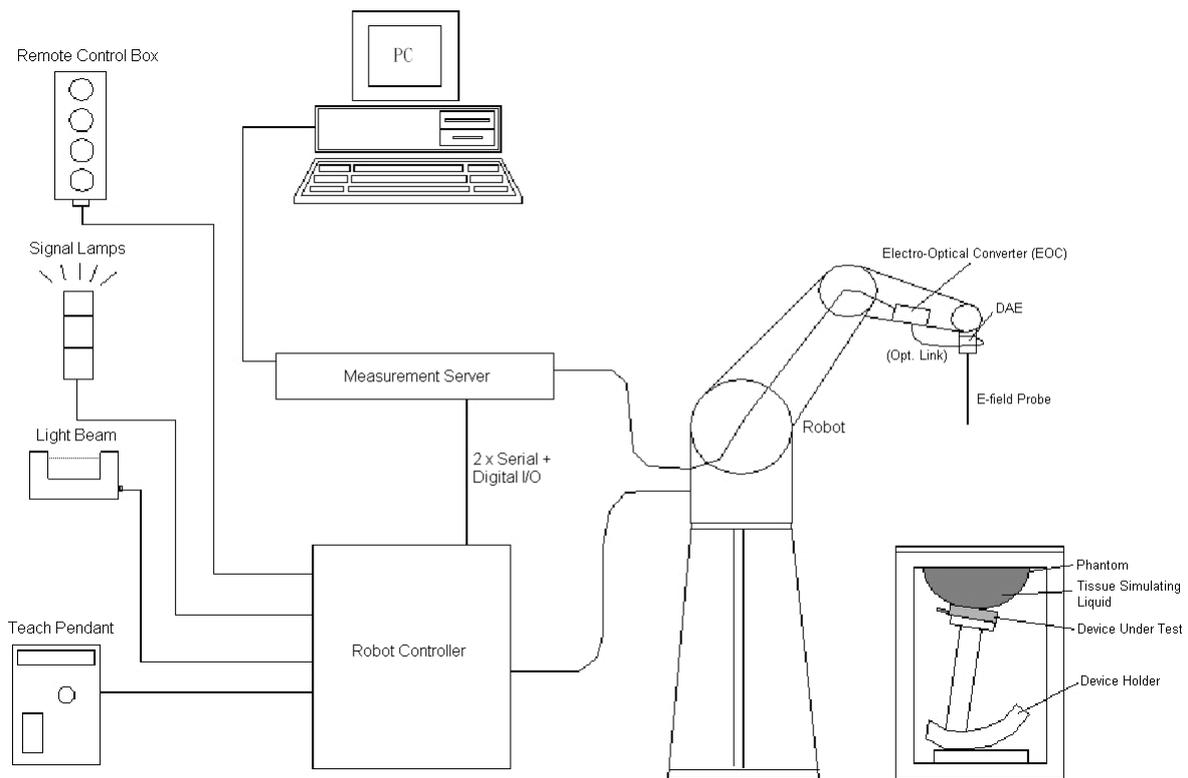


Fig-3.1 DASY System Setup

3.2.1 Robot

The DASY system uses the high precision robots from Stäubli SA (France). For the 6-axis controller system, the robot controller version (DASY4: CS7MB; DASY5: CS8c) from Stäubli is used. The Stäubli robot 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)

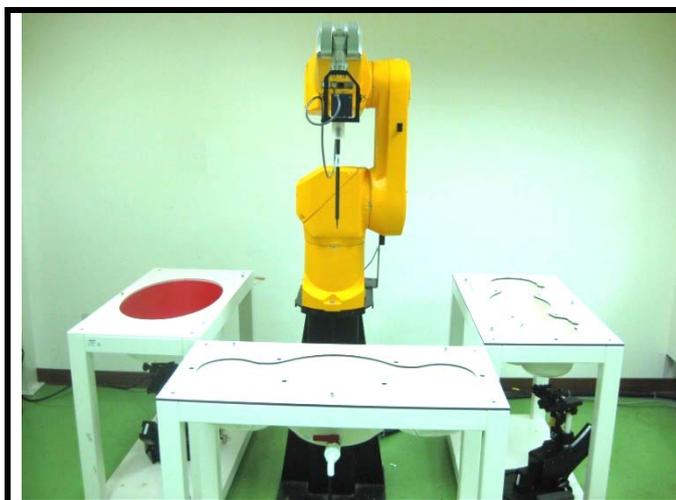


Fig-3.2 DASY4



Fig-3.3 DASY5

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3.2.2 Probes

The SAR measurement is conducted with the dosimetric probe. 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.

| | | |
|----------------------|--|---|
| Model | EX3DV4 |  |
| Construction | Symmetrical design with triangular core. Built-in shielding against static charges. PEEK enclosure material (resistant to organic solvents, e.g., DGBE). | |
| Frequency | 10 MHz to 6 GHz Linearity: ± 0.2 dB | |
| Directivity | ± 0.3 dB in HSL (rotation around probe axis) ± 0.5 dB in tissue material (rotation normal to probe axis) | |
| Dynamic Range | 10 μ W/g to 100 mW/g Linearity: ± 0.2 dB (noise: typically < 1 μ W/g) | |
| Dimensions | Overall length: 337 mm (Tip: 20 mm) Tip diameter: 2.5 mm (Body: 12 mm) Typical distance from probe tip to dipole centers: 1 mm | |

| | | |
|----------------------|---|--|
| Model | ES3DV3 |  |
| Construction | Symmetrical design with triangular core. Interleaved sensors. Built-in shielding against static charges. PEEK enclosure material (resistant to organic solvents, e.g., DGBE). | |
| Frequency | 10 MHz to 4 GHz Linearity: ± 0.2 dB | |
| Directivity | ± 0.2 dB in HSL (rotation around probe axis) ± 0.3 dB in tissue material (rotation normal to probe axis) | |
| Dynamic Range | 5 μ W/g to 100 mW/g Linearity: ± 0.2 dB | |
| Dimensions | Overall length: 337 mm (Tip: 20 mm) Tip diameter: 3.9 mm (Body: 12 mm) Distance from probe tip to dipole centers: 2.0 mm | |

3.2.3 Data Acquisition Electronics (DAE)

| | | |
|-----------------------------|--|---|
| Model | DAE3, DAE4 |  |
| Construction | Signal amplifier, multiplexer, A/D converter and control logic. Serial optical link for communication with DASY4/5 embedded system (fully remote controlled). Two step probe touch detector for mechanical surface detection and emergency robot stop. | |
| Measurement Range | -100 to +300 mV (16 bit resolution and two range settings: 4mV, 400mV) | |
| Input Offset Voltage | < 5 μ V (with auto zero) | |
| Input Bias Current | < 50 fA | |
| Dimensions | 60 x 60 x 68 mm | |

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3.2.4 Phantoms

| | | |
|------------------------|---|---|
| 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. | |
| Material | Vinylester, glass fiber reinforced (VE-GF) | |
| Shell Thickness | 2 ± 0.2 mm (6 ± 0.2 mm at ear point) | |
| Dimensions | Length: 1000 mm Width: 500 mm Height: adjustable feet | |
| Filling Volume | approx. 25 liters | |

| | | |
|------------------------|---|--|
| Model | ELI |  |
| 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. | |
| Material | Vinylester, glass fiber reinforced (VE-GF) | |
| Shell Thickness | 2.0 ± 0.2 mm (bottom plate) | |
| Dimensions | Major axis: 600 mm Minor axis: 400 mm | |
| Filling Volume | approx. 30 liters | |

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3.2.5 Device Holder

| | | |
|---------------------|---|---|
| Model | Mounting Device |  |
| Construction | In combination with the Twin SAM Phantom or ELI4, the Mounting Device enables the rotation of the mounted transmitter device in spherical coordinates. Rotation point is the ear opening point. Transmitter devices can be easily and accurately positioned according to IEC, IEEE, FCC or other specifications. The device holder can be locked for positioning at different phantom sections (left head, right head, flat). | |
| Material | POM | |

| | | |
|---------------------|---|---|
| Model | Laptop Extensions Kit |  |
| Construction | Simple but effective and easy-to-use extension for Mounting Device that facilitates the testing of larger devices according to IEC 62209-2 (e.g., laptops, cameras, etc.). It is lightweight and fits easily on the upper part of the Mounting Device in place of the phone positioner. | |
| Material | POM, Acrylic glass, Foam | |

3.2.6 System Validation Dipoles

| | | |
|-------------------------|--|---|
| Model | D-Serial |  |
| Construction | Symmetrical dipole with 1/4 balun. Enables measurement of feed point impedance with NWA. Matched for use near flat phantoms filled with tissue simulating solutions. | |
| Frequency | 750 MHz to 5800 MHz | |
| Return Loss | > 20 dB | |
| Power Capability | > 100 W (f < 1GHz), > 40 W (f > 1GHz) | |

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3.2.7 Tissue Simulating Liquids

For SAR measurement of the field distribution inside the phantom, the phantom must be filled with homogeneous tissue simulating liquid to a depth of at least 15 cm. 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. For body SAR testing, the liquid height from the center of the flat phantom to the liquid top surface is larger than 15 cm. The nominal dielectric values of the tissue simulating liquids in the phantom and the tolerance of 5% are listed in below table.

The dielectric properties of the tissue simulating liquids were verified prior to the SAR evaluation using an Agilent 85070D Dielectric Probe Kit and an Agilent Network Analyzer.

Table-3.1 Targets of Tissue Simulating Liquid

| Frequency (MHz) | Target Permittivity | Range of $\pm 5\%$ | Target Conductivity | Range of $\pm 5\%$ |
|-----------------|---------------------|--------------------|---------------------|--------------------|
| For Head | | | | |
| 750 | 41.9 | 39.8 ~ 44.0 | 0.89 | 0.85 ~ 0.93 |
| 835 | 41.5 | 39.4 ~ 43.6 | 0.90 | 0.86 ~ 0.95 |
| 900 | 41.5 | 39.4 ~ 43.6 | 0.97 | 0.92 ~ 1.02 |
| 1450 | 40.5 | 38.5 ~ 42.5 | 1.20 | 1.14 ~ 1.26 |
| 1640 | 40.3 | 38.3 ~ 42.3 | 1.29 | 1.23 ~ 1.35 |
| 1750 | 40.1 | 38.1 ~ 42.1 | 1.37 | 1.30 ~ 1.44 |
| 1800 | 40.0 | 38.0 ~ 42.0 | 1.40 | 1.33 ~ 1.47 |
| 1900 | 40.0 | 38.0 ~ 42.0 | 1.40 | 1.33 ~ 1.47 |
| 2000 | 40.0 | 38.0 ~ 42.0 | 1.40 | 1.33 ~ 1.47 |
| 2300 | 39.5 | 37.5 ~ 41.5 | 1.67 | 1.59 ~ 1.75 |
| 2450 | 39.2 | 37.2 ~ 41.2 | 1.80 | 1.71 ~ 1.89 |
| 2600 | 39.0 | 37.1 ~ 41.0 | 1.96 | 1.86 ~ 2.06 |
| 3500 | 37.9 | 36.0 ~ 39.8 | 2.91 | 2.76 ~ 3.06 |
| 5200 | 36.0 | 34.2 ~ 37.8 | 4.66 | 4.43 ~ 4.89 |
| 5300 | 35.9 | 34.1 ~ 37.7 | 4.76 | 4.52 ~ 5.00 |
| 5500 | 35.6 | 33.8 ~ 37.4 | 4.96 | 4.71 ~ 5.21 |
| 5600 | 35.5 | 33.7 ~ 37.3 | 5.07 | 4.82 ~ 5.32 |
| 5800 | 35.3 | 33.5 ~ 37.1 | 5.27 | 5.01 ~ 5.53 |
| For Body | | | | |
| 750 | 55.5 | 52.7 ~ 58.3 | 0.96 | 0.91 ~ 1.01 |
| 835 | 55.2 | 52.4 ~ 58.0 | 0.97 | 0.92 ~ 1.02 |
| 900 | 55.0 | 52.3 ~ 57.8 | 1.05 | 1.00 ~ 1.10 |
| 1450 | 54.0 | 51.3 ~ 56.7 | 1.30 | 1.24 ~ 1.37 |
| 1640 | 53.8 | 51.1 ~ 56.5 | 1.40 | 1.33 ~ 1.47 |
| 1750 | 53.4 | 50.7 ~ 56.1 | 1.49 | 1.42 ~ 1.56 |
| 1800 | 53.3 | 50.6 ~ 56.0 | 1.52 | 1.44 ~ 1.60 |
| 1900 | 53.3 | 50.6 ~ 56.0 | 1.52 | 1.44 ~ 1.60 |
| 2000 | 53.3 | 50.6 ~ 56.0 | 1.52 | 1.44 ~ 1.60 |
| 2300 | 52.9 | 50.3 ~ 55.5 | 1.81 | 1.72 ~ 1.90 |
| 2450 | 52.7 | 50.1 ~ 55.3 | 1.95 | 1.85 ~ 2.05 |
| 2600 | 52.5 | 49.9 ~ 55.1 | 2.16 | 2.05 ~ 2.27 |
| 3500 | 51.3 | 48.7 ~ 53.9 | 3.31 | 3.14 ~ 3.48 |
| 5200 | 49.0 | 46.6 ~ 51.5 | 5.30 | 5.04 ~ 5.57 |
| 5300 | 48.9 | 46.5 ~ 51.3 | 5.42 | 5.15 ~ 5.69 |
| 5500 | 48.6 | 46.2 ~ 51.0 | 5.65 | 5.37 ~ 5.93 |
| 5600 | 48.5 | 46.1 ~ 50.9 | 5.77 | 5.48 ~ 6.06 |
| 5800 | 48.2 | 45.8 ~ 50.6 | 6.00 | 5.70 ~ 6.30 |

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The following table gives the recipes for tissue simulating liquids.

Table-3.2 Recipes of Tissue Simulating Liquid

| Tissue Type | Bactericide | DGBE | HEC | NaCl | Sucrose | Triton X-100 | Water | Diethylene Glycol Mono-hexylether |
|-------------|-------------|------|-----|------|---------|--------------|-------|-----------------------------------|
| H750 | 0.2 | - | 0.2 | 1.5 | 56.0 | - | 42.1 | - |
| H835 | 0.2 | - | 0.2 | 1.5 | 57.0 | - | 41.1 | - |
| H900 | 0.2 | - | 0.2 | 1.4 | 58.0 | - | 40.2 | - |
| H1450 | - | 43.3 | - | 0.6 | - | - | 56.1 | - |
| H1640 | - | 45.8 | - | 0.5 | - | - | 53.7 | - |
| H1750 | - | 47.0 | - | 0.4 | - | - | 52.6 | - |
| H1800 | - | 44.5 | - | 0.3 | - | - | 55.2 | - |
| H1900 | - | 44.5 | - | 0.2 | - | - | 55.3 | - |
| H2000 | - | 44.5 | - | 0.1 | - | - | 55.4 | - |
| H2300 | - | 44.9 | - | 0.1 | - | - | 55.0 | - |
| H2450 | - | 45.0 | - | 0.1 | - | - | 54.9 | - |
| H2600 | - | 45.1 | - | 0.1 | - | - | 54.8 | - |
| H3500 | - | 8.0 | - | 0.2 | - | 20.0 | 71.8 | - |
| H5G | - | - | - | - | - | 17.2 | 65.5 | 17.3 |
| B750 | 0.2 | - | 0.2 | 0.8 | 48.8 | - | 50.0 | - |
| B835 | 0.2 | - | 0.2 | 0.9 | 48.5 | - | 50.2 | - |
| B900 | 0.2 | - | 0.2 | 0.9 | 48.2 | - | 50.5 | - |
| B1450 | - | 34.0 | - | 0.3 | - | - | 65.7 | - |
| B1640 | - | 32.5 | - | 0.3 | - | - | 67.2 | - |
| B1750 | - | 31.0 | - | 0.2 | - | - | 68.8 | - |
| B1800 | - | 29.5 | - | 0.4 | - | - | 70.1 | - |
| B1900 | - | 29.5 | - | 0.3 | - | - | 70.2 | - |
| B2000 | - | 30.0 | - | 0.2 | - | - | 69.8 | - |
| B2300 | - | 31.0 | - | 0.1 | - | - | 68.9 | - |
| B2450 | - | 31.4 | - | 0.1 | - | - | 68.5 | - |
| B2600 | - | 31.8 | - | 0.1 | - | - | 68.1 | - |
| B3500 | - | 28.8 | - | 0.1 | - | - | 71.1 | - |
| B5G | - | - | - | - | - | 10.7 | 78.6 | 10.7 |

3.3 SAR System Verification

The system check verifies that the system operates within its specifications. It is performed daily or before every SAR measurement. The system check uses normal SAR measurements in the flat section of the phantom with a matched dipole at a specified distance. The system verification setup is shown as below.

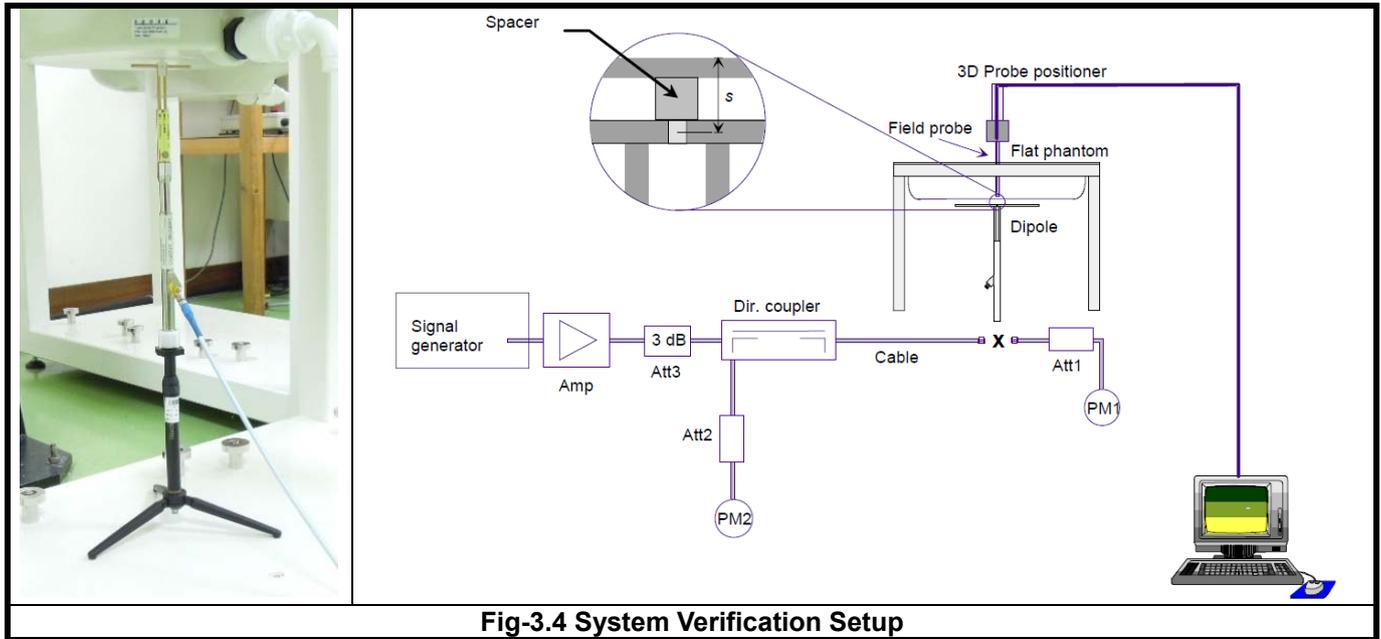


Fig-3.4 System Verification Setup

The validation dipole is placed beneath the flat phantom with the specific spacer in place. The distance spacer is touch the phantom surface with a light pressure at the reference marking and be oriented parallel to the long side of the phantom. The power meter PM1 measures the forward power at the location of the system check dipole connector. The signal generator is adjusted for the desired forward power (250 mW is used for 700 MHz to 3 GHz, 100 mW is used for 3.5 GHz to 6 GHz) at the dipole connector and the power meter PM2 is read at that level. After connecting the cable to the dipole, the signal generator is readjusted for the same reading at power meter PM2.

After system check testing, the SAR result will be normalized to 1W forward input power and compared with the reference SAR value derived from validation dipole certificate report. The deviation of system check should be within 10 %.

3.4 SAR Measurement Procedure

According to the SAR 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

The SAR measurement procedures for each of test conditions are as follows:

- (a) Make EUT to transmit maximum output power
- (b) Measure conducted output power through RF cable
- (c) Place the EUT in the specific position of phantom
- (d) Perform SAR testing steps on the DASY system
- (e) Record the SAR value

3.4.1 Area & Zoom Scan Procedure

First Area Scan is used to locate the approximate location(s) of the local peak SAR value(s). The measurement grid within an Area Scan is defined by the grid extent, grid step size and grid offset. Next, in order to determine the EM field distribution in a three-dimensional spatial extension, Zoom Scan is required. The Zoom Scan measures 5x5x7 points with step size 8, 8 and 5 mm for below 3 GHz, and 7x7x9 points with step size 4, 4 and 2.5 mm for above 5 GHz. The Zoom Scan is performed around the highest E-field value to determine the averaged SAR-distribution over 10 g.

3.4.2 Volume Scan Procedure

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 DUT 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.

3.4.3 Power Drift Monitoring

All SAR testing is under the DUT 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 DUT 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.

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3.4.4 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 from 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

3.4.5 SAR Averaged Methods

In DASY, the interpolation and extrapolation are both based on the modified Quadratic Shepard's method. The interpolation scheme combines a least-square fitted function method and a weighted average method which are the two basic types of computational interpolation and approximation.

Extrapolation routines are used to obtain SAR values between the lowest measurement points and the inner phantom surface. The extrapolation distance is determined by the surface detection distance and the probe sensor offset. The uncertainty increases with the extrapolation distance. To keep the uncertainty within 1% for the 1 g and 10 g cubes, the extrapolation distance should not be larger than 5 mm.

4. SAR Measurement Evaluation

4.1 EUT Configuration and Setting

For WWAN SAR testing, the EUT was linked and controlled by base station emulator. Communication between the EUT and the emulator was established by air link. The distance between the EUT and the communicating 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 DUT. The EUT was set from the emulator to radiate maximum output power during SAR testing.

The EUT is communicated with base station simulator (Agilent E5515C is used for CDMA, and Anritsu MT8820C is used for LTE) by air link. During SAR testing, the base station simulator is set to make the EUT to radiate maximum output power.

For LTE, set the related parameters of operating band, channel bandwidth, uplink channel number, modulation type, and RB in base station simulator. When the EUT has registered and communicated to base station simulator, set the simulator to make EUT transmitting the maximum radiated power. The steps for system simulator (Anritsu ET8820C) setup are as below.

1. Press the “Std” button to select “LTE 22.20S” function
2. Choose the “Screen Select” item to “Fundamental Measurement”
3. Enter the “Common” item
4. Set the Operating Band
5. Set the Channel Bandwidth
6. Set the UL Channel & Frequency
7. Set the Modulation
8. Set the RB number and RB shift
9. Press “Start Call” button when EUT register to the system simulator
10. Set the TX-1 Max. Power to make the EUT transmit maximum output power

For WLAN SAR testing, the EUT has installed WLAN engineering testing software which can provide continuous transmitting RF signal. This RF signal utilized in SAR measurement has almost 100% duty cycle. The data rates for WLAN SAR testing were set in lowest data rate as 1 Mbps for 802.11b, 6 Mbps for 802.11g, and MCS0 for 802.11n per KDB 248227 request.

4.2 EUT Testing Position

Based on the worst case of original report, this DUT was tested in **Right Cheek, Left Cheek, Left Tilted, Front Face, Rear Face, Right Side and Left Side** positions as illustrated below:

1. Define two imaginary lines on the handset

- (a) The vertical centerline 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.
- (b) The horizontal line is perpendicular to the vertical centerline and passes through the center of the acoustic output. The horizontal line is also tangential to the face of the handset at point A.
- (c) 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 centerline is not necessarily parallel to the front face of the handset, especially for clamshell handsets, handsets with flip covers, and other irregularly shaped handsets.

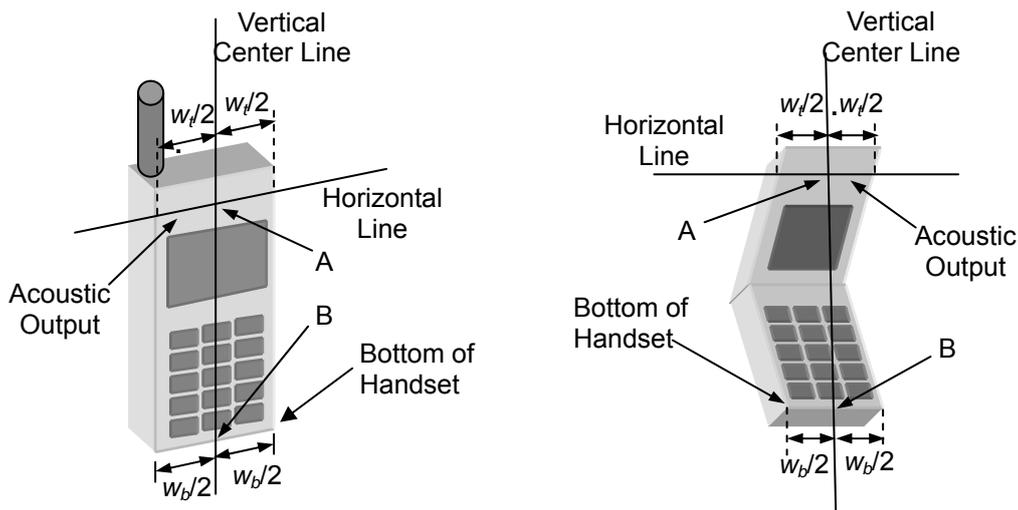


Fig-4.1 Illustration for Handset Vertical and Horizontal Reference Lines

2. Cheek Position

- (a) 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.
- (b) 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 Fig-4.2).

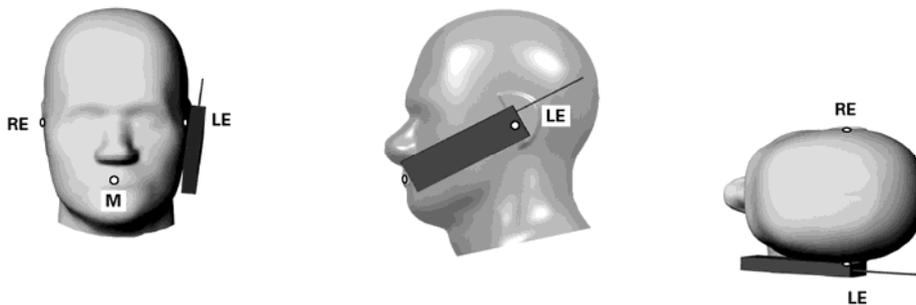


Fig-4.2 Illustration for Cheek Position

3. Tilted Position

- (a) To position the device in the “cheek” position described above.
- (b) 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 Fig-4.3).

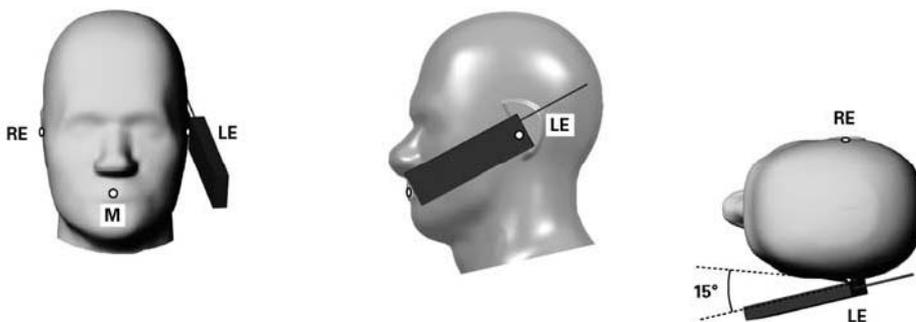


Fig-4.3 Illustration for Tilted Position

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4. Body Worn Position

- (a) To position the EUT parallel to the phantom surface.
- (b) To adjust the EUT parallel to the flat phantom.
- (c) To adjust the distance between the EUT surface and the flat phantom to 1 cm.

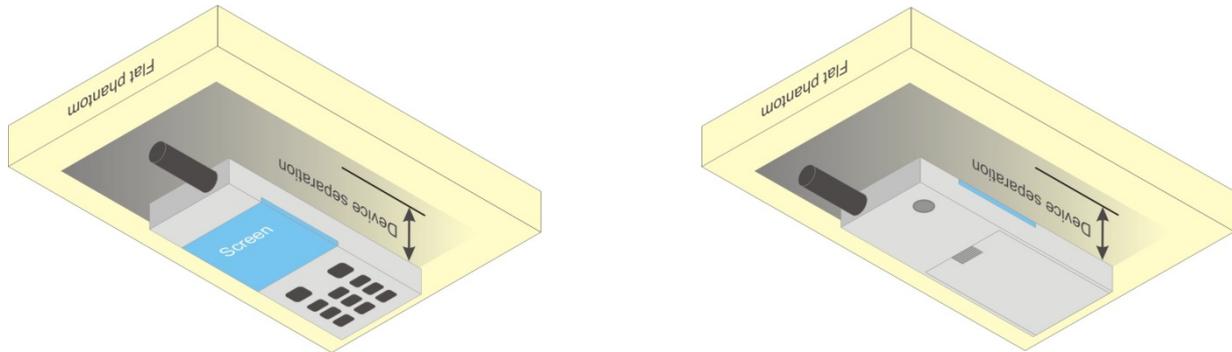


Fig-4.4 Illustration for Body Worn Position

4.3 Tissue Verification

The measuring results for tissue simulating liquid are shown as below.

| Tissue Type | Frequency (MHz) | Liquid Temp. (°C) | Measured Conductivity (σ) | Measured Permittivity (ϵ_r) | Target Conductivity (σ) | Target Permittivity (ϵ_r) | Conductivity Deviation (%) | Permittivity Deviation (%) | Test Date |
|-------------|-----------------|-------------------|------------------------------------|--|----------------------------------|--------------------------------------|----------------------------|----------------------------|---------------|
| H835 | 835 | 20.3 | 0.920 | 43.008 | 0.90 | 41.5 | 2.22 | 3.63 | Feb. 04, 2012 |
| H835 | 835 | 20.4 | 0.887 | 42.124 | 0.90 | 41.5 | -1.44 | 1.50 | Feb. 06, 2012 |
| B835 | 835 | 20.4 | 0.993 | 54.827 | 0.97 | 55.2 | 2.37 | -0.68 | Feb. 04, 2012 |
| B835 | 835 | 20.5 | 0.988 | 54.796 | 0.97 | 55.2 | 1.86 | -0.73 | Feb. 06, 2012 |
| B835 | 835 | 20.6 | 0.992 | 54.672 | 0.97 | 55.2 | 2.27 | -0.96 | Mar. 07, 2012 |
| H1900 | 1900 | 20.6 | 1.440 | 41.255 | 1.40 | 40.0 | 2.86 | 3.14 | Feb. 06, 2012 |
| B1900 | 1900 | 20.4 | 1.549 | 52.054 | 1.52 | 53.3 | 1.91 | -2.34 | Feb. 06, 2012 |
| H750 | 750 | 20.3 | 0.89 | 41.109 | 0.89 | 41.9 | 0.00 | -1.89 | Feb. 04, 2012 |
| B750 | 750 | 20.7 | 0.966 | 55.259 | 0.96 | 55.5 | 0.63 | -0.43 | Mar. 07, 2012 |
| B750 | 750 | 20.3 | 0.974 | 56.000 | 0.96 | 55.5 | 1.46 | 0.90 | Mar. 07, 2012 |
| H2450 | 2450 | 20.6 | 1.824 | 37.441 | 1.80 | 39.2 | 1.33 | -4.49 | Feb. 04, 2012 |
| B2450 | 2450 | 20.6 | 1.977 | 50.996 | 1.95 | 52.7 | 1.38 | -3.23 | Feb. 04, 2012 |
| H5200 | 5200 | 20.5 | 4.752 | 35.533 | 4.66 | 36.0 | 1.97 | -1.30 | Feb. 04, 2012 |
| B5200 | 5200 | 20.4 | 5.228 | 49.243 | 5.30 | 49.0 | -1.36 | 0.50 | Feb. 04, 2012 |
| B5200 | 5200 | 20.6 | 5.208 | 51.025 | 5.30 | 49.0 | -1.74 | 4.13 | Mar. 06, 2012 |
| H5500 | 5500 | 20.5 | 4.918 | 35.065 | 4.96 | 35.6 | -0.85 | -1.50 | Feb. 04, 2012 |
| B5500 | 5500 | 20.4 | 5.706 | 48.974 | 5.65 | 48.6 | 0.99 | 0.77 | Feb. 04, 2012 |
| B5500 | 5500 | 20.6 | 5.718 | 50.595 | 5.65 | 48.6 | 1.20 | 4.10 | Mar. 06, 2012 |
| H5800 | 5800 | 20.5 | 5.114 | 34.826 | 5.27 | 35.3 | -2.96 | -1.34 | Feb. 04, 2012 |
| H5800 | 5800 | 20.6 | 5.385 | 35.489 | 5.27 | 35.3 | 2.18 | 0.54 | Mar. 06, 2012 |
| B5800 | 5800 | 20.4 | 6.215 | 48.332 | 6.00 | 48.2 | 3.58 | 0.27 | Feb. 04, 2012 |
| B5800 | 5800 | 20.6 | 6.189 | 49.858 | 6.00 | 48.2 | 3.15 | 3.44 | Mar. 06, 2012 |

Note:

The dielectric properties of the tissue simulating liquid must be measured within 24 hours before the SAR testing and within $\pm 5\%$ of the target values. Liquid temperature during the SAR testing must be within $\pm 2^\circ\text{C}$.



4.4 System Verification

The measuring results for system check are shown as below.

| Test Date | Frequency (MHz) | 1W Target SAR-1g (W/kg) | Measured SAR-1g (W/kg) | Normalized to 1W SAR-1g (W/kg) | Deviation (%) | Dipole S/N | Probe S/N | DAE S/N |
|---------------|-----------------|-------------------------|------------------------|--------------------------------|---------------|------------|-----------|---------|
| Feb. 04, 2012 | 835 | 9.65 | 2.42 | 9.68 | 0.31 | 4d021 | 3590 | 1277 |
| Feb. 06, 2012 | 835 | 9.65 | 2.27 | 9.08 | -5.91 | 4d021 | 3800 | 861 |
| Feb. 04, 2012 | 835 | 10.10 | 2.59 | 10.36 | 2.57 | 4d021 | 3590 | 1277 |
| Feb. 06, 2012 | 835 | 10.10 | 2.63 | 10.52 | 4.16 | 4d021 | 3800 | 861 |
| Mar. 07, 2012 | 835 | 10.10 | 2.54 | 10.16 | 0.59 | 4d021 | 3590 | 579 |
| Feb. 06, 2012 | 1900 | 39.40 | 10.70 | 42.80 | 8.63 | 5d142 | 3800 | 861 |
| Feb. 06, 2012 | 1900 | 40.50 | 10.30 | 41.20 | 1.73 | 5d142 | 3800 | 861 |
| Feb. 04, 2012 | 750 | 8.39 | 2.22 | 8.88 | 5.84 | 1013 | 3590 | 1277 |
| Mar. 07, 2012 | 750 | 8.93 | 2.07 | 8.28 | -7.28 | 1013 | 3590 | 579 |
| Mar. 07, 2012 | 750 | 8.93 | 2.19 | 8.76 | -1.90 | 1013 | 3590 | 579 |
| Feb. 04, 2012 | 2450 | 53.30 | 13.50 | 54.00 | 1.31 | 735 | 3590 | 1277 |
| Feb. 04, 2012 | 2450 | 51.20 | 13.90 | 55.60 | 8.59 | 735 | 3590 | 1277 |
| Feb. 04, 2012 | 5200 | 81.20 | 8.38 | 83.80 | 3.20 | 1040 | 3590 | 1277 |
| Feb. 04, 2012 | 5200 | 76.00 | 8.12 | 81.20 | 6.84 | 1040 | 3590 | 1277 |
| Mar. 06, 2012 | 5200 | 72.70 | 7.79 | 77.90 | 7.15 | 1018 | 3590 | 579 |
| Feb. 04, 2012 | 5500 | 85.60 | 8.29 | 82.90 | -3.15 | 1040 | 3590 | 1277 |
| Feb. 04, 2012 | 5500 | 81.70 | 8.24 | 82.40 | 0.86 | 1040 | 3590 | 1277 |
| Mar. 06, 2012 | 5500 | 78.30 | 8.44 | 84.40 | 7.79 | 1018 | 3590 | 579 |
| Feb. 04, 2012 | 5800 | 78.90 | 7.68 | 76.80 | -2.66 | 1040 | 3590 | 1277 |
| Mar. 06, 2012 | 5800 | 78.60 | 8.10 | 81.00 | 3.05 | 1018 | 3590 | 579 |
| Feb. 04, 2012 | 5800 | 75.40 | 7.30 | 73.00 | -3.18 | 1040 | 3590 | 1277 |
| Mar. 06, 2012 | 5800 | 73.40 | 7.69 | 76.90 | 4.77 | 1018 | 3590 | 579 |

Note:

Comparing to the reference SAR value provided by SPEAG, the validation data should be within its specification of 10 %. The result indicates the system check can meet the variation criterion and the plots can be referred to Appendix A of this report.

4.5 Conducted Power Results

The measuring conducted power (Unit: dBm) are shown as below.

| Band | CDMA2000 BC0 | | | CDMA2000 BC1 | | |
|-------------------------|--------------|--------|--------|--------------|-------|---------|
| | 1013 | 384 | 777 | 25 | 600 | 1175 |
| Channel | | | | | | |
| Frequency | 824.7 | 836.52 | 848.31 | 1851.25 | 1880 | 1908.75 |
| RC1+SO55 | 24.63 | 24.56 | 24.78 | 24.63 | 24.71 | 24.70 |
| RC3+SO55 | 24.60 | 24.53 | 24.79 | 24.64 | 24.72 | 24.68 |
| RC3+SO32 (FCH) | 24.62 | 24.52 | 24.74 | 24.58 | 24.66 | 24.63 |
| RC3+SO32 (SCH) | 24.57 | 24.54 | 24.75 | 24.65 | 24.69 | 24.63 |
| 1xEVDO Rev.0 RTAP 153.6 | 24.62 | 24.55 | 24.64 | 24.54 | 24.66 | 24.64 |
| 1xEVDO Rev.A RETAP 4096 | 24.55 | 24.58 | 24.57 | 24.55 | 24.58 | 24.57 |



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| Band | 802.11b | | | 802.11g | | |
|-----------------|---------|-------|-------|---------|-------|-------|
| Channel | 1 | 6 | 11 | 1 | 6 | 11 |
| Frequency (MHz) | 2412 | 2437 | 2462 | 2412 | 2437 | 2462 |
| Average Power | 18.24 | 18.25 | 18.01 | 13.18 | 13.24 | 13.06 |

| Band | 802.11n (HT20) | | | | | |
|-----------------|----------------|-------|-------|---|---|---|
| Channel | 1 | 6 | 11 | - | - | - |
| Frequency (MHz) | 2412 | 2437 | 2462 | - | - | - |
| Average Power | 12.11 | 12.18 | 11.94 | - | - | - |

| Band | 802.11a | | | | | | | |
|-----------------|---------|-------|-------|-------|-------|-------|-------|-------|
| Channel | 36 | 40 | 44 | 48 | 52 | 56 | 60 | 64 |
| Frequency (MHz) | 5180 | 5200 | 5220 | 5240 | 5260 | 5280 | 5300 | 5320 |
| Average Power | 13.28 | 13.26 | 13.24 | 13.21 | 13.21 | 13.20 | 13.15 | 13.11 |

| Band | 802.11a | | | | | | | |
|-----------------|---------|-------|-------|-------|-------|-------|-------|-------|
| Channel | 100 | 104 | 108 | 112 | 116 | 132 | 136 | 140 |
| Frequency (MHz) | 5500 | 5520 | 5540 | 5560 | 5580 | 5660 | 5680 | 5700 |
| Average Power | 13.09 | 13.21 | 13.19 | 13.16 | 13.21 | 13.18 | 13.15 | 13.24 |

| Band | 802.11a | | | | | | | |
|-----------------|---------|-------|-------|-------|---|---|---|---|
| Channel | 149 | 153 | 157 | 161 | - | - | - | - |
| Frequency (MHz) | 5745 | 5765 | 5785 | 5805 | - | - | - | - |
| Average Power | 13.11 | 13.10 | 12.93 | 13.12 | - | - | - | - |

| Band | 802.11n (HT20) | | | | | | | |
|-----------------|----------------|-------|-------|-------|-------|-------|-------|-------|
| Channel | 36 | 40 | 44 | 48 | 52 | 56 | 60 | 64 |
| Frequency (MHz) | 5180 | 5200 | 5220 | 5240 | 5260 | 5280 | 5300 | 5320 |
| Average Power | 10.26 | 10.24 | 10.22 | 10.20 | 10.18 | 10.21 | 10.16 | 10.24 |

| Band | 802.11n (HT20) | | | | | | | |
|-----------------|----------------|-------|-------|-------|-------|-------|-------|-------|
| Channel | 100 | 104 | 108 | 112 | 116 | 132 | 136 | 140 |
| Frequency (MHz) | 5500 | 5520 | 5540 | 5560 | 5580 | 5660 | 5680 | 5700 |
| Average Power | 10.18 | 10.26 | 10.23 | 10.19 | 10.28 | 10.26 | 10.23 | 10.31 |

| Band | 802.11n (HT20) | | | | | | | |
|-----------------|----------------|-------|------|-------|---|---|---|---|
| Channel | 149 | 153 | 157 | 161 | - | - | - | - |
| Frequency (MHz) | 5745 | 5765 | 5785 | 5805 | - | - | - | - |
| Average Power | 10.12 | 10.16 | 9.96 | 10.13 | - | - | - | - |

| Band | 802.11n (HT40) | | | | | | | | |
|-----------------|----------------|-------|-------|-------|-------|-------|-------|-------|-------|
| Channel | 38 | 46 | 54 | 62 | 102 | 118 | 134 | 151 | 159 |
| Frequency (MHz) | 5190 | 5230 | 5270 | 5310 | 5510 | 5590 | 5670 | 5755 | 5795 |
| Average Power | 10.32 | 10.29 | 10.25 | 10.16 | 10.78 | 10.61 | 10.68 | 10.42 | 10.38 |

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| LTE Band 13 | | | | | | | | |
|-------------|------------|-------|-----------------|----|-----------|-----|--------------|----------------|
| BW | Modulation | CH | Frequency (MHz) | RB | RB Offset | MPR | Target Power | Measured Power |
| 5 MHz | QPSK | 23230 | 782 | 1 | 0 | 0 | 25.5 | 25.45 |
| | | 23230 | 782 | 1 | 24 | 0 | 25.5 | 25.43 |
| | | 23230 | 782 | 12 | 6 | 1 | 25.5 | 24.65 |
| | | 23230 | 782 | 25 | 0 | 1 | 25.5 | 24.69 |
| | 16QAM | 23230 | 782 | 1 | 0 | 1 | 25.5 | 24.72 |
| | | 23230 | 782 | 1 | 24 | 1 | 25.5 | 24.74 |
| | | 23230 | 782 | 12 | 6 | 2 | 25.5 | 23.59 |
| | | 23230 | 782 | 25 | 0 | 2 | 25.5 | 23.63 |
| 10 MHz | QPSK | 23230 | 782 | 1 | 0 | 0 | 25.5 | 25.49 |
| | | 23230 | 782 | 1 | 49 | 0 | 25.5 | 25.46 |
| | | 23230 | 782 | 25 | 12 | 1 | 25.5 | 24.81 |
| | | 23230 | 782 | 50 | 0 | 1 | 25.5 | 24.70 |
| | 16QAM | 23230 | 782 | 1 | 0 | 1 | 25.5 | 24.72 |
| | | 23230 | 782 | 1 | 49 | 1 | 25.5 | 24.77 |
| | | 23230 | 782 | 25 | 12 | 2 | 25.5 | 23.77 |
| | | 23230 | 782 | 50 | 0 | 2 | 25.5 | 23.85 |

4.6 SAR Testing Results

4.6.1 SAR Results for Head

| Plot No. | Band | Mode | Test Position | Channel | Battery | Battery Cover | SAR-1g (W/kg) |
|----------|--------------|------------|---------------|---------|---------|---------------|---------------|
| 30 | CDMA2000 BC0 | RC3+SO55 | Left Cheek | 777 | 1 | 3 | 0.458 |
| 32 | CDMA2000 BC1 | RC3+SO55 | Left Cheek | 600 | 1 | 3 | 0.460 |
| 31 | CDMA2000 BC0 | EVDO Rev.0 | Right Cheek | 777 | 1 | 3 | 0.481 |
| 33 | CDMA2000 BC1 | EVDO Rev.0 | Left Tilted | 600 | 1 | 3 | 0.645 |

Note:

- The SAR testing above is verified on the worst case of original report.

| Plot No. | Band | Mode | Test Position | Channel | Battery | Battery Cover | RB | Offset | SAR-1g (W/kg) |
|----------|--------|----------|---------------|---------|---------|---------------|----|--------|---------------|
| 51 | LTE 13 | QPSK_10M | Left Cheek | 23230 | 1 | 3 | 1 | 49 | 0.760 |

Note:

- The SAR testing above is verified on the worst case of original report.

| Plot No. | Band | Test Position | Channel | Battery | Battery Cover | SAR-1g (W/kg) |
|----------|---------|---------------|---------|---------|---------------|---------------|
| 1 | 802.11b | Left Cheek | 6 | 1 | 3 | 0.121 |
| 3 | 802.11a | Left Cheek | 36 | 1 | 3 | 0.101 |
| 4 | 802.11a | Left Cheek | 52 | 1 | 3 | 0.130 |
| 5 | 802.11a | Left Cheek | 140 | 1 | 3 | 0.115 |
| 11 | 802.11a | Left Cheek | 161 | 1 | 3 | 0.075 |

Note:

- The SAR testing above is verified on the worst case of original report.

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4.6.2 SAR Results for Body

<Hotspot Mode>

| Plot No. | Band | Mode | Test Position | Separation Distance (cm) | Channel | Battery | Battery Cover | Earphone | SAR-1g (W/kg) |
|----------|--------------|------------|---------------|--------------------------|---------|---------|---------------|----------|---------------|
| 34 | CDMA2000 BC0 | RC3+SO32 | Rear Face | 1 | 777 | 1 | 3 | w/o | 0.687 |
| 36 | CDMA2000 BC1 | RC3+SO32 | Front Face | 1 | 600 | 1 | 3 | w/o | 0.460 |
| 35 | CDMA2000 BC0 | EVDO Rev.0 | Left Side | 1 | 777 | 1 | 3 | w/o | 0.505 |
| 37 | CDMA2000 BC1 | EVDO Rev.0 | Rear Face | 1 | 600 | 1 | 3 | w/o | 0.388 |

Note:

1. The SAR testing above is verified on the worst case of original report.

| Plot No. | Band | Mode | Test Position | Separation Distance (cm) | Channel | Battery | Battery Cover | RB | Offset | SAR-1g (W/kg) |
|----------|--------|----------|---------------|--------------------------|---------|---------|---------------|----|--------|---------------|
| 52 | LTE 13 | QPSK_10M | Right Side | 1 | 23230 | 1 | 3 | 1 | 0 | 0.396 |

Note:

1. The SAR testing above is verified on the worst case of original report.

| Plot No. | Band | Test Position | Separation Distance (cm) | Channel | Battery | Battery Cover | SAR-1g (W/kg) |
|----------|---------|---------------|--------------------------|---------|---------|---------------|---------------|
| 2 | 802.11b | Rear Face | 1 | 6 | 1 | 3 | 0.083 |
| 7 | 802.11a | Left Side | 1 | 36 | 1 | 3 | 0.227 |
| 8 | 802.11a | Left Side | 1 | 52 | 1 | 3 | 0.229 |
| 9 | 802.11a | Left Side | 1 | 140 | 1 | 3 | 0.228 |
| 10 | 802.11a | Left Side | 1 | 161 | 1 | 3 | 0.220 |

Note:

1. The SAR testing above is verified on the worst case of original report.



FCC SAR Test Report

<Body Worn Mode>

| Plot No. | Band | Mode | Test Position | Separation Distance (cm) | Channel | Battery | Battery Cover | SAR-1g (W/kg) |
|----------|--------------|------------|---------------|--------------------------|---------|---------|---------------|---------------|
| 34 | CDMA2000 BC0 | RC3+SO32 | Rear Face | 1 | 777 | 1 | 3 | 0.687 |
| 36 | CDMA2000 BC1 | RC3+SO32 | Front Face | 1 | 600 | 1 | 3 | 0.460 |
| 38 | CDMA2000 BC0 | EVDO Rev.0 | Rear Face | 1 | 777 | 1 | 3 | 0.421 |
| 37 | CDMA2000 BC1 | EVDO Rev.0 | Rear Face | 1 | 600 | 1 | 3 | 0.388 |

Note:

1. The SAR testing above is verified on the worst case of original report.

| Plot No. | Band | Mode | Test Position | Separation Distance (cm) | Channel | Battery | Battery Cover | RB | Offset | SAR-1g (W/kg) |
|----------|--------|----------|---------------|--------------------------|---------|---------|---------------|----|--------|---------------|
| 53 | LTE 13 | QPSK_10M | Rear Face | 1 | 23230 | 1 | 3 | 1 | 0 | 0.351 |

Note:

1. The SAR testing above is verified on the worst case of original report.

| Plot No. | Band | Test Position | Separation Distance (cm) | Channel | Battery | Battery Cover | SAR-1g (W/kg) |
|----------|---------|---------------|--------------------------|---------|---------|---------------|---------------|
| 2 | 802.11b | Rear Face | 1 | 6 | 1 | 3 | 0.083 |
| 12 | 802.11a | Rear Face | 1 | 36 | 1 | 3 | 0.07 |
| 13 | 802.11a | Rear Face | 1 | 52 | 1 | 3 | 0.162 |
| 14 | 802.11a | Rear Face | 1 | 140 | 1 | 3 | 0.138 |
| 15 | 802.11a | Rear Face | 1 | 161 | 1 | 3 | 0.145 |

Note:

1. The SAR testing above is verified on the worst case of original report.

Test Engineer : Isaac Liao, Morrison Huang and Match Tsui

FCC SAR Test Report

4.6.3 Simultaneous Multi-band Transmission Evaluation

Since all the verified SAR value for wireless charging battery cover are less than SAR value of original report, simultaneous transmission evaluation below is the same as original SAR report.

<SPLSR calculation procedure>

1. Use DASY software to open SAR data file with zoom scan results.
2. Export data file to SEMCAD using 'Field Data Export' function.
3. Search for highest SAR based on the imported measured/interpolated data and identify the X, Y, and Z coordinates. Per the SAR system manufacture, DASY stores the individual coordinates of each measurement point in the measurement file where the, center coordinate (x=0, y=0) is always the Grid Reference Point as set in DASY for a phantom section.
4. Calculate the peak SAR separation distances using the Pythagoras' theorem where
Peak SAR separation distance = $\sqrt{(X_1 - X_2)^2 + (Y_1 - Y_2)^2 + (Z_1 - Z_2)^2}$
5. Calculate SPLSR = (SAR1 + SAR2) / Peak SAR separation distance.
6. The SPLSR calculation plots shown in test report are for reference only as the images were generated in a separate software program to add the antenna and arrow references. The distance information in the calculations below each plot is derived from the DASY SAR zoom scan data as specified in this procedure.



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Table 7.1 Simultaneous Transmission Analysis for RTT BC0 Voice + EVDO BC0 Data + WLAN

| Position | Transmitter 1 RTT BC0 Voice | Transmitter 2 EVDO BC0 Data | Transmitter 3 WLAN | All 3 SAR Summation | SPLSR T1&T2 | SPLSR T1&T3 | SPLSR T2&T3 | Note |
|----------------------------------|--------------------------------|--------------------------------|-----------------------|------------------------|----------------|----------------|----------------|--|
| Head SAR | | | | | | | | |
| Head-Right Cheek | 0.485 | 0.517 | 0.074 | 1.076 | - | - | - | SUM SAR<1.6, Simul-TX SAR not required |
| Head-Right Tilted | 0.285 | 0.278 | 0.042 | 0.605 | - | - | - | SUM SAR<1.6, Simul-TX SAR not required |
| Head-Left Cheek | 0.545 | 0.332 | 0.148 | 1.025 | - | - | - | SUM SAR<1.6, Simul-TX SAR not required |
| Head-Left Tilted | 0.255 | 0.167 | 0.035 | 0.457 | - | - | - | SUM SAR<1.6, Simul-TX SAR not required |
| Body SAR : Hotspot Mode | | | | | | | | |
| Body-Front Face | 0.549 | 0.191 | 0.044 | 0.784 | - | - | - | SUM SAR<1.6, Simul-TX SAR not required |
| Body-Rear Face | 1.05 | 0.504 | 0.227 | 1.781 | 0.2 | 0.294 | 0.14 | All SPLSR<0.3, Simul-TX SAR not required |
| Body-Left Side | 0.445 | 0.52 | 0.345 | 1.31 | - | - | - | SUM SAR<1.6, Simul-TX SAR not required |
| Body-Right Side | 0.425 | 0 | 0 | 0.425 | - | - | - | SUM SAR<1.6, Simul-TX SAR not required |
| Body-Top Side | 0 | 0.057 | 0 | 0.057 | - | - | - | SUM SAR<1.6, Simul-TX SAR not required |
| Body-Bottom Side | 0.011 | 0 | 0 | 0.011 | - | - | - | SUM SAR<1.6, Simul-TX SAR not required |
| Body SAR : Body Worn Mode | | | | | | | | |
| Body-Front Face | 0.549 | 0.191 | 0.044 | 0.784 | - | - | - | SUM SAR<1.6, Simul-TX SAR not required |
| Body-Rear Face | 1.05 | 0.504 | 0.227 | 1.781 | 0.2 | 0.294 | 0.14 | All SPLSR<0.3, Simul-TX SAR not required |

Note: The calculation of SPLSR is as follows.

The calculation of SAR to peak location separation ratio for (Body-Rear Face, T1+T2) is as below:

Coordinate of Peak SAR Location (X, Y, Z) : T1(-0.01, -0.042, -0.178), T2(0.024, 0.028, -0.178)

Peak Location Spacing = 7.8 cm

SPLSR (SAR to Peak Location Spacing Ratio) = (1.05 + 0.504) / 7.8 = 0.2

The calculation of SAR to peak location separation ratio for (Body-Rear Face, T1+T3) is as below:

Coordinate of Peak SAR Location (X, Y, Z) : T1(-0.01, -0.042, -0.178), T3(0.00906, -0.0139, -0.205)

Peak Location Spacing = 4.3 cm

SPLSR (SAR to Peak Location Spacing Ratio) = (1.05 + 0.227) / 4.3 = 0.294

The calculation of SAR to peak location separation ratio for (Body-Rear Face, T2+T3) is as below:

Coordinate of Peak SAR Location (X, Y, Z) : T2(0.024, 0.028, -0.178), T3(0.00906, -0.0139, -0.205)

Peak Location Spacing = 5.2 cm

SPLSR (SAR to Peak Location Spacing Ratio) = (0.504 + 0.227) / 5.2 = 0.14



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Table 7.2 Simultaneous Transmission Analysis for RTT BC0 Voice + EVDO BC1 Data + WLAN

| Position | Transmitter 1 RTT BC0 Voice | Transmitter 2 EVDO BC1 Data | Transmitter 3 WLAN | All 3 SAR Summation | SPLSR T1&T2 | SPLSR T1&T3 | SPLSR T2&T3 | Note |
|----------------------------------|--------------------------------|--------------------------------|-----------------------|------------------------|----------------|----------------|----------------|--|
| Head SAR | | | | | | | | |
| Head-Right Cheek | 0.485 | 0.599 | 0.074 | 1.158 | - | - | - | SUM SAR<1.6, Simul-TX SAR not required |
| Head-Right Tilted | 0.285 | 0.683 | 0.042 | 1.01 | - | - | - | SUM SAR<1.6, Simul-TX SAR not required |
| Head-Left Cheek | 0.545 | 0.511 | 0.148 | 1.204 | - | - | - | SUM SAR<1.6, Simul-TX SAR not required |
| Head-Left Tilted | 0.255 | 0.712 | 0.035 | 1.002 | - | - | - | SUM SAR<1.6, Simul-TX SAR not required |
| Body SAR : Hotspot Mode | | | | | | | | |
| Body-Front Face | 0.549 | 0.271 | 0.044 | 0.864 | - | - | - | SUM SAR<1.6, Simul-TX SAR not required |
| Body-Rear Face | 1.05 | 0.56 | 0.227 | 1.837 | 0.178 | 0.294 | 0.12 | All SPLSR<0.3, Simul-TX SAR not required |
| Body-Left Side | 0.445 | 0.381 | 0.345 | 1.171 | - | - | - | SUM SAR<1.6, Simul-TX SAR not required |
| Body-Right Side | 0.425 | 0 | 0 | 0.425 | - | - | - | SUM SAR<1.6, Simul-TX SAR not required |
| Body-Top Side | 0 | 0.352 | 0 | 0.352 | - | - | - | SUM SAR<1.6, Simul-TX SAR not required |
| Body-Bottom Side | 0.011 | 0 | 0 | 0.011 | - | - | - | SUM SAR<1.6, Simul-TX SAR not required |
| Body SAR : Body Worn Mode | | | | | | | | |
| Body-Front Face | 0.549 | 0.271 | 0.044 | 0.864 | - | - | - | SUM SAR<1.6, Simul-TX SAR not required |
| Body-Rear Face | 1.05 | 0.56 | 0.227 | 1.837 | 0.178 | 0.294 | 0.12 | All SPLSR<0.3, Simul-TX SAR not required |

Note: The calculation of SPLSR is as follows.

The calculation of SAR to peak location separation ratio for (Body-Rear Face, T1+T2) is as below:

Coordinate of Peak SAR Location (X, Y, Z) : T1(-0.01, -0.042, -0.178), T2(0.01, 0.046, -0.178)

Peak Location Spacing = 9 cm

SPLSR (SAR to Peak Location Spacing Ratio) = (1.05 + 0.56) / 9 = 0.178

The calculation of SAR to peak location separation ratio for (Body-Rear Face, T1+T3) is as below:

Coordinate of Peak SAR Location (X, Y, Z) : T1(-0.01, -0.042, -0.178), T3(0.00906, -0.0139, -0.205)

Peak Location Spacing = 4.3 cm

SPLSR (SAR to Peak Location Spacing Ratio) = (1.05 + 0.227) / 4.3 = 0.294

The calculation of SAR to peak location separation ratio for (Body-Rear Face, T2+T3) is as below:

Coordinate of Peak SAR Location (X, Y, Z) : T2(0.01, 0.046, -0.178), T3(0.00906, -0.0139, -0.205)

Peak Location Spacing = 6.6 cm

SPLSR (SAR to Peak Location Spacing Ratio) = (0.56 + 0.227) / 6.6 = 0.12



Table 7.3 Simultaneous Transmission Analysis for RTT BC0 Voice + LTE 13 Data + WLAN

| Position | Transmitter 1 RTT BC0 Voice | Transmitter 2 LTE 13 Data | Transmitter 3 WLAN | All 3 SAR Summation | SPLSR T1&T2 | SPLSR T1&T3 | SPLSR T2&T3 | Note |
|----------------------------------|--------------------------------|------------------------------|-----------------------|------------------------|----------------|----------------|----------------|--|
| Head SAR | | | | | | | | |
| Head-Right Cheek | 0.485 | 0.475 | 0.074 | 1.034 | - | - | - | SUM SAR<1.6, Simul-TX SAR not required |
| Head-Right Tilted | 0.285 | 0.346 | 0.042 | 0.673 | - | - | - | SUM SAR<1.6, Simul-TX SAR not required |
| Head-Left Cheek | 0.545 | 0.799 | 0.148 | 1.492 | - | - | - | SUM SAR<1.6, Simul-TX SAR not required |
| Head-Left Tilted | 0.255 | 0.591 | 0.035 | 0.881 | - | - | - | SUM SAR<1.6, Simul-TX SAR not required |
| Body SAR : Hotspot Mode | | | | | | | | |
| Body-Front Face | 0.549 | 0.287 | 0.044 | 0.88 | - | - | - | SUM SAR<1.6, Simul-TX SAR not required |
| Body-Rear Face | 1.05 | 0.368 | 0.227 | 1.645 | 0.156 | 0.294 | 0.09 | All SPLSR<0.3, Simul-TX SAR not required |
| Body-Left Side | 0.445 | 0 | 0.345 | 0.79 | - | - | - | SUM SAR<1.6, Simul-TX SAR not required |
| Body-Right Side | 0.425 | 0.443 | 0 | 0.868 | - | - | - | SUM SAR<1.6, Simul-TX SAR not required |
| Body-Top Side | 0 | 0.195 | 0 | 0.195 | - | - | - | SUM SAR<1.6, Simul-TX SAR not required |
| Body-Bottom Side | 0.011 | 0 | 0 | 0.011 | - | - | - | SUM SAR<1.6, Simul-TX SAR not required |
| Body SAR : Body Worn Mode | | | | | | | | |
| Body-Front Face | 0.549 | 0.287 | 0.044 | 0.88 | - | - | - | SUM SAR<1.6, Simul-TX SAR not required |
| Body-Rear Face | 1.05 | 0.368 | 0.227 | 1.645 | 0.156 | 0.294 | 0.09 | All SPLSR<0.3, Simul-TX SAR not required |

Note: The calculation of SPLSR is as follows.

The calculation of SAR to peak location separation ratio for (Body-Rear Face, T1+T2) is as below:

Coordinate of Peak SAR Location (X, Y, Z) : T1(-0.01, -0.042, -0.178), T2(-0.023, 0.044, -0.205)

Peak Location Spacing = 9.1 cm

SPLSR (SAR to Peak Location Spacing Ratio) = (1.05 + 0.368) / 9.1 = 0.156

The calculation of SAR to peak location separation ratio for (Body-Rear Face, T1+T3) is as below:

Coordinate of Peak SAR Location (X, Y, Z) : T1(-0.01, -0.042, -0.178), T3(0.00906, -0.0139, -0.205)

Peak Location Spacing = 4.3 cm

SPLSR (SAR to Peak Location Spacing Ratio) = (1.05 + 0.227) / 4.3 = 0.294

The calculation of SAR to peak location separation ratio for (Body-Rear Face, T2+T3) is as below:

Coordinate of Peak SAR Location (X, Y, Z) : T2(-0.023, 0.044, -0.205), T3(0.00906, -0.0139, -0.205)

Peak Location Spacing = 6.6 cm

SPLSR (SAR to Peak Location Spacing Ratio) = (0.368 + 0.227) / 6.6 = 0.09



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Table 7.4 Simultaneous Transmission Analysis for RTT BC1 Voice + EVDO BC0 Data + WLAN

| Position | Transmitter 1 RTT BC1 Voice | Transmitter 2 EVDO BC0 Data | Transmitter 3 WLAN | All 3 SAR Summation | SPLSR T1&T2 | SPLSR T1&T3 | SPLSR T2&T3 | Note |
|----------------------------------|--------------------------------|--------------------------------|-----------------------|------------------------|----------------|----------------|----------------|--|
| Head SAR | | | | | | | | |
| Head-Right Cheek | 0.48 | 0.517 | 0.074 | 1.071 | - | - | - | SUM SAR<1.6, Simul-TX SAR not required |
| Head-Right Tilted | 0.228 | 0.278 | 0.042 | 0.548 | - | - | - | SUM SAR<1.6, Simul-TX SAR not required |
| Head-Left Cheek | 0.577 | 0.332 | 0.148 | 1.057 | - | - | - | SUM SAR<1.6, Simul-TX SAR not required |
| Head-Left Tilted | 0.185 | 0.167 | 0.035 | 0.387 | - | - | - | SUM SAR<1.6, Simul-TX SAR not required |
| Body SAR : Hotspot Mode | | | | | | | | |
| Body-Front Face | 0.714 | 0.191 | 0.044 | 0.949 | - | - | - | SUM SAR<1.6, Simul-TX SAR not required |
| Body-Rear Face | 0.57 | 0.504 | 0.227 | 1.301 | - | - | - | SUM SAR<1.6, Simul-TX SAR not required |
| Body-Left Side | 0.193 | 0.52 | 0.345 | 1.058 | - | - | - | SUM SAR<1.6, Simul-TX SAR not required |
| Body-Right Side | 0.264 | 0 | 0 | 0.264 | - | - | - | SUM SAR<1.6, Simul-TX SAR not required |
| Body-Top Side | 0 | 0.057 | 0 | 0.057 | - | - | - | SUM SAR<1.6, Simul-TX SAR not required |
| Body-Bottom Side | 0.434 | 0 | 0 | 0.434 | - | - | - | SUM SAR<1.6, Simul-TX SAR not required |
| Body SAR : Body Worn Mode | | | | | | | | |
| Body-Front Face | 0.714 | 0.191 | 0.044 | 0.949 | - | - | - | SUM SAR<1.6, Simul-TX SAR not required |
| Body-Rear Face | 0.57 | 0.504 | 0.227 | 1.301 | - | - | - | SUM SAR<1.6, Simul-TX SAR not required |

Table 7.5 Simultaneous Transmission Analysis for RTT BC1 Voice + EVDO BC1 Data + WLAN

| Position | Transmitter 1 RTT BC1 Voice | Transmitter 2 EVDO BC1 Data | Transmitter 3 WLAN | All 3 SAR Summation | SPLSR T1&T2 | SPLSR T1&T3 | SPLSR T2&T3 | Note |
|----------------------------------|--------------------------------|--------------------------------|-----------------------|------------------------|----------------|----------------|----------------|--|
| Head SAR | | | | | | | | |
| Head-Right Cheek | 0.48 | 0.599 | 0.074 | 1.153 | - | - | - | SUM SAR<1.6, Simul-TX SAR not required |
| Head-Right Tilted | 0.228 | 0.683 | 0.042 | 0.953 | - | - | - | SUM SAR<1.6, Simul-TX SAR not required |
| Head-Left Cheek | 0.577 | 0.511 | 0.148 | 1.236 | - | - | - | SUM SAR<1.6, Simul-TX SAR not required |
| Head-Left Tilted | 0.185 | 0.712 | 0.035 | 0.932 | - | - | - | SUM SAR<1.6, Simul-TX SAR not required |
| Body SAR : Hotspot Mode | | | | | | | | |
| Body-Front Face | 0.714 | 0.271 | 0.044 | 1.029 | - | - | - | SUM SAR<1.6, Simul-TX SAR not required |
| Body-Rear Face | 0.57 | 0.56 | 0.227 | 1.357 | - | - | - | SUM SAR<1.6, Simul-TX SAR not required |
| Body-Left Side | 0.193 | 0.381 | 0.345 | 0.919 | - | - | - | SUM SAR<1.6, Simul-TX SAR not required |
| Body-Right Side | 0.264 | 0 | 0 | 0.264 | - | - | - | SUM SAR<1.6, Simul-TX SAR not required |
| Body-Top Side | 0 | 0.352 | 0 | 0.352 | - | - | - | SUM SAR<1.6, Simul-TX SAR not required |
| Body-Bottom Side | 0.434 | 0 | 0 | 0.434 | - | - | - | SUM SAR<1.6, Simul-TX SAR not required |
| Body SAR : Body Worn Mode | | | | | | | | |
| Body-Front Face | 0.714 | 0.271 | 0.044 | 1.029 | - | - | - | SUM SAR<1.6, Simul-TX SAR not required |
| Body-Rear Face | 0.57 | 0.56 | 0.227 | 1.357 | - | - | - | SUM SAR<1.6, Simul-TX SAR not required |



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Table 7.6 Simultaneous Transmission Analysis for RTT BC1 Voice + LTE 13 Data + WLAN

| Position | Transmitter 1 RTT BC1 Voice | Transmitter 2 LTE 13 Data | Transmitter 3 WLAN | All 3 SAR Summation | SPLSR T1&T2 | SPLSR T1&T3 | SPLSR T2&T3 | Note |
|----------------------------------|--------------------------------|------------------------------|-----------------------|------------------------|----------------|----------------|----------------|--|
| Head SAR | | | | | | | | |
| Head-Right Cheek | 0.48 | 0.475 | 0.074 | 1.029 | - | - | - | SUM SAR<1.6, Simul-TX SAR not required |
| Head-Right Tilted | 0.228 | 0.346 | 0.042 | 0.616 | - | - | - | SUM SAR<1.6, Simul-TX SAR not required |
| Head-Left Cheek | 0.577 | 0.799 | 0.148 | 1.524 | - | - | - | SUM SAR<1.6, Simul-TX SAR not required |
| Head-Left Tilted | 0.185 | 0.591 | 0.035 | 0.811 | - | - | - | SUM SAR<1.6, Simul-TX SAR not required |
| Body SAR : Hotspot Mode | | | | | | | | |
| Body-Front Face | 0.714 | 0.287 | 0.044 | 1.045 | - | - | - | SUM SAR<1.6, Simul-TX SAR not required |
| Body-Rear Face | 0.57 | 0.368 | 0.227 | 1.165 | - | - | - | SUM SAR<1.6, Simul-TX SAR not required |
| Body-Left Side | 0.193 | 0 | 0.345 | 0.538 | - | - | - | SUM SAR<1.6, Simul-TX SAR not required |
| Body-Right Side | 0.264 | 0.443 | 0 | 0.707 | - | - | - | SUM SAR<1.6, Simul-TX SAR not required |
| Body-Top Side | 0 | 0.195 | 0 | 0.195 | - | - | - | SUM SAR<1.6, Simul-TX SAR not required |
| Body-Bottom Side | 0.434 | 0 | 0 | 0.434 | - | - | - | SUM SAR<1.6, Simul-TX SAR not required |
| Body SAR : Body Worn Mode | | | | | | | | |
| Body-Front Face | 0.714 | 0.287 | 0.044 | 1.045 | - | - | - | SUM SAR<1.6, Simul-TX SAR not required |
| Body-Rear Face | 0.57 | 0.368 | 0.227 | 1.165 | - | - | - | SUM SAR<1.6, Simul-TX SAR not required |

Summary:

According to KDB 648474, the simultaneous transmission SAR for WWAN and WLAN was not required, because the SAR summation is less than 1.6 W/kg or the SPLSR is less than 0.3. The BT standalone SAR and WWAN/BT simultaneous transmission SAR were not required, because the maximum output power of Bluetooth is less than P_{Ref} (10.8 dBm) and the closest separation distance of these antennas is larger than 2.5 cm, and maximum WWAN SAR is less than 1.2 W/kg.



5. Calibration of Test Equipment

| Equipment | Manufacturer | Model | SN | Cal. Date | Cal. Interval |
|------------------------------|--------------|------------|------------|---------------|---------------|
| System Validation Kit | SPEAG | D750V3 | 1013 | May 25, 2011 | Annual |
| System Validation Kit | SPEAG | D835V2 | 4d021 | Mar. 23, 2011 | Annual |
| System Validation Kit | SPEAG | D1900V2 | 5d142 | Jul. 22, 2011 | Annual |
| System Validation Kit | SPEAG | D2450V2 | 735 | Jun. 22, 2011 | Annual |
| System Validation Kit | SPEAG | D5GHzV2 | 1018 | Jan. 18, 2012 | Annual |
| System Validation Kit | SPEAG | D5GHzV2 | 1040 | Jun. 21, 2011 | Annual |
| Dosimetric E-Field Probe | SPEAG | EX3DV4 | 3590 | Feb. 25, 2011 | Annual |
| Dosimetric E-Field Probe | SPEAG | EX3DV4 | 3800 | Aug. 05, 2011 | Annual |
| Data Acquisition Electronics | SPEAG | DAE4 | 579 | Sep. 23, 2011 | Annual |
| Data Acquisition Electronics | SPEAG | DAE4 | 861 | Aug. 29, 2011 | Annual |
| Data Acquisition Electronics | SPEAG | DAE4 | 1277 | Jul. 29, 2011 | Annual |
| SAM Phantom | SPEAG | QD000P40CD | TP-1485 | N/A | N/A |
| SAM Phantom | SPEAG | QD000P40CD | TP-1202 | N/A | N/A |
| SAM Phantom | SPEAG | QD000P40CD | TP-1653 | N/A | N/A |
| SAM Phantom | SPEAG | QD000P40CD | TP-1654 | N/A | N/A |
| ELI Phantom | SPEAG | QDOVA001B | TP-1043 | N/A | N/A |
| Radio Communication Tester | Agilent | E5515C | MY50266628 | Sep. 26, 2011 | Biennial |
| Radio Communication Analyzer | Anritsu | MT8820C | 6201010284 | Aug. 01, 2011 | Biennial |
| ENA Series Network Analyzer | Agilent | E5071C | MY46104190 | Apr. 15, 2011 | Annual |
| Signal Generator | Agilent | E8257C | MY43320668 | Dec. 20, 2011 | Annual |
| Power Meter | Anritsu | ML2487A | 6K00001571 | May 25, 2011 | Annual |
| Power Sensor | Anritsu | MA2491A | 030954 | May 25, 2011 | Annual |
| Dielectric Probe Kit | Agilent | 85070D | N/A | N/A | N/A |
| Thermometer | YFE | YF-160A | 110600361 | Feb. 21, 2012 | Annual |

6. Measurement Uncertainty

| Error Description | Uncertainty Value (±%) | Probability Distribution | Divisor | Ci (1g) | Standard Uncertainty (1g) | Vi |
|--------------------------------------|------------------------|--------------------------|---------|---------|---------------------------|----|
| Measurement System | | | | | | |
| Probe Calibration | 6.0 | Normal | 1 | 1 | ± 6.0 % | ∞ |
| Axial Isotropy | 4.7 | Rectangular | √3 | 0.7 | ± 1.9 % | ∞ |
| Hemispherical Isotropy | 9.6 | Rectangular | √3 | 0.7 | ± 3.9 % | ∞ |
| Boundary Effects | 1.0 | Rectangular | √3 | 1 | ± 0.6 % | ∞ |
| Linearity | 4.7 | Rectangular | √3 | 1 | ± 2.7 % | ∞ |
| System Detection Limits | 1.0 | Rectangular | √3 | 1 | ± 0.6 % | ∞ |
| Readout Electronics | 0.6 | Normal | 1 | 1 | ± 0.6 % | ∞ |
| Response Time | 0.0 | Rectangular | √3 | 1 | ± 0.0 % | ∞ |
| Integration Time | 1.7 | Rectangular | √3 | 1 | ± 1.0 % | ∞ |
| RF Ambient Noise | 3.0 | Rectangular | √3 | 1 | ± 1.7 % | ∞ |
| RF Ambient Reflections | 3.0 | Rectangular | √3 | 1 | ± 1.7 % | ∞ |
| Probe Positioner | 0.5 | Rectangular | √3 | 1 | ± 0.3 % | ∞ |
| Probe Positioning | 2.9 | Rectangular | √3 | 1 | ± 1.7 % | ∞ |
| Max. SAR Eval. | 2.3 | Rectangular | √3 | 1 | ± 1.3 % | ∞ |
| Test Sample Related | | | | | | |
| Device Positioning | 3.9 | Normal | 1 | 1 | ± 3.9 % | 31 |
| Device Holder | 2.7 | Normal | 1 | 1 | ± 2.7 % | 19 |
| Power Drift | 5.0 | Rectangular | √3 | 1 | ± 2.9 % | ∞ |
| Phantom and Setup | | | | | | |
| Phantom Uncertainty | 4.0 | Rectangular | √3 | 1 | ± 2.3 % | ∞ |
| Liquid Conductivity (Target) | 5.0 | Rectangular | √3 | 0.64 | ± 1.8 % | ∞ |
| Liquid Conductivity (Meas.) | 5.0 | Normal | 1 | 0.64 | ± 3.2 % | 29 |
| Liquid Permittivity (Target) | 5.0 | Rectangular | √3 | 0.6 | ± 1.7 % | ∞ |
| Liquid Permittivity (Meas.) | 5.0 | Normal | 1 | 0.6 | ± 3.0 % | 29 |
| Combined Standard Uncertainty | | | | | ± 11.7 % | |
| Expanded Uncertainty (K=2) | | | | | ± 23.4 % | |

Uncertainty budget for frequency range 300 MHz to 3 GHz



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| Error Description | Uncertainty Value (±%) | Probability Distribution | Divisor | Ci (1g) | Standard Uncertainty (1g) | Vi |
|--------------------------------------|------------------------|--------------------------|---------|---------|---------------------------|----|
| Measurement System | | | | | | |
| Probe Calibration | 6.55 | Normal | 1 | 1 | ± 6.55 % | ∞ |
| Axial Isotropy | 4.7 | Rectangular | √3 | 0.7 | ± 1.9 % | ∞ |
| Hemispherical Isotropy | 9.6 | Rectangular | √3 | 0.7 | ± 3.9 % | ∞ |
| Boundary Effects | 2.0 | Rectangular | √3 | 1 | ± 1.2 % | ∞ |
| Linearity | 4.7 | Rectangular | √3 | 1 | ± 2.7 % | ∞ |
| System Detection Limits | 1.0 | Rectangular | √3 | 1 | ± 0.6 % | ∞ |
| Readout Electronics | 0.3 | Normal | 1 | 1 | ± 0.3 % | ∞ |
| Response Time | 0.8 | Rectangular | √3 | 1 | ± 0.5 % | ∞ |
| Integration Time | 2.6 | Rectangular | √3 | 1 | ± 1.5 % | ∞ |
| RF Ambient Noise | 3.0 | Rectangular | √3 | 1 | ± 1.7 % | ∞ |
| RF Ambient Reflections | 3.0 | Rectangular | √3 | 1 | ± 1.7 % | ∞ |
| Probe Positioner | 0.8 | Rectangular | √3 | 1 | ± 0.5 % | ∞ |
| Probe Positioning | 9.9 | Rectangular | √3 | 1 | ± 5.7 % | ∞ |
| Max. SAR Eval. | 4.0 | Rectangular | √3 | 1 | ± 2.3 % | ∞ |
| Test Sample Related | | | | | | |
| Device Positioning | 3.9 | Normal | 1 | 1 | ± 3.9 % | 31 |
| Device Holder | 2.7 | Normal | 1 | 1 | ± 2.7 % | 19 |
| Power Drift | 5.0 | Rectangular | √3 | 1 | ± 2.9 % | ∞ |
| Phantom and Setup | | | | | | |
| Phantom Uncertainty | 4.0 | Rectangular | √3 | 1 | ± 2.3 % | ∞ |
| Liquid Conductivity (Target) | 5.0 | Rectangular | √3 | 0.64 | ± 1.8 % | ∞ |
| Liquid Conductivity (Meas.) | 5.0 | Normal | 1 | 0.64 | ± 3.2 % | 30 |
| Liquid Permittivity (Target) | 5.0 | Rectangular | √3 | 0.6 | ± 1.7 % | ∞ |
| Liquid Permittivity (Meas.) | 5.0 | Normal | 1 | 0.6 | ± 3.0 % | 30 |
| Combined Standard Uncertainty | | | | | ± 13.4 % | |
| Expanded Uncertainty (K=2) | | | | | ± 26.8 % | |

Uncertainty budget for frequency range 3 GHz to 6 GHz



7. Information on the Testing Laboratories

We, Bureau Veritas Consumer Products Services (H.K.) Ltd., Taoyuan Branch, were founded in 1988 to provide our best service in EMC, Radio, Telecom and Safety consultation. Our laboratories are accredited and approved according to ISO/IEC 17025.

Copies of accreditation and authorization certificates of our laboratories obtained from approval agencies can be downloaded from our web site. If you have any comments, please feel free to contact us at the following:

Taiwan HwaYa EMC/RF/Safety/Telecom Lab:

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Taiwan LinKo EMC/RF Lab:

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The road map of all our labs can be found in our web site also.

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