SAR EVALUATION REPORT

For

elco

1 Rue Galilée 56270 Ploemeur France

FCC ID: 2AEBFS5160Q4G

Report Type:	**Product Type:**
Original Report	Smart Phone

Test Engineer:	Wilson Chen
Report Number:	RSZ150304004-20
Report Date:	2015-03-17
Reviewed By:	Bell Hu SAR Engineer
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Attestation of Test Results			
EUT Information	**Company Name**	elco	
	EUT Description	Smart Phone	
	FCC ID	2AEBFS5160Q4G	
	Model Number	S5160Q 4G	
	Test Date	2015-03-09	
Frequency	**Max. SAR Level(s) Reported**		**Limit(W/Kg)**
GSM 850	0.501 W/kg 1g Head SAR 0.831 W/kg 1g Body SAR		**1. 6**
PCS 1900	0.330 W/kg 1g Head SAR 0.959 W/kg 1g Body SAR		
WCDMA850	0.126 W/kg 1g Head SAR 0.249 W/kg 1g Body SAR		
WCDMA1900	0.218 W/kg 1g Head SAR 0.630 W/kg 1g Body SAR		
LTE Band 4	0.241 W/kg 1g Head SAR 0.605 W/kg 1g Body SAR		
LTE Band 7	0.334 W/kg 1g Head SAR 0.566 W/kg 1g Body SAR		
Simultaneous	0.883 W/kg 1g Head SAR 1.150 W/kg 1g Body SAR		
Applicable Standards	**ANSI / IEEE C95.1 : 2005** IEEE Standard for Safety Levels with Respect to Human Exposure to Radio Frequency Electromagnetic Fileds,3 kHz to 300 GHz.		
	ANSI / IEEE C95.3 : 2002 IEEE Recommended Practice for Measurements and Computations of Radio Frequency Electromagnetic Fields With Respect to Human Exposure to SuchFields,100 kHz—300 GHz.		
	IEEE1528:2013 IEEE Recommended Practice for Determining the Peak Spatial-Average Specific Absorption Rate (SAR) in the Human Head from Wireless Communications Devices: Measurement Techniques		
	KDB procedures KDB 447498 D01 General RF Exposure Guidance v05r02. KDB 648474 D04 Handset SAR v01r02. KDB 865664 D01 SAR measurement 100 MHz to 6 GHz v01r03 KDB 865664 D02 RF Exposure Reporting v01r01 KDB 941225 D01 3G SAR Procedures v03 KDB 941225 D05 SAR for LTE Devices v02r03 KDB 941225 D06 Hotspot Mode v02		

Note: This wireless device has been shown to be capable of compliance for localized specific absorption rate (SAR) for General Population/Uncontrolled Exposure limits specified in ANSI/IEEE Standards and has been tested in accordance with the measurement procedures specified in IEEE 1528-2013 and RF exposure KDB procedures.

The results and statements contained in this report pertain only to the device(s) evaluated.

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DOCUMENT REVISION HISTORY

Revision Number	Report Number	Description of Revision	Date of Revision
0	RDG150304004-20	Original Report	2015-03-17

EUT DESCRIPTION

This report has been prepared on behalf of elco and their product, FCC ID: 2AEBFS5160Q4G, Model: S5160Q 4G or the EUT (Equipment under Test) as referred to in the rest of this report.

Note: *The device is capable of personal hotspot mode. Wi-Fi Hotspot mode permits the device to share its cellular data connection with other 2.4 GHz Wi-Fi enabled devices (channels 1 - 13).*

Technical Specification

Product Type	Portable
Exposure Category:	Population / Uncontrolled
Antenna Type(s):	Internal Antenna
Body-Worn Accessories:	Headset
Face-Head Accessories:	None
Multi-slot Class:	Class12
Operation Mode :	GSM Voice, EGPRS/GPRS Data, WCDMA,LTE, Wi-Fi and Bluetooth
Frequency Band:	GSM 850 : 824-849 MHz(TX) ; 869-894 MHz(RX) PCS 1900: 1850-1910 MHz(TX) ; 1930-1990 MHz(RX) WCDMA850: 824-849 MHz(TX) ; 869-894 MHz(RX) WCDMA1900: 1850-1910 MHz(TX) ; 1930-1990 MHz(RX) LTE Band 4: 1710-1755MHz(TX) ; 2110-2155MHz(RX) LTE Band 7: 2500-2570MHz(TX) ; 2620-2690MHz(RX) Wi-Fi: 2412MHz-2472MHz Bluetooth : 2402MHz-2480MHz
Conducted RF Power:	GSM 850 : 32.81 dBm PCS 1900: 28.66 dBm WCDMA 850: 22.56 dBm WCDMA 1900: 22.35 dBm LTE Band 4: 22.61dBm LTE Band 7: 22.39 dBm Wi-Fi: 9.58 dBm Bluetooth:-0.20 dBm
Dimensions (L*W*H):	146 mm (L) × 74 mm (W) × 10 mm (H)
Power Source:	3.7 V_{DC} Rechargeable Battery
Normal Operation:	Head and Body-worn

REFERENCE, STANDARDS, AND GUILDELINES

FCC:

The Report and Order requires routine SAR evaluation prior to equipment authorization of portable transmitter devices, including portable telephones. For consumer products, the applicable limit is 1.6 mW/g as recommended by the ANSI/IEEE standard C95.1-1992 [6] for an uncontrolled environment (Paragraph 65). According to the Supplement C of OET Bulletin 65 “Evaluating Compliance with FCC Guide-lines for Human Exposure to Radio frequency Electromagnetic Fields", released on Jun 29, 2001 by the FCC, the device should be evaluated at maximum output power (radiated from the antenna) under “worst-case” conditions for normal or intended use, incorporating normal antenna operating positions, device peak performance frequencies and positions for maximum RF energy coupling.

This report describes the methodology and results of experiments performed on wireless data terminal. The objective was to determine if there is RF radiation and if radiation is found, what is the extent of radiation with respect to safety limits. SAR (Specific Absorption Rate) is the measure of RF exposure determined by the amount of RF energy absorbed by human body (or its parts) – to determine how the RF energy couples to the body or head which is a primary health concern for body worn devices. The limit below which the exposure to RF is considered safe by regulatory bodies in North America is 1.6 mW/g average over 1 gram of tissue mass.

CE:

The order requires routine SAR evaluation prior to equipment authorization of portable transmitter devices, including portable telephones. For consumer products, the applicable limit is 2 mW/g as recommended by EN62209-1 for an uncontrolled environment. According to the Standard, the device should be evaluated at maximum output power (radiated from the antenna) under “worst-case” conditions for normal or intended use, incorporating normal antenna operating positions, device peak performance frequencies and positions for maximum RF energy coupling.

This report describes the methodology and results of experiments performed on wireless data terminal. The objective was to determine if there is RF radiation and if radiation is found, what is the extent of radiation with respect to safety limits. SAR (Specific Absorption Rate) is the measure of RF exposure determined by the amount of RF energy absorbed by human body (or its parts) – to determine how the RF energy couples to the body or head which is a primary health concern for body worn devices. The limit below which the exposure to RF is considered safe by regulatory bodies in Europe is 2 mW/g average over 10 gram of tissue mass.

The test configurations were laid out on a specially designed test fixture to ensure the reproducibility of measurements. Each configuration was scanned for SAR. Analysis of each scan was carried out to characterize the above effects in the device.

SAR Limits

FCC Limit (1g Tissue)

EXPOSURE LIMITS	SAR (W/kg)	
	(General Population / Uncontrolled Exposure Environment)	(Occupational / Controlled Exposure Environment)
Spatial Average (averaged over the whole body)	0.08	0.4
Spatial Peak (averaged over any 1 g of tissue)	1.60	8.0
Spatial Peak (hands/wrists/feet/ankles averaged over 10 g)	4.0	20.0

CE Limit (10g Tissue)

EXPOSURE LIMITS	SAR (W/kg)	
	(General Population / Uncontrolled Exposure Environment)	(Occupational / Controlled Exposure Environment)
Spatial Average (averaged over the whole body)	0.08	0.4
Spatial Peak (averaged over any 10 g of tissue)	2.0	10
Spatial Peak (hands/wrists/feet/ankles averaged over 10 g)	4.0	20.0

Population/Uncontrolled Environments are defined as locations where there is the exposure of individual who have no knowledge or control of their exposure.

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

General Population/Uncontrolled environments Spatial Peak limit 1.6W/kg (FCC) & 2 W/kg (CE) applied to the EUT.

FACILITIES

The test site used by Bay Area Compliance Laboratories Corp. (Shenzhen) to collect data is located at 6/F, the 3rd Phase of WanLi Industrial Building, Shi Hua Road, Fu Tian Free Trade Zone, Shenzhen, Guangdong, P.R. of China

DESCRIPTION OF TEST SYSTEM

These measurements were performed with ALSAS 10 Universal Integrated SAR Measurement system from APREL Laboratories.

ALSAS-10U System Description

ALSAS-10-U is fully compliant with the technical and scientific requirements of IEEE 1528, IEC 62209, CENELEC, ARIB, ACA, and the Federal Communications Commission. The system comprises of a six axes articulated robot which utilizes a dedicated controller.
ALSAS-10U uses the latest methodologies. And FDTD modeling to provide a platform which is repeatable with minimum uncertainty.

Applications

Predefined measurement procedures compliant with the guidelines of CENELEC, IEEE, IEC, FCC, etc are utilized during the assessment for the device. Automatic detection for all SAR maxima are embedded within the core architecture for the system, ensuring that peak locations used for centering the zoom scan are within a 1mm resolution and a 0.05mm repeatable position. System operation range currently available up-to 6 GHz in simulated tissue.

Area Scans

Area scans are defined prior to the measurement process being executed with a user defined variable spacing between each measurement point (integral) allowing low uncertainty measurements to be conducted. Scans defined for FCC applications utilize a 10mm2 step integral, with 1mm interpolation used to locate the peak SAR area used for zoom scan assessments.

Where the system identifies multiple SAR peaks (which are within 25% of peak value) the system will provide the user with the option of assessing each peak location individually for zoom scan averaging.

Zoom Scan (Cube Scan Averaging)

The averaging zoom scan volume utilized in the ALSAS-10U software is in the shape of a cube and the side dimension of a 1 g or 10 g mass is dependent on the density of the liquid representing the simulated tissue. A density of 1000 kg/m3 is used to represent the head and body tissue density and not the phantom liquid density, in order to be consistent with the definition of the liquid dielectric properties, i.e. the side length of the 1 g cube is 10mm,with the side length of the 10 g cube 21,5mm.

When the cube intersects with the surface of the phantom, it is oriented so that 3 vertices touch the surface of the shell or the center of a face is tangent to the surface. The face of the cube closest to the surface is modified in order to conform to the tangent surface.

The zoom scan integer steps can be user defined so as to reduce uncertainty, but normal practice for typical test applications (including FCC) utilize a physical step of 5x5x8 (8mmx8mmx5mm) providing a volume of 32mm in the X & Y axis, and 35mm in the Z axis.

ALSAS-10U Interpolation and Extrapolation Uncertainty

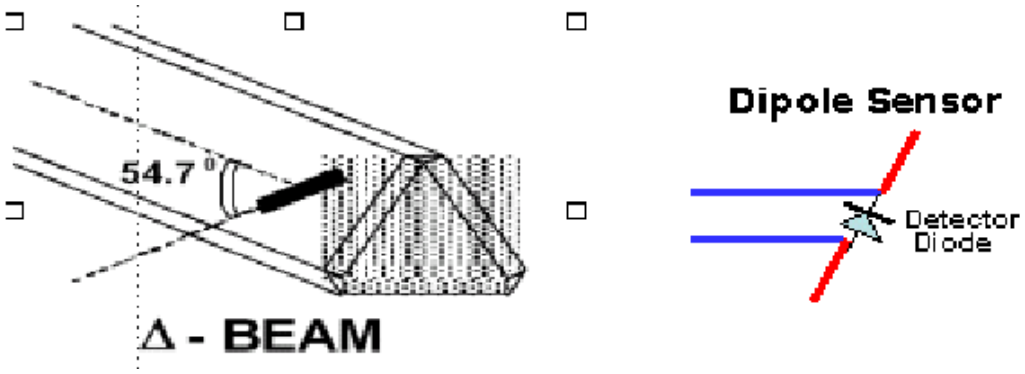
The overall uncertainty for the methodology and algorithms the used during the SAR calculation was evaluated using the data from IEEE 1528 based on the example f3 algorithm:

$$f_3(x,y,z) = A \frac{a^2}{\frac{a^2}{4} + x'^2 + y'^2} \cdot \left(e^{-\frac{2z}{a}} + \frac{a^2}{2(a+2z)^2} \right)$$

Isotropic E-Field Probe

The isotropic E-Field probe has been fully calibrated and assessed for isotropicity, and boundary effect within a controlled environment. Depending on the frequency for which the probe is calibrated the method utilized for calibration will change.

The E-Field probe utilizes a triangular sensor arrangement as detailed in the diagram below:



SAR is assessed with a calibrated probe which moves at a default height of 5mm from the center of the diode, which is mounted to the sensor, to the phantom surface (in the Z Axis). The 5mm offset height has been selected so as to minimize any resultant boundary effect due to the probe being in close proximity to the phantom surface.

The following algorithm is an example of the function used by the system for linearization of the output from the probe when measuring complex modulation schemes.

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

Isotropic E-Field Probe Specification

Calibration Method	Frequency Dependent Below 1 GHz Calibration in air performed in a TEM Cell Above 1 GHz Calibration in air performed in waveguide
Sensitivity	0.70 μV/(V/m)^2 to 0.85 μV/(V/m)^2
Dynamic Range	0.0005 W/kg to 100 W/kg
Isotropic Response	Better than 0.1 dB
Diode Compression Point (DCP)	Calibration for Specific Frequency
Probe Tip Diameter	< 2.9 mm
Sensor Offset	1.56 (+/- 0.02 mm)
Probe Length	289 mm
Video Bandwidth	@ 500 Hz: 1 dB @ 1.02 kHz: 3 dB
Boundary Effect	Less than 2.1% for distance greater than 0.58 mm
Spatial Resolution	The spatial resolution uncertainty is less than 1.5% for 4.9mm diameter probe. The spatial resolution uncertainty is less than 1.0% for 2.5mm diameter probe

Boundary Detection Unit and Probe Mounting Device

ALSAS-10U incorporates a boundary detection unit with a sensitivity of 0.05mm for detecting all types of surfaces. The robust design allows for detection during probe tilt (probe normalize) exercises, and utilizes a second stage emergency stop. The signal electronics are fed directly into the robot controller for high accuracy surface detection in lateral and axial detection modes (X, Y, & Z).

The probe is mounted directly onto the Boundary Detection unit for accurate tooling and displacement calculations controlled by the robot kinematics. The probe is connect to an isolated probe interconnect where the output stage of the probe is fed directly into the amplifier stage of the Daq-Paq.

Daq-Paq (Analog to Digital Electronics)

ALSAS-10U incorporates a fully calibrated Daq-Paq (analog to digital conversion system) which has a 4 channel input stage, sent via a 2 stage auto-set amplifier module. The input signal is amplified accordingly so as to offer a dynamic range from 5μV to 800mV. Integration of the fields measured is carried out at board level utilizing a Co-Processor which then sends the measured fields down into the main computational module in digitized form via an RS232 communications port. Probe linearity and duty cycle compensation is carried out within the main Daq-Paq module.

ADC	12 Bit
Amplifier Range	20 mV to 200 mV and 150 mV to 800 mV
Field Integration	Local Co-Processor utilizing proprietary integration algorithms
Number of Input Channels	4 in total 3 dedicated and 1 spare
Communication	Packet data via RS232

Axis Articulated Robot

ALSAS-10U utilizes a six axis articulated robot, which is controlled using a Pentium based real-time movement controller. The movement kinematics engine utilizes proprietary (Thermo CRS) interpolation and extrapolation algorithms, which allow full freedom of movement for each of the six joints within the working envelope. Utilization of joint 6 allows for full probe rotation with a tolerance better than 0.05mm around the central axis.

Robot/Controller Manufacturer	Thermo CRS
Number of Axis	Six independently controlled axis
Positioning Repeatability	0.05 mm
Controller Type	Single phase Pentium based C500C
Robot Reach	710 mm
Communication	RS232 and LAN compatible

ALSAS Universal Workstation

ALSAS Universal workstation allows for repeatability and fast adaptability. It allows users to do calibration, testing and measurements using different types of phantoms with one set up, which significantly speeds up the measurement process.

Universal Device Positioner

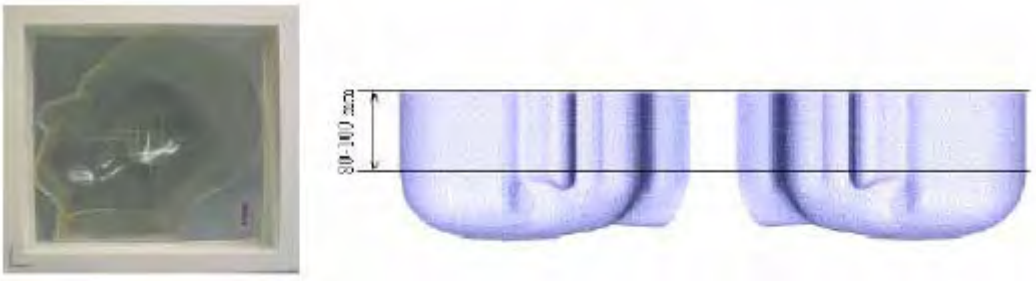
The universal device positioner allows complete freedom of movement of the EUT. Developed to hold a EUT in a free-space scenario any additional loading attributable to the material used in the construction of the positioner has been eliminated. Repeatability has been enhanced through the linear scales which form the design used to indicate positioning for any given test scenario in all major axes. A 15° tilt indicator is included for the of aid cheek to tilt movements for head SAR analysis. Overall uncertainty for measurements have been reduced due to the design of the Universal device positioner, which allows positioning of a device in as near to a free-space scenario as possible, and by providing the means for complete repeatability.

Phantom Types

The ALSAS-10U allows the integration of multiple phantom types. SAM Phantoms fully compliant with IEEE 1528, Universal Phantom, and Universal Flat.

APREL SAM Phantoms

The SAM phantoms developed using the IEEE SAM CAD file. They are fully compliant with the requirements for both IEEE 1528 and FCC Supplement C. Both the left and right SAM phantoms are interchangeable, transparent and include the IEEE 1528 grid with visible NF and MB lines.



APREL Laboratories Universal Phantom

The Universal Phantom is used on the ALSAS-10U as a system validation phantom. The Universal Phantom has been fully validated both experimentally from 800MHz to 6GHz and numerically using XFDTD numerical software.

The shell thickness is 2mm overall, with a 4mm spacer located at the NF/MB intersection providing an overall thickness of 6mm in line with the requirements of IEEE-1528.

The design allows for fast and accurate measurements, of handsets, by allowing the conservative SAR to be evaluated at on frequency for both left and right head experiments in one measurement.

Tissue Dielectric Parameters for Head and Body Phantoms

The head tissue dielectric parameters recommended by the IEEE SCC-34/SC-2 in P1528 have been incorporated in the following table. These head parameters are derived from planar layer models simulating the highest expected SAR for the dielectric properties and tissue thickness variations in a human head. Other head and body tissue parameters that have not been specified in P1528 are derived from the tissue dielectric parameters computed from the 4-Cole-Cole equations described in Reference [12] and extrapolated according to the head parameters specified in P1528.

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

Recommended Tissue Dielectric Parameters for Head and Body

Frequency (MHz)	Head Tissue		Body Tissue	
	εr	σ (S/m)	εr	σ (S/m)
150	52.3	0.76	61.9	0.80
300	45.3	0.87	58.2	0.92
450	43.5	0.87	56.7	0.94
835	41.5	0.90	55.2	0.97
900	41.5	0.97	55.0	1.05
915	41.5	0.98	55.0	1.06
1450	40.5	1.20	54.0	1.30
1610	40.3	1.29	53.8	1.40
1800-2000	40.0	1.40	53.3	1.52
2450	39.2	1.80	52.7	1.95
3000	38.5	2.40	52.0	2.73
5800	35.3	5.27	48.2	6.00

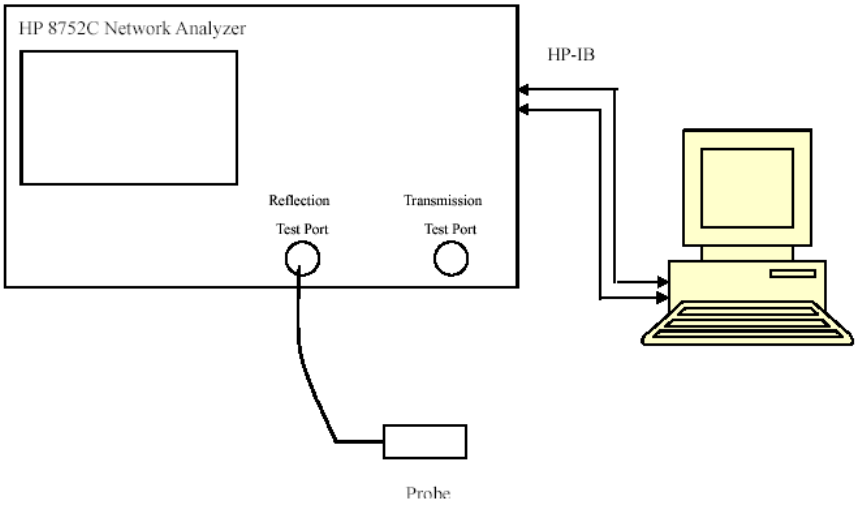
EQUIPMENT LIST AND CALIBRATION

Equipments List & Calibration Information

Equipment	Model	Calibration Date	S/N
CRS F3 robot	ALS-F3	N/A	RAF0805352
CRS F3 Software	ALS-F3-SW	N/A	N/A
CRS C500C controller	ALS-C500	N/A	RCF0805379
Probe mounting device & Boundary Detection Sensor System	ALS-PMDPS-3	N/A	120-00270
Universal Work Station	ALS-UWS	N/A	100-00157
Data Acquisition Package	ALS-DAQ-PAQ-3	2014-10-14	110-00212
Miniature E-Field Probe	ALS-E-020	2014-10-14	500-00283
Dipole, 835MHz	ALS-D-835-S-2	2014-10-08	180-00558
Dipole, 1750MHz	ALS-D-1750-S-2	2013-10-08	198-00304
Dipole, 1900MHz	ALS-D-1900-S-2	2014-10-09	210-00710
Dipole, 2450MHz	ALS-D-2450-S-2	2014-10-09	220-00758
Dipole Spacer	ALS-DS-U	N/A	250-00907
Device holder/Positioner	ALS-H-E-SET-2	N/A	170-00510
Left ear SAM phantom	ALS-P-SAM-L	N/A	130-00311
Right ear SAM phantom	ALS-P-SAM-R	N/A	140-00359
UniPhantom	ALS-P-UP-1	N/A	150-00413
Simulated Tissue 835 MHz Head	ALS-TS-835-H	Each Time	270-01002
Simulated Tissue 835 MHz Body	ALS-TS-835-B	Each Time	270-02101
Simulated Tissue 1750 MHz Head	ALS-TS-1750-H	Each Time	295-01103
Simulated Tissue 1750 MHz Body	ALS-TS-1750-B	Each Time	295-02102
Simulated Tissue 1900 MHz Head	ALS-TS-1900-H	Each Time	295-01103
Simulated Tissue 1900 MHz Body	ALS-TS-1900-B	Each Time	295-02102
Simulated Tissue 2450 MHz Head	ALS-TS-2450-H	Each Time	290-01108
Simulated Tissue 2450 MHz Body	ALS-TS-2450-B	Each Time	290-01109
Directional couple	DC6180A	N/A	0325849
Power Amplifier	5S1G4	N/A	71377
Dielectric probe kit	HP85070B	2014-06-13	N/A
Attenuator	3dB	2014-05-08	5402
Network analyzer	8752C	2014-06-03	3410A02356
Synthesized Sweeper	HP 8341B	2014-06-03	2624A00116
UNIVERSAL RADIO COMMUNICATION TESTER	CMU200	2013-11-23	106891
WIDEBAND RADIO COMMUNICATION TESTER	CMW500	2014-04-19	114772
EMI Test Receiver	ESCI	2014-06-13	101746

SAR MEASUREMENT SYSTEM VERIFICATION

Liquid Verification



Liquid Verification Setup Block Diagram

Liquid Verification Results

Frequency	Liquid Type	Liquid Parameter		Target Value		Delta (%)		Tolerance (%)
		ε_r	σ (S/m)	ε_r	σ (S/m)	$\Delta\varepsilon_r$	$\Delta\sigma$ (S/m)	
824.2	Head	41.08	0.90	41.50	0.90	-1.012	0.000	±5
	Body	53.79	0.95	55.20	0.97	-2.554	-2.062	±5
826.4	Head	41.06	0.91	41.50	0.90	-1.060	1.111	±5
	Body	53.87	0.95	55.20	0.97	-2.409	-2.062	±5
836.6	Head	41.04	0.92	41.50	0.90	-1.108	2.222	±5
	Body	53.85	0.96	55.20	0.97	-2.446	-1.031	±5
846.6	Head	41.06	0.91	41.50	0.90	-1.060	1.111	±5
	Body	53.78	0.97	55.20	0.97	-2.572	0.000	±5
848.8	Head	41.10	0.92	41.50	0.90	-0.964	2.222	±5
	Body	53.83	0.97	55.20	0.97	-2.482	0.000	±5
1720	Head	39.48	1.39	40.08	1.37	-1.497	1.460	±5
	Body	52.28	1.49	53.43	1.49	-2.152	0.000	±5
1732.5	Head	39.47	1.36	40.08	1.37	-1.522	-0.730	±5
	Body	52.55	1.52	53.43	1.49	-1.647	2.013	±5
1745	Head	39.35	1.38	40.08	1.37	-1.821	0.730	±5
	Body	52.57	1.53	53.43	1.49	-1.610	2.685	±5
1850.2	Head	39.72	1.38	40.00	1.40	-0.700	-1.429	±5
	Body	52.09	1.50	53.30	1.52	-2.270	-1.316	±5
1852.4	Head	39.70	1.37	40.00	1.40	-0.750	-2.143	±5
	Body	51.94	1.48	53.30	1.52	-2.552	-2.632	±5
1880.0	Head	39.56	1.40	40.00	1.40	-1.100	0.000	±5
	Body	51.96	1.51	53.30	1.52	-2.514	-0.658	±5
1907.6	Head	39.68	1.42	40.00	1.40	-0.800	1.429	±5
	Body	52.09	1.54	53.30	1.52	-2.270	1.316	±5
1909.8	Head	39.57	1.42	40.00	1.40	-1.075	1.429	±5
	Body	52.02	1.54	53.30	1.52	-2.402	1.316	±5
2510	Head	39.61	1.79	39.20	1.80	1.046	-0.556	±5
	Body	52.81	2.03	52.70	1.95	0.209	4.103	±5
2535	Head	39.82	1.82	39.20	1.80	1.582	1.111	±5
	Body	52.81	1.90	52.70	1.95	0.209	-2.564	±5
2560	Head	39.84	1.82	39.20	1.80	1.633	1.111	±5
	Body	52.87	1.97	52.70	1.95	0.323	1.026	±5

**Liquid Verification was performed on 2015-03-09.*

Please refer to the following tables.

835 MHz Head				835 MHz Body		
Frequency (MHz)	**e'**	**e''**		**Frequency (MHz)**	**e'**	**e''**
824.0	41.0842	19.7338		824.0	53.7943	20.6394
824.5	41.0567	19.6881		824.5	53.8371	20.6591
825.0	41.0071	19.7061		825.0	53.8601	20.6235
825.5	41.0893	19.6867		825.5	53.8240	20.6363
826.0	41.0141	19.6638		826.0	53.8149	20.6861
826.5	41.0649	19.7307		826.5	53.8682	20.6916
827.0	41.0769	19.7373		827.0	53.8422	20.7048
827.5	41.0569	19.7432		827.5	53.8065	20.6504
828.0	41.0848	19.7549		828.0	53.8451	20.6505
828.5	41.1002	19.6731		828.5	53.8532	20.7106
829.0	41.0518	19.6703		829.0	53.8106	20.6353
829.5	41.0549	19.7534		829.5	53.7637	20.6740
830.0	41.0193	19.7474		830.0	53.8298	20.6423
830.5	41.0163	19.7075		830.5	53.7887	20.6623
831.0	41.0503	19.7193		831.0	53.7859	20.6689
831.5	41.0207	19.7375		831.5	53.8565	20.6535
832.0	41.1068	19.7096		832.0	53.7791	20.6906
832.5	41.0965	19.6717		832.5	53.8014	20.7072
833.0	40.9971	19.6697		833.0	53.7734	20.6161
833.5	41.1035	19.7677		833.5	53.7859	20.7072
834.0	41.1009	19.6784		834.0	53.8476	20.6825
834.5	41.0447	19.6851		834.5	53.8510	20.6510
835.0	40.9981	19.6660		835.0	53.8414	20.6374
835.5	41.0164	19.6991		835.5	53.8373	20.6471
836.0	41.0705	19.7655		836.0	53.8029	20.6372
836.5	41.0387	19.6758		836.5	53.8549	20.6168
837.0	41.0999	19.7485		837.0	53.7911	20.6331
837.5	41.0265	19.6737		837.5	53.8372	20.6850
838.0	41.0105	19.7617		838.0	53.8213	20.6520
838.5	41.0102	19.6641		838.5	53.7929	20.7058
839.0	41.0900	19.6974		839.0	53.8354	20.6650
839.5	41.0095	19.7405		839.5	53.8210	20.6592
840.0	41.0530	19.4571		840.0	53.8079	20.6682
840.5	41.0982	19.4216		840.5	53.8496	20.6880
841.0	41.0534	19.3635		841.0	53.8404	20.6159
841.5	41.0721	19.4642		841.5	53.8572	20.6369
842.0	41.0299	19.3910		842.0	53.7700	20.6637
842.5	41.0927	19.4500		842.5	53.8345	20.6352
843.0	41.0598	19.3950		843.0	53.7886	20.7004
843.5	41.0909	19.4420		843.5	53.7671	20.6480
844.0	41.0063	19.3702		844.0	53.8332	20.7075
844.5	41.0495	19.4446		844.5	53.8470	20.6966
845.0	41.0825	19.4076		845.0	53.7741	20.6274
845.5	41.0592	19.4404		845.5	53.8498	20.6218
846.0	41.0966	19.4482		846.0	53.8004	20.6687
846.5	41.0576	19.4009		846.5	53.7774	20.6330
847.0	41.0028	19.4334		847.0	53.8495	20.6940
847.5	41.0308	19.4538		847.5	53.8691	20.6256
848.0	41.0481	19.4450		848.0	53.8092	20.6792
848.5	41.0936	19.3844		848.5	53.7839	20.6945
849.0	41.0980	19.3911		849.0	53.8288	20.6398

1750 MHz Head				1750 MHz Body		
Frequency (MHz)	e'	e''		Frequency (MHz)	e'	e''
1710.0	39.5109	14.5647		1710.0	51.9516	15.6066
1711.5	39.1906	14.2732		1711.5	52.0898	15.5613
1713.0	39.5044	14.1723		1713.0	52.1619	15.5462
1714.5	39.1728	14.5361		1714.5	52.2818	15.5855
1716.0	39.0917	14.0883		1716.0	52.4800	15.7060
1717.5	39.5523	14.2515		1717.5	52.6990	15.7772
1719.0	39.1972	14.4008		1719.0	52.3732	15.7068
1720.5	39.4781	14.5426		1720.5	52.2781	15.5875
1722.0	39.2035	14.1656		1722.0	52.2695	15.6008
1723.5	39.4160	14.0904		1723.5	52.2158	15.5342
1725.0	39.2569	14.2305		1725.0	52.4600	15.6465
1726.5	39.4170	14.3510		1726.5	52.3698	15.6190
1728.0	39.3352	14.2049		1728.0	52.1438	15.4919
1729.5	39.1131	14.5060		1729.5	52.2880	15.5379
1731.0	39.4632	14.2120		1731.0	52.1937	15.5266
1732.5	39.4704	14.1012		1732.5	52.5534	15.7503
1734.0	39.3876	14.3550		1734.0	52.5889	15.7358
1735.5	39.5950	14.1784		1735.5	52.1230	15.4825
1737.0	39.5512	14.1005		1737.0	52.0029	15.4192
1738.5	39.2409	14.5744		1738.5	52.3126	15.5597
1740.0	39.5911	14.5393		1740.0	52.5416	15.7159
1741.5	39.2201	14.5137		1741.5	52.3556	15.5669
1743.0	39.4402	14.3423		1743.0	52.1811	15.5034
1744.5	39.3541	14.1966		1744.5	52.5739	15.7673
1746.0	39.5839	14.3118		1746.0	52.6213	15.7694
1747.5	39.3370	14.5663		1747.5	52.2910	15.6522
1749.0	39.5376	14.0847		1749.0	51.9388	15.4463
1750.5	39.1239	14.1540		1750.5	51.9850	15.5049
1752.0	39.1774	14.1864		1752.0	52.5624	15.8026
1753.5	39.5648	14.5588		1753.5	52.6873	15.7853
1755.0	39.3960	14.3673		1755.0	52.4572	15.7096
1756.5	39.3861	14.0957		1756.5	52.3293	15.6401
1758.0	39.4898	14.4183		1758.0	52.5245	15.7111
1759.5	39.3021	14.4250		1759.5	52.6102	15.7639
1761.0	39.5803	14.1641		1761.0	52.3919	15.7252
1762.5	39.4580	14.4677		1762.5	52.4466	15.6620
1764.0	39.6107	14.3757		1764.0	52.7221	15.8530
1765.5	39.3621	14.5296		1765.5	52.6741	15.7972
1767.0	39.3357	14.4472		1767.0	52.5483	15.7545
1768.5	39.3405	14.5135		1768.5	52.3531	15.7437
1770.0	39.6169	14.2328		1770.0	52.5950	15.7495
1771.5	39.1552	14.1737		1771.5	52.6456	15.7515
1773.0	39.3697	14.5498		1773.0	52.3546	15.6818
1774.5	39.1302	14.1041		1774.5	52.3208	15.6430
1776.0	39.2531	14.3765		1776.0	52.6550	15.7872
1777.5	39.4970	14.5652		1777.5	52.7254	15.8787
1779.0	39.4366	14.3805		1779.0	52.6610	15.7959
1780.5	39.3291	14.4344		1780.5	52.4856	15.7328
1782.0	39.5634	14.1815		1782.0	52.6089	15.8156
1783.5	39.6148	14.2594		1783.5	52.7747	15.9088
1785.0	39.1353	14.4378		1785.0	52.8093	15.8736

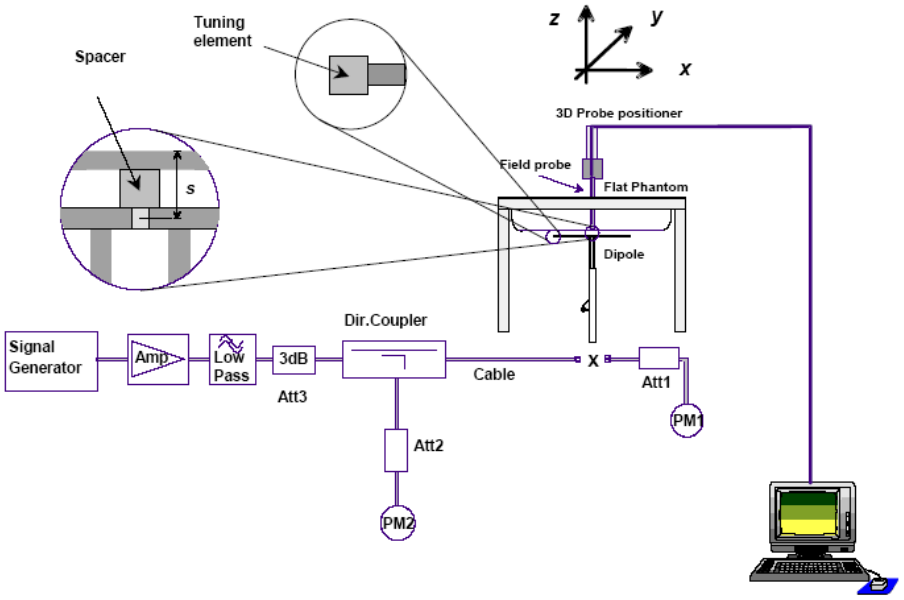
1900 MHz Head				1900 MHz Body		
Frequency (MHz)	e'	e''		Frequency (MHz)	e'	e''
1850.0	39.7235	13.4055		1850.0	52.0897	14.5359
1851.2	39.7206	13.3485		1851.2	52.0404	14.4620
1852.4	39.7037	13.2547		1852.4	51.9432	14.4122
1853.6	39.5889	13.2424		1853.6	51.9569	14.4839
1854.8	39.6430	13.3286		1854.8	52.0349	14.5616
1856.0	39.7308	13.2660		1856.0	52.0698	14.4479
1857.2	39.5701	13.2675		1857.2	51.7478	14.5361
1858.4	39.5524	13.2838		1858.4	51.8906	14.4127
1859.6	39.5665	13.4020		1859.6	52.0913	14.4385
1860.8	39.7124	13.2840		1860.8	51.8637	14.4256
1862.0	39.6794	13.2801		1862.0	52.0410	14.4972
1863.2	39.6485	13.3819		1863.2	51.7716	14.5373
1864.4	39.6470	13.4105		1864.4	51.8459	14.4524
1865.6	39.6312	13.2661		1865.6	51.7612	14.5212
1866.8	39.7127	13.2948		1866.8	51.8197	14.4617
1868.0	39.7157	13.3315		1868.0	52.0541	14.4485
1869.2	39.6256	13.2419		1869.2	52.0873	14.4843
1870.4	39.6903	13.4301		1870.4	52.0482	14.5210
1871.6	39.7345	13.2390		1871.6	52.0964	14.5226
1872.8	39.5746	13.3111		1872.8	52.0661	14.5028
1874.0	39.6723	13.3317		1874.0	51.9293	14.4261
1875.2	39.5855	13.2714		1875.2	51.8500	14.4952
1876.4	39.7385	13.2944		1876.4	52.0652	14.5462
1877.6	39.7190	13.2469		1877.6	51.7607	14.4891
1878.8	39.7326	13.4130		1878.8	51.9025	14.5676
1880.0	39.5595	13.4187		1880.0	51.9574	14.4799
1881.2	39.5555	13.3486		1881.2	51.7920	14.4920
1882.4	39.7113	13.2867		1882.4	51.8045	14.5093
1883.6	39.5737	13.3793		1883.6	51.8785	14.4156
1884.8	39.5468	13.2874		1884.8	52.0005	14.5663
1886.0	39.7229	13.3438		1886.0	52.0909	14.4286
1887.2	39.7430	13.4151		1887.2	51.7784	14.5479
1888.4	39.6912	13.2511		1888.4	51.7445	14.5519
1889.6	39.6132	13.3386		1889.6	51.7694	14.5782
1890.8	39.6371	13.3047		1890.8	51.9408	14.4794
1892.0	39.6748	13.4339		1892.0	51.9690	14.4760
1893.2	39.6152	13.2585		1893.2	51.7439	14.5623
1894.4	39.6054	13.2881		1894.4	52.0745	14.5760
1895.6	39.6902	13.3429		1895.6	52.0880	14.4902
1896.8	39.6689	13.3733		1896.8	52.0854	14.4541
1898.0	39.5791	13.3494		1898.0	51.8656	14.5213
1899.2	39.5884	13.3083		1899.2	52.0894	14.4707
1900.4	39.5908	13.3149		1900.4	52.0404	14.5569
1901.6	39.6555	13.2972		1901.6	51.9453	14.4386
1902.8	39.6344	13.3462		1902.8	51.8742	14.4748
1904.0	39.5461	13.4303		1904.0	52.0983	14.4681
1905.2	39.6332	13.3490		1905.2	52.0691	14.5004
1906.4	39.6092	13.2976		1906.4	52.0421	14.5147
1907.6	39.6834	13.3744		1907.6	52.0890	14.5517
1908.8	39.7424	13.2996		1908.8	51.8319	14.5496
1910.0	39.5658	13.3834		1910.0	52.0158	14.4764

2450 MHz Head				2450 MHz Body		
Frequency (MHz)	**e'**	**e''**		**Frequency (MHz)**	**e'**	**e''**
2510	39.6139	12.8505		2510	52.8132	14.5499
2511	39.6503	12.9457		2511	52.8079	14.3787
2512	39.5693	12.8880		2512	52.8060	14.3320
2513	39.5217	12.9752		2513	52.8040	14.4236
2514	39.4656	12.8749		2514	52.8693	13.8060
2515	39.4976	12.9825		2515	52.8158	13.7251
2516	39.7022	12.9003		2516	52.8507	14.5848
2517	39.8490	12.7912		2517	52.8654	13.5635
2518	39.9775	13.0321		2518	52.8661	13.5656
2519	39.5123	12.9382		2519	52.8898	14.2540
2520	39.7064	12.9002		2520	52.8849	14.3173
2521	39.7538	12.8599		2521	52.8126	14.3550
2522	39.8313	13.0963		2522	52.8056	13.6365
2523	39.7426	12.9040		2523	52.8037	13.9405
2524	39.6899	12.8113		2524	52.8775	14.1873
2525	39.8841	12.9341		2525	52.8282	14.6024
2526	39.9916	12.9572		2526	52.8799	14.1628
2527	39.4769	12.9520		2527	52.8124	14.3445
2528	39.6290	12.9179		2528	52.8748	14.5864
2529	39.7842	12.7918		2529	52.8334	14.3781
2530	39.7150	12.9690		2530	52.8150	13.7479
2531	39.9127	13.0618		2531	52.8397	13.5473
2532	39.6964	13.0520		2532	52.8833	13.5933
2533	39.8286	12.8517		2533	52.8464	13.9219
2534	39.5798	12.8935		2534	52.8828	13.8896
2535	39.8187	12.9063		2535	52.8110	13.5050
2536	39.6358	12.8387		2536	52.7970	13.6526
2537	39.5966	13.0946		2537	52.8283	13.8184
2538	39.6110	13.0799		2538	52.8703	14.4815
2540	39.7912	12.9214		2540	52.8555	14.3036
2541	39.9477	13.0550		2541	52.8767	14.5073
2542	39.6216	12.8049		2542	52.8139	14.5325
2543	39.4493	13.0736		2543	52.8892	13.9395
2544	39.9500	13.0344		2544	52.8221	13.9601
2545	39.9742	13.0912		2545	52.8759	14.1083
2546	39.6925	12.9276		2546	52.8196	13.8551
2547	39.9676	13.0349		2547	52.8856	14.5123
2548	39.9775	12.9094		2548	52.8494	14.1325
2549	39.7369	12.8681		2549	52.8005	14.5705
2550	39.4484	12.9009		2550	52.8451	14.4246
2551	39.6493	12.8287		2551	52.8451	14.4147
2552	39.7965	12.8441		2552	52.8117	14.3198
2553	39.8190	13.0289		2553	52.8527	13.8823
2554	39.5446	13.0543		2554	52.8685	14.2577
2555	39.8294	12.8680		2555	52.8458	14.0917
2556	39.7674	12.9246		2556	52.7988	14.5527
2557	39.9323	12.8376		2557	52.8538	13.5626
2558	39.6853	13.0115		2558	52.8031	14.6306
2559	39.7754	13.0912		2559	52.8049	14.4407
2560	39.8410	12.7816		2560	52.8692	13.8063
2561	39.8452	13.0769		2561	52.8110	14.6368
2562	39.6579	12.9991		2562	52.8593	14.3512

System Accuracy Verification

Prior to the assessment, the system validation kit was used to test whether the system was operating within its specifications of ±10%. The validation results are tabulated below. And also the corresponding SAR plot is attached as well in the SAR plots files.

System Verification Setup Block Diagram



Probe and dipole antenna List and Detail

Manufacturer	Description	Model	Serial Number	Calibration Date	Calibration Due Date
APREL	Probe	ALS-E-020	500-00283	2014-10-14	2015-10-13
APREL	Dipole antenna(850MHz)	ALS-D-835-S-2	180-00558	2014-10-08	2017-10-07
APREL	Dipole antenna(1750MHz)	ALS-D-1750-S-2	198-00304	2013-10-08	2016-10-07
APREL	Dipole antenna(1900MHz)	ALS-D-1900-S-2	210-00710	2014-10-09	2017-10-08
APREL	Dipole antenna(2450MHz)	ALS-D-2450-S-2	220-00758	2014-10-09	2017-10-08

System Accuracy Check Results

Date	Frequency Band	Liquid Type	Measured SAR (W/Kg)		Target Value (W/Kg)	Delta (%)	Tolerance (%)
2015-03-09	835	Head	1g	10.130	9.773	3.653	±10
		Body	1g	9.552	9.736	-1.890	±10
	1750	Head	1g	35.637	37.020	-3.736	±10
		Body	1g	36.315	36.650	-0.914	±10
	1900	Head	1g	40.533	39.481	2.665	±10
		Body	1g	39.877	39.715	0.408	±10
	2450	Head	1g	51.696	54.916	-5.864	±10
		Body	1g	52.966	52.418	1.045	±10

*All SAR values are normalized to 1 Watt forward power.

SAR SYSTEM VALIDATION DATA

Test Laboratory: Bay Area Compliance Lab Corp. (Shenzhen)

System Performance Check 835 MHz Head Liquid

Dipole 835 MHz; Type: ALS-D-835-S-2; S/N: 180-00558

Product Data
Device Name : Dipole 835 MHz
Serial No. : 180-00558
Type : Dipole
Model : ALS-D-835-S-2
Frequency Band : 835
Max. Transmit Pwr : 1 W
Drift Time : 3 min(s)
Power Drift-Start : 10.038 W/kg
Power Drift-Finish : 9.923 W/kg
Power Drift (%) : -1.061

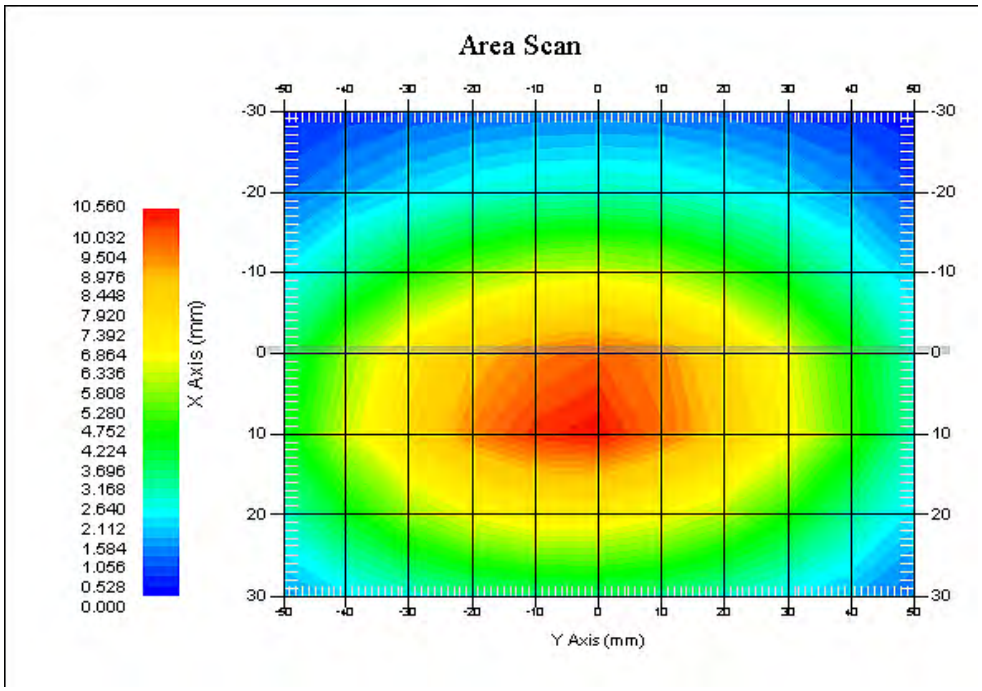
Phantom Data
Name : APREL-Uni
Type : Uni-Phantom
Serial No. : System Default
Location : Center
Description : Default
Phantom Data

Tissue Data
Type : Head
Serial No. : 270-01002
Frequency : 835.0 MHz
Last Calib. Date : 09-Mar-2015
Temperature : 20.00 °C
Ambient Temp. : 21.00 °C
Humidity : 56.00 RH%
Epsilon : 41.00 F/m
Sigma : 0.91 S/m
Density : 1000.00 kg/cu. m

Probe Data
Name : E-Field
Model : E-020
Type : E-Field Triangle
Serial No. : 500-00283
Last Calib. Date : 14-Oct-2014
Frequency Band : 835
Duty Cycle Factor : 1
Conversion Factor : 5.9
Probe Sensitivity : 1.20 1.20 1.20 µV/(V/m)2
Compression Point : 95.00 mV
Offset : 1.56 mm

Measurement Data
Crest Factor : 1
Scan Type : Complete
Tissue Temp. : 21.00 °C
Ambient Temp. : 21.00 °C
Area Scan : 7x9x1 : Measurement x=10mm, y=10mm, z=4mm
Zoom Scan : 7x7x7 : Measurement x=5mm, y=5mm, z=5mm

1 gram SAR value : 10.130 W/kg
10 gram SAR value : 6.582 W/kg
Area Scan Peak SAR : 10.536 W/kg
Zoom Scan Peak SAR : 17.362 W/kg



835 MHz System Validation with Head Tissue

Test Laboratory: Bay Area Compliance Lab Corp. (Shenzhen)

System Performance Check 835 MHz Body Liquid

Dipole 835 MHz; Type: ALS-D-835-S-2; S/N: 180-00558

Product Data
Device Name : Dipole 835 MHz
Serial No. : 180-00558
Type : Dipole
Model : ALS-D-835-S-2
Frequency Band : 835
Max. Transmit Pwr : 1 W
Drift Time : 3 min(s)
Power Drift-Start : 9.655 W/kg
Power Drift-Finish : 9.521 W/kg
Power Drift (%) : 1.379

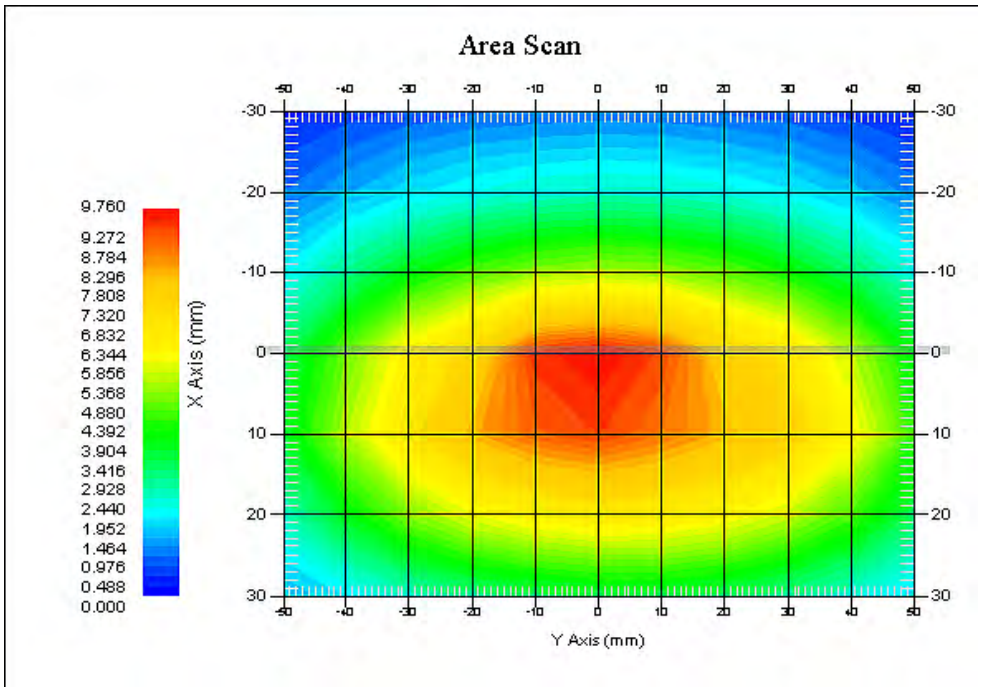
Phantom Data
Name : APREL-Uni
Type : Uni-Phantom
Serial No. : System Default
Location : Center
Description : Default
Phantom Data

Tissue Data
Type : Body
Serial No. : 270-02101
Frequency : 835.0 MHz
Last Calib. Date : 09-Mar-2015
Temperature : 20.00 °C
Ambient Temp. : 21.00 °C
Humidity : 56.00 RH%
Epsilon : 53.84 F/m
Sigma : 0.96 S/m
Density : 1000.00 kg/cu. m

Probe Data
Name : E-Field
Model : E-020
Type : E-Field Triangle
Serial No. : 500-00283
Last Calib. Date : 14-Oct-2014
Frequency Band : 835
Duty Cycle Factor : 1
Conversion Factor : 5.9
Probe Sensitivity : 1.20 1.20 1.20 µV/(V/m)2
Compression Point : 95.00 mV
Offset : 1.56 mm

Measurement Data
Crest Factor : 1
Scan Type : Complete
Tissue Temp. : 21.00 °C
Ambient Temp. : 21.00 °C
Area Scan : 7x9x1 : Measurement x=10mm, y=10mm, z=4mm
Zoom Scan : 7x7x7 : Measurement x=5mm, y=5mm, z=5mm

1 gram SAR value : 9.552 W/kg
10 gram SAR value : 6.222 W/kg
Area Scan Peak SAR : 9.720 W/kg
Zoom Scan Peak SAR : 15.598 W/kg



835 MHz System Validation with Body Tissue

Test Laboratory: Bay Area Compliance Lab Corp. (Shenzhen)

System Performance Check 1750 MHz Head Liquid

Dipole 1750 MHz; Type: ALS-D-1750-S-2; S/N: 198-00304

Product Data
Device Name : Dipole 1750MHz
Serial No. : 198-00304
Type : Dipole
Model : ALS-D-1750-S-2
Frequency Band : 1700
Max. Transmit Pwr : 1 W
Drift Time : 3 min(s)
Power Drift-Start : 32.132 W/kg
Power Drift-Finish : 32.831 W/kg
Power Drift (%) : 2.151

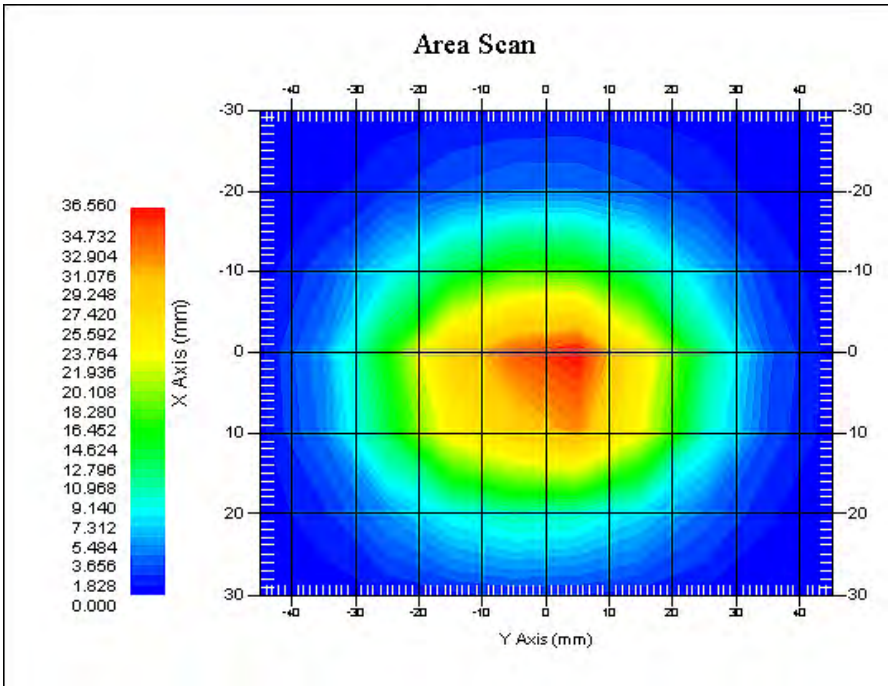
Phantom Data
Name : APREL-Uni
Type : Uni-Phantom
Serial No. : System Default
Location : Center
Description : Default

Tissue Data
Type : Head
Serial No. : 295-01101
Frequency : 1750.00 MHz
Last Calib. Date : 09-Mar-2015
Temperature : 20.00 °C
Ambient Temp. : 21.00 °C
Humidity : 56.00 RH%
Epsilon : 39.33 F/m
Sigma : 1.37 S/m
Density : 1000.00 kg/cu. M

Probe Data
Name : E-Field
Model : E-020
Type : E-Field Triangle
Serial No. : 500-00283
Last Calib. Date : 14-Oct-2014
Frequency Band : 1750
Duty Cycle Factor : 1
Conversion Factor : 5.4
Probe Sensitivity : 1.20 1.20 1.20 µV/(V/m)2
Compression Point : 95.00 mV
Offset : 1.56 mm

Measurement Data
Crest Factor : 1
Scan Type : Complete
Tissue Temp. : 20.00 °C
Ambient Temp. : 20.00 °C
Area Scan : 7x9x1 : Measurement x=10mm, y=10mm, z=4mm
Zoom Scan : 7x7x7 : Measurement x=5mm, y=5mm, z=5mm

1 gram SAR value : 35.637 W/kg
10 gram SAR value : 19.739 W/kg
Area Scan Peak SAR : 36.538 W/kg
Zoom Scan Peak SAR : 68.793 W/kg



1750 MHz System Validation with Head Tissue

Test Laboratory: Bay Area Compliance Lab Corp. (Shenzhen)

System Performance Check 1750 MHz Body Liquid

Dipole 1750 MHz; Type: ALS-D-1750-S-2; S/N: 198-00304

Product Data
Device Name : Dipole 1750MHz
Serial No. : 198-00304
Type : Dipole
Model : ALS-D-1750-S-2
Frequency Band : 1700
Max. Transmit Pwr : 1 W
Drift Time : 3 min(s)
Power Drift-Start : 35.233 W/kg
Power Drift-Finish : 35.756 W/kg
Power Drift (%) : 1.426

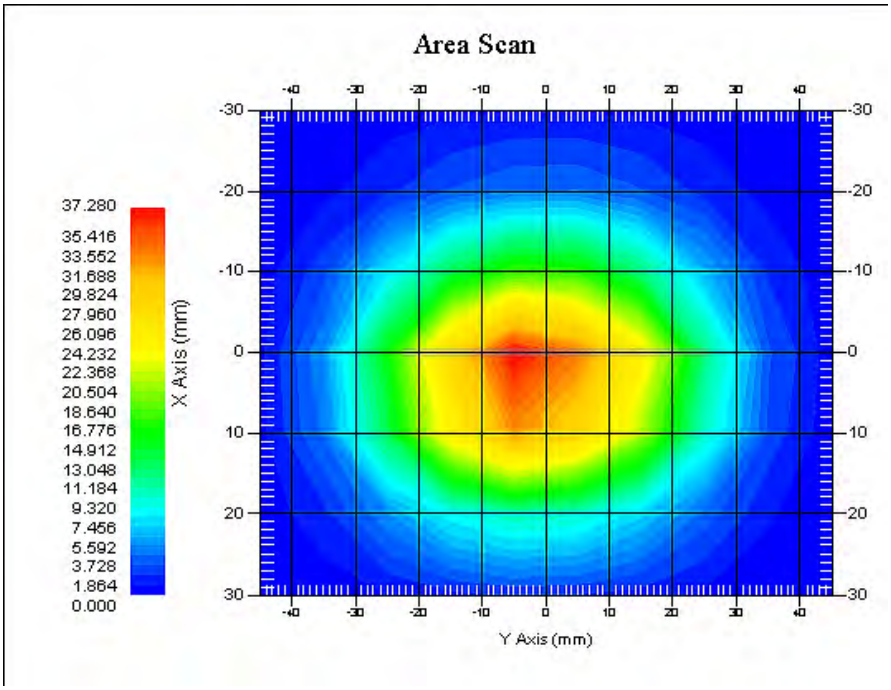
Phantom Data
Name : APREL-Uni
Type : Uni-Phantom
Serial No. : System Default
Location : Center
Description : Default

Tissue Data
Type : Body
Serial No. : 295-02105
Frequency : 1750.00 MHz
Last Calib. Date : 09-Mar-2015
Temperature : 20.00 °C
Ambient Temp. : 21.00 °C
Humidity : 56.00 RH%
Epsilon : 51.95 F/m
Sigma : 1.51 S/m
Density : 1000.00 kg/cu. m

Probe Data
Name : E-Field
Model : E-020
Type : E-Field Triangle
Serial No. : 500-00283
Last Calib. Date : 14-Oct-2014
Frequency Band : 1750
Duty Cycle Factor : 1
Conversion Factor : 5.3
Probe Sensitivity : 1.20 1.20 1.20 µV/(V/m)2
Compression Point : 95.00 mV
Offset : 1.56 mm

Measurement Data
Crest Factor : 1
Scan Type : Complete
Tissue Temp. : 20.00 °C
Ambient Temp. : 21.00 °C
Area Scan : 7x9x1 : Measurement x=10mm, y=10mm, z=4mm
Zoom Scan : 7x7x7 : Measurement x=5mm, y=5mm, z=5mm

1 gram SAR value : 36.315 W/kg
10 gram SAR value : 19.137 W/kg
Area Scan Peak SAR : 37.157 W/kg
Zoom Scan Peak SAR : 66.537 W/kg



1750 MHz System Validation with Body Tissue

Test Laboratory: Bay Area Compliance Lab Corp. (Shenzhen)

System Performance Check 1900 MHz Head Liquid

Dipole 1900 MHz; Type: ALS-D-1900-S-2; S/N: 210-00710

Product Data
Device Name : Dipole 1900MHz
Serial No. : 210-00710
Type : Dipole
Model : ALS-D-1900-S-2
Frequency Band : 1900
Max. Transmit Pwr : 1 W
Drift Time : 3 min(s)
Power Drift-Start : 37.862 W/kg
Power Drift-Finish : 37.331 W/kg
Power Drift (%) : -1.316

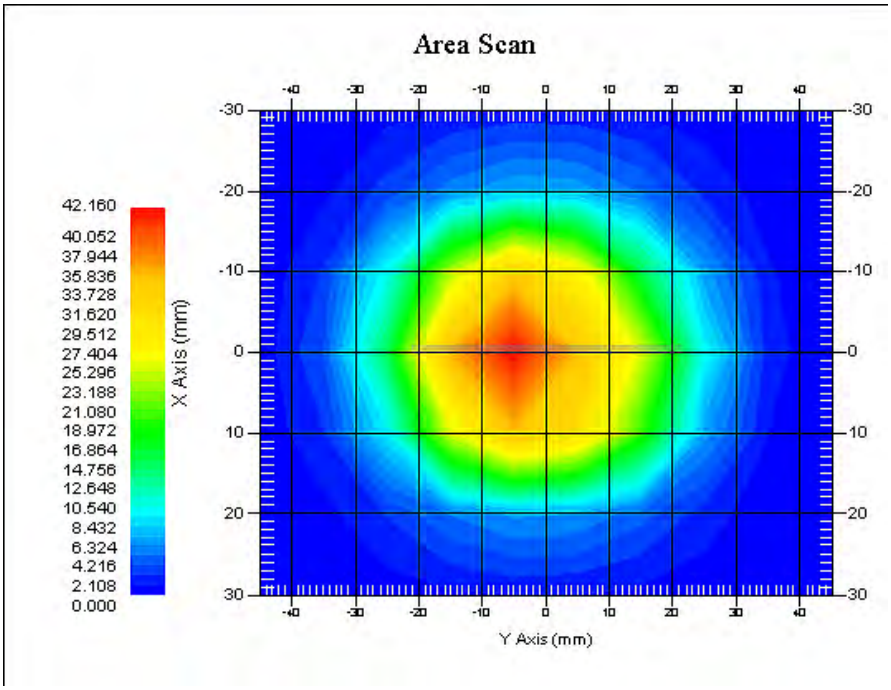
Phantom Data
Name : APREL-Uni
Type : Uni-Phantom
Serial No. : System Default
Location : Center
Description : Default

Tissue Data
Type : Head
Serial No. : 295-01103
Frequency : 1900.00 MHz
Last Calib. Date : 09-Mar-2015
Temperature : 20.00 °C
Ambient Temp. : 21.00 °C
Humidity : 56.00 RH%
Epsilon : 39.59 F/m
Sigma : 1.41 S/m
Density : 1000.00 kg/cu. M

Probe Data
Name : E-Field
Model : E-020
Type : E-Field Triangle
Serial No. : 500-00283
Last Calib. Date : 14-Oct-2014
Frequency Band : 1900
Duty Cycle Factor : 1
Conversion Factor : 4.8
Probe Sensitivity : 1.20 1.20 1.20 µV/(V/m)2
Compression Point : 95.00 mV
Offset : 1.56 mm

Measurement Data
Crest Factor : 1
Scan Type : Complete
Tissue Temp. : 20.00 °C
Ambient Temp. : 20.00 °C
Area Scan : 7x9x1 : Measurement x=10mm, y=10mm, z=4mm
Zoom Scan : 7x7x7 : Measurement x=5mm, y=5mm, z=5mm

1 gram SAR value : 40.533 W/kg
10 gram SAR value : 20.926 W/kg
Area Scan Peak SAR : 42.010 W/kg
Zoom Scan Peak SAR : 71.280 W/kg



1900 MHz System Validation with Head Tissue

Test Laboratory: Bay Area Compliance Lab Corp. (Shenzhen)

System Performance Check 1900 MHz Body Liquid

Dipole 1900 MHz; Type: ALS-D-1900-S-2; S/N: 210-00710

Product Data
Device Name : Dipole 1900MHz
Serial No. : 210-00710
Type : Dipole
Model : ALS-D-1900-S-2
Frequency Band : 1900
Max. Transmit Pwr : 1 W
Drift Time : 3 min(s)
Power Drift-Start : 38.436 W/kg
Power Drift-Finish : 38.899 W/kg
Power Drift (%) : 1.185

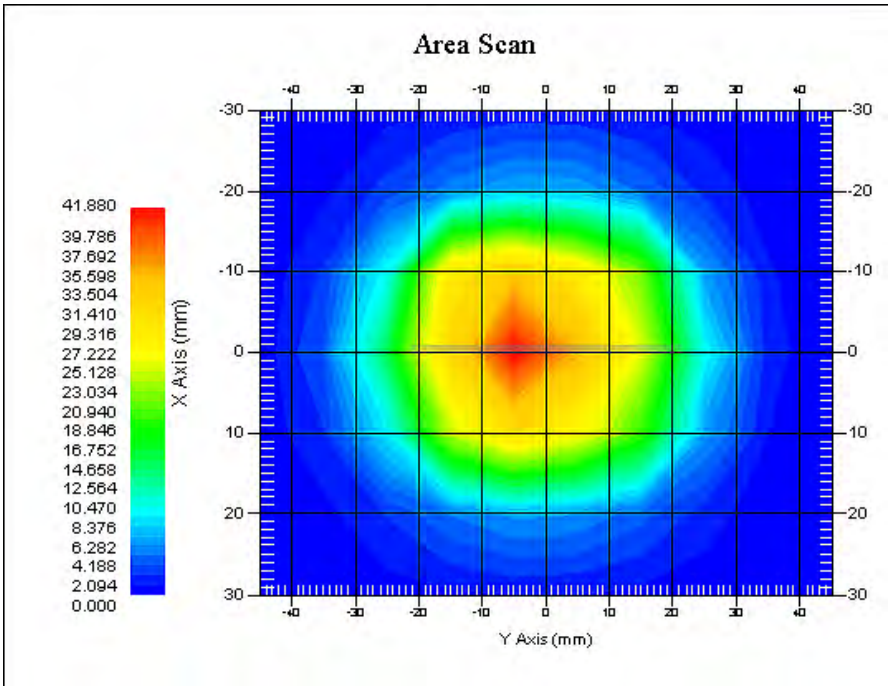
Phantom Data
Name : APREL-Uni
Type : Uni-Phantom
Serial No. : System Default
Location : Center
Description : Default

Tissue Data
Type : Body
Serial No. : 295-02102
Frequency : 1900.00 MHz
Last Calib. Date : 09-Mar-2015
Temperature : 20.00 °C
Ambient Temp. : 21.00 °C
Humidity : 56.00 RH%
Epsilon : 52.06 F/m
Sigma : 1.54 S/m
Density : 1000.00 kg/cu. m

Probe Data
Name : E-Field
Model : E-020
Type : E-Field Triangle
Serial No. : 500-00283
Last Calib. Date : 14-Oct-2014
Frequency Band : 1900
Duty Cycle Factor : 1
Conversion Factor : 4.5
Probe Sensitivity : 1.20 1.20 1.20 µV/(V/m)2
Compression Point : 95.00 mV
Offset : 1.56 mm

Measurement Data
Crest Factor : 1
Scan Type : Complete
Tissue Temp. : 20.00 °C
Ambient Temp. : 21.00 °C
Area Scan : 7x9x1 : Measurement x=10mm, y=10mm, z=4mm
Zoom Scan : 7x7x7 : Measurement x=5mm, y=5mm, z=5mm

1 gram SAR value : 39.877 W/kg
10 gram SAR value : 21.233 W/kg
Area Scan Peak SAR : 41.840 W/kg
Zoom Scan Peak SAR : 73.802 W/kg



1900 MHz System Validation with Body Tissue

Test Laboratory: Bay Area Compliance Lab Corp. (Shenzhen)

System Performance Check 2450 MHz Head Liquid

Dipole 2450 MHz; Type: ALS-D-2450-S-2; S/N: 220-00758

Product Data
Device Name : Dipole 2450MHz
Serial No. : 220-00758
Type : Dipole
Model : ALS-D-2450-S-2
Frequency Band : 2450 MHz
Max. Transmit Pwr : 1 W
Drift Time : 3 min(s)
Power Drift-Start : 48.374 W/kg
Power Drift-Finish : 49.269 W/kg
Power Drift (%) : 1.736

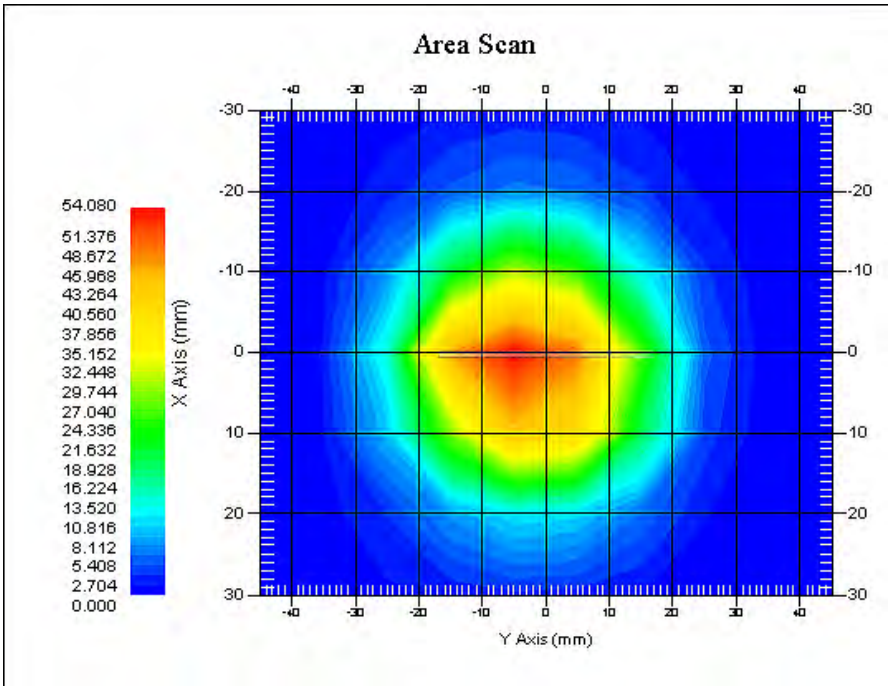
Phantom Data
Name : APREL-Uni
Type : Uni-Phantom
Serial No. : System Default
Location : Center
Description : Default

Tissue Data
Type : Head
Serial No. : 290-01109
Frequency : 2450.0 MHz
Last Calib. Date : 09-Mar-2015
Temperature : 20.00 °C
Ambient Temp. : 21.00 °C
Humidity : 50.00 RH%
Epsilon : 39.54 F/m
Sigma : 1.83 S/m
Density : 1000.00 kg/cu. M

Probe Data
Name : E-Field
Model : E-020
Type : E-Field Triangle
Serial No. : 500-00283
Last Calib. Date : 14-Oct-2014
Frequency Band : 2450 MHz
Duty Cycle Factor : 1
Conversion Factor : 4.3
Probe Sensitivity : 1.20 1.20 1.20 $\mu V/(V/m)^2$
Compression Point : 95.00 mV
Offset : 1.56 mm

Measurement Data
Crest Factor : 1
Scan Type : Complete
Tissue Temp. : 20.00 °C
Ambient Temp. : 20.00 °C
Area Scan : 7x9x1 : Measurement x=10mm, y=10mm, z=4mm
Zoom Scan : 7x7x7 : Measurement x=5mm, y=5mm, z=5mm

1 gram SAR value : 51.696 W/kg
10 gram SAR value : 22.718 W/kg
Area Scan Peak SAR : 54.025 W/kg
Zoom Scan Peak SAR : 92.689 W/kg



2450 MHz System Validation with Head Tissue

Test Laboratory: Bay Area Compliance Lab Corp. (Shenzhen)

System Performance Check 2450 MHz Body Liquid

Dipole 2450 MHz; Type: ALS-D-2450-S-2; S/N: 220-00758

Product Data
Device Name : Dipole 2450MHz
Serial No. : 220-00758
Type : Dipole
Model : ALS-D-2450-S-2
Frequency Band : 2450 MHz
Max. Transmit Pwr : 1 W
Drift Time : 3 min(s)
Power Drift-Start : 54.355 W/kg
Power Drift-Finish : 52.986 W/kg
Power Drift (%) : 2.367

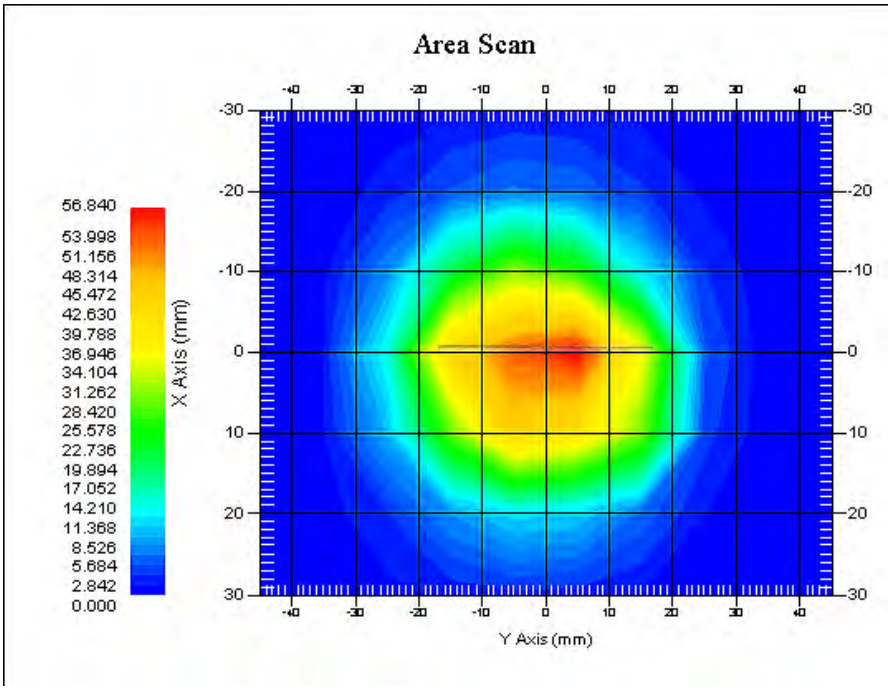
Phantom Data
Name : APREL-Uni
Type : Uni-Phantom
Serial No. : System Default
Location : Center
Description : Default

Tissue Data
Type : BODY
Serial No. : 290-01109
Frequency : 2450.0 MHz
Last Calib. Date : 09-Mar-2015
Temperature : 20.00 °C
Ambient Temp. : 21.00 °C
Humidity : 50.00 RH%
Epsilon : 54.05 F/m
Sigma : 2.01 S/m
Density : 1000.00 kg/cu. M

Probe Data
Name : E-Field
Model : E-020
Type : E-Field Triangle
Serial No. : 500-00283
Last Calib. Date : 14-Oct-2014
Frequency Band : 2450 MHz
Duty Cycle Factor : 1
Conversion Factor : 4.3
Probe Sensitivity : 1.20 1.20 1.20 $\mu V/(V/m)^2$
Compression Point : 95.00 mV
Offset : 1.56 mm

Measurement Data
Crest Factor : 1
Scan Type : Complete
Tissue Temp. : 20.00 °C
Ambient Temp. : 20.00 °C
Area Scan : 8x9x1 : Measurement x=10mm, y=10mm, z=4mm
Zoom Scan : 7x7x7 : Measurement x=5mm, y=5mm, z=5mm

1 gram SAR value : 52.966 W/kg
10 gram SAR value : 23.711 W/kg
Area Scan Peak SAR : 56.655 W/kg
Zoom Scan Peak SAR : 95.396 W/kg



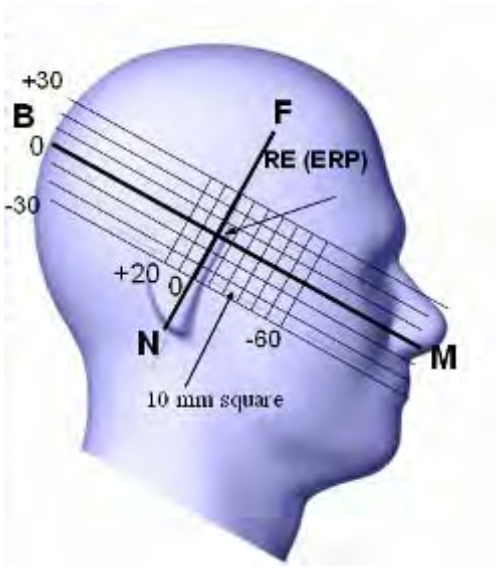
2450 MHz System Validation with Body Tissue

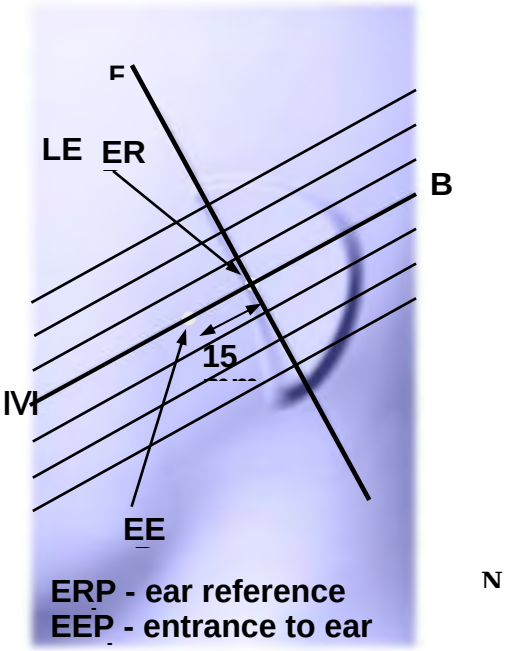
EUT TEST STRATEGY AND METHODOLOGY

Test Positions for Device Operating Next to a Person's Ear

This category includes most wireless handsets with fixed, retractable or internal antennas located toward the top half of the device, with or without a foldout, sliding or similar keypad cover. The handset should have its earpiece located within the upper ¼ of the device, either along the centerline or off-centered, as perceived by its users. This type of handset should be positioned in a normal operating position with the "test device reference point" located along the "vertical centerline" on the front of the device aligned to the "ear reference point". The "test device reference point" should be located at the same level as the center of the earpiece region. The "vertical centerline" should bisect the front surface of the handset at its top and bottom edges. A "ear reference point" is located on the outer surface of the head phantom on each ear spacer. It is located 1.5 cm above the center of the ear canal entrance in the "phantom reference plane" defined by the three lines joining the center of each "ear reference point" (left and right) and the tip of the mouth.

A handset should be initially positioned with the earpiece region pressed against the ear spacer of a head phantom. For the SCC-34/SC-2 head phantom, the device should be positioned parallel to the "N-F" line defined along the base of the ear spacer that contains the "ear reference point". For interim head phantoms, the device should be positioned parallel to the cheek for maximum RF energy coupling. The "test device reference point" is aligned to the "ear reference point" on the head phantom and the "vertical centerline" is aligned to the "phantom reference plane". This is called the "initial ear position". While maintaining these three alignments, the body of the handset is gradually adjusted to each of the following positions for evaluating SAR:





Cheek/Touch Position

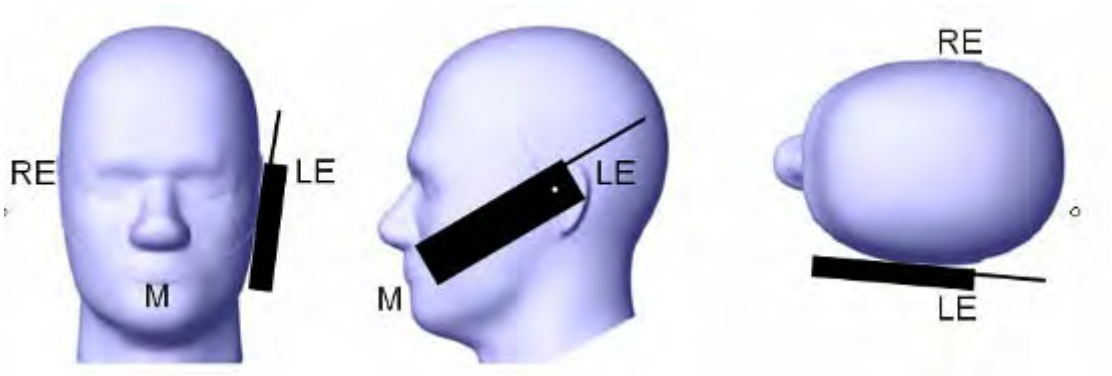
The device is brought toward the mouth of the head phantom by pivoting against the "ear reference point" or along the "N-F" line for the SCC-34/SC-2 head phantom.

This test position is established:

- When any point on the display, keypad or mouthpiece portions of the handset is in contact with the phantom.
- (or) When any portion of a foldout, sliding or similar keypad cover opened to its intended self-adjusting normal use position is in contact with the cheek or mouth of the phantom.

For existing head phantoms – when the handset loses contact with the phantom at the pivoting point, rotation should continue until the device touches the cheek of the phantom or breaks its last contact from the ear spacer.

Cheek /Touch Position



Ear/Tilt Position

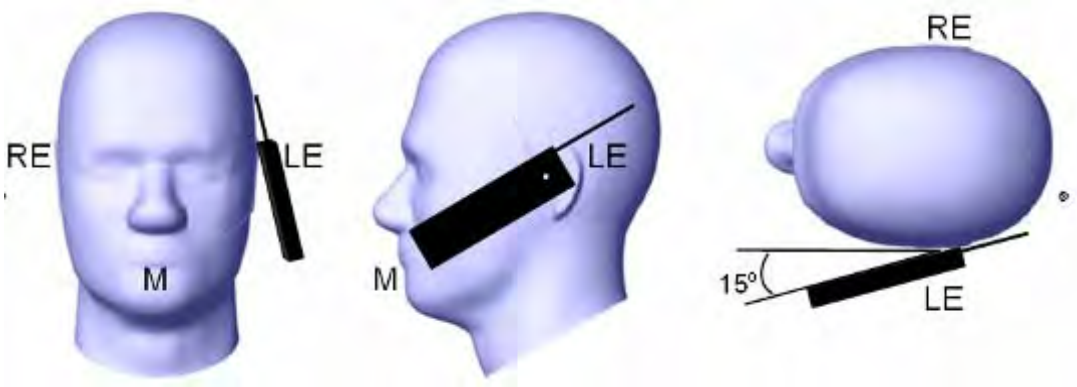
With the handset aligned in the "Cheek/Touch Position":

1) If the earpiece of the handset is not in full contact with the phantom's ear spacer (in the "Cheek/Touch position") and the peak SAR location for the "Cheek/Touch" position is located at the ear spacer region or corresponds to the earpiece region of the handset, the device should be returned to the "initial ear position" by rotating it away from the mouth until the earpiece is in full contact with the ear spacer.

2) (otherwise) The handset should be moved (translated) away from the cheek perpendicular to the line passes through both "ear reference points" (note: one of these ear reference points may not physically exist on a split head model) for approximate 2-3 cm. While it is in this position, the device handset is tilted away from the mouth with respect to the "test device reference point" until the inside angle between the vertical centerline on the front surface of the phone and the horizontal line passing through the ear reference point isby 15 80°. After the tilt, it is then moved (translated) back toward the head perpendicular to the line passes through both "ear reference points" until the device touches the phantom or the ear spacer. If the antenna touches the head first, the positioning process should be repeated with a tilt angle less than 15° so that the device and its antenna would touch the phantom simultaneously. This test position may require a device holder or positioner to achieve the translation and tilting with acceptable positioning repeatability.

If a device is also designed to transmit with its keypad cover closed for operating in the head position, such positions should also be considered in the SAR evaluation. The device should be tested on the left and right side of the head phantom in the "Cheek/Touch" and "Ear/Tilt" positions. When applicable, each configuration should be tested with the antenna in its fully extended and fully retracted positions. These test configurations should be tested at the high, middle and low frequency channels of each operating mode; for example, AMPS, CDMA, and TDMA. If the SAR measured at the middle channel for each test configuration (left, right, Cheek/Touch, Tilt/Ear, extended and retracted) is at least 2.0 dB lower than the SAR limit, testing at the high and low channels is optional for such test configuration(s). If the transmission band of the test device is less than 10 MHz, testing at the high and low frequency channels is optional.

Ear /Tilt 15° Position



Test positions for body-worn and other configurations

Body-worn operating configurations should be tested with the belt-clips and holsters attached to the device and positioned against a flat phantom in normal use configurations. Devices with a headset output should be tested with a headset connected to the device. When multiple accessories that do not contain metallic components are supplied with the device, the device may be tested with only the accessory that dictates the closest spacing to the body. When multiple accessories that contain metallic components are supplied with the device, the device must be tested with each accessory that contains a unique metallic component. If multiple accessories share an identical metallic component (e.g., the same metallic belt-clip used with different holsters with no other metallic components), only the accessory that dictates the closest spacing to the body must be tested.

Body-worn accessories may not always be supplied or available as options for some devices that are intended to be authorized for body-worn use. A separation distance of 1.5 cm between the back of the device and a flat phantom is recommended for testing body-worn SAR compliance under such circumstances. Other separation distances may be used, but they should not exceed 2.5 cm. In these cases, the device may use body-worn accessories that provide a separation distance greater than that tested for the device provided however that the accessory contains no metallic components.

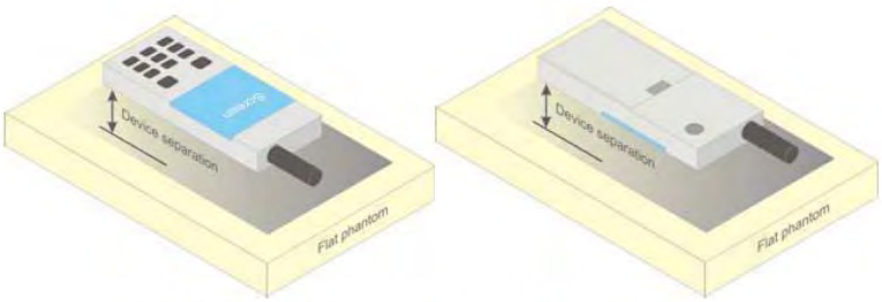


Figure 5 – Test positions for body-worn devices

SAR Evaluation Procedure

The evaluation was performed with the following procedure:

Step 1: Measurement of the SAR value at a fixed location above the ear point or central position was used as a reference value for assessing the power drop. The SAR at this point is measured at the start of the test and then again at the end of the testing.

Step 2: The SAR distribution at the exposed side of the head was measured at a distance of 4 mm from the inner surface of the shell. The area covered the entire dimension of the head or EUT and the horizontal grid spacing was 10 mm x 10 mm. Based on these data, the area of the maximum absorption was determined by spline interpolation. The first Area Scan covers the entire dimension of the EUT to ensure that the hotspot was correctly identified.

Step 3: Around this point, a volume of 35 mm x 35 mm x 35 mm was assessed by measuring 7x 7 x 7 points. On the basis of this data set, the spatial peak SAR value was evaluated under the following procedure:

1) The data at the surface were extrapolated, since the center of the dipoles is 1.2 mm away from the tip of the probe and the distance between the surface and the lowest measuring point is 1.3 mm. The extrapolation was based on a least square algorithm. A polynomial of the fourth order was calculated through the points in z-axes. This polynomial was then used to evaluate the points between the surface and the probe tip.

2) The maximum interpolated value was searched with a straightforward algorithm. Around this maximum the SAR values averaged over the spatial volumes (1 g or 10 g) were computed by the 3D-Spline interpolation algorithm. The 3D-Spline is composed of three one dimensional splines with the “Not a knot"-condition (in x, y and z-directions). The volume was integrated with the trapezoidal-algorithm. One thousand points (10 x 10 x 10) were interpolated to calculate the averages.

All neighboring volumes were evaluated until no neighboring volume with a higher average value was found.

Step 4: Re-measurement of the SAR value at the same location as in Step 1. If the value changed by more than 5%, the evaluation was repeated.

Test methodology

KDB 447498 D01 General RF Exposure Guidance v05r02.
KDB 648474 D04 Handset SAR v01r02.
KDB 865664 D01 SAR measurement 100 MHz to 6 GHz v01r03
KDB 865664 D02 RF Exposure Reporting v01r01
KDB 941225 D01 3G SAR Procedures v03
KDB 941225 D05 SAR for LTE Devices v02r03
KDB 941225 D06 Hotspot Mode v02

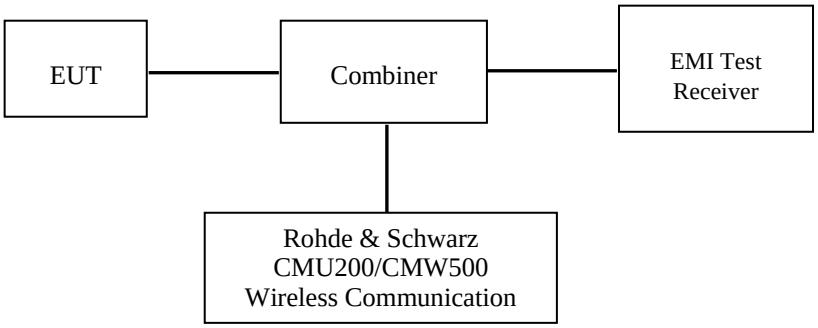
CONDUCTED OUTPUT POWER MEASUREMENT

Provision Applicable

The measured peak output power should be greater and within 5% than EMI measurement.

Test Procedure

The RF output of the transmitter was connected to the input of the EMI Test Receiver through sufficient attenuation.



GSM&3G&LTE

Maximum Output Power among production units

Max Target Power for Production Unit (dBm)			
Mode/Band	Channel		
	Low	Middle	High
GSM 850	32.90	32.90	32.90
GPRS 1 slot	32.80	32.80	32.80
GPRS 2 slot	32.70	32.70	32.70
GPRS 3 slot	32.60	32.60	32.60
GPRS 4 slot	32.40	32.40	32.40
EGPRS 1 slot	26.00	26.00	26.00
EGPRS 2 slot	26.00	26.00	26.00
EGPRS 3 slot	26.00	26.00	26.00
EGPRS 4 slot	26.00	26.00	26.00
PCS 1900	28.70	28.70	28.70
GPRS 1 slot	28.70	28.70	28.70
GPRS 2 slot	28.60	28.60	28.60
GPRS 3 slot	28.60	28.60	28.60
GPRS 4 slot	28.30	28.30	28.30
EGPRS 1 slot	24.50	24.50	24.50
EGPRS 2 slot	24.50	24.50	24.50
EGPRS 3 slot	24.50	24.50	24.50
EGPRS 4 slot	24.50	24.50	24.50
WCDMA850	22.60	22.60	22.60
WCDMA1900	22.40	22.40	22.40
LTE Band 4	22.70	22.70	22.70
LTE Band 7	22.50	22.50	22.50
Wi-Fi	9.60	9.60	9.60

Bluetooth	-0.20	-0.20	-0.20

Test Results:

GSM:

Band	Frequency (MHz)	Conducted Output Power	
		Meas. Power (dBm)	Meas. Power (W)
GSM 850	824.2	32.32	1.706
	836.6	32.65	1.841
	848.8	**32.81**	1.910
PCS 1900	1850.2	28.64	0.731
	1880.0	28.63	0.729
	1909.8	**28.66**	0.735

GPRS:

Band	Channel No.	Frequency (MHz)	RF Output Power (dBm)			
			1 slot	2 slot	3 slots	4 slots
GSM 850	128	824.2	32.32	32.24	32.07	31.94
	190	836.6	32.69	32.56	32.44	32.28
	251	848.8	32.75	32.69	32.58	**32.37**
PCS 1900	512	1850.2	28.56	28.44	28.51	**28.27**
	661	1880.0	28.61	28.52	28.23	27.98
	810	1909.8	28.59	28.50	28.25	28.08

EGPRS:

Band	Channel No.	Frequency (MHz)	RF Output Power (dBm)			
			1 slot	2 slot	3 slots	4 slots
GSM 850	128	824.2	25.63	25.63	25.57	25.43
	190	836.6	25.86	25.74	25.73	25.61
	251	848.8	26.06	25.96	25.92	25.83
PCS 1900	512	1850.2	24.44	24.32	24.30	24.06
	661	1880.0	24.38	24.31	24.22	24.03
	810	1909.8	24.50	24.38	24.29	24.13

For SAR, the time based average power is relevant, the difference in between depends on the duty cycle of the TDMA signal.

Number of Time slot	1	2	3	4
Duty Cycle	1:8	1:4	1:2.66	1:2
Time based Ave. power compared to slotted Ave. power	-9 dB	-6 dB	-4.25 dB	-3 dB
Crest Factor	8	4	2.66	2

The time based average power for GPRS

Band	Channel No.	Frequency (MHz)	Time based average Power (dBm)			
			1 slot	2 slot	3 slots	4 slots
GSM 850	128	824.2	23.32	26.24	27.82	28.94
	190	836.6	23.69	26.56	28.19	29.28
	251	848.8	23.75	26.69	28.33	**29.37**
PCS 1900	512	1850.2	19.56	22.44	24.26	**25.27**
	661	1880.0	19.61	22.52	23.98	24.98
	810	1909.8	19.59	22.50	24.00	25.08

The time based average power for EGPRS

Band	Channel No.	Frequency (MHz)	Time based average Power (dBm)			
			1 slot	2 slot	3 slots	4 slots
GSM 850	128	824.2	16.63	19.63	21.32	22.43
	190	836.6	16.86	19.74	21.48	22.61
	251	848.8	17.06	19.96	21.67	22.83
PCS 1900	512	1850.2	15.44	18.32	20.05	21.06
	661	1880.0	15.38	18.31	19.97	21.03
	810	1909.8	15.50	18.38	20.04	21.13

Note:
1. Rohde & Schwarz Radio Communication Tester (CMU200) was used for the measurement of GSM peak and average output power for active timeslots.
2. For GSM voice, 1 timeslot has been activated with power level 5 (850 MHz band) and 0 (1900 MHz band).
3. For GPRS, 1, 2, 3 and 4 timeslots has been activated separately with power level 3(850 MHz band) and 3(1900 MHz band).
4. According to KDB941225D06-SAR for GPRS and EDGE modes are not required when the source-based time-averaged output power for each data mode is lower than that in the normal GSM voice mode

WCDMA-Release 99:

The following tests were conducted according to the test requirements outlines in section 5.2 of the 3GPP TS34.121-1 specification. The EUT has a nominal maximum output power of 24dBm (+1.7/-3.7).

WCDMA General Settings	**Loopback Mode**	Test Mode 1
	Rel99 RMC	12.2kbps RMC
	Power Control Algorithm	Algorithm2
	βc /βd	8/15

WCDMA HSDPA

The following tests were conducted according to the test requirements outlines in section 5.2 of the 3GPP TS34.121-1 specification.

	Mode	HSDPA	HSDPA	HSDPA	HSDPA
	Subset	1	2	3	4
WCDMA General Settings	Loopback Mode	Test Mode 1			
	Rel99 RMC	12.2kbps RMC			
	HSDPA FRC	H-Set1			
	Power Control Algorithm	Algorithm2			
	βc	2/15	12/15	15/15	15/15
	βd	15/15	15/15	8/15	4/15
	βd (SF)	64			
	βc/ βd	2/15	12/15	15/8	15/4
	βhs	4/15	24/15	30/15	30/15
	MPR(dB)	0	0	0.5	0.5
HSDPA Specific Settings	D_{ACK}	8			
	D_{NAK}	8			
	D_{CQI}	8			
	Ack-Nack repetition factor	3			
	CQI Feedback	4ms			
	CQI Repetition Factor	2			
	Ahs= βhs/βc	30/15			

WCDMA HSUPA

The following tests were conducted according to the test requirements outlines in section 5.2 of the 3GPP TS34.121-1 specification.

	Mode	HSUPA	HSUPA	HSUPA	HSUPA	HSUPA
	Subset	1	2	3	4	5
WCDMA General Settings	Loopback Mode	Test Mode 1				
	Rel99 RMC	12.2kbps RMC				
	HSDPA FRC	H-Set1				
	HSUPA Test	HSUPA Loopback				
	Power Control Algorithm	Algorithm2				
	βc	11/15	6/15	15/15	2/15	15/15
	βd	15/15	15/15	9/15	15/15	0
	βec	209/225	12/15	30/15	2/15	5/15
	βc/ βd	11/15	6/15	15/9	2/15	-
	βhs	22/15	12/15	30/15	4/15	5/15
	CM(dB)	1.0	3.0	2.0	3.0	1.0
	MPR(dB)	0	2	1	2	0
HSDPA Specific Settings	DACK	8				
	DNAK	8				
	DCQI	8				
	Ack-Nack repetition factor	3				
	CQI Feedback	4ms				
	CQI Repetition Factor	2				
	Ahs= βhs/βc	30/15				
HSUPA Specific Settings	DE-DPCCH	6	8	8	5	7
	DHARQ	0	0	0	0	0
	AG Index	20	12	15	17	21
	ETFCI	75	67	92	71	81
	Associated Max UL Data Rate kbps	242.1	174.9	482.8	205.8	308.9
	Reference E_FCIs	E-TFCI 11 E E-TFCI PO 4 E-TFCI 67 E-TFCI PO 18 E-TFCI 71 E-TFCI PO23 E-TFCI 75 E-TFCI PO26 E-TFCI 81 E-TFCI PO 27		E-TFCI 11 E-TFCI PO4 E-TFCI 92 E-TFCI PO 18	E-TFCI 11 E E-TFCI PO 4 E-TFCI 67 E-TFCI PO 18 E-TFCI 71 E-TFCI PO23 E-TFCI 75 E-TFCI PO26 E-TFCI 81 E-TFCI PO 27	

Results (12.2kbps RMC)

Band	Frequency (MHz)	Channel NO.	Conducted Output Power	
			(dBm)	(Watt)
WCDMA 850	826.4	4132	22.48	0.177
	836.6	4183	**22.56**	0.180
	846.6	4233	22.46	0.176
WCDMA 1900	1852.4	9262	**22.35**	0.172
	1880.0	9400	22.28	0.169
	1907.6	9538	22.26	0.168

Results (HSDPA)

Band	Frequency (MHz)	Channel NO.	Conducted Output Power (dBm)			
			Subset 1	Subset 2	Subset 3	Subset 4
WCDMA 850	826.4	4132	21.36	21.25	21.41	21.26
	836.6	4183	21.23	21.10	21.3	21.19
	846.6	4233	21.30	21.22	21.34	21.21
WCDMA 1900	1852.4	9262	21.25	21.14	21.36	21.21
	1880.0	9400	21.17	21.05	21.25	21.11
	1907.6	9538	21.32	21.24	21.43	21.22

Results (HSUPA)

Band	Frequency (MHz)	Channel NO.	Conducted Output Power (dBm)				
			Subset 1	Subset 2	Subset 3	Subset 4	Subset 5
WCDMA 850	826.4	4132	20.73	20.62	20.84	20.62	20.82
	836.6	4183	20.83	20.75	20.91	20.78	20.94
	846.6	4233	20.78	20.75	20.88	20.71	20.84
WCDMA 1900	1852.4	9262	20.75	20.72	20.81	20.64	20.85
	1880.0	9400	20.58	20.47	20.61	20.55	20.64
	1907.6	9538	20.56	20.49	20.6	20.51	20.63

Note:

1. The default test configuration is to measure SAR with an established radio link between the EUT and a communication test set using a 12.2 kbps RMC (reference measurement Channel) Configured in Test Loop Model 1.
2. KDB 941225 D01-Body SAR is not required for HSDPA when the maximum average output of each RF channel with HSDPA active is less than ¼ dB higher than measured without HSDPA using 12.2kbps RMC or the maximum SAR for 12.2kbps RMC is < 75% of SAR limit.
3. KDB 941225 D01-Body SAR is not required for HSUPA when the maximum average output of each RF channel with HSUPA active is less than ¼ dB higher than measured without HSUPA using 12.2kbps RMC and the maximum SAR for 12.2kbps RMC is < 75% of SAR limit.

LTE Band 4:

BW	Modulation	Resource Block Size& Resource Block Offset	Ave Tx Power (dBm)		
			Low Channel	Mid Channel	High Channel
1.4M	QPSK	RB Size=1, RB Offset=0	22.34	22.42	22.42
		RB Size=1, RB Offset=2	22.42	22.43	22.43
		RB Size=1, RB Offset=5	22.42	22.54	22.33
		RB Size=3, RB Offset=0	22.23	22.26	22.34
		RB Size=3, RB Offset=1	22.38	22.30	22.28
		RB Size=3, RB Offset=2	22.23	22.31	22.34
		RB Size=6, RB Offset=0	21.98	22.03	22.10
	16QAM	RB Size=1, RB Offset=0	21.98	22.02	22.06
		RB Size=1, RB Offset=2	22.41	22.41	22.43
		RB Size=1, RB Offset=5	22.15	22.25	22.28
		RB Size=3, RB Offset=0	22.42	22.47	22.48
		RB Size=3, RB Offset=1	22.14	22.21	22.29
		RB Size=3, RB Offset=2	22.47	22.40	22.43
		RB Size=6, RB Offset=0	22.18	22.25	22.33
3M	QPSK	RB Size=1, RB Offset=0	22.29	22.01	22.05
		RB Size=1, RB Offset=7	21.66	21.73	21.79
		RB Size=1, RB Offset=14	22.31	22.39	22.40
		RB Size=8, RB Offset=0	22.11	22.16	22.20
		RB Size=8, RB Offset=4	21.65	21.68	21.71
		RB Size=8, RB Offset=7	22.06	22.09	22.14
		RB Size=15, RB Offset=0	21.91	22.01	22.09
	16QAM	RB Size=1, RB Offset=0	21.99	22.08	22.17
		RB Size=1, RB Offset=7	22.65	22.02	22.04
		RB Size=1, RB Offset=14	22.02	22.04	22.10
		RB Size=8, RB Offset=0	22.05	22.11	22.12
		RB Size=8, RB Offset=4	22.33	22.36	22.40
		RB Size=8, RB Offset=7	22.15	22.23	22.32
		RB Size=15, RB Offset=0	22.00	22.02	22.09
5M	QPSK	RB Size=1, RB Offset=0	22.37	22.46	22.56
		RB Size=1, RB Offset=12	22.36	22.43	22.49
		RB Size=1, RB Offset=24	22.04	22.05	22.10
		RB Size=12, RB Offset=0	21.95	22.02	22.07
		RB Size=12, RB Offset=6	21.99	22.03	22.03
		RB Size=12, RB Offset=11	21.88	21.96	21.97
		RB Size=25, RB Offset=0	22.00	22.09	22.12
	16QAM	RB Size=1, RB Offset=0	22.01	22.07	22.10
		RB Size=1, RB Offset=12	21.96	22.06	22.15
		RB Size=1, RB Offset=24	21.99	22.03	22.05
		RB Size=12, RB Offset=0	21.07	21.17	21.23
		RB Size=12, RB Offset=6	20.86	20.95	21.02
		RB Size=12, RB Offset=11	21.99	22.04	22.13
		RB Size=25, RB Offset=0	21.88	21.90	21.94
10M	QPSK	RB Size=1, RB Offset=0	22.26	22.36	22.45
		RB Size=1, RB Offset=24	22.30	22.31	22.32
		RB Size=1, RB Offset=49	22.42	22.45	22.40
		RB Size=25, RB Offset=0	22.33	22.43	22.39

		RB Size=25, RB Offset=12	22.30	22.39	22.41
		RB Size=25, RB Offset=24	22.06	22.06	22.12
		RB Size=50, RB Offset=0	22.25	22.30	22.30
	16QAM	RB Size=1, RB Offset=0	22.40	22.50	22.56
		RB Size=1, RB Offset=24	22.36	22.43	22.44
		RB Size=1, RB Offset=49	22.12	22.15	22.24
		RB Size=25, RB Offset=0	21.93	21.99	22.01
		RB Size=25, RB Offset=12	22.00	22.03	22.11
		RB Size=25, RB Offset=24	21.97	22.06	22.07
		RB Size=50, RB Offset=0	22.03	22.12	22.21
15M	QPSK	RB Size=1, RB Offset=0	22.24	22.04	22.11
		RB Size=1, RB Offset=37	21.94	21.98	22.06
		RB Size=1, RB Offset=74	21.98	22.05	22.10
		RB Size=36, RB Offset=0	22.28	22.36	22.40
		RB Size=36, RB Offset=18	22.12	22.12	22.20
		RB Size=36, RB Offset=37	21.97	22.01	22.03
		RB Size=75, RB Offset=0	22.33	22.42	22.45
	16QAM	RB Size=1, RB Offset=0	22.06	22.14	22.20
		RB Size=1, RB Offset=37	21.98	22.06	22.10
		RB Size=1, RB Offset=74	22.24	22.27	22.37
		RB Size=36, RB Offset=0	22.28	22.33	22.37
		RB Size=36, RB Offset=18	22.32	22.36	22.44
		RB Size=36, RB Offset=37	22.64	22.40	22.35
		RB Size=75, RB Offset=0	22.23	22.24	22.28
20M	QPSK	RB Size=1, RB Offset=0	**22.50**	**22.57**	**22.61**
		RB Size=1, RB Offset=49	21.97	22.00	22.07
		RB Size=1, RB Offset=99	22.37	22.03	22.09
		RB Size=50, RB Offset=0	21.68	21.77	21.82
		RB Size=50, RB Offset=24	22.27	22.29	22.31
		RB Size=50, RB Offset=49	22.06	22.11	22.20
		RB Size=100, RB Offset=0	21.58	21.66	21.71
	16QAM	RB Size=1, RB Offset=0	21.99	22.08	22.15
		RB Size=1, RB Offset=49	21.89	21.99	22.07
		RB Size=1, RB Offset=99	21.98	22.03	22.08
		RB Size=50, RB Offset=0	22.14	22.36	22.01
		RB Size=50, RB Offset=24	21.96	22.01	22.03
		RB Size=50, RB Offset=49	21.98	22.08	22.14
		RB Size=100, RB Offset=0	21.10	21.15	21.20

LTE Band 7:

BW	Modulation	Resource Block Size& Resource Block Offset	Ave Tx Power (dBm)		
			Low Channel	Mid Channel	High Channel
5M	QPSK	RB Size=1, RB Offset=0	21.51	21.58	21.63
		RB Size=1, RB Offset=12	21.59	21.67	21.69
		RB Size=1, RB Offset=24	21.98	22.00	22.02
		RB Size=12, RB Offset=0	21.89	21.91	21.97
		RB Size=12, RB Offset=6	22.00	22.06	22.07
		RB Size=12, RB Offset=11	22.00	22.08	22.15
		RB Size=25, RB Offset=0	21.94	21.94	21.96
	16QAM	RB Size=1, RB Offset=0	21.97	21.98	22.01

		RB Size=1, RB Offset=12	21.09	21.18	21.22
		RB Size=1, RB Offset=24	20.86	20.92	20.92
		RB Size=12, RB Offset=0	21.98	22.05	22.07
		RB Size=12, RB Offset=6	22.12	22.30	22.23
		RB Size=12, RB Offset=11	22.04	22.05	22.08
		RB Size=25, RB Offset=0	21.99	22.02	22.12
10M	QPSK	RB Size=1, RB Offset=0	21.65	21.68	21.75
		RB Size=1, RB Offset=24	22.01	22.10	22.11
		RB Size=1, RB Offset=49	21.69	21.72	21.78
		RB Size=25, RB Offset=0	21.69	21.77	21.86
		RB Size=25, RB Offset=12	21.76	21.82	21.82
		RB Size=25, RB Offset=24	21.59	21.61	21.67
		RB Size=50, RB Offset=0	21.57	21.64	21.67
	16QAM	RB Size=1, RB Offset=0	22.04	22.04	22.04
		RB Size=1, RB Offset=24	21.94	22.00	22.03
		RB Size=1, RB Offset=49	22.07	22.09	22.15
		RB Size=25, RB Offset=0	21.99	22.05	22.07
		RB Size=25, RB Offset=12	21.98	22.06	22.09
		RB Size=25, RB Offset=24	22.01	22.08	22.18
		RB Size=50, RB Offset=0	21.11	21.20	21.23
15M	QPSK	RB Size=1, RB Offset=0	22.22	22.25	22.27
		RB Size=1, RB Offset=37	22.09	22.07	22.12
		RB Size=1, RB Offset=74	22.15	22.00	22.17
		RB Size=36, RB Offset=0	22.02	22.11	22.07
		RB Size=36, RB Offset=18	22.08	22.17	22.24
		RB Size=36, RB Offset=37	22.06	22.16	22.17
		RB Size=75, RB Offset=0	22.28	22.27	22.13
	16QAM	RB Size=1, RB Offset=0	21.71	21.74	21.83
		RB Size=1, RB Offset=37	21.90	21.92	21.93
		RB Size=1, RB Offset=74	21.62	21.71	21.74
		RB Size=36, RB Offset=0	21.63	21.72	21.81
		RB Size=36, RB Offset=18	22.00	22.00	22.09
		RB Size=36, RB Offset=37	21.75	21.84	21.88
		RB Size=75, RB Offset=0	21.72	21.80	21.82
20M	QPSK	RB Size=1, RB Offset=0	**22.38**	**22.31**	**22.39**
		RB Size=1, RB Offset=49	22.06	22.14	22.21
		RB Size=1, RB Offset=99	21.70	21.74	21.83
		RB Size=50, RB Offset=0	21.68	21.71	21.78
		RB Size=50, RB Offset=24	21.73	21.74	21.80
		RB Size=50, RB Offset=49	21.56	21.64	21.71
		RB Size=100, RB Offset=0	21.58	21.61	21.68
	16QAM	RB Size=1, RB Offset=0	22.02	22.08	22.16
		RB Size=1, RB Offset=49	21.92	22.02	22.11
		RB Size=1, RB Offset=99	22.02	22.05	22.06
		RB Size=50, RB Offset=0	22.01	22.11	22.14
		RB Size=50, RB Offset=24	21.98	22.01	22.02
		RB Size=50, RB Offset=49	22.02	22.07	22.07
		RB Size=100, RB Offset=0	21.15	21.21	21.28

Note:
1. SAR for LTE band exposure configurations is measured according to the procedures of KDB 941225 D05 SAR for LTE Devices v02.

3. The CMW500 Wideband Radio Communication tester is used for LTE output power measurements and SAR testing. Closed loop power control is used to keep the radio transmitters the max output power during the test.
2. KDB941225D05v02- SAR for higher order modulation is required only when the highest maximum output power for the configuration in the higher order modulation is > ½ dB higher than the same configuration in QPSK or when the reported SAR for the QPSK configuration is > 1.45 W/kg

Bluetooth

Mode	Channel frequency (MHz)	Conducted Output Power	
		(dBm)	(mw)
BDR(GFSK)	(Low)2402	-0.82	0.828
	(Middle)2441	-0.25	0.944
	(High)2480	**-0.20**	0.955
EDR(4-DQPSK)	(Low)2402	-1.15	0.767
	(Middle)2441	-0.64	0.863
	(High)2480	-0.64	0.863
EDR-8DPSK	(Low)2402	-0.76	0.839
	(Middle)2441	-0.20	0.955
	(High)2480	-0.25	0.944
BT4.0	(Low)2402	-8.49	0.142
	(Middle)2441	-8.43	0.144
	(High)2480	-8.56	0.139

Wi-Fi

Band	Frequency (MHz)	Conducted Output Power	
		(dBm)	(mw)
802.11b	2412	9.22	8.356
	2437	9.31	8.531
	2472	9.31	8.531
802.11g	2412	**9.58**	9.078
	2437	9.43	8.770
	2472	9.53	8.974
802.11n HT20	2412	9.26	8.433
	2437	9.09	8.110
	2472	9.12	8.166
802.11n HT40	2422	9.32	8.551
	2437	9.24	8.395
	2462	9.36	8.630

Note:

1. The output power was tested under data rate 1Mbps for 802.11b, 6Mbps for 802.11g, 6.5Mbps for 802.11n HT20, 13.5Mbps for 802.11n HT40.

SAR MEASUREMENT RESULTS

This page summarizes the results of the performed dosimetric evaluation.

SAR Test Data

Environmental Conditions

Temperature:	21-24 ℃
Relative Humidity:	50-53 %
ATM Pressure:	1001-1002 mbar

Testing was performed by Wilson Chen on 2015-03-09

GSM 850:

EUT Position	Frequency (MHz)	Test Mode	Power Drift (%)	Max. Meas. Power (dBm)	Max. Rated Power (dBm)	1g SAR (W/Kg)			
						Scaled Factor	Meas. SAR	Scaled SAR	Plot
Left Head Cheek	824.2	GSM	/	/	/	/	/	/	/
	836.6	GSM	0.984	32.65	32.90	1.059	0.429	0.454	/
	848.8	GSM	/	/	/	/	/	/	/
Left Head Tilt	824.2	GSM	/	/	/	/	/	/	/
	836.6	GSM	1.538	32.65	32.90	1.059	0.247	0.262	/
	848.8	GSM	/	/	/	/	/	/	/
Right Head Cheek	824.2	GSM	0.344	32.32	32.90	1.143	0.378	0.432	/
	836.6	GSM	-2.287	32.65	32.90	1.059	0.473	**0.501**	**1#**
	848.8	GSM	-2.066	32.81	32.90	1.021	0.455	0.465	/
Right Head Tilt	824.2	GSM	/	/	/	/	/	/	/
	836.6	GSM	3.577	32.65	32.90	1.059	0.268	0.284	/
	848.8	GSM	/	/	/	/	/	/	/
Body-Back-Headset (10mm)	824.2	GSM	/	/	/	/	/	/	/
	836.6	GSM	0.732	32.65	32.90	1.059	0.427	0.452	/
	848.8	GSM	/	/	/	/	/	/	/

Note:
1. When the 1-g SAR is ≤ 0.8W/Kg, testing for other channels are optional.
2. The EUT transmit and receive through the same GSM antenna while testing SAR.
3. When SAR or MPE is not measured at the maximum power level allowed for production units, the results must be scaled to the maximum tune-up tolerance limit according to the power applied to the individual channels tested to determine compliance.

PCS Band:

EUT Position	Frequency (MHz)	Test Mode	Power Drift (%)	Max. Meas. Power (dBm)	Max. Rated Power (dBm)	1g SAR (W/Kg)			
						Scaled Factor	Meas. SAR	Scaled SAR	Plot
Left Head Cheek	1850.2	GSM	1.426	28.64	28.70	1.014	0.298	0.302	/
	1880.0	GSM	-1.965	28.63	28.70	1.016	0.325	**0.330**	**2#**
	1909.8	GSM	0.379	28.66	28.70	1.009	0.327	0.330	/
Left Head Tilt	1850.2	GSM	/	/	/	/	/	/	/
	1880.0	GSM	3.646	28.63	28.70	1.016	0.139	0.141	/
	1909.8	GSM	/	/	/	/	/	/	/
Right Head Cheek	1850.2	GSM	/	/	/	/	/	/	/
	1880.0	GSM	-1.951	28.63	28.70	1.016	0.302	0.307	/
	1909.8	GSM	/	/	/	/	/	/	/
Right Head Tilt	1850.2	GSM	/	/	/	/	/	/	/
	1880.0	GSM	2.841	28.63	28.70	1.016	0.142	0.144	/
	1909.8	GSM	/	/	/	/	/	/	/
Body-Back-Headset (10mm)	1850.2	GSM	/	/	/	/	/	/	/
	1880.0	GSM	3.714	28.63	28.70	1.016	0.496	0.504	/
	1909.8	GSM	/	/	/	/	/	/	/

Note:
1. When the 1-g SAR is ≤ 0.8W/Kg, testing for other channels are optional.
2. The EUT transmit and receive through the same GSM antenna while testing SAR.
3. When SAR or MPE is not measured at the maximum power level allowed for production units, the results must be scaled to the maximum tune-up tolerance limit according to the power applied to the individual channels tested to determine compliance.
4. 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.

WCDMA 850

EUT Position	Frequency (MHz)	Test Mode	Power Drift (%)	Max. Meas. Power (dBm)	Max. Rated Power (dBm)	1g SAR (W/Kg)			
						Scaled Factor	Meas. SAR	Scaled SAR	Plot
Left Head Cheek	826.4	WCDMA 850	/	/	/	/	/	/	/
	836.6	WCDMA 850	2.013	22.56	22.60	1.009	0.119	0.120	/
	846.6	WCDMA 850	/	/	/	/	/	/	/
Left Head Tilt	826.4	WCDMA 850	/	/	/	/	/	/	/
	836.6	WCDMA 850	4.012	22.56	22.60	1.009	0.081	0.082	/
	846.6	WCDMA 850	/	/	/	/	/	/	/
Right Head Cheek	826.4	WCDMA 850	/	/	/	/	/	/	/
	836.6	WCDMA 850	-3.599	22.56	22.60	1.009	0.125	**0.126**	**3#**
	846.6	WCDMA 850	/	/	/	/	/	/	/
Right Head Tilt	826.4	WCDMA 850	/	/	/	/	/	/	/
	836.6	WCDMA 850	2.314	22.56	22.60	1.009	0.076	0.077	/
	846.6	WCDMA 850	/	/	/	/	/	/	/

WCDMA1900

EUT Position	Frequency (MHz)	Test Mode	Power Drift (%)	Max. Meas. Power (dBm)	Max. Rated Power (dBm)	1g SAR (W/Kg)			
						Scaled Factor	Meas. SAR	Scaled SAR	Plot
Left Head Cheek	1852.4	WCDMA1900	-2.912	22.35	22.40	1.012	0.215	**0.218**	**4#**
	1880.0	WCDMA1900	/	/	/	/	/	/	/
	1907.6	WCDMA1900	/	/	/	/	/	/	/
Left Head Tilt	1852.4	WCDMA1900	1.492	22.35	22.40	1.012	0.095	0.096	/
	1880.0	WCDMA1900	/	/	/	/	/	/	/
	1907.6	WCDMA1900	/	/	/	/	/	/	/
Right Head Cheek	1852.4	WCDMA1900	2.052	22.35	22.40	1.012	0.199	0.201	/
	1880.0	WCDMA1900	/	/	/	/	/	/	/
	1907.6	WCDMA1900	/	/	/	/	/	/	/
Right Head Tilt	1852.4	WCDMA1900	-2.926	22.35	22.40	1.012	0.102	0.103	/
	1880.0	WCDMA1900	/	/	/	/	/	/	/
	1907.6	WCDMA1900	/	/	/	/	/	/	/

Note:

1. When the 1-g SAR is ≤ 0.8W/Kg, testing for other channels are optional.
2. The default test configuration is to measure SAR with an established radio link between the EUT and a communication test set using a 12.2 kbps RMC (reference measurement Channel) Configured in Test Loop Model.
3. When SAR or MPE is not measured at the maximum power level allowed for production units, the results must be scaled to the maximum tune-up tolerance limit according to the power applied to the individual channels tested to determine compliance.

LTE Band 4:

EUT Position	Frequency (MHz)	Test Mode	Power Drift (%)	Max. Meas. Power (dBm)	Max. Rated Power (dBm)	1g SAR (W/Kg)			
						Scaled Factor	Meas. SAR	Scaled SAR	Plot
Left Head Cheek	1720	1RB	/	/	/	/	/	/	/
	1732.5	1RB	/	/	/	/	/	/	/
	1745	1RB	-1.698	22.61	22.70	1.021	0.236	**0.241**	**5#**
	1745	50% RB	-0.371	22.29	22.70	1.099	0.198	0.218	
Left Head Tilt	1720	1RB	/	/	/	/	/	/	/
	1732.5	1RB	/	/	/	/	/	/	/
	1745	1RB	3.394	22.61	22.70	1.021	0.112	0.114	/
Right Head Cheek	1720	1RB	/	/	/	/	/	/	/
	1732.5	1RB	/	/	/	/	/	/	/
	1745	1RB	4.167	22.61	22.70	1.021	0.217	0.222	/
Right Head Tilt	1720	1RB	/	/	/	/	/	/	/
	1732.5	1RB	/	/	/	/	/	/	/
	1745	1RB	3.985	22.61	22.70	1.021	0.095	0.097	/

LTE Band 7:

EUT Position	Frequency (MHz)	Test Mode	Power Drift (%)	Max. Meas. Power (dBm)	Max. Rated Power (dBm)	1g SAR (W/Kg)			
						Scaled Factor	Meas. SAR	Scaled SAR	Plot
Left Head Cheek	2510	1RB	/	/	/	/	/	/	/
	2535	1RB	/	/	/	/	/	/	/
	2560	1RB	-2.756	22.39	22.50	1.026	0.326	0.334	**6#**
	2560	50% RB	-1.761	21.78	22.50	1.180	0.245	0.289	
Left Head Tilt	2510	1RB	/	/	/	/	/	/	/
	2535	1RB	/	/	/	/	/	/	/
	2560	1RB	-1.367	22.39	22.50	1.026	0.139	0.143	/
Right Head Cheek	2510	1RB	/	/	/	/	/	/	/
	2535	1RB	/	/	/	/	/	/	/
	2560	1RB	0.234	22.39	22.50	1.026	0.300	0.308	/
Right Head Tilt	2510	1RB	/	/	/	/	/	/	/
	2535	1RB	/	/	/	/	/	/	/
	2560	1RB	-1.644	22.39	22.50	1.026	0.151	0.155	/

Note:

1. When the 1-g SAR is ≤ 0.8W/Kg, testing for other channels are optional.
2. SAR for LTE band exposure configurations is measured according to the procedures of KDB 941225 D05 SAR for LTE Devices v02.
3. KDB941225D05- SAR for higher order modulation is required only when the highest maximum output power for the configuration in the higher order modulation is > ½ dB higher than the same configuration in QPSK or when the reported SAR for the QPSK configuration is > 1.45 W/kg

4. KDB941225D05- For QPSK with 100% RB allocation, when the reported SAR measured for the Highest output power channel is <1.45 W/kg, tests for the remaining required test channels are optional.

5.KDB941225D05- For QPSK with 100% RB allocation, SAR is not required when the highest maximum output power for 100 % RB allocation is less than the highest maximum output power in 50% and 1 RB allocations and the highest *reported* SAR for 1 RB and 50% RB allocation are ≤ 0.8 W/kg.

6. KDB941225D05- Start with the largest channel bandwidth (20M) and measure SAR for QPSK with 1 RB allocation, using the RB offset and required test channel combination with the highest maximum output power among RB offset the upper edge, middle and lower edge of each required test channel.

7. Worst case SAR for 50% RB allocation is selected to be tested.

Mobile Hot-Spot Test Result

The DUT is capable of functioning as a Wi-Fi to Cellular Mobile hotspot. Additional SAR testing was performed according to KDB 941225 D06. Testing was performed with a separation of 1cm between the DUT and the flat phantom. The DUT was positioned for SAR tests with the front and back surfaces facing the phantom, and also with the edges facing the phantom in which the transmitting antenna is <2.5 cm from the edge. Each transmit band was utilized for SAR testing. The tested mode has been selected within each band that exhibits the highest time average output power.

Hot spot-GPRS (Frequency Band: 835)

EUT Position	Frequency (MHz)	Test Mode	Power Drift (%)	Max. Meas. Power (dBm)	Max. Rated Power (dBm)	1g SAR (W/Kg)			
						Scaled Factor	Meas. SAR	Scaled SAR	Plot
Body-Back (10mm)	824.2	GPRS	3.240	31.94	32.40	1.112	0.718	0.798	/
	836.6	GPRS	-0.327	32.28	32.40	1.028	0.769	0.791	/
	848.8	GPRS	-2.574	32.37	32.40	1.007	0.825	**0.831**	**7#**
Body-Left (10mm)	824.2	GPRS	/	/	/	/	/	/	/
	836.6	GPRS	/	/	/	/	/	/	/
	848.8	GPRS	2.833	32.37	32.40	1.007	0.396	0.399	/
Body-Right (10mm)	824.2	GPRS	/	/	/	/	/	/	/
	836.6	GPRS	/	/	/	/	/	/	/
	848.8	GPRS	1.470	32.37	32.40	1.007	0.174	0.175	/
Body-Bottom (10mm)	824.2	GPRS	/	/	/	/	/	/	/
	836.6	GPRS	/	/	/	/	/	/	/
	848.8	GPRS	-1.048	32.37	32.40	1.007	0.229	0.231	/

Hot spot-GPRS (Frequency Band: 1900)

EUT Position	Frequency (MHz)	Test Mode	Power Drift (%)	Max. Meas. Power (dBm)	Max. Rated Power (dBm)	1g SAR (W/Kg)			
						Scaled Factor	Meas. SAR	Scaled SAR	Plot
Body-Back (10mm)	1850.2	GPRS	-0.692	28.27	28.30	1.007	0.952	**0.959**	**8#**
	1880.0	GPRS	2.399	27.98	28.30	1.076	0.871	0.937	/
	1909.8	GPRS	1.968	28.08	28.30	1.052	0.849	0.893	/
Body-Left (10mm)	1850.2	GPRS	-2.322	28.27	28.30	1.007	0.402	0.405	/
	1880.0	GPRS	/	/	/	/	/	/	/
	1909.8	GPRS	/	/	/	/	/	/	/
Body-Right (10mm)	1850.2	GPRS	0.212	28.27	28.30	1.007	0.163	0.164	/
	1880.0	GPRS	/	/	/	/	/	/	/
	1909.8	GPRS	/	/	/	/	/	/	/
Body-Bottom (10mm)	1850.2	GPRS	2.250	28.27	28.30	1.007	0.769	0.774	/
	1880.0	GPRS	/	/	/	/	/	/	/
	1909.8	GPRS	/	/	/	/	/	/	/

Note:
1 .When the 1-g SAR is ≤ 0.8W/Kg, testing for other channels are optional.
2. The EUT is a Capability Class B mobile phone which can be attached to both GPRS and GSM services.
3. The Multi-slot Classes of EUT is Class12 which has maximum 4 Downlink slots and 4 Uplink slots, the maximum active slots is 5, when perform the multiple slots scan, 1DL+4UL is the worst case.
4. The EUT transmit and receive through the same GSM antenna while testing SAR.
5. When SAR or MPE is not measured at the maximum power level allowed for production units, the results must be scaled to the maximum tune-up tolerance limit according to the power applied to the individual channels tested to determine compliance.

Hot Spot-WCDMA850

EUT Position	Frequency (MHz)	Test Mode	Power Drift (%)	Max. Meas. Power (dBm)	Max. Rated Power (dBm)	1g SAR (W/Kg)			
						Scaled Factor	Meas. SAR	Scaled SAR	Plot
Body-Back (10mm)	826.4	WCDMA850	/	/	/	/	/	/	/
	836.6	WCDMA850	-1.269	22.56	22.60	1.009	0.247	**0.249**	**9#**
	846.6	WCDMA850	/	/	/	/	/	/	/
Body-Left (10mm)	826.4	WCDMA850	/	/	/	/	/	/	/
	836.6	WCDMA850	1.305	22.56	22.60	1.009	0.156	0.157	/
	846.6	WCDMA850	/	/	/	/	/	/	/
Body-Right (10mm)	826.4	WCDMA850	/	/	/	/	/	/	/
	836.6	WCDMA850	0.793	22.56	22.60	1.009	0.076	0.077	/
	846.6	WCDMA850	/	/	/	/	/	/	/
Body-Bottom (10mm)	826.4	WCDMA850	/	/	/	/	/	/	/
	836.6	WCDMA850	0.117	22.56	22.60	1.009	0.103	0.104	/
	846.6	WCDMA850	/	/	/	/	/	/	/

Hot Spot-WCDMA1900

EUT Position	Frequency (MHz)	Test Mode	Power Drift (%)	Max. Meas. Power (dBm)	Max. Rated Power (dBm)	1g SAR (W/Kg)			
						Scaled Factor	Meas. SAR	Scaled SAR	Plot
Body-Back (10mm)	1852.4	WCDMA1900	-1.395	22.35	22.40	1.012	0.623	**0.630**	**10#**
	1880.0	WCDMA1900	/	/	/	/	/	/	/
	1907.6	WCDMA1900	/	/	/	/	/	/	/
Body-Left (10mm)	1852.4	WCDMA1900	0.389	22.35	22.40	1.012	0.359	0.363	/
	1880.0	WCDMA1900	/	/	/	/	/	/	/
	1907.6	WCDMA1900	/	/	/	/	/	/	/
Body-Right (10mm)	1852.4	WCDMA1900	2.921	22.35	22.40	1.012	0.194	0.196	/
	1880.0	WCDMA1900	/	/	/	/	/	/	/
	1907.6	WCDMA1900	/	/	/	/	/	/	/
Body-Bottom (10mm)	1852.4	WCDMA1900	0.149	22.35	22.40	1.012	0.585	0.592	/
	1880.0	WCDMA1900	/	/	/	/	/	/	/
	1907.6	WCDMA1900	/	/	/	/	/	/	/

Note:
1. When the 1-g SAR is ≤ 0.8W/Kg, testing for other channels are optional.
2. The default test configuration is to measure SAR with an established radio link between the EUT and a communication test set using a 12.2 kbps RMC (reference measurement Channel) Configured in Test Loop Model.
5. When SAR or MPE is not measured at the maximum power level allowed for production units, the results must be scaled to the maximum tune-up tolerance limit according to the power applied to the individual channels tested to determine compliance.

LTE Band 4:

EUT Position	Frequency (MHz)	Test Mode	Power Drift (%)	Max. Meas. Power (dBm)	Max. Rated Power (dBm)	1g SAR (W/Kg)			
						Scaled Factor	Meas. SAR	Scaled SAR	Plot
Body-Back (10mm)	1720	1RB	/	/	/	/	/	/	
	1732.5	1RB	/	/	/	/	/	/	
	1745	1RB	-0.845	22.61	22.70	1.021	0.593	**0.605**	**11#**
	1745	50% RB	-1.029	22.29	22.70	1.099	0.475	0.522	
Body-Left (10mm)	1720	1RB	/	/	/	/	/	/	
	1732.5	1RB	/	/	/	/	/	/	
	1745	1RB	-2.413	22.61	22.70	1.021	0.329	0.336	
Body- Right (10mm)	1720	1RB	/	/	/	/	/	/	
	1732.5	1RB	/	/	/	/	/	/	
	1745	1RB	-0.537	22.61	22.70	1.021	0.122	0.125	
Body- Bottom (10mm)	1720	1RB	/	/	/	/	/	/	
	1732.5	1RB	/	/	/	/	/	/	
	1745	1RB	2.747	22.61	22.70	1.021	0.498	0.508	

LTE Band 7:

EUT Position	Frequency (MHz)	Test Mode	Power Drift (%)	Max. Meas. Power (dBm)	Max. Rated Power (dBm)	1g SAR (W/Kg)			
						Scaled Factor	Meas. SAR	Scaled SAR	Plot
Body-Back (10mm)	2510	1RB	/	/	/	/	/	/	
	2535	1RB	/	/	/	/	/	/	
	2560	1RB	-1.854	22.39	22.50	1.026	0.552	**0.566**	**12#**
	2560	50% RB	1.763	21.78	22.50	1.180	0.471	0.556	
Body-Left (10mm)	2510	1RB	/	/	/	/	/	/	
	2535	1RB	/	/	/	/	/	/	
	2560	1RB	-2.039	22.39	22.50	1.026	0.259	0.266	
Body- Right (10mm)	2510	1RB	/	/	/	/	/	/	
	2535	1RB	/	/	/	/	/	/	
	2560	1RB	4.486	22.39	22.50	1.026	0.095	0.097	
Body-Bottom (10mm)	2510	1RB	/	/	/	/	/	/	
	2535	1RB	/	/	/	/	/	/	
	2560	1RB	-2.291	22.39	22.50	1.026	0.469	0.481	

Note:

1. When the 1-g SAR is ≤ 0.8W/Kg, testing for other channels are optional.
2. SAR for LTE band exposure configurations is measured according to the procedures of KDB 941225 D05 SAR for LTE Devices v02.
3. KDB941225D05- SAR for higher order modulation is required only when the highest maximum output power for the configuration in the higher order modulation is > ½ dB higher than the same configuration in QPSK or when the reported SAR for the QPSK configuration is > 1.45 W/kg
4. KDB941225D05- For QPSK with 100% RB allocation, when the reported SAR measured for the Highest output power channel is <1.45 W/kg, tests for the remaining required test channels are optional.

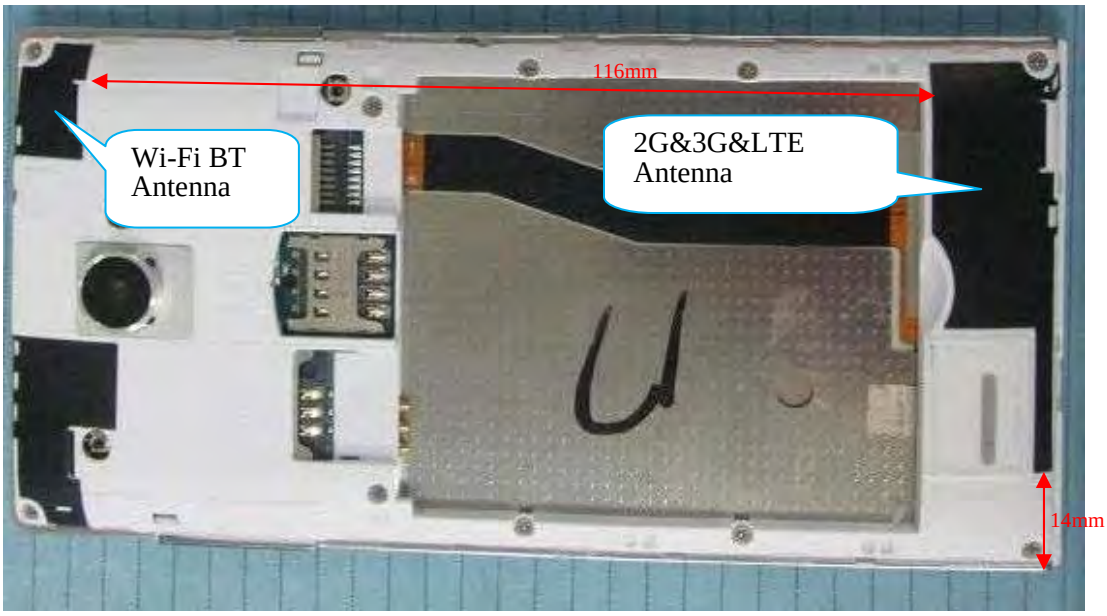
5.KDB941225D05- For QPSK with 100% RB allocation, SAR is not required when the highest maximum output power for 100 % RB allocation is less than the highest maximum output power in 50% and 1 RB allocations and the highest *reported* SAR for 1 RB and 50% RB allocation are ≤ 0.8 W/kg.

6. KDB941225D05- Start with the largest channel bandwidth (20M) and measure SAR for QPSK with 1 RB allocation, using the RB offset and required test channel combination with the highest maximum output power among RB offset the upper edge, middle and lower edge of each required test channel.

7. Worst case SAR for 50% RB allocation is selected to be tested.

SAR SIMULTANEOUS TRANSMISSION DESCRIPTION

BT& Wi-Fi and LTE&GSM&3G Antennas Location:



Simultaneous Transmission:

Description of Simultaneous Transmit Capabilities			Antennas Distance (mm)
Transmitter Combination	Simultaneous?	Hotspot?	
GSM + WCDMA	×	×	0
GSM + LTE	×	×	0
GSM + Bluetooth	√	×	116
GSM + Wi-Fi	√	√	116
WCDMA + LTE	×	×	0
WCDMA + Bluetooth	√	×	116
WCDMA + Wi-Fi	√	√	116
LTE+ Bluetooth	√	×	116
LTE++ Wi-Fi	√	√	116

Standalone SAR test exclusion considerations

Head Position:

Mode	Frequency (MHz)	P_{avg} (dBm)	P_{avg} (mW)	Distance (mm)	Calculated value	Threshold (1-g)	SAR Test Exclusion
GSM850	850	23.90	245.47	0	45.26	3.0	No
PCS1900	1900	19.70	93.33	0	25.73	3.0	No
WCDMA850	850	22.60	181.97	0	33.55	3.0	No
WCDMA1900	1900	22.40	173.78	0	47.91	3.0	No
LTE Band 4	1732.5	22.70	186.21	0	48.98	3.0	No
LTE Band 7	2535	22.50	177.83	0	56.90	3.0	No
Wi-Fi	2450	9.60	9.12	0	**2.86**	3.0	Yes
Bluetooth	2450	-0.20	0.95	0	**0.30**	3.0	Yes

Body Position:

Mode	Frequency (MHz)	P_{avg} (dBm)	P_{avg} (Mw)	Distance (mm)	Calculated value	Threshold (1-g)	SAR Test Exclusion
GPRS850	850	29.4	870.96	10.00	80.30	3.0	No
GPRS1900	1900	25.3	338.84	10.00	46.71	3.0	No
WCDMA850	850	22.6	181.97	10.00	16.78	3.0	No
WCDMA1900	1900	22.4	173.78	10.00	23.95	3.0	No
LTE Band 4	1732.5	22.7	186.21	10.00	24.49	3.0	No
LTE Band 7	2535	22.5	177.83	10.00	28.45	3.0	No
Wi-Fi	2450	9.6	9.12	10.00	**1.43**	3.0	Yes
Bluetooth	2450	-0.2	0.95	10.00	**0.15**	3.0	Yes

The 1-g and 10-g SAR test exclusion thresholds for 100 MHz to 6 GHz at *test separation distances* ≤ 50 mm are determined by:
[(*max. power of channel, including tune-up tolerance, mW*)/(*min. test separation distance, mm*)] · [√f(GHz)] ≤ 3.0 for 1-g SAR and ≤ 7.5 for 10-g extremity SAR, where
1. f(GHz) is the RF channel transmit frequency in GHz.
2. Power and distance are rounded to the nearest mW and mm before calculation.
3. The result is rounded to one decimal place for comparison.
4. When the minimum test separation distance is < 5 mm, a distance of 5 mm is applied to determine SAR test Exclusion.

Standalone SAR estimation:

Mode	Frequency (GHz)	Distance (mm)	P_{avg} (dBm)	P_{avg} (mW)	Estimated $_{1-g}$ (W/kg)
BT Head	2.45	0	-0.2	0.95	0.040
BT Body	2.45	10	9.6	9.12	0.020
Wi-Fi Head	2.45	0	-0.2	0.95	0.382
Wi-Fi Body	2.45	10	9.6	9.12	0.191

When standalone SAR test exclusion applies to an antenna that transmits simultaneously with other antennas, the standalone SAR must be estimated according to following to determine simultaneous transmission SAR test exclusion:
[(*max. power of channel, including* ***tune-up tolerance****, mW*)/(*min. test separation distance,mm*)]·[√f(GHz)/*x*] W/kg for *test separation distances* ≤ 50 mm;
where *x* = 7.5 for 1-g SAR.
When the minimum test separation distance is < 5 mm, a distance of 5 mm is applied to determine SAR test Exclusion

Simultaneous SAR test exclusion considerations:

GSM with BT:

Mode	Position	Reported SAR (W/kg)		ΣSAR
		GSM	BT	< 1.6W/kg
GSM850	Left Head Cheek	0.454	0.040	0.494
	Left Head Tilt	0.262	0.040	0.302
	Right Head Cheek	0.501	0.040	0.541
	Right Head Tilt	0.284	0.040	0.324
	Body–Headset-Back	0.452	0.020	0.472
PCS1900	Left Head Cheek	0.330	0.040	0.370
	Left Head Tilt	0.141	0.040	0.181
	Right Head Cheek	0.307	0.040	0.347
	Right Head Tilt	0.144	0.040	0.184
	Body–Headset-Back	0.504	0.020	0.524

WCDMA with BT:

Mode	Position	Reported SAR (W/kg)		ΣSAR
		WCDMA	BT	< 1.6W/kg
WCDMA 850	Left Head Cheek	0.120	0.040	0.160
	Left Head Tilt	0.082	0.040	0.122
	Right Head Cheek	0.126	0.040	0.166
	Right Head Tilt	0.077	0.040	0.117
WCDMA 1900	Left Head Cheek	0.218	0.040	0.258
	Left Head Tilt	0.096	0.040	0.136
	Right Head Cheek	0.201	0.040	0.241
	Right Head Tilt	0.103	0.040	0.143

LTE with BT:

Mode	Position	Reported SAR (W/kg)		ΣSAR
		LTE	BT	< 1.6W/kg
LTE BAND4	Left Head Cheek	0.241	0.040	0.281
	Left Head Tilt	0.114	0.040	0.154
	Right Head Cheek	0.222	0.040	0.262
	Right Head Tilt	0.097	0.040	0.137
LTE BAND7	Left Head Cheek	0.334	0.040	0.374
	Left Head Tilt	0.143	0.040	0.183
	Right Head Cheek	0.308	0.040	0.348
	Right Head Tilt	0.155	0.040	0.195

GSM with Wi-Fi:

Mode	Position	Reported SAR (W/kg)		ΣSAR
		GSM	Wi-Fi	< 1.6W/kg
GSM850	Left Head Cheek	0.454	0.382	0.836
	Left Head Tilt	0.262	0.382	0.644
	Right Head Cheek	0.501	0.382	**0.883**
	Right Head Tilt	0.284	0.382	0.666
	Body–Headset-Back	0.452	0.191	0.643
PCS1900	Left Head Cheek	0.330	0.382	0.712
	Left Head Tilt	0.141	0.382	0.523
	Right Head Cheek	0.307	0.382	0.689
	Right Head Tilt	0.144	0.382	0.526
	Body–Headset-Back	0.504	0.191	0.695

WCDMA with Wi-Fi:

Mode	Position	Reported SAR (W/kg)		ΣSAR
		WCDMA	Wi-Fi	< 1.6W/kg
WCDMA 850	Left Head Cheek	0.120	0.382	0.502
	Left Head Tilt	0.082	0.382	0.464
	Right Head Cheek	0.126	0.382	0.508
	Right Head Tilt	0.077	0.382	0.459
WCDMA 1900	Left Head Cheek	0.218	0.382	0.600
	Left Head Tilt	0.096	0.382	0.478
	Right Head Cheek	0.201	0.382	0.583
	Right Head Tilt	0.103	0.382	0.485

LTE with Wi-Fi:

Mode	Position	Reported SAR (W/kg)		ΣSAR
		LTE	Wi-Fi	< 1.6W/kg
LTE BAND4	Left Head Cheek	0.241	0.382	0.623
	Left Head Tilt	0.114	0.382	0.496
	Right Head Cheek	0.222	0.382	0.604
	Right Head Tilt	0.097	0.382	0.479
LTE BAND7	Left Head Cheek	0.334	0.382	0.716
	Left Head Tilt	0.143	0.382	0.525
	Right Head Cheek	0.308	0.382	0.690
	Right Head Tilt	0.155	0.382	0.537

Conclusion:

ΣSAR < 1.6 W/kg therefore simultaneous transmission SAR with Volume Scans is **not** required.

Hotspot:

Evaluations for Simultaneous SAR, Mobile Hot Spot Positions					
Test Position	Body-Back (1.0cm)	Body-Left (1.0cm)	Body-Right (1.0cm)	Body-Bottom (1.0cm)	Body-Top (1.0cm)
Mode	Stand Alone 1-g SAR (W/Kg)				
GPRS 850	0.831	0.399	0.175	0.231	/
GPRS 1900	0.959	0.405	0.164	0.774	/
WCDMA850	0.249	0.157	0.077	0.104	/
WCDMA 1900	0.630	0.363	0.196	0.592	/
LTE Band 4	0.605	0.336	0.125	0.508	/
LTE Band7	0.566	0.266	0.097	0.481	/
Wi-Fi	0.191	0.191	0.191	0.191	/
	∑ 1-g SAR(W/Kg)				
GPRS850 + Wi-Fi	1.022	0.590	0.366	0.422	/
GPRS1900 + Wi-Fi	**1.150**	0.596	0.355	0.965	/
WCDMA850 + Wi-Fi	0.440	0.348	0.268	0.295	/
WCDMA 1900 + Wi-Fi	0.821	0.554	0.387	0.783	/
LTE BAND4+ Wi-Fi	0.796	0.527	0.316	0.699	/
LTE BAND7+ Wi-Fi	0.757	0.457	0.288	0.672	/

Note:

If the sum of the 1g SAR measured for the simultaneously transmitting antennas is less than the SAR limit, SAR measurement for simultaneous transmission is not required.

SAR Plots (Summary of the Highest SAR Values)

Test Laboratory: Bay Area Compliance Lab Corp. (Shenzhen)

Right Head Cheek (836.6 MHz Middle Channel)

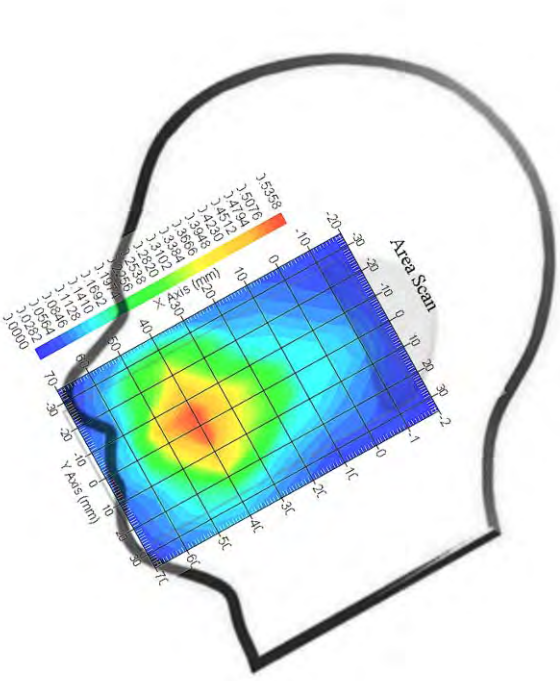
Measurement Data
Test mode : GSM
Crest Factor : 8
Scan Type : Complete
Area Scan : 11x8x1: Measurement x=10mm, y=10mm, z=4mm
Zoom Scan : 7x7x7: Measurement x=5mm, y=5mm, z=5mm
Power Drift-Start : 0.024 W/kg
Power Drift-Finish : 0.024 W/kg
Power Drift (%) : -2.287

Tissue Data
Type : Head
Frequency : 836.6 MHz
Epsilon : 41.04 F/m
Sigma : 0.92 S/m
Density : 1000.00 kg/cu. m

Probe Data
Serial No. : 500-00283
Frequency Band : 835
Duty Cycle Factor : 8
Conversion Factor : 5.9
Probe Sensitivity : 1.20 1.20 1.20 µV/(V/m)2
Compression Point : 95.00 mV
Offset : 1.56 mm

1 gram SAR value : 0.473 W/kg
10 gram SAR value : 0.260 W/kg
Area Scan Peak SAR : 0.535 W/kg
Zoom Scan Peak SAR : 0.849 W/kg

Plot 1#



Test Laboratory: Bay Area Compliance Lab Corp. (Shenzhen)

Left Head Cheek(1880.0 MHz Middle Channel)

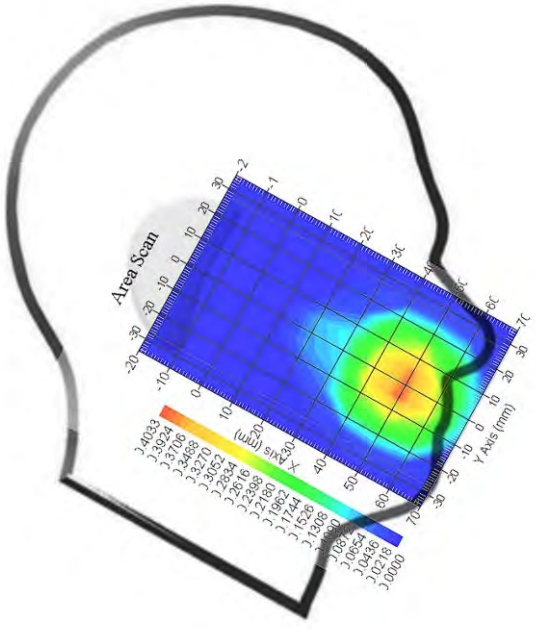
Measurement Data
Test mode : GSM
Crest Factor : 8
Scan Type : Complete
Area Scan : 11x8x1 : Measurement x=10mm, y=10mm, z=4mm
Zoom Scan : 7x7x7 : Measurement x=5mm, y=5mm, z=5mm
Power Drift-Start : 0.001 W/kg
Power Drift-Finish : 0.001 W/kg
Power Drift (%) : -1.965

Tissue Data
Type : Head
Frequency : 1880.0 MHz
Epsilon : 39.56 F/m
Sigma : 1.40 S/m
Density : 1000.00 kg/cu. M

Probe Data
Serial No. : 500-00283
Frequency Band : 1900
Duty Cycle Factor : 8
Conversion Factor : 4.8
Probe Sensitivity : 1.20 1.20 1.20 µV/(V/m)2
Compression Point : 95.00 mV
Offset : 1.56 mm

1 gram SAR value : 0.325 W/kg
10 gram SAR value : 0.176 W/kg
Area Scan Peak SAR : 0.403 W/kg
Zoom Scan Peak SAR : 0.632 W/kg

Plot 2#



Test Laboratory: Bay Area Compliance Lab Corp. (Shenzhen)

WCDMA850; Right Head Cheek (836.6 MHz Middle Channel)

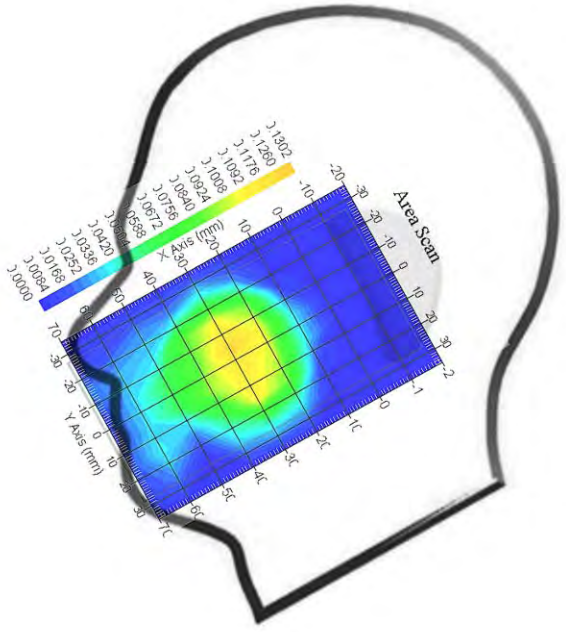
Measurement Data
Test mode : WCDMA850
Crest Factor : 1
Scan Type : Complete
Area Scan : 11x8x1: Measurement x=10mm, y=10mm, z=4mm
Zoom Scan : 7x7x7: Measurement x=5mm, y=5mm, z=5mm
Power Drift-Start : 0.002 W/kg
Power Drift-Finish : 0.002 W/kg
Power Drift (%) : -3.599

Tissue Data
Type : Head
Frequency : 836.6 MHz
Epsilon : 41.04 F/m
Sigma : 0.92 S/m
Density : 1000.00 kg/cu. m

Probe Data
Serial No. : 500-00283
Frequency Band : 835
Duty Cycle Factor : 1
Conversion Factor : 5.9
Probe Sensitivity : 1.20 1.20 1.20 µV/(V/m)2
Compression Point : 95.00 mV
Offset : 1.56 mm

1 gram SAR value : 0.125 W/kg
10 gram SAR value : 0.063 W/kg
Area Scan Peak SAR : 0.130 W/kg
Zoom Scan Peak SAR : 0.174 W/kg

Plot 3#



Test Laboratory: Bay Area Compliance Lab Corp. (Shenzhen)

WCDMA1900; Left Head Cheek (1852.4 MHz Low Channel)

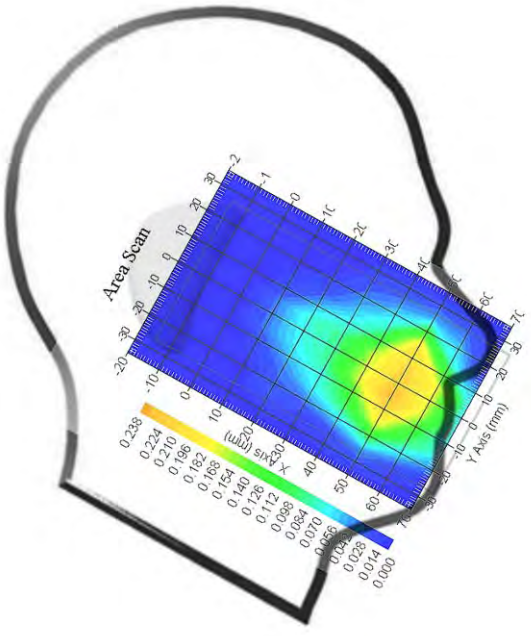
Measurement Data
Test mode : WCDMA1900
Crest Factor : 1
Scan Type : Complete
Area Scan : 11x9x1: Measurement x=10mm, y=10mm, z=4mm
Zoom Scan : 7x7x7: Measurement x=5mm, y=5mm, z=5mm
Power Drift-Start : 0.002 W/kg
Power Drift-Finish : 0.002 W/kg
Power Drift (%) : -2.912

Tissue Data
Type : Head
Frequency : 1852.4 MHz
Epsilon : 39.70 F/m
Sigma : 1.37 S/m
Density : 1000.00 kg/cu. m

Probe Data
Serial No. : 500-00283
Frequency Band : 1900
Duty Cycle Factor : 1
Conversion Factor : 4.8
Probe Sensitivity : 1.20 1.20 1.20 µV/(V/m)2
Compression Point : 95.00 mV
Offset : 1.56 mm

1 gram SAR value : 0.215 W/kg
10 gram SAR value : 0.135 W/kg
Area Scan Peak SAR : 0.234 W/kg
Zoom Scan Peak SAR : 0.369 W/kg

Plot 4#



Test Laboratory: Bay Area Compliance Lab Corp. (Shenzhen)

LTE FDD Band4; Left-Head-Cheek (1745 MHz High Channel);

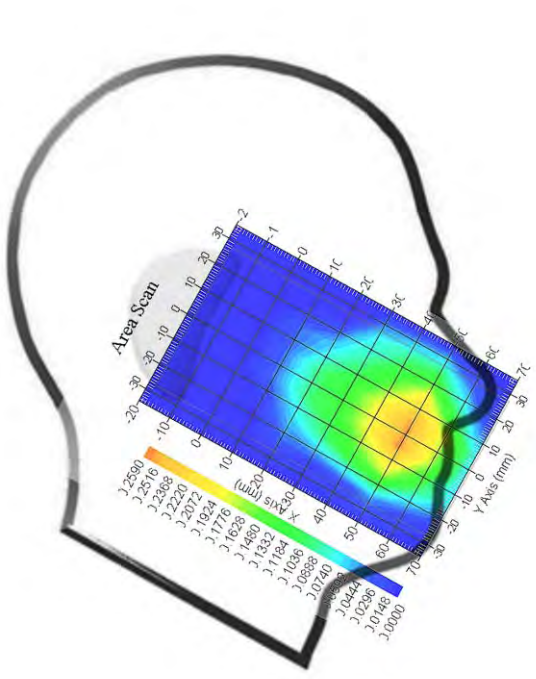
Measurement Data
Test mode : RB1
Crest Factor : 1
Scan Type： : Complete
Area Scan : 8x11x1 : Measurement x=10mm, y=10mm, z=4mm
Zoom Scan : 7x7x7 : Measurement x=5mm, y=5mm, z=5mm
Power Drift-Start : 0.002 W/kg
Power Drift-Finish : 0.002 W/kg
Power Drift (%) : -1.698

Tissue Data
Type : Head
Frequency : 1745 MHz
Epsilon : 39.35 F/m
Sigma : 1.38 S/m
Density : 1000.00 kg/cu. m

Probe Data
Serial No. : 500-00283
Frequency Band : 1750
Duty Cycle Factor : 1
Conversion Factor : 5.4
Probe Sensitivity : 1.20 1.20 1.20 μV/(V/m)2
Compression Point : 95.00 mV
Offset : 1.56 mm

1 gram SAR value : 0.236 W/kg
10 gram SAR value : 0.147 W/kg
Area Scan Peak SAR : 0.259 W/kg
Zoom Scan Peak SAR : 0.375 W/kg

Plot 5#

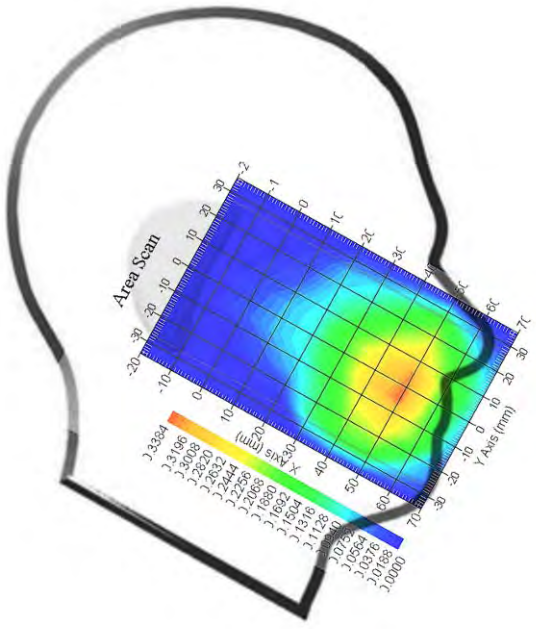


Test Laboratory: Bay Area Compliance Lab Corp. (Shenzhen)

LTE FDD Band7; Left-Head-Cheek (2560 MHz High Channel);

Measurement Data	
Test mode	: RB1
Crest Factor	: 1
Scan Type：	: Complete
Area Scan	: 8x11x1 : Measurement x=10mm, y=10mm, z=4mm
Zoom Scan	: 7x7x7 : Measurement x=5mm, y=5mm, z=5mm
Power Drift-Start	: 0.001 W/kg
Power Drift-Finish	: 0.001 W/kg
Power Drift (%)	: -2.756
Tissue Data	
Type	: Head and Body
Frequency	: 2560 MHz
Epsilon	: 39.84 F/m
Sigma	: 1.82 S/m
Density	: 1000.00 kg/cu. m
Probe Data	
Serial No.	: 500-00283
Frequency Band	: 2450
Duty Cycle Factor	: 1
Conversion Factor	: 4.9
Probe Sensitivity	: 1.20 1.20 1.20 µV/(V/m)2
Compression Point	: 95.00 mV
Offset	: 1.56 mm
1 gram SAR value	: 0.326 W/kg
10 gram SAR value	: 0.198 W/kg
Area Scan Peak SAR	: 0.334 W/kg
Zoom Scan Peak SAR	: 0.498 W/kg

Plot 6#



Test Laboratory: Bay Area Compliance Lab Corp. (Shenzhen)

Body-worn-Back (848.8 MHz High Channel)

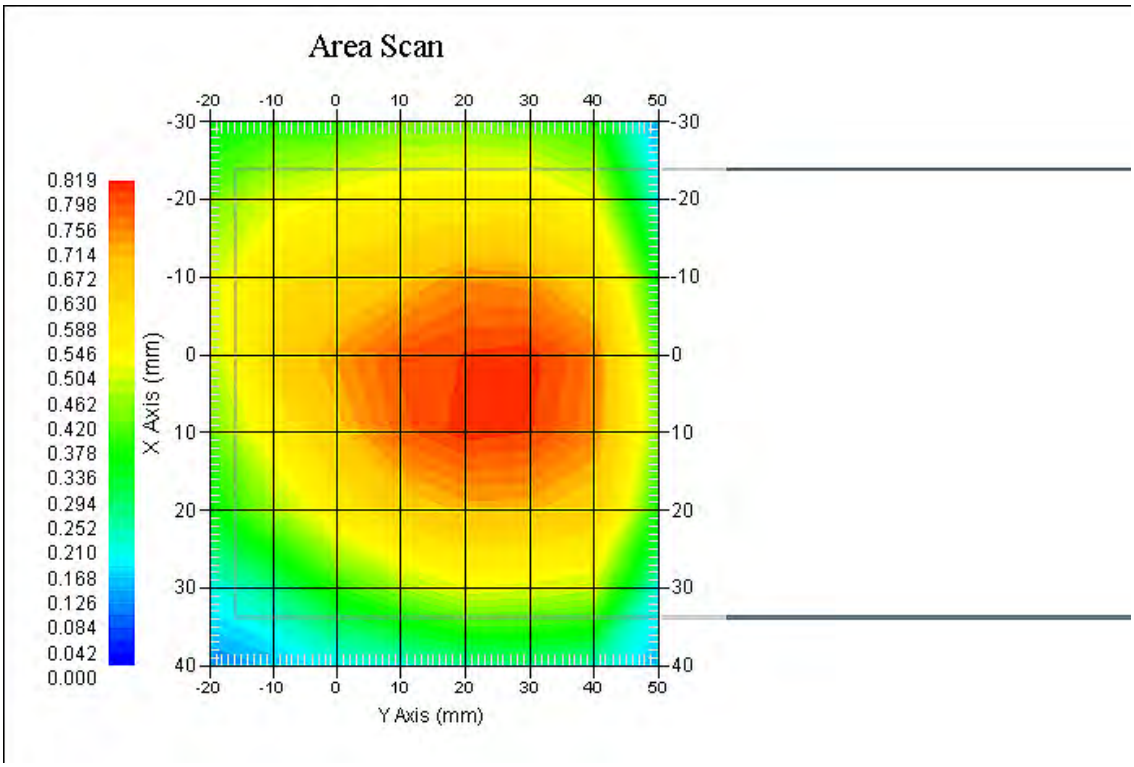
Measurement Data
Test mode : GPRS
Crest Factor : 2
Scan Type： : Complete
Area Scan : 8x11x1 : Measurement x=10mm, y=10mm, z=4mm
Zoom Scan : 7x7x7 : Measurement x=5mm, y=5mm, z=5mm
Power Drift-Start : 0.628 W/kg
Power Drift-Finish : 0.613 W/kg
Power Drift (%) : -2.574

Tissue Data
Type : Body
Frequency : 848.8 MHz
Epsilon : 53.83 F/m
Sigma : 0.97 S/m
Density : 1000.00 kg/cu. m

Probe Data
Serial No. : 500-00283
Frequency Band : 835
Duty Cycle Factor : 2
Conversion Factor : 5.9
Probe Sensitivity : 1.20 1.20 1.20 µV/(V/m)2
Compression Point : 95.00 mV
Offset : 1.56 mm

1 gram SAR value : 0.825 W/kg
10 gram SAR value : 0.651 W/kg
Area Scan Peak SAR : 0.817 W/kg
Zoom Scan Peak SAR : 1.263 W/kg

Plot 7#



Test Laboratory: Bay Area Compliance Lab Corp. (Shenzhen)

Body-worn-Back (1850.2 MHz Low Channel)

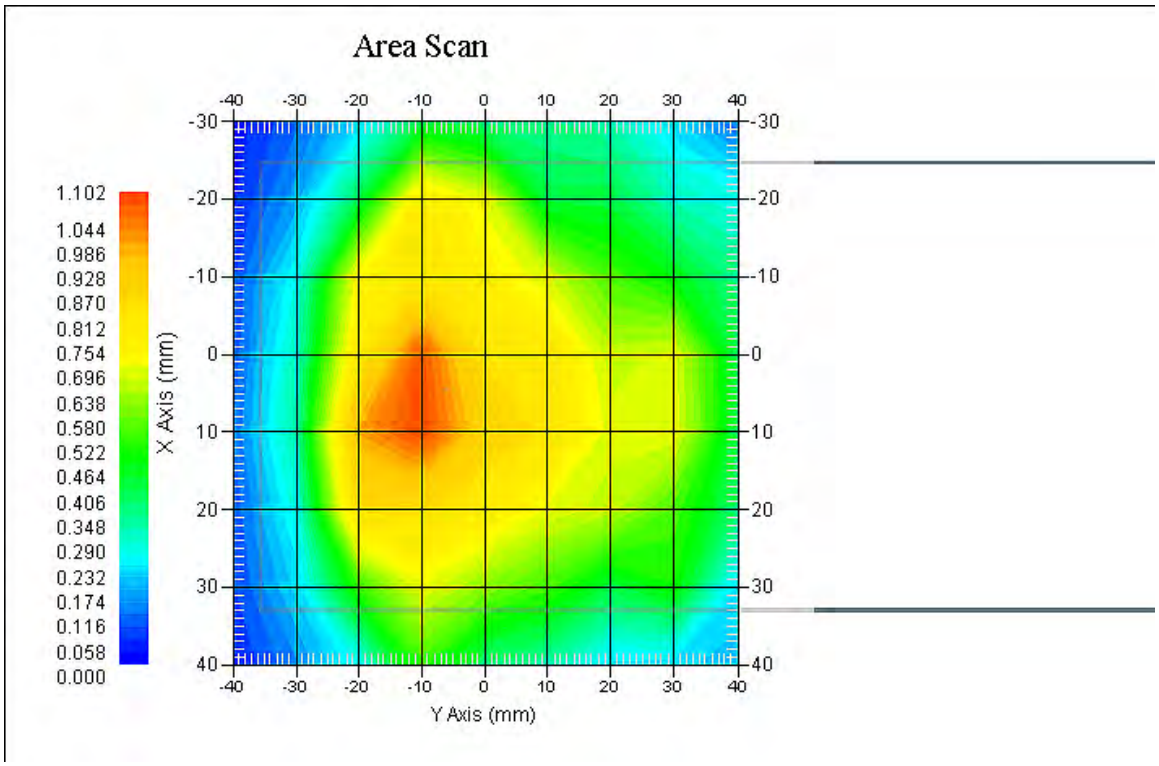
Measurement Data
Test mode : GPRS
Crest Factor : 2
Scan Type : Complete
Area Scan : 8x11x1 : Measurement x=10mm, y=10mm, z=4mm
Zoom Scan : 7x7x7 : Measurement x=5mm, y=5mm, z=5mm
Power Drift-Start : 0.289 W/kg
Power Drift-Finish : 0.287 W/kg
Power Drift (%) : -0.692

Tissue Data
Type : Body
Frequency : 1850.2 MHz
Epsilon : 52.09 F/m
Sigma : 1.50 S/m
Density : 1000.00 kg/cu. m

Probe Data
Serial No. : 500-00283
Frequency Band : 1900
Duty Cycle Factor : 2
Conversion Factor : 4.5
Probe Sensitivity : 1.20 1.20 1.20 µV/(V/m)2
Compression Point : 95.00 mV
Offset : 1.56 mm

1 gram SAR value : 0.952 W/kg
10 gram SAR value : 0.701 W/kg
Area Scan Peak SAR : 1.101 W/kg
Zoom Scan Peak SAR : 1.596 W/kg

Plot 8#



Test Laboratory: Bay Area Compliance Lab Corp. (Shenzhen)

WCDMA850; Body-Worn-Back (836.6 MHz Middle Channel)

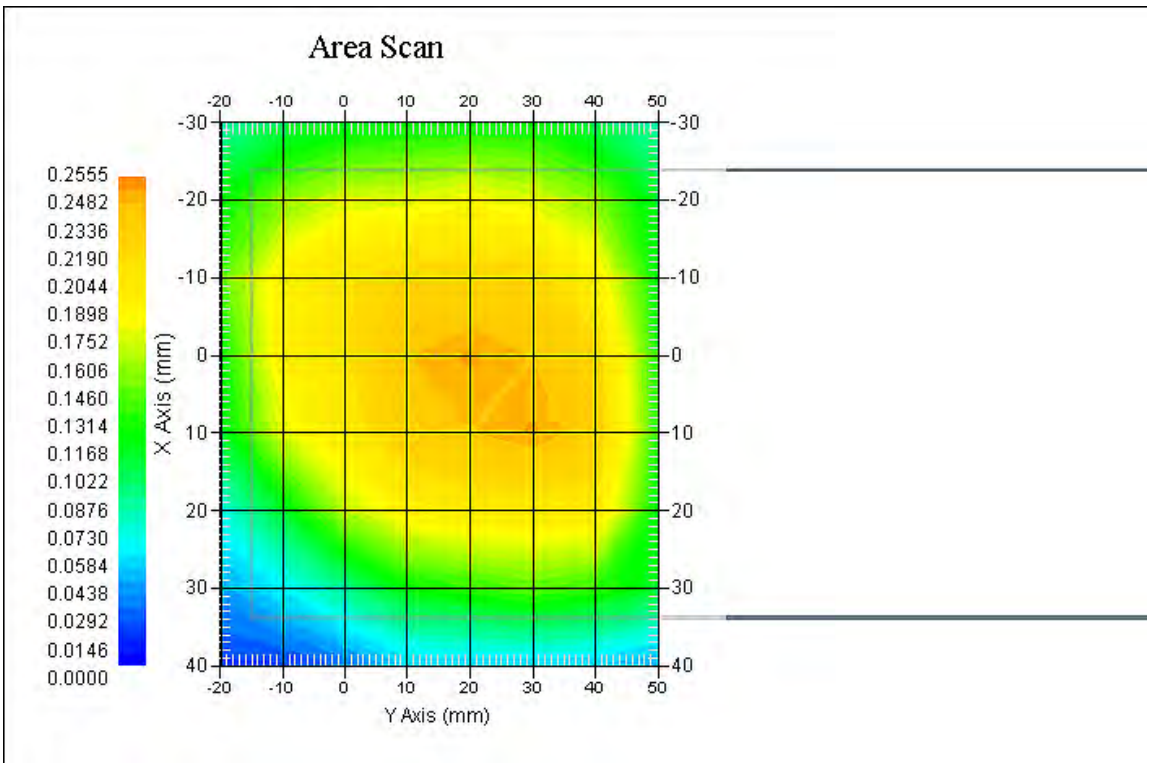
Measurement Data
Test mode : WCDMA850
Crest Factor : 1
Scan Type : Complete
Area Scan : 11x8x1: Measurement x=10mm, y=10mm, z=4mm
Zoom Scan : 7x7x7: Measurement x=5mm, y=5mm, z=5mm
Power Drift-Start : 0.185 W/kg
Power Drift-Finish : 0.183 W/kg
Power Drift (%) : -1.269

Tissue Data
Type : Body
Frequency : 836.6 MHz
Epsilon : 53.85 F/m
Sigma : 0.96 S/m
Density : 1000.00 kg/cu. m

Probe Data
Serial No. : 500-00283
Frequency Band : 835
Duty Cycle Factor : 1
Conversion Factor : 5.9
Probe Sensitivity : 1.20 1.20 1.20 µV/(V/m)2
Compression Point : 95.00 mV
Offset : 1.56 mm

1 gram SAR value : 0.247 W/kg
10 gram SAR value : 0.198 W/kg
Area Scan Peak SAR : 0.255 W/kg
Zoom Scan Peak SAR : 0.326 W/kg

Plot 9#



Test Laboratory: Bay Area Compliance Lab Corp. (Shenzhen)

WCDMA1900; Body-Worn-Back (1852.4 MHz Low Channel)

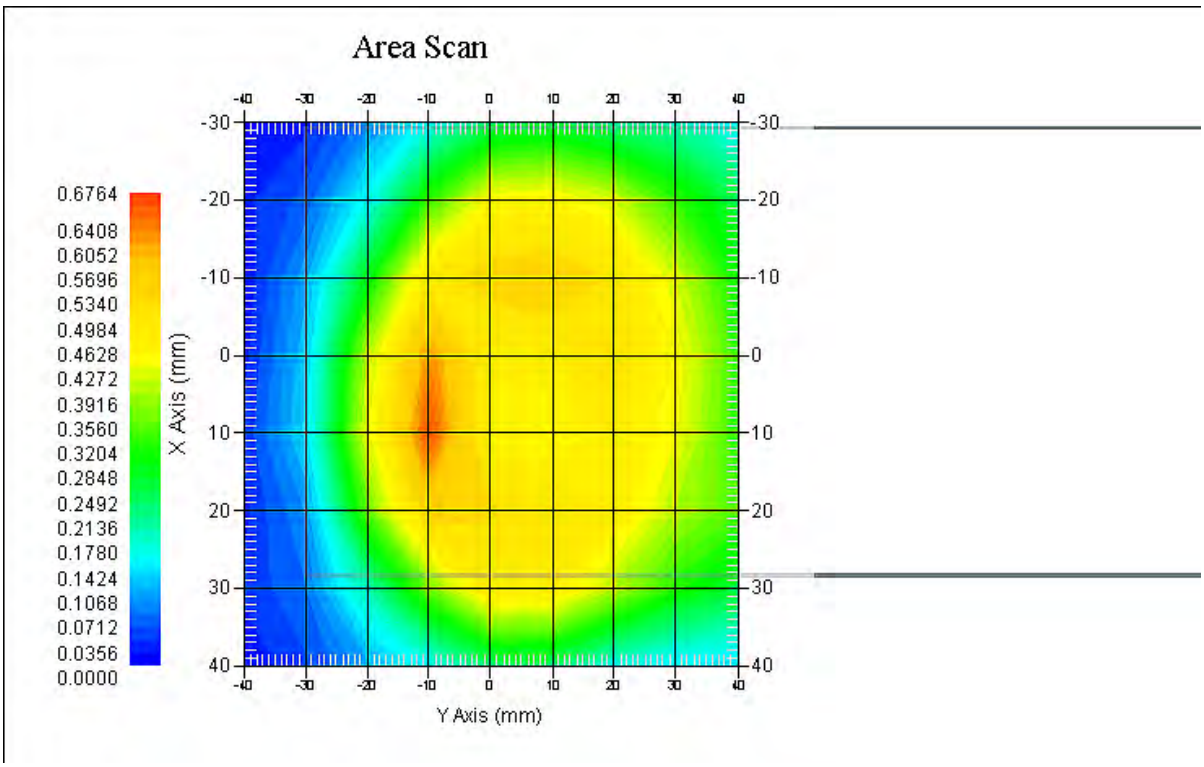
Measurement Data
Test mode : WCDMA1900
Crest Factor : 1
Scan Type : Complete
Area Scan : 11x9x1: Measurement x=10mm, y=10mm, z=4mm
Zoom Scan : 7x7x7: Measurement x=5mm, y=5mm, z=5mm
Power Drift-Start : 0.477 W/kg
Power Drift-Finish : 0.471 W/kg
Power Drift (%) : -1.395

Tissue Data
Type : Body
Frequency : 1852.4 MHz
Epsilon : 51.94 F/m
Sigma : 1.48 S/m
Density : 1000.00 kg/cu. m

Probe Data
Serial No. : 500-00283
Frequency Band : 1900
Duty Cycle Factor : 1
Conversion Factor : 4.8
Probe Sensitivity : 1.20 1.20 1.20 µV/(V/m)2
Compression Point : 95.00 mV
Offset : 1.56 mm

1 gram SAR value : 0.623 W/kg
10 gram SAR value : 0.465 W/kg
Area Scan Peak SAR : 0.674 W/kg
Zoom Scan Peak SAR : 1.002 W/kg

Plot 10#



Test Laboratory: Bay Area Compliance Lab Corp. (Shenzhen)

LTE FDD Band4; Body-Worn-Back (1745 MHz High Channel);

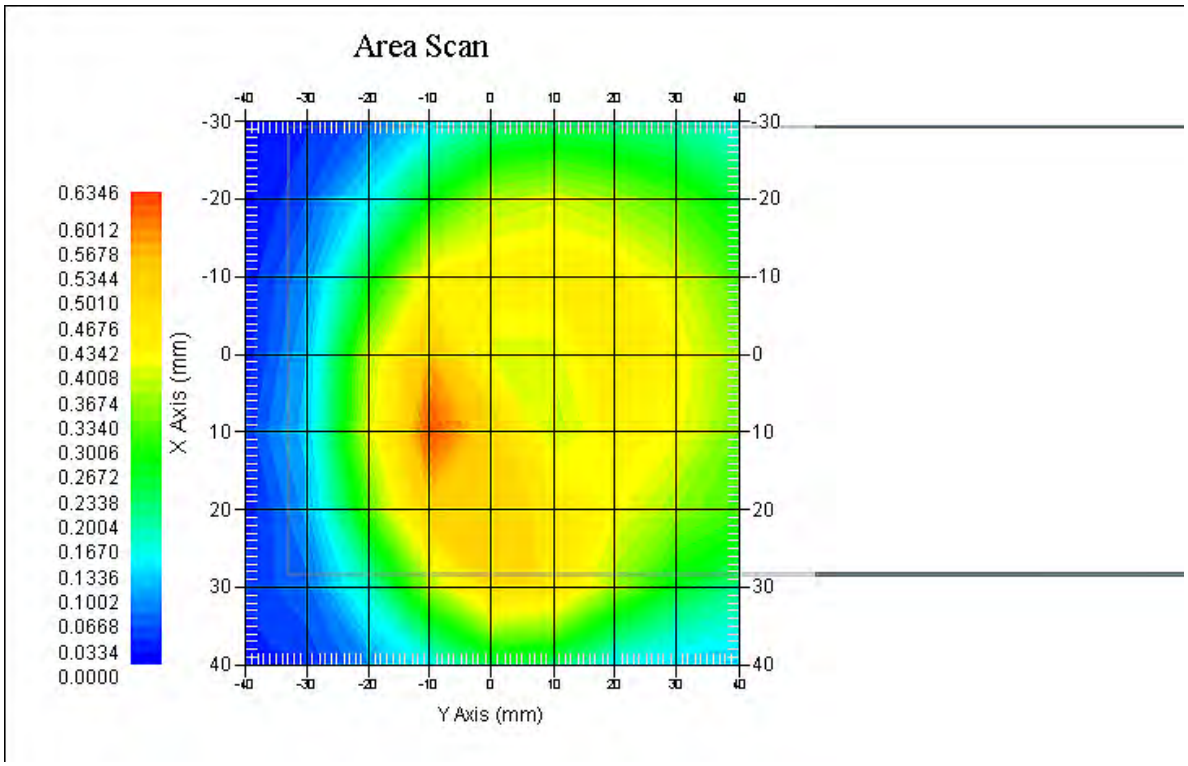
Measurement Data
Test mode : 1RB
Crest Factor : 1
Scan Type： : Complete
Area Scan : 8x11x1 : Measurement x=10mm, y=10mm, z=4mm
Zoom Scan : 7x7x7 : Measurement x=5mm, y=5mm, z=5mm
Power Drift-Start : 0.433 W/kg
Power Drift-Finish : 0.429 W/kg
Power Drift (%) : -0.845

Tissue Data
Type : Body
Frequency : 1745.0 MHz
Epsilon : 52.57 F/m
Sigma : 1.53 S/m
Density : 1000.00 kg/cu. m

Probe Data
Serial No. : 500-00283
Frequency Band : 1750
Duty Cycle Factor : 1
Conversion Factor : 5.3
Probe Sensitivity : 1.20 1.20 1.20 μV/(V/m)2
Compression Point : 95.00 mV
Offset : 1.56 mm

1 gram SAR value : 0.593 W/kg
10 gram SAR value : 0.376 W/kg
Area Scan Peak SAR : 0.633 W/kg
Zoom Scan Peak SAR : 0.912 W/kg

Plot 11#



Test Laboratory: Bay Area Compliance Lab Corp. (Shenzhen)

LTE FDD Band7; Body-Worn-Back (2560 MHz High Channel);

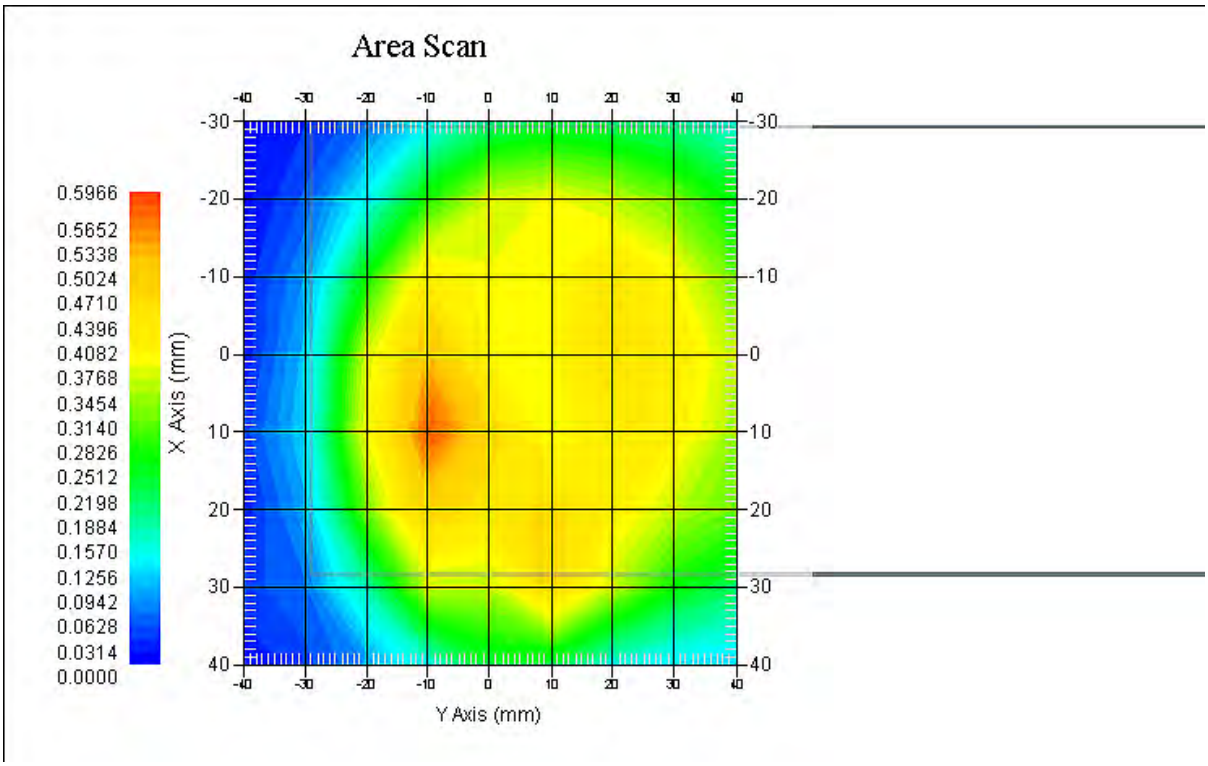
Measurement Data
Test mode : 1RB
Crest Factor : 1
Scan Type： : Complete
Area Scan : 8x11x1 : Measurement x=10mm, y=10mm, z=4mm
Zoom Scan : 7x7x7 : Measurement x=5mm, y=5mm, z=5mm
Power Drift-Start : 0.377 W/kg
Power Drift-Finish : 0.370 W/kg
Power Drift (%) : -1.854

Tissue Data
Type : Body
Frequency : 2560 MHz
Epsilon : 52.87 F/m
Sigma : 1.97 S/m
Density : 1000.00 kg/cu. m

Probe Data
Serial No. : 500-00283
Frequency Band : 2450
Duty Cycle Factor : 1
Conversion Factor : 4.3
Probe Sensitivity : 1.20 1.20 1.20 µV/(V/m)2
Compression Point : 95.00 mV
Offset : 1.56 mm

1 gram SAR value : 0.552W/kg
10 gram SAR value : 0.401W/kg
Area Scan Peak SAR : 0.597 W/kg
Zoom Scan Peak SAR : 0.862 W/kg

Plot 12#



APPENDIX A MEASUREMENT UNCERTAINTY

The uncertainty budget has been determined for the measurement system and is given in the following Table.

Measurement Uncertainty for 30MHz to 6GHz

Source of Uncertainty	Tolerance Value	Probability Distribution	Divisor	c_i^1 (1-g)	c_i^1 (10-g)	Standard Uncertainty (1-g) %	Standard Uncertainty (10-g) %
Measurement System							
Probe Calibration	3.5	normal	1	1	1	3.5	3.5
Axial Isotropy	3.7	rectangular	$\sqrt{3}$	$(1\text{-cp})^{1/2}$	$(1\text{-cp})^{1}_{/2}$	1.5	1.5
Hemispherical Isotropy	10.9	rectangular	$\sqrt{3}$	$\sqrt{cp}$	$\sqrt{cp}$	4.4	4.4
Boundary Effect	1.0	rectangular	$\sqrt{3}$	1	1	0.6	0.6
Linearity	4.7	rectangular	$\sqrt{3}$	1	1	2.7	2.7
Detection Limit	1.0	rectangular	$\sqrt{3}$	1	1	0.6	0.6
Readout Electronics	1.0	normal	1	1	1	1.0	1.0
Response Time	0.8	rectangular	$\sqrt{3}$	1	1	0.5	0.5
Integration Time	1.7	rectangular	$\sqrt{3}$	1	1	1.0	1.0
RF Ambient Condition -Noise	0.6	rectangular	$\sqrt{3}$	1	1	0.3	0.3
RF Ambient Condition - Reflections	3.0	rectangular	$\sqrt{3}$	1	1	1.7	1.7
Probe Positioner Mech. Restrictions	0.4	rectangular	$\sqrt{3}$	1	1	0.2	0.2
Restriction							
Probe Positioning with respect to Phantom Shell	2.9	rectangular	$\sqrt{3}$	1	1	1.7	1.7
Extrapolation and Integration	3.7	rectangular	$\sqrt{3}$	1	1	2.1	2.1
Test Sample Positioning	2.3	normal	1	1	1	2.3	2.3
Device Holder Uncertainty	6.215	normal	1	1	1	6.215	6.215
Drift of Output Power	4.627	rectangular	$\sqrt{3}$	1	1	2.67	2.67
Phantom and Setup							
Phantom Uncertainty(shape & thickness tolerance)	3.4	rectangular	$\sqrt{3}$	1	1	2.0	2.0
Liquid Conductivity(target)	5.0	rectangular	$\sqrt{3}$	0.7	0.5	2.0	1.4
Liquid Conductivity(meas.)	1.938	normal	1	0.7	0.5	1.36	0.97
Liquid Permittivity(target)	5.0	rectangular	$\sqrt{3}$	0.6	0.5	1.7	1.4
Liquid Permittivity(meas.)	3.093	normal	1	0.6	0.5	1.86	1.55
Combined Uncertainty		RSS				10.78	10.55
Expanded uncertainty (coverage factor=2)		Normal(k=2)				21.56	21.10

APPENDIX B – PROBE CALIBRATION CERTIFICATES

NCL CALIBRATION LABORATORIES

Calibration File No.: PC-1598

Task No: BACL-5778

CERTIFICATE OF CALIBRATION

It is certified that the equipment identified below has been calibrated in the **NCL CALIBRATION LABORATORIES** by qualified personnel following recognized procedures and using transfer standards traceable to NRC/NIST.

Equipment: Miniature Isotropic RF Probe
Record of Calibration
Head and Body
Manufacturer: APREL Laboratories
Model No.: E-020
Serial No.: 500-00283

Calibration Procedure: D01-032-E020-V2, D22-012-Tissue, D28-002-Dipole
Project No: BACL-5745

Calibrated: 14th October 2014
Released on: 14th October 2014

This Calibration Certificate is Incomplete Unless Accompanied with the Calibration Results Summary

Released By: _____

Art Brennan, Quality Manager

NCL CALIBRATION LABORATORIES
Suite 102, 303 Terry Fox Dr, OTTAWA, ONTARIO CANADA K2K 3J1
Division of APREL Lab. TEL: (613) 435-8300 FAX: (613) 435-8306

NCL Calibration Laboratories
Division of APREL Inc.

Introduction

This Calibration Report reproduces the results of the calibration performed in line with the references listed below. Calibration is performed using accepted methodologies as per the references listed below. Probes are calibrated for air, and tissue and the values reported are the results from the physical quantification of the probe through meteorgical practices.

Calibration Method

Probes are calibrated using the following methods.

<1000MHz
TEM Cell for sensitivity in air
Standard phantom using temperature transfer method for sensitivity in tissue

>1000MHz
Waveguide* method to determine sensitivity in air and tissue
*Waveguide is numerically (simulation) assessed to determine the field distribution and power

The boundary effect for the probe is assessed using a standard flat phantom where the probe output is compared against a numerically simulated series of data points

References

- IEEE Standard 1528
  IEEE Recommended Practice for Determining the Peak Spatial-Average Specific Absorption Rate (SAR) in the Human Head from Wireless Communications Devices: Measurement Techniques
- EN 62209-1
  Human Exposure to RF Fields from hand-held and body-mounted wireless communication devices - Human models, instrumentation, and procedures-Part 1: Procedure to measure the Specific Absorption Rate (SAR) for hand-held mobile wireless devices
- IEC 62209-2
  Human exposure to RF fields from hand-held and body-mounted wireless devices - Human models, instrumentation, and procedures - Part 2: specific absorption rate (SAR) for wireless communication devices (30 MHz - 6 GHz)
- TP-D01-032-E020-V2 E-Field probe calibration procedure
- D22-012-Tissue dielectric tissue calibration procedure
- D28-002-Dipole procedure for validation of SAR system using a dipole
- IEEE 1309 Standard for Calibration of Electromagnetic Field Sensors and Probes, Excluding Antennas, from 9kHz to 40GHz

NCL Calibration Laboratories
Division of APREL Inc.

Conditions

Probe 500-00283 was a recalibration.

Ambient Temperature of the Laboratory:	22 °C +/- 1.5°C
Temperature of the Tissue:	21 °C +/- 1.5°C
Relative Humidity:	< 60%

Primary Measurement Standards

Instrument	**Serial Number**	**Cal due date**
Tektronix USB Power Meter	11C940	May 14, 2015
Signal Generator HP 83640B	3844A00689	Feb 12, 2015

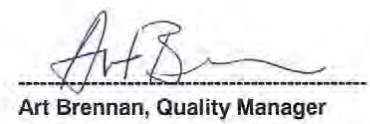
Secondary Measurement Standards

Network Analyzer Anritsu 37347C	002106	Feb. 20, 2015

Attestation

The below named signatories have conducted the calibration and review of the data which is presented in this calibration report.

We the undersigned attest that to the best of our knowledge the calibration of this subject has been accurately conducted and that all information contained within the results pages have been reviewed for accuracy.



Art Brennan, Quality Manager

Dan Brooks, Test Engineer

NCL Calibration Laboratories
Division of APREL Inc.

Probe Summary

Probe Type:	E-Field Probe E020
Serial Number:	500-00283
Frequency:	As presented on page 5
Sensor Offset:	1.56
Sensor Length:	2.5
Tip Enclosure:	Composite*
Tip Diameter:	< 2.9 mm
Tip Length:	55 mm
Total Length:	289 mm

*Resistive to recommended tissue recipes per IEEE-1528

Sensitivity in Air

Channel X:	1.2 μV/(V/m)^2
Channel Y:	1.2 μV/(V/m)^2
Channel Z:	1.2 μV/(V/m)^2
Diode Compression Point:	95 mV

NCL Calibration Laboratories
Division of APREL Inc.

Calibration for Tissue (Head H, Body B)

Frequency	Tissue Type	Measured Epsilon	Measured Sigma	Standard Uncertainty (%)	Calibration Frequency Range (MHz)	Conversion Factor
450 H	Head	43.59	0.86	3.5	±50	5.7
450 B	Body	56.74	0.94	3.5	±50	5.8
750 H	Head	42.98	0.92	3.5	±50	6.0
750 B	Body	43.05	0.93	3.5	±50	5.5
835 H	Head	43.42	0.94	3.5	±50	5.9
835 B	Body	55.77	1.01	3.5	±50	5.9
900 H	Head	41.87	1.06	3.5	±50	6.0
900 B	Body	55.62	1.05	3.5	±50	5.9
1450 H	Head	X	X	X	X	X
1450 B	Body	X	X	X	X	X
1500 H	Head	X	X	X	X	X
1500 B	Body	X	X	X	X	X
1640 H	Head	X	X	X	X	X
1640 B	Body	X	X	X	X	X
1750 H	Head	38.23	1.38	3.5	±75	5.4
1750 B	Body	52.86	1.54	3.5	±75	5.3
1800 H	Head	X	X	X	X	X
1800 B	Body	X	X	X	X	X
1900 H	Head	40.20	1.38	3.5	±75	4.8
1900 B	Body	52.63	1.46	3.5	±75	4.5
2000 H	Head	X	X	X	X	X
2000 B	Body	X	X	X	X	X
2100 H	Head	X	X	X	X	X
2100 B	Body	X	X	X	X	X
2300 H	Head	X	X	X	X	X
2300 B	Body	X	X	X	X	X
2450 H	Head	37.26	1.84	3.5	±75	4.9
2450B	Body	53.61	1.9	3.5	±75	4.3
3000 H	Head	X	X	X	X	X
3000 B	Body	X	X	X	X	X
3600 H	Head	37.49	3.16	3.5	±100	4.5
3600 B	Body	49.94	3.86	3.5	±100	4.0
5250 H	Head	35.51	4.78	3.5	±100	3.0
5250 B	Body	47.54	5.11	3.5	±100	2.8
5600 H	Head	36.05	5.15	3.5	±100	2.8
5600 B	Body	46.49	5.72	3.5	±100	2.2
5800 H	Head	45.99	6.01	3.5	±100	3.2
5800 B	Body	35.6	5.37	3.5	±100	2.5

Page 5 of 10
This page has been reviewed for content and attested to on Page 2 of this document.

Boundary Effect:

Uncertainty resulting from the boundary effect is less than 2.1% for the distance between the tip of the probe and the tissue boundary, when less than 0.58mm.

Spatial Resolution:

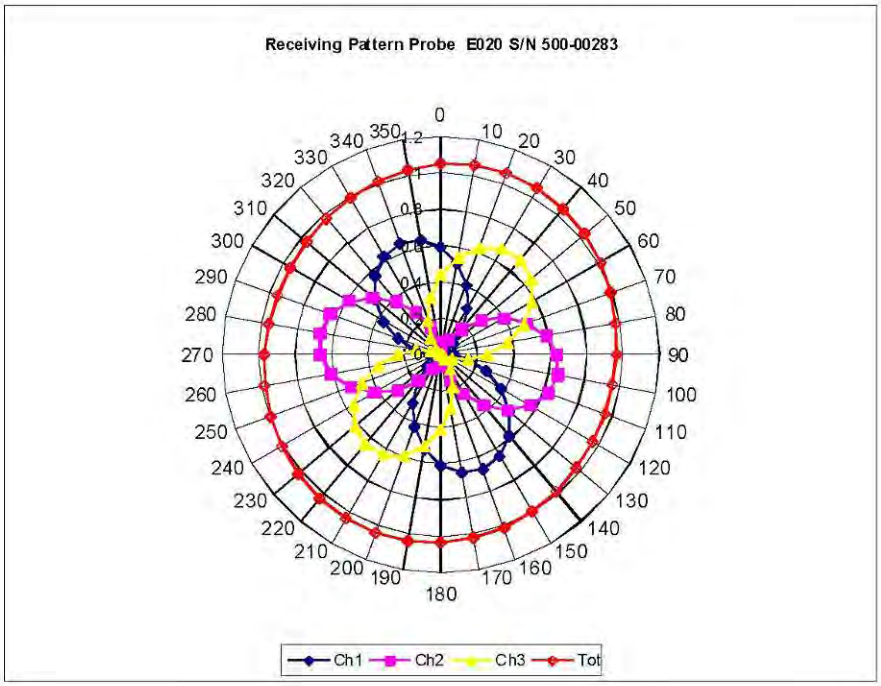
The spatial resolution uncertainty is less than 1.5% for 4.9mm diameter probe.
The spatial resolution uncertainty is less than 1.0% for 2.5mm diameter probe.

DAQ-PAQ Contribution

To minimize the uncertainty calculation all tissue sensitivity values were calculated using a load impedance of 5 MΩ.

NCL Calibration Laboratories
Division of APREL Inc.

Receiving Pattern Air



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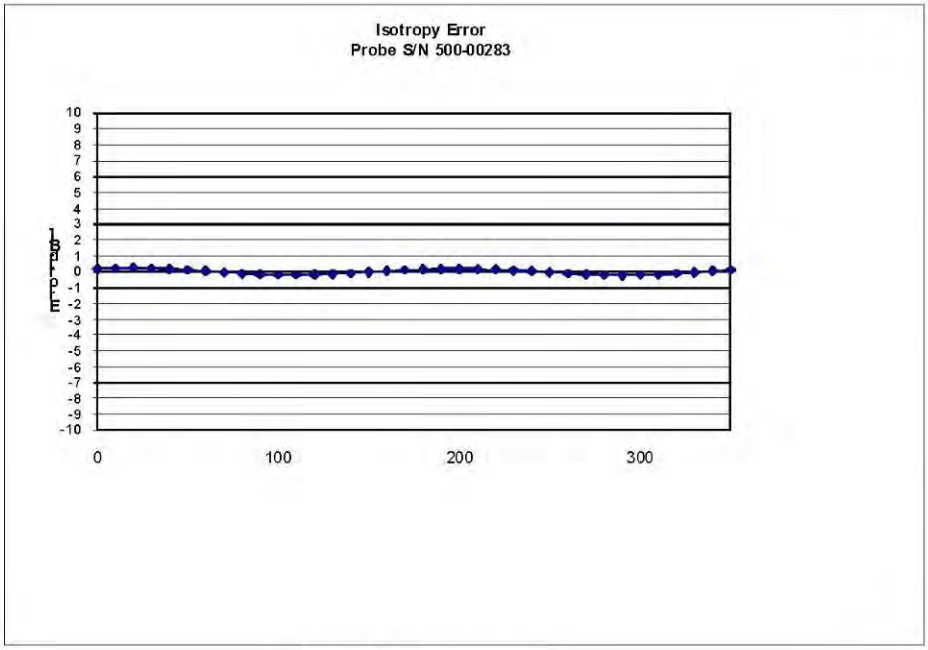
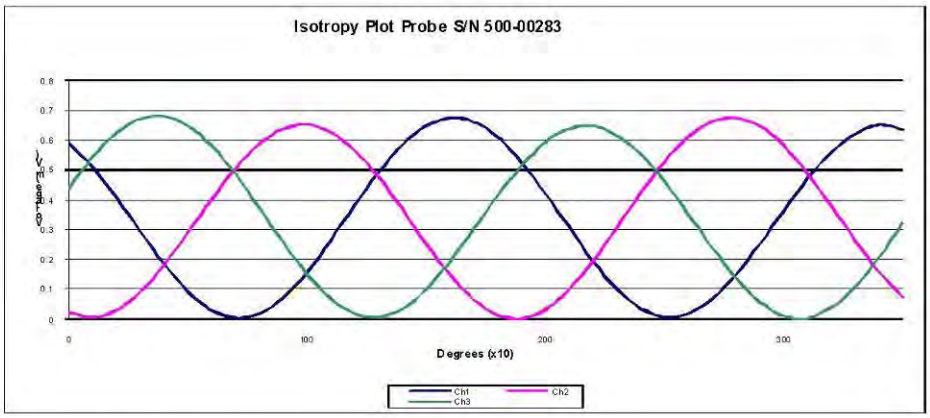
This page has been reviewed for content and attested to on Page 2 of this document.

NCL Calibration Laboratories
Division of APREL Inc.

Isotropy Error Air





Isotropicity Tissue: 0.10 dB

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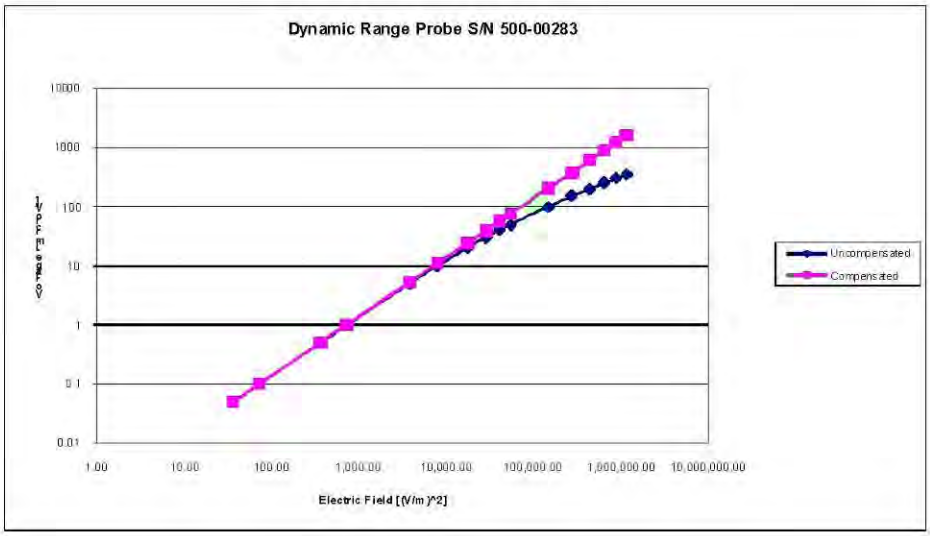
Dynamic Range



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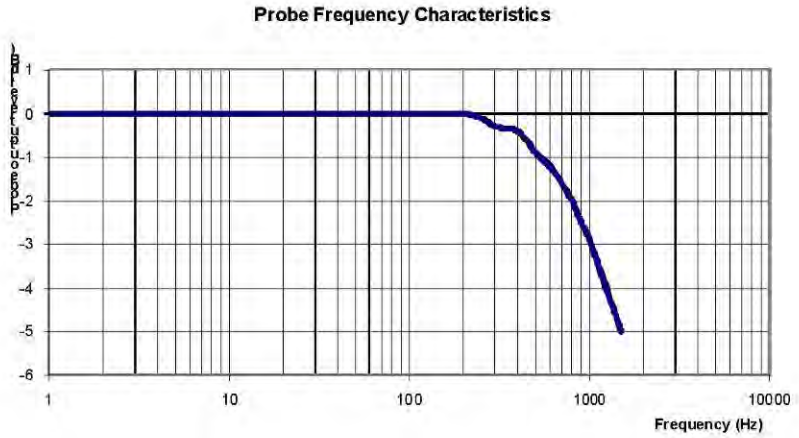
Video Bandwidth



Video Bandwidth at 500 Hz	1 dB
Video Bandwidth at 1.02 KHz:	3 dB

Test Equipment

The test equipment used during Probe Calibration, manufacturer, model number and, current calibration status are listed and located on the main APREL server R:\NCL\Calibration Equipment\Instrument List May 2014.

APPENDIX C DIPOLE CALIBRATION CERTIFICATES

NCL CALIBRATION LABORATORIES

Calibration File No: DC-1599
Project Number: BAC-dipole-cal-5779

CERTIFICATE OF CALIBRATION

It is certified that the equipment identified below has been calibrated in the **NCL CALIBRATION LABORATORIES** by qualified personnel following recognized procedures and using transfer standards traceable to NRC/NIST.

Validation Dipole(Head and Body)

Manufacturer: APREL Laboratories
Part number: ALS-D-835-S-2
Frequency: 835 MHz
Serial No: 180-00558

Customer: Bay Area Compliance Laboratory (China)

Calibrated: 8th October 2014
Released on: 8th October 2014

This Calibration Certificate is Incomplete Unless Accompanied with the Calibration Results Summary

Released By: _____

Art Brennan, Quality Manager

NCL CALIBRATION LABORATORIES

Suite 102, 303 Terry Fox Dr.
Kanata, ONTARIO
CANADA K2K 3J1

Division of APREL Lab.
TEL: (613) 435-8300
FAX: (613)435-8306

NCL Calibration Laboratories
Division of APREL Laboratories.

Conditions

Dipole 180-00558 was received with a damaged connection for a re-calibration.

Ambient Temperature of the Laboratory:	22 °C +/- 0.5°C
Temperature of the Tissue:	21 °C +/- 0.5°C

Attestation

The below named signatories have conducted the calibration and review of the data which is presented in this calibration report.

We the undersigned attest that to the best of our knowledge the calibration of this subject has been accurately conducted and that all information contained within the results pages have been reviewed for accuracy.

Art Brennan, Quality Manager

Maryna Nesterova Calibration Engineer

Primary Measurement Standards

Instrument	**Serial Number**	**Cal due date**
Tektronix USB Power Meter	11C940	May 14, 2015
Network Analyzer Anritsu 37347C	002106	Feb. 20, 2015

This page has been reviewed for content and attested to by signature within this document.

NCL Calibration Laboratories
Division of APREL Laboratories.

Calibration Results Summary

The following results relate the Calibrated Dipole and should be used as a quick reference for the user.

Mechanical Dimensions

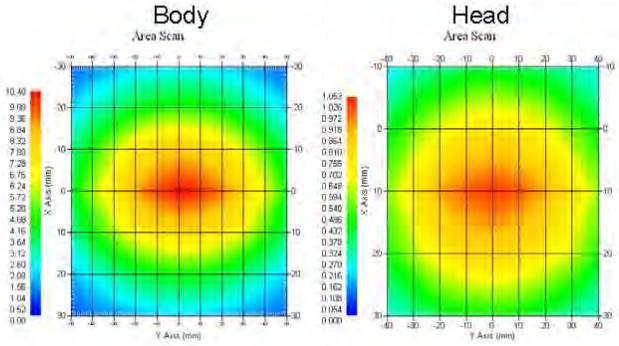
Length: 162.2 mm
Height: 89.4 mm

Electrical Specification

Tissue	Frequency	SWR:	Return Loss	Impedance
Head	835 MHz	1.066 U	-30.344 dB	49.001 Ω
Body	835 MHz	1.089 U	-28.118 dB	53.117 Ω

System Validation Results

Tissue	Frequency	1 Gram	10 Gram	Peak
Head	835 MHz	9.773	6.174	14.713
Body	835 MHz	9.736	6.297	14.513



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This page has been reviewed for content and attested to by signature within this document.

NCL Calibration Laboratories
Division of APREL Laboratories.

Introduction

This Calibration Report has been produced in line with the SSI Dipole Calibration Procedure SSI-TP-018-ALSAS. The results contained within this report are for Validation Dipole 180-00558. The calibration routine consisted of a three-step process. Step 1 was a mechanical verification of the dipole to ensure that it meets the mechanical specifications. Step 2 was an Electrical Calibration for the Validation Dipole, where the SWR, Impedance, and the Return loss were assessed. Step 3 involved a System Validation using the ALSAS-10U, along with APREL E-020 30 MHz to 6 GHz E-Field Probe Serial Number 225.

References

- IEC-62209 "Human exposure to radio frequency fields from hand-held and body-mounted wireless communication devices – Human models, instrumentation, and procedures"
- Part 2: "Procedure to determine the Specific Absorption Rate (SAR) for hand-held devices used in close proximity of the ear (frequency range of 30 MHz to 6 GHz)"
- TP-D01-032-E020-V2 E-Field probe calibration procedure
- D22-012-Tissue dielectric tissue calibration procedure
- D28-002-Dipole procedure for validation of SAR system using a dipole
- IEEE 1309 Draft Standard for Calibration of Electromagnetic Field Sensors and Probes, Excluding Antennas, from 9kHz to 40GHz

Conditions

Dipole 180-00558 was repaired prior to this calibration. The repair reliability depends upon correct usage of the dipole.

Ambient Temperature of the Laboratory: 22 °C +/- 0.5°C
Temperature of the Tissue: 20 °C +/- 0.5°C

Dipole Calibration uncertainty

The calibration uncertainty for the dipole is made up of various parameters presented below.

Mechanical	1%
Positioning Error	1.22%
Electrical	1.7%
Tissue	2.2%
Dipole Validation	2.2%
TOTAL	**8.32% (16.64% K=2)**

This page has been reviewed for content and attested to by signature within this document.

NCL Calibration Laboratories
Division of APREL Laboratories.

Dipole Calibration Results

Mechanical Verification

APREL Length	APREL Height	Measured Length	Measured Height
161.0 mm	89.8 mm	162.2 mm	89.4 mm

Electrical Verification

Tissue Type	Return Loss:	SWR:	Impedance:
Head	-30.344 dB	1.066 U	49.001Ω
Body	-28.118 dB	1.089 U	53.117 Ω □

Tissue Validation

	Dielectric constant, ε_r	Conductivity, σ [S/m]
Head Tissue 835MHz	43.42	0.94
Body Tissue 835MHz	55.77	1.01

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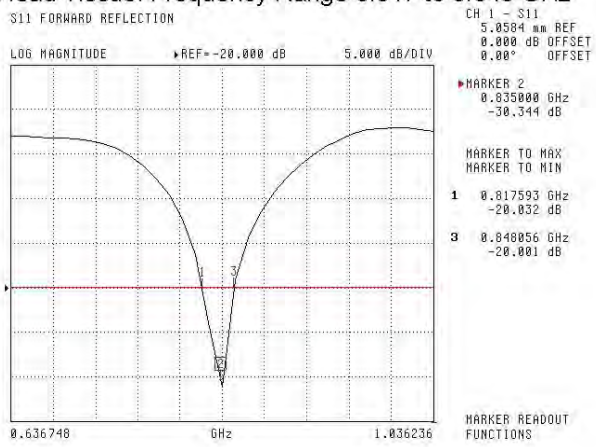
This page has been reviewed for content and attested to by signature within this document.

NCL Calibration Laboratories
Division of APREL Laboratories.

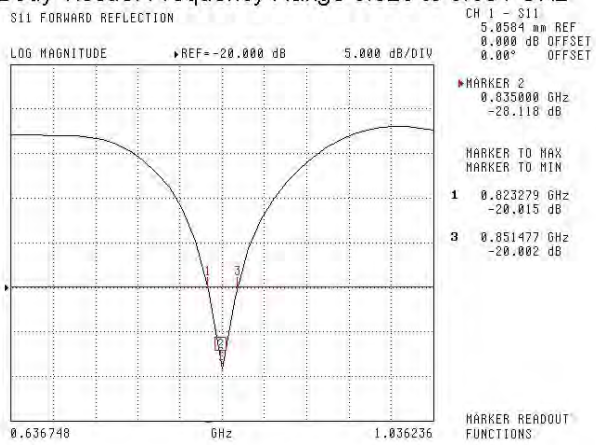
The Following Graphs are the results as displayed on the Vector Network Analyzer.

S11 Parameter Return Loss

Head Tissue: Frequency Range 0.817 to 0.848 GHz



Body Tissue: Frequency Range 0.823 to 0.851 GHz



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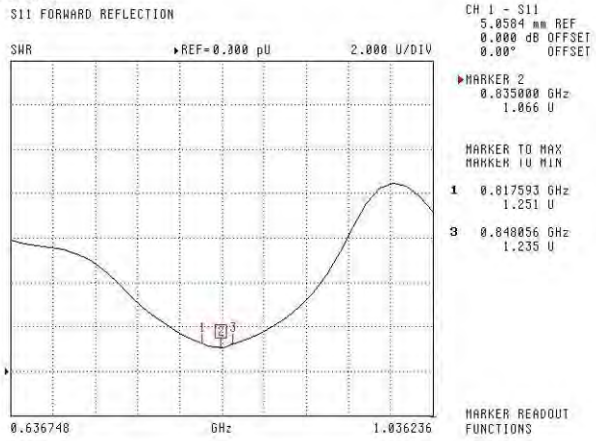
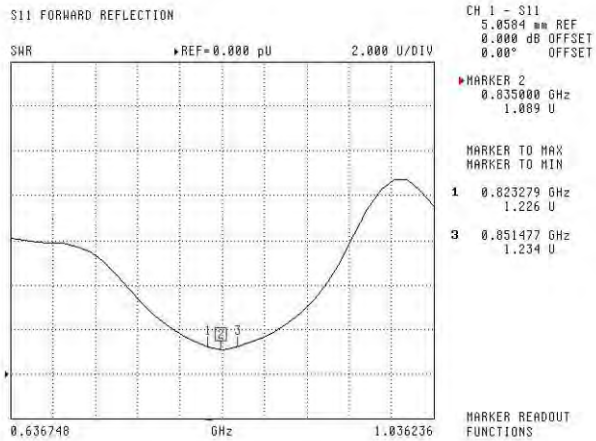
SWR

Head



Body



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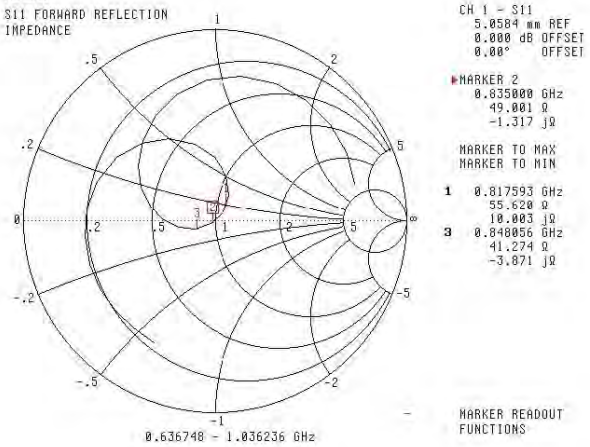
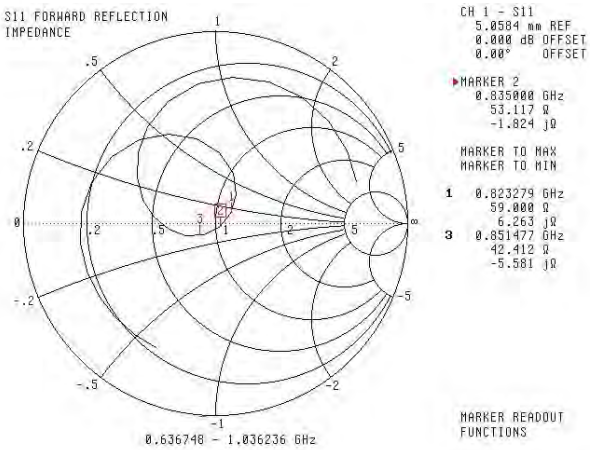
NCL Calibration Laboratories
Division of APREL Laboratories.

Smith Chart Dipole Impedance

Head



Body



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This page has been reviewed for content and attested to by signature within this document.

NCL Calibration Laboratories
Division of APREL Laboratories.

Test Equipment

The test equipment used during Probe Calibration, manufacturer, model number and, current calibration status are listed and located on the main APREL server R:\NCL\Calibration Equipment\Instrument List 2014.

This page has been reviewed for content and attested to by signature within this document.

NCL CALIBRATION LABORATORIES

Calibration File No: DC-1531
Project Number: BACL-5745

CERTIFICATE OF CALIBRATION

It is certified that the equipment identified below has been calibrated in the **NCL CALIBRATION LABORATORIES** by qualified personnel following recognized procedures and using transfer standards traceable to NRC/NIST.

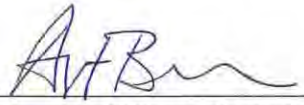
BACL Head & Body Validation Dipole

Manufacturer: APREL Laboratories
Part number: ALS-D-1750-S-2
Frequency: 1750 MHz
Serial No: 198-00304

Customer: ISL

Calibrated: 8th October, 2013
Released on: 8th October, 2013

This Calibration Certificate is Incomplete Unless Accompanied with the Calibration Results Summary

Released By: 

Art Brennan, Quality Manager

NCL CALIBRATION LABORATORIES

Suite 102, 303 Terry Fox Dr,
OTTAWA, ONTARIO
CANADA K2K 3J1

Division of APREL Lab.
TEL: (613) 435-8300
FAX: (613) 435-8306

NCL Calibration Laboratories
Division of APREL Laboratories.

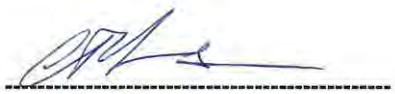
Conditions

Dipole 198-00304 was an original calibration.

Ambient Temperature of the Laboratory:	22 °C +/- 0.5°C
Temperature of the Tissue:	21 °C +/- 0.5°C

We the undersigned attest that to the best of our knowledge the calibration of this subject has been accurately conducted and that all information contained within the results pages have been reviewed for accuracy.

Art Brennan, Quality Manager



Constantin Teodorian, Test Engineer

2

This page has been reviewed for content and attested to by signature within this document.

NCL Calibration Laboratories
Division of APREL Laboratories.

Calibration Results Summary

The following results relate the Calibrated Dipole and should be used as a quick reference for the user.

Mechanical Dimensions

Length: 75 mm
Height: 42 mm

Electrical Calibration

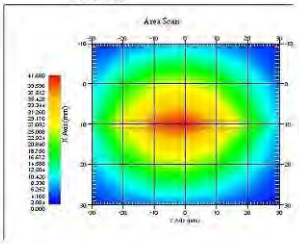
Test	Result Head	Result Body
S11 R/L	-25.567	-20.548 dB
SWR	1.111U	1.207 U
Impedance	53.637Ω	55.929 Ω

System Validation Results, 1750 MHz

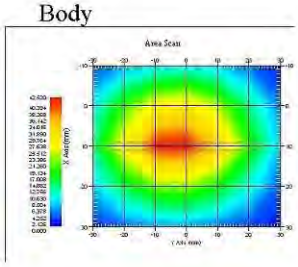
	1g	10g
Head	37.02	18.99
Body	36.65	18.85

Type	Epsilon	Sigma
Head	38.51	1.36
Body	51.79	1.53

Head



Body



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This page has been reviewed for content and attested to by signature within this document.

NCL Calibration Laboratories
Division of APREL Laboratories.

Introduction

This Calibration Report has been produced in line with the SSI Dipole Calibration Procedure SSI-TP-018-ALSAS. The results contained within this report are for Validation Dipole. The calibration routine consisted of a three-step process. Step 1 was a mechanical verification of the dipole to ensure that it meets the mechanical specifications. Step 2 was an Electrical Calibration for the Validation Dipole, where the SWR, Impedance, and the Return loss were assessed. Step 3 involved a System Validation using the ALSAS-10U, along with APREL E-030 130 MHz to 26 GHz E-Field Probe Serial Number 215.

References

SSI-TP-018-ALSAS Dipole Calibration Procedure
SSI-TP-016 Tissue Calibration Procedure
IEEE 1528 "Recommended Practice for Determining the Peak Spatial-Average Specific Absorption Rate (SAR) in the Human Body Due to Wireless Communications Devices: Experimental Techniques"
IEC-62209 "Human exposure to radio frequency fields from hand-held and body-mounted wireless communication devices – Human models, instrumentation, and procedures"
Part 1: "Procedure to determine the Specific Absorption Rate (SAR) for hand-held devices used in close proximity of the ear (frequency range of 300 MHz to 3 GHz)"
IEC-62209 "Human exposure to radio frequency fields from hand-held and body-mounted wireless communication devices – Human models, instrumentation, and procedures"
Part 2 *Draft*: "Procedure to determine the Specific Absorption Rate (SAR) for hand-held devices used in close proximity of the ear (frequency range of 30 MHz to 6 GHz)"

Conditions

Ambient Temperature of the Laboratory:	22 °C +/- 0.5°C
Temperature of the Tissue:	20 °C +/- 0.5°C

This was an original calibration taken from stock.

Dipole Calibration uncertainty

The calibration uncertainty for the dipole is made up of various parameters presented below.

Mechanical	1%
Positioning Error	1.22%
Electrical	1.7%
Tissue	2.2%
Dipole Validation	2.2%
TOTAL	**8.32% (16.64% K=2)**

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This page has been reviewed for content and attested to by signature within this document.

NCL Calibration Laboratories
Division of APREL Laboratories.

Dipole Calibration Results

Mechanical Verification

Measured Length	Measured Height
75 mm	42 mm

Tissue Validation

Frequency	Permittivity ε	Conductivity σ
1750 Head	38.23	1.38
1750 Body	52.86	1.54

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This page has been reviewed for content and attested to by signature within this document.

NCL Calibration Laboratories
Division of APREL Laboratories.

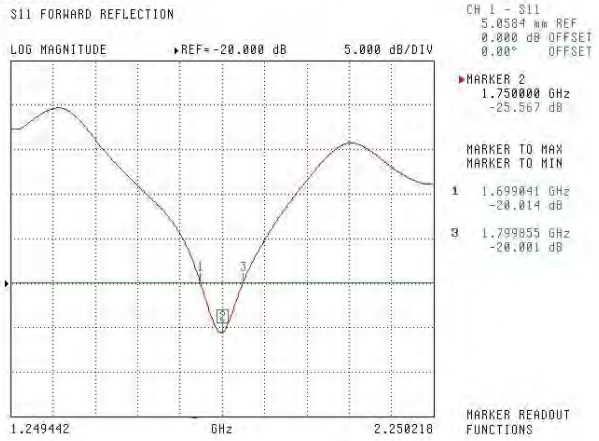
Electrical Calibration

Test	Result Head	Result Body
S11 R/L	-25.567	-20.548 dB
SWR	1.111U	1.207 U
Impedance	53.637Ω	55.929 Ω

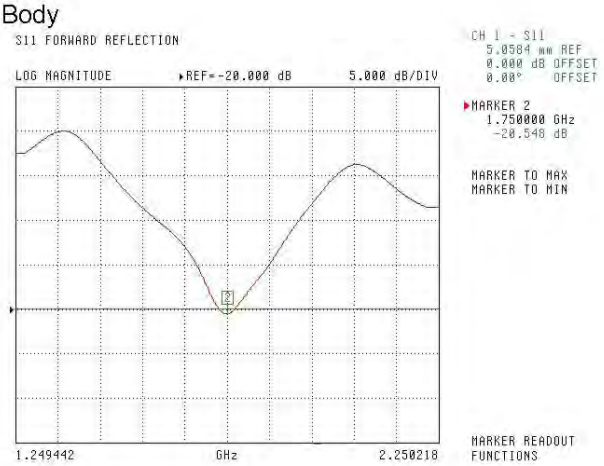
The Following Graphs are the results as displayed on the Vector Network Analyzer.

S11 Parameter Return Loss

Head



Body



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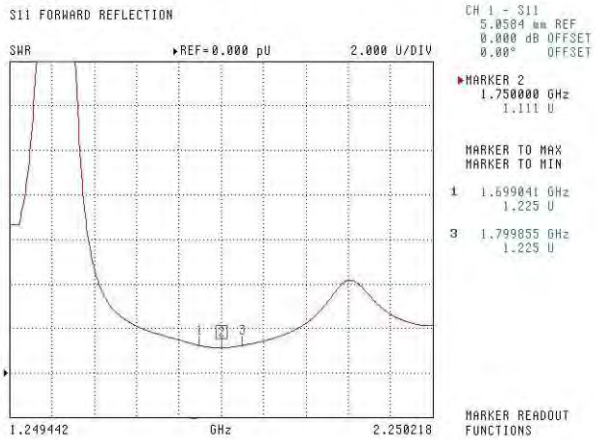
This page has been reviewed for content and attested to by signature within this document.

NCL Calibration Laboratories
Division of APREL Laboratories.

SWR

Head



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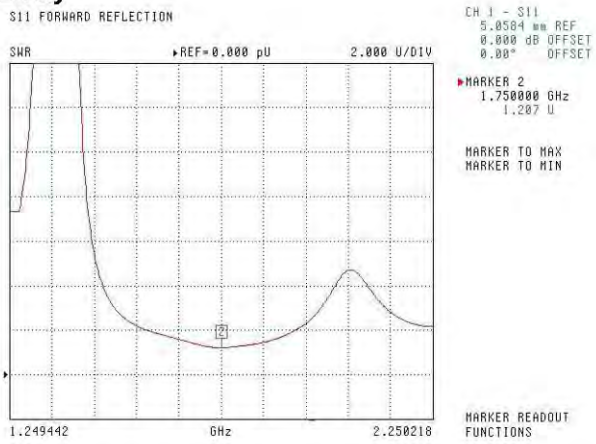

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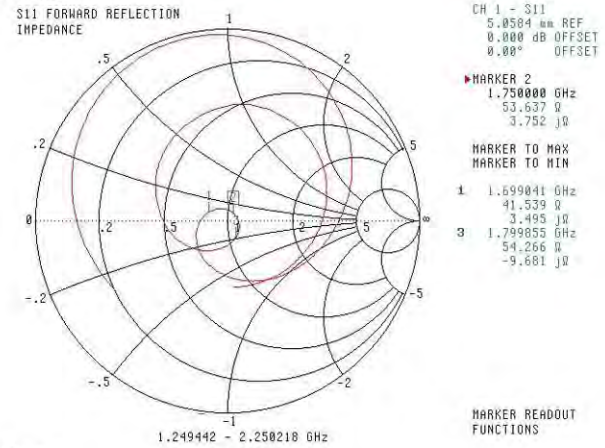
This page has been reviewed for content and attested to by signature within this document.

NCL Calibration Laboratories
Division of APREL Laboratories.

Smith Chart Dipole Impedance

Head



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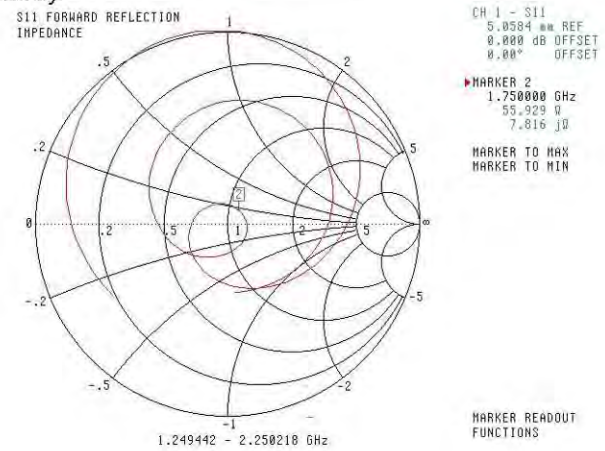

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This page has been reviewed for content and attested to by signature within this document.

NCL Calibration Laboratories
Division of APREL Laboratories.

Test Equipment

The test equipment used during Probe Calibration, manufacturer, model number and, current calibration status are listed and located on the main APREL server R:\NCL\Calibration Equipment\Instrument List May 2013

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This page has been reviewed for content and attested to by signature within this document.

NCL CALIBRATION LABORATORIES

Calibration File No: DC-1601
Project Number: BAC-dipole –cal-5779

CERTIFICATE OF CALIBRATION

It is certified that the equipment identified below has been calibrated in the **NCL CALIBRATION LABORATORIES** by qualified personnel following recognized procedures and using transfer standards traceable to NRC/NIST.

Validation Dipole (Head & Body)

Manufacturer: APREL Laboratories
Part number: ALS-D-1900-S-2
Frequency: 1900 MHz
Serial No: 210-00710

Customer: Bay Area Compliance Laboratory (China)

Calibrated: 9th October, 2014
Released on: 9th October, 2014

This Calibration Certificate is Incomplete Unless Accompanied with the Calibration Results Summary

Released By: _____

Art Brennan, Quality Manager

NCL CALIBRATION LABORATORIES
Suite 102, 303 Terry Fox Dr.
Kanata, ONTARIO
CANADA K2K 3J1
Division of APREL Lab.
TEL: (613) 435-8300
FAX: (613)435-8306

NCL Calibration Laboratories
Division of APREL Laboratories.

Conditions

Dipole 210-00710 was received in good condition and was a re-calibration.

Ambient Temperature of the Laboratory: 22 °C +/- 0.5°C
Temperature of the Tissue: 21 °C +/- 0.5°C

Attestation

The below named signatories have conducted the calibration and review of the data which is presented in this calibration report.

We the undersigned attest that to the best of our knowledge the calibration of this subject has been accurately conducted and that all information contained within the results pages have been reviewed for accuracy.

Art Brennan, Quality Manager

Maryna Nesterova Calibration Engineer

Primary Measurement Standards

Instrument	Serial Number	Cal due date
Tektronix USB Power Meter	11C940	May 14, 2015
Network Analyzer Anritsu 37347C	002106	Feb. 20, 2015

This page has been reviewed for content and attested to by signature within this document.

NCL Calibration Laboratories
Division of APREL Laboratories.

Calibration Results Summary

The following results relate the Calibrated Dipole and should be used as a quick reference for the user.

Mechanical Dimensions

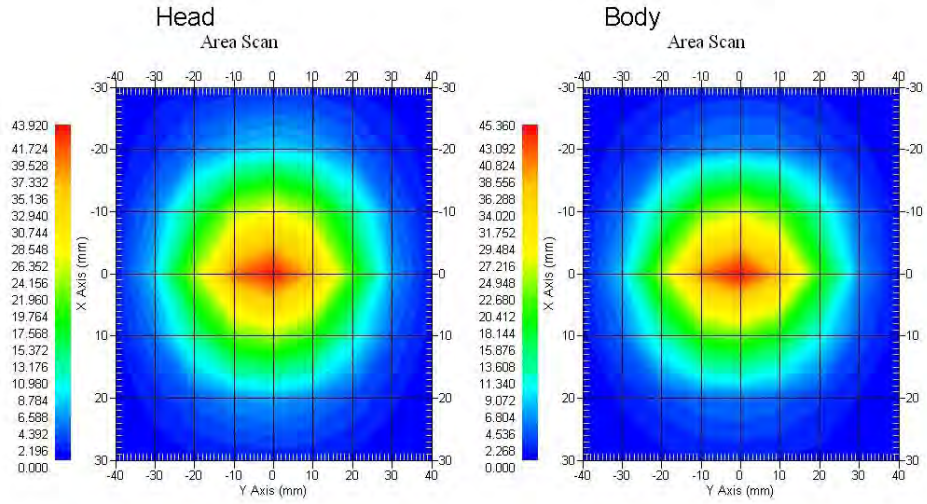
Length: 67.1 mm
Height: 38.9 mm

Electrical Specification

Tissue	Frequency	SWR:	Return Loss	Impedance
Head	1900MHz	1.084 U	-27.92 dB	52.247 Ω
Body	1900MHz	1.128 U	-24.40 dB	52.618 Ω

System Validation Results

Tissue	Frequency	1 Gram	10 Gram	Peak
Head	1900 MHz	39.481	20.44	73.364
Body	1900 MHz	39.715	20.552	73.565



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This page has been reviewed for content and attested to by signature within this document.

NCL Calibration Laboratories
Division of APREL Laboratories.

Introduction

This Calibration Report has been produced in line with the SSI Dipole Calibration Procedure SSI-TP-018-ALSAS. The results contained within this report are for Validation Dipole 210-00710. The calibration routine consisted of a three-step process. Step 1 was a mechanical verification of the dipole to ensure that it meets the mechanical specifications. Step 2 was an Electrical Calibration for the Validation Dipole, where the SWR, Impedance, and the Return loss were assessed. Step 3 involved a System Validation using the ALSAS-10U, along with APREL E-020 30 MHz to 6 GHz E-Field Probe Serial Number 225.

References

- IEC-62209 "Human exposure to radio frequency fields from hand-held and body-mounted wireless communication devices – Human models, instrumentation, and procedures"
- Part 2: "Procedure to determine the Specific Absorption Rate (SAR) for hand-held devices used in close proximity of the ear (frequency range of 30 MHz to 6 GHz)"
- TP-D01-032-E020-V2 E-Field probe calibration procedure
- D22-012-Tissue dielectric tissue calibration procedure
- D28-002-Dipole procedure for validation of SAR system using a dipole
- IEEE 1309 Draft Standard for Calibration of Electromagnetic Field Sensors and Probes, Excluding Antennas, from 9kHz to 40GHz

Conditions

Dipole 210-00710 was a recalibration.

Ambient Temperature of the Laboratory:	22 °C +/- 0.5°C
Temperature of the Tissue:	20 °C +/- 0.5°C

Dipole Calibration uncertainty

The calibration uncertainty for the dipole is made up of various parameters presented below.

Mechanical	1%
Positioning Error	1.22%
Electrical	1.7%
Tissue	2.2%
Dipole Validation	2.2%
TOTAL	**8.32% (16.64% K=2)**

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NCL Calibration Laboratories
Division of APREL Laboratories.

Dipole Calibration Results

Mechanical Verification

APREL Length	APREL Height	Measured Length	Measured Height
68.0 mm	39.5 mm	67.1mm	38.9 mm

Electrical Validation

Tissue	Frequency	SWR:	Return Loss	Impedance
Head	1900MHz	1.084 U	-27.92 dB	52.247 Ω
Body	1900MHz	1.128 U	-24.40 dB	52.618 Ω

Tissue Validation

	Dielectric constant, ε_r	Conductivity, σ [S/m]
Head Tissue 1900MHz	40.20	1.38
Body Tissue 1900MHz	52.63	1.46

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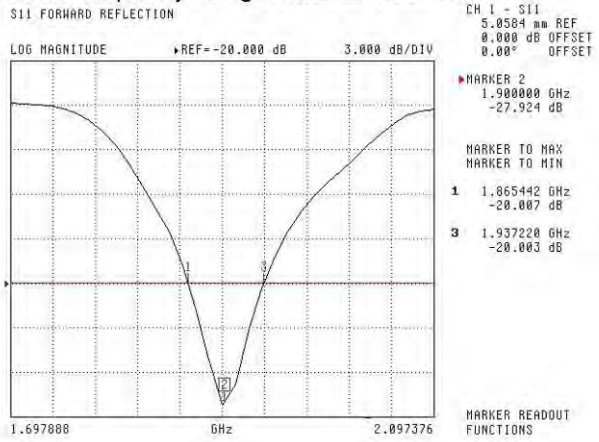
NCL Calibration Laboratories
Division of APREL Laboratories.

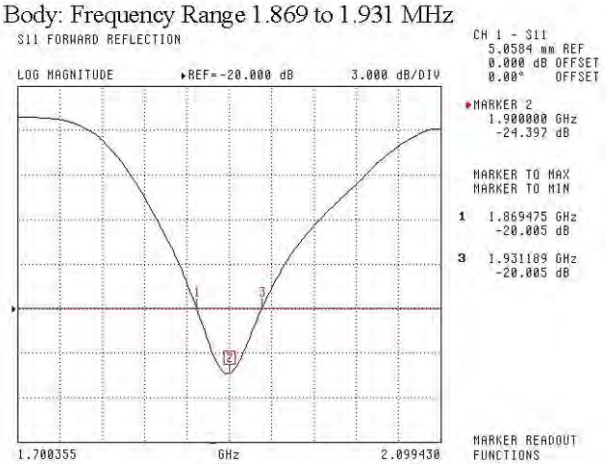
The Following Graphs are the results as displayed on the Vector Network Analyzer.

S11 Parameter Return Loss

Head: Frequency Range 1.865 to 1.937 GHz



Body: Frequency Range 1.869 to 1.931 MHz



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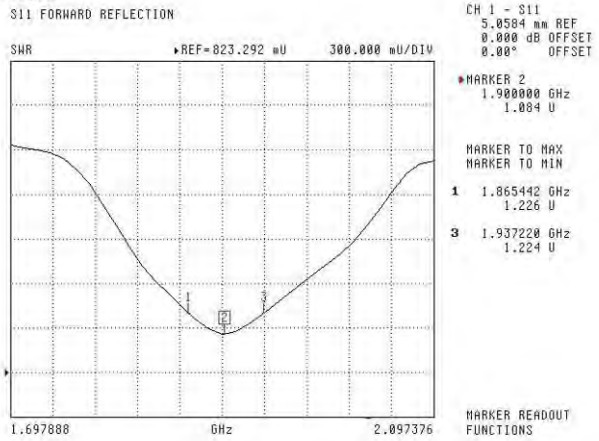
This page has been reviewed for content and attested to by signature within this document.

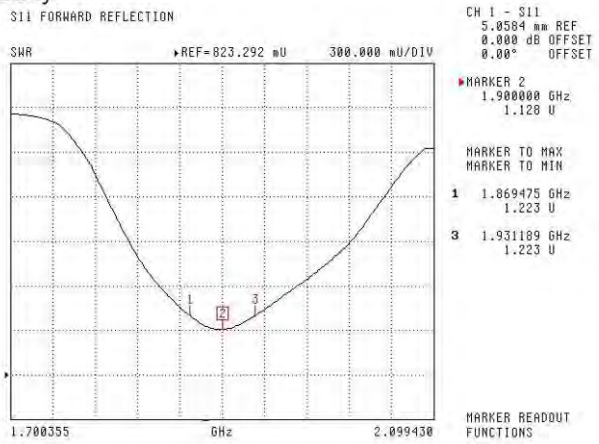
NCL Calibration Laboratories
Division of APREL Laboratories.

SWR

Head



Body



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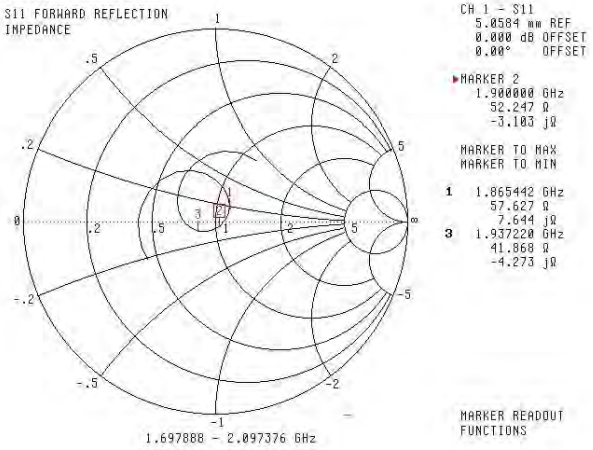
This page has been reviewed for content and attested to by signature within this document.

NCL Calibration Laboratories
Division of APREL Laboratories.

Smith Chart Dipole Impedance

Head



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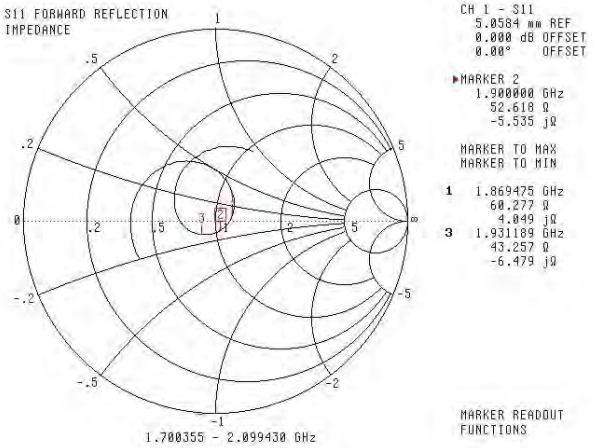

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This page has been reviewed for content and attested to by signature within this document.

NCL Calibration Laboratories
Division of APREL Laboratories.

Test Equipment

The test equipment used during Probe Calibration, manufacturer, model number and, current calibration status are listed and located on the main APREL server R:\NCL\Calibration Equipment\Instrument List 2014

This page has been reviewed for content and attested to by signature within this document.

NCL CALIBRATION LABORATORIES

Calibration File No: DC-1602
Project Number: BAC-dipole-cal-5779

CERTIFICATE OF CALIBRATION

It is certified that the equipment identified below has been calibrated in the **NCL CALIBRATION LABORATORIES** by qualified personnel following recognized procedures and using transfer standards traceable to NRC/NIST.

Validation Dipole (Head & Body)

Manufacturer: APREL Laboratories
Part number: ALS-D-2450-S-2
Frequency: 2450 MHz
Serial No: 220-00758

Customer: Bay Area Compliance Laboratory

Calibrated: 9th October, 2014
Released on: 9th October, 2014

This Calibration Certificate is Incomplete Unless Accompanied with the Calibration Results Summary

Released By: 

Art Brennan, Quality Manager

NCL CALIBRATION LABORATORIES

Suite 102, 303 Terry Fox Dr.
Kanata, ONTARIO
CANADA K2K 3J1

Division of APREL Lab.
TEL: (613) 435-8300
FAX: (613)435-8306

NCL Calibration Laboratories
Division of APREL Laboratories.

Conditions

Dipole 220-00758 was received in good condition and was a re-calibration.

Ambient Temperature of the Laboratory: 22 °C +/- 0.5°C
Temperature of the Tissue: 21 °C +/- 0.5°C

Attestation

The below named signatories have conducted the calibration and review of the data which is presented in this calibration report.

We the undersigned attest that to the best of our knowledge the calibration of this subject has been accurately conducted and that all information contained within the results pages have been reviewed for accuracy.

Art Brennan, Quality Manager

Maryna Nesterova Calibration Engineer

Primary Measurement Standards

Instrument	Serial Number	Cal due date
Tektronix USB Power Meter	11C940	May 14, 2015
Network Analyzer Anritsu 37347C	002106	Feb. 20, 2015

This page has been reviewed for content and attested to by signature within this document.

NCL Calibration Laboratories
Division of APREL Laboratories.

Calibration Results Summary

The following results relate the Calibrated Dipole and should be used as a quick reference for the user.

Mechanical Dimensions

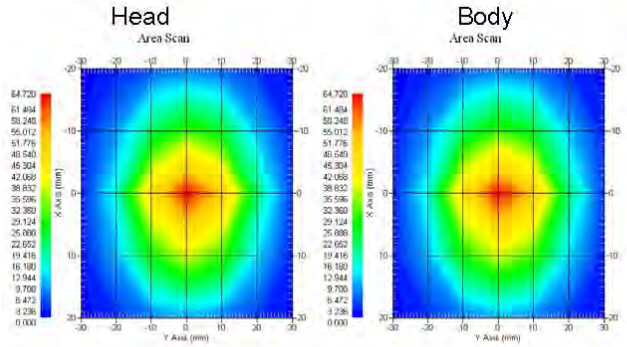
Length: 52.4 mm
Height: 30.3 mm

Electrical Specification

Tissue	Frequency	SWR:	Return Loss	Impedance
Head	2450 MHz	1.014 U	-45.184 dB	50.006Ω
Body	2450 MHz	1.070 U	-29.453 dB	50.672 Ω

System Validation Results

Tissue	Frequency	1 Gram	10 Gram	Peak
Head	2450 MHz	54.916	25.327	111.97
Body	2450 MHz	52.418	24.691	103.91



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This page has been reviewed for content and attested to by signature within this document.

NCL Calibration Laboratories
Division of APREL Laboratories.

Introduction

This Calibration Report has been produced in line with the SSI Dipole Calibration Procedure SSI-TP-018-ALSAS. The results contained within this report are for Validation Dipole 220-00758. The calibration routine consisted of a three-step process. Step 1 was a mechanical verification of the dipole to ensure that it meets the mechanical specifications. Step 2 was an Electrical Calibration for the Validation Dipole, where the SWR, Impedance, and the Return loss were assessed. Step 3 involved a System Validation using the ALSAS-10U, along with APREL E-020 30 MHz to 6 GHz E-Field Probe Serial Number 225.

References

SSI-TP-018-ALSAS Dipole Calibration Procedure
SSI-TP-016 Tissue Calibration Procedure
IEEE 1528 "Recommended Practice for Determining the Peak Spatial-Average Specific Absorption Rate (SAR) in the Human Body Due to Wireless Communications Devices: Experimental Techniques"
IEC-62209 "Human exposure to radio frequency fields from hand-held and body-mounted wireless communication devices – Human models, instrumentation, and procedures"
Part 1: "Procedure to determine the Specific Absorption Rate (SAR) for hand-held devices used in close proximity of the ear (frequency range of 300 MHz to 3 GHz)"
IEC-62209 "Human exposure to radio frequency fields from hand-held and body-mounted wireless communication devices – Human models, instrumentation, and procedures"
Part 2 *Draft*: "Procedure to determine the Specific Absorption Rate (SAR) for hand-held devices used in close proximity of the ear (frequency range of 30 MHz to 6 GHz)"

Conditions

Dipole 220-00758 was a re-calibration.

Ambient Temperature of the Laboratory:	22 °C +/- 0.5°C
Temperature of the Tissue:	20 °C +/- 0.5°C

Dipole Calibration uncertainty

The calibration uncertainty for the dipole is made up of various parameters presented below.

Mechanical	1%
Positioning Error	1.22%
Electrical	1.7%
Tissue	2.2%
Dipole Validation	2.2%
TOTAL	**8.32% (16.64% K=2)**

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This page has been reviewed for content and attested to by signature within this document.

NCL Calibration Laboratories
Division of APREL Laboratories.

Dipole Calibration Results

Mechanical Verification

APREL Length	APREL Height	Measured Length	Measured Height
51.5 mm	30.4 mm	52.4 mm	30.3 mm

Electrical Specification

Tissue	Frequency	SWR:	Return Loss	Impedance
Head	2450 MHz	1.014 U	-45.184 dB	50.006Ω
Body	2450 MHz	1.070 U	-29.453 dB	50.672 Ω

Tissue Validation

	Dielectric constant, ε_r	Conductivity, σ [S/m]
Head Tissue 2450MHz	37.26	1.84
Body Tissue 2450MHz	53.61	1.90

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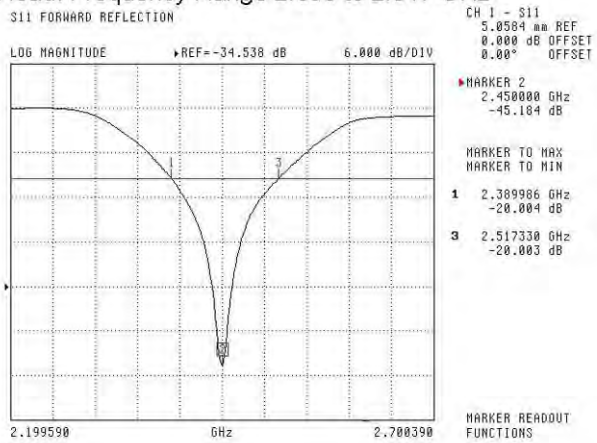
NCL Calibration Laboratories
Division of APREL Laboratories.

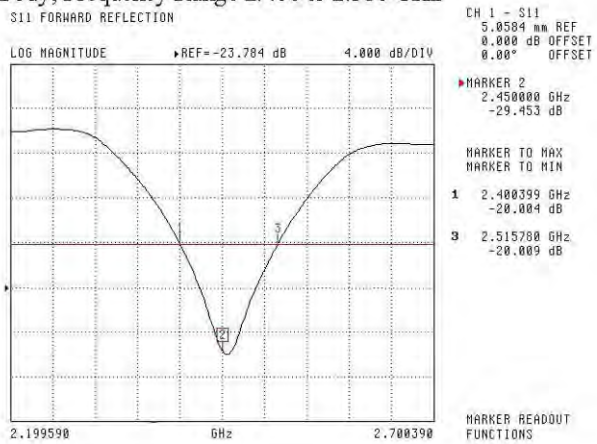
The Following Graphs are the results as displayed on the Vector Network Analyzer.

S11 Parameter Return Loss

Head: Frequency Range 2.390 to 2.517 GHz



Body; Frequency Range 2.400 to 2.516 GHz



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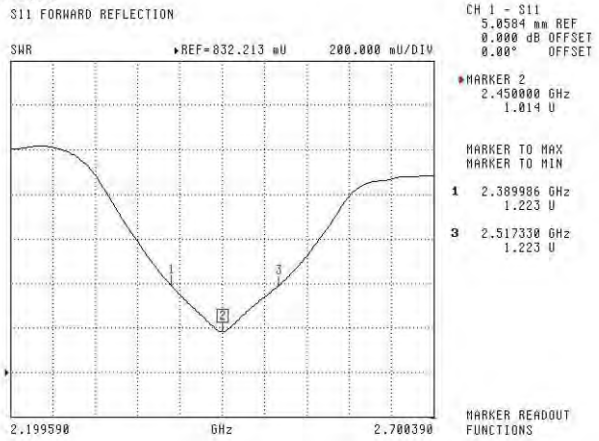
This page has been reviewed for content and attested to by signature within this document.

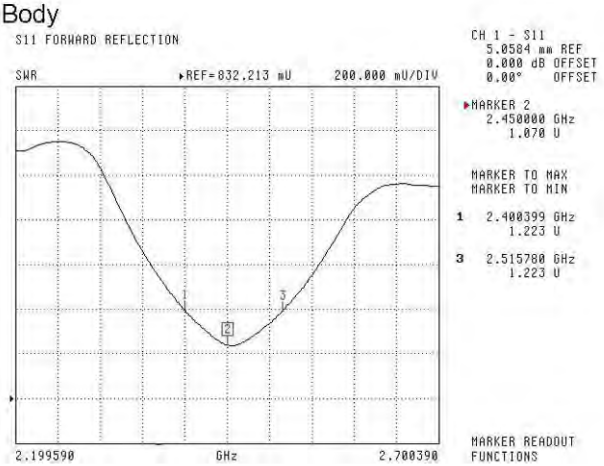
NCL Calibration Laboratories
Division of APREL Laboratories.

SWR

Head



Body



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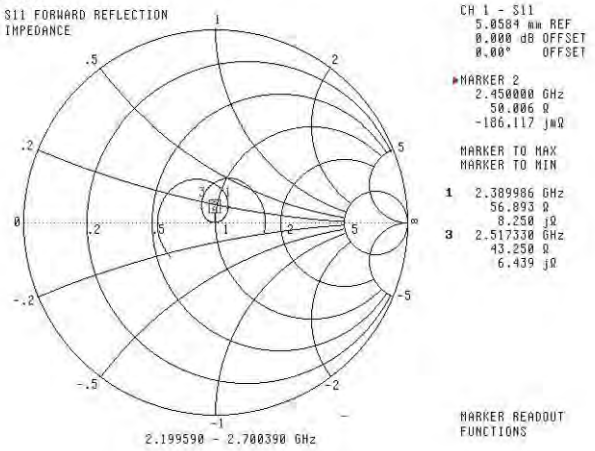
This page has been reviewed for content and attested to by signature within this document.

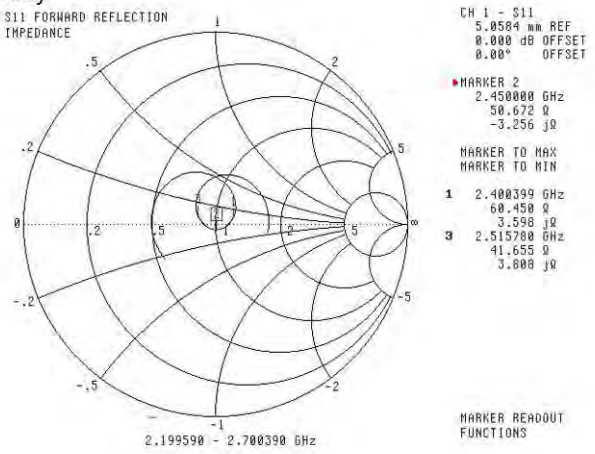
NCL Calibration Laboratories
Division of APREL Laboratories.

Smith Chart Dipole Impedance

Head



Body



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This page has been reviewed for content and attested to by signature within this document.

NCL Calibration Laboratories
Division of APREL Laboratories.

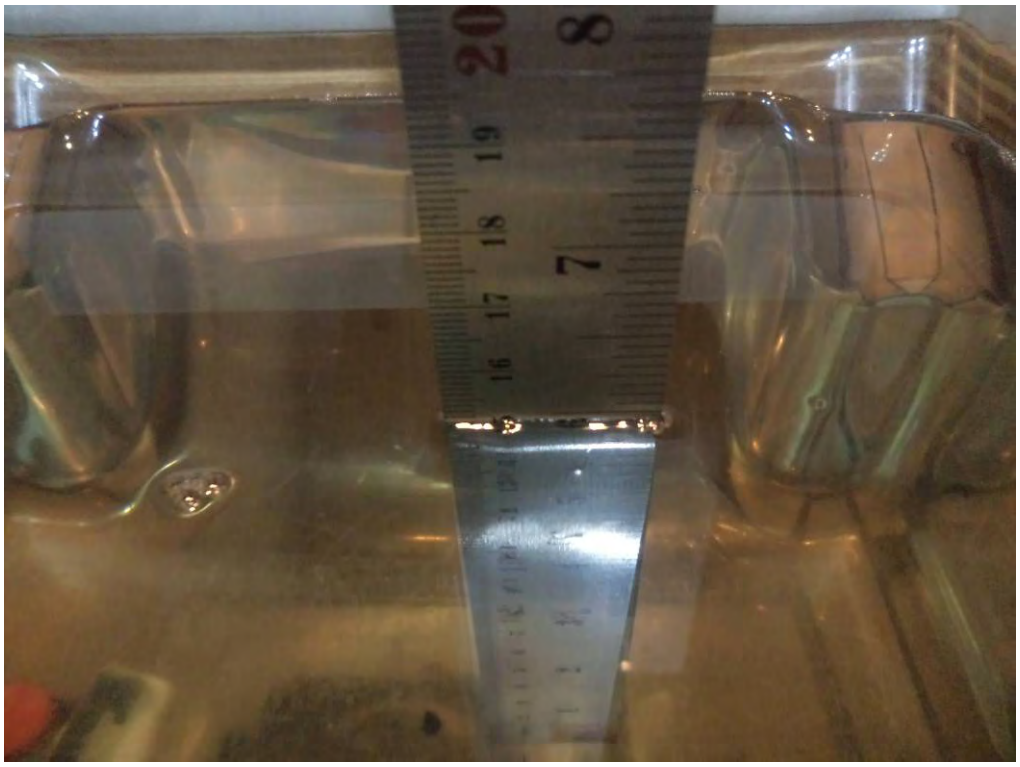
Test Equipment

The test equipment used during Probe Calibration, manufacturer, model number and, current calibration status are listed and located on the main APREL server R:\NCL\Calibration Equipment\Instrument List May 2014.

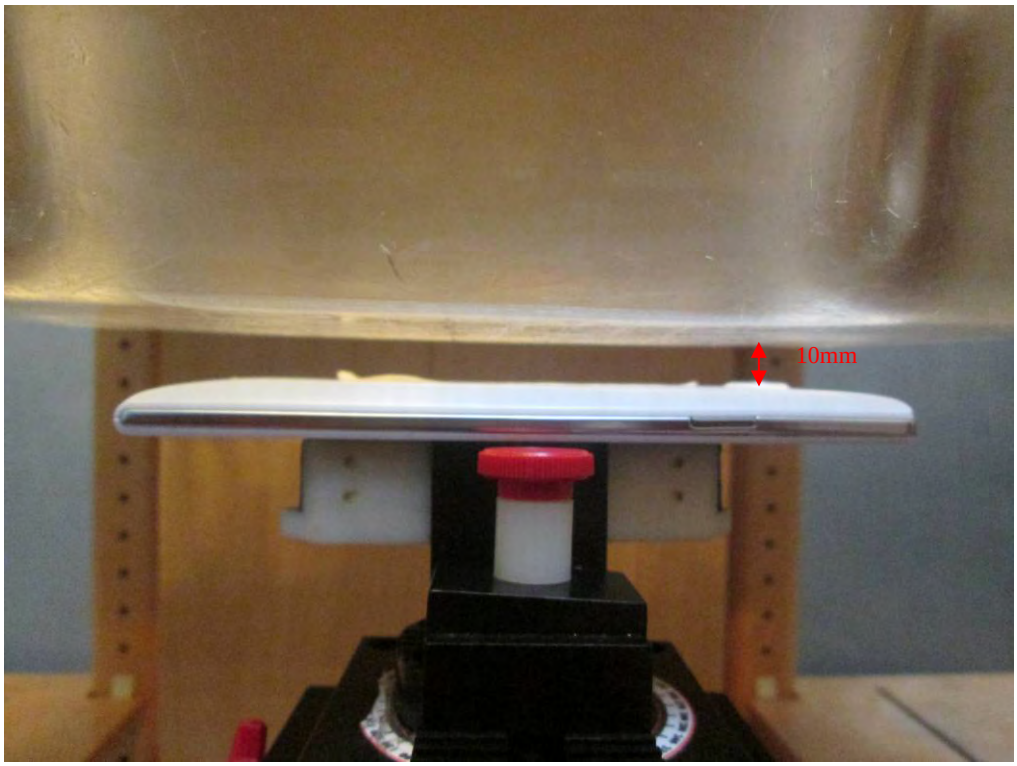
This page has been reviewed for content and attested to by signature within this document.

APPENDIX D EUT TEST POSITION PHOTOS

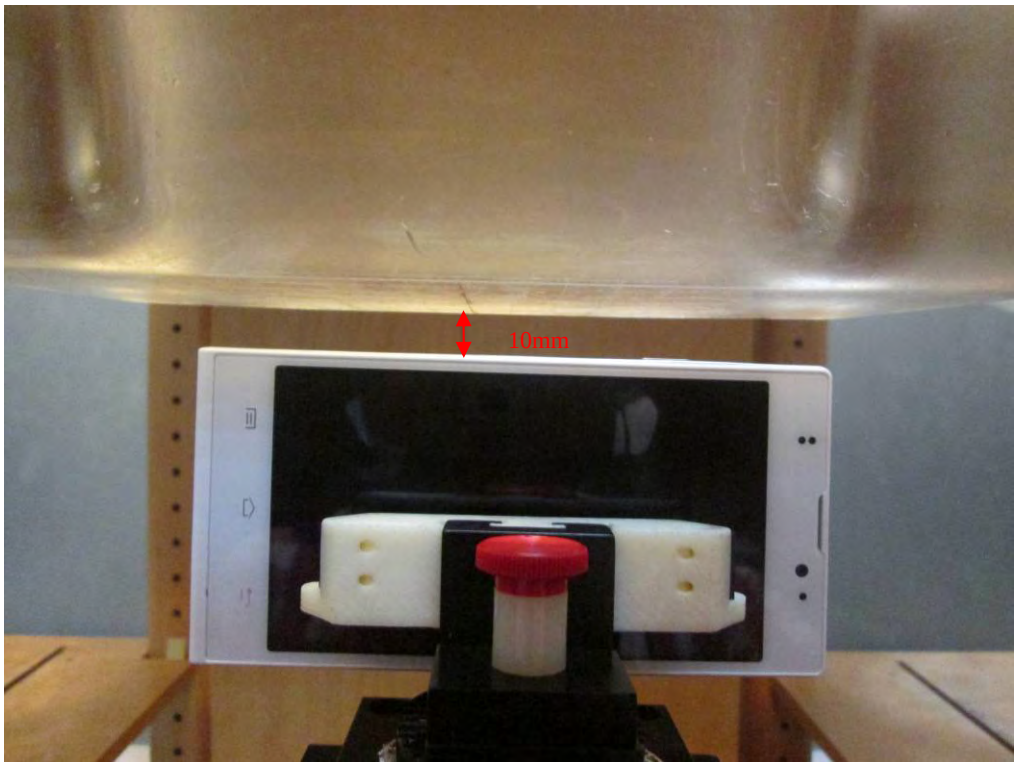
Liquid depth ≥ 15cm



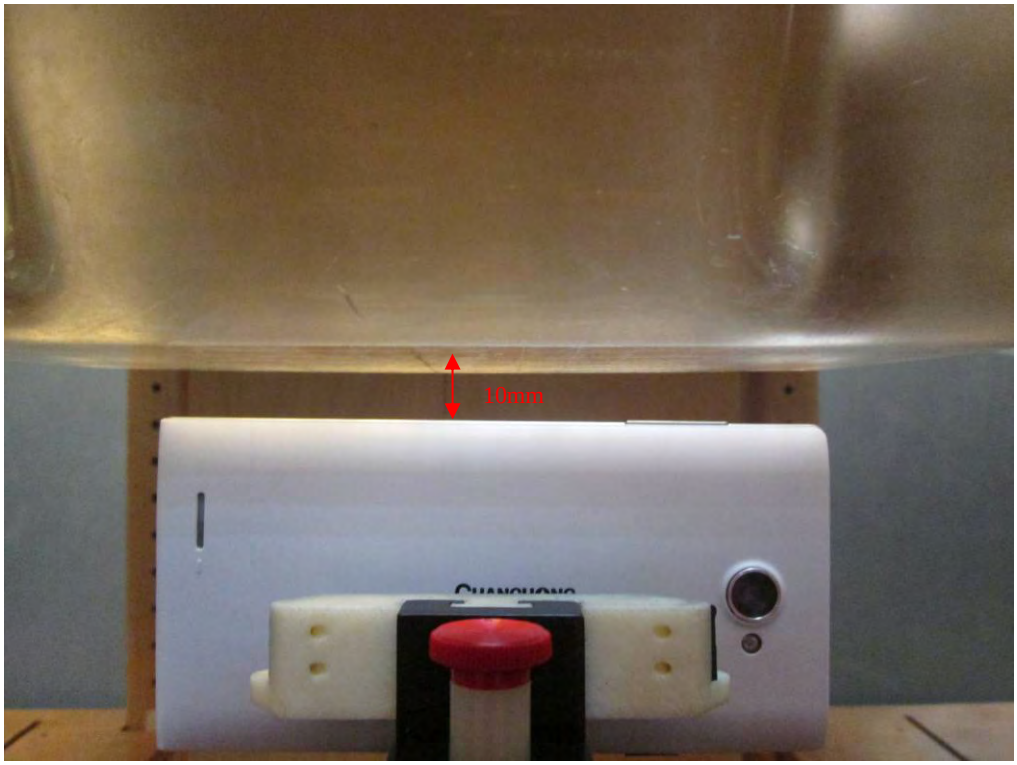
Body-worn Back Setup Photo (10mm)



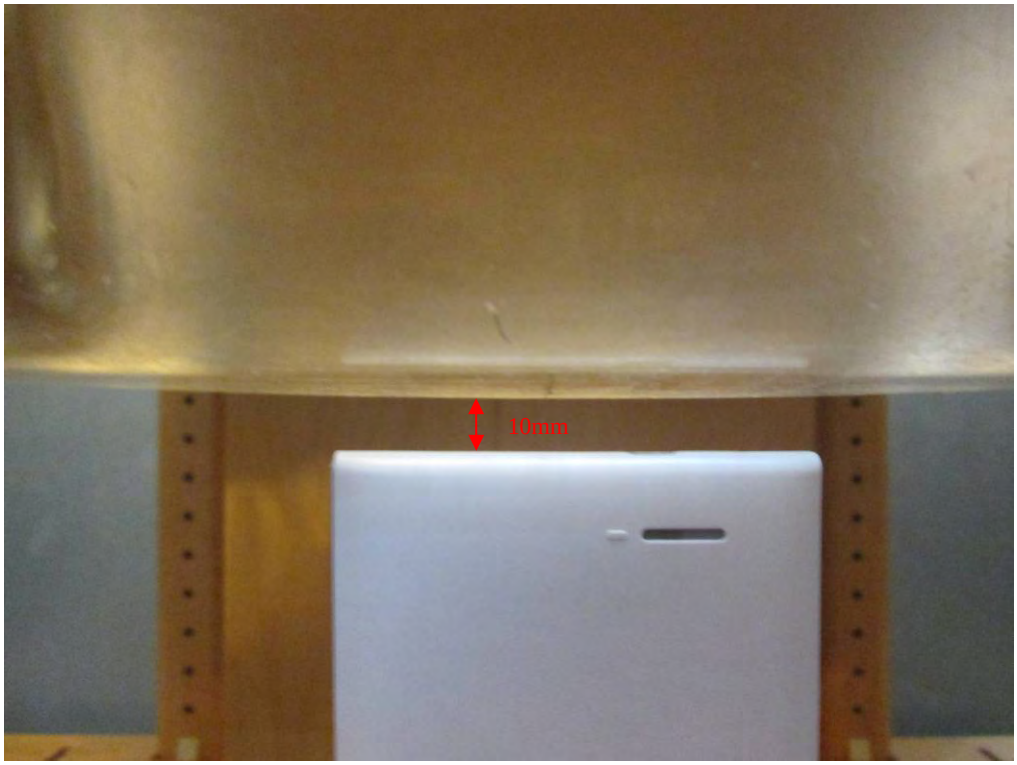
Body-worn Left Setup Photo (10mm)



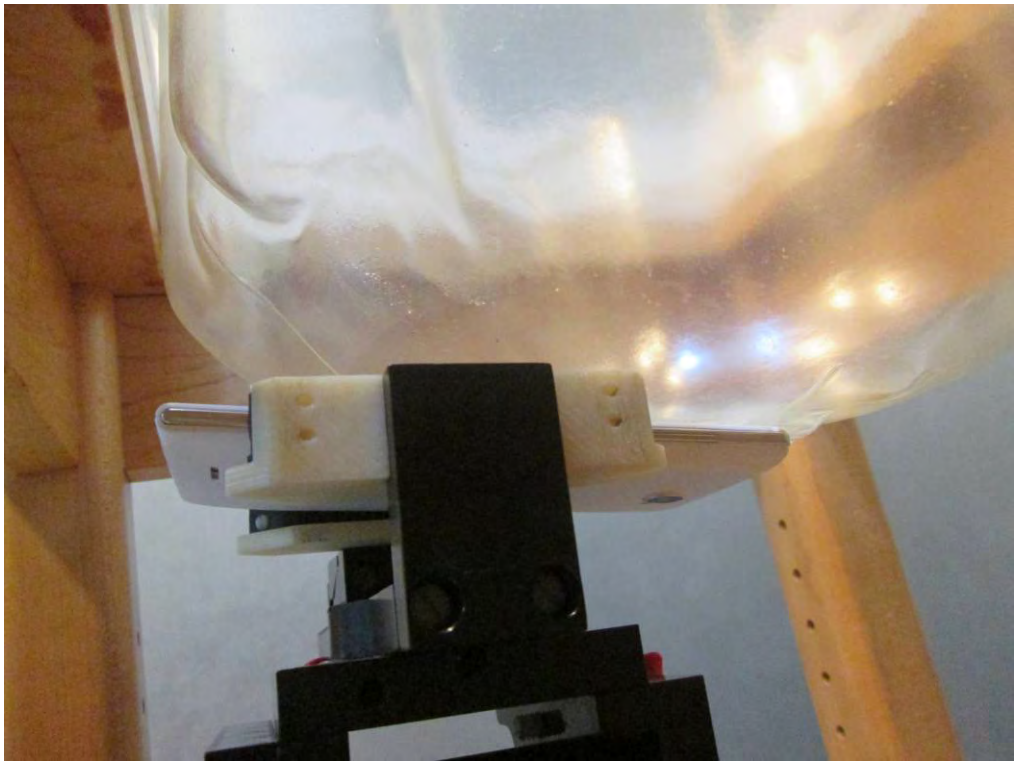
Body-worn Right Setup Photo (10mm)



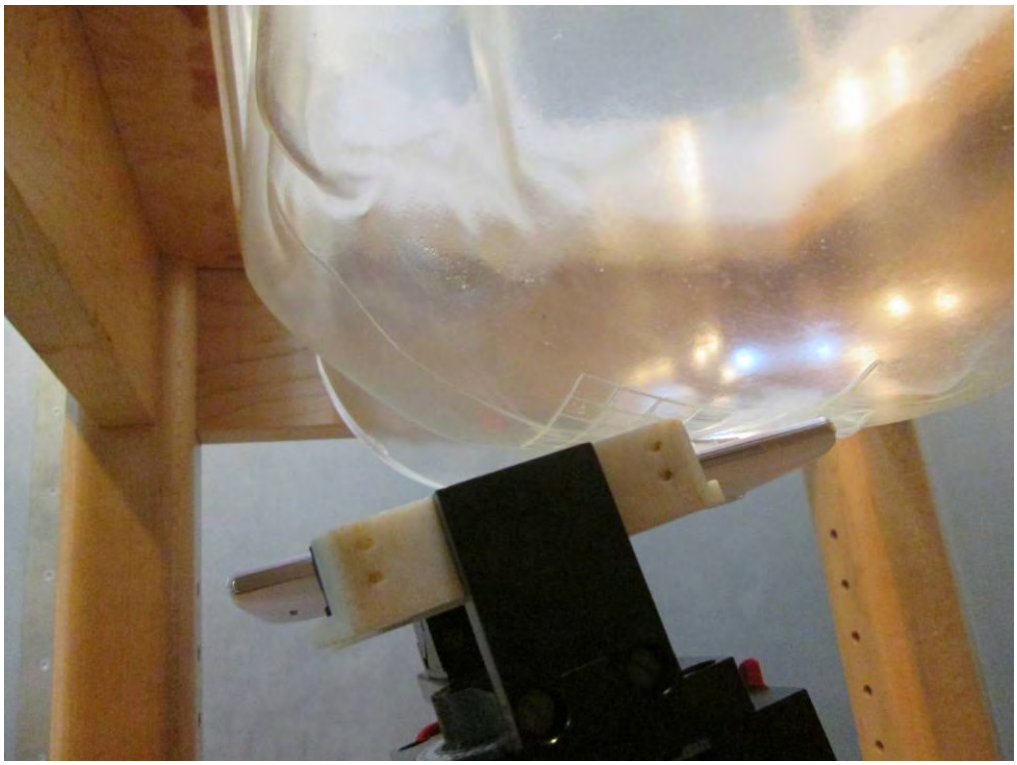
Body-worn Bottom Setup Photo (10mm)



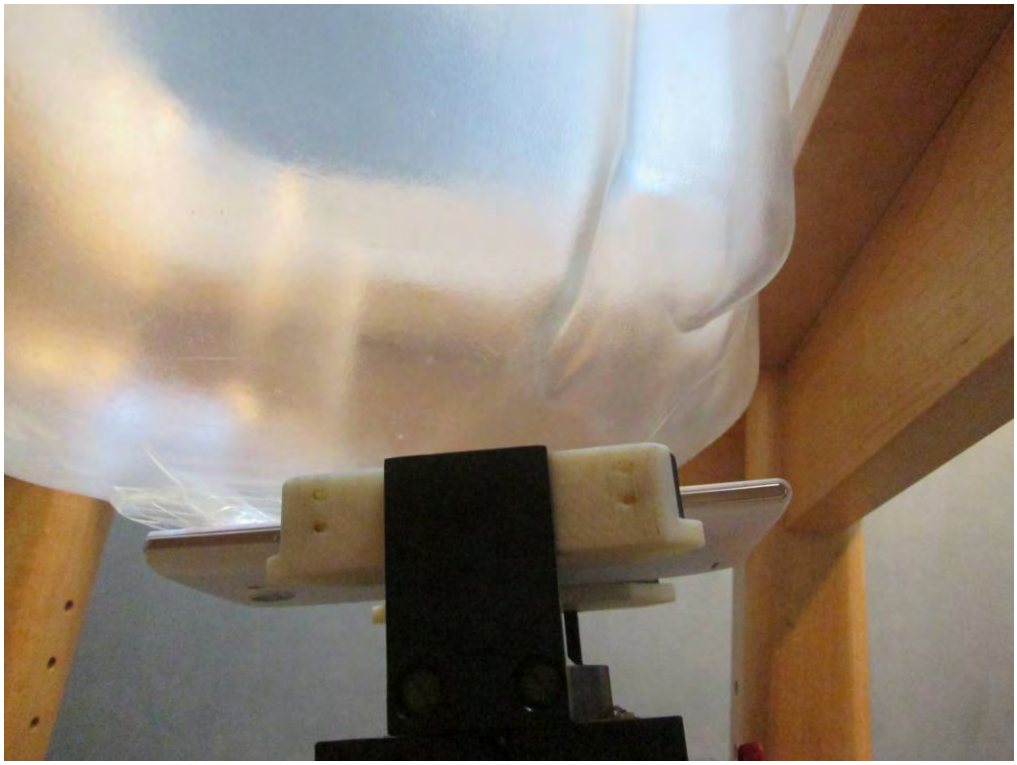
Left Head Touch Setup Photo



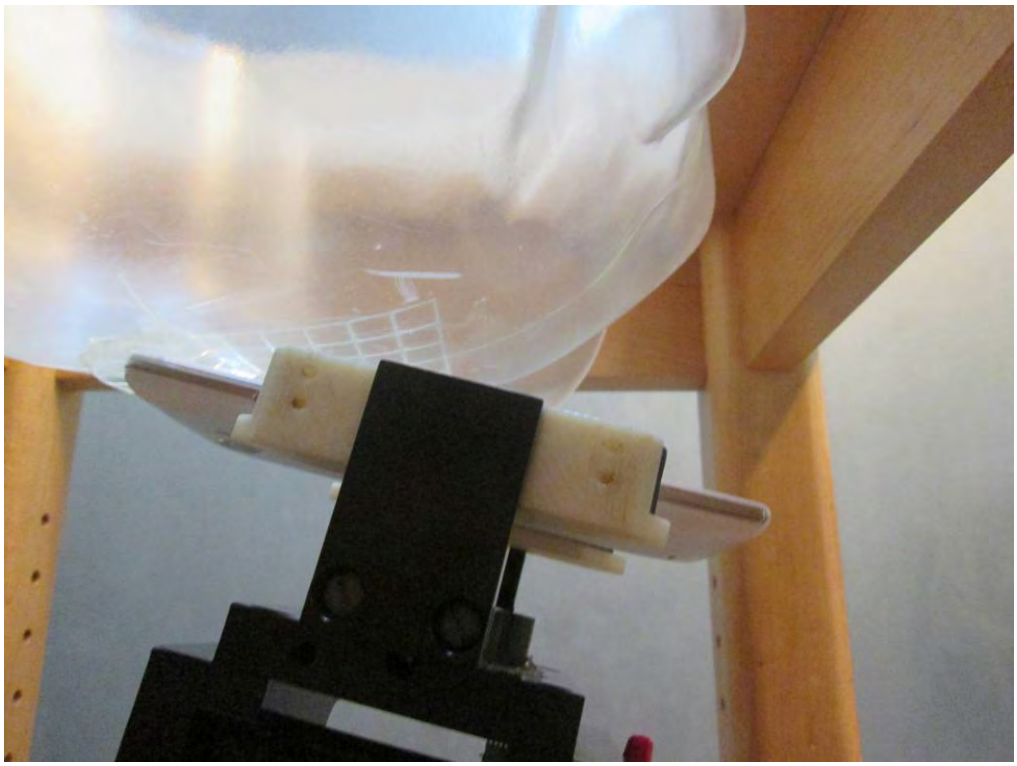
Left Head Tilt Setup Photo



Right Head Touch Setup Photo



Right Head Tilt Setup Photo



APPENDIX E EUT PHOTOS

EUT – Front View

EUT – Back View

EUT –Left Side View

EUT – Right Side View

EUT – Top View

EUT – Bottom View

EUT – Uncover View

APPENDIX F INFORMATIVE REFERENCES

[1] Federal Communications Commission, \Report and order: Guidelines for evaluating the environmental effects of radiofrequency radiation", Tech. Rep. FCC 96-326, FCC, Washington, D.C. 20554, 1996.

[2] David L. Means Kwok Chan, Robert F. Cleveland, \Evaluating compliance with FCC guidelines for human exposure to radiofrequency electromagnetic fields", Tech. Rep., Federal Communication Commission, O_ce of Engineering & Technology, Washington, DC, 1997.

[3] Thomas Schmid, Oliver Egger, and Niels Kuster, \Automated E-_eld scanning system for dosimetricPage 136 of 136
assessments", IEEE Transactions on Microwave Theory and Techniques, vol. 44, pp. 105{113, Jan. 1996.

[4] Niels Kuster, Ralph K.astle, and Thomas Schmid, \Dosimetric evaluation of mobile communications equipment with known precision", IEICE Transactions on Communications, vol. E80-B, no. 5, pp. 645{652, May 1997.

[5] CENELEC, \Considerations for evaluating of human exposure to electromagnetic fields (EMFs) from mobile telecommunication equipment (MTE) in the frequency range 30MHz - 6GHz", Tech. Rep., CENELEC, European Committee for Electrotechnical Standardization, Brussels, 1997.

[6] ANSI, ANSI/IEEE C95.1-1992: IEEE Standard for Safety Levels with Respect to Human Exposure to Radio Frequency Electromagnetic Fields, 3 kHz to 300 GHz, The Institute of Electrical and Electronics Engineers, Inc., New York, NY 10017, 1992.

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