SAR EVALUATION REPORT

For

MAXWEST INTERNATIONAL LIMITED

No.1,Longgang Road,Buji,Longgang,ShenzhenCity,Guangdong Province, P.R. China

FCC ID:2AEN3ASTROX5

Report Type:	**Product Type:**
Original Report	Mobile Phone

Test Engineer:	Rocky Xiao
Report Number:	RDG150803001-20
Report Date:	2015-08-12
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Attestation of Test Results

EUT Information	Company Name	MAXWEST INTERNATIONAL LIMITED
	EUT Description	Astro X5
	FCC ID	2AEN3ASTROX5
	Model Number:	Astro X5
	Serial Number:	150803001
	Test Date	2015-08-10,2015-08-11

MODE		Max. SAR Level(s) Reported(W/Kg)	Limit(W/Kg)
GSM 850	1g Head SAR	0.172	1. 6
	1g Body SAR	0.882	
PCS 1900	1g Head SAR	0.222	
	1g Body SAR	0.92	
WCDMA 850	1g Head SAR	0.248	
	1g Body SAR	0.453	
WCDMA 1900	1g Head SAR	0.5	
	1g Body SAR	1.316	
WLAN 2.4G	1g Head SAR	0.875	
	1g Body SAR	0.329	
Simultaneous	1g Head SAR	1.332	
	1g Body SAR	1.645 (SPLSR=0.0189)	
Hotspot	1g Body SAR	1.645 (SPLSR=0.0189)	

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.
	FCC 47 CFR part 2.1093 Radiofrequency radiation exposure evaluation: portable devices
	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
	IEC 62209-2:2010 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 wireless communication devices used in close proximity to the human body (frequency range of 30 MHz to 6 GHz)
	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 v01r04 KDB 865664 D02 RF Exposure Reporting v01r01 KDB 941225 D01 3G SAR Procedures v03 KDB 941225 D06 Hotspot Mode v02 248227 D01 802.11 Wi-Fi SAR v02r01

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.

TABLE OF CONTENTS

DOCUMENT REVISION HISTORY

Revision Number	Report Number	Description of Revision	Date of Revision
0	RDG150803001-20	Original Report	2015-08-12

EUT DESCRIPTION

This report has been prepared on behalf of MAXWEST INTERNATIONAL LIMITED and their product, Model: Astro X5, FCC ID: 2AEN3ASTROX5 or the EUT (Equipment under Test) as referred to in the rest of this report.

Technical Specification

Product Type	Astro X5
Exposure Category:	Population / Uncontrolled
Antenna Type(s):	Internal Antenna
Body-Worn Accessories:	Portable
Face-Head Accessories:	None
Multi-slot Class:	Class12
Operation Mode :	GSM Voice, GPRS/EDGE Data, WCDMA R99 (Voice+Data), HSUPA Rel 6,HSDPA Rel 7, DC-HSDPA Rel 8, HSPA+ Rel 6 WLAN 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) WLAN: 2412MHz-2462MHz Bluetooth : 2402MHz-2480MHz
Conducted RF Power:	GSM 850 : 33.65 dBm PCS 1900:30.62 dBm WCDMA 850: 21.7 dBm WCDMA 1900: 21.68 dBm WLAN: 17.56 dBm Bluetooth:4.21 dBm
Dimensions (L*W*H):	143.7 mm (L) × 72.8 mm (W) × 9.50 mm (H)
Power Source:	3.8 VDC 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

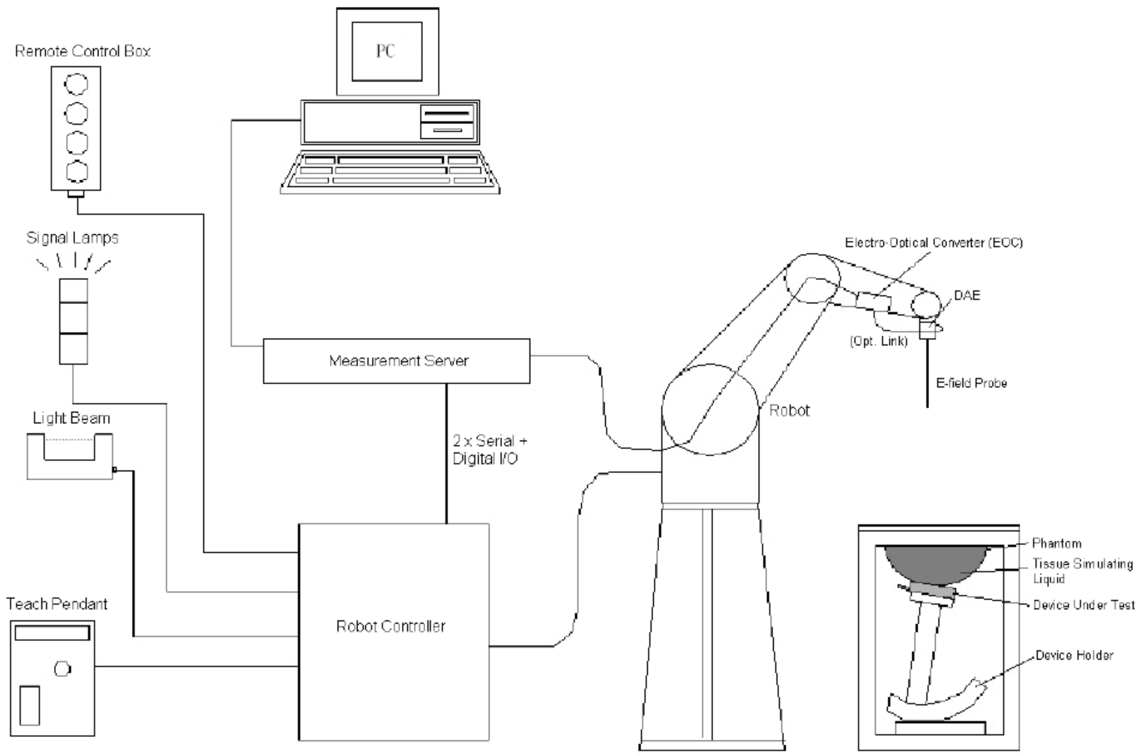
The Test site used by Bay Area Compliance Laboratories Corp. (Dongguan) to collect test data is located on the No.69 Pulongcun, Puxinhu Industrial Zone, Tangxia, Dongguan, Guangdong, China

DESCRIPTION OF TEST SYSTEM

These measurements were performed with the automated near-field scanning system DASY5 from Schmid & Partner Engineering AG (SPEAG) which is the Fifth generation of the system shown in the figure hereinafter:

DASY5 System Description

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



- A standard high precision 6-axis robot (Staubli TX=RX family) with controller, teach pendant and software. An arm extension for accommodating the data acquisition electronics (DAE).
- An isotropic field probe optimized and calibrated for the targeted measurement.
- A data acquisition electronics (DAE) which performs the signal amplication, signal multiplexing, AD-conversion, offset measurements, mechanical surface detection, collision detection, etc. The unit is battery powered with standard or rechargeable batteries. The signal is optically transmitted to the EOC.
- The Electro-optical converter (EOC) performs the conversion from optical to electrical signals for the digital communication to the DAE. To use optical surface detection, a special version of the EOC is required. The EOC signal is transmitted to the measurement server.
- The function of the measurement server is to perform the time critical tasks such as signal filtering, control of the robot operation and fast movement interrupts.
- The Light Beam used is for probe alignment. This improves the (absolute) accuracy of the probe positioning.
- A computer running Win7 profesional operating system and the DASY52 software.
- Remote control and teach pendant as well as additional circuitry for robot safety such as warning lamps, etc.
- The phantom, the device holder and other accessories according to the targeted measurement.

DASY5 Measurement Server

The DASY5 measurement server is based on a PC/104 CPU board with a 400MHz intel ULV Celeron, 128MB chip-disk and 128MB RAM. The necessary circuits for communication with the DAE4 (or DAE3) electronics box, as well as the 16 bit AD converter system for optical detection and digital I/O interface are contained on the DASY5 I/O board, which is directly connected to the PC/104 bus of the CPU board.

The measurement server performs all real-time data evaluation of field measurements and surface detection, controls robot movements and handles safety operation. The PC operating system cannot interfere with these time critical processes. All connections are supervised by a watchdog, and disconnection of any of the cables to the measurement server will automatically disarm the robot and disable all program-controlled robot movements. Furthermore, the measurement server is equipped with an expansion port which is reserved for future applications. Please note that this expansion port does not have a standardized point out, and therefore only devices provided by SPEAG can be connected. Devices from any other supplier could seriously damage the measurement server.

Data Acquisition Electronics

The data acquisition electronics (DAE4) consist of a highly sensitive electrometer-grade preamplifer with auto-zeroing, a channel and gain-switching multiplexer, a fast 16 bit AD-converter and a command decoder with a control logic unit. Transmission to the measurement server is accomplished through an optical downlink for data and status information, as well as an optical uplink for commands and the clock.

The mechanical probe mounting device includes two different sensor systems for frontal and sideways probe contacts. They are used for mechanical surface detection and probe collision detection.

The input impedance of both the DAE4 as well as of the DAE3 box is 200MOhm; the inputs are symmetrical and floating. Common mode rejection is above 80 dB.

EX3DV4 E-Field Probes

Frequency	10 MHz to > 6 GHz Linearity: ± 0.2 dB (30 MHz to 6 GHz)
Directivity	± 0.3 dB in TSL (rotation around probe axis) ± 0.5 dB in TSL (rotation normal to probe axis)
Dynamic Range	10 µW/g to > 100 mW/g Linearity: ± 0.2 dB (noise: typically < 1 µW/g)
Dimensions	Overall length: 337 mm (Tip: 20 mm) Tip diameter: 2.5 mm (Body: 12 mm) Typical distance from probe tip to dipole centers: 1 mm
Application	High precision dosimetric measurements in any exposure scenario (e.g., very strong gradient fields); the only probe that enables compliance testing for frequencies up to 6 GHz with precision of better 30%.
Compatibility	DASY3, DASY4, DASY52 SAR and higher, EASY4/MRI

SAM Twin Phantom

The SAM twin phantom is a fiberglass shell phantom with 2mm shell thickness (except the ear region, where shell thickness increases to 6 mm). The phantom has three measurement areas:
_ Left hand
_ Right hand
_ Flat phantom

The phantom table for the DASY systems based on the TX90XL and RX160L robots have the size of 100 x 50 x 85 cm (L xWx H). The phantom table for the compact DASY systems based on the RX60L robot have the size of 100 x 75 x 91 cm (L xWx H); these tables are reinforced for mounting of the robot onto the table. For easy dislocation these tables have fork lift cut outs at the bottom.
The bottom plate contains three pairs of bolts for locking the device holder. The device holder positions are adjusted to the standard measurement positions in the three sections. Only one device holder is necessary if two phantoms are used (e.g., for different liquids)

A white cover is provided to cover the phantom during the periods to prevent water evaporation and changes in the liquid parameters. Free space scans of devices on top of this phantom cover are possible. Three reference marks are provided on the phantom counter. These reference marks are used to teach the absolute phantom position relative to the robot.

Device Holder for SAM Twin Phantom

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

The DASY device holder is designed to cope with different positions given in the standard. It has two scales for the device rotation (with respect to the body axis) and the device inclination (with respect to the line between the ear reference points). The rotation centers for both scales are the ear reference point ERP). Thus the device needs no repositioning when changing the angles.

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

Robots

The DASY5 system uses the high precision industrial robots TX90XL from Staubli SA (France). The TX robot family is the successor of the well known RX robot family and offers the same features important for our application:

- High precision (repeatability 0.02mm)
- High reliability (industrial design)
- Low maintenance costs (virtually maintenance free due to direct drive gears; no belt drives)
- Jerk-free straight movements (brushless synchron motors; no stepper motors)
- Low ELF interference (motor control fields shielded via the closed metallic construction shields)

The above mentioned robots are controlled by the Staubli CS8c robot controllers. All information regarding the use and maintenance of the robot arm and the robot controller is contained on the CDs delivered along with the robot. Paper manuals are available upon request direct from Staubli.

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 DASY5 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.

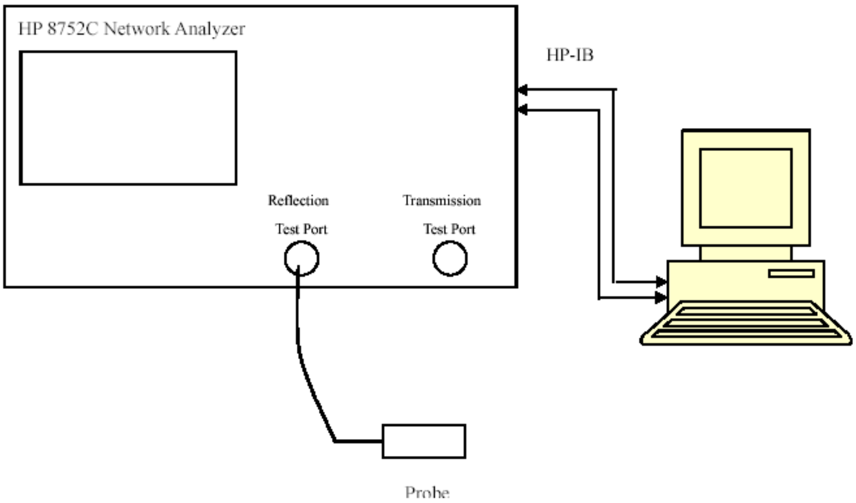
EQUIPMENT LIST AND CALIBRATION

Equipments List & Calibration Information

Equipment	Model	S/N	Calibration Date	Calibration Due Date
Robot	RX90	D03636	N/A	N/A
DASY5 Test Software	DASY52.8	N/A	N/A	N/A
DASY5 Measurement Server	DASY5 4.5.12	1470	N/A	N/A
Data Acquistion Electronics	DAE4	1459	2015-01-26	2016-01-26
E-Field Probe	EX3DV4	7329	2015-02-05	2016-02-05
Dipole, 835MHz	ALS-D-835-S-2	180-00558	2014-10-08	2017-10-08
Dipole,1900MHz	ALS-D-1900-S-2	210-00710	2013-10-09	2016-10-09
Dipole,2450MHz	ALS-D-2450-S-2	220-00758	2014-10-09	2017-10-09
R&S, universal Radio Communication Tester	CMU200	105047	2014-11-20	2015-11-20
Mounting Device	MD4HHTV5	SD 000 H01 KA	N/A	N/A
Twin SAM	Twin SAM V5.0	1874	N/A	N/A
Simulated Tissue 835 MHz Head	TS-835-H	201504	Each Time	/
Simulated Tissue 835 MHz Body	TS-835-B	201505	Each Time	/
Simulated Tissue 1900 MHz Head	TS-1900-H	201506	Each Time	/
Simulated Tissue 1900 MHz Body	TS-1900-B	201507	Each Time	/
Simulated Tissue 2450 MHz Head	TS-2450-H	201512	Each Time	/
Simulated Tissue 2450 MHz Body	TS-2450-B	201513	Each Time	/
Network Analyzer	8752C	3140A02356	2015-06-03	2016-06-03
Dielectric probe kit	85070B	US33020324	2015-06-03	2016-06-03
Signal Generator	E4422B	MY41000355	2014-10-27	2015-10-27
Power Meter	EPM-441A	GB37481494	2014-11-03	2015-11-03
Power Meter Sensor	8481A	T-03-EM-127	2014-11-03	2015-11-03
Power Amplifier	5205PE	1015	N/A	N/A
Directional Coupler	488Z	N/A	N/A	N/A
attenuator	20dB, 100W	N/A	N/A	N/A

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	Ơ (S/m)	ε_r	Ơ (S/m)	$\Delta\varepsilon_r$	ΔƠ (S/m)	
824.2	Head	42.91	0.88	41.5	0.9	3.4	-2.22	±5
	Body	55.16	0.96	55.2	0.97	-0.07	-1.03	±5
826.4	Head	42.89	0.88	41.5	0.9	3.35	-2.22	±5
	Body	55.12	0.97	55.2	0.97	-0.14	0	±5
836.6	Head	42.87	0.89	41.5	0.9	3.3	-1.11	±5
	Body	55.09	0.98	55.2	0.97	-0.2	1.03	±5
846.6	Head	42.8	0.9	41.5	0.9	3.13	0	±5
	Body	55.03	0.99	55.2	0.97	-0.31	2.06	±5
848.8	Head	42.71	0.9	41.5	0.9	2.92	0	±5
	Body	54.99	0.99	55.2	0.97	-0.38	2.06	±5
1850.2	Head	39.84	1.36	40	1.4	-0.4	-2.86	±5
	Body	55.29	1.48	53.3	1.52	3.73	-2.63	±5
1852.4	Head	39.85	1.35	40	1.4	-0.37	-3.57	±5
	Body	55.22	1.47	53.3	1.52	3.6	-3.29	±5
1880	Head	39.76	1.39	40	1.4	-0.6	-0.71	±5
	Body	53.75	1.54	53.3	1.52	0.84	1.32	±5
1907.6	Head	39.57	1.41	40	1.4	-1.08	0.71	±5
	Body	53.62	1.49	53.3	1.52	0.6	-1.97	±5
1909.8	Head	39.57	1.41	40	1.4	-1.08	0.71	±5
	Body	53.38	1.49	53.3	1.52	0.15	-1.97	±5

**Liquid Verification above was performed on 2015-08-10.*

Frequency	Liquid Type	Liquid Parameter		Target Value		Delta(%)		Tolerance (%)
		ε_r	Ơ (S/m)	ε_r	Ơ (S/m)	$\Delta\varepsilon_r$	ΔƠ (S/m)	
2412	Head	39.33	1.79	39.2	1.8	0.33	-0.56	±5
	Body	53.24	1.94	52.7	1.95	1.02	-0.51	±5
2437	Head	39.21	1.82	39.2	1.8	0.03	1.11	±5
	Body	51.64	1.98	52.7	1.95	-2.01	1.54	±5
2450	Head	39.11	1.83	39.2	1.8	-0.23	1.67	±5
	Body	52.24	2.03	52.7	1.95	-0.87	4.1	±5
2462	Head	38.99	1.84	39.2	1.8	-0.54	2.22	±5
	Body	52.22	1.98	52.7	1.95	-0.91	1.54	±5

**Liquid Verification above was performed on 2015-08-11.*

Please refer to the following tables.

835 MHz Head			835 MHz Body		
Frequency (MHz)	**e'**	**e''**	**Frequency (MHz)**	**e'**	**e''**
824	42.8832	19.1651	824	55.143	21.0327
824.5	42.9528	19.1221	824.5	55.1809	20.9273
825	42.9737	19.1334	825	55.1385	20.9861
825.5	42.9215	19.1844	825.5	55.1759	20.9887
826	42.9215	19.1434	826	55.1266	21.0416
826.5	42.8882	19.1535	826.5	55.1169	21.0122
827	42.9137	19.1901	827	55.0263	20.9888
827.5	42.9108	19.1504	827.5	55.159	20.981
828	42.9475	19.1982	828	55.1403	21.0112
828.5	42.9121	19.1763	828.5	55.1655	21.038
829	42.9563	19.2204	829	55.1017	20.9267
829.5	42.9499	19.1674	829.5	55.0869	20.9106
830	43.0155	19.1598	830	55.1216	20.9519
830.5	42.9369	19.1919	830.5	55.1026	20.9702
831	42.9519	19.166	831	55.1178	20.9503
831.5	42.8765	19.1828	831.5	55.1461	20.9725
832	42.9406	19.1691	832	55.2174	20.9347
832.5	42.9289	19.2456	832.5	55.0815	20.9132
833	42.9883	19.19	833	55.1223	20.9261
833.5	42.9043	19.2243	833.5	55.1456	20.9444
834	42.9036	19.218	834	55.1614	21.0419
834.5	42.9011	19.224	834.5	55.1008	20.9298
835	42.9361	19.2104	835	55.0749	20.9673
835.5	42.9264	19.1398	835.5	55.0863	20.9946
836	42.9465	19.1557	836	55.1013	20.9982
836.5	42.8721	19.1775	836.5	55.0912	20.9807
837	42.8459	19.2109	837	55.0704	21.0075
837.5	42.8565	19.169	837.5	55.0272	20.9298
838	42.8436	19.2403	838	55.1196	20.9947
838.5	42.9167	19.207	838.5	55.1414	20.9932
839	42.9456	19.1882	839	55.0742	20.9474
839.5	42.9326	19.1599	839.5	55.0729	21.0008
840	42.9329	19.1205	840	55.0241	20.992
840.5	42.88	19.0665	840.5	55.1457	20.9864
841	42.9031	19.1765	841	55.072	21.0243
841.5	42.9052	19.157	841.5	55.0577	20.982
842	42.8871	19.0805	842	55.1032	20.9579
842.5	42.822	19.1389	842.5	54.9833	20.9573
843	42.7961	19.0845	843	55.0577	20.9737
843.5	42.8094	19.0975	843.5	55.0071	20.9237
844	42.7942	19.0664	844	55.0763	20.9185
844.5	42.8642	18.995	844.5	55.0929	21.0376
845	42.7763	19.065	845	55.0733	20.9513
845.5	42.8102	19.0845	845.5	55.0432	20.9191
846	42.8379	18.9937	846	55.0461	20.974
846.5	42.8154	18.99	846.5	55.038	20.9384
847	42.7496	19.1113	847	55.0045	20.9499
847.5	42.7601	18.9745	847.5	55.0327	21.006
848	42.7819	18.9845	848	54.9928	21.0114
848.5	42.7081	19.0362	848.5	54.9912	20.9138
849	42.715	18.9729	849	54.988	20.9381

1900 MHz Head			1900 MHz Body		
Frequency (MHz)	e'	e''	Frequency (MHz)	e'	e''
1850	39.829	13.219	1850	55.2703	14.398
1851	39.8797	13.1798	1851	55.3745	14.3443
1852	39.8441	13.1561	1852	55.242	14.3379
1853	39.8657	13.1522	1853	55.1788	14.2746
1854	39.8687	13.1898	1854	55.0786	14.1883
1855	39.8817	13.1995	1855	55.0484	14.2504
1856	39.8581	13.1903	1856	54.9147	14.2665
1857	39.8874	13.1832	1857	54.7296	14.192
1858	39.8673	13.1823	1858	54.638	14.1354
1859	39.8307	13.2133	1859	54.5759	14.0658
1860	39.8001	13.2166	1860	54.4652	14.1728
1861	39.8751	13.2267	1861	54.5159	14.0778
1862	39.9037	13.2191	1862	54.3583	14.0967
1863	39.8316	13.1516	1863	54.1808	14.1195
1864	39.8178	13.1787	1864	54.1254	14.171
1865	39.8504	13.2006	1865	54.0815	14.1385
1866	39.8072	13.2163	1866	53.9666	14.1529
1867	39.7941	13.2183	1867	53.9052	14.1379
1868	39.7822	13.2065	1868	53.8105	14.2291
1869	39.8566	13.2737	1869	53.7228	14.1983
1870	39.8321	13.2335	1870	53.675	14.2925
1871	39.8376	13.2129	1871	53.6488	14.3201
1872	39.7828	13.2105	1872	53.6892	14.3208
1873	39.7857	13.2057	1873	53.6468	14.458
1874	39.7366	13.2786	1874	53.6103	14.4416
1875	39.7615	13.2307	1875	53.5972	14.4912
1876	39.7709	13.2182	1876	53.6119	14.5799
1877	39.8197	13.2659	1877	53.6773	14.6324
1878	39.7777	13.2131	1878	53.6109	14.6799
1879	39.7594	13.224	1879	53.6991	14.6716
1880	39.7638	13.2747	1880	53.747	14.7726
1881	39.7147	13.2341	1881	53.7704	14.7682
1882	39.767	13.2887	1882	53.7916	14.8071
1883	39.7297	13.2965	1883	53.823	14.7787
1884	39.7362	13.2699	1884	53.9124	14.7774
1885	39.6842	13.3183	1885	53.9353	14.8397
1886	39.7128	13.2956	1886	54.0904	14.8034
1887	39.6573	13.3012	1887	54.184	14.7579
1888	39.6839	13.2831	1888	54.2357	14.801
1889	39.6862	13.3244	1889	54.2367	14.7393
1890	39.6687	13.2974	1890	54.2917	14.7367
1891	39.7075	13.3215	1891	54.3094	14.7339
1892	39.7102	13.3034	1892	54.3932	14.7276
1893	39.659	13.2882	1893	54.3624	14.6625
1894	39.6578	13.2803	1894	54.3114	14.6488
1895	39.6261	13.3154	1895	54.3142	14.5913
1896	39.6856	13.2984	1896	54.4592	14.5187
1897	39.6543	13.2735	1897	54.4113	14.4949
1898	39.6393	13.3096	1898	54.4158	14.4501
1899	39.6577	13.2678	1899	54.276	14.371
1900	39.6566	13.3334	1900	54.1829	14.3314

1900 MHz Head			1900 MHz Body		
Frequency (MHz)	**e'**	**e''**	**Frequency (MHz)**	**e'**	**e''**
1901	39.6622	13.3143	1901	54.1159	14.2577
1902	39.6263	13.3602	1902	54.0947	14.2204
1903	39.6215	13.282	1903	53.9844	14.2042
1904	39.6259	13.3445	1904	53.8617	14.1309
1905	39.6672	13.3286	1905	53.789	14.12
1906	39.6144	13.356	1906	53.7034	14.1074
1907	39.5406	13.3365	1907	53.6515	14.1044
1908	39.5942	13.318	1908	53.5948	14.0164
1909	39.554	13.3509	1909	53.4519	14.0156
1910	39.5801	13.3034	1910	53.3589	14.0525

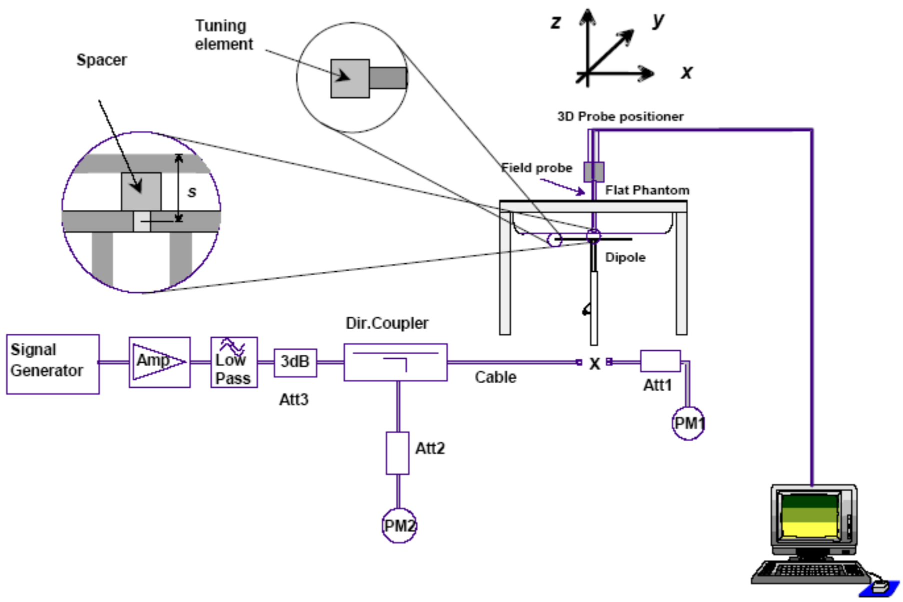
2450 MHz Head					
Frequency (MHz)	**e'**	**e''**	**Frequency (MHz)**	**e'**	**e''**
2412	39.328	13.3794	2443	39.1467	13.4641
2413	39.2716	13.3495	2444	39.1775	13.4089
2414	39.3113	13.3534	2445	39.1843	13.462
2415	39.3351	13.3878	2446	39.1665	13.4202
2416	39.3259	13.3559	2447	39.1391	13.4603
2417	39.3635	13.3761	2448	39.1519	13.4369
2418	39.3182	13.388	2449	39.1321	13.4642
2419	39.3552	13.3709	2450	39.1143	13.4282
2420	39.3532	13.4201	2451	39.1334	13.4653
2421	39.2341	13.4888	2452	39.1011	13.3964
2422	39.2095	13.4678	2453	39.106	13.4273
2423	39.2335	13.4935	2454	39.1042	13.3817
2424	39.2313	13.4926	2455	39.1042	13.4297
2425	39.2018	13.4334	2456	39.1011	13.4117
2426	39.1869	13.4819	2457	39.0751	13.409
2427	39.2104	13.4514	2458	39.0712	13.3943
2428	39.1672	13.4998	2459	39.0279	13.4213
2429	39.1544	13.4531	2460	39.0337	13.4443
2430	39.2395	13.4343	2461	39.0716	13.4324
2431	39.2018	13.4696	2462	38.9939	13.4471
2432	39.2453	13.4627	2463	39.0114	13.4973
2433	39.2623	13.5086	2464	39.0358	13.4624
2434	39.2276	13.488	2465	39.0286	13.4829
2435	39.1823	13.4794	2466	38.9962	13.5165
2436	39.1848	13.4697	2467	38.964	13.516
2437	39.2092	13.4619	2468	39.0315	13.5294
2438	39.195	13.4708	2469	38.9714	13.5129
2439	39.1751	13.4456	2470	38.9836	13.5019
2440	39.2104	13.4607	2471	39.0099	13.5226
2441	39.2009	13.4199	2472	38.9528	13.541
2442	39.1885	13.4249	/	/	/

2450 MHz Body					
Frequency (MHz)	e'	e''	Frequency (MHz)	e'	e''
2412	53.2383	14.4742	2443	51.7492	14.8464
2413	53.3733	14.4671	2444	51.7718	14.8707
2414	53.235	14.4621	2445	51.81	14.8943
2415	53.1708	14.4336	2446	51.8478	14.9302
2416	53.034	14.3382	2447	51.9608	14.931
2417	53.044	14.3492	2448	52.0858	14.9087
2418	52.9527	14.3856	2449	52.136	14.8648
2419	52.7778	14.3083	2450	52.2449	14.8723
2420	52.6594	14.2725	2451	52.2211	14.8342
2421	52.5998	14.1892	2452	52.2862	14.8381
2422	52.4617	14.3276	2453	52.3536	14.832
2423	52.4866	14.228	2454	52.3355	14.7905
2424	52.3174	14.2828	2455	52.331	14.7508
2425	52.1745	14.2542	2456	52.3419	14.7387
2426	52.1429	14.2816	2457	52.3581	14.7269
2427	52.0434	14.2932	2458	52.45	14.588
2428	51.9669	14.2896	2459	52.3986	14.62
2429	51.9129	14.3118	2460	52.3998	14.5342
2430	51.8447	14.339	2461	52.2595	14.5228
2431	51.7103	14.3365	2462	52.2202	14.4621
2432	51.6801	14.3932	2463	52.1042	14.3832
2433	51.6369	14.4464	2464	52.0586	14.375
2434	51.7213	14.4656	2465	51.9812	14.3412
2435	51.6759	14.5283	2466	51.901	14.2697
2436	51.5866	14.5641	2467	51.8099	14.2558
2437	51.6442	14.5939	2468	51.7487	14.2382
2438	51.6541	14.6707	2469	51.6385	14.247
2439	51.6427	14.7007	2470	51.5524	14.2192
2440	51.6146	14.7826	2471	51.4585	14.1538
2441	51.6716	14.7727	2472	51.342	14.1978
2442	51.7179	14.8612	/	/	/

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



System Accuracy Check Results

Date	Frequency Band	Liquid Type	Measured SAR (W/Kg)		Target Value (W/Kg)	Delta (%)	Tolerance (%)
2015/8/10	835	Head	1g	9.41	9.773	-3.71	±10
		Body	1g	9.27	9.736	-4.79	±10
	1900	Head	1g	39.4	39.481	-0.21	±10
		Body	1g	41.6	39.715	4.75	±10
2015/8/11	2450	Head	1g	49.6	52.4	-5.34	±10
		Body	1g	54.1	52.4	3.24	±10

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

SAR SYSTEM VALIDATION DATA

Test Laboratory: Bay Area Compliance Labs Corp.(Dongguan)

System Performance 835MHz Head

DUT: ALS-D-835-S-2; Type: 835 MHz; Serial: 180-00558

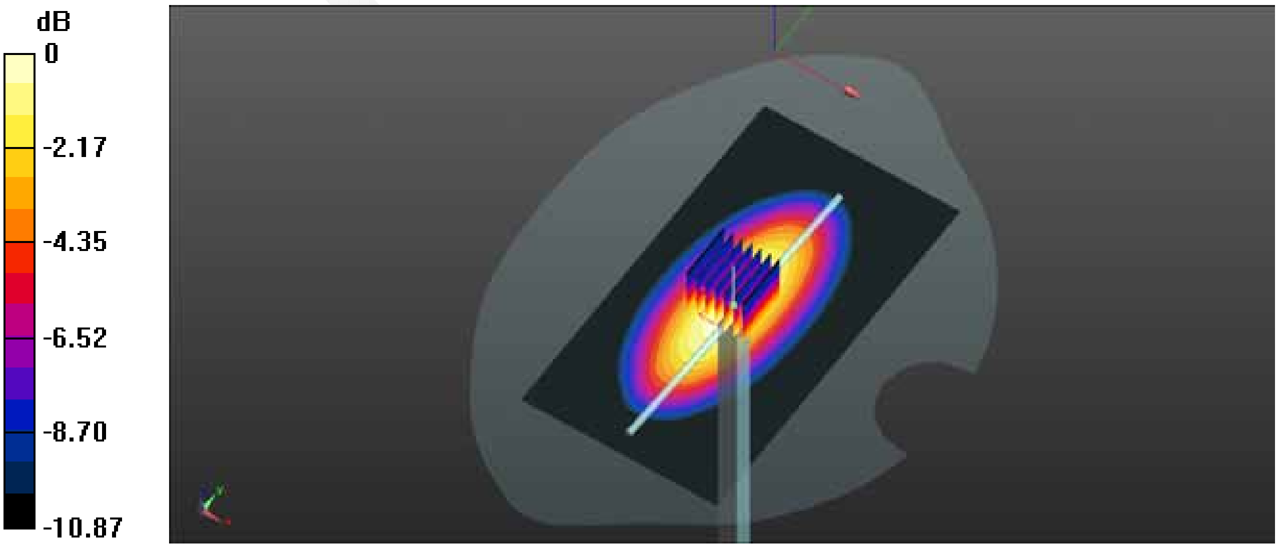
Communication System: CW; Frequency: 835 MHz; Duty Cycle: 1:1
Medium parameters used: f = 835 MHz; σ = 0.892 S/m; ε_r = 42.936; ρ = 1000 kg/m^3
Phantom section: Flat Section

DASY5 Configuration:

- Probe: EX3DV4 - SN7329; ConvF(9.52, 9.52, 9.52); Calibrated: 2015/2/5;
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1459; Calibrated: 2015/1/26
- Phantom: SAM (30deg probe tilt) with CRP v5.0_20150321; Type: QD000P40CD; Serial: TP:1874
- Measurement SW: DASY52, Version 52.8 (8);

System Performance 835MHz Head /Area Scan (71x131x1): Interpolated grid: dx=1.500 mm, dy=1.500 mm
Maximum value of SAR (interpolated) = 9.95 W/kg

System Performance 835MHz Head /Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 105.0 V/m; Power Drift = 0.09 dB
Peak SAR (extrapolated) = 14.7 W/kg
SAR(1 g) = 9.41 W/kg; SAR(10 g) = 6.01 W/kg
Maximum value of SAR (measured) = 10.2 W/kg



0 dB = 10.2 W/kg = 10.09 dBW/kg

Test Laboratory: Bay Area Compliance Labs Corp.(Dongguan)

System Performance 835MHz Body

DUT: ALS-D-835-S-2; Type: 835 MHz; Serial: 180-00558

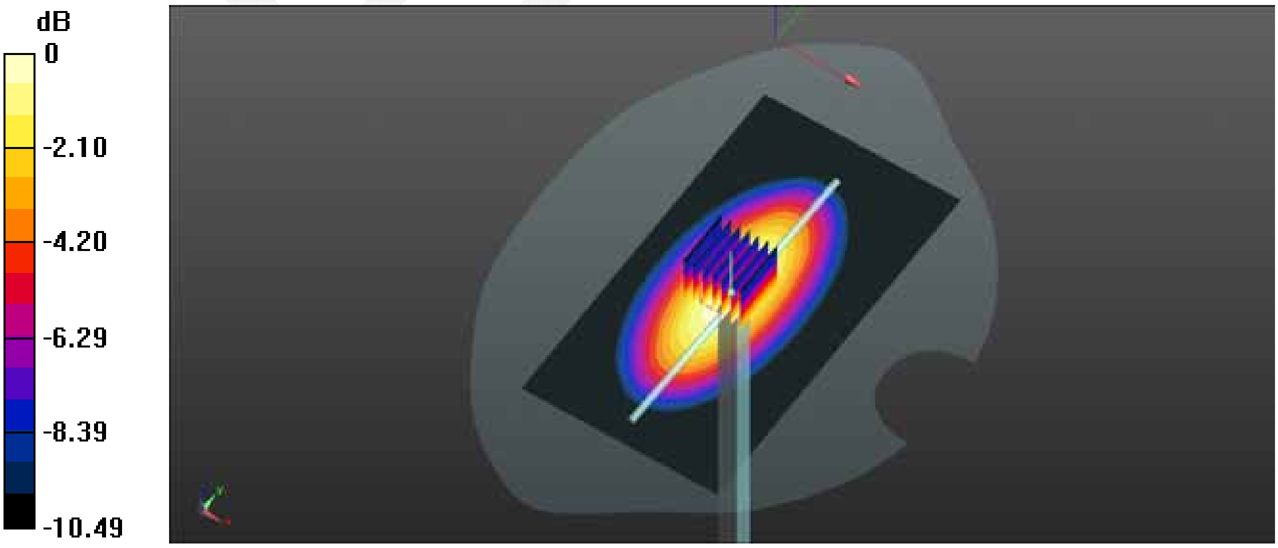
Communication System: CW; Frequency: 835 MHz; Duty Cycle: 1:1
Medium parameters used: f = 835 MHz; σ = 0.974 S/m; ε_r = 55.075; ρ = 1000 kg/m^3
Phantom section: Flat Section

DASY5 Configuration:

- Probe: EX3DV4 - SN7329; ConvF(9.17, 9.17, 9.17); Calibrated: 2015/2/5;
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1459; Calibrated: 2015/1/26
- Phantom: SAM (30deg probe tilt) with CRP v5.0_20150321; Type: QD000P40CD; Serial: TP:1874
- Measurement SW: DASY52, Version 52.8 (8);

System Performance 835MHz Body /Area Scan (71x131x1): Interpolated grid: dx=1.500 mm, dy=1.500 mm
Maximum value of SAR (interpolated) = 9.96 W/kg

System Performance 835MHz Body /Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 99.47 V/m; Power Drift = 0.02 dB
Peak SAR (extrapolated) = 13.9 W/kg
SAR(1 g) = 9.27 W/kg; SAR(10 g) = 6.08 W/kg
Maximum value of SAR (measured) = 9.99 W/kg



0 dB = 9.99 W/kg = 10.00 dBW/kg

Test Laboratory:Bay Area Compliance Labs Corp.(Dongguan)

System Performance 1900MHz Head

DUT: ALS-D-1900-S-2; Type: 1900 MHz; Serial: 210-00710

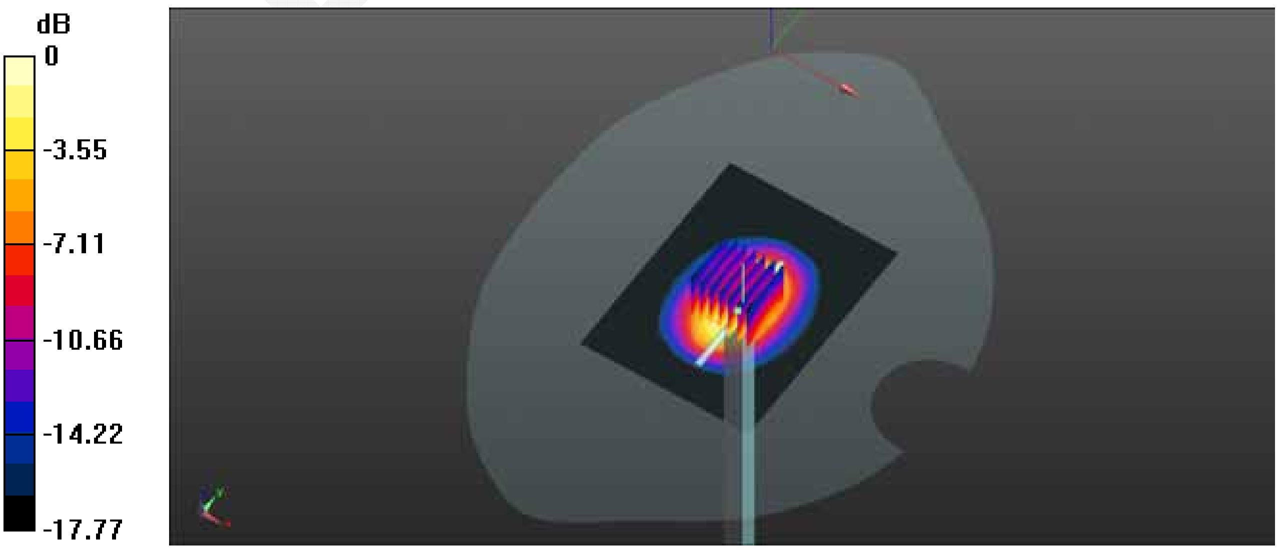
Communication System: CW; Frequency: 1900 MHz;Duty Cycle: 1:1
Medium parameters used: f = 1900 MHz; σ = 1.409 S/m; ε_r = 39.657; ρ = 1000 kg/m^3
Phantom section: Flat Section

DASY5 Configuration:

- Probe: EX3DV4 - SN7329; ConvF(7.88, 7.88, 7.88); Calibrated: 2015/2/5;
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1459; Calibrated: 2015/1/26
- Phantom: SAM (30deg probe tilt) with CRP v5.0_20150321; Type: QD000P40CD; Serial: TP:1874
- Measurement SW: DASY52, Version 52.8 (8);

System Performance 1900MHz Head /Area Scan (61x81x1): Interpolated grid: dx=1.500 mm, dy=1.500 mm
Maximum value of SAR (interpolated) = 46.9 W/kg

System Performance 1900MHz Head /Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 174.5 V/m; Power Drift = -0.15 dB
Peak SAR (extrapolated) = 73.9 W/kg
SAR(1 g) = 39.4 W/kg; SAR(10 g) = 20.4 W/kg
Maximum value of SAR (measured) = 44.4 W/kg



0 dB = 44.4 W/kg = 16.47 dBW/kg

Test Laboratory: Bay Area Compliance Labs Corp.(Dongguan)

System Performance 1900MHz Body

DUT: ALS-D-1900-S-2; Type: 1900 MHz; Serial: 210-00710

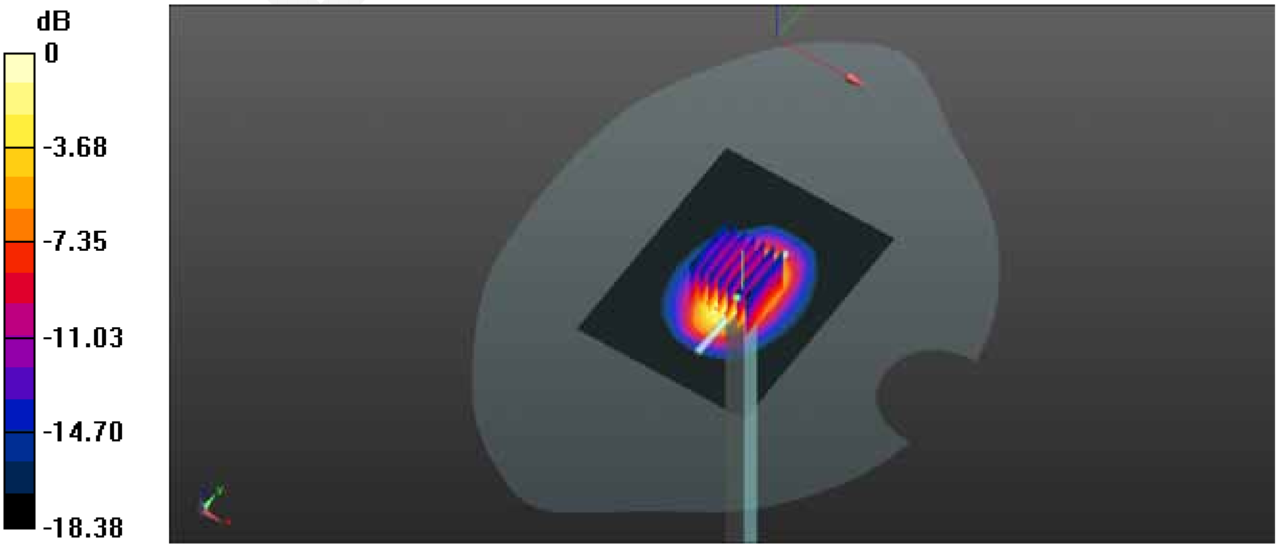
Communication System: CW; Frequency: 1900 MHz; Duty Cycle: 1:1
Medium parameters used: f = 1900 MHz; σ = 1.515 S/m; ε_r = 54.183; ρ = 1000 kg/m^3
Phantom section: Flat Section

DASY5 Configuration:

- Probe: EX3DV4 - SN7329; ConvF(7.56, 7.56, 7.56); Calibrated: 2015/2/5;
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1459; Calibrated: 2015/1/26
- Phantom: SAM (30deg probe tilt) with CRP v5.0_20150321; Type: QD000P40CD; Serial: TP:1874
- Measurement SW: DASY52, Version 52.8 (8);

System Performance 1900MHz Body /Area Scan (61x81x1): Interpolated grid: dx=1.500 mm, dy=1.500 mm
Maximum value of SAR (interpolated) = 48.6 W/kg

System Performance 1900MHz Body /Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 171.8 V/m; Power Drift = 0.14 dB
Peak SAR (extrapolated) = 78.9 W/kg
SAR(1 g) = 41.6 W/kg; SAR(10 g) = 21 W/kg
Maximum value of SAR (measured) = 47.0 W/kg



0 dB = 47.0 W/kg = 16.72 dBW/kg

Test Laboratory: Bay Area Compliance Labs Corp.(Dongguan)

System Performance 2450MHz Head

DUT: ALS-D-2450-S-2; Type: 2450 MHz; Serial: 220-00759

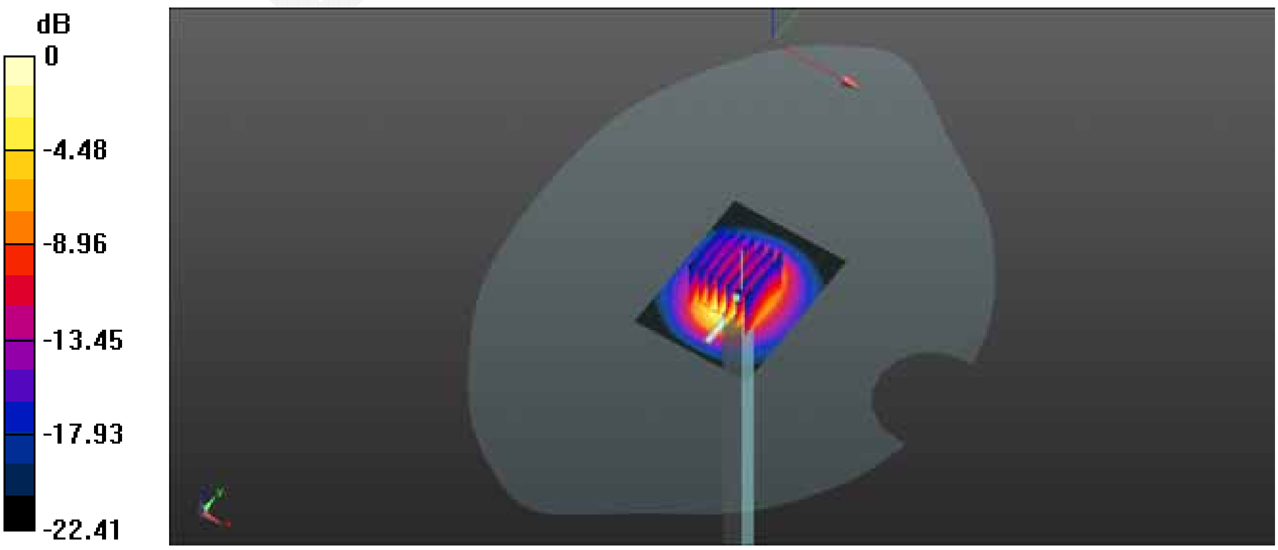
Communication System: CW; Frequency: 2450 MHz; Duty Cycle: 1:1
Medium parameters used: f = 2450 MHz; σ = 1.83 S/m; ε_r = 39.114; ρ = 1000 kg/m^3
Phantom section: Flat Section

DASY5 Configuration:

- Probe: EX3DV4 - SN7329; ConvF(7.06, 7.06, 7.06); Calibrated: 2015/2/5;
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1459; Calibrated: 2015/1/26
- Phantom: SAM (30deg probe tilt) with CRP v5.0_20150321; Type: QD000P40CD; Serial: TP:1874
- Measurement SW: DASY52, Version 52.8 (8);

System Performance 2450MHz Head /Area Scan (61x81x1): Interpolated grid: dx=1.000 mm, dy=1.000 mm
Maximum value of SAR (interpolated) = 60.7 W/kg

System Performance 2450MHz Head /Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 183.4 V/m; Power Drift = -0.13 dB
Peak SAR (extrapolated) = 103 W/kg
SAR(1 g) = 49.6 W/kg; SAR(10 g) = 22.5 W/kg
Maximum value of SAR (measured) = 56.6 W/kg



0 dB = 56.6 W/kg = 17.53 dBW/kg

Test Laboratory: Bay Area Compliance Labs Corp.(Dongguan)

System Performance 2450MHz Body

DUT: ALS-D-2450-S-2; Type: 2450 MHz; Serial: 220-00759

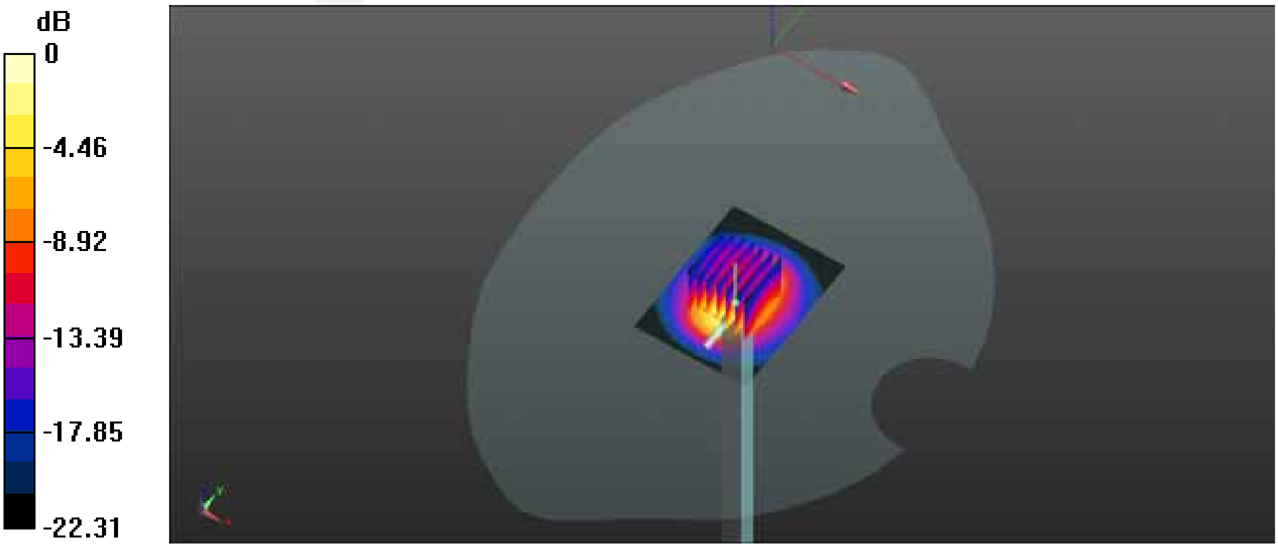
Communication System: CW; Frequency: 2450 MHz;Duty Cycle: 1:1
Medium parameters used: f = 2450 MHz; σ = 2.027 S/m; ε_r = 52.245; ρ = 1000 kg/m^3
Phantom section: Flat Section

DASY5 Configuration:

- Probe: EX3DV4 - SN7329; ConvF(7.2, 7.2, 7.2); Calibrated: 2015/2/5;
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1459; Calibrated: 2015/1/26
- Phantom: SAM (30deg probe tilt) with CRP v5.0_20150321; Type: QD000P40CD; Serial: TP:1874
- Measurement SW: DASY52, Version 52.8 (8);

System Performance 2450MHz Body /Area Scan (61x81x1): Interpolated grid: dx=1.000 mm, dy=1.000 mm
Maximum value of SAR (interpolated) = 61.3 W/kg

System Performance 2450MHz Body /Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 184.1 V/m; Power Drift = 0.03 dB
Peak SAR (extrapolated) = 105 W/kg
SAR(1 g) = 54.1 W/kg; SAR(10 g) = 23.3 W/kg
Maximum value of SAR (measured) = 59.0 W/kg



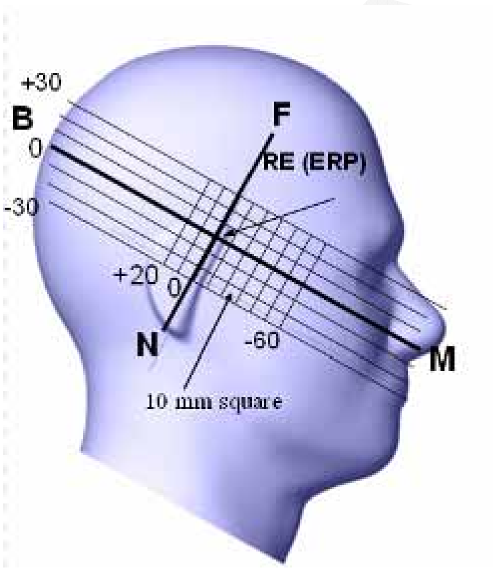
0 dB = 59.0 W/kg = 17.71 dBW/kg

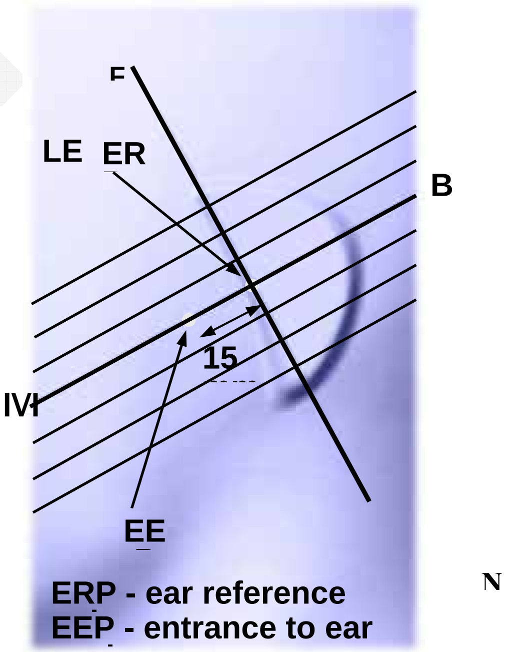
EUT TEST STRATEGY AND METHODOLOGY

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.

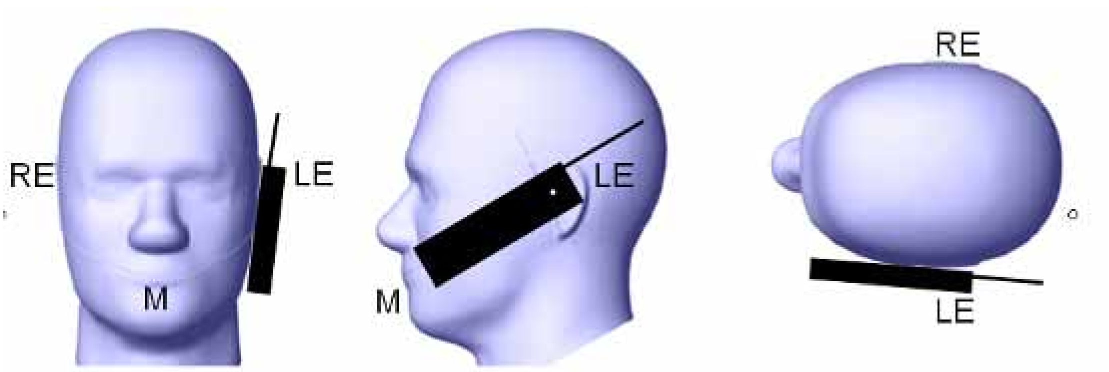
This test position is established:

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

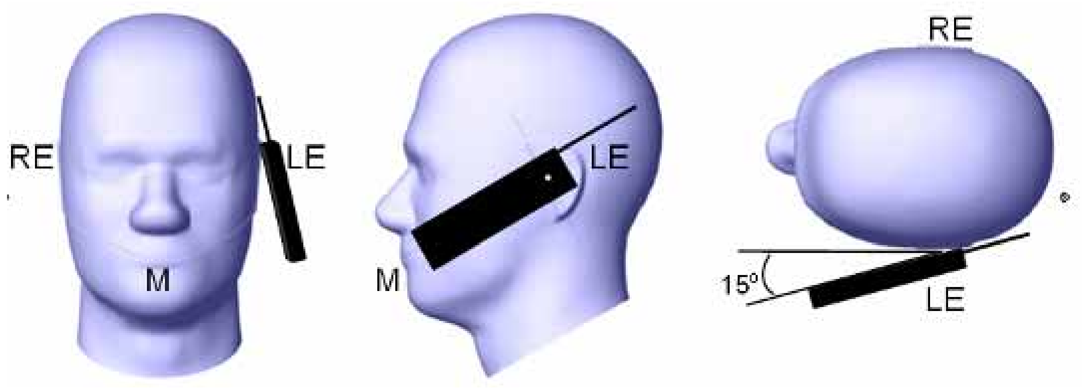
With the handset aligned in the "Cheek/Touch Position":

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.

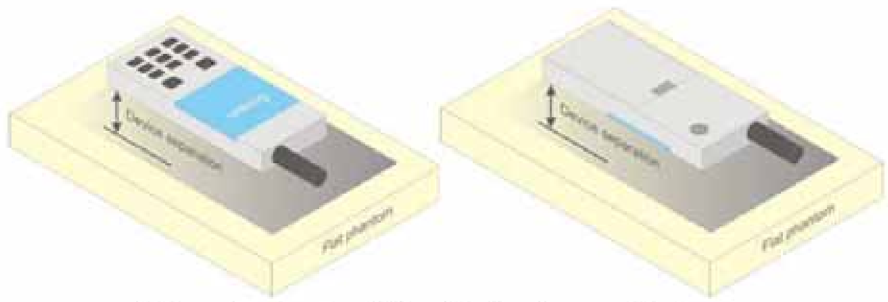


Figure 5 – Test positions for body-worn devices

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 30 mm x 30 mm x 30 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 v01r04
KDB 865664 D02 RF Exposure Reporting v01r01
KDB 941225 D01 3G SAR Procedures v03
KDB 941225 D06 Hotspot Mode v02
KDB 248227 D01 802.11 Wi-Fi SAR v02r01

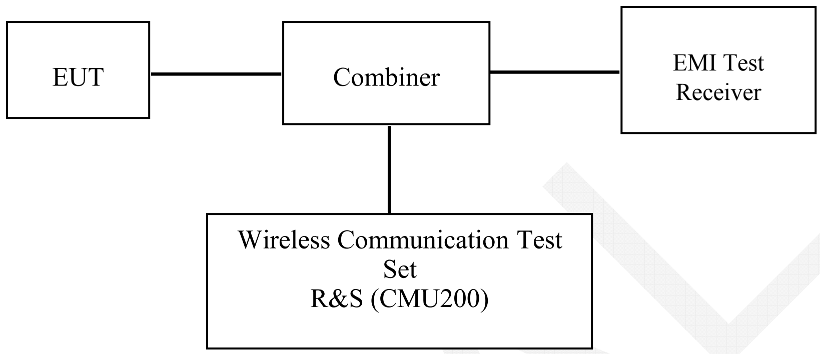
CONDUCTED OUTPUT POWER MEASUREMENT

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/WCDMA

Radio Configuration

The power measurement was configured by the Wireless Communication Test Set CMU200 for all Radio configurations except the HSPA+/DC-HSDPA configured by E5515C.

GSM

Function: Menu select > GSM Mobile Station > GSM 850/1900
Press Connection control to choose the different menus
Press RESET > choose all the reset all settings
Connection: Press Signal Off to turn off the signal and change settings
Network Support > GSM + only
MS Signal
    > 33 dBm for GSM 850
    > 30 dBm for GSM 1900
BS Signal:Enter the same channel number for TCH channel (test channel) and BCCH channel
Frequency Offset >+ 0 Hz
Mode > BCCH and TCH
BCCH Level > -85 dBm (May need to adjust if link is not stabe)
BCCH Channel >choose desire test channel [Enter the same channel number for TCH channel (test channel) and BCCH channel]
Channel Type > Off
P0 > 4 dB
TCH > choose desired test channel
Hopping >Off
AF/RF: Enter appropriate offsets for Ext. Att. Output and Ext. Att. Input
Connection: Press Signal on to turn on the signal and change settings

GPRS

Function: Menu select > GSM Mobile Station > GSM 850/1900
Press Connection control to choose the different menus
Press RESET > choose all the reset all settings
Connection:Press Signal Off to turn off the signal and change settings
Network Support > GSM + GPRS or GSM + EGSM
Main Service > Packet Data

Service selection > Test Mode A – Auto Slot Config. off
MS Signal:Press Slot Config Bottom on the right twice to select and change the number of time slots and power setting
> Slot configuration > Uplink/Gamma
> 33 dBm for GPRS 850
> 30 dBm for GPRS 1900
BS Signal: Enter the same channel number for TCH channel (test channel) and BCCH channel
Frequency Offset >+ 0 Hz
Mode >BCCH and TCH
BCCH Level >-85 dBm (May need to adjust if link is not stabe)
BCCH Channel > choose desire test channel [Enter the same channel number for TCH channel (test channel) and BCCH channel]

Channel Type > Off
P0 > 4 dB
Slot Config > Unchanged (if already set under MS signal)
TCH > choose desired test channel
Hopping >Off
Main Timeslot >3
Network:Coding Scheme >CS4 (GPRS)
Bit Stream >2E9-1 PSR Bit Stream
AF/RF: Enter appropriate offsets for Ext. Att. Output and Ext. Att. Input
Connection: Press Signal on to turn on the signal and change settings

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

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	DACK	8			
	DNAK	8			
	DCQI	8			
	Ack-Nack repetition factor	3			
	CQI Feedback	4ms			
	CQI Repetition Factor	2			
	Ahs=βhs/ βc	30/15			

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_FCls	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	

HSPA+

The following tests were conducted according to the test requirements in Table C.11.1.4 of 3GPP TS 34.121-1

Sub-test	β_c (Note3)	β_d	β_{HS} (Note1)	β_{ec}	β_{ed} (2xSF2) (Note 4)	β_{ed} (2xSF4) (Note 4)	CM (dB) (Note 2)	MPR (dB) (Note 2)	AG Index (Note 4)	E-TFCI (Note 5)	E-TFCI (boost)
1	1	0	30/15	30/15	β_{ed}1: 30/15 β_{ed}2: 30/15	β_{ed}3: 24/15 β_{ed}4: 24/15	3.5	2.5	14	105	105

Note 1: Δ_{ACK}, Δ_{NACK} and Δ_{CQI} = 30/15 with $\beta_{hs} = 30/15 * \beta_c$.
Note 2: CM = 3.5 and the MPR is based on the relative CM difference, MPR = MAX(CM-1,0).
Note 3: DPDCH is not configured, therefore the β_c is set to 1 and β_d = 0 by default.
Note 4: β_{ed} can not be set directly; it is set by Absolute Grant Value.
Note 5: All the sub-tests require the UE to transmit 2SF2+2SF4 16QAM EDCH and they apply for UE using E-DPDCH category 7. E-DCH TTI is set to 2ms TTI and E-DCH table index = 2. To support these E-DCH configurations DPDCH is not allocated. The UE is signalled to use the extrapolation algorithm.

DC-HSDPA

The following tests were conducted according to the test requirements in Table Table C.8.1.12 of 3GPP TS 34.121-1

Table C.8.1.12: Fixed Reference Channel H-Set 12

Parameter	Unit	Value
Nominal Avg. Inf. Bit Rate	kbps	60
Inter-TTI Distance	TTI's	1
Number of HARQ Processes	Processes	6
Information Bit Payload (N_{INF})	Bits	120
Number Code Blocks	Blocks	1
Binary Channel Bits Per TTI	Bits	960
Total Available SML's in UE	SML's	19200
Number of SML's per HARQ Proc.	SML's	3200
Coding Rate		0.15
Number of Physical Channel Codes	Codes	1
Modulation		QPSK

Note 1: The RMC is intended to be used for DC-HSDPA mode and both cells shall transmit with identical parameters as listed in the table.
Note 2: Maximum number of transmission is limited to 1, i.e., retransmission is not allowed. The redundancy and constellation version 0 shall be used.

Maximum Target Output Power

Max Target Power (dBm)			
Mode/Band	Channel		
	Low	Middle	High
GSM 850	33.7	33.7	33.7
GPRS 1 TX Slot	33.6	33.6	33.6
GPRS 2 TX Slot	31.9	31.9	31.9
GPRS 3 TX Slot	29.8	29.8	29.8
GPRS 4 TX Slot	27.8	27.8	27.8
EDGE 1 TX Slot	27	27	27
EDGE 2 TX Slot	24.8	24.8	24.8
EDGE 3 TX Slot	22.7	22.7	22.7
EDGE 4 TX Slot	20.6	20.6	20.6
GSM 1900	30.7	30.7	30.7
GPRS 1 TX Slot	30.6	30.6	30.6
GPRS 2 TX Slot	28.9	28.9	28.9
GPRS 3 TX Slot	26.9	26.9	26.9
GPRS 4 TX Slot	24.6	24.6	24.6
EDGE 1 TX Slot	24.7	24.7	24.7
EDGE 2 TX Slot	24.1	24.1	24.1
EDGE 3 TX Slot	21.7	21.7	21.7
EDGE 4 TX Slot	20	20	20
WCDMA850	21.8	21.8	21.8
HSDPA	22	22	22
HSUPA	22.1	22.1	22.1
DC-HSDPA	21.8	21.8	21.8
HSPA+	21.8	21.8	21.8
WCDMA1900	21.8	21.8	21.8
HSDPA	21.9	21.9	21.9
HSUPA	21.9	21.9	21.9
DC-HSDPA	21.8	21.8	21.8
HSPA+	21.8	21.8	21.8
WLAN	17.7	17.7	17.7
Bluetooth BDR/EDR	4.3	4.3	4.3
Bluetooth LE	-2.9	-2.9	-2.9

Test Results:

GSM:

Band	Channel No.	Frequency (MHz)	RF Output Power (dBm)
GSM 850	128	824.2	33.3
	190	836.6	33.35
	251	848.8	**33.63**
PCS 1900	512	1850.2	30.21
	661	1880	30.38
	810	1909.8	**30.62**

GPRS:

Band	Channel No.	Frequency (MHz)	RF Output Power (dBm)			
			1 slot	2 slots	3 slots	4 slots
GSM 850	128	824.2	33.25	31.78	29.68	27.35
	190	836.6	33.15	31.65	29.58	27.68
	251	848.8	33.47	31.36	29.47	27.67
PCS 1900	512	1850.2	30.12	28.47	26.7	24.52
	661	1880	30.24	28.54	26.46	24.15
	810	1909.8	30.45	28.75	26.75	24.27

EGPRS:

Band	Channel No.	Frequency (MHz)	RF Output Power (dBm)			
			1 slot	2 slots	3 slots	4 slots
GSM 850	128	824.2	26.87	24.25	22.05	20.45
	190	836.6	26.04	24.73	22.62	20.36
	251	848.8	26.35	24.15	22.45	20.4
PCS 1900	512	1850.2	24.21	23.17	21.34	19.86
	661	1880	24.62	23.98	21.63	19.65
	810	1909.8	24.25	23.63	21.35	19.74

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	24.25	**25.78**	25.43	24.35
	190	836.6	24.15	25.65	25.33	24.68
	251	848.8	24.47	25.36	25.22	24.67
PCS 1900	512	1850.2	21.12	22.47	22.45	21.52
	661	1880	21.24	22.54	22.21	21.15
	810	1909.8	21.45	**22.75**	22.5	21.27

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	17.87	18.25	17.8	17.45
	190	836.6	17.04	18.73	18.37	17.36
	251	848.8	17.35	18.15	18.2	17.4
PCS 1900	512	1850.2	15.21	17.17	17.09	16.86
	661	1880	15.62	17.98	17.38	16.65
	810	1909.8	15.25	17.63	17.1	16.74

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 EGPRS mode are not required when the source-based time-averaged output power for data mode is lower than that in the normal GPRS mode

WCDMA:

Results (12.2kbps RMC)

Band	Channel No.	Frequency (MHz)	RF Output Power (dBm)
WCDMA 850	4132	826.4	21.34
	4183	836.6	**21.7**
	4233	846.6	21.65
WCDMA 1900	9262	1852.4	21.57
	9400	1880	21.54
	9538	1907.6	**21.68**

Results (HSDPA)

Band	Channel No.	Frequency (MHz)	RF Output Power (dBm)			
			Subset 1	Subset 2	Subset 3	Subset 4
WCDMA 850	4132	826.4	21.21	21.13	21.43	21.56
	4183	836.6	21.81	21.76	21.67	21.93
	4233	846.6	21.43	21.7	21.52	21.79
WCDMA 1900	9262	1852.4	21.52	21.66	21.61	21.48
	9400	1880	21.65	21.6	21.48	21.42
	9538	1907.6	21.81	21.55	21.7	21.66

Results (HSUPA)

Band	Channel No.	Frequency (MHz)	RF Output Power (dBm)				
			Subset 1	Subset 2	Subset 3	Subset 4	Subset 5
WCDMA 850	4132	826.4	21.44	21.58	21.3	21.49	21.59
	4183	836.6	21.95	21.73	21.66	21.76	21.71
	4233	846.6	21.85	21.66	21.76	21.47	21.52
WCDMA 1900	9262	1852.4	21.64	21.36	21.57	21.61	21.56
	9400	1880	21.57	21.59	21.62	21.73	21.59
	9538	1907.6	21.5	21.65	21.79	21.8	21.74

Results (DC-HSDPA):

Band	Channel No.	Frequency (MHz)	RF Output Power (dBm)			
			Subset 1	Subset 2	Subset 3	Subset 4
WCDMA 850	4132	826.4	21.23	21.36	21.2	21.49
	4183	836.6	21.78	21.83	21.65	21.79
	4233	846.6	21.48	21.78	21.5	21.72
WCDMA 1900	9262	1852.4	21.52	21.4	21.37	21.55
	9400	1880	21.49	21.44	21.59	21.36
	9538	1907.6	21.71	21.55	21.55	21.77

Results (HSPA+)

Band	Channel No.	Frequency (MHz)	RF Output Power (dBm)
WCDMA 850	4132	826.4	**21.34**
	4183	836.6	21.51
	4233	846.6	21.38
WCDMA 1900	9262	1852.4	21.25
	9400	1880	21.36
	9538	1907.6	**21.49**

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/HSUPA/HSPA+/DC-HSDPA when the maximum average output of each RF channel is less than ¼ dB higher than measured 12.2kbps RMC or the maximum SAR for 12.2kbps RMC is < 75% of SAR limit.

Bluetooth

Mode	Channel No.	Channel frequency (MHz)	RF Output Power (dBm)
BDR(GFSK)	0	2402	3.35
	39	2441	3.97
	78	2480	**4.21**
EDR(4-DQPSK)	0	2402	2.5
	39	2441	3.34
	78	2480	3.44
EDR-8DPSK	0	2402	2.8
	39	2441	3.43
	78	2480	3.51
BLE	0	2402	-3.33
	19	2440	-3.03
	39	2480	-2.99

WLAN

Mode	Channel No.	Channel frequency (MHz)	RF Output Power (dBm)
802.11b	1	2412	**17.56**
	6	2437	17.26
	11	2462	17.51
802.11g	1	2412	14.76
	6	2437	14.76
	11	2462	14.49
802.11n HT20	1	2412	13.40
	6	2437	13.26
	11	2462	12.94
802.11n HT40	3	2422	11.98
	6	2437	11.80
	9	2452	11.09

Note:
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.

The EUT is capable of function as a WLAN to cellular mobile hotspot. Additional SAR test was performed according to KDB941225 D06. Test was performed with a separation of 1cm between the EUT and the flat phantom. The EUT was positioned for SAR tests with the front and back surfaces facing 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.

SAR Test Data

Environmental Conditions

Temperature	21.5-23	22-23
Relative	30-31 %	31 %
ATM	1000 mbar	1002 mbar
Recorded	2015-08-10	2015-08-11

Testing was performed by Rocky Xiao

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	-2.253	33.3	33.7	1.096	0.149	0.163	/
	836.6	GSM	3.268	33.35	33.7	1.084	0.151	0.164	/
	848.8	GSM	2.094	33.63	33.7	1.016	0.169	0.172	**1#**
Left Head Tilt	824.2	GSM	/	/	/	/	/	/	/
	836.6	GSM	-1.657	33.35	33.7	1.084	0.0872	0.095	/
	848.8	GSM	/	/	/	/	/	/	/
Right Head Cheek	824.2	GSM	/	/	/	/	/	/	/
	836.6	GSM	-2.997	33.35	33.7	1.084	0.144	0.156	/
	848.8	GSM	/	/	/	/	/	/	/
Right Head Tilt	824.2	GSM	/	/	/	/	/	/	/
	836.6	GSM	1.831	33.35	33.7	1.084	0.082	0.089	/
	848.8	GSM	/	/	/	/	/	/	/
Body Worm Headset (10mm)	824.2	GSM	/	/	/	/	/	/	/
	836.6	GSM	-1.235	33.35	33.7	1.084	0.654	0.709	/
	848.8	GSM	/	/	/	/	/	/	/
Body Worm Bottom (10mm)	824.2	GPRS	/	/	/	/	/	/	/
	836.6	GPRS	2.047	31.65	31.9	1.059	0.224	0.237	/
	848.8	GPRS	/	/	/	/	/	/	/
Body Worm Left (10mm)	824.2	GPRS	/	/	/	/	/	/	/
	836.6	GPRS	-0.195	31.65	31.9	1.059	0.143	0.151	/
	848.8	GPRS	/	/	/	/	/	/	/
Body Worm Right (10mm)	824.2	GPRS	/	/	/	/	/	/	/
	836.6	GPRS	-3.703	31.65	31.9	1.059	0.102	0.108	/
	848.8	GPRS	/	/	/	/	/	/	/
Body Worm Back (10mm)	824.2	GPRS	-2.756	31.78	31.9	1.028	0.837	0.86	/
	836.6	GPRS	-1.145	31.65	31.9	1.059	0.833	0.882	**2#**
	848.8	GPRS	-1.879	31.36	31.9	1.132	0.775	0.877	/

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.
5. The Multi-slot Classes of EUT is Class 12 which has maximum 4 Downlink slots and 4 Uplink slots, the maximum active slots is 5, when perform the multiple slots scan, 3DL+2UL is the worst case.

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	/	/	/	/	/	/	/
	1880	GSM	-0.855	30.38	30.7	1.076	0.188	0.202	/
	1909.8	GSM	/	/	/	/	/	/	/
Left Head Tilt	1850.2	GSM	/	/	/	/	/	/	/
	1880	GSM	2.314	30.38	30.7	1.076	0.125	0.135	/
	1909.8	GSM	/	/	/	/	/	/	/
Right Head Cheek	1850.2	GSM	-1.563	30.21	30.7	1.119	0.194	0.217	/
	1880	GSM	-1.213	30.38	30.7	1.076	0.201	0.216	/
	1909.8	GSM	-4.06	30.62	30.7	1.019	0.218	0.222	**3#**
Right Head Tilt	1850.2	GSM	/	/	/	/	/	/	/
	1880	GSM	1.175	30.38	30.7	1.076	0.132	0.142	/
	1909.8	GSM	/	/	/	/	/	/	/
Body Worm Headset (10mm)	1850.2	GSM	/	/	/	/	/	/	/
	1880	GSM	3.299	30.38	30.7	1.076	0.613	0.66	/
	1909.8	GSM	/	/	/	/	/	/	/
Body Worm Bottom (10mm)	1850.2	GPRS	/	/	/	/	/	/	/
	1880	GPRS	1.457	28.54	28.9	1.086	0.302	0.328	/
	1909.8	GPRS	/	/	/	/	/	/	/
Body Worm Left (10mm)	1850.2	GPRS	/	/	/	/	/	/	/
	1880	GPRS	1.914	28.54	28.9	1.086	0.124	0.135	/
	1909.8	GPRS	/	/	/	/	/	/	/
Body Worm Right (10mm)	1850.2	GPRS	/	/	/	/	/	/	/
	1880	GPRS	-1.576	28.54	28.9	1.086	0.159	0.173	/
	1909.8	GPRS	/	/	/	/	/	/	/
Body Worm Back (10mm)	1850.2	GPRS	-0.342	28.47	28.9	1.104	0.812	0.896	/
	1880	GPRS	2.168	28.54	28.9	1.086	0.836	0.908	/
	1909.8	GPRS	-3.617	28.75	28.9	1.035	0.889	0.92	**4#**

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.
5. The Multi-slot Classes of EUT is Class 12 which has maximum 4 Downlink slots and 4 Uplink slots, the maximum active slots is 5, when perform the multiple slots scan, 3DL+2UL is the worst case.

WCDMA 850 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	826.4	RMC	-0.487	21.34	21.8	1.112	0.208	0.231	/
	836.6	RMC	3.276	21.7	21.8	1.023	0.242	0.248	**5#**
	846.6	RMC	-2.59	21.65	21.8	1.035	0.231	0.239	/
Left Head Tilt	826.4	RMC	/	/	/	/	/	/	/
	836.6	RMC	2.372	21.7	21.8	1.023	0.138	0.141	/
	846.6	RMC	/	/	/	/	/	/	/
Right Head Cheek	826.4	RMC	/	/	/	/	/	/	/
	836.6	RMC	-0.696	21.7	21.8	1.023	0.222	0.227	/
	846.6	RMC	/	/	/	/	/	/	/
Right Head Tilt	826.4	RMC	/	/	/	/	/	/	/
	836.6	RMC	-2.809	21.7	21.8	1.023	0.132	0.135	/
	846.6	RMC	/	/	/	/	/	/	/
Body Worm Bottom (10mm)	826.4	RMC	/	/	/	/	/	/	/
	836.6	RMC	3.611	21.7	21.8	1.023	0.121	0.124	/
	846.6	RMC	/	/	/	/	/	/	/
Body Worm Left (10mm)	826.4	RMC	/	/	/	/	/	/	/
	836.6	RMC	-3.128	21.7	21.8	1.023	0.0854	0.087	/
	846.6	RMC	/	/	/	/	/	/	/
Body Worm Right (10mm)	826.4	RMC	/	/	/	/	/	/	/
	836.6	RMC	-3.054	21.7	21.8	1.023	0.0923	0.094	/
	846.6	RMC	/	/	/	/	/	/	/
Body Worm Back (10mm)	826.4	RMC	-0.589	21.34	21.8	1.112	0.403	0.448	/
	836.6	RMC	0.925	21.7	21.8	1.023	0.443	0.453	**6#**
	846.6	RMC	3.851	21.65	21.8	1.035	0.425	0.44	/

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 antenna while testing SAR.
3. 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.
4. KDB 941225 D01-Body SAR is not required for HSDPA/HSUPA/HSPA+/DC-HSDPA when the maximum average output of each RF channel is less than ¼ dB higher than measured 12.2kbps RMC or the maximum SAR for 12.2kbps RMC is < 75% of SAR limit.
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.

WCDMA 1900 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	1852.4	RMC	/	/	/	/	/	/	/
	1880	RMC	/	/	/	/	/	/	/
	1907.6	RMC	-3.07	21.68	21.8	1.028	0.437	0.449	/
Left Head Tilt	1852.4	RMC	/	/	/	/	/	/	/
	1880	RMC	/	/	/	/	/	/	/
	1907.6	RMC	-3.968	21.68	21.8	1.028	0.279	0.287	/
Right Head Cheek	1852.4	RMC	1.699	21.57	21.8	1.054	0.456	0.481	/
	1880	RMC	-3.989	21.54	21.8	1.062	0.446	0.474	/
	1907.6	RMC	-2.949	21.68	21.8	1.028	0.486	0.5	**7#**
Right Head Tilt	1852.4	RMC	/	/	/	/	/	/	/
	1880	RMC	/	/	/	/	/	/	/
	1907.6	RMC	-0.764	21.68	21.8	1.028	0.301	0.309	/
Body Worm Bottom (10mm)	1852.4	RMC	/	/	/	/	/	/	/
	1880	RMC	/	/	/	/	/	/	/
	1907.6	RMC	-0.618	21.68	21.8	1.028	0.543	0.561	/
Body Worm Left (10mm)	1852.4	RMC	/	/	/	/	/	/	/
	1880	RMC	/	/	/	/	/	/	/
	1907.6	RMC	1.043	21.68	21.8	1.028	0.169	0.174	/
Body Worm Right (10mm)	1852.4	RMC	/	/	/	/	/	/	/
	1880	RMC	/	/	/	/	/	/	/
	1907.6	RMC	-2.803	21.68	21.8	1.028	0.203	0.209	/
Body Worm Back (10mm)	1852.4	RMC	1.764	21.57	21.8	1.054	1.08	1.138	/
	1880	RMC	-3.268	21.54	21.8	1.062	1.02	1.083	/
	1907.6	RMC	-0.917	21.68	21.8	1.028	1.28	1.316	**8#**

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 antenna while testing SAR.
3. 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.
4. KDB 941225 D01-Body SAR is not required for HSDPA/HSUPA/HSPA+/DC-HSDPA when the maximum average output of each RF channel is less than ¼ dB higher than measured 12.2kbps RMC or the maximum SAR for 12.2kbps RMC is < 75% of SAR limit.
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.

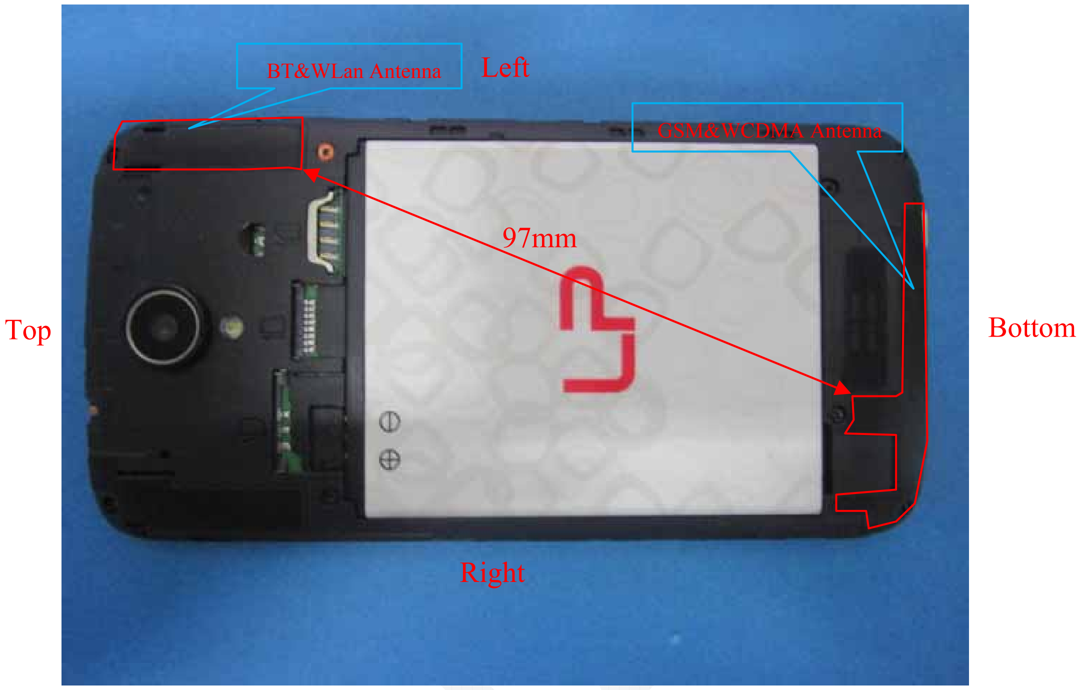
WLAN 2.4G:

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	2412	802.11b	-1.165	17.56	17.7	1.033	0.833	0.86	/
	2437	802.11b	-1.631	17.26	17.7	1.107	0.774	0.857	/
	2462	802.11b	-1.825	17.51	17.7	1.045	0.837	0.875	**9#**
Left Head Tilt	2412	802.11b	/	/	/	/	/	/	/
	2437	802.11b	-2.54	17.26	17.7	1.107	0.672	0.744	/
	2462	802.11b	/	/	/	/	/	/	/
Right Head Cheek	2412	802.11b	/	/	/	/	/	/	/
	2437	802.11b	1.052	17.26	17.7	1.107	0.752	0.832	/
	2462	802.11b	/	/	/	/	/	/	/
Right Head Tilt	2412	802.11b	/	/	/	/	/	/	/
	2437	802.11b	-2.925	17.26	17.7	1.107	0.625	0.692	/
	2462	802.11b	/	/	/	/	/	/	/
Body-Worn-Top (10mm)	2412	802.11b	/	/	/	/	/	/	/
	2437	802.11b	-0.195	17.26	17.7	1.107	0.241	0.267	
	2462	802.11b	/	/	/	/	/	/	/
Body-Worn-Left (10mm)	2412	802.11b	/	/	/	/	/	/	/
	2437	802.11b	0.018	17.26	17.7	1.107	0.225	0.249	/
	2462	802.11b	/	/	/	/	/	/	/
Body-Worn-Back (10mm)	2412	802.11b	-1.504	17.56	17.7	1.033	0.303	0.313	/
	2437	802.11b	-3.185	17.26	17.7	1.107	0.287	0.318	/
	2462	802.11b	3.276	17.51	17.7	1.045	0.315	0.329	**10#**

Note:
1.When the 1-g SAR is≤ 0.8W/Kg, testing for other channels are optional.
2.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.
3.KDB248227-SAR is not required for 802.11g channels when the maximum average output power is less than 1/4 dB higher than that measured on the corresponding 802.11b channels.

SAR SIMULTANEOUS TRANSMISSION DESCRIPTION

BT&WLAN and GSM&3G Antennas Location:



Simultaneous Transmission:

Description of Simultaneous Transmit Capabilities			Antennas Distance (mm)
Transmitter Combination	Simultaneous?	Hotspot?	
GSM + WCDMA	×	×	0
GSM + Bluetooth	√	×	97
GSM + WLAN	√	√	97
WCDMA+Bluetooth	√	×	97
WCDMA + WLAN	√	√	97

Note:
Hotspot mode SAR is only required for the edges within 25mm from the transmitting antenna located.

Standalone SAR test exclusion considerations

Mode	Frequency (MHz)	Pavg (dBm)	Pavg (mW)	Distance (mm)	Calculated value	Threshold (1-g)	SAR Test Exclusion
Bluetooth	2450	4.3	2.69	0	0.84	3	YES

NOTE:
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)	Pavg (dBm)	Pavg (mW)	Distance (mm)	Estimated 1-g (W/kg)
BT Head	2450	4.3	2.69	0	0.112
BT Body	2450	4.3	2.69	10	0.056

NOTE:
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 and Hotspot SAR test exclusion considerations:

Mode (SAR1+SAR2)	Position	Reported SAR (W/kg)		ΣSAR
		SAR1	SAR2	Limit < 1.6W/kg
GSM 850 +BT	Left Head Cheek	0.172	0.112	0.284
	Left Head Tilt	0.095	0.112	0.207
	Right Head Cheek	0.156	0.112	0.268
	Right Head Tilt	0.089	0.112	0.201
	Body-Back-Headset	0.709	0.056	0.765
	Body-Bottom	0.237	0.056	0.293
	Body-Left	0.151	0.056	0.207
	Body-Right	0.108	0.056	0.164
	Body-Back	0.882	0.056	0.938
PCS 1900+BT	Left Head Cheek	0.202	0.112	0.314
	Left Head Tilt	0.135	0.112	0.247
	Right Head Cheek	0.222	0.112	0.334
	Right Head Tilt	0.142	0.112	0.254
	Body-Back-Headset	0.66	0.056	0.716
	Body-Bottom	0.328	0.056	0.384
	Body-Left	0.135	0.056	0.191
	Body-Right	0.173	0.056	0.229
	Body-Back	0.92	0.056	0.976
WCDMA 850 + BT	Left Head Cheek	0.248	0.112	0.36
	Left Head Tilt	0.141	0.112	0.253
	Right Head Cheek	0.227	0.112	0.339
	Right Head Tilt	0.135	0.112	0.247
	Body-Bottom	0.124	0.056	0.18
	Body-Left	0.087	0.056	0.143
	Body-Right	0.094	0.056	0.15
	Body-Back	0.453	0.056	0.509
WCDMA 1900 + BT	Left Head Cheek	0.449	0.112	0.561
	Left Head Tilt	0.287	0.112	0.399
	Right Head Cheek	0.5	0.112	0.612
	Right Head Tilt	0.309	0.112	0.421
	Body-Bottom	0.561	0.056	0.617
	Body-Left	0.174	0.056	0.23
	Body-Right	0.209	0.056	0.265
	Body-Back	1.316	0.056	1.372

Mode (SAR1+SAR2)	Position	Reported SAR (W/kg)		ΣSAR
		SAR1	SAR2	Limit< 1.6W/kg
GSM 850+ WLAN	Left Head Cheek	0.172	0.875	1.047
	Left Head Tilt	0.095	0.744	0.839
	Right Head Cheek	0.156	0.832	0.988
	Right Head Tilt	0.089	0.692	0.781
	Body Headset Back	0.709	0.329	1.038
	Body-Left	0.151	0.249	0.4
	Body-Back	0.882	0.329	1.211
PCS 1900 + WLAN	Left Head Cheek	0.202	0.875	1.077
	Left Head Tilt	0.135	0.744	0.879
	Right Head Cheek	0.222	0.832	1.054
	Right Head Tilt	0.142	0.692	0.834
	Body Headset Back	0.66	0.329	0.989
	Body-Left	0.135	0.249	0.384
	Body-Back	0.92	0.329	1.249
WCDMA 850 + WLAN	Left Head Cheek	0.248	0.875	1.123
	Left Head Tilt	0.141	0.744	0.885
	Right Head Cheek	0.227	0.832	1.059
	Right Head Tilt	0.135	0.692	0.827
WCDMA 850 + WLAN (Hotspot)	Body-Left	0.087	0.249	0.336
	Body-Back	0.453	0.329	0.782
WCDMA 1900 + WLAN	Left Head Cheek	0.449	0.875	1.324
	Left Head Tilt	0.287	0.744	1.031
	Right Head Cheek	0.5	0.832	1.332
	Right Head Tilt	0.309	0.692	1.001
WCDMA 1900 + WLAN (Hotspot)	Body-Left	0.174	0.249	0.423
	Body-Back	1.316	0.329	**1.645**[Note 1]

Note:

1. When the sum is greater than the SAR limit, the SAR to peak location separation ratio(SPLSR) was applied to determine if simultaneous transmission SAR test exclusion applies.

SPLSR:

Distance(Ri) = $[(x_1-x_2)^2+(y_1-y_2)^2+(z_1-z_2)^2]^{0.5}$=111.5mm

SPLSR= $(SAR1 + SAR2)^{1.5}/Ri=(1.316+0.329)^{1.5}/111.5 = 0.0189 < 0.04$

Conclusion:

Sum of SAR: **Σ SAR < 1.6 W/kg** or SAR to peak location separation ratio:**$(SAR1 + SAR2)^{1.5}/Ri < 0.04$,** therefore simultaneous transmission SAR with Volume Scans is **not required**.

SAR Plots (Summary of the Highest SAR Values)

Test Laboratory: Bay Area Compliance Labs Corp.(Dongguan)

Test Plot 1#:GSM 850 Left Cheek High Channel

DUT: Astro X5; Type: Astro X5

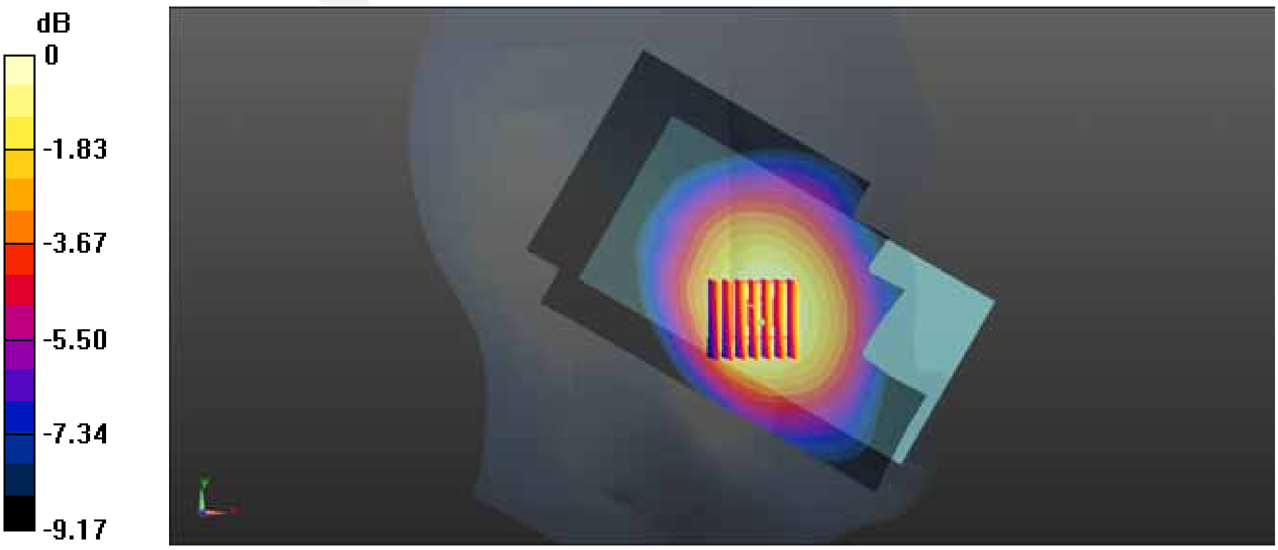
Communication System: Generic GSM; Frequency: 848.8 MHz;Duty Cycle: 1: 8
Medium parameters used: f = 849 MHz; σ = 0.896 S/m; ε_r = 42.715; ρ = 1000 kg/m^3
Phantom section: Left Section

DASY5 Configuration:

- Probe: EX3DV4 - SN7329; ConvF(9.52, 9.52, 9.52); Calibrated: 2015/2/5;
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1459; Calibrated: 2015/1/26
- Phantom: SAM (30deg probe tilt) with CRP v5.0_20150321; Type: QD000P40CD; Serial: TP:1874
- Measurement SW: DASY52, Version 52.8 (8);

Head/GSM 850 Left Cheek/Area Scan (71x111x1): Interpolated grid: dx=1.500 mm, dy=1.500 mm
Maximum value of SAR (interpolated) = 0.179 W/kg

Head/GSM 850 Left Cheek/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 4.491 V/m; Power Drift = 0.09 dB
Peak SAR (extrapolated) = 0.217 W/kg
SAR(1 g) = 0.169 W/kg; SAR(10 g) = 0.128 W/kg
Maximum value of SAR (measured) = 0.177 W/kg



0 dB = 0.177 W/kg = -7.52 dBW/kg

Test Laboratory: Bay Area Compliance Labs Corp.(Dongguan)

Test Plot 2#:GSM 850 Back Middle Channel

DUT: Astro X5; Type: Astro X5

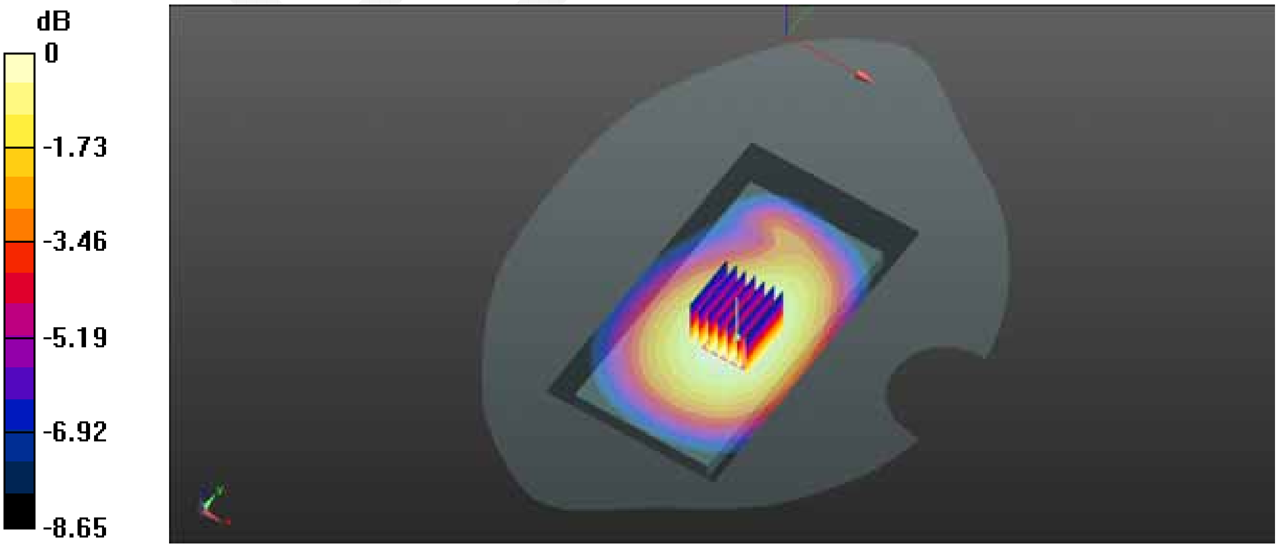
Communication System: Generic GPRS-2 SLOTS; Frequency: 836.6 MHz;Duty Cycle: 1:4
Medium parameters used: f = 836.6 MHz; σ = 0.989 S/m; ε_r = 54.988; ρ = 1000 kg/m^3
Phantom section: Flat Section

DASY5 Configuration:

- Probe: EX3DV4 - SN7329; ConvF(9.17, 9.17, 9.17); Calibrated: 2015/2/5;
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1459; Calibrated: 2015/1/26
- Phantom: SAM (30deg probe tilt) with CRP v5.0_20150321; Type: QD000P40CD; Serial: TP:1874
- Measurement SW: DASY52, Version 52.8 (8);

Body/GSM 850 Back/Area Scan (61x111x1): Interpolated grid: dx=1.500 mm, dy=1.500 mm
Maximum value of SAR (interpolated) = 0.889 W/kg

Body/GSM 850 Back/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 29.88 V/m; Power Drift = -0.05 dB
Peak SAR (extrapolated) = 1.04 W/kg
SAR(1 g) = 0.833 W/kg; SAR(10 g) = 0.645 W/kg
Maximum value of SAR (measured) = 0.872 W/kg



0 dB = 0.872 W/kg = -0.59 dBW/kg

Test Laboratory: Bay Area Compliance Labs Corp.(Dongguan)

Test Plot 3#:PCS 1900 Right Cheek High Channel

DUT: Astro X5; Type: Astro X5

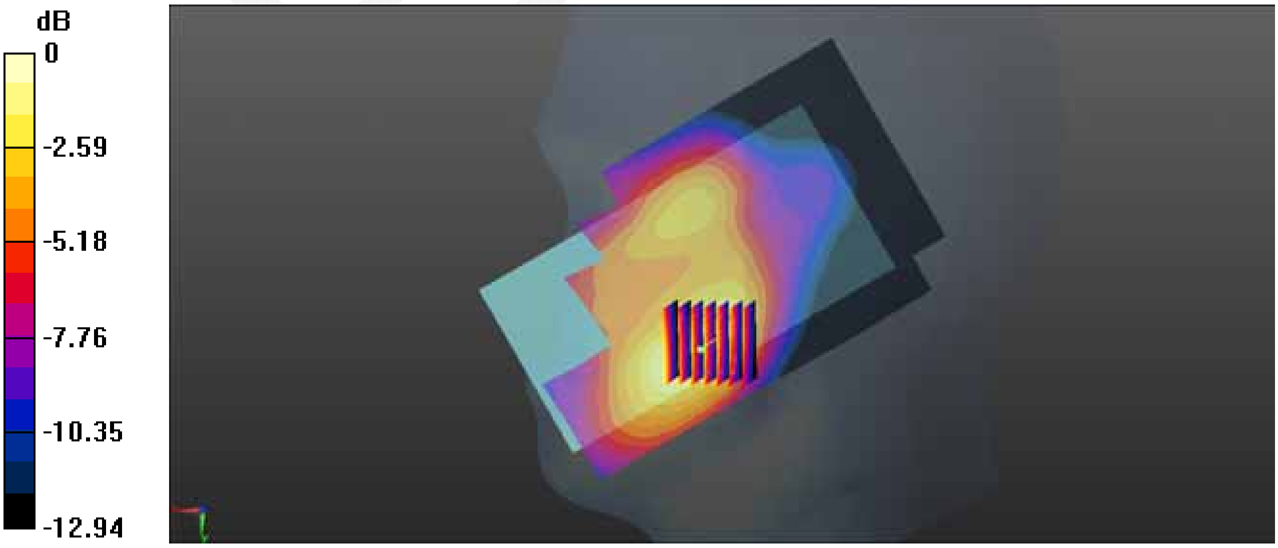
Communication System: Generic GSM; Frequency: 1909.8 MHz;Duty Cycle: 1: 8
Medium parameters used: f = 1910 MHz; σ = 1.414 S/m; ε_r = 39.58; ρ = 1000 kg/m^3
Phantom section: Right Section

DASY5 Configuration:

- Probe: EX3DV4 - SN7329; ConvF(7.88, 7.88, 7.88); Calibrated: 2015/2/5;
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1459; Calibrated: 2015/1/26
- Phantom: SAM (30deg probe tilt) with CRP v5.0_20150321; Type: QD000P40CD; Serial: TP:1874
- Measurement SW: DASY52, Version 52.8 (8);

Head/PCS 1900 Right Cheek/Area Scan (71x111x1): Interpolated grid: dx=1.500 mm, dy=1.500 mm
Maximum value of SAR (interpolated) = 0.225 W/kg

Head/PCS 1900 Right Cheek/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 4.368 V/m; Power Drift = -0.18 dB
Peak SAR (extrapolated) = 0.353 W/kg
SAR(1 g) = 0.218 W/kg; SAR(10 g) = 0.133 W/kg
Maximum value of SAR (measured) = 0.239 W/kg



0 dB = 0.239 W/kg = -6.22 dBW/kg

Test Laboratory: Bay Area Compliance Labs Corp.(Dongguan)

Test Plot 4#:PCS 1900 Back High Channel

DUT: Astro X5; Type: Astro X5

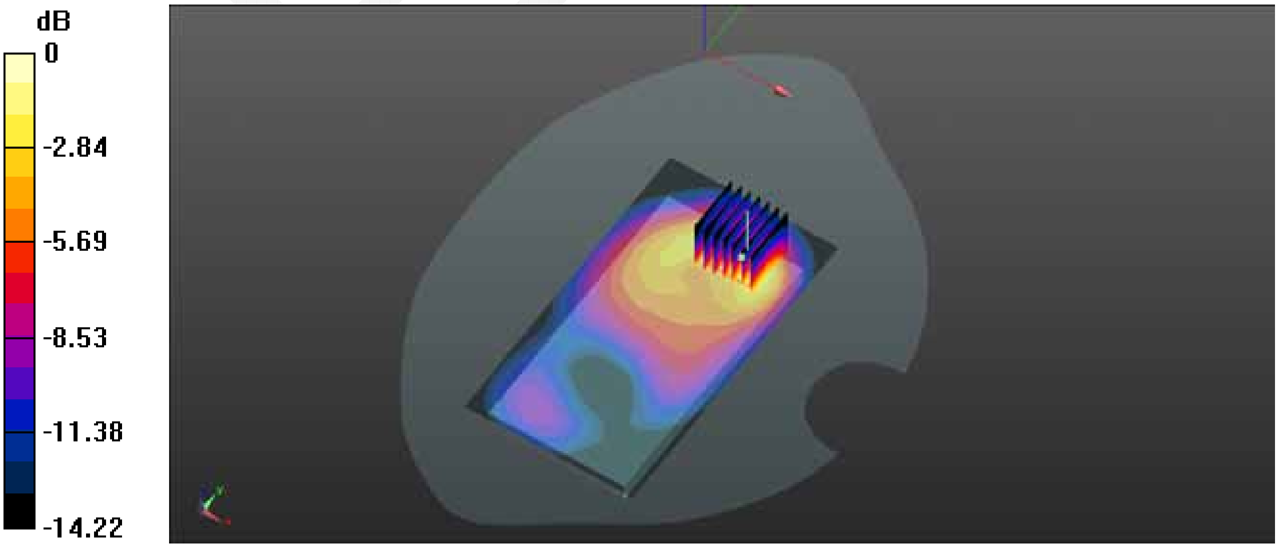
Communication System: Generic GPRS-2 SLOTS; Frequency: 1909.8 MHz;Duty Cycle: 1:4
Medium parameters used: f = 1910 MHz; σ = 1.493 S/m; ε_r = 53.359; ρ = 1000 kg/m^3
Phantom section: Flat Section

DASY5 Configuration:

- Probe: EX3DV4 - SN7329; ConvF(7.56, 7.56, 7.56); Calibrated: 2015/2/5;
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1459; Calibrated: 2015/1/26
- Phantom: SAM (30deg probe tilt) with CRP v5.0_20150321; Type: QD000P40CD; Serial: TP:1874
- Measurement SW: DASY52, Version 52.8 (8);

Body/PCS 1900 Back/Area Scan (61x111x1): Interpolated grid: dx=1.500 mm, dy=1.500 mm
Maximum value of SAR (interpolated) = 0.947 W/kg

Body/PCS 1900 Back/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 14.79 V/m; Power Drift = -0.16 dB
Peak SAR (extrapolated) = 1.61 W/kg
SAR(1 g) = 0.889 W/kg; SAR(10 g) = 0.461 W/kg
Maximum value of SAR (measured) = 0.989 W/kg



0 dB = 0.989 W/kg = -0.05 dBW/kg

Test Laboratory: Bay Area Compliance Labs Corp.(Dongguan)

Test Plot 5#:WCDMA 850 Left Cheek Middle Channel

DUT: Astro X5; Type: Astro X5

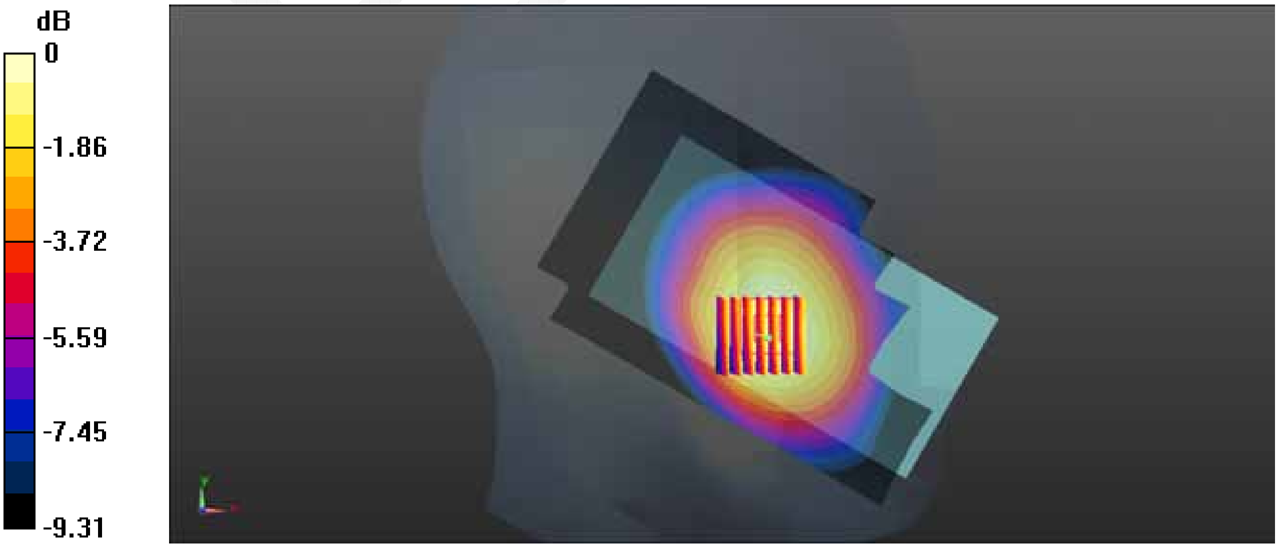
Communication System: BAND V; Frequency: 836.6 MHz;Duty Cycle: 1:1
Medium parameters used: f = 836.5 MHz; σ = 0.892 S/m; ε_r = 42.872; ρ = 1000 kg/m^3
Phantom section: Left Section

DASY5 Configuration:

- Probe: EX3DV4 - SN7329; ConvF(9.52, 9.52, 9.52); Calibrated: 2015/2/5;
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1459; Calibrated: 2015/1/26
- Phantom: SAM (30deg probe tilt) with CRP v5.0_20150321; Type: QD000P40CD; Serial: TP:1874
- Measurement SW: DASY52, Version 52.8 (8);

Head/WCDMA 850 Left Cheek/Area Scan (71x111x1): Interpolated grid: dx=1.500 mm, dy=1.500 mm
Maximum value of SAR (interpolated) = 0.269 W/kg

Head/WCDMA 850 Left Cheek/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 5.664 V/m; Power Drift = 0.14 dB
Peak SAR (extrapolated) = 0.312 W/kg
SAR(1 g) = 0.242 W/kg; SAR(10 g) = 0.183 W/kg
Maximum value of SAR (measured) = 0.253 W/kg



0 dB = 0.253 W/kg = -5.97 dBW/kg

Test Laboratory: Bay Area Compliance Labs Corp.(Dongguan)

Test Plot 6#:WCDMA 850 Back Middle Channel

DUT: Astro X5; Type: Astro X5

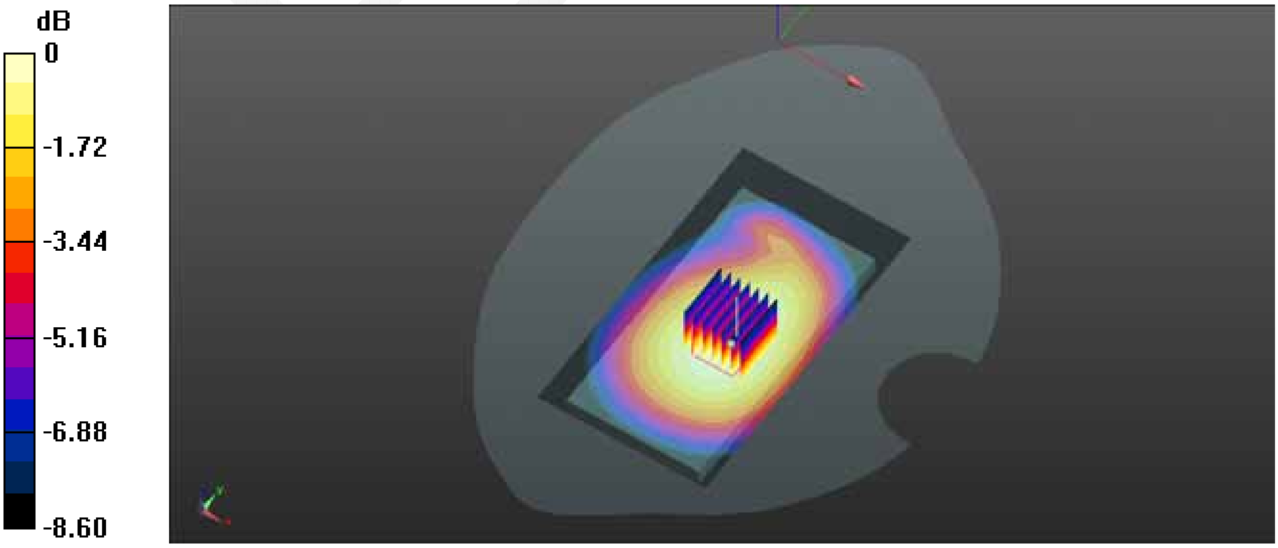
Communication System: BAND V; Frequency: 836.6 MHz;Duty Cycle: 1:1
Medium parameters used: f = 836.5 MHz; σ = 0.976 S/m; ε_r = 55.091; ρ = 1000 kg/m^3
Phantom section: Flat Section

DASY5 Configuration:

- Probe: EX3DV4 - SN7329; ConvF(9.17, 9.17, 9.17); Calibrated: 2015/2/5;
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1459; Calibrated: 2015/1/26
- Phantom: SAM (30deg probe tilt) with CRP v5.0_20150321; Type: QD000P40CD; Serial: TP:1874
- Measurement SW: DASY52, Version 52.8 (8);

Body/WCDMA 850 Back/Area Scan (61x111x1): Interpolated grid: dx=1.500 mm, dy=1.500 mm
Maximum value of SAR (interpolated) = 0.463 W/kg

Body/WCDMA 850 Back/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 21.70 V/m; Power Drift = 0.04 dB
Peak SAR (extrapolated) = 0.557 W/kg
SAR(1 g) = 0.443 W/kg; SAR(10 g) = 0.346 W/kg
Maximum value of SAR (measured) = 0.463 W/kg



0 dB = 0.463 W/kg = -3.34 dBW/kg

Test Laboratory: Bay Area Compliance Labs Corp.(Dongguan)

Test Plot 7#:WCDMA 1900 Right Cheek High Channel

DUT: Astro X5; Type: Astro X5

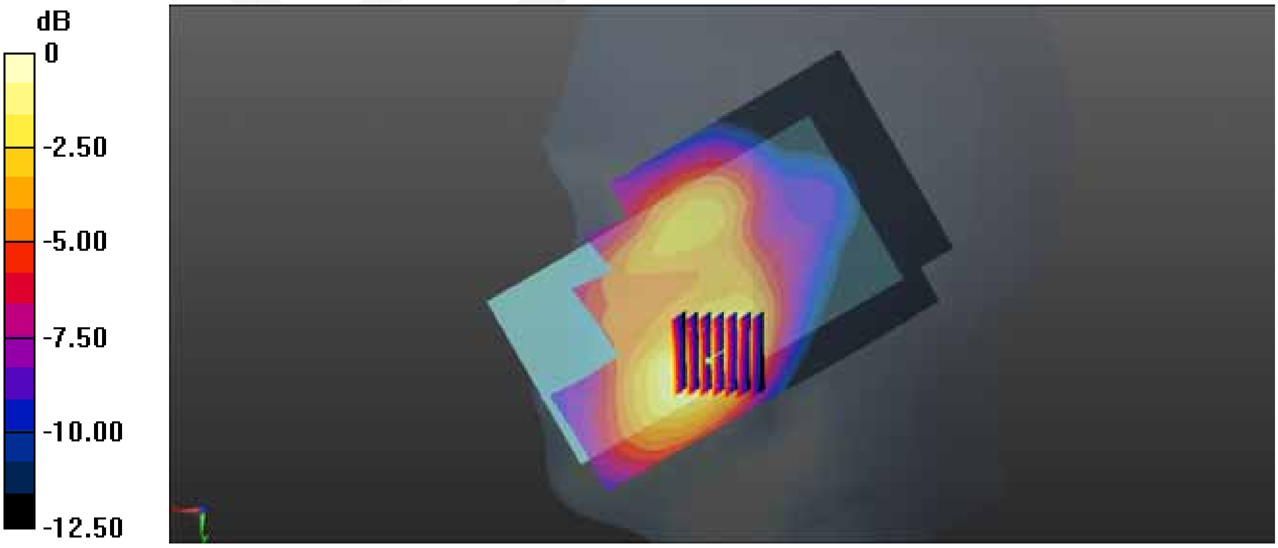
Communication System: BAND II; Frequency: 1907.6 MHz;Duty Cycle: 1:1
Medium parameters used: f = 1908 MHz; σ = 1.414 S/m; ε_r = 39.594; ρ = 1000 kg/m^3
Phantom section: Right Section

DASY5 Configuration:

- Probe: EX3DV4 - SN7329; ConvF(7.88, 7.88, 7.88); Calibrated: 2015/2/5;
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1459; Calibrated: 2015/1/26
- Phantom: SAM (30deg probe tilt) with CRP v5.0_20150321; Type: QD000P40CD; Serial: TP:1874
- Measurement SW: DASY52, Version 52.8 (8);

Head/WCDMA 1900 Right Cheek/Area Scan (71x111x1): Interpolated grid: dx=1.500 mm, dy=1.500 mm
Maximum value of SAR (interpolated) = 0.514 W/kg

Head/WCDMA 1900 Right Cheek/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 6.496 V/m; Power Drift = -0.13 dB
Peak SAR (extrapolated) = 0.775 W/kg
SAR(1 g) = 0.486 W/kg; SAR(10 g) = 0.295 W/kg
Maximum value of SAR (measured) = 0.528 W/kg



0 dB = 0.528 W/kg = -2.77 dBW/kg

Test Laboratory: Bay Area Compliance Labs Corp.(Dongguan)

Test Plot 8#:WCDMA 1900 Back High Channel

DUT: Astro X5; Type: Astro X5

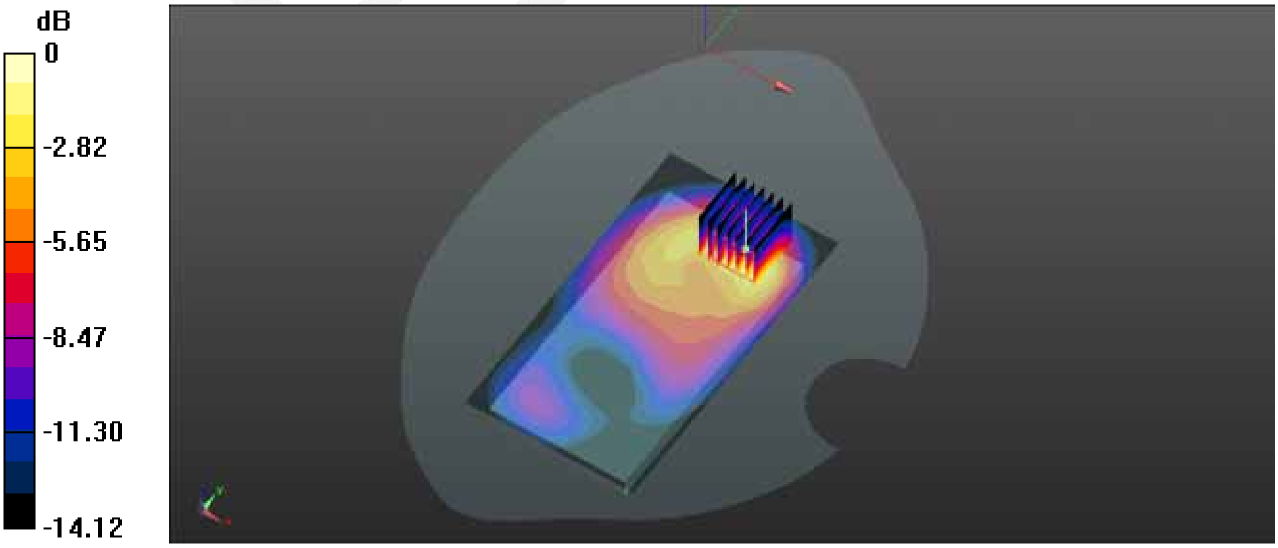
Communication System: BAND II; Frequency: 1907.6 MHz;Duty Cycle: 1:1
Medium parameters used: f = 1908 MHz; σ = 1.414 S/m; ε_r = 39.594; ρ = 1000 kg/m^3
Phantom section: Flat Section

DASY5 Configuration:

- Probe: EX3DV4 - SN7329; ConvF(7.56, 7.56, 7.56); Calibrated: 2015/2/5;
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1459; Calibrated: 2015/1/26
- Phantom: SAM (30deg probe tilt) with CRP v5.0_20150321; Type: QD000P40CD; Serial: TP:1874
- Measurement SW: DASY52, Version 52.8 (8);

Body/WCDMA 1900 Back/Area Scan (61x111x1): Interpolated grid: dx=1.500 mm, dy=1.500 mm
Maximum value of SAR (interpolated) = 1.42 W/kg

Body/WCDMA 1900 Back/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 18.00 V/m; Power Drift = -0.04 dB
Peak SAR (extrapolated) = 2.53 W/kg
SAR(1 g) = 1.28 W/kg; SAR(10 g) = 0.728 W/kg
Maximum value of SAR (measured) = 1.60 W/kg



0 dB = 1.60 W/kg = 2.04 dBW/kg

Test Laboratory: Bay Area Compliance Labs Corp.(Dongguan)

Test Plot 9#:WLAN B Mode Left Cheek High Channel

DUT: Astro X5; Type: Astro X5

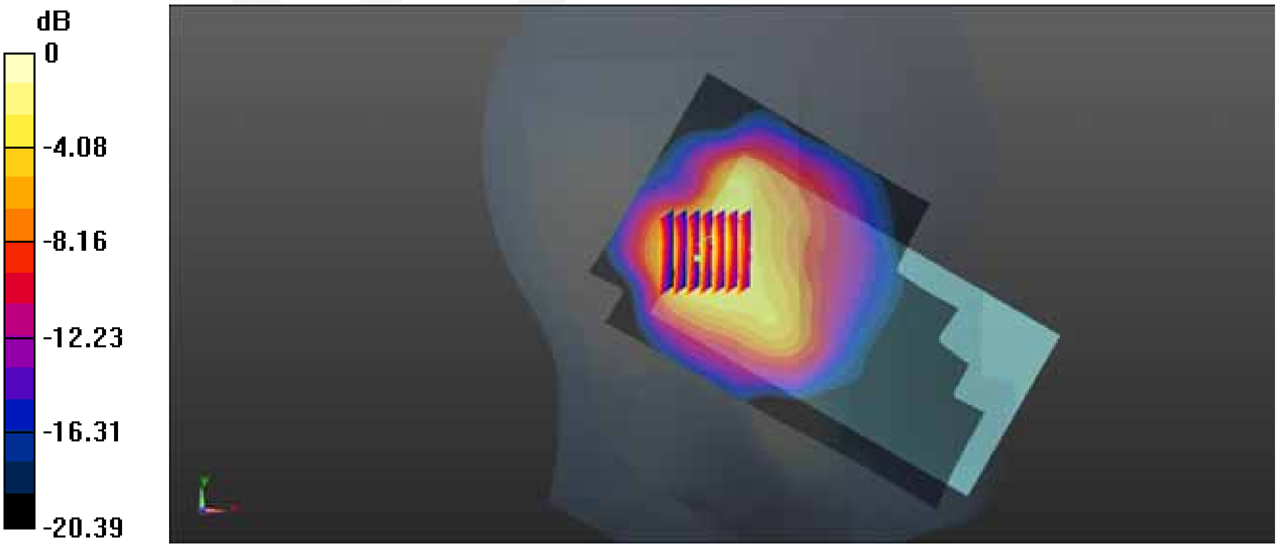
Communication System: CW; Frequency: 2462 MHz;Duty Cycle: 1:1
Medium parameters used: f = 2462 MHz; $\sigma = 1.842$ S/m; $\varepsilon_r = 38.994$; $\rho = 1000$ kg/m^3
Phantom section: Left Section

DASY5 Configuration:

- Probe: EX3DV4 - SN7329; ConvF(7.06, 7.06, 7.06); Calibrated: 2015/2/5;
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1459; Calibrated: 2015/1/26
- Phantom: SAM (30deg probe tilt) with CRP v5.0_20150321; Type: QD000P40CD; Serial: TP:1874
- Measurement SW: DASY52, Version 52.8 (8);

Head/WLAN B Mode Left Cheek/Area Scan (71x111x1): Interpolated grid: dx=1.500 mm, dy=1.500 mm
Maximum value of SAR (interpolated) = 1.05 W/kg

Head/WLAN B Mode Left Cheek/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 17.06 V/m; Power Drift = -0.08 dB
Peak SAR (extrapolated) = 1.47 W/kg
SAR(1 g) = 0.837 W/kg; SAR(10 g) = 0.454 W/kg
Maximum value of SAR (measured) = 0.941 W/kg



0 dB = 0.941 W/kg = -0.26 dBW/kg

Test Laboratory: Bay Area Compliance Labs Corp.(Dongguan)

Test Plot 10#: WLAN B Mode Back High Channel

DUT: Astro X5; Type: Astro X5

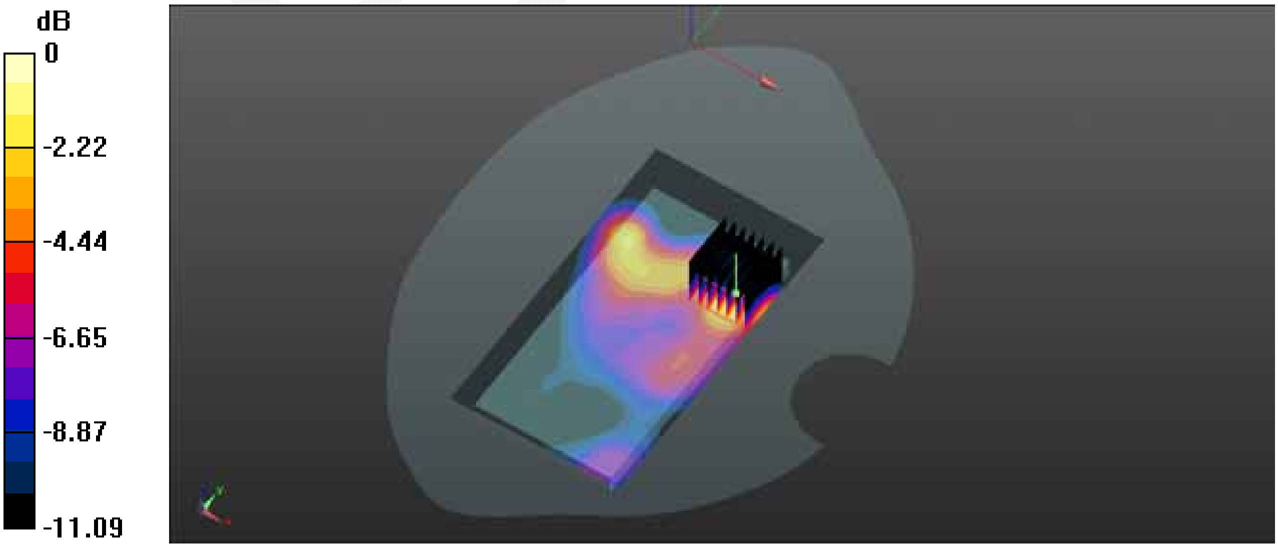
Communication System: CW; Frequency: 2462 MHz;Duty Cycle: 1:1
Medium parameters used: f = 2462 MHz; σ = 1.981 S/m; ε_r = 52.22; ρ = 1000 kg/m^3
Phantom section: Flat Section

DASY5 Configuration:

- Probe: EX3DV4 - SN7329; ConvF(7.2, 7.2, 7.2); Calibrated: 2015/2/5;
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1459; Calibrated: 2015/1/26
- Phantom: SAM (30deg probe tilt) with CRP v5.0_20150321; Type: QD000P40CD; Serial: TP:1874
- Measurement SW: DASY52, Version 52.8 (8);

Body/WLAN B Mode Back/Area Scan (61x111x1): Interpolated grid: dx=1.500 mm, dy=1.500 mm
Maximum value of SAR (interpolated) = 0.383 W/kg

Body/WLAN B Mode Back/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 8.113 V/m; Power Drift = 0.14 dB
Peak SAR (extrapolated) = 0.609 W/kg
SAR(1 g) = 0.315 W/kg; SAR(10 g) = 0.155 W/kg
Maximum value of SAR (measured) = 0.357 W/kg



0 dB = 0.357 W/kg = -4.47 dBW/kg

APPENDIX A MEASUREMENT UNCERTAINTY

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

Measurement uncertainty evaluation for IEEE1528-2013 SAR test

Source of uncertainty	Tolerance/ uncertainty ± %	Probability distribution	Disisor	ci (1 g)	ci (10 g)	Standard uncertainty ± %, (1 g)	Standard uncertainty ± %, (10 g)
Measurement system							
Probe calibration	6.55	N	1	1	1	6.6	6.6
Axial Isotropy	4.7	R	√3	1	1	2.7	2.7
Hemispherical Isotropy	9.6	R	√3	0	0	0.0	0.0
Boundary effect	1.0	R	√3	1	1	0.6	0.6
Linearity	4.7	R	√3	1	1	2.7	2.7
Detection limits	1.0	R	√3	1	1	0.6	0.6
Readout electronics	0.3	N	1	1	1	0.3	0.3
Response time	0.0	R	√3	1	1	0.0	0.0
Integration time	0.0	R	√3	1	1	0.0	0.0
RF ambientconditions – noise	1.0	R	√3	1	1	0.6	0.6
RF ambient conditions–reflections	1.0	R	√3	1	1	0.6	0.6
Probe positioner mech. Restrictions	0.8	R	√3	1	1	0.5	0.5
Probe positioning with respect to phantom shell	6.7	R	√3	1	1	3.9	3.9
Post-processing	2.0	R	√3	1	1	1.2	1.2
Test sample related							
Test sample positioning	2.8	N	1	1	1	2.8	2.8
Device holder uncertainty	6.3	N	1	1	1	6.3	6.3
Drift of output power	5.0	R	√3	1	1	2.9	2.9
Phantom and set-up							
Phantom uncertainty (shape and thickness tolerances)	4.0	R	√3	1	1	2.3	2.3
Liquid conductivity target)	5.0	R	√3	0.64	0.43	1.8	1.2
Liquid conductivity meas.)	2.5	N	1	0.64	0.43	1.6	1.1
Liquid permittivity target)	5.0	R	√3	0.6	0.49	1.7	1.4
Liquid permittivity meas.)	2.5	N	1	0.6	0.49	1.5	1.2
Combined standard uncertainty		RSS				12.2	12.0
Expanded uncertainty 95 % confidence interval)						24.3	23.9

Measurement uncertainty evaluation for IEC62209-2 SAR test

Source of uncertainty	Tolerance/ uncertainty ± %	Probability distribution	Disisor	ci (1 g)	ci (10 g)	Standard uncertainty ± %, (1 g)	Standard uncertainty ± %, (10 g)
Measurement system							
Probe calibration	6.55	N	1	1	1	6.6	6.6
Axial Isotropy	4.7	R	√3	1	1	2.7	2.7
Hemispherical Isotropy	9.6	R	√3	0	0	0.0	0.0
Linearity	4.7	R	√3	1	1	2.7	2.7
Modulation Response	0.0	R	√3	1	1	0.0	0.0
Detection limits	1.0	R	√3	1	1	0.6	0.6
Boundary effect	1.0	R	√3	1	1	0.6	0.6
Readout electronics	0.3	N	1	1	1	0.3	0.3
Response time	0.0	R	√3	1	1	0.0	0.0
Integration time	0.0	R	√3	1	1	0.0	0.0
RF ambientconditions – noise	1.0	R	√3	1	1	0.6	0.6
RF ambient conditions–reflections	1.0	R	√3	1	1	0.6	0.6
Probe positioner mech. Restrictions	0.8	R	√3	1	1	0.5	0.5
Probe positioning with respect to phantom shell	6.7	R	√3	1	1	3.9	3.9
Post-processing	2.0	R	√3	1	1	1.2	1.2
Test sample related							
Device holder Uncertainty	6.3	N	1	1	1	6.3	6.3
Test sample positioning	2.8	N	1	1	1	2.8	2.8
Power scaling	4.5	R	√3	1	1	2.6	2.6
Drift of output power	5.0	R	√3	1	1	2.9	2.9
Phantom and set-up							
Phantom uncertainty (shape and thickness tolerances)	4.0	R	√3	1	1	2.3	2.3
Algorithm for correcting SAR for deviations in permittivity and conductivity	1.9	N	1	1	0.84	1.1	0.9
Liquid conductivity (meas.)	2.5	N	1	0.64	0.43	1.6	1.1
Liquid permittivity (meas.)	2.5	N	1	0.6	0.49	1.5	1.2
Temp. unc. - Conductivity	1.7	R	√3	0.78	0.71	0.8	0.7
Temp. unc. - Permittivity	0.3	R	√3	0.23	0.26	0.0	0.0
Combined standard uncertainty		RSS				12.2	12.1
Expanded uncertainty 95 % confidence interval)						24.5	24.2

APPENDIX B – PROBE CALIBRATION CERTIFICATES

Calibration Laboratory of
Schmid & Partner
Engineering AG
Zeughausstrasse 43, 8004 Zurich, Switzerland

S Schweizerischer Kalibrierdienst
C Service suisse d'étalonnage
S Servizio svizzero di taratura
S Swiss Calibration Service

Accredited by the Swiss Accreditation Service (SAS)
The Swiss Accreditation Service is one of the signatories to the EA Multilateral Agreement for the recognition of calibration certificates

Accreditation No.: **SCS 0108**

Client **BACL China (Vitec)**

Certificate No: **EX3-7329_Feb15**

CALIBRATION CERTIFICATE

Object	EX3DV4 - SN:7329
Calibration procedure(s)	QA CAL-01.v9, QA CAL-23.v5, QA CAL-25.v6 Calibration procedure for dosimetric E-field probes
Calibration date:	February 5, 2015

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

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

Calibration Equipment used (M&TE critical for calibration)

Primary Standards	ID	Cal Date (Certificate No.)	Scheduled Calibration
Power meter E4419B	GB41293874	03-Apr-14 (No. 217-01911)	Apr-15
Power sensor E4412A	MY41498087	03-Apr-14 (No. 217-01911)	Apr-15
Reference 3 dB Attenuator	SN: S5054 (3c)	03-Apr-14 (No. 217-01915)	Apr-15
Reference 20 dB Attenuator	SN: S5277 (20x)	03-Apr-14 (No. 217-01919)	Apr-15
Reference 30 dB Attenuator	SN: S5129 (30b)	03-Apr-14 (No. 217-01920)	Apr-15
Reference Probe ES3DV2	SN: 3013	30-Dec-14 (No. ES3-3013_Dec14)	Dec-15
DAE4	SN: 660	14-Jan-15 (No. DAE4-660_Jan15)	Jan-16
Secondary Standards	ID	Check Date (in house)	Scheduled Check
RF generator HP 8648C	US3642U01700	4-Aug-99 (in house check Apr-13)	In house check: Apr-16
Network Analyzer HP 8753E	US37390585	18-Oct-01 (in house check Oct-14)	In house check: Oct-15

	Name	Function	Signature
Calibrated by:	Claudio Leubler	Laboratory Technician	
Approved by:	Katja Pokovic	Technical Manager	

Issued: February 9, 2015

This calibration certificate shall not be reproduced except in full without written approval of the laboratory.

Certificate No: EX3-7329_Feb15 Page 1 of 11

Calibration Laboratory of
Schmid & Partner
Engineering AG
Zeughausstrasse 43, 8004 Zurich, Switzerland

S Schweizerischer Kalibrierdienst
C Service suisse d'étalonnage
Servizio svizzero di taratura
S Swiss Calibration Service

Accredited by the Swiss Accreditation Service (SAS)
The Swiss Accreditation Service is one of the signatories to the EA Multilateral Agreement for the recognition of calibration certificates

Accreditation No.: **SCS 0108**

Glossary:

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

Calibration is Performed According to the Following Standards:

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

b) IEC 62209-1, "Procedure to measure the Specific Absorption Rate (SAR) for hand-held devices used in close proximity to the ear (frequency range of 300 MHz to 3 GHz)", February 2005

Methods Applied and Interpretation of Parameters:

- *NORMx,y,z:* Assessed for E-field polarization ϑ = 0 (f ≤ 900 MHz in TEM-cell; f > 1800 MHz: R22 waveguide). NORMx,y,z are only intermediate values, i.e., the uncertainties of NORMx,y,z does not affect the E^2-field uncertainty inside TSL (see below *ConvF*).
- *NORM(f)x,y,z = NORMx,y,z * frequency_response* (see Frequency Response Chart). This linearization is implemented in DASY4 software versions later than 4.2. The uncertainty of the frequency response is included in the stated uncertainty of *ConvF*.
- *DCPx,y,z:* DCP are numerical linearization parameters assessed based on the data of power sweep with CW signal (no uncertainty required). DCP does not depend on frequency nor media.
- *PAR:* PAR is the Peak to Average Ratio that is not calibrated but determined based on the signal characteristics
- *Ax,y,z; Bx,y,z; Cx,y,z; Dx,y,z; VRx,y,z: A, B, C, D* are numerical linearization parameters assessed based on the data of power sweep for specific modulation signal. The parameters do not depend on frequency nor media. *VR* is the maximum calibration range expressed in RMS voltage across the diode.
- *ConvF and Boundary Effect Parameters:* Assessed in flat phantom using E-field (or Temperature Transfer Standard for f ≤ 800 MHz) and inside waveguide using analytical field distributions based on power measurements for f > 800 MHz. The same setups are used for assessment of the parameters applied for boundary compensation (alpha, depth) of which typical uncertainty values are given. These parameters are used in DASY4 software to improve probe accuracy close to the boundary. The sensitivity in TSL corresponds to *NORMx,y,z * ConvF* whereby the uncertainty corresponds to that given for *ConvF*. A frequency dependent *ConvF* is used in DASY version 4.4 and higher which allows extending the validity from ± 50 MHz to ± 100 MHz.
- *Spherical isotropy (3D deviation from isotropy)*: in a field of low gradients realized using a flat phantom exposed by a patch antenna.
- *Sensor Offset*: The sensor offset corresponds to the offset of virtual measurement center from the probe tip (on probe axis). No tolerance required.
- *Connector Angle*: The angle is assessed using the information gained by determining the *NORMx* (no uncertainty required).

Certificate No: EX3-7329_Feb15 Page 2 of 11

Probe EX3DV4

SN:7329

Manufactured: December 11, 2014
Calibrated: February 5, 2015

Calibrated for DASY/EASY Systems
(Note: non-compatible with DASY2 system!)

EX3DV4– SN:7329 February 5, 2015

DASY/EASY - Parameters of Probe: EX3DV4 - SN:7329

Basic Calibration Parameters

	Sensor X	Sensor Y	Sensor Z	Unc (k=2)
Norm (µV/(V/m)^2)[A]	0.48	0.43	0.46	± 10.1 %
DCP (mV)[B]	96.7	97.6	94.2	

Modulation Calibration Parameters

UID	Communication System Name		A dB	B dB√µV	C	D dB	VR mV	Unc[E] (k=2)
0	CW	X	0.0	0.0	1.0	0.00	137.9	±3.0 %
		Y	0.0	0.0	1.0		147.0	
		Z	0.0	0.0	1.0		150.5	

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

[A] The uncertainties of NormX,Y,Z do not affect the E^2-field uncertainty inside TSL (see Pages 5 and 6).
[B] Numerical linearization parameter: uncertainty not required.
[E] Uncertainty is determined using the max. deviation from linear response applying rectangular distribution and is expressed for the square of the field value.

Certificate No: EX3-7329_Feb15 Page 4 of 11

DASY/EASY - Parameters of Probe: EX3DV4 - SN:7329

Calibration Parameter Determined in Head Tissue Simulating Media

f (MHz) [C]	Relative Permittivity [F]	Conductivity (S/m) [F]	ConvF X	ConvF Y	ConvF Z	Alpha [G]	Depth [G] (mm)	Unct. (k=2)
900	41.5	0.97	9.52	9.52	9.52	0.40	0.86	± 12.0 %
1750	40.1	1.37	8.12	8.12	8.12	0.29	0.90	± 12.0 %
1900	40.0	1.40	7.88	7.88	7.88	0.68	0.61	± 12.0 %
2450	39.2	1.80	7.06	7.06	7.06	0.33	0.84	± 12.0 %

[C] Frequency validity above 300 MHz of ± 100 MHz only applies for DASY v4.4 and higher (see Page 2), else it is restricted to ± 50 MHz. The uncertainty is the RSS of the ConvF uncertainty at calibration frequency and the uncertainty for the indicated frequency band. Frequency validity below 300 MHz is ± 10, 25, 40, 50 and 70 MHz for ConvF assessments at 30, 64, 128, 150 and 220 MHz respectively. Above 5 GHz frequency validity can be extended to ± 110 MHz.
[F] At frequencies below 3 GHz, the validity of tissue parameters (ε and σ) can be relaxed to ± 10% if liquid compensation formula is applied to measured SAR values. At frequencies above 3 GHz, the validity of tissue parameters (ε and σ) is restricted to ± 5%. The uncertainty is the RSS of the ConvF uncertainty for indicated target tissue parameters.
[G] Alpha/Depth are determined during calibration. SPEAG warrants that the remaining deviation due to the boundary effect after compensation is always less than ± 1% for frequencies below 3 GHz and below ± 2% for frequencies between 3-6 GHz at any distance larger than half the probe tip diameter from the boundary.

EX3DV4– SN:7329 February 5, 2015

DASY/EASY - Parameters of Probe: EX3DV4 - SN:7329

Calibration Parameter Determined in Body Tissue Simulating Media

f (MHz) [C]	Relative Permittivity [F]	Conductivity (S/m) [F]	ConvF X	ConvF Y	ConvF Z	Alpha [G]	Depth [G] (mm)	Unct. (k=2)
900	55.0	1.05	9.17	9.17	9.17	0.41	0.90	± 12.0 %
1750	53.4	1.49	7.85	7.85	7.85	0.70	0.64	± 12.0 %
1900	53.3	1.52	7.56	7.56	7.56	0.56	0.70	± 12.0 %
2450	52.7	1.95	7.20	7.20	7.20	0.78	0.59	± 12.0 %

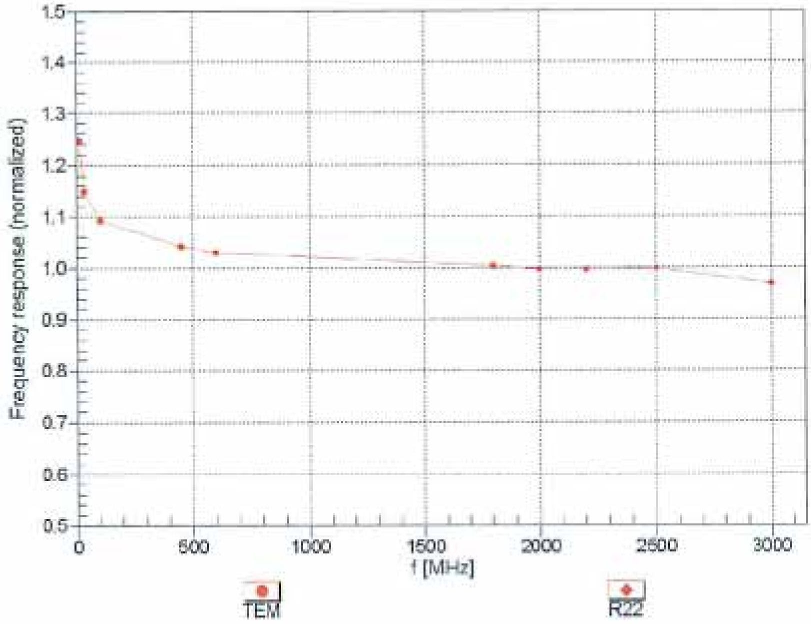
[C] Frequency validity above 300 MHz of ± 100 MHz only applies for DASY v4.4 and higher (see Page 2), else it is restricted to ± 50 MHz. The uncertainty is the RSS of the ConvF uncertainty at calibration frequency and the uncertainty for the indicated frequency band. Frequency validity below 300 MHz is ± 10, 25, 40, 50 and 70 MHz for ConvF assessments at 30, 64, 128, 150 and 220 MHz respectively. Above 5 GHz frequency validity can be extended to ± 110 MHz.
[F] At frequencies below 3 GHz, the validity of tissue parameters (ε and σ) can be relaxed to ± 10% if liquid compensation formula is applied to measured SAR values. At frequencies above 3 GHz, the validity of tissue parameters (ε and σ) is restricted to ± 5%. The uncertainty is the RSS of the ConvF uncertainty for indicated target tissue parameters.
[G] Alpha/Depth are determined during calibration. SPEAG warrants that the remaining deviation due to the boundary effect after compensation is always less than ± 1% for frequencies below 3 GHz and below ± 2% for frequencies between 3-6 GHz at any distance larger than half the probe tip diameter from the boundary.

Certificate No: EX3-7329_Feb15 Page 6 of 11

EX3DV4– SN:7329 February 5, 2015

Frequency Response of E-Field

(TEM-Cell:ifi110 EXX, Waveguide: R22)



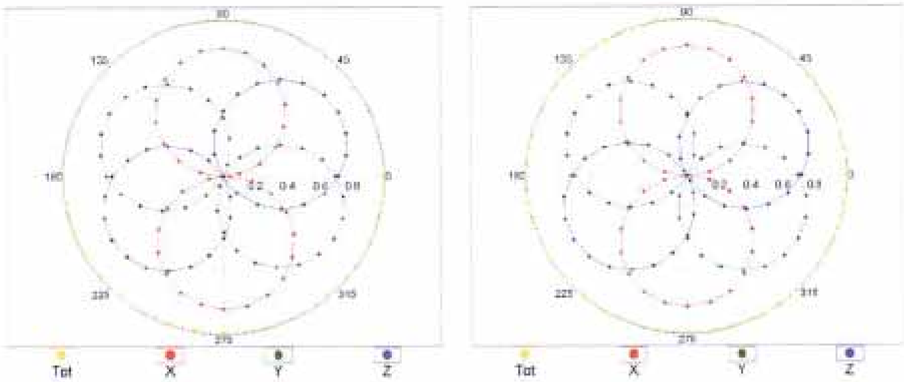
Uncertainty of Frequency Response of E-field: ± 6.3% (k=2)

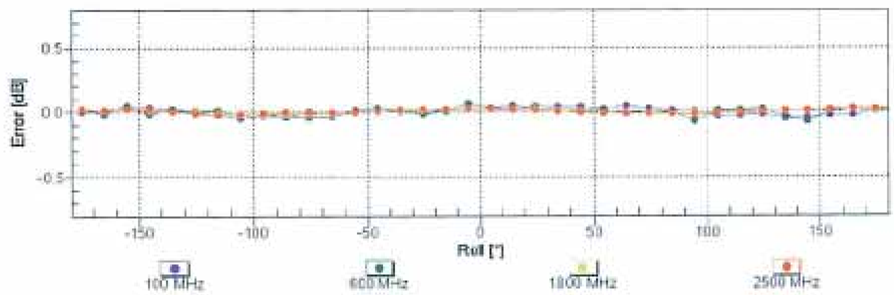
Certificate No: EX3-7329_Feb15 Page 7 of 11

EX3DV4– SN:7329 February 5, 2015

Receiving Pattern (ϕ), ϑ = 0°

f=600 MHz,TEM f=1800 MHz,R22





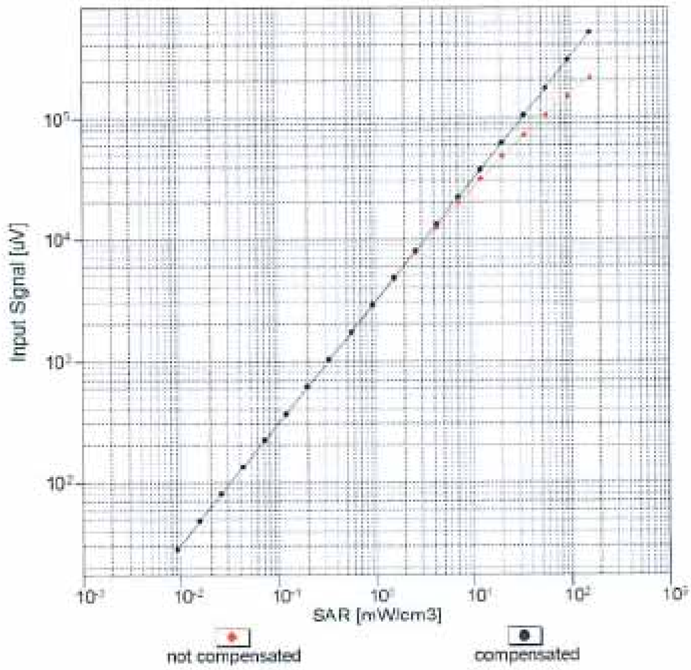
Uncertainty of Axial Isotropy Assessment: ± 0.5% (k=2)

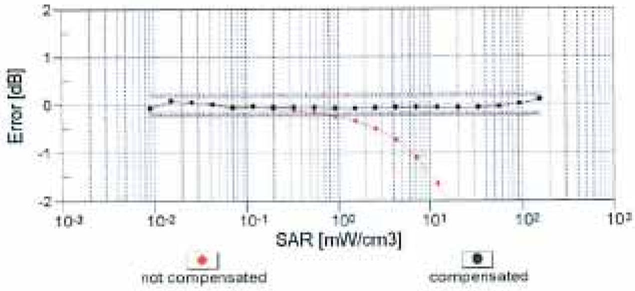
Certificate No: EX3-7329_Feb15 Page 8 of 11

EX3DV4– SN:7329 February 5, 2015

Dynamic Range f(SAR_{head})

(TEM cell , f_{eval}= 1900 MHz)





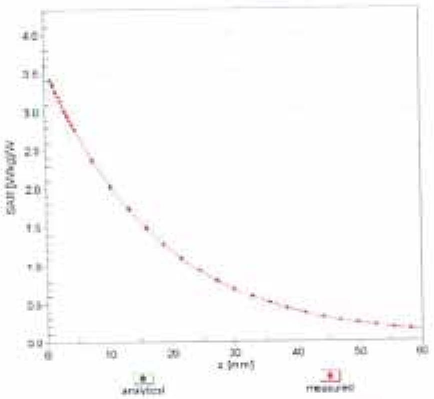
Uncertainty of Linearity Assessment: ± 0.6% (k=2)

Certificate No: EX3-7329_Feb15 Page 9 of 11

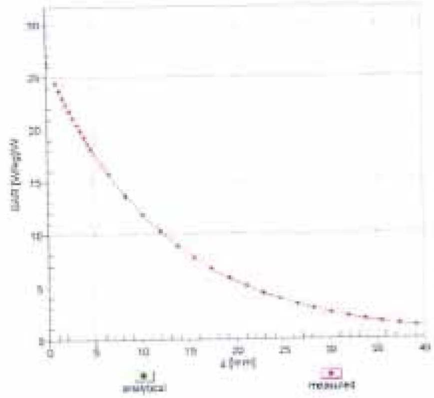
EX3DV4– SN:7329 February 5, 2015

Conversion Factor Assessment

f = 900 MHz,WGLS R9 (H_convF)

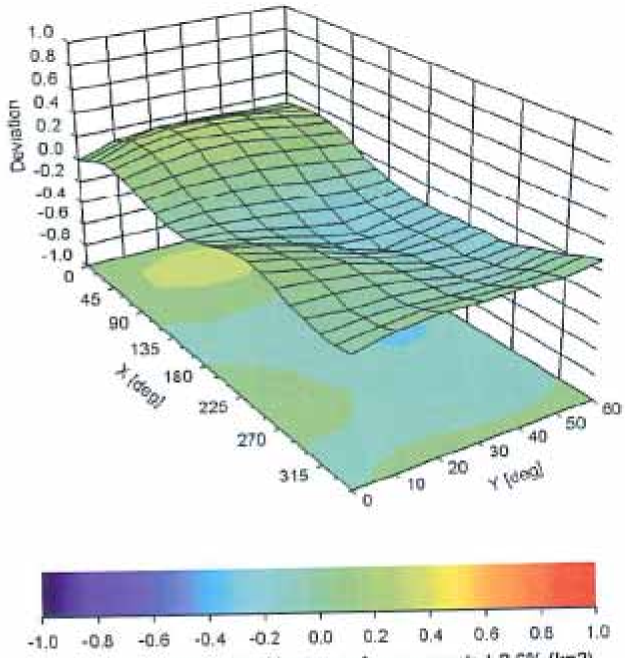


f = 1750 MHz,WGLS R22 (H_convF)



Deviation from Isotropy in Liquid

Error (ϕ, ϑ), f = 900 MHz



Uncertainty of Spherical Isotropy Assessment: ± 2.6% (k=2)

Certificate No: EX3-7329_Feb15 Page 10 of 11

DASY/EASY - Parameters of Probe: EX3DV4 - SN:7329

Other Probe Parameters

Sensor Arrangement	Triangular
Connector Angle (°)	24.5
Mechanical Surface Detection Mode	enabled
Optical Surface Detection Mode	disabled
Probe Overall Length	337 mm
Probe Body Diameter	10 mm
Tip Length	9 mm
Tip Diameter	2.5 mm
Probe Tip to Sensor X Calibration Point	1 mm
Probe Tip to Sensor Y Calibration Point	1 mm
Probe Tip to Sensor Z Calibration Point	1 mm
Recommended Measurement Distance from Surface	1.4 mm

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

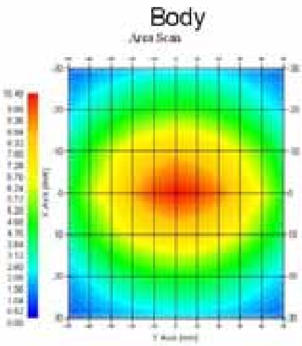
Length: 162.2 mm
Height: 89.4 mm

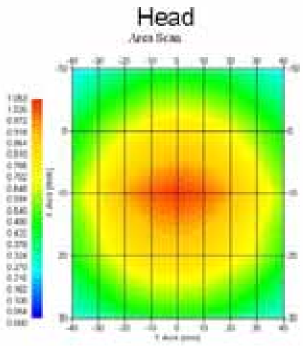
Electrical Specification

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





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

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)**

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	49.001 Ω
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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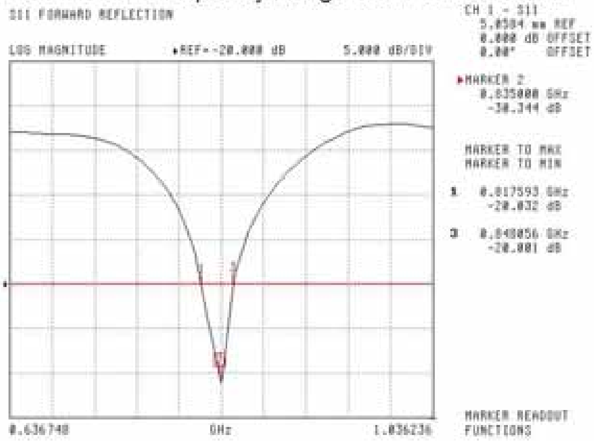
NCL Calibration Laboratories

Division of APREL Laboratories.

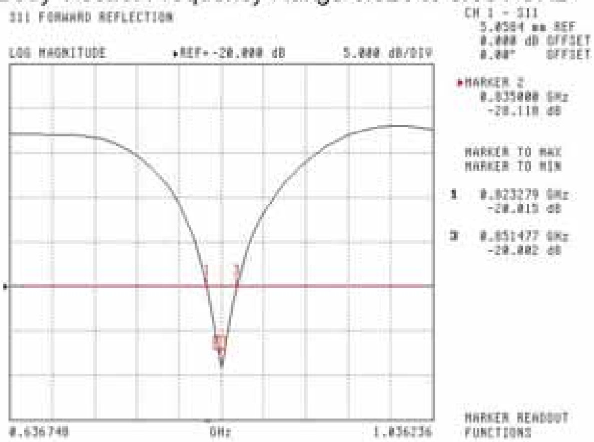
The Following Graphs are the results as displayed on the Vector Network Analyzer.

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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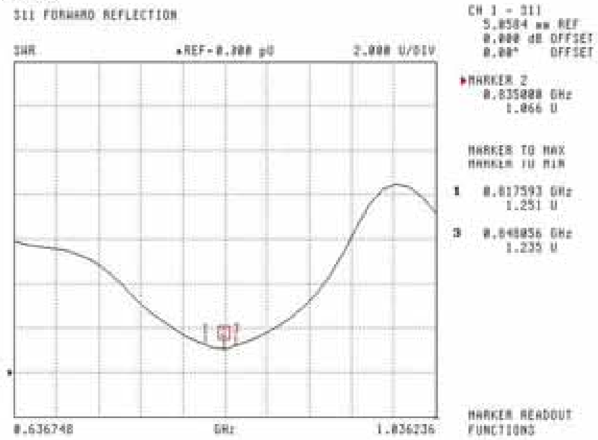
NCL Calibration Laboratories

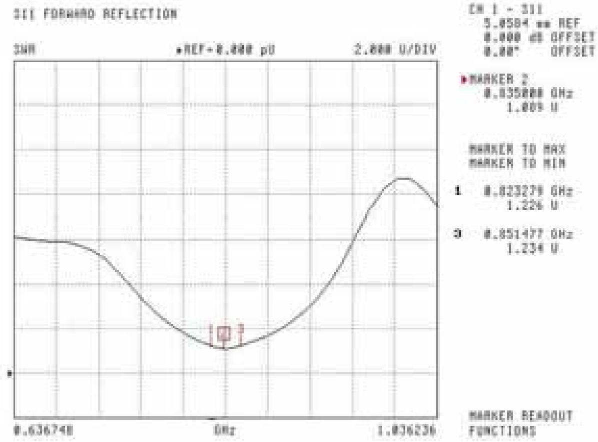
Division of APREL Laboratories.

SWR

Head



Body



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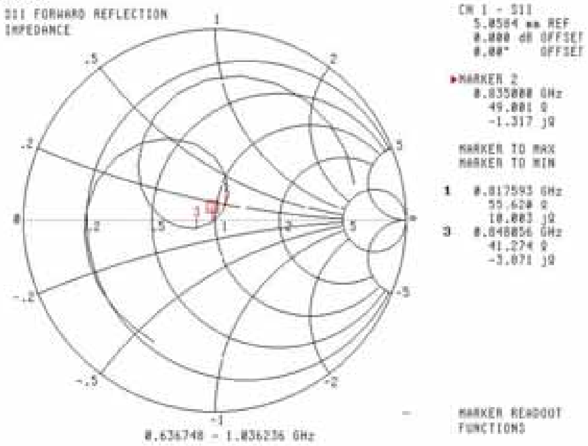
NCL Calibration Laboratories

Division of APREL Laboratories.

Smith Chart Dipole Impedance

Head



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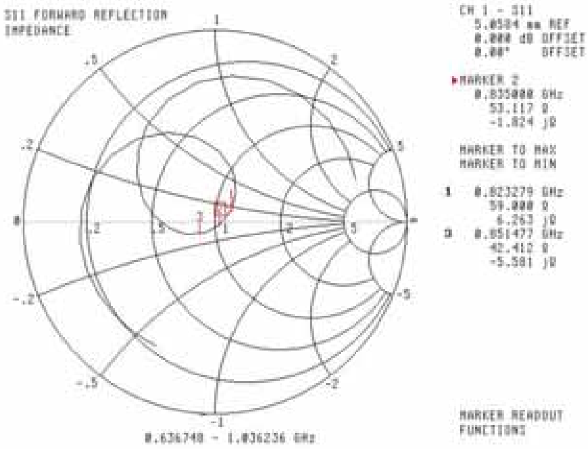

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Test Equipment

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.

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

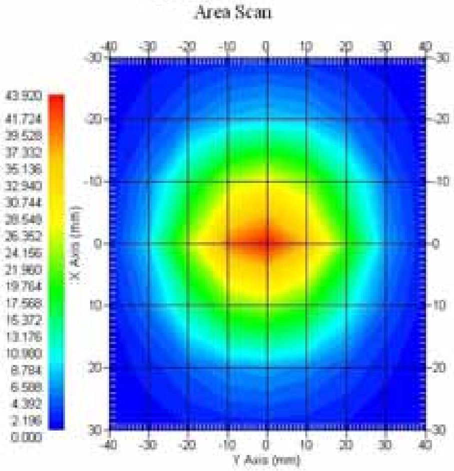
Electrical Specification

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

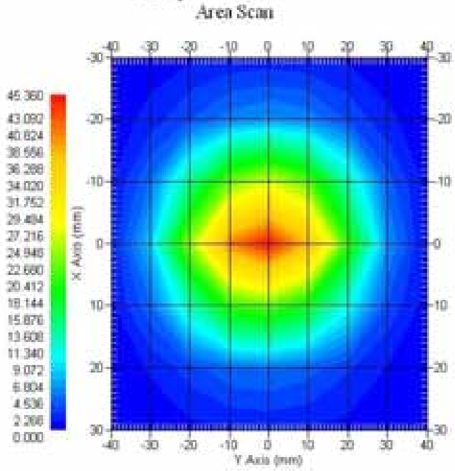
System Validation Results

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

Head



Body



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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)**

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

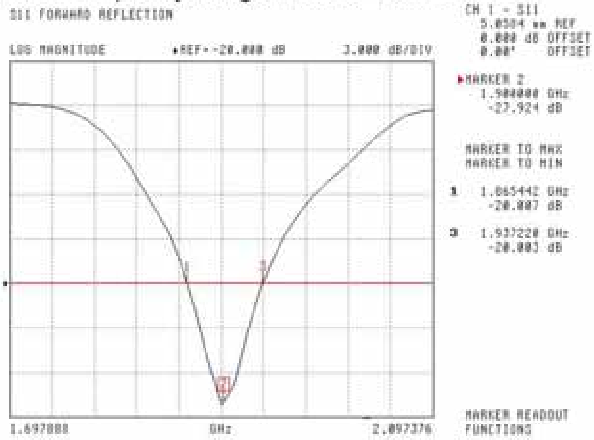
This page has been reviewed for content and attested to by signature within this document.

NCL Calibration Laboratories
Division of APREL Laboratories.

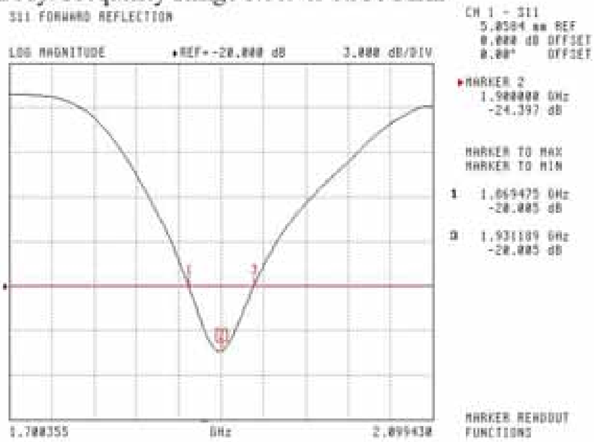
The Following Graphs are the results as displayed on the Vector Network Analyzer.

S11 Parameter Return Loss

Head: Frequency Range 1.865 to 1.937 GHz



Body: Frequency Range 1.869 to 1.931 MHz



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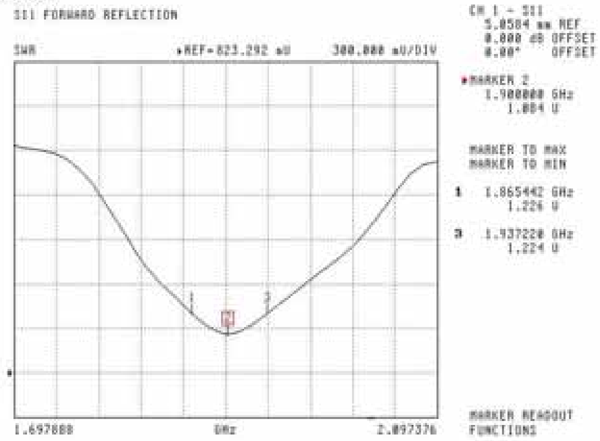
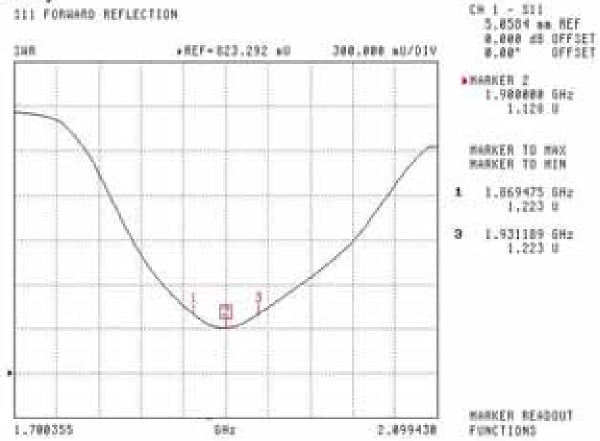
SWR

Head



Body



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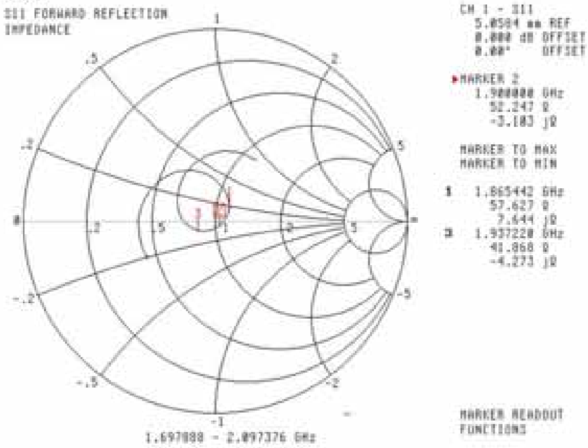
NCL Calibration Laboratories

Division of APREL Laboratories.

Smith Chart Dipole Impedance

Head



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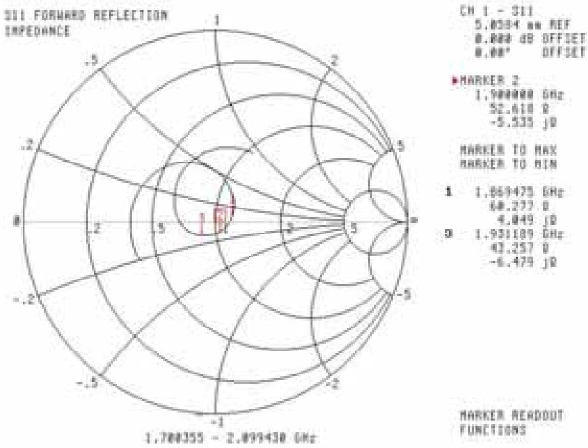

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NCL Calibration Laboratories
Division of APREL Laboratories.

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

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.
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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

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Calibration Results Summary

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

Mechanical Dimensions

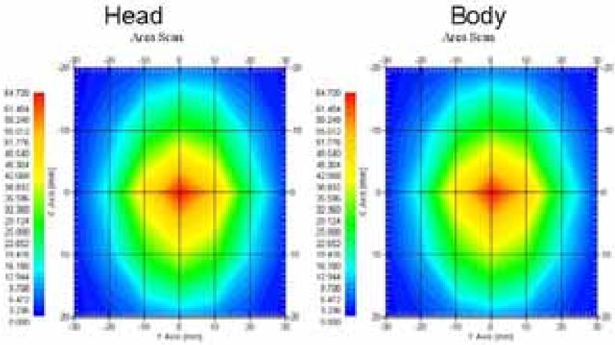
Length: 52.4 mm
Height: 30.3 mm

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



3

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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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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

5

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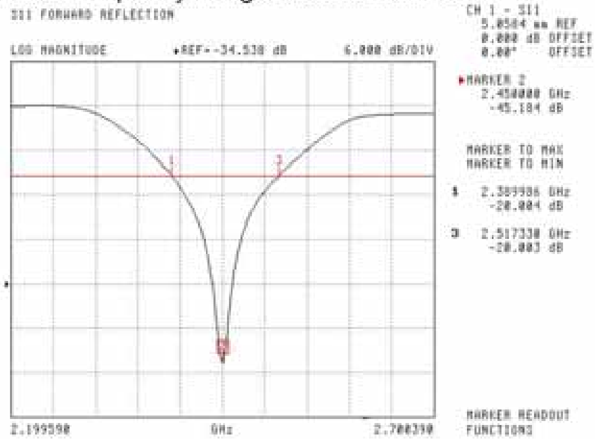
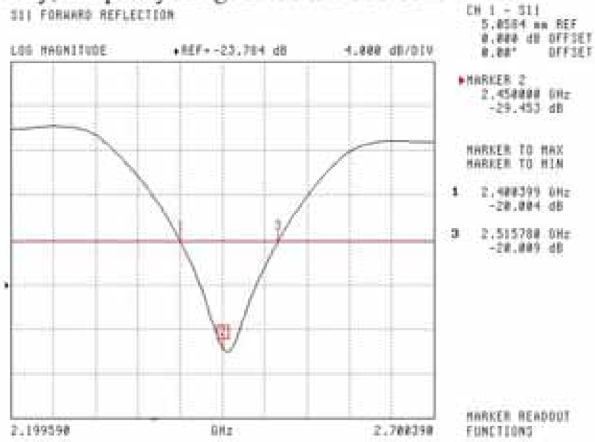
The Following Graphs are the results as displayed on the Vector Network Analyzer.

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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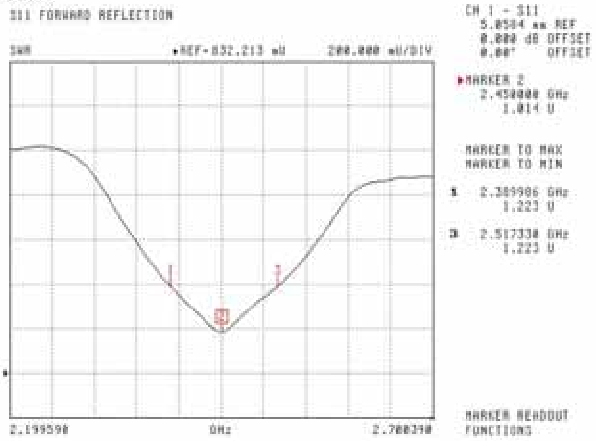
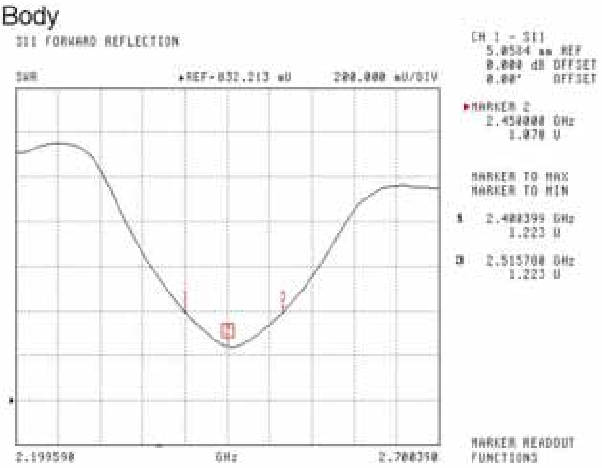
SWR

Head



Body



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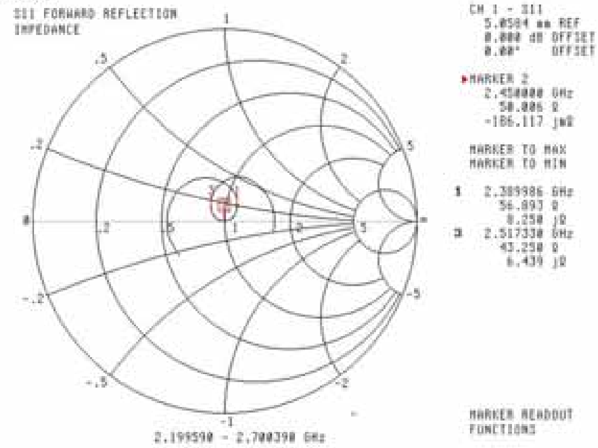
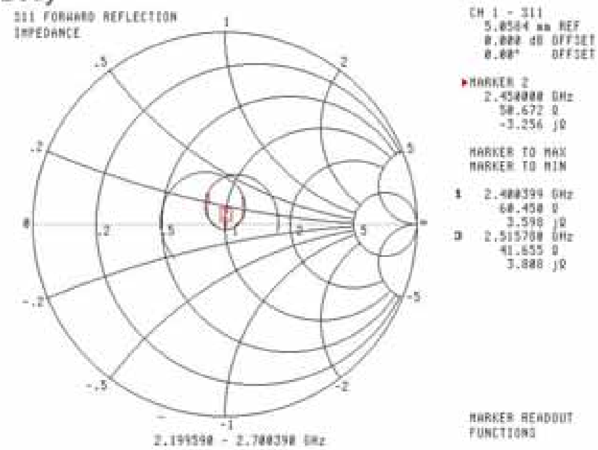
Smith Chart Dipole Impedance

Head



Body



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8

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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.

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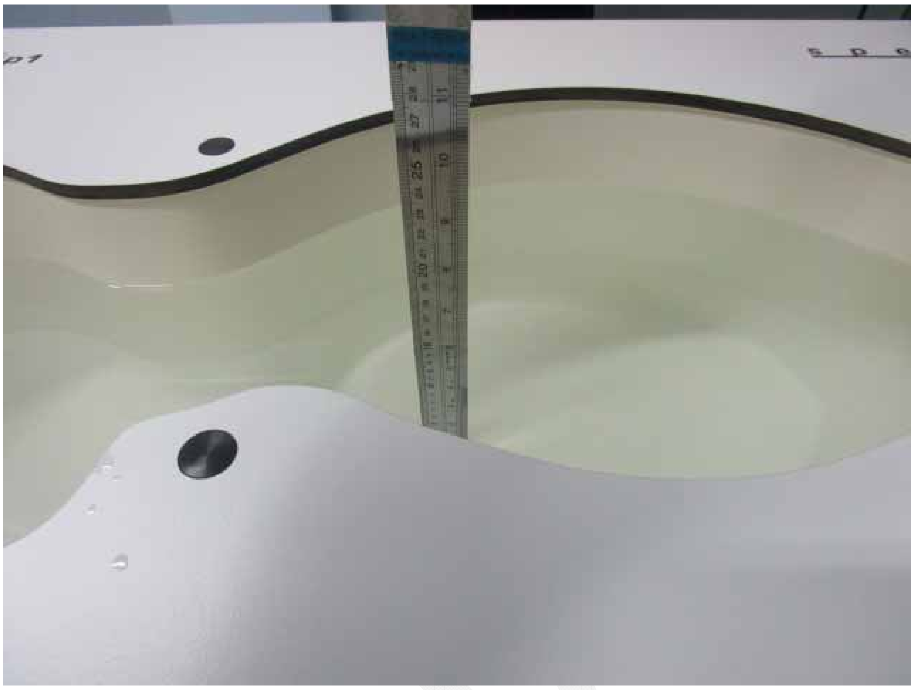
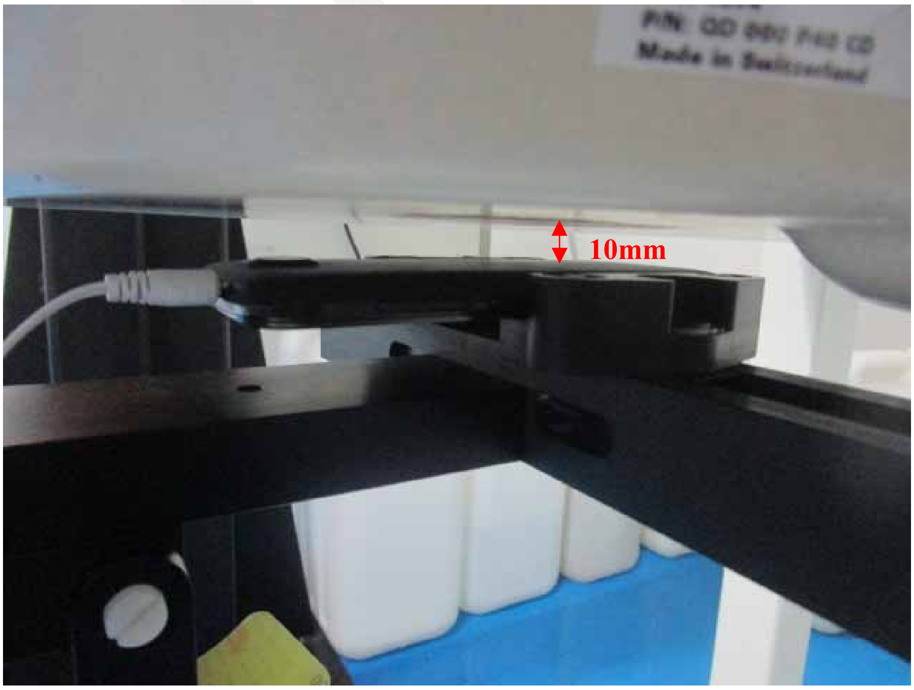
APPENDIX D EUT TEST POSITION PHOTOS

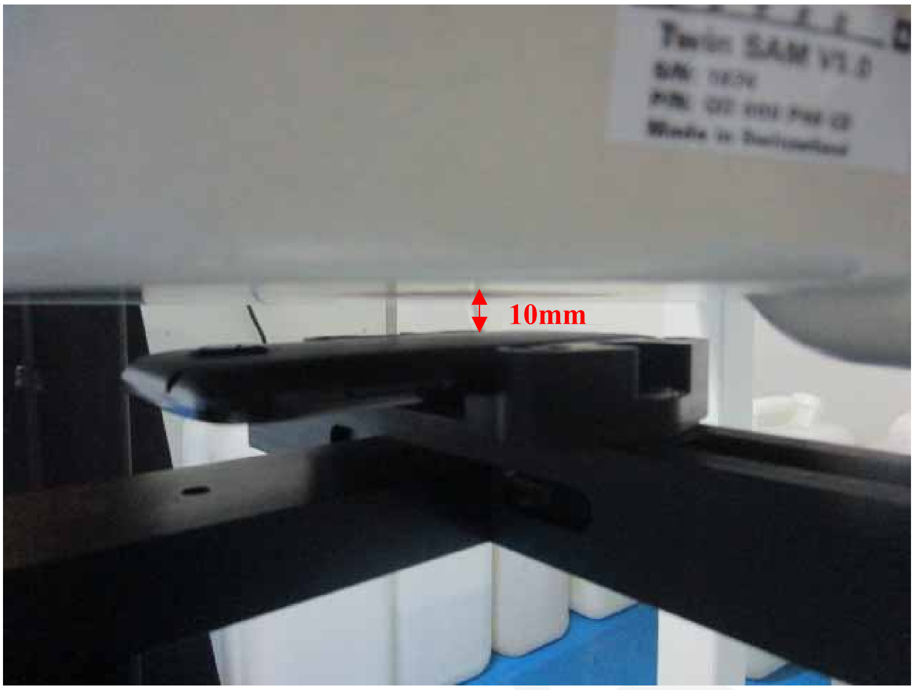
Liquid depth ≥15cm



Body-worn Headset Setup Photo

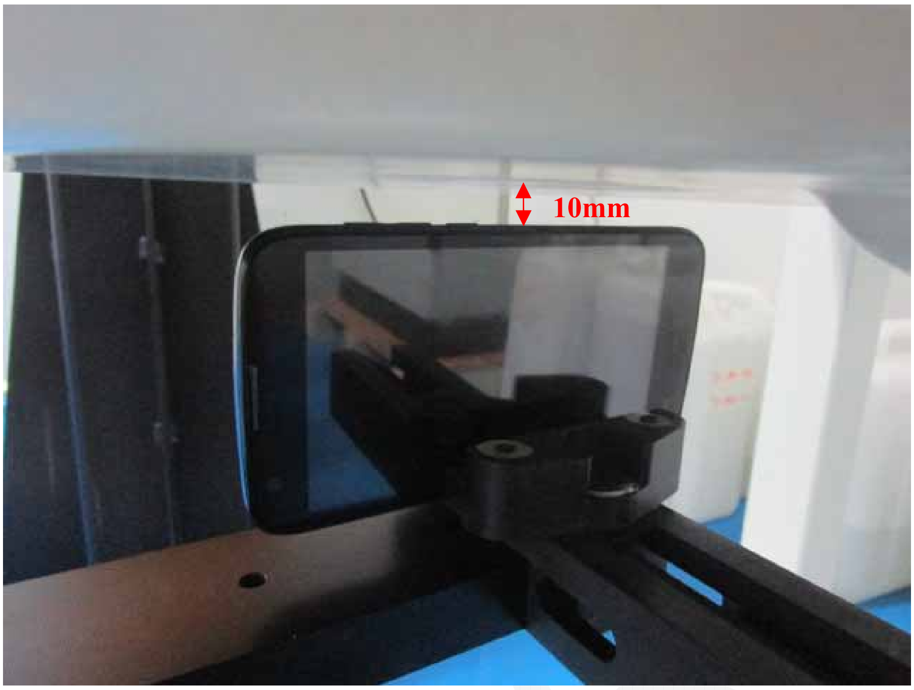


Body-worn Back Setup Photo

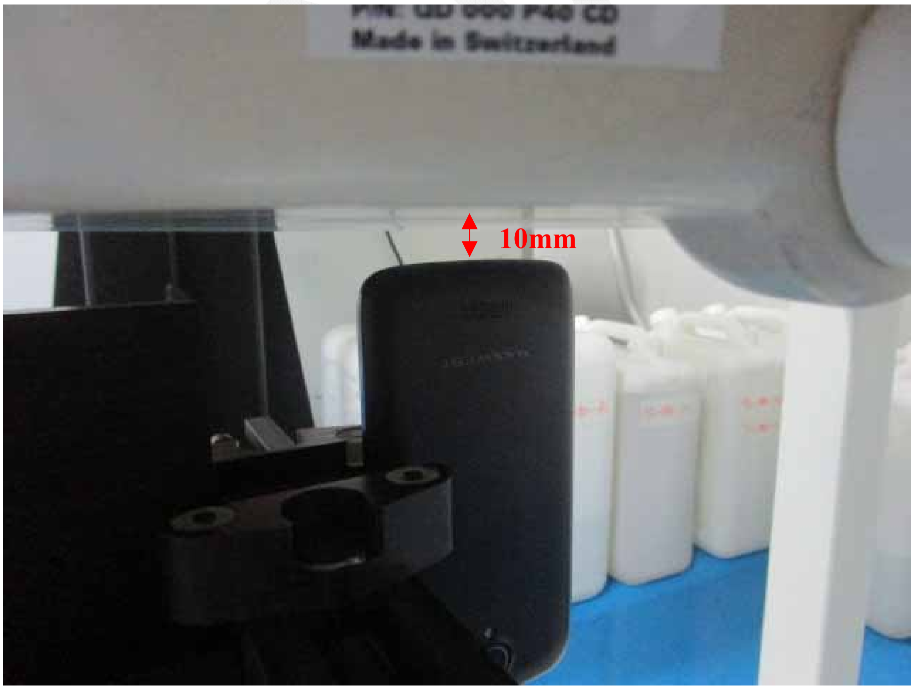


Body-worn Left Setup Photo

Body-worn Right Setup Photo

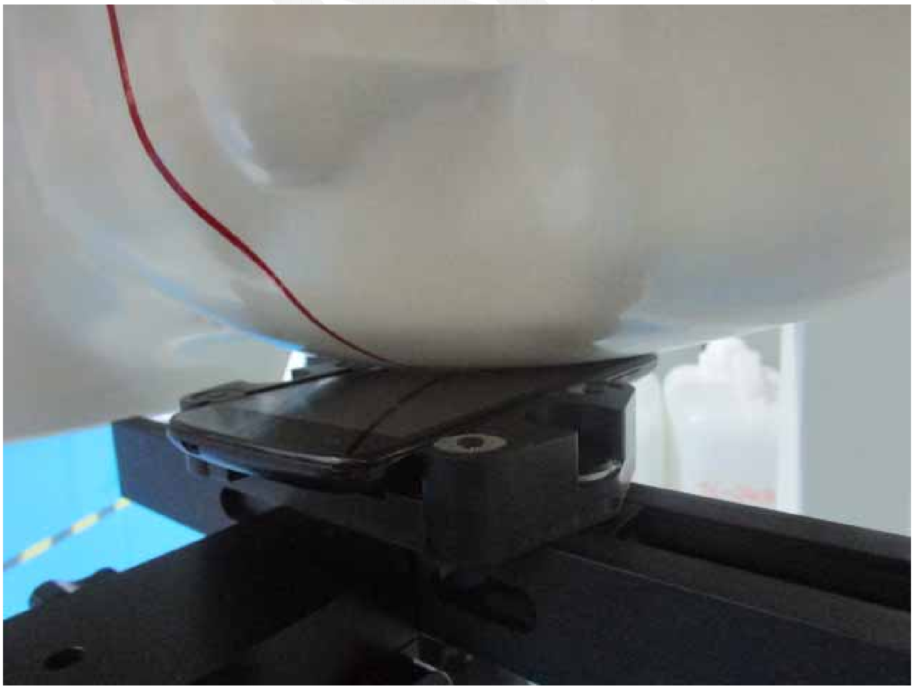


Body-worn Bottom Setup Photo

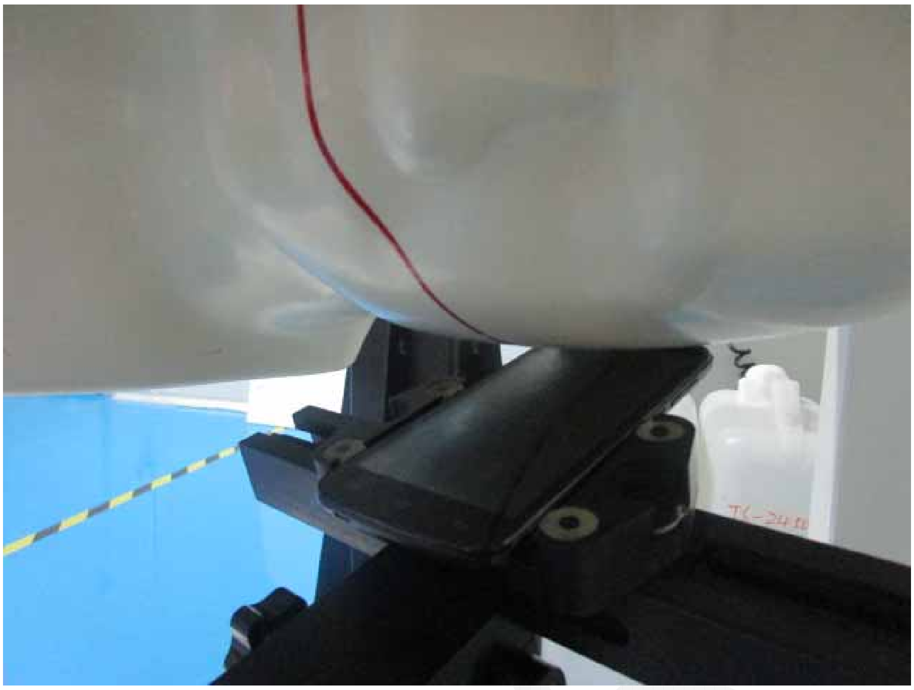


Body-worn Top Setup Photo

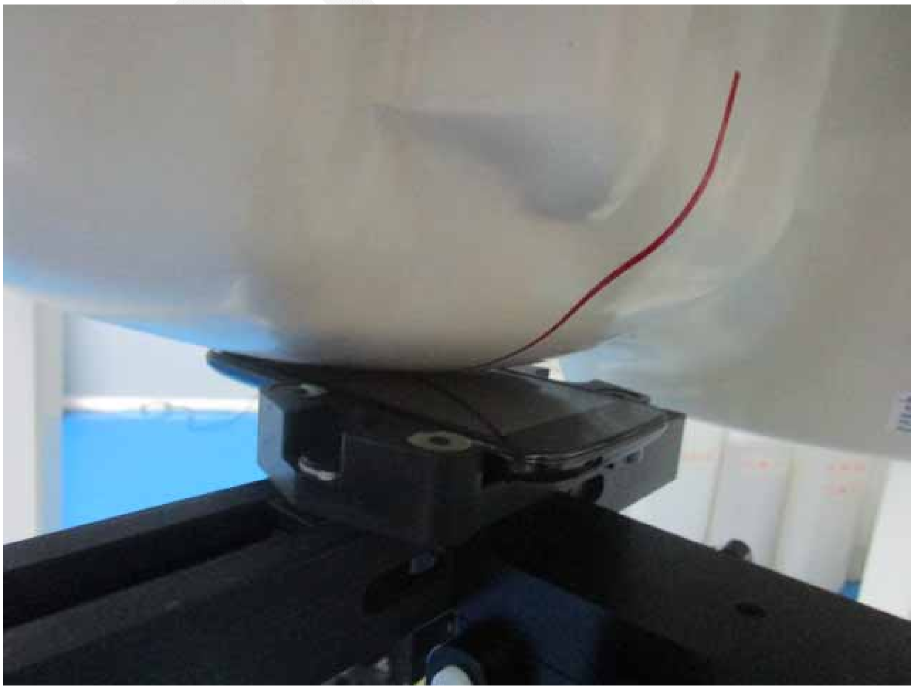
Left Head Touch Setup Photo



Left Head Tilt Setup Photo



Right Head Touch Setup Photo



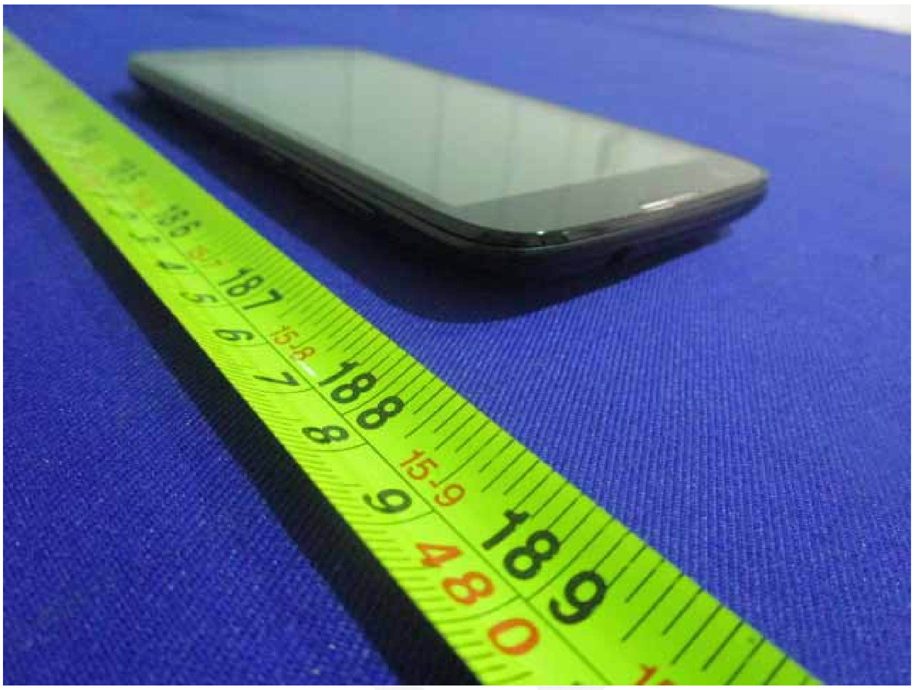
Right Head Tilt Setup Photo

APPENDIX E EUT PHOTOS

EUT – Front View

EUT –Back View

EUT – Side View-1



EUT – Side View-2

EUT – Cover off View

***** END OF REPORT *****