

SAR EVALUATION REPORT

For

Hytera Communications Co., Ltd.

HYT Tower, Hi-Tech Industrial Park North, Nanshan District, Shenzhen China

FCC ID: YAMPD50XU1

Report Type: Original Report	Product Type: Digital Portable Radio
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Report Number: RSZ130802005-20A	
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Note: This test report is prepared for the customer shown above and for the device described herein. It may not be duplicated or used in part without prior written consent from Bay Area Compliance Laboratories Corp.

Attestation of Test Results				
EUT Information	Company Name	Hytera Communications Co., Ltd.		
	EUT Description	Digital Portable Radio		
	FCC ID	YAMPD50XU1		
	Model Number	PD500 U(1), PD502 U(1), PD505 U(1), PD506 U(1), PD508 U(1), HD505 U(1)		
	Test Date	2013-08-03 to 2013-08-05		
Mode	Frequency (MHz)	Max. SAR Level(s) Reported		Limit (W/Kg)
Digital	400-470	12.5kHz	Face up: 2.847 W/kg Body-Back: 5.303W/kg	8
Analog	400-470	12.5kHz	Face up: 3.215 W/kg (50% duty cycle) Body-Back: 5.172 W/kg (50% duty cycle)	
Applicable Standards	ANSI / IEEE C95.1: 2005 IEEE Standard for Safety Levels with Respect to Human Exposure to Radio Frequency Electromagnetic Fields, 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 Such Fields, 100 kHz—300 GHz.			
	IEEE 1528:2003 IEEE Recommended Practice for Determining the Peak Spatial-Average Specific Absorption Rate (SAR) in the Human Head from Wireless Communications Devices: Measurement Techniques			
	KDB procedures KDB 447498 D01 Mobile and Portable Devices RF Exposure Procedures and Equipment Authorization Policies KDB 643646 SAR Test Reduction Considerations for Occupational PTT Radios			
<p>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 1528-2003 and RF exposure KDB procedures.</p> <p>The results and statements contained in this report pertain only to the device(s) evaluated.</p>				

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DOCUMENT REVISION HISTORY

Revision Number	Report Number	Description of Revision	Date of Revision
0	RSZ130802005-20A	Original Report	2013-09-10

EUT DESCRIPTION

This report has been prepared on behalf of Hytera Communications Co., Ltd. and their product, FCC ID: YAMPD50XU1, Model: PD500 U(1), PD502 U(1), PD505 U(1), PD506 U(1), PD508 U(1), HD505 U(1) or the EUT(Equipment Under Test) as referred to in the rest of this report.

*Note: This series products model: PD500 U(1), PD502 U(1), PD505 U(1), PD506 U(1), PD508 U(1), HD505 U(1), we select model: PD502 U(1) to test, there is no electrical change has been made to the equipment.

Technical Specification

Product Type	Portable
Exposure Category:	Occupational/Controlled Exposure
Antenna Type(s):	External Antenna
Body-Worn Accessories:	Belt Clip and Headset Cable
Face-Head Accessories:	None
Modulation Type:	FM and 4FSK
Frequency Band:	400MHz-470MHz
Conducted RF Power:	36.26dBm
Dimensions (L*W*H):	122mm (L)×55mm (W)×28mm (H)
Power Source:	Rechargeable Li-ION Battery
Normal Operation:	Face Up and Body-worn

REFERENCE, STANDARDS, AND GUIDELINES

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).

Occupational/Controlled environments Spatial Peak limit 8.0W/kg (FCC/IC) & 10 W/kg (CE) applied to the EUT.

FACILITIES

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

DESCRIPTION OF TEST SYSTEM

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

ALSAS-10U System Description

ALSAS-10-U is fully compliant with the technical and scientific requirements of IEEE 1528, IEC 62209, CENELEC, ARIB, ACA, and the Federal Communications Commission. The system comprises of a six axes articulated robot which utilizes a dedicated controller.

ALSAS-10U uses the latest methodologies. And FDTD modeling to provide a platform which is repeatable with minimum uncertainty.

Applications

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

Area Scans

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

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

Zoom Scan (Cube Scan Averaging)

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

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

The zoom scan integer steps can be user defined so as to reduce uncertainty, but normal practice for typical test applications (including FCC) utilize a physical step of 5x5x8 (8mmx8mmx5mm) providing a volume of 32mm³ in the X & Y axis, and 35mm in the Z axis.



ALSAS-10U Interpolation and Extrapolation Uncertainty

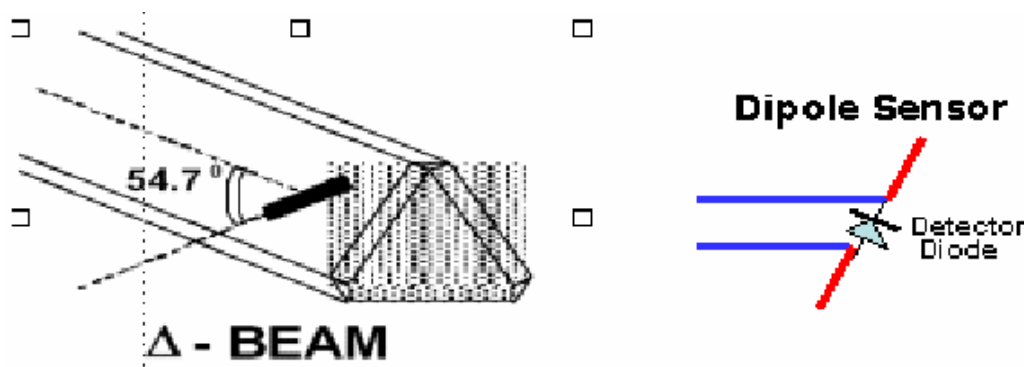
The overall uncertainty for the methodology and algorithms the used during the SAR calculation was evaluated using the data from IEEE 1528 based on the example f3 algorithm:

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

Isotropic E-Field Probe

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

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



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

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

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

Isotropic E-Field Probe Specification

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

Boundary Detection Unit and Probe Mounting Device

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

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

Daq-Paq (Analog to Digital Electronics)

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

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

Axis Articulated Robot

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



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

ALSAS Universal Workstation

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

Universal Device Positioner

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

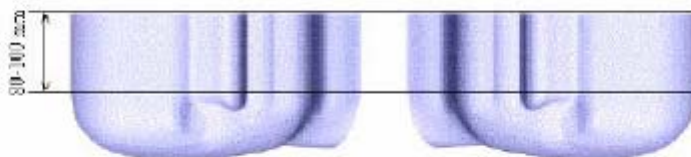


Phantom Types

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

APREL SAM Phantoms

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

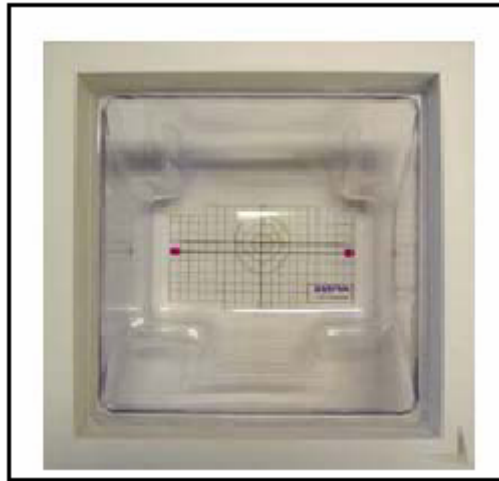


APREL Laboratories Universal Phantom

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

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

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



Tissue Dielectric Parameters for Head and Body Phantoms

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

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

Recommended Tissue Dielectric Parameters for Head and Body

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

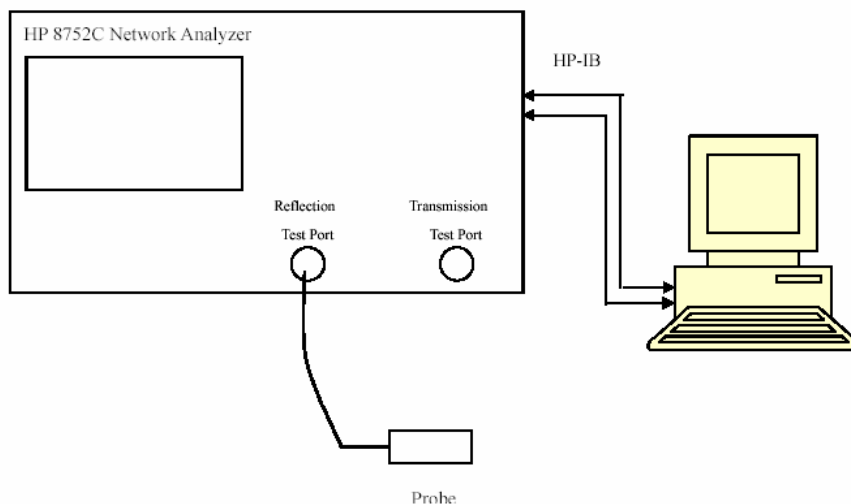
EQUIPMENT LIST AND CALIBRATION

Equipments List & Calibration Information

Equipment	Model	Calibration Date	S/N
CRS F3 robot	ALS-F3	N/A	RAF0805352
CRS F3 Software	ALS-F3-SW	N/A	N/A
CRS C500C controller	ALS-C500	N/A	RCF0805379
Probe mounting device & Boundary Detection Sensor System	ALS-PMDPS-3	N/A	120-00270
Universal Work Station	ALS-UWS	N/A	100-00157
Data Acquisition Package	ALS-DAQ-PAQ-3	2013-05-12	110-00212
Miniature E-Field Probe	E-020	2012-08-09	500-00283
Dipole, 450 MHz	ALS-D-450-S-2	2012-07-31	175-00503
Dipole Spacer	ALS-DS-U	N/A	250-00907
Device holder/Positioner	ALS-H-E-SET-2	N/A	170-00510
Left ear SAM phantom	ALS-P-SAM-L	N/A	130-00311
Right ear SAM phantom	ALS-P-SAM-R	N/A	140-00359
UniPhantom	ALS-P-UP-1	N/A	150-00413
Simulated Tissue 450 MHz Head	ALS-TS-450-H	Each Time	260-01106
Simulated Tissue 450 MHz Body	ALS-TS-450-B	Each Time	260-02108
Power Amplifier	5S1G4	N/A	71377
Synthesized Sweeper	HP 8341B	2013-05-16	2624A00116
Signal Analyzer	FSIQ26	2012-08-08	8386001028

SAR MEASUREMENT SYSTEM VERIFICATION

Liquid Verification



Liquid Verification Setup Block Diagram

Liquid Verification Results

Frequency (MHz)	Liquid Type	Liquid Parameter		Target Value		Delta (%)		Tolerance (%)
		ϵ_r	σ (S/m)	ϵ_r	σ (S/m)	$\Delta\epsilon_r$	$\Delta\sigma$ (S/m)	
400.0125	Head	42.27	0.85	43.5	0.87	-2.828	-2.054	±5
	Body	55.84	0.92	56.7	0.94	-1.517	-1.632	±5
418.0125	Head	42.22	0.87	43.5	0.87	-2.943	0.000	±5
	Body	55.88	0.92	56.7	0.94	-1.446	-2.563	±5
435.0125	Head	42.09	0.88	43.5	0.87	-3.241	1.691	±5
	Body	55.91	0.91	56.7	0.94	-1.393	-2.995	±5
450.0125	Head	42.20	0.90	43.5	0.87	-2.989	3.027	±5
	Body	55.94	0.91	56.7	0.94	-1.340	-2.852	±5
469.9875	Head	42.07	0.91	43.5	0.87	-3.310	4.211	±5
	Body	55.99	0.92	56.7	0.94	-1.252	-2.481	±5

*Liquid Verification was performed on 2013-08-03.

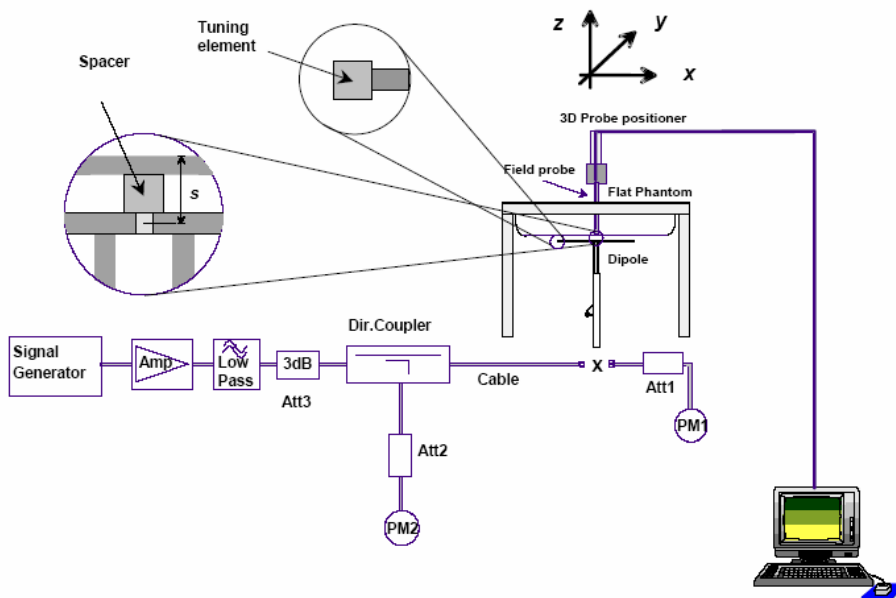
Please refer to the following tables.

450 Head				450 Body		
Frequency (MHz)	e'	e''		Frequency (MHz)	e'	e''
400.0	42.265755	38.315325		400.0	55.840273	41.576567
401.5	42.250787	38.239878		401.5	55.843411	41.276078
403.0	42.237584	38.164401		403.0	55.846544	41.088596
404.5	42.231791	38.088932		404.5	55.849687	40.901030
406.0	42.254964	38.013490		406.0	55.852825	40.736092
407.5	42.213494	37.937990		407.5	55.855963	40.499823
409.0	42.203425	37.862518		409.0	55.859101	40.414322
410.5	42.205895	37.787050		410.5	55.862239	40.192458
412.0	42.216962	37.711578		412.0	55.865377	40.127020
413.5	42.206324	37.636118		413.5	55.868515	39.884443
415.0	42.189596	37.560652		415.0	55.871653	39.688598
416.5	42.219038	37.485181		416.5	55.874791	39.531427
418.0	42.220740	37.409704		418.0	55.877929	39.409324
419.5	42.224436	37.334234		419.5	55.881067	39.273712
421.0	42.218531	37.258764		421.0	55.884205	39.158887
422.5	42.142234	37.183304		422.5	55.887343	38.966311
424.0	42.218486	37.107834		424.0	55.890480	38.943975
425.5	42.172777	37.032364		425.5	55.893618	38.820674
427.0	42.098795	36.956894		427.0	55.896756	39.150907
428.5	42.114097	36.881424		428.5	55.899894	38.465505
430.0	42.068680	36.805954		430.0	55.903032	38.317362
431.5	42.109619	36.730494		431.5	55.906170	38.110324
433.0	42.089888	36.655024		433.0	55.909308	37.953783
434.5	42.093072	36.579554		434.5	55.912446	37.701490
436.0	42.066674	36.504084		436.0	55.915584	37.508413
437.5	42.071269	36.428614		437.5	55.918722	37.366220
439.0	42.031537	36.353144		439.0	55.921860	37.293303
440.5	42.265755	36.277674		440.5	55.924998	37.229569
442.0	42.250787	36.202214		442.0	55.928136	37.113852
443.5	42.237584	36.126744		443.5	55.931274	37.029056
445.0	42.231791	36.051274		445.0	55.934412	36.851068
446.5	42.254964	35.975804		446.5	55.937550	36.686026
448.0	42.213494	35.900334		448.0	55.940688	36.653169
449.5	42.203425	35.824864		449.5	55.943826	36.498533
451.0	42.205895	35.749404		451.0	55.946964	36.453661
452.5	42.216962	35.673934		452.5	55.950102	36.290398
454.0	42.206324	35.598464		454.0	55.953240	36.166238
455.5	42.189596	35.522994		455.5	55.956378	36.134751
457.0	42.219038	35.447524		457.0	55.959516	35.995149
458.5	42.220740	35.372054		458.5	55.962654	35.950660
460.0	42.224436	35.296584		460.0	55.965792	35.768318
461.5	42.218531	35.221124		461.5	55.968930	35.694225
463.0	42.142234	35.145654		463.0	55.972068	35.603643
464.5	42.218486	35.070184		464.5	55.975206	35.550029
466.0	42.172777	34.994714		466.0	55.978344	35.423030
467.5	42.098795	34.919244		467.5	55.981482	35.284434
469.0	42.114097	34.843774		469.0	55.984620	35.233293
470.5	42.068680	34.768314		470.5	55.987758	35.153594
472.0	42.109619	34.692844		472.0	55.990895	35.043751
473.5	42.089888	34.617374		473.5	55.994033	34.921835
475.0	42.093072	34.541904		475.0	55.997171	34.822017

System Accuracy Verification

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

System Verification Setup Block Diagram



Probe and dipole antenna List and Detail

Manufacturer	Description	Model	Serial Number	Calibration Date	Calibration Due Date
APREL	Probe	ALS-E-020	500-00283	2012-08-08	2013-08-07
APREL	Dipole antenna(450MHz)	ALS-D-450-S-2	175-00503	2012-07-31	2015-07-30

System Accuracy Check Results

Date	Frequency (MHz)	Liquid Type	Measured SAR (W/Kg)		Target Value (W/Kg)	Delta (%)	Tolerance (%)
2013-08-03	450	Head	1g	4.683	4.572	2.428	± 10
		Body	1g	4.657	4.508	3.305	± 10

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

SAR SYSTEM VALIDATION DATA**Test Laboratory: Bay Area Compliance Lab Corp. (Shenzhen)****System Performance Check 450 MHz Head Liquid****Dipole 450 MHz; Type: ALS-D-450-S-2; S/N: 175-00503**

Product Data

Device Name : Dipole 450 MHz
Serial No. : 175-00503
Type : Dipole
Model : ALS-D-450-S-2
Frequency Band : 450
Max. Transmit Pwr : 1 W
Drift Time : 3 min(s)
Power Drift-Start : 4.528 W/kg
Power Drift-Finish : 4.001 W/kg
Power Drift (%) : -1.153

Phantom Data

Name : APREL-Uni
Type : Uni-Phantom
Size (mm) : 280 x 280 x 200
Serial No. : System Default
Location : Center
Description : Default
Phantom Data

Tissue Data

Type : Head
Serial No. : 260-01106
Frequency : 450.00MHz
Last Calib. Date : 03-Aug-2013
Temperature : 20.00 °C
Ambient Temp. : 21.00 °C
Humidity : 56.00 RH%
Epsilon : 42.09 F/m
Sigma : 0.88 S/m
Density : 1000.00 kg/cu. m

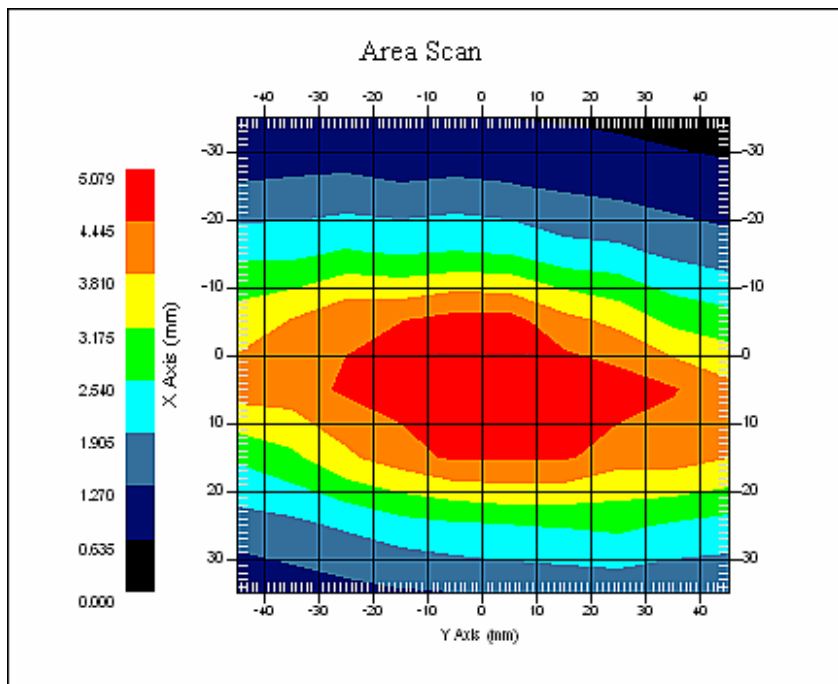
Probe Data

Name : E-Field
Model : E-020
Type : E-Field Triangle
Serial No. : 500-00283
Last Calib. Date : 09-Aug-2012
Frequency Band : 450
Duty Cycle Factor : 1
Conversion Factor : 6.0
Probe Sensitivity : 1.20 1.20 1.20 $\mu\text{V}/(\text{V}/\text{m})^2$
Compression Point : 95.00 mV
Offset : 1.56 mm

Measurement Data

Crest Factor : 1
Scan Type : Complete
Tissue Temp. : 21.00 °C
Ambient Temp. : 21.00 °C
Area Scan : 8x10x1 : Measurement x=10mm, y=10mm, z=4mm
Zoom Scan : 7x7x7 : Measurement x=5mm, y=5mm, z=5mm

1 gram SAR value : 4.683 W/kg
10 gram SAR value : 2.962 W/kg
Area Scan Peak SAR : 4.953 W/kg
Zoom Scan Peak SAR : 8.967 W/kg



450 MHz System Validation with Head Tissue

Test Laboratory: Bay Area Compliance Lab Corp. (Shenzhen)**System Performance Check 450 MHz Body Liquid****Dipole 450 MHz; Type: ALS-D-450 -S-2; S/N: 175-00503**

Product Data

Device Name : Dipole 450 MHz
Serial No. : 175-00503
Type : Dipole
Model : ALS-D-450-S-2
Frequency Band : 450
Max. Transmit Pwr : 1 W
Drift Time : 3 min(s)
Power Drift-Start : 4.631 W/kg
Power Drift-Finish : 4.537 W/kg
Power Drift (%) : -2.209

Phantom Data

Name : APREL-Uni
Type : Uni-Phantom
Size (mm) : 280 x 280 x 200
Serial No. : System Default
Location : Center
Description : Default
Phantom Data

Tissue Data

Type : Body
Serial No. : 260-02108
Frequency : 450.00MHz
Last Calib. Date : 03-Aug-2013
Temperature : 20.00 °C
Ambient Temp. : 21.00 °C
Humidity : 56.00 RH%
Epsilon : 55.91 F/m
Sigma : 0.91 S/m
Density : 1000.00 kg/cu. m

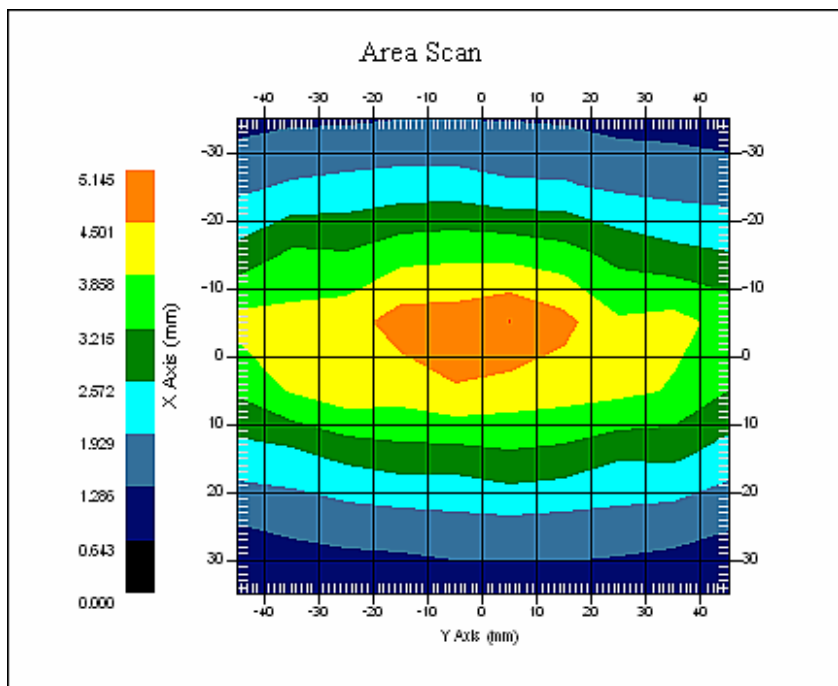
Probe Data

Name : E-Field
Model : E-020
Type : E-Field Triangle
Serial No. : 500-00283
Last Calib. Date : 09-Aug-2012
Frequency Band : 450
Duty Cycle Factor : 1
Conversion Factor : 6.0
Probe Sensitivity : 1.20 1.20 1.20 $\mu\text{V}/(\text{V}/\text{m})^2$
Compression Point : 95.00 mV
Offset : 1.56 mm

Measurement Data

Crest Factor : 1
Scan Type : Complete
Tissue Temp. : 21.00 °C
Ambient Temp. : 21.00 °C
Area Scan : 8x10x1 : Measurement x=10mm, y=10mm, z=4mm
Zoom Scan : 7x7x7 : Measurement x=5mm, y=5mm, z=5mm

1 gram SAR value : 4.657 W/kg
10 gram SAR value : 2.952 W/kg
Area Scan Peak SAR : 5.143 W/kg
Zoom Scan Peak SAR : 9.708 W/kg



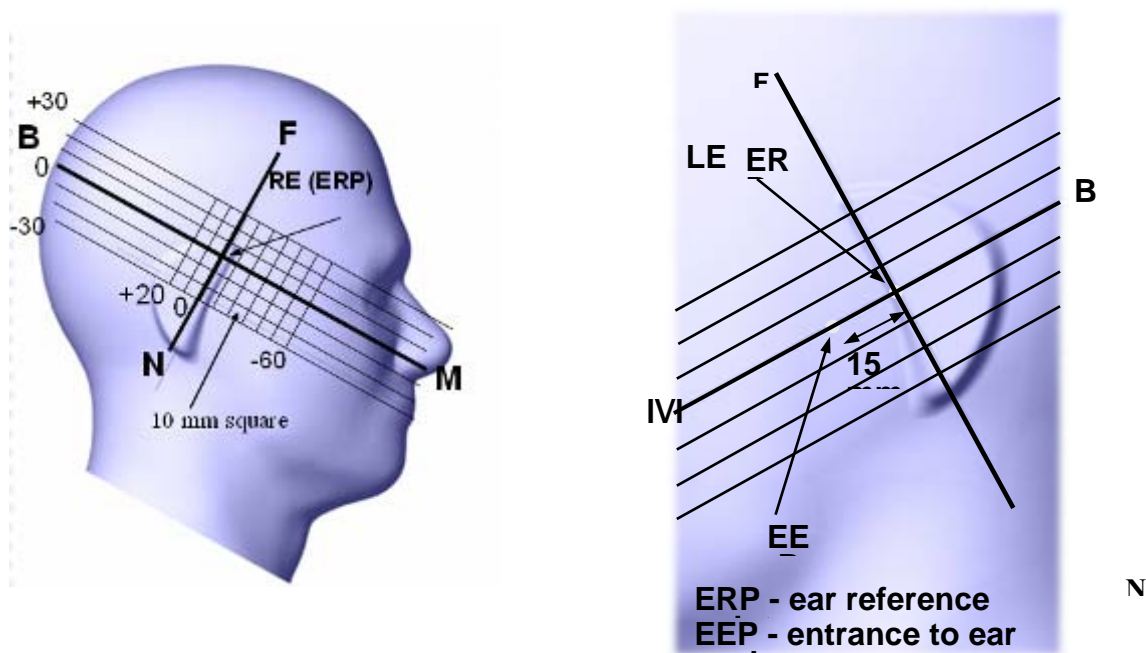
450 MHz System Validation with Body Tissue

EUT TEST STRATEGY AND METHODOLOGY

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

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

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



Cheek/Touch Position

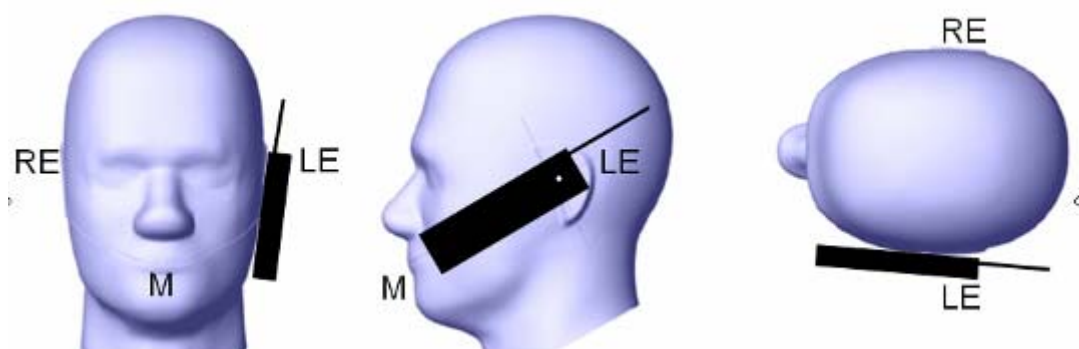
The device is brought toward the mouth of the head phantom by pivoting against the “ear reference point” or along the “N-F” line for the SCC-34/SC-2 head phantom.

This test position is established:

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

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

Cheek /Touch Position



Ear/Tilt Position

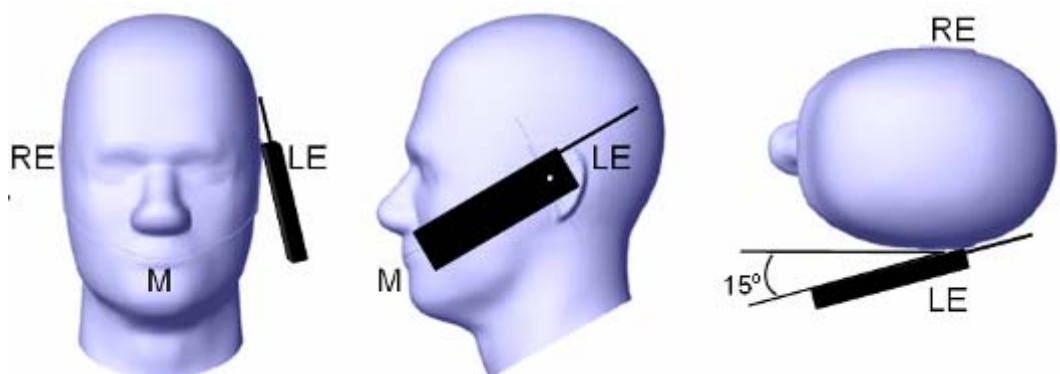
With the handset aligned in the “Cheek/Touch Position”:

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

2) (otherwise) The handset should be moved (translated) away from the cheek perpendicular to the line passes through both “ear reference points” (note: one of these ear reference points may not physically exist on a split head model) for approximate 2-3 cm. While it is in this position, the device handset is tilted away from the mouth with respect to the “test device reference point” until the inside angle between the vertical centerline on the front surface of the phone and the horizontal line passing through the ear reference point is by 15° to 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, Tile/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.

SAR Evaluation Procedure

The evaluation was performed with the following procedure:

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

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

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

- 1) The data at the surface were extrapolated, since the center of the dipoles is 1.2 mm away from the tip of the probe and the distance between the surface and the lowest measuring point is 1.3 mm. The extrapolation was based on a least square algorithm. A polynomial of the fourth order was calculated through the points in z-axes. This polynomial was then used to evaluate the points between the surface and the probe tip.
- 2) The maximum interpolated value was searched with a straightforward algorithm. Around this maximum the SAR values averaged over the spatial volumes (1 g or 10 g) were computed by the 3D-Spline interpolation algorithm. The 3D-Spline is composed of three one dimensional splines with the "Not a knot"-condition (in x, y and z-directions). The volume was integrated with the trapezoidal-algorithm. One thousand points (10 x 10 x 10) were interpolated to calculate the averages.

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

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

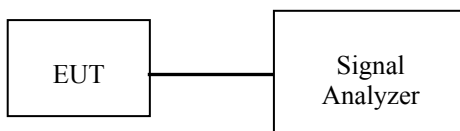
CONDUCTED OUTPUT POWER MEASUREMENT

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 Signal Analyzer through sufficient attenuation.



Maximum Output Power among production units

Max. tune-up tolerance power limit for Production Unit (dBm)					
PTT/Mode	Frequency				
	400.0125	418.0125	435.0125	450.0125	469.9875
Digital-12.5K	36.8	36.8	36.8	36.8	36.8
Analog-12.5K	36.8	36.8	36.8	36.8	36.8

Test Results:

Mode	Frequency Spacing (kHz)	Frequency (MHz)	Output(dBm)	Output Power(W)	Power level
Digital	12.5	400.0125	36.11	4.083	High
		418.0125	36.26	4.227	High
		435.0125	36.20	4.169	High
		450.0125	36.22	4.188	High
		469.9875	36.13	4.102	High
Analog	12.5	400.0125	36.12	4.093	High
		418.0125	36.25	4.217	High
		435.0125	36.19	4.159	High
		450.0125	36.21	4.178	High
		469.9875	36.15	4.121	High

SAR MEASUREMENT RESULTS

This page summarizes the results of the performed dosimetric evaluation.

SAR Test Data

Environmental Conditions

Temperature:	21 °C
Relative Humidity:	50%
ATM Pressure:	1002 mbar

* Testing was performed by Sandy Wang on 2013-08-03 and 2013-08-05

Associated Accessories List		
Antenna	1	AN0435H13
Battery	1	BL1502 1500mAh
	2	BL2010 2000mAh
Body-worn Accessories	1	BC12
	2	NCN011
Audio Accessories	1	EHM18
	2	ESM12
	3	EAM12
	4	EAM15
	5	EAM13
	6	EHM15
	7	SM08M3
	8	SM13M1
	9	ACM-01+(EH-01/EH-02/ES-01/ES-02)

1. When multiple default body-worn accessories are supplied with a radio, the standard body-worn accessory expected to result in the highest SAR based on its construction and exposure conditions is considered the default body-worn accessory for making body-worn SAR measurements.
2. When multiple standard batteries are supplied with a radio, the battery with the highest capacity is considered the default battery for making head SAR measurements.
3. Testing a PTT radio with the thinnest battery and a standard (default) body-worn accessory that are both supplied with the radio and, if applicable, a default audio accessory, to measure the body SAR.
4. For audio accessories with similar construction and operating requirements, test only the audio accessory within the group that is expected to result in the highest SAR, with respect to changes in RF characteristics and exposure conditions for the combination.
5. The highlight accessories combination is regard as a default one for different construction and operating requirements accessories.

Test Result:**Digital (Modulation 4FSK; Channel Spacing 12.5 kHz):**

EUT Position	Frequency (MHz)	Body-Worn Accessory	Battery	Power Drift (%)	Max. Meas. Power (dBm)	Max. Rated Power (dBm)	1 g SAR Value(W/Kg)		
							Scaled Factor	Meas. SAR	Scaled SAR
Face up (2.5cm)	400.0125	/	BL2010	-1.204	36.11	36.8	1.172	0.936	1.097
	418.0125	/	BL2010	-1.905	36.26	36.8	1.132	2.514	2.847
	469.9875	/	BL2010	-1.847	36.13	36.8	1.167	0.652	0.761
	418.0125	/	BL1502	1.332	36.26	36.8	1.132	2.167	2.454
Body-Back (0.0cm)	400.0125	BC12	BL1502	-1.435	36.11	36.8	1.172	2.583	3.028
	418.0125	BC12	BL1502	-1.167	36.26	36.8	1.132	4.683	5.303
	435.0125	BC12	BL1502	-2.053	36.20	36.8	1.148	1.994	2.289
	450.0125	BC12	BL1502	-2.188	36.22	36.8	1.143	1.734	1.982
	469.9875	BC12	BL1502	-2.916	36.13	36.8	1.167	1.485	1.733
	418.0125	BC12	BL2010	-1.943	36.26	36.8	1.132	4.619	5.231
	418.0125	NCN011	BL1502	-1.275	36.26	36.8	1.132	4.492	5.087

Note:

1. When the 1-g SAR tested using the default battery and default accessories is $\leq 3.5W/Kg$, testing for other channels are optional.
2. When 1-g SAR tested using the default battery and default accessories is $\leq 4.0W/Kg$, the test using additional batteries is only required for the configuration that resulted in the highest SAR among previous test. We used BL2010 (2000mAh) as the default battery for SAR head measurements and used BL1502(1500mAh) as the default battery for SAR body measurements.
3. When the 1-g SAR is $> 6.0 W/kg$, test additional battery and antenna combination with the default body-worn and audio accessory on all required channels.
4. Passive body-worn and audio accessories generally do not apply to the head SAR of PTT radios.
5. The audio accessory ACM-01+EH-01 will result higher SAR value than other audio accessory. So all test of the body-back are testing with the audio accessory ACM-01+EH-01.

Analog (Modulation FM; Channel Spacing 12.5 kHz):

EUT Position	Frequency (MHz)	Body-Worn Accessory	Battery	Power Drift (%)	Max. Meas. Power (dBm)	Max. Rated Power (dBm)	1 g SAR Value(W/Kg)			
							Scaled Factor	Meas. SAR	Scaled SAR	50% duty cycle
Face up (2.5cm)	400.0125	/	BL2010	-1.891	36.12	36.8	1.169	2.44	2.854	1.427
	418.0125	/	BL2010	4.719	36.25	36.8	1.135	5.666	6.431	3.215
	469.9875	/	BL2010	-1.974	36.15	36.8	1.161	1.315	1.527	0.764
	418.0125	/	BL1502	-2.275	36.25	36.8	1.135	5.362	6.086	3.043
Body-Back (0.0cm)	400.0125	BC12	BL1502	-2.715	36.12	36.8	1.169	4.794	5.607	2.803
	418.0125	BC12	BL1502	-2.986	36.25	36.8	1.135	9.113	10.343	5.172
	435.0125	BC12	BL1502	-2.835	36.19	36.8	1.151	3.397	3.909	1.955
	450.0125	BC12	BL1502	-1.017	36.21	36.8	1.146	3.137	3.593	1.797
	469.9875	BC12	BL1502	-1.729	36.15	36.8	1.161	2.735	3.177	1.588
	418.0125	BC12	BL2010	-3.779	36.25	36.8	1.135	8.953	10.162	5.081
	418.0125	NCN011	BL1502	-2.826	36.25	36.8	1.135	8.936	10.142	5.071

Note:

1. When the 1-g SAR(50%duty cycle) tested using the default battery and default accessories is $\leq 3.5W/Kg$, testing for other channels are optional.
2. When 1-g SAR(50%duty cycle) tested using the default battery and default accessories is $\leq 4.0W/Kg$, the test using additional batteries is only required for the configuration that resulted in the highest SAR among previous test. We used BL2010 (2000mAh) as the default battery for SAR head measurements and used BL1502 (1500mAh) as the default battery for SAR body measurements.
3. When the 1-g(50%duty cycle) SAR is $> 6.0 W/kg$, test additional battery and antenna combination with the default body-worn and audio accessory on all required channels.
4. Passive body-worn and audio accessories generally do not apply to the head SAR of PTT radios.
5. The audio accessory ACM-01+EH-01 will result higher SAR value than other audio accessory. So all test of the body-back are testing with the audio accessory ACM-01+EH-01.
6. 50% duty cycle applies to FM Modulation.

EUT SCAN RESULTS

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

Face-Up 2.5cm (Digital 12.5k-400.0125 MHz)

Battery: BL2010

Measurement Data

Modulation mode : 4FSK
 Crest Factor : 2
 Scan Type : Complete
 Area Scan : 11x8x1: Measurement x=10mm, y=10mm, z=4mm
 Zoom Scan : 7x7x7: Measurement x=5mm, y=5mm, z=5mm
 Power Drift-Start : 0.914 W/kg
 Power Drift-Finish : 0.903 W/kg
 Power Drift (%) : -1.204

Tissue Data

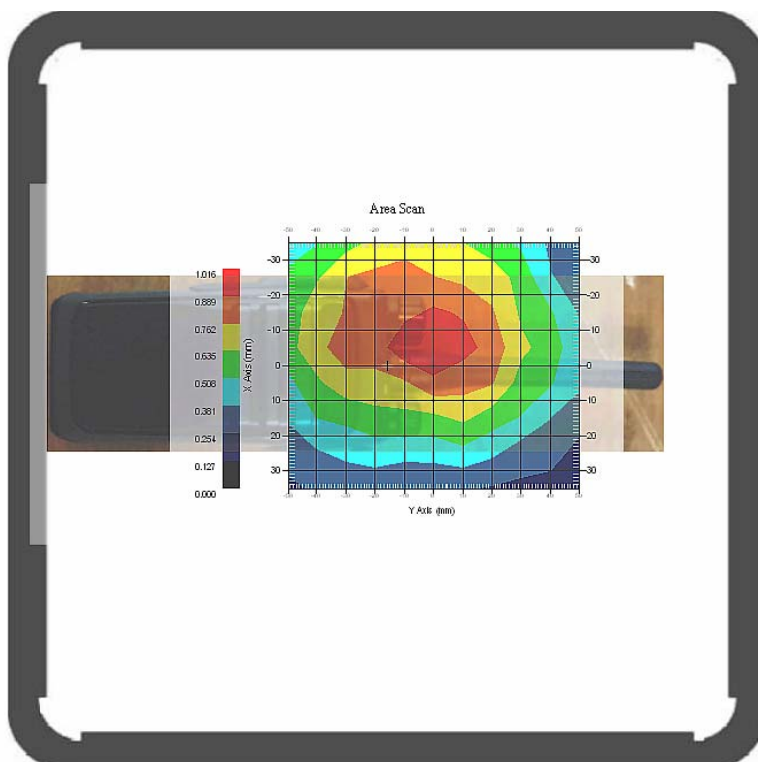
Type : Head
 Frequency : 400.0125 MHz
 Epsilon : 42.27F/m
 Sigma : 0.85 S/m
 Density : 1000.00 kg/cu. m

Probe Data

Serial No. : 500-00283
 Frequency Band : 450
 Duty Cycle Factor : 2
 Conversion Factor : 6.0
 Probe Sensitivity : 1.20 1.20 1.20 $\mu\text{V}/(\text{V}/\text{m})^2$
 Compression Point : 95.00 mV
 Offset : 1.56 mm

1 gram SAR value : 0.936 W/kg
 10 gram SAR value : 0.642 W/kg
 Area Scan Peak SAR : 1.015 W/kg
 Zoom Scan Peak SAR : 1.781 W/kg

Plot 1#



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

**Face-Up 2.5cm (Digital 12.5k-418.0125 MHz)
Battery: BL2010**

Measurement Data

Modulation mode : 4FSK
 Crest Factor : 2
 Scan Type : Complete
 Area Scan : 11x8x1: Measurement x=10mm, y=10mm, z=4mm
 Zoom Scan : 7x7x7: Measurement x=5mm, y=5mm, z=5mm
 Power Drift-Start : 2.749 W/kg
 Power Drift-Finish : 2.697 W/kg
 Power Drift (%) : -1.905

Tissue Data

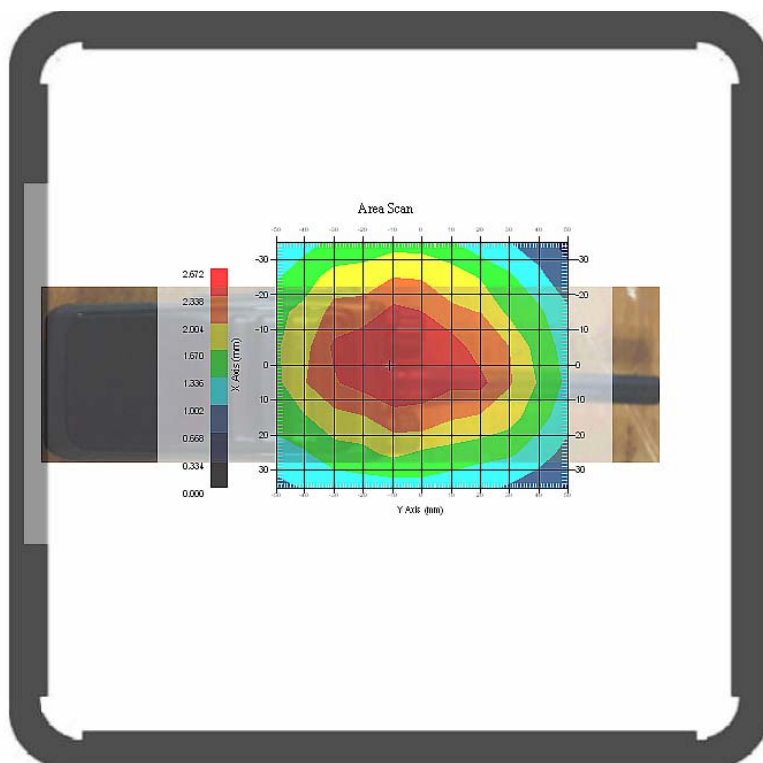
Type : Head
 Frequency : 418.0125 MHz
 Epsilon : 42.22 F/m
 Sigma : 0.87 S/m
 Density : 1000.00 kg/cu. m

Probe Data

Serial No. : 500-00283
 Frequency Band : 450
 Duty Cycle Factor : 2
 Conversion Factor : 6.0
 Probe Sensitivity : 1.20 1.20 1.20 $\mu\text{V}/(\text{V}/\text{m})^2$
 Compression Point : 95.00 mV
 Offset : 1.56 mm

1 gram SAR value : 2.514 W/kg
 10 gram SAR value : 1.867 W/kg
 Area Scan Peak SAR : 2.669 W/kg
 Zoom Scan Peak SAR : 3.493 W/kg

Plot 2#



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

**Face-Up 2.5cm (Digital 12.5k-469.9875MHz)
Battery: BL2010**

Measurement Data

Modulation mode : 4FSK
 Crest Factor : 2
 Scan Type : Complete
 Area Scan : 11x8x1: Measurement x=10mm, y=10mm, z=4mm
 Zoom Scan : 7x7x7: Measurement x=5mm, y=5mm, z=5mm
 Power Drift-Start : 0.603 W/kg
 Power Drift-Finish : 0.592 W/kg
 Power Drift (%) : -1.847

Tissue Data

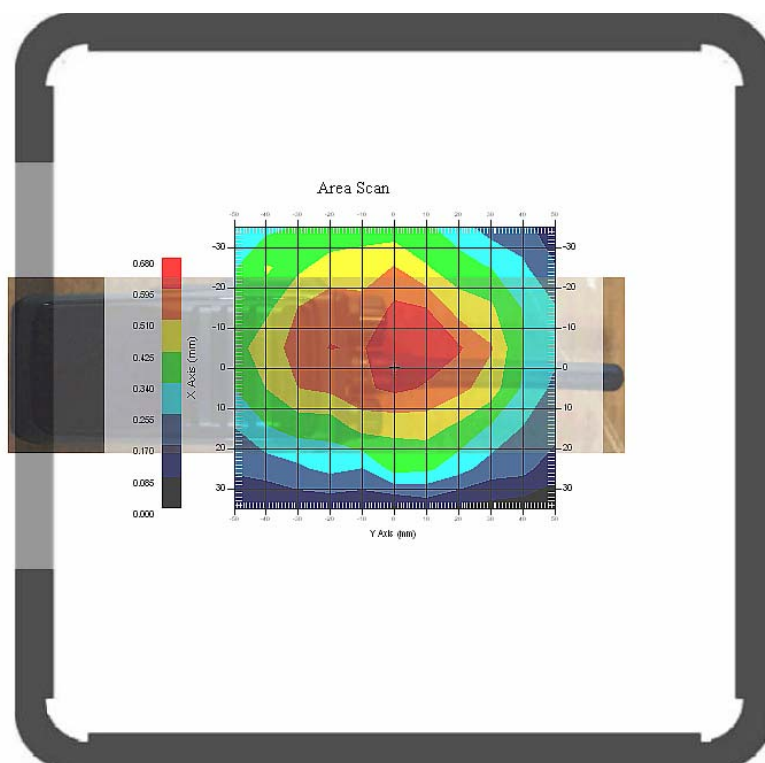
Type : Head
 Frequency : 469.9875 MHz
 Epsilon : 42.07 F/m
 Sigma : 0.91 S/m
 Density : 1000.00 kg/cu. m

Probe Data

Serial No. : 500-00283
 Frequency Band : 450
 Duty Cycle Factor : 2
 Conversion Factor : 6.0
 Probe Sensitivity : 1.20 1.20 1.20 $\mu\text{V}/(\text{V}/\text{m})^2$
 Compression Point : 95.00 mV
 Offset : 1.56 mm

1 gram SAR value : 0.652 W/kg
 10 gram SAR value : 0.351 W/kg
 Area Scan Peak SAR : 0.677 W/kg
 Zoom Scan Peak SAR : 1.010 W/kg

Plot 3#



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

**Face-Up 2.5cm (Digital 12.5k-418.0125 MHz)
Battery: BL1502**

Measurement Data

Modulation mode : 4FSK
 Crest Factor : 2
 Scan Type : Complete
 Area Scan : 11x8x1: Measurement x=10mm, y=10mm, z=4mm
 Zoom Scan : 7x7x7: Measurement x=5mm, y=5mm, z=5mm
 Power Drift-Start : 2.362 W/kg
 Power Drift-Finish : 2.330 W/kg
 Power Drift (%) : -1.332

Tissue Data

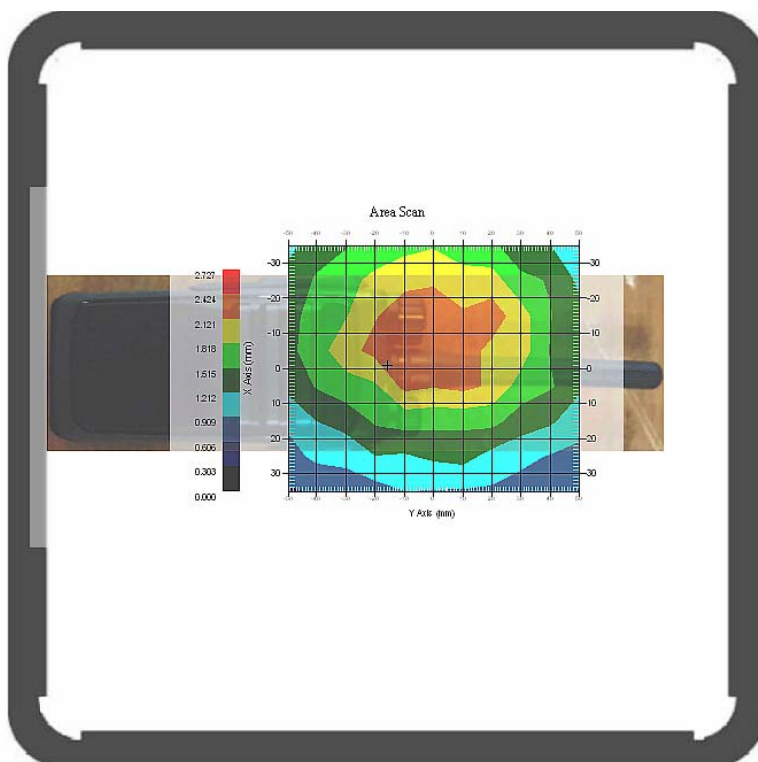
Type : Head
 Frequency : 418.0125 MHz
 Epsilon : 42.22 F/m
 Sigma : 0.87 S/m
 Density : 1000.00 kg/cu. m

Probe Data

Serial No. : 500-00283
 Frequency Band : 450
 Duty Cycle Factor : 2
 Conversion Factor : 6.0
 Probe Sensitivity : 1.20 1.20 1.20 $\mu\text{V}/(\text{V}/\text{m})^2$
 Compression Point : 95.00 mV
 Offset : 1.56 mm

1 gram SAR value : 2.167 W/kg
 10 gram SAR value : 1.646 W/kg
 Area Scan Peak SAR : 2.427 W/kg
 Zoom Scan Peak SAR : 3.373 W/kg

Plot 4#



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

**Body-Back 0.0cm (Digital 12.5k-400.0125MHz);
Body-worn accessory: BC12; Battery: BL1502**

Measurement Data

Modulation mode : 4FSK
 Crest Factor : 2
 Scan Type : Complete
 Area Scan : 11x8x1: Measurement x=10mm, y=10mm, z=4mm
 Zoom Scan : 7x7x7: Measurement x=5mm, y=5mm, z=5mm
 Power Drift-Start : 2.315 W/kg
 Power Drift-Finish : 2.282 W/kg
 Power Drift (%) : -1.435

Tissue Data

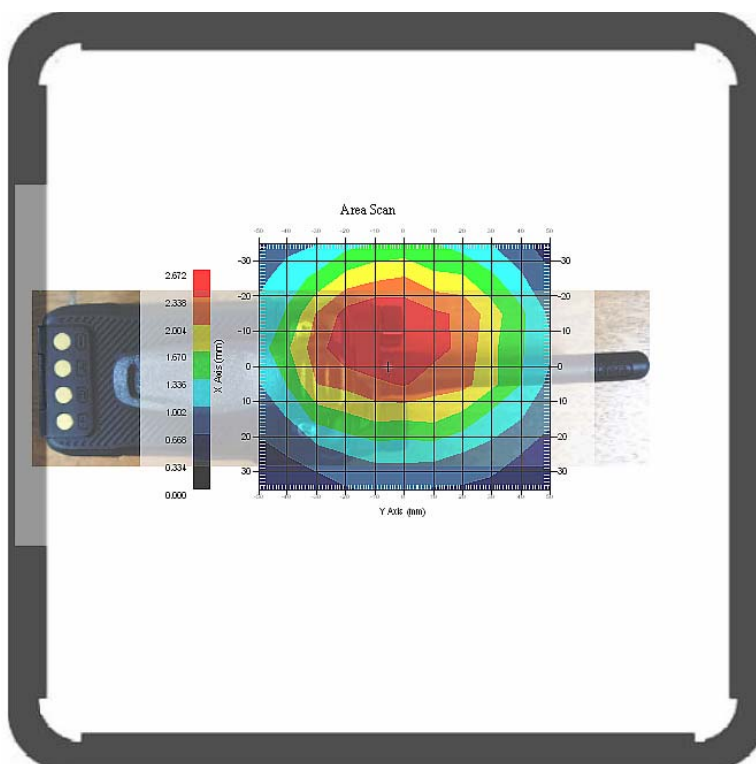
Type : Body
 Frequency : 400.0125 MHz
 Epsilon : 55.84 F/m
 Sigma : 0.92 S/m
 Density : 1000.00 kg/cu. m

Probe Data

Serial No. : 500-00283
 Frequency Band : 450
 Duty Cycle Factor : 2
 Conversion Factor : 6.0
 Probe Sensitivity : 1.20 1.20 1.20 $\mu\text{V}/(\text{V}/\text{m})^2$
 Compression Point : 95.00 mV
 Offset : 1.56 mm

1 gram SAR value : 2.583 W/kg
 10 gram SAR value : 1.977 W/kg
 Area Scan Peak SAR : 2.669 W/kg
 Zoom Scan Peak SAR : 3.923 W/kg

Plot 5#



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

**Body-Back 0.0cm (Digital 12.5k-418.0125 MHz);
Body-worn accessory: BC12; Battery: BL1502**

Measurement Data

Modulation mode : 4FSK
 Crest Factor : 2
 Scan Type : Complete
 Area Scan : 11x8x1: Measurement x=10mm, y=10mm, z=4mm
 Zoom Scan : 7x7x7: Measurement x=5mm, y=5mm, z=5mm
 Power Drift-Start : 4.555 W/kg
 Power Drift-Finish : 4.502 W/kg
 Power Drift (%) : -1.167

Tissue Data

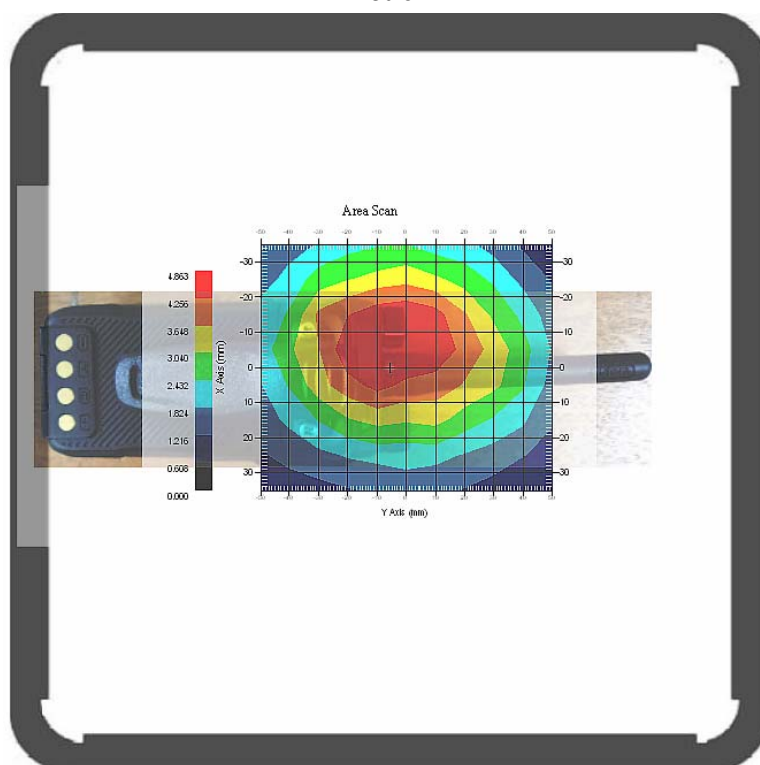
Type : Body
 Frequency : 418.0125 MHz
 Epsilon : 55.88 F/m
 Sigma : 0.92 S/m
 Density : 1000.00 kg/cu. m

Probe Data

Serial No. : 500-00283
 Frequency Band : 450
 Duty Cycle Factor : 2
 Conversion Factor : 6.0
 Probe Sensitivity : 1.20 1.20 1.20 $\mu\text{V}/(\text{V}/\text{m})^2$
 Compression Point : 95.00 mV
 Offset : 1.56 mm

1 gram SAR value : 4.683 W/kg
 10 gram SAR value : 3.290 W/kg
 Area Scan Peak SAR : 4.863 W/kg
 Zoom Scan Peak SAR : 7.086 W/kg

Plot 6#



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

**Body-Back 0.0cm (Digital 12.5k-435.0125 MHz);
Body-worn accessory: BC12; Battery: BL1502**

Measurement Data

Modulation mode : 4FSK
 Crest Factor : 2
 Scan Type : Complete
 Area Scan : 11x8x1: Measurement x=10mm, y=10mm, z=4mm
 Zoom Scan : 7x7x7: Measurement x=5mm, y=5mm, z=5mm
 Power Drift-Start : 2.858 W/kg
 Power Drift-Finish : 2.796 W/kg
 Power Drift (%) : -2.053

Tissue Data

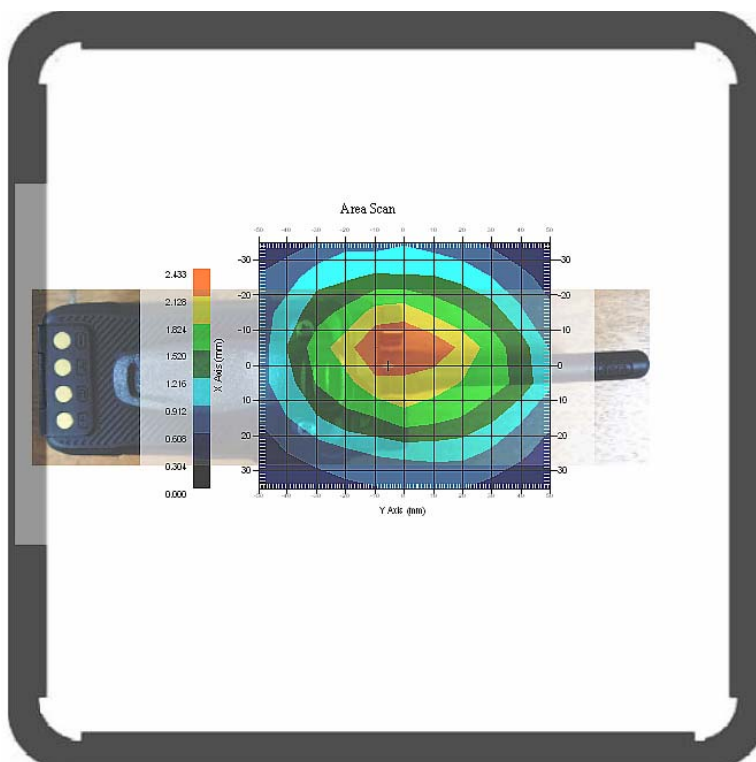
Type : Body
 Frequency : 435.0125 MHz
 Epsilon : 55.91 F/m
 Sigma : 0.91 S/m
 Density : 1000.00 kg/cu. m

Probe Data

Serial No. : 500-00283
 Frequency Band : 450
 Duty Cycle Factor : 2
 Conversion Factor : 6.0
 Probe Sensitivity : 1.20 1.20 1.20 $\mu\text{V}/(\text{V}/\text{m})^2$
 Compression Point : 95.00 mV
 Offset : 1.56 mm

1 gram SAR value : 1.994 W/kg
 10 gram SAR value : 1.557 W/kg
 Area Scan Peak SAR : 2.433 W/kg
 Zoom Scan Peak SAR : 3.082 W/kg

Plot 7#



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

**Body-Back 0.0cm (Digital 12.5k-450.0125 MHz);
Body-worn accessory: BC12; Battery: BL1502**

Measurement Data

Modulation mode : 4FSK
 Crest Factor : 2
 Scan Type : Complete
 Area Scan : 11x8x1: Measurement x=10mm, y=10mm, z=4mm
 Zoom Scan : 7x7x7: Measurement x=5mm, y=5mm, z=5mm
 Power Drift-Start : 1.751 W/kg
 Power Drift-Finish : 1.712 W/kg
 Power Drift (%) : -2.188

Tissue Data

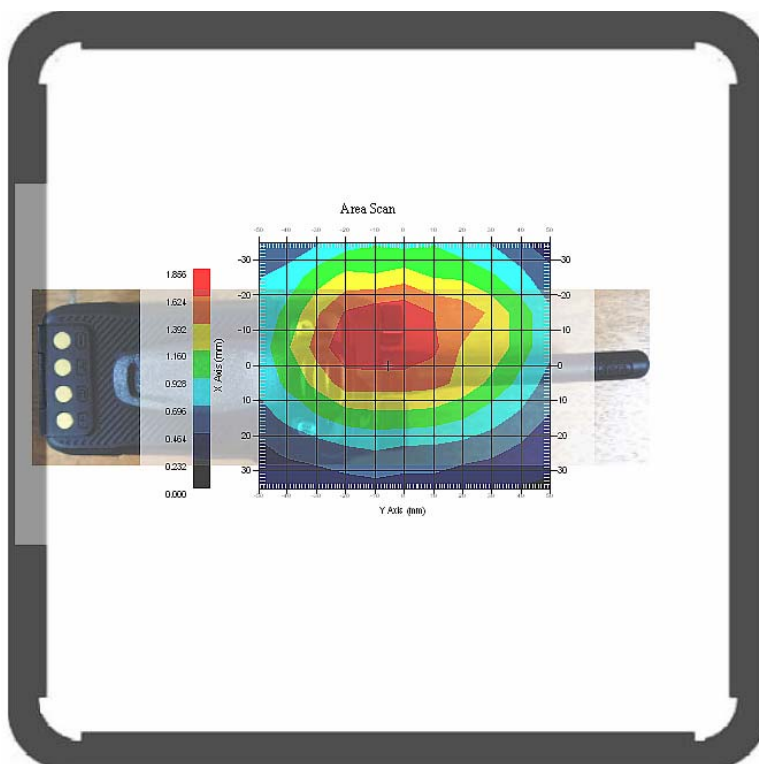
Type : Body
 Frequency : 450.0125 MHz
 Epsilon : 55.94 F/m
 Sigma : 0.91 S/m
 Density : 1000.00 kg/cu. m

Probe Data

Serial No. : 500-00283
 Frequency Band : 450
 Duty Cycle Factor : 2
 Conversion Factor : 6.0
 Probe Sensitivity : 1.20 1.20 1.20 $\mu\text{V}/(\text{V}/\text{m})^2$
 Compression Point : 95.00 mV
 Offset : 1.56 mm

1 gram SAR value : 1.734 W/kg
 10 gram SAR value : 1.176 W/kg
 Area Scan Peak SAR : 1.854 W/kg
 Zoom Scan Peak SAR : 2.752 W/kg

Plot 8#



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

**Body-Back 0.0cm (Digital 12.5k-469.9875MHz);
Body-worn accessory: BC12; Battery: BL1502**

Measurement Data

Modulation mode : 4FSK
 Crest Factor : 2
 Scan Type : Complete
 Area Scan : 11x8x1: Measurement x=10mm, y=10mm, z=4mm
 Zoom Scan : 7x7x7: Measurement x=5mm, y=5mm, z=5mm
 Power Drift-Start : 1.804 W/kg
 Power Drift-Finish : 1.762 W/kg
 Power Drift (%) : -2.916

Tissue Data

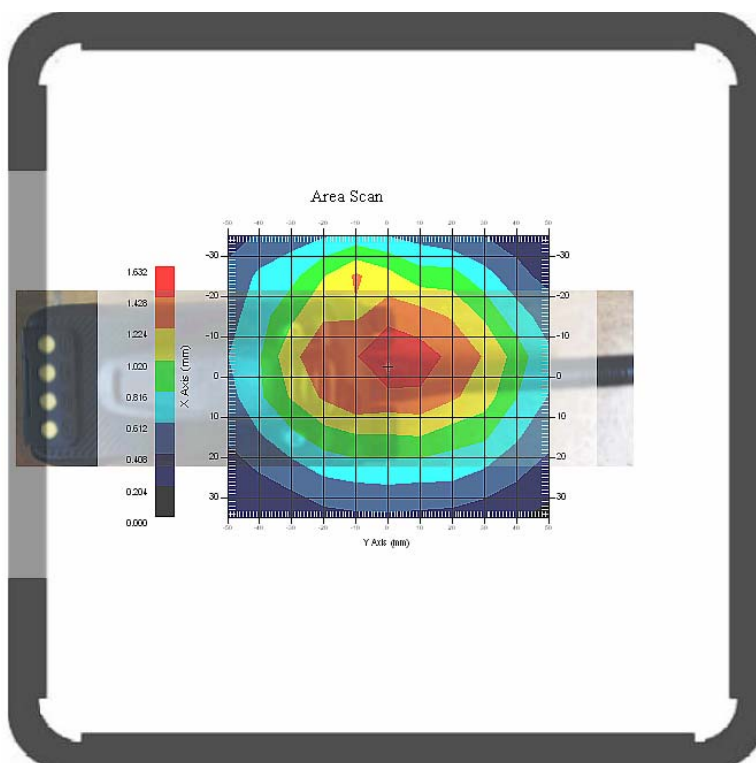
Type : Body
 Frequency : 469.9875 MHz
 Epsilon : 55.99 F/m
 Sigma : 0.92 S/m
 Density : 1000.00 kg/cu. m

Probe Data

Serial No. : 500-00283
 Frequency Band : 450
 Duty Cycle Factor : 2
 Conversion Factor : 6.0
 Probe Sensitivity : 1.20 1.20 1.20 $\mu\text{V}/(\text{V}/\text{m})^2$
 Compression Point : 95.00 mV
 Offset : 1.56 mm

1 gram SAR value : 1.485 W/kg
 10 gram SAR value : 1.023 W/kg
 Area Scan Peak SAR : 1.632 W/kg
 Zoom Scan Peak SAR : 2.121 W/kg

Plot 9#



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

**Body-Back 0.0cm (Digital 12.5k-418.0125 MHz);
Body-worn accessory: BC12; Battery: BL2010**

Measurement Data

Modulation mode : 4FSK
 Crest Factor : 2
 Scan Type : Complete
 Area Scan : 11x8x1: Measurement x=10mm, y=10mm, z=4mm
 Zoom Scan : 7x7x7: Measurement x=5mm, y=5mm, z=5mm
 Power Drift-Start : 3.996 W/kg
 Power Drift-Finish : 3.925 W/kg
 Power Drift (%) : -1.943

Tissue Data

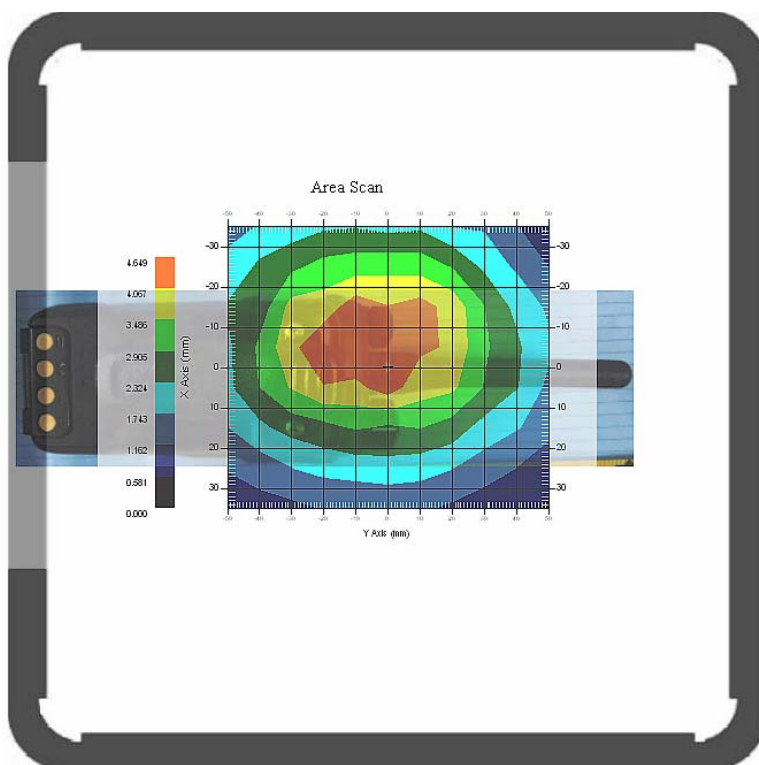
Type : Body
 Frequency : 418.0125 MHz
 Epsilon : 55.88 F/m
 Sigma : 0.92 S/m
 Density : 1000.00 kg/cu. m

Probe Data

Serial No. : 500-00283
 Frequency Band : 450
 Duty Cycle Factor : 2
 Conversion Factor : 6.0
 Probe Sensitivity : 1.20 1.20 1.20 $\mu\text{V}/(\text{V}/\text{m})^2$
 Compression Point : 95.00 mV
 Offset : 1.56 mm

1 gram SAR value : 4.619 W/kg
 10 gram SAR value : 3.384 W/kg
 Area Scan Peak SAR : 4.649 W/kg
 Zoom Scan Peak SAR : 6.496 W/kg

Plot 10#



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

**Body-Back 0.0cm (Digital 12.5k-418.0125 MHz);
Body-worn accessory: NCN011; Battery: BL1502**

Measurement Data

Modulation mode : 4FSK
 Crest Factor : 2
 Scan Type : Complete
 Area Scan : 11x8x1: Measurement x=10mm, y=10mm, z=4mm
 Zoom Scan : 7x7x7: Measurement x=5mm, y=5mm, z=5mm
 Power Drift-Start : 4.574 W/kg
 Power Drift-Finish : 4.512W/kg
 Power Drift (%) : -1.275

Tissue Data

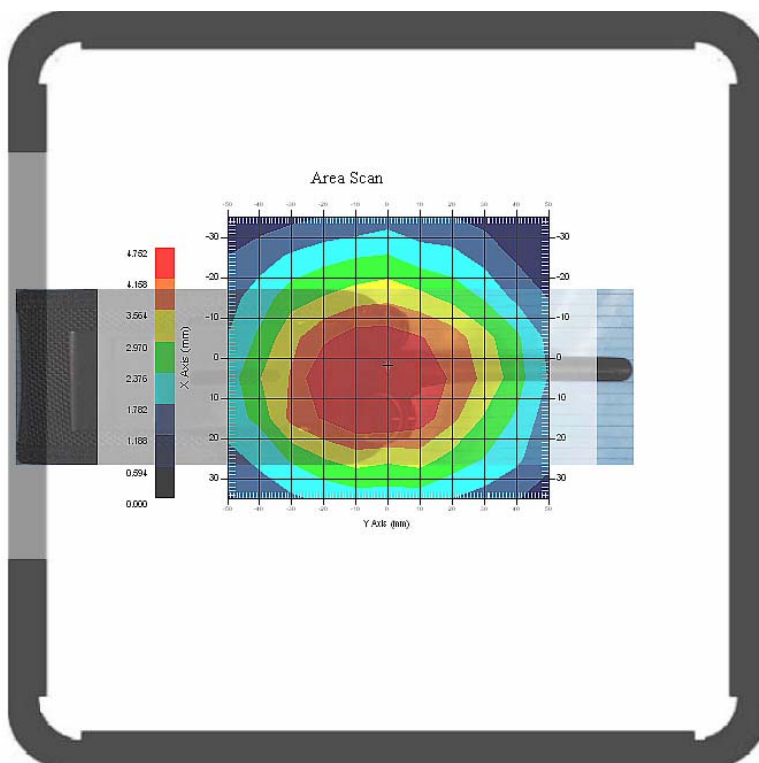
Type : Body
 Frequency : 418.0125 MHz
 Epsilon : 55.88 F/m
 Sigma : 0.92 S/m
 Density : 1000.00 kg/cu. m

Probe Data

Serial No. : 500-00283
 Frequency Band : 450
 Duty Cycle Factor : 2
 Conversion Factor : 6.0
 Probe Sensitivity : 1.20 1.20 1.20 $\mu\text{V}/(\text{V}/\text{m})^2$
 Compression Point : 95.00 mV
 Offset : 1.56 mm

1 gram SAR value : 4.492 W/kg
 10 gram SAR value : 3.190 W/kg
 Area Scan Peak SAR : 4.683 W/kg
 Zoom Scan Peak SAR : 7.964 W/kg

Plot 11#



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

**Face-Up 2.5cm (Analog 12.5k-400.0125 MHz)
Battery: BL2010**

Measurement Data

Modulation mode : FM
 Crest Factor : 1
 Scan Type : Complete
 Area Scan : 11x8x1: Measurement x=10mm, y=10mm, z=4mm
 Zoom Scan : 7x7x7: Measurement x=5mm, y=5mm, z=5mm
 Power Drift-Start : 2.302 W/kg
 Power Drift-Finish : 2.261 W/kg
 Power Drift (%) : -1.891

Tissue Data

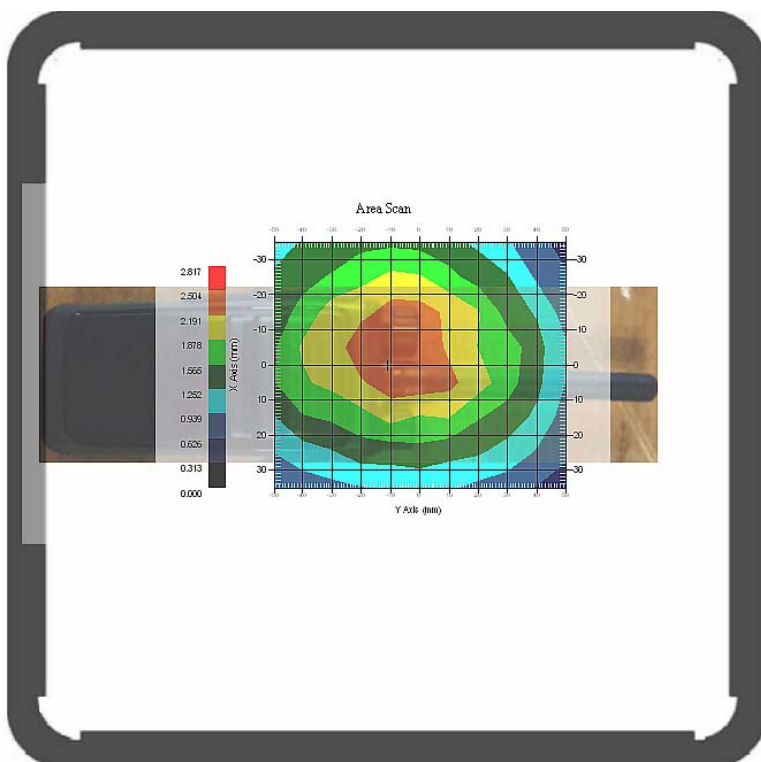
Type : Head
 Frequency : 400.0125 MHz
 Epsilon : 42.27 F/m
 Sigma : 0.85 S/m
 Density : 1000.00 kg/cu. m

Probe Data

Serial No. : 500-00283
 Frequency Band : 450
 Duty Cycle Factor : 1
 Conversion Factor : 6.0
 Probe Sensitivity : 1.20 1.20 1.20 $\mu\text{V}/(\text{V}/\text{m})^2$
 Compression Point : 95.00 mV
 Offset : 1.56 mm

1 gram SAR value : 2.440 W/kg
 10 gram SAR value : 1.754 W/kg
 Area Scan Peak SAR : 2.507 W/kg
 Zoom Scan Peak SAR : 3.393 W/kg

Plot 12#



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

**Face-Up 2.5cm (Analog 12.5k-418.0125 MHz)
Battery: BL2010**

Measurement Data

Modulation mode : FM
 Crest Factor : 1
 Scan Type : Complete
 Area Scan : 11x8x1: Measurement x=10mm, y=10mm, z=4mm
 Zoom Scan : 7x7x7: Measurement x=5mm, y=5mm, z=5mm
 Power Drift-Start : 5.430 W/kg
 Power Drift-Finish : 5.687 W/kg
 Power Drift (%) : 4.719

Tissue Data

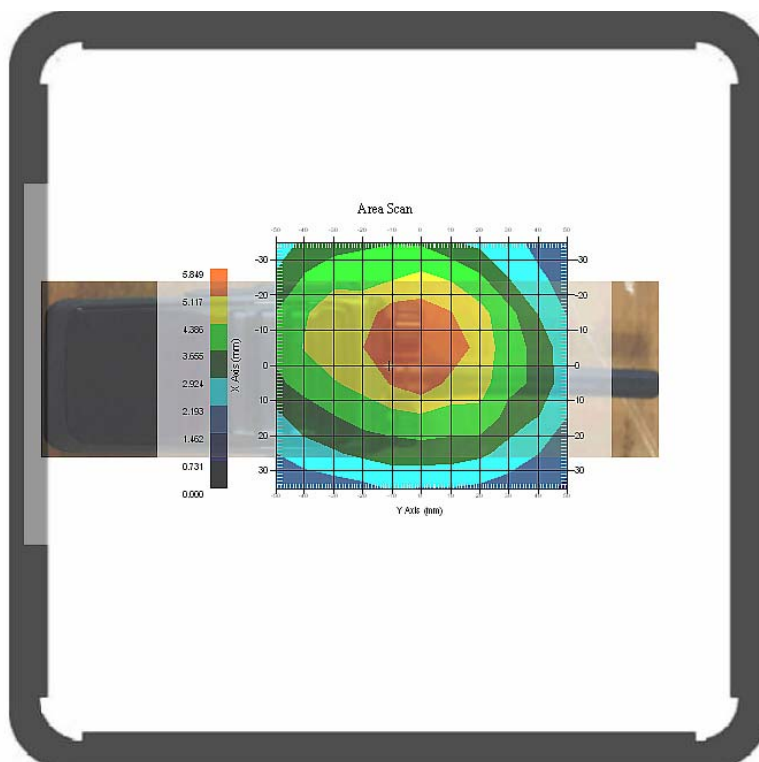
Type : Head
 Frequency : 418.0125 MHz
 Epsilon : 42.22 F/m
 Sigma : 0.87 S/m
 Density : 1000.00 kg/cu. m

Probe Data

Serial No. : 500-00283
 Frequency Band : 450
 Duty Cycle Factor : 1
 Conversion Factor : 6.0
 Probe Sensitivity : 1.20 1.20 1.20 $\mu\text{V}/(\text{V}/\text{m})^2$
 Compression Point : 95.00 mV
 Offset : 1.56 mm

1 gram SAR value : 5.666 W/kg
 10 gram SAR value : 4.523 W/kg
 Area Scan Peak SAR : 5.849 W/kg
 Zoom Scan Peak SAR : 7.537 W/kg

Plot 13#



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

**Face-Up 2.5cm (Analog 12.5k-469.9875MHz)
Battery: BL2010**

Measurement Data

Modulation mode : FM
 Crest Factor : 1
 Scan Type : Complete
 Area Scan : 11x8x1: Measurement x=10mm, y=10mm, z=4mm
 Zoom Scan : 7x7x7: Measurement x=5mm, y=5mm, z=5mm
 Power Drift-Start : 1.453 W/kg
 Power Drift-Finish : 1.425 W/kg
 Power Drift (%) : -1.974

Tissue Data

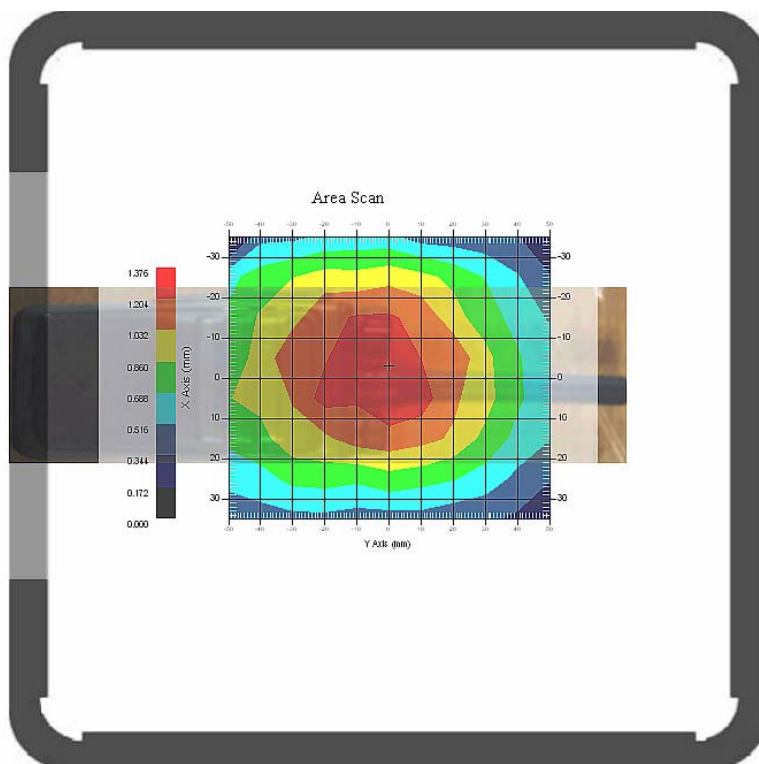
Type : Head
 Frequency : 469.9875 MHz
 Epsilon : 42.07 F/m
 Sigma : 0.91 S/m
 Density : 1000.00 kg/cu. m

Probe Data

Serial No. : 500-00283
 Frequency Band : 450
 Duty Cycle Factor : 1
 Conversion Factor : 6.0
 Probe Sensitivity : 1.20 1.20 1.20 $\mu\text{V}/(\text{V}/\text{m})^2$
 Compression Point : 95.00 mV
 Offset : 1.56 mm

1 gram SAR value : 1.315 W/kg
 10 gram SAR value : 0.822 W/kg
 Area Scan Peak SAR : 1.376 W/kg
 Zoom Scan Peak SAR : 1.911 W/kg

Plot 14#



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

**Face-Up 2.5cm (Analog 12.5k-418.0125MHz)
Battery: BL1502**

Measurement Data

Modulation mode : FM
 Crest Factor : 1
 Scan Type : Complete
 Area Scan : 11x8x1: Measurement x=10mm, y=10mm, z=4mm
 Zoom Scan : 7x7x7: Measurement x=5mm, y=5mm, z=5mm
 Power Drift-Start : 3.782 W/kg
 Power Drift-Finish : 3.701 W/kg
 Power Drift (%) : -2.275

Tissue Data

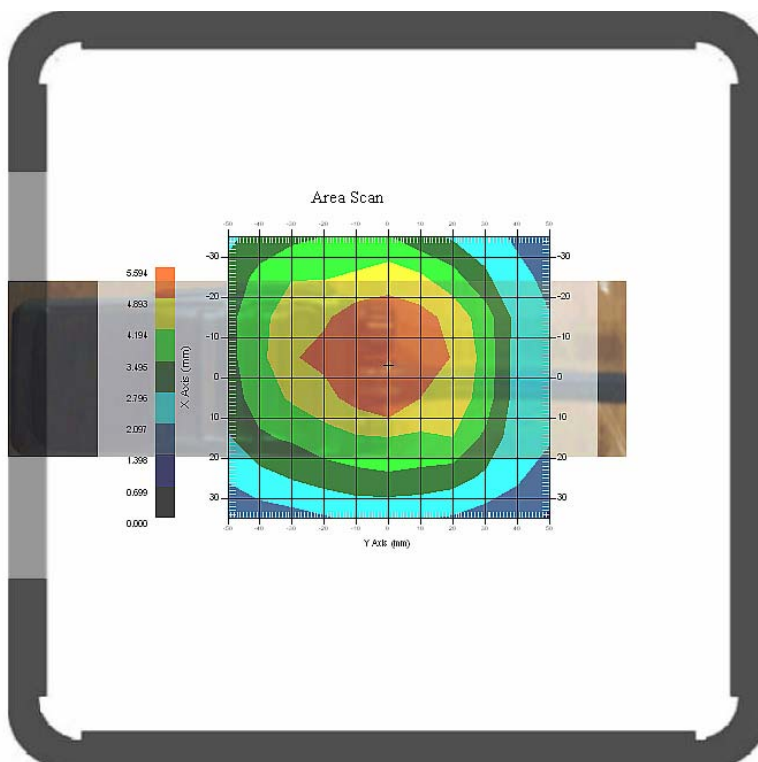
Type : Head
 Frequency : 418.0125 MHz
 Epsilon : 42.22 F/m
 Sigma : 0.87 S/m
 Density : 1000.00 kg/cu. m

Probe Data

Serial No. : 500-00283
 Frequency Band : 450
 Duty Cycle Factor : 1
 Conversion Factor : 6.0
 Probe Sensitivity : 1.20 1.20 1.20 $\mu\text{V}/(\text{V}/\text{m})^2$
 Compression Point : 95.00 mV
 Offset : 1.56 mm

1 gram SAR value : 5.362 W/kg
 10 gram SAR value : 4.253 W/kg
 Area Scan Peak SAR : 5.549 W/kg
 Zoom Scan Peak SAR : 7.357 W/kg

Plot 15#



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

**Body-Back 0.0cm (Analog 12.5k-400.0125 MHz);
Body-worn accessory: BC12; Battery: BL1502**

Measurement Data

Modulation mode : FM
 Crest Factor : 1
 Scan Type : Complete
 Area Scan : 11x8x1: Measurement x=10mm, y=10mm, z=4mm
 Zoom Scan : 7x7x7: Measurement x=5mm, y=5mm, z=5mm
 Power Drift-Start : 2.928 W/kg
 Power Drift-Finish : 2.846 W/kg
 Power Drift (%) : -2.715

Tissue Data

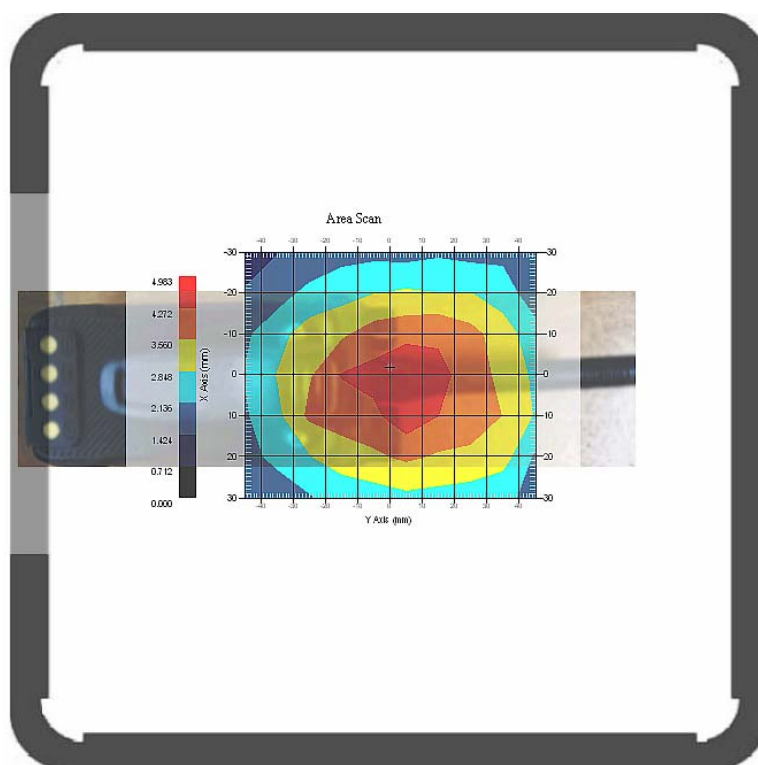
Type : Body
 Frequency : 400.0125 MHz
 Epsilon : 55.84F/m
 Sigma : 0.92 S/m
 Density : 1000.00 kg/cu. m

Probe Data

Serial No. : 500-00283
 Frequency Band : 450
 Duty Cycle Factor : 1
 Conversion Factor : 6.0
 Probe Sensitivity : 1.20 1.20 1.20 $\mu\text{V}/(\text{V}/\text{m})^2$
 Compression Point : 95.00 mV
 Offset : 1.56 mm

1 gram SAR value : 4.794 W/kg
 10 gram SAR value : 3.218 W/kg
 Area Scan Peak SAR : 4.873 W/kg
 Zoom Scan Peak SAR : 7.386 W/kg

Plot 16#



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

**Body-Back 0.0cm (Analog 12.5k-418.0125 MHz);
Body-worn accessory: BC12; Battery: BL1502**

Measurement Data

Modulation mode : FM
 Crest Factor : 1
 Scan Type : Complete
 Area Scan : 11x8x1: Measurement x=10mm, y=10mm, z=4mm
 Zoom Scan : 7x7x7: Measurement x=5mm, y=5mm, z=5mm
 Power Drift-Start : 8.960 W/kg
 Power Drift-Finish : 8.693 W/kg
 Power Drift (%) : -2.986

Tissue Data

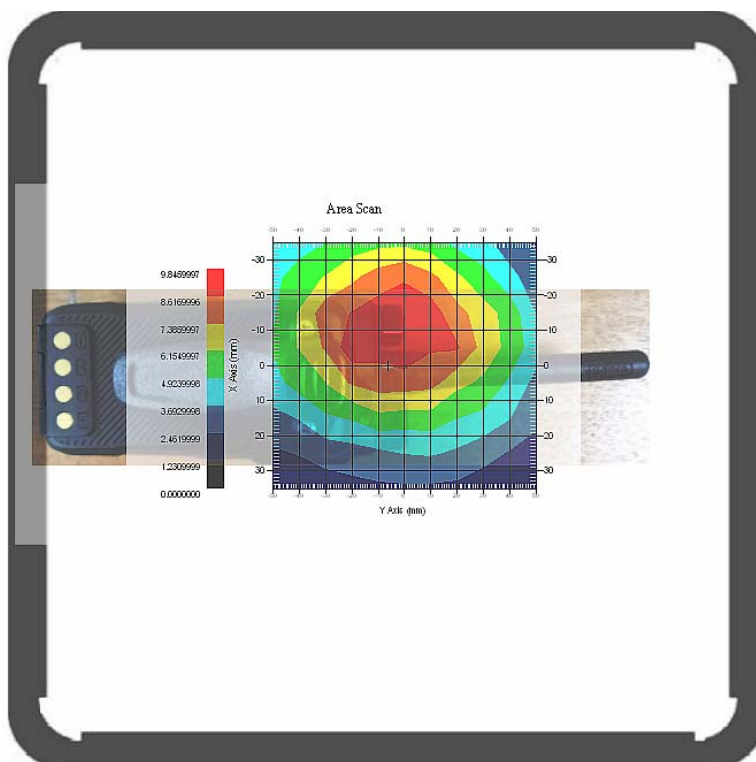
Type : Body
 Frequency : 418.0125 MHz
 Epsilon : 55.88 F/m
 Sigma : 0.92 S/m
 Density : 1000.00 kg/cu. m

Probe Data

Serial No. : 500-00283
 Frequency Band : 450
 Duty Cycle Factor : 1
 Conversion Factor : 6.0
 Probe Sensitivity : 1.20 1.20 1.20 $\mu\text{V}/(\text{V}/\text{m})^2$
 Compression Point : 95.00 mV
 Offset : 1.56 mm

1 gram SAR value : 9.113 W/kg
 10 gram SAR value : 6.844 W/kg
 Area Scan Peak SAR : 9.846 W/kg
 Zoom Scan Peak SAR : 16.012 W/kg

Plot 17#



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

**Body-Back 0.0cm (Analog 12.5k-435.0125 MHz);
Body-worn accessory: BC12; Battery: BL1502**

Measurement Data

Modulation mode : FM
 Crest Factor : 1
 Scan Type : Complete
 Area Scan : 11x8x1: Measurement x=10mm, y=10mm, z=4mm
 Zoom Scan : 7x7x7: Measurement x=5mm, y=5mm, z=5mm
 Power Drift-Start : 2.592 W/kg
 Power Drift-Finish : 2.521 W/kg
 Power Drift (%) : -2.835

Tissue Data

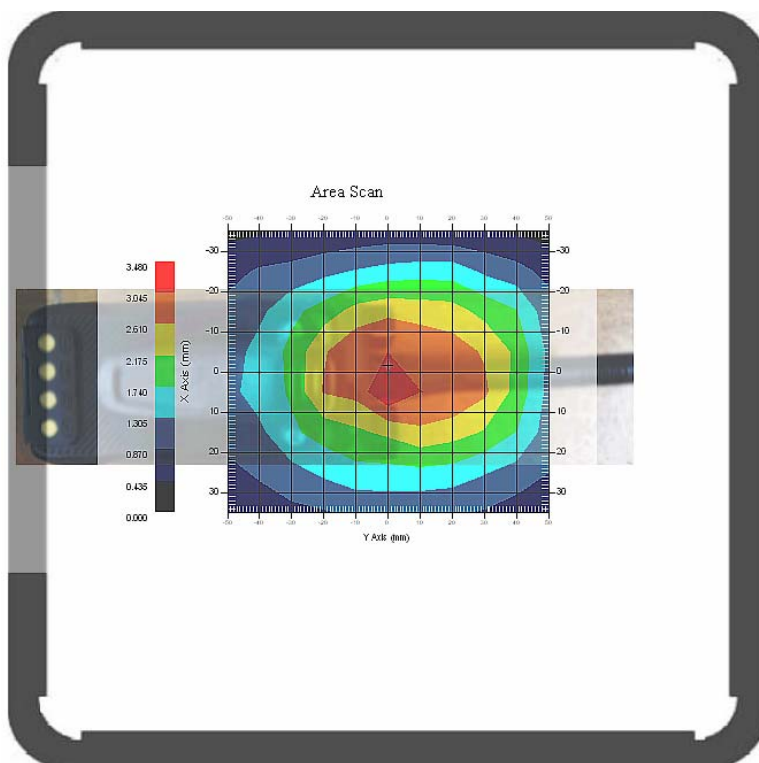
Type : Body
 Frequency : 435.0125 MHz
 Epsilon : 55.91F/m
 Sigma : 0.91 S/m
 Density : 1000.00 kg/cu. m

Probe Data

Serial No. : 500-00283
 Frequency Band : 450
 Duty Cycle Factor : 1
 Conversion Factor : 6.0
 Probe Sensitivity : 1.20 1.20 1.20 $\mu\text{V}/(\text{V}/\text{m})^2$
 Compression Point : 95.00 mV
 Offset : 1.56 mm

1 gram SAR value : 3.397 W/kg
 10 gram SAR value : 2.314 W/kg
 Area Scan Peak SAR : 3.458 W/kg
 Zoom Scan Peak SAR : 7.034 W/kg

Plot 18#



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

**Body-Back 0.0cm (Analog 12.5k-450.0125 MHz);
Body-worn accessory: BC12; Battery: BL1502**

Measurement Data

Modulation mode : FM
 Crest Factor : 1
 Scan Type : Complete
 Area Scan : 11x8x1: Measurement x=10mm, y=10mm, z=4mm
 Zoom Scan : 7x7x7: Measurement x=5mm, y=5mm, z=5mm
 Power Drift-Start : 2.810 W/kg
 Power Drift-Finish : 2.782 W/kg
 Power Drift (%) : -1.017

Tissue Data

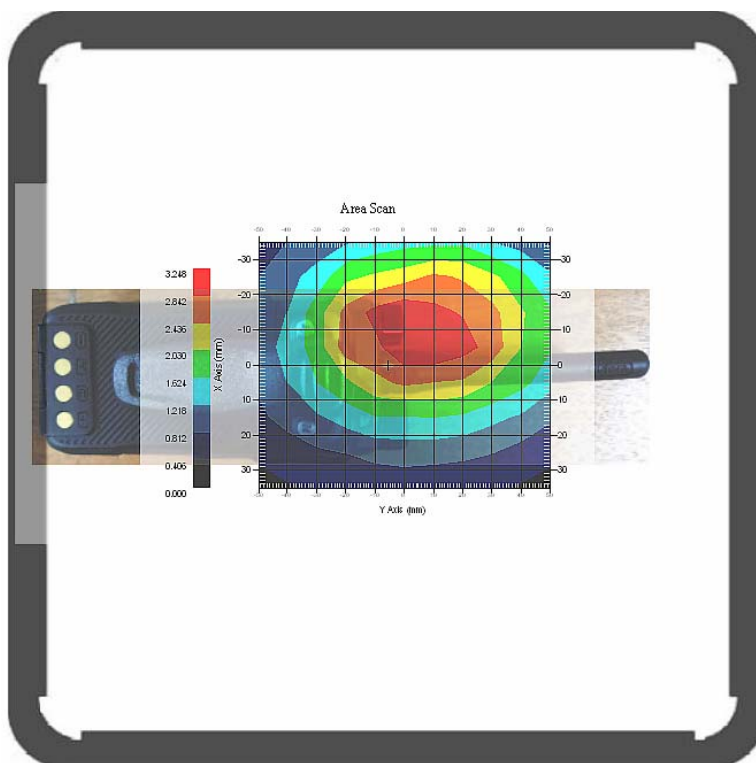
Type : Body
 Frequency : 450.0125 MHz
 Epsilon : 55.94 F/m
 Sigma : 0.91 S/m
 Density : 1000.00 kg/cu. m

Probe Data

Serial No. : 500-00283
 Frequency Band : 450
 Duty Cycle Factor : 1
 Conversion Factor : 6.0
 Probe Sensitivity : 1.20 1.20 1.20 $\mu\text{V}/(\text{V}/\text{m})^2$
 Compression Point : 95.00 mV
 Offset : 1.56 mm

1 gram SAR value : 3.137 W/kg
 10 gram SAR value : 2.241 W/kg
 Area Scan Peak SAR : 3.248 W/kg
 Zoom Scan Peak SAR : 5.374 W/kg

Plot 19#



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

**Body-Back 0.0cm (Analog 12.5k-469.9875 MHz);
Body-worn accessory: BC12; Battery: BL1502**

Measurement Data

Modulation mode : FM
 Crest Factor : 1
 Scan Type : Complete
 Area Scan : 11x8x1: Measurement x=10mm, y=10mm, z=4mm
 Zoom Scan : 7x7x7: Measurement x=5mm, y=5mm, z=5mm
 Power Drift-Start : 1.541 W/kg
 Power Drift-Finish : 1.515 W/kg
 Power Drift (%) : -1.729

Tissue Data

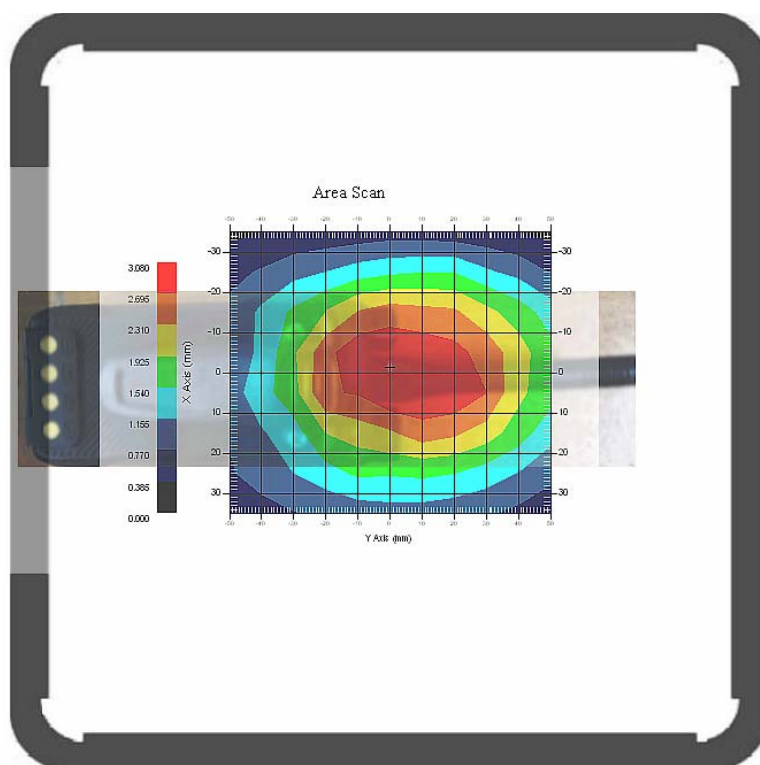
Type : Body
 Frequency : 469.9875 MHz
 Epsilon : 55.99F/m
 Sigma : 0.92 S/m
 Density : 1000.00 kg/cu. m

Probe Data

Serial No. : 500-00283
 Frequency Band : 450
 Duty Cycle Factor : 1
 Conversion Factor : 6.0
 Probe Sensitivity : 1.20 1.20 1.20 $\mu\text{V}/(\text{V}/\text{m})^2$
 Compression Point : 95.00 mV
 Offset : 1.56 mm

1 gram SAR value : 2.735 W/kg
 10 gram SAR value : 2.041 W/kg
 Area Scan Peak SAR : 2.928 W/kg
 Zoom Scan Peak SAR : 4.035 W/kg

Plot 20#



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

**Body-Back 0.0cm (Analog 12.5k-418.0125 MHz);
Body-worn accessory: BC12; Battery: BL2010**

Measurement Data

Modulation mode : FM
 Crest Factor : 1
 Scan Type : Complete
 Area Scan : 11x8x1: Measurement x=10mm, y=10mm, z=4mm
 Zoom Scan : 7x7x7: Measurement x=5mm, y=5mm, z=5mm
 Power Drift-Start : 8.838 W/kg
 Power Drift-Finish : 8.504 W/kg
 Power Drift (%) : -3.779

Tissue Data

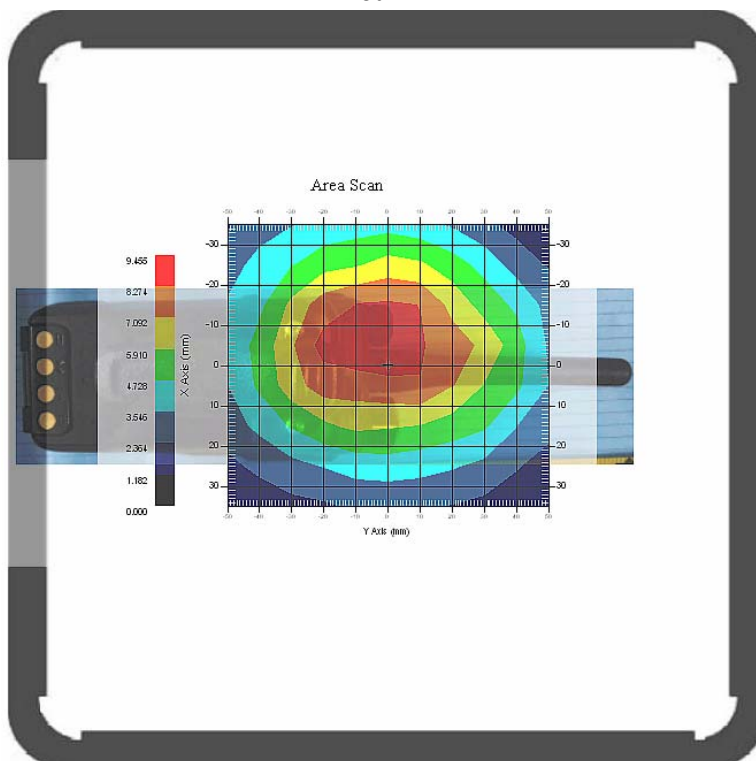
Type : Body
 Frequency : 418.0125 MHz
 Epsilon : 55.88 F/m
 Sigma : 0.92 S/m
 Density : 1000.00 kg/cu. m

Probe Data

Serial No. : 500-00283
 Frequency Band : 450
 Duty Cycle Factor : 1
 Conversion Factor : 6.0
 Probe Sensitivity : 1.20 1.20 1.20 $\mu\text{V}/(\text{V}/\text{m})^2$
 Compression Point : 95.00 mV
 Offset : 1.56 mm

1 gram SAR value : 8.953 W/kg
 10 gram SAR value : 6.339 W/kg
 Area Scan Peak SAR : 9.455 W/kg
 Zoom Scan Peak SAR : 11.711 W/kg

Plot 21#



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

**Body-Back 0.0cm (Analog 12.5k-418.0125 MHz);
Body-worn accessory: NCN011; Battery: BL1502**

Measurement Data

Modulation mode : FM
 Crest Factor : 1
 Scan Type : Complete
 Area Scan : 11x8x1: Measurement x=10mm, y=10mm, z=4mm
 Zoom Scan : 7x7x7: Measurement x=5mm, y=5mm, z=5mm
 Power Drift-Start : 5.902 W/kg
 Power Drift-Finish : 5.751 W/kg
 Power Drift (%) : -2.826

Tissue Data

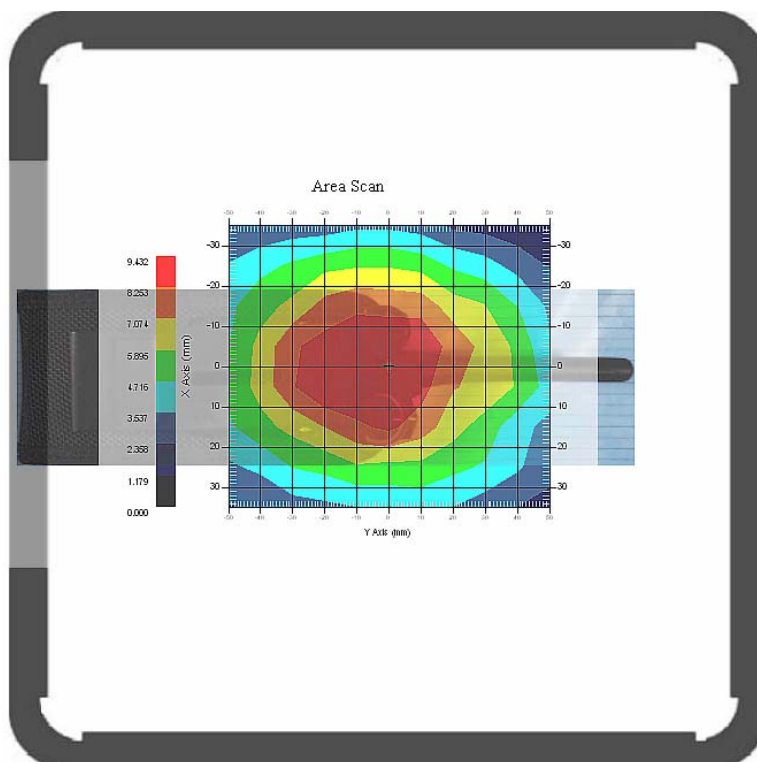
Type : Body
 Frequency : 418.0125 MHz
 Epsilon : 55.88 F/m
 Sigma : 0.92 S/m
 Density : 1000.00 kg/cu. m

Probe Data

Serial No. : 500-00283
 Frequency Band : 450
 Duty Cycle Factor : 1
 Conversion Factor : 6.0
 Probe Sensitivity : 1.20 1.20 1.20 $\mu\text{V}/(\text{V}/\text{m})^2$
 Compression Point : 95.00 mV
 Offset : 1.56 mm

1 gram SAR value : 8.936 W/kg
 10 gram SAR value : 6.244 W/kg
 Area Scan Peak SAR : 9.168 W/kg
 Zoom Scan Peak SAR : 15.153 W/kg

Plot 22#



APPENDIX A – MEASUREMENT UNCERTAINTY

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

Measurement Uncertainty for 300MHz to 3GHz

Source of Uncertainty	Tolerance Value	Probability Distribution	Divisor	c_i^1 (1-g)	c_i^1 (10-g)	Standard Uncertainty (1-g) %	Standard Uncertainty (10-g) %
Measurement System							
Probe Calibration	3.5	normal	1	1	1	3.5	3.5
Axial Isotropy	3.7	rectangular	$\sqrt{3}$	$(1-cp)^{1/2}$	$(\frac{1-cp}{2})^{1/2}$	1.5	1.5
Hemispherical Isotropy	10.9	rectangular	$\sqrt{3}$	\sqrt{cp}	\sqrt{cp}	4.4	4.4
Boundary Effect	1.0	rectangular	$\sqrt{3}$	1	1	0.6	0.6
Linearity	4.7	rectangular	$\sqrt{3}$	1	1	2.7	2.7
Detection Limit	1.0	rectangular	$\sqrt{3}$	1	1	0.6	0.6
Readout Electronics	1.0	normal	1	1	1	1.0	1.0
Response Time	0.8	rectangular	$\sqrt{3}$	1	1	0.5	0.5
Integration Time	1.7	rectangular	$\sqrt{3}$	1	1	1.0	1.0
RF Ambient Condition -Noise	0.006	rectangular	$\sqrt{3}$	1	1	0.003	0.003
RF Ambient Condition - Reflections	3.0	rectangular	$\sqrt{3}$	1	1	1.7	1.7
Probe Positioner Mech. Restrictions	0.4	rectangular	$\sqrt{3}$	1	1	0.2	0.2
Restriction							
Probe Positioning with respect to Phantom Shell	2.9	rectangular	$\sqrt{3}$	1	1	1.7	1.7
Extrapolation and Integration	3.7	rectangular	$\sqrt{3}$	1	1	2.1	2.1
Test Sample Positioning	0.023	normal	1	1	1	0.023	0.023
Device Holder Uncertainty	6.215	normal	1	1	1	6.215	6.215
Drift of Output Power	4.627	rectangular	$\sqrt{3}$	1	1	2.67	2.67
Phantom and Setup							
Phantom Uncertainty(shape & thickness tolerance)	3.4	rectangular	$\sqrt{3}$	1	1	2.0	2.0
Liquid Conductivity(target)	5.0	rectangular	$\sqrt{3}$	0.7	0.5	2.0	1.4
Liquid Conductivity(meas.)	1.938	normal	1	0.7	0.5	1.36	0.97
Liquid Permittivity(target)	5.0	rectangular	$\sqrt{3}$	0.6	0.5	1.7	1.4
Liquid Permittivity(meas.)	3.093	normal	1	0.6	0.5	1.86	1.55
Combined Uncertainty		RSS				10.78	10.55
Expanded uncertainty (coverage factor=2)		Normal(k=2)				21.56	21.10

APPENDIX B – PROBE CALIBRATION CERTIFICATES

NCL CALIBRATION LABORATORIES

Calibration File No.: 1427-1430

Client.: BACL Lab

CERTIFICATE OF CALIBRATION

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

Equipment: Miniature Isotropic RF Probe

Record of Calibration

Head and Body

Manufacturer: APREL Laboratories

Model No.: E-020

Serial No.: 500-00283

Calibration Procedure: D01-032-E020-V2, D22-012-Tissue, D28-002-Dipole
Project No: BACL-5673

Calibrated: 8th August 2012
Released on: 9th August 2012

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

Released By: _____



Art Brennan, Quality Manager

NCL CALIBRATION LABORATORIES

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

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

NCL Calibration Laboratories

Division of APREL Inc.

Introduction

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

Calibration Method

Probes are calibrated using the following methods.

<1000MHz

TEM Cell for sensitivity in air

Standard phantom using temperature transfer method for sensitivity in tissue

>1000MHz

Waveguide* method to determine sensitivity in air and tissue

*Waveguide is numerically (simulation) assessed to determine the field distribution and power

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

References

- IEEE Standard 1528 (2003) including Amendment 1
IEEE Recommended Practice for Determining the Peak Spatial-Average Specific Absorption Rate (SAR) in the Human Head from Wireless Communications Devices: Measurement Techniques
- EN 62209-1 (2006)
Human Exposure to RF Fields from hand-held and body-mounted wireless communication devices - Human models, instrumentation, and procedures-Part 1: Procedure to measure the Specific Absorption Rate (SAR) for hand-held mobile wireless devices
- IEC 62209-2 Ed. 1.0 (2010-03)
Human exposure to RF fields from hand-held and body-mounted wireless devices - Human models, instrumentation, and procedures - Part 2: specific absorption rate (SAR) for wireless communication devices (30 MHz - 6 GHz)
- TP-D01-032-E020-V2 E-Field probe calibration procedure
- D22-012-Tissue dielectric tissue calibration procedure
- D28-002-Dipole procedure for validation of SAR system using a dipole
- IEEE 1309 Draft Standard for Calibration of Electromagnetic Field Sensors and Probes, Excluding Antennas, from 9kHz to 40GHz

Page 2 of 10

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

NCL Calibration Laboratories

Division of APREL Inc.

Conditions

Probe 500-00283 was a recalibration with the exception frequency of 450 MHz .which was a new calibration

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

Primary Measurement Standards

Instrument	Serial Number	Cal due date
Power meter Anritsu MA2408A	90025437	Nov.4, 2012
Power Sensor Anritsu MA2481D	103555	Nov 4, 2012
Attenuator HP 8495A (70dB)	1944A10711	Sept. 14, 2012
Network Analyzer Anritsu MT8801C	MB11855	Feb. 8, 2013

Secondary Measurement Standards

Signal Generator Agilent E4438C -506 MY55182336 June 7, 2013


Attestation

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

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



Art Brennan, Quality Manager



Dan Brooks, Test Engineer

Page 3 of 10
 This page has been reviewed for content and attested to on Page 2 of this document.

NCL Calibration Laboratories

Division of APREL Inc.

Probe Summary

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

*Resistive to recommended tissue recipes per IEEE-1528

Sensitivity in Air

Channel X:	$1.2 \mu\text{V}/(\text{V}/\text{m})^2$
Channel Y:	$1.2 \mu\text{V}/(\text{V}/\text{m})^2$
Channel Z:	$1.2 \mu\text{V}/(\text{V}/\text{m})^2$
Diode Compression Point:	95 mV

Page 4 of 10

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

NCL Calibration Laboratories

Division of APREL Inc.

Calibration for Tissue (Head H, Body B)

Frequency	Tissue Type	Measured Epsilon	Measured Sigma	Calibration Uncertainty	Tolerance Uncertainty for 5%*	Conversion Factor
450 H	Head	43.98	0.9	3.5	3.4	6
450 B	Body	57.07	0.92	3.5	3.4	6
750 H	Head	X	X	X	X	X
750 B	Body	X	X	X	X	X
835 H	Head	42.35	0.938	3.5	3.4	6.6
835 B	Body	56.65	1.018	3.5	3.4	6.6
900 H	Head	41.35	0.98	3.5	3.4	6
900 B	Body	56.08	1.05	3.5	3.4	6
1450 H	Head	X	X	X	X	X
1450 B	Body	X	X	X	X	X
1500 H	Head	X	X	X	X	X
1500 B	Body	X	X	X	X	X
1640 H	Head	X	X	X	X	X
1640 B	Body	X	X	X	X	X
1750 H	Head	X	X	X	X	X
1750 B	Body	X	X	X	X	X
1800 H	Head	X	X	X	X	X
1800 B	Body	X	X	X	X	X
1900 H	Head	38.72	1.35	3.5	2.7	5.2
1900 B	Body	51.62	1.48	3.5	2.7	5
2000 H	Head	X	X	X	X	X
2000 B	Body	X	X	X	X	X
2100 H	Head	X	X	X	X	X
2100 B	Body	X	X	X	X	X
2300 H	Head	X	X	X	X	X
2300 B	Body	X	X	X	X	X
2450 H	Head	38.06	1.87	3.5	3.5	4.9
2450 B	Body	50.22	2.03	3.5	3.5	4.3
2600 H	Head	X	X	X	X	X
2600 B	Body	X	X	X	X	X
3000 H	Head	X	X	X	X	X
3000 B	Body	X	X	X	X	X
3600 H	Head	X	X	X	X	X
3600 B	Body	X	X	X	X	X
5200 H	Head	X	X	X	X	X
5200 B	Body	X	X	X	X	X
5600 H	Head	X	X	X	X	X
5600 B	Body	X	X	X	X	X
5800 H	Head	X	X	X	X	X
5800 B	Body	X	X	X	X	X

NCL Calibration Laboratories

Division of APREL Inc.

Boundary Effect:

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

Spatial Resolution:

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

DAQ-PAQ Contribution

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

Boundary Effect:

For a distance of 0.58mm the worst case evaluated uncertainty (increase in the probe sensitivity) is less than 2.1%.

NOTES:

*The maximum deviation from the centre frequency when comparing the lower to upper range is listed.

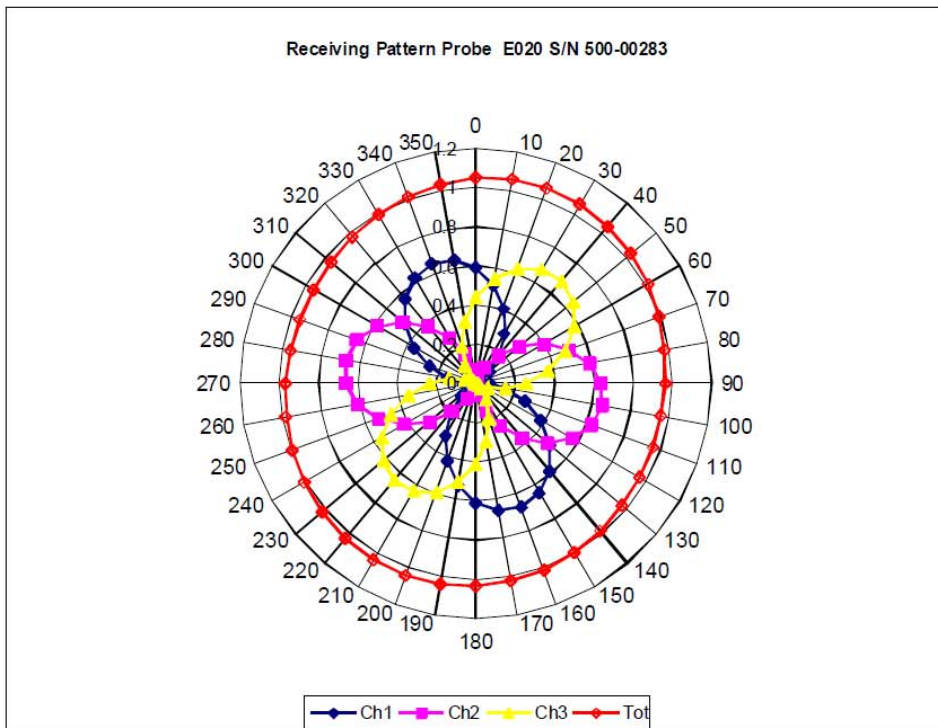
Page 6 of 10

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NCL Calibration Laboratories

Division of APREL Inc.

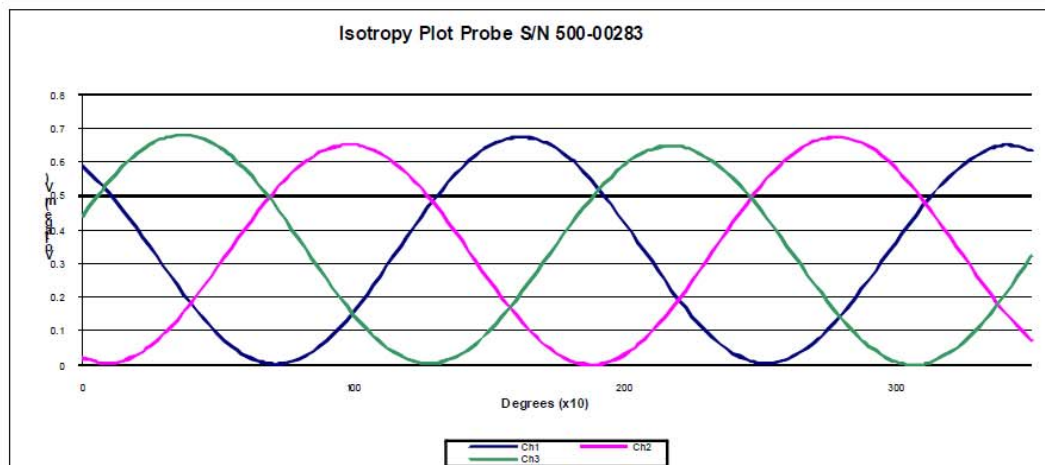
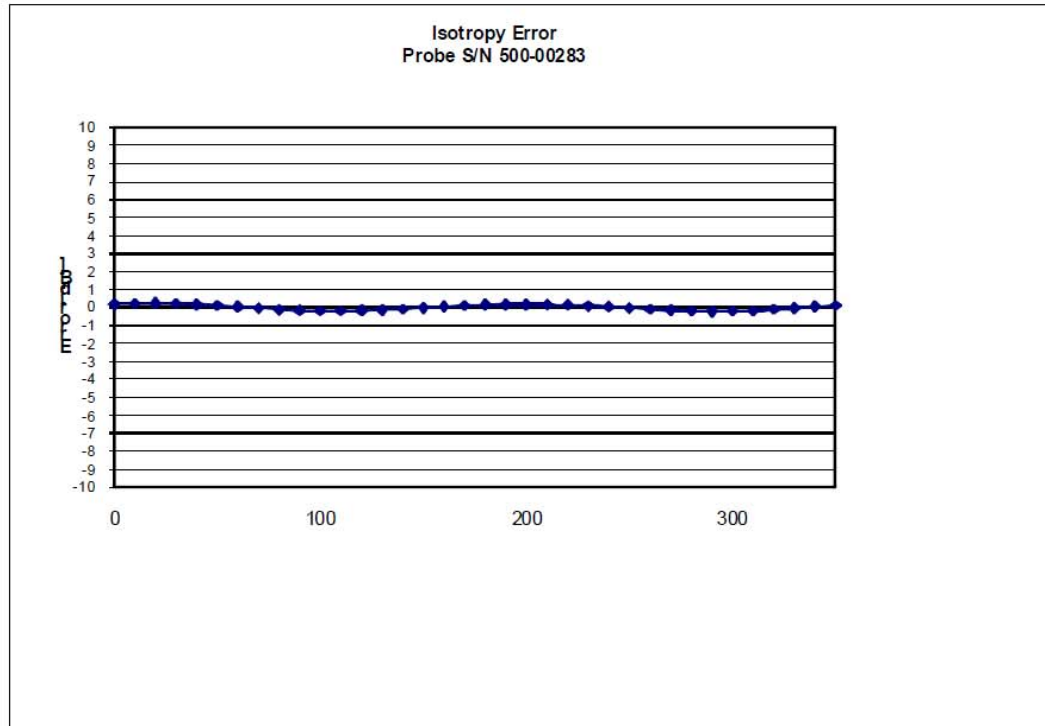
Receiving Pattern Air



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Division of APREL Inc.

Isotropy Error Air



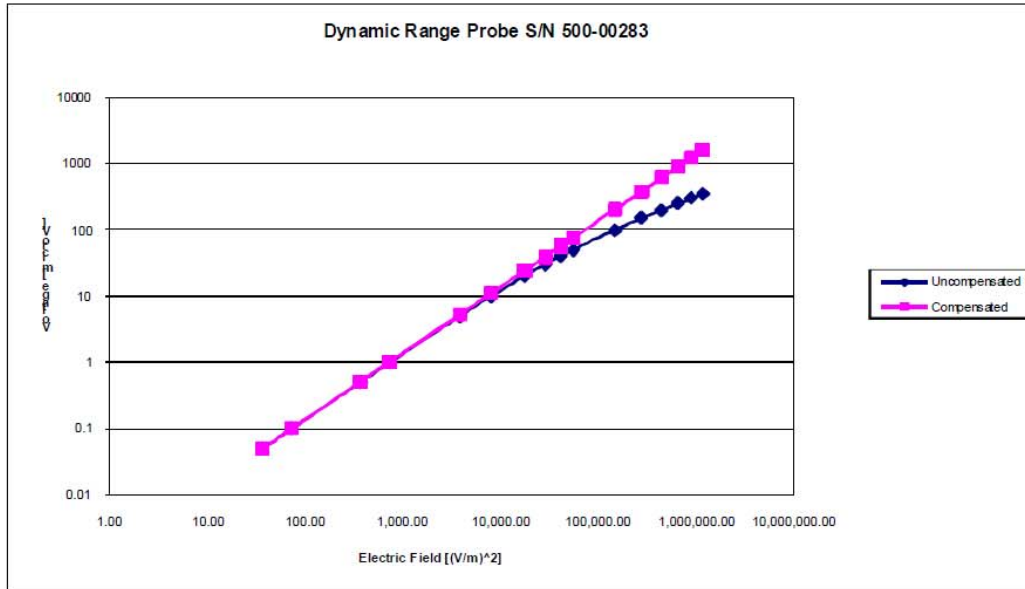
Isotropy Tissue:

0.10 dB

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Division of APREL Inc.

Dynamic Range

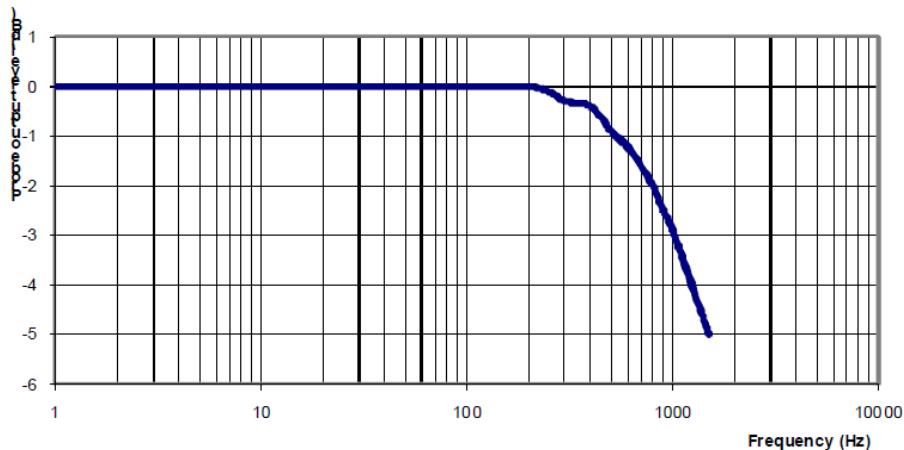


NCL Calibration Laboratories

Division of APREL Inc.

Video Bandwidth

Probe Frequency Characteristics



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

Test Equipment

The test equipment used during Probe Calibration, manufacturer, model number and, current calibration status are listed and located on the main APREL server R:\NCL\Calibration Equipment\Instrument List May 2012.

APPENDIX C – DIPOLE CALIBRATION CERTIFICATES

NCL CALIBRATION LABORATORIES

Calibration File No: DC-1426
Project Number: BACL-5672

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

Manufacturer: APREL Laboratories

Part number: ALS-D-450-S-2

Frequency: 450 MHz

Serial No: **175-00503**

Customer: Bay Area Compliance

Head and Body Calibration

Calibrated: 31st July 2012

Released on: 2nd August 2012

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

Released By: _____



Art Brennan, Quality Manager

NCL CALIBRATION LABORATORIES

303 Terry Fox Drive, Suite 102
Kanata, Ontario
CANADA K2K 3J1

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

NCL Calibration Laboratories

Division of APREL Laboratories.

Conditions

Dipole 175-00503 was taken from stock for an original calibration..

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

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

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



Art Brennan, Quality Manager



Dan Brooks, Test Engineer

Calibration Results Summary

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

Mechanical Dimensions

Length: 270.0 mm

Height: 166.7 mm

Electrical Specification

	Head	Body
Return Loss	-30.726 dB	-33.258 dB
SWR	1.061 U	1.049 U
Impedance	50.600 Ω	48.155 Ω

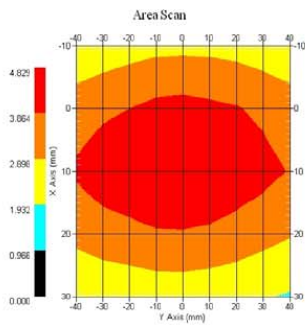
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NCL Calibration Laboratories

Division of APREL Laboratories.

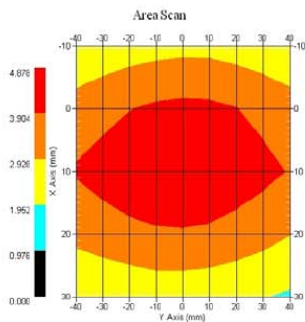
System Validation Results Head

Frequency	1 Gram	10 Gram	Peak
450 MHz	4.572	2.952	6.746



System Validation Results Body

Frequency	1 Gram	10 Gram	Peak
450 MHz	4.508	2.959	6.656



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

NCL Calibration Laboratories

Division of APREL Laboratories.

Introduction

This Calibration Report has been produced in line with the SSI Dipole Calibration Procedure SSI-TP-018-ALSAS. The results contained within this report are for Validation Dipole RFE-362. 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-020 130 MHz to 26 GHz E-Field Probe Serial Number 212.

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"

Conditions

Original calibration.

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

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

4

NCL Calibration Laboratories

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Dipole Calibration Results

Mechanical Verification

APREL Length	APREL Height	Measured Length	Measured Height
280.0 mm	166.7 mm	280.0 mm	166.0 mm

Tissue Validation

Body Tissue 450MHz	Measured Head	Measured Body
Dielectric constant, ϵ_r	43.98	57.07
Conductivity, σ [S/m]	0.9	0.92

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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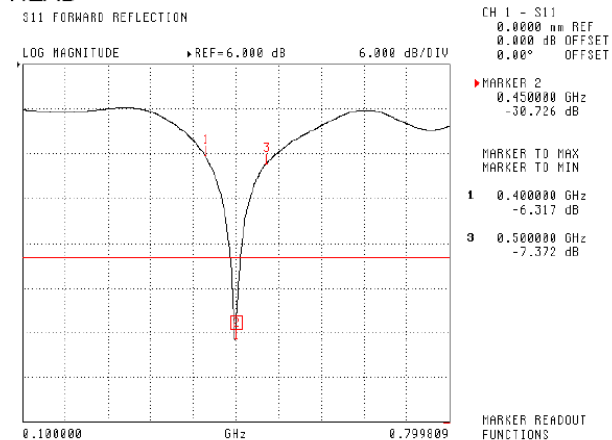
Electrical Calibration

Test	Result Head	Result Body
S11 R/L	-30.726 dB	-33.258 dB
SWR	1.061 U	1.049 U
Impedance	50.600 Ω	48.155 Ω

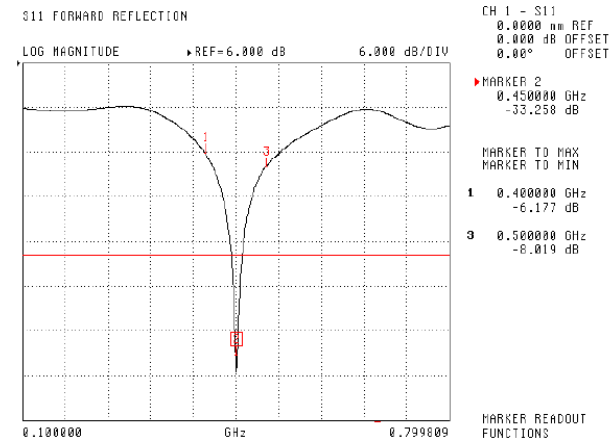
The Following Graphs are the results as displayed on the Vector Network Analyzer.

S11 Parameter Return Loss

HEAD



BODY



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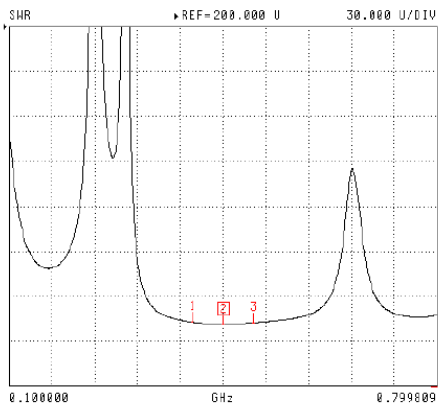
NCL Calibration Laboratories

Division of APREL Laboratories.

SWR

HEAD

S11 FORWARD REFLECTION



CH 1 - S11
0.0000 nm REF
0.000 dB OFFSET
0.00° OFFSET

MARKER 2
0.450000 GHz
1.051 U

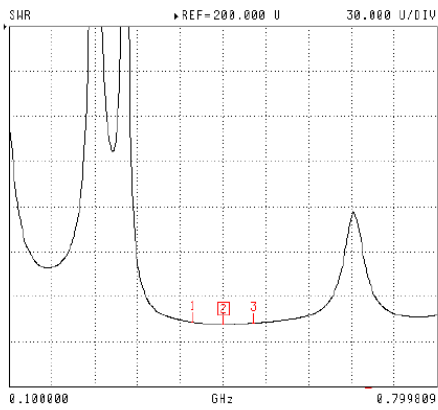
MARKER TO MAX
MARKER TO MIN

1 0.400000 GHz
2.872 U
3 0.500000 GHz
2.497 U

MARKER READOUT
FUNCTIONS

BODY

S11 FORWARD REFLECTION



CH 1 - S11
0.0000 nm REF
0.000 dB OFFSET
0.00° OFFSET

MARKER 2
0.450000 GHz
1.049 U

MARKER TO MAX
MARKER TO MIN

1 0.400000 GHz
2.931 U
3 0.500000 GHz
2.319 U

MARKER READOUT
FUNCTIONS

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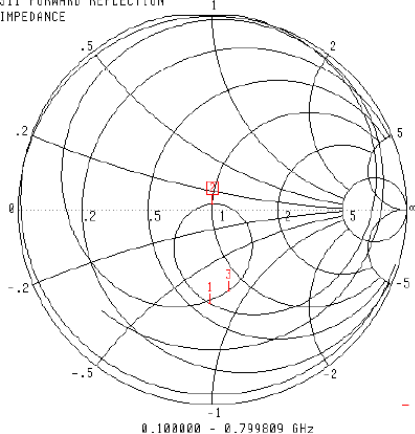
NCL Calibration Laboratories

Division of APREL Laboratories.

Smith Chart Dipole Impedance

HEAD

S11 FORWARD REFLECTION
IMPEDANCE



CH 1 - S11
0.0000 nm REF
0.000 dB OFFSET
0.00° OFFSET

▶ MARKER 2
0.450000 GHz
50.600 Ω
2.584 jΩ

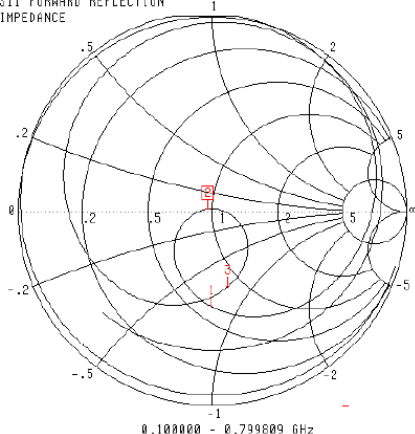
MARKER TO MAX
MARKER TO MIN

- 1 0.400000 GHz
30.689 Ω
-38.618 jΩ
- 3 0.500000 GHz
40.424 Ω
-41.402 jΩ

MARKER READOUT
FUNCTIONS

BODY

S11 FORWARD REFLECTION
IMPEDANCE



CH 1 - S11
0.0000 nm REF
0.000 dB OFFSET
0.00° OFFSET

▶ MARKER 2
0.450000 GHz
48.155 Ω
995.105 jΩ

MARKER TO MAX
MARKER TO MIN

- 1 0.400000 GHz
30.680 Ω
-39.631 jΩ
- 3 0.500000 GHz
42.524 Ω
-39.206 jΩ

MARKER READOUT
FUNCTIONS

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

NCL Calibration Laboratories

Division of APREL Laboratories.

Test Equipment

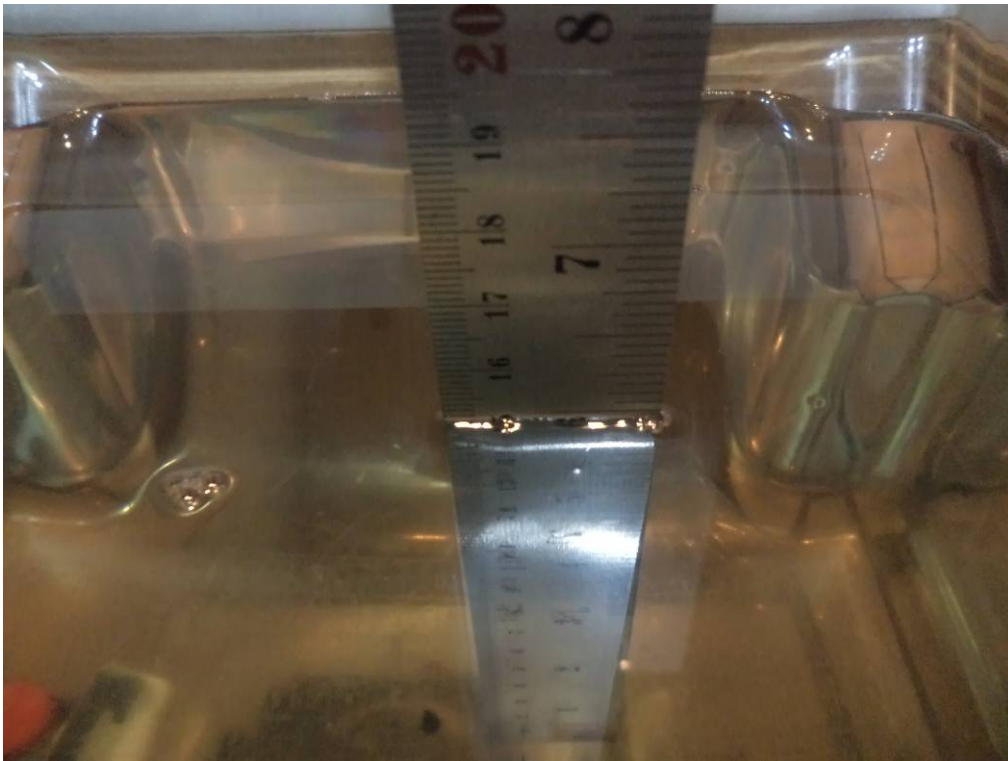
The test equipment used during Probe Calibration, manufacturer, model number and, current calibration status are listed and located on the main APREL server R:\NCL\Calibration Equipment\Instrument List May 2012.

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

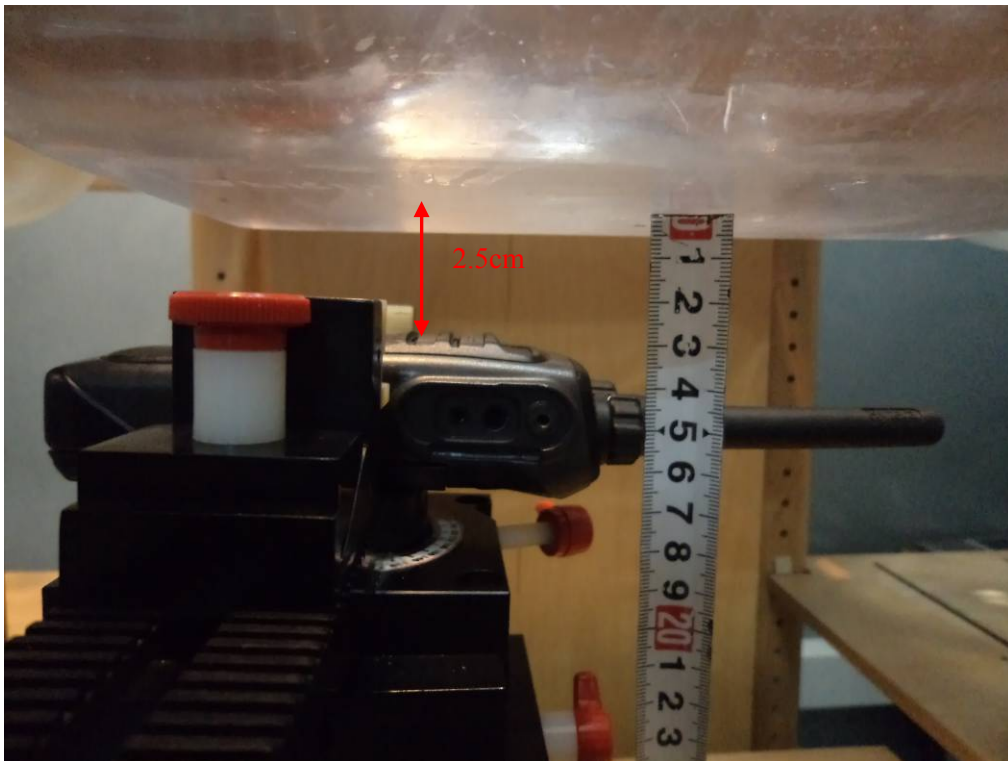
9

APPENDIX D – EUT TEST POSITION PHOTOS

Liquid depth $\geq 15\text{cm}$



Face-Up 2.5 cm Separation to Flat Phantom Setup Photo



Body-Back 0.0 cm Separation to Flat Phantom Setup Photo (BC12)



Body-Back 0.0 cm Separation to Flat Phantom Setup Photo (NCN011)



APPENDIX E – EUT PHOTOS

EUT – Front View



EUT – Back View



EUT – Left View



EUT – Right View



EUT – Top View



EUT – Bottom View



EUT – Uncovered View



EUT – Battery: BL1502 1500mAh



EUT – Battery: BL2010 2000mAh



EUT – Headset: EHM18



EUT – Headset: ESM12



EUT – Headset: EAM12



EUT – Headset: EAM15



EUT – Headset: EAM13



EUT – Headset: EHM15



EUT – Headset: ACM-01



EUT – Headset: EH-01



EUT – Headset: EH-02



EUT – Headset: ES-01



EUT – Headset: ES-02



EUT-Headset: SM08M3



EUT – Headset: SM13M1



EUT – Body-Worn Accessories View: BC12



EUT – Body-Worn Accessories View: NCN011



APPENDIX F – ACCESSORIES LIST

Accessory Name	Model		Description
Antenna	Antenna	AN0435H13	400MHz-470MHz
Battery	Thicker Battery	BL1502	Li-ion Battery;7.4V 1500 mAh
	Thinner Battery	BL2010	Li-ion Battery;7.4V 2000 mAh
Body Worn	Belt Clip	BC12	/
	Case	NCN011	/
Audio Accessories	Earphone 1	EHM18	Earset With in-Line PTT
	Earphone 2	ESM12	Earpiece with on-MIC PTT
	Earphone 3	EAM12	Earbud with Transparent Acoustic Tube with on-MIC PTT
	Earphone 4	EAM15	3-wire Surveillance Earpiece with Transparent Acoustic Tube (Beige)
	Earphone 5	EAM13	2-wire Surveillance Earpiece with Transparent Acoustic Tube(Black)
	Earphone 6	EHM15	D-Earset with in-line PTT
	Earphone 7	ESM14	Detachable Earpiece,contains two parts,one is ACM-01,the other is ES-01
	Earphone 8	EAM17	Detachable Earpiece with Transparent Acoustic Tube,contains two parts,one is ACM-01,the other is ES-02
	Earphone 9	EHM20	Remote Swivel Earset,contains two parts,one is ACM-01,the other is EH-02
	Earphone 10	EHM19	Remote C-Earset,contains two parts,one is ACM-01,the other is EH-01
	Earphone 11	ACM-01	PTT&MIC cable(for use with Receive-Only Earpiece)
	Earphone 12	EH-01	Receive – Only C Style Earloop(for use with PTT&MIC cable)
	Earphone 13	EH-02	Receive – Only Ajustable Earhook with Swivel Speaker(for use with PTT&MIC cable)
	Earphone 14	ES-02	Receive-Only Earpiece with Transparent Acoustic Tube
	Earphone 15	ES-01	Receive – Only Earpiece(for use with PTT&MIC cable)
	RSM1	SM08M3	Remote speaker microphone
RSM2	SM13M1	Remote speaker microphone IP55 protect	

Note: The manufacturer is Hytera Communications Co., Ltd.

APPENDIX G – INFORMATIVE REFERENCES

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PRODUCT SIMILARITY DECLARATION LETTER



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2013-9-9

Product Similarity Declaration

To Whom It May Concern,

We, Hytera Communications Corporation Ltd., hereby declare that our Digital Mobile Radio, Model Number: PD500 U(1), PD505 U(1), PD506 U(1), PD508 U(1), HD505 U(1) are electrically identical with PD502 U(1) that was certified by BACL. There are named differently due to market purpose.

Please contact me if you have any question.

Signature: 

Lei Xiong
General Director

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