SAR Test Report

Report No.: AGC01570140302FH01

FCC ID	:	2AB4FA2V
APPLICATION PURPOSE	:	Original Equipment
Product Designation	:	Handheld Two Way Radio
Brand Name	:	HYDX
Model Name	:	A2,A28, A68, A88
Client	:	Fujian Juston Electronic Equipment Co., Ltd.
Date of Issue	:	Apr.29,2014
STANDARD(S)	:	IEEE Std. 1528:2003 47CFR § 2.1093 IEEE/ANSI C95.1
REPORT VERSION	:	V1.0

*A*ttestation of *G*lobal *C*ompliance(Shenzhen) Co., Ltd.

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Report Revise Record

Report Version	Revise Time	Issued Date	Valid Version	Notes
V1.0	/	Apr.29,2014	Valid	Original Report

Test Report Certification

Applicant Name	Fujian Juston Electronic Equipment Co., Ltd.
Applicant Address	No.115 ,Yuantai 3rd Road, Jiangnan, Hi-tech Park ,Licheng District , Quanzhou , China 362000
Manufacturer Name	Fujian Juston Electronic Equipment Co., Ltd
Manufacturer Address	No.115 ,Yuantai 3rd Road, Jiangnan, Hi-tech Park ,Licheng District , Quanzhou , China 362000
Product Name	Handheld Two Way Radio
Brand Name	N/A
Model Name	A2,A28, A68, A88
Difference Description	All the models are the same, only different in model names. The main test Model is A2.
EUT Voltage	DC7.4V by battery
Applicable Standard	IEEE Std. 1528:2003 47CFR § 2.1093 IEEE/ANSI C95.1
Test Date	Apr.29,2014
Performed Location	Attestation of Global Compliance (Shenzhen)Co., Ltd.
	2F, Building 2, No.1-No.4, Chaxi Sanwei Technical Industrial Park, Gushu, Xixiang Street, Bao'an District, Shenzhen, China
Report Template	AGCRT-EC-PPT/SAR (2013-03-01)

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1. SUMMARY OF MAXIMUM SAR VALUE
The maximum results of Specific Absorption Rate (SAR) found during testing for EUT are as follows:

Highest Report standalone SAR Summary（with 50% duty cycle）
VHF:

Exposure Position	Separation	Highest Tested 1g-SAR(W/Kg)	Highest Scaled SAR(W/Kg)
Face Up	12.5 KHz	**0.540**	**0.606**
Back Touch	12.5 KHz	**0.550**	**0.617**

This device is compliance with Specific Absorption Rate (SAR) for Occupational / Controlled Exposure Environment limits (8.0W/Kg) specified in FCC 47 CFR part 2 (2.1093) and ANSI/IEEE C95.1, and had been tested in accordance with measurement methods and procedures specified in IEEE 1528-2003 and the following specific FCC Test Procedures:
KDB 865664 D01 SAR Measurement 100MHz to 6GHz v01r03
KDB 643646 D01 SAR Test for PTT Radios V01r01

2. GENERAL INFORMATION

2.1. EUT Description

General Information	
Product Name	Handheld Two Way Radio
Test Model	A2
Hardware Version	N/A
Software Version	N/A
Exposure Category:	Occupational/Controlled Exposure
Device Category	FM VHF Portable Transceiver
Modulation Type	FM
TX Frequency Range	136-174MHz
Rated Power	VHF:5Watt
Max. Average Power	VHF:36.60dBm
Channel Spacing	12.5 KHz
Antenna Type	External Antenna
Antenna Gain	2.15dBi
Body-Worn Accessories:	Belt Clip with headset
Face-Head Accessories:	None
Battery Type (s) Tested:	DC7.4V by battery

Note: The sample used for testing is end product.

2.2. Test Procedure

1	Setup the EUT for two typical configuration of hold to face and body worn individually
2	Power on the EUT and make it continuously transmitting on required operating channel
3	Make sure the EUT work normally during the test

2.3. Test Environment

Ambient conditions in the laboratory:

Items	Required	Actual
Temperature (°C)	18-25	21 ± 2
Humidity (%RH)	30-70	56

3. SAR MEASUREMENT SYSTEM

3.1. Specific Absorption Rate (SAR)

SAR is related to the rate at which energy is absorbed per unit mass in object exposed to a radio field. The SAR distribution in a biological body is complicated and is usually carried out by experimental techniques or numerical modeling. The standard recommends limits for two tiers of groups, occupational/controlled and occupational/uncontrolled, based on a person's awareness and ability to exercise control over his or her exposure. In general, occupational/controlled exposure limits are higher than the limits for general population/uncontrolled.

The SAR definition is the time derivative (rate) of the incremental energy (dW) absorbed by (dissipated in) an incremental mass (dm) contained in a volume (dv) of given mass density (ρ). The equation description is as below:

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

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

SAR can be obtained using either of the following equations:

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

$$SAR = c_h \left.\frac{dT}{dt}\right|_{t=0}$$

Where

SAR	is the specific absorption rate in watts per kilogram;
E	is the r.m.s. value of the electric field strength in the tissue in volts per meter;
σ	is the conductivity of the tissue in siemens per metre;
ρ	is the density of the tissue in kilograms per cubic metre;
c_h	is the heat capacity of the tissue in joules per kilogram and Kelvin;

$\frac{dT}{dt}\mid t = 0$ is the initial time derivative of temperature in the tissue in kelvins per second

3.2. SAR Measurement Procedure

The EUT is set to transmit at the required power in line with product specification, at each frequency relating to the LOW, MID, and HIGH channel settings.

Pre-scans are made on the device to establish the location for the transmitting antenna, using a large area scan in either air or tissue simulation fluid.

The EUT is placed against the Universal Phantom where the maximum area scan dimensions are larger than the physical size of the resonating antenna. When the scan size is not large enough to cover the peak SAR distribution, it is modified by either extending the area scan size in both the X and Y directions, or the device is shifted within the predefined area.

The area scan is then run to establish the peak SAR location (interpolated resolution set at 1mm²) which is then used to orient the center of the zoom scan. The zoom scan is then executed and the 1g and 10g averages are derived from the zoom scan volume (interpolated resolution set at 1mm³).

When multiple peak SAR location were found during the same configuration or test mode, Zoom scan shall performed on each peak SAR location, only the peak point with maximum SAR value will be reported for the configuration or test mode.

3.3. COMOSAR System Description
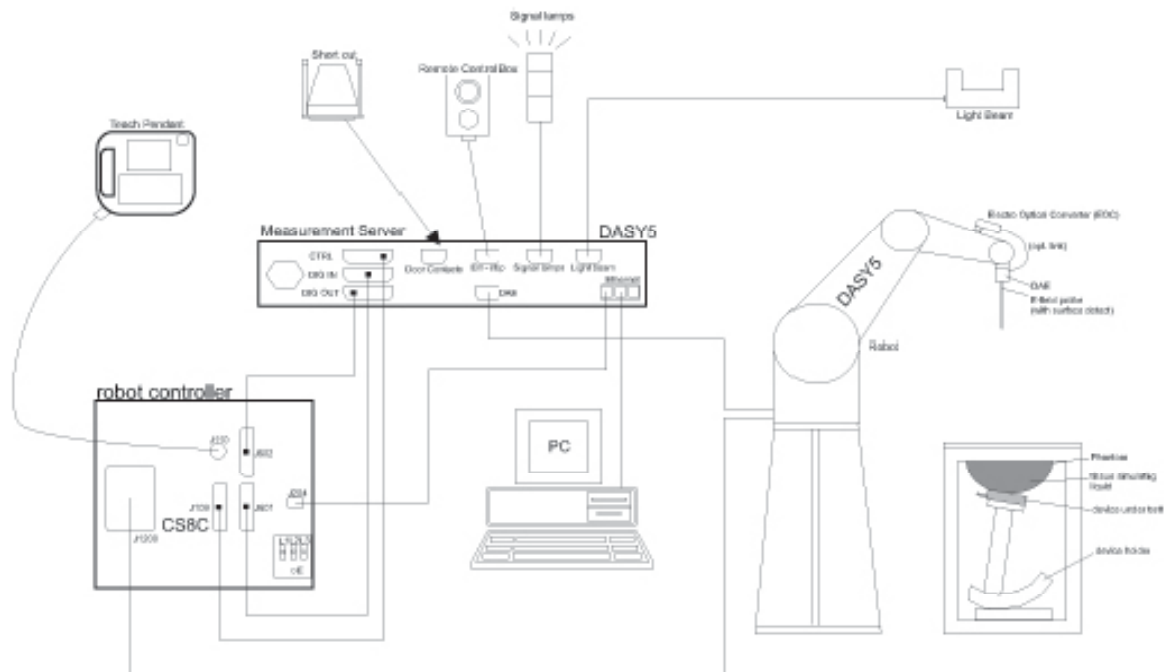
DASY5 System Configurations

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

(1) A standard high precision 6-axis robot with controller, teach pendant and software.

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

(3) A dosimetric probe equipped with an optical surface detector system.

(4) The Electro-optical converter (EOC) performs the conversion from optical to electrical signals for the digital Communication to the DAE. To use optical surface detection, a special version of the EOC is required. The EOC signal is transmitted to the measurement server..\

(5) A Light Beam used is for probe alignment. This improves the (absolute) accuracy of the probe positioning.

(6) A computer running WinXP .

(7) DASY software.

(8) Remote control and teach pendant as well as additional circuitry for robot safety such as warning lamps, etc.

(9) Phantoms, device holders and other accessories according to the targeted measurement.

3.3.1. Applications

Predefined procedures and evaluations for automated compliance testing with all worldwide standards, e.g., IEEE 1528, OET 65, IEC 62209-1, IEC 62209-2, EN 50360, EN 50383 and others.

3.3.2. 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. When an Area Scan has measured all reachable points, it computes the field maxima found in the scanned area, within a range of the global maximum. The range (in dB) is specified in the standards for compliance testing. For example, a 2 dB range is required in IEEE 1528-2003, EN 50361 and IEC 62209 standards, whereby 3 dB is a requirement when compliance is assessed in accordance with the ARIB standard (Japan).

3.3.3. Zoom Scan (Cube Scan Averaging)

Zoom Scans are used to assess the peak spatial SAR values within a cubic averaging volume containing 1 g and 10 g of 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. The zoom scan integer steps can be user defined so as to reduce uncertainty, but normal practice for typical test applications utilize a physical step of 7x7x7 (5mmx5mmx5mm) providing a volume of 30mm in the X & Y axis, and 30mm in the Z axis.

3.3.4. Uncertainty of Inter-/Extrapolation and Averaging

In order to evaluate the uncertainty of the interpolation, extrapolation and averaged SAR calculation algorithms of the Post processor, COMOSAR allows the generation of measurement grids which are artificially predefined by analytically based test functions. Therefore, the grids of area scans and zoom scans can be filled with uncertainty test data, according to the SAR benchmark functions of IEEE 1528.The three analytical functions shown in equations as below are used to describe the possible range of the expected SAR distributions for the tested handsets. The field gradients are covered by the spatially flat distribution f1, the spatially steep distribution f3 and f2 accounts for H-field cancellation on the phantom/tissue surface.

$$f_1(x, y, z) = A e^{-\frac{z}{2a}} \cos^2\left(\frac{\pi}{2} \frac{\sqrt{x'^2 + y'^2}}{5a}\right)$$

$$f_2(x, y, z) = A e^{-\frac{z}{a}} \frac{a^2}{a^2 + x'^2} \left(3 - e^{-\frac{2z}{a}}\right) \cos^2\left(\frac{\pi}{2} \frac{y'}{3a}\right)$$

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

3.4. DASY5 E-Field Probe

The SAR measurement is conducted with the dissymmetric probe manufactured by SPEAG. The probe is specially designed and calibrated for use in liquid with high permittivity. The dissymmetric probe has special calibration in liquid at different frequency. SPEAG conducts the probe calibration in compliance with international and national standards (e.g. IEEE 1528, EN62209-1, IEC 62209, etc.) Under ISO17025. The calibration data are in Appendix D.

3.5. Isotropic E-Field Probe Specification

Model	ES3DV3	
Manufacture	SPEAG	
frequency	0.03GHz-3GHz Linearity:±0.2dB(30MHz-3GHz)	
Dynamic Range	0.01W/Kg-100W/Kg Linearity:±0.2dB	
Dimensions	Overall length:337mm Tip diameter:4mm Typical distance from probe tip to dipole centers:2mm	
Application	High precision dosimetric measurements in any exposure scenario (e.g., very strong gradient fields). Only probe which enables compliance testing for frequencies up to 3GHz with precision of better 30%.	

3.6. Robot

The DASY system uses the high precision robots (DASY5:TX60) type from Stäubli SA (France). For the 6-axis controller system, the robot controller version from is used.
The XL robot series have many features that are important for our application:
  High precision (repeatability 0.02 mm)
  High reliability (industrial design)
  Jerk-free straight movements
   Low ELF interference (the closed metallic construction shields against motor control fields)
  6-axis controller	

3.7. Light Beam Unit

The light beam switch allows automatic "tooling" of the probe. During the process, the actual position of the probe tip with respect to the robot arm is measured, as well as the probe length and the horizontal probe offset. The software then corrects all movements, such that the robot coordinates are valid for the probe tip.

The repeatability of this process is better than 0.1 mm. If a position has been taught with an aligned probe, the same position will be reached with another aligned probe within 0.1 mm, even if the other probe has different dimensions. During probe rotations, the probe tip will keep its actual position.

3.8. Device Holder

The DASY device holder is designed to cope with different positions given in the standard. It has two scales for the device rotation (with respect to the body axis) and the device inclination (with respect to the line between the ear reference points). The rotation center for both scales is the ear reference point (EPR).

Thus the device needs no repositioning when changing the angles.

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

3.9. Measurement Server

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

The measurement server performs all the real-time data evaluation for field measurements and surface detection, controls robot movements and handles safety operations.

3.10. SAM Twin Phantom

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

Flat phantom
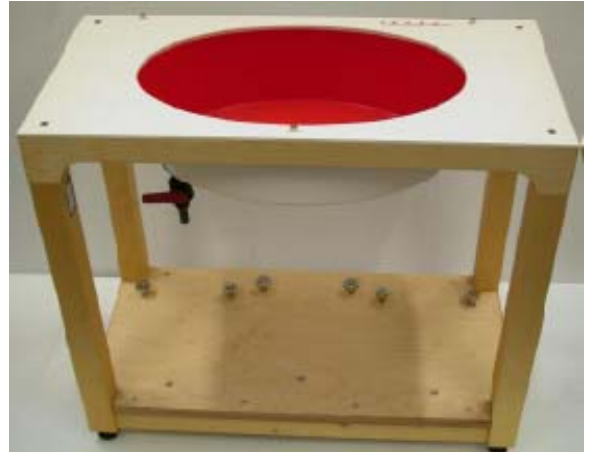
The bottom plate contains three pair of bolts for locking the device holder. The device holder positions are adjusted to the standard measurement positions in the three sections. A white cover is provided to tap the phantom during off-periods to prevent water evaporation and changes in the liquid parameters. On the phantom top, three reference markers are provided to identify the phantom position with respect to the robot.

4. TISSUE SIMULATING LIQUID

   For SAR measurement of the field distribution inside the phantom, the phantom must be filled with homogeneous tissue simulating liquid to a depth of at least 15cm. For head SAR testing the liquid height from the ear reference point (ERP) of the phantom to the liquid top surface is larger than 15cm For body SAR testing, the liquid height from the center of the flat phantom to the liquid top surface is larger than 15cm.The nominal dielectric values of the tissue simulating liquids in the phantom and the tolerance of 5% are listed in 4.2

4.1. The composition of the tissue simulating liquid

Ingredient (% Weight) Tissue Type	150MHz
Water	55.12
Salt (NaCl)	1.57
Tween	43.31
Emulsifiers	0.0
Mineral Oil	0.0
Diethylenglycol monohexylether	0.0
Triton X-100	0.0
DGBE	0.0
Additives and Salt	0.0

4.2. Tissue Calibration Result

The dielectric parameters of the liquids were verified prior to the SAR evaluation using DASY5Dielectric
Probe Kit and R&S Network Analyzer ZVL6 .

Tissue Stimulant Measurement for 150MHz						
Fr. (MHz)	Ch.	Dielectric Parameters (±5%)				Tissue Temp [°C]	Test time
		head		body			
		εr 52.3 49.685 to 54.915	δ[s/m] 0.76 0.722to 0.798	εr 61.9 58.805 to 64.995	δ[s/m] 0.80 0.76 to 0.84		
150	Low	50.66	0.75	61.24	0.82	21	Apr.29,2014
150	Mid	52.78	0.77	60.58	0.79	21	Apr.29,2014
150	High	53.60	0.76	62.33	0.77	21	Apr.29,2014

4.3. 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.

| Target Frequency (MHz)	head		body	
	εr	σ (S/m)	εr	σ (S/m)
150	**52.3**	**0.76**	**61.9**	**0.80**
300	45.3	0.87	58.2	0.92
450	43.5	0.87	56.7	0.94
835	41.5	0.90	55.2	0.97
900	41.5	0.97	55.0	1.05
915	41.5	0.98	55.0	1.06
1450	40.5	1.20	54.0	1.30
1610	40.3	1.29	53.8	1.40
1800 – 2000	40.0	1.40	53.3	1.52
2450	39.2	1.80	52.7	1.95
3000	38.5	2.40	51.6	2.73
5800	35.3	5.27	48.2	6.00

(ε_r = relative permittivity, σ = conductivity and ρ = 1000 kg/m3)

5. SAR MEASUREMENT PROCEDURE

5.1. SAR System Validation Procedures

Each DASY5 system is equipped with one or more system validation kits. These units, together with the predefined measurement procedures within the DASY5 software, enable the user to conduct the system performance check and system validation. System kit includes a dipole, and dipole device holder.

The system check verifies that the system operates within its specifications. It's performed daily or before every SAR measurement. The system check uses normal SAR measurement in the flat section of the phantom with a matched dipole at a specified distance. The system validation setup is shown as below.
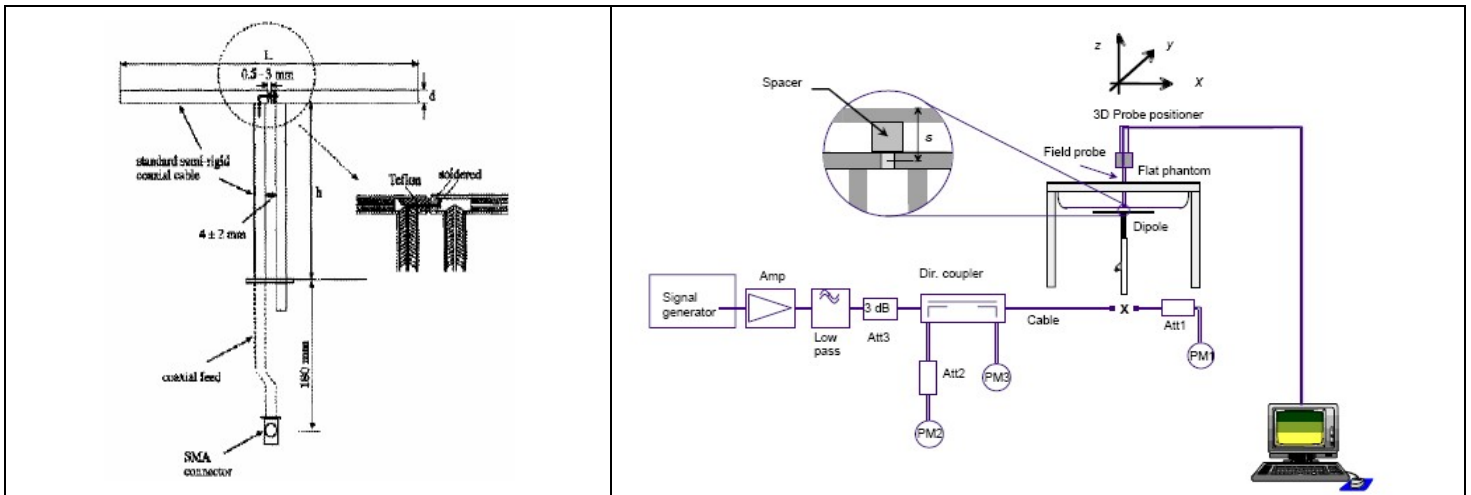
5.2. SAR System Validation
5.2.1. Validation Dipoles

	The dipoles used is based on the IEEE-1528 standard, and is complied with mechanical and electrical specifications in line with the requirements of both IEEE and FCC Supplement C. the table below provides details for the mechanical and electrical Specifications for the dipoles.

Frequency	R (mm)	R (mm)	d (mm)
150MHz	222	222	97

5.2.2. Validation Result

System Performance Check at 150MHz for Head								
Validation Kit: ES3DV3-SN:3337								
Frequency [MHz]	Target Value(W/Kg)		Reference Result (± 10%)		Tested Value(W/Kg)		Tissue Temp. [°C]	Test time
	1g	10g	1g	10g	1g	10g		
150	2.97	1.99	2.673-3.267	1.791-2.189	2.9	1.8	21	Apr.29,2014

6. EUT TEST POSITION
This EUT was tested in **Front Face and Rear Face.**

6.1. Body Worn Position
(1) To position the EUT parallel to the phantom surface.
(2) To adjust the EUT parallel to the flat phantom.
(3) To adjust the distance between the EUT surface and the flat phantom to **25mm.**
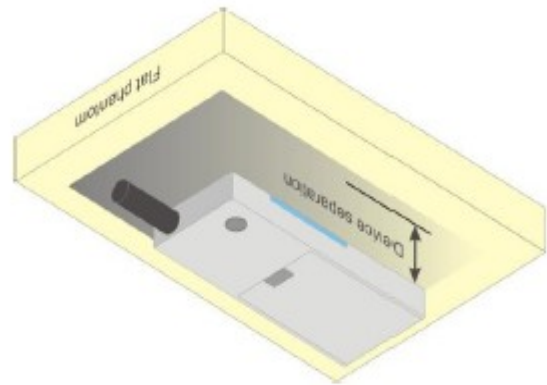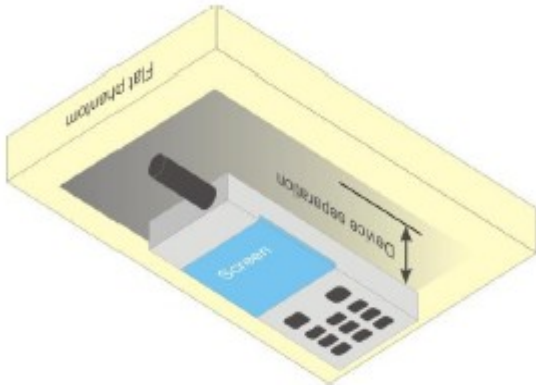
7. SAR EXPOSURE LIMITS

SAR assessments have been made in line with the requirements of IEEE-1528, FCC Supplement C, and comply with ANSI/IEEE C95.1-1992 "Controlled Exposure Environment" limits. These limits apply to a location which is deemed as "Controlled Exposure Environment" which can be described as a situation where the general public may be exposed to an RF source with no prior knowledge or control over their exposure.

Limits for Occupational / Controlled Exposure Environment

Type Exposure Limits	Occupational / Controlled Exposure Environment(W/Kg)
Spatial Average SAR (whole body)	8.0

8. TEST EQUIPMENT LIST

Equipment description	Manufacturer/ Model	Identification No.	Current calibration date	Next calibration date
Stäubli Robot	Stäubli-TX60	F13/5Q2UD1/A/01	N/A	N/A
Robot Controller	Stäubli-CS8	139522	N/A	N/A
E-Field Probe	ES3DV3	SN:3337	01/28/2014	01/27/2015
SAM Twin Phantom	Speag-SAM	1790	N/A	N/A
Device Holder	Speag-SD 000 H01 KA	SD 000 H01 KA	N/A	N/A
DAE4	Speag-SD 000 D04 BM	1398	10/10/2013	10/09/2014
SAR Software	Speag-DASY5	DASY52.8	N/A	N/A
Liquid	SATIMO	-	N/A	N/A
Radio Communication Tester	R&S-CMU200	069Y7-158-13-712	02/17/2014	02/16/2015
Dipole	Speag-CLA150	SN 4008	01/24/2014	01/24/2015
Amplifier	Aethercomm	SN 046	12/08/2013	12/07/2014
Signal Generator	Agilent-E4421B	MY43351603	05/13/2013	05/12/2014
Power Probe	NRP-Z23	US38261498	02/17/2014	02/16/2015
SPECTRUM ANALYZER	Agilent- E4440A	MY44303916	10/22/2013	10/21/2014
Power Attenuator	BED	DLA-5W	07/30/2013	07/29/2014
Network Analyzer	Rhode & Schwarz ZVA	SN100132	02/17/2014	02/16/2015

Note: Per KDB 50824 Dipole SAR Validation Verification, AGC Lab has adopted 3 years calibration intervals. On annual basis, every measurement dipole has been evaluated and is in compliance with the following criteria:
1. There is no physical damage on the dipole;
2. System validation with specific dipole is within 10% of calibrated value;
3. Return-loss is within 20% of calibrated measurement;
4. Impedance is within 5Ω of calibrated measurement.

9. MEASUREMENT UNCERTAINTY

DAYS5 Uncertainty

Measurement uncertainty for 30 MHz to 3GHz averaged over 1 gram / 10 gram.

Error Description	Uncert. value	Prob. Dist.	Div.	(c_i) 1g	(c_i) 10g	Std. Unc. (1g)	Std. Unc. (10g)	(v_i) v_{eff}
Measurement System								
Probe Calibration	±6.55%	N	1	1	1	±6.55%	±6.55%	∞
Axial Isotropy	±4.7%	R	$\sqrt{3}$	0.7	0.7	±1.9%	±1.9%	∞
Hemispherical Isotropy	±9.6%	R	$\sqrt{3}$	0.7	0.7	±3.9%	±3.9%	∞
Boundary Effects	±2.0%	R	$\sqrt{3}$	1	1	±1.2%	±1.2%	∞
Linearity	±4.7%	R	$\sqrt{3}$	1	1	±2.7%	±2.7%	∞
System Detection Limits	±1.0%	R	$\sqrt{3}$	1	1	±0.6%	±0.6%	∞
Readout Electronics	±0.3%	N	1	1	1	±0.3%	±0.3%	∞
Response Time	±0.8%	R	$\sqrt{3}$	1	1	±0.5%	±0.5%	∞
Integration Time	±2.6%	R	$\sqrt{3}$	1	1	±1.5%	±1.5%	∞
RF Ambient Noise	±3.0%	R	$\sqrt{3}$	1	1	±1.7%	±1.7%	∞
RF Ambient Reflections	±3.0%	R	$\sqrt{3}$	1	1	±1.7%	±1.7%	∞
Probe Positioner	±0.8%	R	$\sqrt{3}$	1	1	±0.5%	±0.5%	∞
Probe Positioning	±6.7%	R	$\sqrt{3}$	1	1	±3.9%	±3.9%	∞
Max. SAR Eval.	±4.0%	R	$\sqrt{3}$	1	1	±2.3%	±2.3%	∞
Test Sample Related								
Device Positioning	±2.9%	N	1	1	1	±2.9%	±2.9%	145
Device Holder	±3.6%	N	1	1	1	±3.6%	±3.6%	5
Power Drift	±5.0%	R	$\sqrt{3}$	1	1	±2.9%	±2.9%	∞
Phantom and Setup								
Phantom Uncertainty	±4.0%	R	$\sqrt{3}$	1	1	±2.3%	±2.3%	∞
Liquid Conductivity (target)	±5.0%	R	$\sqrt{3}$	0.64	0.43	±1.8%	±1.2%	∞
Liquid Conductivity (mea.)^{DAK}	±2.5%	R	$\sqrt{3}$	0.64	0.43	±0.9%	±0.6%	∞
Liquid Permittivity (target)	±5.0%	R	$\sqrt{3}$	0.6	0.49	±1.7%	±1.4%	∞
Liquid Permittivity (mea.)^{DAK}	±2.5%	R	$\sqrt{3}$	0.6	0.49	±0.9%	±0.7%	∞
Combined Std. Uncertainty						±12.0%	±11.8%	330
Expanded STD Uncertainty						±24.0%	±23.7%	

10. CONDUCTED POWER MEASUREMENT

Frequency (MHz)	Channel Spacing	Measured Conducted Output power	
		Max. Peak Power (dBm)	Avg. Power (dBm)
136.025		36.97	36.52
155.000	12.5KHz	36.99	36.60
173.975		36.94	36.50

11. TEST RESULTS

11.1. SAR Test Results Summary

11.1.1. Test position and configuration

Head SAR was performed with the device configured in the positions according to KDB 643646 and Body SAR was performed with the device configured with all accessories close to the Flat Phantom.

11.1.2. Operation Mode

Set the EUT to maximum output power level and transmit on lower, middle and top channel with 100% duty cycle individually during SAR measurement.

11.1.3. Co-located SAR

The following KDB was used for assessing this device.

KDB 643646 and KDB 865664.

11.1.4. Test Result

SAR MEASUREMENT										
Ambient Temperature (°C) : 21 ±2					Ambient Temperature (°C) : 21 ±2					
Liquid Temperature (°C) : 21 ±2					Liquid Temperature (°C) : 21 ±2					
Product: Handheld Two Way Radio										
Test Mode: Hold to Face with 2.5 cm separation(VHF)										
Position	Mode	Separation (KHz)	Power Drift (<±0.2 %)	SAR 1g with 100% duty Cycle (W/kg)*1	SAR 1g with 50% duty cycle (W/Kg)*2	SAR 1g with 50% duty cycle (W/Kg)*3	Max. Turn-up Power (dBm)	Meas. output Power (dBm)	Scaled SAR (W/Kg)	Limit W/kg
Face Up	Low	12.5	-0.13	0.126	0.063	**0.315**	37.00	36.52	0.352	8.0
Face Up	Mid.	12.5	-0.14	0.218	0.109	**0.545**	37.00	36.60	0.598	8.0
Face Up	Top	12.5	-0.15	0.216	0.108	**0.540**	37.00	36.50	0.606	8.0
Back Touch	Low	12.5	0.11	0.121	0.061	**0.303**	37.00	36.52	0.338	8.0
Back Touch	Mid.	12.5	-0.15	0.218	0.109	**0.545**	37.00	36.60	0.598	8.0
Back Touch	Top	12.5	0.11	0.220	0.110	**0.550**	37.00	36.50	0.617	8.0
Note: *1 During the test, EUT power is 1 W with 100% duty cycle; *2 Calculated the SAR value(1W) with 50% duty cycle according to *1; *3 Calculated the SAR value(5W) with 50% duty cycle according to *2; When the 1-g SAR of middle channel is ≤ 3.5 W/kg, testing for other channel is optional. refer to KDB 643646.										

APPENDIX A. SAR SYSTEM VALIDATION DATA

Test Laboratory: AGC Lab   **Test date: Apr.29,2014**

System Check Body 150MHz

DUT: Dipole 150 MHz Type: SID 150

Communication System: CW; Communication System Band: CW; Duty Cycle: 1:1; Conv.F=9.52

Frequency: 150MHz; Medium parameters used: f = 150MHz; σ=0.79 mho/m; εr =60.58; ρ = 1000 kg/m³ ;

Phantom Type: Elliptical Phantom; Input Power=10dBm

Ambient temperature (℃): 21.0, Liquid temperature (℃): 21.0

DASY Configuration:

· Probe: ES3DV3-SN:3337; ConvF(9.52,9.52,9.52); Calibrated: 01/28/2014;

· Sensor-Surface: 3mm (Mechanical Surface Detection), z = 1.0

· Electronics: DAE4 Sn1398; Calibrated: 10/10/2013

· Phantom: SAM (20deg probe tilt) with CRP v5.0; Type: QD000P40CD;

· DASY52 52.8.7(1137); SEMCAD X 14.6.10(7164)

Configuration/System Check 150MHz Body/Area Scan (221×221×1): Measurement grid: dx=1.000mm, dy=1.000mm,

Maximum value of SAR (measured)=0.0354 W/Kg

Configuration/System Check 150MHz Body/Zoom Scan (7×7×7)/Cube 0: Measurement grid: dx=5mm, dy =5mm, dz=5mm, Reference Value=3.839 V/m; Power Drift=-0.06 dB

Peak SAR (extrapolated) =0.0327 W/kg

SAR (1g) =0.029W/Kg; SAR (10g) =0.018 W/Kg

Maximum value of SAR (measured)=0.0315W/Kg
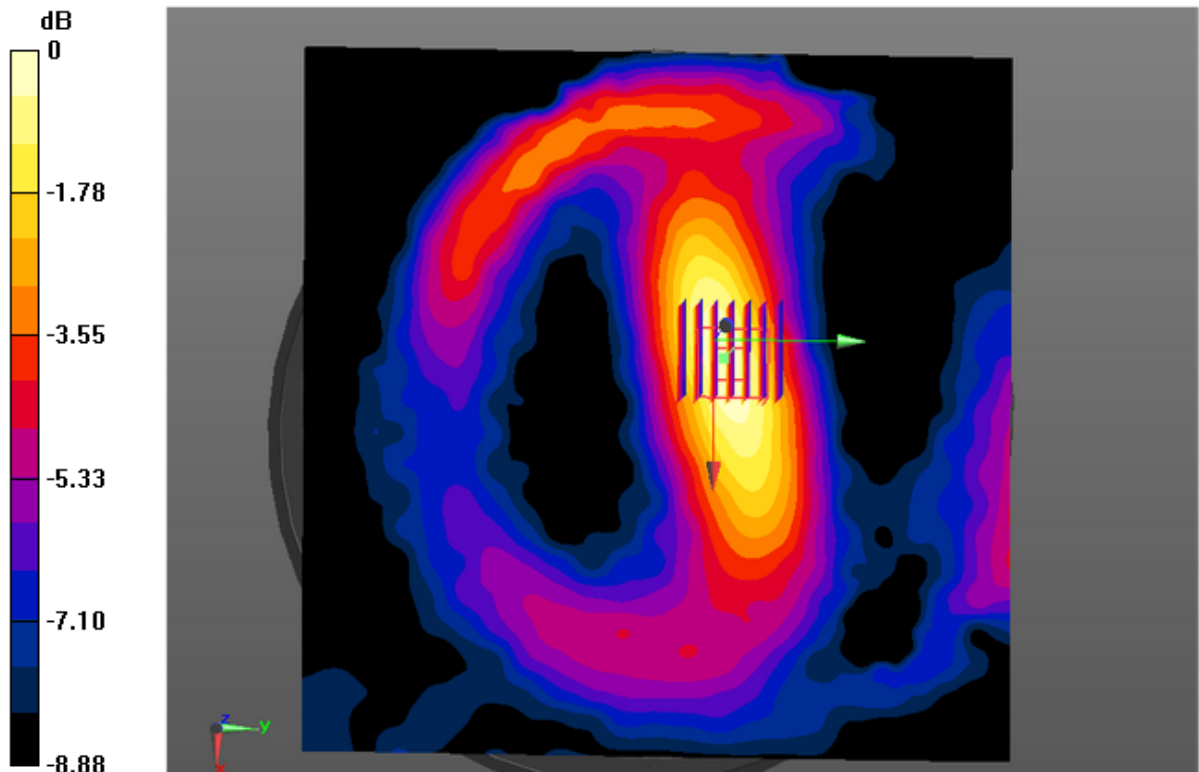
0 dB = 0.0315 W/kg = -19.59 dBW/kg

APPENDIX B. SAR MEASUREMENT DATA

Test Laboratory: AGC Lab   **Date: Apr.29,2014**
CW150Low-face up 2.5cm (12.5 KHz)
DUT: Handheld Two Way Radio;   Type: A2

Communication System: CW; Communication System Band: CW 150MHz; Duty Cycle: 1:1; Conv.F=7.26
Frequency: 136.025 MHz; Medium parameters used: f = 150MHz; σ=0.75 mho/m; εr =50.66; ρ= 1000 kg/m³ ;
Phantom Type: Elliptical Phantom
Ambient temperature (℃): 21.5, Liquid temperature (℃): 21.0

DASY Configuration:
· Probe: ES3DV3-SN:3337; ConvF(7.26,7.26,7.26); Calibrated: 01/28/2014;
· Sensor-Surface: 3mm (Mechanical Surface Detection), z = 1.0
· Electronics: DAE4 Sn1398; Calibrated: 10/10/2013
· Phantom: SAM (20deg probe tilt) with CRP v5.0; Type: QD000P40CD;
· DASY52 52.8.7(1137); SEMCAD X 14.6.10(7164)

Face up /Low/Area Scan (121x181x1): Interpolated grid: dx=1.000 mm, dy=1.000 mm
Maximum value of SAR (interpolated) =0.149 W/kg
Face up /Low/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 13.644 V/m; Power Drift = -0.13 dB
Peak SAR (extrapolated) = 0.191 W/kg
SAR(1 g) = 0.126 W/kg; SAR(10 g) = 0.093 W/kg
Maximum value of SAR (measured) = 0.141 W/kg
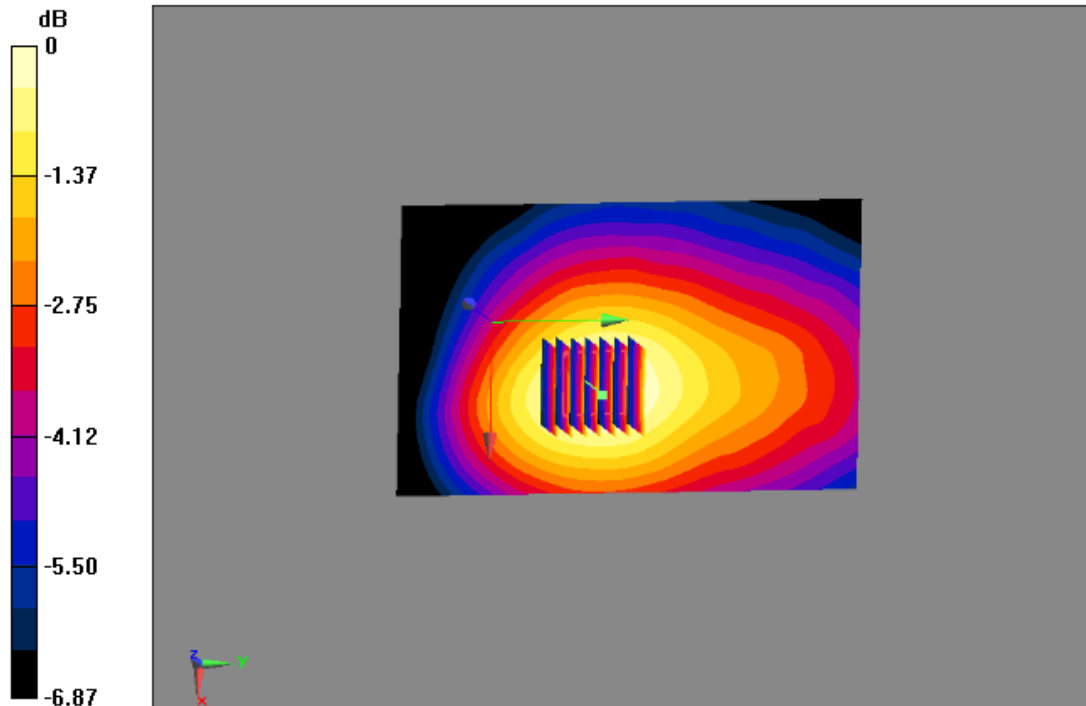
0 dB = 0.141 W/kg = -8.51 dBW/kg

Test Laboratory: AGC Lab   **Date: Apr.29,2014**

CW150Mid- face up 2.5cm (12.5 KHz)

DUT: Handheld Two Way Radio;   Type: A2

Communication System: CW; Communication System Band: CW 150MHz; Duty Cycle: 1:1; Conv.F=7.26
Frequency:155.000 MHz; Medium parameters used: f = 150MHz; σ=0.77 mho/m; εr =52.78; ρ= 1000 kg/m³ ;
Phantom Type: Elliptical Phantom
Ambient temperature (℃): 21.5, Liquid temperature (℃): 21.0

DASY Configuration:

· Probe: ES3DV3-SN:3337; ConvF(7.26,7.26,7.26); Calibrated: 10/15/2013;

· Sensor-Surface: 3mm (Mechanical Surface Detection), z = 1.0

· Electronics: DAE4 Sn1398; Calibrated: 10/10/2013

· Phantom: SAM (20deg probe tilt) with CRP v5.0; Type: QD000P40CD;

· DASY52 52.8.7(1137); SEMCAD X 14.6.10(7164)

Face up /Mid./Area Scan (121x181x1): Interpolated grid: dx=1.000 mm, dy=1.000 mm
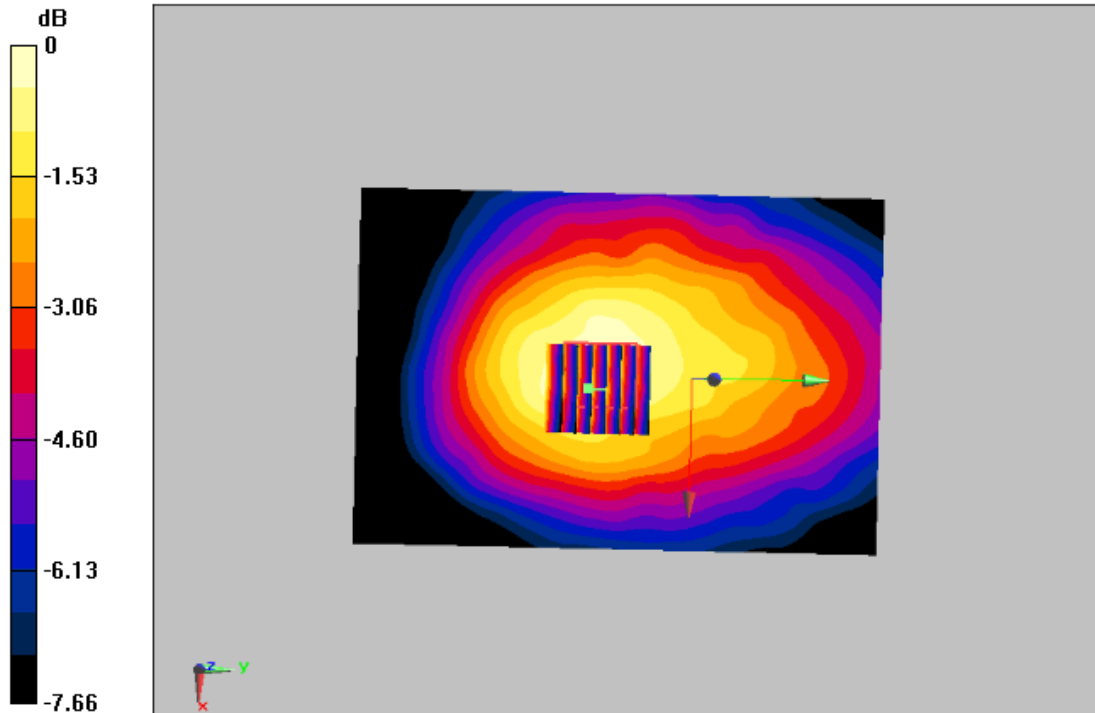Maximum value of SAR (interpolated) = 0.266 W/kg
Face up /Mid./Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 18.489 V/m; Power Drift = -0.14 dB
Peak SAR (extrapolated) = 0.353 W/kg
SAR(1 g) = 0.218 W/kg; SAR(10 g) = 0.162 W/kg
Maximum value of SAR (measured) = 0.266 W/kg

0 dB = 0.266 W/kg = -5.75 dBW/kg

Test Laboratory: AGC Lab   **Date: Apr.29,2014**
CW150High- face up 2.5cm (12.5 KHz)
DUT: Handheld Two Way Radio;   Type: A2

Communication System: CW; Communication System Band: CW 150MHz; Duty Cycle: 1:1; Conv.F=7.26
Frequency: 173.9875MHz; Medium parameters used: f = 150MHz; σ=0.76 mho/m; εr =53.60; ρ= 1000 kg/m³ ;
Phantom Type: Elliptical Phantom
Ambient temperature (℃): 21.5, Liquid temperature (℃): 21.0

DASY Configuration:
· Probe: ES3DV3-SN:3337; ConvF(7.26,7.26,7.26); Calibrated: 10/15/2013;
· Sensor-Surface: 3mm (Mechanical Surface Detection), z = 1.0
· Electronics: DAE4 Sn1398; Calibrated: 10/10/2013
· Phantom: SAM (20deg probe tilt) with CRP v5.0; Type: QD000P40CD;
· DASY52 52.8.7(1137); SEMCAD X 14.6.10(7164)

Face up/High/Area Scan (91x151x1): Interpolated grid: dx=1.000 mm, dy=1.000 mm
Maximum value of SAR (interpolated) = 0.258 W/kg
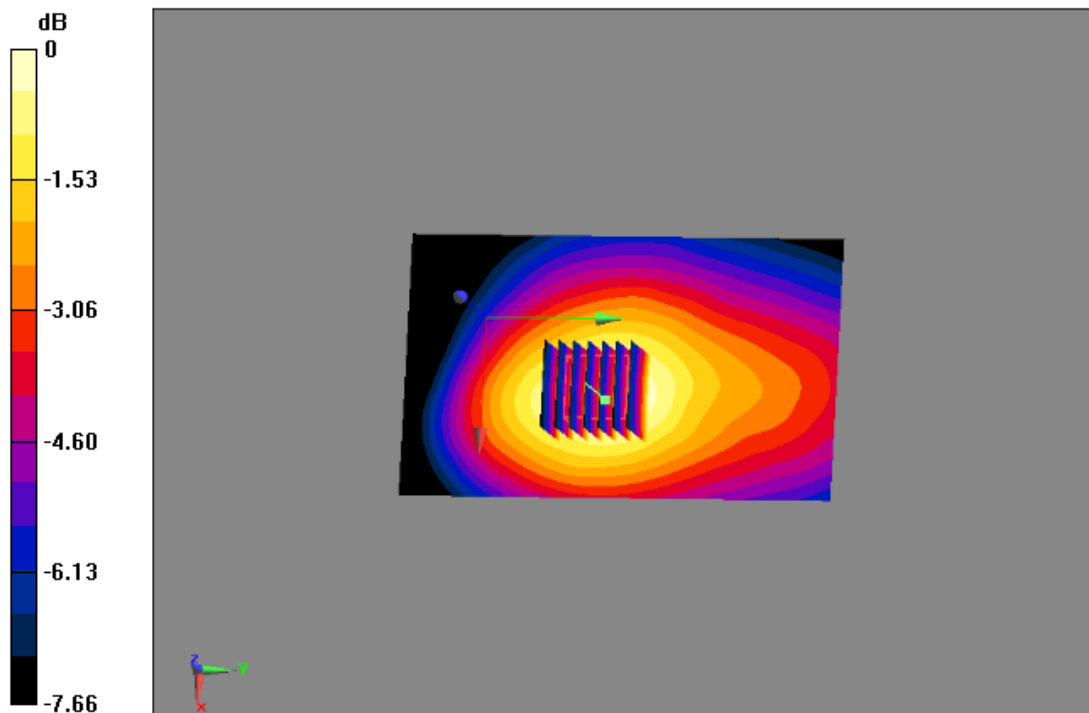**Face up/High /Zoom Scan (7x7x7)/Cube 0:** Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 17.701 V/m; Power Drift = -0.15 dB
Peak SAR (extrapolated) = 0.350 W/kg
SAR(1 g) = 0.216 W/kg; SAR(10 g) = 0.153 W/kg
Maximum value of SAR (measured) = 0.248 W/kg

0 dB = 0.248 W/kg = -6.06 dBW/kg

Test Laboratory: AGC Lab   **Date: Apr.29,2014**
CW150 Low -Body -Touch (12.5 KHz)
DUT: Handheld Two Way Radio;   Type: A2

Communication System: CW; Communication System Band: CW 150 MHz; Duty Cycle: 1:1; Conv.F=9.52
Frequency:136.025MHz; Medium parameters used: f = 150 MHz; σ=0.82mho/m; εr =61.24; ρ= 1000 kg/m³ ;
Phantom Type: Elliptical Phantom
Ambient temperature (℃): 21.5, Liquid temperature(℃): 21.0

DASY Configuration:
· Probe: ES3DV3-SN:3337; ConvF(9.52,9.52,9.52); Calibrated: 01/28/2014;
· Sensor-Surface: 3mm (Mechanical Surface Detection), z = 1.0
· Electronics: DAE4 Sn1398; Calibrated: 10/10/2013
· Phantom: SAM (20deg probe tilt) with CRP v5.0; Type: QD000P40CD;
· DASY52 52.8.7(1137); SEMCAD X 14.6.10(7164)

Back touch/Low/Area Scan (81x181x1): Interpolated grid: dx=1.000 mm, dy=1.000 mm
Maximum value of SAR (interpolated) = 0.137 W/kg
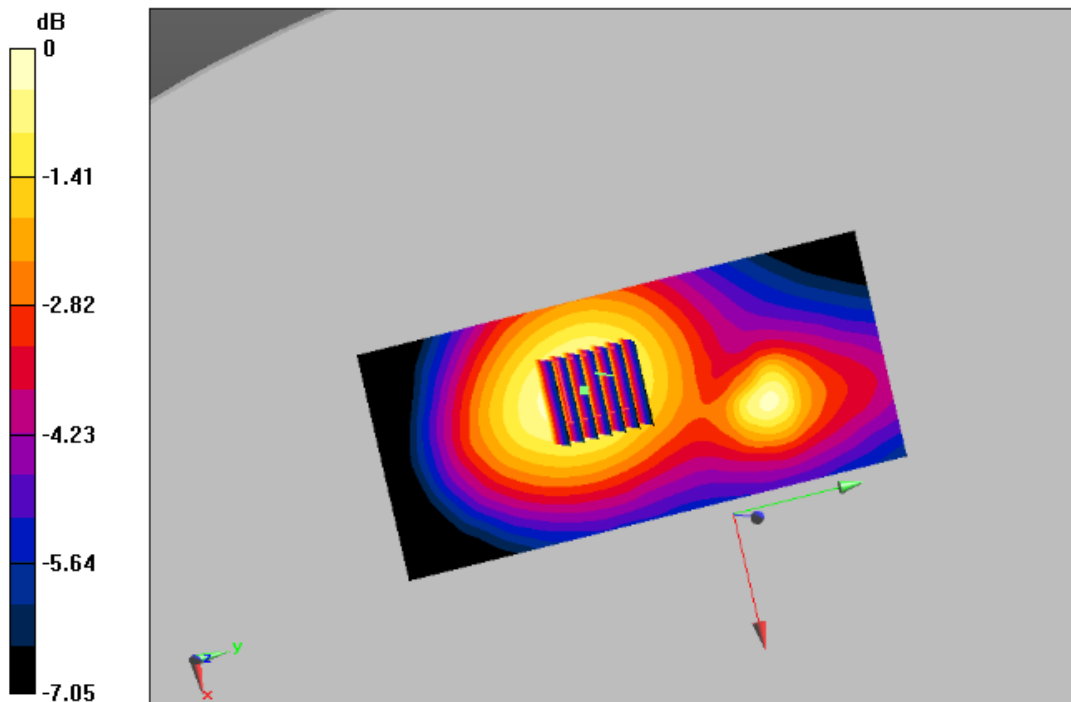**Back touch/Low/Zoom Scan (7x7x7)/Cube 0:** Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 8.314 V/m; Power Drift = 0.11 dB
Peak SAR (extrapolated) = 0.184 W/kg
SAR(1 g) = 0.121 W/kg; SAR(10 g) = 0.089 W/kg
Maximum value of SAR (measured) = 0.137 W/kg

0 dB = 0.137 W/kg = -8.63 dBW/kg

Test Laboratory: AGC Lab **Date: Apr.29,2014**
CW150 Mid -Body –Touch (12.5 KHz)
DUT: Handheld Two Way Radio;   Type: A2

Communication System: CW; Communication System Band: CW 150 MHz; Duty Cycle: 1:1; Conv.F=9.52
Frequency:155.000 MHz; Medium parameters used: f = 150 MHz; σ=0.79 mho/m; εr =60.58; ρ= 1000 kg/m³ ;
Phantom Type: Elliptical Phantom
Ambient temperature (℃): 21.5, Liquid temperature(℃): 21.0

DASY Configuration:
・ Probe: ES3DV3-SN:3337; ConvF(9.52,9.52,9.52); Calibrated: 01/28/2014;
・ Sensor-Surface: 3mm (Mechanical Surface Detection), z = 1.0
・ Electronics: DAE4 Sn1398; Calibrated: 10/10/2013
・ Phantom: SAM (20deg probe tilt) with CRP v5.0; Type: QD000P40CD;
・ DASY52 52.8.7(1137); SEMCAD X 14.6.10(7164)

Back touch/Mid./Area Scan (81x181x1): Interpolated grid: dx=1.000 mm, dy=1.000 mm
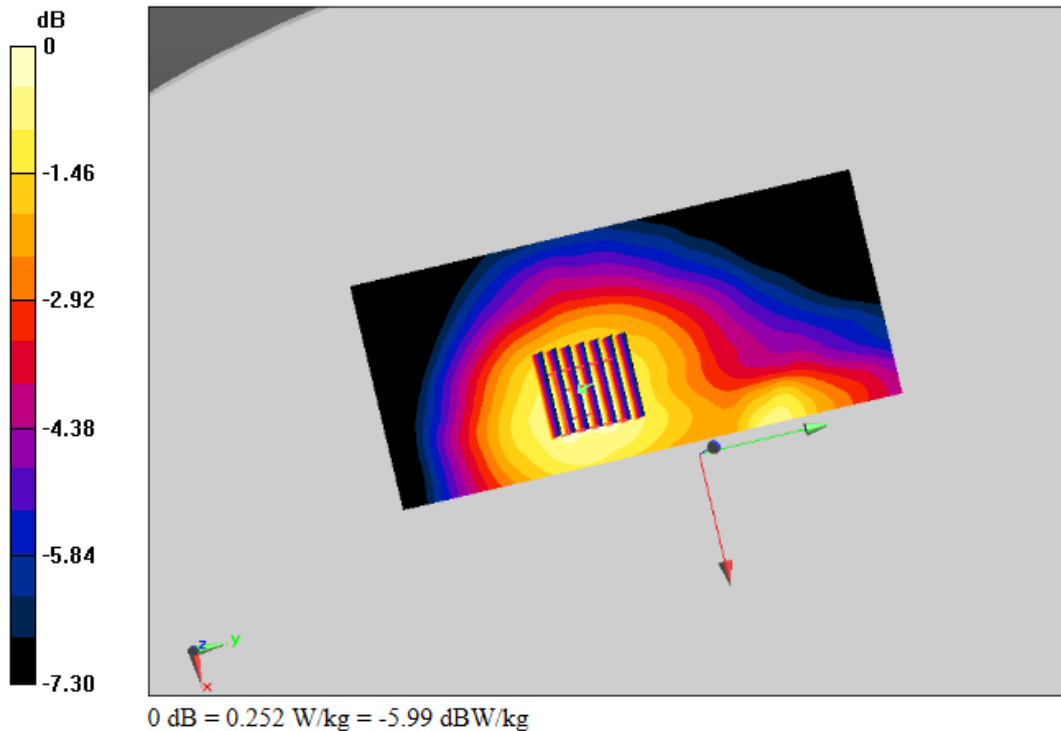Maximum value of SAR (interpolated) = 0.232 W/kg
Back touch/Mid./Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 12.897 V/m; Power Drift = -0.11 dB
Peak SAR (extrapolated) = 0.356 W/kg
SAR(1 g) = 0.218 W/kg; SAR(10 g) = 0.158 W/kg
Maximum value of SAR (measured) = 0.252 W/kg

0 dB = 0.252 W/kg = -5.99 dBW/kg

Test Laboratory: AGC Lab   **Date: Apr.29,2014**
CW150 High -Body –Touch (12.5 KHz)
DUT: Handheld Two Way Radio;   Type: A2

Communication System: CW; Communication System Band: CW 150 MHz; Duty Cycle: 1:1; Conv.F=9.52
Frequency: 173.975MHz; Medium parameters used: f = 150 MHz; σ=0.77 mho/m; εr =62.33; ρ= 1000 kg/m³ ;
Phantom Type: Elliptical Phantom
Ambient temperature (℃): 21.5, Liquid temperature(℃): 21.0

DASY Configuration:
· Probe: ES3DV3-SN:3337; ConvF(9.52,9.52,9.52); Calibrated: 01/28/2014;
· Sensor-Surface: 3mm (Mechanical Surface Detection), z = 1.0
· Electronics: DAE4 Sn1398; Calibrated: 10/10/2013
· Phantom: SAM (20deg probe tilt) with CRP v5.0; Type: QD000P40CD;
· DASY52 52.8.7(1137); SEMCAD X 14.6.10(7164)

Back touch/High/Area Scan (81x181x1): Interpolated grid: dx=1.000 mm, dy=1.000 mm
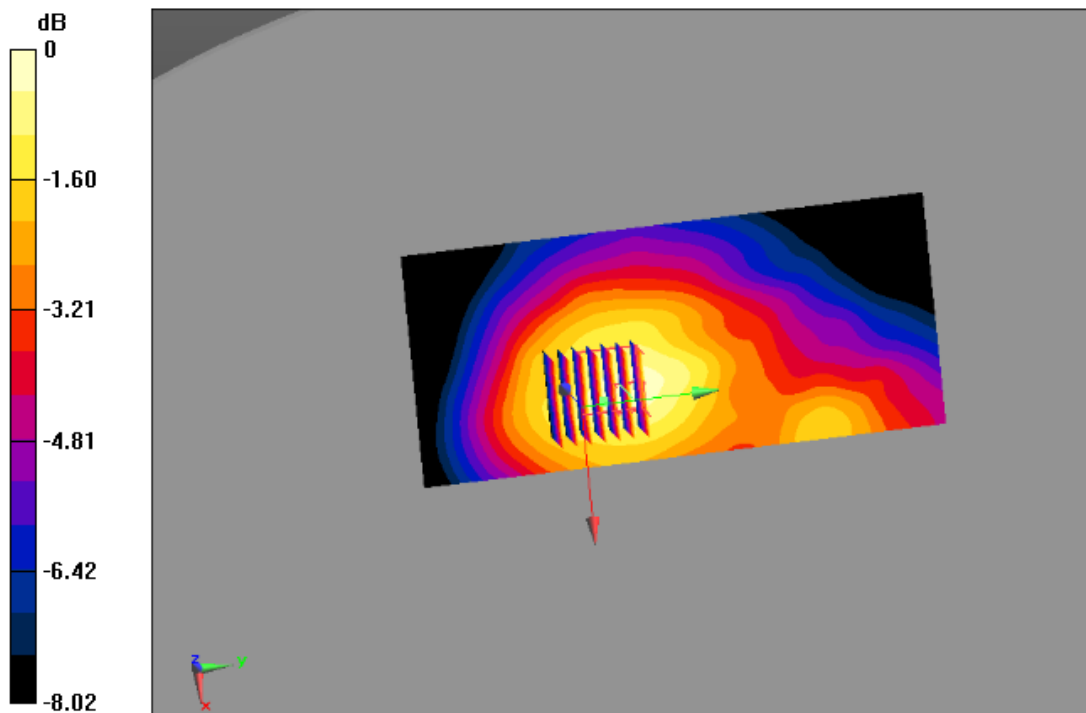Maximum value of SAR (interpolated) = 0.246 W/kg
Back touch/High/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 11.794 V/m; Power Drift = 0.11 dB
Peak SAR (extrapolated) = 0.348 W/kg
SAR(1 g) = 0.220 W/kg; SAR(10 g) = 0.158 W/kg
Maximum value of SAR (measured) = 0.257 W/kg

0 dB = 0.257 W/kg = -5.90 dBW/kg