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SAR Test Report

Report Number: M031117

Test Sample: Handheld Transceiver
Model Number: PT 2208
Tested For: Kirisun

Date of Issue: 6th January 2004

Nata Accredited Laboratory Number: 5292

CONTENTS

SAR EVALUATION
Kirisun Electronics (Shenzhen) Co. Ltd. Handheld Transceiver
Model: PT 2208
Report Number: M031117

1.0 GENERAL INFORMATION

Test Sample:	Handheld Transceiver
Device Category:	Portable Transmitter
Test Device:	Production Unit
Model Number:	PT 2208
RF exposure Category:	General Population/Uncontrolled
Manufacturer:	Kirisun Electronics (Shenzhen) Co. Ltd.
Address:	BLDG, H-2, East Industrial Zone of Overseas Chinese Toen, Nashan Dist. Shenzhen, China
Test Standard/s:	Evaluating Compliance with FCC Guidelines For Human Exposure to Radiofrequency Electromagnetic Fields Supplement C (Edition 01-01) to OET Bulletin 65 (Edition 97-01)
SAR References:	IEEE P1528/D1.2 Recommended Practice for Determining the Peak Spatial-Average Specific Absorption Rate (SAR) in the Human Head From Wireless Communications Devices: Measurement Techniques.
Statement Of Compliance:	The Kirisun Handheld Transceiver model PT 2208 Complied with the FCC General public/uncontrolled RF exposure limits of 1.6mW/g per requirements of 47CFR2.1093(d).
Test Dates:	23rd and 24th December 2003
Tested for:	Kirisun Electronics (Shenzhen) Co. Ltd.
Address:	BLDG, H-2, East Industrial Zone of Overseas Chinese Toen, Nashan Dist. Shenzhen, China
Test Officer:	**Peter Jakubiec** **Assoc Dip Elec Eng**
Authorised Signature:	**Aaron Sargent B.Eng** **EMR Engineer**

2.0 DESCRIPTION OF DEVICE

2.1 Description of Test Sample

The device tested was a Kirsun Handheld Transceiver operating in 150 MHz frequency band. It has an external fixed length antenna and was tested in the Face Frontal and Belt Clip configurations of the phantom. Refer to section 7.0 for details of test positions.

Operating Mode during Testing	: Continuous Wave 100% duty cycle
Operating Mode production sample	: 50% duty cycle
Modulation Scheme	: FM (F3E)
Device Power Rating	: 5 W
Device Dimensions (LxWxH)	: 235 mm x 55mm x 35mm
Antenna type	: Helical
Applicable Head Configurations	: None
Applicable Face Frontal-Configurations	: Face Frontal and Belt Clip Position
Battery Options	: 7.2 V 1000 mAh Ni-MH Battery Pack

2.2 Test sample Accessories

2.2.1 Battery Types

A 7.2 V 1000 mAh Ni-MH Battery Pack is used to power the Kirsun Handheld Transceiver Model: PT 2208. The maximum rated power is 5 W. SAR measurements were performed with a standard 7.2 V battery.

2.2.2 Belt Clip

One type of plastic belt clip is sold with the device. The belt clip is fixed to the back of the device and provides a spacing of 7 mm between the device and flat phantom. This plastic belt-clip was attached to the device during testing in the Belt-Clip position.

2.3 Test Signal, Frequency and Output Power

The Handheld Transceiver is a 10-channel device that operates in the 150 MHz frequency band. The frequency range is 150 MHz to 174 MHz. The transmitter was configured into a test mode that ensured continuous RF transmission for the duration of each SAR scan. The device transmission characteristics were also monitored during testing to confirm the device was transmitting continuously. A hands free speaker/microphone was connected to the device during all testing in the belt-clip position. See following photograph. Excluding the speaker/microphone accessory there were no wires or other connections to the Handheld Transceiver during the SAR measurements.

Photos of Accessories

Headset

Belt Clip

Belt Clip

The conducted RF power of the device was measured with a calibrated Power Meter. The results of this measurement are listed in table 1.

Table 1: Frequency and Output Power

Channel Frequency MHz	Battery Type	Maximum Conducted Output Power dBm
150	7.2 V 1000 mAh Ni-MH	36.69
162	7.2 V 1000 mAh Ni-MH	37.16
174	7.2 V 1000 mAh Ni-MH	37.10

2.4 Battery Status

The device battery was fully charged prior to commencement of measurement. Each SAR test was completed within 30 minutes. The battery condition was monitored by measuring the conducted RF at the antenna port before the commencement of each test and again after the completion of the test.

2.5 DETAILS OF TEST LABORATORY

2.5.1 Location

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2.5.2 Accreditations

EMC Technologies Pty. Ltd. is accredited by the National Association of Testing Authorities, Australia (NATA). **NATA Accredited Laboratory Number: 5292**

EMC Technologies Pty Ltd is NATA accredited for the following standards:

AS/NZS 2772.1:	RF and microwave radiation hazard measurement
ACA:	Radio communications (Electromagnetic Radiation - Human Exposure) Standard 2003
FCC:	Guidelines for Human Exposure to RF Electromagnetic Field OET65C 01/01
CENELEC:	ES59005: 1998
EN 50360: 2001	Product standard to demonstrate the compliance of mobile phones with the basic restrictions related to human exposure to electromagnetic fields (300 MHz – 3 GHz)
EN 50361: 2001	Basic standard for the measurement of Specific Absorption Rate related to human exposure to electromagnetic fields from mobile phones (300MHz – 3GHz)
IEEE 1528: 2003	Recommended Practice for Determining the Peak Spatial-Average Specific Absorption Rate (SAR) in the Human Head Due to Wireless Communications Devices: Measurement Techniques.

Refer to NATA website www.nata.asn.au for the full scope of accreditation.

2.5.3 Environmental Factors

The measurements were performed in a shielded room with no background RF signals. The temperature in the laboratory was controlled to within 22 ± 1 °C, the humidity was 49 to 64 %. The liquid parameters were measured prior to the commencement of the tests. Tests were performed to check that reflections within the environment did not influence the SAR measurements. The noise floor of the DASY4 SAR measurement system using the SN1377 probe is less than 5μV in both air and liquid mediums.

3.0 DESCRIPTION OF SAR MEASUREMENT SYSTEM

3.1 Probe Positioning System

The measurements were performed with the state of the art automated near-field scanning system DASY4 V4.1 Build 47 from Schmid & Partner Engineering AG (SPEAG). The system is based on a high precision 6-axis robot (working range greater that 1.1m), which positions the SAR measurement probes with a positional repeatability of better than ±0.02 mm. The DASY4 fully complies with the OET65 C (01-01), IEEE 1528 and EN50361 SAR measurement requirements.

3.2 E-Field Probe Type and Performance

The SAR measurements were conducted with the dosimetric probe ET3DV6 Serial: 1377 (manufactured by SPEAG) designed in the classical triangular configuration and optimised for dosimetric evaluation. The probe has been calibrated and found to be accurate to better than ±0.25 dB. The probe is suitable for measurements close to material discontinuity at the surface of the phantom. The sensors of the probe are directly loaded with Schottky diodes and connected via highly resistive lines (length = 300 mm) to the data acquisition unit.

3.3 Data Acquisition Electronics

The data acquisition electronics (DAE3) consists 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 and control logic unit. The input impedance of the DAE3 box is 200 MΩ; the inputs are symmetrical and floating. Common mode rejection is above 80dB.Transmission to the PC-card is accomplished through an optical downlink for data and status information as well as an optical uplink for commands and the clock.

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

3.4 Calibration and Validation Procedures and Data

Prior to the SAR assessment, the system validation kit was used to verify that the DASY4 was operating within its specifications. The validation was performed at 300 MHz with the SPEAG D300V2 calibrated dipole.

The validation dipoles are highly symmetric and matched at the centre frequency for the specified liquid and distance to the phantom. The accurate distance between the liquid surface and the dipole centre is achieved with a distance holder that snaps onto the dipole.

System validation is performed by feeding a known power level into a reference dipole, set at a know distance from the phantom. The measured SAR is compared to the theoretically derived level.

3.4.1 Validation Results @ 300 MHz

The following table lists the dielectric properties of the tissue simulating liquid measured prior to SAR validation. The results of the validation are listed in columns 4 and 5. The forward power into the reference dipole for each SAR validation was adjusted to 400mW.

Table 2: Validation Results (Dipole: SPEAG D300V2 SN: 1005)

1. Validation Date	2. ϵr (measured)	3. σ (mho/m) (measured)	4. Measured SAR 1g (mW/g)	5. Measured SAR 10g (mW/g)
23rd Dec. 2003	46.0	0.91	1.26	0.824
24th Dec. 2003	44.7	0.89	1.23	0.809

3.4.2 Deviation from reference validation values

The reference SAR values are derived using a reference dipole and flat phantom suitable for a centre frequency of 300 MHz. These reference SAR values are obtained from the IEEE Std 1528-2003 and are normalized to 1W.

The SPEAG calibration reference SAR value is the SAR validation result obtained in a specific dielectric liquid using the validation dipole (D300V2) during calibration. The measured one-gram SAR should be within 10% of the expected target reference values shown in table 3 below.

Table 3: Deviation from reference validation values with 400 mW into dipole

Frequency and Date	Measured SAR 1g (mW/g)	Measured SAR 1g (Normalized to 1W)	SPEAG Calibration reference SAR Value 1g (mW/g)	Deviation From SPEAG (%)	IEEE Std 1528 reference SAR value 1g (mW/g)	Deviation From IEEE (%)
300 MHz 23rd Dec 2003	1.26	3.15	2.94	7.1%	3.00	5.0%
300 MHz 24th Dec 2003	1.23	3.08	2.94	4.8%	3.00	2.7%

NOTE: All reference validation values are referenced to 1W input power.

3.4.3 Liquid Depth 15cm

During the SAR measurement process the liquid level was maintained to a level of 15cm with a tolerance of ±0.5cm. The following photo shows the depth of the liquid maintained during the testing.

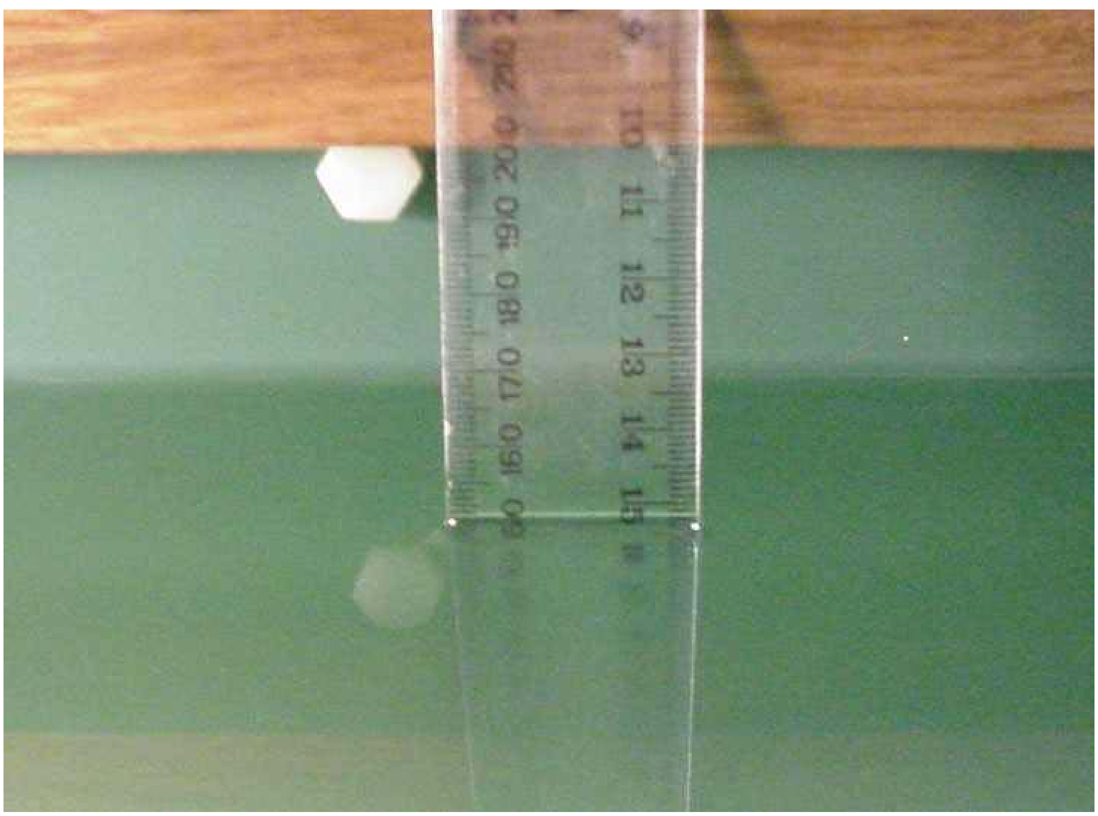


Photo of liquid Depth in Flat Phantom

3.5 Phantom Properties (Size, Shape, Shell Thickness)

The phantom used during the validations was the "Flat Phantom" model: PO1A V4.4e from SPEAG. It has a single thickness of 6mm and was filled with the required tissue simulating liquid. The flat phantom support structures were all non-metallic and spaced more than one device width away in transverse directions.

For SAR testing in the Face Frontal positions an AndreT Flat Phantom V10.1 was used. The phantom thickness is 2.0mm +/-0.2 mm and the phantom was filled with the required tissue simulating liquid. Table 4 provides a summary of the measured phantom properties

Table 4: Phantom Properties

Phantom Properties	Requirement for specific EUT	Measured
Depth of Phantom	150mm	200mm
Width of flat section	110mm	540mm
Length of flat section	470mm	620mm
Thickness of flat section	2.0mm ±0.2mm (flat section)	2.08 – 2.20mm

Photo 1: Flat_Phantom V10.1 2mm

3.6 Tissue Material Properties

The dielectric parameters of the brain and muscle simulating liquids were measured prior to SAR assessment using the HP85070A dielectric probe kit and HP8714B Network Analyser. The actual measured dielectric parameters are shown in tables 5 and 6.

Table 5: Measured Brain Simulating Liquid Dielectric Values

Frequency Band	ϵr (measured range)	ϵr (target)	σ (mho/m) (measured range)	σ (target)	ρ kg/m^3
150MHz	51.1	51.9 ±5% (49.3 to 54.4)	0.79	0.78 ±5% (0.74 to 0.82)	1000
162MHz	50.5	51.9 ±5% (49.3 to 54.4)	0.80	0.78 ±5% (0.74 to 0.82)	1000
174MHz	49.6	51.9 ±5% (49.3 to 54.4)	0.81	0.78 ±5% (0.74 to 0.82)	1000

Table 6: Measured Body Simulating Liquid Dielectric Values

Frequency Band	ϵr (measured range)	ϵr (target)	σ (mho/m) (measured range)	σ (target)	ρ kg/m^3
150MHz	62.1	61.7 ±5% (58.6 to 67.9)	0.82	0.83 ±5% (0.79 to 0.87)	1000
162MHz	62.3	61.7 ±5% (58.6 to 67.9)	0.82	0.83 ±5% (0.79 to 0.87)	1000
174MHz	61.0	61.7 ±5% (58.6 to 67.9)	0.84	0.83 ±5% (0.79 to 0.87)	1000

NOTE: The brain and muscle liquid parameters were within the required tolerances of ±5%.

3.6.1 Liquid Temperature and Humidity

The humidity and dielectric/ambient temperatures are recorded during the assessment of the tissue material dielectric parameters. The difference between the ambient temperature of the liquid during the dielectric measurement and during tests was less than |2|°C.

Table 7: Temperature and Humidity recorded for each day

Date	Ambient Temperature (°C)	Liquid Temperature (°C)	Humidity (%)
23rd December 2003	21.9	21.3	49
24th December 2003	21.8	21.2	64

3.7 Simulated Tissue Composition Used for SAR Test

The tissue simulating liquids are created prior to the SAR evaluation and often require slight modification each day to obtain the correct dielectric parameters.

Table 8: Tissue Type: Brain @ 150MHz
Volume of Liquid: 60 Litres

Approximate Composition	% By Weight
Distilled Water	37.50
Salt	6.41
Sugar	55.56
HEC	0.48
Bactericide	0.05

Table 9: Tissue Type: Muscle @ 150MHz
Volume of Liquid: 60 Litres

Approximate Composition	% By Weight
Distilled Water	48.43
Salt	2.86
Sugar	48.13
HEC	0.53
Bactericide	0.06

3.8 Device Holder for DASY4

The DASY4 device holder supplied by SPEAG 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) Thus the device needs no repositioning when changing the angles.

The DASY4 device holder is made of low-loss material having the following dielectric parameters: relative permittivity ε=3 and loss tangent δ=0.02. The amount of dielectric material has been reduced in the closest vicinity of the device, to reduce the influence on the clamp on the test results.

Refer to Appendix A2-A3 for photographs of device positioning

4.0 SAR MEASUREMENT PROCEDURE USING DASY4

The SAR evaluation was performed with the SPEAG DASY4 system. A summary of the procedure follows:

a) A measurement of the conducted power value at the antenna port is used as a reference value for assessing the power drop of the EUT. Also a measurement of the SAR value at a fixed location is used. The power is measured at the start of the test and then again at the end of the test.

b) The SAR distribution at the exposed side of the head *or* the flat section of the flat phantom is measured at a distance of 3.9 mm from the inner surface of the shell. The area covers the entire dimension of the head and the horizontal grid spacing is 20 mm x 20 mm. The actual Area Scan has dimensions of 51 mm x 133 mm surrounding the test device hot spot location. Based on this data, the area of the maximum absorption is determined by Spline interpolation. A pre-scan is performed for each phantom configuration to ensure that entire hot spot is identified.

c) Around this point, a volume of 30 mm x 30 mm x 30 mm is assessed by measuring 7 x 7 x 7 points. On the basis of this data set, the spatial peak SAR value is evaluated with the following procedure:

   (i) The data at the surface are extrapolated, since the centre of the dipoles is 2.7 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 is based on a least square algorithm. A polynomial of the fourth order is calculated through the points in z-axes. This polynomial is then used to evaluate the points between the surface and the probe tip.

   (ii) The maximum interpolated value is searched with a straightforward algorithm. Around this maximum the SAR values averaged over the spatial volumes (1 g and 10 g) are computed using 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-direction). The volume is integrated with the trapezoidal – algorithm. One thousand points (10 x 10 x 10) are interpolated to calculate the averages.

   (iii) All neighbouring volumes are evaluated until no neighbouring volume with a higher average value is found.

   (iv) The SAR value at the same location as in Step (a) is again measured and the difference is recorded as the drift.

5.0 MEASUREMENT UNCERTAINTY

The uncertainty analysis is based on the template listed in the IEEE Std 1528-2003 for both Handset SAR tests and Validation uncertainty. The measurement uncertainty of a specific device is evaluated independently and the total uncertainty for both evaluations (95% confidence level) must be less than 30%.

Table 10: Uncertainty Budget for DASY4 Version V4.1 Build 47 – EUT SAR test

a	b	c	d	e= f(d,k)	f	g	h=cxf/e	i=cxg/e	k
Uncertainty Component	Sec.	Tol. (%)	Prob. Dist.	Div.	C_i (1g)	C_i (10g)	1g u_i (%)	10g u_i (%)	v_i
Measurement System									
Probe Calibration (k=1) (standard calibration)	E.2.1	4.8	N	1	1	1	4.8	4.8	∞
Axial Isotropy	E.2.2	4.7	R	1.73	0.707	0.707	1.9	1.9	∞
Hemispherical Isotropy	E.2.2	9.6	R	1.73	0.707	0.707	3.9	3.9	∞
Boundary Effect	E.2.3	1	R	1.73	1	1	0.6	0.6	∞
Linearity	E.2.4	4.7	R	1.73	1	1	2.7	2.7	∞
System Detection Limits	E.2.5	1	R	1.73	1	1	0.6	0.6	∞
Readout Electronics	E.2.6	1	N	1	1	1	1.0	1.0	∞
Response Time	E.2.7	0.8	R	1.73	1	1	0.5	0.5	∞
Integration Time	E.2.8	0	R	1.73	1	1	0.0	0.0	∞
RF Ambient Conditions	E.6.1	0.05	R	1.73	1	1	0.0	0.0	∞
Probe Positioner Mechanical Tolerance	E.6.2	0.4	R	1.73	1	1	0.2	0.2	∞
Probe Positioning with respect to Phantom Shell	E.6.3	2.9	R	1.73	1	1	1.7	1.7	∞
Extrapolation, interpolation and Integration Algorithms for Max. SAR Evaluation	E.5	1	R	1.73	1	1	0.6	0.6	∞
Test Sample Related									
Test Sample Positioning	E.4.2	2.9	N	1	1	1	2.9	2.9	11
Device Holder Uncertainty	E.4.1	3.6	N	1	1	1	3.6	3.6	7
Output Power Variation – SAR Drift Measurement	6.6.2	10.7	R	1.73	1	1	6.2	6.2	∞
Phantom and Tissue Parameters									
Phantom Uncertainty (shape and thickness tolerances)	E.3.1	4	R	1.73	1	1	2.3	2.3	∞
Liquid Conductivity – Deviation from target values	E.3.2	5	R	1.73	0.64	0.43	1.8	1.2	∞
Liquid Conductivity – Measurement uncertainty	E.3.3	10	N	1	0.64	0.43	6.4	4.3	5
Liquid Permittivity – Deviation from target values	E.3.2	5	R	1.73	0.6	0.49	1.7	1.4	∞
Liquid Permittivity – Measurement uncertainty	E.3.3	5	N	1	0.6	0.49	3.0	2.5	5
Combined standard Uncertainty			RSS				13.3	12.1	154
Expanded Uncertainty (95% CONFIDENCE LEVEL)			k=2				26.5	24.28	

Estimated total measurement uncertainty for the DASY4 measurement system was ±13.3. The extended uncertainty (K = 2) was assessed to be ±26.5 based on 95% confidence level. The uncertainty is not added to the measurement result. The uncertainty due to device power drift (up to 10.7%) was factored into the final SAR values.

Table 11: Uncertainty Budget for DASY4 Version V4.1 Build 47 - Validation

a	b	c	d	e= f(d,k)	f	g	h=cxf/e	i=cxg/e	k
Uncertainty Component	Sec.	Tol. (6%)	Prob. Dist.	Div.	C_i (1g)	C_i (10g)	1g u_i (6%)	10g u_i (6%)	v_i
Measurement System									
Probe Calibration (k=1) (standard calibration)	E.2.1	4.4	N	1	1	1	4.4	4.4	∞
Axial Isotropy	E.2.2	4.7	R	1.73	1	1	2.7	2.7	∞
Hemispherical Isotropy	E.2.2	0	R	1.73	1	1	0.0	0.0	∞
Boundary Effect	E.2.3	8.3	R	1.73	1	1	4.8	4.8	∞
Linearity	E.2.4	4.7	R	1.73	1	1	2.7	2.7	∞
System Detection Limits	E.2.5	1	R	1.73	1	1	0.6	0.6	∞
Readout Electronics	E.2.6	1	N	1	1	1	1.0	1.0	∞
Response Time	E.2.7	0	R	1.73	1	1	0.0	0.0	∞
Integration Time	E.2.8	0	R	1.73	1	1	0.0	0.0	∞
RF Ambient Conditions	E.6.1	0.05	R	1.73	1	1	0.0	0.0	∞
Probe Positioner Mechanical Tolerance	E.6.2	0.4	R	1.73	1	1	0.2	0.2	∞
Probe Positioning with respect to Phantom Shell	E.6.3	2.9	R	1.73	1	1	1.7	1.7	∞
Extrapolation, interpolation and Integration Algorithms for Max. SAR Evaluation	E.5	3.9	R	1.73	1	1	2.3	2.3	∞
Test Sample Related									
Dipole axis to liquid		1	R	1.73	1	1	0.6	0.6	∞
Input power and SAR drift measurement		4.7	R	1.73	1	1	2.7	2.7	∞
Phantom and Tissue Parameters									
Phantom Uncertainty (shape and thickness tolerances)	E.3.1	4	R	1.73	1	1	2.3	2.3	∞
Liquid Conductivity – Deviation from target values	E.3.2	5	R	1.73	0.6	0.43	1.7	1.2	∞
Liquid Conductivity – Measurement uncertainty	E.3.3	10	N	1.73	0.6	0.43	3.5	2.5	5
Liquid Permittivity – Deviation from target values	E.3.2	5	R	1.73	0.6	0.49	1.7	1.4	∞
Liquid Permittivity – Measurement uncertainty	E.3.3	5	N	1.73	0.6	0.49	1.7	1.4	5
Combined standard Uncertainty			RSS				±10.0	±9.5	154
Expanded Uncertainty (95% CONFIDENCE LEVEL)			k=2				±20.0	±19.1	

Estimated total measurement uncertainty for the DASY4 measurement system was ±10.0%. The extended uncertainty (K = 2) was assessed to be ±20.0% based on 95% confidence level. The uncertainty is not added to the Validation measurement result.

6.0 EQUIPMENT LIST AND CALIBRATION DETAILS

Table 12: SPEAG DASY4 Version 4.0 Build 51

Equipment Type	Manufacturer	Model Number	Serial Number	Calibration Due	Used For this Test?
Robot - Six Axes	Staubli	RX90BL	N/A	Not applicable	Yes
Robot Remote Control	SPEAG	CS7MB	RX90B	Not applicable	Yes
SAM Phantom	SPEAG	N/A	1260	Not applicable	No
SAM Phantom	SPEAG	N/A	1060	Not applicable	No
Flat Phantom	AndreT	10.1	P 10.1	Not Applicable	Yes
Flat Phantom	AndreT	9.1	P 9.1	Not Applicable	No
Flat Phantom	SPEAG	PO1A V4.4e 6mm	1003	Not Applicable	Yes
Data Acquisition Electronics	SPEAG	DAE3 V1	359	16-July-2004	No
Data Acquisition Electronics	SPEAG	DAE3 V1	442	9–Sept - 2004	Yes
Probe E-Field - Dummy	SPEAG	DP1	N/A	Not Applicable	No
Probe E-Field	SPEAG	ET3DV6	1380	18–July-04	No
Probe E-Field	SPEAG	ET3DV6	1377	19-Sept-04	Yes
Antenna Dipole 300 MHz	SPEAG	D300V2	1005	27-Nov-2005	Yes
Antenna Dipole 450 MHz	SPEAG	D450V2	1009	24-Jan-05	No
Antenna Dipole 900 MHz	SPEAG	D900V2	047	27-Aug-2004	No
Antenna Dipole 1800 MHz	SPEAG	D1800V2	242	28-Aug-2004	No
Antenna Dipole 2450 MHz	SPEAG	D2450V2	724	9-Nov-2004	No
RF Amplifier	ENI	603L	N/A	In test	Yes
RF Amplifier	Mini-Circuits	ZHL-42	N/A	In test	No
Synthesized signal generator	Hewlett Packard	ESG-D3000A	GB37420238	In test	Yes
RF Power Meter Dual	Hewlett Packard	437B	3125012786	25-May-04	Yes
RF Power Sensor 0.01 - 18 GHz	Hewlett Packard	8481H	1545A01634	25-May-04	Yes
RF Power Meter Dual	Hewlett Packard	435A	1733A05847	*Not Required	Yes
RF Power Sensor	Hewlett Packard	8482A	2349A10114	*Not Required	Yes
Network Analyser	Hewlett Packard	8714B	GB3510035	13-June-04	Yes
Dual Directional Coupler	Hewlett Packard	778D	1144 04700	In test	Yes

*Used as a reference only

7.0 SAR TEST METHOD

7.1 Description of the Test Positions (Face Frontal and Belt Clip)

SAR measurements were performed in the “Face Frontal” and “Belt Clip” positions. Both the “Face Frontal” and “Belt Clip” positions were measured in the flat section of the AndreT 10.1 phantom.
See Appendix A for photos of test positions.

7.1.1 “Face Frontal Position”

The SAR evaluation was performed in the flat section of the AndreT phantom. The device was placed 25mm from the phantom, this position is equivalent to the device placed in front of the nose. The supporting hand was not used.

7.1.2 “Belt Clip” Position

The device was tested in the (2.00 mm) AndreT flat phantom for the “Belt Clip” position. A belt clip maintained a distance of approximately 7mm between the back of the device and the flat phantom. The Transceiver was placed at the flat section of the phantom and suspended until the Belt Clip touched the phantom. The belt clip was made of plastic and the device was connected with the hands free earpiece/microphone.

7.2 List of All Test Cases (Antenna In/Out, Test Frequencies, User Modes)

The device has a fixed antenna. The SAR was measured at three test channels with the test sample operating at maximum power, as specified in section 2.3.

7.3 FCC RF Exposure Limits for Occupational/ Controlled Exposure

Spatial Peak SAR Limits For:	
Partial-Body:	8.0 mW/g (averaged over any 1g cube of tissue)
Hands, Wrists, Feet and Ankles:	20.0 mW/g (averaged over 10g cube of tissue)

7.4 FCC RF Exposure Limits for Un-controlled/Non–occupational

Spatial Peak SAR Limits For:	
Partial-Body:	1.6 mW/g (averaged over any 1g cube of tissue)
Hands, Wrists, Feet and Ankles:	4.0 mW/g (averaged over 10g cube of tissue)

8.0 SAR MEASUREMENT RESULTS

The SAR values averaged over 1 g tissue mass were determined for the sample device for the Face Frontal and Belt Clip configurations of the phantom.

Table 13: SAR MEASUREMENT RESULTS– Face Frontal and Belt Clip positions

1. Test Position	2. Plot No.	3. Test Channel	4. Test Freq (MHz)	5. Measured 1g SAR Results (mW/g)	6. Measured 1g SAR Results 50% Duty Cycle (mW/g)	7. Measured Drift (dB)
Face Frontal	1	1	150	0.052	0.026	-0.03
	2	2	162	1.110	0.555	-0.24
	3	3	174	0.698	0.349	-0.40
Belt Clip	4	1	150	0.321	0.161	0.10
	5	2	162	2.800	1.400	-0.41
	6	3	174	0.378	0.189	-0.44

Note: The uncertainty of the system (± 26.5%) has not been added to the results.

The FCC SAR limit for Non-occupational exposure is 1.6 m W/g measurement in a 1g cube of tissue.

9.0 COMPLIANCE STATEMENT

The Kirisun Model PT 2208 150 MHz band Handheld Transceiver was found to comply with the FCC SAR requirements.

After extrapolating to a 50% duty cycle the highest SAR level recorded was 1.4 mW/g for a 1g cube. This value was measured in the “Belt Clip” position, and was below the uncontrolled limit of 1.6 mW/g, and also below the controlled limit of 8.0 mW/g. In the case of the uncontrolled use limit, the SAR level was within the band of measurement uncertainty around the limit. In the case of the controlled use limit, the SAR was below the limit, even taking the measurement uncertainty into account.

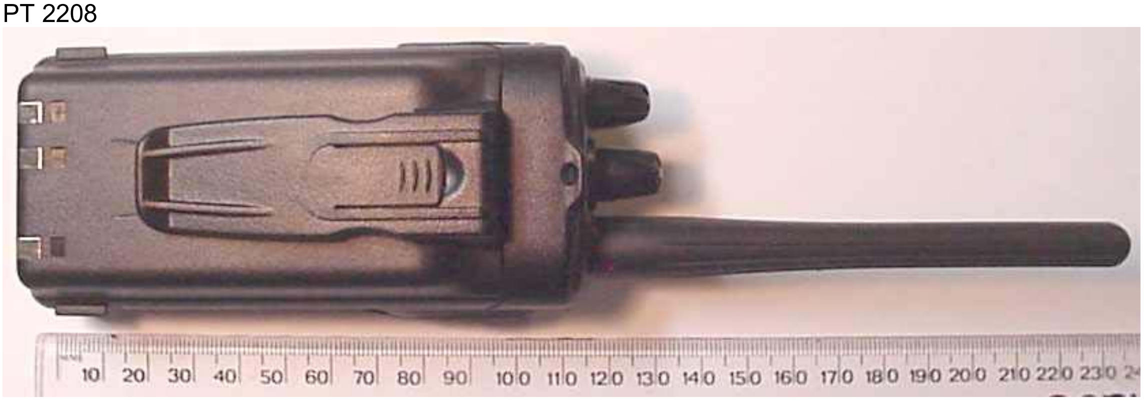
APPENDIX A1
TEST SAMPLE PHOTOGRAPHS

Battery

Battery with the Belt Clip

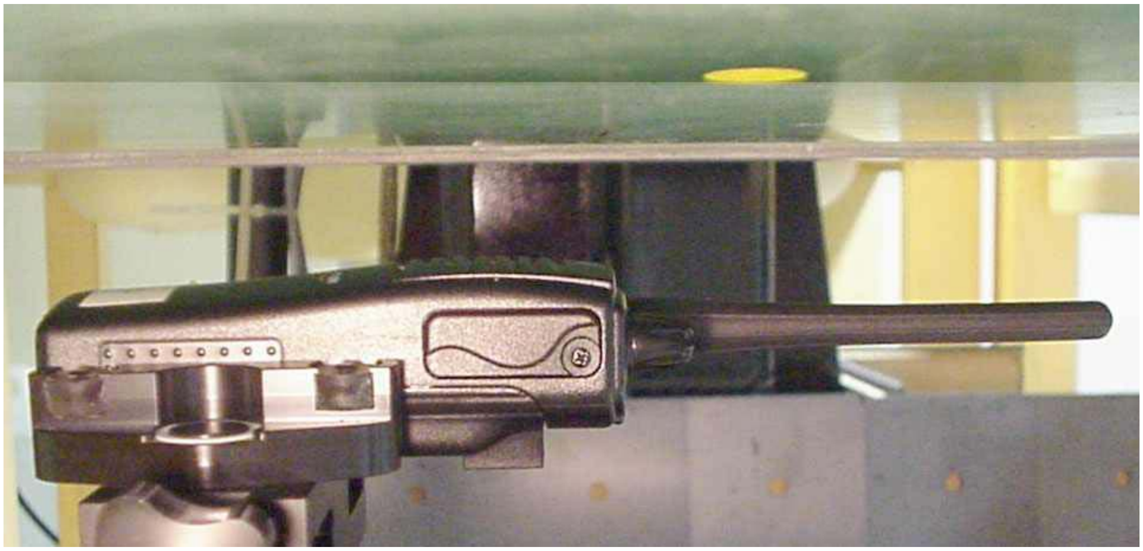
PT 2208

PT 2208

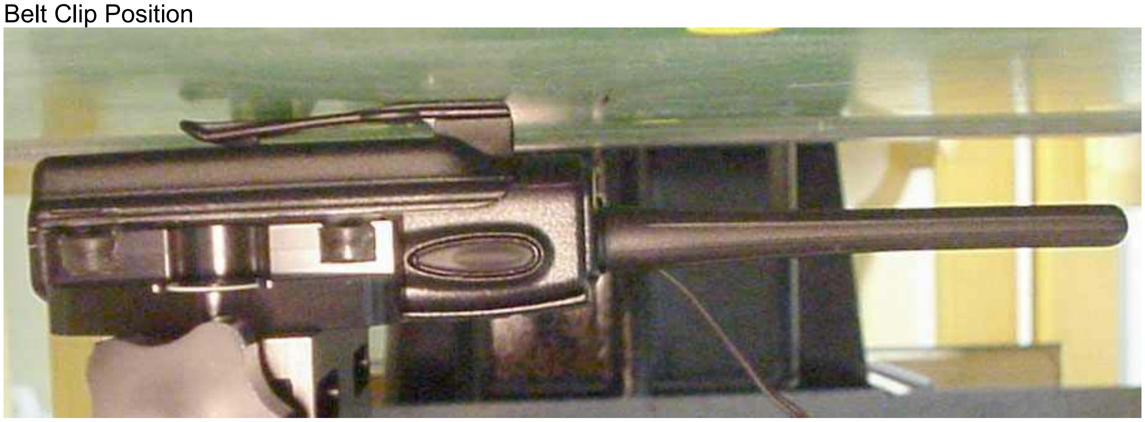


APPENDIX A2
TEST SETUP PHOTOGRAPHS

Face Frontal Position

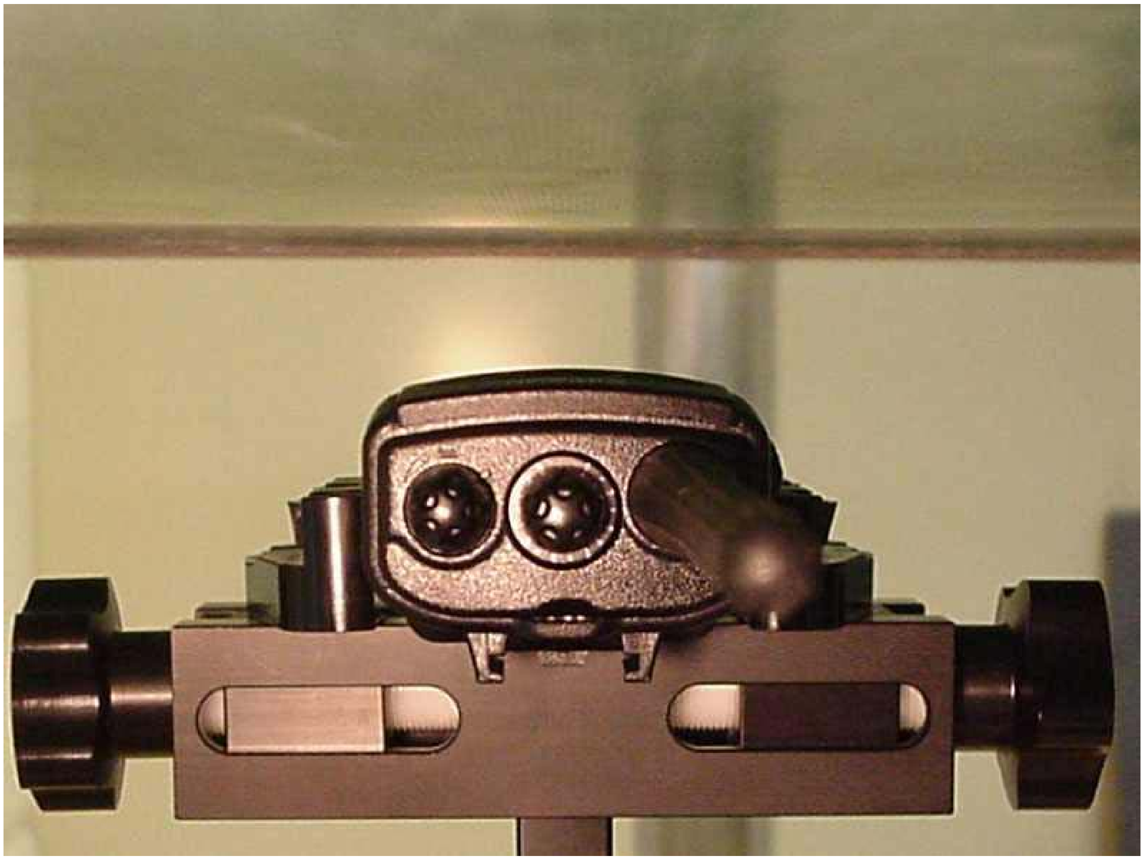


Belt Clip Position

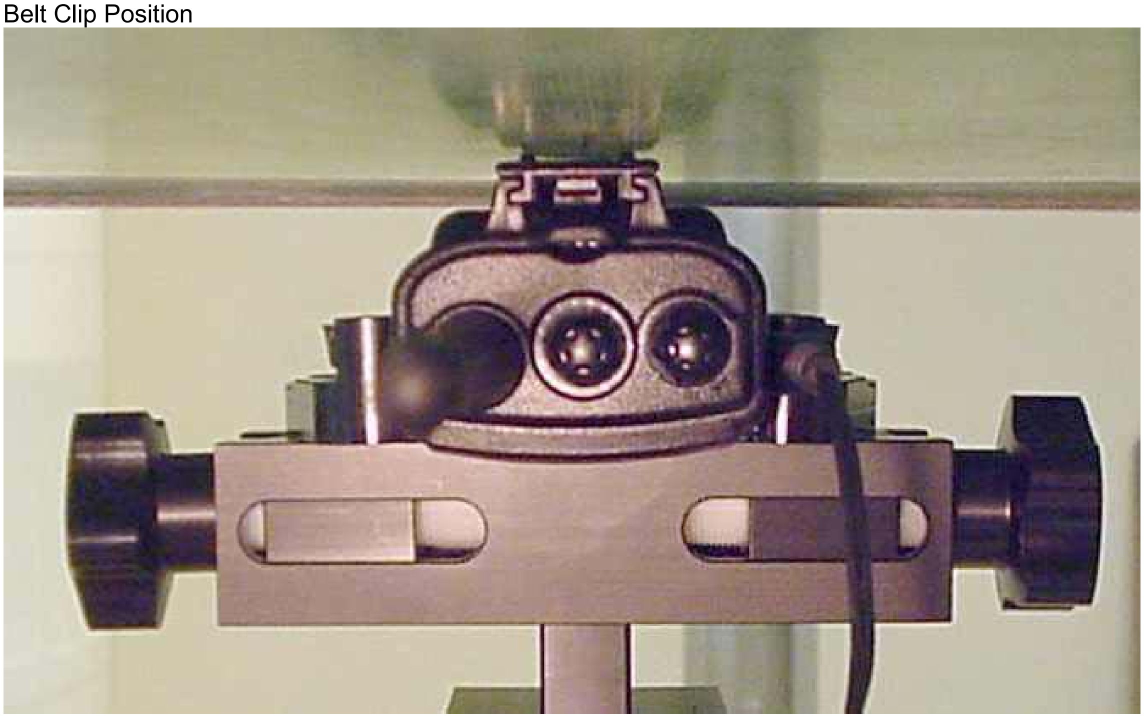


APPENDIX A3
TEST SET UP PHOTOGRAPHS

Face Frontal Position



Belt Clip Position



APPENDIX B
PLOTS OF THE SAR MEASUREMENTS

Plots of the measured SAR distributions inside the phantom are given in this Appendix for all tested configurations. The spatial peak SAR values were assessed with the procedure described in this report.

Table 14: 150MHz Band SAR Measurement Plot Numbers

Plot 1	Face Frontal Position	150 Mhz
Plot 2	Face Frontal Position	162 Mhz
Plot 3	Face Frontal Position	174 Mhz
Plot 4	Belt Clip Position	150 Mhz
Plot 5	Belt Clip Position	162 Mhz
Plot 6	Belt Clip Position	174 Mhz

Table 15: 300MHz Validation Plot Numbers

Plot 7	Validation 300MHz 23-12-03
Plot 8	Validation 300MHz 24-12-03

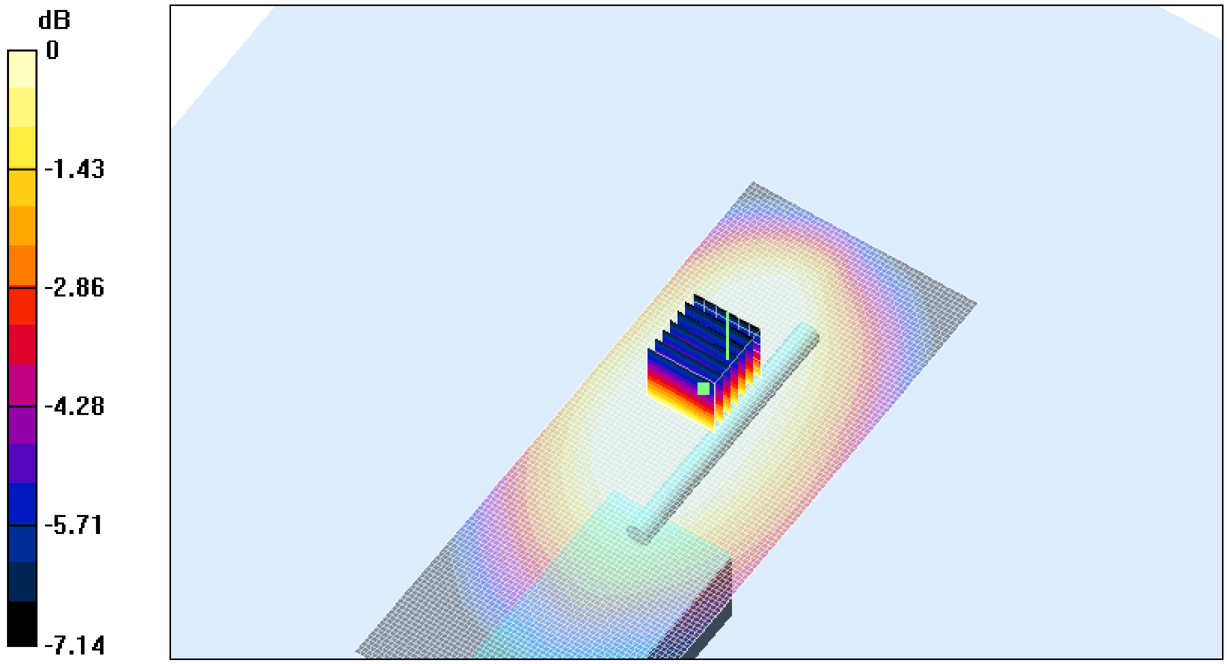
Test Date: 23 December 2003

File Name: Face Position (DAE442 Probe1377) 23-12-03.da4
DUT: Kirisun Handheld Transceiver; Type: PT-2208; Serial: 30217838

* Communication System: CW 150 - 174 MHz; Frequency: 150 MHz; Duty Cycle: 1:1
* Medium: FCC 162 MHz Head; (σ = 0.791333 mho/m, ε_r = 51.0933, ρ = 1000 kg/m^3)
- Electronics: DAE3 Sn442; Probe: ET3DV6 - SN1377; ConvF(8.6, 8.6, 8.6)
- Phantom: Flat Phantom 10.1; Serial: P 10.1; Phantom section: Flat 2.2 Section

Channel 1 Test/Area Scan (51x131x1): Measurement grid: dx=20mm, dy=20mm
Reference Value = 11.6 V/m
Power Drift = -3 dB
Maximum value of SAR = 0.067 mW/g

Channel 1 Test/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Peak SAR (extrapolated) = 0.090 W/kg
SAR(1 g) = 0.052 mW/g; SAR(10 g) = 0.038 mW/g
Reference Value = 11.6 V/m
Power Drift = -0.03 dB
Maximum value of SAR = 0.054 mW/g



0 dB = 0.054mW/g

SAR MEASUREMENT PLOT 1

Ambient Temperature	**21.9 Degrees Celsius**
Liquid Temperature	**21.3 Degrees Celsius**
Humidity	**49 %**

Test Date: 23 December 2003

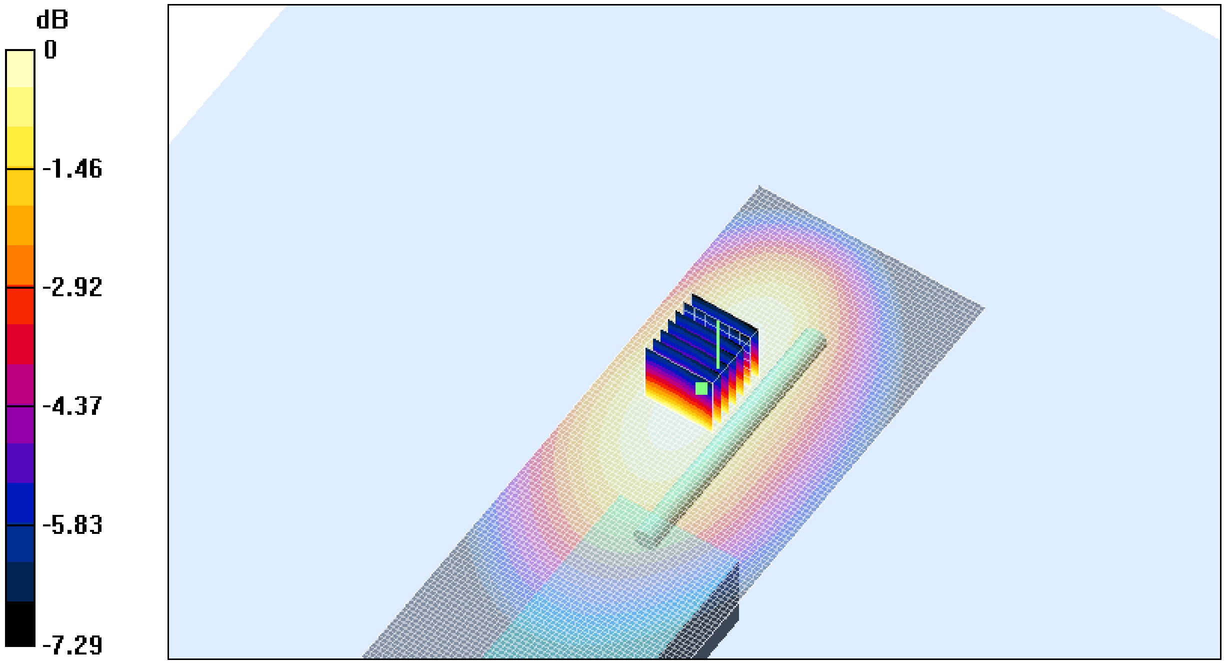
File Name: Face Position (DAE442 Probe1377) 23-12-03.da4
DUT: Kirisun Handheld Transceiver; Type: PT-2208; Serial: 30217838

* Communication System: CW 150 - 174 MHz; Frequency: 162 MHz; Duty Cycle: 1:1
* Medium: FCC 162 MHz Head; (σ = 0.796977 mho/m, ε_r = 50.5165, ρ = 1000 kg/m^3)

- Electronics: DAE3 Sn442; Probe: ET3DV6 - SN1377; ConvF(8.6, 8.6, 8.6)
- Phantom: Flat Phantom 10.1; Serial: P 10.1; Phantom section: Flat 2.2 Section

Channel 2 Test/Area Scan (51x131x1): Measurement grid: dx=20mm, dy=20mm
Reference Value = 36.1 V/m
Power Drift = 0.3 dB
Maximum value of SAR = 1.11 mW/g

Channel 2 Test/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Peak SAR (extrapolated) = 1.83 W/kg
SAR(1 g) = 1.11 mW/g; SAR(10 g) = 0.815 mW/g
Reference Value = 36.1 V/m
Power Drift = -0.24 dB
Maximum value of SAR = 1.16 mW/g



0 dB = 1.16mW/g

SAR MEASUREMENT PLOT 2

Ambient Temperature	**21.9 Degrees Celsius**
Liquid Temperature	**21.3 Degrees Celsius**
Humidity	**49 %**

Test Date: 23 December 2003

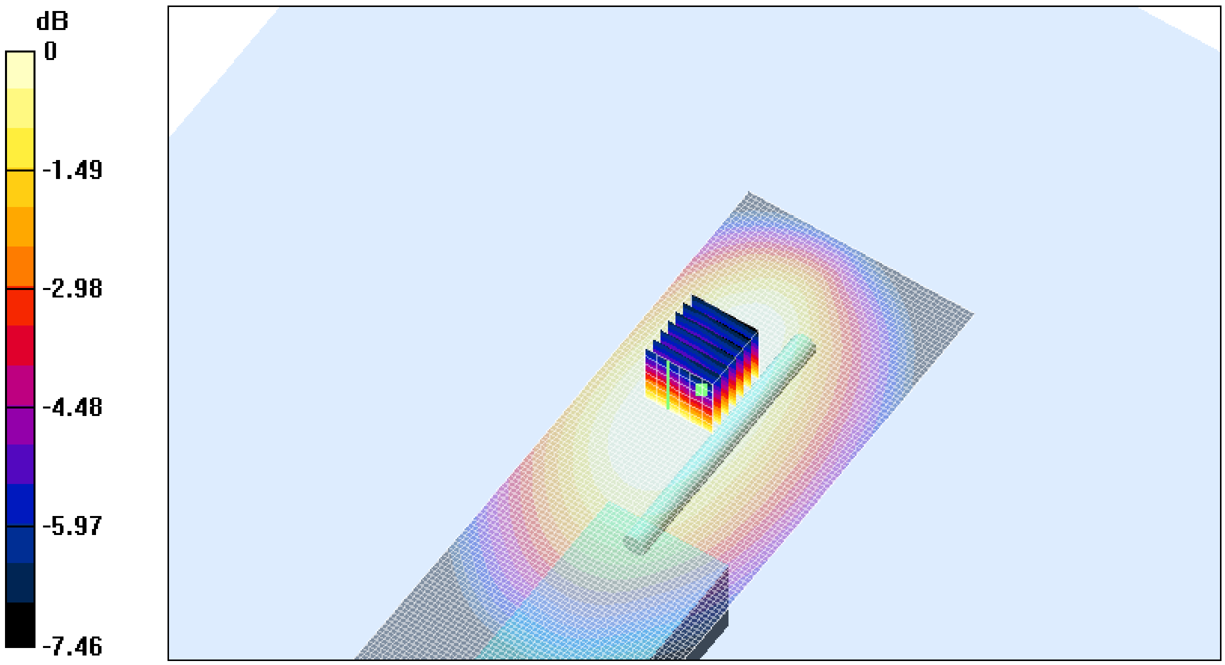
File Name: Face Position (DAE442 Probe1377) 23-12-03.da4

DUT: Kirisun Handheld Transceiver; Type: PT-2208; Serial: 30217838

* Communication System: CW 150 - 174 MHz; Frequency: 174 MHz; Duty Cycle: 1:1
* Medium: FCC 162 MHz Head; (σ = 0.811513 mho/m, ε_r = 49.6138, ρ = 1000 kg/m^3)
- Electronics: DAE3 Sn442; Probe: ET3DV6 - SN1377; ConvF(8.6, 8.6, 8.6)
- Phantom: Flat Phantom 10.1; Serial: P 10.1; Phantom section: Flat 2.2 Section

Channel 3 Test/Area Scan (51x131x1): Measurement grid: dx=20mm, dy=20mm
Reference Value = 34.6 V/m
Power Drift = -1 dB
Maximum value of SAR = 0.787 mW/g

Channel 3 Test/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Peak SAR (extrapolated) = 1.12 W/kg
SAR(1 g) = 0.698 mW/g; SAR(10 g) = 0.514 mW/g
Reference Value = 34.6 V/m
Power Drift = -0.4 dB
Maximum value of SAR = 0.720 mW/g



0 dB = 0.720mW/g

SAR MEASUREMENT PLOT 3

Ambient Temperature	**21.9 Degrees Celsius**
Liquid Temperature	**21.3 Degrees Celsius**
Humidity	**49 %**

Test Date: 24 December 2003

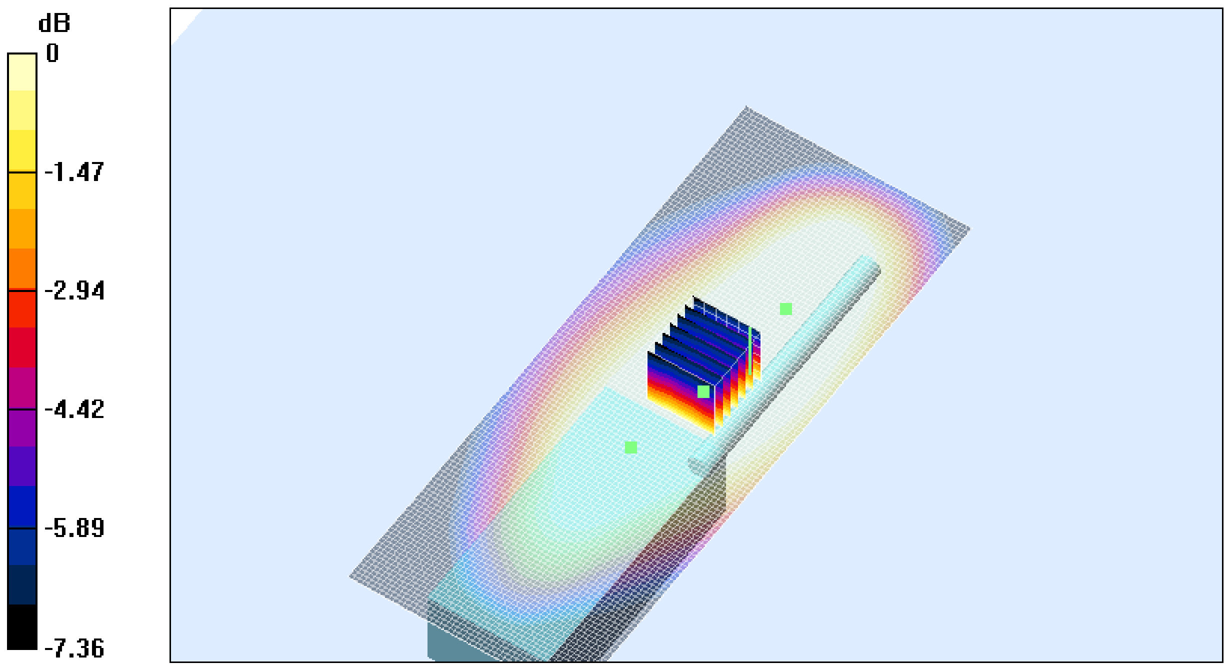
File Name: Belt Clip Position (DAE442 Probe1377) 24-12-03.da4

DUT: Kirisun Handheld Transceiver; Type: PT-2208; Serial: 30217838

* Communication System: CW 150 - 174 MHz; Frequency: 150 MHz; Duty Cycle: 1:1
* Medium: FCC 162 MHz Body; (σ = 0.819373 mho/m, ε_r = 62.14, ρ = 1000 kg/m^3)
- Electronics: DAE3 Sn442; Probe: ET3DV6 - SN1377; ConvF(8.1, 8.1, 8.1)
- Phantom: Flat Phantom 10.1; Serial: P 10.1; Phantom section: Flat 2.2 Section

Channel 1 Test/Area Scan (51x131x1): Measurement grid: dx=20mm, dy=20mm
Reference Value = 26.9 V/m
Power Drift = -3 dB
Maximum value of SAR = 0.507 mW/g

Channel 1 Test/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Peak SAR (extrapolated) = 0.503 W/kg
SAR(1 g) = 0.321 mW/g; SAR(10 g) = 0.235 mW/g
Reference Value = 26.9 V/m
Power Drift = 0.1 dB
Maximum value of SAR = 0.334 mW/g



0 dB = 0.334mW/g

SAR MEASUREMENT PLOT 4

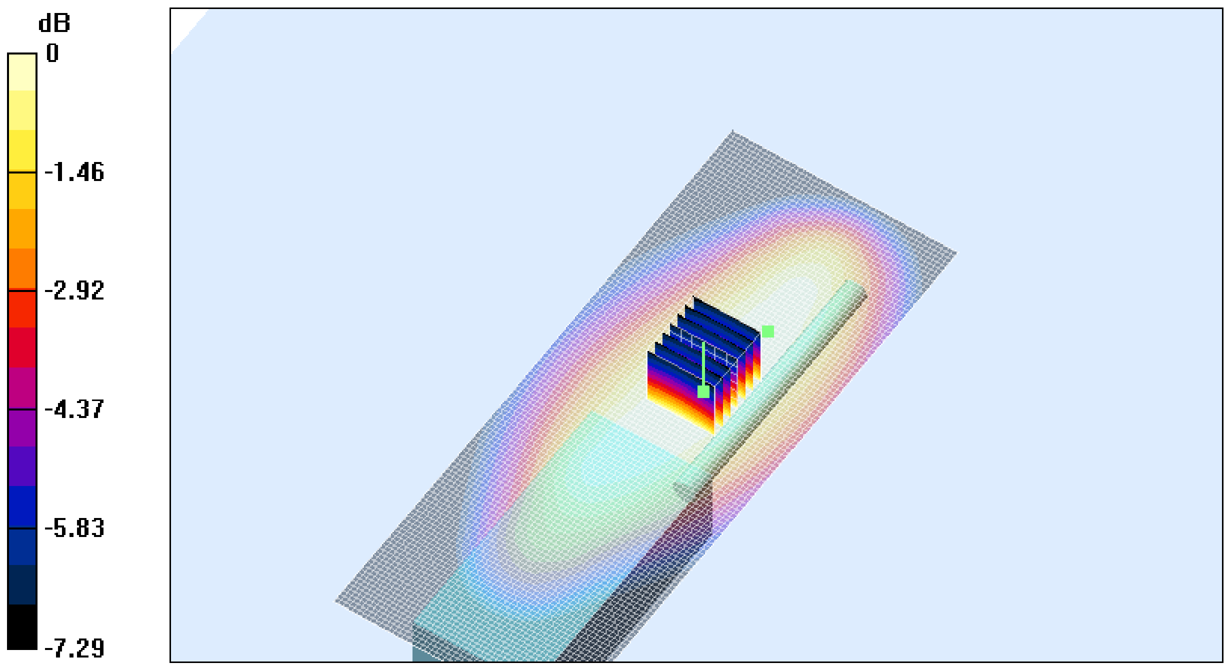
Ambient Temperature	**21.8 Degrees Celsius**
Liquid Temperature	**21.2 Degrees Celsius**
Humidity	**64 %**

Test Date: 24 December 2003
File Name: Belt Clip Position (DAE442 Probe1377) 24-12-03.da4
DUT: Kirisun Handheld Transceiver; Type: PT-2208; Serial: 30217838

* Communication System: CW 150 - 174 MHz; Frequency: 162 MHz; Duty Cycle: 1:1
* Medium: FCC 162 MHz Body; (σ = 0.824653 mho/m, ε_r = 62.3425, ρ = 1000 kg/m^3)
- Electronics: DAE3 Sn442; Probe: ET3DV6 - SN1377; ConvF(8.1, 8.1, 8.1)
- Phantom: Flat Phantom 10.1; Serial: P 10.1; Phantom section: Flat 2.2 Section

Channel 2 Test/Area Scan (51x131x1): Measurement grid: dx=20mm, dy=20mm
Reference Value = 62.2 V/m
Power Drift = -0.8 dB
Maximum value of SAR = 3 mW/g

Channel 2 Test/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Peak SAR (extrapolated) = 4.37 W/kg
SAR(1 g) = 2.8 mW/g; SAR(10 g) = 2.03 mW/g
Reference Value = 62.2 V/m
Power Drift = -0.41 dB
Maximum value of SAR = 2.91 mW/g



0 dB = 2.91mW/g

SAR MEASUREMENT PLOT 5

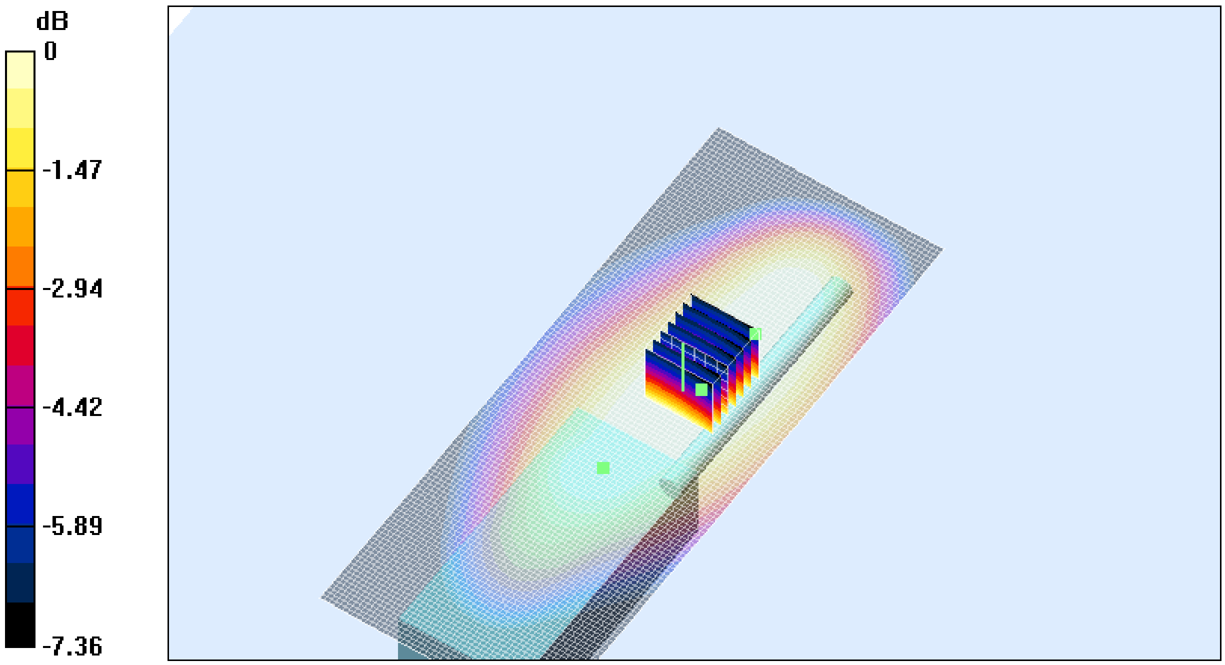
Ambient Temperature	**21.8 Degrees Celsius**
Liquid Temperature	**21.2 Degrees Celsius**
Humidity	**64 %**

Test Date: 24 December 2003
File Name: Belt Clip Position (DAE442 Probe1377) 24-12-03.da4
DUT: Kirisun Handheld Transceiver; Type: PT-2208; Serial: 30217838

* Communication System: CW 150 - 174 MHz; Frequency: 174 MHz; Duty Cycle: 1:1
* Medium: FCC 162 MHz Body; (σ = 0.835534 mho/m, ε_r = 61.0049, ρ = 1000 kg/m^3)
- Electronics: DAE3 Sn442; Probe: ET3DV6 - SN1377; ConvF(8.1, 8.1, 8.1)
- Phantom: Flat Phantom 10.1; Serial: P 10.1; Phantom section: Flat 2.2 Section

Channel 3 Test/Area Scan (51x131x1): Measurement grid: dx=20mm, dy=20mm
Reference Value = 26.1 V/m
Power Drift = -2 dB
Maximum value of SAR = 0.449 mW/g

Channel 3 Test/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Peak SAR (extrapolated) = 0.590 W/kg
SAR(1 g) = 0.378 mW/g; SAR(10 g) = 0.275 mW/g
Reference Value = 26.1 V/m
Power Drift = -0.44 dB
Maximum value of SAR = 0.392 mW/g



0 dB = 0.392mW/g

SAR MEASUREMENT PLOT 6

Ambient Temperature	**21.8 Degrees Celsius**
Liquid Temperature	**21.2 Degrees Celsius**
Humidity	**64 %**

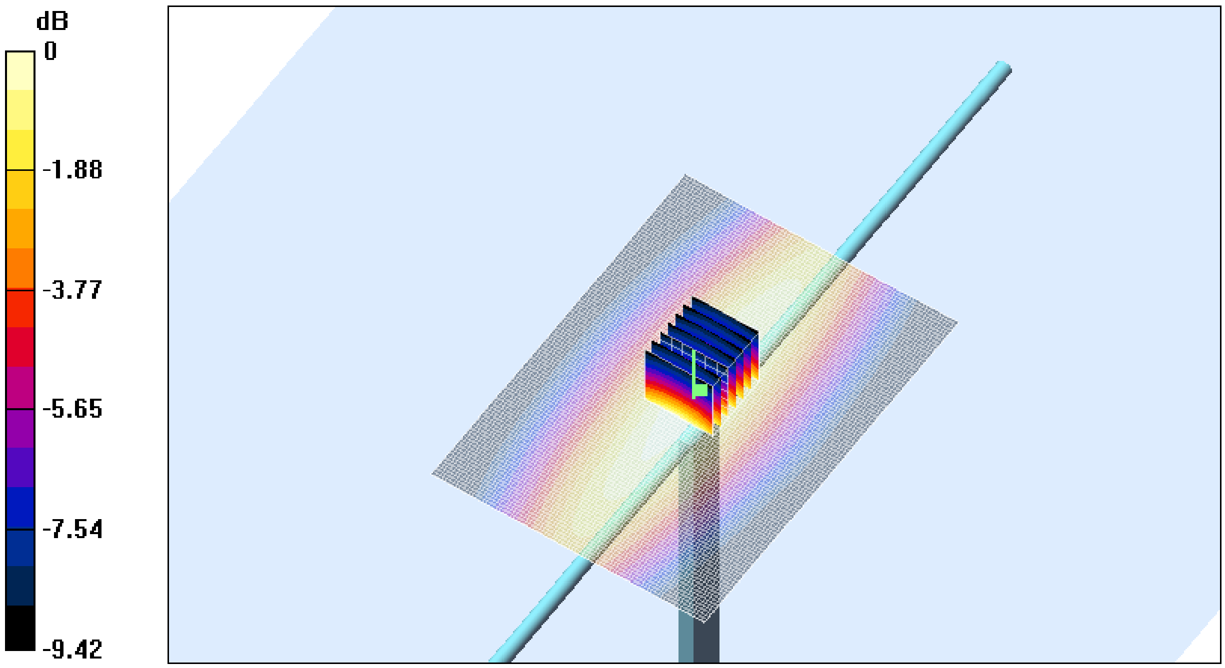
Test Date: 23 December 2003

File Name: Validation 300 MHz Head (DAE442 Probe1377) 23-12-03.da4
DUT: Dipole 300 MHz; Type: D300V2; Serial: 1005

* Communication System: CW 300 MHz; Frequency: 300 MHz; Duty Cycle: 1:1
* Medium: FCC 300MHz Head; (σ = 0.908594 mho/m, ε_r = 45.9843, ρ = 1000 kg/m^3)
- Electronics: DAE3 Sn442; Probe: ET3DV6 - SN1377; ConvF(7.8, 7.8, 7.8)
- Phantom: Flat Phantom 4.4; Serial: P 4.4; Phantom section: Flat Section

Channel 1Test/Area Scan (81x111x1): Measurement grid: dx=15mm, dy=15mm
Reference Value = 29.3 V/m
Power Drift = 0.0 dB
Maximum value of SAR = 1.31 mW/g

Channel 1Test/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Peak SAR (extrapolated) = 2.17 W/kg
SAR(1 g) = 1.26 mW/g; SAR(10 g) = 0.824 mW/g
Reference Value = 29.3 V/m
Power Drift = 0.0 dB
Maximum value of SAR = 1.33 mW/g 10.1% !!!!



0 dB = 1.33mW/g

SAR MEASUREMENT PLOT 7

Ambient Temperature	**21.9 Degrees Celsius**
Liquid Temperature	**21.3 Degrees Celsius**
Humidity	**49 %**

Test Date: 24 December 2003

File Name: Validation 300 MHz Head (DAE442 Probe1377) 24-12-03.da4

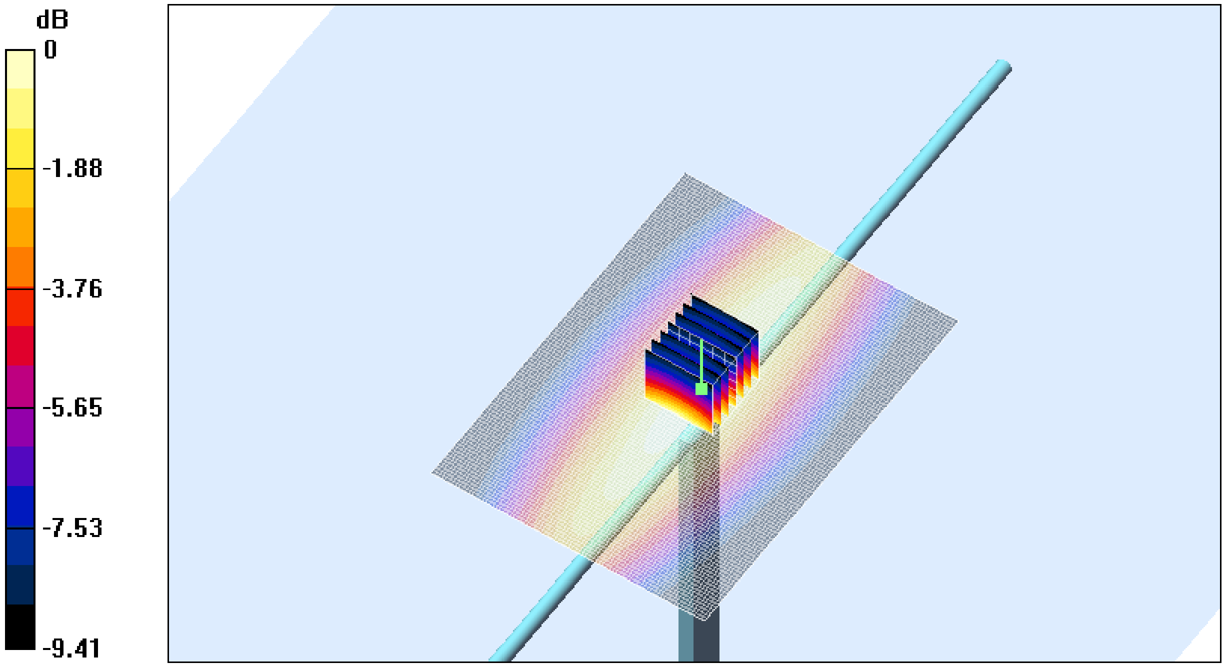
DUT: Dipole 300 MHz; Type: D300V2; Serial: 1005

* Communication System: CW 300 MHz; Frequency: 300 MHz; Duty Cycle: 1:1
* Medium: FCC 300MHz Head; (σ = 0.888917 mho/m, ε_r = 44.6944, ρ = 1000 kg/m^3)

- Electronics: DAE3 Sn442; Probe: ET3DV6 - SN1377; ConvF(7.8, 7.8, 7.8)
- Phantom: Flat Phantom 4.4; Serial: P 4.4; Phantom section: Flat Section

Channel 1Test/Area Scan (81x111x1): Measurement grid: dx=15mm, dy=15mm
Reference Value = 29.5 V/m
Power Drift = -0.0 dB
Maximum value of SAR = 1.28 mW/g

Channel 1Test/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Peak SAR (extrapolated) = 2.09 W/kg
SAR(1 g) = 1.23 mW/g; SAR(10 g) = 0.809 mW/g
Reference Value = 29.5 V/m
Power Drift = -0.0 dB
Maximum value of SAR = 1.31 mW/g



0 dB = 1.31mW/g

SAR MEASUREMENT PLOT 8

Ambient Temperature	**21.8 Degrees Celsius**
Liquid Temperature	**21.2 Degrees Celsius**
Humidity	**64 %**

APPENDIX C
SAR Testing Equipment Calibration Certificate Attachments

Calibration Certificate Attachments

1. E-Field Probe Calibration Sheet	10 Pages
2. E-Field Additional Factors	2 Pages
3. 300MHz Dipole Calibration information	6 pages