SAR Test Report

Product Name ： Tablet PC
Model No. ： T200, Sahara i series,
SlimBook 110 series,
RMTAB3-01, Slate

Applicant ： AMTEK SYSTEM CO., LTD
Address ： 14F-11, NO.79, Sec.1, Hsin Tai Wu Rd., His Chih City, Taipei Hsien, Taiwan

Date of Receipt ： 2004/07/29
Issued Date ： 2004/08/03
Report No. ： 048L028SF

Test Report Certification

Issued Date: 2004/08/03
Report No.:048L028

QuieTek

Product Name	：	Tablet PC
Applicant	：	AMTEK SYSTEM CO., LTD
Address	：	14F-11, NO.79, Sec.1, Hsin Tai Wu Rd., His Chih City, Taipei Hsien, Taiwan
Manufacturer	：	AMTEK SYSTEM CO., LTD
Model No.	：	T200, Sahara i series, SlimBook 110 series, RMTAB3-01, Slate
Trade Name	：	iTablet, Sahara Slate PC, PaceBlade, RM, Slate
Measurement Standard	：	FCC Oet65 Supplement C
Measurement Procedure	：	FCC Oet65 Supplement C
Test Result	：	Max. SAR Measurement (1g) 802.11b: 0.46 W/kg 802.11g: 0.43 W/kg
Application Type		Certification

The test results relate only to the samples tested.
The test report shall not be reproduced except in full without the written approval of QuieTek Corporation.

Documented By ： Grace Lin
(Grace Lin)

Tested By ： Shine Hsu
(Shine Hsu)

Approved By ： Gene Chang
(Gene Chang)

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1. General Information

1.1 EUT Description

Product Name	Tablet PC
Trade Name	iTablet, Sahara Slate PC, PaceBlade, RM, Slate
Model No.	T200, Sahara i series, SlimBook 110 series, RMTAB3-01, Slate
FCC ID	R4RAIR2200BG
TX Frequency	2412MHz ~ 2462MHz
Number of Channel	11
Type of Modulation	DSSS/OFDM
Antenna Type	Connector
Device Category	Portable
RF Exposure Environment	Uncontrolled
Transfer Rate	802.11b: 11Mbps 802.11g: 54Mbps
Max. Output Power (Conducted)	802.11b: 22.4dBm 802.11g: 19.3dBm

Note:

1. The EUT is a Table PC.
2. The variation of model is for different OEM

Trade Name	Model Name	Trade Name	Model Name
iTablet	T200	Sahara Slate PC	Sahara i series
PaceBlade	SlimBook 110 series	RM	RMTAB3-01
Slate	Slate		

1.2 Test Environment

Ambient conditions in the laboratory:

Items	Required	Actual
Temperature (°C)	18-25	23.0
Humidity (%RH)	30-70	55

2. SAR Measurement System

2.1 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 odeling to provide aplatform which is repeatable with minimum uncertainty.

2.1.1 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.

2.1.2 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 $10mm^2$ 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.

2.1.3 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/m^3 is used to represent the head and body tissue density and not the phantom liquid density, in order to be consistent with the definition of the liquid dielectric properties, i.e. the side length of the 1 g cube is 10mm, with the side length of the 10 g cube 21,5mm.

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

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

2.1.4 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:

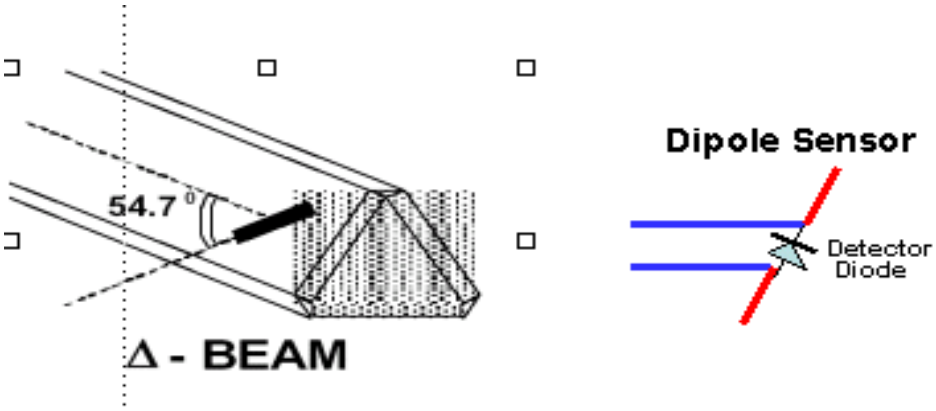
$$f_3(x,y,z) = A\frac{a^2}{\frac{a^2}{4} + x'^2 + y'^2}\cdot\left(e^{-\frac{2z}{a}} + \frac{a^2}{2(a+2z)^2}\right)$$

2.2 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. A number of methods is used for calibrating probes, and these are outlined in the table below:

Calibration Frequency	Air Calibration	Tissue Calibration
2450MHz	Waveguide	Temperature

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.

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

2.2.1 Isotropic E-Field Probe Specification

Calibration in Air	Frequency Dependent Below 2GHz Calibration in air performed in a TEM Cell Above 2GHz Calibration in air performed in waveguide
Sensitivity	0.70 μV/(V/m)^2 to 0.85 μV/(V/m)^2
Dynamic Range	0.0005 W/kg to 100W/kg
Isotropic Response	Better than 0.2dB
Diode Compression point (DCP)	Calibration for Specific Frequency
Probe Tip Radius	< 5mm
Sensor Offset	1.56 (+/- 0.02mm)
Probe Length	290mm
Video Bandwidth	@ 500 Hz: 1dB @1.02 KHz: 3dB
Boundary Effect	Less than 2% for distance greater than 2.4mm
Spatial Resolution	Diameter less than 5mm Compliant with Standards

2.3 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

2.4 Daq-Paq (Analog to Digital Electronics)

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

ADC	12 Bit
Amplifier Range	20mV to 200mV and 150mV to 800mV
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

2.5 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	0.05mm
Controller Type	Single phase Pentium based C500C
Robot Reach	710mm
Communication	RS232 and LAN compatible

2.6 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.

2.7 Universal Device Positioner

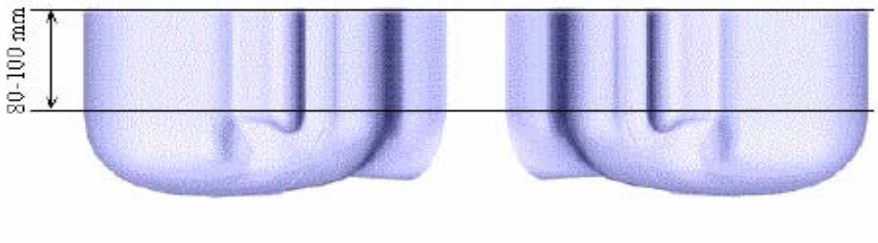
The universal device positioner allow complete freedom of movement of the EUT. Developed to hold a EUT in a free-space scenario any additional loading attributable to the material used in the construction of the positioner has been eliminated. Repeatability has been enhanced through the linear scales 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.

2.8 Phantom Types

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

2.8.1 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.



2.8.2 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.

3. Tissue Simulating Liquid

3.1 The composition of the tissue simulating liquid

INGREDIENT (% Weight)	900MHz Head	1800MHz Head	1900MHz Head	2450MHz Body
Water	--	--	--	73.2
Salt	--	--	--	0.04
Sugar	--	--	--	x
HEC	--	--	--	x
Preventol	--	--	--	x
DGBE	--	--	--	26.7

3.2 Tissue Calibration Result

The dielectric parameters of the liquids were verified prior to the SAR evaluation using APREL Dielectric Probe Kit and Anritsu MS4623B Vector Network Analyzer

Liquid	Frequency	Parameters	Target Value	Measured Value	Deviation [%]	Limit [%]
Body	2450MHz	ε_r	52.7	51.57	-2.1	± 5
		σ	1.95	2.00	+2.5	± 5

3.3 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.

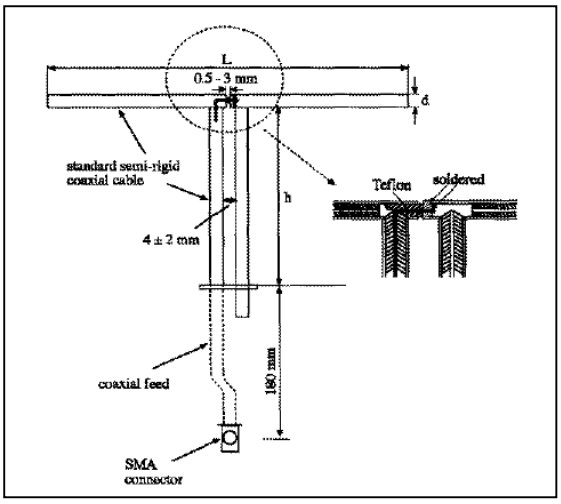
Target Frequency	Head		Body	
(MHz)	ε_r	σ (S/m)	ε_r	σ (S/m)
150	52.3	0.76	61.9	0.80
300	45.3	0.87	58.2	0.92
450	43.5	0.87	56.7	0.94
835	41.5	0.90	55.2	0.97
900	41.5	0.97	55.0	1.05
915	41.5	0.98	55.0	1.06
1450	40.5	1.20	54.0	1.30
1610	40.3	1.29	53.8	1.40
1800 – 2000	40.0	1.40	53.3	1.52
2450	39.2	1.80	52.7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

(ε_r = relative permittivity, σ = conductivity and ρ = 1000 kg/m^3)

4. SAR Measurement Procedure

4.1 SAR System Validation

4.1.1 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	L (mm)	h (mm)	d (mm)
2450MHz	53.5	30.4	3.6

4.1.2 Validation Result

Validation Kit: ASL-D-2450-S-2

Frequency	Power	Measured Value [mW/g]		Target Value [mW/g]		Deviation [%]		Limit [%]
		1g	10g	1g	10g	1g	10g	
2450 MHz Head	1W	52.12	24.88	52.4	24.0	-0.5	+3.6	± 5

4.2 SAR Measurement Procedure

The ALSAS-10U calculates SAR using the following equation,

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

σ: represents the simulated tissue conductivity

ρ: represents the tissue density

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 $1mm^2$)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 $1mm^3$).

5. 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 “Uncontrolled Environments” limits. These limits apply to a location which is deemed as “Uncontrolled 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 General Population/Uncontrolled Exposure (W/kg)

Type Exposure	**Uncontrolled Environment Limit**
Spatial Peak SAR (1g cube tissue for brain or body)	**1.60 W/kg**
Spatial Average SAR (whole body)	**0.08 W/kg**
Spatial Peak SAR (10g for hands, feet, ankles and wrist)	**4.00 W/kg**

6. Test Equipment List

Instrument	Manufacturer	Model No.	Serial No.	Last Calibration
Data Acquisition Package	Aprel	ALS-DAQ-PAQ-1	QTK-313	Jun. 2004
Boundary Detection Sensor System	Aprel	ALS-PMDPS-1	QTK-314	Jun. 2004
Aprel Laboratories Probe	Aprel	ALS-E020	225	Jun. 2004
Aprel Laboratories Probe	Aprel	ALS-E020	226	Jun. 2004
Aprel Reference Dipole 2450MHz	Aprel	ALS-D-2450-S-2	QTK-319	Jun. 2004
Dielectric Probe Kit	Aprel	ALS-PR-DIEL	QTK-296	N/A
Universal Work Station	Aprel	ALS-UWS	QTK-326	N/A
Device Holder 2.0	Aprel	ALS-H-E-SET-2	QTK-294	N/A
Left Ear SAM Phantom	Aprel	ALS-P-SAM-L	QTK-292	N/A
Right Ear SAM Phantom	Aprel	ALS-P-SAM-R	QTK-288	N/A
Universal Phantom	Aprel	ALS-P-UP-1	QTK-246	N/A
Aprel Dipole Spacer	Aprel	ALS-DS-U	QTK-295	N/A
SAR Software	Aprel	ALSAS-10	Ver. 1.1.14	N/A
CRS C500C Controller	Thermo	ALS-C500	RCF0404433	N/A
CRF F3 Robot	Thermo	ALS-F3	RAF0412222	N/A
Power Amplifier	Mini-Circuit	ZHL-42	D051404-20	N/A
Directional Coupler	Agilent	87300C	3239A01864	N/A
Vector Network	Anritsu	MS4623B	992801	Mar 2004
Signal Generator	Anritsu	MG3692A	042319	Jun. 2004
Power Meter	Anritsu	ML2487A	6K00001447	Jan. 2004
Wide Bandwidth Sensor	Anritsu	MA2491	030677	Nov. 2003

Note: All equipment upon which need to be calibrated are with calibration period of 1 year.

7. Measurement Uncertainty

Exposure Assessment Measurement Uncertainty

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	$\sqrt{3}$	$(1-cp)^{1/2}$	$(1-cp)^{1/2}$	1.5	1.5
Hemispherical Isotropy	10.9	rectangular	$\sqrt{3}$	$\sqrt{cp}$	$\sqrt{cp}$	4.4	4.4
Boundary Effect	1.0	rectangular	$\sqrt{3}$	1	1	0.6	0.6
Linearity	4.7	rectangular	$\sqrt{3}$	1	1	2.7	2.7
Detection Limit	1.0	rectangular	$\sqrt{3}$	1	1	0.6	0.6
Readout Electronics	1.0	normal	1	1	1	1.0	1.0
Response Time	0.8	rectangular	$\sqrt{3}$	1	1	0.5	0.5
Integration Time	1.7	rectangular	$\sqrt{3}$	1	1	1.0	1.0
RF Ambient Condition	3.0	rectangular	$\sqrt{3}$	1	1	1.7	1.7
Probe Positioner Mech.	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	2.1	2.1
Extrapolation and Integration	3.7	rectangular	$\sqrt{3}$	1	1	2.1	2.1
Test Sample Positioning	4.0	normal	1	1	1	4.0	4.0
Device Holder Uncertainty	2.0	normal	1	1	1	2.0	2.0
Drift of Output Power	0.1	rectangular	$\sqrt{3}$	1	1	0.0	0.0
Phantom and Setup							
Phantom Uncertainty(shape & thickness tolerance)	3.4	rectangular	$\sqrt{3}$	1	1	2.0	2.0
Liquid Conductivity(target)	13.0	rectangular	$\sqrt{3}$	0.7	0.5	5.3	3.8
Liquid Conductivity(meas.)	0.2	rectangular	$\sqrt{3}$	0.7	0.5	0.1	0.1
Liquid Permittivity(target)	2.0	rectangular	$\sqrt{3}$	0.6	0.5	0.8	0.6
Liquid Permittivity(meas.)	3.9	rectangular	$\sqrt{3}$	0.6	0.5	1.4	1.1
Combined Uncertainty		RSS				10.3	9.5
Combined Uncertainty (coverage factor=2)		Normal(k=2)				20.6	19.1

8. Test Results

8.1 SAR Test Results Summary

SAR MEASUREMENT						
Ambient Temperature (°C) : 23.0				Relative Humidity (%): 55		
Liquid Temperature (°C) : 22.1				Depth of Liquid (cm):>15		
Product: Tablet PC						
Test Mode: 802.11b						
Test Position Head	Antenna Position	Frequency		Conducted Power (dBm)	**SAR** 1g (W/kg)	Limit (W/kg)
		Channel	MHz			
Rear side	Internal	1	2412	22.4	0.40	1.6
Rear side	Internal	6	2437	21.2	0.31	1.6
Rear side	Internal	11	2462	21.3	0.30	1.6
Bottom face	Internal	1	2412	22.4	0.41	1.6
Bottom face	Internal	6	2437	21.2	0.46	1.6
Bottom face	Internal	11	2462	21.3	0.36	1.6
LCD panel	Internal	1	2412	22.4	0.35	1.6
LCD panel	Internal	6	2437	21.2	0.33	1.6
LCD panel	Internal	11	2462	21.3	0.31	1.6

SAR MEASUREMENT

Ambient Temperature (°C) : 23.0	Relative Humidity (%): 55
Liquid Temperature (°C) : 22.1	Depth of Liquid (cm):>15
Product: Tablet PC	
Test Mode: 802.11g	

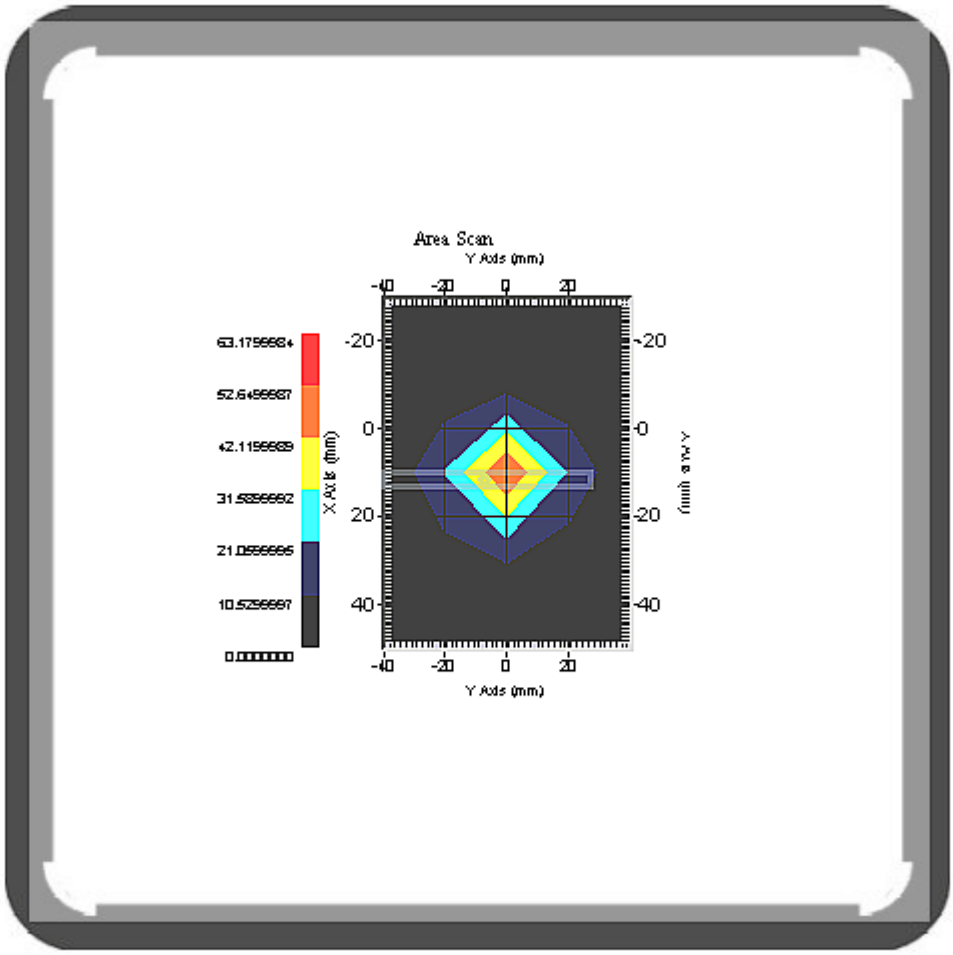
Test Position Head	Antenna Position	Frequency		Conducted Power (dBm)	**SAR** 1g (W/kg)	Limit (W/kg)
		Channel	MHz			
Rear side	Internal	1	2412	19.0	0.30	1.6
Rear side	Internal	6	2437	19.1	0.28	1.6
Rear side	Internal	11	2462	19.3	0.27	1.6
Bottom face	Internal	1	2412	19.0	0.41	1.6
Bottom face	Internal	6	2437	19.1	0.35	1.6
Bottom face	Internal	11	2462	19.3	0.43	1.6
LCD panel	Internal	1	2412	19.0	0.31	1.6
LCD panel	Internal	6	2437	19.1	0.39	1.6
LCD panel	Internal	11	2462	19.3	0.39	1.6

8.2 SAR System Validation Data

SAR Test Report

Type : Uni-Phantom

Channel : Dipole - 2450



1 gram SAR value : 52.12 W/kg

10 gram SAR value : 24.88 W/kg

Area Scan Peak SAR : 52.66

Zoom Scan Peak SAR : 113.00

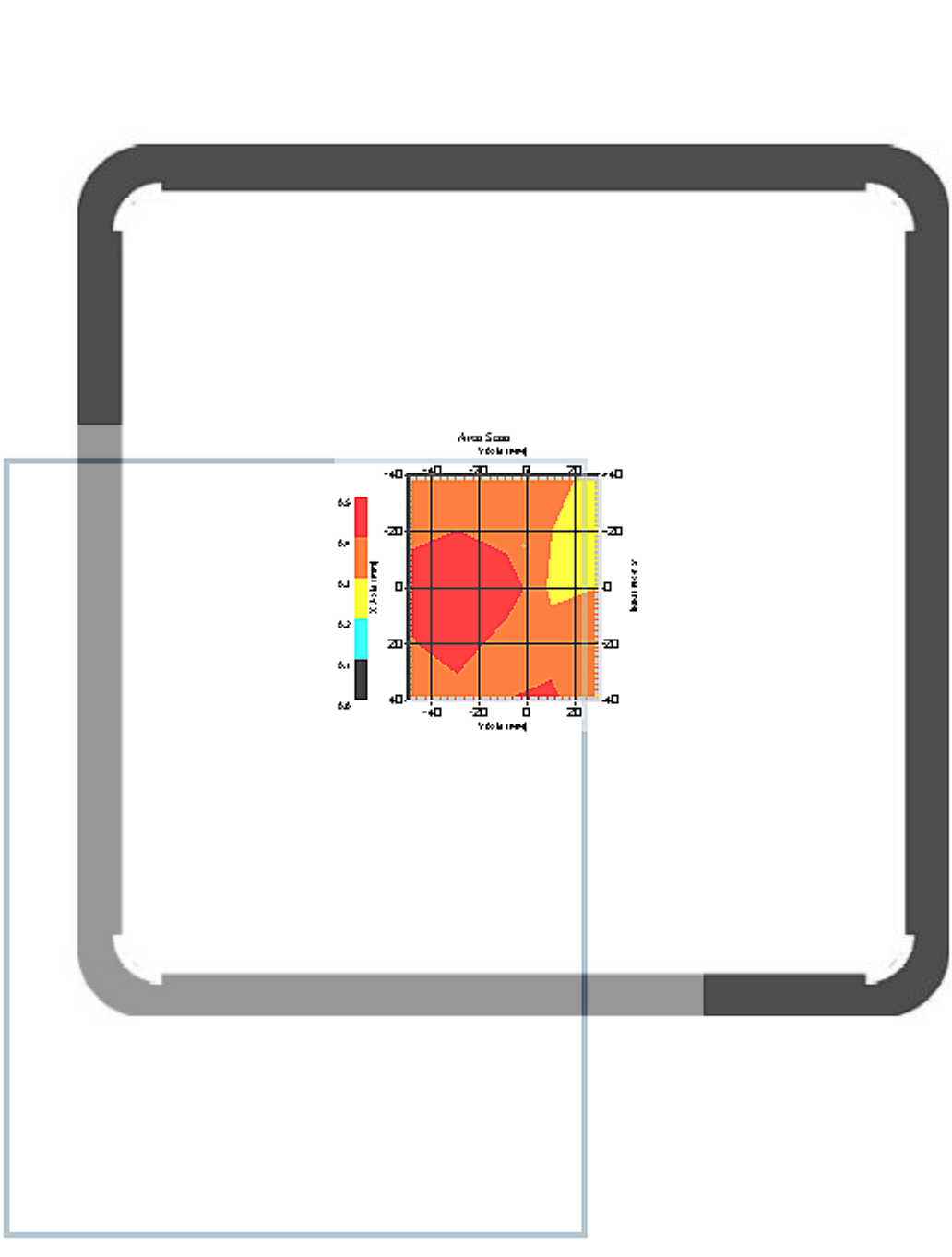
8.3 SAR Measurement Data

SAR Test Report (802.11b)

Type : Uni-Phantom

DUT Position : Touch(Bottom face)

Channel : Low - 1



1 gram SAR value : 0.41 W/kg

10 gram SAR value : 0.35 W/kg

Area Scan Peak SAR : 0.48

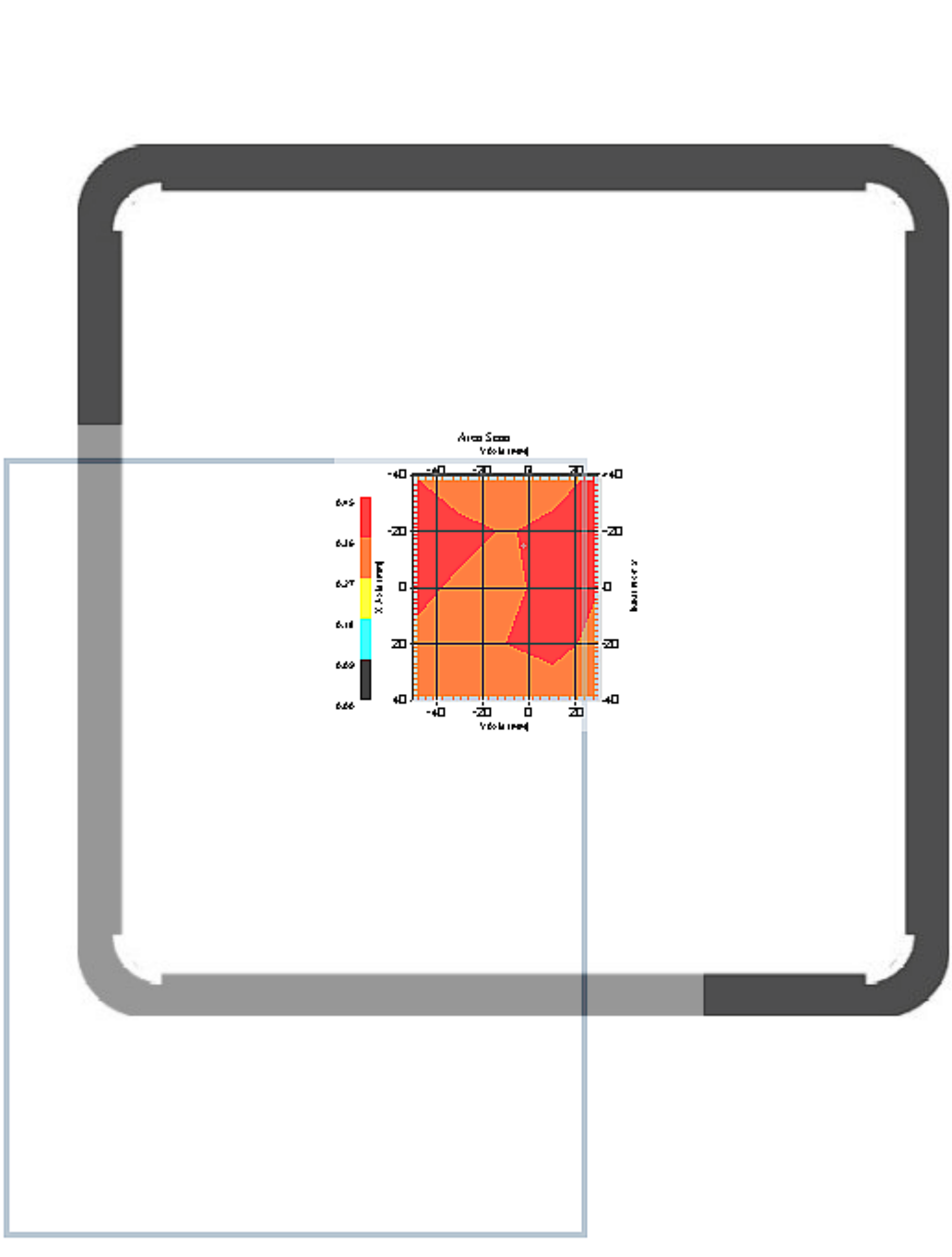
Zoom Scan Peak SAR : 1.01

SAR Test Report (802.11b)

Type : Uni-Phantom

DUT Position : Touch(Bottom face)

Channel : Mid - 6



1 gram SAR value : 0.46 W/kg

10 gram SAR value : 0.40 W/kg

Area Scan Peak SAR : 0.44

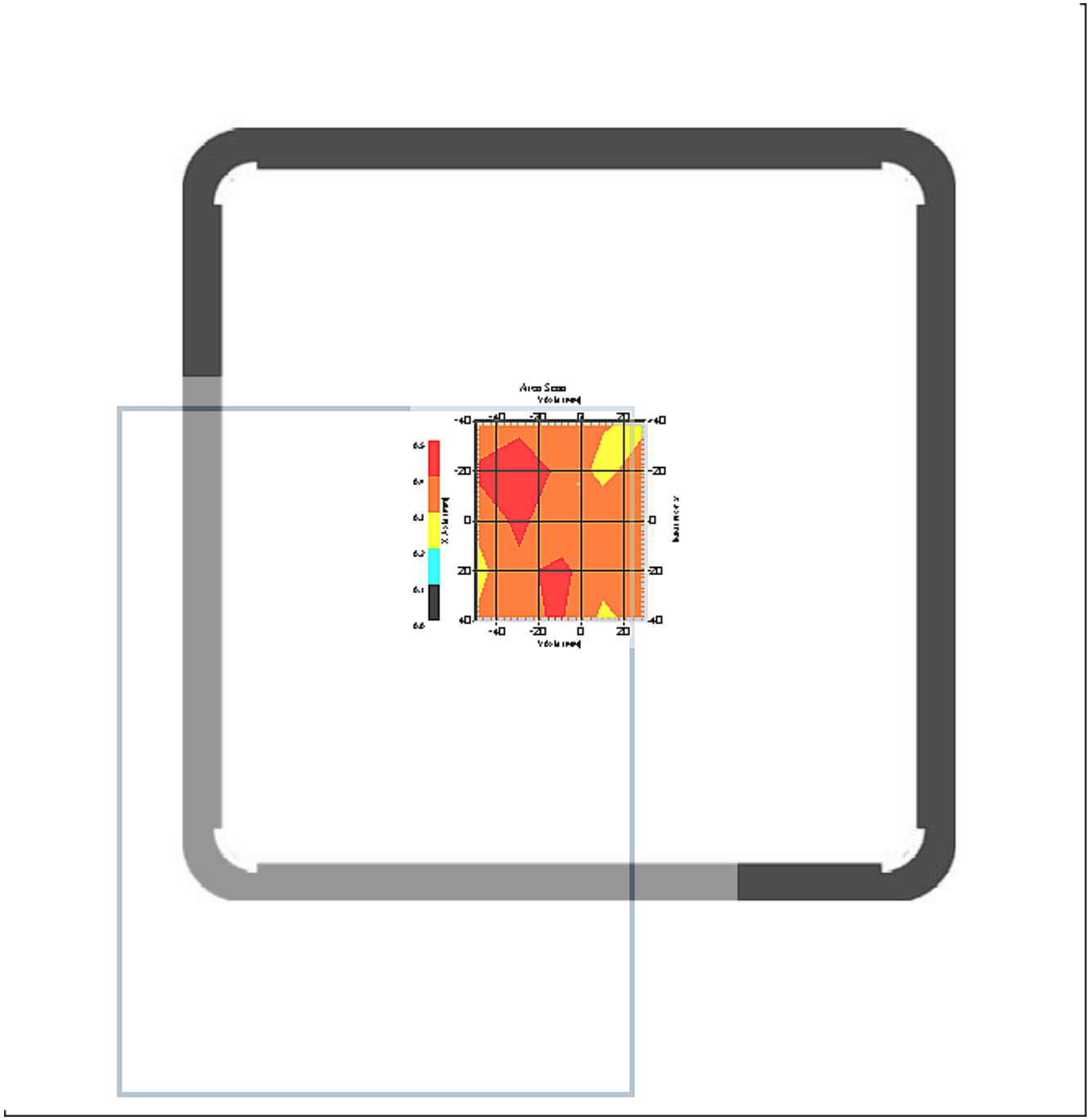
Zoom Scan Peak SAR : 1.00

SAR Test Report (802.11b)

Type : Uni-Phantom

DUT Position : Touch(Bottom face)

Channel : High - 11



1 gram SAR value : 0.36 W/kg

10 gram SAR value : 0.33 W/kg

Area Scan Peak SAR : 0.49

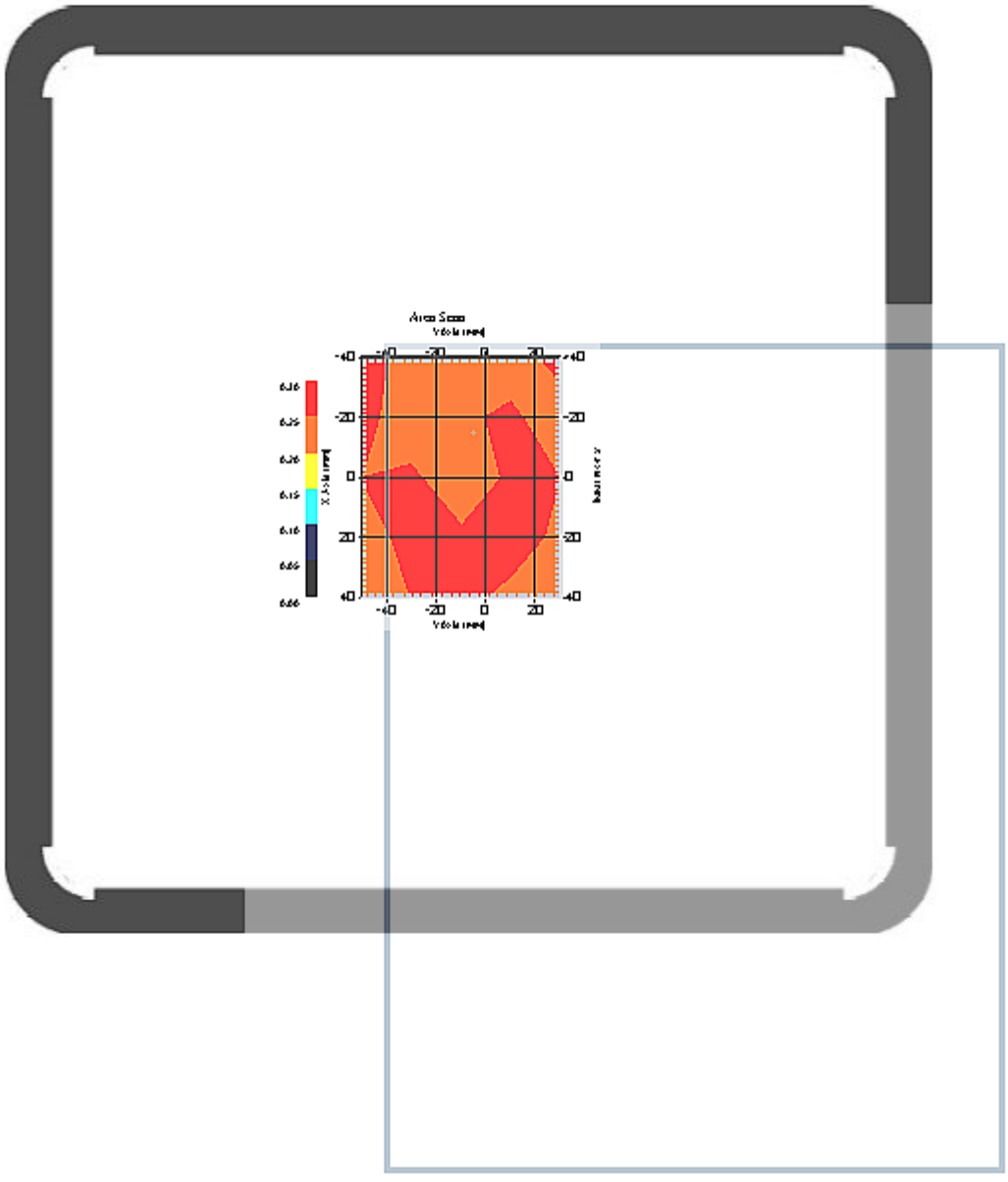
Zoom Scan Peak SAR : 0.87

SAR Test Report (802.11b)

Type : Uni-Phantom

DUT Position : Touch(LCD panel)

Channel : Low - 1



1 gram SAR value : 0.35 W/kg

10 gram SAR value : 0.30 W/kg

Area Scan Peak SAR : 0.27

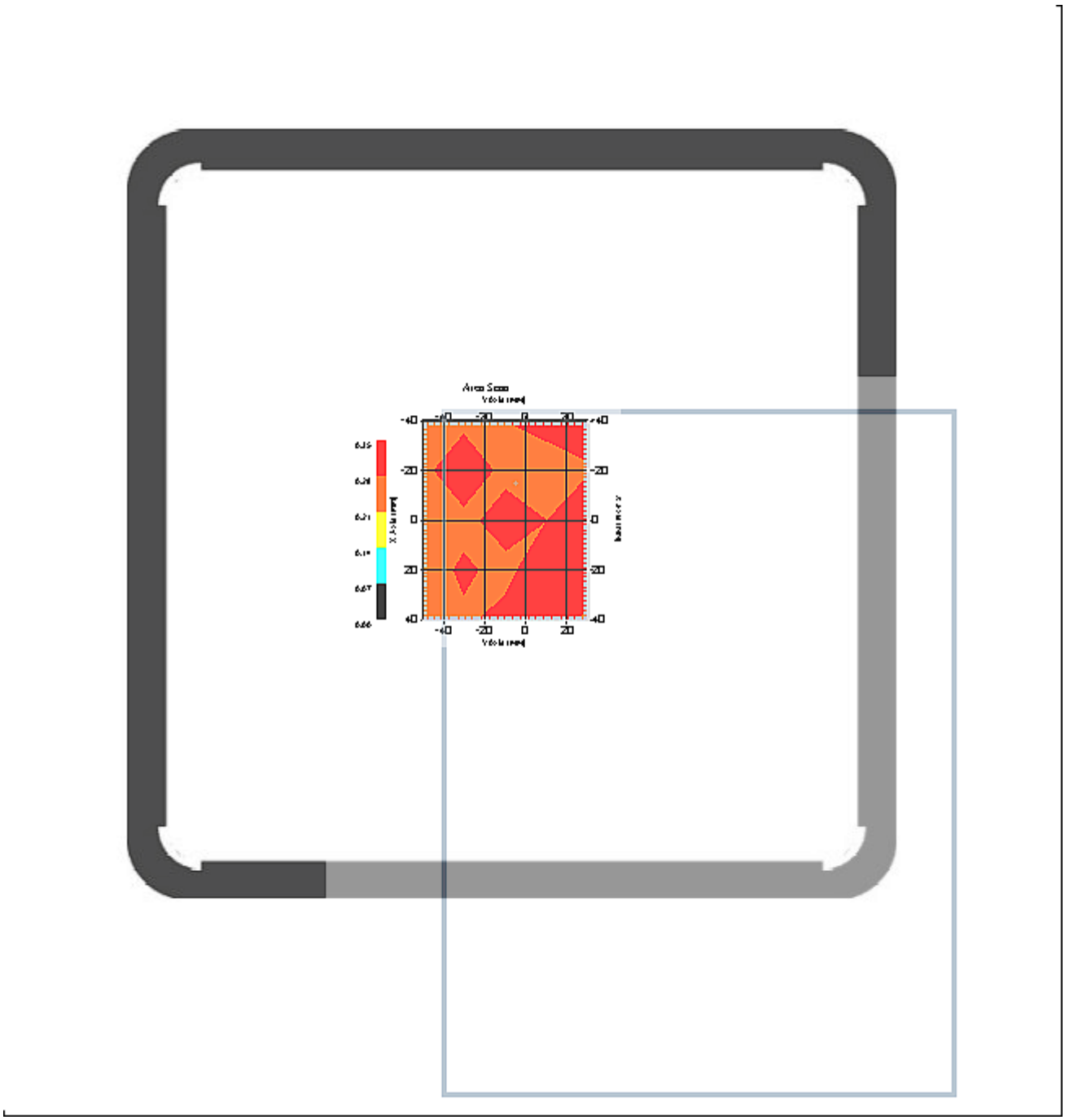
Zoom Scan Peak SAR : 0.72

SAR Test Report (802.11b)

Type : Uni-Phantom

DUT Position : Touch(LCD panel)

Channel : Mid - 6



1 gram SAR value : 0.33 W/kg

10 gram SAR value : 0.30 W/kg

Area Scan Peak SAR : 0.34

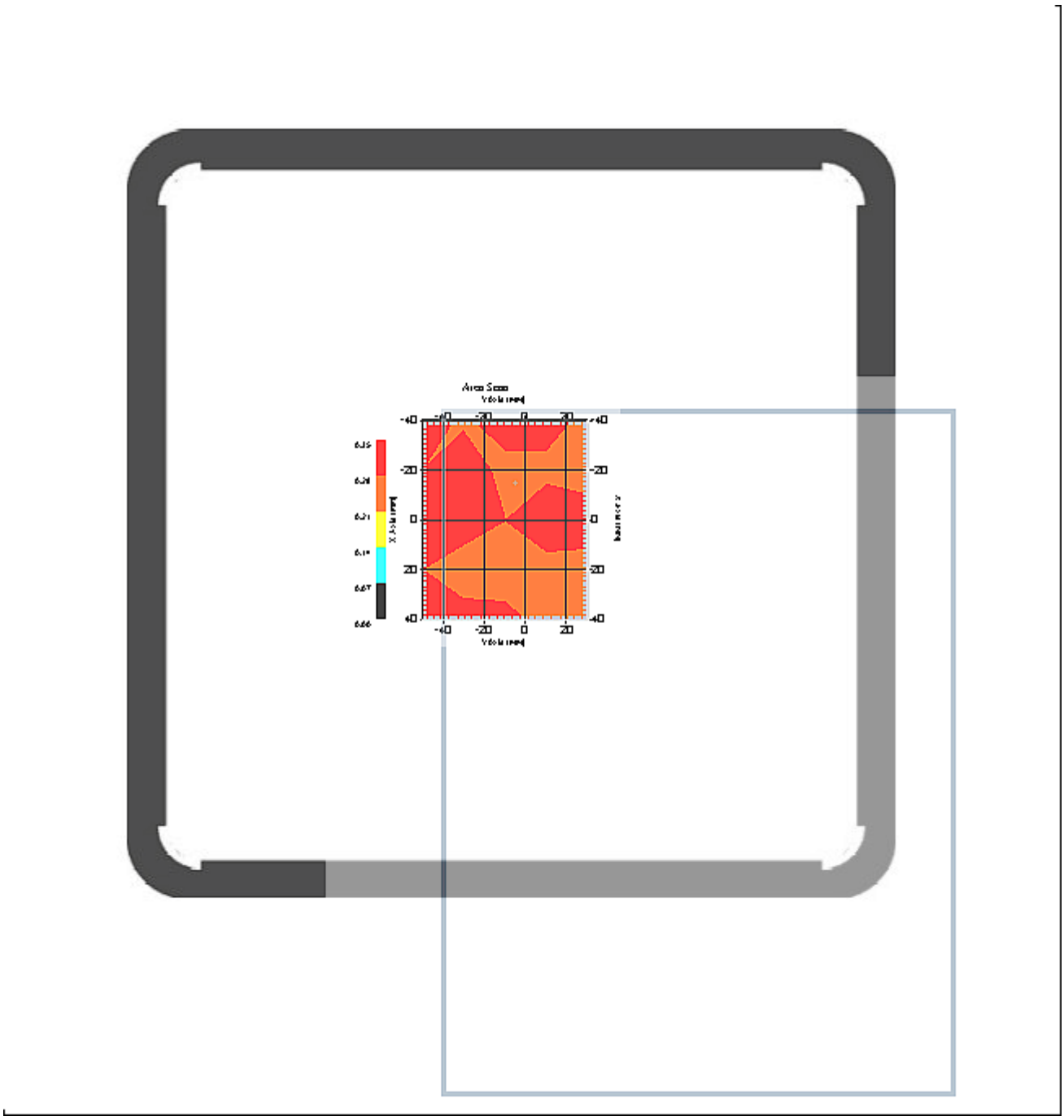
Zoom Scan Peak SAR : 0.72

SAR Test Report (802.11b)

Type : Uni-Phantom

DUT Position : Touch(LCD panel)

Channel : High - 11



1 gram SAR value : 0.31 W/kg

10 gram SAR value : 0.28 W/kg

Area Scan Peak SAR : 0.33

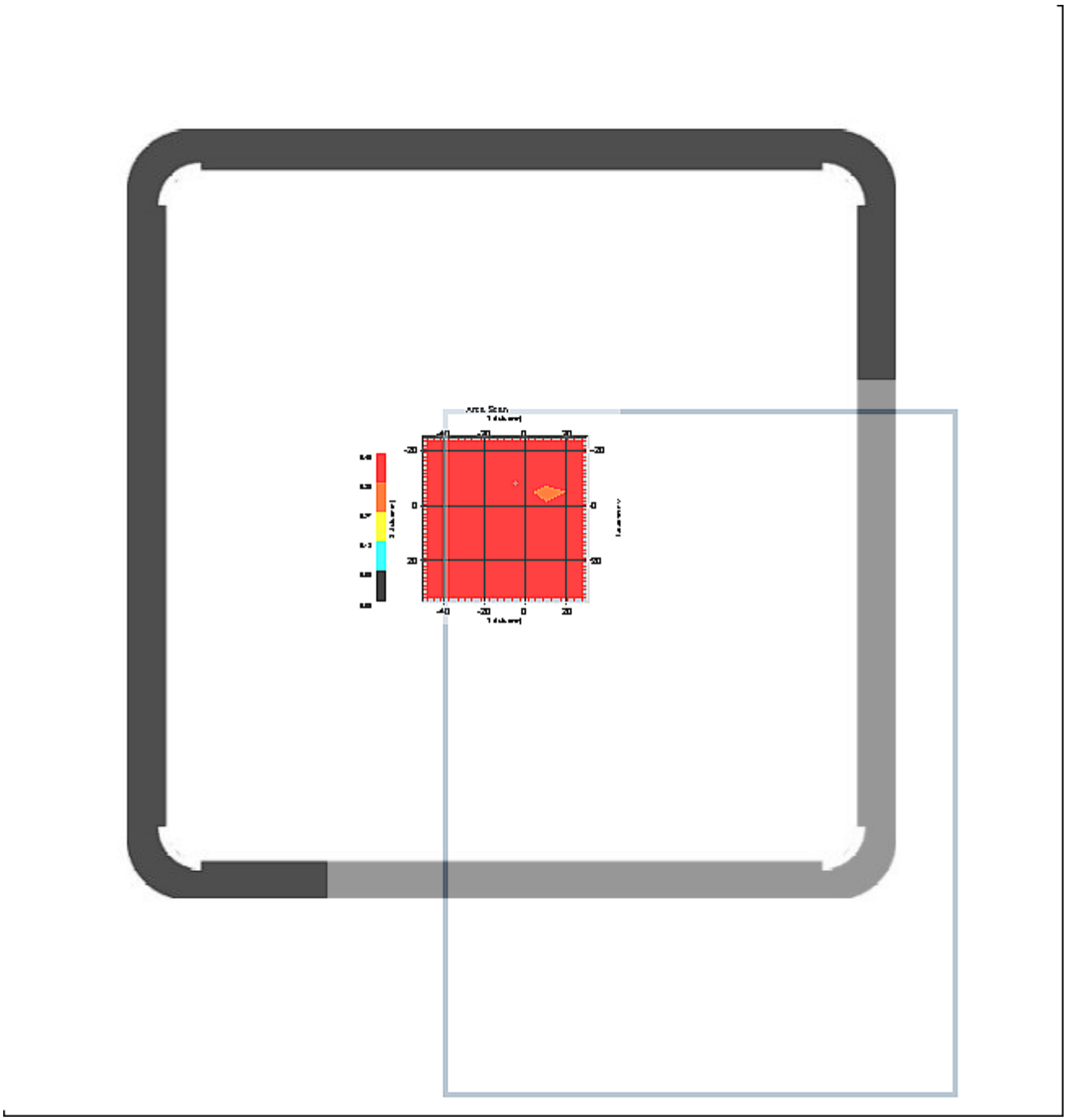
Zoom Scan Peak SAR : 0.56

SAR Test Report (802.11b)

Type : Uni-Phantom

DUT Position : Touch(Rear side)

Channel : Low - 1



1 gram SAR value : 0.40 W/kg

10 gram SAR value : 0.36 W/kg

Area Scan Peak SAR : 0.44

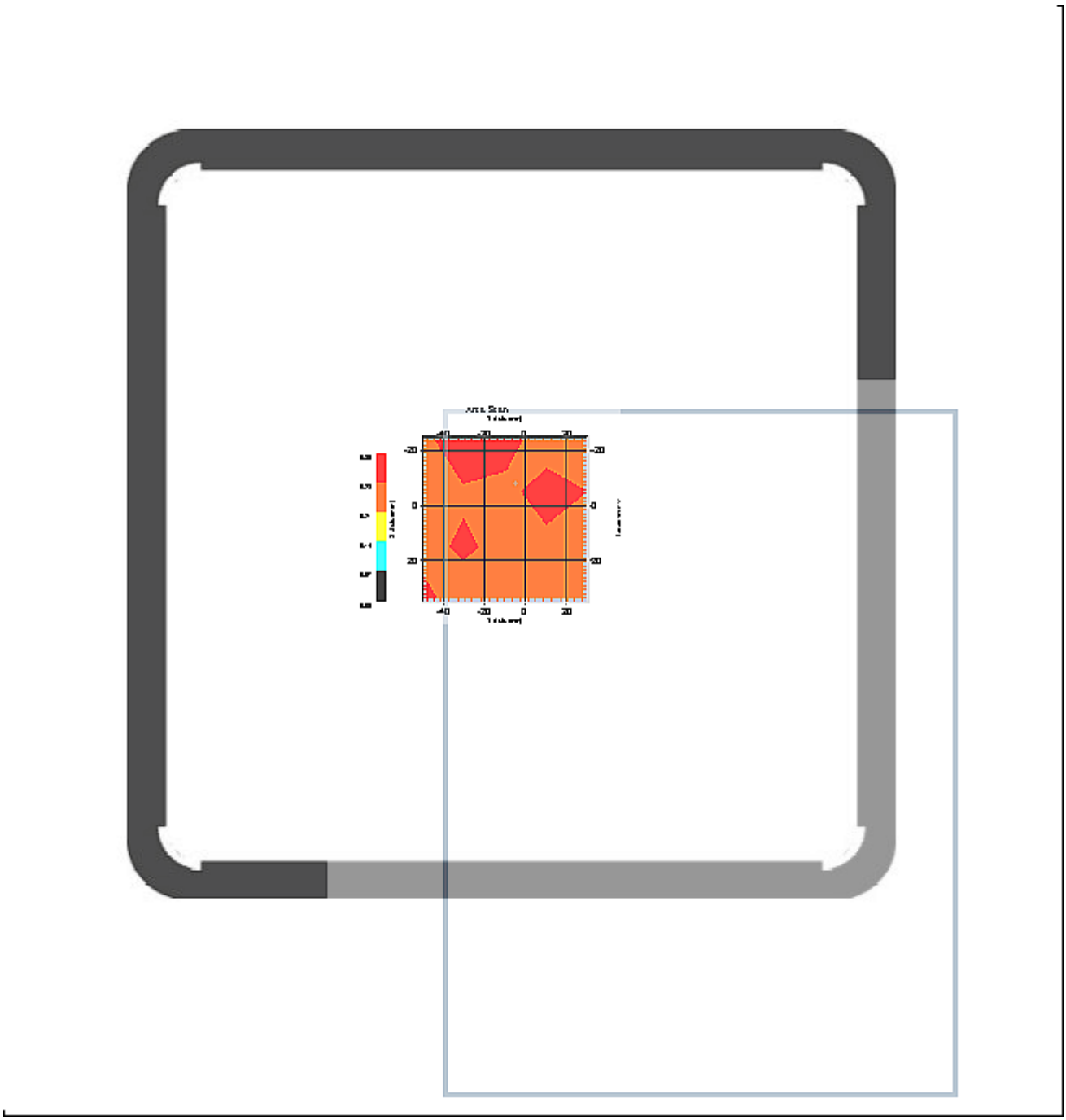
Zoom Scan Peak SAR : 0.61

SAR Test Report (802.11b)

Type : Uni-Phantom

DUT Position : Touch(Rear side)

Channel : Mid - 6



1 gram SAR value : 0.31 W/kg

10 gram SAR value : 0.28 W/kg

Area Scan Peak SAR : 0.34

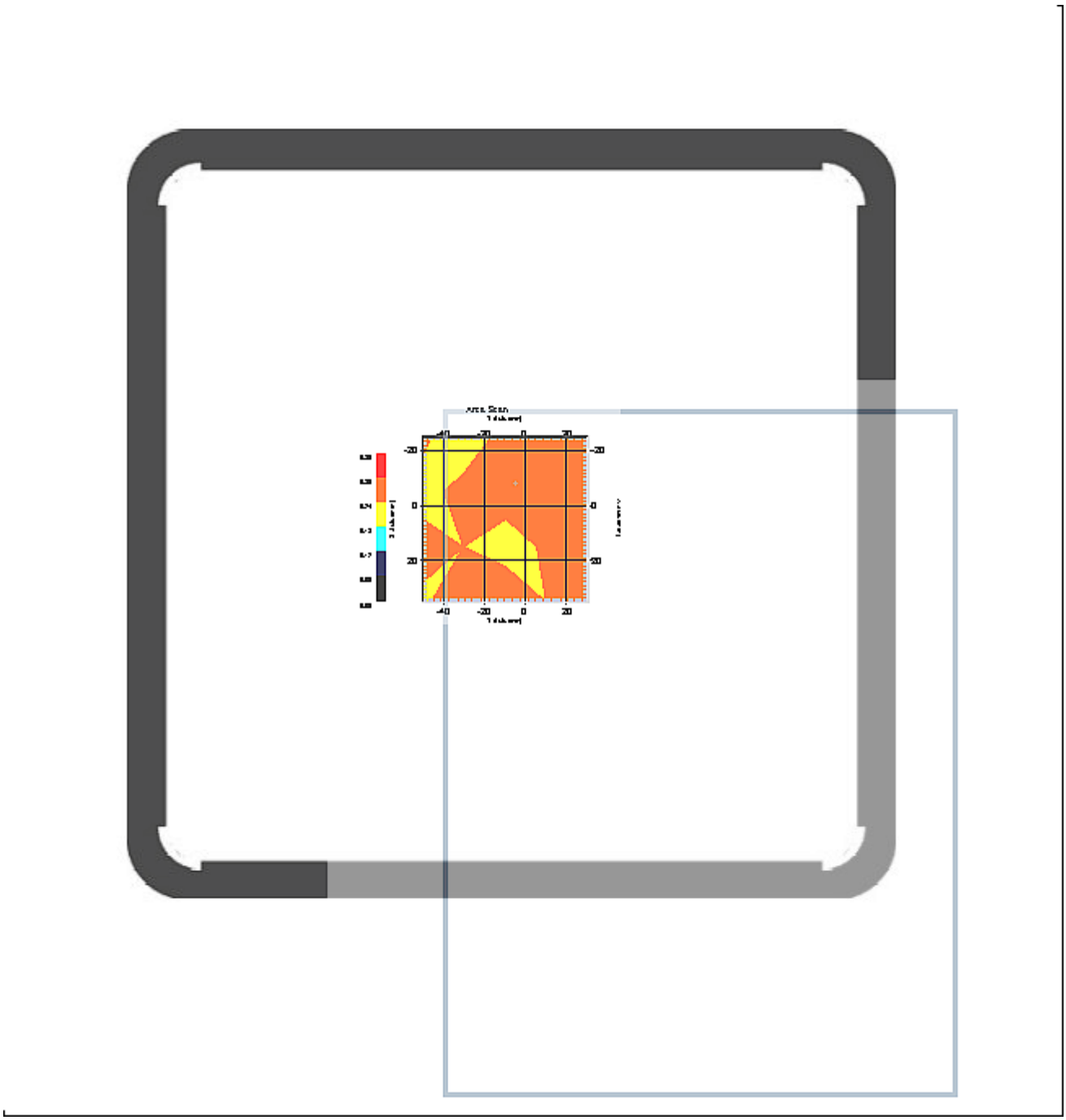
Zoom Scan Peak SAR : 0.60

SAR Test Report (802.11b)

Type : Uni-Phantom

DUT Position : Touch(Rear side)

Channel : High - 11



1 gram SAR value : 0.30 W/kg

10 gram SAR value : 0.28 W/kg

Area Scan Peak SAR : 0.30

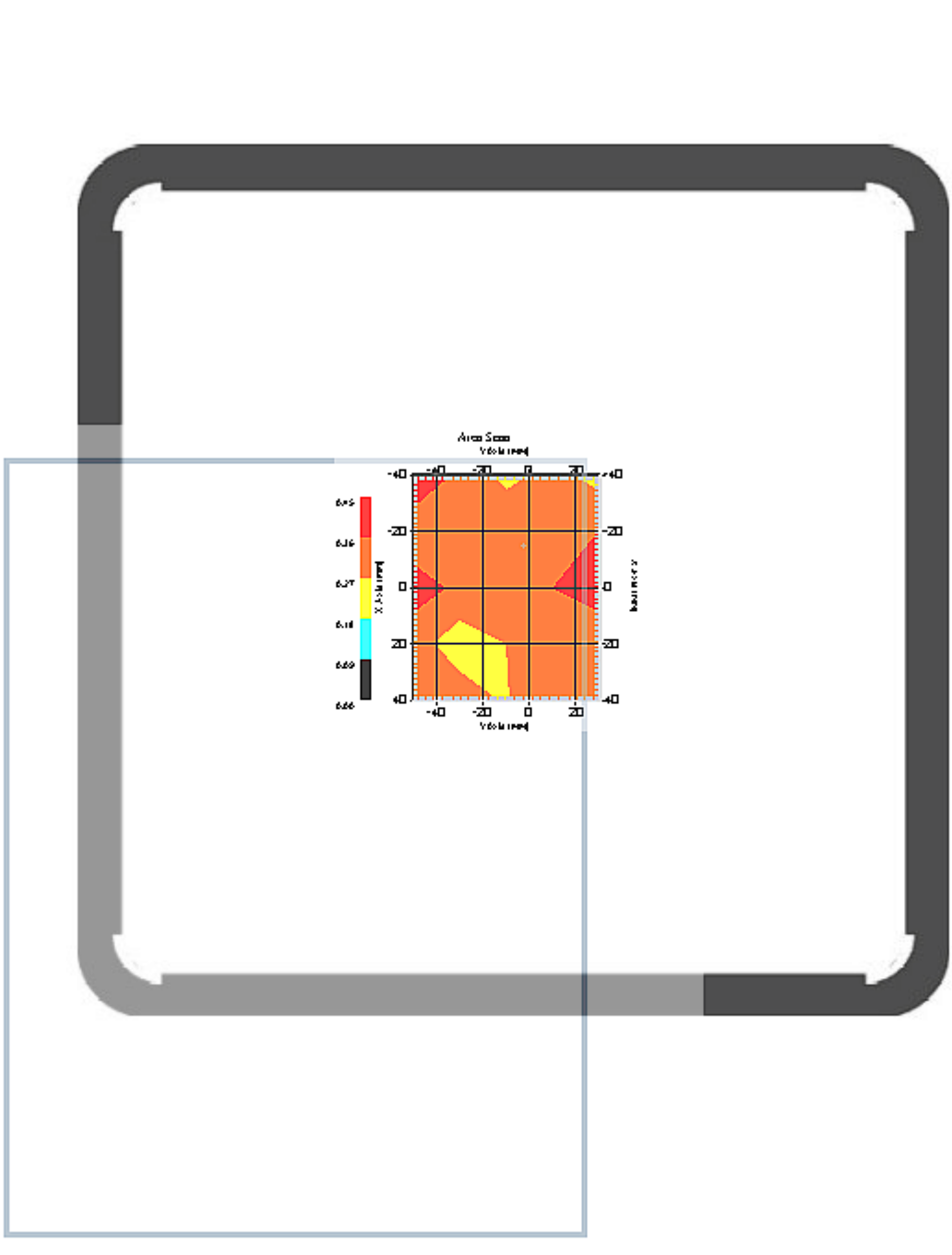
Zoom Scan Peak SAR : 0.53

SAR Test Report (802.11g)

Type : Uni-Phantom

DUT Position : Touch(Bottom face)

Channel : Low - 1



1 gram SAR value : 0.41 W/kg

10 gram SAR value : 0.33 W/kg

Area Scan Peak SAR : 0.44

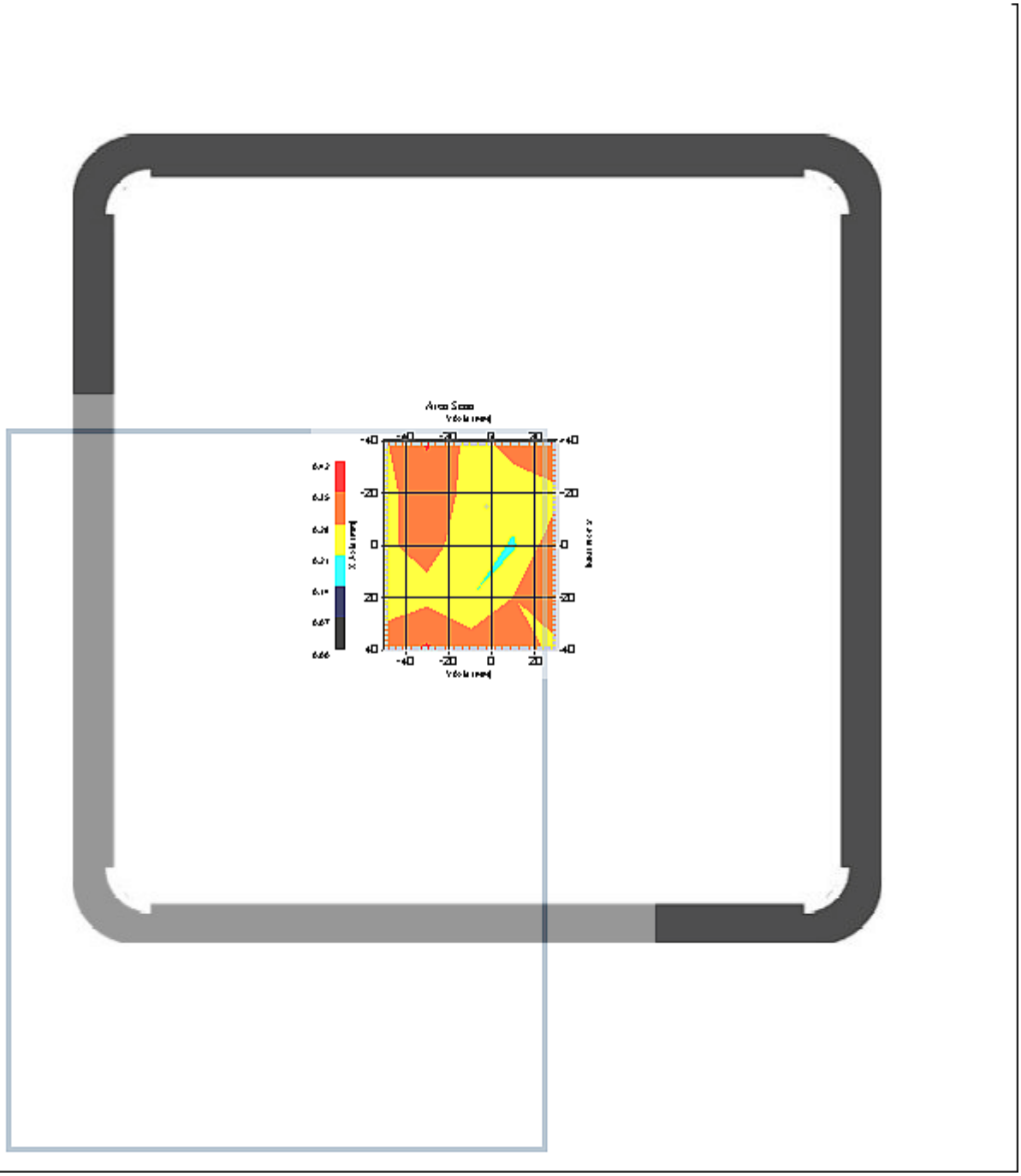
Zoom Scan Peak SAR : 0.98

SAR Test Report (802.11g)

Type : Uni-Phantom

DUT Position : Touch(Bottom face)

Channel : Mid - 6



1 gram SAR value : 0.35 W/kg

10 gram SAR value : 0.30 W/kg

Area Scan Peak SAR : 0.36

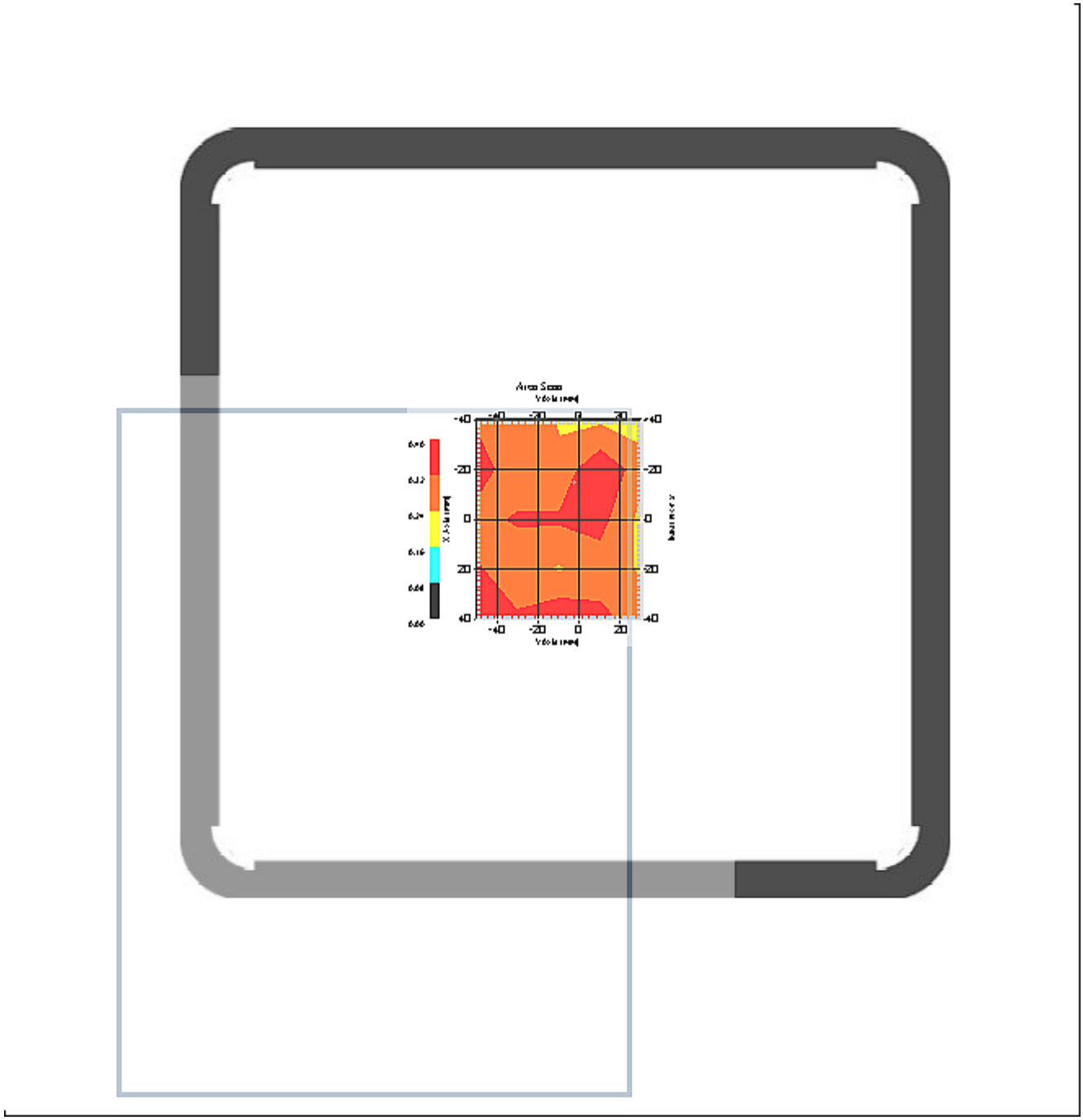
Zoom Scan Peak SAR : 0.79

SAR Test Report (802.11g)

Type : Uni-Phantom

DUT Position : Touch(Bottom face)

Channel : High - 11



1 gram SAR value : 0.43 W/kg

10 gram SAR value : 0.39 W/kg

Area Scan Peak SAR : 0.39

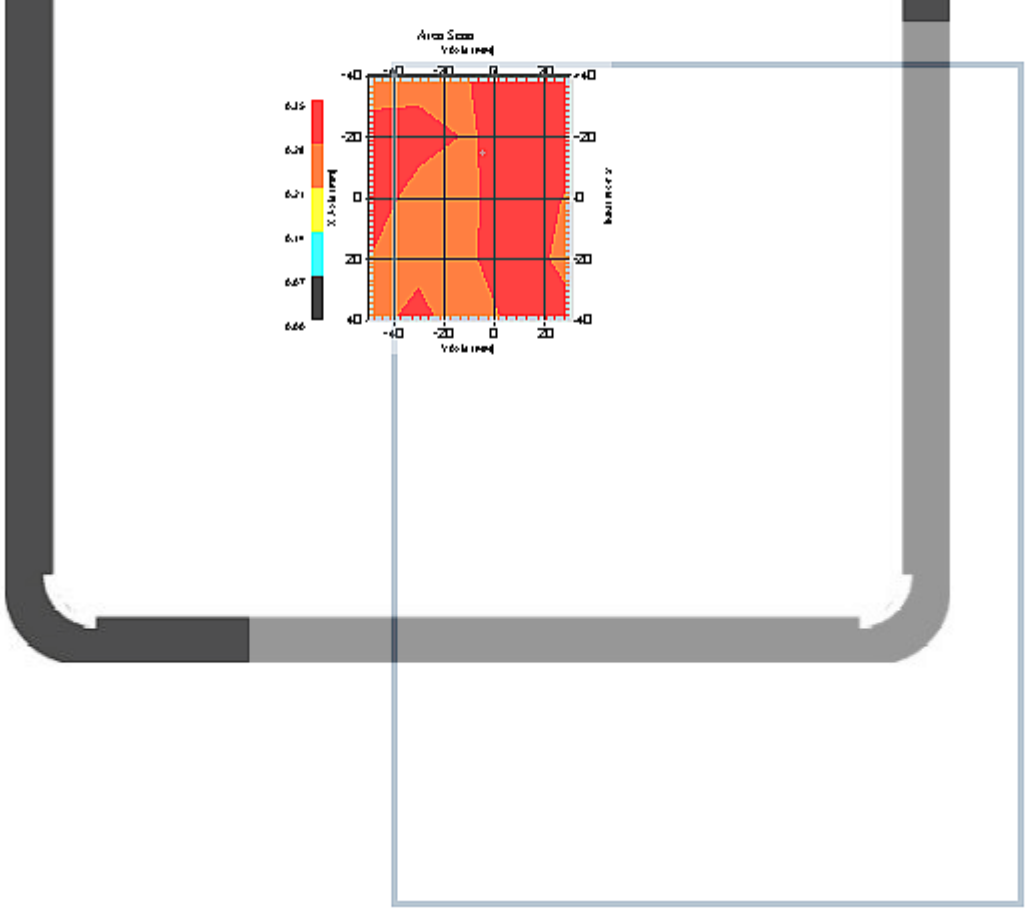
Zoom Scan Peak SAR : 1.02

SAR Test Report (802.11g)

Type : Uni-Phantom

DUT Position : Touch(LCD panel)

Channel : Low - 1



1 gram SAR value : 0.31 W/kg

10 gram SAR value : 0.28 W/kg

Area Scan Peak SAR : 0.34

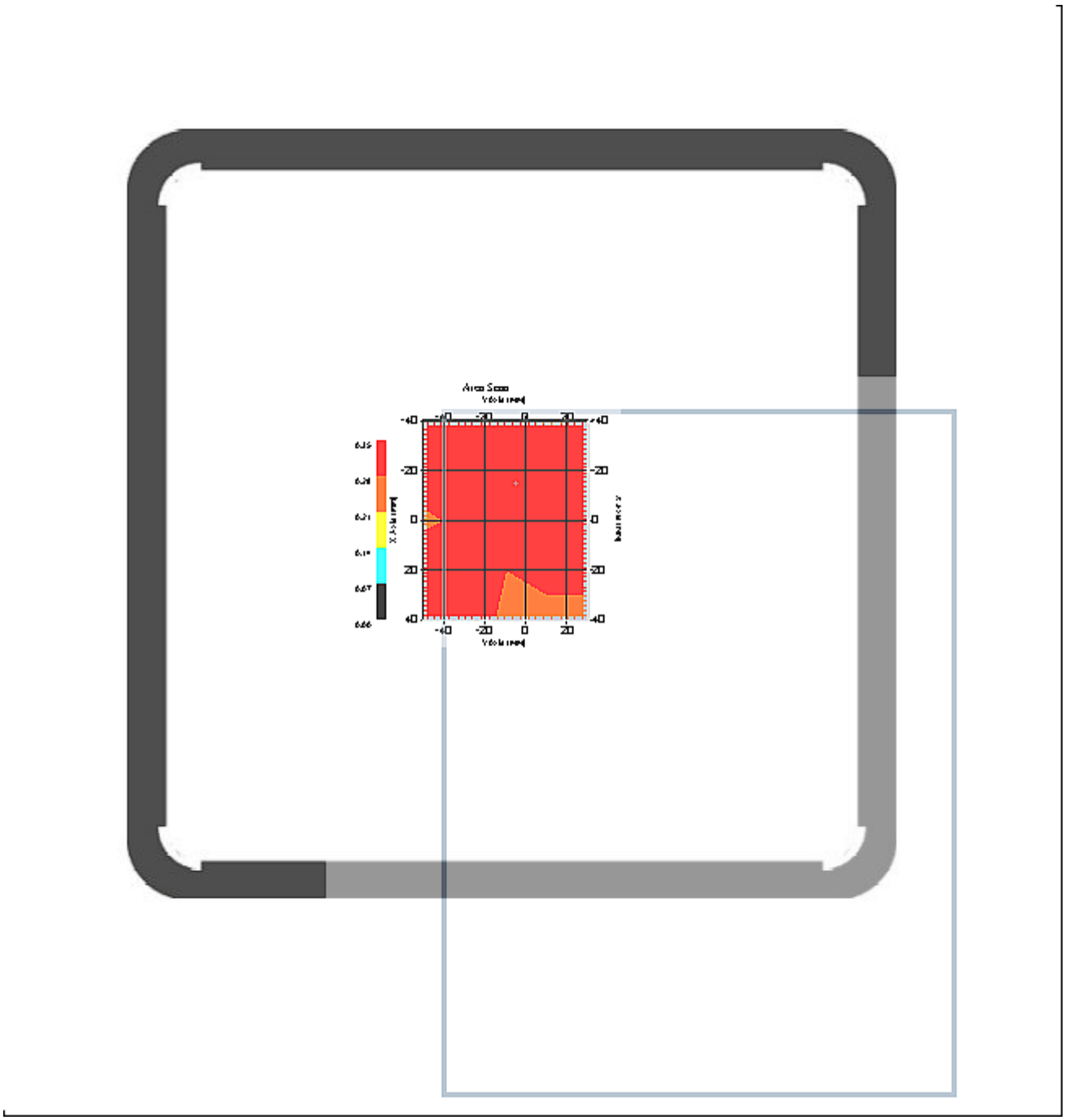
Zoom Scan Peak SAR : 0.74

SAR Test Report (802.11g)

Type : Uni-Phantom

DUT Position : Touch(LCD panel)

Channel : Mid - 6



1 gram SAR value : 0.39 W/kg

10 gram SAR value : 0.36 W/kg

Area Scan Peak SAR : 0.35

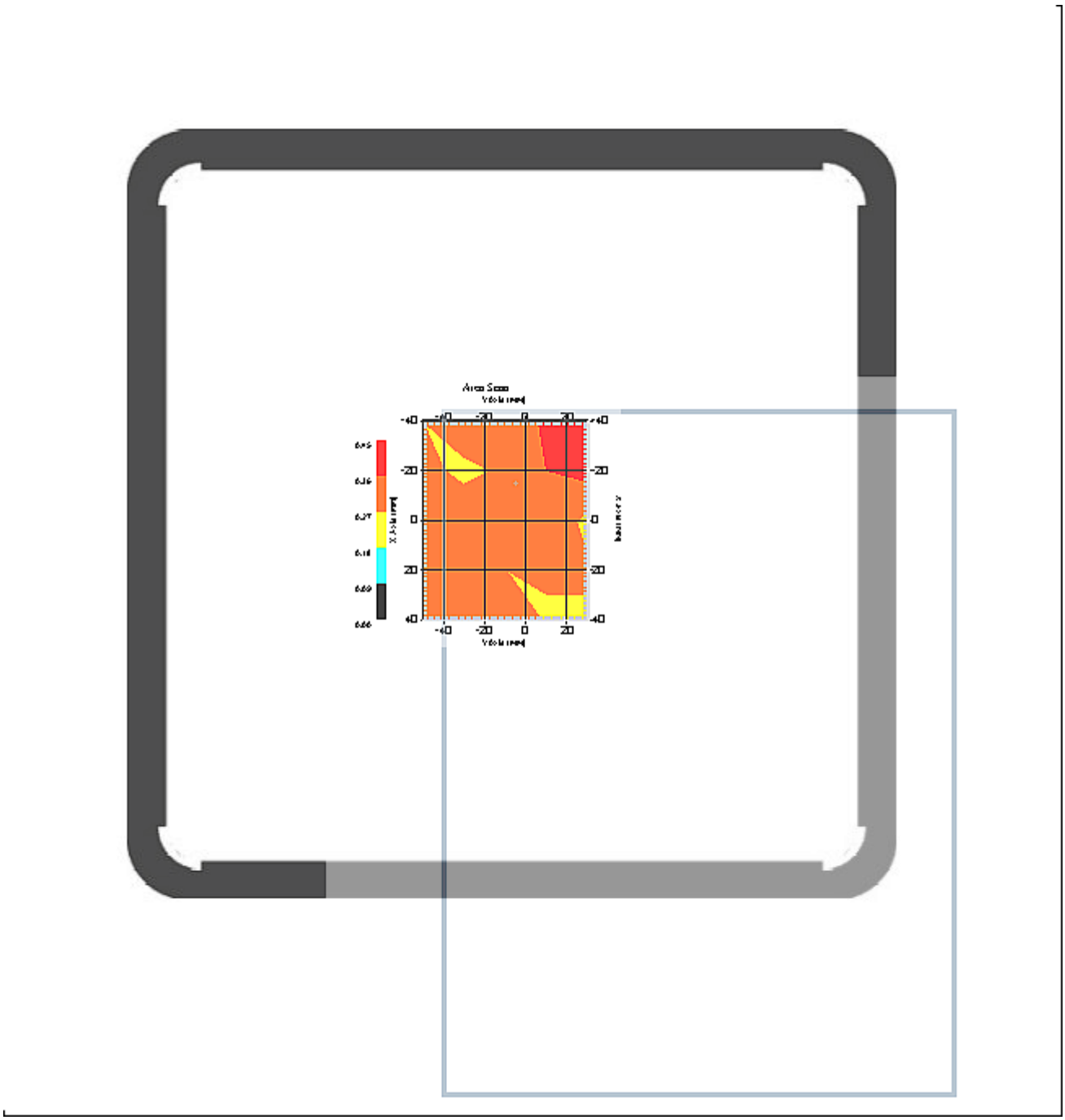
Zoom Scan Peak SAR : 0.66

SAR Test Report (802.11g)

Type : Uni-Phantom

DUT Position : Touch(LCD panel)

Channel : High - 11



1 gram SAR value : 0.39 W/kg

10 gram SAR value : 0.33 W/kg

Area Scan Peak SAR : 0.43

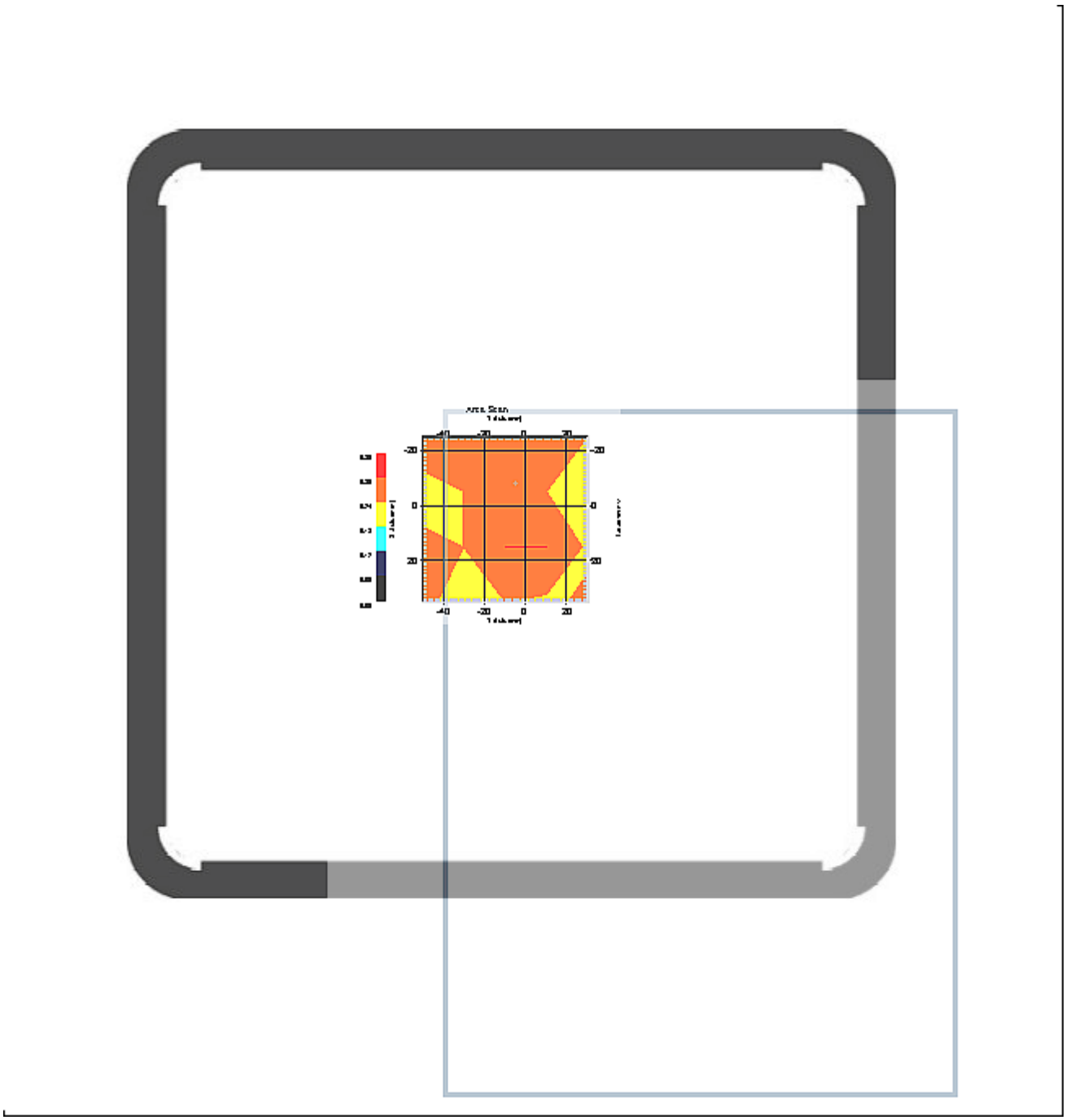
Zoom Scan Peak SAR : 0.86

SAR Test Report (802.11g)

Type : Uni-Phantom

DUT Position : Touch(Rear side)

Channel : Low - 1



1 gram SAR value : 0.30 W/kg

10 gram SAR value : 0.26 W/kg

Area Scan Peak SAR : 0.30

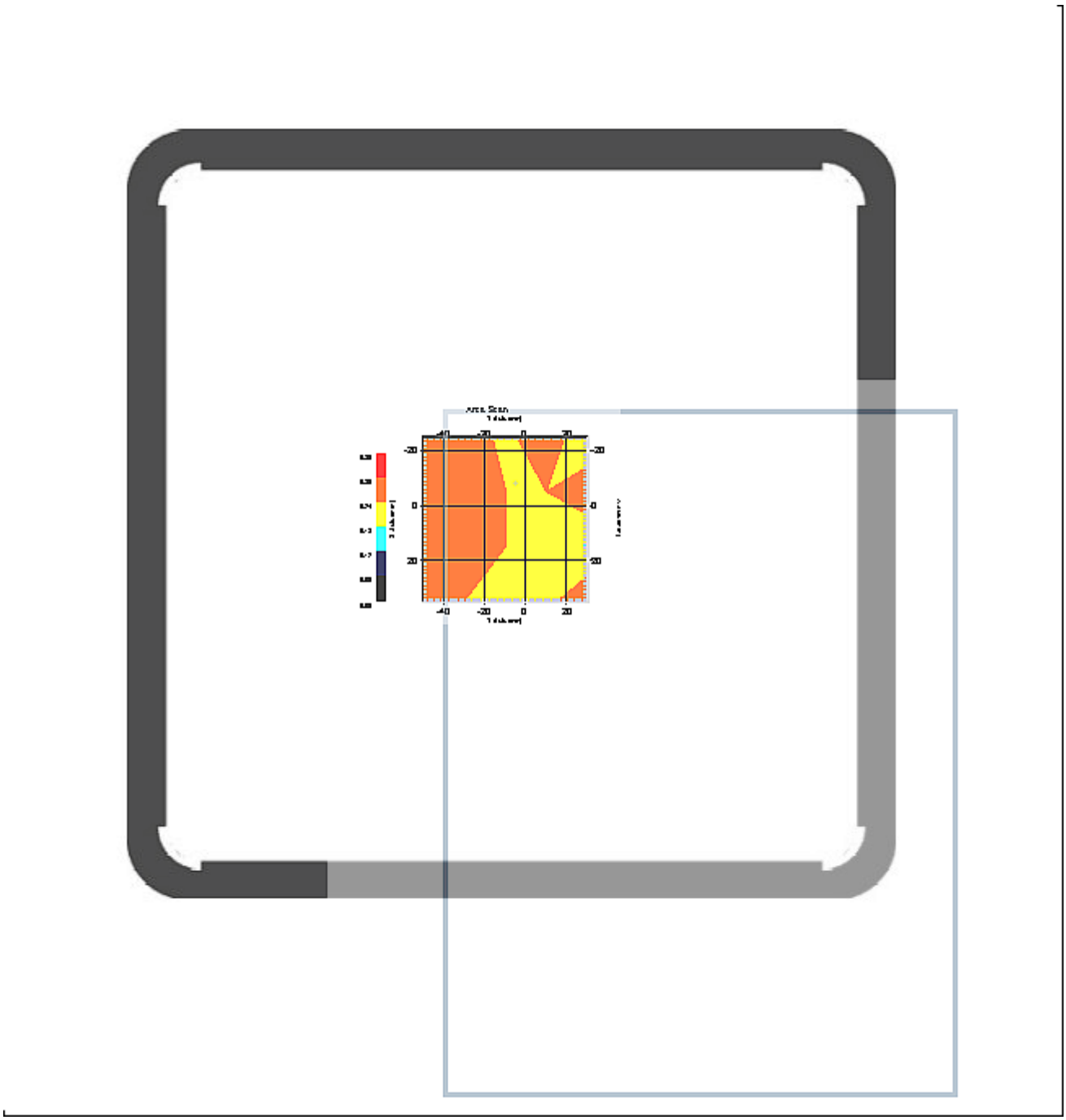
Zoom Scan Peak SAR : 0.63

SAR Test Report (802.11g)

Type : Uni-Phantom

DUT Position : Touch(Rear side)

Channel : Mid - 6



1 gram SAR value : 0.28 W/kg

10 gram SAR value : 0.25 W/kg

Area Scan Peak SAR : 0.30

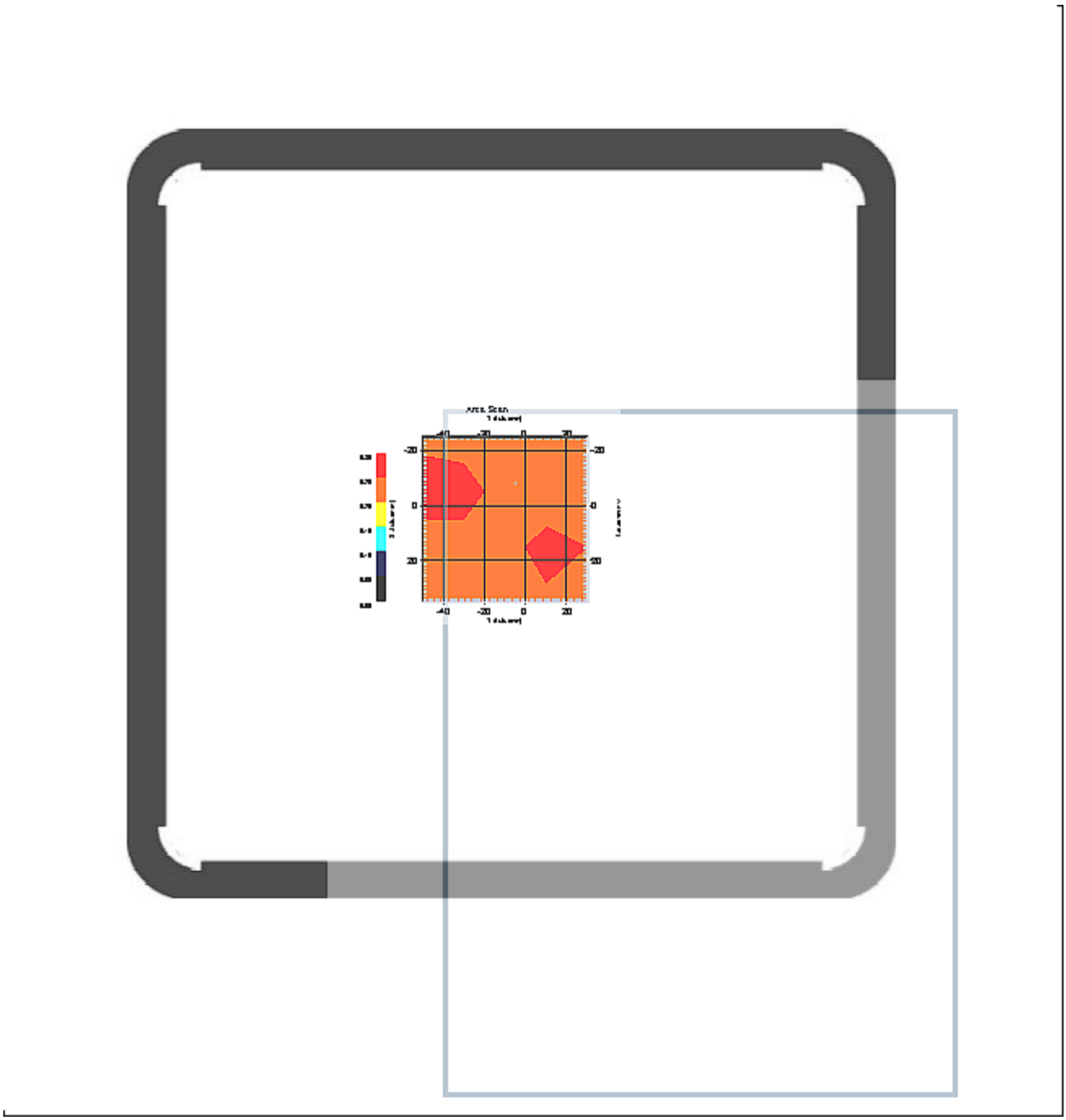
Zoom Scan Peak SAR : 0.44

SAR Test Report (802.11g)

Type : Uni-Phantom

DUT Position : Touch(Rear side)

Channel : High - 11



1 gram SAR value : 0.27 W/kg

10 gram SAR value : 0.25 W/kg

Area Scan Peak SAR : 0.27

Zoom Scan Peak SAR : 0.45

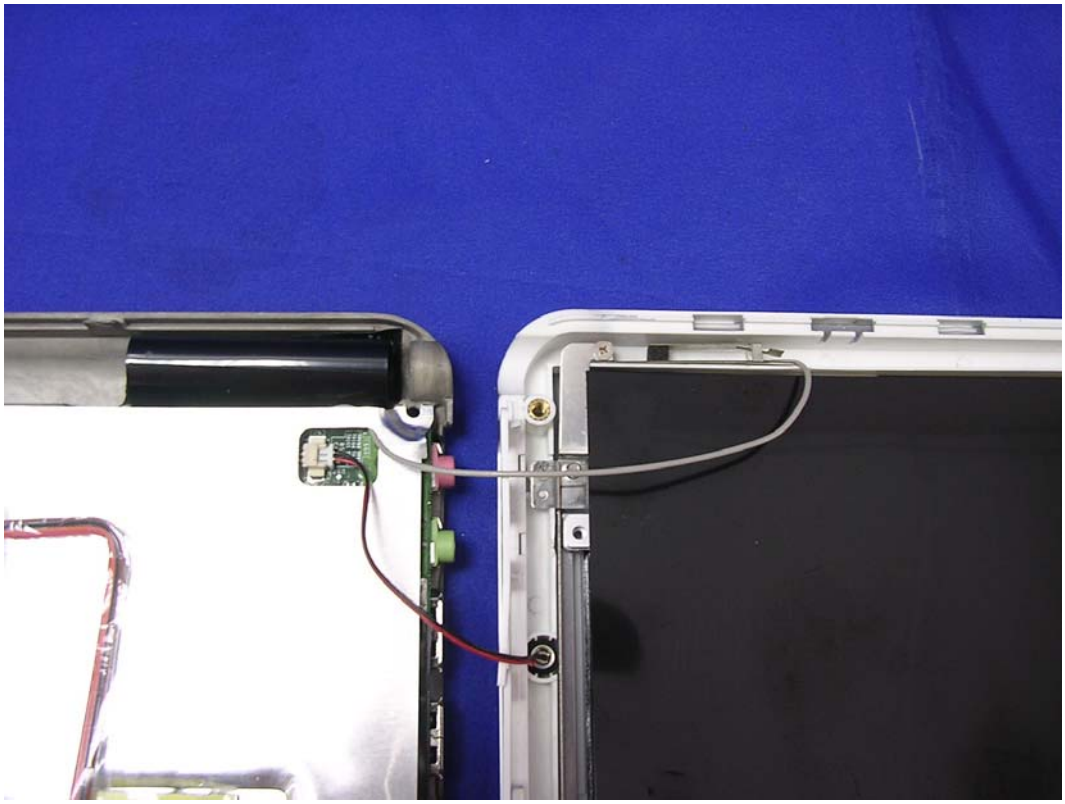
Test Setup Photographs

LCD panel (Touch)

Bottom face (Touch)

Rear side (Touch)

EUT Photographs



Dipole Calibration

NCL CALIBRATION LABORATORIES

Calibration File No: DC-409
Project Number: QTKB-ALSAS-10U-5050

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.

Quietek Validation Dipole

Manufacturer: APREL Laboratories
Part number: ALS-D-2450-S-2
Frequency: 2.45 GHz
Serial No: QTK-319

Customer: Quietek

Calibrated: 23 June 2004
Released on: 23 June 2004

Released By: _____

NCL CALIBRATION LABORATORIES
51 SPECTRUM WAY
NEPEAN, ONTARIO
CANADA K2R 1E6
Division of APREL Lab.
TEL: (613) 820-4988
FAX: (613) 820-4161

NCL Calibration Laboratories
Division of APREL Laboratories.

Calibration Results Summary

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

Mechanical Dimensions

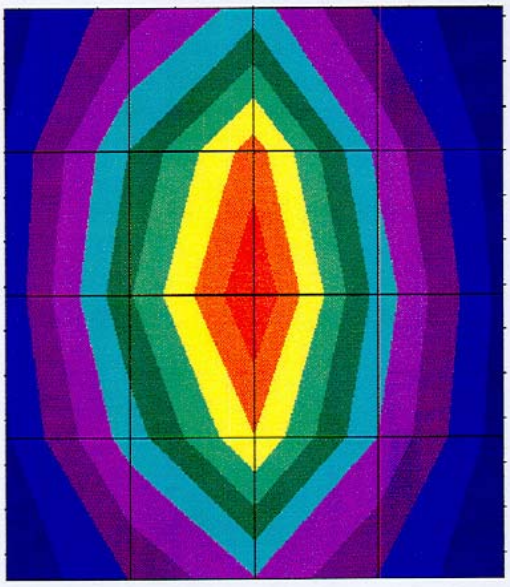
Length:	53.5 mm
Height:	30.4 mm

Electrical Specification

SWR:	1.19 U
Return Loss:	-20.8 dB
Impedance:	49.4 Ω

System Validation Results

Frequency	1 Gram	10 Gram	Peak
2.45 GHz	48.07	25.65	95.6



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Calibrated by:

Approved by:

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 QTK-319. The calibration routine consisted of a three-step process. Step 1 was a mechanical verification of the dipole to ensure that it meets the IEEE/APREL 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 QTK 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

Dipole QTK-319 was new taken from stock.

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

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Dipole Calibration Results

Mechanical Verification

IEEE Length	IEEE Height	Measured Length	Measured Height
51.5 mm	30.4 mm	53.5 mm	30.4 mm

Tissue Validation

Body Tissue 2450 MHz	Measured
Dielectric constant, ε_r	52.5
Conductivity, σ [S/m]	1.78

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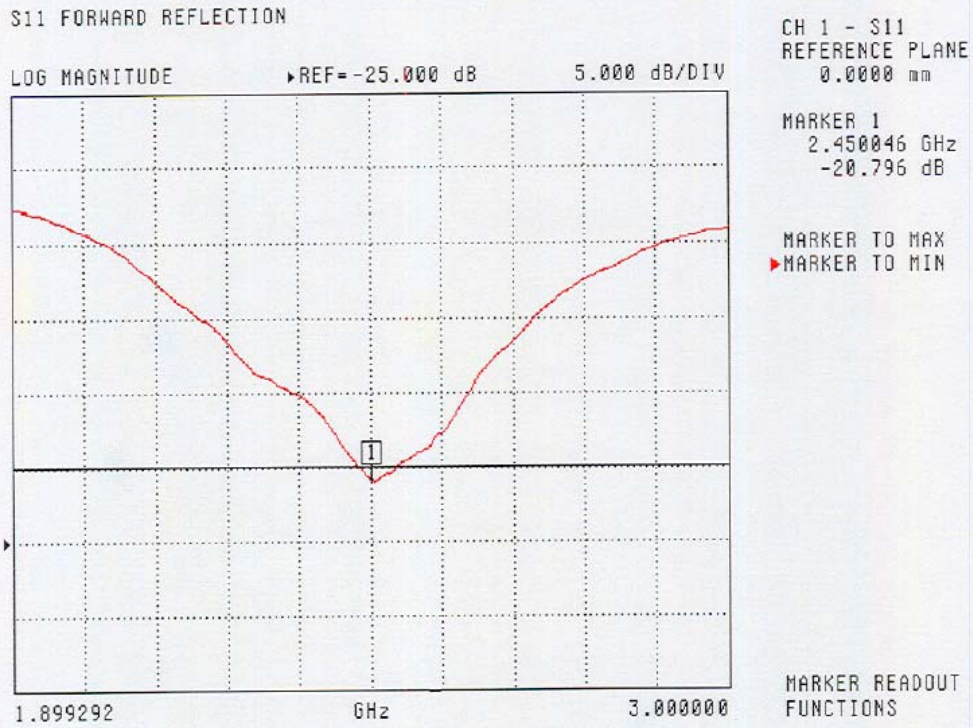
Division of APREL Laboratories.

Electrical Calibration

Test	Result
S11 R/L	-20.8 dB
SWR	1.2 U
Impedance	49.4 Ω

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

S11 Parameter Return Loss



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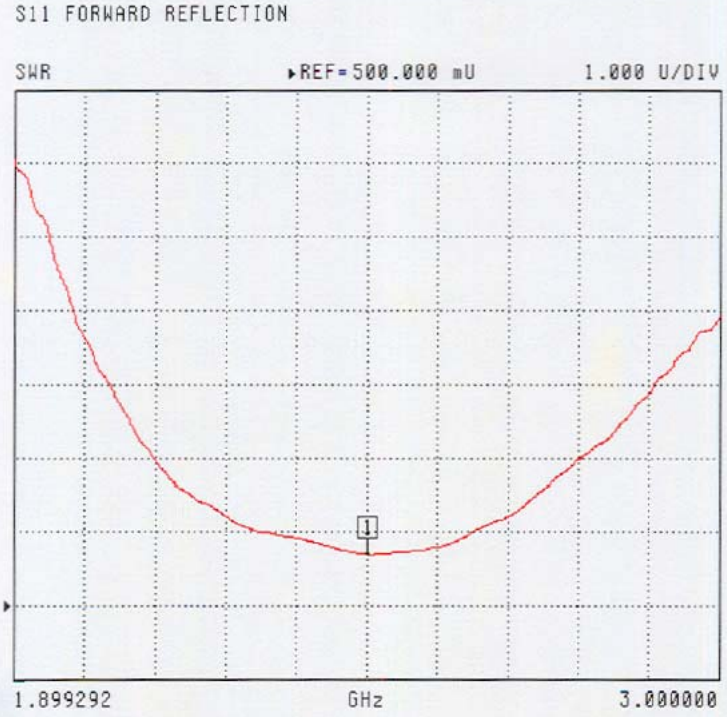
SWR

S11 FORWARD REFLECTION



CH 1 - S11
REFERENCE PLANE
0.0000 mm

MARKER 1
2.450046 GHz
1.199 U

MARKER TO MAX
▸MARKER TO MIN

MARKER READOUT
FUNCTIONS

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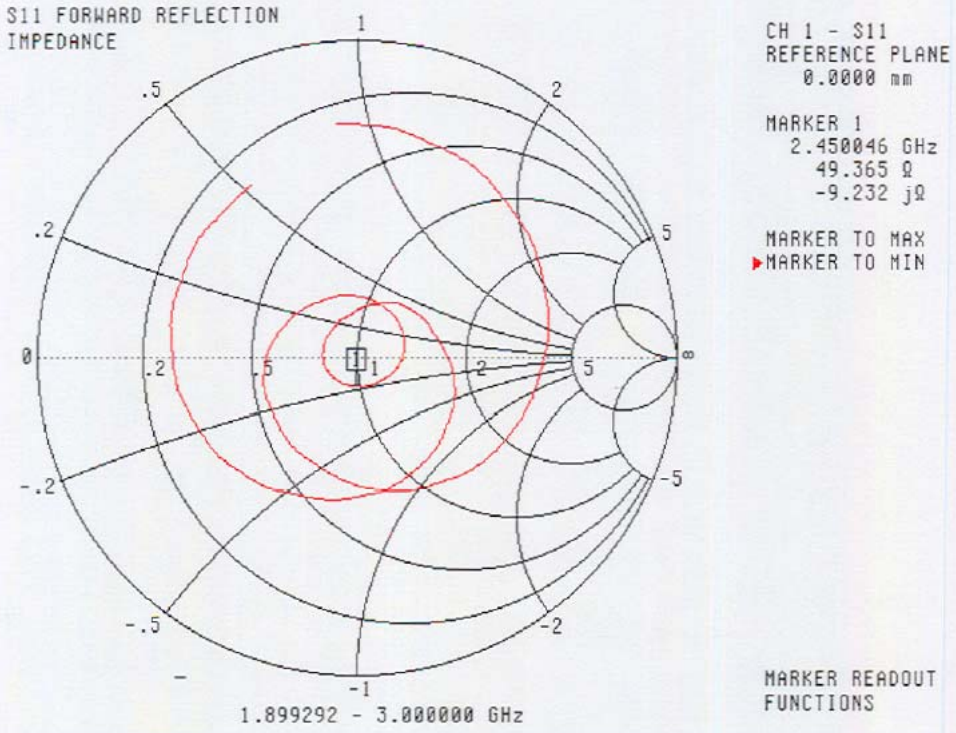
Smith Chart Dipole Impedance



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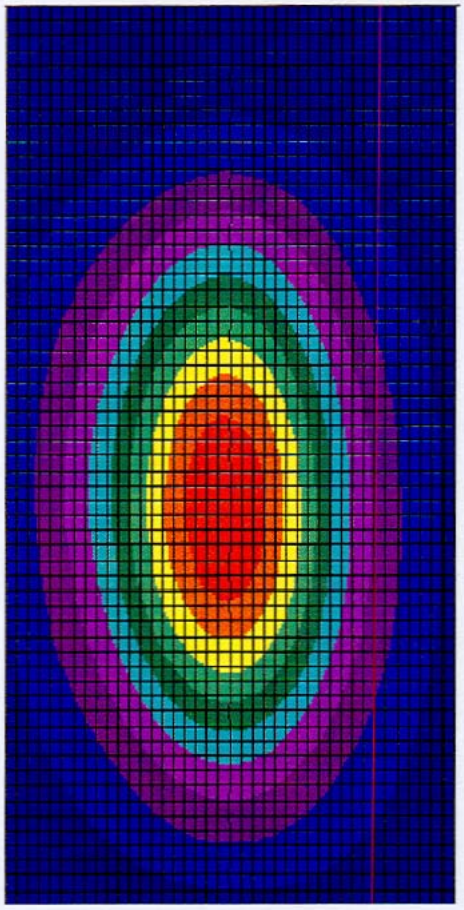
System Validation Results Using the Electrically Calibrated Dipole

Frequency	1 Gram	10 Gram	Peak Above Feed Point
2.45 GHz	48.07	25.65	95.6



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Test Equipment

The test equipment used during Probe Calibration, manufacturer, model number and, current calibration status are listed and located on the main APREL server R:\NCL\Calibration Equipment\Instrument List May 2003

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