Hearing Aid Compatibility (HAC) RF Emissions Test Report

APPLICANT	: Intermec Technologies Corporation
EQUIPMENT	: Mobile Computer
MODEL NAME	: 1005CP01
FCC ID	: EHA011005CP01
Date	:Sep 25 2010
Report No	: SL10050603-ICT-001(HAC RF))
M Category	: M3

(This report supersedes NONE)

FCC HAC RF Emission Test Report

To: FCC 47 CFR 20.19 , ANSI C63.19

SIEMIC, INC.
Accessing global markets

Statement of Compliance

Date of Issue : Sep 25 2010
Company Name : Intermec Technologies Corporation
Product Name/Model : Mobile Computer / 1005CP01
Stipulated Standard: (1) CFR 20.19 , ANSI C63.19:2007

The maximum results of RF Emission of Hearing Aid Compliance (HAC) found during testing for the EUT are as follows (with expanded uncertainly ±12.71%):

Band	HAC RF Emission Test Result		M Rating

Equipment complied with the specification [X]
Equipment did not comply with the specification [ ]

This wireless mobile and/or portable device has been shown to be in compliance with HAC limits (HAC Rated category M3) specified in guidelines FCC 47 CFR §20.19 and ANSI Standard ANSI C63.19:2007.

I attest to the accuracy of the data. All measurements were performed by myself or were made under my supervision and are correct to the best of my knowledge and belief. I assume full responsibility for the completeness of these measurements and vouch for the qualifications of all persons taking them.

Modifications made to the product : None

This Test Report is Issued Under the Authority of:	
	
Dan Coronia **Compliance Engineer**	**Leslie Bai** **Director of Certification**

We, SIEMIC Inc would like to declare that the tested sample has been evaluated in accordance with the procedure and shown the compliance with the applicable technical standards.

Laboratory Introduction

SIEMIC, headquartered in the heart of Silicon Valley, with superior facilities in US and Asia, is one of the leading independent testing and certification facilities providing customers with one-stop shop services for Compliance Testing and Global Certifications.

In addition to testing and certification, SIEMIC provides initial design reviews and compliance management through out a project. Our extensive experience with China, Asia Pacific, North America, European, and international compliance requirements, assures the fastest, most cost effective way to attain regulatory compliance for the global markets.

Accreditations for Conformity Assessment

Country/Region	Accreditation Body	Scope
USA	FCC, A2LA	EMC , RF/Wireless , Telecom
Canada	IC, A2LA, NIST	EMC, RF/Wireless , Telecom
Taiwan	BSMI , NCC , NIST	EMC, RF, Telecom , Safety
Hong Kong	OFTA , NIST	RF/Wireless ,Telecom
Australia	NATA, NIST	EMC, RF, Telecom , Safety
Korea	KCC/RRA, NIST	EMI, EMS, RF , Telecom, Safety
Japan	VCCI, JATE, TELEC, RFT	EMI, RF/Wireless, Telecom
Mexico	NOM, COFETEL, Caniety	Safety, EMC , RF/Wireless, Telecom
Europe	A2LA, NIST	EMC, RF, Telecom , Safety

Accreditations for Product Certifications

Country	Accreditation Body	Scope
USA	FCC TCB, NIST	EMC , RF , Telecom
Canada	IC FCB , NIST	EMC , RF , Telecom
Singapore	iDA, NIST	EMC , RF , Telecom

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1 TECHNICAL DETAILS

Purpose	Compliance testing of Mobile Computer model 1005CP01 with HAC RF Emission.
Applicant / Client	Intermec Technologies Corporation
Manufacturer	Intermec Technologies Corporation 6001 36th Avenue West Everett, Washington 98203
Laboratory performing the tests	SIEMIC Laboratories 2206 Ringwood Ave San Jose, CA 95127 USA
Test report reference number	SL10050603-ICT-001(HAC RF))
Date EUT received	Aug 18th 2010
Standard applied	CFR 20.19 , ANSI C63.19:2007
Dates of test (from – to)	Aug 18th-Sep 09th 2010
No of Units:	1
Equipment Category:	PCE
Trade Name:	Intermec Technologies Corporation
Model Name:	1005CP01
RF Operating Frequency (ies)	GSM850 : 824.2 ~ 848.8 MHz(TX) / 869.2 ~ 893.8 MHz(RX) GSM1900 : 1850.2 ~ 1909.8 MHz(TX) / 1930.2 ~ 1989.8 MHz(RX) WCDMA Band V : 826.4 ~ 846.6 MHz(TX) / 871.4 ~ 891.6 MHz(RX) WCDMA Band IV :1712.4 ~ 1752.6 MHz(TX) / 2112.4MHz ~ 2152.6MHz(RX) WCDMA Band II : 1852.4 ~ 1907.6 MHz(TX) / 1932.4 ~ 1987.6 MHz(RX)
RF Conducted Power (dBm)	GSM850 : 32.62 dBm GPRS850: 30.98 dBm EGPRS850: 31.14 dBm GSM1900 : 27.53 dBm GPRS1900: 29.03 dBm EGPRS1900: 27.54 dBm WCDMA Band V (RMC 12.2Kbps) : WCDMA Band II (RMC 12.2Kbps) : 22.72 dBm WCDMA Band IV (RMC 12.2Kbps) : 23.55 dBm
Antenna Type:	Fixed Antenna Type
Modulation:	GSM / GPRS : GMSK EGPRS : 8PSK WCDMA : QPSK
FCC ID:	EHA011005CP01
IC ID:	1223A-011005CP01

850 MHz Band Conducted RF Power

Operating Mode	Channel	Channel Frequency (MHz)	Measured Output Power(dBm)
GSM850 (GMSK)	Low	824.2	32.62
	Mid	836.4	32.56
	High	848.8	32.42
GSM900 (GMSK)	Low(975)	880.2	32.22
	Mid(38)	897.6	32.24
	High(124)	914.8	32.57
GPRS850 (GMSK-MCS4)	Low	824.2	30.98
	Mid	836.4	30.92
	High	848.8	30.76
GPRS900 (GMSK-MCS4)	Low(975)	880.2	30.76
	Mid(38)	897.6	30.80
	High(124)	914.8	30.08
EGPRS850 (8PSK-MCS9)	Low(128)	824.2	27.15
	Mid(189)	836.4	26.90
	High(250)	848.8	26.80
EGPRS900 (8PSK-MCS9)	Low(975)	880.2	26.92
	Mid(38)	897.6	27.00
	High(124)	914.8	27.26
WCDMA Band V (R99, RMC 12.2 Kbps)	Low	826.4	23.61
	Mid	836.4	23.49
	High	846.6	23.62
WCDMA Band V (Rel6, HSDPA) Subtest1	Low(4132)	826.4	23.64
	Mid(4182)	836.4	23.44
	High(4233)	846.6	23.74
WCDMA Band V (Rel6, HSDPA) Subtest2	Low	826.4	23.21
	Mid	836.4	23.09
	High	846.6	23.36
WCDMA Band V (Rel6, HSDPA) Subtest3	Low	826.4	22.64
	Mid	836.4	22.62
	High	846.6	22.74
WCDMA Band V (HSDPA) Subtest4	Low	826.4	21.92
	Mid	836.4	21.96
	High	846.6	21.96
WCDMA Band V (Rel6, HSPA) Subtest1	Low(4132)	826.4	23.56
	Mid(4182)	836.4	23.35
	High(4233)	846.6	23.58
WCDMA Band V (Rel6, HSPA) Subtest2	Low	826.4	23.41
	Mid	836.4	23.35
	High	846.6	23.73
WCDMA Band V (Rel6, HSPA) Subtest3	Low	826.4	23.49
	Mid	836.4	23.41
	High	846.6	23.73
WCDMA Band V (HSPA) Subtest4	Low	826.4	23.39
	Mid	836.4	23.46
	High	846.6	23.44

1900 MHz Band Conducted RF Power

GSM1800(GMSK)	Channel	Channel Frequency (MHz)	Measured Output Power(dBm)
GSM1900(GMSK)	Low(512)	1710.2	27.17
	Mid(699)	1747.6	27.51
	High(884)	1784.8	27.40
GPRS1900(GMSK-MCS4)	Low	1850.2	27.53
	Mid	1880.0	27.39
	High	1909.8	27.34
GPRS1800(GMSK-MCS4)	Low	1850.2	28.95
	Mid	1880.0	29.03
	High	1909.8	28.88
EGPRS1900(8MSK-MCS9)	Low	1710.2	28.96
	Mid	1747.6	29.31
	High	1784.8	29.17
EGPRS1800(8MSK-MCS9)	Low	1850.2	27.54
	Mid	1880.0	27.38
	High	1909.8	27.32
WCDMA Band II (RMC 12.2Kbps)	Low	1710.2	25.65
	Mid	1747.6	26.01
	High	1784.8	25.91
WCDMA Band II (Rel6, HSDPA) Subtest1	Low	1852.4	22.62
	Mid	1880.0	22.72
	High	1907.6	22.62
WCDMA Band II (Rel6, HSDPA) Subtest2	Low(9262)	1852.4	22.18
	Mid(9400)	1880.0	22.65
	High(9538)	1907.6	22.51
WCDMA Band II(Rel6, HSDPA) Subtest3	Low	1852.4	22.10
	Mid	1880.0	22.39
	High	1907.6	22.77
WCDMA Band II (Rel6, HSDPA) Subtest4	Low	1852.4	22.01
	Mid	1880.0	22.36
	High	1907.6	22.21
WCDMA Band II (Rel6, HSPA) Subtest1	Low	1852.4	22.08
	Mid	1880.0	22.31
	High	1907.6	21.95
WCDMA Band II (Rel6, HSPA) Subtest2	Low(9262)	1852.4	21.99
	Mid(9400)	1880.0	22.30
	High(9538)	1907.6	22.13
WCDMA Band II(Rel6, HSPA) Subtest3	Low	1852.4	21.82
	Mid	1880.0	22.22
	High	1907.6	22.01
WCDMA Band II (Rel6, HSPA) Subtest4	Low	1852.4	21.90
	Mid	1880.0	22.24
	High	1907.6	22.02

1700 MHz Band Conducted RF Power

Operating Mode	Channel	Channel Frequency (MHz)	Measured Output Power(dBm)
WCDMA Band IV (RMC 12.2Kbps)	Low(1312)	1712.4	23.55
	Mid(1412)	1732.4	23.08
	High(1512)	1752.6	23.05
WCDMA Band IV (Rel6, HSDPA) Subtest1	Low	1712.4	23.13
	Mid	1732.4	22.95
	High	1752.6	23.04
WCDMA Band IV (Rel6, HSDPA) Subtest2	Low	1712.4	23.44
	Mid	1732.4	23.21
	High	1752.6	23.19
WCDMA Band IV (Rel6, HSDPA) Subtest3	Low	1712.4	23.14
	Mid	1732.4	23.19
	High	1752.6	23.39
WCDMA Band IV (Rel6, HSDPA) Subtest4	Low	1712.4	23.15
	Mid	1732.4	23.07
	High	1752.6	23.24
WCDMA Band IV (Rel6, HSPA) Subtest1	Low(1312)	1712.4	23.09
	Mid(1412)	1732.4	23.03
	High(1512)	1752.6	23.31
WCDMA Band IV (Rel6, HSPA) Subtest2	Low(1312)	1712.4	23.59
	Mid(1412)	1732.4	23.30
	High(1512)	1752.6	23.19
WCDMA Band IV (Rel6, HSPA) Subtest3	Low(1312)	1712.4	23.49
	Mid(1412)	1732.4	23.41
	High(1512)	1752.6	23.24
WCDMA Band IV (Rel6, HSPA) Subtest4	Low(1312)	1712.4	23.20
	Mid(1412)	1732.4	23.33
	High(1512)	1752.6	23.21

2 Applied Standard

The ANSI Standard ANSI C63.19-2007 represents performance requirements for acceptable interoperability of hearing aids with wireless communications devices. When these parameters are met, a hearing aid operates acceptably in close proximity to a wireless communications device.

The federal communication commission (FCC) adopted ANSI C63.19 as HAC test standard.

The following AWF(Articulation Weighting Factor) shall be used for the standard transmission protocols:

Standard	Technology	AWF (dB)
TIA/EIA/IS-2000	CDMA	0
TIA/EIA-136	TDMA (50Hz)	0
J-STD-007	GSM (217)	-5
T1/T1P1/3GPP	UMTS (WCDMA)	0
iDENTM	TDMA (22 and 11 Hz)	0

Category	Telephone RF Parameter		
Near Field	AWF	E Field Emissions (V / M)	H Field Emissions (A / M)
		< 960 MHz	
Category M1	0	631.0 – 1122.0 V/m	1.91 – 3.39 A/m
	-5	473.2 – 841.4 V/m	1.43 – 2.54 A/m
Category M2	0	354.8 – 631.0 V/m	1.07 – 1.91 A/m
	-5	266.1 – 473.2 V/m	0.80 – 1.43 A/m
Category M3	0	199.5 – 354.8 V/m	0.6 – 1.07 A/m
	-5	149.6 – 266.1 V/m	0.45 – 0.80 A/m
Category M4	0	< 199.5 V/m	< 0.60 A/m
	-5	< 149.6 V/m	< 0.45 A/m
		> 960 MHz	
Category M1	0	199.5 – 354.8 V/m	0.60 – 1.07 A/m
	-5	149.6 – 266.1 V/m	0.45 – 0.80 A/m
Category M2	0	112.2 – 199.5 V/m	0.34 – 0.60 A/m
	-5	84.1 – 149.6 V/m	0.25 – 0.45 A/m
Category M3	0	63.1 – 112.2 V/m	0.19 – 0.34 A/m
	-5	47.3 – 84.1 V/m	0.14 – 0.25 A/m
Category M4	0	< 63.1 V/m	< 0.19 A/m
	-5	< 47.3 V/m	< 0.14 A/m

3 Test Condition, Configuration, Location

Ambient Condition

Temperature : 20 ~ 24 C

Humidity : < 60 %

Testing Configuration

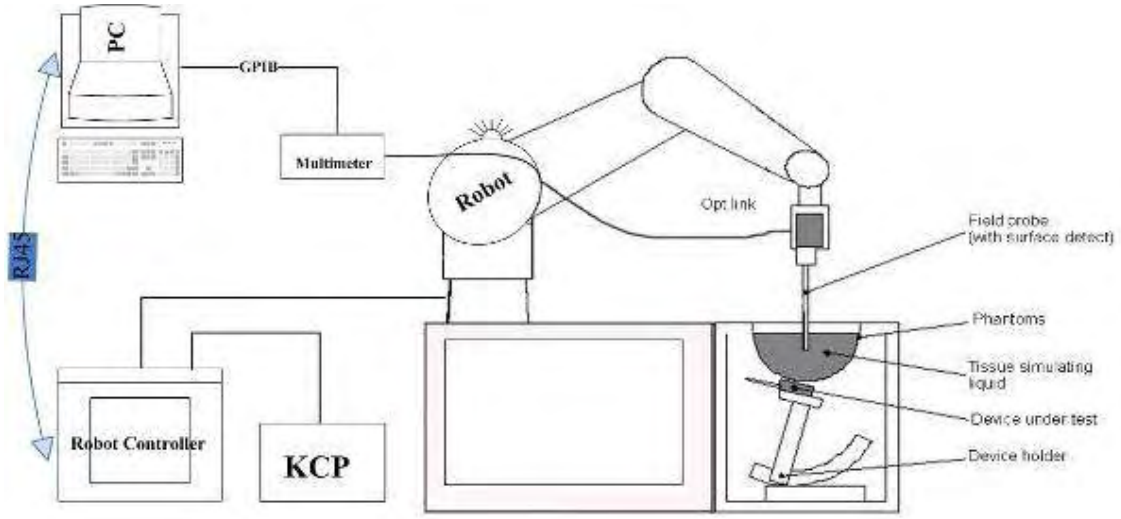
The device was controlled by using a base station emulator R&S CMU200. Communication between the device and the emulator was established by air link. The power control bits was set to "Always Up" from the emulator to radiate maximum output power during all testing

Measurements were performed on the low, middle and high channels of all bands

Test Facility

2206 Ringwood Avenue , San Jose, CA 95131 USA

4 HAC RF Emissions Test System



These measurements were performed with the automated near-field scanning system OPENSAR from SATIMO. The system is based on a high precision robot (working range: 850 mm), which positions the probes with a positional repeatability of better than ± 0.02 mm. Special E- and H-field probes have been developed for measurements close to material discontinuity, the sensors of which are directly loaded with a Schottky diode and connected via highly resistive lines to the data acquisition unit.

The OPENSAR system for performing compliance tests consist of the following items:

1. A standard high precision 6-axis robot (KUKA) with controller and software.
2. KUKA Control Panel (KCP).
3. A dosimetric probe, i.e., an isotropic E-field probe optimized and calibrated for usage in tissue simulating liquid. The probe is equipped with an optical surface detector system.
4. The functions of the PC plug-in card are to perform the time critical task such as signal filtering, surveillance of the robot operation fast movement interrupts.
5. A computer operating Windows XP.
6. OPENSAR software.
7. Remote control with teaches pendant and additional circuitry for robot safety such as warning lamps, etc.
8. The SAM phantom enabling testing left-hand right-hand and body usage.
9. The Position device for handheld EUT.
10. Tissue simulating liquid mixed according to the given recipes (see Application Note).
11. System validation dipoles to validate the proper functioning of the system.

COMOHAC E-Field Probe

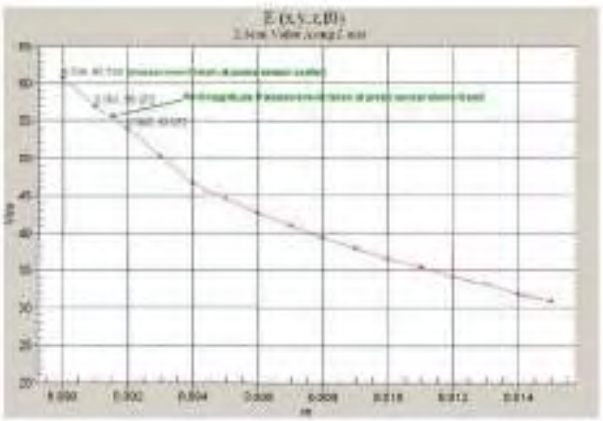
The probe could be checked by measuring the resistance of the three dipoles
Probe calibration is realized by using the waveguide method as described in the IEEE 1309-2005 standard.

Frequency Range	100 MHz - 3 GHz
Probe length	330 mm
Length of one dipole	3.3 mm
Maximum external diameter	8 mm
Probe extremity diameter	6 mm
Distance between dipoles/probe extremity	3.5 mm
Resistance of the three dipole (at the connector)	Dipole 1: R1=1.337 MΩ Dipole 2: R2=1.125 MΩ Dipole 3: R3=1.338 MΩ
Diode Compression Point	Dipole 1: DCP1=129 mV Dipole 2: DCP2=128 mV Dipole 3: DCP3=129 mV

HAC field measurements take place in the close near field with high gradients. Increasing the measuring distance from the source will generally decrease the measured field values (in case of the validation dipole approx. 10％per mm).

Magnetic field sensors are measuring the integral of the H-field across their sensor area surrounded by the loop. They are calibrated in a precise, homogeneous field. When measuring a gradient field, the result will be very close to the field in the center of the loop which is equivalent to the value of a homogeneous field equivalent to the center value. But it will be different from the field at the field at the border of the loop.

Consequently, two sensors with different loop diameters – both calibrated ideally – would give different results when measuring from the edge of the probe sensor elements. The behavior for electrically small E-field sensors is equivalent. See below for distance plots from a WD which show the conservative nature of field readings at the probe element center vs. measurements at the sensor end:



Z-Axis Scan at maximum point above a typical wireless device for E-field

COMOHAC H-Field Probe

The probe could be checked by measuring the resistance of the three ways.
Probe calibration is realized by using the waveguide method as described in the IEEE 1309-2005 standard.

Frequency Range	100 MHz - 30 GHz
Probe length	330 mm
Dimension of one loop	3.3 mm
Maximum external diameter	8 mm
Probe extremity diameter	6 mm
Distance between dipoles/probe extremity	3 mm
Resistance of the three dipole (at the connector)	Dipole 1: R1=1.337 MΩ Dipole 2: R2=1.125 MΩ Dipole 3: R3=1.338 MΩ
Diode Compression Point	Dipole 1: DCP1=129 mV Dipole 2: DCP2=128 mV Dipole 3: DCP3=129 mV

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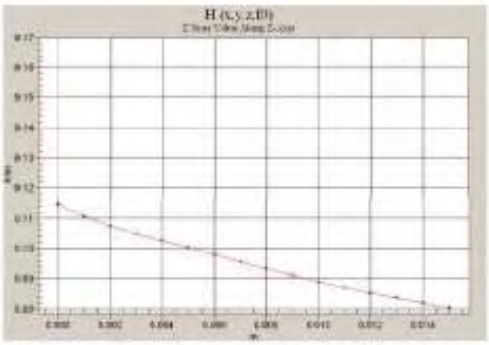


Z-Axis Scan at maximum point above a typical wireless device for H-field

Device Holder

the Mounting Device enables the rotation of the mounted transmitter in spherical coordinates whereby the rotation points is the ear opening. The devices can be easily, accurately, and repeatedly positioned according to the FCC and CENELEC specifications. The device holder can be locked at different phantom locations (left head, right head, flat phantom).

Data Evaluation

The OPENHAC software automatically executes the following procedure to calculate the field units from the microvolt readings at the probe connector. The parameters used in the valuation are stored in the configuration modules of the software:

Probe Parameters	- -Sensitivity	Normi , ai0, ai1, ai2
	- - Conversion factor	ConvFi
	- - Diode compression point Dcpi	dcpi
Device Parameter	- Frequency	f
	- Crest factor	cf
Media Parametrs	- Conductivity	σ
	- Density	ρ

These parameters must be set correctly in the software. They can either be found in the component documents or be imported into the software from the configuration files issued for the OPENHAC components.

The first step of the evaluation is a linearization of the filtered input signal to account for the compression characteristics of the detector diode. The compensation depends on the input signal, the diode type and the DC-transmission factor from the diode to the evaluation electronics. If the exciting field is pulsed, the crest factor of the signal must be known to correctly compensate for peak power. The formula for each channel can be given as：

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

Where V_i = Compensated signal of channel i (i = x, y, z)
U_i = Input signal of channel i (i = x, y, z)
cf = Crest factor of exciting field (DASY parameter)
dcp_i = Diode compression point (DASY parameter)

From the compensated input signals the primary field data for each channel can be evaluated:

E-field probes: $E_i = \sqrt{\frac{V_i}{Norm_i \cdot ConvF}}$

H-field probes: $H_i = \sqrt{Vi} \cdot \frac{a_{i0} + a_{i1} f + a_{i2} f^2}{f}$

Where V_i = Compensated signal of channel i (i = x, y, z)
$Norm_i$ = Sensor sensitivity of channel i (i = x, y, z)
$\mu V/(V/m)2$ for E0field Probes
ConvF= Sensitivity enhancement in solution
a_{ij} = Sensor sensitivity factors for H-field probes

f = Carrier frequency (GHz)
E_i = Electric field strength of channel i in V/m
H_i = Magnetic field strength of channel i in A/m

The RSS value of the field components gives the total field strength (Hermitian magnitude):

$E_{tot} = \sqrt{E_x^2 + E_y^2 + E_z^2}$

The primary field data are used to calculate the derived field units.

The measurement/integration time per point, as specified by the system manufacturer is > 500 ms. The signal response time is evaluated as the time required by the system to reach 90％ of the expected final value after an on/off switch of the power source with an integration time of 500 ms and a probe response time of < 5 ms. In the current implementation, OpenHAC waits longer than 100 ms after having reached the grid point before starting a measurement, i.e., the response time uncertainty is negligible.

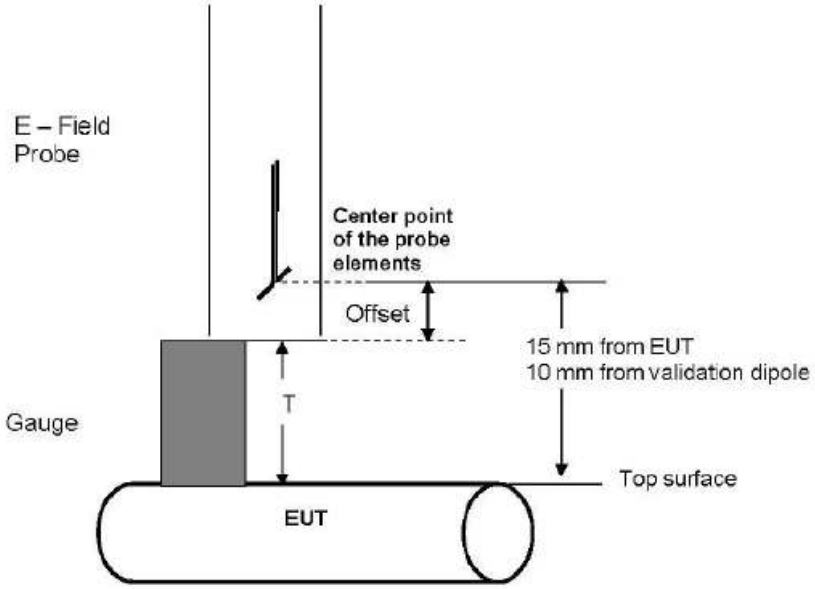
If the device under test does not emit a CW signal, the integration time applied to measure the electric field at a specific point may introduce additional uncertainties due to the discretization. The tolerances for the different systems had the worst-case of 2.6％.

Device Reference Points

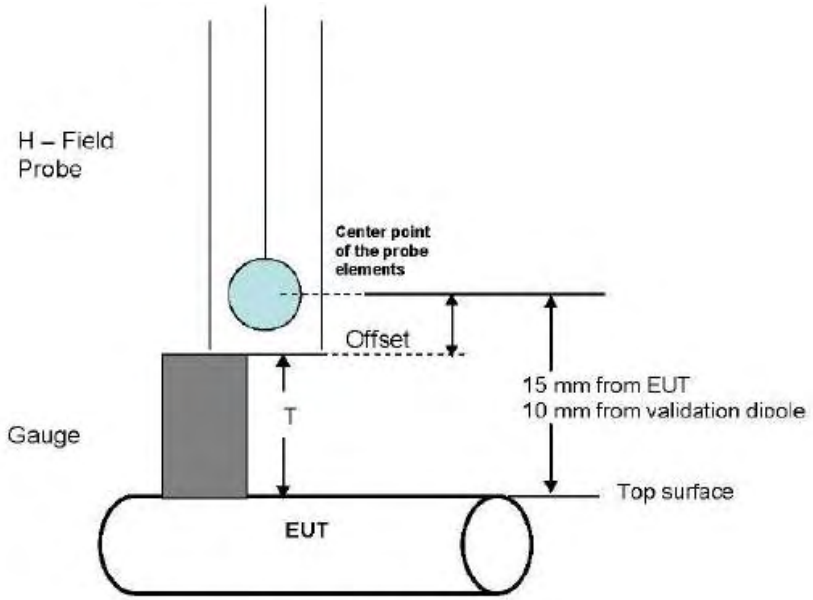
The DUT was put on device holder and adjusted to the accurate and reliable position. Please refer to Appendix E for the Setup photographs

Below diagram illustrate the references and reference plane that shall be used in a typical DUT emissions measurement. The principle of this section is applied to DUT with similar geometry.

- The grid is 5 cm by 5 cm area that is divided into 9 evenly sized blocks or sub-grids.
- The grid is centered on the audio frequency output transducer of the DUT.
- The grid is in a reference plane, which is defined as the planar area that contains the highest point in the area of the phone that normally rests against the user's ear. It is parallel to the centerline of the receiver area of the phone and is defined by the points of the receiver-end of the DUT handset, which, in normal handset use, rest against the ear.
- The measurement plane is parallel to, and 15 mm in front of, the reference plane.



Gauge block with E-field probe



Gauge block with H-field probe

HAC RF Emission Test Procedure

The following illustrate a typical RF emissions test scan over a wireless communications device:

1. Proper operation of the field probe, probe measurement system, other instrumentation, and the positioning system was confirmed.

2. DUT is positioned in its intended test position, acoustic output point of the device perpendicular to the field probe.

3. The DUT operation for maximum rated RF output power was configured and confirmed with the base station simulator, at the test channel and other normal operating parameters as intended for the test. The battery was ensured to be fully charged before each test.

4. The center sub-grid was centered over the center of the acoustic output (also audio band magnetic output, if applicable). The DUT audio output was positioned tangent (as physically possible) to the measurement plane.

5. A surface calibration was performed before each setup change to ensure repeatable spacing and proper maintenance of the measurement plane using the test Arch.

6. The measurement system measured the field strength at the reference location.

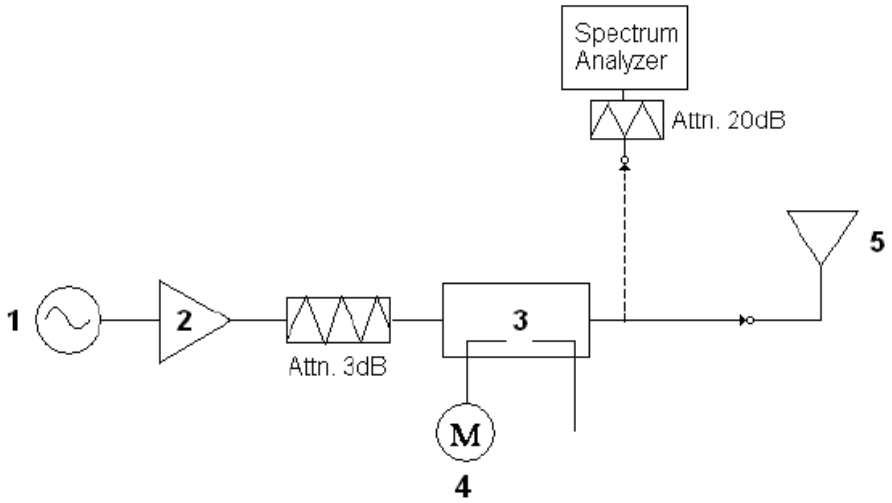
7. Measurements at 5 mm increments in the 5 x 5 cm region were performed and recorded. A 360◦ rotation about the azimuth axis at the maximum interpolated position was measured. For the worst-case condition, the peak reading from this rotation was used in re-evaluating the HAC category.

8. The system performed a drift evaluation by measuring the field at the reference location.

9. Steps 1 ~ 8 were done for both the E and H-Field measurements.

5 HAC E/H Probe Modulation factor

A calibration shall be made of the modulation response of the probe and its instrumentation chain. This calibration shall be performed with the field probe, attached to the instrumentation that is to be used with it during the measurement. The response of the probe system to a CW field at the frequency(s) of interest is compared to its response to a modulated signal with equal peak amplitude. The field level of the test signals shall be more than 10 dB above the ambient level and the noise floor of the instrumentation being used. The ratio of the CW reading to that taken with a modulated field shall be applied to the readings taken of modulated fields of the specified type.



This was done using the following procedure:

1. Fixing the probe in a set location relative to a field generating device.
2. Illuminate the probe with a CW signal at the intended measurement frequency.
3. Record the reading of the probe measurement system of the CW signal.
4. Determine the level of the CW signal being used to drive the field generating device.
5. Substitute a signal using the same modulation as that used by the intended WD for the CW signal.
6. Set the peak amplitude during transmission of the modulated signal to equal the amplitude of the CW signal.
7. Record the reading of the probe measurement system of the modulated signal.
8. The ratio of the CW to modulated signal reading is the modulation factor.
9. Repeat 2~8 steps at intended measurement frequency for both E and H field probe.

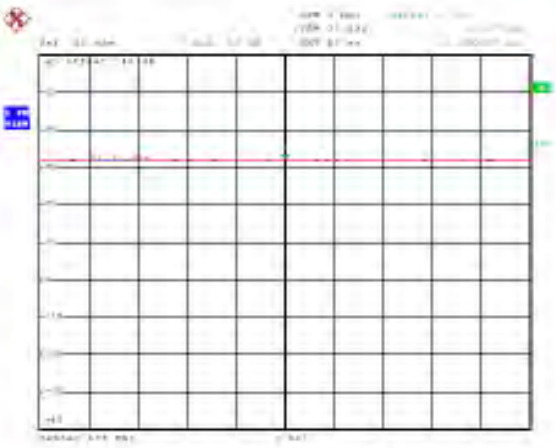
PMF Summary :

Frequency	Modulation	E Field	H Field	PMF	
		V/M	A/M	E Field	H Field
835	CW	662	1.792	-	-
835	AM 80%	415	1.440	1.60	1.24
835	GSM	252	1.199	2.63	1.50
1880	CW	465	1.525	-	-
1880	AM 80%	293.8	1.278	1.58	1.19
1880	GSM	172.2	1.195	2.7	1.28

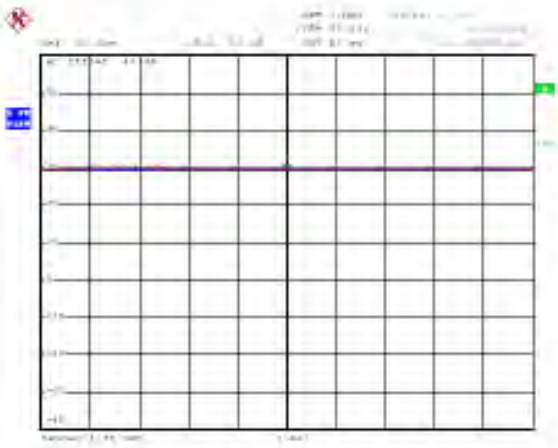
Frequency	Modulation	E Field	H Field	PMF	
		V/M	A/M	E Field	H Field
835	CW	318.6	0.658	-	-
835	AM 80%	201.5	0.449	1.581	1.465
835	WCDMA	325.4	0.825	0.980	0.798
1880	CW	229.5	0.752	-	-
1880	AM 80%	155.7	0.629	1.474	1.196
1880	WCDMA	234.5	1.457	0.979	0.516

Note: Modulation factor = CW / WD_GSM

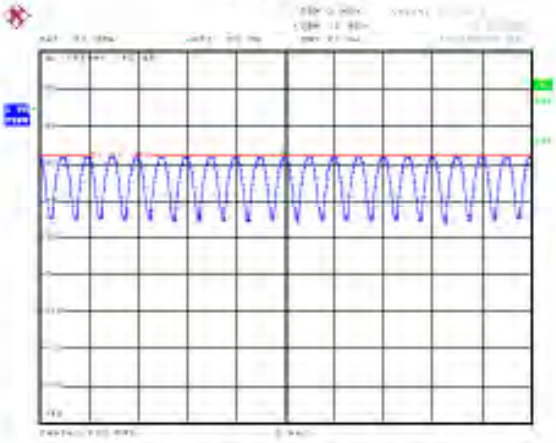
Zero span Spectrum Plots for RF Field Probe Modulation Factor



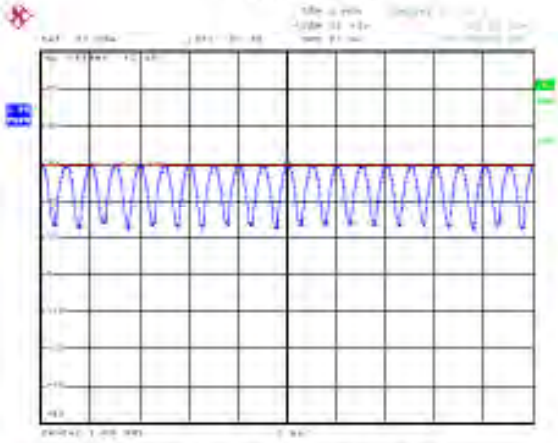
835MHz - CW



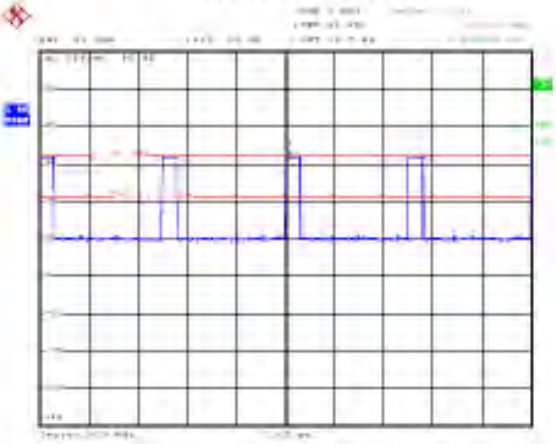
1880MHz - CW



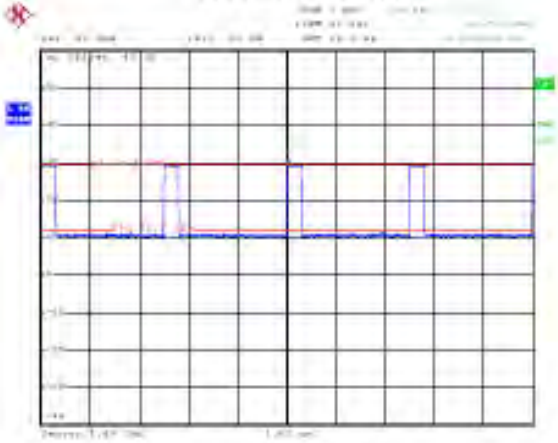
835MHz - 80% AM



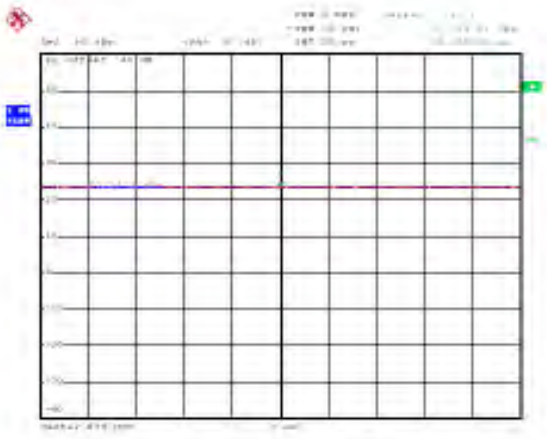
1880MHz - 80% AM



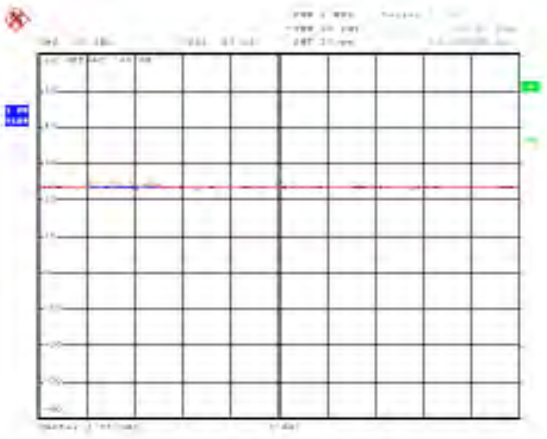
835MHz - GSM



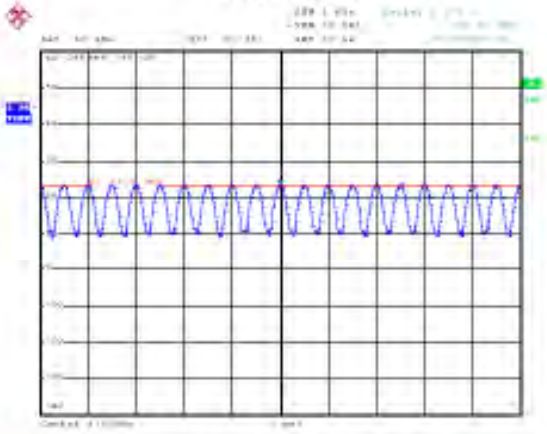
1880MHz - GSM



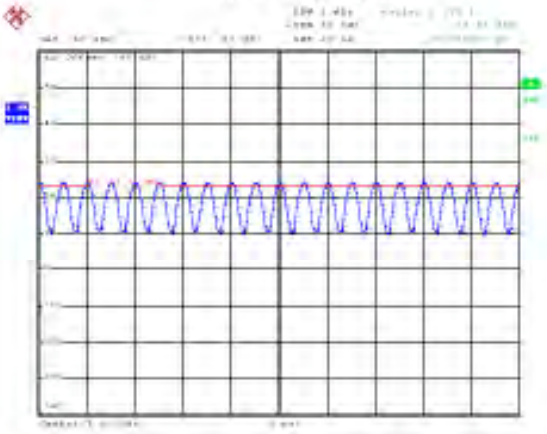
835MHz - CW



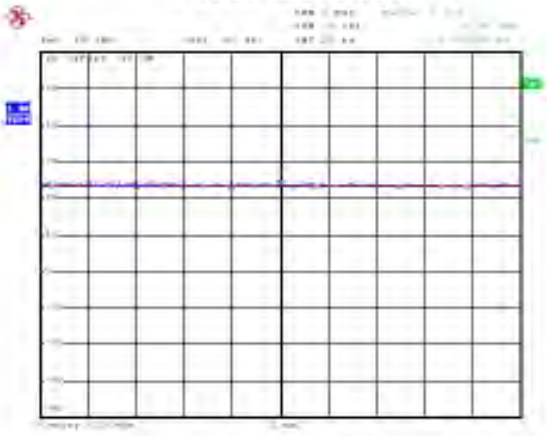
1880MHz - CW



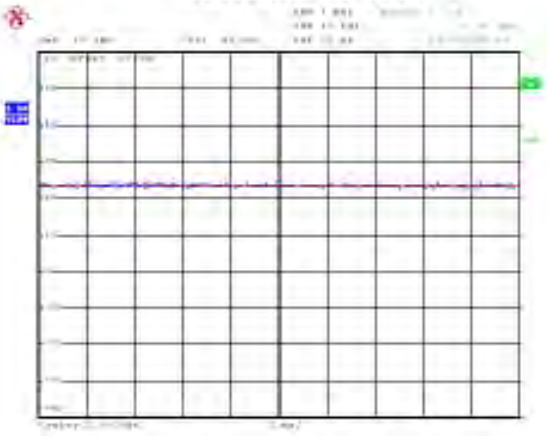
835MHz - 80% AM



1880MHz - 80% AM



835MHz - WCDMA



1880MHz - WCDMA

6 List of Equipments

Name of Equipment	Manufacturer	Type/Model	Serial Number	Calibration Due
P C	Compaq	PV 3.06GHz	375052-AA1	N/A
Signal Generator	Agilent	8665B-008	3744A01304	5/17/2011
MultiMeter	Keithley	MiltiMeter 2000	1259033	08/13/2011
S-Parameter Network Analyzer	Agilent	8753ES	US38161019	08/04/2012
Wireless Communication Test Set	R & S	CMU200	111078	2/22/2012
Power Meter	HP	437B	3038A03648	5/17/2011
COMOHAC E-Field Probe	SATIMO	EPH25	SN 3110 EPH25	08/04/2011
COMOHAC H-Field Probe	SATIMO	HPH38	SN 3110 HPH38	08/04/2011
COMOSAR Open Coaxial Probe	SATIMO	OCP36	SN 31/10 OCP36	08/04/2012
T-Coil Probe	SATIMO	TCP17	SN 31/10 TCP17	08/04/2011
Communication Antenna	SATIMO	ANTA30	SN 31/10 ANTA30	N/A
Laptop POSITIONING DEVICE	SATIMO	LSH63	SN 31/10 LSH13	N/A
Mobile Phone POSITIONING DEVICE	SATIMO	MSH63	SN 31/10 MSH63	N/A
COMOHAC Broadband Dipole 800-950	SATIMO	COMOHAC Broadband Dipole 800-950MHz	SN 31/10 DHA25	08/04/2012
COMOHAC Broadband Dipole 1700-2000	SATIMO	COMOHAC Broadband Dipole 1700-2000MHz	SN 31/10 DHB26	08/04/2012
COMOHAC TELEPHONE MAGNETIC FIELD SIMULATOR	SATIMO	TMFS08	SN 31/10 TMFS08	08/04/2012
DUMMY PROBE	ANTENNESSA	None	SN 31/10	N/A
SAM PHANTOM	SATIMO	SAM77	SN 31/10 SAM77	N/A
Elliptic Phantom	SATIMO	ELLI17	SN 31-10 ELLI17	N/A
PHANTOM TABLE	SATIMO	N/A	N/A	N/A
6 AXIS ROBOT	KUKA	KR5	949319	N/A
High Power Solid State Amplifier (80MHz~1000MHz)	Instruments for Industry	CMC150	M631-0408	N/A
Medium Power Solid State Amplifier (0.8~4.2GHz)	Instruments for Industry	S41-25	M629-0408	N/A
Wave Tube Amplifier 4-8 GHz at 20Watt	Hughes Aircraft Company	1277H02F000	81	N/A

7 HAC RF Emissions Measurement Uncertainty

Uncertainty Component	Tolerances (dB) / %	Probability Distribution	Divisor	Ci	Uncertainty (dB)	Uncertainty (%)
Measurement System Related						
RF Reflections	0.1 dB	R	√3	1	0.06	N/A
Field Probe Conv. Factor	0.2 dB	R	√3	1	0.12	N/A
Field Probe Anisotropy	0.25 dB	R	√3	1	0.14	N/A
Positioning Accuracy	0.1 dB	R	√3	1	0.06	N/A
Probe Cable Placement	0.1 dB	R	√3	1	0.06	N/A
System Repeatability	0.2 dB	R	√3	1	0.12	N/A
EUT Repeatability	0.1 dB	N	1	1	0.10	N/A
Combined Standard Uncertainty :					0.26	6.36 %
Test Sample Related						
Device Positioning Vertical	4.7 %	R	√3	0.67	N/A	1.8 %
Device Positioning Lateral	1.0 %	R	√3	1	N/A	0.6 %
Device Holder	2.4 %	R	√3	1	N/A	1.4 %
Test Sample	0.3 %	N	1	1	N/A	0.3 %
Power drift	5 %	R	√3	1	N/A	1.7 %
PMF Calculation						
Power Sensor	1.0 %	R	√3	1	N/A	0.6 %
Dual Directional Coupler	1.0 %	R	√3	1	N/A	0.6 %
Phantom and setup Related						
Phantom Thickness	2.4 %	R	√3	0.67	N/A	0.9 %
Combined Standard Uncertainty						7.1 %
Expanded Standard Uncertainty (K=2 , confidence 95%)						14.2 %

8 System and Liquid Validation

System Validation

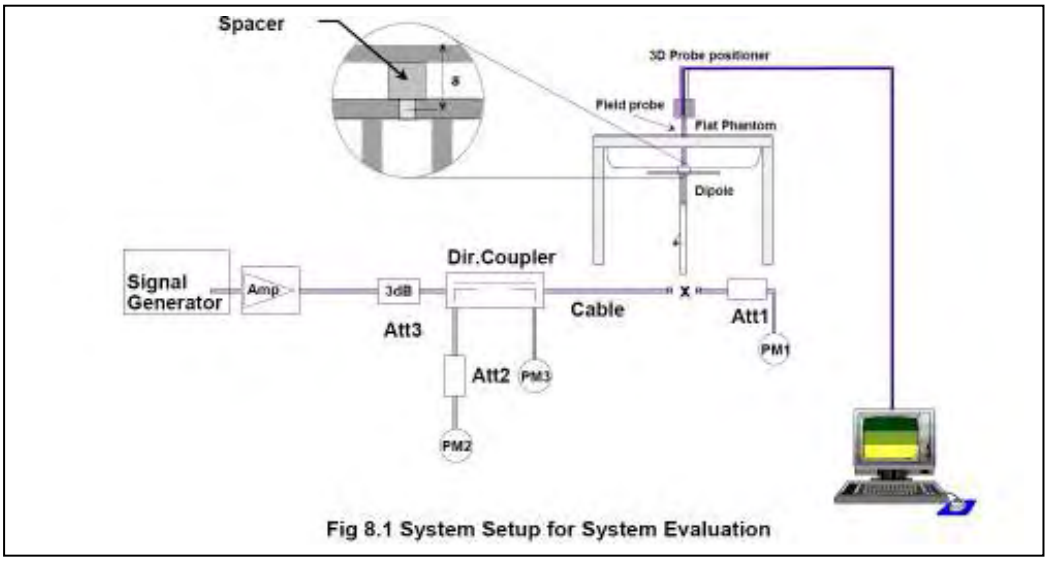


Fig 8.1 System Setup for System Evaluation

The system performance check verifies that the system operates within its specifications. System and operator errors can be detected and corrected. It is recommended that the system performance check be performed prior to any usage of the system in order to guarantee reproducible results. The system performance check uses normal HAC measurements in a simplified setup with a well characterized source. This setup was selected to give a high sensitivity to all parameters that might fail or vary over time. The system check does not intend to replace the calibration of the components, but indicates situations where the system uncertainty is exceeded due to drift or failure.

In the simplified setup for system evaluation, the DUT is replaced by a calibrated dipole and the power source is replaced by a continuous wave that comes from a signal generator. The calibrated dipole must be placed beneath the flat phantom section of the SAM twin phantom with the correct distance holder. The distance holder should touch the phantom surface with a light pressure at the reference marking and be oriented parallel to the long side of the phantom. The equipment setup is shown below:

1. Signal Generator
2. Amplifier
3. Directional Coupler
4. Power Meter
5. Calibrated Dipole

Comparing to the original E-field or H-field value provided by SATIMO, the validation data should be within its specification of 25 %. Below Table shows the target value and measured value. The table below indicates the system performance check can meet the variation criterion and the plots can be referred to Appendix A of this report.

Measurement Date	Frequency (MHz)	Target Value (V/M)	Measured E Field (V/M)	Deviation (%)	Input Power (dBm)
Sept 03 2010	835	228	230.32	1.02	20
Sept 03 2010	1900	163	168.97	3.66	20
Measurement Date	**Frequency (MHz)**	**Target Value (A/M)**	**Measured H Field (A/M)**	**Deviation (%)**	**Input Power (dBm)**
Sept 03 2010	835	0.43	0.519	20.70	20
Sept 03 2010	1900	0.494	0.526	6.50	20

9 HAC RF Test Result

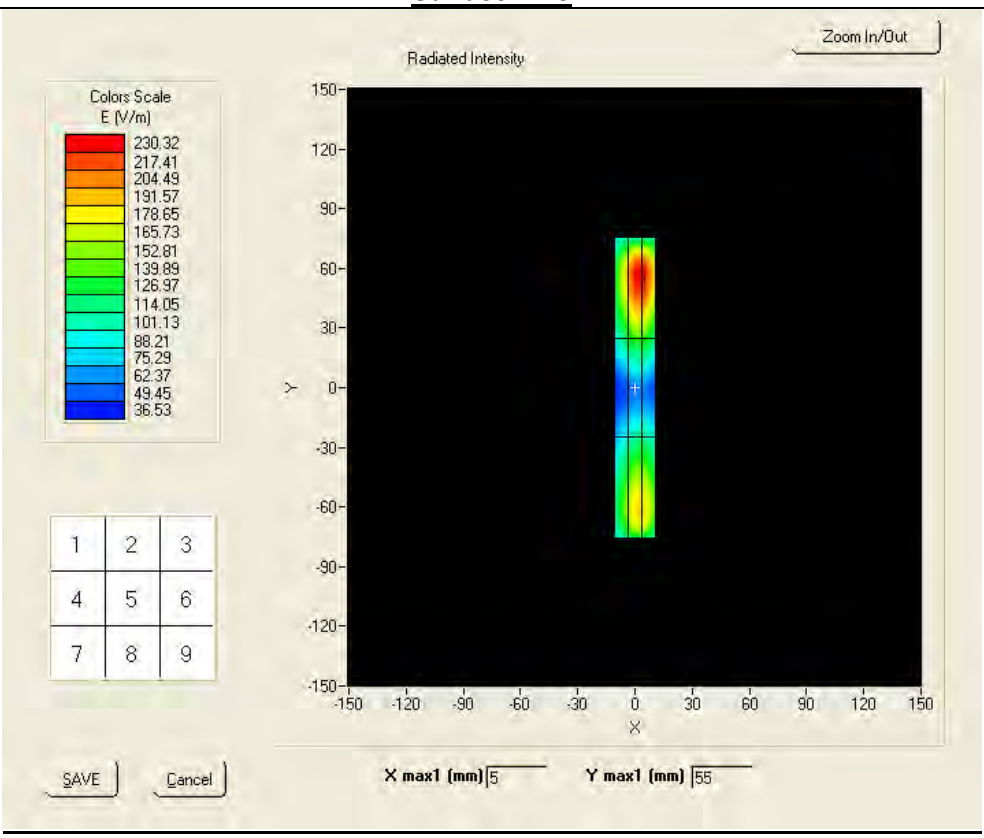
HAC E Field Test Result Summary

Operating Mode	Channel	EUT Configuration	Peak E Field (V/M)	M rating
GSM850	Low	Standard	41.47	M4
	Mid	Standard	44.39	**M3**
	High	Standard	45.92	M3
GSM1900	Low	Standard	31.21	M4
	Mid	Standard	31.86	M4
	High	Standard	33.21	M4
WCDMA850	Low	Standard	37.70	M4
	Mid	Standard	38.29	M4
	High	Standard	39.25	M4
WCDMA1700	Low	Standard	28.19	M4
	Mid	Standard	26.92	M4
	High	Standard	27.70	M4
WCDMA1900	Low	Standard	25.92	M4
	Mid	Standard	25.76	M4
	High	Standard	26.69	M4

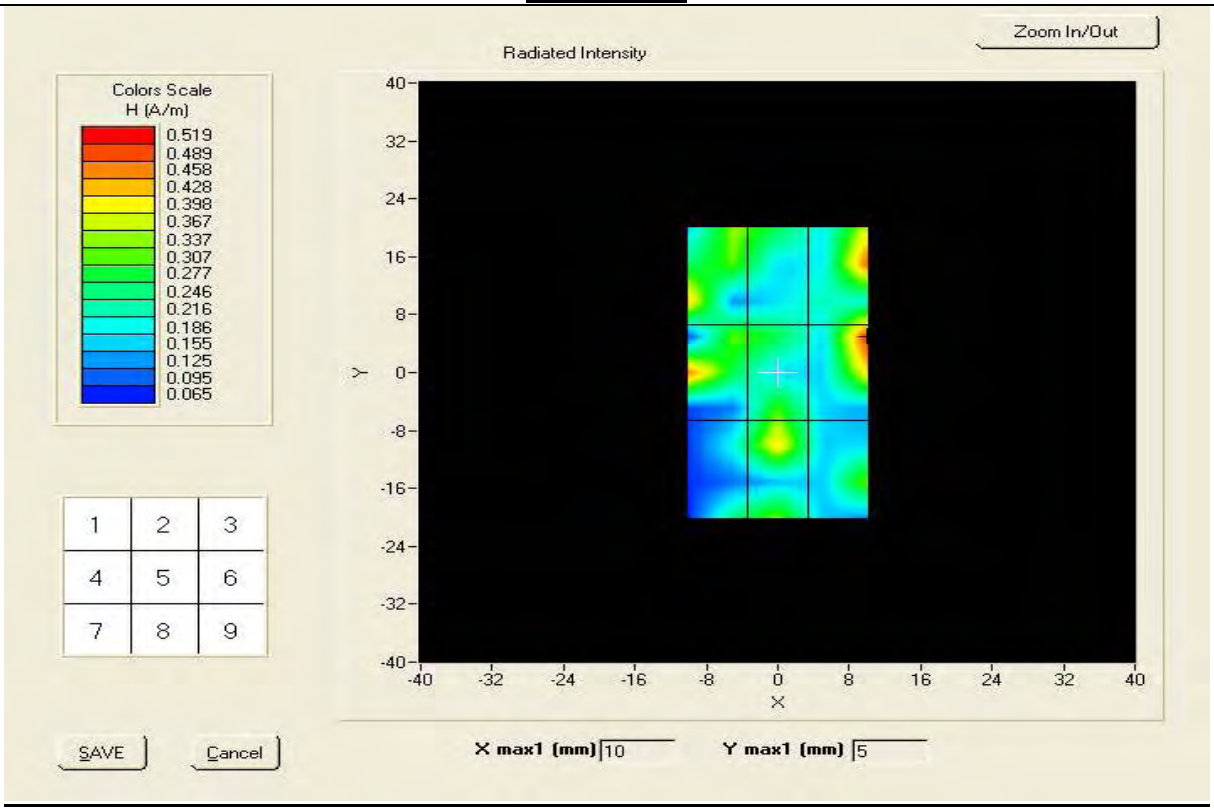
HAC H Field Test Result Summary

Operating Mode	Channel	EUT Configuration	Peak H Field (A/M)	M rating
GSM850	Low	Standard	-10.83	M4
	Mid	Standard	-9.95	M4
	High	Standard	-8.28	M4
GSM1900	Low	Standard	-19.35	M4
	Mid	Standard	-17.95	M4
	High	Standard	-16.64	M4
WCDMA850	Low	Standard	-19.08	M4
	Mid	Standard	-18.06	M4
	High	Standard	-16.63	M4
WCDMA1700	Low	Standard	-24.06	M4
	Mid	Standard	-25.62	M4
	High	Standard	-25.02	M4
WCDMA1900	Low	Standard	-23.35	M4
	Mid	Standard	-23.39	M4
	High	Standard	-23.18	M4

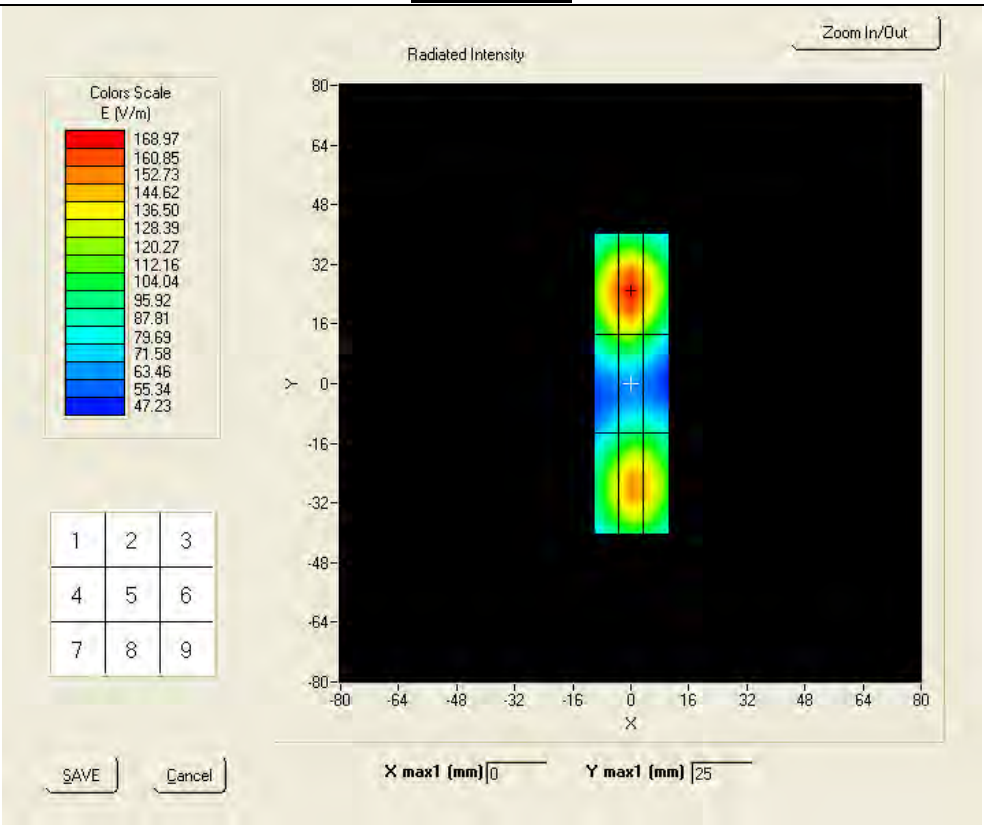
Annex A HAC RF Emissions Validation

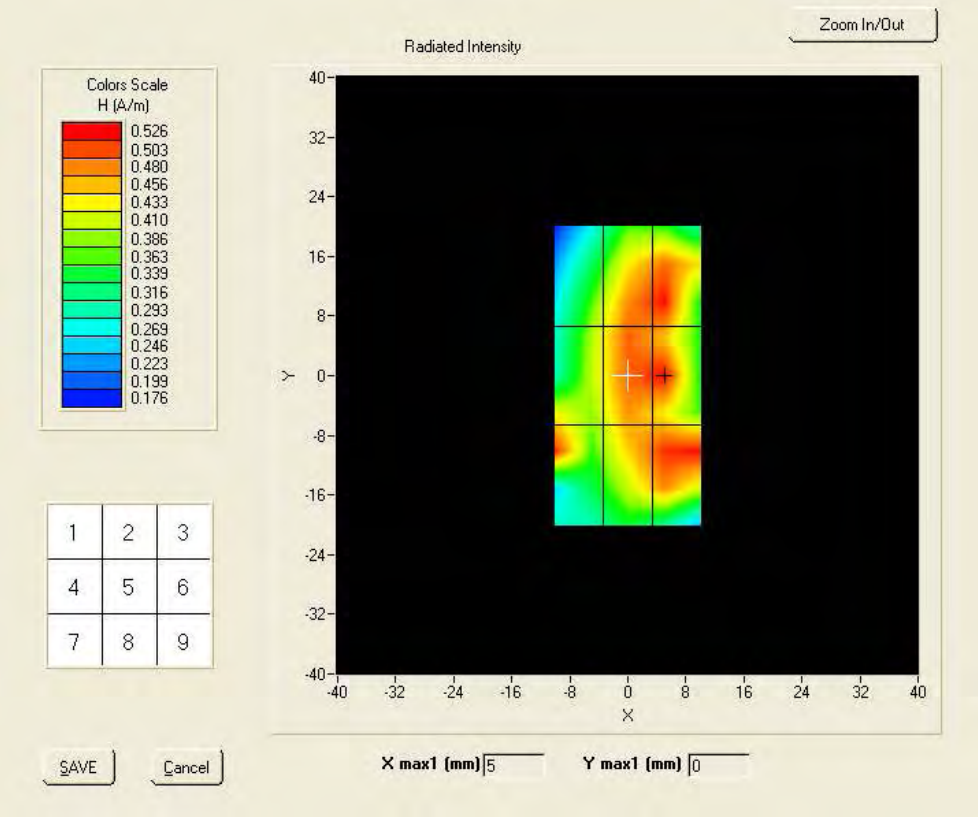
GSM850
Lower Band
Frequency (MHz): 835.000000
Surface HAC

Probe Modulation Factor = 1.000000
Maximum value of Field = 230.32 V/m

GSM850
Lower Band
Frequency (MHz): 835.000000
Surface HAC



Probe Modulation Factor = 1.000000
Maximum value of field = 0.519 A/m

GSM1900
Middle Band
Frequency (MHz): 1990.00000
Surface HAC

Probe Modulation Factor = 1.000000
Maximum value of field = 168.97 V/m

GSM1900
Middle Band
Frequency (MHz): 1900.000000
Surface HAC

Probe Modulation Factor = 1.000000
Maximum value of field = 0.526 A/m

Annex B HAC RF Emissions Data

Item	Type	Band	Test Configurations
1	Standard Phone	GSM850	E Field
2	Standard Phone	GSM850	H Field
3	Standard Phone	GSM850	E Field
4	Standard Phone	GSM850	H Field
5	Standard Phone	GSM850	E Field
6	Standard Phone	GSM850	H Field
7	Standard Phone	GSM1900	E Field
8	Standard Phone	GSM1900	H Field
9	Standard Phone	GSM1900	E Field
10	Standard Phone	GSM1900	H Field
11	Standard Phone	GSM1900	E Field
12	Standard Phone	GSM1900	H Field
13	Standard Phone	WCDMA850	E Field
14	Standard Phone	WCDMA850	H Field
14	Standard Phone	WCDMA850	E Field
15	Standard Phone	WCDMA850	H Field
16	Standard Phone	WCDMA850	E Field
17	Standard Phone	WCDMA850	H Field
18	Standard Phone	WCDMA850	E Field
19	Standard Phone	WCDMA1700	H Field
20	Standard Phone	WCDMA1700	E Field
21	Standard Phone	WCDMA1700	H Field
22	Standard Phone	WCDMA1700	E Field
23	Standard Phone	WCDMA1700	H Field

24	Standard Phone	WCDMA1700	E Field
25	Standard Phone	WCDMA1900	H Field
26	Standard Phone	WCDMA1900	E Field
27	Standard Phone	WCDMA1900	H Field
28	Standard Phone	WCDMA1900	E Field
29	Standard Phone	WCDMA1900	H Field
30	Standard Phone	WCDMA1900	E Field

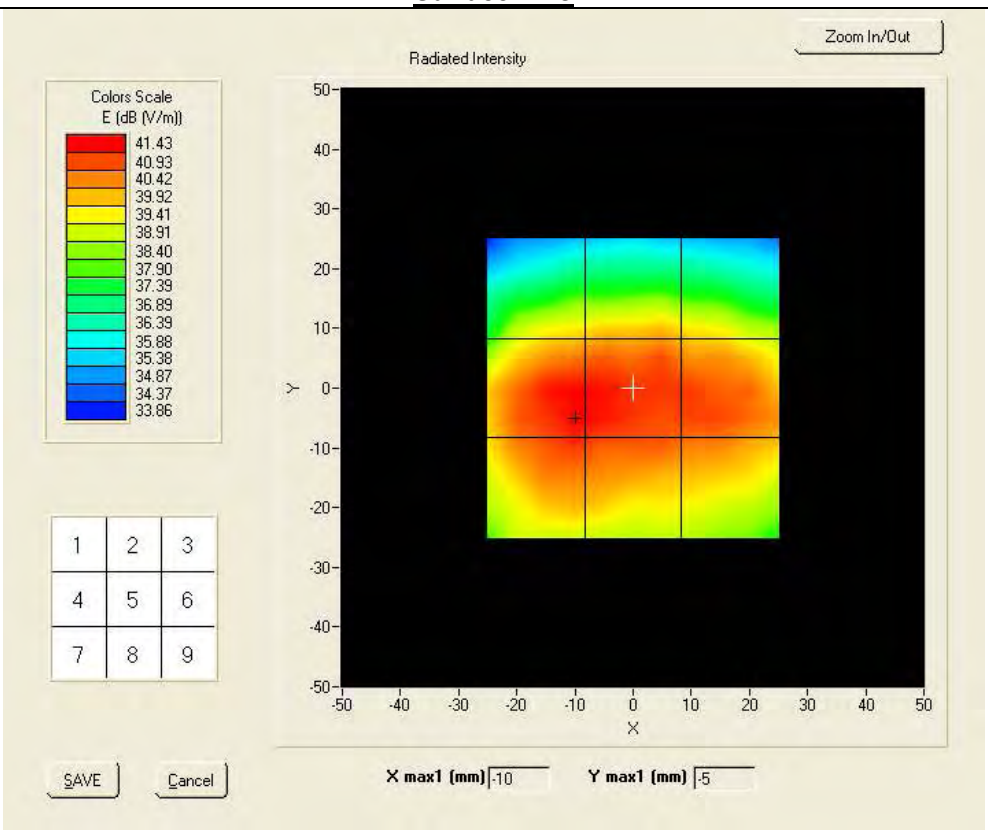
Test Item 1

GSM850

Lower Band

Frequency (MHz): 824.200000

Surface HAC



Probe Modulation Factor = 2.630000

Maximum value of total field = 41.47 V/m

Hearing Aid Near-Field Category: M4 (AWF -5 dB)

E In V/M

Grid 1: 39.55	Grid 2: 39.88	Grid 3: 39.47
Grid 4: 41.51	**Grid 5: 41.47**	Grid 6: 41.07
Grid 7: 41.21	**Grid 8: 41.09**	Grid 9: 40.69

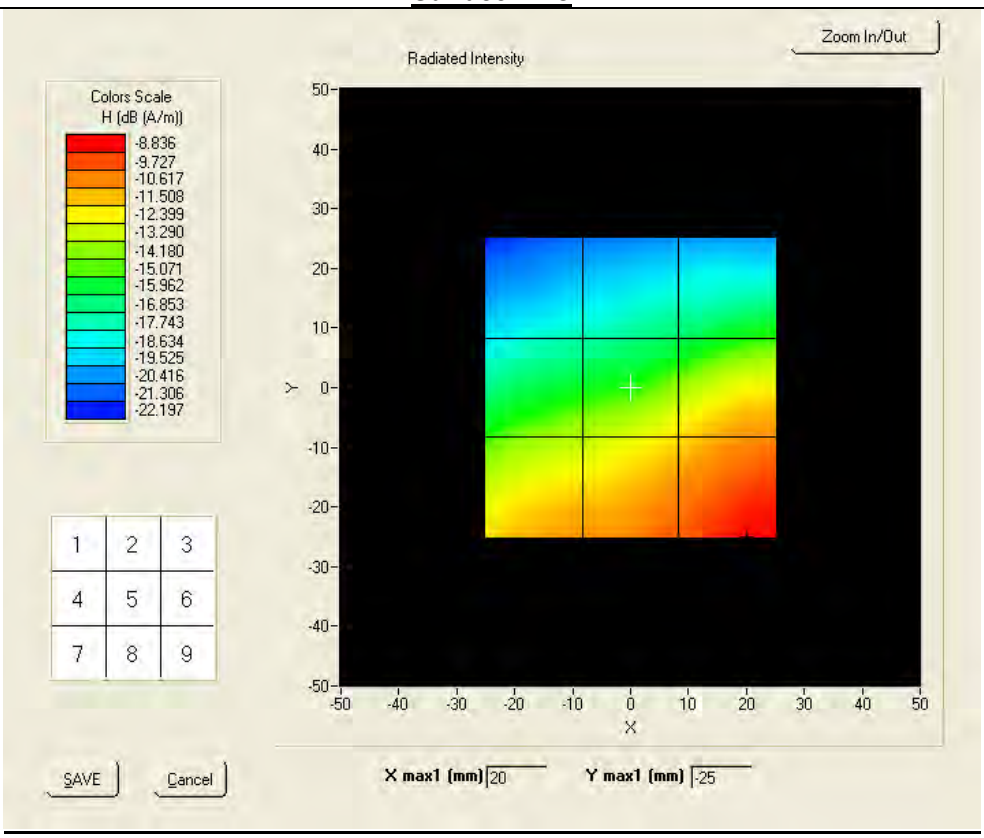
Test Item 2

GSM850

Lower Band

Frequency (MHz): 824.200000

Surface HAC



Probe Modulation Factor = 1.500000

Maximum value of total field = -10.83 A/m

Hearing Aid Near-Field Category: M4 (AWF -5 dB)

H In A/M

Grid 1: -18.22	Grid 2: -16.99	Grid 3: -15.55
Grid 4: -13.77	Grid 5: -12.20	**Grid 6: -10.80**
Grid 7: -10.83	**Grid 8: -10.02**	**Grid 9: -8.81**

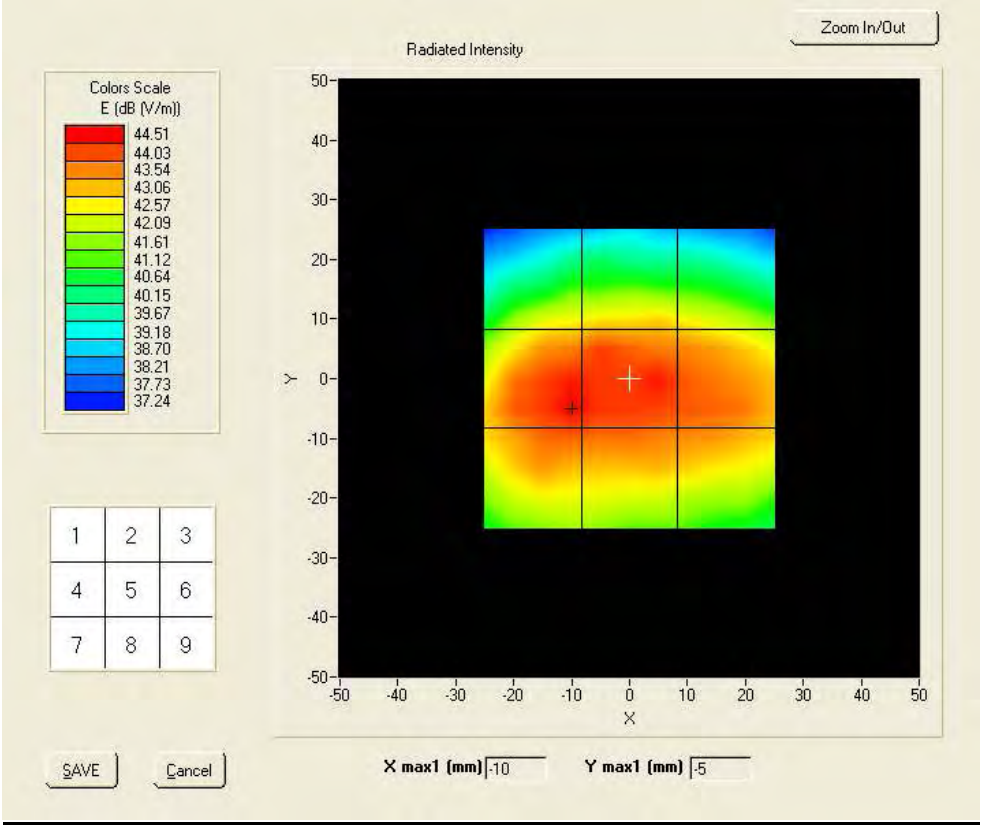
Test Item 3

GSM850

Middle Band

Frequency (MHz): 836.400000

Surface HAC



Probe Modulation Factor = 2.630000

Maximum value of total field = 44.39 V/m

Hearing Aid Near-Field Category: M3 (AWF -5 dB)

E In V/M

Grid 1: 42.54	Grid 2: 42.84	Grid 3: 42.45
Grid 4: 44.53	**Grid 5: 44.39**	Grid 6: 43.96
Grid 7: 44.13	**Grid 8: 44.02**	Grid 9: 43.67

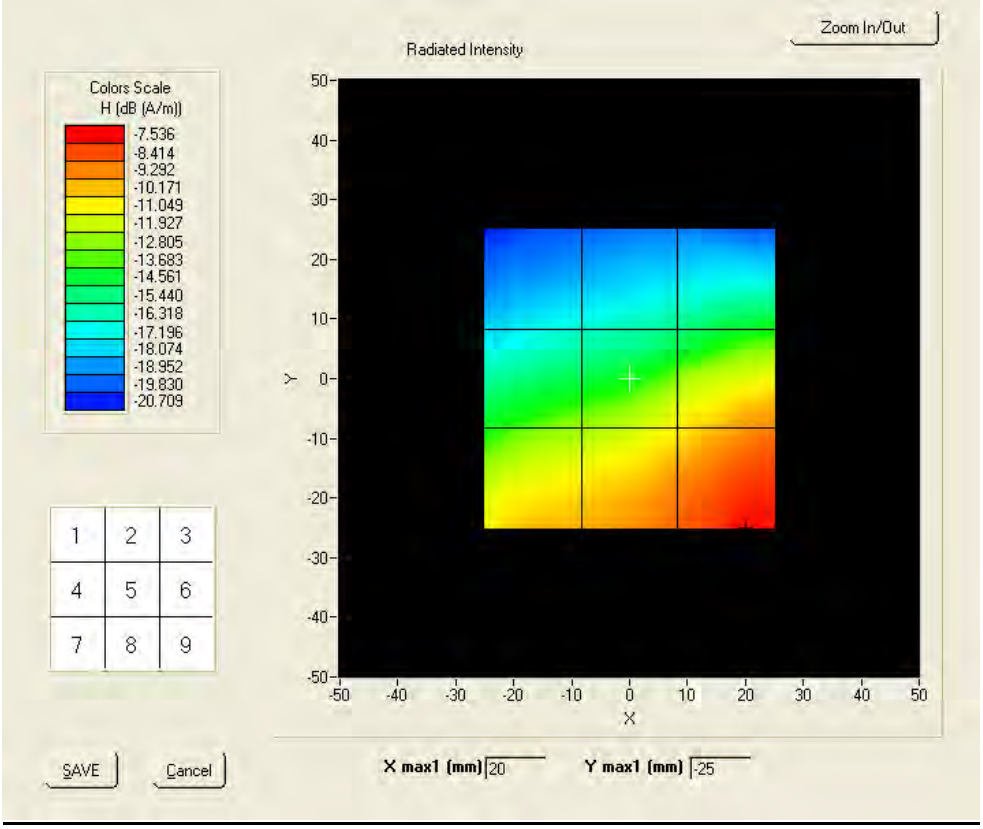
Test Item 4

GSM850

Middle Band

Frequency (MHz): 836.400000

Surface HAC



Probe Modulation Factor = 1.500000

Maximum value of total field = -9.95 A/m

Hearing Aid Near-Field Category: M4 (AWF -5 dB)

H In A/M

Grid 1: -17.21	Grid 2: -15.99	Grid 3: -14.61
Grid 4: -12.81	Grid 5: -11.16	**Grid 6: -9.46**
Grid 7: -9.95	**Grid 8: -8.71**	**Grid 9: -7.51**

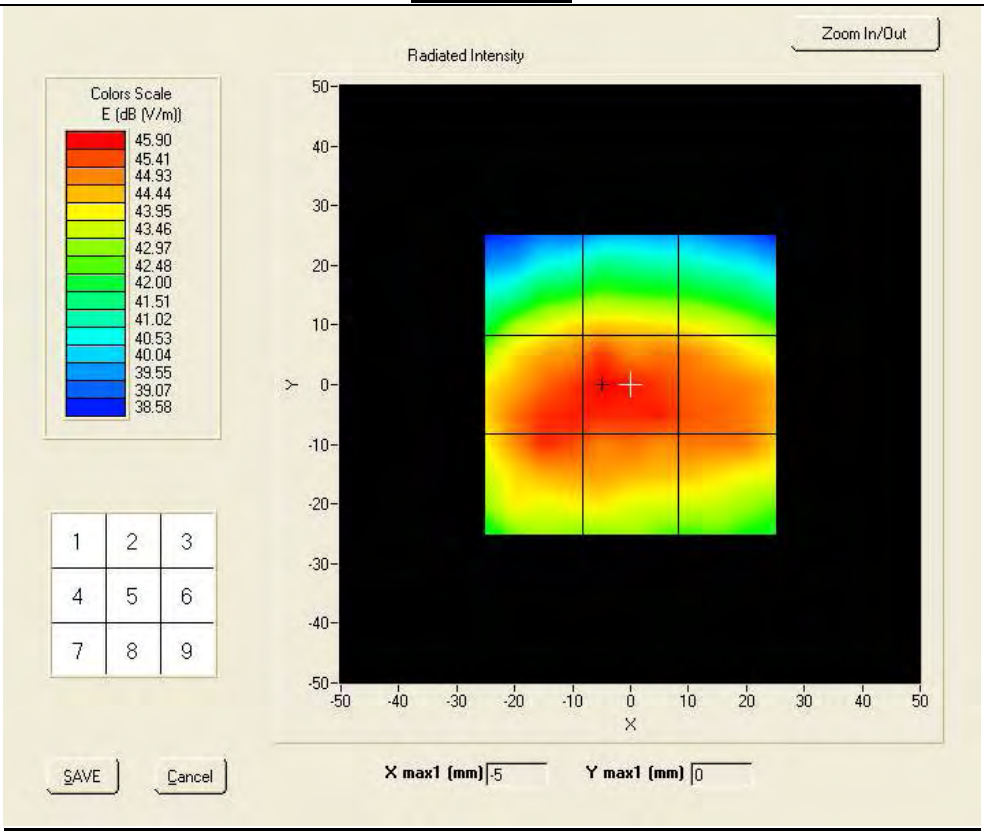
Test Item 5

GSM850

Higher Band

Frequency (MHz): 848.600000

Surface HAC



Probe Modulation Factor = 12.630000

Maximum value of total field = 45.92 V/m

Hearing Aid Near-Field Category: M3 (AWF -5 dB)

E In V/M

Grid 1: 44.21	Grid 2: 44.26	Grid 3: 43.92
Grid 4: 45.79	**Grid 5: 45.92**	Grid 6: 45.33
Grid 7: 45.76	**Grid 8: 45.35**	Grid 9: 45.19

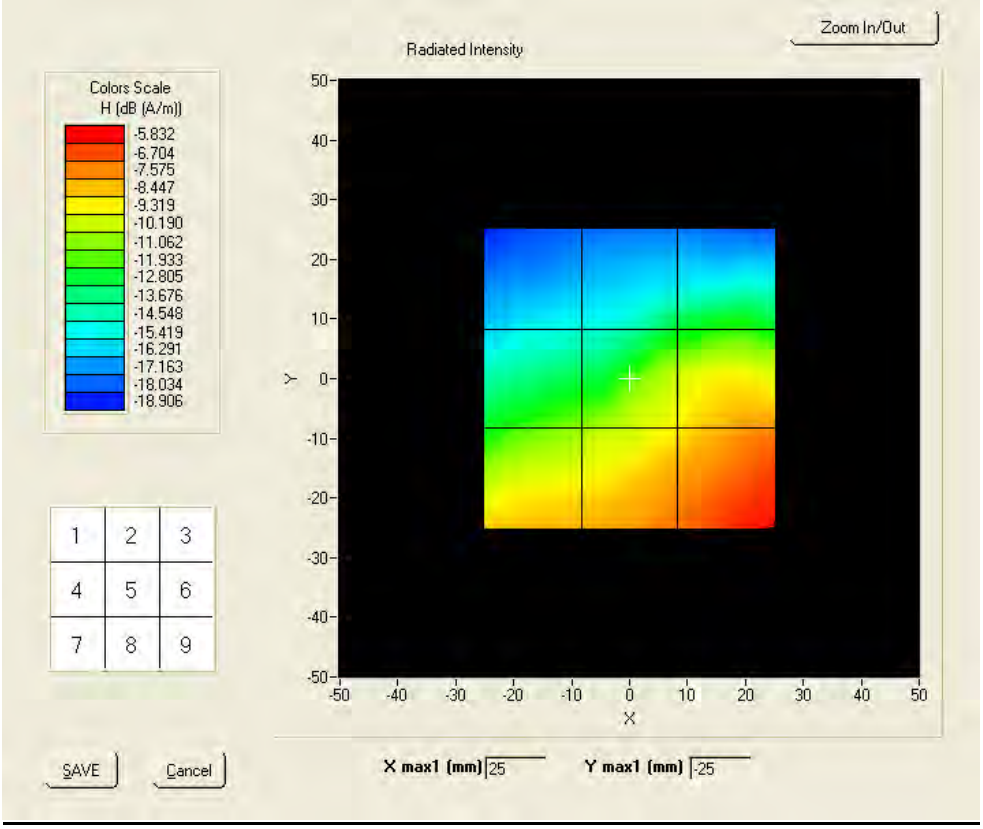
Test Item 6

GSM850

Higher Band

Frequency (MHz): 848.600000

Surface HAC



Probe Modulation Factor = 1.500000

Maximum value of total field = -8.28 A/m

Hearing Aid Near-Field Category: M4 (AWF -5 dB)

H In A/M

Grid 1: -15.61	Grid 2: -13.11	Grid 3: -12.20
Grid 4: -11.10	Grid 5: -9.25	**Grid 6: -8.02**
Grid 7: -8.28	**Grid 8: -7.23**	**Grid 9: -5.83**

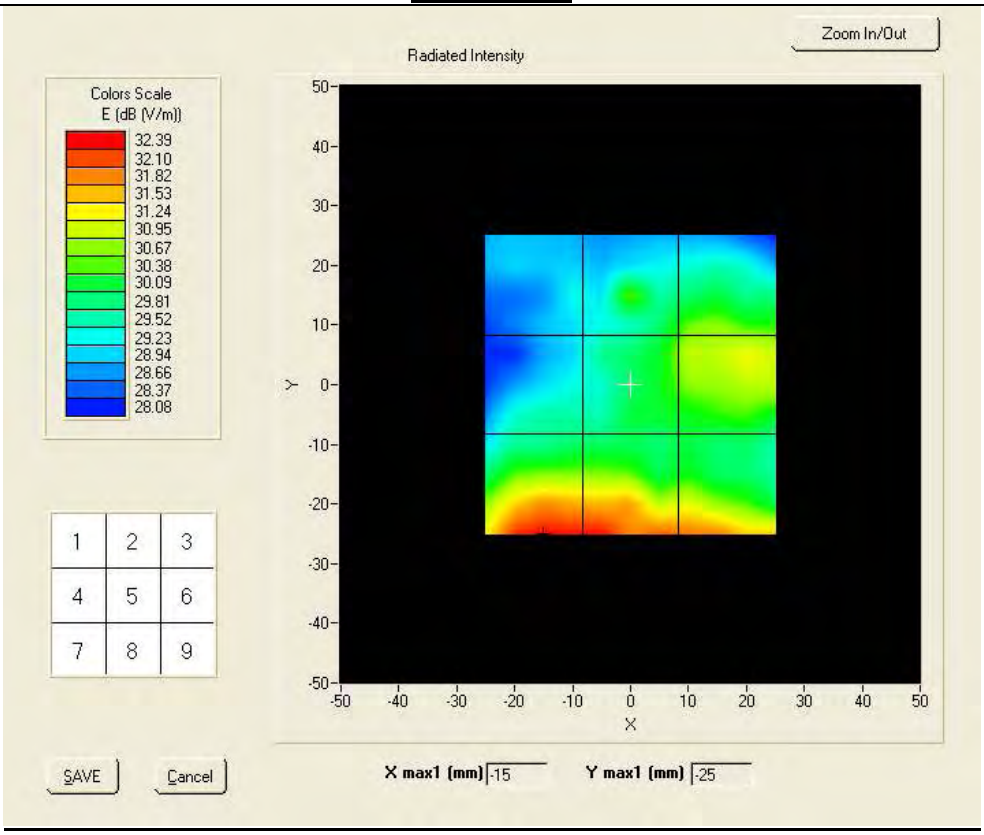
Test Item 7

GSM1900

Lower Band

Frequency (MHz): 1850.200000

Surface HAC



Probe Modulation Factor = 2.700000

Maximum value of total field = 31.21 V/m

Hearing Aid Near-Field Category: M4 (AWF -5 dB)

E In V/M

Grid 1: 29.25	Grid 2: 30.64	Grid 3: 30.71
Grid 4: 29.67	Grid 5: 30.77	**Grid 6: 31.21**
Grid 7: 32.39	**Grid 8: 32.38**	**Grid 9: 31.90**

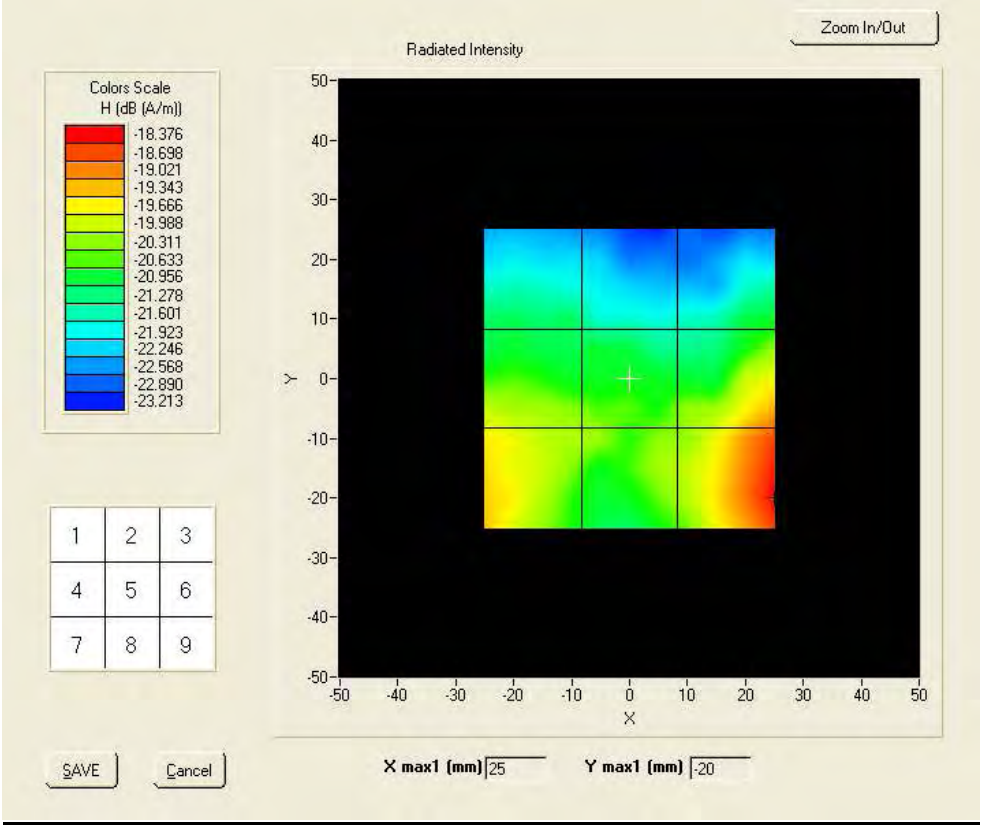
Test Item 8

GSM1900

Lower Band

Frequency (MHz): 1850.200000

Surface HAC



Probe Modulation Factor = 1.280000

Maximum value of total field = -19.35 A/m

Hearing Aid Near-Field Category: M4 (AWF -5 dB)

H In A/M

Grid 1: -21.08	Grid 2: -21.56	Grid 3: -20.90
Grid 4: -19.84	Grid 5: -20.28	**Grid 6: -19.00**
Grid 7: -19.35	**Grid 8: -20.05**	**Grid 9: -18.38**

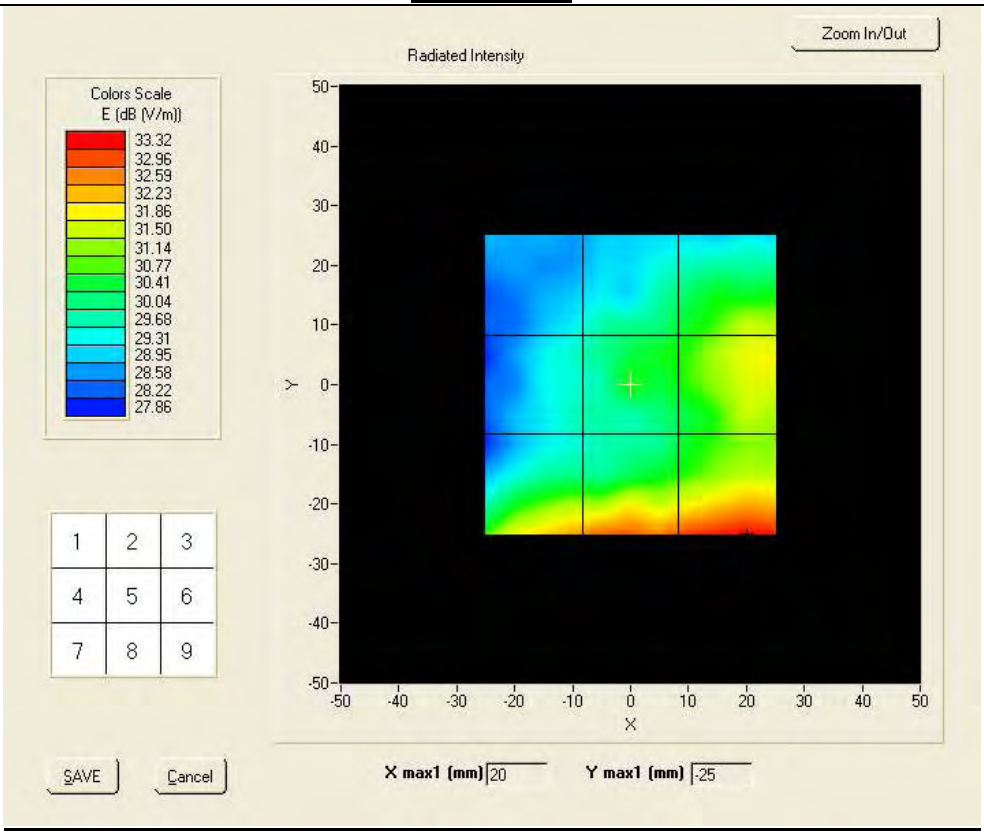
Test Item 9

GSM1900

Middle Band

Frequency (MHz): 1880.000000

Surface HAC



Probe Modulation Factor = 2.700000

Maximum value of total field = 31.86 V/m

Hearing Aid Near-Field Category: M4 (AWF -5 dB)

E In V/M

Grid 1: 29.40	Grid 2: 30.48	Grid 3: 31.52
Grid 4: 29.71	Grid 5: 30.82	**Grid 6: 31.86**
Grid 7: 32.57	**Grid 8: 32.95**	**Grid 9: 33.32**

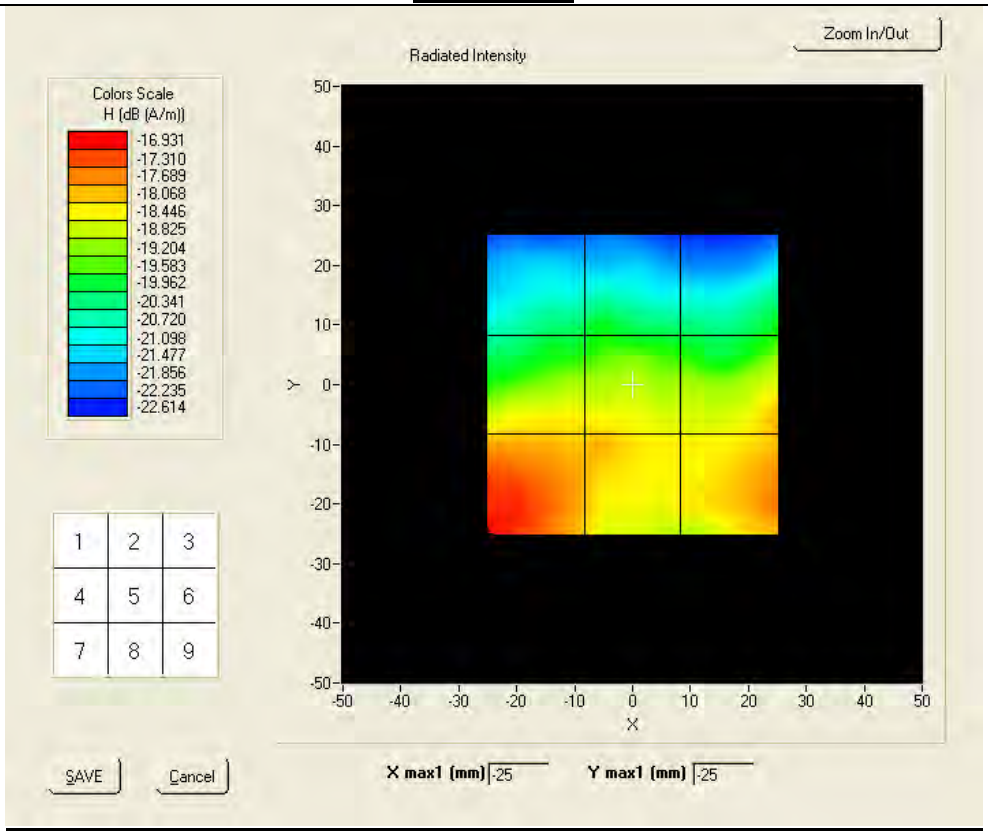
Test Item 10

GSM1900

Middle Band

Frequency (MHz): 1880.000000

Surface HAC



Probe Modulation Factor = 1.280000

Maximum value of total field = -17.95 A/m

Hearing Aid Near-Field Category: M4 (AWF -5 dB)

H In A/M

Grid 1: -20.02	Grid 2: -19.75	Grid 3: -19.72
Grid 4: -18.26	Grid 5: -18.28	**Grid 6: -17.95**
Grid 7: -16.93	**Grid 8: -17.96**	**Grid 9: -17.59**

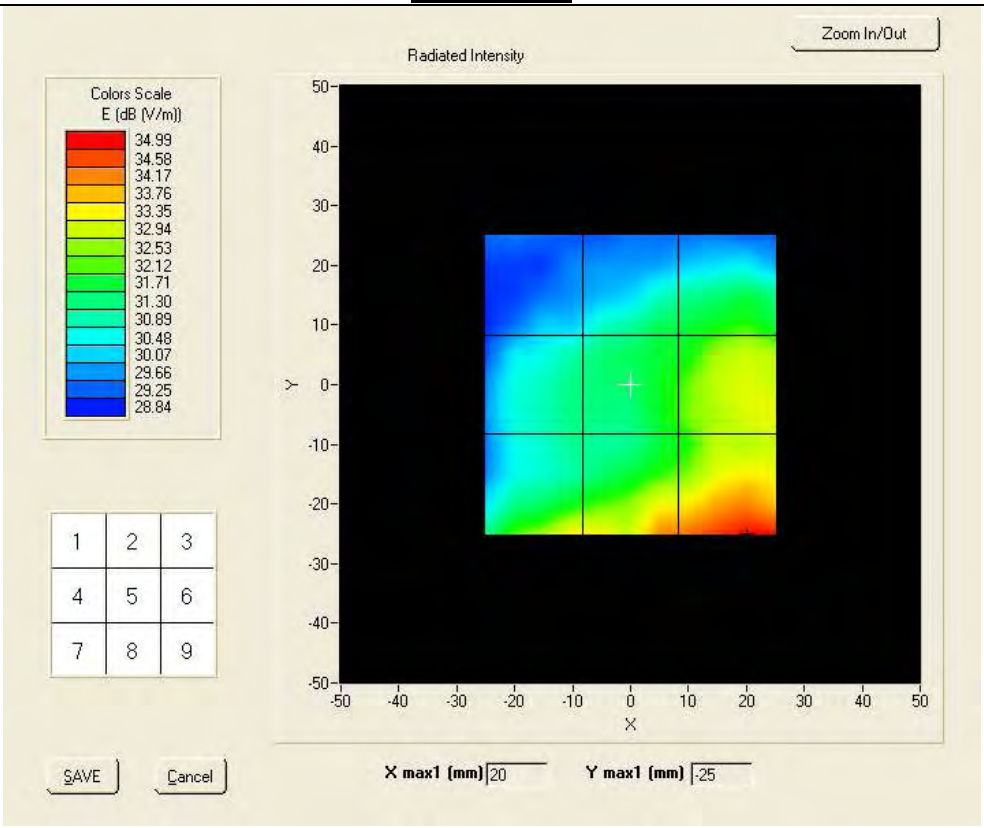
Test Item 11

GSM1900

higher Band

Frequency (MHz): 1909.800000

Surface HAC



Probe Modulation Factor = 2.700000

Maximum value of total field = 33.21 V/m

Hearing Aid Near-Field Category: M4 (AWF -5 dB)

E In V/M

Grid 1: 30.25	Grid 2: 31.64	Grid 3: 32.20
Grid 4: 31.34	Grid 5: 32.37	**Grid 6: 33.21**
Grid 7: 33.45	**Grid 8: 34.31**	**Grid 9: 35.01**

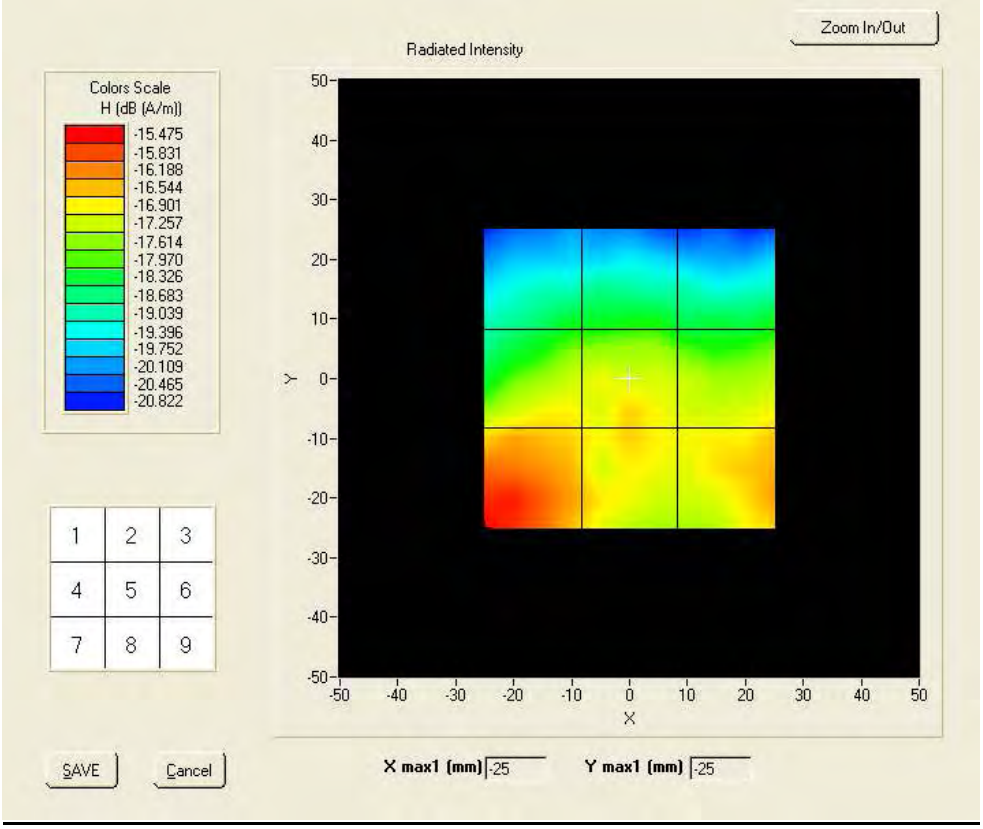
Test Item 12

GSM1900

higher Band

Frequency (MHz): 1909.800000

Surface HAC



Probe Modulation Factor = 1.280000

Maximum value of total field = -16.64 A/m

Hearing Aid Near-Field Category: M4 (AWF -5 dB)

H In A/M

Grid 1: -18.22	Grid 2: -18.09	Grid 3: -18.19
Grid 4: -16.75	**Grid 5: -16.64**	Grid 6: -16.83
Grid 7: -15.47	**Grid 8: -16.63**	**Grid 9: -16.33**

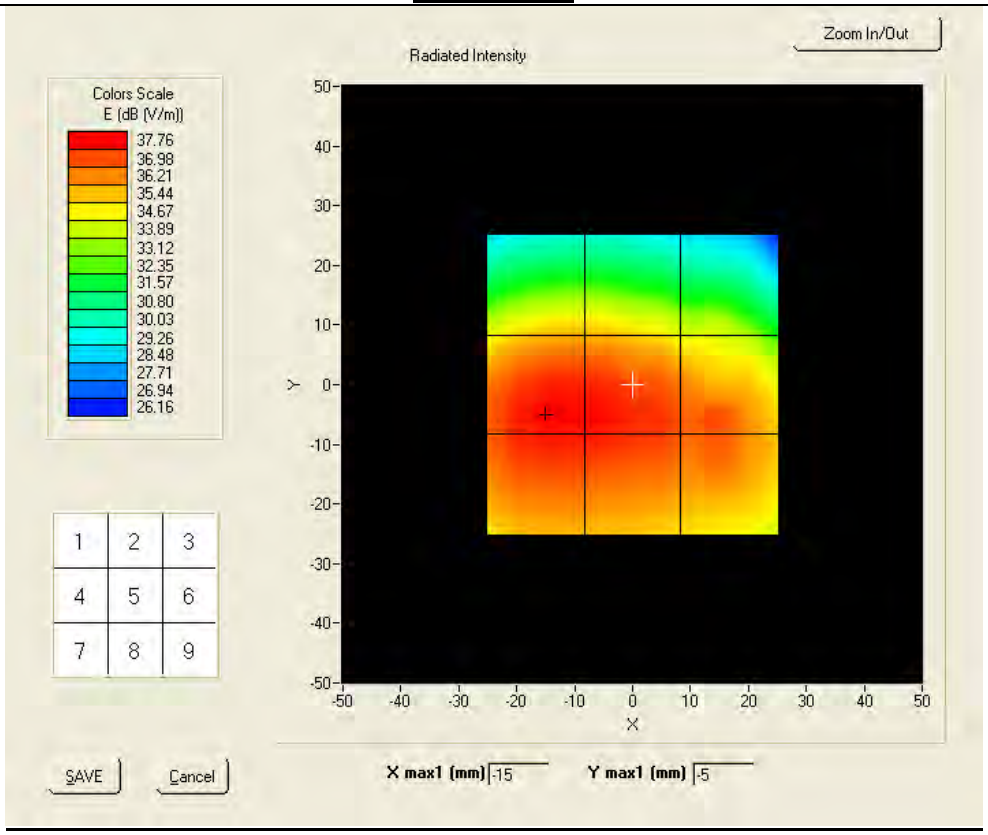
Test Item 13

WCDMA850

Lower Band

Frequency (MHz): 826.400000

Surface HAC



Probe Modulation Factor = 0.980000

Maximum value of total field = 37.70 V/m

Hearing Aid Near-Field Category: M4 (AWF 0 dB)

E In V/M

Grid 1: 35.05	Grid 2: 35.04	Grid 3: 33.90
Grid 4: 37.76	**Grid 5: 37.70**	Grid 6: 37.13
Grid 7: 37.65	**Grid 8: 37.57**	Grid 9: 37.01

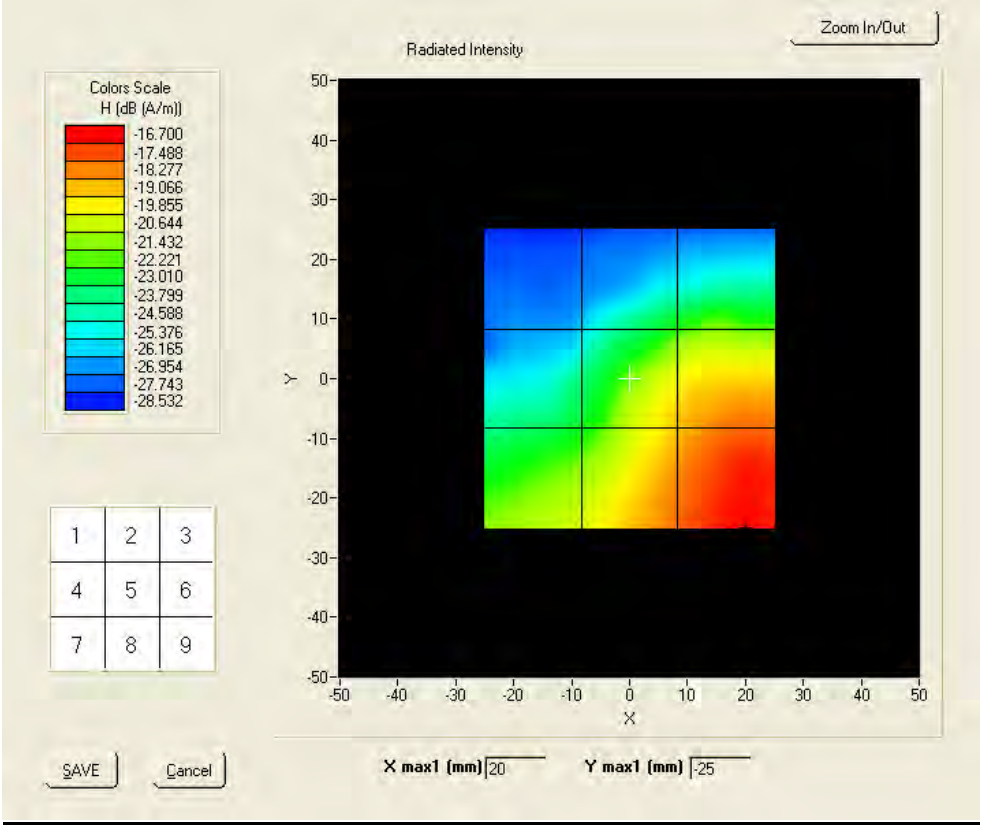
Test Item 14

WCDMA850

Lower Band

Frequency (MHz): 826.400000

Surface HAC



Probe Modulation Factor = 0.798000

Maximum value of total field = -19.08 A/m

Hearing Aid Near-Field Category: M4 (AWF 0 dB)

H In A/M

Grid 1: -26.51	Grid 2: -22.69	Grid 3: -21.80
Grid 4: -22.79	**Grid 5: -19.08**	**Grid 6: -18.02**
Grid 7: -20.29	**Grid 8: -17.80**	**Grid 9: -16.70**

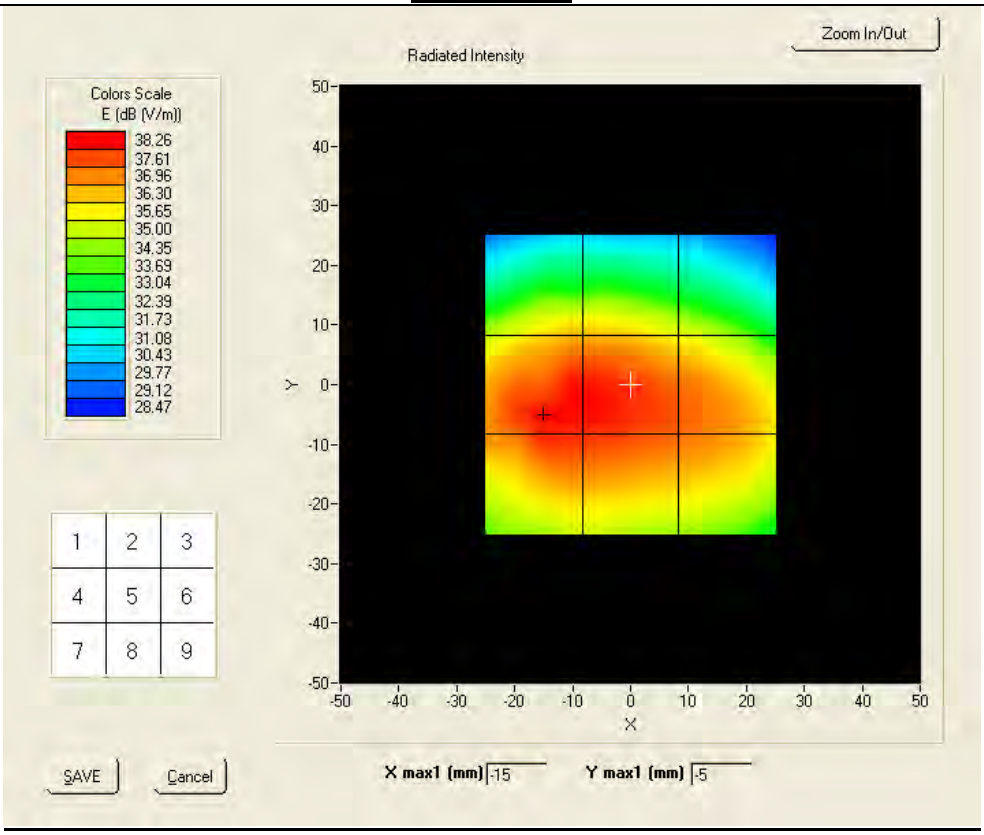
Test Item 15

WCDMA850

Middle Band

Frequency (MHz): 836.000000

Surface HAC



Probe Modulation Factor = 0.980000

Maximum value of total field = 38.29 V/m

Hearing Aid Near-Field Category: M4 (AWF 0 dB)

E In V/M

Grid 1: 35.96	Grid 2: 35.93	Grid 3: 34.83
Grid 4: 38.33	**Grid 5: 38.29**	Grid 6: 37.38
Grid 7: 38.14	**Grid 8: 37.89**	Grid 9: 37.24

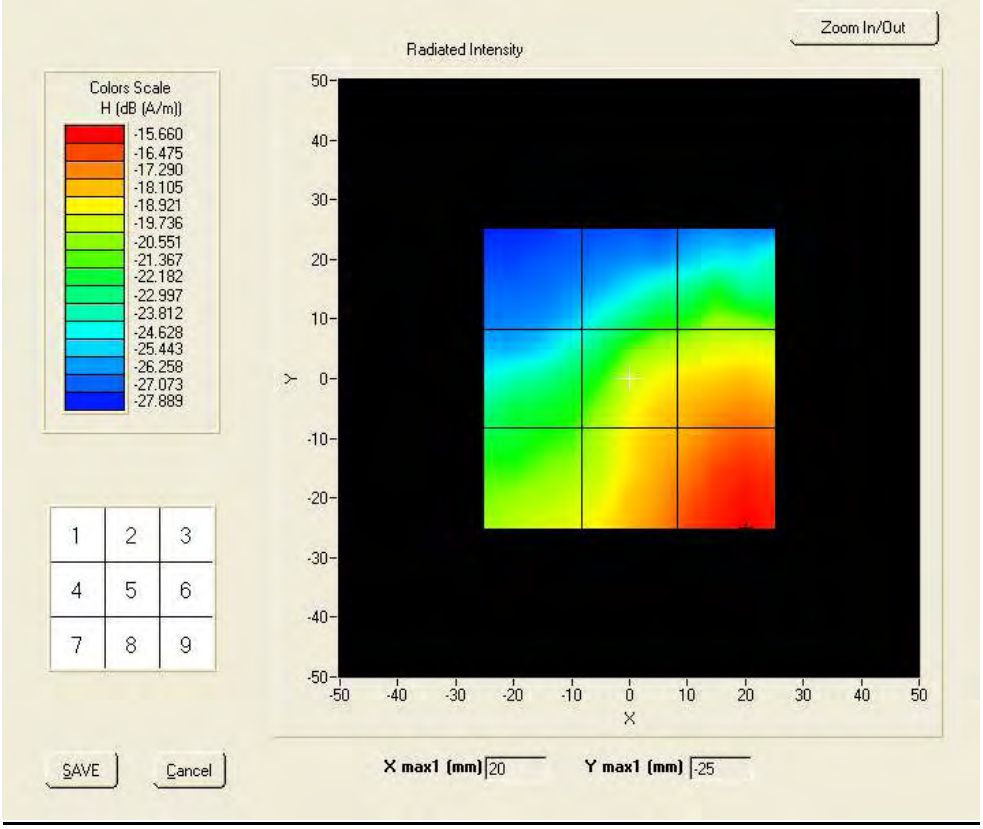
Test Item 16

WCDMA850

Middle Band

Frequency (MHz): 836.000000

Surface HAC



Probe Modulation Factor = 0.798000

Maximum value of total field = -18.06 A/m

Hearing Aid Near-Field Category: M4 (AWF 0 dB)

H In A/M

Grid 1: -25.25	Grid 2: -21.66	Grid 3: -20.43
Grid 4: -20.98	**Grid 5: -18.06**	**Grid 6: -17.05**
Grid 7: -19.11	**Grid 8: -16.61**	**Grid 9: -15.66**

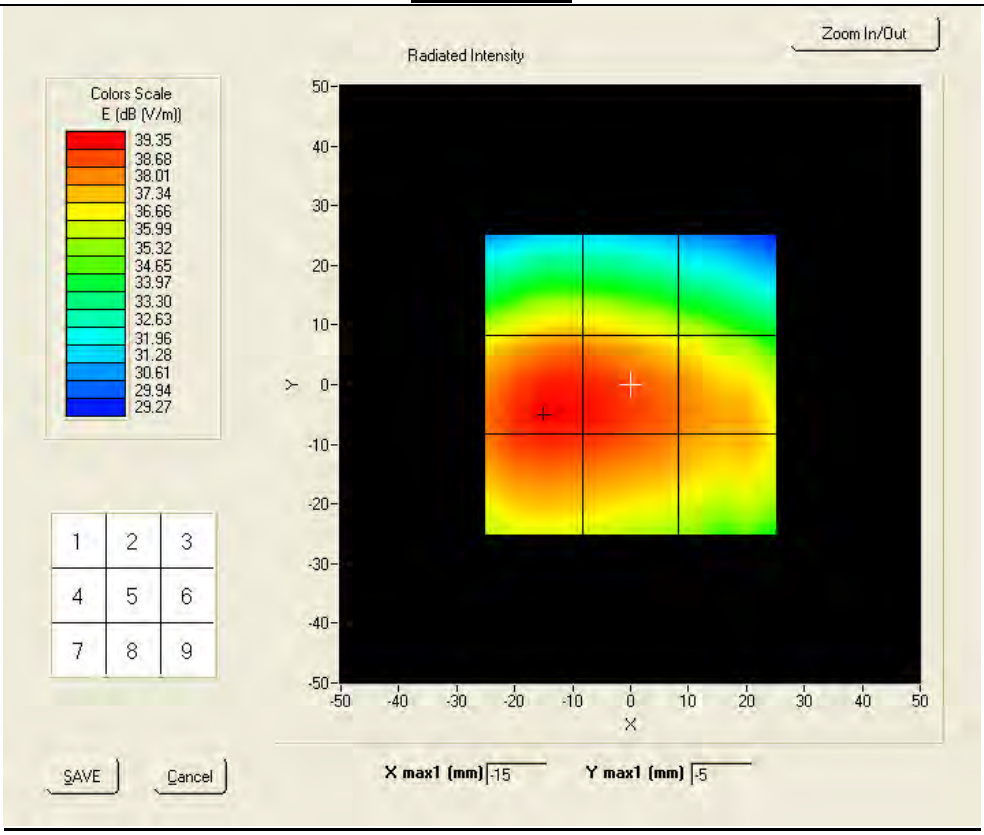
Test Item 17

WCDMA 850

Higher Band

Frequency (MHz): 846.600000

Surface HAC



Probe Modulation Factor = 0.980000

Maximum value of total field = 39.25 V/m

Hearing Aid Near-Field Category: M4 (AWF 0 dB)

E In V/M

Grid 1: 36.92	Grid 2: 36.86	Grid 3: 35.53
Grid 4: 39.38	**Grid 5: 39.25**	Grid 6: 38.14
Grid 7: 39.17	**Grid 8: 39.02**	Grid 9: 37.85

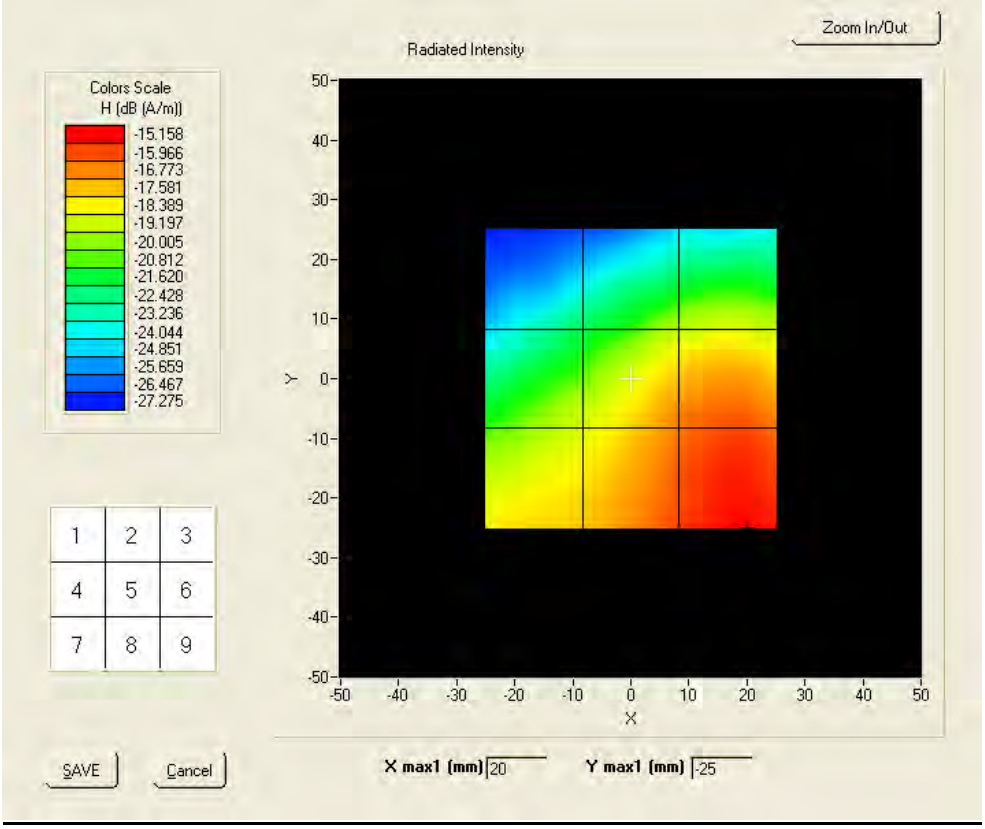
Test Item 18

WCDMA 850

Higher Band

Frequency (MHz): 846.600000

Surface HAC



Probe Modulation Factor = 0.798000

Maximum value of total field = -16.63 A/m

Hearing Aid Near-Field Category: M4 (AWF 0 dB)

H In A/M

Grid 1: -22.28	Grid 2: -19.75	Grid 3: -19.31
Grid 4: -19.04	**Grid 5: -16.63**	**Grid 6: -16.08**
Grid 7: -17.67	**Grid 8: -15.82**	**Grid 9: -15.16**

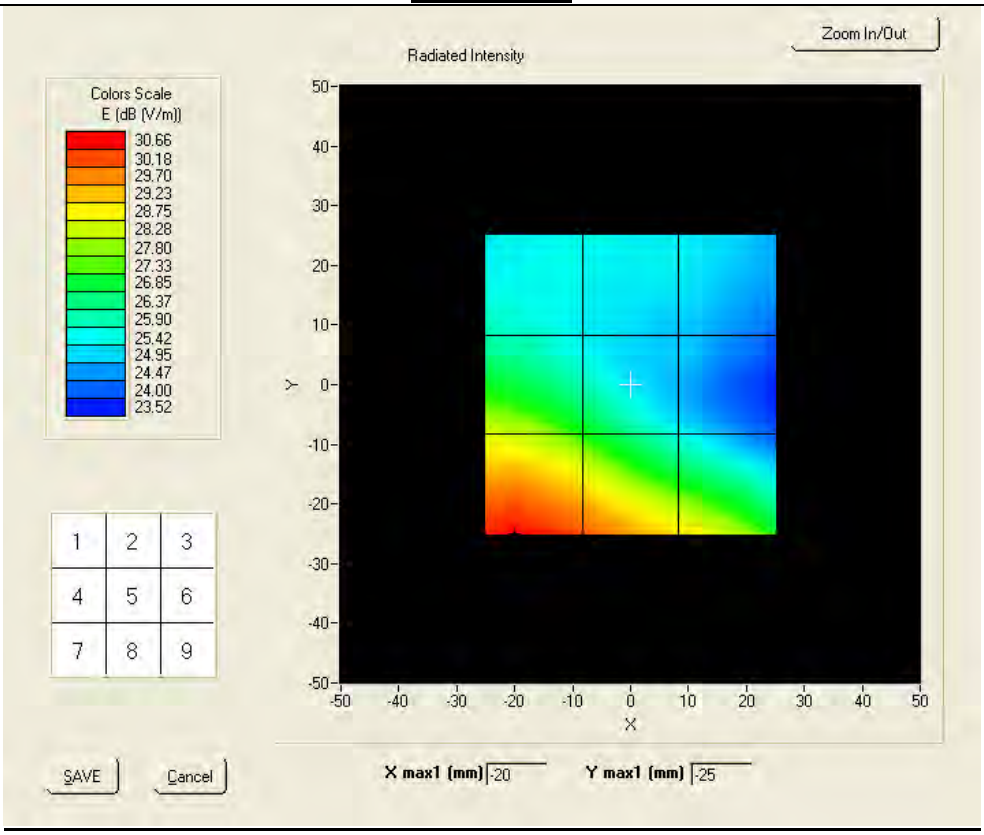
Test Item 19

WCDMA1700

Lower Band

Frequency (MHz): 1712.400000

Surface HAC



Probe Modulation Factor = 0.980000

Maximum value of total field = 28.19 V/m

Hearing Aid Near-Field Category: M4 (AWF 0 dB)

E In V/M

Grid 1: 25.85	Grid 2: 25.41	Grid 3: 25.24
Grid 4: 28.19	Grid 5: 26.85	Grid 6: 25.02
Grid 7: 30.66	**Grid 8: 30.03**	**Grid 9: 28.81**

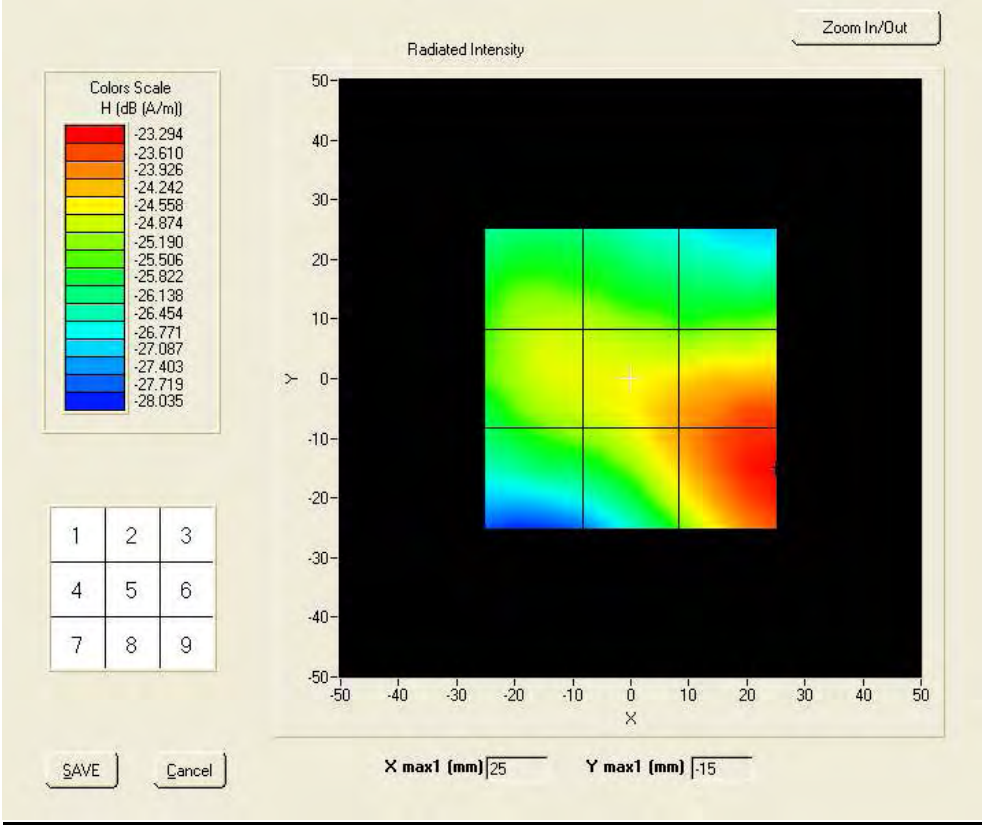
Test Item 20

WCDMA1700

Lower Band

Frequency (MHz): 1712.400000

Surface HAC



Probe Modulation Factor = 0.625000

Maximum value of total field = -24.06 A/m

Hearing Aid Near-Field Category: M4 (AWF 0 dB)

H In A/M

Grid 1: -24.96	Grid 2: -25.02	Grid 3: -25.32
Grid 4: -24.67	**Grid 5: -24.06**	**Grid 6: -23.51**
Grid 7: -25.02	**Grid 8: -24.06**	**Grid 9: -23.29**

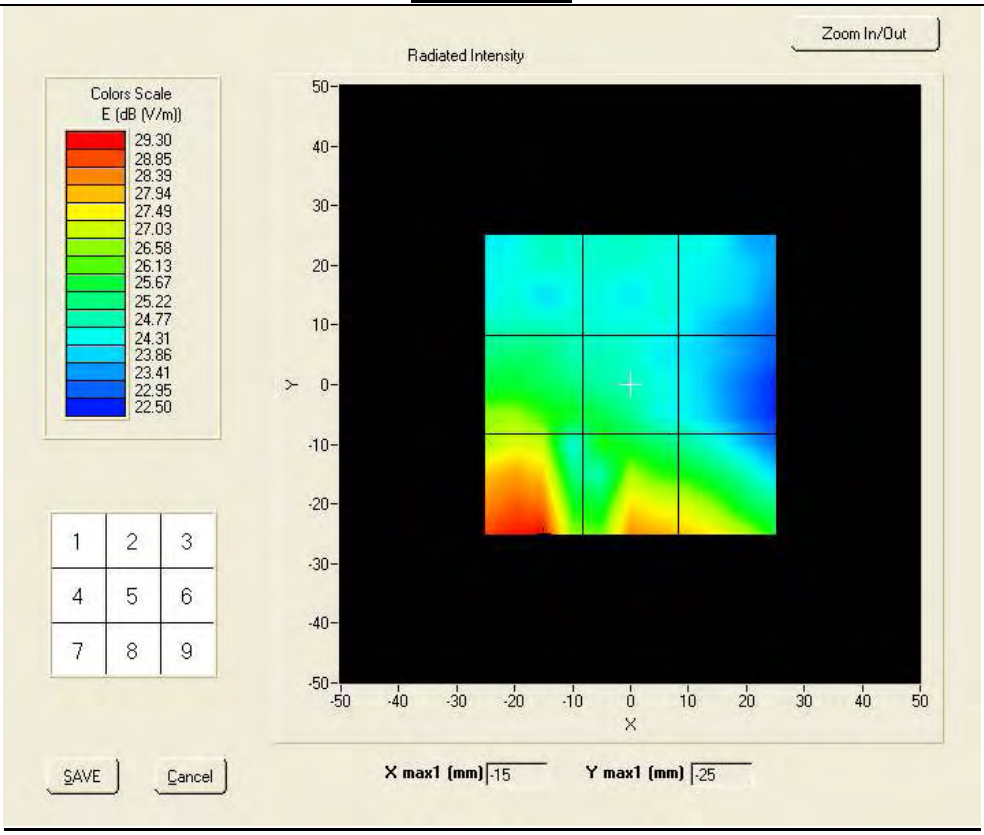
Test Item 21

WCDMA1700

MIddle Band

Frequency (MHz): 1732.400000

Surface HAC



Probe Modulation Factor = 0.980000

Maximum value of total field = 26.92 V/m

Hearing Aid Near-Field Category: M4 (AWF 0 dB)

E In V/M

Grid 1: 24.73	Grid 2: 24.68	Grid 3: 24.39
Grid 4: 26.92	Grid 5: 25.87	Grid 6: 24.45
Grid 7: 29.47	**Grid 8: 28.40**	**Grid 9: 27.81**

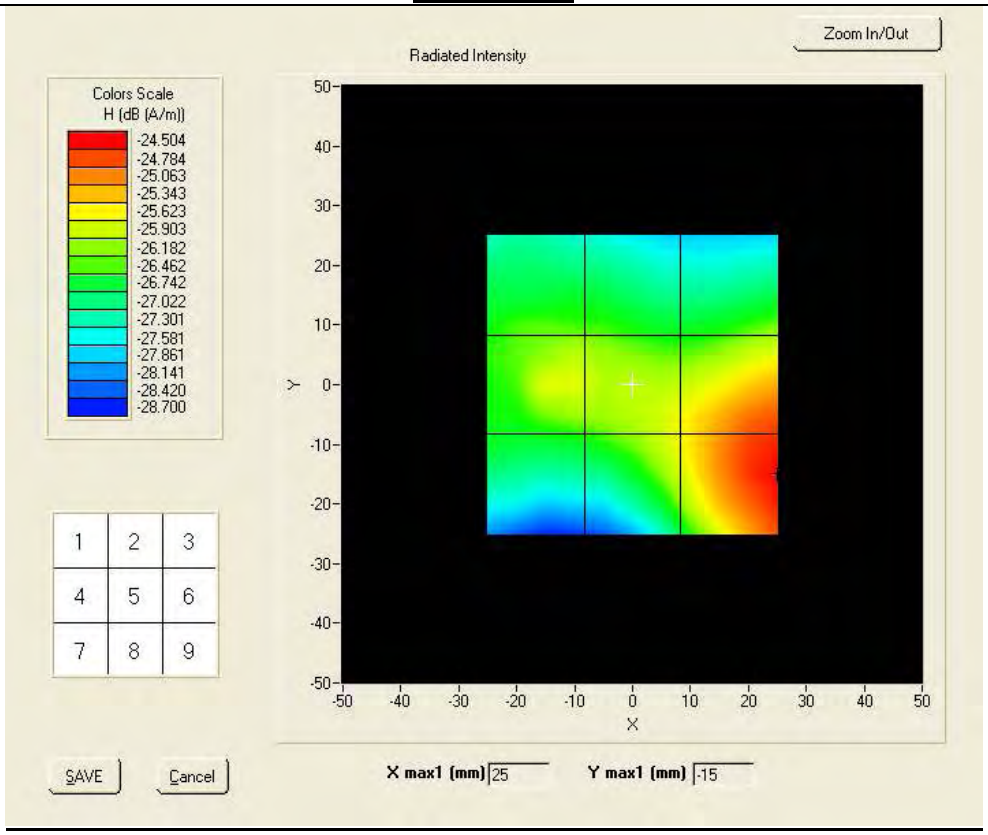
Test Item 22

WCDMA1700

MIddle Band

Frequency (MHz): 1732.400000

Surface HAC



Probe Modulation Factor = 0.625000

Maximum value of total field = -25.62 A/m

Hearing Aid Near-Field Category: M4 (AWF 0 dB)

H In A/M

Grid 1: -26.32	Grid 2: -26.38	Grid 3: -26.27
Grid 4: -25.71	**Grid 5: -25.62**	**Grid 6: -24.74**
Grid 7: -26.40	**Grid 8: -25.62**	**Grid 9: -24.50**

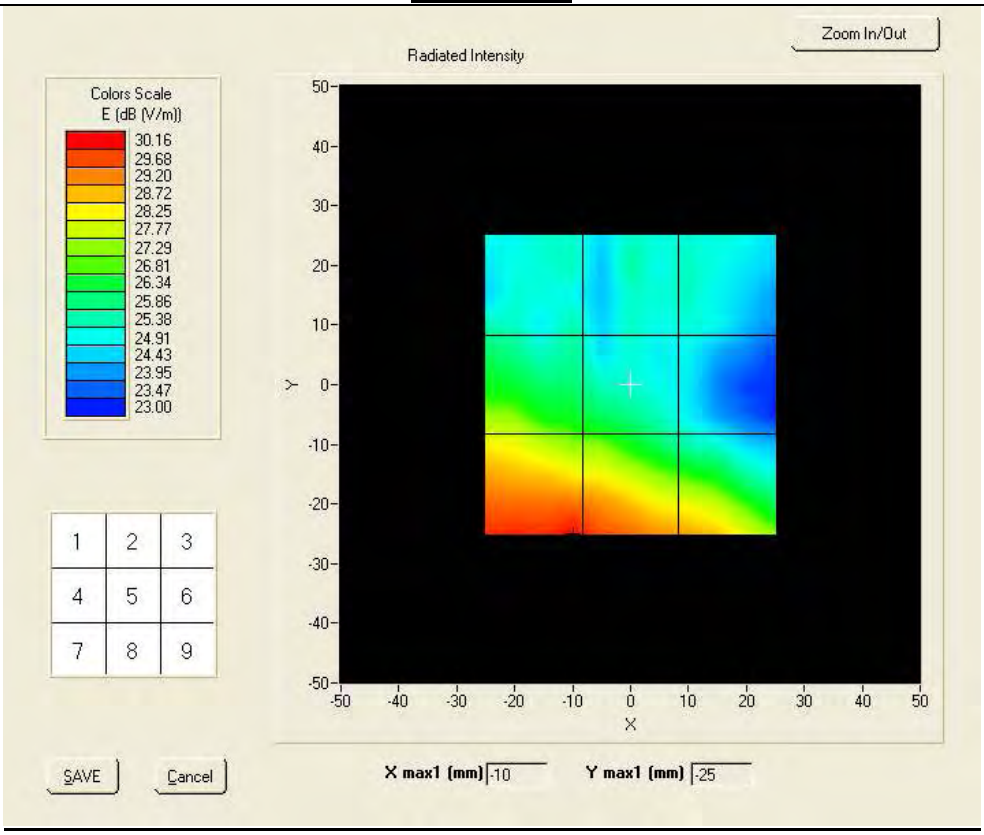
Test Item 23

WCDMA1700

Higher Band

Frequency (MHz): 1752.600000

Surface HAC



Probe Modulation Factor = 0.980000

Maximum value of total field = 27.70 V/m

Hearing Aid Near-Field Category: M4 (AWF 0 dB)

E In V/M

Grid 1: 25.42	Grid 2: 25.55	Grid 3: 25.27
Grid 4: 27.70	Grid 5: 26.64	Grid 6: 25.00
Grid 7: 30.16	**Grid 8: 29.86**	**Grid 9: 28.94**

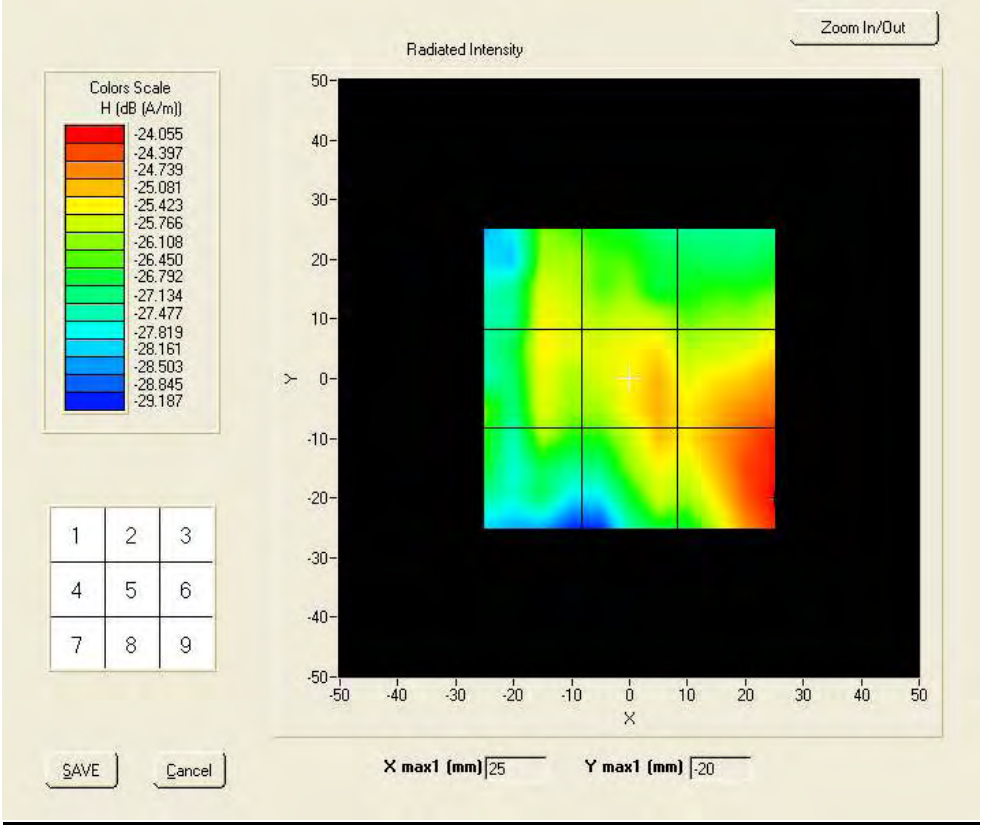
Test Item 24

WCDMA1700

Higher Band

Frequency (MHz): 1752.600000

Surface HAC



Probe Modulation Factor = 0.625000

Maximum value of total field = -25.02 A/m

Hearing Aid Near-Field Category: M4 (AWF 0 dB)

H In A/M

Grid 1: -25.35	Grid 2: -25.69	Grid 3: -25.76
Grid 4: -25.31	**Grid 5: -25.02**	**Grid 6: -24.39**
Grid 7: -25.76	**Grid 8: -25.07**	**Grid 9: -24.05**

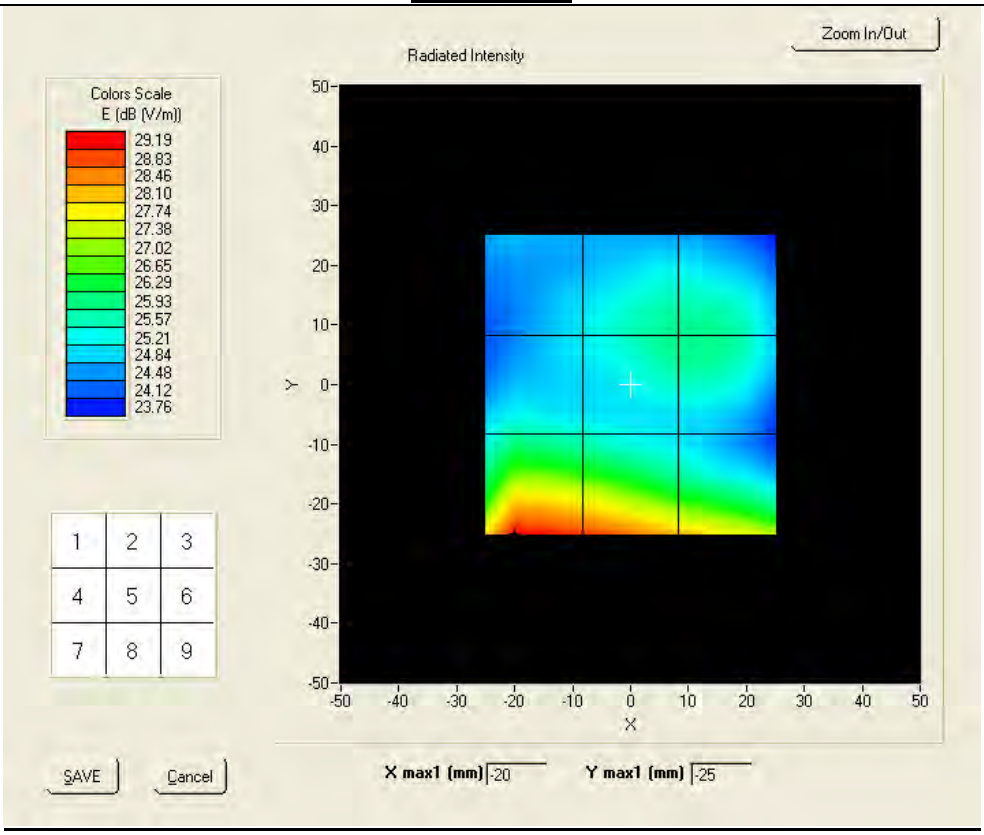
Test Item 25

WCDMA1900

Lower Band

Frequency (MHz): 1852.400000

Surface HAC



Probe Modulation Factor = 0.9790000

Maximum value of total field = 25.92 V/m

Hearing Aid Near-Field Category: M4 (AWF 0 dB)

E In V/M

Grid 1: 25.08	Grid 2: 25.86	Grid 3: 25.88
Grid 4: 25.45	Grid 5: 25.89	**Grid 6: 25.92**
Grid 7: 29.26	**Grid 8: 28.83**	**Grid 9: 28.03**

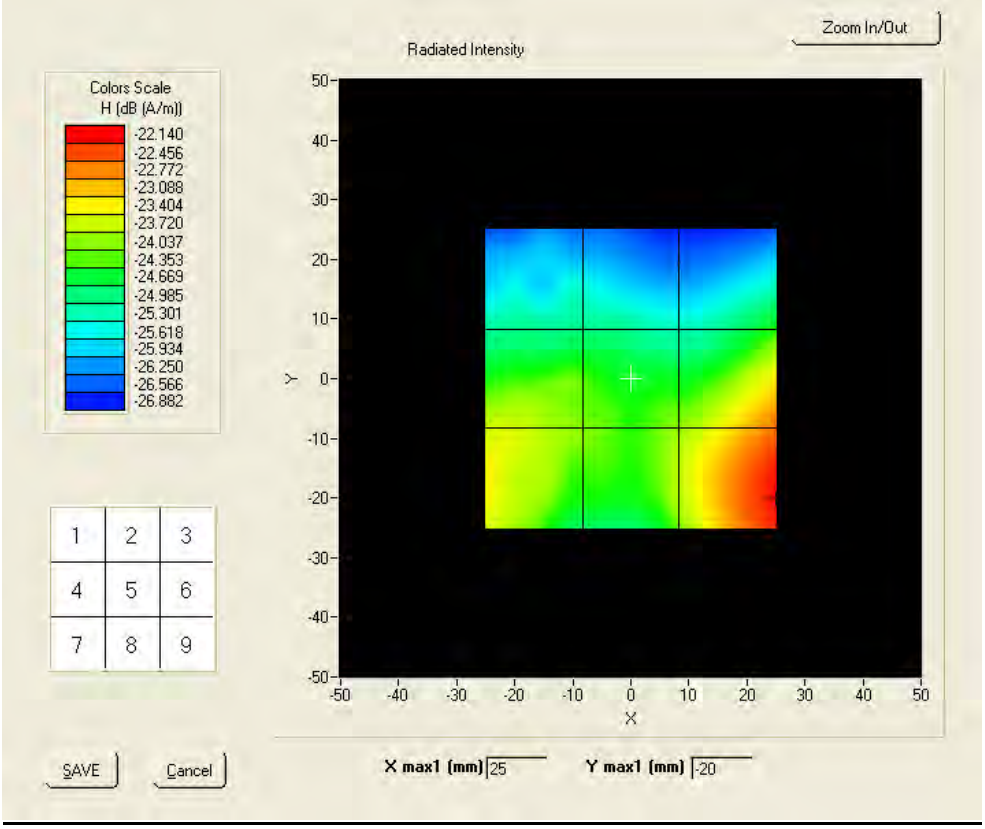
Test Item 26

WCDMA1900

Lower Band

Frequency (MHz): 1852.400000

Surface HAC



Probe Modulation Factor = 0.516000

Maximum value of total field = -23.35 A/m

Hearing Aid Near-Field Category: M4 (AWF 0 dB)

H In A/M

Grid 1: -25.17	Grid 2: -25.13	Grid 3: -24.59
Grid 4: -23.69	Grid 5: -24.02	**Grid 6: -22.75**
Grid 7: -23.35	**Grid 8: -23.71**	**Grid 9: -22.14**

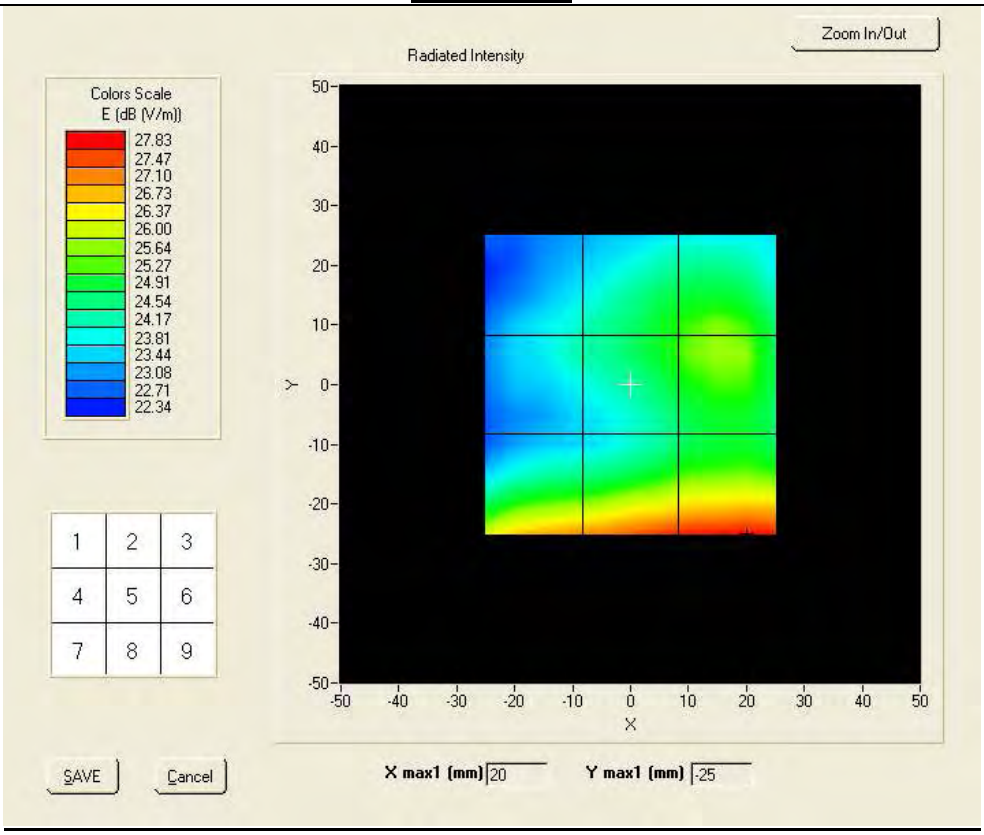
Test Item 27

WCDMA1900

Lower Band

Frequency (MHz): 1852.400000

Surface HAC



Probe Modulation Factor = 0.979000

Maximum value of total field = 25.76 V/m

Hearing Aid Near-Field Category: M4 (AWF 0 dB)

E In V/M

Grid 1: 24.07	Grid 2: 25.30	Grid 3: 25.61
Grid 4: 24.23	Grid 5: 25.44	**Grid 6: 25.76**
Grid 7: 27.08	**Grid 8: 27.68**	**Grid 9: 27.83**

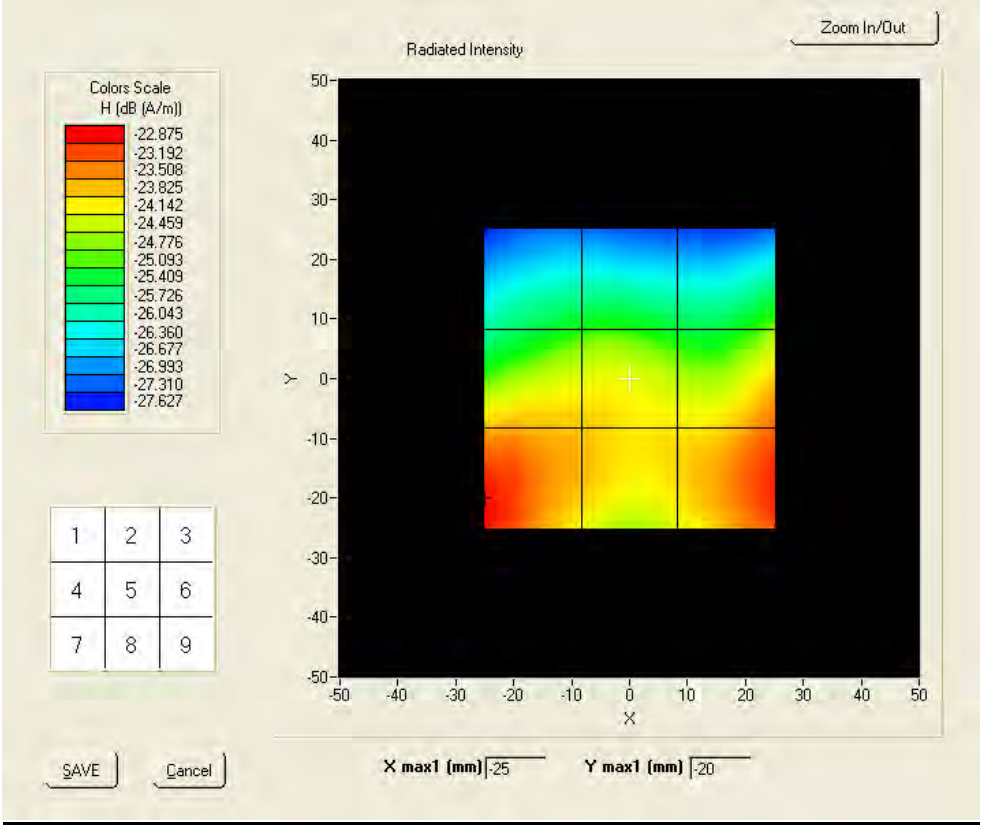
Test Item 28

WCDMA1900

Lower Band

Frequency (MHz): 1852.400000

Surface HAC



Probe Modulation Factor = 0.516000

Maximum value of total field = -23.39 A/m

Hearing Aid Near-Field Category: M4 (AWF 0 dB)

H In A/M

Grid 1: -25.32	Grid 2: -25.26	Grid 3: -24.98
Grid 4: -23.82	Grid 5: -23.92	**Grid 6: -23.39**
Grid 7: -22.86	**Grid 8: -23.82**	**Grid 9: -22.98**

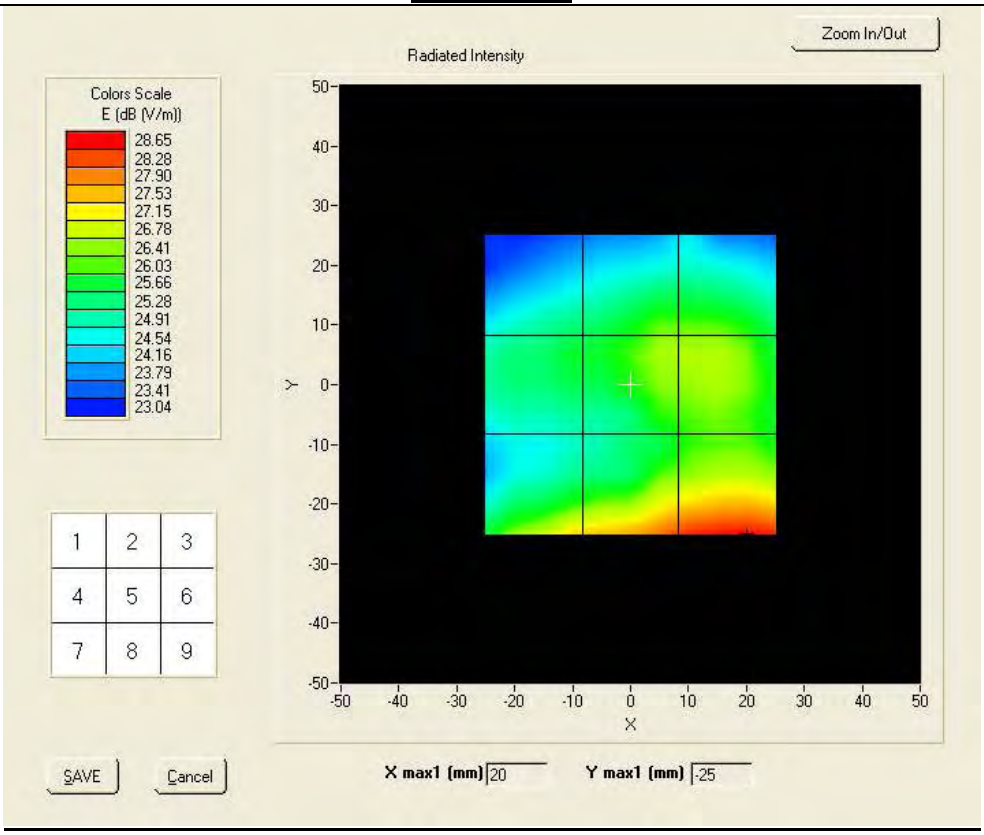
Test Item 29

WCDMA1900

Middle Band

Frequency (MHz): 1907.000000

Surface HAC



Probe Modulation Factor = 0.979000

Maximum value of total field = 26.69 V/m

Hearing Aid Near-Field Category: M4 (AWF 0 dB)

E In V/M

Grid 1: 25.35	Grid 2: 26.28	Grid 3: 26.23
Grid 4: 25.78	Grid 5: 26.63	**Grid 6: 26.69**
Grid 7: 27.44	**Grid 8: 28.39**	**Grid 9: 28.65**

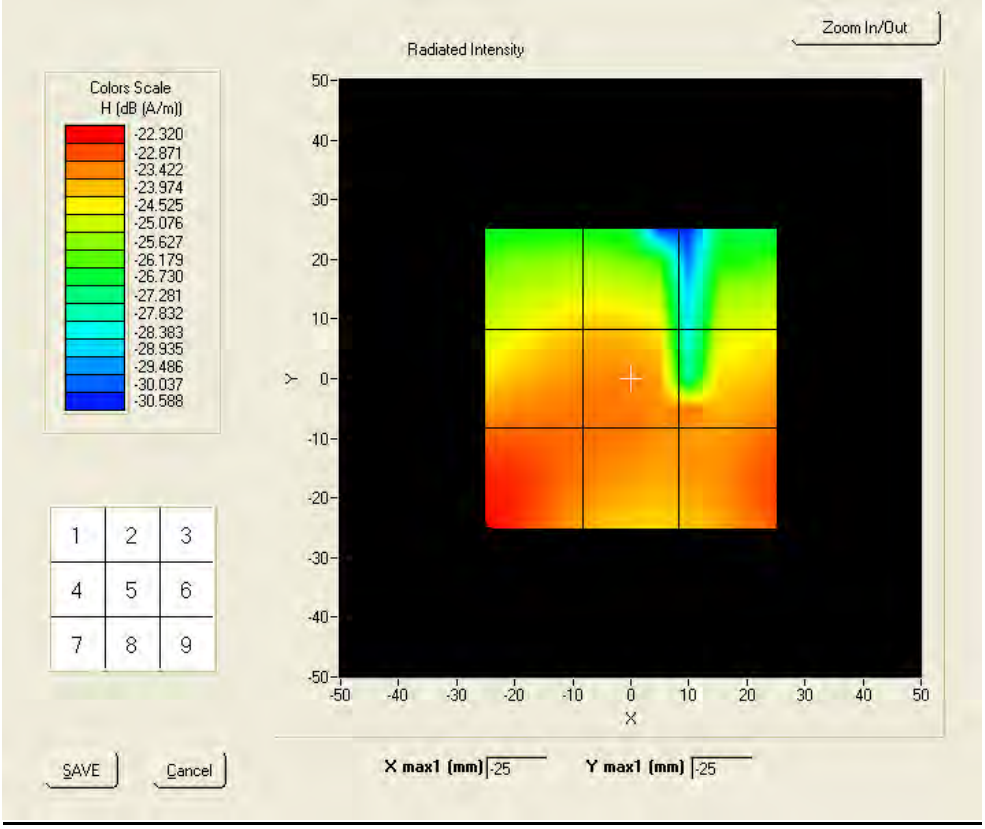
Test Item 30

WCDMA1900

Middle Band

Frequency (MHz): 1907.000000

Surface HAC



Probe Modulation Factor = 0.516000

Maximum value of total field = -23.18 A/m

Hearing Aid Near-Field Category: M4 (AWF 0 dB)

H In A/M

Grid 1: -24.27	Grid 2: -24.10	Grid 3: -24.72
Grid 4: -23.23	Grid 5: -23.20	**Grid 6: -23.18**
Grid 7: -22.32	**Grid 8: -23.23**	**Grid 9: -22.80**

Annex C TEST SETUP PHOTO


Intermec
Enter
Scan
Esc
Speaker On
Mute
Contacts
End
Hold
Keypad
Menu

Annex D CALIBRATION REPORT

COMOHAC E-Field probe Calibration Report	SATIMO A microwave vision company		
	Ref: CR.216.30.10.SATB.A		
	Page: 1/6	Issue: A	Date: 2010/08/04

COMOHAC E-FIELD PROBE CALIBRATION REPORT

Prepared By: LUC Jérôme, SATIMO

Project Description: HAC TEST BENCH

Prepared For (End User): SIEMIC, INC.

COMOHAC E-Field probe Calibration Report	SATIMO A microwave vision company		
	Ref: CR.216.30.10.SATB.A		
	Page: 2/6	Issue: A	Date: 2010/08/04

COMOHAC E-FIELD PROBE CALIBRATION REPORT

DATE: 9/9/2010

OBJECT: COMOHAC E-FIELD PROBE

MANUFACTURER: SATIMO

SERIAL NUMBER: SN 3110 EPH25

CUSTOMER: SIEMIC, INC.

CONTRACT: PO1007001

DATE OF CALIBRATION: 04/08/2010

WARRANTY:

Date

09-09-10

SAR TEAM MANAGER

SATIMO
2105 Barrett Park Dr., Suite 104
Kennesaw, GA - USA
Tel: +1 678 797 9172
Fax: +1 678 797 9173
www.satimo.com

COMOHAC E-Field probe Calibration Report	SATIMO A microwave vision company		
	Ref: CR.216.30.10.SATB.A		
	Page: 3/6	Issue: A	Date: 2010/08/04

PRODUCT DESCRIPTION

Frequency Range	100 MHz - 3 GHz
Probe length	330 mm
Length of one dipole	3.3 mm
Maximum external diameter	8 mm
Probe extremity diameter	6 mm
Distance between dipoles/probe extremity	3.5 mm
Resistance of the three dipole (at the connector)	Dipole 1: R1=1.337 MΩ Dipole 2: R2=1.125 MΩ Dipole 3: R3=1.338 MΩ
Diode Compression Point	Dipole 1: DCP1=129 mV Dipole 2: DCP2=128 mV Dipole 3: DCP3=129 mV

The probe could be checked by measuring the resistance of the three dipoles.

CALIBRATION TEST EQUIPMENT

TYPE	IDENTIFICATION	DATE OF CALIBRATION
Calibration bench	SATIMO AIR CALIBRATION SYSTEM V1.0	
Multimeter	Keithley (2000, SN: 1000572)	Date of calibration: 10-10-2009

MEASUREMENT PROCEDURE

Probe calibration is realized by using the waveguide method as described in the IEEE 1309-2005 standard.

Keithley configuration:

Rate = Medium; Filter =ON; RDGS=10; FILTER TYPE =MOVING AVERAGE; RANGE AUTO

COMOHAC E-Field probe Calibration Report	SATIMO A microwave vision company		
	Ref: CR.216.30.10.SATB.A		
	Page: 4/6	Issue: A	Date: 2010/08/04

PROBE UNCERTAINTIES

Calibration report of dosimetric SATIMO probe

Uncertainty on calibration system

ERROR SOURCES	Uncertainty value (%)	Probability Distribution	Divisor	ci	Standard Uncertainty (%)
Incident or forward power	3,00%	Rectangular	$\sqrt{3}$	1	1,732%
Reflected power	3,00%	Rectangular	$\sqrt{3}$	1	1,732%
Field homogeneity	3,00%	Rectangular	$\sqrt{3}$	1	1,732%
Field probe positioning	5,00%	Rectangular	$\sqrt{3}$	1	2,887%
Field probe linearity	3,00%	Rectangular	$\sqrt{3}$	1	1,732%
Combined standard uncertainty					4,509%
Expanded uncertainty (confidence interval of 95%)					8,838%

COMOHAC E-Field probe Calibration Report	SATIMO A microwave vision company		
	Ref: CR.216.30.10.SATB.A		
	Page: 5/6	Issue: A	Date: 2010/08/04

1. 800-2500 MHz.

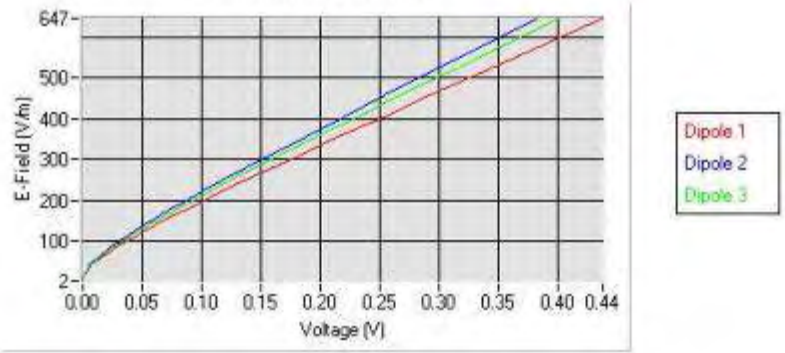
A. Calibration parameters.

Temperature	21°C
Cable loss	0.00 dB
Coupler loss	20.30 dB
Low limit detection	0.009 V/m

Calibration curves hi=f(V) (i=1,2,3) allow to obtain H-field value using the formula:

$$E = \sqrt{E_1^2 + E_2^2 + E_3^2}$$

Calibration curves



The following tables represent the calibration curves linearization by curve segment in CW signal.

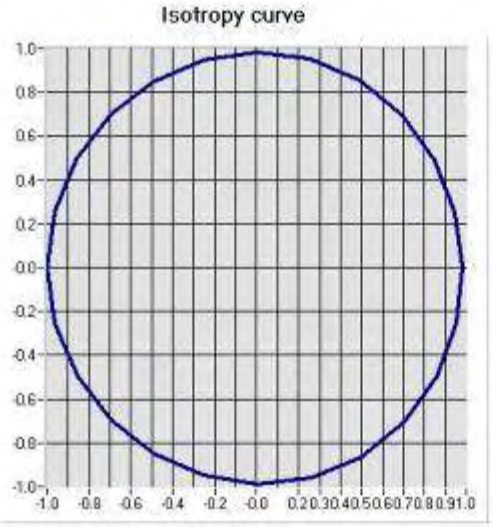
Calibration coefficients for the three dipoles in CW:

Sensitivity in air:

Normx dipole 1 ($\mu V/(V/m)^2$)	Normy dipole 2 ($\mu V/(V/m)^2$)	Normz dipole 3 ($\mu V/(V/m)^2$)
211236.61	265687.99	245462.33

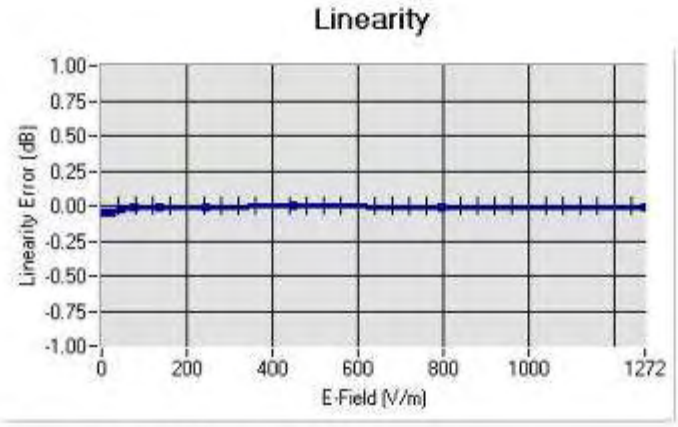
COMOHAC E-Field probe Calibration Report	SATIMO A microwave vision company		
	Ref: CR.216.30.10.SATB.A		
	Page: 6/6	Issue: A	Date: 2010/08/04

B. Isotropy.



Isotropy +/-1.01% (+/-0.04dB)

C. Linearity.



Linearity: +/-1.25% (+/-0.05dB)

COMOHAC H-Field probe Calibration Report	SATIMO A microwave vision company		
	Ref: CR.216.31.10.SATB.A		
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COMOHAC H-FIELD PROBE CALIBRATION REPORT

Prepared By: LUC Jérôme, SATIMO

Project Description: HAC TEST BENCH

Prepared For (End User): SIEMIC, INC.

COMOHAC H-Field probe Calibration Report	SATIMO A microwave vision company		
	Ref: CR.216.31.10.SATB.A		
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COMOHAC H-FIELD PROBE CALIBRATION REPORT

DATE: 9/9/2010

OBJECT: COMOHAC H-FIELD PROBE

MANUFACTURER: SATIMO

SERIAL NUMBER: SN 3110 HPH38

CUSTOMER: SIEMIC, INC.

CONTRACT: PO1007001

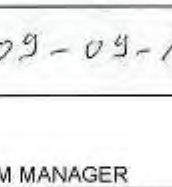
DATE OF CALIBRATION: 04/08/2010

WARRANTY:

Date

09-09-10

SAR TEAM MANAGER



COMOHAC H-Field probe Calibration Report	SATIMO A microwave vision company		
	Ref: CR.216.31.10.SATB.A		
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PRODUCT DESCRIPTION

Frequency Range	100 MHz - 30 GHz
Probe length	330 mm
Dimension of one loop	3.3 mm
Maximum external diameter	8 mm
Probe extremity diameter	6 mm
Distance between dipoles/probe extremity	3 mm
Resistance of the three dipole (at the connector)	Dipole 1: R1=1.337 MΩ Dipole 2: R2=1.125 MΩ Dipole 3: R3=1.338 MΩ
Diode Compression Point	Dipole 1: DCP1=129 mV Dipole 2: DCP2=128 mV Dipole 3: DCP3=129 mV

The probe could be checked by measuring the resistance of the three ways.

CALIBRATION TEST EQUIPMENT

TYPE	IDENTIFICATION	DATE OF CALIBRATION
Calibration bench	SATIMO AIR CALIBRATION SYSTEM V1.0	
Multimeter	Keithley (2000, SN: 1000572)	Date of calibration: 10-10-2009

MEASUREMENT PROCEDURE

Probe calibration is realized by using the waveguide method as described in the IEEE 1309-2005 standard.

Keithley configuration:

Rate = Medium; Filter =ON; RDGS=10; FILTER TYPE =MOVING AVERAGE; RANGE AUTO

COMOHAC H-Field probe Calibration Report	SATIMO A microwave vision company		
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PROBE UNCERTAINTIES

Calibration report of dosimetric SATIMO probe

Uncertainty on calibration system

ERROR SOURCES	Uncertainty value (%)	Probability Distribution	Divisor	ci	Standard Uncertainty (%)
Incident or forward power	3,00%	Rectangular	$\sqrt{3}$	1	1,732%
Reflected power	3,00%	Rectangular	$\sqrt{3}$	1	1,732%
Field homogeneity	3,00%	Rectangular	$\sqrt{3}$	1	1,732%
Field probe positioning	5,00%	Rectangular	$\sqrt{3}$	1	2,887%
Field probe linearity	3,00%	Rectangular	$\sqrt{3}$	1	1,732%
Combined standard uncertainty					4,509%
Expanded uncertainty (confidence interval of 95%)					8,838%

COMOHAC H-Field probe Calibration Report	SATIMO A microwave vision company		
	Ref: CR.216.31.10.SATB.A		
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1. 800-1000 MHz.

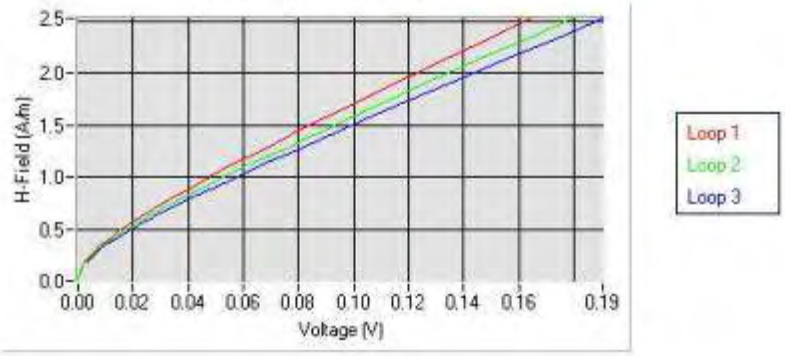
A. Calibration parameters.

Temperature	21°C
Cable loss	0.00 dB
Coupler loss	20.30 dB
Low limit detection	0.009 A/m

Calibration curves hi=f(V) (i=1,2,3) allow to obtain H-field value using the formula:

$$H = \sqrt{H_1^2 + H_2^2 + H_3^2}$$

Calibration curves



The following tables represent the calibration curves linearization by curve segment in CW signal.

Calibration coefficients for the three loops in CW:

Sensitivity in air:

NormX loop 1 $(V/(A/m)^2)$	NormY loop 2 $(V/(A/m)^2)$	NormZ loop 3 $(V/(A/m)^2)$
13.56	10.97	12.00

COMOHAC H-Field probe Calibration Report	SATIMO A microwave vision company		
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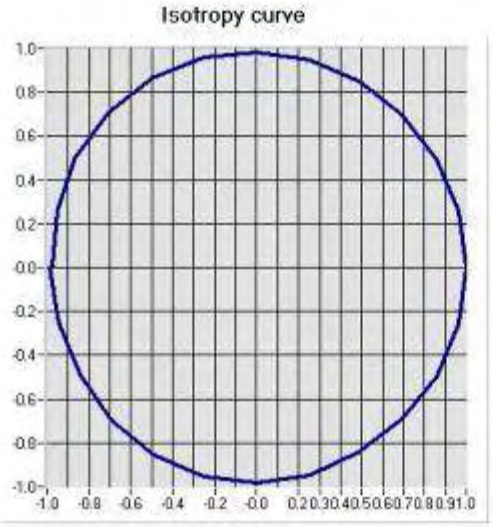
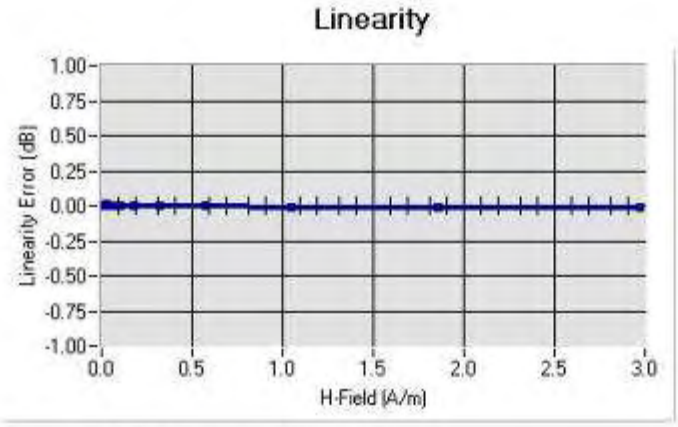
B. Isotropy.



Isotropy +/-1.27% (+/-0.06dB)

C. Linearity.



Linearity: +/-0.32% (+/-0.01dB)

COMOHAC H-Field probe Calibration Report	SATIMO A microwave vision company		
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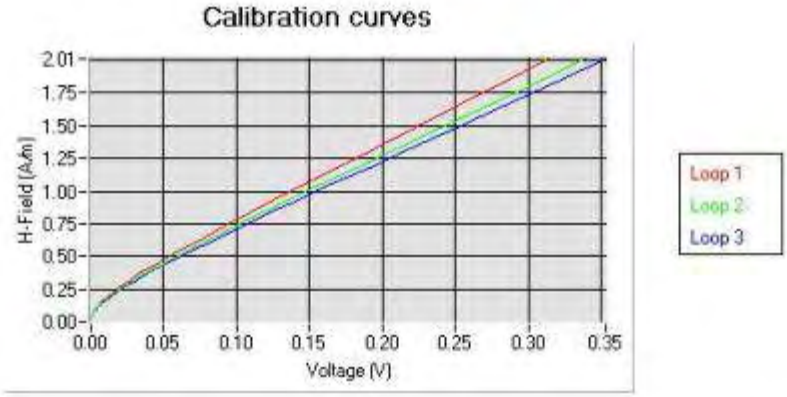
2. 1700-2450 MHz.

A. Calibration parameters.

Temperature	21°C
Cable loss	0.00 dB
Coupler loss	20.13 dB
Low limit detection	0.009 A/m

Calibration curves hi=f(V) (i=1,2,3) allow to obtain H-field value using the formula:

$$H = \sqrt{H_1^2 + H_2^2 + H_3^2}$$



The following tables represent the calibration curves linearization by curve segment in CW signal.

Calibration coefficients for the three loops in CW:

Sensitivity in air:

Normx loop 1 $(V/(A/m)^2)$	Normy loop 2 $(V/(A/m)^2)$	Normz loop 3 $(V/(A/m)^2)$
2.94	2.48	2.60

COMOHAC H-Field probe Calibration Report	SATIMO A microwaves vision company		
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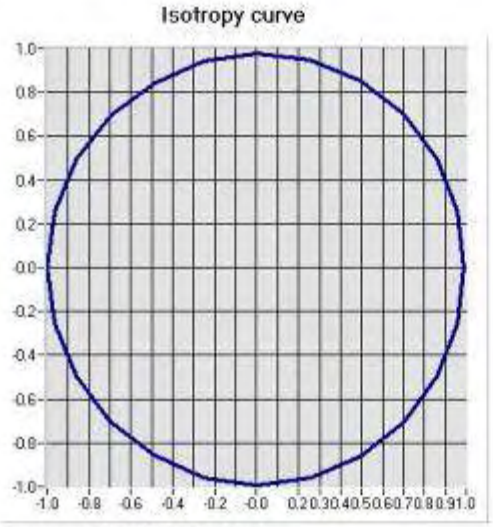
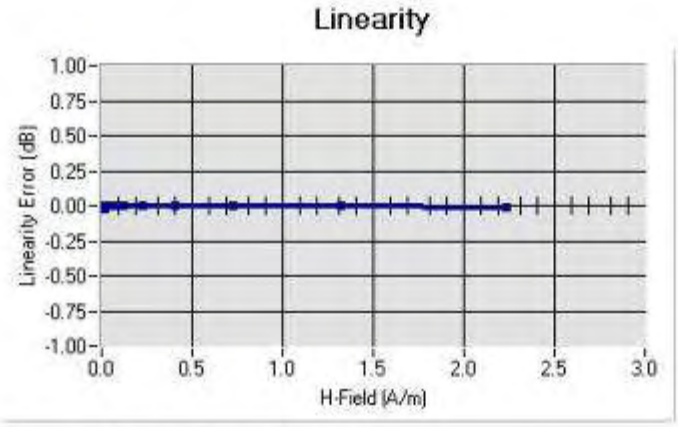
B. Isotropy.



Isotropy:+/-1.42% (+/-0.06dB)

C. Linearity.



Linearity:+/-0.55% (+/-0.02dB)

COMOHAC Broadband 800-950 MHz dipole Calibration Report	SATIMO		
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COMOHAC BROADBAND 800-950 MHZ DIPOLE CALIBRATION REPORT

Prepared By: LUC Jérôme, SATIMO

Project Description: HAC TEST BENCH

Prepared For (End User): SIEMIC, INC.

COMOHAC Broadband 800-950 MHz dipole Calibration Report	SATIMO		
	Ref: CR.216.33.10.SATB.A		
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COMOHAC BROADBAND DIPOLE 800-950 MHz CALIBRATION REPORT

DATE: 15/09/2010

OBJECT: BROADBAND DIPOLE 800-950 MHz

MANUFACTURER: SATIMO

SERIAL NUMBER: SN 31/10 DHA25

CUSTOMER: SIEMIC, INC.

CONTRACT: PO1007001

DATE OF CALIBRATION: 04/08/2010

WARRANTY:

Date

09-09-10

SAR TEAM MANAGER

COMOHAC Broadband 800-950 MHz dipole Calibration Report	SATIMO		
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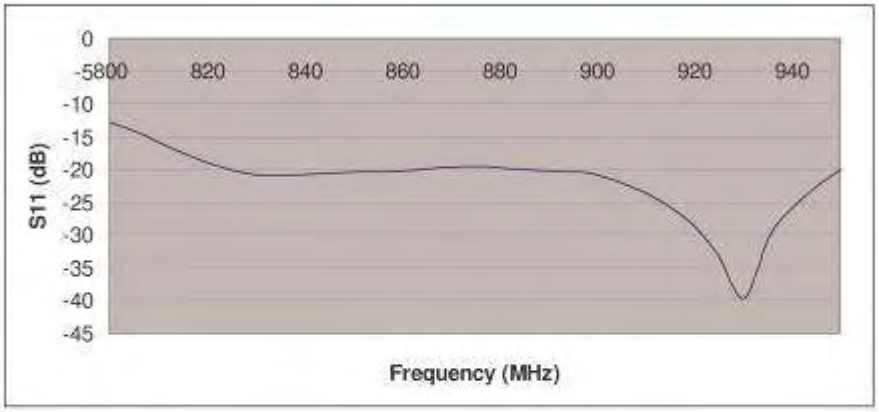
PRODUCT DESCRIPTION

CALIBRATION TEST EQUIPMENT

TYPE	IDENTIFICATION	DATE OF CALIBRATION
Vector Network Analyzer	HP8753D (SN: 5410A08882)	08-06-2009

MEASUREMENT PROCEDURE

Measurement of the return loss of the dipole in air



VSWR between 800 and 950 MHz < -10 dB.

COMOHAC Broadband 800-950 MHz dipole Calibration Report	SATIMO		
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HAC MEASUREMENT EQUIPEMENT

Voltmeter	Keithley (2000, SN:1000572)	Date of calibration: 01-07-2008
Signal generator	Rohde&Schwarz (SML_03, SN:101868)	Date of calibration: 15-11-2007
Power amplifier	Nuclétudes (ALB216, SN:10800)	Date of calibration: 24-10-2007
Power meter	Rohde&Schwarz (NRVD, SN:101066)	Date of calibration: 04-07-2008
E-Field probe	SATIMO Bretagne (SN:EPH06) CF (0.142,0.146,0.138)	Date of calibration: 14-01-2009
H-Field probe	SATIMO Bretagne (SN:HPH04) CF (3.67,3.90,3.12)	Date of calibration: 09-02-2010

HAC MEASUREMENT CONDITION

Software	OpenHAC V2
HAC positioning ruler	SATIMO Bretagne (SN: SN_10_07_SUPH09)
Distance between the center of the sensor and the dipole	10 mm
E-field scan size	X=150mm/Y=20mm
H-field scan size	X=40mm/Y=20mm
Scan resolution	dx=5mm/dy=5mm
Frequency	835 MHz
Input power	20 dBm
Expanded uncertainty (K=1.95)	16.02%

HAC MEASUREMENT RESULT

E-Field	H-Field
228 V/m	0.430 A/m

COMOHAC Broadband 800-950 MHz dipole Calibration Report	SATIMO		
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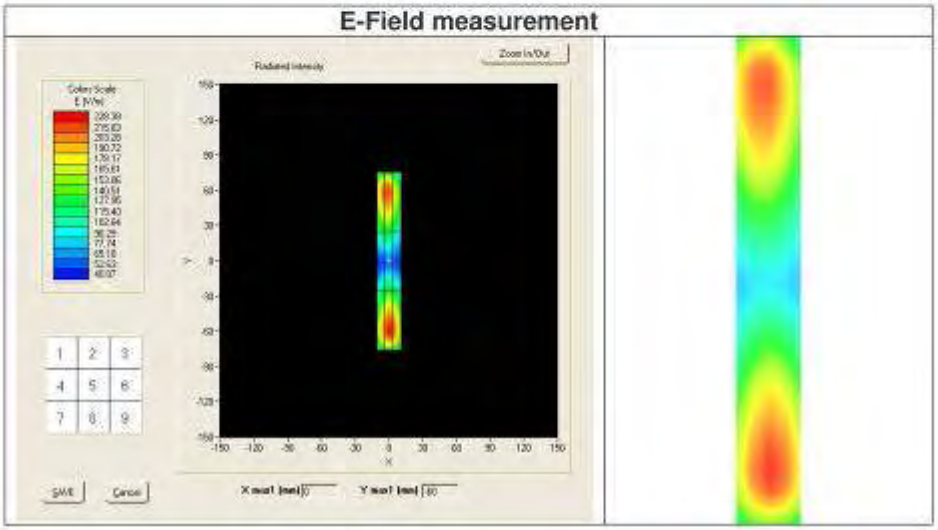
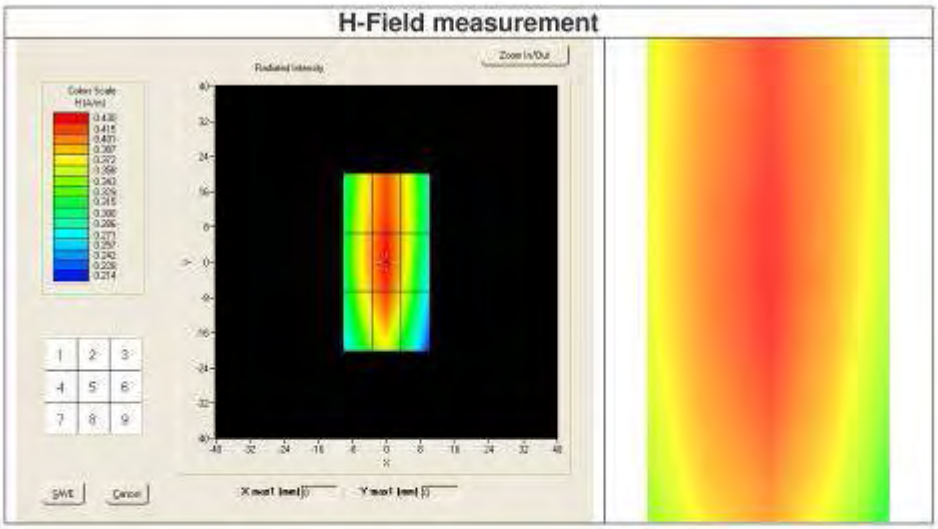
HAC MEASUREMENT PLOTS

E-Field measurement



H-Field measurement



COMOHAC Broadband 1700-2000 MHz dipole Calibration Report	SATIMO		
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COMOHAC BROADBAND 1700-2000 MHZ DIPOLE CALIBRATION REPORT

Prepared By: LUC Jérôme, SATIMO

Project Description: HAC TEST BENCH

Prepared For (End User): SIEMIC, INC.

COMOHAC Broadband 1700-2000 MHz dipole Calibration Report	SATIMO		
	Ref: CR.216.34.10.SATB.A		
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COMOHAC BROADBAND DIPOLE 1700-2000 MHz CALIBRATION REPORT

DATE: 15/09/2010

OBJECT: BROADBAND DIPOLE 1700-2000 Mhz

MANUFACTURER: SATIMO

SERIAL NUMBER: SN 31/10 DHB26

CUSTOMER: SIEMIC, INC.

CONTRACT: PO1007001

DATE OF CALIBRATION: 04/08/2010

WARRANTY:

Date

09-09-10

SAR TEAM MANAGER

COMOHAC Broadband 1700-2000 MHz dipole Calibration Report	SATIMO		
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	Page: 3/5	Issue: A	Date: 2010/08/04

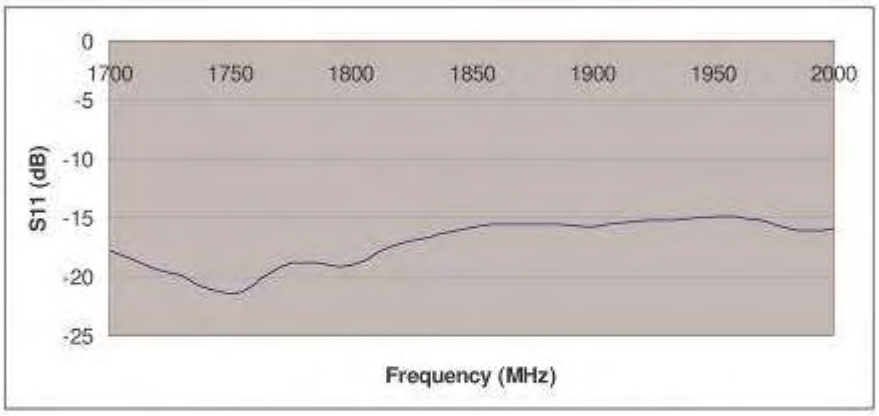
PRODUCT DESCRIPTION

CALIBRATION TEST EQUIPMENT

TYPE	IDENTIFICATION	DATE OF CALIBRATION
Vector Network Analyzer	HP8753D (SN: 5410A08882)	08-06-2009

MEASUREMENT PROCEDURE

Measurement of the return loss of the dipole in air



VSWR between 1700 and 2000 MHz < -10 dB.

COMOHAC Broadband 1700-2000 MHz dipole Calibration Report	SATIMO		
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HAC MEASUREMENT EQUIPEMENT

Voltmeter	Keithley (2000, SN:1000572)	Date of calibration: 01-07-2008
Signal generator	Rohde&Schwarz (SML_03, SN:101868)	Date of calibration: 15-11-2007
Power amplifier	Nuclétudes (ALB216, SN:10800)	Date of calibration: 24-10-2007
Power meter	Rohde&Schwarz (NRVD, SN:101066)	Date of calibration: 04-07-2008
E-Field probe	SATIMO Bretagne (SN:EPH06) CF (0.142,0.146,0.138)	Date of calibration: 14-01-2009
H-Field probe	SATIMO Bretagne (SN:HPH04) CF (0.12,0.10,0.09)	Date of calibration: 08-02-2010

HAC MEASUREMENT CONDITION

Software	OpenHAC V2
HAC positioning ruler	SATIMO Bretagne (SN: SN_10_07_SUPH09)
Distance between the center of the sensor and the dipole	10 mm
E-field scan size	X=80mm/Y=20mm
H-field scan size	X=40mm/Y=20mm
Scan resolution	dx=5mm/dy=5mm
Frequency	1900 MHz
Input power	20 dBm
Expanded uncertainty (K=1.95)	16.02%

HAC MEASUREMENT RESULT

E-Field	H-Field
163 V/m	0.494 A/m

COMOHAC Broadband 1700-2000 MHz dipole Calibration Report	SATIMO		
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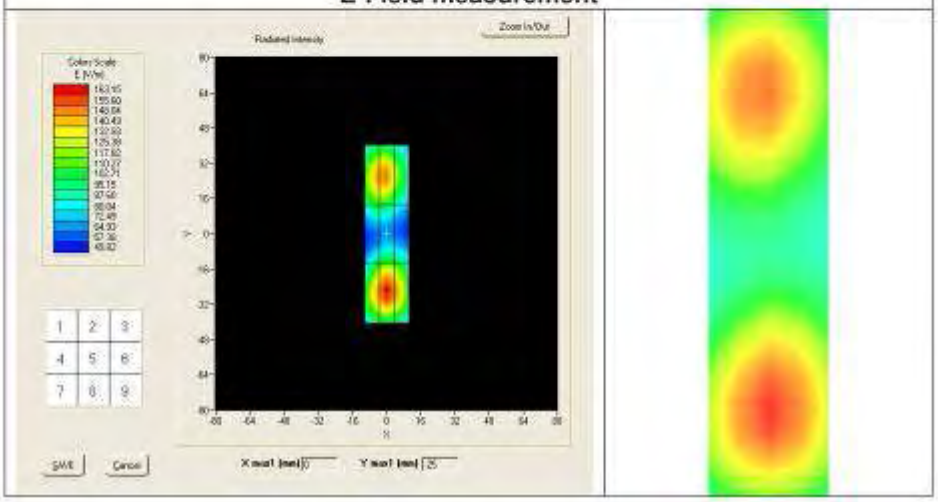
HAC MEASUREMENT PLOTS

E-Field measurement



H-Field measurement