

Hearing Aid Compatibility (HAC) RF Emissions Test Report

APPLICANT : ZTE CORPORATION
EQUIPMENT : CDMA/LTE Digital Mobile Handset
BRAND NAME : ZTE
MODEL NAME : ZTE FLASH 4G LTE
FCC ID : Q78-ZTEN9500
STANDARD : FCC 47 CFR §20.19
ANSI C63.19-2007
M CATEGORY : M4

The product was received on Jul. 02, 2012 and completely tested on Jul. 12, 2012. We, SPORTON INTERNATIONAL (KUNSHAN) INC., would like to declare that the tested sample has been evaluated in accordance with the procedures and shown the compliance with the applicable technical standards.

The test results in this report apply exclusively to the tested model / sample. Without written approval of SPORTON INTERNATIONAL (KUNSHAN) INC., the test report shall not be reproduced except in full.

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Revision History

REPORT NO.	VERSION	DESCRIPTION	ISSUED DATE
HA270201A	Rev. 01	Initial issue of report	Jul. 11, 2012
HA270201A	Rev. 02	Update report for revising model name	Jul. 12, 2012
HA270201A	Rev. 03	Update report for adding CDMA2000 BC1 test items	Jul. 16, 2012

1. Statement of Compliance

The maximum results of RF Emission of Hearing Aid Compliance (HAC) found during testing for the **ZTE CORPORATION DUT: CDMA/LTE Digital Mobile Handset; Brand Name: ZTE; Model Name: ZTE FLASH 4G LTE** are follows (with expanded uncertainty $\pm 30.4\%$ for E-field and $\pm 21.6\%$ for H-field):

Band	HAC RF Emission Test Result		M Rating
CDMA2000 BC0	E-Field (V/m)	54.035	M4
	H-Field (A/m)	0.088	M4
CDMA2000 BC10	E-Field (V/m)	49.302	M4
	H-Field (A/m)	0.092	M4
CDMA2000 BC1	E-Field (V/m)	21.600	M4
	H-Field (A/m)	0.056	M4

They are in compliance with HAC limits (HAC Rated category M3) specified in guidelines FCC 47 CFR §20.19 and ANSI Standard ANSI C63.19.

Results Summary : M Category = M4 (ANSI C63.19-2007)

2. Administration Data

2.1 Testing Laboratory

Test Site	SPORTON INTERNATIONAL (KUNSHAN) INC.
Test Site Location	No. 3-2, PingXiang Road, Kunshan, Jiangsu Province, P.R.C. TEL: +86-0512-5790-0158 FAX: +86-0512-5790-0958
Test Site No.	Sporton Site No. : SAR01-KS

Test Site	SPORTON INTERNATIONAL INC.
Test Site Location	No. 52, Hwa Ya 1 st Rd., Hwa Ya Technology Park, Kwei-Shan Hsiang, Tao Yuan Hsien, Taiwan, R.O.C. TEL: +886-3-327-3456 FAX: +886-3-328-4978
Test Site No.	Sporton Site No. : SAR01-HY

2.2 Applicant

Company Name	ZTE CORPORATION
Address	ZTE Plaza, Keji Road South, Hi-Tech, Industrial Park, Nanshan District, Shenzhen, Guangdong, 518057, P.R.China

2.3 Manufacturer

Company Name	ZTE CORPORATION
Address	ZTE Plaza, Keji Road South, Hi-Tech, Industrial Park, Nanshan District, Shenzhen, Guangdong, 518057, P.R.China

2.4 Application Details

Date of Receipt of Application	Jul. 02, 2012
Date of Start during the Test	Jul. 05, 2012
Date of End during the Test	Jul. 12, 2012

3. General Information

3.1 Description of Device Under Test (DUT)

Product Feature & Specification	
DUT Type	CDMA/LTE Digital Mobile Handset
Brand Name	ZTE
Model Name	ZTE FLASH 4G LTE
MEID	99000058110516
FCC ID	Q78-ZTEN9500
Tx Frequency	CDMA2000 BC0: 824.70 MHz ~ 848.31 MHz CDMA2000 BC10: 817.90 MHz ~ 823.10 MHz CDMA2000 BC1: 1851.25 MHz ~ 1908.75 MHz
Rx Frequency	CDMA2000 BC0: 869.70 MHz ~ 893.31 MHz CDMA2000 BC10: 903.8 MHz ~ 914.2 MHz CDMA2000 BC1: 1931.25 MHz ~ 1988.75 MHz
Maximum Output Power to Antenna	CDMA2000 BC0 : 23.97 dBm CDMA2000 BC10 : 24.02 dBm CDMA2000 BC1 : 24.15 dBm
Antenna Type	PIFA Antenna
HW Version	N9500.H01
SW Version	N9500V1.0.0B05
Type of Modulation	QPSK
DUT Stage	Identical Prototype

List of air interfaces / frequency bands:

Air Interface	Band (MHz)	Voice/Data	C63.19-2007 Tested	Concurrent connections	Reduced power 20.19 (c)(1)
CDMA2000	BC0,BC10,BC1	Voice/Data	Yes	WLAN,BT,LTE	No
WLAN	2450	Data(*)	No	CDMA2000,BT,LTE	No
BT	2450	Data(*)	No	CDMA2000,WLAN,LTE	No
LTE	Band 25	Data(*)	No	CDMA2000,BT,WLAN	No

Note:

1. (*): The voice function maybe be activated via 3rd party software application.
2. Per KDB 285076 D01 7)a), during RF test, concurrent transmission is disabled.

3.2 Product Photos

Refer to Appendix D.

3.3 Applied Standards

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 following AWF factors shall be used for the standard transmission protocols:

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

Table 3.1 Articulation Weighting Factor (AWF)

Category	Telephone RF Parameters		
Near Field	AWF	E-Field Emissions	H-Field Emissions
< 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

Table 3.2 Telephone near-field categories in linear units



3.4 Test Conditions

3.4.1 Ambient Condition

Ambient Temperature	20 to 24 °C
Humidity	< 60 %

3.4.2 Test Configuration

The device was controlled by using a base station emulator Agilent 8960. 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.



4. Hearing Aid Compliance (HAC)

Introduction

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

5. HAC RF Emission Measurement Setup

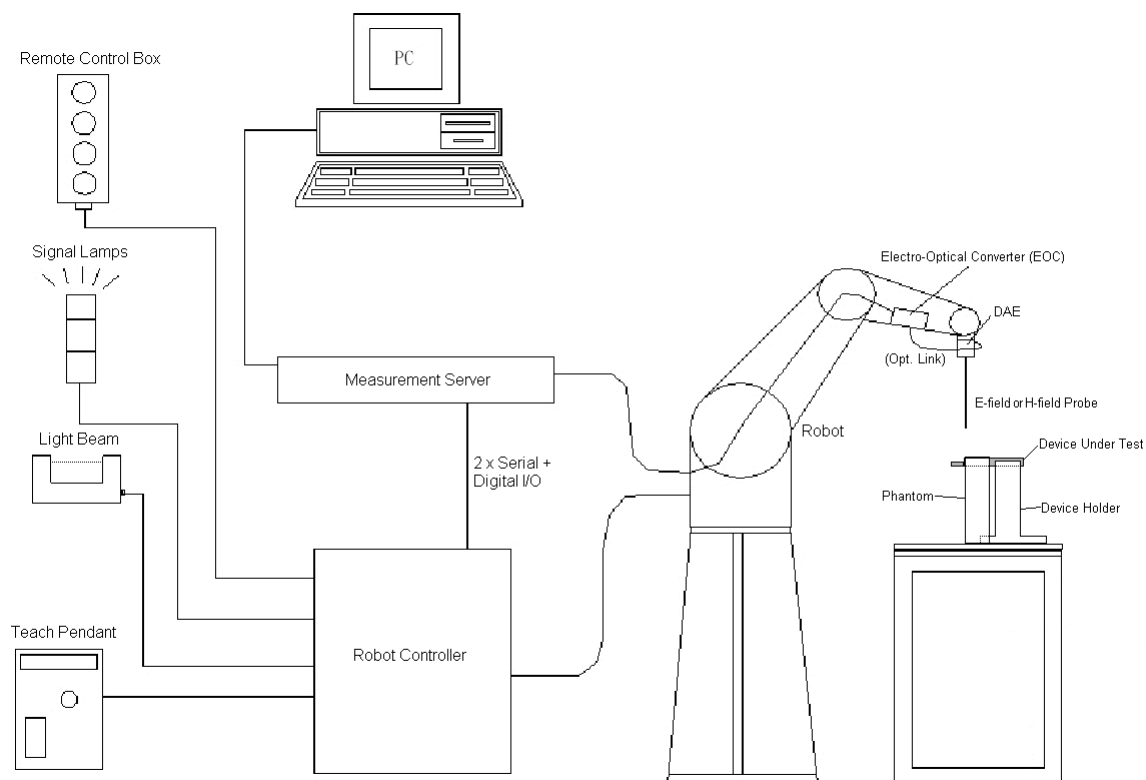


Fig 5.1 SPEAG DASY4 or DASY5 System Configurations

The DASY4 or DASY5 system for performance compliance tests is illustrated above graphically. This system consists of the following items:

- A standard high precision 6-axis robot with controller, a teach pendant and software
- A data acquisition electronic (DAE) attached to the robot arm extension
- A dosimetric probe equipped with an optical surface detector system
- The electro-optical converter (EOC) performs the conversion between optical and electrical signals
- A measurement server performs the time critical tasks such as signal filtering, control of the robot operation and fast movement interrupts.
- A probe alignment unit which improves the accuracy of the probe positioning
- A computer operating Windows XP
- DASY4 or DASY5 software
- Remote control with teach pendant and additional circuitry for robot safety such as warning lamps, etc.
- The SAM twin phantom
- A device holder
- Tissue simulating liquid
- Dipole for evaluating the proper functioning of the system

Some of the components are described in details in the following sub-sections.

5.1 E-Field and H-Field Probe System

The HAC measurement is conducted with the dosimetric probe ER3DV6 and H3DV6 (manufactured by SPEAG). The probe is specially designed and calibrated. This probe has a built in optical surface detection system to prevent from collision with DUT.

5.1.1 E-Field Probe Specification

<ER3DV6>

Construction	One dipole parallel, two dipoles normal to probe axis Built-in shielding against static charges
Calibration	In air from 100 MHz to 3.0 GHz (absolute accuracy $\pm 6.0\%$, $k=2$)
Frequency	100 MHz to 6 GHz; Linearity: ± 2.0 dB (100 MHz to 3 GHz)
Directivity	± 0.2 dB in air (rotation around probe axis) ± 0.4 dB in air (rotation normal to probe axis)
Dynamic Range	2 V/m to 1000 V/m (M3 or better device readings fall well below diode compression point)
Linearity	± 0.2 dB
Dimensions	Overall length: 330 mm (Tip: 16 mm) Tip diameter: 8 mm (Body: 12 mm) Distance from probe tip to dipole centers: 2.5 mm



Fig 5.2 Photo of E-field Probe

5.1.2 H-Field Probe Description

<H3DV6>

Construction	Three concentric loop sensors with 3.8 mm loop diameters Resistively loaded detector diodes for linear response Built-in shielding against static charges
Frequency	200 MHz to 3 GHz (absolute accuracy $\pm 6.0\%$, $k=2$); Output linearized
Directivity	± 0.25 dB (spherical isotropy error)
Dynamic Range	10 m A/m to 2 A/m at 1 GHz (M3 or better device readings fall well below diode compression point)
Dimensions	Overall length: 330 mm (Tip: 40 mm) Tip diameter: 6 mm (Body: 12 mm) Distance from probe tip to dipole centers: 3 mm
E-Field Interference	$< 10\%$ at 3 GHz (for plane wave)



Fig 5.3 Photo of H-field Probe

5.1.3 Probe Tip Description

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:

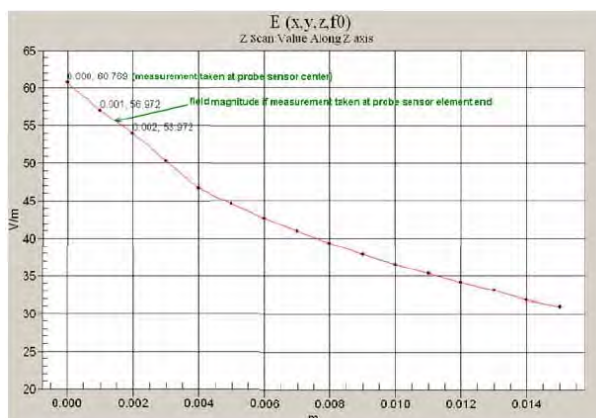


Fig 5.4 Z-Axis Scan at maximum point above a typical wireless device for E-field

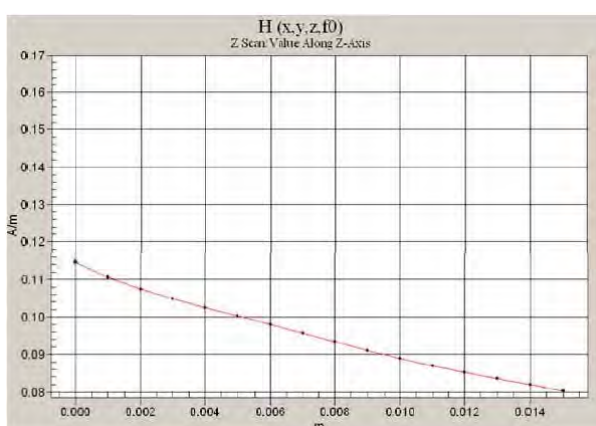


Fig 5.5 Z-Axis Scan at maximum point above a typical wireless device for H-field

The magnetic field loops of the H3D probes are concentric, with the center 3mm from the tip for H3DV6. Their radius is 1.9 mm.

The electric field probes have a more irregular internal geometry because it is physically not possible to have the 3 orthogonal sensors situated with the same center. The effect of the different sensor centers is accounted for in the HAC uncertainty budget ("sensor displacement"). Their geometric center is at 2.5 mm from the tip, and the element ends are 1.1 mm closer to the tip.

Where:

Peak Field = Peak field (in dB V/m or dB A/m)

Raw = Raw field measurement from the measurement system (in V/m or A/m).

PMF = Probe Modulation Factor (in Linear units). See Chapter 8 of test report.

5.2 DATA Acquisition Electronics (DAE)

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

The input impedance of the DAE is 200 MOhm; the inputs are symmetrical and floating. Common mode rejection is above 80 dB.



Fig 5.6 Photo of DAE

5.3 Robot

The SPEAG DASY system uses the high precision robots (DASY5: TX90XL) type from Stäubli SA (France). For the 6-axis controller system, the robot controller version (DASY5: CS8c) from Stäubli is used. The Stäubli robot series have many features that are important for our application:

- High precision (repeatability ± 0.035 mm)
- High reliability (industrial design)
- Jerk-free straight movements
- Low ELF interference (the closed metallic construction shields against motor control fields)
- 6-axis controller



Fig 5.7 Photo of DASY5

5.4 Measurement Server

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

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



Fig 5.8 Photo of Server for DASY5

5.5 Phone Positioner

The phone positioner shown in Fig. 5.11 is used to adjust DUT to the suitable position.



Fig 5.9 Phone Positioner

5.6 Test Arch Phantom

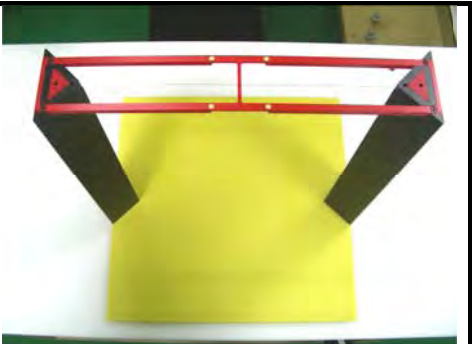
Construction :	Enables easy and well defined positioning of the phone and validation dipoles as well as simple teaching of the robot.	
Dimensions :	370 x 370 x 370 mm	

Fig 5.10 Photo of Arch Phantom

5.7 Data Storage and Evaluation

5.7.1 Data Storage

The DASY software stores the assessed data from the data acquisition electronics as raw data (in microvolt readings from the probe sensors), together with all the necessary software parameters for the data evaluation (probe calibration data, and device frequency and modulation data) in measurement files. The post-processing software evaluates the desired unit and format for output each time the data is visualized or exported. This allows verification of the complete software setup even after the measurement and allows correction of erroneous parameter settings.

5.7.2 Data Evaluation

The DASY post-processing software (SEMCAD) automatically executes the following procedures to calculate the field units from the microvolt readings at the probe connector. The parameters used in the evaluation are stored in the configuration modules of the software :

Probe parameters :	- Sensitivity	Norm _i , a _{i0} , a _{i1} , a _{i2}
	- Conversion factor	ConvF _i
	- Diode compression point	dcp _i
Device parameters :	- Frequency	f
	- Crest factor	cf
Media parameters :	- Conductivity	σ
	- Density	ρ

These parameters must be set correctly in the software. They can be found in the component documents or they can be imported into the software from the configuration files issued for the DASY components. In the direct measuring mode of the multi-meter option, the parameters of the actual system setup are used. In the scan visualization and export modes, the parameters stored in the corresponding document files are used.

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 :

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

with 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 :

$$\text{E-field Probes : } \mathbf{E}_i = \sqrt{\frac{V_i}{\text{Norm}_i \cdot \text{ConvF}}}$$

$$\text{H-field Probes : } \mathbf{H}_i = \sqrt{V_i} \cdot \frac{a_{i0} + a_{i1}f + a_{i2}f^2}{f}$$

with V_i = compensated signal of channel i , ($i = x, y, z$)
 Norm_i = sensor sensitivity of channel i , ($i = x, y, z$), $\mu\text{V}/(\text{V/m})^2$ for E-field 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) :

$$\mathbf{E}_{\text{tot}} = \sqrt{\mathbf{E}_x^2 + \mathbf{E}_y^2 + \mathbf{E}_z^2}$$

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, DASY 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%.

5.8 Test Equipment List

<SAR01-KS>:

Manufacturer	Name of Equipment	Type/Model	Serial Number	Calibration	
				Last Cal.	Due Date
SPEAG	Probe	ER3DV6	2476	Nov. 21, 2011	Nov. 20, 2012
SPEAG	Probe	H3DV6	6300	Nov. 22, 2011	Nov. 21, 2012
SPEAG	Dipole	CD835V3	1045	Jun. 14, 2012	Jun. 13, 2013
SPEAG	Data Acquisition Electronics	DAE4	1210	Nov. 18, 2011	Nov. 17, 2012
SPEAG	Test Arch Phantom	Par phantom	1105	NCR	NCR
SPEAG	Phone Positioner	N/A	N/A	NCR	NCR
Agilent	Wireless Communication Test Set	E5515C	GB47050646	Aug. 18, 2011	Aug. 17, 2012
R&S	Signal Generator	SMR40	100455	Dec. 30, 2011	Dec. 29, 2012
AR	Amplifier	551G4	333096	NCR	NCR
Agilent	Power Meter	E4416A	MY45101555	Aug. 23, 2011	Aug. 22, 2012
Agilent	Power Sensor	E9327A	MY44421198	Aug. 23, 2011	Aug. 22, 2012
ARRA	Power Divider	A3200-2	N/A	NA	NA
MCL	Attenuation	BW-S10W5	N/A	NA	NA
R&S	Spectrum Analyzer	FSP07	100819	Jun. 01, 2012	May 31, 2013

<SAR01-HY>:

Manufacturer	Name of Equipment	Type/Model	Serial Number	Calibration	
				Last Cal.	Due Date
SPEAG	Probe	ER3DV6	2358	Jan. 26, 2012	Jan. 25, 2013
SPEAG	Probe	H3DV6	6184	Jan. 26, 2012	Jan. 25, 2013
SPEAG	Dipole	CD1880V3	1038	Jun. 14, 2012	Jun. 13, 2013
SPEAG	Data Acquisition Electronics	DAE4	1338	Jun. 12, 2012	Jun. 11, 2013
SPEAG	Audio Magnetic Calibration Coil	AMCC	1049	NCR	NCR
SPEAG	Audio Measuring Instrument	AMMI	1041	NCR	NCR
SPEAG	Test Arch Phantom	N/A	N/A	NCR	NCR
SPEAG	Phone Positoiner	N/A	N/A	NCR	NCR
Agilent	ESG Vector Series Signal Generator	E4438C	MY49070755	Oct. 17, 2011	Oct. 16, 2012
Anritsu	Power Meter	ML2495A	0932001	Sep. 21, 2011	Sep. 20, 2012
R&S	Universal Digital Radiocommunication Tester	CMU200	117995	Jul. 28, 2011	Jul. 27, 2012
R&S	Spectrum Analyzer	FSP7	101131	Jul. 29, 2011	Jul. 28, 2012

Table 5.1 Test Equipment List

6. Uncertainty Assessment

The component of uncertainty may generally be categorized according to the methods used to evaluate them. The evaluation of uncertainty by the statistical analysis of a series of observations is termed a Type A evaluation of uncertainty. The evaluation of uncertainty by means other than the statistical analysis of a series of observation is termed a Type B evaluation of uncertainty. Each component of uncertainty, however evaluated, is represented by an estimated standard deviation, termed standard uncertainty, which is determined by the positive square root of the estimated variance.

A Type A evaluation of standard uncertainty may be based on any valid statistical method for treating data. This includes calculating the standard deviation of the mean of a series of independent observations; using the method of least squares to fit a curve to the data in order to estimate the parameter of the curve and their standard deviations; or carrying out an analysis of variance in order to identify and quantify random effects in certain kinds of measurement.

A type B evaluation of standard uncertainty is typically based on scientific judgment using all of the relevant information available. These may include previous measurement data, experience and knowledge of the behavior and properties of relevant materials and instruments, manufacture's specification, data provided in calibration reports and uncertainties assigned to reference data taken from handbooks. Broadly speaking, the uncertainty is either obtained from an outdoor source or obtained from an assumed distribution, such as the normal distribution, rectangular or triangular distributions indicated in Table 6.1.

Uncertainty Distributions	Normal	Rectangular	Triangular	U-Shape
Multi-plying Factor ^(a)	1/k ^(b)	1/√3	1/√6	1/√2

(a) standard uncertainty is determined as the product of the multiplying factor and the estimated range of variations in the measured quantity

(b) κ is the coverage factor

Table 6.1 Multiplying Factors for Various Distributions

The combined standard uncertainty of the measurement result represents the estimated standard deviation of the result. It is obtained by combining the individual standard uncertainties of both Type A and Type B evaluation using the usual "root-sum-squares" (RSS) methods of combining standard deviations by taking the positive square root of the estimated variances.

Expanded uncertainty is a measure of uncertainty that defines an interval about the measurement result within which the measured value is confidently believed to lie. It is obtained by multiplying the combined standard uncertainty by a coverage factor. Typically, the coverage factor ranges from 2 to 3. Using a coverage factor allows the true value of a measured quantity to be specified with a defined probability within the specified uncertainty range. For purpose of this document, a coverage factor two is used, which corresponds to confidence interval of about 95 %. The DASY uncertainty Budget is showed in Table 6.2.

Error Description	Uncertainty Value (±%)	Probability Distribution	Divisor	Ci (E)	Ci (H)	Standard Uncertainty (E)	Standard Uncertainty (H)
Measurement System							
Probe Calibration	5.1	Normal	1	1	1	± 5.1 %	± 5.1 %
Axial Isotropy	4.7	Rectangular	√3	1	1	± 2.7 %	± 2.7 %
Sensor Displacement	16.5	Rectangular	√3	1	0.145	± 9.5 %	± 1.4 %
Test Arch	7.2	Rectangular	√3	1	0	± 4.1 %	± 0.0 %
Linearity	4.7	Rectangular	√3	1	1	± 2.7 %	± 2.7 %
Scaling to Peak Envelope Power	0.0	Rectangular	√3	1	1	± 0.0 %	± 0.0 %
System Detection Limit	1.0	Rectangular	√3	1	1	± 0.6 %	± 0.6 %
Readout Electronics	0.3	Normal	1	1	1	± 0.3 %	± 0.3 %
Response Time	0.8	Rectangular	√3	1	1	± 0.5 %	± 0.5 %
Integration Time	2.6	Rectangular	√3	1	1	± 1.5 %	± 1.5 %
RF Ambient Conditions	3.0	Rectangular	√3	1	1	± 1.7 %	± 1.7 %
RF Reflections	12.0	Rectangular	√3	1	1	± 6.9 %	± 6.9 %
Probe Positioner	1.2	Rectangular	√3	1	0.67	± 0.7 %	± 0.5 %
Probe Positioning	4.7	Rectangular	√3	1	0.67	± 2.7 %	± 1.8 %
Extrap. and Interpolation	1.0	Rectangular	√3	1	1	± 0.6 %	± 0.6 %
Test Sample Related							
Device Positioning Vertical	4.7	Rectangular	√3	1	0.67	± 2.7 %	± 1.8 %
Device Positioning Lateral	1.0	Rectangular	√3	1	1	± 0.6 %	± 0.6 %
Device Holder and Phantom	2.4	Rectangular	√3	1	1	± 1.4 %	± 1.4 %
Power Drift	5.0	Rectangular	√3	1	1	± 2.9 %	± 2.9 %
Phantom and Setup Related							
Phantom Thickness	2.4	Rectangular	√3	1	0.67	± 1.4 %	± 0.9 %
Combined Standard Uncertainty						± 15.2 %	± 10.8 %
Coverage Factor for 95 %						K = 2	
Expanded Uncertainty						± 30.4 %	± 21.6 %

Table 6.2 Uncertainty Budget of DASY

7. HAC RF Emission Measurement Evaluation

Each DASY system is equipped with one or more system validation kits. These units, together with the predefined measurement procedures within the DASY software, enable the user to conduct the system performance check and system validation. System validation kit includes a dipole, tripod holder to fix it underneath the test Arch and a corresponding distance holder.

7.1 Purpose of System Performance Check

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.

7.2 System Setup

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 which comes from a signal generator. The calibrated dipole must be placed beneath the arch phantom. The equipment setup is shown below:

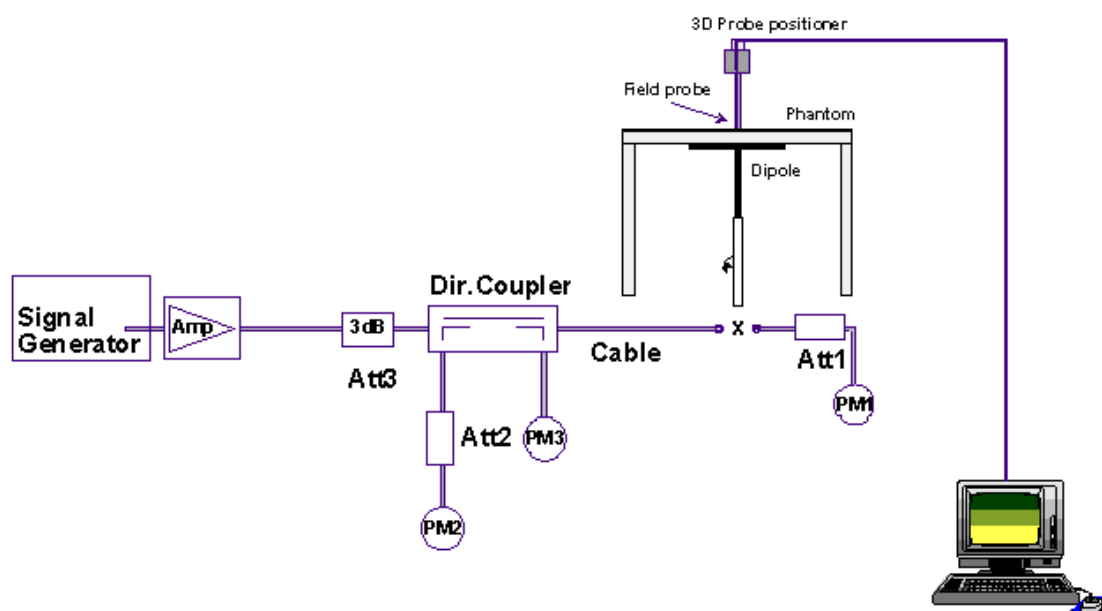


Fig. 7.1 System Setup of System Evaluation

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

The output power on dipole port must be calibrated to 20dBm (100mW) before dipole is connected.

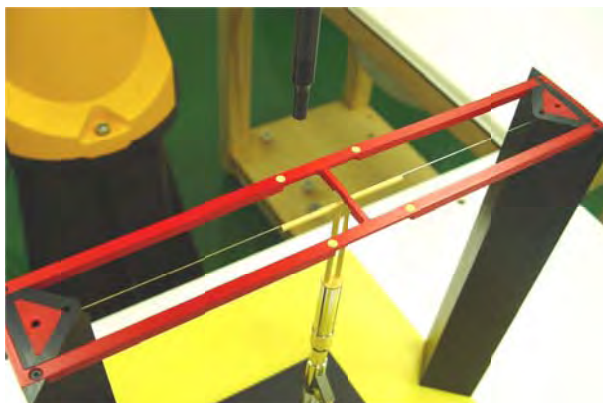


Fig 7.2 Dipole Setup

7.3 Validation Results

Comparing to the original E-field or H-field value provided by SPEAG, the validation data should be within its specification of 25 %. Table 7.1 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.

Frequency (MHz)	Input Power (dBm)	Target Value (V/m)	E-Field 1 (V/m)	E-Field 2 (V/m)	Average Value (V/m)	Deviation (%)	Date
835	20	167.6	165.1	157.6	161.35	-2.27	Jul. 05, 2012
1880	20	139.0	130.4	130.4	130.4	-5.44	Jul. 12, 2012
Frequency (MHz)	Input Power (dBm)	Target Value (A/m)	H-Field (A/m)			Deviation (%)	Date
835	20	0.455	0.464			0.65	Jul. 05, 2012
1880	20	0.463	0.491			5.59	Jul. 12, 2012

Table 7.1 Test Results of System Validation

Note: Deviation = ((E or H-field Result) - (Target field)) / (Target field) * 100%

8. RF Field 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.

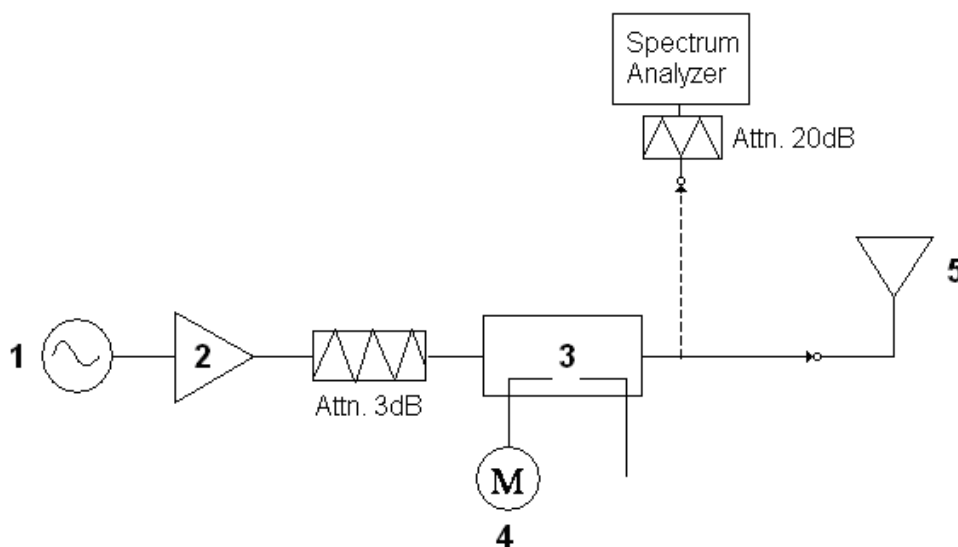


Fig. 8.1 System Calibration

This was done using the following procedure:

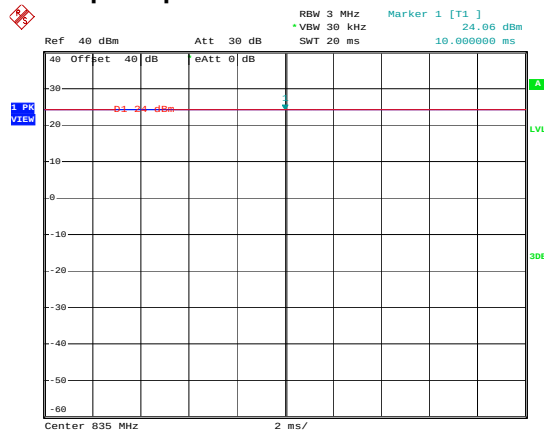
1. Fixing the probe in a set location relative to a field generating device.
2. Illuminate the probe with a CW signal at the intended measurement frequency.
3. Record the reading of the probe measurement system of the CW signal.
4. Determine the level of the CW signal being used to drive the field generating 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.



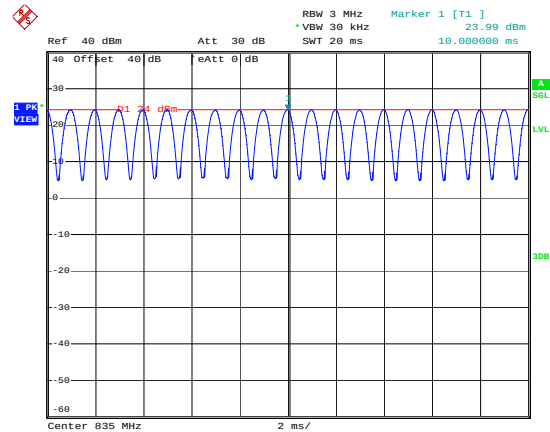
PMF Measurement Summary:

Frequency	Functions	E-field	H-field	PMF	
		V/m	A/m	E-field	H-field
835MHz	CW	316.0	0.804	-	-
835MHz	AM	162.2	0.492	1.95	1.63
835MHz	CDMA	271.1	0.804	1.17	1.00
1880MHz	CW	301.4	0.999	-	-
1880MHz	AM	187.9	0.770	1.60	1.30
1880MHz	CDMA	308.5	1.231	0.98	0.81

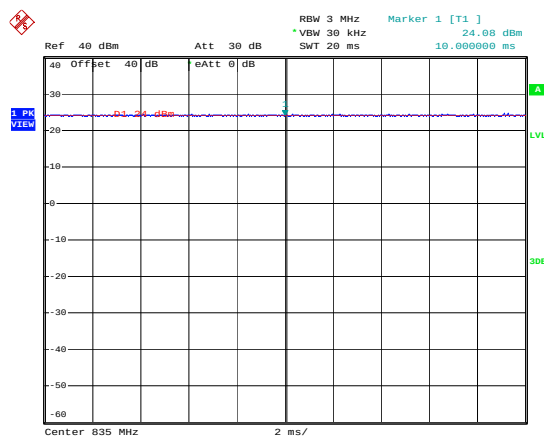
Zero span Spectrum Plots for RF Field Probe Modulation Factor



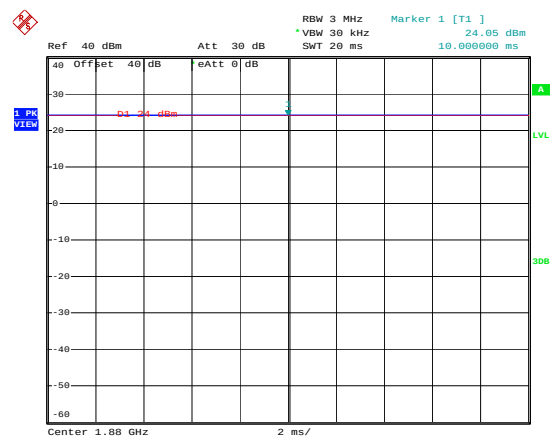
835MHz - CW



835MHz - 80% AM



835MHz - CDMA (Full Rate)

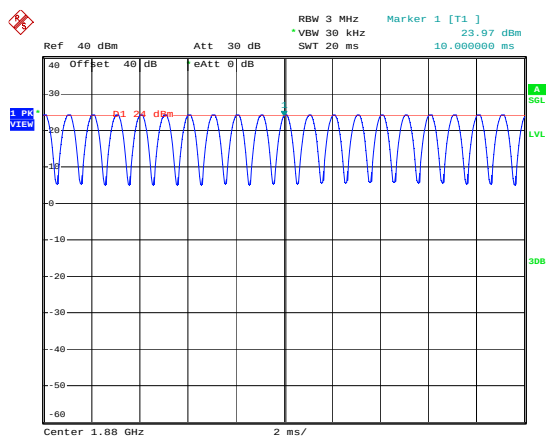


1880MHz - CW

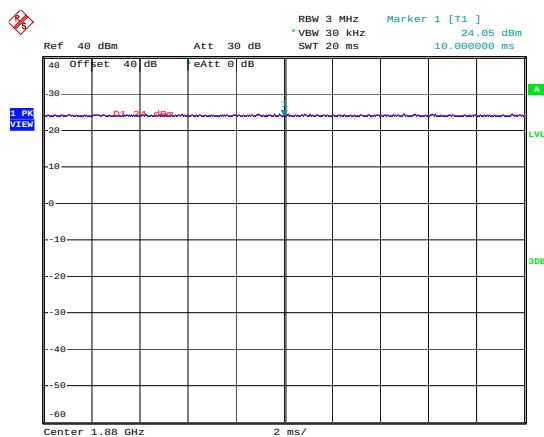


FCC HAC RF Emissions Test Report

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1880MHz - 80% AM



1880MHz - CDMA (Full Rate)

9. Description for DUT Testing Position

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

Fig. 9.1 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.



Fig 9.1 A typical DUT reference and plane for HAC measurements

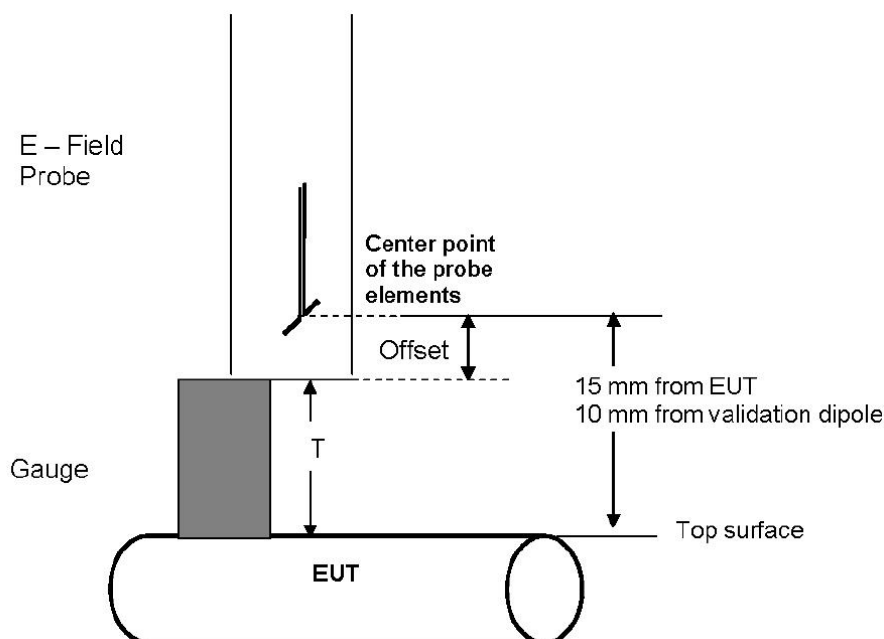


Fig. 9.2 Gauge block with E-field probe

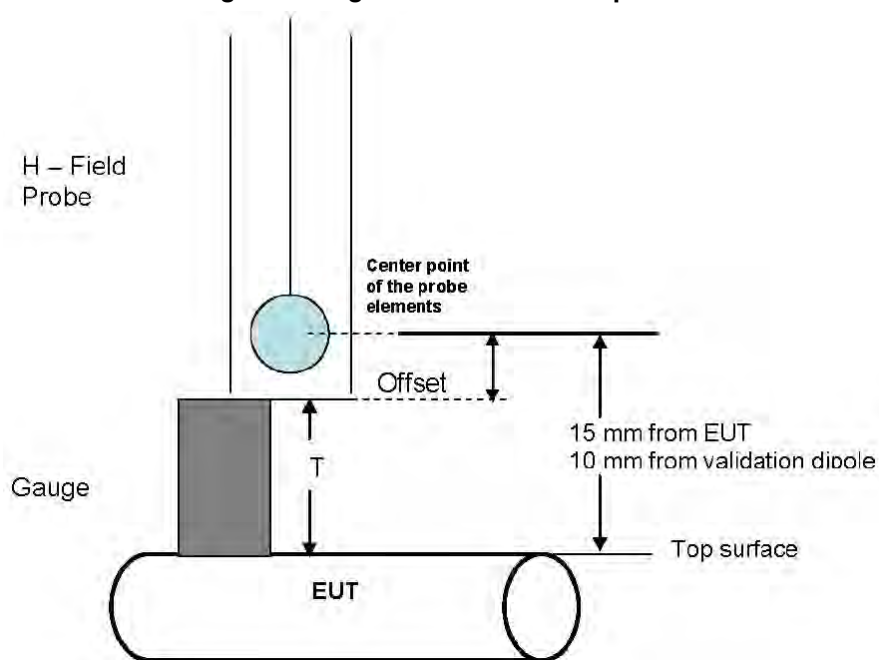


Fig. 9.3 Gauge block with H-field probe



10. RF Emissions 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.

11. HAC RF Emission Test Results

11.1 Conducted Power (Unit: dBm)

Band	CDMA2000 BC0			CDMA2000 BC10			CDMA2000 BC1		
Channel	1013	384	777	476	580	684	25	600	1175
Frequency	824.7	836.52	848.31	817.9	820.5	823.1	1851.25	1880	1908.75
1xRTT RC1+SO55	23.73	23.94	23.94	24.01	24.01	24.01	23.88	24.12	23.98
1xRTT RC3+SO55	23.69	23.93	23.95	23.98	23.97	24.01	23.78	24.10	23.87
1xRTT RC3+SO32(+ F-SCH)	23.71	23.93	23.97	23.95	23.97	24.02	23.91	24.15	24.01
1xRTT RC3+SO32(+SCH)	23.69	23.94	23.92	23.94	23.98	24.00	23.81	24.10	23.91
1xEVDO RTAP 9.6	23.65	23.89	23.88	23.86	23.91	23.94	23.88	24.05	23.94
1xEVDO RETAP 38.4	23.51	23.82	23.80	23.79	23.88	23.90	23.81	24.01	23.97
1xEVDO RTAP 153.6	23.55	23.79	23.86	23.83	23.86	23.92	23.79	24.10	23.96
1xEVDO RETAP 128	23.57	23.81	23.83	23.80	23.84	23.93	23.78	24.09	23.88
1xEVDO RTAP 512	23.53	23.80	23.82	23.82	23.89	23.91	23.81	24.08	23.89
1xEVDO RETAP 1024	23.51	23.78	23.81	23.83	23.87	23.89	23.87	24.11	23.97
1xEVDO RTAP 2048	23.49	23.77	23.79	23.79	23.85	23.91	23.89	24.07	23.94
1xEVDO RETAP 4096	23.51	23.78	23.81	23.80	23.89	23.90	23.84	24.07	23.91

11.2 E-Field Emission

Plot No.	Band	Mode	Channel	PMF	Peak E-Field (V/m)	M-Rating
1	CDMA2000 BC0	RC3_SO55_Loop	1013	1.17	49.044	M4
2	CDMA2000 BC0	RC3_SO55_Loop	384	1.17	49.006	M4
3	CDMA2000 BC0	RC3_SO55_Loop	777	1.17	54.035	M4
4	CDMA2000 BC10	RC3_SO55_Loop	476	1.17	49.302	M4
5	CDMA2000 BC10	RC3_SO55_Loop	580	1.17	46.573	M4
6	CDMA2000 BC10	RC3_SO55_Loop	684	1.17	48.544	M4
7	CDMA2000 BC1	RC3+SO55_Loop	25	0.98	16.200	M4
8	CDMA2000 BC1	RC3+SO55_Loop	600	0.98	19.700	M4
9	CDMA2000 BC1	RC3+SO55_Loop	1175	0.98	21.600	M4

11.3 H-Field Emission

Plot No.	Band	Mode	Channel	PMF	Peak H-Field (A/m)	M-Rating
1	CDMA2000 BC0	RC3_SO55_Loop	1013	1.00	0.088	M4
2	CDMA2000 BC0	RC3_SO55_Loop	384	1.00	0.079	M4
3	CDMA2000 BC0	RC3_SO55_Loop	777	1.00	0.066	M4
4	CDMA2000 BC10	RC3_SO55_Loop	476	1.00	0.092	M4
5	CDMA2000 BC10	RC3_SO55_Loop	580	1.00	0.089	M4
6	CDMA2000 BC10	RC3_SO55_Loop	684	1.00	0.089	M4
7	CDMA2000 BC1	RC3+SO55_Loop	25	0.81	0.044	M4
8	CDMA2000 BC1	RC3+SO55_Loop	600	0.81	0.052	M4
9	CDMA2000 BC1	RC3+SO55_Loop	1175	0.81	0.056	M4

Remark:

1. The volume was adjusted to maximum level and the backlight turned off during RF Emission testing.
2. There is no special HAC mode software on this DUT.
3. Test Engineer : Fulu Hu and A-Rod Chen



12. References

- [1] ANSI C63.19-2007, "American National Standard for Methods of Measurement of Compatibility between Wireless Communications Devices and Hearing Aids", 8 June 2007
- [2] SPEAG DASY System Handbook



Appendix A. Plots of System Performance Check

The plots are shown as follows.

HAC_E_Dipole_835_120705**DUT: HAC-Dipole 835 MHz**

Communication System: CW; Frequency: 835 MHz; Duty Cycle: 1:1

Medium: Air Medium parameters used: $\sigma = 0$ mho/m, $\epsilon_r = 1$; $\rho = 0$ kg/m³

Ambient Temperature : 23.3 °C

DASY5 Configuration:

- Probe: ER3DV6 - SN2476; ConvF(1, 1, 1); Calibrated: 2011-11-21
- Electronics: DAE4 Sn1210; Calibrated: 2011-11-18
- Phantom: HAC Test Arch with AMCC; Type: SD HAC P01 BA;
- Measurement SW: DASY52, Version 52.8 (0); SEMCAD X Version 14.4.5 (3634)

E Scan - measurement distance from the probe sensor center to CD835 Dipole = 10mm/Hearing Aid Compatibility Test (41x361x1): Measurement grid: dx=5mm, dy=5mm

Maximum value of peak Total field = 165.1 V/m

Probe Modulation Factor = 1.000

Reference Value = 110.7 V/m; Power Drift = -0.0019 dB

Average value of Total=(165.1+157.6) /2 = 161.35 V/m)

Peak E-field in V/m

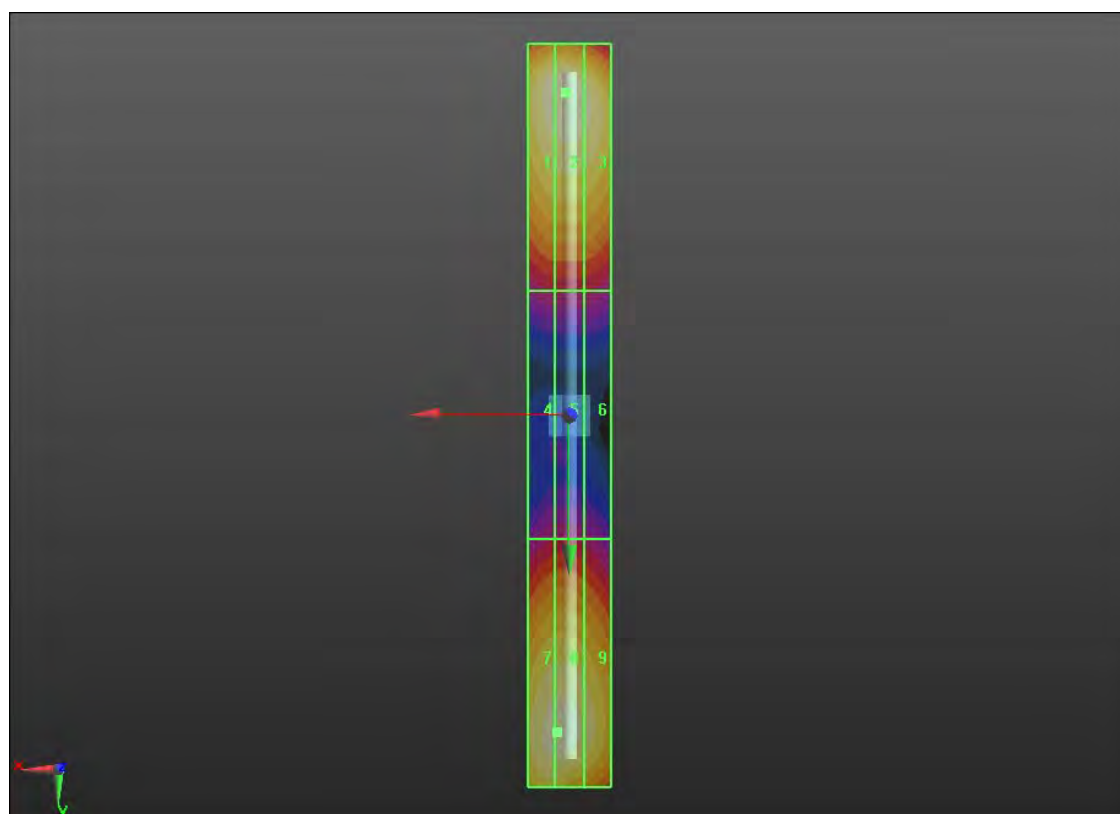
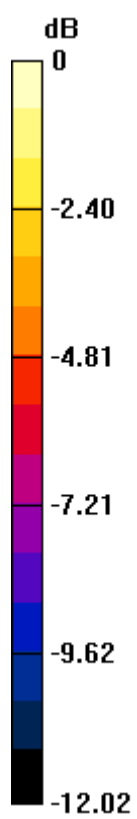
Grid 1 162.7 M4	Grid 2 165.1 M4	Grid 3 157.4 M4
Grid 4 79.847 M4	Grid 5 80.300 M4	Grid 6 80.037 M4
Grid 7 157.4 M4	Grid 8 157.6 M4	Grid 9 148.6 M4

Cursor:

Total = 165.1 V/m

E Category: M4

Location: 1, -78, 4.7 mm



0 dB = 165.1V/m

HAC_E_Dipole_1880_120712**DUT: HAC Dipole 1880 MHz**

Communication System: CW; Frequency: 1880 MHz; Duty Cycle: 1:1

Medium: Air Medium parameters used: $\sigma = 0$ mho/m, $\epsilon_r = 1$; $\rho = 1000$ kg/m³

Ambient Temperature : 22.5 °C

DASY5 Configuration:

- Probe: ER3DV6 - SN2358; ConvF(1, 1, 1); Calibrated: 2012/1/26
- Sensor-Surface: (Fix Surface)
- Electronics: DAE4 Sn1338; Calibrated: 2012/6/12
- Phantom: HAC Test Arch with AMCC; Type: SD HAC P01 BA
- Software: DASY5 Version; SEMCAD X Version 13.4 Build 45

E Scan - measurement distance from the probe sensor center to CD1880 Dipole = 10mm/Hearing Aid

Compatibility Test (41x181x1): Measurement grid: dx=5mm, dy=5mm

Maximum value of peak Total field = 130.4 V/m

Probe Modulation Factor = 1

Reference Value = 132.5 V/m; Power Drift = 0.00473 dB

Average value of Total=(130.4+130.4) / 2 = 130.4 V/m

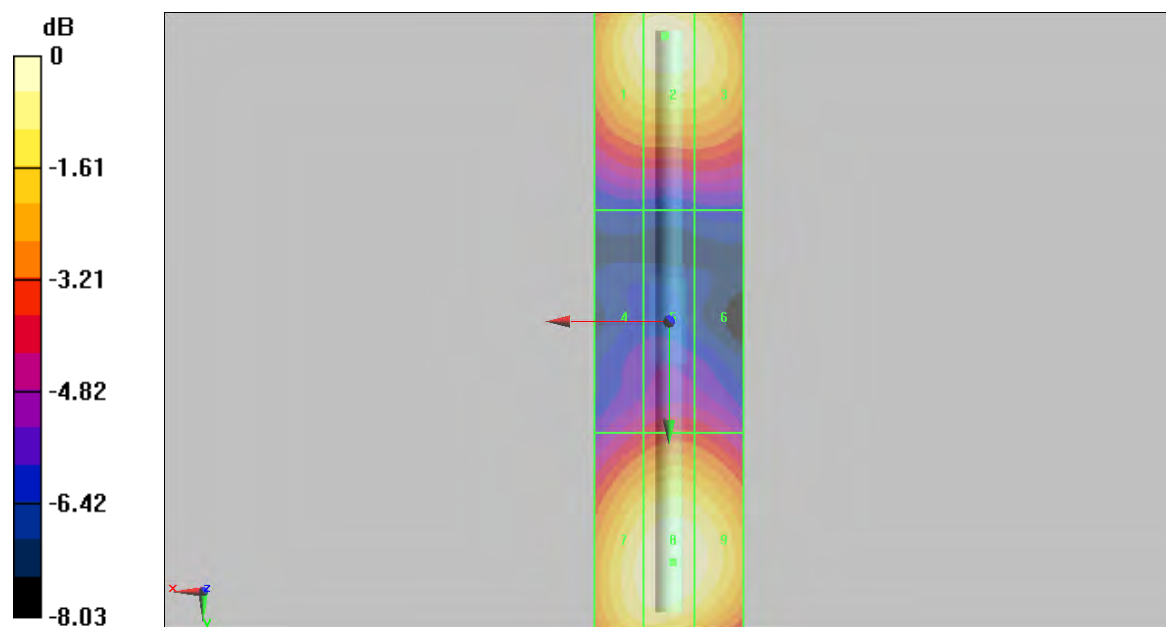
Peak E-field in V/m

Grid 1 126.8 M2	Grid 2 130.4 M2	Grid 3 124.2 M2
Grid 4 81.5 M3	Grid 5 86.7 M3	Grid 6 85 M3
Grid 7 126.1 M2	Grid 8 130.4 M2	Grid 9 127.3 M2

Total = 130.4 V/m

E Category: M2

Location: 0.5, -38.5, 4.7 mm



HAC_H_Dipole_835_120705**DUT: HAC-Dipole 835 MHz**

Communication System: CW; Frequency: 835 MHz; Duty Cycle: 1:1

Medium: Air Medium parameters used: $\sigma = 0$ mho/m, $\epsilon_r = 1$; $\rho = 0$ kg/m³

Ambient Temperature : 23.3 °C

DASY5 Configuration:

- Probe: H3DV6 - SN6300; ; Calibrated: 2011-11-22
- Electronics: DAE4 Sn1210; Calibrated: 2011-11-18
- Phantom: HAC Test Arch with AMCC; Type: SD HAC P01 BA;
- Measurement SW: DASY52, Version 52.8 (0); SEMCAD X Version 14.4.5 (3634)

H Scan - measurement distance from the probe sensor center to CD835 Dipole = 10mm/Hearing Aid Compatibility Test (41x361x1): Measurement grid: dx=5mm, dy=5mm

Probe Modulation Factor = 1.000

Reference Value = 0.492 A/m; Power Drift = 0.02 dB

Maximum value of peak Total field = 0.464 A/m

Peak H-field in A/m

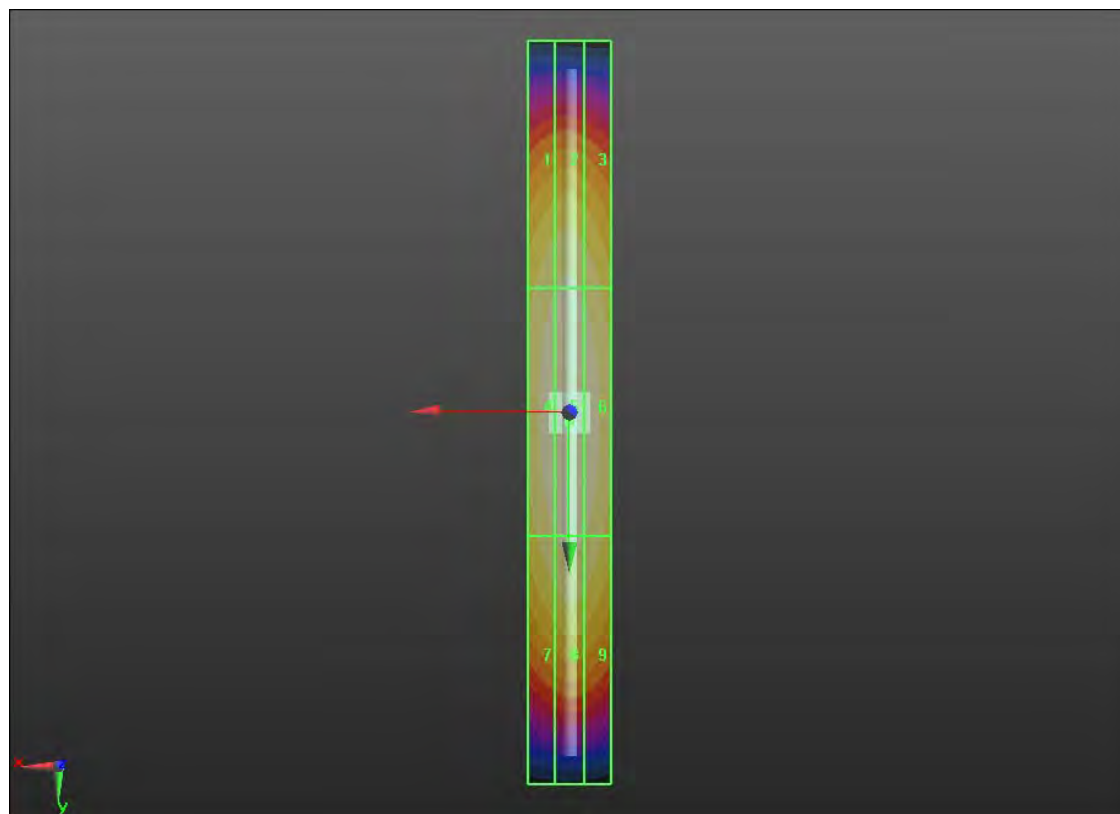
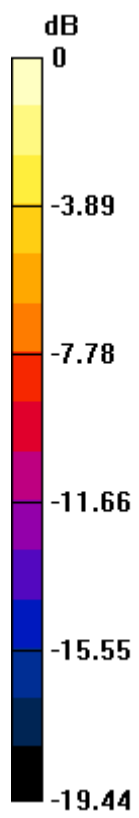
Grid 1 0.395 M4	Grid 2 0.410 M4	Grid 3 0.389 M4
Grid 4 0.444 M4	Grid 5 0.464 M4	Grid 6 0.444 M4
Grid 7 0.394 M4	Grid 8 0.416 M4	Grid 9 0.398 M4

Cursor:

Total = 0.464 A/m

H Category: M4

Location: 0, 2, 4.7 mm



0 dB = 0.460A/m

HAC_H_Dipole_1880_120712**DUT: HAC Dipole 1880 MHz**

Communication System: CW; Frequency: 1880 MHz; Duty Cycle: 1:1

Medium: Air Medium parameters used: $\sigma = 0$ mho/m, $\epsilon_r = 1$; $\rho = 1$ kg/m³

Ambient Temperature : 22.5 °C

DASY5 Configuration:

- Probe: H3DV6 - SN6184; ; Calibrated: 2012/1/26
- Sensor-Surface: (Fix Surface)
- Electronics: DAE4 Sn1338; Calibrated: 2012/6/12
- Phantom: HAC Test Arch with AMCC; Type: SD HAC P01 BA
- Software: DASY5 Version; SEMCAD X Version 13.4 Build 45

H Scan - measurement distance from the probe sensor center to CD1880 Dipole = 10mm/Hearing Aid

Compatibility Test (41x181x1): Measurement grid: dx=5mm, dy=5mm

Probe Modulation Factor = 1

Reference Value = 0.542 A/m; Power Drift = 0.00106 dB

Maximum value of peak Total field = 0.491 A/m

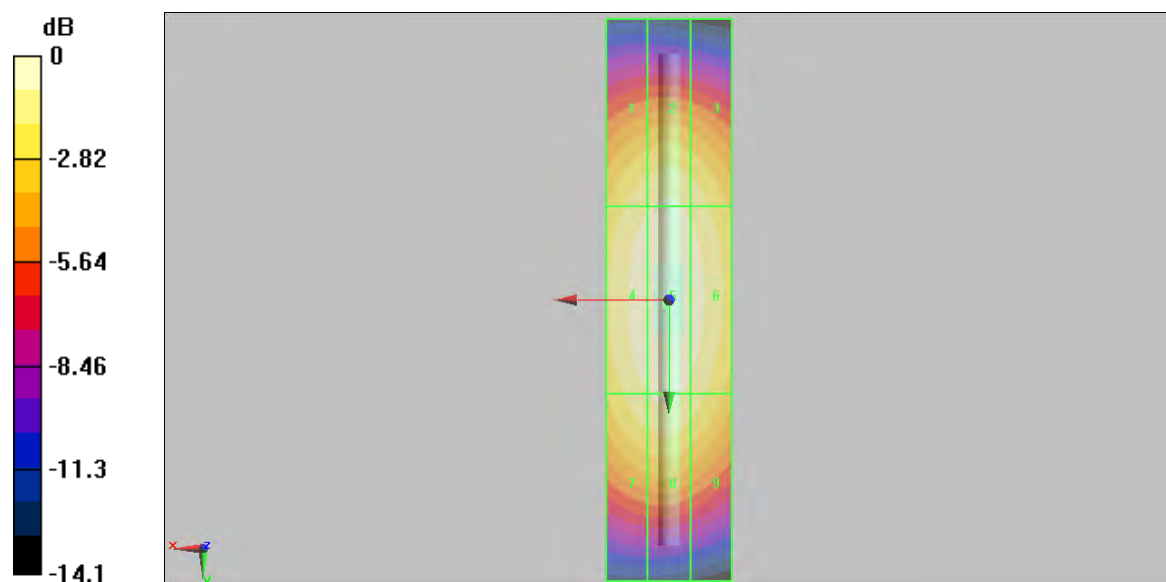
Peak H-field in A/m

Grid 1 0.435 M2	Grid 2 0.451 M2	Grid 3 0.429 M2
Grid 4 0.475 M2	Grid 5 0.491 M2	Grid 6 0.468 M2
Grid 7 0.439 M2	Grid 8 0.453 M2	Grid 9 0.426 M2

Total = 0.491 A/m

H Category: M2

Location: 0.5, 0.5, 5.2 mm



0 dB = 0.491A/m



Appendix B. Plots of RF Emission Measurement

The plots are shown as follows.

#01 HAC RF_CDMA2000 BC0_RC3 SO55_Ch1013(E)**DUT: 270201A**

Communication System: CDMA2000; Frequency: 824.7 MHz; Duty Cycle: 1:1

Medium: Air Medium parameters used: $\sigma = 0$ mho/m, $\epsilon_r = 1$; $\rho = 0$ kg/m³

Ambient Temperature : 23.3 °C

DASY5 Configuration:

- Probe: ER3DV6 - SN2476; ConvF(1, 1, 1); Calibrated: 2011-11-21
- Electronics: DAE4 Sn1210; Calibrated: 2011-11-18
- Phantom: HAC Test Arch with AMCC; Type: SD HAC P01 BA;
- Measurement SW: DASY52, Version 52.8 (0); SEMCAD X Version 14.4.5 (3634)

Ch1013/Hearing Aid Compatibility Test (101x101x1): Measurement grid: dx=5mm, dy=5mm

Maximum value of peak Total field = 49.044 V/m

Probe Modulation Factor = 1.17

Device Reference Point: 0, 0, -6.3 mm

Reference Value = 54.803 V/m; Power Drift = -0.02 dB

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

Peak E-field in V/m

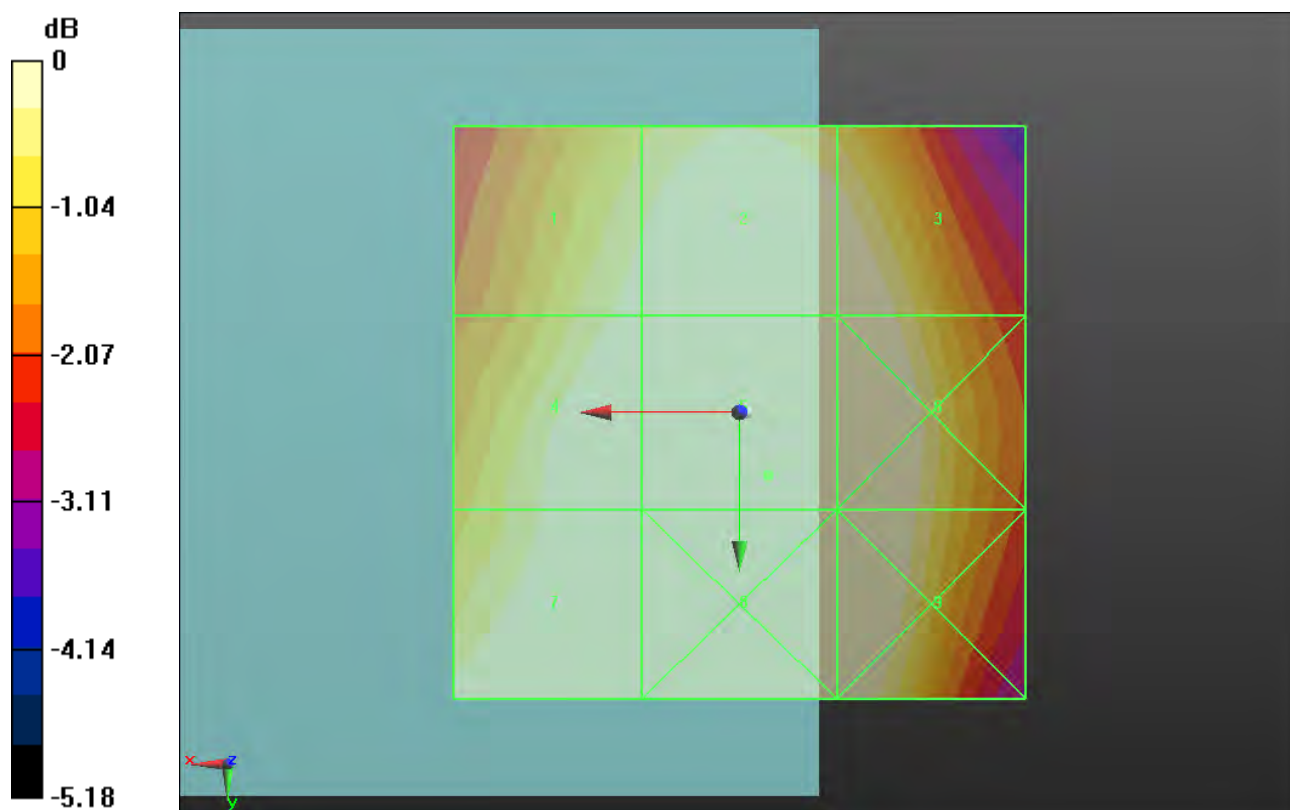
Grid 1 41.864 M4	Grid 2 45.579 M4	Grid 3 44.135 M4
Grid 4 45.453 M4	Grid 5 49.044 M4	Grid 6 47.014 M4
Grid 7 46.944 M4	Grid 8 48.850 M4	Grid 9 46.880 M4

Cursor:

Total = 49.044 V/m

E Category: M4

Location: -2.5, 5.5, 8.7 mm



#02 HAC RF_CDMA2000 BC0_RC3 SO55_Ch384(E)**DUT: 270201A**

Communication System: CDMA2000; Frequency: 836.52 MHz; Duty Cycle: 1:1

Medium: Air Medium parameters used: $\sigma = 0$ mho/m, $\epsilon_r = 1$; $\rho = 0$ kg/m³

Ambient Temperature : 23.3 °C

DASY5 Configuration:

- Probe: ER3DV6 - SN2476; ConvF(1, 1, 1); Calibrated: 2011-11-21
- Electronics: DAE4 Sn1210; Calibrated: 2011-11-18
- Phantom: HAC Test Arch with AMCC; Type: SD HAC P01 BA;
- Measurement SW: DASY52, Version 52.8 (0); SEMCAD X Version 14.4.5 (3634)

Ch384/Hearing Aid Compatibility Test (101x101x1): Measurement grid: dx=5mm, dy=5mm

Maximum value of peak Total field = 49.006 V/m

Probe Modulation Factor = 1.17

Device Reference Point: 0, 0, -6.3 mm

Reference Value = 55.476 V/m; Power Drift = -0.03 dB

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

Peak E-field in V/m

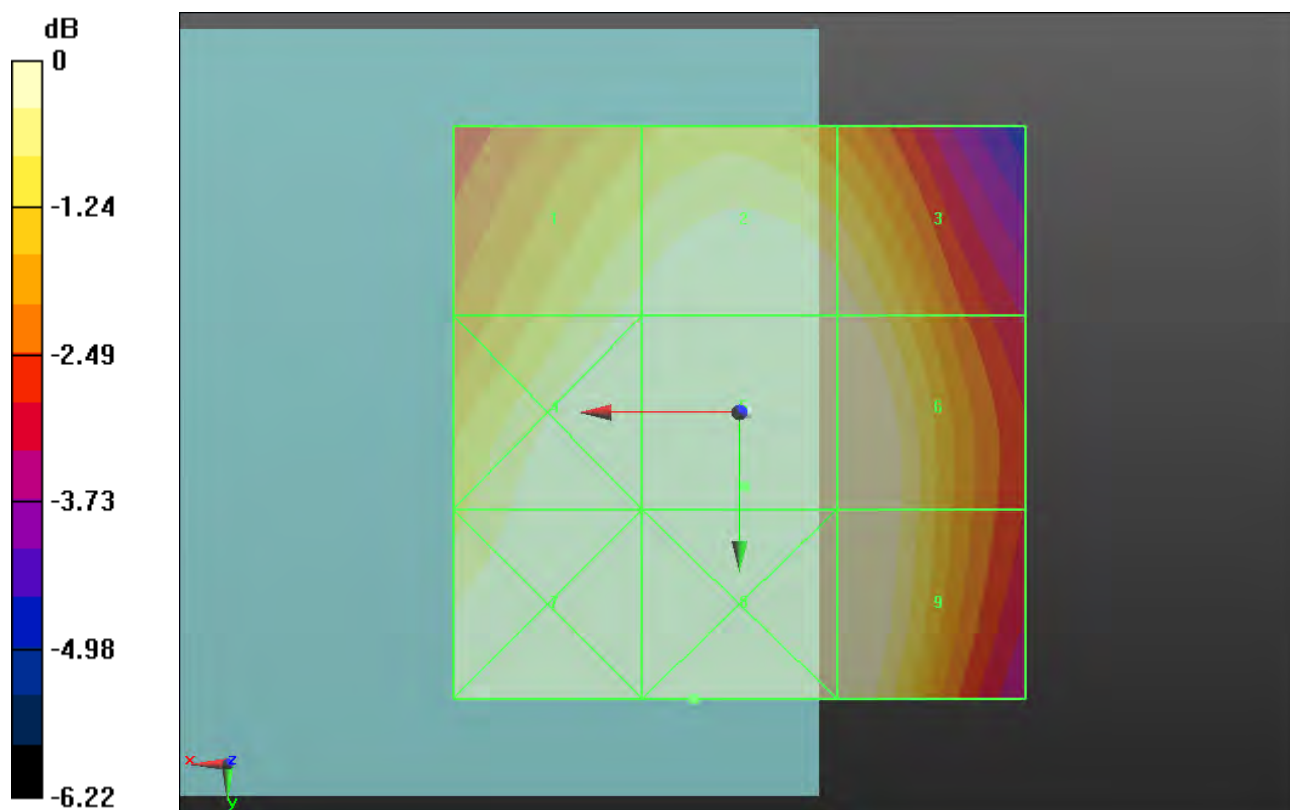
Grid 1 41.276 M4	Grid 2 44.225 M4	Grid 3 42.011 M4
Grid 4 45.951 M4	Grid 5 49.006 M4	Grid 6 45.896 M4
Grid 7 48.580 M4	Grid 8 49.394 M4	Grid 9 45.810 M4

Cursor:

Total = 49.394 V/m

E Category: M4

Location: 4, 25, 8.7 mm



#03 HAC RF_CDMA2000 BC0_RC3 SO55_Ch777(E)**DUT: 270201A**

Communication System: CDMA2000; Frequency: 848.31 MHz; Duty Cycle: 1:1

Medium: Air Medium parameters used: $\sigma = 0$ mho/m, $\epsilon_r = 1$; $\rho = 0$ kg/m³

Ambient Temperature : 23.3 °C

DASY5 Configuration:

- Probe: ER3DV6 - SN2476; ConvF(1, 1, 1); Calibrated: 2011-11-21
- Electronics: DAE4 Sn1210; Calibrated: 2011-11-18
- Phantom: HAC Test Arch with AMCC; Type: SD HAC P01 BA;
- Measurement SW: DASY52, Version 52.8 (0); SEMCAD X Version 14.4.5 (3634)

Ch777/Hearing Aid Compatibility Test (101x101x1): Measurement grid: dx=5mm, dy=5mm

Maximum value of peak Total field = 54.035 V/m

Probe Modulation Factor = 1.17

Device Reference Point: 0, 0, -6.3 mm

Reference Value = 61.483 V/m; Power Drift = -0.06 dB

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

Peak E-field in V/m

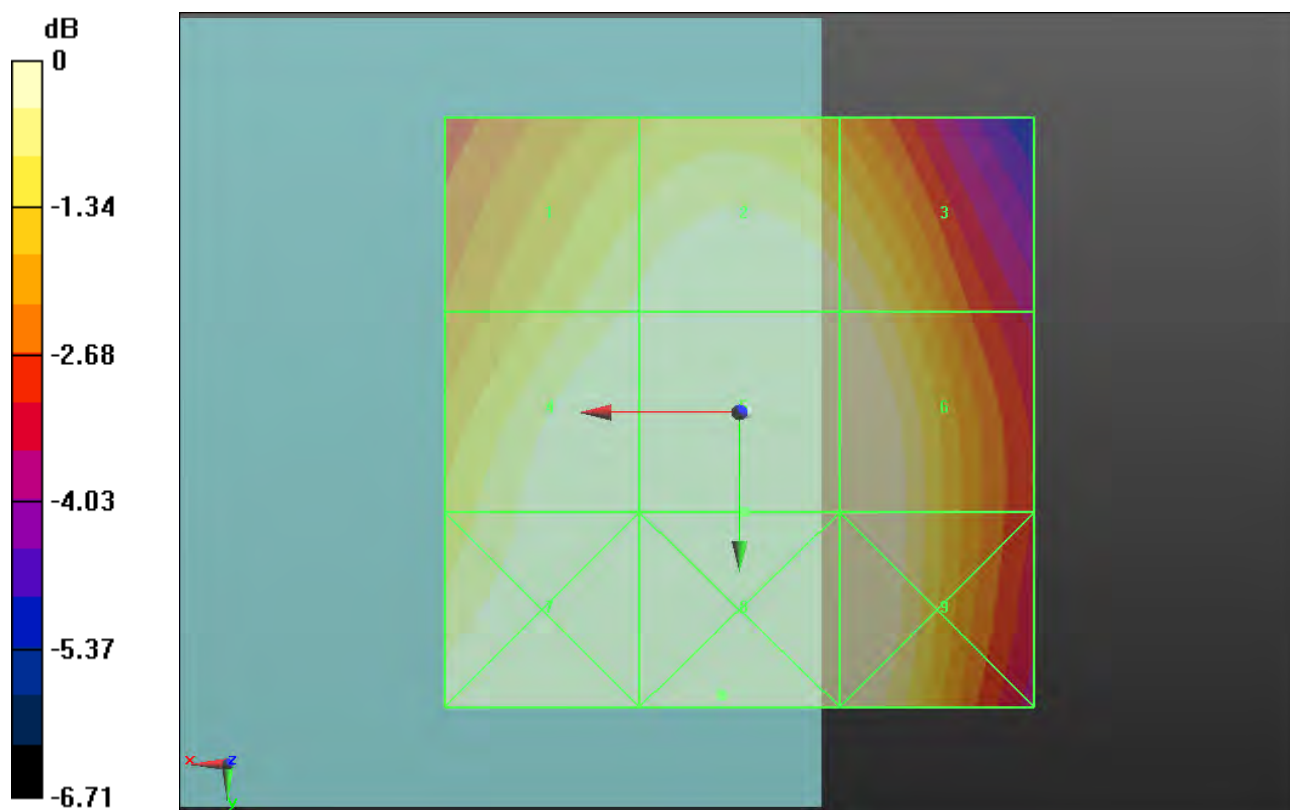
Grid 1 45.053 M4	Grid 2 48.607 M4	Grid 3 46.043 M4
Grid 4 50.381 M4	Grid 5 54.035 M4	Grid 6 50.624 M4
Grid 7 53.017 M4	Grid 8 54.375 M4	Grid 9 50.568 M4

Cursor:

Total = 54.375 V/m

E Category: M4

Location: 1.5, 24, 8.7 mm



0 dB = 46.470V/m

#04 HAC RF_CDMA2000 BC10_RC3 SO55_Ch476(E)**DUT: 270201A**

Communication System: CDMA2000; Frequency: 817.9 MHz; Duty Cycle: 1:1

Medium: Air Medium parameters used: $\sigma = 0$ mho/m, $\epsilon_r = 1$; $\rho = 0$ kg/m³

Ambient Temperature : 23.3 °C

DASY5 Configuration:

- Probe: ER3DV6 - SN2476; ConvF(1, 1, 1); Calibrated: 2011-11-21
- Electronics: DAE4 Sn1210; Calibrated: 2011-11-18
- Phantom: HAC Test Arch with AMCC; Type: SD HAC P01 BA;
- Measurement SW: DASY52, Version 52.8 (0); SEMCAD X Version 14.4.5 (3634)

Ch476/Hearing Aid Compatibility Test (101x101x1): Measurement grid: dx=5mm, dy=5mm

Maximum value of peak Total field = 49.302 V/m

Probe Modulation Factor = 1.17

Device Reference Point: 0, 0, -6.3 mm

Reference Value = 54.434 V/m; Power Drift = 0.01 dB

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

Peak E-field in V/m

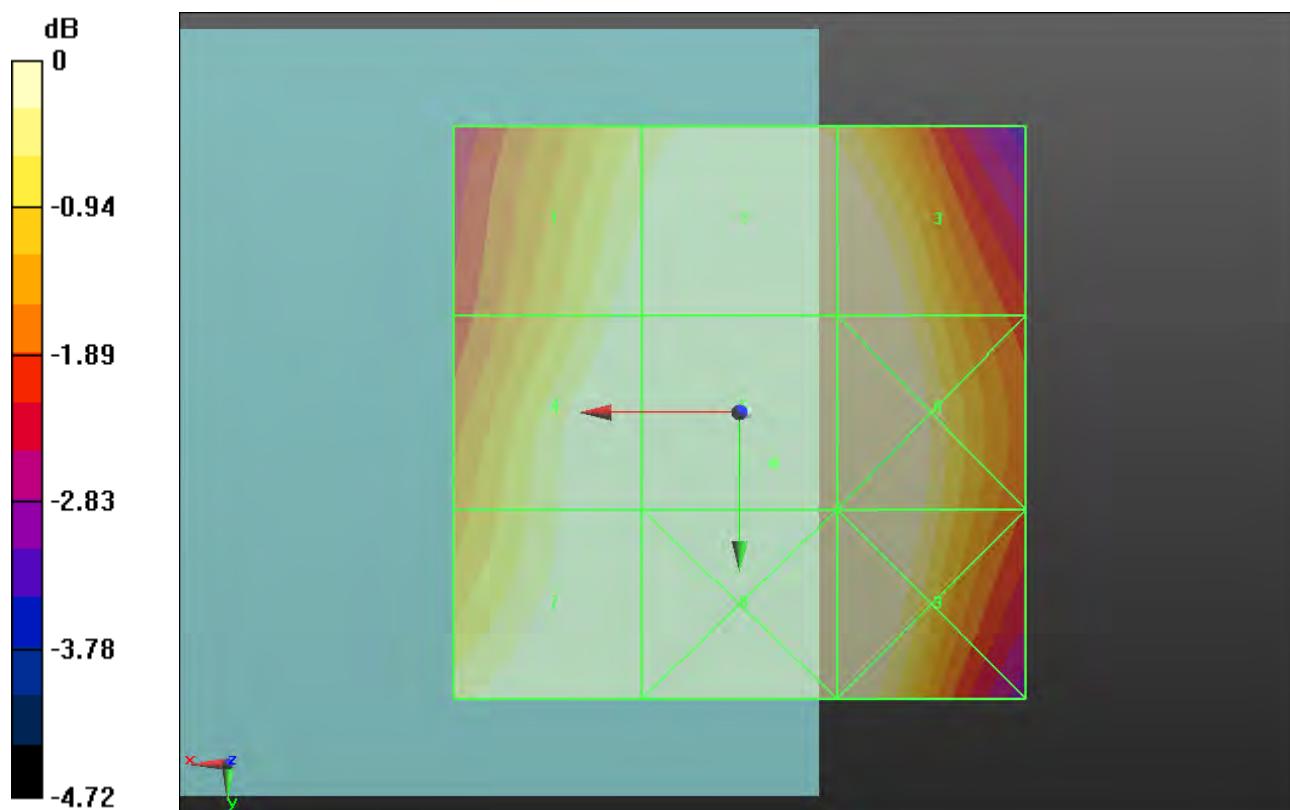
Grid 1 42.264 M4	Grid 2 46.390 M4	Grid 3 45.501 M4
Grid 4 45.228 M4	Grid 5 49.302 M4	Grid 6 47.726 M4
Grid 7 46.293 M4	Grid 8 48.815 M4	Grid 9 47.145 M4

Cursor:

Total = 49.302 V/m

E Category: M4

Location: -3, 4.5, 8.7 mm



#05 HAC RF_CDMA2000 BC10_RC3 SO55_Ch580(E)**DUT: 270201A**

Communication System: CDMA2000; Frequency: 820.5 MHz; Duty Cycle: 1:1

Medium: Air Medium parameters used: $\sigma = 0$ mho/m, $\epsilon_r = 1$; $\rho = 0$ kg/m³

Ambient Temperature : 23.3 °C

DASY5 Configuration:

- Probe: ER3DV6 - SN2476; ConvF(1, 1, 1); Calibrated: 2011-11-21
- Electronics: DAE4 Sn1210; Calibrated: 2011-11-18
- Phantom: HAC Test Arch with AMCC; Type: SD HAC P01 BA;
- Measurement SW: DASY52, Version 52.8 (0); SEMCAD X Version 14.4.5 (3634)

Ch580/Hearing Aid Compatibility Test (101x101x1): Measurement grid: dx=5mm, dy=5mm

Maximum value of peak Total field = 46.573 V/m

Probe Modulation Factor = 1.17

Device Reference Point: 0, 0, -6.3 mm

Reference Value = 51.758 V/m; Power Drift = -0.06 dB

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

Peak E-field in V/m

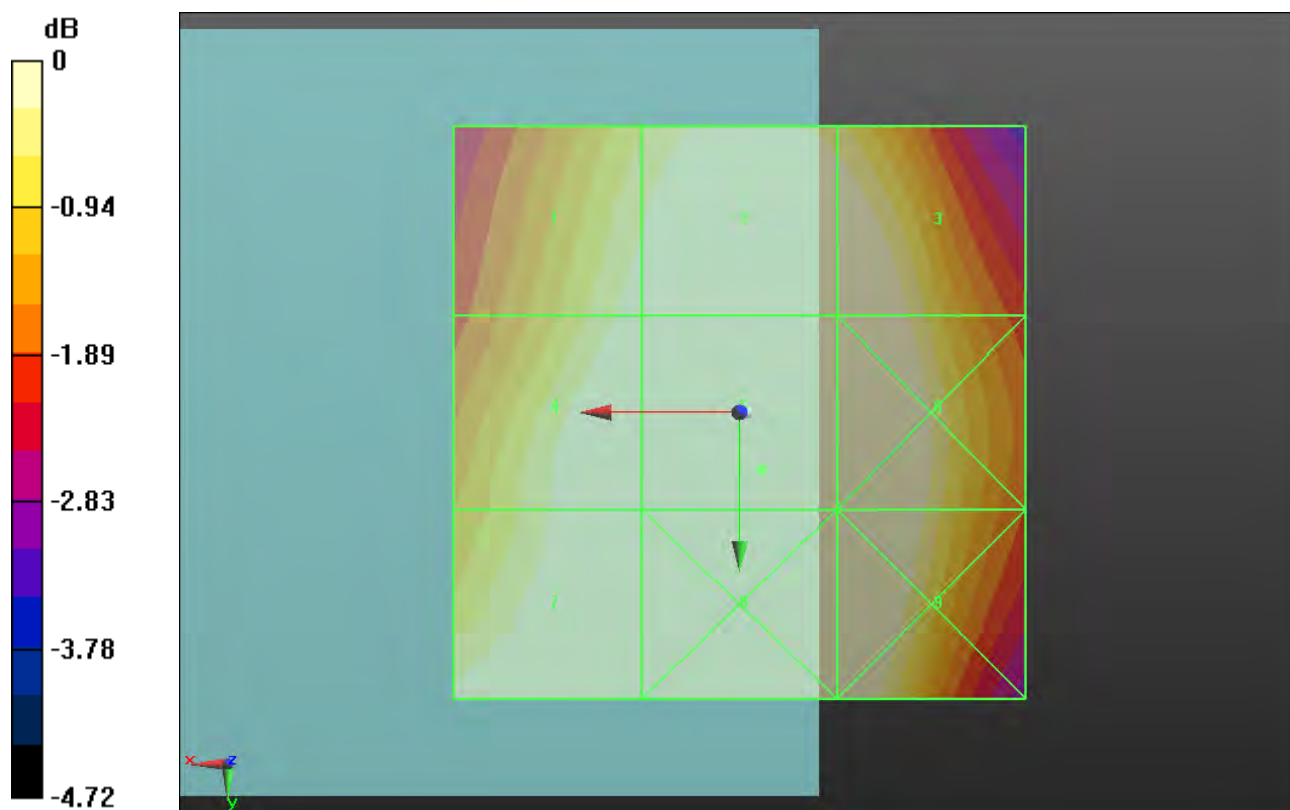
Grid 1 39.732 M4	Grid 2 43.678 M4	Grid 3 42.776 M4
Grid 4 42.834 M4	Grid 5 46.573 M4	Grid 6 45.056 M4
Grid 7 44.284 M4	Grid 8 46.232 M4	Grid 9 44.757 M4

Cursor:

Total = 46.573 V/m

E Category: M4

Location: -2, 5, 8.7 mm



0 dB = 39.810V/m

#06 HAC RF_CDMA2000 BC10_RC3 SO55_Ch684(E)**DUT: 270201A**

Communication System: CDMA2000; Frequency: 823.1 MHz; Duty Cycle: 1:1

Medium: Air Medium parameters used: $\sigma = 0$ mho/m, $\epsilon_r = 1$; $\rho = 0$ kg/m³

Ambient Temperature : 23.3 °C

DASY5 Configuration:

- Probe: ER3DV6 - SN2476; ConvF(1, 1, 1); Calibrated: 2011-11-21
- Electronics: DAE4 Sn1210; Calibrated: 2011-11-18
- Phantom: HAC Test Arch with AMCC; Type: SD HAC P01 BA;
- Measurement SW: DASY52, Version 52.8 (0); SEMCAD X Version 14.4.5 (3634)

Ch684/Hearing Aid Compatibility Test (101x101x1): Measurement grid: dx=5mm, dy=5mm

Maximum value of peak Total field = 48.544 V/m

Probe Modulation Factor = 1.17

Device Reference Point: 0, 0, -6.3 mm

Reference Value = 54.064 V/m; Power Drift = -0.02 dB

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

Peak E-field in V/m

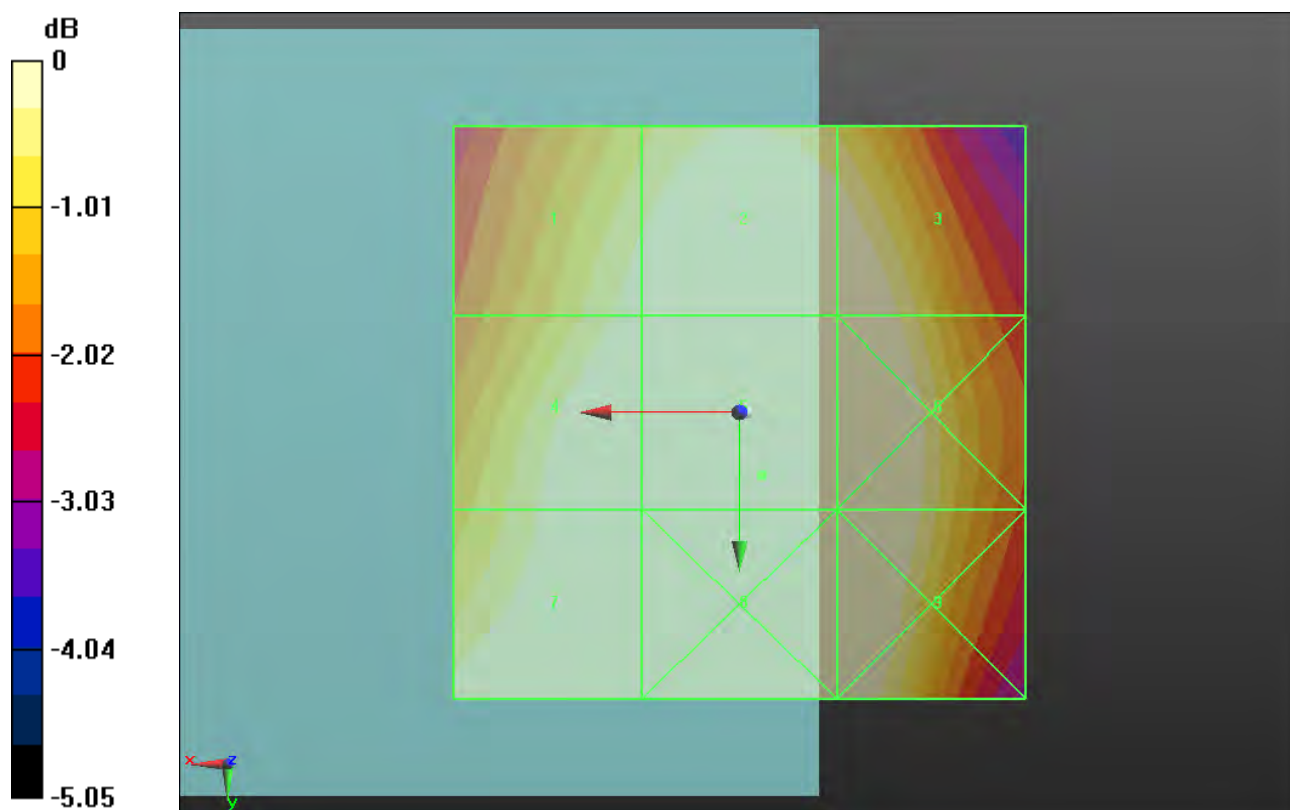
Grid 1 41.347 M4	Grid 2 45.285 M4	Grid 3 43.901 M4
Grid 4 44.925 M4	Grid 5 48.544 M4	Grid 6 46.724 M4
Grid 7 46.538 M4	Grid 8 48.294 M4	Grid 9 46.364 M4

Cursor:

Total = 48.544 V/m

E Category: M4

Location: -2, 5.5, 8.7 mm



0 dB = 41.490V/m

#07 HAC_E_CDMA2000 BC1_RC3_SO55_Ch25**DUT: 270201A**

Communication System: CDMA ; Frequency: 1851.25 MHz;Duty Cycle: 1:1

Medium: Air Medium parameters used: $\sigma = 0$ mho/m, $\epsilon_r = 1$; $\rho = 1000$ kg/m³

Ambient Temperature : 22.5 °C

DASY5 Configuration:

- Probe: ER3DV6 - SN2358; ConvF(1, 1, 1); Calibrated: 2012/1/26
- Sensor-Surface: (Fix Surface)
- Electronics: DAE4 Sn1338; Calibrated: 2012/6/12
- Phantom: HAC Test Arch with AMCC; Type: SD HAC P01 BA
- Software: DASY5 Version; SEMCAD X Version 13.4 Build 45

Ch25/Hearing Aid Compatibility Test (101x101x1): Measurement grid: dx=5mm, dy=5mm

Maximum value of peak Total field = 16.200 V/m

Probe Modulation Factor = 0.98

Device Reference Point: 0, 0, -6.3 mm

Reference Value = 15.2 V/m; Power Drift = -0.126 dB

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

Peak E-field in V/m

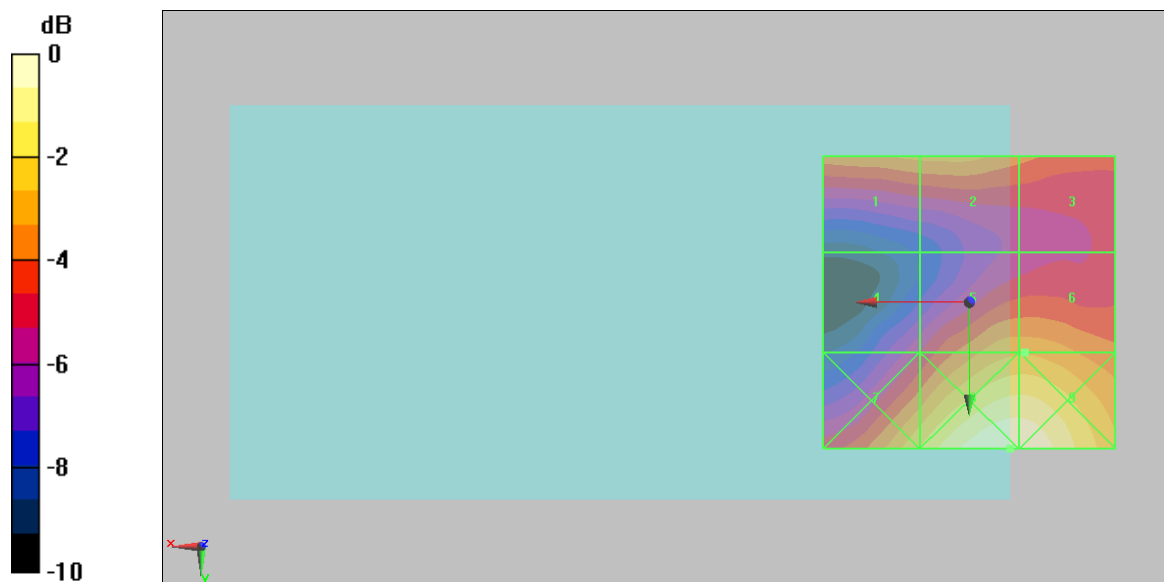
Grid 1 15.6 M4	Grid 2 15.7 M4	Grid 3 14.6 M4
Grid 4 12 M4	Grid 5 16.2 M4	Grid 6 16.2 M4
Grid 7 17.8 M4	Grid 8 22.3 M4	Grid 9 22.3 M4

Cursor:

Total = 22.3 V/m

E Category: M4

Location: -7, 25, 8.7 mm



#08 HAC_E_CDMA2000 BC1_RC3_SO55_Ch600**DUT: 270201A**

Communication System: CDMA ; Frequency: 1880 MHz;Duty Cycle: 1:1

Medium: Air Medium parameters used: $\sigma = 0$ mho/m, $\epsilon_r = 1$; $\rho = 1000$ kg/m³

Ambient Temperature : 22.5 °C

DASY5 Configuration:

- Probe: ER3DV6 - SN2358; ConvF(1, 1, 1); Calibrated: 2012/1/26
- Sensor-Surface: (Fix Surface)
- Electronics: DAE4 Sn1338; Calibrated: 2012/6/12
- Phantom: HAC Test Arch with AMCC; Type: SD HAC P01 BA
- Software: DASY5 Version; SEMCAD X Version 13.4 Build 45

Ch600/Hearing Aid Compatibility Test (101x101x1): Measurement grid: dx=5mm, dy=5mm

Maximum value of peak Total field = 19.700 V/m

Probe Modulation Factor = 0.98

Device Reference Point: 0, 0, -6.3 mm

Reference Value = 22.2 V/m; Power Drift = 0.034 dB

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

Peak E-field in V/m

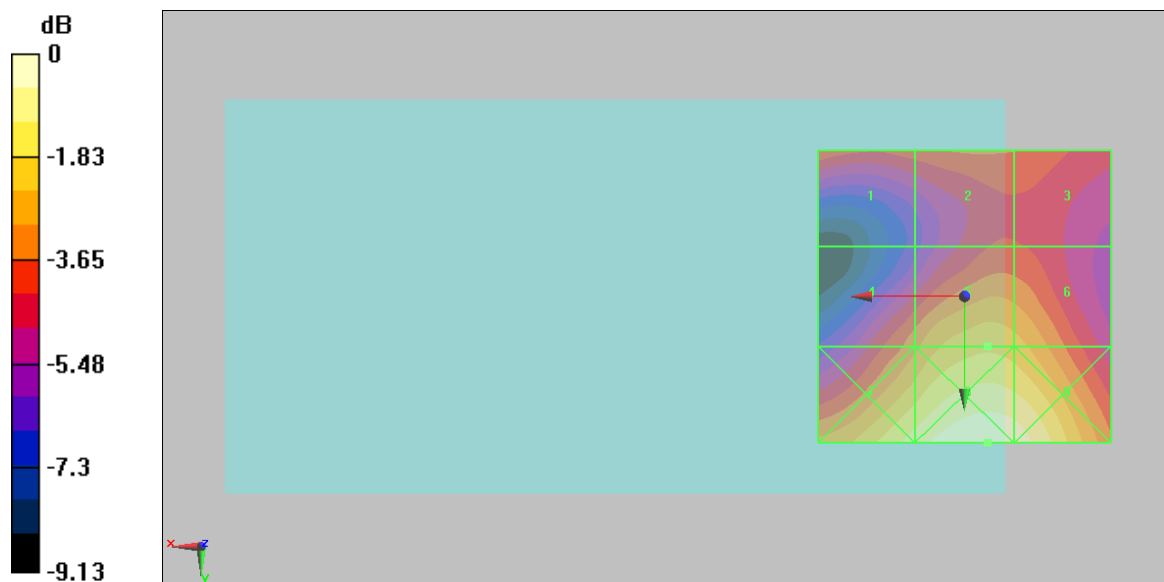
Grid 1 16.3 M4	Grid 2 16.5 M4	Grid 3 16.3 M4
Grid 4 17.1 M4	Grid 5 19.7 M4	Grid 6 19.3 M4
Grid 7 22.3 M4	Grid 8 24.7 M4	Grid 9 24.1 M4

Cursor:

Total = 24.7 V/m

E Category: M4

Location: -4, 25, 8.7 mm



#09 HAC_E_CDMA2000 BC1_RC3_SO55_Ch1175**DUT: 270201A**

Communication System: CDMA ; Frequency: 1908.75 MHz;Duty Cycle: 1:1

Medium: Air Medium parameters used: $\sigma = 0$ mho/m, $\epsilon_r = 1$; $\rho = 1000$ kg/m³

Ambient Temperature : 22.5 °C

DASY5 Configuration:

- Probe: ER3DV6 - SN2358; ConvF(1, 1, 1); Calibrated: 2012/1/26
- Sensor-Surface: (Fix Surface)
- Electronics: DAE4 Sn1338; Calibrated: 2012/6/12
- Phantom: HAC Test Arch with AMCC; Type: SD HAC P01 BA
- Software: DASY5 Version; SEMCAD X Version 13.4 Build 45

Ch1175/Hearing Aid Compatibility Test (101x101x1): Measurement grid: dx=5mm, dy=5mm

Maximum value of peak Total field = 21.600 V/m

Probe Modulation Factor = 0.98

Device Reference Point: 0, 0, -6.3 mm

Reference Value = 19.5 V/m; Power Drift = -0.118 dB

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

Peak E-field in V/m

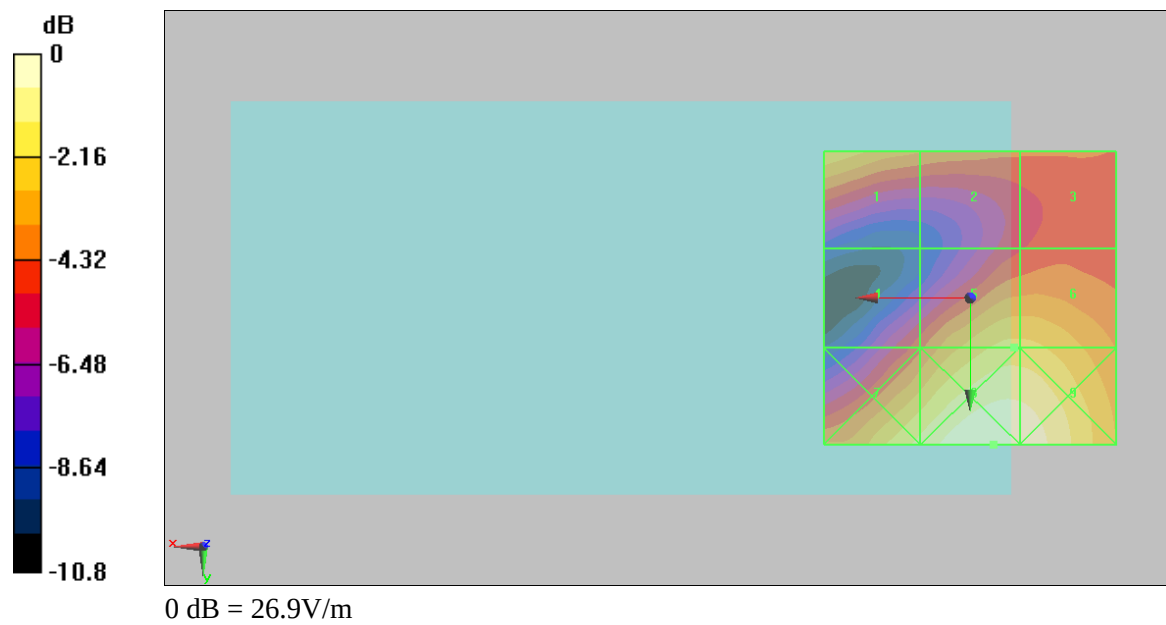
Grid 1 20.7 M4	Grid 2 17.9 M4	Grid 3 16.7 M4
Grid 4 16.1 M4	Grid 5 21.6 M4	Grid 6 21.6 M4
Grid 7 23.5 M4	Grid 8 26.9 M4	Grid 9 26.4 M4

Cursor:

Total = 26.9 V/m

E Category: M4

Location: -4, 25, 8.7 mm



#01 HAC RF_CDMA2000 BC0_RC3 SO55_Ch1013(H)**DUT: 270201A**

Communication System: CDMA2000; Frequency: 824.7 MHz; Duty Cycle: 1:1

Medium: Air Medium parameters used: $\sigma = 0$ mho/m, $\epsilon_r = 1$; $\rho = 0$ kg/m³

Ambient Temperature : 23.3 °C

DASY5 Configuration:

- Probe: H3DV6 - SN6300; ; Calibrated: 2011-11-22
- Electronics: DAE4 Sn1210; Calibrated: 2011-11-18
- Phantom: HAC Test Arch with AMCC; Type: SD HAC P01 BA;
- Measurement SW: DASY52, Version 52.8 (0); SEMCAD X Version 14.4.5 (3634)

Ch1013/Hearing Aid Compatibility Test (101x101x1): Measurement grid: dx=5mm, dy=5mm

Maximum value of peak Total field = 0.088 A/m

Probe Modulation Factor = 1.00

Device Reference Point: 0, 0, -6.3 mm

Reference Value = 0.054 A/m; Power Drift = 0.10 dB

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

Peak H-field in A/m

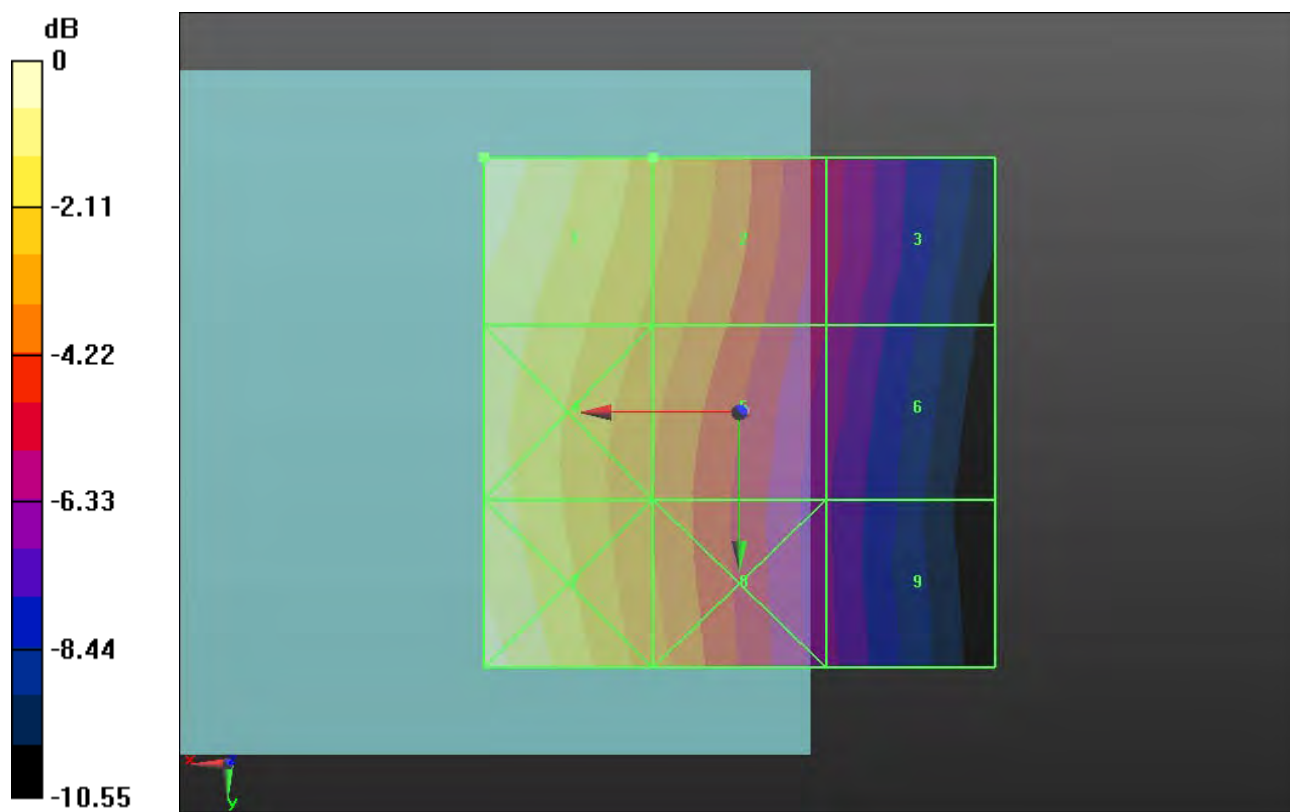
Grid 1 0.088 M4	Grid 2 0.068 M4	Grid 3 0.046 M4
Grid 4 0.081 M4	Grid 5 0.064 M4	Grid 6 0.044 M4
Grid 7 0.087 M4	Grid 8 0.062 M4	Grid 9 0.042 M4

Cursor:

Total = 0.088 A/m

H Category: M4

Location: 25, -25, 8.7 mm



0 dB = 0.090A/m

#02 HAC RF_CDMA2000 BC0_RC3 SO55_Ch384(H)**DUT: 270201A**

Communication System: CDMA2000; Frequency: 836.52 MHz; Duty Cycle: 1:1

Medium: Air Medium parameters used: $\sigma = 0$ mho/m, $\epsilon_r = 1$; $\rho = 0$ kg/m³

Ambient Temperature : 23.3 °C

DASY5 Configuration:

- Probe: H3DV6 - SN6300; ; Calibrated: 2011-11-22
- Electronics: DAE4 Sn1210; Calibrated: 2011-11-18
- Phantom: HAC Test Arch with AMCC; Type: SD HAC P01 BA;
- Measurement SW: DASY52, Version 52.8 (0); SEMCAD X Version 14.4.5 (3634)

Ch384/Hearing Aid Compatibility Test (101x101x1): Measurement grid: dx=5mm, dy=5mm

Maximum value of peak Total field = 0.079 A/m

Probe Modulation Factor = 1.00

Device Reference Point: 0, 0, -6.3 mm

Reference Value = 0.057 A/m; Power Drift = -0.10 dB

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

Peak H-field in A/m

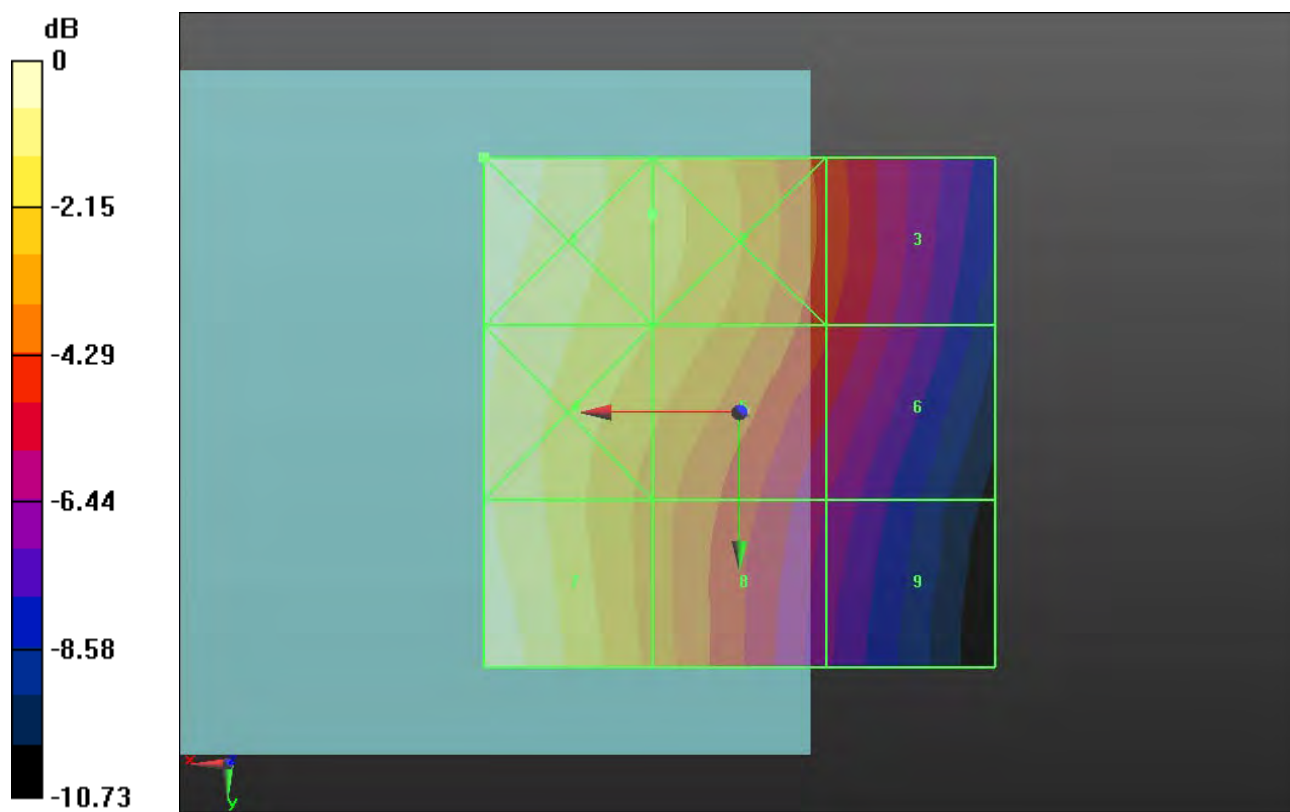
Grid 1 0.080 M4	Grid 2 0.065 M4	Grid 3 0.048 M4
Grid 4 0.075 M4	Grid 5 0.063 M4	Grid 6 0.046 M4
Grid 7 0.079 M4	Grid 8 0.056 M4	Grid 9 0.038 M4

Cursor:

Total = 0.080 A/m

H Category: M4

Location: 25, -25, 8.7 mm



0 dB = 0.080A/m

#03 HAC RF_CDMA2000 BC0_RC3 SO55_Ch777(H)**DUT: 270201A**

Communication System: CDMA2000; Frequency: 848.31 MHz; Duty Cycle: 1:1

Medium: Air Medium parameters used: $\sigma = 0$ mho/m, $\epsilon_r = 1$; $\rho = 0$ kg/m³

Ambient Temperature : 23.3 °C

DASY5 Configuration:

- Probe: H3DV6 - SN6300; ; Calibrated: 2011-11-22
- Electronics: DAE4 Sn1210; Calibrated: 2011-11-18
- Phantom: HAC Test Arch with AMCC; Type: SD HAC P01 BA;
- Measurement SW: DASY52, Version 52.8 (0); SEMCAD X Version 14.4.5 (3634)

Ch777/Hearing Aid Compatibility Test (101x101x1): Measurement grid: dx=5mm, dy=5mm

Maximum value of peak Total field = 0.066 A/m

Probe Modulation Factor = 1.00

Device Reference Point: 0, 0, -6.3 mm

Reference Value = 0.057 A/m; Power Drift = 0.0026 dB

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

Peak H-field in A/m

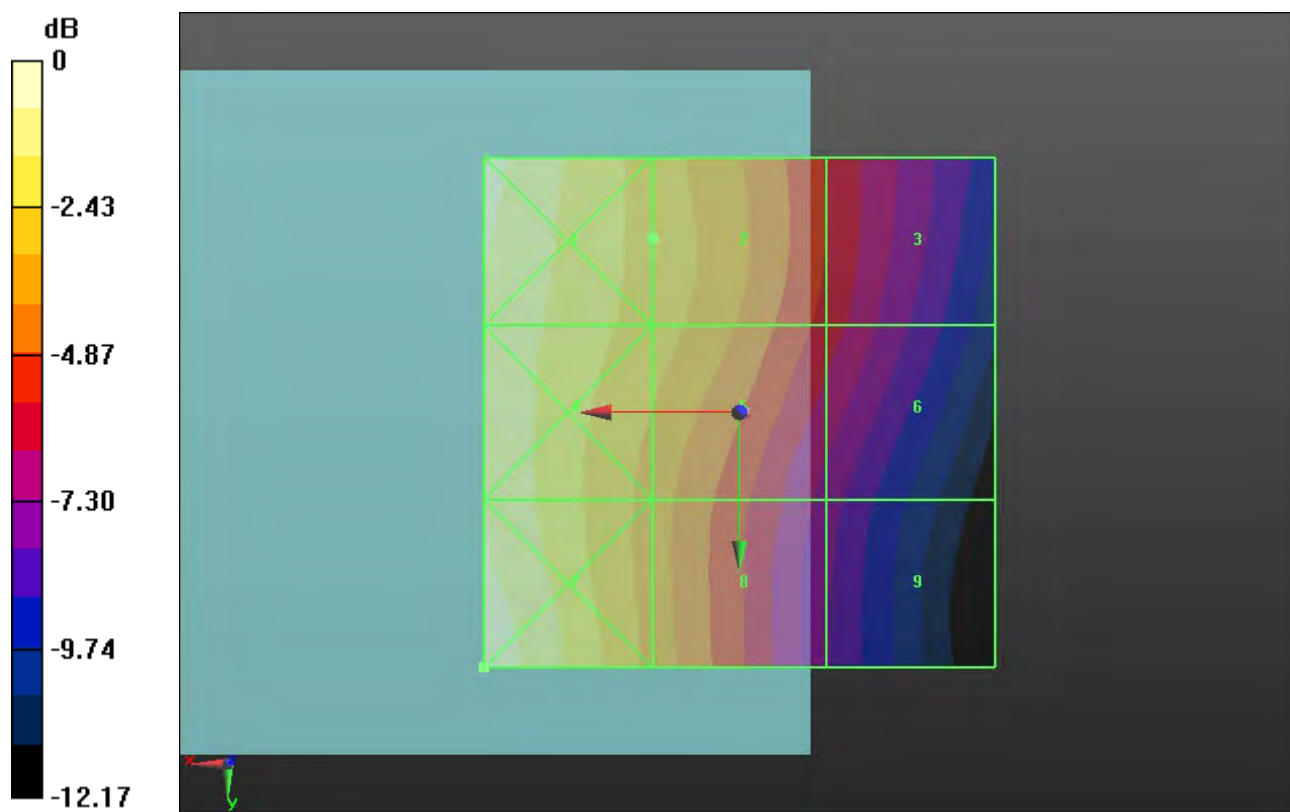
Grid 1 0.085 M4	Grid 2 0.066 M4	Grid 3 0.047 M4
Grid 4 0.082 M4	Grid 5 0.065 M4	Grid 6 0.045 M4
Grid 7 0.087 M4	Grid 8 0.060 M4	Grid 9 0.037 M4

Cursor:

Total = 0.087 A/m

H Category: M4

Location: 25, 25, 8.7 mm



0 dB = 0.090A/m

#04 HAC RF_CDMA2000 BC10_RC3 SO55_Ch476(H)**DUT: 270201A**

Communication System: CDMA2000; Frequency: 817.9 MHz; Duty Cycle: 1:1

Medium: Air Medium parameters used: $\sigma = 0$ mho/m, $\epsilon_r = 1$; $\rho = 0$ kg/m³

Ambient Temperature : 23.3 °C

DASY5 Configuration:

- Probe: H3DV6 - SN6300; ; Calibrated: 2011-11-22
- Electronics: DAE4 Sn1210; Calibrated: 2011-11-18
- Phantom: HAC Test Arch with AMCC; Type: SD HAC P01 BA;
- Measurement SW: DASY52, Version 52.8 (0); SEMCAD X Version 14.4.5 (3634)

Ch476/Hearing Aid Compatibility Test (101x101x1): Measurement grid: dx=5mm, dy=5mm

Maximum value of peak Total field = 0.092 A/m

Probe Modulation Factor = 1.00

Device Reference Point: 0, 0, -6.3 mm

Reference Value = 0.055 A/m; Power Drift = 0.0099 dB

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

Peak H-field in A/m

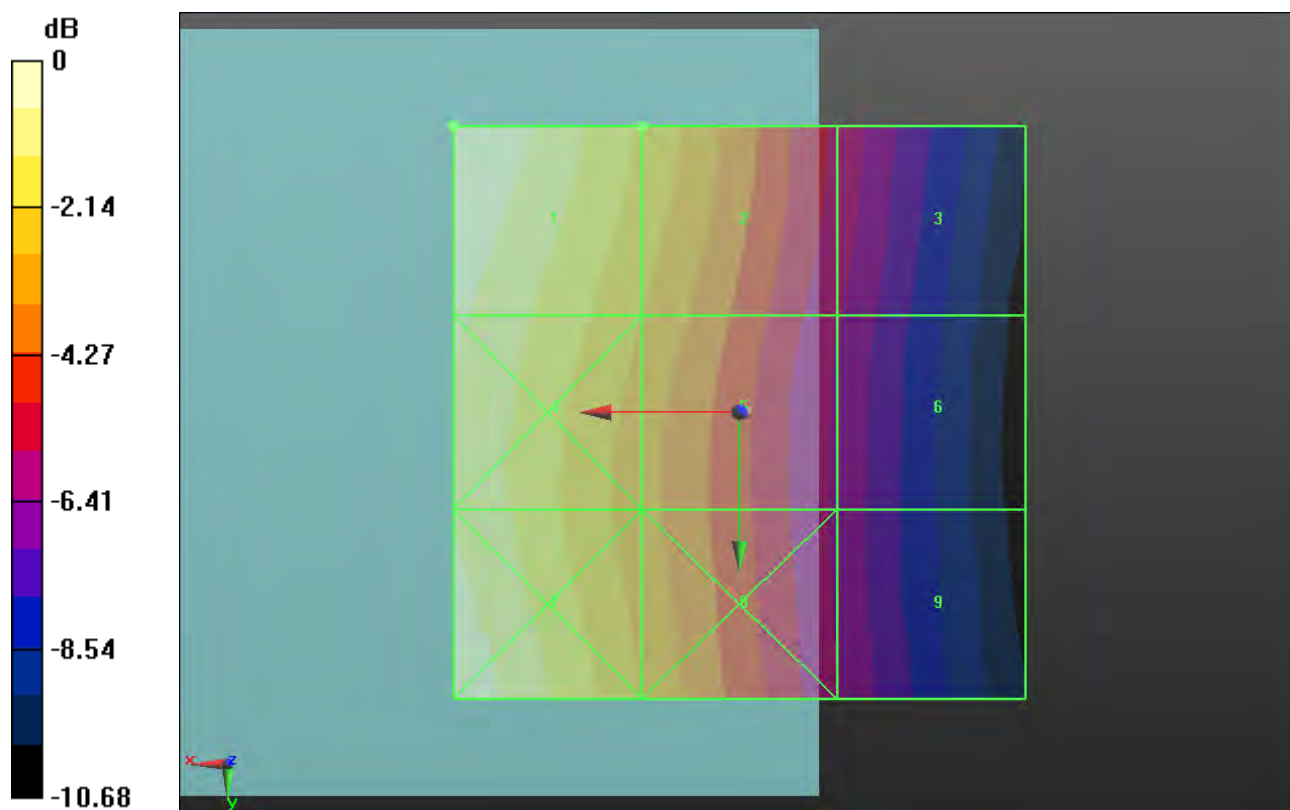
Grid 1 0.092 M4	Grid 2 0.070 M4	Grid 3 0.046 M4
Grid 4 0.084 M4	Grid 5 0.065 M4	Grid 6 0.044 M4
Grid 7 0.089 M4	Grid 8 0.065 M4	Grid 9 0.043 M4

Cursor:

Total = 0.092 A/m

H Category: M4

Location: 25, -25, 8.7 mm



0 dB = 0.090A/m

#05 HAC RF_CDMA2000 BC10_RC3 SO55_Ch580(H)**DUT: 270201A**

Communication System: CDMA2000; Frequency: 820.5 MHz; Duty Cycle: 1:1

Medium: Air Medium parameters used: $\sigma = 0$ mho/m, $\epsilon_r = 1$; $\rho = 0$ kg/m³

Ambient Temperature : 23.3 °C

DASY5 Configuration:

- Probe: H3DV6 - SN6300; ; Calibrated: 2011-11-22
- Electronics: DAE4 Sn1210; Calibrated: 2011-11-18
- Phantom: HAC Test Arch with AMCC; Type: SD HAC P01 BA;
- Measurement SW: DASY52, Version 52.8 (0); SEMCAD X Version 14.4.5 (3634)

Ch580/Hearing Aid Compatibility Test (101x101x1): Measurement grid: dx=5mm, dy=5mm

Maximum value of peak Total field = 0.089 A/m

Probe Modulation Factor = 1.00

Device Reference Point: 0, 0, -6.3 mm

Reference Value = 0.054 A/m; Power Drift = 0.06 dB

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

Peak H-field in A/m

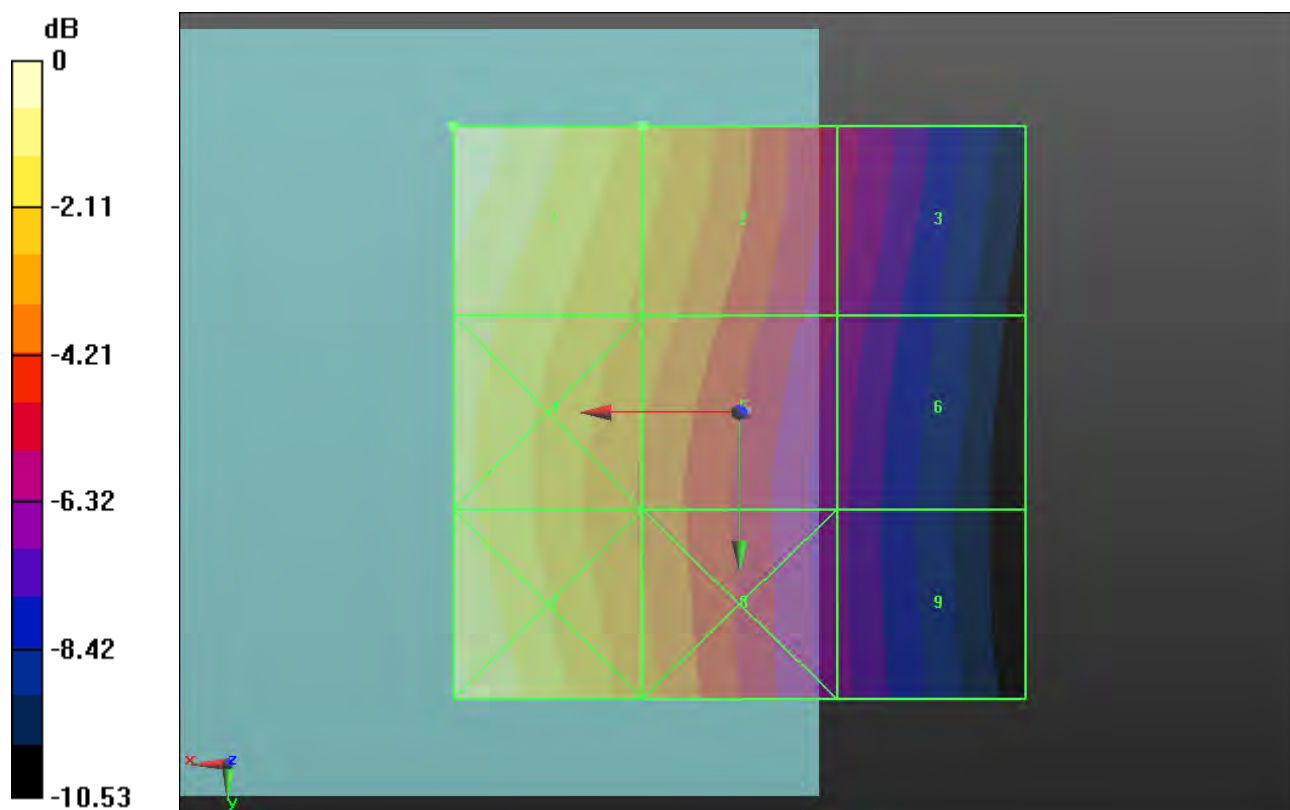
Grid 1 0.089 M4	Grid 2 0.068 M4	Grid 3 0.046 M4
Grid 4 0.081 M4	Grid 5 0.064 M4	Grid 6 0.043 M4
Grid 7 0.085 M4	Grid 8 0.062 M4	Grid 9 0.042 M4

Cursor:

Total = 0.089 A/m

H Category: M4

Location: 25, -25, 8.7 mm



0 dB = 0.090A/m

#06 HAC RF_CDMA2000 BC10_RC3 SO55_Ch684(H)**DUT: 270201A**

Communication System: CDMA2000; Frequency: 823.1 MHz; Duty Cycle: 1:1

Medium: Air Medium parameters used: $\sigma = 0$ mho/m, $\epsilon_r = 1$; $\rho = 0$ kg/m³

Ambient Temperature : 23.3 °C

DASY5 Configuration:

- Probe: H3DV6 - SN6300; ; Calibrated: 2011-11-22
- Electronics: DAE4 Sn1210; Calibrated: 2011-11-18
- Phantom: HAC Test Arch with AMCC; Type: SD HAC P01 BA;
- Measurement SW: DASY52, Version 52.8 (0); SEMCAD X Version 14.4.5 (3634)

Ch684/Hearing Aid Compatibility Test (101x101x1): Measurement grid: dx=5mm, dy=5mm

Maximum value of peak Total field = 0.089 A/m

Probe Modulation Factor = 1.00

Device Reference Point: 0, 0, -6.3 mm

Reference Value = 0.055 A/m; Power Drift = 0.05 dB

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

Peak H-field in A/m

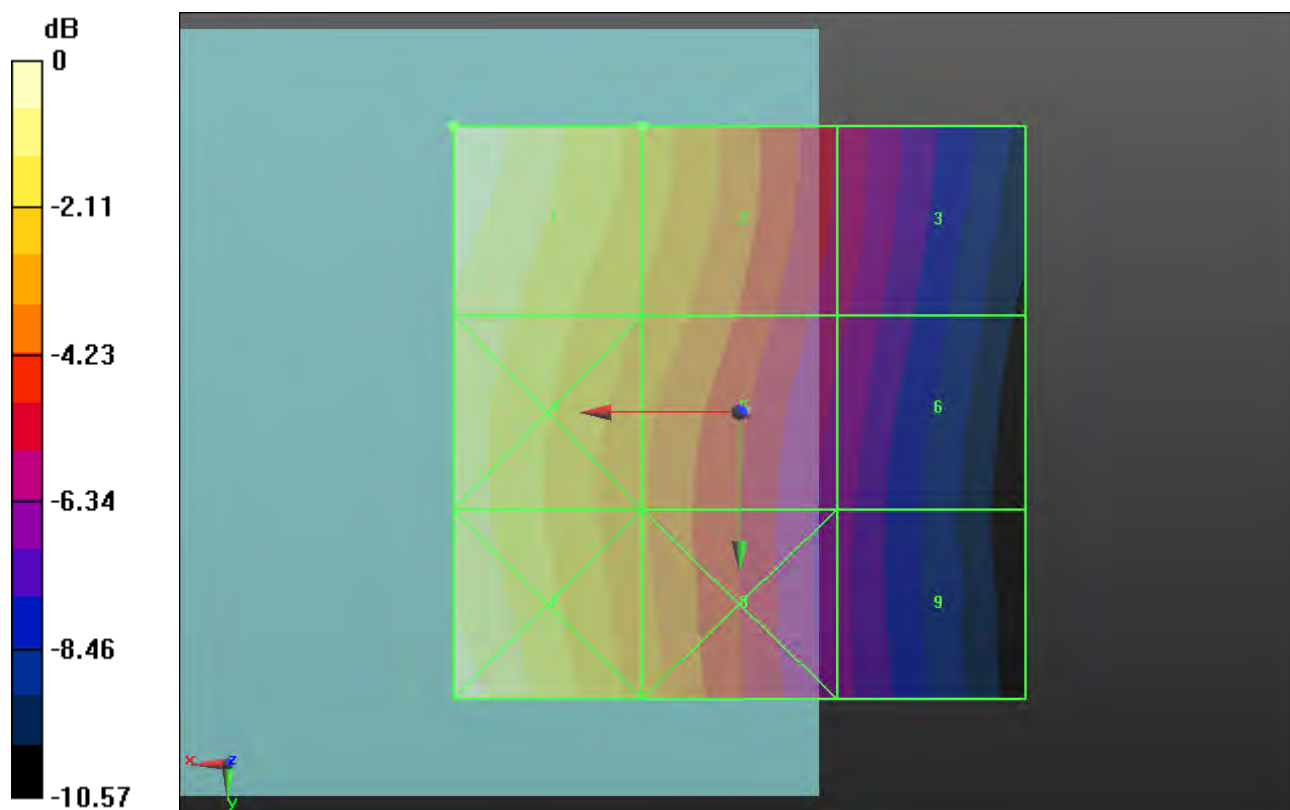
Grid 1 0.089 M4	Grid 2 0.069 M4	Grid 3 0.047 M4
Grid 4 0.082 M4	Grid 5 0.064 M4	Grid 6 0.045 M4
Grid 7 0.087 M4	Grid 8 0.063 M4	Grid 9 0.042 M4

Cursor:

Total = 0.089 A/m

H Category: M4

Location: 25, -25, 8.7 mm



0 dB = 0.090A/m

#07 HAC_H_CDMA2000 BC1_RC3_SO55_Ch25**DUT: 270201A**

Communication System: CDMA ; Frequency: 1851.25 MHz;Duty Cycle: 1:1

Medium: Air Medium parameters used: $\sigma = 0$ mho/m, $\epsilon_r = 1$; $\rho = 1$ kg/m³

Ambient Temperature : 22.5 °C

DASY5 Configuration:

- Probe: H3DV6 - SN6184; ; Calibrated: 2012/1/26
- Sensor-Surface: (Fix Surface)
- Electronics: DAE4 Sn1338; Calibrated: 2012/6/12
- Phantom: HAC Test Arch with AMCC; Type: SD HAC P01 BA
- Software: DASY5 Version; SEMCAD X Version 13.4 Build 45

Ch25/Hearing Aid Compatibility Test (101x101x1): Measurement grid: dx=5mm, dy=5mm

Maximum value of peak Total field = 0.044 A/m

Probe Modulation Factor = 0.81

Device Reference Point: 0, 0, -6.3 mm

Reference Value = 0.058 A/m; Power Drift = 0.059 dB

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

Peak H-field in A/m

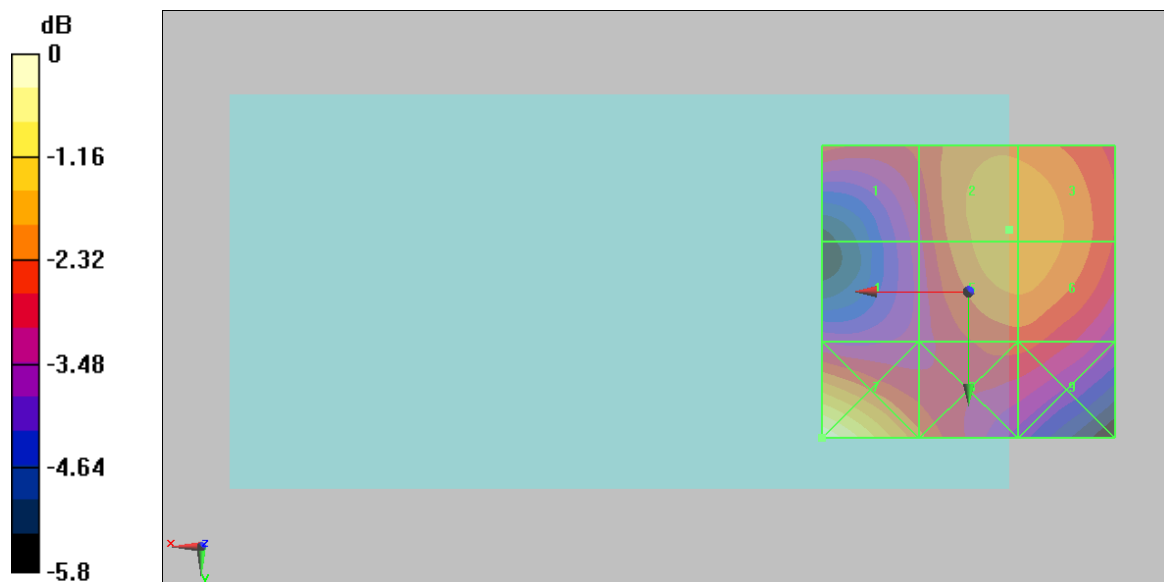
Grid 1 0.040 M4	Grid 2 0.044 M4	Grid 3 0.044 M4
Grid 4 0.037 M4	Grid 5 0.044 M4	Grid 6 0.044 M4
Grid 7 0.053 M4	Grid 8 0.041 M4	Grid 9 0.040 M4

Cursor:

Total = 0.053 A/m

H Category: M4

Location: 25, 25, 8.7 mm



0 dB = 0.053A/m

#08 HAC_H_CDMA2000 BC1_RC3_SO55_Ch600**DUT: 270201A**

Communication System: CDMA ; Frequency: 1880 MHz;Duty Cycle: 1:1

Medium: Air Medium parameters used: $\sigma = 0$ mho/m, $\epsilon_r = 1$; $\rho = 1$ kg/m³

Ambient Temperature : 22.5 °C

DASY5 Configuration:

- Probe: H3DV6 - SN6184; ; Calibrated: 2012/1/26
- Sensor-Surface: (Fix Surface)
- Electronics: DAE4 Sn1338; Calibrated: 2012/6/12
- Phantom: HAC Test Arch with AMCC; Type: SD HAC P01 BA;
- Software: DASY5 Version; SEMCAD X Version 13.4 Build 45

Ch600/Hearing Aid Compatibility Test (101x101x1): Measurement grid: dx=5mm, dy=5mm

Maximum value of peak Total field = 0.052 A/m

Probe Modulation Factor = 0.81

Device Reference Point: 0, 0, -6.3 mm

Reference Value = 0.057 A/m; Power Drift = -0.024 dB

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

Peak H-field in A/m

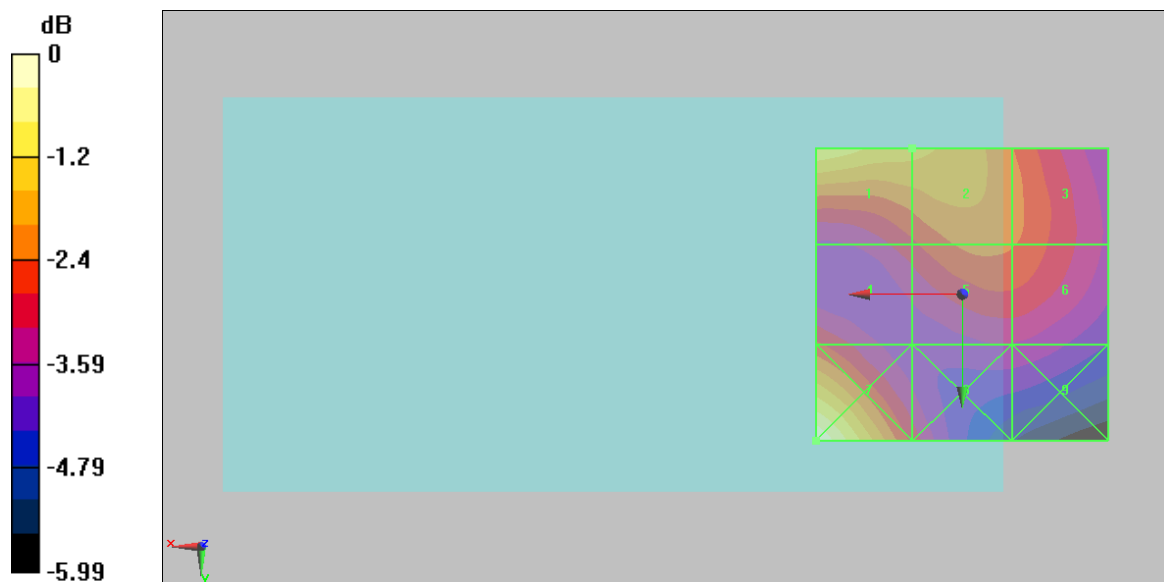
Grid 1 0.052 M4	Grid 2 0.048 M4	Grid 3 0.044 M4
Grid 4 0.042 M4	Grid 5 0.044 M4	Grid 6 0.043 M4
Grid 7 0.057 M4	Grid 8 0.041 M4	Grid 9 0.038 M4

Cursor:

Total = 0.057 A/m

H Category: M4

Location: 25, 25, 8.7 mm



#09 HAC_H_CDMA2000 BC1_RC3_SO55_Ch1175**DUT: 270201A**

Communication System: CDMA ; Frequency: 1908.75 MHz;Duty Cycle: 1:1

Medium: Air Medium parameters used: $\sigma = 0$ mho/m, $\epsilon_r = 1$; $\rho = 1$ kg/m³

Ambient Temperature : 22.5 °C

DASY5 Configuration:

- Probe: H3DV6 - SN6184; ; Calibrated: 2012/1/26
- Sensor-Surface: (Fix Surface)
- Electronics: DAE4 Sn1338; Calibrated: 2012/6/12
- Phantom: HAC Test Arch with AMCC; Type: SD HAC P01 BA
- Software: DASY5 Version; SEMCAD X Version 13.4 Build 45

Ch1175/Hearing Aid Compatibility Test (101x101x1): Measurement grid: dx=5mm, dy=5mm

Maximum value of peak Total field = 0.056 A/m

Probe Modulation Factor = 0.81

Device Reference Point: 0, 0, -6.3 mm

Reference Value = 0.066 A/m; Power Drift = -0.065 dB

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

Peak H-field in A/m

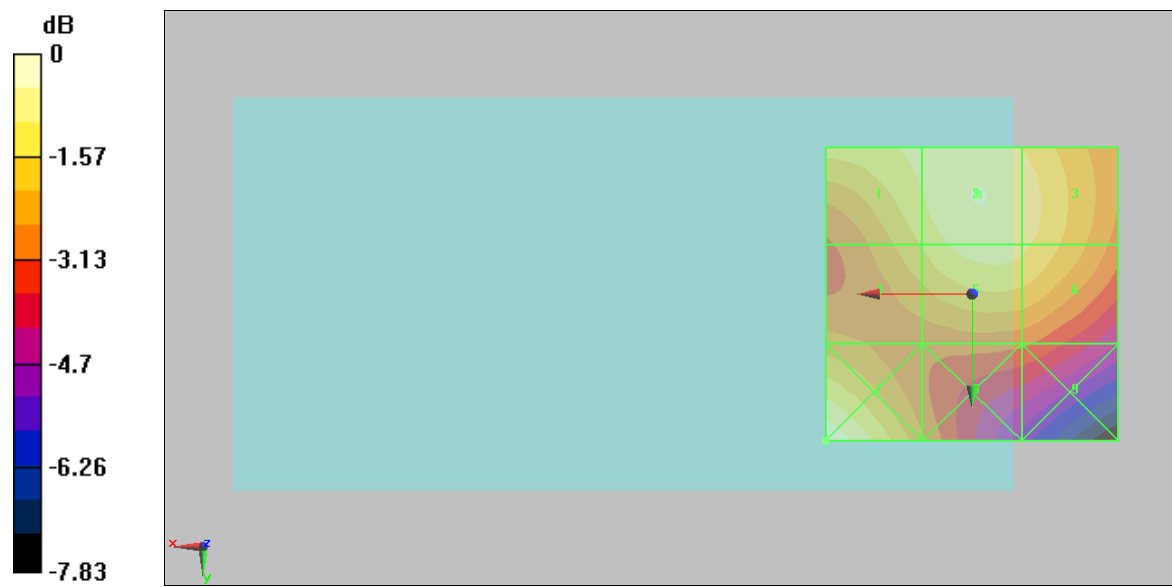
Grid 1 0.053 M4	Grid 2 0.056 M4	Grid 3 0.054 M4
Grid 4 0.050 M4	Grid 5 0.054 M4	Grid 6 0.053 M4
Grid 7 0.059 M4	Grid 8 0.044 M4	Grid 9 0.042 M4

Cursor:

Total = 0.059 A/m

H Category: M4

Location: 25, 25, 8.7 mm



0 dB = 0.059A/m