HAC Test Report

Project Number:	**3720850**
Report Number:	**3720850EMC03** **Revision Level: 1**
Client:	**Hi-P (SINGAPORE) TECHNOLOGY PTE LTD**
Equipment Under Test:	**iDEN Cellular Phone with Bluetooth**
Model Number:	**H375i**
FCC ID:	**2ACUZH375I**
Applicable Standards:	**ANSI C63.19-2011** **FCC Rule Parts: §20.19(b), §6.3(v), §7.3(v)**
Report issued on:	**7 July 2015**
Test Result:	**Compliant**

Tested by: _____
Fabian Nica, Senior Engineering Technician

Reviewed by: _____
David Schramm, EMC/RF/SAR/HAC Manager

Remarks:

This report details the results of the testing carried out on one sample, the results contained in this test report do not relate to other samples of the same product. The manufacturer should ensure that all products in series production are in conformity with the product sample detailed in this report.

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1 GENERAL INFORMATION

1.1 CLIENT INFORMATION

Name:	Hi-P (SINGAPORE) TECHNOLOGY PTE LTD
Address:	12 ANG MO KIO STREET 64 #03-02, UE BIZHUB CENTRAL (BLK A)
City, State, Zip, Country:	Singapore 569088

1.2 TEST LABORATORY

Name:	SGS North America, Inc.
Address:	620 Old Peachtree Road NW, Suite 100
City, State, Zip, Country:	Suwanee, GA 30024, USA
Accrediting Body:	A2LA
Type of lab:	Testing Laboratory
Certificate Number:	3212.01

1.3 GENERAL INFORMATION OF EUT

Serial Number:	364KRE0088
Antenna:	Integral
Rated Voltage:	3.7 VDC 1830mAh Rechargeable Battery
Sample Received Date:	31 March 2015
Date of testing:	22 April 2015

1.4 EQUIPMENT UNDER TEST

EUT	iDEN Cellular Phone with Bluetooth
Normal operation:	Hand held, worn on body, or held to face
Body Worn Accessory	None provided
Device category:	Portable
Exposure category:	General Population/Uncontrolled Exposure
Sample Modification:	No modifications made

Air Interface	Band MHz	Type	C63.19 Tested	Simultaneous Transmission	OTT	Power Reduction
iDEN	806-824 896-902	VO	Yes	BT	NA	NA
BT	2450	DT	NA	iDEN	NA	NA

VO = CMRS Voice Service
DT = Digital Transport
VD = CMRS IP Voice and Digital Transport
1 = No associated T-Coil measurement has been made in accordance with 285076 D02 T-Coil testing for CMRS IP

1.5 TEST RESULTS SUMMARY

E-Field Test Data						
Date Tested	Band	Ch	Freq. MHz	Peak E-Field V/m	Drift dB	M-Rating
4/22/2015	iDEN 800	1	806.0125	65.5	0.05	M4
		2	815.5125	59.51	0.1	M4
		3	824.9875	56.83	0.08	M4
	iDEN 900	1	896.01875	63.97	-0.2	M4
		2	901.98125	60.84	-0.29	M4
Overall M Rating						**M4**

1.6 TEST METHODOLOGY

Testing was performed in accordance with the ANSI C63.19-2011 methods of measurement of compatibility between a wireless device and hearing aids. FCC published KDB 285076 D01 HAC Guidance v04 were followed.

2 TEST EQUIPMENT

Test Date: 22-Apr-2015 Tester: FRN

Equipment	Model	Manufacturer	Asset Number	Cal Due Date
HAC DIPOLE	CD835V3	SPEAG	B085942	20-Jan-2016
HAC PROBE	ER3DV6	SPEAG	B085919	23-Jan-2016
EPM SERIES POWER	E4419B	AGILENT / HP	B079628	8-Aug-2015
POWER SENSOR	8481A	AGILENT / HP	B079679	8-Aug-2015
POWER SENSOR	8481A	AGILENT	B086132	8-Aug-2015
DIRECTIONAL COUPLER	778D	HEWLETT PACKARD	B087456	6-Aug-2017
SIGNAL GENERATOR	SMB 100A	ROHDE & SCHWARZ	B085760	18-Jun-2016

Equipment	Model	Manufacturer	Serial Number	Cal Due Date
Dasy5 Controller	SP1D	Stäubli	S-1188	NA
Probe Alignment Light Beam	LB5/80	SPEAG	SEUKS030AA	NA
Data Acquisition Electronics	DAE4	SPEAG	1287	NA
Device Holder	HAC Test Arch	SPEAG	1163	NA
PC	Compaq 8000 Elite	HP	CZC1231RWS	NA

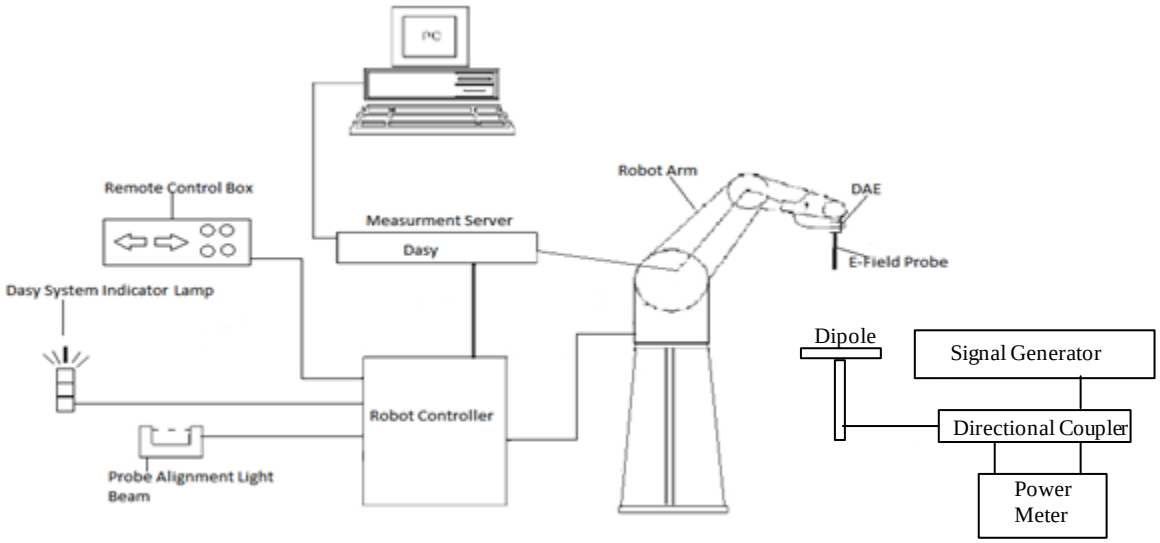
2.1 MEASUREMENT UNCERTAINTY

Test Name:	Hearing Aid Compatability - RF
Instrument(s) Used:	HAC Measurement Sytem
Standard(s) Reference:	ANSI C63.19

Symbol	Source of Uncertainty	Value	Probability Distribution	Divisor	ci E	Std. Unc. E
	MEASUREMENT DESCRIPTION					
	Probe Calibration	5.1%	N1	1	1	5.1%
	Axial Isotropy	4.7%	R	1.732	1	2.7%
	Sensor Displacement	16.5%	R	1.732	1	9.5%
	Boundry Effects	2.4%	R	1.732	1	1.4%
	Phantom Boundary Effects	7.2%	R	1.732	1	4.2%
	Linearity	4.7%	R	1.732	1	2.7%
	Scaling to PMR Calibration	10.0%	R	1.732	1	5.8%
	System Detection Limit	1.0%	R	1.732	1	0.6%
	Readout Electronics	0.3%	N1	1	1	0.3%
	Response Time	0.8%	R	1.732	1	0.5%
	Integration Time	2.6%	R	1.732	1	1.5%
	RF Ambient Conditions	3.0%	R	1.732	1	1.7%
	RF Reflections	12.0%	R	1.732	1	6.9%
	Probe Positioner	1.2%	R	1.732	1	0.7%
	Probe Positioning	4.7%	R	1.732	1	2.7%
	Extrapolation and Interpolation	1.0%	R	1.732	1	0.6%
	Test sample related					
	Test Positioning Vertical	4.7%	R	1.732	1	2.7%
	Test Positioning Lateral	1.0%	R	1.732	1	0.6%
	Device Holder and Phantom	2.4%	R	1.732	1	1.4%
	Power Drift	5.0%	R	1.732	1	2.9%
	Phantom and Setup Related					
	Phantom Thickness	2.4%	R	1.732	1	1.4%

uc(Fs)	Combined Standard Uncertainty	N1	1	16.3%
U(Fs)	Expanded Std. Uncertainty on Power	Normal k=	2	**32.6%**
U(Fs)	Expanded Std. Uncertainty on Field	Normal k=	2	**16.3%**

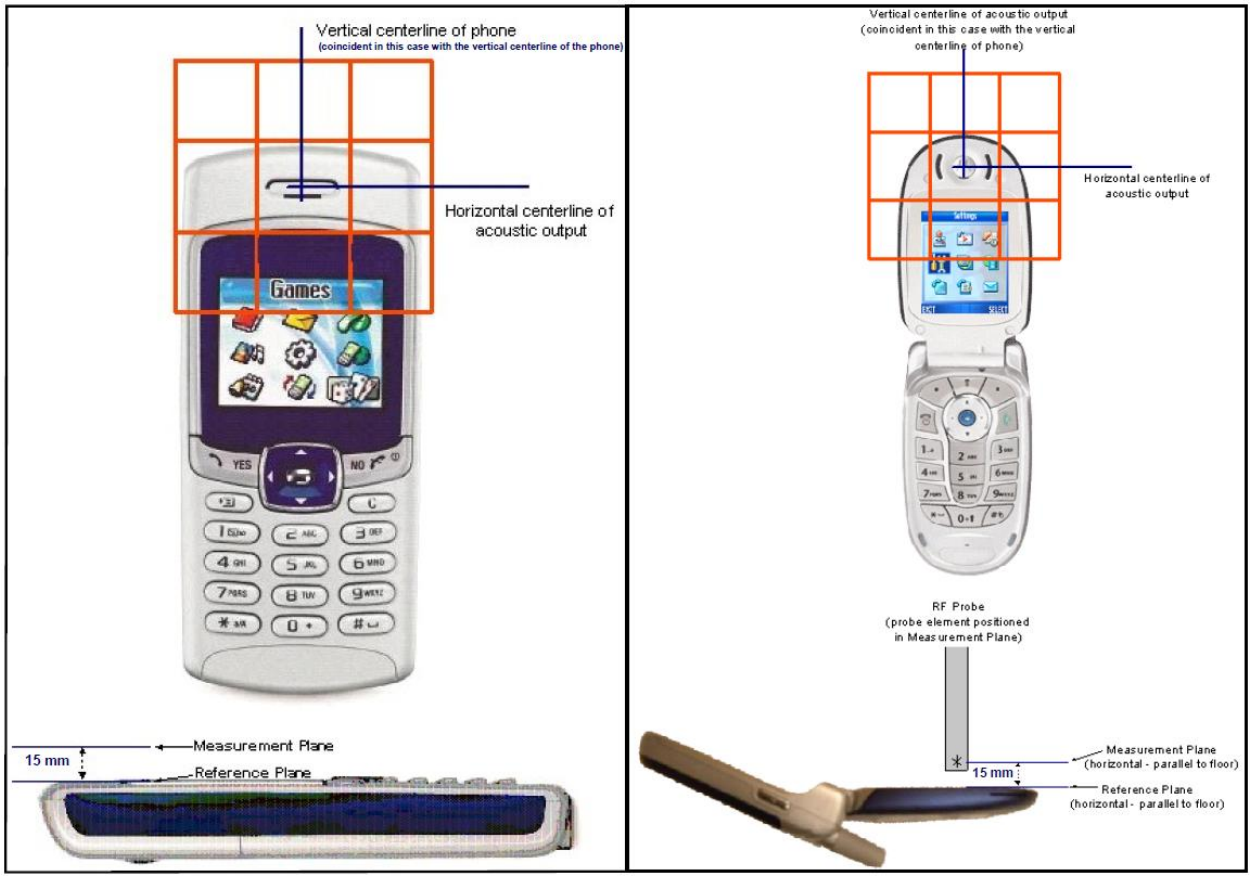
3 SYSTEM VALIDATION SETUP DIAGRAM



The Dasy5 HAC test system consists of:

- 1 Stäubli Robot and system controller cabinet
- 1 Electro Optical Converter mounted on robots arm
- Robot stand
- Robot remote controller
- Light beam for E-field probe alignment
- DASY5 measurement server
- Hand-Held/ Laptop device holder
- HP PC with DASY5 software
- Data Acquisition Electronics(DAE)
- System validation dipole kit
- E/H-field probe
- Warning lamps
- Signal Generator
- Dual Directional Coupler
- Power Meter

4 WIRELESS DEVICE POSITIONING



5 SYSTEM VALIDATION PROCEDURE:

A calibrated dipole antenna per ANSI C63.19-2011 requirements was placed under the HAC Test Arch in the position normally occupied by the WD position. The dipoles are calibrated to a known electric and magnetic field at a specified forward power.

E and/or H-Field calibrations were performed prior to start of testing to verify correct operation.

- The appropriate probe was selected and installed into the DAE.
- Probe and its cables were placed parallel to the coaxial feed of the dipole.
- Correct position of the test arche's four reference points was checked.
- Appropriate dipole was selected and installed in the test position under the HAC Test Arch.
- Appropriate dipole was illuminated with P=100mW(20 dBm) of forward power and adjusted for return loss. This is the input power used by the calibration lab.
- The center point of the probe sensor element was set to 15mm from the closest surface of the dipole element.
- DASY52 profile was used to measure the maximum field strength along the dipole length for E-Field and record the two maximum values found near the dipole ends.
- An average of the two maximum values for E-field and H-field results were compared with calibration certificated and verified to be in tolerance.

6 SYSTEM VALIDATION RESULTS

Date	Dipole	f(MHz)	Input Power (mW)	E-Field (V/m)	E-Field Calibration Target (dBV/m)	E-Field Calibration Target (V/m)	E-field Deviation from Calibration (%)
4/22/2015	CD835V3	835	100	100.8	40.66	107.89	-6.6

Notes:

1. Maximum E-Field was evaluated and compared to the target values provided by the calibration Lab.

6.1 SYSTEM VALIDATION PLOT

DUT: B085942-SN 1060-HAC-Dipole 835 MHz (Cal 20Jan2015); Type: CD835V3; Serial: 1060

Communication System: UID 0, CW; Communication System Band: ITD835 (835.0 MHz); Frequency: 835 MHz;Communication System PAR: 0 dB; PMF: 1
Medium parameters used: $\sigma = 0$ S/m, $\varepsilon_r = 1$; $\rho = 0$ kg/m^3
Phantom section: RF Section
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2007)

DASY Configuration:

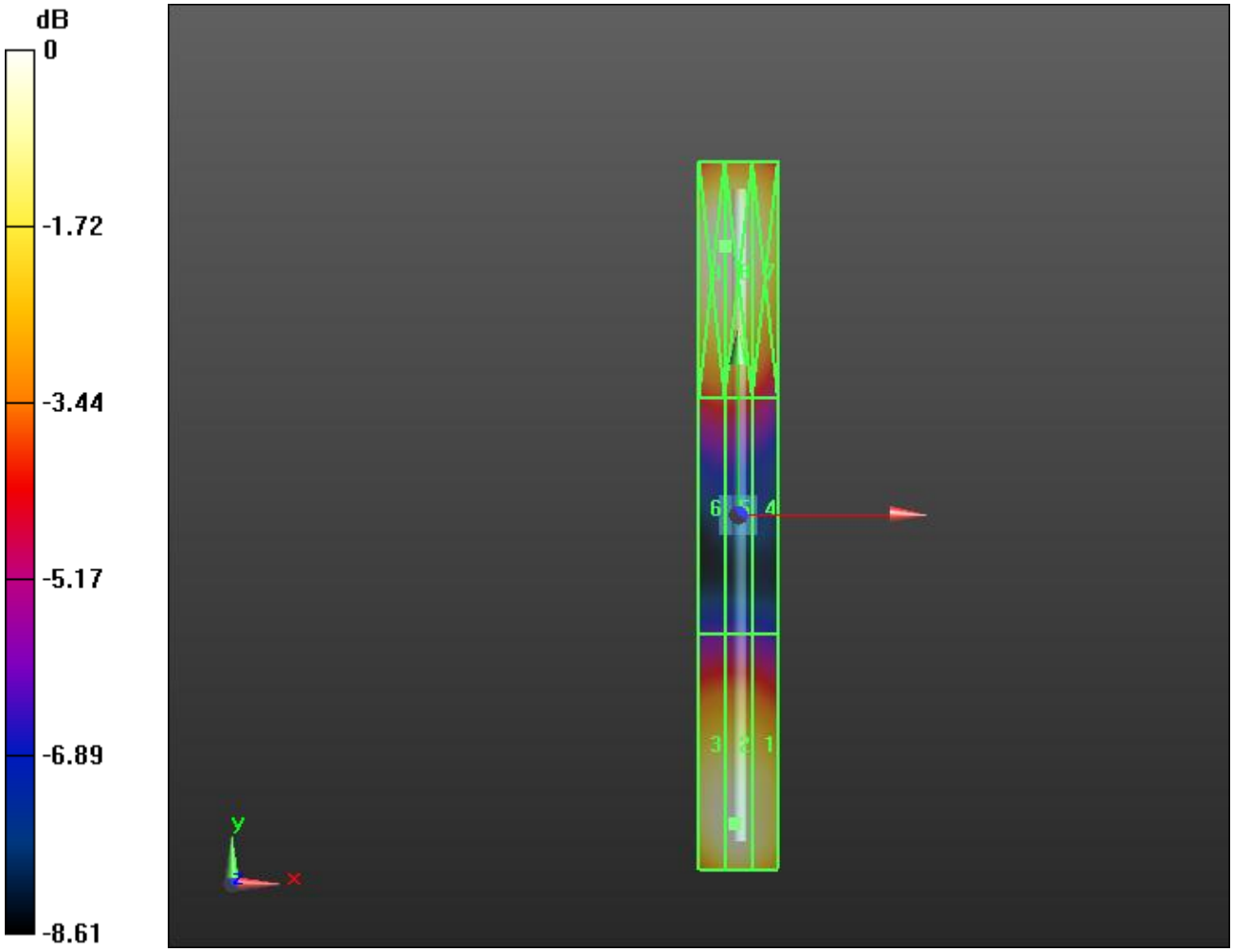
- Probe: ER3DV6 - SN2308; ConvF(1, 1, 1); Calibrated: 1/23/2015;
- Sensor-Surface: (Fix Surface), z = 9.7
- Electronics: DAE4 Sn1287; Calibrated: 1/20/2015
- Phantom: HAC Test Arch with AMCC; Type: SD HAC P01 BA; Serial: NA
- DASY52 52.8.8(1222); SEMCAD X 14.6.10(7331)

Dipole E-Field measurement (E-field scan for ANSI C63.19-2011 compliance)/E Scan - measurement distance from the probe sensor center to CD835=15mm/Hearing Aid Compatibility Test at 15mm distance (41x361x1): Interpolated grid: dx=0.5000 mm, dy=0.5000 mm
Device Reference Point: 0, 0, -6.3 mm
Reference Value = 112.0 V/m; Power Drift = 0.19 dB
PMR not calibrated. PMF = 1.000 is applied.
E-field emissions = 100.2 V/m
Near-field category: M4 (AWF 0 dB)

PMF scaled E-field

Grid 1 **M4** **93.41 V/m**	Grid 2 **M4** **100.2 V/m**	Grid 3 **M4** **98.36 V/m**
Grid 4 **M4** **61.67 V/m**	Grid 5 **M4** **65.15 V/m**	Grid 6 **M4** **65.15 V/m**
Grid 7 **M4** **94.75 V/m**	Grid 8 **M4** **100.8 V/m**	Grid 9 **M4** **100.8 V/m**

Cursor:
Total = 100.8 V/m
E Category: M4
Location: -3.5, 68.5, 9.7 mm



0 dB = 100.8 V/m = 40.07 dBV/m

7 RF MEASUREMENT PROCEDURE

a) Proper operation of the probe, measurement system and instrumentation position was confirmed.
b) WD was positioned in its proper test position according to Section 4 diagram of this report.
c) A grid of 50mm X 50mm was scanned. This grid is divided into nine evenly sized sub grids.
d) Once scan was completed a reading of each measurement point was recorded.
e) The five lowest contiguous sub grids around the center grid were identified.
f) Three sub grids of the maximum readings are eliminated.
g) This identifies the six areas which are used to determine the WD highest emissions.
h) Once highest field reading from step g is identified the value is converted to RF audio interference level in V/m.

7.1 ANSI CATEGORIES

The procedure outlined in ANSI C63.19 was followed. Table below for the test criteria was used to assign the wireless device's M rating

7.1.1 WD RF AUDIO INTERFERENCE LEVEL CATEGORIES IN LOGARITHMIC UNITS

Emission Categories	E-field emissions	
	<960MHz	>960MHz
Category M1	316.2 to 562.3 (V/m)	100.0 to 177.8 (V/m)
Category M2	177.8 to 316.2 (V/m)	56.2 to 100 (V/m)
Category M3	100.0 to 177.8 (V/m)	31.6 to 56.2 (V/m)
Category M4	<100 (V/m)	<31.6 (V/m)

7.1.2 SYSTEM PERFORMANCE CLASSIFICATION TABLE

System Classification	Category sum hearing aid category + telephone category
Usable	Hearing aid category + telephone category = 4
Normal use	Hearing aid category + telephone category = 5
Excellent performance	Hearing aid category + telephone category = ≥ 6

8 HAC RF EMISSIONS TEST RESULTS

The EUT is iDEN capable. The sample was placed in a test mode which allows control of the transmitter without the need to establish a connection to a base station simulator. Software was configured to proper channels, transmitter power leves and transmit modes of operation.

The results listed below summarize the data obtained after the device was tested in the operating conditions described previously.

8.1 TEST RESULTS

E-Field Test Data							
Plot #	Date Tested	Band	Ch	Freq. MHz	Peak E-Field V/m	Drift dB	M-Rating
1	4/22/2015	iDEN 800	1	806.0125	65.5	0.05	M4
2			2	815.5125	59.51	0.1	M4
3			3	824.9875	56.83	0.08	M4
4		iDEN 900	1	896.01875	63.97	-0.2	M4
5			2	901.98125	60.84	-0.29	M4
Overall M Rating							**M4**

8.2 TEST SEMCAD PLOTS

Plot 1

DUT: Hi-P Electronics; Type: Cellular Phone; Serial: 364KRE0088

Communication System: UID 0, iDEN 800; Communication System Band: FullSpan (0.0 - 6000.0 MHz); Frequency: 806.013 MHz;Communication System PAR: 0 dB; PMF: 1
Medium parameters used: $\sigma = 0$ S/m, $\varepsilon_r = 1$; $\rho = 0$ kg/m^3
Phantom section: RF Section
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2007)

DASY Configuration:

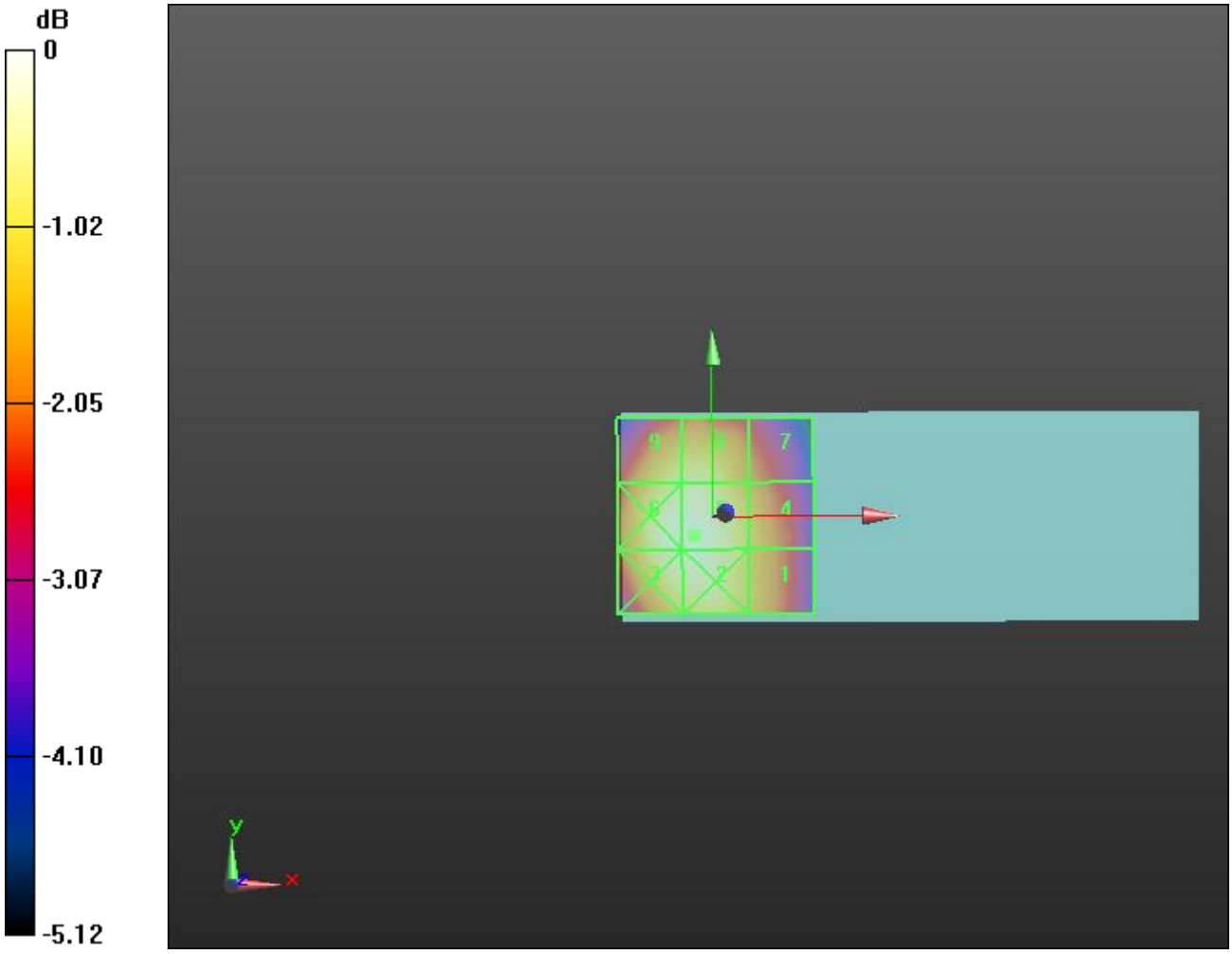
- Probe: ER3DV6 - SN2308; ConvF(1, 1, 1); Calibrated: 1/23/2015;
- Sensor-Surface: (Fix Surface), z = 8.7
- Electronics: DAE4 Sn1287; Calibrated: 1/20/2015
- Phantom: HAC Test Arch with AMCC; Type: SD HAC P01 BA; Serial: NA
- DASY52 52.8.8(1222); SEMCAD X 14.6.10(7331)

Device E-Field measurement (E-field scan for ANSI C63.19-2011 compliance)/E Scan - ER3D: 15 mm from Probe Center to the Device/Hearing Aid Compatibility Test (101x101x1): Interpolated grid: dx=0.5000 mm, dy=0.5000 mm
Device Reference Point: 0, 0, -6.3 mm
Reference Value = 74.17 V/m; Power Drift = 0.05 dB
PMR not calibrated. PMF = 1.000 is applied.
E-field emissions = 65.50 V/m
Near-field category: M4 (AWF 0 dB)

PMF scaled E-field

Grid 1 **M4** **56.63 V/m**	Grid 2 **M4** **64.72 V/m**	Grid 3 **M4** **63.55 V/m**
Grid 4 **M4** **57.18 V/m**	Grid 5 **M4** **65.50 V/m**	Grid 6 **M4** **64.17 V/m**
Grid 7 **M4** **53.36 V/m**	Grid 8 **M4** **60.90 V/m**	Grid 9 **M4** **60.67 V/m**

Cursor:
Total = 65.50 V/m
E Category: M4
Location: -5.5, -5, 8.7 mm



0 dB = 65.50 V/m = 36.32 dBV/m

Plot 2

DUT: Hi-P Electronics; Type: Cellular Phone; Serial: 364KRE0088

Communication System: UID 0, iDEN 800; Communication System Band: FullSpan (0.0 - 6000.0 MHz); Frequency: 815.513 MHz;Communication System PAR: 0 dB; PMF: 1
Medium parameters used: $\sigma = 0$ S/m, $\varepsilon_r = 1$; $\rho = 0$ kg/m^3
Phantom section: RF Section
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2007)

DASY Configuration:

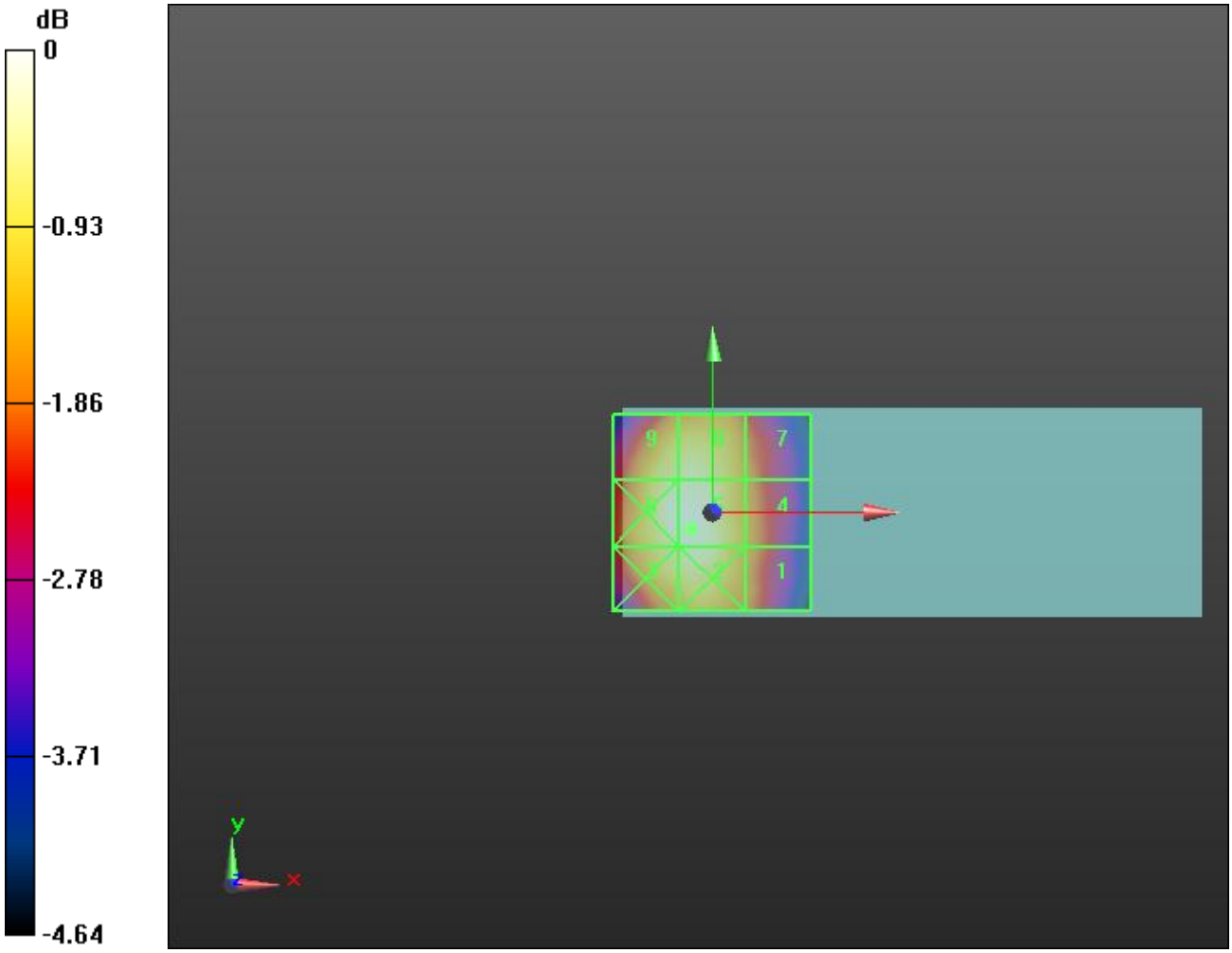
- Probe: ER3DV6 - SN2308; ConvF(1, 1, 1); Calibrated: 1/23/2015;
- Sensor-Surface: (Fix Surface), z = 8.7
- Electronics: DAE4 Sn1287; Calibrated: 1/20/2015
- Phantom: HAC Test Arch with AMCC; Type: SD HAC P01 BA; Serial: NA
- DASY52 52.8.8(1222); SEMCAD X 14.6.10(7331)

Device E-Field measurement (E-field scan for ANSI C63.19-2011 compliance)/E Scan - ER3D: 15 mm from Probe Center to the Device/Hearing Aid Compatibility Test (101x101x1): Interpolated grid: dx=0.5000 mm, dy=0.5000 mm
Device Reference Point: 0, 0, -6.3 mm
Reference Value = 66.73 V/m; Power Drift = 0.10 dB
PMR not calibrated. PMF = 1.000 is applied.
E-field emissions = 59.51 V/m
Near-field category: M4 (AWF 0 dB)

PMF scaled E-field

Grid 1 **M4** **50.33 V/m**	Grid 2 **M4** **58.31 V/m**	Grid 3 **M4** **56.91 V/m**
Grid 4 **M4** **50.47 V/m**	Grid 5 **M4** **59.51 V/m**	Grid 6 **M4** **59.34 V/m**
Grid 7 **M4** **49.71 V/m**	Grid 8 **M4** **57.34 V/m**	Grid 9 **M4** **56.69 V/m**

Cursor:
Total = 59.51 V/m
E Category: M4
Location: -5.5, -4, 8.7 mm



0 dB = 59.51 V/m = 35.49 dBV/m

Plot 3

DUT: Hi-P Electronics; Type: Cellular Phone; Serial: 364KRE0088

Communication System: UID 0, iDEN 800; Communication System Band: FullSpan (0.0 - 6000.0 MHz); Frequency: 824.987 MHz;Communication System PAR: 0 dB; PMF: 1
Medium parameters used: $\sigma = 0$ S/m, $\varepsilon_r = 1$; $\rho = 0$ kg/m^3
Phantom section: RF Section
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2007)

DASY Configuration:

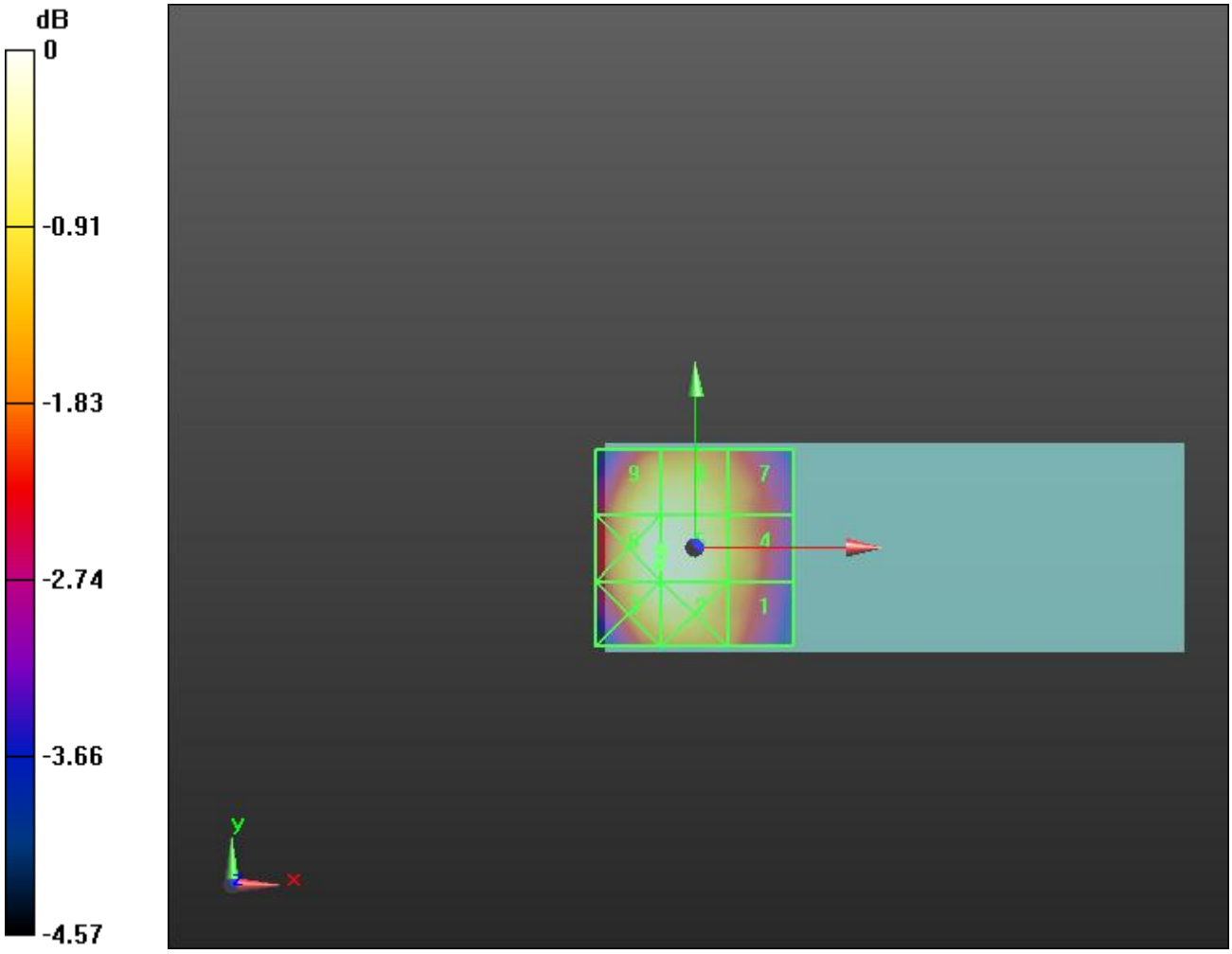
- Probe: ER3DV6 - SN2308; ConvF(1, 1, 1); Calibrated: 1/23/2015;
- Sensor-Surface: (Fix Surface), z = 8.7
- Electronics: DAE4 Sn1287; Calibrated: 1/20/2015
- Phantom: HAC Test Arch with AMCC; Type: SD HAC P01 BA; Serial: NA
- DASY52 52.8.8(1222); SEMCAD X 14.6.10(7331)

Device E-Field measurement (E-field scan for ANSI C63.19-2011 compliance)/E Scan - ER3D: 15 mm from Probe Center to the Device/Hearing Aid Compatibility Test (101x101x1): Interpolated grid: dx=0.5000 mm, dy=0.5000 mm
Device Reference Point: 0, 0, -6.3 mm
Reference Value = 68.08 V/m; Power Drift = 0.08 dB
PMR not calibrated. PMF = 1.000 is applied.
E-field emissions = 56.81 V/m
Near-field category: M4 (AWF 0 dB)

PMF scaled E-field

Grid 1 **M4** **49.12 V/m**	Grid 2 **M4** **55.94 V/m**	Grid 3 **M4** **55.94 V/m**
Grid 4 **M4** **50.74 V/m**	Grid 5 **M4** **56.81 V/m**	Grid 6 **M4** **56.83 V/m**
Grid 7 **M4** **49.71 V/m**	Grid 8 **M4** **54.73 V/m**	Grid 9 **M4** **54.71 V/m**

Cursor:
Total = 56.83 V/m
E Category: M4
Location: -9, -4, 8.7 mm



0 dB = 56.83 V/m = 35.09 dBV/m

Plot 4

DUT: Hi-P Electronics; Type: Cellular Phone; Serial: 364KRE0088

Communication System: UID 0, iDEN 900; Communication System Band: FullSpan (0.0 - 6000.0 MHz); Frequency: 896.019 MHz;Communication System PAR: 0 dB; PMF: 1
Medium parameters used: $\sigma = 0$ S/m, $\varepsilon_r = 1$; $\rho = 0$ kg/m^3
Phantom section: RF Section
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2007)

DASY Configuration:

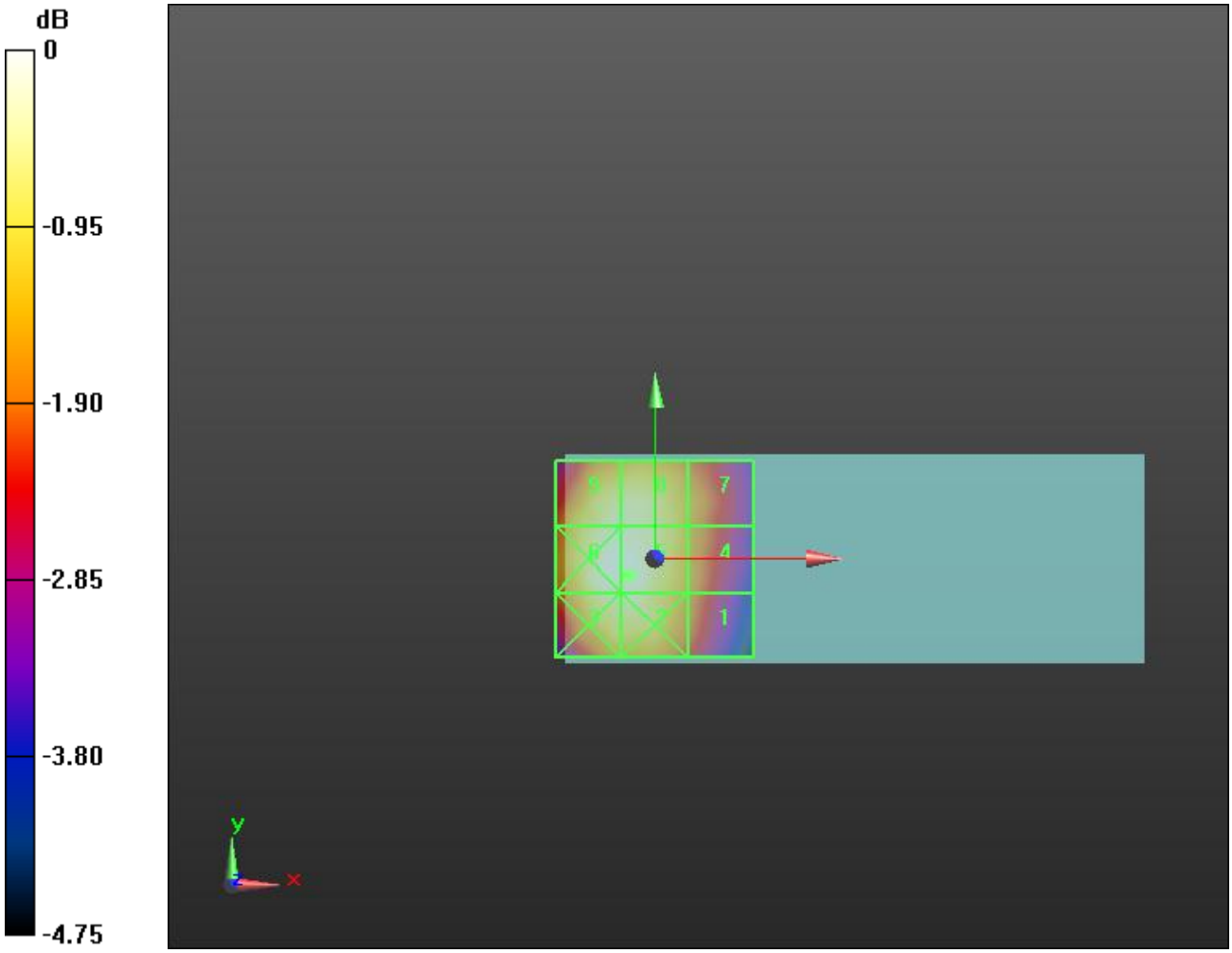
- Probe: ER3DV6 - SN2308; ConvF(1, 1, 1); Calibrated: 1/23/2015;
- Sensor-Surface: (Fix Surface), z = 8.7
- Electronics: DAE4 Sn1287; Calibrated: 1/20/2015
- Phantom: HAC Test Arch with AMCC; Type: SD HAC P01 BA; Serial: NA
- DASY52 52.8.8(1222); SEMCAD X 14.6.10(7331)

Device E-Field measurement (E-field scan for ANSI C63.19-2011 compliance)/E Scan - ER3D: 15 mm from Probe Center to the Device/Hearing Aid Compatibility Test (101x101x1): Interpolated grid: dx=0.5000 mm, dy=0.5000 mm
Device Reference Point: 0, 0, -6.3 mm
Reference Value = 73.75 V/m; Power Drift = -0.20 dB
PMR not calibrated. PMF = 1.000 is applied.
E-field emissions = 63.97 V/m
Near-field category: M4 (AWF 0 dB)

PMF scaled E-field

Grid 1 **M4** **53.07 V/m**	Grid 2 **M4** **62.10 V/m**	Grid 3 **M4** **61.87 V/m**
Grid 4 **M4** **54.20 V/m**	Grid 5 **M4** **63.97 V/m**	Grid 6 **M4** **63.96 V/m**
Grid 7 **M4** **54.33 V/m**	Grid 8 **M4** **61.74 V/m**	Grid 9 **M4** **61.74 V/m**

Cursor:
Total = 63.97 V/m
E Category: M4
Location: -6.5, -4, 8.7 mm



0 dB = 63.97 V/m = 36.12 dBV/m

Plot 5

DUT: Hi-P Electronics; Type: Cellular Phone; Serial: 364KRE0088

Communication System: UID 0, iDEN 900; Communication System Band: FullSpan (0.0 - 6000.0 MHz); Frequency: 901.981 MHz;Communication System PAR: 0 dB; PMF: 1
Medium parameters used: $\sigma = 0$ S/m, $\varepsilon_r = 1$; $\rho = 0$ kg/m^3
Phantom section: RF Section
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2007)

DASY Configuration:

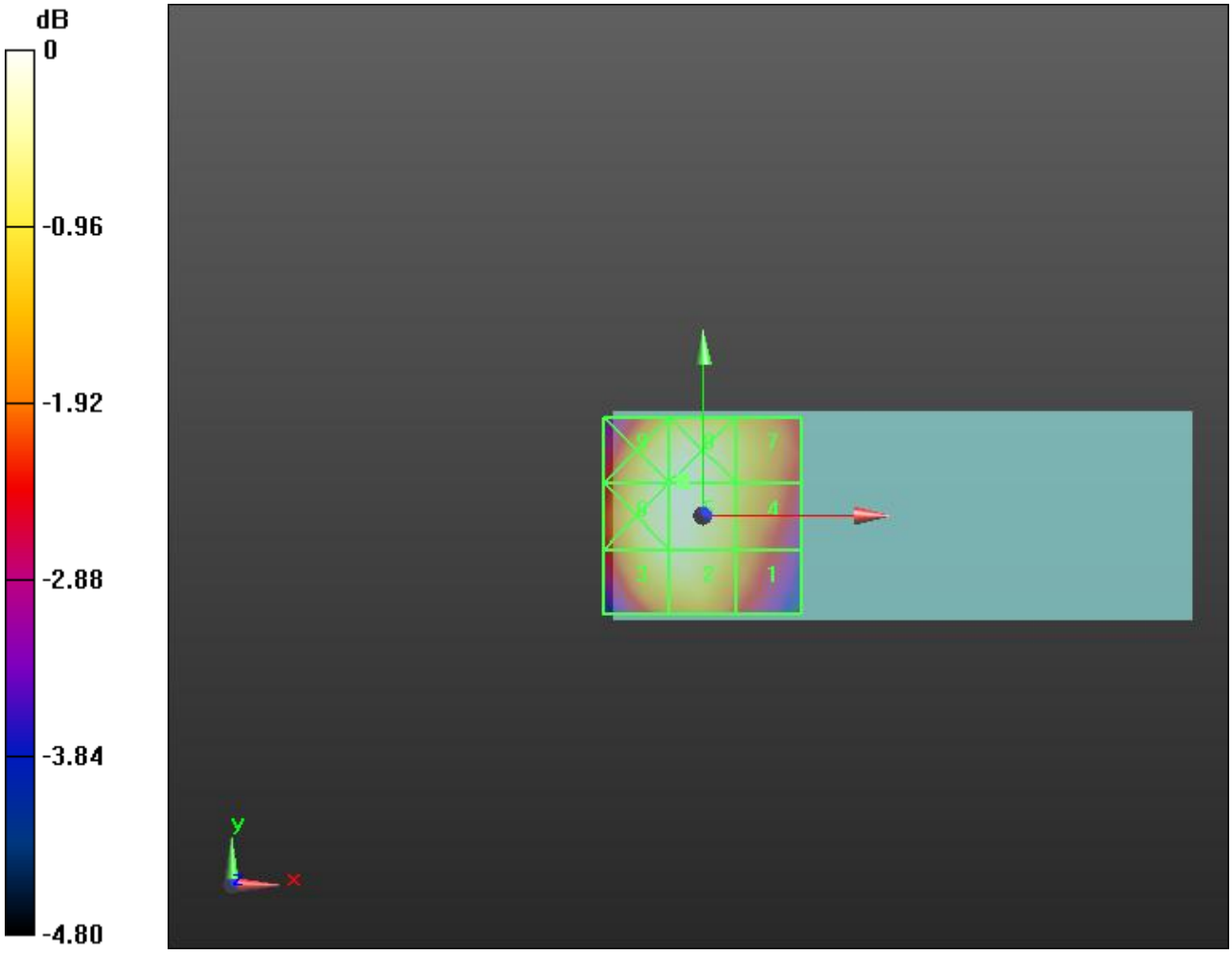
- Probe: ER3DV6 - SN2308; ConvF(1, 1, 1); Calibrated: 1/23/2015;
- Sensor-Surface: (Fix Surface), z = 8.7
- Electronics: DAE4 Sn1287; Calibrated: 1/20/2015
- Phantom: HAC Test Arch with AMCC; Type: SD HAC P01 BA; Serial: NA
- DASY52 52.8.8(1222); SEMCAD X 14.6.10(7331)

Device E-Field measurement (E-field scan for ANSI C63.19-2007 & -2011 compliance)/E Scan - ER3D: 15 mm from Probe Center to the Device/Hearing Aid Compatibility Test (101x101x1): Interpolated grid: dx=0.5000 mm, dy=0.5000 mm
Device Reference Point: 0, 0, -6.3 mm
Reference Value = 72.77 V/m; Power Drift = -0.29 dB
PMR not calibrated. PMF = 1.000 is applied.
E-field emissions = 60.79 V/m
Near-field category: M4 (AWF 0 dB)

PMF scaled E-field

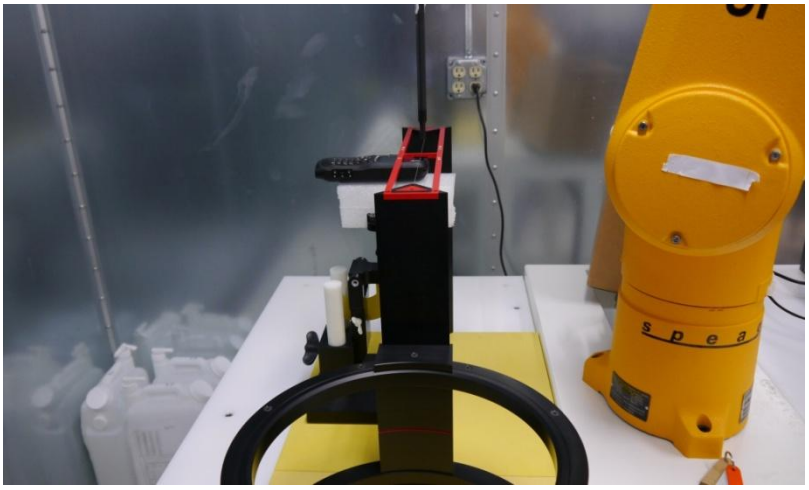
Grid 1 **M4** **52.18 V/m**	Grid 2 **M4** **58.72 V/m**	Grid 3 **M4** **58.69 V/m**
Grid 4 **M4** **54.71 V/m**	Grid 5 **M4** **60.79 V/m**	Grid 6 **M4** **60.06 V/m**
Grid 7 **M4** **55.10 V/m**	Grid 8 **M4** **60.84 V/m**	Grid 9 **M4** **59.83 V/m**

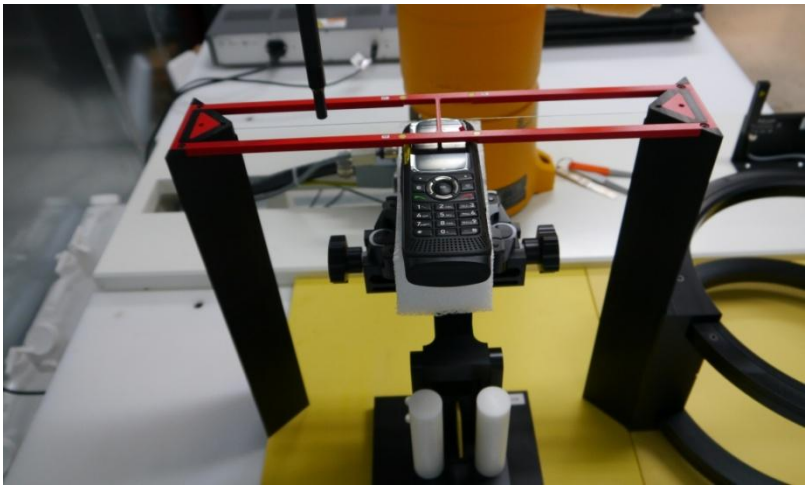
Cursor:
Total = 60.84 V/m
E Category: M4
Location: -5, 9, 8.7 mm



0 dB = 60.84 V/m = 35.68 dBV/m

9 SETUP PHOTOGRAPHS





10 REFERENCES

1. SPEAG DASY V52.6 User manual, May 2014
2. ANSI C63.19-2011 ” American National Standard for Methods of Measurement of Compatibility between Wireless Communication Devices and Hearing Aids”.

12 REVISION HISTORY

Revision Level	Description of changes	Revision Date
0	Initial release	24 Apr 2015
1	Corrected FCC ID	7 Jul 2015