

HAC Test Report

Project Number: 3986695
Report Number: 3986695EMC05 **Revision Level:** 0
Client: Hi-P Electronics Pte. Ltd.
FCC ID: 2ACUZ375iS
Equipment Under Test: iDEN Cellular Phone with Bluetooth, Mototalk
Model Number: H375iS

Applicable Standards: ANSI C63.19-2011
FCC Rule Parts: §20.19(b), §6.3(v), §7.3(v)

Report issued on: 15 July 2015

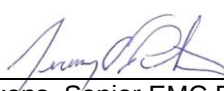
Test Result: Compliant

Tested by:



Fabian Nica, Senior Technician

Reviewed by:



Jeremy Pickens, Senior EMC Engineer

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.

This report may only be reproduced and distributed in full. If the product in this report is used in any configuration other than that detailed in the report, the manufacturer must ensure the new system complies with all relevant standards. Any mention of SGS International Electrical Approvals or Testing done by SGS International Electrical Approvals in connection with distribution or use of the product described in this report must be approved by SGS international Electrical Approvals in writing.

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1 GENERAL INFORMATION

1.1 CLIENT INFORMATION

Name: Hi-P Electronics 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

Model Number: H375iS01B32A
Serial Number: 364KSL00NL
IMEI Number: 02800001867780
FCC ID: 2ACUZ375iS

Antenna: Integral
Rated Voltage: 3.7 VDC 1800mAh Rechargeable Battery

Sample Received Date: 24 June 2016
Date of testing: 14 July 2016

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							
Scan Name	Date Tested	Band	Ch	Freq. MHz	Peak E-Field V/m	Drift dB	M-Rating
1	7/14/2016	iDEN 800	1	806.0125	48.04	0.17	M4
2			2	815.5125	46.27	0.11	M4
3			3	824.9875	46.02	0.01	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: 14-Jul-2016

Tester: FRN

Equipment	Model	Manufacturer	Asset Number	Cal Due Date
HAC DIPOLE	CD835V3	SPEAG	B085942	27-Jan-2017
HAC PROBE	ER3DV6	SPEAG	B085919	19-Jan-2017
EPM SERIES POWER	E4419B	AGILENT / HP	B079628	5-Aug-2016
POWER SENSOR	8481A	AGILENT / HP	B079679	5-Aug-2016
POWER SENSOR	8481A	AGILENT	B086132	5-Aug-2016
DIRECTIONAL COUPLER	778D	HEWLETT PACKARD	B087456	6-Aug-2017
SIGNAL GENERATOR	SMB 100A	ROHDE & SCHWARZ	B094876	2-Dec-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	1/19/2017
Device Holder	HAC Test Arch	SPEAG	1163	NA
PC	Compaq 8000 Elite	HP	CZC1231RWS	NA

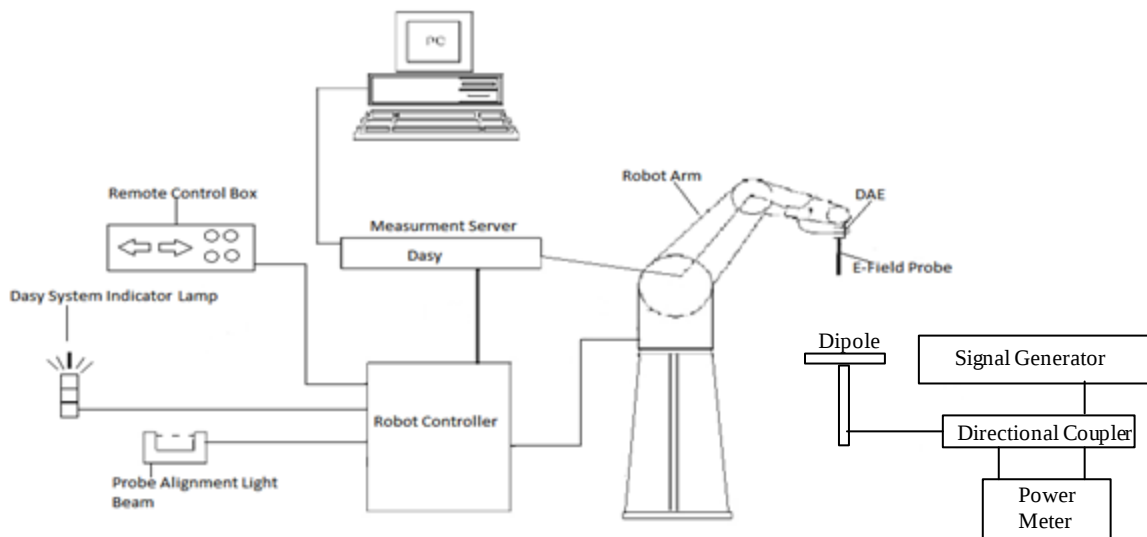
2.1 MEASUREMENT UNCERTAINTY

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 arch'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 $P=100\text{mW}$ (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 maximum value for E-field results was compared with calibration certificated and verified to be in tolerance.

6 SYSTEM VALIDATION RESULTS

Scan Name	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 (%)	Category
H1	7/14/2016	CD835V3	835	100	100.8	40.48	105.68	-4.6	M4

Notes:

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

6.1 SYSTEM VALIDATION PLOT

H1

DUT: B085942-SN 1060-HAC-Dipole 835 MHz (Cal 27Jan2017); 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, $\epsilon_r = 1$; $\rho = 0$ kg/m³

Phantom section: RF Section

Measurement Standard: DASYS (IEEE/IEC/ANSI C63.19-2011)

DASY Configuration:

- Probe: ER3DV6 - SN2308; ConvF(1, 1, 1); Calibrated: 1/19/2016;
- Sensor-Surface: 0mm (Fix Surface), Sensor-Surface: (Fix Surface), z = 4.7, 9.7
- Electronics: DAE4 Sn1287; Calibrated: 1/19/2016
- Phantom: HAC Test Arch with AMCC; Type: SD HAC P01 BA
- DASYS 52.8.8(1222); SEMCAD X 14.6.10(7331)

Dipole E-Field measurement (E-field scan for ANSI C63.19-2011 & -2011 compliance)/E Scan - measurement distance from the probe sensor center to CD835 = 10mm & 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 = 108.5 V/m; Power Drift = 0.02 dB

PMR not calibrated. PMF = 1.000 is applied.

E-field emissions = 100.5 V/m

Near-field category: M4 (AWF 0 dB)

PMF scaled E-field

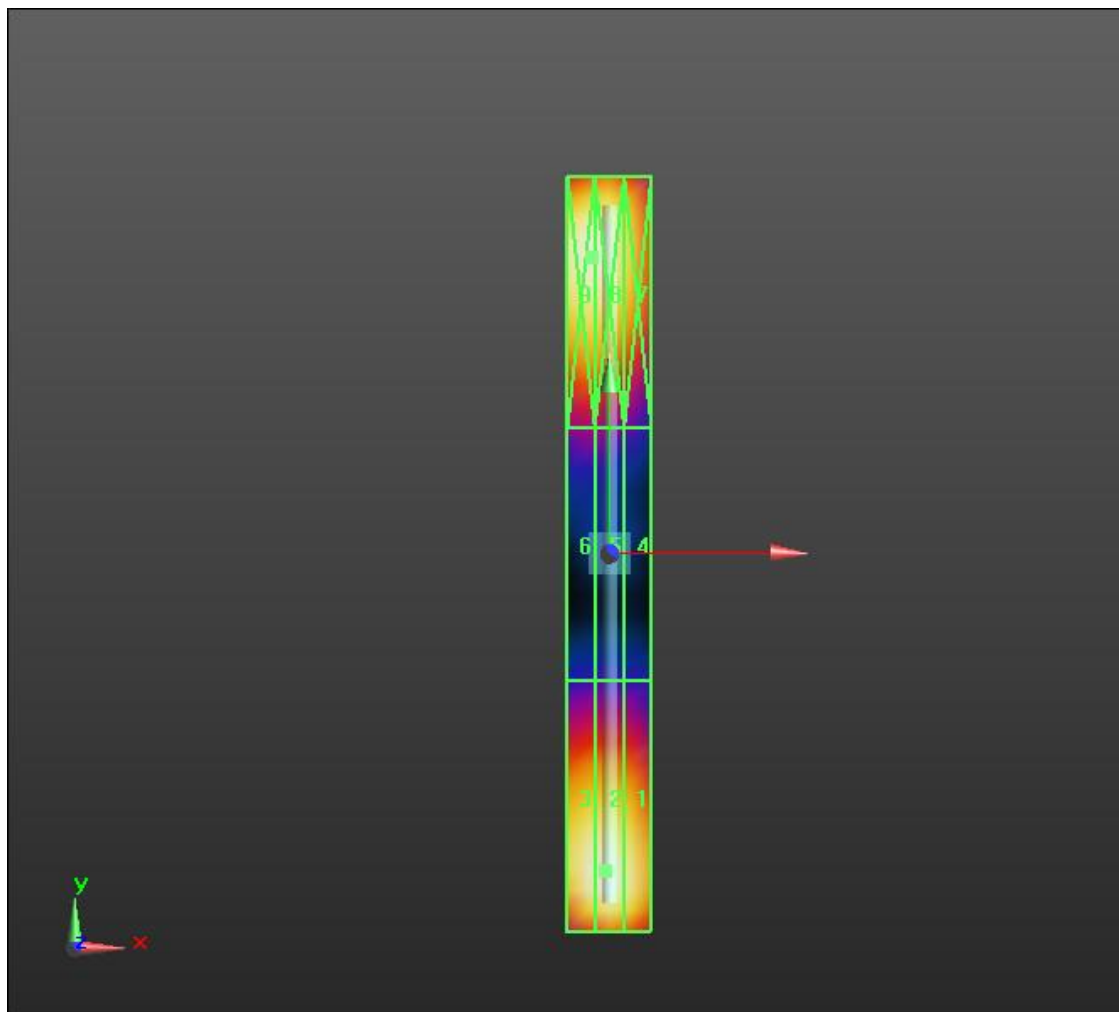
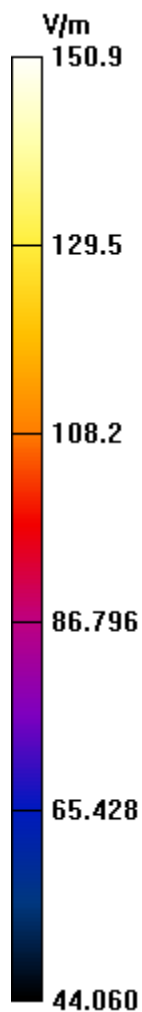
Grid 1 M4	Grid 2 M4	Grid 3 M4
97.87 V/m	100.5 V/m	99.46 V/m
Grid 4 M4	Grid 5 M4	Grid 6 M4
57.87 V/m	61.84 V/m	61.88 V/m
Grid 7 M4	Grid 8 M4	Grid 9 M4
93.62 V/m	100.8 V/m	100.8 V/m

Cursor:

Total = 100.8 V/m

E Category: M4

Location: -4, 70.5, 9.7 mm



7 RF MEASUREMENT PROCEDURE

- Proper operation of the probe, measurement system and instrumentation position was confirmed.
- WD was positioned in its proper test position according to Section 4 diagram of this report.
- A grid of 50mm X 50mm was scanned. This grid is divided into nine evenly sized sub grids.
- Once scan was completed a reading of each measurement point was recorded.
- The five lowest contiguous sub grids around the center grid were identified.
- Three sub grids of the maximum readings are eliminated.
- This identifies the six areas which are used to determine the WD highest emissions.
- 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 levels 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							
Scan Name	Date Tested	Band	Ch	Freq. MHz	Peak E-Field V/m	Drift dB	M-Rating
1	7/14/2016	iDEN 800	1	806.0125	48.04	0.17	M4
2			2	815.5125	46.27	0.11	M4
3			3	824.9875	46.02	0.01	M4
Overall M Rating							M4

8.2 TEST SEMCAD PLOTS

Scan 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, $\epsilon_r = 1$; $\rho = 0$ kg/m³

Phantom section: RF Section

Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2011)

DASY Configuration:

- Probe: ER3DV6 - SN2308; ConvF(1, 1, 1); Calibrated: 1/19/2016;
- Sensor-Surface: 0mm (Fix Surface), Sensor-Surface: (Fix Surface), z = 8.7
- Electronics: DAE4 Sn1287; Calibrated: 1/19/2016
- Phantom: HAC Test Arch with AMCC; Type: SD HAC P01 BA
- DASY52 52.8.8(1222); SEMCAD X 14.6.10(7331)

Device E-Field measurement (E-field scan for ANSI C63.19-2011 & -2011 compliance)/E Scan - ER3D: 15 mm from Probe Center to the Device/Hearing Aid Compatibility Test (11x11x1): Measurement grid: dx=5mm, dy=5mm

Device Reference Point: 0, 0, -6.3 mm

Reference Value = 51.68 V/m; Power Drift = 0.17 dB

PMR not calibrated. PMF = 1.000 is applied.

Maximum value of Total (measured) = 47.98 V/m

Device E-Field measurement (E-field scan for ANSI C63.19-2011 & -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 = 51.68 V/m; Power Drift = 0.17 dB

PMR not calibrated. PMF = 1.000 is applied.

E-field emissions = 47.62 V/m

Near-field category: M4 (AWF 0 dB)

PMF scaled E-field

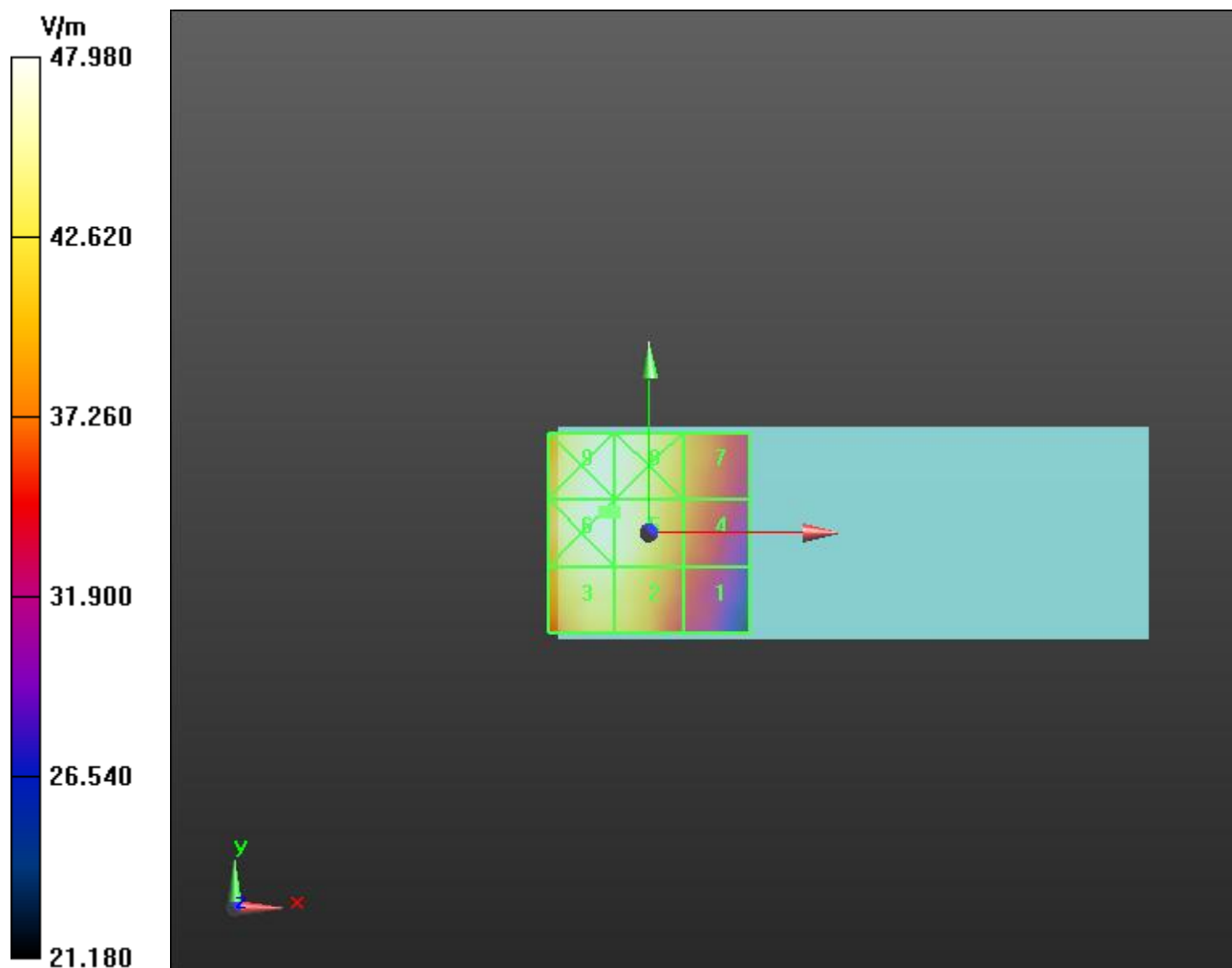
Grid 1 M4 36.11 V/m	Grid 2 M4 45.52 V/m	Grid 3 M4 46.02 V/m
Grid 4 M4 38.98 V/m	Grid 5 M4 47.62 V/m	Grid 6 M4 48.04 V/m
Grid 7 M4 40.15 V/m	Grid 8 M4 47.65 V/m	Grid 9 M4 47.81 V/m

Cursor:

Total = 48.04 V/m

E Category: M4

Location: -11, 5, 8.7 mm



Scan 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, $\epsilon_r = 1$; $\rho = 0$ kg/m³
Phantom section: RF Section
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2011)

DASY Configuration:

- Probe: ER3DV6 - SN2308; ConvF(1, 1, 1); Calibrated: 1/19/2016;
- Sensor-Surface: 0mm (Fix Surface), Sensor-Surface: (Fix Surface), z = 8.7
- Electronics: DAE4 Sn1287; Calibrated: 1/19/2016
- Phantom: HAC Test Arch with AMCC; Type: SD HAC P01 BA
- DASY52 52.8.8(1222); SEMCAD X 14.6.10(7331)

Device E-Field measurement (E-field scan for ANSI C63.19-2011 & -2011 compliance)/E Scan - ER3D: 15 mm from Probe Center to the Device/Hearing Aid Compatibility Test (11x11x1): Measurement grid: dx=5mm, dy=5mm
Device Reference Point: 0, 0, -6.3 mm
Reference Value = 47.34 V/m; Power Drift = 0.11 dB
PMR not calibrated. PMF = 1.000 is applied.
Maximum value of Total (measured) = 46.13 V/m

Device E-Field measurement (E-field scan for ANSI C63.19-2011 & -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 = 47.34 V/m; Power Drift = 0.11 dB
PMR not calibrated. PMF = 1.000 is applied.
E-field emissions = 44.95 V/m
Near-field category: M4 (AWF 0 dB)

PMF scaled E-field

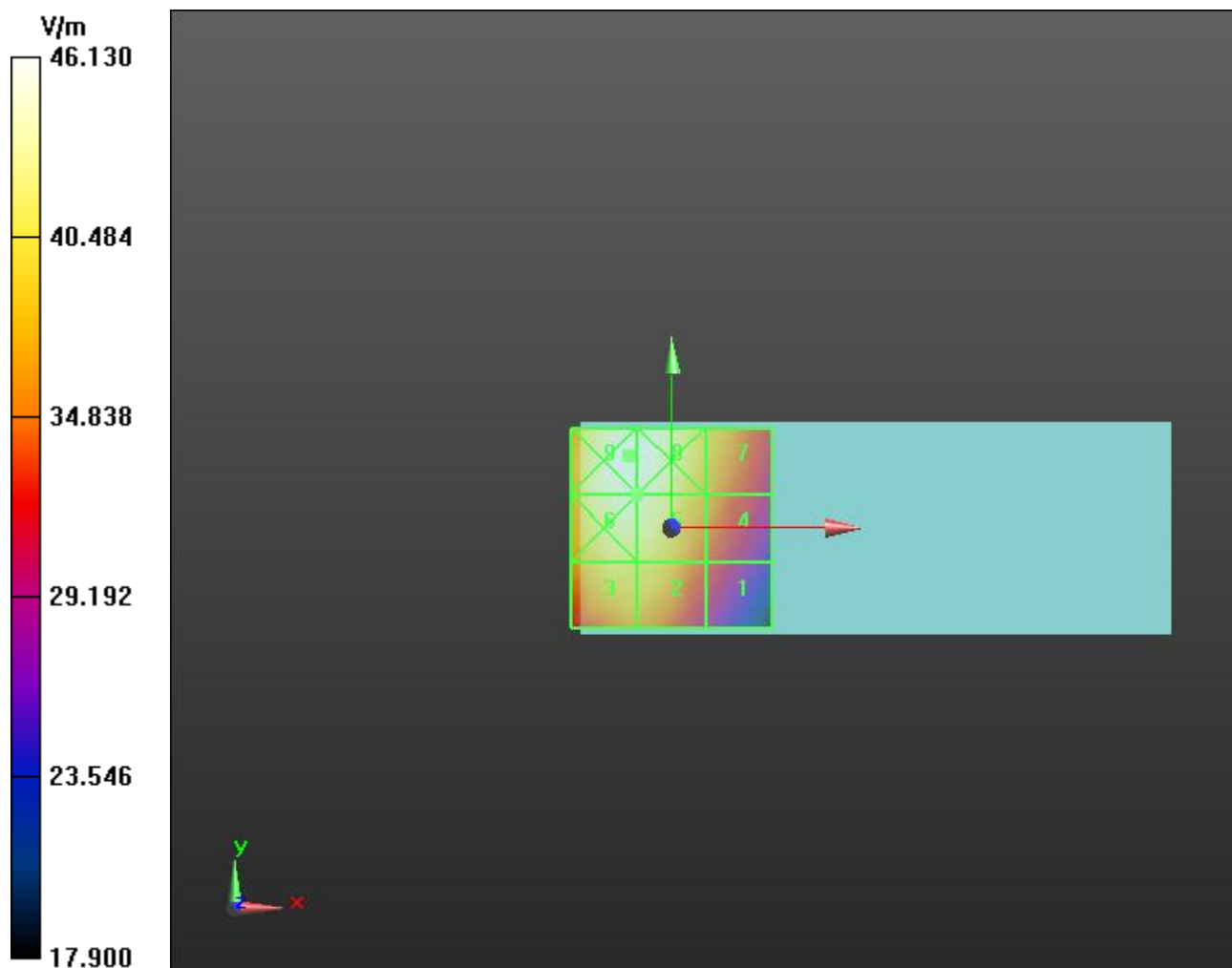
Grid 1 M4 32.61 V/m	Grid 2 M4 40.57 V/m	Grid 3 M4 40.98 V/m
Grid 4 M4 36.74 V/m	Grid 5 M4 44.95 V/m	Grid 6 M4 45.13 V/m
Grid 7 M4 39.08 V/m	Grid 8 M4 46.17 V/m	Grid 9 M4 46.27 V/m

Cursor:

Total = 46.27 V/m

E Category: M4

Location: -10.5, 18, 8.7 mm



Scan 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, $\epsilon_r = 1$; $\rho = 0$ kg/m³
Phantom section: RF Section
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2011)

DASY Configuration:

- Probe: ER3DV6 - SN2308; ConvF(1, 1, 1); Calibrated: 1/19/2016;
- Sensor-Surface: 0mm (Fix Surface), Sensor-Surface: (Fix Surface), z = 8.7
- Electronics: DAE4 Sn1287; Calibrated: 1/19/2016
- Phantom: HAC Test Arch with AMCC; Type: SD HAC P01 BA
- DASY52 52.8.8(1222); SEMCAD X 14.6.10(7331)

Device E-Field measurement (E-field scan for ANSI C63.19-2011 & -2011 compliance)/E Scan - ER3D: 15 mm from Probe Center to the Device/Hearing Aid Compatibility Test (11x11x1): Measurement grid: dx=5mm, dy=5mm
Device Reference Point: 0, 0, -6.3 mm
Reference Value = 49.25 V/m; Power Drift = 0.01 dB
PMR not calibrated. PMF = 1.000 is applied.
Maximum value of Total (measured) = 45.99 V/m

Device E-Field measurement (E-field scan for ANSI C63.19-2011 & -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 = 49.25 V/m; Power Drift = 0.01 dB
PMR not calibrated. PMF = 1.000 is applied.
E-field emissions = 45.40 V/m
Near-field category: M4 (AWF 0 dB)

PMF scaled E-field

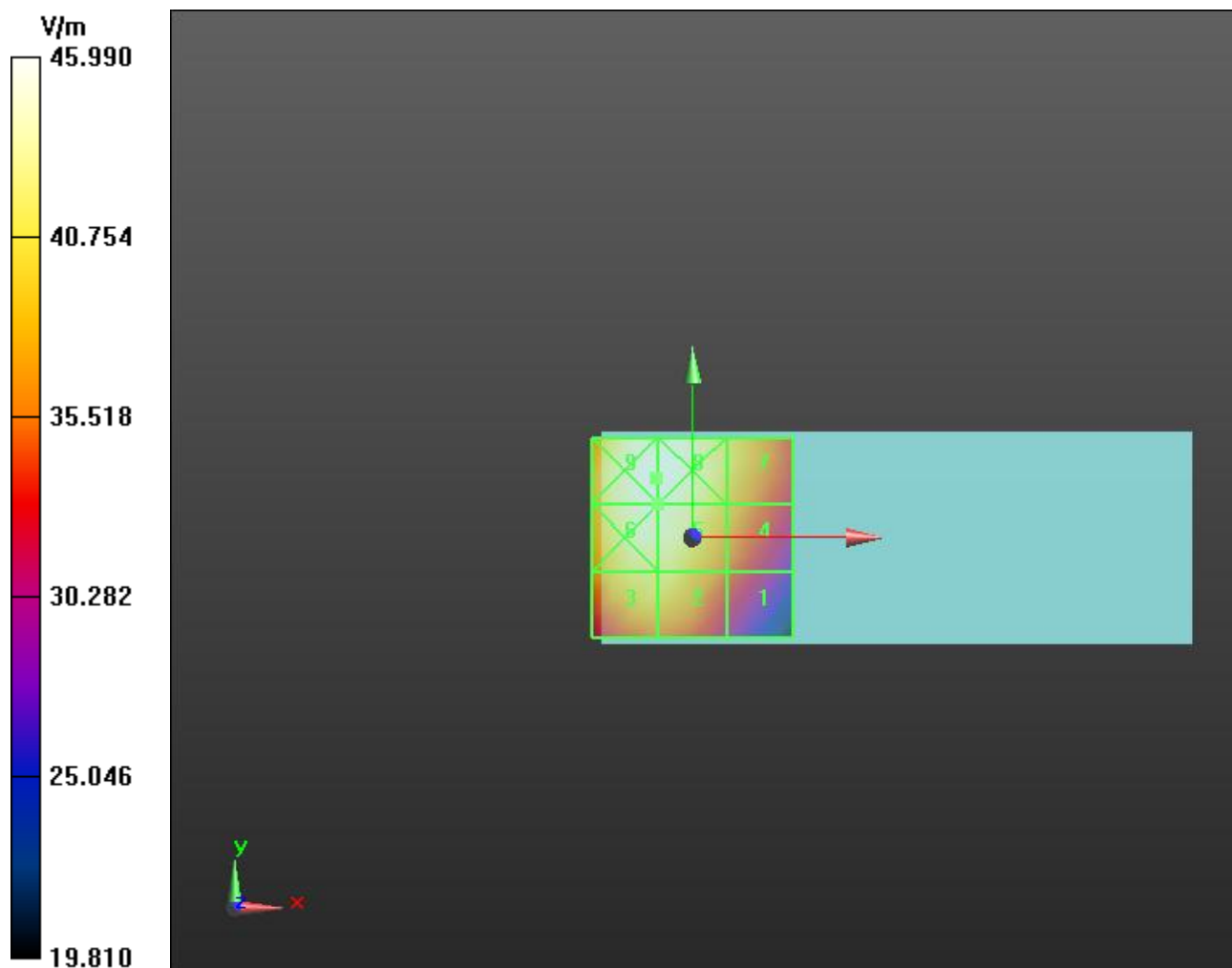
Grid 1 M4 34.56 V/m	Grid 2 M4 41.57 V/m	Grid 3 M4 41.57 V/m
Grid 4 M4 38.59 V/m	Grid 5 M4 45.40 V/m	Grid 6 M4 45.53 V/m
Grid 7 M4 40.70 V/m	Grid 8 M4 46.02 V/m	Grid 9 M4 46.02 V/m

Cursor:

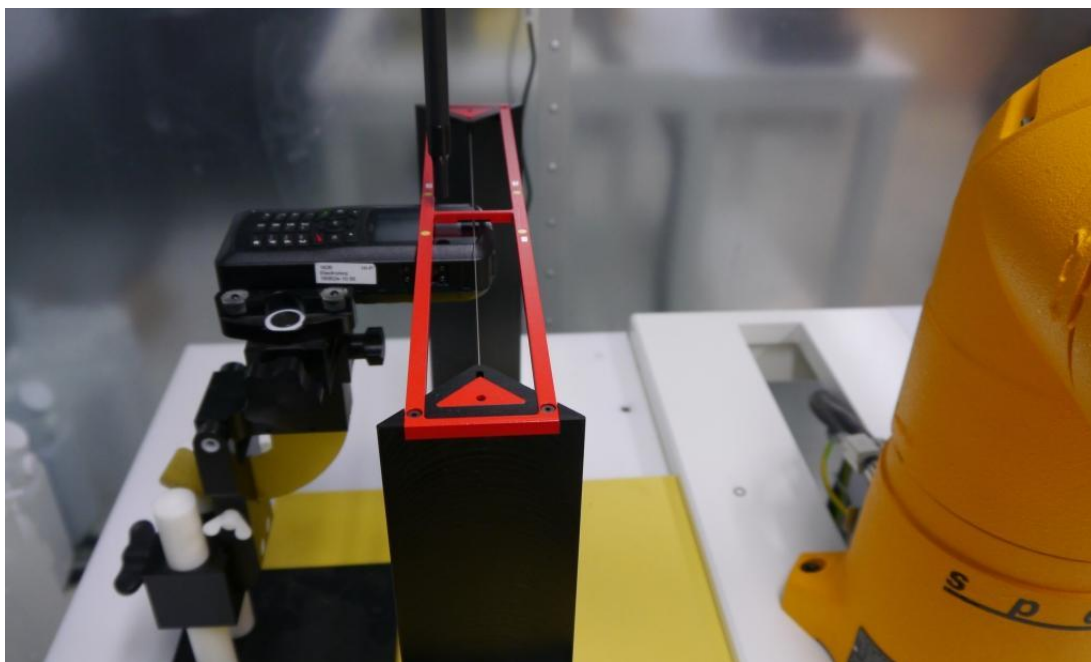
Total = 46.02 V/m

E Category: M4

Location: -9, 15, 8.7 mm



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".

11 REVISION HISTORY

Revision Level	Description of changes	Revision Date
0	Initial release	7/15/2016