Registration No.788871

TEST REPORT
FOR HAC RF Emission

Report No. : SRTC2018-9004(F)-18030601(J)

Product Name: Mobile Phone

Product Model: H1A1000

Applicant: RED Technologies LLC

Manufacturer: RED Technologies LLC

Specification: FCC Part 20.19 (2017-10)

ANSI C63.19-2011

FCC ID: 2AOYWH1A1000

The State Radio_monitoring_center Testing Center (SRTC)

15th Building, No.30, Shixing Street, Shijingshan District, Beijing, P.R.China

Tel: 86-10-57996183 Fax: 86-10-57996388

Contents

1 GENERAL INFORMATION

1.1 Notes of the test report

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The test results relate only to individual items of the samples which have been tested.

1.2 Information about the testing laboratory

Company:	The State Radio_monitoring_center Testing Center (SRTC)
Address:	15th Building, No.30 Shixing Street, Shijingshan District, Beijing P.R.China
City:	Beijing
Country or Region:	P.R.China
Contacted person:	Liu Jia
Tel:	+86 10 57996183
Fax:	+86 10 57996388
Email:	liujiaf@srtc.org.cn

1.3 Applicant's details

Company:	RED Technologies LLC
Address:	34 Parker, Irvine, California, United States
City:	Irvine
Country or Region:	United States
Grantee Code:	2AOYW
Contacted person:	Doug Kwon
Tel:	9492067900 ext 7794
Fax:	---
Email:	Doug.kwon@Red.com

1.4 Manufacturer's details

Company:	RED Technologies LLC
Address:	34 Parker, Irvine, California, United States
City:	Irvine
Country or Region:	United States
Contacted person:	Doug Kwon
Tel:	9492067900 ext 7794
Fax:	---
Email:	Doug.kwon@Red.com

1.5 Test Environment

Date of Receipt of test sample at SRTC:	2018.04.28
Testing Start Date:	2018.04.30
Testing End Date:	2018.07.27

Environmental Data:	Temperature (°C)	Humidity (%)
Ambient	21.0-23.0	40.0-45.0

Normal Supply Voltage (V d.c.):	3.85

2 DESCRIPTION OF THE DEVICE UNDER TEST

2.1 Final Equipment Build Status

Wireless Technology and Frequency Bands	☒GSM Band: GSM850/PCS1900 ☒CDMA Band: BC0/BC1 ☒WCDMA Band: FDD2/4/5 ☒LTE Band: FDD2/3/4/5/7/12/13/14/17/18/19/25/26/28/29/30/66 TDD38/40/41 ☒Bluetooth Band: 2.4GHz~2.4835GHz ☒Wi-Fi Band: 2.4GHz ,5GHz(U-NII-1,U-NII-3)
Mode	GSM ☒Voice (GMSK) ☒GPRS (GMSK) ☒EGPRS (GMSK/8PSK) CDMA2000 ☒1x RTT ☒1x EV-DO WCDMA ☒UMTS Rel. 99 (Voice & Data) ☒HSDPA (Rel. 5) ☒HSUPA (Rel. 6) ☒HSPA+ (Rel.) ☒DC-HSDPA (Rel.) Wi-Fi (802.11a/b/g/n) ☒802.11a ☒802.11b ☒802.11g ☒802.11n (20MHz) ☒802.11n (40MHz) ☒802.11ac (20MHz) ☒802.11ac (40MHz) ☒802.11ac (80MHz) ☐802.11ac (160MHz) Bluetooth ☒BR(GFSK) ☒EDR(π/4 DQPSK , 8-DPSK) ☒BLE(GFSK) LTE ☒QPSK ☒16QAM ☐64QAM

Note: We don't need to consider LTE band3,18,19,28,29 (CA-downlink),40 in the report according to "LTE in FCC Bands and Services"

2.2 Support Equipment

The following support equipment was used to exercise the DUT during testing:

State of sample	Normal
Headset	QZESDM1532001A00/KAN TSANG iNDUSTRIAL CO.Ltd
Batteries	RED-A2H-4500/DONGGUAN DRN NEW ENERGY CO.,LTD
H/W Version S/W Version	EVT2.1 HiA1000.005ho.01.00.01d.403
IMEI	355929090024713/355929090025314
Normal	operation
Back	The Back Cover is not removable
Notes	Considering the worst condition, We used SIM card hold1 perform all the test.

3 REFERENCE SPECIFICATION

Specification	Version	Title
Part 20.19	2017	Hearing aid-compatible mobile handsets.
C63.19	2011	American National Standard Methods of Measurement of Compatibility between Wireless Communications Devices and Hearing Aids
285076 D01	v05	HAC Guidance

4 TEST CONDITIONS

4.1 Test Signal, Frequencies, and Output Power

The transmitter of the device was put into operation by using a call tester communications between the device and the call tester were established by air link.
For all tests the device output power was set to maximum power level; a fully charged battery was used for every test sequence.
The measurements were performed on low, middle, high channels.

4.2 Device Holder

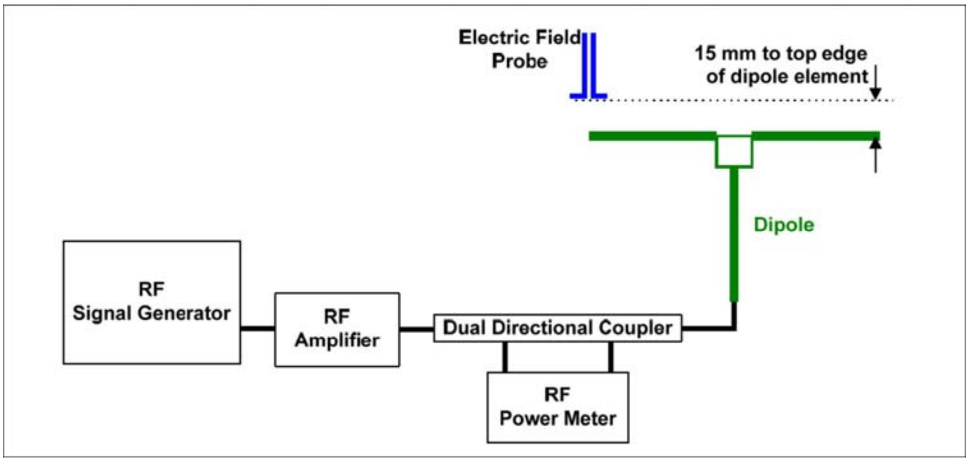
The Device Holder and Test Arch are manufactured by Speag,Test arch is used for all tests i.e. for both validation testing and device testing. The holder and test arch conforms to requirements of ANSI C63.19.
The SPEAG device holder was used to position the test device in all tests.

4.3 Validation of the system

4.3.1 System check description

The input signal was an unmodulated continuous wave. The following points were taken into consideration in performing this check :

- Average Input Power P=100mW RMS(20dBm RMS) after adjustment for return loss
- The test fixture must meet the 2 wavelength separation criterion
- The proper measurement of the 15 mm probe to dipole separation , which is measured from top surface of the dipole to the calibration reference point of the sensor , defined by probe manufacturer is shown in the following diagram:



Separation distance from dipole to field-probe

Scan the length of the dipole with the E-field probe and record the two maximum values found near the dipole ends. Average the two readings and compare the reading to the expected value in the calibration certificate or the expected value in this standard.

4.3.2 System validation E-field result

Date	f(MHz)	Input power (mW)	Max. measured from		Average	E-field Target Values (From SPEAG)	Deviation (%)
			E-Field above high end (V/m	E-Field above low end (V/m)	V/m	V/m	
2018/04/30	835	100	100.7	98.28	99.49	108.9	-8.64
2018/05/10	1880	100	90.49	87.04	88.77	89.4	-0.70
2018/06/25	2450	100	98.10	96.32	97.21	87.4	11.22
2018/07/27	2450	100	97.67	93.11	95.39	87.4	9.14

Notes:

1)Deviation = ((Average E-field Value) – (Target value)) / (Target value) * 100%. Deltas within ±25% are acceptable, of which 12% is deviation and 13% is measurement uncertainty.

2) The maximum E-field was evaluated and compared to the target values provided by SPEAG in the calibration certificate of specific dipoles.

3) Please refer to the appendix for detailed measurement data and plots. Plots of the system validation scans are given in Appendix A

5 RESULT SUMMAR

Mode	E-Field M Rating
GSM	M4
CDMA2000	M4
LTE-TDD	M4
WIFI 802.11g	M4
WCDMA&LTE& WIFI802.11b/n/a/ac	These applicable air-interfaces are exempt from testing in accordance with C63.19-2011 Clause 4.4 and are rated M4.
Final M Category	**M4**

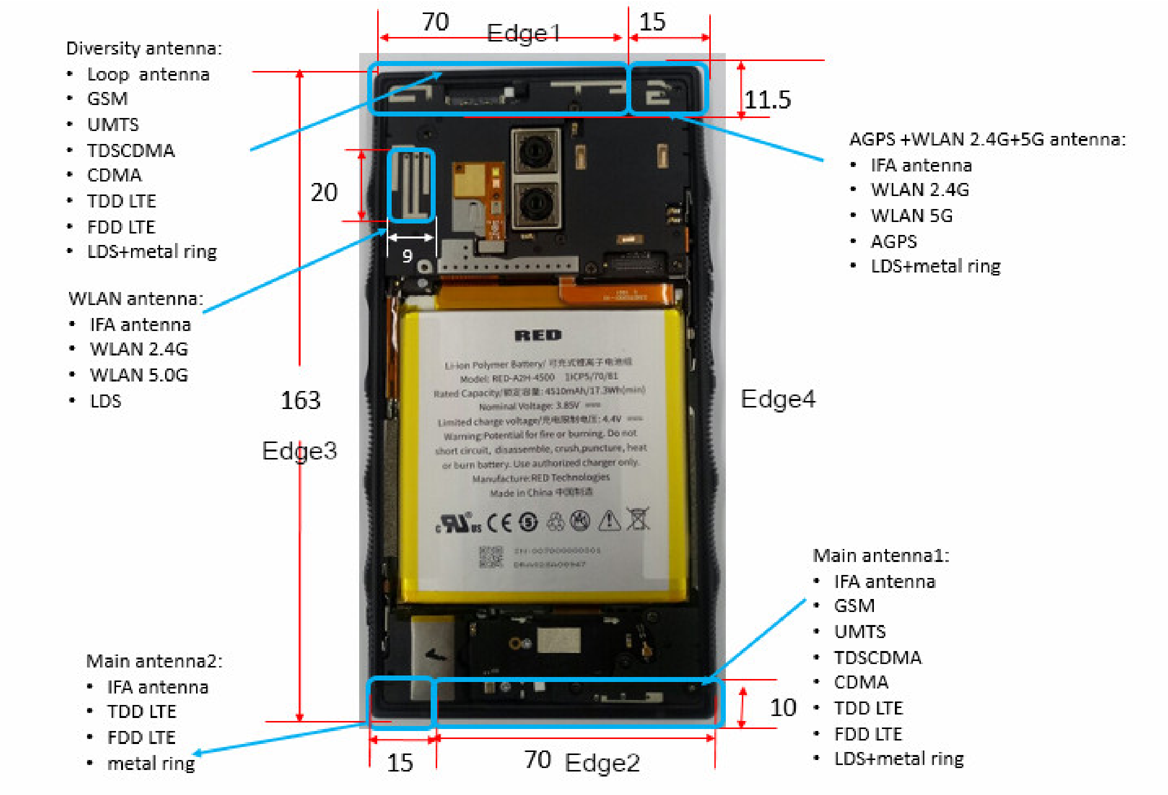
This Test Report Is Issued by: Mr. Peng Zhen 彭振	Checked by: Ms. Li Bin 李彬
Tested by: Mr. Chang Tianyu 常天宇	Issued date: 20180727

6 RF EXPOSURE CONDITIONS

Refer to the follow picture “Antenna Locations” there are 4 antennas in total, 2 licensed antennas and other two unlicensed antennas.

Licensed antennas:
Main antenna 1 support : GSM850/1900 ,CDMA BC0/BC1,WCDMA Band 2/4/5;LTE Band 2/4/5/12/13/14/17/25/26/66.
Main antenna 2 support : LTE 7/30/38/41.

Unlicensed antennas:
AGPS+WLAN2.4G+5G antenna: WIFI 2.4/5GHz ;Bluetooth 2.4GHz
WLAN antenna: WIFI 2.4/5GHz ;Bluetooth 2.4GHz



7 AVERAGE ANTENNA INPUT POWER & EVALUATION FOR LOW-POWER EXEMPTION

Max tune-up limit

Mode		Average Power (dBm)
GSM	GSM850	32.00
	GSM1900	28.00
CDMA2000	BC0	24.00
	BC1	23.50
WCDMA	WCDMA BAND2	22.00
	WCDMA BAND4	22.50
	WCDMA BAND5	24.00
FDD LTE	LTE BAND2	21.00
	LTE BAND4	21.00
	LTE BAND5	22.50
	LTE BAND7	23.20
	LTE BAND12	22.00
	LTE BAND13	22.50
	LTE BAND14	23.00
	LTE BAND17	22.00
	LTE BAND25	20.10
	LTE BAND26	22.50
	LTE BAND30	23.50
	LTE BAND66	21.00
TDD LTE	LTE BAND38	23.50
	LTE BAND41	23.90

Mode		Average Power (dBm)
2.4GHz WLAN Antenna 1	802.11b	19.00
	802.11g	18.50
	802.11n-HT20	17.00
	802.11n-HT40	17.00
5GHz WLAN Antenna 1	802.11a	14.00
	802.11n-HT20	14.00
	802.11n-HT40	14.00
	802.11ac-HT20	14.00
	802.11ac-HT40	14.00
	802.11ac-HT80	14.00
2.4GHz WLAN Antenna 2	802.11b	19.00
	802.11g	18.50
	802.11n-HT20	17.00
	802.11n-HT40	17.00
5GHz WLAN Antenna 2	802.11a	12.00
	802.11n-HT20	12.00
	802.11n-HT40	11.00
	802.11ac-HT20	12.00
	802.11ac-HT40	11.00
	802.11ac-HT80	10.00

Note：For WIFI2.4GHz, the performance of each antenna chain are similar, but for 5G frequency bands, the average antenna1 input power is much high than the average antenna2 input power

Air-Interface		Max Interface Average Antenna Input Power (dBm)	Worst Case MIF (dB)	Input Power plus its MIF (dBm)	HAC Tested
GSM850		**32.00**	**3.63**	**35.63**	**Yes**
GSM1900		**28.00**	**3.63**	**31.63**	**Yes**
CDMA2000 BC0		**24.00**	**3.26**	**27.26**	**Yes**
CDMA2000 BC1		**23.50**	**3.26**	**26.76**	**Yes**
WCDMA		24.00	-27.23	-3.23	No
LTE - FDD(16QAM)		23.50	-9.76	13.74	No
LTE - TDD	**QPSK**	**23.50**	**-1.62**	**21.88**	**Yes**
	16QAM	23.00	-1.44	21.56	No(1)
802.11b Ant1 2.4GHz		19.00	-2.02	16.98	No
802.11g Ant1 2.4GHz		**18.50**	**0.12**	**18.62**	**Yes(2)**
802.11n-HT20 Ant1 2.4GHz		17.00	-5.61	11.39	No
802.11n-HT40 Ant1 2.4GHz		17.00	-5.59	11.41	No
802.11a Ant1 5GHz		14.00	-3.15	10.85	No
802.11n-HT20 Ant1 5GHz		14.00	-5.61	8.39	No
802.11n-HT40 Ant1 5GHz		14.00	-5.59	8.41	No
802.11ac-HT20 Ant1 5GHz		14.00	-5.60	8.40	No
802.11ac-HT40 Ant1 5GHz		14.00	-5.57	8.43	No
802.11ac-HT80 Ant1 5GHz		14.00	-5.64	8.36	No
802.11b Ant2 2.4GHz		19.00	-2.02	16.98	No
802.11g Ant2 2.4GHz		**18.50**	**0.12**	**18.62**	**Yes(2)**
802.11n-HT20 Ant2 2.4GHz		17.00	-5.61	11.39	No
802.11n-HT40 Ant2 2.4GHz		17.00	-5.59	11.41	No
802.11a Ant2 5GHz		12.00	-3.15	8.85	No
802.11n-HT20 Ant2 5GHz		12.00	-5.61	6.39	No
802.11n-HT40 Ant2 5GHz		11.00	-5.59	5.41	No
802.11ac-HT20 Ant2 5GHz		12.00	-5.60	6.40	No
802.11ac-HT40 Ant2 5GHz		11.00	-5.57	5.43	No
802.11ac-HT80 Ant2 5GHz		10.00	-5.64	4.36	No

Note:

1): GPRS / EGPRS data modes and TDD 16QAM are not necessary due the GSM Voice mode and TDD QPSK modulation are the worst case.

2): There are two WIFI antennas, and we use the guidance provided by customer to evaluate the compliance individually.

3): The reason why we choose LTE-FDD with 16QAM modulation is that MIF for 16QAM is much larger than MIF for QPSK (refer to MIF documents supplied by SPEAG), while the variance of conducted power for each modulation is within 2db, so we consider the worst condition. But for LTE-TDD, both MIF and conducted power for each modulation are very similar and we list these two modulation types.

4): According to ANSI C63.19 2011-version, a device is exempt from testing when its average antenna input power plus its MIF is ≤17 dBm for any of its operating modes. If a device supports multiple RF air interfaces, each RF air interface shall be evaluated individually.

5): HAC RF rating is M4 for the air interface which meets the low power exemption.

8 AIR INTERFACES AND OPERATING MODE

Air interface	Bands (MHz)	Type	ANSI C63.19 Tested	Simultaneous Transmitter	Voice Service	Power Reduction
GSM	GSM850	VO	YES	WIFI, BT	CMRS Voice	NA
	GSM1900		YES	WIFI, BT	CMRS Voice	**No**
	GPRS/EGPRS(850&1900)	DT	NO	WIFI, BT	NA	NA
CDMA 2000	BC0 1xRTT	VO	YES	WIFI, BT	CMRS Voice	NA
	BC1 1xRTT		YES	WIFI, BT	CMRS Voice	NA
	1x EVDO (BC0/BC1)	DT	NO	WIFI, BT	NA	NA
WCDMA (UMTS)	Band 2	VO	YES	WIFI, BT	CMRS Voice	NA
	Band 4	VO	YES	WIFI, BT	CMRS Voice	NA
	Band 5	VO	YES	WIFI, BT	CMRS Voice	NA
	HSPA&HSPA+(Band 2/4/5)	DT	NO	WIFI, BT	NA	NA
LTE (FDD)	LTE BAND2	VD	NO	WIFI, BT	VoLTE	NA
	LTE BAND4			WIFI, BT		NA
	LTE BAND5			WIFI, BT		NA
	LTE BAND7			WIFI, BT		NA
	LTE BAND12			WIFI, BT		NA
	LTE BAND13			WIFI, BT		NA
	LTE BAND14			WIFI, BT		NA
	LTE BAND17			WIFI, BT		NA
	LTE BAND25			WIFI, BT		NA
	LTE BAND26			WIFI, BT		NA
	LTE BAND30			WIFI, BT		NA
	LTE BAND66			WIFI, BT		NA
LTE (TDD)	LTE BAND38	VD	YES	WIFI, BT	VoLTE	NA
	LTE BAND41			WIFI, BT		NA

Air interface	Bands (MHz)	Type	ANSI C63.19 Tested	Simultaneous Transmitter	Voice Service	Power Reduction
WIFI	2.4GHz	VD	YES	GSM,WCDMA,LTE	VoWiFi	NA
	5GHz(U-NII-1)			GSM,WCDMA,LTE,BT		NA
	5GHz(U-NII-3)			GSM,WCDMA,LTE,BT		NA
BT	2.4GHz	DT	NO	GSM,WCDMA,LTE, WIFI 5G	NA	NA

Abbreviation Type
VO=CMRS Voice Service
DT = Digital Transport
VD=CMRS or IP **V**oice Service and **D**igital Transport
BT=Bluetooth

Note:

1). WCDMA and LTE is exempted from testing by low power exemption that its average antenna input power plus its MIF is ≤17dBm
2). For Simultaneous transmission , WIFI 2.4GHz cannot work with Bluetooth(2.4G)at the same time. But WIFI 5GHz could work with BT together.

9 MODULATION INTERFERENCE FACTOR (MIF)

The HAC Standard ANSI C63.19-2011 defines a new scaling using the Modulation Interference Factor (MIF) which replaces the need for the Articulation Weighting Factor (AWF) during the evaluation and is applicable to any modulation scheme.
The Modulation Interference factor (MIF, in dB) is added to the measured average E-field (in dBV/m) and converts it to the RF Audio Interference level (in dBV/m). This level considers the audible amplitude modulation components in the RF E-field. CW fields without amplitude modulation are assumed to not interfere with the hearing aid electronics. Modulations without time slots and low fluctuations at low frequencies have low MIF values, TDMA modulations with narrow transmission and repetition rates of few 100 Hz have high MIF values and give similar classifications as ANSI C63-2007.
Definitions
ER3D, E-field probes have a bandwidth <10 kHz and can therefore not evaluate the RF envelope in the full audio band. DASY52 is therefore using the "indirect" measurement method according to ANSI C63.19-2011 which is the primary method. These near field probes read the averaged E-field measurement. Especially for the new high peak-to-average (PAR) signal types, the probes shall be linearized by probe modulation response (PMR) calibration in order to not overestimate the field reading.
The evaluation method or the MIF is defined in ANSI C63.19-2011 section D.7. An RMS demodulated RF signal is fed to a spectral filter (similar to an A weighting filter) and forwarded to a temporal filter acting as a quasi-peak detector. The averaged output of these filtering is called to a 1 kHz 80% AM signal as reference. MIF measurement requires additional instrumentation and is not well suited for evaluation by the end user with reasonable uncertainty It may alternatively be determined through analysis and simulation, because it is constraint and characteristic for a communication signal. DASY52 uses well defined signals for PMR calibration. The MIF of these signals has been determined by simulation and is automatically applied.
MIF values were not tested by a probe or as specified in the standards but are based on analysis provided by SPEAG for all the air interfaces (GSM, WCDMA, CDMA, LTE, WIFI).

MIF values applied in this test report were provided by the HAC equipment provider of SPEAG, and the **worst values** for all air interface are listed below to be determine the Low-power Exemption.

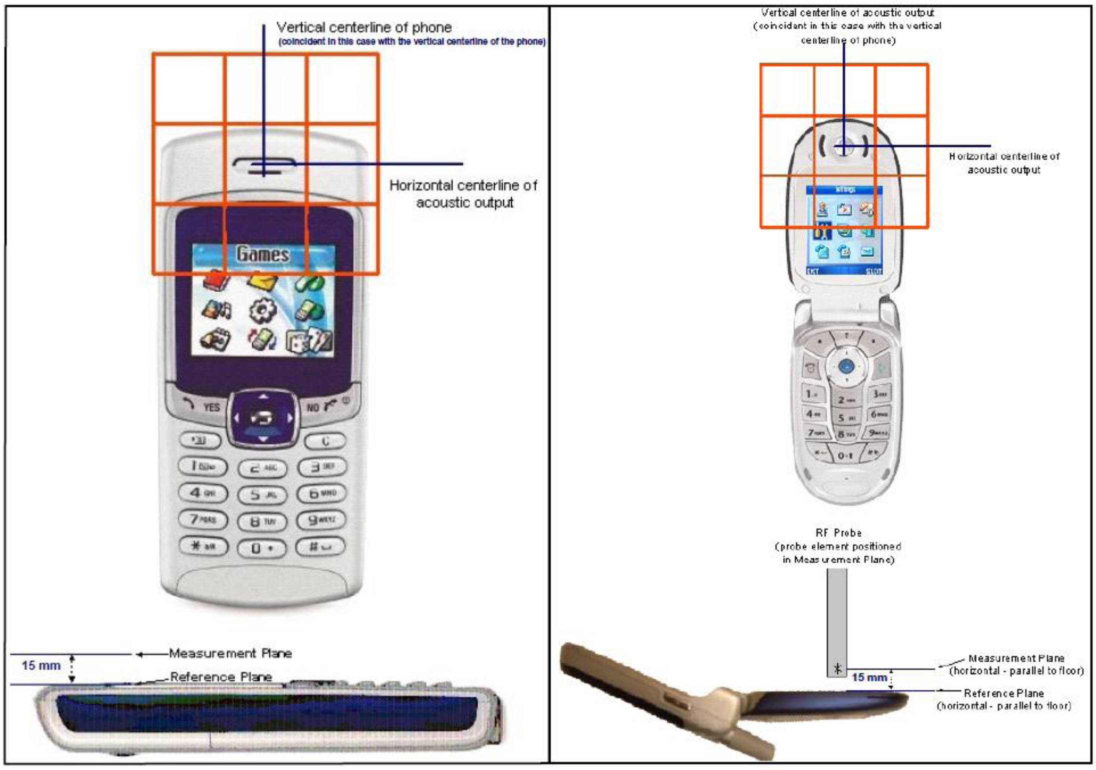
UID	Communication system name	MIF(dB)
10021	**GSM-FDD(TDMA,GMSK)**	**3.63**
10295	**CDMA2000, RC1, SO3, 1/8th Rate 25 fr.**	**3.26**
10011	UMTS-FDD (WCDMA)	-27.23
10170	LTE-FDD (SC-FDMA, 1 RB, 20 MHz, 16-QAM)	-9.76
10182	LTE-FDD (SC-FDMA, 1 RB, 15 MHz, 16-QAM)	-9.76
10176	LTE-FDD (SC-FDMA, 1 RB, 10 MHz, 16-QAM)	-9.76
10172	**LTE-TDD (SC-FDMA, 1 RB, 20 MHz, QPSK)**	**-1.62**
10173	LTE-TDD (SC-FDMA, 1 RB, 20 MHz, 16-QAM)	-1.44

UID	Communication system name	MIF(dB)
10061	IEEE 802.11b WiFi 2.4 GHz (DSSS, 11 Mbps)	-2.02
10077	**IEEE 802.11g WiFi 2.4 GHz (DSSS/OFDM, 54 Mbps)**	**0.12**
10591	IEEE 802.11n (HT Mixed, 20MHz, MCS0, 90pc duty cycle)	-5.61
10599	IEEE 802.11n (HT Mixed, 40MHz, MCS0, 90pc duty cycle)	-5.59
10069	IEEE 802.11a/h WiFi 5 GHz (OFDM, 54 Mbps)	-3.15
10607	IIEEE 802.11ac WiFi (20MHz, MCS0, 90pc duty cycle)	-5.60
10616	IEEE 802.11ac WiFi (40MHz, MCS0, 90pc duty cycle)	-5.57
10626	IEEE 802.11ac WiFi (80MHz, MCS0, 90pc duty cycle)	-5.64

Note: The nominal MIF values for PMR calibration waveforms has been determined from sampled RF signals with numerical evaluation. AIA measurements were used to verify these results. The correlation allows to quantify the uncertainty of the nominal MIF: **0.2 dB for MIF in the range -7 to +5 dB**, 0.5 dB in the range -13 to +11 dB, 1.0 dB for MIF > -20 dB. Modulation with low MIF, low modulation frequency (< 50 Hz) or high dynamic range (PAR > 10 dB) result in higher uncertainties for the measurement.

10 HAC RF EMISSIONS TEST PROCEDURE

The following are step-by-step test procedures.
a) Confirm proper operation of the field probe, probe measurement system and other instrumentation and the positioning system.
b) Position the WD in its intended test position.
c) Set the WD to transmit a fixed and repeatable combination of signal power and modulation characteristic that is representative of the worst case (highest interference potential) encountered in normal use. Transiently occurring start-up, changeover, or termination conditions, or other operations likely to occur less than 1% of the time during normal operation, may be excluded from consideration.
d) The center sub-grid shall be centered on the T-Coil mode perpendicular measurement point or the acoustic output, as appropriate. Locate the field probe at the initial test position in the 50 mm by 50 mm grid, which is contained in the measurement plane, refer to illustrated in Figure 1. If the field alignment method is used, align the probe for maximum field reception.
e) Record the reading at the output of the measurement system
f) Scan the entire 50 mm by 50 mm region in equally spaced increments and record the reading at each measurement point. The distance between measurement points shall be sufficient to assure the identification of the maximum reading.
g) Identify the five contiguous sub-grids around the center sub-grid whose maximum reading is the lowest of all available choices. This eliminates the three sub-grids with the maximum readings. Thus, the six areas to be used to determine the WD's highest emissions are identified.
h) Identify the maximum reading within the non-excluded sub-grids identified in step g).
i) Convert the highest field reading within identified in step h) to RF audio interference level, in V/m, by taking the square root of the reading and then dividing it by the measurement system transfer function, established in 5.5.1.1 Convert this result to dB(V/m) by taking the base-10 logarithm and multiplying by 20.
Indirect measurement method
Replacing step i), the RF audio interference level in dB (V/m) is obtained by adding the MIF (in dB) to the maximum steady-state rms field-strength reading, in dB (V/m), from step h). Use this result to determine the category rating
j) Compare this RF audio interference level with the categories in Clause 8 (ANSI C63.19-2011) and record the resulting WD category rating
k) For the T-Coil mode M-rating assessment, determine whether the chosen perpendicular measurement point is contained in an included sub-grid of the first scan. If so, then a second scan is not necessary. The first scan and resultant category rating may be used for the T-Coil mode M rating.



WD reference and plane for RF emission measurements

Test Instructions

- Confirm proper operation of probes and instrumentation
- Position WD
- Configure WD TX operation

Per 5.4.1.2 (1-3)

↓

- Initialize field probe
- Scan Area

Per 5.4.1.2 (4-6)

↓

- Identify exclusion area.
- Rescan or reanalyze open area to determine maximum
- Direct method: Record RF Audio Interference Level, in dB(V/m)
- Indirect method: Add the MIF to the maximum steady state rms field strength and record RF Audio Interference Level, in dB(V/m)

Per 5.4.1.2 (7-9) & 5.4.1.3

↓

- Identify and record the category

Per 5.4.1.2 (9-10)

Test flowchart Per ANSI-C63.19 2011

11 RF EMISSIONS MEASUREMENT CRITERIA

WD RF audio interference level categories in logarithmic units

Emission categories	<960 MHz	
	E-field emissions	
Category M1	50 to 55	dB (V/m)
Category M2	45 to 50	dB (V/m)
Category M3	40 to 45	dB (V/m)
Category M4	<40	dB (V/m)

Emission categories	>960 MHz	
	E-field emissions	
Category M1	40 to 45	dB (V/m)
Category M2	35 to 40	dB (V/m)
Category M3	30 to 35	dB (V/m)
Category M4	<30	dB (V/m)

12 HAC RF EMISSIONS TEST RESULTS

Air-interface	Mode	Channel	E-Field (dBV/m)	E-Field plus 0.2db MIF Uncertainty (dBV/m)*	M-Rating
GSM850	GSM-FDD (TDMA,GMSK)	128	26.28	26.48	M4
		189	28.75	28.95	M4
		251	24.03	24.23	M4
GSM1900		512	23.89	24.09	M4
		661	22.49	22.69	M4
		810	22.58	22.78	M4
CDMA2000 BC0	CDMA2000, RC1, SO3, 1/8th Rate 25 fr.	1013	18.05	18.25	M4
		384	17.60	17.80	M4
		777	17.13	17.33	M4
CDMA2000 BC1		25	19.29	19.49	M4
		600	17.89	18.09	M4
		1175	18.16	18.36	M4
LTE Band38	LTE-TDD (SC-FDMA, 1 RB, 20 MHz, QPSK)	37850	18.89	19.09	M4
		38000	19.17	19.37	M4
		38150	19.50	19.70	M4
LTE Band41		39750	18.51	18.71	M4
		40185	18.48	18.68	M4
		40620	18.59	18.79	M4
		41055	18.81	19.01	M4
		41490	18.69	18.89	M4
802.11g(Ant1)	IEEE 802.11g WiFi 2.4 GHz (DSSS/OFDM, 54 Mbps)	1	25.70	25.90	M4
		6	26.76	26.96	M4
		11	26.64	26.84	M4
802.11g(Ant2)		1	24.80	25.00	M4
		6	24.25	24.45	M4
		11	24.58	24.78	M4

Note:

1*): The following MIF values used for each communication system in this report, and 0.2 dB uncertainty for MIF in the range -7 to +5 dB

GSM-FDD(TDMA,GMSK)	3.63
CDMA2000, RC1, SO3, 1/8th Rate 25 fr.	3.26
LTE-TDD (SC-FDMA, 1 RB, 20 MHz, QPSK)	-1.62
IEEE 802.11g WiFi 2.4 GHz (DSSS/OFDM, 54 Mbps)	0.12

2): The HAC measurement system applies MIF value onto the measured RMS E-field, which is indirect method in ANSI C63.19 2011 version, and reports the RF audio interference level.

3): Phone Condition: Mute on; Backlight off; Max Volume

13 MEASUREMENT UNCERTAINTY

HAC Uncertainty Budget
According to ANSI C63.19 [1], [2]

Error Description	Uncert. value	Prob. Dist.	Div.	(c_i) E	(c_i) H	Std. Unc. E	Std. Unc. H
Measurement System							
Probe Calibration	±5.1 %	N	1	1	1	±5.1 %	±5.1 %
Axial Isotropy	±4.7 %	R	$\sqrt{3}$	1	1	±2.7 %	±2.7 %
Sensor Displacement	±16.5 %	R	$\sqrt{3}$	1	0.145	±9.5 %	±1.4 %
Boundary Effects	±2.4 %	R	$\sqrt{3}$	1	1	±1.4 %	±1.4 %
Phantom Boundary Effect	±7.2 %	R	$\sqrt{3}$	1	0	±4.1 %	±0.0 %
Linearity	±4.7 %	R	$\sqrt{3}$	1	1	±2.7 %	±2.7 %
Scaling with PMR calibration	±10.0 %	R	$\sqrt{3}$	1	1	±5.8 %	±5.8 %
System Detection Limit	±1.0 %	R	$\sqrt{3}$	1	1	±0.6 %	±0.6 %
Readout Electronics	±0.3 %	N	1	1	1	±0.3 %	±0.3 %
Response Time	±0.8 %	R	$\sqrt{3}$	1	1	±0.5 %	±0.5 %
Integration Time	±2.6 %	R	$\sqrt{3}$	1	1	±1.5 %	±1.5 %
RF Ambient Conditions	±3.0 %	R	$\sqrt{3}$	1	1	±1.7 %	±1.7 %
RF Reflections	±12.0 %	R	$\sqrt{3}$	1	1	±6.9 %	±6.9 %
Probe Positioner	±1.2 %	R	$\sqrt{3}$	1	0.67	±0.7 %	±0.5 %
Probe Positioning	±4.7 %	R	$\sqrt{3}$	1	0.67	±2.7 %	±1.8 %
Extrap. and Interpolation	±1.0 %	R	$\sqrt{3}$	1	1	±0.6 %	±0.6 %
Test Sample Related							
Device Positioning Vertical	±4.7 %	R	$\sqrt{3}$	1	0.67	±2.7 %	±1.8 %
Device Positioning Lateral	±1.0 %	R	$\sqrt{3}$	1	1	±0.6 %	±0.6 %
Device Holder and Phantom	±2.4 %	R	$\sqrt{3}$	1	1	±1.4 %	±1.4 %
Power Drift	±5.0 %	R	$\sqrt{3}$	1	1	±2.9 %	±2.9 %
Phantom and Setup Related							
Phantom Thickness	±2.4 %	R	$\sqrt{3}$	1	0.67	±1.4 %	±0.9 %
Combined Std. Uncertainty						±16.3 %	±12.3 %
Expanded Std. Uncertainty on Power						±32.6 %	±24.6 %
Expanded Std. Uncertainty on Field						±16.3 %	±12.3 %

14 TEST EQUIPMENTS

The measurements were performed using an automated near-field scanning system, DASY5, manufactured by Schmid & Partner Engineering AG (SPEAG) in Switzerland .

The following table lists calibration dates of SPEAG components:

Test equipment	Model	S/N	Cal Date	Cal Due Date
DAE	DAE 4	720	2017.10.30	2018.10.29
E-field probe	ER3DV6	2368	2017.11.08	2018.11.07
Dipole	CD835V3	1106	2017.10.30	2018.10.29
Dipole	CD1880V3	1075	2017.10.30	2018.10.29
Dipole	CD2450V3	1069	2017.10.30	2018.10.29

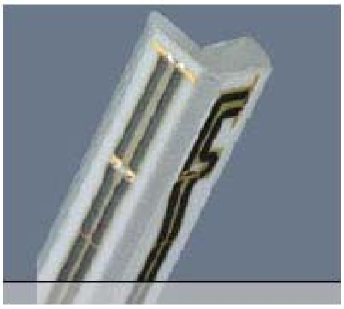
Additional test equipment used in testing and validation:

Test equipment	Model	S/N	Cal Date	Cal Due Date
Signal generator	E4428C	MY45280865	2017.08.20	2018.08.19
Power meter	E4417A	MY45101004	2017.08.20	2018.08.19
Power sensor	E9300B	MY41496001	2017.08.20	2018.08.19
Power sensor	E9300B	MY41496003	2017.08.20	2018.08.19
Radio Tester	CMU200	114666	2017.08.20	2018.08.19
Radio Tester	CMU500	161702	2017-08-20	2018.08.19
Radio Test Set	CMU500	160132	2017.08.20	2018.08.19

Test Arch Phantom

The specially designed Test Arch allows high precision positioning of both the device and any of the validation dipoles.

ER3DV6 E-Field Probe Description

Construction:	One dipole parallel, two dipoles normal to probe axis .Built-in shielding against static charges PEEK enclosure material
Calibration:	In air from 100 MHz to 3.0 GHz (absolute accuracy ±6.0%, k=2)
Frequency:	100 MHz to > 6 GHz; Linearity: ± 0.2 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
Application:	General near-field measurements up to 6GHz Field component measurements Fast automatic scanning in phantoms
E-field Free-space probe	

ANNEX A: SYSTEM CHECK AND TEST PLOT

ANNEX B: DIPOLE & PROBE CALIBRATION CERTIFICATES

ANNEX A: SYSTEM CHECK AND TEST PLOT

System validation data 835MHz

Communication System: UID 0, CW (0); Frequency: 835 MHz
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)

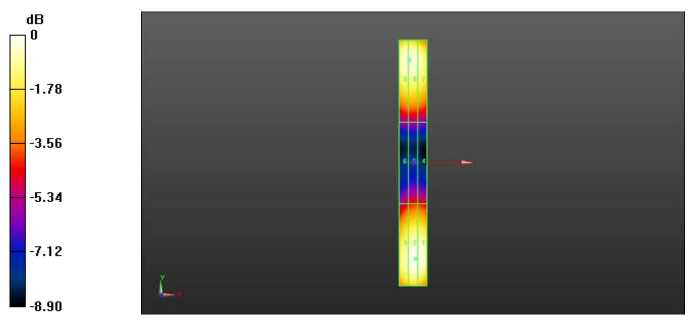
DASY Configuration:

- Probe: ER3DV6 - SN2368; ConvF(1, 1, 1); Calibrated: 2017/10/20;
- Sensor-Surface: (Fix Surface), z = 9.7
- Electronics: DAE4 Sn546; Calibrated: 2017/9/15
- Phantom: HAC Test Arch; Type: SD HAC P01 BA;
- DASY52 52.8.8(1258); SEMCAD X 14.6.10(7373)

system check Dipole E-Field measurement/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 = 99.92 V/m; Power Drift = 0.03 dB
PMR not calibrated. PMF = 1.000 is applied.
E-field emissions = 100.7 V/m
Near-field category: M4 (AWF 0 dB)

PMF scaled E-field

Grid 1 **M4** **100.3 V/m**	Grid 2 **M4** **100.7 V/m**	Grid 3 **M4** **97.12 V/m**
Grid 4 **M4** **62.19 V/m**	Grid 5 **M4** **62.46 V/m**	Grid 6 **M4** **60.45 V/m**
Grid 7 **M4** **95.24 V/m**	Grid 8 **M4** **98.28 V/m**	Grid 9 **M4** **98.15 V/m**



0 dB = 100.7 V/m = 40.06 dBV/m

System validation data 1880MHz

Communication System: UID 0, CW; Frequency: 1880 MHz
Medium parameters used: σ = 0 S/m, ε_r = 1; ρ = 0 kg/m^3
Phantom section: RF Section
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2007)

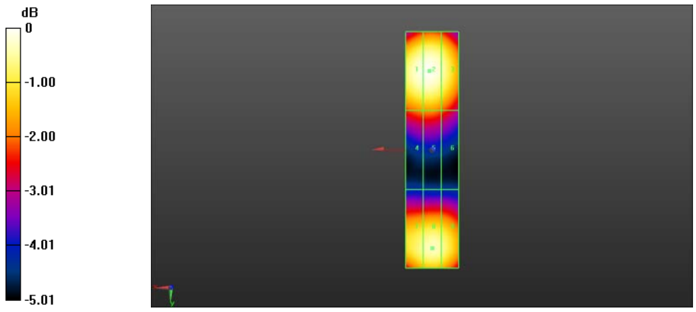
DASY Configuration:

- Probe: ER3DV6 - SN2368; ConvF(1, 1, 1); Calibrated: 2017/10/20;
- Sensor-Surface: (Fix Surface), z = 9.7
- Electronics: DAE4 Sn546; Calibrated: 2017/9/15
- Phantom: HAC Test Arch; Type: SD HAC P01 BA;
- DASY52 52.8.8(1258); SEMCAD X 14.6.10(7373)

system check Dipole E-Field measurement (E-field scan for ANSI C63.19-2007 & -2011 compliance)/E Scan - measurement distance from the probe sensor center to CD1880 15mm/Hearing Aid Compatibility Test at 15mm distance (41x181x1): Interpolated grid: dx=0.5000 mm, dy=0.5000 mm
Device Reference Point: 0, 0, -6.3 mm
Reference Value = 153.6 V/m; Power Drift = 0.01 dB
PMR not calibrated. PMF = 1.000 is applied.
E-field emissions = 90.49 V/m
Near-field category: M3 (AWF 0 dB)

PMF scaled E-field

Grid 1 **M3** **89.90 V/m**	Grid 2 **M3** **90.49 V/m**	Grid 3 **M3** **86.98 V/m**
Grid 4 **M3** **73.22 V/m**	Grid 5 **M3** **73.59 V/m**	Grid 6 **M3** **70.99 V/m**
Grid 7 **M3** **85.17 V/m**	Grid 8 **M3** **87.04 V/m**	Grid 9 **M3** **85.33 V/m**



0 dB = 90.49 V/m = 39.13 dBV/m

System validation data 2450MHz

Communication System: UID 0, CW; Frequency: 2450 MHz
Medium parameters used: σ = 0 S/m, ε_r = 1; ρ = 0 kg/m^3
Phantom section: RF Section
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2007)

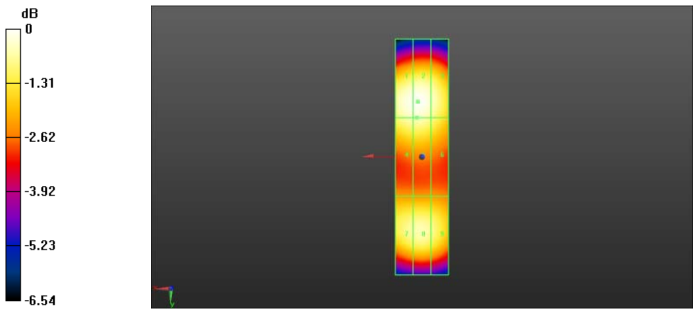
DASY Configuration:

- Probe: ER3DV6 - SN2368; ConvF(1, 1, 1); Calibrated: 2017/10/20;
- Sensor-Surface: (Fix Surface), z = 9.7
- Electronics: DAE4 Sn546; Calibrated: 2017/9/15
- Phantom: HAC Test Arch; Type: SD HAC P01 BA;
- DASY52 52.8.8(1258); SEMCAD X 14.6.10(7373)

system check Dipole E-Field measurement (E-field scan for ANSI C63.19-2007 & -2011 compliance)/E Scan - measurement distance from the probe sensor center to CD2450 = 15mm/Hearing Aid Compatibility Test at 15mm distance (41x181x1): Interpolated grid: dx=0.5000 mm, dy=0.5000 mm
Device Reference Point: 0, 0, -6.3 mm
Reference Value = 102.7 V/m; Power Drift = 0.03 dB
PMR not calibrated. PMF = 1.000 is applied.
E-field emissions = 98.1 V/m
Near-field category: M3 (AWF 0 dB)

PMF scaled E-field

Grid 1 **M3** **98 V/m**	Grid 2 **M3** **98.1 V/m**	Grid 3 **M3** **96.15 V/m**
Grid 4 **M3** **97.43 V/m**	Grid 5 **M3** **97.67 V/m**	Grid 6 **M3** **93.84 V/m**
Grid 7 **M3** **95.07 V/m**	Grid 8 **M3** **96.32 V/m**	Grid 9 **M3** **93.82 V/m**



0 dB = 98.1 V/m = 39.83 dBV/m

System validation data 2450MHz

Communication System: UID 0, CW; Frequency: 2450 MHz
Medium parameters used: σ = 0 S/m, ε_r = 1; ρ = 0 kg/m^3
Phantom section: RF Section
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2007)

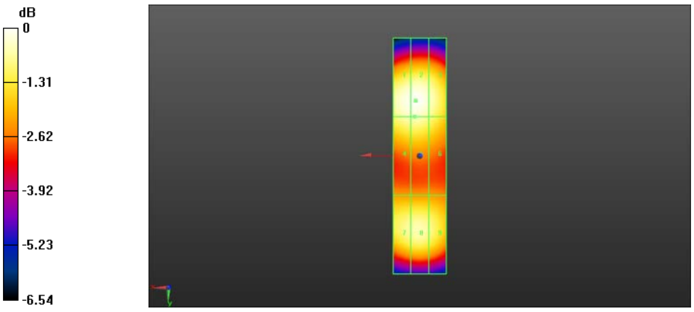
DASY Configuration:

- Probe: ER3DV6 - SN2368; ConvF(1, 1, 1); Calibrated: 2017/10/20;
- Sensor-Surface: (Fix Surface), z = 9.7
- Electronics: DAE4 Sn546; Calibrated: 2017/9/15
- Phantom: HAC Test Arch; Type: SD HAC P01 BA;
- DASY52 52.8.8(1258); SEMCAD X 14.6.10(7373)

system check Dipole E-Field measurement (E-field scan for ANSI C63.19-2007 & -2011 compliance)/E Scan - measurement distance from the probe sensor center to CD2450 = 15mm/Hearing Aid Compatibility Test at 15mm distance (41x181x1): Interpolated grid: dx=0.5000 mm, dy=0.5000 mm
Device Reference Point: 0, 0, -6.3 mm
Reference Value = 95.5V/m; Power Drift = -0.07 dB
PMR not calibrated. PMF = 1.000 is applied.
E-field emissions = 97.67 V/m
Near-field category: M3 (AWF 0 dB)

PMF scaled E-field

Grid 1 **M3** **95.2 V/m**	Grid 2 **M3** **97.76 V/m**	Grid 3 **M3** **93.66 V/m**
Grid 4 **M3** **93.13 V/m**	Grid 5 **M3** **97.67 V/m**	Grid 6 **M3** **93.72 V/m**
Grid 7 **M3** **92.26 V/m**	Grid 8 **M3** **93.11 V/m**	Grid 9 **M3** **91.84 V/m**



0 dB = 97.76 V/m = 39.82 dBV/m

GSM850

Communication System: UID 10021 - DAB, GSM-FDD (TDMA, GMSK); Frequency: 824.2 MHz; Medium parameters used: $\sigma = 0$ S/m, $\varepsilon_r = 1$; $\rho = 0$ kg/m^3

Phantom section: RF Section

DASY5 Configuration:

- Probe: ER3DV6 - SN2368; ConvF(1, 1, 1); Calibrated: 2017/10/20;
- Sensor-Surface: (Fix Surface)
- Electronics: DAE4 Sn546; Calibrated: 2017/9/15
- Phantom: HAC Test Arch; Type: SD HAC P01 BA;
- Measurement SW: DASY52, Version 52.8 (8); SEMCAD X Version 14.6.10 (7373)

GSM Device E-Field measurement upper ant(E-field scan for ANSI C63.19-2007 & -2011 compliance)/E Scan - ER3D: 15 mm from Probe Center to the Device 128/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 = 14.09 V/m; Power Drift = 0.10 dB

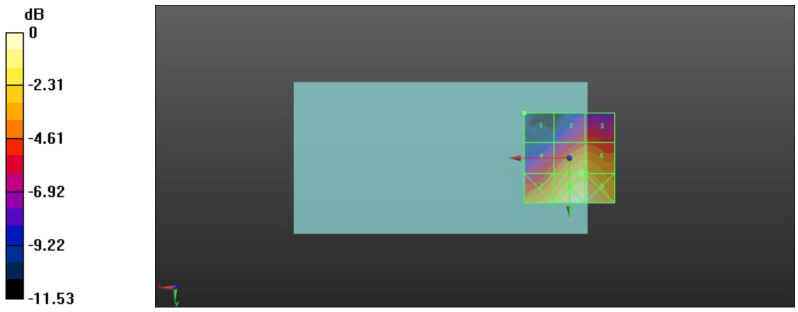
Applied MIF = 3.63 dB

RF audio interference level = 26.28 dBV/m

Emission category: M4

MIF scaled E-field

Grid 1 **M4** **19.95 dBV/m**	Grid 2 **M4** **23.35 dBV/m**	Grid 3 **M4** **23.5 dBV/m**
Grid 4 **M4** **23.97 dBV/m**	Grid 5 **M4** **26.28 dBV/m**	Grid 6 **M4** **26.23 dBV/m**
Grid 7 **M4** **26.57 dBV/m**	Grid 8 **M4** **28.28 dBV/m**	Grid 9 **M4** **28.27 dBV/m**



0 dB = 25.93 V/m = 28.28 dBV/m

GSM850

Communication System: UID 10021 - DAB, GSM-FDD (TDMA, GMSK); Frequency: 836.6 MHz; Medium parameters used: $\sigma = 0$ S/m, $\varepsilon_r = 1$; $\rho = 0$ kg/m^3
Phantom section: RF Section

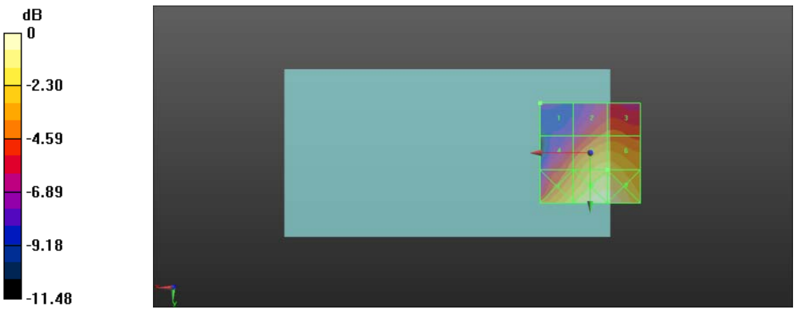
DASY5 Configuration:

- Probe: ER3DV6 - SN2368; ConvF(1, 1, 1); Calibrated: 2017/10/20;
- Sensor-Surface: (Fix Surface)
- Electronics: DAE4 Sn546; Calibrated: 2017/9/15
- Phantom: HAC Test Arch; Type: SD HAC P01 BA;
- Measurement SW: DASY52, Version 52.8 (8); SEMCAD X Version 14.6.10 (7373)

GSM Device E-Field measurement upper ant(E-field scan for ANSI C63.19-2007 & -2011 compliance)/E Scan - ER3D: 15 mm from Probe Center to the Device 189/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 = 18.85 V/m; Power Drift = -0.06 dB
Applied MIF = 3.63 dB
RF audio interference level = 28.75 dBV/m
Emission category: M4

MIF scaled E-field

Grid 1 **M4** **23.5 dBV/m**	Grid 2 **M4** **26.36 dBV/m**	Grid 3 **M4** **26.44 dBV/m**
Grid 4 **M4** **26.68 dBV/m**	Grid 5 **M4** **28.75 dBV/m**	Grid 6 **M4** **28.75 dBV/m**
Grid 7 **M4** **29 dBV/m**	Grid 8 **M4** **30.59 dBV/m**	Grid 9 **M4** **30.58 dBV/m**



0 dB = 33.83 V/m = 30.59 dBV/m

GSM850

Communication System: UID 10021 - DAB, GSM-FDD (TDMA, GMSK); Frequency: 848.6 MHz; Medium parameters used: $\sigma = 0$ S/m, $\varepsilon_r = 1$; $\rho = 0$ kg/m^3
Phantom section: RF Section

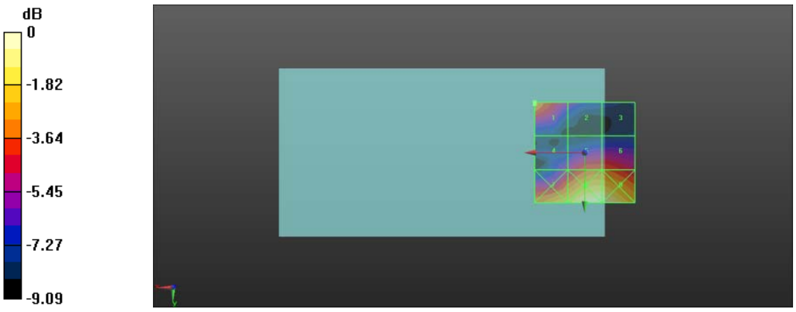
DASY5 Configuration:

- Probe: ER3DV6 - SN2368; ConvF(1, 1, 1); Calibrated: 2017/10/20;
- Sensor-Surface: (Fix Surface)
- Electronics: DAE4 Sn546; Calibrated: 2017/9/15
- Phantom: HAC Test Arch; Type: SD HAC P01 BA;
- Measurement SW: DASY52, Version 52.8 (8); SEMCAD X Version 14.6.10 (7373)

GSM Device E-Field measurement upper ant(E-field scan for ANSI C63.19-2007 & -2011 compliance)/E Scan - ER3D: 15 mm from Probe Center to the Device 251/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 = 10.32 V/m; Power Drift = -0.09 dB
Applied MIF = 3.63 dB
RF audio interference level = 24.03 dBV/m
Emission category: M4

MIF scaled E-field

Grid 1 **M4** **24.03 dBV/m**	Grid 2 **M4** **21.66 dBV/m**	Grid 3 **M4** **19.84 dBV/m**
Grid 4 **M4** **21.73 dBV/m**	Grid 5 **M4** **23.66 dBV/m**	Grid 6 **M4** **23.61 dBV/m**
Grid 7 **M4** **25.71 dBV/m**	Grid 8 **M4** **27.16 dBV/m**	Grid 9 **M4** **27.15 dBV/m**



0 dB = 22.81 V/m = 27.16 dBV/m

GSM1900

Communication System: UID 10021 - DAB, GSM-FDD (TDMA, GMSK); Frequency: 1850.2 MHz; Medium parameters used: σ = 0 S/m, ε_r = 1; ρ = 0 kg/m^3
Phantom section: RF Section

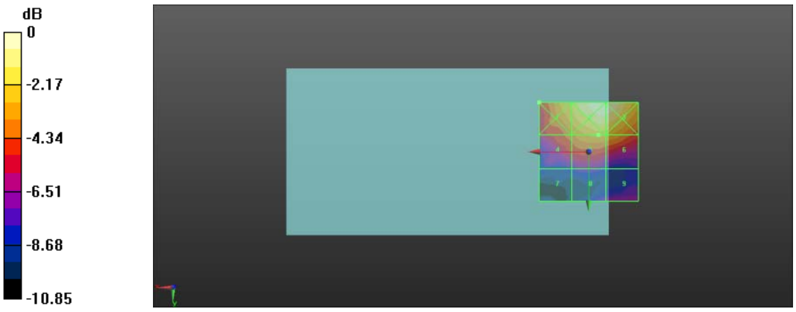
DASY5 Configuration:

- Probe: ER3DV6 - SN2368; ConvF(1, 1, 1); Calibrated: 2017/10/20;
- Sensor-Surface: (Fix Surface)
- Electronics: DAE4 Sn546; Calibrated: 2017/9/15
- Phantom: HAC Test Arch; Type: SD HAC P01 BA;
- Measurement SW: DASY52, Version 52.8 (8); SEMCAD X Version 14.6.10 (7373)

GSM Device E-Field measurement upper ant(E-field scan for ANSI C63.19-2007 & -2011 compliance)/E Scan - ER3D: 15 mm from Probe Center to the Device 512/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 = 10.87 V/m; Power Drift = -0.08 dB
Applied MIF = 3.63 dB
RF audio interference level = 23.89 dBV/m
Emission category: M4

MIF scaled E-field

Grid 1 **M4** **24.51 dBV/m**	Grid 2 **M4** **26.5 dBV/m**	Grid 3 **M4** **26.47 dBV/m**
Grid 4 **M4** **22.72 dBV/m**	Grid 5 **M4** **23.88 dBV/m**	Grid 6 **M4** **23.79 dBV/m**
Grid 7 **M4** **18.75 dBV/m**	Grid 8 **M4** **20.02 dBV/m**	Grid 9 **M4** **20.31 dBV/m**



0 dB = 21.13 V/m = 26.50 dBV/m

GSM1900

Communication System: UID 10021 - DAB, GSM-FDD (TDMA, GMSK); Frequency: 1880 MHz; Medium parameters used: σ = 0 S/m, ε_r = 1; ρ = 0 kg/m^3
Phantom section: RF Section

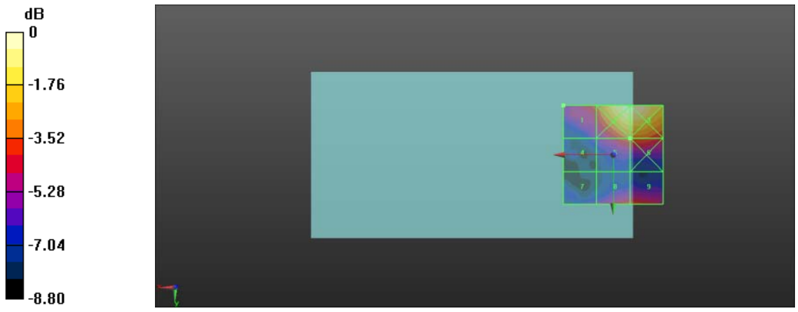
DASY5 Configuration:

- Probe: ER3DV6 - SN2368; ConvF(1, 1, 1); Calibrated: 2017/10/20;
- Sensor-Surface: (Fix Surface)
- Electronics: DAE4 Sn546; Calibrated: 2017/9/15
- Phantom: HAC Test Arch; Type: SD HAC P01 BA;
- Measurement SW: DASY52, Version 52.8 (8); SEMCAD X Version 14.6.10 (7373)

GSM Device E-Field measurement upper ant(E-field scan for ANSI C63.19-2007 & -2011 compliance)/E Scan - ER3D: 15 mm from Probe Center to the Device 661/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 = 8.595 V/m; Power Drift = 0.05 dB
Applied MIF = 3.63 dB
RF audio interference level = 22.49 dBV/m
Emission category: M4

MIF scaled E-field

Grid 1 **M4** **22.34 dBV/m**	Grid 2 **M4** **25.87 dBV/m**	Grid 3 **M4** **25.89 dBV/m**
Grid 4 **M4** **20.13 dBV/m**	Grid 5 **M4** **22.49 dBV/m**	Grid 6 **M4** **22.59 dBV/m**
Grid 7 **M4** **20.22 dBV/m**	Grid 8 **M4** **22.34 dBV/m**	Grid 9 **M4** **22.36 dBV/m**



0 dB = 19.71 V/m = 25.89 dBV/m

GSM1900

Communication System: UID 10021 - DAB, GSM-FDD (TDMA, GMSK); Frequency: 1909.8 MHz; Medium parameters used: $\sigma = 0$ S/m, $\varepsilon_r = 1$; $\rho = 0$ kg/m^3
Phantom section: RF Section

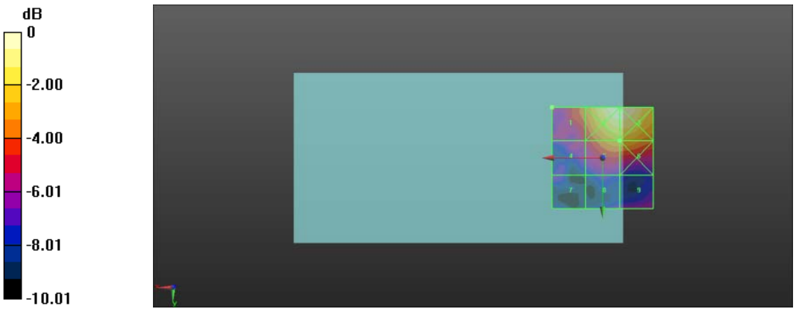
DASY5 Configuration:

- Probe: ER3DV6 - SN2368; ConvF(1, 1, 1); Calibrated: 2017/10/20;
- Sensor-Surface: (Fix Surface)
- Electronics: DAE4 Sn546; Calibrated: 2017/9/15
- Phantom: HAC Test Arch; Type: SD HAC P01 BA;
- Measurement SW: DASY52, Version 52.8 (8); SEMCAD X Version 14.6.10 (7373)

GSM Device E-Field measurement upper ant(E-field scan for ANSI C63.19-2007 & -2011 compliance)/E Scan - ER3D: 15 mm from Probe Center to the Device 810/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 = 9.444 V/m; Power Drift = 0.17 dB
Applied MIF = 3.63 dB
RF audio interference level = 22.58 dBV/m
Emission category: M4

MIF scaled E-field

Grid 1 **M4** **21.82 dBV/m**	Grid 2 **M4** **25.19 dBV/m**	Grid 3 **M4** **25.19 dBV/m**
Grid 4 **M4** **20.03 dBV/m**	Grid 5 **M4** **22.58 dBV/m**	Grid 6 **M4** **22.59 dBV/m**
Grid 7 **M4** **18.57 dBV/m**	Grid 8 **M4** **19.02 dBV/m**	Grid 9 **M4** **19.4 dBV/m**



0 dB = 18.18 V/m = 25.19 dBV/m

CDMA 2000 BC0

Communication System: UID 10295, CDMA2000, RC1, SO3, 1/8th Rate 25 fr.; Frequency: 824.7 MHz
Medium parameters used: $\sigma = 0$ S/m, $\varepsilon_r = 1$; $\rho = 0$ kg/m^3
Phantom section: RF Section

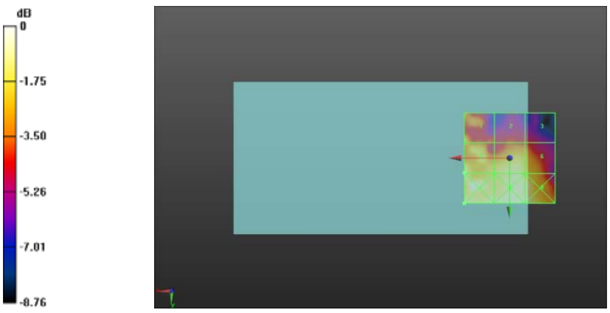
DASY Configuration:

- Probe: ER3DV6 - SN2368; ConvF(1, 1, 1); Calibrated: 2017/10/20;
- Sensor-Surface: (Fix Surface), z = 8.7
- Electronics: DAE4 Sn720; Calibrated: 2017/10/23
- Phantom: HAC Test Arch; Type: SD HAC P01 BA;
- DASY52 52.8.8(1258); SEMCAD X 14.6.10(7373)

CDMA/E Scan - ER3D: 15 mm from Probe Center to the Device CDMA2000 BC0 low/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 = 6.725 V/m; Power Drift = 0.19 dB
Applied MIF = 3.26 dB
RF audio interference level = 18.05 dBV/m
Emission category: M4

MIF scaled E-field

Grid 1 **M4** **16.91 dBV/m**	Grid 2 **M4** **14.56 dBV/m**	Grid 3 **M4** **14.19 dBV/m**
Grid 4 **M4** **18.05 dBV/m**	Grid 5 **M4** **17.64 dBV/m**	Grid 6 **M4** **16.89 dBV/m**
Grid 7 **M4** **18.49 dBV/m**	Grid 8 **M4** **18.31 dBV/m**	Grid 9 **M4** **18.21 dBV/m**



0 dB = 8.402 V/m = 18.49 dBV/m

CDMA 2000 BC0

Communication System: UID 10295, CDMA2000, RC1, SO3, 1/8th Rate 25 fr.; Frequency: 836.52 MHz
Medium parameters used: σ = 0 S/m, ε_r = 1; ρ = 0 kg/m^3
Phantom section: RF Section

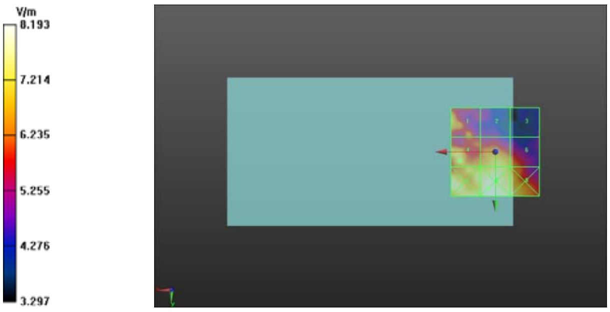
DASY Configuration:

- Probe: ER3DV6 - SN2368; ConvF(1, 1, 1); Calibrated: 2017/10/20;
- Sensor-Surface: (Fix Surface), z = 8.7
- Electronics: DAE4 Sn720; Calibrated: 2017/10/23
- Phantom: HAC Test Arch; Type: SD HAC P01 BA;
- DASY52 52.8.8(1258); SEMCAD X 14.6.10(7373)

CDMA/E Scan - ER3D: 15 mm from Probe Center to the Device CDMA2000 BC0 MID/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 = 6.796 V/m; Power Drift = 0.00 dB
Applied MIF = 3.26 dB
RF audio interference level = 17.60 dBV/m
Emission category: M4

MIF scaled E-field

Grid 1 **M4** **17.45 dBV/m**	Grid 2 **M4** **14.26 dBV/m**	Grid 3 **M4** **13.86 dBV/m**
Grid 4 **M4** **17.6 dBV/m**	Grid 5 **M4** **17.42 dBV/m**	Grid 6 **M4** **16.48 dBV/m**
Grid 7 **M4** **17.88 dBV/m**	Grid 8 **M4** **18.27 dBV/m**	Grid 9 **M4** **18.14 dBV/m**



CDMA 2000 BC0

Communication System: UID 10295, CDMA2000, RC1, SO3, 1/8th Rate 25 fr.; Frequency: 848.31 MHz
Medium parameters used: σ = 0 S/m, ε_r = 1; ρ = 0 kg/m^3
Phantom section: RF Section

DASY Configuration:

- Probe: ER3DV6 - SN2368; ConvF(1, 1, 1); Calibrated: 2017/10/20;
- Sensor-Surface: (Fix Surface), z = 8.7
- Electronics: DAE4 Sn720; Calibrated: 2017/10/23
- Phantom: HAC Test Arch; Type: SD HAC P01 BA;
- DASY52 52.8.8(1258); SEMCAD X 14.6.10(7373)

CDMA/E Scan - ER3D: 15 mm from Probe Center to the Device CDMA2000 BC0 HIGH/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 = 6.598 V/m; Power Drift = -0.02 dB
Applied MIF = 3.26 dB
RF audio interference level = 17.13 dBV/m
Emission category: M4

MIF scaled E-field

Grid 1 **M4** **16.74 dBV/m**	Grid 2 **M4** **14.45 dBV/m**	Grid 3 **M4** **12.87 dBV/m**
Grid 4 **M4** **17.06 dBV/m**	Grid 5 **M4** **17.13 dBV/m**	Grid 6 **M4** **16.55 dBV/m**
Grid 7 **M4** **17.32 dBV/m**	Grid 8 **M4** **17.62 dBV/m**	Grid 9 **M4** **17.62 dBV/m**

CDMA 2000 BC1

Communication System: UID 10295, CDMA2000, RC1, SO3, 1/8th Rate 25 fr.; Frequency: 1851.25 MHz
Medium parameters used: $\sigma = 0$ S/m, $\varepsilon_r = 1$; $\rho = 0$ kg/m^3
Phantom section: RF Section

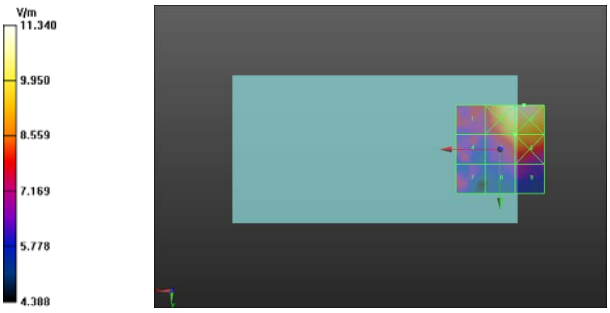
DASY Configuration:

- Probe: ER3DV6 - SN2368; ConvF(1, 1, 1); Calibrated: 2017/10/20;
- Sensor-Surface: (Fix Surface), z = 8.7
- Electronics: DAE4 Sn720; Calibrated: 2017/10/23
- Phantom: HAC Test Arch; Type: SD HAC P01 BA;
- DASY52 52.8.8(1258); SEMCAD X 14.6.10(7373)

  CDMA/E Scan - ER3D: 15 mm from Probe Center to the Device CDMA2000 BC1 low/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 = 6.631 V/m; Power Drift = 0.09 dB
  Applied MIF = 3.26 dB
  RF audio interference level = 19.29 dBV/m
  Emission category: M4

MIF scaled E-field

Grid 1 **M4** **18.19 dBV/m**	Grid 2 **M4** **20.88 dBV/m**	Grid 3 **M4** **21.1 dBV/m**
Grid 4 **M4** **17.6 dBV/m**	Grid 5 **M4** **19.29 dBV/m**	Grid 6 **M4** **19.43 dBV/m**
Grid 7 **M4** **17.58 dBV/m**	Grid 8 **M4** **16.79 dBV/m**	Grid 9 **M4** **16.87 dBV/m**



CDMA 2000 BC1

Communication System: UID 10295, CDMA2000, RC1, SO3, 1/8th Rate 25 fr.; Frequency: 1880 MHz
Medium parameters used: σ = 0 S/m, ε_r = 1; ρ = 0 kg/m^3
Phantom section: RF Section

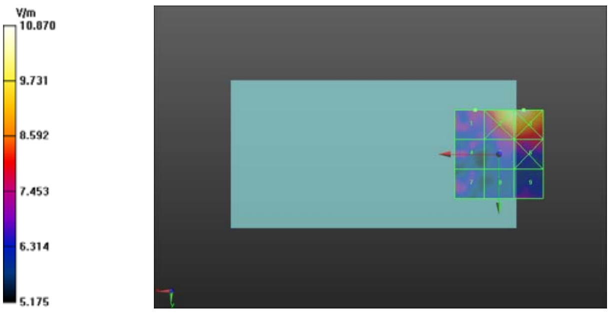
DASY Configuration:

- Probe: ER3DV6 - SN2368; ConvF(1, 1, 1); Calibrated: 2017/10/20;
- Sensor-Surface: (Fix Surface), z = 8.7
- Electronics: DAE4 Sn720; Calibrated: 2017/10/23
- Phantom: HAC Test Arch; Type: SD HAC P01 BA;
- DASY52 52.8.8(1258); SEMCAD X 14.6.10(7373)

CDMA/E Scan - ER3D: 15 mm from Probe Center to the Device CDMA2000 BC1 MID/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 = 5.898 V/m; Power Drift = 0.13 dB
Applied MIF = 3.26 dB
RF audio interference level = 17.89 dBV/m
Emission category: M4

MIF scaled E-field

Grid 1 **M4** **17.89 dBV/m**	Grid 2 **M4** **20.3 dBV/m**	Grid 3 **M4** **20.72 dBV/m**
Grid 4 **M4** **17.45 dBV/m**	Grid 5 **M4** **17.82 dBV/m**	Grid 6 **M4** **17.92 dBV/m**
Grid 7 **M4** **17.55 dBV/m**	Grid 8 **M4** **16.64 dBV/m**	Grid 9 **M4** **17.14 dBV/m**



CDMA 2000 BC1

Communication System: UID 10295, CDMA2000, RC1, SO3, 1/8th Rate 25 fr.; Frequency: 1908.75 MHz
Medium parameters used: $\sigma = 0$ S/m, $\varepsilon_r = 1$; $\rho = 0$ kg/m^3
Phantom section: RF Section

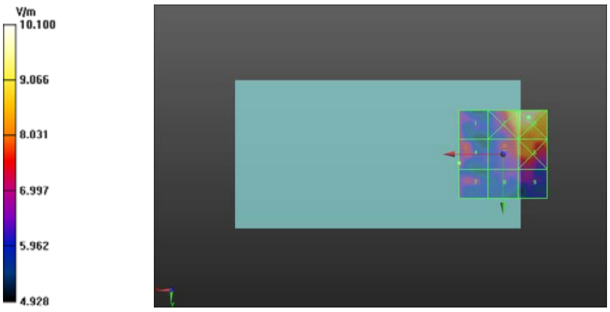
DASY Configuration:

- Probe: ER3DV6 - SN2368; ConvF(1, 1, 1); Calibrated: 2017/10/20;
- Sensor-Surface: (Fix Surface), z = 8.7
- Electronics: DAE4 Sn720; Calibrated: 2017/10/23
- Phantom: HAC Test Arch; Type: SD HAC P01 BA;
- DASY52 52.8.8(1258); SEMCAD X 14.6.10(7373)

CDMA/E Scan - ER3D: 15 mm from Probe Center to the Device CDMA2000 BC1 HIGH/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 = 6.228 V/m; Power Drift = 0.04 dB
Applied MIF = 3.26 dB
RF audio interference level = 18.16 dBV/m
Emission category: M4

MIF scaled E-field

Grid 1 **M4** **17.91 dBV/m**	Grid 2 **M4** **19.35 dBV/m**	Grid 3 **M4** **20.08 dBV/m**
Grid 4 **M4** **18.16 dBV/m**	Grid 5 **M4** **17.97 dBV/m**	Grid 6 **M4** **18.39 dBV/m**
Grid 7 **M4** **17.31 dBV/m**	Grid 8 **M4** **16.66 dBV/m**	Grid 9 **M4** **16.84 dBV/m**



LET BAND38

Communication System: UID 10172, LTE-TDD (SC-FDMA, 1 RB, 20 MHz, QPSK);
Frequency: 2580 MHz; Medium parameters used: σ = 0 S/m, ε_r = 1; ρ = 0 kg/m^3
Phantom section: RF Section

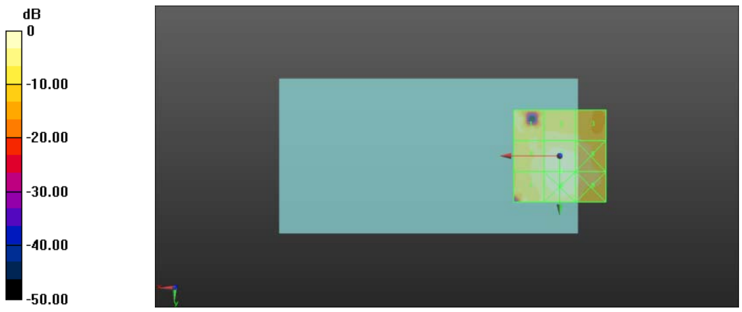
DASY5 Configuration:

- Probe: ER3DV6 - SN2368; ConvF(1, 1, 1); Calibrated: 2017/10/20;
- Sensor-Surface: (Fix Surface)
- Electronics: DAE4 Sn546; Calibrated: 2017/9/15
- Phantom: HAC Test Arch; Type: SD HAC P01 BA;
- Measurement SW: DASY52, Version 52.8 (8); SEMCAD X Version 14.6.10 (7373)

LTE/E Scan - ER3D: 15 mm from Probe Center to the Device BAND38 low/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 = 7.342 V/m; Power Drift = 0.10 dB
Applied MIF = -1.62 dB
RF audio interference level = 18.89 dBV/m
Emission category: M4

MIF scaled E-field

Grid 1 **M4** **14.9 dBV/m**	Grid 2 **M4** **14.07 dBV/m**	Grid 3 **M4** **13.31 dBV/m**
Grid 4 **M4** **15.48 dBV/m**	Grid 5 **M4** **18.89 dBV/m**	Grid 6 **M4** **16.81 dBV/m**
Grid 7 **M4** **15.4 dBV/m**	Grid 8 **M4** **18.88 dBV/m**	Grid 9 **M4** **16.95 dBV/m**



0 dB = 8.8 V/m =18.89 dBV/m

LET BAND38

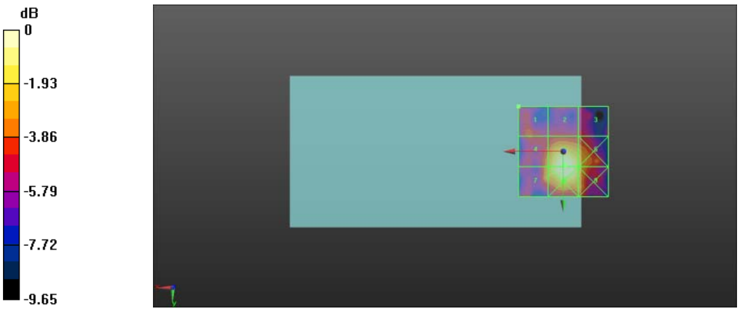
Communication System: UID 10172, LTE-TDD (SC-FDMA, 1 RB, 20 MHz, QPSK);
Frequency: 2595 MHz; Medium parameters used: σ = 0 S/m, ε_r = 1; ρ = 0 kg/m^3
Phantom section: RF Section

DASY5 Configuration:

- Probe: ER3DV6 - SN2368; ConvF(1, 1, 1); Calibrated: 2017/10/20;
- Sensor-Surface: (Fix Surface)
- Electronics: DAE4 Sn546; Calibrated: 2017/9/15
- Phantom: HAC Test Arch; Type: SD HAC P01 BA;
- Measurement SW: DASY52, Version 52.8 (8); SEMCAD X Version 14.6.10 (7373)
  LTE/E Scan - ER3D: 15 mm from Probe Center to the Device BAND38 mid/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 = 8.272 V/m; Power Drift = -0.01 dB
  Applied MIF = -1.62 dB
  RF audio interference level = 19.17 dBV/m
  Emission category: M4

MIF scaled E-field

Grid 1 **M4** **15.3 dBV/m**	Grid 2 **M4** **14.59 dBV/m**	Grid 3 **M4** **14.61 dBV/m**
Grid 4 **M4** **16.47 dBV/m**	Grid 5 **M4** **19.17 dBV/m**	Grid 6 **M4** **17.33 dBV/m**
Grid 7 **M4** **16.56 dBV/m**	Grid 8 **M4** **19.13 dBV/m**	Grid 9 **M4** **17.32 dBV/m**



0 dB = 9.089 V/m = 19.17 dBV/m

LET BAND38

Communication System: UID 10172, LTE-TDD (SC-FDMA, 1 RB, 20 MHz, QPSK);
Frequency: 2610 MHz; Medium parameters used: $\sigma = 0$ S/m, $\varepsilon_r = 1$; $\rho = 0$ kg/m^3
Phantom section: RF Section

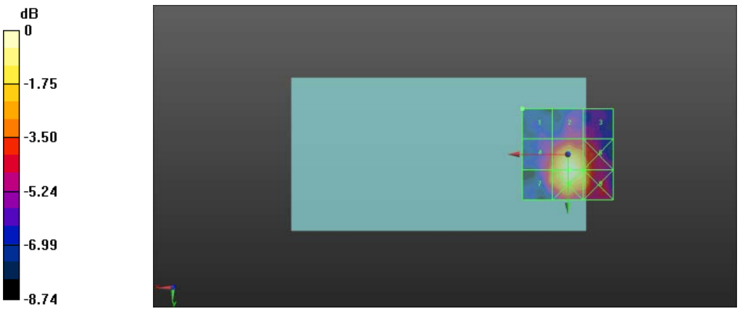
DASY5 Configuration:

- Probe: ER3DV6 - SN2368; ConvF(1, 1, 1); Calibrated: 2017/10/20;
- Sensor-Surface: (Fix Surface)
- Electronics: DAE4 Sn546; Calibrated: 2017/9/15
- Phantom: HAC Test Arch; Type: SD HAC P01 BA;
- Measurement SW: DASY52, Version 52.8 (8); SEMCAD X Version 14.6.10 (7373)

LTE/E Scan - ER3D: 15 mm from Probe Center to the Device BAND38 high/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 = 8.239 V/m; Power Drift = 0.13 dB
Applied MIF = -1.62 dB
RF audio interference level = 19.50 dBV/m
Emission category: M4

MIF scaled E-field

Grid 1 **M4** **13.57 dBV/m**	Grid 2 **M4** **14.96 dBV/m**	Grid 3 **M4** **14.78 dBV/m**
Grid 4 **M4** **16.62 dBV/m**	Grid 5 **M4** **19.5 dBV/m**	Grid 6 **M4** **17.61 dBV/m**
Grid 7 **M4** **16.85 dBV/m**	Grid 8 **M4** **19.51 dBV/m**	Grid 9 **M4** **17.73 dBV/m**



0 dB = 9.441 V/m = 19.51 dBV/m

LET BAND41

Communication System: UID 10172, LTE-TDD (SC-FDMA, 1 RB, 20 MHz, QPSK);
Frequency: 2506 MHz; Medium parameters used: $\sigma = 0$ S/m, $\varepsilon_r = 1$; $\rho = 0$ kg/m^3
Phantom section: RF Section

DASY5 Configuration:

- Probe: ER3DV6 - SN2368; ConvF(1, 1, 1); Calibrated: 2017/10/20;
- Sensor-Surface: (Fix Surface)
- Electronics: DAE4 Sn546; Calibrated: 2017/9/15
- Phantom: HAC Test Arch; Type: SD HAC P01 BA;
- Measurement SW: DASY52, Version 52.8 (8); SEMCAD X Version 14.6.10 (7373)

LTE/E Scan - ER3D: 15 mm from Probe Center to the Device BAND41 low/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 = 6.979 V/m; Power Drift = 0.16 dB
Applied MIF = -1.62 dB
RF audio interference level = 18.51 dBV/m
Emission category: M4

MIF scaled E-field

Grid 1 **M4** **13.99 dBV/m**	Grid 2 **M4** **14.47 dBV/m**	Grid 3 **M4** **14.17 dBV/m**
Grid 4 **M4** **16.23 dBV/m**	Grid 5 **M4** **18.51 dBV/m**	Grid 6 **M4** **16.76 dBV/m**
Grid 7 **M4** **16.43 dBV/m**	Grid 8 **M4** **18.44 dBV/m**	Grid 9 **M4** **16.75 dBV/m**

0 dB = 8.414 V/m = 18.51 dBV/m

LET BAND41

Communication System: UID 10172, LTE-TDD (SC-FDMA, 1 RB, 20 MHz, QPSK);
Frequency: 2549.5 MHz; Medium parameters used: σ = 0 S/m, ε_r = 1; ρ = 0 kg/m^3
Phantom section: RF Section

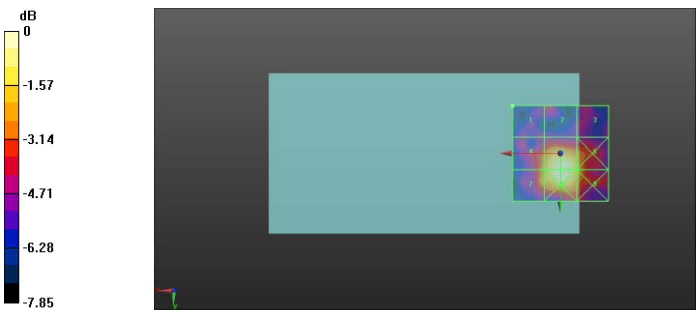
DASY5 Configuration:

- Probe: ER3DV6 - SN2368; ConvF(1, 1, 1); Calibrated: 2017/10/20;
- Sensor-Surface: (Fix Surface)
- Electronics: DAE4 Sn546; Calibrated: 2017/9/15
- Phantom: HAC Test Arch; Type: SD HAC P01 BA;
- Measurement SW: DASY52, Version 52.8 (8); SEMCAD X Version 14.6.10 (7373)

LTE/E Scan - ER3D: 15 mm from Probe Center to the Device BAND41 low-mid/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 = 6.838 V/m; Power Drift = 0.11 dB
Applied MIF = -1.62 dB
RF audio interference level = 18.48 dBV/m
Emission category: M4

MIF scaled E-field

Grid 1 **M4** **14.49 dBV/m**	Grid 2 **M4** **14.53 dBV/m**	Grid 3 **M4** **14.22 dBV/m**
Grid 4 **M4** **16.27 dBV/m**	Grid 5 **M4** **18.48 dBV/m**	Grid 6 **M4** **16.46 dBV/m**
Grid 7 **M4** **16.48 dBV/m**	Grid 8 **M4** **18.51 dBV/m**	Grid 9 **M4** **16.69 dBV/m**



0 dB = 8.424 V/m = 18.51 dBV/m

LET BAND41

Communication System: UID 10172, LTE-TDD (SC-FDMA, 1 RB, 20 MHz, QPSK);
Frequency: 2593 MHz; Medium parameters used: $\sigma = 0$ S/m, $\varepsilon_r = 1$; $\rho = 0$ kg/m^3
Phantom section: RF Section

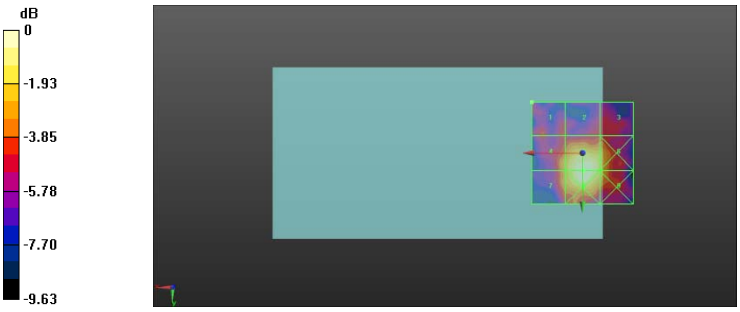
DASY5 Configuration:

- Probe: ER3DV6 - SN2368; ConvF(1, 1, 1); Calibrated: 2017/10/20;
- Sensor-Surface: (Fix Surface)
- Electronics: DAE4 Sn546; Calibrated: 2017/9/15
- Phantom: HAC Test Arch; Type: SD HAC P01 BA;
- Measurement SW: DASY52, Version 52.8 (8); SEMCAD X Version 14.6.10 (7373)

LTE/E Scan - ER3D: 15 mm from Probe Center to the Device BAND41 mid/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 = 6.953 V/m; Power Drift = 0.00 dB
Applied MIF = -1.62 dB
RF audio interference level = 18.59 dBV/m
Emission category: M4

MIF scaled E-field

Grid 1 **M4** **14.21 dBV/m**	Grid 2 **M4** **13.98 dBV/m**	Grid 3 **M4** **14.08 dBV/m**
Grid 4 **M4** **16.29 dBV/m**	Grid 5 **M4** **18.59 dBV/m**	Grid 6 **M4** **16.98 dBV/m**
Grid 7 **M4** **16.04 dBV/m**	Grid 8 **M4** **18.6 dBV/m**	Grid 9 **M4** **16.82 dBV/m**



0 dB = 8.511 V/m = 18.60 dBV/m

LET BAND41

Communication System: UID 10172, LTE-TDD (SC-FDMA, 1 RB, 20 MHz, QPSK);Frequency: 2636.5 MHz; Medium parameters used: $\sigma = 0$ S/m, $\varepsilon_r = 1$; $\rho = 0$ kg/m^3
Phantom section: RF Section

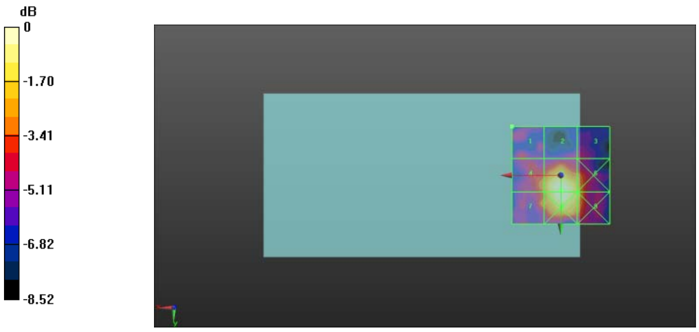
DASY5 Configuration:

- Probe: ER3DV6 - SN2368; ConvF(1, 1, 1); Calibrated: 2017/10/20;
- Sensor-Surface: (Fix Surface)
- Electronics: DAE4 Sn546; Calibrated: 2017/9/15
- Phantom: HAC Test Arch; Type: SD HAC P01 BA;
- Measurement SW: DASY52, Version 52.8 (8); SEMCAD X Version 14.6.10 (7373)

  LTE/E Scan - ER3D: 15 mm from Probe Center to the Device BAND41 mid-high/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 = 6.795 V/m; Power Drift = 0.18 dB
  Applied MIF = -1.62 dB
  RF audio interference level = 18.81 dBV/m
  Emission category: M4

MIF scaled E-field

Grid 1 **M4** **14.41 dBV/m**	Grid 2 **M4** **14.12dBV/m**	Grid 3 **M4** **14.20 dBV/m**
Grid 4 **M4** **17.13 dBV/m**	Grid 5 **M4** **18.81 dBV/m**	Grid 6 **M4** **16.89 dBV/m**
Grid 7 **M4** **16.68 dBV/m**	Grid 8 **M4** **18.66dBV/m**	Grid 9 **M4** **18.1dBV/m**



0 dB = 8.72 V/m = 18.81 dBV/m

LET BAND41

Communication System: UID 10172, LTE-TDD (SC-FDMA, 1 RB, 20 MHz, QPSK);
Frequency: 2680 MHz; Medium parameters used: σ = 0 S/m, ε_r = 1; ρ = 0 kg/m^3
Phantom section: RF Section

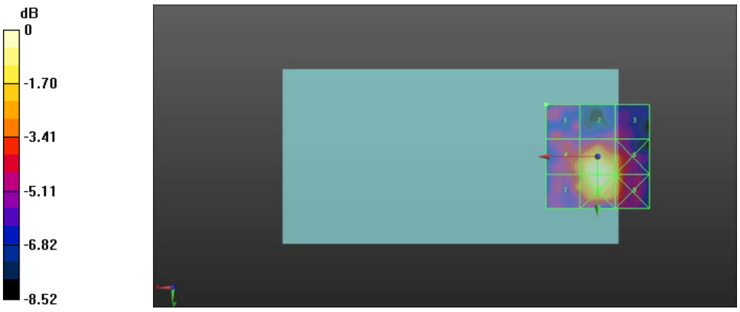
DASY5 Configuration:

- Probe: ER3DV6 - SN2368; ConvF(1, 1, 1); Calibrated: 2017/10/20;
- Sensor-Surface: (Fix Surface)
- Electronics: DAE4 Sn546; Calibrated: 2017/9/15
- Phantom: HAC Test Arch; Type: SD HAC P01 BA;
- Measurement SW: DASY52, Version 52.8 (8); SEMCAD X Version 14.6.10 (7373)

LTE/E Scan - ER3D: 15 mm from Probe Center to the Device BAND41 high/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 = 5.991 V/m; Power Drift = 0.06 dB
Applied MIF = -1.62 dB
RF audio interference level = 18.69 dBV/m
Emission category: M4

MIF scaled E-field

Grid 1 **M4** **14.72 dBV/m**	Grid 2 **M4** **14.03 dBV/m**	Grid 3 **M4** **14.11 dBV/m**
Grid 4 **M4** **16.23 dBV/m**	Grid 5 **M4** **18.69 dBV/m**	Grid 6 **M4** **16.93 dBV/m**
Grid 7 **M4** **15.87 dBV/m**	Grid 8 **M4** **18.68 dBV/m**	Grid 9 **M4** **17 dBV/m**



0 dB =8.60 V/m =18.69 dBV/m

WIFI 2.4G 802.11g (antenna1)

Communication System UID 10077, IEEE 802.11g WiFi 2.4 GHz (DSSS/OFDM, 54 Mbps); Frequency: 2412 MHz; Medium parameters used: $\sigma = 0$ S/m, $\varepsilon_r = 1$; $\rho = 0$ kg/m^3
Phantom section: RF Section

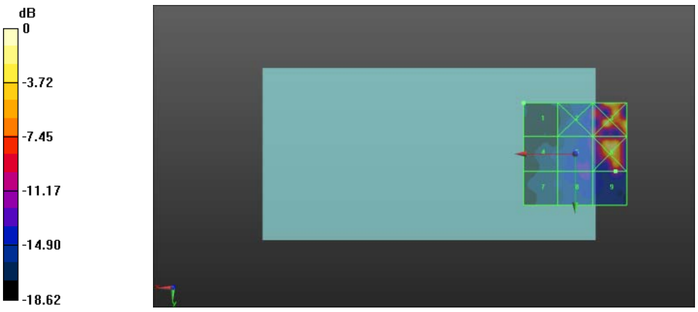
DASY5 Configuration:

- Probe: ER3DV6 - SN2368; ConvF(1, 1, 1); Calibrated: 2017/10/20;
- Sensor-Surface: (Fix Surface)
- Electronics: DAE4 Sn546; Calibrated: 2017/9/15
- Phantom: HAC Test Arch; Type: SD HAC P01 BA;
- Measurement SW: DASY52, Version 52.8 (8); SEMCAD X Version 14.6.10 (7373)

LTE/E Scan - ER3D: 15 mm from Probe Center to the Device wifi2.4 11g L ANT1/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 = 6.408 V/m; Power Drift = 0.07 dB
Applied MIF = 0.12 dB
RF audio interference level = 25.70 dBV/m
Emission category: M4

MIF scaled E-field

Grid 1 **M4** **20.44 dBV/m**	Grid 2 **M4** **26.39 dBV/m**	Grid 3 **M4** **27.1 dBV/m**
Grid 4 **M4** **21.52 dBV/m**	Grid 5 **M4** **25.54 dBV/m**	Grid 6 **M4** **25.84 dBV/m**
Grid 7 **M4** **21.31 dBV/m**	Grid 8 **M4** **23.87 dBV/m**	Grid 9 **M4** **25.7 dBV/m**



0 dB = 22.64 V/m = 27.10 dBV/m

WIFI 2.4G 802.11g (antenna1)

Communication System: UID 10077, IEEE 802.11g WiFi 2.4 GHz (DSSS/OFDM, 54 Mbps); Frequency: 2437 MHz; Medium parameters used: $\sigma = 0$ S/m, $\varepsilon_r = 1$; $\rho = 0$ kg/m^3

Phantom section: RF Section

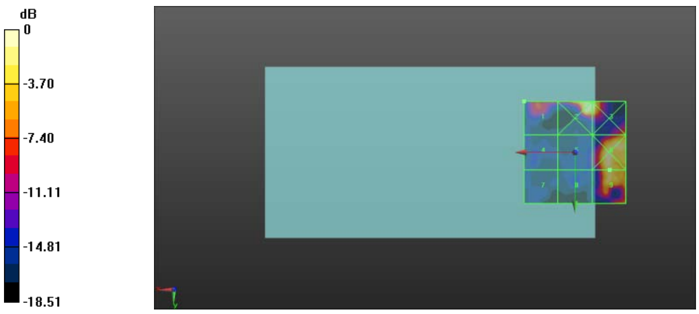
DASY5 Configuration:

- Probe: ER3DV6 - SN2368; ConvF(1, 1, 1); Calibrated: 2017/10/20;
- Sensor-Surface: (Fix Surface)
- Electronics: DAE4 Sn546; Calibrated: 2017/9/15
- Phantom: HAC Test Arch; Type: SD HAC P01 BA;
- Measurement SW: DASY52, Version 52.8 (8); SEMCAD X Version 14.6.10 (7373)

LTE/E Scan - ER3D: 15 mm from Probe Center to the Device wifi2.4 11g M ANT1/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 = 8.506 V/m; Power Drift = -0.02 dB
Applied MIF = 0.12 dB
RF audio interference level = 26.76 dBV/m
Emission category: M4

MIF scaled E-field

Grid 1 **M4** **20.41 dBV/m**	Grid 2 **M4** **28.47 dBV/m**	Grid 3 **M4** **27.71 dBV/m**
Grid 4 **M4** **16.27 dBV/m**	Grid 5 **M4** **16.34 dBV/m**	Grid 6 **M4** **28.52 dBV/m**
Grid 7 **M4** **14.44 dBV/m**	Grid 8 **M4** **15.04 dBV/m**	Grid 9 **M4** **26.76 dBV/m**



0 dB = 26.66 V/m = 28.52 dBV/m

WIFI 2.4G 802.11g (antenna1)

Communication System: UID 10077, IEEE 802.11g WiFi 2.4 GHz (DSSS/OFDM, 54 Mbps); Frequency: 2462 MHz; Medium parameters used: $\sigma = 0$ S/m, $\varepsilon_r = 1$; $\rho = 0$ kg/m^3
Phantom section: RF Section

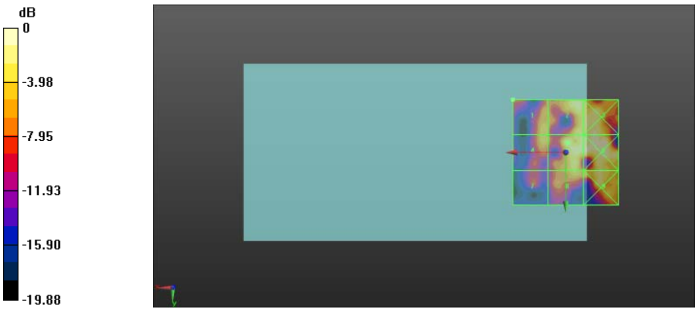
DASY5 Configuration:

- Probe: ER3DV6 - SN2368; ConvF(1, 1, 1); Calibrated: 2017/10/20;
- Sensor-Surface: (Fix Surface)
- Electronics: DAE4 Sn546; Calibrated: 2017/9/15
- Phantom: HAC Test Arch; Type: SD HAC P01 BA;
- Measurement SW: DASY52, Version 52.8 (8); SEMCAD X Version 14.6.10 (7373)

LTE/E Scan - ER3D: 15 mm from Probe Center to the Device wifi2.4 11g H ANT1/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 = 11.17 V/m; Power Drift = -0.13 dB
Applied MIF = 0.12 dB
RF audio interference level = 26.64 dBV/m
Emission category: M4

MIF scaled E-field

Grid 1 **M4** **24.01 dBV/m**	Grid 2 **M4** **26.23 dBV/m**	Grid 3 **M4** **27.09 dBV/m**
Grid 4 **M4** **23.95 dBV/m**	Grid 5 **M4** **26.64 dBV/m**	Grid 6 **M4** **28.18 dBV/m**
Grid 7 **M4** **19.93 dBV/m**	Grid 8 **M4** **24.47 dBV/m**	Grid 9 **M4** **26.42 dBV/m**



0 dB = 25.64 V/m = 28.18 dBV/m

WIFI 2.4G 802.11g (antenna2)

Communication System: UID 10077, IEEE 802.11g WiFi 2.4 GHz (DSSS/OFDM, 54 Mbps);
Frequency: 2412 MHz; Medium parameters used: σ = 0 S/m, ε_r = 1; ρ = 0 kg/m^3
Phantom section: RF Section

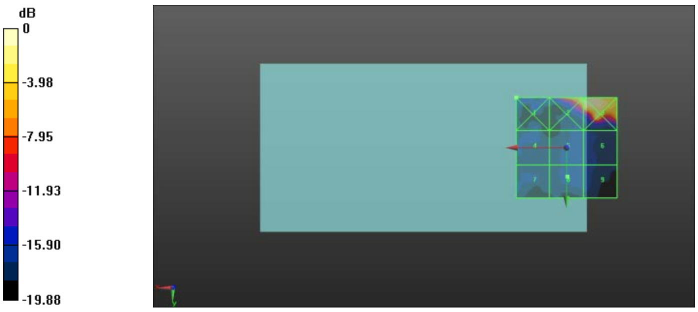
DASY5 Configuration:

- Probe: ER3DV6 - SN2368; ConvF(1, 1, 1); Calibrated: 2017/10/20;
- Sensor-Surface: (Fix Surface)
- Electronics: DAE4 Sn546; Calibrated: 2017/9/15
- Phantom: HAC Test Arch; Type: SD HAC P01 BA;
- Measurement SW: DASY52, Version 52.8 (8); SEMCAD X Version 14.6.10 (7373)

LTE/E Scan - ER3D: 15 mm from Probe Center to the Device wifi2.4 11g L ANT2/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 = 6.880 V/m; Power Drift = 0.08 dB
Applied MIF = 0.12 dB
RF audio interference level = 24.80 dBV/m
Emission category: M4

MIF scaled E-field

Grid 1 **M4** **27.92 dBV/m**	Grid 2 **M4** **27.94 dBV/m**	Grid 3 **M3** **27.02 dBV/m**
Grid 4 **M4** **24.55 dBV/m**	Grid 5 **M4** **24.14 dBV/m**	Grid 6 **M4** **24.04 dBV/m**
Grid 7 **M4** **23.84 dBV/m**	Grid 8 **M4** **24.8 dBV/m**	Grid 9 **M4** **23.98 dBV/m**



0 dB = 31.69 V/m = 30.02 dBV/m

WIFI 2.4G 802.11g (antenna2)

Communication System: UID 10077, IEEE 802.11g WiFi 2.4 GHz (DSSS/OFDM, 54 Mbps);
Frequency: 2437 MHz; Medium parameters used: $\sigma = 0$ S/m, $\varepsilon_r = 1$; $\rho = 0$ kg/m^3
Phantom section: RF Section

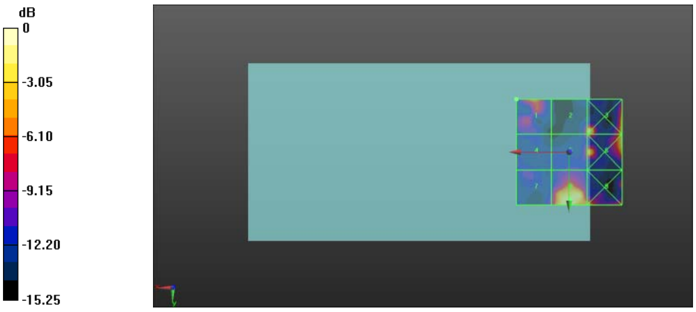
DASY5 Configuration:

- Probe: ER3DV6 - SN2368; ConvF(1, 1, 1); Calibrated: 2017/10/20;
- Sensor-Surface: (Fix Surface)
- Electronics: DAE4 Sn546; Calibrated: 2017/9/15
- Phantom: HAC Test Arch; Type: SD HAC P01 BA;
- Measurement SW: DASY52, Version 52.8 (8); SEMCAD X Version 14.6.10 (7373)

LTE/E Scan - ER3D: 15 mm from Probe Center to the Device wifi2.4 11g M ANT2/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 = 6.248 V/m; Power Drift = 0.16 dB
Applied MIF = 0.12 dB
RF audio interference level = 24.25 dBV/m
Emission category: M4

MIF scaled E-field

Grid 1 **M4** **20.37 dBV/m**	Grid 2 **M4** **20.77 dBV/m**	Grid 3 **M4** **25.06 dBV/m**
Grid 4 **M4** **14.72 dBV/m**	Grid 5 **M4** **19.76 dBV/m**	Grid 6 **M4** **25.16 dBV/m**
Grid 7 **M4** **15.65 dBV/m**	Grid 8 **M4** **24.25 dBV/m**	Grid 9 **M4** **21.72 dBV/m**



0 dB = 18.10 V/m = 25.15 dBV/m

WIFI 2.4G 802.11g (antenna2)

Communication System: UID 10077, IEEE 802.11g WiFi 2.4 GHz (DSSS/OFDM, 54 Mbps);
Frequency: 2462 MHz; Medium parameters used: $\sigma = 0$ S/m, $\varepsilon_r = 1$; $\rho = 0$ kg/m^3
Phantom section: RF Section

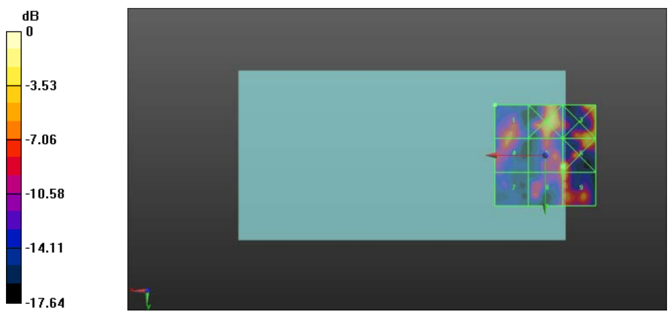
DASY5 Configuration:

- Probe: ER3DV6 - SN2368; ConvF(1, 1, 1); Calibrated: 2017/10/20;
- Sensor-Surface: (Fix Surface)
- Electronics: DAE4 Sn546; Calibrated: 2017/9/15
- Phantom: HAC Test Arch; Type: SD HAC P01 BA;
- Measurement SW: DASY52, Version 52.8 (8); SEMCAD X Version 14.6.10 (7373)

  LTE/E Scan - ER3D: 15 mm from Probe Center to the Device wifi2.4 11g H ANT2/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 = 6.478 V/m; Power Drift = 0.19 dB
  Applied MIF = 0.12 dB
  RF audio interference level = 24.58 dBV/m
  Emission category: M4

MIF scaled E-field

Grid 1 **M4** **21.46 dBV/m**	Grid 2 **M4** **25.45 dBV/m**	Grid 3 **M4** **27.9 dBV/m**
Grid 4 **M4** **21.44 dBV/m**	Grid 5 **M4** **24.58 dBV/m**	Grid 6 **M4** **25.88 dBV/m**
Grid 7 **M4** **15.65 dBV/m**	Grid 8 **M4** **22.6 dBV/m**	Grid 9 **M4** **23.01 dBV/m**



0 dB = 24.82 V/m = 27.90 dBV/m

ANNEX B: DIPOLE & PROBE CALIBRATION CERTIFICATES

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Multilateral Agreement for the recognition of calibration certificates

Accreditation No.: **SCS 0108**

Client: SRTC (Auden)

Certificate No: CD835V3-1106_Oct17

CALIBRATION CERTIFICATE

Object: CD835V3 - SN: 1106

Calibration procedure(s): QA CAL-20.v6
Calibration procedure for dipoles in air

Calibration date: October 24, 2017

This calibration certificate documents the traceability to national standards, which realize the physical units of measurements (SI).
The measurements and the uncertainties with confidence probability are given on the following pages and are part of the certificate.

All calibrations have been conducted in the closed laboratory facility: environment temperature (22 ± 3)°C and humidity < 70%.

Calibration Equipment used (M&TE critical for calibration)

Primary Standards	ID #	Cal Date (Certificate No.)	Scheduled Calibration
Power meter NRP	SN: 104778	04-Apr-17 (No. 217-02521/02522)	Apr-18
Power sensor NRP-Z91	SN: 103244	04-Apr-17 (No. 217-02521)	Apr-18
Power sensor NRP-Z91	SN: 103245	04-Apr-17 (No. 217-02522)	Apr-18
Reference 20 dB Attenuator	SN: 5058 (20k)	07-Apr-17 (No. 217-02528)	Apr-18
Type-N mismatch combination	SN: 5047.2 / 06327	07-Apr-17 (No. 217-02529)	Apr-18
Probe ER3DV6	SN: 2336	30-Dec-16 (No. ER3-2336_Dec16)	Dec-17
Probe H3DV6	SN: 6065	30-Dec-16 (No. H3-6065_Dec16)	Dec-17
DAE4	SN: 781	13-Jul-17 (No. DAE4-781_Jul17)	Jul-18

Secondary Standards	ID #	Check Date (in house)	Scheduled Check
Power meter Agilent 4419B	SN: GB42420191	09-Oct-09 (in house check Oct-17)	In house check: Oct-20
Power sensor HP E4412A	SN: US38485102	05-Jan-10 (in house check Oct-17)	In house check: Oct-20
Power sensor HP 8482A	SN: US37295597	09-Oct-09 (in house check Oct-17)	In house check: Oct-20
RF generator R&S SMT-06	SN: 832283/011	27-Aug-12 (in house check Oct-17)	In house check: Oct-20
Network Analyzer HP 8753E	SN: US37390585	18-Oct-01 (in house check Oct-17)	In house check: Oct-18

	Name	Function	Signature
Calibrated by:	Leif Klysner	Laboratory Technician	
Approved by:	Katja Pokovic	Technical Manager	

Issued: October 26, 2017

This calibration certificate shall not be reproduced except in full without written approval of the laboratory.

Certificate No: CD835V3-1106_Oct17 Page 1 of 5

Tel: 86-10-5799 6183
Fax: 86-10-5799 6388

Calibration Laboratory of
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Zeughausstrasse 43, 8004 Zurich, Switzerland

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Accreditation No.: **SCS 0108**

References

[1] ANSI-C63.19-2011
American National Standard, Methods of Measurement of Compatibility between Wireless Communications Devices and Hearing Aids.

Methods Applied and Interpretation of Parameters:

- *Coordinate System:* y-axis is in the direction of the dipole arms. z-axis is from the basis of the antenna (mounted on the table) towards its feed point between the two dipole arms. x-axis is normal to the other axes. In coincidence with the standards [1], the measurement planes (probe sensor center) are selected to be at a distance of 15 mm above the top metal edge of the dipole arms.
- *Measurement Conditions:* Further details are available from the hardcopies at the end of the certificate. All figures stated in the certificate are valid at the frequency indicated. The forward power to the dipole connector is set with a calibrated power meter connected and monitored with an auxiliary power meter connected to a directional coupler. While the dipole under test is connected, the forward power is adjusted to the same level.
- *Antenna Positioning:* The dipole is mounted on a HAC Test Arch phantom using the matching dipole positioner with the arms horizontal and the feeding cable coming from the floor. The measurements are performed in a shielded room with absorbers around the setup to reduce the reflections.
It is verified before the mounting of the dipole under the Test Arch phantom, that its arms are perfectly in a line. It is installed on the HAC dipole positioner with its arms parallel below the dielectric reference wire and able to move elastically in vertical direction without changing its relative position to the top center of the Test Arch phantom. The vertical distance to the probe is adjusted after dipole mounting with a DASY5 Surface Check job. Before the measurement, the distance between phantom surface and probe tip is verified. The proper measurement distance is selected by choosing the matching section of the HAC Test Arch phantom with the proper device reference point (upper surface of the dipole) and the matching grid reference point (tip of the probe) considering the probe sensor offset. The vertical distance to the probe is essential for the accuracy.
- *Feed Point Impedance and Return Loss:* These parameters are measured using a HP 8753E Vector Network Analyzer. The impedance is specified at the SMA connector of the dipole. The influence of reflections was eliminating by applying the averaging function while moving the dipole in the air, at least 70cm away from any obstacles.
- *E-field distribution:* E field is measured in the x-y-plane with an isotropic ER3D-field probe with 100 mW forward power to the antenna feed point. In accordance with [1], the scan area is 20mm wide, its length exceeds the dipole arm length (180 or 90mm). The sensor center is 15 mm (in z) above the metal top of the dipole arms. Two 3D maxima are available near the end of the dipole arms. Assuming the dipole arms are perfectly in one line, the average of these two maxima (in subgrid 2 and subgrid 8) is determined to compensate for any non-parallelity to the measurement plane as well as the sensor displacement. The E-field value stated as calibration value represents the maximum of the interpolated 3D-E-field, in the plane above the dipole surface.

The reported uncertainty of measurement is stated as the standard uncertainty of measurement multiplied by the coverage factor k=2, which for a normal distribution corresponds to a coverage probability of approximately 95%.

Measurement Conditions

DASY system configuration, as far as not given on page 1.

DASY Version	DASY5	V52.10.0
Phantom	HAC Test Arch	
Distance Dipole Top - Probe Center	15 mm	
Scan resolution	dx, dy = 5 mm	
Frequency	835 MHz ± 1 MHz	
Input power drift	< 0.05 dB	

Maximum Field values at 835 MHz

E-field 15 mm above dipole surface	condition	Interpolated maximum
Maximum measured above high end	100 mW input power	111.0 V/m = 40.91 dBV/m
Maximum measured above low end	100 mW input power	106.8 V/m = 40.57 dBV/m
Averaged maximum above arm	100 mW input power	**108.9 V/m ± 12.8 % (k=2)**

Appendix (Additional assessments outside the scope of SCS 0108)

Antenna Parameters

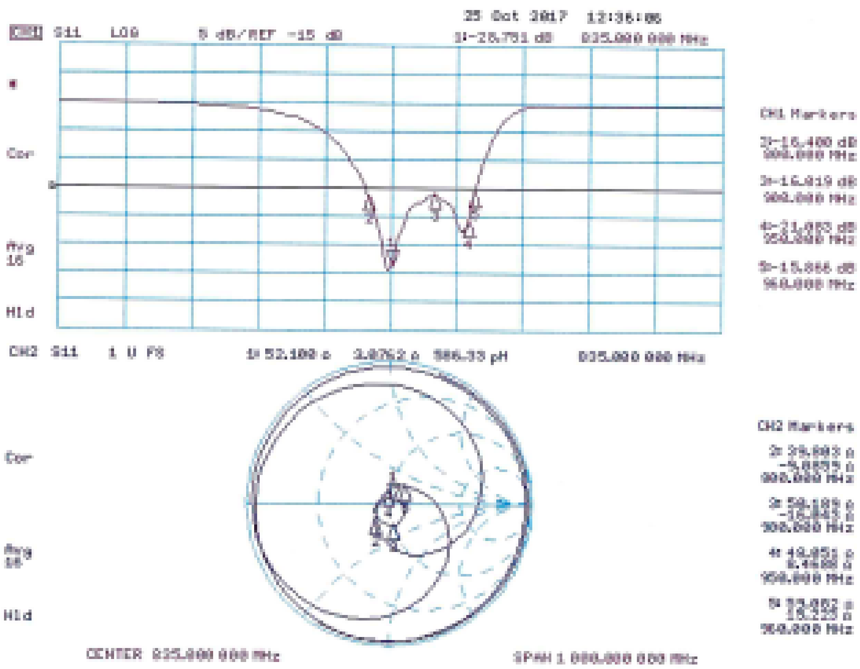
Frequency	Return Loss	Impedance
800 MHz	16.4 dB	39.8 Ω - 9.1 jΩ
835 MHz	28.8 dB	52.1 Ω + 3.1 jΩ
900 MHz	16.0 dB	50.2 Ω - 16.0 jΩ
950 MHz	21.1 dB	48.1 Ω + 8.5 jΩ
960 MHz	15.9 dB	59.1 Ω + 15.2 jΩ

3.2 Antenna Design and Handling

The calibration dipole has a symmetric geometry with a built-in two stub matching network, which leads to the enhanced bandwidth.
The dipole is built of standard semirigid coaxial cable. The internal matching line is open ended. The antenna is therefore open for DC signals.
Do not apply force to dipole arms, as they are liable to bend. The soldered connections near the feedpoint may be damaged. After excessive mechanical stress or overheating, check the impedance characteristics to ensure that the internal matching network is not affected.

After long term use with 40W radiated power, only a slight warming of the dipole near the feedpoint can be measured.

Impedance Measurement Plot



Certificate No: CD835V3-1106_Oct17 Page 4 of 5

DASY5 E-field Result

Date: 24.10.2017

Test Laboratory: SPEAG Lab2

DUT: HAC-Dipole 835 MHz; Type: CD835V3; Serial: CD835V3 - SN: 1106

Communication System: UID 0 - CW ; Frequency: 835 MHz
Medium parameters used: $\sigma = 0$ S/m, $\epsilon_r = 1$; $\rho = 1000$ kg/m^3
Phantom section: RF Section
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2011)

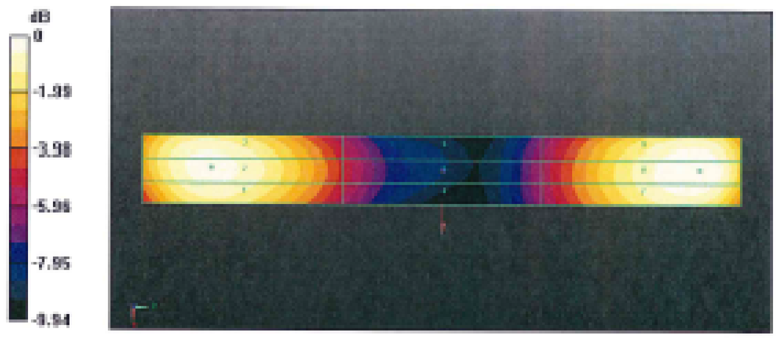
DASY52 Configuration:

- Probe: ER3DV6 - SN2336; ConvF(1, 1, 1); Calibrated: 30.12.2016;
- Sensor-Surface: (Fix Surface)
- Electronics: DAE4 Sn781; Calibrated: 13.07.2017
- Phantom: HAC Test Arch with AMCC; Type: SD HAC P01 BA; Serial: 1070
- DASY52 52.10.0(1446); SEMCAD X 14.6.10(7417)

Dipole E-Field measurement @ 835MHz/E-Scan - 835MHz d=15mm/Hearing Aid Compatibility Test (41x361x1):
Interpolated grid: dx=0.5000 mm, dy=0.5000 mm
Device Reference Point: 0, 0, -6.3 mm
Reference Value = 113.4 V/m; Power Drift = -0.00 dB
Applied MIF = 0.00 dB
RF audio interference level = 40.90 dBV/m
Emission category: M3

MIF scaled E-field

Grid 1 M3 40.32 dBV/m	Grid 2 M3 40.57 dBV/m	Grid 3 M3 40.48 dBV/m
Grid 4 M4 35.96 dBV/m	Grid 5 M4 36.13 dBV/m	Grid 6 M4 36.01 dBV/m
Grid 7 M3 40.71 dBV/m	Grid 8 M3 40.91 dBV/m	Grid 9 M3 40.77 dBV/m



0 dB = 111.0 V/m = 40.91 dBV/m

Certificate No: CD835V3-1106_Oct17 Page 5 of 5

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Accreditation No.: SCS 0108

Client **SRTC (Auden)**

Certificate No: CD1880V3-1075_Oct17

CALIBRATION CERTIFICATE

Object	CD1880V3 - SN: 1075
Calibration procedure(s)	QA CAL-20.v6 Calibration procedure for dipoles in air
Calibration date:	October 25, 2017

This calibration certificate documents the traceability to national standards, which realize the physical units of measurements (SI).
The measurements and the uncertainties with confidence probability are given on the following pages and are part of the certificate.

All calibrations have been conducted in the closed laboratory facility: environment temperature (22 ± 3)°C and humidity < 70%.

Calibration Equipment used (M&TE critical for calibration)

Primary Standards	ID #	Cal Date (Certificate No.)	Scheduled Calibration
Power meter NRP	SN: 104778	04-Apr-17 (No. 217-02521/02522)	Apr-18
Power sensor NRP-Z91	SN: 103244	04-Apr-17 (No. 217-02521)	Apr-18
Power sensor NRP-Z91	SN: 103245	04-Apr-17 (No. 217-02522)	Apr-18
Reference 20 dB Attenuator	SN: 5058 (20k)	07-Apr-17 (No. 217-02528)	Apr-18
Type-N mismatch combination	SN: 5047.2 / 06327	07-Apr-17 (No. 217-02529)	Apr-18
Probe ER3DV6	SN: 2336	30-Dec-16 (No. ER3-2336_Dec16)	Dec-17
Probe H3DV6	SN: 6065	30-Dec-16 (No. H3-6065_Dec16)	Dec-17
DAE4	SN: 781	13-Jul-17 (No. DAE4-781_Jul17)	Jul-18

Secondary Standards	ID #	Check Date (in house)	Scheduled Check
Power meter Agilent 4419B	SN: GB42420191	09-Oct-09 (in house check Oct-17)	In house check: Oct-20
Power sensor HP E4412A	SN: US38485102	05-Jan-10 (in house check Oct-17)	In house check: Oct-20
Power sensor HP 8482A	SN: US37295597	09-Oct-09 (in house check Oct-17)	In house check: Oct-20
RF generator R&S SMT-06	SN: 832283/011	27-Aug-12 (in house check Oct-17)	In house check: Oct-20
Network Analyzer HP 8753E	SN: US37390585	18-Oct-01 (in house check Oct-17)	In house check: Oct-18

	Name	Function	Signature
Calibrated by:	Leif Klysner	Laboratory Technician	
Approved by:	Katja Pokovic	Technical Manager	

Issued: October 25, 2017

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Accreditation No.: SCS 0108

References

[1] ANSI-C63.19-2011
American National Standard, Methods of Measurement of Compatibility between Wireless Communications Devices and Hearing Aids.

Methods Applied and Interpretation of Parameters:

- *Coordinate System:* y-axis is in the direction of the dipole arms. z-axis is from the basis of the antenna (mounted on the table) towards its feed point between the two dipole arms. x-axis is normal to the other axes. In coincidence with the standards [1], the measurement planes (probe sensor center) are selected to be at a distance of 15 mm above the top metal edge of the dipole arms.
- *Measurement Conditions:* Further details are available from the hardcopies at the end of the certificate. All figures stated in the certificate are valid at the frequency indicated. The forward power to the dipole connector is set with a calibrated power meter connected and monitored with an auxiliary power meter connected to a directional coupler. While the dipole under test is connected, the forward power is adjusted to the same level.
- *Antenna Positioning:* The dipole is mounted on a HAC Test Arch phantom using the matching dipole positioner with the arms horizontal and the feeding cable coming from the floor. The measurements are performed in a shielded room with absorbers around the setup to reduce the reflections.
  It is verified before the mounting of the dipole under the Test Arch phantom, that its arms are perfectly in a line. It is installed on the HAC dipole positioner with its arms parallel below the dielectric reference wire and able to move elastically in vertical direction without changing its relative position to the top center of the Test Arch phantom. The vertical distance to the probe is adjusted after dipole mounting with a DASY5 Surface Check job. Before the measurement, the distance between phantom surface and probe tip is verified. The proper measurement distance is selected by choosing the matching section of the HAC Test Arch phantom with the proper device reference point (upper surface of the dipole) and the matching grid reference point (tip of the probe) considering the probe sensor offset. The vertical distance to the probe is essential for the accuracy.
- *Feed Point Impedance and Return Loss:* These parameters are measured using a HP 8753E Vector Network Analyzer. The impedance is specified at the SMA connector of the dipole. The influence of reflections was eliminating by applying the averaging function while moving the dipole in the air, at least 70cm away from any obstacles.
- *E-field distribution:* E field is measured in the x-y-plane with an isotropic ER3D-field probe with 100 mW forward power to the antenna feed point. In accordance with [1], the scan area is 20mm wide, its length exceeds the dipole arm length (180 or 90mm). The sensor center is 15 mm (in z) above the metal top of the dipole arms. Two 3D maxima are available near the end of the dipole arms. Assuming the dipole arms are perfectly in one line, the average of these two maxima (in subgrid 2 and subgrid 8) is determined to compensate for any non-parallelity to the measurement plane as well as the sensor displacement. The E-field value stated as calibration value represents the maximum of the interpolated 3D-E-field, in the plane above the dipole surface.

The reported uncertainty of measurement is stated as the standard uncertainty of measurement multiplied by the coverage factor k=2, which for a normal distribution corresponds to a coverage probability of approximately 95%.

Measurement Conditions

DASY system configuration, as far as not given on page 1.

DASY Version	DASY5	V52.10.0
Phantom	HAC Test Arch	
Distance Dipole Top - Probe Center	15 mm	
Scan resolution	dx, dy = 5 mm	
Frequency	1880 MHz ± 1 MHz	
Input power drift	< 0.05 dB	

Maximum Field values at 1880 MHz

E-field 15 mm above dipole surface	condition	**Interpolated maximum**
Maximum measured above high end	100 mW input power	91.0 V/m = 39.18 dBV/m
Maximum measured above low end	100 mW input power	87.9 V/m = 38.88 dBV/m
Averaged maximum above arm	100 mW input power	**89.4 V/m ± 12.8 % (k=2)**

Appendix (Additional assessments outside the scope of SCS 0108)

Antenna Parameters

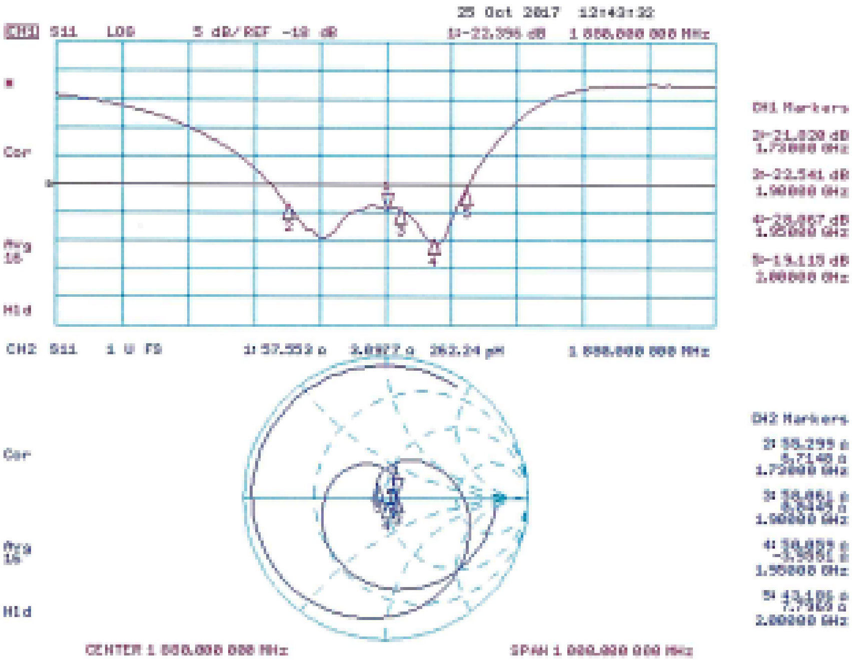
Frequency	**Return Loss**	**Impedance**
1730 MHz	21.8 dB	55.3 Ω + 6.7 jΩ
1880 MHz	22.4 dB	57.6 Ω + 3.1 jΩ
1900 MHz	22.5 dB	58.1 Ω + 0.0 jΩ
1950 MHz	28.1 dB	50.1 Ω - 4.0 jΩ
2000 MHz	19.1 dB	43.2 Ω + 7.8 jΩ

3.2 Antenna Design and Handling

The calibration dipole has a symmetric geometry with a built-in two stub matching network, which leads to the enhanced bandwidth.
The dipole is built of standard semirigid coaxial cable. The internal matching line is open ended. The antenna is therefore open for DC signals.
Do not apply force to dipole arms, as they are liable to bend. The soldered connections near the feedpoint may be damaged. After excessive mechanical stress or overheating, check the impedance characteristics to ensure that the internal matching network is not affected.

After long term use with 40W radiated power, only a slight warming of the dipole near the feedpoint can be measured.

Impedance Measurement Plot



Certificate No: CD1880V3-1075_Oct17 Page 4 of 5

DASY5 E-field Result

Date: 24.10.2017

Test Laboratory: SPEAG Lab2

DUT: HAC Dipole 1880 MHz; Type: CD1880V3; Serial: CD1880V3 - SN: 1075

Communication System: UID 0 - CW ; Frequency: 1880 MHz
Medium parameters used: $\sigma = 0$ S/m, $\varepsilon_r = 1$; $\rho = 1000$ kg/m^3
Phantom section: RF Section
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2011)

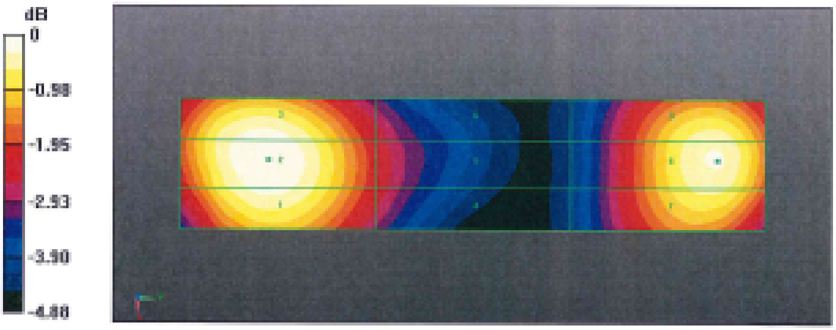
DASY52 Configuration:

- Probe: ER3DV6 - SN2336; ConvF(1, 1, 1); Calibrated: 30.12.2016;
- Sensor-Surface: (Fix Surface)
- Electronics: DAE4 Sn781; Calibrated: 13.07.2017
- Phantom: HAC Test Arch with AMCC; Type: SD HAC P01 BA; Serial: 1070
- DASY52 52.10.0(1446); SEMCAD X 14.6.10(7417)

Dipole E-Field measurement @ 1880MHz/E-Scan - 1880MHz d=15mm/Hearing Aid Compatibility Test (41x181x1):
Interpolated grid: dx=0.5000 mm, dy=0.5000 mm
Device Reference Point: 0, 0, -6.3 mm
Reference Value = 156.6 V/m; Power Drift = 0.02 dB
Applied MIF = 0.00 dB
RF audio interference level = 39.18 dBV/m
Emission category: M2

MIF scaled E-field

Grid 1 **M2** 38.97 dBV/m	Grid 2 **M2** 39.18 dBV/m	Grid 3 **M2** 39.06 dBV/m
Grid 4 **M2** 36.89 dBV/m	Grid 5 **M2** 37.01 dBV/m	Grid 6 **M2** 36.85 dBV/m
Grid 7 **M2** 38.64 dBV/m	Grid 8 **M2** 38.88 dBV/m	Grid 9 **M2** 38.77 dBV/m



0 dB = 90.95 V/m = 39.18 dBV/m

Certificate No: CD1880V3-1075_Oct17 Page 5 of 5

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Multilateral Agreement for the recognition of calibration certificates

Accreditation No.: **SCS 0108**

Client **SRTC (Auden)**

Certificate No: **CD2450V3-1069_Oct17**

CALIBRATION CERTIFICATE

Object	CD2450V3 - SN: 1069
Calibration procedure(s)	QA CAL-20.v6 Calibration procedure for dipoles in air
Calibration date:	October 25, 2017

This calibration certificate documents the traceability to national standards, which realize the physical units of measurements (SI).
The measurements and the uncertainties with confidence probability are given on the following pages and are part of the certificate.

All calibrations have been conducted in the closed laboratory facility: environment temperature (22 ± 3)°C and humidity < 70%.

Calibration Equipment used (M&TE critical for calibration)

Primary Standards	ID #	Cal Date (Certificate No.)	Scheduled Calibration
Power meter NRP	SN: 104778	04-Apr-17 (No. 217-02521/02522)	Apr-18
Power sensor NRP-Z91	SN: 103244	04-Apr-17 (No. 217-02521)	Apr-18
Power sensor NRP-Z91	SN: 103245	04-Apr-17 (No. 217-02522)	Apr-18
Reference 20 dB Attenuator	SN: 5058 (20k)	07-Apr-17 (No. 217-02528)	Apr-18
Type-N mismatch combination	SN: 5047.2 / 06327	07-Apr-17 (No. 217-02529)	Apr-18
Probe ER3DV6	SN: 2336	30-Dec-16 (No. ER3-2336_Dec16)	Dec-17
Probe H3DV6	SN: 6065	30-Dec-16 (No. H3-6065_Dec16)	Dec-17
DAE4	SN: 781	13-Jul-17 (No. DAE4-781_Jul17)	Jul-18

Secondary Standards	ID #	Check Date (in house)	Scheduled Check
Power meter Agilent 4419B	SN: GB42420191	09-Oct-09 (in house check Oct-17)	In house check: Oct-20
Power sensor HP E4412A	SN: US38485102	05-Jan-10 (in house check Oct-17)	In house check: Oct-20
Power sensor HP 8482A	SN: US37295597	09-Oct-09 (in house check Oct-17)	In house check: Oct-20
RF generator R&S SMT-06	SN: 832283/011	27-Aug-12 (in house check Oct-17)	In house check: Oct-20
Network Analyzer HP 8753E	SN: US37390585	18-Oct-01 (in house check Oct-17)	In house check: Oct-18

	Name	Function	Signature
Calibrated by:	Leif Klysner	Laboratory Technician	
Approved by:	Katja Pokovic	Technical Manager	

Issued: October 26, 2017

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Certificate No: CD2450V3-1069_Oct17 Page 1 of 5

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Accreditation No.: **SCS 0108**

References

[1] ANSI-C63.19-2011
American National Standard, Methods of Measurement of Compatibility between Wireless Communications Devices and Hearing Aids.

Methods Applied and Interpretation of Parameters:

- *Coordinate System:* y-axis is in the direction of the dipole arms. z-axis is from the basis of the antenna (mounted on the table) towards its feed point between the two dipole arms. x-axis is normal to the other axes. In coincidence with the standards [1], the measurement planes (probe sensor center) are selected to be at a distance of 15 mm above the top metal edge of the dipole arms.
- *Measurement Conditions:* Further details are available from the hardcopies at the end of the certificate. All figures stated in the certificate are valid at the frequency indicated. The forward power to the dipole connector is set with a calibrated power meter connected and monitored with an auxiliary power meter connected to a directional coupler. While the dipole under test is connected, the forward power is adjusted to the same level.
- *Antenna Positioning:* The dipole is mounted on a HAC Test Arch phantom using the matching dipole positioner with the arms horizontal and the feeding cable coming from the floor. The measurements are performed in a shielded room with absorbers around the setup to reduce the reflections.
It is verified before the mounting of the dipole under the Test Arch phantom, that its arms are perfectly in a line. It is installed on the HAC dipole positioner with its arms parallel below the dielectric reference wire and able to move elastically in vertical direction without changing its relative position to the top center of the Test Arch phantom. The vertical distance to the probe is adjusted after dipole mounting with a DASY5 Surface Check job. Before the measurement, the distance between phantom surface and probe tip is verified. The proper measurement distance is selected by choosing the matching section of the HAC Test Arch phantom with the proper device reference point (upper surface of the dipole) and the matching grid reference point (tip of the probe) considering the probe sensor offset. The vertical distance to the probe is essential for the accuracy.
- *Feed Point Impedance and Return Loss:* These parameters are measured using a HP 8753E Vector Network Analyzer. The impedance is specified at the SMA connector of the dipole. The influence of reflections was eliminating by applying the averaging function while moving the dipole in the air, at least 70cm away from any obstacles.
- *E-field distribution:* E field is measured in the x-y-plane with an isotropic ER3D-field probe with 100 mW forward power to the antenna feed point. In accordance with [1], the scan area is 20mm wide, its length exceeds the dipole arm length (180 or 90mm). The sensor center is 15 mm (in z) above the metal top of the dipole arms. Two 3D maxima are available near the end of the dipole arms. Assuming the dipole arms are perfectly in one line, the average of these two maxima (in subgrid 2 and subgrid 8) is determined to compensate for any non-parallelity to the measurement plane as well as the sensor displacement. The E-field value stated as calibration value represents the maximum of the interpolated 3D-E-field, in the plane above the dipole surface.

The reported uncertainty of measurement is stated as the standard uncertainty of measurement multiplied by the coverage factor k=2, which for a normal distribution corresponds to a coverage probability of approximately 95%.

Measurement Conditions

DASY system configuration, as far as not given on page 1.

DASY Version	DASY5	V52.10.0
Phantom	HAC Test Arch	
Distance Dipole Top - Probe Center	15 mm	
Scan resolution	dx, dy = 5 mm	
Frequency	2450 MHz ± 1 MHz	
Input power drift	< 0.05 dB	

Maximum Field values at 2450 MHz

E-field 15 mm above dipole surface	condition	Interpolated maximum
Maximum measured above high end	100 mW input power	90.0 V/m = 39.08 dBV/m
Maximum measured above low end	100 mW input power	84.8 V/m = 38.57 dBV/m
Averaged maximum above arm	100 mW input power	**87.4 V/m ± 12.8 % (k=2)**

Appendix (Additional assessments outside the scope of SCS 0108)

Antenna Parameters

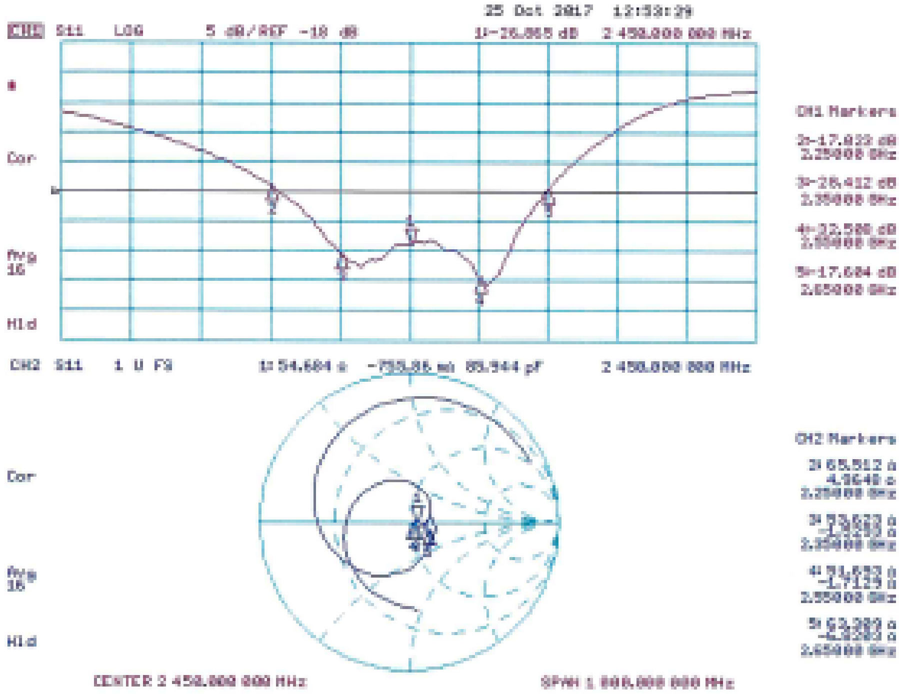
Frequency	Return Loss	Impedance
2250 MHz	17.0 dB	65.5 Ω + 5.0 jΩ
2350 MHz	28.4 dB	53.8 Ω - 1.5 jΩ
2450 MHz	26.9 dB	54.7 Ω - 0.8 jΩ
2550 MHz	32.5 dB	51.7 Ω - 1.7 jΩ
2650 MHz	17.6 dB	63.3 Ω - 6.8 jΩ

3.2 Antenna Design and Handling

The calibration dipole has a symmetric geometry with a built-in two stub matching network, which leads to the enhanced bandwidth.
The dipole is built of standard semirigid coaxial cable. The internal matching line is open ended. The antenna is therefore open for DC signals.
Do not apply force to dipole arms, as they are liable to bend. The soldered connections near the feedpoint may be damaged. After excessive mechanical stress or overheating, check the impedance characteristics to ensure that the internal matching network is not affected.

After long term use with 40W radiated power, only a slight warming of the dipole near the feedpoint can be measured.

Impedance Measurement Plot



Certificate No: CD2450V3-1069_Oct17 Page 4 of 5

DASY5 E-field Result

Date: 24.10.2017

Test Laboratory: SPEAG Lab2

DUT: HAC Dipole 2450 MHz; Type: CD2450V3; Serial: CD2450V3 - SN: 1069

Communication System: UID 0 - CW ; Frequency: 2450 MHz
Medium parameters used: $\sigma = 0$ S/m, $\varepsilon_r = 1$; $\rho = 1000$ kg/m^3
Phantom section: RF Section
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2011)

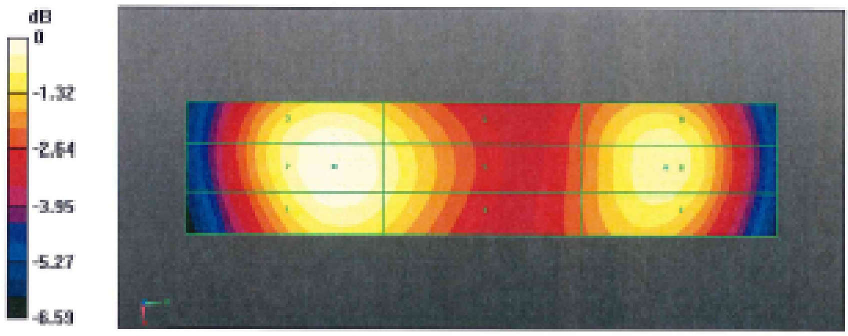
DASY52 Configuration:

- Probe: ER3DV6 - SN2336; ConvF(1, 1, 1); Calibrated: 30.12.2016;
- Sensor-Surface: (Fix Surface)
- Electronics: DAE4 Sn781; Calibrated: 13.07.2017
- Phantom: HAC Test Arch with AMCC; Type: SD HAC P01 BA; Serial: 1070
- DASY52 52.10.0(1446); SEMCAD X 14.6.10(7417)

Dipole E-Field measurement @ 2450MHz/E-Scan - 2450MHz d=15mm/Hearing Aid Compatibility Test (41x181x1):
Interpolated grid: dx=0.5000 mm, dy=0.5000 mm
Device Reference Point: 0, 0, -6.3 mm
Reference Value = 83.80 V/m; Power Drift = 0.01 dB
Applied MIF = 0.00 dB
RF audio interference level = 39.08 dBV/m
Emission category: M2

MIF scaled E-field

Grid 1 **M2** 38.89 dBV/m	Grid 2 **M2** 39.08 dBV/m	Grid 3 **M2** 38.95 dBV/m
Grid 4 **M2** 38.4 dBV/m	Grid 5 **M2** 38.54 dBV/m	Grid 6 **M2** 38.37 dBV/m
Grid 7 **M2** 38.35 dBV/m	Grid 8 **M2** 38.57 dBV/m	Grid 9 **M2** 38.49 dBV/m



0 dB = 89.95 V/m = 39.08 dBV/m

Certificate No: CD2450V3-1069_Oct17 Page 5 of 5

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Accreditation No.: **SCS 0108**

Client **SRTC (Auden)**

Certificate No: **ER3-2368_Oct17**

CALIBRATION CERTIFICATE

Object	ER3DV6 - SN:2368
Calibration procedure(s)	QA CAL-02.v8, QA CAL-25.v6 Calibration procedure for E-field probes optimized for close near field evaluations in air
Calibration date:	October 20, 2017

This calibration certificate documents the traceability to national standards, which realize the physical units of measurements (SI).
The measurements and the uncertainties with confidence probability are given on the following pages and are part of the certificate.

All calibrations have been conducted in the closed laboratory facility: environment temperature (22 ± 3)°C and humidity < 70%.

Calibration Equipment used (M&TE critical for calibration)

Primary Standards	ID	Cal Date (Certificate No.)	Scheduled Calibration
Power meter NRP	SN: 104778	04-Apr-17 (No. 217-02521/02522)	Apr-18
Power sensor NRP-Z91	SN: 103244	04-Apr-17 (No. 217-02521)	Apr-18
Power sensor NRP-Z91	SN: 103245	04-Apr-17 (No. 217-02525)	Apr-18
Reference 20 dB Attenuator	SN: S5277 (20x)	07-Apr-17 (No. 217-02528)	Apr-18
Reference Probe ER3DV6	SN: 2328	10-Oct-17 (No. ER3-2328_Oct17)	Oct-18
DAE4	SN: 789	2-Aug-17 (No. DAE4-789_Aug17)	Aug-18
Secondary Standards	ID	Check Date (in house)	Scheduled Check
Power meter E4419B	SN: GB41293874	06-Apr-16 (in house check Jun-16)	In house check: Jun-18
Power sensor E4412A	SN: MY41498087	06-Apr-16 (in house check Jun-16)	In house check: Jun-18
Power sensor E4412A	SN: 000110210	06-Apr-16 (in house check Jun-16)	In house check: Jun-18
RF generator HP 8648C	SN: US3642U01700	04-Aug-99 (in house check Jun-16)	In house check: Jun-18
Network Analyzer HP 8753E	SN: US37390585	18-Oct-01 (in house check Oct-17)	In house check: Oct-18

	Name	Function	Signature
Calibrated by:	Leif Klysner	Laboratory Technician	
Approved by:	Katja Pokovic	Technical Manager	

Issued: October 21, 2017

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Certificate No: ER3-2368_Oct17 Page 1 of 10

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Accreditation No.: **SCS 0108**

Glossary:

NORMx,y,z	sensitivity in free space
DCP	diode compression point
CF	crest factor (1/duty_cycle) of the RF signal
A, B, C, D	modulation dependent linearization parameters
Polarization φ	φ rotation around probe axis
Polarization ϑ	ϑ rotation around an axis that is in the plane normal to probe axis (at measurement center), i.e., ϑ = 0 is normal to probe axis
Connector Angle	information used in DASY system to align probe sensor X to the robot coordinate system

Calibration is Performed According to the Following Standards:

a) IEEE Std 1309-2005, " IEEE Standard for calibration of electromagnetic field sensors and probes, excluding antennas, from 9 kHz to 40 GHz", December 2005
b) CTIA Test Plan for Hearing Aid Compatibility, Rev 3.0, November 2013

Methods Applied and Interpretation of Parameters:

- *NORMx,y,z:* Assessed for E-field polarization ϑ = 0 for XY sensors and ϑ = 90 for Z sensor (f ≤ 900 MHz in TEM-cell; f > 1800 MHz: R22 waveguide).
- *NORM(f)x,y,z = NORMx,y,z * frequency_response* (see Frequency Response Chart).
- *DCPx,y,z:* DCP are numerical linearization parameters assessed based on the data of power sweep with CW signal (no uncertainty required). DCP does not depend on frequency nor media.
- *PAR:* PAR is the Peak to Average Ratio that is not calibrated but determined based on the signal characteristics
- *Ax,y,z; Bx,y,z; Cx,y,z; Dx,y,z; VRx,y,z: A, B, C, D* are numerical linearization parameters assessed based on the data of power sweep for specific modulation signal. The parameters do not depend on frequency nor media. *VR* is the maximum calibration range expressed in RMS voltage across the diode.
- *Spherical isotropy (3D deviation from isotropy):* in a locally homogeneous field realized using an open waveguide setup.
- *Sensor Offset:* The sensor offset corresponds to the offset of virtual measurement center from the probe tip (on probe axis). No tolerance required.
- *Connector Angle:* The angle is assessed using the information gained by determining the *NORMx* (no uncertainty required).

Probe ER3DV6

SN:2368

Manufactured: October 12, 2005
Calibrated: October 20, 2017

Calibrated for DASY/EASY Systems
(Note: non-compatible with DASY2 system!)

DASY/EASY - Parameters of Probe: ER3DV6 - SN:2368

Basic Calibration Parameters

	Sensor X	Sensor Y	Sensor Z	Unc (k=2)
Norm ($\mu V/(V/m)^2$)	1.65	1.56	1.80	± 10.1 %
DCP (mV)[B]	98.7	98.2	102.6	

Modulation Calibration Parameters

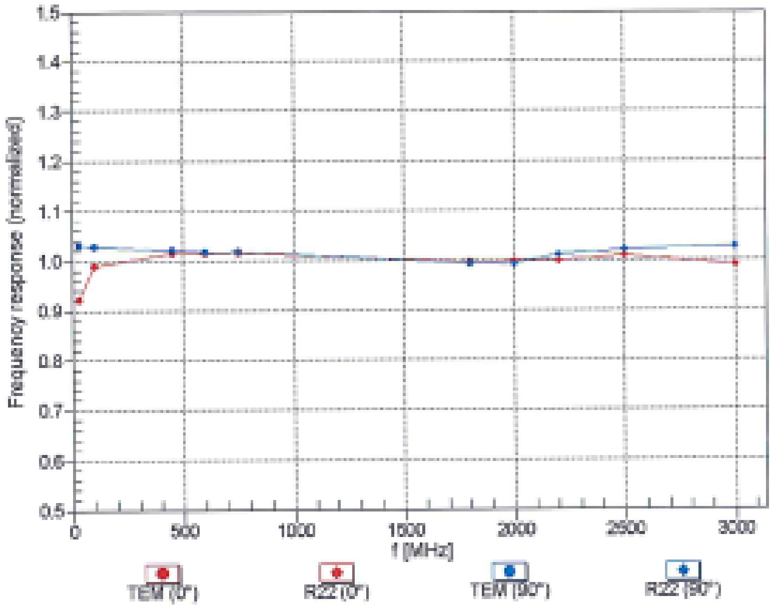
UID	Communication System Name		A dB	B dB√μV	C	D dB	VR mV	Unc[E] (k=2)
0	CW	X	0.0	0.0	1.0	0.00	193.0	±3.5 %
		Y	0.0	0.0	1.0		199.6	
		Z	0.0	0.0	1.0		191.2	
10021-DAC	GSM-FDD (TDMA, GMSK)	X	21.75	99.7	28.5	9.39	114.2	±3.3 %
		Y	20.68	99.6	28.5		115.6	
		Z	26.62	99.5	28.4		136.0	

The reported uncertainty of measurement is stated as the standard uncertainty of measurement multiplied by the coverage factor k=2, which for a normal distribution corresponds to a coverage probability of approximately 95%.

[B] Numerical linearization parameter: uncertainty not required.
[E] Uncertainty is determined using the max. deviation from linear response applying rectangular distribution and is expressed for the square of the field value.

Frequency Response of E-Field

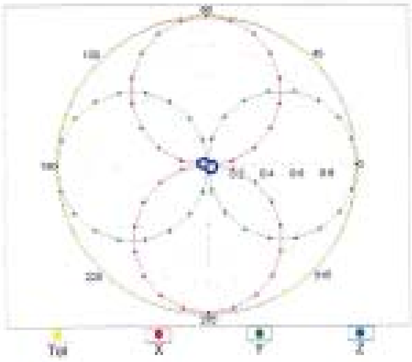
(TEM-Cell:ifi110 EXX, Waveguide: R22)



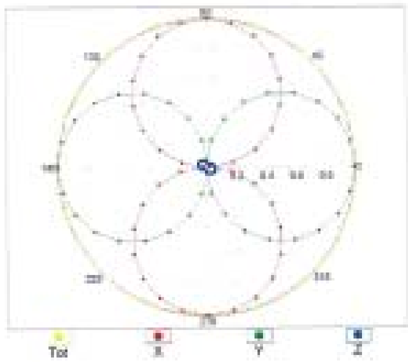
Uncertainty of Frequency Response of E-field: ± 6.3% (k=2)

Receiving Pattern (ϕ), ϑ = 0°

f=600 MHz,TEM,0°

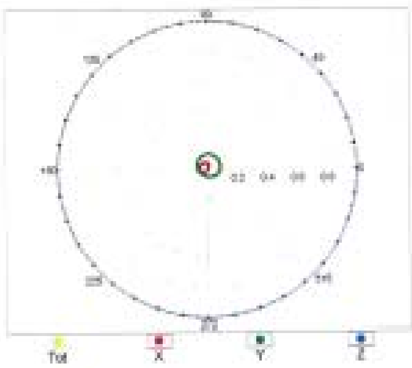


f=2500 MHz,R22,0°

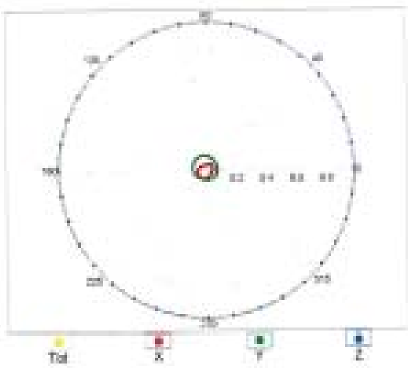


Receiving Pattern (ϕ), ϑ = 90°

f=600 MHz,TEM,90°

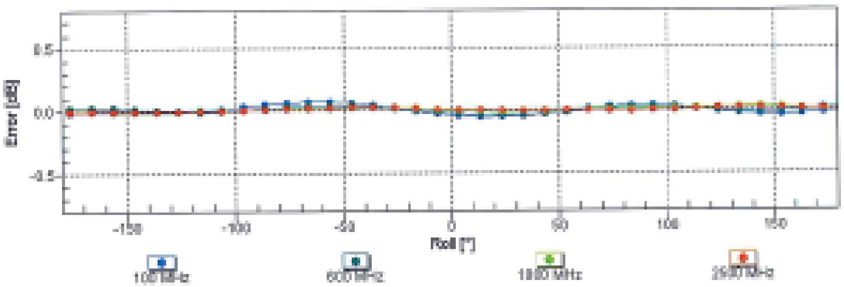


f=2500 MHz,R22,90°



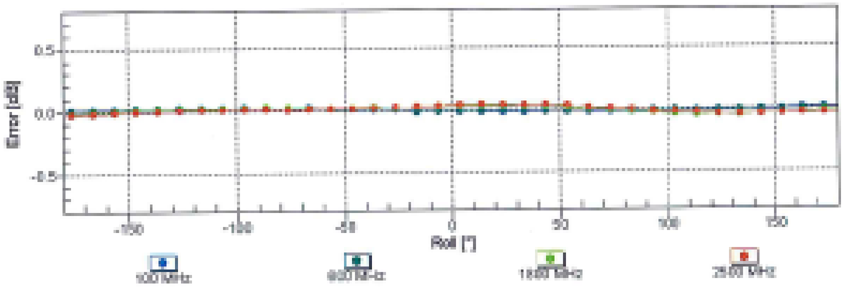
ER3DV6 – SN:2368 October 20, 2017

Receiving Pattern (φ), ϑ = 0°



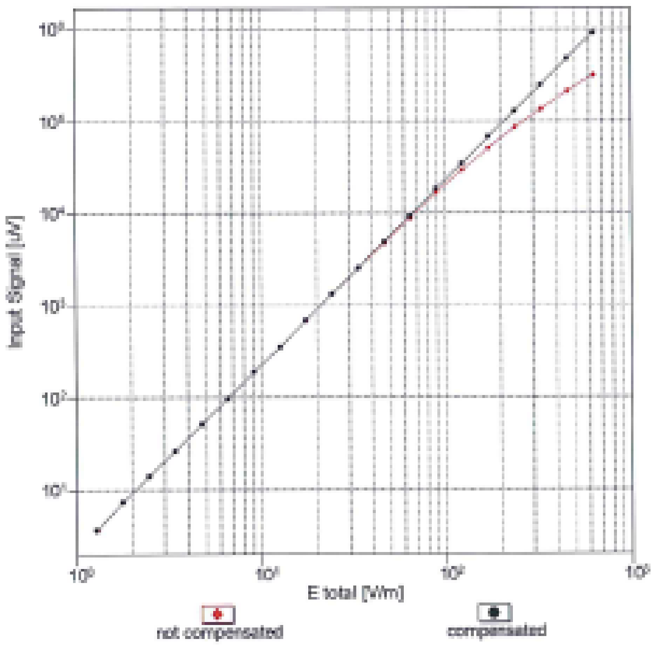
Uncertainty of Axial Isotropy Assessment: ± 0.5% (k=2)

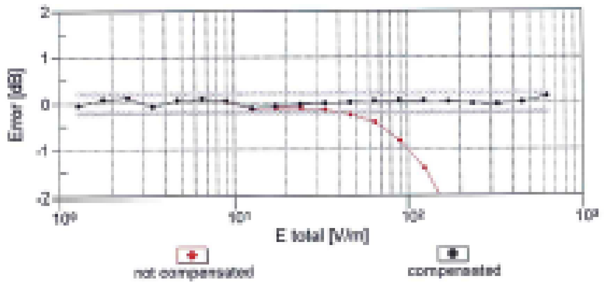
Receiving Pattern (φ), ϑ = 90°



Uncertainty of Axial Isotropy Assessment: ± 0.5% (k=2)

Dynamic Range f(E-field)
(TEM cell , f = 900 MHz)

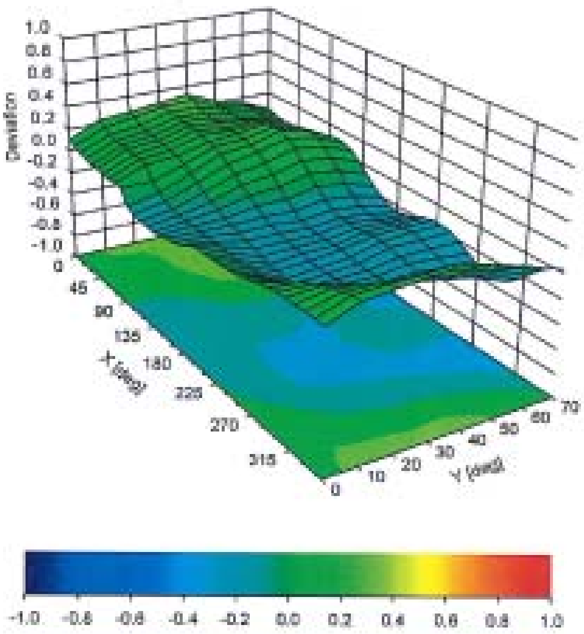




Uncertainty of Linearity Assessment: ± 0.6% (k=2)

Deviation from Isotropy in Air

Error (φ, θ), f = 900 MHz



Uncertainty of Spherical Isotropy Assessment: ± 2.6% (k=2)

DASY/EASY - Parameters of Probe: ER3DV6 - SN:2368

Other Probe Parameters

Sensor Arrangement	Rectangular
Connector Angle (°)	103.5
Mechanical Surface Detection Mode	enabled
Optical Surface Detection Mode	disabled
Probe Overall Length	337 mm
Probe Body Diameter	10 mm
Tip Length	10 mm
Tip Diameter	8 mm
Probe Tip to Sensor X Calibration Point	2.5 mm
Probe Tip to Sensor Y Calibration Point	2.5 mm
Probe Tip to Sensor Z Calibration Point	2.5 mm