FCC HAC (RF Emission) Test Report

Report No.	:	**SA170328C23-1**
Applicant	:	**Kyocera Corporation c/o Kyocera International, Inc.**
Address	:	**8611 Balboa Avenue, San Diego, CA 92123**
Product	:	**Feature Phone**
FCC ID	:	**V65E4750**
Brand	:	**KYOCERA**
Model No.	:	**E4750**
Standards	:	**FCC 47 CFR Part 20.19** **ANSI C63.19-2011**
Sample Received Date	:	**Mar. 28, 2017**
Date of Testing	:	**Apr. 11, 2017 ~ Apr. 22, 2017**
Summary M-Rating	:	**M4**
Lab Address	:	**No. 47-2, 14th Ling, Chia Pau Vil., Lin Kou Dist., New Taipei City, Taiwan, R.O.C.**
Test Location	:	**No. 19, Hwa Ya 2nd Rd, Wen Hwa Vil, Kwei Shan Dist., Taoyuan City 33383, Taiwan (R.O.C)**

CERTIFICATION: The above equipment have been tested by **Bureau Veritas Consumer Products Services (H.K.) Ltd., Taoyuan Branch – Lin Kou Laboratories**, and found compliance with the requirement of the above standards. The test record, data evaluation & Equipment Under Test (EUT) configurations represented herein are true and accurate accounts of the measurements of the sample's HAC characteristics under the conditions specified in this report. It should not be reproduced except in full, without the written approval of our laboratory. The client should not use it to claim product certification, approval, or endorsement by TAF or any government agencies.

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Testing Laboratory
2021

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Release Control Record

Report No.	Reason for Change	Date Issued
SA170328C23-1	Initial release	May 12, 2017

1. Summary of Maximum M-Rating

Mode / Band	Maximum RF Audio Interference Level (dBV/m)	M-Rating
WCDMA Band II	N/A	M4
WCDMA Band IV	N/A	M4
WCDMA Band V	N/A	M4
CDMA BC0	33.68	M4
CDMA BC1	24.24	M4
CDMA BC10	30.06	M4
WLAN 2.4G	28.55	M4
Summary		M4

Note:

1. The HAC RF emission limit **(M-rating Category M3)** is specified in FCC 47 CFR part 20.19 and ANSI C63.19.
2. The device RF emission rating is determined by the minimum rating.

2. Description of Equipment Under Test

EUT Type	Feature Phone
FCC ID	V65E4750
Brand Name	KYOCERA
Model Name	E4750
Tx Frequency Bands (Unit: MHz)	WCDMA Band II : 1852.4 ~ 1907.6 WCDMA Band IV : 1712.4 ~ 1752.6 WCDMA Band V : 826.4 ~ 846.6 CDMA BC0 : 824.7 ~ 848.31 CDMA BC1 : 1851.25 ~ 1908.75 CDMA BC10 : 817.9 ~ 823.1 WLAN : 2412 ~ 2462, 5180 ~ 5240, 5260 ~ 5320, 5500 ~ 5700, 5745 ~ 5825
Uplink Modulations	WCDMA : QPSK CDMA : QPSK 802.11b : DSSS 802.11a/g/n : OFDM
Maximum Tune-up Conducted Power (Unit: dBm)	Please refer to section 4.4.1 of this report.
Antenna Type	Fixed Internal Antenna
EUT Stage	Identical Prototype

Note:

1. The above EUT information is declared by manufacturer and for more detailed features description please refers to the manufacturer's specifications or User's Manual.

List of Accessory:

Battery	**Brand Name**	KYOCERA
	Model Name	SCP-71LBPS
	Power Rating	3.8Vdc, 2900mAh
	Type	Li-ion

Air Interface and Operational Mode

Air Interface	Bands	Type Transport	HAC Tested	Simultaneous But Not Tested	Voice Over Digital Transport OTT Capability	WiFi Low Power	Additional GSM Power Reduction
WCDMA	II	VO	NO[1]	WLAN or BT	N/A	N/A	N/A
	IV						
	V						
	HSPA	DT	N/A	WLAN or BT	YES		
CDMA	BC0	VO	NO[1]	WLAN or BT	N/A	N/A	N/A
	BC1						
	BC10						
	EVDO	DT	N/A	WLAN or BT	YES		
LTE	2	DT	N/A	WLAN or BT	YES	N/A	N/A
	4						
	5						
	12						
	25						
	26						
	41						
WLAN	2.4G / 5G	VD	YES[2]	WWAN	YES	N/A	N/A
Bluetooth	2.4G	DT	N/A	WWAN	N/A	N/A	N/A

Type Transport
VO = Voice only
DT = Digital Data – Not Indented for CMRS Service
VD = CMRS and Data transport

Note
1. It applies the low power exemption per ANSI C63.19-2011.
2. No associated T-Coil measurement has been made in accordance with the guidance issued by OET in KDB publication 285076 D02 T-Coil testing for CMRS IP.

3. HAC RF Emission Measurement System

3.1 SPEAG DASY System

DASY system consists of high precision robot, probe alignment sensor, phantom, robot controller, controlled measurement server and near-field probe. The robot includes six axes that can move to the precision position of the DASY5 software defined. The DASY software can define the area that is detected by the probe. The robot is connected to controlled box. Controlled measurement server is connected to the controlled robot box. The DAE includes amplifier, signal multiplexing, AD converter, offset measurement and surface detection. It is connected to the Electro-optical coupler (ECO). The ECO performs the conversion form the optical into digital electric signal of the DAE and transfers data to the PC.

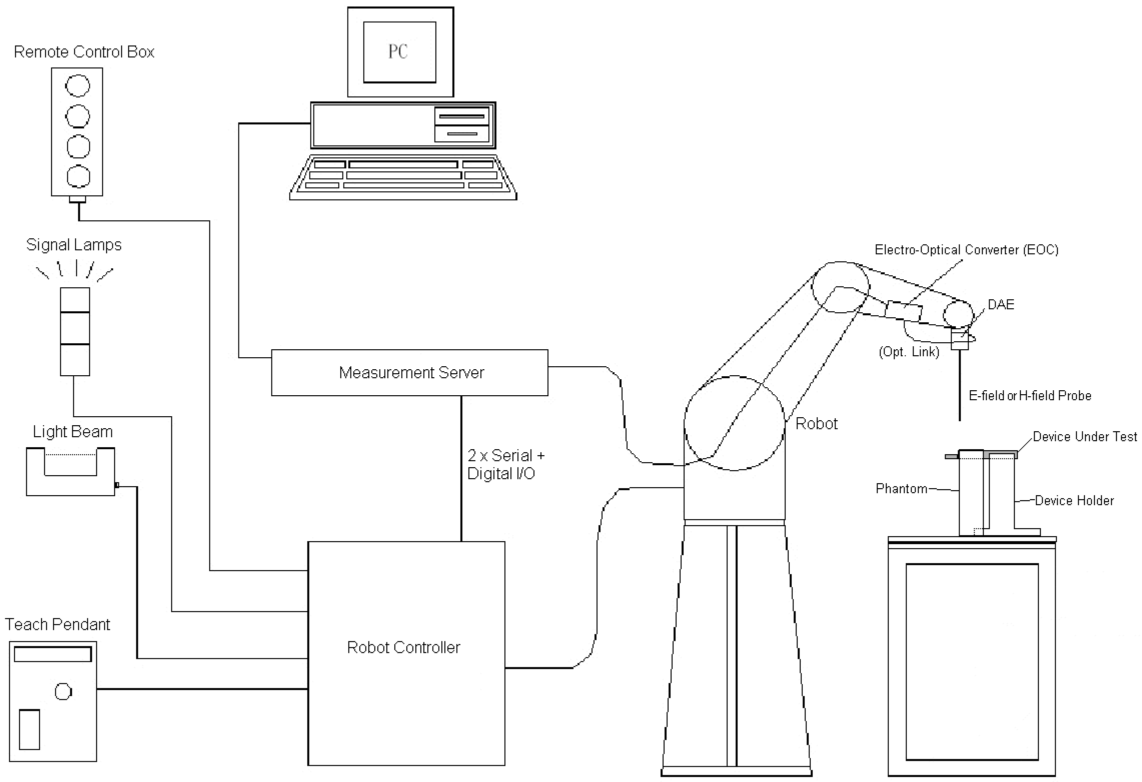

Fig-3.1 DASY System Setup

3.1.1 Robot

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

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

Fig-3.2 DASY5

3.1.2 Probes

Model	ER3DV6
Construction	One dipole parallel, two dipoles normal to probe axis Built-in shielding against static charges
Frequency	40 MHz to 6 GHz Linearity: ± 0.2 dB
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 Linearity: ± 0.2 dB
Dimensions	Overall length: 337 mm (Tip: 16 mm) Tip diameter: 8 mm (Body: 12 mm) Distance from probe tip to dipole centers: 2.5 mm

3.1.3 Data Acquisition Electronics (DAE)

Model	DAE3, DAE4
Construction	Signal amplifier, multiplexer, A/D converter and control logic. Serial optical link for communication with DASY embedded system (fully remote controlled). Two step probe touch detector for mechanical surface detection and emergency robot stop.
Measurement Range	-100 to +300 mV (16 bit resolution and two range settings: 4mV, 400mV)
Input Offset Voltage	< 5µV (with auto zero)
Input Bias Current	< 50 fA
Dimensions	60 x 60 x 68 mm

3.1.4 Phantoms

Model	Test Arch
Construction	Enables easy and well defined positioning of the phone and validation dipoles as well as simple teaching of the robot.
Dimensions	Length : 370 mm Width : 370 mm Height : 370 mm

3.1.5 Device Holder

Model	Mounting Device
Construction	The Mounting Device enables the rotation of the mounted transmitter device in spherical coordinates. Rotation point is the ear opening point. Transmitter devices can be easily and accurately positioned according to ANSI C63.19.
Material	POM

3.1.6 RF Emission Calibration Dipoles

Model	CD-Serial
Construction	Free space antenna Hearing Aid susceptibility measurements according to ANSI C63.19. Validation of Hearing Aid RF setup for wireless device emission measurements according to ANSI C63.19
Frequency	CD835V3 : 800 ~ 960 MHz CD1880V3 : 1710 ~ 2000 MHz CD2450 : 2250 ~ 2650 MHz
Return Loss	CD835V3 : > 15 dB (835 MHz > 25 dB) CD1880V3 : > 18 dB (1880 MHz > 20 dB) CD2450V3 : > 18 dB (2450 MHz > 25 dB)
Power Capability	> 40 W continuous

3.2 DASY System Verification

The system check verifies that the system operates within its specifications. It is performed before every E-field measurement. The system check uses normal measurements in the center section of the arch phantom with a matched dipole at a specified distance. The system verification setup is shown as below.

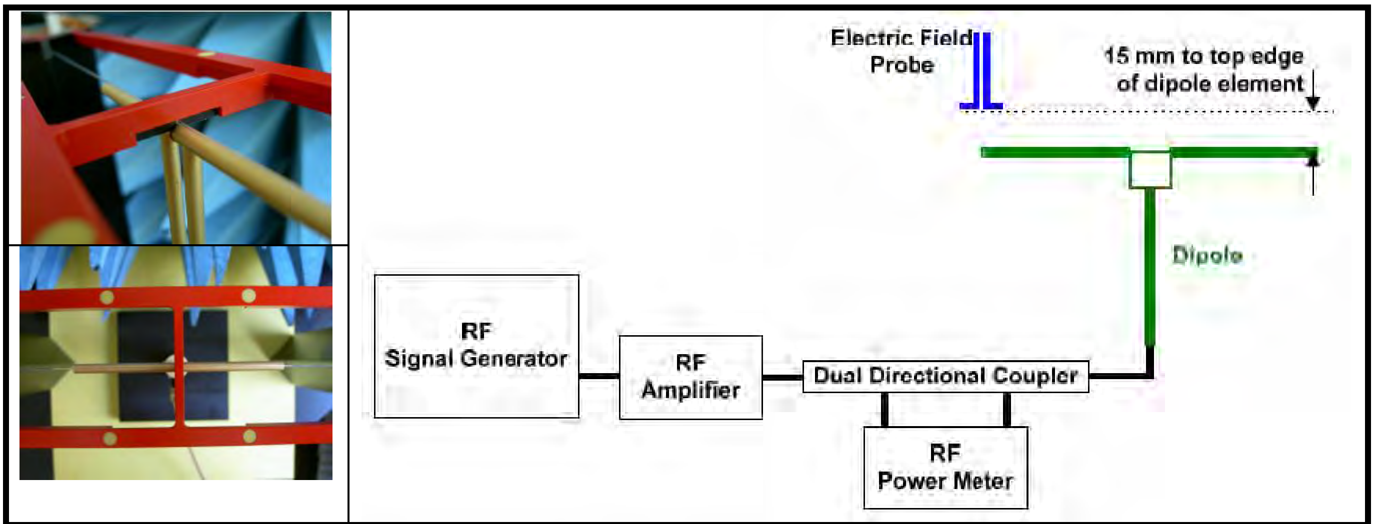

Fig-3.3 System Verification Setup

The validation dipole is placed beneath the center of arch phantom. The power meter measures the forward power at the location of the system check dipole connector. The signal generator is adjusted for the desired forward power, 100 mW (20 dBm) at the dipole connector and the RF power meter is read at that level. After connecting the cable to the dipole, the signal generator is readjusted for the same reading at RF power meter.

After system check testing, the E-field result will be compared with the reference value derived from validation dipole certificate report. The deviation of system check should be within 25 %.

The result of system verification is shown in section 4.3 of this report.

3.3 EUT Measurements Reference and Plane

The EUT is mounted in the device holder. The acoustic output of the EUT will coincide with the center point of the area formed by the dielectric wire and the middle bar of the arch's top frame. Then EUT will be moved vertically upwards until it touches the frame.

Fig-3.4 and Fig-3.5 illustrate the references and reference plane that is used in the RF emissions measurement.

(a) The grid is 50 mm by 50 mm area that is divided into nine evenly sized blocks or sub-grids.

(b) The grid is centered on the audio frequency output transducer of the EUT.

(c) The grid is in a reference plane, which is defined as the planar area that contains the highest point in the area of the phone that normally rests against the user's ear. It is parallel to the centerline of the receiver area of the phone and is defined by the points of the receiver-end of the EUT handset, which in normal handset use rest against the ear.

(d) The measurement plane is parallel to and 15 mm in front of the reference plane.

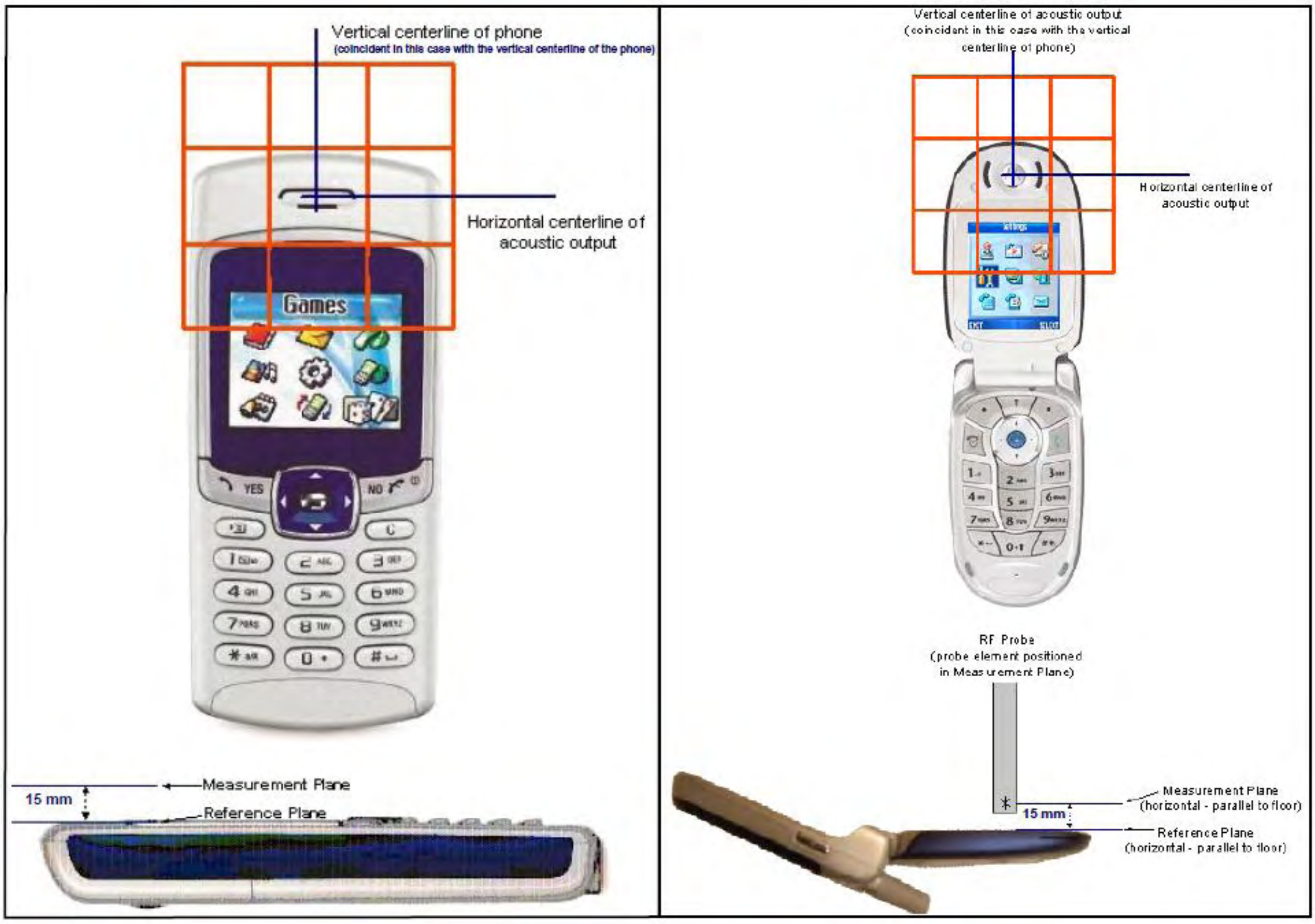

Fig-3.4 EUT Reference and Plane

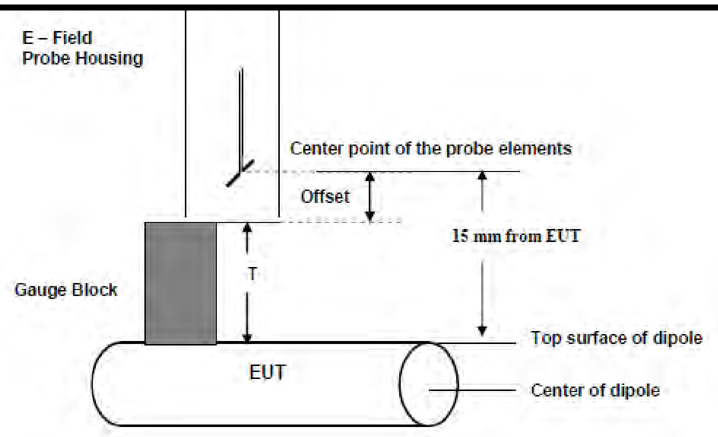

Fig-3.5 Gauge Block for Setting Measurement Distance to Probe

3.4 HAC RF Emission Measurement Procedure

The RF emissions test procedure for wireless communications device is as below.

1. Confirm the proper operation of the field probe, probe measurement system, and other instrumentation and the positioning system.
2. Position the WD in its intended test position.
3. 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.
4. 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, illustrated in Fig-3.4. If the field alignment method is used, align the probe for maximum field reception.
5. Record the reading at the output of the measurement system.
6. 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.
7. 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.
8. Identify the maximum reading within the non-excluded sub-grids identified in step 7.
9. Indirect Measurement Method: 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 8. Use this result to determine the category rating.

10.Compare this RF audio interference level with the categories in section 4.1 and record the resulting WD category rating.

11 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 can. 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. Otherwise, repeat step 1 through step 9, with the grid shifted so that it is centered on the perpendicular measurement point. Record the WD category rating.

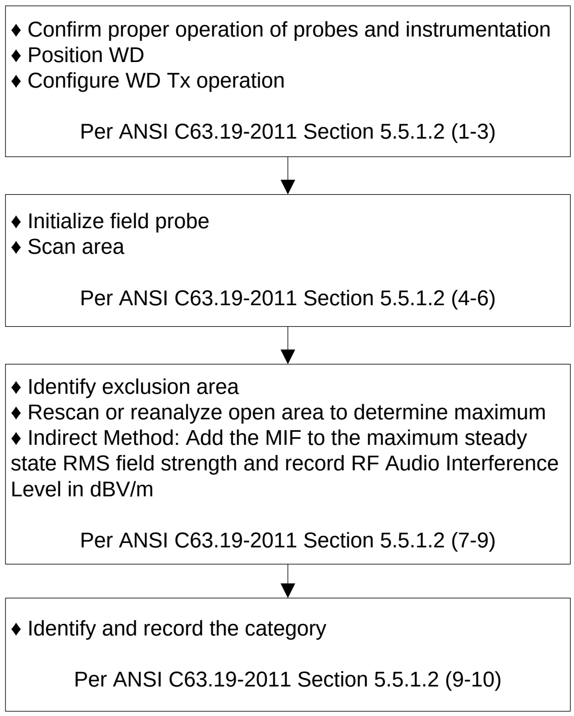

Fig-3.6 WD Near-Field Emission Test Flowchart

3.5 Modulation Interference Factor

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 potential (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 slots and repetition rates of few 100 Hz have high MIF values and give similar classification as ANSI C63.19-2007.

ER3D E-field probe 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. This near field probe read the averaged E-field. Especially for the new high peak-to-average (PAR) signal types, the probes shall be linearized by PMR calibration in order to not overestimate the field reading.

The evaluation method for 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 scaled to a 1 kHz 80% AM signal as reference. It may alternatively be determined through analysis and simulation, because it is constant and characteristic for a communication signal. DASY52 uses well-defined signals for PMR calibration. The MIF of these signals has been determined numerically. It allows a precise scaling and is therefore automatically applied.

The following table lists the MIF values evaluated by DASY manufacturer (SPEAG), and the test result will be calculated with the MIF parameter automatically. The detailed parameters for E-field probe can be found in the probe calibration report in appendix C.

SPEAG UID	UID Version	Communication System	MIF (dB)
10011	CAB (16.01.2014)	UMTS-FDD (WCDMA)	-27.23
10081	CAB (16.01.2014)	CDMA2000 (1xRTT, RC3)	-19.71
10295	AAB (16.01.2014)	CDMA2000 (RC1, SO3, 1/8 Rate)	3.26
10061	CAB (26.11.2014)	IEEE 802.11b WiFi 2.4 GHz (DSSS, 11 Mbps)	-2.02
10077	CAB (26.11.2014)	IEEE 802.11g WiFi 2.4 GHz (DSSS/OFDM, 54 Mbps)	0.12
10069	CAB (26.11.2014)	IEEE 802.11a/h WiFi 5 GHz (OFDM, 54 Mbps)	-3.15

The MIF measurement uncertainty listed in following table is estimated by SPEAG.

MIF (dB)	MIF Measurement Uncertainty (dB)
-7 to +5	0.2
-13 to +11	0.5
> -20	1.0

4. HAC Measurement Evaluation

4.1 M-Rating Category

The HAC Standard ANSI C63.19-2011 represents performance requirements for acceptable interoperability of hearing aids with wireless communications devices. When these parameters are met, a hearing aid operates acceptably in close proximity to a wireless communications device.

Emission Categories	E-Field Emissions < 960 MHz (dB V/m)	E-Field Emissions > 960 MHz (dB V/m)
Category M1	50 - 55	40 - 45
Category M2	45 - 50	35 - 40
Category M3	40 - 45	30 - 35
Category M4	< 40	< 30

4.2 EUT Configuration and Setting

For HAC RF emission testing, the EUT was linked and controlled by base station emulator. Communication between the EUT and the emulator was established by air link. The distance between the EUT and the communicating antenna of the emulator is larger than 50 cm and the output power radiated from the emulator antenna is at least 30 dB smaller than the output power of EUT. The EUT was set from the emulator to radiate maximum output power during HAC testing.

4.3 System Verification

The measuring results for system check are shown as below.

Frequency (MHz)	Input Power (dBm)	Target Value (V/m)	E-Field 1 (V/m)	E-Field 2 (V/m)	Average E-Field (V/m)	Deviation (%)	Test Date
835	20	107.2	111.8	113.3	112.55	4.99	Apr. 11, 2017
1880	20	89.0	90.36	90.41	90.385	1.56	Apr. 11, 2017
2450	20	88.3	89.61	94.86	92.235	4.46	Apr. 22, 2017

Note:

1. Comparing to the reference target value provided by SPEAG, the validation data should be within its specification of 25 %. The result indicates the system check can meet the variation criterion and the plots can be referred to Appendix A of this report.
2. For E-Field, the deviation is **[(E-Field 1 + E-Field 2) / 2 – Target Value] / Target Value x 100%**

4.4 Maximum Output Power

4.4.1 Maximum Conducted Power

The maximum conducted average power (Unit: dBm) including tune-up tolerance is shown as below.

Mode	WCDMA Band II	WCDMA Band IV	WCDMA Band V
RMC 12.2K	25.3	25.1	L CH: 24.1 M CH: 25.1 H CH: 25.1

Mode	CDMA BC0	CDMA BC1	CDMA BC10
1xRTT	L CH: 23.9 M CH: 24.2 H CH: 24.9	24.9	23.9

Mode	2.4G WLAN	5.2G WLAN	5.3G WLAN	5.6G WLAN	5.8G WLAN
802.11b	17.3	N/A	N/A	N/A	N/A
802.11g	17.3	N/A	N/A	N/A	N/A
802.11a	N/A	CH 36: 17.1 CH 40~48: 20.0	CH 52~60: 20.0 CH 64: 17.1	CH 100: 15.1 CH 104~136: 20.0 CH 140: 15.1	CH 149: 13.6 CH 153~161: 20.0 CH 165: 17.6
802.11n HT20	17.3	CH 36: 17.1 CH 40~48: 20.0	CH 52~60: 20.0 CH 64: 17.1	CH 100: 15.1 CH 104~136: 20.0 CH 140: 15.1	CH 149: 13.6 CH 153~161: 20.0 CH 165: 17.6
802.11n HT40	N/A	CH 38: 14.1 CH 46: 14.1	CH 54: 14.1 CH 62: 14.1	CH 102: 14.1 CH 110~126: 14.1 CH 134: 14.1	CH 151~159: 14.1

4.4.2 Measured Conducted Power Result

The measuring conducted average power (Unit: dBm) are shown as below.

Band	CDMA BC0			CDMA BC1			CDMA BC10		
Channel	1013	384	476	25	600	1175	476	580	684
Frequency (MHz)	824.70	836.52	817.9	1851.25	1880.00	1908.75	817.9	820.5	823.1
1xRTT RC1+SO3	22.89	24.09	24.11	24.27	24.08	24.16	23.01	23.17	22.99

<WLAN 2.4G>

Mode	802.11g		
Channel / Frequency (MHz)	1 (2412)	6 (2437)	11 (2462)
Average Power	15.96	16.36	16.29

4.5 Low Power Exemption Evaluation

According to ANSI C63.19-2011 section 4, RF air interface technologies that have low power have been found to produce sufficiently low RF interference potential, so it is possible to exempt them from the product testing. An RF air interface technology of a device is exempt from testing when its average antenna input power plus its worst-case 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. An RF air interface technology that is exempted from testing by above method could be rated as M4.

The low power exemption for this device is analyzed in below.

Mode / Band		Max. Output Power (dBm)	Worst Case MIF (dB)	Power Plus MIF (dB)	HAC Testing Required?
WCDMA II		25.3	-27.23	-1.93	No
WCDMA IV		25.1	-27.23	-2.13	No
WCDMA V		25.1	-27.23	-2.13	No
CDMA BC0		24.9	3.26	28.16	**Yes**
CDMA BC1		24.9	3.26	28.16	**Yes**
CDMA BC10		23.9	3.26	27.16	**Yes**
WiFi 2.4G	11b	17.3	-2.02	15.28	No
	11g	20	0.12	20.12	**Yes**
WiFi 5G		20	-3.15	16.85	No

4.6 HAC RF Emission Testing Results

Plot No.	Band	Mode	Channel	MIF (dB)	Peak RF Audio Interference (dBV/m)	M-Rating	Margin to Next Lower Rated Category (dB)
01	CDMA2000 BC0	RC1+SO3	1013	3.26	**33.68**	**M4**	9.58
	CDMA2000 BC0	RC1+SO3	384	3.26	30.90	M4	12.36
	CDMA2000 BC0	RC1+SO3	777	3.26	30.59	M4	12.67
02	CDMA2000 BC1	RC1+SO3	25	3.26	**24.24**	**M4**	9.02
	CDMA2000 BC1	RC1+SO3	600	3.26	22.67	M4	10.59
	CDMA2000 BC1	RC1+SO3	1175	3.26	22.09	M4	11.17
	CDMA2000 BC10	RC1+SO3	476	3.26	29.96	M4	13.3
03	CDMA2000 BC10	RC1+SO3	580	3.26	**30.06**	**M4**	13.2
	CDMA2000 BC10	RC1+SO3	684	3.26	30.01	M4	13.25
	2.4G WLAN	802.11g	1	0.12	21.72	M4	8.4
	2.4G WLAN	802.11g	6	0.12	27.59	M4	2.53
04	2.4G WLAN	802.11g	11	0.12	**28.55**	**M4**	1.57

Note:

1. Margin to Next Lower Rated Category, defined as: The e-field transition value for the next lower rated category of the established HAC category minus the maximum steady-state RMS field strength (before adding the MIF).

Test Engineer： Willy Chang

5. Calibration of Test Equipment

Equipment	Manufacturer	Model	SN	Cal. Date	Cal. Interval
835MHz Calibration Dipole	SPEAG	CD835V3	1149	Dec. 16, 2016	2 Years
1880MHz Calibration Dipole	SPEAG	CD1880V3	1023	Jun. 23, 2016	2 Years
2450MHz Calibration Dipole	SPEAG	CD2450V3	1125	Dec. 16, 2016	2 Years
Isotropic E-Field Probe	SPEAG	ER3DV6	2445	Feb. 17, 2017	1 Year
Data Acquisition Electronics	SPEAG	DAE3	579	Sep. 05, 2016	1 Year
Data Acquisition Electronics	SPEAG	DAE4	917	Jan. 06, 2017	1 Year
Wireless Communication Test Set	Agilent	E5515C	MY50260642	Dec. 02, 2016	1 Year
MXG Analog Signal Generator	Agilent	N5181A	MY50143868	Jul. 07, 2016	1 Year
Power Meter	Anritsu	ML2495A	1218009	Jul. 06, 2016	1 Year
Power Sensor	Anritsu	MA2411B	1207252	Jul. 06, 2016	1 Year
Test Arch Phantom	SPEAG	Arch	N/A	N/A	N/A

6. Measurement Uncertainty

Error Description	Uncertainty Value (±%)	Probability Distribution	Divisor	Ci (E)	Ci (H)	Standard Uncertainty (E)
Measurement System						
Probe Calibration	5.1	Normal	1	1	1	± 5.1 %
Axial Isotropy	4.7	Rectangular	√3	1	1	± 2.7 %
Sensor Displacement	16.5	Rectangular	√3	1	0.145	± 9.5 %
Boundary Effects	2.4	Rectangular	√3	1	1	± 1.4 %
Phantom Boundary Effect	7.2	Rectangular	√3	1	0	± 4.1 %
Linearity	4.7	Rectangular	√3	1	1	± 2.7 %
Scaling with PMR Calibration	10.0	Rectangular	√3	1	1	± 5.8 %
System Detection Limit	1.0	Rectangular	√3	1	1	± 0.6 %
Readout Electronics	0.3	Normal	1	1	1	± 0.3 %
Response Time	0.8	Rectangular	√3	1	1	± 0.5 %
Integration Time	2.6	Rectangular	√3	1	1	± 1.5 %
RF Ambient Conditions	3.0	Rectangular	√3	1	1	± 1.7 %
RF Reflections	12.0	Rectangular	√3	1	1	± 6.9 %
Probe Positioner	1.2	Rectangular	√3	1	0.67	± 0.7 %
Probe Positioning	4.7	Rectangular	√3	1	0.67	± 2.7 %
Extrap. and Interpolation	1.0	Rectangular	√3	1	1	± 0.6 %
Test Sample Related						
Device Positioning Vertical	4.7	Rectangular	√3	1	0.67	± 2.7 %
Device Positioning Lateral	1.0	Rectangular	√3	1	1	± 0.6 %
Device Holder and Phantom	2.4	Rectangular	√3	1	1	± 1.4 %
Power Drift	5.0	Rectangular	√3	1	1	± 2.9 %
Phantom and Setup Related						
Phantom Thickness	2.4	Rectangular	√3	1	0.67	± 1.4 %
Combined Standard Uncertainty						± 16.3 %
Coverage Factor for 95 %						K = 2
Expanded Uncertainty						**± 32.6 %**

Uncertainty budget for HAC RF Emission

7. Information on the Testing Laboratories

We, Bureau Veritas Consumer Products Services (H.K.) Ltd., Taoyuan Branch, were founded in 1988 to provide our best service in EMC, Radio, Telecom and Safety consultation. Our laboratories are accredited and approved according to ISO/IEC 17025.

If you have any comments, please feel free to contact us at the following:

Taiwan HwaYa EMC/RF/Safety/Telecom Lab:
Add: No. 19, Hwa Ya 2nd Rd, Wen Hwa Vil., Kwei Shan Hsiang, Taoyuan Hsien 333, Taiwan, R.O.C.
Tel: 886-3-318-3232
Fax: 886-3-327-0892

Taiwan LinKo EMC/RF Lab:
Add: No. 47-2, 14th Ling, Chia Pau Vil., Linkou Dist., New Taipei City 244, Taiwan, R.O.C.
Tel: 886-2-2605-2180
Fax: 886-2-2605-1924

Taiwan HsinChu EMC/RF Lab:
Add: No. 81-1, Lu Liao Keng, 9th Ling, Wu Lung Vil., Chiung Lin Township, Hsinchu County 307, Taiwan, R.O.C.
Tel: 886-3-593-5343
Fax: 886-3-593-5342

Email: service.adt@tw.bureauveritas.com
Web Site: www.adt.com.tw

The road map of all our labs can be found in our web site also.

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Appendix A. Plots of System Verification

The plots for system verification are shown as follows.

Test Laboratory: Bureau Veritas ADT SAR/HAC Testing Lab Date: 2017/04/11

System Check_E-Field_835_170411

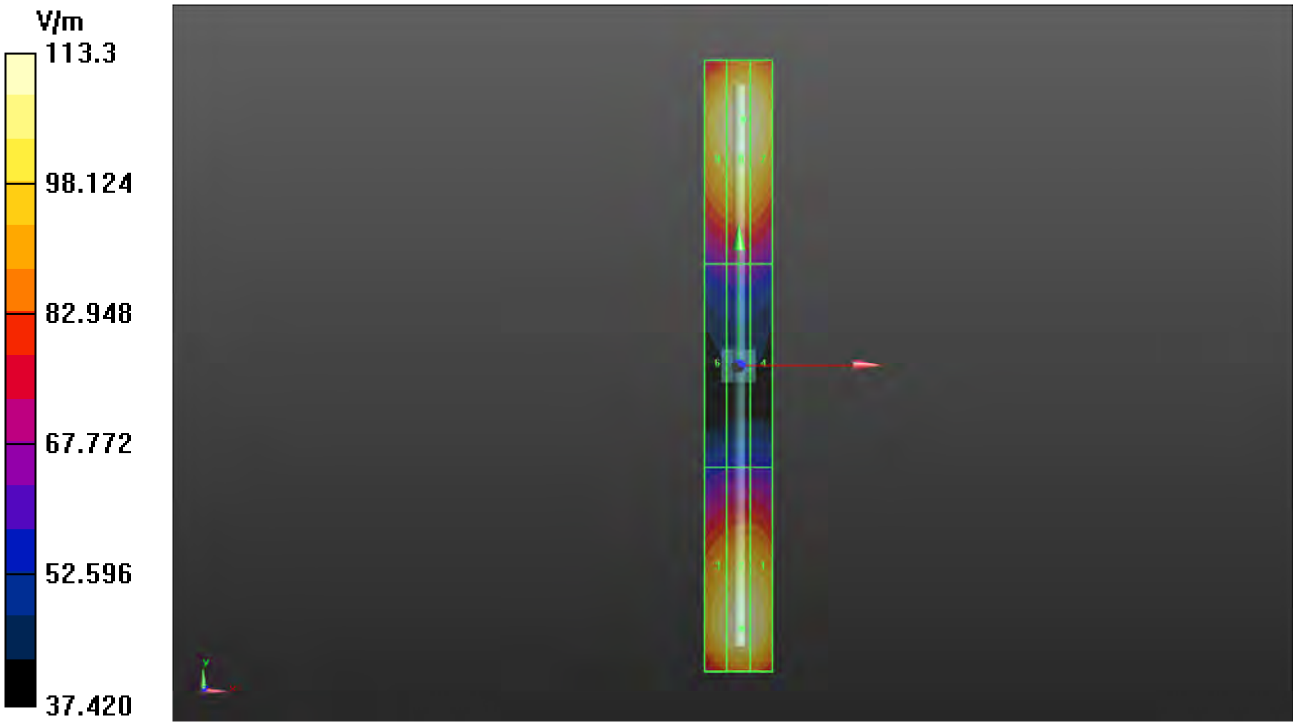
DUT: HAC Dipole 835 MHz; Type: CD835V3; SN: 1149

Communication System: CW; Frequency: 835 MHz;Duty Cycle: 1:1
Medium: Air Medium parameters used: $\sigma = 0$ S/m, $\varepsilon_r = 1$; $\rho = 1000$ kg/m^3
Ambient Temperature：23.8 ℃

DASY5 Configuration:
- Probe: ER3DV6 - SN2445; ConvF(1, 1, 1); Calibrated: 2017/02/17;
- Sensor-Surface: (Fix Surface)
- Electronics: DAE3 Sn579; Calibrated: 2016/09/05
- Phantom: HAC Test Arch with AMCC; Type: SD HAC P01 BA;
- Measurement SW: DASY52, Version 52.8 (8); SEMCAD X Version 14.6.10 (7373)

Hearing Aid Compatibility (41x361x1): Interpolated grid: dx=0.5000 mm, dy=0.5000 mm
Device Reference Point: 0, 0, -6.3 mm
Reference Value = 131.9 V/m; Power Drift = -0.09 dB
E-field emissions = 113.3 V/m

Grid 1 **M4** **110.8 V/m**	Grid 2 **M4** **111.8 V/m**	Grid 3 **M4** **107.9 V/m**
Grid 4 **M4** **66.09 V/m**	Grid 5 **M4** **66.73 V/m**	Grid 6 **M4** **65.23 V/m**
Grid 7 **M4** **112.6 V/m**	Grid 8 **M4** **113.3 V/m**	Grid 9 **M4** **109.3 V/m**



Test Laboratory: Bureau Veritas ADT SAR/HAC Testing Lab Date: 2017/04/11

System Check_E-Field_1880_170411

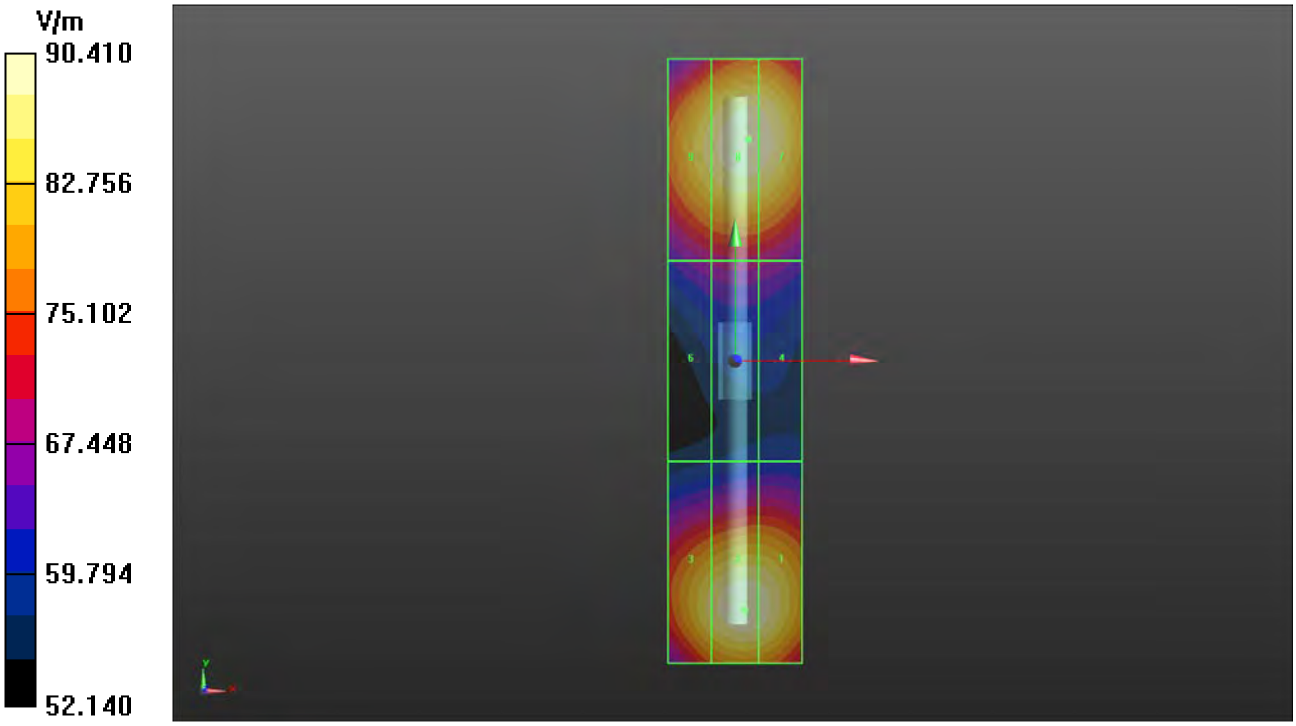
DUT: HAC Dipole 1880 MHz; Type: CD1880V3; SN: 1023

Communication System: CW; Frequency: 1880 MHz;Duty Cycle: 1:1
Medium: Air Medium parameters used: $\sigma = 0$ S/m, $\varepsilon_r = 1$; $\rho = 1000$ kg/m^3
Ambient Temperature：23.8 ℃

DASY5 Configuration:
- Probe: ER3DV6 - SN2445; ConvF(1, 1, 1); Calibrated: 2017/02/17;
- Sensor-Surface: (Fix Surface)
- Electronics: DAE3 Sn579; Calibrated: 2016/09/05
- Phantom: HAC Test Arch with AMCC; Type: SD HAC P01 BA;
- Measurement SW: DASY52, Version 52.8 (8); SEMCAD X Version 14.6.10 (7373)

Hearing Aid Compatibility (41x181x1): Interpolated grid: dx=0.5000 mm, dy=0.5000 mm
Device Reference Point: 0, 0, -6.3 mm
Reference Value = 142.7 V/m; Power Drift = -0.01 dB
E-field emissions = 90.41 V/m

Grid 1 **M3** **89.67 V/m**	Grid 2 **M3** **90.36 V/m**	Grid 3 **M3** **86.63 V/m**
Grid 4 **M3** **68.85 V/m**	Grid 5 **M3** **69.58 V/m**	Grid 6 **M3** **68.38 V/m**
Grid 7 **M3** **90.05 V/m**	Grid 8 **M3** **90.41 V/m**	Grid 9 **M3** **87.08 V/m**



Test Laboratory: Bureau Veritas ADT SAR/HAC Testing Lab Date: 2017/04/22

System Check_E-Field_2450_170422

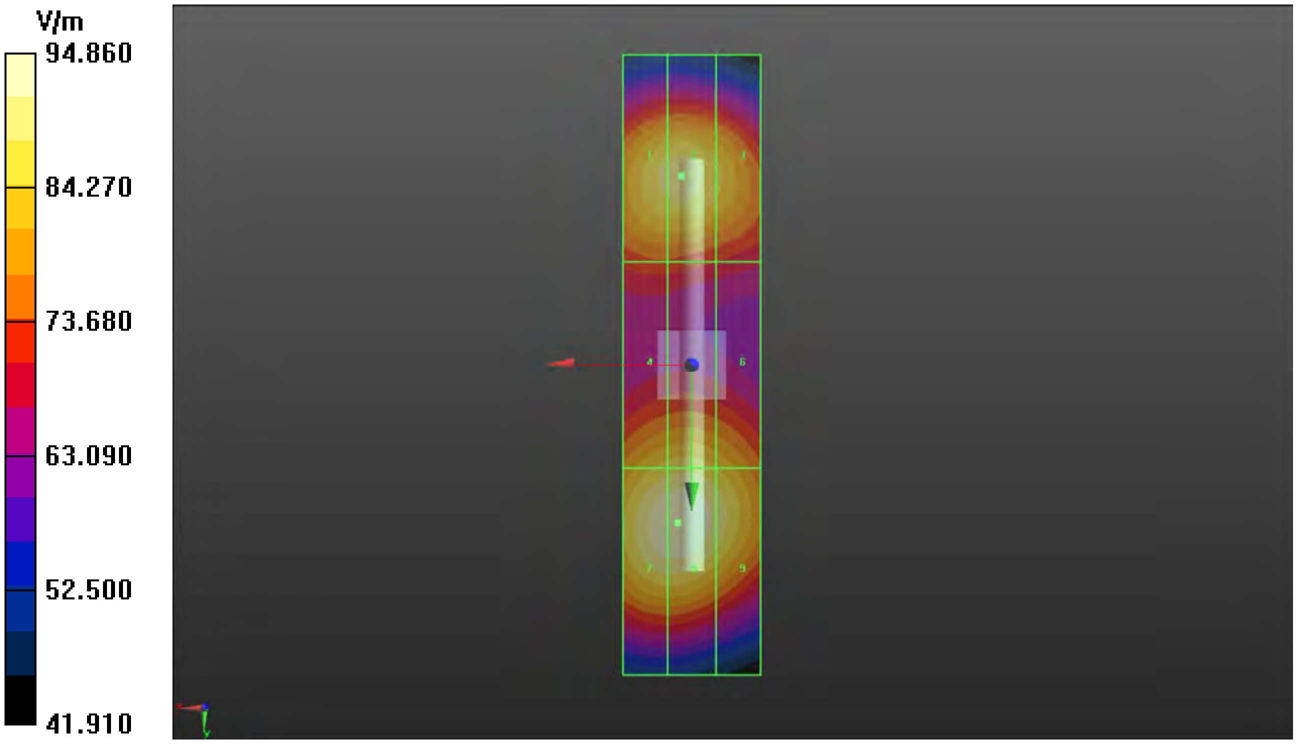
DUT: HAC Dipole 2450 MHz; Type: CD2450V3; SN: 1033

Communication System: CW; Frequency: 2450 MHz;Duty Cycle: 1:1
Medium: Air Medium parameters used: $\sigma = 0$ S/m, $\varepsilon_r = 1$; $\rho = 1000$ kg/m^3
Ambient Temperature：23.6 ℃

DASY5 Configuration:
- Probe: ER3DV6 - SN2445; ConvF(1, 1, 1); Calibrated: 2017/02/17;
- Sensor-Surface: (Fix Surface)
- Electronics: DAE4 Sn917; Calibrated: 2017/01/06
- Phantom: HAC Test Arch with AMCC; Type: SD HAC P01 BA;
- Measurement SW: DASY52, Version 52.8 (8); SEMCAD X Version 14.6.10 (7373)

Hearing Aid Compatibility (41x181x1): Interpolated grid: dx=0.5000 mm, dy=0.5000 mm
Device Reference Point: 0, 0, -6.3 mm
Reference Value = 87.13 V/m; Power Drift = 0.01 dB
E-field emissions = 94.86 V/m

Grid 1 **M3** **89.02 V/m**	Grid 2 **M3** **89.61 V/m**	Grid 3 **M3** **85.66 V/m**
Grid 4 **M3** **86.20 V/m**	Grid 5 **M3** **86.97 V/m**	Grid 6 **M3** **84.42 V/m**
Grid 7 **M3** **94.42 V/m**	Grid 8 **M3** **94.86 V/m**	Grid 9 **M3** **90.41 V/m**



Appendix B. Plots of HAC RF Emission Measurement

The plots for HAC measurement are shown as follows.

Test Laboratory: Bureau Veritas ADT SAR/HAC Testing Lab Date: 2017/04/11

P01 RF_CDMA2000 BC0_RC1+SO3_Ch1013

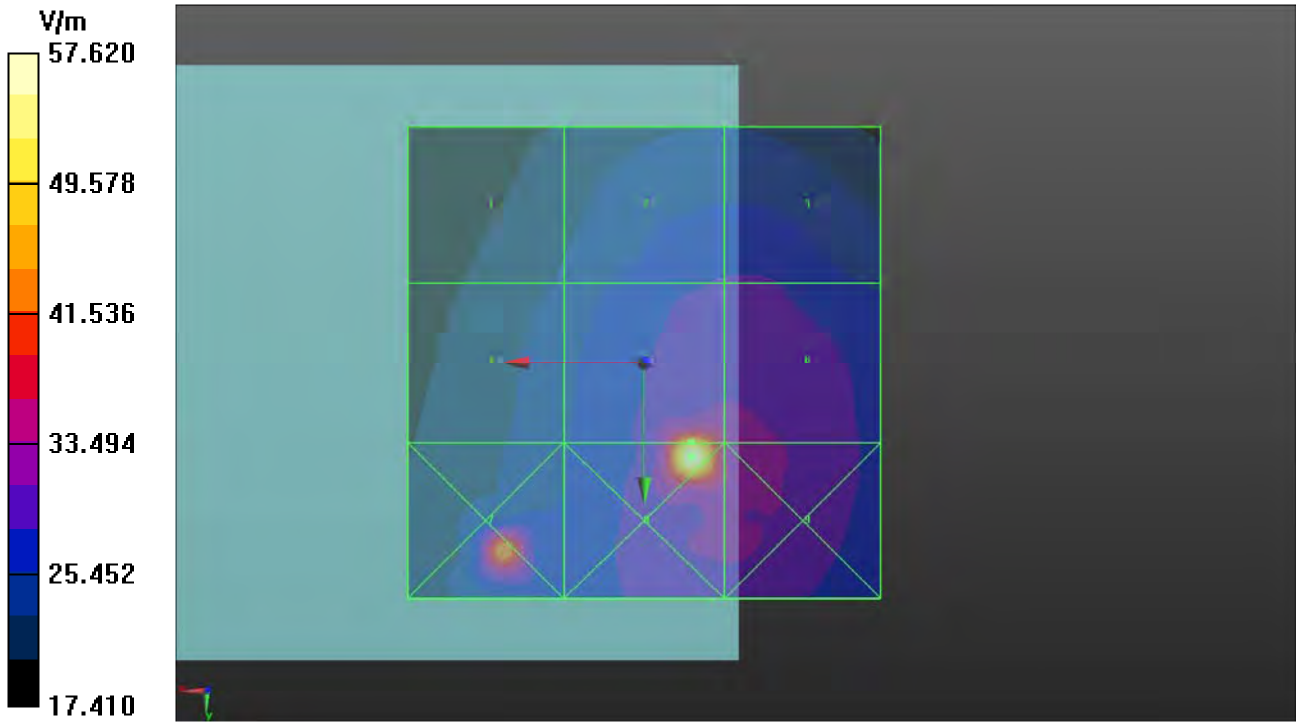
DUT: 170328C23

Communication System: CDMA2000, RC1, SO3, 1/8th Rate 25 fr.; Frequency: 824.7 MHz;Duty Cycle: 1:17.74
Medium: Air Medium parameters used: σ = 0 S/m, ε_r = 1; ρ = 1000 kg/m^3
Ambient Temperature：23.8 ℃

DASY5 Configuration:
- Probe: ER3DV6 - SN2445; ConvF(1, 1, 1); Calibrated: 2017/02/17;
- Sensor-Surface: (Fix Surface)
- Electronics: DAE3 Sn579; Calibrated: 2016/09/05
- Phantom: HAC Test Arch with AMCC; Type: SD HAC P01 BA;
- Measurement SW: DASY52, Version 52.8 (8); SEMCAD X Version 14.6.10 (7373)

- Hearing Aid Compatibility (101x101x1): Interpolated grid: dx=0.5000 mm, dy=0.5000 mm
Device Reference Point: 0, 0, -6.3 mm
Reference Value = 25.24 V/m; Power Drift = -0.09 dB
MIF = 3.26 dB
RF audio interference level = 33.68 dBV/m
Emission category: M4

Grid 1 **M4** **27.4 dBV/m**	Grid 2 **M4** **29.1 dBV/m**	Grid 3 **M4** **29.12 dBV/m**
Grid 4 **M4** **28.05 dBV/m**	Grid 5 **M4** **33.68 dBV/m**	Grid 6 **M4** **30.78 dBV/m**
Grid 7 **M4** **32.94 dBV/m**	Grid 8 **M4** **35.21 dBV/m**	Grid 9 **M4** **30.81 dBV/m**



Test Laboratory: Bureau Veritas ADT SAR/HAC Testing Lab Date: 2017/04/11

P02 RF_CDMA2000 BC1_RC1+SO3_Ch25

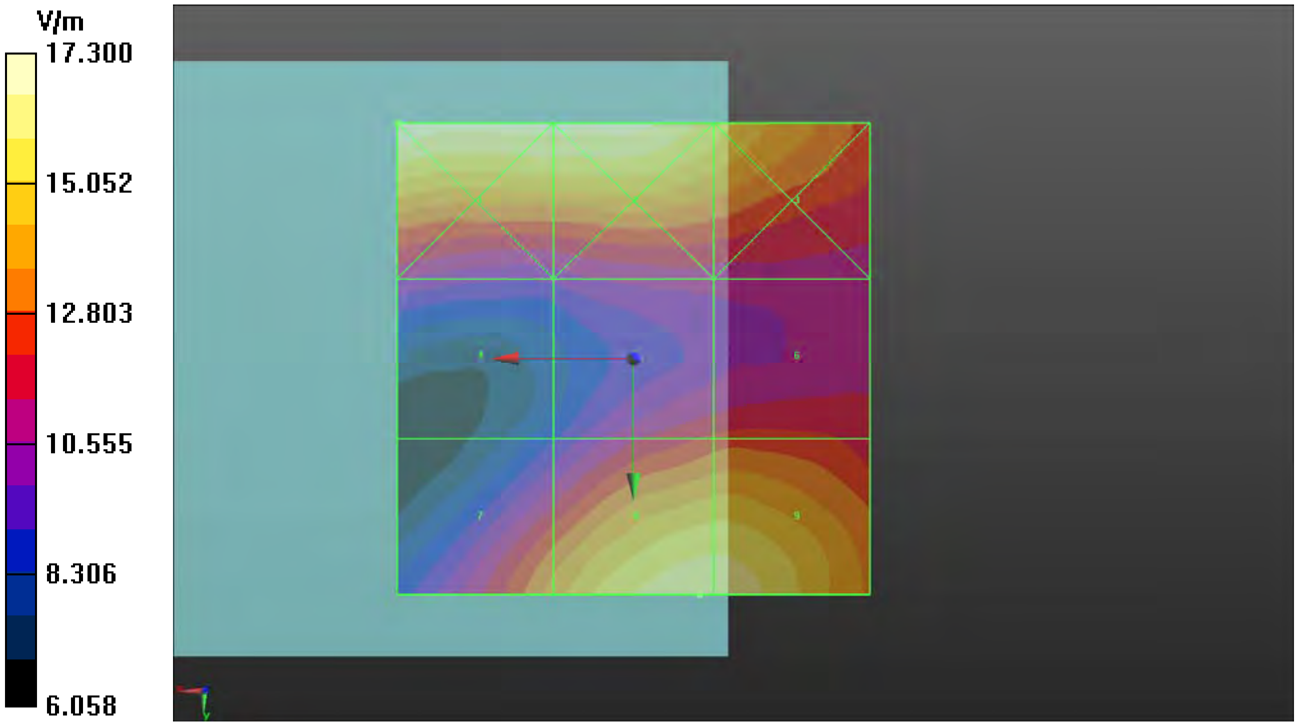
DUT: 170328C23

Communication System: CDMA2000, RC1, SO3, 1/8th Rate 25 fr.; Frequency: 1851.25 MHz;Duty Cycle: 1:17.74
Medium: Air Medium parameters used: σ = 0 S/m, ε_r = 1; ρ = 1000 kg/m^3
Ambient Temperature：23.8 ℃

DASY5 Configuration:
- Probe: ER3DV6 - SN2445; ConvF(1, 1, 1); Calibrated: 2017/02/17;
- Sensor-Surface: (Fix Surface)
- Electronics: DAE3 Sn579; Calibrated: 2016/09/05
- Phantom: HAC Test Arch with AMCC; Type: SD HAC P01 BA;
- Measurement SW: DASY52, Version 52.8 (8); SEMCAD X Version 14.6.10 (7373)

- Hearing Aid Compatibility (101x101x1): Interpolated grid: dx=0.5000 mm, dy=0.5000 mm
Device Reference Point: 0, 0, -6.3 mm
Reference Value = 7.307 V/m; Power Drift = 0.18 dB
MIF = 3.26 dB
RF audio interference level = 24.24 dBV/m
Emission category: M4

Grid 1 **M4** **24.76 dBV/m**	Grid 2 **M4** **24.53 dBV/m**	Grid 3 **M4** **23.78 dBV/m**
Grid 4 **M4** **20.58 dBV/m**	Grid 5 **M4** **21.8 dBV/m**	Grid 6 **M4** **21.92 dBV/m**
Grid 7 **M4** **22.87 dBV/m**	Grid 8 **M4** **24.24 dBV/m**	Grid 9 **M4** **24.22 dBV/m**



Test Laboratory: Bureau Veritas ADT SAR/HAC Testing Lab Date: 2017/04/11

P03 RF_CDMA2000 BC10_RC1+SO3_Ch580

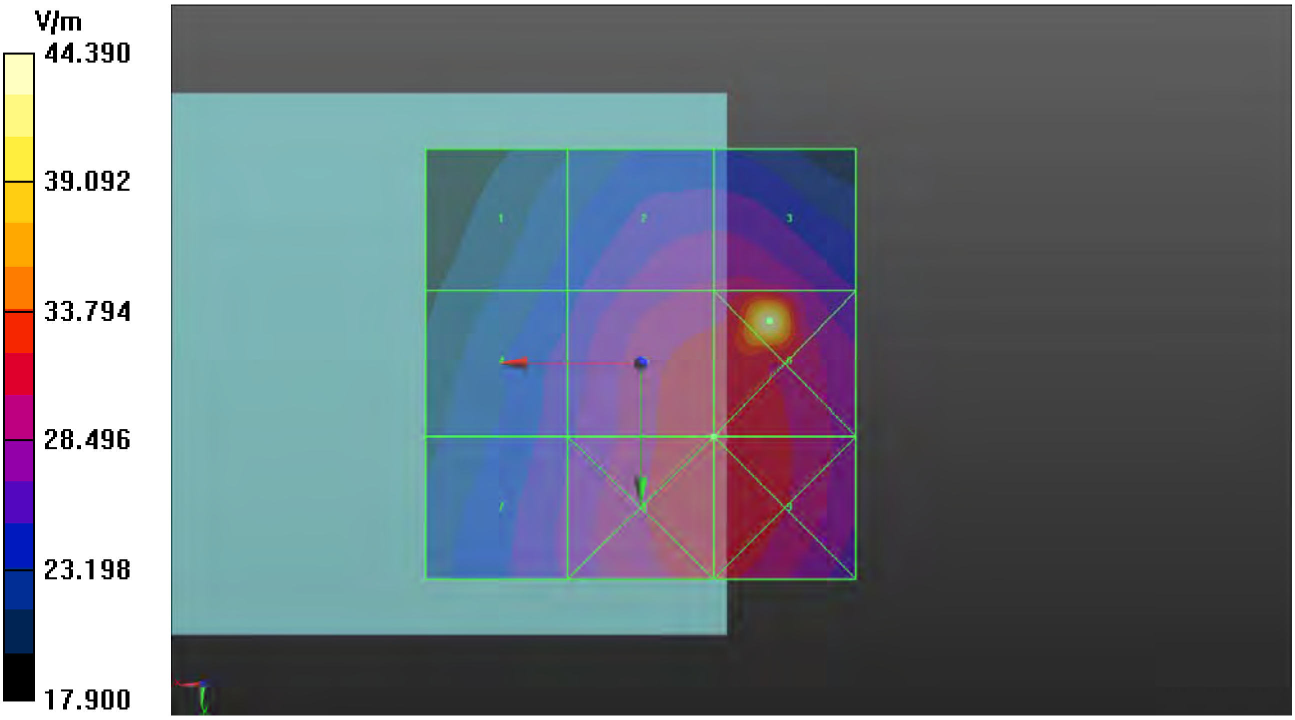
DUT: 170328C23

Communication System: CDMA2000, RC1, SO3, 1/8th Rate 25 fr.; Frequency: 820.5 MHz;Duty Cycle: 1:17.74
Medium: Air Medium parameters used: $\sigma = 0$ S/m, $\varepsilon_r = 1$; $\rho = 1000$ kg/m^3
Ambient Temperature：23.8 ℃

DASY5 Configuration:
- Probe: ER3DV6 - SN2445; ConvF(1, 1, 1); Calibrated: 2017/02/17;
- Sensor-Surface: (Fix Surface)
- Electronics: DAE3 Sn579; Calibrated: 2016/09/05
- Phantom: HAC Test Arch with AMCC; Type: SD HAC P01 BA;
- Measurement SW: DASY52, Version 52.8 (8); SEMCAD X Version 14.6.10 (7373)

- Hearing Aid Compatibility (101x101x1): Interpolated grid: dx=0.5000 mm, dy=0.5000 mm
Device Reference Point: 0, 0, -6.3 mm
Reference Value = 25.75 V/m; Power Drift = 0.10 dB
MIF = 3.26 dB
RF audio interference level = 30.06 dBV/m
Emission category: M4

Grid 1 **M4** **27.73 dBV/m**	Grid 2 **M4** **29.26 dBV/m**	Grid 3 **M4** **29.69 dBV/m**
Grid 4 **M4** **28.45 dBV/m**	Grid 5 **M4** **30.06 dBV/m**	Grid 6 **M4** **32.95 dBV/m**
Grid 7 **M4** **28.73 dBV/m**	Grid 8 **M4** **30.11 dBV/m**	Grid 9 **M4** **30.12 dBV/m**



Test Laboratory: Bureau Veritas ADT SAR/HAC Testing Lab Date: 2017/04/22

P04 RF_2.4G WLAN_802.11g_Ch11

DUT: 170328C23

Communication System: IEEE 802.11g WiFi 2.4 GHz (DSSS/OFDM, 54 Mbps); Frequency: 2462 MHz;Duty Cycle: 1:12.59
Medium: Air Medium parameters used: $\sigma = 0$ S/m, $\varepsilon_r = 1$; $\rho = 1000$ kg/m^3
Ambient Temperature：23.6 ℃

DASY5 Configuration:
- Probe: ER3DV6 - SN2445; ConvF(1, 1, 1); Calibrated: 2017/02/17;
- Sensor-Surface: (Fix Surface)
- Electronics: DAE4 Sn917; Calibrated: 2017/01/06
- Phantom: HAC Test Arch with AMCC; Type: SD HAC P01 BA;
- Measurement SW: DASY52, Version 52.8 (8); SEMCAD X Version 14.6.10 (7373)

- Hearing Aid Compatibility (101x101x1): Interpolated grid: dx=0.5000 mm, dy=0.5000 mm
Device Reference Point: 0, 0, -6.3 mm
Reference Value = 24.38 V/m; Power Drift = -0.01 dB
MIF = 0.12 dB
RF audio interference level = 28.55 dBV/m
Emission category: M4

Grid 1 **M4** **24.41 dBV/m**	Grid 2 **M4** **26.11 dBV/m**	Grid 3 **M4** **26.13 dBV/m**
Grid 4 **M4** **27.99 dBV/m**	Grid 5 **M4** **28.55 dBV/m**	Grid 6 **M4** **28.2 dBV/m**
Grid 7 **M4** **29.74 dBV/m**	Grid 8 **M4** **29.78 dBV/m**	Grid 9 **M4** **28.9 dBV/m**