RF Emission

HAC

TEST REPORT

ISSUED BY
Shenzhen BALUN Technology Co., Ltd.

FOR

4G Smart Phone

ISSUED TO
Guizhou Fortuneship Technology Co., Ltd.

(No. 4 Plant, High-tech Industrial Park, Xinpu Economic Development Zone) Jingkai Road, Xinpu Jingkai District, Xinpu New District, Zunyi City, Guizhou Province, P. R. China

Tested by: Zong Liyao
Zong Liyao
(Engineer)
Date Dec. 21, 2017

Approved by:
Liao Jianming
(Technical Director)
Date Dec. 21, 2017

Report No.:	BL-SZ17B0271-701
EUT Name:	4G Smart Phone
Model Name:	C145
Brand Name:	NC1
FCC ID:	2ALQJB125C
Test Standard:	FCC 47 CFR Part 20.19
	ANSI C63.19: 2011
	KDB 285076 D01 HAC Guidance v05
M-Rating:	E-Field: M4
Test conclusion:	Pass
Test Date:	Dec. 06, 2017
Date of Issue:	Dec. 21, 2017

Block B, 1st FL,Baisha Science and Technology Park, Shahe Xi Road, Nanshan District, Shenzhen, Guangdong, P. R. China 518055
TEL: +86-755-66850100
FAX: +86-755-61824271
www.baluntek.com

Revision History

Version	Issue Date	Revisions Content
Rev. 01	Dec. 13, 2017	Initial Issue
Rev. 02	Dec. 18, 2017	Updated the Test Standard version on cover page; Updated the section 2.7 on page 8; Updated the section 3.1 Test Standard on page 9; Updated the Test Photo in the document "BL-SZ17B0271-AS-E-Field PDF".
Rev. 03	Dec. 21, 2017	Added note for OTT capabilities on page 8. Updated the Test Standard version in section 11.

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1 GENERAL INFORMATION

1.1 Identification of the Testing Laboratory

Company Name	Shenzhen BALUN Technology Co., Ltd.
Address	Block B, 1st FL, Baisha Science and Technology Park, Shahe Xi Road, Nanshan District, Shenzhen, Guangdong Province, P. R. China
Phone Number	+86 755 6685 0100
Fax Number	+86 755 6182 4271

1.2 Identification of the Responsible Testing Location

Test Location	Shenzhen BALUN Technology Co., Ltd.
Address	Block B, 1st FL, Baisha Science and Technology Park, Shahe Xi Road, Nanshan District, Shenzhen, Guangdong Province, P. R. China
Accreditation Certificate	The laboratory has been listed by Industry Canada to perform electromagnetic emission measurements. The recognition numbers of test site are 11524A-1. The laboratory is a testing organizatin accredited by FCC as a accredited testing laboratory. The designation number is CN1196. The laboratory is a testing organization accredited by American Association for Laboratory Accreditation (A2LA) according to ISO/IEC 17025.The accreditation certificate is 4344.01. The laboratory is a testing organization accredited by China National Accreditation Service for Conformity Assessment (CNAS) according to ISO/IEC 17025. The accreditation certificate number is L6791.
Description	All measurement facilities used to collect the measurement data are located at Block B, FL 1, Baisha Science and Technology Park, Shahe Xi Road, Nanshan District, Shenzhen, Guangdong Province, P. R. China 518055

1.3 Test Environment Condition

Ambient Temperature	20 to 22 ℃
Ambient Relative Humidity	40 to 51 %
Ambient Pressure	100 to 102 kPa

1.4 Announce

(1) The test report reference to the report template version v1.1.

(2) The test report is invalid if not marked with the signatures of the persons responsible for preparing and approving the test report.

(3) The test report is invalid if there is any evidence and/or falsification.

(4) The results documented in this report apply only to the tested sample, under the conditions and modes of operation as described herein.

(5) This document may not be altered or revised in any way unless done so by BALUN and all revisions are duly noted in the revisions section.

(6) Content of the test report, in part or in full, cannot be used for publicity and/or promotional purposes without prior written approval from the laboratory.

2 PRODUCT INFORMATION

2.1 Applicant Information

Applicant	Guizhou Fortuneship Technology Co., Ltd.
Address	(No. 4 Plant, High-tech Industrial Park, Xinpu Economic Development Zone) Jingkai Road, Xinpu Jingkai District, Xinpu New District, Zunyi City, Guizhou Province, P. R. China

2.2 Manufacturer Information

Manufacturer	Guizhou Fortuneship Technology Co., Ltd.
Address	(No. 4 Plant, High-tech Industrial Park, Xinpu Economic Development Zone) Jingkai Road, Xinpu Jingkai District, Xinpu New District, Zunyi City, Guizhou Province, P. R. China

2.3 Factory Information

Factory	N/A
Address	N/A

2.4 General Description for Equipment under Test (EUT)

EUT Name	4G Smart Phone
EUT Model Under the test	C145
Series Model Name	N/A
Difference description	N/A
Hardware Version	S525_MAIN_PCB_V1.0
Software Version	S525_D1_LS020E_V1.0_20171104
Dimensions	N/A
Weight	N/A
Network and Wireless connectivity	2G Network GSM 850/900/1900; 3G Network WCDMA Band 2/5; 4G Network LTE Band 2/4/7/12/17; WIFI 802.11b, 802.11g and 802.11n (HT20/40) Bluetooth, GPS, GLONASS

2.5 Ancillary Equipment

Ancillary Equipment 1	Battery	
	Brand Name	N/A
	Model No.	BTGLIBAT-B125C
	Serial No.	N/A
	Capacitance	1950 mAh
	Rated Voltage	3.8 V
	Limit Charge Voltage	4.2 V

2.6 Technical Information

The requirement for the following technical information of the EUT was tested in this report:

Operating Mode	GSM, WCDMA, LTE, WLAN, Bluetooth		
Frequency Range	GSM 850	TX: 824 ~ 849 MHz	RX: 869 ~ 894 MHz
	GSM 1900	TX: 1850 ~ 1910 MHz	RX: 1930 ~ 1990 MHz
	WCDMA Band 2	TX: 1850 ~ 1910 MHz	RX: 1930 ~ 1990 MHz
	WCDMA Band 5	TX: 824 ~ 849 MHz	RX: 869 ~ 894 MHz
	LTE Band 2	TX: 1850 ~ 1910 MHz	RX: 1930 ~ 1990 MHz
	LTE Band 4	TX: 1710 ~ 1755 MHz	RX: 2110 ~ 2155 MHz
	LTE Band 7	TX: 2500 ~ 2570 MHz	RX: 2620 ~ 2690 MHz
	LTE Band 12	TX: 699 ~ 716 MHz	RX: 729 ~746 MHz
	LTE Band 17	TX: 704 ~ 716 MHz	RX: 734 ~ 746 MHz
	802.11b/g	2400 ~2483.5 MHz	
	802.11n (HT20/HT40)	2400 ~2483.5 MHz	
	Bluetooth	2400 ~2483.5 MHz	
Antenna Type	PIFA Antenna		
Hotspot Function	Support		
Exposure Category	General Population/Uncontrolled exposure		
EUT Stage	Portable Device		

2.7 EUT Air Interface description

Air Interface	Band	Type	C63.19 Tested	Simultaneous Transmitter	OTT	Power Reduction
GSM	850	VO	Yes	Bluetooth/WLAN	NA	Not Support
	1900	VO	Yes	Bluetooth/WLAN	NA	Not Support
	GPRS/EDGE	DT	No	Bluetooth/WLAN	Yes	Not Support
WCDMA	Band 2	VO	Yes	Bluetooth/WLAN	NA	Not Support
	Band 5	VO	Yes	Bluetooth/WLAN	NA	Not Support
	HSUPA/HSDPA	DT	No	Bluetooth/WLAN	Yes	Not Support
LTE	Band 2	DT	No	Bluetooth/WLAN	Yes	Not Support
	Band 4	DT	No	Bluetooth/WLAN	Yes	Not Support
	Band 7	DT	No	Bluetooth/WLAN	Yes	Not Support
	Band 12	DT	No	Bluetooth/WLAN	Yes	Not Support
	Band 17	DT	No	Bluetooth/WLAN	Yes	Not Support
2.4G WLAN	2450	DT	No	WWAN	Yes	Not Support
Bluetooth	2450	DT	No	WWAN	NA	Not Support

VO=CMRS Voice Service
DT=Digital Transport
VD=CMRS IP Voice Service and Digital Transport
Note: The manufacturer not install applications to support VoIP function for this product.

3 SUMMARY OF TEST RESULTS

3.1 Test Standards

No.	Identity	Document Title
1	FCC 47 CFR Part 20.19	Hearing aid-compatible mobile handsets.
2	ANSI C 63.19:2011	American National Standard Methods of Measurement of Compatibility between Wireless Communications Devices and Hearing Aids
3	KDB 285076 D01 HAC Guidance v05	Provides equipment authorization guidance for mobile handsets subject to the requirements of Section 20.19 for hearing aid compatibility

3.2 HAC Test Configuration and Setting

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

3.3 Summary Of HAC M-Rating

Band	Measurement Result		M-Rating
GSM 850	E-Field dB (V/m)	38.72	M4
	E-Field dB (V/m)	38.89	M4
	E-Field dB (V/m)	38.74	M4
GSM 1900	E-Field dB (V/m)	29.00	M4
	E-Field dB (V/m)	29.74	M4
	E-Field dB (V/m)	28.92	M4
WCDMA Band2	E-Field dB (V/m)	0.28	M4
	E-Field dB (V/m)	0.38	M4
	E-Field dB (V/m)	0.56	M4
WCDMA Band5	E-Field dB (V/m)	5.97	M4
	E-Field dB (V/m)	5.31	M4
	E-Field dB (V/m)	5.06	M4

3.4 ANSI C63.19 HAC RF Categories

3.4.1 RF Emissions

The ANSI Standard presents performance requirements for acceptable interoperability of hearing with wireless communications devices. When these parameters are met, a hearing aid operates acceptably in close proximity to a wireless communications device.

WD RF audio interference level categories:

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

3.5 HAC Test Uncertainty

The following measurement uncertainty levels have been estimated for tests performed on the EUT as specified in ANSI C 63.19:2011.This uncertainty represents an expanded uncertainty expressed at approximately the 95% confidence level using a coverage factor of k=2.

Uncertainty Component	Uncertainty Value	Prob. Dist.	Div.	Ci (E)	Ci (H)	Std. Unc. (+/- %)	
						E	H
Measurement System							
Probe calibration	6.00	N	1.000	1	1	6.00	6.00
Axial Isotropy	2.02	R	1.732		1	1.17	1.17
Sensor Displacement	14.30	R	1.732	1	0.217	8.26	1.79
Boundary effect	2.50	R	1.732	1	1	0.87	0.87
Phantom Boundary Effect	6.89	R	1.732	1	0	3.52	0.00
Linearity	2.58	R	1.732	1	1	1.49	1.49
Scaling tp PMR Calibration	9.02	N	1.000	1	1	9.02	9.02
System detection limits	1.30	R	1.732	1	1	0.75	0.75
Readout Electronics	0.25	R	1.732	1	1	0.14	0.14
Response Time	1.23	R	1.732	1	1	0.71	0.71
Integration Time	2.15	R	1.732	1	1	1.24	1.24
RF ambient Conditions	2.03	R	1.732	1	1	1.17	1.17
RF Reflections	9.09	R	1.732	1	1	5.25	5.25
Probe positioner	0.63	N	1.000	1	0.71	0.63	0.45
Probe positioning	3.12	N	1.000	1	0.71	3.12	2.22
Extrapolation and Interpolation	1.18	R	1.732	1	1	0.68	0.68
Test sample Related							
Test sample positioning Vertical	2.73	R	1.732	1	0.71	1.58	1.12
Test sample positioning Lateral	1.19	R	1.732	1	1	0.69	0.69
Device holder and Phantom	2.20	N	1.000	1	1	2.20	2.20
Power drift	4.08	R	1.732	1	1	2.36	2.36
Phantom and Setup Related							
Phantom Thickness	2.00	N	1.000	1	0.6	2.00	1,20
Combined Std. Uncertainty(k=1)						16.18	13.25
Expanded Uncertainty on Power						32.35	26.50
Expanded Uncertainty on Field						16.18	13.25

4 SATIMO HSC MEASUREMENT SYSTEM

4.1 Definition of Hearing Aid Compatibility (HAC)

On July 10.2003.the Federal Communications Commission (FCC) adopted new rules requiring wireless manufacturers and service providers to provide digital wireless phones that are compatible with hearing aids. The FCC has modified the exemption for wireless phones under the Hearing Aid Compatibility Act of 1998 (HAC Act) in WT Docket 01-309 RM-8658 to extend the benefits of wireless telecommunications to individuals with hearing disabilities. These benefits encompass business, social and emergency communications, which increase the value of the wireless network for everyone. An estimated more than 10% of the population in the United States show signs of hearing impairment and of that fraction, almost 80% use hearing aids. Approximately 500 million people worldwide suffer from hearing loss.

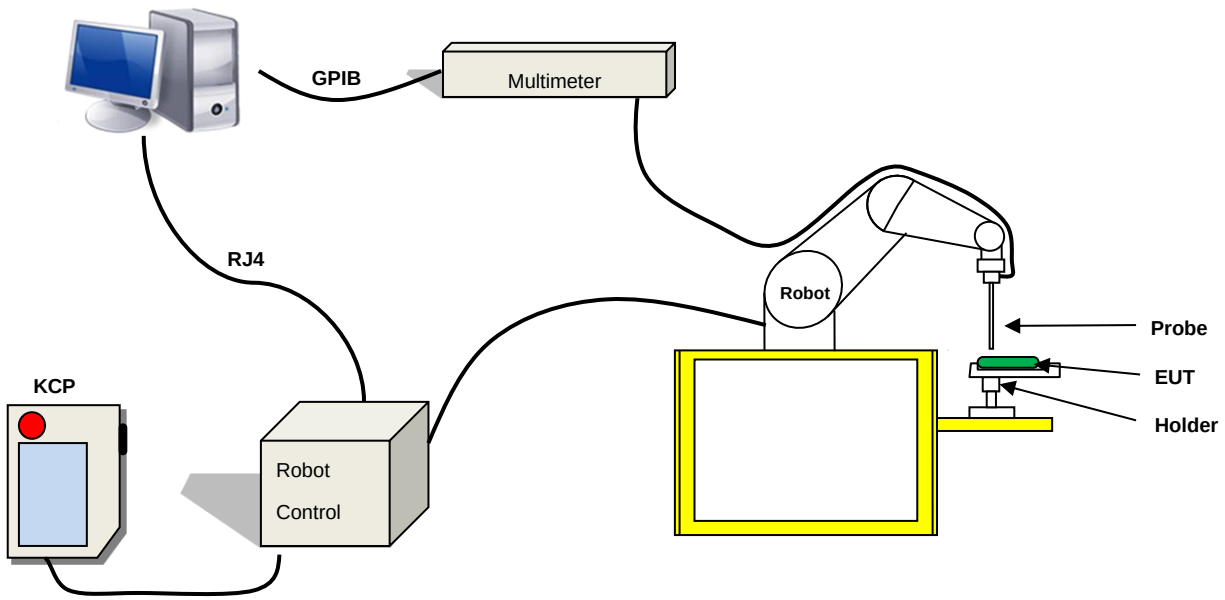
Compatibility Tests involved:

The standard calls for wireless communications devices to be measured for:
- RF Electric-field emissions.
- RF Magnetic- field emissions.
- T-coil mode, magnetic-signal strength in the audio band.
- T-coil mode, magnetic-signal frequency response through the audio band.
- T-coil mode, magnetic-signal and noise articulation index.

The hearing aid must be measured for:
- RF immunity in microphone mode
- RF immunity in T-coil mode

4.2 SATIMO HAC System

SATIMO HAC System Diagram:



4.2.1 Robot

The SATIMO HAC system uses the high precision robots from KUKA. For the 6-axis controller system, the robot controller version (KUKA) from KUKA is used. The KUKA 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)

4.2.2 HAC E-Field Probe

Serial Number:	SN 03/16 EPH47
Frequency:	0.7GHz – 2.5GHz
Probe length:	330mm
Length of one dipole:	3.3mm
Maximum external diameter:	8mm
Probe extremity diameter:	5mm
Distance between dipoles/probe extremity:	3mm
Resistance of the three dipole (at the connector):	Dipole 1:R1=0.208 MΩ Dipole 2:R1=0.203 MΩ Dipole 3:R3=0.214 MΩ
Connector (HIROSE series SR30)	6 wire male (Hirose SR30series)

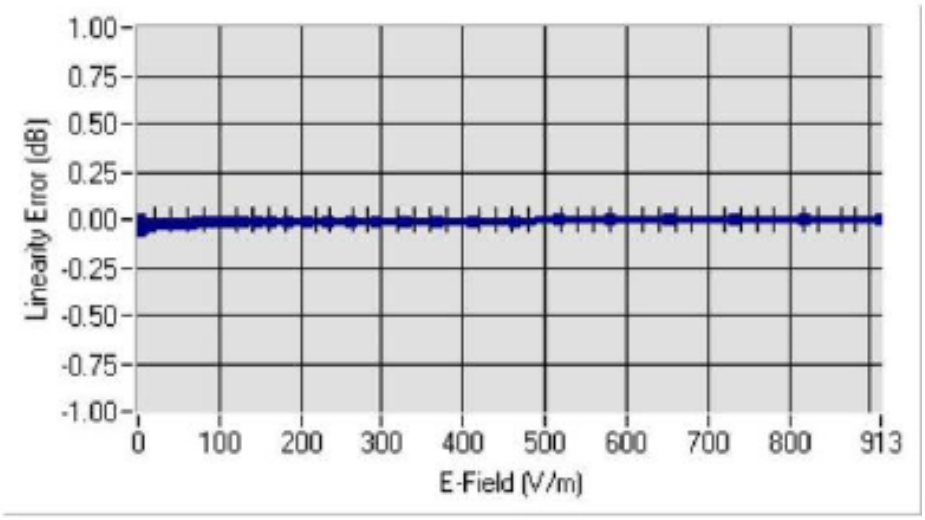
E-Field Probe Calibration Process

All methods used to perform the measurements and calibrations comply with the ANSI C63.19 and IEEE 1309 standards.

LINEARITY

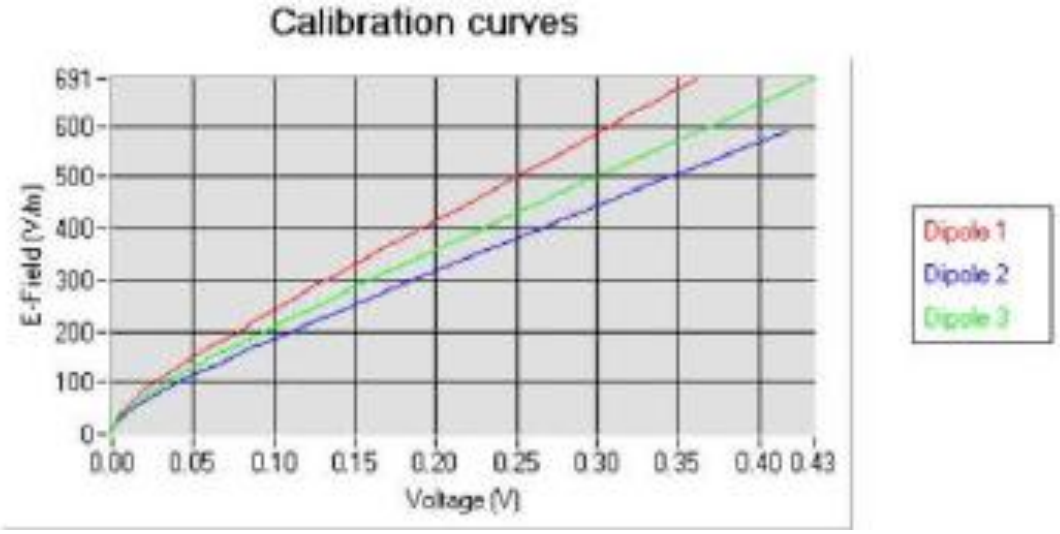
The linearity was determined using a standard dipole with the probe positioned 10 mm above the dipole. The input power of the dipole was adjusted from -15 to 36 dBm using a 1dB step (to cover the range 2V/m to 1000V/m).

Linearity: +/- 1.32% (+/- 0.06 dB)



SENSITIVITY

The sensitivity factors of the three dipoles were determined using the waveguide method outlined in the fore mentioned standards.

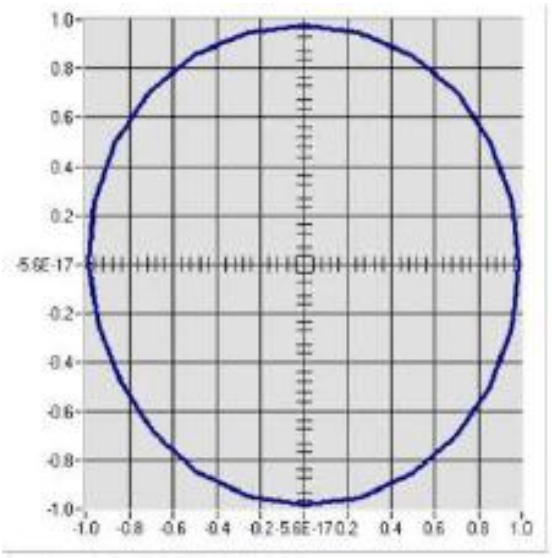


Frequency (GHz)	Normz dipole 1 (μV/(V/m)^2)	Normz dipole 2 (μV/(V/m)^2)	Normz dipole 3 (μV/(V/m)^2)
0.7GHz-2.5GHz	3.69	4.41	4.60
Frequency (GHz)	**DCP dipole 1 (mV)**	**DCP dipole 2 (mV)**	**DCP dipole 3 (mV)**
0.7GHz-2.5GHz	106	117	121

ISOTROPY

The axial isotropy was evaluated by exposing the probe to a reference wave from a standard dipole. The probe was rotated along its main axis from 0 - 360 degrees in 15 degree steps.

Isotropy: +/- 1.59% (+/- 0.07 dB)



5 SYSTEM VERIFICATION

5.1 System Check Procedure

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 1 cm probe to dipole separation, which is measured from top surfaceof the dipole to the calibration reference point of the sensor, defined by the probe manufacturer is shown in the following diagram:

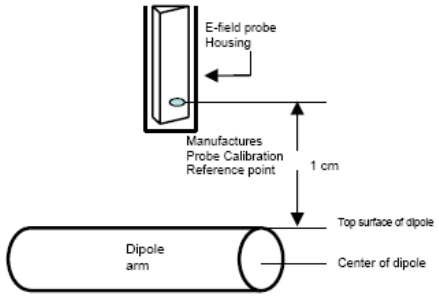


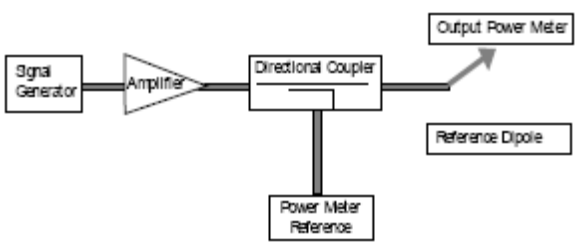
Figure 15
Separation Distance from Dipole to Field Probe

RF power was recorded using both an average reading meter and a peak reading meter. Readings of the probe are provided by the measurement system. To assure proper operation of the near-field measurement probe the input power to the dipole shall be commensurate with the full rated output power of the wireless device (e.g. - for a cellular phone wireless device the average peak antenna input power will be on the order of 100mW (i.e. - 20dBm) RMS after adjustment for any mismatch.

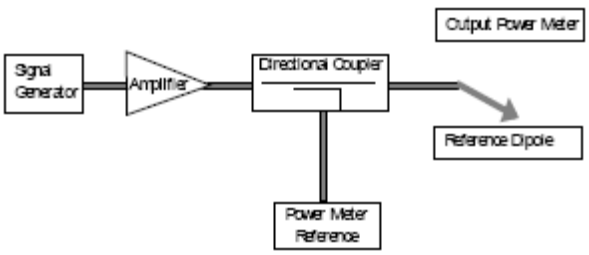
5.2 Validation Procedure

A dipole antenna meeting the requirements given in PC63.19 was placed in the position normally occupied by the WD. The length of the dipole was scanned with both E-field and H-field probes and the maximum values for each were recorde. Using the near-field measurement system, scan the antenna over the radiating dipole and record the greatest field reading observed. Due to the nature of E-fields about free-space dipoles, the two E-field peaks measured over the dipole are averaged to compensate for non-paralellity of the setup see manufacturer method on dipole calibration certificates, Field strength measurements shall be made only when the probe is stationary. RF power was recorded using both an average and a peak power reading meter.

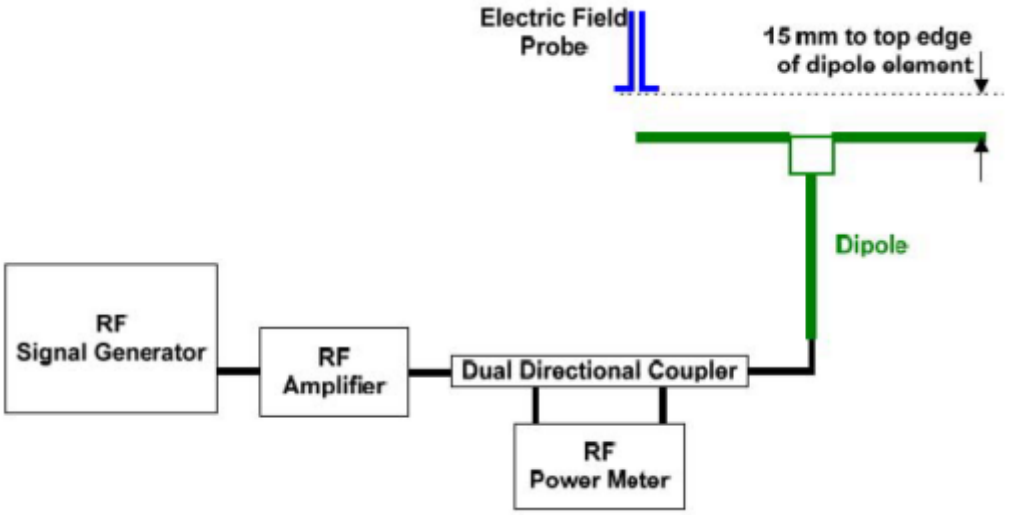
Setup for Desired Output Power to Dipole



Setup to Dipole



5.3 System Validation Setup



Using this setup configuration, the signal generator was adjusted for the desired output power 20dBm (100mW) at a specified frequency. The reference power from the coupled port of the directional coupler is recorded. Next, the output cable is connected to the reference dipole

5.4 System Validation Results

Comparing to the original HAC value provided by SATIMO, the validation data should be within its specification of 10 %.

Frequency	Input Power (dBm)	E-field Result (V/m)	Target Field (V/m)	Tolerance (%)	Date
835 MHz	20.0	214.09	220.4	-2.86	06/12/2017
1900MHz	20.0	155.75	153.4	1.53	06/12/2017

6 Modulation Interference Factor (MIF)

The HAC Standard ANSI C63.19-2011 defines a new scaling using the Modulation Interference Factor (MIF). For any specific fixed and repeatable modulated signal, a modulation interference factor (MIF, expressed in dB) may be developed that relates its interference potential to its steady-state rms signal level or average power level. This factor is a function only of the audio-frequency amplitude modulation characteristics of the signal and is the same for field-strength and conducted power measurements. It is important to emphasize that the MIF is valid only for a specific repeatable audio-frequency amplitude modulation characteristic. Any change in modulation characteristic requires determination and application of a new MIF.

The MIF may be determined using a radiated RF field, a conducted RF signal, or in a preliminary stage, a mathematical analysis of a modeled RF signal:

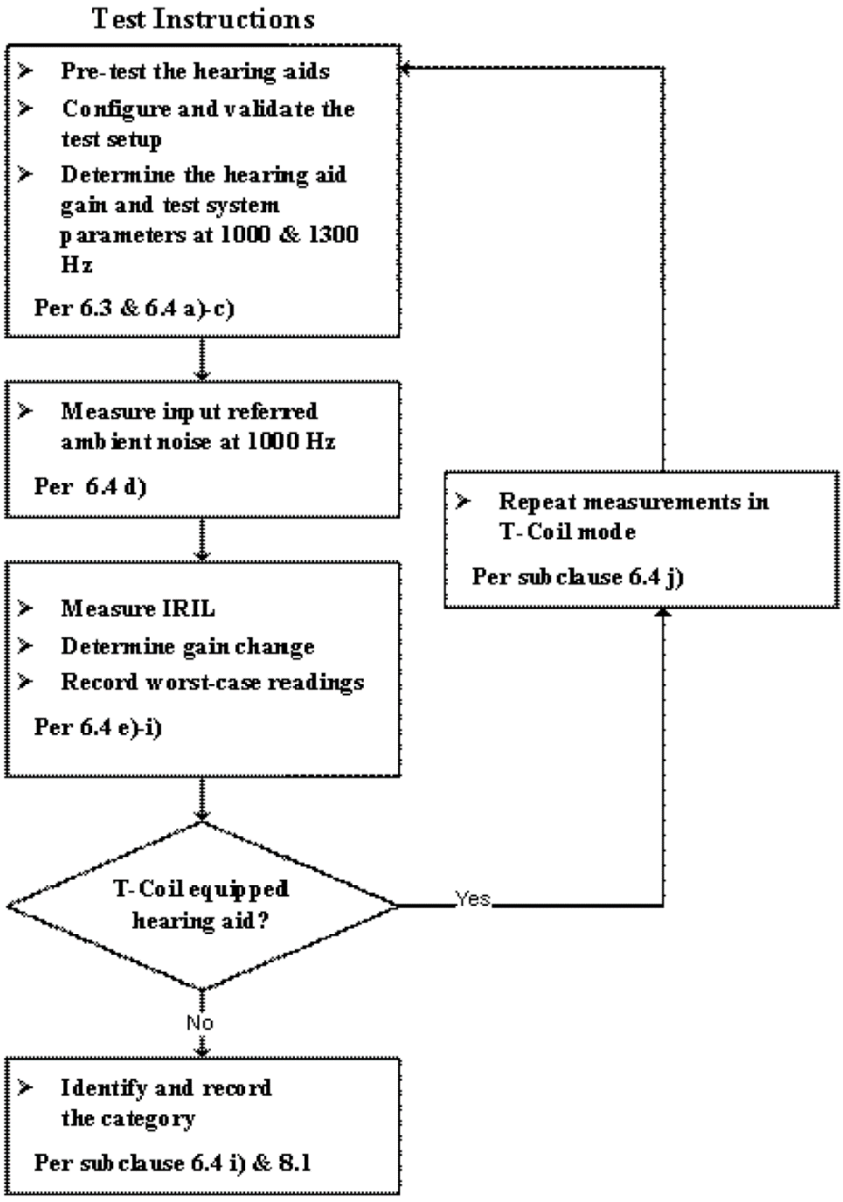
a) Verify the slope accuracy and dynamic range capability over the desired operating frequency band of a fast probe or sensor, square-law detector, as specified in D.3, and weighting system as specified in D.4 and D.5. For the probe and instrumentation included in the measurement of MIF, additional calibration and application of calibration factors are not required.
b) Using RF illumination or conducted coupling, apply the specific modulated signal in question to the measurement system at a level within its confirmed operating dynamic range.
c) Measure the steady-state rms level at the output of the fast probe or sensor.
d) Measure the steady-state average level at the weighting output.
e) Without changing the square-law detector or weighting system, and using RF illumination or conducted coupling, substitute for the specific modulated signal a 1kHz, 80% amplitude-modulated carrier at the same frequency and adjust its strength until the level at the weighting output equals the step d) measurement.
f) Without changing the carrier level from step e), remove the 1 kHz modulation and again measure the steady-state rms level indicated at the output of the fast probe or sensor.
g) The MIF for the specific modulation characteristic is provided by the ratio of the step f) measurement to the step c) measurement, expressed in dB (20 × log(step f))/step c)).

In practice, step e) and step f) need not be repeated for each MIF determination if the relationship between the two measurements has been preestablished for the measurement system over the operating frequency and dynamic ranges.

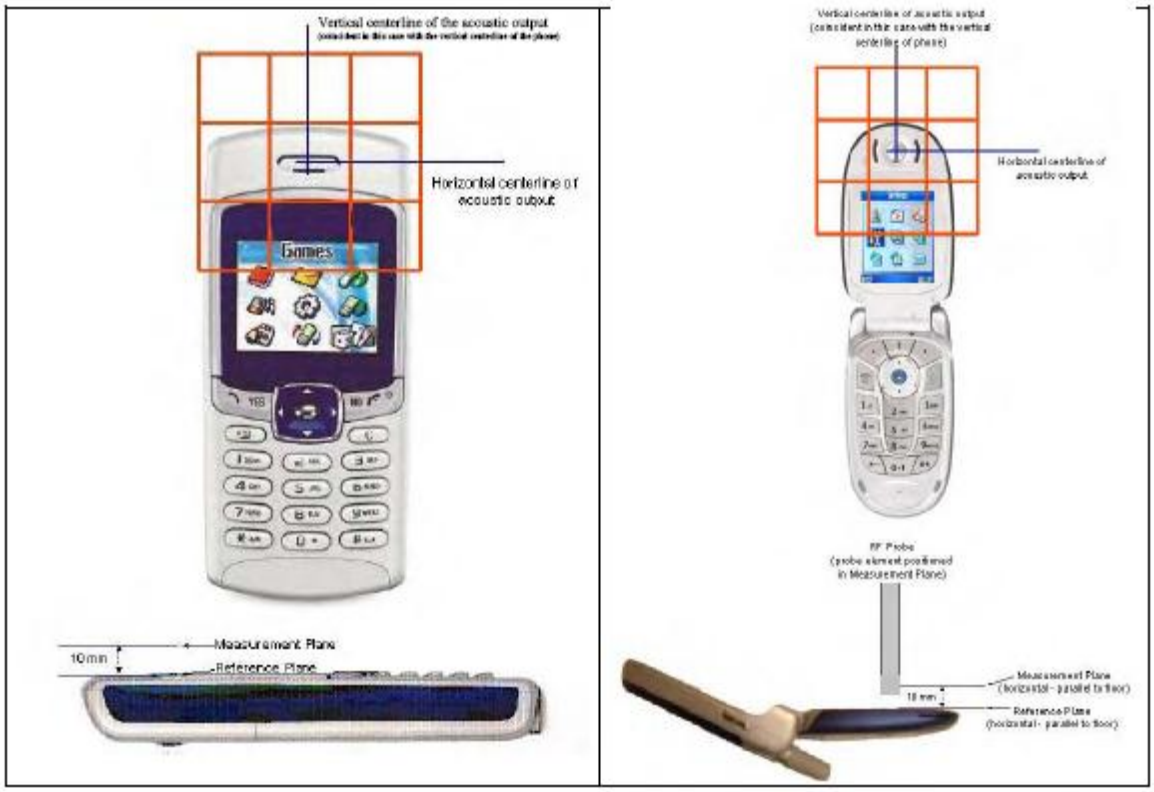
Probe	Signal Type	MIF
E-Field Probe	CW	-100.00
	GSM	3.63
	WCDMA	-27.23
	CDMA2000	-19.75
	TD-SCDMA	3.10
	FDD-LTE	-15.6
	TDD-LTE	-1.6

7 HAC RF IMMUNITY MEASUREMENT PROCEDURES

7.1 HAC Measurement Process Diagram



7.2 HAC RF Test Setup



Reference and plane for RF emission measurements

7.3 RF Emission Measurement Procedure

The following illustrate a typical RF emissions test scan over a wireless communications device:

a. Proper operation of the field probe, probe measurement system, other instrumentation, and the positioning system was confirmed.

b. WD is positioned in its intended test position, acoustic output point of the device perpendicular to the field probe.

c. The WD operation for maximum rated RF output power was configured and confirmed with the base station simulator, at the test channel and other normal operating parameters as intended for the test. The battery was ensured to be fully charged before each test.

d. The center sub-grid was centered over the center of the acoustic output (also audio band magnetic output, if applicable). The WD audio output was positioned tangent (as physically possible) to the measurement plane.

e. A surface calibration was performed before each setup change to ensure repeatable spacing and proper maintenance of the measurement plane using the HAC Phantom.

f. The measurement system measured the field strength at the reference location.

8 CONDUCTED RF OUPUT POWER

8.1 GSM

GSM 850							
GSM850 Band	Burst Average Power(dBm)			Tune-up Power(dBm)	Frame-Averaged power (dBm)		
Channel	128	190	251		128	190	251
GSM (GMSK, 1-Slot)	31.78	31.90	31.96	32.00	22.78	22.90	**22.96**
GPRS (GMSK, 1-Slot)	31.69	31.80	31.89	32.00	22.69	22.80	22.89
GPRS (GMSK, 2-Slots)	30.18	30.28	30.29	30.50	24.18	24.28	24.29
GPRS (GMSK, 3-Slots)	29.50	29.61	29.64	30.00	25.24	25.35	25.38
GPRS (GMSK, 4-Slots)	28.49	28.55	28.59	29.00	25.49	25.55	**25.59**
EGPRS (8PSK, 1-Slot)	26.92	26.01	26.08	27.00	17.92	17.01	17.08
EGPRS (8PSK, 2-Slots)	25.66	25.18	25.39	26.00	19.66	19.18	19.39
EGPRS (8PSK, 3-Slots)	24.32	24.14	24.12	24.50	**20.06**	19.88	19.86
EGPRS (8PSK, 4-Slots)	22.90	22.06	22.20	23.00	19.90	19.06	19.20
GSM 1900							
GSM1900 Band	Burst Average Power(dBm)			Tune-up Power(dBm)	Frame-Averaged power (dBm)		
Channel	975	38	124		975	38	124
GSM (GMSK, 1-Slot)	28.41	28.35	28.24	28.50	**19.41**	19.35	19.24
GPRS (GMSK, 1-Slot)	28.40	28.34	28.22	28.50	19.40	19.34	19.22
GPRS (GMSK, 2-Slots)	27.69	27.66	27.54	28.00	21.69	21.66	21.54
GPRS (GMSK, 3-Slots)	26.01	26.08	26.18	26.50	21.75	21.82	21.92
GPRS (GMSK, 4-Slots)	25.19	25.20	25.26	25.50	22.19	22.20	**22.26**
EGPRS (8PSK, 1-Slot)	24.35	24.19	24.27	24.50	15.35	15.19	15.27
EGPRS (8PSK, 2-Slots)	23.57	23.41	23.21	24.00	17.57	17.41	17.21
EGPRS (8PSK, 3-Slots)	22.19	22.17	22.05	22.50	17.93	17.91	17.79
EGPRS (8PSK, 4-Slots)	21.36	21.21	21.05	21.50	**18.36**	18.21	18.05

Note [1]: SAR testing was performed on the maximum frame-averaged power mode.

Note [2]: The frame-averaged power is linearly proportion to the slot number configured and it is linearly scaled the maximum burst-averaged power based on time slots. The calculated method is shown as below:

Frame-averaged power = Burst averaged power (1 Tx Slot) - 9 dB

Frame-averaged power = Burst averaged power (2 Tx Slots) - 6 dB

Frame-averaged power = Burst averaged power (3 Tx Slots) - 4.26 dB

Frame-averaged power = Burst averaged power (4 Tx Slots) - 3 dB

8.2 WCDMA

WCDMA	Band 2				Band 5			
Channel	9262	9400	9538	Tune-up Power (dBm)	4132	4182	4233	Tune-up Power (dBm)
RMC 12.2Kbps	**22.36**	22.22	22.14	22.50	22.55	22.57	**22.62**	23.00
HSDPA Subtest-1	21.59	21.94	21.65	22.00	21.88	21.95	21.41	22.00
HSDPA Subtest-2	21.53	21.89	21.59	22.00	21.78	21.94	21.38	22.00
HSDPA Subtest-3	21.52	21.88	21.43	22.00	21.72	21.84	21.36	22.00
HSDPA Subtest-4	21.51	21.85	21.53	22.00	21.67	21.76	21.25	22.00
HSUPA Subtest-1	21.37	21.09	21.77	22.00	21.22	21.98	21.56	22.00
HSUPA Subtest-2	21.39	21.09	21.74	22.00	21.17	21.92	21.62	22.00
HSUPA Subtest-3	21.29	21.06	21.67	22.00	21.15	21.89	21.54	22.00
HSUPA Subtest-4	21.27	21.03	21.56	22.00	21.08	21.85	21.48	22.00
HSUPA Subtest-5	21.23	21.04	21.51	22.00	21.11	21.77	21.48	22.00

9 11 HAC RF Emission Test Results

9.1 E-Filled Emission Test Results

Band	Mode	Ch.	Freq. (MHz)	Peak E-Field dB (V/m)	M-Rating	Meas. No.
GSM850	Voice	128	824.20	38.72	M4	1#
		190	836.60	38.89	M4	2#
		251	848.80	38.74	M4	3#
GSM1900	Voice	512	1850.20	29.00	M4	4#
		661	1880.00	29.74	M4	5#
		810	1909.80	28.92	M4	6#
WCDMA Band2	Voice	9262	1852.40	0.28	M4	7#
		9400	1880.00	0.38	M4	8#
		9538	1907.60	0.56	M4	9#
WCDMA Band5	Voice	4132	826.40	5.97	M4	10#
		4182	836.40	5.31	M4	11#
		4233	846.60	5.06	M4	12#

10 TEST EQUIPMENTS LIST

Description	Manufacturer	Model	Serial No.	Cal. Date	Cal. Due
PC	Dell	N/A	N/A	N/A	N/A
800-950MHz Dipole	SATIMO	SIDB835	SN 18/12 DHA41	2017/02/17	2018/02/16
1700-2000MHz Dipole	SATIMO	SIDB1900	SN 18/12 DHB46	2017/02/17	2018/02/16
E-Field Probe	SATIMO	SCE	SN 03/16 EPH47	2017/03/22	2018/03/21
Antenna	SATIMO	ANTA3	SN 17/13 ZNTA45	N/A	N/A
MultiMeter	Keithley	MultiMeter 2000	4024022	2017/06/12	2018/06/11
Signal Generator	R&S	SMF100A	1167.0000k02/104260	2017/06/12	2018/06/11
Power Meter	Agilent	E4419B	GB40201833	2017/11/02	2018/11/01
Power Sensor	Agilent	E9300A	MY41498012	2017/11/02	2018/11/01
Power Sensor	Agilent	E9300A	MY41499891	2017/11/02	2018/11/01
Power Amplifier	SATIMO	6552B	22374	2017/06/12	2018/06/11
Wireless Communication Test Set	Agilent	8960-E5515C	MY50260493	2017/11/02	2018/11/01
Wireless Communication Test Set	R&S	CMU 200	123666	2017/11/02	2018/11/01

11 REFERENCES

1 FCC 47 CFR Part 20.19 “Hearing aid-compatible mobile handsets.”

2 ANSI C 63.19:2011 “American National Standard Methods of Measurement of Compatibility between Wireless Communications Devices and Hearing Aids”, 27 May 2011

3 KDB 285076 D01 HAC Guidance v05, “provides equipment authorization guidance for mobile handsets subject to the requirements of Section 20.19 for hearing aid compatibility

4 KDB 285076 D02, T-Coil testing for CMRS IP v03 provides guidance for T-Coil tests for voice-over-IP (e.g. LTE and Wi-Fi) CMRS based Telephone Services.

4 SATIMO COMOHAC_V4

5 SATIMO OPENHAC_V4

ANNEX A HAC TEST RESULT OF SYSTEM VERIFICAION

E-Field System Check Data(835MHz Head)

Experimental conditions.

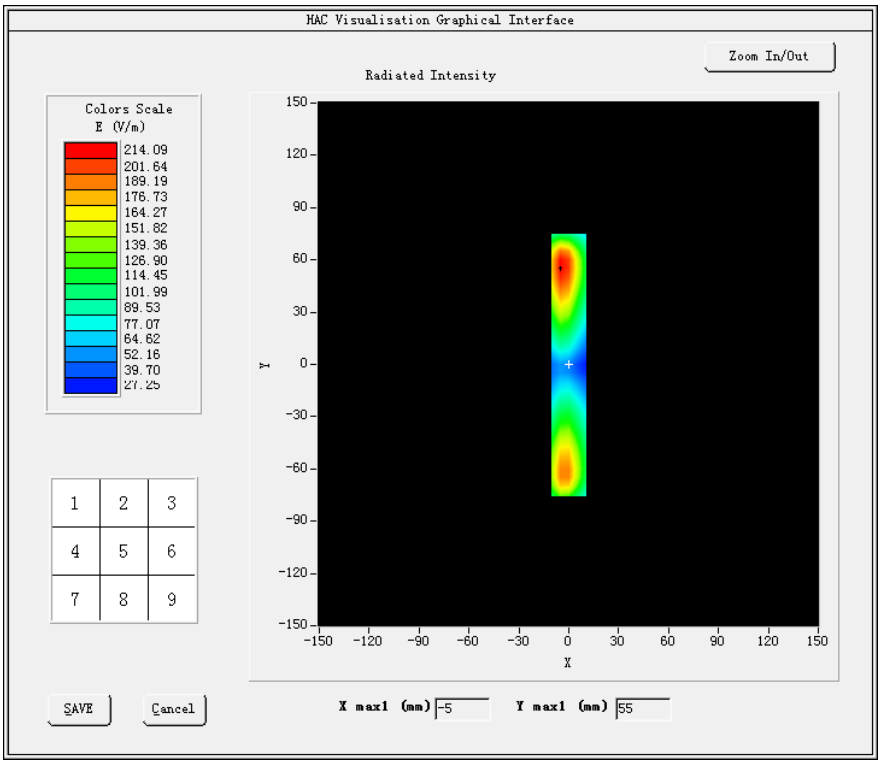
Grid size (mm x mm)	20.0, 150.0
Step (mm)	5
Band	835MHz
Channel	
Signal	CW
Date of measurement	06/12/2017

HAC Measurement Results

Frequency (MHz): 835.000000

Maximum value of total field = 214.09 V/m

SURFACE E-Field



E-Filed System Check Data (1880MHz)

Experimental conditions

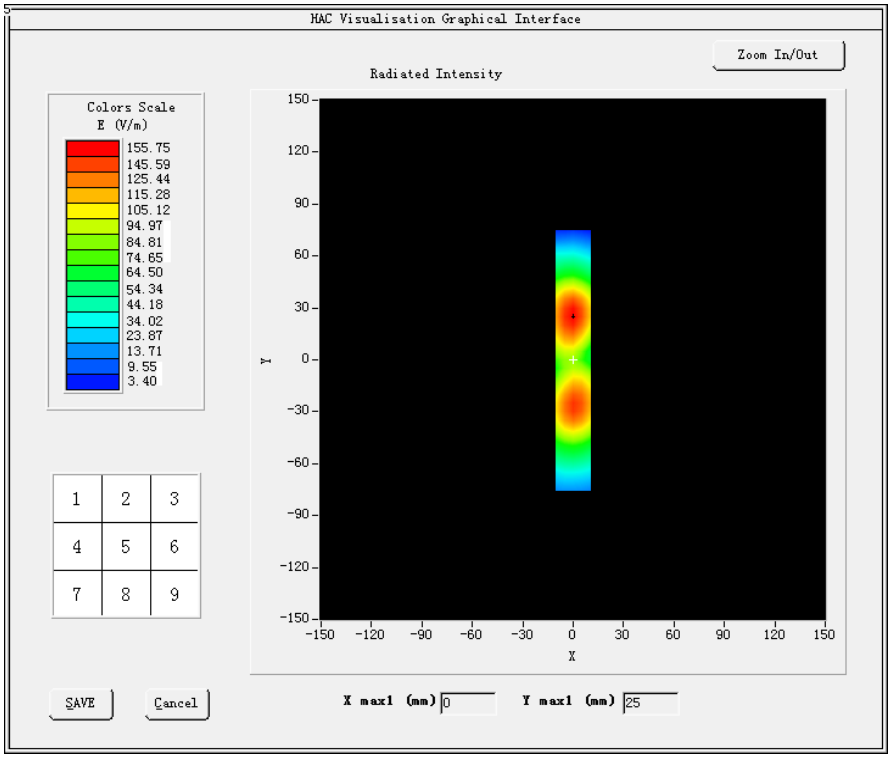
Grid size (mm x mm)	20.0, 150.0
Step (mm)	5
Band	1900 MHz
Channel	
Signal	CW
Date of measurement	06/12/2017

HAC Measurement Results

Frequency (MHz): 1900.000000

Maximum value of total field = 155.75V/m

SURFACE HAC



ANNEX B HAC RF MEASUREMENT RESULT

MEASUREMENT 1

Experimental conditions

Grid size (mm x mm)	50.0, 50.0
Step (mm)	5
Band	GSM850
Channel	Low
Signal	GSM
Date of measurement	06/12/2017

HAC Measurement Results

Lower Band (Channel 128):

Frequency (MHz): 824.200000

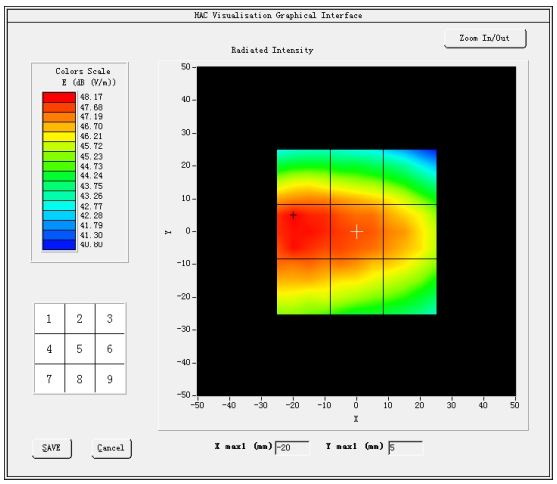
Modulation Interference Factor(MIF)= 3.630000

Maximum value of total field = 38.72 dB (V/m)

Hearing Aid Near-Field Category: M4

SURFACE HAC

E in dB (V/m)



Grid 1: 38.10	Grid 2: 37.91	Grid 3: 37.22
Grid 4: 39.15	Grid 5: 38.72	Grid 6: 38.10
Grid 7: 38.56	Grid 8: 38.37	Grid 9: 37.69

MEASUREMENT 2

Experimental conditions

Grid size (mm x mm)	50.0, 50.0
Step (mm)	5
Band	GSM850
Channel	Middle
Signal	GSM
Date of measurement	06/12/2017

HAC Measurement Results

Middle Band (Channel 190):

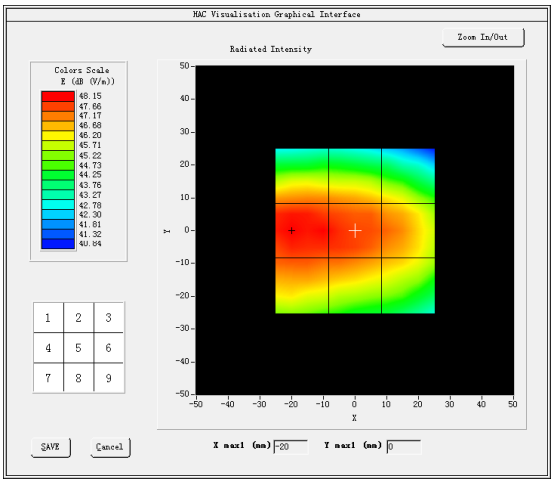
Frequency (MHz): 836.600000

Modulation Interference Factor(MIF)= 3.630000

Maximum value of total field = 38.89 dB (V/m)

Hearing Aid Near-Field Category: M4

SURFACE HAC



E in dB (V/m)

Grid 1: 38.02	Grid 2: 37.91	Grid 3: 37.26
Grid 4: 39.10	Grid 5: 38.89	Grid 6: 38.30
Grid 7: 38.58	Grid 8: 38.42	Grid 9: 37.73

MEASUREMENT 3

Experimental conditions

Grid size (mm x mm)	50.0, 50.0
Step (mm)	5
Band	GSM850
Channel	High
Signal	GSM
Date of measurement	06/12/2017

HAC Measurement Results

Higher Band (Channel 251):

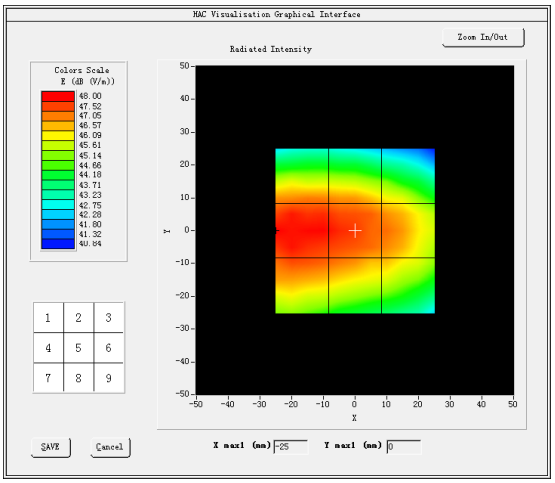
Frequency (MHz): 848.800000

Modulation Interference Factor(MIF)= 3.630000

Maximum value of total field = 38.74 dB (V/m)

Hearing Aid Near-Field Category: M4

SURFACE HAC



E in dB (V/m)

Grid 1: 37.98	Grid 2: 37.83	Grid 3: 36.97
Grid 4: 38.94	Grid 5: 38.74	Grid 6: 38.11
Grid 7: 38.55	Grid 8: 38.22	Grid 9: 37.60

MEASUREMENT 4

Experimental conditions

Grid size (mm x mm)	50.0, 50.0
Step (mm)	5
Band	GSM1900
Channel	Low
Signal	GSM
Date of measurement	06/12/2017

HAC Measurement Results

Lower Band (Channel 512):

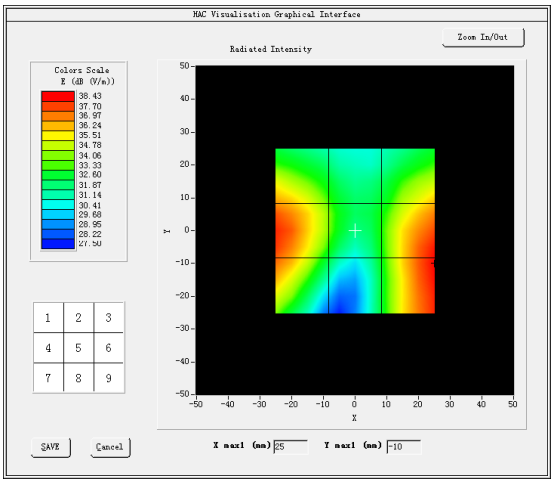
Frequency (MHz): 1850.200000

Modulation Interference Factor(MIF)= 3.630000

Maximum value of total field = 29.00 dB (V/m)

Hearing Aid Near-Field Category: M4

SURFACE HAC



E in dB (V/m)

Grid 1: 27.27	Grid 2: 24.08	Grid 3: 26.90
Grid 4: 29.00	Grid 5: 24.70	Grid 6: 29.31
Grid 7: 28.43	Grid 8: 24.29	Grid 9: 29.42

MEASUREMENT 5

Experimental conditions

Grid size (mm x mm)	50.0, 50.0
Step (mm)	5
Band	GSM1900
Channel	Middle
Signal	GSM
Date of measurement	06/12/2017

HAC Measurement Results

Middle Band (Channel 661):

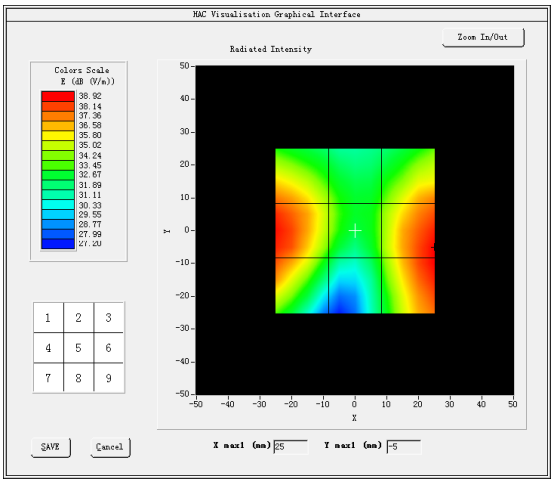
Frequency (MHz): 1880.000000

Modulation Interference Factor(MIF)= 3.630000

Maximum value of total field = 29.74 dB (V/m)

Hearing Aid Near-Field Category: M4

SURFACE HAC



E in dB (V/m)

Grid 1: 28.41	Grid 2: 24.92	Grid 3: 28.25
Grid 4: 29.74	Grid 5: 25.52	Grid 6: 29.96
Grid 7: 29.14	Grid 8: 25.20	Grid 9: 29.96

MEASUREMENT 6

Experimental conditions

Grid size (mm x mm)	50.0, 50.0
Step (mm)	5
Band	GSM1900
Channel	High
Signal	GSM
Date of measurement	06/12/2017

HAC Measurement Results

Higher Band (Channel 810):

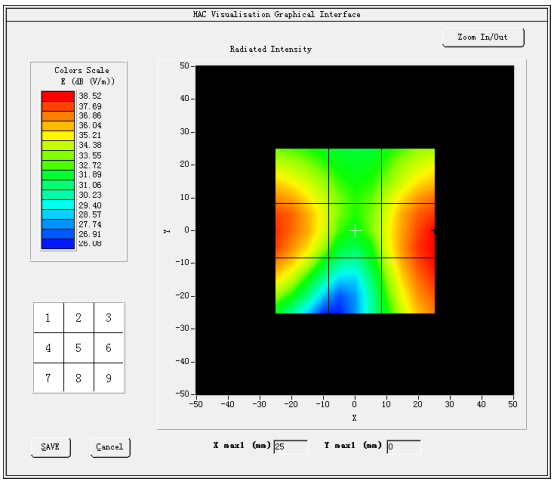
Frequency (MHz): 1909.800000

Modulation Interference Factor(MIF)= 3.630000

Maximum value of total field = 28.92 dB (V/m)

Hearing Aid Near-Field Category: M4

SURFACE HAC



E in dB (V/m)

Grid 1: 27.64	Grid 2: 25.11	Grid 3: 28.03
Grid 4: 28.92	Grid 5: 25.61	Grid 6: 29.57
Grid 7: 28.09	Grid 8: 25.04	Grid 9: 29.45

MEASUREMENT 7

Experimental conditions

Grid size (mm x mm)	50.0, 50.0
Step (mm)	5
Band	Band2_WCDMA1900
Channel	Low
Signal	WCDMA
Date of measurement	06/12/2017

HAC Measurement Results

Lower Band (Channel 9262):

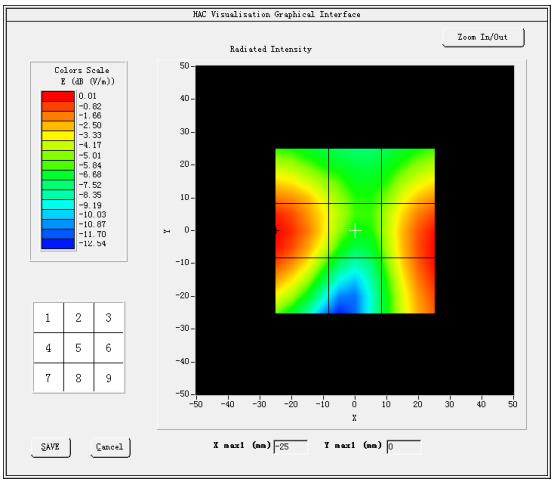
Frequency (MHz): 1852.400000

Modulation Interference Factor(MIF)= -27.230000

Maximum value of total field = 0.28 dB (V/m)

Hearing Aid Near-Field Category: M4

SURFACE HAC



E in dB (V/m)

Grid 1: -1.38	Grid 2: -4.10	Grid 3: -1.73
Grid 4: 0.28	Grid 5: -3.68	Grid 6: 0.21
Grid 7: -0.34	Grid 8: -5.13	Grid 9: 0.17

MEASUREMENT 8

Experimental conditions

Grid size (mm x mm)	50.0, 50.0
Step (mm)	5
Band	Band2_WCDMA1900
Channel	Middle
Signal	WCDMA
Date of measurement	06/12/2017

HAC Measurement Results

Middle Band (Channel 9400):

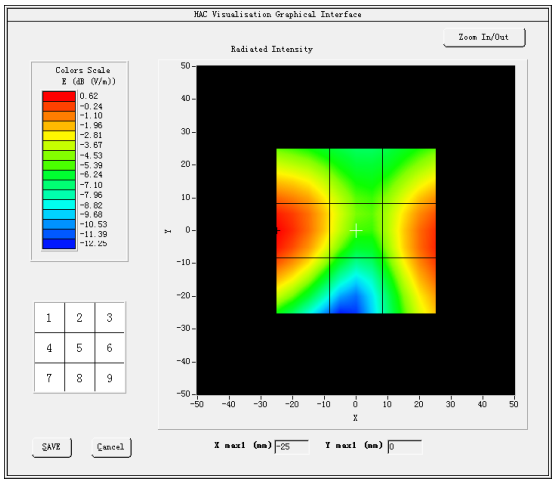
Frequency (MHz): 1880.000000

Modulation Interference Factor(MIF)= -27.230000

Maximum value of total field = 0.38 dB (V/m)

Hearing Aid Near-Field Category: M4

SURFACE HAC



E in dB (V/m)

Grid 1: -0.51	Grid 2: -3.13	Grid 3: -1.14
Grid 4: 0.88	Grid 5: -2.66	Grid 6: 0.38
Grid 7: 0.10	Grid 8: -4.56	Grid 9: 0.19

MEASUREMENT 9

Experimental conditions

Grid size (mm x mm)	50.0, 50.0
Step (mm)	5
Band	Band2_WCDMA1900
Channel	High
Signal	WCDMA
Date of measurement	06/12/2017

HAC Measurement Results

Higher Band (Channel 9538):

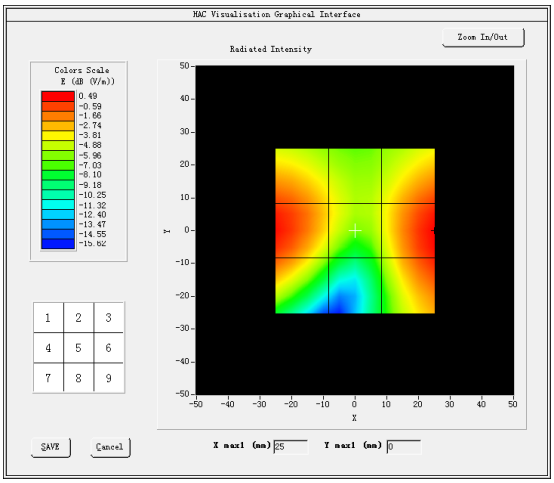
Frequency (MHz): 1907.600000

Modulation Interference Factor(MIF)= -27.230000

Maximum value of total field = 0.56 dB (V/m)

Hearing Aid Near-Field Category: M4

SURFACE HAC



E in dB (V/m)

Grid 1: -0.65	Grid 2: -3.70	Grid 3: -0.48
Grid 4: 0.56	Grid 5: -3.49	Grid 6: 0.76
Grid 7: -0.58	Grid 8: -5.03	Grid 9: 0.34

MEASUREMENT 10

Experimental conditions

Grid size (mm x mm)	50.0, 50.0
Step (mm)	5
Band	Band5_WCDMA850
Channel	Low
Signal	WCDMA
Date of measurement	06/12/2017

HAC Measurement Results

Lower Band (Channel 4132):

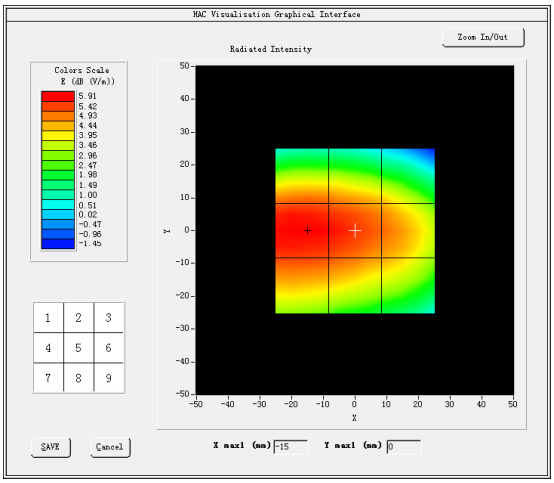
Frequency (MHz): 826.400000

Modulation Interference Factor(MIF)= -27.230000

Maximum value of total field = 5.97 dB (V/m)

Hearing Aid Near-Field Category: M4

SURFACE HAC



E in dB (V/m)

Grid 1: 5.24	Grid 2: 5.04	Grid 3: 4.29
Grid 4: 6.09	Grid 5: 5.97	Grid 6: 5.19
Grid 7: 5.63	Grid 8: 5.43	Grid 9: 4.71

MEASUREMENT 11

Experimental conditions

Grid size (mm x mm)	50.0, 50.0
Step (mm)	5
Band	Band5_WCDMA850
Channel	Middle
Signal	WCDMA
Date of measurement	06/12/2017

HAC Measurement Results

Middle Band (Channel 4182):

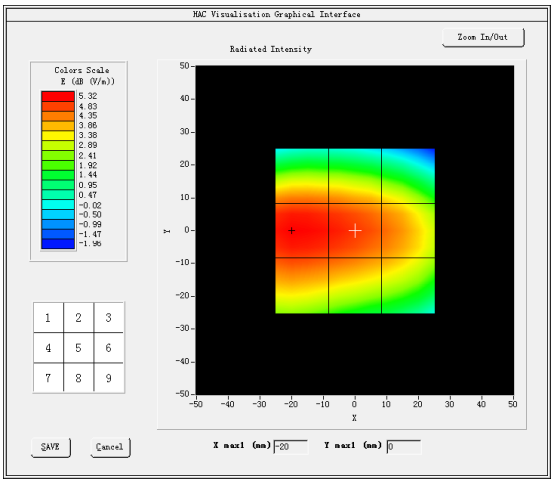
Frequency (MHz): 836.400000

Modulation Interference Factor(MIF)= -27.230000

Maximum value of total field = 5.31 dB (V/m)

Hearing Aid Near-Field Category: M4

SURFACE HAC



E in dB (V/m)

Grid 1: 4.55	Grid 2: 4.41	Grid 3: 3.67
Grid 4: 5.49	Grid 5: 5.31	Grid 6: 4.65
Grid 7: 5.07	Grid 8: 4.84	Grid 9: 4.23

MEASUREMENT 12

Experimental conditions

Grid size (mm x mm)	50.0, 50.0
Step (mm)	5
Band	Band5_WCDMA850
Channel	High
Signal	WCDMA
Date of measurement	06/12/2017

HAC Measurement Results

Higher Band (Channel 4233):

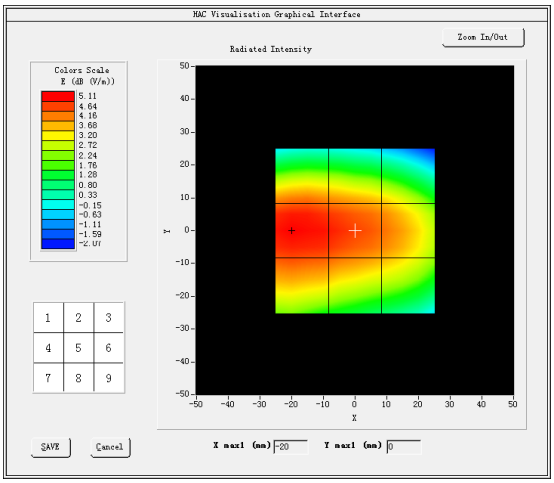
Frequency (MHz): 846.600000

Modulation Interference Factor(MIF)= -27.230000

Maximum value of total field = 5.06 dB (V/m)

Hearing Aid Near-Field Category: M4

SURFACE HAC



E in dB (V/m)

Grid 1: 4.38	Grid 2: 4.11	Grid 3: 3.49
Grid 4: 5.29	Grid 5: 5.06	Grid 6: 4.38
Grid 7: 4.78	Grid 8: 4.55	Grid 9: 3.91

ANNEX C EUT EXTERNAL PHOTO

Please refer the document “BL-SZ17B0271-AW. PDF”.

ANNEX D TEST SETUP PHOTO

Please refer the document “BL-SZ17B0271-AS-E-Field PDF”.

ANNEX E CALIBRATION FOR PROBE AND DIPOLE

Please refer the document “CALIBRATION FOR PROBE AND DIPOLE PDF”.

--END OF REPORT--