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Hearing Aid Compatibility
（HAC）
RF Emissions TEST REPORT

Report No: STS1604080H01

Issued for

Xwireless LLC

11426 Rockville pike,Rockville, MD 20852United States

Product Name:	Mobile Phone
Brand Name:	VORTEX
Model No.:	Profile 3G
Series Model:	UW2405S
FCC ID:	2ADLJPROFILE3G
Test Standard:	ANSI C63.19:2011
Test Result:	Pass

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Shenzhen STS Test Services Co., Ltd.
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Test Report Certification

Applicant's name................. : Xwireless LLC

Address .... : 11426 Rockville pike,Rockville, MD 20852United States

Manufacture's Name............ : Xwireless LLC

Address .... : 11426 Rockville pike,Rockville, MD 20852United States

Product description

Product name .... : Mobile Phone

Trademark .... : VORTEX

Model and/or type reference : Profile 3G

Serial Model : UW2405S

Standards............................. : ANSI C63.19:2011

The device was tested by Shenzhen STS Test Services Co., Ltd. in accordance with the measurement methods and procedures specified in KDB 865664 The test results in this report apply only to the tested sample of the stated device/equipment. Other similar device/equipment will not necessarily produce the same results due to production tolerance and measurement uncertainties.

Date of Test.. :

Date (s) of performance of tests............. : 20 Apr. 2016

Date of Issue... : 25 Apr. 2016

Test Result .... : **Pass**

Testing Engineer : Allen Chen

(Allen Chen)

Technical Manager : John Zou

(John Zou)

Authorized Signatory : Bovey Yang

(Bovey Yang)

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1. General Information

1.1 EUT Description

Equipment	Mobile Phone
Brand Name	VORTEX
Model No.	Profile 3G
Serial Model	UW2405S
FCC ID	2ADLJPROFILE3G
Model Difference	Only different in model name
Hardware Version	N/A
Software Version	N/A
Frequency Range	GSM 850: 824.2 ~ 848.8 MHz PCS1900: 1850.2 ~ 1909.8 MHz WCDMA II: 1852.4~1907.6 MHz WCDMA V: 826.4~846.6 MHz Bluetooth：2402~2480MHz
Transmit Power(Average):	GSM 850: 32.83dBm GSM 1900: 30.11dBm WCDMA II: 22.76dBm WCDMA V: 22.72dBm
M category	M4
Test Result	Pass
Operating Mode:	GSM: GSM Voice, GPRS, Class 12; WCDMA: RMC, HSDPA, HSUPA Release 6; Bluetooth: V2.1+EDR (GFSK+π/4DQPSK+8DPSK)
Antenna Specification:	GSM/WCDMA: PIFA Antenna BT: Dipole Antenna
Hotspot Mode:	Not Support
DTM Mode:	Not Support

1.2 Test Environment

Ambient conditions in the SAR laboratory:

Items	Required	Actual
Temperature (℃)	15-30	21~23
Humidity (%RH)	30-70	55~65

1.3 Test Facility

Shenzhen STS Test Services Co., Ltd.
Add. : 1/F., Building B, Zhuoke Science Park, No.190, Chongqing Road, Fuyong Street, Bao'an District, Shenzhen, Guangdong, China
CNAS Registration No.: L7649
FCC Registration No.: 842334; IC Registration No.: 12108A-1

2. System components

2.1 SATIMO System Description

SATIMO is fully compliant with the technical and scientific requirements of IEEE 1528, IEC 62209, CENELEC, ARIB, ACA, and the Federal Communications Commission. The system comprises of a six axes articulated robot which utilizes a dedicated controller.
SATIMO uses the latest methodologies and FDTD order to provide a platform which is repeatable with minimum uncertainty.

2.2 E-Field Probe Specification

Device Under Test	
Device Type	COMOHAC E FIELD PROBE
Manufacturer	Satimo
Model	SCE
Serial Number	SN 06/14 EPH42
Product Condition (new / used)	new
Frequency Range of Probe	0.7GHz-2.5GHz
Resistance of Three Dipoles at Connector	Dipole 1: R1=0.214 MΩ Dipole 2: R2=0.213 MΩ Dipole 3: R3=0.204 MΩ

2.3 H-Field Probe Specification

Device Under Test	
Device Type	COMOHAC H FIELD PROBE
Manufacturer	Satimo
Model	SCH
Serial Number	SN 06/14 HPH51
Product Condition (new / used)	New
Frequency Range of Probe	0.7GHz-2.5GHz
Resistance of Three Loops at Connector	Loop 1: R1=0.280 MΩ Loop 2: R2=0.309 MΩ Loop 3: R3=0.297 MΩ

2.4 Axis Articulated Robot

SATIMO utilizes a six articulated robot, which is controlled using a Pentium based real-time movement controller. The movement kinematics engine utilizes proprietary (Thermo CRS) interpolation and extrapolation algorithms, which allow full freedom of movement for each of the six joints within the working envelop. Utilization of joint 6 allows for full probe rotation with a tolerance better than 0.05mm around the central axis.

Robot /Controller Manufacturer	KUKA
Number of Axis	Six independently controlled axis
Positioning Repeatability	＜±0.03mm
Controller Type	KR C4 compact
Robot Reach	901mm
Communication	RS232 and LAN compatible

2.5 Universal Device Positioner

The universal device positioner allows complete freedom of movement of the EUT. Developed to hold a EUT in a free-space scenario any additional loading attributable to the material used in the construction of the positioner has been eliminated. Repeatability has been enhanced through the linear scales which form the design used to indicate positioning for any given test scenario in all major axes.

2.6 Test Equipment List

NO.	Instrument	Manufacturer	Model	S/N	Cal. Date	Cal. Due Date
1	E-Field Probe	SATIMO	SCE	SN 06/14 EPH42	2014.09.01	2015.08.31
2	Reference Validation Dipole 850MHz	SATIMO	SID835	SN 13/14 DHA55	2014.09.01	2015.08.31
3	Reference Validation Dipole 1900MHz	SATIMO	SIDB1900	SN 13/14 DHB59	2014.09.01	2015.08.31
4	Dielectric Probe Kit	SATIMO	SCLMP	SN 32/14 OCPG52	2014.09.01	2015.08.31
5	Device Holder	SATIMO	SCLMP	SN 32/14 TABH37	2014.09.01	2015.08.31
6	Waveguide	SATIMO	SWG5500	SN 13/14 WGA32	2014.09.01	2015.08.31
7	COMHAC Test Bench	SATIMO	Version 2	NA	Validated. No cal required	Validated. No cal required
8	HAC positioning ruler	SATIMO	TABH12 SN 42/09	NA	Validated. No cal required	Validated. No cal required
9	SAR TEST BENCH	SATIMO	3G MOBILE PHONE POSITIONNING SYSTEM	SN 32/14 MSH97	2014.09.01	2015.08.31
10	SAR TEST BENCH	SATIMO	LAPTOP POSITIONNING SYSTEM	SN 32/14 LSH29	2014.09.01	2015.08.31
11	Temperature/Humidity sensor	Mieo	HH660	STS-H025	2014.10.28	2015.10.27
12	Multi Meter	Keithley	Multi Meter 2000	4050073	2014.11.20	2015.11.19
13	Amplifier	Mini-Circuit	ZHL-42	22374	2014.11.20	2015.11.19
14	Signal Generator	R&S	SMF100A	104260	2014.10.27	2015.10.26
15	Power Meter	R&S	NRP	100510	2014.10.25	2015.10.24
16	Power Sensor	R&S	NRP-Z11	101919	2014.10.25	2015.10.24
17	Network Analyzer	R&S	5071C	EMY46103472	2014.12.12	2015.12.11
18	KUKA Robot	KUKA	10012265	501821	2014.09.01	2015.08.31

Note: All equipment upon which need to be calibrated are with calibration period of 1 year.

2.7 Measurement Uncertainty

UNCERTAINTY EVALUATION FOR RF HAC MEASUREMENT

Uncertainty Component	Tol. (± dB)	Prob. Dist.	Div.	Uncertainty (dB)	Uncertainty (%)
Measurement System					
RF reflections	0.1	R	√3	0.06	
Field probe conv. Factor	0.4	R	√3	0.23	
Field probe anisotropy	0.25	R	√3	0.14	
Positioning accuracy	0.2	R	√3	0.12	
Probe cable placement	0.1	R	√3	0.06	
System repeatability	0.2	R	√3	0.12	
EUT repeatability	0.4	N	1	0.40	
Combined Standard Uncertainty		N	1	0.52	
Expanded Uncertainty (95% CONFIDENCE INTERVAL)		N	k=2	1.03	12.65
REPORTED Expanded uncertainty (confidence level of 95%, k = 2)		N	k=2	1.00	13.00

UNCERTAINTY EVALUATION FOR AUDIO HAC MEASUREMENT

Uncertainty Component	Tol. (± dB)	Prob. Dist.	Div.	Uncertainty (dB)	Uncertainty (%)
Measurement System					
RF reflections	0.1	R	√3	0.06	
Acoustic noise	0.1	R	√3	0.06	
Probe coil sensitivity	0.49	R	√3	0.28	
Reference signal level	0.25	R	√3	0.14	
Positioning accuracy	0.4	R	√3	0.23	
Cable loss	0.1	N	2	0.05	
Frequency analyzer	0.15	R	√3	0.09	
System repeatability	0.2	N	1	0.20	
Repeatability of the WD	0.4	N	1	0.40	
Combined Standard Uncertainty		N	1	0.61	
Expanded uncertainty (confidence level of 95%, k = 2)		N	k=2	1.22	15.05
REPORTED Expanded uncertainty (confidence level of 95%, k = 2)		N	k=2	1.20	15.00

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3. HAC RF Emission Measurement Evaluation

3.1 System Check

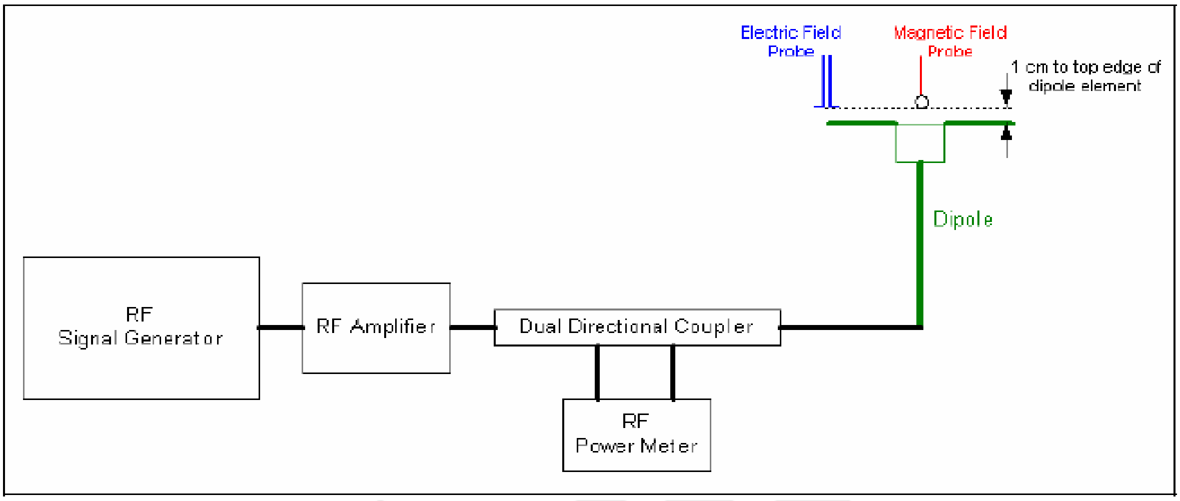
The test setup should be validated when first configured and verified periodically thereafter to ensure proper function. The procedure consists of two parts: dipole validation and determination of probe modulation factor

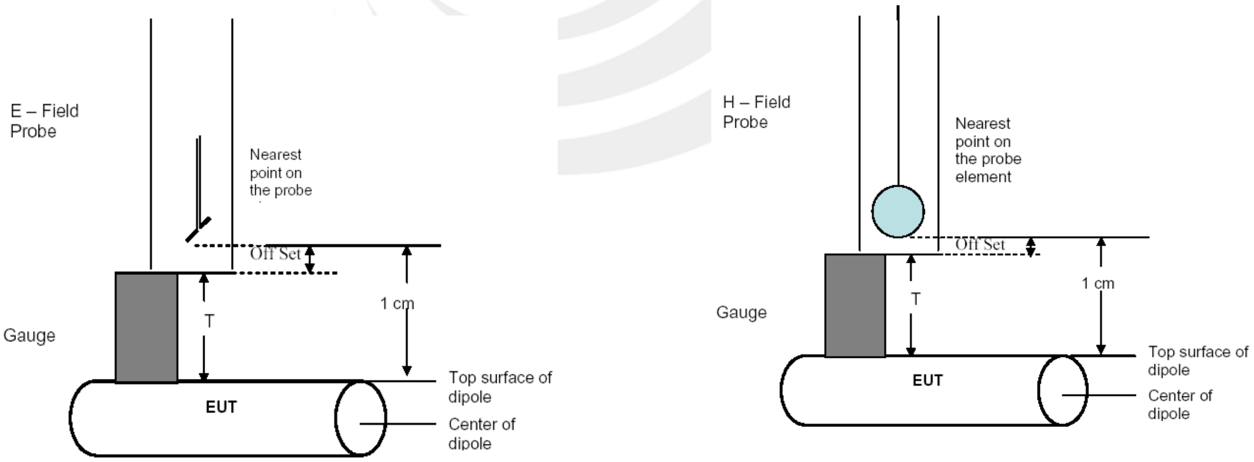
3.2 Dipole validation

The HAC validation dipole antenna serves as a known source for an electrical and magnetic RF output. Figure 2 shows the setup used for the dipole validation.

1. The dipole antenna was placed in the position normally occupied by the WD.
2. The dipole was energized with a 20 dBm un-modulated continuous-wave signal.
3. The length of the dipole was scanned with both E-field and H-field probes and the maximum value for each scan was recorded.
4. The readings were compared with the values provided by the probe manufacturer and were found to agree within the allowed tolerance of 10%.

Figure 2: Dipole Validation Procedure





The probe is positioned over the illuminated dipole at 10 mm distance from the nearest point on the probe sensor element to the top surface (edge) of the dipole element.

3.3 System Validation Results

Lab Temperature: 21℃, Lab Humidity: 45%.

Date	Calibration Dipole	Frequency (MHz)	Input Power (dBm)	Target Value(V/m)	Measured (V/m)	Deviation(%)
2016/4/20	SN 06/14 EPH42 E-field	850	20	220.4	218.15	-0.01
2016/4/20		1900	20	153.4	156.32	0.02

Note: Deviation=((Measured Result)-(Target Value))/(Target Value)*100%

4. Device Under Test

Mobile model：	Profile 3G
Normal operation：	Held to head
Accessory：	Standard cover

List of air interfaces/bands & operating modes for model Profile 3G

air interfaces	Bands (MHz)	Type	C63.19/ Tested	Simultaneous Transmissions Note:Not to be tested	OTT	Reduced power 20.19(c)(1)
GSM	850	VO	Yes	Bluetooth	N/A	N/A
	1900		Yes			
	GPRS/ FDGE	DT	N/A	Bluetooth	N/A	No
WCDMA	850	VO	No	Bluetooth	N/A	N/A
	1900					
	HSPA	DT	N/A	Bluetooth	N/A	N/A
Bluetooth	2450	DT	N/A	GSM,WCDMA	N/A	N/A
VO: Voice CMRS/PTSN Service Only V/D: Voice CMRS/PTSN and Data Service DT: Digital Transport						

5. 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 emphasizethat the MIF is valid only for a specific repeatable audio-frequency amplitude modulation characteristic. Anychange 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 1 kHz, 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)measurementtothestepc)measurement,expressedindB(20×log(stepf))/stepc)).

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.
As a check on the procedure, the MIF for the specific modulation consisting of a 1 kHz, 80% AM signal is–1.2 dB, which is the ratio in dB of the average power of the unmodulated carrier to the average power of themodulated carrier (10 × log(Punmod/Pmod), or equivalently the ratio in dB of the rms level of the unmodulated carrier to the rms level of the modulated carrier (20 × log(Lunmod /Lmod). The MIF for a1/8 duty cycle, 217 Hz pulse-modulated signal (similar to basic GSM) is +3.3 dB. (Actual GSM WDmeasurements could vary due to differences in implementation or network protocol.)

MIF results for a given amplitude modulation characteristic should remain consistent at any signal level within the operating dynamic range of the test system. Caution should be used when measuring modulations that have large-magnitude MIF measurements as these place greater requirements on the test system dynamic range
Typical MIF levels are presented in Table D.1. The results shown may be considered representative for the specified protocols, but they are not intended to substitute for measurements of actual devices under test and their respective operating modes.

Transmission protocol	Modulation interference factor
GSM; full-rate version 2; speech codec/handset low	+3.63 dB
WCDMA; speech; speech codec low; AMR 12.2 kb/s	-27.23 dB
CDMA; speech; SO3; RC3; full frame rate: 8kEVRC	-19.75 dB
CDMA; speech; SO3; RC1;1/8thframe rate; 8kEVRC	+3.10 dB

Table D.1—Sample MIF values for sine-wave modulations

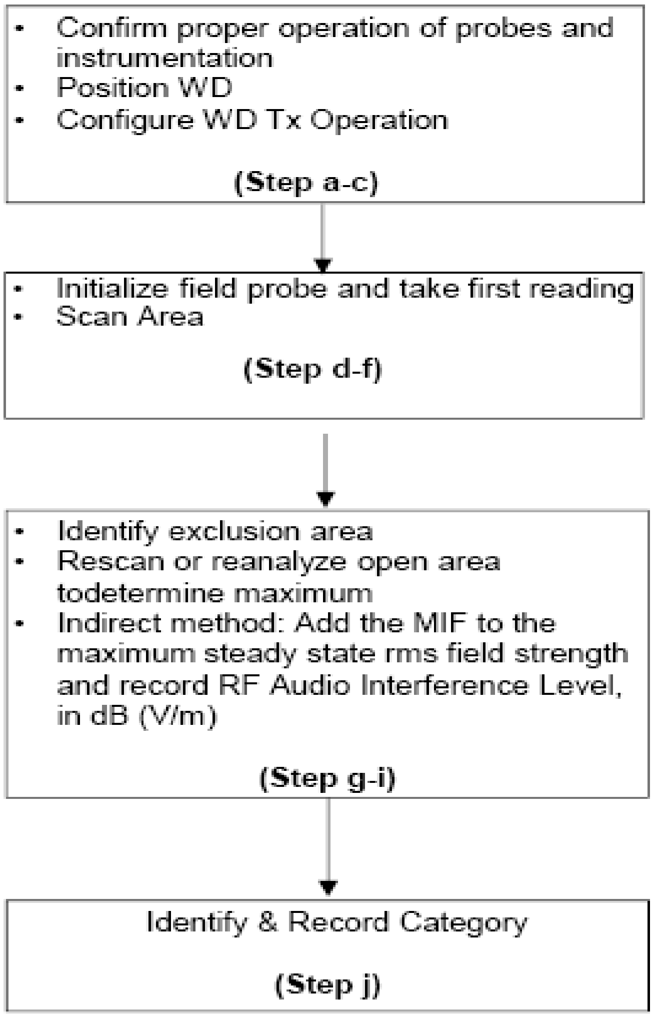
6. HAC TEST PROCEDURES

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

1. Proper operation of the field probe, probe measurement system, other instrumentation, and the positioning system was confirmed.
2. DUT is positioned in its intended test position, acoustic output point of the device perpendicular to the field probe.
3. The DUT 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.
4. The center sub-grid was centered over the center of the acoustic output (also audio band magnetic output, if applicable). The DUT audio output was positioned tangent (as physically possible) to the measurement plane.
5. A surface calibration was performed before each setup change to ensure repeatable spacing and proper maintenance of the measurement plane using the test Arch.
6. The measurement system measured the field strength at the reference location.
7. Measurements at 5 mm increments in the 5 x 5 cm region were performed and recorded. A 360° rotation about the azimuth axis at the maximum interpolated position was measured. For the worst-case condition, the peak reading from this rotation was used in re-evaluating the HAC category.
8. The system performed a drift evaluation by measuring the field at the reference location.
9. Steps 1 ~ 8 were done for both the E and H-Field measurements.

7. Test flowchart Per ANSI-PC63.19 2011

Test Instructions



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8. RF EMISSIONS

The ANSI Standard presents 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	> 960 MHz
Category M1	50 to 55 dB (V/m)	40 to 45 dB (V/m)
Category M2	45 to 50 dB (V/m)	35 to 40 dB (V/m)
Category M3	40 to 45 dB (V/m)	30 to 35 dB (V/m)
Category M4	<40 dB (V/m)	<30 dB (V/m)

9 HAC RF Emission Test Results

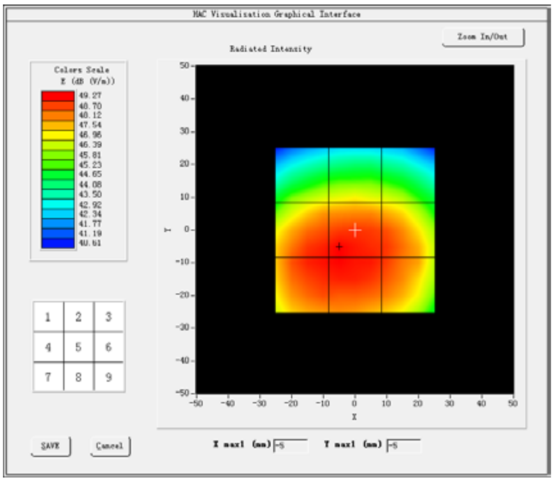
9.1 Test Result

Band	GSM 850			GSM 1900		
Channel	128	190	251	512	661	810
Frequency(MHz)	824.2	836.6	848.8	1850.2	1880.0	1909.8
RF Output power(dBm)	32.83	32.82	32.47	29.92	30.11	29.97
Result(dB V/m)	18.44	19.28	20.34	9.79	8.43	9.50
M-Rating	M4	M4	M4	M4	M4	M4

Band	WCDMA 850			WCDMA 1900		
Channel	4133	4175	4232	9263	9400	9537
Frequency(MHz)	826.6	8.35	846.4	1852.6	1880.0	1907.4
RF Output power(dBm)	22.66	22.72	22.58	22.76	22.59	22.39
Result(dB V/m)	8.53	9.88	9.31	2.07	1.83	2.09
M-Rating	M4	M4	M4	M4	M4	M4

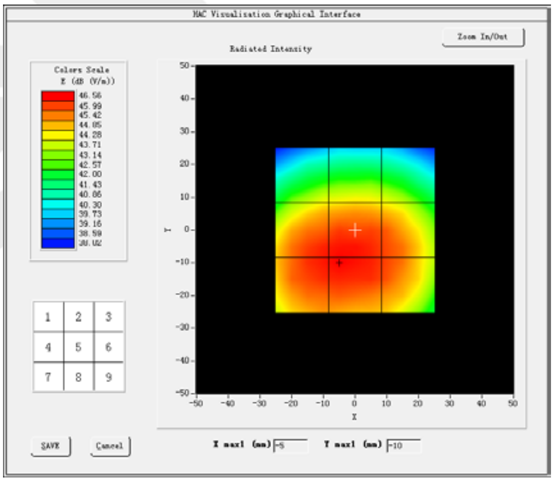
9.2 E-Field Emission for GSM:

Grid 1: 15.78	Grid 2: 16.09	Grid 3: 15.67
Grid 4: 18.34	**Grid 5: 18.44**	Grid 6: 17.93
Grid 7: 18.35	**Grid 8: 18.43**	Grid 9: 17.91



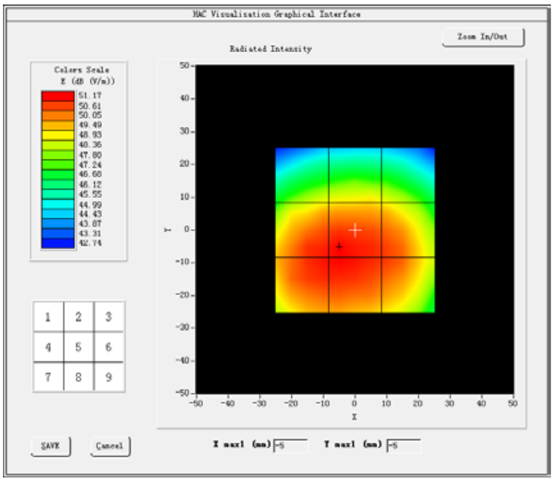
Operation mode	MIF(dB)	Channel	f(MHz)	Maximum value of total field (dB V/m)	M-Rating
GSM 850	3.63	128	824.2	18.44	M4

Grid 1: 16.72	Grid 2: 16.94	Grid 3: 16.57
Grid 4: 19.19	**Grid 5: 19.28**	Grid 6: 18.68
Grid 7: 19.22	**Grid 8: 19.33**	Grid 9: 18.71



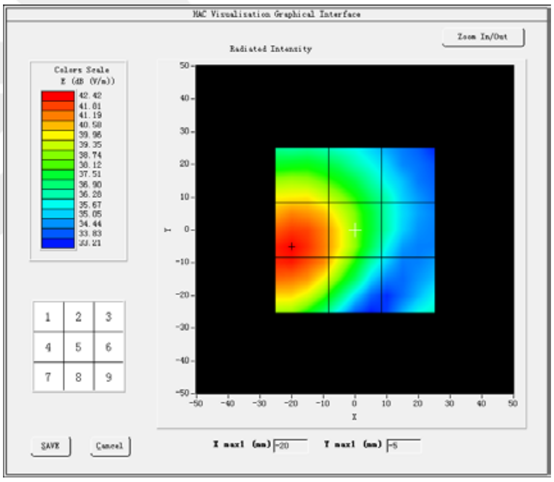
Operation mode	MIF(dB)	Channel	f(MHz)	Maximum value of total field (dB V/m)	M-Rating
GSM 850	3.63	189	836.4	19.28	M4

Grid 1: 17.74	Grid 2: 18.07	Grid 3: 17.63
Grid 4: 20.20	**Grid 5: 20.34**	Grid 6: 19.80
Grid 7: 20.22	**Grid 8: 20.33**	Grid 9: 19.81



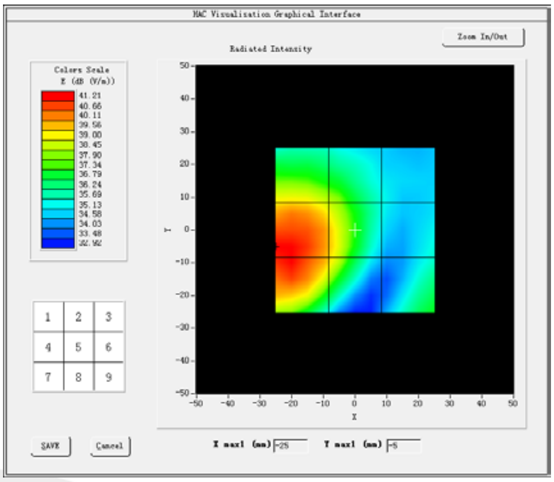
Operation mode	MIF(dB)	Channel	f(MHz)	Maximum value of total field (dB V/m)	M-Rating
GSM 850	3.63	250	848.6	20.34	M4

Grid 1: 9.25	Grid 2: 8.31	Grid 3: 5.31
Grid 4: 11.57	**Grid 5: 9.79**	Grid 6: 5.44
Grid 7: 11.51	**Grid 8: 9.56**	Grid 9: 5.14



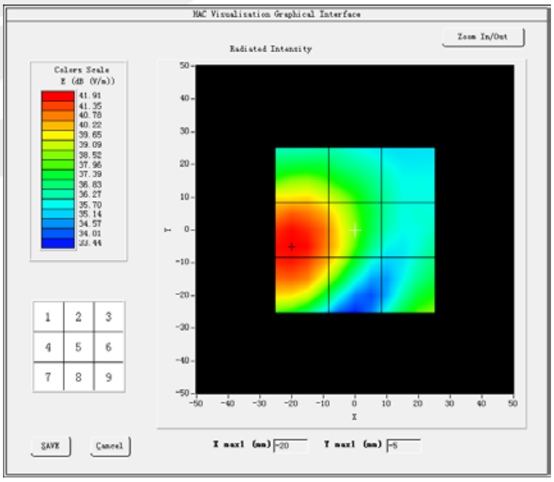
Operation mode	MIF(dB)	Channel	f(MHz)	Maximum value of total field (dB V/m)	M-Rating
GSM 1900	3.63	512	1850.4	9.79	M4

Grid 1: 8.03	Grid 2: 7.22	Grid 3: 4.13
Grid 4: 10.45	**Grid 5: 8.43**	Grid 6: 4.45
Grid 7: 10.43	**Grid 8: 8.26**	Grid 9: 6.16



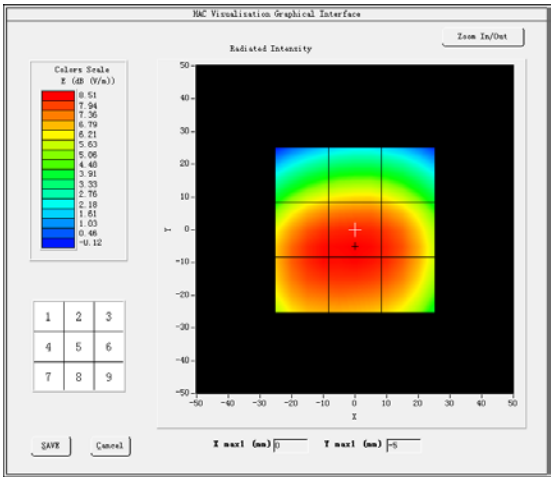
Operation mode	MIF(dB)	Channel	f(MHz)	Maximum value of total field (dB V/m)	M-Rating
GSM 1900	3.63	661	1880.0	8.43	M4

Grid 1: 9.02	Grid 2: 8.19	Grid 3: 5.43
Grid 4: 11.10	**Grid 5: 9.50**	Grid 6: 5.72
Grid 7: 10.97	**Grid 8: 9.19**	Grid 9: 7.67



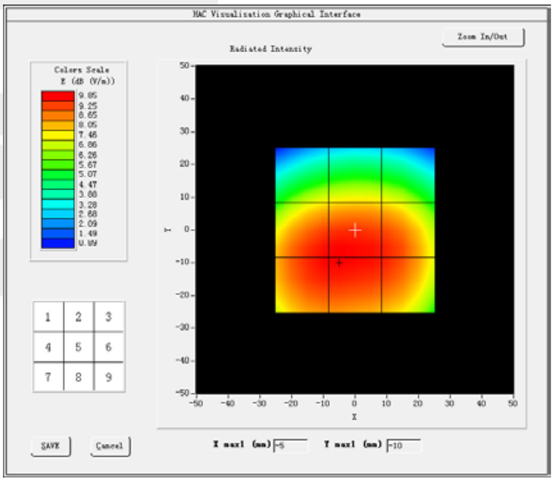
Operation mode	MIF(dB)	Channel	f(MHz)	Maximum value of total field (dB V/m)	M-Rating
GSM 1900	3.63	810	1909.8	9.50	M4

Grid 1: 6.20	Grid 2: 6.47	Grid 3: 6.20
Grid 4: 8.47	**Grid 5: 8.53**	Grid 6: 8.22
Grid 7: 8.47	**Grid 8: 8.52**	Grid 9: 8.21



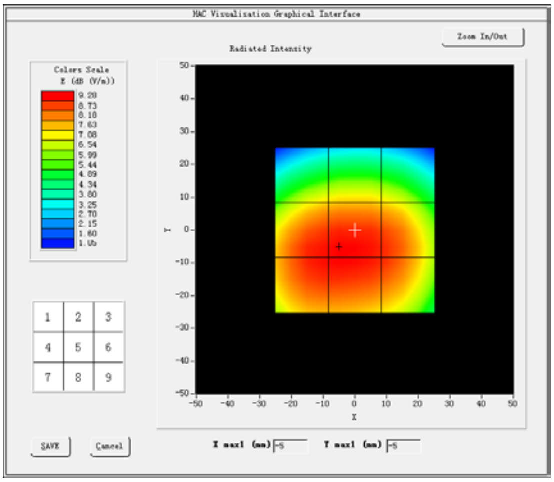
Operation mode	MIF(dB)	Channel	f(MHz)	Maximum value of total field (dB V/m)	M-Rating
WCDMA 850	-27.23	4133	826.6	8.53	M4

Grid 1: 7.17	Grid 2: 7.38	Grid 3: 7.13
Grid 4: 9.84	**Grid 5: 9.88**	Grid 6: 9.54
Grid 7: 9.85	**Grid 8: 9.88**	Grid 9: 9.54



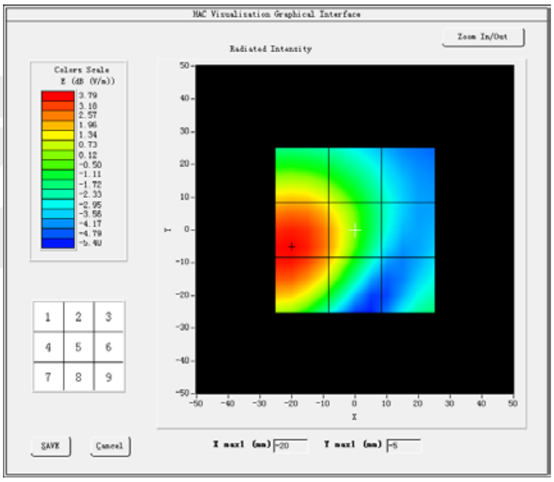
Operation mode	MIF(dB)	Channel	f(MHz)	Maximum value of total field (dB V/m)	M-Rating
WCDMA 850	-27.23	4175	835.0	9.88	M4

Grid 1: 7.04	Grid 2: 7.22	Grid 3: 6.89
Grid 4: 9.23	**Grid 5: 9.31**	Grid 6: 8.89
Grid 7: 9.23	**Grid 8: 9.30**	Grid 9: 8.88



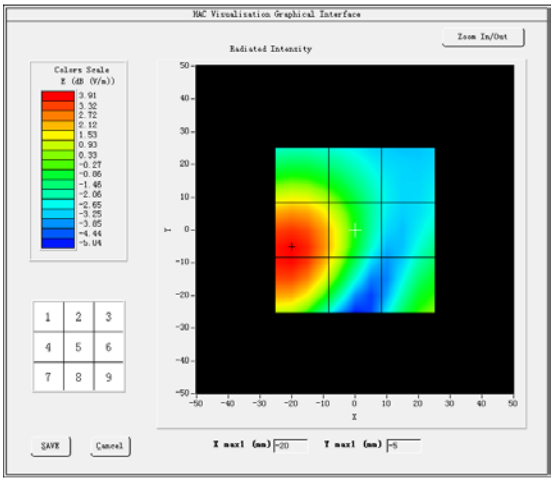
Operation mode	MIF(dB)	Channel	f(MHz)	Maximum value of total field (dB V/m)	M-Rating
WCDMA 850	-27.23	4232	846.4	9.31	M4

Grid 1: 1.74	Grid 2: 0.71	Grid 3: -2.78
Grid 4: 3.81	**Grid 5: 2.07**	Grid 6: -2.69
Grid 7: 3.76	Grid 8: 1.73	Grid 9: -1.76



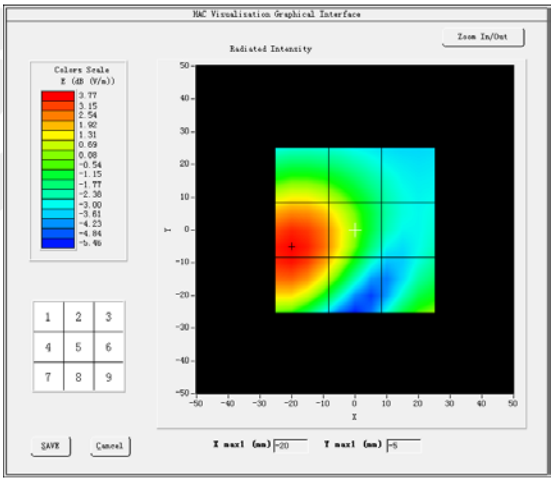
Operation mode	MIF(dB)	Channel	f(MHz)	Maximum value of total field (dB V/m)	M-Rating
WCDMA 1900	-27.23	9263	1852.6	2.07	M4

Grid 1: 1.36	Grid 2: 0.25	Grid 3: -2.82
Grid 4: 3.94	**Grid 5: 1.83**	Grid 6: -1.57
Grid 7: 3.93	**Grid 8: 1.57**	Grid 9: 0.36



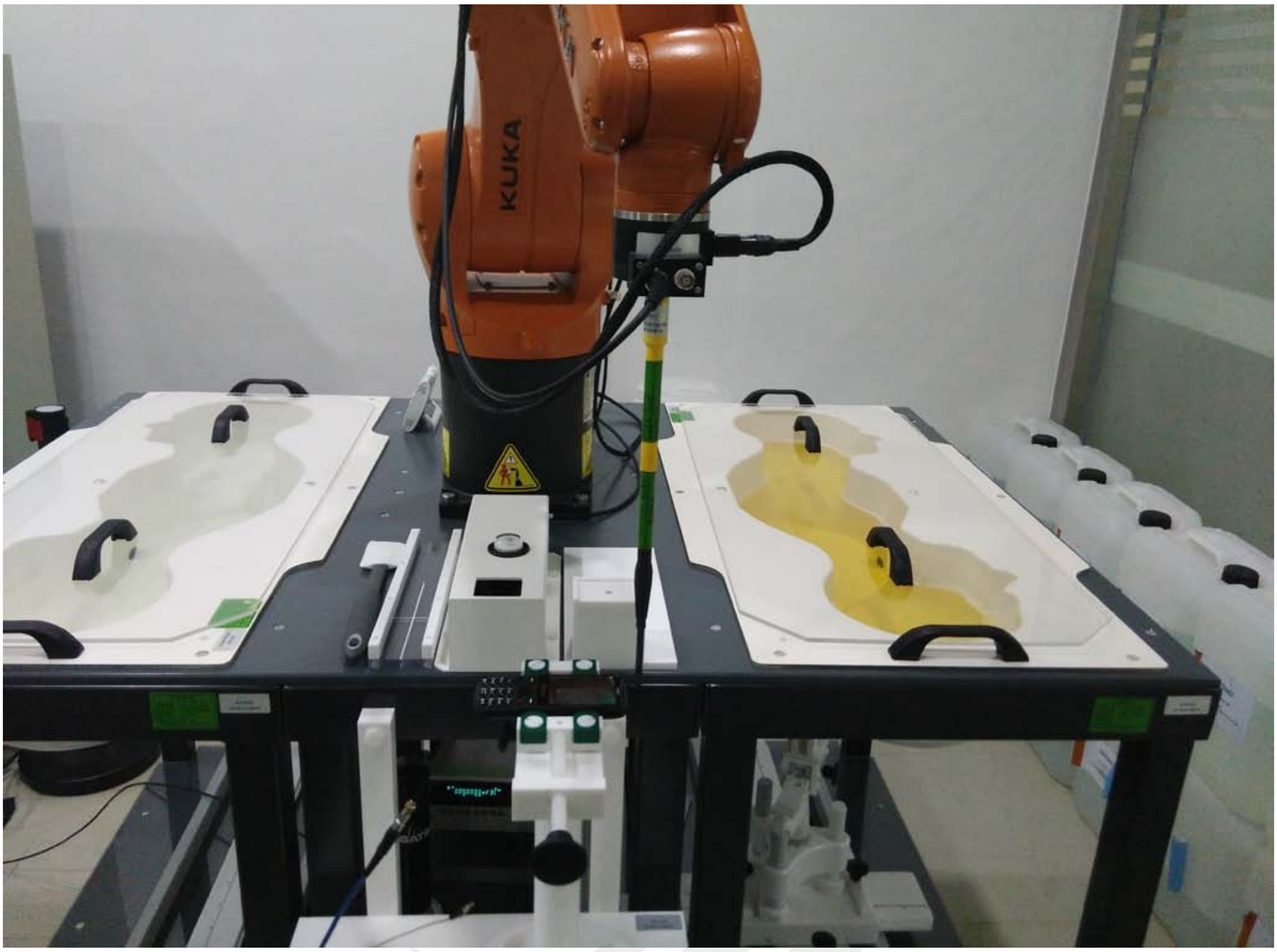
Operation mode	MIF(dB)	Channel	f(MHz)	Maximum value of total field (dB V/m)	M-Rating
WCDMA 1900	-27.23	9400	1880.0	1.83	M4

Grid 1: 1.30	Grid 2: 0.47	Grid 3: -2.45
Grid 4: 3.78	**Grid 5: 2.09**	Grid 6: -2.35
Grid 7: 3.73	**Grid 8: 1.74**	Grid 9: 0.14



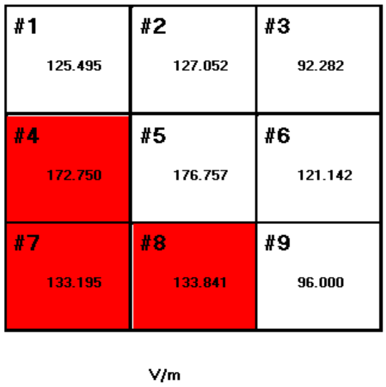
Operation mode	MIF(dB)	Channel	f(MHz)	Maximum value of total field (dB V/m)	M-Rating
WCDMA 1900	-27.23	9537	1907.4	2.09	M4

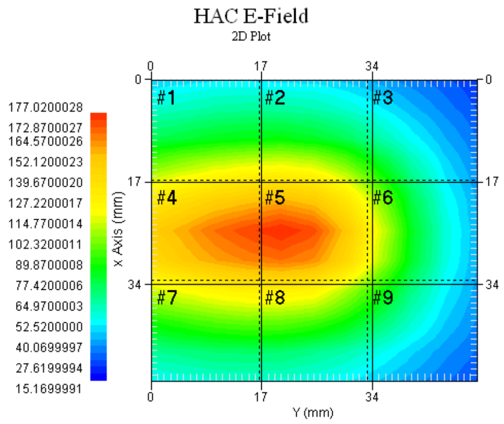
10. HAC Test Photographs



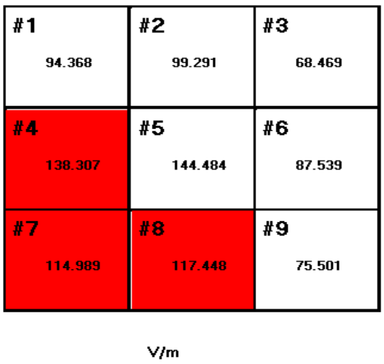
E-field

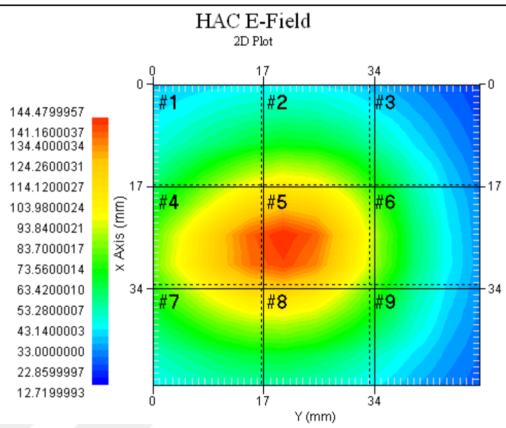
11. System VALIDATION RESULTS





Frequency(MHz)	Input power (dBm)	Target Value (dB V/m)	E-Field (dB V/m)	Deviation(%)	data
835	20	220.4	218.15	-0.01	Apr.20.2015





Frequency(MHz)	Input power (dBm)	Target Value (dB V/m)	E-Field (dB V/m)	Deviation(%)	data
1880	20	153.4	156.32	0.02	Apr.20.2015

12. Probe Calibration And Dipole Calibration Report

The following pages include the probe calibration used to evaluate HAC for the DUT.

SATIMO
The microwave vision company

COMOHAC E-Field Probe Calibration Report

Ref : ACR.262.14.14.SATU.A

SHENZHEN STS TEST SERVICES CO., LTD.
1/F, BUILDING 2, ZHUOKE SCIENCE PARK, CHONGQING ROAD
FUYONG, BAO' AN DISTRICT, SHENZHEN,CHINA
SATIMO COMOHAC E-FIELD PROBE
SERIAL NO.: SN 06/14 EPH42

Calibrated at SATIMO US
2105 Barrett Park Dr. - Kennesaw, GA 30144

09/01/2014

Summary:

This document presents the method and results from an accredited COMOHAC E-Field Probe calibration performed in SATIMO USA using the CALIBAIR test bench, for use with a SATIMO COMOHAC system only. All calibration results are traceable to national metrology institutions.

	Name	*Function*	*Date*	*Signature*
Prepared by :	Jérôme LUC	Product Manager	9/19/2014	
Checked by :	Jérôme LUC	Product Manager	9/19/2014	
Approved by :	Kim RUTKOWSKI	Quality Manager	9/19/2014	

	Customer Name
Distribution :	Shenzhen STS Test Services Co., Ltd.

Issue	*Date*	*Modifications*
A	9/19/2014	Initial release

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1/F., Building B, Zhuoke Science Park, No.190,Chongqing Road, Fuyong Street, Bao'an District, Shenzhen, Guangdong,China
Tel: 0755-36886288 Fax: 0755-36886277 Http://www.stsapp.com E-mail: sts@stsapp.com

1 DEVICE UNDER TEST

Device Under Test	
Device Type	COMOHAC E FIELD PROBE
Manufacturer	Satimo
Model	SCE
Serial Number	SN 06/14 EPH42
Product Condition (new / used)	new
Frequency Range of Probe	0.7GHz-2.5GHz
Resistance of Three Dipoles at Connector	Dipole 1: R1=0.214 MΩ Dipole 2: R2=0.213 MΩ Dipole 3: R3=0.204 MΩ

A yearly calibration interval is recommended.

2 PRODUCT DESCRIPTION

2.1 GENERAL INFORMATION

Satimo's COMOHAC E field Probes are built in accordance to the ANSI C63.19 and IEEE 1309 standards.

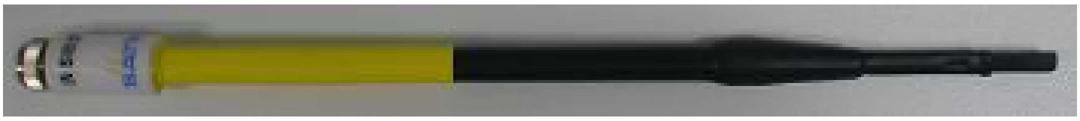


Figure 1 – *Satimo COMOHAC E field Probe*

Probe Length	330 mm
Length of Individual Dipoles	3.3 mm
Maximum external diameter	8 mm
Probe Tip External Diameter	5 mm
Distance between dipoles / probe extremity	3 mm

3 MEASUREMENT METHOD

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

3.1 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 1000A/m).

3.2 SENSITIVITY

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

3.3 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.

3.4 PROBE MODULATION RESPONSE

The modulation factor was determined by illuminating the probe with a reference wave from a standard dipole 10 mm away, applying first a CW signal and then a modulated signal (both at same power level). The modulation factor is the ratio, in linear units, of the CW to modulated signal reading.

4 MEASUREMENT UNCERTAINTY

The guidelines outlined in the IEEE 1528 and IEC/CEI 62209 standards were followed to generate the measurement uncertainty associated with an E-field probe calibration using the waveguide technique. All uncertainties listed below represent an expanded uncertainty expressed at approximately the 95% confidence level using a coverage factor of k=2, traceable to the Internationally Accepted Guides to Measurement Uncertainty.

Uncertainty analysis of the probe calibration in waveguide					
ERROR SOURCES	Uncertainty value (%)	Probability Distribution	Divisor	ci	Standard Uncertainty (%)
Incident or forward power	3.00%	Rectangular	$\sqrt{3}$	1	1.732%
Reflected power	3.00%	Rectangular	$\sqrt{3}$	1	1.732%
Field homogeneity	3.00%	Rectangular	$\sqrt{3}$	1	1.732%
Field probe positioning	5.00%	Rectangular	$\sqrt{3}$	1	2.887%
Field probe linearity	3.00%	Rectangular	$\sqrt{3}$	1	1.732%
Combined standard uncertainty					4.509%
Expanded uncertainty 95 % confidence level k = 2					9.0%

5 CALIBRATION MEASUREMENT RESULTS

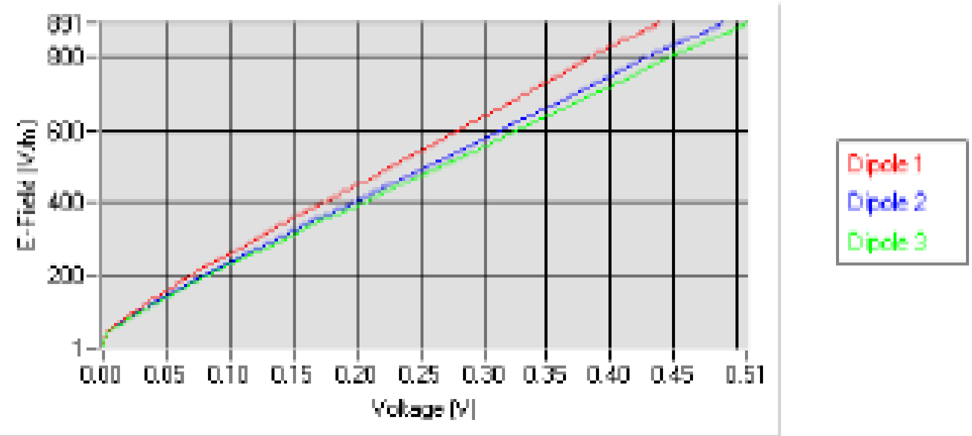
Calibration Parameters	
Lab Temperature	21 °C
Lab Humidity	45 %

5.1 SENSITIVITY IN AIR

Normx dipole 1 ($\mu V/(V/m)^2$)	Normy dipole 2 ($\mu V/(V/m)^2$)	Normz dipole 3 ($\mu V/(V/m)^2$)
3.06	3.86	4.00

DCP dipole 1 (mV)	DCP dipole 2 (mV)	DCP dipole 3 (mV)
96	92	96

Calibration curves



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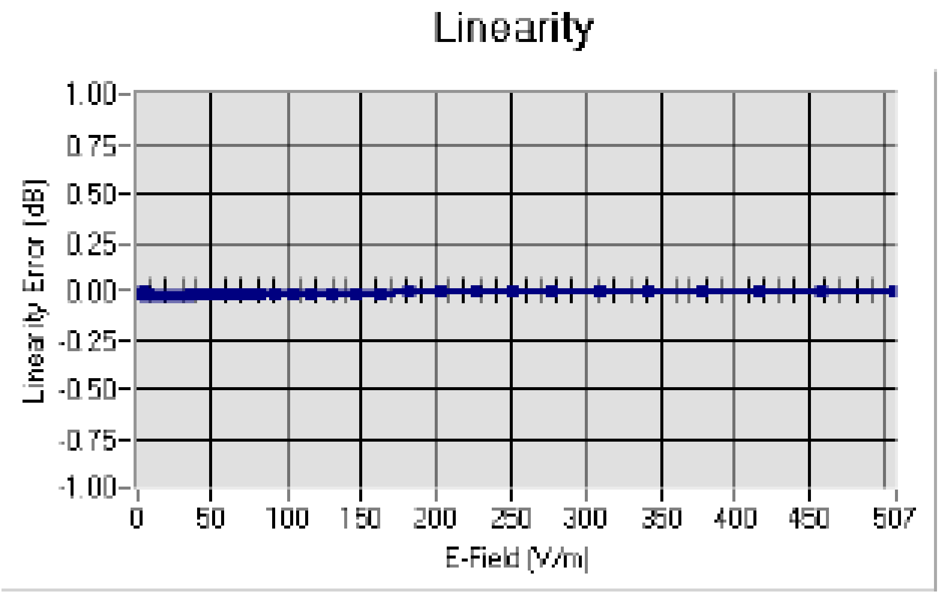
1/F., Building B, Zhuoke Science Park, No.190,Chongqing Road, Fuyong Street, Bao'an District, Shenzhen, Guangdong,China

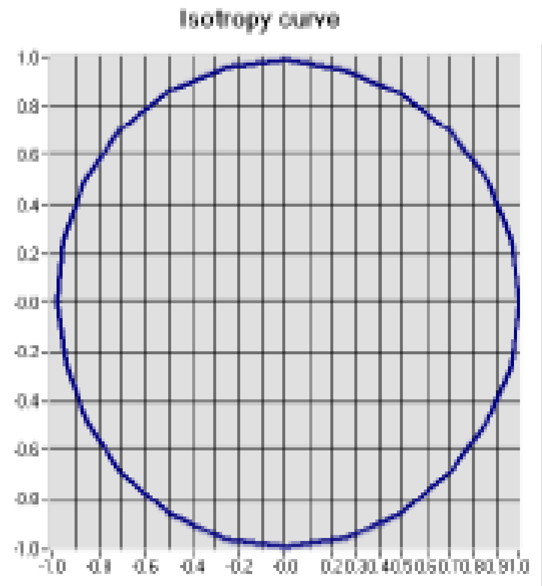
Tel: 0755-36886288 Fax: 0755-36886277 Http://www.stsapp.com E-mail: sts@stsapp.com

5.2 LINEARITY



Linearity:0+/-0.68% (+/-0.03dB)

5.3 ISOTROPY



Isotropy:0+/-1.32% (+/-0.06dB)

6 LIST OF EQUIPMENT

Equipment Summary Sheet				
Equipment Description	**Manufacturer / Model**	**Identification No.**	**Current Calibration Date**	**Next Calibration Date**
HAC positioning ruler	Satimo	TABH12 SN 42/09	Validated. No cal required.	Validated. No cal required.
COMOHAC Test Bench	Version 2	NA	Validated. No cal required.	Validated. No cal required.
Network Analyzer	Rhode & Schwarz ZVA	SN100132	02/2013	02/2016
Reference Probe	Satimo	EPH28 SN 08/11	10/2013	10/2014
Reference Probe	Satimo	HPH38 SN31/10	10/2013	10/2014
Multimeter	Keithley 2000	1188656	12/2013	12/2016
Signal Generator	Agilent E4438C	MY49070581	12/2013	12/2016
Amplifier	Aethercomm	SN 046	Characterized prior to test. No cal required.	Characterized prior to test. No cal required.
Power Meter	HP E4418A	US38261498	12/2013	12/2016
Power Sensor	HP ECP-E26A	US37181460	12/2013	12/2016
Directional Coupler	Narda 4216-20	01386	Characterized prior to test. No cal required.	Characterized prior to test. No cal required.
Waveguide	Mega Industries	069Y7-158-13-712	Validated. No cal required.	Validated. No cal required.
Waveguide Transition	Mega Industries	069Y7-158-13-701	Validated. No cal required.	Validated. No cal required.
Waveguide Termination	Mega Industries	069Y7-158-13-701	Validated. No cal required.	Validated. No cal required.
Temperature / Humidity Sensor	Control Company	11-661-9	8/2012	8/2015

COMOHAC H-Field Probe Calibration

Ref : ACR.262.15.14.SATU.A

SHENZHEN STS TEST SERVICES CO., LTD.
1/F, BUILDING 2, ZHUOKE SCIENCE PARK, CHONGQING ROAD
FUYONG, BAO' AN DISTRICT, SHENZHEN,CHINA
SATIMO COMOHAC H-FIELD PROBE
SERIAL NO.: SN 06/14 HPH51

Calibrated at SATIMO US
2105 Barrett Park Dr. - Kennesaw, GA 30144

09/01/2014

Summary:

This document presents the method and results from an accredited COMOHAC H-Field Probe calibration performed in SATIMO USA using the CALIBAIR test bench, for use with a SATIMO COMOHAC system only. All calibration results are traceable to national metrology institutions.

	Name	*Function*	*Date*	*Signature*
Prepared by :	Jérôme LUC	Product Manager	9/19/2014	
Checked by :	Jérôme LUC	Product Manager	9/19/2014	
Approved by :	Kim RUTKOWSKI	Quality Manager	9/19/2014	

	Customer Name
Distribution :	Shenzhen STS Test Services Co., Ltd.

Issue	*Date*	*Modifications*
A	9/19/2014	Initial release

1/F., Building B, Zhuoke Science Park, No.190,Chongqing Road, Fuyong Street, Bao'an District, Shenzhen, Guangdong,China
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1/F., Building B, Zhuoke Science Park, No.190,Chongqing Road, Fuyong Street, Bao'an District, Shenzhen, Guangdong,China
Tel: 0755-36886288 Fax: 0755-36886277 Http://www.stsapp.com E-mail: sts@stsapp.com

1 INTRODUCTION

This document contains a summary of the requirements set forth by the ANSI C63.19 standard for reference dipoles used for HAC measurement system validations and the measurements that were performed to verify that the product complies with the fore mentioned standards.

2 DEVICE UNDER TEST

Device Under Test	
Device Type	COMOHAC 800-950 MHz REFERENCE DIPOLE
Manufacturer	Satimo
Model	SIDB835
Serial Number	SN 13/14 DHA55
Product Condition (new / used)	New

A yearly calibration interval is recommended.

3 PRODUCT DESCRIPTION

3.1 GENERAL INFORMATION

Satimo's COMOHAC Validation Dipoles are built in accordance to the ANSI C63.19 standard. The product is designed for use with the COMOHAC system only.

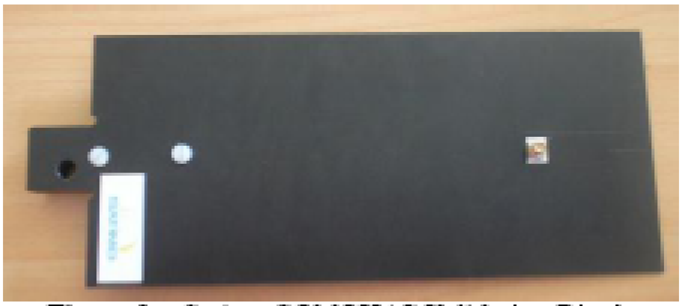

Figure 1 – *Satimo COMOHAC Validation Dipole*

4 MEASUREMENT METHOD

The ANSI C63.19 standard outlines the requirements for reference dipoles to be used for system validation measurements. The following measurements were performed to verify that the product complies with the fore mentioned standard.

1 INTRODUCTION

This document contains a summary of the requirements set forth by the ANSI C63.19 standard for reference dipoles used for HAC measurement system validations and the measurements that were performed to verify that the product complies with the fore mentioned standards.

2 DEVICE UNDER TEST

Device Under Test	
Device Type	COMOHAC 800-950 MHz REFERENCE DIPOLE
Manufacturer	Satimo
Model	SIDB835
Serial Number	SN 13/14 DHA55
Product Condition (new / used)	New

A yearly calibration interval is recommended.

3 PRODUCT DESCRIPTION

3.1 GENERAL INFORMATION

Satimo's COMOHAC Validation Dipoles are built in accordance to the ANSI C63.19 standard. The product is designed for use with the COMOHAC system only.

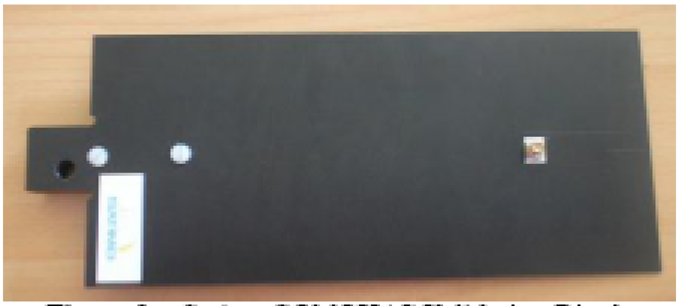

Figure 1 – *Satimo COMOHAC Validation Dipole*

4 MEASUREMENT METHOD

The ANSI C63.19 standard outlines the requirements for reference dipoles to be used for system validation measurements. The following measurements were performed to verify that the product complies with the fore mentioned standard.

4.1 RETURN LOSS REQUIREMENTS

The dipole used for HAC system validation measurements and checks must have a return loss of -10 dB or better. The return loss measurement shall be performed in free space.

4.2 REFERENCE DIPOLE CALIBRATION

The IEEE ANSI C63-19 standard states that the dipole used for validation measurements and checks must be scanned with the E and H field probe, with the dipole 10 mm below the probe. The E and H field strength plots are compared to the simulation results obtained by SATIMO.

5 MEASUREMENT UNCERTAINTY

All uncertainties listed below represent an expanded uncertainty expressed at approximately the 95% confidence level using a coverage factor of k=2, traceable to the Internationally Accepted Guides to Measurement Uncertainty.

5.1 RETURN LOSS

The following uncertainties apply to the return loss measurement:

Frequency band	Expanded Uncertainty on Gain
400-6000MHz	0.1 dB

5.2 VALIDATION MEASUREMENT

The guideline outlined in the IEEE ANSI C63.19 standard was followed to generate the measurement uncertainty for validation measurements.

Uncertainty analysis of the probe calibration in waveguide					
ERROR SOURCES	Uncertainty value (%)	Probability Distribution	Divisor	Uncertainty (dB)	Standard Uncertainty (%)
RF reflections	0.1	R	$\sqrt{3}$	0.06	
Field probe conv. Factor	0.4	R	$\sqrt{3}$	0.23	
Field probe anisotropy	0.25	R	$\sqrt{3}$	0.14	
Positioning accuracy	0.2	R	$\sqrt{3}$	0.12	
Probe cable placement	0.1	R	$\sqrt{3}$	0.06	
System repeatability	0.2	R	$\sqrt{3}$	0.12	
EUT repeatability	0.4	N	1	0.40	
Combined standard uncertainty				0.52	
Expanded uncertainty 95 % confidence level k = 2				1.00	13.0

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1/F., Building B, Zhuoke Science Park, No.190,Chongqing Road, Fuyong Street, Bao'an District, Shenzhen, Guangdong,China
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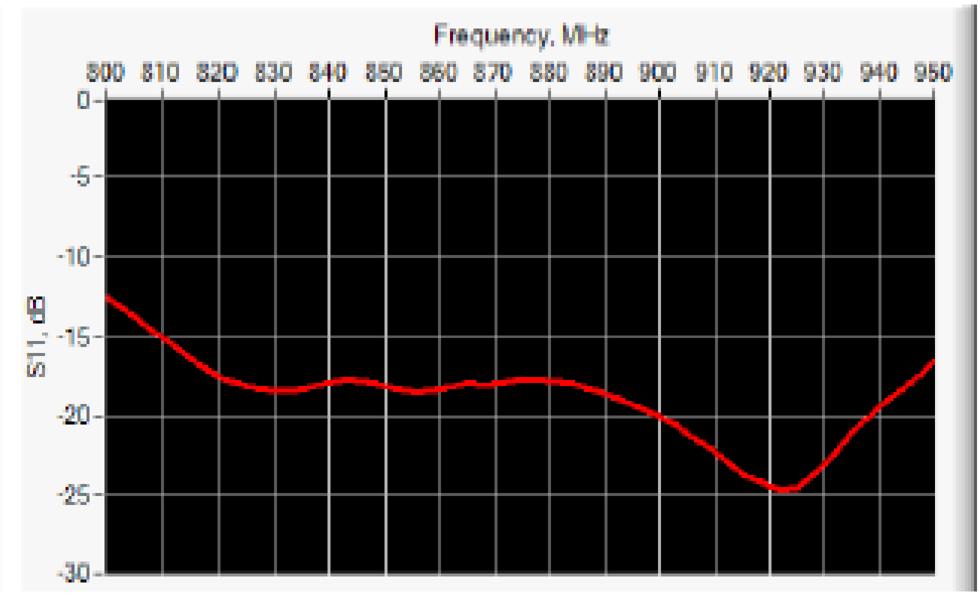
6 CALIBRATION MEASUREMENT RESULTS

6.1 RETURN LOSS



Frequency (MHz)	Worst Case Return Loss (dB)	Requirement (dB)
800-950 MHz	-12.94	-10

6.2 VALIDATION MEASUREMENT

The IEEE ANSI C63.19 standard states that the system validation measurements must be performed using a reference dipole meeting the fore mentioned return loss requirements. The system validations measurement results are then compared to SATIMO's simulated results.

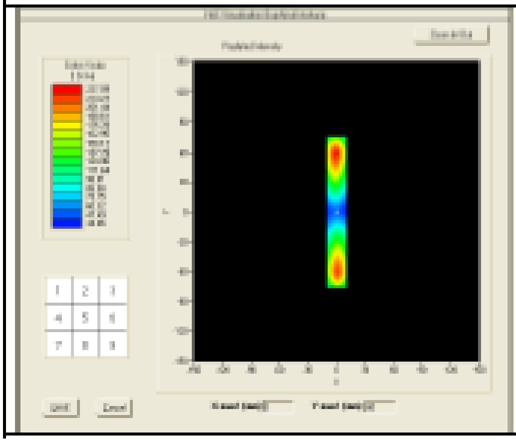
Measurement Condition

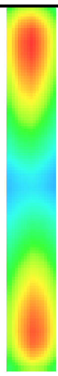
Software Version	OpenHAC V2
HAC positioning ruler	SN 42/09 TABH12
E-Field probe	SN 08/11 EPH28
H-Field probe	SN 31/10 HPH38
Distance between dipole and sensor center	10 mm
E-field scan size	X=150mm/Y=20mm
H-field scan size	X=40mm/Y=20mm
Scan resolution	dx=5mm/dy=5mm
Frequency	835 MHz
Input power	20 dBm
Lab Temperature	21°C
Lab Humidity	45%

Measurement Result

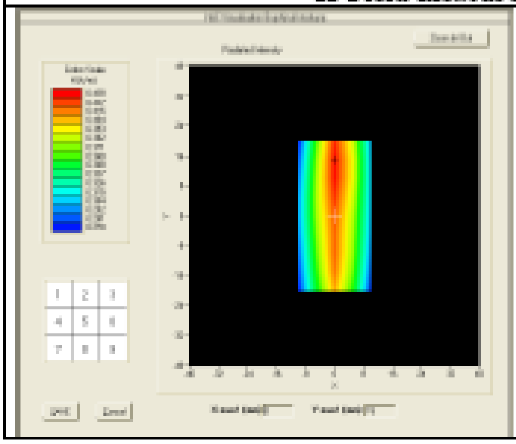
	Measured	Internal Requirement
E field (V/m)	227.09	220.4
H field (A/m)	0.44	0.445

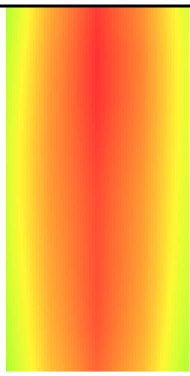
E-Field measurement





H-Field measurement





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Tel: 0755-36886288 Fax: 0755-36886277 Http://www.stsapp.com E-mail: sts@stsapp.com

7 LIST OF EQUIPMENT

Equipment Summary Sheet				
Equipment Description	**Manufacturer / Model**	**Identification No.**	**Current Calibration Date**	**Next Calibration Date**
HAC positioning ruler	Satimo	TABH12 SN 42/09	Validated. No cal required.	Validated. No cal required.
COMOHAC Test Bench	Version 2	NA	Validated. No cal required.	Validated. No cal required.
Network Analyzer	Rhode & Schwarz ZVA	SN100132	02/2013	02/2016
Reference Probe	Satimo	EPH28 SN 08/11	10/2013	10/2014
Reference Probe	Satimo	HPH38 SN31/10	10/2013	10/2014
Multimeter	Keithley 2000	1188656	12/2013	12/2016
Signal Generator	Agilent E4438C	MY49070581	12/2013	12/2016
Amplifier	Aethercomm	SN 046	Characterized prior to test. No cal required.	Characterized prior to test. No cal required.
Power Meter	HP E4418A	US38261498	12/2013	12/2016
Power Sensor	HP ECP-E26A	US37181460	12/2013	12/2016
Directional Coupler	Narda 4216-20	01386	Characterized prior to test. No cal required.	Characterized prior to test. No cal required.
Temperature and Humidity Sensor	Control Company	11-661-9	8/2012	8/2015

HAC Reference Dipole Calibration Report

Ref : ACR.262.18.14.SATU.A

SHENZHEN STS TEST SERVICES CO., LTD.
1/F, BUILDING 2, ZHUOKE SCIENCE PARK, CHONGQING ROAD
FUYONG, BAO' AN DISTRICT, SHENZHEN,CHINA
SATIMO COMOHAC REFERENCE DIPOLE
FREQUENCY: 1700-2000MHZ
SERIAL NO.: SN 13/14 DHB59

Calibrated at SATIMO US
2105 Barrett Park Dr. - Kennesaw, GA 30144

09/01/2014

Summary:

This document presents the method and results from an accredited HAC reference dipole calibration performed in SATIMO USA using the COMOHAC test bench. All calibration results are traceable to national metrology institutions.

	Name	*Function*	*Date*	*Signature*
Prepared by :	Jérôme LUC	Product Manager	9/19/2014	
Checked by :	Jérôme LUC	Product Manager	9/19/2014	
Approved by :	Kim RUTKOWSKI	Quality Manager	9/19/2014	

	Customer Name
Distribution :	Shenzhen STS Test Services Co., Ltd.

Issue	*Date*	*Modifications*
A	9/19/2014	Initial release

TABLE OF CONTENTS

1 INTRODUCTION

This document contains a summary of the requirements set forth by the ANSI C63.19 standard for reference dipoles used for HAC measurement system validations and the measurements that were performed to verify that the product complies with the fore mentioned standards.

2 DEVICE UNDER TEST

Device Under Test	
Device Type	COMOHAC 1700-2000 MHz REFERENCE DIPOLE
Manufacturer	Satimo
Model	SIDB1900
Serial Number	SN 13/14 DHB59
Product Condition (new / used)	New

A yearly calibration interval is recommended.

3 PRODUCT DESCRIPTION

3.1 GENERAL INFORMATION

Satimo's COMOHAC Validation Dipoles are built in accordance to the ANSI C63.19 standard. The product is designed for use with the COMOHAC system only.

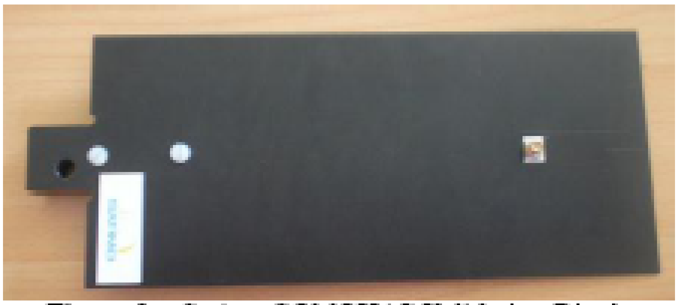

Figure 1 – *Satimo COMOHAC Validation Dipole*

4 MEASUREMENT METHOD

The ANSI C63.19 standard outlines the requirements for reference dipoles to be used for system validation measurements. The following measurements were performed to verify that the product complies with the fore mentioned standard.

4.1 RETURN LOSS REQUIREMENTS

The dipole used for HAC system validation measurements and checks must have a return loss of -10 dB or better. The return loss measurement shall be performed in free space.

4.2 REFERENCE DIPOLE CALIBRATION

The IEEE ANSI C63-19 standard states that the dipole used for validation measurements and checks must be scanned with the E and H field probe, with the dipole 10 mm below the probe. The E and H field strength plots are compared to the simulation results obtained by SATIMO.

5 MEASUREMENT UNCERTAINTY

All uncertainties listed below represent an expanded uncertainty expressed at approximately the 95% confidence level using a coverage factor of k=2, traceable to the Internationally Accepted Guides to Measurement Uncertainty.

5.1 RETURN LOSS

The following uncertainties apply to the return loss measurement:

Frequency band	Expanded Uncertainty on Gain
400-6000MHz	0.1 dB

5.2 VALIDATION MEASUREMENT

The guideline outlined in the IEEE ANSI C63.19 standard was followed to generate the measurement uncertainty for validation measurements.

Uncertainty analysis of the probe calibration in waveguide					
ERROR SOURCES	Uncertainty value (%)	Probability Distribution	Divisor	Uncertainty (dB)	Standard Uncertainty (%)
RF reflections	0.1	R	$\sqrt{3}$	0.06	
Field probe conv. Factor	0.4	R	$\sqrt{3}$	0.23	
Field probe anisotropy	0.25	R	$\sqrt{3}$	0.14	
Positioning accuracy	0.2	R	$\sqrt{3}$	0.12	
Probe cable placement	0.1	R	$\sqrt{3}$	0.06	
System repeatability	0.2	R	$\sqrt{3}$	0.12	
EUT repeatability	0.4	N	1	0.40	
Combined standard uncertainty				0.52	
Expanded uncertainty 95 % confidence level k = 2				1.00	13.0

Shenzhen STS Test Services Co., Ltd.
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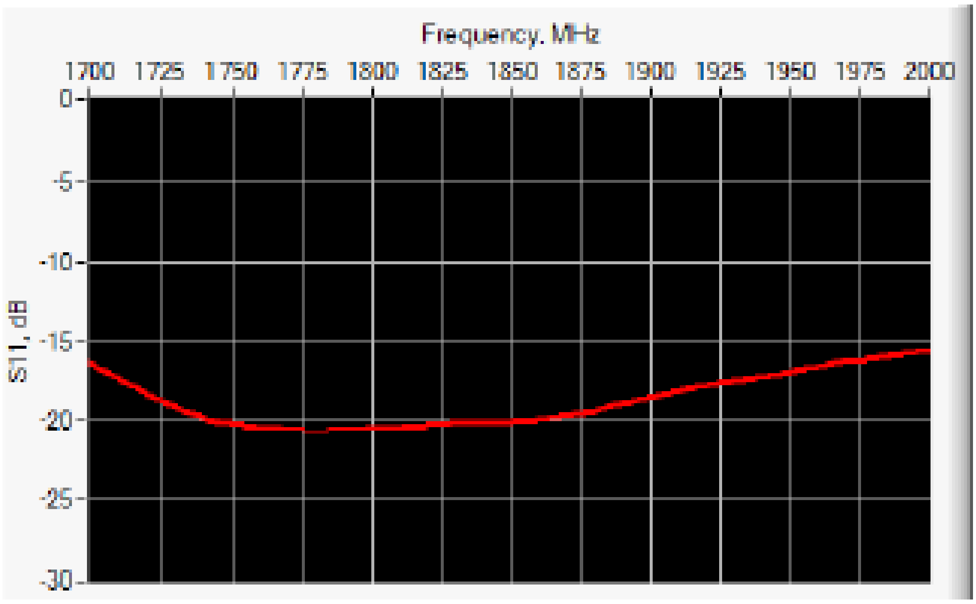
6 CALIBRATION MEASUREMENT RESULTS

6.1 RETURN LOSS



Frequency (MHz)	Worst Case Return Loss (dB)	Requirement (dB)
1700-2000 MHz	-15.74	-10

6.2 VALIDATION MEASUREMENT

The IEEE ANSI C63.19 standard states that the system validation measurements must be performed using a reference dipole meeting the fore mentioned return loss requirements. The system validations measurement results are then compared to SATIMO's simulated results.

Measurement Condition

Software Version	OpenHAC V2
HAC positioning ruler	SN 42/09 TABH12
E-Field probe	SN 08/11 EPH28
H-Field probe	SN 31/10 HPH38
Distance between dipole and sensor center	10 mm
E-field scan size	X=150mm/Y=20mm
H-field scan size	X=40mm/Y=20mm
Scan resolution	dx=5mm/dy=5mm
Frequency	1900 MHz
Input power	20 dBm
Lab Temperature	21°C
Lab Humidity	45%

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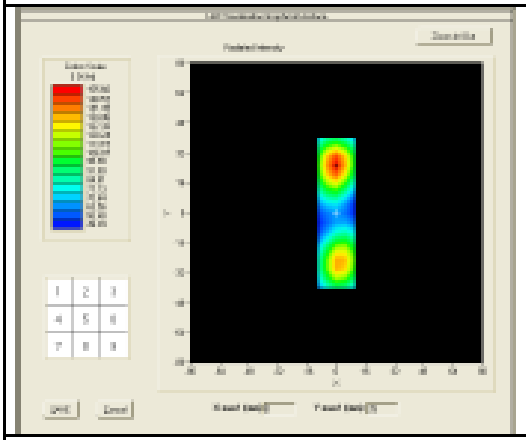
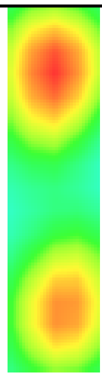
Measurement Result

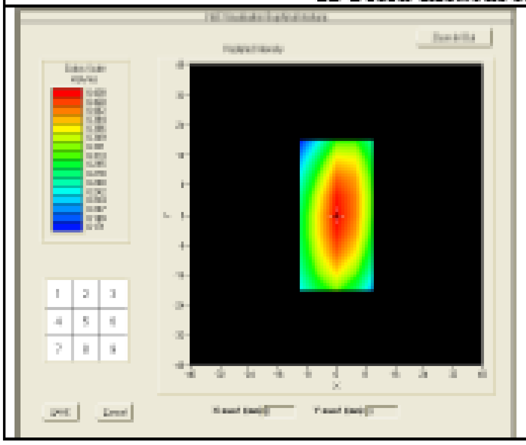
	Measured	Internal Requirement
E field (V/m)	155.66	153.4
H field (A/m)	0.44	0.445

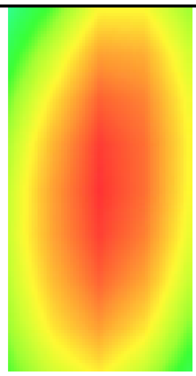
E-Field measurement





H-Field measurement





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7 LIST OF EQUIPMENT

Equipment Summary Sheet				
Equipment Description	**Manufacturer / Model**	**Identification No.**	**Current Calibration Date**	**Next Calibration Date**
HAC positioning ruler	Satimo	TABH12 SN 42/09	Validated. No cal required.	Validated. No cal required.
COMOHAC Test Bench	Version 2	NA	Validated. No cal required.	Validated. No cal required.
Network Analyzer	Rhode & Schwarz ZVA	SN100132	02/2013	02/2016
Reference Probe	Satimo	EPH28 SN 08/11	10/2013	10/2014
Reference Probe	Satimo	HPH38 SN31/10	10/2013	10/2014
Multimeter	Keithley 2000	1188656	12/2013	12/2016
Signal Generator	Agilent E4438C	MY49070581	12/2013	12/2016
Amplifier	Aethercomm	SN 046	Characterized prior to test. No cal required.	Characterized prior to test. No cal required.
Power Meter	HP E4418A	US38261498	12/2013	12/2016
Power Sensor	HP ECP-E26A	US37181460	12/2013	12/2016
Directional Coupler	Narda 4216-20	01386	Characterized prior to test. No cal required.	Characterized prior to test. No cal required.
Temperature and Humidity Sensor	Control Company	11-661-9	8/2012	8/2015

COMOHAC TMFS Calibration Report

Ref : ACR.262.19.14.SATU.A

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1/F, BUILDING 2, ZHUOKE SCIENCE PARK, CHONGQING ROAD
FUYONG, BAO' AN DISTRICT, SHENZHEN,CHINA
SATIMO COMOHAC MAGNETIC FIELD SIMULATOR
SERIAL NO.: SN 07/14 TMFS24

Calibrated at SATIMO US
2105 Barrett Park Dr. - Kennesaw, GA 30144

09/01/2014

Summary:

This document presents the method and results from an accredited COMOHAC TMFS calibration performed in SATIMO USA using the COMOHAC test bench, for use with a SATIMO COMOHAC system only. All calibration results are traceable to national metrology institutions.

	Name	Function	Date	Signature
Prepared by :	Jérôme LUC	Product Manager	9/19/2014	
Checked by :	Jérôme LUC	Product Manager	9/19/2014	
Approved by :	Kim RUTKOWSKI	Quality Manager	9/19/2014	Kim Rutkowski

	Customer Name
Distribution :	Shenzhen STS Test Services Co., Ltd.

Issue	Date	Modifications
A	9/19/2014	Initial release

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1 DEVICE UNDER TEST

Device Under Test	
Device Type	COMOHAC Magnetic Field Simulator
Manufacturer	Satimo
Model	STMFS
Serial Number	SN 07/14 TMFS24
Product Condition (new / used)	New
Frequency Range	200-5000 Hz

A yearly calibration interval is recommended.

2 PRODUCT DESCRIPTION

2.1 GENERAL INFORMATION

Satimo's COMOHAC T-coil Probes are built in accordance to the ANSI C63.19 and ANSI S3.22-2003 standards.

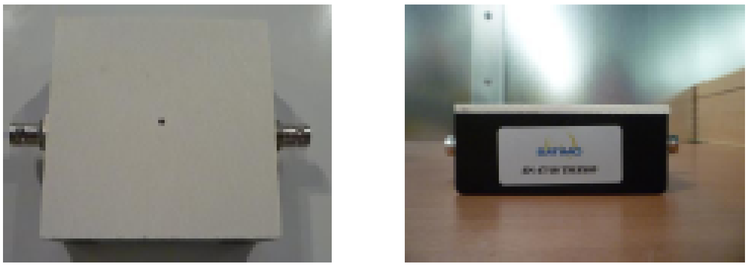

Figure 1 – *Satimo COMOHAC Magnetic Field Simulator*

3 MEASUREMENT METHOD

All methods used to perform the measurements and calibrations comply with the ANSI C63.19. All measurements were performed with the TMFS in the standard device test configuration, with the TMFS in free space, 10 mm below the coil center.

3.1 MAXIMUM AXIAL AND RADIAL MAGNETIC FIELD VALUES

An audio signal was fed into the TMFS and the magnetic field measured and recorded over an area scan with the T-coil probe in three orientations; axial and two radial. The maximum magnetic field is recorded for all three T-coil orientations.

4 MEASUREMENT UNCERTAINTY

The guideline outlined in the IEEE ANSI C63.19 standard was followed to generate the measurement uncertainty for validation measurements. All uncertainties listed below represent an expanded uncertainty expressed at approximately the 95% confidence level using a coverage factor of k=2, traceable to the Internationally Accepted Guides to Measurement Uncertainty.

Uncertainty analysis of the probe calibration in Helmholtz Coil					
Uncertainty Component	Tol. (± dB)	Prob. Dist.	Div.	Uncertainty (dB)	Uncertainty (%)
Reflections	0.1	R	$\sqrt{3}$	0.06	
Acoustic noise	0.1	R	$\sqrt{3}$	0.06	
Probe coil sensitivity	0.49	R	$\sqrt{3}$	0.28	
Reference signal level	0.25	R	$\sqrt{3}$	0.14	
Positioning accuracy	0.2	R	$\sqrt{3}$	0.12	
Cable loss	0.1	N	1	0.05	
Frequency analyzer	0.15	R	$\sqrt{3}$	0.09	
System repeatability	0.2	N	1	0.20	
Repeatability of the WD	0.1	N	1	0.10	
Combined standard uncertainty		N	1	0.43	
Expanded uncertainty 95 % confidence level k = 2		N	2	0.85	10.3%

5 CALIBRATION MEASUREMENT RESULTS

Calibration Parameters	
Software	OpenHAC V2
HAC positioning ruler	SN 42/09 TABH12
T-Coil probe	SN 47/10 TCP18
Distance between TMFS and coil center	10 mm
Frequency	1025 Hz
Scan Size	X=70mm/Y=70mm
Scan Resolution	dx=5mm/dy=5mm
Output level	0.5 VAC
Lab Temperature	21°C
Lab Humidity	45%

5.1 MAXIMUM AXIAL AND RADIAL MAGNETIC FIELD VALUES

Test Description	Measured Magnetic Field	
	Location	Intensity (dB A/m)
Axial	Max	-12.06
Radial H	Right side	-19.27
	Left side	-19.03

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6 LIST OF EQUIPMENT

Equipment Summary Sheet				
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COMOHAC Test Bench	Version 2	NA	Validated. No cal required.	Validated. No cal required.
HAC positioning ruler	Satimo	TABH12 SN 42/09	Validated. No cal required.	Validated. No cal required.
Audio Generator	National Instruments	15222AE	01/2014	01/2017
Reference Probe	Satimo	TCP 18 SN 47/10	10/2013	10/2014
Multimeter	Keithley 2000	1188656	12/2013	12/2016
Temperature / Humidity Sensor	Control Company	11-661-9	8/2012	8/2015

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