

FCC- TEST REPORT

Report Number : **68.950.17.019.01** Date of Issue: **January 12, 2017**

Model : **MRHH600, MRHH600W**

Product Type : **MR HH600 GPS BT**

Applicant : **Cobra Electronics Corporation**

Address : **6500 West Cortland Street, Chicago, IL**

Manufacturer : **XIN XING GREAT SUCCESS PLASTIC PRODUCTS LIMITED**

Address : **Building A, District 1, B2-02, Xincheng Industrial Park, Xinxing,
YunFu, Guangdong, P.R.C**

Test Result : **Positive** **Negative**

Total pages including Appendices : **29**

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2 Details about the Test Laboratory

Details about the Test Laboratory

Test Site 1

Company name: TÜV SÜD Certification and Testing (China) Co., Ltd. Shenzhen Branch
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Nantou Checkpoint Road 2, Nanshan District,
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IC Registration No: 10320A-1

Telephone: 86 755 8828 6998
Fax: 86 755 8828 5299

Test Site 2

Company name: Shenzhen Huatongwei International Inspection Co., Ltd.
1/F, Bldg 3, Hongfa Hi-tech Industrial Park, Genyu Road,
Tianliao, Gongming,
Shenzhen, China


FCC Registration No.: 317478

IC Registration No: 5377A&5377B

Telephone: +86-755-2674 8019
Fax: +86-755-2674 8089

3 Description of the Equipment under Test

Description of the Equipment Under Test

Product:	MR HH600 GPS BT
Model no.:	MRHH600, MRHH600W
FCC ID:	BBOMRHH600
IC:	906A-MRHH600
Brand Name:	
Options and accessories:	NIL
Rating:	7.4Vdc Li-ion rechargeable battery
Adapter information:	Model: K12S120100U Input: 100-240Va.c., 50/60Hz, 0.45A Output:12Vd.c.,1.0A
RF Transmission Frequency:	2402-2480MHz
No. of Operated Channel:	40
Modulation:	GFSK
Antenna Type:	Integral Antenna
Antenna Gain:	1.0dBi
Description of the EUT:	The Equipment Under Test (EUT) is a VHF transceiver VHF transceiver for the maritime mobile service with buletooth function operated at 2.4GHz

Remark 1: The above EUT's information was declared by manufacturer. Please refer to the specifications or user's manual for more detailed description.

Remark 2: As per Client Declaration, MRHH600 and MRHH600W are identical, only the cosmetics have different color, so we use MRHH600 as a representative to perform all testing.

4 Summary of Test Standards

Test Standards	
FCC Part 15 Subpart C 10-1-2015 Edition	PART 15 - RADIO FREQUENCY DEVICES Subpart C - Intentional Radiators
RSS-247 Issue 1 May 2015	RSS-247 —Digital Transmission Systems (DTSs), Frequency Hopping Systems (FHSs) and Licence-Exempt Local Area Network (LE-LAN) Devices
RSS-Gen Issue 4 November 2014	General Requirements for the Certification of Radio Apparatus

All the test methods were according to KDB558074 D01 DTS Meas Guidance v03r05 and ANSI C63.10 (2014).

5 Summary of Test Results

Technical Requirements							
FCC Part 15 Subpart C							
Test Condition			Pages	Test Site	Test Result		
					Pass	Fail	N/A
§15.207	RSS-GEN A8.8	Conducted emission AC power port	10	Site 2	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
§15.247 (b) (1)	RSS-247 5.4(4)	Conducted peak output power	13	Site 2	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
§15.247(a)(1)	RSS-247 5.1(2)	20dB bandwidth	---	---	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
§15.247(a)(1)	RSS-247 5.1(2)	Carrier frequency separation	---	---	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
§15.247(a)(1)(iii)	RSS-247 5.1(3)	Number of hopping frequencies	---	---	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
§15.247(a)(1)(iii)	RSS-247 5.1(3)	Dwell Time	---	---	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
§15.247(a)(2)	RSS-247 5.2 (1)	6dB bandwidth	14	Site 2	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
§15.247(e)	RSS-247 5.2 (2)	Power spectral density	18	Site 2	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
§15.247(d)	RSS-247 5.5	Spurious RF conducted emissions	19	Site 2	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
§15.247(d)	RSS-247 5.5	Band edge	22	Site 2	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
§15.247(d) & §15.209	RSS-247 5.5 & RSSGEN 6.13	Spurious radiated emissions for transmitter	24	Site 2	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
§15.203	RSSGEN 8.3	Antenna requirement	See note 1		<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Remark 1: N/A – Not Applicable.

Note 1: The EUT uses an integral antenna, which gain is 1.0dBi. According to §15.203 and RSSGEN 8.3, it is considered sufficiently to comply with the provisions of this section.

6 General Remarks

Remarks

This submittal(s) (test report) is intended for FCC ID: BBOMRHH600 and IC: 906A-MRHH600 complies with Section 15.207, 15.209, 15.247 of the FCC Part 15, Subpart C Rules, RSS-GEN and RSS-247.

SUMMARY:

All tests according to the regulations cited on page 5 were

- Performed

- **Not** Performed

The Equipment under Test

- **Fulfills** the general approval requirements.

- **Does not** fulfill the general approval requirements.

Sample Received Date: November 24, 2016

Testing Start Date: November 25, 2016

Testing End Date: January 9, 2017

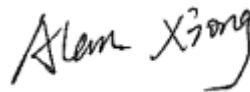
- TÜV SÜD Certification and Testing (China) Co., Ltd. Shenzhen Branch -

Reviewed by:

Prepared by:



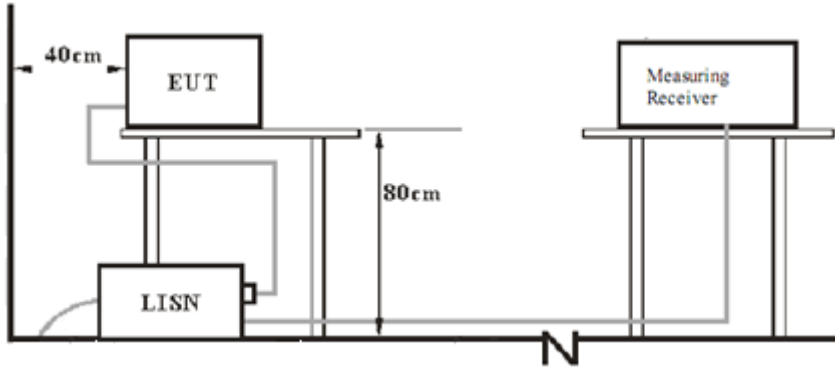
John Zhi
Section Manager



Alan Xiong
Project Engineer

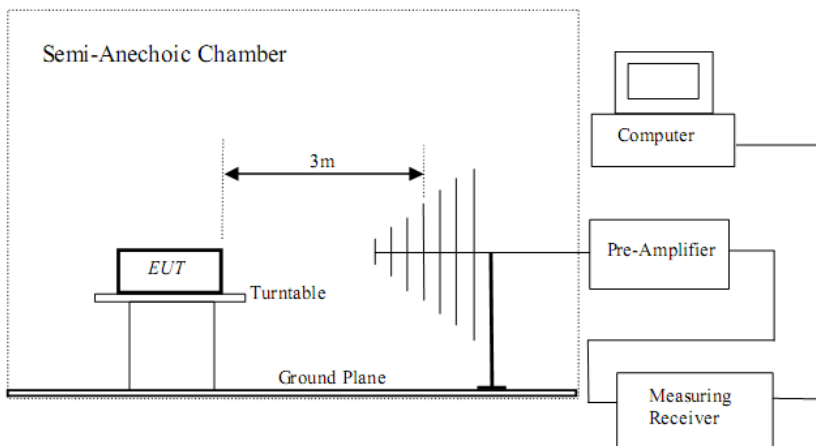
7 Test Setups

7.1 AC Power Line Conducted Emission test setups

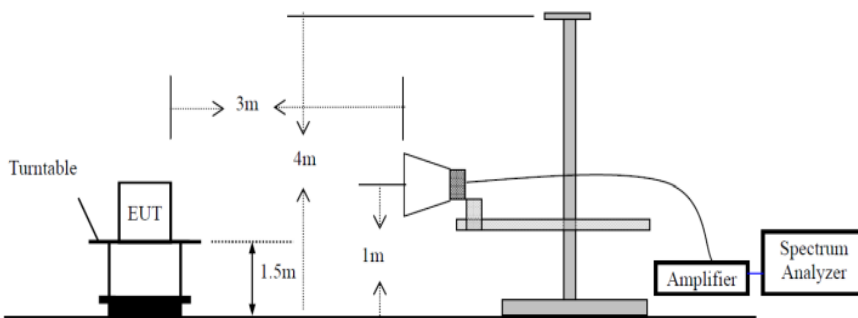


7.2 Radiated test setups

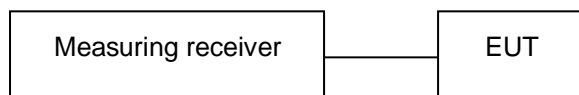
Below 1GHz:



Above 1GHz:



7.3 Conducted RF test setups



8 Systems test configuration

Auxiliary Equipment Used during Test:

DESCRIPTION	MANUFACTURER	MODEL NO.(SHIELD)	S/N(LENGTH)
---	---	---	---

The system was configured to channel 0, 19, and 39 for the test.

Channel	Frequency (MHz)
0	2402
19	2440
39	2480

9 Technical Requirement

9.1

9.1 Conducted Emission

Test Method

1. The EUT was placed on a table, which is 0.8m above ground plane
2. The power line of the EUT is connected to the AC mains through an Artificial Mains Network (A.M.N.).
3. Maximum procedure was performed to ensure EUT compliance
4. A EMI test receiver is used to test the emissions from both sides of AC line

Limit

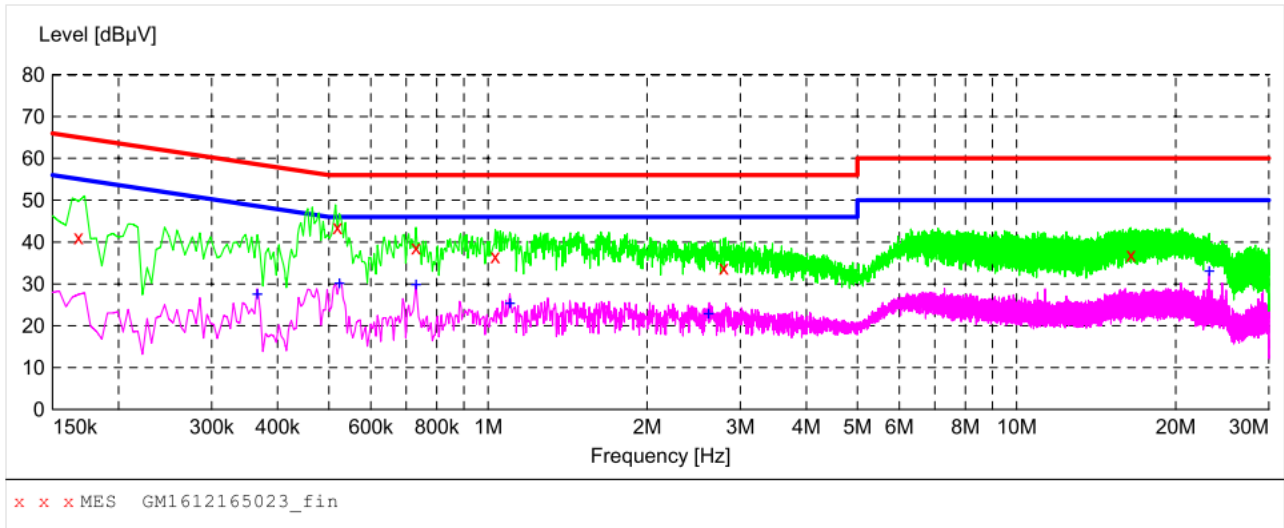
According to §15.207 & RSS-GEN A8.8, conducted emissions limit as below:

Frequency MHz	QP Limit dB μ V	AV Limit dB μ V
0.150-0.500	66-56*	56-46*
0.500-5	56	46
5-30	60	50

Decreasing linearly with logarithm of the frequency



Product Type : MR HH600 GPS BT
 M/N : MRHH600
 Operating Condition : Normal Working
 Test Specification : Line
 Comment : AC 120V/60Hz



MEASUREMENT RESULT: "GM1612165023_fin"

12/16/2016 2:01PM

Frequency MHz	Level dBµV	Transd dB	Limit dBµV	Margin dB	Detector	Line	PE
0.168000	41.20	10.4	65	23.9	QP	L1	GND
0.519000	43.60	10.2	56	12.4	QP	L1	GND
0.730500	38.70	10.2	56	17.3	QP	L1	GND
1.032000	36.60	10.2	56	19.4	QP	L1	GND
2.791500	33.90	10.2	56	22.1	QP	L1	GND
16.458000	37.00	10.5	60	23.0	QP	L1	GND

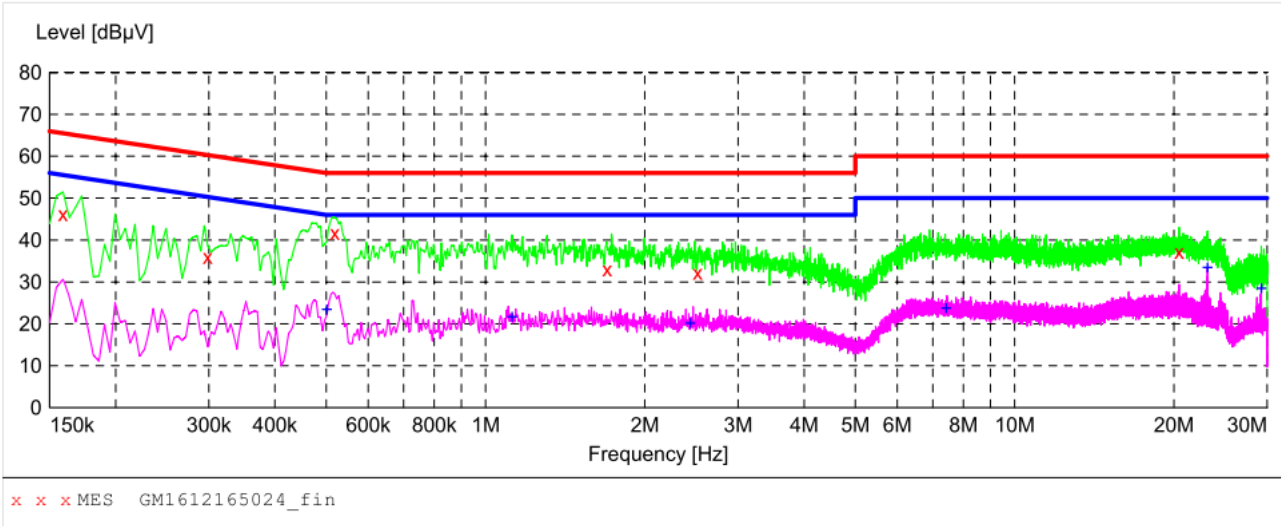
MEASUREMENT RESULT: "GM1612165023_fin2"

12/16/2016 2:01PM

Frequency MHz	Level dBµV	Transd dB	Limit dBµV	Margin dB	Detector	Line	PE
0.366000	27.50	10.2	49	21.1	AV	L1	GND
0.523500	30.10	10.2	46	15.9	AV	L1	GND
0.730500	29.80	10.2	46	16.2	AV	L1	GND
1.099500	25.30	10.2	46	20.7	AV	L1	GND
2.611500	22.80	10.2	46	23.2	AV	L1	GND
23.131500	33.00	10.7	50	17.0	AV	L1	GND



Product Type : MR HH600 GPS BT
 M/N : MRHH600
 Operating Condition : Normal Working
 Test Specification : Neutral
 Comment : AC 120V/60Hz



MEASUREMENT RESULT: "GM1612165024_fin"

12/16/2016 2:03PM

Frequency MHz	Level dBµV	Transd dB	Limit dBµV	Margin dB	Detector	Line	PE
0.159000	46.20	10.4	66	19.3	QP	N	GND
0.298500	36.00	10.2	60	24.3	QP	N	GND
0.519000	41.70	10.2	56	14.3	QP	N	GND
1.698000	33.00	10.2	56	23.0	QP	N	GND
2.517000	32.20	10.2	56	23.8	QP	N	GND
20.445000	37.20	10.6	60	22.8	QP	N	GND

MEASUREMENT RESULT: "GM1612165024_fin2"

12/16/2016 2:03PM

Frequency MHz	Level dBµV	Transd dB	Limit dBµV	Margin dB	Detector	Line	PE
0.501000	23.40	10.2	46	22.6	AV	N	GND
1.122000	21.60	10.2	46	24.4	AV	N	GND
2.436000	20.10	10.2	46	25.9	AV	N	GND
7.422000	23.70	10.4	50	26.3	AV	N	GND
23.131500	33.40	10.7	50	16.6	AV	N	GND
29.238000	28.40	10.8	50	21.6	AV	N	GND

9.2 Conducted peak output power

Test Method

1. Use the following spectrum analyzer settings:
RBW > the 6 dB bandwidth of the emission being measured, VBW \geq 3RBW, Span \geq 3RBW
Sweep = auto, Detector function = peak, Trace = max hold.
2. Add a correction factor to the display.
3. Allow the trace to stabilize. Use the marker-to-peak function to set the marker to the peak of the emission. The indicated level is the peak output power.

Limits

According to §15.247 (b) (1) & RSS-247 5.4(4), conducted peak output power limit as below:

Frequency Range MHz	Limit W	Limit dBm
2400-2483.5	≤ 1	≤ 30

Test result as below table

Frequency MHz	Conducted Peak Output Power dBm	Result
Low channel 2402MHz	-1.02	Pass
Middle channel 2440MHz	-1.21	Pass
High channel 2480MHz	-1.97	Pass

9.3 6dB bandwidth & 99% bandwidth

Test Method

1. Use the following spectrum analyzer settings:
RBW=100K, VBW \geq 3RBW, Sweep = auto, Detector function = peak, Trace = max hold
2. Use the automatic bandwidth measurement capability of an instrument, may be employed using the X dB bandwidth mode with X set to 6 dB, care shall be taken so that the bandwidth measurement is not influenced by any intermediate power nulls in the fundamental emission that might be \geq 6 dB.
3. Allow the trace to stabilize, record the X dB Bandwidth value.

Limit

According to §15.247 (a) (2) & RSS-247 5.2 (1), 6dB bandwidth limit as below:

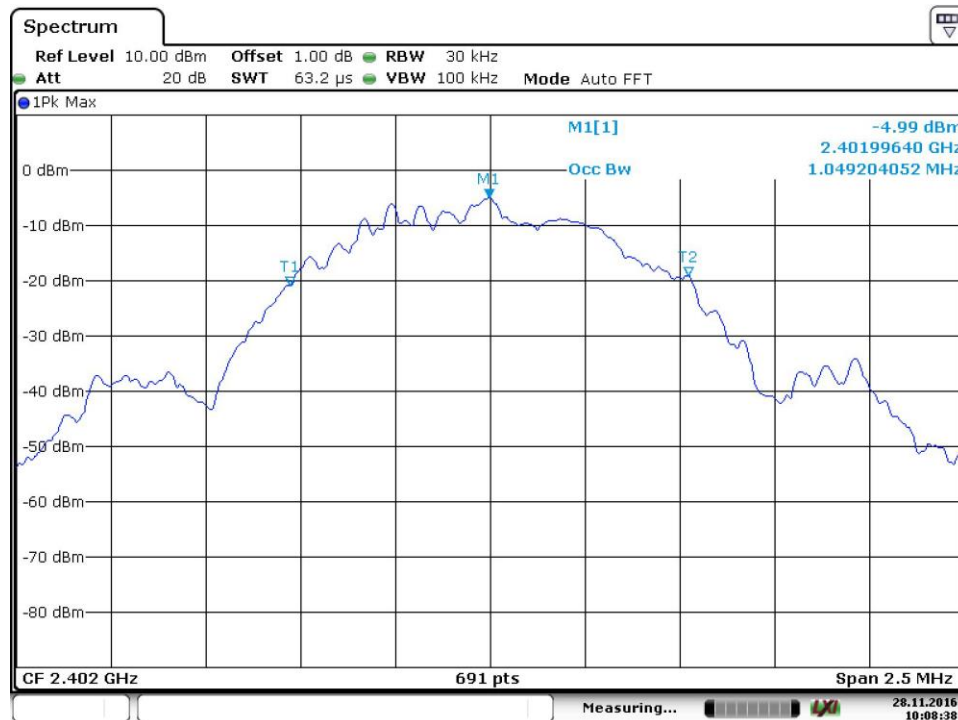
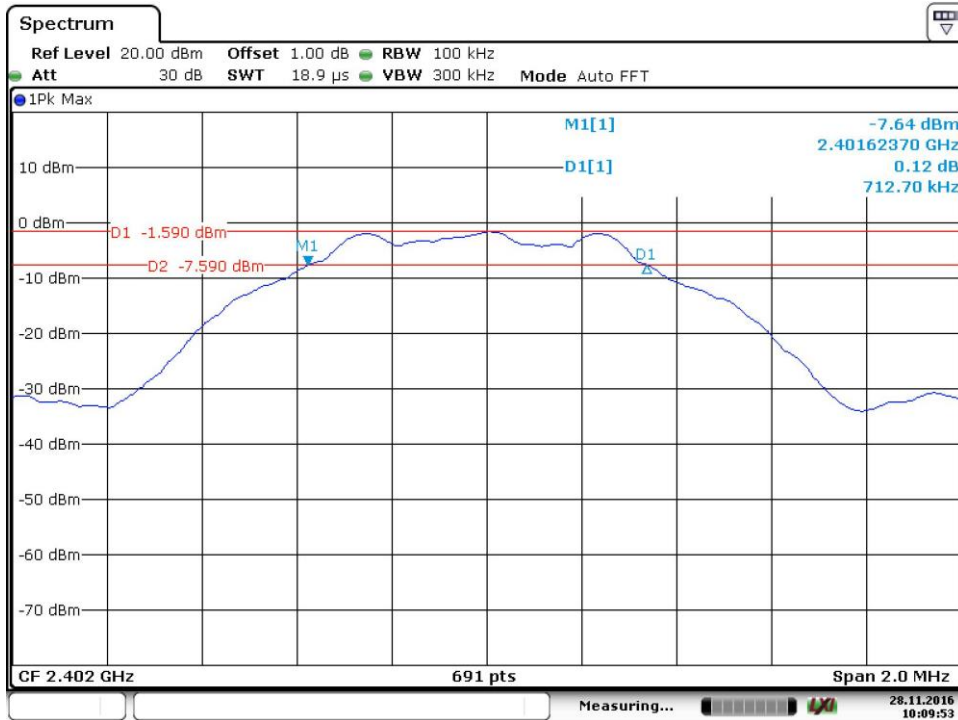
Limit [kHz]

—————
 \geq 500

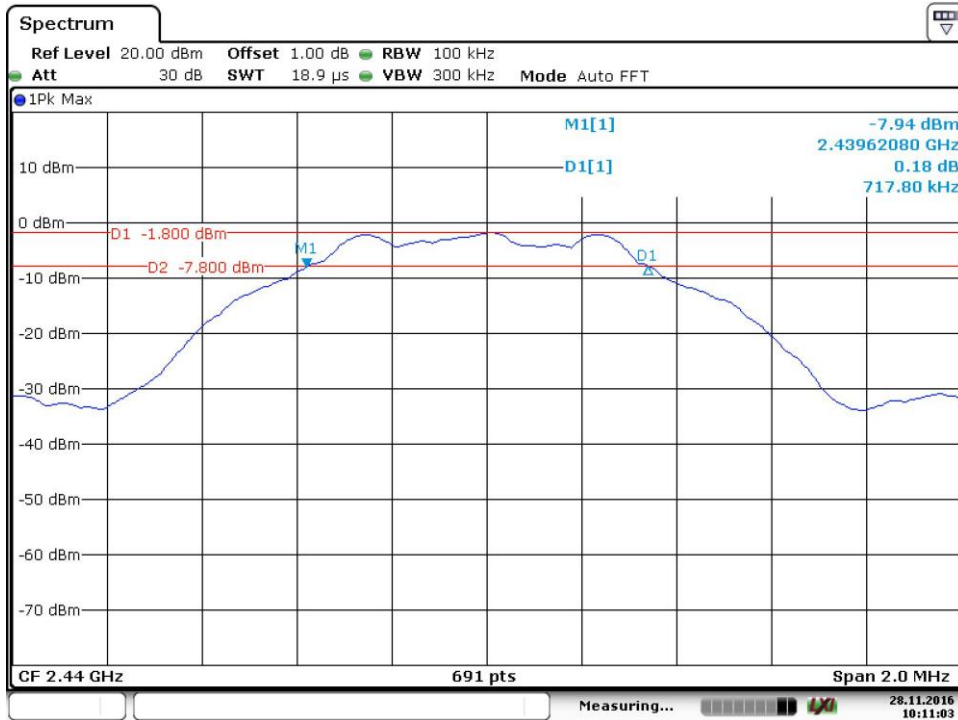
Test result

Frequency MHz	6dB bandwidth kHz	99% bandwidth MHz	Result
Top channel 2402MHz	712.70	1.05	Pass
Middle channel 2440MHz	717.80	1.05	Pass
Bottom channel 2480MHz	718.50	1.05	Pass

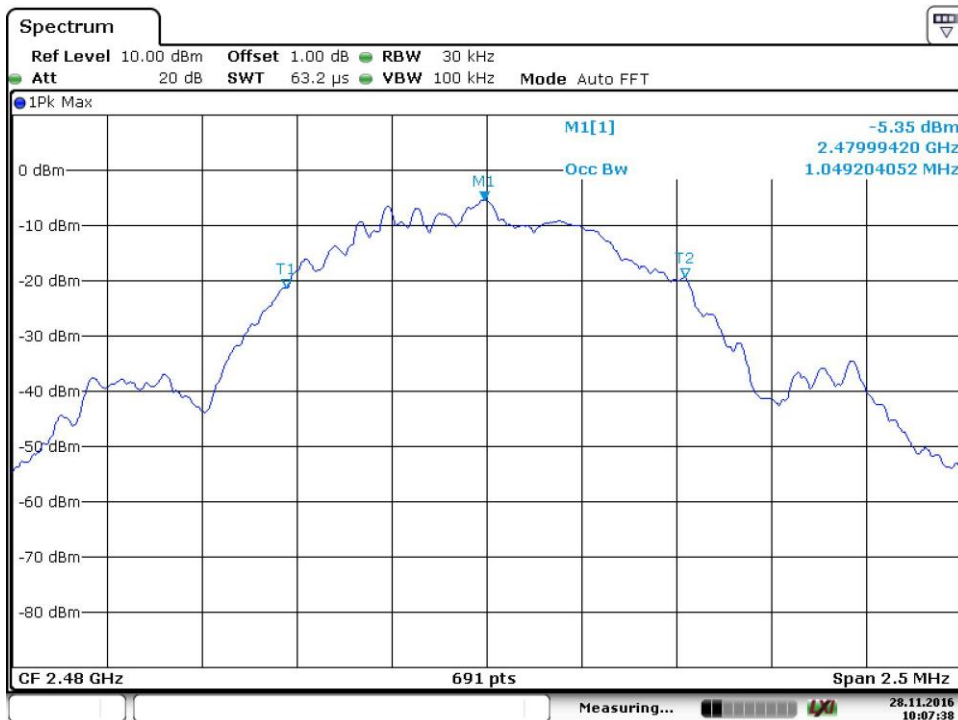
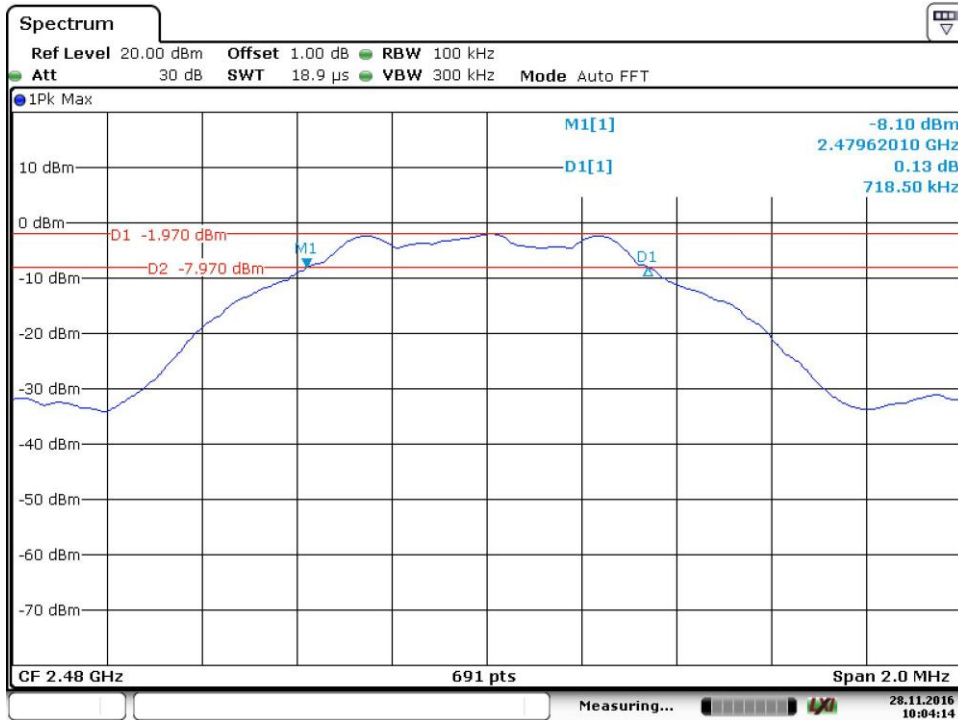
2402MHz



2440MHz



2480MHz



9.4 Power spectral density

Test Method

This procedure shall be used if maximum peak conducted output power was used to demonstrate compliance:

1. Set analyzer center frequency to DTS channel center frequency.
RBW=3kHz,VBW≥3RBW,Span=1.5 times DTS bandwidth, Detector=Peak, Sweep=auto, Trace= max hold.
2. Allow trace to fully stabilize, use the peak marker function to determine the maximum amplitude level within the RBW.
3. Repeat above procedures until other frequencies measured were completed.

Limit

According to §15.247 (e) (2) & RSS-247 5.2 (2), power spectral density limit as below:

Limit [dBm]

≤8

Test result

Frequency MHz	Power spectral density dBm	Result
Low channel 2402MHz	-16.27	Pass
Middle channel 2440MHz	-16.31	Pass
High channel 2480MHz	-16.68	Pass

9.5 Spurious RF conducted emissions

Test Method

1. Establish a reference level by using the following procedure:
 - a. Set RBW=100 kHz. VBW \geq 3RBW. Detector =peak, Sweep time = auto couple, Trace mode = max hold.
 - b. Allow trace to fully stabilize, use the peak marker function to determine the maximum PSD level.
2. Use the maximum PSD level to establish the reference level.
 - a. Set the center frequency and span to encompass frequency range to be measured.
 - b. Use the peak marker function to determine the maximum amplitude level. Ensure that the amplitude of all unwanted emissions outside of the authorized frequency band (excluding restricted frequency bands) are attenuated by at least the minimum requirements, report the three highest emissions relative to the limit.
3. Repeat above procedures until other frequencies measured were completed.

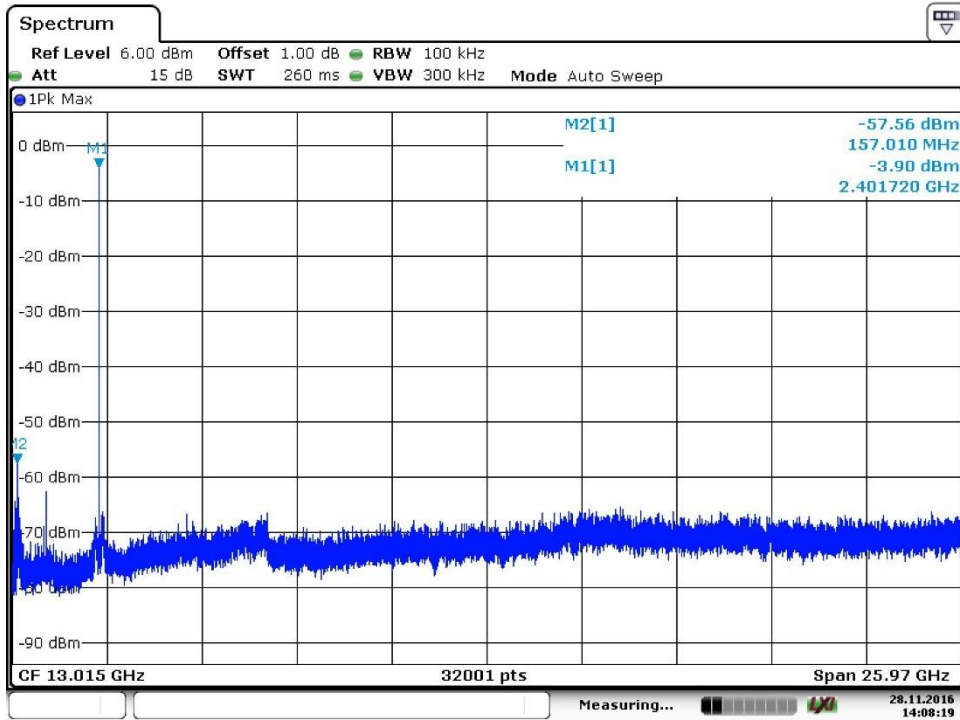
Limit

According to §15.247 (d) & RSS-247 5.5, spurious RF conducted emissions limit as below:

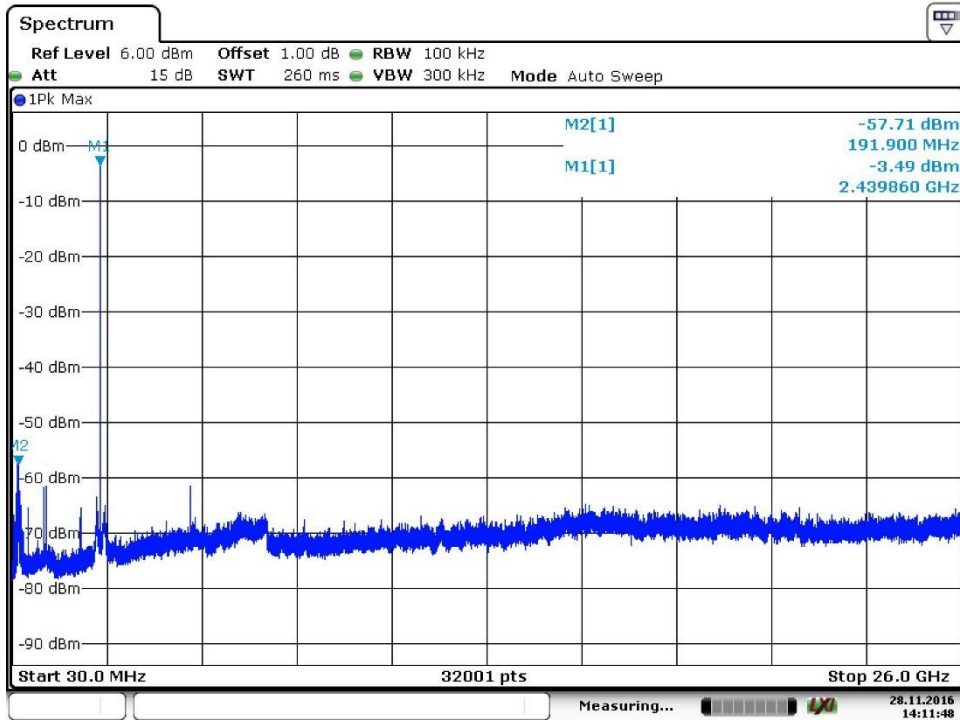
Frequency Range MHz	Limit (dBc)
30-25000	-20

Spurious RF conducted emissions

2402MHz

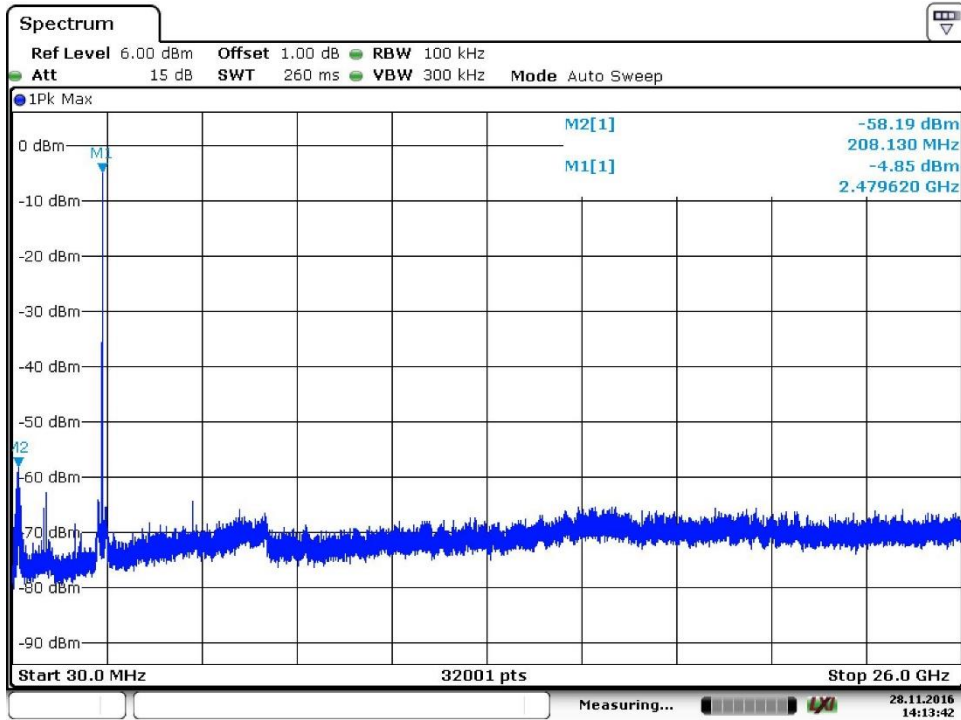


2440MHz



Spurious RF conducted emissions

2480MHz



9.6 Band edge

Test Method

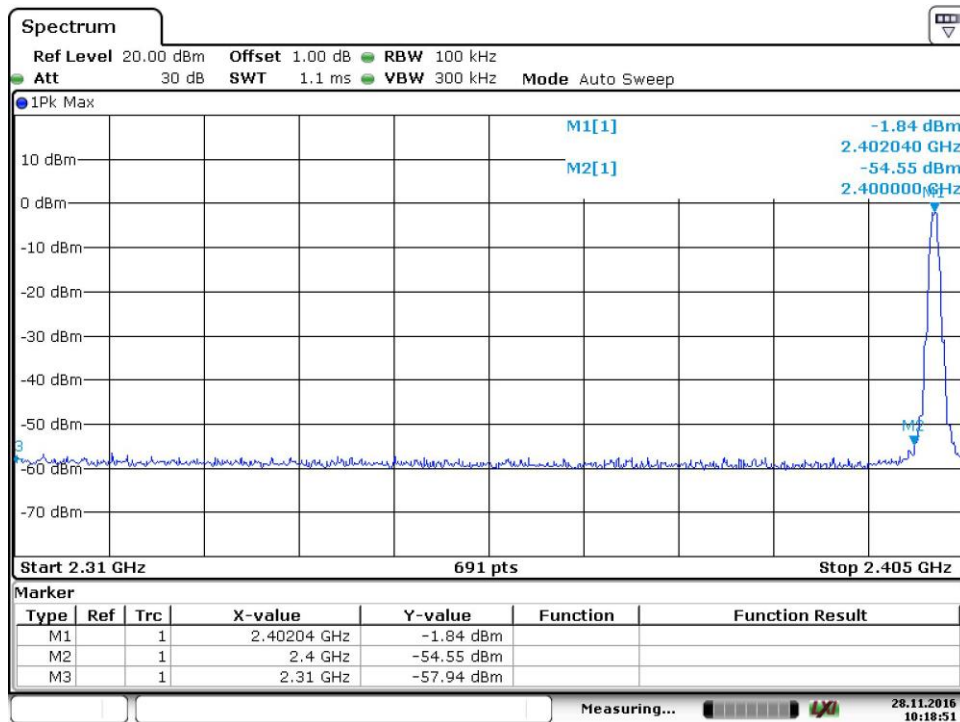
- 1 Use the following spectrum analyzer settings:
Span = wide enough to capture the peak level of the in-band emission and all spurious
RBW = 100 kHz, VBW ≥ RBW, Sweep = auto, Detector function = peak, Trace = max hold.
- 2 Allow the trace to stabilize, use the peak and delta measurement to record the result.
- 3 The level displayed must comply with the limit specified in this Section.

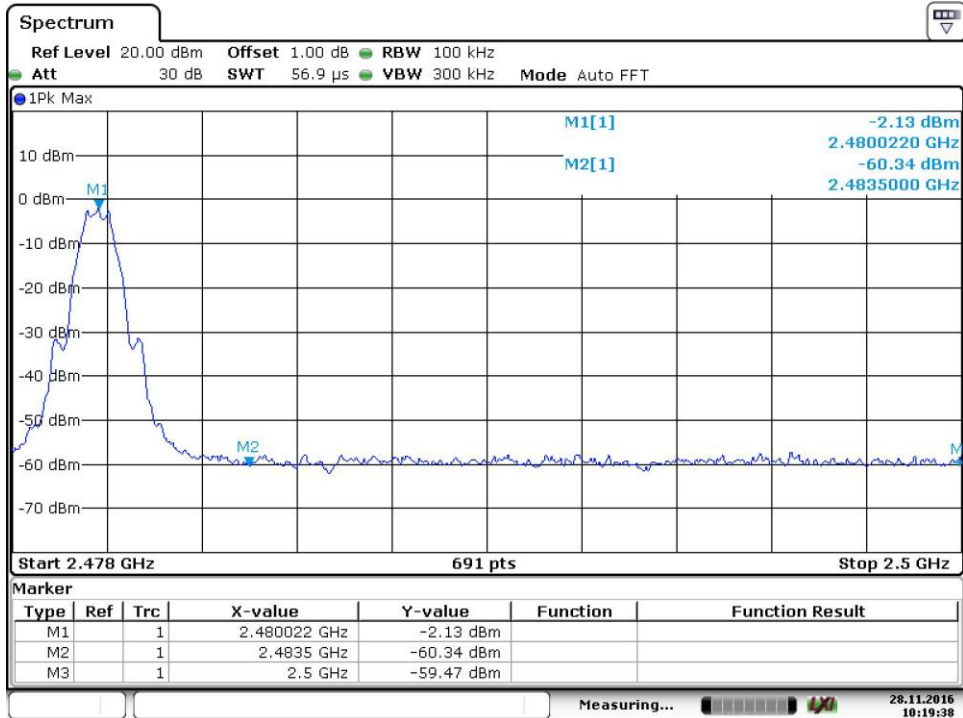
Limit

According to §15.247 (d) & RSS-247 5.5, band edge limit as below:

Frequency Range MHz	Limit (dBc)
30-25000	-20

Test result





9.7 Spurious radiated emissions for transmitter

Test Method

1. The EUT was placed on a turn table which is 1.5m above ground plane for above 1GHz and 0.8m above ground for below 1GHz at 3 meter chamber room for test. The table was rotated 360 degrees to determine the position of the highest radiation.
2. The EUT was set 3 meters away from the interference – receiving antenna, which was mounted on the top of a variable – height antenna tower.
3. The height of antenna is varied from one meter to four meters above the ground to determine the maximum value of the field strength. Both horizontal and vertical polarizations of the antenna are set to make the measurement.
4. For each suspected emission, the EUT was arranged to its worst case and then the antenna was tuned to heights from 1 meter to 4 meters and the rotatable table was turned
5. Use the following spectrum analyzer settings According to C63.10:
For Above 1GHz
Span = wide enough to capture the peak level of the in-band emission and all spurious
RBW = 1MHz, VBW \geq RBW for peak measurement and VBW = 10Hz for average measurement, Sweep = auto, Detector function = peak, Trace = max hold.
For Below 1GHz
Use the following spectrum analyzer settings:
Span = wide enough to capture the peak level of the in-band emission and all spurious
RBW = 100 KHz, VBW \geq RBW for peak measurement, Sweep = auto, Detector function = peak, Trace = max hold.

Note:

1. The resolution bandwidth and video bandwidth of test receiver/spectrum analyzer is 120 KHz for Quasi-peak detection (QP) at frequency below 1GHz.
2. The resolution bandwidth of test receiver/spectrum analyzer is 1MHz and the video bandwidth is 3MHz for peak detection (PK) at frequency above 1GHz.
3. The resolution bandwidth of test receiver/spectrum analyzer is 1MHz and the video bandwidth is 3MHz for RMS Average ((duty cycle < 98%) for Average detection (AV) at frequency above 1GHz, then the measurement results was added to a correction factor (20log(1/duty cycle)).
4. The resolution bandwidth of test receiver/spectrum analyzer is 1MHz and the video bandwidth is 10Hz (duty cycle > 98%) for Average detection (AV) at frequency above 1GHz.

Limit

According to part 15.247(d) & RSS-247 5.5, the radio emission outside the operating frequency band shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power. Radiated emissions which fall in the restricted bands, as defined in section 15.205, must comply with the radiated emission limits specified in section 15.209.

Frequency MHz	Field Strength uV/m	Field Strength dBµV/m	Detector
30-88	100	40	QP
88-216	150	43.5	QP
216-960	200	46	QP
960-1000	500	54	QP
Above 1000	500	54	AV
Above 1000	5000	74	PK

Spurious radiated emissions for transmitter

According to C63.10, if the peak (or quasi-peak) measured value complies with the average limit, it is unnecessary to perform an average measurement, so AV emission value did not show in below table if the peak value complies with average limit.

Transmitting spurious emission test result as below:

2402MHz

Frequency	Emission Level	Polarization	Limit	Detector	Margin	Result
MHz	dBuV/m		dBμV/m		dBuV/m	
30-1000	--	Horizontal	40.00	QP	--	Pass
30-1000	--	Vertical	40.00	QP	--	Pass
2390	47.52	Vertical	74	PK	-26.48	Pass
2390	49.25	Horizontal	74	AV	-24.75	Pass
2390	40.36	Vertical	54	PK	-13.64	Pass
2390	39.74	Horizontal	54	AV	-14.26	Pass
4804.00	38.45	Horizontal	74	PK	-35.55	Pass
7206.00	42.47	Horizontal	74	PK	-31.53	Pass
9608.00	45.46	Horizontal	74	PK	-28.54	Pass
4804.00	39.45	Vertical	74	PK	-34.55	Pass
7206.00	43.36	Vertical	74	PK	-30.64	Pass
9608.00	46.85	Vertical	74	PK	-27.15	Pass

2440MHz

Frequency	Emission Level	Polarization	Limit	Detector	Margin	Result
MHz	dBuV/m		dBμV/m		dBuV/m	
4804.00	38.74	Horizontal	74	PK	-35.26	Pass
7206.00	43.05	Horizontal	74	PK	-30.95	Pass
9608.00	46.74	Horizontal	74	PK	-27.26	Pass
4804.00	39.65	Vertical	74	PK	-34.35	Pass
7206.00	44.87	Vertical	74	PK	-29.13	Pass
9608.00	46.25	Vertical	74	PK	-27.75	Pass

2480MHz

Frequency	Emission Level	Polarization	Limit	Detector	Margin	Result
MHz	dBuV/m		dBμV/m		dBuV/m	
2483.5	55.74	Vertical	74	PK	-18.26	Pass
2483.5	57.42	Horizontal	74	AV	-16.58	Pass
2483.5	49.85	Vertical	54	PK	-4.15	Pass
2483.5	50.74	Horizontal	54	AV	-3.26	Pass
4804.00	38.52	Horizontal	74	PK	-35.48	Pass
7206.00	42.58	Horizontal	74	PK	-31.42	Pass
9608.00	45.94	Horizontal	74	PK	-28.06	Pass
4804.00	40.02	Vertical	74	PK	-33.98	Pass
7206.00	43.65	Vertical	74	PK	-30.35	Pass
9608.00	46.74	Vertical	74	PK	-27.26	Pass

Remark:

- (1) Data of measurement within 30-1000MHz frequency range shown "--" in the table above means the reading of emissions are attenuated more than 20db below the permissible limits or the field strength is too small to be measured.

10 Test Equipment List

Name of Equipment	Manufacturer	Model	Serial Number	Last Cal.
Ultra-Broadband Antenna	Rohde&Schwarz	HL562	100015	11/13/2016
EMI Test Receiver	Rohde&Schwarz	ESI 26	100009	11/13/2016
RF Test Panel	Rohde&Schwarz	TS / RSP	335015/ 0017	N/A
HORN ANTENNA	Rohde&Schwarz	HF906	100039	11/13/2016
Turntable	ETS	2088	2149	N/A
Antenna Mast	ETS	2075	2346	N/A
EMI Test Software	Rohde&Schwarz	ES-K1 V1.71	N/A	N/A
RF COMMUNICATION TEST SET	HP	8920A	3813A10206	11/13/2016
Ultra-Broadband Antenna	ShwarzBeck	VULB9163	538	11/13/2016
Ultra-Broadband Antenna	ShwarzBeck	VULB9163	539	11/13/2016
HORN ANTENNA	ShwarzBeck	9120D	1012	11/13/2016
HORN ANTENNA	ShwarzBeck	9120D	1011	11/13/2016
TURNTABLE	MATURO	TT2.0	----	N/A
ANTENNA MAST	MATURO	TAM-4.0-P	----	N/A

11 System Measurement Uncertainty

For a 95% confidence level, the measurement expanded uncertainties for defined systems, in accordance with the recommendations of ISO 17025 were:

System Measurement Uncertainty	
Test Items	Extended Uncertainty
Radiated Emission 30~1000MHz	4.65 dB
Radiated Emission 1~18GHz	5.16 dB
Radiated Emission 18-40GHz	5.54 dB
Uncertainty for Conducted RF test	Power level test involved: 2.04dB Frequency test involved: 1.1×10^{-7}

THE END