



FCC/IC- TEST REPORT

Report Number	:	68.950.16.642.01	Date of Issue:	<u>December 9, 2016</u>
Model	:	<u>MUSE 5</u>		
Product Type	:	<u>Bluetooth Earphone</u>		
Applicant	:	<u>ERATO(HK) CO., LTD</u>		
Address	:	<u>Unit P, 8th Floor, Kaiser Estate 3rd Phase, No.11, Hong Kong.</u>		
Production Facility	:	<u>Charter Media (Dongguan) Co., Ltd.</u>		
Address	:	<u>Dabandi Industrial Zone, Daning District, Humen Town, 523930</u>		
	:	<u>Dongguan City, Guangdong Province, PEOPLE'S REPUBLIC</u>		
	:	<u>OF CHINA</u>		
Test Result	:	<input checked="" type="checkbox"/> Positive	<input type="checkbox"/> Negative	
Total pages including Appendices	:	<u>29</u>		

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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
Building 12&13, Zhiheng Wisdomland Business Park,
Nantou Checkpoint Road 2, Nanshan District,
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FCC Registration No.: 502708

IC Registration No.: 10320A -1

3 Description of the Equipment under Test

Description of the Equipment Under Test

Product:	Bluetooth Earphone
Model no.:	MUSE 5
FCC ID:	2AHD9-ANMU050000
IC:	21132-ANMU050000
Options and accessories:	NIL
Rating:	DC3.7V (Supplied by Li-ion rechargeable battery) DC5.0V (Charged by USB Port)
RF Transmission Frequency:	2402-2480MHz
No. of Operated Channel:	40
Modulation:	GFSK
Antenna Type:	Integral Antenna
Antenna Gain:	2.0dBi
Description of the EUT:	The Equipment Under Test (EUT) is a Bluetooth headset operated at 2.4GHz

4 Summary of Test Standards

Test Standards	
FCC Part 15 Subpart C 10-1-2014 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

All the test methods were according to KDB558074 D01 DTS Meas Guidance v03r02 and ANSI C63.10 (2013).

5 Summary of Test Results

Technical Requirements					
FCC Part 15 Subpart C/RSS-247 Issue 1/RSS-Gen Issue 4					
Test Condition	Pages	Test Site	Test Result		
			Pass	Fail	N/A
§15.207	RSS-Gen A8.8	Conducted emission AC power port	10	Site 1	<input type="checkbox"/> <input type="checkbox"/> <input checked="" type="checkbox"/>
§15.247 (b) (1)	RSS-247 5.4(2)	Conducted peak output power	13	Site 1	<input checked="" type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>
§15.247(a)(1)	RSS-247 5.1(1) & RSS-Gen 6.6	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(4)	Number of hopping frequencies	---	---	<input type="checkbox"/> <input type="checkbox"/> <input checked="" type="checkbox"/>
§15.247(a)(1)(iii)	RSS-247 5.1(4)	Dwell Time	---	---	<input type="checkbox"/> <input type="checkbox"/> <input checked="" type="checkbox"/>
§15.247(a)(2)	RSS-247 5.2(1)	6dB bandwidth and 99% Occupied Bandwidth	15	Site 1	<input checked="" type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>
§15.247(e)	RSS-247 5.2(2)	Power spectral density	17	Site 1	<input checked="" type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>
§15.247(d)	RSS-247 5.5	Spurious RF conducted emissions	19	Site 1	<input checked="" type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>
§15.247(d)	RSS-247 5.5	Band edge	23	Site 1	<input checked="" type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>
§15.247(d) & §15.209	RSS-247 5.5 & RSS-Gen 6.13	Spurious radiated emissions for transmitter	25	Site 1	<input checked="" type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>
§15.203	RSS-Gen 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 a patch antenna, which gain is 2dBi. In accordance to §15.203 and RSS-Gen 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 ID: 2AHD9-ANMU050000, IC: 21132-ANMU050000 complies with Section 15.207, 15.209, 15.247 of the FCC Part 15, Subpart C Rules 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 2, 2016

Testing Start Date: November 2, 2016

Testing End Date: December 9, 2016



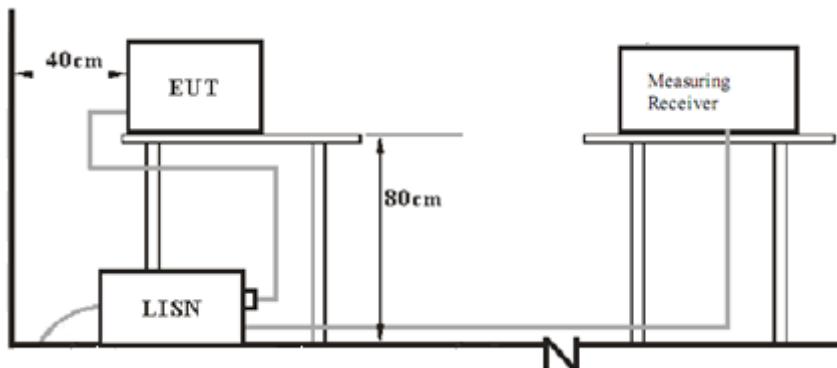
Prepared By EMC Project Engineer	2016-12-09 Date	Mark Chen Name	Signature
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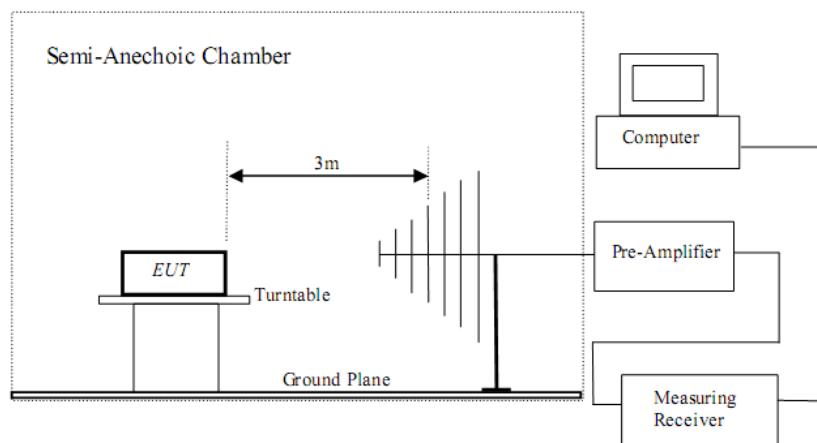
Approved by EMC Project Manager	2016-12-09 Date	Cookies Bu Name	Signature
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7 Test Setups

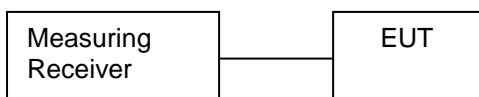
7.1 AC Power Line Conducted Emission test setups



7.2 Radiated test setups



7.3 Conducted RF test setups



8 Systems test configuration

Auxiliary Equipment Used during Test:

DESCRIPTION	MANUFACTURER	MODEL NO.(SHIELD)	S/N(LENGTH)
Notebook	lenovo	X220	---

9 Technical Requirement

9.1 Conducted Emission

Test Method

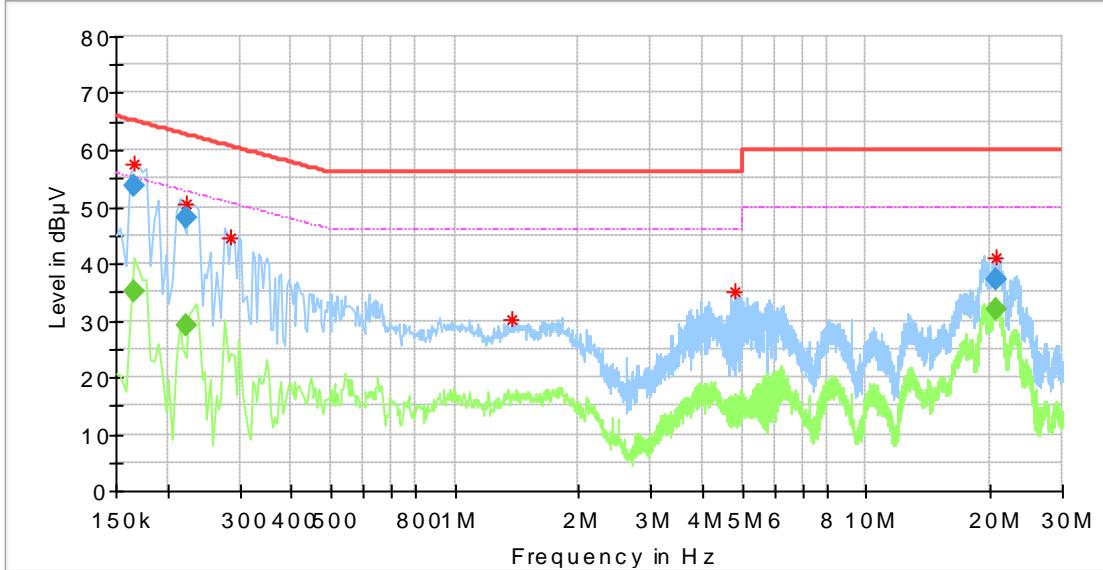
1. The EUT was placed on a table, which is 0.8m above ground plane
2. The power line of the EUT is connected to the AC mains through a Artificial Mains Network (A.M.N.).
3. Maximum procedure was performed to ensure EUT compliance
4. A EMI test receiver is used to test the emissions from both sides of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

Limit

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 lineal

Product Type : Bluetooth Earphone
 M/N : MUSE 5
 Operating Condition : Charging & TX
 Test Specification : Live
 Comment : AC 120V/60Hz



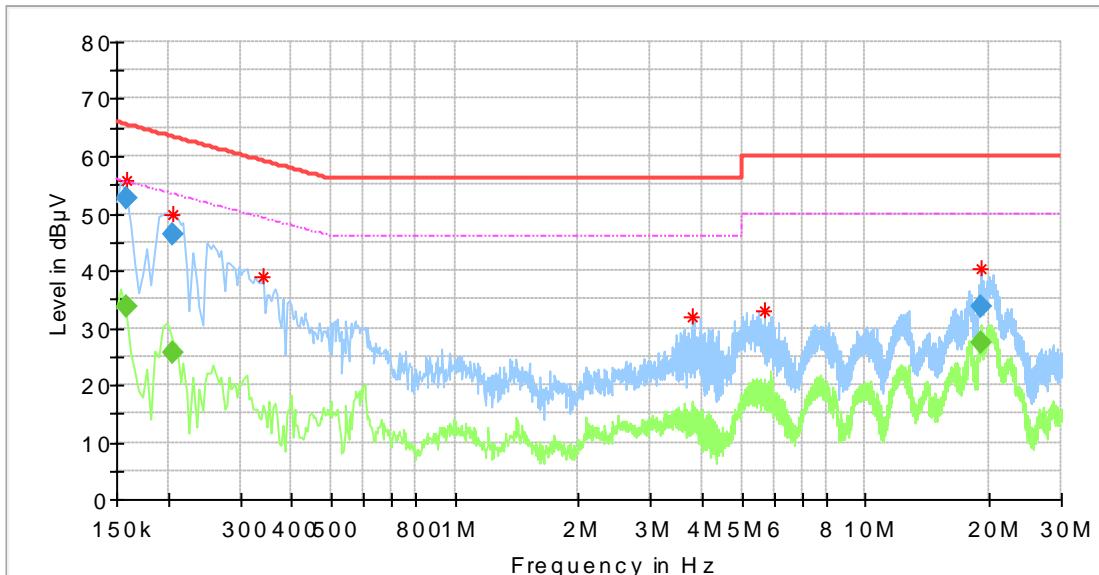
Critical_Freqs

Frequency (MHz)	MaxPeak (dBµV)	Average (dBµV)	Limit (dBµV)	Margin (dB)	Line	Corr. (dB)
0.165500	57.43	---	64.96	7.53	L1	9.7
0.221500	50.64	---	62.60	11.96	L1	9.7
0.286000	44.64	---	60.64	16.00	L1	9.7
1.378000	30.31	---	56.00	25.69	L1	9.7
4.802000	34.98	---	56.00	21.02	L1	9.8
20.673500	41.19	---	60.00	18.81	L1	10.2

Final_Result

Frequency (MHz)	QuasiPeak (dBµV)	Average (dBµV)	Limit (dBµV)	Margin (dB)	Line	Corr. (dB)
0.165500	---	35.21	55.18	19.97	L1	9.7
0.165500	53.65	---	65.18	11.53	L1	9.7
0.221500	---	29.10	52.76	23.66	L1	9.7
0.221500	47.97	---	62.76	14.79	L1	9.7
20.673500	---	32.07	50.00	17.93	L1	10.2
20.673500	37.26	---	60.00	22.74	L1	10.2

Product Type : Bluetooth Earphone
 M/N : MUSE 5
 Operating Condition : Charging & TX
 Test Specification : Neutral
 Comment : AC 120V/60Hz



Critical_Freqs

Frequency (MHz)	MaxPeak (dBµV)	Average (dBµV)	Limit (dBµV)	Margin (dB)	Line	Corr. (dB)
0.158500	55.90	---	65.78	9.88	N	9.6
0.205500	49.92	---	63.37	13.45	N	9.6
0.342000	38.80	---	59.15	20.36	N	9.7
3.802000	31.87	---	56.00	24.13	N	9.8
5.658000	33.08	---	60.00	26.92	N	9.8
19.129500	40.37	---	60.00	19.63	N	10.1

Final_Result

Frequency (MHz)	QuasiPeak (dBµV)	Average (dBµV)	Limit (dBµV)	Margin (dB)	Line	Corr. (dB)
0.158500	---	33.51	55.54	22.03	N	9.6
0.158500	52.57	---	65.54	12.97	N	9.6
0.205500	---	25.76	53.39	27.63	N	9.6
0.205500	46.21	---	63.39	17.18	N	9.6
19.129500	---	27.39	50.00	22.61	N	10.1
19.129500	33.57	---	60.00	26.43	N	10.1

9.2 Conducted peak output power

Test Method

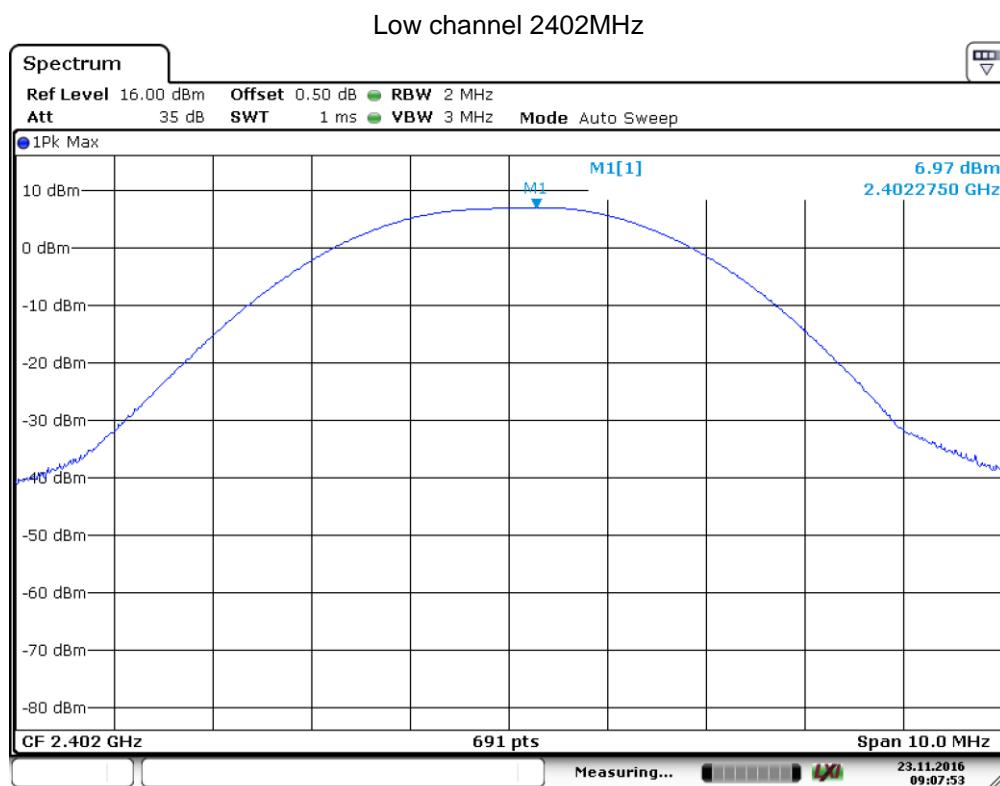
1. Use the following spectrum analyzer settings:
RBW > the 6 dB bandwidth of the emission being measured, $VBW \geq 3RBW$, $Span \geq 3RBW$
Sweep = auto, Detector function = peak, Trace = max hold.
2. Add a correction factor to the display.
3. Allow the trace to stabilize. Use the marker-to-peak function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

Limits

Frequency Range MHz	Limit W	Limit dBm
2402-2480	≤ 1	≤ 30

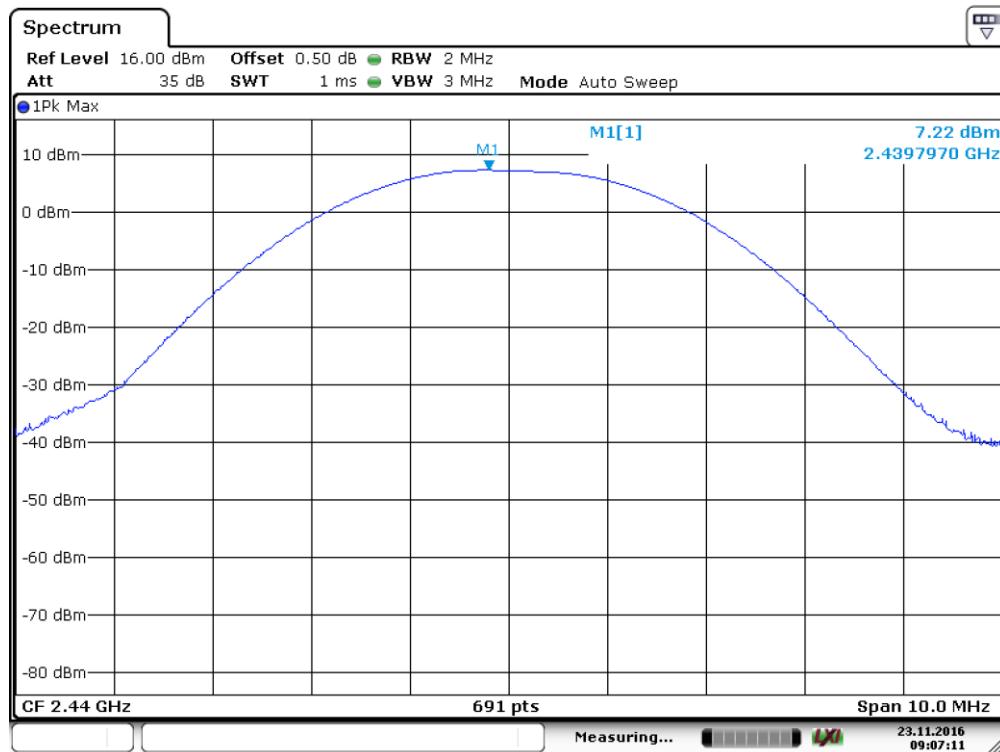
Test result as below table

Frequency MHz	Conducted Peak Output Power dBm	Result
Low channel 2402MHz	6.97	Pass
Middle channel 2440MHz	7.22	Pass
High channel 2480MHz	6.71	Pass



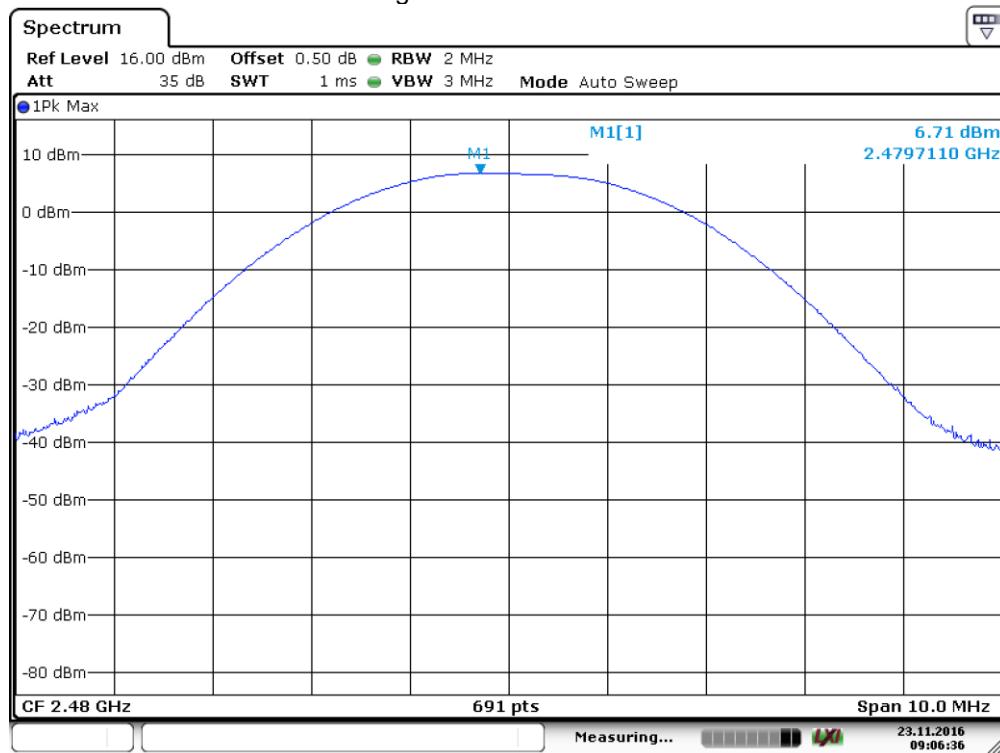
Date: 23.NOV.2016 09:07:53

Middle channel 2440MHz



Date: 23.NOV.2016 09:07:11

High channel 2480MHz



Date: 23.NOV.2016 09:06:37

9.3 6dB bandwidth and 99% Occupied 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

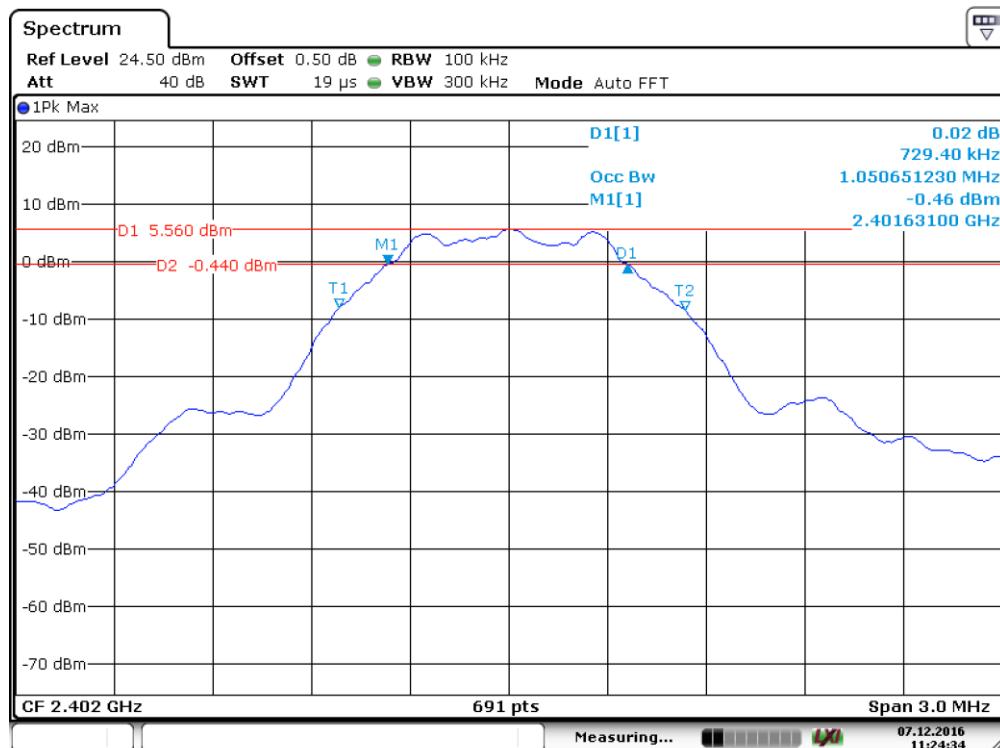
Limit [kHz]

≥ 500

Test result

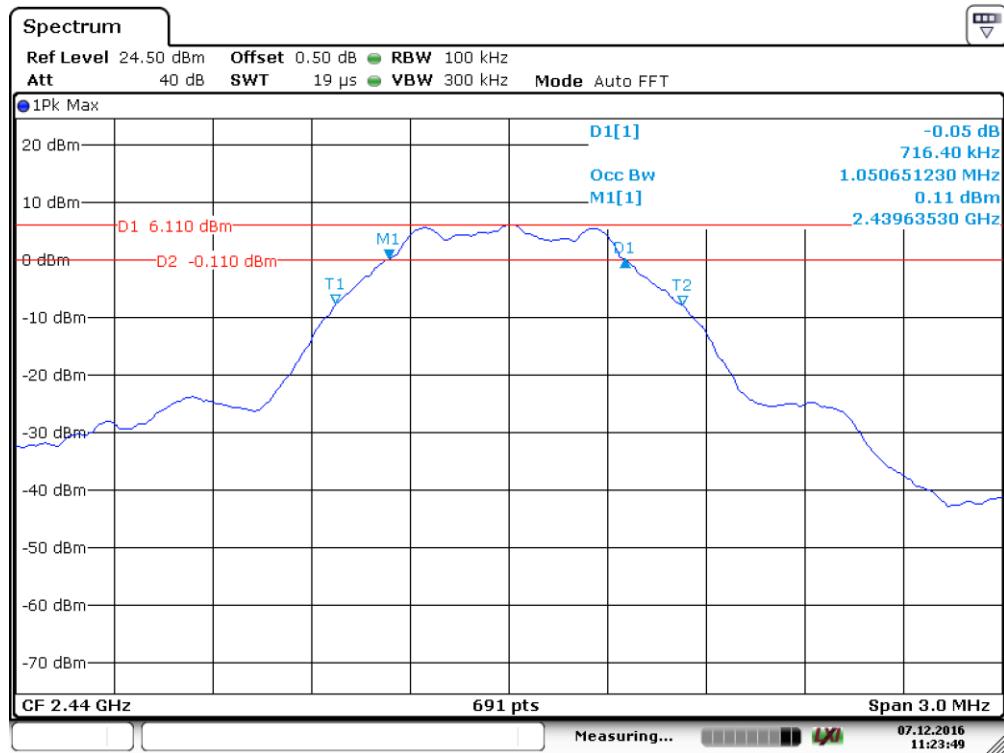
Frequency MHz	6dB bandwidth kHz	99% Bandwidth kHz	Result
Low channel 2402MHz	729.4	1050.65	Pass
Middle channel 2440MHz	716.40	1050.65	Pass
High channel 2480MHz	716.40	1050.65	Pass

Low channel 2402MHz



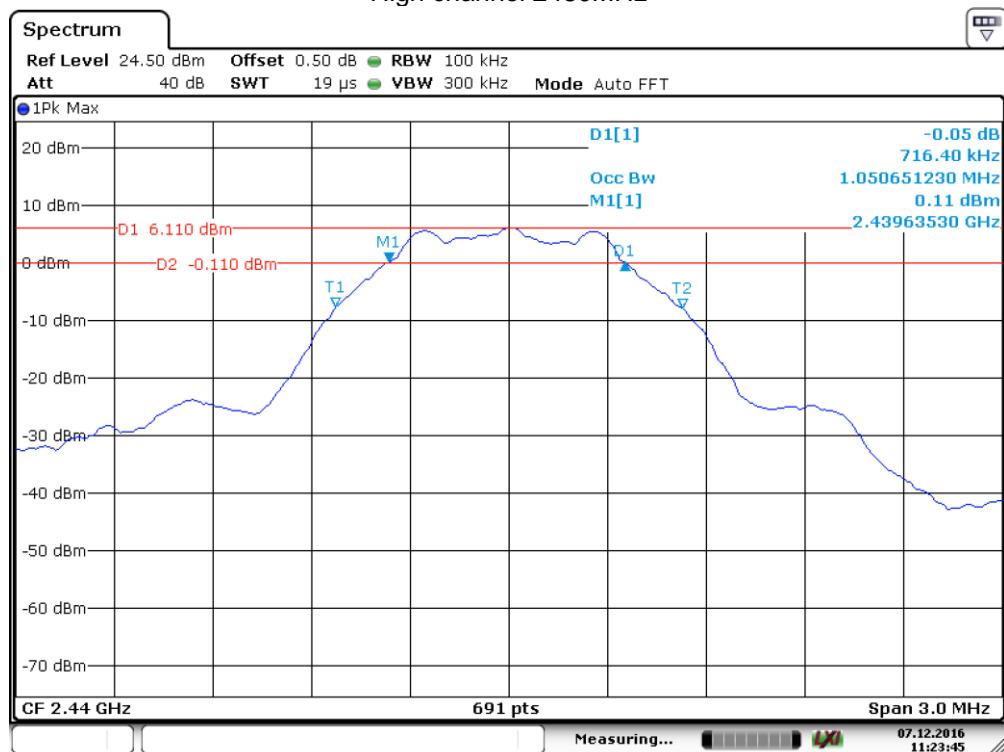
Date: 7.DEC.2016 11:24:34

Middle channel 2440MHz



Date: 7.DEC.2016 11:23:49

High channel 2480MHz



Date: 7.DEC.2016 11:23:46

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 \geq 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

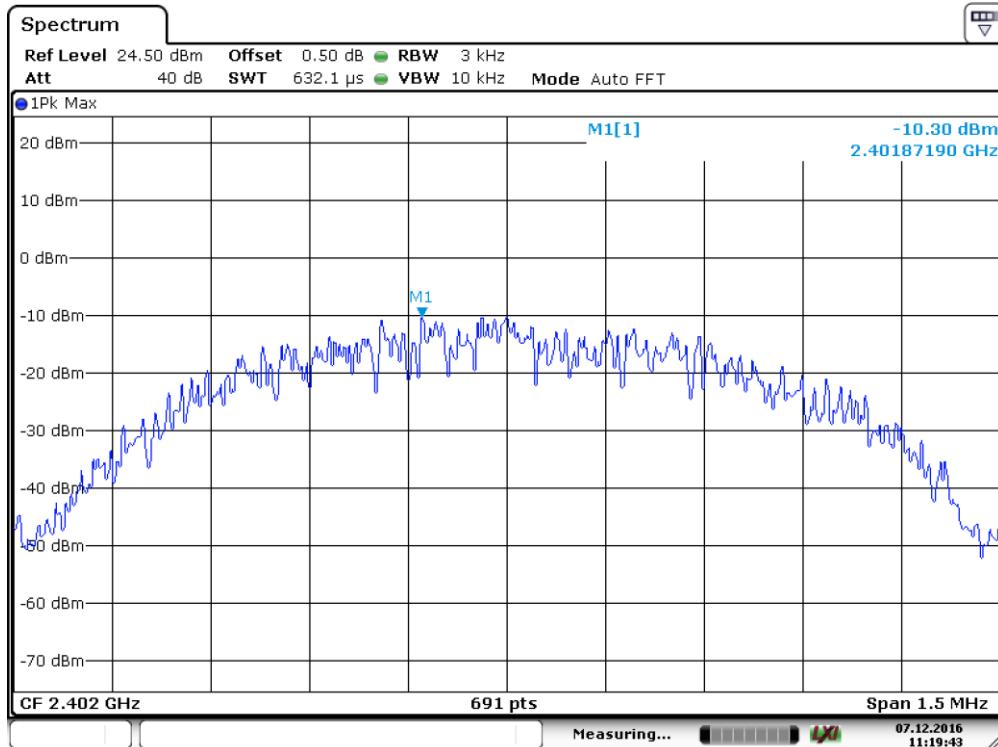
Limit [dBm]

≤ 8

Test result

Frequency MHz	Power spectral density dBm	Result
Low channel 2402MHz	-10.30	Pass
Middle channel 2440MHz	-9.51	Pass
High channel 2480MHz	-10.13	Pass

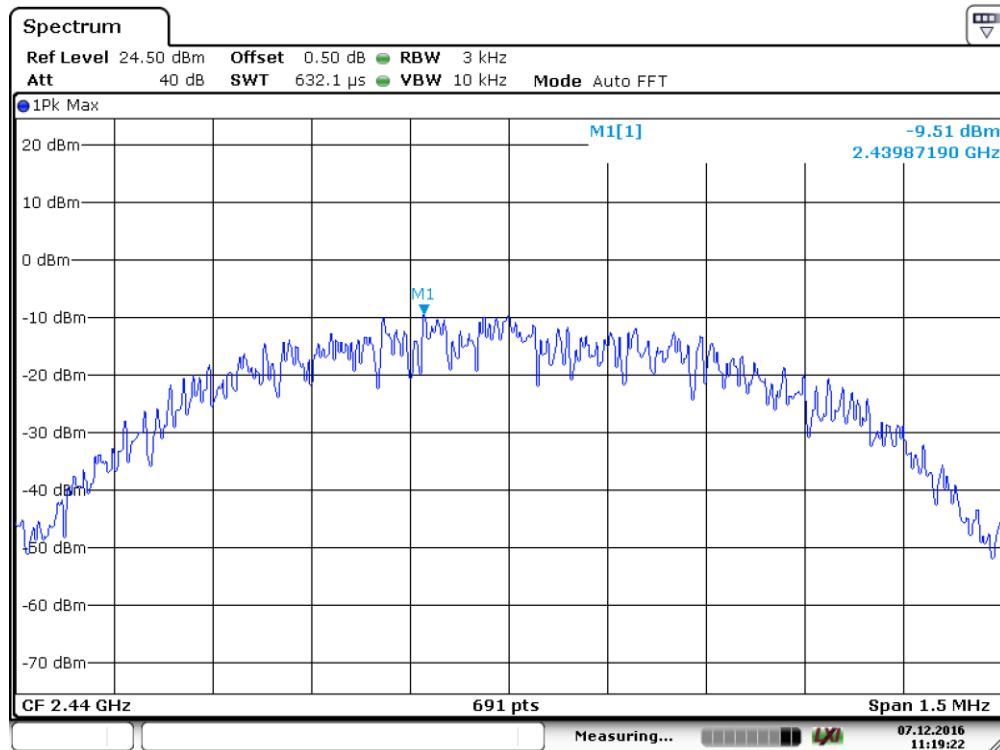
Low channel 2402MHz



Date: 7.DEC.2016 11:19:43

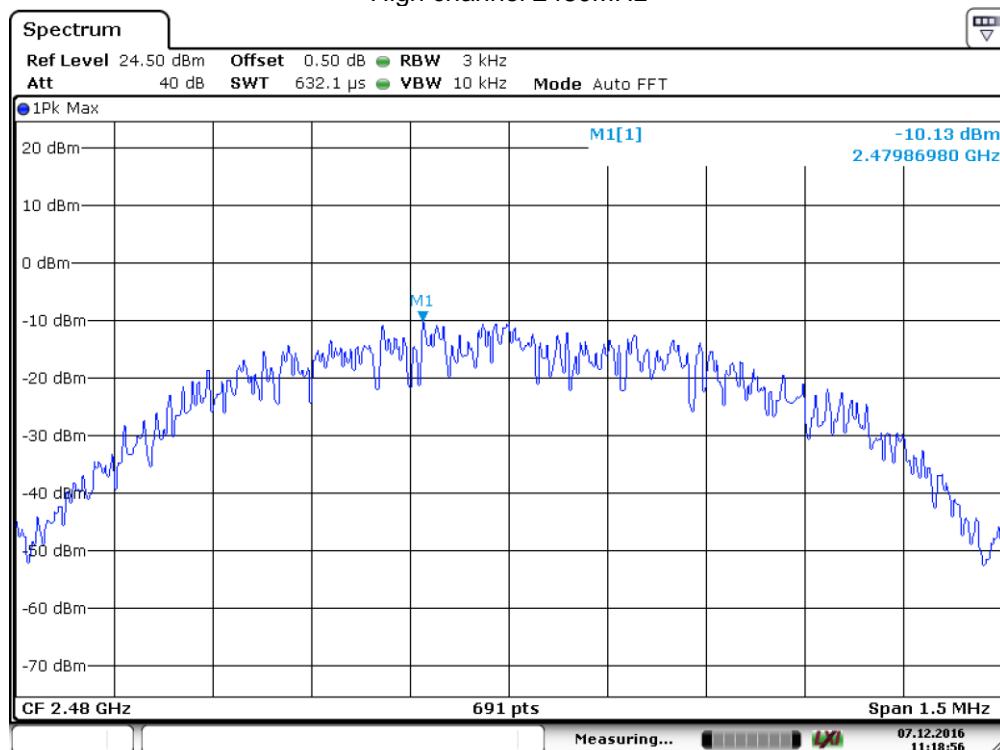


Middle channel 2440MHz



Date: 7.DEC.2016 11:19:22

High channel 2480MHz



Date: 7.DEC.2016 11:18:56

9.5 Spurious RF conducted emissions

Test Method

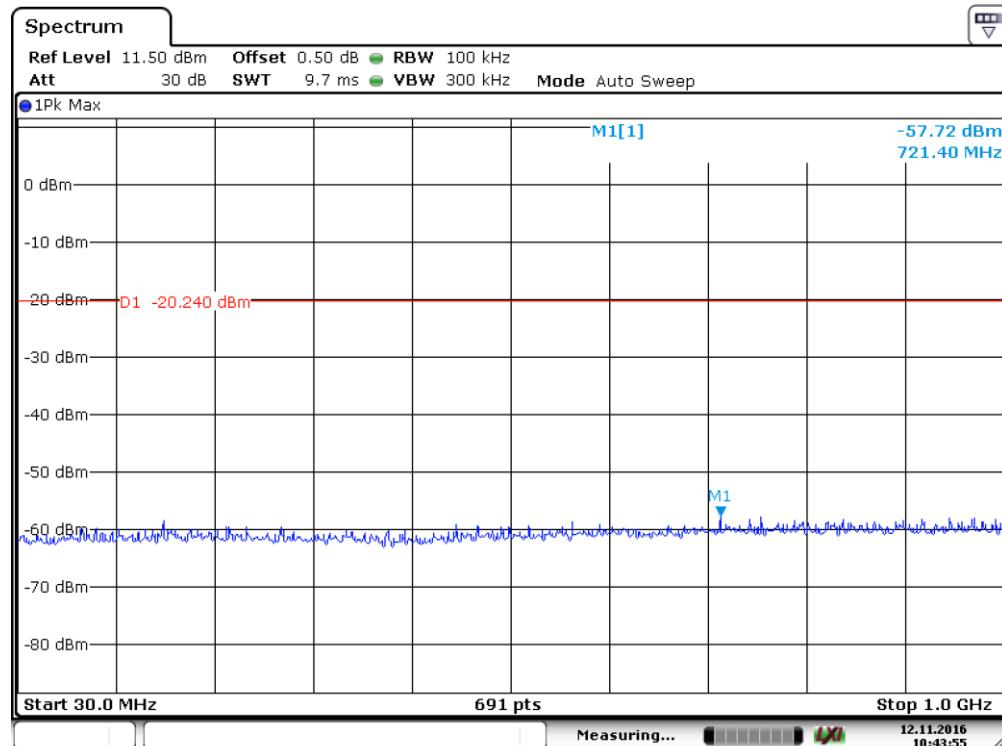
1. Establish a reference level by using the following procedure:
 - a. Set RBW=100 kHz. VBW \geq 3RBW. Detector =peak, Sweep time = auto couple, Trace mode = max hold.
 - b. Allow trace to fully stabilize, use the peak marker function to determine the maximum PSD level.
2. Use the maximum PSD level to 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

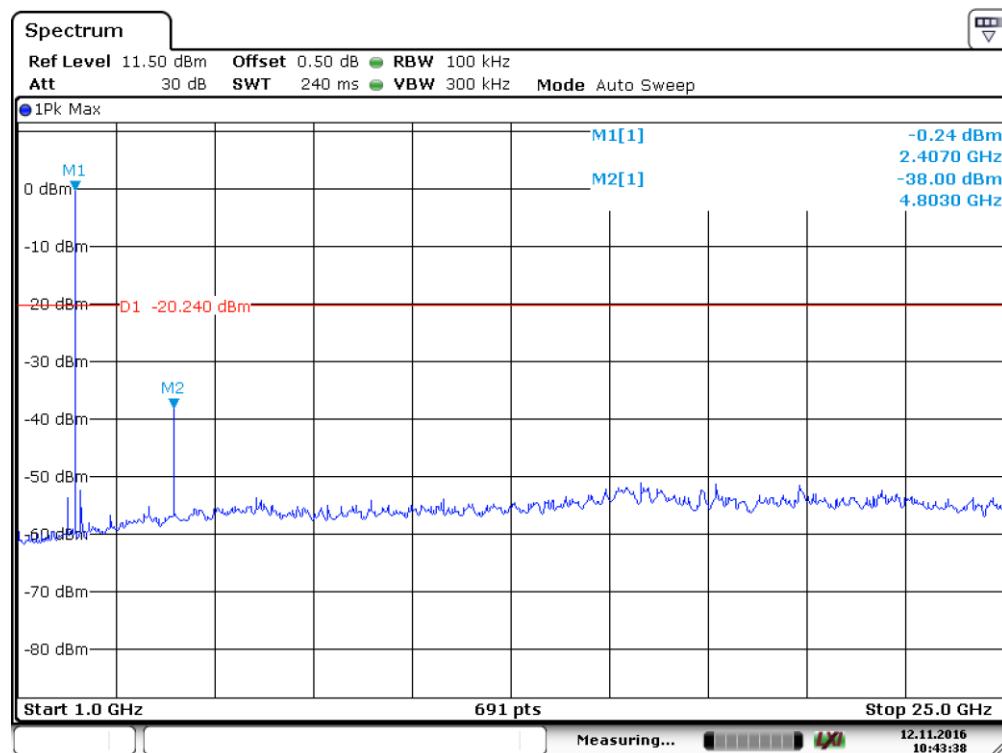
Frequency Range MHz	Limit (dBc)
30-25000	-20

Spurious RF conducted emissions

Low channel 2402MHz

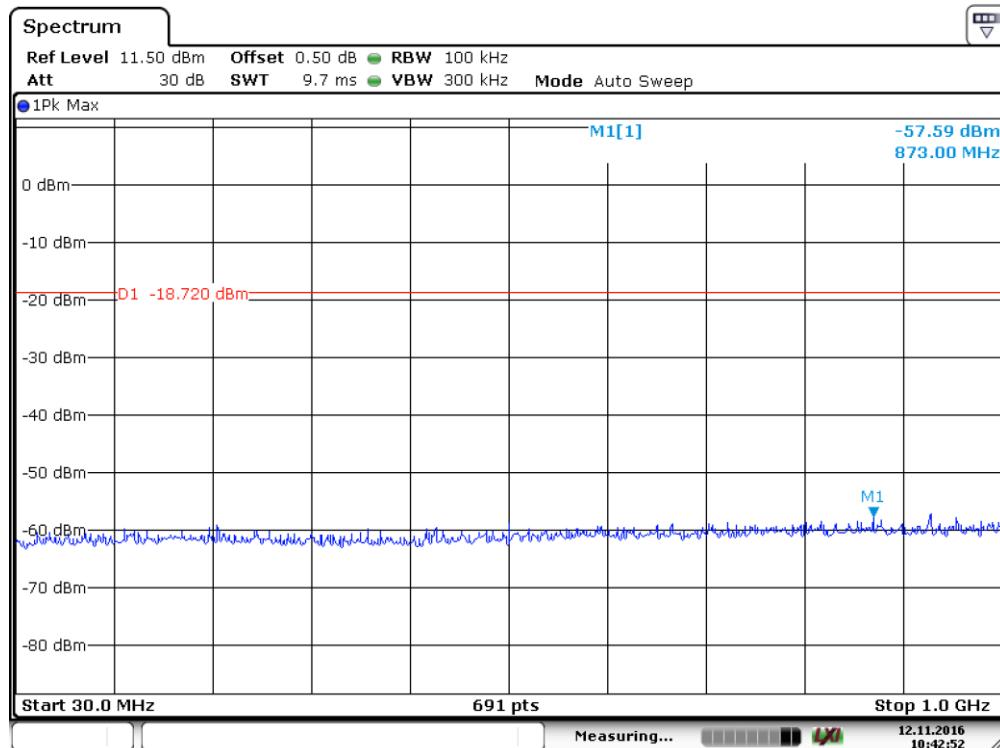


Date: 12.NOV.2016 10:43:55

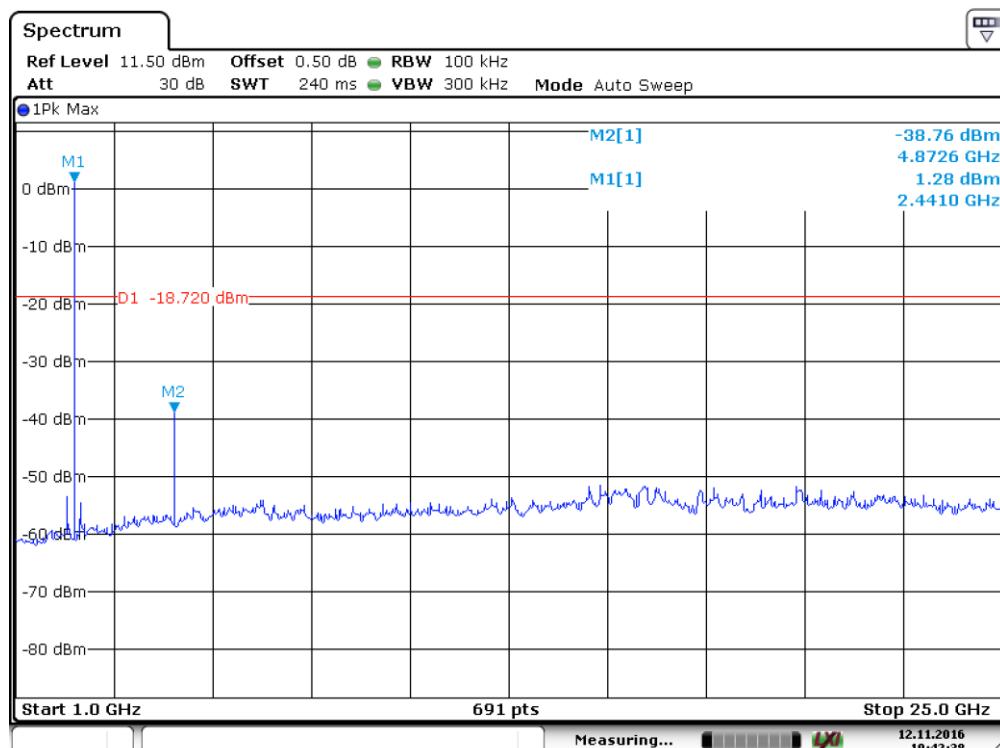


Date: 12.NOV.2016 10:43:38

Middle channel 2440MHz



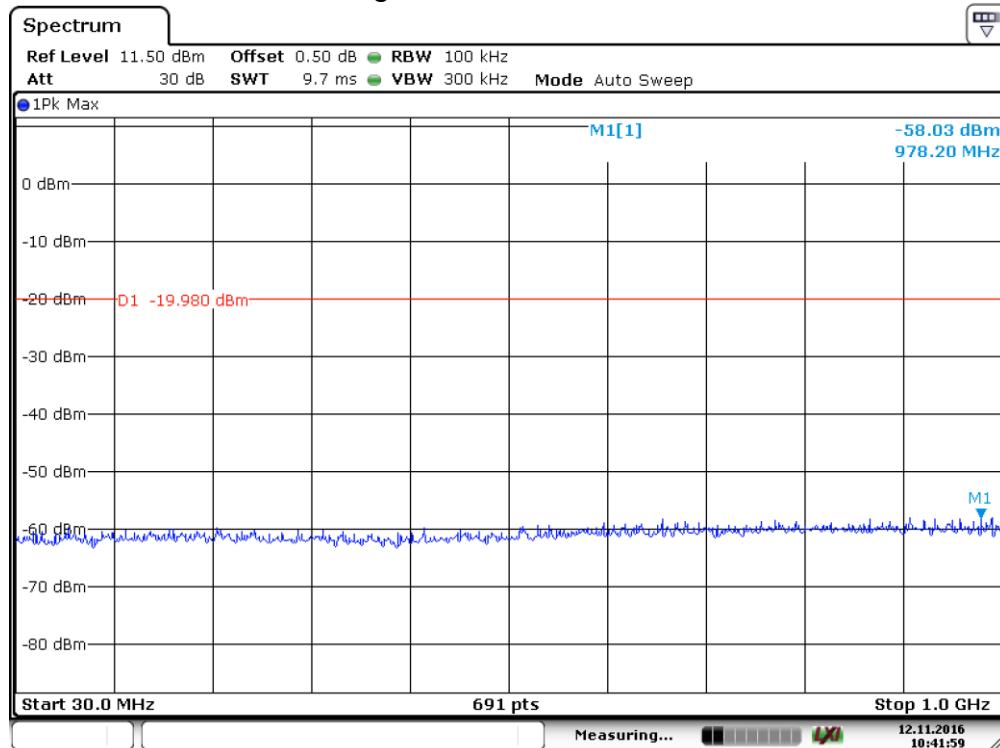
Date: 12.NOV.2016 10:42:52



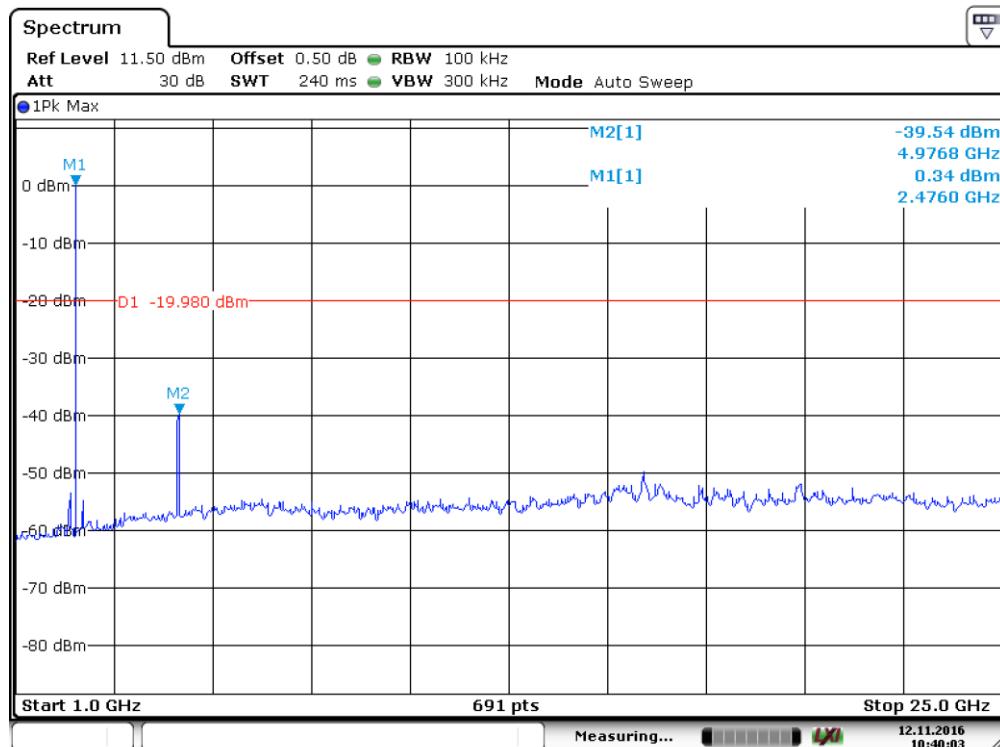
Date: 12.NOV.2016 10:42:38



High channel 2480MHz



Date: 12.NOV.2016 10:41:59



Date: 12.NOV.2016 10:40:03

9.6 Band edge

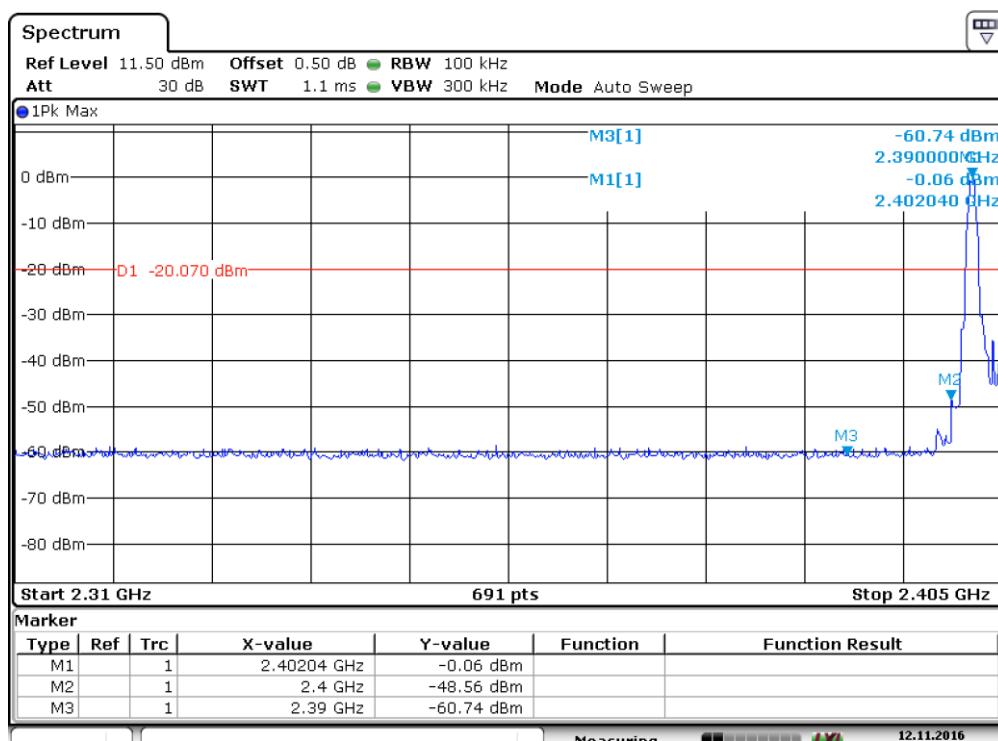
Test Method

- 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 \geq 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.

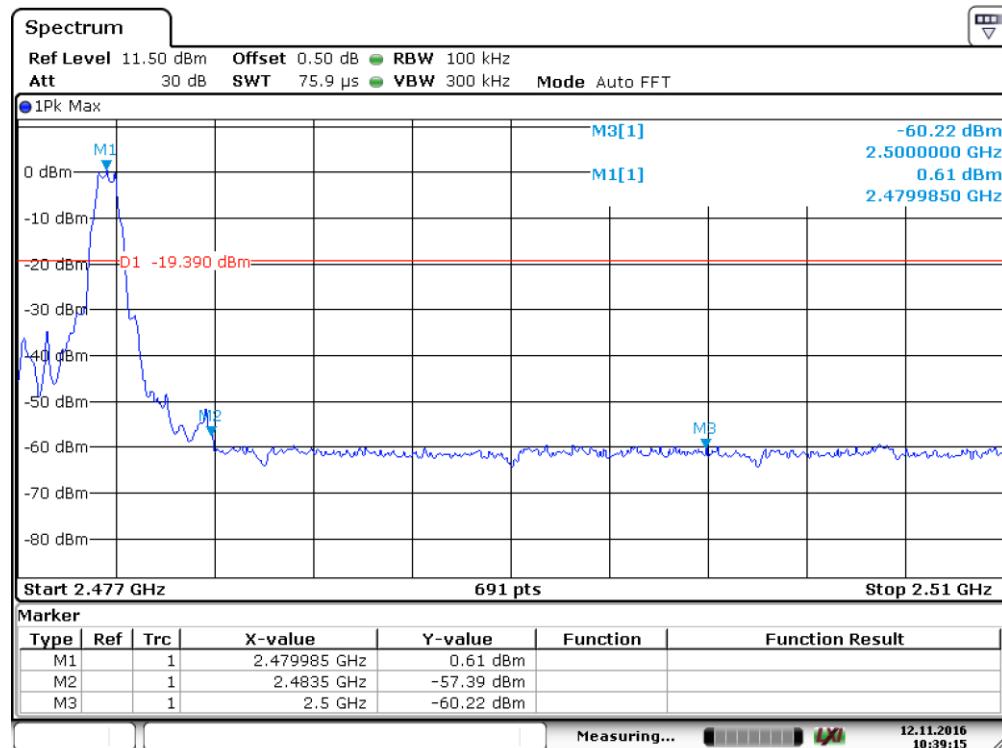
Limit

In any 100 kHz bandwidth outside the frequency bands in which the spread spectrum intentional radiator is operating, the radio frequency power that is produced by the intentional radiator 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, based on either an RF conducted or a radiated measurement, provided the transmitter demonstrates compliance with the peak conducted power limits. In addition, radiated emissions which fall in the restricted bands, as defined in §15.205(a) and RSS-Gen8.10, must also comply with the radiated emission limits specified in 15.209(a) (see Section 15.205(c)) and RSS-Gen.

Test result



Date: 12.NOV.2016 10:38:14



Date: 12.NOV.2016 10:39:15

9.7 Spurious radiated emissions for transmitter

Test Method

1. The EUT is placed on a turntable, which is 0.8m above ground plane.
2. EUT is set 3m away from the receiving antenna, which is varied from 1m to 4m to find out the highest emissions.
3. Use the following spectrum analyzer settings:
Span = wide enough to fully capture the emission being measured, RBW = 1 MHz for $f \geq 1\text{GHz}$, 100 kHz for $f < 1\text{ GHz}$, VBW \geq RBW, Sweep = auto, Detector function = peak, Trace = max hold
4. Follow the guidelines in ANSI C63.4-1992 with respect to maximizing the emission by rotating the EUT, adjusting the measurement antenna height and polarization, etc.
The peak reading of the emission, after being corrected by the antenna factor, cable loss, pre-amp gain, etc., is the peak field strength, submit this data. Each emission was to be maximized by changing the polarization of receiving antenna both horizontal and vertical.
5. Set the VBW to 10 Hz, while maintaining all of the other instrument settings. This peak level, once corrected, must comply with the limit specified in Section 15.209. If the duty cycle per channel of the hopping signal is less than 100 ms, then the reading obtained with the 10 Hz VBW may be further adjusted by a “duty cycle correction factor”, derived from $20\log(\text{duty cycle}/100\text{ ms})$, in an effort to demonstrate compliance with the 15.209 limit. Submit this data.

Limit

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 dB μ V/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:

Low channel 2402MHz Test Result

Frequency Band	Frequency	Emission Level	Polarization	Limit	Detector	Margin	Result
	MHz	dB μ V/m		dB μ V/m		dB μ V/m	
30-1000MHz	955.65	33.85	H	46	QP	12.15	Pass
	921.27	34.32	V	46	QP	11.68	Pass
1000-25000MHz	4804.22	46.30	H	74	PK	27.70	Pass
	--	--	H	54	AV	--	Pass
	4803.28	47.74	V	74	PK	26.26	Pass
	--	--	V	54	AV	--	Pass

Middle channel 2440MHz Test Result

Frequency Band	Frequency	Emission Level	Polarization	Limit	Detector	Margin	Result
	MHz	dB μ V/m		dB μ V/m		dB μ V/m	
30-1000MHz	--	--	H	43.5	QP	--	Pass
	--	--	H	46	QP	--	Pass
1000-25000MHz	12576.1	44.44	H	74	PK	29.56	Pass
	--	--	H	54	AV	--	Pass
	4879.22	46.21	V	74	PK	27.79	Pass
	--	--	V	54	AV	--	Pass

High channel 2480MHz Test Result

Frequency Band	Frequency	Emission Level	Polarization	Limit	Detector	Margin	Result
	MHz	dB μ V/m		dB μ V/m		dB μ V/m	
30-1000MHz	--	--	H	43.5	QP	--	Pass
	--	--	H	46	QP	--	Pass
1000-25000MHz	4959.38	45.12	H	74	PK	28.88	Pass
	--	--	H	54	AV	--	Pass
	15033.75	47.95	V	74	PK	26.05	Pass
	--	--	V	54	AV	--	Pass

Remark:

- (1) “*” means the emission(s) appear within the restrict bands shall follow the requirement of section 15.205.
- (2) Data of measurement within this frequency range shown “--” in the table above means the reading of emissions are the noise floor or attenuated more than 10dB below the permissible limits or the field strength is too small to be measured.

10 Test Equipment List

List of Test Instruments

	DESCRIPTION	MANUFACTURER	MODEL NO.	SERIAL NO.	CAL. DUE DATE
CE	EMI Test Receiver	Rohde & Schwarz	ESR 3	101782	2017-7-15
	LISN	Rohde & Schwarz	ENV4200	100249	2017-7-15
	LISN	Rohde & Schwarz	ENV216	100326	2017-7-15
	ISN	Rohde & Schwarz	ENY81	100177	2017-7-15
	ISN	Rohde & Schwarz	ENY81-CAT6	101664	2017-7-15
	High Voltage Probe	Rohde & Schwarz	TK9420(VT9 420)	9420-58	2017-7-15
	RF Current probe	Rohde & Schwarz	EZ-17	100816	2017-7-15
C	Signal Generator	Rohde & Schwarz	SMB100A	108272	2017-7-15
	Signal Analyzer	Rohde & Schwarz	FSV40	101030	2017-7-15
	Vector Signal Generator	Rohde & Schwarz	SMU 200A	105324	2017-7-15
	RF Switch Module	Rohde & Schwarz	OSP120/OS P-B157	101226/10085 1	2017-7-15
RE	EMI Test Receiver	Rohde & Schwarz	ESR 26	101269	2017-7-15
	Trilog Super Broadband Test Antenna	Schwarzbeck	VULB 9163	707	2017-8-3
	Horn Antenna	Rohde & Schwarz	HF907	102294	2017-7-15
	Pre-amplifier	Rohde & Schwarz	SCU 18	102230	2017-7-15
	3m Semi-anechoic chamber	TDK	9X6X6	----	2019-5-29

C - Conducted RF tests

- Conducted peak output power
- 6dB bandwidth and 99% Occupied Bandwidth
- Power spectral density*
- Spurious RF conducted emissions
- Band edge

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	
Items	Extended Uncertainty
Uncertainty for Radiated Emission in 3m chamber 30MHz-1000MHz	Horizontal: 4.83dB; Vertical: 4.91dB;
Uncertainty for Radiated Emission in 3m chamber 1000MHz-18000MHz	Horizontal: 4.89dB; Vertical: 4.88dB;
Uncertainty for Conducted RF test with TS 8997	2.04dB