

FCC- TEST REPORT

Report Number : **68.930.16.015.01** Date of Issue: **July 12, 2016**

Model : **COM-DEX Remote MIC**

Product Type : **COM-DEX Remote MIC**

Applicant : **Widex A/S**

Address : **Nymoellevej 6, DK-3540 Lyngby, Denmark**

Production Facility : **Widex A/S**

Address : **Nymoellevej 6, DK-3540 Lyngby, Denmark**

Test Result : ☒ **Positive** ☐ **Negative**

Total pages including
Appendices : **24**

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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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3 Description of the Equipment under Test

Description of the Equipment Under Test

Product:	COM-DEX Remote MIC
Model no.:	COM-DEX Remote MIC
Brand Name:	Widex
FCC ID:	TTY-CDRM
Options and accessories:	NIL
Rating:	DC 3.7V by Li-ion Battery
RF Transmission Frequency:	2402-2480MHz
No. of Operated Channel:	40
Modulation:	GFSK
Antenna Type:	Integral Antenna
Antenna Gain:	-0.15dBi
Description of the EUT:	The Equipment Under Test (EUT) is a Bluetooth Low Energy Module operated at 2.4GHz

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

All the test methods were according to KDB558074 D01 DTS Meas Guidance v03r02 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	Conducted emission AC power port	---	---	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
§15.247 (b) (1)	Conducted peak output power	10	Site 1	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
§15.247(a)(1)	20dB bandwidth	---	---	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
§15.247(a)(1)	Carrier frequency separation	---	---	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
§15.247(a)(1)(iii)	Number of hopping frequencies	---	---	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
§15.247(a)(1)(iii)	Dwell Time	---	---	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
§15.247(a)(2)	6dB bandwidth	11	Site 1	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
§15.247(e)	Power spectral density	13	Site 1	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
§15.247(d)	Spurious RF conducted emissions	14	Site 1	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
§15.247(d)	Band edge	18	Site 1	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
§15.247(d) & §15.209	Spurious radiated emissions for transmitter	20	Site 1	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
§15.203	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 -0.15dBi. 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: TTY-CDRM complies with Section 15.207, 15.209, 15.247 of the FCC Part 15, Subpart C Rules.

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: June 24, 2016

Testing Start Date: June 26, 2016

Testing End Date: July 4, 2016

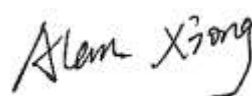
- TÜV SÜD Certification and Testing (China) Co., Ltd. Shenzhen Branch-

Reviewed by:

Prepared by:



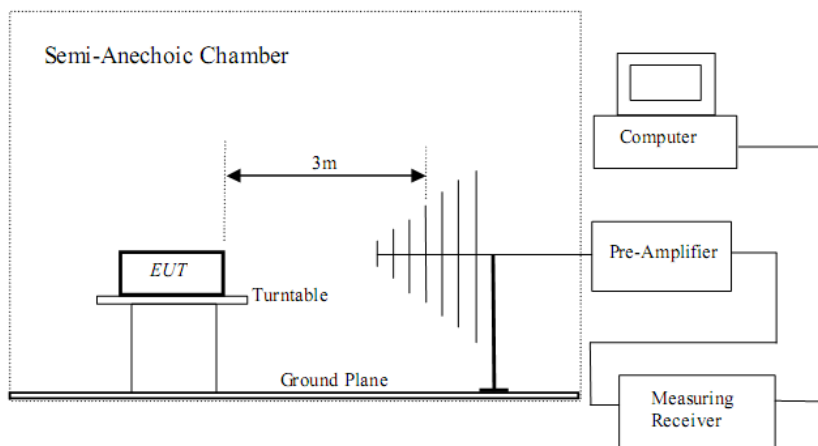
John Zhi
EMC Project Manager



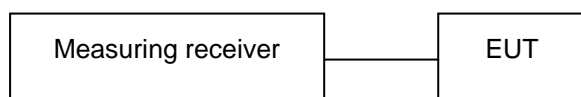
Alan Xiong
EMC Project Engineer

7 Test Setups

7.1 Radiated test setups



7.2 Conducted RF test setups



8 Systems test configuration

Auxiliary Equipment Used during Test:

DESCRIPTION	MANUFACTURER	MODEL NO.(SHIELD)	S/N(LENGTH)
Notebook	Lenovo	X240	---

Test software: Bluetest 3, which used to control the EUT in continues transmitting mode

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 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), 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	-1.00	Pass
Middle channel 2440MHz	1.87	Pass
High channel 2480MHz	1.57	Pass

9.2 6dB 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), 6dB bandwidth limit as below:

Limit [kHz]

≥ 500

Test result

Frequency MHz	6dB bandwidth kHz	Result
Low channel 2402MHz	707.7	Pass
Middle channel 2440MHz	699.0	Pass
High channel 2480MHz	699.0	Pass

2402MHz



2440MHz



2480MHz



9.3 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), power spectral density limit as below:

Limit [dBm]

≤8

Test result

Frequency MHz	Power spectral density dBm	Result
Low channel 2402MHz	-17.00	Pass
Middle channel 2440MHz	-13.93	Pass
High channel 2480MHz	-13.60	Pass

9.4 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.

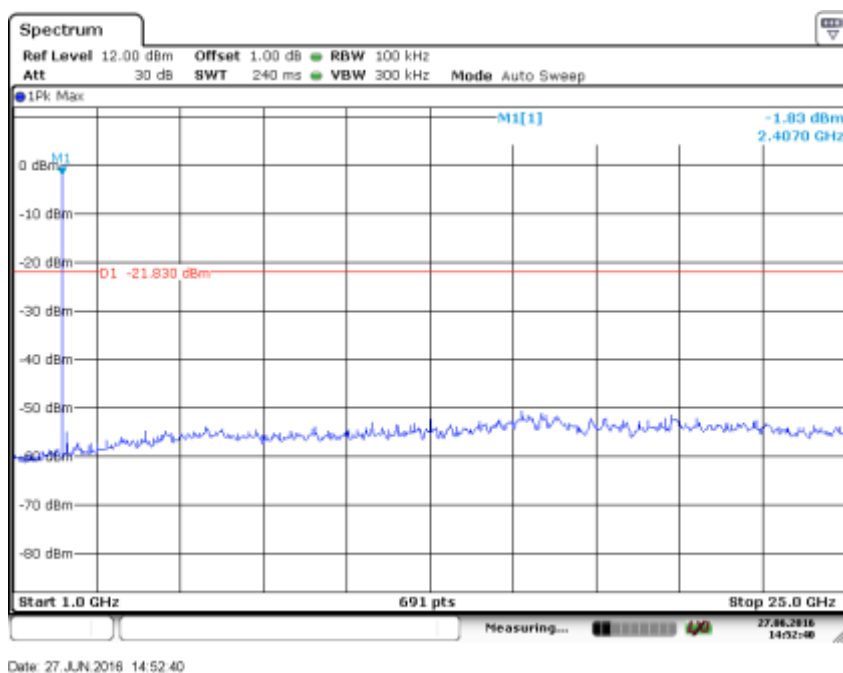
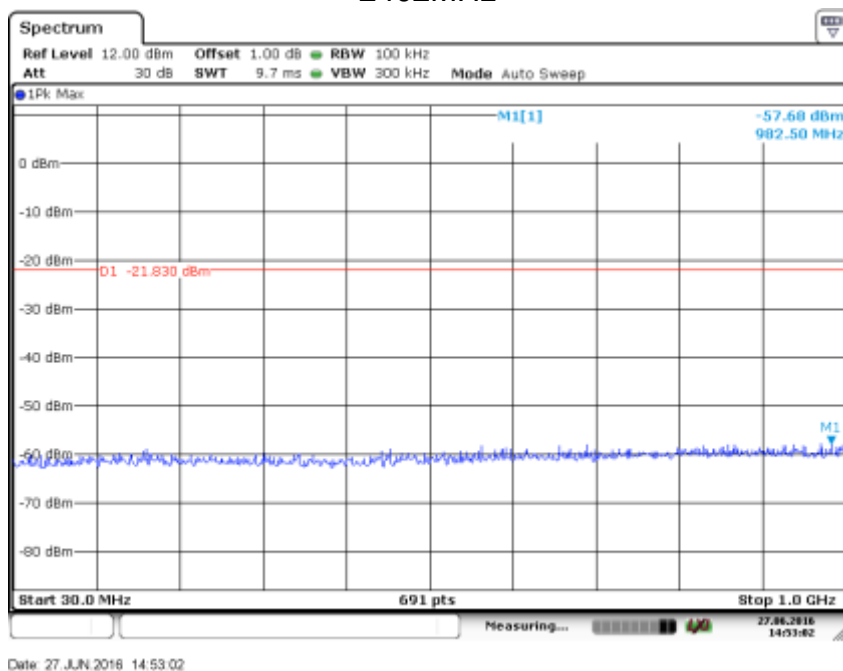
Limit

According to §15.247 (d), spurious RF conducted emissions limit as below:

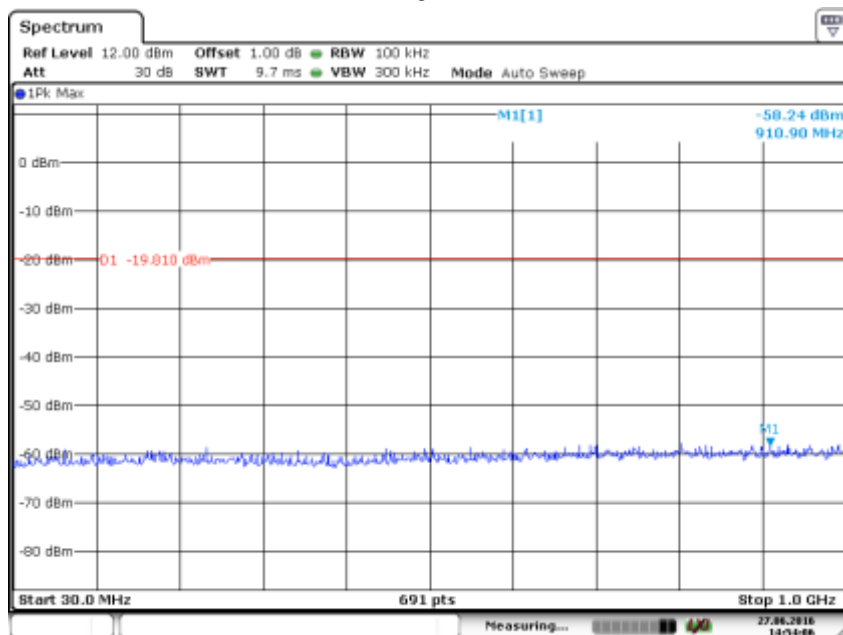
Frequency Range MHz	Limit (dBc)
30-25000	-20

Spurious RF conducted emissions

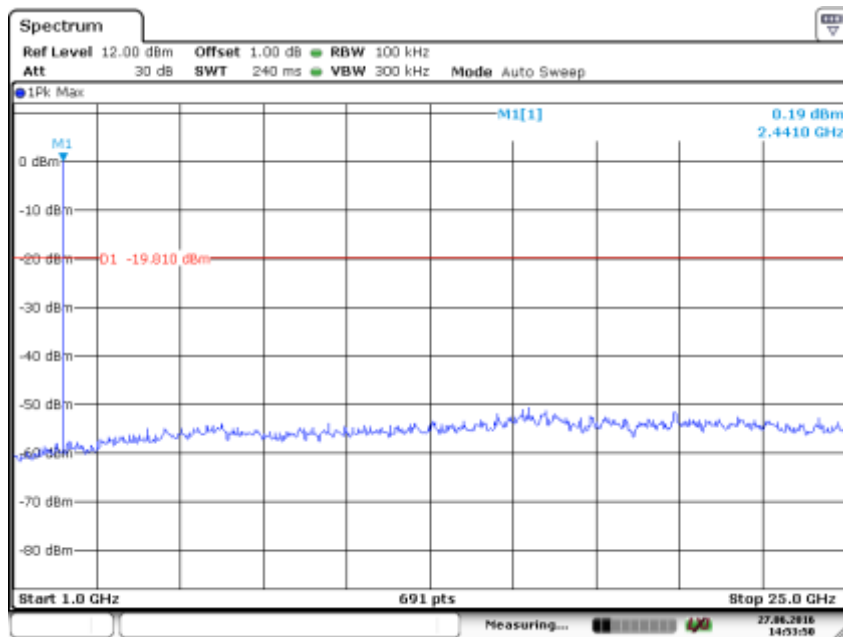
2402MHz



2440MHz

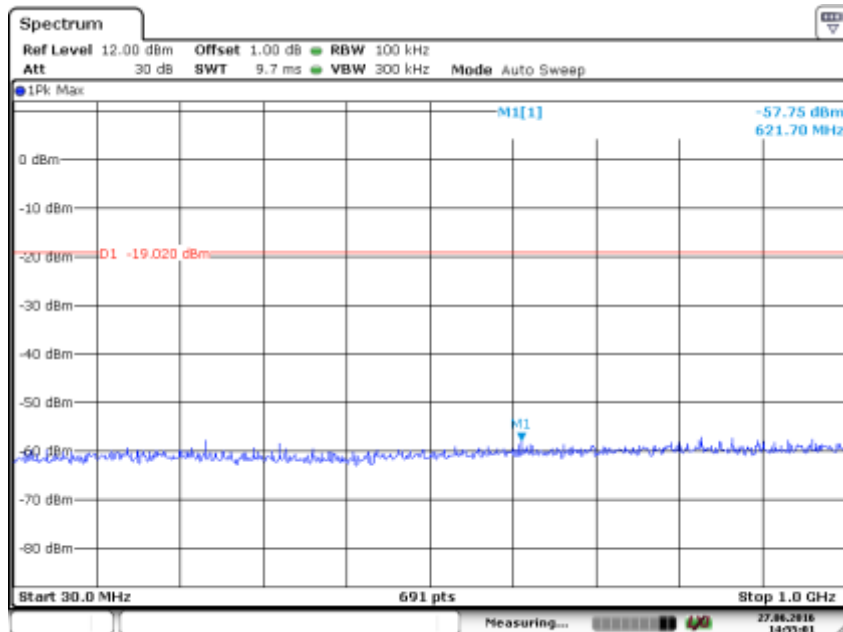


Date: 27 JUN 2016 14:54:06

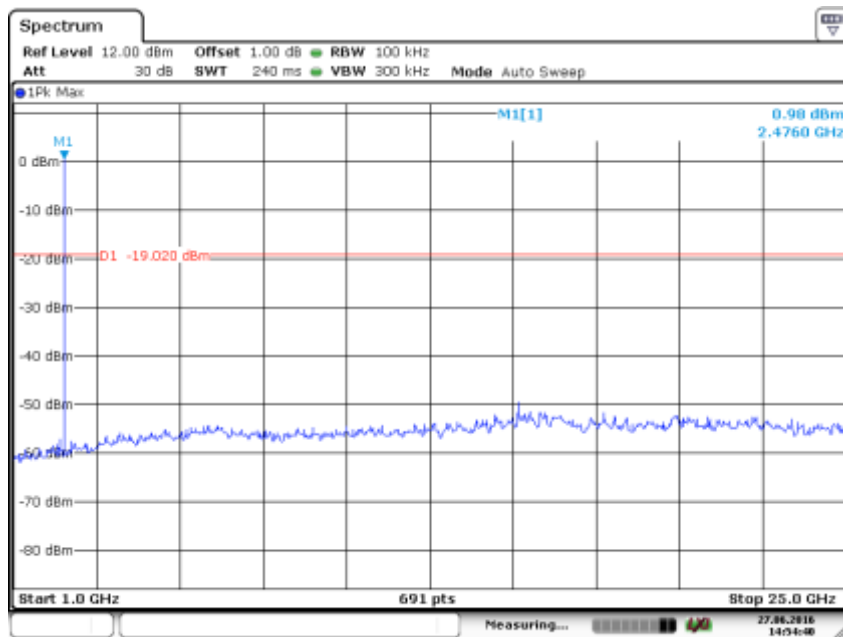


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2480MHz



Date: 27 JUN 2016 14:55:01



Date: 27 JUN 2016 14:54:40

9.5 Band edge

Test Method

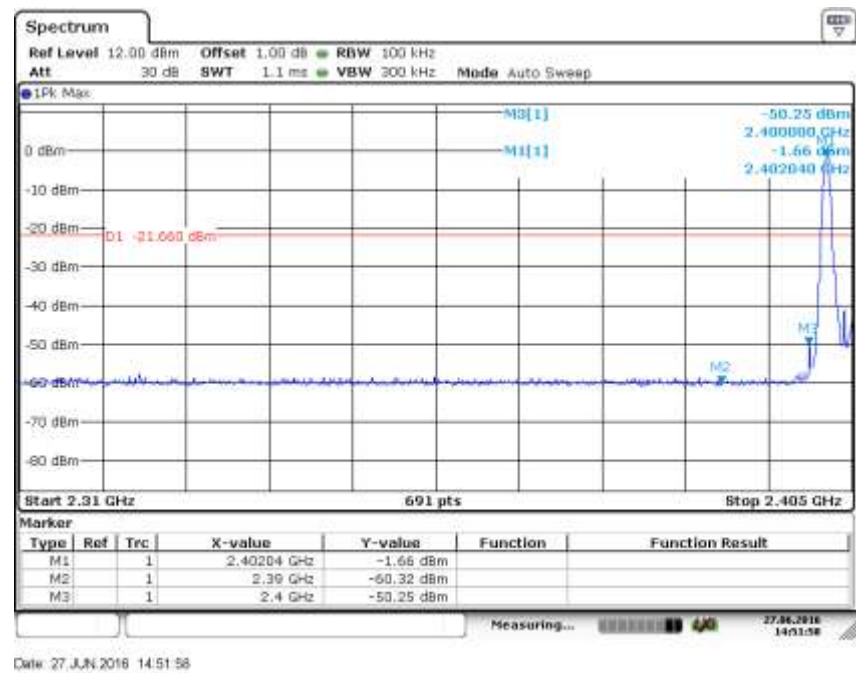
- 1 Use the following spectrum analyzer settings:
Span = wide enough to capture the peak level of the in-band emission and all spurious
RBW = 100 kHz, VBW ≥ RBW, Sweep = auto, Detector function = peak, Trace = max hold.
- 2 Allow the trace to stabilize, use the peak and delta measurement to record the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

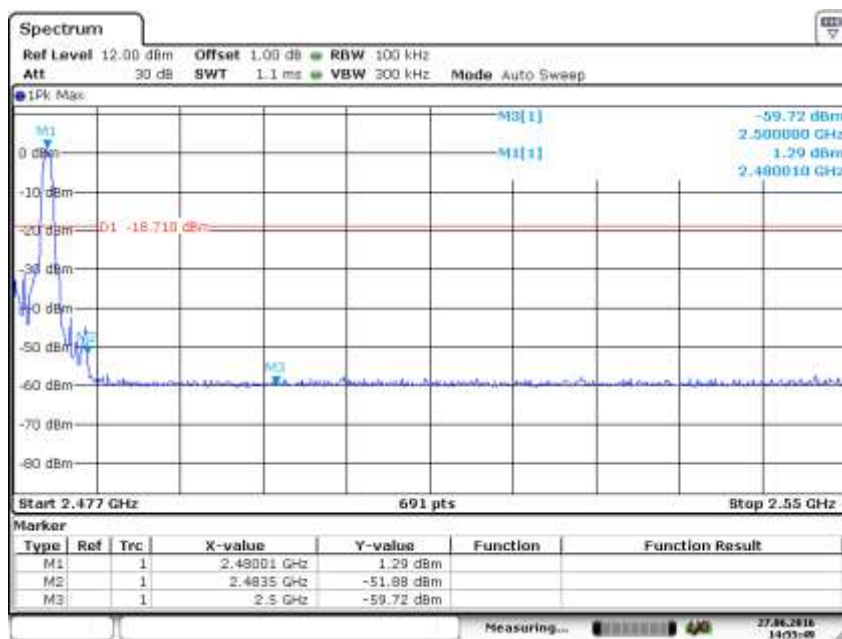
Limit

According to §15.247 (d), band edge limit as below:

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

Test result





Date: 27 JUN 2016 14:55:49

9.6 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 ≥ 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 ≥ 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 ($20\log(1/\text{duty cycle})$).
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), 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 MHz	Emission Level dBuV/m	Polarization	Limit dBuV/m	Detector	Margin dBuV/m	Result
33.72	19.47	Horizontal	40.00	QP	20.53	Pass
44.93	25.18	Horizontal	40.00	QP	14.82	Pass
275.79	21.81	Horizontal	46.00	QP	24.19	Pass
887.48	33.30	Horizontal	46.00	QP	12.70	Pass
33.72	21.14	Vertical	40.00	QP	18.86	Pass
43.80	23.45	Vertical	40.00	QP	16.55	Pass
871.10	29.99	Vertical	46.00	QP	16.01	Pass
1000-12750	--	Horizontal	74	PK	--	Pass
1000-12750	--	Vertical	74	PK	--	Pass

2440MHz

Frequency MHz	Emission Level dBuV/m	Polarization	Limit dBuV/m	Detector	Margin dBuV/m	Result
1000-12750	--	Horizontal	74	PK	--	Pass
1000-12750	--	Vertical	74	PK	--	Pass

2480MHz

Frequency MHz	Emission Level dBuV/m	Polarization	Limit dBuV/m	Detector	Margin dBuV/m	Result
1000-12750	--	Horizontal	74	PK	--	Pass
1000-12750	--	Vertical	74	PK	--	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

List of Test Instruments

DESCRIPTION	MANUFACTURER	MODEL NO.	SERIAL NO.	CAL. DUE DATE
EMI Test Receiver	Rohde & Schwarz	ESR 26	101269	2016-7-24
Trilog Super Broadband Test Antenna	Schwarzbeck	VULB 9163	707	2016-8-14
Horn Antenna	Rohde & Schwarz	HF907	102294	2016-7-24
Pre-amplifier	Rohde & Schwarz	SCU 18	102230	2016-7-24
3m Semi-anechoic chamber	TDK	9X6X6	----	2019-5-29

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

System Measurement Uncertainty	
Test 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-26000MHz	Horizontal: 4.89dB; Vertical: 4.88dB;
Conducted RF test	Power level test involved: 2.04dB Frequency test involved: 1.1×10^{-7}