

FCC- TEST REPORT

Report Number : **68.910.15.007.01** Date of Issue: Apr 07, 2015

Model : RFM100

Product Type : Sleep and Fitness Tracker

Applicant : JAB Distributors, LLC DBA Protect-A-Bed

Address : 1500 S Wolf Rd, Wheeling, Illinois, United States

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

Total pages including
Appendices : 26

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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:	Sleep and Fitness Tracker
Model no.:	RFM100
FCC ID:	2ADHT-RFM100
Options and accessories:	NIL
Rating:	DC3.7V (supplied by Li-ion rechargeable battery) DC5V (charged by USB port)
RF Transmission Frequency:	2402-2480MHz
No. of Operated Channel:	40
Modulation:	GFSK
Antenna Type:	SMD Antenna
Antenna Gain:	2dBi
Description of the EUT:	The Equipment Under Test (EUT) is a Sleep and Fitness Tracker with Bluetooth 4.0 function operating at 2.4 GHz.

4 Summary of Test Standards

Test Standards	
FCC Part 15 Subpart C 10-1-14 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 (2013).

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	10	---	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
§15.247 (b) (1) Conducted peak output power	13	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	14	Site 1	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
§15.247(e) Power spectral density	16	Site 1	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
§15.247(d) Spurious RF conducted emissions	17	Site 1	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
§15.247(d) Band edge	21	Site 1	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
§15.247(d) & §15.209 Spurious radiated emissions for transmitter	23	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 a permanently SMD Antenna, which gain is 2dBi. According to §15.203, 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: 2ADHT-RMF100 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: March 18, 2015

Testing Start Date: March 19, 2015

Testing End Date: April 1, 2015

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

Reviewed by:

Prepared by:

Tested by:



Phoebe Hu
EMC Project Manager



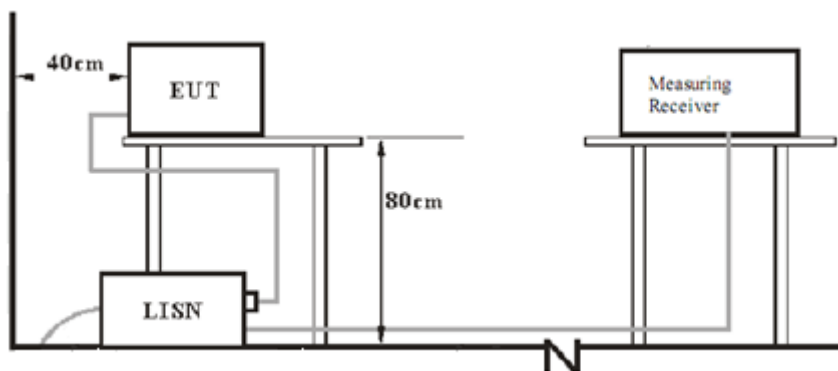
Calvin Weng
EMC Project Engineer



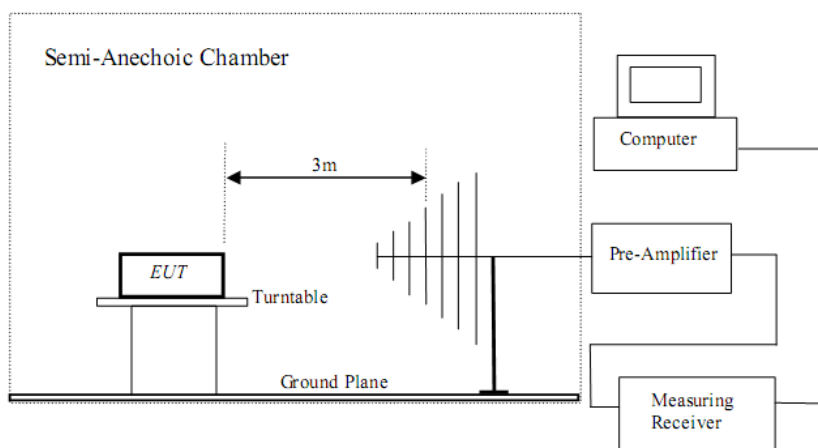
Leon Zhang
EMC Test Engineer

7 Test Setups

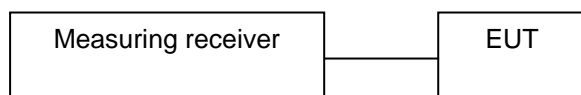
7.1 AC Power Line Conducted Emission test setups



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	X240	---

Test software: N/A.

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

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

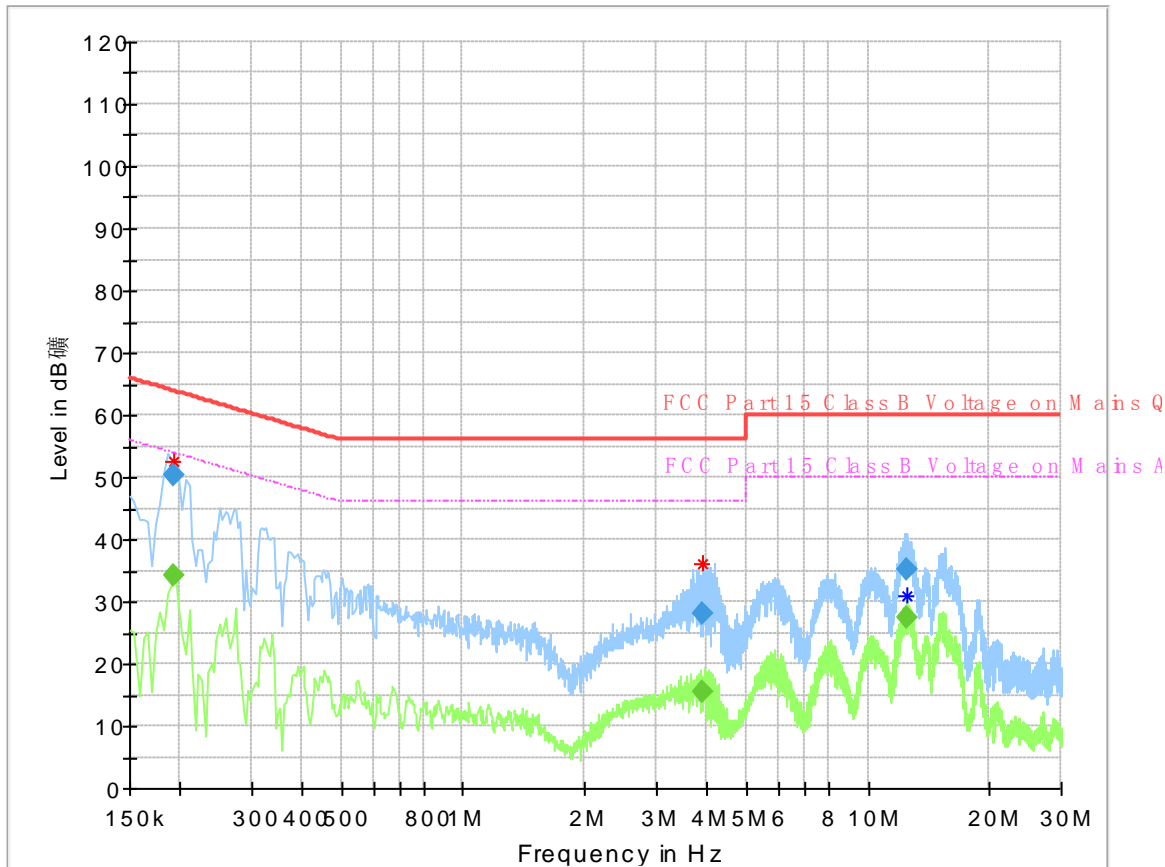
Limit

According to §15.207, 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

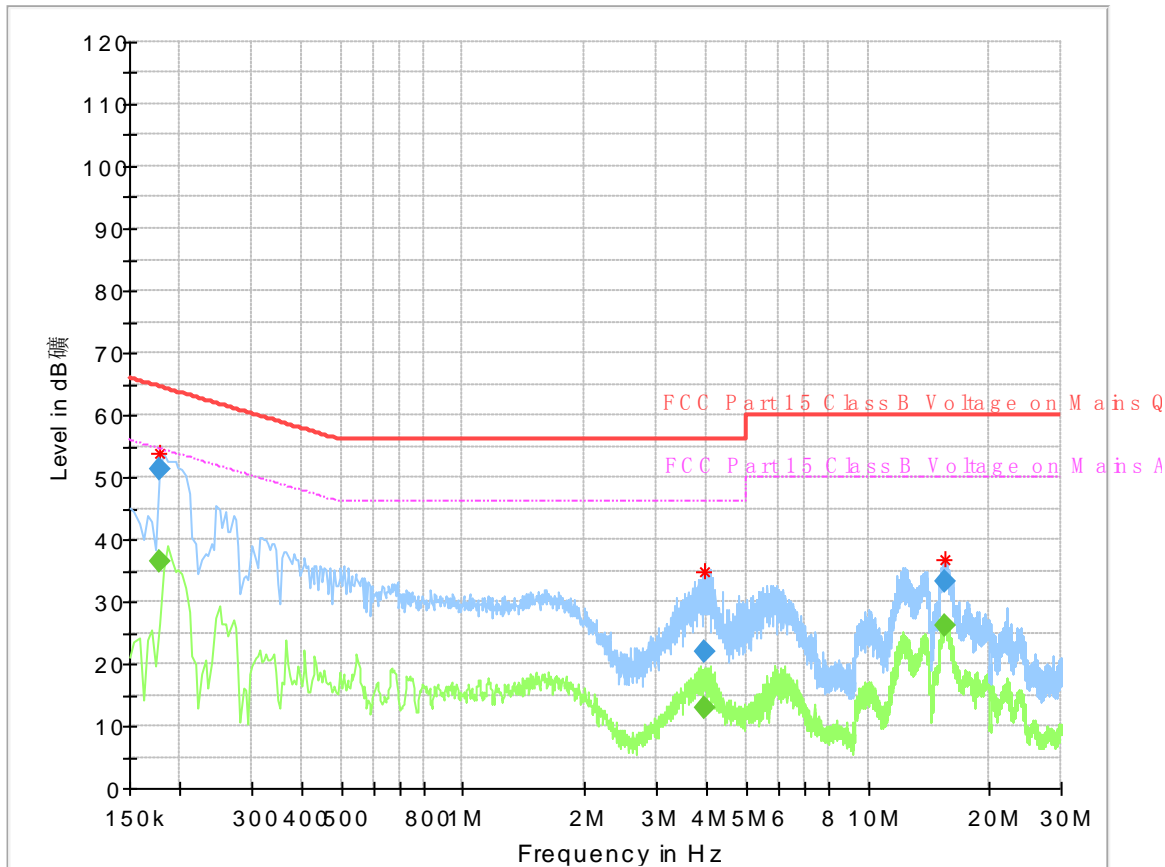
Decreasing linearly with logarithm of the frequency

Product Type : Sleep and Fitness Tracker
 M/N : RFM100
 Operating Condition : Charging & Transmitting
 Test Specification : Line
 Comment : AC 120V/60Hz



Frequency (MHz)	QuasiPeak (dBµV)	Average (dBµV)	Limit (dBµV)	Margin (dB)	Line	Corr. (dB)
0.193500	---	34.21	53.88	19.67	L1	9.7
0.193500	50.35	---	63.88	13.53	L1	9.7
3.914500	---	15.62	46.00	30.38	L1	9.9
3.914500	27.95	---	56.00	28.05	L1	9.9
12.473500	---	27.37	50.00	22.63	L1	10.0
12.473500	35.32	---	60.00	24.68	L1	10.0

Product Type : Sleep and Fitness Tracker
 M/N : RFM100
 Operating Condition : Charging & Transmitting
 Test Specification : Neutral
 Comment : AC 120V/60Hz



Frequency (MHz)	QuasiPeak (dBµV)	Average (dBµV)	Limit (dBµV)	Margin (dB)	Line	Corr. (dB)
0.177500	---	36.43	54.60	18.17	N	9.7
0.177500	51.35	---	64.60	13.25	N	9.7
3.965500	---	13.05	46.00	32.95	N	9.8
3.965500	21.91	---	56.00	34.09	N	9.8
15.405500	---	26.08	50.00	23.92	N	10.0
15.405500	33.19	---	60.00	26.81	N	10.0

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), 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
Top channel 2402MHz	-14.5	Pass
Middle channel 2440MHz	-15.2	Pass
Bottom channel 2480MHz	-15.2	Pass

9.3 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 ≥ 6 dB.
3. Allow the trace to stabilize, record the X dB Bandwidth value.

Limit

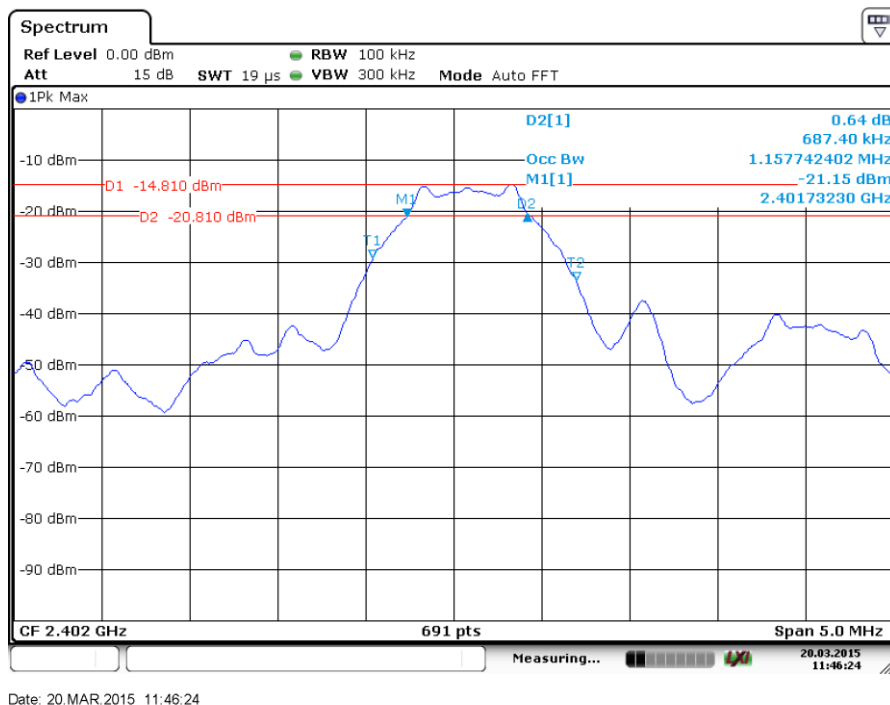
Limit [kHz]

≥ 500

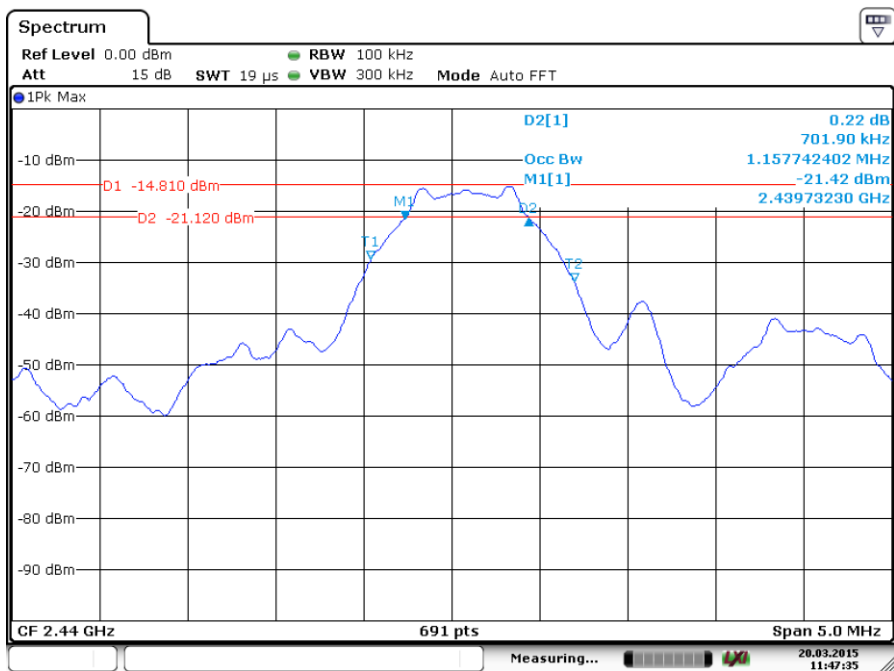
Test result

Frequency MHz	6dB bandwidth kHz	Result
Top channel 2402MHz	687.4	Pass
Middle channel 2440MHz	701.9	Pass
Bottom channel 2480MHz	694.6	Pass

2402MHz

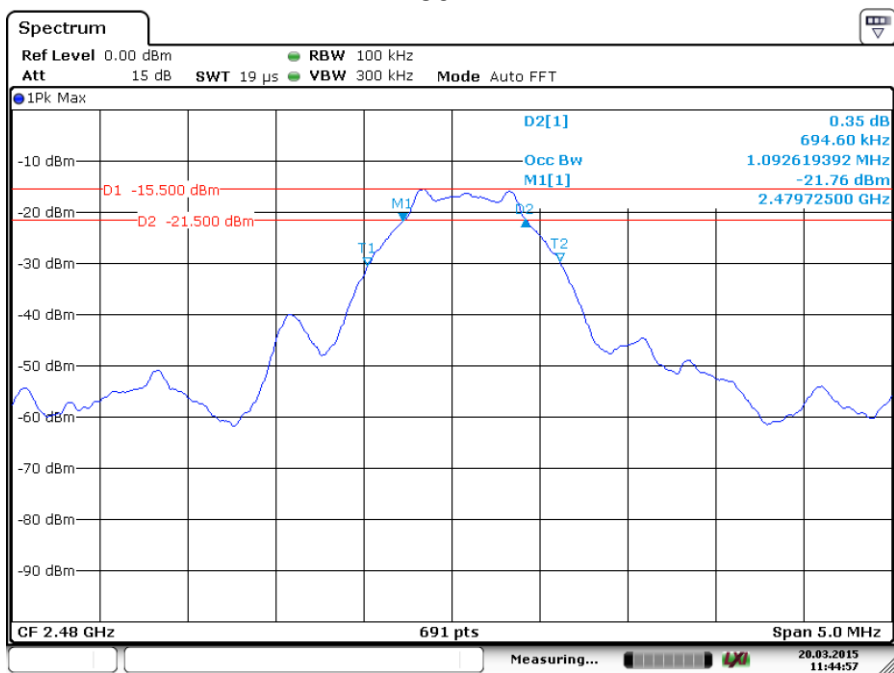


2440MHz



Date: 20.MAR.2015 11:47:35

2480MHz



Date: 20.MAR.2015 11:44:57

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
Top channel 2402MHz	-26.1	Pass
Middle channel 2440MHz	-27.22	Pass
Bottom channel 2480MHz	-27.22	Pass

9.5 Spurious RF conducted emissions

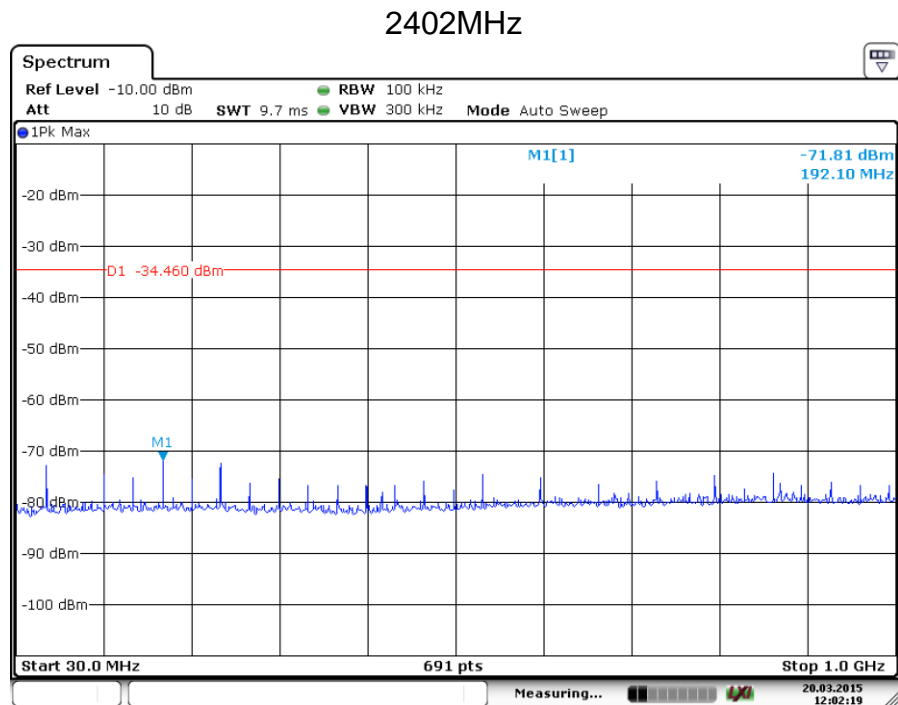
Test Method

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.

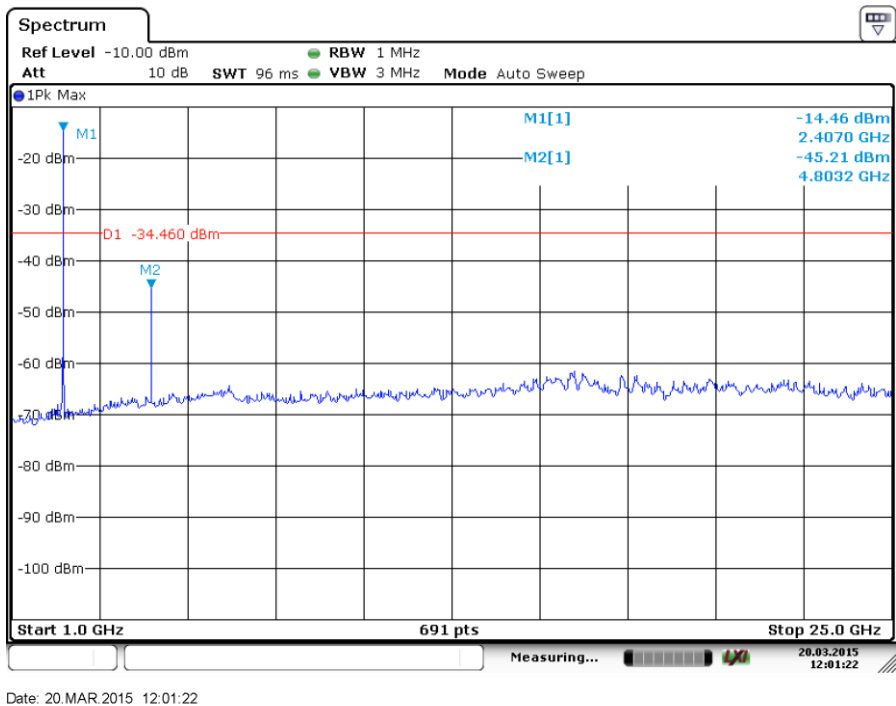
Limit

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

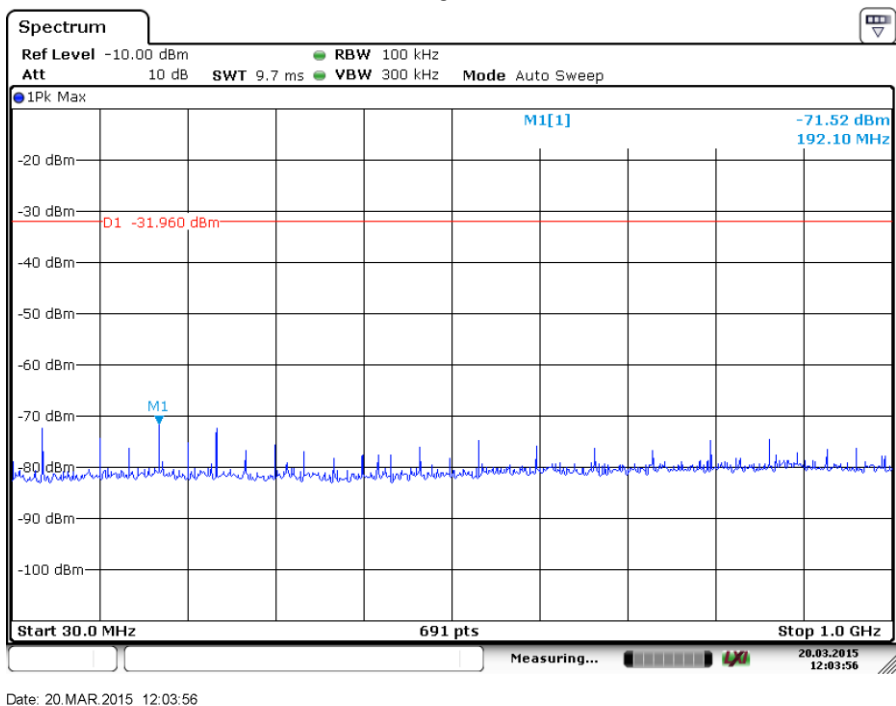
Spurious RF conducted emissions

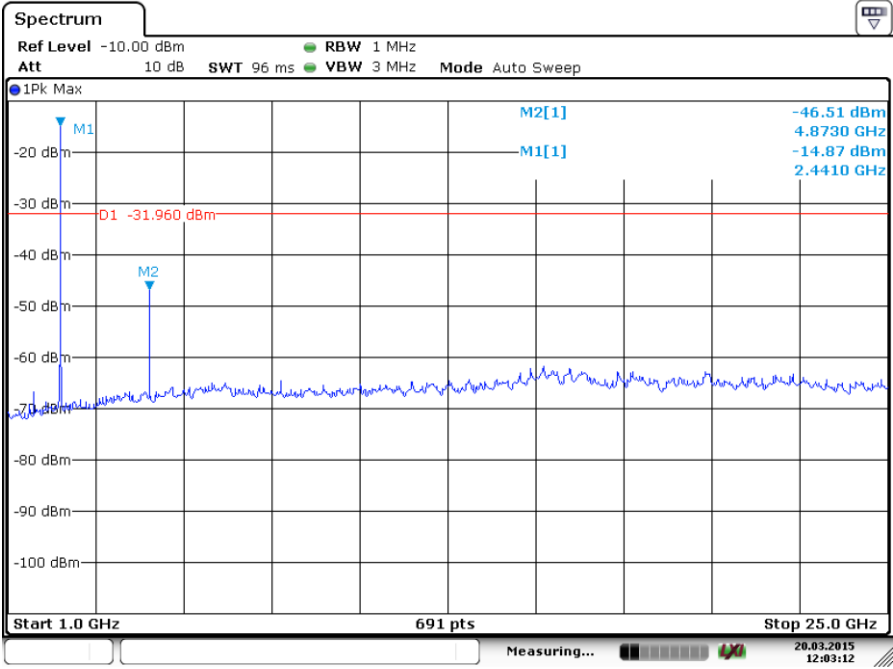


Date: 20.MAR.2015 12:02:19



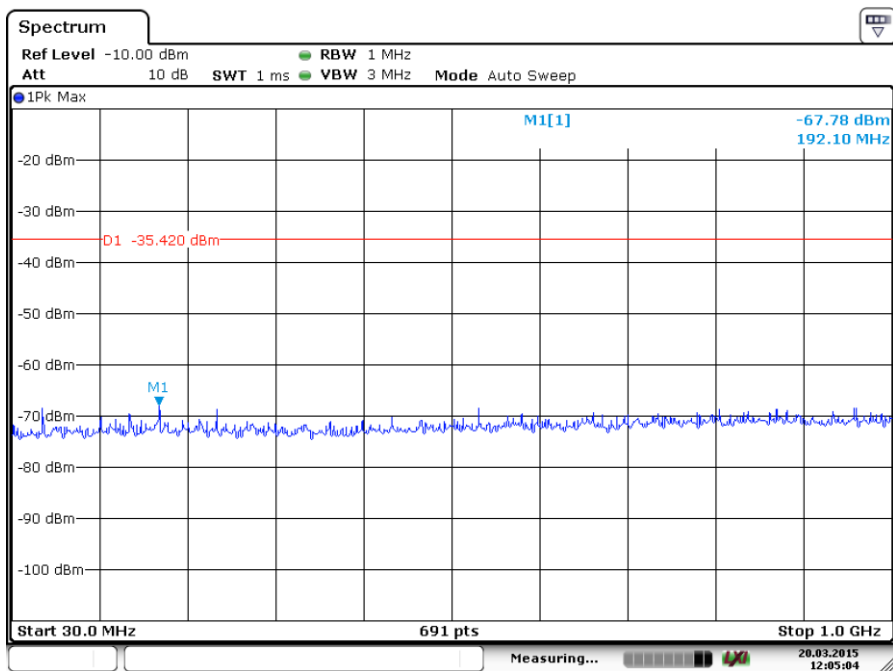
2440MHz



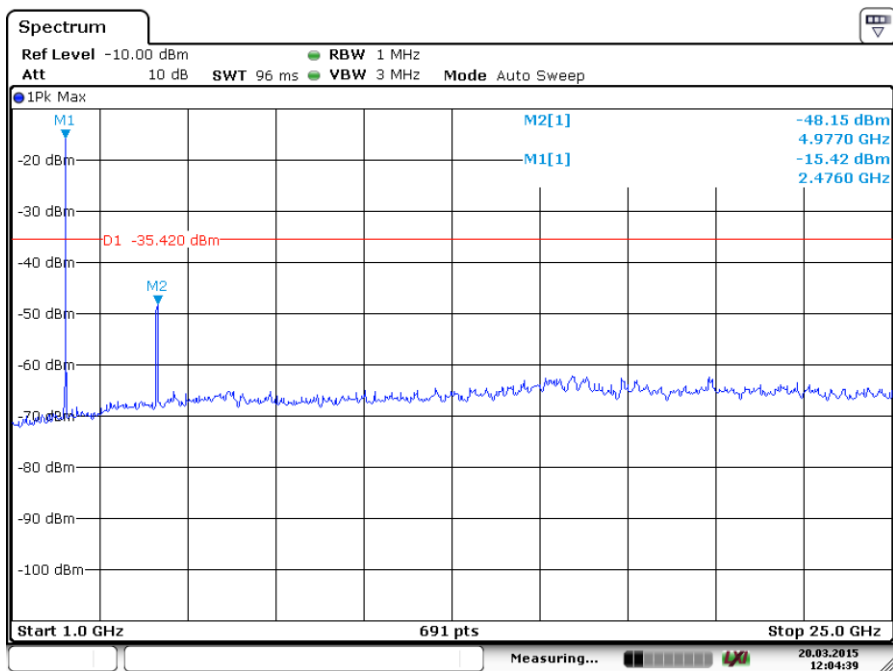


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2480MHz



Date: 20.MAR.2015 12:05:04



Date: 20.MAR.2015 12:04:39

9.6 Band edge

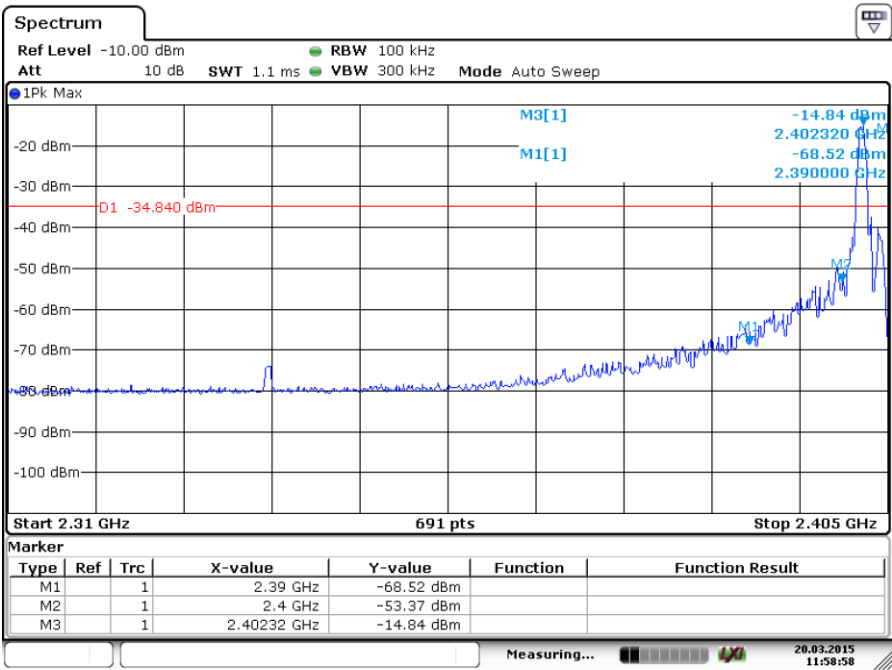
Test Method

- 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.

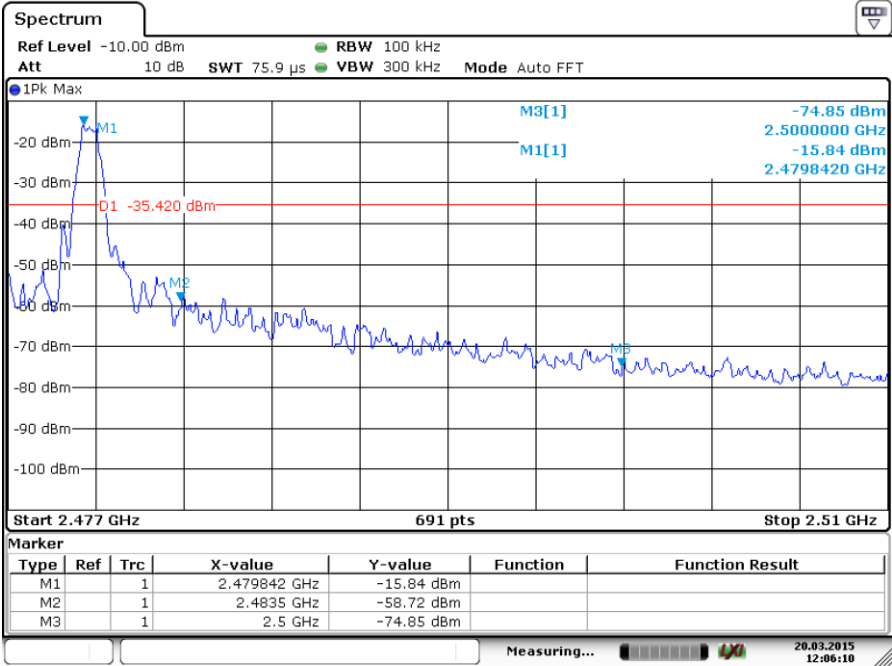
Limit

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

Test result



Date: 20.MAR.2015 11:58:58



Date: 20.MAR.2015 12:06:10

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

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 dBuV/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	Result
399.5	29.80	Horizontal	46	QP	Pass
566.7	31.59	Vertical	46	QP	Pass
2402	92.26	Horizontal	-	PK	-
2402	90.22	Vertical	-	PK	-
*4804	47.69	Horizontal	74	PK	Pass
*4804	50.99	Vertical	74	PK	Pass

2440MHz

Frequency MHz	Emission Level dBuV/m	Polarization	Limit dBuV/m	Detector	Result
2440	89.73	Horizontal	-	PK	-
2440	86.23	Vertical	-	PK	-
*4880	42.56	Horizontal	74	PK	Pass
*4880	46.63	Vertical	74	PK	Pass

2480MHz

Frequency MHz	Emission Level dBuV/m	Polarization	Limit dBuV/m	Detector	Result
2480	86.17	Horizontal	-	PK	-
2480	82.00	Vertical	-	PK	-
*4960	47.77	Horizontal	74	PK	Pass
*4960	47.88	Vertical	74	PK	Pass

Remark:

- (1) QP Emission Level= Antenna Factor +Cable Loss + Reading
PK Emission Level= Antenna Factor +Cable Loss - Amp. Factor + Reading
AV Emission Level= PK Emission Level+20log (dutycycle)
- (2) 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.
- (3) "*" means the emission(s) appear within the restrict bands shall follow the requirement of section 15.205.

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	Aug 17, 2015
	LISN	Rohde & Schwarz	ENV4200	100249	Aug 17, 2015
	LISN	Rohde & Schwarz	ENV216	100326	Aug 17, 2015
C	Signal Analyzer	Rohde & Schwarz	FSV40	101030	Aug 17, 2015
RE	EMI Test Receiver	Rohde & Schwarz	ESR 26	101269	Aug 17, 2015
	Trilog Super Broadband Test Antenna	Schwarzbeck	VULB 9163	707	Aug 17, 2017
	Horn Antenna	Rohde & Schwarz	HF907	102294	Aug 17, 2017
	Pre-amplifier	Rohde & Schwarz	SCU 18	102230	Aug 17, 2015
	3m Semi-anechoic chamber	TDK	9X6X6	----	May 29, 2019

C - Conducted RF tests

- Conducted peak output power
- 6dB 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
Radiation emission	U=4.32dB (30MHz-25GHz)
Output power test	0.94 dB
Power density test	2.10 dB
Bandwidth	1x10-9