TEST REPORT

Product	:	Blue Tooth Remote Shutter
Trade mark	:	N/A
Model/Type reference	:	080082976
Serial number	:	N/A
Ratings	:	DC 3V
FCC ID	:	2ADX8-360
Report number	:	EESZG12310051
Date	:	Jan. 06, 2015
Regulations	:	See below

Test Standards	Results
☒ 47 CFR FCC Part 15 Subpart C 15.247: 2014	PASS

Prepared for:

Import Marketing Solutions, Inc
355 East Kellogg Blvd, St Paul, MN 55101, United States

Prepared by:

Centre Testing International (Shenzhen) Corporation
Hongwei Industrial Zone, 70 Area, Bao'an District,
Shenzhen, Guangdong, China
TEL: +86-755-3368 3668
FAX: +86-755-3368 3385

Tested by: Christy Chen Reviewed by: Louisa Li

Approved by: Jimmy Li Date: Jan. 06, 2015

Jimmy Li
Lab manager

Check No.: 1022534287

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N/A means not applicable.

1. GENERAL INFORMATION

Applicant: Import Marketing Solutions, Inc
355 East Kellogg Blvd, St Paul, MN 55101, United States

Manufacturer: Ningbo Jiaqi Plastic Co., Ltd

FCC ID: 2ADX8-360

Product: Blue Tooth Remote Shutter

Model/Type reference: 080082976

Trade mark: N/A

Serial Number: N/A

Report Number: EESZG12310051

Sample Received Date: Dec. 29, 2014

Sample tested Date: Dec. 29, 2014 to Jan. 05, 2015

The above equipment was tested by Centre Testing International (Shenzhen) Corporation for compliance with the requirements set forth in the FCC Rules and the measurement procedure according to ANSI C63.4:2009.

2. TEST SUMMARY

No.	Test Item	Rule	Test Result
1	20dB bandwidth	FCC 15.247(a)(1)	**PASS**
2	Carrier Frequency Separation	FCC15.247(a)(1)	**PASS**
3	Number of Hopping Frequency	FCC 15.247(a)(iii)	**PASS**
4	Time of Occupancy (Dwell Time)	FCC 15.247(a)(iii)	**PASS**
5	Maximum Peak Conducted Output Power	FCC 15.247(b)(1)	**PASS**
6	Conducted Bandedge Emission / Conducted Spurious Emission	FCC PART15.247(d)	**PASS**
7	Radiated Bandedge Emission / Radiated Spurious Emission	FCC PART15.247(d)	**PASS**
8	AC Conducted Emission	FCC PART15.207	**---**
9	Antenna Requirements *	FCC PART15.203	**PASS** (See Notes)

*: According to Section 15.203, an intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device. The EUT has a built in antenna which is a short wire solder on the PCB, this is permanently attached antenna and meets the requirements of this section.

3. PRODUCT INFORMATION

Items	Description
Rating	DC 3V
Type of Modulation	GFSK (1Mbps)
Antenna Type	Integral antenna
Frequency Range	2402 ~ 2480 MHz
Gain	0dBi

4. MEASUREMENT UNCERTAINTY

This uncertainty represents an expanded uncertainty expressed at approximately the 95% confidence level using a coverage factor of k=2.

Measurement items	Uncertainty
Conducted Emission Test	3.2 dB
Radiated Emissions / Bandedge Emission	4.5 dB

5. TEST EQUIPMENT LIST

Equipment	Manufacturer	Model	Serial No.	Due Date
3M Chamber & Accessory Equipment	TDK	SAC-3	---	06/01/2016
Receiver	R&S	ESCI	100435	07/19/2015
TRILOG Broadband Antenna	schwarzbeck	VULB 9163	617	06/25/2015
Multi device Controller	maturo	NCD/070/10711112	---	N/A
Horn Antenna	ETS-LINGREN	3117	00057407	07/19/2015
Microwave Preamplifier	Agilent	8449B	3008A02425	03/19/2015
Spectrum Analyzer	R&S	FSP40	100416	07/06/2015

6. SUPPORT EQUIPMENT LIST

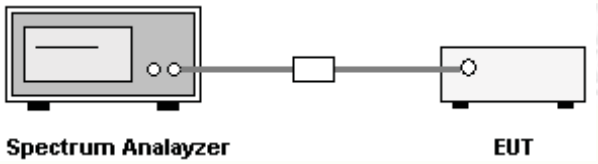
Device Type	Brand	Model	Data Cable	Remark
---	---	---	---	---
---	---	---	---	---

7. 20dB Bandwidth Measurement

7.1. LIMITS

None

7.2. BLOCK DIAGRAM OF TEST SETUP



7.3. TEST PROCEDURE

1. The RF output of EUT was connected to the spectrum analyzer by RF cable. The path loss was compensated to the results for each measurement.

2. Set to the maximum power setting and enable the EUT transmit continuously.

3. Use the following spectrum analyzer settings for 20dB Bandwidth measurement. Span = approximately 2 to 3 times the 20 dB bandwidth, centered on a hopping channel; RBW ≥ 1% of the 20 dB bandwidth; VBW ≥ RBW; Sweep = auto; Detector function = peak; Trace = max hold.

4. Measure and record the results in the test report.

7.4. TEST RESULT

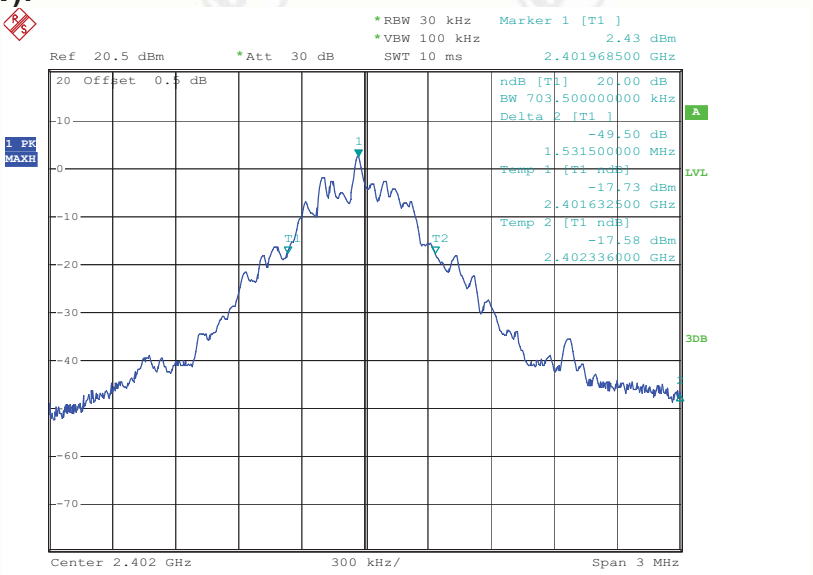
The test data of worst case are below:

GFSK:

Frequency (MHz)	20dB BW (kHz)
2402	703.5
2441	703.5
2480	703.5

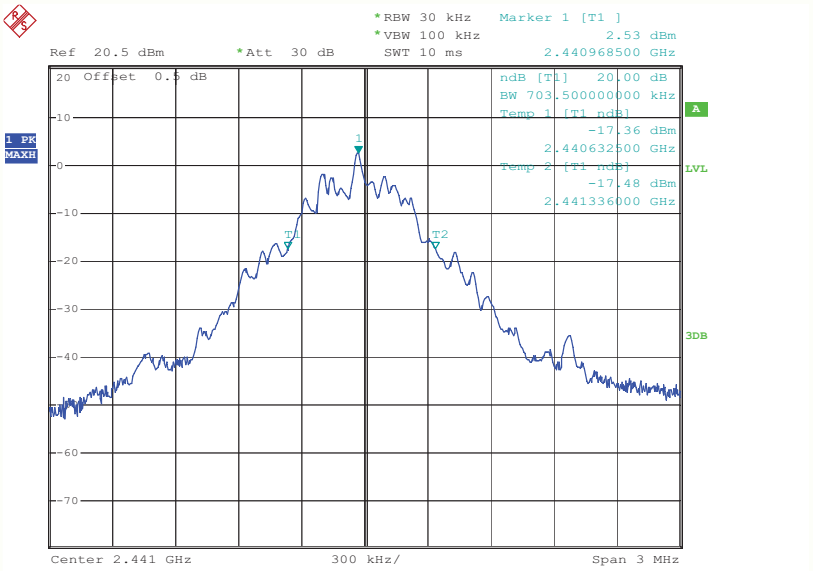
Please see the following plots (worst case):

GFSK (20dB BW):



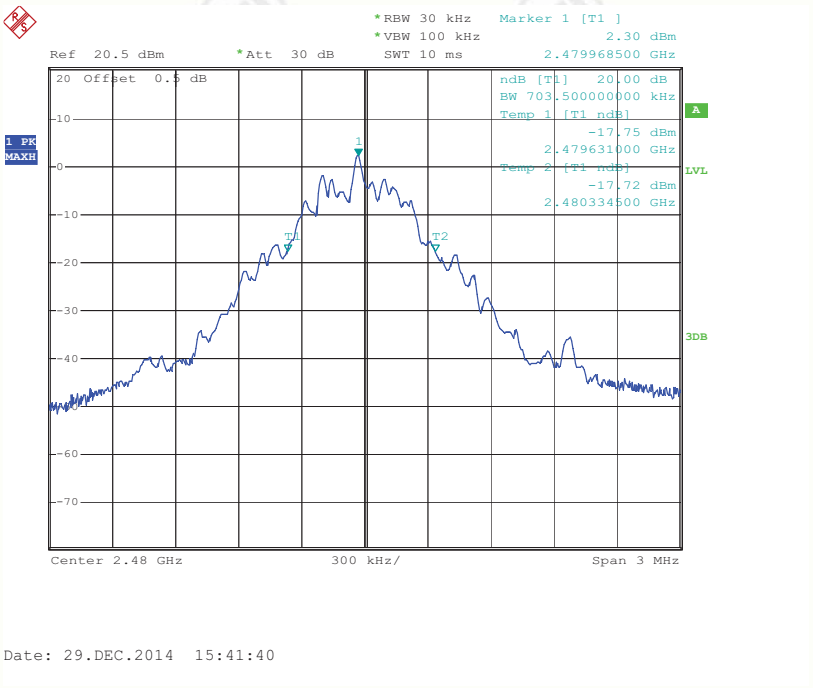
Date: 29.DEC.2014 15:38:54

2402 MHz



Date: 29.DEC.2014 15:40:06

2441 MHz


*RBW 30 kHz
*VBW 100 kHz
SWT 10 ms
Marker 1 [T1]
2.30 dBm
2.479968500 GHz
Ref 20.5 dBm
*Att 30 dB
20 Offset 0.5 dB
ndB [T1] 20.00 dB
BW 703.500000000 kHz
Temp 1 [T1 ndB]
-17.75 dBm
2.479631000 GHz
Temp 2 [T1 ndB]
-17.72 dBm
2.480334500 GHz
1 PK MAXH
A
LVL
3DB
T1
T2
Center 2.48 GHz
300 kHz/
Span 3 MHz
Date: 29.DEC.2014 15:41:40

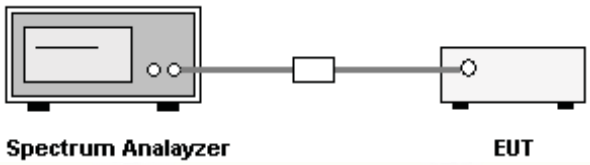
2480 MHz

8. CARRIER FREQUENCY SEPARATION

8.1. LIMITS

Frequency hopping systems operating in the 2400-2483.5MHz band may have hopping channel carrier frequencies that are separated by 25 kHz or two-thirds of the 20 dB bandwidth of the hopping channel, whichever is greater, provided the systems operate with an output power no greater than 125mW.

8.2. BLOCK DIAGRAM OF TEST SETUP



8.3. TEST PROCEDURE

1. The RF output of EUT was connected to the spectrum analyzer by RF cable. The path loss was compensated to the results for each measurement.

2. Set to the maximum power setting and enable the EUT transmit continuously.

3. Enable the EUT hopping function.

4. Use the following spectrum analyzer settings: Span = wide enough to capture the peaks of two adjacent channels; RBW ≥ 1% of the span; VBW ≥ RBW; Sweep = auto; Detector function = peak; Trace = max hold.

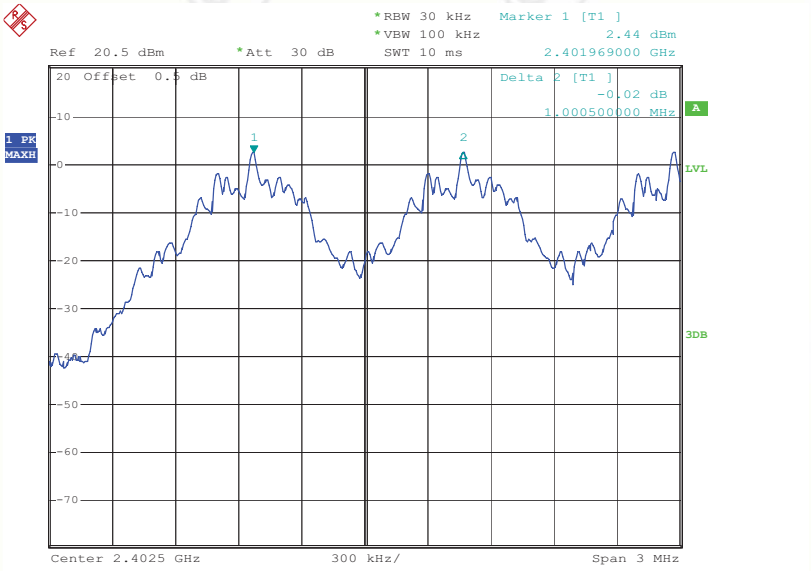
5. Measure and record the results in the test report.

8.4. TEST RESULT

Carrier Frequency Separation: 1 MHz

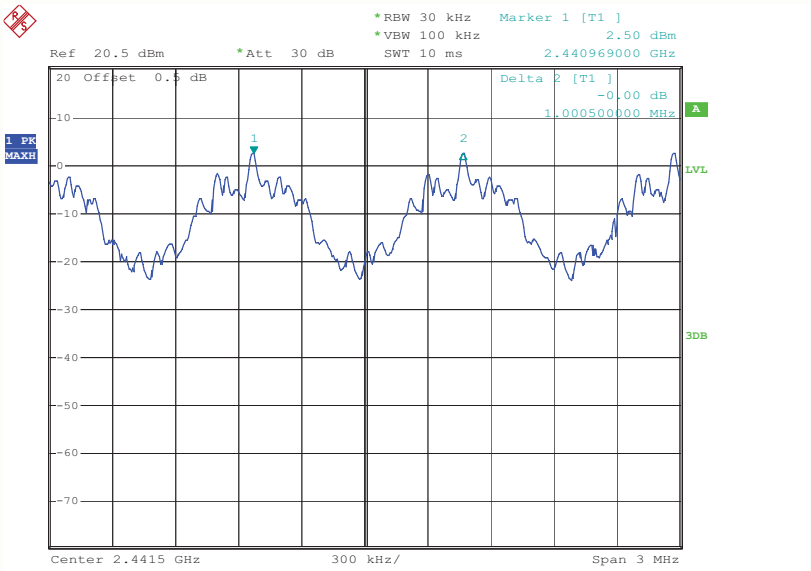
Please see the following plots (worst case):

GFSK:



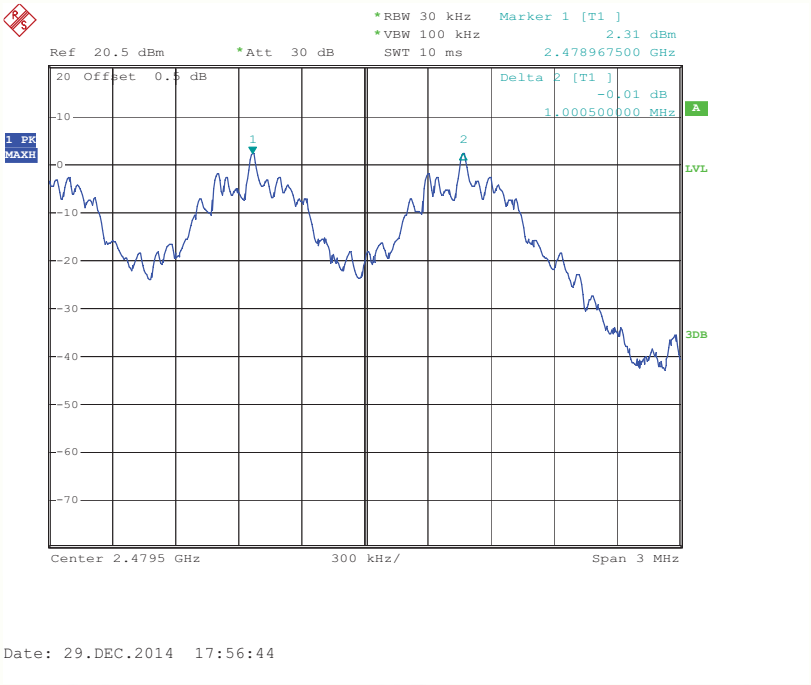
Date: 29.DEC.2014 18:03:53

Low channel



Date: 29.DEC.2014 18:00:07

Middle channel



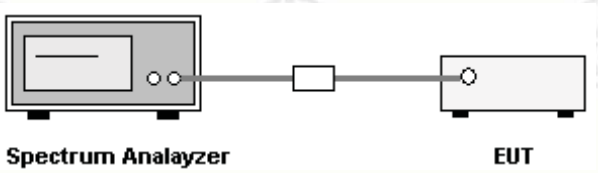
High channel

9. NUMBER OF HOPPING FREQUENCY

9.1. LIMITS

Frequency hopping systems in the 2400-2483.5 MHz band shall use at least 15 channels.

9.2. BLOCK DIAGRAM OF TEST SETUP



9.3. TEST PROCEDURE

1. The RF output of EUT was connected to the spectrum analyzer by RF cable. The path loss was compensated to the results for each measurement.

2. Set to the maximum power setting and enable the EUT transmit continuously.

3. Enable the EUT hopping function.

4. Use the following spectrum analyzer settings: Span = the frequency band of operation; RBW ≥ 1% of the span; VBW ≥ RBW; Sweep = auto; Detector function = peak; Trace = max hold.

5. The number of hopping frequency used is defined as the number of total channel.

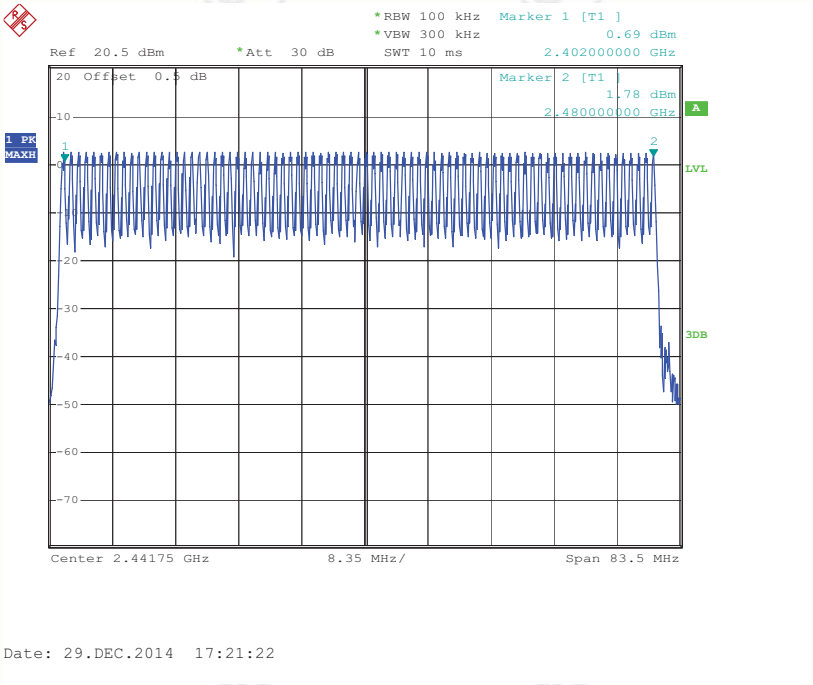
6. Record the measurement data derived from spectrum analyzer.

9.4. TEST RESULT

Number of Hopping Frequency is 79, with frequency space = 1MHz.

Please see the following plots (worst case):

GFSK:

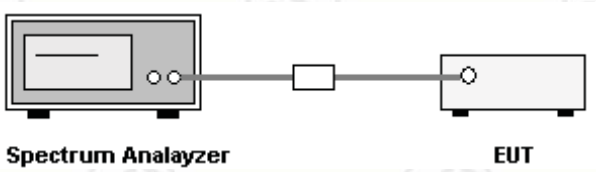


10. TIME OF OCCUPANCY (DWELL TIME)

10.1. LIMITS

The average time of occupancy on any channel shall not be greater than 0.4 seconds within a period of 0.4 seconds multiplied by the number of hopping channels employed.

10.2. BLOCK DIAGRAM OF TEST SETUP



10.3. TEST PROCEDURE

1. The RF output of EUT was connected to the spectrum analyzer by RF cable.

The path loss was compensated to the results for each measurement.

2. Set to the maximum power setting and enable the EUT transmit continuously.

3. Enable the EUT hopping function.

4. Use the following spectrum analyzer settings: Span = zero span, centered on a hopping channel; RBW = 1 MHz; VBW ≥ RBW; Sweep = as necessary to capture the entire dwell time per hopping channel; Detector function = peak; Trace = max hold.

5. Measure and record the results in the test report.

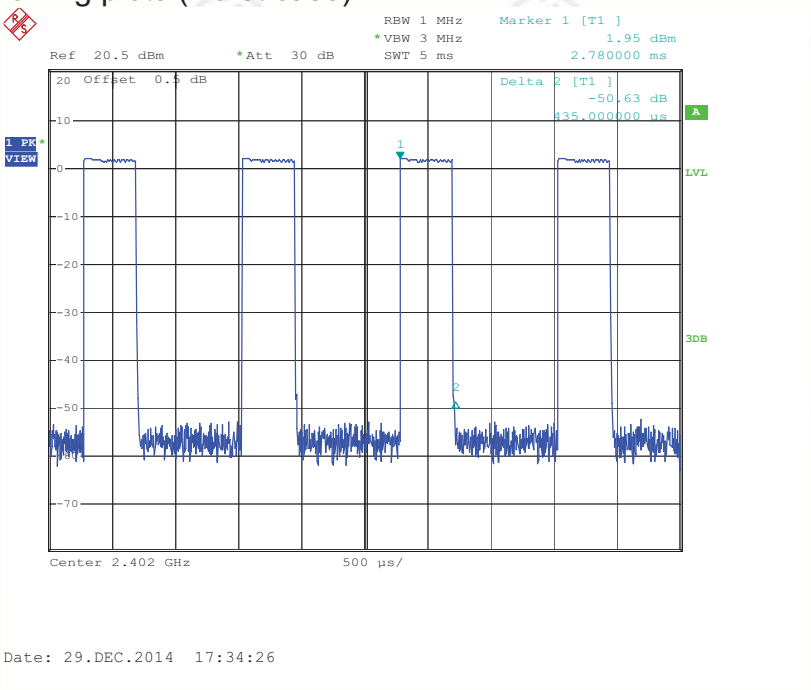
10.4. TEST RESULT

The test data of worst case (GFSK mode) are below:

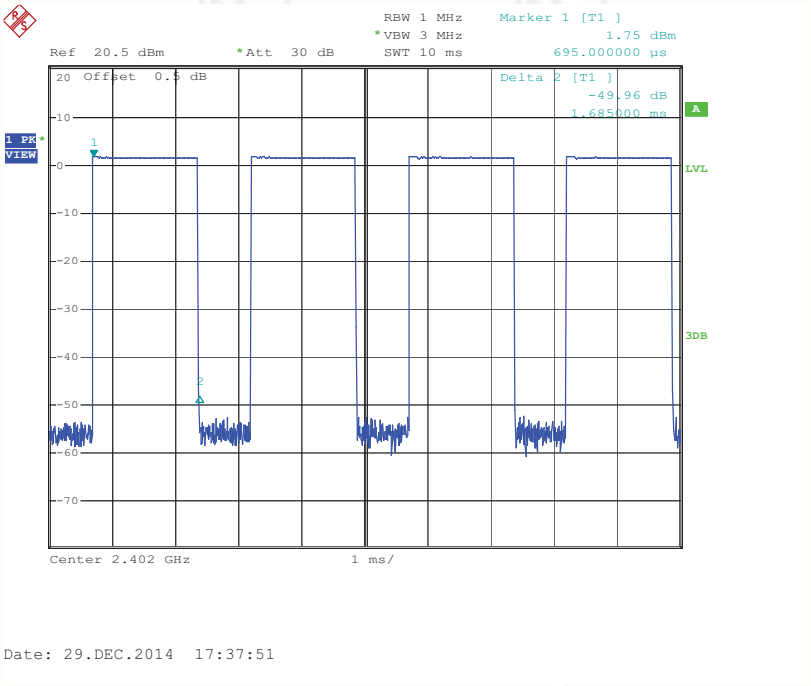
Frequency (MHz)	Pulse Wide(ms)		Dwell Time (ms)	Limit (s)	Result (Pass / Fail)
2402	DH1	0.435	139.20	0.4	Pass
	DH3	1.685	269.60		
	DH5	2.92	311.48		
2441	DH1	0.425	136.00	0.4	Pass
	DH3	1.675	268.00		
	DH5	2.93	312.54		
2480	DH1	0.43	137.60	0.4	Pass
	DH3	1.67	267.20		
	DH5	2.93	312.54		

Remark:
DH1 Packet permit maximum 1600 / 79 /2 = 10.12 hops per second in each channel (1 time slot RX, 1 time slot TX). So, total hops is 10.12 x 31.6 = 320
DH3 Packet permit maximum 1600 / 79 / 4 = 5.06 hops per second in each channel (3 time slots RX, 1 time slot TX). So, total hops is 5.06 x 31.6 = 160
DH5 Packet permit maximum 1600/ 79 / 6 = 3.37 hops per second in each channel (5 time slots RX, 1 time slot TX). So, total hops is 3.37 x 31.6 = 106.67

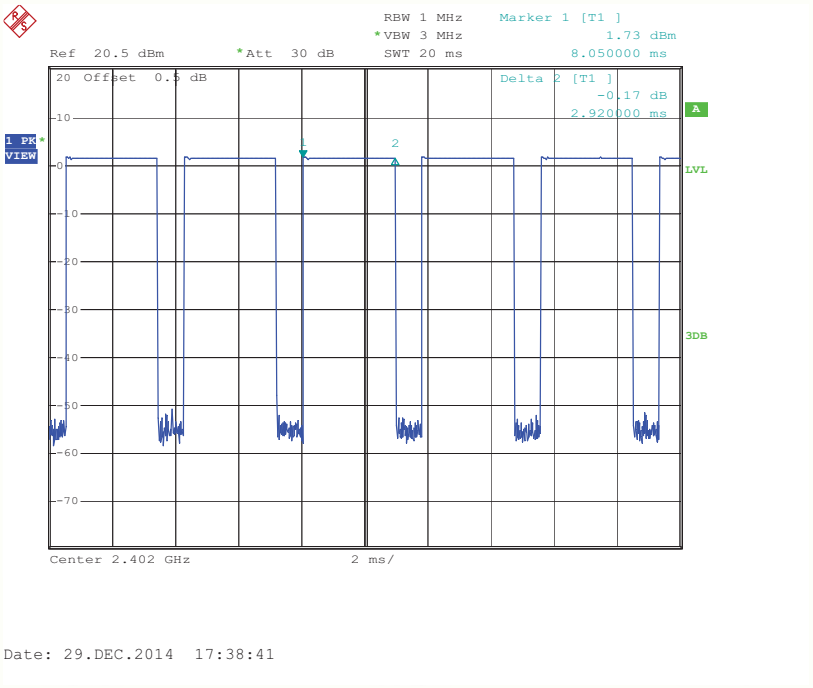
Please see the following plots (worst case):



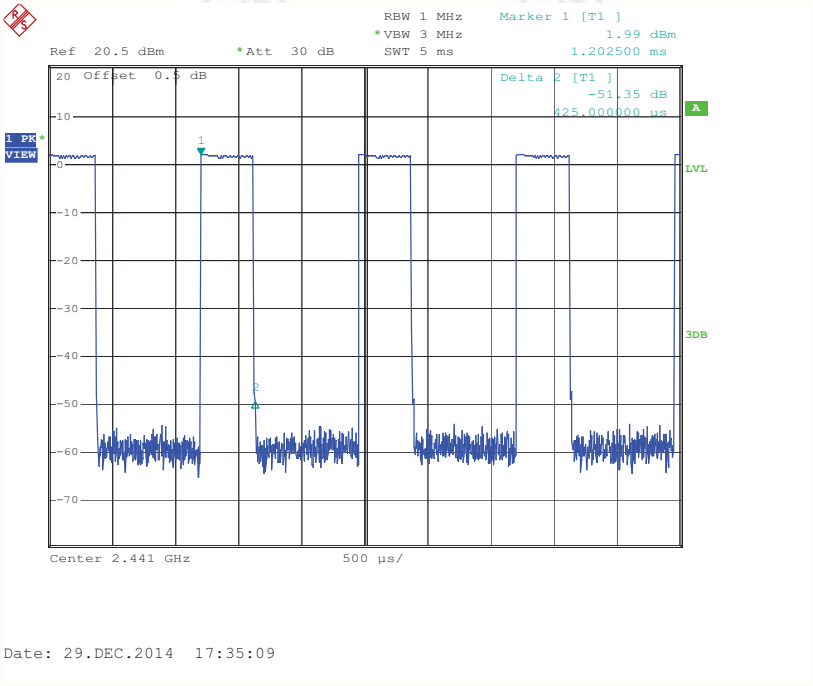
2402 MHz_DH1



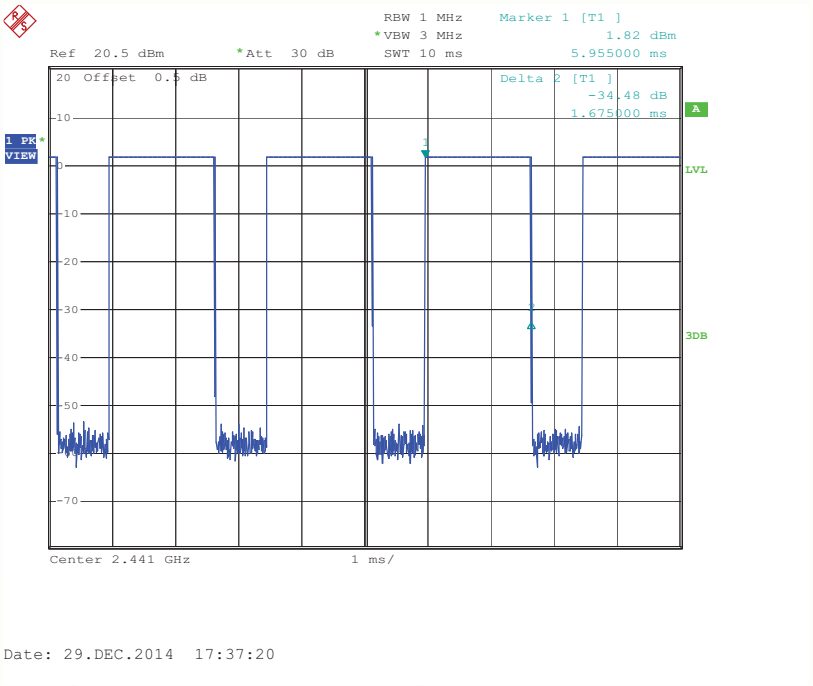
2402 MHz_DH3



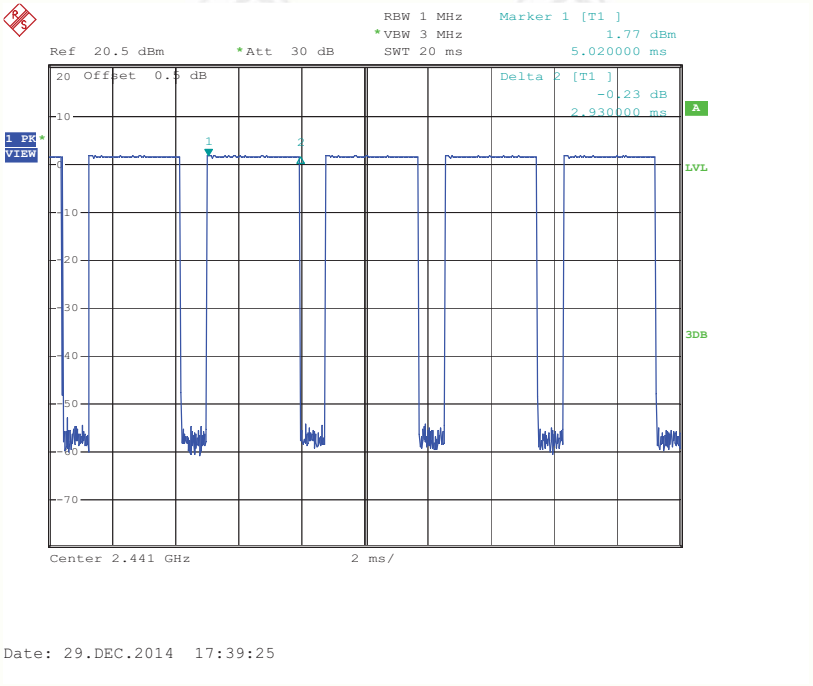
2402 MHz_DH5



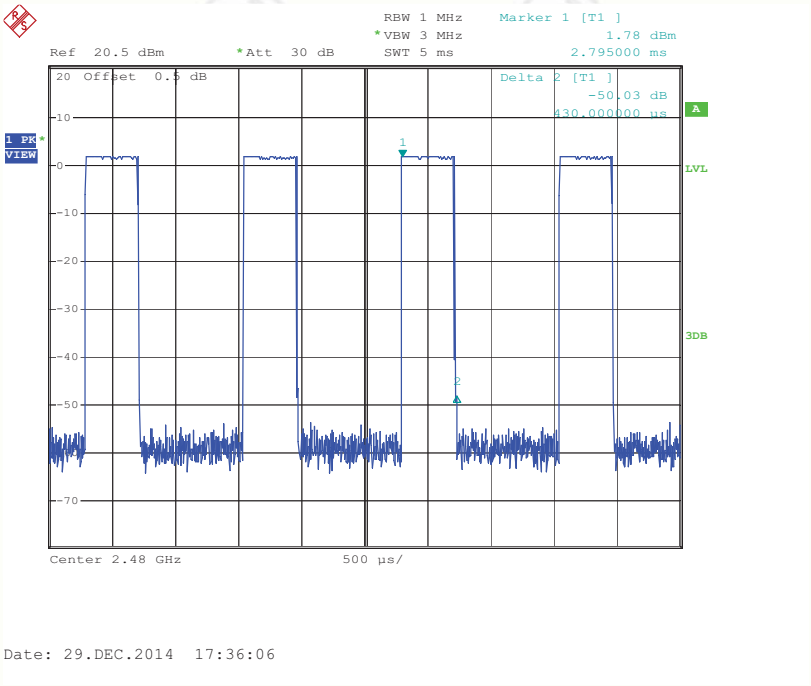
2441 MHz_DH1



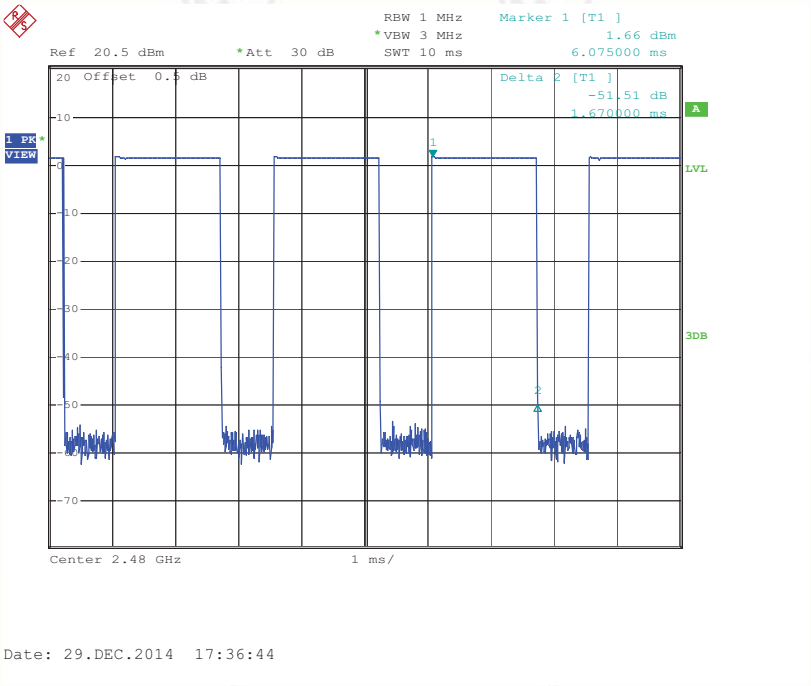
2441 MHz_DH3



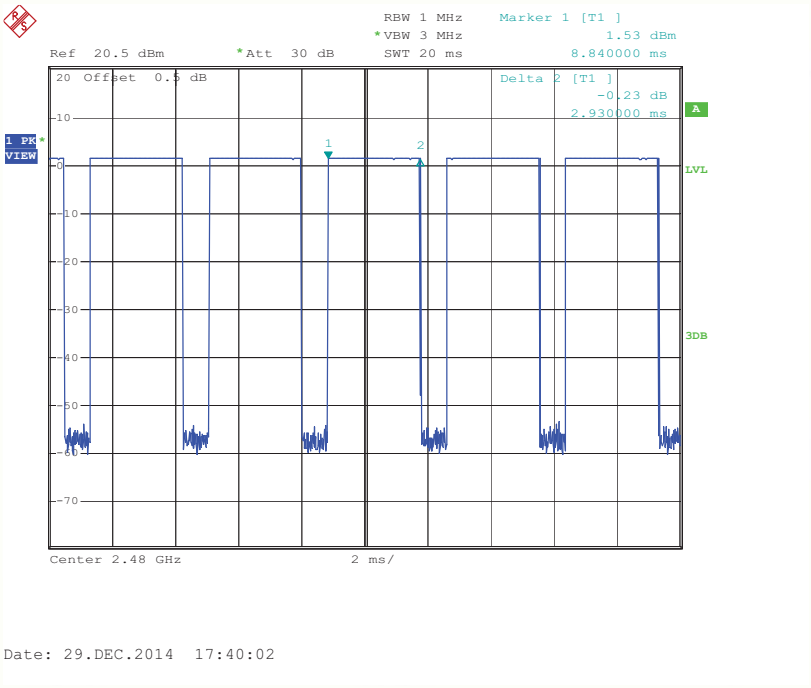
2441 MHz_DH5



2480 MHz_DH1



2480 MHz_DH3


RBW 1 MHz
*VBW 3 MHz
SWT 20 ms
Marker 1 [T1]
1.53 dBm
8.840000 ms
Ref 20.5 dBm
*Att 30 dB
20 Offset 0.5 dB
Delta 2 [T1]
-0.23 dB
2.930000 ms
1 PK
VIEW
A
LVL
3DB
Center 2.48 GHz
2 ms/
Date: 29.DEC.2014 17:40:02

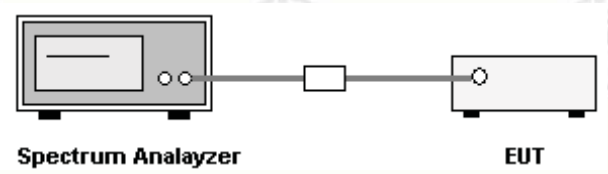
2480 MHz_DH5

11. MAXIMUM PEAK CONDUCTED OUTPUT POWER MEASUREMENT

11.1. LIMITS

The limit for peak output power is 0.125Watt (21 dBm).

11.2. BLOCK DIAGRAM OF TEST SETUP



11.3. TEST PROCEDURE

1. The RF output of EUT was connected to the power meter by RF cable and attenuator. The path loss was compensated to the results for each measurement.

2. Set to the maximum power setting and enable the EUT transmit continuously.

3. Measure the conducted output power with cable loss and record the results in the test report.

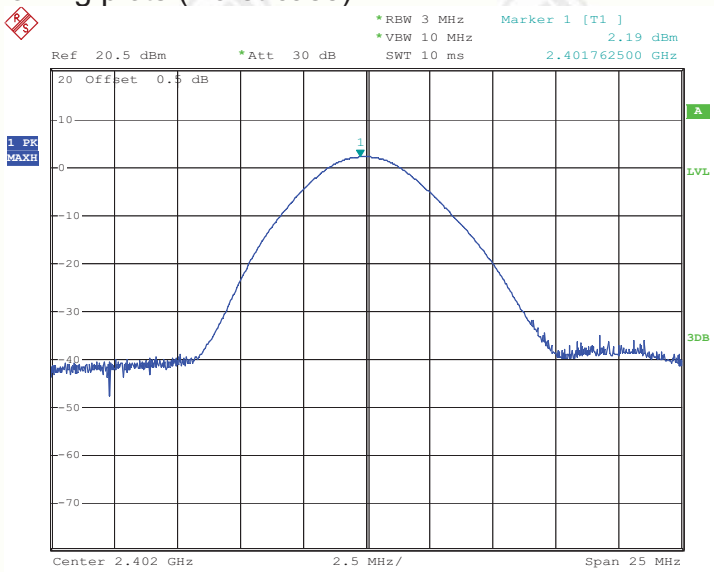
4. Measure and record the results in the test report.

11.4. TEST RESULT

The test data of worst case (GFSK mode) are below:

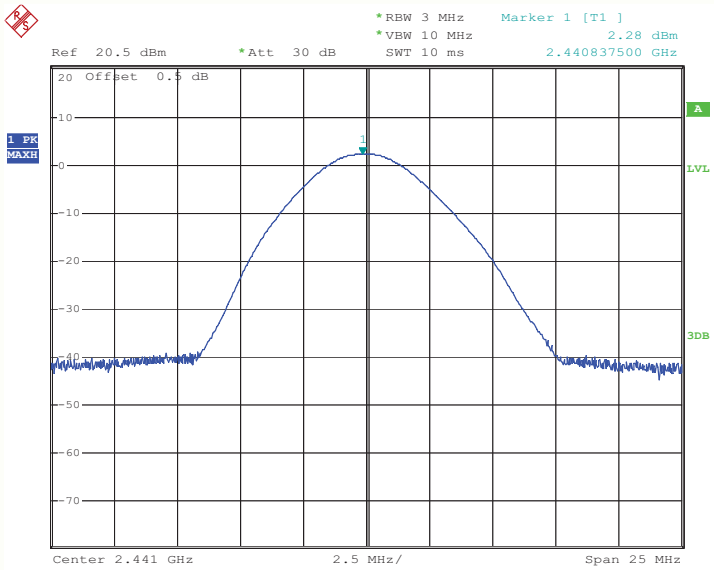
Frequency (MHz)	Peak Power (dBm)	Limit (dBm)	Result (Pass / Fail)
2402	2.19	21	Pass
2441	2.28	21	Pass
2480	2.07	21	Pass

Please see the following plots (worst case):



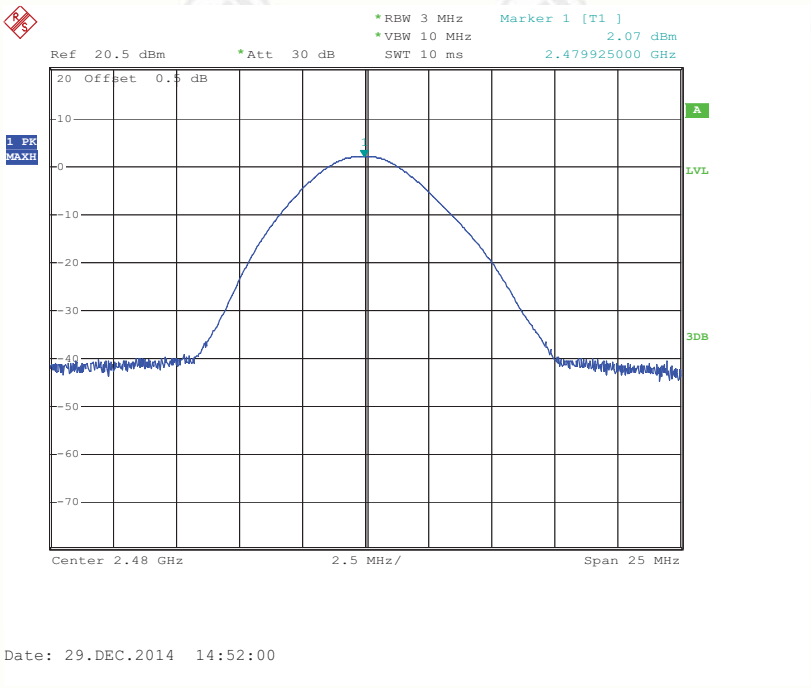
Date: 29.DEC.2014 14:50:14

2402MHz



Date: 29.DEC.2014 14:47:28

2441MHz


*RBW 3 MHz
*VBW 10 MHz
SWT 10 ms
Marker 1 [T1]
2.07 dBm
2.479925000 GHz
Ref 20.5 dBm
*Att 30 dB
20 Offset 0.5 dB
1 PK MAXH
A
LVL
3DB
Center 2.48 GHz
2.5 MHz/
Span 25 MHz
Date: 29.DEC.2014 14:52:00

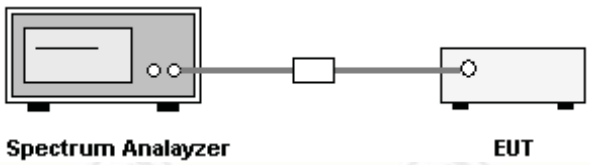
2480MHz

12. CONDUCTED BANDEDGE EMISSION MEASUREMENT

12.1. LIMITS

In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated 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. If the transmitter complies with the conducted power limits based on the use of RMS averaging over a time interval, as permitted under paragraph (b)(3) of this section, the attenuation required under this paragraph shall be 30 dB instead of 20 dB. Attenuation below the general limits specified in §15.209(a) is not required. In addition, radiated emissions which fall in the restricted bands, as defined in §15.205(a), must also comply with the radiated emission limits specified in §15.209(a).

12.2. BLOCK DIAGRAM OF TEST SETUP



12.3. TEST PROCEDURE

1. Set to the maximum power setting and enable the EUT transmit continuously.

2. Set RBW = 100 kHz, VBW = 300 kHz (≥ RBW). Band edge emissions must be at least 20 dB down from the highest emission level within the authorized band as measured with a 100 kHz RBW.

3. Enable hopping function of the EUT and then repeat step 1 and 2.

4. Measure and record the results in the test report.

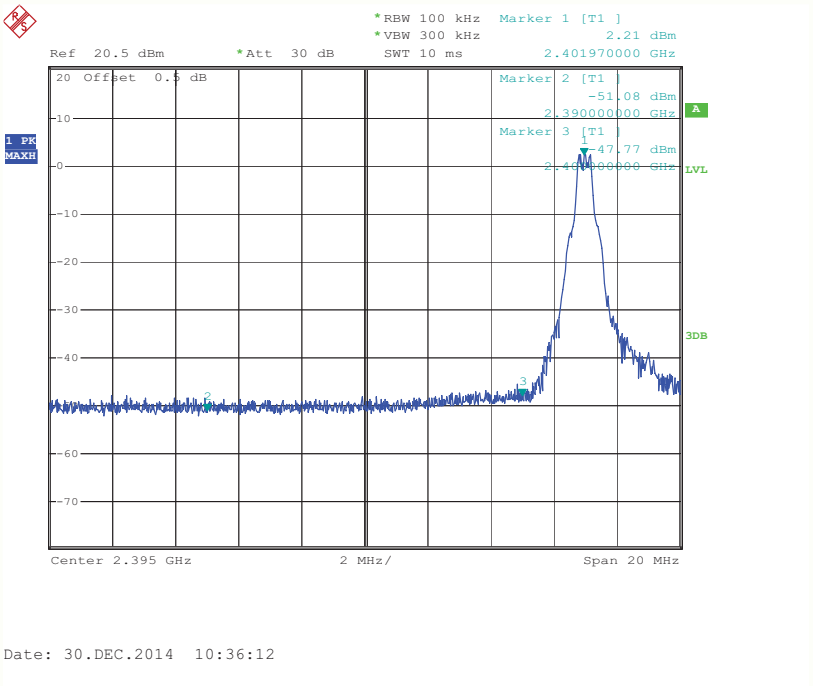
12.4. TEST RESULT

Pass.

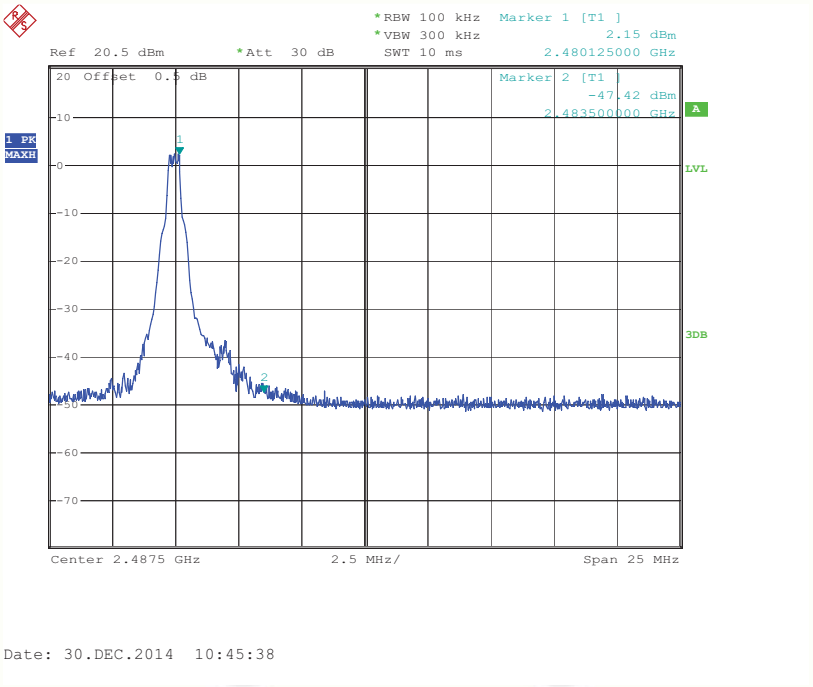
The test data of worst case are below:

GFSK:

Hopping off mode:

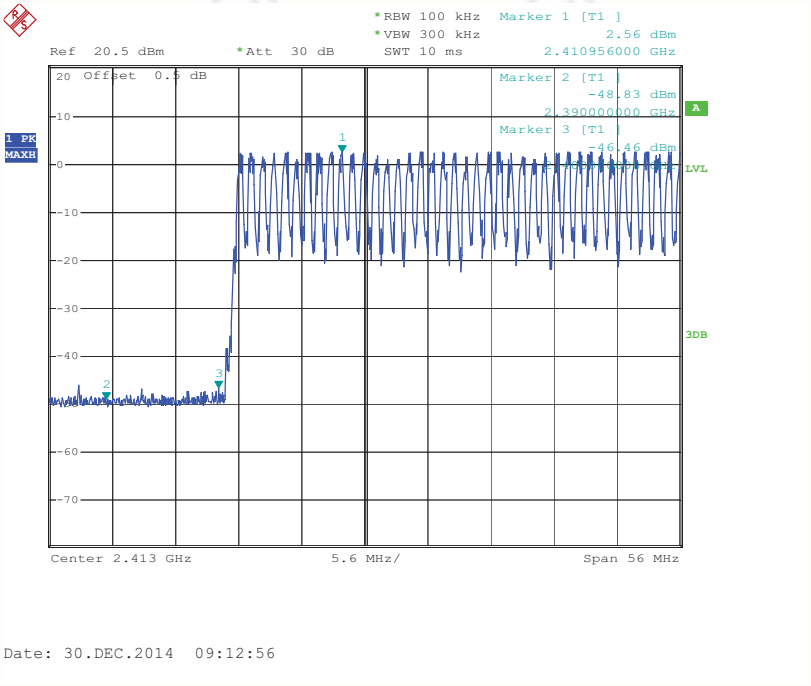


Low channel

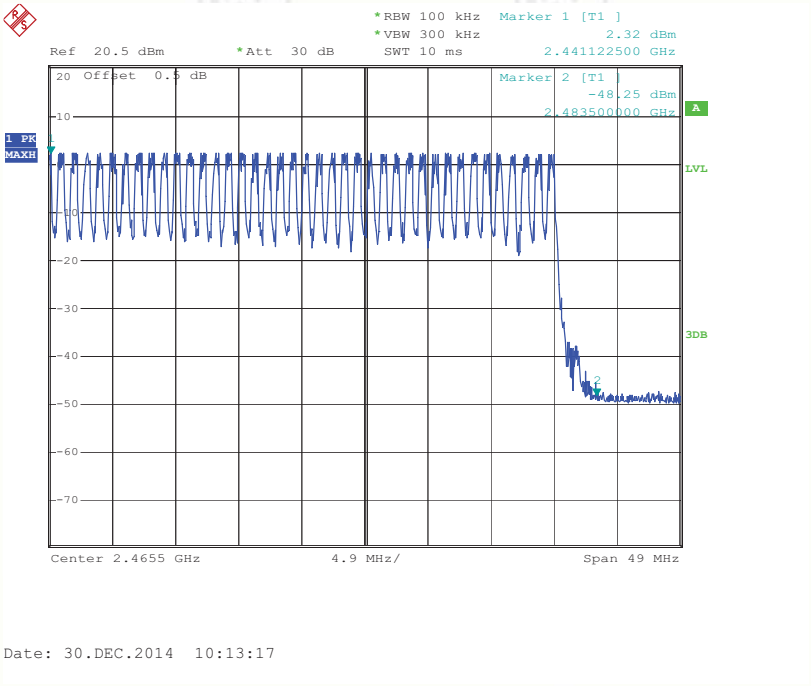


High channel

Hopping mode:



Low channel



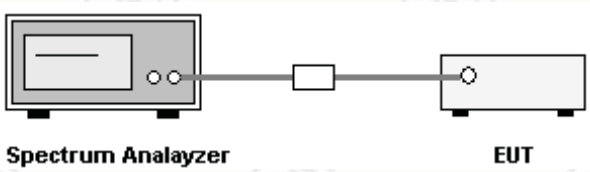
High channel

13. CONDUCTED SPURIOUS EMISSION MEASUREMENT

13.1. LIMITS

In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated 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.

13.2. BLOCK DIAGRAM OF TEST SETUP



13.3. TEST PROCEDURE

1. The RF output of EUT was connected to the spectrum analyzer by RF cable. The path loss was compensated to the results for each measurement.

2. Set to the maximum power setting and enable the EUT transmit continuously.

3. Set RBW = 100 kHz, VBW = 300 kHz, scan up through 10th harmonic. All harmonics / spurs must be at least 20 dB down from the highest emission level within the authorized band as measured with a 100 kHz RBW.

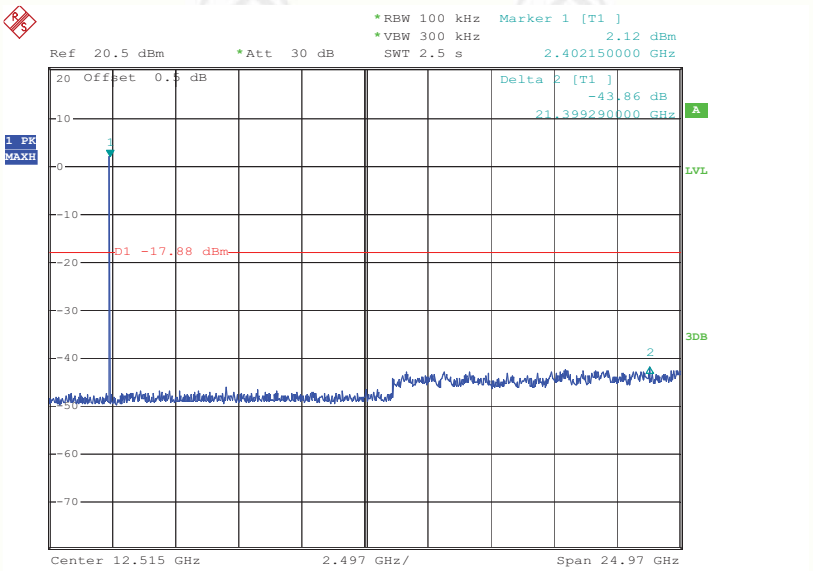
4. Measure and record the results in the test report.

5. The RF fundamental frequency should be excluded against the limit line in the operating frequency band.

13.4. TEST RESULT

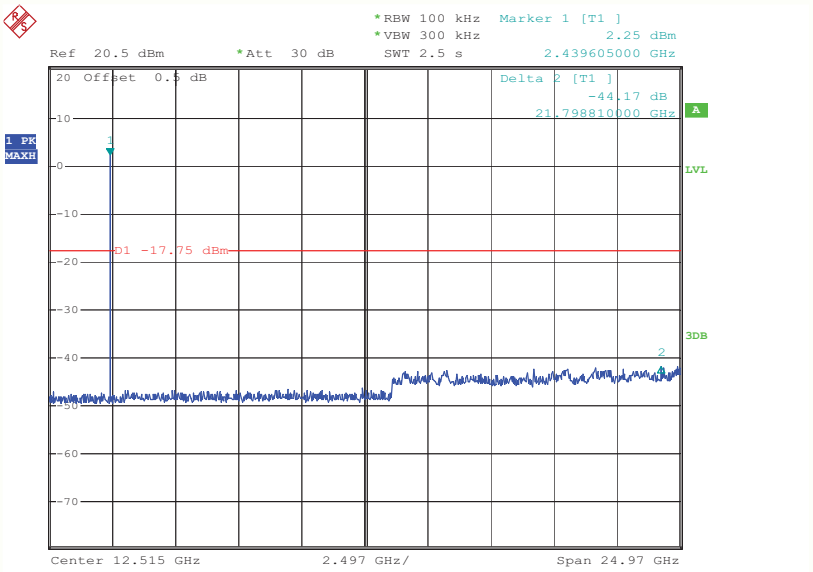
Pass.

Please see the following plots (worst case, GFSK mode):



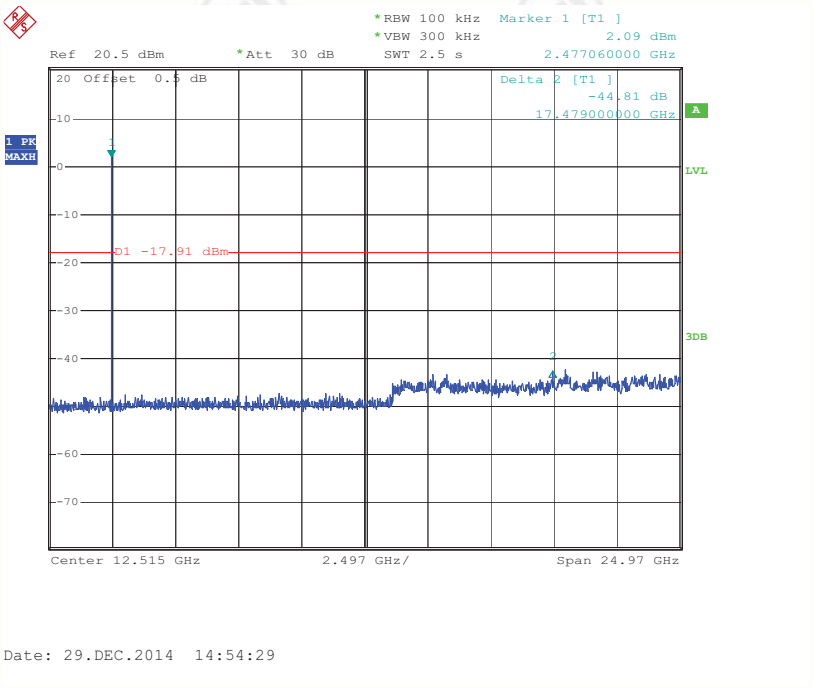
Date: 29.DEC.2014 15:19:42

2402MHz



Date: 29.DEC.2014 15:35:59

2441MHz


*RBW 100 kHz
*VBW 300 kHz
SWT 2.5 s
Marker 1 [T1]
2.09 dBm
2.477060000 GHz
Ref 20.5 dBm
*Att 30 dB
20 Offset 0.5 dB
Delta 2 [T1]
-44.81 dB
17.479000000 GHz
1 PK MAXH
A
LVL
3DB
D1 -17.91 dBm
Center 12.515 GHz
2.497 GHz/
Span 24.97 GHz
Date: 29.DEC.2014 14:54:29

2480MHz

14. RADIATED BANDEDGE EMISSION / RADIATED SPURIOUS EMISSION MEASUREMENT

14.1. LIMITS

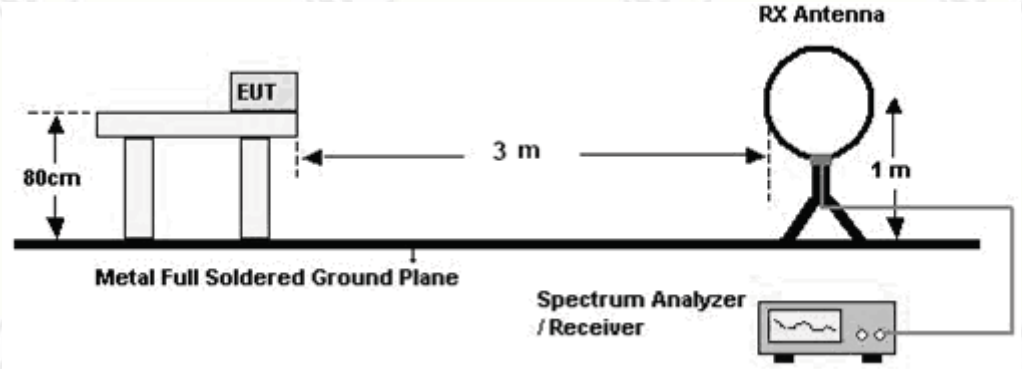
The field strength of any emissions, which appear outside of operating frequency band and restricted band specified on FCC 15.205(a), shall not exceed the general radiated emission limits as below.

Frequency (MHz)	Field strength (μV/m)	Distance (m)
0.009-0.490	2400/F(kHz)	300
0.490-1.705	24000/F(kHz)	30
1.705-30	30	30
30-88	100	3
88-216	150	3
216-960	200	3
Above 960	500	3

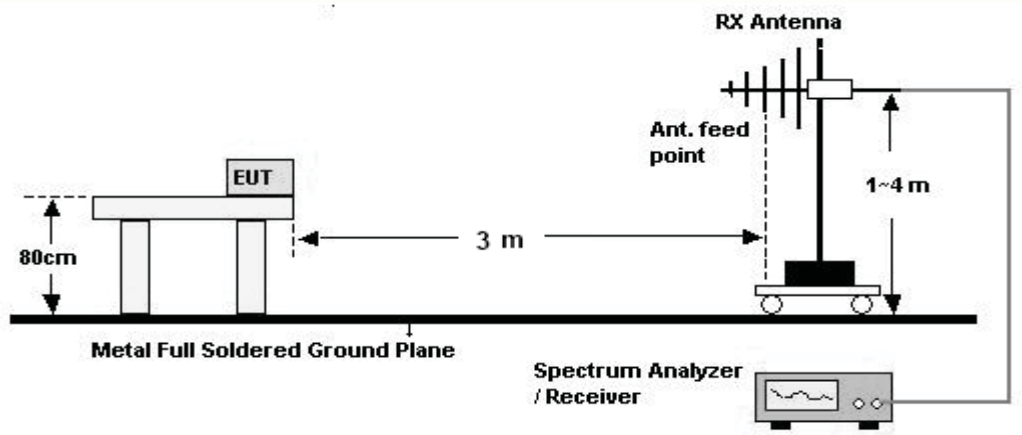
Note: the tighter limit applies at the band edges.

14.2. BLOCK DIAGRAM OF TEST SETUP

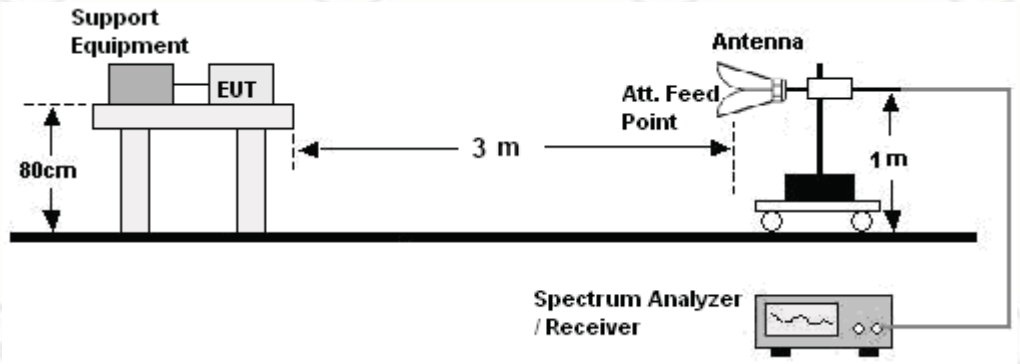
For radiated emissions from 9kHz to 30MHz



For radiated emissions from 30 - 1000MHz



For radiated emissions from 1GHz to 25GHz



14.3. TEST PROCEDURE

Below 30MHz

a. The Product is placed on a turntable 0.8 meters above the ground in the chamber, 3 meter away from the antenna (loop antenna). The maximum values of the field strength are recorded by adjusting the polarizations of the test antenna and rotating the turntable.

b. For each suspected emission, the Product was arranged to its worst case and then turn table was turned from 0 degrees to 360 degrees to find the maximum reading.

c. The test frequency analyzer system was set to Peak Detect (300Hz RBW in 9kHz to 150kHz and 10kHz RBW in 150kHz to 30MHz) Function and Specified Bandwidth with Maximum Hold Mode.

30MHz ~ 1GHz:

a. The Product was placed on the non-conductive turntable 0.8m above the ground at a chamber.

b. Set the spectrum analyzer/receiver in Peak detector, Max Hold mode, and 100 kHz RBW. Record the maximum field strength of all the pre-scan process in the full band when the antenna is varied between 1~4 m in both horizontal and vertical, and the turntable is rotated from 0 to 360 degrees.

c. For each frequency whose maximum record was higher or close to limit, measure its QP value (120 kHz RBW): vary the antenna's height and rotate the turntable from 0 to 360 degrees to find the height and degree where Product radiated the maximum emission, then set the test frequency analyzer/receiver to QP Detector and specified bandwidth with Maximum Hold Mode, and record the maximum value.

Above 1GHz:

a. The EUT was placed on the non-conductive turntable 0.8 m above the ground at a chamber.

b. Set the spectrum analyzer/receiver in Peak detector, Max Hold mode, and 1MHz RBW. Record the maximum field strength of all the pre-scan process in the full band when the antenna is varied in both horizontal and vertical, and the turntable is rotated from 0 to 360 degrees.

14.4. TEST RESULT

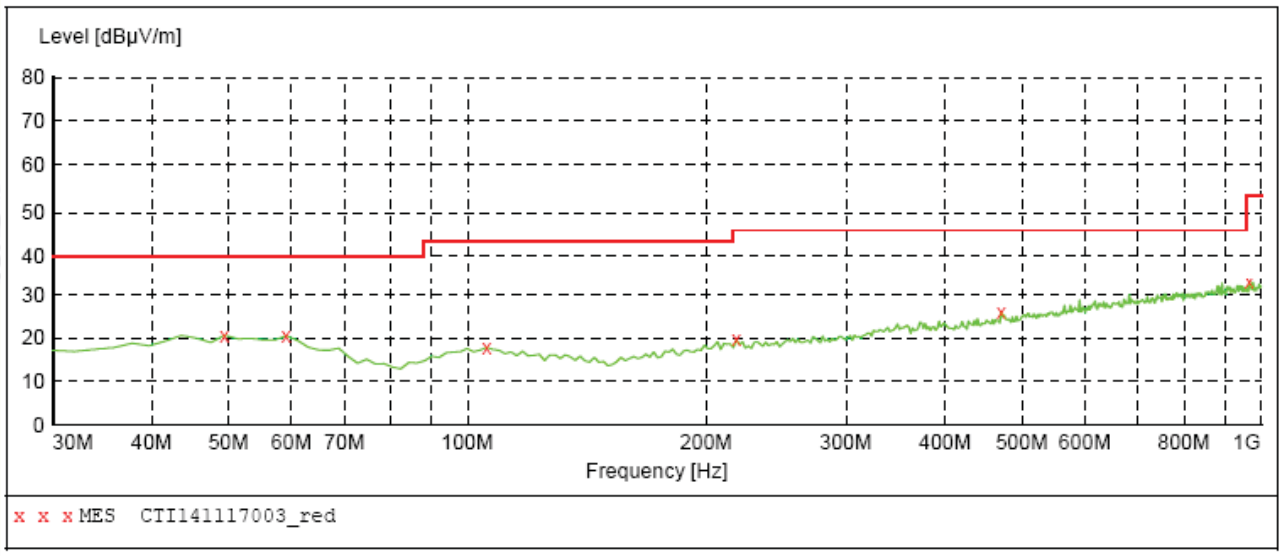
A. Below 30MHz:

No emissions were found higher than the background below 30MHz and background is lower than the limit, so it deems to compliance with the limit without recorded.

B. 30MHz ～ 1GHz:

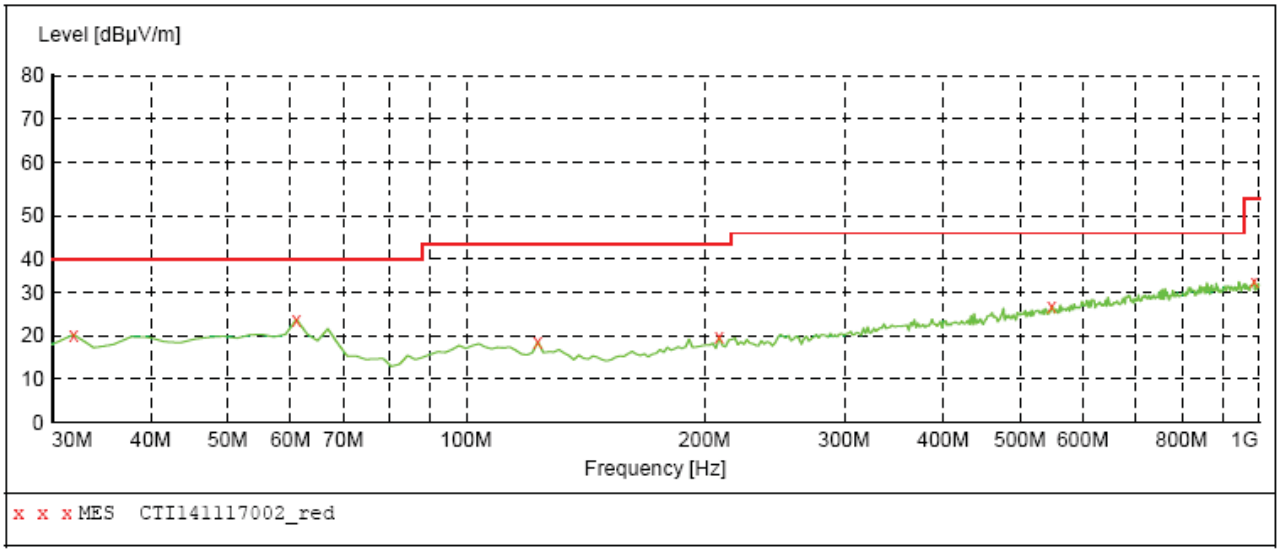
The test data of low channel, middle channel and high channel are almost same in frequency bands 30MHz to 1GHz, and the data of middle channel (GFSK mode) are chosen as representative in below:

H:



Frequency MHz	Level dBµV/m	Transd dB	Limit dBµV/m	Margin dB	Det.	Height cm	Azimuth deg	Polarization
49.400000	20.60	14.9	40.0	19.4	QP	100.0	323.00	HORIZONTAL
59.100000	20.50	13.9	40.0	19.5	QP	200.0	86.00	HORIZONTAL
105.660000	17.80	12.3	43.5	25.7	QP	200.0	248.00	HORIZONTAL
218.180000	19.60	13.8	46.0	26.4	QP	100.0	209.00	HORIZONTAL
470.380000	26.00	19.5	46.0	20.0	QP	100.0	266.00	HORIZONTAL
967.020000	33.00	26.6	54.0	21.0	QP	100.0	76.00	HORIZONTAL

V:



Frequency MHz	Level dBµV/m	Transd dB	Limit dBµV/m	Margin dB	Det.	Height cm	Azimuth deg	Polarization
31.940000	20.30	11.9	40.0	19.7	QP	100.0	308.00	VERTICAL
61.040000	23.80	13.4	40.0	16.2	QP	100.0	211.00	VERTICAL
123.120000	18.60	11.2	43.5	24.9	QP	100.0	370.00	VERTICAL
208.480000	19.60	13.6	43.5	23.9	QP	100.0	95.00	VERTICAL
547.980000	26.90	21.0	46.0	19.1	QP	200.0	291.00	VERTICAL
986.420000	32.50	26.8	54.0	21.5	QP	200.0	227.00	VERTICAL

C. Above 1GHz:

Test Results-(Measurement Distance: 3m)_Channel low_2402MHz_GFSK mode:

Frequency (MHz)	Measurement (dBuV/m)	Limit (dBuV/m)	Detector Type	Antenna (H/V)	Result (P/F)
2390.0	35.21	74	PK	H	P
2400.0	42.36	74	PK	H	P
2402.0*	92.65	---	PK	H	P
4804.0	36.25	74	PK	H	P
2390.0	34.26	74	PK	V	P
2400.0	40.29	74	PK	V	P
2402.0*	93.12	---	PK	V	P
4804.0	36.87	74	PK	V	P

*: fundamental frequency

Test Results-(Measurement Distance: 3m)_Channel middle_2441MHz_GFSK mode:

Frequency (MHz)	Measurement (dBuV/m)	Limit (dBuV/m)	Detector Type	Antenna (H/V)	Result (P/F)
2441.0*	92.36	---	PK	H	P
4882.0	35.62	74	PK	H	P
2441.0*	93.01	---	PK	V	P
4882.0	36.01	74	PK	V	P

*: fundamental frequency

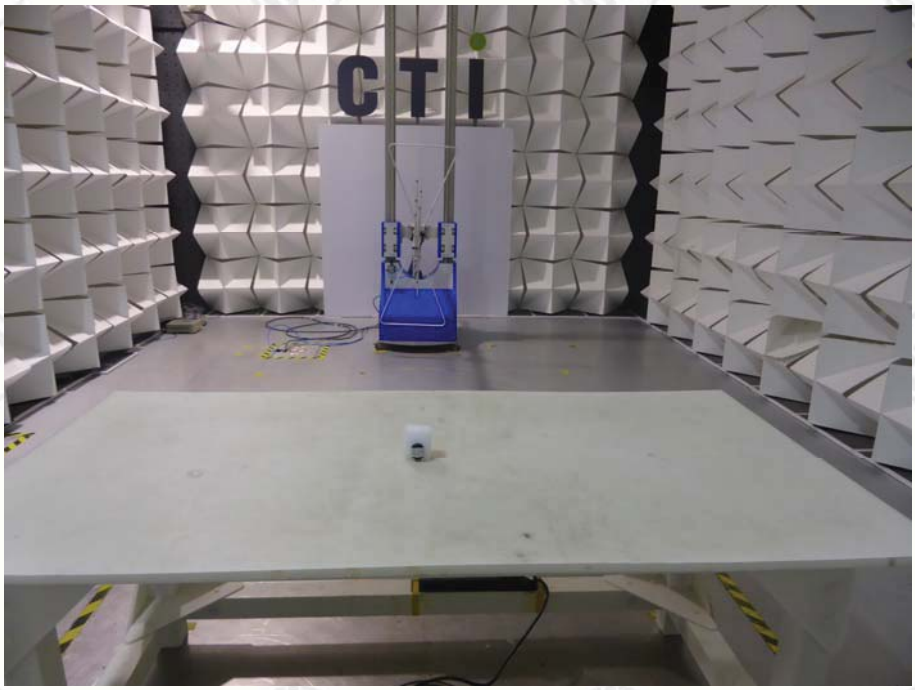
Test Results-(Measurement Distance: 3m)_Channel high_2480MHz_GFSK mode:

Frequency (MHz)	Measurement (dBuV/m)	Limit (dBuV/m)	Detector Type	Antenna (H/V)	Result (P/F)
2480.0*	91.69	---	PK	H	P
2483.5	42.63	74	PK	H	P
4960.0	35.12	74	PK	H	P
2480.0*	92.12	---	PK	V	P
2483.5	40.95	74	PK	V	P
4960.0	36.01	74	PK	V	P

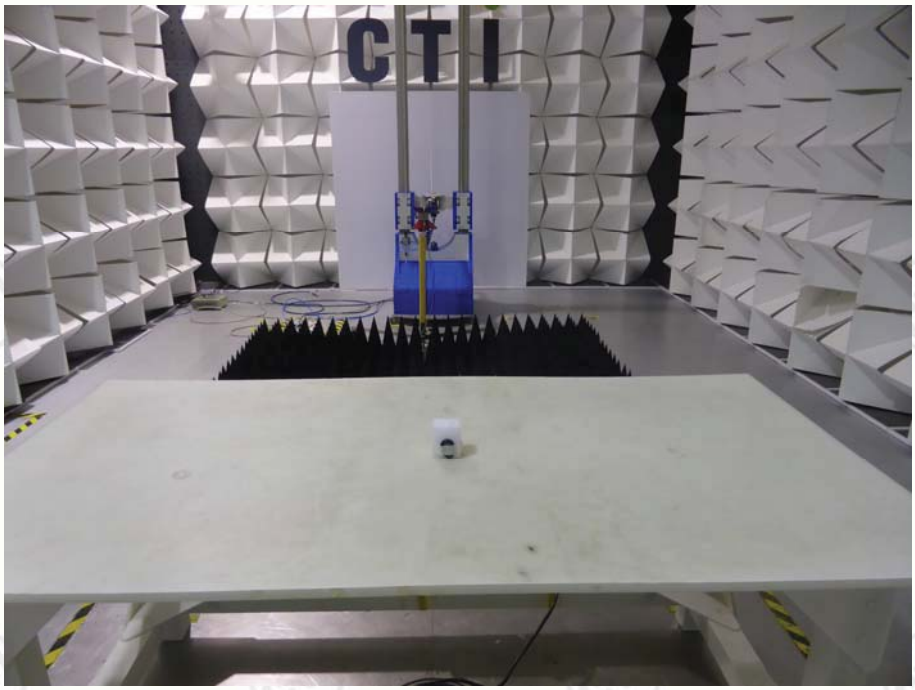
*: fundamental frequency

Remark:
1. The above tables show that the frequencies peak data are all below the average limit, so the average data of these frequencies are deems to fulfill the average limits and not reported.
2. No emission found from 18GHz to 25GHz.
3. All outside of operating frequency band and restricted band specified are below 15.209.

APPENDIX 1 PHOTOGRAPHS OF TEST SETUP



TEST SETUP OF RADIATED EMISSION (30MHz-1GHz)



TEST SETUP OF RADIATED EMISSION (above 1GHz)

APPENDIX 2 EXTERNAL PHOTOGRAPHS OF PRODUCT

Fig.1- General View

Fig.2- General View

APPENDIX 3 INTERNAL PHOTOGRAPHS OF PRODUCT

Fig.1- View of EUT

Fig.2- View of EUT

Fig.3- View of EUT

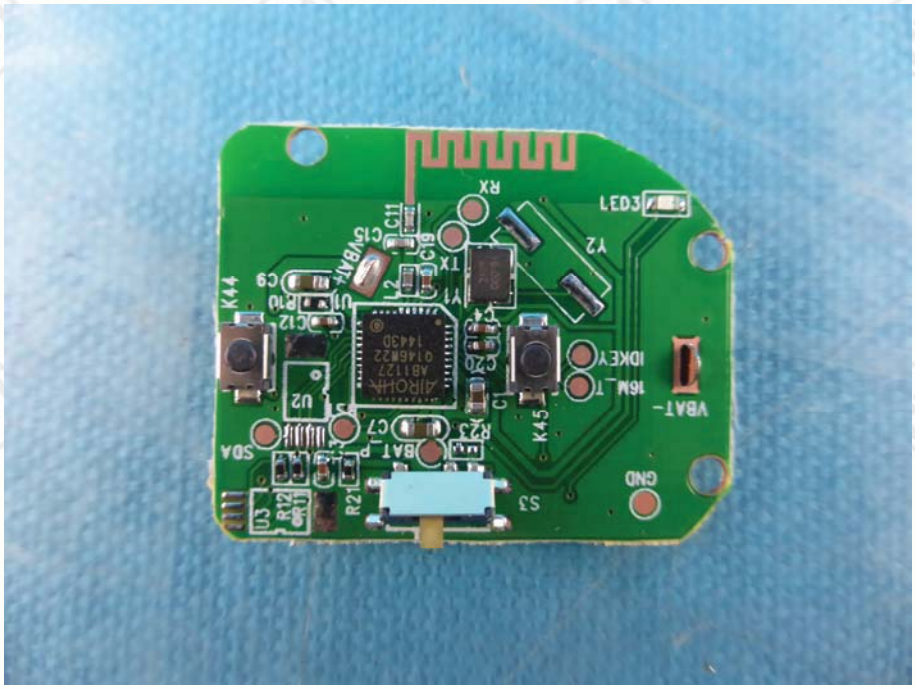


Fig.4- View of EUT

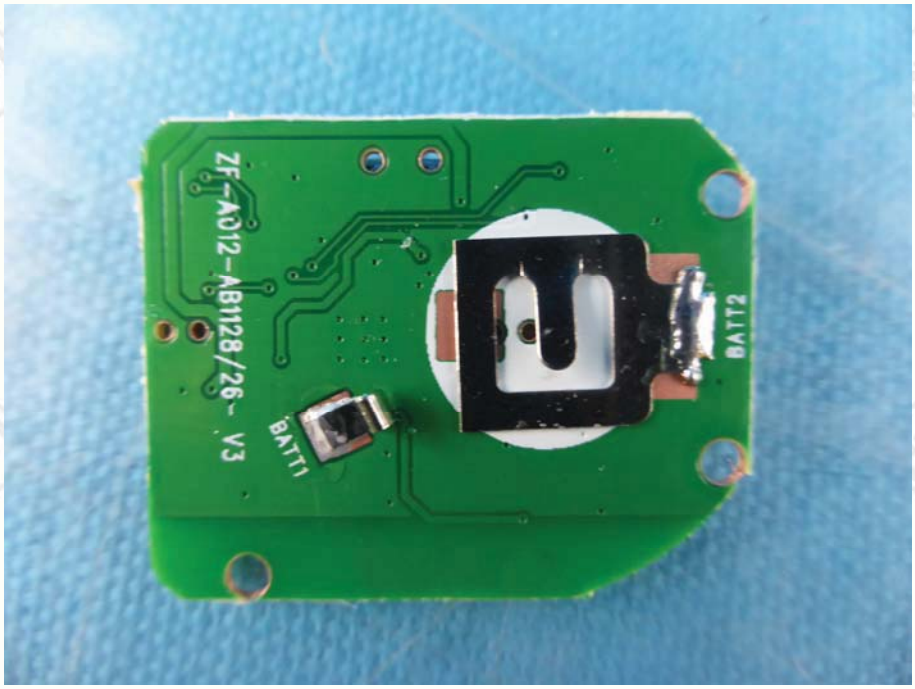


Fig.5- View of EUT

*** End of Report ***

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