ELECTROMAGNETIC EMISSIONS COMPLIANCE REPORT
INTENTIONAL RADIATOR CERTIFICATION

Product Name	:	Bluetooth Headset
Model Number	:	BT304 / BT311
Trade Name	:	N/A
FCC ID	:	Z63-001AONI
Report Number	:	EESZD10200001
Date	:	November 11, 2011

Standards	Results
☒ 47 CFR FCC Part 15 Subpart C 15.247: 2010	PASS

Prepared for:

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Prepared by:

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Check No.: 115111337

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Description Page

N/A means not applicable.

1. CERTIFICATION INFORMATION

Applicant & Address:	ShenZhen Aoni Electronic Industry Co., Ltd. HongHui Industrial Park, 2nd LiuXian Road, Xin'An streets, District 68, Bao'an District, ShenZhen, China
Manufacturer & Address:	ShenZhen Aoni Electronic Industry Co., Ltd. HongHui Industrial Park, 2nd LiuXian Road, Xin'An streets, District 68, Bao'an District, ShenZhen, China
Type of Test:	FCC Part 15 (Certification)
FCC ID:	Z63-001AONI
Equipment Under Test:	Bluetooth Headset
Test Model:	BT304 / BT311
Model Difference:	BT304 and BT311 are identical in interior structure, electrical circuits and components with different appearance and model names for marketing requirements.
Trade Name:	Not Applicable
Serial Number:	Not Applicable
Technical Data:	DC 3.7V
Date of test:	October 20, 2011 to November 11, 2011

The above equipment was tested by Centre Testing International for compliance with the requirements set forth in the FCC Rules and Regulations Part 15, Subpart C and the measurement procedure according to ANSI C63.4.
The test results of this report relate only to the tested sample identified in this report.

Prepared by : Louisa Lu

Reviewed by : Christy Chen

Approved by : Jimmy Li
Manager

Date : November 11, 2011

2. TEST SUMMARY

No.	Test Item	Rule	Result
1	20dB Bandwidth	15.247(a)(1)	**PASS**
2	Carrier Frequency Separation	15.247(a)(1)	**PASS**
3	Number of Hopping Frequency	15.247(a)(iii)	**PASS**
4	Time of Occupancy (Dwell Time)	15.247(a)(iii)	**PASS**
5	Maximum Peak Conducted Output Power	15.247(b)(1)	**PASS**
6	Bandedge Emission	15.247(d)	**PASS**
7	Spurious RF Conducted Emission	15.247(d)	**PASS**
8	Radiated Emission	15.247(d)	**PASS**
9	Antenna requirements	15.203	**PASS**

Note: "Measurement Guidelines for Frequency Hopping Spread Spectrum Systems" procedure DA 00-705.

3. 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
Maximum Peak Conducted Output Power	0.22dB
Radiated Emissions / Bandedge Emission	4.4 dB

4. PRODUCT INFORMATION

Items	Description
Rating	DC 3.7V
Intentional Transceiver	Intentional Transceiver
Modulation	Frequency Hopping Spread Spectrum (FHSS) 1. GFSK 2. π/4-DQPSK 3. 8DPSK
Data Rate (Mbps)	GFSK: 1 ; π/4-DQPSK: 2 ; 8DPSK: 3
Frequency Range	2402 ~ 2480 MHz
Channel Number	79 (at intervals of 1MHz)
Antenna Type	PCB Antenna

5. SYSTEM TEST CONFIGURATION

5.1 Justification

For emissions testing, the equipment under test (EUT) setup to transmit continuously to simplify the measurement methodology. Care was taken to ensure proper power supply voltages during testing. During testing, all cables were manipulated to produce worst case emissions. It was powered by 3.7VDC. Only the worst case data were recorded in this test report.

The signal is maximized through rotation and placement in the three orthogonal axes. The antenna height and polarization are varied during the search for maximum signal level. The antenna height is varied from 1 to 4 meters. Radiated emissions are taken at three meters unless the signal level is too low for measurement at that distance. If necessary, a pre-amplifier is used and/or the test is conducted at a closer distance.

All readings are extrapolated back to the equivalent three meter reading using inverse scaling with distance. Analyzer resolution is 100 kHz or greater for frequencies below 1000 MHz. The resolution is 1 MHz or greater for frequencies above 1000 MHz. The spurious emissions more than 20 dB below the permissible value are not reported.

Radiated emission measurement were performed the lowest radio frequency signal generated in the device which is greater than 9 kHz to the tenth harmonic of the highest fundamental frequency or to 40 GHz, whichever is lower.

5.2 EUT Exercising Software

The EUT exercise program CSR, (provided by client) used during testing was designed to exercise the various system components in a manner similar to a typical use.

The parameters of test software setting:
During the test, Channel and power controlling software provided by the applicant was used to control the operating channel as well as the output power level. The RF output power selection is for the setting of RF output power expected by the application and is going to be fixed on the firmware of the end product.

Power Parameters of EUT

Channel No.	Data rate	Modulation Type
1 to 79	1 Mbps / 2 Mbps / 3 Mbps	GFSK / π/4-DQPSK / 8DPSK

6. TEST EQUIPMENT LIST

Equipment	Manufacturer	Model Number	Serial Number	Due Date
3M Chamber & Accessory Equipment	ETS-LINDGREN	FACT-3	3510	07/09/2012
Spectrum Analyzer	Agilent	E4440A	MY46185649	03/29/2012
Biconilog Antenna	ETS-LINGREN	3142C	00044562	07/06/2012
Multi device Controller	ETS-LINGREN	2090	00057230	N/A
Horn Antenna	ETS-LINGREN	3117	00057407	07/06/2012
Microwave Preamplifier	Agilent	8449B	3008A02425	07/06/2012
Loop Antenna	ETS-LINDGREN	6502	00071730	07/06/2012
Spectrum Analyzer	Agilent	E4443A	MY46185649	03/29/2012

7. SUPPORT EQUIPMENT LIST

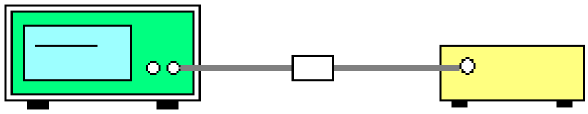
No special auxiliary equipment used.

8. 20DB BANDWIDTH MEASUREMENT

8.1. LIMITS

None

8.2. BLOCK DIAGRAM OF TEST SETUP



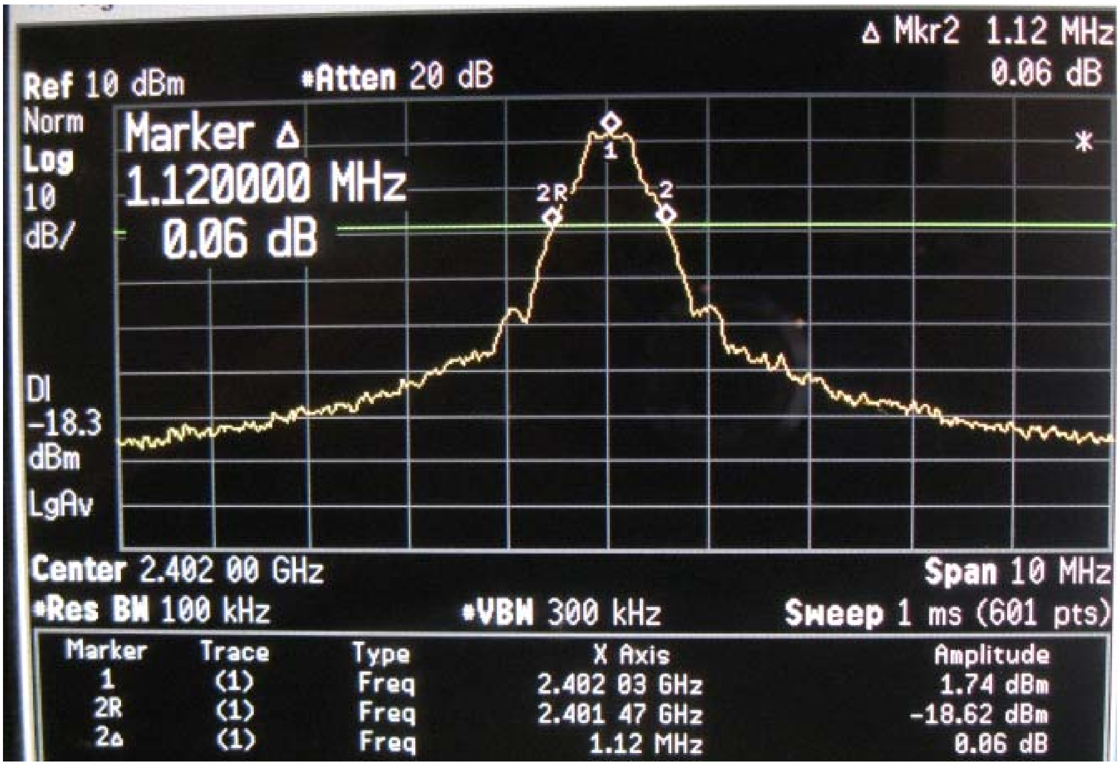
8.3. TEST PROCEDURE

1. The transmitter output (antenna port) was connected to the spectrum analyzer.
2. Set spectrum analyzer's RBW and VBW to applicable value with Peak in Max Hold.
3. A PEAK output reading was taken, a DISPLAY line was drawn 20 dB lower than PEAK level.
4. The 20dB bandwidth was determined from where the channel output spectrum intersected the display line.

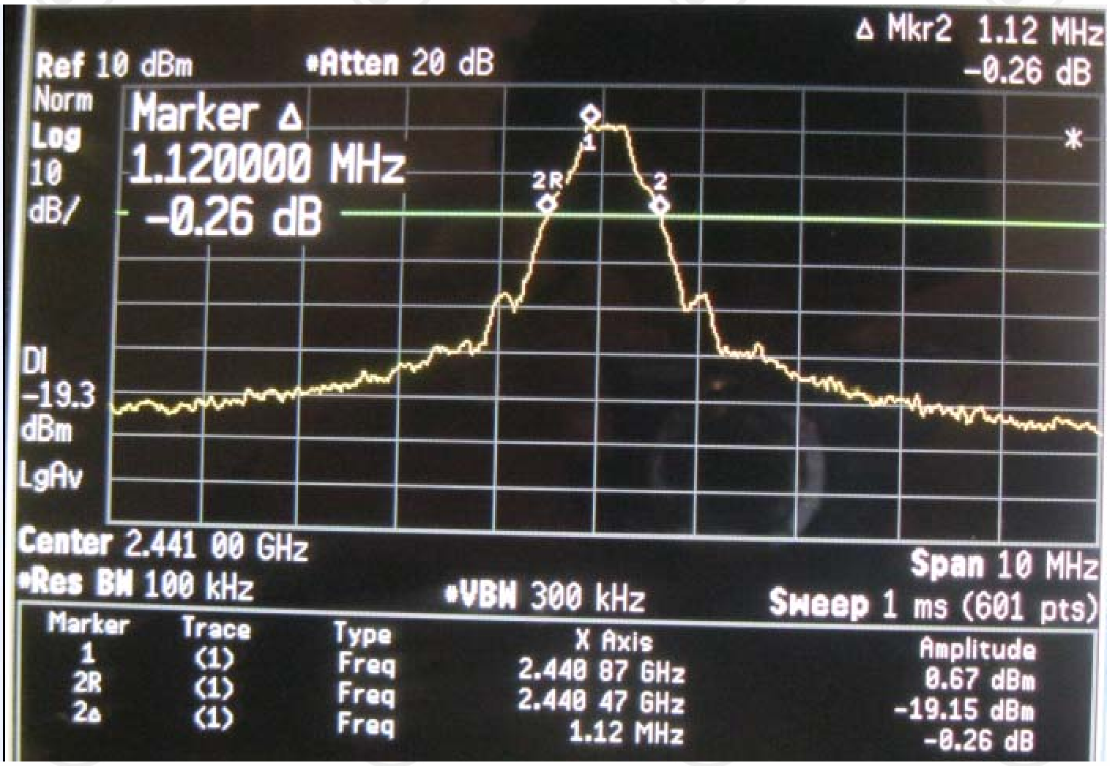
8.4. TEST RESULT

Worst case-- Modulation Type: 8DPSK Data Rate: 3Mbps

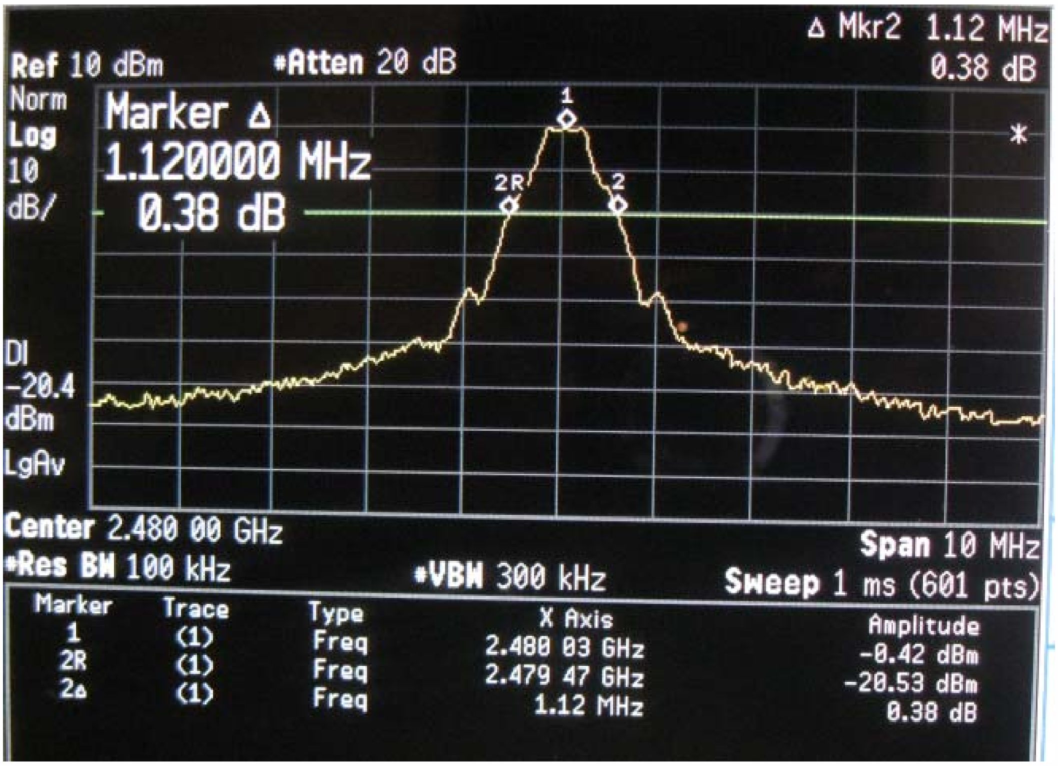
Frequency (MHz)	20 dB BW (MHz)	Result
2402	1.12	1.12MHz
2441	1.12	
2480	1.12	



2402 MHz



2441 MHz


Δ Mkr2 1.12 MHz
0.38 dB
Ref 10 dBm
#Atten 20 dB
Norm
Log
10
dB/
Marker Δ
1.120000 MHz
0.38 dB
DI
-20.4
dBm
LgAv
Center 2.480 00 GHz
#Res BW 100 kHz
#VBW 300 kHz
Span 10 MHz
Sweep 1 ms (601 pts)
Marker Trace Type X Axis Amplitude
1 (1) Freq 2.480 03 GHz -0.42 dBm
2R (1) Freq 2.479 47 GHz -20.53 dBm
2Δ (1) Freq 1.12 MHz 0.38 dB

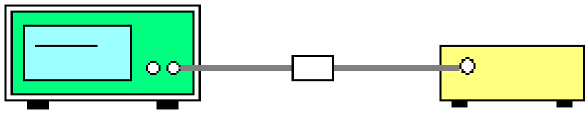
2480 MHz

9. CARRIER FREQUENCY SEPARATION

9.1. 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.
As the system's 20 dB bandwidth is 1.12MHz,
thus, Carrier Frequency Separation should be greater than 747kHz.

9.2. BLOCK DIAGRAM OF TEST SETUP

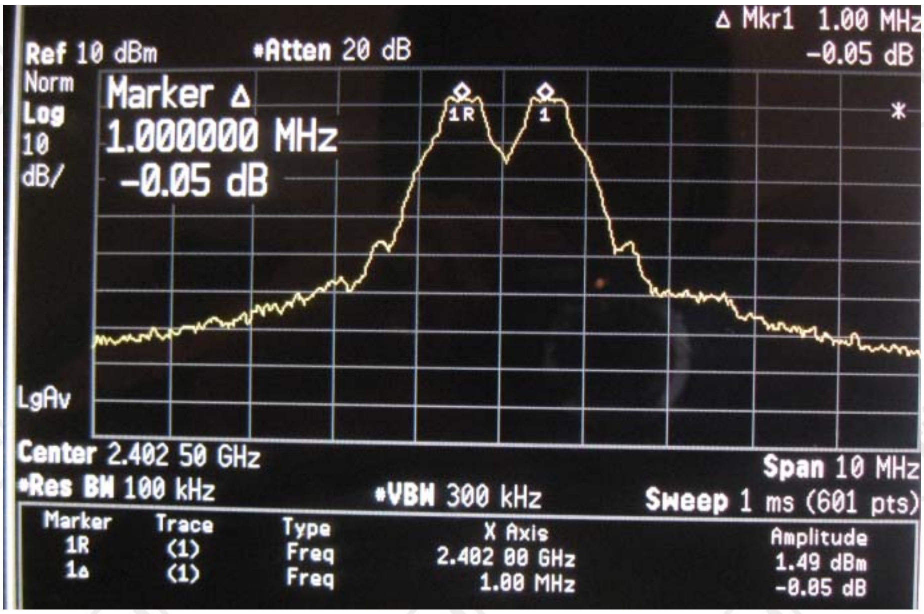


9.3. TEST PROCEDURE

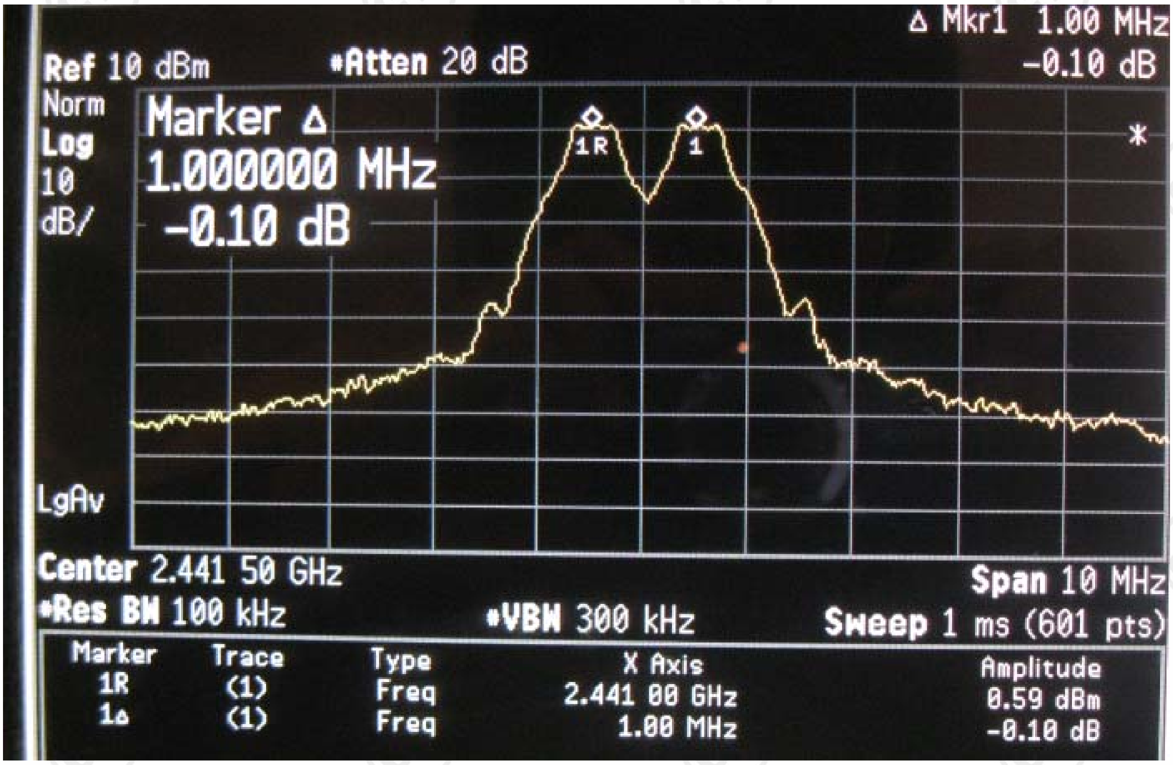
1. The transmitter output (antenna port) was connected to the spectrum analyzer.
2. Set spectrum analyzer's RBW and VBW to applicable value with Peak in Max Hold.
   The original channel 's carrier frequency was taken.
3. Make EUT transmit in adjacent channel.
4. Use the delta maker button on spectrum analyzer to read the channel separation from the adjacent channel to original channel.

9.4. TEST RESULT

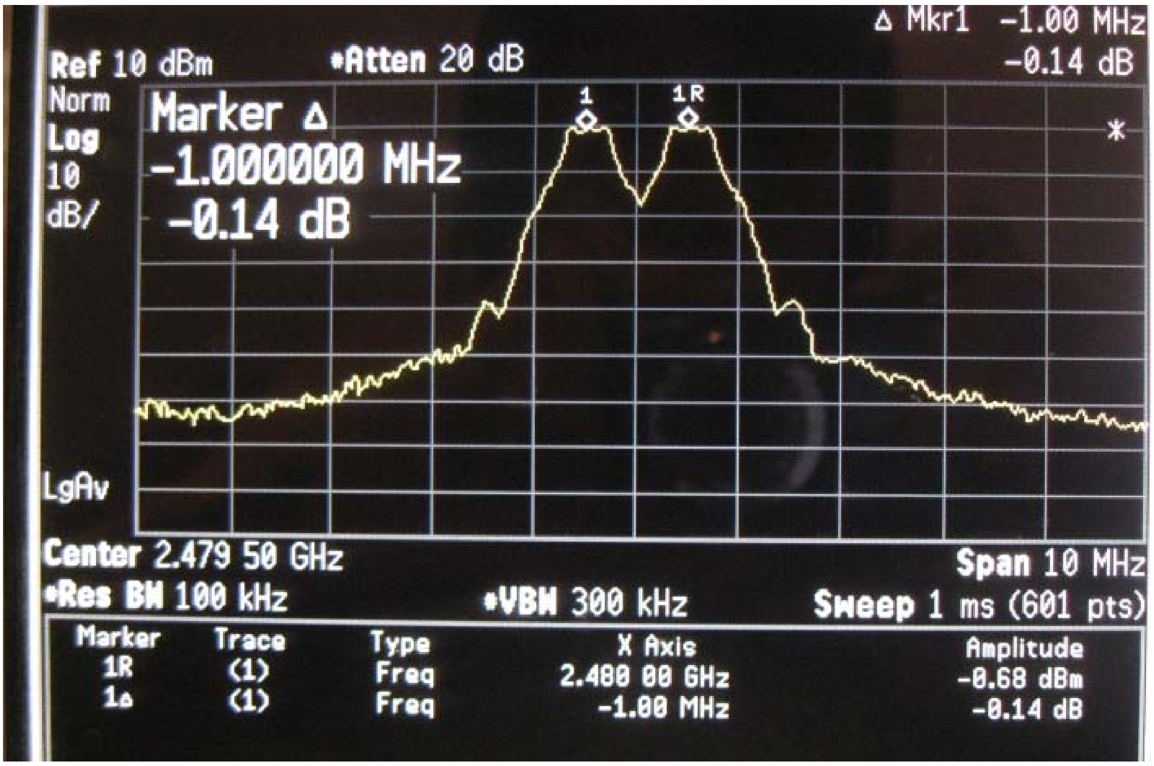
Worst case-- Modulation Type: 8DPSK Data Rate: 3Mbps



2402 MHz



2441 MHz



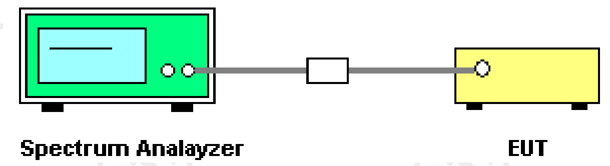
2480 MHz

10. NUMBER OF HOPPING FREQUENCY

10.1. LIMITS

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

10.2. BLOCK DIAGRAM OF TEST SETUP

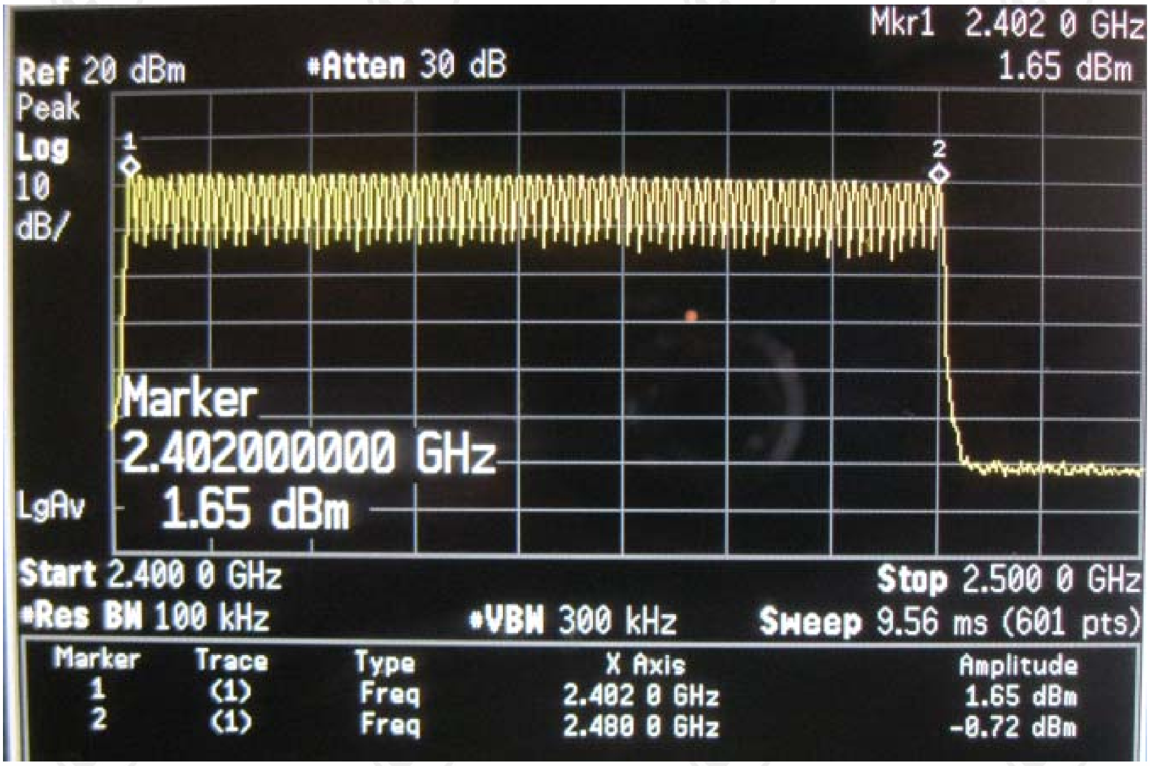


10.3. TEST PROCEDURE

1. The transmitter output (antenna port) was connected to the spectrum analyzer.
2. Set spectrum analyzer to Peak in Max Hold.
3. Make EUT work continually, till all operation channels were recorded.

10.4. TEST RESULT

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

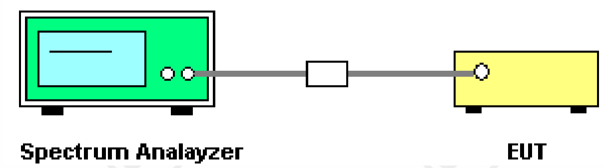


11. TIME OF OCCUPANCY (DWELL TIME)

11.1. 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.

11.2. BLOCK DIAGRAM OF TEST SETUP



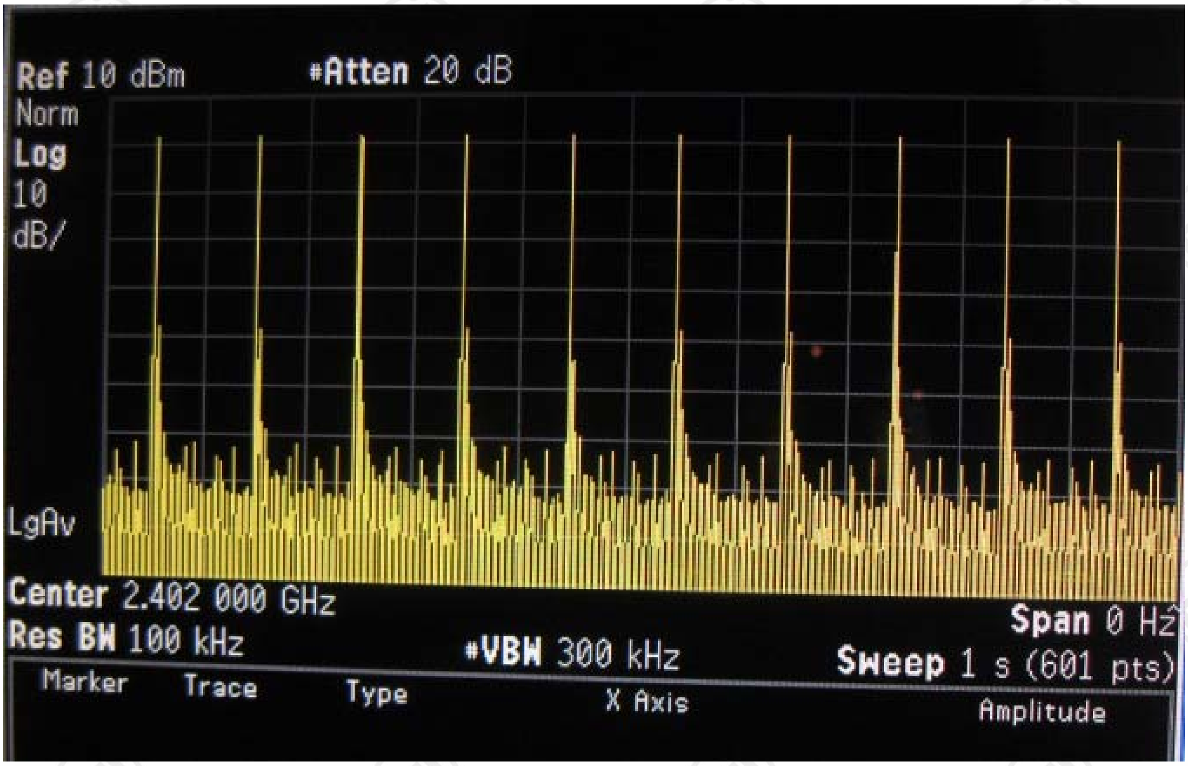
11.3. TEST PROCEDURE

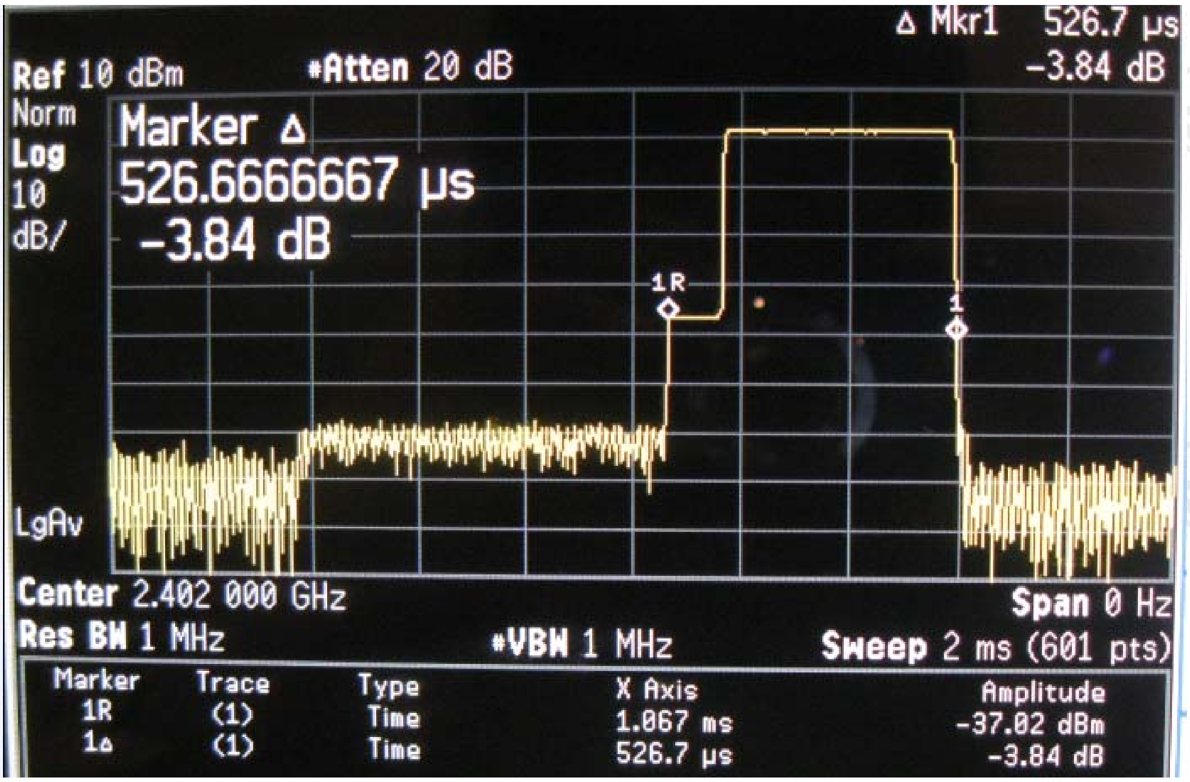
1. The transmitter output (antenna port) was connected to the spectrum analyzer.
2. Set spectrum analyzer's RBW and VBW to applicable value with Peak in Max Hold.
3. Measured pulse time and Time separation.

11.4. TEST RESULT

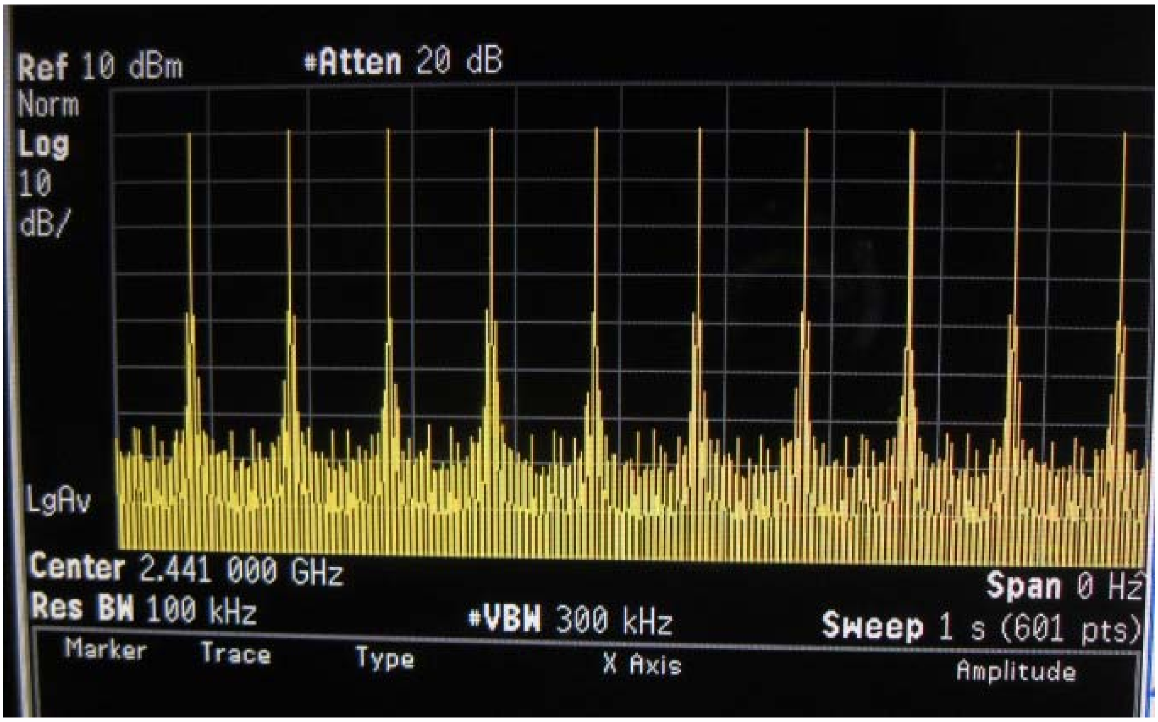
Worst case-- Modulation Type: 8DPSK Data Rate: 3Mbps

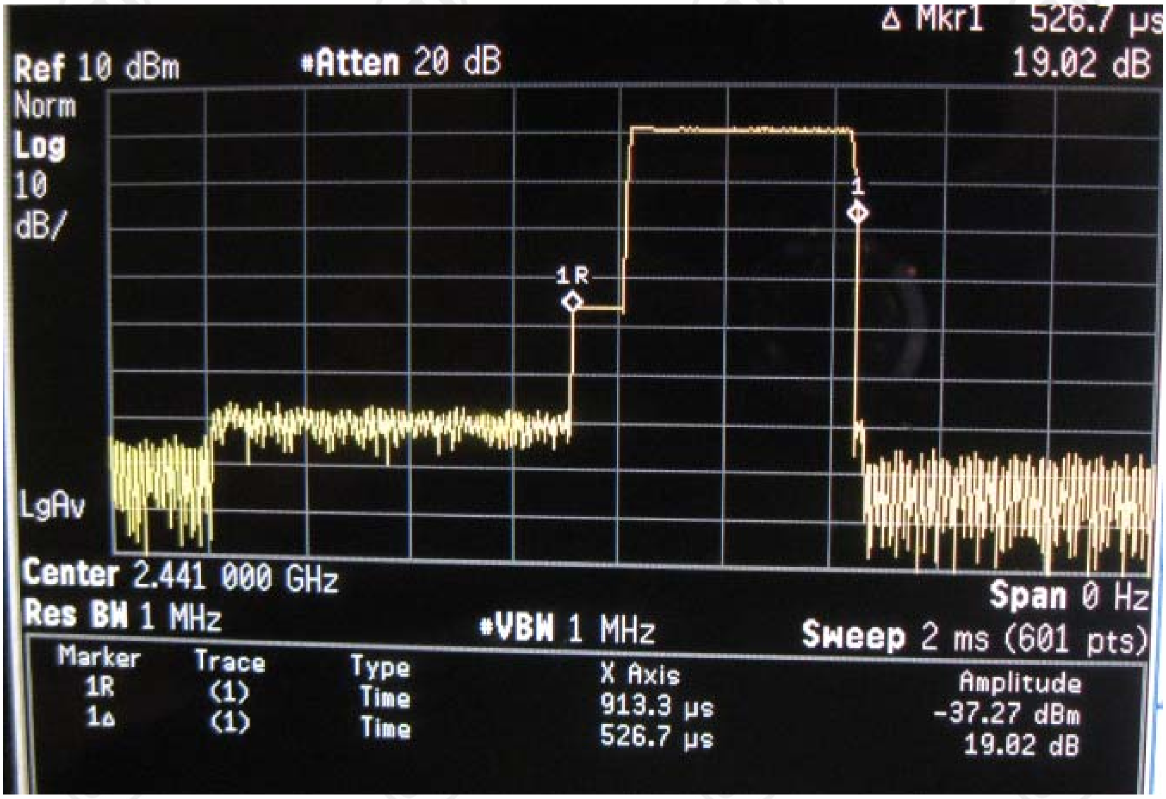
Freq. (MHz)	Pulse Wide (ms)	Number of Hopping Pulses in 0.4s*channel number	Dwell Time (s)	Limit (s)	Result (Pass / Fail)
2402	0.527	316	0.167	0.4	Pass
2441	0.527	316	0.167	0.4	Pass
2480	0.533	316	0.168	0.4	Pass


Ref 10 dBm #Atten 20 dB
Norm
Log
10
dB/
LgAv
Center 2.402 000 GHz
Res BW 100 kHz #VBW 300 kHz
Span 0 Hz
Sweep 1 s (601 pts)
Marker Trace Type X Axis Amplitude

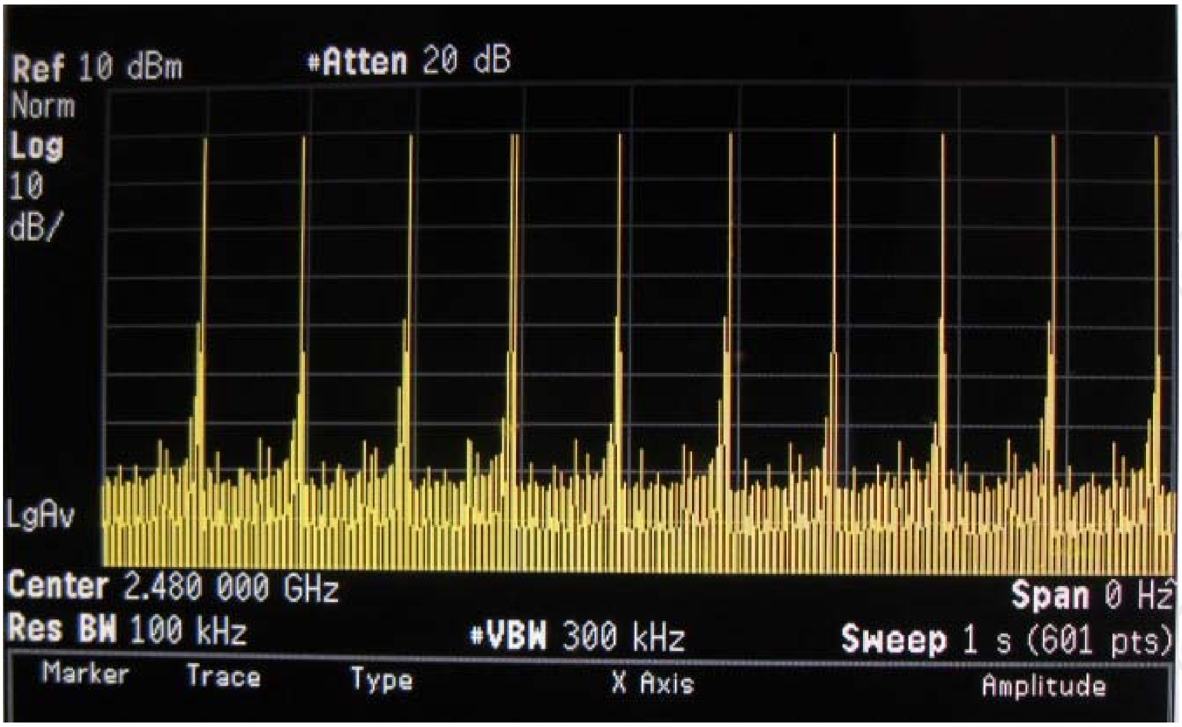

Δ Mkr1 526.7 μs
-3.84 dB
Ref 10 dBm #Atten 20 dB
Norm
Log
10
dB/
Marker Δ
526.6666667 μs
-3.84 dB
LgAv
Center 2.402 000 GHz
Res BW 1 MHz #VBW 1 MHz
Span 0 Hz
Sweep 2 ms (601 pts)
Marker Trace Type X Axis Amplitude
1R (1) Time 1.067 ms -37.02 dBm
1Δ (1) Time 526.7 μs -3.84 dB

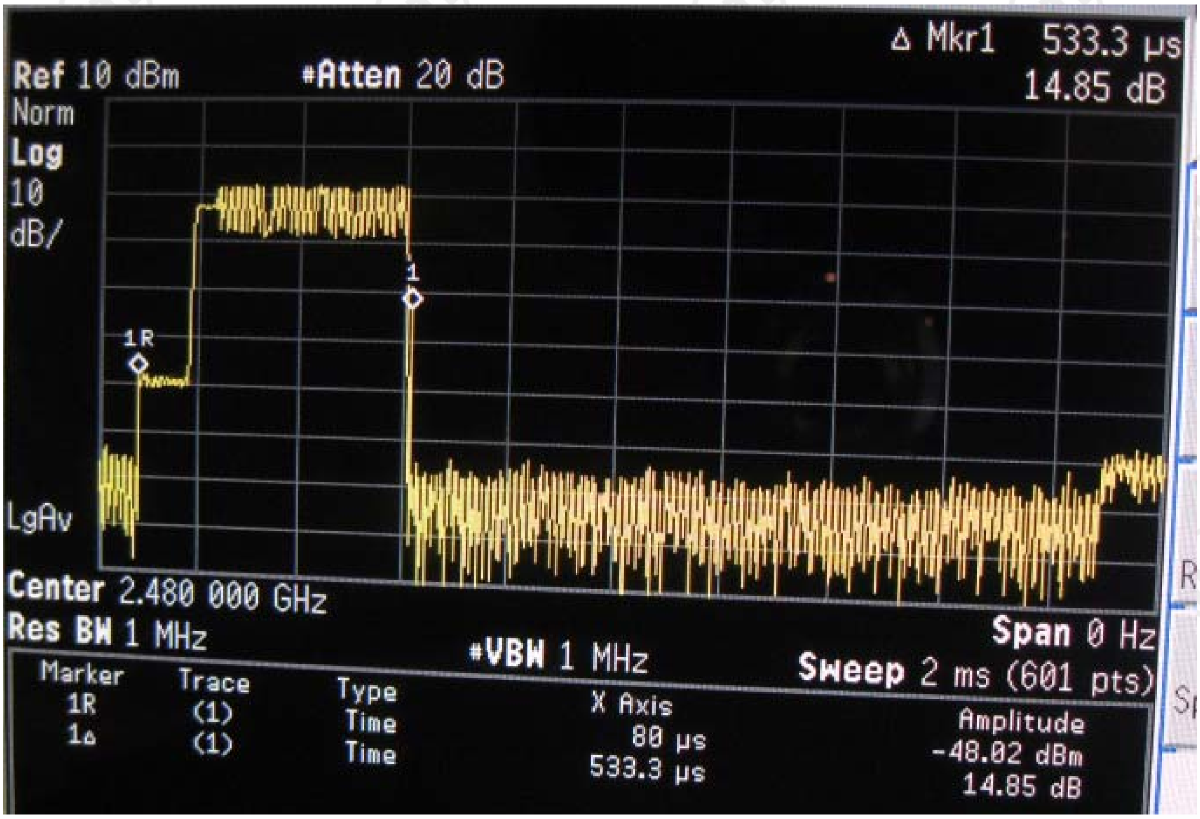
2402 MHz


Ref 10 dBm
#Atten 20 dB
Norm
Log
10
dB/
LgAv
Center 2.441 000 GHz
Res BW 100 kHz
#VBW 300 kHz
Span 0 Hz
Sweep 1 s (601 pts)
Marker
Trace
Type
X Axis
Amplitude


Δ Mkr1 526.7 μs
19.02 dB
Ref 10 dBm
#Atten 20 dB
Norm
Log
10
dB/
LgAv
1R
1
Center 2.441 000 GHz
Res BW 1 MHz
#VBW 1 MHz
Span 0 Hz
Sweep 2 ms (601 pts)
Marker Trace Type X Axis Amplitude
1R (1) Time 913.3 μs -37.27 dBm
1Δ (1) Time 526.7 μs 19.02 dB

2441 MHz


Ref 10 dBm
#Atten 20 dB
Norm
Log
10
dB/
LgAv
Center 2.480 000 GHz
Span 0 Hz
Res BW 100 kHz
#VBW 300 kHz
Sweep 1 s (601 pts)
Marker
Trace
Type
X Axis
Amplitude


Δ Mkr1 533.3 μs
14.85 dB
Ref 10 dBm
#Atten 20 dB
Norm
Log
10
dB/
1R
1
LgAv
Center 2.480 000 GHz
Res BW 1 MHz
#VBW 1 MHz
Span 0 Hz
Sweep 2 ms (601 pts)
Marker Trace Type X Axis Amplitude
1R (1) Time 80 μs -48.02 dBm
1Δ (1) Time 533.3 μs 14.85 dB

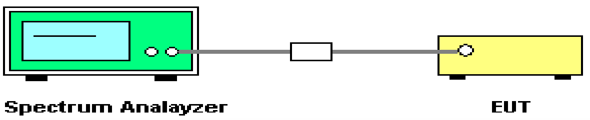
2480 MHz

12. MAXIMUM PEAK CONDUCTED OUTPUT POWER MEASUREMENT

12.1. LIMITS

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

12.2. BLOCK DIAGRAM OF TEST SETUP



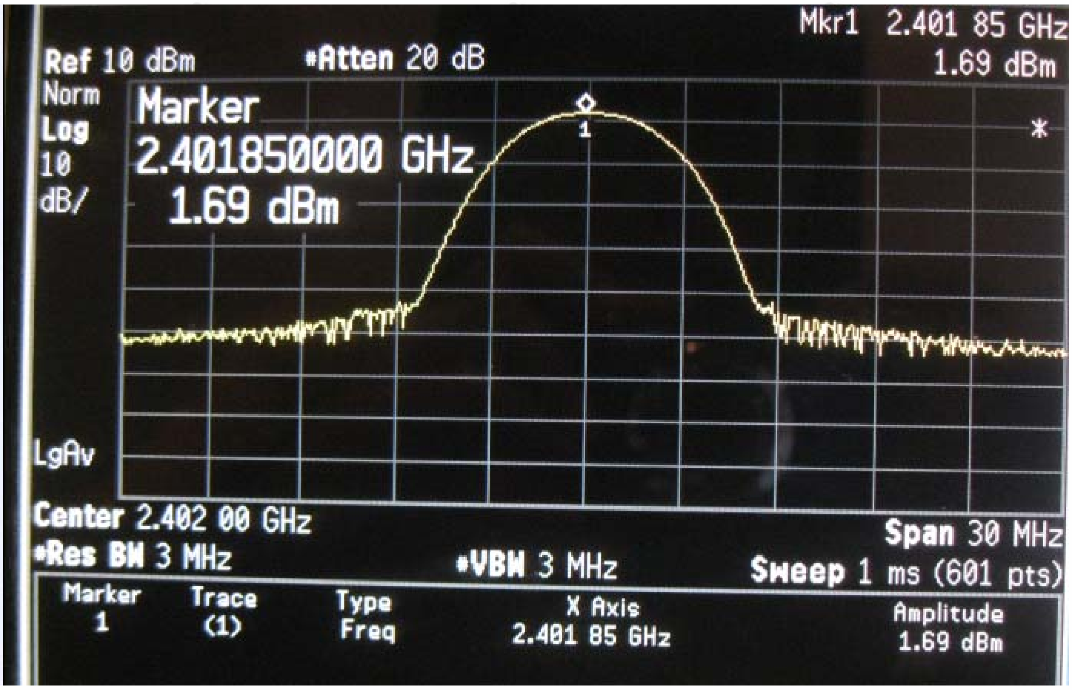
12.3. TEST PROCEDURE

1. The transmitter output (antenna port) was connected to the spectrum analyzer.
2. Set spectrum analyzer's RBW and VBW to applicable value with Peak in Max Hold.
3. Record the channel power directly from the spectrum analyzer.

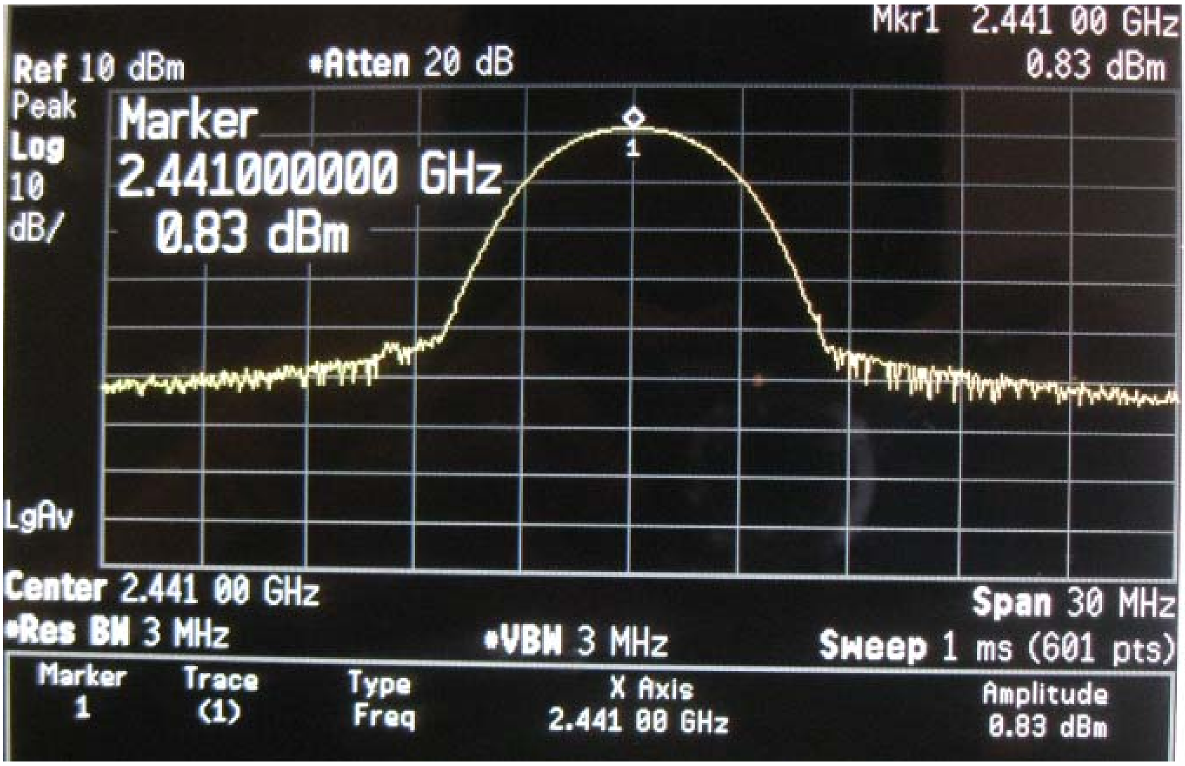
12.4. TEST RESULT

Worst case-- Modulation Type: 8DPSK Data Rate: 3Mbps

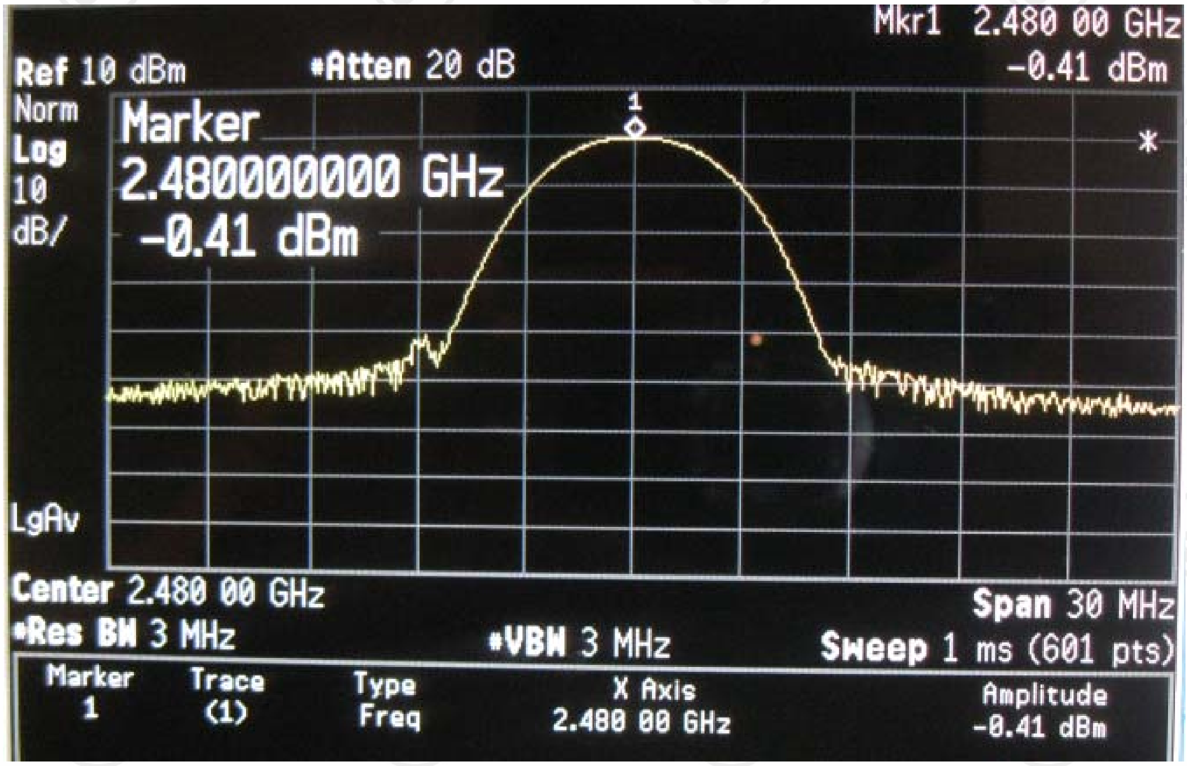
Freq. (MHz)	Reading Power (dBm)	Cable Loss (dB)	Measured Power (dBm)	Limit (dBm)	Result (Pass / Fail)
2402	1.69	0.5	2.19	21	Pass
2441	0.83	0.5	1.33	21	Pass
2480	-0.41	0.5	0.09	21	Pass



2402MHz



2441MHz



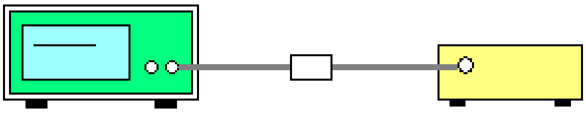
2480MHz

13. BAND EDGE 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. 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).

13.2. BLOCK DIAGRAM OF TEST SETUP



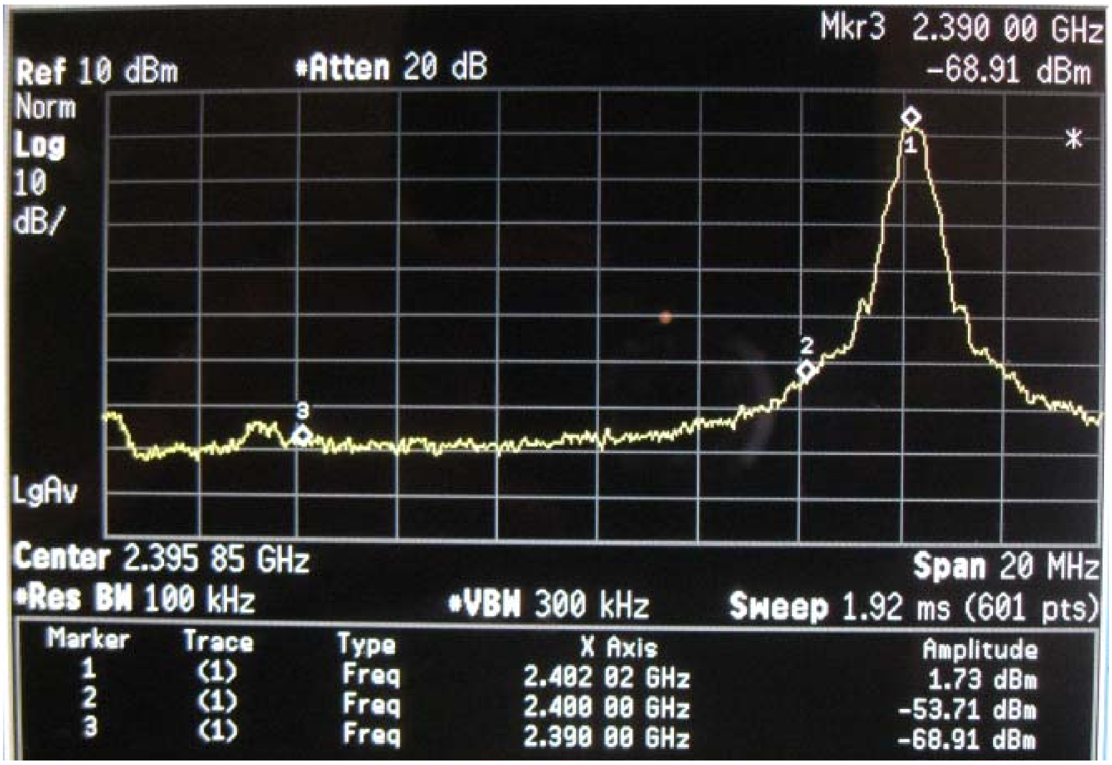
13.3. TEST PROCEDURE

1. The transmitter output (antenna port) was connected to the spectrum analyzer.
2. Set spectrum analyzer's RBW and VBW to applicable value with Peak in Max Hold.
3. Record the emission drops at the band-edge relative to the highest fundamental emission level.
4. Use the marker-delta method to determine band-edge compliance as required.

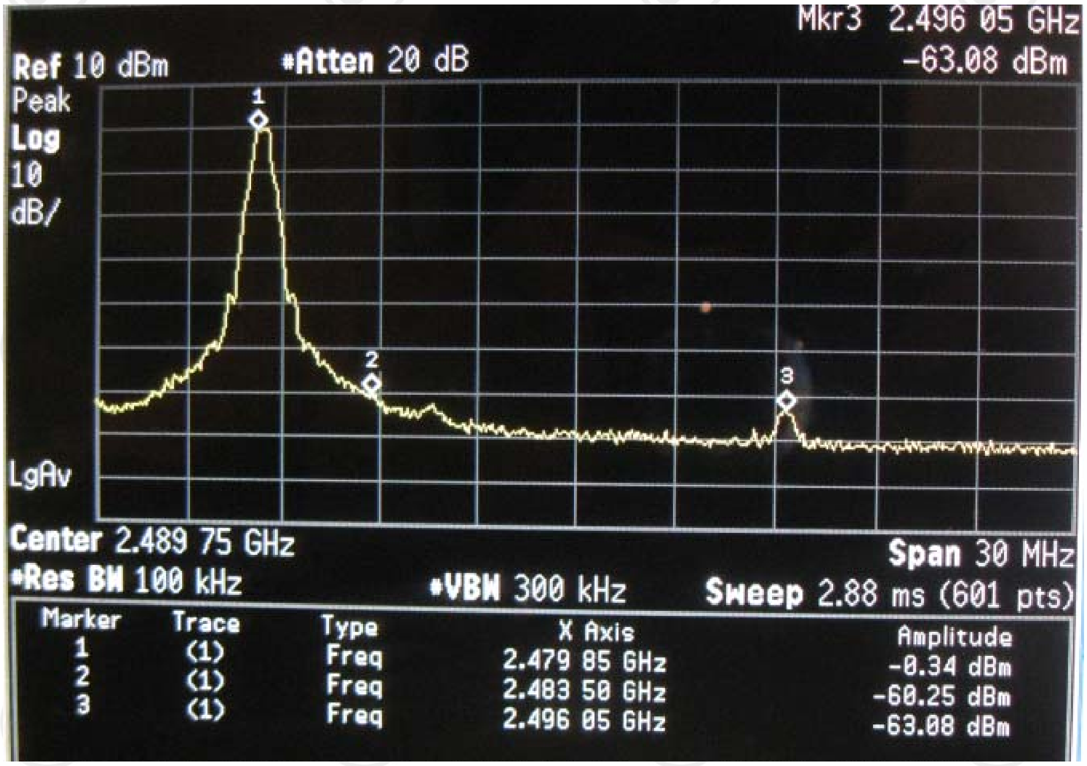
13.4. TEST RESULT

Worst case-- Modulation Type: 8DPSK Data Rate: 3Mbps

Freq. (MHz)	Fundamental Emission (dBµV/m)	delta	Final Emission (dBµV/m)	Limit (dBµV/m)	Result (Pass / Fail)
2390.000	87.7	70.64	17.06	54	Pass
2400.000	87.7	55.44	32.26	54	Pass
2483.500	88.4	59.91	28.49	54	Pass
2496.050	88.4	62.74	25.66	54	Pass



2402MHz



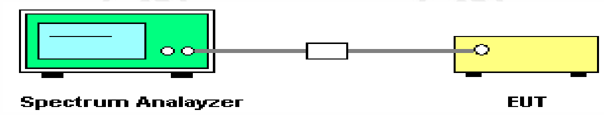
2480MHz

14. SPURIOUS RF CONDUCTED EMISSIONS MEASUREMENT

14.1. 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.

14.2. BLOCK DIAGRAM OF TEST SETUP

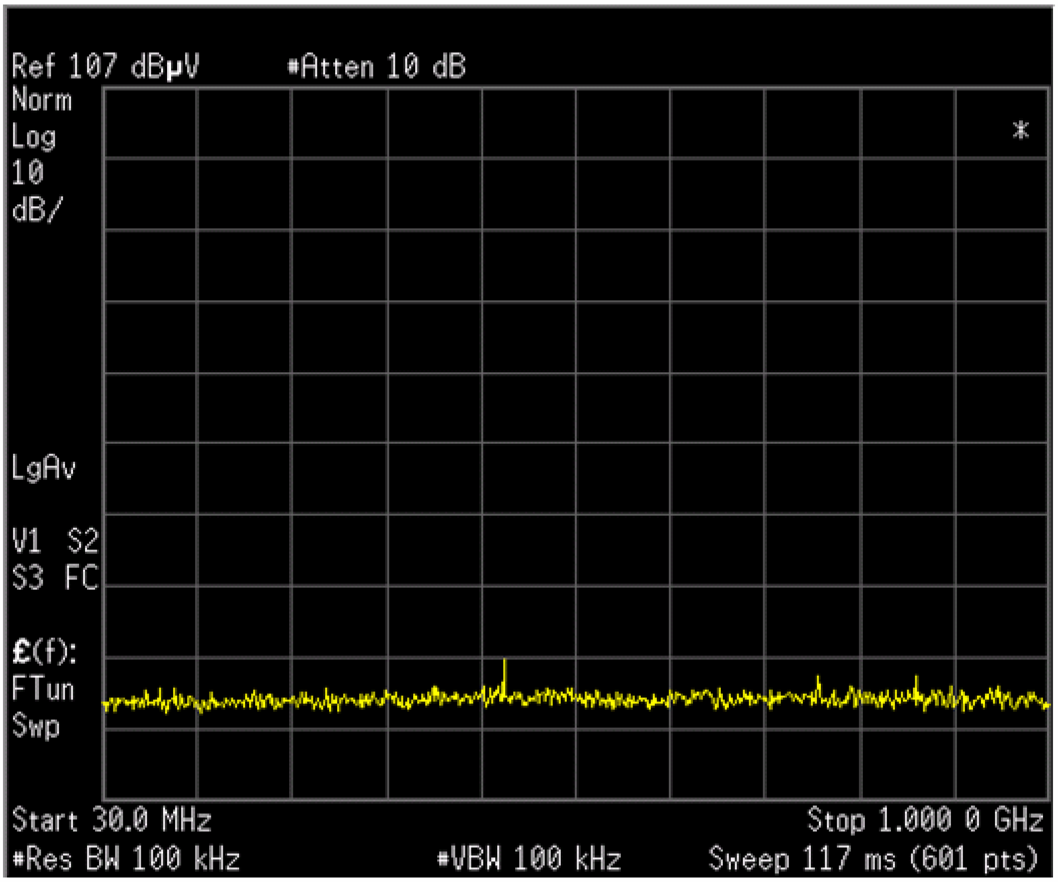


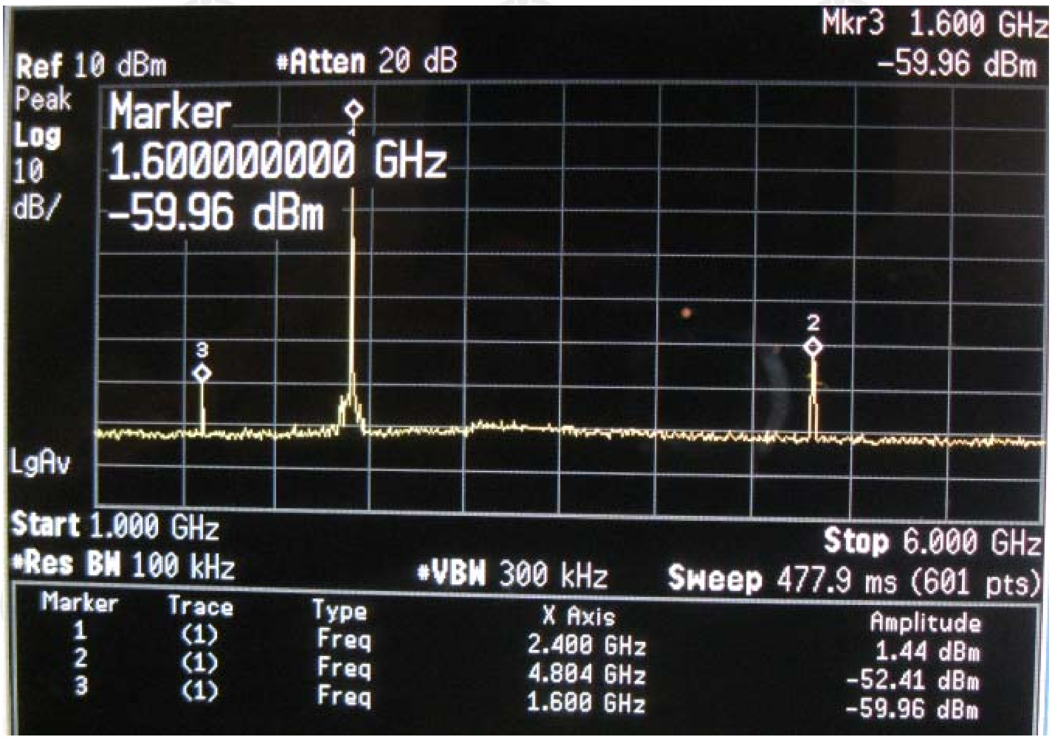
14.3. TEST PROCEDURE

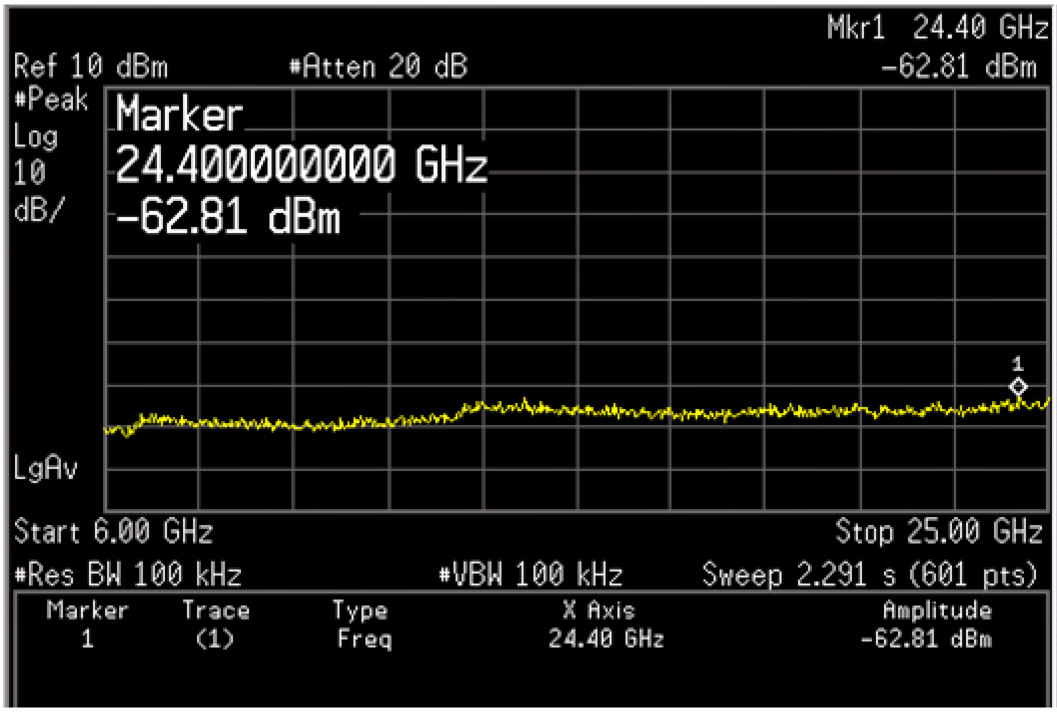
1. The transmitter output (antenna port) was connected to the spectrum analyzer.
2. Set spectrum analyzer's RBW and VBW to applicable value with Peak in Max Hold.
3. Record the peak level of the in-band emission and all spurious emissions from the lowest frequency generated in the EUT up through the 10^{th} harmonic.

14.4. TEST RESULT

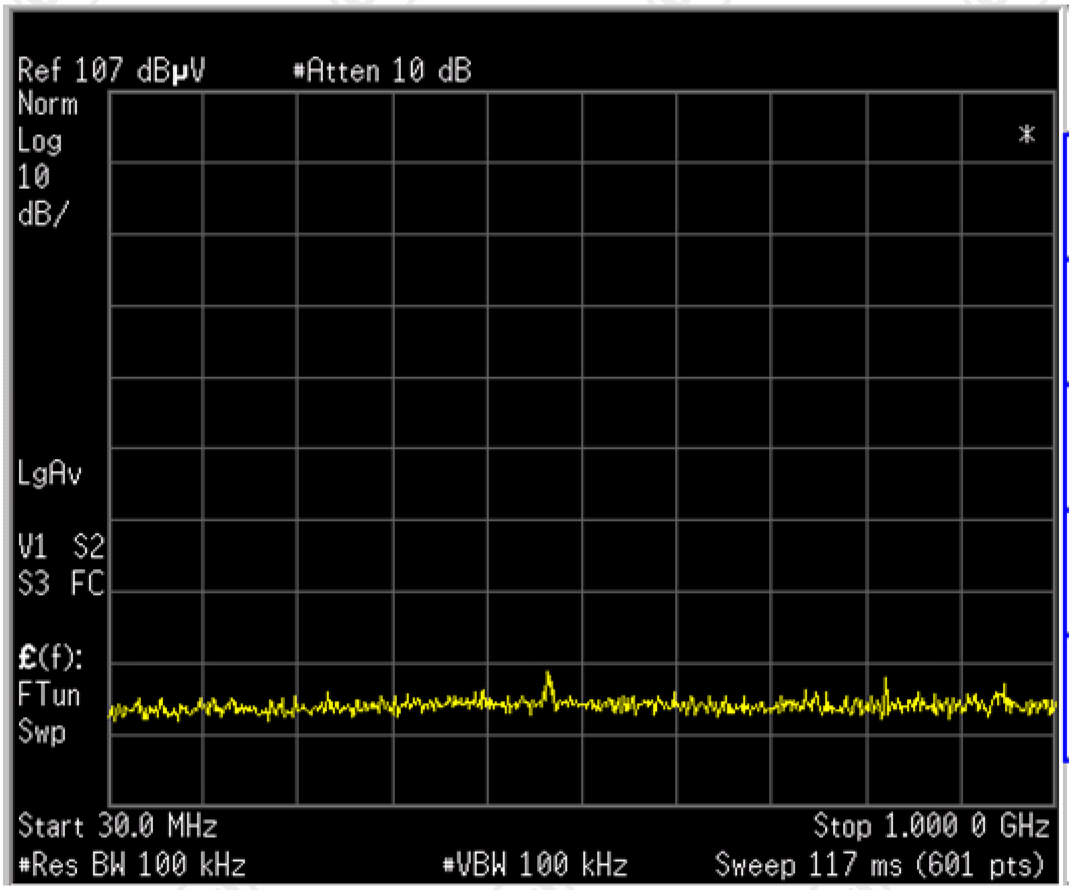
Please see the following plots.

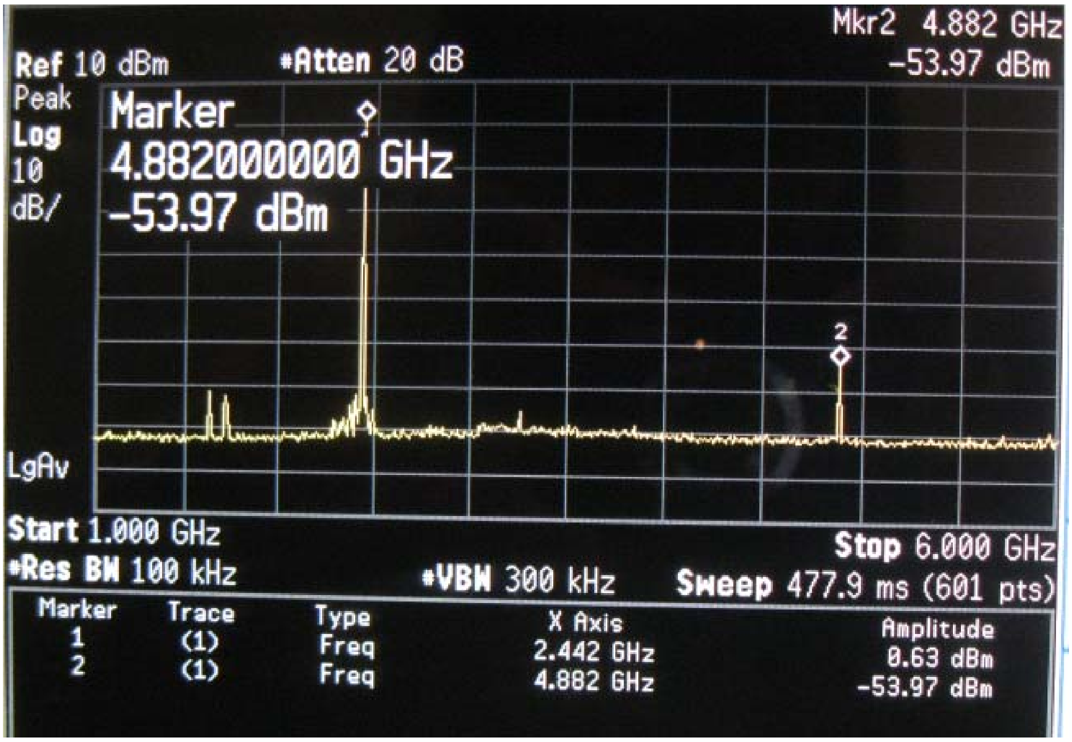

Ref 107 dBμV
#Atten 10 dB
Norm
Log
10
dB/
LgAv
V1 S2
S3 FC
£(f):
FTun
Swp
Start 30.0 MHz
Stop 1.000 0 GHz
#Res BW 100 kHz
#VBW 100 kHz
Sweep 117 ms (601 pts)

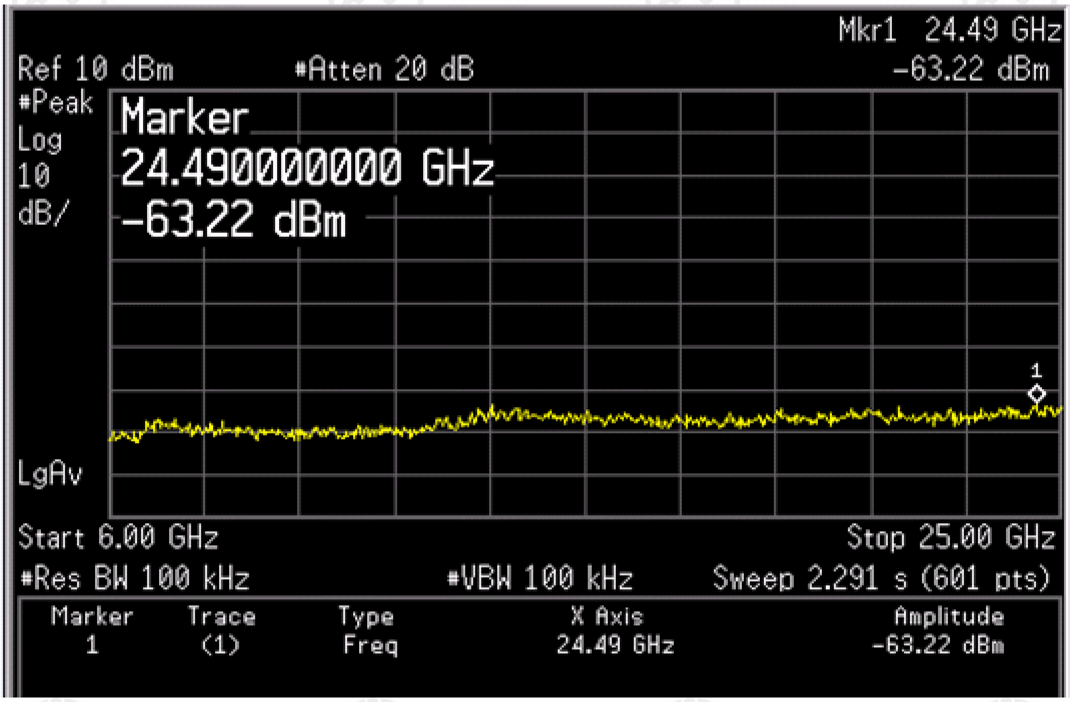

Mkr3 1.600 GHz
-59.96 dBm
Ref 10 dBm
#Atten 20 dB
Peak
Log
10
dB/
Marker
1.600000000 GHz
-59.96 dBm
LgAv
Start 1.000 GHz
Stop 6.000 GHz
#Res BW 100 kHz
#VBW 300 kHz
Sweep 477.9 ms (601 pts)
Marker Trace Type X Axis Amplitude
1 (1) Freq 2.400 GHz 1.44 dBm
2 (1) Freq 4.804 GHz -52.41 dBm
3 (1) Freq 1.600 GHz -59.96 dBm


Mkr1 24.40 GHz
-62.81 dBm
Ref 10 dBm #Atten 20 dB
#Peak
Log
10
dB/
Marker
24.400000000 GHz
-62.81 dBm
LgAv
Start 6.00 GHz
Stop 25.00 GHz
#Res BW 100 kHz
#VBW 100 kHz
Sweep 2.291 s (601 pts)
Marker 1
Trace (1)
Type Freq
X Axis 24.40 GHz
Amplitude -62.81 dBm

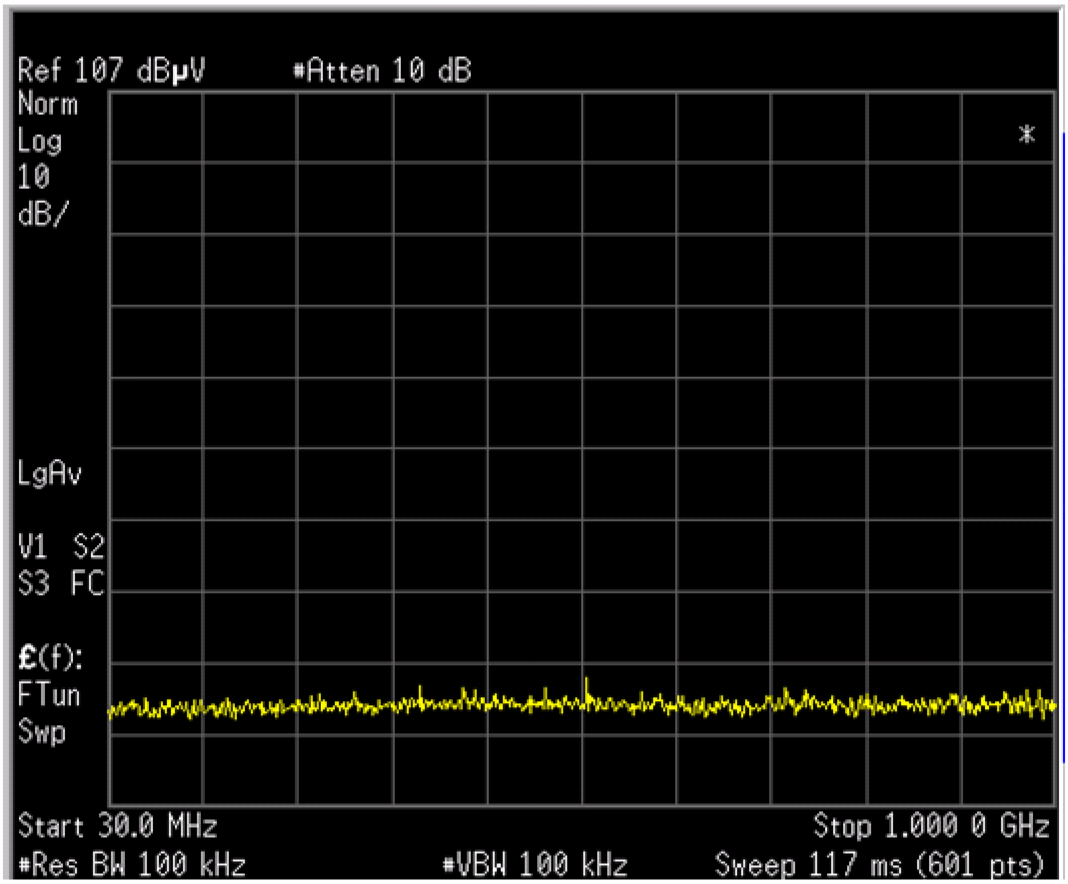
2402MHz

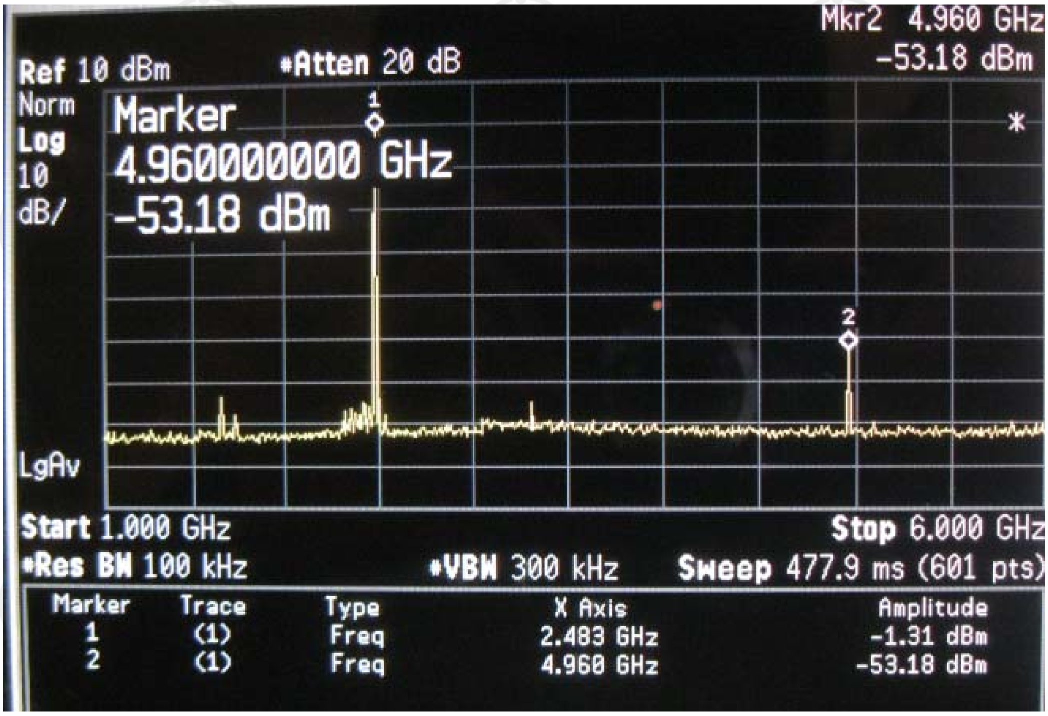

Ref 107 dBμV #Atten 10 dB
Norm
Log
10
dB/
LgAv
V1 S2
S3 FC
£(f):
FTun
Swp
Start 30.0 MHz
Stop 1.000 0 GHz
#Res BW 100 kHz
#VBW 100 kHz
Sweep 117 ms (601 pts)

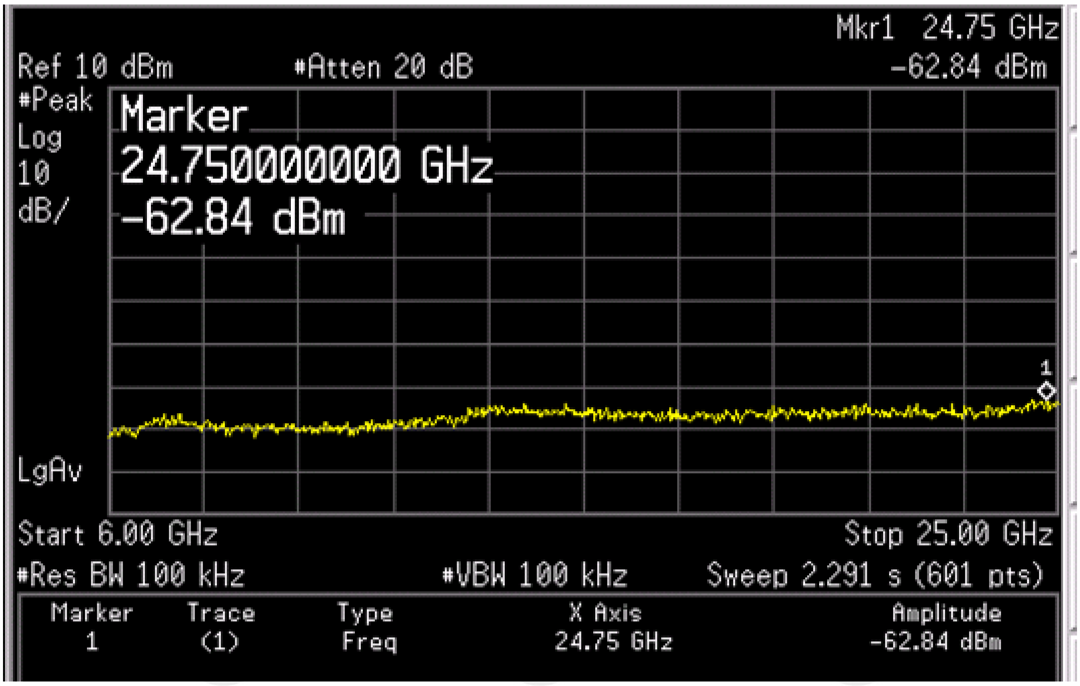

Mkr2 4.882 GHz
-53.97 dBm
Ref 10 dBm #Atten 20 dB
Peak
Log
10
dB/
Marker
4.882000000 GHz
-53.97 dBm
2
LgAv
Start 1.000 GHz
#Res BW 100 kHz
#VBW 300 kHz
Stop 6.000 GHz
Sweep 477.9 ms (601 pts)
Marker Trace Type X Axis Amplitude
1 (1) Freq 2.442 GHz 0.63 dBm
2 (1) Freq 4.882 GHz -53.97 dBm


Mkr1 24.49 GHz
-63.22 dBm
Ref 10 dBm #Atten 20 dB
#Peak
Log
10
dB/
Marker
24.490000000 GHz
-63.22 dBm
1
LgAv
Start 6.00 GHz
Stop 25.00 GHz
#Res BW 100 kHz
#VBW 100 kHz
Sweep 2.291 s (601 pts)
Marker Trace Type X Axis Amplitude
1 (1) Freq 24.49 GHz -63.22 dBm

2441MHz


Ref 107 dBμV #Atten 10 dB
Norm
Log
10
dB/
LgAv
V1 S2
S3 FC
£(f):
FTun
Swp
Start 30.0 MHz
Stop 1.000 0 GHz
#Res BW 100 kHz
#VBW 100 kHz
Sweep 117 ms (601 pts)


Mkr2 4.960 GHz
-53.18 dBm
Ref 10 dBm #Atten 20 dB
Norm
Log
10
dB/
Marker
4.960000000 GHz
-53.18 dBm
LgAv
Start 1.000 GHz
Stop 6.000 GHz
#Res BW 100 kHz
#VBW 300 kHz
Sweep 477.9 ms (601 pts)
Marker Trace Type X Axis Amplitude
1 (1) Freq 2.483 GHz -1.31 dBm
2 (1) Freq 4.960 GHz -53.18 dBm


Mkr1 24.75 GHz
Ref 10 dBm #Atten 20 dB -62.84 dBm
#Peak
Log
10
dB/
Marker
24.750000000 GHz
-62.84 dBm
LgAv
Start 6.00 GHz Stop 25.00 GHz
#Res BW 100 kHz #VBW 100 kHz Sweep 2.291 s (601 pts)
Marker Trace Type X Axis Amplitude
1 (1) Freq 24.75 GHz -62.84 dBm

2480MHz

15. RADIATED EMISSIONS MEASUREMENT

15.1. LIMITS

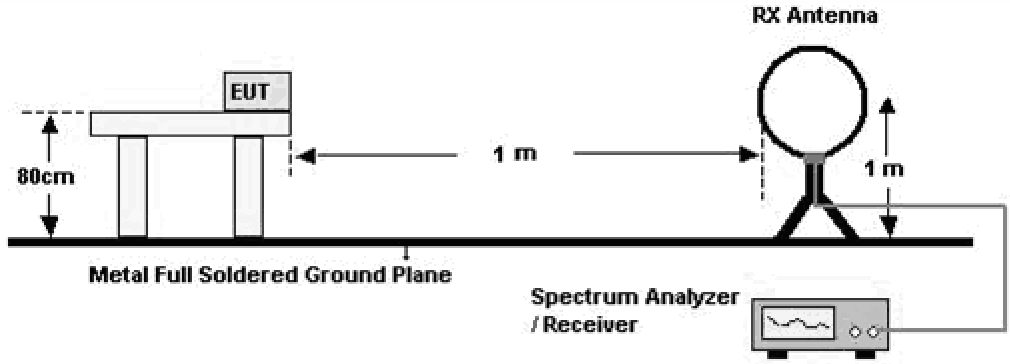
The field strength of any emissions, which appear outside of operating frequency band and restricted band specified on 15.205(a), shall not exceed the general radiated emission limits as below.

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

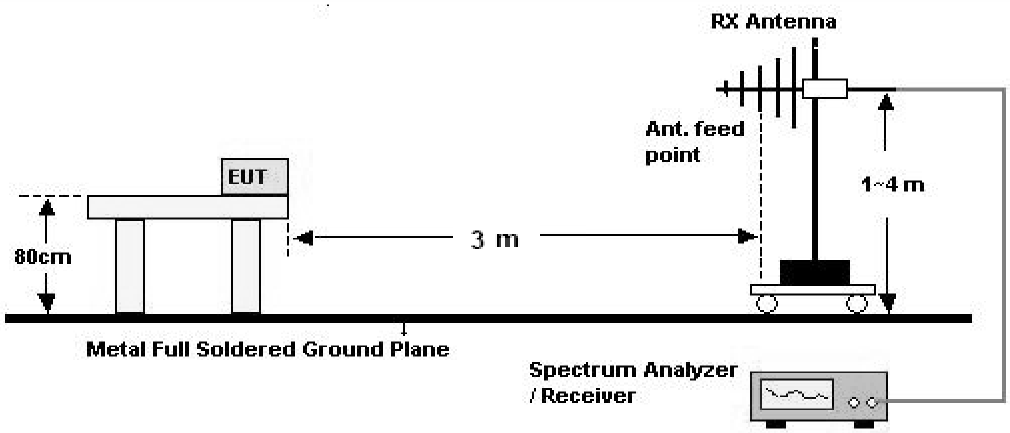
Note: the tighter limit applies at the band edges.

15.2. BLOCK DIAGRAM OF TEST SETUP

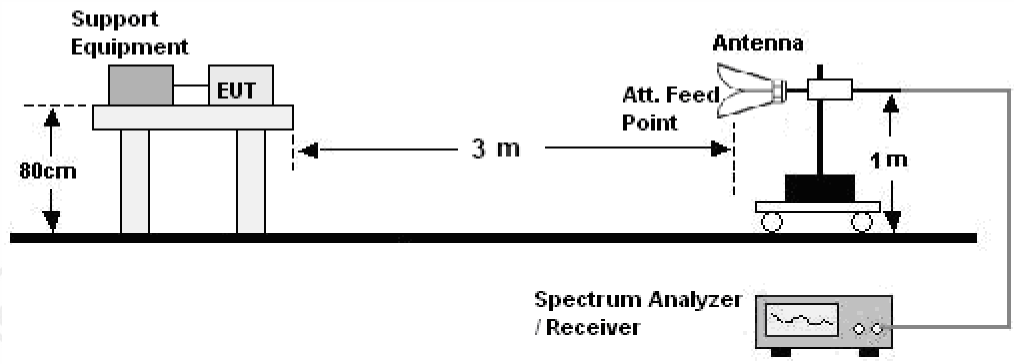
For radiated emissions from 9kHz to 30MHz



For radiated emissions from 30 - 1000MHz



For radiated emissions from 1GHz to 25GHz



15.3. TEST PROCEDURE

A. Above 30MHz

a. The EUT was placed on the top of a turntable 0.8 meters above the ground in the chamber, 3 meters away from the antenna (wideband antenna), which was mounted on the top of a variable-height antenna tower. 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 EUT was arranged to its worst case and then the antenna was tuned to heights from 1 meter to 4 meters and the 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 Function and Specified Bandwidth with Maximum Hold Mode.

B. Below 30MHz

a. The EUT is placed on a turntable 0.8 meters above the ground in the chamber, 1 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 EUT 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 Function and Specified Bandwidth with Maximum Hold Mode.

15.4. TEST RESULT

Frequency (MHZ)	Antenna Polarization (H / V)	Detector (PK / QP / AV)	Final Emission (dBµV/m)	Limit (dBµV/m)	Result (Pass / Fail)
30.000	H	QP	27.8	40.0	Pass
416.300	H	QP	29.3	46.0	Pass
2402.000	H	PK	87.6	---	Pass
3940.000	H	PK	43.8	54.0	Pass
6082.000	H	PK	48.1	54.0	Pass
31.617	V	QP	27.9	40.0	Pass
114.066	V	QP	21.5	43.5	Pass
2402.000	V	PK	87.7	---	Pass
3512.000	V	PK	43.2	54.0	Pass
5770.000	V	PK	46.7	54.0	Pass

2402MHz

Frequency (MHZ)	Antenna Polarization (H / V)	Detector (PK / QP / AV)	Final Emission (dBµV/m)	Limit (dBµV/m)	Result (Pass / Fail)
321.000	H	QP	25.3	46.0	Pass
825.400	H	QP	37.6	46.0	Pass
2441.000	H	PK	88.0	---	Pass
3640.000	H	PK	42.8	54.0	Pass
3850.000	H	PK	42.4	54.0	Pass
204.600	V	QP	24.7	43.5	Pass
665.350	V	QP	34.3	46.0	Pass
2441.000	V	PK	88.1	---	Pass
4862.000	V	PK	44.3	54.0	Pass
5525.000	V	PK	44.7	54.0	Pass

2441MHz

Frequency (MHZ)	Antenna Polarization (H / V)	Detector (PK / QP / AV)	Final Emission (dBμV/m)	Limit (dBμV/m)	Result (Pass / Fail)
30.000	H	QP	28.5	40.0	Pass
440.000	H	QP	29.7	46.0	Pass
2480.000	H	PK	88.3	---	Pass
7015.000	H	PK	48.2	54.0	Pass
7390.00	H	PK	48.4	54.0	Pass
286.000	V	QP	25.3	46.0	Pass
473.000	V	QP	29.8	46.0	Pass
2480.000	V	PK	88.4	---	Pass
4280.000	V	PK	44.5	54.0	Pass
5630.000	V	PK	45.3	54.0	Pass

2480MHz

Note 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.

Note 2: The emissions below 30MHz are not reported for they are much lower than the limits.

Annex
Declaration for Bluetooth Device acc to Part 15.247

1 Output power and channel separation of a Bluetooth device in the different operating modes:

The different operating modes (data-mode, acquisition-mode) of a Bluetooth device has no influence on the output power and the channel spacing. There is only one transmitter which is driven by identical input parameters concerning these two parameters.
Only a different hopping sequence will be used. For this reason the check of these RF parameters in one op-mode is sufficient.

2 Frequency range of a Bluetooth device:

Hereby we declare that the maximum frequency of this device is: 2402 – 2480 MHz. This is according to the Bluetooth Core Specification (+ critical errata) for devices which will be operated in the USA.
This was checked during the Bluetooth Qualification tests (Test Case: TRM/CA/04-E). Other frequency ranges (e.g. for Spain, France, Japan) which are allowed according the Core Specification are not supported by this device.

3 Co-ordination of the hopping sequence in data mode to avoid simultaneous occupancy by multiple transmitters:

Bluetooth units which want to communicate with other units must be organized in a structure called piconet. This piconet consist of max. 8 Bluetooth units. One unit is the master the other seven are the slaves. The master co-ordinates frequency occupation in this piconet for all units. As the master hop sequence is derived from its BD address which is unique for each Bluetooth device, additional masters intending to establish new piconets will always use different hop sequences.

4 Example of a hopping sequence in data mode:

Example of a 79 hopping sequence in data mode:
40, 21, 44, 23, 42, 53, 46, 55, 48, 33, 52, 35, 50, 65, 54, 67,
56, 37, 60, 39, 58, 69, 62, 71, 64, 25, 68, 27, 66, 57, 70, 59,
72, 29, 76, 31, 74, 61, 78, 63, 01, 41, 05, 43, 03, 73, 07, 75,
09, 45, 13, 47, 11, 77, 15, 00, 64, 49, 66, 53, 68, 02, 70, 06,
01, 51, 03, 55, 05, 04

5 Equally average use of frequencies in data mode and behaviour for short transmissions:

The generation of the hopping sequence in connection mode depends essentially on two input values:
1. LAP/UAP of the master of the connection
2. Internal master clock

The LAP (lower address part) are the 24 LSB's of the 48 BD_ADDRESS. The BD_ADDRESS is an unambiguous number of every Bluetooth unit. The UAP (upper address part) are the 24 MSB's of the 48 BD_ADDRESS.

The internal clock of a Bluetooth unit is derived from a free running clock which is never adjusted and is never turned off. For synchronisation with other units only offset are used. It has no relation to the time of the day. Its resolution is at least half the RX/TX slot length of 312.5 μs. The clock has a cycle of about one day (23h30). In most case it is implemented as 28 bit counter. For the deriving of the hopping sequence the entire LAP (24 bits), 4 LSB's (4 bits) (Input 1) and the 27 MSB's of the clock (Input 2) are used. With this input values different mathematical procedures (permutations, additions, XOR-operations) are performed to generate the sequence. This will be done at the beginning of every new transmission.

Regarding short transmissions the Bluetooth system has the following behaviour: The first connection between the two devices is established, a hopping sequencewas generated. For transmitting the wanted data the complete hopping sequencewas not used. The connection ended.

The second connection will be established. A new hopping sequence is generated. Due to the fact that the Bluetooth clock has a different value, because the period between the two transmission is longer (and it cannot be shorter) than the minimum resolution of the clock (312.5 μs). The hopping sequence will always differ from the first one.

6 Receiver input bandwidth and behaviour for repeated single or multiple packets:

The input bandwidth of the receiver is 1 MHz. In every connection one Bluetooth device is the master and the other one is the slave. The master determines the hopping sequence (see chapter 5). The slave follows this sequence. Both devices shift between RX and TX time slot according to the clock of the master.

Additionally the type of connection (e.g. single or multislot packet) is set up at the beginning of the connection. The master adapts its hopping frequency and its TX/RX timing according to the packet type of the connection. Also the slave of the connection will use these settings.

Repeating of a packet has no influence on the hopping sequence. The hopping sequence generated by the master of the connection will be followed in any case. That means, a repeated packet will not be send on the same frequency, it is send on the next frequency of the hopping sequence.

7 Dwell time in data mode

The dwell time of 0.3797s within a 30 second period in data mode is independent from the packet type (packet length). The calculation for a 30 second period is a follows:

Dwell time = time slot length * hop rate / number of hopping channels *30s

Example for a DH1 packet (with a maximum length of one time slot) Dwell time =625 μs * 1600 1/s / 79 * 30s = 0.3797s (in a 30s period) For multislot packet the hopping is reduced according to the length of the packet.

Example for a DH5 packet (with a maximum length of five time slots Dwell time = 5 * 625 s * 1600 * 1/5 *1/s / 79 * 30s = 0.3797s (in a 30s period).

This is according the Bluetooth Core Specification V 1.0B (+ critical errata) for all Bluetooth devices. Therefor all Bluetooth devices comply with the FCC dwell time requirement in data mode. This was checked during the Bluetooth Qualification tests. The Dwell time in hybrid mode is measured and stated in the test report.

8 Channel Separation in hybrid mode

The nominal channel spacing of the Bluetooth system is 1Mhz independent of the operating mode.

The maximum “initial carrier frequency tolerance” which is allowed for Bluetooth is fcenter = 75 kHz.

This was checked during the Bluetooth Qualification tests (Test Case: TRM/CA/07-E) for three frequencies (2402, 2441, 2480 MHz). Additionally an example for the channel separation is given in the test report

9 Derivation and examples for a hopping sequence in hybrid mode

For the generation of the inquiry and page hop sequences the same procedures as described for the data mode are used (see chapter 5), but this time with different input vectors:

● For the inquiry hop sequence, a predefined fixed address is always used. This results in the same 32 frequencies used by all devices doing an inquiry but every time with a different start frequency and phase in this sequence.

● For the page hop sequence, the device address of the paged unit is used as input vector. This results in the use of a subset of 32 frequencies which is specific for that initial state of the connection establishment between the two units. A page to different devices would result in a different subset of 32 frequencies.

So it is ensured that also in hybrid mode the frequency use equally averaged.

Example of a hopping sequence in inquiry mode:
48, 50, 09, 13, 52, 54,41, 45, 56, 58, 11, 15, 60, 62, 43, 47, 00, 02, 64, 68, 04, 06, 17, 21, 08, 10, 66, 70, 12, 14, 19, 23

Example of a hopping sequence in paging mode:
08, 57, 68, 70, 51, 02, 42, 40, 04, 61, 44, 46, 63, 14, 50, 48, 16, 65, 52, 54, 67, 18, 58, 56, 20, 53, 60, 62, 55, 06, 66, 64

10 Receiver input bandwidth and synchronisation in hybrid mode:

The receiver input bandwidth is the same as in the data mode (1 MHz). When two Bluetooth devices establish contact for the first time, one device sends an inquiry access code, the other device is scanning for this inquiry access code. If two devices have been connected previously and want to start a new transmission, asimilar procedure takes place. The only difference is, instead of the inquiry access code, an special access code, derived from the BD_ADDRESS of the paged device will be, will be sent by the master of this connection.
Due to the fact that both units have been connected before (in the inquiry procedure) the paging unit has timing and frequency information about the page scan of the paged unit. For this reason the time to establish the connection is reduced considerable.

11 Spread rate / data rate of the direct sequence signal

The Spread rate / Data rate in inquiry and paging mode can be defined via the access code. The access code is the only criterion for the system to check if there is a valid transmission or not. If you regard the presence of a valid access code as one bit of information, and compare it with the length of the access code of 68 bits, the Spread rate / Data rate will be 68/1.

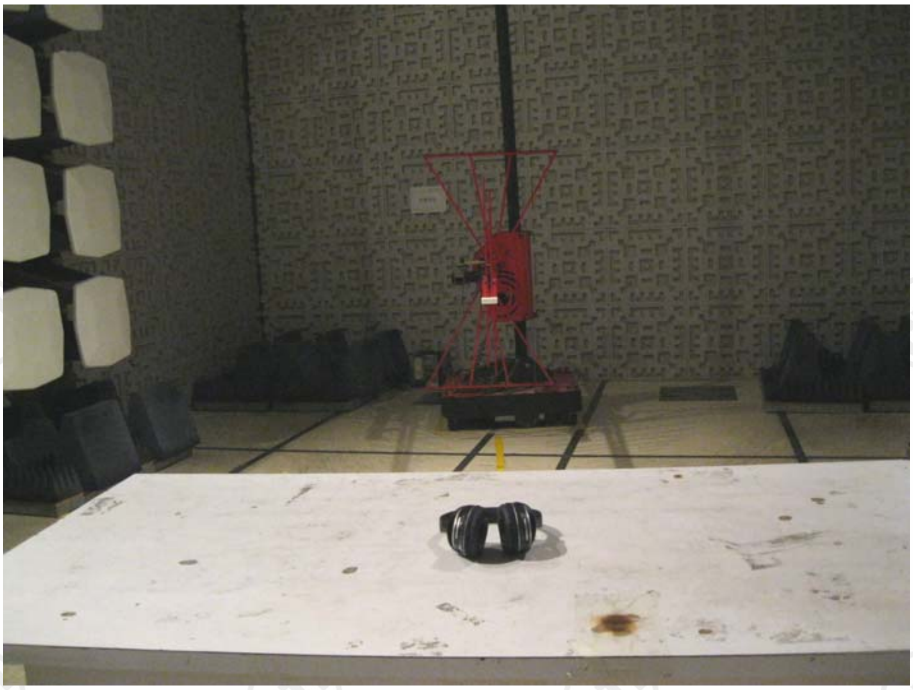
12 Spurious emission in hybrid mode

The dwell time in hybrid mode is shorter than in data mode. For this reason the spurious emissions average level in data mode is worst case. The spurious emissions peak level is the same for both modes.

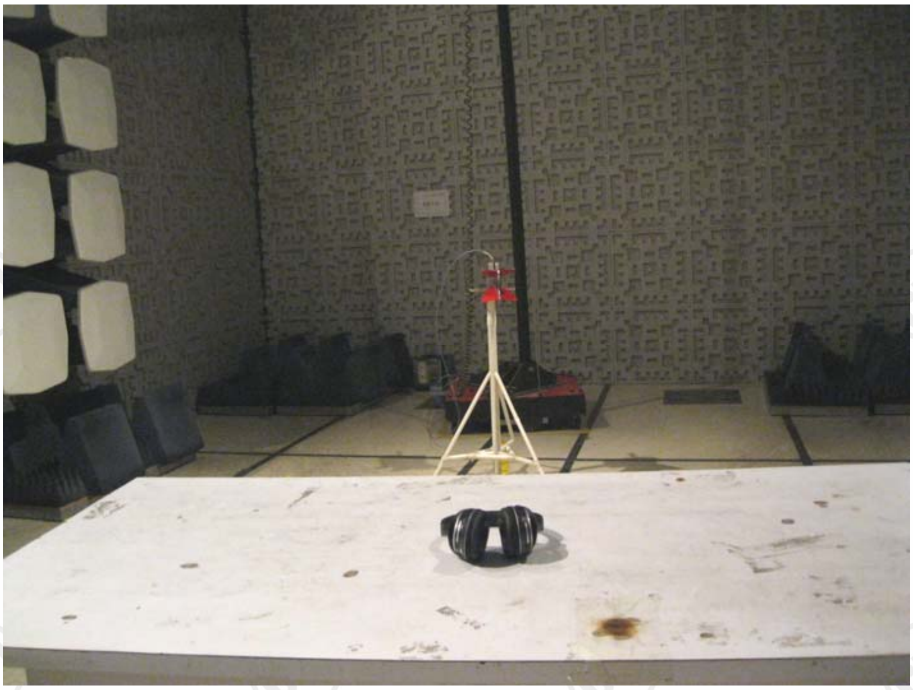
13 Peak power spectral density measurement

Since the transmitter is only active for some milliseconds on one channel you would get a result with many interruptions if using a sweep time of e.g. 1s as stated in the FCC rules. Therefore a fast sweep in maxhold function is used instead and the EUT is activated several times until the measurement curve has stabilized.

APPENDIX 1 PHOTOGRAPHS OF TEST SETUP



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



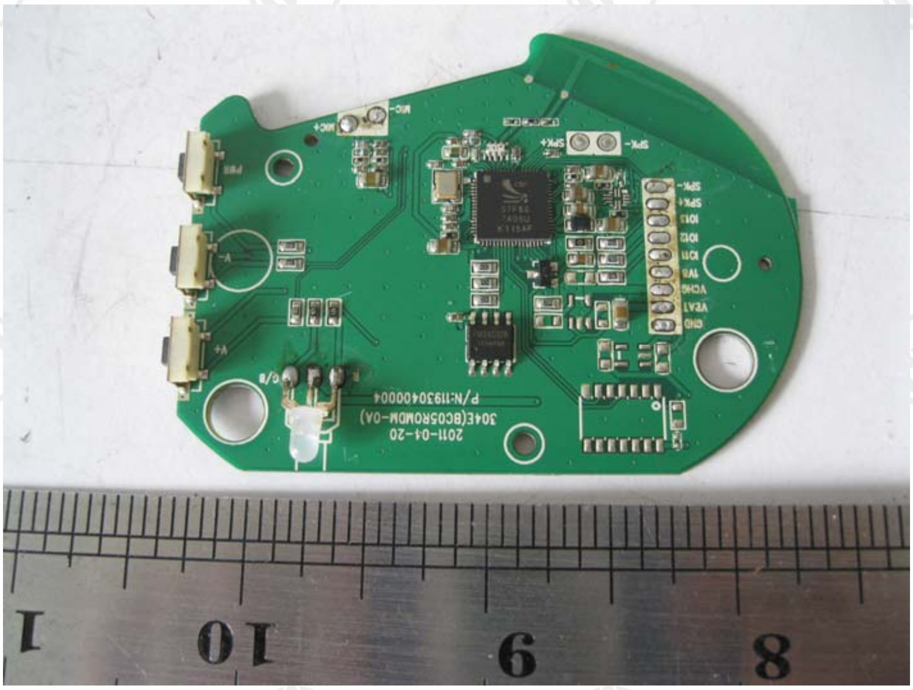
TEST SETUP OF RADIATED EMISSION (above 1GHz)

APPENDIX 2 EXTERNAL PHOTOGRAPHS OF EUT

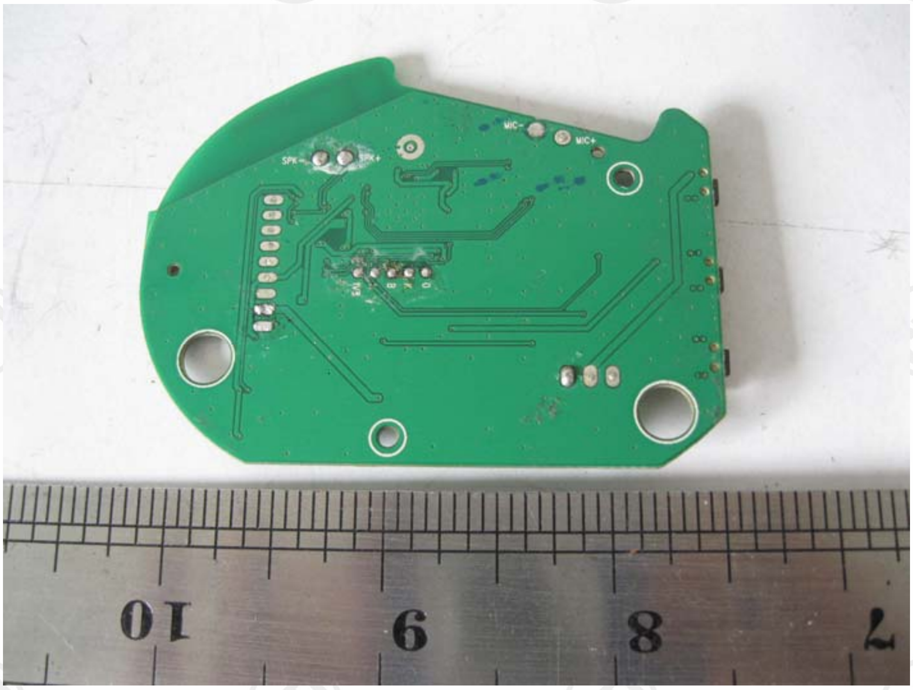
External View of EUT-1

External View of EUT-2

APPENDIX 3 INTERNAL PHOTOGRAPHS OF EUT



Internal View of EUT-1



Internal View of EUT-2

------- End of report -------