Test Report of FCC CFR 47 Part 15 Subpart C

On Behalf of

Pro Tv Development Inc.

FCC ID:	**W66MF-MO**
Product Description:	**Magic Finder**
Model No.:	**MF-MO**
Supplementary Model:	**MF-MC12**
Brand Name:	**N/A**
Prepared for:	**Pro Tv Development Inc.** 11F-1, No.15, Sec.4, CHUNG HSIAO E RD., TAIPEI, TAIWAN
Prepared by:	**Shenzhen Hongcai Testing Technology Co., Ltd.** 1st-3rd Floor,Building C,Shuanghuan Xin Yi Dai Hi-Tech Industrial Park,No.8 Baoqing Road,Baolong Industrial Zone,Longgang District, Shenzhen, Guangdong, China Tel: 86-755-86337020 Fax: 86-755-86337028
Report No.:	HCT15FR026E
Issue Date:	July 2, 2015
Test Date:	June 8~ July 2,2015

Tested by: Jiankaui.Li

Reviewed by: Owen Yang

Approved by: Tony Wu

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1. GENERAL INFORMATION

1.1 Product Description for Equipment Under Test (EUT)

Client Information

Applicant:	**Pro Tv Development Inc.**
Address of Applicant:	11F-1, No.15, Sec.4, CHUNG HSIAO E RD., TAIPEI, TAIWAN
Manufacturer:	**Pro Tv Development Inc.**
Address of Manufacturer:	11F-1, No.15, Sec.4, CHUNG HSIAO E RD., TAIPEI, TAIWAN

General Description of E.U.T

Items	Description
EUT Description:	Magic Finder
Model No.:	MF-MO
Trade Name:	N/A
Supplementary Model:	MF-MC12
BT Module	Bluetooth 4.0
Frequency Band:	2402~2480MHz
Number of Channels:	40
Type of Modulation:	Only GFSK Modulation technology
Antenna Gain	2 dBi
Antenna Type:	Integral Antenna
Rated Voltage:	DC 3 V from Battery

Remark:* *The test data gathered are from the production sample provided by the manufacturer.*
**Supplementary models have the same circuit, only the appearance different.*

1.2 Test standards

The tests were performed based on the Electromagnetic Interference (EMI) tests performed on the EUT. Both conducted and radiated testing were performed according to the procedures in ANSI C63.4 – 2009 Radiated testing was performed at an antenna to EUT distance 3 meters.

The tests were performed in order to determine compliance with FCC Part 15, Subpart C, and section 15.203, 15.207, 15.209 and 15.247 rules and the FCC publication KDB558074 of Guidance on Measurements for Digital Transmission Systems (47 CFR 15.247).

1.3 Test Facility

All measurement required was performed at laboratory of Shenzhen CTL Testing Technology Co., Ltd. at Floor 1-A,Baisha Technology Park,No.3011,Shahexi Road, Nanshan District, Shenzhen, China 518055.

The test facility is recognized, certified, or ac credited by the following organizations:

FCC – Registration No.: 970318

Shenzhen CTL Testing Technology Co., Ltd. EMC Laboratory has been registered and fully described in a report filed with the (FCC) Federal Communications Commission. The acceptance letter from the FCC is maintained in our files. Registration 970318, December, 2013.

2. SYSTEM TEST CONFIGURATION

2.1 EUT Configuration

The EUT configuration for testing is installed on RF field strength measurement to meet the Commissions requirement and operating in a manner that intends to maximize its emission characteristics in a continuous normal application.

2.2 EUT Exercise

The calibrated antennas used to sample the radiated field strength are mounted on a non-conductive, motorized antenna mast 3 or 10 meters from the leading edge of the turntable.

2.3 General Test Procedures

Conducted Emissions:The EUT is placed on the turntable, which is 0.8 m above ground plane. According to the requirements in Section 7.1 of ANSI C63.4-2009 Conducted emissions from the EUT measured in the frequency range between 0.15 MHz and 30MHz using CISPR Quasi-Peak detector mode.

Radiated Emissions: The EUT is a placed on as turntable, which is 0.8 m above ground plane. The turntable shall rotate 360 degrees to determine the position of maximum emission level. EUT is set 3m away from the receiving antenna, which varied from 1m to 4m to find out the highest emission. And also, each emission was to be maximized by changing the polarization of receiving antenna both horizontal and vertical. In order to find out the maximum emissions, exploratory radiated emission measurements were made according to the requirements in Section 13.1.4.1 of ANSI C63.4-2009.

2.4 Measurement Uncertainty

Where relevant, the following measurement uncertainty levels have been estimated for tests performed on the apparatus:

Parameter	Uncertainty
Power Line Conducted Emission	+/- 2.3 dB
Radiated Emission	+/- 3.4 dB

Uncertainty figures are valid to a confidence level of 95%.

2.5 List of Measuring Equipments Used

Test equipments list of Shenzhen Bontek Compliance Testing Laboratory Co., Ltd.

No.	Instrument no.	Equipment	Manufacturer	Model No.	S/N	Last Calculator	Due Calculator
1	BCT-EMC001	EMI Test Receiver	R&S	ESCI	100687	2015-4-25	2016-4-24
2	BCT-EMC002	EMI Test Receiver	R&S	ESPI	100097	2014-11-1	2015-10-31
3	BCT-EMC003	Amplifier	HP	8447D	1937A02492	2015-4-25	2016-4-24
4	BCT-EMC018	TRILOG Broadband Test-Antenna	SCHWARZBECK	VULB9163	9163-324	2014-4-25	2015-4-24
5	BCT-EMC021	Triple-Loop Antenna	EVERFINE	LLA-2	711002	2014-11-1	2015-10-31
6	BCT-EMC026	RF POWER AMPLIFIER	FRANKONIA	FLL-75	1020A1109	2015-4-25	2016-4-24
7	BCT-EMC029	6DB Attenuator	FRANKONIA	N/A	1001698	2015-4-25	2016-4-24
8	BCT-EMC032	10dB attenuator	ELECTRO-METRICS	EM-7600	836	2015-4-25	2016-4-24
9	BCT-EMC036	Spectrum Analyzer	R&S	FSP	100397	2014-11-1	2015-10-31
10	BCT-EMC037	Broadband preamplifier	SCH WARZBECK	BBV9718	9718-182	2015-4-25	2016-4-24
11	BCT-EMC039	Horn Antenna	SCHWARZBECK	BBHA 9120D	0437	2015-4-25	2016-4-24
12	BCT-EMC038	Horn Antenna	SCHWARZBECK	BBHA9170	0483	2015-4-5	2016-4-4

3. SUMMARY OF TEst RESULTS

FCC Rules	Description of Test	Result
FCC §15.207	AC Power Line Conducted Emission	Pass
FCC §15.247(b)	Maximum Peak Output Power	Pass
FCC §15.247(e)	Power Spectral Density	Pass
FCC §15.247(a)	6dB Bandwidth	Pass
FCC §15.247 (d)	Conducted Spurious Emission	Pass
FCC §15.205 and §15.209	Radiated Spurious Emission	Pass
FCC §15.203/15.247(b)/(c)	Antenna Requirement	Pass

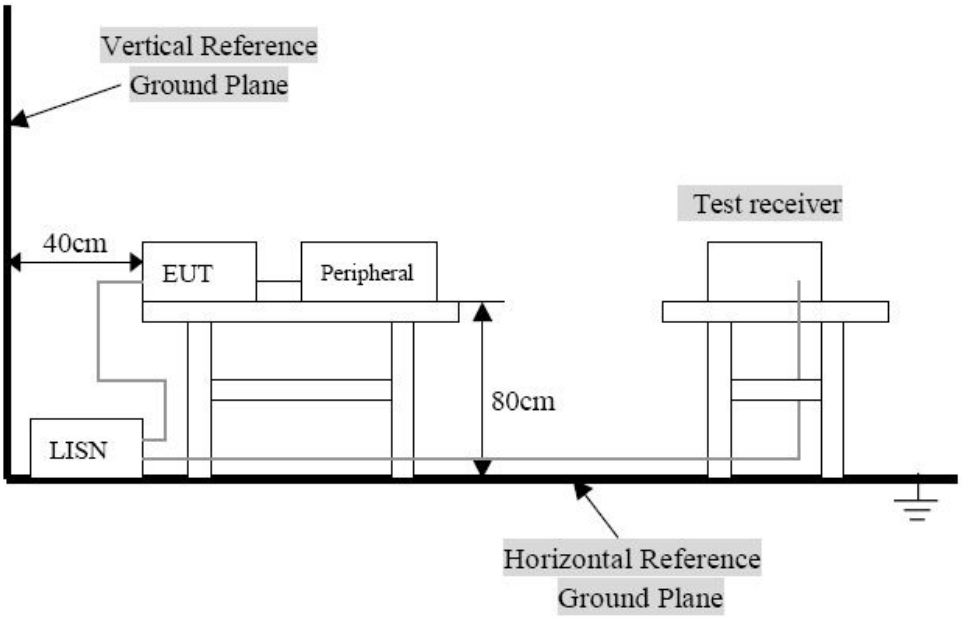
4. TEst OF AC POWER LINE CONDUCTED EMISSION

4.1 Applicable standard

Refer to FCC §15.207.
For a Low-power Radio-frequency Device is designed to be connected to the AC power line, the radio frequency voltage that is conducted back onto the AC power line on any frequency or frequencies within the band 150 kHz to 30 MHz shall not exceed below limits table.

Frequency Range (MHz)	Limits (dBuV)	
	Quasi-Peak	Average
0.150～0.500	66～56	56～46
0.500～5.000	56	46
5.000～30.00	60	50

4.2 Test Setup Diagram



Remark: The EUT was connected to a 120 VAC/ 60Hz power source.

4.3 Test Result

Temperature (℃) : 23~25	EUT: Magic Finder
Humidity (%RH): 45~58	M/N: MF-MO
Barometric Pressure (mbar): 950~1000	Operation Condition: Charging with Tx Mode

Not applicable, the device is supplied by button battery.

5. Test of Maximum Peak Output Power

5.1 Applicable standard

Refer to FCC §15.247 (b)

5.2 EUT Setup

Spectrum Analyzer

5.3 Test Equipment List and Details

See section 2.5.

5.4 Test Procedure

This procedure should only be used when the maximum available RBW of the spectrum/signal analyzer is less than the DTS bandwidth. The transmitter output was connected to a spectrum analyzer and the parameter was set as below:

1. Set the RBW = maximum available (at least 1 MHz).

2. Set the VBW = 3 x RBW or maximum available setting (must be ⩾ RBW).

3. Set the span to fully encompass the DTS bandwidth.

4. Detector = peak.

5. Sweep time = auto couple.

6. Trace mode = max hold.

7. Allow trace to fully stabilize.

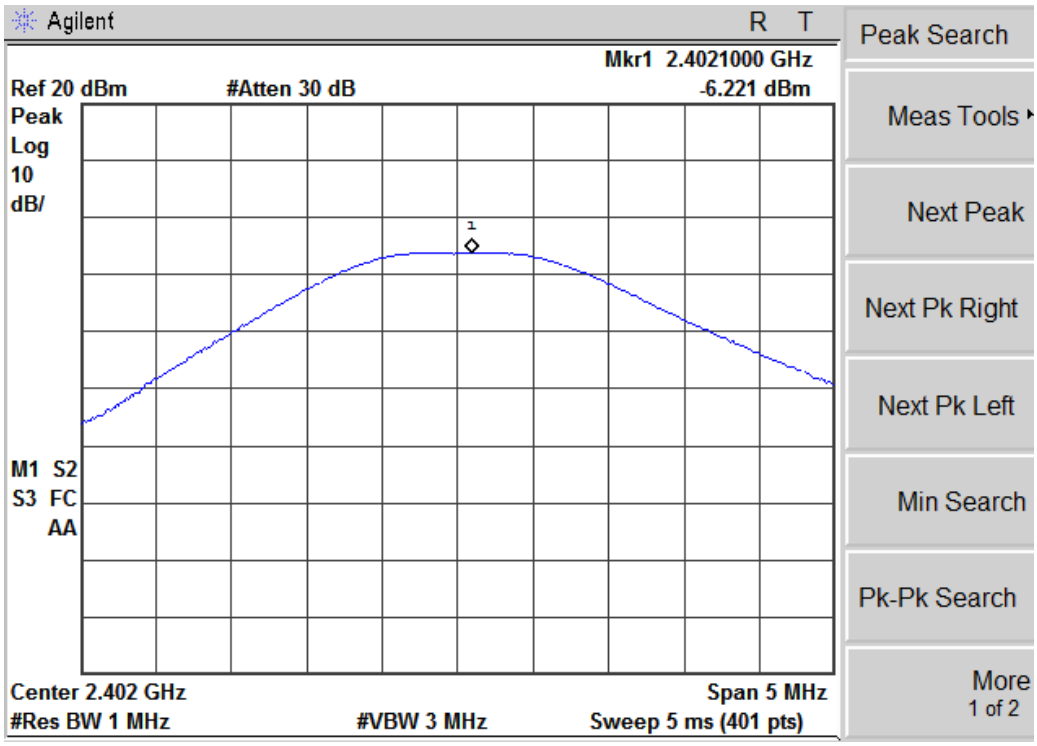
8. Use the spectrum analyzer's band/channel power measurement function with the band limits set equal to the DTS bandwidth edges (for some analyzers, this may require a manual override to ensure use of peak detector). If the spectrum analyzer does not have a band power function, sum the spectrum levels (in linear power units) at intervals equal to the RBW extending across the DTS channel bandwidth.

5.5 Test Result

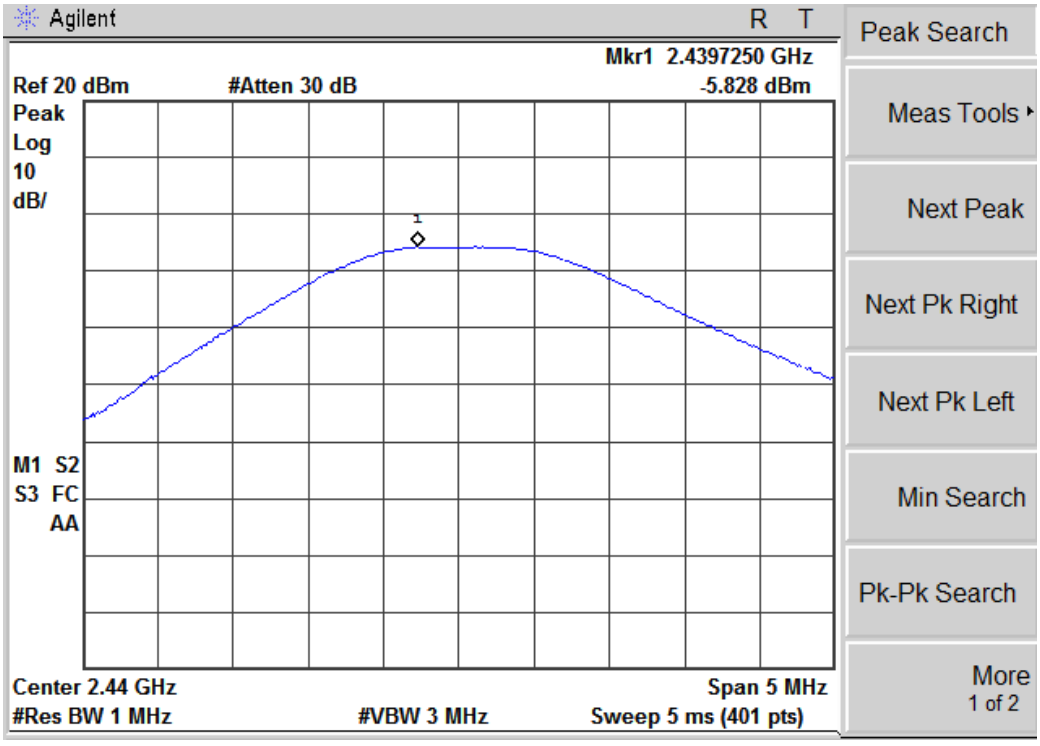
Temperature (℃) : 22~23	EUT: Magic Finder
Humidity (%RH): 50~54	M/N: MF-MO
Barometric Pressure (mbar): 950~1000	Operation Condition: Tx Mode

Channel	Channel Frequency (MHz)	Peak Power (dBm)	Peak Power Limit (dBm)	Pass / Fail
Low	2402	-6.221	30	PASS
Middle	2440	-5.828	30	PASS
High	2480	-6.885	30	PASS

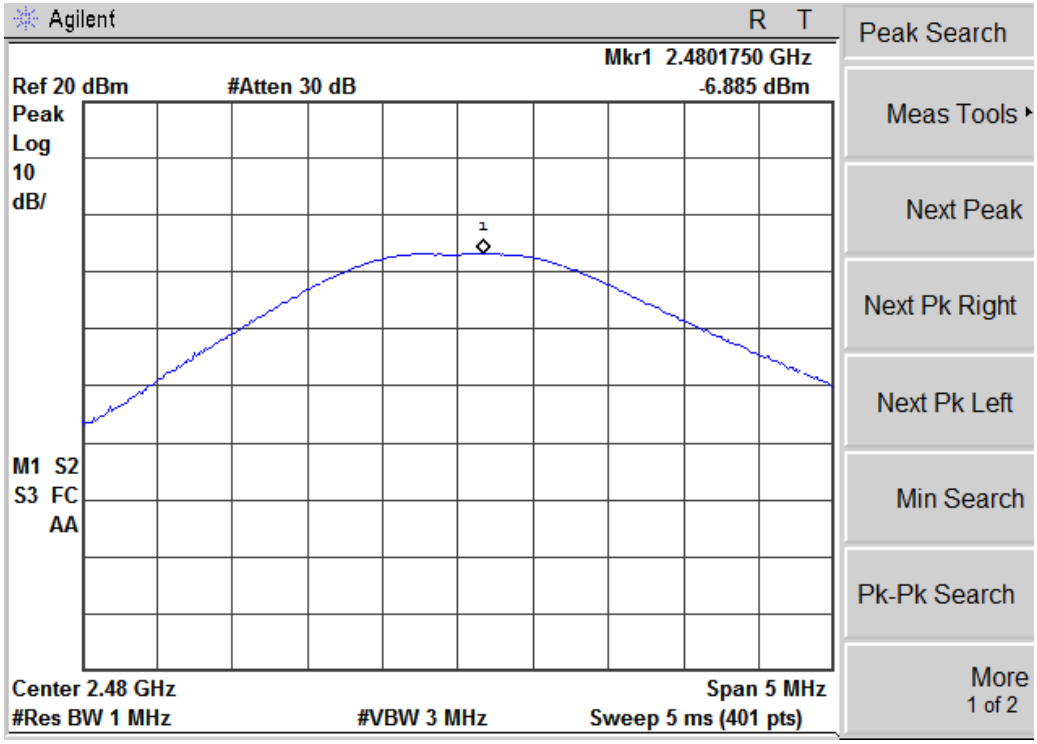
MAXIMUM PEAK OUTPUT POWER (MODE CH Low)



MAXIMUM PEAK OUTPUT POWER (MODE CH Mid)



MAXIMUM PEAK OUTPUT POWER (MODE CH High)



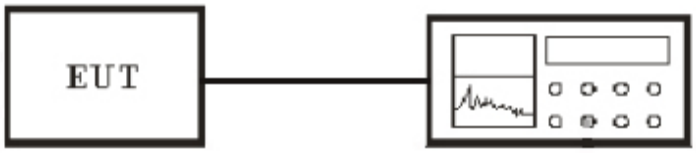
6. Test of Peak Power Spectral Density

6.1 Applicable standard

Refer to FCC §15.247 (e).

The power spectral density conducted from the transmitter to the antenna shall not be greater than 8 dBm in any 3 kHz band during any time interval of continuous transmission.

6.2 EUT Setup



Spectrum Analyzer

6.3 Test Equipment List and Details

See section 2.5.

6.4 Test Procedure

The transmitter output was connected to the spectrum analyzer and the parameter was set as below:

1. Set analyzer center frequency to DTS channel center frequency.

2. Set the span to 1.5 times the DTS channel bandwidth.

3. Set the RBW ≥ 3 kHz.

4. Set the VBW ≥ 3 x RBW.

5. Detector = peak.

6. Sweep time = auto couple.

7. Trace mode = max hold.

8. Allow trace to fully stabilize.

9. Use the peak marker function to determine the maximum amplitude level.

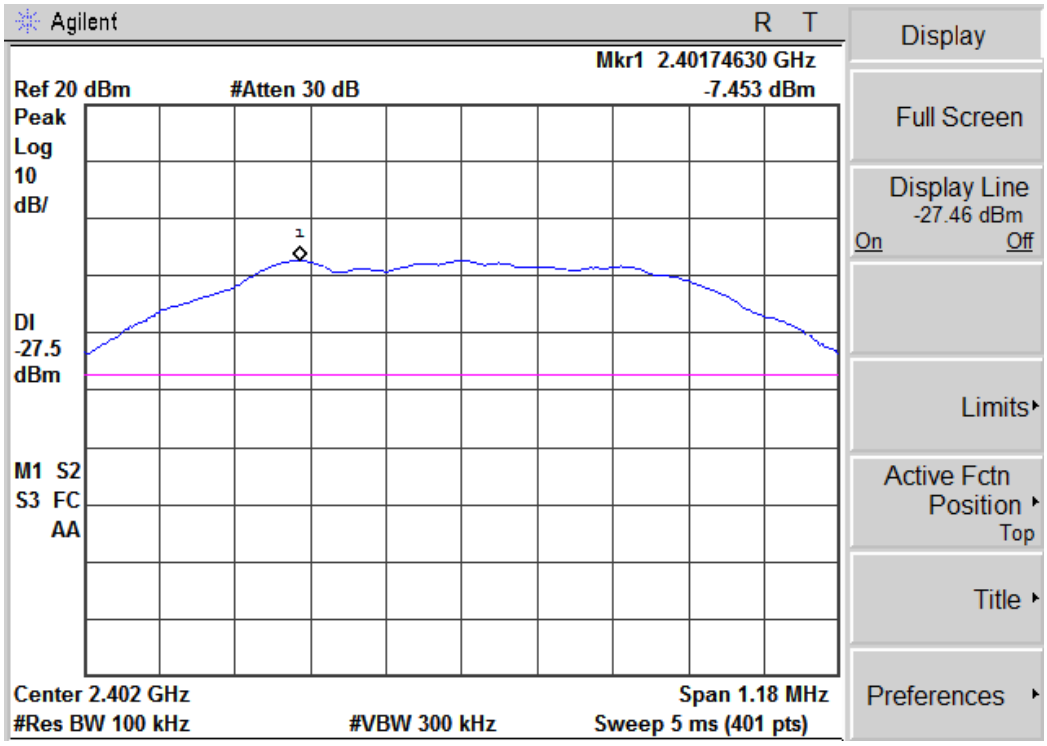
10. If measured value exceeds limit, reduce RBW (no less than 3 kHz) and repeat.

6.5 Test Result

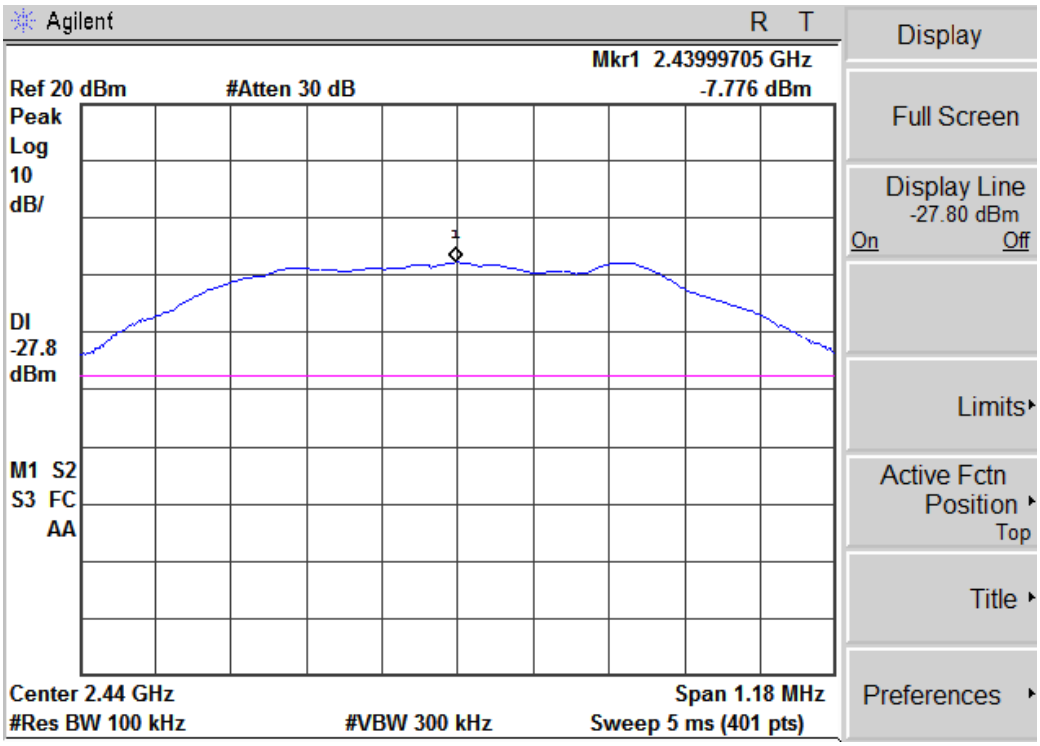
Temperature (℃) : 22~23	EUT: Magic Finder
Humidity (%RH): 50~54	M/N: MF-MO
Barometric Pressure (mbar): 950~1000	Operation Condition: Tx Mode

Channel	Channel Frequency (MHz)	RF Power Level in 100KHz RBW (dBm)	Correct Factor 100KHz to 3KHz (dB)	Final RF Power Level in 3KHz RBW (dBm)	Maximum Limit (dBm)	Pass / Fail
Low	2402	-7.453	-15.22	-22.673	8	PASS
Middle	2440	-7.776	-15.22	-22.996	8	PASS
High	2480	-8.644	-15.22	-23.864	8	PASS

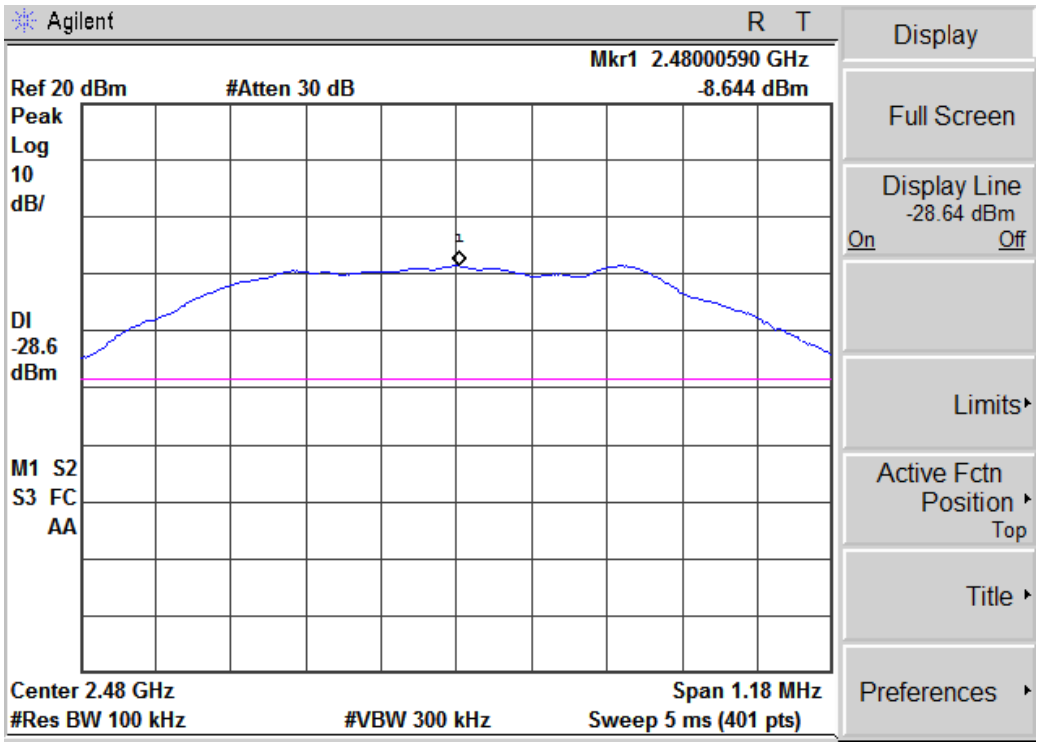
POWER SPECTRAL DENSITY (MODE CH Low)



POWER SPECTRAL DENSITY (MODE CH Mid)



POWER SPECTRAL DENSITY (MODE CH High)



7. Test of 6dB Bandwidth

7.1 Applicable standard

Refer to FCC §15.247 (a) (2) .

The minimum 6 dB bandwidth shall be at least 500 kHz.

7.2 EUT Setup

Spectrum Analyzer

7.3 Test Equipment List and Details

See section 2.5.

7.4 Test Procedure

The 6dB bandwidth is defined as the total spectrum the power of which is higher than peak power minus 6dB. The transmitter output was connected to a spectrum analyzer and the parameter was set as below:

1. Set resolution bandwidth (RBW) = 1-5% or DTS BW, not to exceed 100 kHz.

2. Set the video bandwidth (VBW) ⩾ 3 x RBW.

3. Detector = Peak.

4. Trace mode = max hold.

5. Sweep = auto couple.

6. Allow the trace to stabilize.

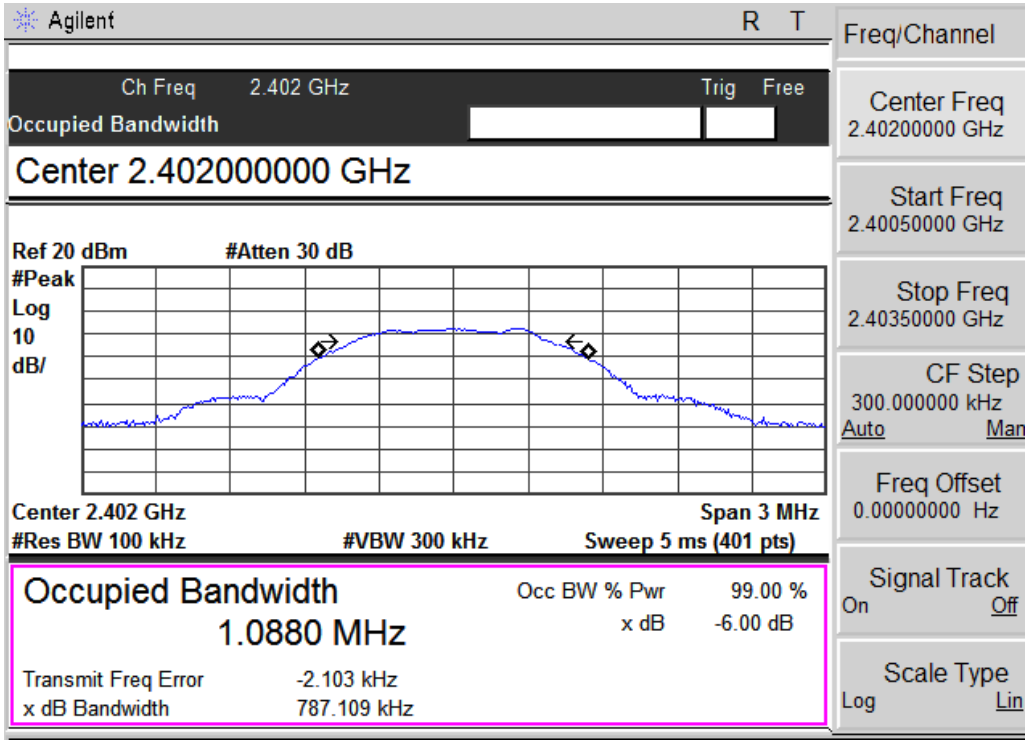
7. Measure the maximum width of the emission that is constrained by the frequencies associated with the two outermost amplitude points (upper and lower) that are attenuated by 6 dB relative to the maximum level measured in the fundamental emission.

7.5 Test Result

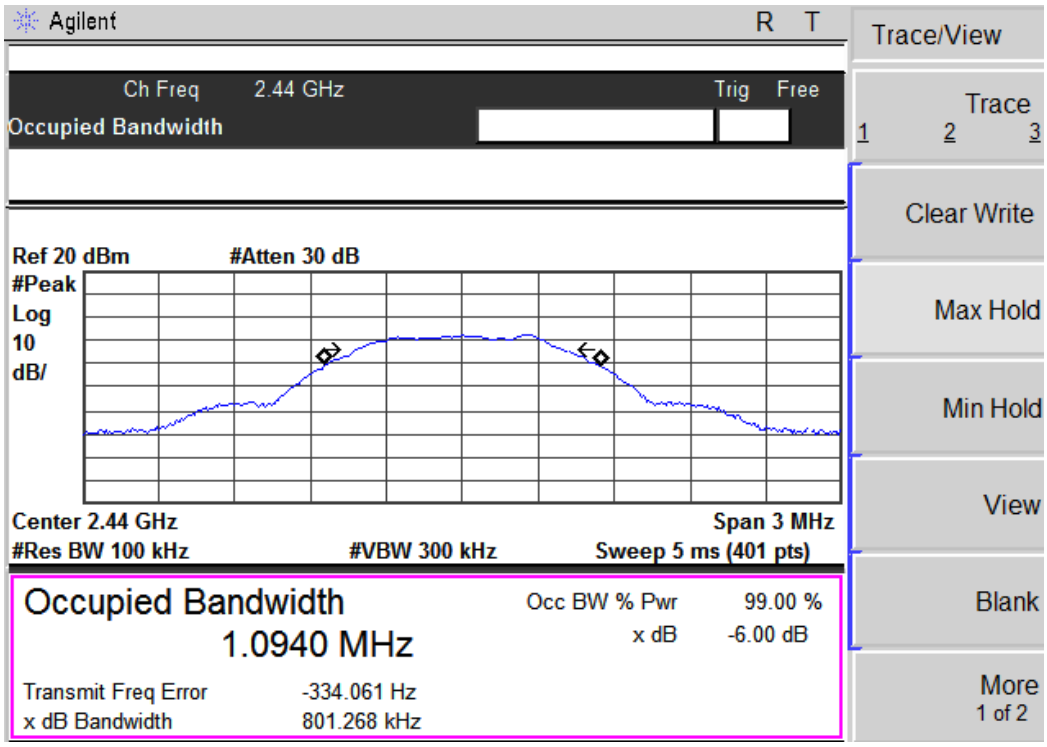
Temperature (℃) : 22~23	EUT: Magic Finder
Humidity (%RH): 50~54	M/N: MF-MO
Barometric Pressure (mbar): 950~1000	Operation Condition: Tx Mode

Channel	Channel Frequency (MHz)	6dB Bandwidth (KHz)	Minimum Limit (kHz)	Pass / Fail
Low	2402	1088.0	500	PASS
Middle	2440	1094.0	500	PASS
High	2480	1082.8	500	PASS

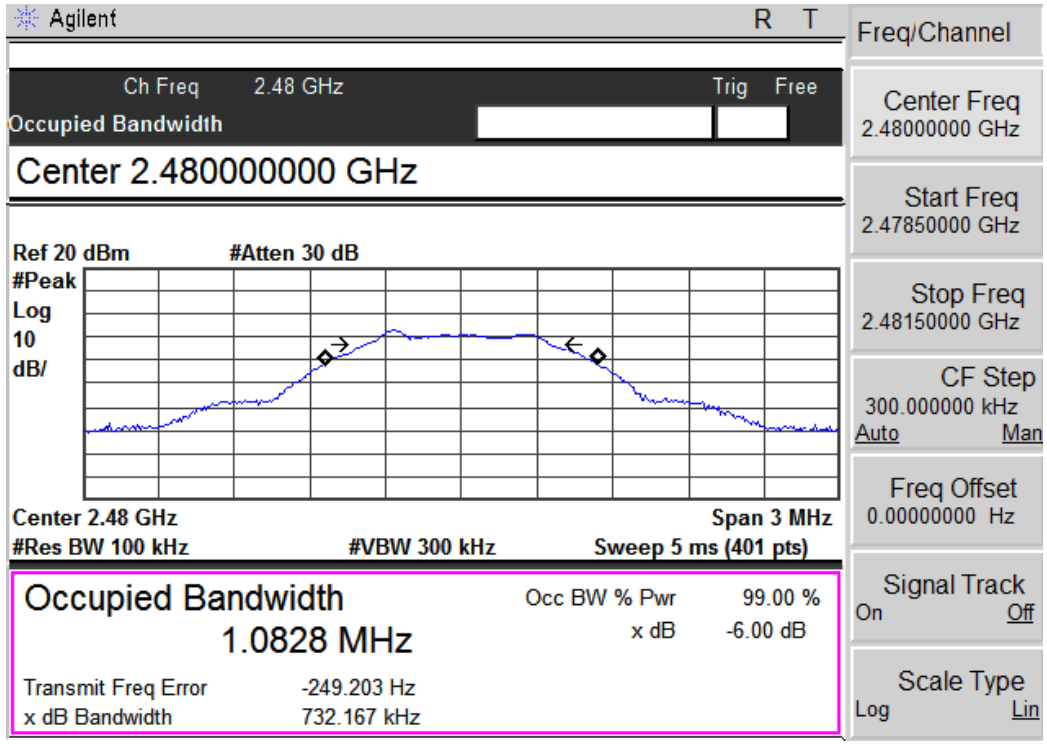
6dB BANDWIDTH (MODE CH Low)



6dB BANDWIDTH (MODE CH Mid)



6dB BANDWIDTH (MODE CH High)



8. Test of Conducted Spurious Emission

8.1 Applicable standard

Refer to FCC §15.247 (d)

Output power was measured based on the use of RMS averaging over a time interval, therefore the required attenuation is 30 dB.

8.2 EUT Setup

Spectrum Analyzer

8.3 Test Equipment List and Details

See section 2.5.

8.4 Test Procedure

The transmitter output was connected to a spectrum analyzer. The spectrum from 30 MHz to 26.5 GHz is investigated with the transmitter set to the lowest, middle, and highest channels in the 2.4 GHz band.The parameter of the spectrum analyzer was set as below:

1. Set start frequency to DTS channel edge frequency.

2. Set stop frequency so as to encompass the spectrum to be examined.

3. Set RBW = 100 kHz.

4. Set VBW ≥ 300 kHz.

5. Detector = peak.

6. Trace Mode = max hold.

7. Sweep = auto couple.

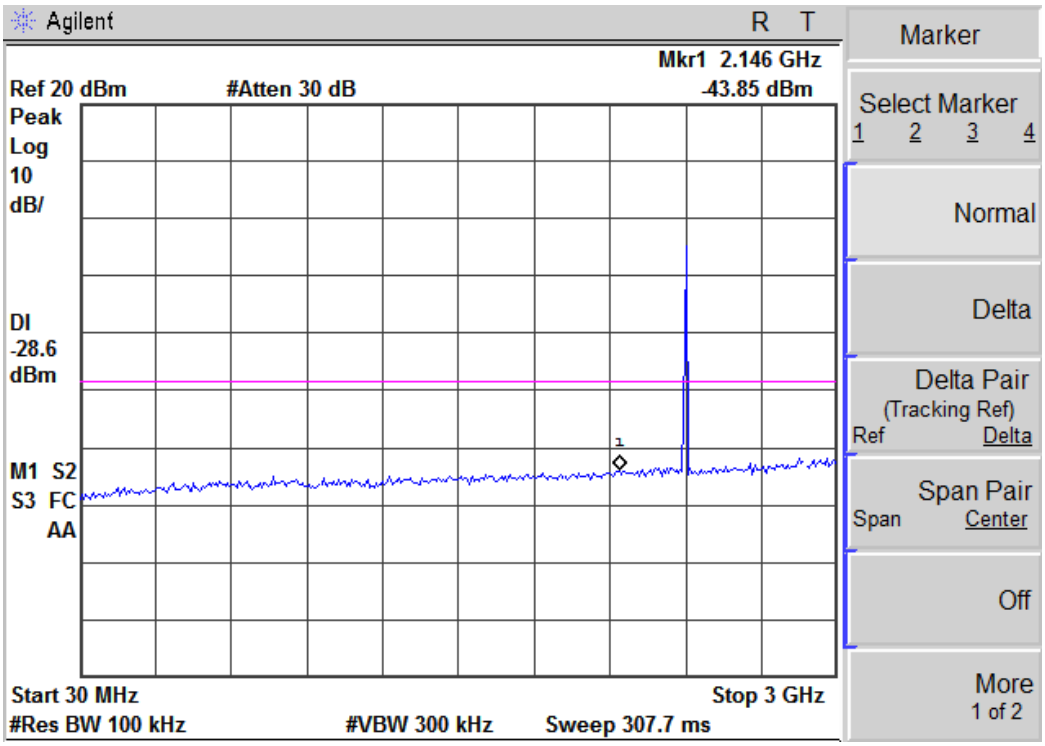
8. Allow the trace to stabilize (this may take some time, depending on the extent of the span).

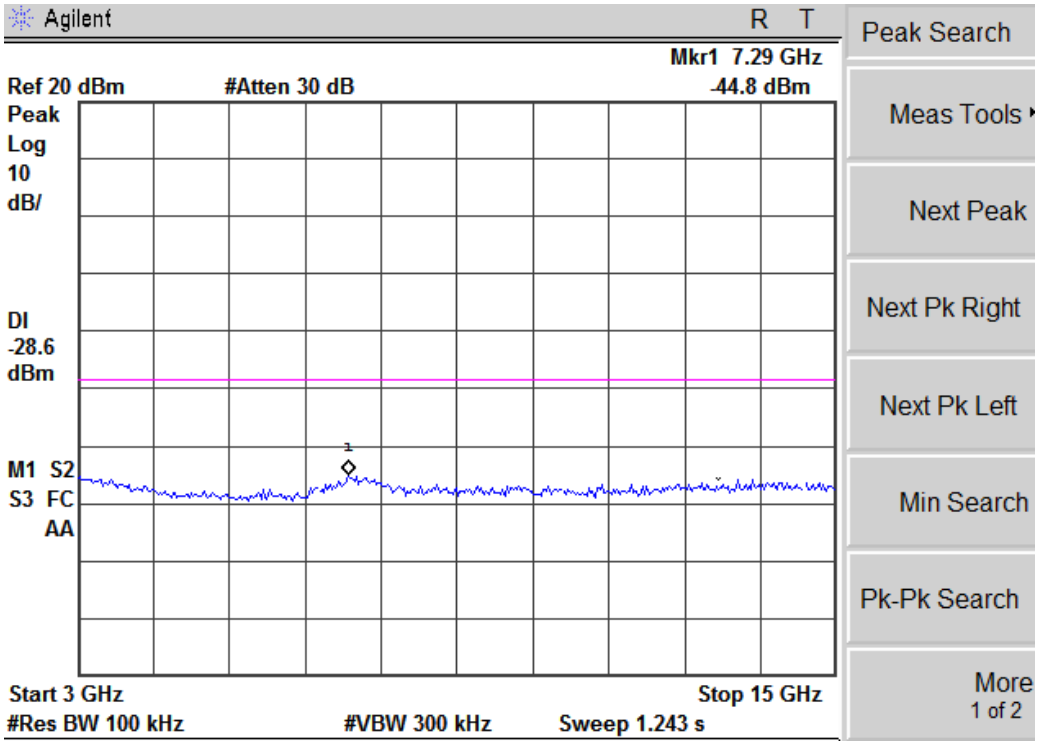
9. Use peak marker function to determine maximum amplitude of all unwanted emissions within any 100 kHz bandwidth.

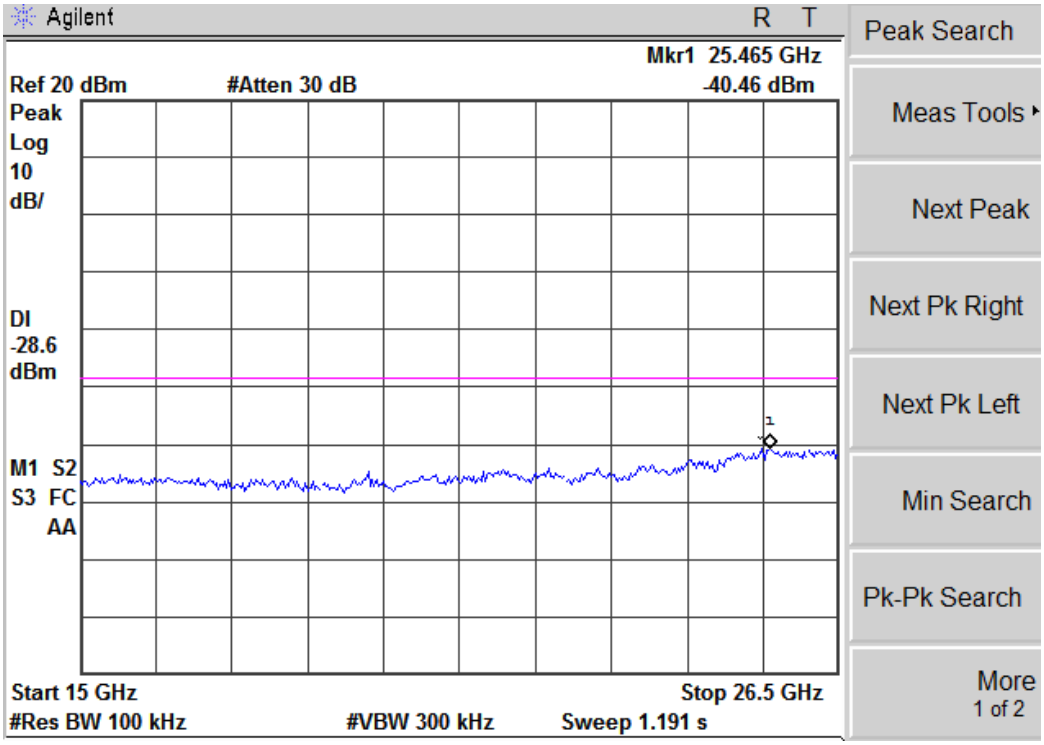
8.5 Test Result

Temperature (℃) : 22~23	EUT: Magic Finder
Humidity (%RH): 50~54	M/N: MF-MO
Barometric Pressure (mbar): 950~1000	Operation Condition: TX Mode

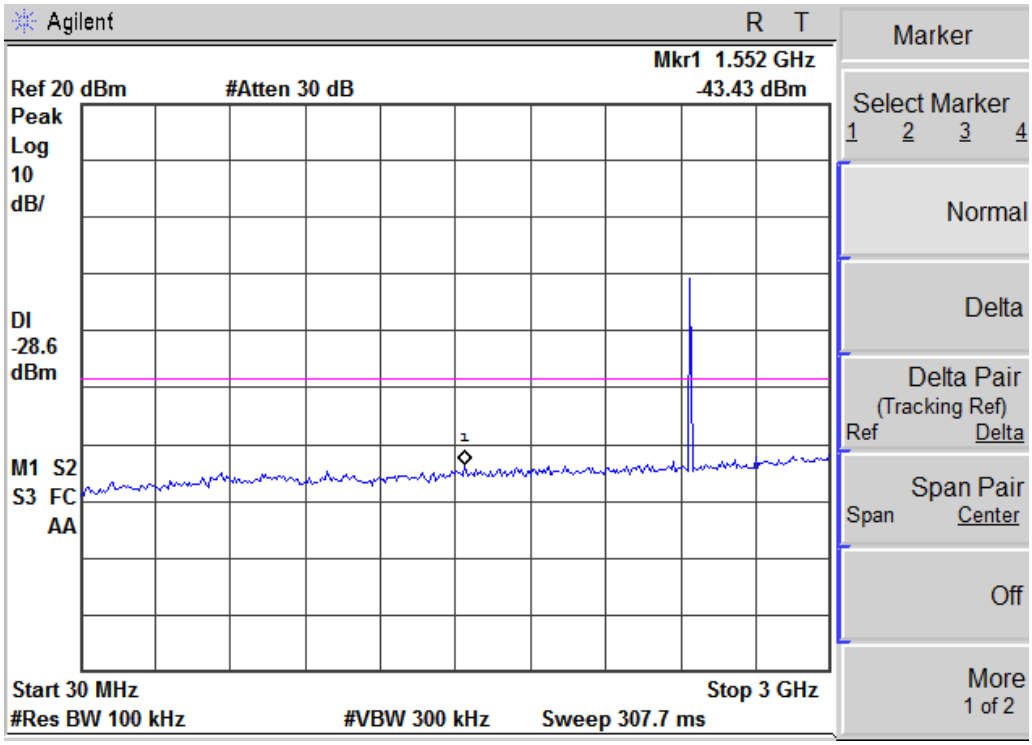
CH Low

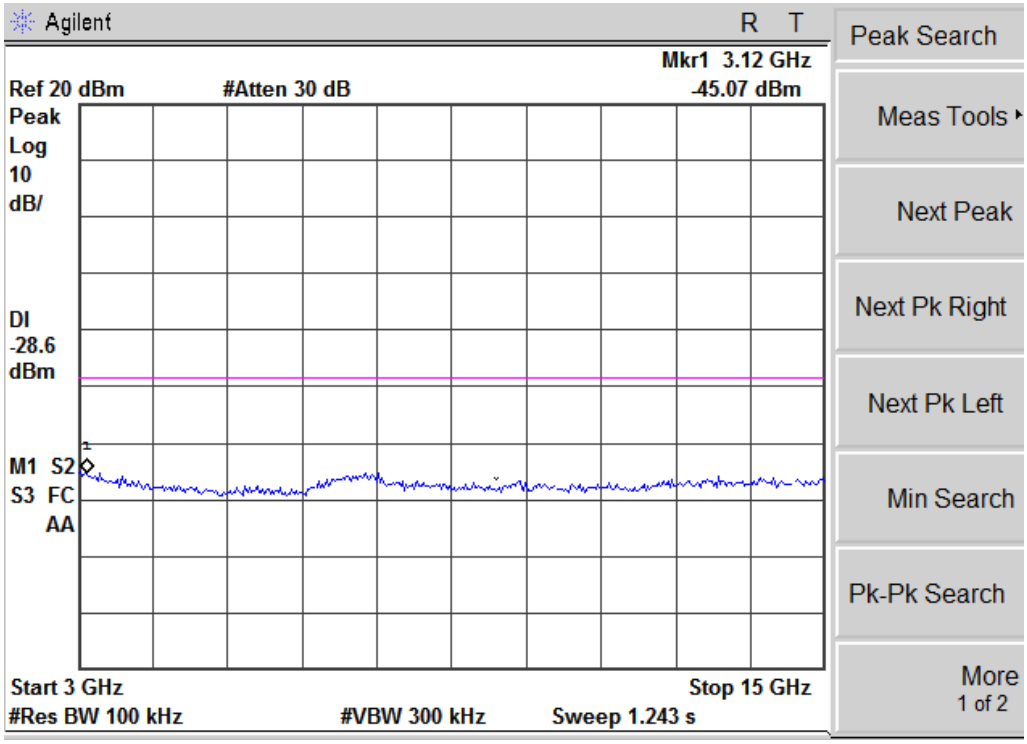

Agilent
R T
Mkr1 2.146 GHz
Ref 20 dBm
#Atten 30 dB
-43.85 dBm
Peak
Log
10
dB/
DI
-28.6
dBm
M1 S2
S3 FC
AA
Start 30 MHz
#Res BW 100 kHz
#VBW 300 kHz
Stop 3 GHz
Sweep 307.7 ms
Marker
Select Marker
1 2 3 4
Normal
Delta
Delta Pair
(Tracking Ref)
Ref Delta
Span Pair
Span Center
Off
More
1 of 2

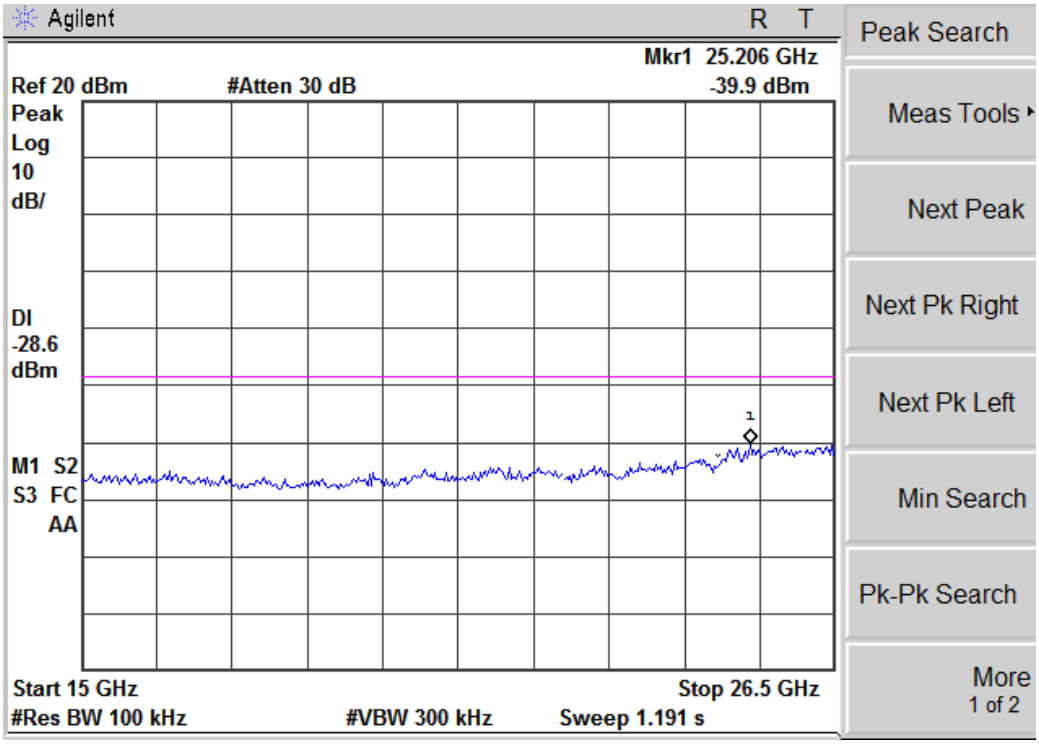

Agilent
R T
Mkr1 7.29 GHz
Ref 20 dBm
#Atten 30 dB
-44.8 dBm
Peak
Log
10
dB/
DI
-28.6
dBm
M1 S2
S3 FC
AA
Start 3 GHz
#Res BW 100 kHz
#VBW 300 kHz
Stop 15 GHz
Sweep 1.243 s
Peak Search
Meas Tools
Next Peak
Next Pk Right
Next Pk Left
Min Search
Pk-Pk Search
More
1 of 2


Agilent
R T
Mkr1 25.465 GHz
Ref 20 dBm
#Atten 30 dB
-40.46 dBm
Peak
Log
10
dB/
Dl
-28.6
dBm
M1 S2
S3 FC
AA
Start 15 GHz
Stop 26.5 GHz
#Res BW 100 kHz
#VBW 300 kHz
Sweep 1.191 s
Peak Search
Meas Tools
Next Peak
Next Pk Right
Next Pk Left
Min Search
Pk-Pk Search
More
1 of 2

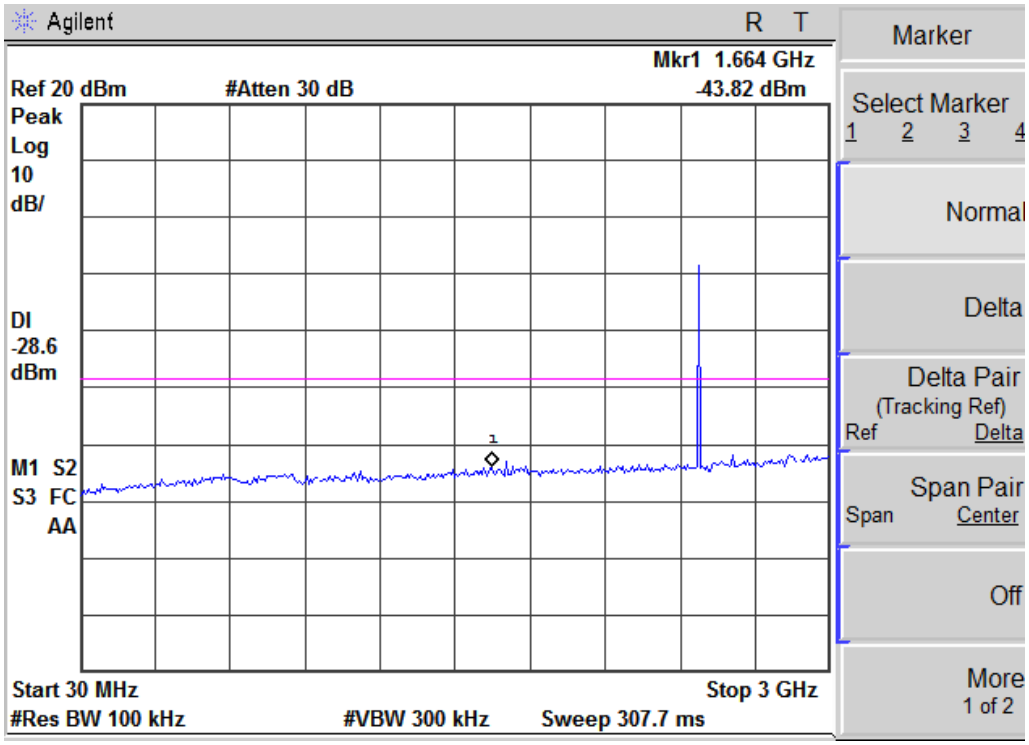
CH Mid

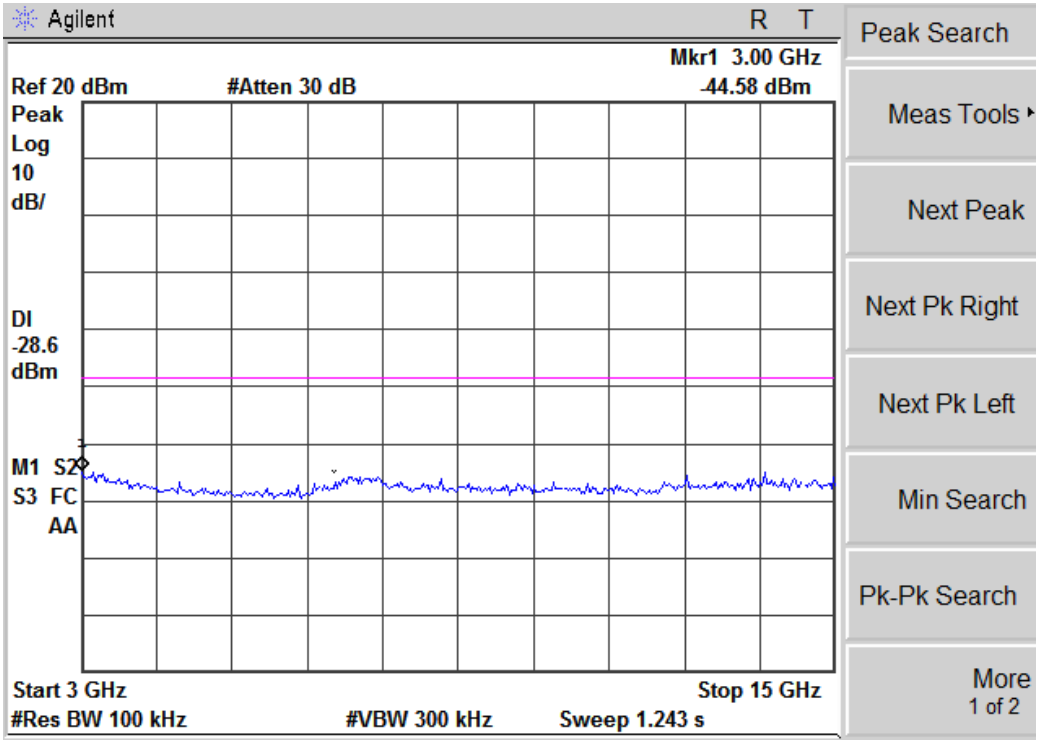

Agilent
R T
Mkr1 1.552 GHz
Ref 20 dBm
#Atten 30 dB
-43.43 dBm
Peak
Log
10
dB/
Dl
-28.6
dBm
M1 S2
S3 FC
AA
Start 30 MHz
Stop 3 GHz
#Res BW 100 kHz
#VBW 300 kHz
Sweep 307.7 ms
Marker
Select Marker
1 2 3 4
Normal
Delta
Delta Pair
(Tracking Ref)
Ref Delta
Span Pair
Span Center
Off
More
1 of 2

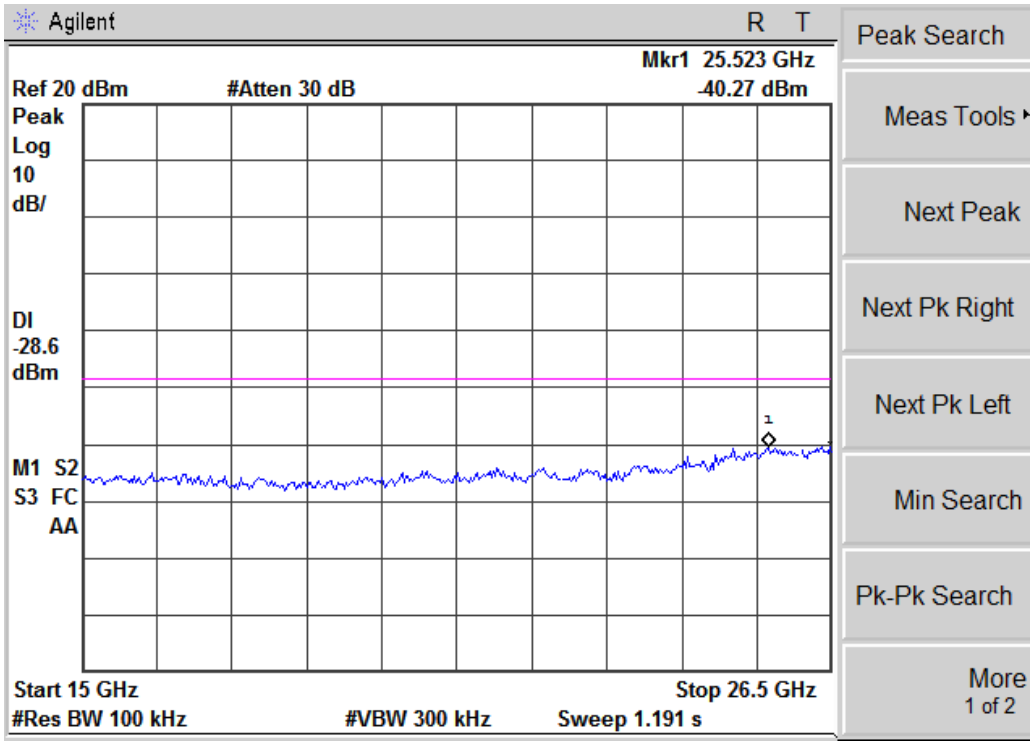

Agilent
R T
Mkr1 3.12 GHz
Ref 20 dBm
#Atten 30 dB
-45.07 dBm
Peak
Log
10
dB/
DI
-28.6
dBm
M1 S2
S3 FC
AA
Start 3 GHz
Stop 15 GHz
#Res BW 100 kHz
#VBW 300 kHz
Sweep 1.243 s
Peak Search
Meas Tools
Next Peak
Next Pk Right
Next Pk Left
Min Search
Pk-Pk Search
More
1 of 2


Agilent
R T
Mkr1 25.206 GHz
Ref 20 dBm
#Atten 30 dB
-39.9 dBm
Peak
Log
10
dB/
DI
-28.6
dBm
M1 S2
S3 FC
AA
Start 15 GHz
Stop 26.5 GHz
#Res BW 100 kHz
#VBW 300 kHz
Sweep 1.191 s
Peak Search
Meas Tools
Next Peak
Next Pk Right
Next Pk Left
Min Search
Pk-Pk Search
More
1 of 2

CH High


Agilent
R T
Mkr1 1.664 GHz
Ref 20 dBm
#Atten 30 dB
-43.82 dBm
Peak
Log
10
dB/
Dl
-28.6
dBm
M1 S2
S3 FC
AA
Start 30 MHz
#Res BW 100 kHz
#VBW 300 kHz
Sweep 307.7 ms
Stop 3 GHz
Marker
Select Marker
1 2 3 4
Normal
Delta
Delta Pair
(Tracking Ref)
Ref Delta
Span Pair
Span Center
Off
More
1 of 2


Agilent
R T
Mkr1 3.00 GHz
Ref 20 dBm
#Atten 30 dB
-44.58 dBm
Peak
Log
10
dB/
Dl
-28.6
dBm
M1 S2
S3 FC
AA
Start 3 GHz
#Res BW 100 kHz
#VBW 300 kHz
Sweep 1.243 s
Stop 15 GHz
Peak Search
Meas Tools
Next Peak
Next Pk Right
Next Pk Left
Min Search
Pk-Pk Search
More
1 of 2


Agilent
R T
Mkr1 25.523 GHz
Ref 20 dBm
#Atten 30 dB
-40.27 dBm
Peak
Log
10
dB/
Dl
-28.6
dBm
M1 S2
S3 FC
AA
Start 15 GHz
Stop 26.5 GHz
#Res BW 100 kHz
#VBW 300 kHz
Sweep 1.191 s
Peak Search
Meas Tools
Next Peak
Next Pk Right
Next Pk Left
Min Search
Pk-Pk Search
More
1 of 2

9. Test of Radiated Spurious Emission

9.1 Radiated Spurious Emission

9.1.1 Limits

15.205 (a) Except as shown in paragraph (d) of this section, only spurious emissions are permitted in any of the frequency bands listed below:

MHz	MHz	MHz	GHz
0.090 - 0.110	16.42 - 16.423	399.9 - 410	4.5 - 5.15
[1]0.495 - 0.505	16.69475 - 16.69525	608 - 614	5.35 - 5.46
2.1735 - 2.1905	16.80425 - 16.80475	960 - 1240	7.25 - 7.75
4.125 - 4.128	25.5 - 25.67	1300 - 1427	8.025 - 8.5
4.17725 - 4.17775	37.5 - 38.25	1435 - 1626.5	9.0 - 9.2
4.20725 - 4.20775	73 - 74.6	1645.5 - 1646.5	9.3 - 9.5
6.215 - 6.218	74.8 - 75.2	1660 -1710	10.6 -12.7
6.26775 - 6.26825	108 -121.94	1718.8 - 1722.2	13.25 -13.4
6.31175 - 6.31225	123 - 138	2200 - 2300	14.47 – 14.5
8.291 - 8.294	149.9 - 150.05	2310 - 2390	15.35 -16.2
8.362 - 8.366	156.52475 - 156.52525	2483.5 - 2500	17.7 - 21.4
8.37625 - 8.38675	156.7 - 156.9	2655 - 2900	22.01 - 23.12
8.41425 - 8.41475	162.0125 - 167.17	3260 - 3267	23.6 - 24.0
12.29 - 12.293	167.72 - 173.2	3332 - 3339	31.2 - 31.8
12.51975 - 12.52025	240 - 285	3345.8 - 3338	36.43 - 36.5
12.57675 - 12.57725	322 -335.4	3600 - 4400	([2])
13.36 - 13.41			

15.205 (b) Except as provided in paragraphs (d) and (e), the field strength of emissions appearing within these frequency bands shall not exceed the limits shown is Section 15.209. At frequencies equal to or less than 1000 MHz, compliance with the limits in Section 15.209 shall be demonstrated using measurement instrumentation employing a CISPR quasi-peak detector. Above 1000 MHz, compliance with the emission limits in Section 15.209 shall be demonstrated based on the average value of the measured emissions. The provisions in Section 15.35 apply to these measurements.

15.209 (a) Except as provided elsewhere in this Subpart, the emissions from an intentional radiator shall not exceed the field strength levels specified in the following table :

Frequency (MHz)	Field strength (microvolts/meter)	Measurement Distance (meters)
30 - 88	100 **	3
88 - 216	150 **	3
216 - 960	200 **	3
Above 960	500	3

** Except as provided in paragraph (g), fundamental emissions from intentional radiators operating under this Section shall not be located in the frequency bands 54-72 MHz, 76-88 MHz, 174-216 MHz

or 470-806 MHz, However, operation within these frequency bands is permitted under other sections of this Part, e-g, Sections 15.231 and 15.241.
15.209 (b) In the emission table above, the tighter limit applies at the band edges.

9.1.2 EUT Setup

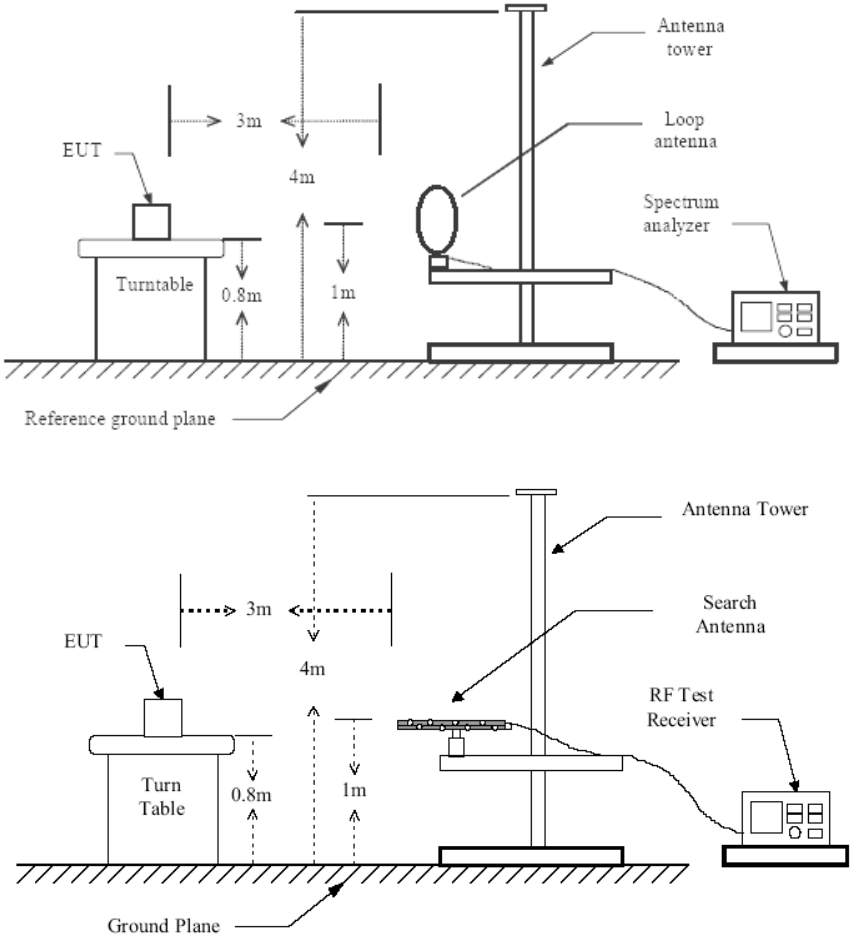


Figure 1 : Frequencies measured below 1 GHz configuration

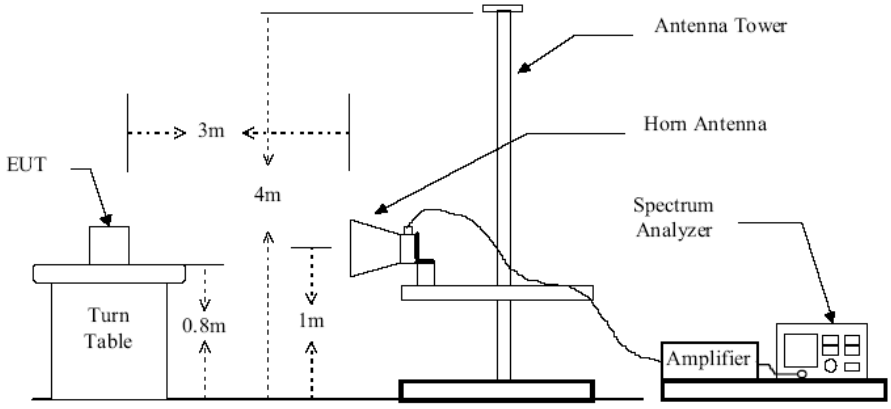


Figure 2 : Frequencies measured above 1 GHz configuration

9.1.3 Test Procedure

1. Configure the EUT according to ANSI C63.4-2009

2. The EUT was placed on the top of the turntable 0.8 meter above ground.

3. The turntable was rotated by 360 degrees to determine the position of the highest radiation.

4. For each suspected emission, the antenna tower was scanned (from 1 M to 4 M) and then the turntable was rotated (from 0 degree to 360 degrees) to find the maximum reading.

5. According to the characteristic of the EUT crystals, the range of frequencies was investigated from 9KHz to 30MHz, 30MHz to 1GHz and 1GHz to 24.8GHz.

6. Any testing performed below 30 MHz was performed using a magnetic loop antenna in accordance with ANSI C63.10: section 4.5, Table 1

7. In accordance with 15.35(b), above 1 GHz, emissions measured using a peak detector shall not exceed a level 20 dB above the average limit.

8. Measurements at 2400 & 2483.5 MHz were made to ensure band edge compliance.

9. Testing was performed with the EUT orientated in three orthogonal planes and the maximum emissions level recorded. In addition, the EUT antenna was varied within its range of motion in order to maximise emissions.

10. For Frequencies below 1 GHz, RBW= 100 kHz, testing was performed with CISPR16 compliant test receiver with QP detector. Above 1 GHz tests were performed using a spectrum analyser using the following settings:
Peak RBW=VBW= 1MHz
Average RBW=VBW= 1MHz

These settings as per ANSI C63.10

9.1.4 Test Result

Temperature (℃) : 22~23	EUT: Magic Finder
Humidity (%RH): 50~54	M/N: MF-MO
Barometric Pressure (mbar): 950~1000	Operation Condition: Normal operation & TX Mode

Note: In this testing, the EUT was respectively tested in three different orientations. That is:

1. EUT was lie vertically, and then its Antenna oriented upward
2. EUT was lie vertically, and then its Antenna oriented downward
3. EUT was lie flatwise, and then its Antenna oriented to the receiving antenna

The worst test data see following pages
When the EUT was lie flatwise, and its Antenna oriented to the receiving antenna, the worst test data was got as following table.

WORST-CASE RADIATED EMISSION BELOW 30 MHz

Tx operating Mode:

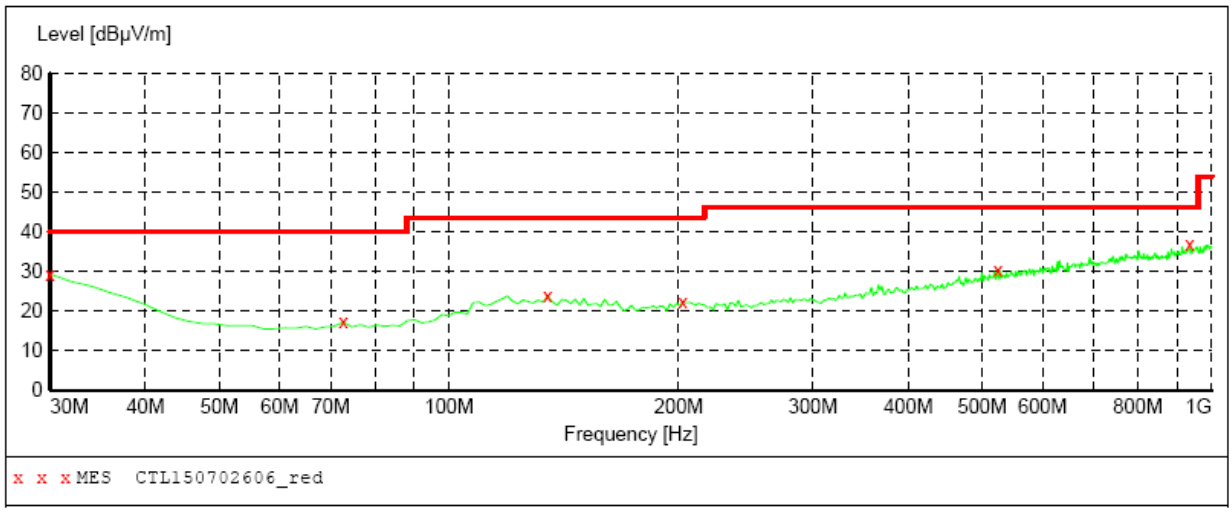
Frequency	Meter Reading	Antenna Factor	Cable Loss	Emission Levels	Limits	Margin	Detector Mode
(MHz)	(dBμV)	(dB/M)	(dB)	(dBμV/M)	(dB μ V/M)	(dB)	PK/QP
5.46	21.54	8.23	1.03	28.74	67	-38.26	QP
14.89	21.25	9.07	1.19	29.13	49.5	-20.37	QP
22.32	22.57	9.25	1.08	30.74	49.5	-18.76	QP
23.45	22.67	8.43	1.66	29.44	49.5	-20.06	QP

Spurious Emission Below 1GHz :

EUT:	Bluetooth Sunglasses
M/N:	MF-MO
Operating Condition:	TX Mode
Test Site:	3m CHAMBER
Operator:	Chen
Test Specification:	DC 3V from battery
Comment:	Polarization: Horizontal

SWEEP TABLE: "test (30M-1G)"

Short Description:			Field Strength		
Start Frequency	Stop Frequency	Detector	Meas. Time	IF Bandw.	Transducer
30.0 MHz	1.0 GHz	MaxPeak	300.0 ms	120 kHz	JB1



MEASUREMENT RESULT: "CTL150702606_red"

7/2/2015 2:29PM

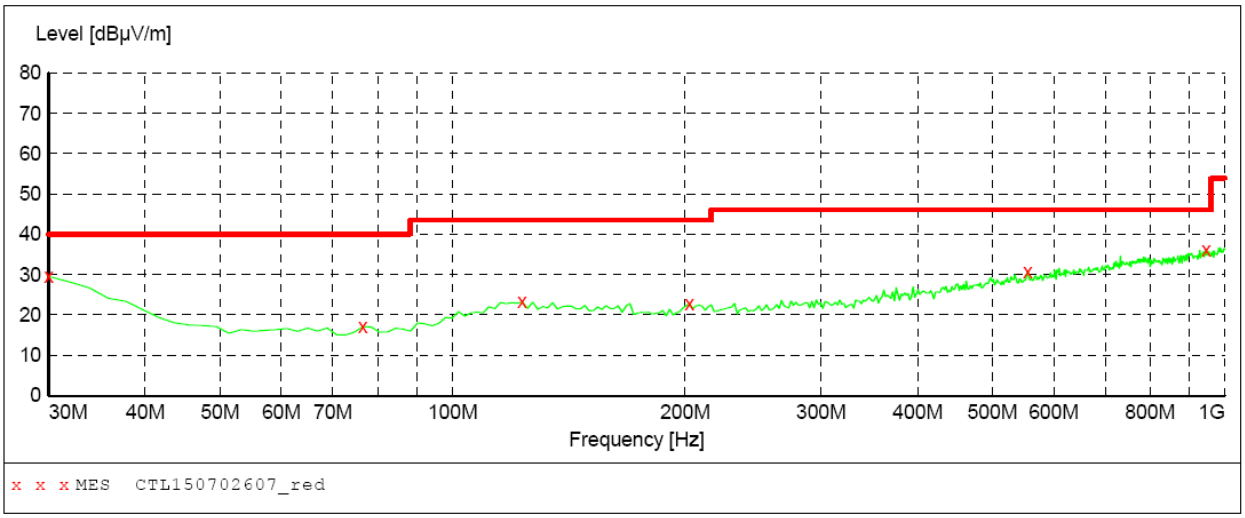
Frequency MHz	Level dBµV/m	Transd dB	Limit dBµV/m	Margin dB	Det.	Height cm	Azimuth deg	Polarization
30.000000	29.30	21.1	40.0	10.7	QP	0.0	0.00	HORIZONTAL
72.680000	17.20	8.5	40.0	22.8	QP	0.0	0.00	HORIZONTAL
134.760000	23.80	14.8	43.5	19.7	QP	0.0	0.00	HORIZONTAL
202.660000	22.40	14.4	43.5	21.1	QP	0.0	0.00	HORIZONTAL
524.700000	30.50	20.5	46.0	15.5	QP	0.0	0.00	HORIZONTAL
935.980000	37.00	26.5	46.0	9.0	QP	0.0	0.00	HORIZONTAL

Spurious Emission Below 1GHz :

EUT:	Bluetooth Sunglasses
M/N:	MF-MO
Operating Condition:	TX Mode
Test Site:	3m CHAMBER
Operator:	Chen
Test Specification:	DC 3V from battery
Comment:	Polarization: Vertical

SWEEP TABLE: "test (30M-1G)"

Short Description:			Field Strength		
Start Frequency	Stop Frequency	Detector	Meas. Time	IF Bandw.	Transducer
30.0 MHz	1.0 GHz	MaxPeak	300.0 ms	120 kHz	JB1



MEASUREMENT RESULT: "CTL150702607_red"

7/2/2015 2:32PM

Frequency MHz	Level dBµV/m	Transd dB	Limit dBµV/m	Margin dB	Det.	Height cm	Azimuth deg	Polarization
30.000000	29.50	21.1	40.0	10.5	QP	0.0	0.00	VERTICAL
76.560000	17.10	8.6	40.0	22.9	QP	0.0	0.00	VERTICAL
123.120000	23.30	15.1	43.5	20.2	QP	0.0	0.00	VERTICAL
202.660000	22.90	14.4	43.5	20.6	QP	0.0	0.00	VERTICAL
555.740000	30.90	21.1	46.0	15.1	QP	0.0	0.00	VERTICAL
945.680000	36.20	26.6	46.0	9.8	QP	0.0	0.00	VERTICAL

RADIATED EMISSION ABOVE 1 GHz

Channel Low（2402MHz）								
Maximum Frequency (MHz)	Polarity and Level					Limit (dBμV/m)	Margin (dBμV/m)	Mark (P/Q/A)
	Polarity	Height (m)	Reading dBμV	Transd	Result dBμV/m			
2402	H	1	99.85	-7.15	92.7	N/A	N/A	P
			90.7	-7.15	83.55	N/A	N/A	A
2402	V	1	98.52	-7.15	91.37	N/A	N/A	P
			94.68	-7.15	87.53	N/A	N/A	A
4804	H	1	40.25	1.07	41.32	74	-32.68	P
			31.89	1.07	32.96	54	-21.04	A
4804	V	1	42.76	1.07	43.83	74	-30.17	P
			32.34	1.07	33.41	54	-20.59	A
7206	H	1	40.59	7.38	47.97	74	-26.03	P
			30.69	7.38	38.07	54	-15.93	A
7206	V	1	43.36	7.38	50.74	74	-23.26	P
			31.21	7.38	38.59	54	-15.41	A
9611.37	H	1	41.38	10.29	51.67	74	-22.33	P
			30.54	10.29	40.83	54	-13.17	A
9611.37	V	1	42.39	7.38	49.77	74	-24.23	P
			31.18	7.38	38.56	54	-15.44	A
12022.89	H	1	41.36	14.01	55.37	74	-18.63	P
			31.05	14.01	45.06	54	-8.94	A
12023.33	V	1	42.74	14.01	56.75	74	-17.25	P
			31.23	14.01	45.24	54	-8.76	A
25220.89	----	----	----	----	----	----	----	----

Remark: 1. Transd.=Antenna Factor+Cable Loss-Pre-amplifier
Margin = Level-Limit
Mark: P means Peak Value, Q means Quasi Peak Value, A means Average Value
2. Data of measurement within this 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. Spectrum analyzer setting P(Peak): RBW=1MHz, VBW=1MHz, A(Average): RBW=1MHz, VBW=10Hz.
4. The test limit distance is 3m limit

Channel Middle（2440MHz）								
Maximum Frequency (MHz)	Polarity and Level					Limit (dBμV/m)	Margin (dBμV/m)	Mark (P/Q/A)
	Polarity	Height (m)	Reading dBμV	Transd	Result dBμV/m			
2440	H	1	98.79	-6.37	92.42	N/A	N/A	P
			90.56	-6.37	84.19	N/A	N/A	A
2440	V	1	98.33	-6.37	91.96	N/A	N/A	P
			95.79	-6.37	89.42	N/A	N/A	A
4880	H	1	40.32	1.07	41.39	74	-32.61	P
			30.25	1.07	31.32	54	-22.68	A
4880	V	1	42.81	1.07	43.88	74	-30.12	P
			31.25	1.07	32.32	54	-21.68	A
7320	H	1	40.84	7.49	48.33	74	-25.67	P
			30.23	7.49	37.72	54	-16.28	A
7320	V	1	42.36	7.49	49.85	74	-24.15	P
			31.82	7.49	39.31	54	-14.69	A
9760	H	1	41.25	10.47	51.72	74	-22.28	P
			30.89	10.47	41.36	54	-12.64	A
9760	V	1	43.52	10.47	53.99	74	-20.01	P
			32.33	10.47	42.8	54	-11.2	A
12168.22	H	1	41.85	14.1	55.95	74	-18.05	P
			30.24	14.1	44.34	54	-9.66	A
12168.22	V	1	42.58	14.1	56.68	74	-17.32	P
			30.86	14.1	44.96	54	-9.04	A
25380.37	----	----	----	----	----	----	----	----

Remark: 1. Transd.=Antenna Factor+Cable Loss-Pre-amplifier

Margin = Level-Limit

Mark: P means Peak Value, Q means Quasi Peak Value, A means Average Value

2. Data of measurement within this 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. Spectrum analyzer setting P(Peak): RBW=1MHz, VBW=1MHz, A(Average): RBW=1MHz, VBW=10Hz.

4. The test limit distance is 3m limit

Channel High（2480MHz）								
Maximum Frequency (MHz)	Polarity and Level					Limit (dBμV/m)	Margin (dBμV/m)	Mark (P/Q/A)
	Polarity	Height (m)	Reading dBμV	Transd	Result dBμV/m			
2480	H	1	99.35	-6.05	93.3	N/A	N/A	P
			91.38	-6.05	85.33	N/A	N/A	A
2480	V	1	99.59	-6.05	93.54	N/A	N/A	P
			94.36	-6.05	88.31	N/A	N/A	A
4960	H	1	40.58	1.07	41.65	74	-32.35	P
			31.02	1.07	32.09	54	-21.91	A
4960	V	1	42.35	1.07	43.42	74	-30.58	P
			32.33	1.07	33.4	54	-20.6	A
7440	H	1	40.89	7.61	48.5	74	-25.5	P
			31.36	7.61	38.97	54	-15.03	A
7440	V	1	42.59	7.61	50.2	74	-23.8	P
			32.33	7.61	39.94	54	-14.06	A
9920	H	1	40.89	10.65	51.54	74	-22.46	P
			31.34	10.65	41.99	54	-12.01	A
9920	V	1	43.25	10.65	53.9	74	-20.1	P
			32.59	10.65	43.24	54	-10.76	A
12362.56	H	1	41.68	14.19	55.87	74	-18.13	P
			31.74	14.19	45.93	54	-8.07	A
12362.56	V	1	42.25	14.19	56.44	74	-17.56	P
			32.18	14.19	46.37	54	-7.63	A
25380.89	----	----	----	----	----	----	----	----

Remark: 1. Transd.=Antenna Factor+Cable Loss-Pre-amplifier
Margin = Level-Limit
Mark: P means Peak Value, Q means Quasi Peak Value, A means Average Value
2. Data of measurement within this 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. Spectrum analyzer setting P(Peak): RBW=1MHz, VBW=1MHz, A(Average): RBW=1MHz, VBW=10Hz.
4. The test limit distance is 3m limit

10.Test of Band Edges Emission

10.1 Applicable standard

Section 15.247(d): 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. In addition, radiated emissions that fall in the restricted bands, as defined in Section 15.205, must also comply with the radiated emission limits specified in Section 15.209.

10.2 EUT Setup

Radiated Measurement Setup

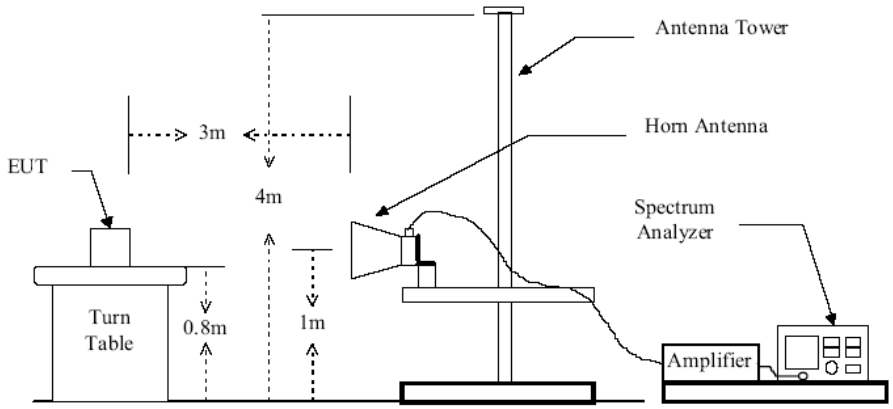


Figure 2 : Frequencies measured above 1 GHz configuration

Conducted Measurement Setup

Spectrum Analyzer

10.3 Test Equipment List and Details

See section 2.5.

10.4 Test Procedure

Conducted Measurement

1. The transmitter is set to the lowest channel.

2. The transmitter output was connected to the spectrum analyzer via a cable and cable loss is used as the offset of the spectrum analyzer.

3. Set both RBW and VBW of spectrum analyzer to 100KHz with convenient frequency span including 100MHz bandwidth from lower band edge. Then detector set to peak and max hold this trace.

4. The lowest band edges emission was measured and recorded.

5. The transmitter set to the highest channel and repeated 2~4.

Radiated Measurement

1. Configure the EUT according to ANSI C63.4-2009

2. The turntable was rotated by 360 degrees to determine the position of the highest radiation.

3. The height of the broadband receiving antenna was varied between one meter and four meters above ground to find the maximum emission field strength of both horizontal and vertical polarization.

4. For band edge emission, the antenna tower was scan (from 1 M to 4 M) and then the turn table was rotated (from 0 degree to 360 degrees) to find the maximum reading.

5. For band edge emission, use 1MHz VBW and 1MHz RBW for reading under AV and use 1MHz VBW and 1MHz RBW for reading under PK.

10.5 Test Result

Temperature (℃) : 22~23	EUT: Magic Finder
Humidity (%RH): 50~54	M/N: st
Barometric Pressure (mbar): 950~1000	Operation Condition: Tx Mode

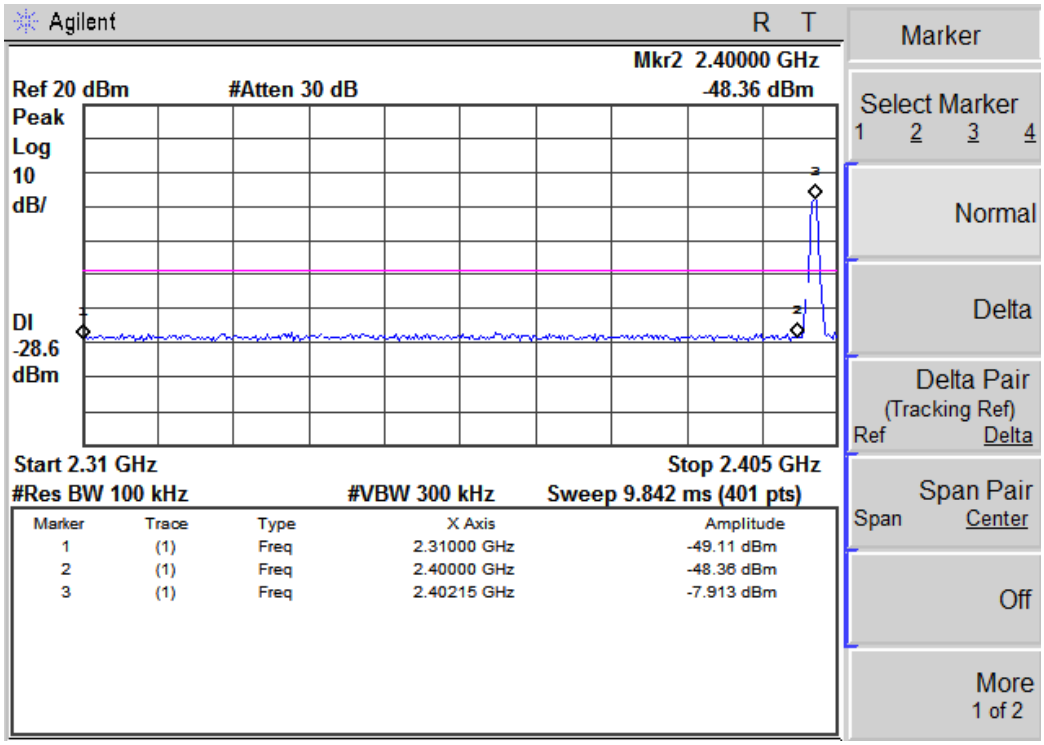
Radiated Test Result

GFSK mode

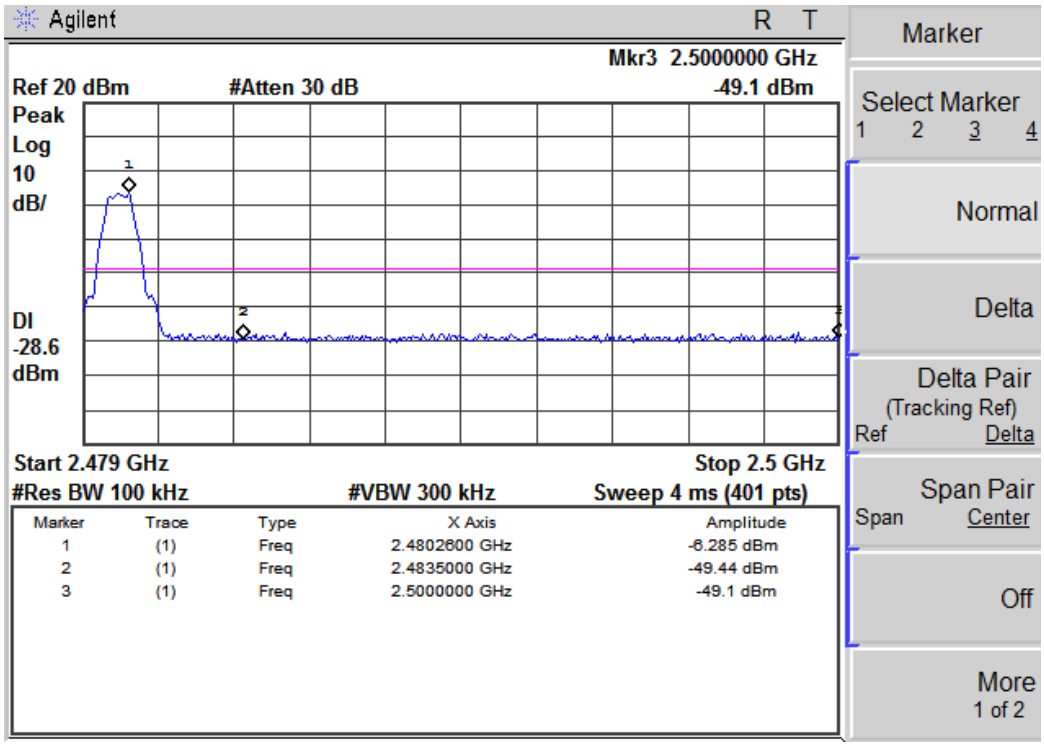
Channel	Freq.(MHz)	Polarity	Level(dBuV/m)	Limit(dBuV)	Margin(dB)	Detector
	2390	H	41.36	74	-32.64	Peak
LOW	2390	H	32.25	54	-21.75	Average
	2390	V	43.25	74	-30.75	Peak
	2390	V	33.33	54	-20.67	Average
HIGH	2483.62	H	42.35	74	-31.65	Peak
	2483.62	H	32.59	54	-21.41	Average
	2483.62	V	43.79	74	-30.21	Peak
	2483.62	V	33.15	54	-20.85	Average

Test of Conducted band edges

CH Low



CH High



11. ANTENNA REQUIREMENT

11.1 standard Applicable

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 use of a permanently attached antenna or of an antenna that uses a unique coupling to the intentional radiator shall be considered sufficient to comply with the provisions of this Section. The manufacturer may design the unit so that a broken antenna can be replaced by the user, but the use of a standard antenna jack or electrical connector is prohibited.

Section 15.247(b)/(c):

If transmitting antennas of directional gain greater than 6 dBi are used, the peak output power from the intentional radiator shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

If the intentional radiator is used exclusively for fixed, point-to-point operations may employ transmitting antennas with directional gain greater than 6 dBi provided the maximum peak output power of the intentional radiator is reduced by 1 dB for every 3 dB that the directional gain of the antenna exceeds 6 dBi.

11.2 Antenna Connected Construction

The antenna is designed with permanent attachment and no consideration of replacement. The antenna used in this product is complied with standard. The maximum Gain of the antenna lower than 6.0dBi and have the definite antenna Specification.

12 .Radio Frequency Exposure

12.1 Objective

The objective of the following report is used to demonstrate that EUT operated in a manner that ensures the public is not exposed to radio frequency energy levels in excess of the relative provisions of FCC 47CFR Part 1.1307

12.2 General Description of Test

Items	Description
EUT Frequency band	☐ FHSS: 2.400GHz ~ 2.4835GHz ☐ WLAN: 2.400GHz ~ 2.4835GHz ☐ WLAN: 5.18GHz ~ 5.32GHz / 5.50GHz ~ 5.70GHz ☐ WLAN: 5.745GHz ~ 5825GHz ☒Others: ___BT 4.0_____
Device category	☒Portable (<20cm separation) ☐Mobile (>20cm separation) ☐Others _____
Exposure classification	☐Occupational/Controlled exposure (S = 5mW/cm2) ☒General Population/Uncontrolled exposure (S=1mW/cm^2) ☐Others: _____
Antenna diversity	☒Single antenna ☐Multiple antennas: ☐Tx diversity ☐Rx diversity ☐Tx/Rx diversity
Max. output power	-5.828dBm (0. 000261W)
Antenna gain (Max)	2dBi (Numeric gain: 1.59)
Evaluation applied	☒MPE Evaluation ☐SAR Evaluation

Note:

1. *The maximum output power is* -5.828dBm (0. 000261W) *at 2440MHz.(with 1.26 numeric antenna gain.)*

2. For mobile or fixed location transmitters, no SAR consideration applied. The minimum separation generally be used is at least 20 cm, even if the calculations indicate that the MPE distance would be lesser.

12.3 Human Exposure Assessment Results

Calculation

Given $E = \frac{\sqrt{30 \times P \times G}}{d}$ & $S = \frac{E^2}{3770}$

Where *E = Field Strength in Volts / meter*
P = Power in Watts
G=Numeric antenna gain
d=Distance in meters
S=Power Density in milliwatts / square centimeter

Combining equations and re-arranging the terms to express the distance as a function of the remaining variables yields:

$$S = \frac{30 \times P \times G}{3770 d^2}$$

Changing to units of mW and cm, using:

P (mW) = P (W) / 1000 and
*d (cm) =100 * d (m)*

Yields

$$S = \frac{30 \times (P/1000) \times G}{3770 \times (d/100)^2} = 0.0796 \times \frac{P \times G}{d^2}$$ ***Equation 1***

Where *d = distance in cm*
P = Power in mW
G = Numeric antenna gain
S = Power Density in mW / cm^2

EUT parameter (data from the separate report)	
Given $E=\frac{\sqrt{30\times P\times G}}{d}$ & $S=\frac{E^2}{3770}$	Where G: numerical gain of transmitting antenna; TP: Transmitted power in watt; d: distance from the transmitting antenna in meter
Max average output power in Watt (TP)	-5.828dBm (0. 000261W)
Antenna gain (G)	2dBi (Numeric gain: 1.59)
Exposure classification	S=1mW/cm^2
Minimum distance in meter (d) (from transmitting structure to the human body)	20cm (0.2m)
Yields $S=\frac{30xPxG}{3770d^2}$, P=0.000261W, G=1.59, d=0.2 S=0.000082mW/cm^2 Or $d=\sqrt{\frac{30xPxG}{3770S}}$, S=1, P=0.000261W, G=1.59 d=0.0018m	
Conclusion: S=0.000082mW/cm^2 is significant lower than the General Population Exposure Power Density Limit 1mW/cm^2 or except the distance when human body proximity to the antenna is less than 0.18cm then will reach the General Population Exposure Power Density Limit (For mobile or fixed location transmitters, the maximum power density is 1.0 mW / cm^2 even if the calculation indicates that the power density would be larger.)	