



FCC Test Report

Report No.: ARFR-ESH-P200324369B-1

FCC ID: 2ANDLTY-R8807

Product: Smart Doorbell

Model: SC222-WH2

Received Date: Mar.24, 2020

Test Date: Mar.27 to Apr.10, 2020

Issued Date: Apr.18, 2020

Applicant: Hangzhou Tuya Information Technology Co., Ltd

Address: Room701, Building3, More Center,No.87 GuDun Road, Hangzhou,
Zhejiang, China

Issued By: BUREAU VERITAS ADT (Shanghai) Corporation

Lab Address: No. 829, Xinzhuan Road, Shanghai, P.R.China (201612)

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Release Control Record

Issue No.	Description	Date Issued
ARFR-ESH-P200324369B-1	Original release	Apr.18, 2020

1 Certificate of Conformity

Product: Smart Doorbell

Brand: --

Model: SC222-WH2

Applicant: Hangzhou Tuya Information Technology Co., Ltd

Test Date: Mar.27 to Apr.10, 2020

Standards: 47 CFR FCC Part 15, Subpart C (Section 15.247)
ANSI C63.10:2013

The above equipment has been tested by **BUREAU VERITAS ADT (Shanghai) Corporation**, and found compliance with the requirement of the above standards. The test record, data evaluation & Equipment Under Test (EUT) configurations represented herein are true and accurate accounts of the measurements of the sample's EMC characteristics under the conditions specified in this report.

Prepared by :



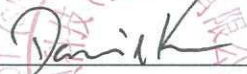
, Date:

Apr.18, 2020

Will Yan

Project Engineer

Approved by :



, Date:

Apr.18, 2020

Daniel Sun

EMC Lab manager





2 Summary of Test Results

The EUT has been tested according to the following specifications:

47 CFR FCC Part 15, Subpart C (SECTION 15.247)			
FCC Clause	Test Item	Result	Remarks
15.207	AC Power Conducted Emission	PASS	Meet the requirement of limit.
15.205 / 15.209 / 15.247(d)	Radiated Emissions Measurement	PASS	Meet the requirement of limit.
15.247(d)	Emissions in non-restricted frequency bands	PASS	Meet the requirement of limit.
15.247(a)(2)	6dB bandwidth	PASS	Meet the requirement of limit.
15.247(b)	Conducted power	PASS	Meet the requirement of limit.
15.247(e)	Power Spectral Density	PASS	Meet the requirement of limit.
15.203	Antenna Requirement	PASS	No antenna connector is used.



2.1 Test Instruments

Equipment	Manufacturer	Model No.	Serial No.	Last Cal.	Next Cal.
Hybrid antenna(25MHz-1.5GHz)	Schwarzbeck	VULB9168	E1A1012	Feb.08,20	Feb.07,21
Horn Antenna(1GHz -18GHz)	Schwarzbeck	BBHA9120D	E1A1017	Aug.26,19	Aug.25,20
Pre-Amplifier(100kHz-1.3GHz)	Agilent	8447D	E1A2001	Oct.18, 19	Oct.17, 20
Pre-Amplifier(1GHz-26.5GHz)	Agilent	8449B	E1A2002	Mar. 25, 20	Mar. 24, 21
EMI test receiver	R&S	ESR7	E1R1005	Dec.04, 19	Dec.03, 20
Spectrum Analyzer	Keysight	N9030B	E1S1003	Jul.23,19	Jul.22, 20
EMI test receiver	R&S	ESCS30	E1R1001	Mar.25, 20	Mar.24, 21
LISN	R&S	ENV216	E1L1011	Jul.18, 19	Jul.17, 20
Humidity&Temp Tester	Baolima	WS508	E1H1011	Apr. 04, 19	Apr. 03, 20
Test Software	ADT	ADT_COND_V 7.3.1	N/A	N/A	N/A
Test Software	Toscend	JS32-RE	N/A	N/A	N/A
Test Software	Toscend	JS1120	N/A	N/A	N/A



2.2 Measurement Uncertainty

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

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

Measurement	Frequency	Expanded Uncertainty ($k=2$) (\pm)
Conducted Emissions at mains ports	150kHz ~ 30MHz	1.83 dB
Radiated Emissions up to 1 GHz	30MHz ~ 1GHz	5.36 dB
Radiated Emissions above 1 GHz	1GHz ~ 6GHz	3.47 dB
	6GHz ~ 18GHz	3.75 dB
	18GHz ~ 40GHz	3.30 dB

2.3 Modification Record

There were no modifications required for compliance.



3 General Information

3.1 General Description of EUT

Product	Smart Doorbell
Brand	--
Test Model	SC222-WH2
Power Rating	12-24Vac~
Modulation Type	CCK, DQPSK, DBPSK for DSSS 64QAM, 16QAM, QPSK, BPSK for OFDM
Modulation Technology	DSSS, OFDM
Operating Frequency	See clause 3.2
Number of Channel	See clause 3.2
Antenna Type	FPC Antenna
Antenna Connector	--
Antenna Gain	2dBi

Modulation Mode	TX /RX Function
802.11b	1TX / 1RX
802.11g	1TX / 1RX
802.11n (HT20)	1TX / 1RX
802.11n (HT40)	1TX / 1RX



3.2 Description of Test Modes

13 channels are provided for 802.11b, 802.11g, 802.11n (HT20) and 802.11n (HT40).

Channel	Frequency	Channel	Frequency
1	2412MHz	7	2442MHz
2	2417MHz	8	2447MHz
3	2422MHz	9	2452MHz
4	2427MHz	10	2457MHz
5	2432MHz	11	2462MHz
6	2437MHz	-	-



3.2.1 Test Mode Applicability:

EUT Configure Mode	Applicable to				Description
	RE ≥ 1G	RE < 1G	PLC	APCM	
-	√	√	√	√	-

Where **RE≥1G**: Radiated Emission above 1GHz **RE<1G**: Radiated Emission below 1GHz
PLC: Power Line Conducted Emission **APCM**: Antenna Port Conducted Measurement

Radiated Emission Test (Above 1 GHz):

- Pre-Scan has been conducted to determine the worst-case mode from all possible combinations between available modulations, data rates and antenna ports (if EUT with antenna diversity architecture).
- Following channel(s) was (were) selected for the final test as listed below.

EUT CONFIGURE MODE	MODE	AVAILABLE CHANNEL	TESTED CHANNEL	MODULATION TECHNOLOGY	MODULATION TYPE	DATA RATE (Mbps)
-	802.11b	1 to 11	1, 6, 11	DSSS	DBPSK	1.0
-	802.11g	1 to 11	1, 6, 11	OFDM	BPSK	6.0
-	802.11n (HT20)	1 to 11	1, 6, 11	OFDM	BPSK	6.5
-	802.11n (HT40)	3 to 9	3, 6, 9	OFDM	BPSK	13.5

Radiated Emission Test (Below 1 GHz):

- Pre-Scan has been conducted to determine the worst-case mode from all possible combinations between available modulations, data rates and antenna ports (if EUT with antenna diversity architecture).

Power Line Conducted Emission Test:

- Pre-Scan has been conducted to determine the worst-case mode from all possible combinations between available modulations, data rates and antenna ports (if EUT with antenna diversity architecture).
- Following channel(s) was (were) selected for the final test as listed below.

EUT CONFIGURE MODE	MODE	AVAILABLE CHANNEL	TESTED CHANNEL	MODULATION TECHNOLOGY	MODULATION TYPE	DATA RATE (Mbps)
-	802.11b	1 to 11	1	DSSS	DBPSK	1.0



Antenna Port Conducted Measurement

Pre-Scan has been conducted to determine the worst-case mode from all possible combinations between available modulations, data rates and antenna ports (if EUT with antenna diversity architecture).

Following channel(s) was (were) selected for the final test as listed below.

EUT CONFIGURE MODE	MODE	AVAILABLE CHANNEL	TESTED CHANNEL	MODULATION TECHNOLOGY	MODULATION TYPE	DATA RATE (Mbps)
-	802.11b	1 to 11	1, 6, 11	DSSS	DBPSK	1.0
-	802.11g	1 to 11	1, 6, 11	OFDM	BPSK	6.0
-	802.11n (HT20)	1 to 11	1, 6, 11	OFDM	BPSK	6.5
-	802.11n (HT40)	3 to 11	3, 6, 9	OFDM	BPSK	13.5

3.2.2 Test Condition:

Applicable to	Normal Environmental Conditions	Normal Input Power
RE ≥ 1G	25deg. C, 60%RH	120Vac, 60Hz
RE < 1G	25deg. C, 60%RH	120Vac, 60Hz
PLC	25deg. C, 60%RH	120Vac, 60Hz
APCM	25deg. C, 60%RH	120Vac, 60Hz

3.3 Duty Cycle of Test Signal

The Duty Cycle of the EUT is 93.55%.



Note: Duty Cycle Factor = $10 \cdot \log(1/\text{Duty Cycle})$. Duty Cycle Factor = 0.29

Description of Support Units

The EUT has been tested as an independent unit together with other necessary accessories or support units.

3.4 General Description of Applied Standards

The EUT is a RF Product. According to the specifications of the manufacturer, it must comply with the requirements of the following standard:

FCC Part 15, Subpart C (15.247)

KDB 558074 D01 DTS Meas Guidance v05r02

ANSI C63.10:2013

All relaxed test items have been performed and recorded as per the above standard.

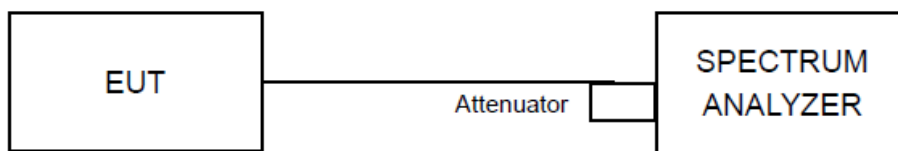
4 Test Procedure and Results

4.1 6dB Bandwidth Measurement

4.1.1 Limit

For digital modulation systems, the minimum 6dB bandwidth shall be at least 500 kHz

4.1.2 Test Setup



4.1.3 Test Procedures



The EUT was tested according to DTS test procedure of “KDB558074 D01 DTS Meas Guidance” for compliance to FCC 47CFR 15.247 requirements (clause 8.2).

The automatic bandwidth measurement capability of an instrument may be employed using the X dB bandwidth mode with X set to 6 dB, if the functionality described above (i.e., $RBW = 100 \text{ kHz}$, $VBW \geq 3 \cdot RBW$, peak detector with maximum hold) is implemented by the instrumentation function.

4.1.4 Deviation of Test Standard

No deviation.

4.1.5 Test Results

802.11b

Channel	Frequency (MHz)	99% Occupied Bandwidth (MHz)	6 dB Bandwidth (MHz)	Minimum Limit (MHz)	Pass / Fail
1	2412	13.349	9.472	0.5	Pass
6	2437	13.376	9.401	0.5	Pass
11	2462	13.339	9.139	0.5	Pass

Spectrum Plot

802.11b(2412MHz)





802.11b(2437MHz)



802.11b(2462MHz)



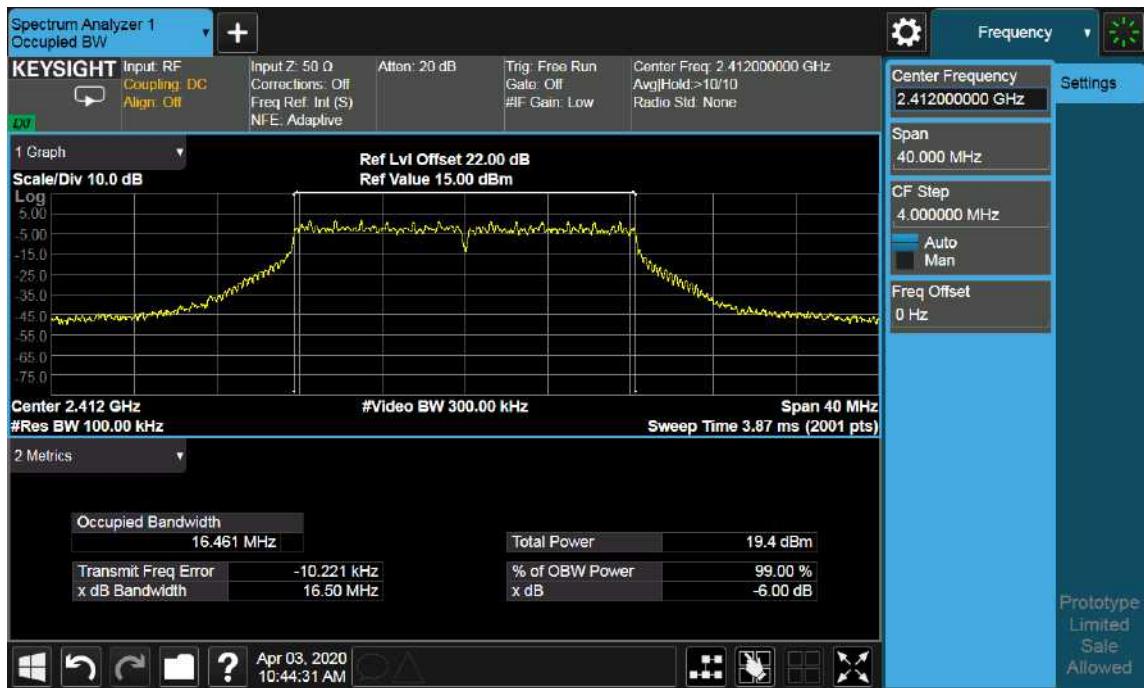


802.11g

Channel	Frequency (MHz)	99% Occupied Bandwidth (MHz)	6 dB Bandwidth (MHz)	Minimum Limit (MHz)	Pass / Fail
1	2412	16.461	16.50	0.5	Pass
6	2437	16.460	16.43	0.5	Pass
11	2462	16.439	16.45	0.5	Pass

Spectrum Plot

802.11g(2412MHz)

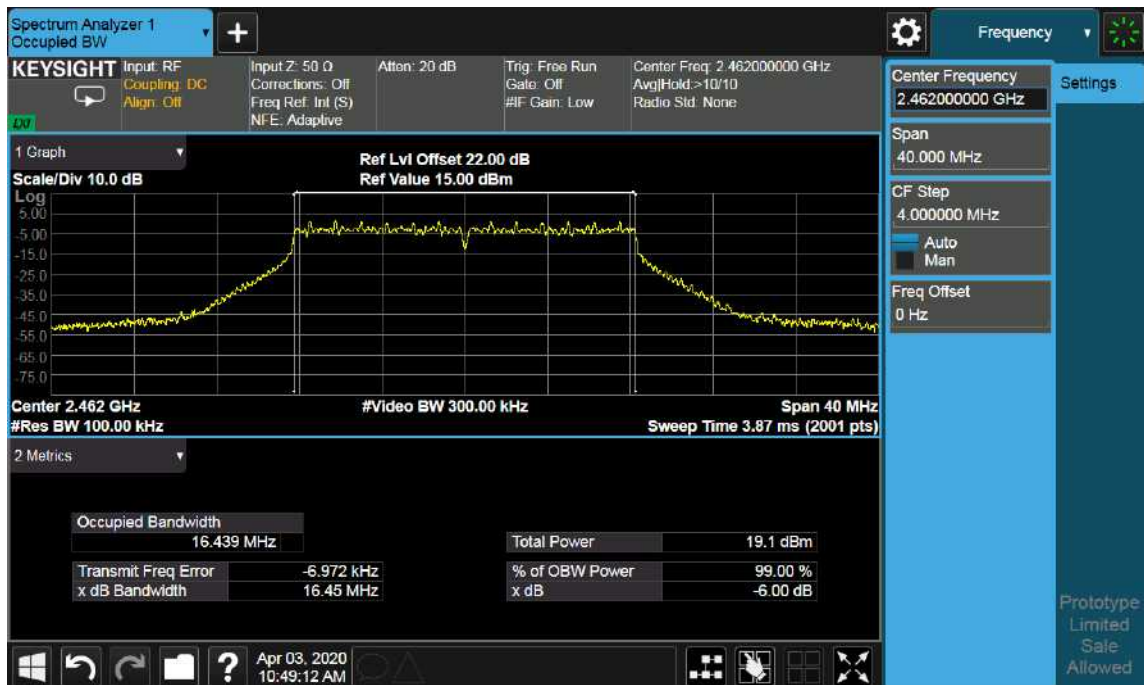




802.11g(2437MHz)



802.11g(2462MHz)





802.11n (HT20)

Channel	Frequency (MHz)	99% Occupied Bandwidth (MHz)	6 dB Bandwidth (MHz)	Minimum Limit (MHz)	Pass / Fail
1	2412	17.610	17.32	0.5	Pass
6	2437	17.620	17.62	0.5	Pass
11	2462	17.621	17.67	0.5	Pass

Spectrum Plot

802.11n(HT20)(2412MHz)

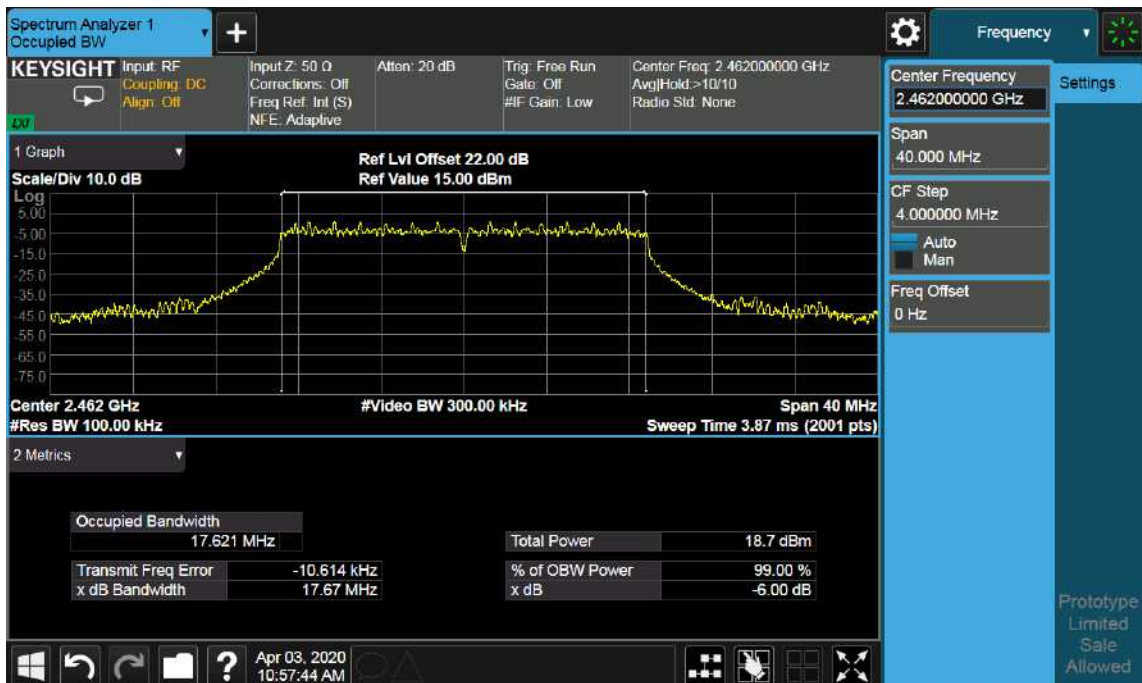




802.11n(HT20)(2437MHz)



802.11n(HT20)(2462MHz)



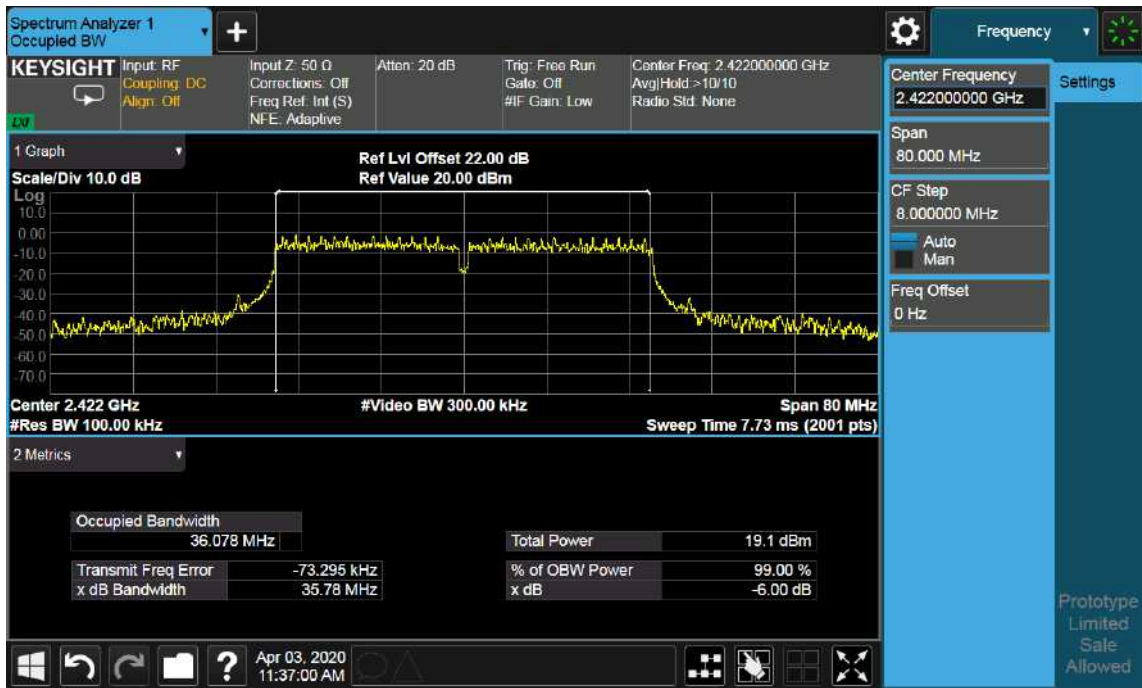


802.11n (HT40)

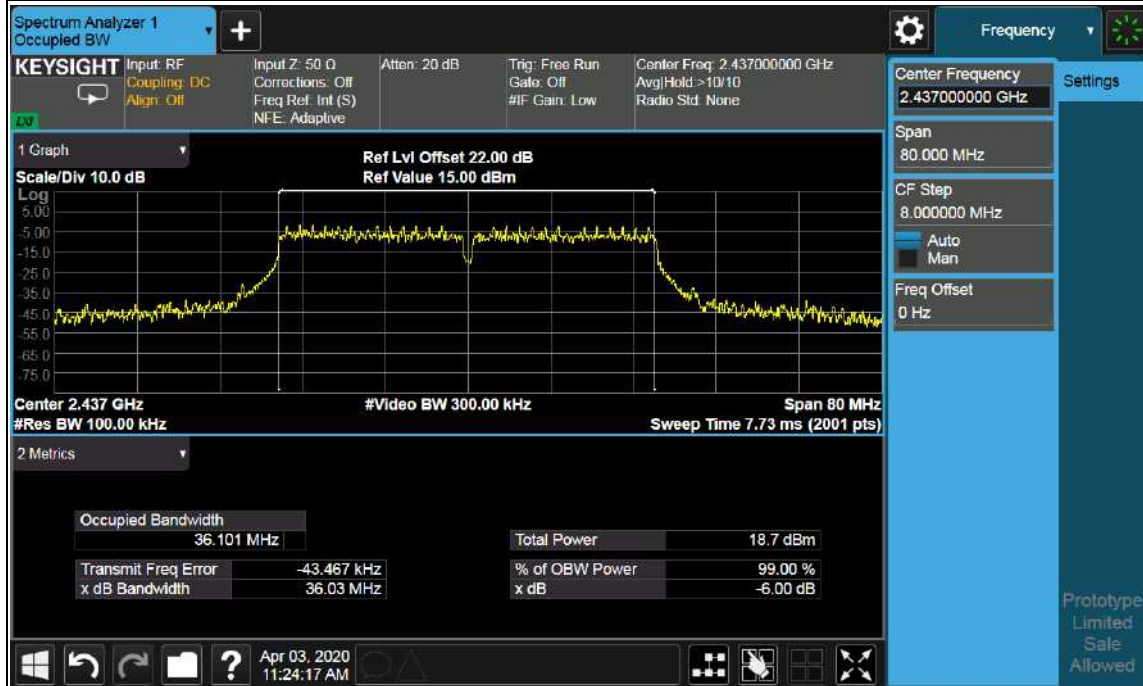
Channel	Frequency (MHz)	99% Occupied Bandwidth (MHz)	6 dB Bandwidth (MHz)	Minimum Limit (MHz)	Pass / Fail
3	2422	36.078	35.78	0.5	Pass
6	2437	36.101	36.03	0.5	Pass
9	2452	36.077	35.81	0.5	Pass

Spectrum Plot

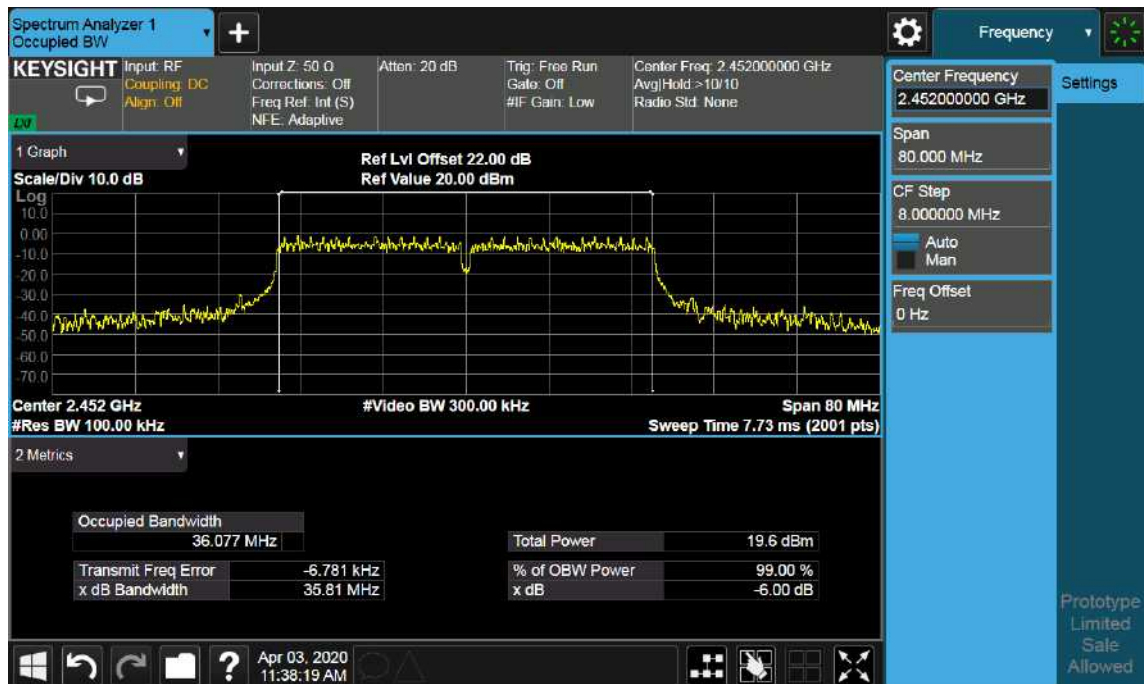
802.11n(HT40)(2422MHz)



802.11n(HT40)(2437MHz)



802.11n(HT40)(2452MHz)

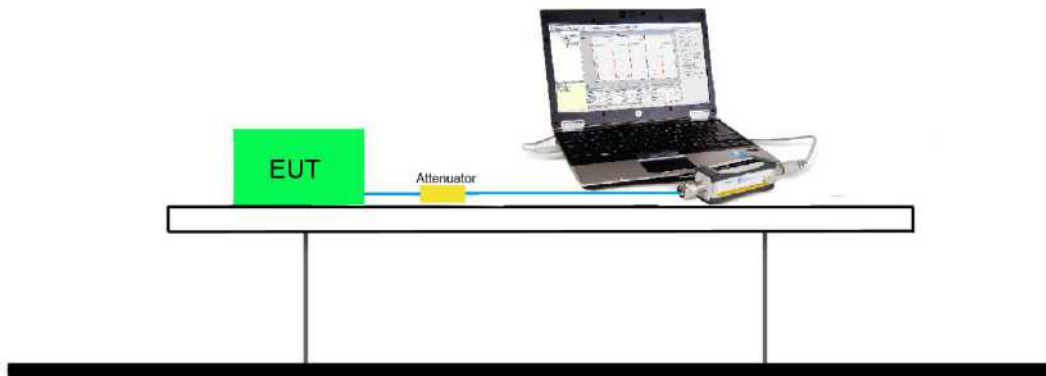


4.2 Conducted Output Power Measurement

4.2.1 Limit

For systems using digital modulation in the 2400 - 2483.5 MHz bands: 1 Watt (30 dBm)

4.2.2 Test Setup



4.2.3 Test Procedures

Method PKPM1 (Peak Power Measurement)

Peak power measurements were performed only when the EUT was transmitting at its maximum power control level using a broadband power meter with a pulse sensor. The pulse sensor employs a VBW = 50MHz so this method was only used for signals whose DTS bandwidth was less than or equal to 50MHz.

Method AVGPM-G (Measurement using a gated RF average-reading power meter)

Measurements may be performed using a wideband gated RF power meter provided that the gate parameters are adjusted such that the power is measured only when the EUT is transmitting at its maximum power control level. Since this measurement is made only during the ON time of the transmitter, no duty cycle correction is required

4.2.4 Deviation of Test Standard

No deviation.

4.2.5 Deviation of Test Standard

No deviation.



4.2.6 Test Results

802.11b

Channel	Frequency (MHz)	Duty Cycle Factor	Peak Power (dBm)	Final Peak Power (dBm)	Limit (dBm)	Pass / Fail
1	2412	0.29	14.93	15.22	30	Pass
6	2437	0.29	14.58	14.87	30	Pass
11	2462	0.29	15.24	15.53	30	Pass

802.11g

Channel	Frequency (MHz)	Duty Cycle Factor	Peak Power (dBm)	Final Peak Power (dBm)	Limit (dBm)	Pass / Fail
1	2412	0.29	12.28	12.57	30	Pass
6	2437	0.29	12.51	12.80	30	Pass
11	2462	0.29	12.36	12.65	30	Pass

802.11n (HT20)

Channel	Frequency (MHz)	Duty Cycle Factor	Peak Power (dBm)	Final Peak Power (dBm)	Limit (dBm)	Pass / Fail
1	2412	0.29	12.03	12.32	30	Pass
6	2437	0.29	11.51	11.80	30	Pass
11	2462	0.29	11.70	11.99	30	Pass

802.11n (HT40)

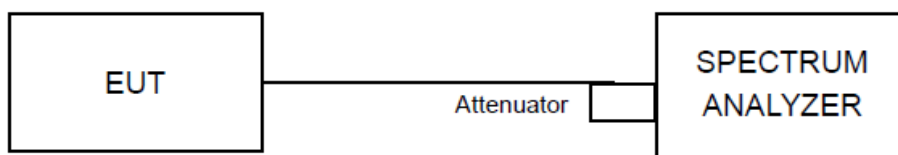
Channel	Frequency (MHz)	Duty Cycle Factor	Peak Power (dBm)	Final Peak Power (dBm)	Limit (dBm)	Pass / Fail
3	2422	0.29	11.84	12.13	30	Pass
6	2437	0.29	11.61	11.90	30	Pass
9	2452	0.29	12.28	12.57	30	Pass

4.3 Power Spectral Density Measurement

4.3.1 Limit

The Maximum of Power Spectral Density Measurement is 8 dBm in any 3 kHz band.

4.3.2 Test Setup



4.3.3 Test Procedures

The power output per FCC § 15.247(e) was tested according to DTS test procedure of “KDB558074 D01 DTS Meas Guidance” (clause 10.5) for compliance to FCC 47CFR 15.247 requirements.

- a) Measure the duty cycle (x) of the transmitter output signal.
- b) Set instrument center frequency to DTS channel center frequency.
- c) Set span to at least 1.5 OBW.
- d) Set RBW to: $3 \text{ kHz} \leq \text{RBW} \leq 100 \text{ kHz}$.
- e) Set VBW $\geq 3 \text{ RBW}$.
- f) Detector = power averaging (RMS) or sample detector (when RMS not available).
- g) Ensure that the number of measurement points in the sweep $\geq 2 \text{ span/RBW}$.
- h) Sweep time = auto couple.
- i) Do not use sweep triggering. Allow sweep to “free run”.
- j) Employ trace averaging (RMS) mode over a minimum of 100 traces.
- k) Use the peak marker function to determine the maximum amplitude level.
- l) Add $10 \log (1/x)$, where x is the duty cycle measured in step (a), to the measured PSD to compute the average PSD during the actual transmission time.
- m) If resultant value exceeds the limit, then reduce RBW (no less than 3 kHz) and repeat (note that this may



require zooming in on the emission of interest and reducing the span in order to meet the minimum measurement point requirement as the RBW is reduced).

4.3.4 Deviation of Test Standard

No deviation.

4.3.5 Test Results

802.11b

Channel	Frequency (MHz)	Duty Cycle Factor	PSD (dBm/3kHz)	Final PSD (dBm/3kHz)	Limit (dBm/3kHz)	Pass / Fail
1	2412	0.29	-9.47	-9.18	8	Pass
6	2437	0.29	-8.47	-8.18	8	Pass
11	2462	0.29	-7.47	-7.18	8	Pass

Spectrum Plot

802.11b(2412MHz)



802.11b(2437MHz)



802.11b(2462MHz)





802.11g

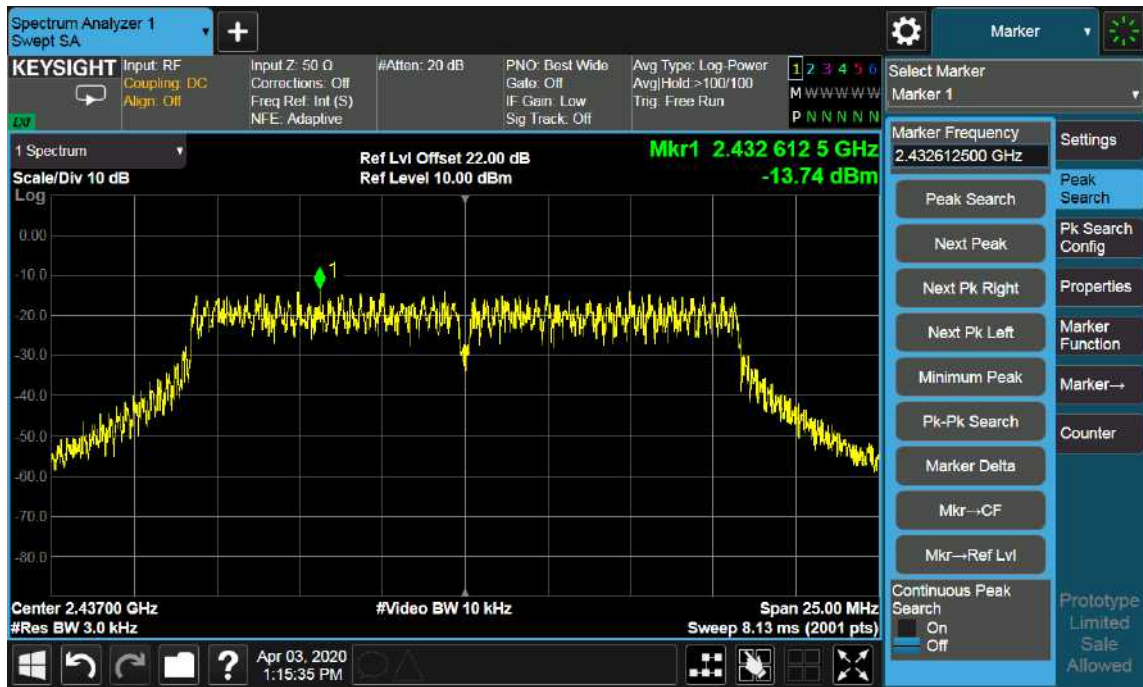
Channel	Frequenc y (MHz)	Duty Cycle Factor	PSD (dBm/3kHz)	Final PSD (dBm/3kHz)	Limit (dBm/3kHz)	Pass / Fail
1	2412	0.29	-13.59	-13.30	8	Pass
6	2437	0.29	-13.74	-13.45	8	Pass
11	2462	0.29	-12.68	-12.39	8	Pass

Spectrum Plot

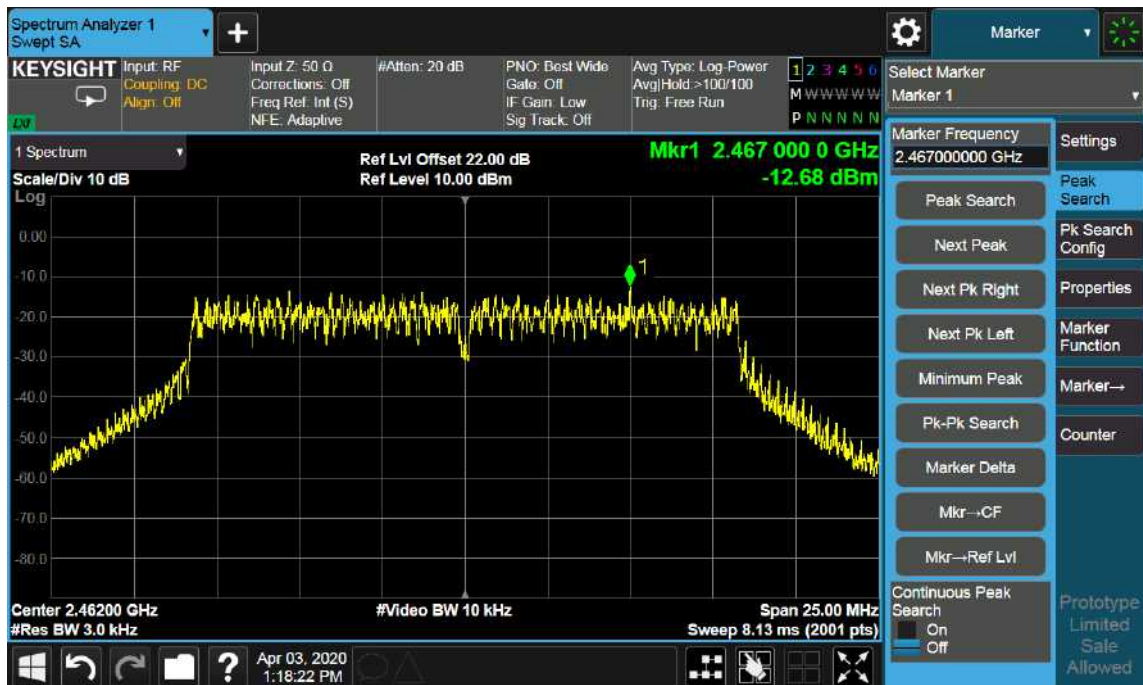
802.11g(2412MHz)



802.11g(2437MHz)



802.11g(2462MHz)



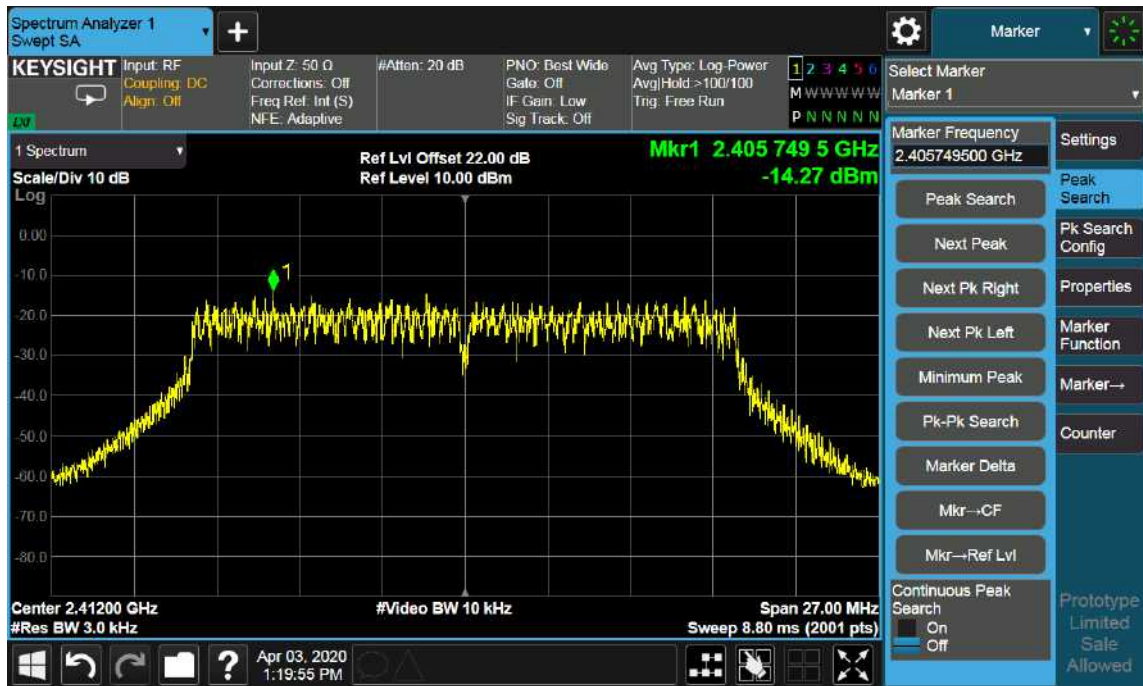


802.11n (HT20)

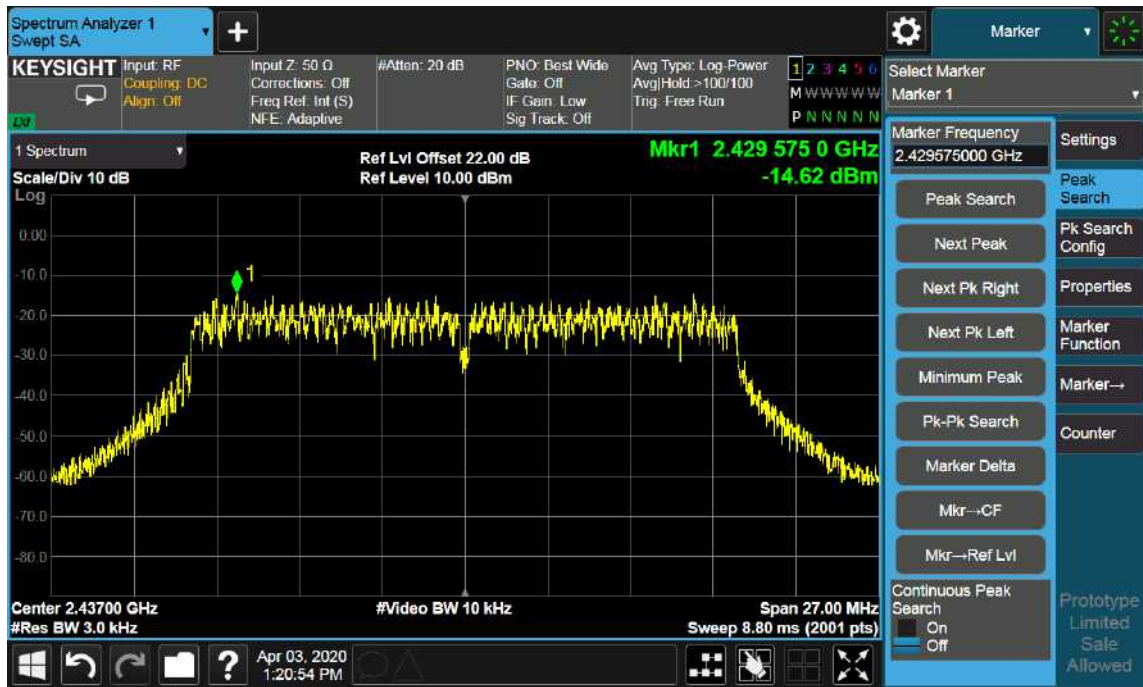
Channel	Frequency (MHz)	Duty Cycle Factor	PSD (dBm/3kHz)	Final PSD (dBm/3kHz)	Limit (dBm/3kHz)	Pass / Fail
1	2412	0.29	-14.27	-13.98	8	Pass
6	2437	0.29	-14.62	-14.33	8	Pass
11	2462	0.29	-13.37	-13.08	8	Pass

Spectrum Plot

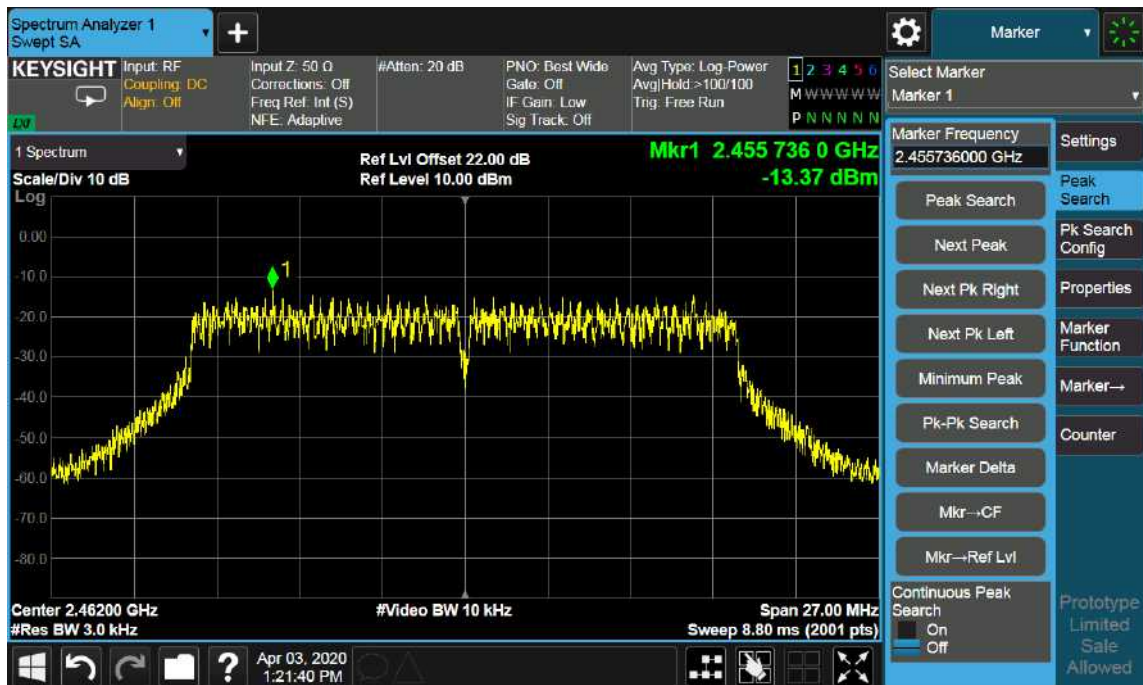
802.11n(HT20)(2412MHz)



802.11n(HT20)(2437MHz)



802.11n(HT20)(2462MHz)





802.11 n(HT40)

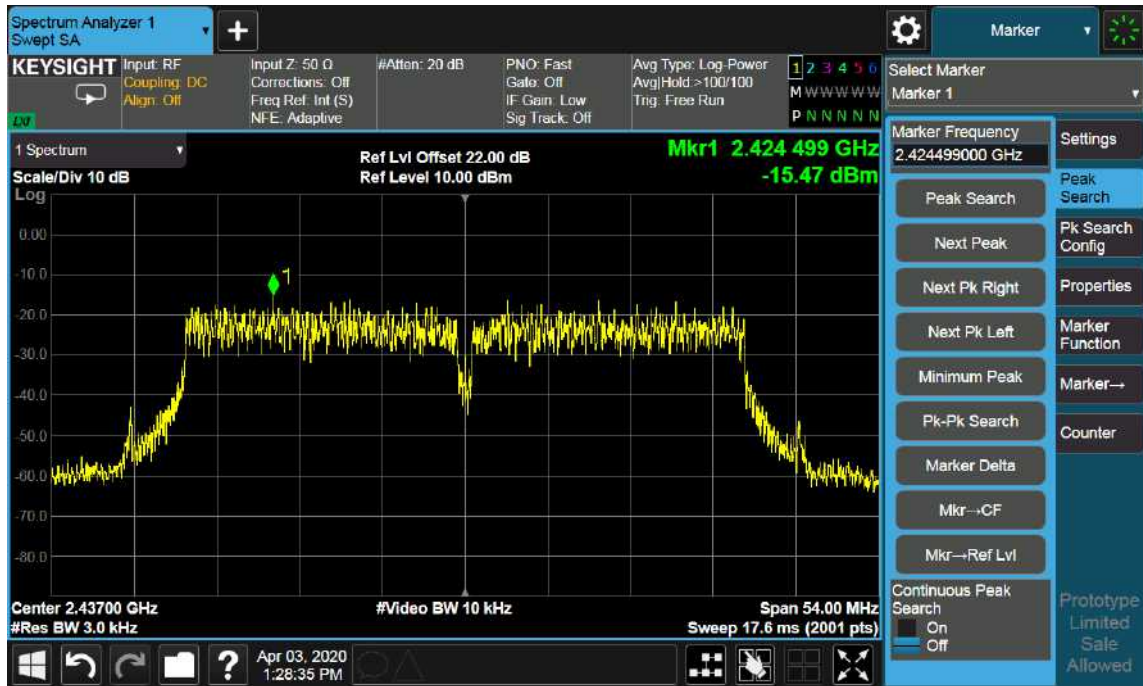
Channel	Frequenc y (MHz)	Duty Cycle Factor	PSD (dBm/3kHz)	Final PSD (dBm/3kHz)	Limit (dBm/3kHz)	Pass / Fail
3	2422	0.29	-17.33	-17.04	8	Pass
6	2437	0.29	-15.47	-15.18	8	Pass
9	2452	0.29	-15.67	-15.38	8	Pass

Spectrum Plot

802.11n(HT40)(2422MHz)



802.11n(HT40)(2422MHz)



802.11n(HT40)(2452MHz)

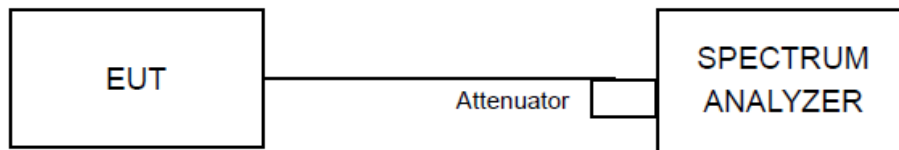


4.4 Emissions in non-restricted frequency bands

4.4.1 Limit

Below 30 dB of the highest emission level of operating band (in 100 kHz Resolution Bandwidth).

4.4.2 Test Setup



4.4.3 Test Procedures

The EUT was tested according to DTS test procedure of “KDB558074 D01 DTS Meas Guidance” (clause 11.0) for compliance to FCC 47CFR 15.247 requirements.

MEASUREMENT PROCEDURE REF

1. Set the RBW = 100 kHz.
2. Set the VBW \geq 300 kHz.
3. Detector = peak.
4. Sweep time = auto couple.
5. Trace mode = max hold.
6. Allow trace to fully stabilize.
7. Use the peak marker function to determine the maximum power level in any 100 kHz band segment within the fundamental EBW.

MEASUREMENT PROCEDURE OOB

1. Set RBW = 100 kHz.
2. Set VBW \geq 300 kHz.
3. Detector = peak.
4. Sweep = auto couple.



5. Trace Mode = max hold.
6. Allow trace to fully stabilize.
7. Use the peak marker function to determine the maximum amplitude level.

4.4.4 Deviation of Test Standard

No deviation.



4.4.5 Test Results

802.11b

Channel	Frequency (MHz)	Pass / Fail
1	2412	Pass
6	2437	Pass
11	2462	Pass

Spectrum Plot

802.11b(2412MHz)





802.11b(2437MHz)

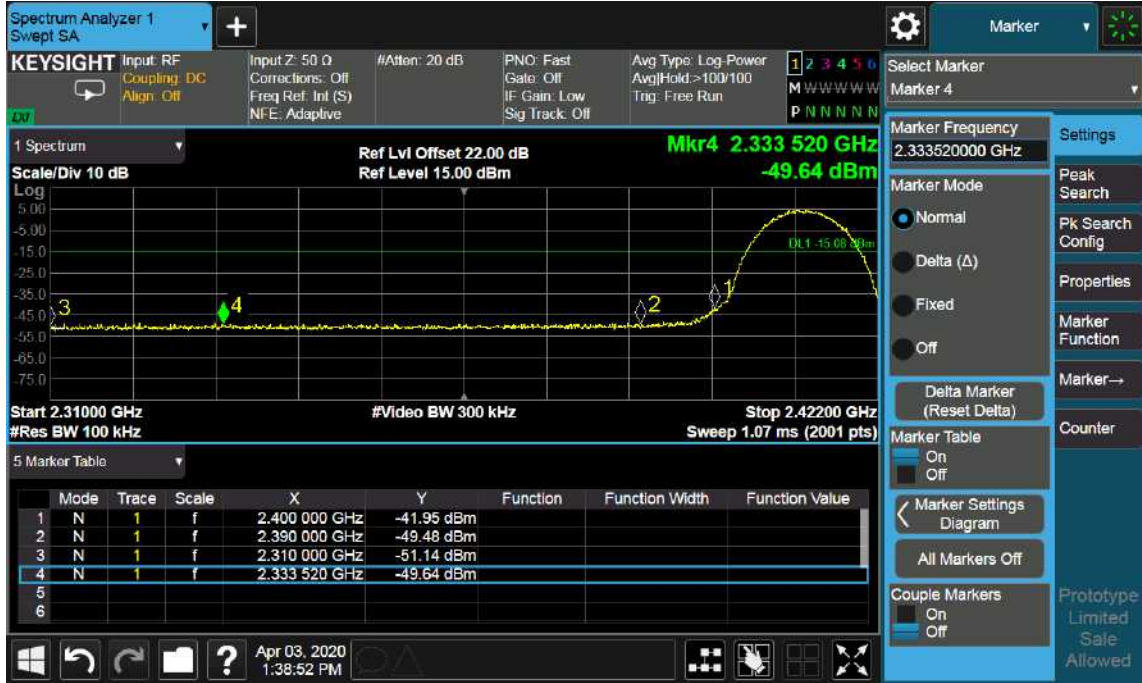


802.11b(2462MHz)



Spectrum Plot

802.11b(2412MHz) Band Edge



802.11b(2462MHz) Band Edge



Spectrum Plot

802.11b(2412MHz) Out-of-Band Emissions





Spectrum Plot

802.11b(2437MHz) Out-of-Band Emissions



Spectrum Plot

802.11b(2462MHz) Out-of-Band Emissions



802.11g



Channel	Frequency (MHz)	Pass / Fail
1	2412	Pass
6	2437	Pass
11	2462	Pass

Spectrum Plot

802.11g(2412MHz)

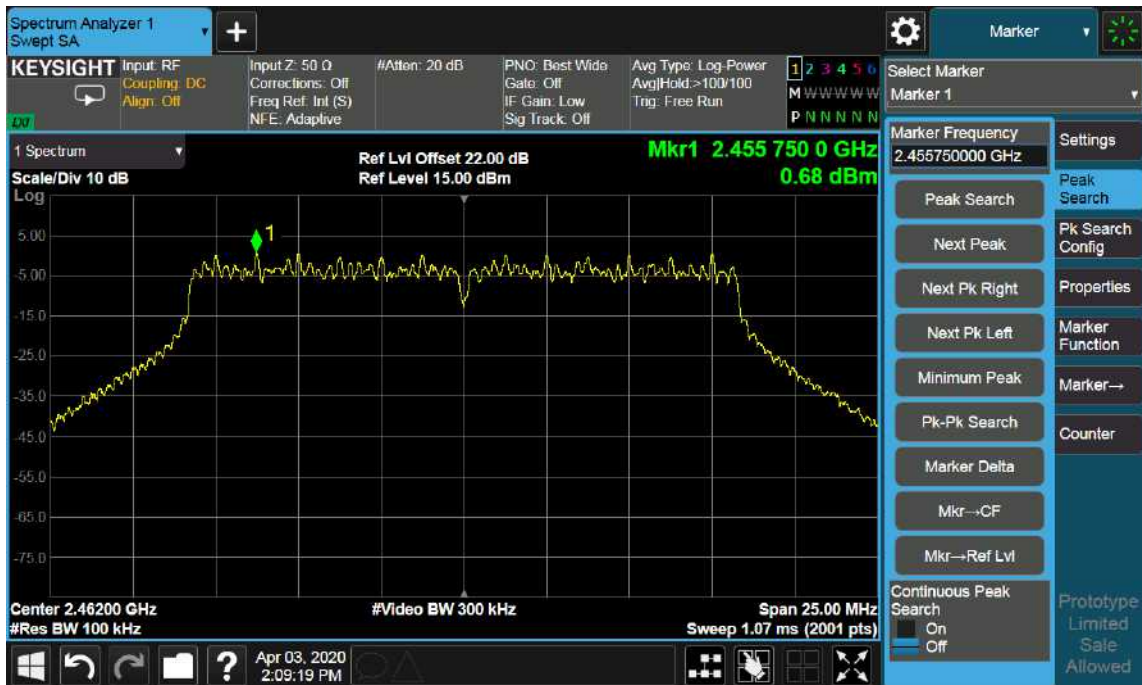


802.11g(2437MHz)



Spectrum Plot

802.11g(2462MHz)



Spectrum Plot

802.11g(2412MHz) Band Edge



802.11g(2462MHz) Band Edge



Spectrum Plot

802.11g(2412MHz) Out-of-Band Emissions



Spectrum Plot

802.11g(2437MHz) Out-of-Band Emissions



Spectrum Plot

802.11g(2462MHz) Out-of-Band Emissions



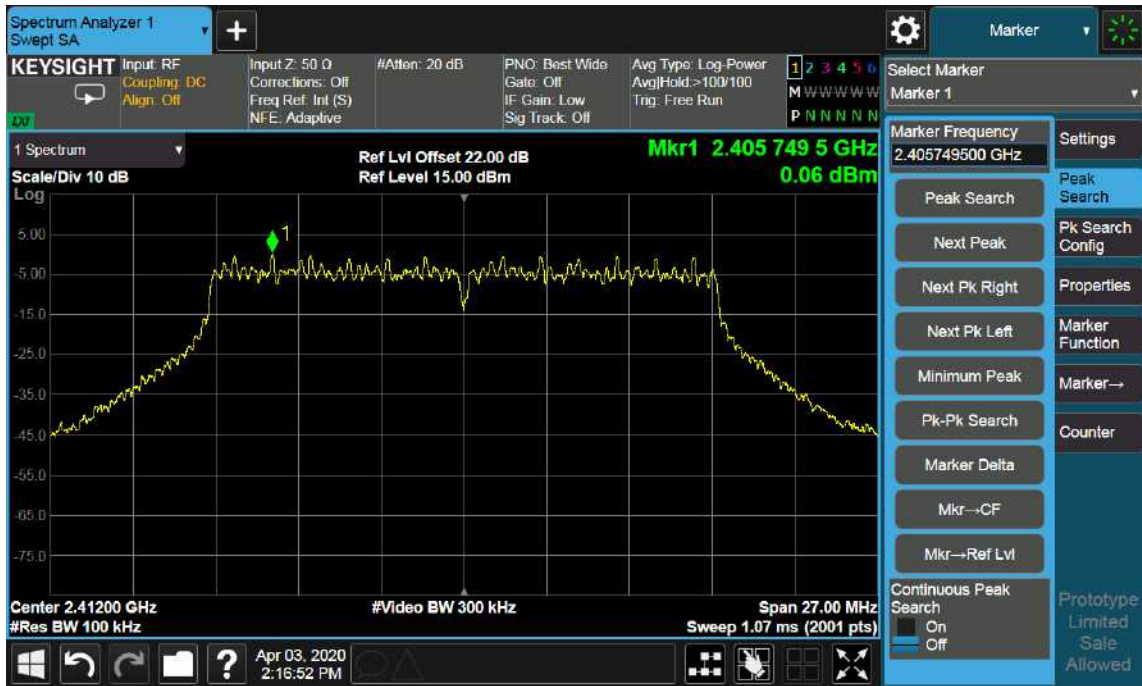
802.11n (HT20)



Channel	Frequency (MHz)	Pass / Fail
1	2412	Pass
6	2437	Pass
11	2462	Pass

Spectrum Plot

802.11n(HT20)(2412MHz)



802.11n(HT20)(2437MHz)



Spectrum Plot

802.11n(HT20)(2462MHz)



Spectrum Plot

802.11n(HT20)(2412MHz) Band Edge



802.11n(HT20)(2462MHz) Band Edge



Spectrum Plot

802.11n(HT20)(2412MHz) Out-of-Band Emissions



Spectrum Plot

802.11n(HT20)(2437MHz) Out-of-Band Emissions



Spectrum Plot

802.11n(HT20)(2462MHz) Out-of-Band Emissions





802.11n (HT40)

Channel	Frequency (MHz)	Pass / Fail
3	2422	Pass
6	2437	Pass
9	2452	Pass

Spectrum Plot

802.11n(HT40)(2422MHz)



802.11n(HT40)(2437MHz)



Spectrum Plot

802.11n(HT40)(2452MHz)



Spectrum Plot

802.11n(HT40)(2422MHz) Band Edge



802.11n(HT40)(2452MHz) Band Edge





Spectrum Plot

802.11n(HT40)(2422MHz) Out-of-Band Emissions



Spectrum Plot

802.11n(HT40)(2437MHz) Out-of-Band Emissions



Spectrum Plot

802.11n(HT40)(2452MHz) Out-of-Band Emissions





4.5 Radiated Emission Measurement

4.5.1 Limits

Radiated emissions which fall in the restricted bands must comply with the radiated emission limits specified as below table.

Frequencies (MHz)	Field Strength (microvolts/meter)	Measurement Distance (meters)
0.009 ~ 0.490	2400/F (kHz)	300
0.490 ~ 1.705	24000/F (kHz)	30
1.705 ~ 30.0	30	30
30 ~ 88	100	3
88 ~ 216	150	3
216 ~ 960	200	3
Above 960	500	3

NOTE:

1. The lower limit shall apply at the transition frequencies.
2. Emission level (dBuV/m) = 20 log Emission level (uV/m).
3. For frequencies above 1000 MHz, the field strength limits are based on average detector, however, the peak field strength of any emission shall not exceed the maximum permitted average limits, specified above by more than 20 dB under any condition of modulation.

4.5.2 Test Procedures

For Radiated emission below 30MHz

- a. The EUT was placed on the top of a rotating table 0.8 meters above the ground at a 3 meter chamber room. The table was rotated 360 degree to determine the position of the highest radiation.
- b. The EUT was set 3 meters away from the interference-receiving antenna, which was mounted on the top of a variable-height antenna tower.
- c. Both X and Y axes of the antenna are set to make the measurement.



- d. For each suspected emission, the EUT was arranged to its worst case and the rotate table was turned from 0 degree to 360 degree to find the maximum reading.
- e. The test-receiver system was set to Quasi-Peak Detect Function and Specified Bandwidth with Maximum Hold Mode.

Note:

The resolution bandwidth and video bandwidth of test receiver/spectrum analyzer is 9kHz at frequency below 30MHz.

For Radiated emission above 30MHz

- a. The EUT was placed on the top of a rotating table 0.8 meters (for below 1 GHz) / 1.5 meters (for above 1 GHz) above the ground at 3 meter chamber room for test. The table was rotated 360 degrees to determine the position of the highest radiation.
- b. The EUT was set 3 meters away from the interference-receiving antenna, which was mounted on the top of a variable-height antenna tower.
- c. The height of antenna is varied from one meter to four meters above the ground to determine the maximum value of the field strength. Both horizontal and vertical polarizations of the antenna are set to make the measurement.
- d. For each suspected emission, the EUT was arranged to its worst case and then the antenna was tuned to heights from 1 meter to 4 meters and the rotatable table was turned from 0 degrees to 360 degrees to find the maximum reading.
- e. The test-receiver system was set to quasi-peak detect function and specified bandwidth with maximum hold mode when the test frequency is below 1 GHz.
- f. The test-receiver system was set to peak and average detected function and specified bandwidth with maximum hold mode when the test frequency is above 1 GHz. If the peak reading value also meets average limit, measurement with the average detector is unnecessary.

Note:

- 1. The resolution bandwidth and video bandwidth of test receiver/spectrum analyzer is 120 kHz & 360 kHz for Quasi-peak detection (QP) at frequency below 1 GHz.
- 2. The resolution bandwidth of test receiver/spectrum analyzer is 1 MHz and the video bandwidth is 3 MHz for Peak detection (PK) at frequency above 1 GHz.
- 3. The resolution bandwidth of test receiver/spectrum analyzer is 1 MHz and the video bandwidth is 1/T for RMS Average (Duty cycle < 98 %) for Peak detection at frequency above 1 GHz.
- 4. The resolution bandwidth of test receiver/spectrum analyzer is 1 MHz and the video bandwidth is 10 Hz (Duty cycle \geq 98 %) for Average detection (AV) at frequency above 1 GHz.



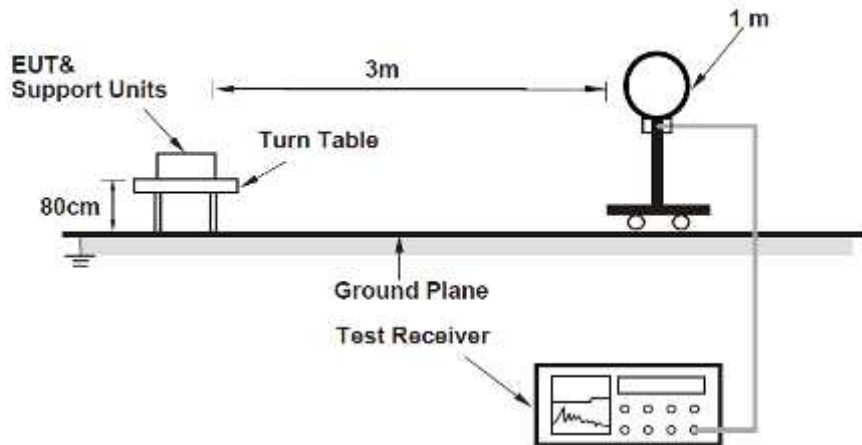
5. All modes of operation were investigated and the worst-case emissions are reported.

4.5.3 Deviation from Test Standard

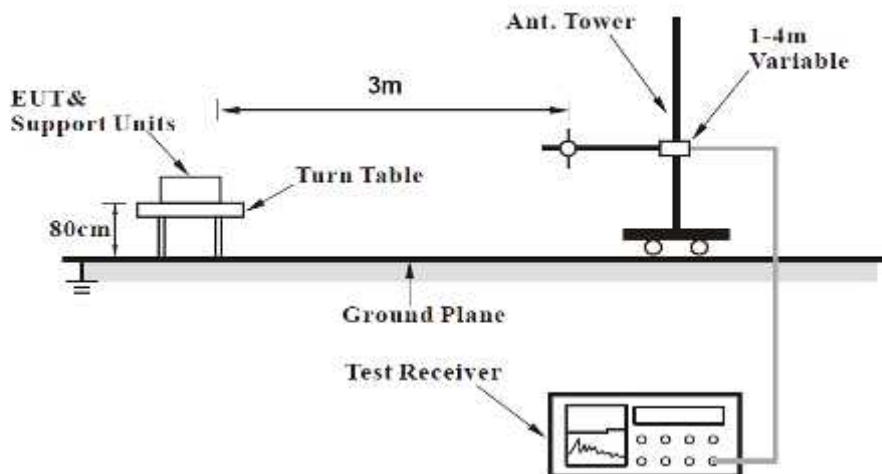
No deviation.

4.5.4 Test Setup

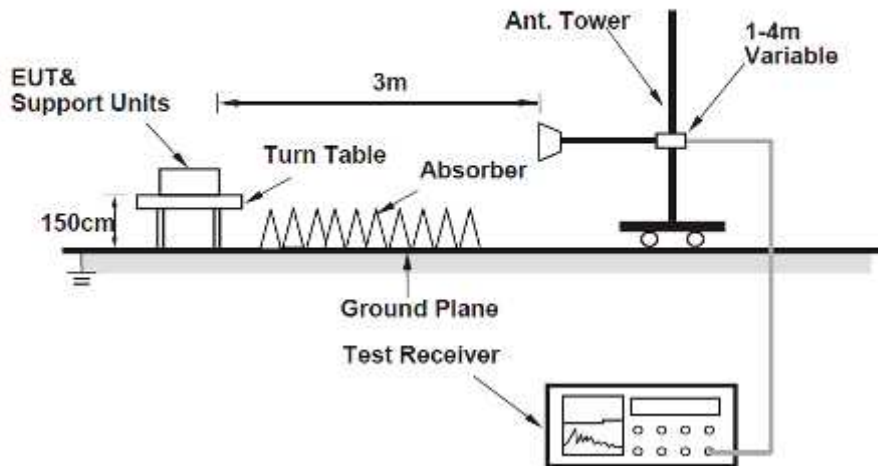
For Radiated emission below 30MHz



For Radiated emission 30MHz to 1GHz



For Radiated emission above 1GHz



For the actual test configuration, please refer to the attached file (Test Setup Photo).

4.5.5 EUT Operating Conditions

- Placed the EUT on a testing table.
- Use the software to control the EUT under transmission condition continuously at specific channel frequency.

4.5.6 Test Results

Radiated Emissions Range 9kHz~30MHz

The amplitude of spurious emissions which are attenuated by more than 20 dB below the permissible value has no need to be reported.

Radiated Emissions Range 30MHz~1GHz



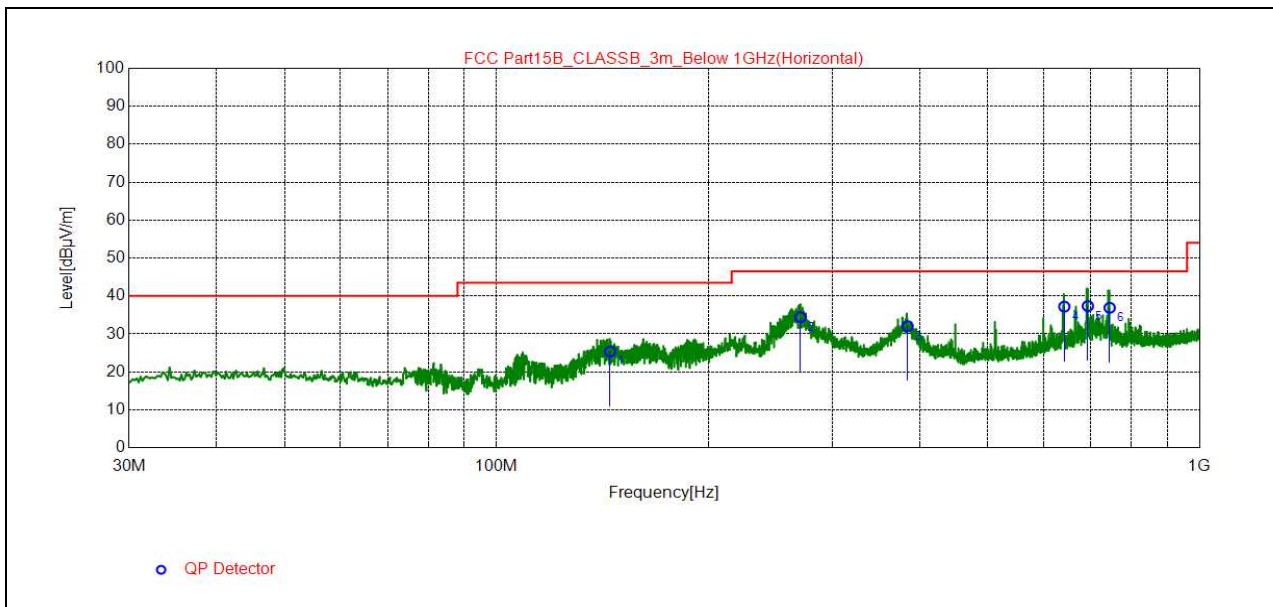
Mode	802.11b-2412MHz	Detector Function	Quasi-Peak (QP)
Frequency Range	30MHz ~ 1GHz	Antenna Polarity	Horizontal

Spurious Emission Level					
No.	Frequency (MHz)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Correction Factor (dB/m)
1	145.0420	25.39	43.50	-18.11	-9.73
2	270.5600	34.42	46.50	-12.08	-9.88
3	384.2440	32.05	46.50	-14.45	-7.82
4	642.0700	37.20	46.50	-9.30	-3.26
5	693.6740	37.34	46.50	-9.16	-2.78
6	744.8900	36.89	46.50	-9.61	-1.52

REMARKS:

1. Emission Level(dBuV/m) = Spectrum reading (dBuV) + Correction Factor(dB/m)
2. Correction Factor(dB/m) = Antenna Factor(dB/m) + Cable Factor(dB) – Pre-Amplifier Factor(dB)
3. The other emission levels were very low against the limit.
4. Margin value = Emission Level – Limit value

Test Plot:





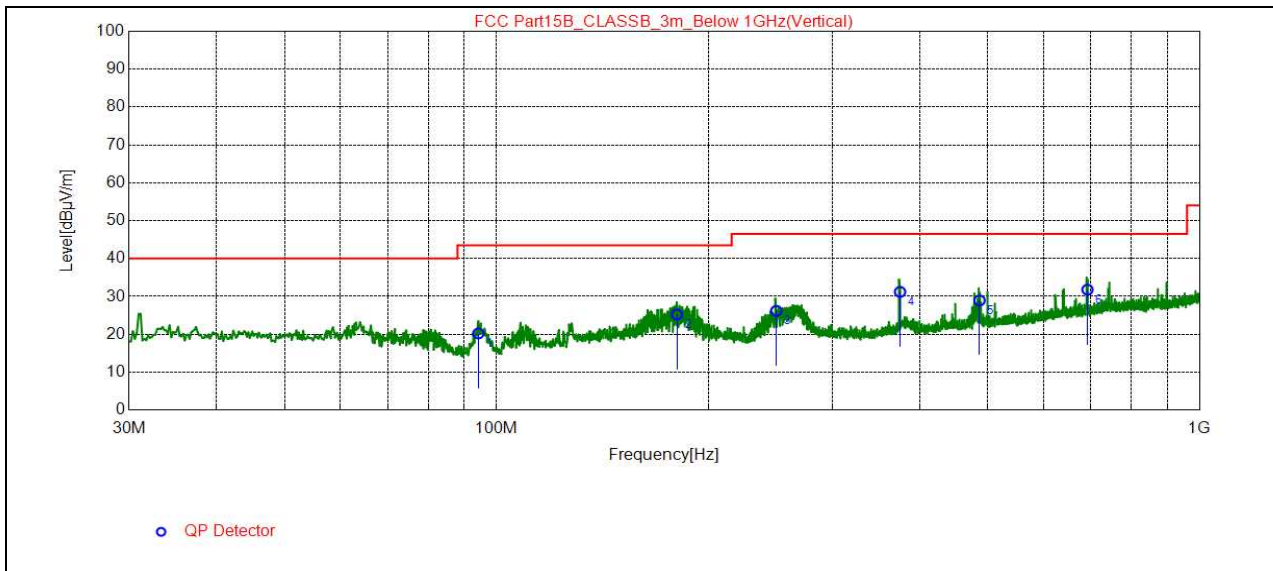
Mode	802.11b-2412MHz	Detector Function	Quasi-Peak (QP)
Frequency Range	30MHz ~ 1GHz	Antenna Polarity	Vertical

Spurious Emission Level					
No.	Frequency (MHz)	Emission Level (dBUV/m)	Limit (dBUV/m)	Margin (dB)	Correction Factor (dB/m)
1	94.2140	20.23	43.50	-23.27	-14.07
2	180.5440	25.23	43.50	-18.27	-11.52
3	249.9960	26.20	46.50	-20.30	-10.43
4	374.9320	31.20	46.50	-15.30	-7.99
5	486.4820	28.93	46.50	-17.57	-5.71
6	692.7040	31.78	46.50	-14.72	-2.80

REMARKS:

1. Emission Level(dBuV/m) = Original Spectrum reading (dBUV) + Correction Factor(dB/m)
2. Correction Factor(dB/m) = Antenna Factor(dB/m) + Cable Factor(dB) – Pre-Amplifier Factor(dB)
3. The other emission levels were very low against the limit.
4. Margin value = Emission Level – Limit value

Test Plot:





Radiated Emission Range 1GHz~10th Harmonic

802.11b

Channel	TX Channel 1	Detector Function	Peak (PK)
Frequency Range	1GHz ~ 25GHz		Average (AV)

Spurious Emission Level							
No.	Frequency (MHz)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Correction Factor (dB/m)	Antenna Polarity	Detector
1	4824.1500	44.39	74.00	-29.61	-9.40	H	PK
2	4825.0000	41.98	54.00	-12.02	-9.40	H	AV
3	4824.1500	44.30	74.00	-29.70	-9.40	V	PK
4	4825.0000	42.30	54.00	-11.70	-9.40	V	AV

REMARKS:

- Emission Level(dBuV/m) = Original Spectrum reading (dBuV) + Correction Factor(dB/m)
- Correction Factor(dB/m) = Antenna Factor(dB/m) + Cable Factor(dB) – Pre-Amplifier Factor(dB)
- The other emission levels were very low against the limit.
- Margin value = Emission Level – Limit value

Channel	TX Channel 6	Detector Function	Peak (PK)
Frequency Range	1GHz ~ 25GHz		Average (AV)

Spurious Emission Level							
No.	Frequency (MHz)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Correction Factor (dB/m)	Antenna Polarity	Detector
1	4874.3000	34.61	74.00	-39.39	-9.33	H	PK
2	4874.3000	31.30	54.00	-22.70	-9.33	H	AV
3	4874.3000	44.02	74.00	-29.98	-9.33	V	PK
4	4875.1500	41.42	54.00	-12.58	-9.33	V	AV

REMARKS:

- Emission Level(dBuV/m) = Original Spectrum reading (dBuV) + Correction Factor(dB/m)
- Correction Factor(dB/m) = Antenna Factor(dB/m) + Cable Factor(dB) – Pre-Amplifier Factor(dB)
- The other emission levels were very low against the limit.
- Margin value = Emission Level – Limit value



Channel	TX Channel 11	Detector Function	Peak (PK)
Frequency Range	1GHz ~ 25GHz		Average (AV)

Spurious Emission Level							
No.	Frequency (MHz)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Correction Factor (dB/m)	Antenna Polarity	Detector
1	4924.4500	37.24	74.00	-36.76	-9.27	H	PK
2	4924.4500	35.85	54.00	-18.15	-9.27	H	AV
3	4924.4500	43.80	74.00	-30.20	-9.27	V	PK
4	4924.4500	42.07	54.00	-11.93	-9.27	V	AV

REMARKS:

1. Emission Level(dBuV/m) = Original Spectrum reading (dBuV) + Correction Factor(dB/m)
2. Correction Factor(dB/m) = Antenna Factor(dB/m) + Cable Factor(dB) – Pre-Amplifier Factor(dB)
3. The other emission levels were very low against the limit.
4. Margin value = Emission Level – Limit value



802.11g

Channel	TX Channel 1	Detector Function	Peak (PK)
Frequency Range	1GHz ~ 25GHz		Average (AV)

Spurious Emission Level							
No.	Frequency (MHz)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Correction Factor (dB/m)	Antenna Polarity	Detector
1	4824.1500	32.80	74.00	-41.20	-9.40	H	PK
2	4824.1500	23.86	54.00	-30.14	-9.40	H	AV
3	4824.1500	36.76	74.00	-37.24	-9.40	V	PK
4	4822.4500	33.32	54.00	-20.68	-9.40	V	AV

REMARKS:

1. Emission Level(dBuV/m) = Original Spectrum reading (dBuV) + Correction Factor(dB/m)
2. Correction Factor(dB/m) = Antenna Factor(dB/m) + Cable Factor(dB) – Pre-Amplifier Factor(dB)
3. The other emission levels were very low against the limit.
4. Margin value = Emission Level – Limit value

Channel	TX Channel 6	Detector Function	Peak (PK)
Frequency Range	1GHz ~ 25GHz		Average (AV)

Spurious Emission Level							
No.	Frequency (MHz)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Correction Factor (dB/m)	Antenna Polarity	Detector
1	4874.3000	28.23	74.00	-45.77	-9.33	H	PK
2	4870.9000	24.62	54.00	-29.38	-9.33	H	AV
3	4874.3000	36.00	74.00	-38.00	-9.33	V	PK
4	4880.2500	33.45	54.00	-20.55	-9.32	V	AV

REMARKS:

1. Emission Level(dBuV/m) = Original Spectrum reading (dBuV) + Correction Factor(dB/m)
2. Correction Factor(dB/m) = Antenna Factor(dB/m) + Cable Factor(dB) – Pre-Amplifier Factor(dB)
3. The other emission levels were very low against the limit.
4. Margin value = Emission Level – Limit value



Channel	TX Channel 11	Detector Function	Peak (PK)
Frequency Range	1GHz ~ 25GHz		Average (AV)

Spurious Emission Level							
No.	Frequency (MHz)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Correction Factor (dB/m)	Antenna Polarity	Detector
1	4924.4500	27.38	74.00	-46.62	-9.27	H	PK
2	4926.1500	21.35	54.00	-32.65	-9.26	H	AV
3	4924.4500	34.66	74.00	-39.34	-9.27	V	PK
4	4924.4500	30.67	54.00	-23.33	-9.27	V	AV

REMARKS:

1. Emission Level(dBuV/m) = Original Spectrum reading (dBuV) + Correction Factor(dB/m)
2. Correction Factor(dB/m) = Antenna Factor(dB/m) + Cable Factor(dB) – Pre-Amplifier Factor(dB)
3. The other emission levels were very low against the limit.
4. Margin value = Emission Level – Limit value

802.11n (HT20)

Channel	TX Channel 1	Detector Function	Peak (PK)
Frequency Range	1GHz ~ 25GHz		Average (AV)

Spurious Emission Level							
No.	Frequency (MHz)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Correction Factor (dB/m)	Antenna Polarity	Detector
1	4824.1500	32.04	74.00	-41.96	-9.40	H	PK
2	4825.0000	26.98	54.00	-27.02	-9.40	H	AV
3	4824.1500	36.91	74.00	-37.09	-9.40	V	PK
4	4824.1500	31.43	54.00	-22.57	-9.40	V	AV

REMARKS:

1. Emission Level(dBuV/m) = Original Spectrum reading (dBuV) + Correction Factor(dB/m)
2. Correction Factor(dB/m) = Antenna Factor(dB/m) + Cable Factor(dB) – Pre-Amplifier Factor(dB)
3. The other emission levels were very low against the limit.
4. Margin value = Emission Level – Limit value



Channel	TX Channel 6	Detector Function	Peak (PK)
Frequency Range	1GHz ~ 25GHz		Average (AV)

Spurious Emission Level							
No.	Frequency (MHz)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Correction Factor (dB/m)	Antenna Polarity	Detector
1	4874.3000	27.00	74.00	-47.00	-9.33	H	PK
2	4874.3000	18.95	54.00	-35.05	-9.33	H	AV
3	4874.3000	34.71	74.00	-39.29	-9.33	V	PK
4	4874.3000	27.13	54.00	-26.87	-9.33	V	AV

REMARKS:

1. Emission Level(dBuV/m) = Original Spectrum reading (dBuV) + Correction Factor(dB/m)
2. Correction Factor(dB/m) = Antenna Factor(dB/m) + Cable Factor(dB) – Pre-Amplifier Factor(dB)
3. The other emission levels were very low against the limit.
4. Margin value = Emission Level – Limit value

Channel	TX Channel 11	Detector Function	Peak (PK)
Frequency Range	1GHz ~ 25GHz		Average (AV)

Spurious Emission Level							
No.	Frequency (MHz)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Correction Factor (dB/m)	Antenna Polarity	Detector
1	4924.4500	28.45	74.00	-45.55	-9.27	H	PK
2	4924.4500	21.30	54.00	-32.70	-9.27	H	AV
3	4924.4500	32.77	74.00	-41.23	-9.27	V	PK
4	4924.4500	27.02	54.00	-26.98	-9.27	V	AV

REMARKS:

1. Emission Level(dBuV/m) = Original Spectrum reading (dBuV) + Correction Factor(dB/m)
2. Correction Factor(dB/m) = Antenna Factor(dB/m) + Cable Factor(dB) – Pre-Amplifier Factor(dB)
3. The other emission levels were very low against the limit.
4. Margin value = Emission Level – Limit value



802.11n (HT40)

Channel	TX Channel 3	Detector Function	Peak (PK)
Frequency Range	1GHz ~ 25GHz		Average (AV)

Spurious Emission Level							
No.	Frequency (MHz)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Correction Factor (dB/m)	Antenna Polarity	Detector
1	4844.5500	23.46	74.00	-50.54	-9.37	H	PK
2	4844.5500	16.49	54.00	-37.51	-9.37	H	AV
3	4844.5500	31.65	74.00	-42.35	-9.37	V	PK
4	4844.5500	24.26	54.00	-29.74	-9.37	V	AV

REMARKS:

1. Emission Level(dBuV/m) = Original Spectrum reading (dBuV) + Correction Factor(dB/m)
2. Correction Factor(dB/m) = Antenna Factor(dB/m) + Cable Factor(dB) – Pre-Amplifier Factor(dB)
3. The other emission levels were very low against the limit.
4. Margin value = Emission Level – Limit value

Channel	TX Channel 6	Detector Function	Peak (PK)
Frequency Range	1GHz ~ 25GHz		Average (AV)

Spurious Emission Level							
No.	Frequency (MHz)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Correction Factor (dB/m)	Antenna Polarity	Detector
1	4874.3000	26.42	74.00	-47.58	-9.33	H	PK
2	4874.3000	18.98	54.00	-35.02	-9.33	H	AV
3	4874.3000	32.93	74.00	-41.07	-9.33	V	PK
4	4874.3000	28.63	54.00	-25.37	-9.33	V	AV

REMARKS:

1. Emission Level(dBuV/m) = Original Spectrum reading (dBuV) + Correction Factor(dB/m)
2. Correction Factor(dB/m) = Antenna Factor(dB/m) + Cable Factor(dB) – Pre-Amplifier Factor(dB)
3. The other emission levels were very low against the limit.
4. Margin value = Emission Level – Limit value



Channel	TX Channel 9	Detector Function	Peak (PK)
Frequency Range	1GHz ~ 25GHz		Average (AV)

Spurious Emission Level

No.	Frequency (MHz)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Correction Factor (dB/m)	Antenna Polarity	Detector
1	4904.0500	22.92	74.00	-51.08	-9.29	H	PK
2	4904.0500	16.17	54.00	-37.83	-9.29	H	AV
3	4904.0500	28.66	74.00	-45.34	-9.29	V	PK
4	4904.0500	21.36	54.00	-32.64	-9.29	V	AV

REMARKS:

1. Emission Level(dBuV/m) = Original Spectrum reading (dBuV) + Correction Factor(dB/m)
2. Correction Factor(dB/m) = Antenna Factor(dB/m) + Cable Factor(dB) – Pre-Amplifier Factor(dB)
3. The other emission levels were very low against the limit.
4. Margin value = Emission Level – Limit value



4.6 Conducted Emission Measurement

4.6.1 Limits

Frequency (MHz)	Conducted Limit (dBuV)	
	Quasi-peak	Average
0.15 - 0.5	66 - 56	56 - 46
0.50 - 5.0	56	46
5.0 - 30.0	60	50

Note: 1. The lower limit shall apply at the transition frequencies.

2. The limit decreases in line with the logarithm of the frequency in the range of 0.15 to 0.50MHz.

4.6.2 Test Procedures

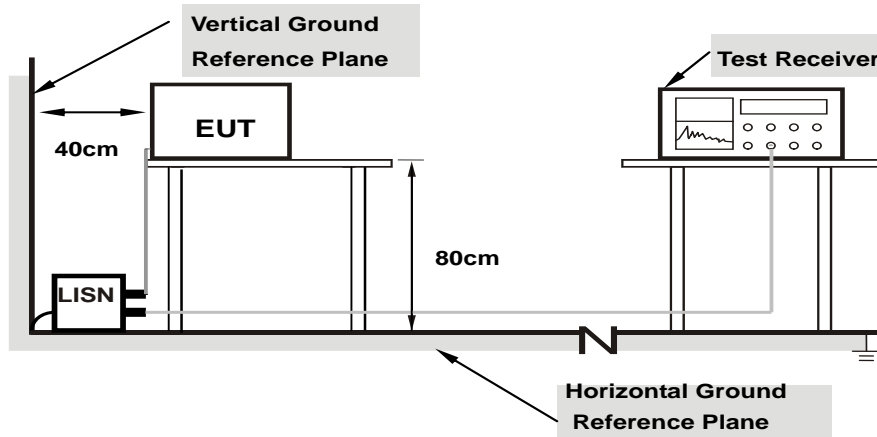
- The EUT was placed 0.4 meters from the conducting wall of the shielded room with EUT being connected to the power mains through a line impedance stabilization network (LISN). Other support units were connected to the power mains through another LISN. The two LISNs provide 50 ohm/ 50uH of coupling impedance for the measuring instrument.
- Both lines of the power mains connected to the EUT were checked for maximum conducted interference.
- The frequency range from 150kHz to 30MHz was searched. Emission levels under (Limit - 20dB) was not recorded.

NOTE: The resolution bandwidth and video bandwidth of test receiver is 9kHz for quasi-peak detection (QP) and average detection (AV) at frequency 0.15MHz-30MHz.

4.6.3 Deviation from Test Standard

No deviation.

4.6.4 Test Setup



Note: 1. Support units were connected to second LISN.

For the actual test configuration, please refer to the attached file (Test Setup Photo).

4.6.5 EUT Operating Conditions

Same as 4.1.6.



4.6.6 Test Results

Working While Charging

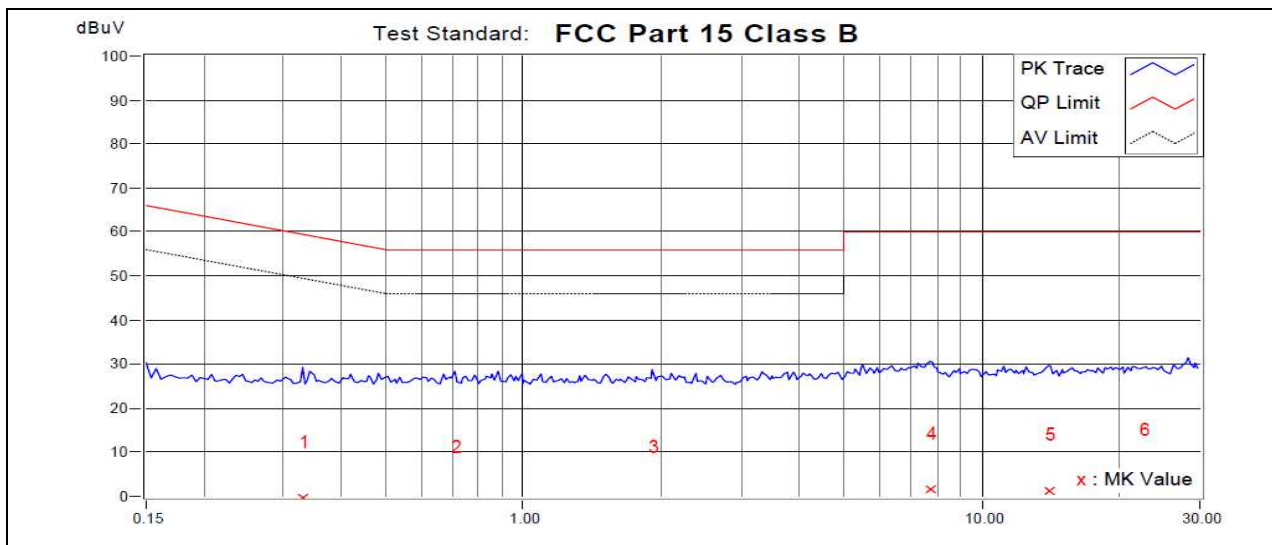
Phase	Line (L)	Detector Function	Quasi-Peak (QP) / Average (AV)
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No	Freq. [MHz]	Corr.	Reading Value		Emission Level		Limit		Margin	
		Factor (dB)	[dB (uV)]		[dB (uV)]		[dB (uV)]		(dB)	
			Q.P.	AV.	Q.P.	AV.	Q.P.	AV.	Q.P.	AV.
1	0.32986	9.71	-10.14	-14.36	-0.43	-4.65	59.45	49.45	-59.89	-54.11
2	0.70913	9.60	-11.25	-15.19	-1.65	-5.59	56.00	46.00	-57.65	-51.59
3	1.91103	9.76	-11.27	-15.19	-1.51	-5.43	56.00	46.00	-57.51	-51.43
4	7.72911	10.23	-8.80	-13.28	1.43	-3.05	60.00	50.00	-58.57	-53.05
5	14.15633	10.34	-9.27	-13.65	1.07	-3.31	60.00	50.00	-58.93	-53.31
6	22.60975	10.13	-7.91	-12.47	2.22	-2.34	60.00	50.00	-57.78	-52.34

REMARKS:

1. Q.P. and AV. are abbreviations of quasi-peak and average individually.
2. The emission levels of other frequencies were very low against the limit.
3. Margin value = Emission level - Limit value
4. Correction factor = Insertion loss + Cable loss
5. Emission Level = Correction Factor + Reading Value.

Test Plot:





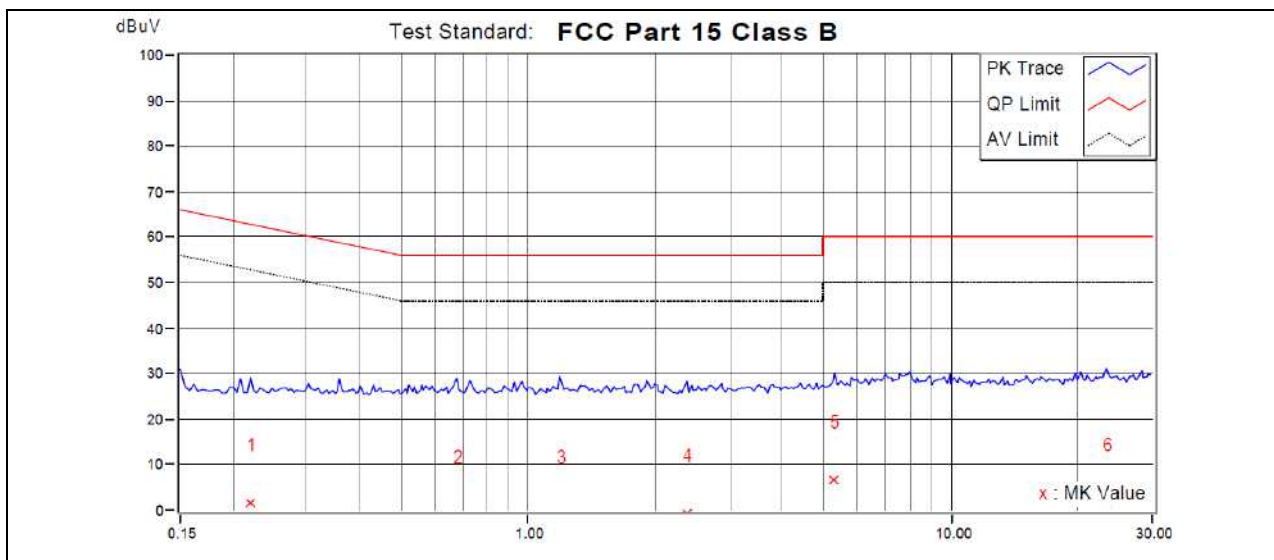
Phase	Neutral (N)	Detector Function	Quasi-Peak (QP) / Average (AV)
-------	-------------	-------------------	--------------------------------

No	Freq. [MHz]	Corr.	Reading Value		Emission Level		Limit		Margin	
		Factor (dB)	[dB (uV)]		[dB (uV)]		[dB (uV)]		(dB)	
	Q.P.	AV.	Q.P.	AV.	Q.P.	AV.	Q.P.	AV.	Q.P.	AV.
1	0.22038	9.81	-8.15	-13.49	1.66	-3.68	62.80	52.80	-61.14	-56.48
2	0.67785	9.81	-11.02	-15.20	-1.21	-5.39	56.00	46.00	-57.21	-51.39
3	1.18768	9.90	-11.06	-15.29	-1.16	-5.39	56.00	46.00	-57.16	-51.39
4	2.38023	9.97	-10.90	-14.91	-0.93	-4.94	56.00	46.00	-56.93	-50.94
5	5.31273	9.78	-3.10	-8.96	6.68	0.82	60.00	50.00	-53.32	-49.18
6	23.34092	10.29	-8.59	-12.95	1.70	-2.66	60.00	50.00	-58.30	-52.66

REMARKS:

1. Q.P. and AV. are abbreviations of quasi-peak and average individually.
2. The emission levels of other frequencies were very low against the limit.
3. Margin value = Emission level - Limit value
4. Correction factor = Insertion loss + Cable loss
5. Emission Level = Correction Factor + Reading Value.

Test Plot:





4.7 Radiated Restricted Band Edge Measurement

4.7.1 Test Limit

For 15.205 requirement:

Radiated emissions which fall in the restricted bands, as defined in Section 15.205(a) of FCC part15, must also comply with the radiated emission limits specified in Section 15.209(a).

Frequency (MHz)	Frequency (MHz)	Frequency (MHz)	Frequency (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 - 156.525	2483.5 - 2500	17.7 - 21.4
8.37625 - 8.38675	156.7 - 156.9	2690 - 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 - 3358	36.43 - 36.5
12.57675 - 12.57725	322 - 335.4	3600 - 4400	(2)
13.36 - 13.41	--	--	--

All out of band emissions appearing in a restricted band as specified in Section 15.205 of the Title 47CFR



must not exceed the limits shown in Table per Section 15.209.

FCC Part 15 Subpart C Paragraph 15.209		
Frequency [MHz]	Field Strength [uV/m]	Measured Distance [Meters]
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

4.7.2 Test Procedure Reference

ANSI C63.10 Section 6.3 (General Requirements)

ANSI C63.10 Section 6.6 (Standard test method above 1GHz)

4.7.3 Test Procedures

Peak Field Strength Measurements

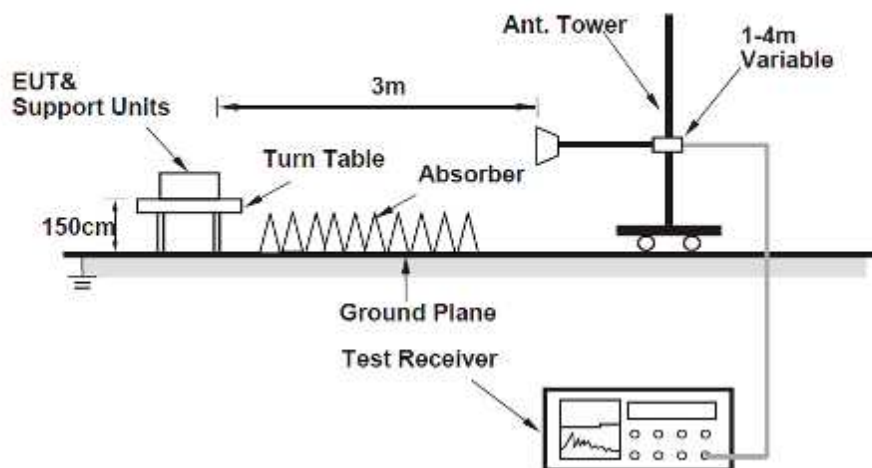
1. Analyzer center frequency was set to the frequency of the radiated spurious emission of interest
2. RBW = 1MHz
3. VBW = 3MHz
4. Detector = peak
5. Sweep time = auto couple
6. Trace mode = max hold
7. Trace was allowed to stabilize

Average Measurements above 1GHz (Method VB)

8. 1. Analyzer center frequency was set to the frequency of the radiated spurious emission of interest
9. 2. RBW = 1MHz
10. 3. VBW; If the EUT is configured to transmit with duty cycle $\geq 98\%$, set VBW = 10 Hz.
11. If the EUT duty cycle is $< 98\%$, set VBW $\geq 1/T$. T is the minimum transmission duration.
12. 4. Detector = Peak
13. 5. Sweep time = auto
14. 6. Trace mode = max hold
15. 7. Trace was allowed to stabilize

4.7.4 Test Setup

For Radiated emission above 1GHz

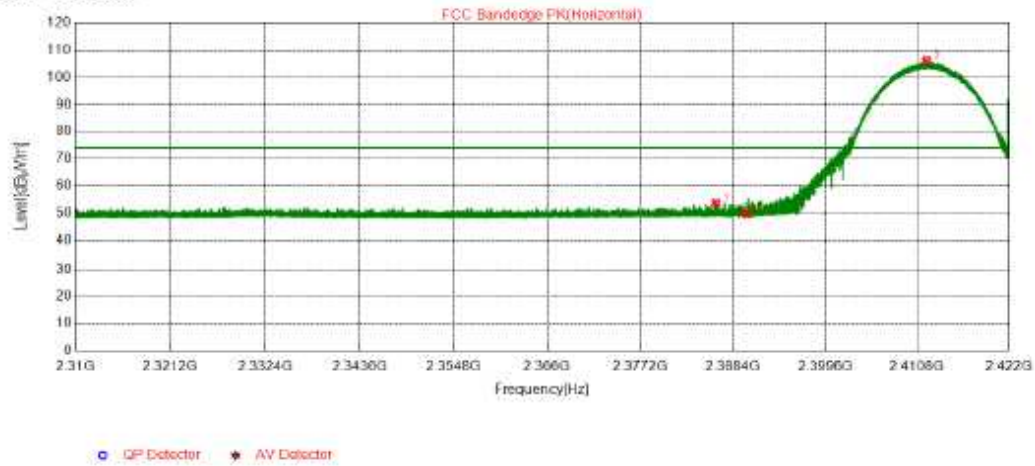


4.7.5 Test Results

Test Plot

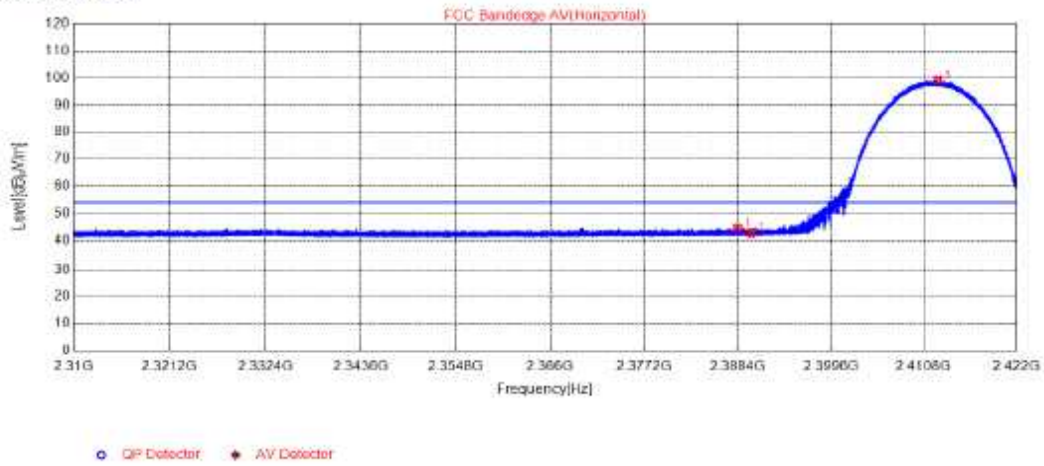
b-2412MHz/ Horizontal

Test Graph



NO.	Freq. [MHz]	Reading [dBµV/m]	Level [dBµV/m]	Limit [dBµV/m]	Margin [dB]	Height [cm]	Angle [°]	Polarity	Detector
1	2386.3168	48.78	53.70	74.00	20.30	155	176	Horizontal	PK
2	2390.0016	44.85	49.77	74.00	24.23	175	8	Horizontal	PK
3	2411.9424	101.21	106.18	74.00	-32.18	155	143	Horizontal	PK

Test Graph

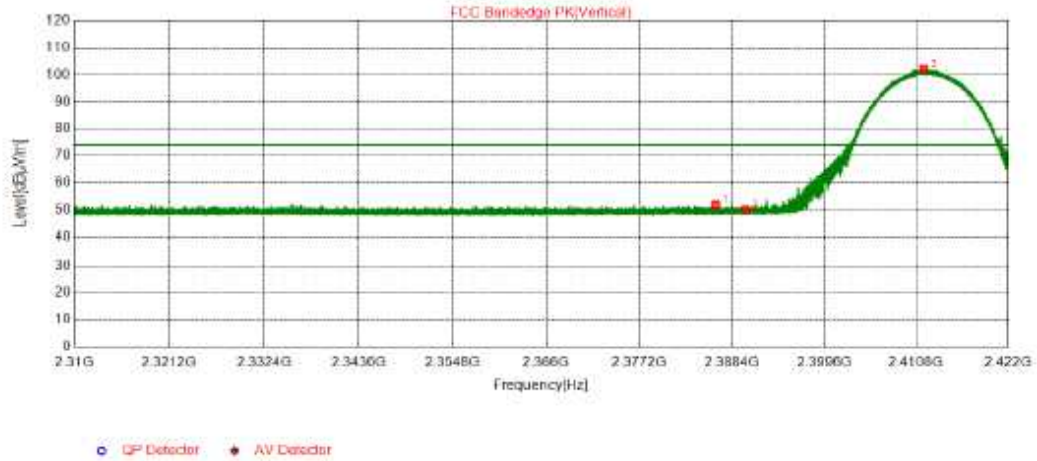


NO.	Freq. [MHz]	Reading [dBµV/m]	Level [dBµV/m]	Limit [dBµV/m]	Margin [dB]	Height [cm]	Angle [°]	Polarity	Detector
1	2388.3932	39.57	44.49	54.00	9.51	175	268	Horizontal	AV
2	2390.0016	37.86	42.78	54.00	11.22	155	318	Horizontal	AV
3	2412.4912	94.30	99.27	54.00	-45.27	175	201	Horizontal	AV

Test Plot

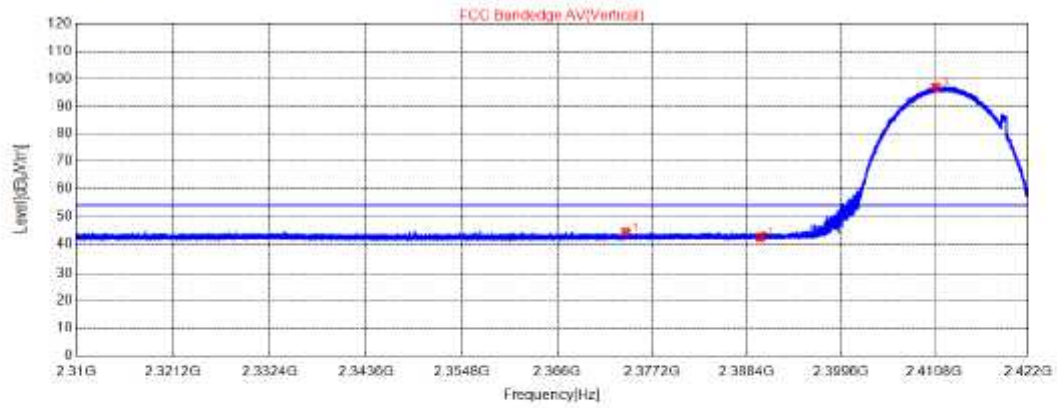
b-2412MHz/ Vertical

Test Graph



NO.	Freq. [MHz]	Reading [dBuV/m]	Level [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Height [cm]	Angle [°]	Polarity	Detector
1	2386.4064	47.03	51.95	74.00	22.05	175	17	Vertical	PK
2	2390.0016	45.11	50.03	74.00	23.97	165	326	Vertical	PK
3	2411.7464	97.20	102.16	74.00	-28.16	175	218	Vertical	PK

Test Graph



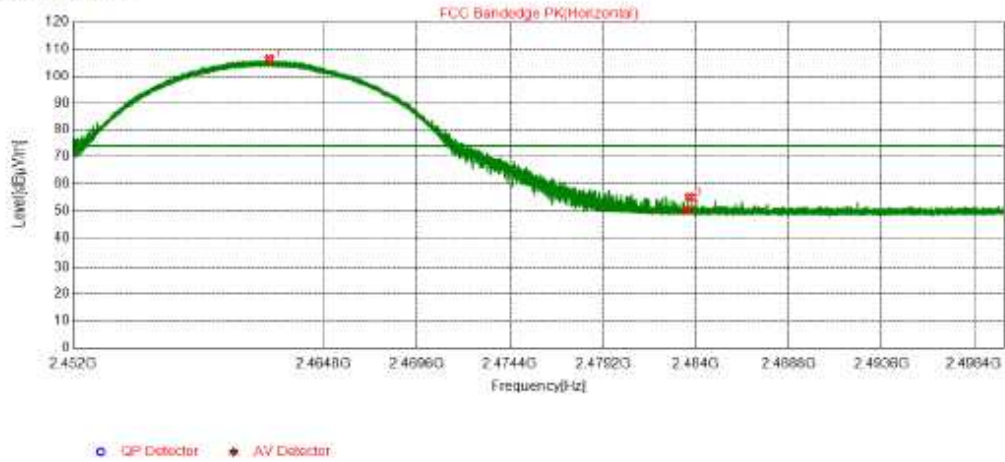
□ GP Detector ◆ AV Detector

NO.	Freq. [MHz]	Reading [dBµV/m]	Level [dBµV/m]	Limit [dBµV/m]	Margin [dB]	Height [cm]	Angle [°]	Polarity	Detector
1	2374.0584	39.33	44.22	54.00	9.78	155	174	Vertical	AV
2	2390.0016	37.51	42.43	54.00	11.57	155	208	Vertical	AV
3	2410.9680	92.08	97.04	54.00	-43.04	175	192	Vertical	AV

Test Plot

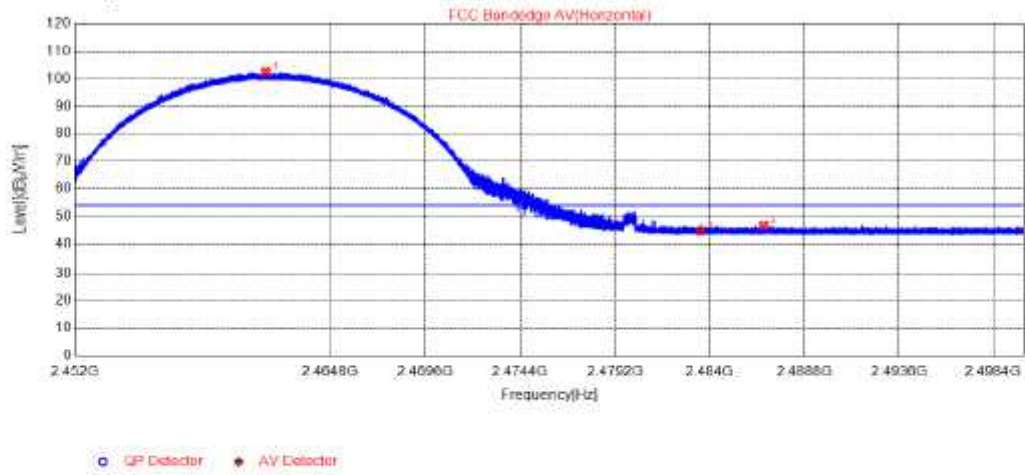
b-2462MHz/ Horizontal

Test Graph



NO.	Freq. [MHz]	Reading [dBµV/m]	Level [dBµV/m]	Limit [dBµV/m]	Margin [dB]	Height [cm]	Angle [°]	Polarity	Detector
1	2462.0272	101.17	106.22	74.00	-32.22	175	201	Horizontal	PK
2	2483.5000	45.15	50.24	74.00	23.76	165	142	Horizontal	PK
3	2483.6488	49.93	55.02	74.00	18.98	155	351	Horizontal	PK

Test Graph

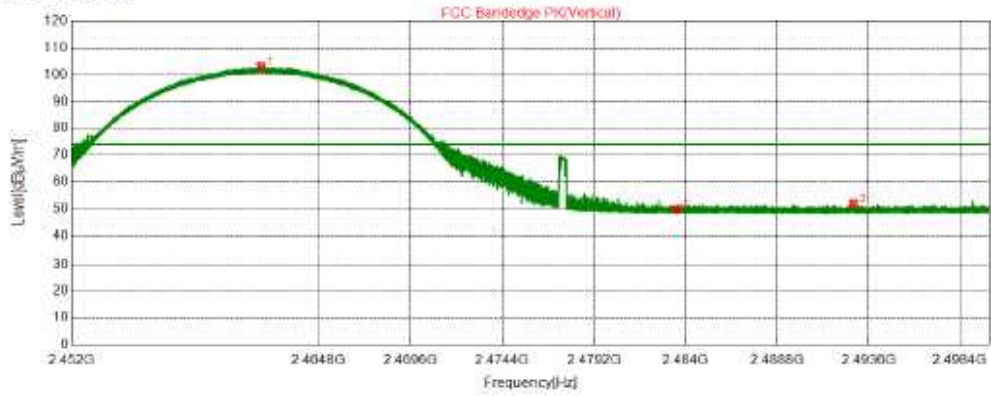


NO.	Freq. [MHz]	Reading [dBuV/m]	Level [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Height [cm]	Angle [°]	Polarity	Detector
1	2461.5664	97.40	102.45	54.00	-48.45	175	201	Horizontal	AV
2	2483.5000	39.48	44.57	54.00	9.43	165	75	Horizontal	AV
3	2486.7136	41.58	46.68	54.00	7.32	175	251	Horizontal	AV

Test Plot

b-2462MHz/ Vertical

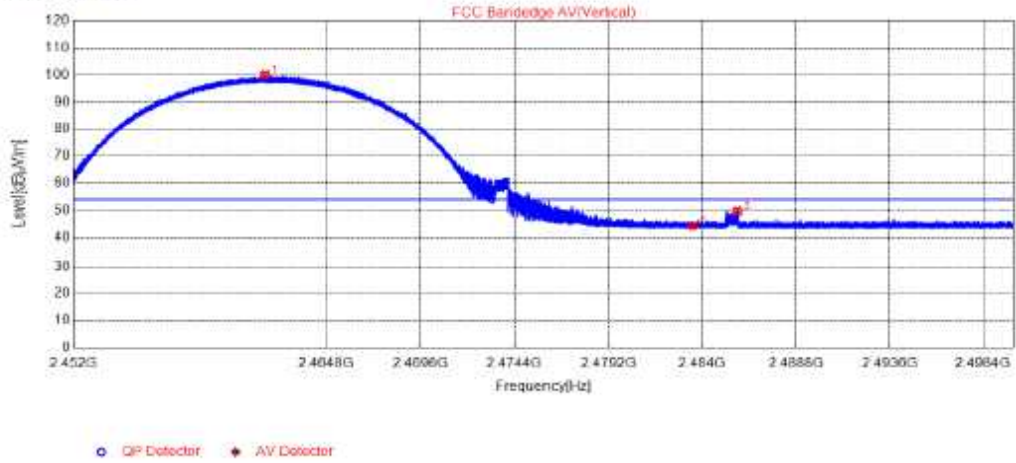
Test Graph



□ QP Detector ◆ AV Detector

NO.	Freq. [MHz]	Reading [dBuV/m]	Level [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Height [cm]	Angle [°]	Polarity	Detector
1	2461.8160	98.11	103.16	74.00	-29.16	165	217	Vertical	PK
2	2493.5000	44.63	49.72	74.00	24.28	155	24	Vertical	PK
3	2492.8120	46.80	51.91	74.00	22.09	155	343	Vertical	PK

Test Graph

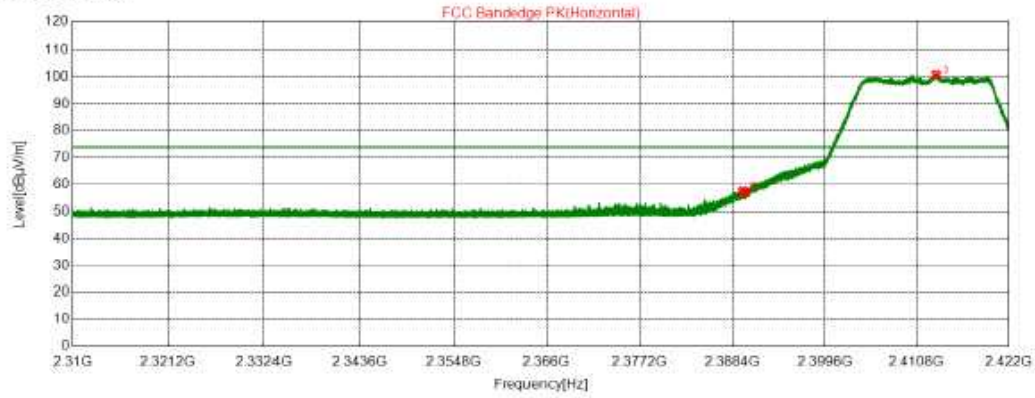


NO.	Freq. [MHz]	Reading [dBµV/m]	Level [dBµV/m]	Limit [dBµV/m]	Margin [dB]	Height [cm]	Angle [°]	Polarity	Detector
1	2461.7200	95.01	100.06	54.00	-46.06	175	200	Vertical	AV
2	2483.5000	39.13	44.22	54.00	9.78	165	93	Vertical	AV
3	2485.7944	44.59	49.68	54.00	4.32	165	143	Vertical	AV

Test Plot

g-2412MHz/ Horizontal

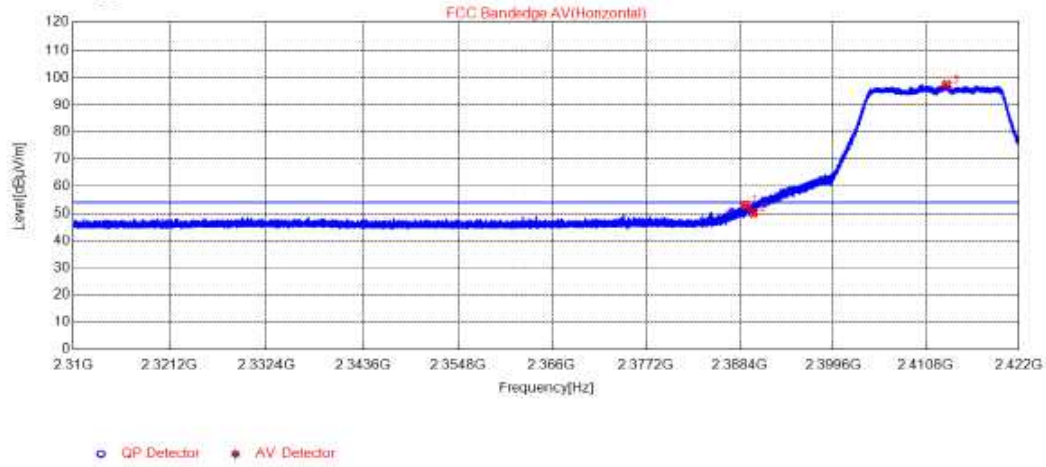
Test Graph



○ QP Detector ★ AV Detector

NO.	Freq. [MHz]	Reading [dBuV/m]	Level [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Height [cm]	Angle [°]	Polarity	Detector
1	2389.6264	52.62	57.54	74.00	16.46	175	260	Horizontal	PK
2	2390.0016	52.23	57.15	74.00	16.85	175	226	Horizontal	PK
3	2413.1744	95.77	100.74	74.00	-26.74	175	260	Horizontal	PK

Test Graph

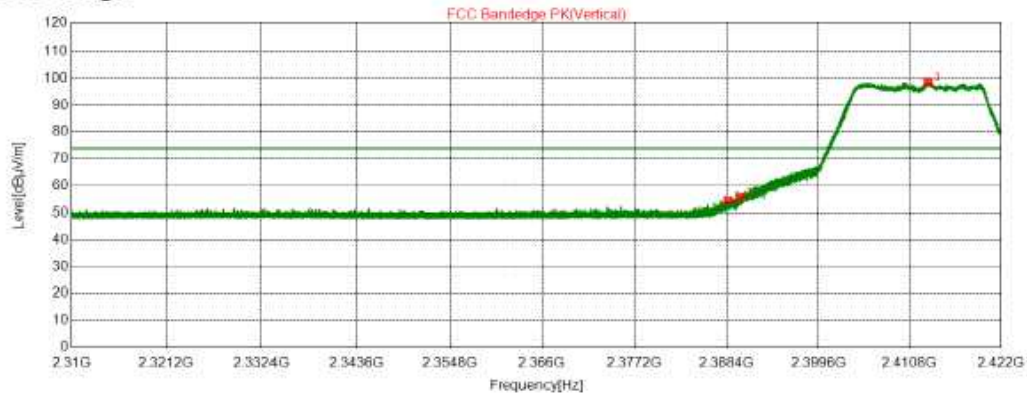


NO.	Freq. [MHz]	Reading [dBuV/m]	Level [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Height [cm]	Angle [°]	Polarity	Detector
1	2389.1112	48.22	53.14	54.00	0.86	175	234	Horizontal	AV
2	2390.0016	45.37	50.29	54.00	3.71	175	268	Horizontal	AV
3	2413.3088	92.48	97.45	54.00	-43.45	175	284	Horizontal	AV

Test Plot

g-2412MHz/ Vertical

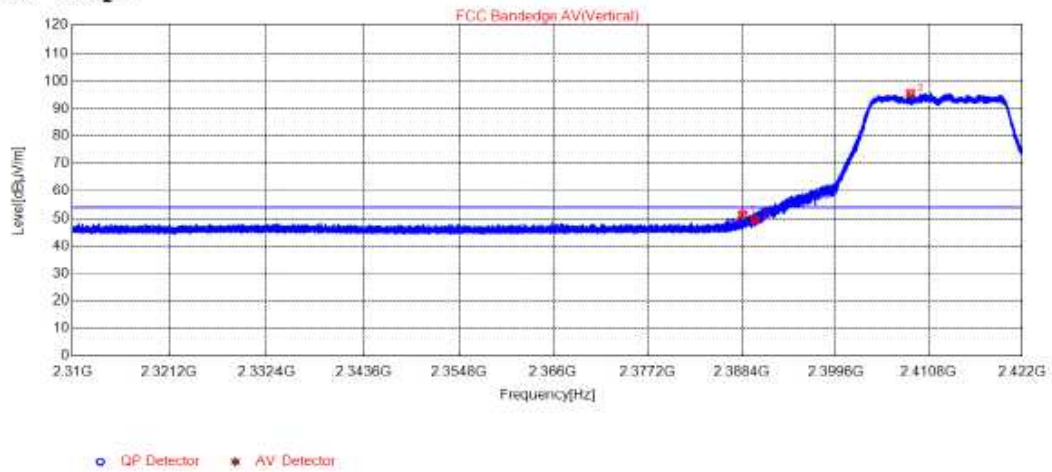
Test Graph



○ QP Detector ● AV Detector

NO.	Freq. [MHz]	Reading [dBuV/m]	Level [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Height [cm]	Angle [°]	Polarity	Detector
1	2388.5568	49.65	54.57	74.00	19.43	175	193	Vertical	PK
2	2390.0016	50.85	55.77	74.00	18.23	175	209	Vertical	PK
3	2413.0568	93.59	98.56	74.00	-24.56	175	193	Vertical	PK

Test Graph

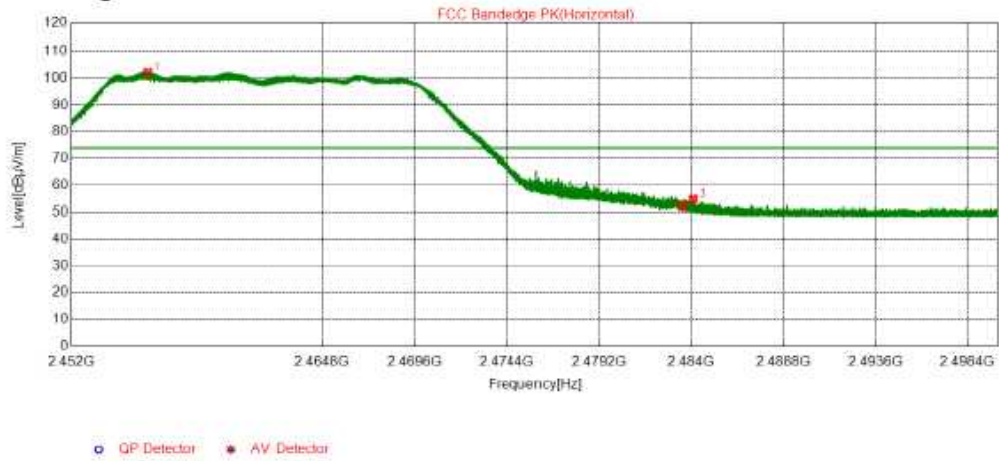


NO.	Freq. [MHz]	Reading [dBuV/m]	Level [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Height [cm]	Angle [°]	Polarity	Detector
1	2388.4952	46.39	51.31	54.00	2.69	175	185	Vertical	AV
2	2390.0016	44.47	49.39	54.00	4.61	175	185	Vertical	AV
3	2408.5992	90.65	95.61	54.00	-41.61	175	244	Vertical	AV

Test Plot

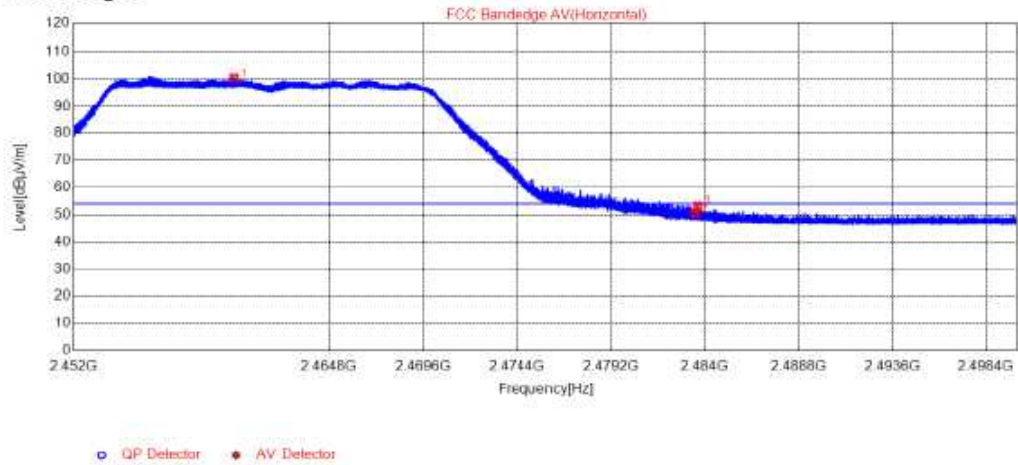
g-2462MHz/ Horizontal

Test Graph



NO.	Freq. [MHz]	Reading [dBuV/m]	Level [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Height [cm]	Angle [°]	Polarity	Detector
1	2455.9216	97.14	102.18	74.00	-28.18	175	176	Horizontal	PK
2	2483.5000	47.13	52.22	74.00	21.78	175	226	Horizontal	PK
3	2484.1024	49.87	54.96	74.00	19.04	175	193	Horizontal	PK

Test Graph

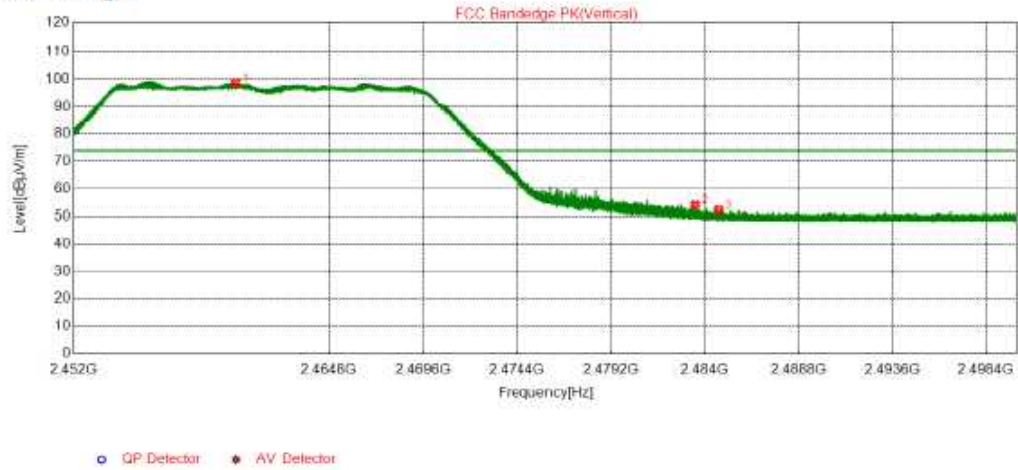


NO.	Freq. [MHz]	Reading [dBuV/m]	Level [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Height [cm]	Angle [°]	Polarity	Detector
1	2460.0976	95.34	100.39	54.00	-46.39	175	176	Horizontal	AV
2	2483.5000	45.41	50.50	54.00	3.50	175	226	Horizontal	AV
3	2483.6368	48.29	53.38	54.00	0.62	175	176	Horizontal	AV

Test Plot

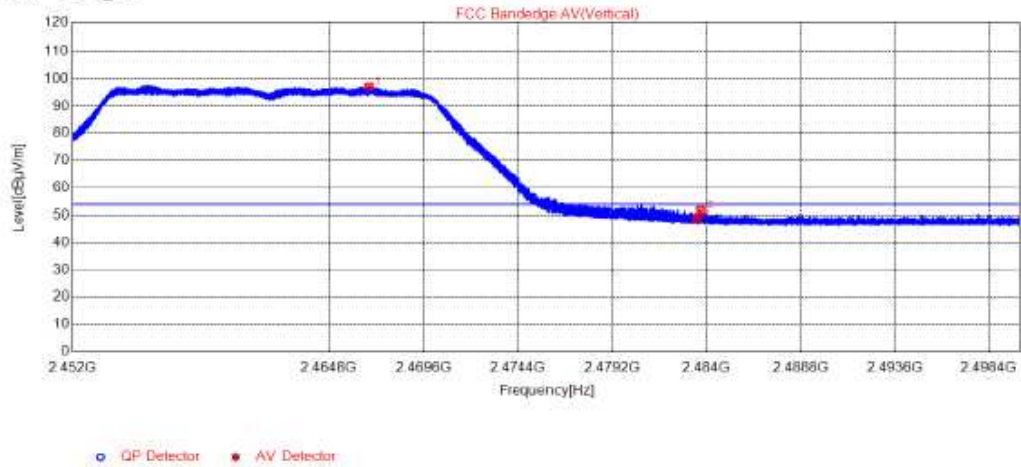
g-2462MHz/ Vertical

Test Graph



NO.	Freq. [MHz]	Reading [dBuV/m]	Level [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Height [cm]	Angle [°]	Polarity	Detector
1	2460.1840	93.50	98.55	74.00	-24.55	175	200	Vertical	PK
2	2483.5000	49.20	54.29	74.00	19.71	175	216	Vertical	PK
3	2484.7048	47.17	52.26	74.00	21.74	165	177	Vertical	PK

Test Graph

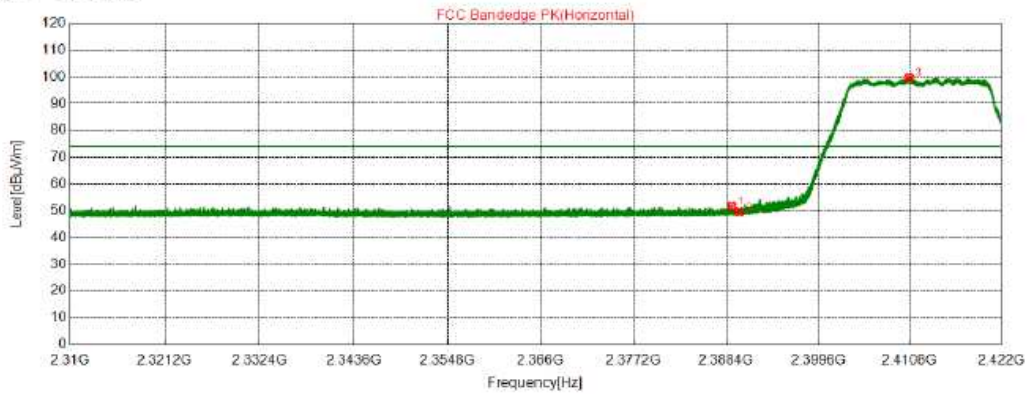


NO.	Freq. [MHz]	Reading [dBuV/m]	Level [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Height [cm]	Angle [°]	Polarity	Detector
1	2466.8320	92.05	97.11	54.00	-43.11	175	176	Vertical	AV
2	2483.5000	43.30	48.39	54.00	5.61	175	176	Vertical	AV
3	2483.6920	46.78	51.87	54.00	2.13	165	218	Vertical	AV

Test Plot

n20-2412MHz/ Horizontal

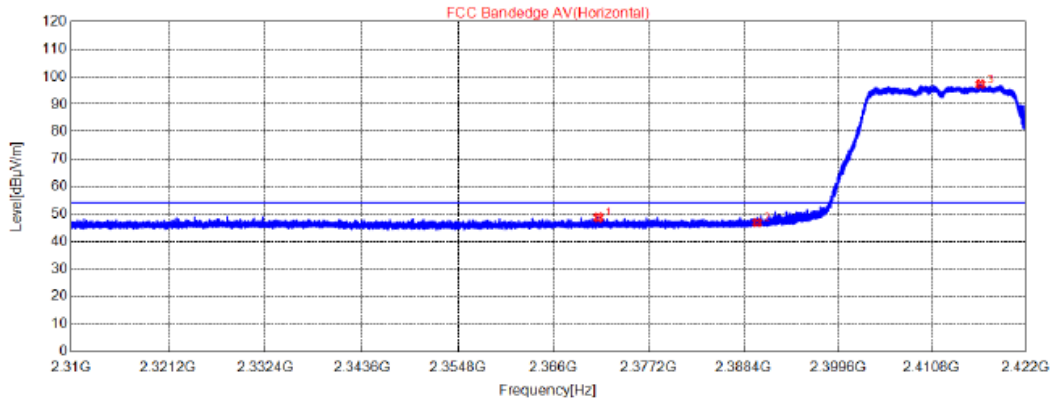
Test Graph



○ QP Detector * AV Detector

NO.	Freq. [MHz]	Reading [dBµV/m]	Level [dBµV/m]	Limit [dBµV/m]	Margin [dB]	Height [cm]	Angle [°]	Polarity	Detector
1	2389.0664	46.77	51.69	74.00	22.31	165	227	Horizontal	PK
2	2390.0016	44.63	49.55	74.00	24.45	175	200	Horizontal	PK
3	2410.7272	94.68	99.64	74.00	-25.64	175	284	Horizontal	PK

Test Graph



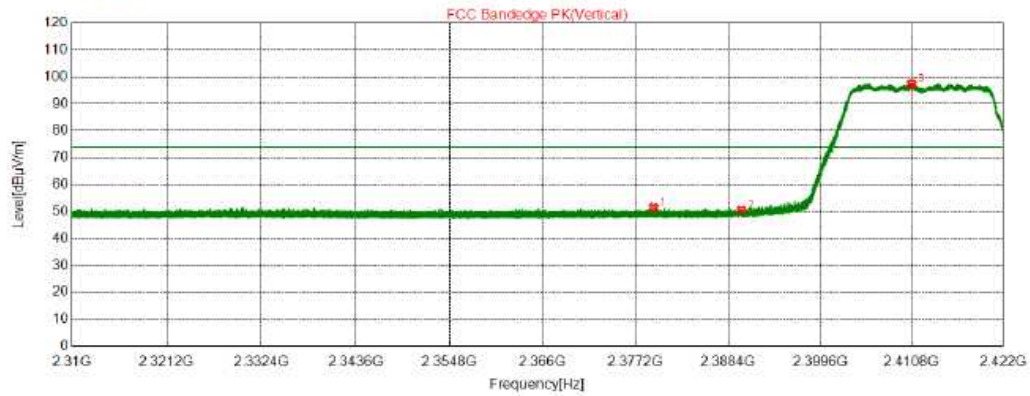
○ QP Detector * AV Detector

NO.	Freq. [MHz]	Reading [dBuV/m]	Level [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Height [cm]	Angle [°]	Polarity	Detector
1	2371.2472	43.84	48.72	54.00	5.28	155	142	Horizontal	AV
2	2390.0016	41.96	46.88	54.00	7.12	165	17	Horizontal	AV
3	2416.6464	92.30	97.27	54.00	-43.27	175	176	Horizontal	AV

Test Plot

n20-2412MHz/ Vertical

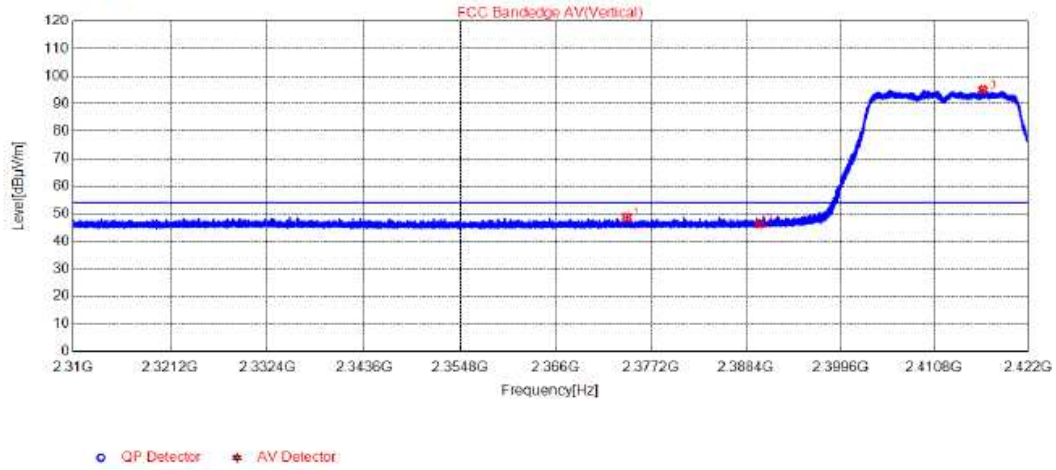
Test Graph



○ QP Detector ★ AV Detector

NO.	Freq. [MHz]	Reading [dBuV/m]	Level [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Height [cm]	Angle [°]	Polarity	Detector
1	2379.3896	46.57	51.47	74.00	22.53	155	133	Vertical	PK
2	2390.0016	45.72	50.64	74.00	23.36	155	163	Vertical	PK
3	2410.8056	92.41	97.37	74.00	-23.37	175	217	Vertical	PK

Test Graph

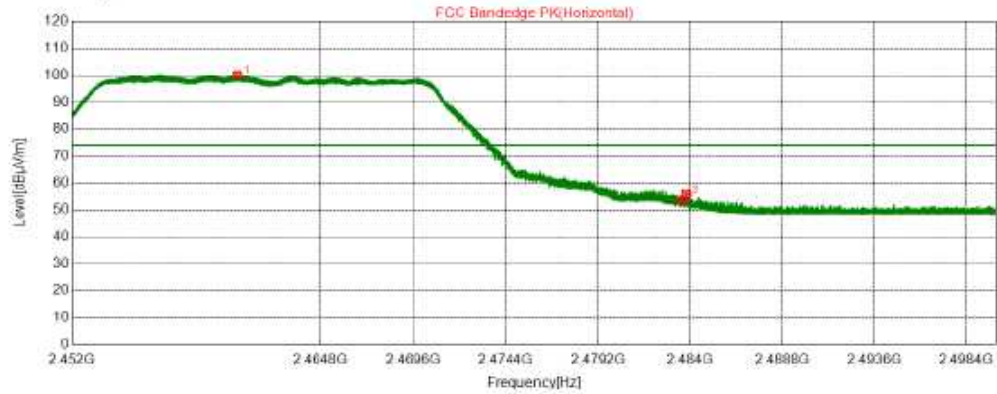


NO.	Freq. [MHz]	Reading [dBuV/m]	Level [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Height [cm]	Angle [°]	Polarity	Detector
1	2374.3496	43.80	48.69	54.00	5.31	155	26	Vertical	AV
2	2390.0016	41.29	46.21	54.00	7.79	175	127	Vertical	AV
3	2416.6520	90.13	95.10	54.00	-41.10	175	194	Vertical	AV

Test Plot

n20-2462MHz/ Horizontal

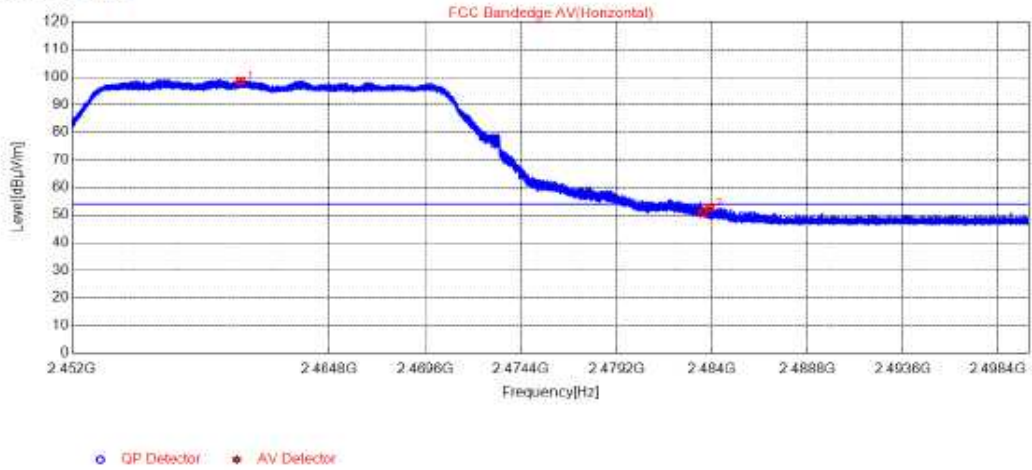
Test Graph



○ DP Detector ★ AV Detector

NO.	Freq. [MHz]	Reading [dBuV/m]	Level [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Height [cm]	Angle [°]	Polarity	Detector
1	2460.5176	94.96	100.01	74.00	-26.01	175	200	Horizontal	PK
2	2483.5000	48.23	53.32	74.00	20.68	165	177	Horizontal	PK
3	2483.7520	50.76	55.85	74.00	18.15	175	200	Horizontal	PK

Test Graph

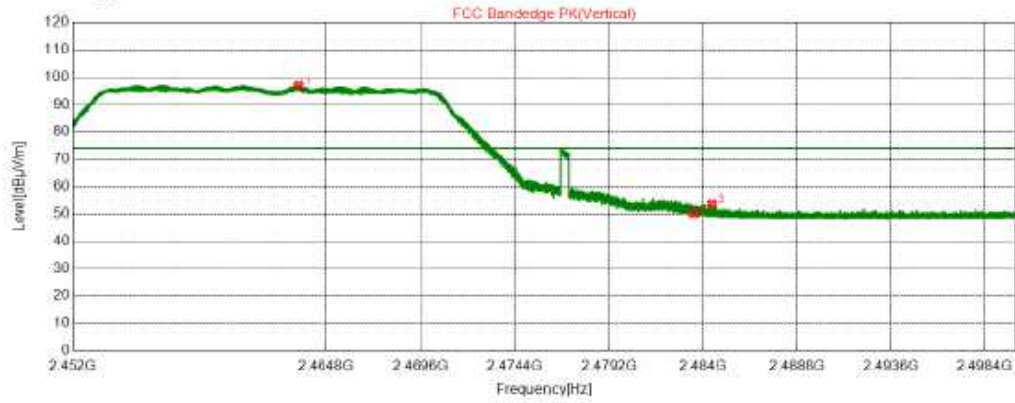


NO.	Freq. [MHz]	Reading [dBuV/m]	Level [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Height [cm]	Angle [°]	Polarity	Detector
1	2460.3880	93.44	98.49	54.00	-44.49	175	177	Horizontal	AV
2	2483.5000	45.61	50.70	54.00	3.30	165	351	Horizontal	AV
3	2483.8576	47.58	52.67	54.00	1.33	175	177	Horizontal	AV

Test Plot

n20-2462MHz/ Vertical

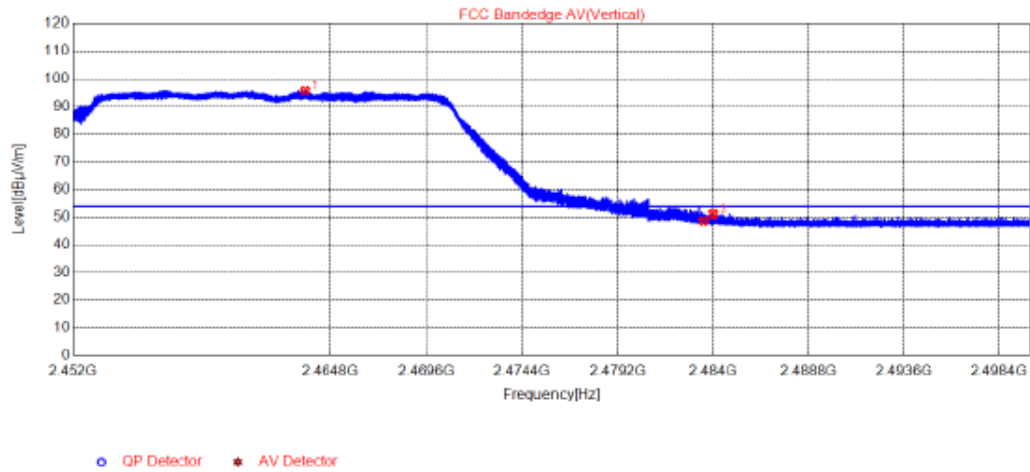
Test Graph



○ QP Detector ● AV Detector

NO.	Freq. [MHz]	Reading [dBuV/m]	Level [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Height [cm]	Angle [°]	Polarity	Detector
1	2463.4168	91.80	96.86	74.00	-22.86	175	200	Vertical	PK
2	2483.5000	45.00	50.09	74.00	23.91	175	249	Vertical	PK
3	2484.4192	48.52	53.61	74.00	20.39	175	216	Vertical	PK

Test Graph

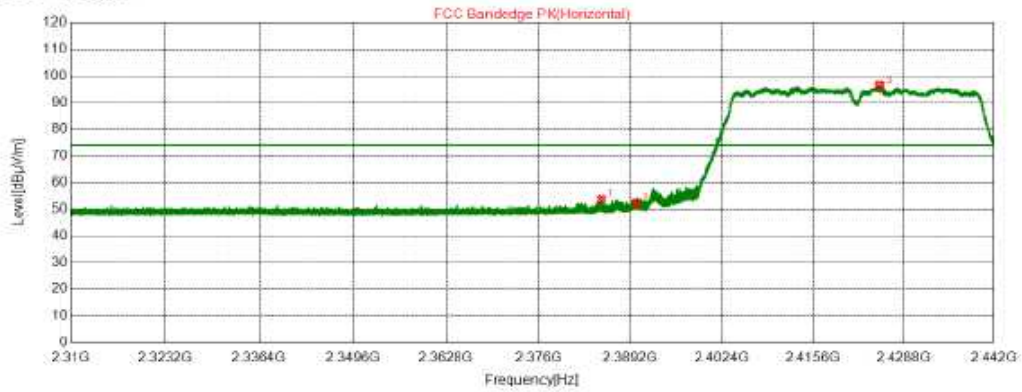


NO.	Freq. [MHz]	Reading [dBuV/m]	Level [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Height [cm]	Angle [°]	Polarity	Detector
1	2463.5464	90.59	95.65	54.00	-41.65	175	177	Vertical	AV
2	2483.5000	43.40	48.49	54.00	5.51	155	110	Vertical	AV
3	2483.9728	46.03	51.12	54.00	2.88	175	260	Vertical	AV

Test Plot

n40-2422MHz/ Horizontal

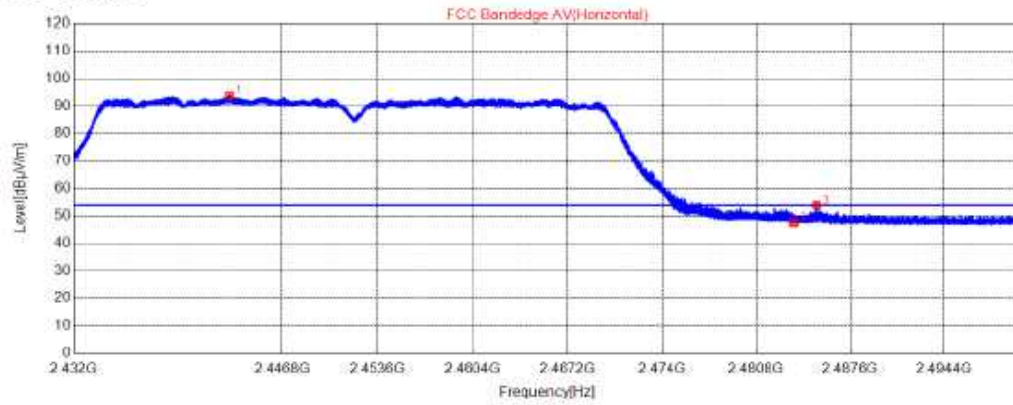
Test Graph



○ OP Detector ● AV Detector

NO.	Freq. [MHz]	Reading [dBuV/m]	Level [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Height [cm]	Angle [°]	Polarity	Detector
1	2385.0420	48.79	53.70	74.00	20.30	175	177	Horizontal	PK
2	2390.0052	47.34	52.26	74.00	21.74	175	227	Horizontal	PK
3	2425.2756	91.48	96.47	74.00	-22.47	175	177	Horizontal	PK

Test Graph



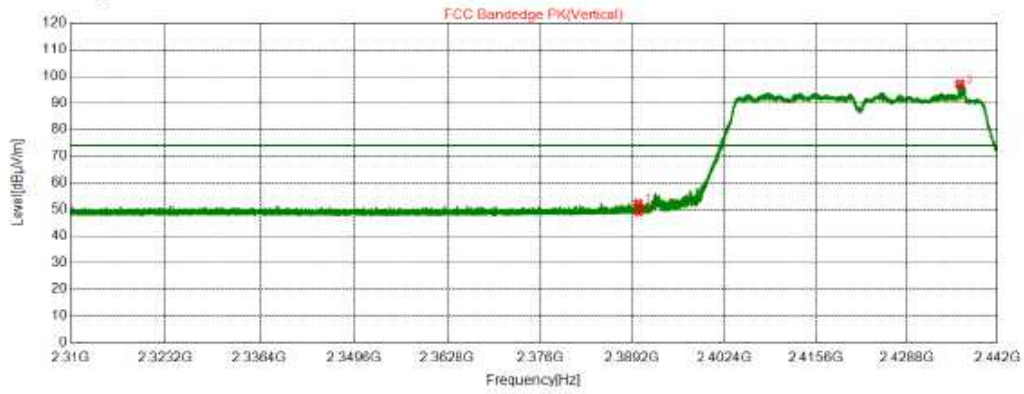
○ GP Detector ★ AV Detector

NO.	Freq. [MHz]	Reading [dBuV/m]	Level [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Height [cm]	Angle [°]	Polarity	Detector
1	2443.0466	88.66	93.68	54.00	-39.68	175	283	Horizontal	AV
2	2483.5032	42.36	47.45	54.00	6.55	165	194	Horizontal	AV
3	2485.1590	48.70	53.79	54.00	0.21	175	200	Horizontal	AV

Test Plot

n40-2422MHz/ Vertical

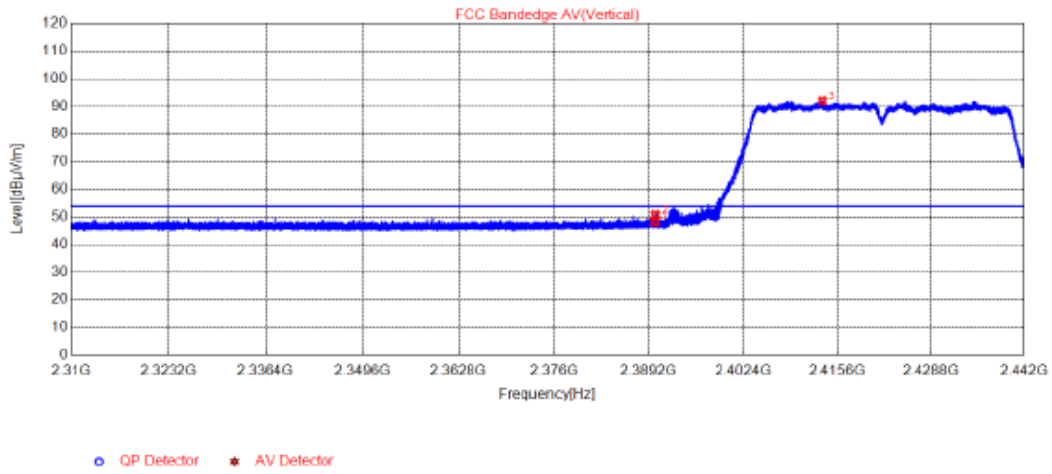
Test Graph



○ GP Detector ★ AV Detector

NO.	Freq. [MHz]	Reading [dBuV/m]	Level [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Height [cm]	Angle [°]	Polarity	Detector
1	2389.9920	47.41	52.33	74.00	21.67	165	216	Vertical	PK
2	2390.0052	44.17	49.09	74.00	24.91	175	194	Vertical	PK
3	2436.5880	91.96	96.97	74.00	-22.97	175	243	Vertical	PK

Test Graph

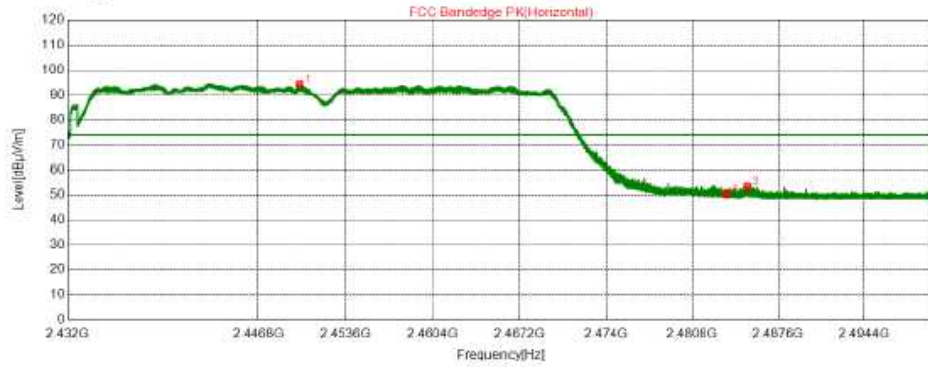


NO.	Freq. [MHz]	Reading [dBµV/m]	Level [dBµV/m]	Limit [dBµV/m]	Margin [dB]	Height [cm]	Angle [°]	Polarity	Detector
1	2390.0052	43.17	48.09	54.00	5.91	155	200	Vertical	AV
2	2390.0580	45.82	50.74	54.00	3.26	155	234	Vertical	AV
3	2413.4946	86.96	91.93	54.00	-37.93	175	216	Vertical	AV

Test Plot

n40-2452MHz/ Horizontal

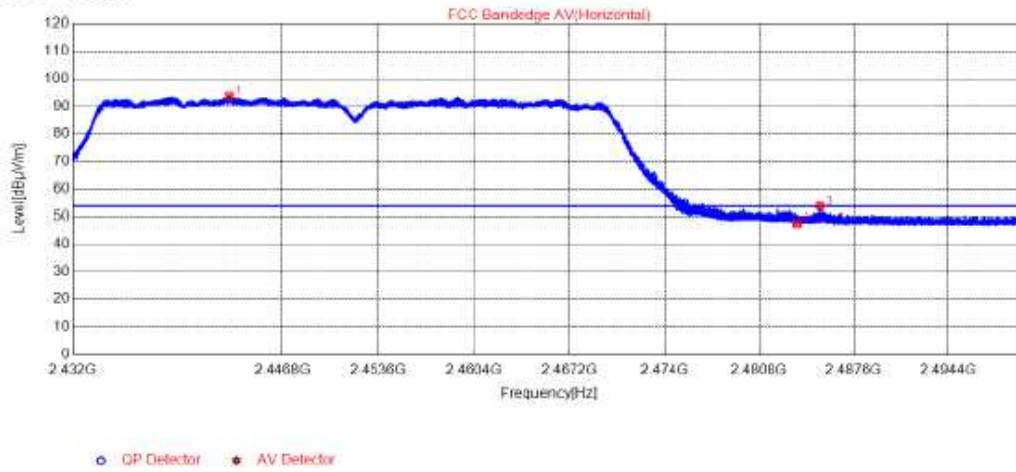
Test Graph



○ DP Detector ■ AV Detector

NO.	Freq. [MHz]	Reading [dBuV/m]	Level [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Height [cm]	Angle [°]	Polarity	Detector
1	2449.9928	89.32	94.35	74.00	-20.35	165	149	Horizontal	PK
2	2483.5032	45.32	50.41	74.00	23.59	165	232	Horizontal	PK
3	2485.1420	48.27	53.36	74.00	20.64	175	194	Horizontal	PK

Test Graph

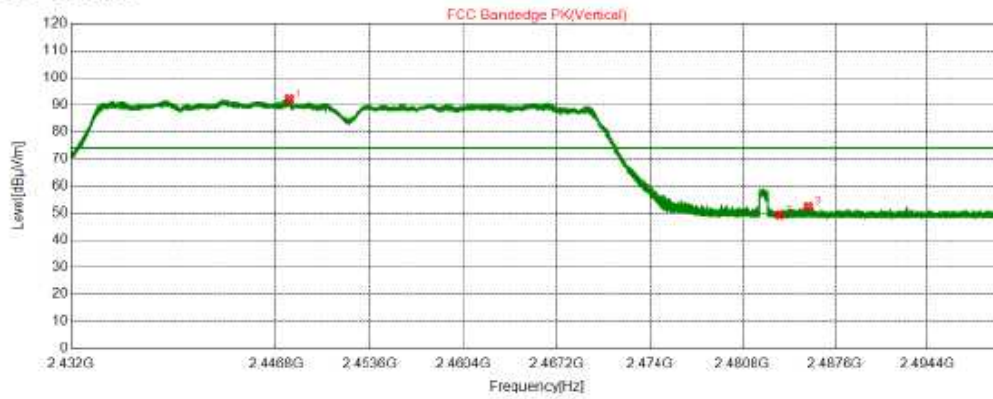


NO.	Freq. [MHz]	Reading [dBuV/m]	Level [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Height [cm]	Angle [°]	Polarity	Detector
1	2443.0466	88.66	93.68	54.00	-39.68	175	283	Horizontal	AV
2	2483.5032	42.36	47.45	54.00	6.55	165	194	Horizontal	AV
3	2485.1590	48.70	53.79	54.00	0.21	175	200	Horizontal	AV

Test Plot

n40-2452MHz/ Vertical

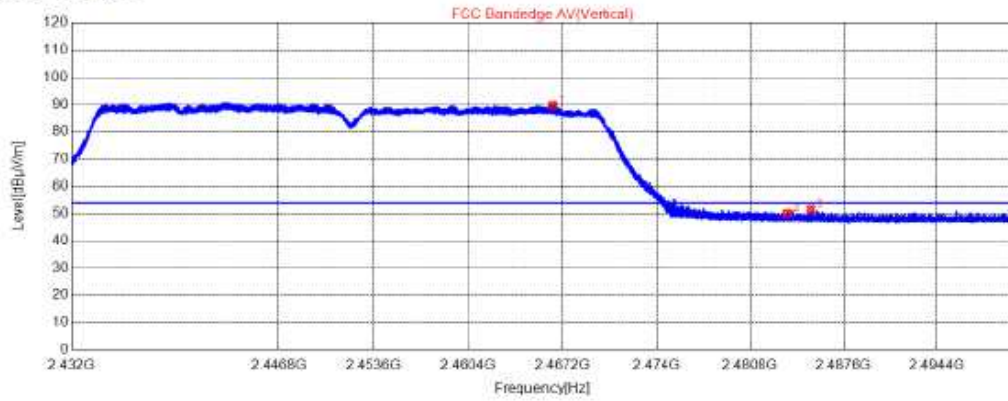
Test Graph



○ GP Detector ★ AV Detector

NO.	Freq. [MHz]	Reading [dBuV/m]	Level [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Height [cm]	Angle [°]	Polarity	Detector
1	2447.7556	87.08	92.11	74.00	-18.11	165	232	Vertical	PK
2	2483.5032	44.10	49.19	74.00	24.81	175	194	Vertical	PK
3	2485.6452	47.38	52.47	74.00	21.53	165	182	Vertical	PK

Test Graph



○ QP Detector ★ AV Detector

NO.	Freq. [MHz]	Reading [dBuV/m]	Level [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Height [cm]	Angle [°]	Polarity	Detector
1	2466.4862	84.66	89.72	54.00	-35.72	175	199	Vertical	AV
2	2483.5032	44.89	49.98	54.00	4.02	165	210	Vertical	AV
3	2485.2032	46.50	51.59	54.00	2.41	155	217	Vertical	AV



5 Pictures of Test Arrangements

Please refer to the attached file (Test Setup Photo).

-----**END**-----