



FCC Test Report

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Application No.: DNT240287R0472-0960
Applicant: Shenzhen Joao Technology Co., Ltd
Address of Applicant: Building 101-3,5 and 6, No.8 , Guixiang Community Square Road, Guanlan Street, Longhua District, Shenzhen, China
EUT Description: Smart Camera
Model No.: A6M-U
FCC ID: 2BBQ4-A6M-U
Power Supply: DC 5V From Adapter Input AC 100-240V,50/60Hz
Trade Mark: N/A
47 CFR FCC Part 2, Subpart J
Standards: 47 CFR Part 15, Subpart C
ANSI C63.10: 2013
Date of Receipt: 2024/3/2
Date of Test: 2024/3/5 to 2024/3/14
Date of Issue: 2024/3/15
Test Result: **PASS ***

Prepared By: Wayne Lin (Testing Engineer)

Reviewed By: Ponils Chen (Project Engineer)

Approved By: Wick Peng (Manager)



Note: If there is any objection to the results in this report, please submit a written inquiry to the company within 15 days from the date of receiving the report. The test report is effective only with both signature and specialized stamp, and is issued by the company in accordance with the requirements of the "Conditions of Issuance of Test Reports" printed in the attached page. Unless otherwise stated, the results presented in this report only apply to the samples tested this time. Partial reproduction of this report is not allowed unless approved by the company in writing.

Dongguan DN Testing Co., Ltd.

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Report Revise Record

Report Version	Revise Time	Issued Date	Valid Version	Notes
V2.0	/	Mar.15, 2024	Valid	Original Report



1 Test Summary

Test Item	Test Requirement	Test Method	Test Result	Result
Antenna Requirement	15.203/247(b)	--	Clause 3.1	PASS
Duty Cycle	--	--	Clause 3.2	PASS
DTS (6 dB) Bandwidth	15.247 (a)(2)	ANSI C63.10: 2013	Clause 3.3	PASS
Conducted Output Power	15.247 (b)(3)	ANSI C63.10: 2013	Clause 3.4	PASS
Power Spectral Density	15.247 (e)	ANSI C63.10: 2013	Clause 3.5	PASS
Band-edge for RF Conducted Emissions	15.247(d)	ANSI C63.10: 2013	Clause 3.6	PASS
RF Conducted Spurious Emissions	15.247(d)	ANSI C63.10: 2013	Clause 3.7	PASS
Radiated Spurious Emissions	15.247(d);15.205/15.209	ANSI C63.10: 2013	Clause 3.8	PASS
Restricted bands around fundamental frequency (Radiated Emission)	15.247(d);15.205/15.209	ANSI C63.10: 2013	Clause 3.9	PASS
AC Power Line Conducted Emission	15.207	ANSI C63.10: 2013	Clause 3.10	PASS

Note:

1. "N/A" denotes test is not applicable in this test report.



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2 General Information

2.1 Test Location

Company:	Dongguan DN Testing Co., Ltd
Address:	No. 1, West Fourth Street, South Xinfu Road, Wusha Liwu, Chang ' an Town, Dongguan City, Guangdong P.R.China
Test engineer:	Wayne Lin



2.2 General Description of EUT

Manufacturer:	Shenzhen Joao Technology Co., Ltd
Address of Manufacturer:	Building 101-3,5 and 6, No.8 , Guixiang Community Square Road, Guanlan Street, Longhua District, Shenzhen, China
EUT Description:	Smart Camera
Model No.:	A6M-U
Additional Model(s):	/
Chip Type:	SV6355
Serial number:	PR240287R0472
Power Supply	DC 5V From Battery Input AC 100-240V, 50/60Hz
Trade Mark:	N/A
Hardware Version:	V1.0
Software Version:	V1.0
IEEE 802.11 WLAN Mode Supported	<input checked="" type="checkbox"/> 802.11b (20 MHz channel bandwidth), <input checked="" type="checkbox"/> 802.11g (20 MHz channel bandwidth) <input checked="" type="checkbox"/> 802.11n HT(20 MHz channel bandwidth), <input checked="" type="checkbox"/> 802.11n HT(40 MHz channel bandwidth). <input checked="" type="checkbox"/> 802.11ax HE(20 MHz channel bandwidth), <input checked="" type="checkbox"/> 802.11ax HE(40 MHz channel bandwidth).
Operation Frequency:	2400 MHz -2483.5MHz $f_c = 2407 \text{ MHz} + N * 5 \text{ MHz}$, where: - f_c = "Operating Frequency" in MHz, -N = "Channel Number" with the range from 1 to 11 for the 20 MHz channel bandwidth, or 3 to 9 for the 40 MHz channel bandwidth.
Type of Modulation:	IEEE for 802.11b: DSSS IEEE for 802.11g : OFDM IEEE for 802.11n(HT20) : OFDM/OFDMA IEEE for 802.11n(HT40) : OFDM/OFDMA IEEE for 802.11ax(HE20) : OFDM/OFDMA IEEE for 802.11ax(HE40) : OFDM/OFDMA
Sample Type:	<input type="checkbox"/> Portable Device, <input type="checkbox"/> Module, <input checked="" type="checkbox"/> Mobile Device
Antenna Type:	<input type="checkbox"/> External, <input checked="" type="checkbox"/> Integrated
Antenna Ports	<input checked="" type="checkbox"/> Ant 1, <input type="checkbox"/> Ant 2, <input type="checkbox"/> Ant 3
Smart System	<input checked="" type="checkbox"/> SISO (for 802.11b/g/n/ax), <input type="checkbox"/> MIMO (for 802.11 b/g/n): 2 Tx & 2 Rx, <input type="checkbox"/> Diversity (for 802.11b/g) : Tx & Rx
Antenna Gain*:	<input checked="" type="checkbox"/> Provided by applicant 4.28dBi
RF Cable*:	<input checked="" type="checkbox"/> Provided by applicant 0.5dB(0.6~1GHz); 0.8dB(1.4~2GHz); 1.0dB(2.1~2.7GHz); 1.5dB(3~4GHz); 1.8dB(4.4~6GHz);

Remark:

*Since the above data and/or information is provided by the applicant relevant results or conclusions of this report are only made for these data and/or information , DNT is not responsible for the authenticity, integrity and results of the data and information and/or the validity of the conclusion.



2.3 Channel List

Operation Frequency of each channel (802.11b/g/n HT20/ax HE20)							
Channel	Frequency	Channel	Frequency	Channel	Frequency	Channel	Frequency
1	2412MHz	4	2427MHz	7	2442MHz	10	2457MHz
2	2417MHz	5	2432MHz	8	2447MHz	11	2462MHz
3	2422MHz	6	2437MHz	9	2452MHz		
Operation Frequency of each channel (802.11n HT40/ax HE40)							
Channel	Frequency	Channel	Frequency	Channel	Frequency	Channel	Frequency
3	2422MHz	6	2437MHz	9	2452MHz		
4	2427MHz	7	2442MHz				
5	2432MHz	8	2447MHz				

Remark:

In section 15.31(m), regards to the operating frequency range over 10 MHz, the Lowest frequency, the middle frequency, and the highest frequency of channel were selected to perform the test, and the selected channel see below:

Channel	Frequency for 802.11 b/g/n (HT20)/ ax (HE20))	Frequency for 802.11n (HT40) / ax(HE40)
The Lowest channel	2412MHz	2422MHz
The Middle channel	2437MHz	2437MHz
The Highest channel	2462MHz	2452MHz

2.4 Test Environment and Mode

Operating Environment:	
Temperature:	20~25.0 °C
Humidity:	45~56 % RH
Atmospheric Pressure:	101.0~101.30 KPa
Test mode:	
Transmitting mode:	Keep the EUT in transmitting mode with all kind of modulation and all kind of data rate.



2.5 Power Setting of Test Software

Software Name	CMD		
Frequency(MHz)	2412	2437	2462
IEEE 802.11b Setting	10	10	10
IEEE 802.11g Setting	10	10	10
IEEE 802.11n HT20 Setting	10	10	10
IEEE 802.11ax HE 20 Setting	10	10	10
Frequency(MHz)	2422	2437	2452
IEEE 802.11n HT40 Setting	10	10	10
IEEE 802.11ax HE 40 Setting	10	10	10

2.6 Description of Support Units

The EUT has been tested independent unit.

2.7 Test Facility

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

Lab A:

- **FCC, USA**

Designation Number: CN1348

- **A2LA (Certificate No. 7050.01)**

DONGGUAN DN TESTING CO., LTD. is accredited by the American Association for Laboratory Accreditation(A2LA). Certificate No. 7050.01.

- **Innovation, Science and Economic Development Canada**

DONGGUAN DN TESTING CO., LTD. EMC Laboratory has been recognized by ISED as an accredited testing laboratory.

IC#: 31026.



2.8 Measurement Uncertainty (95% confidence levels, k=2)

No.	Item	Measurement Uncertainty
1	DTS Bandwidth	$\pm 0.0196\%$
2	Maximum Conducted Output Power	± 0.686 dB
3	Maximum Power Spectral Density Level	± 0.743 dB
4	Band-edge Compliance	± 1.328 dB
5	Unwanted Emissions In Non-restricted Freq Bands	9KHz-1GHz: ± 0.746 dB 1GHz-26GHz: ± 1.328 dB

No.	Item	Measurement Uncertainty
1	Conduction Emission	± 3.0 dB (150kHz to 30MHz)
2	Radiated Emission	± 4.8 dB (Below 1GHz)
		± 4.8 dB (1GHz to 6GHz)
		± 4.5 dB (6GHz to 18GHz)
		± 5.02 dB (Above 18GHz)



2.9 Equipment List

For Connect EUT Antenna Terminal Test					
Description	Manufacturer	Model	Serial Number	Cal date	Due date
Signal Generator	Keysight	N5181A-6G	MY48180415	2023-10-25	2024-10-24
Signal Generator	Keysight	N5182B	MY57300617	2023-10-25	2024-10-24
Power supply	Keysight	E3640A	ZB2022656	2023-10-25	2024-10-24
Radio Communication Tester	R&S	CMW500	105082	2023-10-25	2024-10-24
Spectrum Analyzer	Aglient	N9010A	MY52221458	2023-10-25	2024-10-24
BT/WIFI Test Software	Tonscend	JS1120 V3.1.83	NA	NA	NA
RF Control Unit	Tonscend	JS0806-2	22F8060581	NA	NA
Power Sensor	Anritsu	ML2495A	2129005	2023-10-25	2024-10-24
Pulse Power Sensor	Anritsu	MA2411B	1911397	2023-10-25	2024-10-24
temperature and humidity box	SCOTEK	SCD-C40-80PRO	6866682020008	2023-10-25	2024-10-24

Test Equipment for Conducted Emission					
Description	Manufacturer	Model	Serial Number	Cal Date	Due Date
Receiver	R&S	ESCI3	101152	2023-10-24	2024-10-23
LISN	R&S	ENV216	102874	2023-10-24	2024-10-23
ISN	R&S	ENY81-CA6	1309.8590.03	2023-10-24	2024-10-23

Test Equipment for Radiated Emission(30MHz-1000MHz)					
Description	Manufacturer	Model	Serial Number	Cal Date	Due Date
Receiver	R&S	ESR7	102497	2023-10-24	2024-10-23
Test Software	ETS-LINDGREN	TILE-FULL	NA	NA	NA
RF Cable	ETS-LINDGREN	RFC-NMS-100-NMS-350-IN	NA	2023-10-24	2024-10-23
Log periodic antenna	ETS-LINDGREN	VULB 9168	01475	2023-10-24	2024-10-23
Pre-amplifier	Schwarzbeck	BBV9743B	00423	2023-10-24	2024-10-23



Test Equipment for Radiated Emission(Above 1000MHz)					
Description	Manufacturer	Model	Serial Number	Cal Date	Due Date
Frequency analyser	Keysight	N9010A	MY52221458	2023-10-24	2024-10-23
RF Cable	ETS-LINDGREN	RFC-NMS-100- NMS-350-IN	NA	2023-10-24	2024-10-23
Horn Antenna	ETS-LINDGREN	3117	00252567	2023-10-24	2024-10-23
Double ridged waveguide antenna	ETS-LINDGREN	3116C	00251780	2023-10-24	2024-10-23
Test Software	ETS-LINDGREN	TILE-FULL	NA	NA	NA
Pre-amplifier	ETS-LINDGREN	3117-PA	252567	2023-10-24	2024-10-23
Pre-amplifier	ETS-LINDGREN	3116C-PA	251780	2023-10-24	2024-10-23

2.10 Assistant equipment used for test

Code	Equipment	Manufacturer	Model No.	Equipment No.
1	Computer	acer	N22C8	EMC notebook01
2	Adapter	Chen yang	UC13CN	NA



3 Test results and Measurement Data

3.1 Antenna Requirement

Standard requirement:	47 CFR Part 15C Section 15.203 /247(c)
<p>15.203 requirement: 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, 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.</p> <p>15.247(b) (4) requirement: The conducted output power limit specified in paragraph (b) of this section is based on the use of antennas with directional gains that do not exceed 6 dBi. Except as shown in paragraph (c) of this section, if transmitting antennas of directional gain greater than 6 dBi are used, the conducted output power from the intentional radiator shall be reduced below the stated values in paragraphs (b)(1), (b)(2), and (b)(3) of this section, as appropriate, by the amount in dB that the directional gain of the antenna exceeds 6 dBi.</p>	
<p>The FPC antenna is externally connected to the motherboard, The best case gain of the antenna is 4.28dBi.</p>	



3.2 Duty Cycle

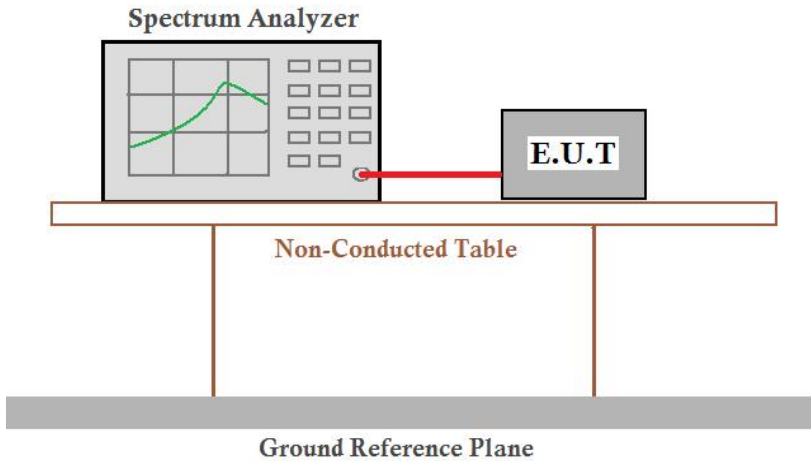
Refer to section : **Appendix A**

Note:

- 1.If duty cycle $< 98\%$, the conducted average output power and average power spectral density should be add duty factor.
- 2.If duty cycle $\geq 98\%$, the EUT is consider to be transmitting continuously, the conducted average output power and average power spectral density no need to add duty factor (consider to be zero).
- 3.The conducted peak output power and peak power spectral density no need to consider duty factor.
- 4.The on-time time is transmission duration (T).



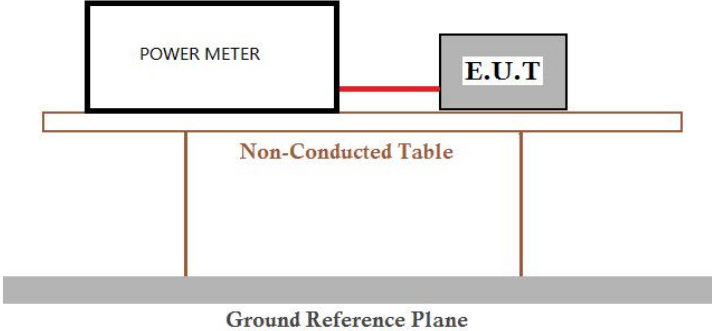
3.3 DTS (6 dB) Bandwidth

Test Requirement:	47 CFR Part 15C Section 15.247 (a)(2)
Test Method:	ANSI C63.10: 2013 Section 11.8.1 Option 1
Test Setup:	 <p>The diagram illustrates the test setup. A Spectrum Analyzer is connected via a red cable to an E.U.T. (Equipment Under Test). Both are placed on a Non-Conducted Table. Below the table is a Ground Reference Plane.</p>
Instruments Used:	Refer to section 2.9 for details
Exploratory Test Mode:	Transmitting with all kind of modulations, data rates
Final Test Mode:	Through Pre-scan, find the 1Mbps of rate is the worst case of 802.11b; 6Mbps of rate is the worst case of 802.11g; 6.5Mbps of rate is the worst case of 802.11n(HT20); 13.5Mbps of rate is the worst case of 802.11n(HT40); 8Mbps of rate is the worst case of 802.11ax(HE20) ; 16Mbps of rate is the worst case of 802.11ax(HE40).
Limit:	≥ 500 kHz
Test Results:	Pass

The detailed test data see: **Appendix B**



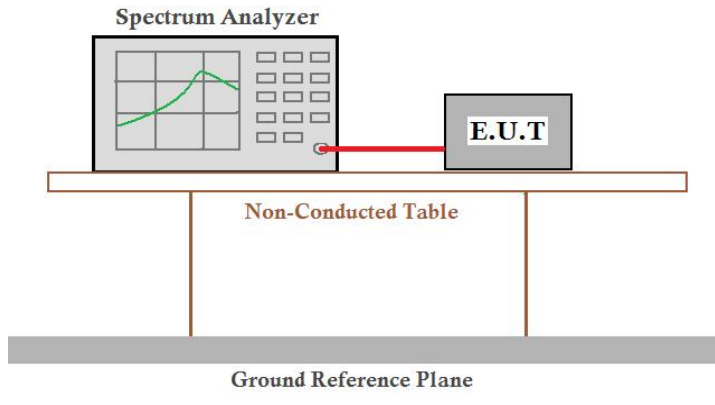
3.4 Conducted Output Power

Test Requirement:	47 CFR Part 15C Section 15.247 (b)(3)
Test Method:	ANSI C63.10: 2013 Section 11.9.1.3
Test Setup:	 <p>The diagram illustrates the test setup for conducted output power. It shows a 'POWER METER' and an 'E.U.T.' (Equipment Under Test) connected by a red line. Both are placed on a 'Non-Conducted Table'. Below the table is a 'Ground Reference Plane'.</p>
Test Instruments:	Refer to section 2.9 for details
Exploratory Test Mode:	Transmitting with all kind of modulations, data rates
Final Test Mode:	Through Pre-scan, find the 1Mbps of rate is the worst case of 802.11b; 6Mbps of rate is the worst case of 802.11g; 6.5Mbps of rate is the worst case of 802.11n(HT20); 13.5Mbps of rate is the worst case of 802.11n(HT40); 8Mbps of rate is the worst case of 802.11ax(HE20) ; 16Mbps of rate is the worst case of 802.11ax(HE40).
Limit:	30dBm
Test Results:	Pass

The detailed test data see: **Appendix C**



3.5 Power Spectral Density

Test Requirement:	47 CFR Part 15C Section 15.247 (e)
Test Method:	ANSI C63.10: 2013 Section 11.10.2
Test Setup:	 <p>The diagram illustrates the test setup. A Spectrum Analyzer is connected to an E.U.T. (Equipment Under Test) via a red cable. Both the Spectrum Analyzer and the E.U.T. are placed on a Non-Conducted Table. The table is supported by a Ground Reference Plane.</p>
Test Instruments:	Refer to section 2.9 for details
Exploratory Test Mode:	Transmitting with all kind of modulations, data rates
Final Test Mode:	Through Pre-scan, find the 1Mbps of rate is the worst case of 802.11b; 6Mbps of rate is the worst case of 802.11g; 6.5Mbps of rate is the worst case of 802.11n(HT20); 13.5Mbps of rate is the worst case of 802.11n(HT40); 8Mbps of rate is the worst case of 802.11ax(HE20) ; 16Mbps of rate is the worst case of 802.11ax(HE40).
Limit:	≤8.00dBm/3kHz
Test Results:	Pass

The detailed test data see: **Appendix D**



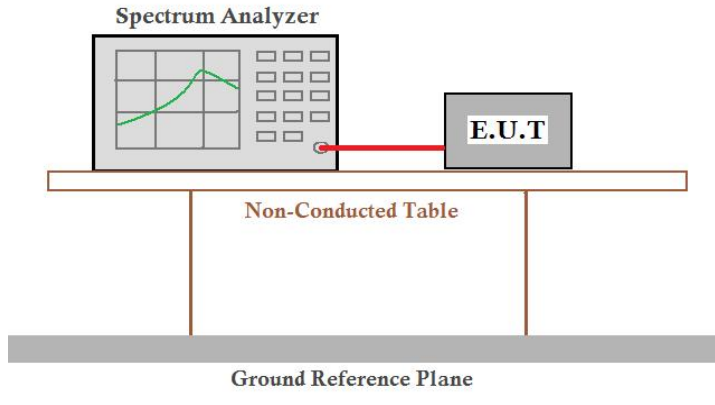
3.6 Band-edge for RF Conducted Emissions

Test Requirement:	47 CFR Part 15C Section 15.247 (d)
Test Method:	ANSI C63.10: 2013 Section 11.13
Test Setup:	<p>The diagram illustrates the test setup. A Spectrum Analyzer is connected via a red cable to an E.U.T. (Equipment Under Test). Both are placed on a Non-Conducted Table. Below the table is a Ground Reference Plane.</p>
Instruments Used:	Refer to section 2.9 for details
Exploratory Test Mode:	Transmitting with all kind of modulations, data rates
Final Test Mode:	Through Pre-scan, find the 1Mbps of rate is the worst case of 802.11b; 6Mbps of rate is the worst case of 802.11g; 6.5Mbps of rate is the worst case of 802.11n(HT20); 13.5Mbps of rate is the worst case of 802.11n(HT40); 8Mbps of rate is the worst case of 802.11ax(HE20) ; 16Mbps of rate is the worst case of 802.11ax(HE40).
Limit:	In any 100 kHz bandwidth outside the frequency band in which the spread spectrum 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.
Test Results:	Pass

The detailed test data see: **Appendix E**



3.7 RF Conducted Spurious Emissions

Test Requirement:	47 CFR Part 15C Section 15.247 (d)
Test Method:	ANSI C63.10: 2013 Section 11.11
Test Setup:	
Instruments Used:	Refer to section 2.9 for details
Exploratory Test Mode:	Transmitting with all kind of modulations, data rates
Final Test Mode:	Through Pre-scan, find the 1Mbps of rate is the worst case of 802.11b; 6Mbps of rate is the worst case of 802.11g; 6.5Mbps of rate is the worst case of 802.11n(HT20); 13.5Mbps of rate is the worst case of 802.11n(HT40); 8Mbps of rate is the worst case of 802.11ax(HE20) ; 16Mbps of rate is the worst case of 802.11ax(HE40).
Limit:	In any 100 kHz bandwidth outside the frequency band in which the spread spectrum 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.
Test Results:	Pass

The detailed test data see: **Appendix F**



3.8 Radiated Spurious Emissions

Test Requirement:	47 CFR Part 15C Section 15.209 and 15.205				
Test Method:	ANSI C63.10: 2013 Section 11.12				
Test Site:	Measurement Distance: 3m or 10m (Semi-Anechoic Chamber)				
Receiver Setup:	Frequency	Detector	RBW	VBW	Remark
	0.009MHz-0.090MHz	Peak	10kHz	30kHz	Peak
	0.009MHz-0.090MHz	Average	10kHz	30kHz	Average
	0.090MHz-0.110MHz	Quasi-peak	10kHz	30kHz	Quasi-peak
	0.110MHz-0.490MHz	Peak	10kHz	30kHz	Peak
	0.110MHz-0.490MHz	Average	10kHz	30kHz	Average
	0.490MHz -30MHz	Quasi-peak	10kHz	30kHz	Quasi-peak
	30MHz-1GHz	Quasi-peak	120kHz	300kHz	Quasi-peak
	Above 1GHz	Peak	1MHz	3MHz	Peak
Peak		1MHz	10Hz (DC ≥ 0.98) ≥ 1/T (DC < 0.98)	Average	
Limit:	Frequency	Field strength (microvolt/meter)	Limit (dBuV/m)	Remark	Measurement distance (m)
	0.009MHz-0.490MHz	2400/F(kHz)	-	-	300
	0.490MHz-1.705MHz	24000/F(kHz)	-	-	30
	1.705MHz-30MHz	30	-	-	30
	30MHz-88MHz	100	40.0	Quasi-peak	3
	88MHz-216MHz	150	43.5	Quasi-peak	3
	216MHz-960MHz	200	46.0	Quasi-peak	3
	960MHz-1GHz	500	54.0	Quasi-peak	3
	Above 1GHz	500	54.0	Average	3
Remark: 15.35(b), Unless otherwise specified, the limit on peak radio frequency emissions is 20dB above the maximum permitted average emission limit applicable to the equipment under test. This peak limit applies to the total peak emission level radiated by the device.					

Test Setup:

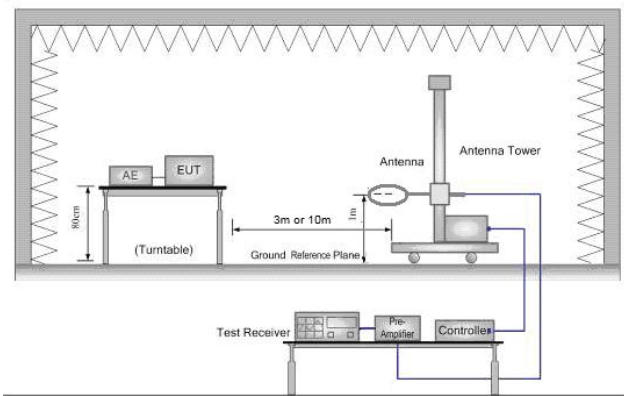


Figure 1. Below 30MHz

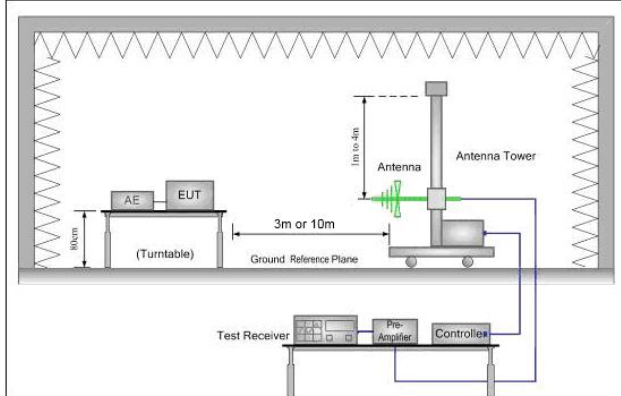


Figure 2. 30MHz to 1GHz

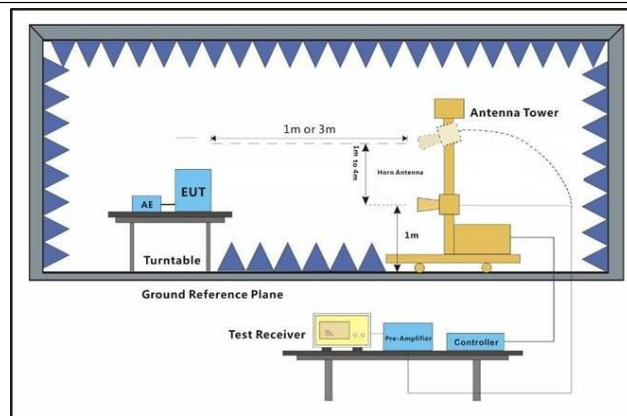


Figure 3. Above 1 GHz

<p>Test Procedure:</p>	<ol style="list-style-type: none"> For below 1GHz, the EUT was placed on the top of a rotating table 0.8 meters above the ground at a 3 or 10 meter semi-anechoic chamber. The table was rotated 360 degrees to determine the position of the highest radiation. For above 1GHz, the EUT was placed on the top of a rotating table 1.5 meters above the ground at a 3 meter semi-anechoic chamber. The table was rotated 360 degrees to determine the position of the highest radiation The EUT was set 3 or 10 meters away from the interference-receiving antenna, which was mounted on the top of a variable-height antenna tower. The antenna height 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. 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 (for the test frequency of below 30MHz, the antenna was tuned to heights 1 meter) and the rotatable table was turned from 0 degrees to 360 degrees to find the maximum reading. The test-receiver system was set to Peak Detect Function and Specified Bandwidth with Maximum Hold Mode. If the emission level of the EUT in peak mode was 10dB lower than the limit specified, then testing could be stopped and the peak values of the EUT would be reported. Otherwise the emissions that did not have 10dB margin would be re-tested one by one using peak, quasi-peak or average method as specified and then reported in a data sheet. Test the EUT in the lowest channel, the middle channel, the Highest channel. The radiation measurements are performed in X, Y, Z axis positioning for Transmitting mode, And found the X axis positioning which it is worse case. Repeat above procedures until all frequencies measured was complete.
<p>Test Configuration:</p>	<p>Measurements Below 1000MHz</p>



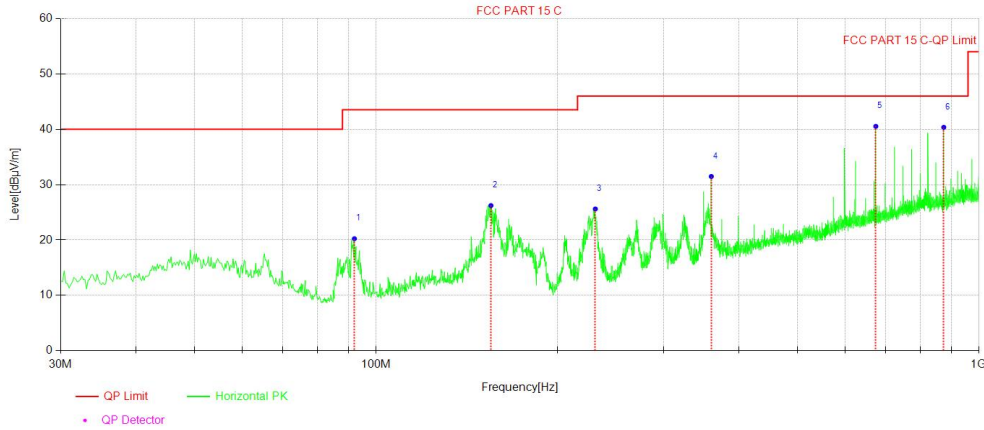
	<ul style="list-style-type: none">• RBW = 120 kHz• VBW = 300 kHz• Detector = Peak• Trace mode = max hold Peak Measurements Above 1000 MHz <ul style="list-style-type: none">• RBW = 1 MHz• VBW \geq 3 MHz• Detector = Peak• Sweep time = auto• Trace mode = max hold Average Measurements Above 1000MHz <ul style="list-style-type: none">• RBW = 1 MHz• VBW = 10 Hz, when duty cycle is no less than 98 percent.• VBW \geq 1/T, when duty cycle is less than 98 percent where T is the minimum transmission duration over which the transmitter is on and is transmitting at its maximum power control level for the tested mode of operation.
Exploratory Test Mode:	Transmitting with all kind of modulations, data rates. Charge + Transmitting mode.
Final Test Mode:	Pretest the EUT at Transmitting mode. Through Pre-scan, find the 1Mbps of rate is the worst case of 802.11b; 6Mbps of rate is the worst case of 802.11g; 6.5Mbps of rate is the worst case of 802.11n(HT20); 13.5Mbps of rate is the worst case of 802.11n(HT40); 8Mbps of rate is the worst case of 802.11ax(HE20) ; 16Mbps of rate is the worst case of 802.11ax(HE40). Only the worst case is recorded in the report.
Instruments Used:	Refer to section 2.9 for details
Test Results:	Pass



Test data

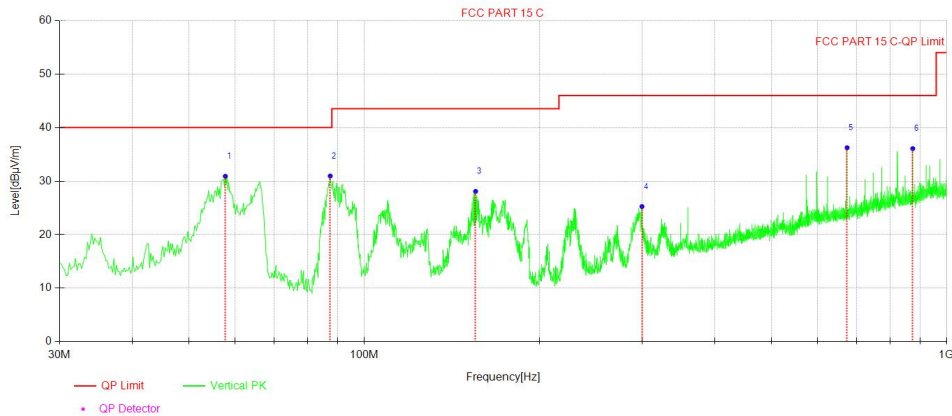
For 30-1000MHz

Horizontal:



NO.	Freq. [MHz]	Reading Level [dBµV]	Correct Factor [dB/m]	Result Level [dBµV/m]	Limit [dBµV/m]	Margin [dB]	Height [cm]	Angle [°]	Detector
1	92.09	33.95	-13.70	20.25	43.50	23.25	200	4	QP
2	155.15	34.15	-7.92	26.23	43.50	17.27	200	11	QP
3	231.21	36.01	-10.39	25.62	46.00	20.38	100	273	QP
4	360.06	37.07	-5.59	31.48	46.00	14.52	100	76	QP
5	674.98	38.68	1.85	40.53	46.00	5.47	100	106	QP
6	875.03	35.66	4.69	40.35	46.00	5.65	200	218	QP

Vertical :



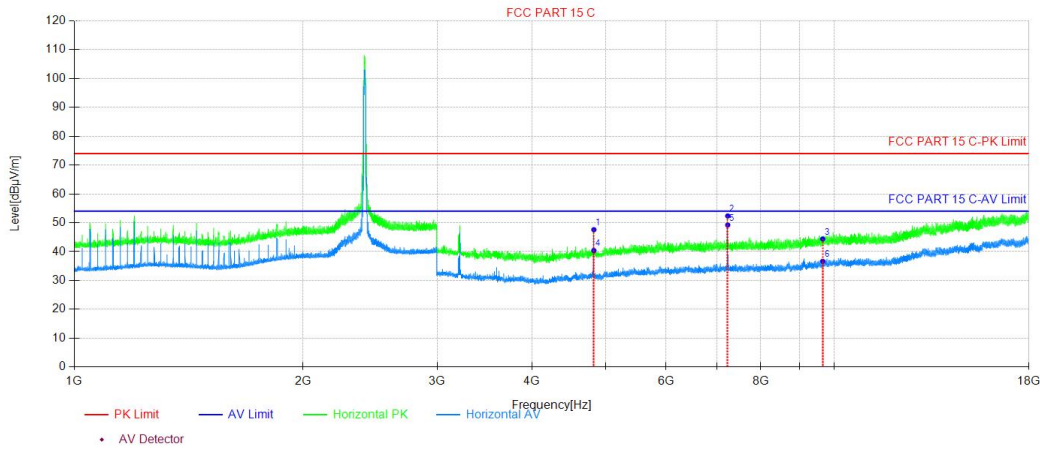
NO.	Freq. [MHz]	Reading Level [dBµV]	Correct Factor [dB/m]	Result Level [dBµV/m]	Limit [dBµV/m]	Margin [dB]	Height [cm]	Angle [°]	Detector
1	57.74	39.44	-8.53	30.91	40.00	9.09	100	356	QP
2	87.43	44.79	-13.83	30.96	40.00	9.04	100	315	QP
3	155.34	36.01	-7.92	28.09	43.50	15.41	100	175	QP
4	299.90	32.31	-7.05	25.26	46.00	20.74	200	313	QP
5	674.98	34.39	1.85	36.24	46.00	9.76	100	186	QP
6	875.03	31.39	4.69	36.08	46.00	9.92	100	77	QP



For above 1GHz

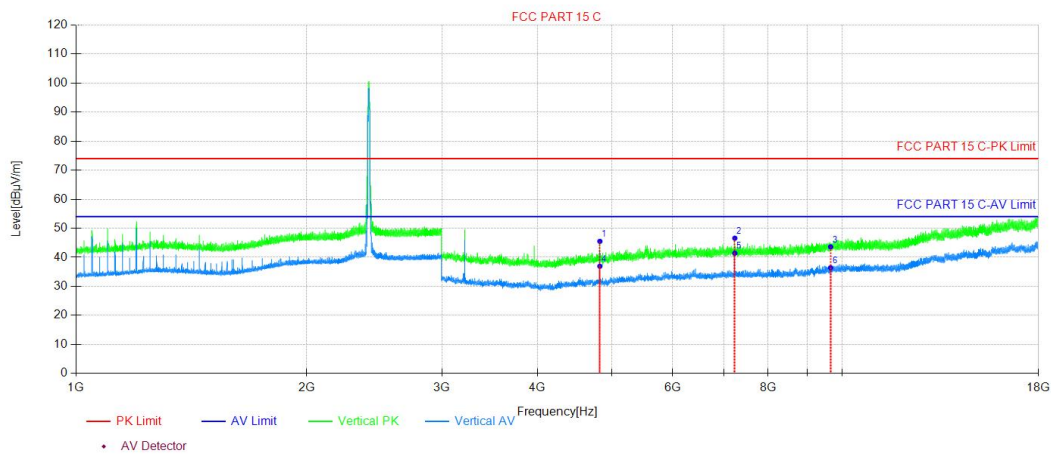
11B 2412MHz

Horizontal:



NO.	Freq. [MHz]	Reading Level [dBµV]	Correct Factor [dB/m]	Result Level [dBµV/m]	Limit [dBµV/m]	Margin [dB]	Height [cm]	Angle [°]	Remark
1	4824.09	48.80	-1.18	47.62	74.00	26.38	150	158	Peak
2	7236.21	49.79	2.58	52.37	74.00	21.63	150	244	Peak
3	9648.33	39.07	5.34	44.41	74.00	29.59	150	321	Peak
4	4824.09	41.58	-1.18	40.40	54.00	13.60	150	168	AV
5	7236.21	46.65	2.58	49.23	54.00	4.77	150	266	AV
6	9648.33	31.32	5.34	36.66	54.00	17.34	150	234	AV

Vertical:

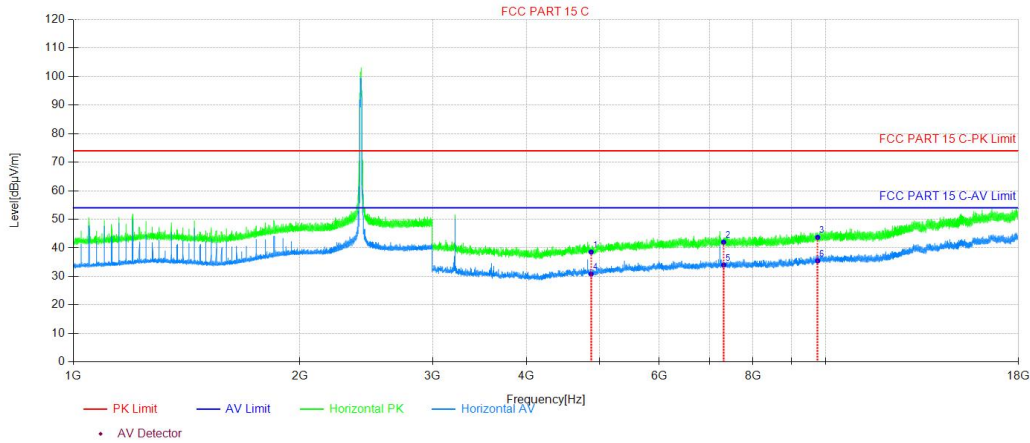


NO.	Freq. [MHz]	Reading Level [dBµV]	Correct Factor [dB/m]	Result Level [dBµV/m]	Limit [dBµV/m]	Margin [dB]	Height [cm]	Angle [°]	Remark
1	4824.09	46.69	-1.18	45.51	74.00	28.49	150	24	Peak
2	7236.21	44.02	2.58	46.60	74.00	27.40	150	353	Peak
3	9648.33	38.28	5.34	43.62	74.00	30.38	150	289	Peak
4	4824.09	38.12	-1.18	36.94	54.00	17.06	150	35	AV
5	7236.21	38.84	2.58	41.42	54.00	12.58	150	353	AV
6	9648.33	31.08	5.34	36.42	54.00	17.58	150	97	AV



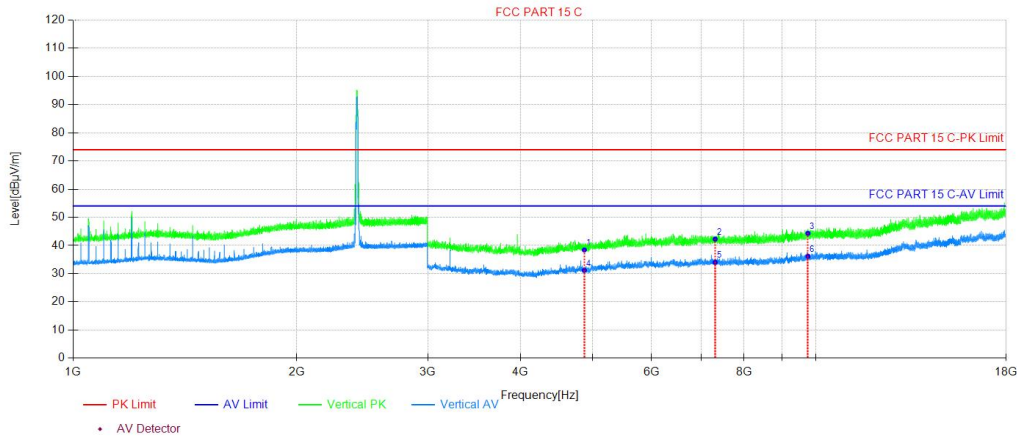
11B 2437MHz

Horizontal:



NO.	Freq. [MHz]	Reading Level [dBµV]	Correct Factor [dB/m]	Result Level [dBµV/m]	Limit [dBµV/m]	Margin [dB]	Height [cm]	Angle [°]	Remark
1	4874.34	40.25	-1.72	38.53	74.00	35.47	150	176	Peak
2	7311.21	39.66	2.35	42.01	74.00	31.99	150	113	Peak
3	9748.08	37.34	6.35	43.69	74.00	30.31	150	64	Peak
4	4874.34	32.55	-1.72	30.83	54.00	23.17	150	1	AV
5	7311.21	31.67	2.35	34.02	54.00	19.98	150	133	AV
6	9748.08	29.12	6.35	35.47	54.00	18.53	150	360	AV

Vertical:

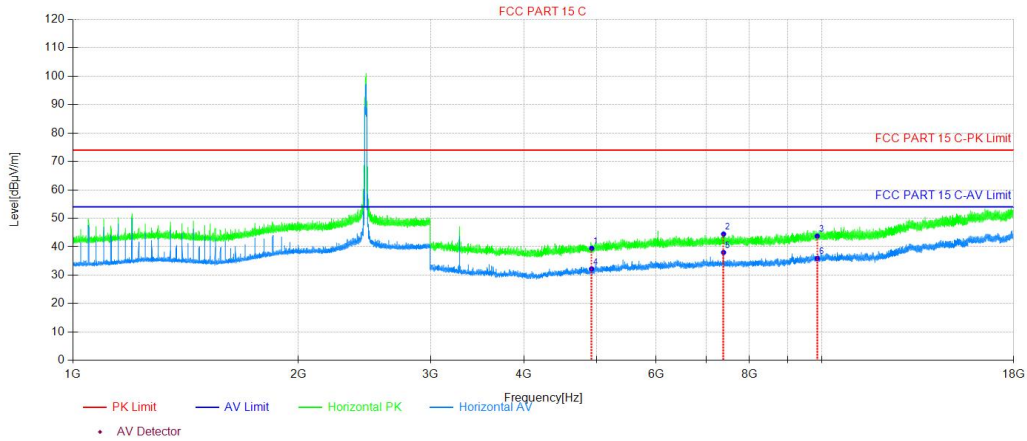


NO.	Freq. [MHz]	Reading Level [dBµV]	Correct Factor [dB/m]	Result Level [dBµV/m]	Limit [dBµV/m]	Margin [dB]	Height [cm]	Angle [°]	Remark
1	4874.34	40.15	-1.72	38.43	74.00	35.57	150	287	Peak
2	7311.21	39.93	2.35	42.28	74.00	31.72	150	2	Peak
3	9748.08	38.00	6.35	44.35	74.00	29.65	150	354	Peak
4	4874.34	32.97	-1.72	31.25	54.00	22.75	150	249	AV
5	7311.21	31.70	2.35	34.05	54.00	19.95	150	90	AV
6	9748.08	29.83	6.35	36.18	54.00	17.82	150	1	AV



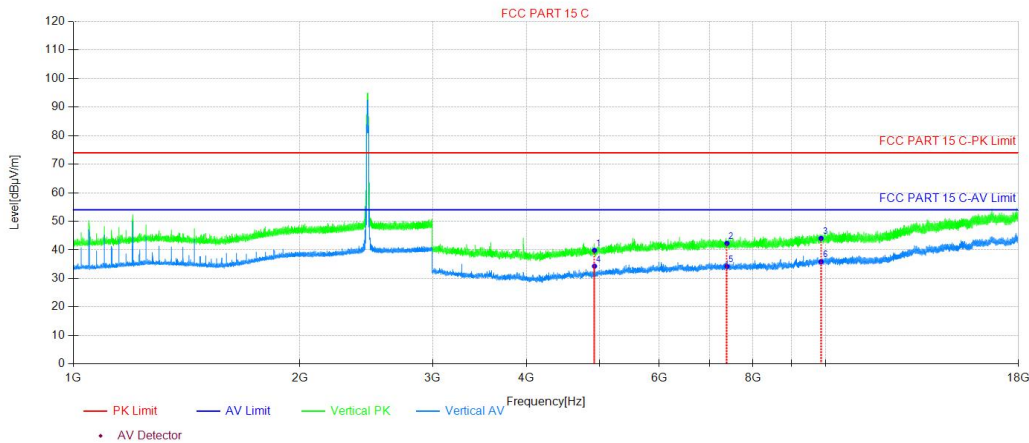
11B 2462MHz

Horizontal:



NO.	Freq. [MHz]	Reading Level [dBµV]	Correct Factor [dB/m]	Result Level [dBµV/m]	Limit [dBµV/m]	Margin [dB]	Height [cm]	Angle [°]	Remark
1	4924.59	41.04	-1.57	39.47	74.00	34.53	150	162	Peak
2	7386.21	41.52	2.95	44.47	74.00	29.53	150	360	Peak
3	9848.59	37.72	6.04	43.76	74.00	30.24	150	268	Peak
4	4924.59	33.78	-1.57	32.21	54.00	21.79	150	183	AV
5	7386.21	35.05	2.95	38.00	54.00	16.00	150	303	AV
6	9848.59	29.84	6.04	35.88	54.00	18.12	150	4	AV

Vertical:



NO.	Freq. [MHz]	Reading Level [dBµV]	Correct Factor [dB/m]	Result Level [dBµV/m]	Limit [dBµV/m]	Margin [dB]	Height [cm]	Angle [°]	Remark
1	4924.59	41.42	-1.57	39.85	74.00	34.15	150	105	Peak
2	7386.21	39.32	2.95	42.27	74.00	31.73	150	198	Peak
3	9848.59	37.99	6.04	44.03	74.00	29.97	150	84	Peak
4	4924.59	35.86	-1.57	34.29	54.00	19.71	150	62	AV
5	7386.21	31.27	2.95	34.22	54.00	19.78	150	232	AV
6	9848.59	29.82	6.04	35.86	54.00	18.14	150	232	AV



Note:

1. The Measurement (Result Level) is calculated by Reading Level adding the Correct Factor(maybe including Ant.Factor and the Cable Factor etc.), The basic equation is as follows:

$$\text{Result Level} = \text{Reading Level} + \text{Correct Factor}(\text{including Ant.Factor, Cable Factor etc.})$$

2. The amplitude of 9KHz to 30MHz spurious emission that is attenuated by more than 20dB below the permissible limit has no need to be reported.

3. The amplitude of 18GHz to 25GHz spurious emission that is attenuated by more than 20dB below the permissible limit has no need to be report.

4. All channels had been pre-test, 802.11b(11B) is the worst case. only the worst case was reported.

3.9 Restricted bands around fundamental frequency

Test Requirement:	47 CFR Part 15C Section 15.209 and 15.205		
Test Method:	ANSI C63.10: 2013 Section 11.12		
Test Site:	Measurement Distance: 3m or 10m (Semi-Anechoic Chamber)		
Limit:	Frequency	Limit (dBuV/m)	Remark
	30MHz-88MHz	40.0	Quasi-peak
	88MHz-216MHz	43.5	Quasi-peak
	216MHz-960MHz	46.0	Quasi-peak
	960MHz-1GHz	54.0	Quasi-peak
Above 1GHz		54.0	Average Value
		74.0	Peak Value
Test Setup:			

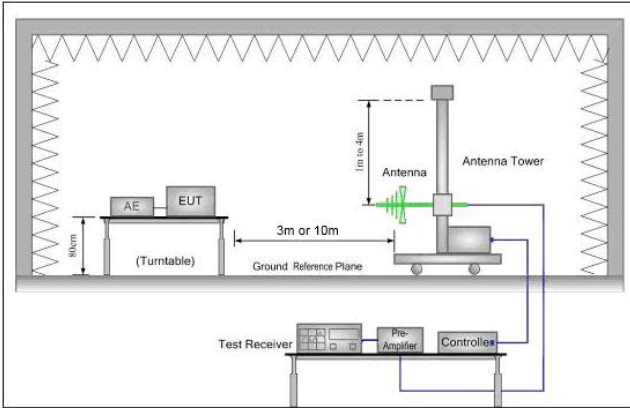


Figure 1. 30MHz to 1GHz

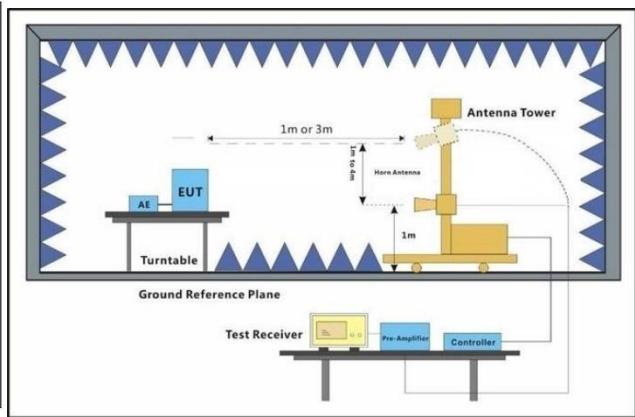


Figure 2. Above 1 GHz

Test Procedure:	<ol style="list-style-type: none"> For below 1GHz, the EUT was placed on the top of a rotating table 0.8 meters above the ground at a 3 or 10 meter semi-anechoic chamber. The table was rotated 360 degrees to determine the position of the highest radiation. For above 1GHz, the EUT was placed on the top of a rotating table 1.5 meters above the ground at a 3 meter semi-anechoic chamber. The table was rotated 360 degrees to determine the position of the highest radiation. The EUT was set 3 or 10 meters away from the interference-receiving antenna, which was mounted on the top of a variable-height antenna tower. The antenna height 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. 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. The test-receiver system was set to Peak Detect Function and Specified Bandwidth with Maximum Hold Mode. Place a marker at the end of the restricted band closest to the transmit frequency to show compliance. Also measure any emissions in the restricted bands. Save the spectrum analyzer plot. Repeat for each power and modulation for lowest and highest channel Test the EUT in the lowest channel , the Highest channel The radiation measurements are performed in X, Y, Z axis positioning for Transmitting mode, And found the X axis positioning which it is worse case. Repeat above procedures until all frequencies measured was complete.
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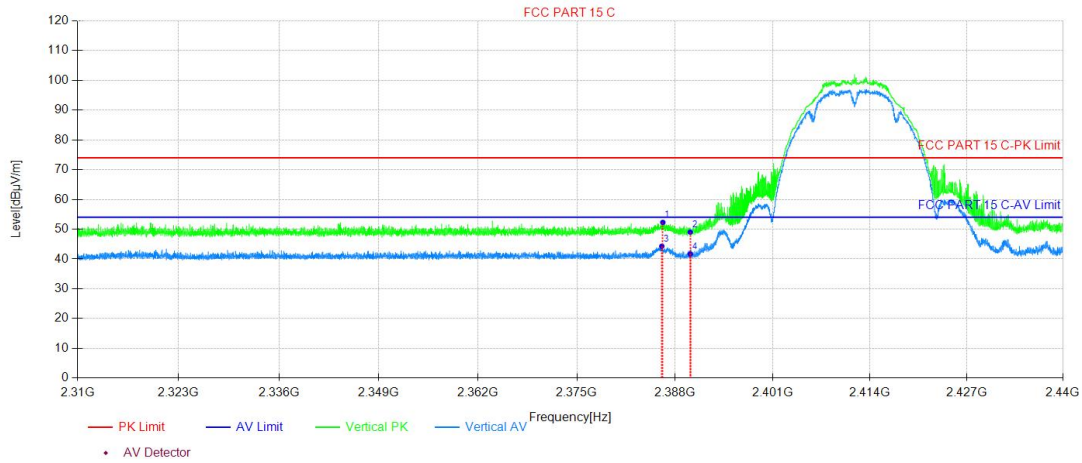


Test Configuration:	<p>Measurements Below 1000MHz</p> <ul style="list-style-type: none">• RBW = 120 kHz• VBW = 300 kHz• Detector = Peak• Trace mode = max hold <p>Peak Measurements Above 1000 MHz</p> <ul style="list-style-type: none">• RBW = 1 MHz• VBW \geq 3 MHz• Detector = Peak• Sweep time = auto• Trace mode = max hold <p>Average Measurements Above 1000MHz</p> <ul style="list-style-type: none">• RBW = 1 MHz• VBW = 10 Hz, when duty cycle is no less than 98 percent.• VBW \geq 1/T, when duty cycle is less than 98 percent where T is the minimum transmission duration over which the transmitter is on and is transmitting at its maximum power control level for the tested mode of operation.
Exploratory Test Mode:	Transmitting with all kind of modulations, data rates. Transmitting mode.
Final Test Mode:	Pretest the EUT at Charge + Transmitting mode. Through Pre-scan, find the 1Mbps of rate is the worst case of 802.11b; 6Mbps of rate is the worst case of 802.11g; 6.5Mbps of rate is the worst case of 802.11n(HT20); 13.5Mbps of rate is the worst case of 802.11n(HT40); 8Mbps of rate is the worst case of 802.11ax(HE20) ; 16Mbps of rate is the worst case of 802.11ax(HE40). Only the worst case is recorded in the report.
Instruments Used:	Refer to section 2.9 for details
Test Results:	Pass



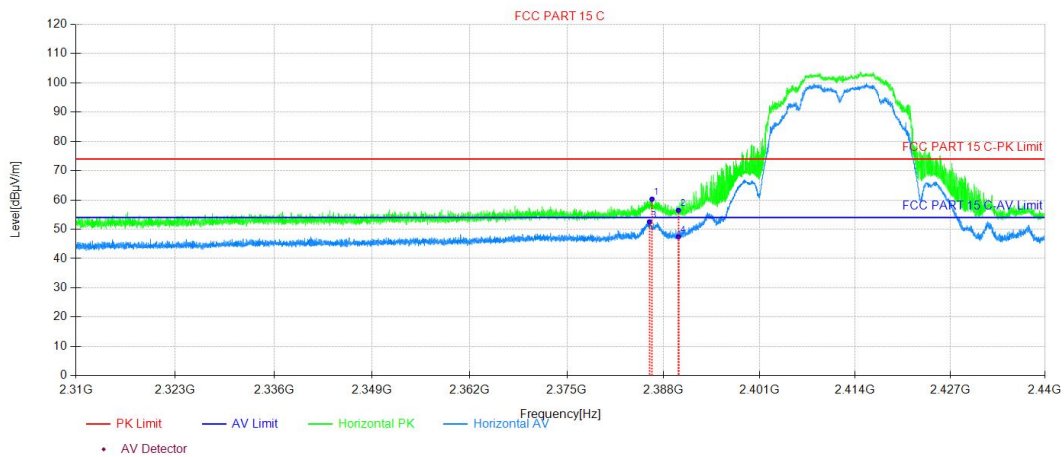
Test Date
11B 2412MHz

Vertical:



NO.	Freq. [MHz]	Reading Level [dBµV]	Correct Factor [dB/m]	Result Level [dBµV/m]	Limit [dBµV/m]	Margin [dB]	Height [cm]	Angle [°]	Remark
1	2386.36	50.94	1.37	52.31	74.00	21.69	150	297	Peak
2	2390.01	47.68	1.37	49.05	74.00	24.95	150	175	Peak
3	2386.23	42.92	1.37	44.29	54.00	9.71	150	175	AV
4	2390.01	40.33	1.37	41.70	54.00	12.30	150	143	AV

Horizontal:

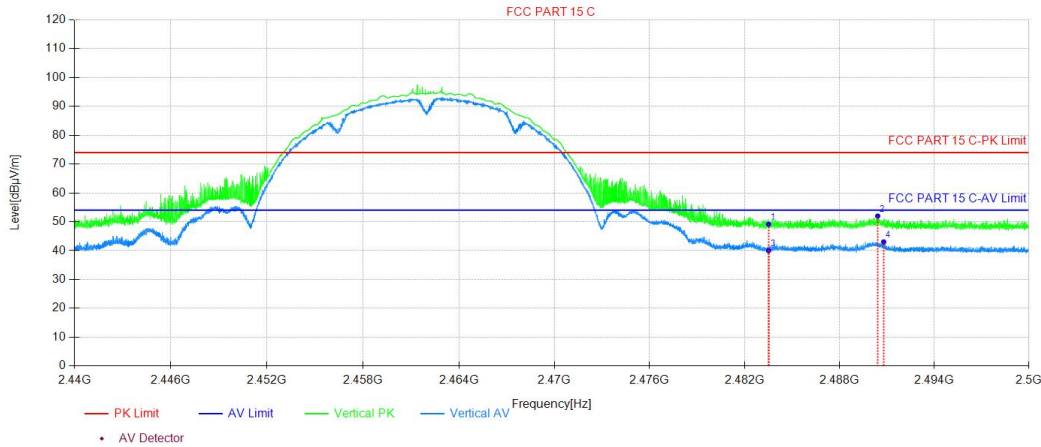


NO.	Freq. [MHz]	Reading Level [dBµV]	Correct Factor [dB/m]	Result Level [dBµV/m]	Limit [dBµV/m]	Margin [dB]	Height [cm]	Angle [°]	Remark
1	2386.44	58.90	1.37	60.27	74.00	13.73	150	275	Peak
2	2390.01	55.10	1.37	56.47	74.00	17.53	150	275	Peak
3	2386.10	51.15	1.37	52.52	54.00	1.48	150	267	AV
4	2390.01	46.06	1.37	47.43	54.00	6.57	150	275	AV



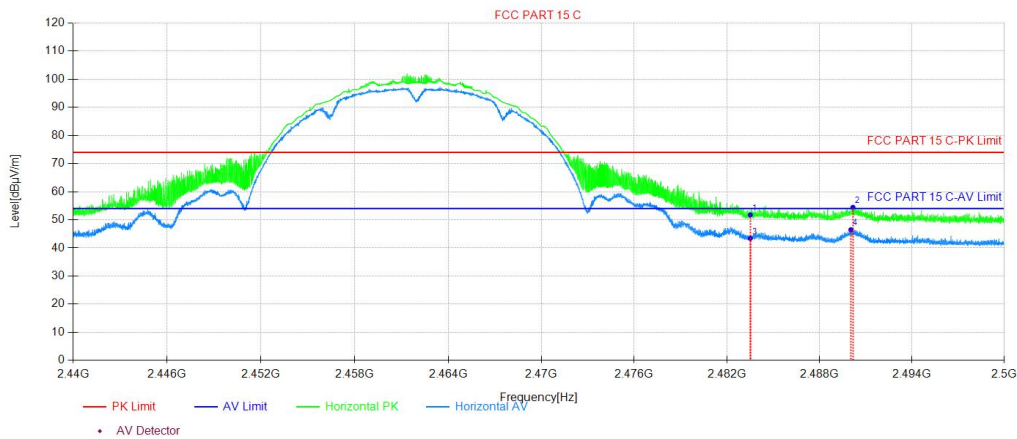
11B 2462MHz

Vertical:



NO.	Freq. [MHz]	Reading Level [dBµV]	Correct Factor [dB/m]	Result Level [dBµV/m]	Limit [dBµV/m]	Margin [dB]	Height [cm]	Angle [°]	Remark
1	2483.50	47.32	1.86	49.18	74.00	24.82	150	49	Peak
2	2490.41	50.13	1.87	52.00	74.00	22.00	150	87	Peak
3	2483.50	38.15	1.86	40.01	54.00	13.99	150	42	AV
4	2490.79	41.17	1.87	43.04	54.00	10.96	150	64	AV

Horizontal:



NO.	Freq. [MHz]	Reading Level [dBµV]	Correct Factor [dB/m]	Result Level [dBµV/m]	Limit [dBµV/m]	Margin [dB]	Height [cm]	Angle [°]	Remark
1	2483.50	49.91	1.86	51.77	74.00	22.23	150	295	Peak
2	2490.16	52.57	1.87	54.44	74.00	19.56	150	234	Peak
3	2483.50	41.55	1.86	43.41	54.00	10.59	150	6	AV
4	2490.03	44.62	1.87	46.49	54.00	7.51	150	243	AV

Note:

1. The 802.11b(11B) is the worse case.
2. The Measurement (Result Level) is calculated by Reading Level adding the Correct Factor(maybe including Ant.Factor and the Cable Factor etc.), The basic equation is as follows:

Result Level= Reading Level + Correct Factor(including Ant.Factor ,Cable Factor etc.)



3.10 AC Power Line Conducted Emissions

Test Requirement:	47 CFR Part 15C Section 15.207		
Test Method:	ANSI C63.10: 2013		
Test Frequency Range:	150kHz to 30MHz		
Limit:	Frequency range (MHz)	Limit (dBuV)	
		Quasi-peak	Average
	0.15-0.5	66 to 56*	56 to 46*
	0.5-5	56	46
	5-30	60	50
* Decreases with the logarithm of the frequency.			
Test Procedure:	<p>1) The mains terminal disturbance voltage test was conducted in a shielded room.</p> <p>2) The EUT was connected to AC power source through a LISN 1 (Line Impedance Stabilization Network) which provides a $50\Omega/50\mu\text{H} + 5\Omega$ linear impedance. The power cables of all other units of the EUT were connected to a second LISN 2, which was bonded to the ground reference plane in the same way as the LISN 1 for the unit being measured. A multiple socket outlet strip was used to connect multiple power cables to a single LISN provided the rating of the LISN was not exceeded.</p> <p>3) The tabletop EUT was placed upon a non-metallic table 0.8m above the ground reference plane. And for floor-standing arrangement, the EUT was placed on the horizontal ground reference plane,</p> <p>4) The test was performed with a vertical ground reference plane. The rear of the EUT shall be 0.4 m from the vertical ground reference plane. The vertical ground reference plane was bonded to the horizontal ground reference plane. The LISN 1 was placed 0.8 m from the boundary of the unit under test and bonded to a ground reference plane for LISNs mounted on top of the ground reference plane. This distance was between the closest points of the LISN 1 and the EUT. All other units of the EUT and associated equipment was at least 0.8 m from the LISN 2. In order to find the maximum emission, the relative positions of equipment and all of the interface cables must be changed according to ANSI C63.10 2013 on conducted measurement.</p>		
Test Setup:			
Exploratory Test Mode:	Transmitting with all kind of modulations, data rates at lowest, middle and		



	highest channel. Charge + Transmitting mode.
Final Test Mode:	Through Pre-scan, find the 6.5Mbps of rate of 802.11n(HT20) at lowest channel is the worst case. Transmitting mode. Only the worst case is recorded in the report.
Instruments Used:	Refer to section 2.9 for details
Test Results:	Pass

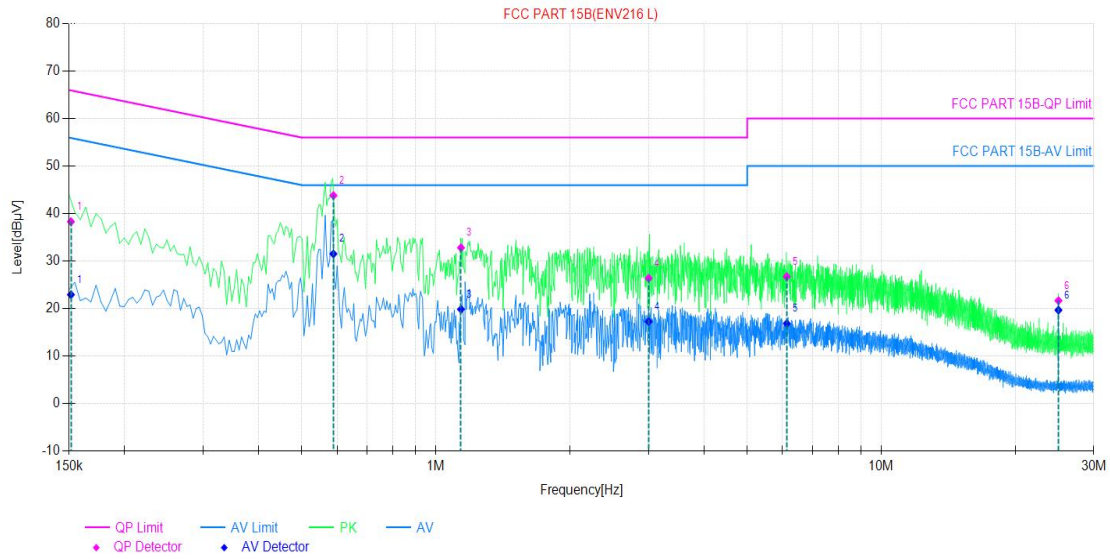


Measurement Data

An initial pre-scan was performed on the live and neutral lines with peak detector.

Quasi-Peak and Average measurement were performed at the frequencies with maximized peak emission were detected.

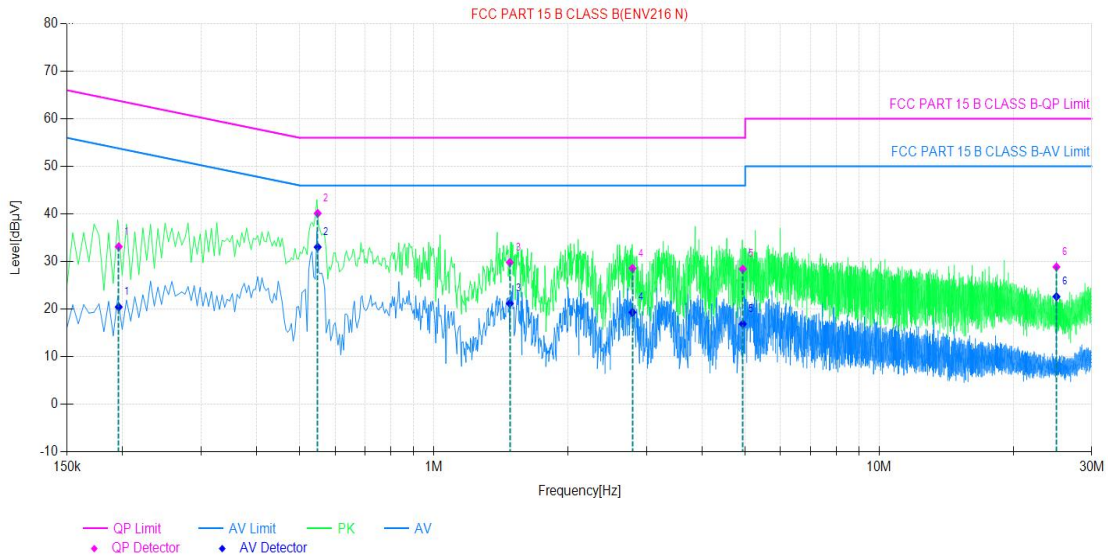
Live Line:



NO.	Freq. [MHz]	Correct Factor [dB]	QP Reading Level [dBµV]	QP Result Level [dBµV]	QP Limit [dBµV]	QP Margin [dB]	AV Reading Level [dBµV]	AV Result Level [dBµV]	AV Limit [dBµV]	AV Margin [dB]
1	0.15	9.89	28.79	38.68	63.78	25.10	12.05	21.94	53.78	31.84
2	0.58	9.83	28.15	37.98	56.00	18.02	21.19	31.02	46.00	14.98
3	1.13	9.72	17.24	26.96	56.00	29.04	8.72	18.44	46.00	27.56
4	3.00	9.74	17.3	27.04	56.00	28.96	8.82	18.56	46.00	27.44
5	6.13	9.84	20.1	29.94	60.00	30.06	8.06	17.90	50.00	32.10
6	24.99	10.20	23.68	33.88	60.00	26.12	11.49	21.69	50.00	28.31



Neutral Line:



NO.	Freq. [MHz]	Correct Factor [dB]	QP Reading Level [dBμV]	QP Result Level [dBμV]	QP Limit [dBμV]	QP Margin [dB]	AV Reading Level [dBμV]	AV Result Level [dBμV]	AV Limit [dBμV]	AV Margin [dB]
1	0.19	9.85	23.29	33.14	63.78	30.64	10.62	20.47	53.78	33.31
2	0.54	9.75	30.38	40.13	56.00	15.87	23.3	33.05	46.00	12.95
3	1.48	9.73	20.11	29.84	56.00	26.16	11.48	21.21	46.00	24.79
4	2.79	9.85	18.74	28.59	56.00	27.41	9.5	19.35	46.00	26.65
5	4.93	9.97	18.46	28.43	56.00	27.57	6.94	16.91	46.00	29.09
6	25.00	10.14	18.74	28.88	60.00	31.12	12.52	22.66	50.00	27.34

Remark:

1. The 802.11b is the worse case.
2. The following Quasi-Peak and Average measurements were performed on the EUT:
3. The Measurement (Result Level) is calculated by Reading Level adding the Correct Factor(maybe including LISN Factor and the Cable Factor etc.), The basic equation is as follows:

$$\text{Result Level} = \text{Reading Level} + \text{Correct Factor}(\text{including LISN Factor, Cable Factor etc.})$$



4 Appendix

Appendix A: Duty Cycle

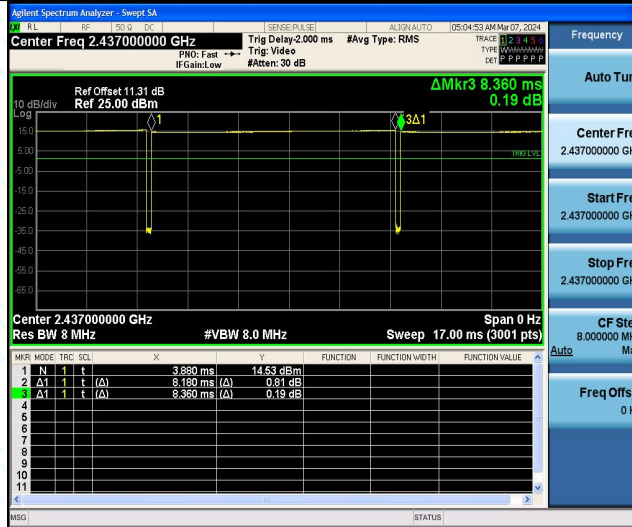
Test Result

Test Mode	Antenna	Freq(MHz)	ON Time [ms]	Period [ms]	DC [%]
11B	Ant1	2437	8.18	8.36	97.85
11G	Ant1	2437	1.36	1.53	88.89
11N20SISO	Ant1	2437	5.09	5.26	96.77
11N40SISO	Ant1	2437	2.46	2.63	93.54
11AX20SISO	Ant1	2437	4.55	4.72	96.40
11AX40SISO	Ant1	2437	2.31	2.48	93.15

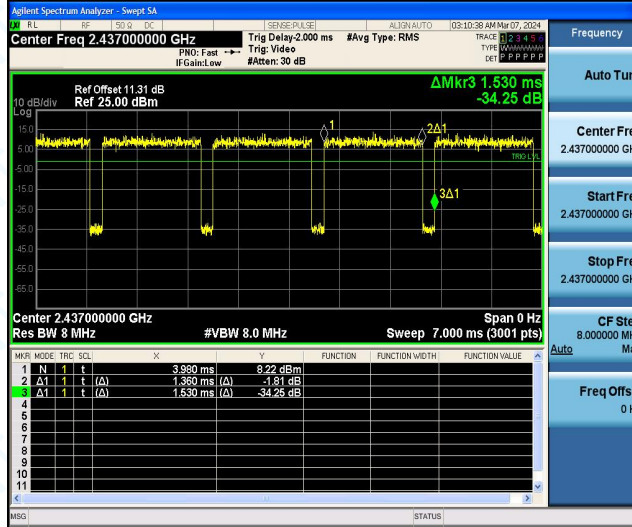


Test Graphs

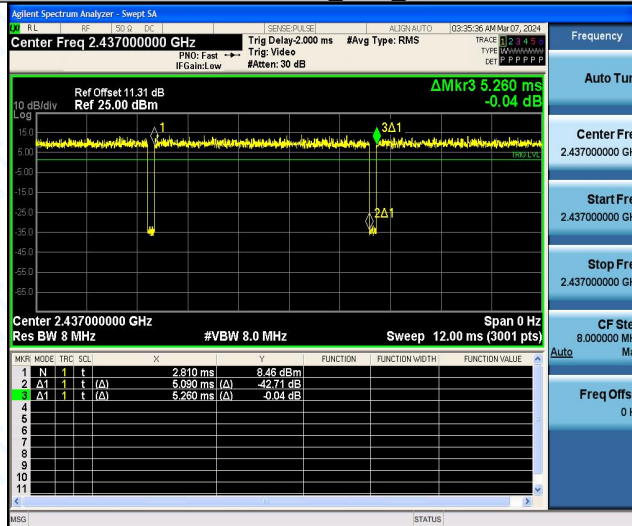
11B Ant1 2437



11G Ant1 2437

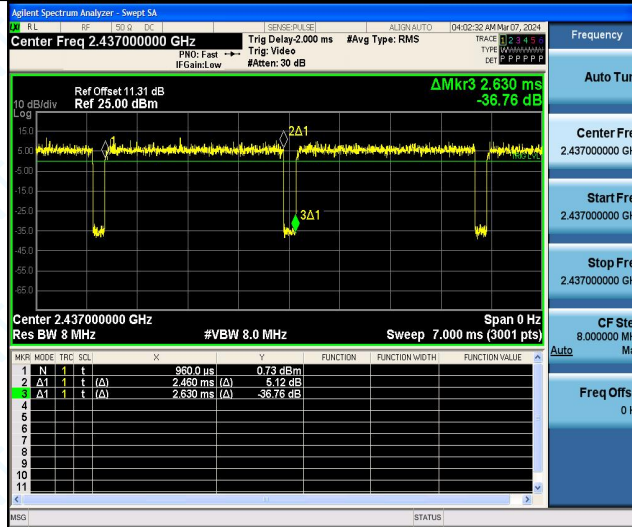


11N20SISO Ant1 2437

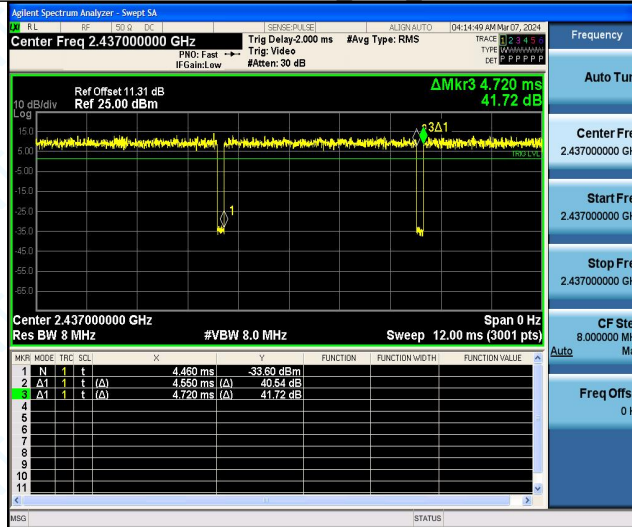




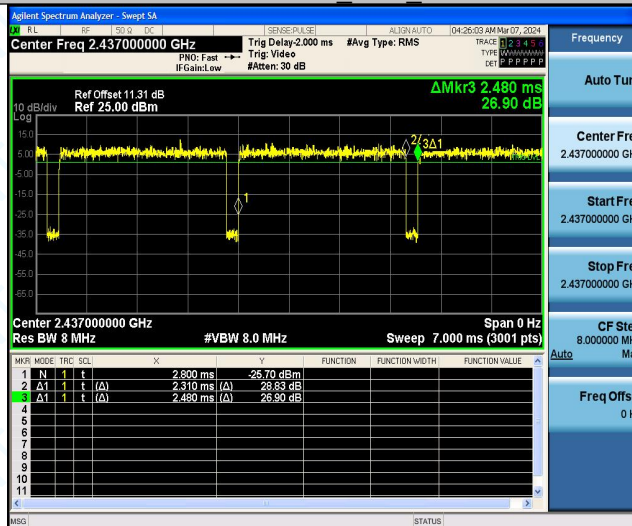
11N40SISO Ant1 2437



11AX20SISO Ant1 2437



11AX40SISO Ant1 2437





Appendix B: DTS Bandwidth

Test Result

Test Mode	Antenna	Freq(MHz)	DTS BW [MHz]	FL[MHz]	FH[MHz]	Limit[MHz]	Verdict
11B	Ant1	2412	9.040	2407.480	2416.520	0.5	PASS
		2437	9.120	2432.440	2441.560	0.5	PASS
		2462	9.600	2457.440	2467.040	0.5	PASS
11G	Ant1	2412	16.360	2403.800	2420.160	0.5	PASS
		2437	16.320	2428.840	2445.160	0.5	PASS
		2462	16.360	2453.800	2470.160	0.5	PASS
11N20SISO	Ant1	2412	17.720	2403.120	2420.840	0.5	PASS
		2437	17.600	2428.200	2445.800	0.5	PASS
		2462	17.600	2453.200	2470.800	0.5	PASS
11N40SISO	Ant1	2422	33.840	2404.800	2438.640	0.5	PASS
		2437	35.040	2419.480	2454.520	0.5	PASS
		2452	35.120	2434.480	2469.600	0.5	PASS
11AX20SISO	Ant1	2412	18.960	2402.520	2421.480	0.5	PASS
		2437	18.880	2427.520	2446.400	0.5	PASS
		2462	18.920	2452.560	2471.480	0.5	PASS
11AX40SISO	Ant1	2422	35.600	2403.440	2439.040	0.5	PASS
		2437	37.280	2418.440	2455.720	0.5	PASS
		2452	37.280	2433.520	2470.800	0.5	PASS



Test Graphs

11B Ant1 2412



11B Ant1 2437



11B Ant1 2462





11G Ant1 2412



11G Ant1 2437



11G Ant1 2462





11N20SISO Ant1 2412



11N20SISO Ant1 2437



11N20SISO Ant1 2462

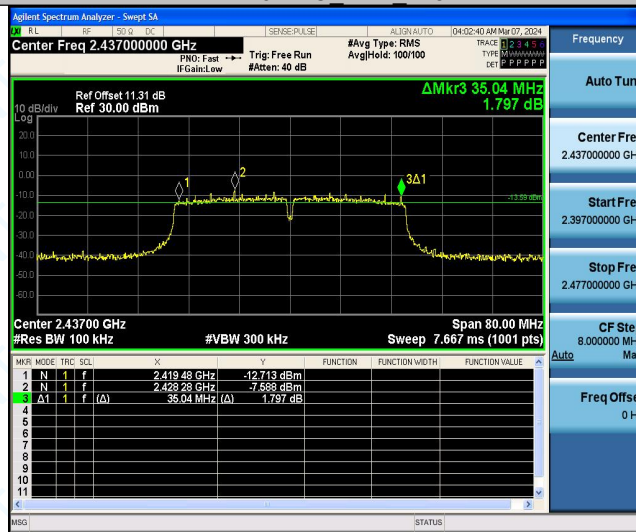




11N40SISO Ant1 2422



11N40SISO Ant1 2437



11N40SISO Ant1 2452





11AX20SISO Ant1 2412



11AX20SISO Ant1 2437



11AX20SISO Ant1 2462

