

TEST REPORT

Product Name: WiFi/BT Module
Trade Mark: msi
Model No. / HVIN: MWH540S
Add. Model No. / HVIN: N/A
Report Number: 24112914988RFC-3
Test Standards: FCC 47 CFR Part 15 Subpart C
RSS-247 Issue 3
RSS-Gen Issue 5
FCC ID: I4L-MWH540S
IC: 3715A-MWH540S
Test Result: PASS
Date of Issue: January 7, 2025

Prepared for:

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No. 69, Lide St., Zhonghe Dist., New Taipei City 235, Taiwan

Prepared by:

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Version

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V1.0	January 7, 2025	Original



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1. GENERAL INFORMATION

1.1 CLIENT INFORMATION

Applicant:	Micro-Star Int'l Co., Ltd.
Address of Applicant:	No. 69, Lide St., Zhonghe Dist., New Taipei City 235, Taiwan
Manufacturer:	Micro-Star Int'l Co., Ltd.
Address of Manufacturer:	No. 69, Lide St., Zhonghe Dist., New Taipei City 235, Taiwan

1.2 EUT INFORMATION

1.2.1 General Description of EUT

Product Name:	WiFi/BT Module		
Model No.:	MWH540S		
Trade Mark:	msi		
DUT Stage:	Identical Prototype		
EUT Supports Function: (Provided by the customer)	2.4 GHz ISM Band:	IEEE 802.11b/g/n	
		Bluetooth V5.0	
	5 GHz U-NII Bands:	5 150 MHz to 5 350 MHz	IEEE 802.11a/n/ac
		5 470 MHz to 5 725 MHz	IEEE 802.11a/n/ac
		5 725 MHz to 5 875 MHz	IEEE 802.11a/n/ac
Software Version:	N/A (Provided by the customer)		
Hardware Version:	V3.00 (Provided by the customer)		
Sample Received Date:	November 11, 2024		
Sample Tested Date:	December 11, 2024 to December 27, 2024		
Remark: The above EUT's information was provided by customer. Please refer to the specifications or user's manual for more detailed description.			

1.2.2 Description of Accessories

None.

1.3 PRODUCT SPECIFICATION SUBJECTIVE TO THIS STANDARD

Frequency Band:	2400 MHz to 2483.5 MHz	
Frequency Range:	2412 MHz to 2462 MHz	
Support Standards:	IEEE 802.11b/g/n-HT20/n-HT40	
Type of Modulation:	IEEE 802.11b: DSSS (CCK, DQPSK, DBPSK) IEEE 802.11g/n: OFDM (64QAM, 16QAM, QPSK, BPSK)	
Data Rate:	IEEE 802.11b: Up to 11 Mbps IEEE 802.11g: Up to 54 Mbps IEEE 802.11n-HT20/HT40: Up to MCS15	
Number of Channels:	IEEE 802.11b/g/n-HT20: 11 IEEE 802.11n-HT40: 7	
Channel Separation:	5 MHz	
Antenna Type: (Provided by the customer)	Antenna 1	Tube Antenna
	Antenna 2	Tube Antenna
Antenna Gain: (Provided by the customer)	Antenna 1	3.38 dBi
	Antenna 2	3.38 dBi
Normal Test Voltage:	3.3 Vdc	

1.4 OTHER INFORMATION

Operation Frequency Each of Channel	
IEEE 802.11b, IEEE 802.11g, IEEE 802.11n-HT20	$f = 2407 + 5k \text{ MHz}, k = 1, \dots, 11$
IEEE 802.11n-HT40	$f = 2407 + 5k \text{ MHz}, k = 3, \dots, 9$
Note: f is the operating frequency (MHz); k is the operating channel.	

1.5 DESCRIPTION OF SUPPORT UNITS

The EUT has been tested with associated equipment below.

1) Support Equipment

Description	Manufacturer	Model No.	Serial Number	Supplied by
Notebook	DELL	Inspiron 5593	N/A	UnionTrust
Mouse	DELL	MS111	CN-011D3V-738	UnionTrust

2) Support Cable

Cable No.	Description	Connector	Length (Meter)	Supplied by
1	Antenna Cable	SMA	0.2 Meter	UnionTrust

1.6 TEST LOCATION

Shenzhen UnionTrust Quality and Technology Co., Ltd.

Address: 16/F, Block A, Building 6th, Baoneng Science and Technology Park, Longhua Street, Longhua District, Shenzhen, China

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1.7 TEST FACILITY

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

CNAS-Lab Code: L9069

The measuring equipment utilized to perform the tests documented in this report has been calibrated once a year or in accordance with the manufacturer's recommendations, and is traceable under the ISO/IEC 17025 to international or national standards. Equipment has been calibrated by accredited calibration laboratories.

A2LA-Lab Certificate No.: 4312.01

Shenzhen UnionTrust Quality and Technology Co., Ltd. has been accredited by A2LA for technical competence in the field of electrical testing, and proved to be in compliance with ISO/IEC 17025 General Requirements for the Competence of Testing and Calibration Laboratories and any additional program requirements in the identified field of testing.

ISED Wireless Device Testing Laboratories

CAB identifier: CN0032

FCC Accredited Lab.

Designation Number: CN1194

Test Firm Registration Number: 259480

1.8 DEVIATION FROM STANDARDS

None.

1.9 ABNORMALITIES FROM STANDARD CONDITIONS

None.

1.10 OTHER INFORMATION REQUESTED BY THE CUSTOMER

None.

1.11 MEASUREMENT UNCERTAINTY

Where relevant, the following measurement uncertainty levels have been estimated for tests performed on the Product as specified in CISPR 16-4-2. This uncertainty represents an expanded uncertainty expressed at approximately the 95% confidence level using a coverage factor of k=2.

No.	Item	Measurement Uncertainty
1	Conducted emission 9KHz-150KHz	±3.8 dB
2	Conducted emission 150KHz-30MHz	±3.4 dB
3	Radiated emission 9KHz-30MHz	±4.9 dB
4	Radiated emission 30MHz-1GHz	±4.7 dB
5	Radiated emission 1GHz-18GHz	±5.1 dB
6	Radiated emission 18GHz-26GHz	±5.2 dB
7	Radiated emission 26GHz-40GHz	±5.2 dB
8	Radio frequency	± 6.5 x 10 ⁻⁸
9	Occupied Channel Bandwidth	± 1.86 %
10	RF output power, conducted	± 0.68 dB
11	Power Spectral Density	± 0.6 dB
12	Spurious emissions, conducted	± 2.7 dB
13	Time	± 0.19 %

2. TEST SUMMARY

Test Cases			
Test Item	Test Requirement	Test Method	Result
Antenna Requirement	FCC 47 CFR Part 15 Subpart C Section 15.203/15.247 (b)(4) RSS-Gen Issue 5, Section 6.8	N/A	PASS ^{NOTE 1}
AC Power Line Conducted Emission	FCC 47 CFR Part 15 Subpart C Section 15.207 RSS-Gen Issue 5, Section 8.8	ANSI C63.10-2013 Clause 6.2	VERIFIED ^{NOTE 1}
Conducted Peak Output Power	FCC 47 CFR Part 15 Subpart C Section 15.247 (b)(3) RSS-247 Issue 3, Section 5.4(d)	ANSI C63.10-2013 Clause 11.9.1.3	VERIFIED ^{NOTE 1}
6dB Bandwidth	FCC 47 CFR Part 15 Subpart C Section 15.247 (a)(2) RSS-247 Issue 3, Section 5.2(a)	ANSI C63.10-2013 Clause 11.8.1	VERIFIED ^{NOTE 1}
Occupied Bandwidth	RSS-Gen Issue 5, Section 6.7	RSS-Gen Issue 5, Section 6.7	VERIFIED ^{NOTE 1}
Power Spectral Density	FCC 47 CFR Part 15 Subpart C Section 15.247 (e) RSS-247 Issue 3, Section 5.2(b)	ANSI C63.10-2013 Clause 11.10.2	VERIFIED ^{NOTE 1}
Conducted Out of Band Emission	FCC 47 CFR Part 15 Subpart C Section 15.247(d) RSS-247 Issue 3, Section 5.5	ANSI C63.10-2013 Clause 11.11	VERIFIED ^{NOTE 1}
Radiated Spurious Emissions	FCC 47 CFR Part 15 Subpart C Section 15.205/15.209 RSS-Gen Issue 5, Section 6.13/8.9/8.10	ANSI C63.10-2013 Clause 11.11 & Clause 11.12	PASS ^{NOTE 1}
Band Edge Measurements (Radiated)	FCC 47 CFR Part 15 Subpart C Section 15.205/15.209 RSS-247 Issue 3, Section 5.5	ANSI C63.10-2013 Clause 11.13	PASS ^{NOTE 1}
Note: 1) This report base on previous reports no.: SRTC2024-9004(F)-24032606(F) Issued by The State Radio_monitoring_center Testing Center (SRTC). Change Antenna, after evaluation, all data refer to previous reports except for the EIRP calculation and verifying the all Radiated Spurious Emissions and Band Edge Measurements (Radiated) tests.			
Disclaimer and Explanations: The declared of product specification and data (e.g., antenna gain, RF specification, etc) for EUT presented in the report are provided by the customer, and the customer takes all the responsibilities for the accuracy of product specification.			

3. EQUIPMENT LIST

Radiated Emission Test Equipment List						
Used	Equipment	Manufacturer	Model No.	Serial Number	Cal. date	Cal. Due date
☒	3m SAC	ETS-LINDGREN	3M	Euroshiedpn-CT001270-1317	11-Nov-2023	10-Nov-2026
☒	Receiver	R&S	ESIB26	100114	25-Oct-2024	24-Oct-2025
☒	Loop Antenna	ETS-LINDGREN	6502	00202525	28-Oct-2024	27-Oct-2025
☒	Broadband Antenna	ETS-LINDGREN	3142E	00201566	29-Oct-2024	28-Oct-2025
☒	6dB Attenuator	Talent	RA6A5-N-18	18103001	29-Oct-2024	28-Oct-2025
☒	Preamplifier	HP	8447F	2805A02960	25-Oct-2024	24-Oct-2025
☒	Double-Ridged Waveguide Horn Antenna (Pre-amplifier)	ETS-LINDGREN	3117-PA	00201541	01-Apr-2024	31-Mar-2025
☒	Pre-amplifier	ETS-LINDGREN	00118385	00201874	01-Apr-2024	31-Mar-2025
☒	Double-Ridged Waveguide Horn Antenna (Pre-amplifier)	ETS-LINDGREN	3116C-PA	00202652	28-Oct-2024	27-Oct-2025
☒	Pre-amplifier	ETS-LINDGREN	00118384	00202652	28-Oct-2024	27-Oct-2025
☒	Band Rejection Filter (2400MHz~2500MHz)	Micro-Tronics	BRM50702	G590	17-Jan-2024	16-Jan-2025
☒	Multi device Controller	ETS-LINDGREN	7006-001	00160105	N/A	N/A
☒	Test Software	Audix	e3	Software Version: 9.160323		

RF Conducted Test Equipment List						
Used	Equipment	Manufacturer	Model No.	Serial Number	Cal. date	Cal. Due date
☒	EXA Spectrum Analyzer	KEYSIGHT	N9010A	MY51440197	29-Mar-2024	28-Mar-2025
☐	EXA Spectrum Analyzer	KEYSIGHT	N9020A	MY51286807	25-Oct-2024	24-Oct-2025
☒	USB Wideband Power Sensor	KEYSIGHT	U2021XA	MY55430035	25-Oct-2024	24-Oct-2025

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4. TEST CONFIGURATION

4.1 ENVIRONMENTAL CONDITIONS FOR TESTING

4.1.1 Normal or Extreme Test Conditions

Environment Parameter	Selected Values During Tests		
Test Condition	Ambient		
	Temperature (°C)	Voltage (V)	Relative Humidity (%)
NT/NV	+15 to +35	3.3	20 to 75
Remark: 1) NV: Normal Voltage; NT: Normal Temperature			

4.1.2 Record of Normal Environment and Test Sample

Test Item	Temp. (°C)	Relative Humidity (%)	Pressure (kPa)	Sample No.	Tested by
Radiated Spurious Emissions	21.1	31.6	100.6	S202410304552-PJA01	Jackson Wu
Band Edge Measurements (Radiated)					

4.2 TEST CHANNELS

Mode	Tx/Rx Frequency (MHz)	Test RF Channel Lists		
		Lowest(L)	Middle(M)	Highest(H)
IEEE 802.11b	2412-2462	Channel 1	Channel 6	Channel 11
IEEE 802.11g		2412 MHz	2437 MHz	2462 MHz
IEEE 802.11n-HT20				
Mode	Tx/Rx Frequency (MHz)	Test RF Channel Lists		
		Lowest(L)	Middle(M)	Highest(H)
IEEE 802.11n-HT40	2422-2452	Channel 3	Channel 6	Channel 9
		2422 MHz	2437 MHz	2452 MHz

4.3 EUT TEST STATUS

Mode	Tx/Rx Function	Description
IEEE 802.11b	1Tx/1Rx	1. Keep the EUT in continuously transmitting or receiving with modulation and data rates test single. 2. Keep the equipment in normal operation and achieve a certain throughput.
IEEE 802.11g		
IEEE 802.11n-HT20	2Tx/2Rx	
IEEE 802.11n-HT40		

Test Software (Provided by the customer)
MPTool

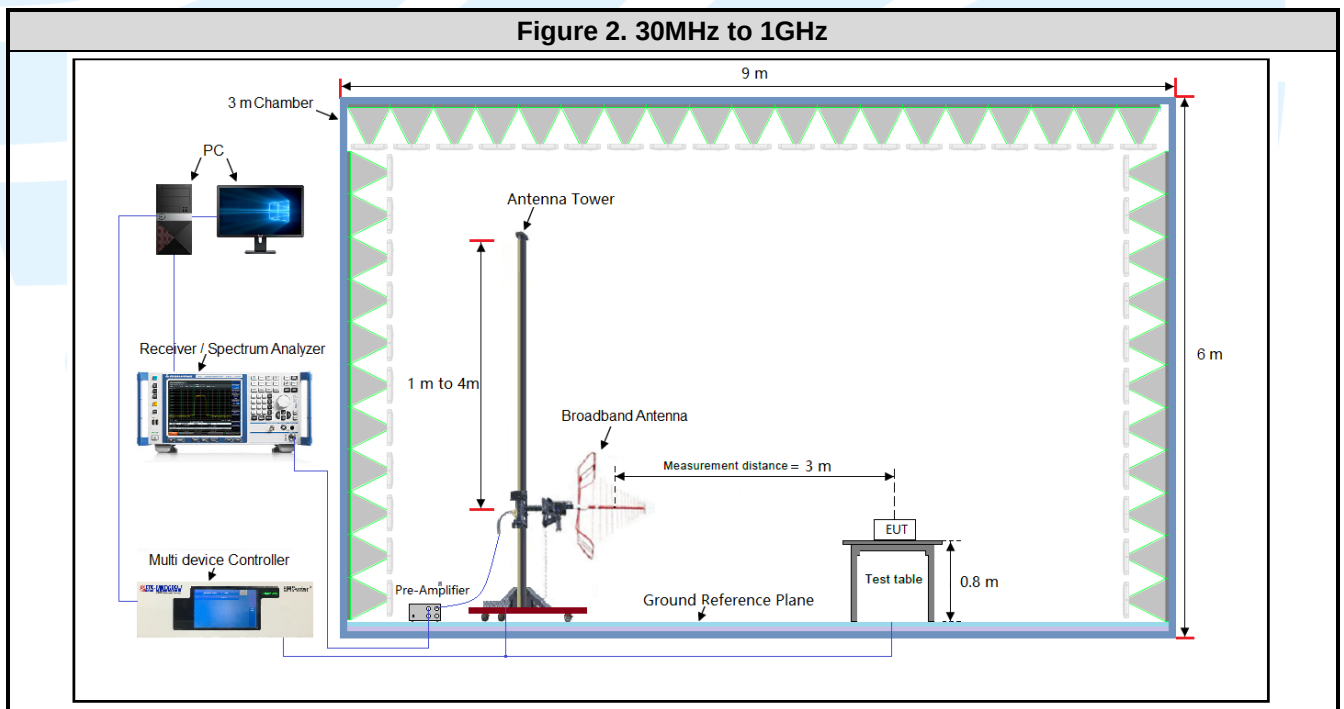
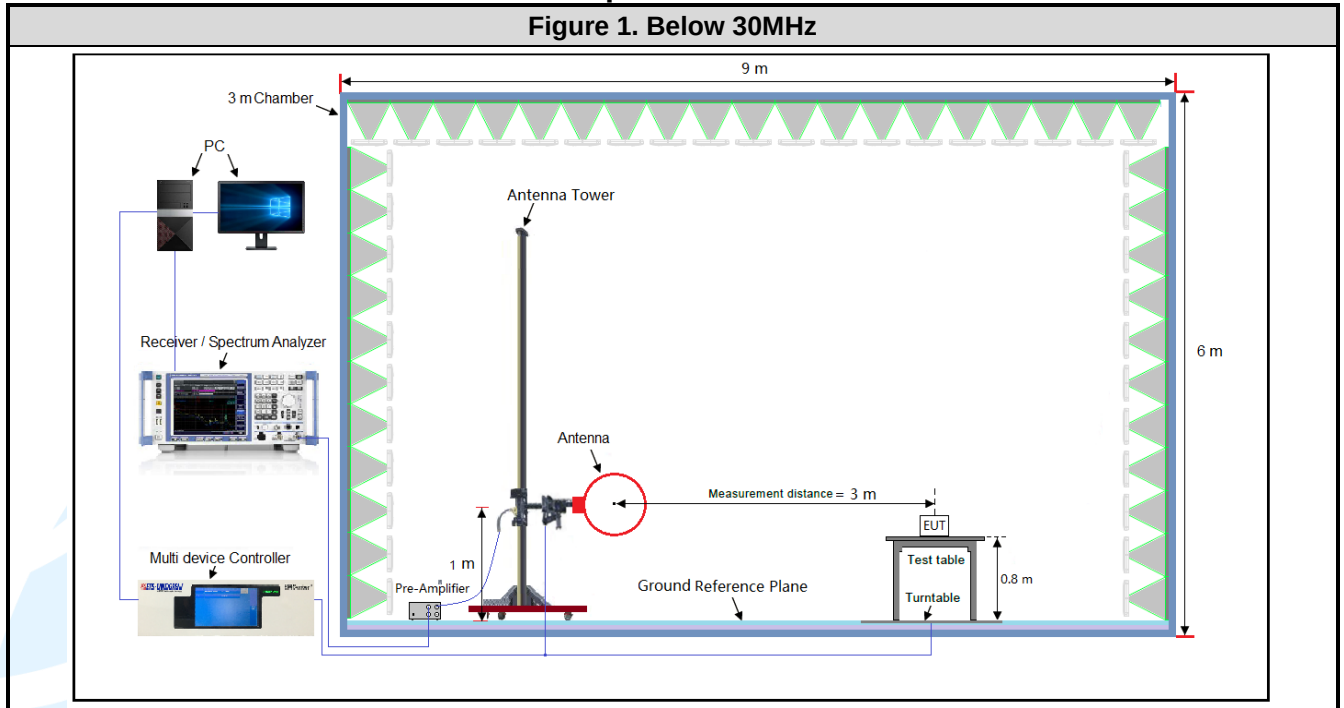
4.4 PRE-SCAN

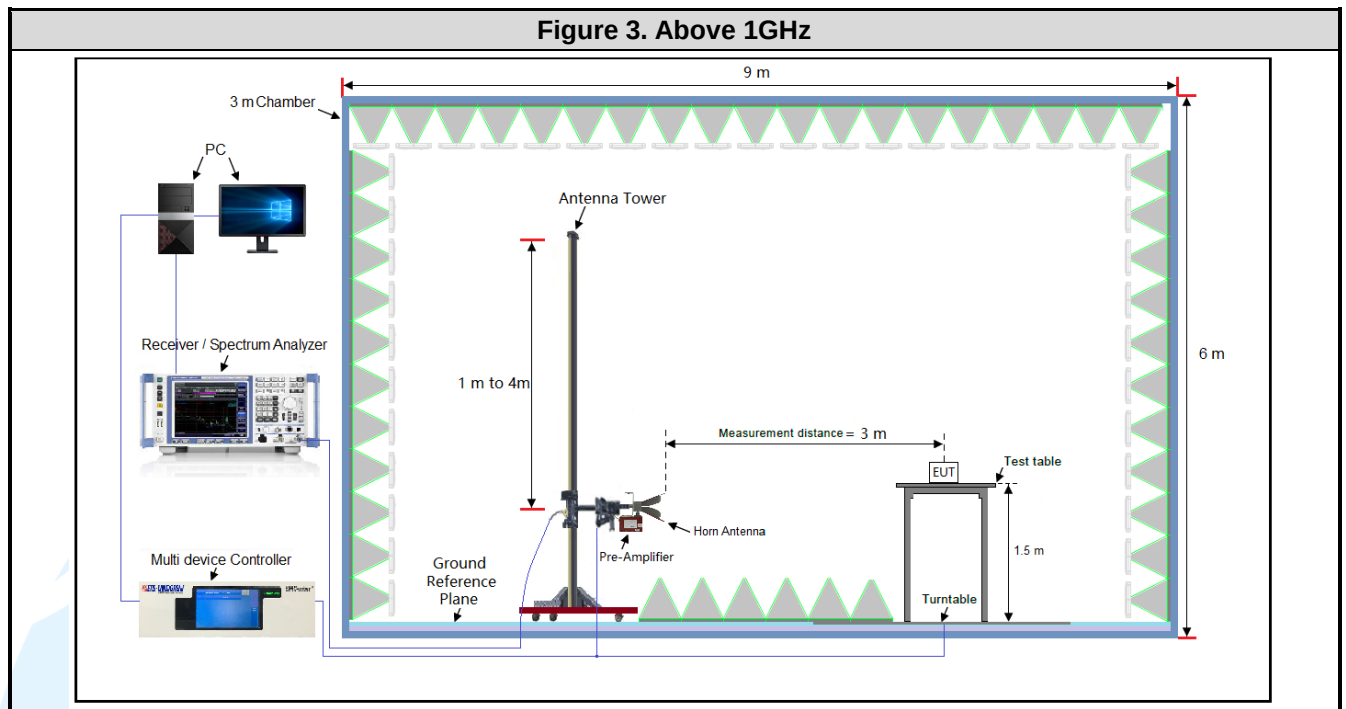
Pre-Scan has been conducted to determine the worst-case mode from all possible combinations between available modulations and data rate. Following data rate was (were) selected for the final test as listed below

Mode	Worst-case data rates
IEEE 802.11b	1 Mbps
IEEE 802.11g	6 Mbps
IEEE 802.11n-HT20	MCS8
IEEE 802.11n-HT40	MCS8

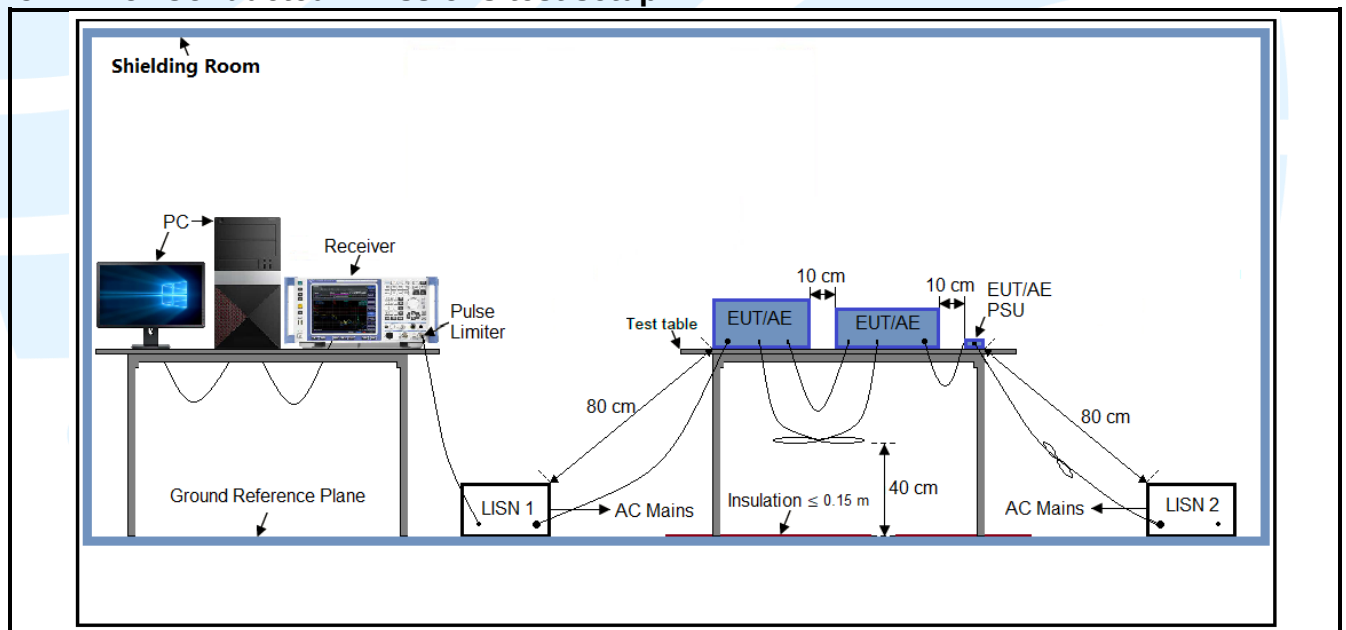
4.5 TEST SETUP

4.5.1 For Radiated Emissions test setup

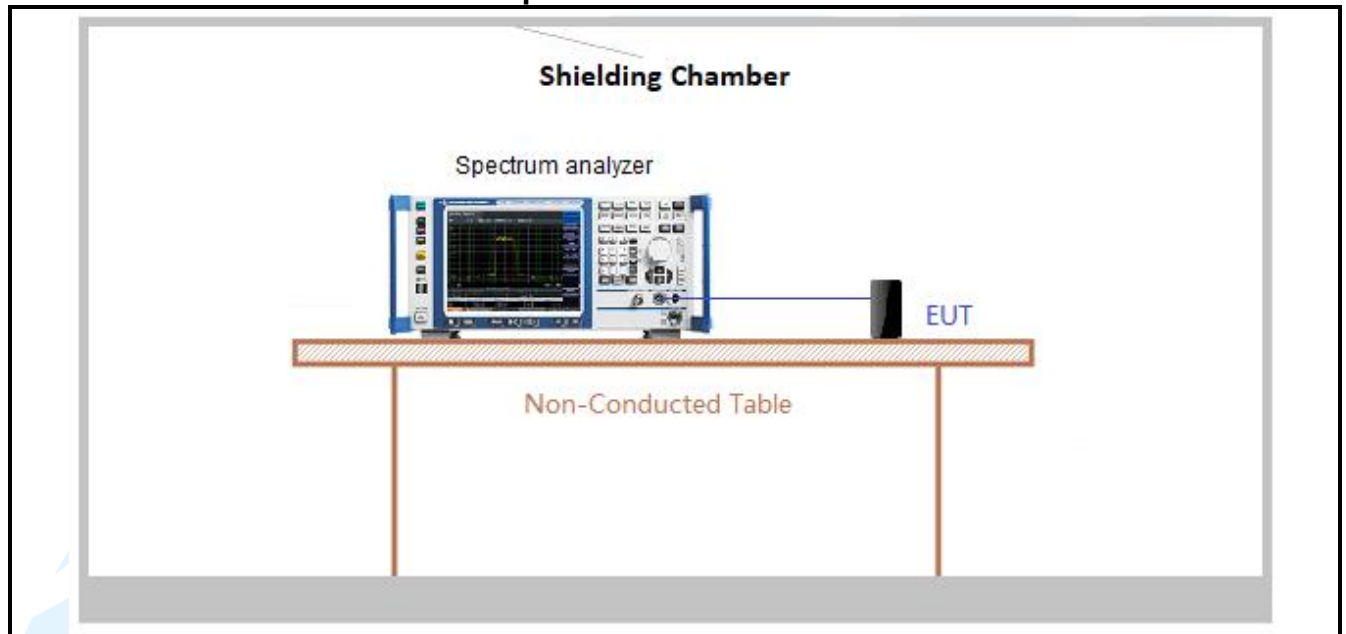




4.5.2 For Conducted Emissions test setup



4.5.3 For Conducted RF test setup



4.6 SYSTEM TEST CONFIGURATION

For emissions testing, the equipment under test (EUT) setup to transmit continuously to simplify the measurement methodology. Care was taken to ensure proper power supply voltages during testing. During testing, radiated emission were performed with the EUT set to transmit at the channel with highest output power as worst-case scenario. Only the worst case data were recorded in this test report.

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

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

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

5. RADIO TECHNICAL REQUIREMENTS SPECIFICATION

5.1 REFERENCE DOCUMENTS FOR TESTING

No.	Identity	Document Title
1	FCC 47 CFR Part 2	Frequency allocations and radio treaty matters; general rules and regulations
2	FCC 47 CFR Part 15	Radio Frequency Devices
3	ANSI C63.10-2013	American National Standard for Testing Unlicensed Wireless Devices
4	KDB 558074 D01 15.247 Meas Guidance v05r02	Guidance for compliance measurements on Digital Transmission Systems, Frequency Hopping Spread Spectrum system, and Hybrid system devices operating under Section 15.247 of the FCC rules
5	KDB 662911 D01 Multiple Transmitter Output v02r01	Emissions Testing of Transmitters with Multiple Outputs in the Same Band

5.2 ANTENNA REQUIREMENT

Standard Requirement
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.
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.
RSS-Gen Issue 5, Section 6.8 requirement: According to RSS-Gen Issue 5, Section 6.8, a transmitter can only be sold or operated with antennas with which it was certified. A transmitter may be certified with multiple antenna types. An antenna type comprises antennas having similar in-band and out-of-band radiation patterns.
EUT Antenna: The antenna adopts IPEX interface and no consideration of replacement. The gain of the antenna is 3.38 dBi.

5.3 CONDUCTED PEAK OUTPUT POWER

- Test Requirement:** RSS-247 Issue 3, Section 5.4(d)
- Test Method:** ANSI C63.10-2013 Clause 11.9.1.3
- Limit:** For DTSSs employing digital modulation techniques operating in the band 2400-2483.5 MHz, the maximum peak conducted output power shall not exceed 1W. The e.i.r.p. shall not exceed 4 W, except as fixed point-to-point systems.
- Test Procedure:**
1. Remove the antenna from the EUT and then connect a low loss RF cable from the antenna port to the power meter.
 2. Measure out each test modes' peak or average output power, record the power level.
- Note: The cable loss and attenuator loss were offset into measure device as an amplitude offset.
- Test Setup:** Refer to section 4.5.3 for details.
- Instruments Used:** Refer to section 3 for details
- Test Results:**

Test Mode	Frequency	Antenna	Max. Peak Power	Peak EIRP	Peak EIRP Limit	Max. Avg. Power
	(MHz)		(dBm)	(dBm)	(dBm)	(dBm)
802.11b	2412	Ant. 1	17.63	21.01	36.02	14.51
802.11b	2437	Ant. 1	18.57	21.95	36.02	15.06
802.11b	2462	Ant. 1	17.91	21.29	36.02	14.65
802.11b	2412	Ant. 2	17.57	20.95	36.02	14.25
802.11b	2437	Ant. 2	17.72	21.10	36.02	14.50
802.11b	2462	Ant. 2	17.84	21.22	36.02	14.57
802.11g	2412	Ant. 1	22.63	26.01	36.02	14.10
802.11g	2437	Ant. 1	21.02	24.40	36.02	12.81
802.11g	2462	Ant. 1	23.18	26.56	36.02	14.83
802.11g	2412	Ant. 2	21.36	24.74	36.02	13.38
802.11g	2437	Ant. 2	23.22	26.60	36.02	14.97
802.11g	2462	Ant. 2	22.07	25.45	36.02	13.88
802.11n HT20	2412	Ant. 1	22.55	25.93	36.02	14.01
802.11n HT20	2412	Ant. 2	20.83	24.21	36.02	12.44
802.11n HT20	2412	MIMO	24.78	28.16	36.02	16.31
802.11n HT20	2437	Ant. 1	22.87	26.25	36.02	14.34
802.11n HT20	2437	Ant. 2	21.03	24.41	36.02	12.70
802.11n HT20	2437	MIMO	25.06	28.44	36.02	16.61
802.11n HT20	2462	Ant. 1	21.17	24.55	36.02	12.57
802.11n HT20	2462	Ant. 2	21.30	24.68	36.02	13.02
802.11n HT20	2462	MIMO	24.25	27.63	36.02	15.81
802.11n HT40	2422	Ant. 1	22.71	26.09	36.02	13.38
802.11n HT40	2422	Ant. 2	22.54	25.92	36.02	13.16
802.11n HT40	2422	MIMO	25.64	29.02	36.02	16.28
802.11n HT40	2437	Ant. 1	23.25	26.63	36.02	13.96
802.11n HT40	2437	Ant. 2	23.28	26.66	36.02	13.49
802.11n HT40	2437	MIMO	26.28	29.66	36.02	16.74
802.11n HT40	2452	Ant. 1	23.66	27.04	36.02	14.26
802.11n HT40	2452	Ant. 2	23.90	27.28	36.02	14.47
802.11n HT40	2452	MIMO	26.79	30.17	36.02	17.38

Note: The maximum EIRP is calculated from max output power and antenna gain, the antenna gain provided by the customer, and the customer takes all the responsibilities for the accuracy of antenna gain.

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5.4 RADIATED SPURIOUS EMISSIONS

Test Requirement: FCC 47 CFR Part 15 Subpart C Section 15.205/15.209
RSS-Gen Issue 5, Section 6.13/8.9/8.10

Test Method: ANSI C63.10-2013 Clause 11.11 & Clause 11.12

Receiver Setup:

Frequency	RBW
0.009 MHz-0.150 MHz	200/300 kHz
0.150 MHz -30 MHz	9/10 kHz
30 MHz-1 GHz	100/120 kHz
Above 1 GHz	1 MHz

Limits:

Spurious Emissions

Frequency	Field strength (microvolt/meter)	Limit (dBμV/m)	Remark	Measurement distance (m)
0.009 MHz-0.490 MHz	2400/F(kHz)	--	--	300
0.490 MHz-1.705 MHz	24000/F(kHz)	--	--	30
1.705 MHz-30 MHz	30	--	--	30
30 MHz-88 MHz	100	40.0	Quasi-peak	3
88 MHz-216 MHz	150	43.5	Quasi-peak	3
216 MHz-960 MHz	200	46.0	Quasi-peak	3
960MHz-1GHz	500	54.0	Quasi-peak	3
Above 1 GHz	500	54.0	Average	3

Remark:

1. The lower limit shall apply at the transition frequencies.
2. Emission level (dBμV/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.

Test Setup: Refer to section 4.5.1 for details.

Test Procedures:

1. From 30 MHz to 1GHz test procedure as below:

- 1) The EUT was placed on the top of a rotating table 0.8 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.
- 2) The EUT was set 3 meters away from the interference-receiving antenna, which was mounted on the top of a variable-height antenna tower.
- 3) 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.
- 4) 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 rota table table was turned from 0 degrees to 360 degrees to find the maximum reading.
- 5) The test-receiver system was set to Peak Detect Function and Specified Bandwidth with Maximum Hold Mode.
- 6) 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.

2. Above 1GHz test procedure as below:

- 1) Different between above is the test site, change from Semi- Anechoic Chamber to fully Anechoic Chamber and change form table 0.8 meter to 1.5 meter (Above 18GHz the distance is 1 meter and table is 1.5 meter).
- 2) Test the EUT in the lowest channel, middle channel, the Highest channel

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- 3) The radiation measurements are performed in X, Y, Z axis positioning for Transmitting mode, and found the Z axis positioning which it is worse case.
- 4) Repeat above procedures until all frequencies measured was complete.

Equipment Used: Refer to section 3 for details.

Test Result: Pass

The measurement data as follows:

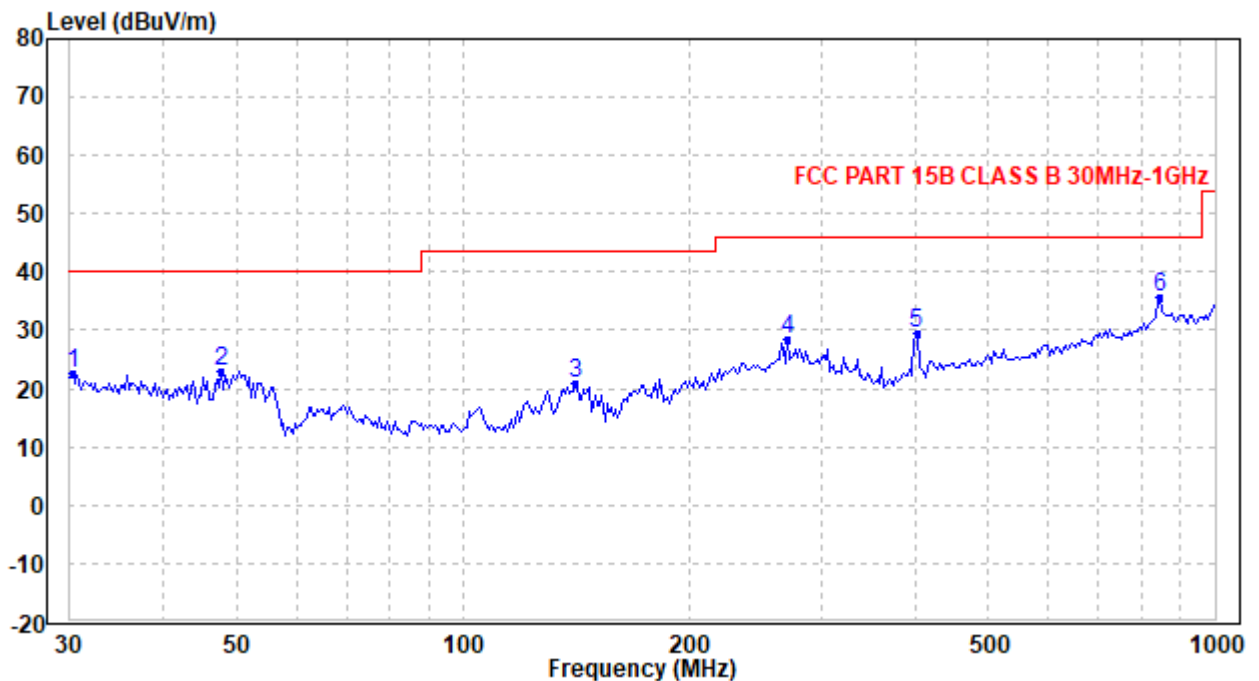
Radiated Emission Test Data (9 kHz ~ 30 MHz):

The amplitude of spurious emissions attenuated more than 20 dB below the permissible value is not required to be report.

Radiated Emission Test Data (30 MHz ~ 1 GHz):

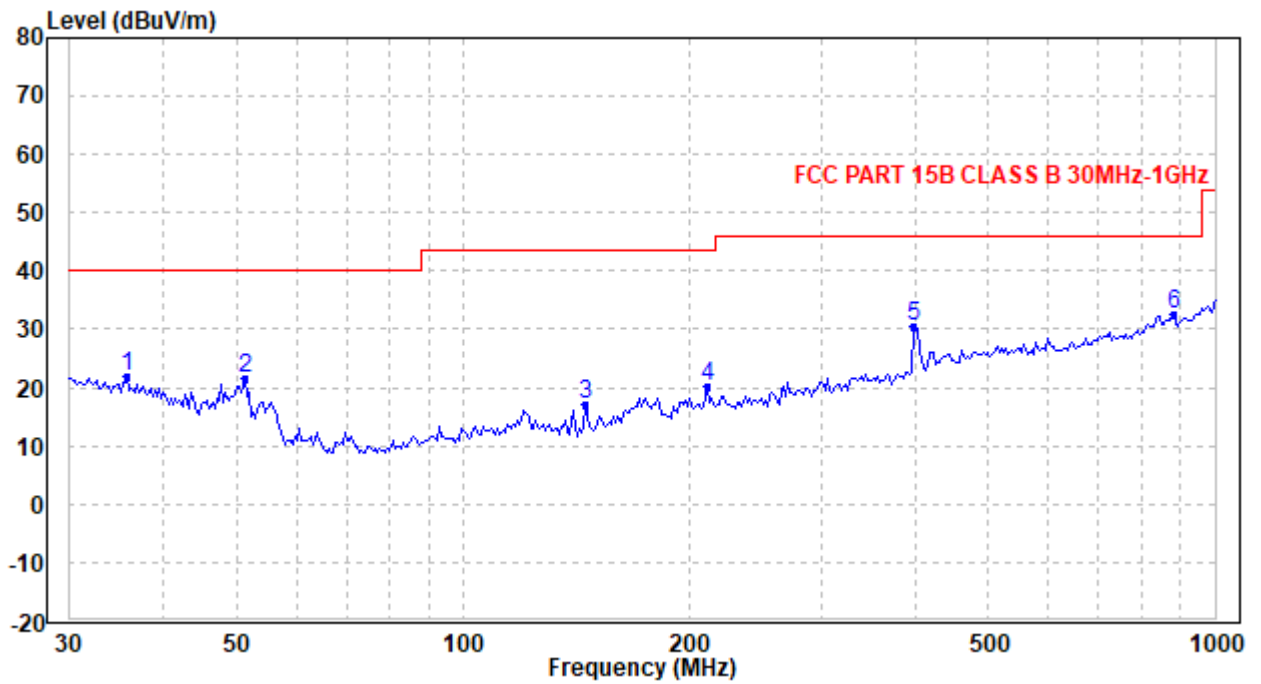
Worst-Case Configuration

Horizontal



No.	Frequency (MHz)	Reading (dBuV)	Correction factor (dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector
1	30.212	26.98	-4.47	22.51	40.00	-17.49	QP
2	47.703	36.10	-13.10	23.00	40.00	-17.00	QP
3	140.777	36.06	-15.22	20.84	43.50	-22.66	QP
4	270.616	38.42	-9.97	28.45	46.00	-17.55	QP
5	401.105	34.34	-4.73	29.61	46.00	-16.39	QP
6	844.803	31.70	3.83	35.53	46.00	-10.47	QP

Vertical



No.	Frequency (MHz)	Reading (dBuV)	Correction factor (dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector
1	35.762	28.71	-6.73	21.98	40.00	-18.02	QP
2	51.176	35.54	-14.01	21.53	40.00	-18.47	QP
3	145.811	32.13	-14.85	17.28	43.50	-26.22	QP
4	211.611	31.06	-10.95	20.11	43.50	-23.39	QP
5	398.296	35.25	-4.87	30.38	46.00	-15.62	QP
6	881.184	28.21	4.48	32.69	46.00	-13.31	QP

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Radiated Emission Test Data (Above 1GHz):								
No.	Freq. (MHz)	Reading (dBμV)	Correction factor (dB/m)	Result (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Detector	Antenna Polaxis
SISO Antenna 1 IEEE 802.11b Channel 1:								
1	4824	36.22	-2.07	34.15	54.00	-19.85	Average	Horizontal
2	4824	48.13	-2.07	46.06	74.00	-27.94	Peak	Horizontal
3	7236	35.56	1.30	36.86	54.00	-17.14	Average	Horizontal
4	7236	47.60	1.30	48.90	74.00	-25.10	Peak	Horizontal
5	4824	36.01	-2.07	33.94	54.00	-20.06	Average	Vertical
6	4824	48.42	-2.07	46.35	74.00	-27.65	Peak	Vertical
7	7236	35.56	1.30	36.86	54.00	-17.14	Average	Vertical
8	7236	48.01	1.30	49.31	74.00	-24.69	Peak	Vertical
SISO Antenna 1 IEEE 802.11b Channel 6:								
1	4874	35.60	-2.05	33.55	54.00	-20.45	Average	Horizontal
2	4874	46.64	-2.05	44.59	74.00	-29.41	Peak	Horizontal
3	7311	35.14	1.31	36.45	54.00	-17.55	Average	Horizontal
4	7311	46.51	1.31	47.82	74.00	-26.18	Peak	Horizontal
5	4874	35.44	-2.05	33.39	54.00	-20.61	Average	Vertical
6	4874	47.33	-2.05	45.28	74.00	-28.72	Peak	Vertical
7	7311	34.90	1.31	36.21	54.00	-17.79	Average	Vertical
8	7311	47.21	1.31	48.52	74.00	-25.48	Peak	Vertical
SISO Antenna 1 IEEE 802.11b Channel 11:								
1	4924	35.82	-2.03	33.79	54.00	-20.21	Average	Horizontal
2	4924	48.37	-2.03	46.34	74.00	-27.66	Peak	Horizontal
3	7386	34.15	1.31	35.46	54.00	-18.54	Average	Horizontal
4	7386	46.99	1.31	48.30	74.00	-25.70	Peak	Horizontal
5	4924	35.75	-2.03	33.72	54.00	-20.28	Average	Vertical
6	4924	47.81	-2.03	45.78	74.00	-28.22	Peak	Vertical
7	7386	34.01	1.31	35.32	54.00	-18.68	Average	Vertical
8	7386	46.53	1.31	47.84	74.00	-26.16	Peak	Vertical

Radiated Emission Test Data (Above 1GHz):								
No.	Freq. (MHz)	Reading (dBμV)	Correction factor (dB/m)	Result (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Detector	Antenna Polaxis
SISO Antenna 1 IEEE 802.11g Channel 1:								
1	4824	35.92	-2.07	33.85	54.00	-20.15	Average	Horizontal
2	4824	47.86	-2.07	45.79	74.00	-28.21	Peak	Horizontal
3	7236	35.46	1.30	36.76	54.00	-17.24	Average	Horizontal
4	7236	47.86	1.30	49.16	74.00	-24.84	Peak	Horizontal
5	4824	35.90	-2.07	33.83	54.00	-20.17	Average	Vertical
6	4824	48.04	-2.07	45.97	74.00	-28.03	Peak	Vertical
7	7236	35.37	1.30	36.67	54.00	-17.33	Average	Vertical
8	7236	47.08	1.30	48.38	74.00	-25.62	Peak	Vertical
SISO Antenna 1 IEEE 802.11g Channel 6:								
1	4874	35.41	-2.05	33.36	54.00	-20.64	Average	Horizontal
2	4874	46.66	-2.05	44.61	74.00	-29.39	Peak	Horizontal
3	7311	34.83	1.31	36.14	54.00	-17.86	Average	Horizontal
4	7311	46.94	1.31	48.25	74.00	-25.75	Peak	Horizontal
5	4874	35.31	-2.05	33.26	54.00	-20.74	Average	Vertical
6	4874	47.34	-2.05	45.29	74.00	-28.71	Peak	Vertical
7	7311	34.83	1.31	36.14	54.00	-17.86	Average	Vertical
8	7311	48.42	1.31	49.73	74.00	-24.27	Peak	Vertical
SISO Antenna 1 IEEE 802.11g Channel 11:								
1	4924	35.73	-2.03	33.70	54.00	-20.30	Average	Horizontal
2	4924	47.91	-2.03	45.88	74.00	-28.12	Peak	Horizontal
3	7386	34.04	1.31	35.35	54.00	-18.65	Average	Horizontal
4	7386	47.23	1.31	48.54	74.00	-25.46	Peak	Horizontal
5	4924	35.58	-2.03	33.55	54.00	-20.45	Average	Vertical
6	4924	47.99	-2.03	45.96	74.00	-28.04	Peak	Vertical
7	7386	33.95	1.31	35.26	54.00	-18.74	Average	Vertical
8	7386	46.22	1.31	47.53	74.00	-26.47	Peak	Vertical

Radiated Emission Test Data (Above 1GHz):								
No.	Freq. (MHz)	Reading (dBμV)	Correction factor (dB/m)	Result (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Detector	Antenna Polaxis
SISO Antenna 2 IEEE 802.11b Channel 1:								
1	4824	35.94	-2.07	33.87	54.00	-20.13	Average	Horizontal
2	4824	47.62	-2.07	45.55	74.00	-28.45	Peak	Horizontal
3	7236	35.41	1.30	36.71	54.00	-17.29	Average	Horizontal
4	7236	47.96	1.30	49.26	74.00	-24.74	Peak	Horizontal
5	4824	36.01	-2.07	33.94	54.00	-20.06	Average	Vertical
6	4824	48.40	-2.07	46.33	74.00	-27.67	Peak	Vertical
7	7236	35.41	1.30	36.71	54.00	-17.29	Average	Vertical
8	7236	47.90	1.30	49.20	74.00	-24.80	Peak	Vertical
SISO Antenna 2 IEEE 802.11b Channel 6:								
1	4874	35.79	-2.05	33.74	54.00	-20.26	Average	Horizontal
2	4874	47.56	-2.05	45.51	74.00	-28.49	Peak	Horizontal
3	7311	34.85	1.31	36.16	54.00	-17.84	Average	Horizontal
4	7311	47.83	1.31	49.14	74.00	-24.86	Peak	Horizontal
5	4874	35.34	-2.05	33.29	54.00	-20.71	Average	Vertical
6	4874	47.00	-2.05	44.95	74.00	-29.05	Peak	Vertical
7	7311	34.83	1.31	36.14	54.00	-17.86	Average	Vertical
8	7311	47.26	1.31	48.57	74.00	-25.43	Peak	Vertical
SISO Antenna 2 IEEE 802.11b Channel 11:								
1	4924	36.12	-2.03	34.09	54.00	-19.91	Average	Horizontal
2	4924	48.64	-2.03	46.61	74.00	-27.39	Peak	Horizontal
3	7386	34.04	1.31	35.35	54.00	-18.65	Average	Horizontal
4	7386	46.69	1.31	48.00	74.00	-26.00	Peak	Horizontal
5	4924	35.82	-2.03	33.79	54.00	-20.21	Average	Vertical
6	4924	47.56	-2.03	45.53	74.00	-28.47	Peak	Vertical
7	7386	34.10	1.31	35.41	54.00	-18.59	Average	Vertical
8	7386	46.71	1.31	48.02	74.00	-25.98	Peak	Vertical

Radiated Emission Test Data (Above 1GHz):								
No.	Freq. (MHz)	Reading (dBμV)	Correction factor (dB/m)	Result (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Detector	Antenna Polaxis
SISO Antenna 2 IEEE 802.11g Channel 1:								
1	4824	36.26	-2.07	34.19	54.00	-19.81	Average	Horizontal
2	4824	48.21	-2.07	46.14	74.00	-27.86	Peak	Horizontal
3	7236	35.39	1.30	36.69	54.00	-17.31	Average	Horizontal
4	7236	47.86	1.30	49.16	74.00	-24.84	Peak	Horizontal
5	4824	36.01	-2.07	33.94	54.00	-20.06	Average	Vertical
6	4824	47.37	-2.07	45.30	74.00	-28.70	Peak	Vertical
7	7236	35.34	1.30	36.64	54.00	-17.36	Average	Vertical
8	7236	48.08	1.30	49.38	74.00	-24.62	Peak	Vertical
SISO Antenna 2 IEEE 802.11g Channel 6:								
1	4874	35.65	-2.05	33.60	54.00	-20.40	Average	Horizontal
2	4874	48.21	-2.05	46.16	74.00	-27.84	Peak	Horizontal
3	7311	34.85	1.31	36.16	54.00	-17.84	Average	Horizontal
4	7311	46.96	1.31	48.27	74.00	-25.73	Peak	Horizontal
5	4874	35.21	-2.05	33.16	54.00	-20.84	Average	Vertical
6	4874	48.51	-2.05	46.46	74.00	-27.54	Peak	Vertical
7	7311	34.80	1.31	36.11	54.00	-17.89	Average	Vertical
8	7311	47.67	1.31	48.98	74.00	-25.02	Peak	Vertical
SISO Antenna 2 IEEE 802.11g Channel 11:								
1	4924	37.40	-2.03	35.37	54.00	-18.63	Average	Horizontal
2	4924	50.17	-2.03	48.14	74.00	-25.86	Peak	Horizontal
3	7386	34.21	1.31	35.52	54.00	-18.48	Average	Horizontal
4	7386	46.22	1.31	47.53	74.00	-26.47	Peak	Horizontal
5	4924	35.89	-2.03	33.86	54.00	-20.14	Average	Vertical
6	4924	47.35	-2.03	45.32	74.00	-28.68	Peak	Vertical
7	7386	34.04	1.31	35.35	54.00	-18.65	Average	Vertical
8	7386	47.61	1.31	48.92	74.00	-25.08	Peak	Vertical

Radiated Emission Test Data (Above 1GHz):								
No.	Freq. (MHz)	Reading (dBμV)	Correction factor (dB/m)	Result (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Detector	Antenna Polaxis
MIMO_Antenna 1+2_IEEE 802.11n-HT20_Channel 1:								
1	4824	36.10	-2.07	34.03	54.00	-19.97	Average	Horizontal
2	4824	48.88	-2.07	46.81	74.00	-27.19	Peak	Horizontal
3	7236	35.37	1.30	36.67	54.00	-17.33	Average	Horizontal
4	7236	47.43	1.30	48.73	74.00	-25.27	Peak	Horizontal
5	4824	35.99	-2.07	33.92	54.00	-20.08	Average	Vertical
6	4824	47.54	-2.07	45.47	74.00	-28.53	Peak	Vertical
7	7236	35.32	1.30	36.62	54.00	-17.38	Average	Vertical
8	7236	47.61	1.30	48.91	74.00	-25.09	Peak	Vertical
MIMO_Antenna 1+2_IEEE 802.11n-HT20_Channel 6:								
1	4874	35.72	-2.05	33.67	54.00	-20.33	Average	Horizontal
2	4874	47.48	-2.05	45.43	74.00	-28.57	Peak	Horizontal
3	7311	34.83	1.31	36.14	54.00	-17.86	Average	Horizontal
4	7311	46.42	1.31	47.73	74.00	-26.27	Peak	Horizontal
5	4874	35.26	-2.05	33.21	54.00	-20.79	Average	Vertical
6	4874	46.87	-2.05	44.82	74.00	-29.18	Peak	Vertical
7	7311	34.75	1.31	36.06	54.00	-17.94	Average	Vertical
8	7311	46.85	1.31	48.16	74.00	-25.84	Peak	Vertical
MIMO_Antenna 1+2_IEEE 802.11n-HT20_Channel 11:								
1	4924	36.39	-2.03	34.36	54.00	-19.64	Average	Horizontal
2	4924	47.77	-2.03	45.74	74.00	-28.26	Peak	Horizontal
3	7386	34.10	1.31	35.41	54.00	-18.59	Average	Horizontal
4	7386	47.09	1.31	48.40	74.00	-25.60	Peak	Horizontal
5	4924	35.70	-2.03	33.67	54.00	-20.33	Average	Vertical
6	4924	47.61	-2.03	45.58	74.00	-28.42	Peak	Vertical
7	7386	34.01	1.31	35.32	54.00	-18.68	Average	Vertical
8	7386	46.42	1.31	47.73	74.00	-26.27	Peak	Vertical

Radiated Emission Test Data (Above 1GHz):								
No.	Freq. (MHz)	Reading (dBμV)	Correction factor (dB/m)	Result (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Detector	Antenna Polaxis
MIMO_Antenna 1+2_IEEE 802.11n-HT40_Channel 3:								
1	4844	36.07	-2.06	34.01	54.00	-19.99	Average	Horizontal
2	4844	48.61	-2.06	46.55	74.00	-27.45	Peak	Horizontal
3	7266	35.28	1.31	36.59	54.00	-17.41	Average	Horizontal
4	7266	48.39	1.31	49.70	74.00	-24.30	Peak	Horizontal
5	4844	35.93	-2.06	33.87	54.00	-20.13	Average	Vertical
6	4844	47.86	-2.06	45.80	74.00	-28.20	Peak	Vertical
7	7266	35.36	1.31	36.67	54.00	-17.33	Average	Vertical
8	7266	47.58	1.31	48.89	74.00	-25.11	Peak	Vertical
MIMO_Antenna 1+2_IEEE 802.11n-HT40_Channel 6:								
1	4874	35.34	-2.05	33.29	54.00	-20.71	Average	Horizontal
2	4874	48.40	-2.05	46.35	74.00	-27.65	Peak	Horizontal
3	7311	34.75	1.31	36.06	54.00	-17.94	Average	Horizontal
4	7311	46.70	1.31	48.01	74.00	-25.99	Peak	Horizontal
5	4874	35.19	-2.05	33.14	54.00	-20.86	Average	Vertical
6	4874	47.32	-2.05	45.27	74.00	-28.73	Peak	Vertical
7	7311	34.75	1.31	36.06	54.00	-17.94	Average	Vertical
8	7311	47.62	1.31	48.93	74.00	-25.07	Peak	Vertical
MIMO_Antenna 1+2_IEEE 802.11n-HT40_Channel 9:								
1	4904	35.78	-2.04	33.74	54.00	-20.26	Average	Horizontal
2	4904	48.15	-2.04	46.11	74.00	-27.89	Peak	Horizontal
3	7356	34.10	1.31	35.41	54.00	-18.59	Average	Horizontal
4	7356	47.17	1.31	48.48	74.00	-25.52	Peak	Horizontal
5	4904	35.76	-2.04	33.72	54.00	-20.28	Average	Vertical
6	4904	47.85	-2.04	45.81	74.00	-28.19	Peak	Vertical
7	7356	34.07	1.31	35.38	54.00	-18.62	Average	Vertical
8	7356	46.58	1.31	47.89	74.00	-26.11	Peak	Vertical

Remark:

1. Correct Factor = Antenna Factor + Cable Loss - Amplifier Gain, the value was added to Original Receiver Reading by the software automatically.
2. Result = Reading + Correct Factor.
3. Margin = Limit – Result
4. The disturbance above 18GHz was very low, and the above harmonics were the highest point could be found when testing, so only the above harmonics had been displayed.

5.5 BAND EDGE MEASUREMENTS (RADIATED)

Test Requirement: FCC 47 CFR Part 15 Subpart C Section 15.205/15.209
RSS-247 Issue 3, Section 5.5

Test Method: ANSI C63.10-2013 Clause 11.13

Limits:

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

Frequency	Limit (dB μ V/m @3m)	Remark
30 MHz-88 MHz	40.0	Quasi-peak Value
88 MHz-216 MHz	43.5	Quasi-peak Value
216 MHz-960 MHz	46.0	Quasi-peak Value
960 MHz-1 GHz	54.0	Quasi-peak Value
Above 1 GHz	54.0	Average Value
	74.0	Peak Value

Test Setup: Refer to section 4.5.1 for details.

Test Procedures:

Radiated band edge measurements at 2390 MHz and 2483.5 MHz were made with the unit transmitting in the low end of the channel range and the high end closest to the restricted bands respectively. The emissions were made on the 966 Semi-Chamber. Use (resolution bandwidth (RBW) = 1 MHz, video bandwidth (VBW) = 3 MHz for peak levels and RBW = 1 MHz and VBW = 10 Hz or 1/T for average levels).

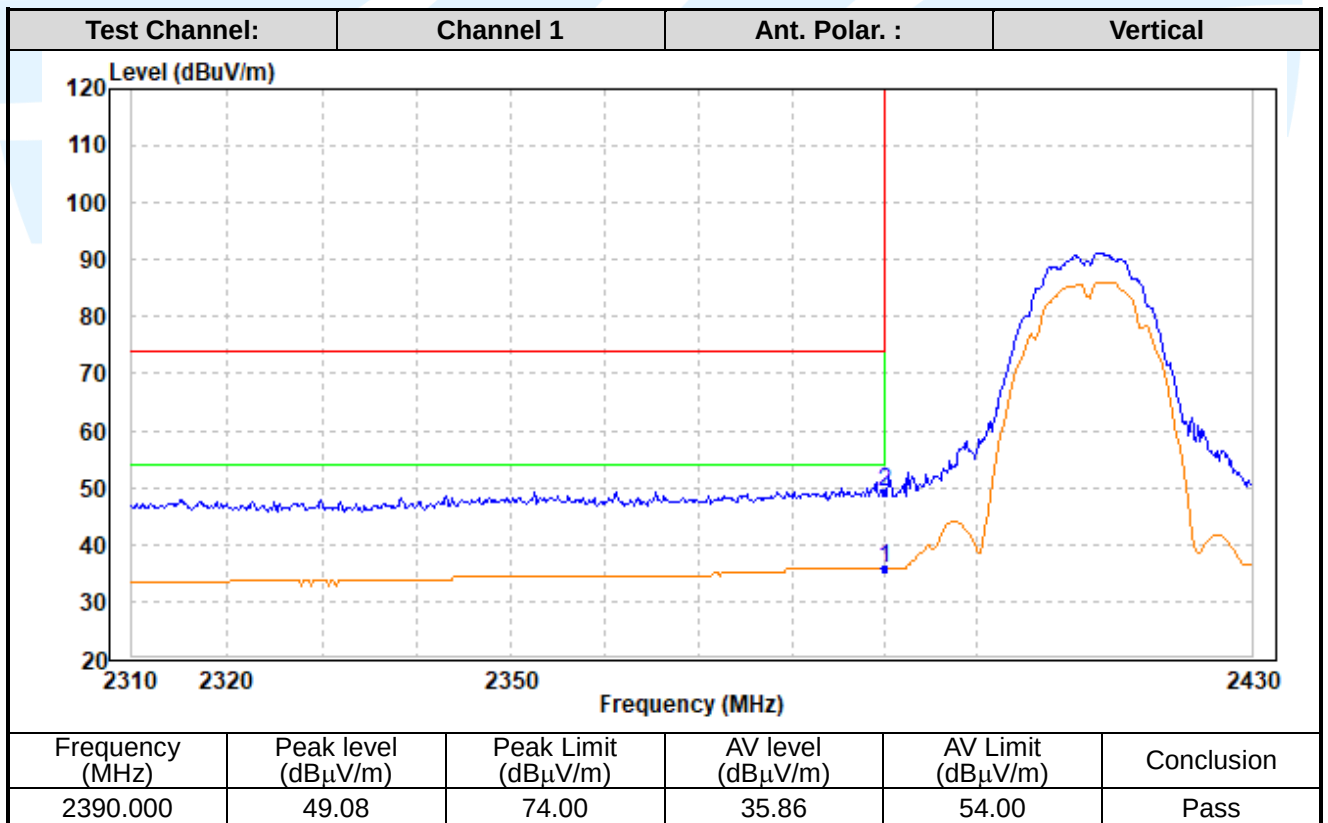
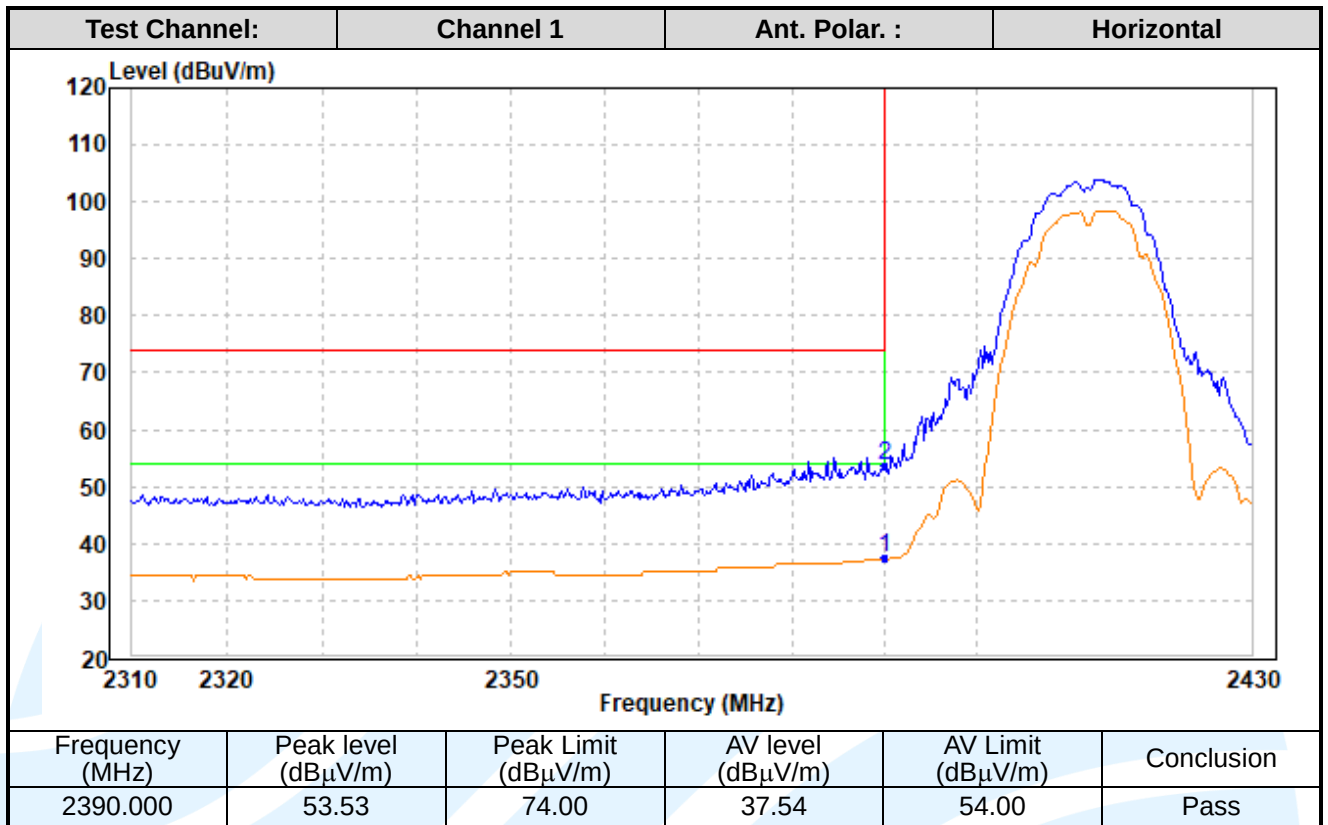
1. Use radiated spurious emission test procedure described in clause 5.7. The transmitter output (antenna port) was connected to the test receiver.
2. Set the PK and AV limit line.
3. Record the fundamental emission and emissions out of the band-edge.
4. Determine band-edge compliance as required.

Equipment Used: Refer to section 3 for details.

Test Result: Pass

The measurement data as follows:

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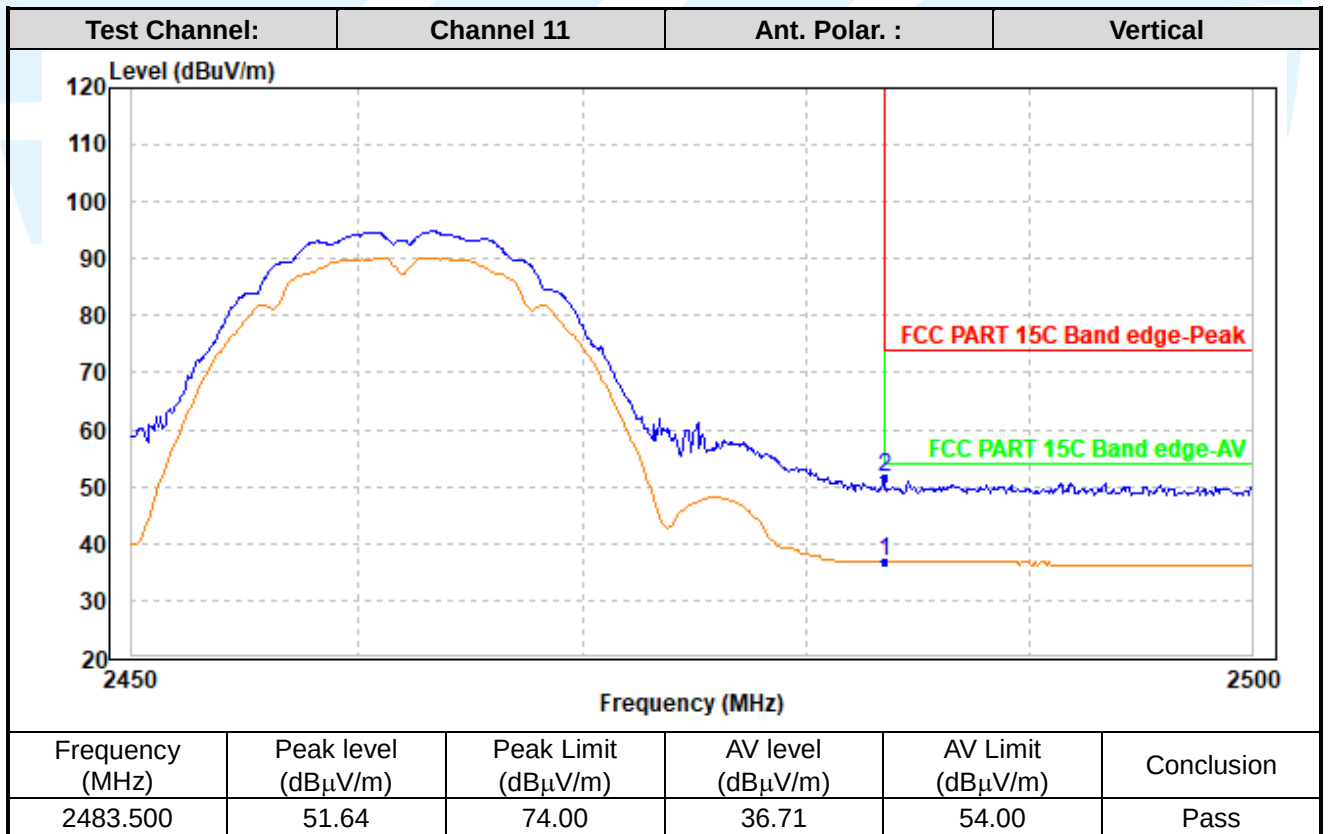
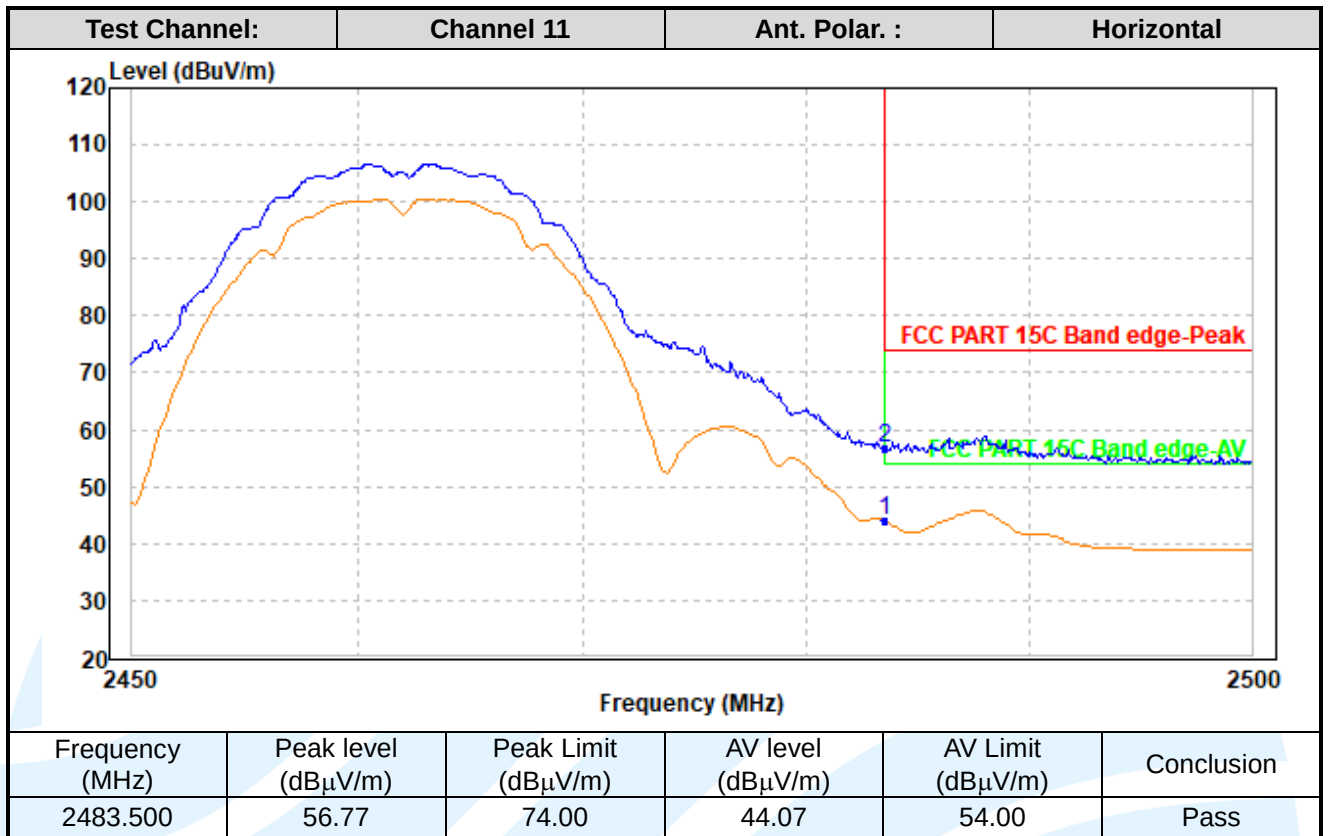
Address: 16/F, Block A, Building 6th, Baoneng Science and Technology Park, Longhua Street, Longhua District, Shenzhen, China

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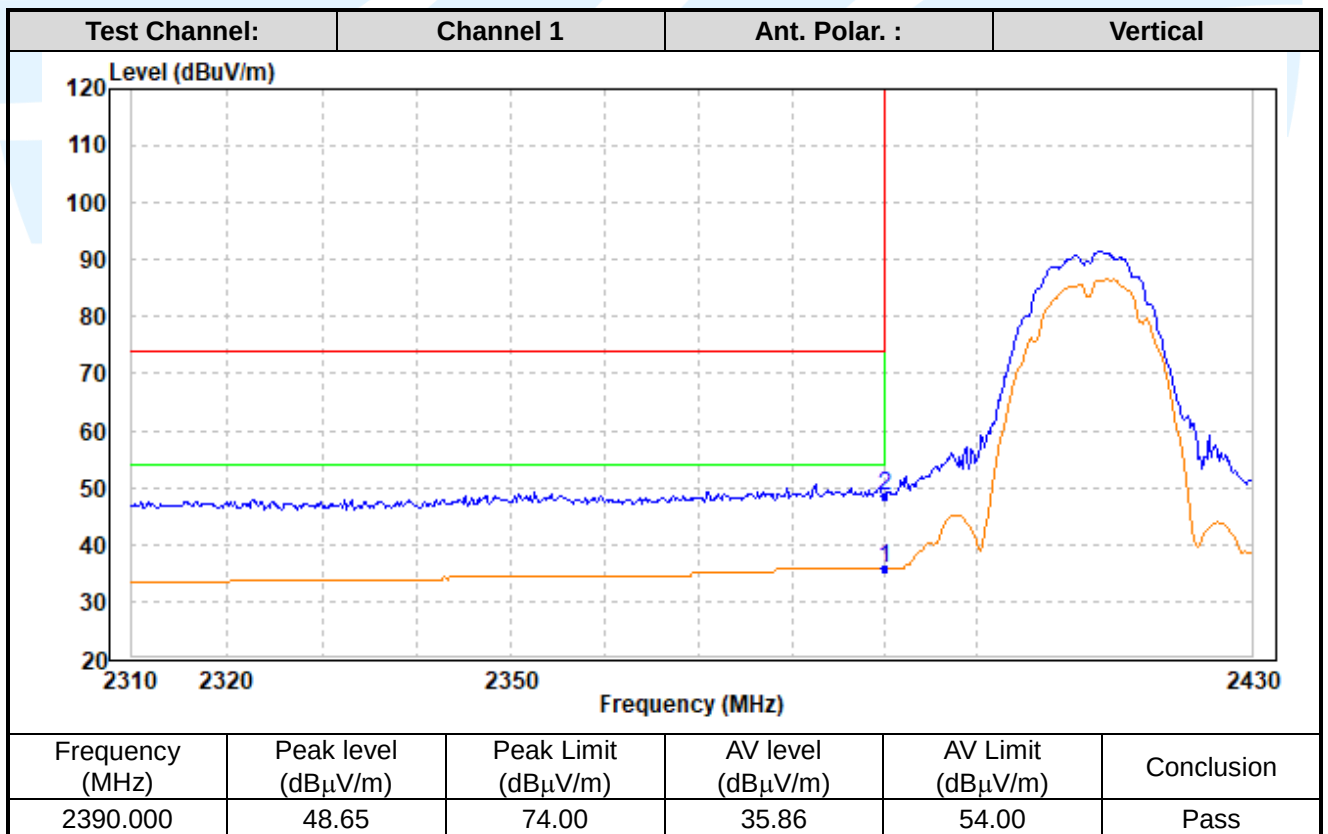
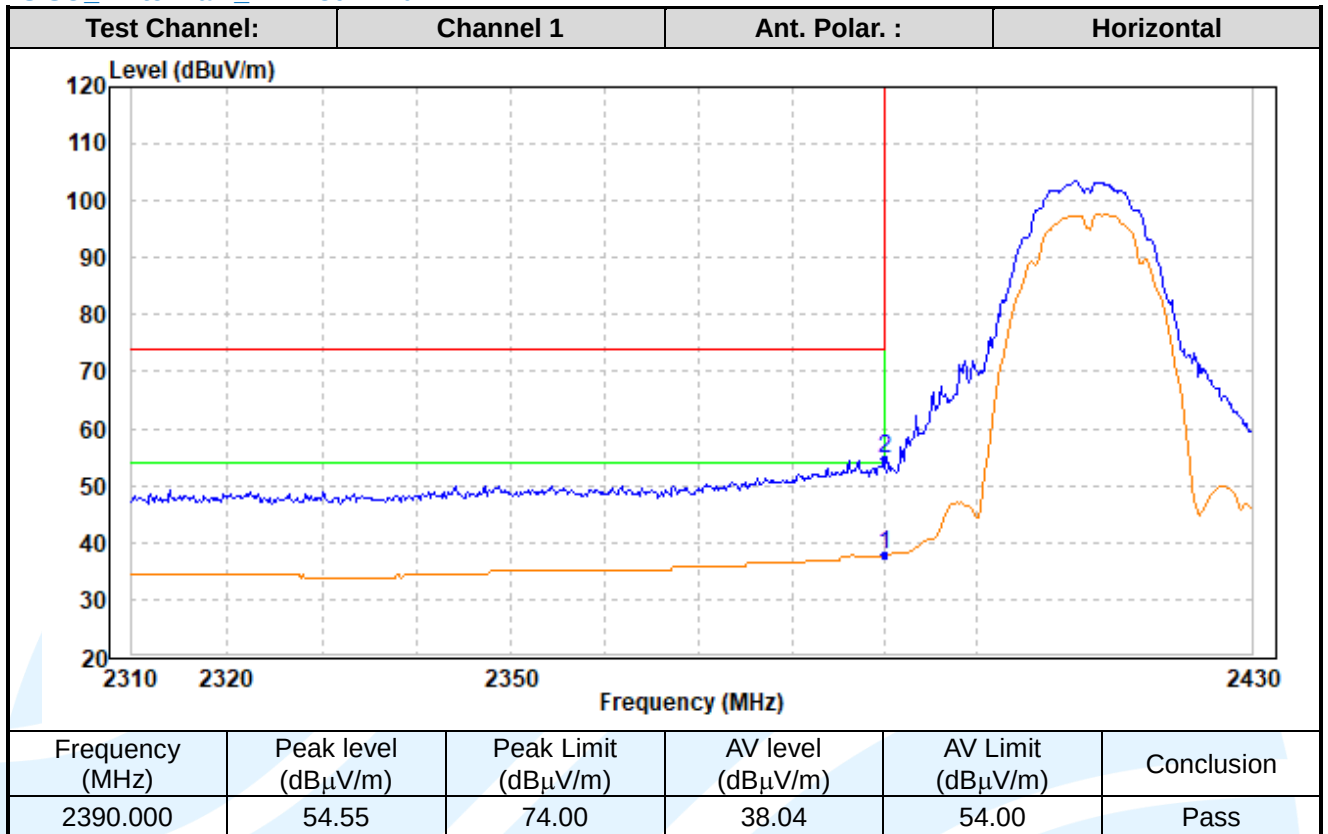
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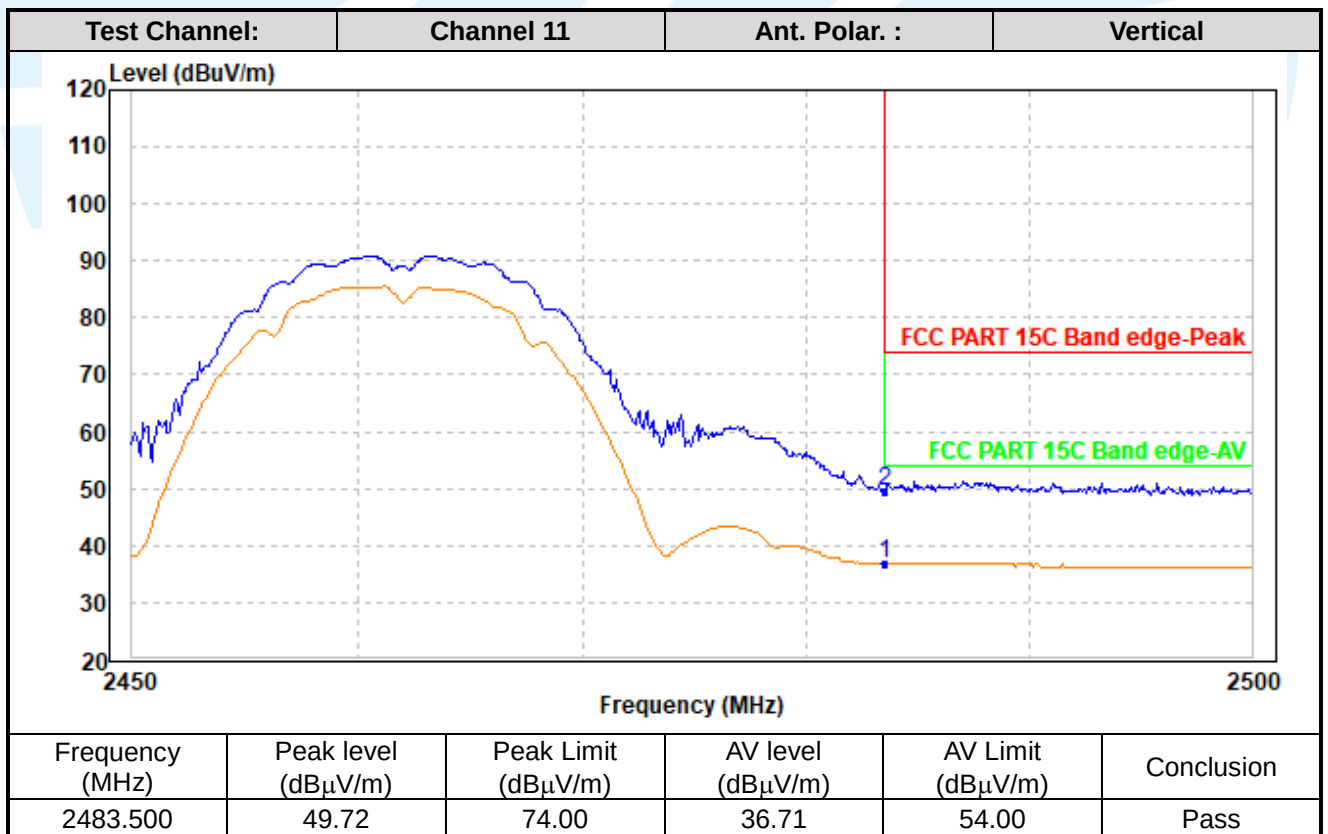
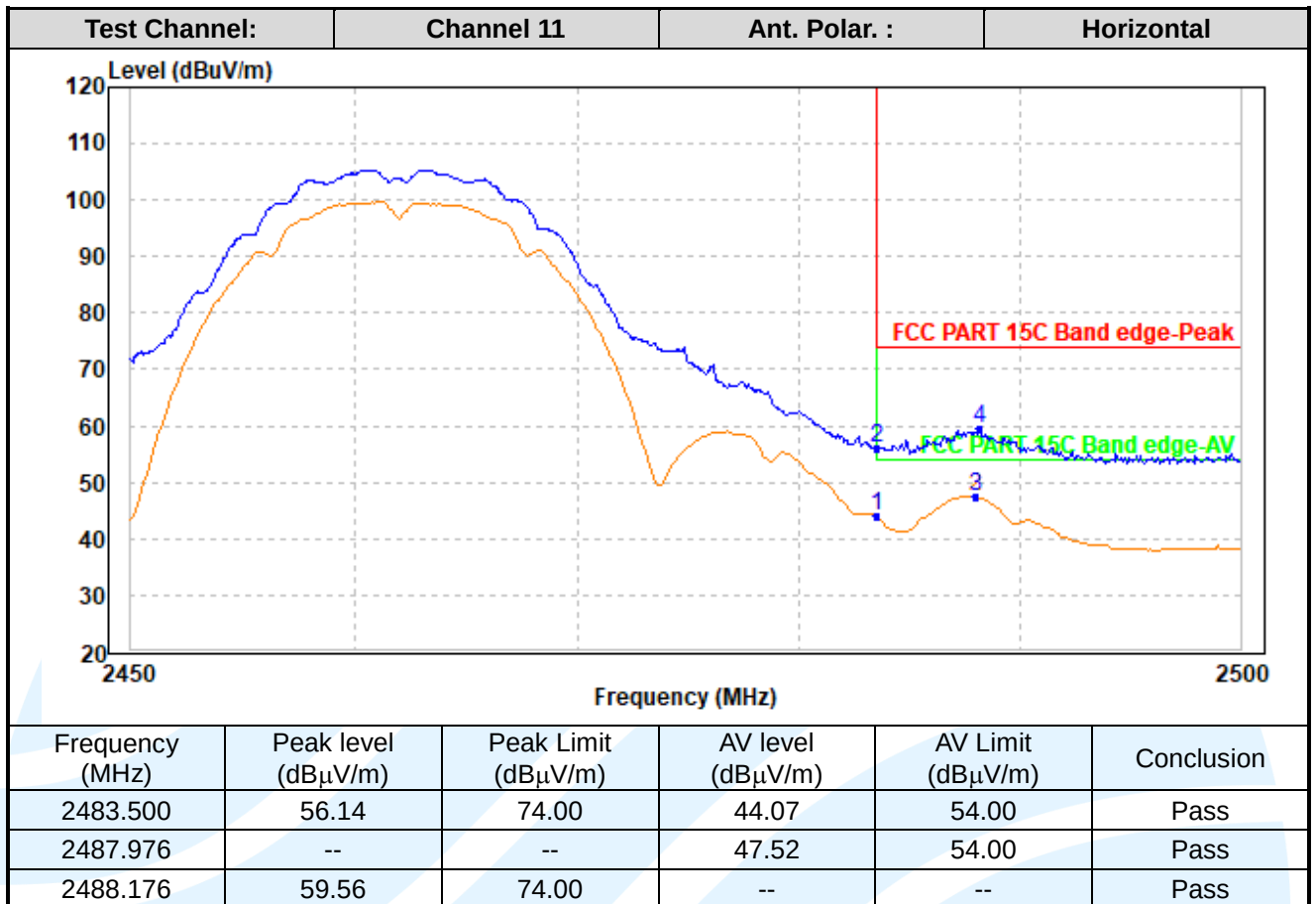
Tel: +86-755-28230888

Fax: +86-755-28230886

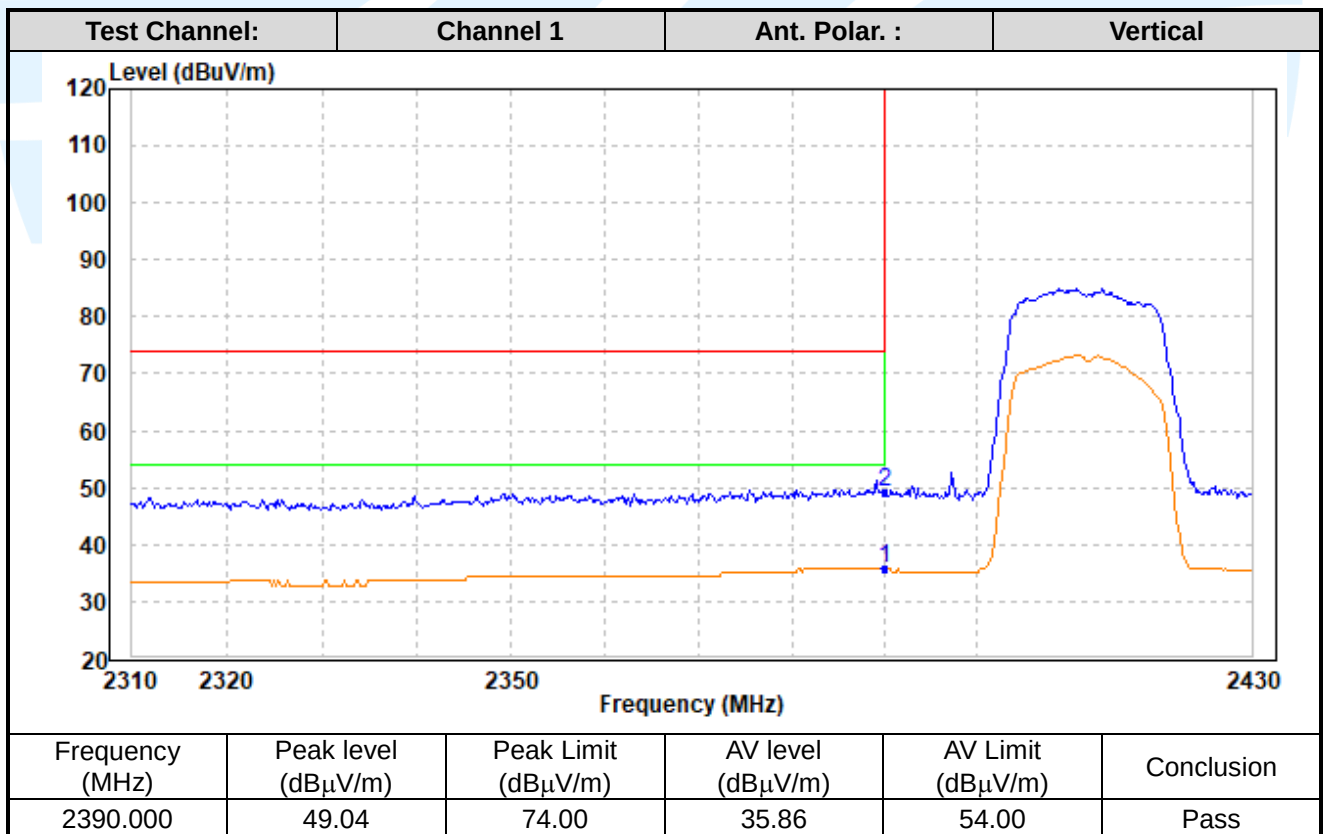
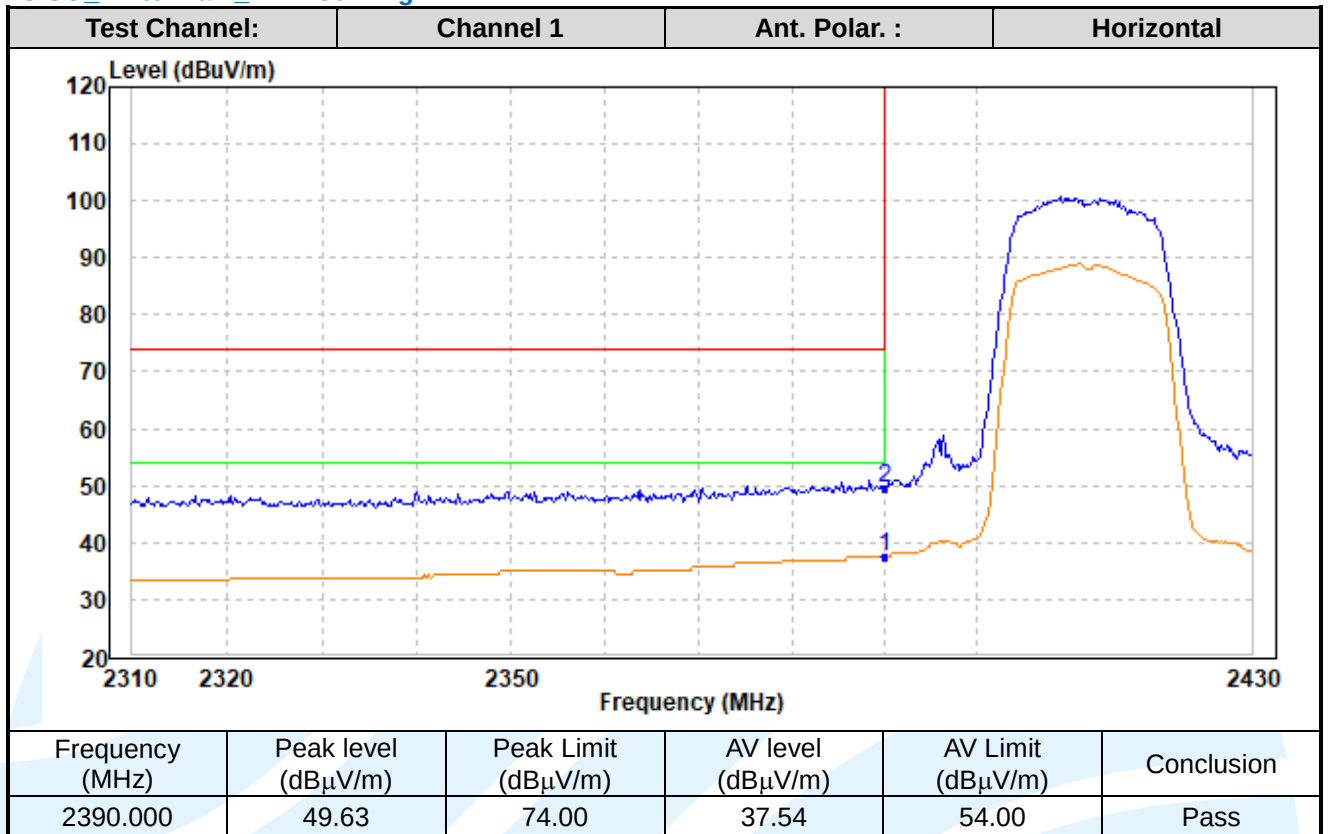
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SISO_Antenna 1_ IEEE 802.11g



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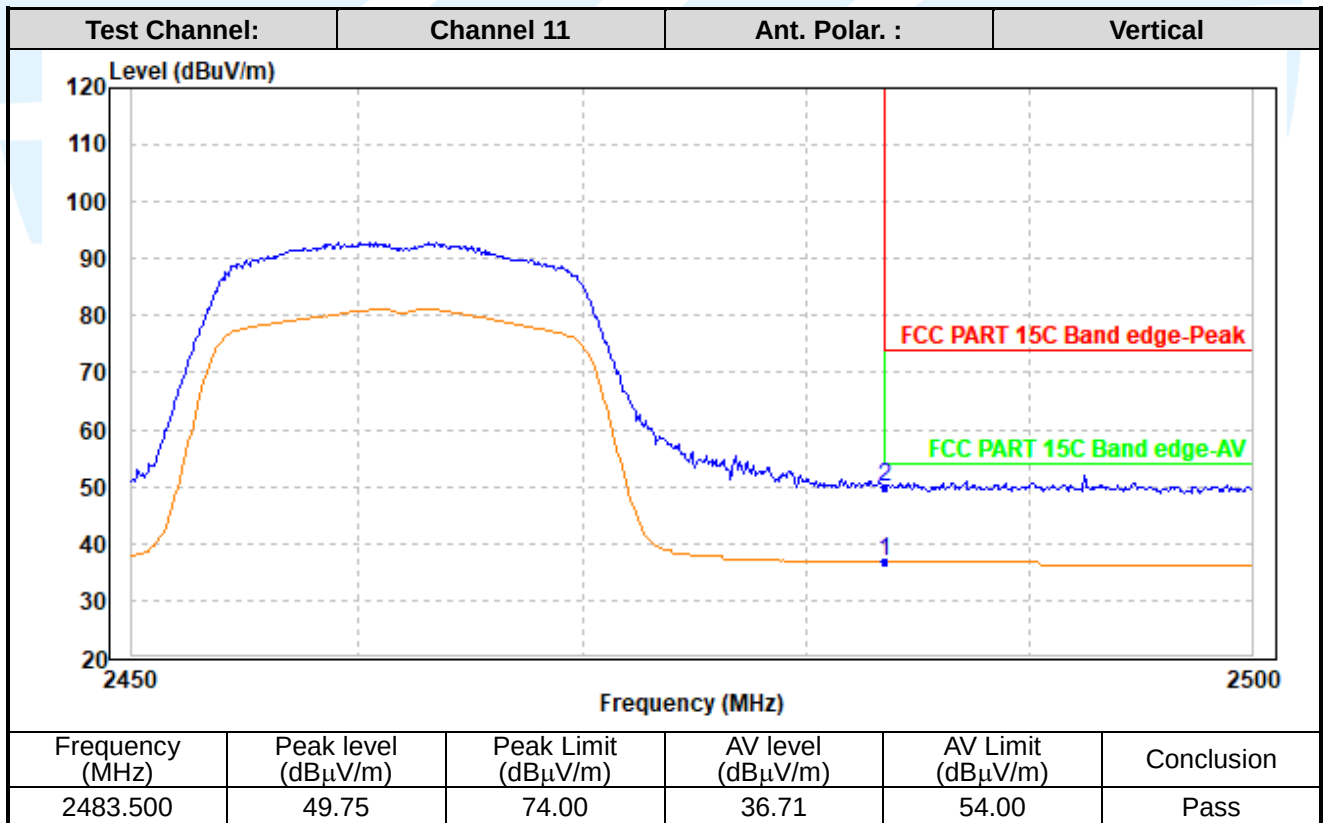
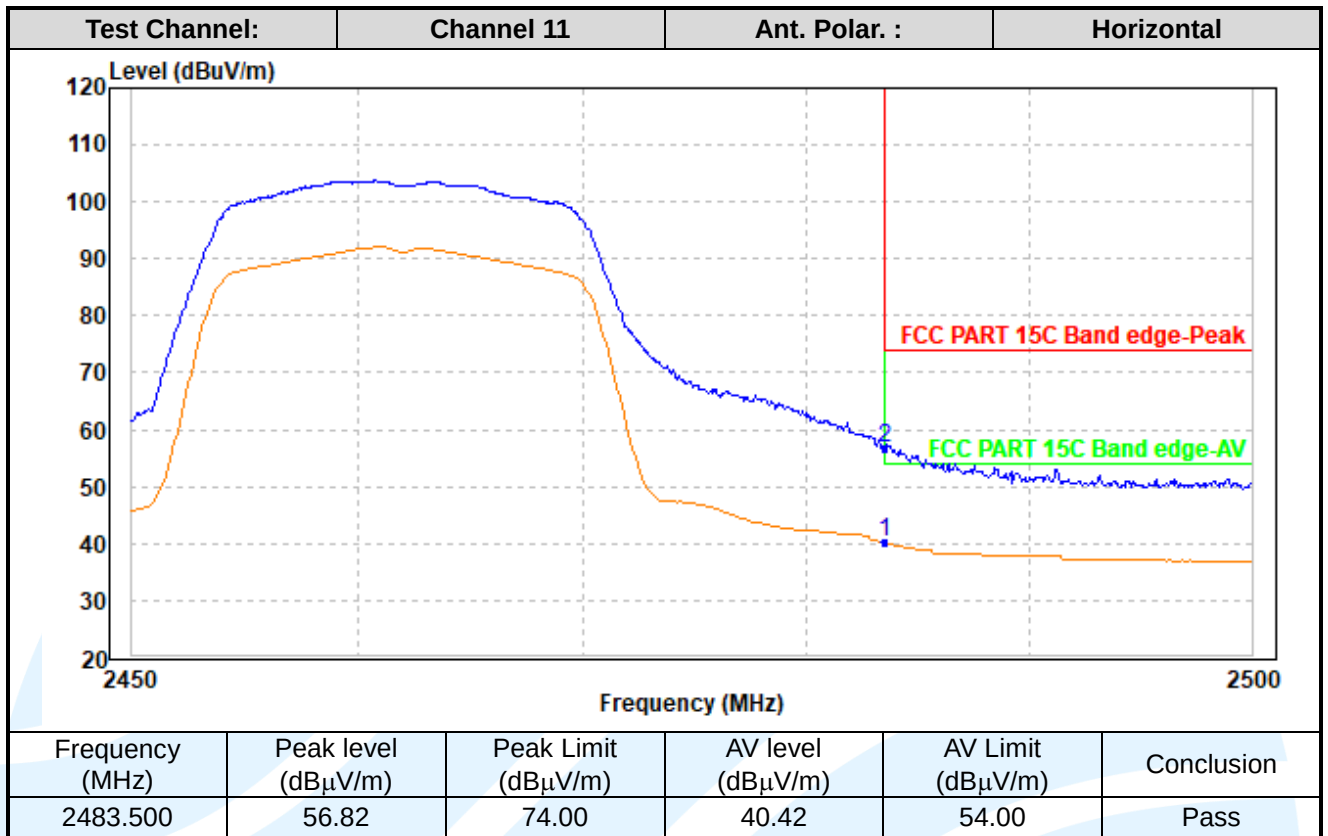
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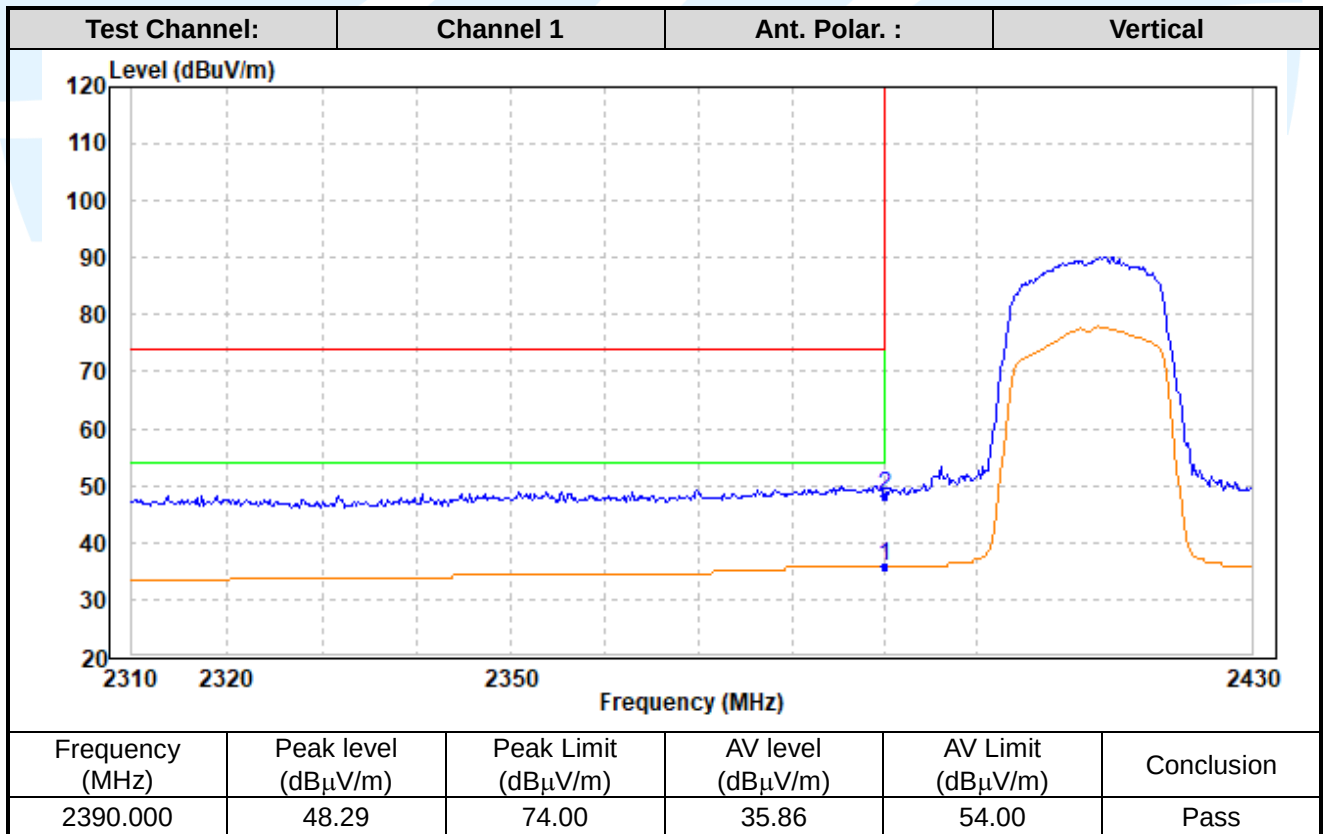
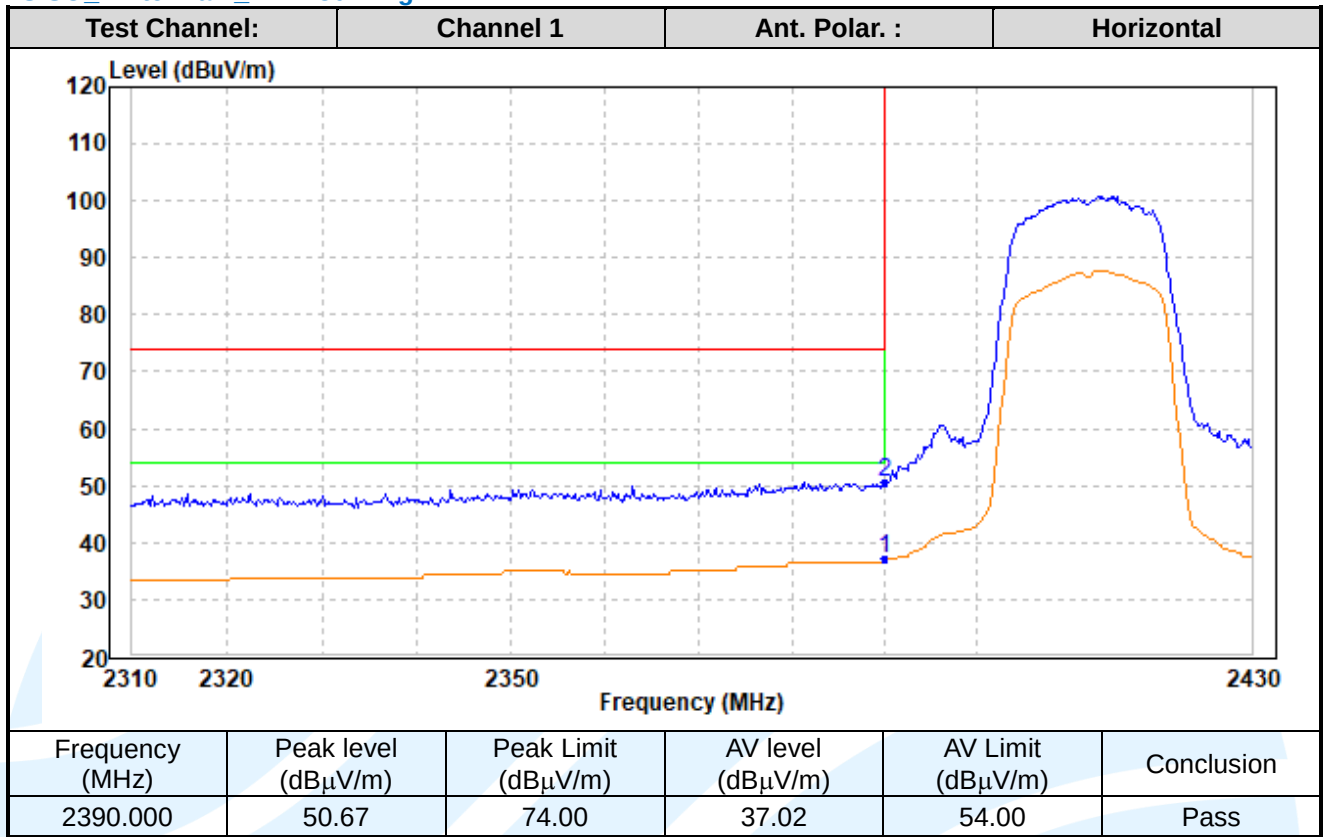
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SISO_Antenna 2_ IEEE 802.11g



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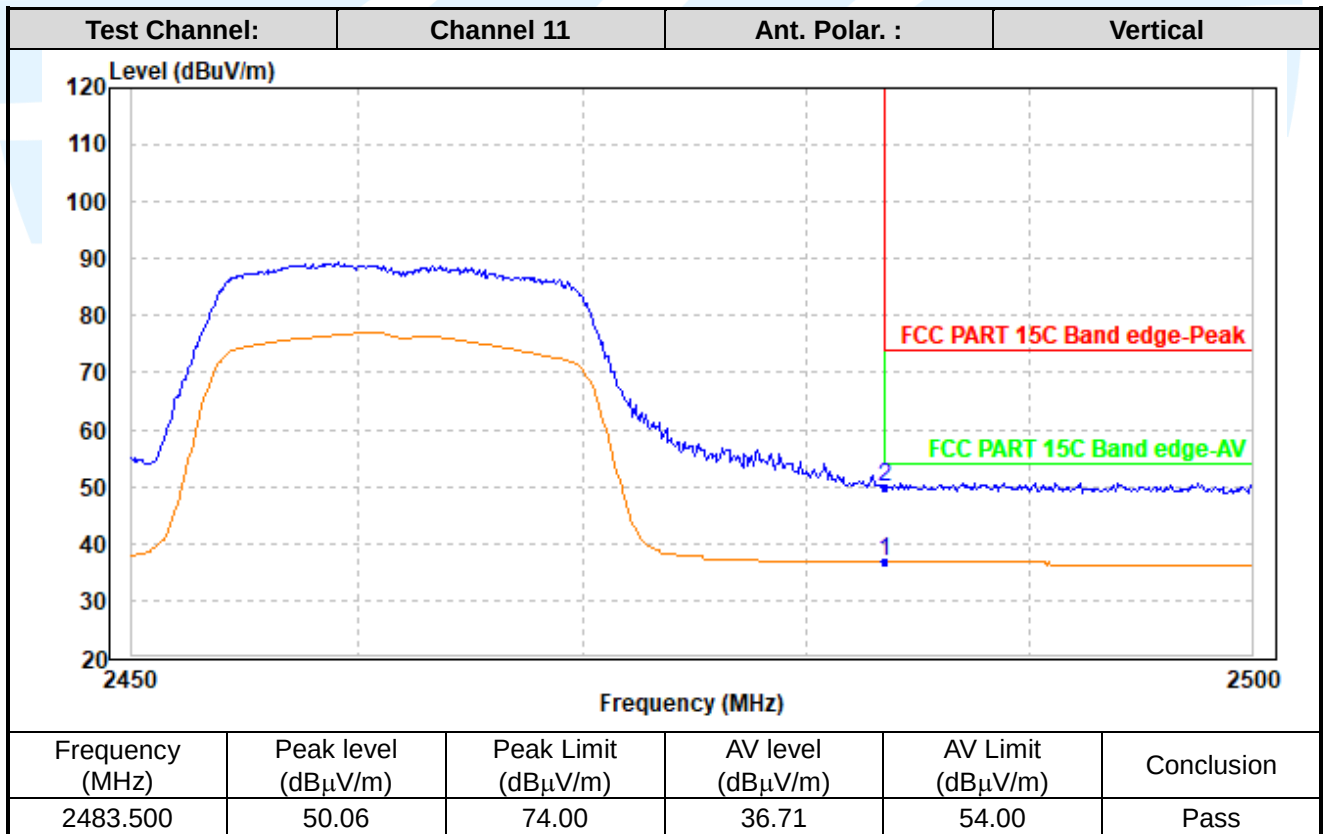
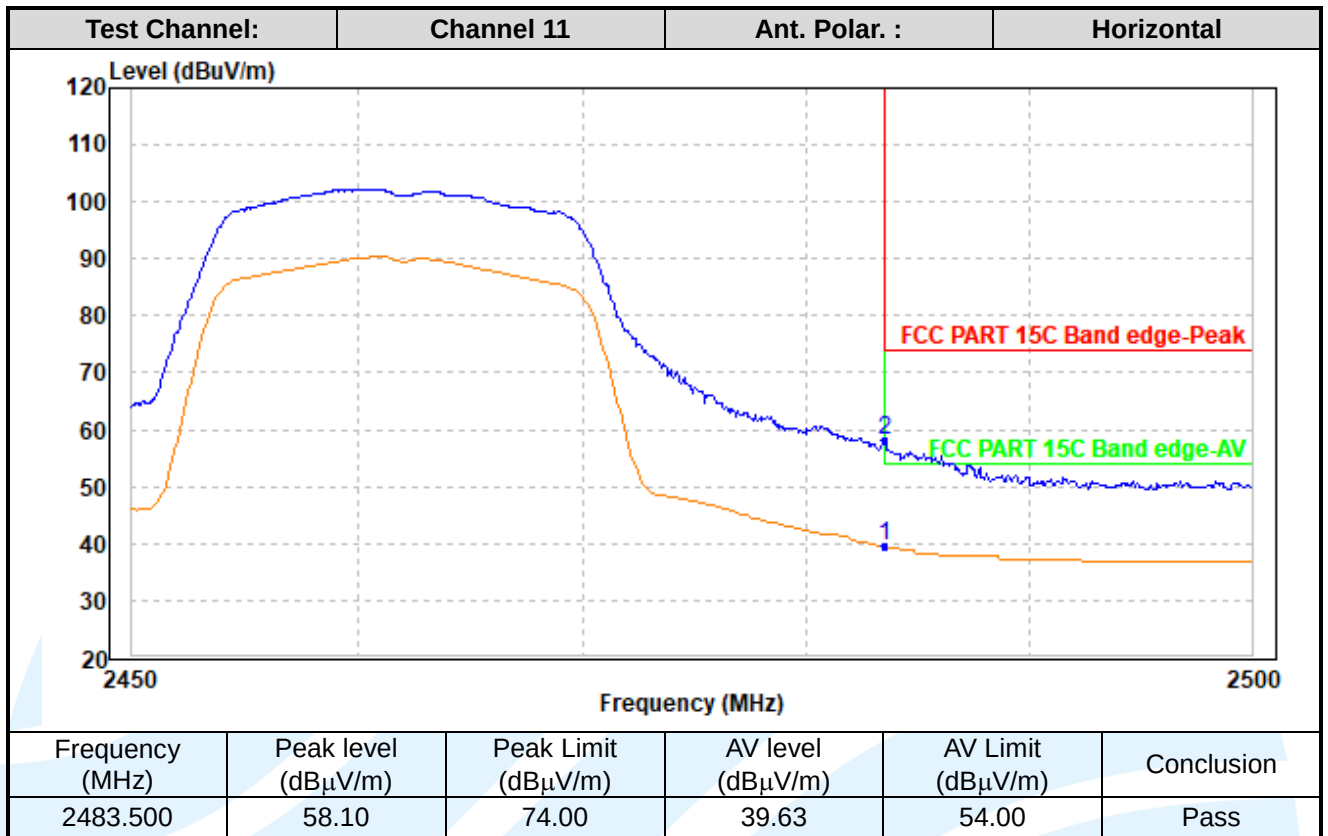
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Fax: +86-755-28230886

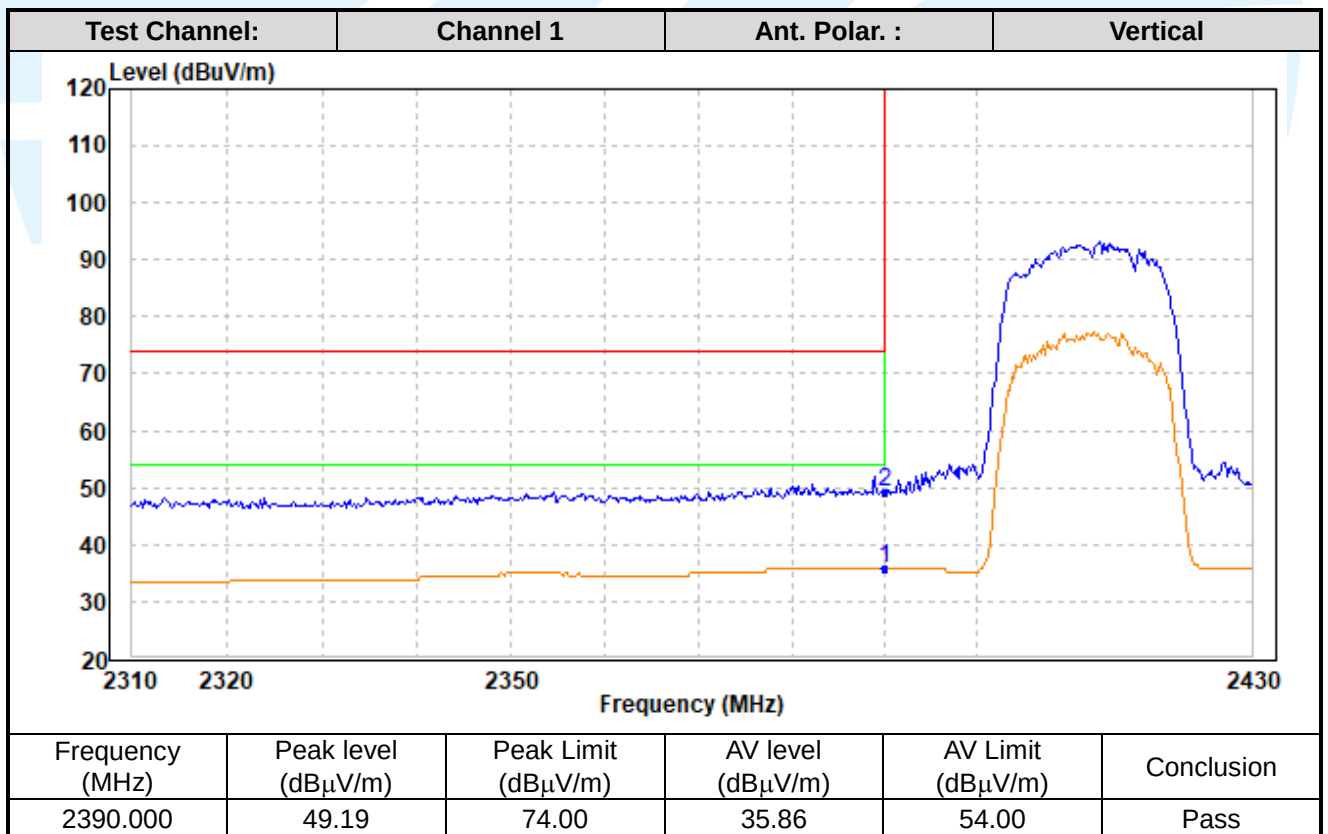
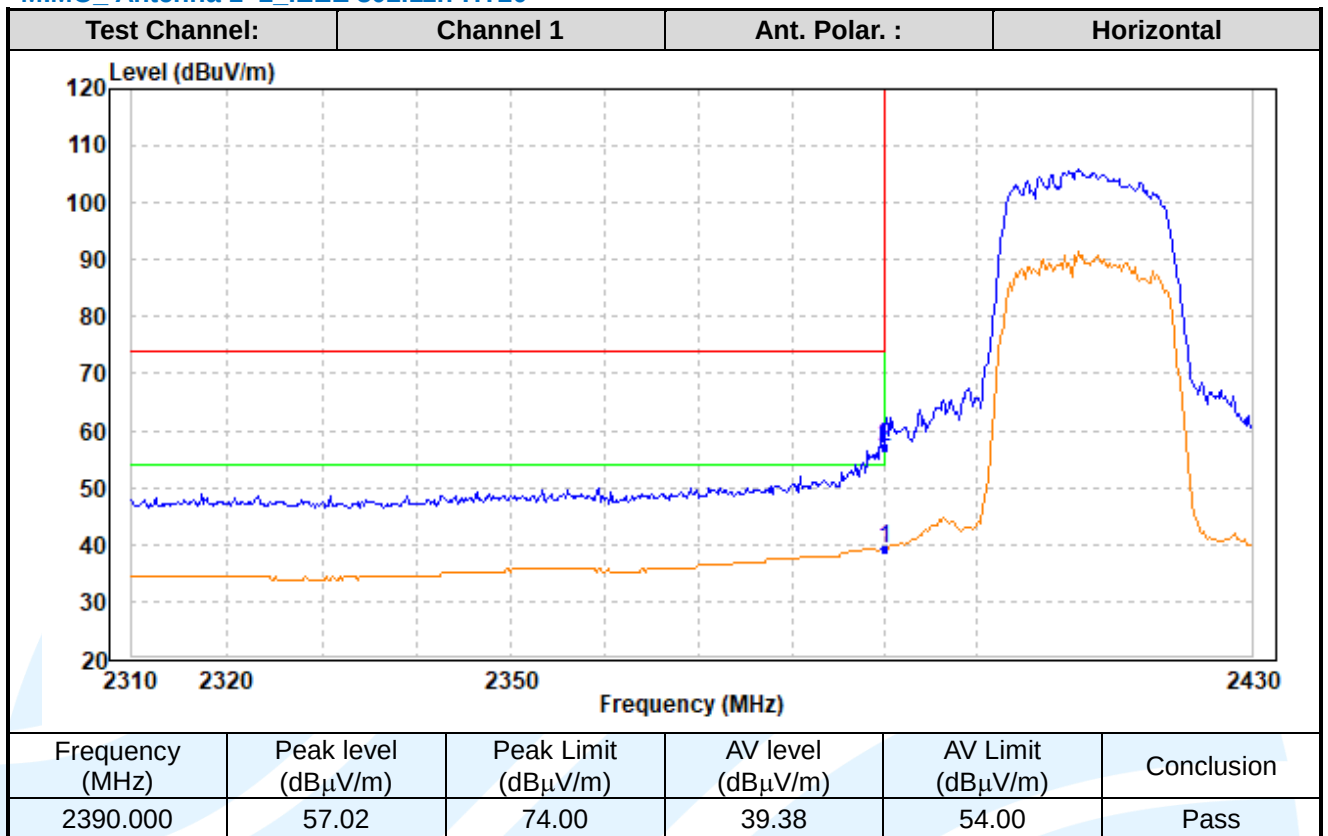
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MIMO_Antenna 1+2_ IEEE 802.11n-HT20



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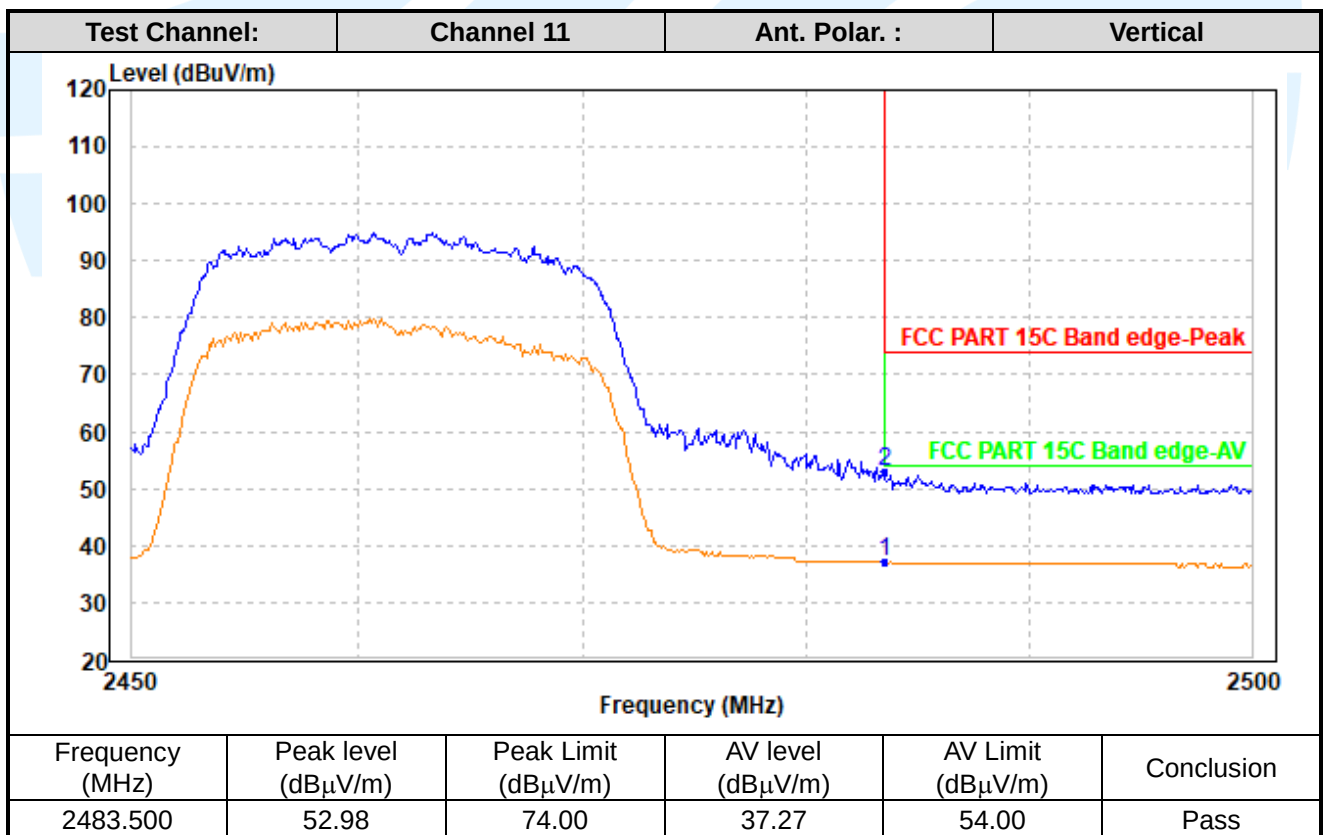
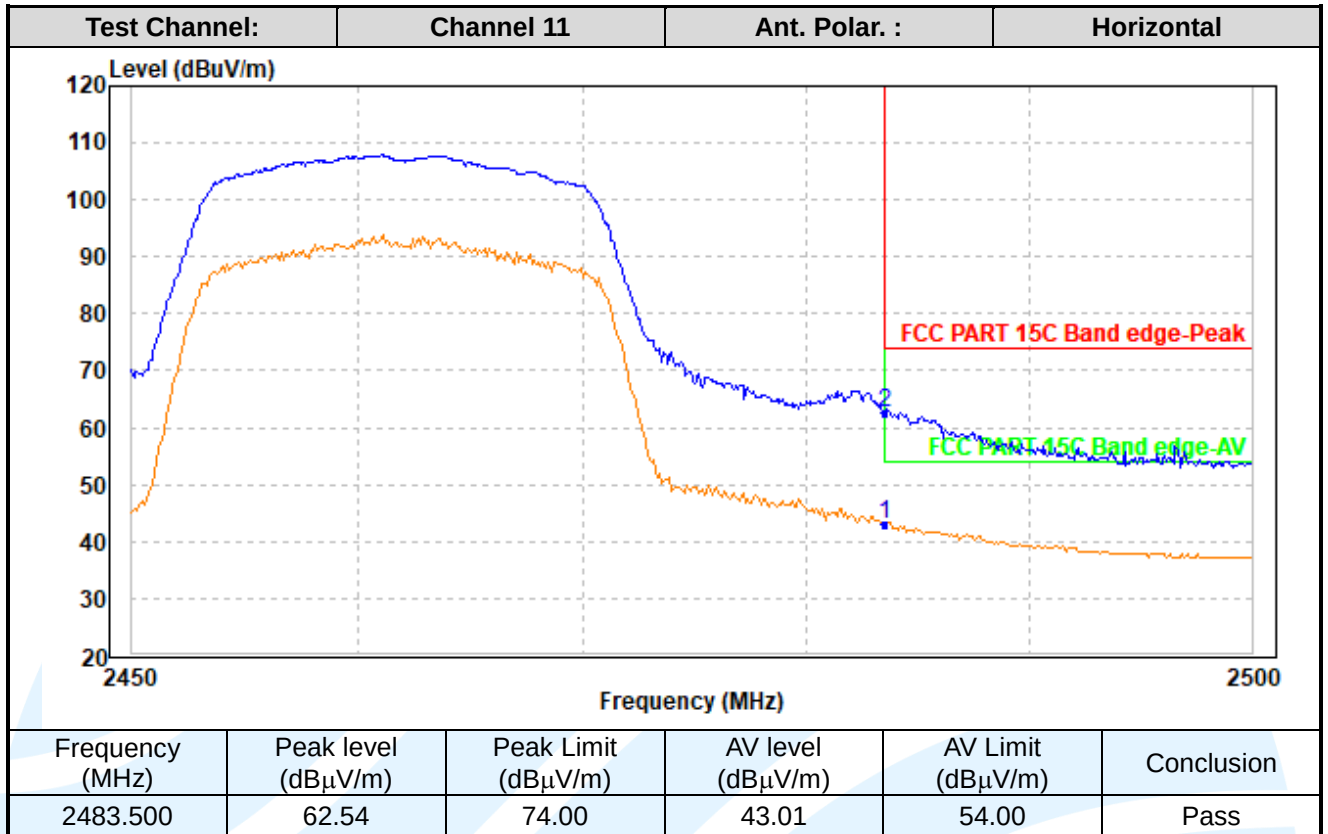
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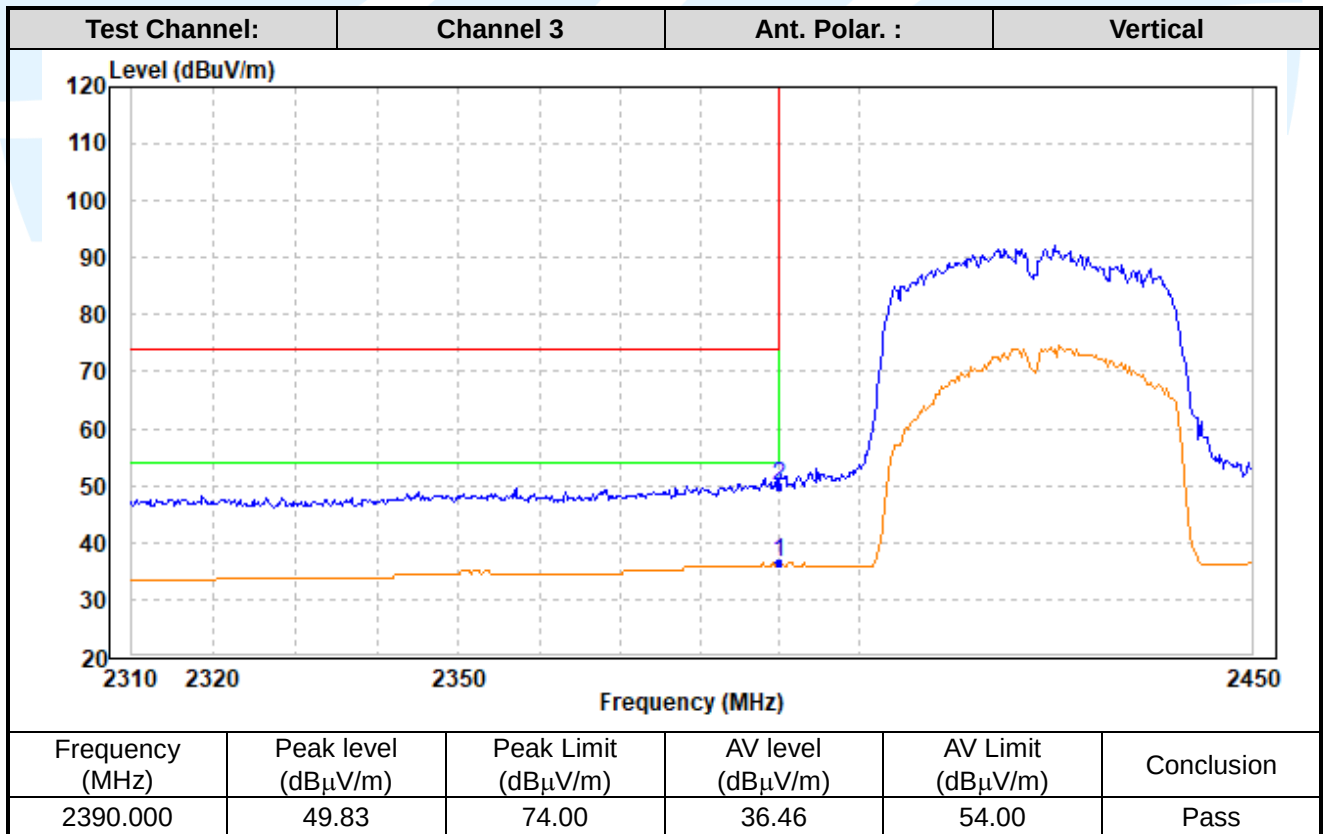
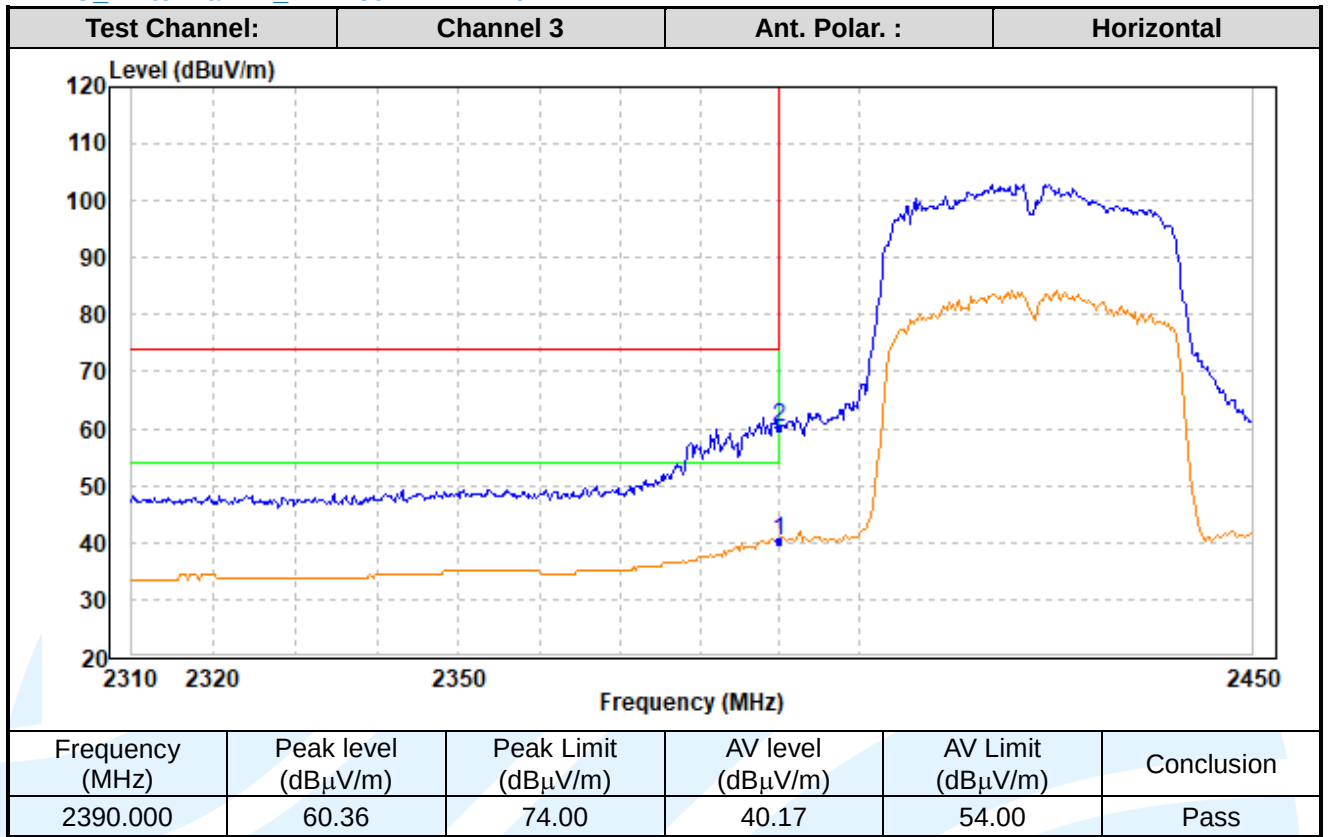
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MIMO_Antenna 1+2_ IEEE 802.11n-HT40



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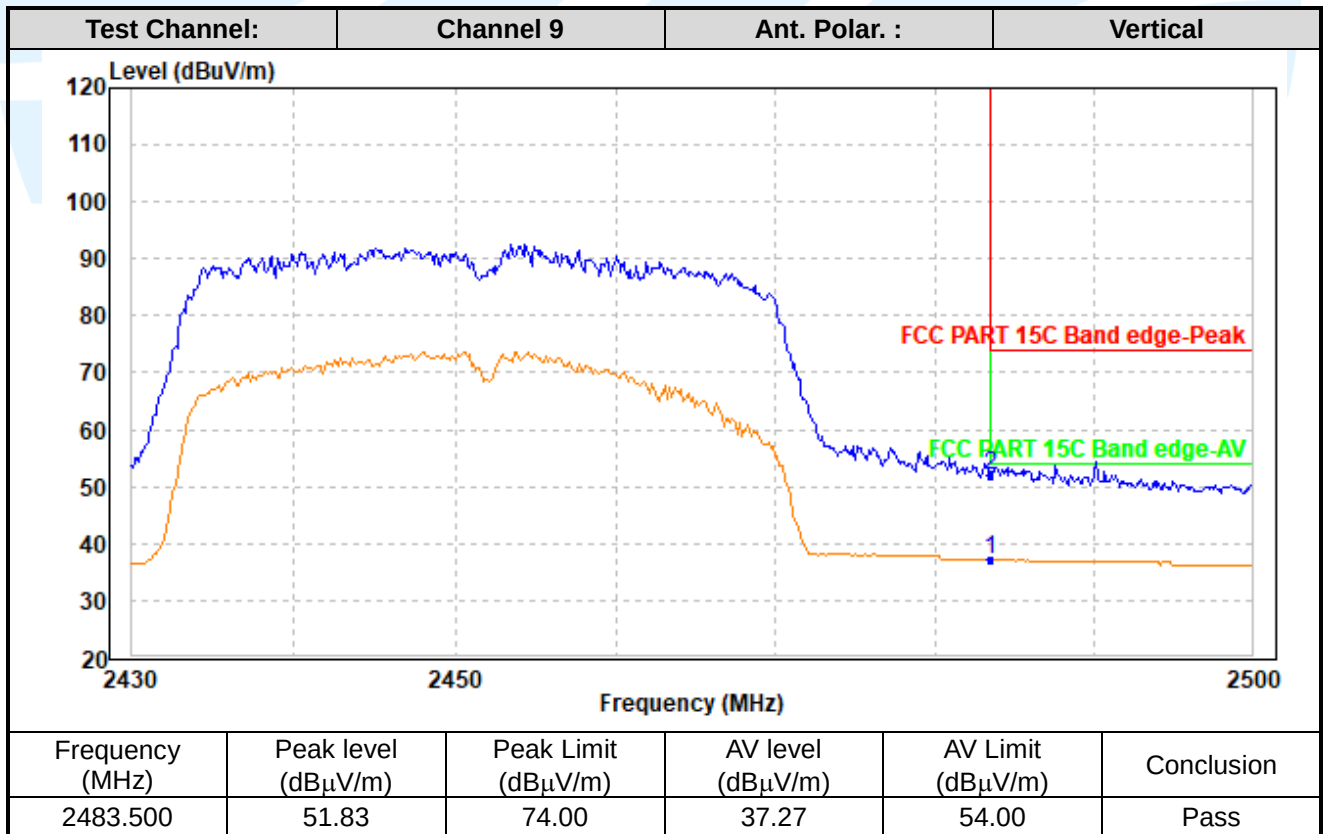
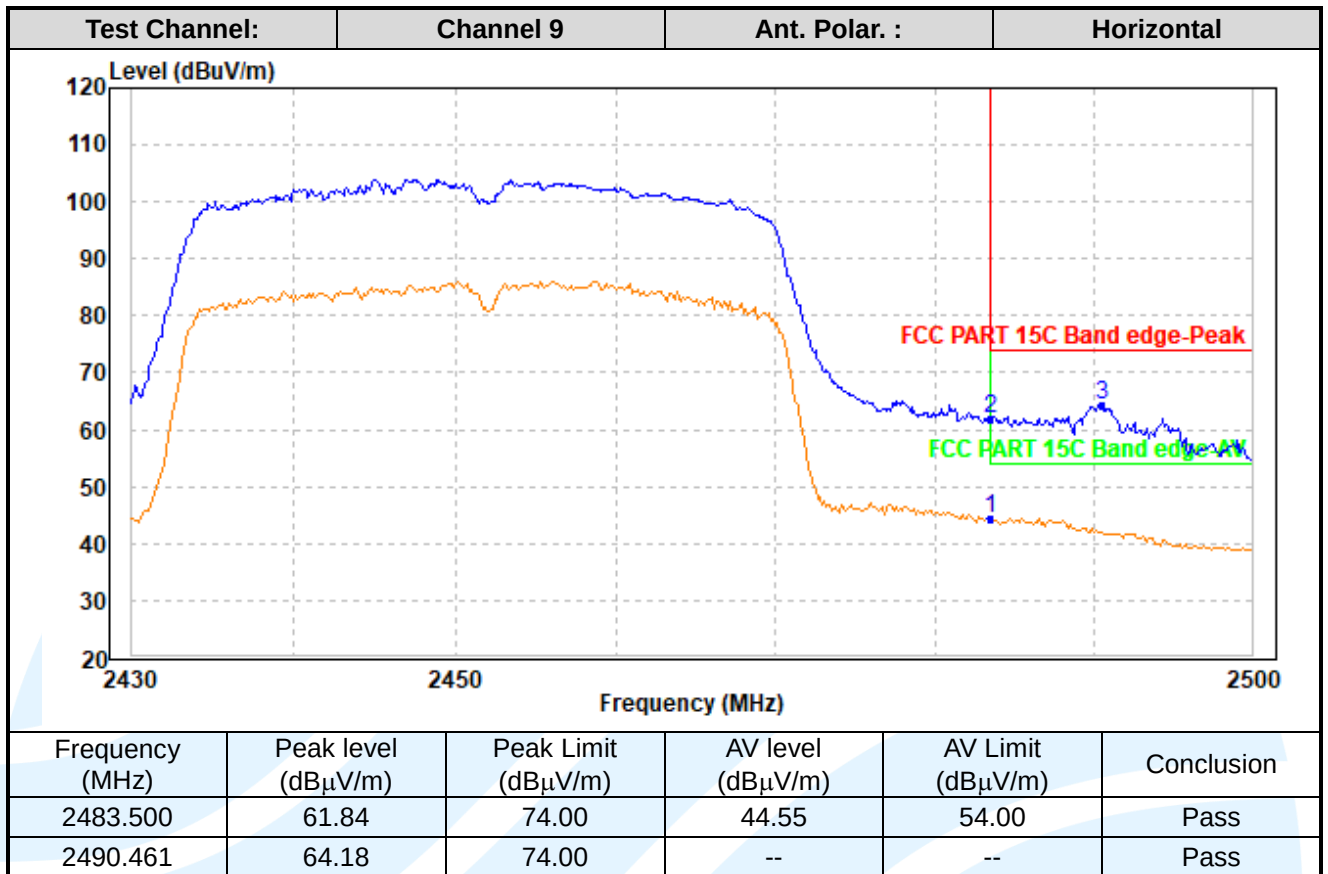
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APPENDIX 1 PHOTOS OF TEST SETUP

See test photos attached in Appendix 1 for the actual connections between Product and support equipment.

APPENDIX 2 PHOTOS OF EUT CONSTRUCTIONAL DETAILS

Refer to Appendix 2 for EUT external and internal photos.

*** End of Report ***

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