Regulatory Test Report

Prepared for Harman International

This report presents detailed information on

INFO3.7-3.8 CSM

Automotive Infotainment Unit

Prepared by

Aravind Buddana

Engineer II

Approved by

Jason Kanakry

General Manager

Issue date: 09/03/2021

Report No: AH20110901-HAR-279-TR1 v5

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The test is traceable to national standard or related international standard

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- # Test Request Information

Test Request #:	7700040166
Test Requested By:	Mark Bowman Harman International Industries, Inc. 30001 Cabot Drive, Novi, MI 48377
Test item Description:	INFO3.7-3.8 CSM (Automotive Infotainment Unit with Bluetooth/WLAN)
Part Number:	84375197
DUT Sample Number:	AH20110901-HAR-279-08, AH20110901-HAR-279-10
Hardware Version of DUT:	PV
Software Version of DUT:	W156
Component Category of DUT:	N/A
FCC ID:	2AHPN-BE2854
IC:	6434C-BE2854
Type of Test:	FCC/ISED Certification
Test Method:	CFR Title 47 FCC Part 15.247, ISED Canada RSS-247 Issue 2, ISED Canada RSS-Gen Issue 5, FCC KDB 558074 D01 15.247 Measurement Guidance v05 and ANSI C63.10-2013
Deviations from standard:	None
Approved Test Plan Number:	N/A
Test Plan Revision:	N/A
Date test sample received:	01/14/2021
Date test started:	02/05/2021
Date test finished:	09/03/2021

- # Test Laboratory Information

Location of Test Lab:	The radiated and conducted emissions test sites are located at Bureau Veritas 815 N. Opdyke Rd #100, Auburn Hills, MI 48326, Phone: +1-248-836-4700
Key Contact:	Jason Kanakry (General Manager) Jason.Kanakry@BureauVeritas.com Phone: +1-248-836-4747
Laboratory Accreditations:	BUREAU VERITAS CONSUMER PRODUCTS SERVICES, INC is accredited in accordance with the recognized International Standard ISO/IEC 17025:2017 General requirements for the competence of testing and calibration laboratories.
ISO/IEC 17025:2017:	5678.01
FCC Test Site Number:	US1278 (242530)
IC Test Site Number:	US0229 (26240)

- ## Statement of Conformity

RSS-GEN	RSS 247	Part 15	Comments
6.4		15.15(b)	There are no controls accessible to the user that varies the output power to operate in violation of the regulatory requirements.
		15.19	The label is shown in the label exhibit.
		15.21	Information to the user is shown in the instruction manual exhibit.
		15.27	No special accessories are required for compliance.
3.2		15.31	The EUT was tested in accordance with the measurement standards in this section.
6.13.2		15.33	Frequency range was investigated according to this section, unless noted in specific rule section under which the equipment operates.
6.13.1		15.35	The EUT emissions were measured using the measurement detector and bandwidth specified in this section, unless noted in specific rule section under which the equipment operates.
6.8		15.203	EUT employs detachable external antenna with 5.98dBi gain.
8.10		15.205 15.209	The fundamental is not in a Restricted band and the spurious and harmonic emissions in the Restricted bands comply with the general emission limits of 15.209 or RSS-Gen as applicable
8.8		15.207	N/A. EUT is vehicle battery powered only.

CFR Title 47 FCC Part 15.247, ISED Canada RSS-247 Issue 2

- **Conducted Testing**

Test Summary

This test report supports an application for certification of a transmitter operating pursuant to:
CFR Title 47 FCC Part 15.247, ISED Canada RSS-247 Issue 2, ISED Canada RSS-Gen Issue 5, FCC KDB 558074 D01 15.247 Measurement Guidance v05 and ANSI C63.10-2013

The product is the INFO3.7-3.8 CSM, It is a direct sequence spread spectrum transmitter that operates in the 2412-2462MHz frequency range.

Details	Description
Frequency Range (MHz)	2412 – 2462
Tested Modes	802.11b 802.11g 802.11n (HT20).
Number of Channels	11
Tested Channels	1, 6 ,11
DUT Antenna Type	External detachable
DUT Antenna Gain	5.98dBi

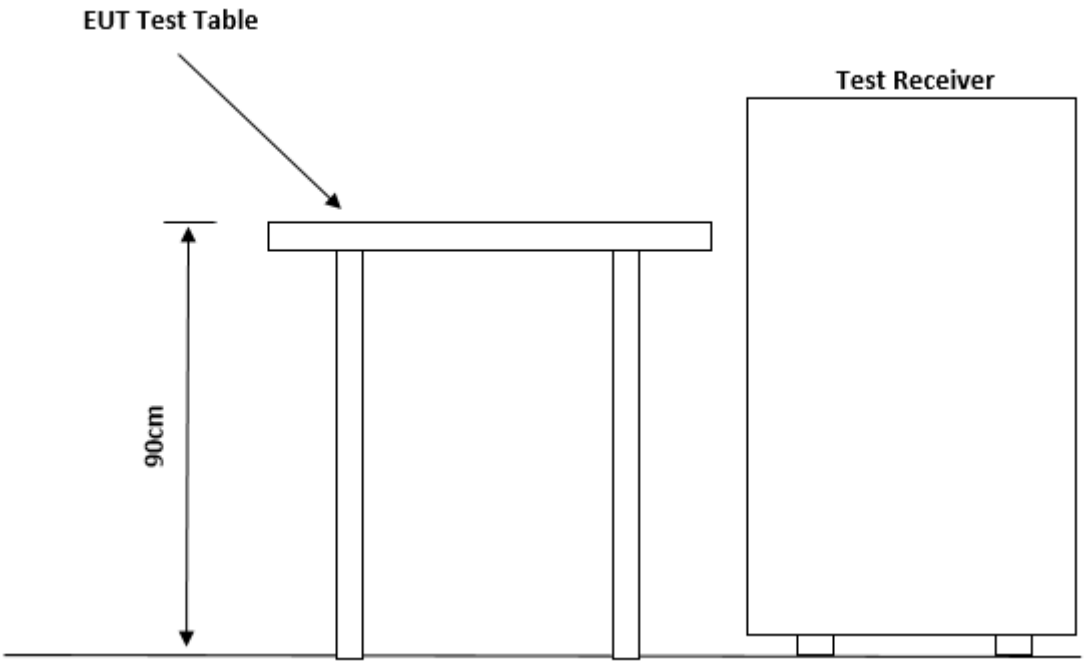
We found that the product met the requirements.
Test samples were received in good condition and remains good and functional post testing.

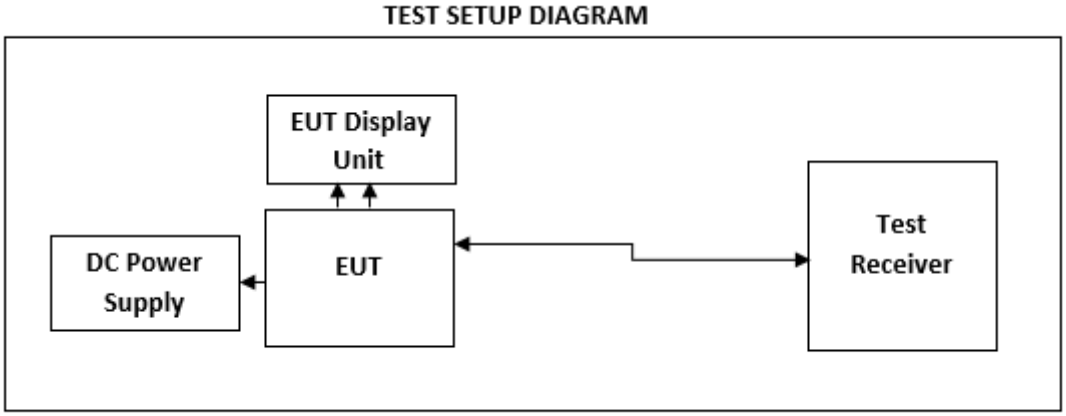
Test Item	Sample #	Result
FCC 15.247 2.4G WLAN	AH20110901-HAR-279-10	Meets Requirements

Test Setup

Conducted Test Site Description

The site is accommodated to test tabletop and floor standing test equipment.





Test Equipment Used

ID #	Equipment	Manufacturer	Model #	Serial #	Cal Due
BVD0226	Spectrum Analyzer 10Hz-44GHz	Rohde & Schwarz	FSV3044	101018	1/14/2022
BVD0227	8 port switch unit for Wireless Test system	Rohde & Schwarz	OSP150	101100	N/A
BVD0228	8 port switch unit for Wireless Test system	Rohde & Schwarz	OSP220	101632	N/A
BVD0224	Signal Generator 100kHz-40GHz	Rohde & Schwarz	SMB100A	181741	11/19/2021
BVD0225	Signal Generator 100k-6GHz with GPS simulator	Rohde & Schwarz	SMW200A	107664	11/18/2021
BVD0250	Wireless Connectivity Tester 70M-6GHz	Rohde & Schwarz	CMW270	102113	11/18/2021
BVD0343	DC Regulated Power Supply	Circuit Specialists, INC	CSI3020X	595215	N/A
BVD0321	Fixed Attenuator 2W 20dB - 40GHz	Mini-Circuits	BW-K20-2W44+	2103	N/A
BVD0477	10db Attenuator -18GHz	Mouser	BW-S10W2+	2043	N/A
BVD0229	Temp and Humidity Meter	Fluke	971	12001009	3/26/2022

Customer Supplied Equipment

ID #	Equipment	Manufacturer	Model	Serial #	Version No.
N/A	DUT Display	Harman	N/A	2133	N/A
N/A	Display Harness	Harman	N/A	N/A	N/A
N/A	Blue Molex Connector Harness	Harman	N/A	N/A	N/A
N/A	DUT 1M Harness	Harman	N/A	N/A	N/A
N/A	USB to DUT Harness	Harman	N/A	102161025	N/A

Equipment List (Software)

ID #	Equipment	Manufacturer	Model	Version No.	
N/A	EMC Test Software	Rodhe & Schwarz	EMC32	11.20.00	N/A

FCC 15.247 2.4G WLAN

Channels and modes available

802.11b, 802.11g and 802.11n (HT20)

Channel	Freq. (MHz)	Channel	Freq. (MHz)
1	**2412**	8	2447
2	2417	9	2452
3	2422	10	2457
4	2427	**11**	**2462**
5	2432		
6	**2437**		
7	2442		

Notes:

1. Channels which were marked bold were tested.
2. Output power measurements were performed at the lowest and highest data rate of each supported 802.11 mode.

Antenna Gain	5.98dBi
Number of transmit Chains	1
Equipment Type	Equipment with wideband modulation other than frequency hopping

Power Settings

802.11b		802.11g	
Channel	**Power Setting**	**Channel**	**Power Setting**
1	Default	**1**	Default
6	Default	**6**	Default
11	Default	**11**	Default
802.11n (HT20)			
Channel	**Power Setting**		
1	Default		
6	Default		
11	Default		

Test Results Summary

Test	Frequency (MHz)	802.11b	802.11g	802.11n (HT20)
RF Output Power	2412/2437/2462	PASS	PASS	PASS
Power Spectral Density	2412/2437/2462	PASS	PASS	PASS
DTS Bandwidth (6dB)	2412/2437/2462	PASS	PASS	PASS
Occupied Channel Bandwidth 99%	2412/2437/2462	PASS	PASS	PASS
Band Edges Low	2412	PASS	PASS	PASS
Band Edges High	2462	PASS	PASS	PASS
Conducted Spurious Emissions	2412/2437/2462	PASS	PASS	PASS

RF Output Power

RF output power is defined as the mean equivalent isotropic radiated power (e.i.r.p.) of the equipment during a transmission burst.

802.11b

Data Rate	Gated RMS (dBm) 2412 MHz	Gated RMS (dBm) 2437 MHz	Gated RMS (dBm) 2462 MHz	Limit (dBm)	Duty Cycle (%)	Power Setting
1 Mbps	9.950	11.012	10.822	30	99.422	Default
11 Mbps	11.252	10.658	10.872	30	94.350	Default

802.11g

Data Rate	Gated RMS (dBm) 2412 MHz	Gated RMS (dBm) 2437 MHz	Gated RMS (dBm) 2462 MHz	Limit (dBm)	Duty Cycle (%)	Power Setting
6 Mbps	12.025	11.267	11.616	30	96.281	Default
54 Mbps	11.607	11.029	10.972	30	75.874	Default

802.11n (HT20)

Data Rate	Gated RMS (dBm) 2412 MHz	Gated RMS (dBm) 2437 MHz	Gated RMS (dBm) 2462 MHz	Limit (dBm)	Duty Cycle (%)	Power Setting
MCS0	11.683	11.107	11.572	30	96.015	Default
MCS7	11.532	10.903	10.870	30	74.235	Default

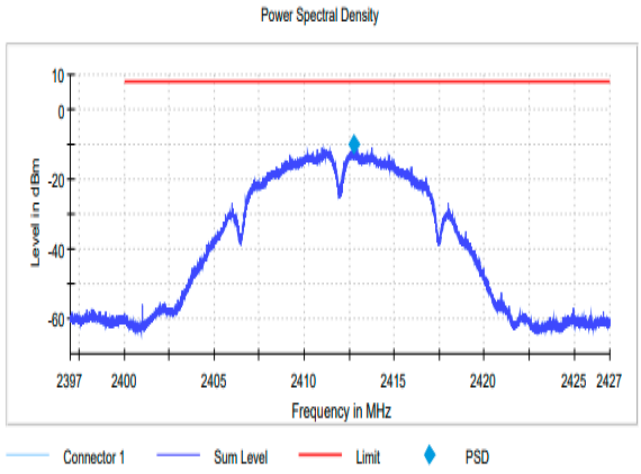
Power Spectral Density

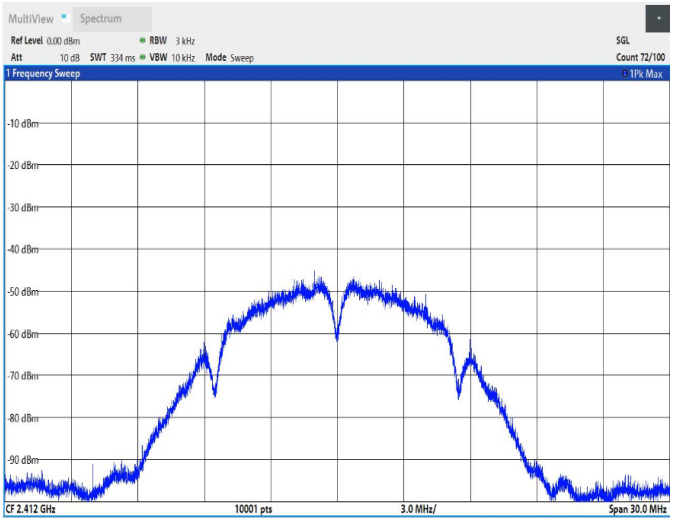
Test according to FCC title 47 part 15 §15.247(a),(e), KDB 558074 D01 DTS Meas Guidance v05 F and ANSI C63.10-2013

Measurement uncertainty calculated in accordance with ETSI TR 100 028-1. Expanded Uncertainty (K=2) < 1.3 dB

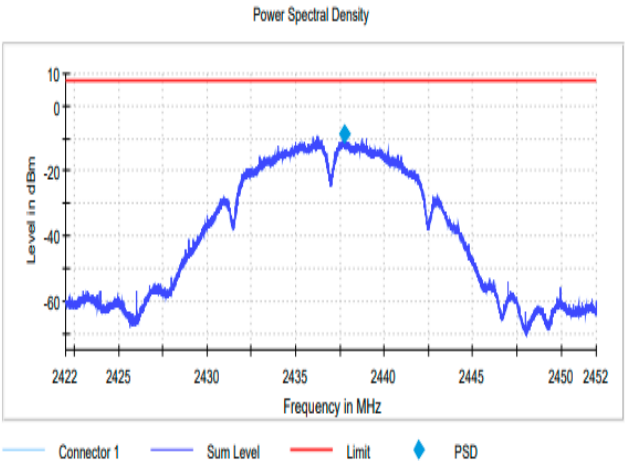
Mode	Data Rate	PSD (dBm) 2412 MHz	PSD (dBm) 2437 MHz	PSD (dBm) 2462 MHz	Limit (dBm)
802.11b	1Mbps	-9.972	-8.823	-10.101	8.0
	11Mbps	-10.290	-10.731	-10.468	8.0

802.11b 2412MHz 1Mbps

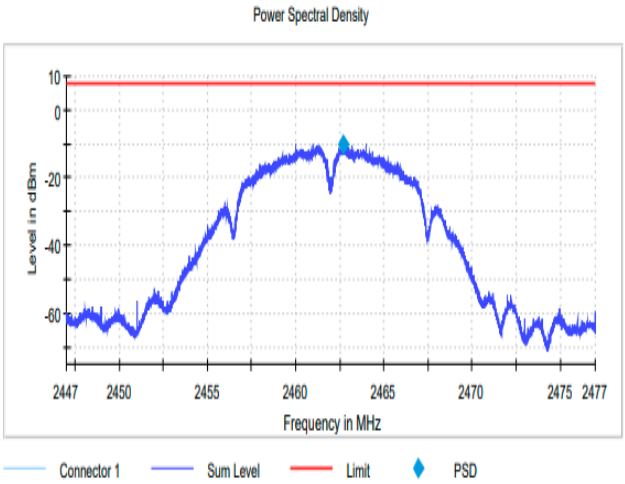




802.11b 2437MHz 1Mbps

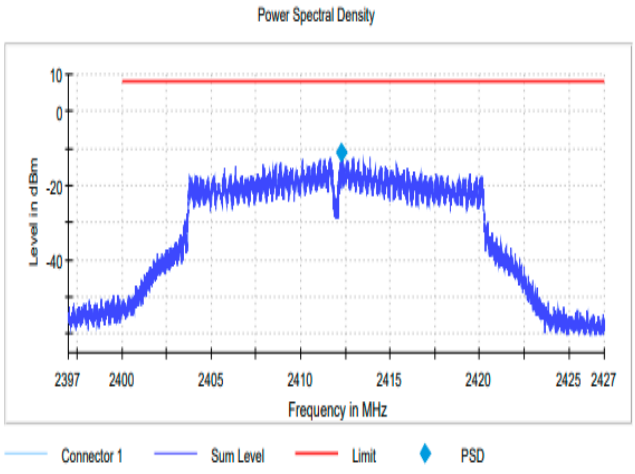


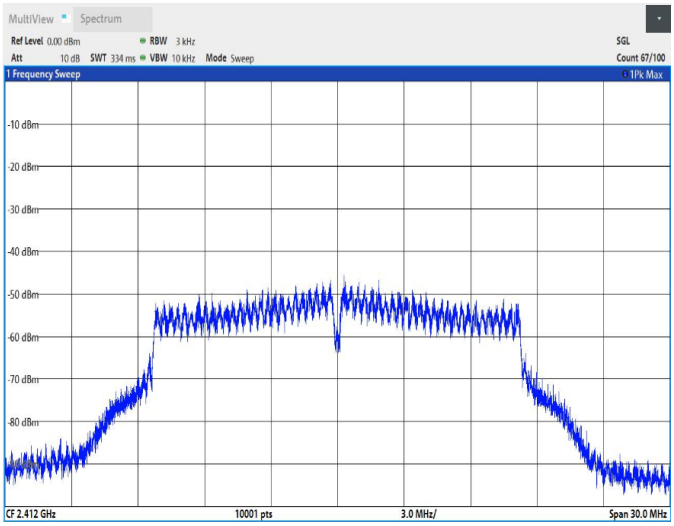
802.11b 2462MHz 1Mbps



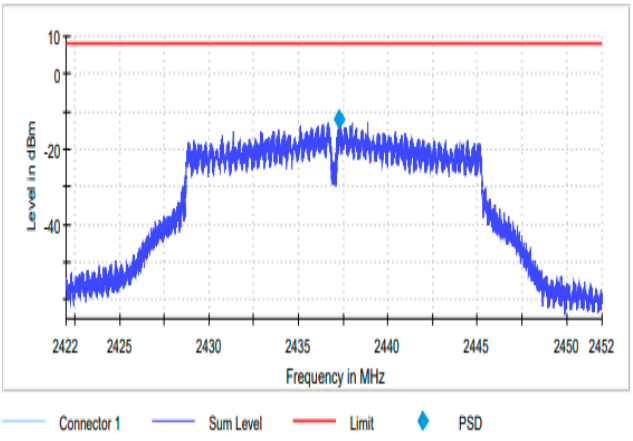
Mode	Data Rate	PSD (dBm) 2412 MHz	PSD (dBm) 2437 MHz	PSD (dBm) 2462 MHz	Limit (dBm)
802.11g	6 Mbps	-11.322	-12.016	-11.524	8.0
	54 Mbps	-15.223	-15.778	-15.877	8.0

802.11g 2412MHz 6Mbps

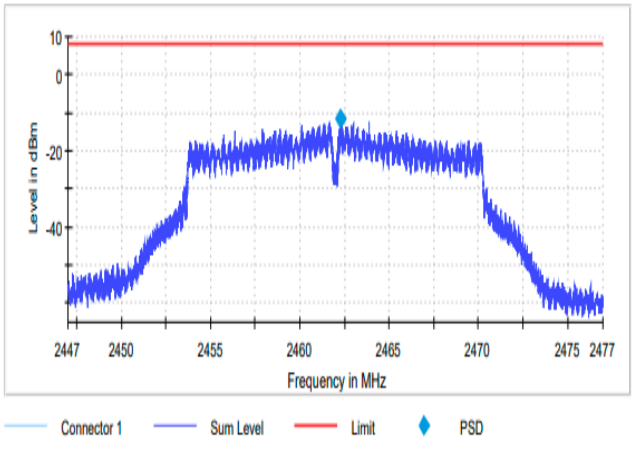




802.11g 2437MHz 6Mbps

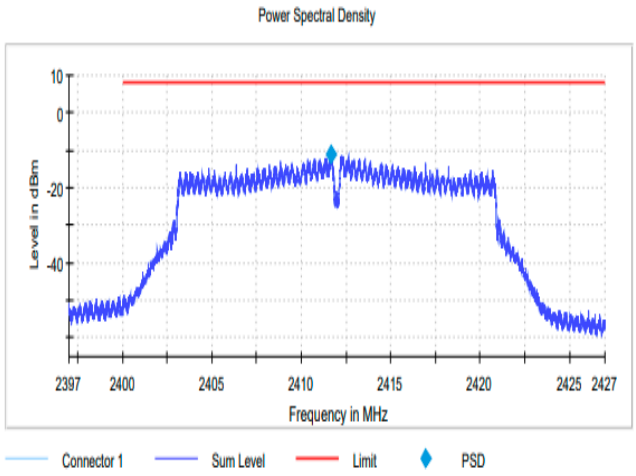


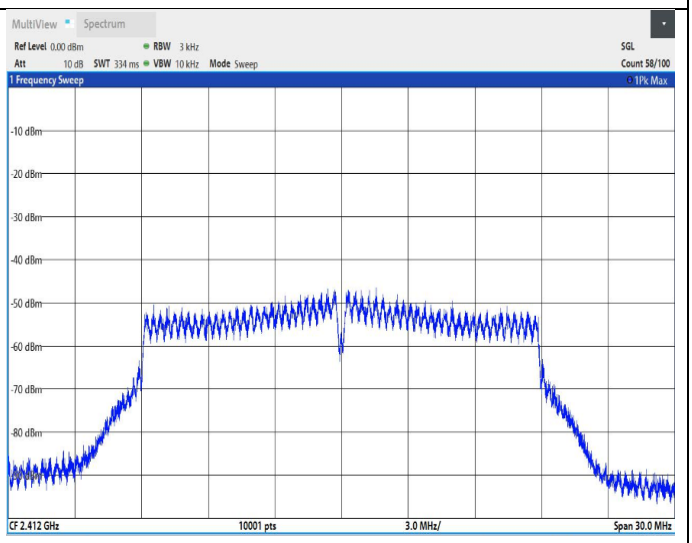
802.11g 2462MHz 6Mbps



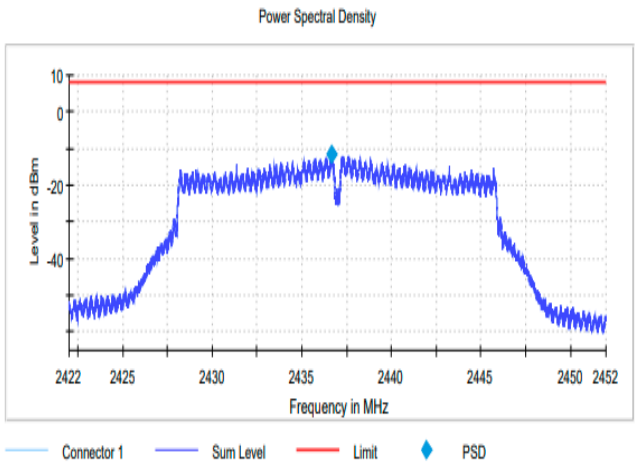
Mode	Data Rate	PSD (dBm) 2412 MHz	PSD (dBm) 2437 MHz	PSD (dBm) 2462 MHz	Limit (dBm)
802.11n (HT20)	MCS0	-10.919	-11.447	-11.370	8.0
	MCS7	-13.907	-14.167	-14.116	8.0

802.11n (HT20) 2412MHz MCS0

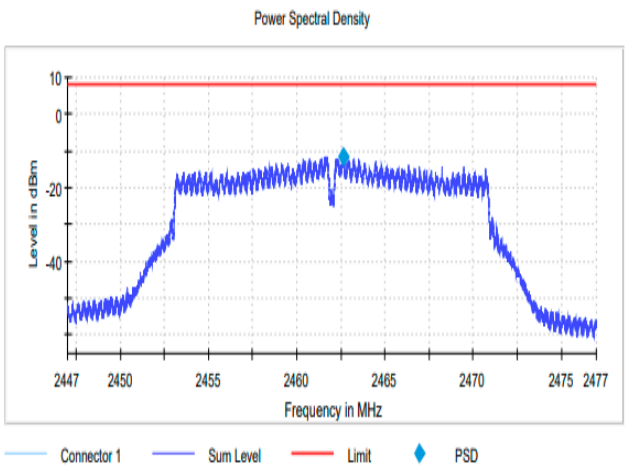




802.11n (HT20) 2437MHz MCS0



802.11n (HT20) 2462MHz MCS0



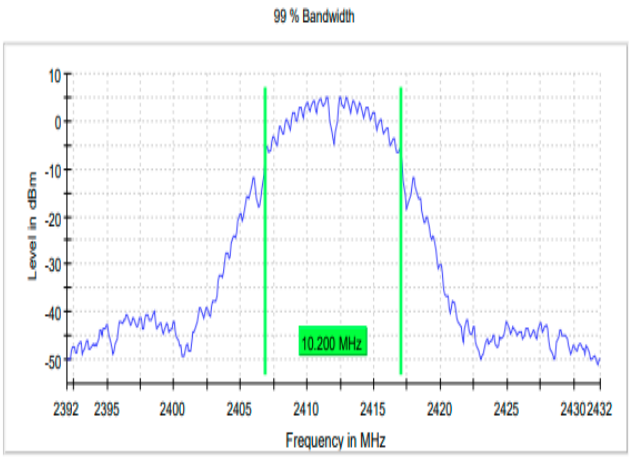
Occupied Channel Bandwidth

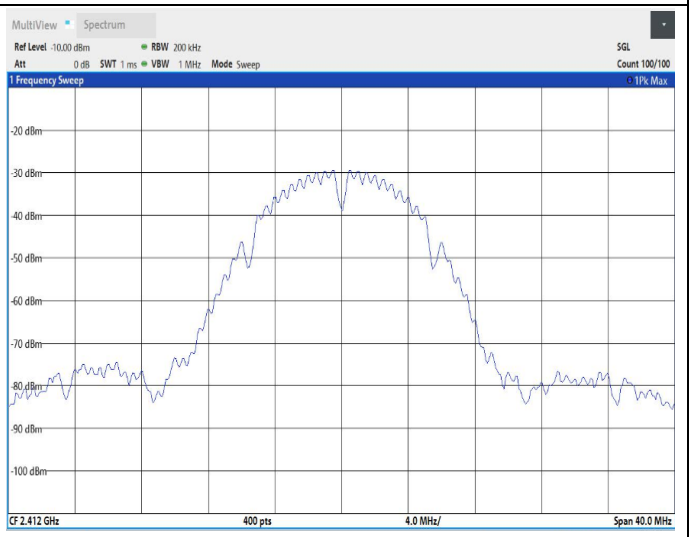
Test according to FCC title 47 part 15 §15.247(a), KDB 558074 D01 DTS Meas Guidance v05 and ANSI C63.10-2013 11.8.1

Measurement uncertainty calculated in accordance with ETSI TR 100 028-1. Expanded Uncertainty (K=2) < 2%

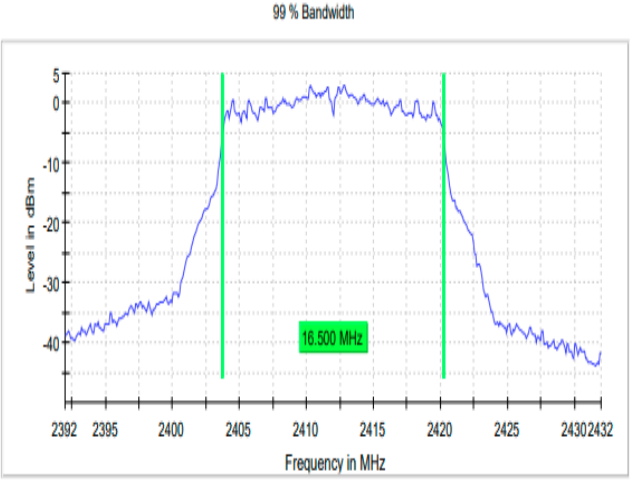
Data Rate	DUT Frequency (MHz)	Bandwidth (MHz)	Band Edge Left (MHz)	Band Edge Right (MHz)
802.11b 1Mbps	2412.000	10.200000	2406.850000	2417.050000
802.11g 6Mbps	2412.000	16.500000	2403.750000	2420.250000
802.11n (HT20) MCS0	2412.000	17.700000	2403.150000	2420.850000
802.11b 1Mbps	2437.000	10.200000	2431.850000	2442.050000
802.11g 6Mbps	2437.000	16.500000	2428.750000	2445.250000
802.11n (HT20) MCS0	2437.000	17.800000	2428.050000	2445.850000
802.11b 1Mbps	2462.000	10.200000	2456.850000	2467.050000
802.11g 6Mbps	2462.000	16.500000	2453.750000	2470.250000
802.11n (HT20) MCS0	2462.000	17.700000	2453.150000	2470.850000

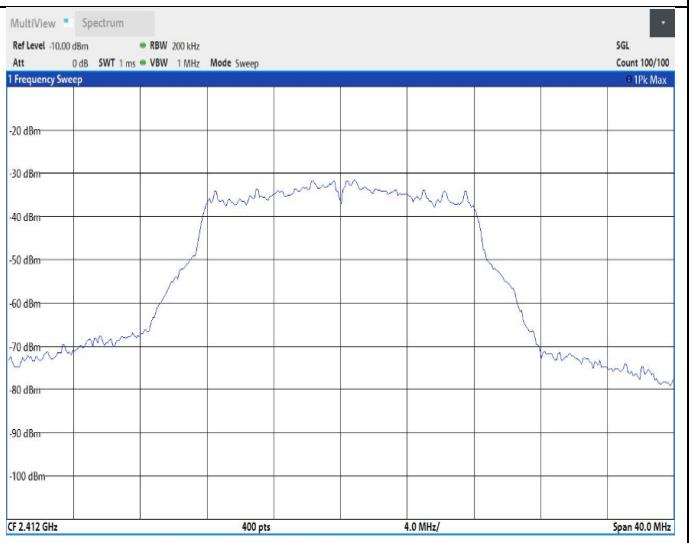
802.11b 2412MHz 1Mbps



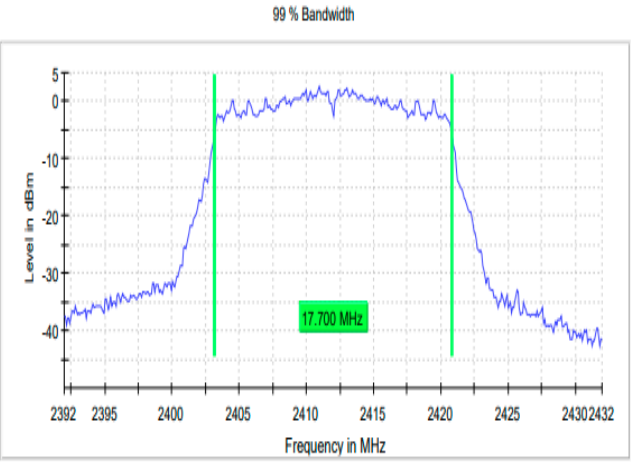


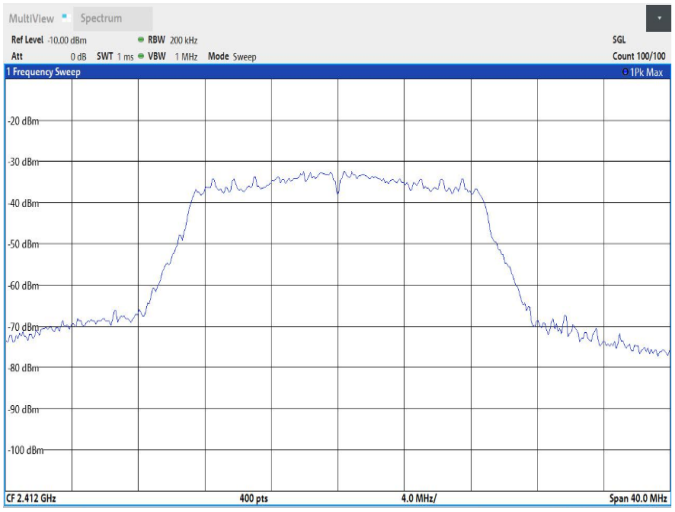
802.11g 2412MHz 6Mbps





802.11n (HT20) 2412MHz MCS0





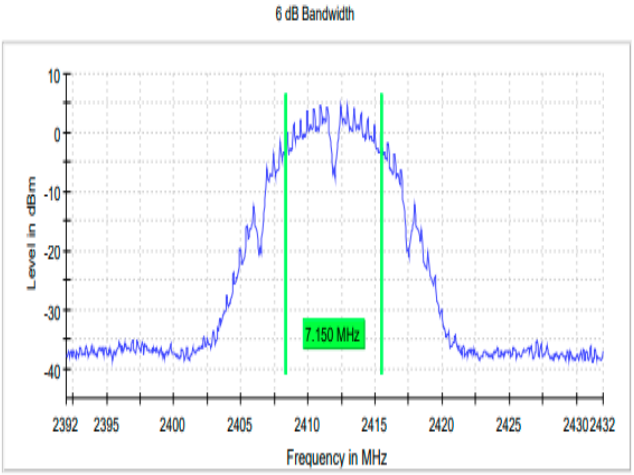
DTS Bandwidth (6dB)

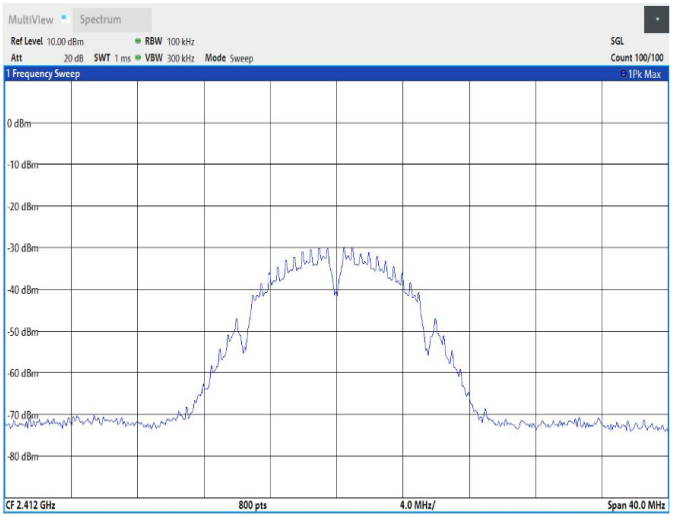
Test according to FCC title 47 part 15 §15.247(a), KDB 558074 D01 DTS Meas Guidance v05 and ANSI C63.10-2013 11.8.1

Measurement uncertainty calculated in accordance with ETSI TR 100 028-1. Expanded Uncertainty (K=2) < 2%

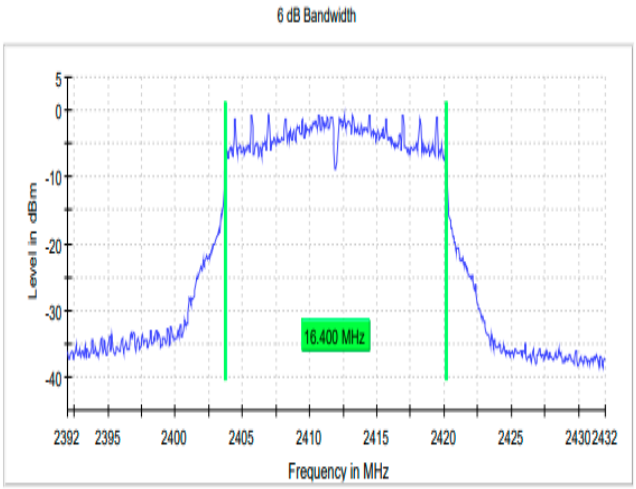
Data Rate	DUT Frequency (MHz)	Bandwidth (MHz)	Band Edge Left (MHz)	Band Edge Right (MHz)	Minimum Limit (MHz)
802.11b 1Mbps	2412.000	7.150000	2408.375000	2415.525000	0.5
802.11g 6Mbps	2412.000	16.400000	2403.775000	2420.175000	0.5
802.11n (HT20) MCS0	2412.000	17.650000	2403.125000	2420.775000	0.5
802.11b 1Mbps	2437.000	7.150000	2433.375000	2440.525000	0.5
802.11g 6Mbps	2437.000	16.400000	2428.775000	2445.175000	0.5
802.11n (HT20) MCS0	2437.000	17.650000	2428.125000	2445.775000	0.5
802.11b 1Mbps	2462.000	7.150000	2458.375000	2465.525000	0.5
802.11g 6Mbps	2462.000	16.400000	2453.775000	2470.175000	0.5
802.11n (HT20) MCS0	2462.000	17.650000	2453.125000	2470.775000	0.5

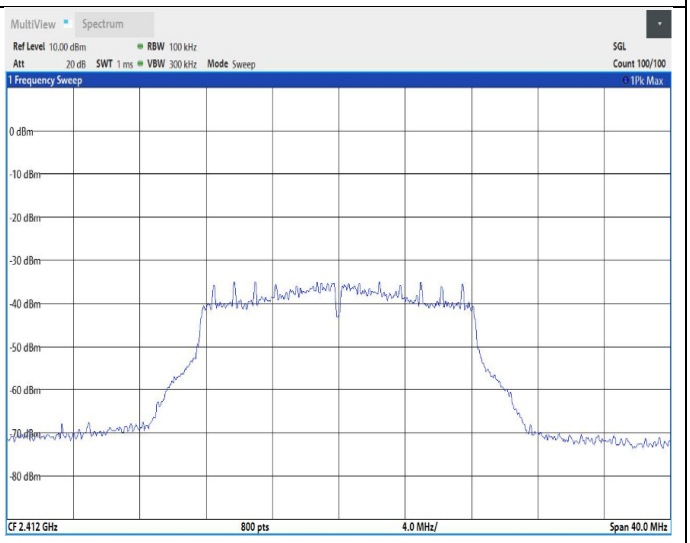
802.11b 2412MHz 1Mbps



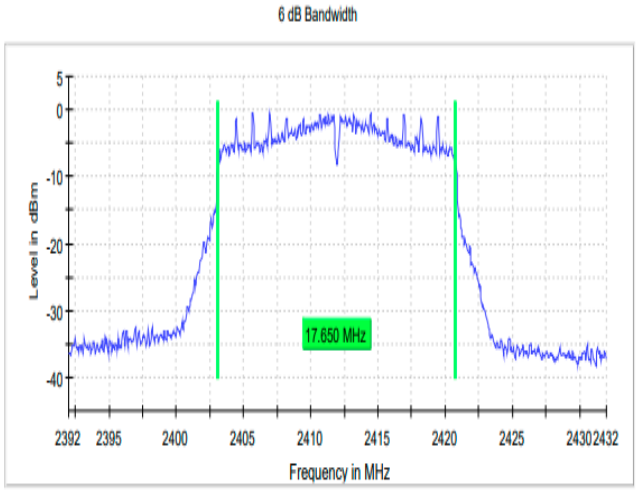


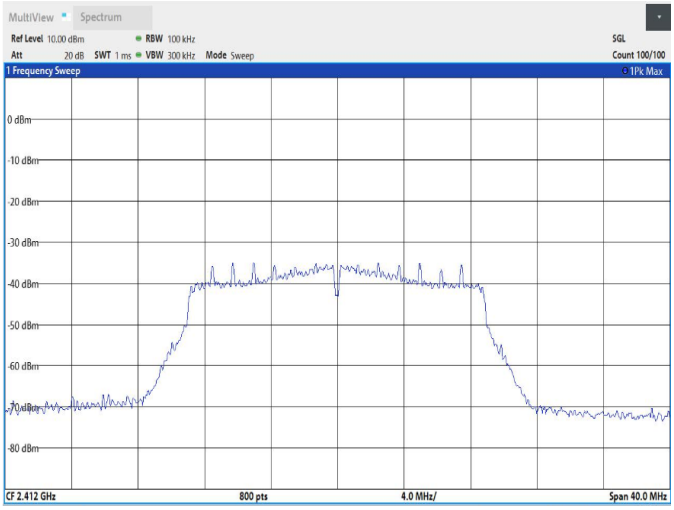
802.11g 2412MHz 6Mbps





802.11n (HT20) 2412MHz MCS0





Conducted Band Edge

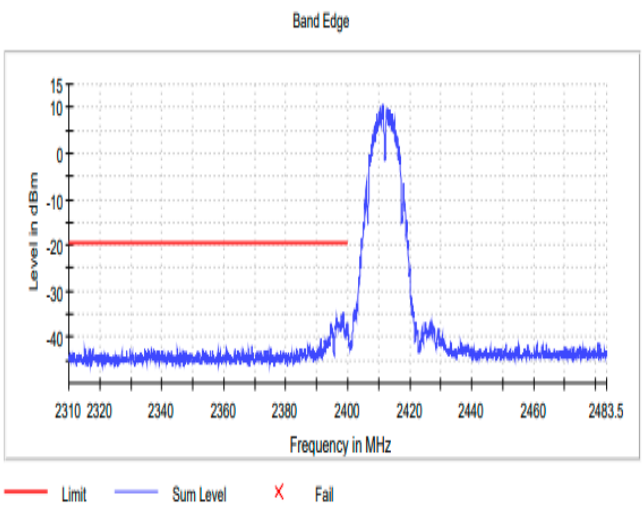
Test according to FCC title 47 part 15 §15.247(d), KDB 558074 D01 DTS Meas Guidance v05 8.7 and ANSI C63.10-2013

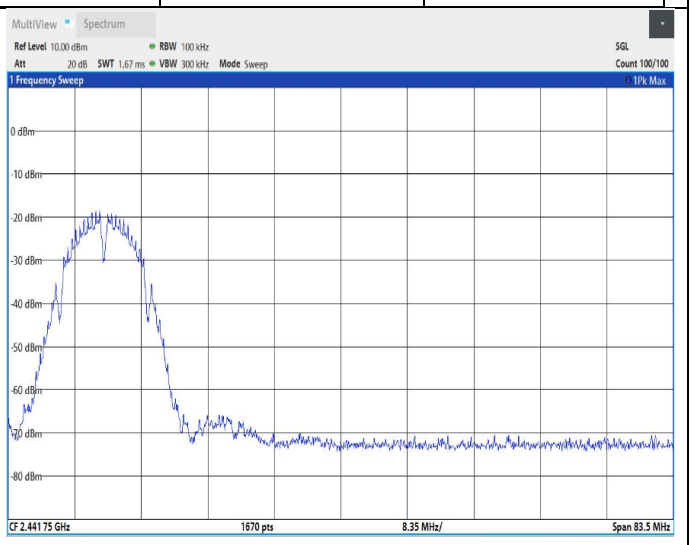
Measurement uncertainty calculated in accordance with ETSI TR 100 028-1. Expanded Uncertainty (K=2) < 0.8 dB

Band Edge Low 802.11b 2412MHz 1Mbps

Frequency (MHz)	Level (dBm)
2411.475000	10.6

Frequency (MHz)	Level (dBm)	Margin (dB)	Limit (dBm)	Result
2398.525000	-34.7	15.3	-19.4	PASS
2398.475000	-34.8	15.4	-19.4	PASS
2397.975000	-35.2	15.8	-19.4	PASS
2398.025000	-35.2	15.8	-19.4	PASS
2396.475000	-35.9	16.5	-19.4	PASS
2396.525000	-36.0	16.5	-19.4	PASS
2397.925000	-36.0	16.6	-19.4	PASS
2398.375000	-36.1	16.6	-19.4	PASS
2396.325000	-36.3	16.9	-19.4	PASS
2398.075000	-36.3	16.9	-19.4	PASS
2398.425000	-36.3	16.9	-19.4	PASS
2396.275000	-36.3	16.9	-19.4	PASS
2398.175000	-36.6	17.2	-19.4	PASS
2398.225000	-36.6	17.2	-19.4	PASS
2398.325000	-36.7	17.2	-19.4	PASS

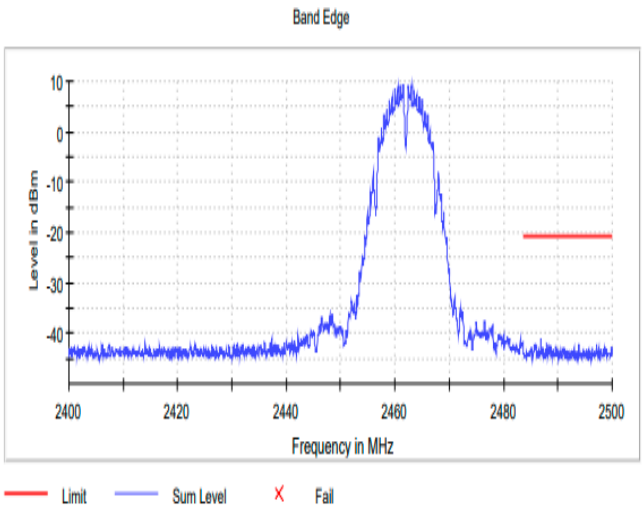


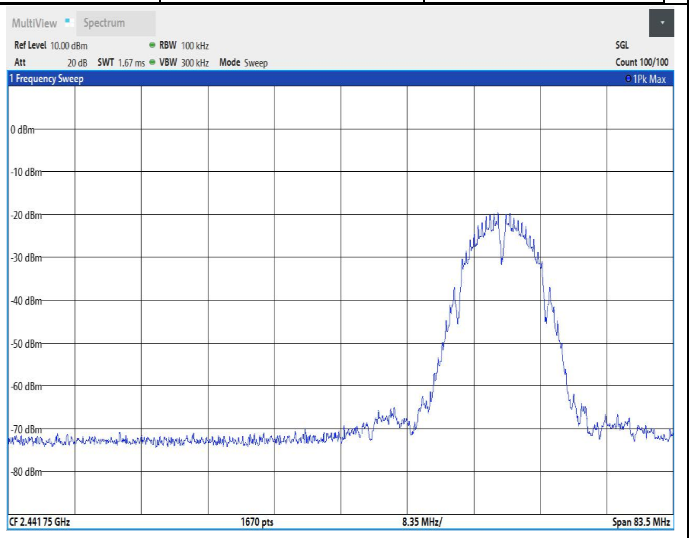


Band Edge High 802.11b 2412MHz 1Mbps

Frequency (MHz)	Level (dBm)
2461.475000	9.4

Frequency (MHz)	Level (dBm)	Margin (dB)	Limit (dBm)	Result
2486.875000	-40.9	20.4	-20.6	PASS
2486.825000	-41.1	20.6	-20.6	PASS
2487.975000	-42.0	21.4	-20.6	PASS
2485.825000	-42.3	21.7	-20.6	PASS
2493.825000	-42.3	21.7	-20.6	PASS
2485.875000	-42.4	21.9	-20.6	PASS
2488.025000	-42.5	21.9	-20.6	PASS
2488.725000	-42.5	21.9	-20.6	PASS
2487.925000	-42.5	22.0	-20.6	PASS
2485.975000	-42.5	22.0	-20.6	PASS
2497.175000	-42.6	22.0	-20.6	PASS
2488.575000	-42.6	22.0	-20.6	PASS
2497.125000	-42.6	22.1	-20.6	PASS
2485.725000	-42.7	22.1	-20.6	PASS
2489.625000	-42.7	22.1	-20.6	PASS

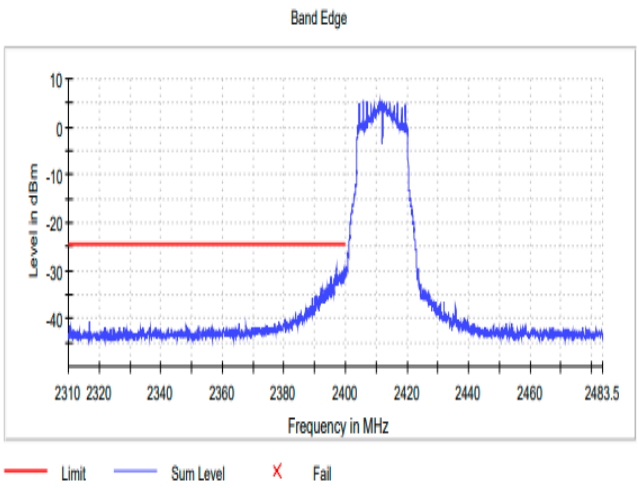


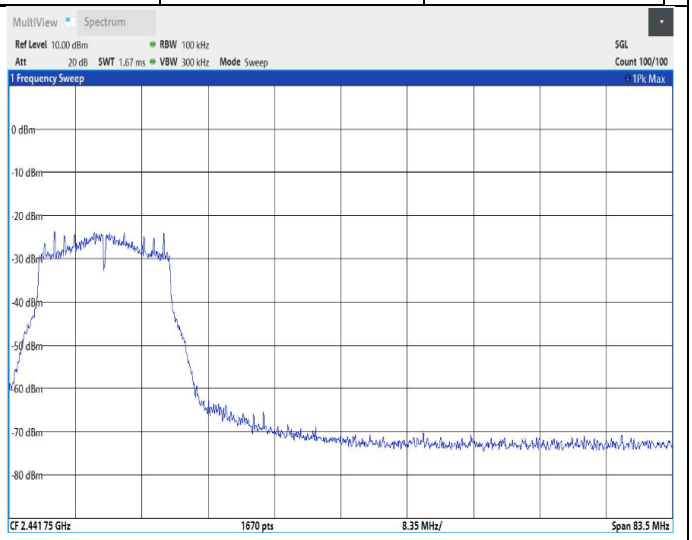


Band Edge Low 802.11g 2412MHz 6Mbps

Frequency (MHz)	Level (dBm)
2405.725000	5.3

Frequency (MHz)	Level (dBm)	Margin (dB)	Limit (dBm)	Result
2399.525000	-29.3	4.6	-24.7	PASS
2399.475000	-29.3	4.7	-24.7	PASS
2397.025000	-29.5	4.8	-24.7	PASS
2396.975000	-29.5	4.8	-24.7	PASS
2399.875000	-29.7	5.0	-24.7	PASS
2399.775000	-29.9	5.2	-24.7	PASS
2399.825000	-29.9	5.3	-24.7	PASS
2399.725000	-30.0	5.3	-24.7	PASS
2398.825000	-30.2	5.6	-24.7	PASS
2398.875000	-30.3	5.7	-24.7	PASS
2399.425000	-30.4	5.8	-24.7	PASS
2398.225000	-30.5	5.8	-24.7	PASS
2399.575000	-30.6	5.9	-24.7	PASS
2399.225000	-30.8	6.1	-24.7	PASS
2396.725000	-30.8	6.1	-24.7	PASS

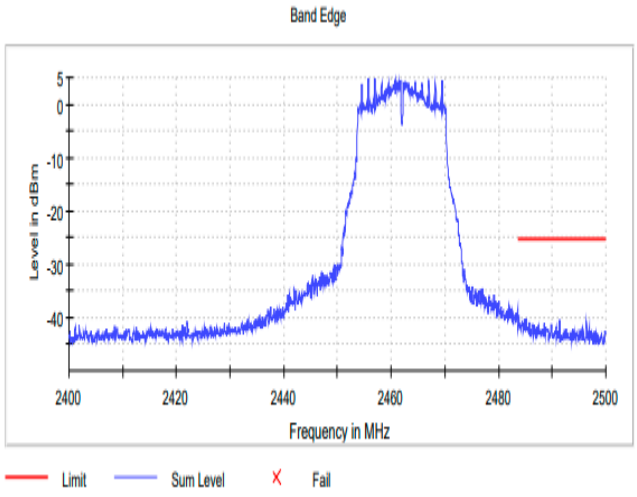


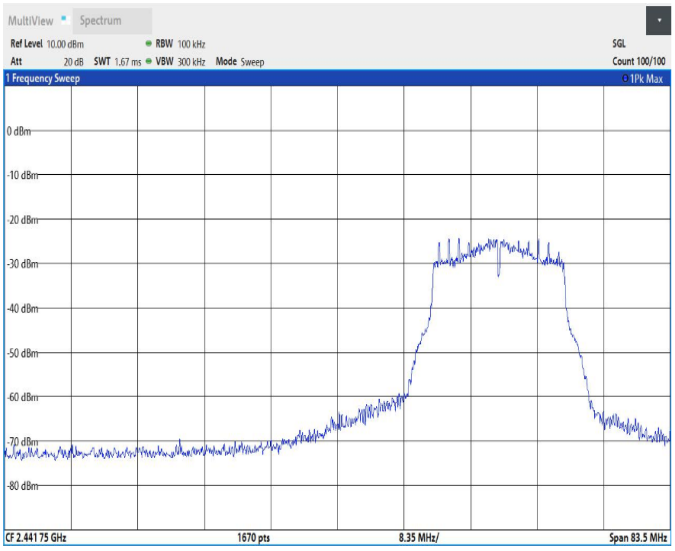


Band Edge High 802.11g 2462MHz 6Mbps

Frequency (MHz)	Level (dBm)
2456.975000	4.7

Frequency (MHz)	Level (dBm)	Margin (dB)	Limit (dBm)	Result
2483.775000	-39.6	14.2	-25.3	PASS
2483.825000	-39.7	14.3	-25.3	PASS
2483.525000	-40.0	14.7	-25.3	PASS
2485.125000	-40.4	15.0	-25.3	PASS
2484.775000	-40.4	15.1	-25.3	PASS
2491.375000	-40.4	15.1	-25.3	PASS
2491.425000	-40.4	15.1	-25.3	PASS
2485.025000	-40.5	15.2	-25.3	PASS
2485.075000	-40.6	15.3	-25.3	PASS
2496.375000	-40.7	15.3	-25.3	PASS
2496.325000	-40.8	15.5	-25.3	PASS
2483.875000	-40.8	15.5	-25.3	PASS
2485.175000	-40.9	15.5	-25.3	PASS
2485.775000	-40.9	15.6	-25.3	PASS
2485.725000	-41.0	15.6	-25.3	PASS

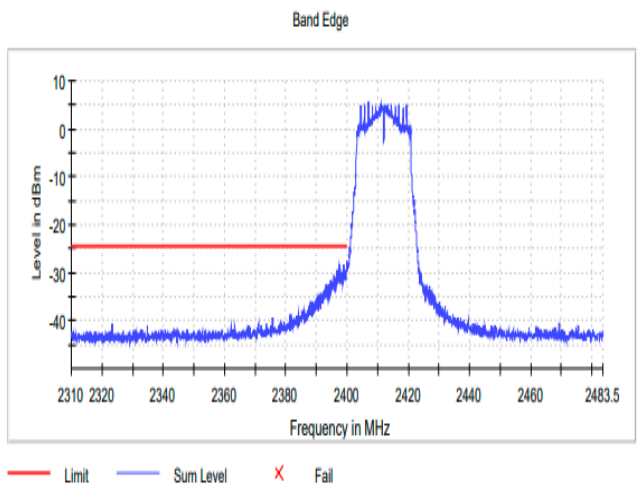


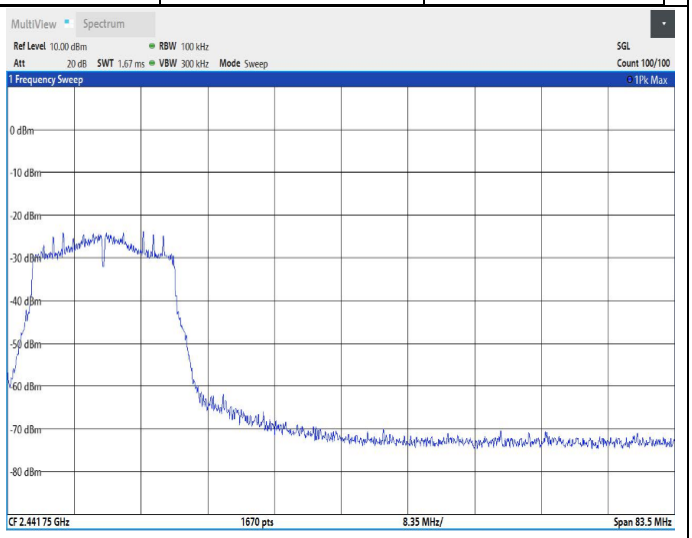


Band Edge Low 802.11n (HT20) 2412MHz MCS0

Frequency (MHz)	Level (dBm)
2406.975000	5.3

Frequency (MHz)	Level (dBm)	Margin (dB)	Limit (dBm)	Result
2397.625000	-28.3	3.6	-24.7	PASS
2398.875000	-28.3	3.6	-24.7	PASS
2398.825000	-28.3	3.7	-24.7	PASS
2397.575000	-28.6	3.9	-24.7	PASS
2399.825000	-28.8	4.2	-24.7	PASS
2399.875000	-28.9	4.2	-24.7	PASS
2398.925000	-29.2	4.5	-24.7	PASS
2397.675000	-29.4	4.7	-24.7	PASS
2399.175000	-29.5	4.9	-24.7	PASS
2396.725000	-29.6	4.9	-24.7	PASS
2397.925000	-29.6	5.0	-24.7	PASS
2399.125000	-29.6	5.0	-24.7	PASS
2397.025000	-29.6	5.0	-24.7	PASS
2396.975000	-29.6	5.0	-24.7	PASS
2399.975000	-29.7	5.0	-24.7	PASS

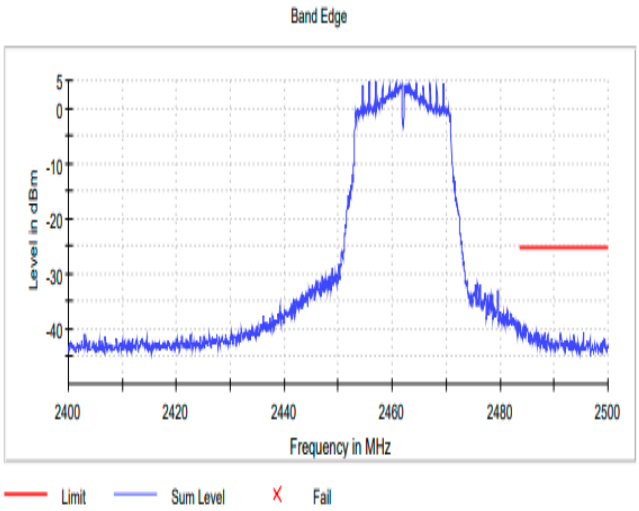


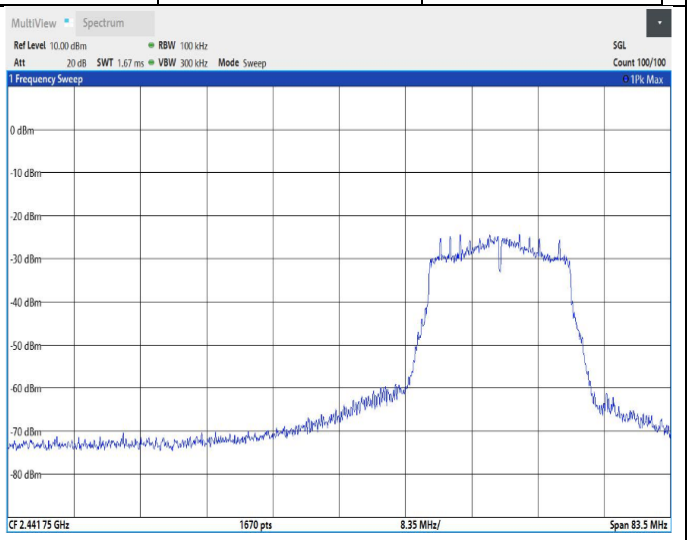


Band Edge High 802.11n (HT20) 2462MHz MCS0

Frequency (MHz)	Level (dBm)
2464.475000	4.7

Frequency (MHz)	Level (dBm)	Margin (dB)	Limit (dBm)	Result
2483.525000	-38.7	13.4	-25.3	PASS
2483.575000	-39.0	13.6	-25.3	PASS
2484.475000	-39.3	14.0	-25.3	PASS
2484.825000	-39.3	14.0	-25.3	PASS
2483.825000	-39.3	14.0	-25.3	PASS
2484.425000	-39.3	14.0	-25.3	PASS
2483.625000	-39.4	14.1	-25.3	PASS
2484.675000	-39.8	14.5	-25.3	PASS
2484.175000	-39.8	14.5	-25.3	PASS
2484.225000	-40.0	14.7	-25.3	PASS
2483.875000	-40.0	14.7	-25.3	PASS
2483.675000	-40.1	14.8	-25.3	PASS
2484.925000	-40.1	14.8	-25.3	PASS
2484.775000	-40.1	14.8	-25.3	PASS
2484.975000	-40.2	14.9	-25.3	PASS





Tx Spurious Emissions

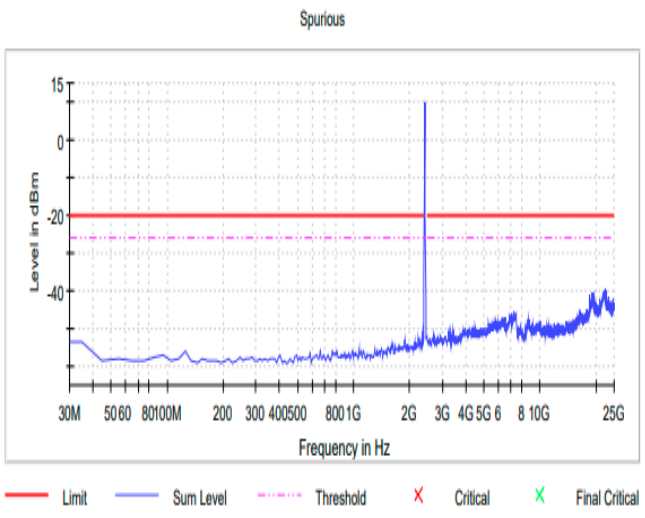
Test according to FCC title 47 part 15 §15.247(d), KDB 558074 D01 DTS Meas Guidance v05 8.5 and ANSI C63.10-2013 11.11.2 & 11.11.3

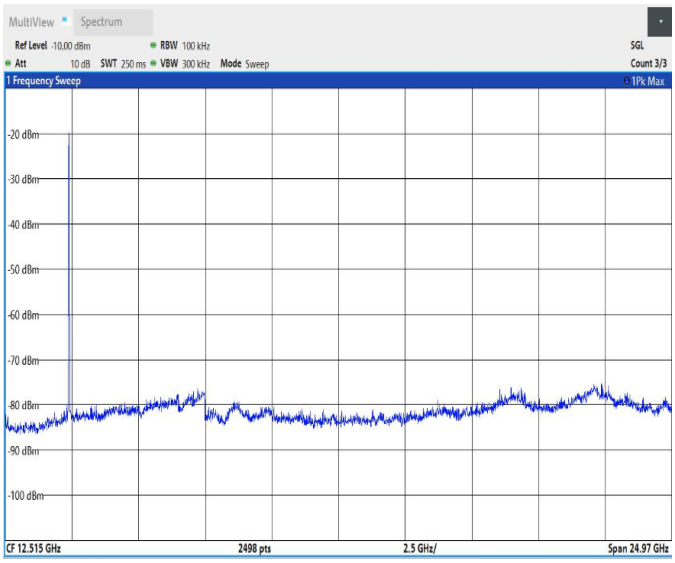
Measurement uncertainty calculated in accordance with ETSI TR 100 028-1. Expanded Uncertainty (K=2) < 1.8 dB

802.11b 2412MHz 1Mbps

Pre Measurement

Frequency (MHz)	Level (dBm)	Margin (dB)	Limit (dBm)
2394.053243	-36.6	16.7	-20.0
22366.054844	-39.7	19.7	-20.0
22086.166934	-39.9	20.0	-20.0
22396.042834	-40.0	20.0	-20.0
22625.950761	-40.1	20.1	-20.0
22206.118895	-40.1	20.1	-20.0
22196.122898	-40.4	20.4	-20.0
22156.138911	-40.5	20.5	-20.0
21976.210969	-40.6	20.6	-20.0
21986.206966	-40.6	20.7	-20.0
18977.411930	-40.7	20.7	-20.0
19367.255805	-40.7	20.7	-20.0
22096.162930	-40.7	20.7	-20.0
22416.034828	-40.7	20.7	-20.0
22216.114892	-40.8	20.9	-20.0

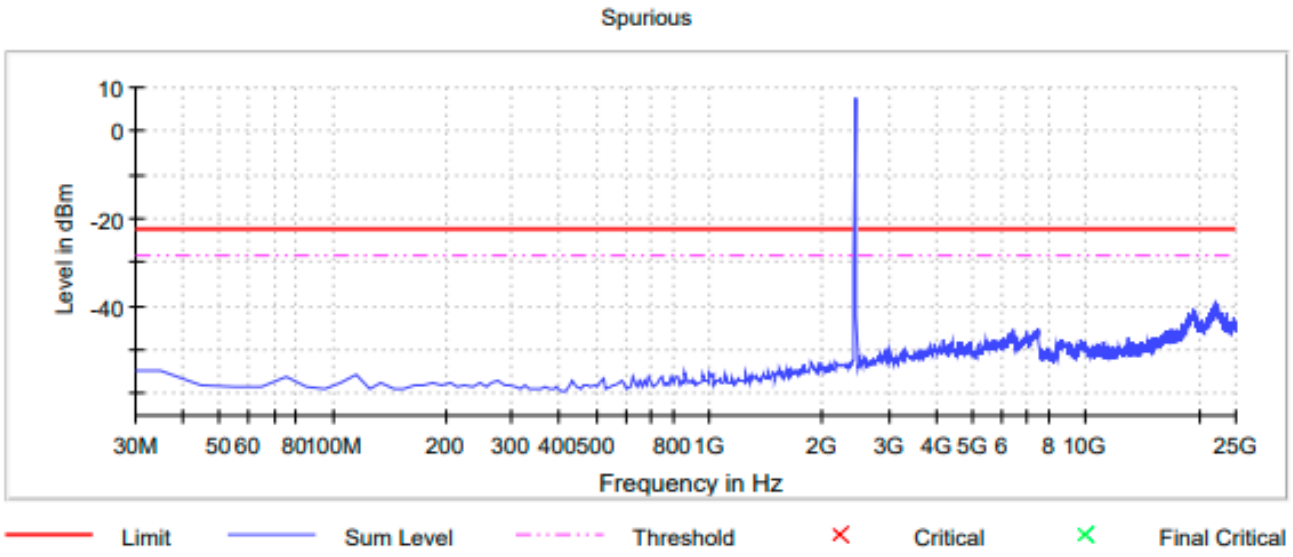




802.11b 2437MHz 1Mbps

Pre Measurement

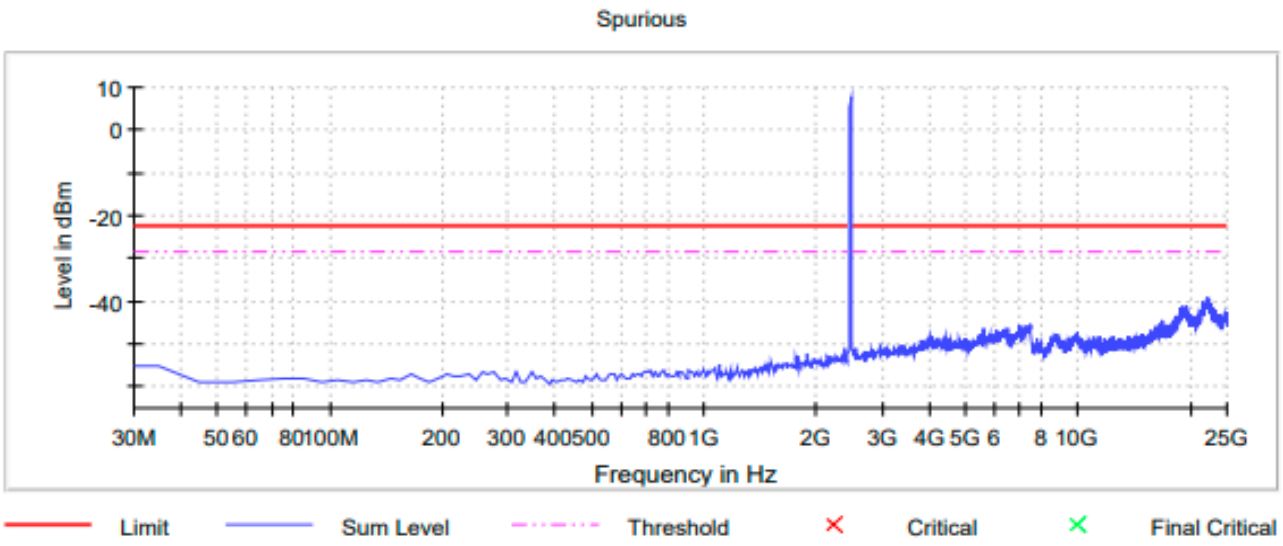
Frequency (MHz)	Level (dBm)	Margin (dB)	Limit (dBm)
22096.162930	-38.7	16.4	-22.2
22066.174940	-39.1	16.8	-22.2
22116.154924	-39.4	17.1	-22.2
22126.150921	-39.6	17.4	-22.2
22226.110889	-39.6	17.4	-22.2
22026.190953	-39.6	17.4	-22.2
22136.146918	-39.6	17.4	-22.2
22246.102882	-39.8	17.6	-22.2
22006.198959	-39.9	17.7	-22.2
22186.126902	-39.9	17.7	-22.2
22106.158927	-40.0	17.7	-22.2
22166.134908	-40.0	17.8	-22.2
22236.106886	-40.2	18.0	-22.2
21886.246998	-40.2	18.0	-22.2
22056.178943	-40.3	18.1	-22.2



802.11b 2462MHz 1Mbps

Pre Measurement

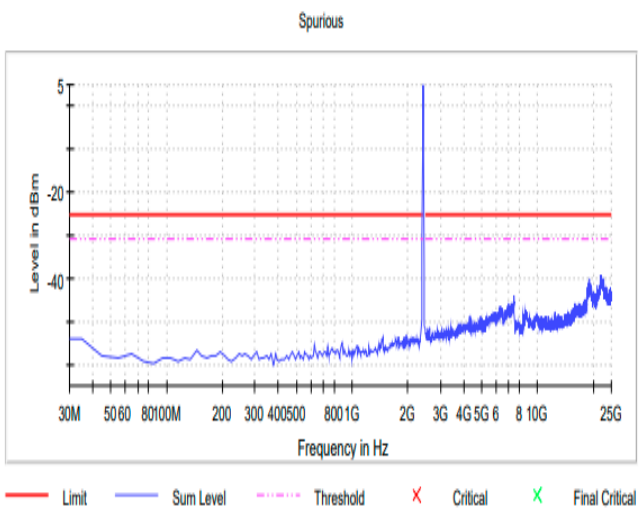
Frequency (MHz)	Level (dBm)	Margin (dB)	Limit (dBm)
22076.170937	-39.0	16.7	-22.3
22266.094876	-39.2	16.8	-22.3
22056.178943	-39.3	17.0	-22.3
22226.110889	-39.6	17.2	-22.3
22086.166934	-39.8	17.4	-22.3
22006.198959	-39.9	17.6	-22.3
22206.118895	-39.9	17.6	-22.3
22146.142914	-40.0	17.6	-22.3
21976.210969	-40.0	17.6	-22.3
21406.439151	-40.3	17.9	-22.3
22176.130905	-40.3	17.9	-22.3
22126.150921	-40.3	18.0	-22.3
22036.186950	-40.4	18.0	-22.3
22116.154924	-40.4	18.0	-22.3
22166.134908	-40.4	18.1	-22.3

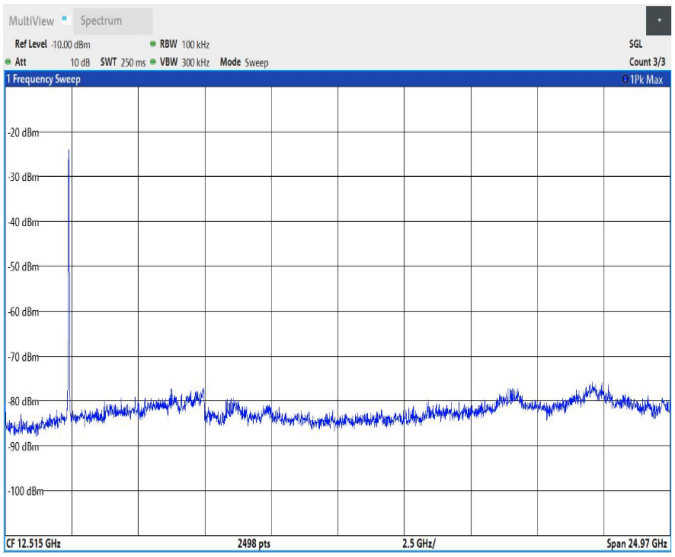


802.11g 2412MHz 6Mbps

Pre Measurement

Frequency (MHz)	Level (dBm)	Margin (dB)	Limit (dBm)
2394.053243	-32.2	7.2	-25.1
21906.238991	-39.0	14.0	-25.1
22066.174940	-39.3	14.3	-25.1
22036.186950	-39.7	14.6	-25.1
22575.970777	-39.9	14.8	-25.1
22426.030825	-40.0	15.0	-25.1
22136.146918	-40.0	15.0	-25.1
19077.371898	-40.2	15.1	-25.1
22076.170937	-40.4	15.3	-25.1
22675.930745	-40.5	15.5	-25.1
21986.206966	-40.5	15.5	-25.1
22126.150921	-40.6	15.6	-25.1
22196.122898	-40.6	15.6	-25.1
22496.002802	-40.7	15.7	-25.1
2384.057246	-40.7	15.7	-25.1



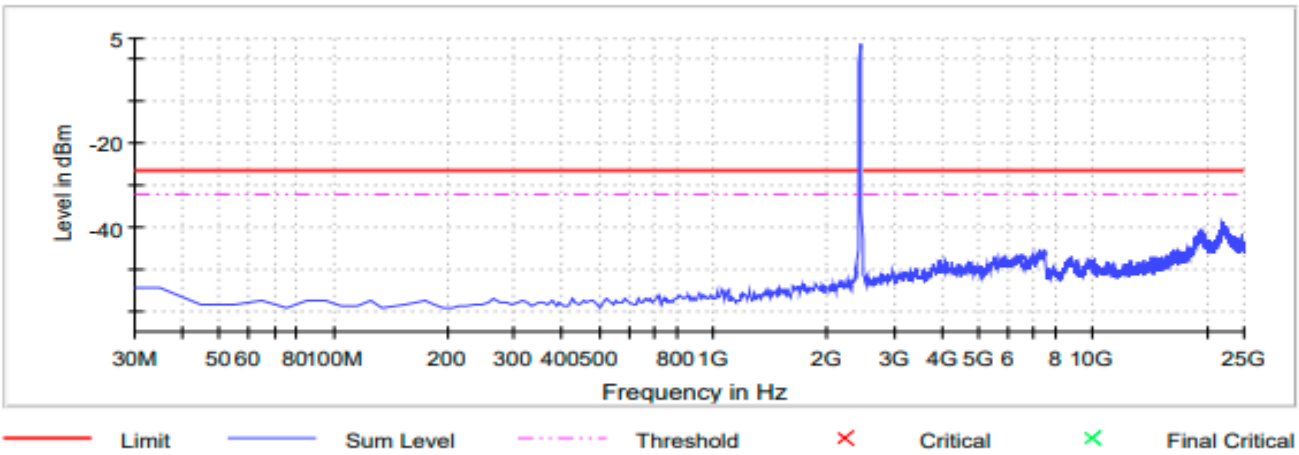


802.11g 2437MHz 6Mbps

Pre Measurement

Frequency (MHz)	Level (dBm)	Margin (dB)	Limit (dBm)
22126.150921	-38.9	12.5	-26.4
21936.226982	-39.2	12.8	-26.4
22076.170937	-39.7	13.3	-26.4
22016.194956	-39.7	13.4	-26.4
22266.094876	-39.8	13.4	-26.4
22316.074860	-39.8	13.5	-26.4
22036.186950	-39.9	13.6	-26.4
22196.122898	-39.9	13.6	-26.4
21996.202962	-40.0	13.7	-26.4
22086.166934	-40.1	13.7	-26.4
21986.206966	-40.2	13.8	-26.4
21966.214972	-40.2	13.8	-26.4
22136.146918	-40.2	13.8	-26.4
22146.142914	-40.2	13.9	-26.4
22216.114892	-40.3	13.9	-26.4

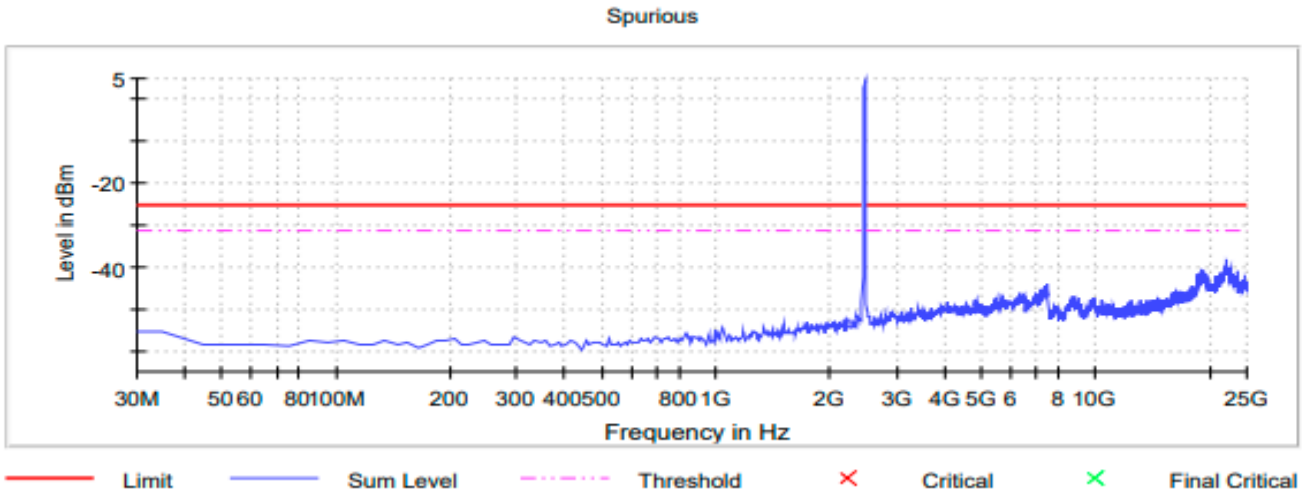
Spurious



802.11g 2462MHz 6Mbps

Pre Measurement

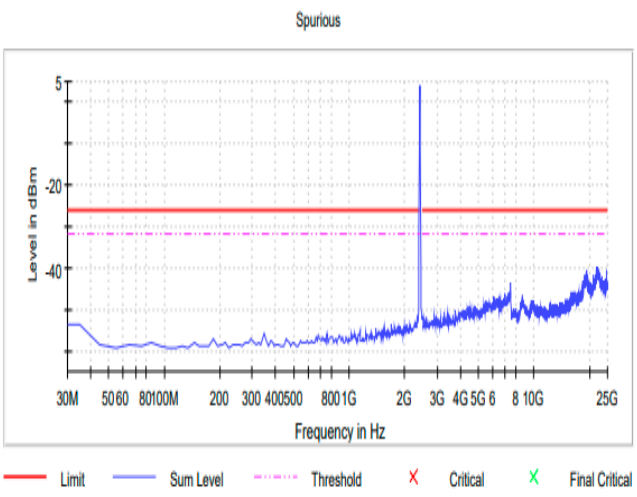
Frequency (MHz)	Level (dBm)	Margin (dB)	Limit (dBm)
22146.142914	-38.3	13.0	-25.3
21996.202962	-39.0	13.7	-25.3
22006.198959	-39.2	13.9	-25.3
22106.158927	-39.3	13.9	-25.3
22076.170937	-39.4	14.1	-25.3
22056.178943	-39.7	14.4	-25.3
22236.106886	-39.8	14.5	-25.3
22086.166934	-39.9	14.6	-25.3
22026.190953	-39.9	14.6	-25.3
22166.134908	-40.0	14.7	-25.3
22316.074860	-40.0	14.7	-25.3
22126.150921	-40.0	14.7	-25.3
22016.194956	-40.1	14.8	-25.3
21876.251001	-40.1	14.8	-25.3
22476.010809	-40.4	15.0	-25.3

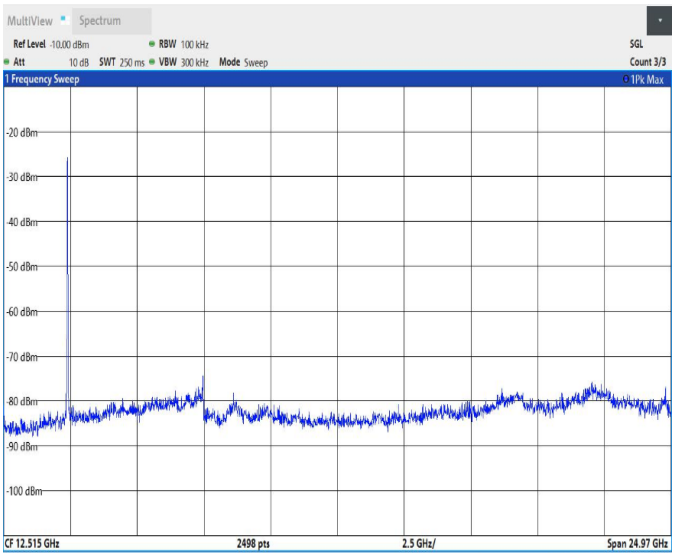


802.11n (HT20) 2412MHz MCS0

Pre Measurement

Frequency (MHz)	Level (dBm)	Margin (dB)	Limit (dBm)
2394.053243	-32.3	6.4	-25.9
22086.166934	-39.6	13.7	-25.9
22186.126902	-39.6	13.7	-25.9
22036.186950	-39.8	13.9	-25.9
21846.263010	-39.8	13.9	-25.9
21766.295036	-39.9	14.0	-25.9
22236.106886	-40.4	14.5	-25.9
21876.251001	-40.4	14.5	-25.9
22206.118895	-40.5	14.6	-25.9
22396.042834	-40.5	14.6	-25.9
21916.234988	-40.5	14.6	-25.9
22056.178943	-40.5	14.6	-25.9
22006.198959	-40.5	14.6	-25.9
19307.279824	-40.6	14.7	-25.9
21786.287030	-40.6	14.7	-25.9

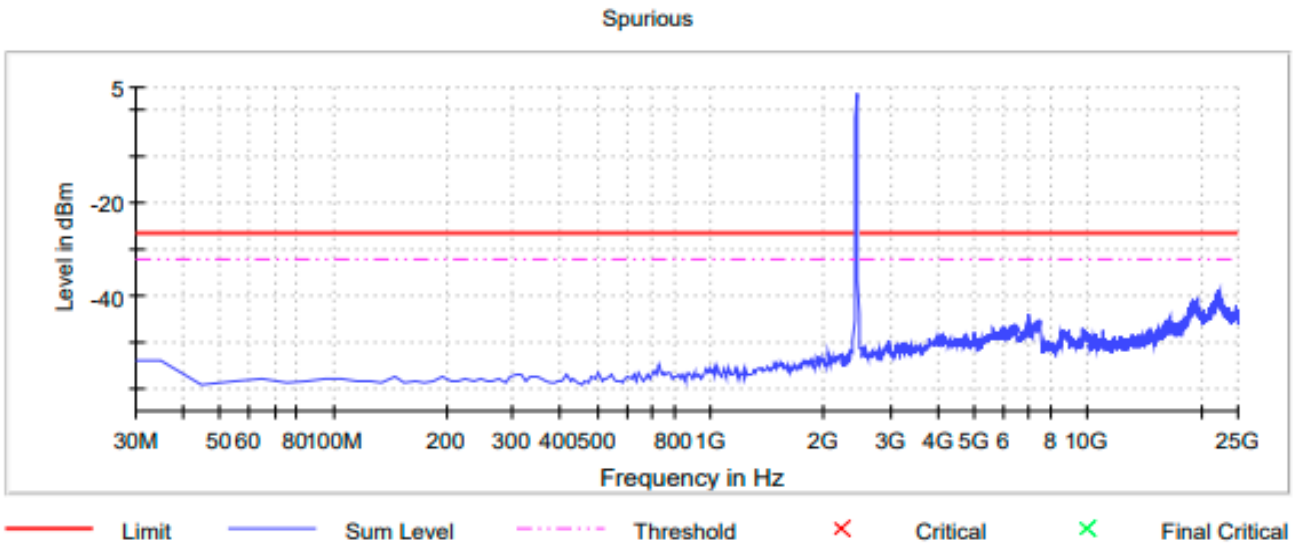




802.11n (HT20) 2437MHz MCS0

Pre Measurement

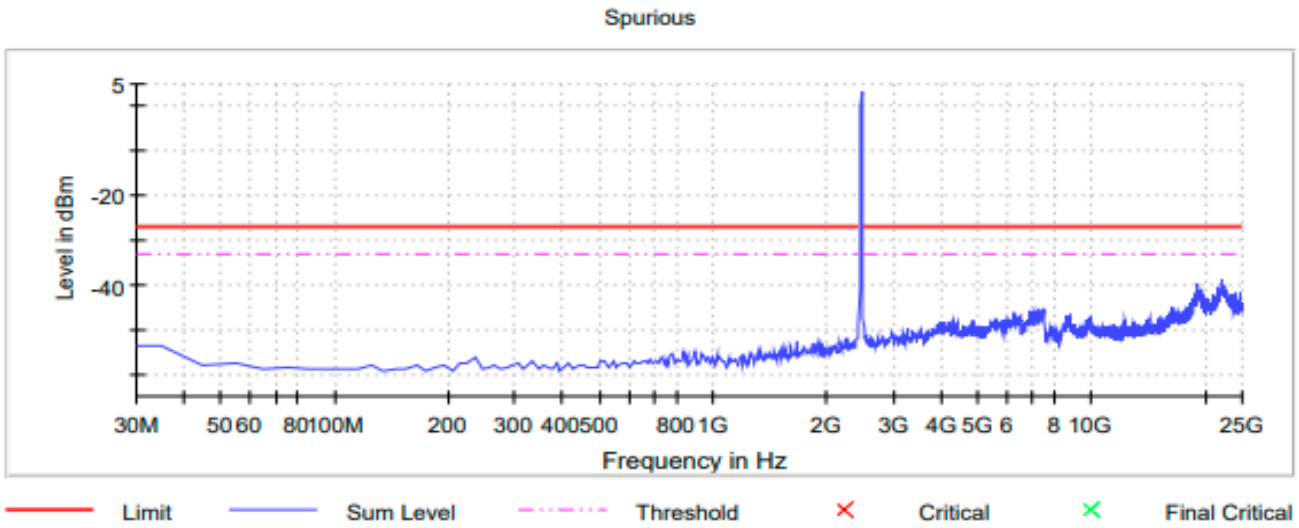
Frequency (MHz)	Level (dBm)	Margin (dB)	Limit (dBm)
22046.182946	-38.9	12.6	-26.3
22246.102882	-39.2	12.9	-26.3
22116.154924	-39.2	12.9	-26.3
22106.158927	-39.7	13.4	-26.3
21886.246998	-39.7	13.4	-26.3
22376.050841	-39.7	13.4	-26.3
22136.146918	-39.8	13.5	-26.3
22126.150921	-39.9	13.6	-26.3
22086.166934	-40.0	13.7	-26.3
22426.030825	-40.1	13.8	-26.3
22196.122898	-40.2	13.9	-26.3
22436.026821	-40.2	13.9	-26.3
22156.138911	-40.2	13.9	-26.3
22026.190953	-40.3	14.0	-26.3
21936.226982	-40.4	14.1	-26.3



802.11n (HT20) 2462MHz MCS0

Pre Measurement

Frequency (MHz)	Level (dBm)	Margin (dB)	Limit (dBm)
22106.158927	-38.9	11.9	-27.0
22206.118895	-39.5	12.5	-27.0
2484.017214	-39.5	12.6	-27.0
22086.166934	-39.6	12.7	-27.0
22096.162930	-39.7	12.8	-27.0
19097.363891	-39.7	12.8	-27.0
22156.138911	-39.8	12.8	-27.0
22066.174940	-39.8	12.8	-27.0
22126.150921	-39.8	12.9	-27.0
22136.146918	-39.9	13.0	-27.0
22166.134908	-40.0	13.1	-27.0
22056.178943	-40.1	13.1	-27.0
22196.122898	-40.2	13.2	-27.0
22406.038831	-40.2	13.2	-27.0
22016.194956	-40.3	13.4	-27.0



- **Radiated Testing**

Test Summary

Start: 8/6/2021	End: 8/25/2021	Temperature: 24°C Humidity: 48%	Initials: RP

DUT S/N	AH20110901-HAR-279-08		DUT Operating Mode	WLAN 2.4GHz
Comment	802.11b			
Antenna	Frequency Range	Polarization	Result Over/Under Limit	Notes
Loop	9kHz-30MHz	Parallel	☐Over ☒Under	√
		Perpendicular	☐Over ☒Under	√
		Ground-Parallel	☐Over ☒Under	√
Log Periodic	30MHz-1GHz	Horizontal	☐Over ☒Under	√
		Vertical	☐Over ☒Under	√
Horn	1GHz-18GHz	Horizontal	☐Over ☒Under	√
		Vertical	☐Over ☒Under	√
Horn	18GHz-27.5GHz	Horizontal	☐Over ☒Under	√
		Vertical	☐Over ☒Under	√

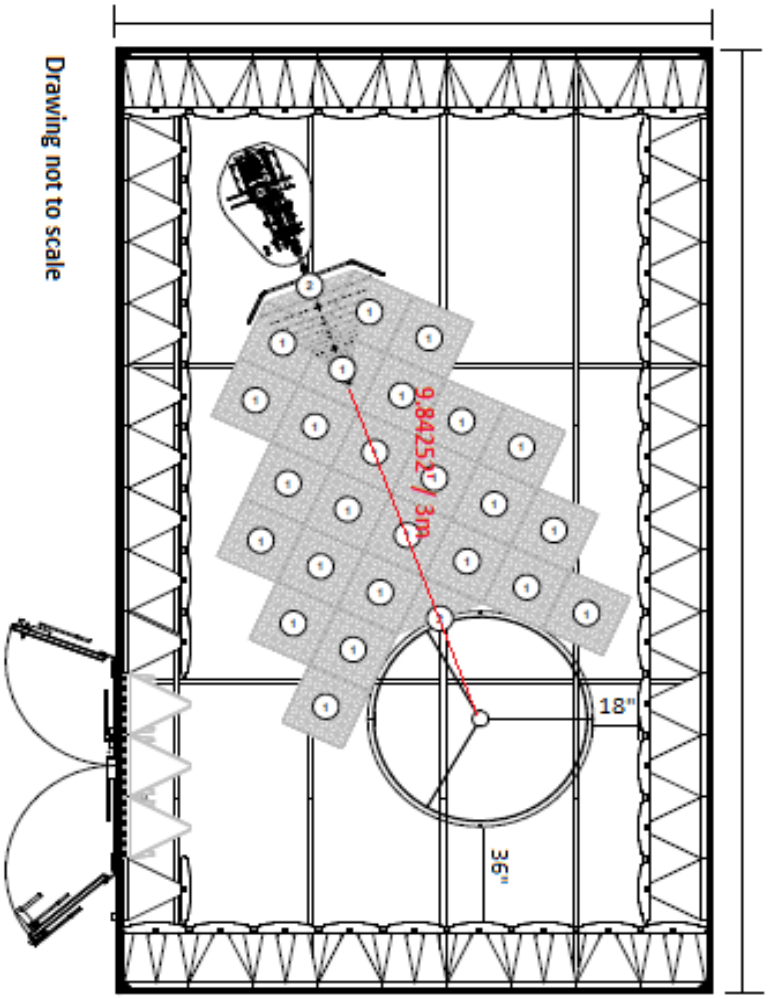
Notes: √ meets the requirements of the acceptance criteria.

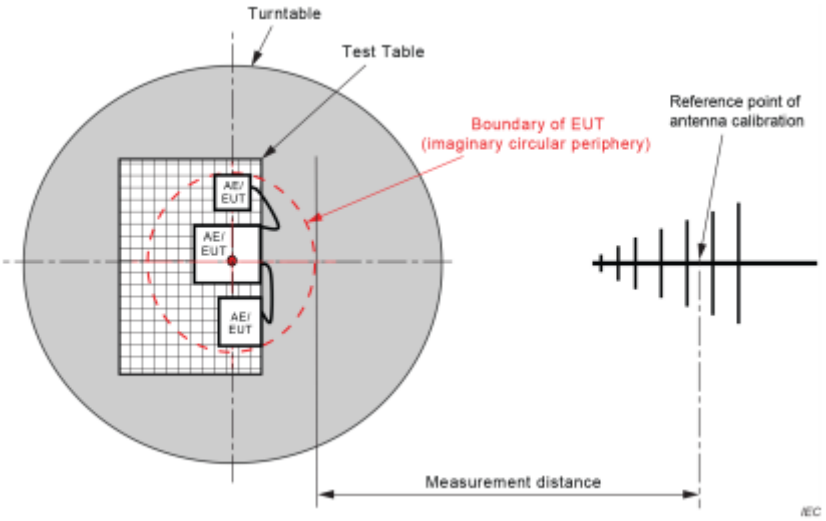
Test Setup

Semi-Anechoic Chamber Test Site-3 meter

Chamber Location	815 N Opdyke Rd Auburn Hills, Michigan 48326
Chamber Manufacturer:	ETS-Lindgren
Chamber Type	Semi-Anechoic
Model	FACT™ 3-2.0 Plus
Chamber Dimensions (L x W x H)	18'x18'x30'
Quiet Zone Diameter	2.0 meters
Quiet Zone Test Heights	1 & 2 meters (front only)
Test Distance	3.0 meters
Test Frequency Range	1-40 GHz
Measured Performance	4.87 dB Site *s*VSWR
Test Completion	December 18th, 2019

Chamber Dimensions




Turntable
Test Table
Boundary of EUT
(imaginary circular periphery)
Reference point of
antenna calibration
AE/
EUT
AE/
EUT
AE/
EUT
Measurement distance
IEC

Test Equipment Used

ID #	Equipment	Manufacturer	Model	Serial #	Cal Due
BVD0011	Loop Antenna 9kHz-30MHz	Rohde & Schwarz	FMZB1519B	145	3/23/2022
BVD0021	UltraLog Antenna 30-6000 MHz	Rohde & Schwarz	HL562E	101113	7/22/2021
BVD0069	Bore Sight Tower	ETS	2171B	226732	N/A
BVD0111	3 Meter Anechoic Chamber	ETS	N/A	N/A	10/16/2022
BVD0118	Antenna Mast Position Controller	ETS	7006-001	00214778/00214648	N/A
BVD0165	Multimeter	Fluke	287	46320228	2/26/2022
BVD0184	Preamplifier 29dB 1-18GHz	Rohde & Schwarz	TS-PR18	101646	4/26/2022
BVD0185	Preamplifier 45dB 18-40GHz	Rohde & Schwarz	TS-PR1840	100064	3/2/2022
BVD0190	Preamplifier 25dB 30MHz-8GHz	Rohde & Schwarz	TS-PR8	102351	3/5/2022
BVD0218	Receiver 2Hz-44GHz	Rohde & Schwarz	ESW44	101870	9/25/2021
BVD0247	Turn Table	ETS	920250	N/A	N/A
BVD0258	Optima 12V Blue top Marine battery	Optima	D34M	N/A	N/A
BVD0267	Double Ridge Waveguide 800MHz-18GHz	Rohde & Schwarz	HF907	102832	8/28/2021
BVD0307	Optima 12V Blue top Marine battery	Optima	D34M	N/A	N/A
BVD0320	18-40GHz Horn Antenna	L3 Narda ATM	PNR 180-442-KF	136164-01	3/8/2022
BVD0323	Foam Test Table For 3 Meter Chamber	ETS-Lindgren	LDT-1.5	N/A	N/A
BVD0394	Double Shielded N-Type Cable 6.9 Meter	Rohde & Schwarz	N-Type	N/A	12/29/2022
BVD0398	Double Shielded N-Type Cable 2 Meter	Rohde & Schwarz	N-Type	N/A	12/29/2022
BVD0407	Double Shielded N-Type Cable 410mm (For PreAmp)	Rohde & Schwarz	N-Type	N/A	8/5/2022
BVD0480	Band Reject Filter 50dB from 2400 to 2500MHz	Micro-Tronics	BRM50702	G482	N/A
BVD0481	Band Reject Filter 40dB from 5150 to 5880MHz	Micro-Tronics	BRM50716	G336	N/A
N/A	Support Laptop	Lenovo	E560	LW10USAUH01ABUD	N/A

Equipment List (Software)

Equipment	Manufacturer	Model	Version No.
EMC Test Software	Nexio	BAT-EMC	3.20.0.21

Customer Supplied Equipment

ID #	Equipment	Manufacturer	Model	Serial #	Version No.
N/A	Display	Harman	N/A	1683	N/A
N/A	Display Harness	Harman	N/A	N/A	N/A
N/A	Bluetooth LAN	Harman	N/A	84375197	N/A
N/A	Antenna	Harman	N/A	20072	N/A
N/A	Blue Molex Connector Harness	Harman	N/A	N/A	N/A
N/A	DUT 1M Harness	Harman	N/A	N/A	N/A
N/A	USB to DUT Harness	Harman	N/A	102161025	N/A

Radiated Emissions

Radiated emissions were maximized by rotating the EUT and its external antenna around Horizontal and vertical Polarizations.

Test Plots

Uncertainty

Radiated Emissions (30MHz to 18GHz)

Test Engineer: Ryan Phillips

The test is to measure the radiated emissions of the EUT. Some error sources that can contribute to the total uncertainty:

- Uncertainty of the receiver
- Uncertainty of the antenna
- Uncertainty of cables
- Uncertainty due to the mismatches
- NSA Calibration
- Etc., details see the below table

30MHz to 1GHZ

Source of Uncertainty	Value(dB)	Probability Distribution	Division	Sensitivity Coefficient	Expanded Uncertainty
Receiver Reading	0.12	Rectangular	1.732	1	0.069284
Cable Insertion Loss	0.21	Normal	2	1	0.105
Filter Insertion Loss	0.25	Normal	2	1	0.125
Antenna Factor	0.65	Normal	2	1	0.325
Receiver CW accuracy	0.5	Rectangular	1.732	1	0.2886836
Pulse Amplitude Response	1.5	Rectangular	1.732	1	0.86605081
PRF Response	1.5	Rectangular	1.732	1	0.86605081
Mismatch Filter - Receiver	0.25	U-Shape	2.449	1	0.1768033
NSA Calibration	4.0	Triangular	1.414	1	1.633332
ETS Foam Table (LDT-1.5)	1.8	Rectangular	1.732	1	1.039261
Combined Standard Uncertainty (square root of the sum of the squares)					2.113781
Expanded Uncertainty (K=2)					**4.227562**

The total derived measurement uncertainty is +/- 4.228 dB

1GHz to 40GHz

Source of Uncertainty	**Value (dB)**	**Probability Distribution**	**Division**	**Sensitivity Coefficient**	**Expanded Uncertainty**
Receiver Reading	0.12	Rectangular	1.732	1	0.069284
Cable Insertion Loss	0.21	Normal	2	1	0.105000
Filter Insertion Loss	0.25	Normal	2	1	0.125000
Antenna Factor	0.65	Normal	2	1	0.325000
Receiver CW accuracy	0.5	Rectangular	1.732	1	0.2886836
Pulse Amplitude Response	1.5	Rectangular	1.732	1	0.866051
PRF Response	1.5	Rectangular	1.732	1	0.866051
Mismatch Filter - Receiver	0.25	U-Shape	1.414	1	0.176803
VSWR Calibration	2.0	Triangular	2.449	1	0.816659
ETS Foam Table (LDT-1.5)	1.8	Rectangular	1.732	1	1.039261
Combined Standard Uncertainty (square root of the sum of the squares)					1.869213
Expanded Uncertainty (K=2)					**3.738426**

The total derived measurement uncertainty is +/- 3.738 dB.

Remarks:

1. Raw Peak Level (dBuV/m) = Level Peak Reading - Correction Factor
2. Correction Factor (dB) = Antenna Factor + Cable Loss – Preamplifier Gain
3. Margin = Level – Limit

AH20110901-HAR-279-08_2.4G 802.11b_Ch 6_9kHz-30MHz_Ground-Parallel

8/25/2021 17:01:01

No	Frequency	Level Peak Reading (dBuV/m)	Correction Factor (dB)	Limit dBuV/m	Margin (dB)	Height (m)	Angle (°)	Judgement
1.	1.654456MHz	31.21	19.13	63.23	-32.02	1.00	314.80	Passed
2.	2.181516MHz	29.39	19.10	69.54	-40.15	1.00	43.70	Passed
3.	8.386255MHz	28.14	19.14	69.54	-41.40	1.00	132.50	Passed
4.	12.577024MHz	28.19	19.57	69.54	-41.35	1.00	63.90	Passed
5.	13.395467MHz	29.37	19.62	69.54	-40.17	1.00	123.80	Passed
6.	25.509277MHz	30.57	20.69	69.54	-38.98	1.00	96.50	Passed

AH20110901-HAR-279-08_2.4G 802.11b_Ch 6_9kHz-30MHz_Parallel

8/25/2021 17:03:04

No	Frequency	Level Peak Reading (dBuV/m)	Correction Factor (dB)	Limit dBuV/m	Margin (dB)	Height (m)	Angle (°)	Judgement
1.	1.680166MHz	30.30	19.13	63.10	-32.79	1.00	231.30	Passed
2.	2.190086MHz	28.95	19.10	69.54	-40.60	1.00	171.80	Passed
3.	4.126924MHz	28.86	19.21	69.54	-40.69	1.00	358.10	Passed
4.	12.577024MHz	28.80	19.57	69.54	-40.74	1.00	358.10	Passed
5.	13.374042MHz	28.46	19.61	69.54	-41.09	1.00	192.70	Passed
6.	25.620688MHz	31.55	20.70	69.54	-37.99	1.00	160.00	Passed

AH20110901-HAR-279-08_2.4G 802.11b_Ch 6_9kHz-30MHz_Perpendicular

8/25/2021 17:05:43

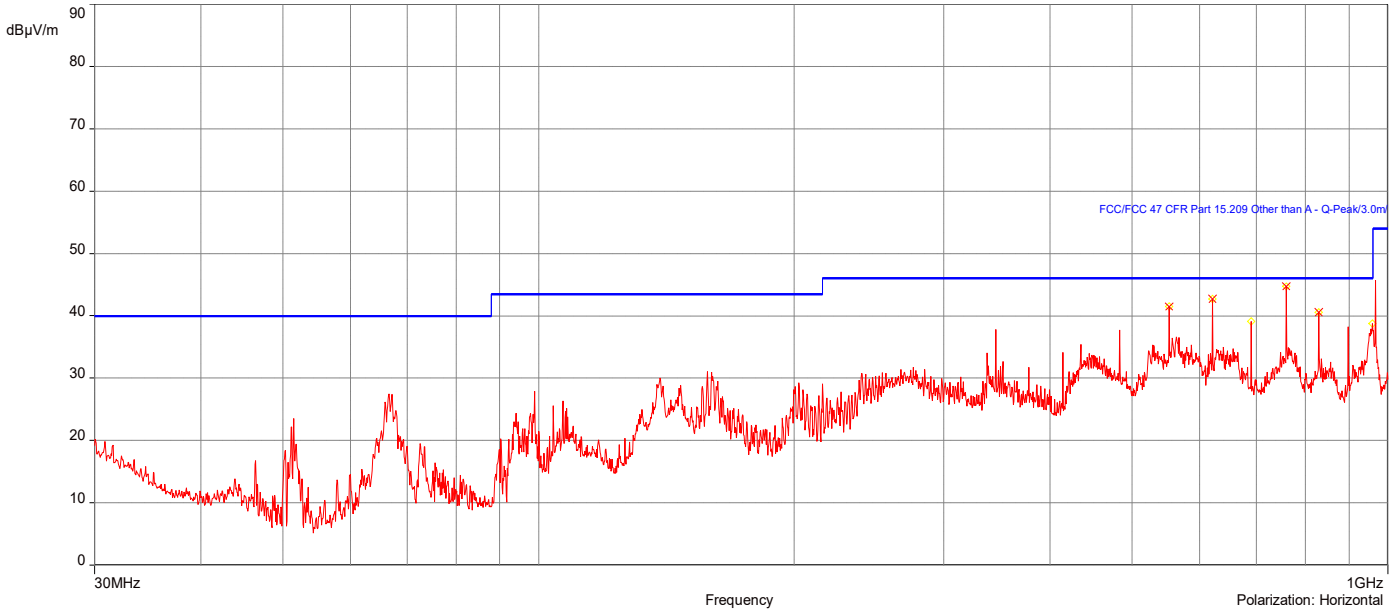
No	Frequency	Level Peak Reading (dBuV/m)	Correction Factor (dB)	Limit dBuV/m	Margin (dB)	Height (m)	Angle (°)	Judgement
1.	1.63303MHz	31.00	19.13	63.34	-32.34	1.00	247.00	Passed
2.	2.177231MHz	29.05	19.10	69.54	-40.50	1.00	358.90	Passed
3.	4.126924MHz	28.44	19.21	69.54	-41.10	1.00	160.00	Passed
4.	13.365472MHz	29.86	19.61	69.54	-39.68	1.00	0.90	Passed
5.	16.694949MHz	28.46	19.70	69.54	-41.08	1.00	358.90	Passed
6.	25.590693MHz	31.40	20.70	69.54	-38.15	1.00	271.00	Passed

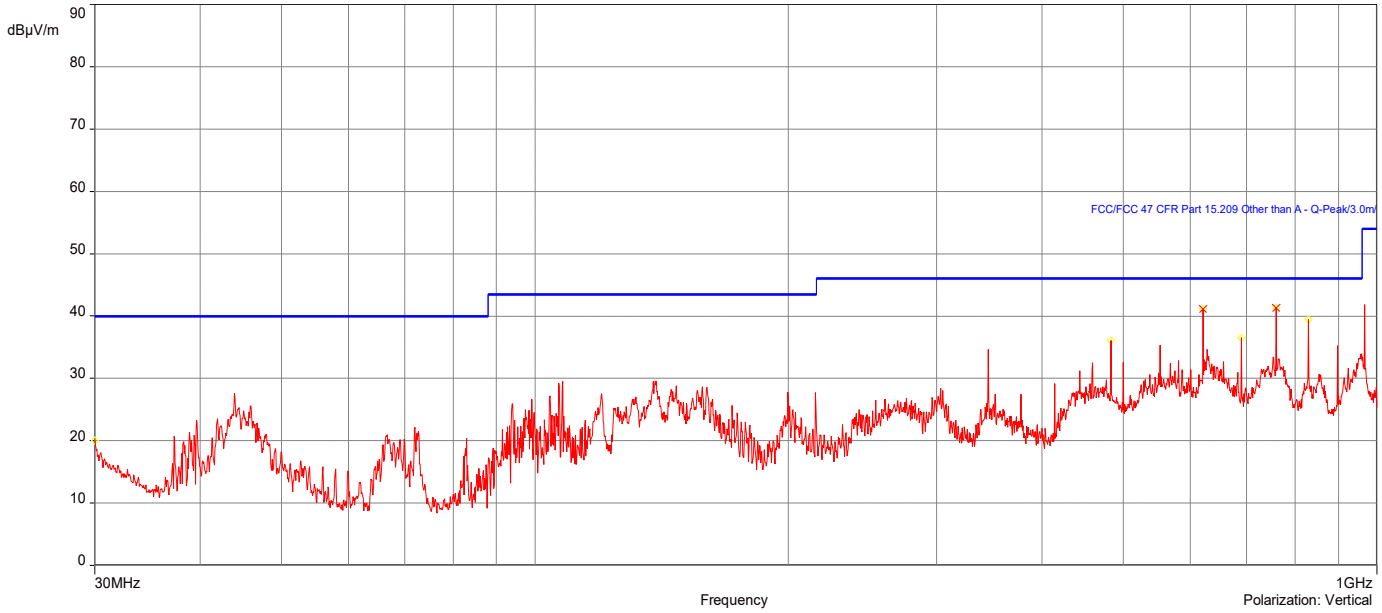
AH20110901-HAR-279-08_2.4G 802.11b_Ch 1_30MHz-1GHz

8/20/2021 07:30:58

No	Frequency	Level Peak Reading (dBμV/m)	Correction Factor (dB)	Limit dBμV/m	Margin (dB)	Height (m)	Angle (°)	Polarization	Judgement
1	621.50656MHz	41.20	-4.78	46.00	-4.80	2.00	332.80	Vertical	Passed
2	759.59704MHz	41.33	-2.94	46.00	-4.67	3.00	358.90	Vertical	Passed
3	552.40426MHz	41.54	-5.30	46.00	-4.46	2.00	351.80	Horizontal	Passed
4	621.50656MHz	42.68	-3.73	46.00	-3.32	2.00	208.10	Horizontal	Passed
5	759.59704MHz	44.76	-1.84	46.00	-1.24	2.50	337.90	Horizontal	Passed
6	828.64227MHz	40.54	-0.51	46.00	-5.46	1.50	103.40	Horizontal	Passed

Overall Graphs:



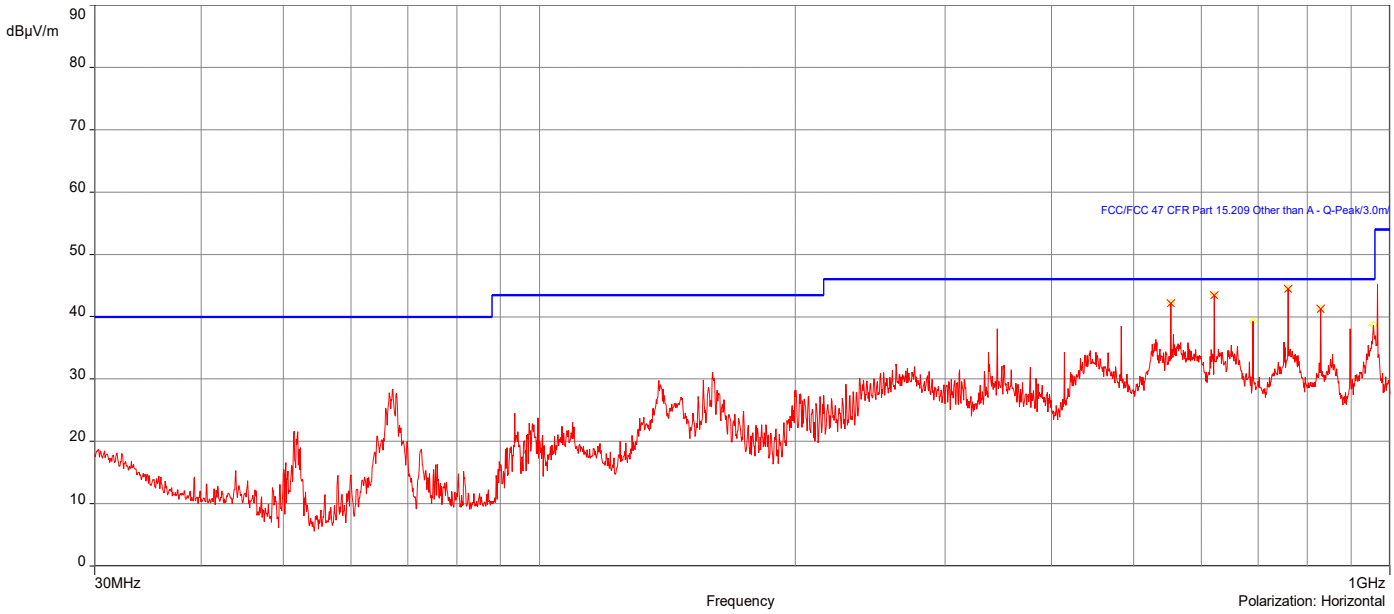


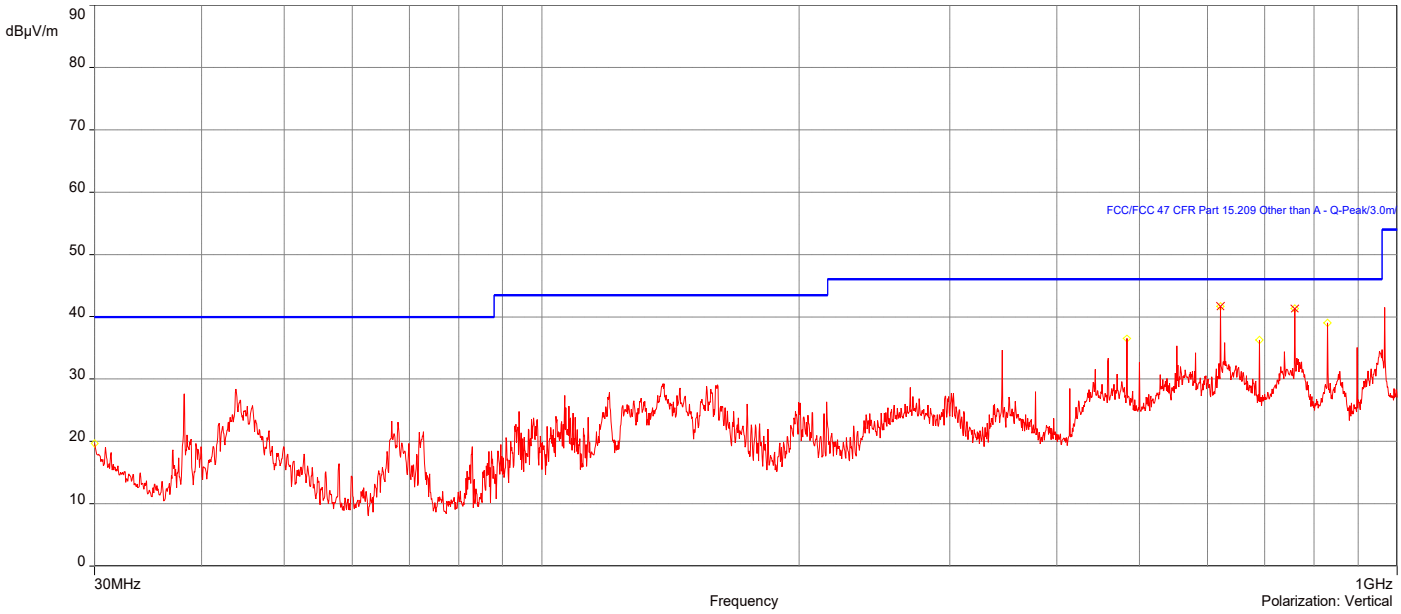
AH20110901-HAR-279-08_2.4G 802.11b_Ch 6_30MHz-1GHz

8/20/2021 07:51:57

No	Frequency	Level Peak Reading (dBμV/m)	Correction Factor (dB)	Limit dBμV/m	Margin (dB)	Height (m)	Angle (°)	Polarization	Judgement
1.	621.50656MHz	41.66	-4.78	46.00	-4.34	2.00	339.10	Vertical	Passed
2.	759.59704MHz	41.32	-2.94	46.00	-4.68	3.00	358.90	Vertical	Passed
3.	552.40426MHz	42.20	-5.30	46.00	-3.80	2.00	357.10	Horizontal	Passed
4.	621.4495MHz	43.45	-3.74	46.00	-2.55	2.00	210.40	Horizontal	Passed
5.	759.59704MHz	44.53	-1.84	46.00	-1.47	2.50	332.10	Horizontal	Passed
6.	828.64227MHz	41.27	-0.51	46.00	-4.73	1.50	102.60	Horizontal	Passed

Overall Graphs:



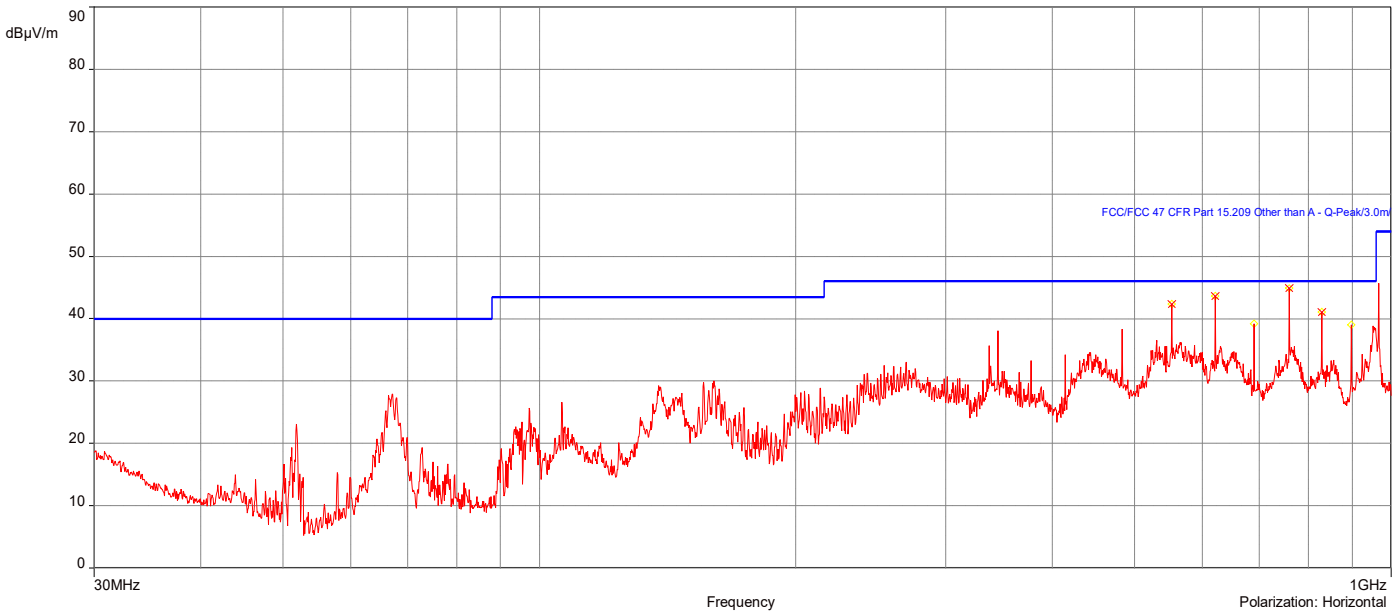

dBµV/m
90
80
70
60
50
40
30
20
10
0
FCC/FCC 47 CFR Part 15.209 Other than A - Q-Peak/3.0m
30MHz
Frequency
1GHz
Polarization: Vertical

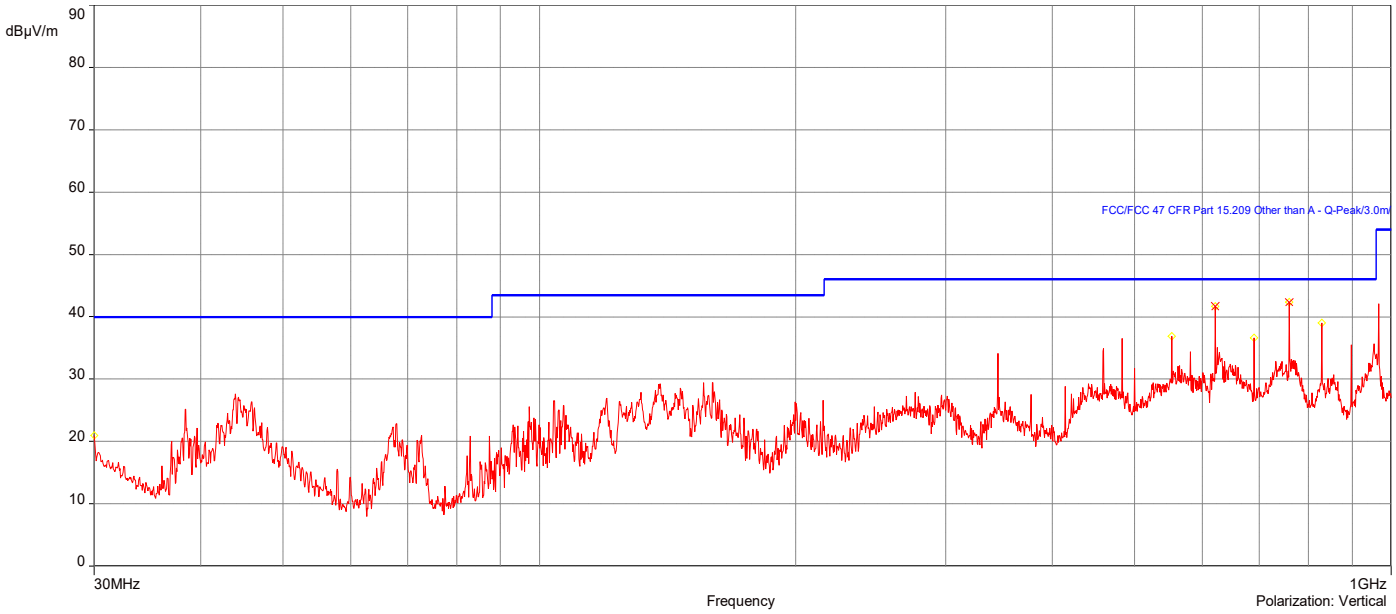
AH20110901-HAR-279-08_2.4G 802.11b_Ch 11_30MHz-1GHz

8/20/2021 08:15:53

No	Frequency	Level Peak Reading (dBμV/m)	Correction Factor (dB)	Limit dBμV/m	Margin (dB)	Height (m)	Angle (°)	Polarization	Judgement
1.	621.50656MHz	41.67	-4.78	46.00	-4.33	2.00	341.40	Vertical	Passed
2.	759.59704MHz	42.35	-2.94	46.00	-3.65	3.00	358.90	Vertical	Passed
3.	552.40426MHz	42.34	-5.30	46.00	-3.66	2.00	351.80	Horizontal	Passed
4.	621.4495MHz	43.61	-3.74	46.00	-2.39	2.00	206.80	Horizontal	Passed
5.	759.59704MHz	44.95	-1.84	46.00	-1.05	2.50	334.00	Horizontal	Passed
6.	828.64227MHz	41.08	-0.51	46.00	-4.92	1.50	99.90	Horizontal	Passed

Overall Graphs:




dBµV/m
90
80
70
60
50
40
30
20
10
0
FCC/FCC 47 CFR Part 15.209 Other than A - Q-Peak/3.0m
30MHz
Frequency
1GHz
Polarization: Vertical

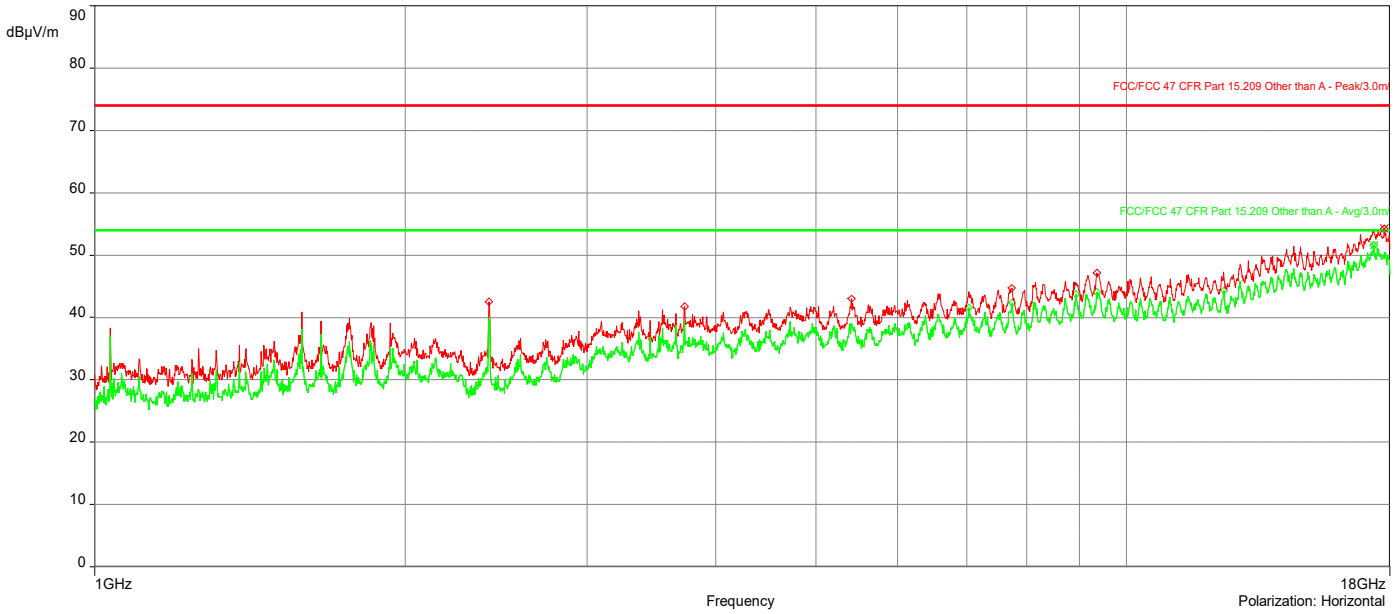
AH20110901-HAR-279-08_2.4G 802.11b_Ch 1_1-18GHz

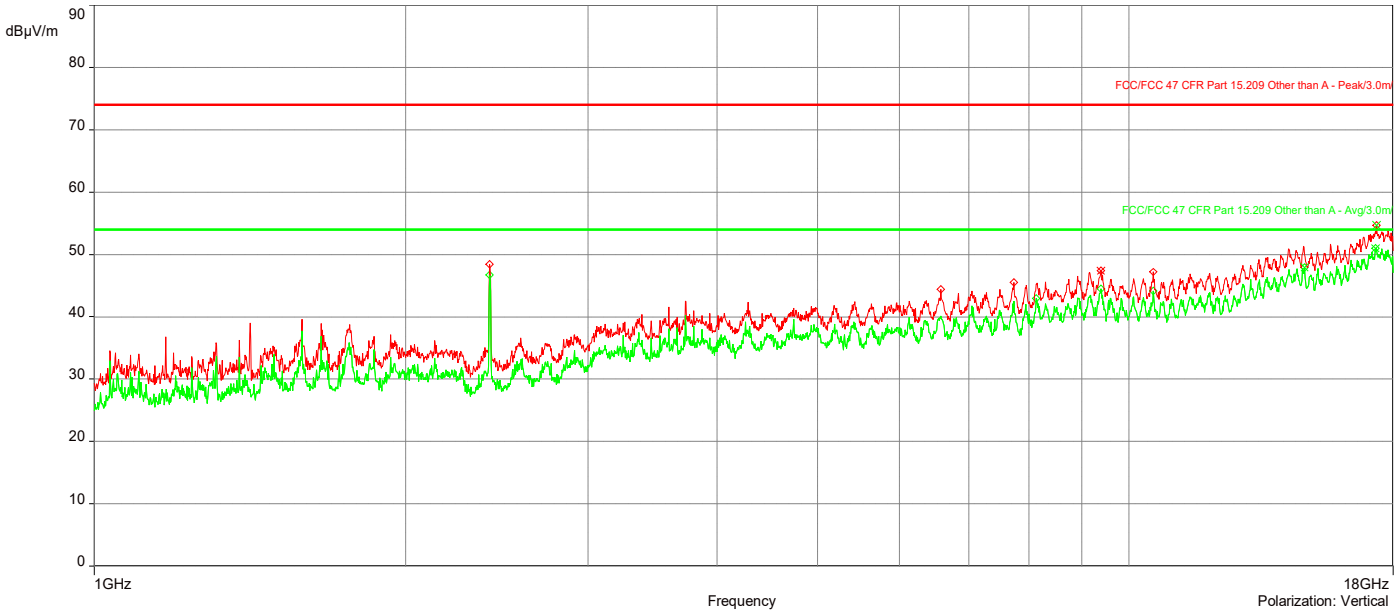
8/17/2021 07:29:24

No	Frequency (MHz)	Level Peak Reading (dBμV/m)	Correction Factor (dB)	Limit dBμV/m	Margin (dB)	Height (m)	Angle (°)	Polarization	Judgement
1.	9.3917468GHz	47.40	10.20	74.00	-26.60	3.50	331.70	Vertical	Passed
2.	17.346481GHz	54.66	19.14	74.00	-19.34	1.50	0	Vertical	Passed
3.	17.780994GHz	54.26	19.56	74.00	-19.74	2.50	65.40	Horizontal	Passed

No	Frequency (MHz)	Level Average Reading (dBμV/m)	Correction Factor (dB)	Limit dBμV/m	Margin (dB)	Height (m)	Angle (°)	Polarization	Judgment
1.	14.774405GHz	47.95	15.32	54.00	-6.05	2.50	353.70	Vertical	Passed
2.	17.30998GHz	51.01	18.99	54.00	-2.99	2.50	274.50	Vertical	Passed
3.	17.367981GHz	51.62	19.24	54.00	-2.38	1.50	134.30	Horizontal	Passed

Overall Graphs:




dBµV/m
90
80
70
60
50
40
30
20
10
0
FCC/FCC 47 CFR Part 15.209 Other than A - Peak/3.0m
FCC/FCC 47 CFR Part 15.209 Other than A - Avg/3.0m
1GHz
Frequency
18GHz
Polarization: Vertical

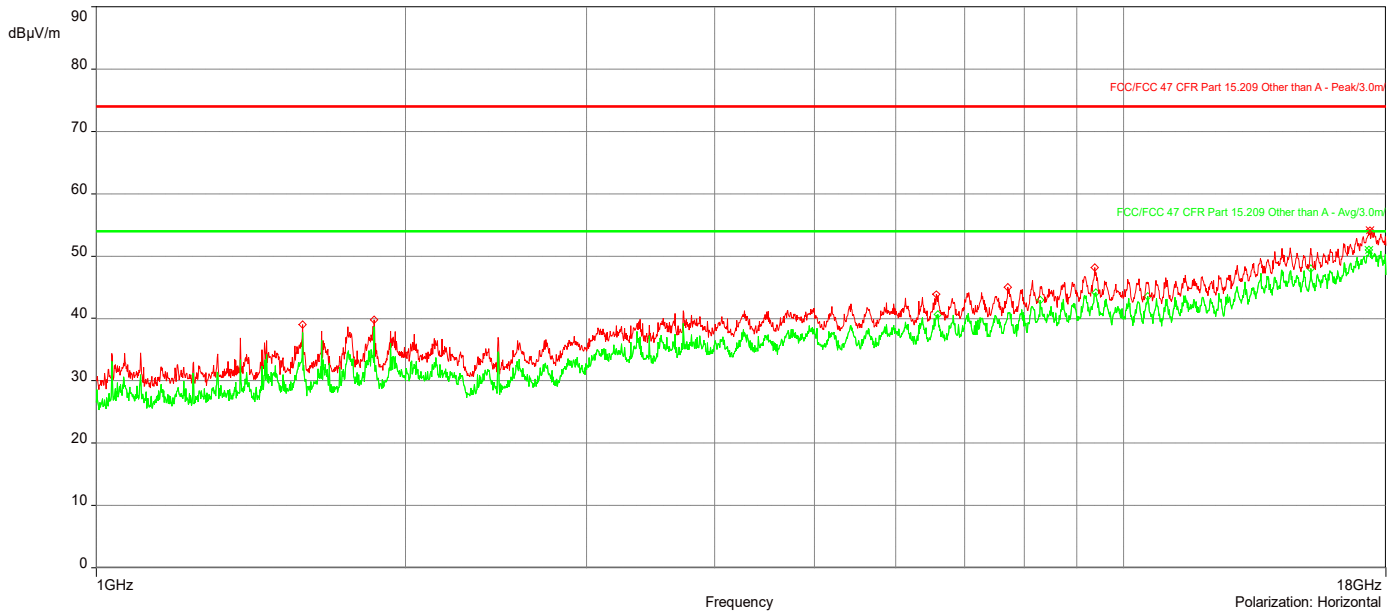
AH20110901-HAR-279-08_2.4G 802.11b_Ch 11_1-18GHz

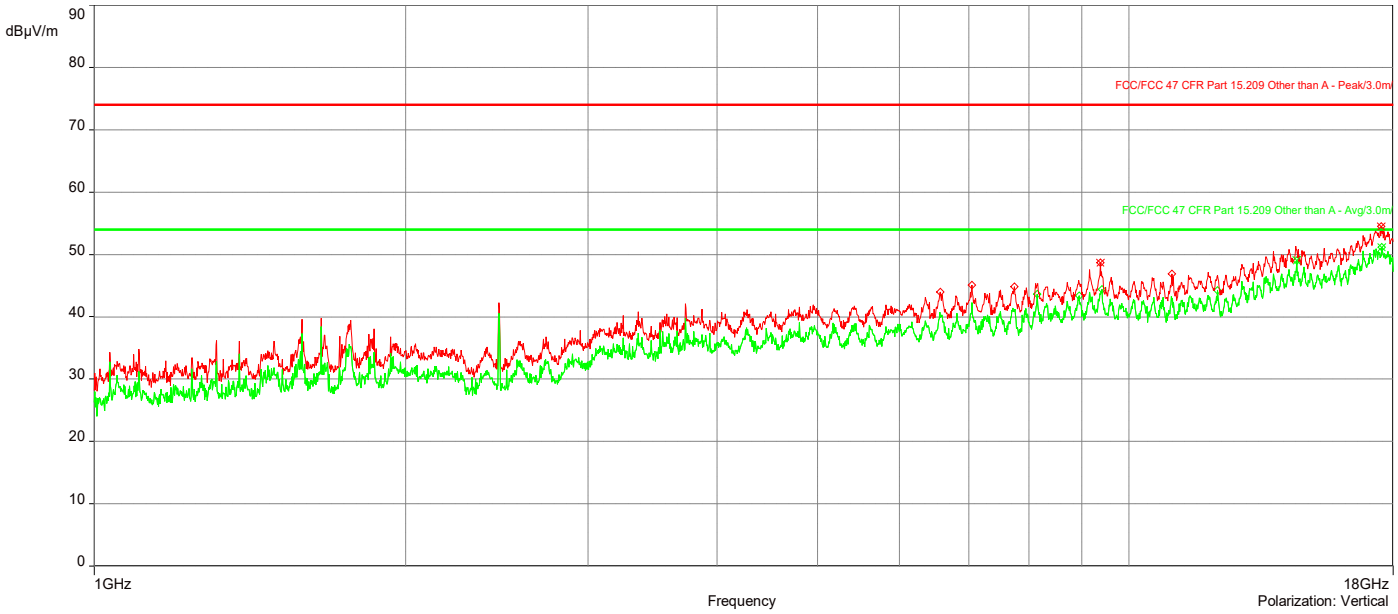
8/17/2021 08:20:20

No	Frequency (MHz)	Level Peak Reading (dBμV/m)	Correction Factor (dB)	Limit dBμV/m	Margin (dB)	Height (m)	Angle (°)	Polarization	Judgement
1.	9.3877467GHz	48.69	10.19	74.00	-25.31	1.00	122.60	Vertical	Passed
2.	17.530486GHz	54.46	19.54	74.00	-19.54	1.50	116.60	Vertical	Passed
3.	17.359481GHz	54.12	19.20	74.00	-19.88	1.00	218.10	Horizontal	Passed

No	Frequency (MHz)	Level Average Reading (dBμV/m)	Correction Factor (dB)	Limit dBμV/m	Margin (dB)	Height (m)	Angle (°)	Polarization	Judgment
1.	14.521398GHz	49.01	15.43	54.00	-4.99	4.00	238.10	Vertical	Passed
2.	17.546987GHz	51.20	19.57	54.00	-2.80	3.00	321.30	Vertical	Passed
3.	17.32248GHz	51.02	19.04	54.00	-2.98	4.00	292.80	Horizontal	Passed

Overall Graphs:




dBµV/m
90
80
70
60
50
40
30
20
10
0
FCC/FCC 47 CFR Part 15.209 Other than A - Peak/3.0m
FCC/FCC 47 CFR Part 15.209 Other than A - Avg/3.0m
1GHz
Frequency
18GHz
Polarization: Vertical

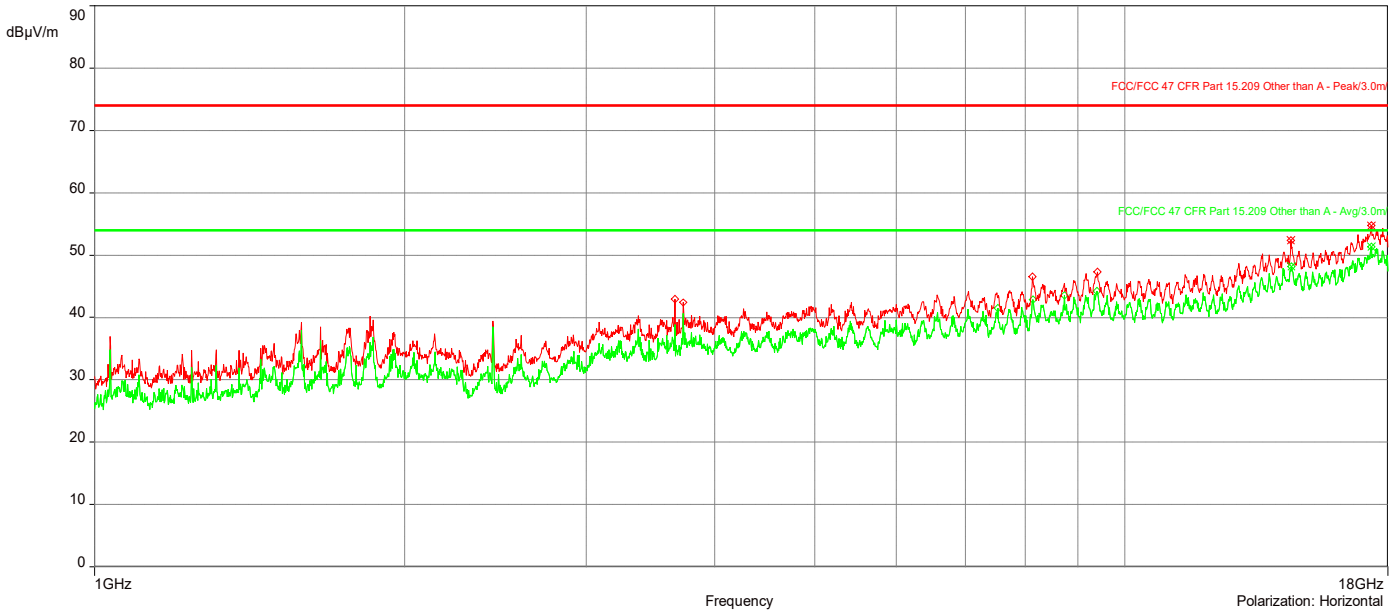
AH20110901-HAR-279-08_2.4G 802.11b_Ch 6_1-18GHz

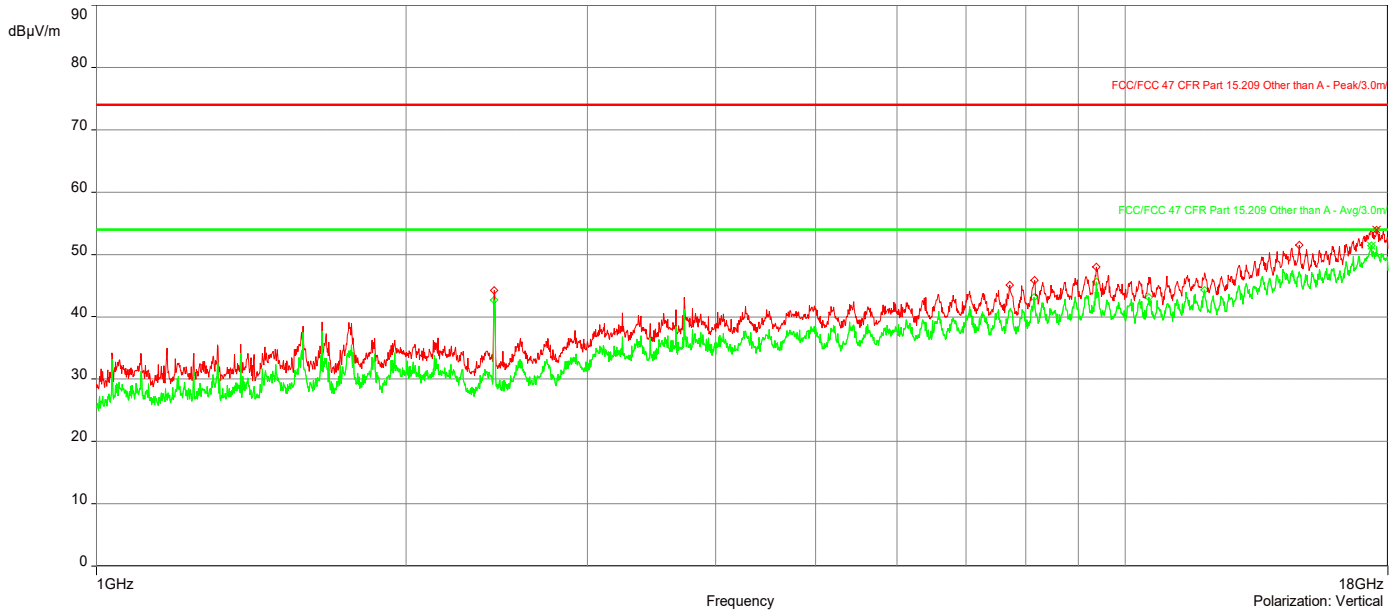
8/17/2021 07:57:29

No	Frequency (MHz)	Level Peak Reading (dBμV/m)	Correction Factor (dB)	Limit dBμV/m	Margin (dB)	Height (m)	Angle (°)	Polarization	Judgement
1.	17.544487GHz	54.01	19.57	74.00	-19.99	2.50	2.00	Vertical	Passed
2.	14.491897GHz	52.34	15.42	74.00	-21.66	1.50	116.60	Horizontal	Passed
3.	17.342981GHz	54.75	19.12	74.00	-19.25	2.50	248.60	Horizontal	Passed

No	Frequency (MHz)	Level Average Reading (dBμV/m)	Correction Factor (dB)	Limit dBμV/m	Margin (dB)	Height (m)	Angle (°)	Polarization	Judgment
4.	17.351981GHz	51.45	19.16	54.00	-2.55	3.00	176.60	Vertical	Passed
5.	14.512397GHz	48.14	15.43	54.00	-5.86	3.50	237.10	Horizontal	Passed
6.	17.355481GHz	51.32	19.18	54.00	-2.68	3.50	188.90	Horizontal	Passed

Overall Graphs:




dBµV/m
90
80
70
60
50
40
30
20
10
0
FCC/FCC 47 CFR Part 15.209 Other than A - Peak/3.0m
FCC/FCC 47 CFR Part 15.209 Other than A - Avg/3.0m
1GHz
Frequency
18GHz
Polarization: Vertical

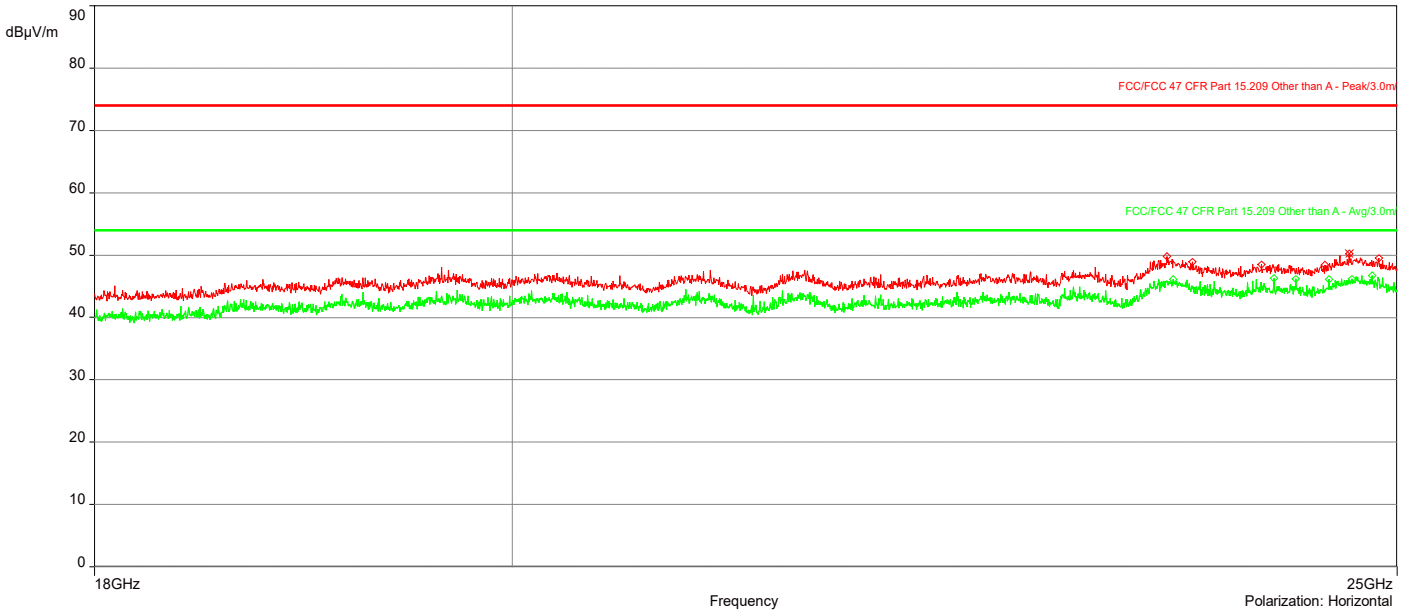
AH20110901-HAR-279-08_2.4G 802.11b_Ch 1_18-25GHz

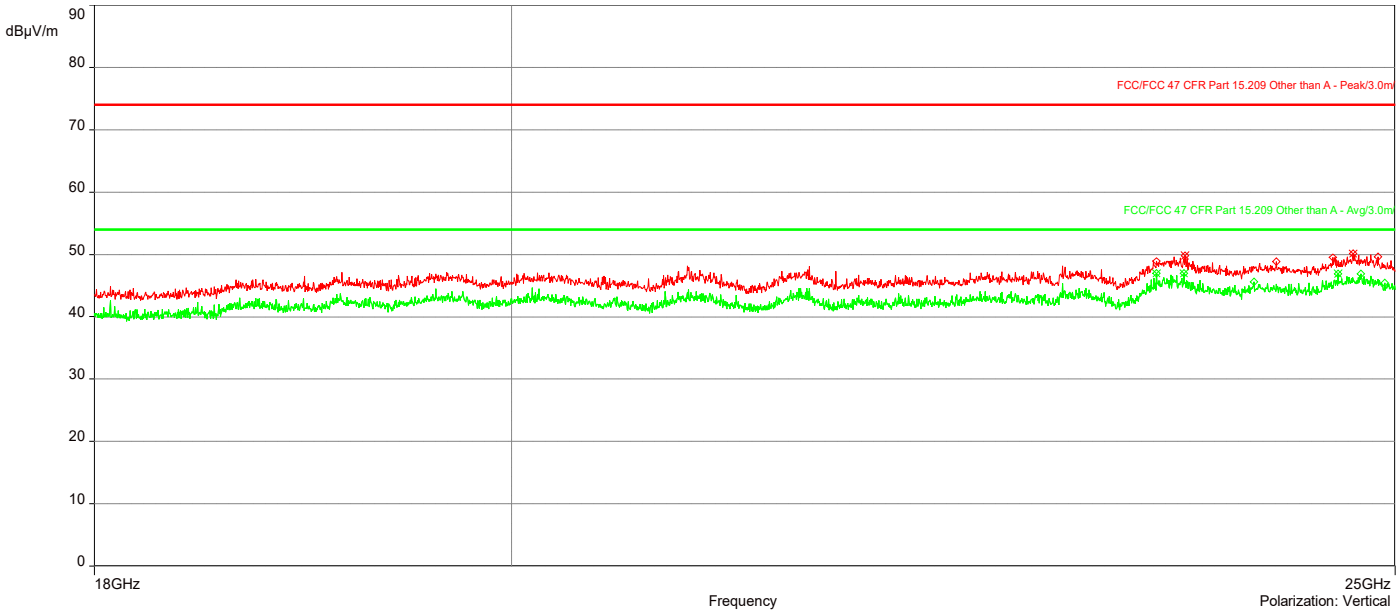
8/17/2021 13:35:09

No	Frequency (MHz)	Level Peak Reading (dBμV/m)	Correction Factor (dB)	Limit dBμV/m	Margin (dB)	Height (m)	Angle (°)	Polarization	Judgement
4.	23.707908GHz	49.79	1.80	74.00	-24.21	2.85	134.90	Vertical	Passed
5.	24.735981GHz	50.11	2.92	74.00	-23.89	4.00	269.90	Vertical	Passed
6.	24.700479GHz	50.26	2.82	74.00	-23.74	2.43	67.40	Horizontal	Passed

No	Frequency (MHz)	Level Average Reading (dBμV/m)	Correction Factor (dB)	Limit dBμV/m	Margin (dB)	Height (m)	Angle (°)	Polarization	Judgment
4.	23.538396GHz	47.00	2.15	54.00	-7.00	4.00	224.90	Vertical	Passed
5.	23.702407GHz	46.98	1.82	54.00	-7.02	2.95	67.40	Vertical	Passed
6.	24.640974GHz	46.90	2.49	54.00	-7.10	1.61	337.40	Vertical	Passed

Overall Graphs:




dBµV/m
90
80
70
60
50
40
30
20
10
0
FCC/FCC 47 CFR Part 15.209 Other than A - Peak/3.0m
FCC/FCC 47 CFR Part 15.209 Other than A - Avg/3.0m
18GHz
Frequency
25GHz
Polarization: Vertical

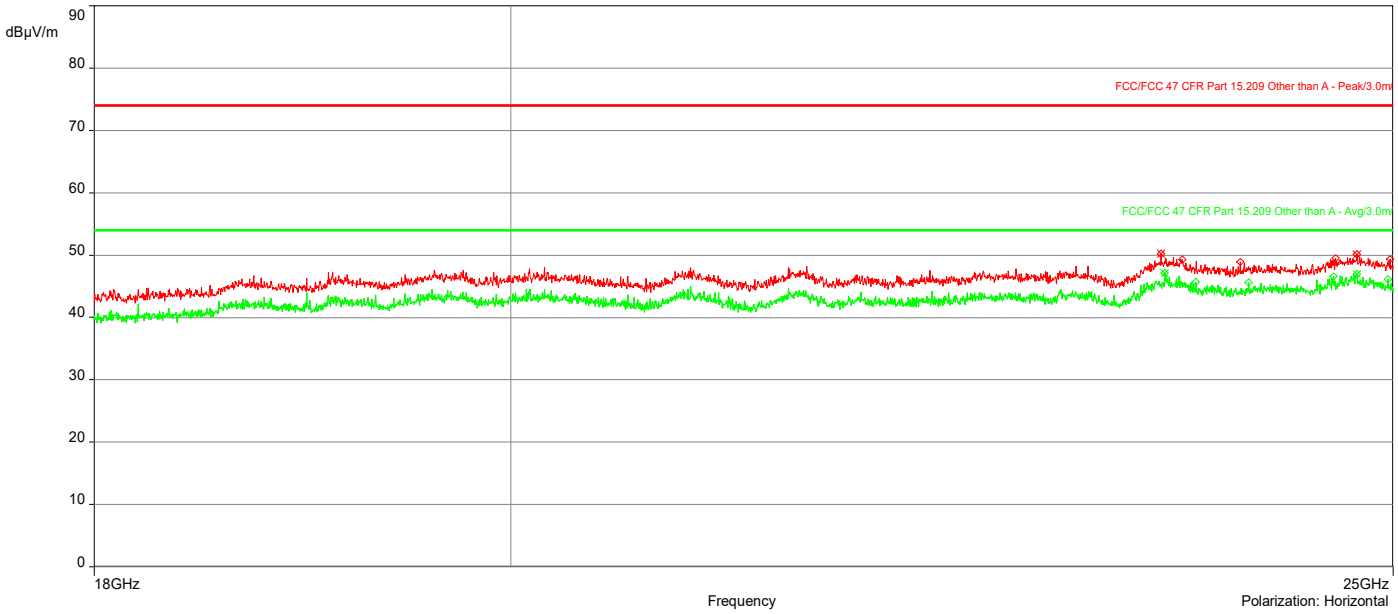
AH20110901-HAR-279-08_2.4G 802.11b_Ch 6_18-25GHz

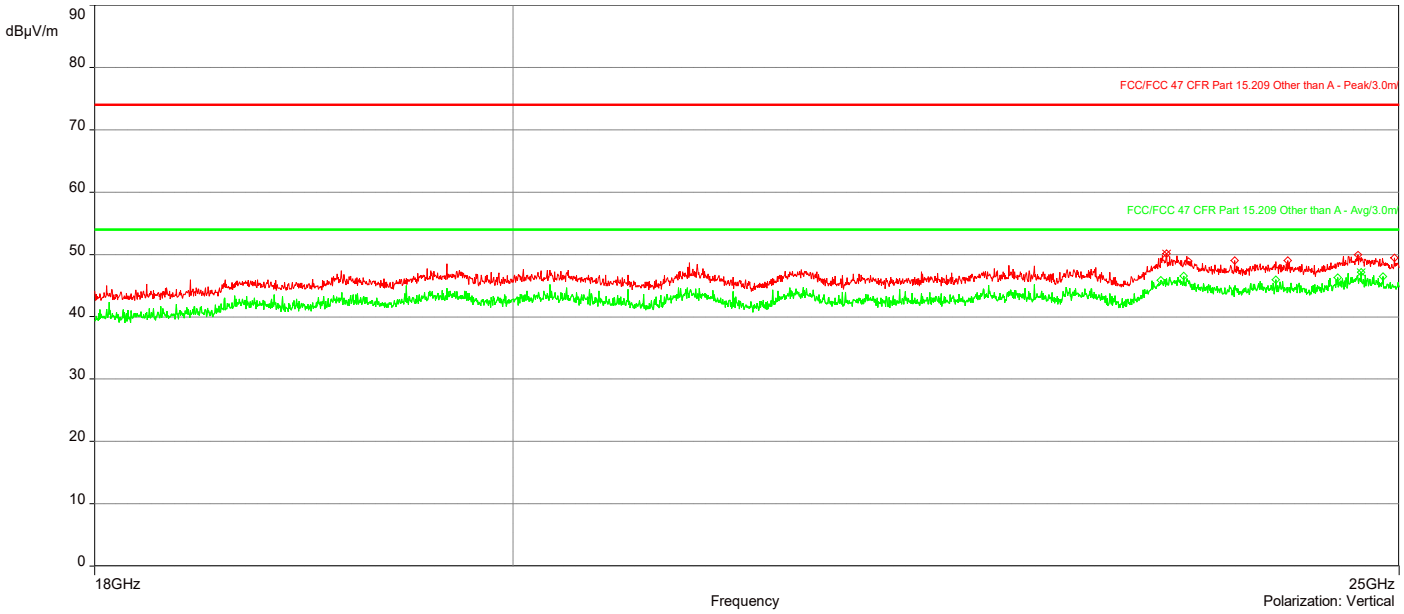
8/19/2021 06:48:56

No	Frequency (MHz)	Level Peak Reading (dBμV/m)	Correction Factor (dB)	Limit dBμV/m	Margin (dB)	Height (m)	Angle (°)	Polarization	Judgement
1.	23.578398GHz	50.18	2.14	74.00	-23.82	3.53	337.40	Vertical	Passed
2.	23.573898GHz	50.26	2.13	74.00	-23.74	3.54	337.40	Horizontal	Passed
3.	24.770984GHz	50.11	2.91	74.00	-23.89	3.80	202.70	Horizontal	Passed

No	Frequency (MHz)	Level Average Reading (dBμV/m)	Correction Factor (dB)	Limit dBμV/m	Margin (dB)	Height (m)	Angle (°)	Polarization	Judgment
1.	24.763483GHz	47.19	2.91	54.00	-6.81	2.30	67.60	Vertical	Passed
2.	23.5954GHz	47.16	2.06	54.00	-6.84	1.74	157.60	Horizontal	Passed
3.	24.770984GHz	46.99	2.91	54.00	-7.01	3.80	202.70	Horizontal	Passed

Overall Graphs:




dBµV/m
90
80
70
60
50
40
30
20
10
0
FCC/FCC 47 CFR Part 15.209 Other than A - Peak/3.0m
FCC/FCC 47 CFR Part 15.209 Other than A - Avg/3.0m
18GHz
Frequency
25GHz
Polarization: Vertical

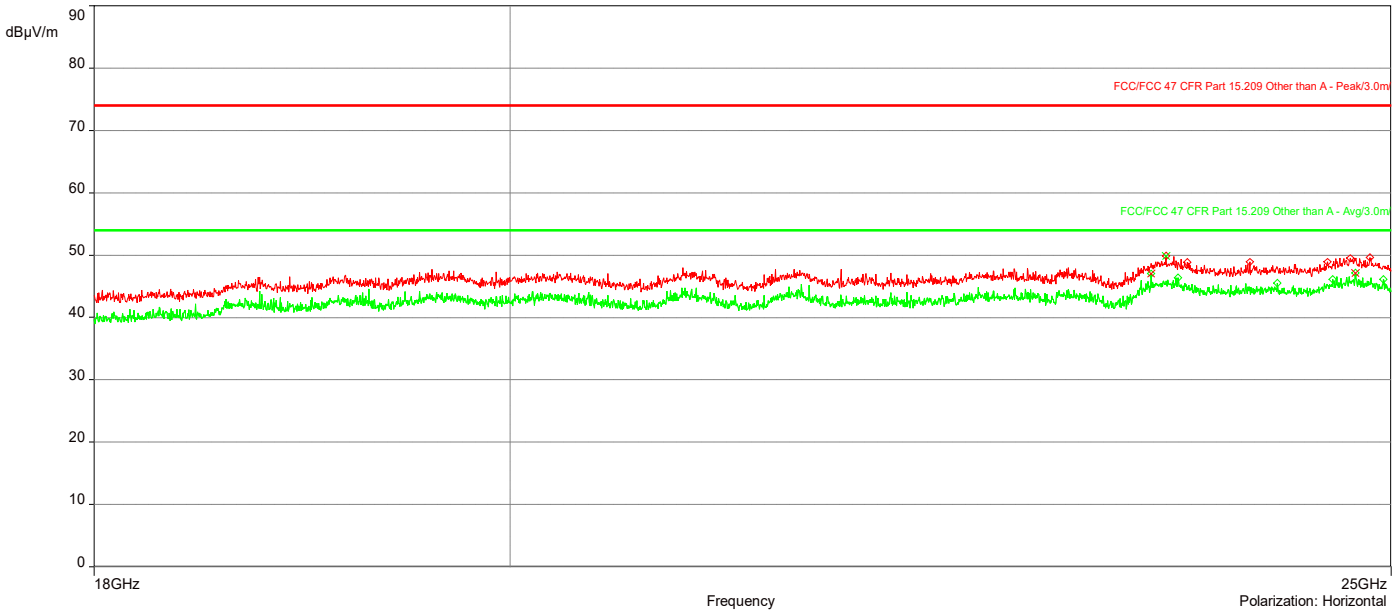
AH20110901-HAR-279-08_2.4G 802.11b_Ch 11_18-25GHz

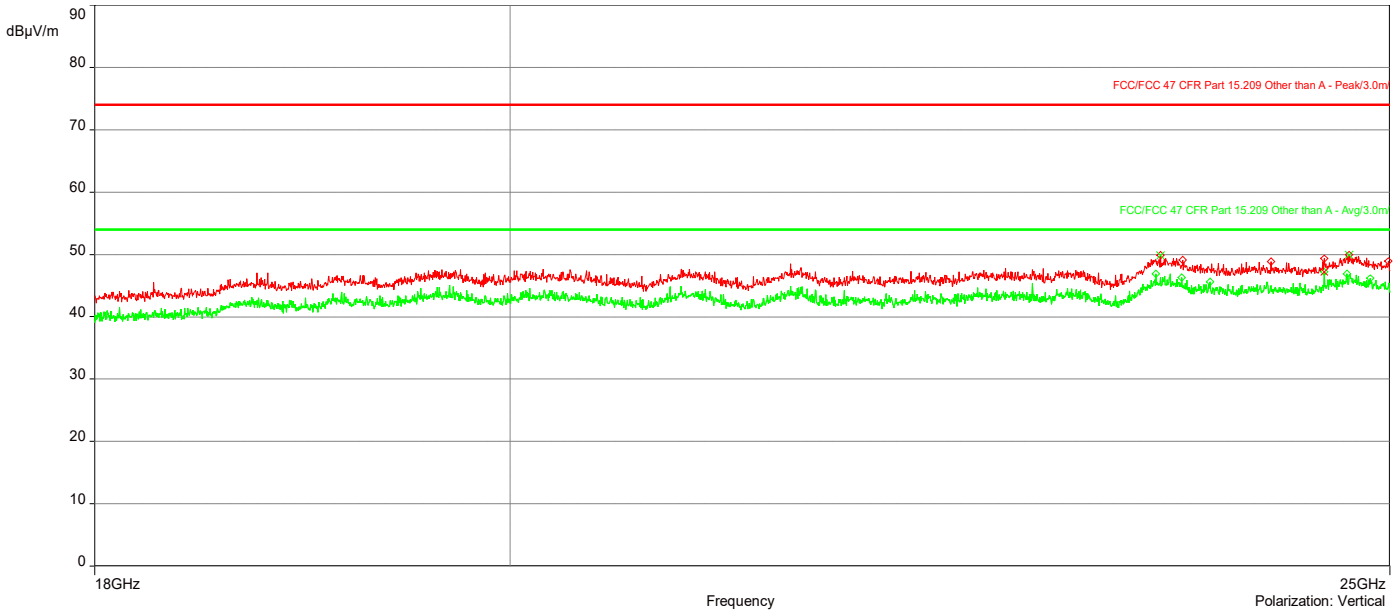
8/19/2021 07:14:35

No	Frequency (MHz)	Level Peak Reading (dBμV/m)	Correction Factor (dB)	Limit dBμV/m	Margin (dB)	Height (m)	Angle (°)	Polarization	Judgement
1.	23.586399GHz	49.92	2.11	74.00	-24.08	1.00	202.40	Vertical	Passed
2.	24.743482GHz	49.99	2.95	74.00	-24.01	2.70	89.90	Vertical	Passed
3.	23.614901GHz	49.84	2.01	74.00	-24.16	1.61	0	Horizontal	Passed

No	Frequency (MHz)	Level Average Reading (dBμV/m)	Correction Factor (dB)	Limit dBμV/m	Margin (dB)	Height (m)	Angle (°)	Polarization	Judgment
1.	24.58597GHz	47.22	2.22	54.00	-6.78	3.67	179.90	Vertical	Passed
2.	23.524395GHz	47.07	1.96	54.00	-6.93	2.80	224.90	Horizontal	Passed
3.	24.775484GHz	47.11	2.89	54.00	-6.89	2.45	22.40	Horizontal	Passed

Overall Graphs:




dBµV/m
90
80
70
60
50
40
30
20
10
0
FCC/FCC 47 CFR Part 15.209 Other than A - Peak/3.0m
FCC/FCC 47 CFR Part 15.209 Other than A - Avg/3.0m
18GHz
Frequency
25GHz
Polarization: Vertical

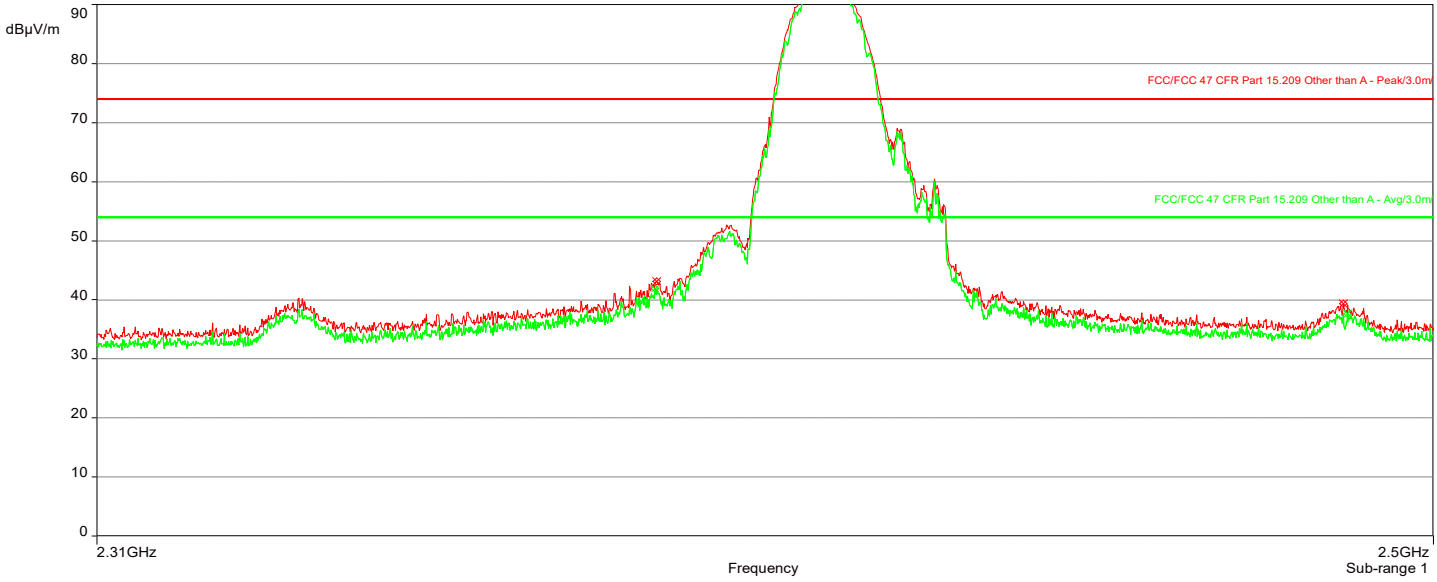
AH20110901-HAR-279-008_Restricted Bandedge_2.4G 802.11b_Ch-1

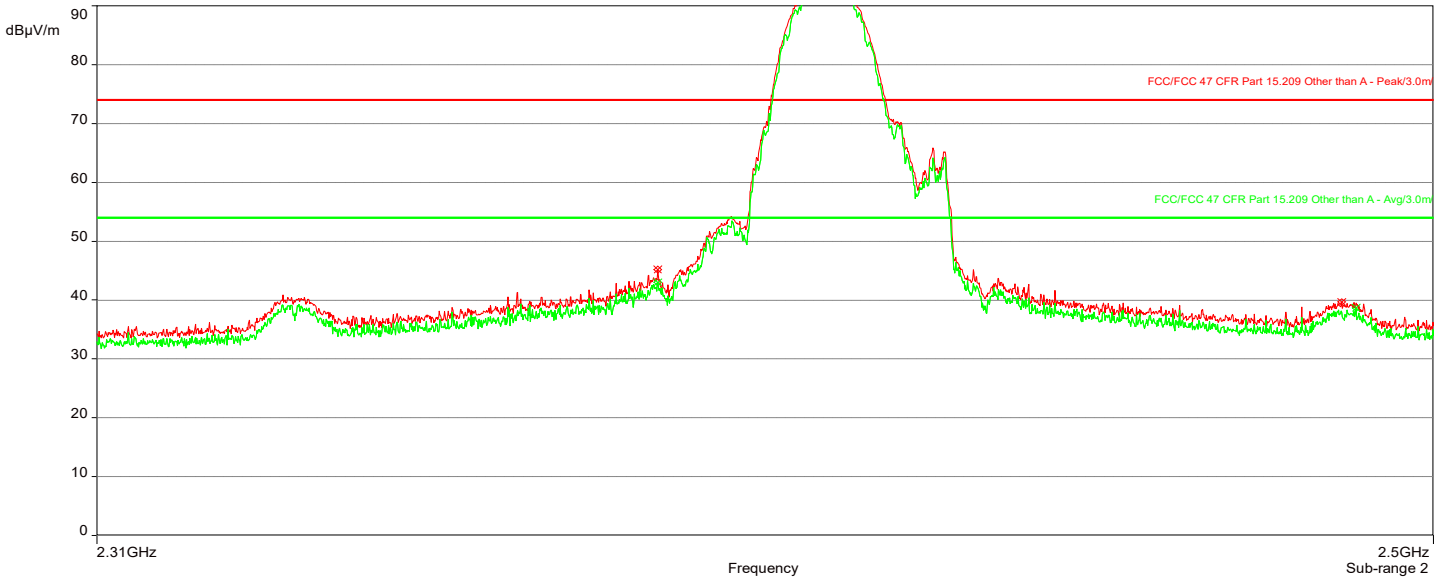
9/3/2021 11:59:52

No	Frequency (MHz)	Level Peak Reading (dBuV/m)	Correction Factor (dB)	Limit dBμV/m	Margin (dB)	Height (m)	Angle (°)	Polarization	Judgement
1.	2.3877489GHz	43.16	-3.15	74.00	-30.84	2.42	202.60	Vertical	Passed
2.	2.4866933GHz	39.37	-2.46	74.00	-34.63	3.31	0.00	Vertical	Passed
3.	2.387939GHz	45.18	-3.15	74.00	-28.82	1.72	45.00	Horizontal	Passed
4.	2.4865033GHz	39.70	-2.46	74.00	-34.30	1.00	67.60	Horizontal	Passed

No	Frequency (MHz)	Level Average Reading (dBuV/m)	Correction Factor (dB)	Limit dBμV/m	Margin (dB)	Height (m)	Angle (°)	Polarization	Judgment
1.	2.3875588GHz	41.96	-3.15	54.00	-12.04	2.42	202.60	Vertical	Passed
2.	2.4873587GHz	37.65	-2.46	54.00	-16.35	3.83	0.00	Vertical	Passed
3.	2.387939GHz	43.04	-3.15	54.00	-10.96	1.72	45.00	Horizontal	Passed
4.	2.4885943GHz	38.68	-2.45	54.00	-15.32	1.62	292.60	Horizontal	Passed

Overall Graphs:





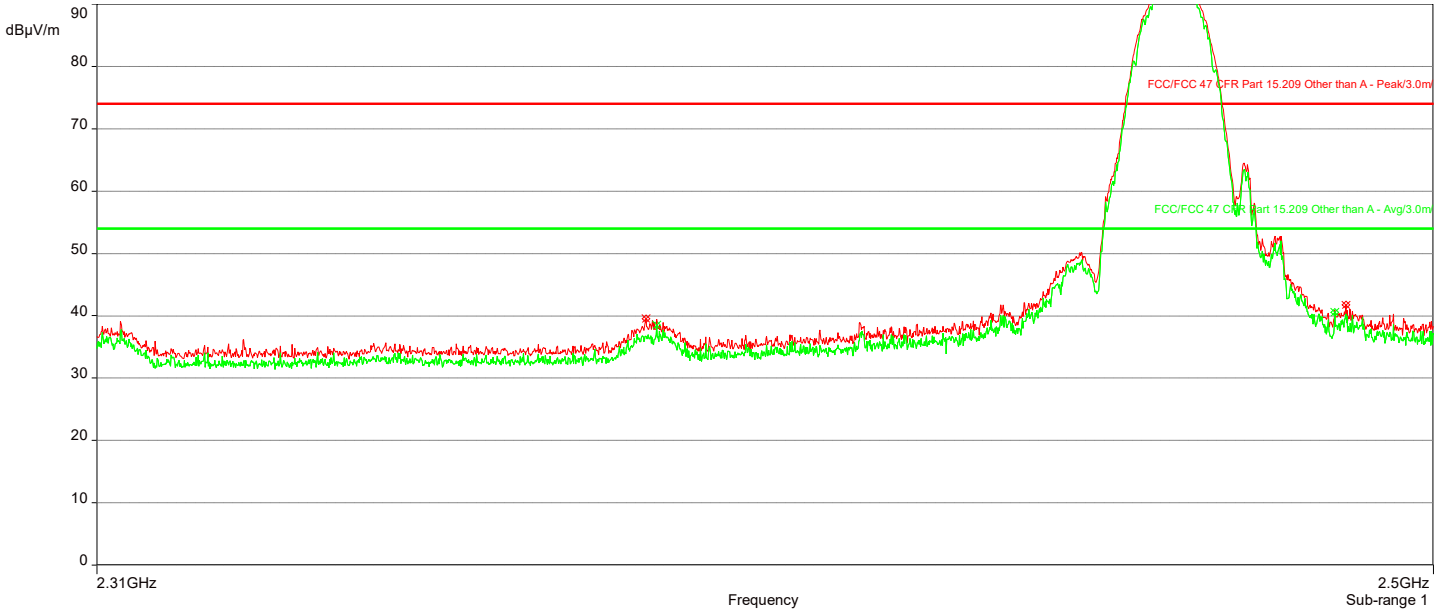
AH20110901-HAR-279-008_Restricted Bandedge_2.4G 802.11b_Ch-11

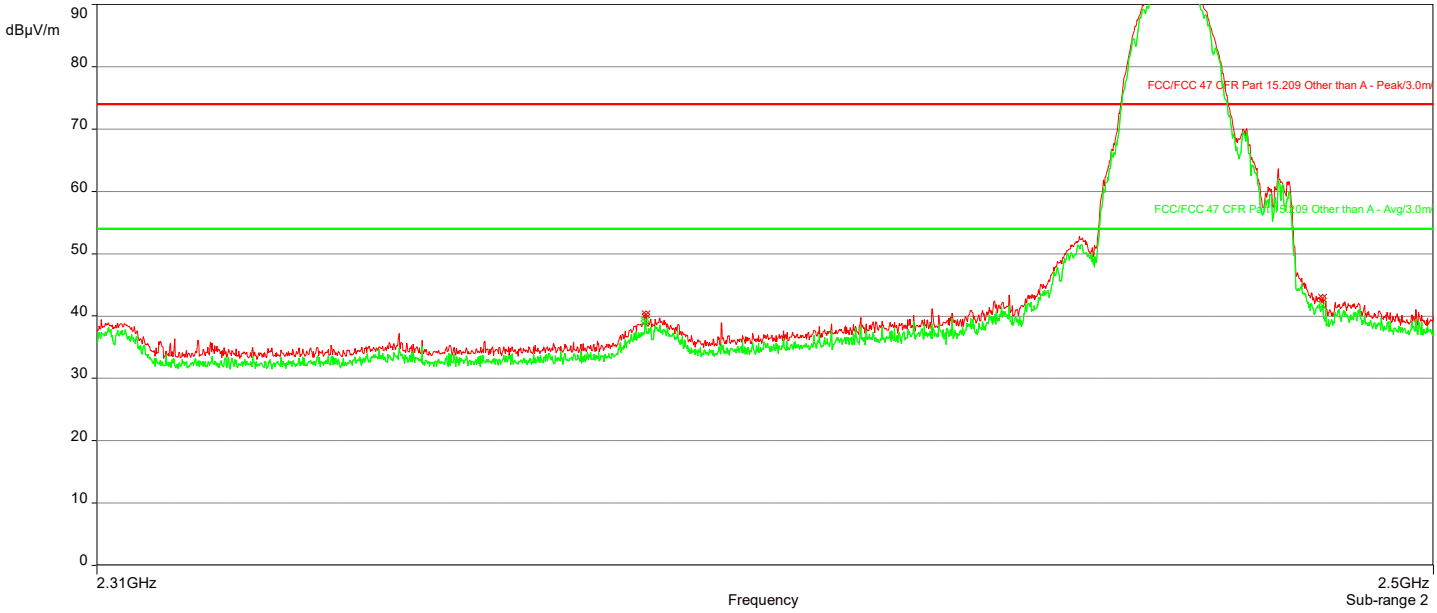
9/3/2021 12:02:33

No	Frequency (MHz)	Level Peak Reading (dBuV/m)	Correction Factor (dB)	Limit dBμV/m	Margin (dB)	Height (m)	Angle (°)	Polarization	Judgement
1.	2.3862281GHz	39.51	-3.16	74.00	-34.49	2.47	202.40	Vertical	Passed
2.	2.4870735GHz	41.77	-2.46	74.00	-32.23	2.71	202.40	Vertical	Passed
3.	2.3862281GHz	40.31	-3.16	74.00	-33.69	3.39	247.40	Horizontal	Passed
4.	2.4836518GHz	42.90	-2.47	74.00	-31.10	1.14	67.40	Horizontal	Passed

No	Frequency (MHz)	Level Average Reading (dBuV/m)	Correction Factor (dB)	Limit dBμV/m	Margin (dB)	Height (m)	Angle (°)	Polarization	Judgment
1.	2.3877489GHz	38.50	-3.15	54.00	-15.50	2.47	202.40	Vertical	Passed
2.	2.4854577GHz	40.54	-2.47	54.00	-13.46	3.27	0.00	Vertical	Passed
3.	2.3861331GHz	39.20	-3.16	54.00	-14.80	3.39	247.40	Horizontal	Passed
4.	2.4836518GHz	41.74	-2.47	54.00	-12.26	1.14	67.40	Horizontal	Passed

Overall Graphs:





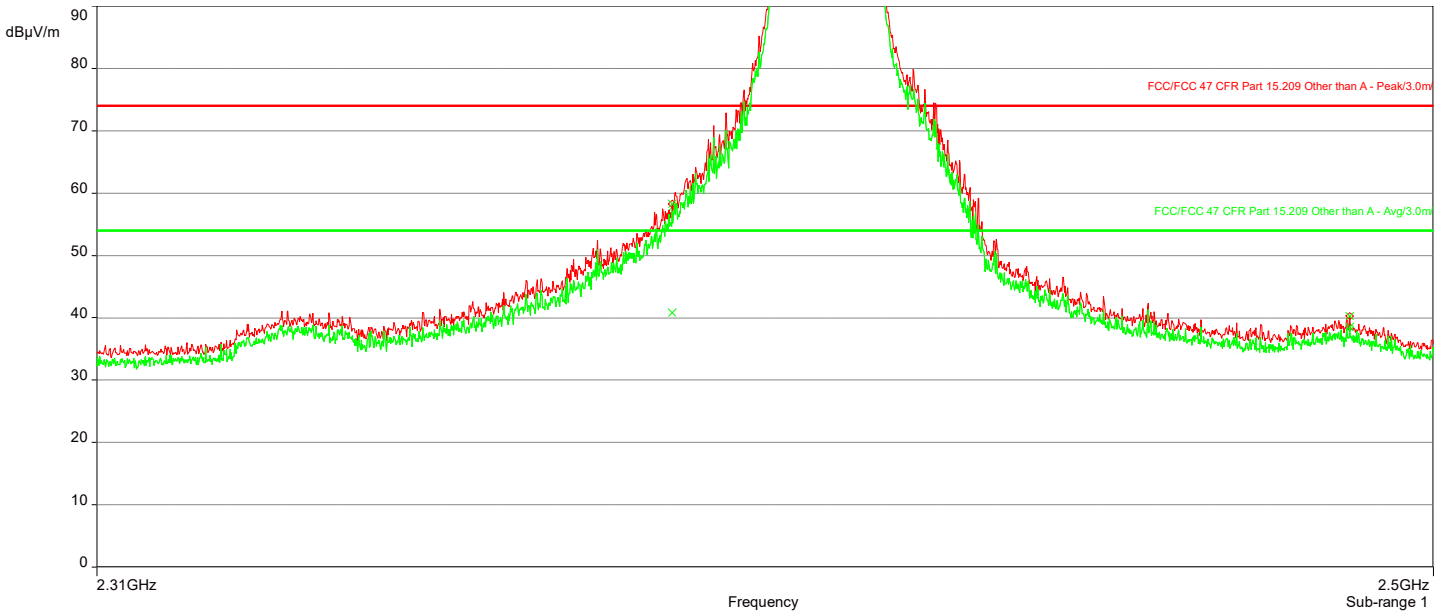
AH20110901-HAR-279-008_Restricted Bandedge_2.4G 802.11g_Ch-1

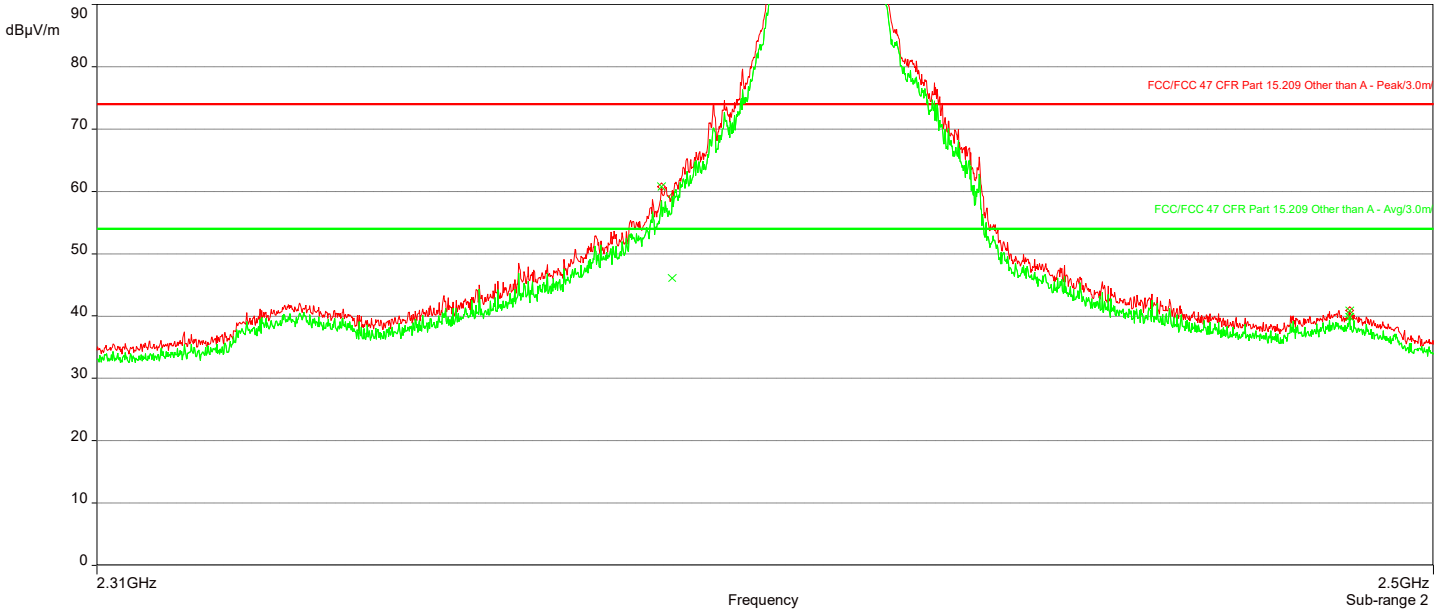
9/3/2021 12:24:03

No	Frequency (MHz)	Level Peak Reading (dBuV/m)	Correction Factor (dB)	Limit dBμV/m	Margin (dB)	Height (m)	Angle (°)	Polarization	Judgement
1.	2.389935GHz	58.24	-3.13	74.00	-15.76	2.52	202.70	Vertical	Passed
2.	2.4876438GHz	40.33	-2.46	74.00	-33.67	3.84	0.10	Vertical	Passed
3.	2.3884142GHz	60.74	-3.14	74.00	-13.26	1.71	45.10	Horizontal	Passed
4.	2.4876438GHz	40.90	-2.46	74.00	-33.10	1.48	292.60	Horizontal	Passed

No	Frequency (MHz)	Level Average Reading (dBuV/m)	Correction Factor (dB)	Limit dBμV/m	Margin (dB)	Height (m)	Angle (°)	Polarization	Judgment
1.	2.389935GHz	40.78	-3.13	54.00	-13.22	2.52	202.70	Vertical	Passed
2.	2.4876438GHz	38.54	-2.46	54.00	-15.46	3.84	0.10	Vertical	Passed
3.	2.389935GHz	46.13	-3.13	54.00	-7.87	1.60	67.90	Horizontal	Passed
4.	2.4876438GHz	39.87	-2.46	54.00	-14.13	1.48	292.60	Horizontal	Passed

Overall Graphs:





AH20110901-HAR-279-008_Restricted Bandedge_2.4G 802.11g_Ch-11

9/3/2021 12:49:03

No	Frequency (MHz)	Level Peak Reading (dBuV/m)	Correction Factor (dB)	Limit dBμV/m	Margin (dB)	Height (m)	Angle (°)	Polarization	Judgement
1.	2.3895548GHz	40.66	-3.14	74.00	-33.34	2.52	202.50	Vertical	Passed
2.	2.4835568GHz	54.65	-2.47	74.00	-19.35	3.59	180.10	Vertical	Passed
3.	2.3853727GHz	41.80	-3.16	74.00	-32.20	1.38	45.10	Horizontal	Passed
4.	2.4835568GHz	61.47	-2.47	74.00	-12.53	1.30	292.60	Horizontal	Passed

No	Frequency (MHz)	Level Average Reading (dBuV/m)	Correction Factor (dB)	Limit dBμV/m	Margin (dB)	Height (m)	Angle (°)	Polarization	Judgment
1.	2.3863232GHz	39.62	-3.16	54.00	-14.38	2.52	202.50	Vertical	Passed
2.	2.4836518GHz	52.24	-2.47	54.00	-1.76	2.64	202.50	Vertical	Passed
3.	2.3853727GHz	40.94	-3.16	54.00	-13.06	1.38	45.10	Horizontal	Passed
4.	2.483937GHz	42.10	-2.47	54.00	-11.90	1.42	292.90	Horizontal	Passed

Overall Graphs:

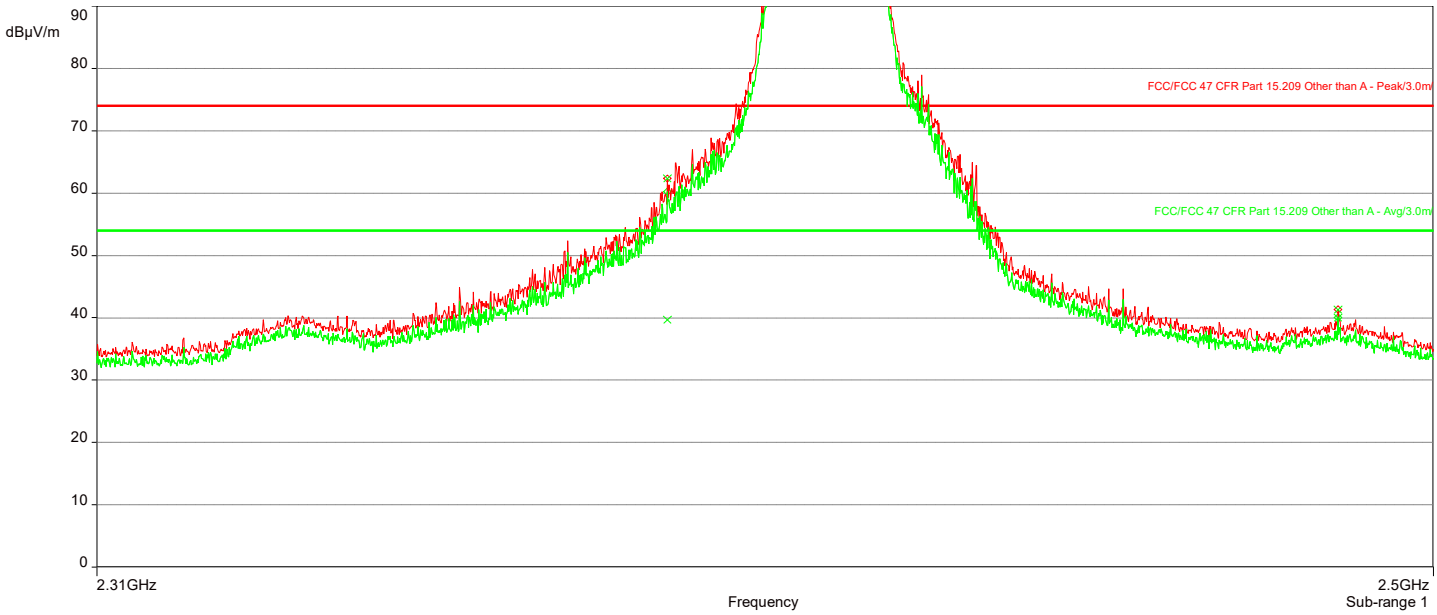
AH20110901-HAR-279-008_Restricted Bandedge_2.4G 802.11n_Ch-1

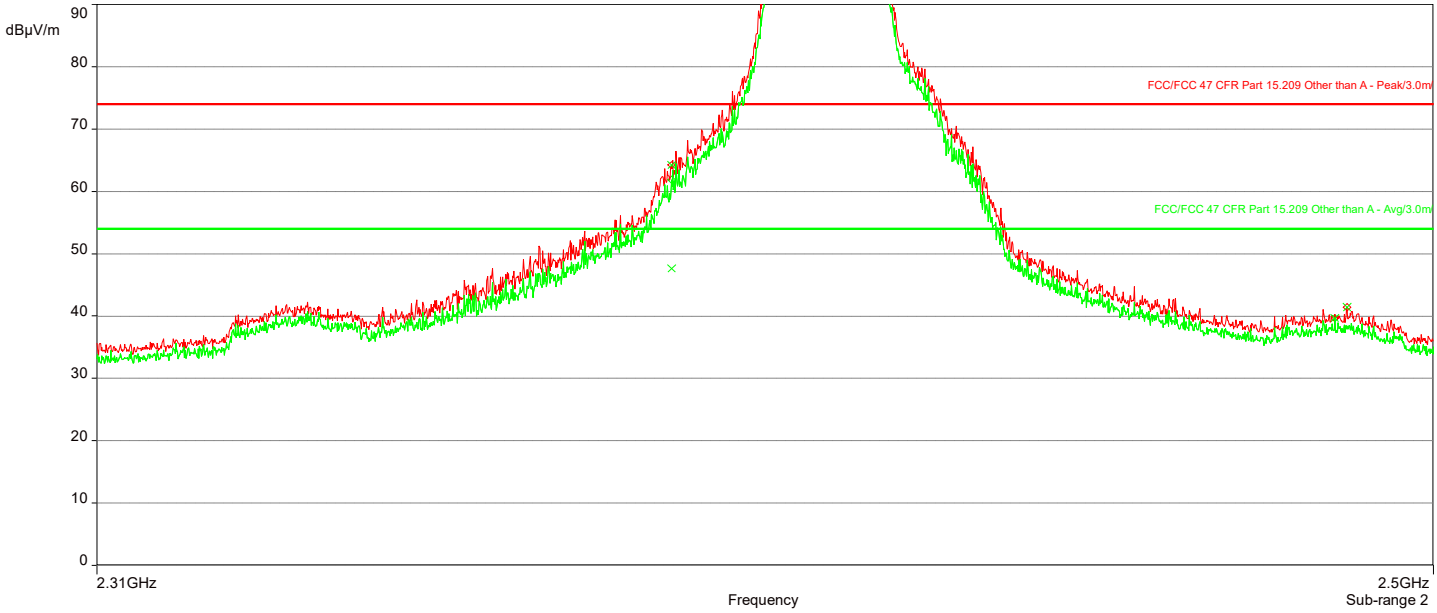
9/3/2021 13:12:48

No	Frequency (MHz)	Level Peak Reading (dBuV/m)	Correction Factor (dB)	Limit dBμV/m	Margin (dB)	Height (m)	Angle (°)	Polarization	Judgement
1.	2.3892696GHz	62.40	-3.14	74.00	-11.60	2.42	202.60	Vertical	Passed
2.	2.485933GHz	41.34	-2.46	74.00	-32.66	3.33	0.20	Vertical	Passed
3.	2.3898399GHz	64.23	-3.13	74.00	-9.77	3.97	247.60	Horizontal	Passed
4.	2.4872636GHz	41.41	-2.46	74.00	-32.59	1.61	292.60	Horizontal	Passed

No	Frequency (MHz)	Level Average Reading (dBuV/m)	Correction Factor (dB)	Limit dBμV/m	Margin (dB)	Height (m)	Angle (°)	Polarization	Judgment
1.	2.3892696GHz	39.72	-3.14	54.00	-14.28	2.42	202.60	Vertical	Passed
2.	2.485933GHz	40.02	-2.46	54.00	-13.98	3.33	0.20	Vertical	Passed
3.	2.3898399GHz	47.63	-3.13	54.00	-6.37	3.97	247.60	Horizontal	Passed
4.	2.4854577GHz	39.70	-2.47	54.00	-14.30	3.52	45.00	Horizontal	Passed

Overall Graphs:





AH20110901-HAR-279-008_Restricted Bandedge_2.4G 802.11n_Ch-11

9/3/2021 13:51:20

No	Frequency (MHz)	Level Peak Reading (dBuV/m)	Correction Factor (dB)	Limit dBμV/m	Margin (dB)	Height (m)	Angle (°)	Polarization	Judgement
1.	2.3895548GHz	40.25	-3.14	74.00	-33.75	2.42	202.60	Vertical	Passed
2.	2.4837469GHz	58.59	-2.47	74.00	-15.41	2.42	202.60	Vertical	Passed
3.	2.3843272GHz	41.77	-3.17	74.00	-32.23	1.48	45.00	Horizontal	Passed
4.	2.4835568GHz	62.66	-2.47	74.00	-11.34	3.13	45.00	Horizontal	Passed

No	Frequency (MHz)	Level Average Reading (dBuV/m)	Correction Factor (dB)	Limit dBμV/m	Margin (dB)	Height (m)	Angle (°)	Polarization	Judgment
1.	2.3895548GHz	38.89	-3.14	54.00	-15.11	2.42	202.60	Vertical	Passed
2.	2.4837469GHz	30.48	-2.47	54.00	-23.52	2.42	202.60	Vertical	Passed
3.	2.3887944GHz	39.93	-3.14	54.00	-14.07	1.13	45.00	Horizontal	Passed
4.	2.483937GHz	40.36	-2.47	54.00	-13.64	2.53	224.90	Horizontal	Passed

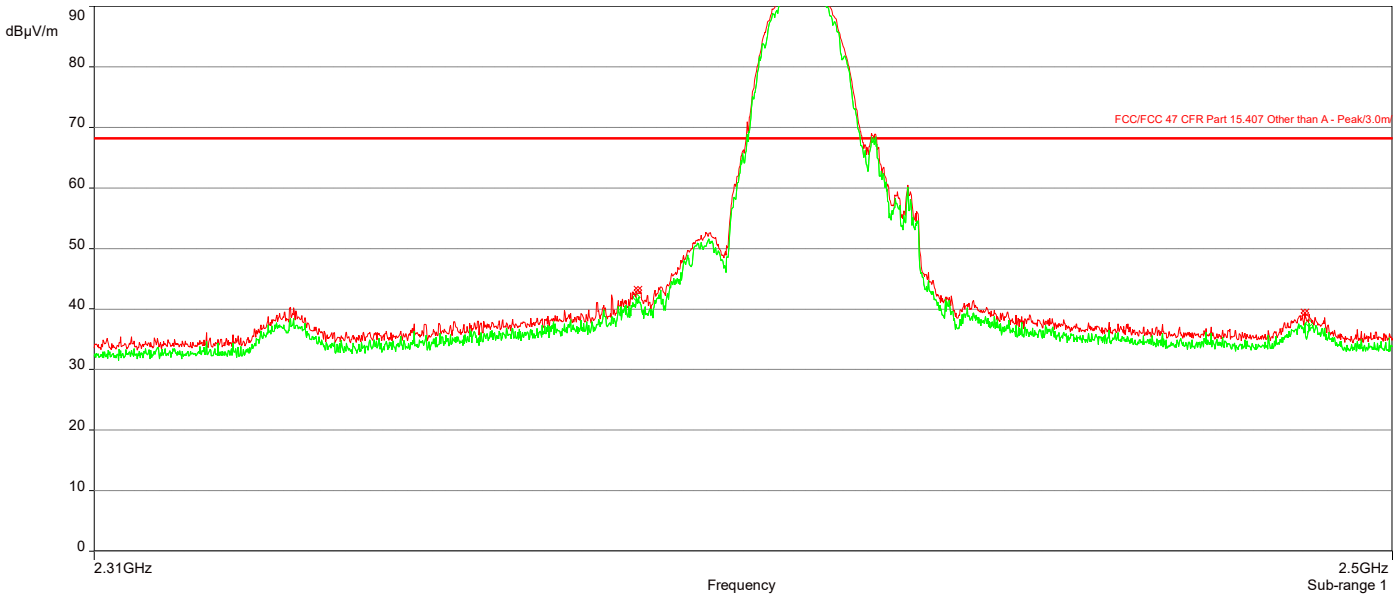
Overall Graphs:

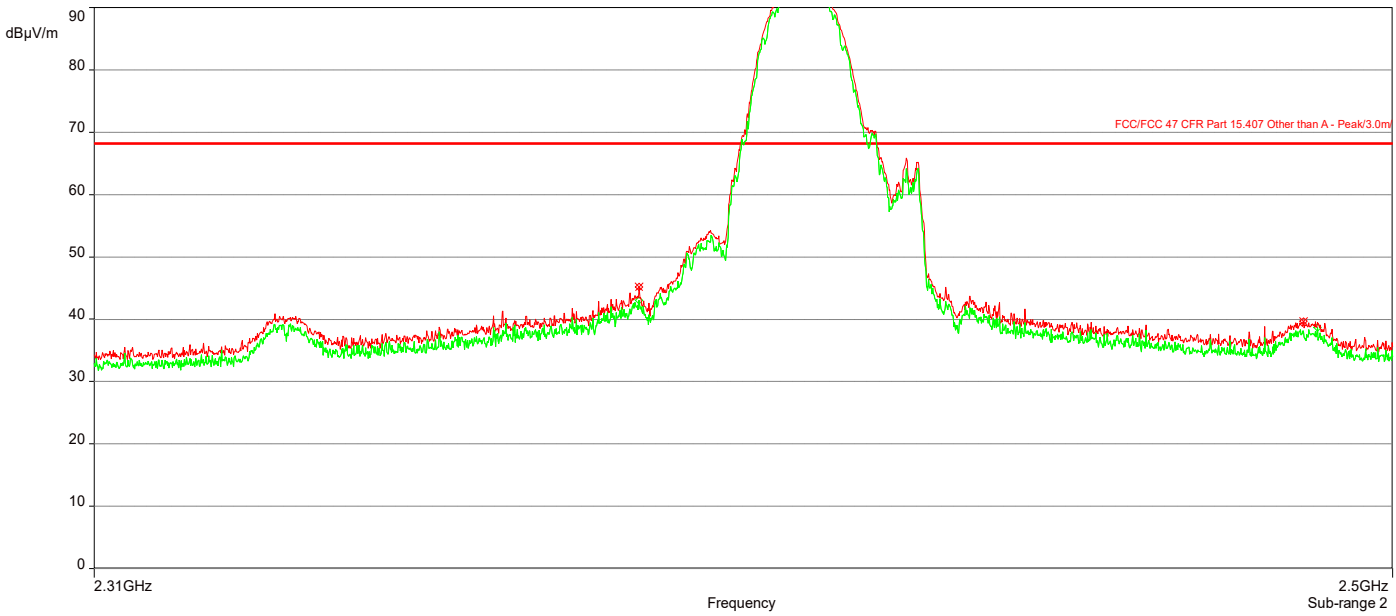
AH20110901-HAR-279-008_Unrestricted Bandedge_2.4G 802.11b_Ch-1

9/3/2021 12:00:42

No	Frequency (MHz)	Level Peak Reading (dBuV/m)	Correction Factor (dB)	Limit dBμV/m	Margin (dB)	Height (m)	Angle (°)	Polarization	Judgement
1.	2.3877489GHz	43.16	-3.15	68.23	-25.07	2.42	202.60	Vertical	Passed
2.	2.4866933GHz	39.37	-2.46	68.23	-28.86	3.31	0.00	Vertical	Passed
3.	2.387939GHz	45.18	-3.15	68.23	-23.05	1.72	45.00	Horizontal	Passed
4.	2.4865033GHz	39.70	-2.46	68.23	-28.53	1.00	67.60	Horizontal	Passed

Graphs:



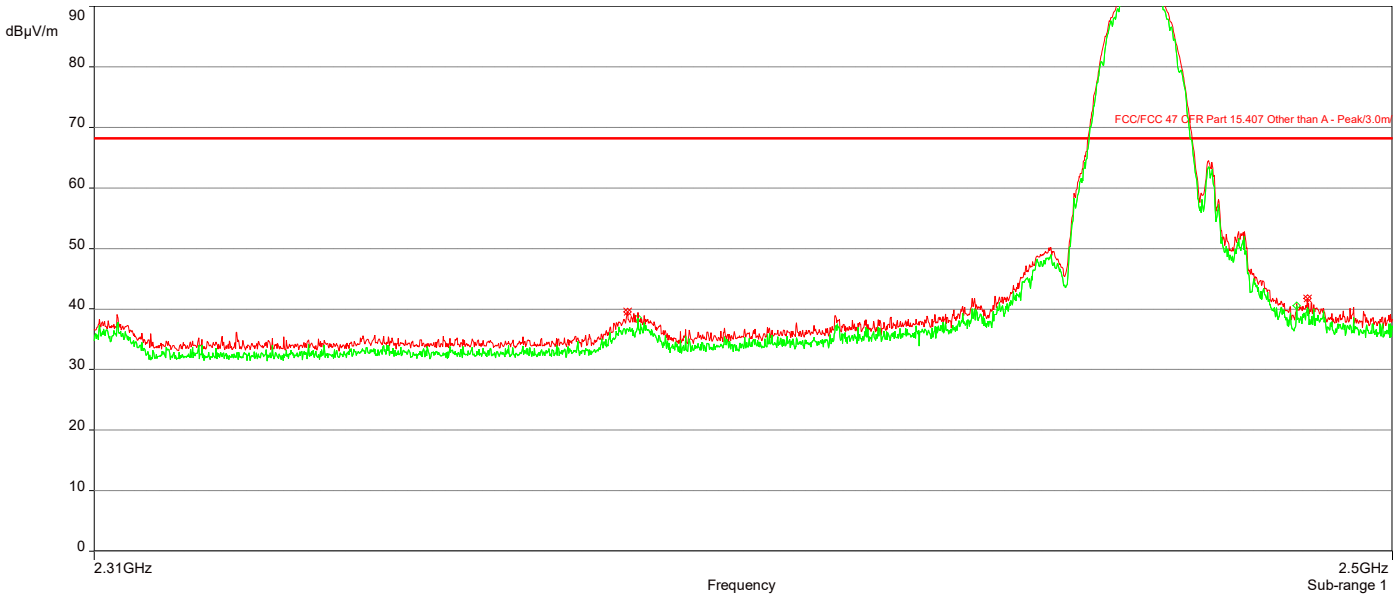


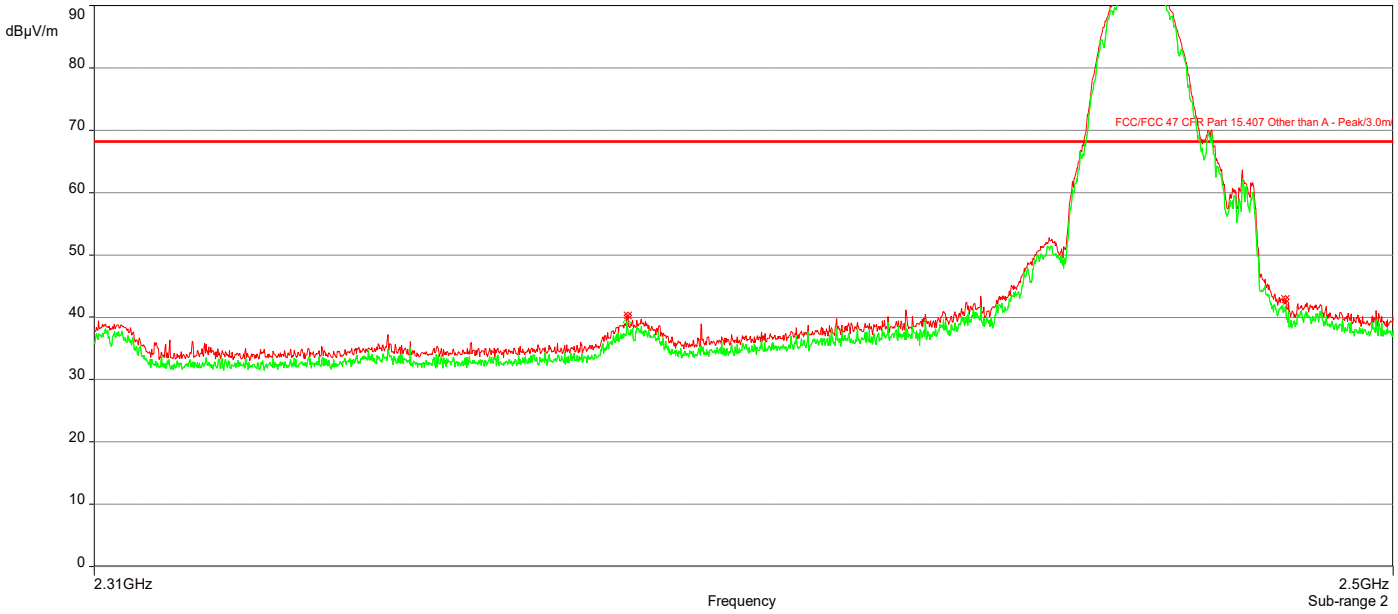
AH20110901-HAR-279-008_Unrestricted Bandedge_2.4G 802.11b_Ch-11

9/3/2021 12:02:33

No	Frequency (MHz)	Level Peak Reading (dBuV/m)	Correction Factor (dB)	Limit dBμV/m	Margin (dB)	Height (m)	Angle (°)	Polarization	Judgement
1.	2.3862281GHz	39.51	-3.16	68.23	-28.72	2.47	202.40	Vertical	Passed
2.	2.4870735GHz	41.77	-2.46	68.23	-26.46	2.71	202.40	Vertical	Passed
3.	2.3862281GHz	40.31	-3.16	68.23	-27.92	3.39	247.40	Horizontal	Passed
4.	2.4836518GHz	42.90	-2.47	68.23	-25.33	1.14	67.40	Horizontal	Passed

Graphs:



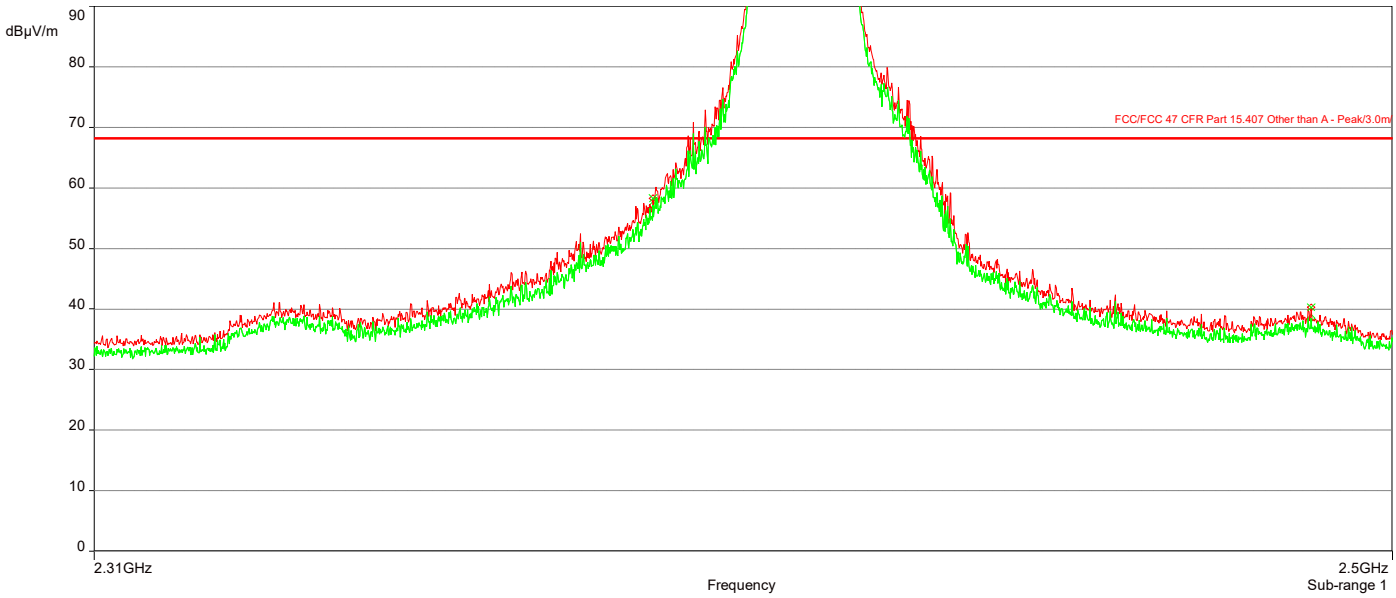


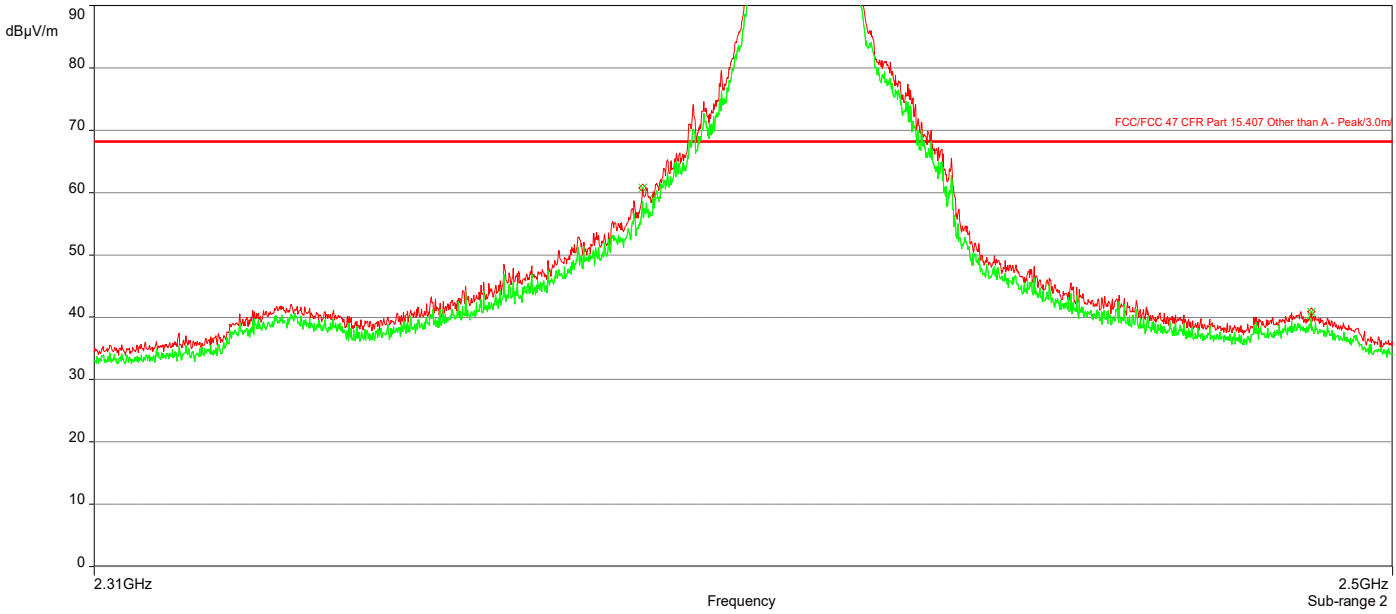
AH20110901-HAR-279-008_Unrestricted Bandedge_2.4G 802.11g_Ch-1

9/3/2021 12:24:03

No	Frequency (MHz)	Level Peak Reading (dBuV/m)	Correction Factor (dB)	Limit dBμV/m	Margin (dB)	Height (m)	Angle (°)	Polarization	Judgement
1.	2.389935GHz	58.24	-3.13	68.23	-9.99	2.52	202.70	Vertical	Passed
2.	2.4876438GHz	40.33	-2.46	68.23	-27.90	3.84	0.10	Vertical	Passed
3.	2.3884142GHz	60.74	-3.14	68.23	-7.49	1.71	45.10	Horizontal	Passed
4.	2.4876438GHz	40.90	-2.46	68.23	-27.33	1.48	292.60	Horizontal	Passed

Graphs:



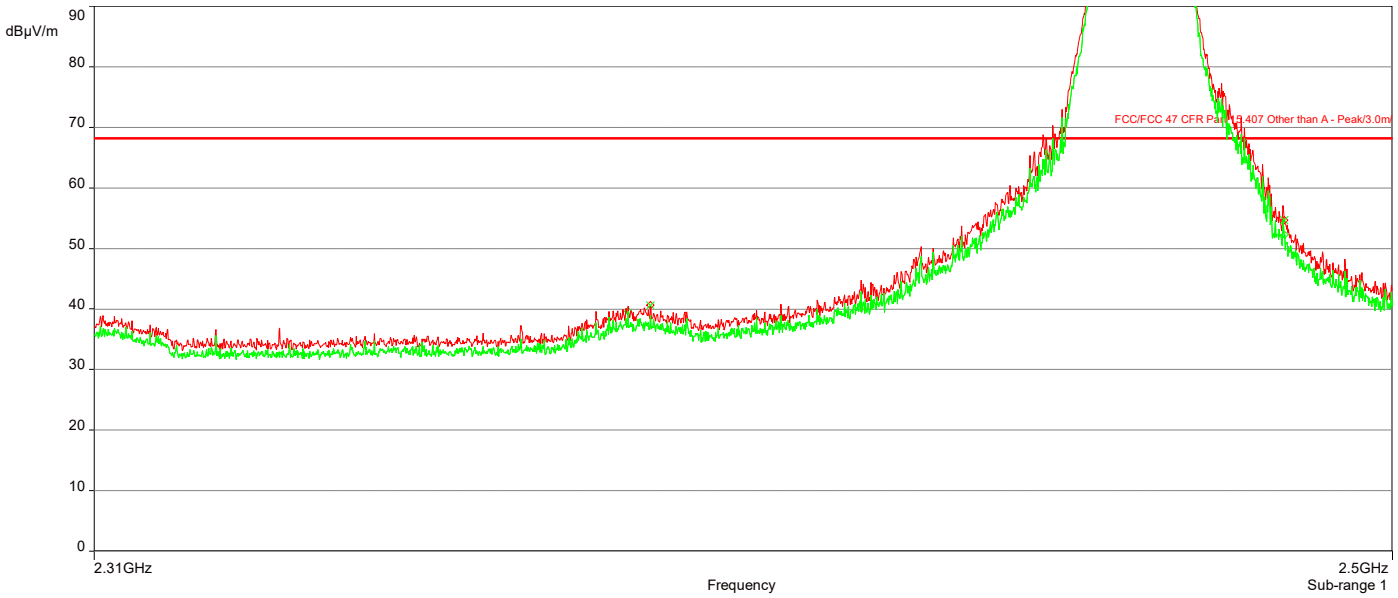


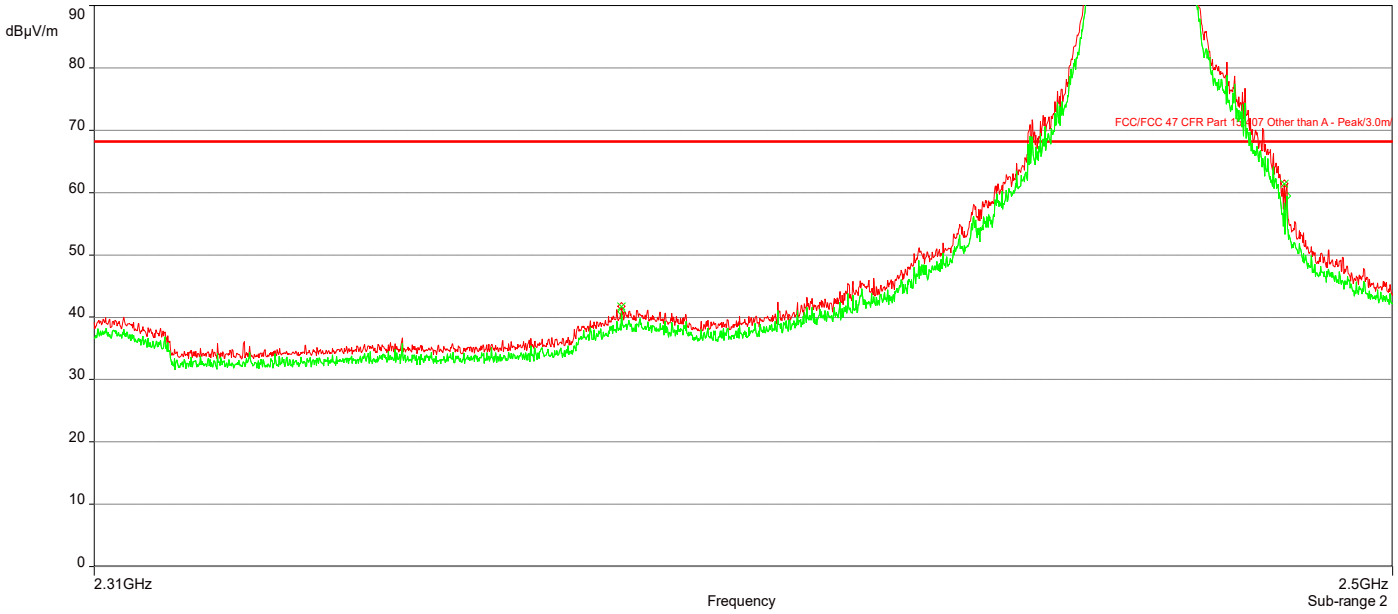
AH20110901-HAR-279-008_Unrestricted Bandedge_2.4G 802.11g_Ch-11

9/3/2021 12:49:03

No	Frequency (MHz)	Level Peak Reading (dBuV/m)	Correction Factor (dB)	Limit dBµV/m	Margin (dB)	Height (m)	Angle (°)	Polarization	Judgement
1.	2.3895548GHz	40.66	-3.14	68.23	-27.57	2.52	202.50	Vertical	Passed
2.	2.4835568GHz	54.65	-2.47	68.23	-13.58	3.59	180.10	Vertical	Passed
3.	2.3853727GHz	41.80	-3.16	68.23	-26.43	1.38	45.10	Horizontal	Passed
4.	2.4835568GHz	61.47	-2.47	68.23	-6.76	1.30	292.60	Horizontal	Passed

Graphs:



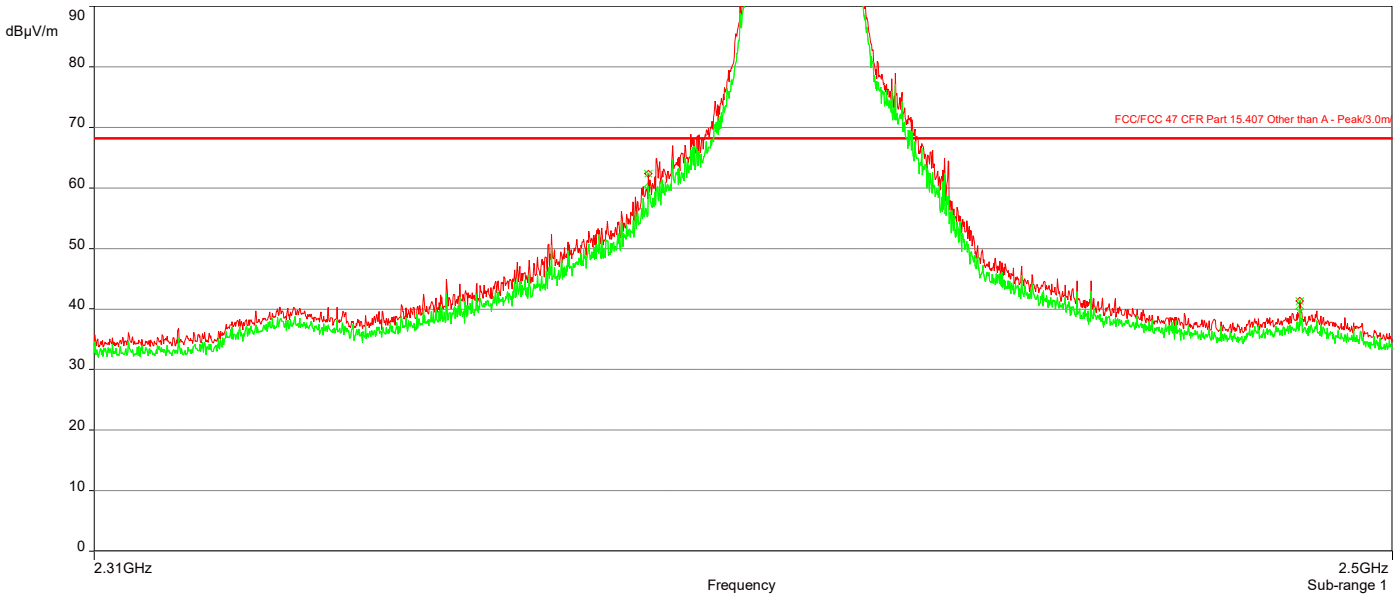


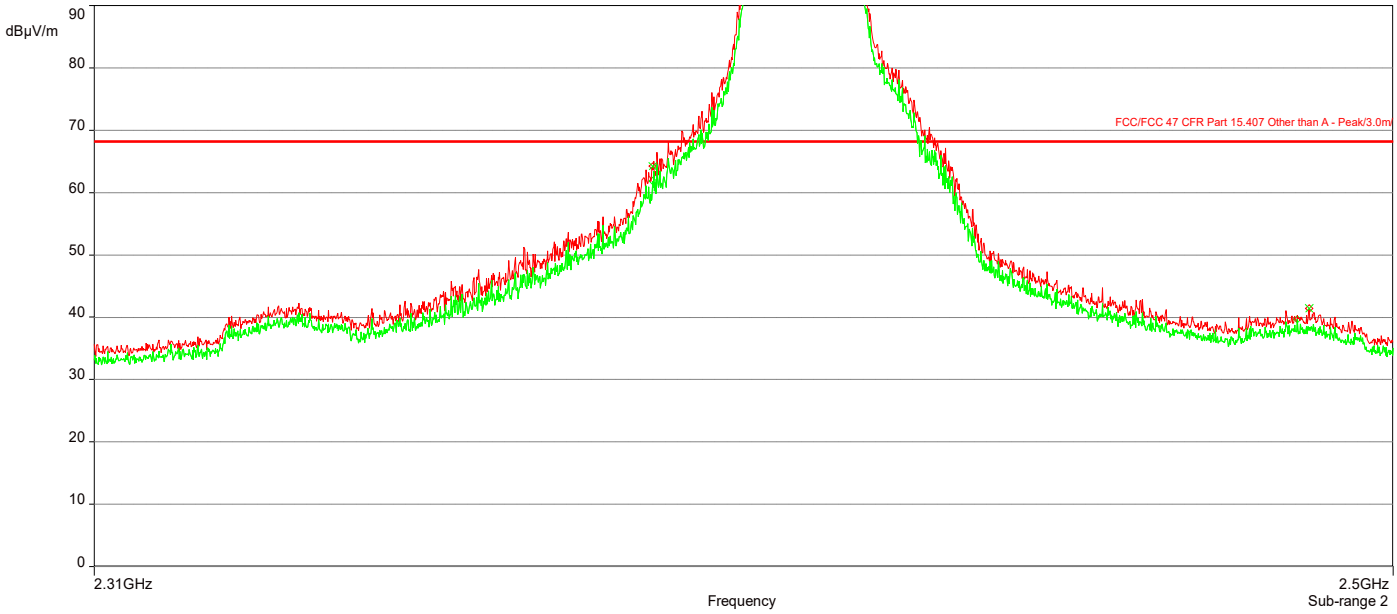
AH20110901-HAR-279-008_Unrestricted Bandedge_2.4G 802.11n_Ch-1

9/3/2021 13:12:48

No	Frequency (MHz)	Level Peak Reading (dBuV/m)	Correction Factor (dB)	Limit dBμV/m	Margin (dB)	Height (m)	Angle (°)	Polarization	Judgement
1.	2.3892696GHz	62.40	-3.14	68.23	-5.83	2.42	202.60	Vertical	Passed
2.	2.485933GHz	41.34	-2.46	68.23	-26.89	3.33	0.20	Vertical	Passed
3.	2.3898399GHz	64.23	-3.13	68.23	-4.00	3.97	247.60	Horizontal	Passed
4.	2.4872636GHz	41.41	-2.46	68.23	-26.82	1.61	292.60	Horizontal	Passed

Graphs:



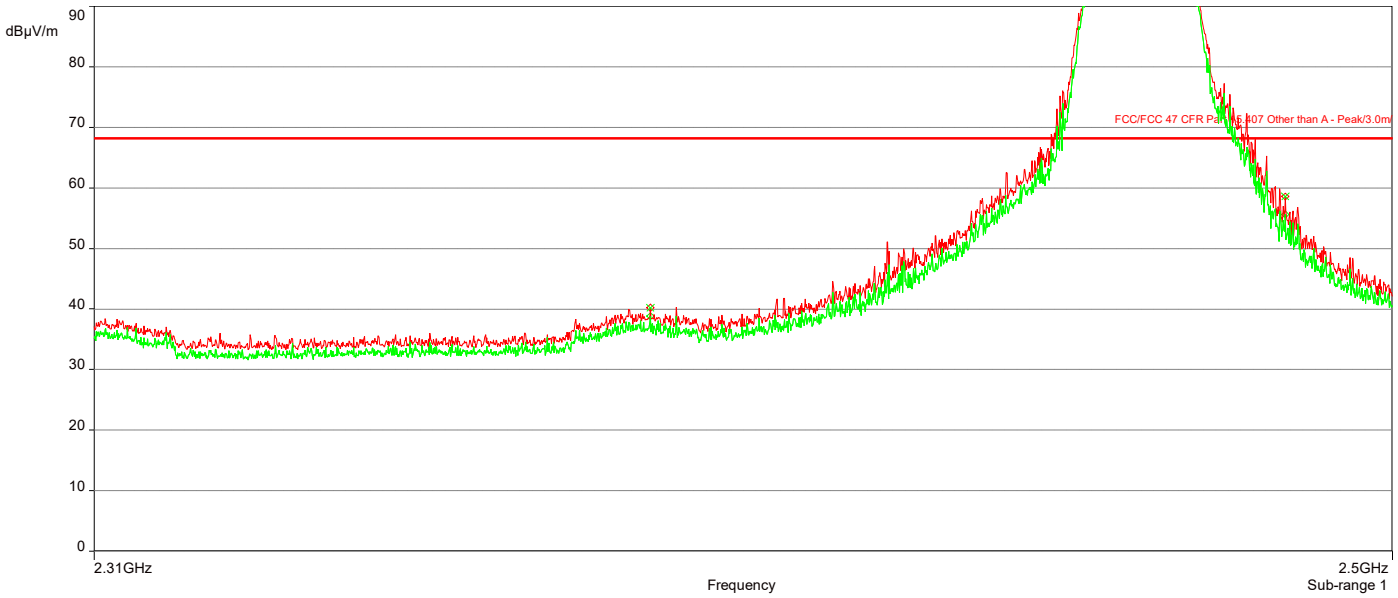


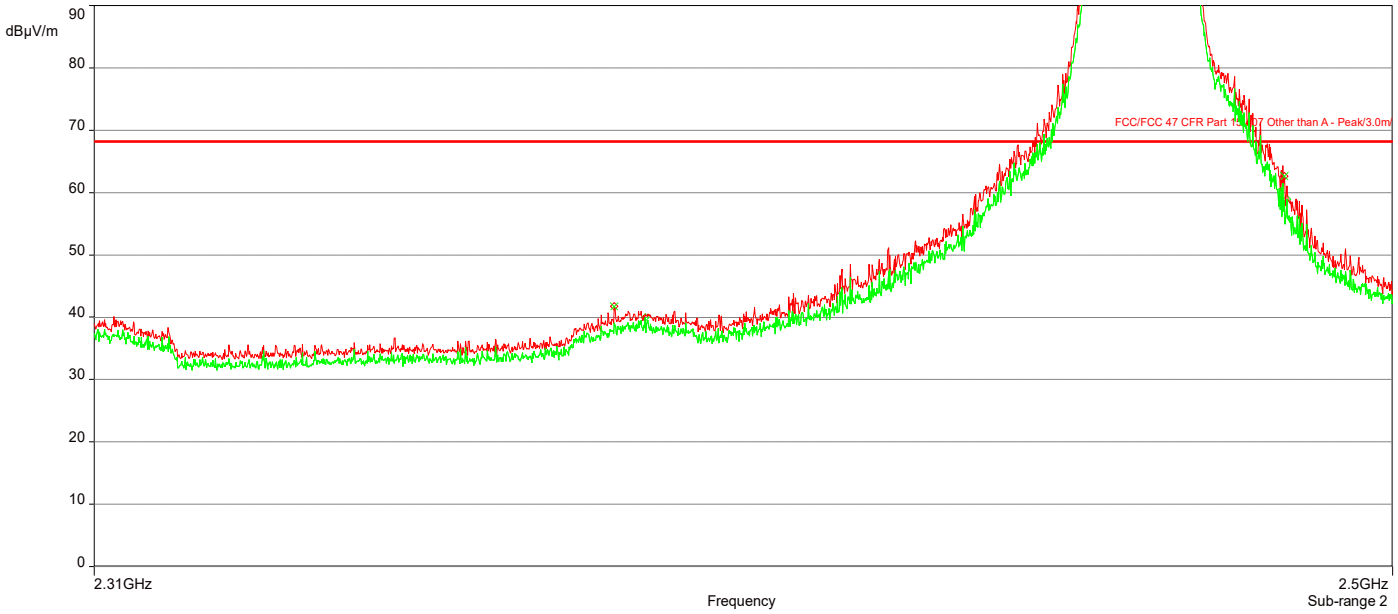
AH20110901-HAR-279-008_Unrestricted Bandedge_2.4G 802.11n_Ch-11

9/3/2021 13:51:20

No	Frequency (MHz)	Level Peak Reading (dBuV/m)	Correction Factor (dB)	Limit dBμV/m	Margin (dB)	Height (m)	Angle (°)	Polarization	Judgement
1.	2.3895548GHz	40.25	-3.14	68.23	-27.98	2.42	202.60	Vertical	Passed
2.	2.4837469GHz	58.59	-2.47	68.23	-9.64	2.42	202.60	Vertical	Passed
3.	2.3843272GHz	41.77	-3.17	68.23	-26.46	1.48	45.00	Horizontal	Passed
4.	2.4835568GHz	62.66	-2.47	68.23	-5.57	3.13	45.00	Horizontal	Passed

Graphs:





Document Revisions

Version	Date	Modifier	Changes
1.0	04-28-2021	Aravind Buddana	• Initial Draft
2.0	05-06-2021	Aravind Buddana	• Updated Report Number. Test Request Addition Information, Laboratory Additional Information • Updated Test Setup Information, Statement of conformity • Moved DUT and Test setup pictures to additional document.
3.0	07-16-2021	Aravind Buddana	• Updated FCC designation and ISED Identifier of Test Firm
3.0	07-16-2021	Ryan Philips	• Updated H-field measurement missing 9kHz – 30MHz
4.0	09-01-2021	Ryan Philips	• Updated the test plots for 9k to 30M
5.0	09-03-2021	Aravind Buddana	• Updated Band Edge Tests

-End of Report-