RF TEST REPORT

Applicant	ZTE Corporation
FCC ID	SRQ-MU5001
Product	UFI
Model	MU5001
Marketing	Vodafone Giga To Go
Report No.	R2106A0528-R2
Issue Date	July 15, 2021

TA Technology (Shanghai) Co., Ltd. tested the above equipment in accordance with the requirements in **FCC CFR47 Part 15C (2020)**. The test results show that the equipment tested is capable of demonstrating compliance with the requirements as documented in this report.

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Approved by: Kai Xu

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Summary of measurement results

Number	Test Case	Clause in FCC rules	Verdict
1	Maximum output power	15.247(b)(3)	PASS
2	6 dB bandwidth	15.247(a)(2)	PASS
3	Power spectral density	15.247(e)	PASS
4	Band Edge	15.247(d)	PASS
5	Spurious RF Conducted Emissions	15.247(d)	PASS
6	Unwanted Emissions	15.247(d),15.205,15.209	PASS
7	Conducted Emissions	15.207	PASS
Date of Testing: June 30, 2021 ~ July 12, 2021 Date of Sample Received: June 22, 2021			
Note: All indications of Pass/Fail in this report are opinions expressed by TA Technology (Shanghai) Co., Ltd. based on interpretations and/or observations of test results. Measurement Uncertainties were not taken into account and are published for informational purposes only.			

1. Test Laboratory

1.1. Notes of the test report

This report shall not be reproduced in full or partial, without the written approval of **TA technology (shanghai) co., Ltd.** The results documented in this report apply only to the tested sample, under the conditions and modes of operation as described herein .Measurement Uncertainties were not taken into account and are published for informational purposes only. This report is written to support regulatory compliance of the applicable standards stated above.

1.2. Test facility

FCC (Designation number: CN1179, Test Firm Registration Number: 446626)

TA Technology (Shanghai) Co., Ltd. has been listed on the US Federal Communications Commission list of test facilities recognized to perform measurements.

A2LA (Certificate Number: 3857.01)

TA Technology (Shanghai) Co., Ltd. has been listed by American Association for Laboratory Accreditation to perform measurement.

1.3. Testing Location

Company:	TA Technology (Shanghai) Co., Ltd.
Address:	No.145, Jintang Rd, Tangzhen Industry Park, Pudong
City:	Shanghai
Post code:	201201
Country:	P. R. China
Contact:	Xu Kai
Telephone:	+86-021-50791141/2/3
Fax:	+86-021-50791141/2/3-8000
Website:	http://www.ta-shanghai.com
E-mail:	xukai@ta-shanghai.com

2. General Description of Equipment under Test

2.1. Applicant and Manufacturer Information

Applicant	ZTE Corporation
Applicant address	ZTE Plaza, Keji Road South, Hi-Tech, Industrial Park, Nanshan District, Shenzhen, Guangdong, 518057, P.R.China
Manufacturer	Vodafone S.à r.l.
Manufacturer address	15 rue Edward Steichen, L-2540, Luxembourg, Grand-Duché de Luxembourg

2.2. General information

EUT Description	
Model	MU5001
IMEI	869926050009519
Hardware Version	Ver.A(T1)
Software Version	BD_VDFMU5001V1.0.0B01
Power Supply	Battery / AC adapter
Antenna Type	Internal Antenna
Antenna Connector	A permanently attached antenna
Antenna Gain	Antenna 1: 1.6 dBi Antenna 2: 1.8 dBi
Power Direction Gain	1.80
PSD Direction Gain	4.81
additional beamforming gain	NA
Test Mode	802.11b, 802.11g, 802.11n(HT20/HT40), 802.11ax (HE20/HE40)
Modulation Type	802.11b: DSSS 802.11g/n(HT20/HT40): OFDM 802.11ax (HE20/HE40):OFDMA, OFDM
Max. Conducted Power	Wi-Fi 2.4G: 17.22dBm
Operating Frequency Range(s)	802.11b/g/n(HT20): 2412 ~ 2462 MHz 802.11n(HT40): 2422 ~ 2452 MHz 802.11ax (HE20): 2412 ~ 2462 MHz 802.11ax (HE40): 2422 ~ 2452 MHz
EUT Accessory	
Adapter1	Manufacturer: SHENZHEN RUIJING INDUSTRIAL CO LTD

	Model: STC-A5930A1-A
Adapter2	Manufacturer: Jiangsu Chenyang Electron Co., Ltd. Model: STC-A5930A1-A
Adapter3	Manufacturer: SHENZHEN RUIJING INDUSTRIAL CO LTD Model: STC-A5930A1-B
Adapter4	Manufacturer: Jiangsu Chenyang Electron Co., Ltd. Model: STC-A5930A1-B
Battery	Manufacturer: Zhuhai CosMX Battery Co., Ltd. Model : Li3945T44P4h815174
USB Cable1	Manufacturer: Luxshare-ICT Co., Ltd Model: USB-TC30-W-100-M
USB Cable2	Manufacturer: King Power Electronics Co.,Ltd Model: USB-TC30-W-100-M
Note: 1. The EUT is sent from the applicant to TA and the information of the EUT is declared by the applicant. 2. There are more than one Adapter, and USB Cable, each one should be applied throughout the compliance test respectively, however, only the worst case (Adapter 1/ USB Cable 1) will be recorded in this report.	

3. Applied Standards

According to the specifications of the manufacturer, it must comply with the requirements of the following standards:

Test standards:

FCC CFR47 Part 15C (2020) Radio Frequency Devices

ANSI C63.10 (2013)

Reference standard:

KDB 558074 D01 15.247 Meas Guidance v05r02

KDB 662911 D01 Multiple Transmitter Output v02r01

4. Test Configuration

Test Mode

The EUT has been associated with peripherals and configuration operated in a manner tended to maximize its emission characteristics in a typical application.

The radiated emission was measured in the following position: EUT stand-up position (Z axis), lie-down position (X, Y axis). The worst emission was found in lie-down position (X axis) and the loop antenna is vertical, the others are vertical and horizontal. and the worst case was recorded.

In order to find the worst case condition, Pre-tests are needed at the presence of different data rate. Preliminary tests have been done on all the configuration for confirming worst case. Data rate below means worst-case rate of each test item.

Worst-case data rates are shown as following table.

Test Mode	Data Rate		
	Antenna 1	Antenna 2	MIMO
802.11b	1 Mbps	1 Mbps	/
802.11g	6 Mbps	6 Mbps	/
802.11n HT20	MCS0	MCS0	MCS8
802.11n HT40	MCS0	MCS0	MCS8
802.11ax HE20	MCS0	MCS0	MCS0
802.11ax HE40	MCS0	MCS0	MCS0

The worst case Antenna mode for each of the following tests for Wi-Fi:

Test Cases	Antenna 1	Antenna 2	MIMO
Maximum conducted output power	O	O	802.11n HT20 802.11n HT40 802.11ax HE20 802.11ax HE 40
6dB Bandwidth	802.11b/g	--	802.11n HT20 802.11n HT40 802.11ax HE20 802.11ax HE 40
Band Edge	802.11b/g	--	802.11n HT20 802.11n HT40 802.11ax HE20 802.11ax HE 40
Power Spectral Density	O	O	802.11n HT20 802.11n HT40 802.11ax HE20 802.11ax HE 40
Spurious RF Conducted Emissions	802.11b/g	--	802.11n HT20 802.11n HT40 802.11ax HE20 802.11ax HE 40
Unwanted Emissions	802.11b/g	--	802.11n HT20 802.11n HT40 802.11ax HE20 802.11ax HE 40
Conducted Emission	802.11b/g	--	802.11n HT20 802.11n HT40 802.11ax HE20 802.11ax HE 40
Note: “O”: test all bands			

According to RF Output power results in chapter 5.1, MIMO was selected as the worst antenna for 802.11n HT20/ HT40 and 802.11ax HE20/ HE40. SISO Antenna 1 was selected as the worst SISO antenna for 802.11b/g.

5. Test Case Results

5.1. Maximum output power

Ambient condition

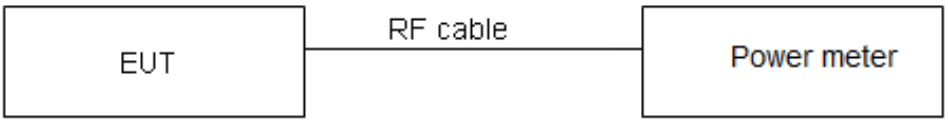
Temperature	Relative humidity	Pressure
23°C ~25°C	45%~50%	101.5kPa

Methods of Measurement

During the process of the testing, The EUT was connected to Power meter with a known loss. The EUT is max power transmission with proper modulation.

The conducted Power is measured at each antenna port. The measured results at the various antenna ports are then summed mathematically.

Test Setup



Limits

Rule Part 15.247 (b) (3) specifies that " For systems using digital modulation in the 902–928 MHz, 2400–2483.5 MHz: 1 Watt."

Average Output Power	≤ 1W (30dBm)

Measurement Uncertainty

The assessed measurement uncertainty to ensure 95% confidence level for the normal distribution is with the coverage factor k = 2, U= 0.44 dB.

Test Results

SISO Antenna Power Index								
Antenna	Channel	802.11b	802.11g	802.11n HT20	Channel	802.11n HT40	802.11ax HE20	802.11ax HE40
Antenna 1	CH1	16	15	14	CH3	14	12	12
	CH6	16	15	14	CH6	14	12	12
	CH11	16	15	14	CH9	14	12	12
Antenna 2	CH1	16	15	14	CH3	14	12	12
	CH6	16	15	14	CH6	14	12	12
	CH11	16	15	14	CH9	14	12	12
MIMO Antenna Power Index								
Antenna	Channel	802.11b	802.11g	802.11n HT20	Channel	802.11n HT40	802.11ax HE20	802.11ax HE40
Antenna 1	CH1	--	--	14	CH3	14	12	12
	CH6	--	--	14	CH6	14	12	12
	CH11	--	--	14	CH9	14	12	12
Antenna 2	CH1	--	--	14	CH3	14	12	12
	CH6	--	--	14	CH6	14	12	12
	CH11	--	--	14	CH9	14	12	12

RU mode

Test Mode	T_{on} (ms)	$T_{(on+off)}$ (ms)	Duty cycle	Duty cycle correction Factor(dB)
802.11b	1.00	1.00	1.00	NA
802.11g	1.00	1.00	1.00	NA
802.11n HT20	1.00	1.00	1.00	NA
802.11n HT40	1.00	1.00	1.00	NA
802.11ax HE20	1.00	1.00	1.00	NA
802.11ax HE40	1.00	1.00	1.00	NA
Note: when Duty cycle⩾0.98, Duty cycle correction Factor not required.				

SISO Antenna 1

Mode	Carrier frequency (MHz)	Average Power Measured (dBm)	Average Power with duty factor (dBm)	Limit (dBm)	Conclusion
802.11b	2412	16.34	16.34	30	PASS
	2437	16.07	16.07	30	PASS
	2462	16.22	16.22	30	PASS
802.11g	2412	14.66	14.66	30	PASS
	2437	14.61	14.61	30	PASS
	2462	14.55	14.55	30	PASS
802.11n HT20	2412	13.57	13.57	30	PASS
	2437	13.43	13.43	30	PASS
	2462	13.28	13.28	30	PASS
802.11n HT40	2422	14.13	14.13	30	PASS
	2437	13.82	13.82	30	PASS
	2452	13.77	13.77	30	PASS
802.11ax HE20	2412	11.74	11.74	30	PASS
	2437	11.68	11.68	30	PASS
	2462	11.35	11.35	30	PASS
802.11ax HE40	2422	12.08	12.08	30	PASS
	2437	11.83	11.83	30	PASS
	2452	11.52	11.52	30	PASS
Note: Average Power with duty factor = Average Power Measured +Duty cycle correction factor					

SISO Antenna 2

Mode	Carrier frequency (MHz)	Average Power Measured (dBm)	Average Power with duty factor (dBm)	Limit (dBm)	Conclusion
802.11b	2412	15.39	15.47	30	PASS
	2437	15.32	15.40	30	PASS
	2462	15.17	15.25	30	PASS
802.11g	2412	14.18	14.18	30	PASS
	2437	14.16	14.16	30	PASS
	2462	14.34	14.34	30	PASS
802.11n HT20	2412	13.67	13.67	30	PASS
	2437	13.43	13.43	30	PASS
	2462	13.21	13.21	30	PASS
802.11n HT40	2422	14.16	14.16	30	PASS
	2437	14.02	14.02	30	PASS
	2452	13.82	13.82	30	PASS
802.11ax HE20	2412	11.13	11.13	30	PASS
	2437	11.07	11.07	30	PASS
	2462	11.12	11.12	30	PASS
802.11ax HE40	2422	11.51	11.51	30	PASS
	2437	11.46	11.46	30	PASS
	2452	11.34	11.34	30	PASS
Note: Average Power with duty factor = Average Power Measured +Duty cycle correction factor					

MIMO

Mode	Carrier frequency (MHz)	MIMO Antenna 1		MIMO Antenna 2		Total Power (dBm)	Limit (dBm)	Conclusion
		Average Power Measured (dBm)	Average Power with duty factor (dBm)	Average Power Measured (dBm)	Average Power with duty factor (dBm)			
802.11n HT20	2412	13.73	13.73	13.52	13.52	16.64	30	PASS
	2437	13.67	13.67	13.38	13.38	16.54	30	PASS
	2462	13.54	13.54	13.26	13.26	16.41	30	PASS
802.11n HT40	2422	14.35	14.35	14.06	14.06	17.22	30	PASS
	2437	14.11	14.11	13.93	13.93	17.03	30	PASS
	2452	13.95	13.95	13.78	13.78	16.88	30	PASS
802.11ax HE20	2412	11.94	11.94	11.47	11.47	14.72	30	PASS
	2437	11.91	11.91	11.45	11.45	14.70	30	PASS
	2462	11.84	11.84	11.36	11.36	14.62	30	PASS
802.11ax HE40	2422	12.37	12.37	11.86	11.86	15.13	30	PASS
	2437	12.19	12.19	11.75	11.75	14.99	30	PASS
	2452	12.28	12.28	11.71	11.71	15.01	30	PASS

Note: 1.Average Power with duty factor = Average Power Measured +Duty cycle correction factor

2. For Total Power, according to KDB 662911 D01 Multiple Transmitter Output v02r01 1),

The Total Power $=10\log(10^{(\text{Power antenna1 in dBm}/10)}+10^{(\text{Power antenna2 in dBm}/10)}$.

3. The manufacturer declared the transmitter output signals is CDD mode. And N_{ss}=2. According to KDB 662911 D01 Multiple Transmitter Output v02r01 2)f)(i): If all antennas have the same gain, Directional gain = G_{ANT} + Array Gain,

For power measurements on IEEE 802.11 devices,

Array Gain = 0 dB (i.e., no array gain) for $N_{ANT} \leq 4$;

Array Gain = 0 dB (i.e., no array gain) for channel widths ≥ 40 MHz for any N_{ANT};

Array Gain = 5 log(N_{ANT}/N_{SS}) dB or 3 dB, whichever is less, for 20-MHz channel widths with $N_{ANT} \geq 5$.

4.If antenna gains are not equal, the user may use either of the following methods to calculate directional gain, provided that each transmit antenna is driven by only one spatial stream: Directional gain may be calculated by using the formulas applicable to equal gain antennas with G_{ANT} set equal to the gain of the antenna having the highest gain.

So directional gain = G_{ANT} + Array Gain =1.8+0=1.8dBi<6dBi. So the power limit is 30dBm

TB Mode

Band	T_{on} (ms)	$T_{(on+off)}$ (ms)	Duty cycle	Duty cycle correction Factor(dB)
802.11ax (HE20) 26-Tones	1.00	1.00	1.00	NA
802.11ax (HE20) 52-Tones	1.00	1.00	1.00	NA
802.11ax (HE20) 106-Tones	1.00	1.00	1.00	NA
802.11ax (HE20) 242-Tones	1.00	1.00	1.00	NA
802.11ax (HE40) 484-Tones	1.00	1.00	1.00	NA
Note: when Duty cycle>0.98, Duty cycle correction Factor not required.				

SISO Antenna1

Mode	Carrier frequency (MHz)	RU Size	Index	Average Power Measured (dBm)	Average Power with duty factor (dBm)	Limits (dBm)	Conclusion
802.11ax HE20 MU Mode	2412	26-Tones	0	11.34	11.34	30	PASS
	2437	26-Tones	4	11.56	11.56	30	PASS
	2462	26-Tones	8	10.75	10.75	30	PASS
	2412	52-Tones	37	11.51	11.51	30	PASS
	2437	52-Tones	39	11.86	11.86	30	PASS
	2462	52-Tones	40	10.67	10.67	30	PASS
	2412	106-Tones	53	11.92	11.92	30	PASS
	2437	106-Tones	53	12.07	12.07	30	PASS
	2462	106-Tones	54	11.10	11.10	30	PASS
802.11ax HE20 SU Mode	2412	242-Tones	61	11.89	11.89	30	PASS
	2437	242-Tones	61	12.08	12.08	30	PASS
	2462	242-Tones	61	11.77	11.77	30	PASS
802.11ax HE40 SU Mode	2422	484-Tones	65	12.85	12.85	30	PASS
	2437	484-Tones	65	12.62	12.62	30	PASS
	2452	484-Tones	65	12.59	12.59	30	PASS
Note: Average Power with duty factor = Average Power Measured +Duty cycle correction factor							

SISO Antenna 2

Mode	Carrier frequency (MHz)	RU Size	Index	Average Power Measured (dBm)	Average Power with duty factor (dBm)	Limits (dBm)	Conclusion
802.11ax HE20 MU Mode	2412	26-Tones	0	11.32	11.32	30	PASS
	2437	26-Tones	4	11.76	11.76	30	PASS
	2462	26-Tones	8	11.17	11.17	30	PASS
	2412	52-Tones	37	11.10	11.10	30	PASS
	2437	52-Tones	39	11.57	11.57	30	PASS
	2462	52-Tones	40	11.05	11.05	30	PASS
	2412	106-Tones	53	11.65	11.65	30	PASS
	2437	106-Tones	53	11.87	11.87	30	PASS
	2462	106-Tones	54	11.13	11.13	30	PASS
802.11ax HE20 SU Mode	2412	242-Tones	61	11.51	11.51	30	PASS
	2437	242-Tones	61	11.43	11.43	30	PASS
	2462	242-Tones	61	11.76	11.76	30	PASS
802.11ax HE40 SU Mode	2422	484-Tones	65	12.69	12.69	30	PASS
	2437	484-Tones	65	12.47	12.47	30	PASS
	2452	484-Tones	65	12.45	12.45	30	PASS
Note: Average Power with duty factor = Average Power Measured +Duty cycle correction factor							

Mode	Carrier frequency (MHz)	Index	MIMO Antenna 1		MIMO Antenna 2		Total Power (dBm)	Limit (dBm)	Conclusion
			Average Power Measured (dBm)	Average Power with duty factor (dBm)	Average Power Measured (dBm)	Average Power with duty factor (dBm)			
802.11ax (HE20) 26-Tones	2412	0	11.23	11.23	10.41	10.41	13.85	30	PASS
	2437	4	11.53	11.53	11.26	11.26	14.41	30	PASS
	2462	8	10.55	10.55	10.59	10.59	13.58	30	PASS
802.11ax (HE20) 52-Tones	2412	37	11.57	11.57	10.93	10.93	14.27	30	PASS
	2437	38	11.83	11.83	11.43	11.43	14.64	30	PASS
	2462	40	10.64	10.64	10.98	10.98	13.82	30	PASS
802.11ax (HE20) 106-Tones	2412	53	11.69	11.69	11.48	11.48	14.60	30	PASS
	2437	53	11.84	11.84	11.70	11.70	14.78	30	PASS
	2462	54	11.07	11.07	10.96	10.96	14.03	30	PASS
802.11ax (HE20) 242-Tones	2412	61	11.76	11.76	11.36	11.36	14.57	30	PASS
	2437	61	11.95	11.95	11.26	11.26	14.63	30	PASS
	2462	61	11.64	11.64	11.54	11.54	14.60	30	PASS
802.11ax (HE40) 484-Tones	2422	65	12.63	12.63	12.52	12.52	15.59	30	PASS
	2437	65	12.51	12.51	12.33	12.33	15.43	30	PASS
	2452	65	12.36	12.36	12.28	12.28	15.33	30	PASS

Note: 1.Average Power with duty factor = Average Power Measured +Duty cycle correction factor

2. For Total Power, according to KDB 662911 D01 Multiple Transmitter Output v02r01 1),

The Total Power $=10\log(10^{(\text{Power antenna1 in dBm/10})}+10^{(\text{Power antenna2 in dBm/10})}$.

3. The manufacturer declared the transmitter output signals is CDD mode. And N_{ss}=2. According to KDB 662911 D01 Multiple Transmitter Output v02r01 2)f)(i): If all antennas have the same gain, Directional gain = G_{ANT} + Array Gain,

For power measurements on IEEE 802.11 devices,

Array Gain = 0 dB (i.e., no array gain) for $N_{ANT} \leq 4$;

Array Gain = 0 dB (i.e., no array gain) for channel widths ≥ 40 MHz for any N_{ANT};

Array Gain = 5 log(N_{ANT}/N_{SS}) dB or 3 dB, whichever is less, for 20-MHz channel widths with $N_{ANT} \geq 5$.

4.If antenna gains are not equal, the user may use either of the following methods to calculate directional gain, provided that each transmit antenna is driven by only one spatial stream: Directional gain may be calculated by using the formulas applicable to equal gain antennas with G_{ANT} set equal to the gain of the antenna having the highest gain.

So directional gain = G_{ANT} + Array Gain =1.8+0=1.8dBi<6dBi. So the power limit is 30dBm

5.2. 99% Bandwidth and 6dB Bandwidth

Ambient condition

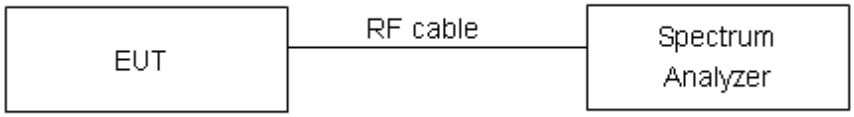
Temperature	Relative humidity	Pressure
23°C ~25°C	45%~50%	101.5kPa

Method of Measurement

The EUT was connected to the spectrum analyzer through an external attenuator (20dB) and a known loss cable. RBW is set to 100 kHz; VBW is set to 300 kHz on spectrum analyzer.
Dector=Peak, Trace mode=max hold.

The EUT was connected to the spectrum analyzer through a known loss cable. The resolution bandwidth (RBW) shall be in the range of 1% to 5% of the actual occupied / x dB bandwidth and the video bandwidth (VBW) shall not be smaller than three times the RBW value.

Test Setup



Limits

Rule Part 15.247 (a) (2) specifies that “Systems using digital modulation techniques may operate in the 902–928 MHz, 2400–2483.5 MHz bands. The minimum 6 dB bandwidth shall be at least 500 kHz.”

minimum 6 dB bandwidth	≥ 500 kHz

Measurement Uncertainty

The assessed measurement uncertainty to ensure 95% confidence level for the normal distribution is with the coverage factor k = 2, U= 936 Hz.

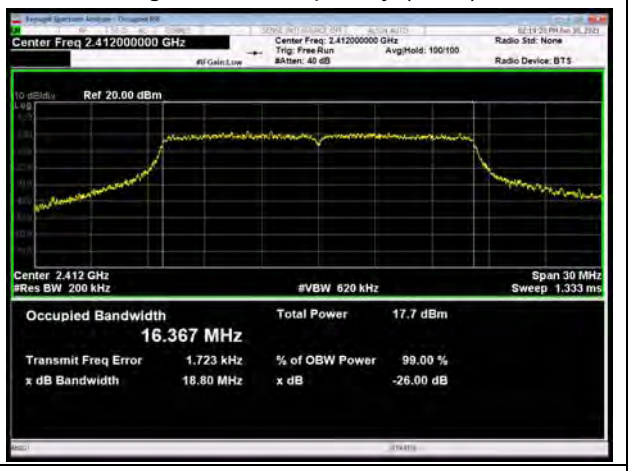
Test Results:

Mode	Carrier frequency (MHz)	99% bandwidth (MHz)	Minimum 6 dB bandwidth (MHz)	Limit (kHz)	Conclusion
802.11b	2412	13.178	8.017	500	PASS
	2437	13.002	8.036	500	PASS
	2462	13.005	8.059	500	PASS
802.11g	2412	16.367	16.323	500	PASS
	2437	16.326	16.313	500	PASS
	2462	16.312	16.035	500	PASS
802.11n HT20	2412	17.563	17.033	500	PASS
	2437	17.507	16.782	500	PASS
	2462	17.514	16.544	500	PASS
802.11n HT40	2422	35.970	35.647	500	PASS
	2437	35.792	35.125	500	PASS
	2452	35.946	34.444	500	PASS
802.11ax HE20	2412	18.906	18.733	500	PASS
	2437	18.863	18.071	500	PASS
	2462	18.863	18.497	500	PASS
802.11ax HE40	2422	37.618	35.677	500	PASS
	2437	37.565	36.974	500	PASS
	2452	37.636	36.649	500	PASS

99%bandwidth

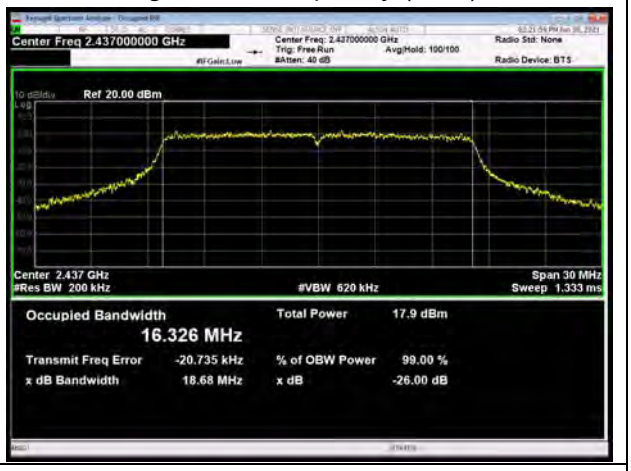
802.11b, Carrier frequency (MHz): 2412

802.11g, Carrier frequency (MHz): 2412



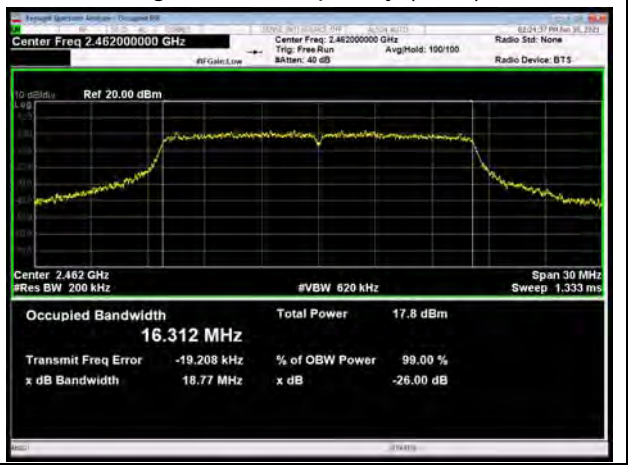
802.11b, Carrier frequency (MHz): 2437

802.11g, Carrier frequency (MHz): 2437



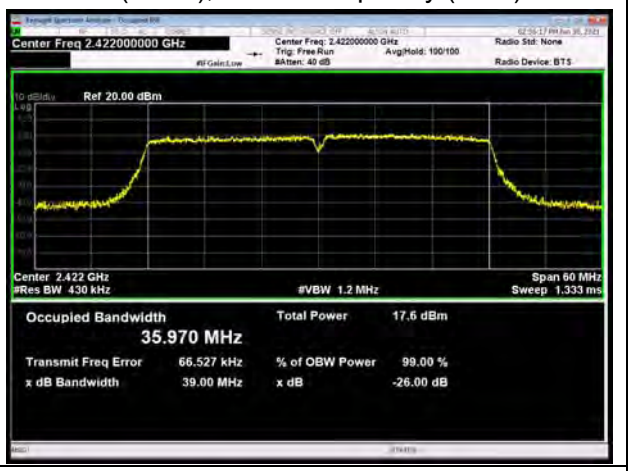
802.11b, Carrier frequency (MHz):2462

802.11g, Carrier frequency (MHz):2462



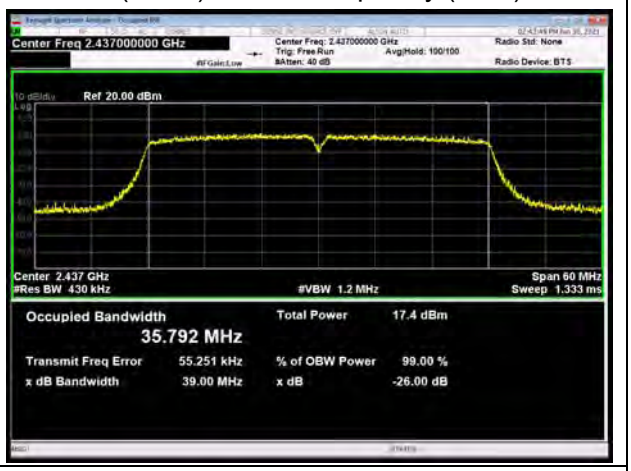
802.11n(HT20), Carrier frequency (MHz): 2412

802.11n(HT40), Carrier frequency (MHz): 2422

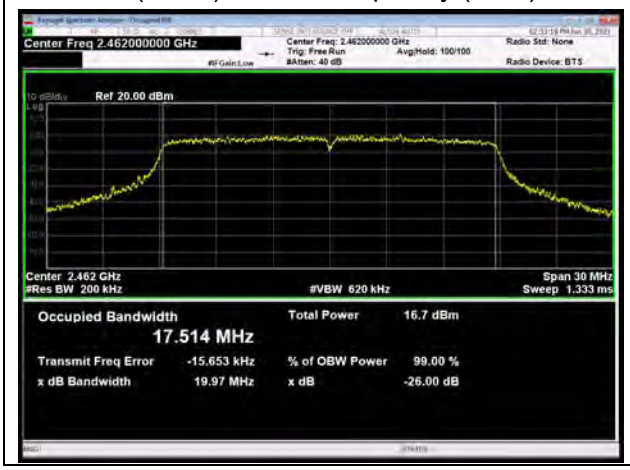


802.11n(HT20), Carrier frequency (MHz): 2437

802.11n(HT40), Carrier frequency (MHz): 2437



802.11n(HT20), Carrier frequency (MHz):2462



802.11n(HT40), Carrier frequency (MHz):2452

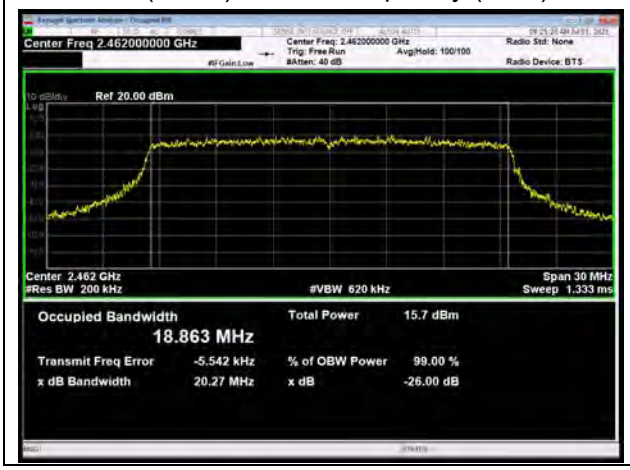
802.11ax(HE20), Carrier frequency (MHz): 2412

802.11 ax(HE40), Carrier frequency (MHz): 2422

802.11 ax(HE20), Carrier frequency (MHz): 2437

802.11 ax(HE40), Carrier frequency (MHz): 2437

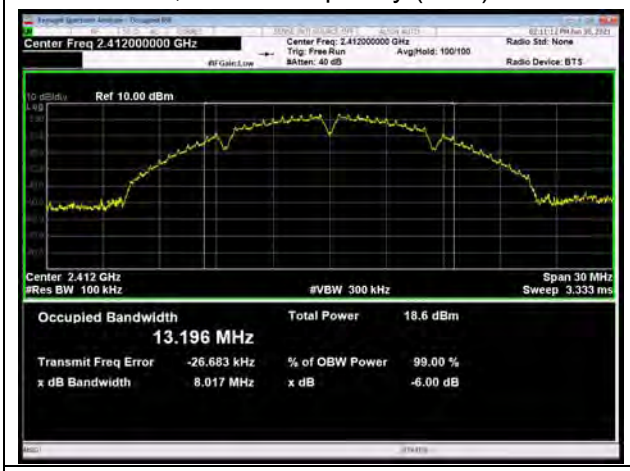
802.11 ax(HE20), Carrier frequency (MHz):2462



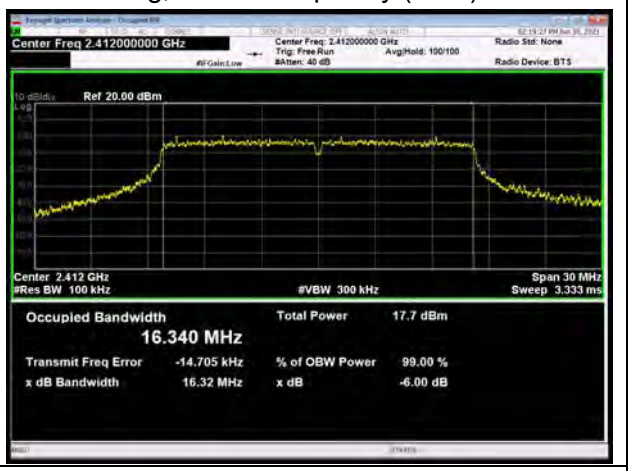
802.11 ax(HE40), Carrier frequency (MHz):2452

6 dB bandwidth

802.11b, Carrier frequency (MHz): 2412



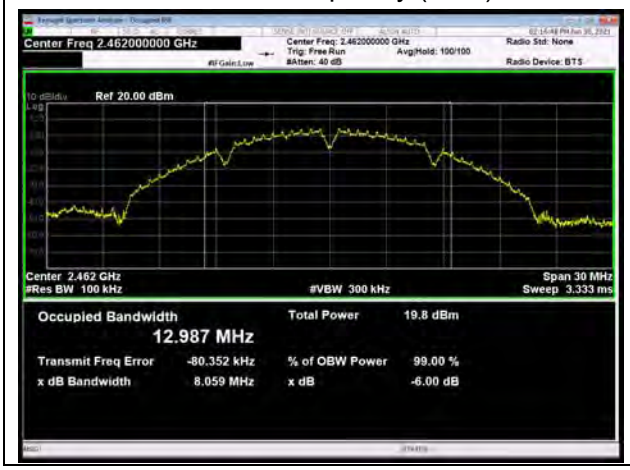
802.11g, Carrier frequency (MHz): 2412



802.11b, Carrier frequency (MHz): 2437

802.11g, Carrier frequency (MHz): 2437

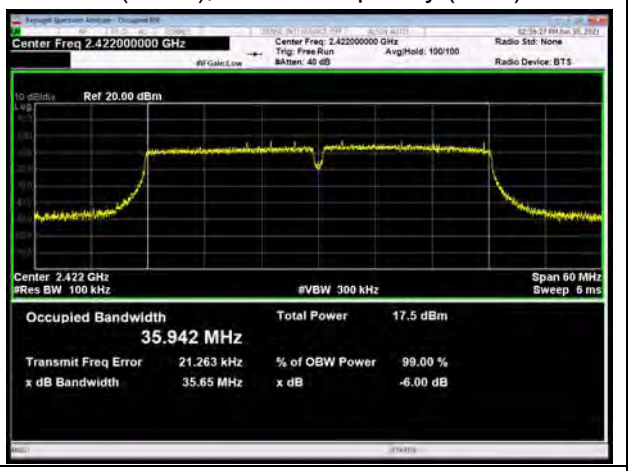
802.11b, Carrier frequency (MHz):2462



802.11g, Carrier frequency (MHz):2462

802.11n(HT20), Carrier frequency (MHz): 2412

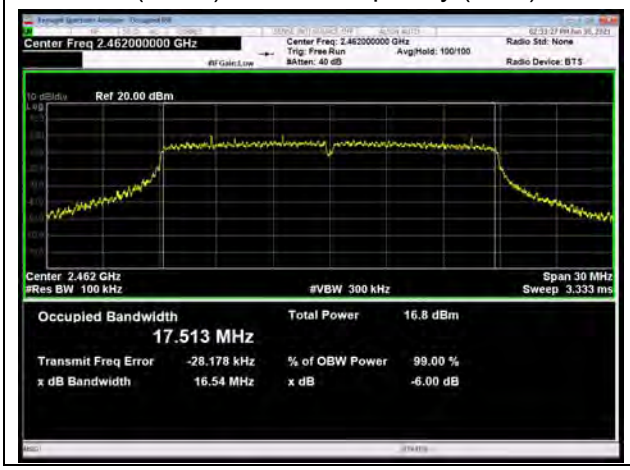
802.11n(HT40), Carrier frequency (MHz): 2422



802.11n(HT20), Carrier frequency (MHz): 2437

802.11n(HT40), Carrier frequency (MHz): 2437

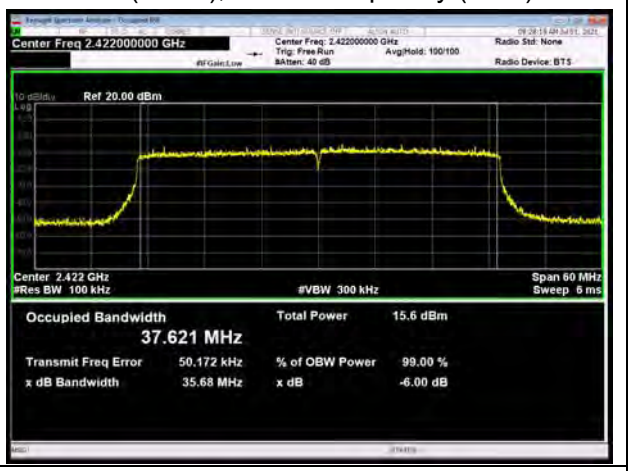
802.11n(HT20), Carrier frequency (MHz):2462



802.11n(HT40), Carrier frequency (MHz):2452

802.11ax(HE20), Carrier frequency (MHz): 2412

802.11 ax(HE40), Carrier frequency (MHz): 2422

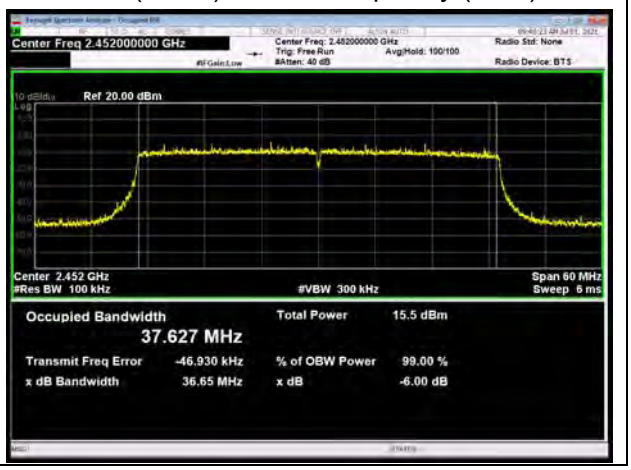


802.11 ax(HE20), Carrier frequency (MHz): 2437

802.11 ax(HE40), Carrier frequency (MHz): 2437

802.11 ax(HE20), Carrier frequency (MHz):2462

802.11 ax(HE40), Carrier frequency (MHz):2452



5.3. Band Edge

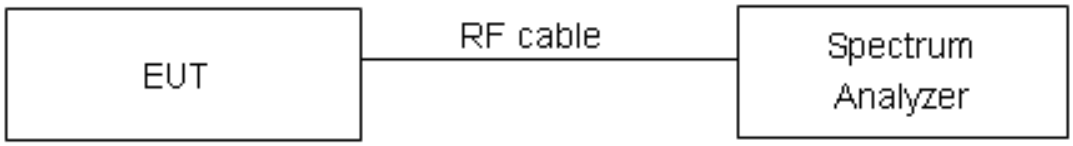
Ambient condition

Temperature	Relative humidity	Pressure
23°C ~25°C	45%~50%	101.5kPa

Method of Measurement

The EUT was connected to the spectrum analyzer through an external attenuator (20dB) and a known loss cable the band edge of the lowest and highest channels were measured. The peak detector is used and RBW is set to 100 kHz and VBW is set to 300 kHz on spectrum analyzer. Spectrum analyzer plots are included on the following pages.

Test Setup



Limits

Rule Part 15.247(d) specifies that “In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement, provided the transmitter demonstrates compliance with the peak conducted power limits.” If the transmitter complies with the conducted power limits based on the use of RMS averaging over a time interval, as permitted under paragraph (b)(3) of this section, the attenuation required under this paragraph shall be 30 dB instead of 20 dB.”

Measurement Uncertainty

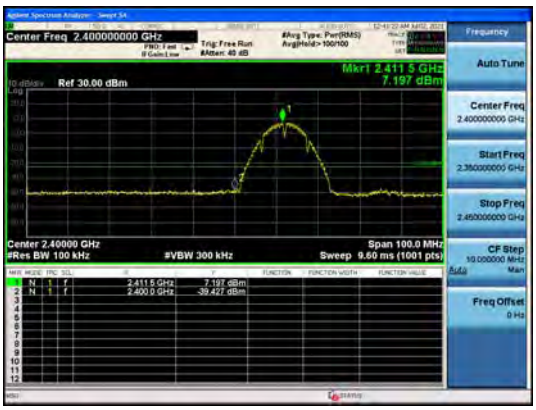
The assessed measurement uncertainty to ensure 95% confidence level for the normal distribution is with the coverage factor k = 1.96.

Frequency	Uncertainty
2GHz-3GHz	1.407 dB

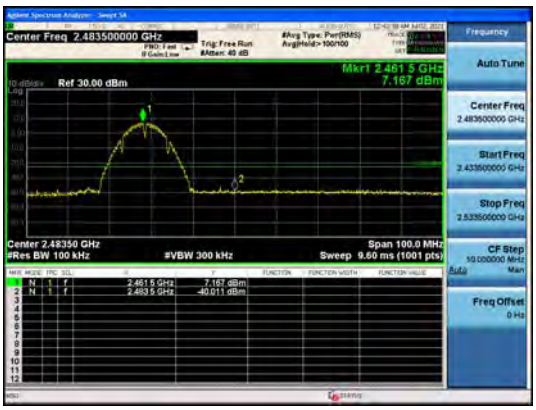
Test Results: PASS

RU mode

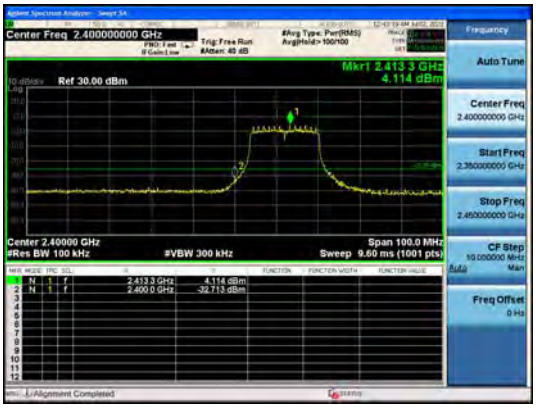
802.11b, Channel No.: 1



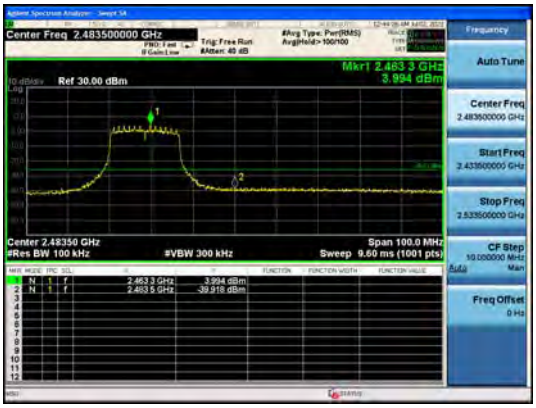
802.11b, Channel No.: 11



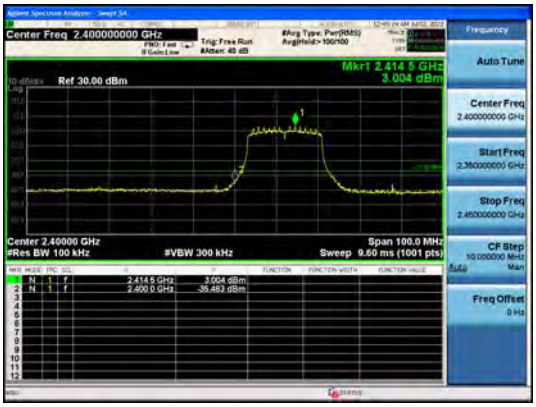
802.11g, Channel No.: 1



802.11g, Channel No.: 11

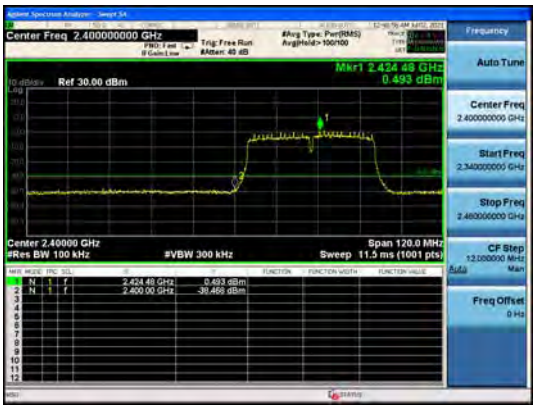


802.11n(HT20), Channel No.: 1



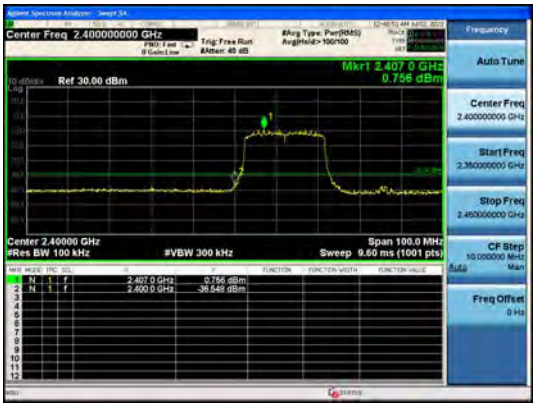
802.11n(HT20), Channel No.: 11

802.11n(HT40), Channel No.: 3



802.11n(HT40), Channel No.: 9

802.11ax(HE20), Channel No.: 1

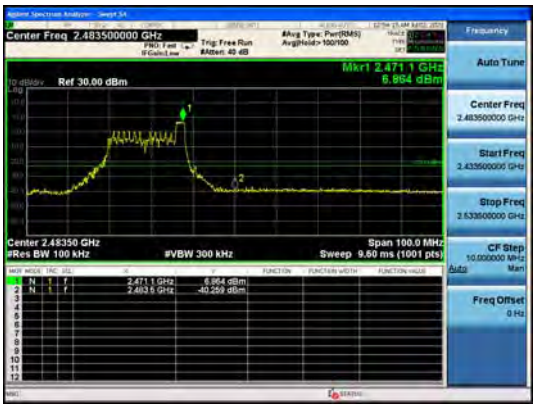
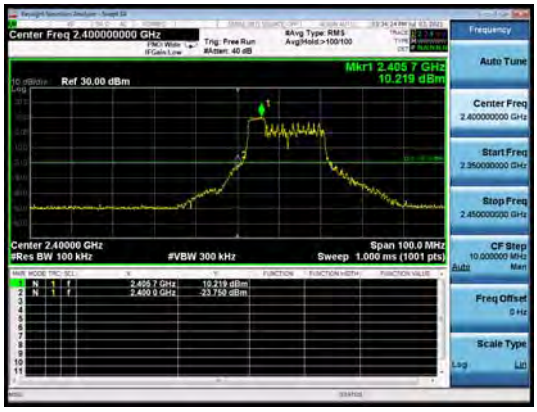


802.11 ax (HE20), Channel No.: 11

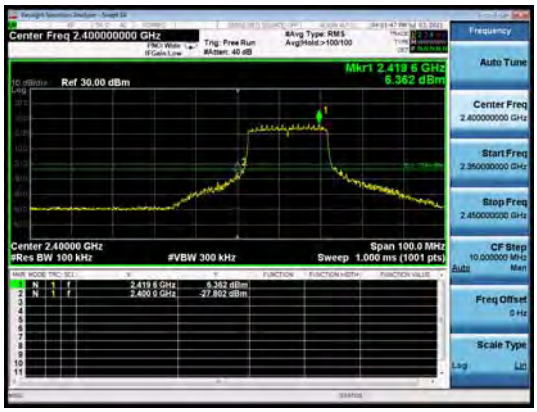
802.11 ax(HE40), Channel No.: 3

802.11 ax(HE40), Channel No.: 9

TB mode

802.11ax(HE20)-26Tone, Channel No.: 1	802.11 ax(HE20) -26Tone, Channel No.: 11
	
802.11ax(HE20) -52Tone, Channel No.: 1	802.11 ax(HE20) -52Tone, Channel No.: 11
	
802.11ax(HE20) -106Tone, Channel No.: 1	802.11 ax(HE20) -106Tone, Channel No.: 11
	

802.11ax(HE20) -242Tone, Channel No.: 1



802.11 ax(HE20) -242Tone, Channel No.: 11

802.11 ax(HE40) -484Tone, Channel No.: 3

802.11 ax(HE40) -484Tone, Channel No.: 9

5.4. Power Spectral Density

Ambient condition

Temperature	Relative humidity	Pressure
23°C ~25°C	45%~50%	101.5kPa

Method of Measurement

During the process of the testing, The EUT was connected to Spectrum Analyzer with a known loss. The EUT is max power transmission with proper modulation.

Method AVGPSD-1 was used for this test.

a) Set instrument center frequency to DTS channel center frequency

b) Set span to at least 1.5 times the OBW

c) Set RBW to:3kHz≤RBW≤100kHz

d) Set VBW≥[3x RBW]

e) Detector=power averaging(rms) or sample detector(when rms not available)

f) Ensure that the number of measurement points in the sweep 2[2 X span/RBWT]

g)Sweep time auto couple

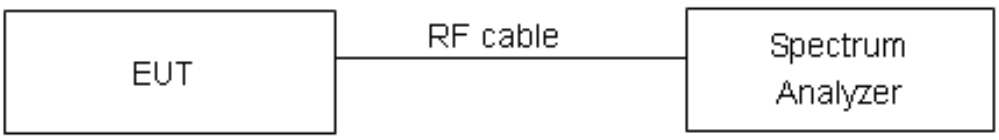
h) Employ trace averaging(rms) mode over a minimum of 100 traces

i) Use the peak marker function to determine the maximum amplitude level.

j) If the measured value exceeds requirement, then reduce RBW (but no less than 3 kHz) and repeat(note that this may require zooming in on the emission of interest and reducing the span to meet the minimum measurement point requirement as the RBW is reduced)

The conducted Power is measured at each antenna port. The measured results at the various antenna ports are then summed mathematically.

Test setup



Limits

Rule Part 15.247(e) specifies that" For digitally modulated systems, the power spectral density conducted from the intentional radiator to the antenna shall not be greater than 8 dBm in any 3 kHz band during any time interval of continuous transmission. ''

Limits	≤ 8 dBm / 3kHz

Measurement Uncertainty

The assessed measurement uncertainty to ensure 95% confidence level for the normal distribution is with the coverage factor k = 2, U= 0.75dB.

Test Results:

RU mode

SISO Antenna 1

Mode	Channel Number	Read Value (dBm / 3kHz)	Power Spectral Density (dBm / 3kHz)	Limit (dBm / 3kHz)	Conclusion
802.11b	1	-15.76	-15.76	8	PASS
	6	-15.48	-15.48	8	PASS
	11	-14.87	-14.87	8	PASS
802.11g	1	-18.59	-18.59	8	PASS
	6	-18.45	-18.45	8	PASS
	11	-18.29	-18.29	8	PASS
802.11n HT20	1	-20.48	-20.48	8	PASS
	6	-20.26	-20.26	8	PASS
	11	-20.07	-20.07	8	PASS
802.11n HT40	3	-22.30	-22.30	8	PASS
	6	-23.00	-23.00	8	PASS
	9	-22.93	-22.93	8	PASS
802.11ax HE20	1	-23.58	-23.58	8	PASS
	6	-23.37	-23.37	8	PASS
	11	-23.82	-23.82	8	PASS
802.11ax HE40	3	-25.84	-25.84	8	PASS
	6	-26.80	-26.80	8	PASS
	9	-26.98	-26.98	8	PASS
Note: Power Spectral Density =Read Value+Duty cycle correction factor					

SISO Antenna 2

Mode	Channel Number	Read Value (dBm / 3kHz)	Power Spectral Density (dBm / 3kHz)	Limit (dBm / 3kHz)	Conclusion
802.11b	1	-14.76	-14.69	8	PASS
	6	-14.50	-14.43	8	PASS
	11	-14.78	-14.71	8	PASS
802.11g	1	-18.05	-18.05	8	PASS
	6	-18.51	-18.51	8	PASS
	11	-18.99	-18.99	8	PASS
802.11n HT20	1	-19.87	-19.87	8	PASS
	6	-19.75	-19.75	8	PASS
	11	-19.94	-19.94	8	PASS
802.11n HT40	3	-23.15	-23.15	8	PASS
	6	-23.04	-23.04	8	PASS
	9	-23.07	-23.07	8	PASS
802.11ax HE20	1	-23.29	-23.29	8	PASS
	6	-24.11	-24.11	8	PASS
	11	-23.12	-23.12	8	PASS
802.11ax HE40	3	-27.09	-27.09	8	PASS
	6	-26.77	-26.77	8	PASS
	9	-26.65	-26.65	8	PASS
Note: Power Spectral Density =Read Value+Duty cycle correction factor					

MIMO

Mode	Channel Number	Power Spectral Density				Total PSD (dBm / 3kHz)	Limit (dBm / 3kHz)	Conclusion
		Antenna 1		Antenna 2				
		Read Value (dBm / 3kHz)	Power Spectral Density (dBm / 3kHz)	Read Value (dBm / 3kHz)	Power Spectral Density (dBm / 3kHz)			
802.11n HT20	1	-20.31	-20.31	-20.22	-20.22	-17.25	8.00	PASS
	6	-20.25	-20.25	-20.75	-20.75	-17.48	8.00	PASS
	11	-20.11	-20.11	-20.47	-20.47	-17.27	8.00	PASS
802.11n HT40	3	-22.28	-22.28	-23.58	-23.58	-19.87	8.00	PASS
	6	-23.14	-23.14	-23.76	-23.76	-20.43	8.00	PASS
	9	-22.73	-22.73	-23.07	-23.07	-19.88	8.00	PASS
802.11ax HE20	1	-23.43	-23.43	-24.00	-24.00	-20.70	8.00	PASS
	6	-23.93	-23.93	-24.85	-24.85	-21.36	8.00	PASS
	11	-24.37	-24.37	-23.84	-23.84	-21.08	8.00	PASS
802.11ax HE40	3	-26.22	-26.22	-26.87	-26.87	-23.52	8.00	PASS
	6	-26.54	-26.54	-27.70	-27.70	-24.07	8.00	PASS
	9	-26.67	-26.67	-26.62	-26.62	-23.63	8.00	PASS

Note: 1.Power Spectral Density =Read Value+Duty cycle correction factor

2. For Total PSD, according to KDB 662911 D01 Multiple Transmitter Output v02r01 2)a),the power spectral density=$10\log(10^{(\text{PSD antenna1 in dBm/10})}+10^{(\text{PSD antenna2 in dBm/10})}$

3. The manufacturer declared the transmitter output signals is CDD mode. And N_{ss}=1. According to KDB 662911 D01 Multiple Transmitter Output v02r01 2)f)(i): If all antennas have the same gain, Directional gain = G_{ANT} + Array Gain. For PSD measurements on all devices, Array Gain=10log(Nant/Nss)dB, so directional gain=GANT+Array Gain=1.8+10log(3/1)=4.81 <6dBi.

So the limit is 8+6-MAX(6, directional gain)dBm=8 dBm

TB mode

SISO Antenna 1

Mode	RU Size	Channel Number	Read Value (dBm / 3kHz)	Power Spectral Density (dBm / 3kHz)	Limit (dBm / 3kHz)	Conclusion
802.11ax HE20 MU Mode	26-Tones	1	-14.51	-14.51	8	PASS
	26-Tones	6	-14.73	-14.73	8	PASS
	26-Tones	11	-15.47	-15.47	8	PASS
	52-Tones	1	-17.08	-17.08	8	PASS
	52-Tones	6	-16.88	-16.88	8	PASS
	52-Tones	11	-17.51	-17.51	8	PASS
	106-Tones	1	-20.20	-20.20	8	PASS
	106-Tones	6	-19.68	-19.68	8	PASS
	106-Tones	11	-20.24	-20.24	8	PASS
802.11ax HE20 SU Mode	242-Tones	1	-23.48	-23.48	8	PASS
	242-Tones	6	-22.53	-22.53	8	PASS
	242-Tones	11	-21.97	-21.97	8	PASS
802.11ax HE40 SU Mode	484-Tones	3	-24.74	-24.74	8	PASS
	484-Tones	6	-25.28	-25.28	8	PASS
	484-Tones	9	-24.74	-24.74	8	PASS
Note: Power Spectral Density =Read Value+Duty cycle correction factor						

SISO Antenna 2

Mode	RU Size	Channel Number	Read Value (dBm / 3kHz)	Power Spectral Density (dBm / 3kHz)	Limit (dBm / 3kHz)	Conclusion
802.11ax HE20 MU Mode	26-Tones	1	-15.92	-15.92	8	PASS
	26-Tones	6	-15.21	-15.21	8	PASS
	26-Tones	11	-15.40	-15.40	8	PASS
	52-Tones	1	-17.78	-17.78	8	PASS
	52-Tones	6	-17.25	-17.25	8	PASS
	52-Tones	11	-17.60	-17.60	8	PASS
	106-Tones	1	-20.82	-20.82	8	PASS
	106-Tones	6	-20.74	-20.74	8	PASS
	106-Tones	11	-20.18	-20.18	8	PASS
802.11ax HE20 SU Mode	242-Tones	1	-23.20	-23.20	8	PASS
	242-Tones	6	-23.21	-23.21	8	PASS
	242-Tones	11	-22.57	-22.57	8	PASS
802.11ax HE40 SU Mode	484-Tones	3	-25.41	-25.41	8	PASS
	484-Tones	6	-25.25	-25.25	8	PASS
	484-Tones	9	-25.01	-25.01	8	PASS
Note: Power Spectral Density =Read Value+Duty cycle correction factor						

MIMO

Mode	RU Size	Channel Number	MIMO Antenna 1		MIMO Antenna 2		Total PSD (dBm / 3kHz)	Limit (dBm / 3kHz)	Conclusion
			Read Value (dBm / 3kHz)	Power Spectral Density (dBm / 3kHz)	Read Value (dBm / 3kHz)	Power Spectral Density (dBm / 3kHz)			
802.11ax HE20 MU Mode	26-Tones	1	-15.80	-15.80	-14.66	-14.66	-12.18	8.00	PASS
	26-Tones	6	-14.92	-14.92	-15.40	-15.40	-12.14	8.00	PASS
	26-Tones	11	-15.35	-15.35	-15.87	-15.87	-12.59	8.00	PASS
	52-Tones	1	-18.47	-18.47	-17.14	-17.14	-14.74	8.00	PASS
	52-Tones	6	-17.67	-17.67	-17.42	-17.42	-14.53	8.00	PASS
	52-Tones	11	-18.34	-18.34	-18.55	-18.55	-15.43	8.00	PASS
	106-Tones	1	-20.85	-20.85	-20.63	-20.63	-17.73	8.00	PASS
	106-Tones	6	-20.74	-20.74	-20.08	-20.08	-17.38	8.00	PASS
	106-Tones	11	-20.73	-20.73	-20.63	-20.63	-17.67	8.00	PASS
802.11ax HE20 SU Mode	242-Tones	1	-23.41	-23.41	-23.26	-23.26	-20.32	8.00	PASS
	242-Tones	6	-23.28	-23.28	-22.51	-22.51	-19.87	8.00	PASS
	242-Tones	11	-22.87	-22.87	-22.65	-22.65	-19.75	8.00	PASS
802.11ax HE40 SU Mode	484-Tones	3	-25.02	-25.02	-24.23	-24.23	-21.59	8.00	PASS
	484-Tones	6	-25.30	-25.30	-25.00	-25.00	-22.14	8.00	PASS
	484-Tones	9	-25.35	-25.35	-25.13	-25.13	-22.23	8.00	PASS

Note: 1.Power Spectral Density =Read Value+Duty cycle correction factor

2. For Total PSD, according to KDB 662911 D01 Multiple Transmitter Output v02r01 2)a),the power spectral density=$10\log(10^{(\text{PSD antenna1 in dBm/10})}+10^{(\text{PSD antenna2 in dBm/10})}$

3. The manufacturer declared the transmitter output signals is CDD mode. And N_{ss}=1. According to KDB 662911 D01 Multiple Transmitter Output v02r01 2)f)(i): If all antennas have the same gain, Directional gain = G_{ANT} + Array Gain. For PSD measurements on all devices, Array Gain=10log(Nant/Nss)dB, so directional gain=GANT+Array Gain=1.8+10log(3/1)=4.81 <6dBi.

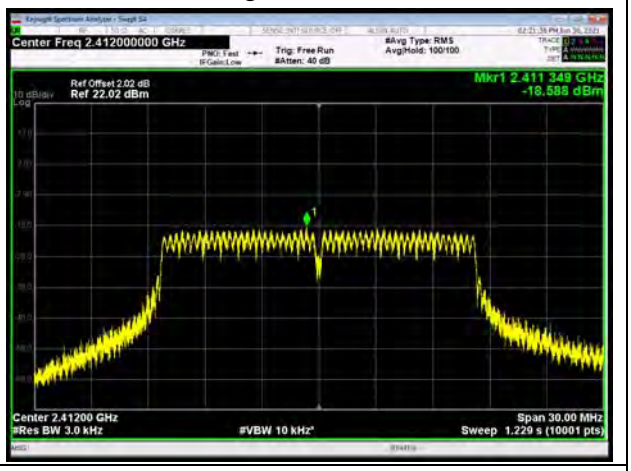
So the limit is 8+6-MAX(6, directional gain)dBm=8 dBm

RU mode

SISO Antenna 1

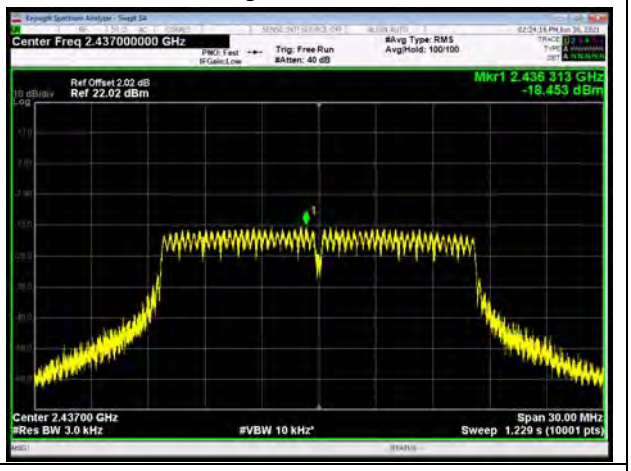
802.11b, Channel No.: 1

802.11g, Channel No.: 1



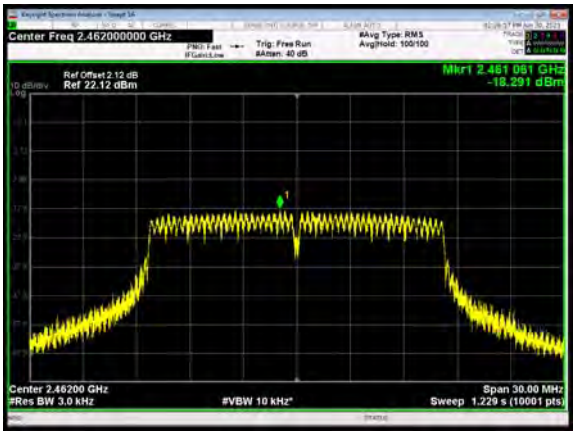
802.11b, Channel No.: 6

802.11g, Channel No.: 6

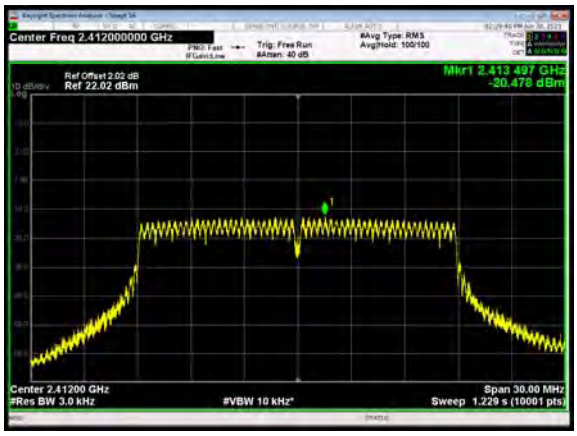


802.11b, Channel No.: 11

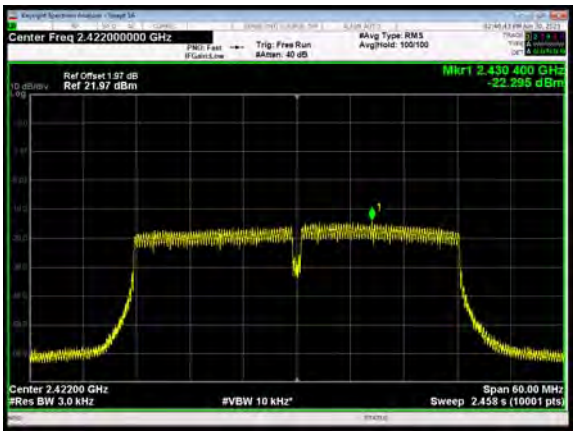
802.11g, Channel No.: 11



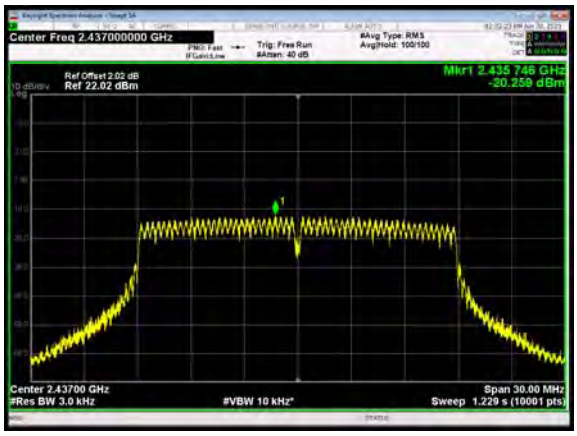
802.11n(HT20), Channel No. 1



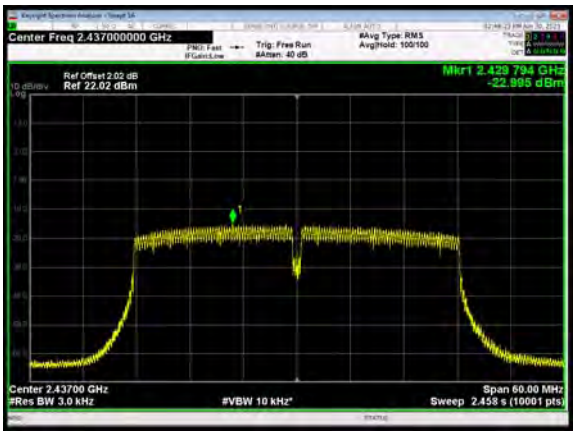
802.11n(HT40), Channel No. 3



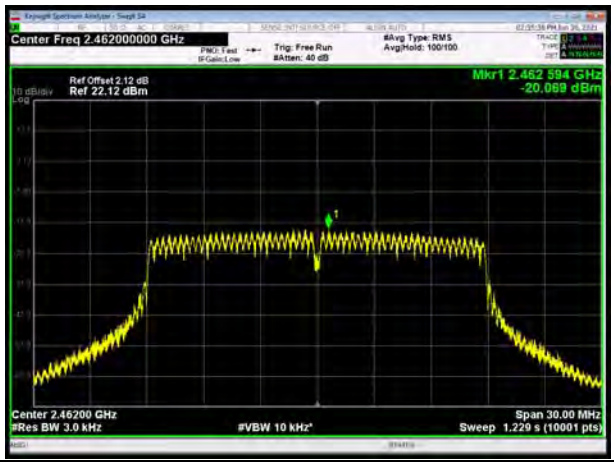
802.11n(HT20), Channel No. 6



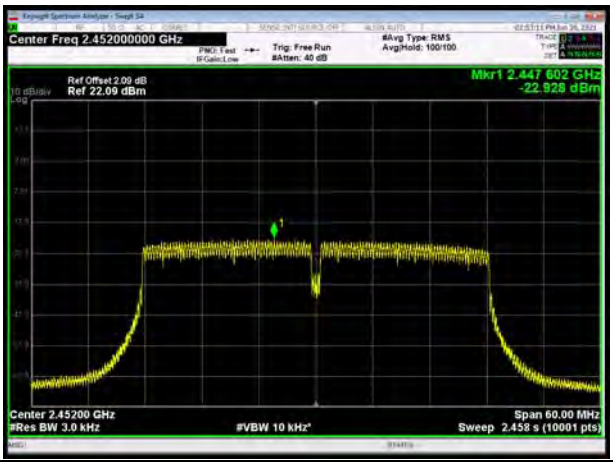
802.11n(HT40), Channel No. 6



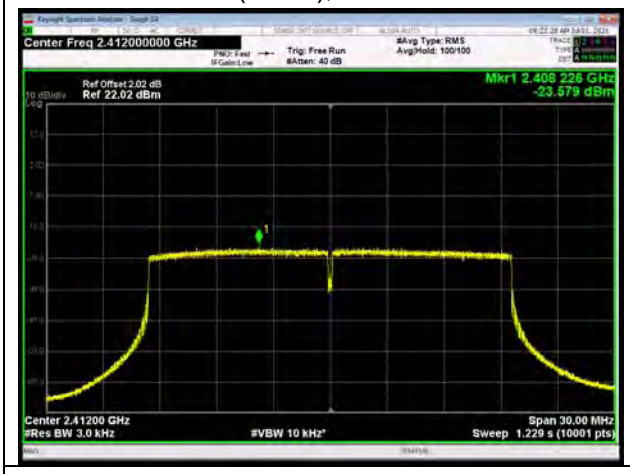
802.11n(HT20), Channel No. 11



802.11n(HT40), Channel No. 9

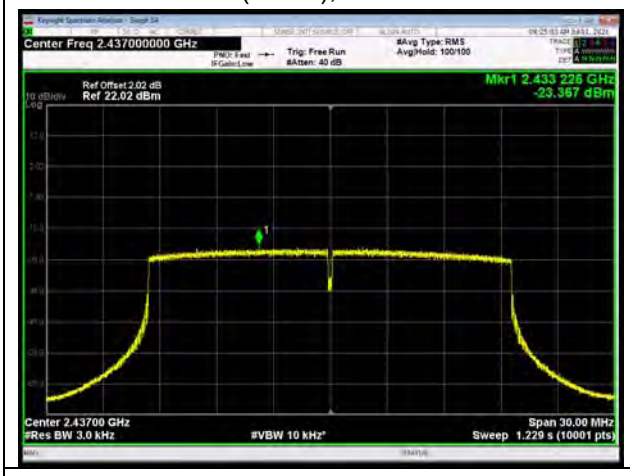


802.11ax(HE20), Channel No. 1

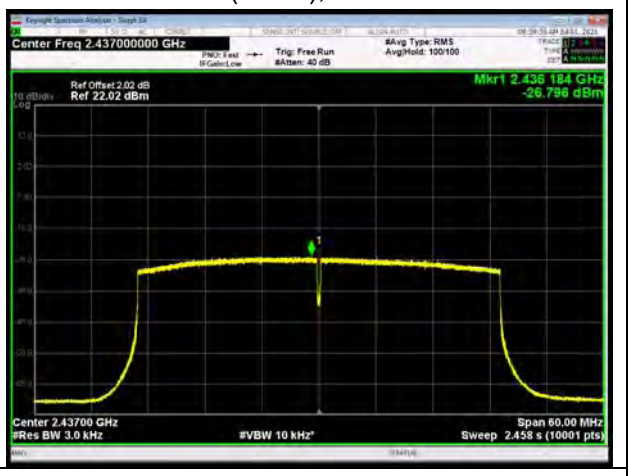


802.11ax(HE40), Channel No. 3

802.11 ax(HE20), Channel No. 6



802.11 ax(HE40), Channel No. 6



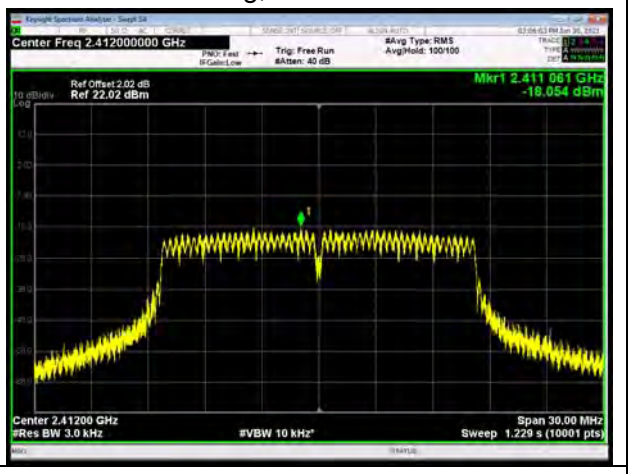
802.11 ax(HE20), Channel No. 11

802.11 ax(HE40), Channel No. 9

SISO Antenna 2

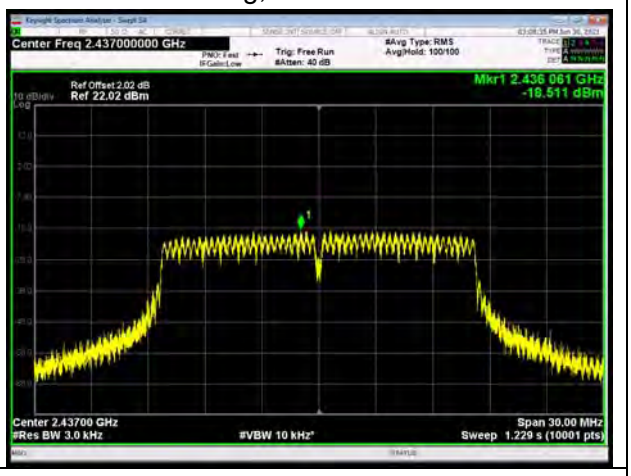
802.11b, Channel No.: 1

802.11g, Channel No.: 1



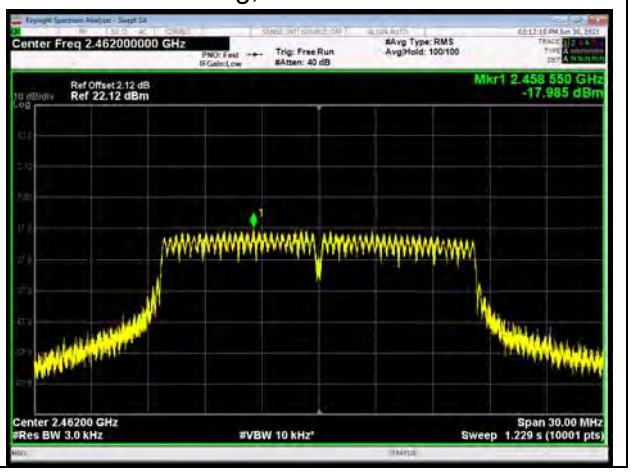
802.11b, Channel No.: 6

802.11g, Channel No.: 6

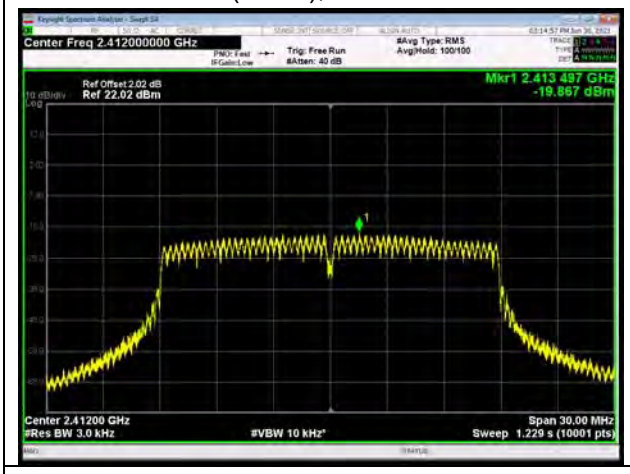


802.11b, Channel No.: 11

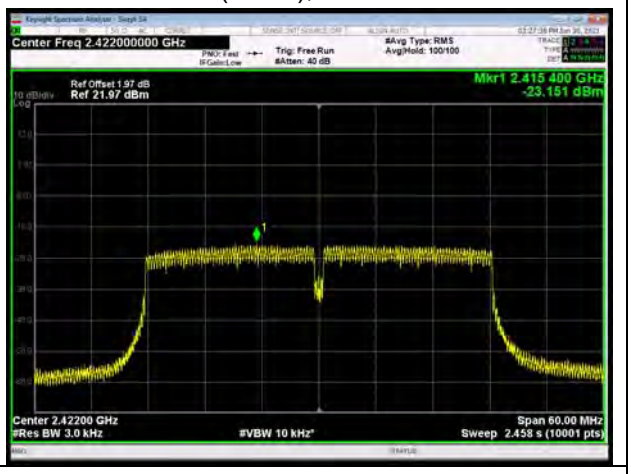
802.11g, Channel No.: 11



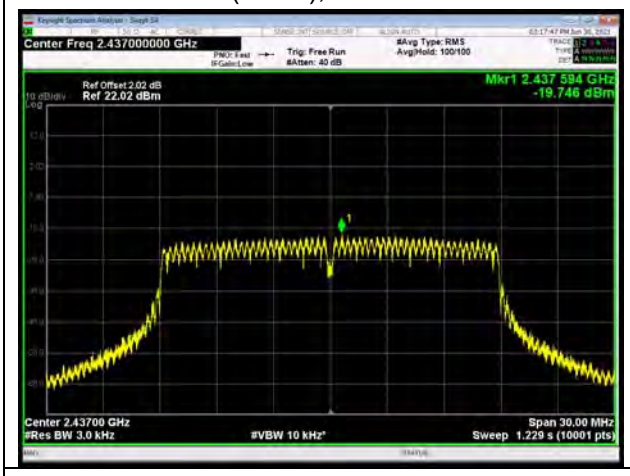
802.11n(HT20), Channel No. 1



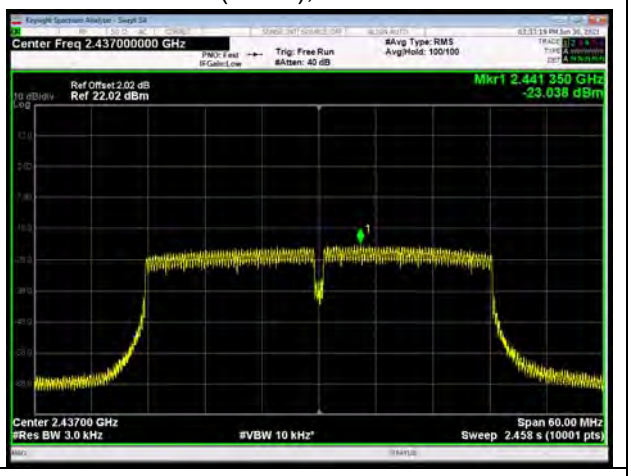
802.11n(HT40), Channel No. 3



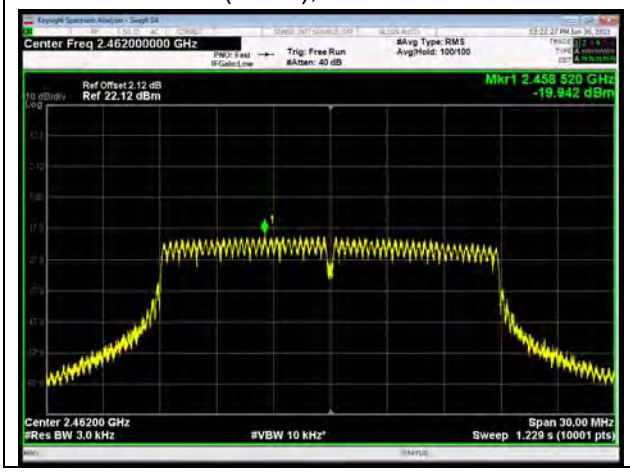
802.11n(HT20), Channel No. 6



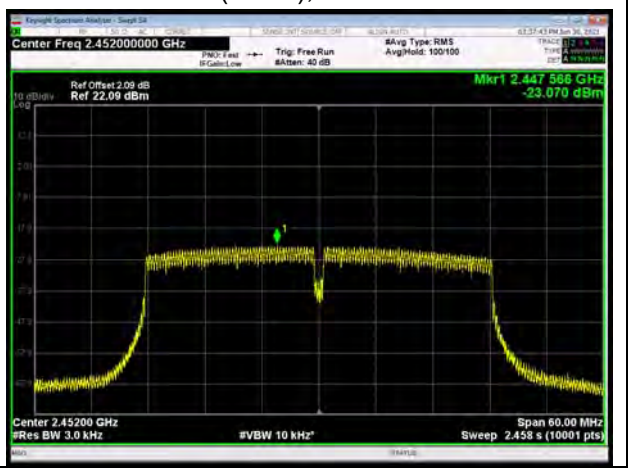
802.11n(HT40), Channel No. 6



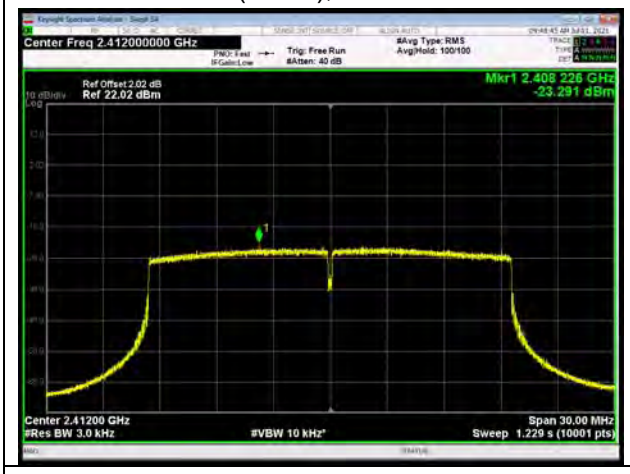
802.11n(HT20), Channel No. 11



802.11n(HT40), Channel No. 9

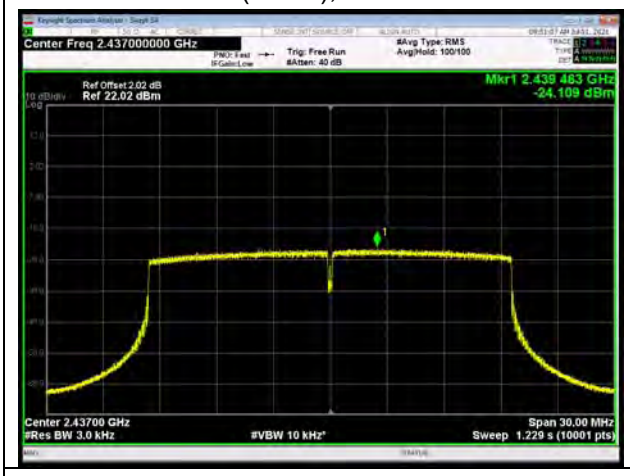


802.11ax(HE20), Channel No. 1

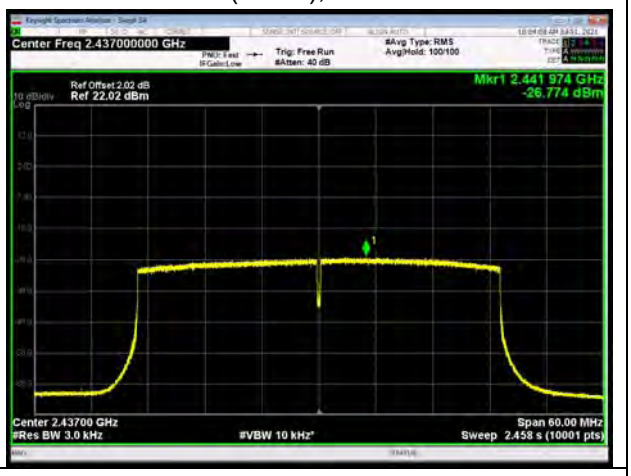


802.11ax(HE40), Channel No. 3

802.11 ax(HE20), Channel No. 6

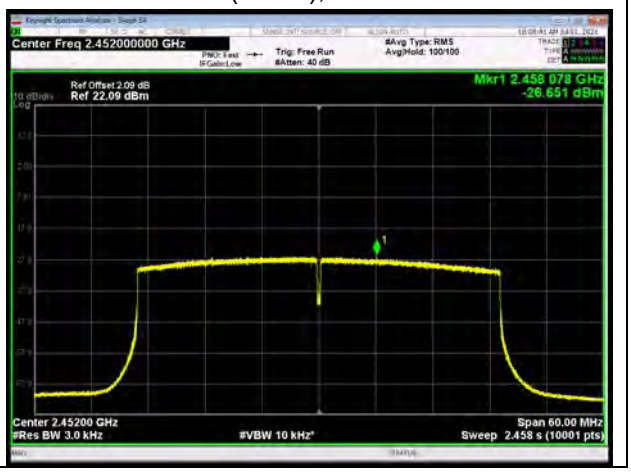


802.11 ax(HE40), Channel No. 6



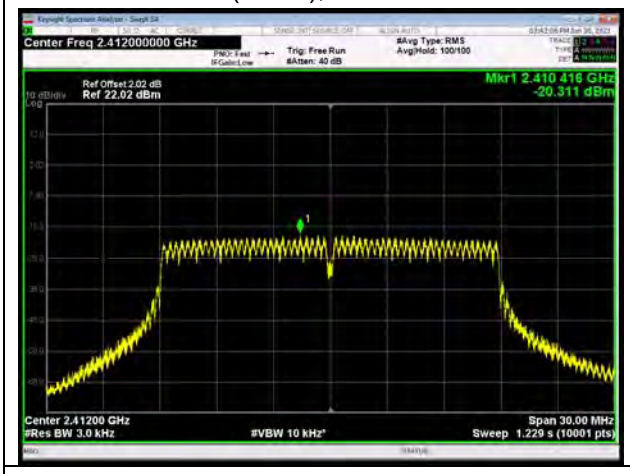
802.11 ax(HE20), Channel No. 11

802.11 ax(HE40), Channel No. 9

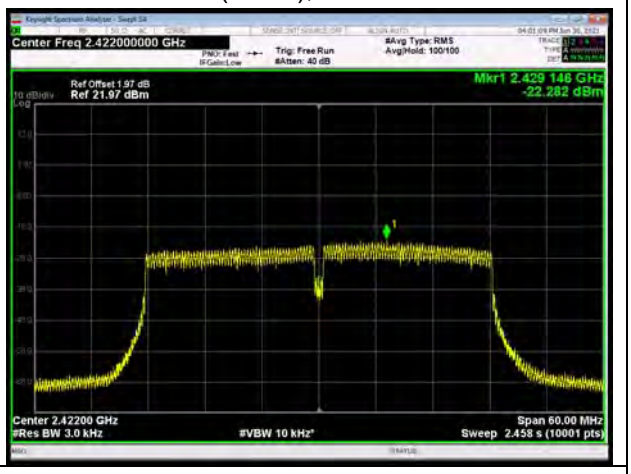


MIMO Antenna 1

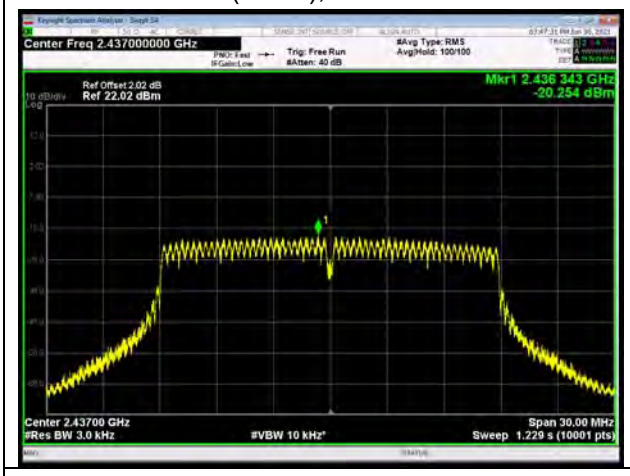
802.11n(HT20), Channel No. 1



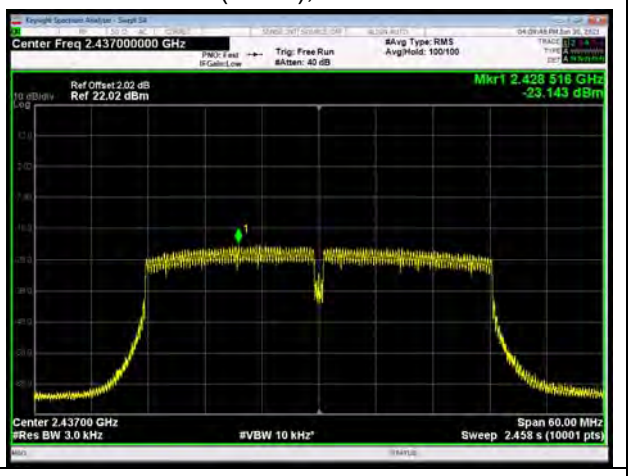
802.11n(HT40), Channel No. 3



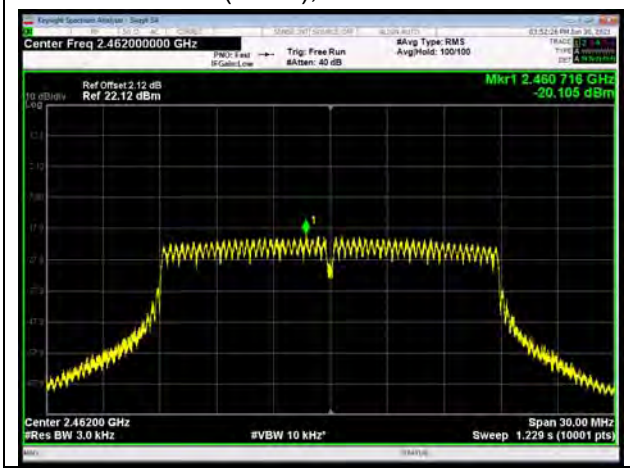
802.11n(HT20), Channel No. 6



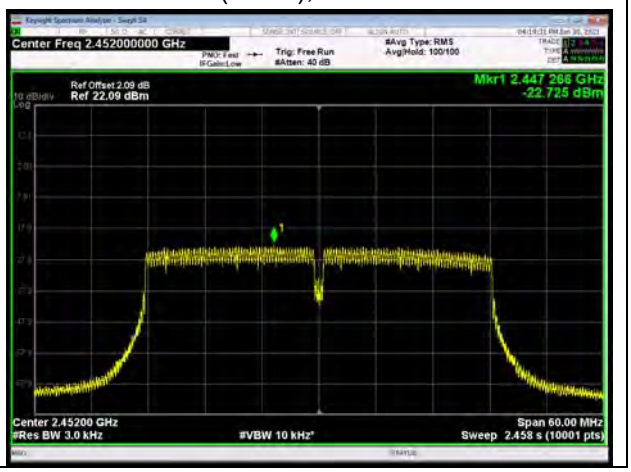
802.11n(HT40), Channel No. 6



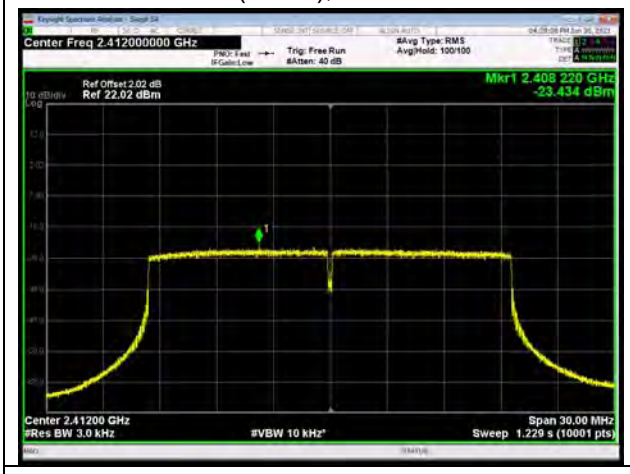
802.11n(HT20), Channel No. 11



802.11n(HT40), Channel No. 9

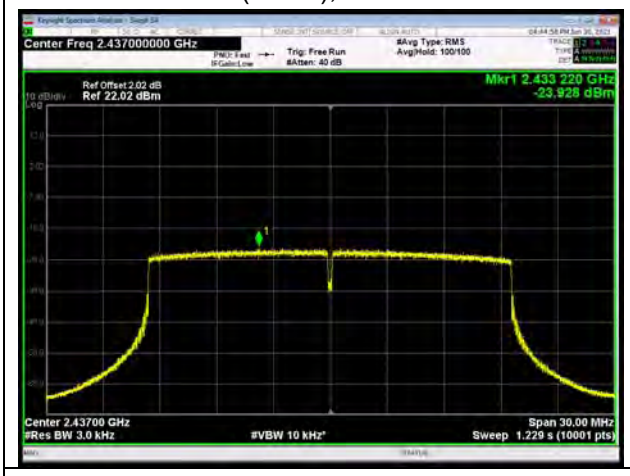


802.11ax(HE20), Channel No. 1

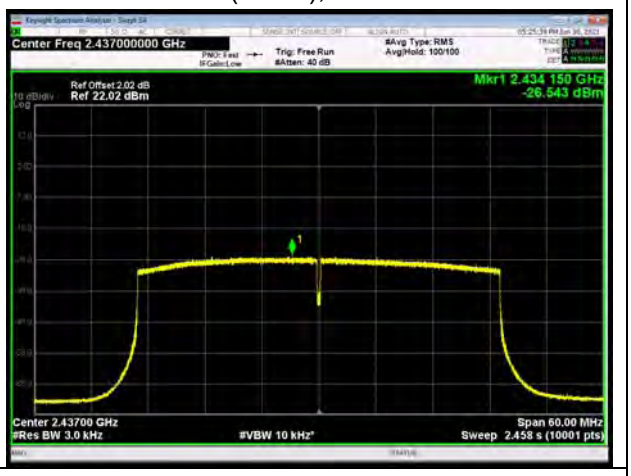


802.11ax(HE40), Channel No. 3

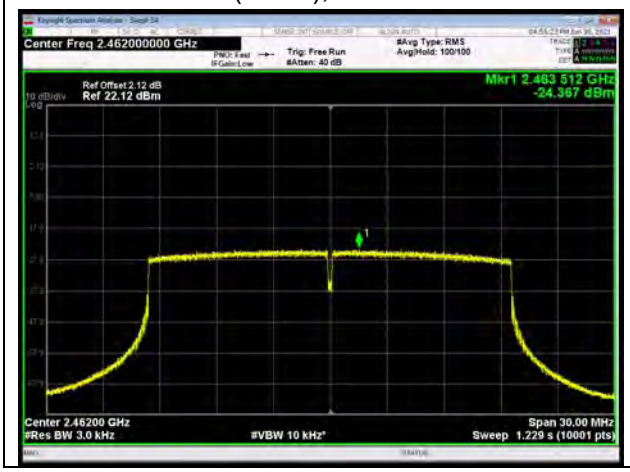
802.11 ax(HE20), Channel No. 6



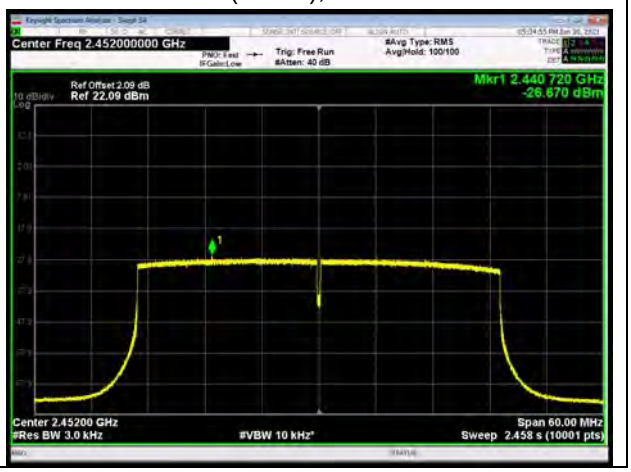
802.11 ax(HE40), Channel No. 6



802.11 ax(HE20), Channel No. 11

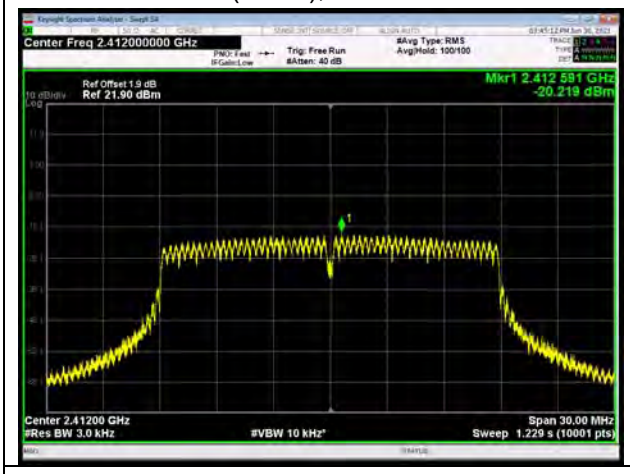


802.11 ax(HE40), Channel No. 9

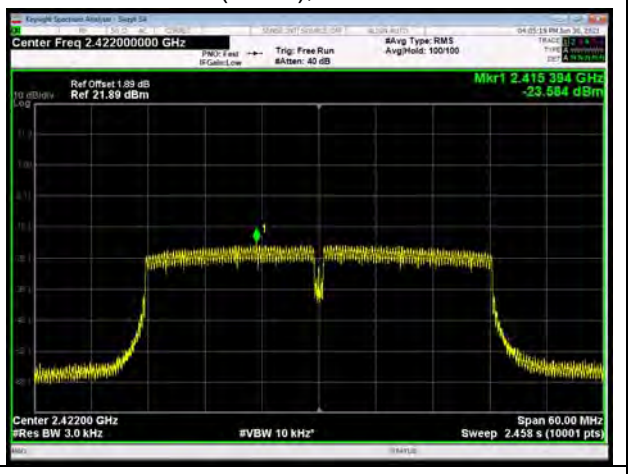


MIMO Antenna 2

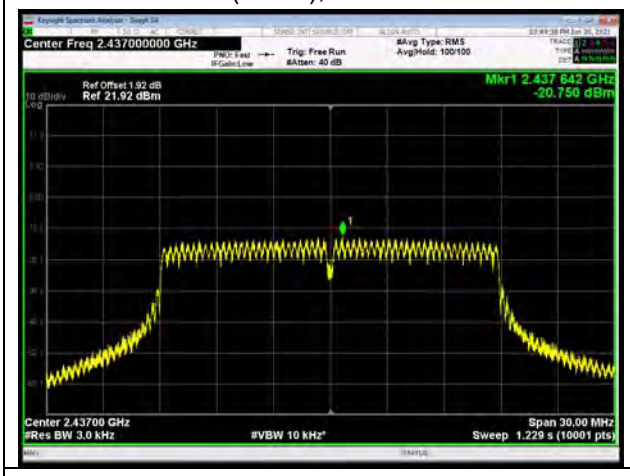
802.11n(HT20), Channel No. 1



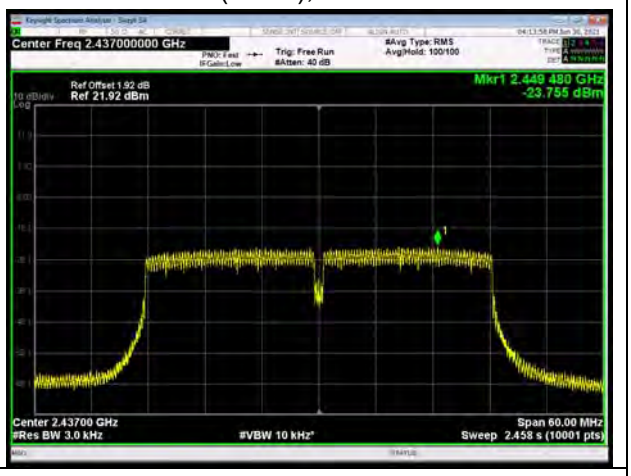
802.11n(HT40), Channel No. 3



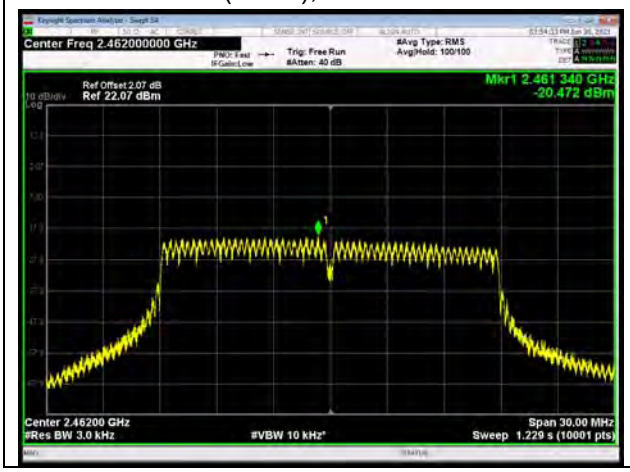
802.11n(HT20), Channel No. 6



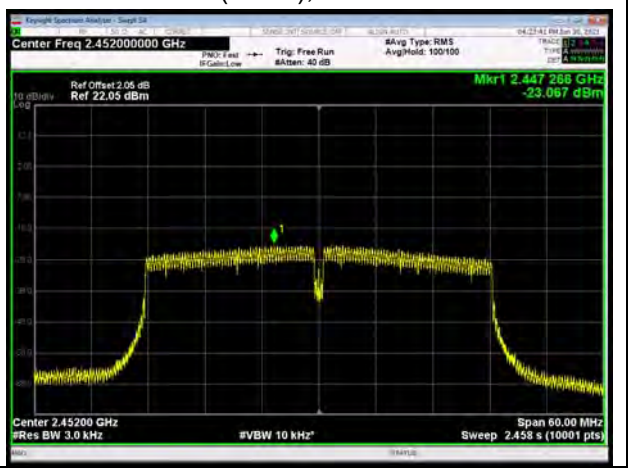
802.11n(HT40), Channel No. 6



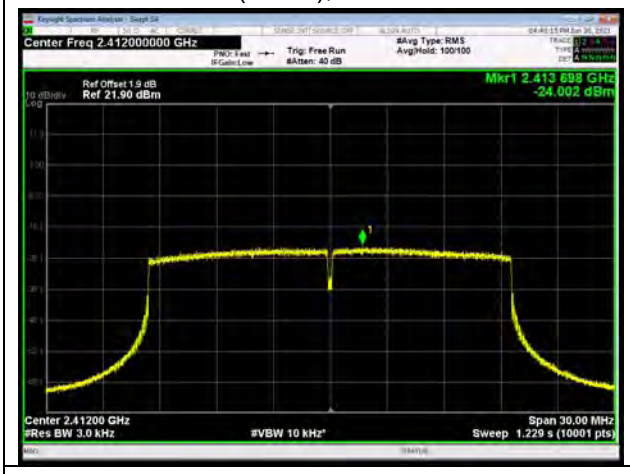
802.11n(HT20), Channel No. 11



802.11n(HT40), Channel No. 9

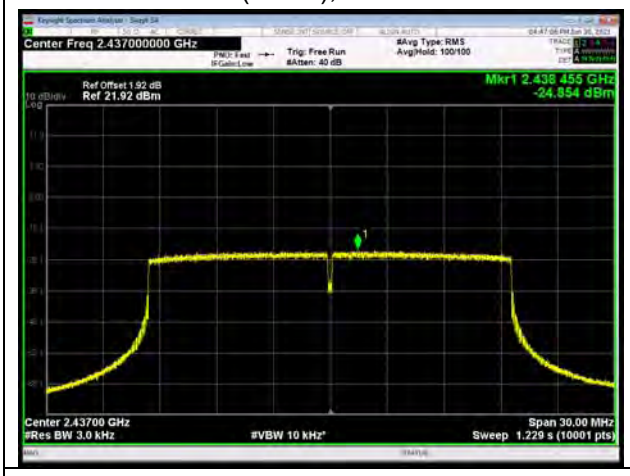


802.11ax(HE20), Channel No. 1



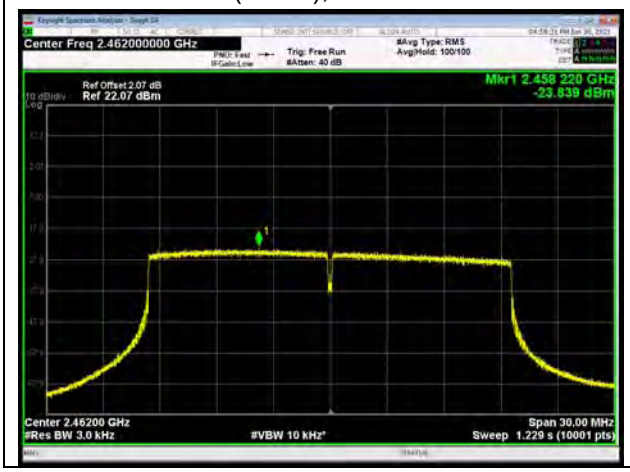
802.11ax(HE40), Channel No. 3

802.11 ax(HE20), Channel No. 6

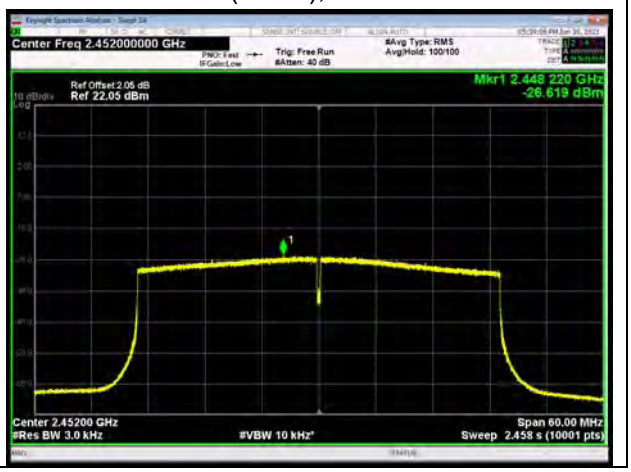


802.11 ax(HE40), Channel No. 6

802.11 ax(HE20), Channel No. 11



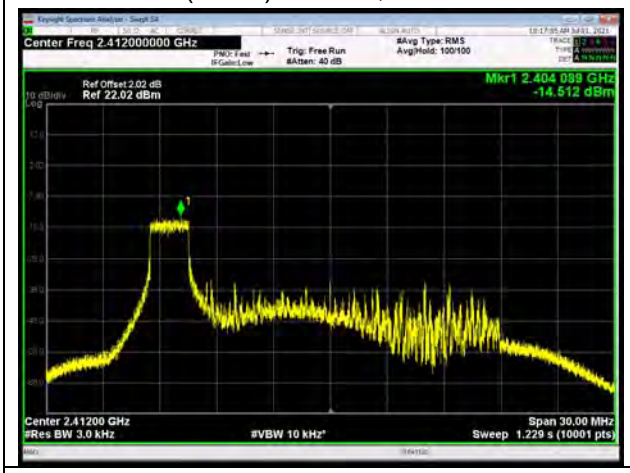
802.11 ax(HE40), Channel No. 9



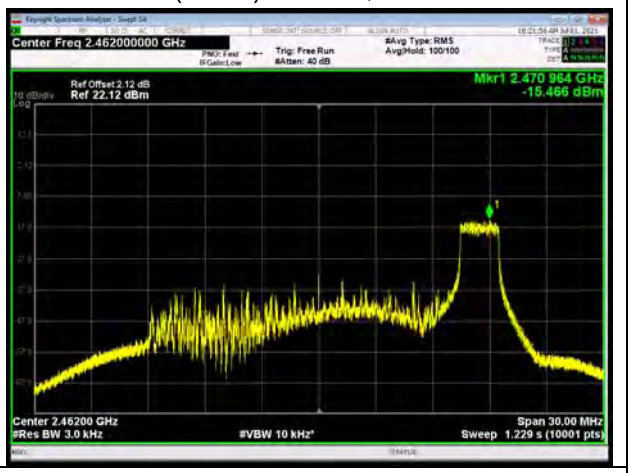
TB mode

SISO Antenna 1

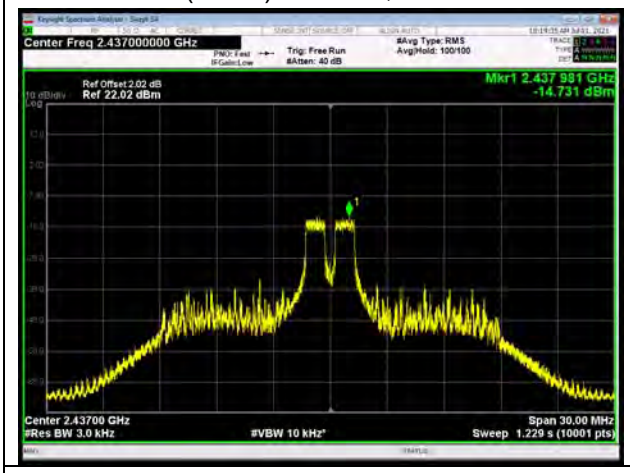
802.11ax(HE20)-26Tone, Channel No. 1



802.11ax(HE20)-52Tone, Channel No. 1

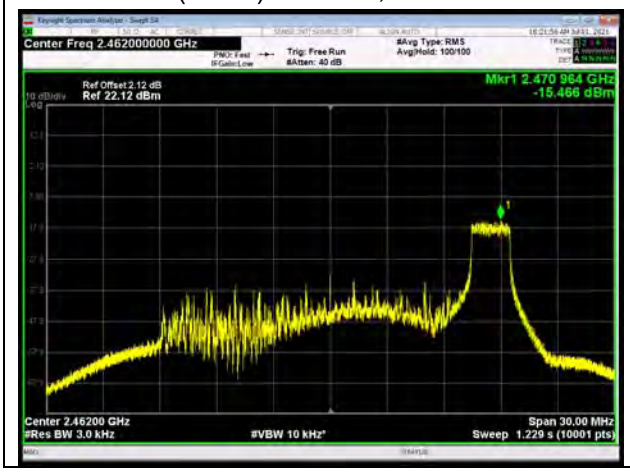


802.11 ax(HE20) -26Tone, Channel No. 6

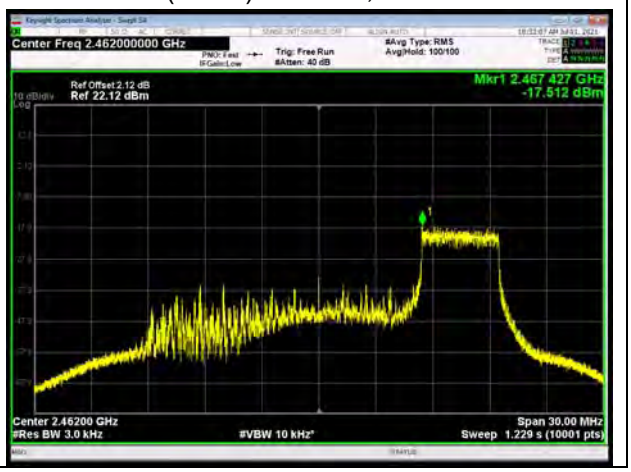


802.11 ax(HE20) -52Tone, Channel No. 6

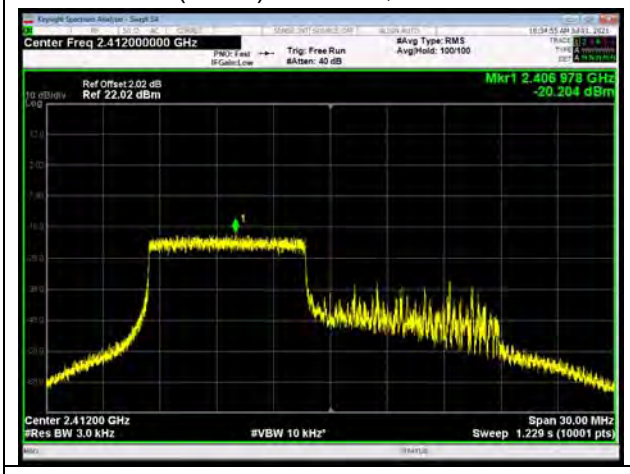
802.11 ax(HE20) -26Tone, Channel No. 11



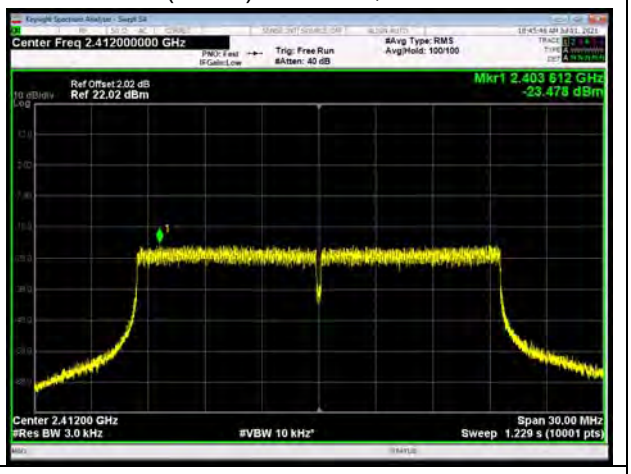
802.11 ax(HE20) -52Tone, Channel No. 11



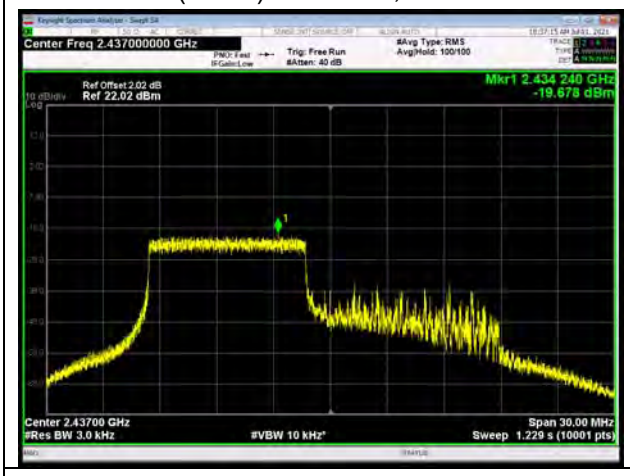
802.11ax(HE20)-106Tone, Channel No. 1



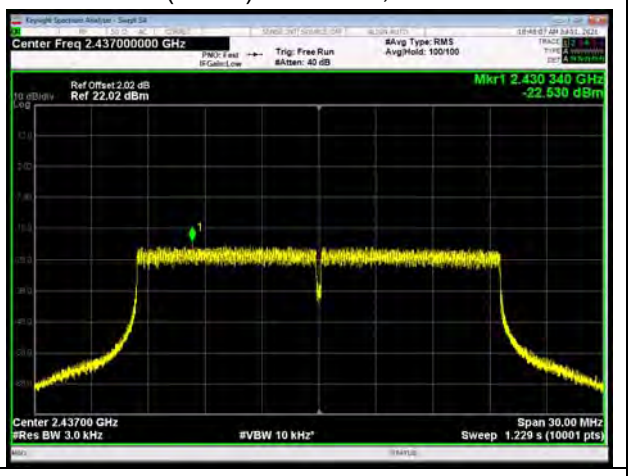
802.11ax(HE20)-242Tone, Channel No. 1



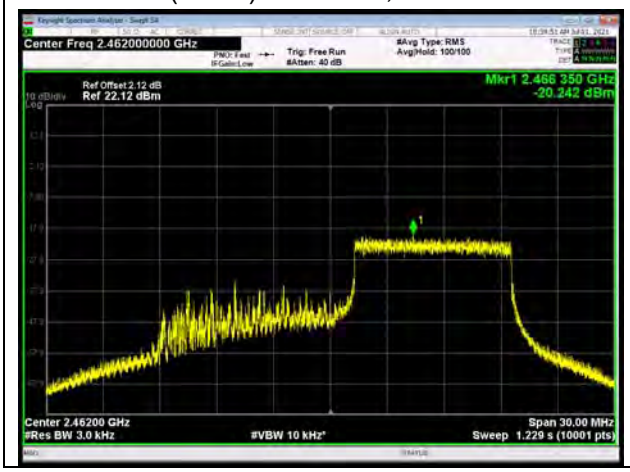
802.11 ax(HE20) -106Tone, Channel No. 6



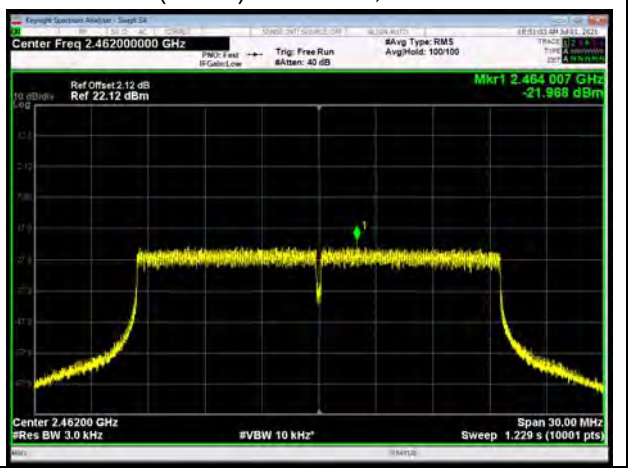
802.11 ax(HE20) -242Tone, Channel No. 6



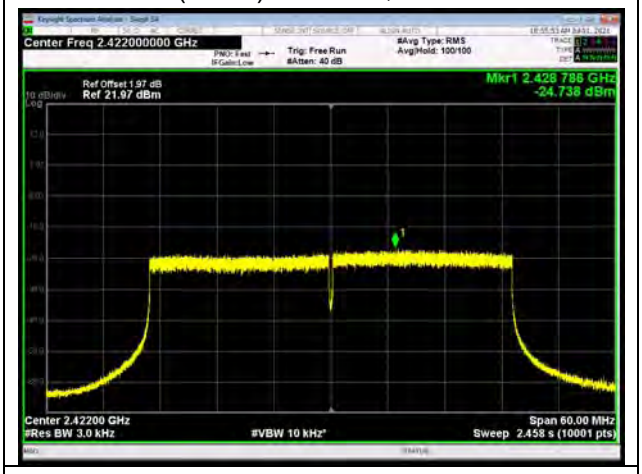
802.11 ax(HE20) -106Tone, Channel No. 11



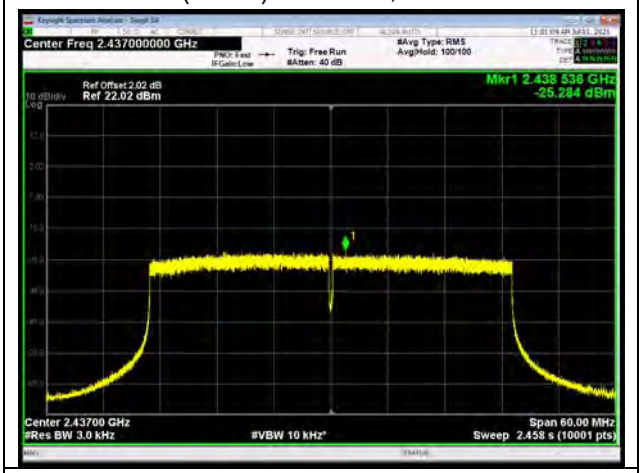
802.11 ax(HE20) -242Tone, Channel No. 11



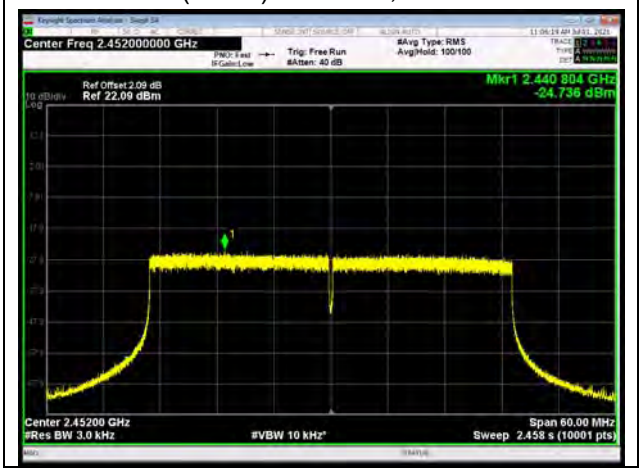
802.11ax(HE40)-484Tone, Channel No. 3



802.11 ax(HE40)-484Tone, Channel No. 6

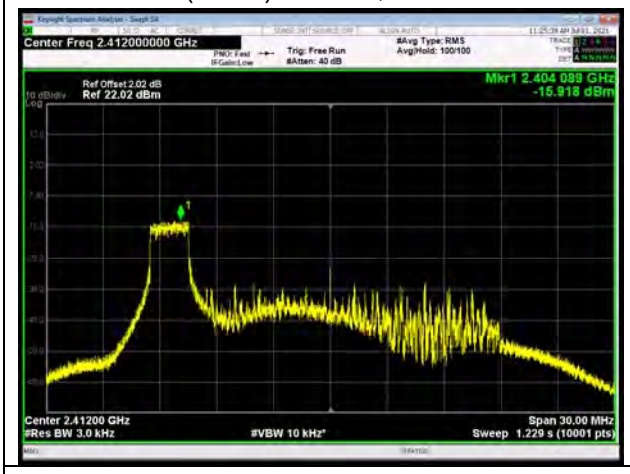


802.11 ax(HE40)-484Tone, Channel No. 9

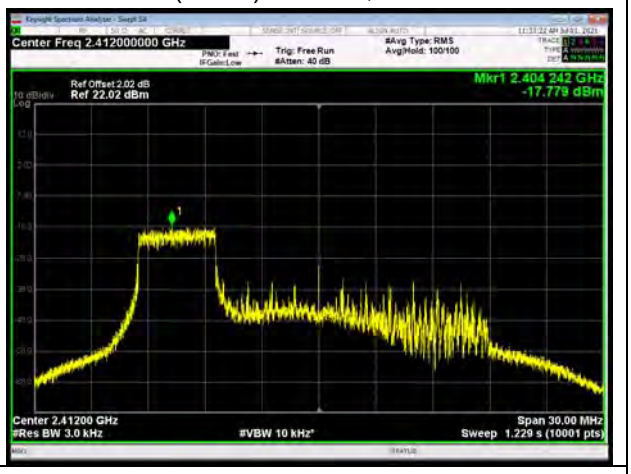


SISO Antenna 2

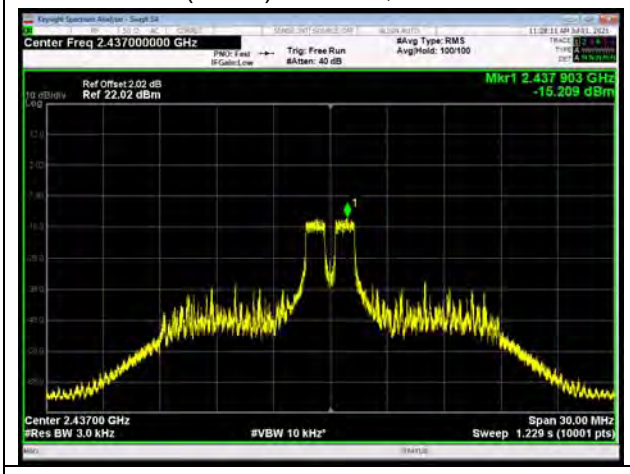
802.11ax(HE20)-26Tone, Channel No. 1



802.11ax(HE20)-52Tone, Channel No. 1

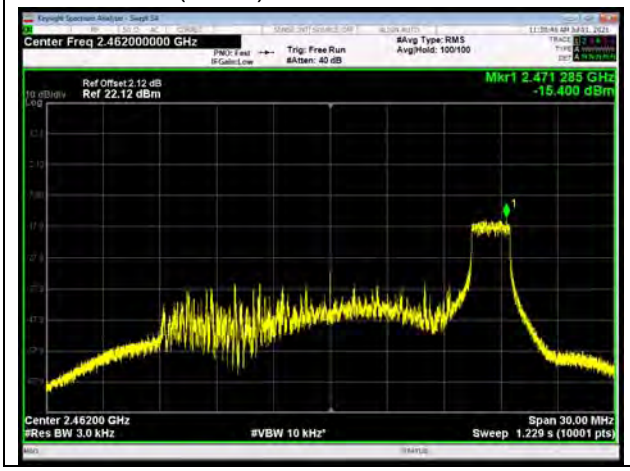


802.11 ax(HE20) -26Tone, Channel No. 6

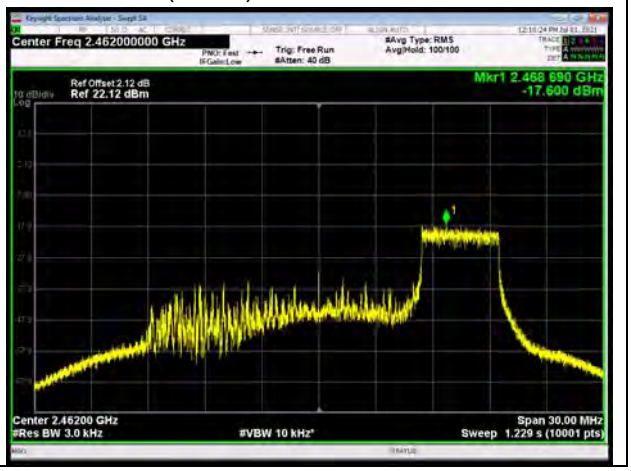


802.11 ax(HE20) -52Tone, Channel No. 6

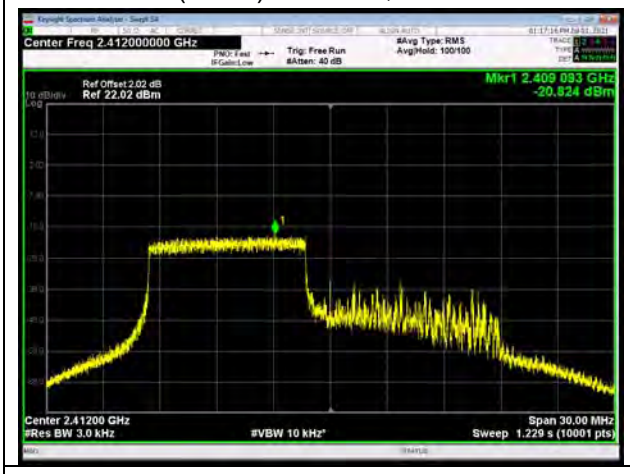
802.11 ax(HE20) -26Tone, Channel No. 11



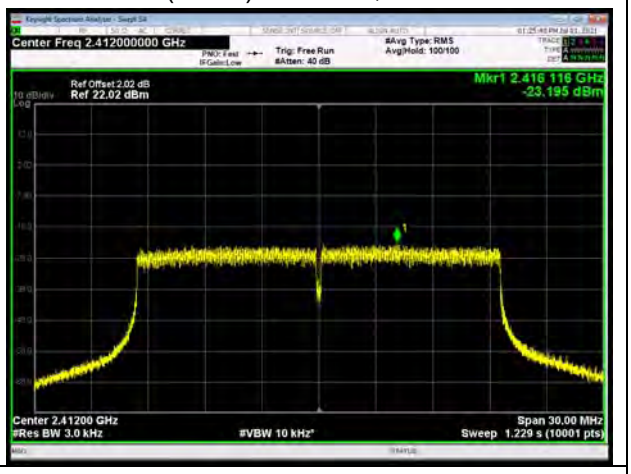
802.11 ax(HE20) -52Tone, Channel No. 11



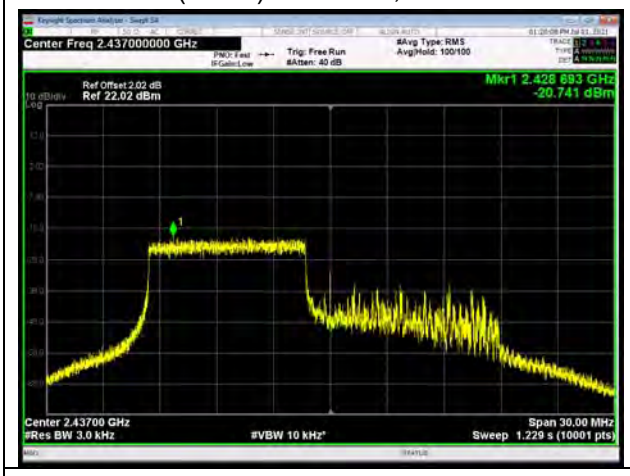
802.11ax(HE20)-106Tone, Channel No. 1



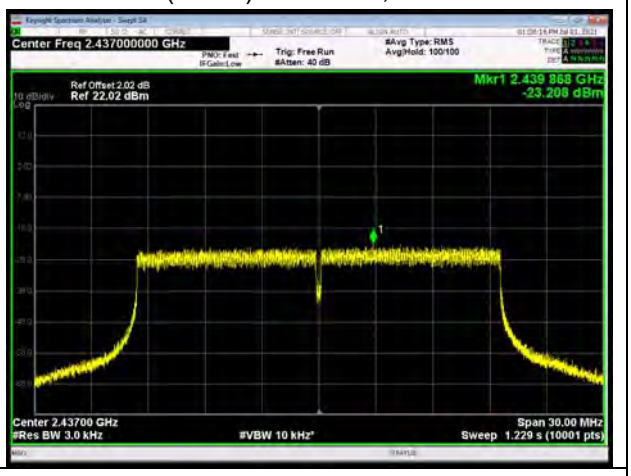
802.11ax(HE20)-242Tone, Channel No. 1



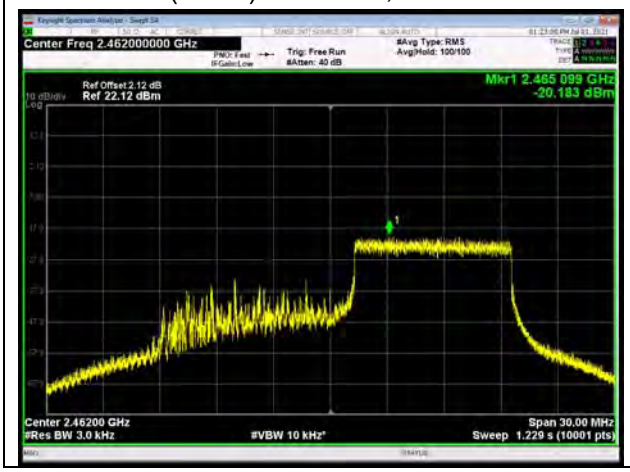
802.11 ax(HE20) -106Tone, Channel No. 6



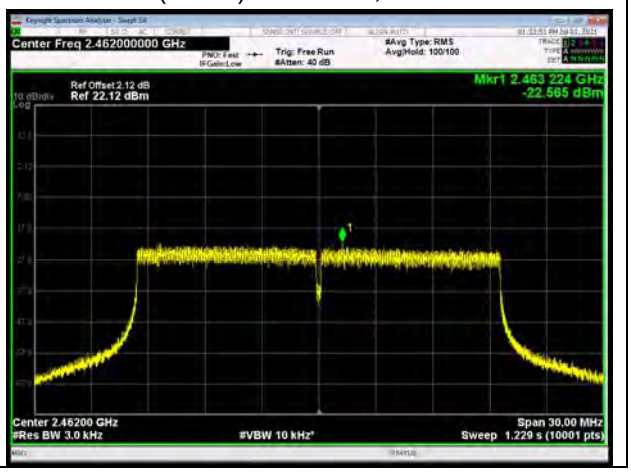
802.11 ax(HE20) -242Tone, Channel No. 6



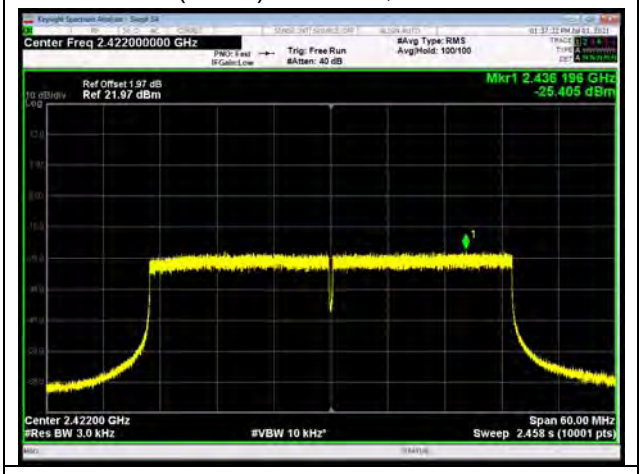
802.11 ax(HE20) -106Tone, Channel No. 11



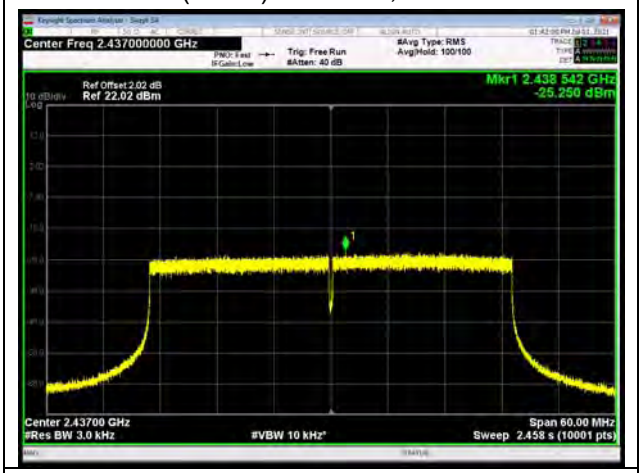
802.11 ax(HE20) -242Tone, Channel No. 11



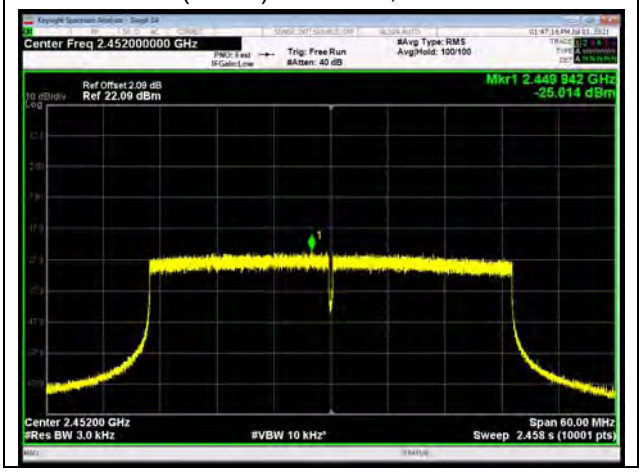
802.11ax(HE40)-484Tone, Channel No. 3



802.11 ax(HE40)-484Tone, Channel No. 6

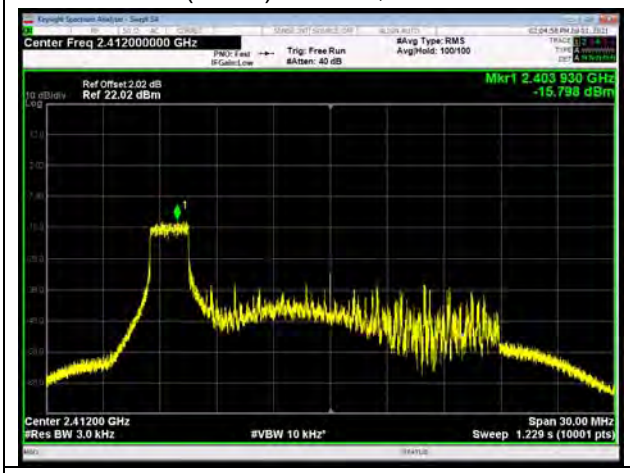


802.11 ax(HE40)-484Tone, Channel No. 9

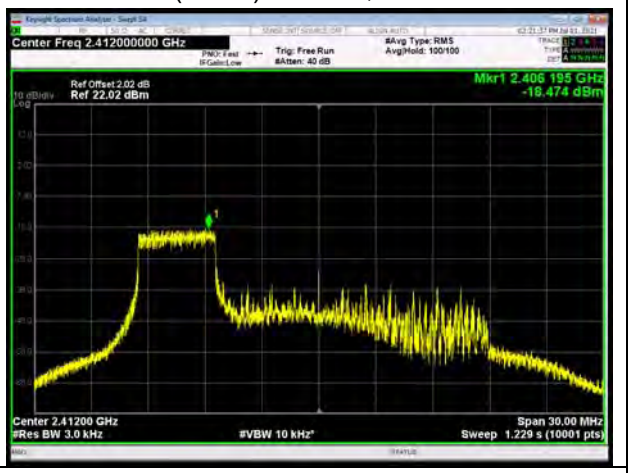


MIMO Antenna 1

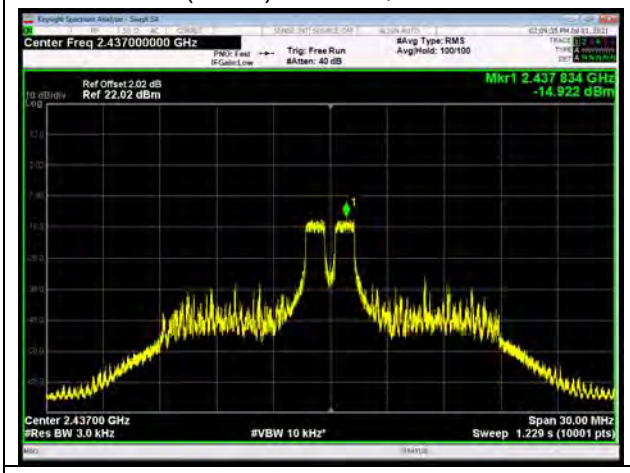
802.11ax(HE20)-26Tone, Channel No. 1



802.11ax(HE20)-52Tone, Channel No. 1



802.11 ax(HE20) -26Tone, Channel No. 6



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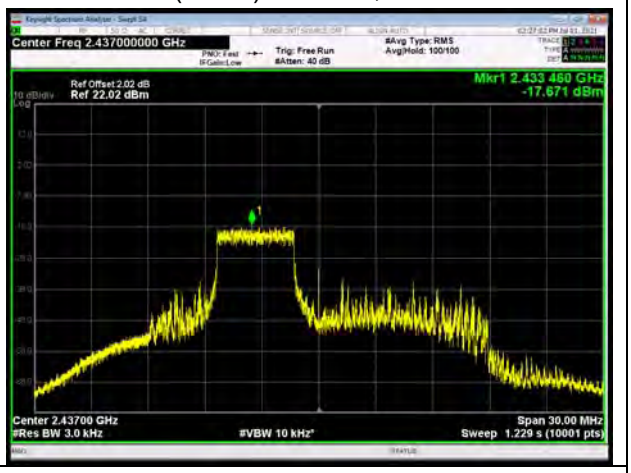
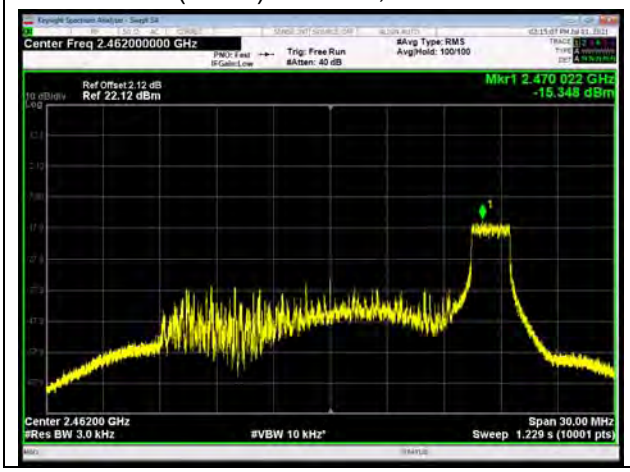
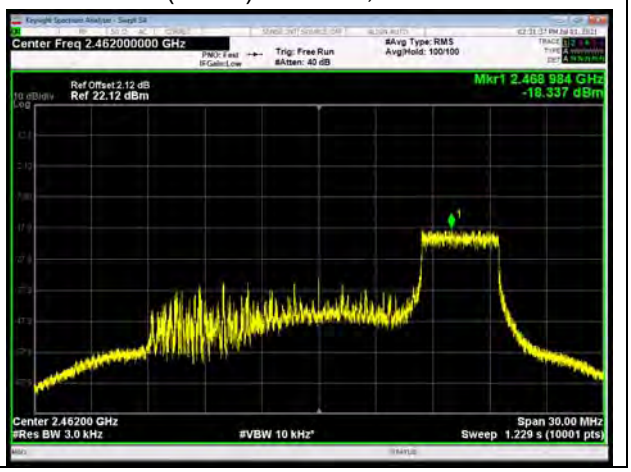


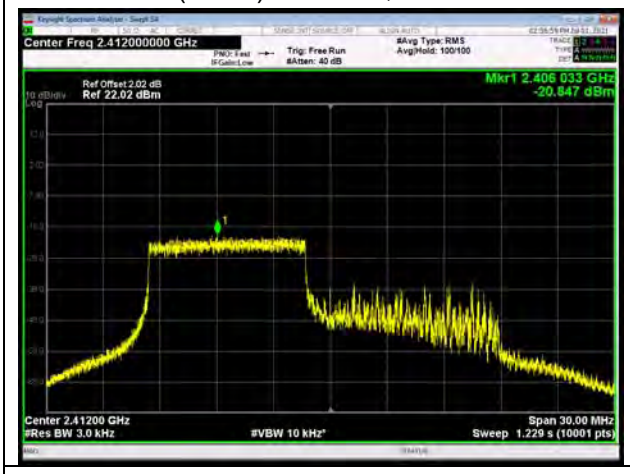
802.11 ax(HE20) -26Tone, Channel No. 11



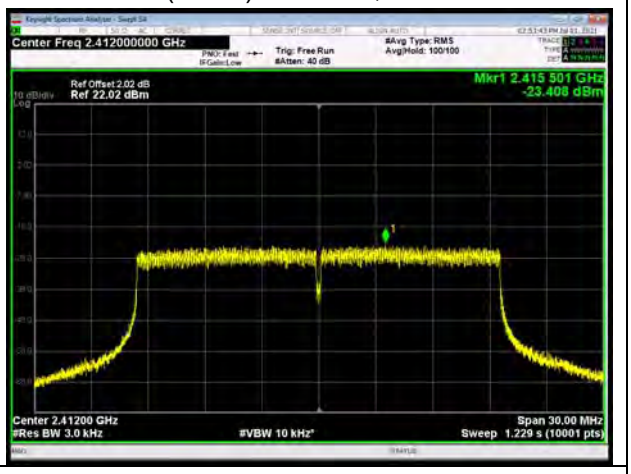
802.11 ax(HE20) -52Tone, Channel No. 11



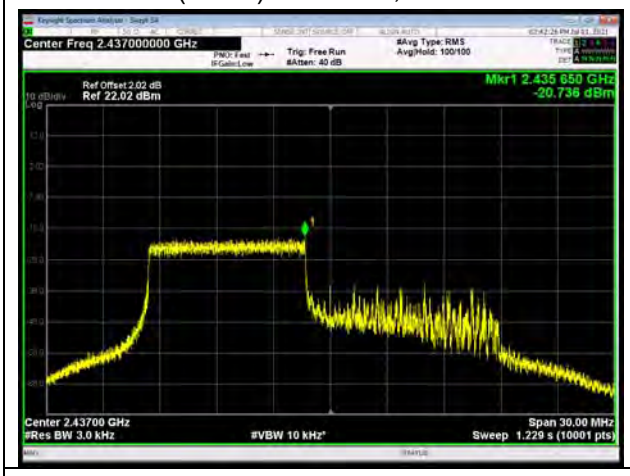
802.11ax(HE20)-106Tone, Channel No. 1



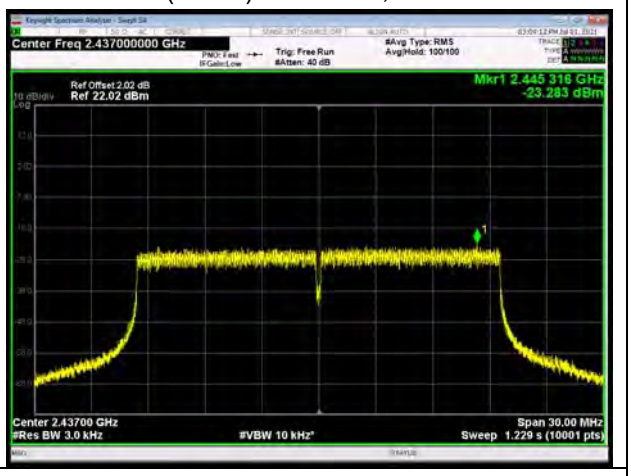
802.11ax(HE20)-242Tone, Channel No. 1



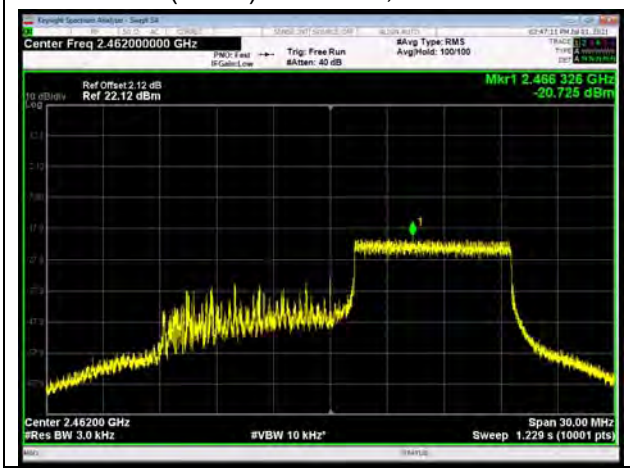
802.11 ax(HE20) -106Tone, Channel No. 6



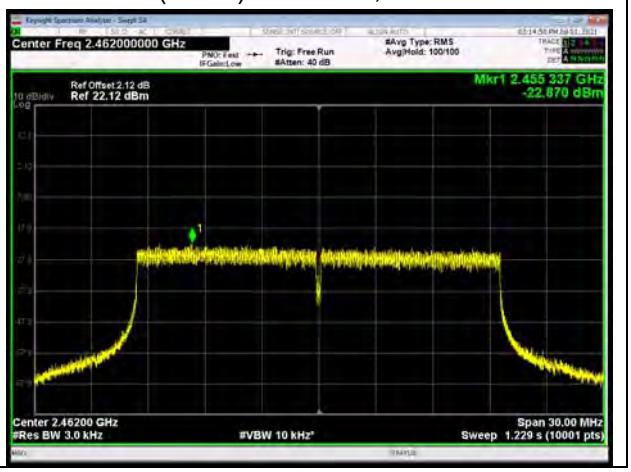
802.11 ax(HE20) -242Tone, Channel No. 6



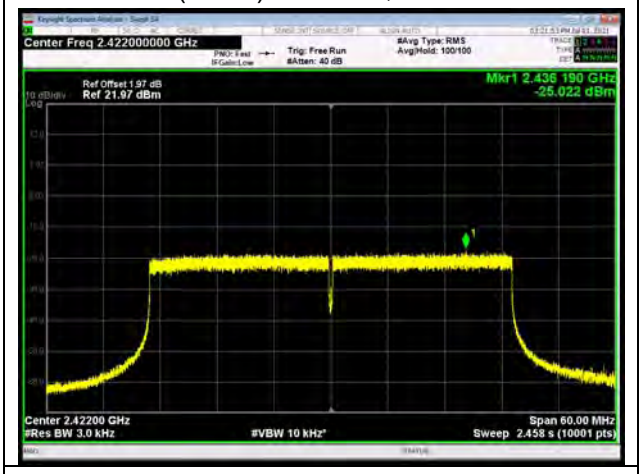
802.11 ax(HE20) -106Tone, Channel No. 11



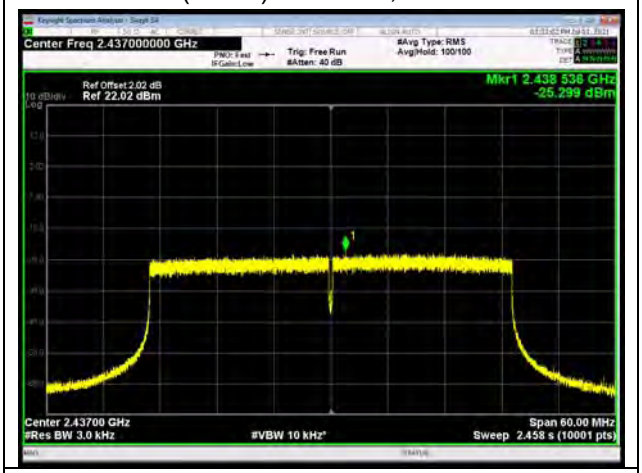
802.11 ax(HE20) -242Tone, Channel No. 11



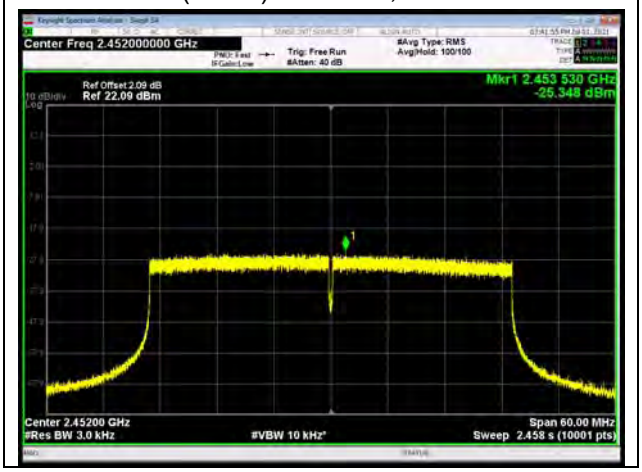
802.11ax(HE40)-484Tone, Channel No. 3



802.11 ax(HE40)-484Tone, Channel No. 6

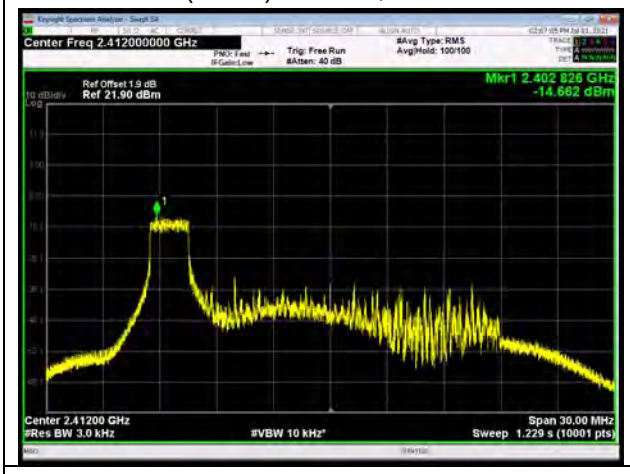


802.11 ax(HE40)-484Tone, Channel No. 9



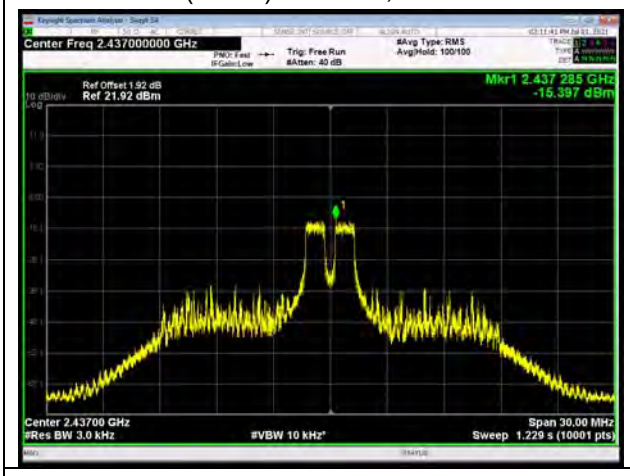
MIMO Antenna 2

802.11ax(HE20)-26Tone, Channel No. 1

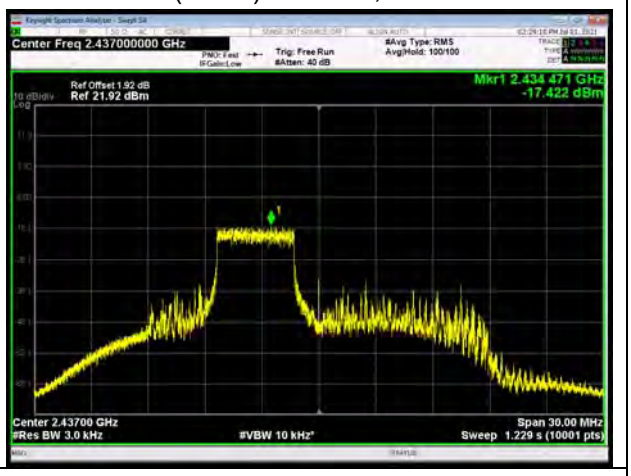


802.11ax(HE20)-52Tone, Channel No. 1

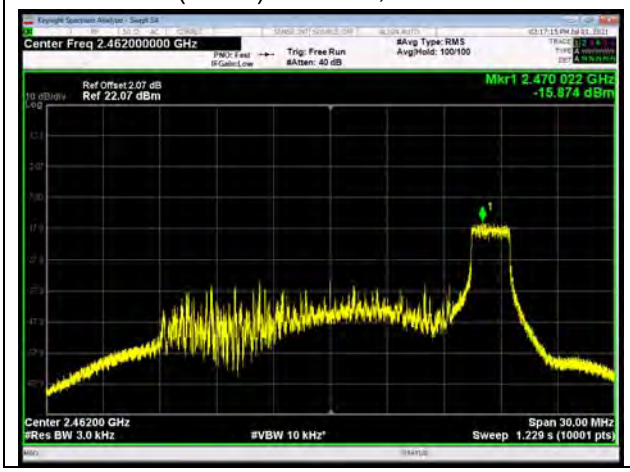
802.11 ax(HE20) -26Tone, Channel No. 6



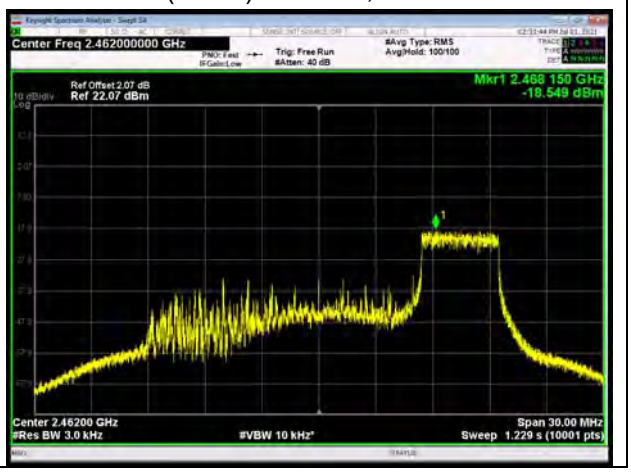
802.11 ax(HE20) -52Tone, Channel No. 6



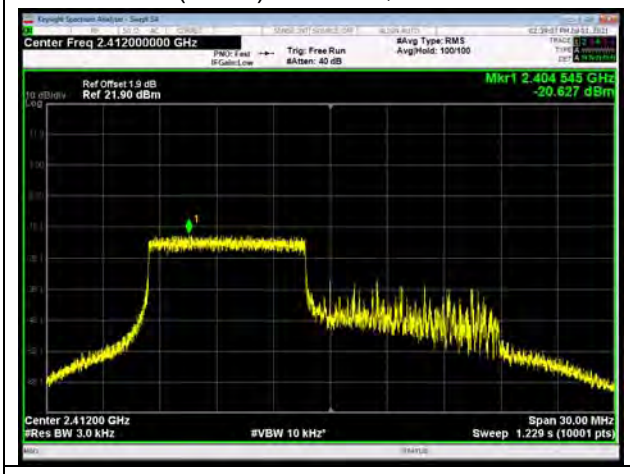
802.11 ax(HE20) -26Tone, Channel No. 11



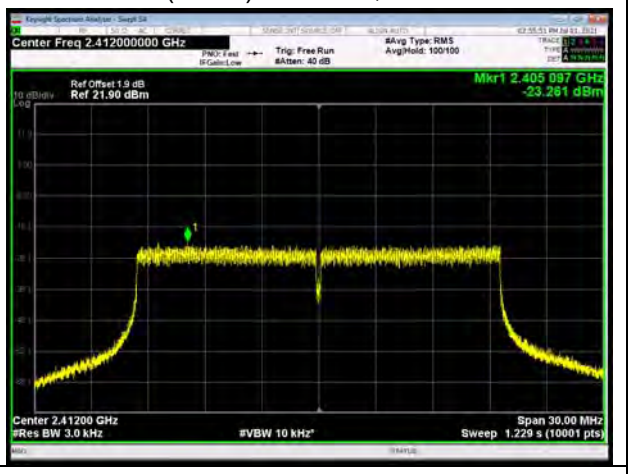
802.11 ax(HE20) -52Tone, Channel No. 11



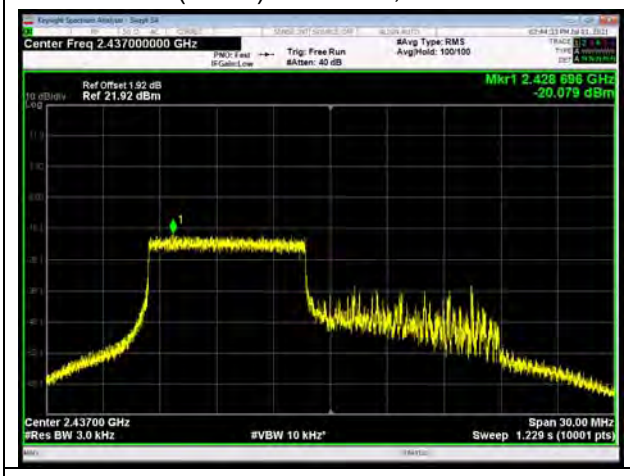
802.11ax(HE20)-106Tone, Channel No. 1



802.11ax(HE20)-242Tone, Channel No. 1



802.11 ax(HE20) -106Tone, Channel No. 6



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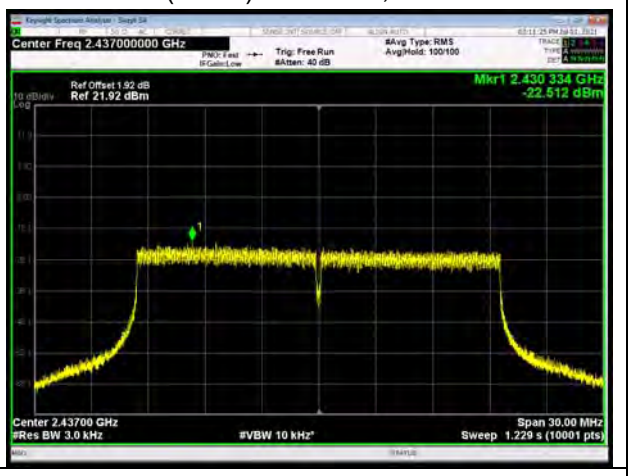
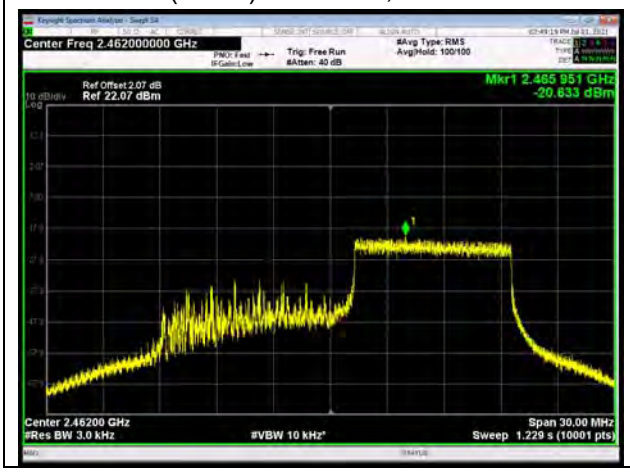
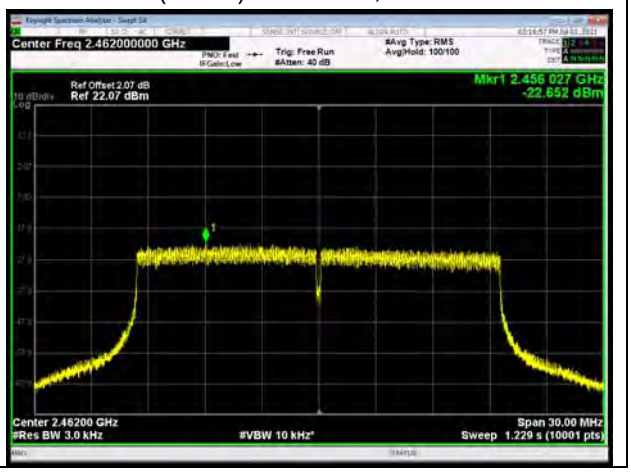


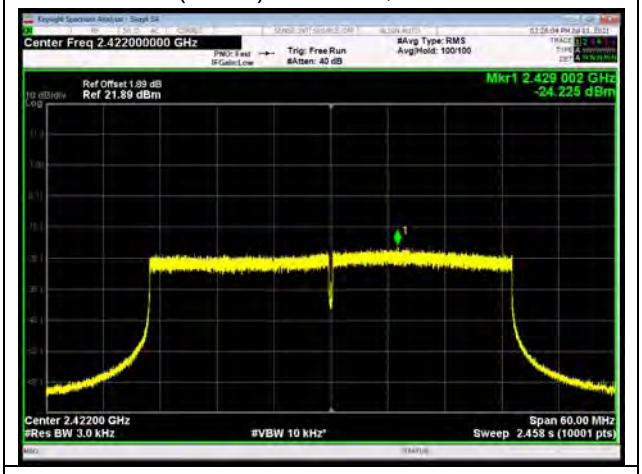
802.11 ax(HE20) -106Tone, Channel No. 11



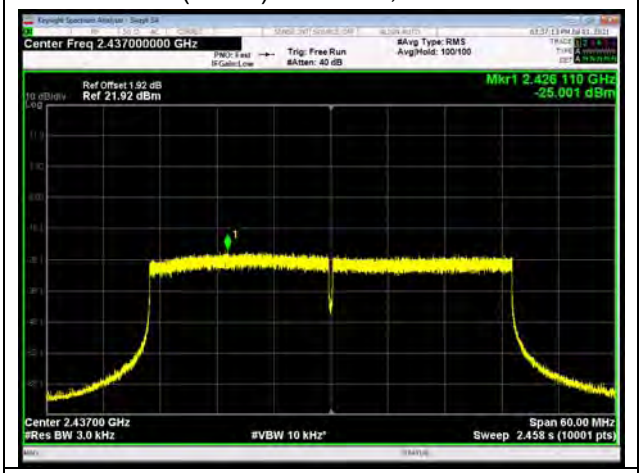
802.11 ax(HE20) -242Tone, Channel No. 11



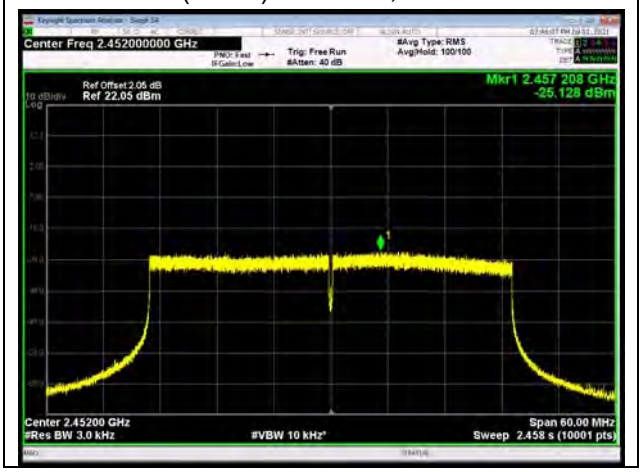
802.11ax(HE40)-484Tone, Channel No. 3



802.11 ax(HE40)-484Tone, Channel No. 6



802.11 ax(HE40)-484Tone, Channel No. 9



5.5. Spurious RF Conducted Emissions

Ambient condition

Temperature	Relative humidity	Pressure
23°C ~25°C	45%~50%	101.5kPa

Method of Measurement

The EUT was connected to the spectrum analyzer with a known loss. The spectrum analyzer scans from 30MHz to the 10th harmonic of the carrier. The peak detector is used. Set RBW to 100 kHz and VBW to 300 kHz, Sweep is set to ATUO.
The test is in transmitting mode.

Test setup

Limits

Rule Part 15.247(d) pacifies that “In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement, provided the transmitter demonstrates compliance with the peak conducted power limits. If the transmitter complies with the conducted power limits based on the use of RMS averaging over a time interval, as permitted under paragraph (b)(3) of this section, the attenuation required under this paragraph shall be 30 dB instead of 20 dB. ”

RU mode

Test Mode	Carrier frequency (MHz)	Reference value (dBm)	Limit
802.11b	2412	6.88	-23.12
	2437	6.40	-23.60
	2462	6.83	-23.17
802.11g	2412	3.06	-26.95
	2437	2.80	-27.20
	2462	3.41	-26.60
802.11n HT20	2412	1.55	-28.45
	2437	1.05	-28.95
	2462	1.94	-28.06
802.11n HT40	2422	-0.33	-30.33
	2437	0.39	-29.61
	2452	-0.04	-30.04
802.11ax HE20	2412	-0.03	-30.03
	2437	-1.78	-31.78
	2462	-4.15	-34.15
802.11ax HE40	2422	-5.11	-35.11
	2437	-4.67	-34.67
	2452	-2.88	-32.88

TB mode

Test Mode	Carrier frequency (MHz)	RU Side	Reference value (dBm)	Limit
802.11ax HE20	2412	26-Tones	6.45	-23.55
	2437	26-Tones	3.85	-26.15
	2462	26-Tones	4.94	-25.06
	2412	52-Tones	3.35	-26.66
	2437	52-Tones	3.51	-26.49
	2462	52-Tones	2.65	-27.35
	2412	106-Tones	1.28	-28.72
	2437	106-Tones	1.17	-28.83
	2462	106-Tones	0.66	-29.35
802.11ax HE20	2412	242-Tones	-0.36	-30.36
	2437	242-Tones	-0.89	-30.89
	2462	242-Tones	-0.45	-30.45
802.11ax HE40	2422	484-Tones	-2.29	-32.29
	2437	484-Tones	-3.28	-33.28
	2452	484-Tones	-4.24	-34.24

Measurement Uncertainty

The assessed measurement uncertainty to ensure 95% confidence level for the normal distribution is with the coverage factor k = 1.96.

Frequency	Uncertainty
100kHz-2GHz	0.684 dB
2GHz-26GHz	1.407 dB

Test Results:

RU Mode

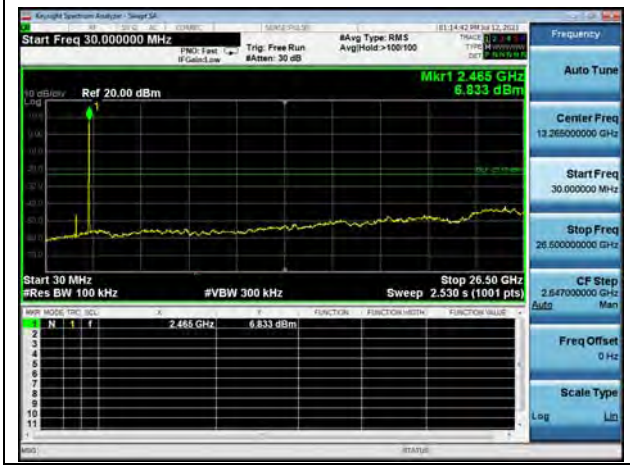
802.11b, Channel No.: 1

802.11g, Channel No.: 1

802.11b, Channel No.: 6

802.11g, Channel No.: 6

802.11b, Channel No.: 11



802.11g, Channel No.: 11

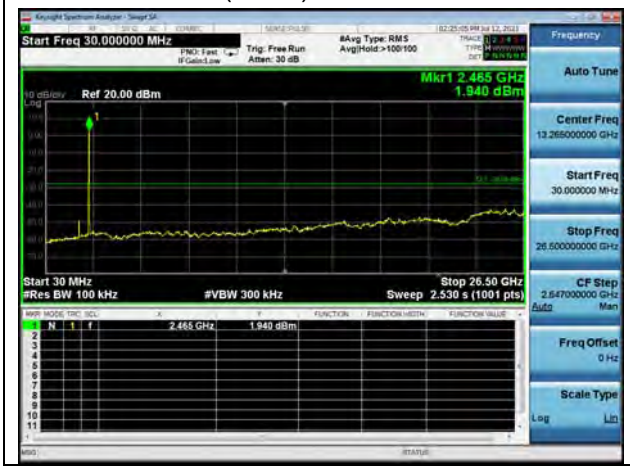
802.11n(HT20), Channel No. 1

802.11n(HT40), Channel No. 3

802.11n(HT20), Channel No. 6

802.11n(HT40), Channel No. 6

802.11n(HT20), Channel No. 11



802.11n(HT40), Channel No. 9

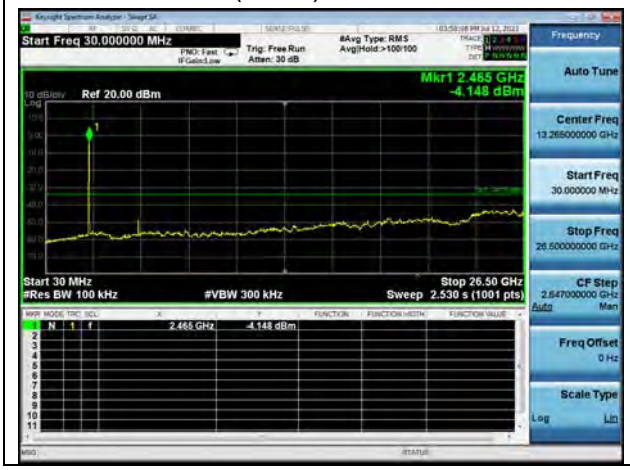
802.11ax(HE20), Channel No. 1

802.11 ax(HE40), Channel No. 3

802.11 ax(HE20), Channel No. 6

802.11 ax(HE40), Channel No. 6

802.11 ax(HE20), Channel No. 11



802.11 ax(HE40), Channel No. 9

TB mode

802.11ax(HE20)-26Tone, Channel No. 1

802.11ax(HE20) -52Tone, Channel No. 1

802.11 ax(HE20) -26Tone, Channel No. 6

802.11 ax(HE20) -52Tone, Channel No. 6

802.11 ax(HE20) -26Tone, Channel No. 11

802.11 ax(HE20) -52Tone, Channel No. 11

802.11ax(HE20) -106Tone, Channel No. 1

802.11ax(HE20) -242Tone, Channel No. 1

802.11 ax(HE20) -106Tone, Channel No. 6

802.11 ax(HE20) -242Tone, Channel No. 6

802.11 ax(HE20) -106Tone, Channel No. 11

802.11 ax(HE20) -242Tone, Channel No. 11

802.11 ax(HE40) -484Tone, Channel No. 3

802.11 ax(HE40) -484Tone, Channel No. 6

802.11 ax(HE40) -484Tone, Channel No. 9

5.6. Unwanted Emission

Ambient condition

Temperature	Relative humidity	Pressure
23°C ~25°C	45%~50%	102.5kPa

Method of Measurement

The test set-up was made in accordance to the general provisions of ANSI C63.10.
The Equipment Under Test (EUT) was set up on a non-conductive table in the semi-anechoic chamber. The test was performed at the distance of 3 m between the EUT and the receiving antenna.

The turntable shall be rotated from 0 to 360 degrees for detecting the maximum of radiated spurious signal level. The measurements shall be repeated with orthogonal polarization of the test antenna. The data of cable loss and antenna factor has been calibrated in full testing frequency range before the testing. Sweep the Restricted Band and the emissions less than 20 dB below the permissible value are reported.
The radiated emissions measurements were made in a typical installation configuration.
Sweep the whole frequency band through the range from 9 kHz to the 10th harmonic of the carrier, and the emissions less than 20 dB below the permissible value are reported.

This method refer to ANSI C63.10.
The procedure for peak unwanted emissions measurements above 1000 MHz is as follows:
Set the spectrum analyzer in the following:
9kHz~150 kHz
RBW=200Hz, VBW=1kHz/ Sweep=AUTO
150 kHz~30MHz
RBW=9KHz, VBW=30KHz,/ Sweep=AUTO
Below 1GHz
RBW=100kHz / VBW=300kHz / Sweep=AUTO
a) Peak emission levels are measured by setting the instrument as follows:
Above 1GHz
PEAK: RBW=1MHz VBW=3MHz/ Sweep=AUTO
b) Average emission levels are measured by setting the instrument as follows:
Above 1GHz
AVERAGE: RBW=1MHz / VBW=3MHz / Sweep=AUTO
c) Detector: The measurements employing a CISPR quasi-peak detector except for the frequency bands 9-90 kHz, 110-490 kHz and above 1000 MHz. Radiated emission limits in these three bands are based on measurements employing an average detector.
d) Averaging type = power (i.e., rms) (As an alternative, the detector and averaging type may be set for linear voltage averaging. Some instruments require linear display mode to use linear voltage

averaging. Log or dB averaging shall not be used.)

e) Sweep time = auto.

f) Perform a trace average of at least 100 traces if the transmission is continuous. If the transmission is not continuous, then the number of traces shall be increased by a factor of 1 / D, where D is the duty cycle. For example, with 50% duty cycle, at least 200 traces shall be averaged. (If a specific emission is demonstrated to be continuous—i.e., 100% duty cycle—then rather than turning ON and OFF with the transmit cycle, at least 100 traces shall be averaged.)

g) If tests are performed with the EUT transmitting at a duty cycle less than 98%, then a correction factor shall be added to the measurement results prior to comparing with the emission limit, to compute the emission level that would have been measured had the test been performed at 100% duty cycle. The correction factor is computed as follows:

1) If power averaging (rms) mode was used in the preceding step e), then the correction factor is [10 log (1 / D)], where D is the duty cycle. For example, if the transmit duty cycle was 50%, then 3 dB shall be added to the measured emission levels.

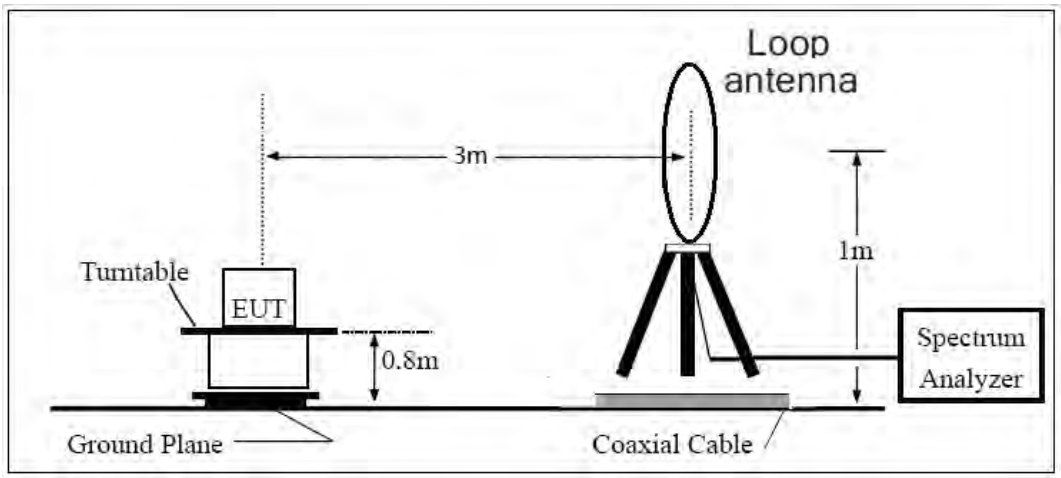
2) If linear voltage averaging mode was used in the preceding step e), then the correction factor is [20 log (1 / D)], where D is the duty cycle. For example, if the transmit duty cycle was 50%, then 6 dB shall be added to the measured emission levels.

3) If a specific emission is demonstrated to be continuous (100% duty cycle) rather than turning ON and OFF with the transmit cycle, then no duty cycle correction is required for that emission.

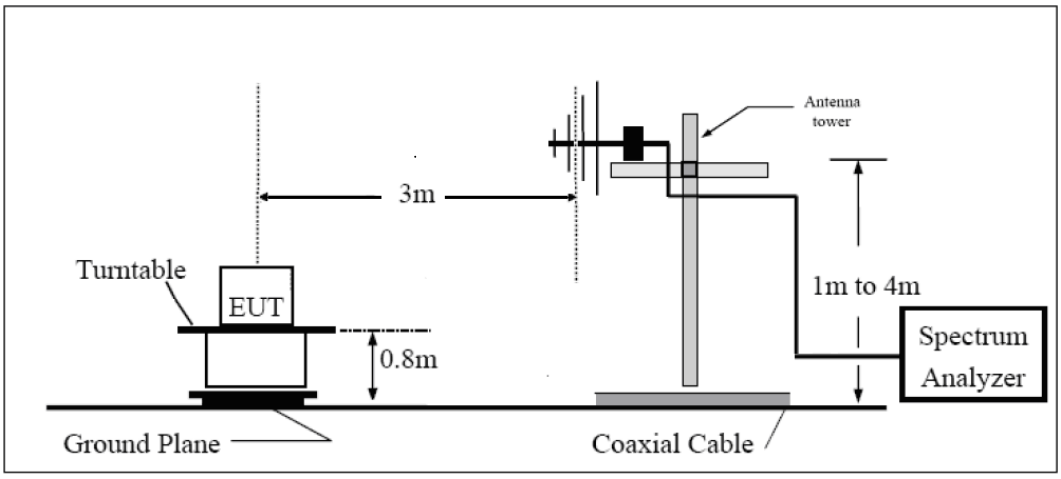
The test is in transmitting mode.

Test setup

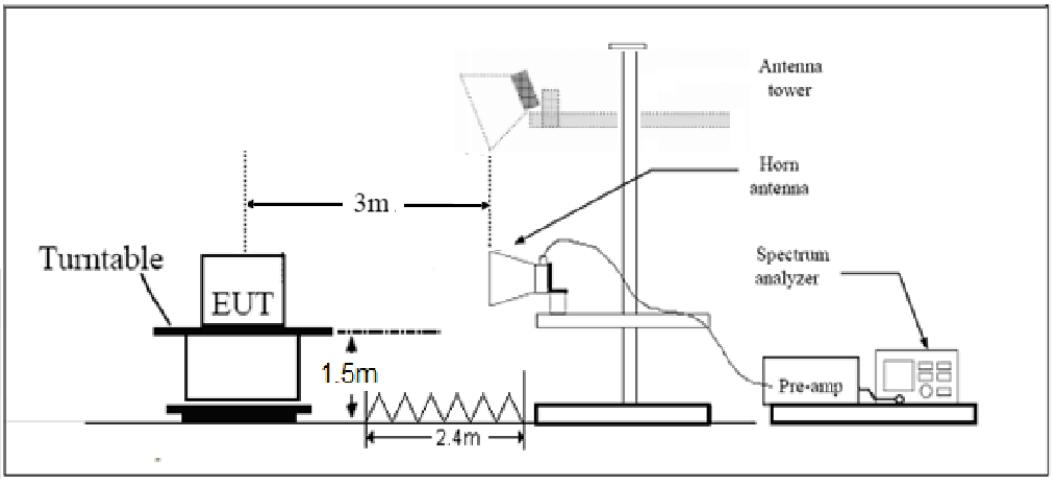
9KHz ~ 30MHz



30MHz ~ 1GHz



Above 1GHz



Note: Area side:2.4mX3.6m

Limits

Rule Part 15.247(d) specifies that “In addition, radiated emissions which fall in the restricted bands, as defined in § 15.205(a), must also comply with the radiated emission limits specified in § 15.209(a) (see § 15.205(c)).”

Limit in restricted band

Frequency of emission (MHz)	Field strength(uV/m)	Field strength(dBuV/m)
0.009–0.490	2400/F(kHz)	/
0.490–1.705	24000/F(kHz)	/
1.705–30.0	30	/
30-88	100	40
88-216	150	43.5
216-960	200	46
Above960	500	54

§15.35(b)

There is also a limit on the radio frequency emissions, as measured using instrumentation with a peak detector function, corresponding to 20 dB above the maximum permitted average limit.

Peak Limit=74 dBuV/m

Average Limit=54 dBuV/m

Spurious Radiated Emissions are permitted in any of the frequency bands listed below:

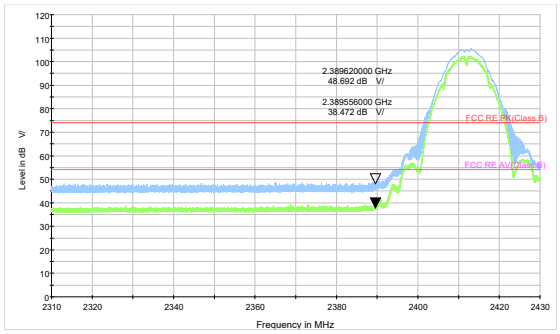
MHz	MHz	MHz	GHz
0.090 - 0.110	16.42 - 16.423	399.9 - 410	4.5 - 5.15
[1]0.495 - 0.505	16.69475 - 16.69525	608 - 614	5.35 - 5.46
2.1735 - 2.1905	16.80425 - 16.80475	960 - 1240	7.25 - 7.75
4.125 - 4.128	25.5 - 25.67	1300 - 1427	8.025 - 8.5
4.17725 - 4.17775	37.5 - 38.25	1435 - 1626.5	9.0 - 9.2
4.20725 - 4.20775	73 - 74.6	1645.5 - 1646.5	9.3 - 9.5
6.215 - 6.218	74.8 - 75.2	1660 - 1710	10.6 - 12.7
6.26775 - 6.26825	108 - 121.94	1718.8 - 1722.2	13.25 - 13.4
6.31175 - 6.31225	123 - 138	2200 - 2300	14.47 - 14.5
8.291 - 8.294	149.9 - 150.05	2310 - 2390	15.35 - 16.2
8.362 - 8.366	156.52475 - 156.52525	2483.5 - 2500	17.7 - 21.4
8.37625 - 8.38675	156.7 - 156.9	2690 - 2900	22.01 - 23.12
8.41425 - 8.41475	162.0125 - 167.17	3260 - 3267	23.6 - 24.0
12.29 - 12.293	167.72 - 173.2	3332 - 3339	31.2 - 31.8
12.51975 - 12.52025	240 - 285	3345.8 - 3358	36.43 - 36.5
12.57675 - 12.57725	322 - 335.4	3600 - 4400	([2])
13.36 - 13.41			

Measurement Uncertainty

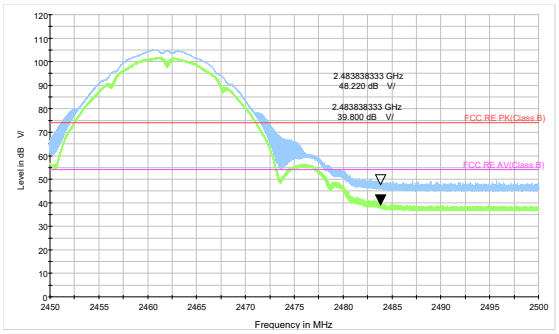
The assessed measurement uncertainty to ensure 95% confidence level for the normal distribution is with the coverage factor *k* = 1.96.

Frequency	Uncertainty
9KHz-30MHz	3.55 dB
30MHz-200MHz	4.17 dB
200MHz-1GHz	4.84 dB
1-18GHz	4.35 dB
18-26.5GHz	5.90 dB
26.5GHz~40GHz	5.92 dB

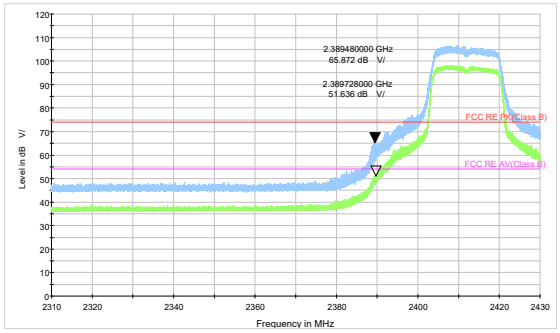
Test Results:



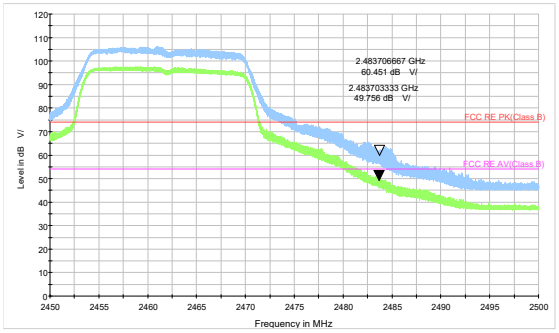
802.11b-Channel 1 Peak+ Average



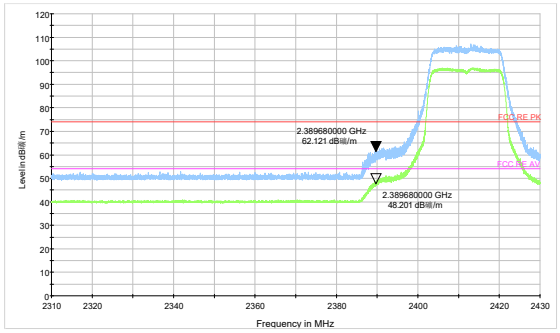
802.11b-Channel 11 Peak+ Average



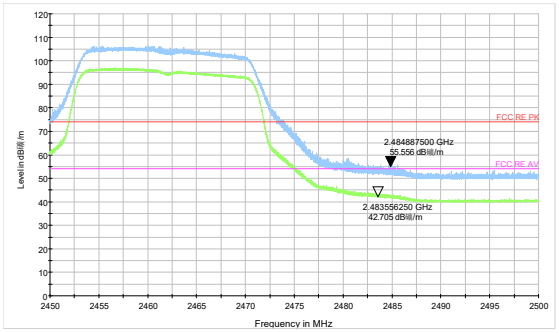
802.11g-Channel 1 Peak+ Average



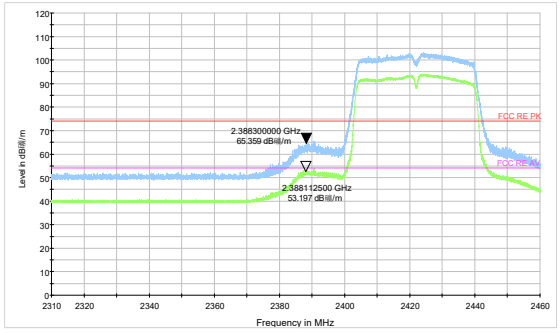
802.11g-Channel 11 Peak+ Average



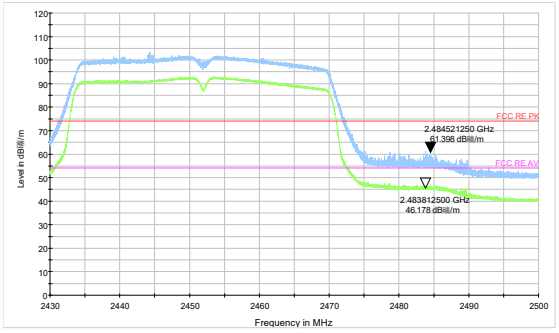
802.11n HT20 -Channel 1 Peak+ Average



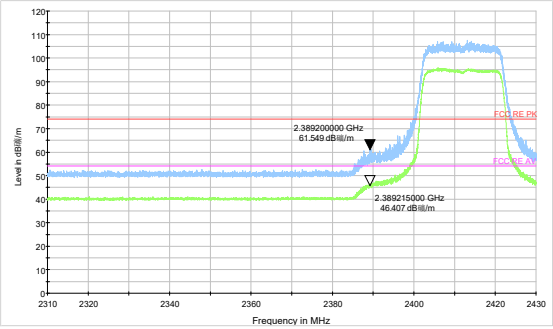
802.11n HT20 -Channel 11 Peak+ Average



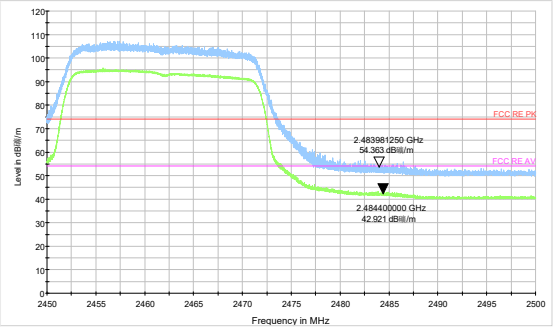
802.11n HT40 –Channel 3 Peak+ Average



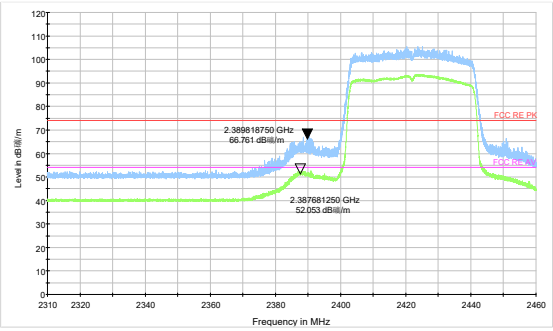
802.11n HT40 -Channel 9 Peak+ Average



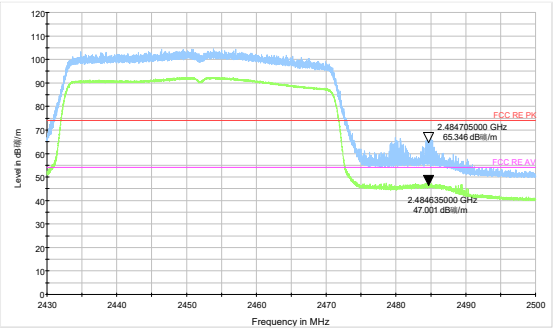
802.11ax HE20 -Channel 1 Peak+ Average



802.11 ax HE 20 -Channel 11 Peak+ Average



802.11 ax HE 40 –Channel 3 Peak+ Average



802.11 ax HE 40 -Channel 9 Peak+ Average

Result of RE

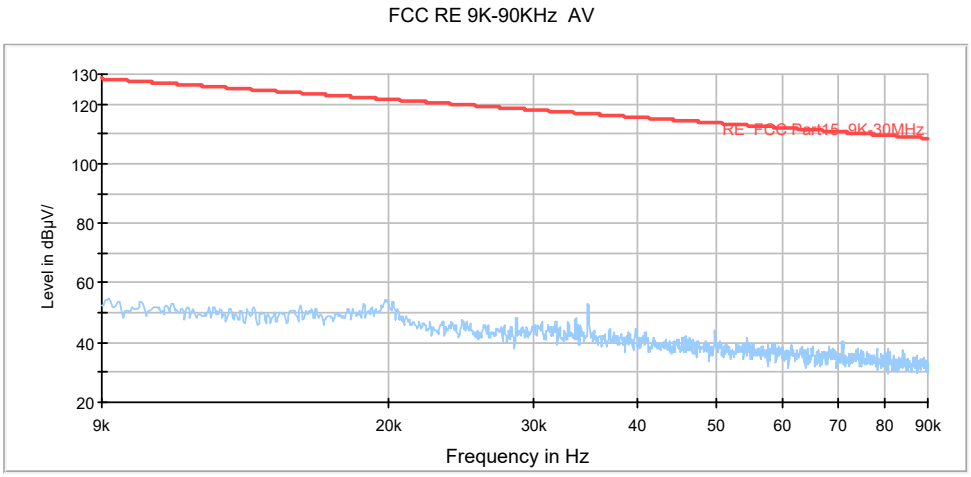
Test result

Sweep the whole frequency band through the range from 9kHz to the 10th harmonic of the carrier, the Emissions in the frequency band 9kHz-30MHz and 18GHz-26.5GHz are more than 20dB below the limit are not reported.

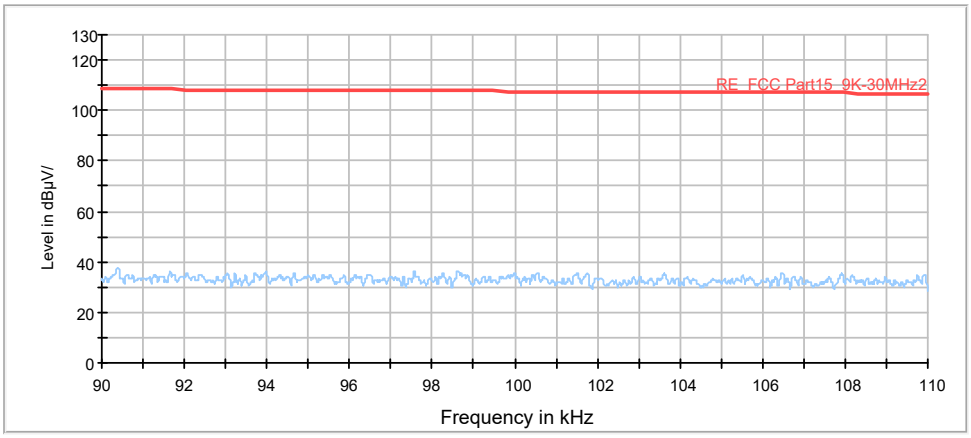
The following graphs display the maximum values of horizontal and vertical by software.
For above 1GHz, Blue trace uses the peak detection, Green trace uses the average detection.
After the pretest, MIMO was selected as the worst antenna for 802.11ax HE20/HE40 and 802.11n HT20/ HT40. SISO Antenna 1 was selected as the worst SISO antenna.

During the test, the Radiates Emission from 30MHz to 1GHz was performed in all modes with all channels, 802.11g, Channel 11 are selected as the worst condition. The test data of the worst-case condition was recorded in this report.
A font (Level in dBµV/)in the test plot =(level in dB µ V/m)

Continuous TX mode:

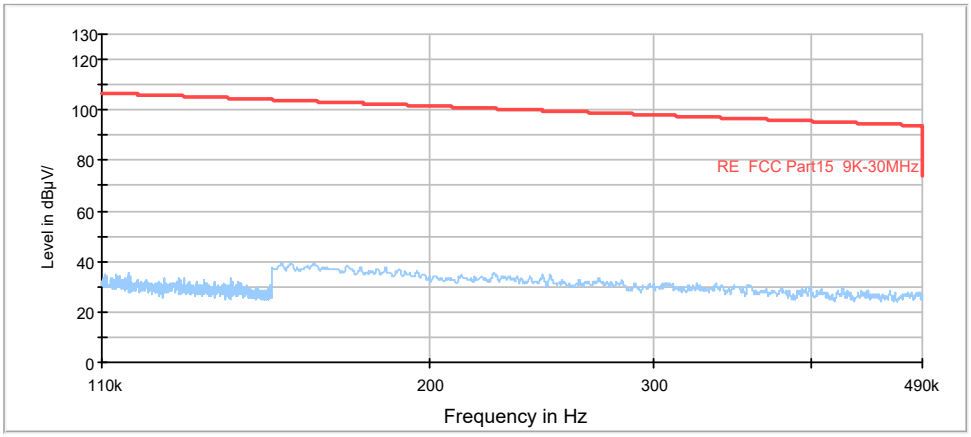


Radiates Emission from 9KHz to 90KHz



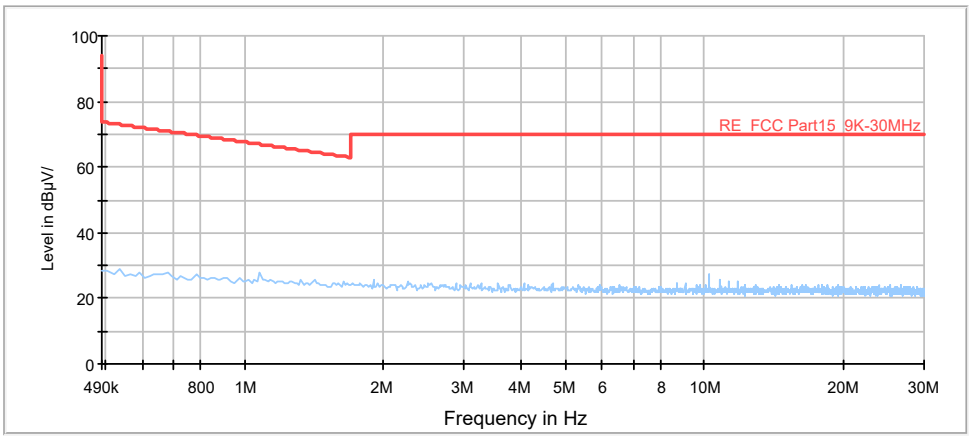
Radiates Emission from 90KHz to 110KHz

FCC RE 110K-490KHz AV

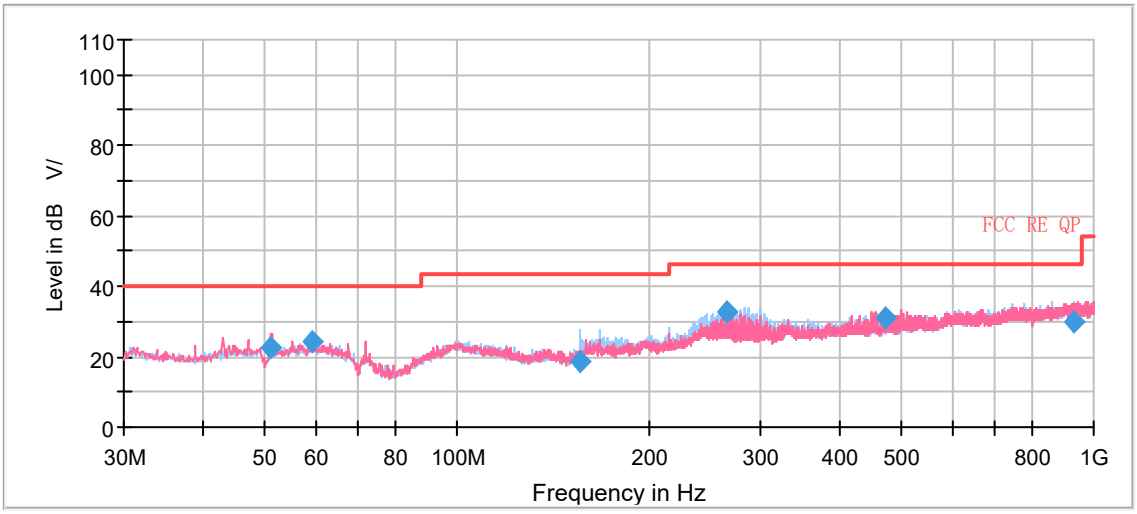


Radiates Emission from 110KHz to 490KHz

FCC RE 490K-30MHz QP



Radiates Emission from 490KHz to 30MHz



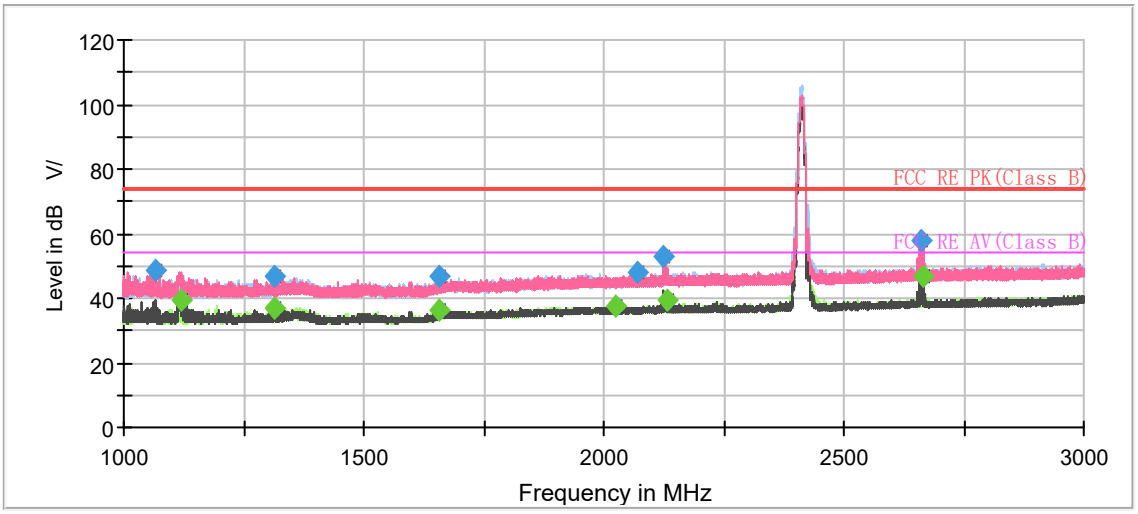
Radiates Emission from 30MHz to 1GHz

Frequency (MHz)	Quasi-Peak (dBuV/m)	Height (cm)	Polarization	Azimuth (deg)	Correct Factor (dB)	Margin (dB)	Limit (dBuV/m)
51.145200	22.43	100.0	V	102.0	-4.8	17.57	40.00
59.386300	24.34	100.0	V	92.0	-5.2	15.66	40.00
156.115200	18.80	175.0	H	151.0	-9.5	24.70	43.50
266.224112	32.54	125.0	H	254.0	-4.4	13.46	46.00
471.078727	31.01	109.0	V	349.0	-0.4	14.99	46.00
929.879835	30.10	100.0	H	50.0	5.8	15.90	46.00

Remark: 1. Correction Factor = Antenna factor+ Insertion loss(cable loss+amplifier gain)

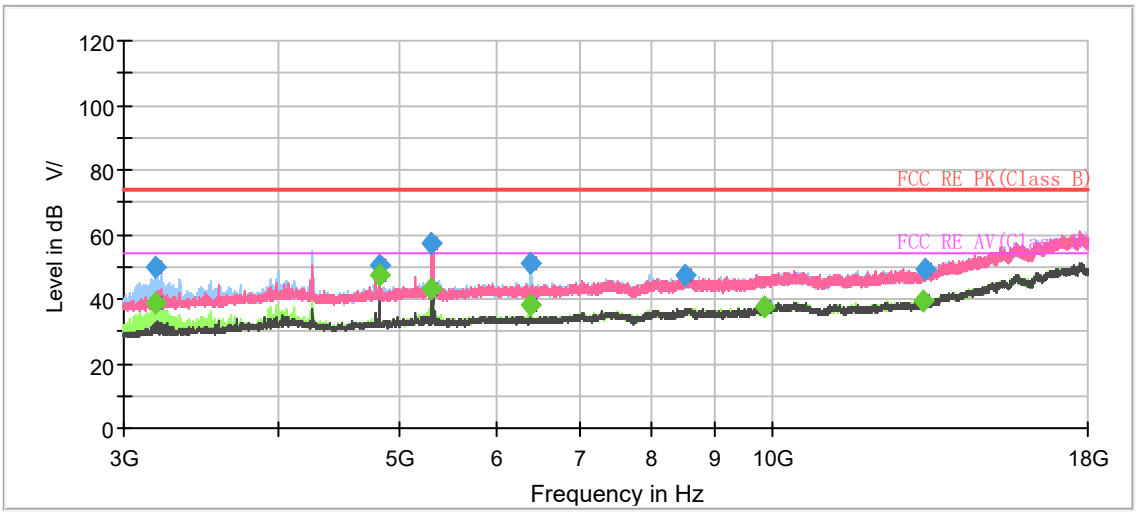
2. Margin = Limit – Quasi-Peak

802.11b CH1



Note: The signal beyond the limit is carrier.

Radiates Emission from 1GHz to 3GHz

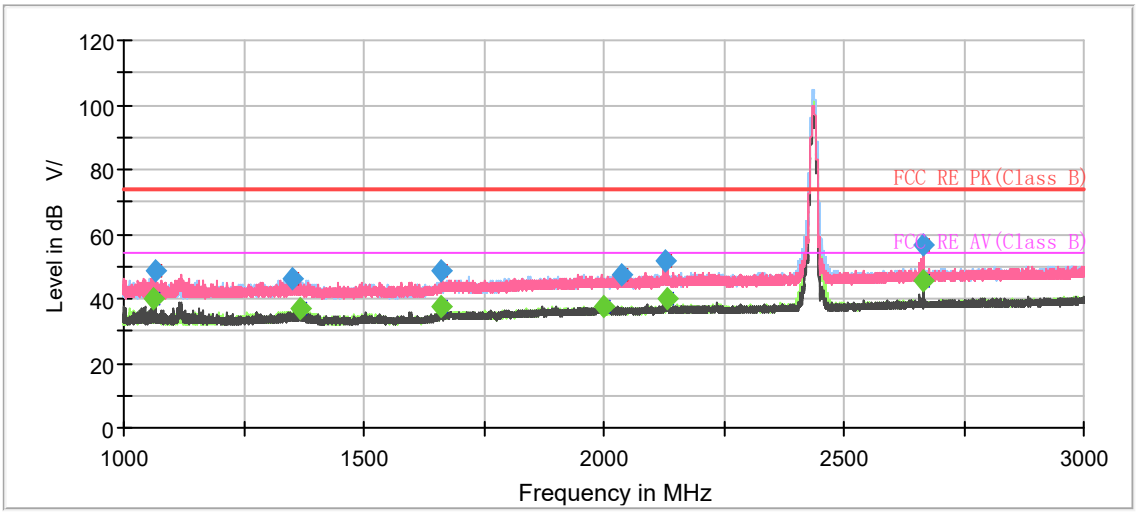


Radiates Emission from 3GHz to 18GHz

Frequency (MHz)	MaxPeak (dB μ V/m)	Average (dB μ V/m)	Limit (dB μ V/m)	Margin (dB)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
1066.400000	48.80	---	74.00	25.20	100.0	H	230.0	-8.0
1117.933333	---	39.29	54.00	14.71	200.0	V	189.0	-7.7
1312.533333	46.99	---	74.00	27.01	100.0	H	159.0	-6.7
1312.533333	---	36.78	54.00	17.22	100.0	H	159.0	-6.7
1658.533333	---	36.52	54.00	17.48	200.0	V	350.0	-4.7
1658.800000	46.83	---	74.00	27.17	200.0	V	350.0	-4.7
2023.933333	---	37.60	54.00	16.40	200.0	H	33.0	-2.6
2070.933333	47.94	---	74.00	26.06	200.0	V	318.0	-2.4
2126.000000	52.73	---	74.00	21.27	100.0	V	16.0	-2.1
2131.933333	---	39.66	54.00	14.34	100.0	V	74.0	-2.1
2659.666667	58.03	---	74.00	15.97	100.0	V	101.0	0.4
2665.466667	---	46.65	54.00	7.35	200.0	V	57.0	0.4

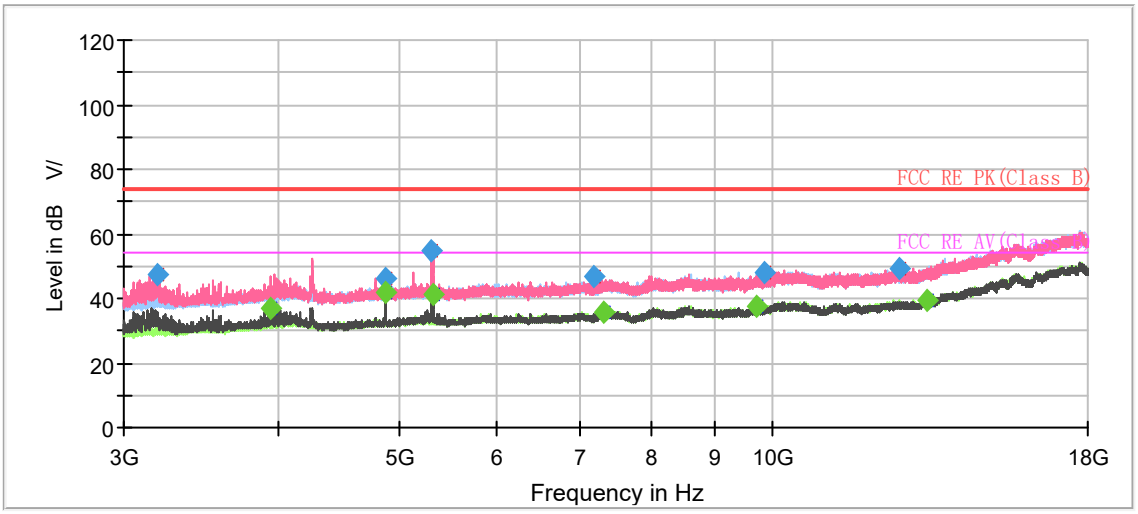
Remark: 1. Correction Factor = Antenna factor+ Insertion loss (cable loss + amplifier gain)

802.11b CH6



Note: The signal beyond the limit is carrier.

Radiates Emission from 1GHz to 3GHz

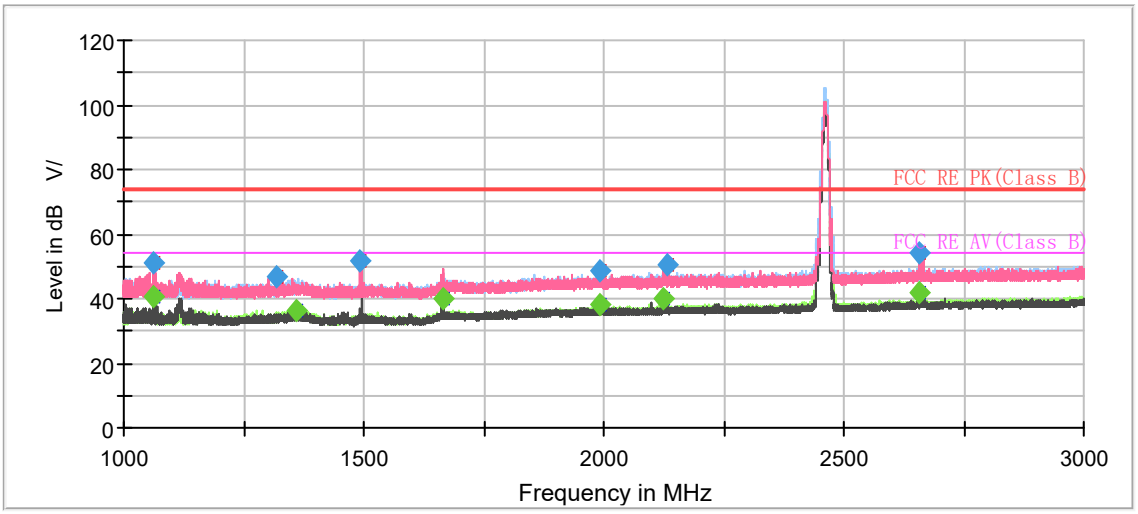


Radiates Emission from 3GHz to 18GHz

Frequency (MHz)	MaxPeak (dB μ V/m)	Average (dB μ V/m)	Limit (dB μ V/m)	Margin (dB)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
1063.800000	---	39.70	54.00	14.30	200.0	V	139.0	-8.0
1064.266667	48.33	---	74.00	25.67	200.0	V	226.0	-8.0
1349.666667	46.31	---	74.00	27.69	200.0	H	133.0	-6.5
1367.133333	---	36.73	54.00	17.27	200.0	H	46.0	-6.4
1663.200000	---	37.49	54.00	16.51	200.0	V	213.0	-4.7
1663.200000	48.84	---	74.00	25.16	200.0	V	213.0	-4.7
1998.400000	---	37.84	54.00	16.16	200.0	H	168.0	-2.7
2036.000000	47.50	---	74.00	26.50	100.0	H	0.0	-2.5
2128.400000	51.64	---	74.00	22.36	200.0	V	183.0	-2.1
2132.400000	---	39.87	54.00	14.13	200.0	V	43.0	-2.1
2665.600000	56.61	---	74.00	17.39	100.0	V	113.0	0.4
2665.600000	---	45.51	54.00	8.49	100.0	V	113.0	0.4

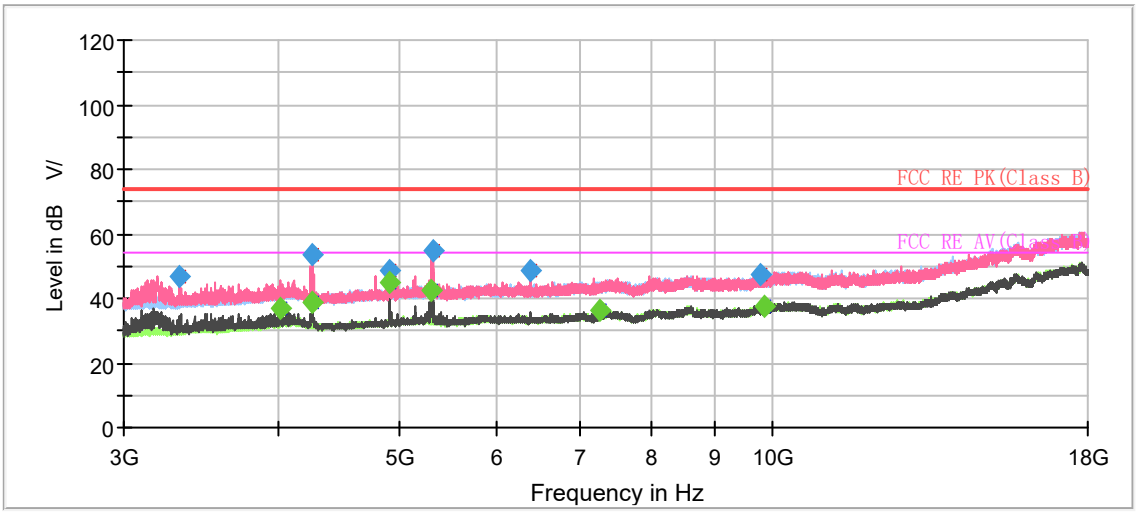
Remark: 1. Correction Factor = Antenna factor+ Insertion loss (cable loss + amplifier gain)

802.11b CH11



Note: The signal beyond the limit is carrier.

Radiates Emission from 1GHz to 3GHz

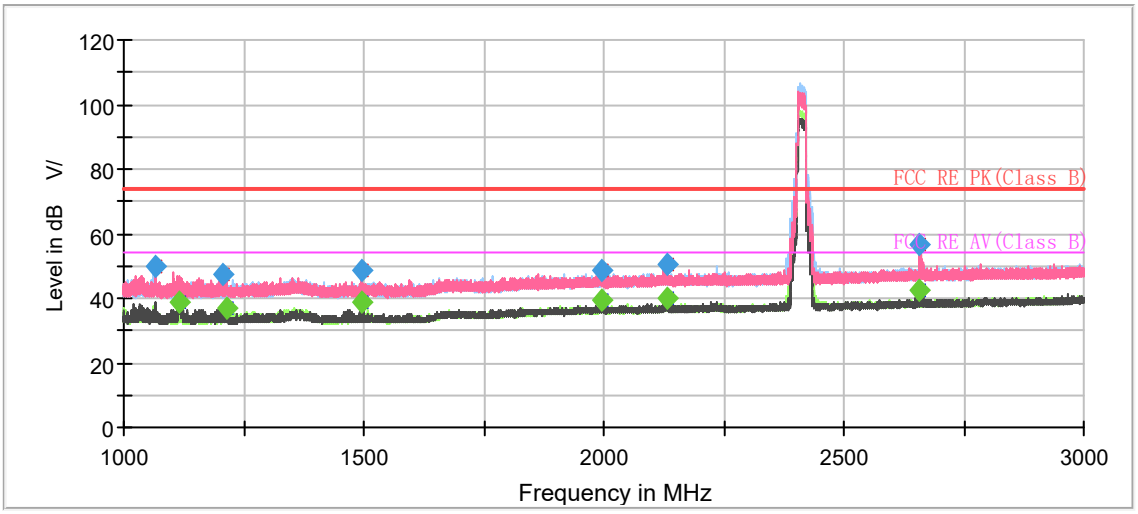


Radiates Emission from 3GHz to 18GHz

Frequency (MHz)	MaxPeak (dB μ V/m)	Average (dB μ V/m)	Limit (dB μ V/m)	Margin (dB)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
1062.200000	51.09	---	74.00	22.91	200.0	V	203.0	-8.0
1062.200000	---	40.39	54.00	13.61	200.0	V	203.0	-8.0
1318.666667	46.83	---	74.00	27.17	200.0	H	238.0	-6.7
1358.866667	---	36.55	54.00	17.45	200.0	H	109.0	-6.4
1493.066667	51.51	---	74.00	22.49	200.0	V	148.0	-5.6
1664.866667	---	40.16	54.00	13.84	100.0	V	352.0	-4.7
1992.000000	---	38.32	54.00	15.68	100.0	V	1.0	-2.7
1992.200000	48.78	---	74.00	25.22	100.0	V	1.0	-2.7
2125.133333	---	40.10	54.00	13.90	100.0	V	40.0	-2.1
2132.533333	50.71	---	74.00	23.29	200.0	H	37.0	-2.1
2658.866667	54.29	---	74.00	19.71	100.0	V	54.0	0.4
2658.866667	---	41.59	54.00	12.41	100.0	V	54.0	0.4

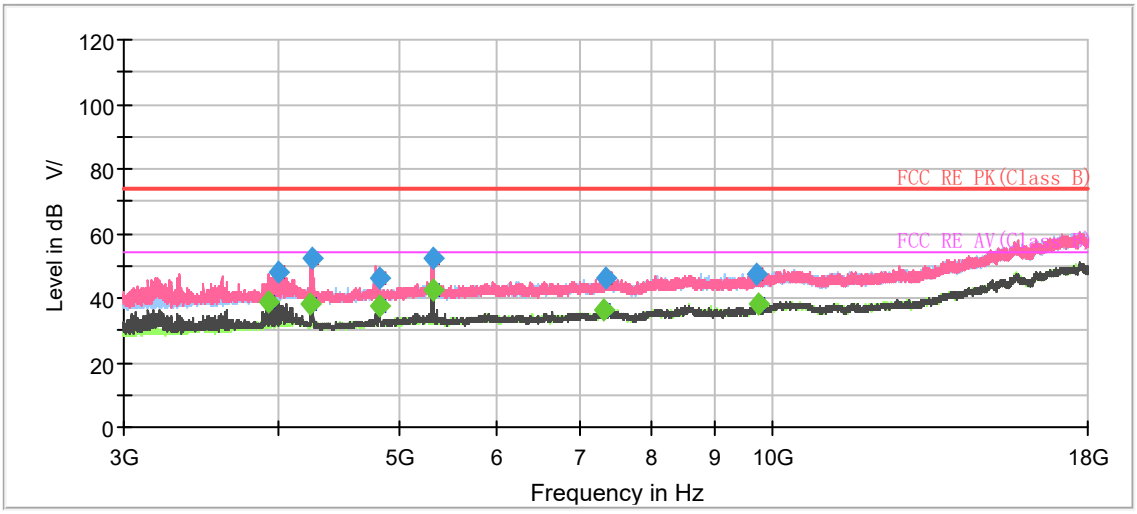
Remark: 1. Correction Factor = Antenna factor+ Insertion loss (cable loss + amplifier gain)

802.11g CH1



Note: The signal beyond the limit is carrier.

Radiates Emission from 1GHz to 3GHz

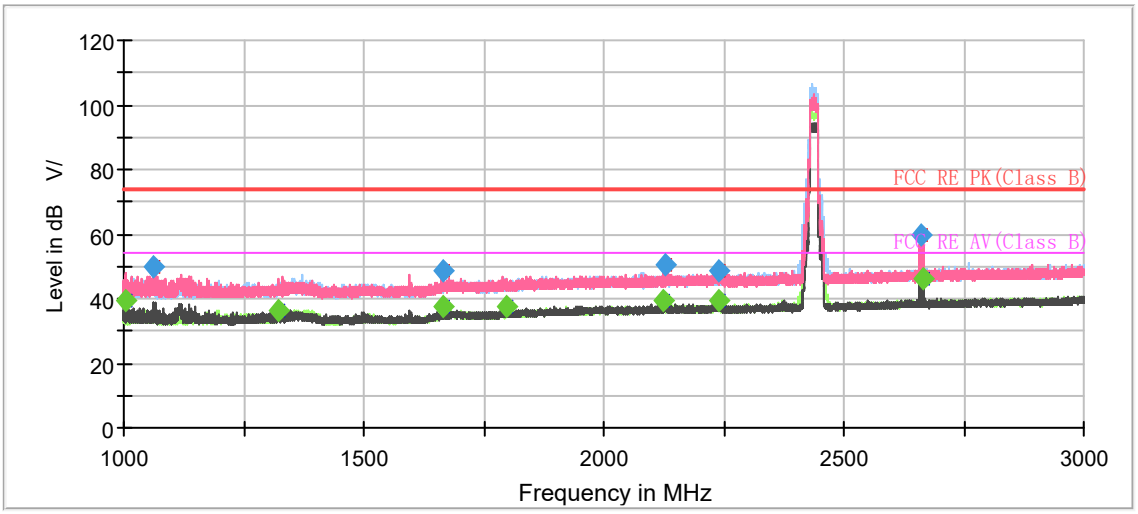


Radiates Emission from 3GHz to 18GHz

Frequency (MHz)	MaxPeak (dB μ V/m)	Average (dB μ V/m)	Limit (dB μ V/m)	Margin (dB)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
1064.933333	49.83	---	74.00	24.17	200.0	V	144.0	-8.0
1115.133333	---	38.93	54.00	15.07	200.0	V	144.0	-7.7
1205.600000	47.16	---	74.00	26.84	100.0	V	165.0	-7.3
1214.866667	---	37.03	54.00	16.97	100.0	V	165.0	-7.2
1495.066667	48.86	---	74.00	25.15	200.0	V	172.0	-5.6
1497.266667	---	38.99	54.00	15.01	200.0	V	172.0	-5.6
1994.333333	---	39.38	54.00	14.62	100.0	V	30.0	-2.7
1995.666667	48.86	---	74.00	25.14	100.0	V	30.0	-2.7
2130.866667	---	39.99	54.00	14.01	200.0	V	144.0	-2.1
2132.666667	50.52	---	74.00	23.48	100.0	V	56.0	-2.1
2658.733333	56.39	---	74.00	17.61	100.0	V	24.0	0.4
2658.733333	---	42.50	54.00	11.50	100.0	V	24.0	0.4

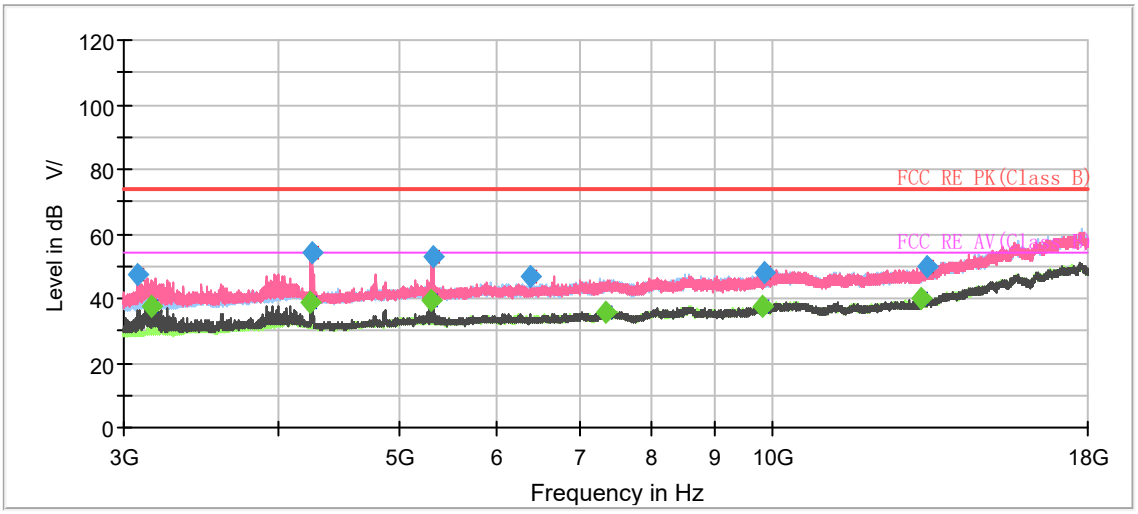
Remark: 1. Correction Factor = Antenna factor+ Insertion loss (cable loss + amplifier gain)

802.11g CH6



Note: The signal beyond the limit is carrier.

Radiates Emission from 1GHz to 3GHz

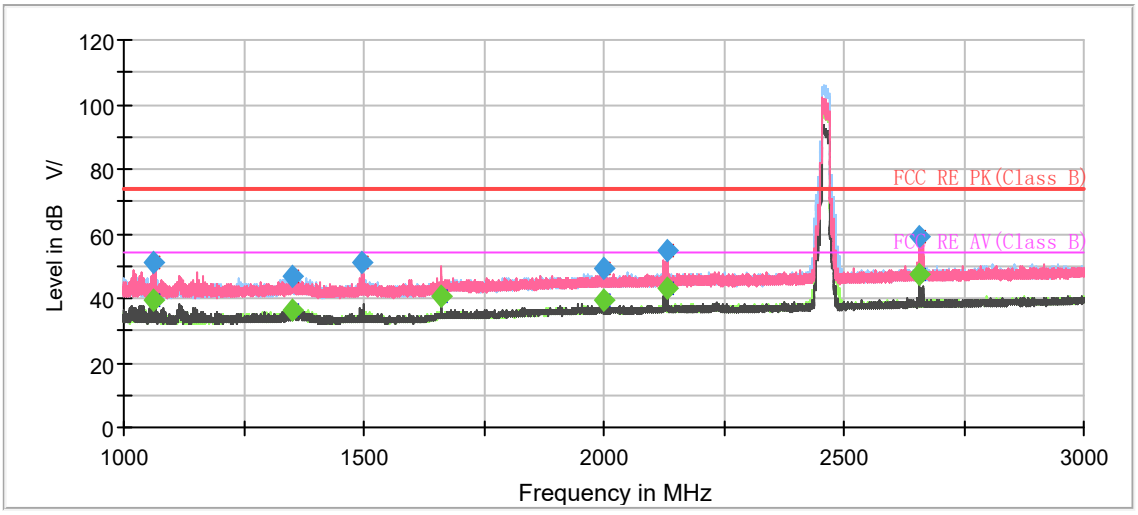


Radiates Emission from 3GHz to 18GHz

Frequency (MHz)	MaxPeak (dB μ V/m)	Average (dB μ V/m)	Limit (dB μ V/m)	Margin (dB)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
1003.800000	---	39.10	54.00	14.90	200.0	V	203.0	-8.5
1063.800000	49.76	---	74.00	24.24	200.0	V	203.0	-8.0
1322.333333	---	36.45	54.00	17.55	200.0	V	143.0	-6.7
1663.333333	---	37.29	54.00	16.71	200.0	V	3.0	-4.7
1663.333333	48.89	---	74.00	25.11	200.0	V	3.0	-4.7
1796.400000	---	37.85	54.00	16.15	200.0	V	157.0	-3.8
2125.733333	---	39.61	54.00	14.39	200.0	H	78.0	-2.1
2128.066667	50.39	---	74.00	23.61	100.0	V	21.0	-2.1
2240.666667	---	39.37	54.00	14.63	200.0	V	163.0	-1.7
2241.000000	48.88	---	74.00	25.12	200.0	H	146.0	-1.7
2662.200000	59.51	---	74.00	14.49	100.0	V	104.0	0.4
2664.600000	---	45.97	54.00	8.03	100.0	V	104.0	0.4

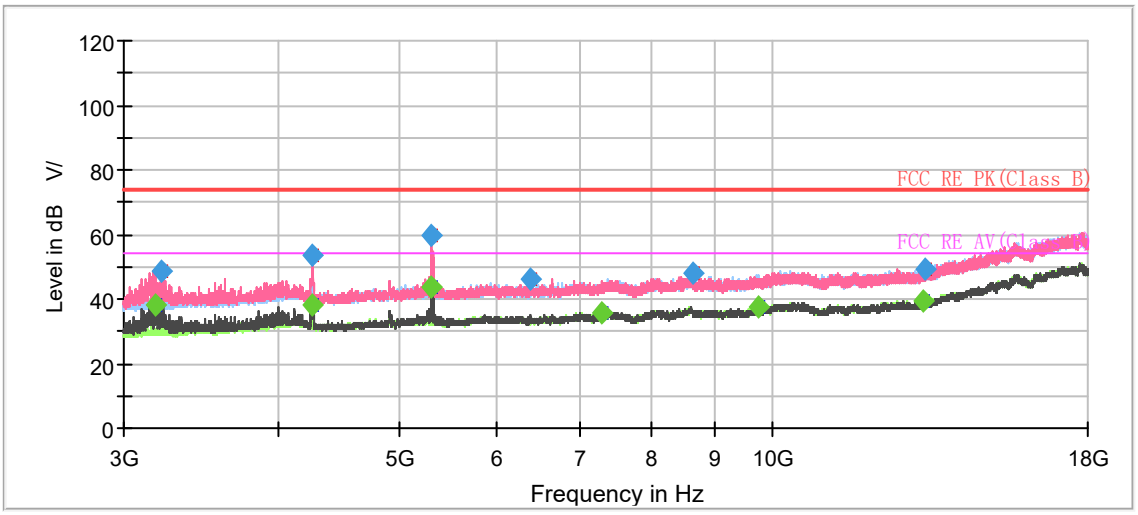
Remark: 1. Correction Factor = Antenna factor+ Insertion loss (cable loss + amplifier gain)

802.11g CH11



Note: The signal beyond the limit is carrier.

Radiates Emission from 1GHz to 3GHz

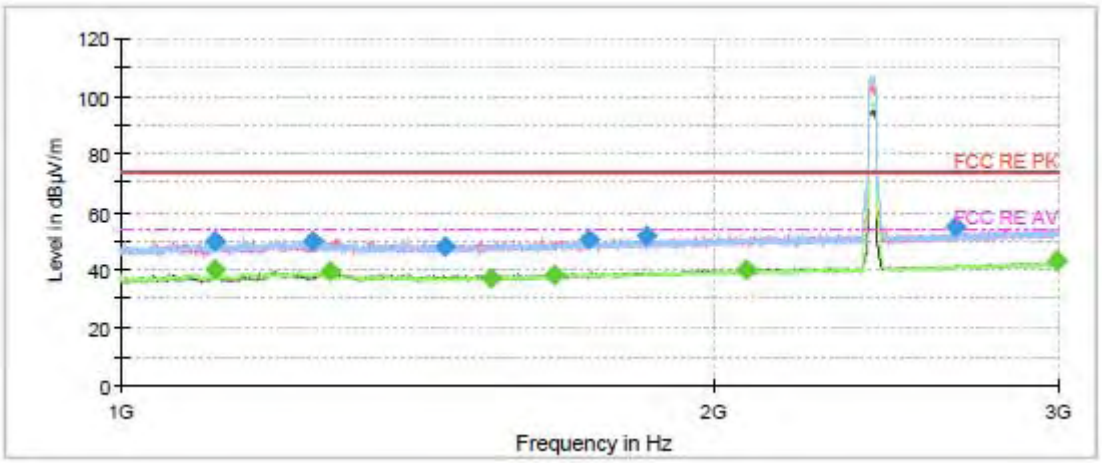


Radiates Emission from 3GHz to 18GHz

Frequency (MHz)	MaxPeak (dB μ V/m)	Average (dB μ V/m)	Limit (dB μ V/m)	Margin (dB)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
1063.133333	51.24	---	74.00	22.76	200.0	V	219.0	-8.0
1063.133333	---	39.66	54.00	14.34	200.0	V	219.0	-8.0
1349.933333	46.77	---	74.00	27.23	200.0	H	98.0	-6.5
1350.333333	---	36.52	54.00	17.48	200.0	H	138.0	-6.5
1496.400000	51.05	---	74.00	22.95	200.0	V	110.0	-5.6
1661.266667	---	40.71	54.00	13.29	200.0	V	343.0	-4.7
1999.200000	---	39.53	54.00	14.47	100.0	V	221.0	-2.7
1999.200000	49.16	---	74.00	24.84	100.0	V	221.0	-2.7
2130.800000	---	42.84	54.00	11.16	100.0	V	45.0	-2.1
2131.600000	54.61	---	74.00	19.39	100.0	V	45.0	-2.1
2656.333333	59.20	---	74.00	14.80	100.0	V	58.0	0.4
2656.333333	---	47.51	54.00	6.49	100.0	V	58.0	0.4

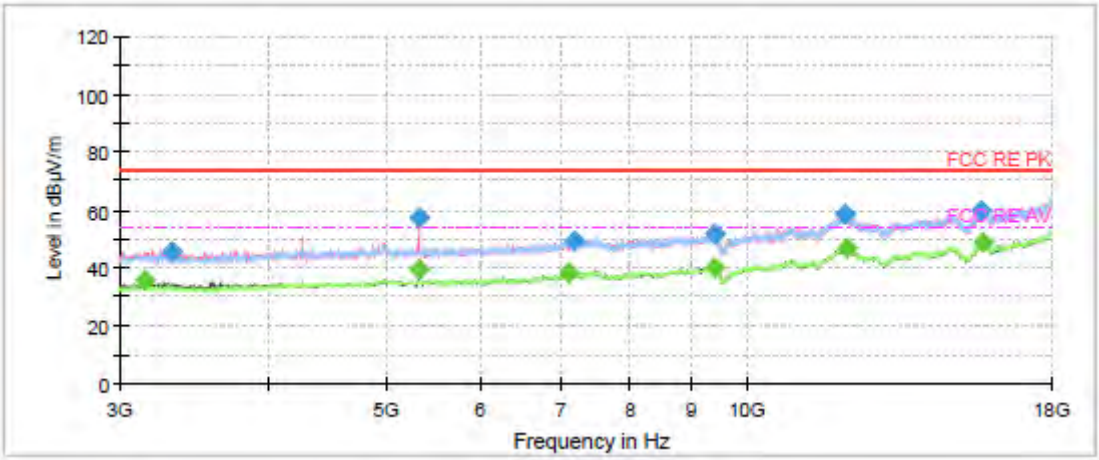
Remark: 1. Correction Factor = Antenna factor+ Insertion loss (cable loss + amplifier gain)

802.11n (HT20) CH1



Note: The signal beyond the limit is carrier.

Radiates Emission from 1GHz to 3GHz

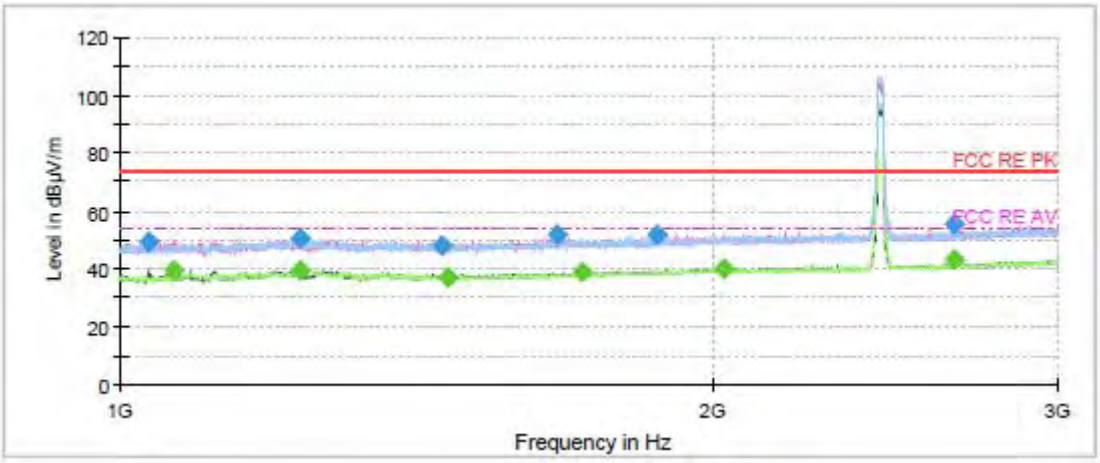


Radiates Emission from 3GHz to 18GHz

Frequency (MHz)	MaxPeak (dB μ V/m)	Average (dB μ V/m)	Limit (dB μ V/m)	Margin (dB)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
1116.750000	---	39.78	54.00	14.22	100.0	V	169.0	-10.6
1117.250000	49.93	---	74.00	24.07	100.0	V	174.0	-10.6
1252.500000	50.04	---	74.00	23.96	200.0	H	120.0	-9.9
1277.000000	---	39.50	54.00	14.50	200.0	V	78.0	-9.7
1463.250000	48.02	---	74.00	25.98	100.0	V	74.0	-8.5
1544.250000	---	36.88	54.00	17.12	200.0	V	58.0	-8.1
1661.750000	---	38.41	54.00	15.59	100.0	V	37.0	-7.4
1729.500000	50.51	---	74.00	23.49	200.0	H	116.0	-7.0
1851.500000	51.65	---	74.00	22.35	100.0	H	302.0	-6.3
2078.750000	---	39.75	54.00	14.25	200.0	V	300.0	-5.4
2656.750000	54.53	---	74.00	19.47	200.0	V	198.0	-3.9
2995.250000	---	42.88	54.00	11.12	200.0	V	351.0	-2.7

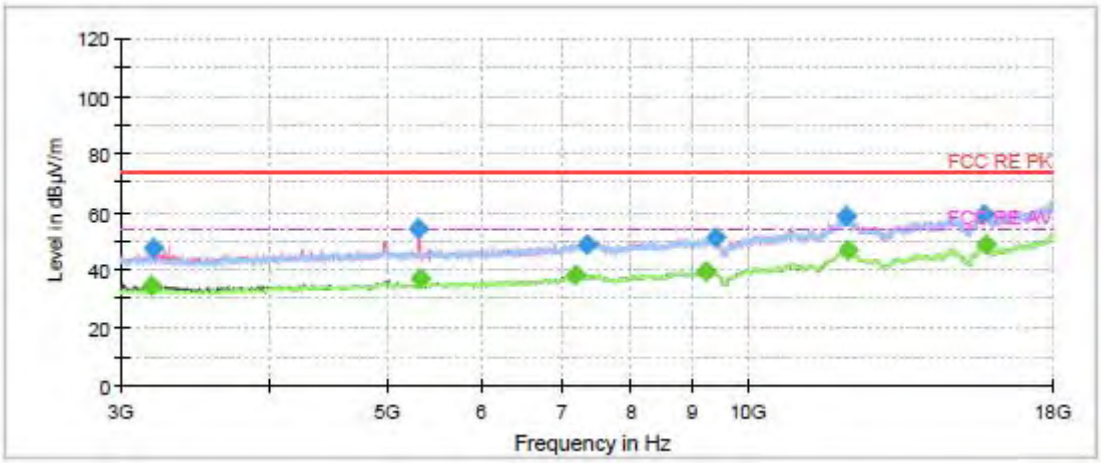
Remark: 1. Correction Factor = Antenna factor+ Insertion loss (cable loss + amplifier gain)

802.11n (HT20) CH6



Note: The signal beyond the limit is carrier.

Radiates Emission from 1GHz to 3GHz

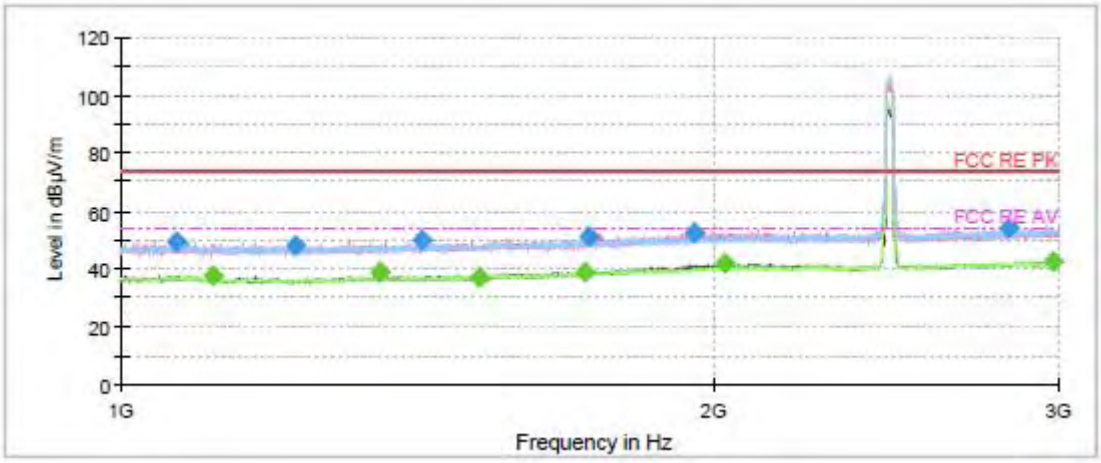


Radiates Emission from 3GHz to 18GHz

Frequency (MHz)	MaxPeak (dB μ V/m)	Average (dB μ V/m)	Limit (dB μ V/m)	Margin (dB)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
1033.250000	49.52	---	74.00	24.48	200.0	V	213.0	-10.8
1065.250000	---	39.66	54.00	14.34	200.0	V	216.0	-10.7
1235.500000	50.56	---	74.00	23.44	100.0	H	129.0	-10.0
1235.750000	---	39.40	54.00	14.60	100.0	H	129.0	-10.0
1458.500000	48.09	---	74.00	25.91	200.0	V	154.0	-8.6
1468.000000	---	36.96	54.00	17.04	100.0	V	91.0	-8.5
1668.000000	51.58	---	74.00	22.42	100.0	V	95.0	-7.3
1719.750000	---	38.78	54.00	15.22	200.0	V	355.0	-7.0
1877.750000	52.00	---	74.00	22.00	200.0	H	286.0	-6.2
2029.750000	---	39.98	54.00	14.02	100.0	V	146.0	-5.5
2656.250000	55.30	---	74.00	18.70	100.0	V	175.0	-3.9
2659.750000	---	43.23	54.00	10.77	100.0	V	175.0	-3.8

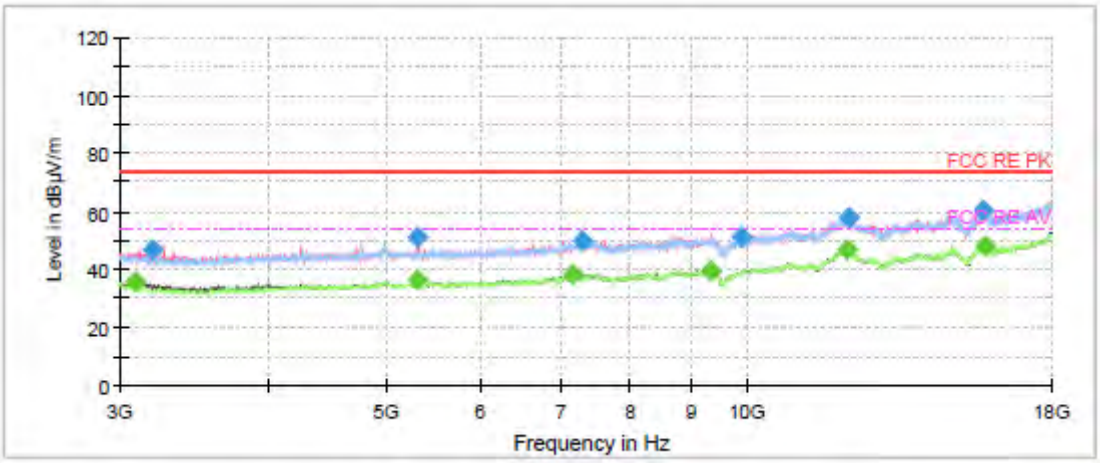
Remark: 1. Correction Factor = Antenna factor+ Insertion loss (cable loss + amplifier gain)

802.11n (HT20) CH11



Note: The signal beyond the limit is carrier.

Radiates Emission from 1GHz to 3GHz

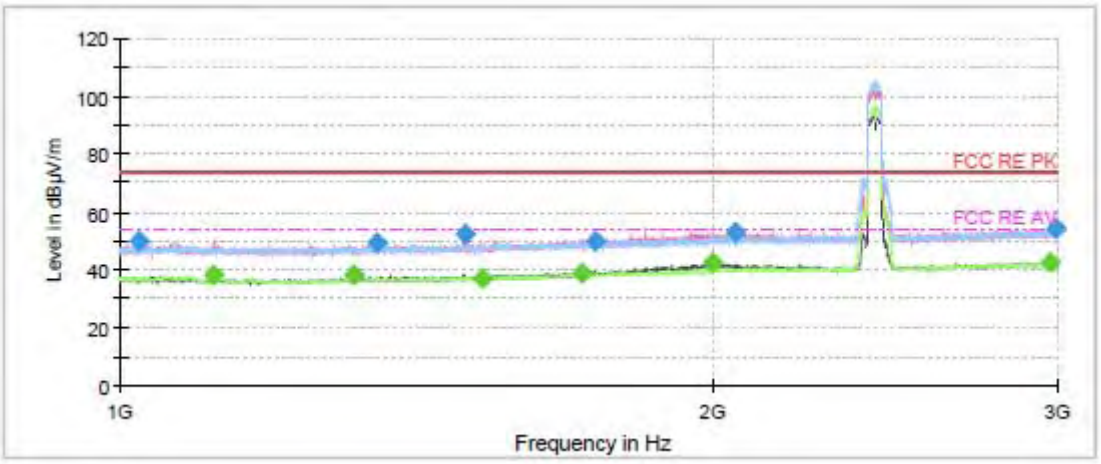


Radiates Emission from 3GHz to 18GHz

Frequency (MHz)	MaxPeak (dB μ V/m)	Average (dB μ V/m)	Limit (dB μ V/m)	Margin (dB)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
1066.750000	49.18	---	74.00	24.82	100.0	V	195.0	-10.7
1115.000000	---	37.82	54.00	16.18	100.0	V	19.0	-10.6
1225.500000	47.92	---	74.00	26.08	200.0	H	125.0	-10.1
1353.250000	---	38.69	54.00	15.31	200.0	V	171.0	-9.2
1421.500000	49.95	---	74.00	24.05	100.0	H	137.0	-8.8
1523.250000	---	37.21	54.00	16.79	200.0	V	312.0	-8.2
1723.250000	---	38.85	54.00	15.15	100.0	H	105.0	-7.0
1730.500000	51.04	---	74.00	22.96	100.0	V	7.0	-7.0
1957.000000	52.42	---	74.00	21.58	100.0	V	81.0	-5.8
2031.000000	---	42.07	54.00	11.93	100.0	V	85.0	-5.5
2829.000000	54.24	---	74.00	19.76	200.0	H	39.0	-3.2
2977.750000	---	42.59	54.00	11.41	200.0	V	272.0	-2.7

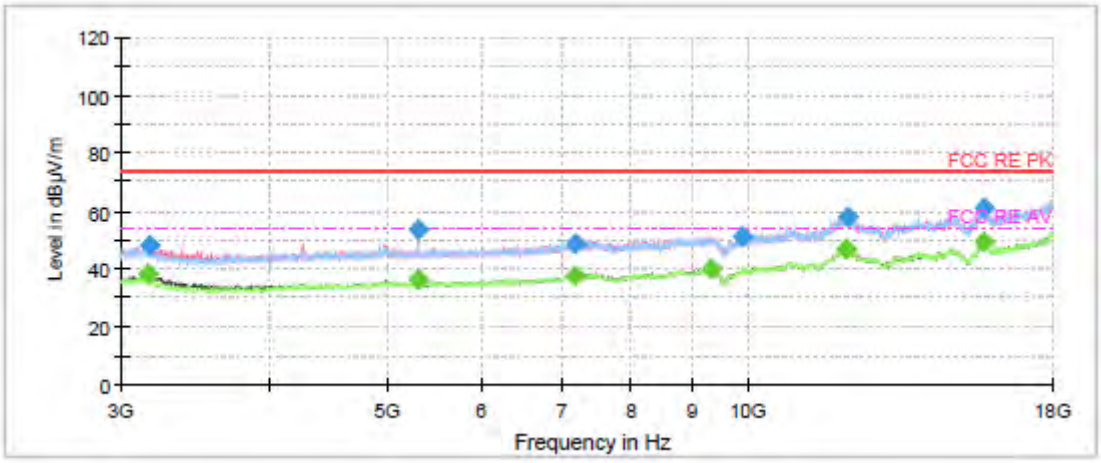
Remark: 1. Correction Factor = Antenna factor+ Insertion loss (cable loss + amplifier gain)

802.11n (HT40) CH3



Note: The signal beyond the limit is carrier.

Radiates Emission from 1GHz to 3GHz

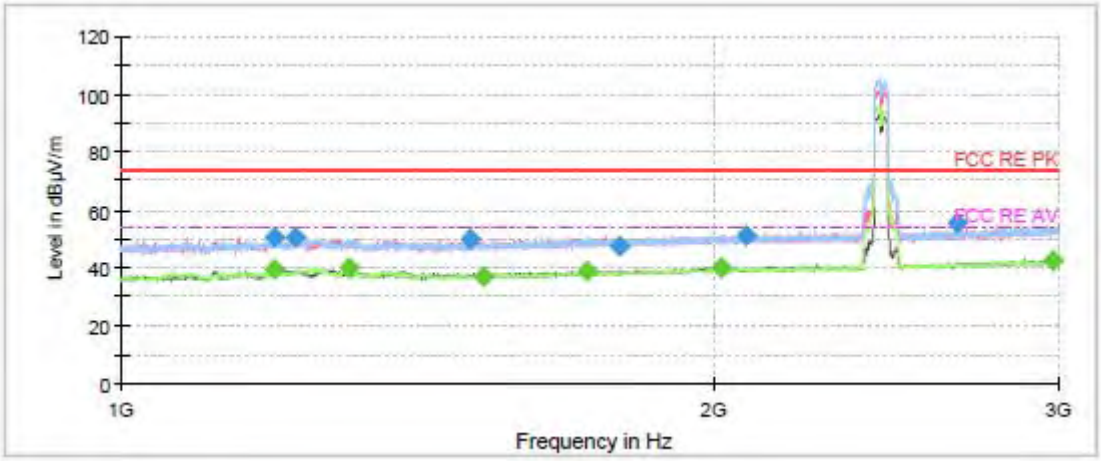


Radiates Emission from 3GHz to 18GHz

Frequency (MHz)	MaxPeak (dB μ V/m)	Average (dB μ V/m)	Limit (dB μ V/m)	Margin (dB)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
1023.000000	50.07	---	74.00	23.93	200.0	V	206.0	-10.8
1115.250000	---	38.27	54.00	15.73	100.0	V	168.0	-10.6
1314.250000	---	38.09	54.00	15.91	200.0	V	170.0	-9.4
1350.000000	49.10	---	74.00	24.90	200.0	V	162.0	-9.2
1499.250000	52.39	---	74.00	21.61	100.0	V	136.0	-8.4
1527.500000	---	36.90	54.00	17.10	200.0	V	308.0	-8.2
1718.750000	---	38.83	54.00	15.17	200.0	V	265.0	-7.0
1745.500000	49.85	---	74.00	24.15	200.0	H	183.0	-6.9
2002.500000	---	42.25	54.00	11.75	200.0	V	84.0	-5.6
2058.000000	52.71	---	74.00	21.29	200.0	V	96.0	-5.5
2972.000000	---	42.54	54.00	11.46	200.0	V	308.0	-2.7
2994.000000	54.25	---	74.00	19.75	100.0	H	202.0	-2.7

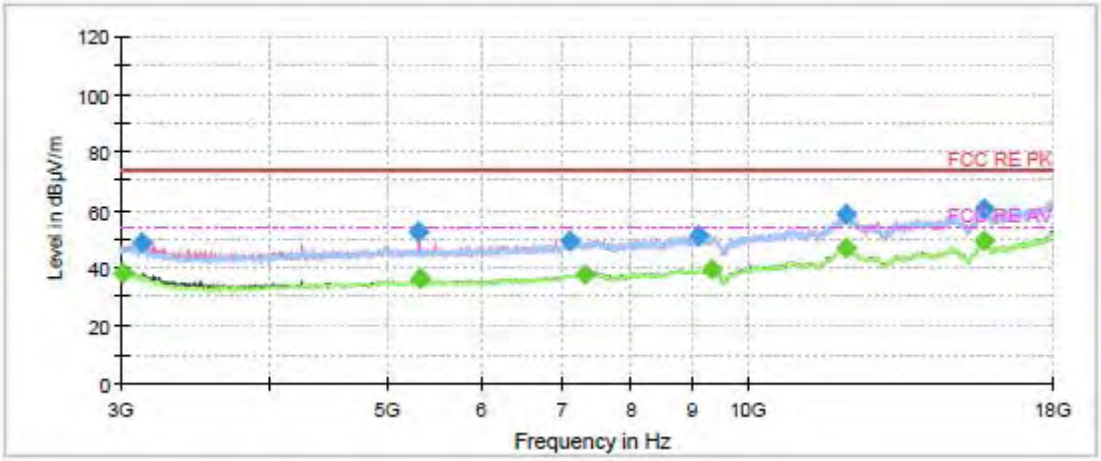
Remark: 1. Correction Factor = Antenna factor+ Insertion loss (cable loss + amplifier gain)

802.11n (HT40) CH6



Note: The signal beyond the limit is carrier.

Radiates Emission from 1GHz to 3GHz

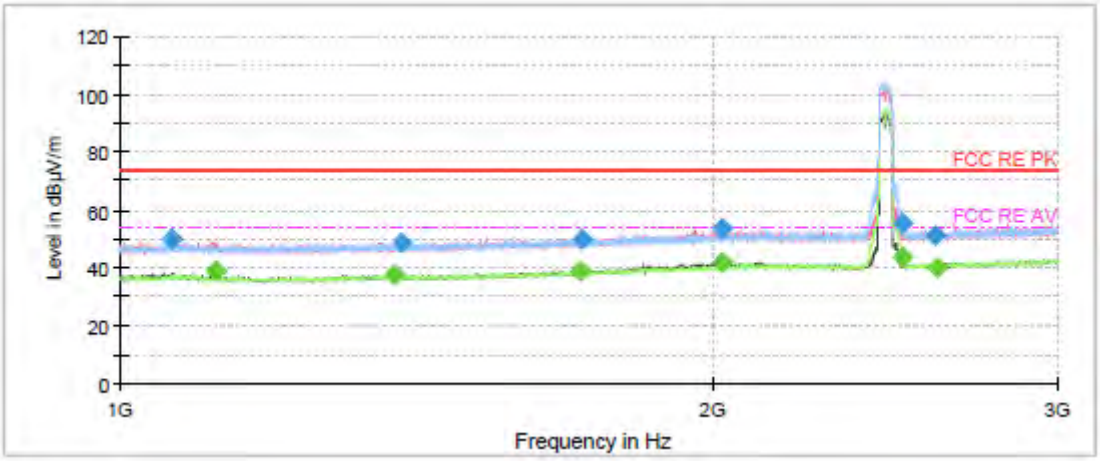


Radiates Emission from 3GHz to 18GHz

Frequency (MHz)	MaxPeak (dB μ V/m)	Average (dB μ V/m)	Limit (dB μ V/m)	Margin (dB)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
1195.750000	---	39.43	54.00	14.57	200.0	V	88.0	-10.2
1196.250000	50.55	---	74.00	23.45	200.0	V	80.0	-10.2
1225.750000	50.43	---	74.00	23.57	200.0	H	88.0	-10.1
1305.750000	---	39.69	54.00	14.31	100.0	H	124.0	-9.5
1504.500000	49.86	---	74.00	24.14	100.0	V	41.0	-8.3
1530.250000	---	37.09	54.00	16.91	200.0	V	160.0	-8.2
1724.750000	---	38.49	54.00	15.51	200.0	V	352.0	-7.0
1793.000000	47.65	---	74.00	26.35	200.0	V	356.0	-6.7
2019.250000	---	39.72	54.00	14.28	100.0	V	7.0	-5.5
2079.750000	51.28	---	74.00	22.72	100.0	H	195.0	-5.4
2662.500000	55.45	---	74.00	18.55	200.0	V	156.0	-3.8
2978.000000	---	42.73	54.00	11.27	100.0	H	100.0	-2.7

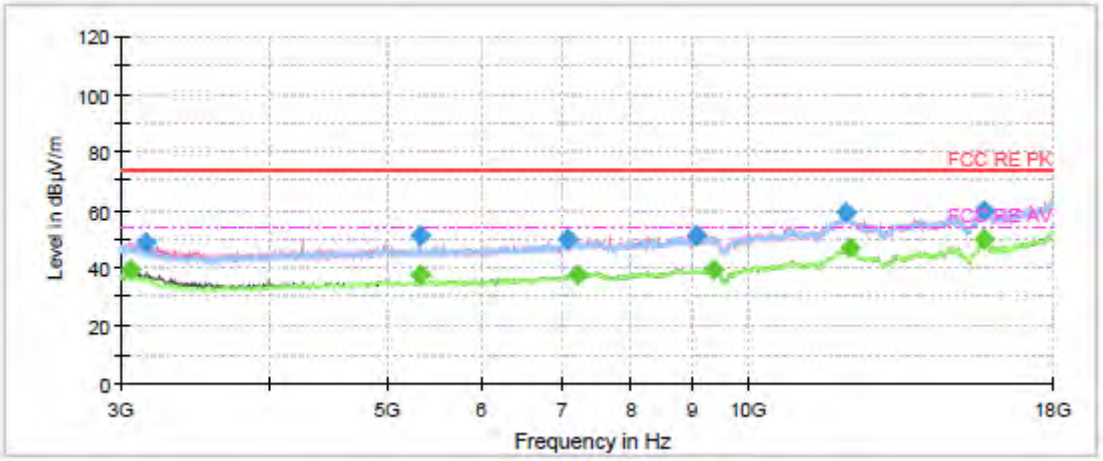
Remark: 1. Correction Factor = Antenna factor+ Insertion loss (cable loss + amplifier gain)

802.11n (HT40) CH9



Note: The signal beyond the limit is carrier.

Radiates Emission from 1GHz to 3GHz

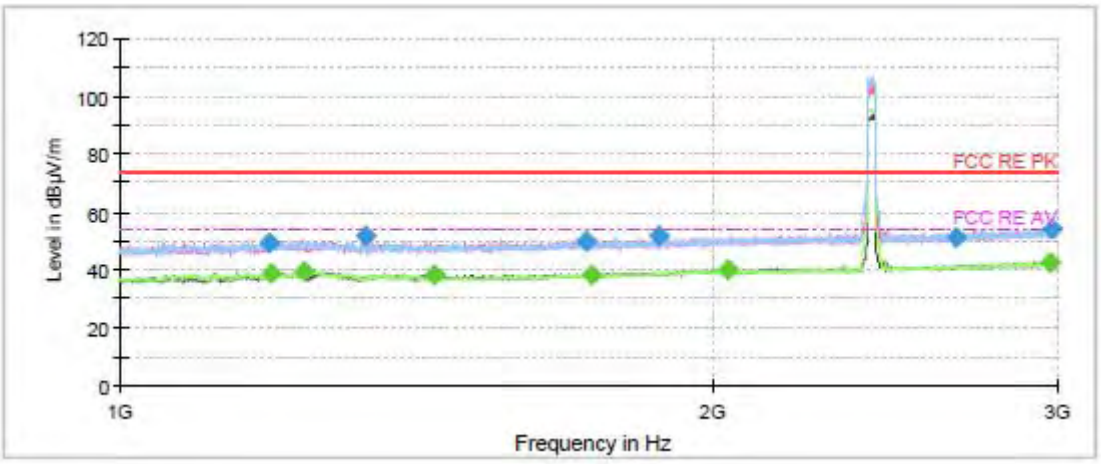


Radiates Emission from 3GHz to 18GHz

Frequency (MHz)	MaxPeak (dB μ V/m)	Average (dB μ V/m)	Limit (dB μ V/m)	Margin (dB)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
1062.750000	50.07	---	74.00	23.93	100.0	V	204.0	-10.7
1118.000000	---	38.84	54.00	15.16	100.0	V	165.0	-10.6
1378.500000	---	37.61	54.00	16.39	200.0	V	275.0	-9.1
1391.000000	48.92	---	74.00	25.08	200.0	V	275.0	-8.9
1715.250000	---	39.02	54.00	14.98	200.0	H	183.0	-7.1
1716.750000	50.13	---	74.00	23.87	200.0	H	0.0	-7.0
2025.250000	53.38	---	74.00	20.62	100.0	V	83.0	-5.5
2025.750000	---	41.90	54.00	12.10	100.0	V	87.0	-5.5
2498.250000	55.47	---	74.00	18.53	100.0	H	279.0	-4.5
2498.250000	---	43.55	54.00	10.45	100.0	H	279.0	-4.5
2599.000000	50.95	---	74.00	23.05	200.0	H	223.0	-4.1
2604.000000	---	40.29	54.00	13.71	200.0	H	100.0	-4.1

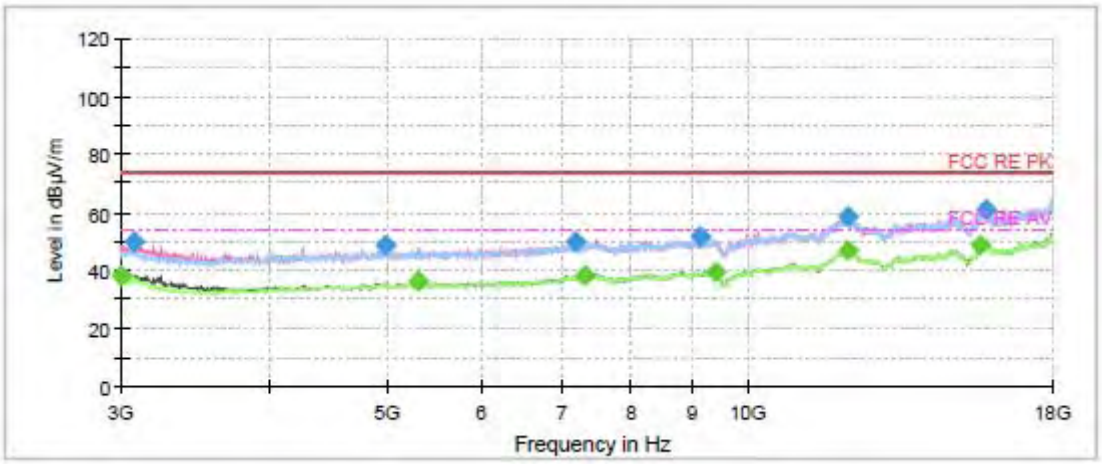
Remark: 1. Correction Factor = Antenna factor+ Insertion loss (cable loss + amplifier gain)

802.11ax (HE 20) CH1



Note: The signal beyond the limit is carrier.

Radiates Emission from 1GHz to 3GHz

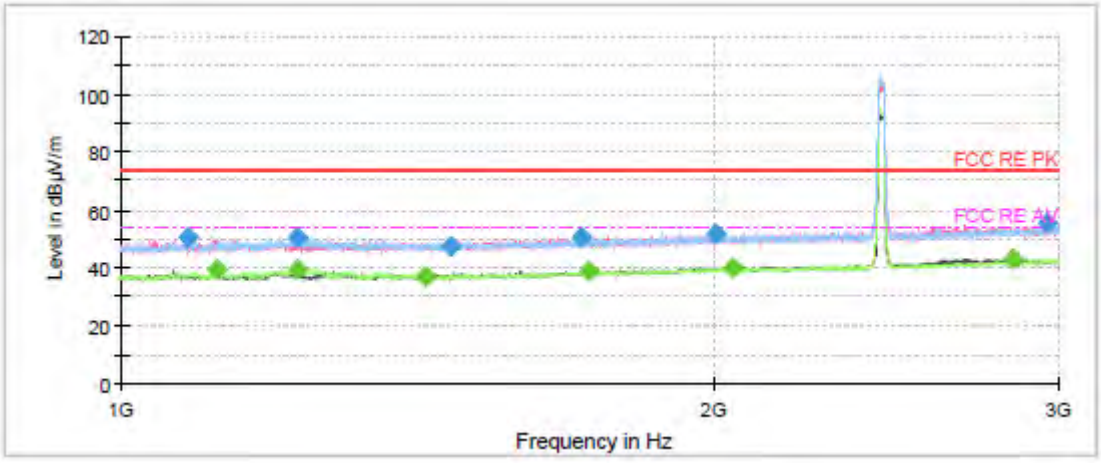


Radiates Emission from 3GHz to 18GHz

Frequency (MHz)	MaxPeak (dB μ V/m)	Average (dB μ V/m)	Limit (dB μ V/m)	Margin (dB)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
1192.750000	49.48	---	74.00	24.52	200.0	H	114.0	-10.2
1195.250000	---	38.96	54.00	15.04	200.0	V	79.0	-10.2
1239.500000	---	39.48	54.00	14.52	100.0	H	141.0	-9.9
1332.750000	51.50	---	74.00	22.50	200.0	V	167.0	-9.3
1445.500000	---	38.38	54.00	15.62	100.0	V	158.0	-8.6
1727.250000	49.92	---	74.00	24.08	200.0	V	298.0	-7.0
1737.000000	---	37.95	54.00	16.05	200.0	V	357.0	-7.0
1881.000000	51.50	---	74.00	22.50	200.0	H	206.0	-6.2
2037.500000	---	39.77	54.00	14.23	100.0	H	348.0	-5.5
2665.250000	51.28	---	74.00	22.72	200.0	V	294.0	-3.8
2971.750000	---	42.56	54.00	11.44	100.0	H	282.0	-2.7
2979.750000	54.29	---	74.00	19.71	200.0	V	240.0	-2.7

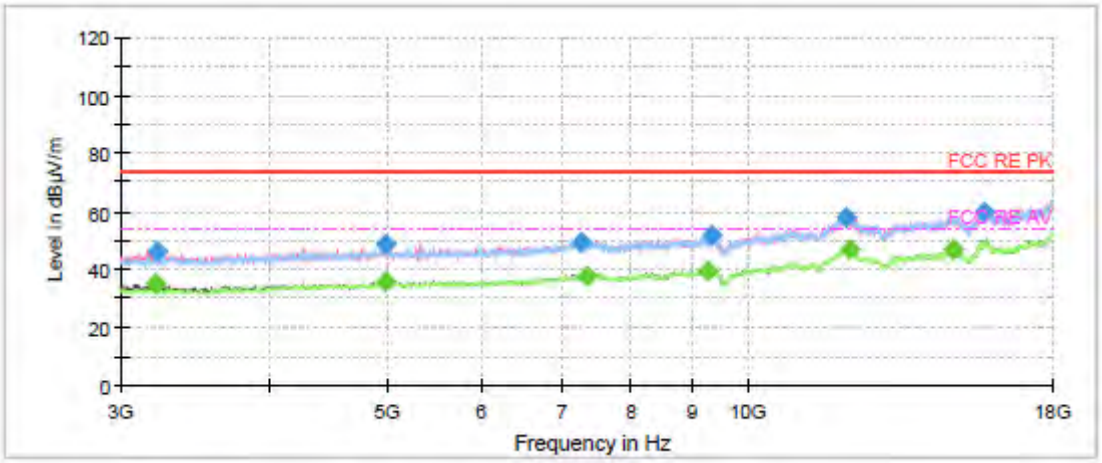
Remark: 1. Correction Factor = Antenna factor+ Insertion loss (cable loss + amplifier gain)

802.11ax (HE 20) CH6



Note: The signal beyond the limit is carrier.

Radiates Emission from 1GHz to 3GHz

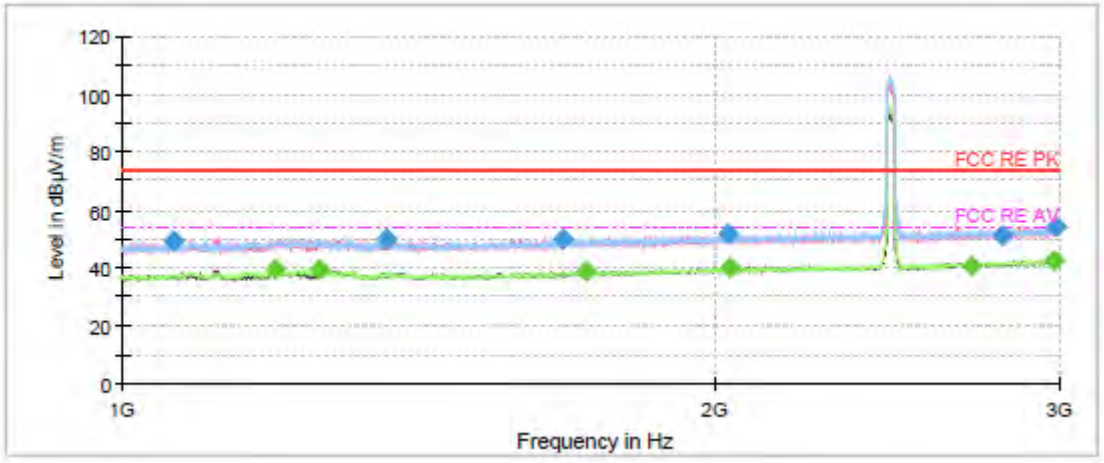


Radiates Emission from 3GHz to 18GHz

Frequency (MHz)	MaxPeak (dB μ V/m)	Average (dB μ V/m)	Limit (dB μ V/m)	Margin (dB)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
1081.500000	50.28	---	74.00	23.72	200.0	H	113.0	-10.7
1118.250000	---	39.41	54.00	14.59	100.0	V	165.0	-10.6
1228.500000	50.37	---	74.00	23.63	100.0	H	128.0	-10.0
1230.000000	---	39.45	54.00	14.55	100.0	H	136.0	-10.0
1427.750000	---	36.97	54.00	17.03	200.0	V	168.0	-8.7
1470.250000	47.26	---	74.00	26.74	100.0	H	147.0	-8.5
1715.750000	50.28	---	74.00	23.72	200.0	H	183.0	-7.1
1729.750000	---	38.62	54.00	15.38	100.0	V	85.0	-7.0
2005.250000	51.62	---	74.00	22.38	200.0	V	304.0	-5.6
2048.500000	---	39.80	54.00	14.20	200.0	V	120.0	-5.5
2840.250000	---	43.08	54.00	10.92	200.0	V	159.0	-3.2
2958.000000	55.32	---	74.00	18.68	100.0	H	96.0	-2.8

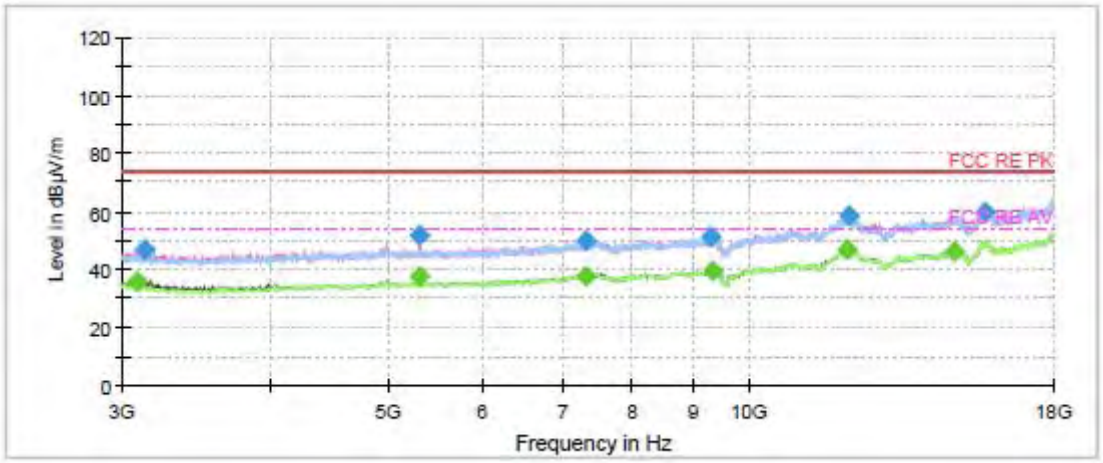
Remark: 1. Correction Factor = Antenna factor+ Insertion loss (cable loss + amplifier gain)

802.11ax (HE 20) CH11



Note: The signal beyond the limit is carrier.

Radiates Emission from 1GHz to 3GHz

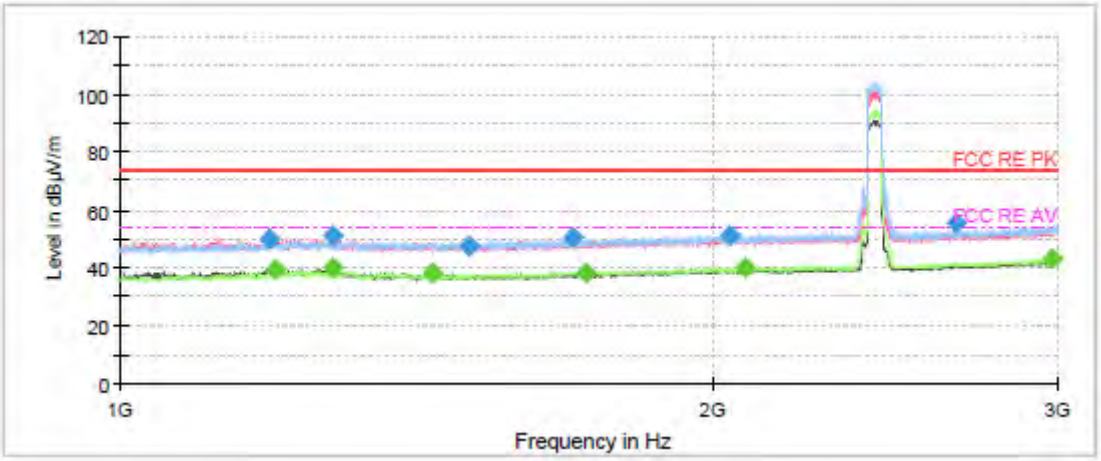


Radiates Emission from 3GHz to 18GHz

Frequency (MHz)	MaxPeak (dB μ V/m)	Average (dB μ V/m)	Limit (dB μ V/m)	Margin (dB)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
1062.000000	49.52	---	74.00	24.48	100.0	V	188.0	-10.7
1197.750000	---	39.24	54.00	14.76	200.0	V	356.0	-10.2
1260.000000	---	39.09	54.00	14.91	200.0	H	119.0	-9.8
1363.750000	50.06	---	74.00	23.94	200.0	H	127.0	-9.1
1678.250000	49.92	---	74.00	24.08	200.0	H	64.0	-7.3
1721.500000	---	38.67	54.00	15.33	200.0	V	0.0	-7.0
2033.250000	51.40	---	74.00	22.60	100.0	H	316.0	-5.5
2036.500000	---	39.70	54.00	14.30	200.0	V	344.0	-5.5
2703.750000	---	40.37	54.00	13.63	200.0	V	314.0	-3.7
2807.000000	51.08	---	74.00	22.92	200.0	V	348.0	-3.3
2977.500000	---	42.62	54.00	11.38	100.0	H	47.0	-2.7
2988.250000	54.28	---	74.00	19.72	200.0	H	48.0	-2.7

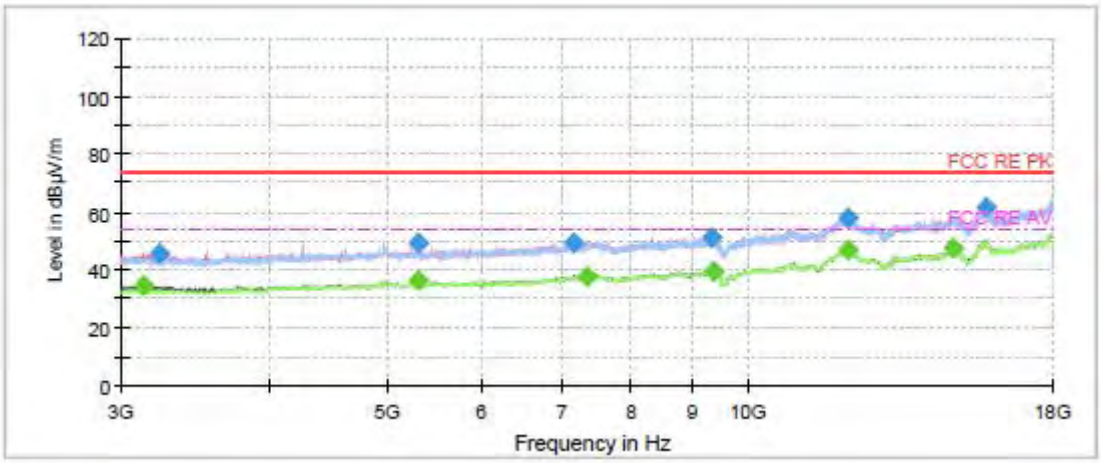
Remark: 1. Correction Factor = Antenna factor+ Insertion loss (cable loss + amplifier gain)

802.11ax (HE 40) CH3



Note: The signal beyond the limit is carrier.

Radiates Emission from 1GHz to 3GHz

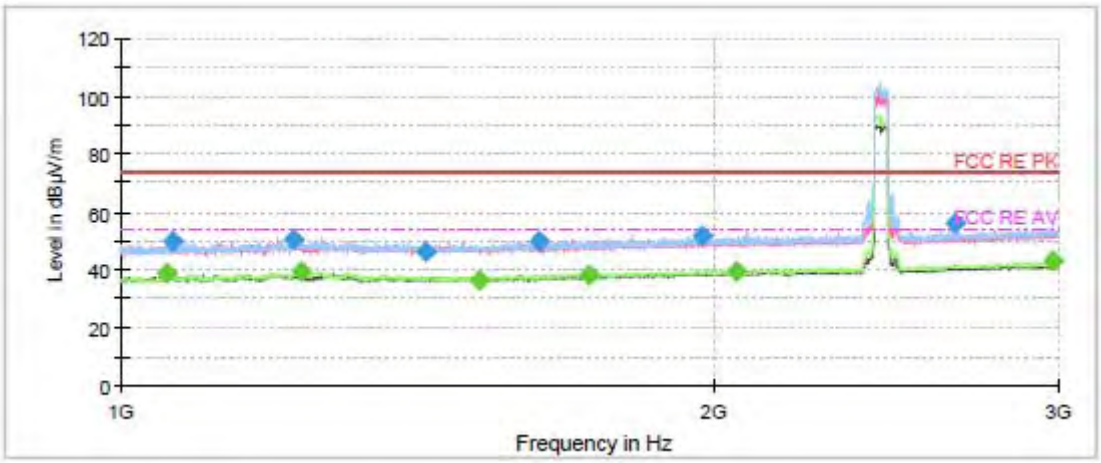


Radiates Emission from 3GHz to 18GHz

Frequency (MHz)	MaxPeak (dB μ V/m)	Average (dB μ V/m)	Limit (dB μ V/m)	Margin (dB)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
1190.750000	49.90	---	74.00	24.10	100.0	V	141.0	-10.2
1198.250000	---	39.56	54.00	14.44	100.0	V	137.0	-10.2
1282.750000	---	39.75	54.00	14.25	100.0	V	148.0	-9.7
1284.000000	50.79	---	74.00	23.21	100.0	V	144.0	-9.7
1442.500000	---	38.00	54.00	16.00	100.0	V	141.0	-8.7
1503.500000	47.33	---	74.00	26.67	200.0	V	138.0	-8.3
1697.750000	50.27	---	74.00	23.73	200.0	H	16.0	-7.2
1727.000000	---	38.28	54.00	15.72	200.0	H	131.0	-7.0
2042.000000	51.35	---	74.00	22.65	100.0	H	243.0	-5.5
2078.500000	---	39.79	54.00	14.21	200.0	H	88.0	-5.4
2663.000000	55.27	---	74.00	18.73	200.0	V	241.0	-3.8
2981.250000	---	43.15	54.00	10.85	100.0	H	151.0	-2.7

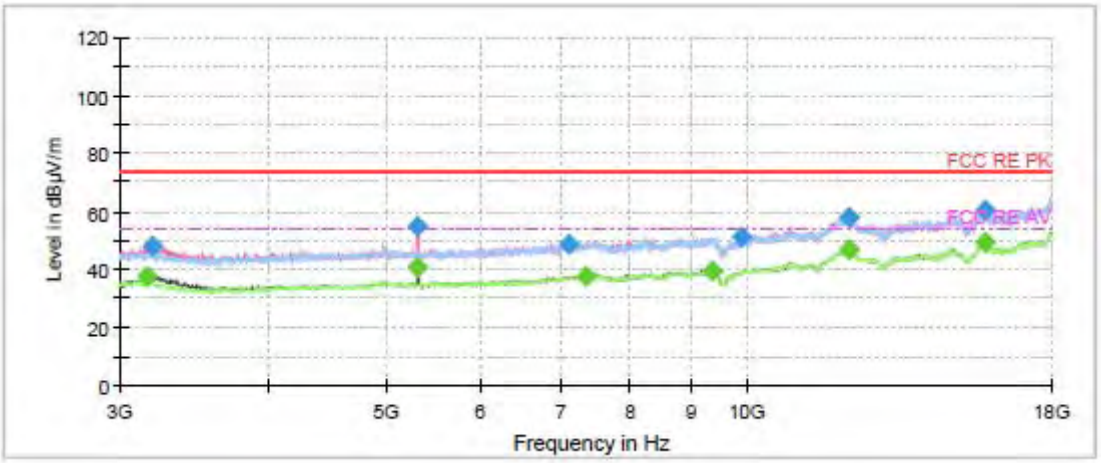
Remark: 1. Correction Factor = Antenna factor+ Insertion loss (cable loss + amplifier gain)

802.11ax (HE 40) CH6



Note: The signal beyond the limit is carrier.

Radiates Emission from 1GHz to 3GHz

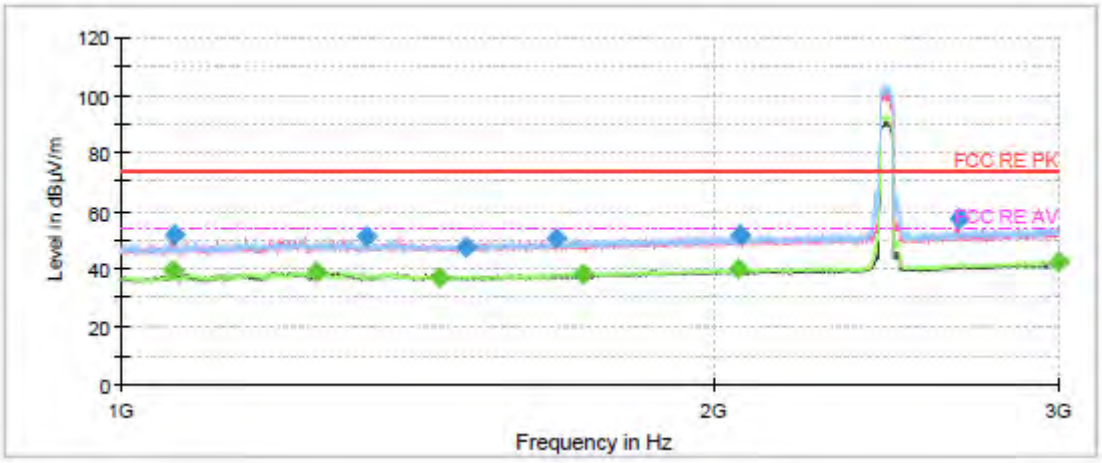


Radiates Emission from 3GHz to 18GHz

Frequency (MHz)	MaxPeak (dB μ V/m)	Average (dB μ V/m)	Limit (dB μ V/m)	Margin (dB)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
1055.750000	---	38.68	54.00	15.32	200.0	V	212.0	-10.8
1062.000000	49.73	---	74.00	24.27	200.0	H	146.0	-10.7
1224.500000	50.47	---	74.00	23.53	100.0	H	125.0	-10.1
1234.750000	---	39.31	54.00	14.69	100.0	H	133.0	-10.0
1430.750000	46.26	---	74.00	27.74	200.0	V	152.0	-8.7
1523.250000	---	36.56	54.00	17.44	200.0	V	140.0	-8.2
1631.750000	49.97	---	74.00	24.03	200.0	H	2.0	-7.6
1729.250000	---	38.41	54.00	15.59	200.0	H	127.0	-7.0
1977.250000	51.59	---	74.00	22.41	200.0	H	79.0	-5.7
2055.500000	---	39.60	54.00	14.40	200.0	H	242.0	-5.5
2656.250000	56.13	---	74.00	17.87	200.0	V	156.0	-3.9
2981.250000	---	42.79	54.00	11.21	200.0	H	88.0	-2.7

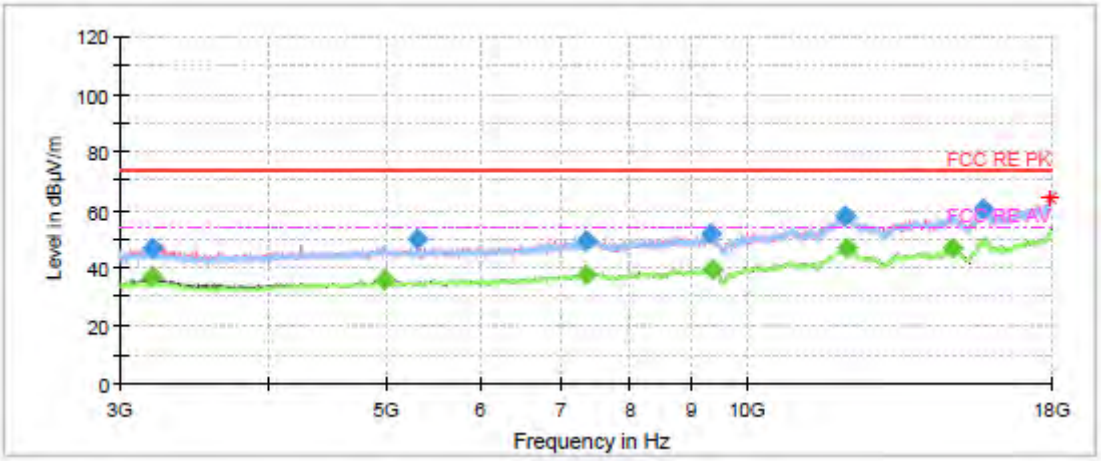
Remark: 1. Correction Factor = Antenna factor+ Insertion loss (cable loss + amplifier gain)

802.11ax (HE40) CH9



Note: The signal beyond the limit is carrier.

Radiates Emission from 1GHz to 3GHz

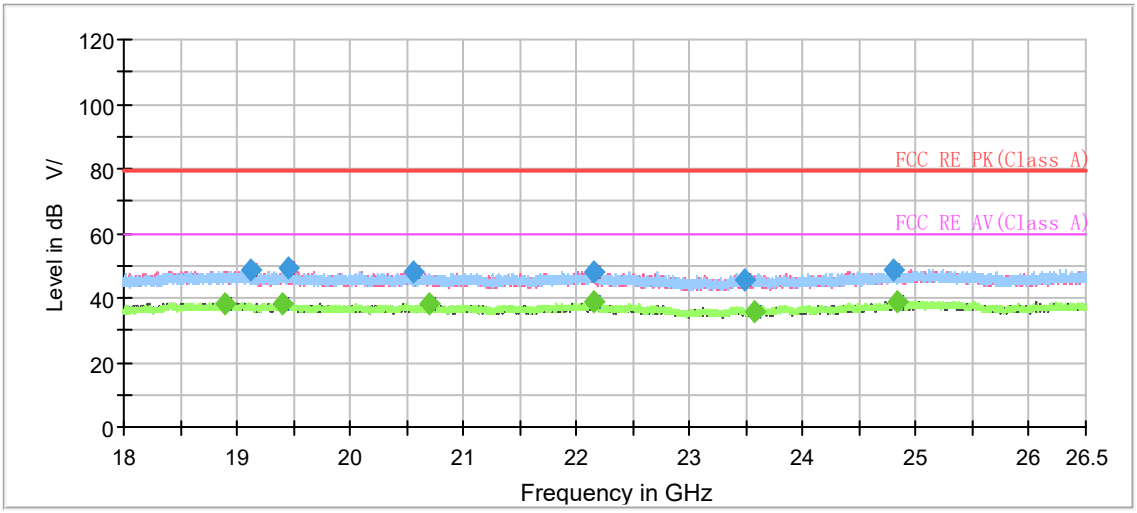


Radiates Emission from 3GHz to 18GHz

Frequency (MHz)	MaxPeak (dB μ V/m)	Average (dB μ V/m)	Limit (dB μ V/m)	Margin (dB)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
1063.250000	---	39.11	54.00	14.89	100.0	V	194.0	-10.7
1065.000000	51.42	---	74.00	22.58	100.0	V	202.0	-10.7
1257.250000	---	39.04	54.00	14.96	200.0	H	125.0	-9.8
1333.000000	51.06	---	74.00	22.94	200.0	V	162.0	-9.3
1452.000000	---	36.72	54.00	17.28	100.0	V	68.0	-8.6
1498.500000	47.44	---	74.00	26.56	100.0	V	134.0	-8.4
1666.750000	50.56	---	74.00	23.44	100.0	V	182.0	-7.3
1717.750000	---	38.39	54.00	15.61	100.0	H	297.0	-7.0
2060.250000	---	39.70	54.00	14.30	100.0	H	150.0	-5.5
2068.250000	51.41	---	74.00	22.59	200.0	V	257.0	-5.5
2666.500000	57.35	---	74.00	16.65	200.0	V	83.0	-3.8
3000.000000	---	42.64	54.00	11.36	100.0	H	218.0	-2.7

Remark: 1. Correction Factor = Antenna factor+ Insertion loss (cable loss + amplifier gain)

During the test, the Radiates Emission from 18GHz to 26.5GHz was performed in all modes with all channels, 802.11g CH11 are selected as the worst condition. The test data of the worst-case condition was recorded in this report.



Radiates Emission from 18GHz to 26.5GHz

5.7. Conducted Emission

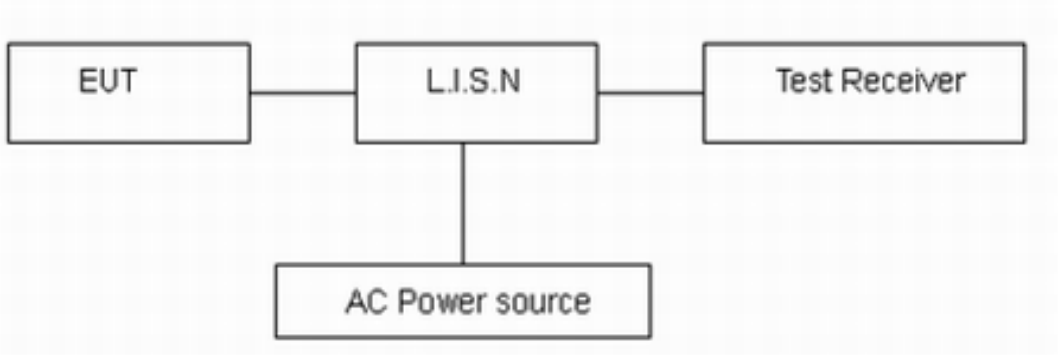
Ambient condition

Temperature	Relative humidity	Pressure
23°C ~25°C	45%~50%	101.5kPa

Methods of Measurement

The EUT is placed on a non-metallic table of 80cm height above the horizontal metal reference ground plane. During the test, the EUT was operating in its typical mode. The test method is according to ANSI C63.10. Connect the AC power line of the EUT to the L.I.S.N. Use EMI receiver to detect the average and Quasi-peak value. RBW is set to 9 kHz, VBW is set to 30kHz.
The measurement result should include both L line and N line.
The test is in transmitting mode.

Test Setup



Note: AC Power source is used to change the voltage 110V/60Hz.

Limits

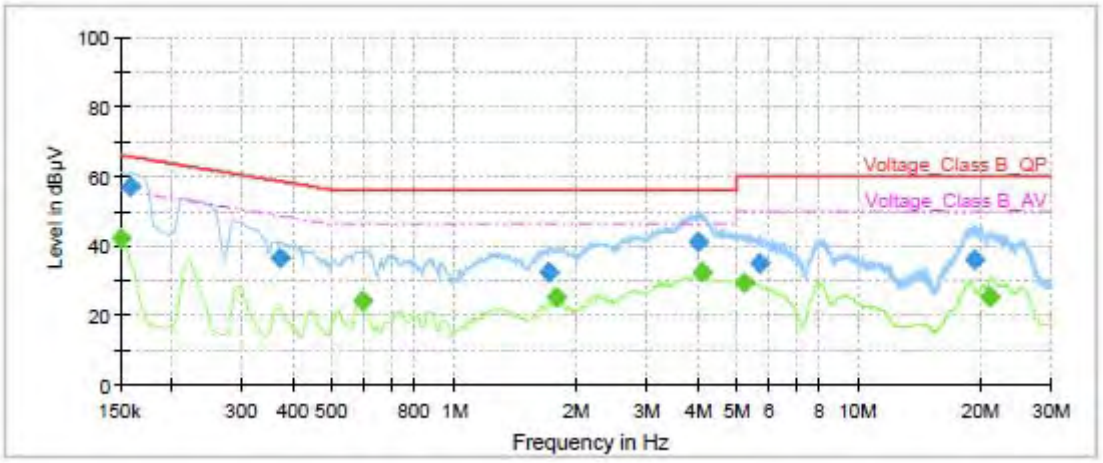
Frequency (MHz)	Conducted Limits(dBμV)	
	Quasi-peak	Average
0.15 - 0.5	66 to 56 *	56 to 46*
0.5 - 5	56	46
5 - 30	60	50
*: Decreases with the logarithm of the frequency.		

Measurement Uncertainty

The assessed measurement uncertainty to ensure 95% confidence level for the normal distribution is with the coverage factor k = 1.96, U= 2.69 dB.

Test Results:

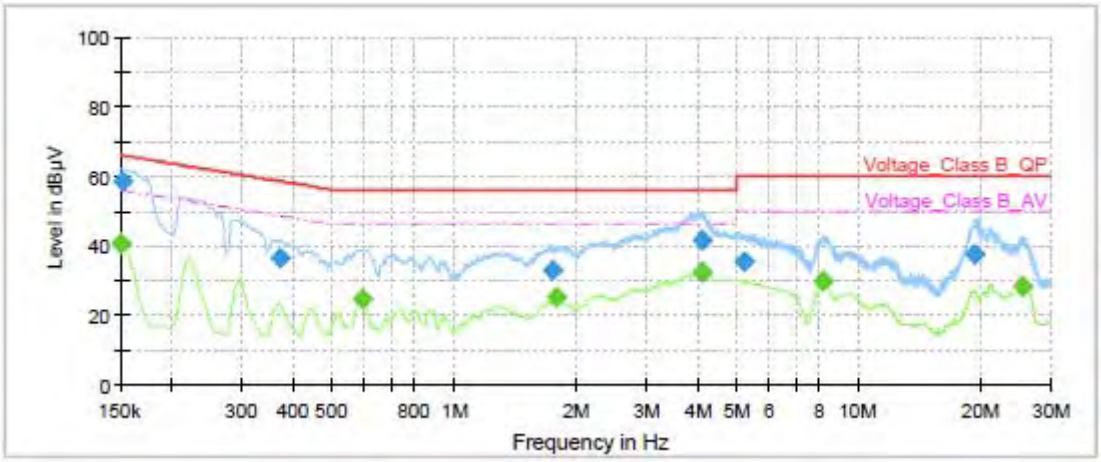
Following plots, Blue trace uses the peak detection and Green trace uses the average detection. During the test, the Conducted Emission was performed in all modes with all channels, 802.11g, Channel 11 are selected as the worst condition. The test data of the worst-case condition was recorded in this report.



Frequency (MHz)	QuasiPeak (dBµV)	Average (dBµV)	Limit (dBµV)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Line	Filter	Corr. (dB)
0.15	---	41.95	56.00	14.05	70.0	9.000	L1	ON	21
0.16	56.79	---	65.52	8.73	70.0	9.000	L1	ON	21
0.37	36.25	---	58.49	22.24	70.0	9.000	L1	ON	21
0.59	---	24.03	46.00	21.97	70.0	9.000	L1	ON	20
1.72	32.24	---	56.00	23.76	70.0	9.000	L1	ON	20
1.78	---	24.96	46.00	21.04	70.0	9.000	L1	ON	20
4.03	41.28	---	56.00	14.72	70.0	9.000	L1	ON	19
4.10	---	32.11	46.00	13.89	70.0	9.000	L1	ON	19
5.20	---	29.25	50.00	20.75	70.0	9.000	L1	ON	19
5.71	34.94	---	60.00	25.06	70.0	9.000	L1	ON	19
19.41	36.04	---	60.00	23.96	70.0	9.000	L1	ON	20
21.16	---	25.32	50.00	24.68	70.0	9.000	L1	ON	20

Remark: Correct factor=cable loss + LISN factor

L line Conducted Emission from 150 KHz to 30 MHz



Frequency (MHz)	QuasiPeak (dBµV)	Average (dBµV)	Limit (dBµV)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Line	Filter	Corr. (dB)
0.15	---	40.55	56.00	15.45	70.0	9.000	N	ON	21
0.15	58.70	---	65.88	7.18	70.0	9.000	N	ON	21
0.37	36.66	---	58.44	21.78	70.0	9.000	N	ON	21
0.59	---	24.37	46.00	21.63	70.0	9.000	N	ON	20
1.76	32.96	---	56.00	23.04	70.0	9.000	N	ON	20
1.78	---	25.19	46.00	20.81	70.0	9.000	N	ON	20
4.10	41.40	---	56.00	14.60	70.0	9.000	N	ON	19
4.13	---	32.30	46.00	13.70	70.0	9.000	N	ON	19
5.20	35.64	---	60.00	24.36	70.0	9.000	N	ON	19
8.16	---	29.87	50.00	20.13	70.0	9.000	N	ON	20
19.44	37.27	---	60.00	22.73	70.0	9.000	N	ON	20
25.59	---	28.02	50.00	21.98	70.0	9.000	N	ON	20

Remark: Correct factor=cable loss + LISN factor

N line Conducted Emission from 150 KHz to 30 MHz

6. Main Test Instruments

Name	Manufacturer	Type	Serial Number	Calibration Date	Expiration Date
Spectrum Analyzer	R&S	FSV30	100815	2020-12-13	2021-12-12
EMI Test Receiver	R&S	ESCI	100948	2021-05-15	2022-05-14
Loop Antenna	SCHWARZBECK	FMZB1519	1519-047	2020-04-02	2023-04-01
TRILOG Broadband Antenna	SCHWARZBECK	VULB 9163	391	2019-12-16	2022-12-15
Horn Antenna	R&S	HF907	102723	2018-08-11	2021-08-10
Horn Antenna	ETS-Lindgren	3160-09	00102643	2018-06-20	2023-06-19
EMI Test Receiver	R&S	ESR	101667	2021-05-16	2022-05-15
LISN	R&S	ENV216	101171	2018-12-15	2021-12-14
Spectrum Analyzer	Agilent	N9010A	MY47191109	2021-05-15	2022-05-14
Spectrum Analyzer	R&S	FSV40	101298	2021-05-15	2022-05-14
Power Sensor	R&S	NRP18S	101955	2021-05-15	2022-05-14
Software	R&S	EMC32	9.26.0	/	/

********END OF REPORT ********

ANNEX A: The EUT Appearance

The EUT Appearance are submitted separately.

ANNEX B: Test Setup Photos

The Test Setup Photos are submitted separately.