



RF TEST REPORT

Applicant ZTE Corporation
FCC ID SRQ-A2023PG
Product 5G NR Multi model smart phone
Model ZTE A2023PG
Report No. R2205A0428-R4
Issue Date June 10, 2022

TA Technology (Shanghai) Co., Ltd. tested the above equipment in accordance with the requirements in **FCC CFR47 Part 15C (2021)**. The test results show that the equipment tested is capable of demonstrating compliance with the requirements as documented in this report.

Prepared by: Peng Tao

Approved by: Kai Xu

TA Technology (Shanghai) Co., Ltd.

No.145, Jintang Rd, Tangzhen Industry Park, Pudong Shanghai, China

TEL: +86-021-50791141/2/3

FAX: +86-021-50791141/2/3-8000



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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: March 17, 2022 ~ May 11, 2022			
Date of Sample Received: March 17, 2022			
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, #55 Keji Road South, Hi-Tech Industrial Park, Nanshan District, Shenzhen, China
Manufacturer	ZTE Corporation
Manufacturer address	ZTE Plaza, #55 Keji Road South, Hi-Tech Industrial Park, Nanshan District, Shenzhen, China

2.2. General information

EUT Description	
Model	ZTE A2023PG
SN	327324440042
Hardware Version	ZTE A2023PGHW1.0
Software Version	MyOS12.0.2_A2023PG_GLB
Power Supply	Battery / AC adapter
Antenna Type	Internal Antenna
Antenna Connector	A permanently attached antenna (meet with the standard FCC Part 15.203 requirement)
Antenna Gain	Antenna 1: -1.70 dBi Antenna 2: -1.70 dBi
additional beamforming gain	NA
Operating Frequency Range(s)	802.11b/g/n(HT20)/ ax(HE20): 2412 ~ 2462 MHz 802.11n(HT40)/ ax(HE40): 2422 ~ 2452 MHz Bluetooth LE V5.2: 2402 ~2480 MHz
Modulation Type	802.11b: DSSS 802.11g/n(HT20/HT40): OFDM 802.11ax (HE20/HE40): OFDM Bluetooth LE: GFSK
Max. Conducted Power	Wi-Fi 2.4G: 21.41dBm Bluetooth LE: 9.09dBm
EUT Accessory	
Adapter	Manufacturer: ShenZhen KunXing Technology Co., Ltd. Model: STC-A59152050AC-Z
Battery	Manufacturer: Zhuhai Cosmx Battery Co., Ltd. Model: Li3949T44P8h806459



Earphone 1	Manufacturer: JUWEI ELECTRONICS CO.,LTD Model: JWEP1092-Z01
Earphone 2	Manufacturer: ShenZhen FDC Electronic Co.,Ltd Model: DEM-9A
USB Cable 1	Manufacturer: King Power Electronics Co., Ltd Model: TC20-TC20-W-100-M-6A-HSF
USB Cable 2	Manufacturer: Luxshare-ICT Co., Ltd Model: TC20-TC20-W-100-M-6A-HSF
Type-C to 3.5 mm Headphone Jack	Manufacturer: JUWEI ELECTRONICS CO., LTD Model: 080503000100
Note: 1. The EUT is sent from the applicant to TA and the information of the EUT is declared by the applicant. 2. There is more than one USB cable, each one should be applied throughout the compliance test respectively, and however, only the worst case (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 (2021) 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 HE40
6dB Bandwidth	O	--	--
Band Edge	O	--	--
Power Spectral Density	O	O	802.11n HT20 802.11n HT40 802.11ax HE20 802.11ax HE40
Spurious RF Conducted Emissions	O	--	--
Unwanted Emissions	802.11b/g	--	802.11n HT20 802.11n HT40 802.11ax HE20 802.11ax HE40
Conducted Emission	802.11b/g	--	802.11n HT20 802.11n HT40 802.11ax HE20 802.11ax HE40
Note: "O": test all bands			

5. Test Case Results

5.1. Maximum output power

Ambient condition

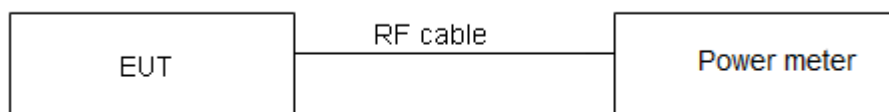
Temperature	Relative humidity	Pressure
23°C ~25°C	45%~50%	101.5kPa

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	$\leq 1W$ (30dBm)
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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	802.11ax HE20	Channel	802.11n HT40	802.11ax HE40
Antenna 1	CH1	20	19.5	19	19	CH3	18.5	18.5
	CH6	20	19.5	19	19	CH6	18.5	18.5
	CH11	20	19.5	19	19	CH9	18.5	18.5
Antenna 2	CH1	20	19.5	19	19	CH3	18.5	18.5
	CH6	20	19.5	19	19	CH6	18.5	18.5
	CH11	20	19.5	19	19	CH9	18.5	18.5
MIMO Antenna Power Index								
Antenna	Channel	802.11b	802.11g	802.11n HT20	802.11a x HE20	Channel	802.11n HT40	802.11ax HE40
Antenna 1	CH1	--	--	19	19	CH3	18.5	18.5
	CH6	--	--	19	19	CH6	18.5	18.5
	CH11	--	--	19	19	CH9	18.5	18.5
Antenna 2	CH1	--	--	19	19	CH3	18.5	18.5
	CH6	--	--	19	19	CH6	18.5	18.5
	CH11	--	--	19	19	CH9	18.5	18.5

Test Mode	T _{on} (ms)	T _(on+off) (ms)	Duty cycle	Duty cycle correction Factor(dB)
802.11b	1.00	1.00	1.00	0.00
802.11g	1.00	1.00	1.00	0.00
802.11n HT20	1.00	1.00	1.00	0.00
802.11n HT40	1.00	1.00	1.00	0.00
802.11ax HE20	1.00	1.00	1.00	0.00
802.11ax HE40	1.00	1.00	1.00	0.00
Bluetooth LE (1M)	0.39	0.62	0.62	2.06
Bluetooth LE (2M)	0.20	0.63	0.32	4.93
Note: when Duty cycle ≥ 0.98 , Duty cycle correction Factor not required.				

Test Mode	Carrier frequency (MHz))/ Channel	Average Power Measured (dBm)	Average Power with duty factor (dBm)	Limit (dBm)	Conclusion
Bluetooth (Low Energy) (1M)	2402/CH0	6.19	8.25	30	PASS
	2440/CH19	6.40	8.46	30	PASS
	2480/CH39	6.66	8.72	30	PASS
Bluetooth (Low Energy) (2M)	2402/CH0	3.77	8.70	30	PASS
	2440/CH19	4.16	9.09	30	PASS
	2480/CH39	2.91	7.84	30	PASS
Note: Average Power with duty factor = Average Power Measured +Duty cycle correction factor					

SISO Antenna 1

Test Mode	Carrier frequency (MHz))/ Channel	Average Power Measured (dBm)	Average Power with duty factor (dBm)	Limit (dBm)	Conclusion
802.11b	2412/CH 1	19.79	19.79	30	PASS
	2437/CH 6	19.60	19.60	30	PASS
	2462/CH11	19.58	19.58	30	PASS
802.11g	2412/CH 1	18.91	18.91	30	PASS
	2437/CH 6	18.93	18.93	30	PASS
	2462/CH11	19.06	19.06	30	PASS
802.11n HT20	2412/CH 1	18.38	18.38	30	PASS
	2437/CH 6	18.57	18.57	30	PASS
	2462/CH11	18.43	18.43	30	PASS
802.11n HT40	2422/CH3	18.11	18.11	30	PASS
	2437/CH6	18.27	18.27	30	PASS
	2452/CH9	17.92	17.92	30	PASS
802.11ax HE20	2412/CH 1	18.31	18.31	30	PASS
	2437/CH 6	18.46	18.46	30	PASS
	2462/CH11	18.48	18.48	30	PASS
802.11ax HE40	2422/CH3	17.96	17.96	30	PASS
	2437/CH6	18.18	18.18	30	PASS
	2452/CH9	17.82	17.82	30	PASS
Note: Average Power with duty factor = Average Power Measured +Duty cycle correction factor					

**SISO Antenna 2**

Test Mode	Carrier frequency (MHz))/ Channel	Average Power Measured (dBm)	Average Power with duty factor (dBm)	Limit (dBm)	Conclusion
802.11b	2412/CH 1	19.53	19.53	30	PASS
	2437/CH 6	19.27	19.27	30	PASS
	2462/CH11	19.21	19.21	30	PASS
802.11g	2412/CH 1	18.90	18.90	30	PASS
	2437/CH 6	17.97	17.97	30	PASS
	2462/CH11	18.09	18.09	30	PASS
802.11n HT20	2412/CH 1	18.19	18.19	30	PASS
	2437/CH 6	17.83	17.83	30	PASS
	2462/CH11	18.07	18.07	30	PASS
802.11n HT40	2422/CH3	17.43	17.43	30	PASS
	2437/CH6	17.91	17.91	30	PASS
	2452/CH9	16.97	16.97	30	PASS
802.11ax HE20	2412/CH 1	17.48	17.48	30	PASS
	2437/CH 6	17.22	17.22	30	PASS
	2462/CH11	17.26	17.26	30	PASS
802.11ax HE40	2422/CH3	17.29	17.29	30	PASS
	2437/CH6	17.19	17.19	30	PASS
	2452/CH9	16.87	16.87	30	PASS
Note: Average Power with duty factor = Average Power Measured +Duty cycle correction factor					

MIMO

Test Mode	Carrier frequency (MHz) / Channel	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/CH 1	18.37	18.37	18.16	18.16	21.28	30	PASS
	2437/CH 6	18.32	18.32	18.43	18.43	21.39	30	PASS
	2462/CH11	18.48	18.48	18.32	18.32	21.41	30	PASS
802.11n HT40	2422/CH3	18.07	18.07	18.16	18.16	21.13	30	PASS
	2437/CH6	18.18	18.18	18.13	18.13	21.17	30	PASS
	2452/CH9	17.92	17.92	17.77	17.77	20.86	30	PASS
802.11ax HE20	2412/CH 1	18.30	18.30	18.17	18.17	21.25	30	PASS
	2437/CH 6	18.28	18.28	18.37	18.37	21.34	30	PASS
	2462/CH11	18.37	18.37	18.26	18.26	21.33	30	PASS
802.11ax HE40	2422/CH3	18.07	18.07	18.11	18.11	21.10	30	PASS
	2437/CH6	18.14	18.14	18.07	18.07	21.12	30	PASS
	2452/CH9	17.85	17.85	17.67	17.67	20.77	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. Direction gain calculation according to KDB662911 D01 Multiple Transmitter Output v02r01 F)2)a)(ii): If all antennas have the same gain, directional gain = $G_{ANT} = -1.7\text{dBi} < 6\text{dBi}$. So the limit is 30dBm

5.2. 99% Bandwidth and 6dB Bandwidth

Ambient condition

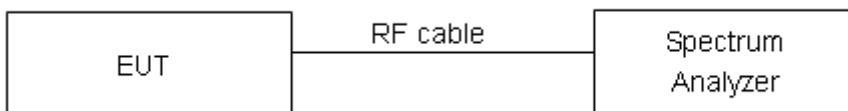
Temperature	Relative humidity	Pressure
23°C ~25°C	45%~50%	101.5kPa

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
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Measurement Uncertainty

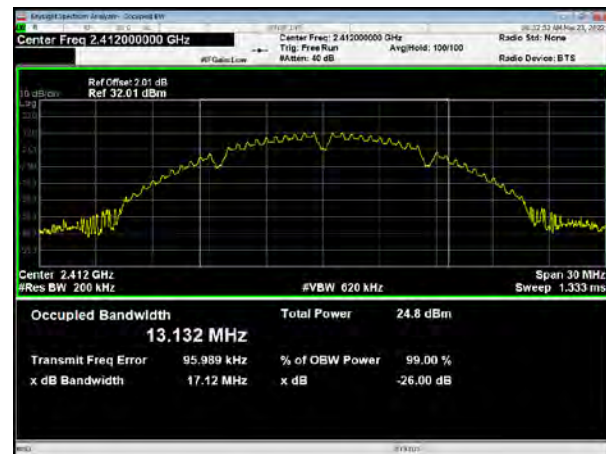
The assessed measurement uncertainty to ensure 95% confidence level for the normal distribution is with the coverage factor $k = 2$, $U = 936$ Hz.

Test Results:

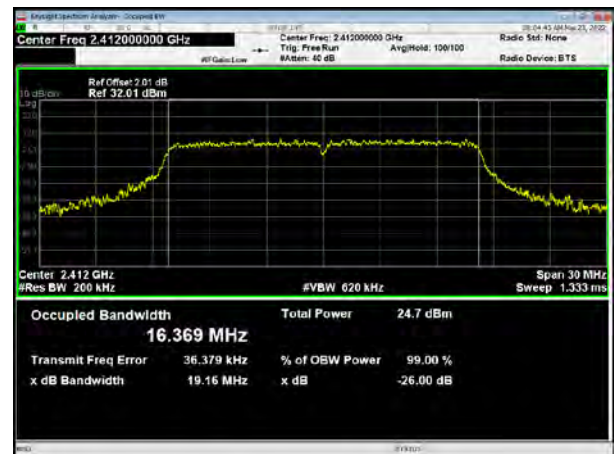
Test Mode	Carrier frequency (MHz)	99% bandwidth (MHz)	Minimum 6 dB bandwidth (MHz)	Limit (kHz)	Conclusion
802.11b	2412	13.13	8.06	500	PASS
	2437	12.96	8.05	500	PASS
	2462	12.92	8.03	500	PASS
802.11g	2412	16.37	16.31	500	PASS
	2437	16.39	16.33	500	PASS
	2462	16.34	16.33	500	PASS
802.11n HT20	2412	17.58	17.21	500	PASS
	2437	17.57	17.53	500	PASS
	2462	17.55	17.52	500	PASS
802.11n HT40	2422	35.99	35.44	500	PASS
	2437	36.02	36.28	500	PASS
	2452	36.10	36.31	500	PASS
802.11ax HE20	2412	18.95	18.92	500	PASS
	2437	18.93	18.92	500	PASS
	2462	18.91	18.82	500	PASS
802.11ax HE40	2422	37.61	36.69	500	PASS
	2437	37.72	37.78	500	PASS
	2452	37.75	38.01	500	PASS
Bluetooth (Low Energy) (1M)	2402	1.03	0.66	500	PASS
	2440	1.03	0.66	500	PASS
	2480	1.03	0.67	500	PASS
Bluetooth (Low Energy) (2M)	2402	2.01	1.14	500	PASS
	2440	2.01	1.15	500	PASS
	2480	2.01	1.11	500	PASS

99%bandwidth

802.11b, Carrier frequency (MHz): 2412



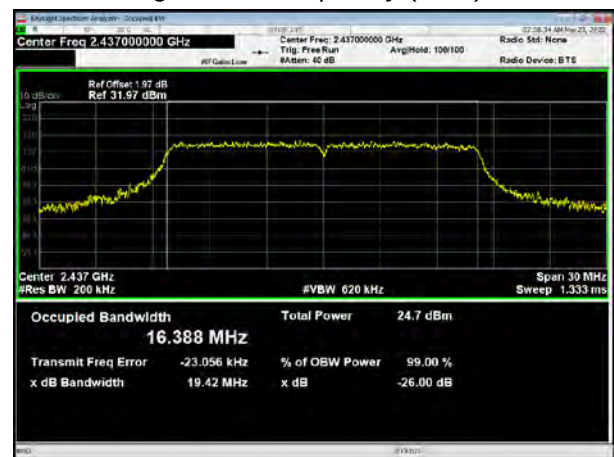
802.11g, Carrier frequency (MHz): 2412



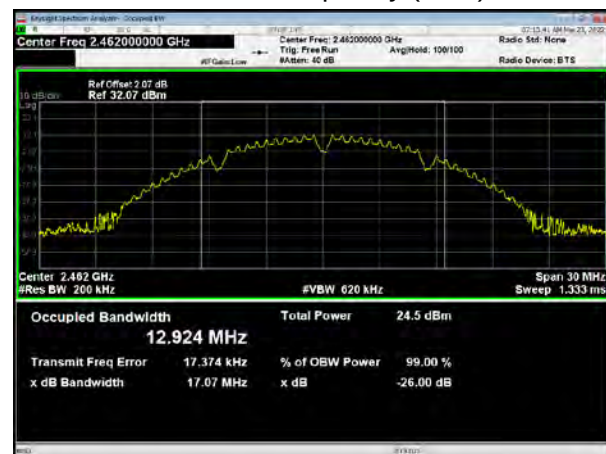
802.11b, Carrier frequency (MHz): 2437



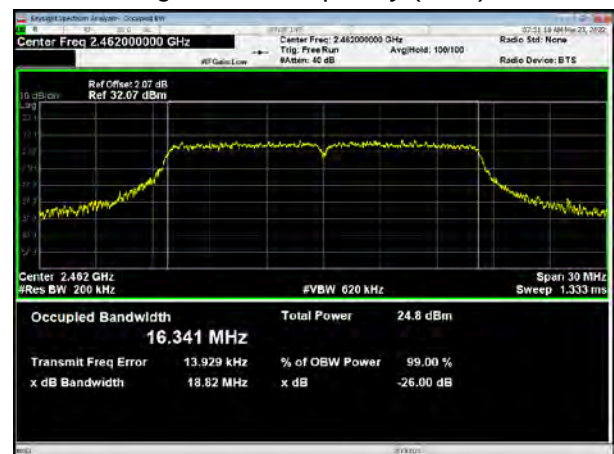
802.11g, Carrier frequency (MHz): 2437



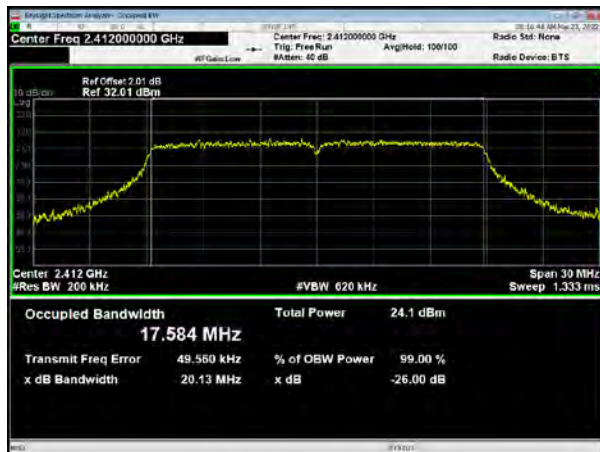
802.11b, Carrier frequency (MHz): 2462



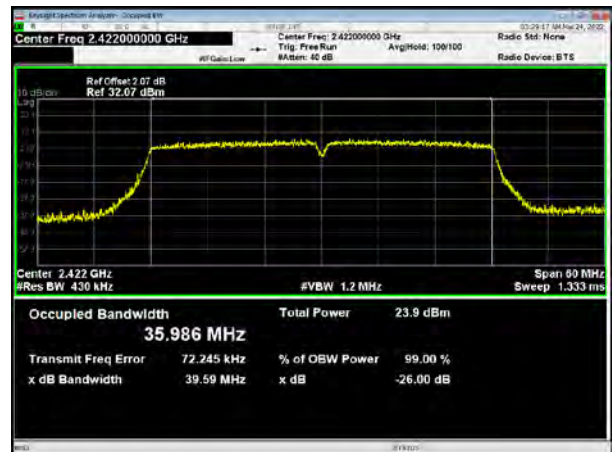
802.11g, Carrier frequency (MHz): 2462



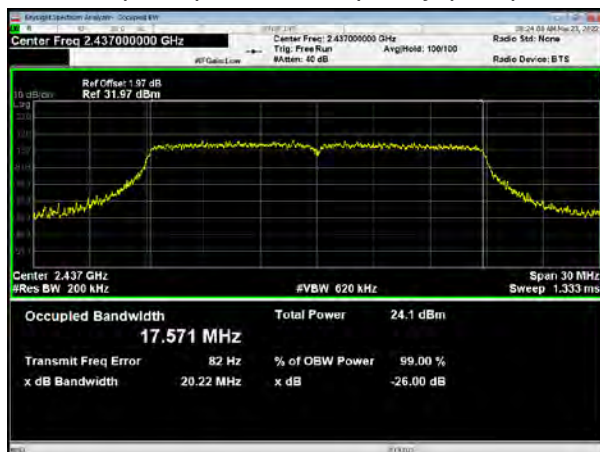
802.11n(HT20), Carrier frequency (MHz): 2412



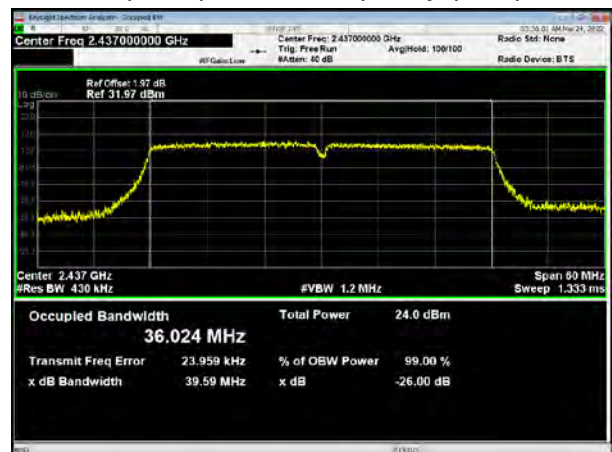
802.11n(HT40), Carrier frequency (MHz): 2422



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



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



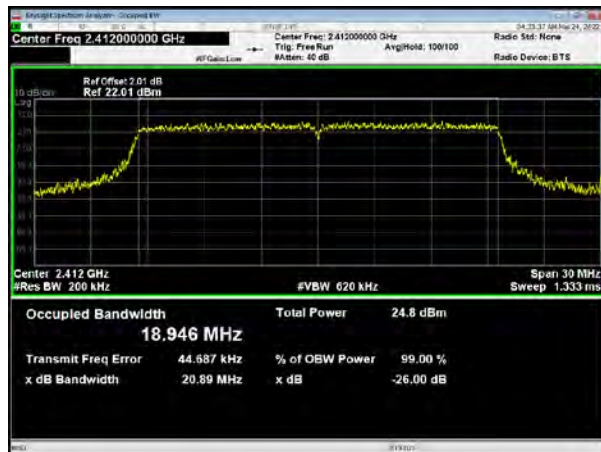
802.11n(HT20), Carrier frequency (MHz): 2462



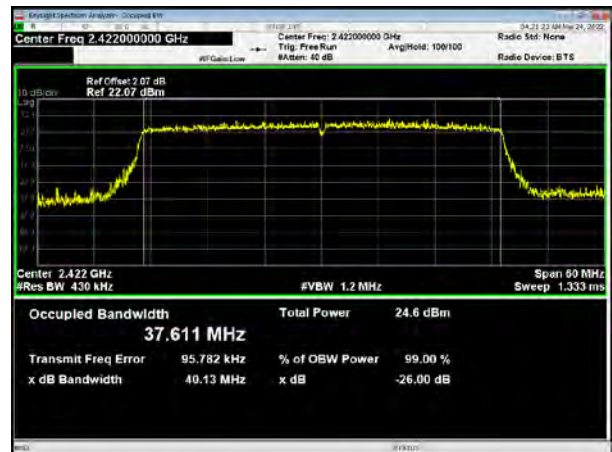
802.11n(HT40), Carrier frequency (MHz): 2452



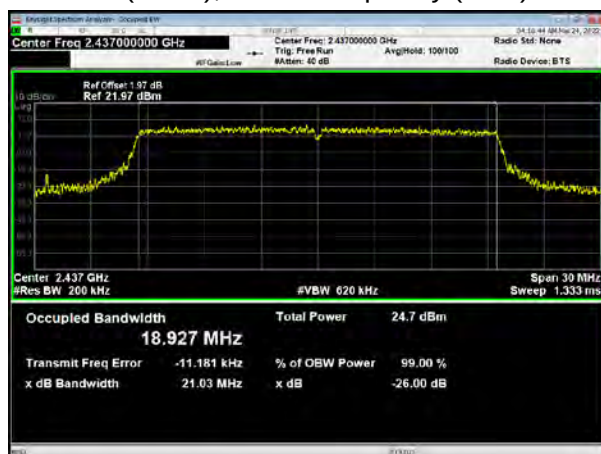
802.11ax(HE20), Carrier frequency (MHz): 2412



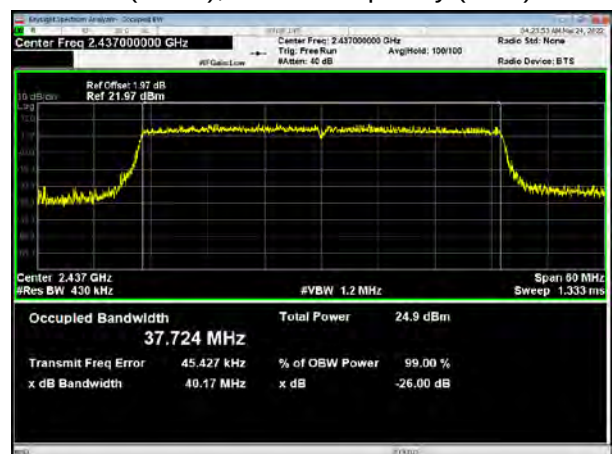
802.11ax(HE40), Carrier frequency (MHz): 2422



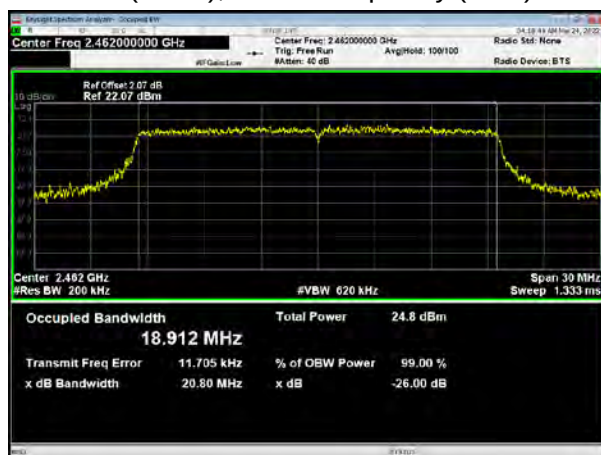
802.11ax(HE20), Carrier frequency (MHz): 2437



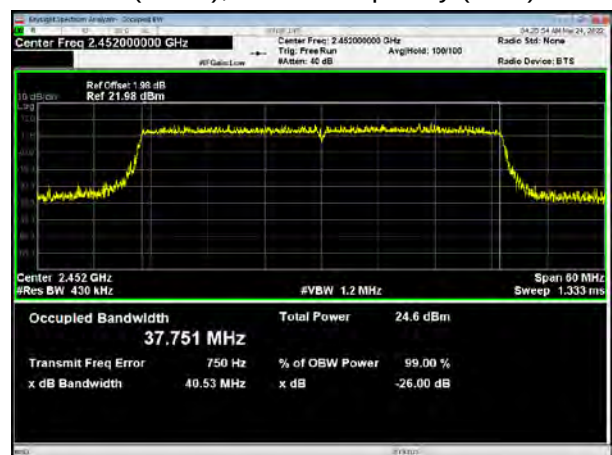
802.11ax(HE40), Carrier frequency (MHz): 2437



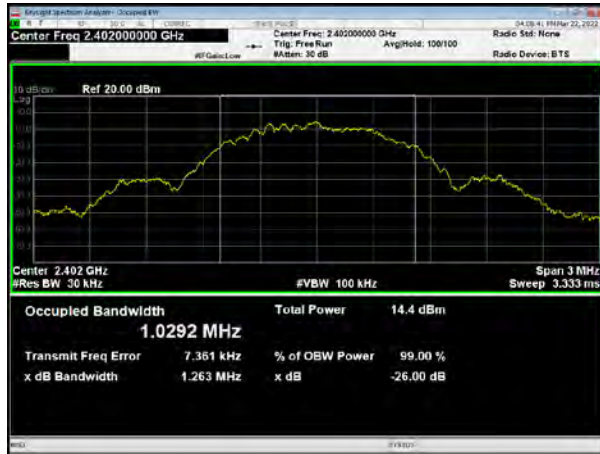
802.11ax(HE20), Carrier frequency (MHz): 2462



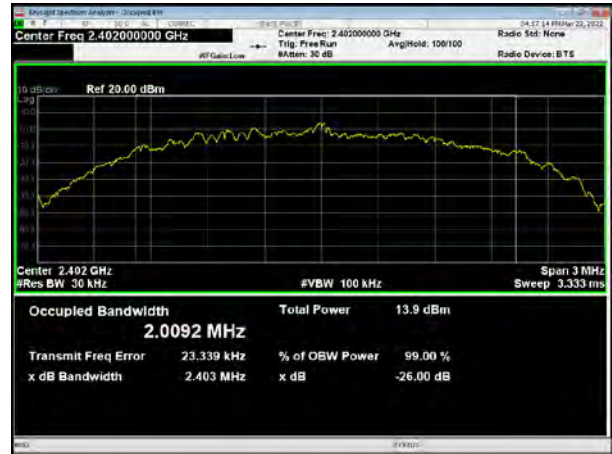
802.11ax(HE40), Carrier frequency (MHz): 2452



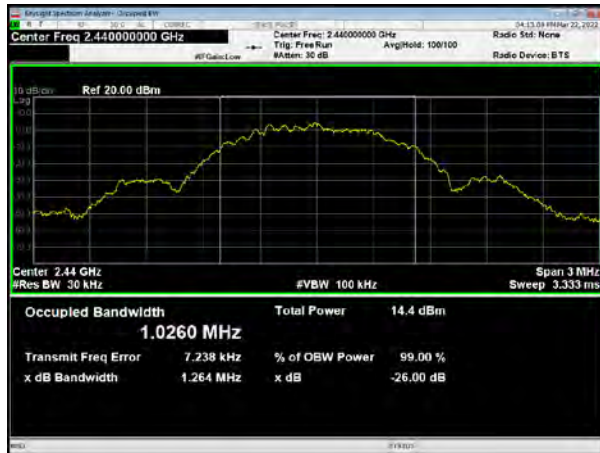
Bluetooth LE (1M) Carrier frequency (MHz):
2402



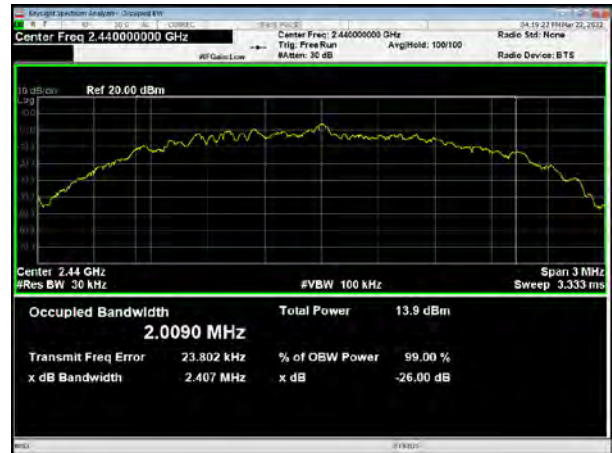
Bluetooth LE (2M) Carrier frequency (MHz):
2402



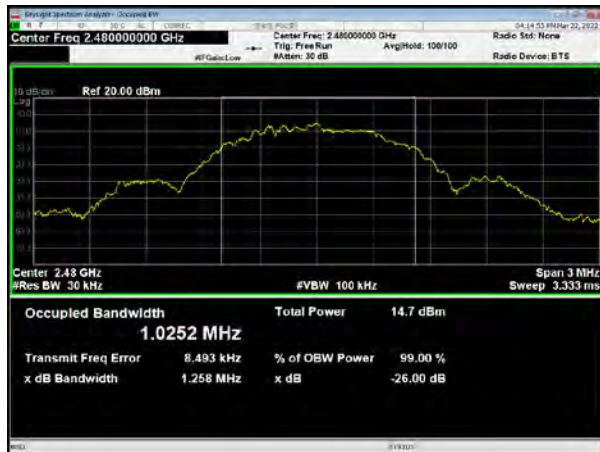
Bluetooth LE (1M) Carrier frequency (MHz):
2440



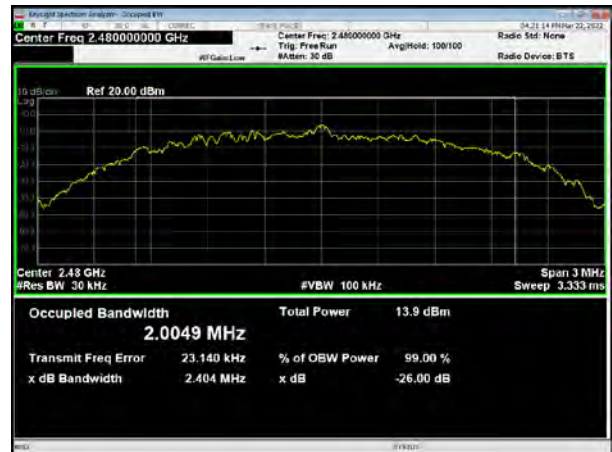
Bluetooth LE (2M) Carrier frequency (MHz):
2440



Bluetooth LE (1M) Carrier frequency (MHz):
2480



Bluetooth LE (2M) Carrier frequency (MHz):
2480

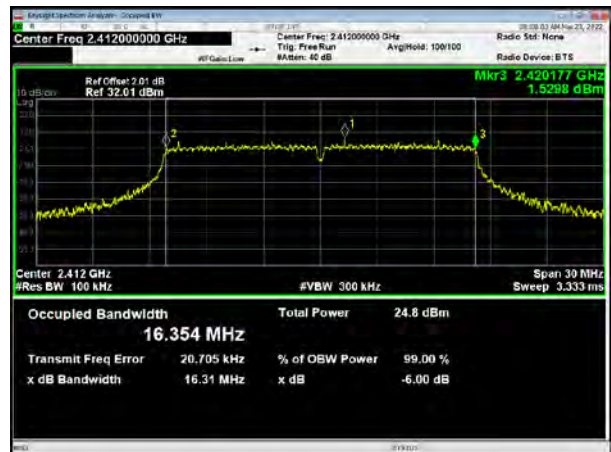


6 dB bandwidth

802.11b, Carrier frequency (MHz): 2412



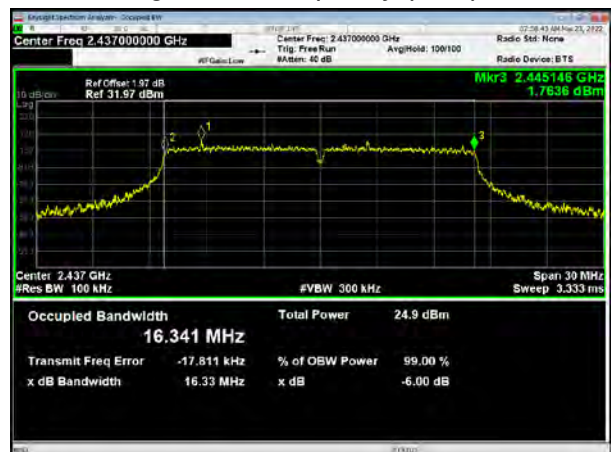
802.11g, Carrier frequency (MHz): 2412



802.11b, Carrier frequency (MHz): 2437



802.11g, Carrier frequency (MHz): 2437



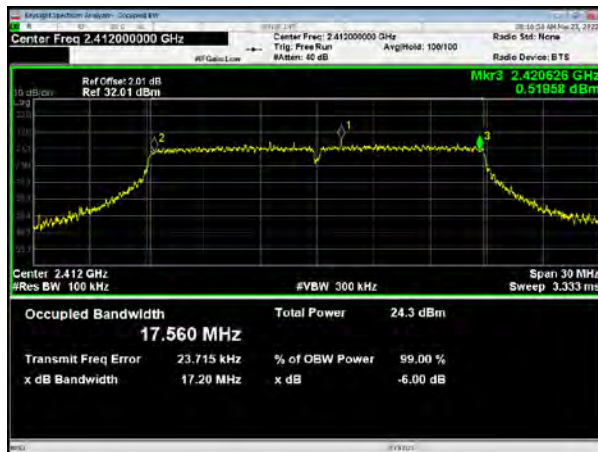
802.11b, Carrier frequency (MHz): 2462



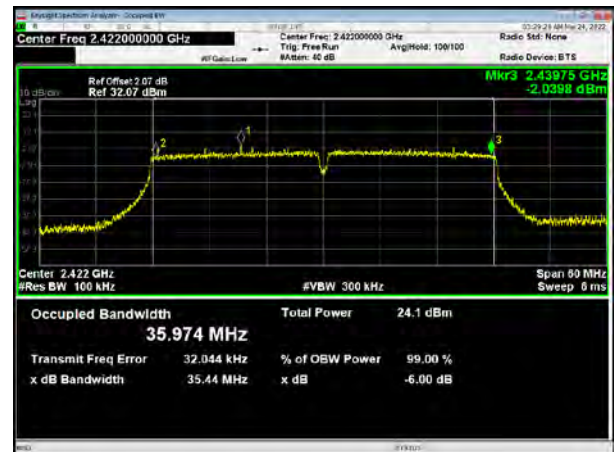
802.11g, Carrier frequency (MHz): 2462



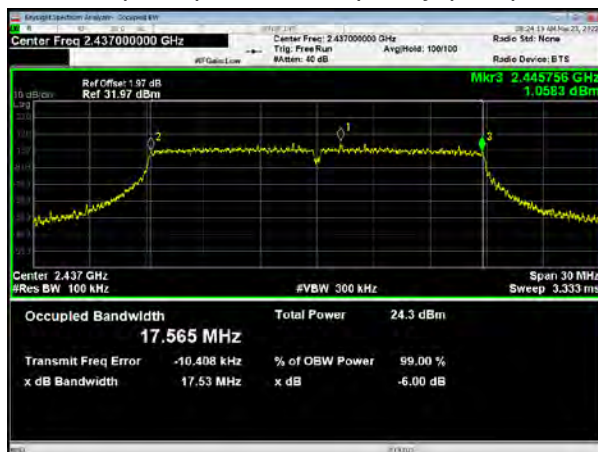
802.11n(HT20), Carrier frequency (MHz): 2412



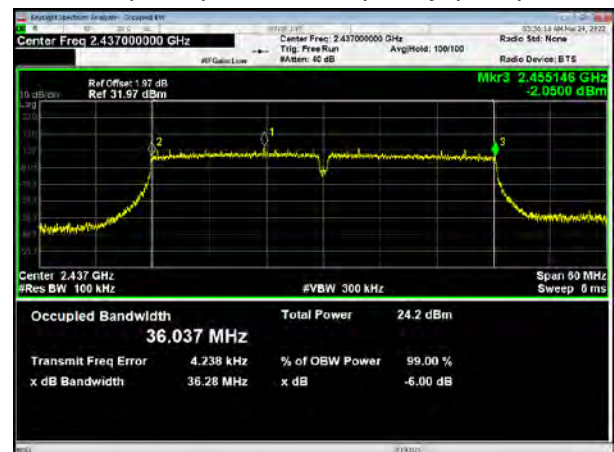
802.11n(HT40), Carrier frequency (MHz): 2422



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



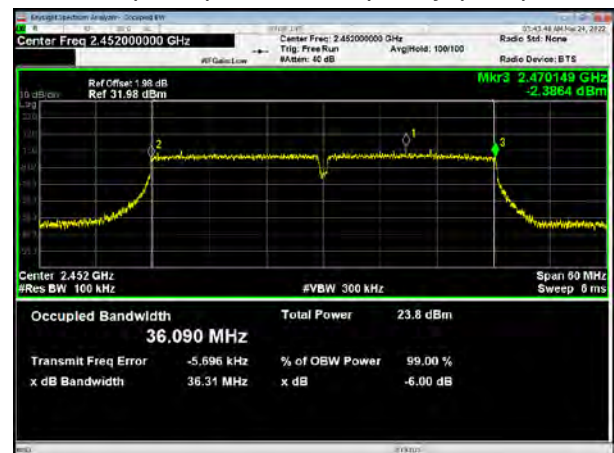
802.11n(HT40), Carrier frequency (MHz): 2437



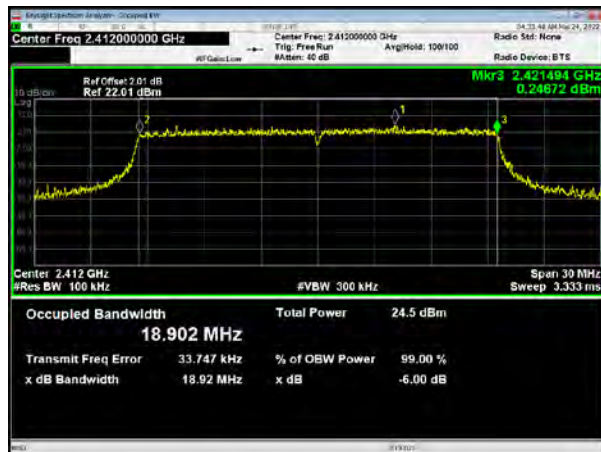
802.11n(HT20), Carrier frequency (MHz): 2462



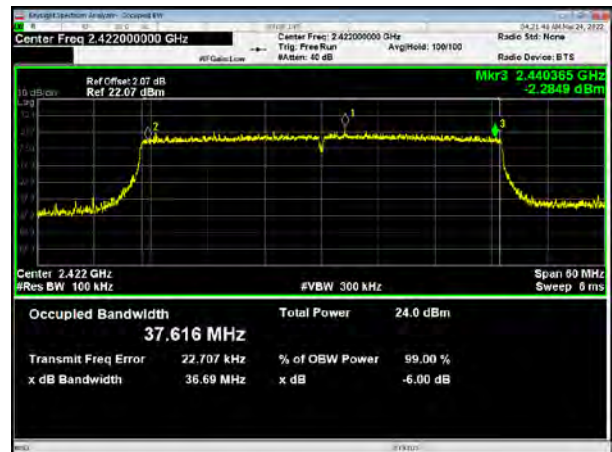
802.11n(HT40), Carrier frequency (MHz): 2452



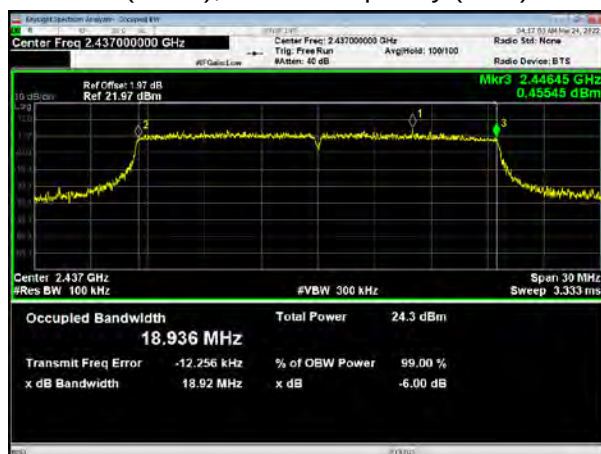
802.11ax(HE20), Carrier frequency (MHz): 2412



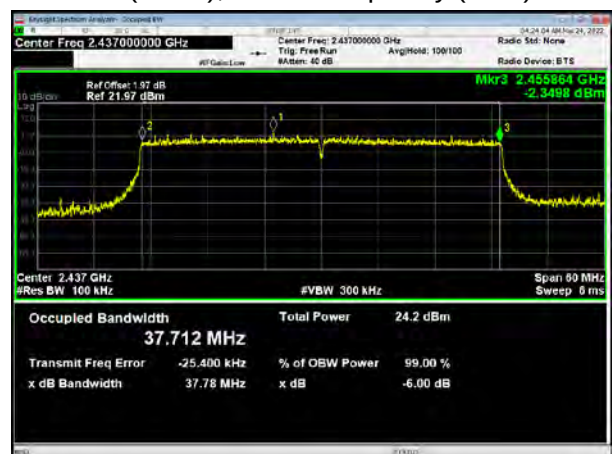
802.11ax(HE40), Carrier frequency (MHz): 2422



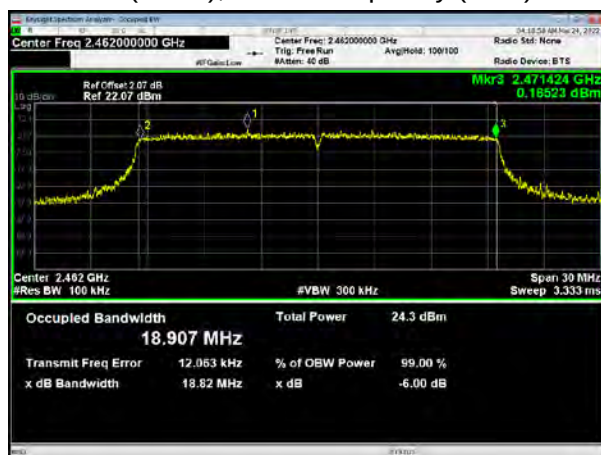
802.11ax(HE20), Carrier frequency (MHz): 2437



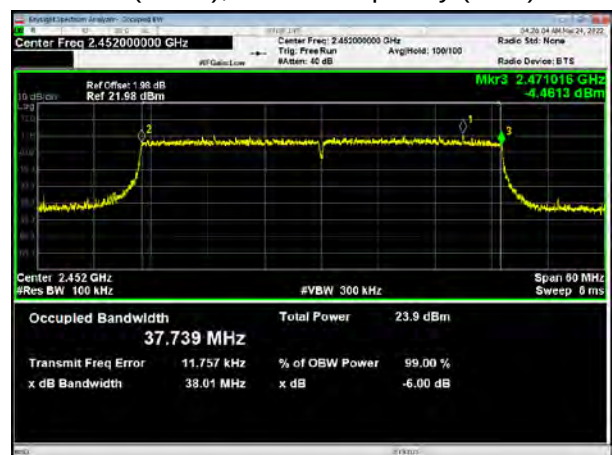
802.11ax(HE40), Carrier frequency (MHz): 2437

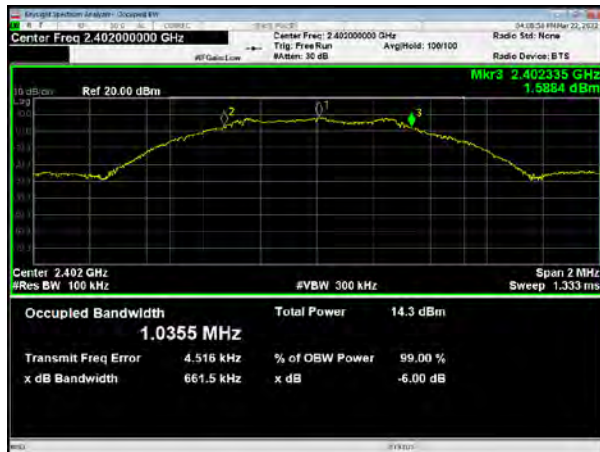
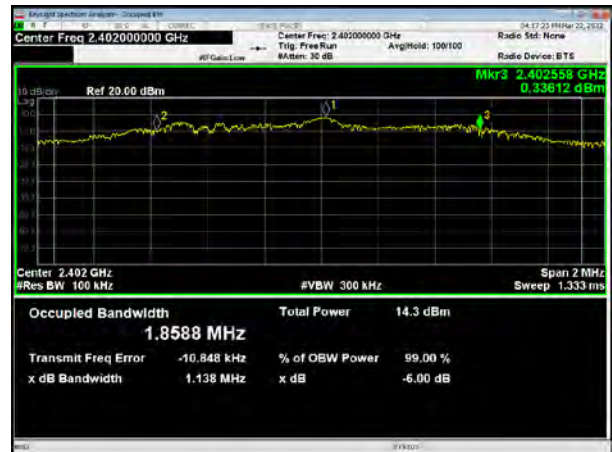
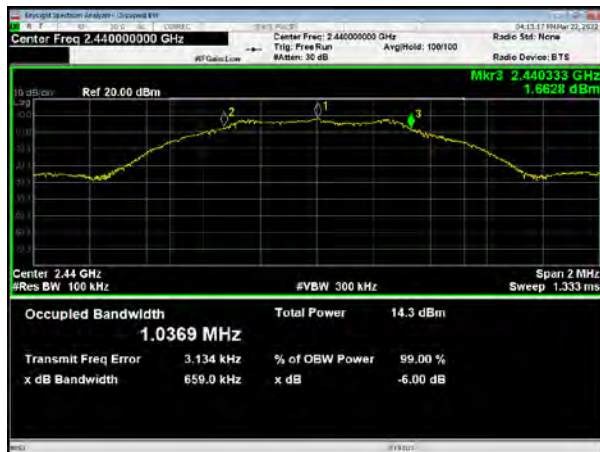
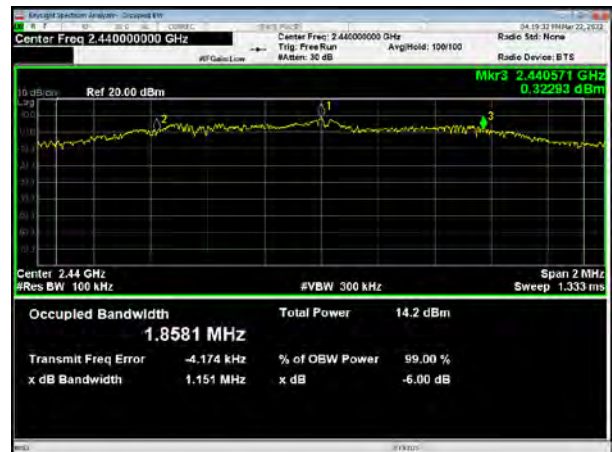
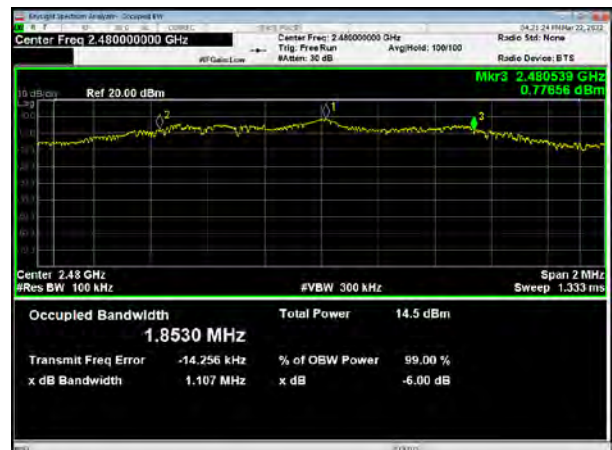


802.11ax(HE20), Carrier frequency (MHz): 2462



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



Bluetooth LE (1M) Carrier frequency (MHz):
2402Bluetooth LE (2M) Carrier frequency (MHz):
2402Bluetooth LE (1M) Carrier frequency (MHz):
2440Bluetooth LE (2M) Carrier frequency (MHz):
2440Bluetooth LE (1M) Carrier frequency (MHz):
2480Bluetooth LE (2M) Carrier frequency (MHz):
2480

5.3. Band Edge

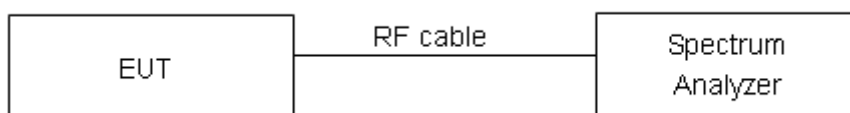
Ambient condition

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

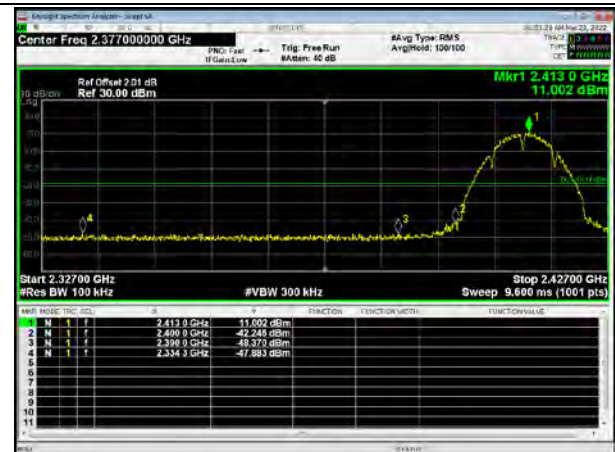
The assessed measurement uncertainty to ensure 95% confidence level for the normal distribution is with the coverage factor $k = 1.96$.

Frequency	Uncertainty
2GHz-3GHz	1.407 dB

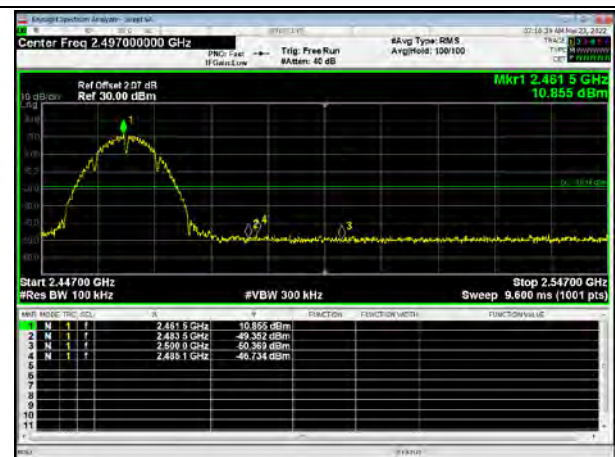


Test Results: PASS

802.11b, Channel No.: 1



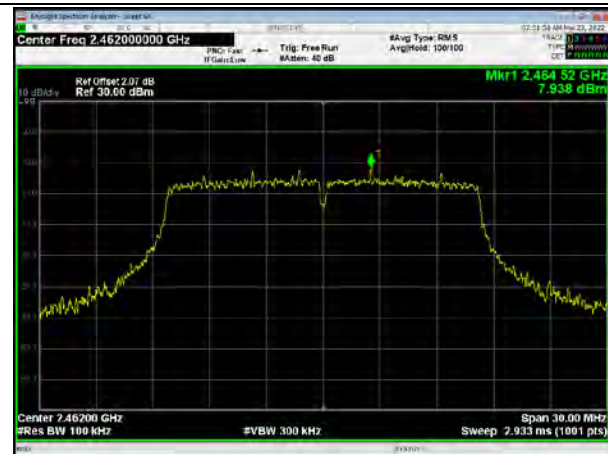
802.11b, Channel No.: 11



802.11g, Channel No.: 1



802.11g, Channel No.: 11



802.11n(HT20), Channel No. 1



802.11n(HT20), Channel No. 11



MySignal Spectrum Analyzer - Sweet M...

Center Freq 2.402000000 GHz

PRF: Fast IF Resolv

Trig: Free Run

RBW: 45 dB

#Avg Type: RMS

ArgHold: 100/100

10:29:53 AM Nov 24, 2019

Trac1: 1 3 4 5

Trac4 Maximum

dBm

Ref Offset 2.07 dB

Ref 30.00 dBm

Mkrt 2.430 7 GHz

3.812 dBm

10 dBm

Start 2.35200 GHz

Stop 2.45200 GHz

#Res BW 100 kHz

#VBW 300 kHz

Sweep 9.600 ms (1001 pts)

MNR	MODE	TRC	SQL	F	FUNCION	FUNCION WIDTH	FUNCION VALUE
1	N	1	1	2.430 7 GHz		3.812 dBm	
2	N	1	1	2.400 0 GHz		-40.942 dBm	
3	N	1	1	2.390 0 GHz		-48.495 dBm	
4	N	1	1	2.389 5 GHz		-44.950 dBm	
5							
6							
7							
8							
9							
10							
11							

File Edit View Window Help

Microsoft Spectrum Analyzer - Signal M

Center Freq 2.472000000 GHz

PRF: 1000 Hz
IF Gain: 0 dB

Trig: Free Run
RBW: 40 dB

RAvg Type: RM S
Avg Hold: 100/100

SC44-17 MHz/Hz 24.72000
Hz22 10.0 0.0 1.0
Type: Minimum
dB: 0.000000

Ref Offset 1.96 dB
Ref 30.00 dBm

MkT1 2.464 5 GHz
3.456 dBm

0.000000

Start 2.42200 GHz
#Res BW 100 kHz

#VBW 300 kHz

Stop 2.52200 GHz
Sweep 9.600 ms (1001 pts)

MARK	MODE	TRIG	SQL	F	FUNCTION	FUNCTION WIDTH	FUNCTION VALUE
1	N	1	1	2.464 5 GHz	3.456 dBm		
2	N	1	1	2.480 5 GHz	-42.421 dBm		
3	N	1	1	2.500 9 GHz	-50.399 dBm		
4	N	1	1	2.454 3 GHz	-39.285 dBm		
5							
6							
7							
8							
9							
10							
11							

dBm

Center Freq 2.377000000 GHz

Ref Offset 201 dB
Ref 20.00 dBm

Trace 1: RMS
AvgType: RMS
Amplitude: 1001.00

Peak 1: 2.419 5 GHz
2.419 5 GHz
6.974 dBm

Start 2.32700 GHz
#BW 300 kHz

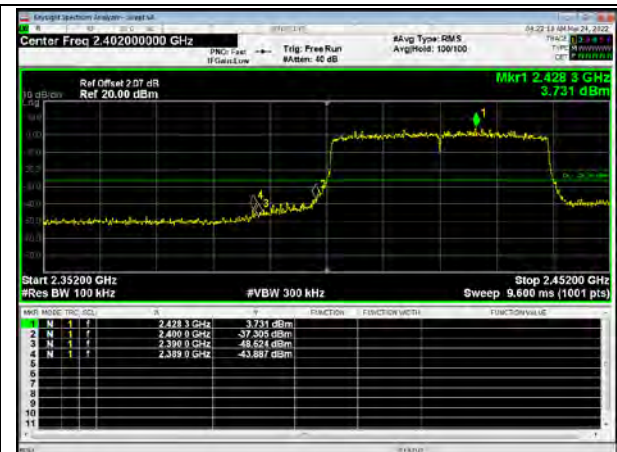
Stop 2.42700 GHz
Sweep 9.600 ms (1001 pts)

Wave Mode	THz (GHz)	Amplitude (dBm)
2	2.419 5 GHz	6.974 dBm
3	2.400 0 GHz	-29.724 dBm
4	2.390 0 GHz	-42.883 dBm
5	2.380 0 GHz	-42.889 dBm

802.11ax(HE20), Channel No. 11



802.11ax(HE40), Channel No. 3

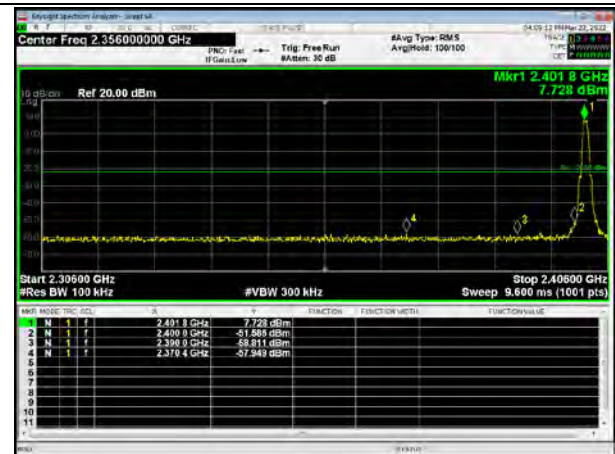
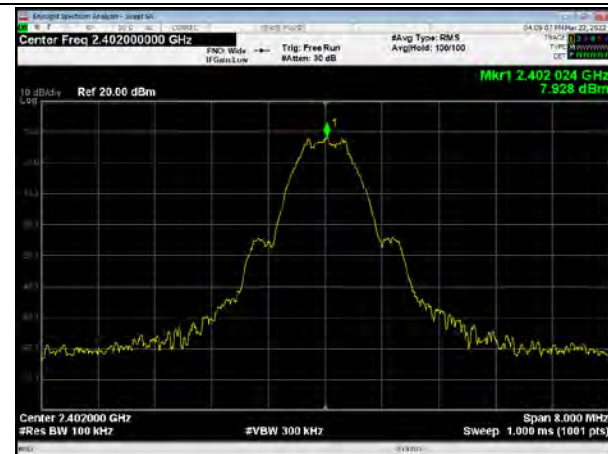


802.11ax(HE40), Channel No. 9

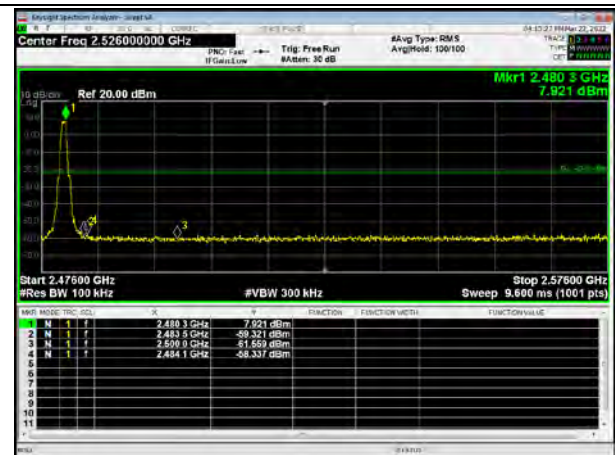




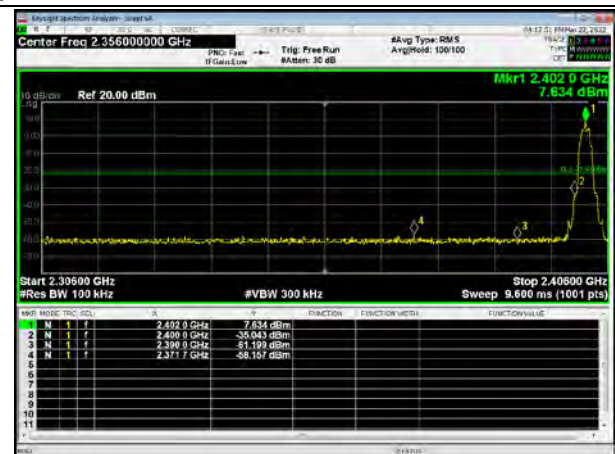
Bluetooth LE (1M), Channel No.: 0



Bluetooth LE (1M), Channel No.: 39

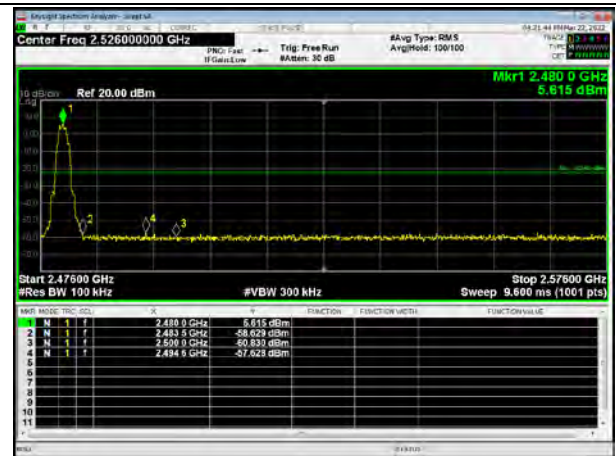


Bluetooth LE (2M), Channel No.: 0





Bluetooth LE (2M), Channel No.: 39



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.

- Set instrument center frequency to DTS channel center frequency
- Set span to at least 1.5 times the OBW
- Set RBW to: $3\text{kHz} \leq \text{RBW} \leq 100\text{kHz}$
- Set VBW $\geq [3 \times \text{RBW}]$
- Detector=power averaging (rms) or sample detector (when rms not available)
- Ensure that the number of measurement points in the sweep $2[2 \times \text{span}/\text{RBW}]$
- Sweep time auto couple
- Employ trace averaging (rms) mode over a minimum of 100 traces
- Use the peak marker function to determine the maximum amplitude level.
- 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)

Method AVGPSD-2 was used for this test.

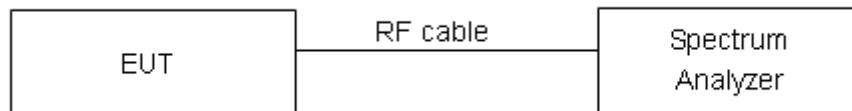
- Measure the duty cycle (D) of the transmitter output signal as described in 11.6
- Set instrument center frequency to DTS channel center frequency
- Set span to at least 1.5 times the OBW
- Set RBW to: $3\text{kHz} \leq \text{RBW} \leq 100\text{Kh}$
- Set VBW $\geq [3 \times \text{RBW}]$
- Detector= power averaging (rms) or sample detector (when rms not available)
- Ensure that the number of measurement points in the sweep $2[2 \times \text{span}/\text{RBW}]$
- Sweep time =auto couple
- Do not use sweep triggering; allow sweep to "free run"
- Employ trace averaging (rms) mode over a minimum of 100 traces
- Use the peak marker function to determine the maximum amplitude level

l) Add $[10 \log(1/D)]$, where D is the duty cycle measured in step a), to the measured PSD to compute the average PSD during the actual transmission time

m) If measured value exceeds requirement specified by regulatory agency 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	$\leq 8 \text{ dBm} / 3\text{kHz}$
--------	------------------------------------

Measurement Uncertainty

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

**Test Results:**

Test Mode	Channel Number	Read Value (dBm/100kHz)	Power Spectral Density (dBm / 3kHz)	Limit (dBm / 3kHz)	Conclusion
Bluetooth (Low Energy) (1M)	0	0.46	-12.71	8	PASS
	19	0.55	-12.62	8	PASS
	39	0.39	-12.78	8	PASS
Bluetooth (Low Energy) (2M)	0	-3.34	-13.64	8	PASS
	19	-3.81	-14.11	8	PASS
	39	-2.30	-12.60	8	PASS

Note: Power Spectral Density =Read Value+Duty cycle correction factor+10*log10(3/100)

SISO Antenna 1

Test Mode	Channel Number	Read Value (dBm / 30kHz)	Power Spectral Density (dBm / 3kHz)	Limit (dBm / 3kHz)	Conclusion
802.11b	1	-1.05	-11.05	8	PASS
	6	-1.30	-11.30	8	PASS
	11	-1.41	-11.41	8	PASS
802.11g	1	-5.56	-15.56	8	PASS
	6	-5.43	-15.43	8	PASS
	11	-5.65	-15.65	8	PASS
802.11n HT20	1	-6.50	-16.50	8	PASS
	6	-6.51	-16.51	8	PASS
	11	-6.27	-16.27	8	PASS
802.11n HT40	3	-9.77	-19.77	8	PASS
	6	-9.72	-19.72	8	PASS
	9	-10.19	-20.19	8	PASS
802.11ax HE20	1	-7.96	-17.96	8	PASS
	6	-7.69	-17.69	8	PASS
	11	-7.58	-17.58	8	PASS
802.11ax HE40	3	-11.28	-21.28	8	PASS
	6	-11.42	-21.42	8	PASS
	9	-12.08	-22.08	8	PASS

Note: Power Spectral Density =Read Value+Duty cycle correction factor +10*log10(3/30)

**SISO Antenna 2**

Test Mode	Channel Number	Read Value (dBm / 30kHz)	Power Spectral Density (dBm / 3kHz)	Limit (dBm / 3kHz)	Conclusion
802.11b	1	-1.62	-11.62	8	PASS
	6	-1.54	-11.54	8	PASS
	11	-1.79	-11.79	8	PASS
802.11g	1	-5.89	-15.89	8	PASS
	6	-6.40	-16.40	8	PASS
	11	-6.04	-16.04	8	PASS
802.11n HT20	1	-6.30	-16.30	8	PASS
	6	-7.04	-17.04	8	PASS
	11	-6.27	-16.27	8	PASS
802.11n HT40	3	-9.77	-19.77	8	PASS
	6	-10.37	-20.37	8	PASS
	9	-10.55	-20.55	8	PASS
802.11ax HE20	1	-8.56	-18.56	8	PASS
	6	-8.96	-18.96	8	PASS
	11	-8.70	-18.70	8	PASS
802.11ax HE40	3	-11.47	-21.47	8	PASS
	6	-12.10	-22.10	8	PASS
	9	-11.96	-21.96	8	PASS
Note: Power Spectral Density =Read Value+Duty cycle correction factor +10*log10(3/30)					

MIMO

Test Mode	Channel Number	Power Spectral Density				Total PSD	Limit (dBm / 3kHz)	Conclusion
		Antenna 1		Antenna 2				
		Read Value (dBm / 30kHz)	Power Spectral Density (dBm / 3kHz)	Read Value (dBm / 30kHz)	Power Spectral Density (dBm / 3kHz)	(dBm / 3kHz)		
802.11n HT20	1	-6.68	-16.68	-6.56	-16.56	-13.61	8.00	PASS
	6	-6.31	-16.31	-6.50	-16.50	-13.39	8.00	PASS
	11	-6.58	-16.58	-6.66	-16.66	-13.61	8.00	PASS
802.11n HT40	3	-9.75	-19.75	-10.01	-20.01	-16.87	8.00	PASS
	6	-9.84	-19.84	-10.14	-20.14	-16.98	8.00	PASS
	9	-10.46	-20.46	-10.18	-20.18	-17.31	8.00	PASS
802.11ax HE20	1	-7.95	-17.95	-8.07	-18.07	-15.00	8.00	PASS
	6	-8.10	-18.10	-8.06	-18.06	-15.07	8.00	PASS
	11	-7.56	-17.56	-8.19	-18.19	-14.85	8.00	PASS
802.11ax HE40	3	-11.08	-21.08	-11.52	-21.52	-18.28	8.00	PASS
	6	-11.18	-21.18	-11.44	-21.44	-18.30	8.00	PASS
	9	-11.81	-21.81	-11.82	-21.82	-18.80	8.00	PASS

Note: 1. Power Spectral Density = Read Value + Duty cycle correction factor + $10 \cdot \log_{10}(3 \text{ kHz} / 30)$
2. For Total PSD, according to KDB 662911 D01 Multiple Transmitter Output v02r01 2)a), the power spectral density = $10 \log_{10}(10^{(\text{PSD antenna1 in dBm}/10)} + 10^{(\text{PSD antenna2 in dBm}/10)})$
3. Direction gain calculation according to KDB 662911 D01 Multiple Transmitter Output v02r01 F)2)a)(ii): If all antennas have the same gain, directional gain = $G_{\text{ANT}} - 1.7 \text{ dBi} < 6 \text{ dBi}$. So the limit is 8 dBm.

Bluetooth LE (1M), Channel No.: 0



Bluetooth LE (2M), Channel No.: 0



Bluetooth LE (1M), Channel No.: 19



Bluetooth LE (2M), Channel No.: 19



Bluetooth LE (1M), Channel No.: 39



Bluetooth LE (2M), Channel No.: 39



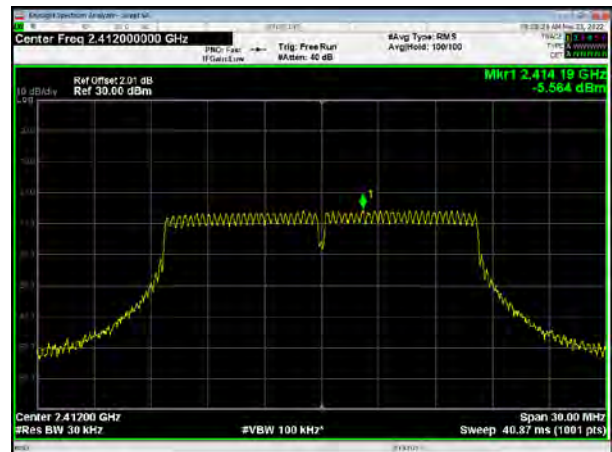


SISO Antenna 1

802.11b, Channel No.: 1



802.11g, Channel No.: 1



802.11b, Channel No.: 6



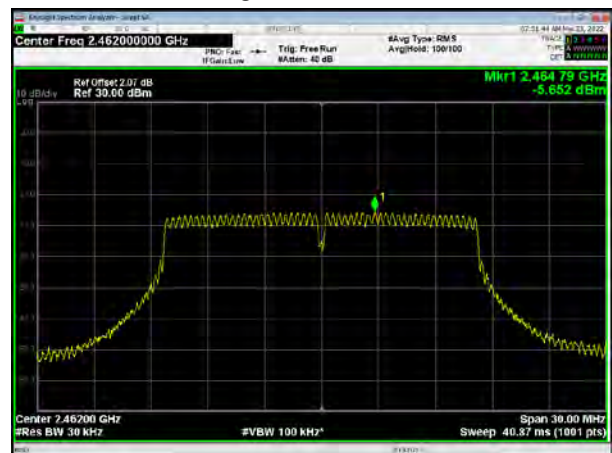
802.11g, Channel No.: 6



802.11b, Channel No.: 11

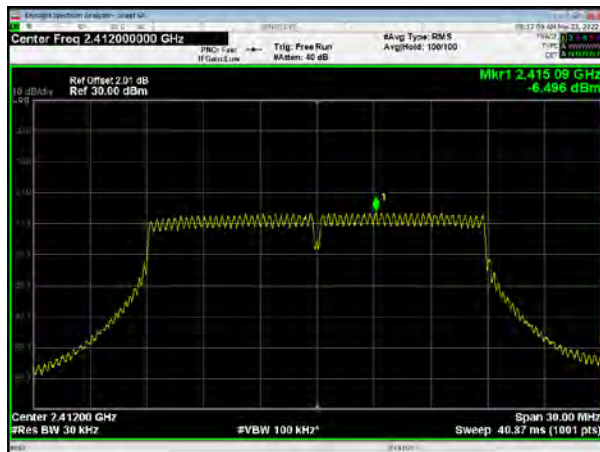


802.11g, Channel No.: 11

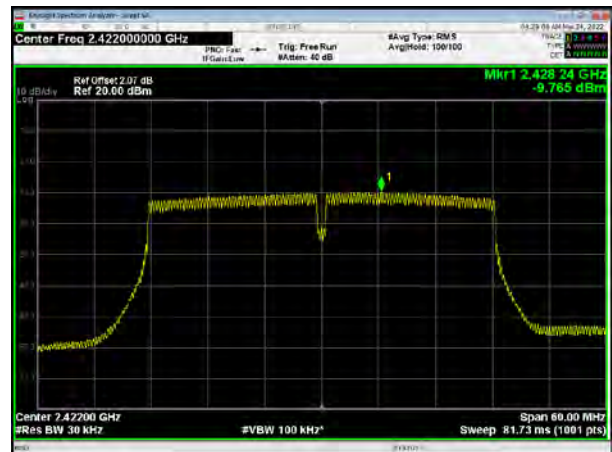




802.11n(HT20), Channel No. 1



802.11n(HT40), Channel No. 3



802.11n(HT20), Channel No. 6



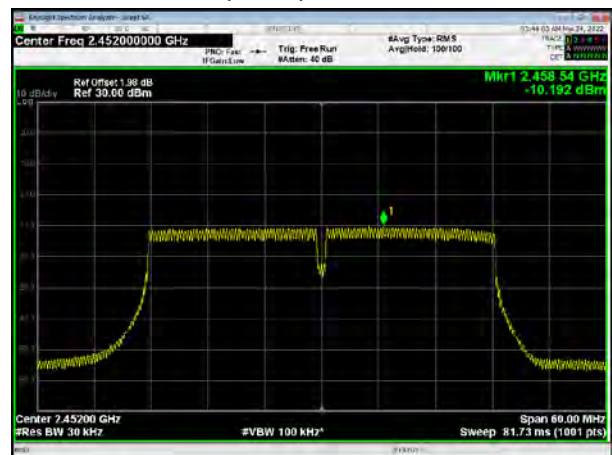
802.11n(HT40), Channel No. 6



802.11n(HT20), Channel No. 11



802.11n(HT40), Channel No. 9



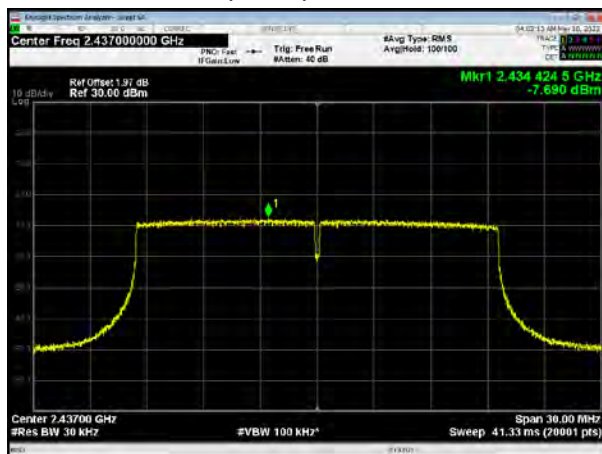
802.11ax(HE20), Channel No. 1



802.11ax(HE40), Channel No. 3



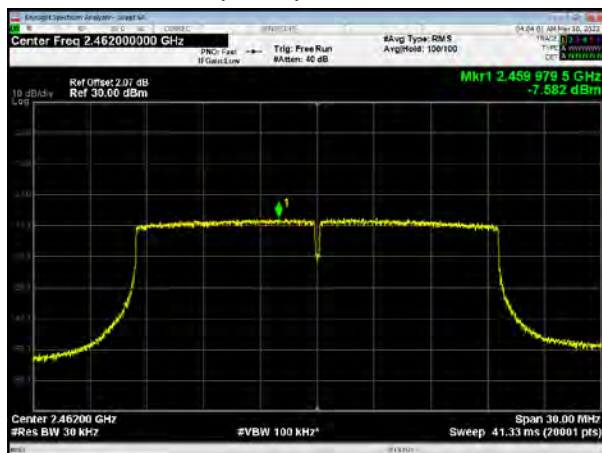
802.11ax(HE20), Channel No. 6



802.11ax(HE40), Channel No. 6



802.11ax(HE20), Channel No. 11



802.11ax(HE40), Channel No. 9





SISO Antenna 2

802.11b, Channel No.: 1



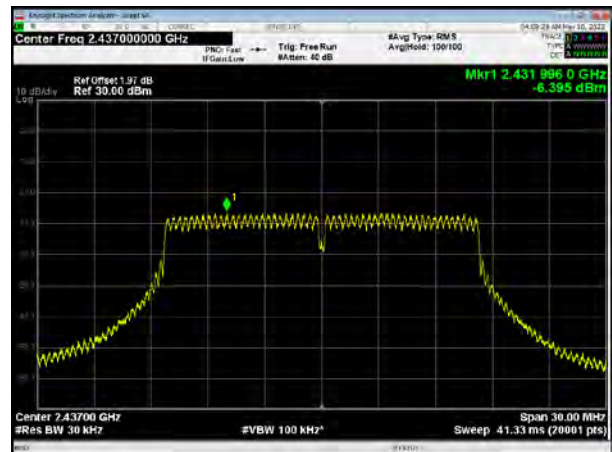
802.11g, Channel No.: 1



802.11b, Channel No.: 6



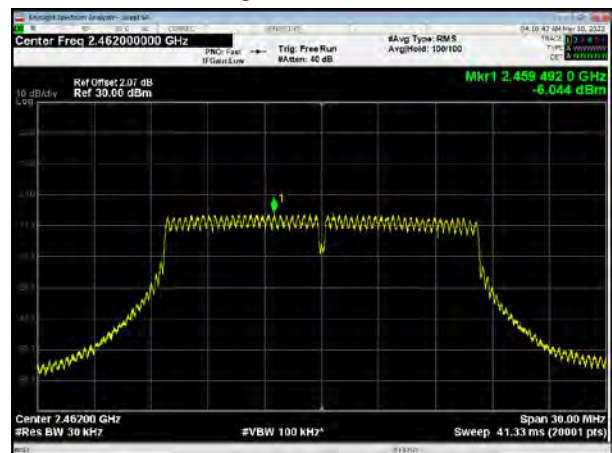
802.11g, Channel No.: 6



802.11b, Channel No.: 11

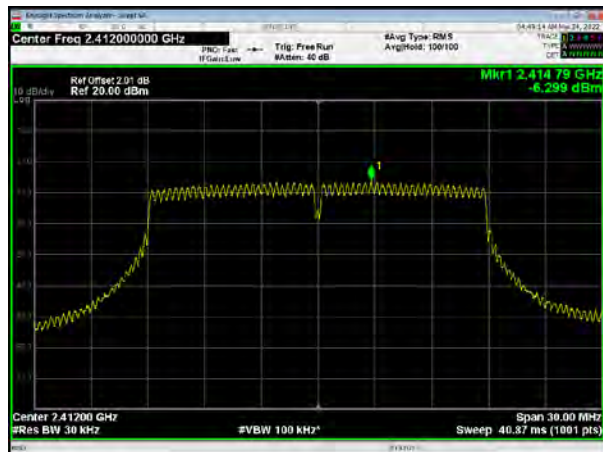


802.11g, Channel No.: 11

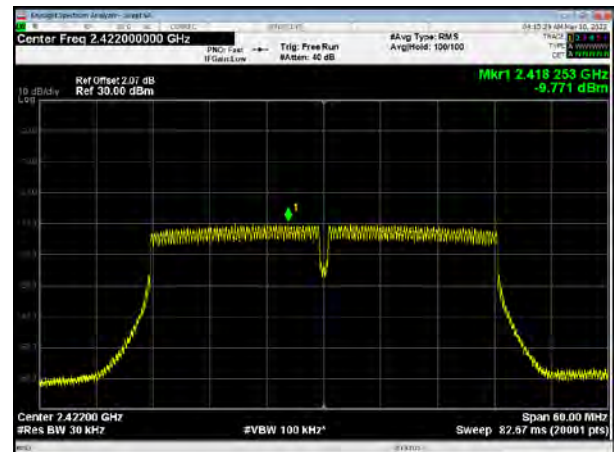




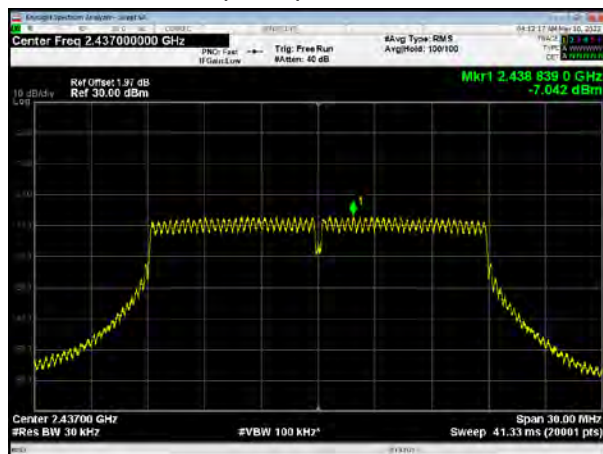
802.11n(HT20), Channel No. 1



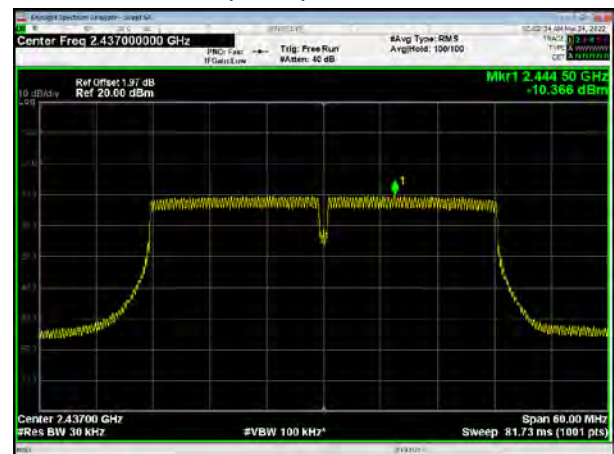
802.11n(HT40), Channel No. 3



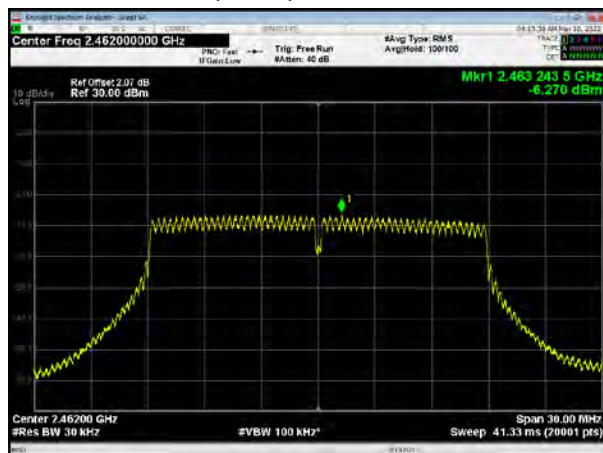
802.11n(HT20), Channel No. 6



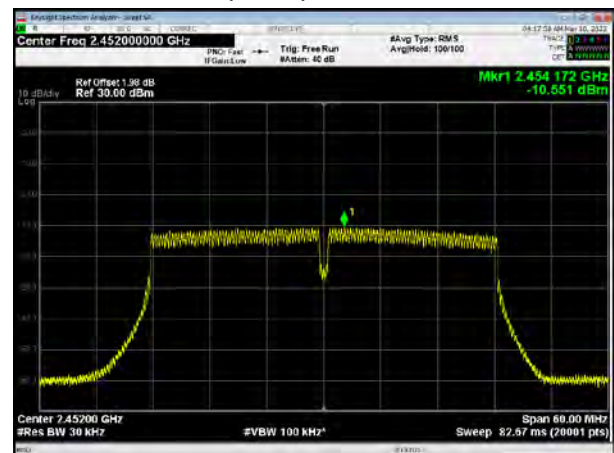
802.11n(HT40), Channel No. 6



802.11n(HT20), Channel No. 11

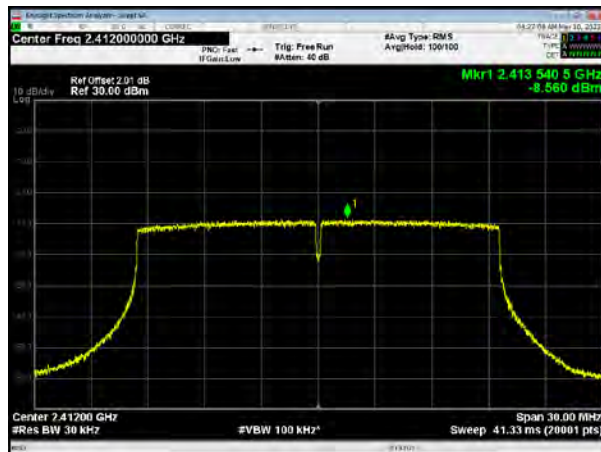


802.11n(HT40), Channel No. 9

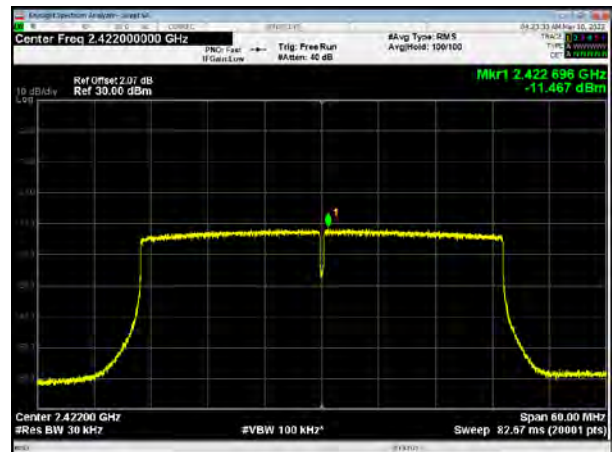




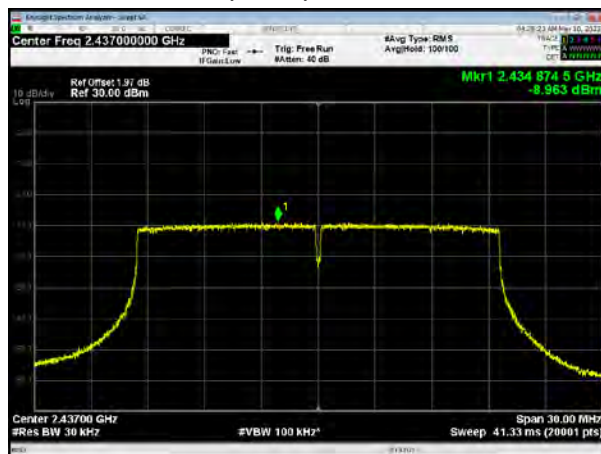
802.11ax(HE20), Channel No. 1



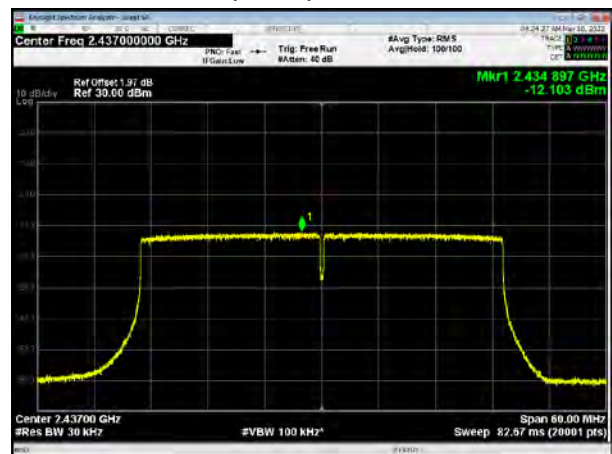
802.11ax(HE40), Channel No. 3



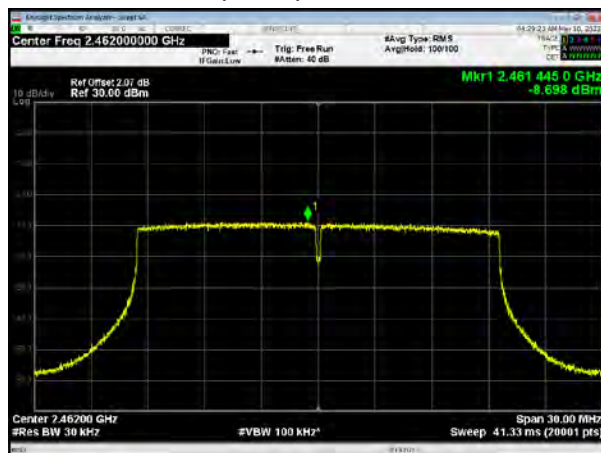
802.11ax(HE20), Channel No. 6



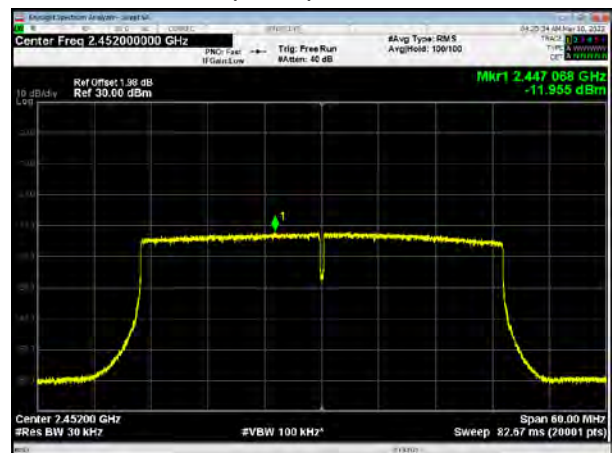
802.11ax(HE40), Channel No. 6



802.11ax(HE20), Channel No. 11



802.11ax(HE40), Channel No. 9

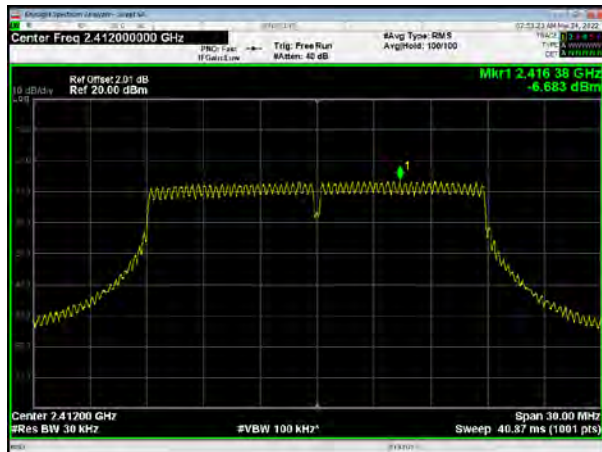




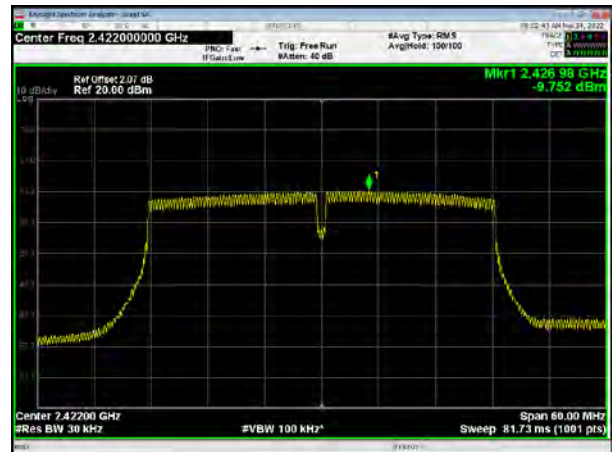
MIMO

Antenna 1

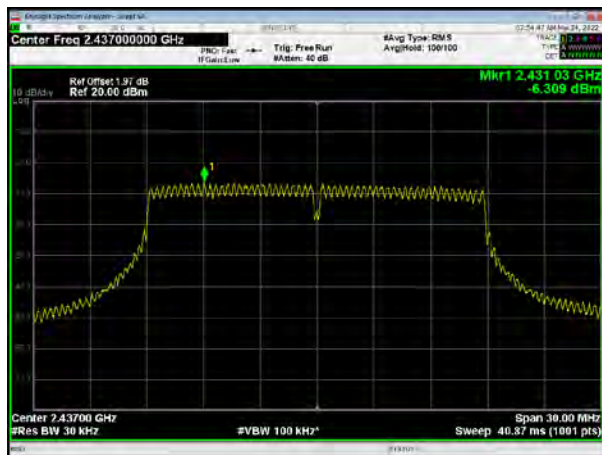
802.11n(HT20), Channel No. 1



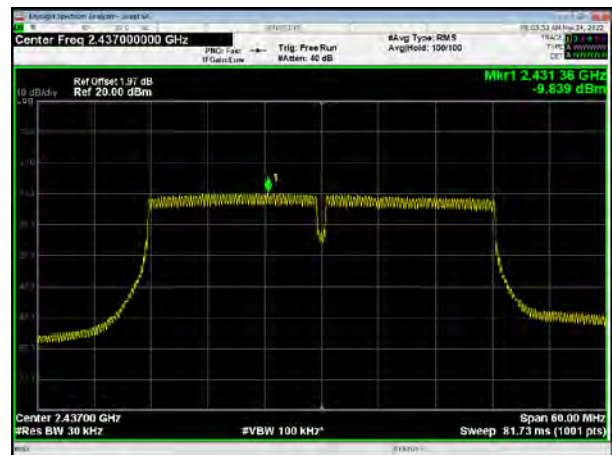
802.11n(HT40), Channel No. 3



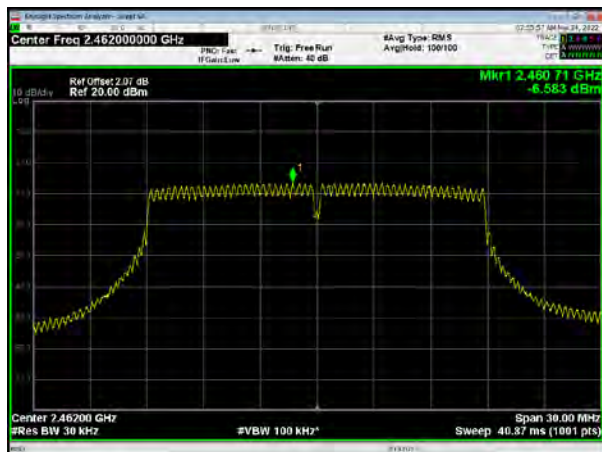
802.11n(HT20), Channel No. 6



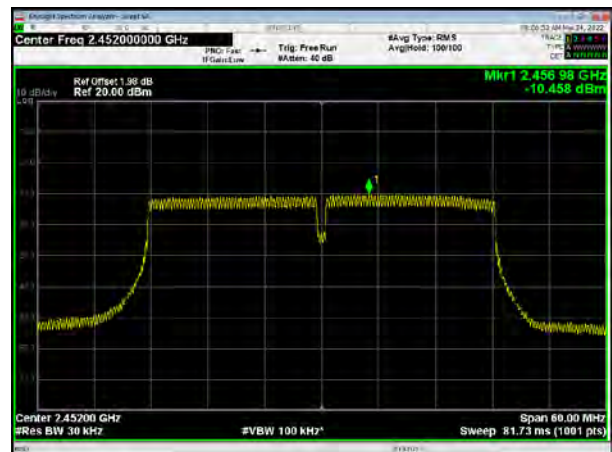
802.11n(HT40), Channel No. 6



802.11n(HT20), Channel No. 11



802.11n(HT40), Channel No. 9



802.11ax(HE20), Channel No. 1



802.11ax(HE40), Channel No. 3



802.11ax(HE20), Channel No. 6



802.11ax(HE40), Channel No. 6



802.11ax(HE20), Channel No. 11



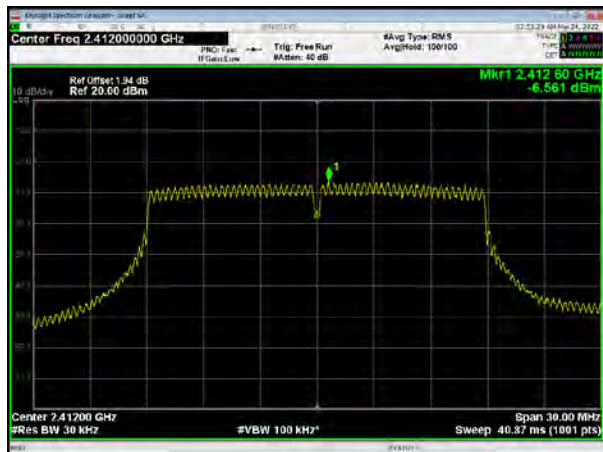
802.11ax(HE40), Channel No. 9



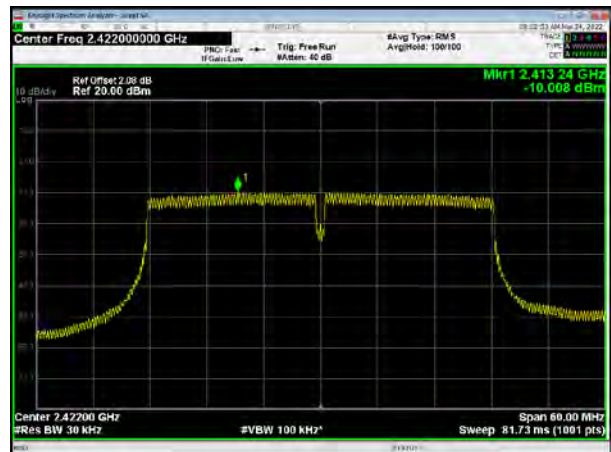


Antenna 2

802.11n(HT20), Channel No. 1



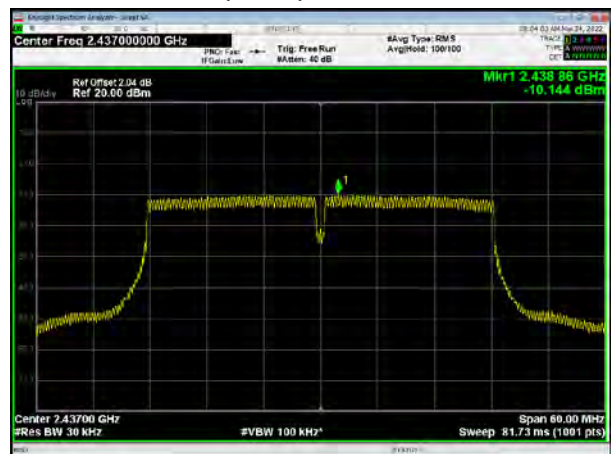
802.11n(HT40), Channel No. 3



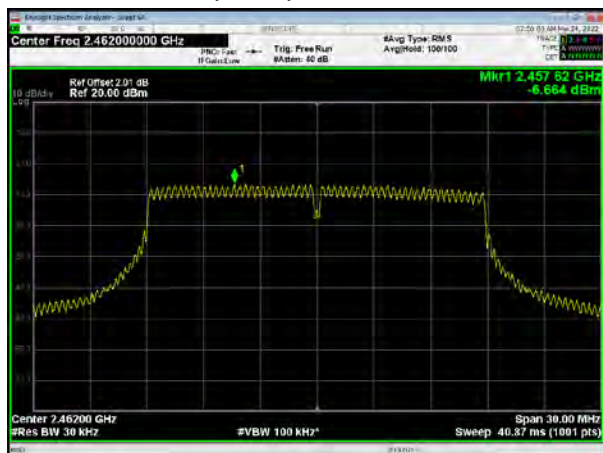
802.11n(HT20), Channel No. 6



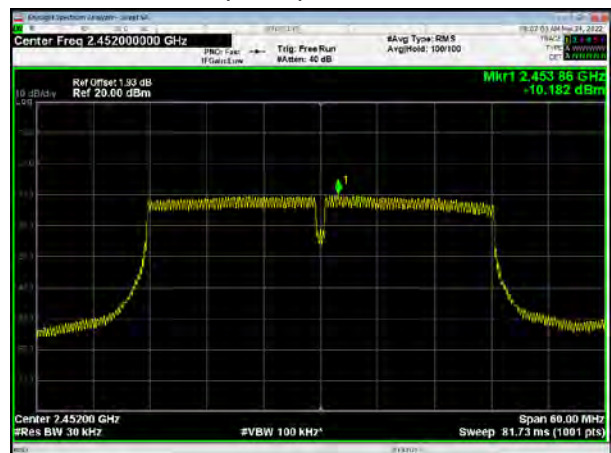
802.11n(HT40), Channel No. 6



802.11n(HT20), Channel No. 11



802.11n(HT40), Channel No. 9





802.11ax(HE20), Channel No. 1



802.11ax(HE40), Channel No. 3



802.11ax(HE20), Channel No. 6



802.11ax(HE40), Channel No. 6



802.11ax(HE20), Channel No. 11



802.11ax(HE40), 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. "

SISO Antenna 1

Test Mode	Carrier frequency (MHz)	Reference value (dBm)	Limit
802.11b	2412	10.88	-19.12
	2437	11.29	-18.71
	2462	10.80	-19.20
802.11g	2412	6.94	-23.06
	2437	7.28	-22.72
	2462	8.20	-21.80
802.11n HT20	2412	6.90	-23.10
	2437	7.38	-22.62
	2462	5.06	-24.94
802.11n HT40	2422	4.00	-26.00
	2437	3.72	-26.28



	2452	3.96	-26.04
802.11ax HE20	2412	5.49	-24.51
	2437	7.05	-22.95
	2462	6.06	-23.94
802.11ax HE40	2422	2.72	-27.28
	2437	3.01	-26.99
	2452	2.99	-27.01
Bluetooth (Low Energy) (1M)	2402	7.96	-22.04
	2440	7.94	-22.06
	2480	8.09	-21.91
Bluetooth (Low Energy) (2M)	2402	7.96	-22.04
	2440	6.60	-23.40
	2480	8.15	-21.85

Measurement Uncertainty

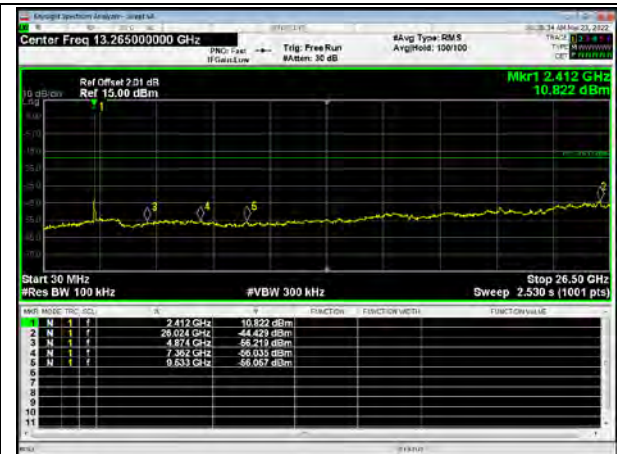
The assessed measurement uncertainty to ensure 95% confidence level for the normal distribution is with the coverage factor $k = 1.96$.

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

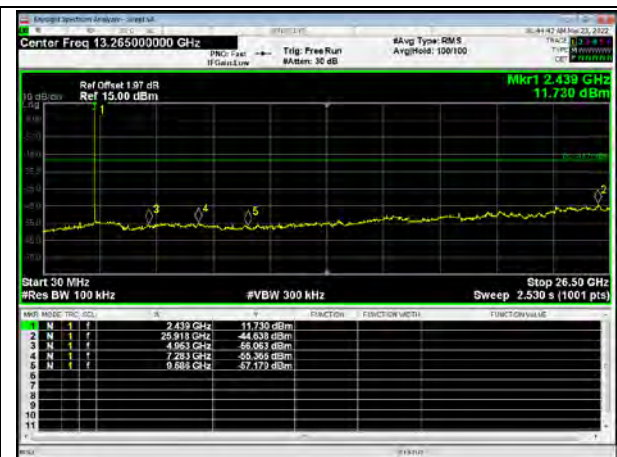


Test Results:

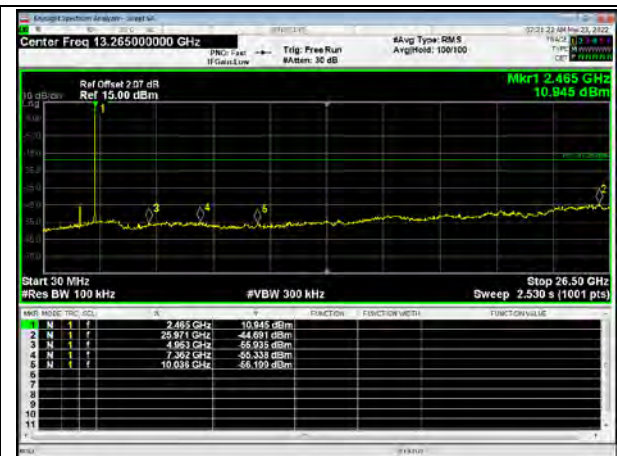
802.11b, Channel No.: 1



802.11b, Channel No.: 6

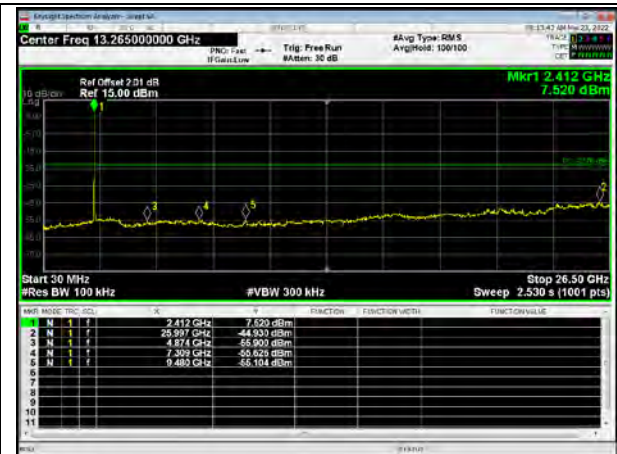


802.11b, Channel No.: 11

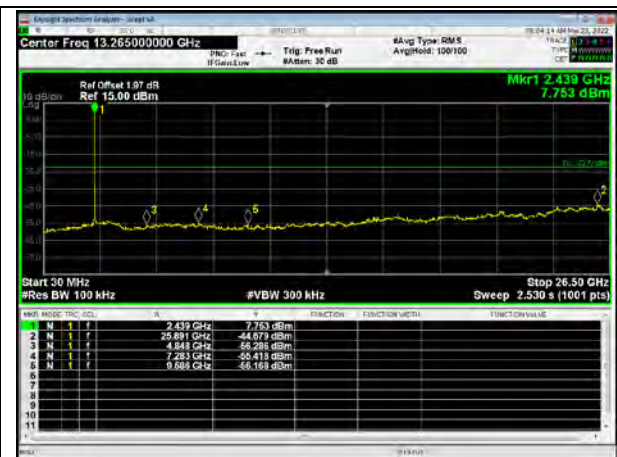




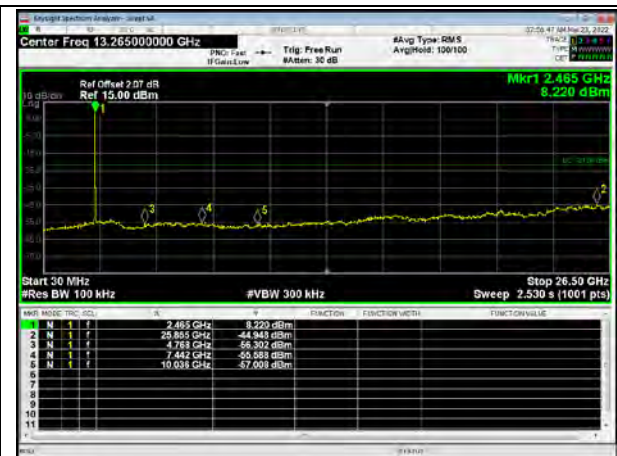
802.11g, Channel No.: 1



802.11g, Channel No.: 6

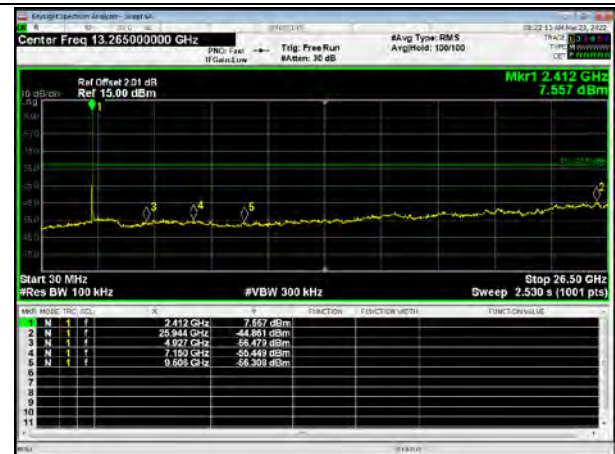


802.11g, Channel No.: 11

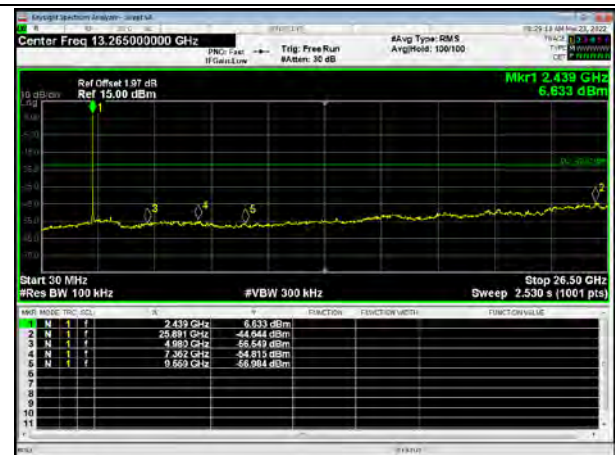




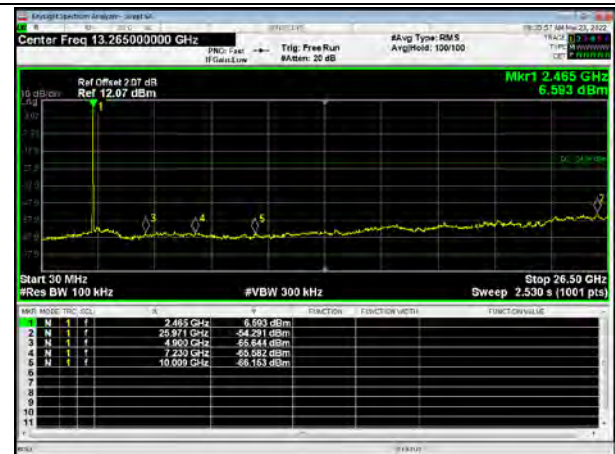
802.11n(HT20), Channel No. 1



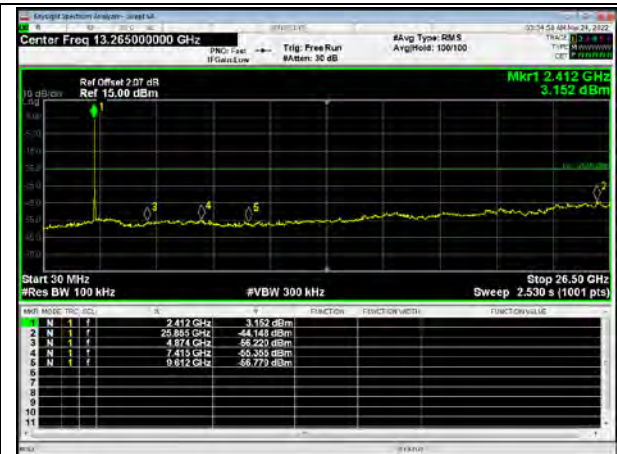
802.11n(HT20), Channel No. 6



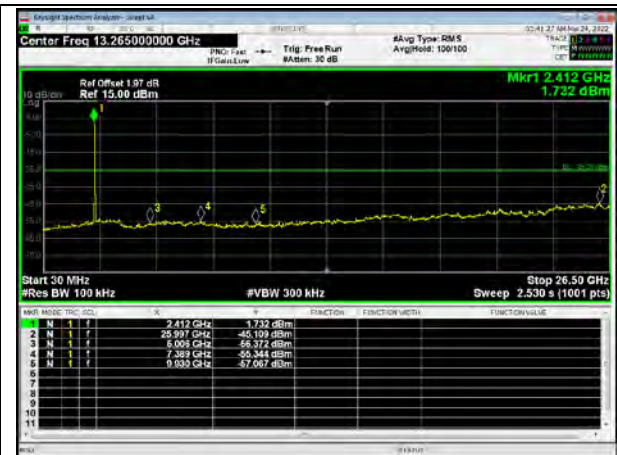
802.11n(HT20), Channel No. 11



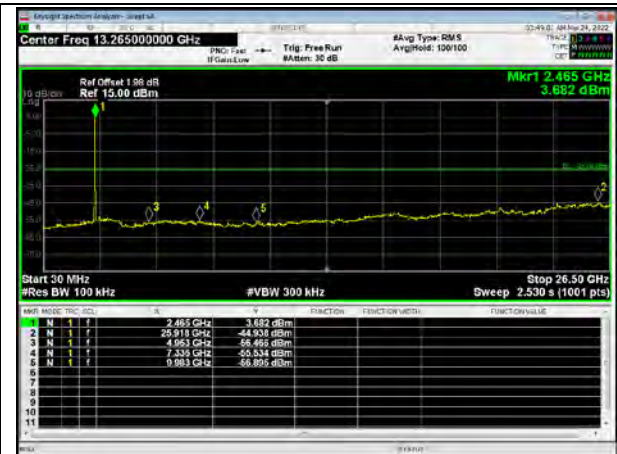
802.11n(HT40), Channel No. 3



802.11n(HT40), Channel No. 6

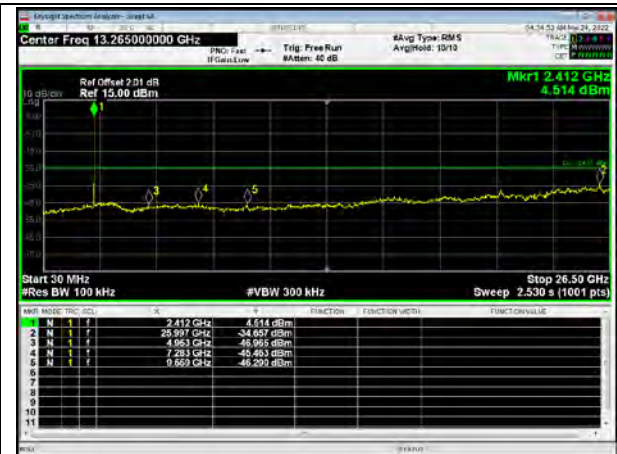


802.11n(HT40), Channel No. 9

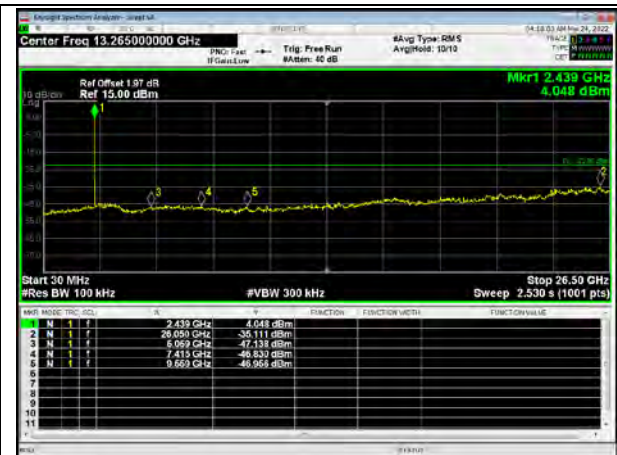




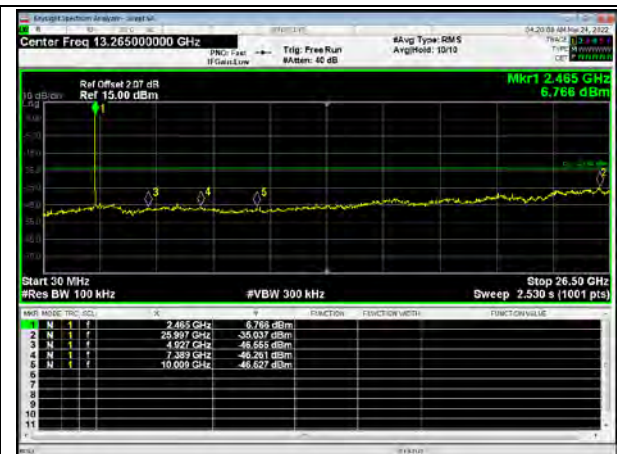
802.11ax(HE20), Channel No. 1



802.11ax(HE20), Channel No. 6



802.11ax(HE20), Channel No. 11



File Edit View Window Help
 04:22:58 AM Nov 24, 2012
 Center Freq 13.265000000 GHz Span 100 kHz
 PRC: FANF 1000 Lines Telp: Free Run Max: -45 dB
 #Avg Type: RM5 ArgHold: 1010
 11642 10.3 dBm
 70.0 dBm
 0.0 dBm
 18.0 dBm
 16.0 dBm
 14.0 dBm
 12.0 dBm
 10.0 dBm
 8.0 dBm
 6.0 dBm
 4.0 dBm
 2.0 dBm
 0.0 dBm
 -2.0 dBm
 -4.0 dBm
 -6.0 dBm
 -8.0 dBm
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 -630.0 dBm
 -632.0 dBm
 -634.0 dBm
 -636.0 dBm
 -63

[illegible]

Keysight Spectral Analyzer - Javad Ali

Center Freq 13.265000000 GHz

PRF: FAN → Trig: Free Run

#Avg Type: RMWS

ArgHold: 10/10

49.27.28 AM Nov 24, 2019

Mkr1 2.439 GHz

0.675 dBm

18 dBm

Ref Offset 1.96 dB

Ref 15.00 dBm

Start 30 MHz

Res BW 100 kHz

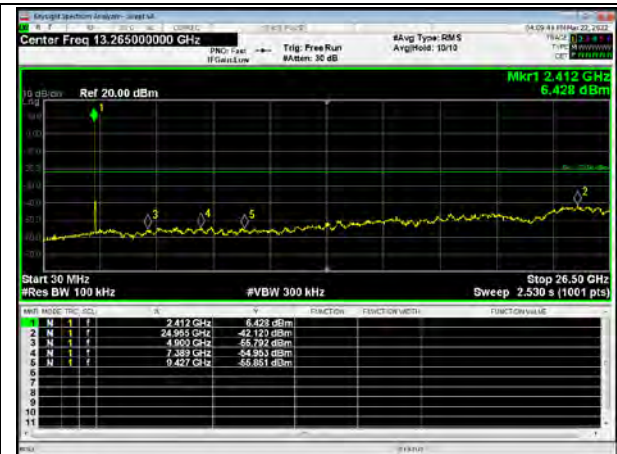
#VBW 300 kHz

Stop 26.50 GHz

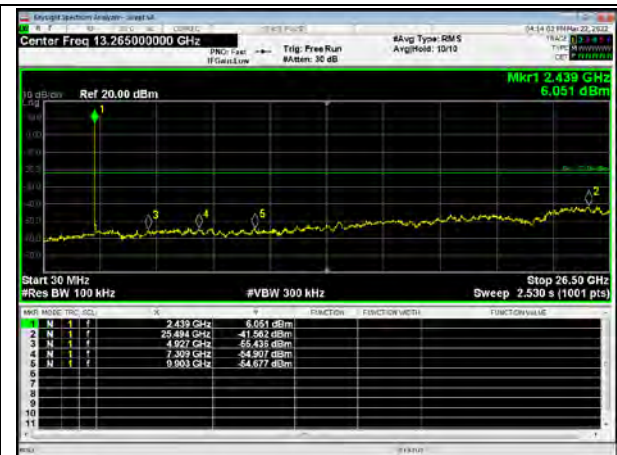
Sweep 2.50 s (1001 pts)

MARK	MODE	PRF	GHz	dBm	FUNCTION	FUNCTION WIDTH	FUNCTIONVILLE
2	N	I	2.439 GHz	0.675 dBm			
3	N	I	25.997 GHz	-39.418 dBm			
4	N	I	5.085 GHz	-46.662 dBm			
5	N	I	7.863 GHz	-44.962 dBm			
6	N	I	9.903 GHz	-46.497 dBm			
7							
8							
9							
10							
11							

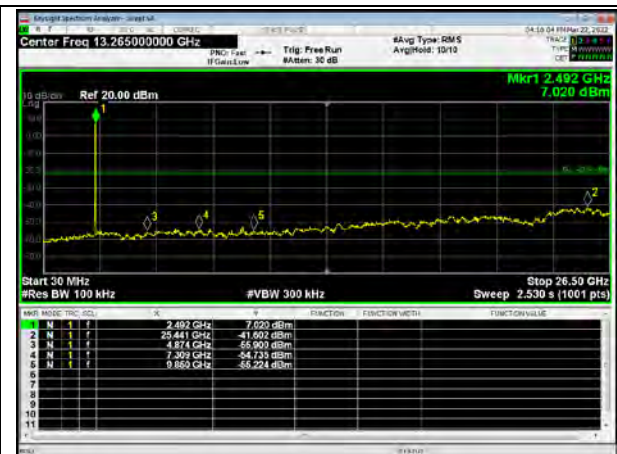
Bluetooth LE (1M), Channel No.: 0



Bluetooth LE (1M), Channel No.: 19



Bluetooth LE (1M), Channel No.: 39



Energy spectrum analysis - swept full

CORRELATION

Center Freq 13.265000000 GHz

PNC: Fast --+-- Tgt: Free Run
W/Freq Low R/Aton: 35 dB

#Avg Type: RMSE
ArgInfo: 1D110

04-09-23 09:48:33.723

16S21 0.3 8.7
Time 4 hours
DBT 4 hours

Mkr1 2.412 GHz
7.557 dBm

18 dBm
Ref 20.00 dBm

Start 30 MHz
#Res BW 100 kHz

Sweep 26.50 GHz
#VBW 300 kHz

Sweep 2.530 s (1001 pts)

NFPI	MODE	FREQ [GHz]	A	FUNCTION	FUNCTION METRIC	FUNCTION VALUE
2	N	I	f	2.412 GHz	-7.557 dBm	
3	N	I	f	26.441 GHz	-41.141 dBm	
4	N	I	f	4.927 GHz	-56.473 dBm	
5	N	I	f	7.335 GHz	-54.084 dBm	
6	N	I	f	9.744 GHz	-56.180 dBm	
7						
8						
9						
10						
11						

Keysight spectrum analyzer - jpeg.vla

Center Freq 13.265000000 GHz

PRF: Fast W: Guard Low

Tel: Free Run

Avg Type: RMS

ArgHold: 1010

04/20/21 14:44:22, 20.21

16421 0.0 0.0

Time 4 minutes

DB 100 dB

Mkr1 2.439 GHz

4.578 dBm

Ref 20.00 dBm

Start 30 MHz

Stop 26.50 GHz

Res BW 100 kHz

Sweep 2.530 s (1001 pts)

#VBW 300 kHz

MNF	MODE	TRF	COL	F	FUNCTION	FUNCTION WDR	FUNCTION WDR
1	N	I	f	2.439 GHz	-4.578 dBm		
2	N	I	f	20.441 GHz	-40.890 dBm		
3	N	I	f	4.974 GHz	-56.172 dBm		
4	N	I	f	7.265 GHz	-54.911 dBm		
5	N	I	f	9.850 GHz	-54.997 dBm		
6							
7							
8							
9							
10							
11							

Copyright Spectrum Analyser - Javad v4.4

Center Freq 13.265000000 GHz

PRF: Fast
IF Gain: Low

dBm: Free Run
Att: 50 dB

#Avg Type: RMW
Avg Hold: 10110

04/23/2014 Mon 10:20:11

16421.03 dBm
TMR: 4.000000
CST: 0.000000

Mkr1 2.492 GHz
4.628 dBm

Ref 20.00 dBm

Start 30 MHz
#Res BW 100 kHz

#VBW 300 kHz

Stop 26.50 GHz
Sweep 2.500 s (1001 pts)

MW MODE: TRF: ACQ

N	F	F	FUNCTION	FUNCTION UNIT	FUNCTION VALUE
2	N	1	2.492 GHz	-1.538 dBm	
3	N	1	25.916 GHz	-41.545 dBm	
4	N	1	4.849 GHz	-56.129 dBm	
5	N	1	7.293 GHz	-54.221 dBm	
6	N	1	9.903 GHz	-54.898 dBm	
7					
8					
9					
10					
11					

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.

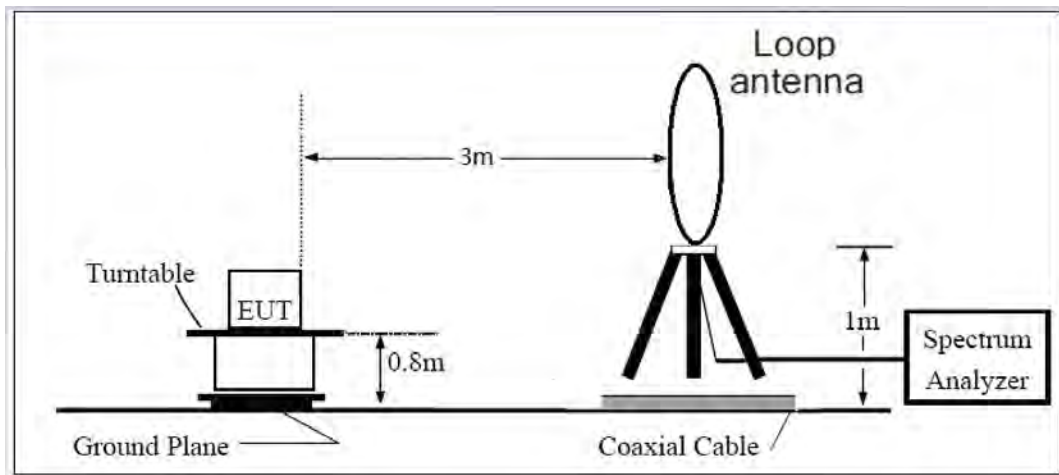
2) If linear voltage averaging mode was used in the preceding step e), then the correction factor is $[20 \log (1 / D)]$, where D is the duty cycle. For example, if the transmit duty cycle was 50%, then 6 dB shall be added to the measured emission levels.

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.

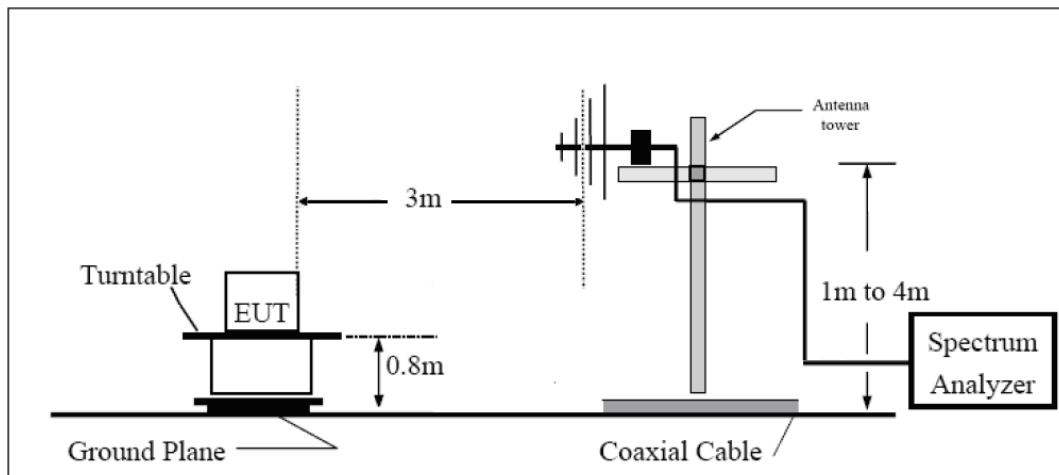
The test is in transmitting mode.

Test setup

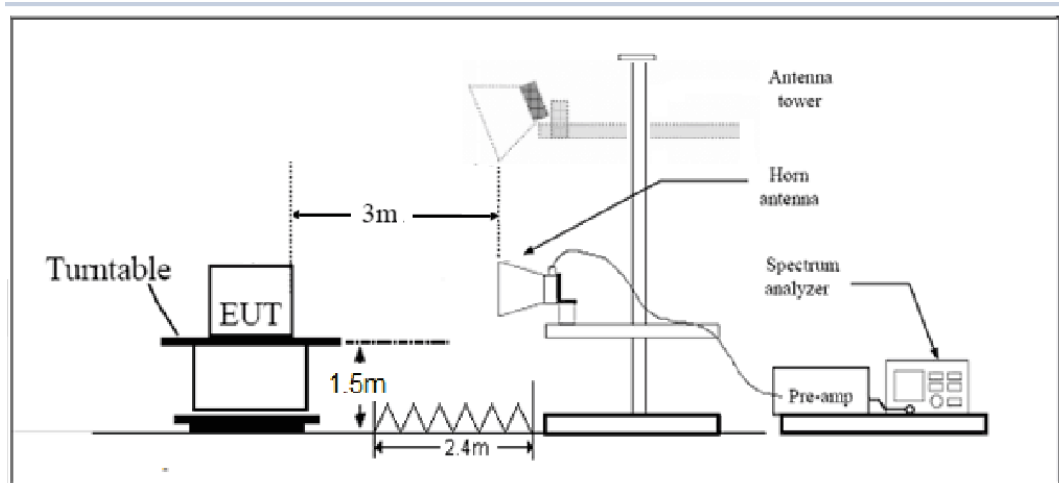
9KHz ~ 30MHz



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

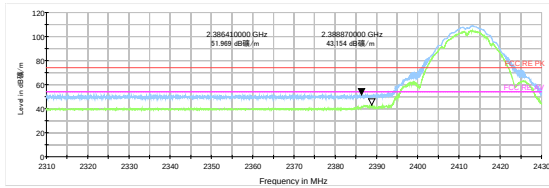
Spurious Radiated Emissions are permitted in any of the frequency bands listed below:

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			

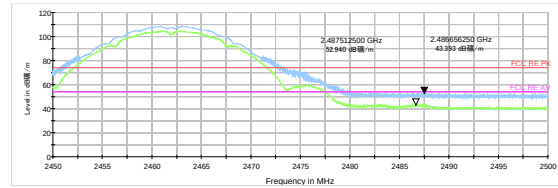
Measurement Uncertainty

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

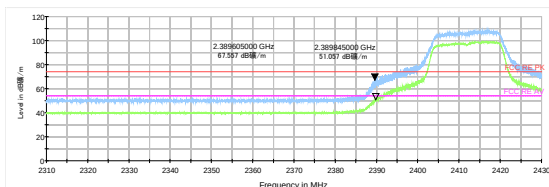
Frequency	Uncertainty
9KHz-30MHz	3.55 dB
30MHz-200MHz	4.17 dB
200MHz-1GHz	4.84 dB
1-18GHz	4.35 dB
18-26.5GHz	5.90 dB
26.5GHz~40GHz	5.92 dB

**Test Results:**A font (dB μ /m) in the test plot = (dB μ V/m)

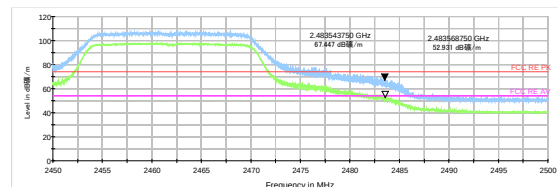
802.11b-Channel 1 Peak+ Average



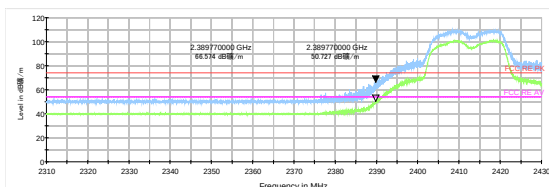
802.11b-Channel 11 Peak+ Average



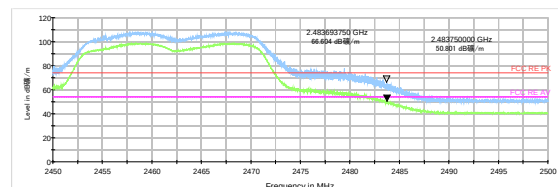
802.11g-Channel 1 Peak+ Average



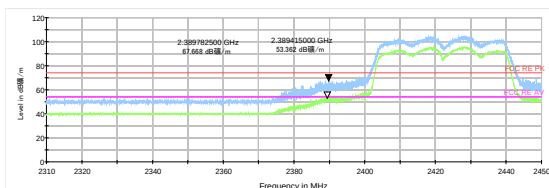
802.11g-Channel 11 Peak+ Average



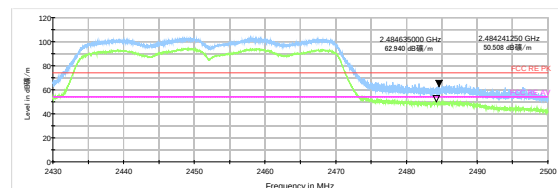
802.11n HT20 -Channel 1 Peak+ Average



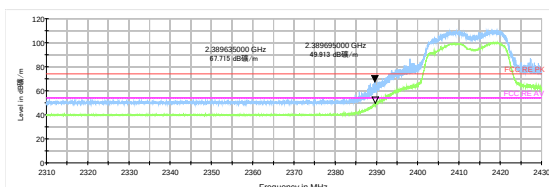
802.11n HT20 -Channel 11 Peak+ Average



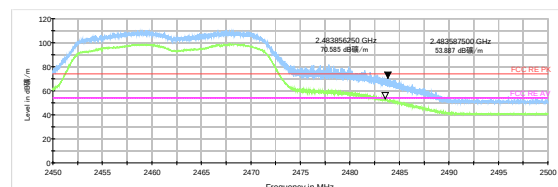
802.11n HT40 -Channel 3 Peak+ Average



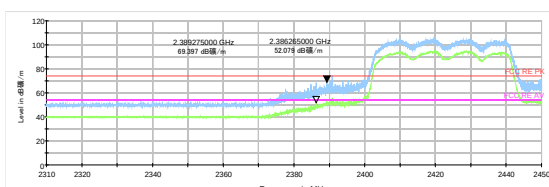
802.11n HT40 -Channel 9 Peak+ Average



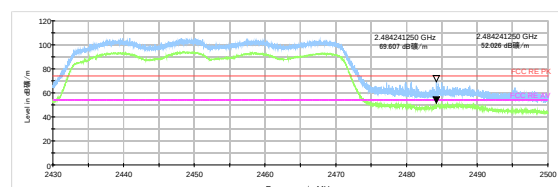
802.11ax HE20 -Channel 1 Peak+ Average



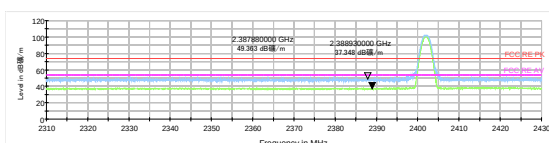
802.11ax HE20 -Channel 11 Peak+ Average



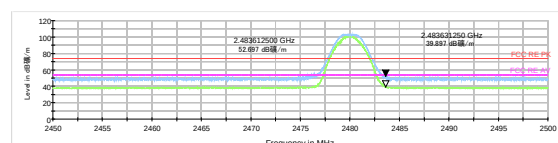
802.11ax HE40 -Channel 3 Peak+ Average



802.11ax HE40 -Channel 9 Peak+ Average

After the pretest, Bluetooth LE (2M) was selected as the worst Mode for Bluetooth LE.

Bluetooth LE Channel 0 Peak+ Average



Bluetooth LE Channel 39 Peak+Average

Result of RE

Test result

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.

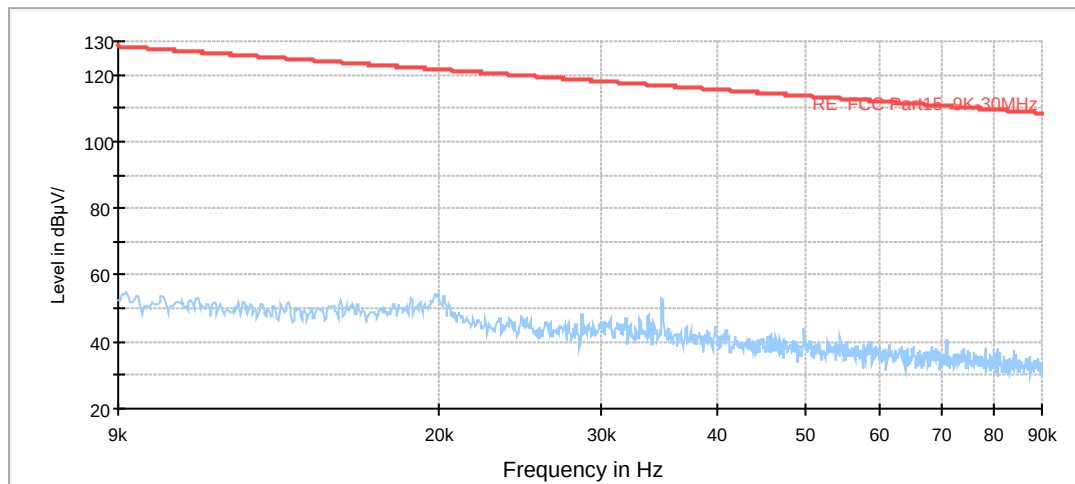
After the pretest, MIMO was selected as the worst antenna for 802.11n HT20/ HT40 and 802.11ax HE20/HE40. SISO Antenna 1 was selected as the worst SISO antenna.

During the test, the Radiates Emission from 9kHz to 1GHz was performed in all modes with all channels, 802.11ax HE40, Channel 6 are selected as the worst condition. The test data of the worst-case condition was recorded in this report.

A font ($\text{Level in dB}\mu\text{V/}$) in the test plot =(level in dB $\mu\text{V/m}$)

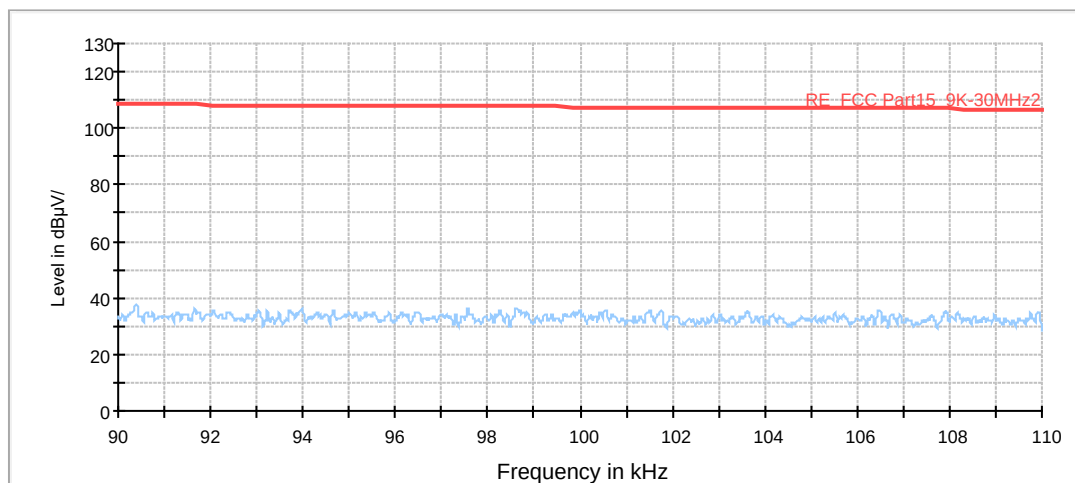
Continuous TX mode:

FCC RE 9K-90KHz AV



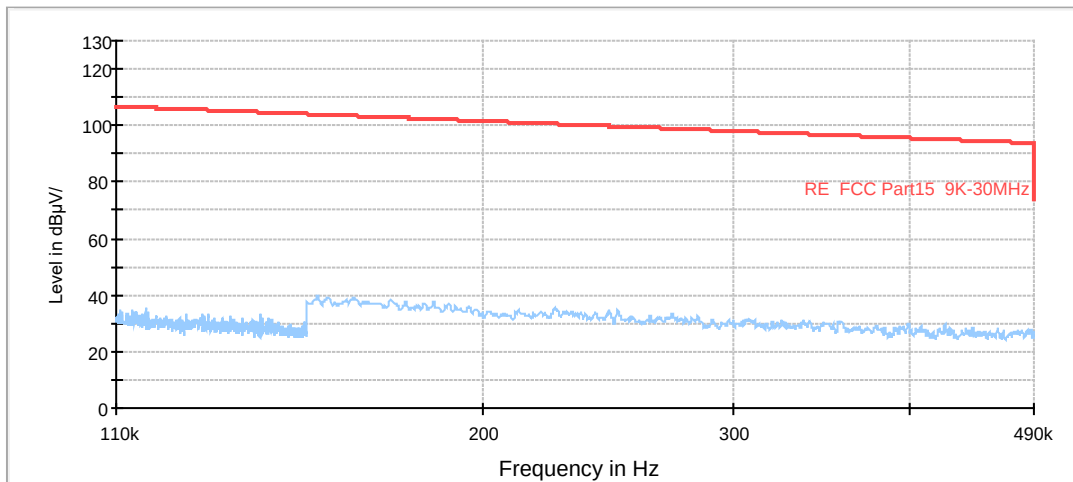
Radiates Emission from 9KHz to 90KHz

FCC RE 90K-110KHz QP



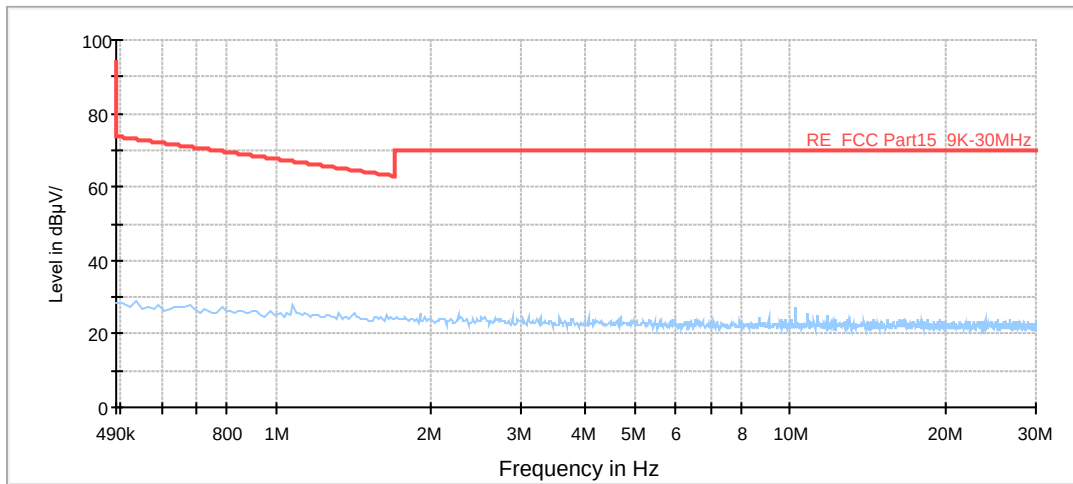
Radiates Emission from 90KHz to 110KHz

FCC RE 110K-490KHz AV

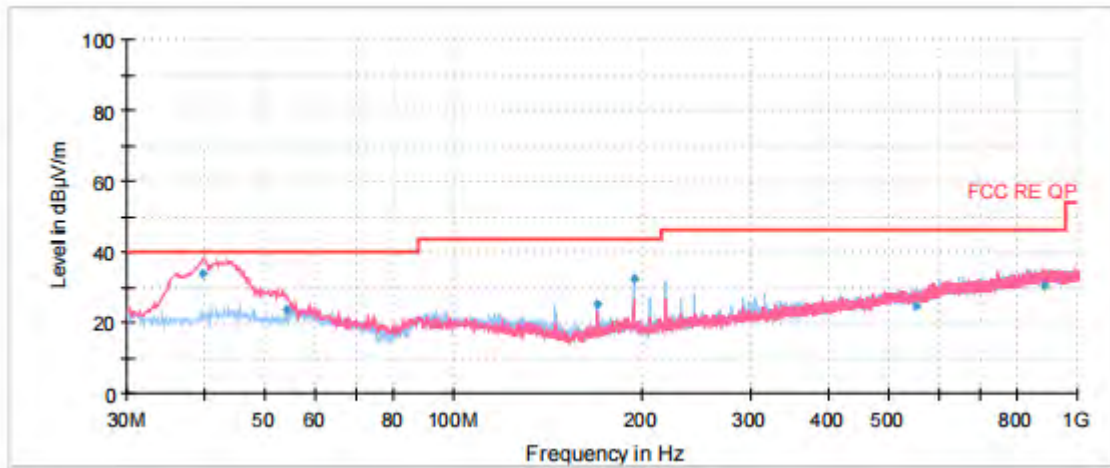


Radiates Emission from 110KHz to 490KHz

FCC RE 490K-30MHz QP



Radiates Emission from 490KHz to 30MHz



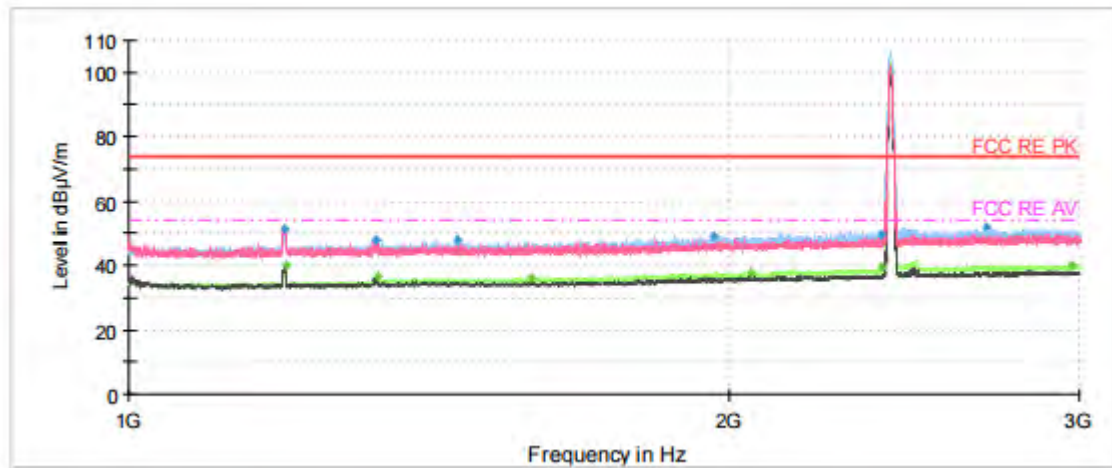
Radiates Emission from 30MHz to 1GHz

Frequency (MHz)	Quasi-Peak (dBuV/m)	Height (cm)	Polarization	Azimuth (deg)	Correct Factor (dB)	Margin (dB)	Limit (dBuV/m)
39.78	34.09	100.0	V	211.00	14	5.91	40.00
53.93	23.62	105.0	V	328.00	13	16.38	40.00
170.21	25.14	187.0	H	261.00	10	18.36	43.50
194.54	32.42	125.0	H	273.00	12	11.08	43.50
550.65	24.70	213.0	H	153.00	20	21.30	46.00
886.71	30.37	203.0	V	270.00	25	15.63	46.00

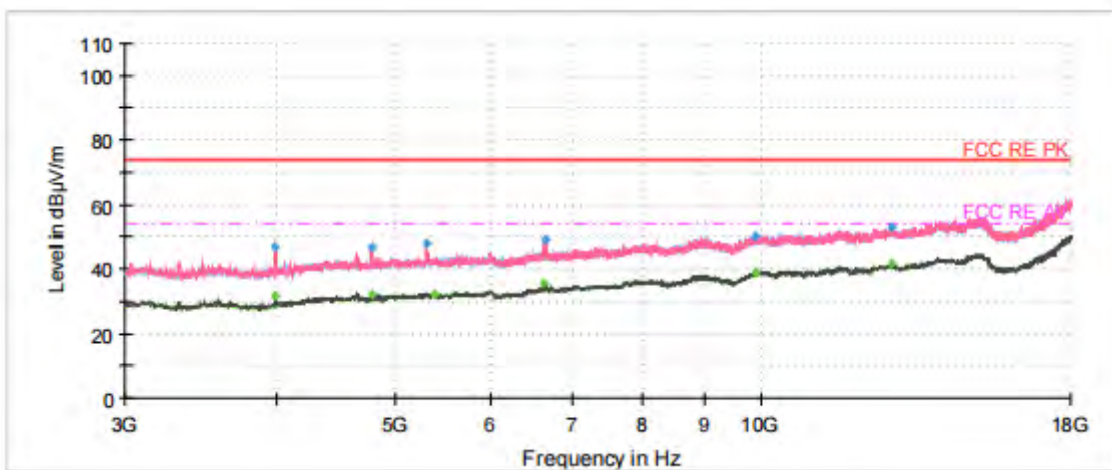
Remark: 1. Correction Factor = Antenna factor+ Insertion loss(cable loss+amplifier gain)

2. Margin = Limit – Quasi-Peak

802.11b CH1



Note: The signal beyond the limit is carrier.
Radiates Emission from 1GHz to 3GHz

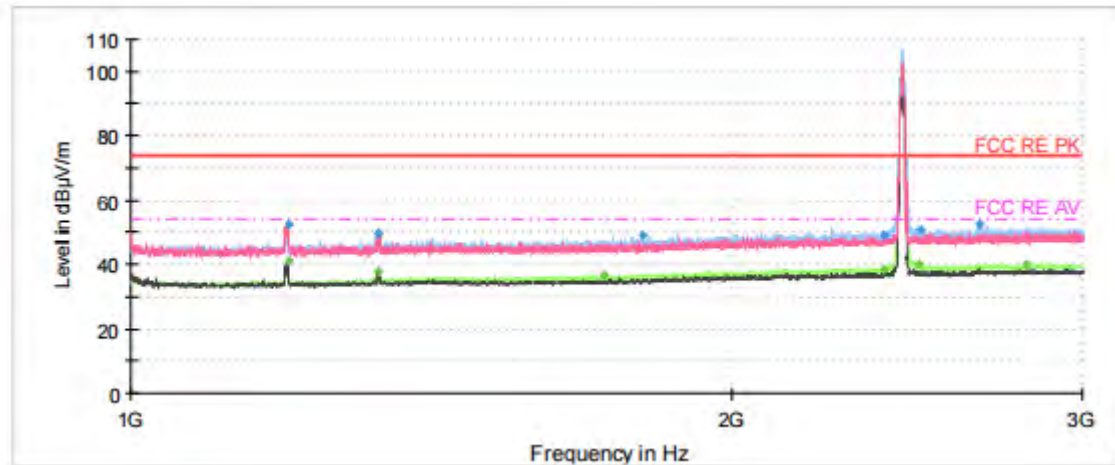


Radiates Emission from 3GHz to 18GHz

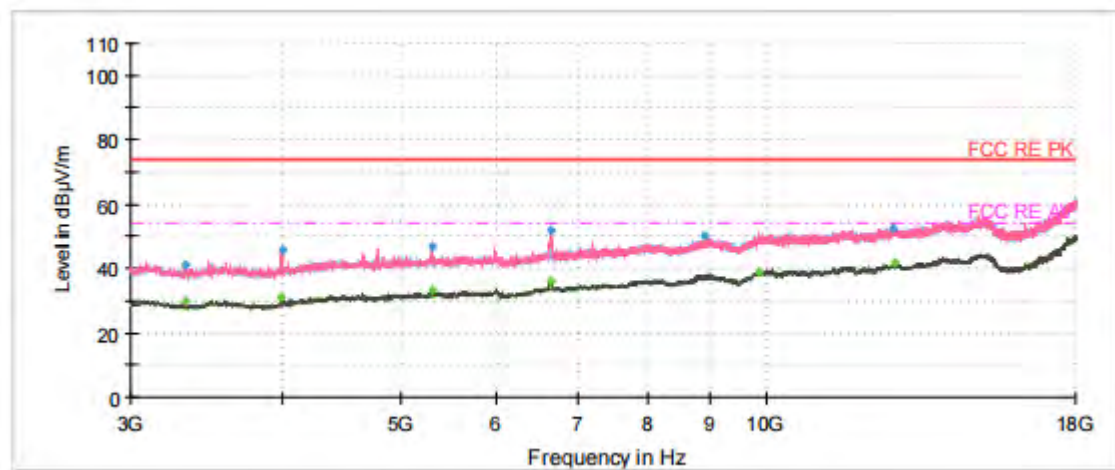
Frequency (MHz)	MaxPeak (dB μ V/m)	Average (dB μ V/m)	Limit (dB μ V/m)	Margin (dB)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
1196.75	51.59	---	74.00	22.41	200.0	V	54.00	-9
1198.50	---	40.04	54.00	13.96	200.0	V	0.00	-9
1330.25	47.97	---	74.00	26.03	200.0	H	2.00	-8
1332.00	---	36.70	54.00	17.30	200.0	V	352.00	-8
1462.25	47.83	---	74.00	26.17	200.0	H	37.00	-7
1593.75	---	36.38	54.00	17.62	200.0	H	17.00	-6
1966.50	49.33	---	74.00	24.67	200.0	H	138.00	-5
2051.50	---	37.66	54.00	16.34	200.0	H	71.00	-5
2387.50	---	39.40	54.00	14.60	100.0	H	354.00	-4
2387.75	49.41	---	74.00	24.59	100.0	H	228.00	-4
2694.25	51.82	---	74.00	22.18	200.0	H	71.00	-4
2971.25	---	40.04	54.00	13.96	200.0	H	54.00	-3

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



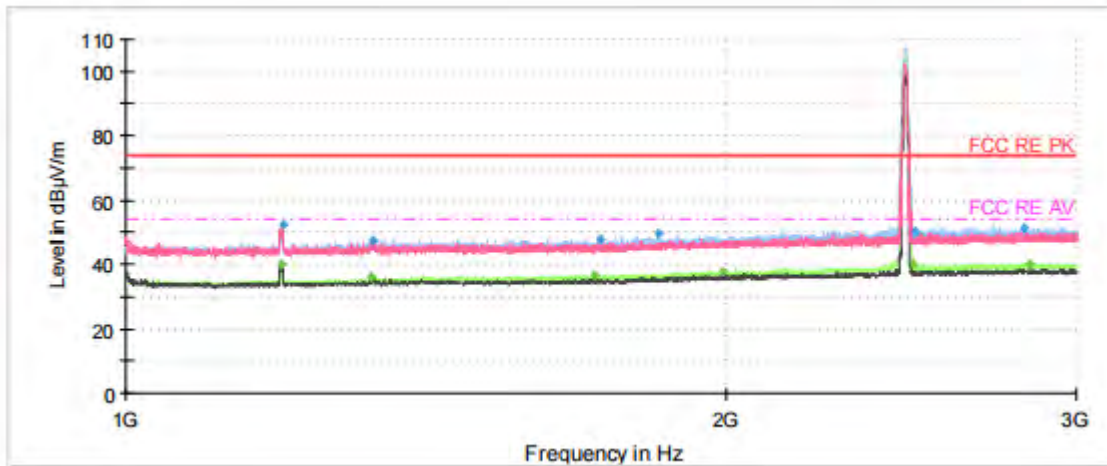
Radiates Emission from 3GHz to 18GHz



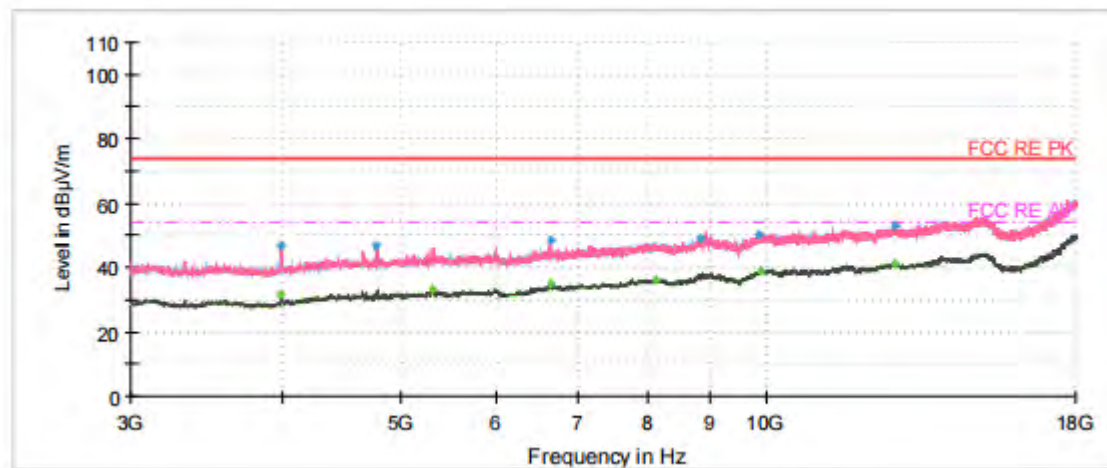
Frequency (MHz)	MaxPeak (dB μ V/m)	Average (dB μ V/m)	Limit (dB μ V/m)	Margin (dB)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
1198.50	52.33	---	74.00	21.67	200.0	V	55.00	-9
1198.75	---	41.18	54.00	12.82	200.0	V	55.00	-9
1328.75	49.37	---	74.00	24.63	100.0	H	49.00	-8
1330.50	---	37.62	54.00	16.38	100.0	H	49.00	-8
1724.75	---	36.54	54.00	17.46	200.0	H	4.00	-6
1805.25	48.82	---	74.00	25.18	100.0	H	359.00	-6
2385.50	49.24	---	74.00	24.76	200.0	H	121.00	-4
2386.50	---	38.57	54.00	15.43	200.0	H	112.00	-4
2484.00	---	39.97	54.00	14.03	200.0	H	0.00	-4
2491.75	50.66	---	74.00	23.34	200.0	H	30.00	-4
2663.50	52.21	---	74.00	21.79	200.0	H	62.00	-3
2812.25	---	40.14	54.00	13.86	200.0	H	199.00	-3

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

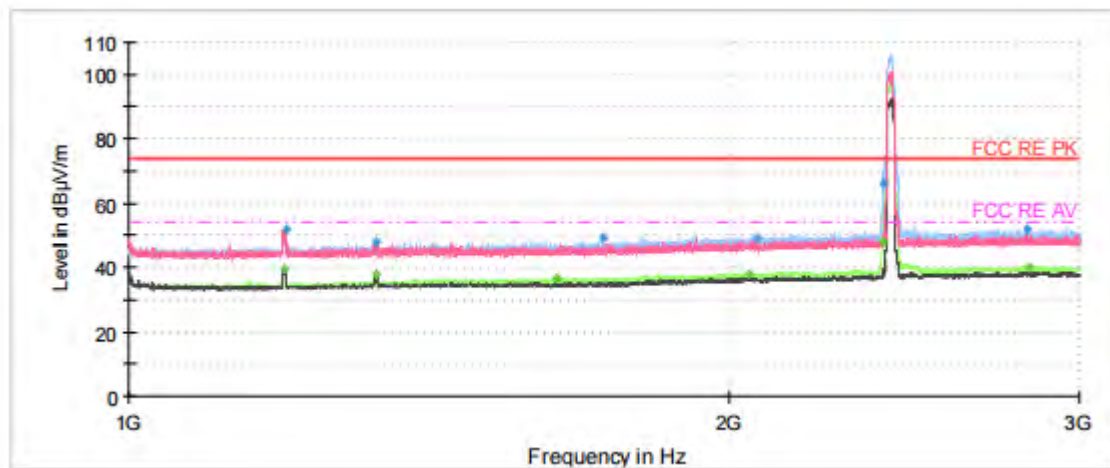


Radiates Emission from 3GHz to 18GHz

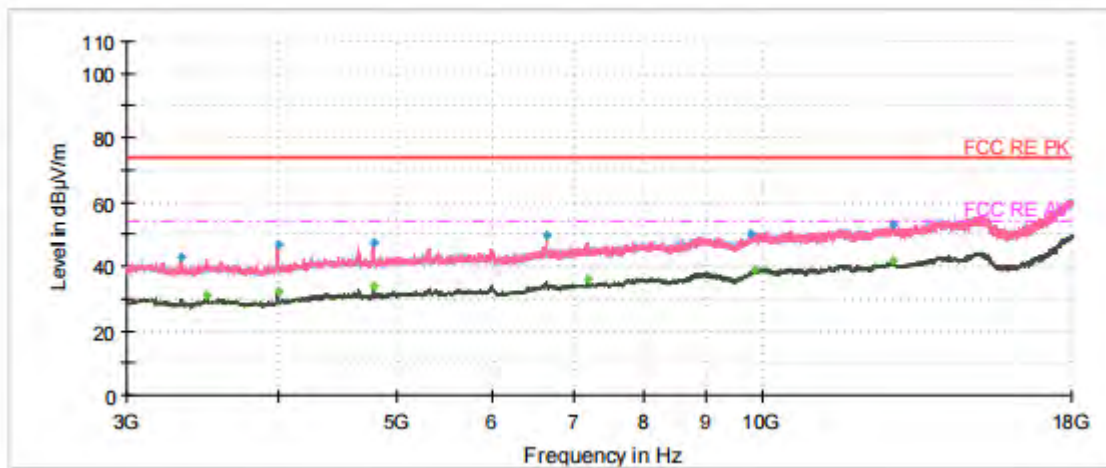
Frequency (MHz)	MaxPeak (dB μ V/m)	Average (dB μ V/m)	Limit (dB μ V/m)	Margin (dB)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
1195.75	---	40.02	54.00	13.98	200.0	V	354.00	-9
1198.25	52.36	---	74.00	21.64	200.0	V	46.00	-9
1328.00	---	36.36	54.00	17.64	200.0	H	96.00	-8
1329.25	47.66	---	74.00	26.34	100.0	V	178.00	-8
1718.00	---	36.70	54.00	17.30	200.0	H	129.00	-6
1729.50	47.93	---	74.00	26.07	100.0	H	324.00	-6
1852.25	49.64	---	74.00	24.36	200.0	H	12.00	-5
1994.25	---	37.78	54.00	16.22	200.0	H	121.00	-5
2486.50	---	40.29	54.00	13.71	200.0	H	3.00	-4
2487.75	50.44	---	74.00	23.56	100.0	H	357.00	-4
2823.00	51.57	---	74.00	22.43	100.0	H	299.00	-3
2844.75	---	40.09	54.00	13.91	200.0	H	70.00	-3

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



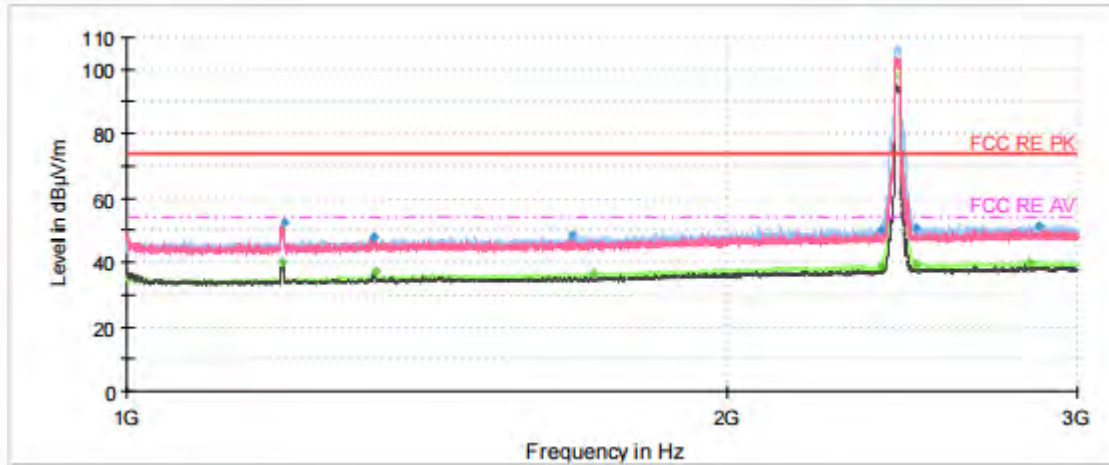
Radiates Emission from 3GHz to 18GHz



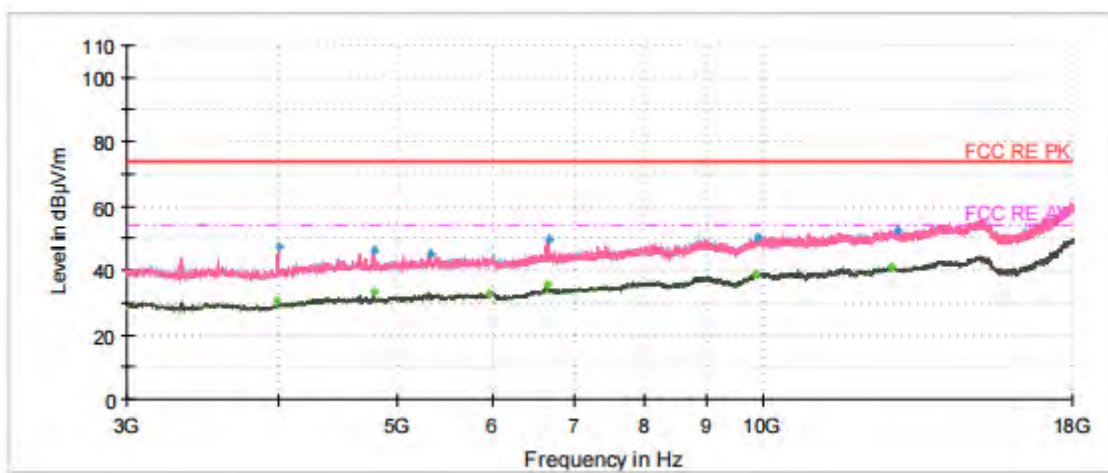
Frequency (MHz)	MaxPeak (dB μ V/m)	Average (dB μ V/m)	Limit (dB μ V/m)	Margin (dB)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
1197.25	---	39.30	54.00	14.70	200.0	V	356.00	-9
1198.25	52.07	---	74.00	21.93	200.0	V	46.00	-9
1329.50	48.02	---	74.00	25.98	200.0	V	339.00	-8
1330.25	---	37.65	54.00	16.35	200.0	V	344.00	-8
1639.00	---	36.56	54.00	17.44	200.0	H	124.00	-6
1730.00	49.14	---	74.00	24.86	200.0	H	66.00	-6
2045.75	---	38.03	54.00	15.97	200.0	H	82.00	-5
2064.50	49.27	---	74.00	24.73	100.0	H	286.00	-5
2389.50	---	48.23	54.00	5.77	100.0	H	226.00	-4
2389.50	66.06	---	74.00	7.94	100.0	H	226.00	-4
2820.50	52.09	---	74.00	21.91	200.0	H	4.00	-3
2832.50	---	40.24	54.00	13.76	200.0	H	14.00	-3

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

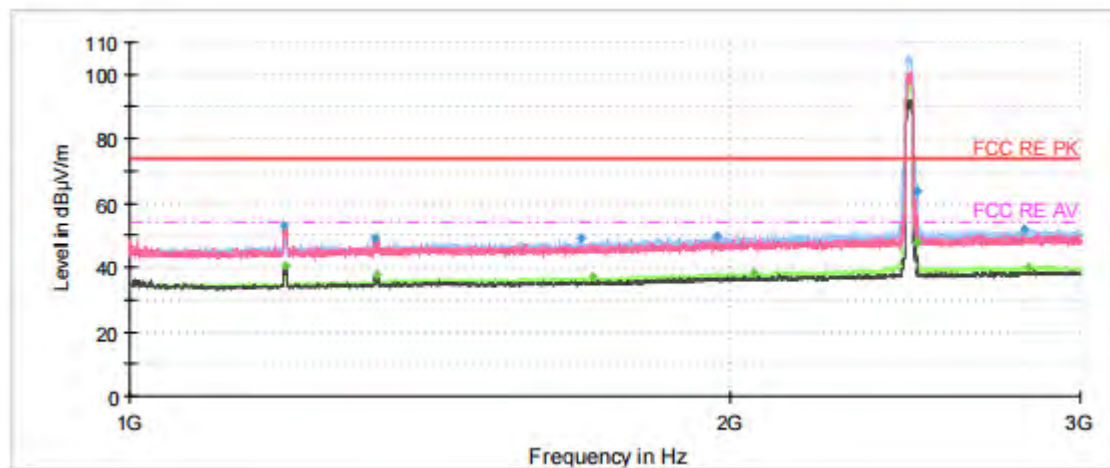


Radiates Emission from 3GHz to 18GHz

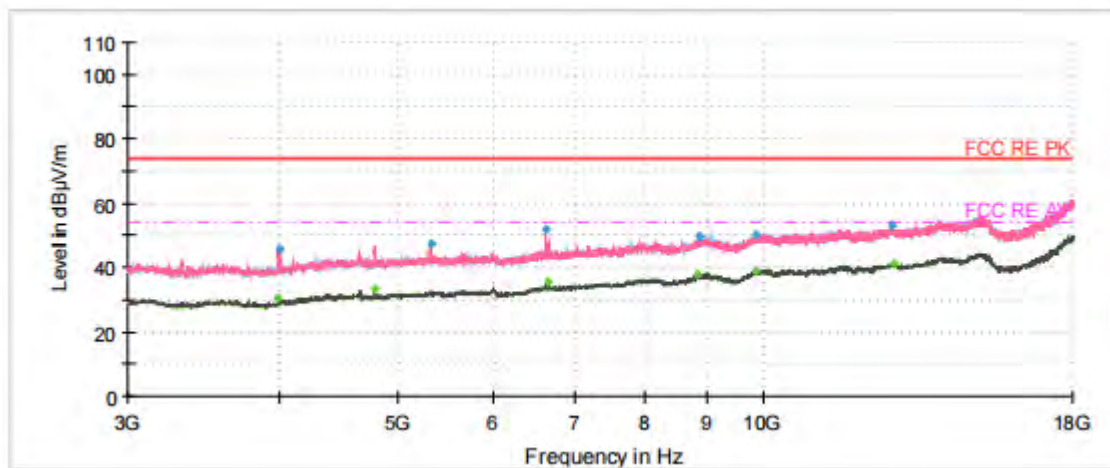
Frequency (MHz)	MaxPeak (dB μ V/m)	Average (dB μ V/m)	Limit (dB μ V/m)	Margin (dB)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
1196.25	---	39.99	54.00	14.01	200.0	V	348.00	-9
1199.75	52.56	---	74.00	21.44	200.0	V	53.00	-9
1330.25	48.21	---	74.00	25.79	200.0	V	344.00	-8
1332.00	---	37.17	54.00	16.83	100.0	H	59.00	-8
1672.50	48.65	---	74.00	25.35	100.0	H	216.00	-6
1715.50	---	36.64	54.00	17.36	200.0	H	67.00	-6
2388.75	50.03	---	74.00	23.97	100.0	H	191.00	-4
2389.50	---	38.89	54.00	15.11	100.0	H	166.00	-4
2487.25	50.54	---	74.00	23.46	100.0	H	343.00	-4
2488.75	---	39.50	54.00	14.50	200.0	H	0.00	-4
2835.50	---	40.23	54.00	13.77	100.0	H	216.00	-3
2866.50	51.59	---	74.00	22.41	200.0	H	107.00	-3

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



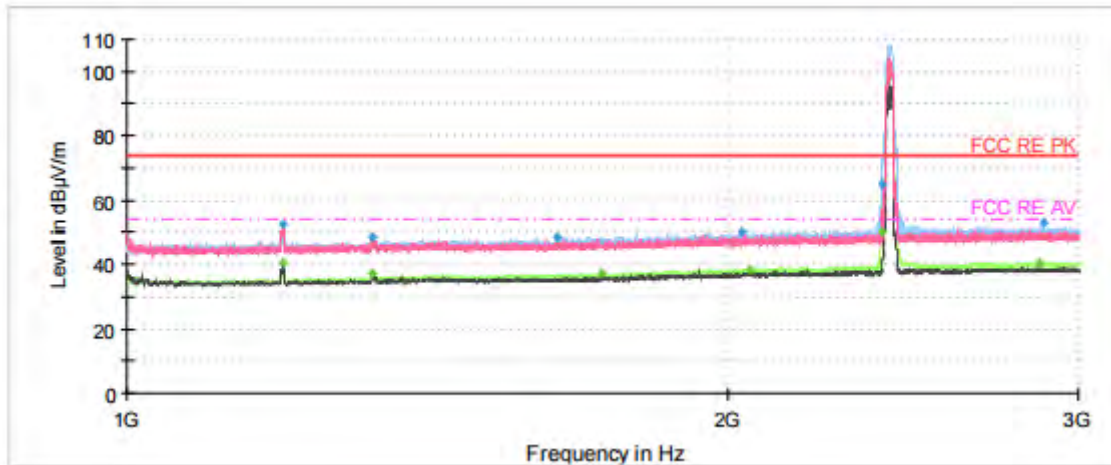
Radiates Emission from 3GHz to 18GHz



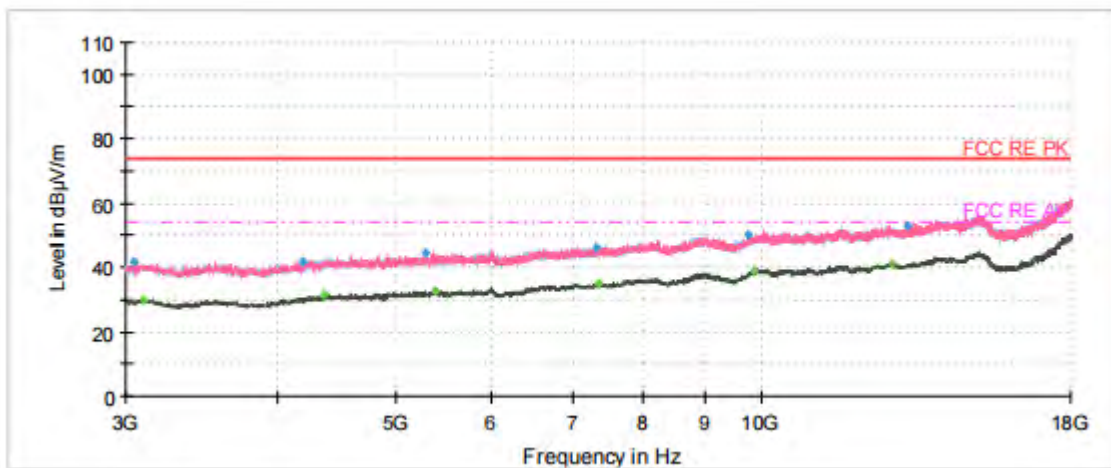
Frequency (MHz)	MaxPeak (dB μ V/m)	Average (dB μ V/m)	Limit (dB μ V/m)	Margin (dB)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
1194.75	52.76	---	74.00	21.24	200.0	V	0.00	-9
1196.50	---	40.54	54.00	13.46	200.0	V	0.00	-9
1328.00	49.10	---	74.00	24.90	200.0	V	342.00	-8
1330.50	---	37.96	54.00	16.04	200.0	V	178.00	-8
1683.75	49.35	---	74.00	24.65	100.0	H	258.00	-6
1707.75	---	36.96	54.00	17.04	100.0	H	241.00	-6
1970.00	49.70	---	74.00	24.30	200.0	H	146.00	-5
2054.75	---	38.26	54.00	15.74	200.0	H	115.00	-5
2484.00	63.77	---	74.00	10.23	100.0	H	224.00	-4
2484.25	---	48.23	54.00	5.77	200.0	H	198.00	-4
2810.25	52.04	---	74.00	21.96	100.0	H	0.00	-3
2824.50	---	40.33	54.00	13.67	200.0	H	164.00	-3

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



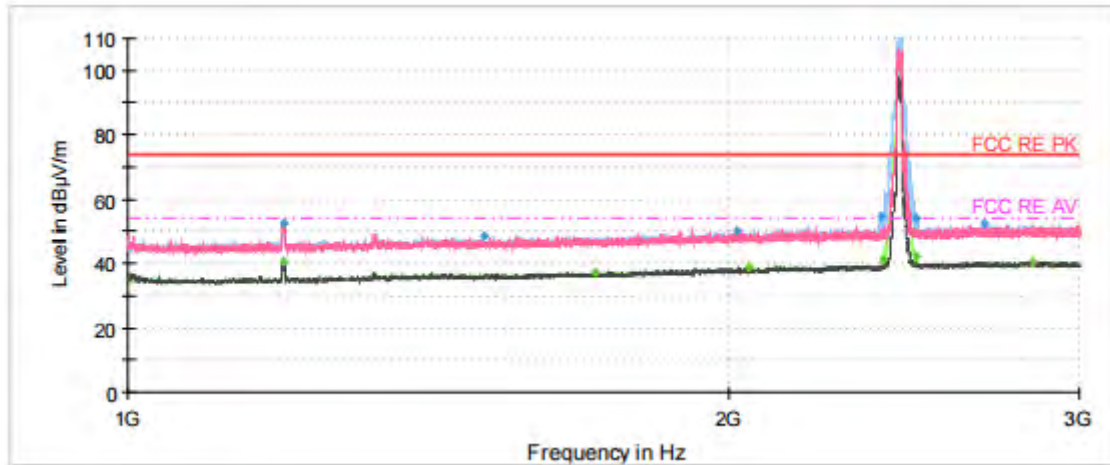
Radiates Emission from 3GHz to 18GHz



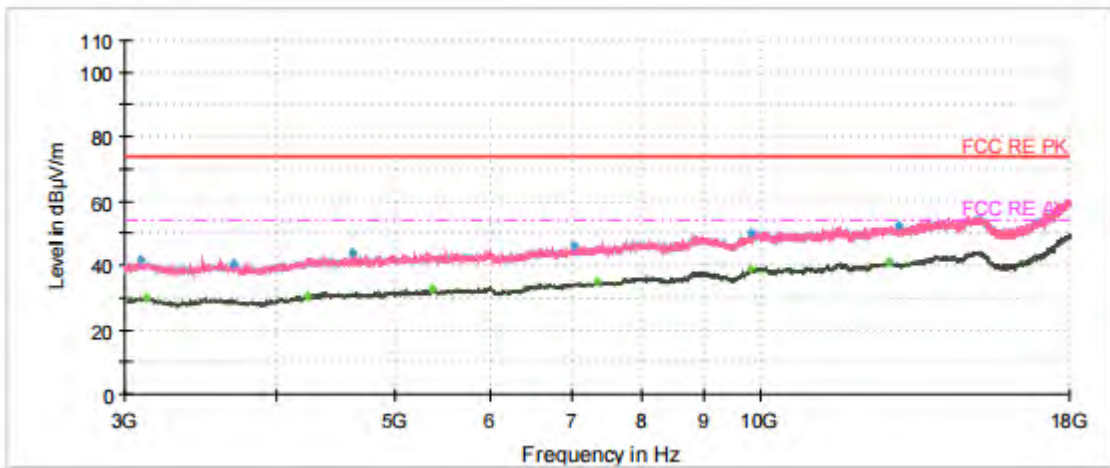
Frequency (MHz)	MaxPeak (dB μ V/m)	Average (dB μ V/m)	Limit (dB μ V/m)	Margin (dB)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
1196.25	---	40.54	54.00	13.46	100.0	V	4.00	-9
1197.50	52.37	---	74.00	21.63	200.0	V	46.00	-9
1328.50	48.54	---	74.00	25.46	200.0	V	358.00	-8
1328.50	---	37.25	54.00	16.75	100.0	V	182.00	-8
1643.50	48.77	---	74.00	25.23	200.0	H	72.00	-6
1731.00	---	37.24	54.00	16.76	200.0	H	3.00	-6
2034.75	50.05	---	74.00	23.95	200.0	H	2.00	-5
2053.75	---	38.55	54.00	15.45	200.0	H	250.00	-5
2389.25	64.85	---	74.00	9.15	100.0	H	355.00	-4
2389.50	---	50.18	54.00	3.82	100.0	H	355.00	-4
2867.50	---	40.64	54.00	13.36	100.0	H	323.00	-3
2880.50	52.77	---	74.00	21.23	200.0	H	39.00	-3

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



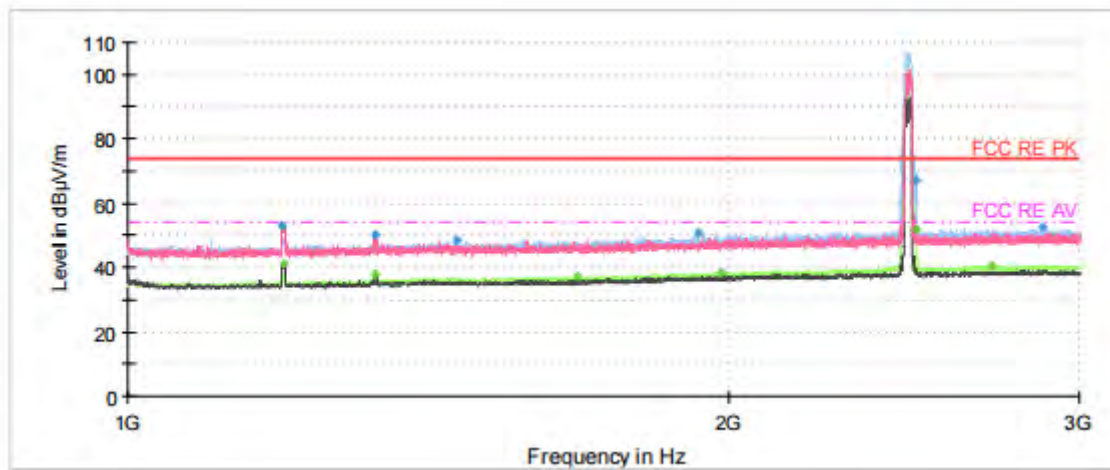
Radiates Emission from 3GHz to 18GHz



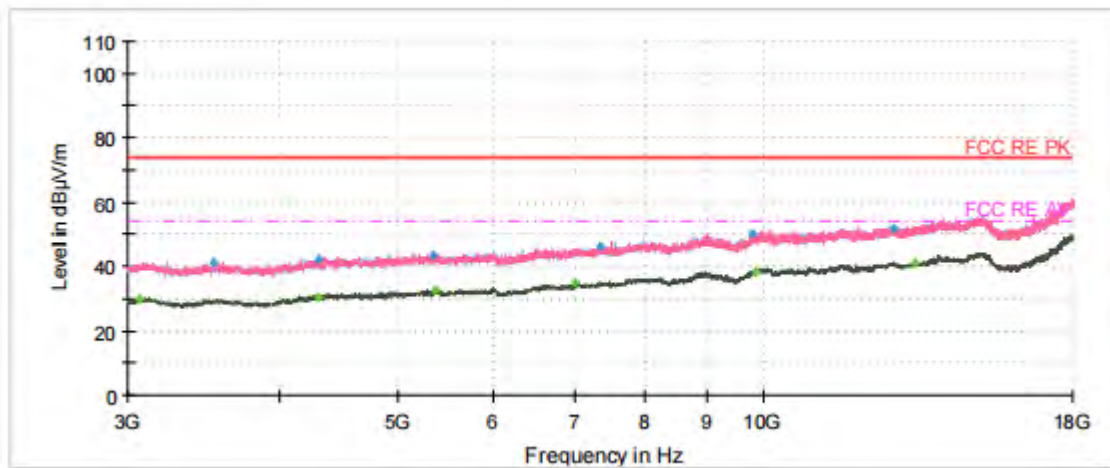
Frequency (MHz)	MaxPeak (dB μ V/m)	Average (dB μ V/m)	Limit (dB μ V/m)	Margin (dB)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
1196.25	---	40.40	54.00	13.60	200.0	V	0.00	-9
1198.00	52.69	---	74.00	21.31	200.0	V	352.00	-9
1507.25	48.69	---	74.00	25.31	100.0	H	150.00	-7
1715.00	---	37.09	54.00	16.91	100.0	H	253.00	-6
2020.50	49.98	---	74.00	24.02	100.0	V	4.00	-5
2048.00	---	38.66	54.00	15.34	100.0	V	123.00	-5
2385.25	54.80	---	74.00	19.20	200.0	H	202.00	-4
2389.25	---	41.00	54.00	13.00	200.0	H	202.00	-4
2484.00	---	42.21	54.00	11.79	200.0	H	202.00	-4
2484.50	54.31	---	74.00	19.69	200.0	H	202.00	-4
2689.75	52.58	---	74.00	21.42	100.0	H	50.00	-4
2843.50	---	40.59	54.00	13.41	200.0	H	5.00	-3

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

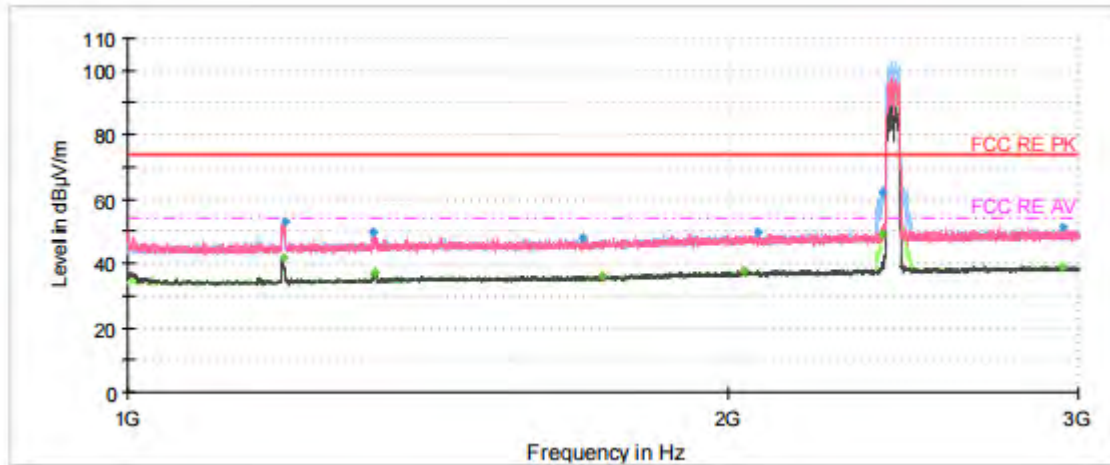


Radiates Emission from 3GHz to 18GHz

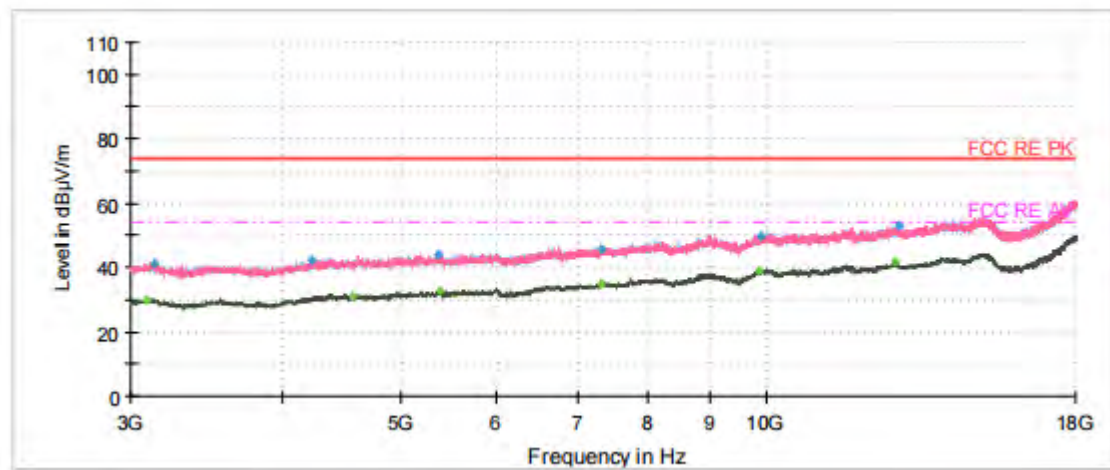
Frequency (MHz)	MaxPeak (dB μ V/m)	Average (dB μ V/m)	Limit (dB μ V/m)	Margin (dB)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
1195.00	52.75	---	74.00	21.25	200.0	V	354.00	-9
1197.25	---	41.25	54.00	12.75	100.0	V	0.00	-9
1329.75	50.13	---	74.00	23.87	200.0	V	352.00	-8
1331.50	---	37.52	54.00	16.48	200.0	V	333.00	-8
1460.75	48.51	---	74.00	25.49	200.0	H	163.00	-7
1680.50	---	37.24	54.00	16.76	100.0	H	359.00	-6
1932.75	50.54	---	74.00	23.46	100.0	H	359.00	-5
1984.00	---	38.56	54.00	15.44	100.0	H	323.00	-5
2483.75	---	51.65	54.00	2.35	200.0	H	201.00	-4
2483.75	67.21	---	74.00	6.79	200.0	H	201.00	-4
2710.50	---	40.46	54.00	13.54	200.0	H	104.00	-4
2877.75	52.50	---	74.00	21.50	100.0	H	273.00	-3

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

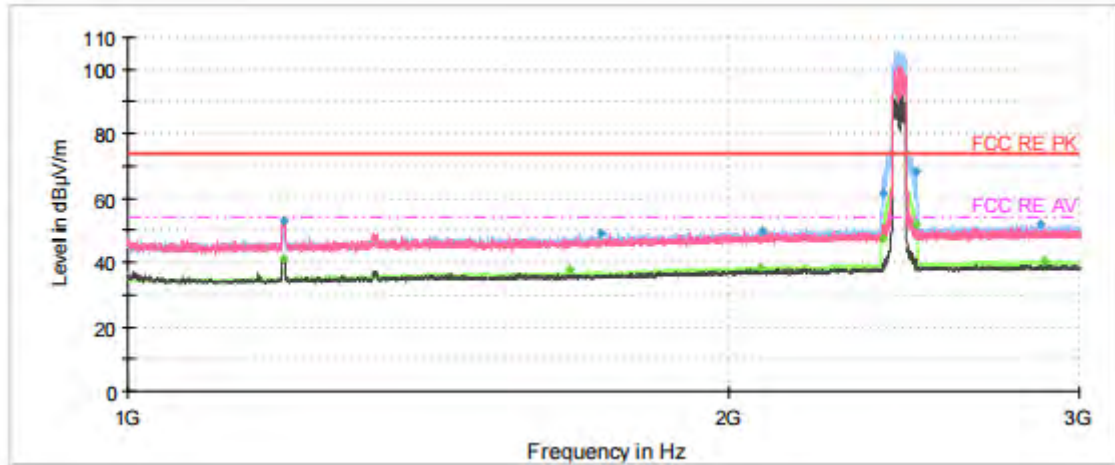


Radiates Emission from 3GHz to 18GHz

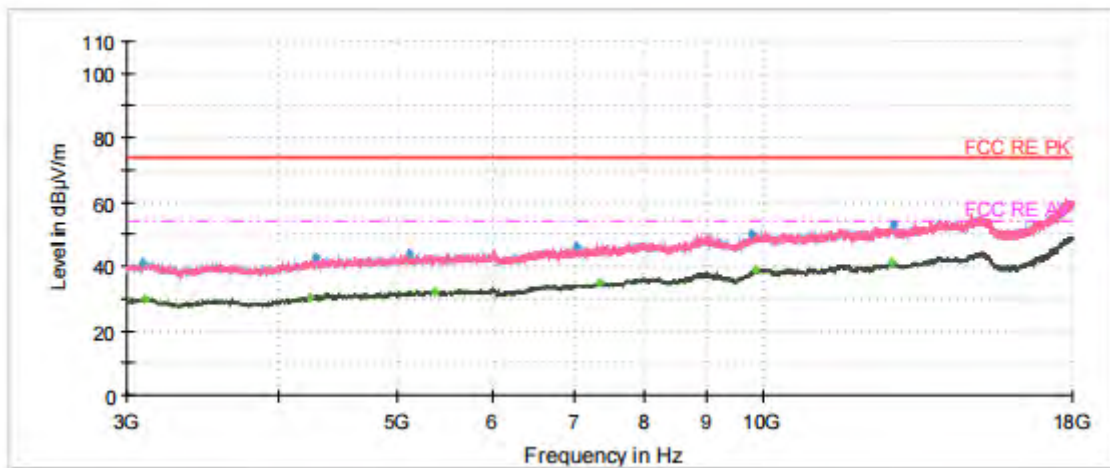
Frequency (MHz)	MaxPeak (dB μ V/m)	Average (dB μ V/m)	Limit (dB μ V/m)	Margin (dB)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
1195.75	---	41.85	54.00	12.15	200.0	V	45.00	-9
1199.75	53.28	---	74.00	20.72	200.0	V	45.00	-9
1328.50	49.37	---	74.00	24.63	200.0	V	186.00	-8
1328.75	---	37.33	54.00	16.67	200.0	V	186.00	-8
1690.75	47.78	---	74.00	26.22	100.0	V	2.00	-6
1730.75	---	36.20	54.00	17.80	200.0	H	11.00	-6
2039.25	---	37.94	54.00	16.06	100.0	V	11.00	-5
2072.25	49.80	---	74.00	24.20	200.0	V	359.00	-5
2388.75	---	49.28	54.00	4.72	200.0	H	193.00	-4
2389.50	62.06	---	74.00	11.94	200.0	H	193.00	-4
2947.00	---	39.18	54.00	14.82	100.0	H	0.00	-3
2947.75	51.26	---	74.00	22.74	200.0	V	335.00	-3

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

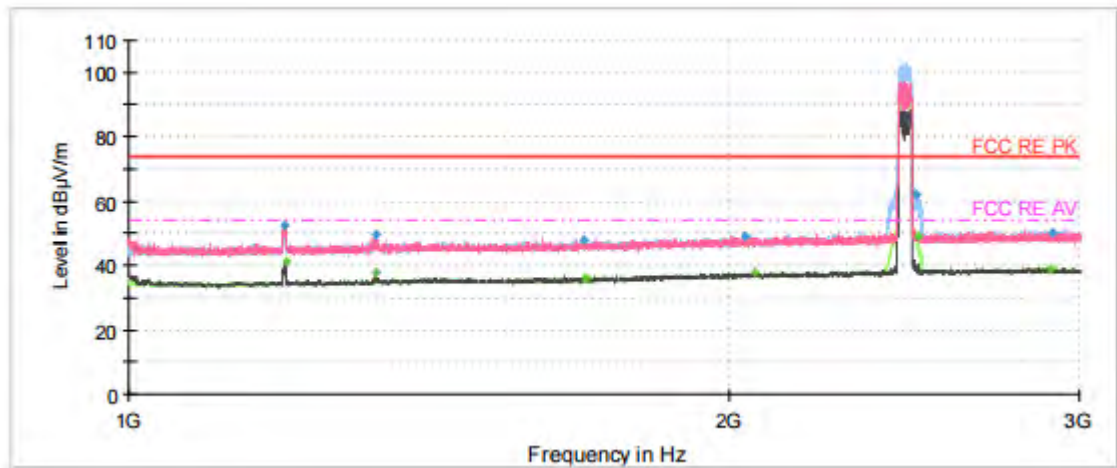


Radiates Emission from 3GHz to 18GHz

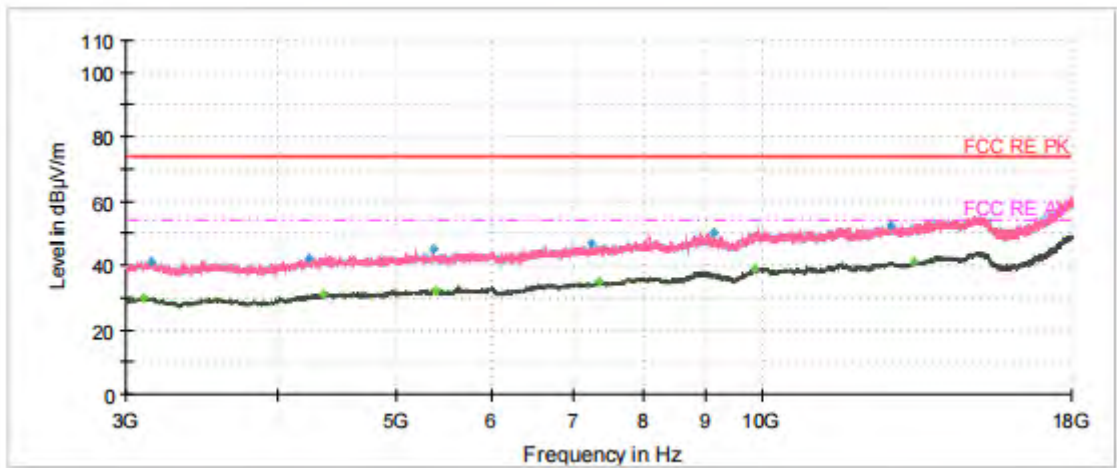
Frequency (MHz)	MaxPeak (dB μ V/m)	Average (dB μ V/m)	Limit (dB μ V/m)	Margin (dB)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
1196.50	52.97	---	74.00	21.03	200.0	V	0.00	-9
1197.25	---	41.00	54.00	13.00	200.0	V	62.00	-9
1663.50	---	37.51	54.00	16.49	200.0	H	125.00	-6
1727.75	48.94	---	74.00	25.06	100.0	H	351.00	-6
2074.25	---	38.61	54.00	15.39	200.0	H	20.00	-5
2077.75	49.43	---	74.00	24.57	200.0	H	57.00	-5
2388.75	61.52	---	74.00	12.48	100.0	H	225.00	-4
2389.50	---	47.51	54.00	6.49	100.0	H	192.00	-4
2483.75	68.11	---	74.00	5.89	200.0	H	196.00	-4
2483.75	---	52.01	54.00	1.99	200.0	H	196.00	-4
2866.25	51.72	---	74.00	22.28	200.0	H	117.00	-3
2883.50	---	40.68	54.00	13.32	200.0	H	32.00	-3

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



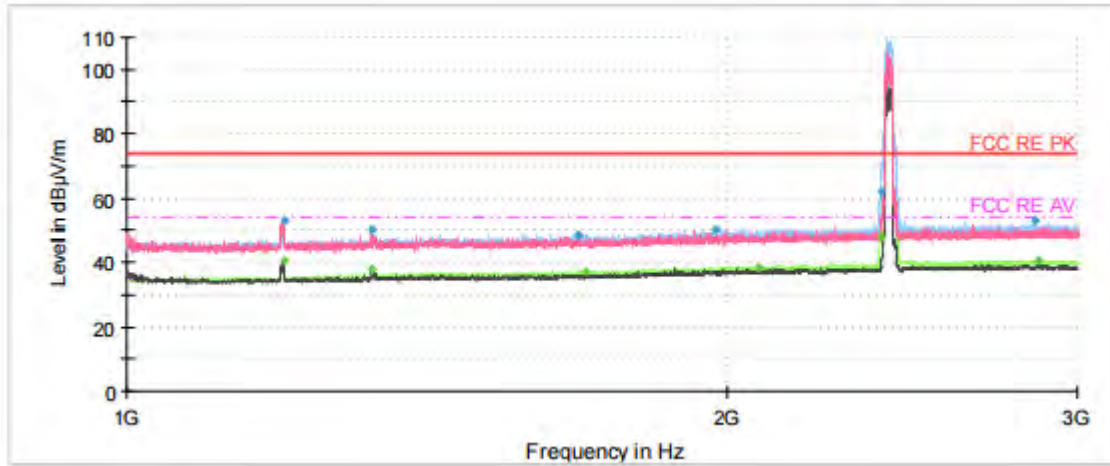
Radiates Emission from 3GHz to 18GHz



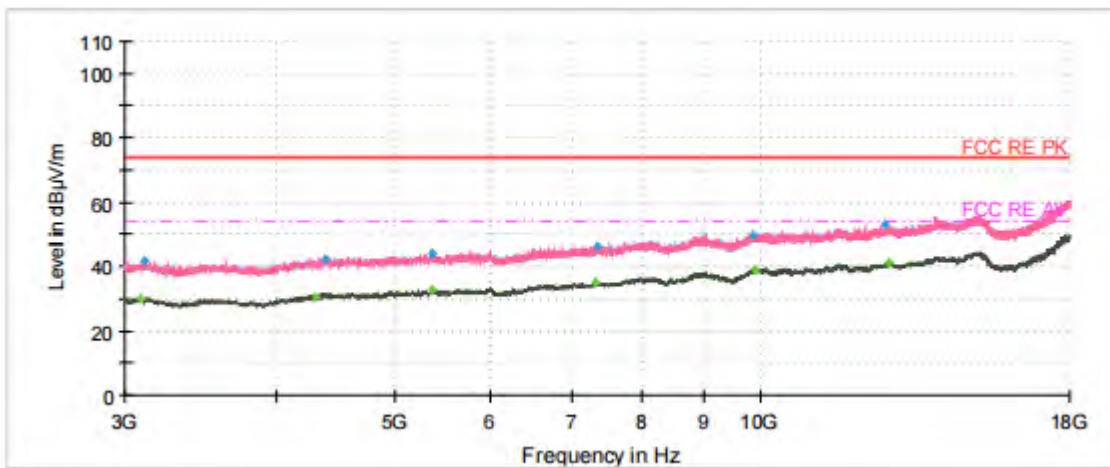
Frequency (MHz)	MaxPeak (dB μ V/m)	Average (dB μ V/m)	Limit (dB μ V/m)	Margin (dB)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
1197.75	52.40	---	74.00	21.60	200.0	V	57.00	-9
1198.25	---	41.01	54.00	12.99	100.0	V	1.00	-9
1329.25	---	37.60	54.00	16.40	100.0	H	47.00	-8
1329.25	49.58	---	74.00	24.42	100.0	H	47.00	-8
1691.50	47.69	---	74.00	26.31	200.0	H	0.00	-6
1697.00	---	36.25	54.00	17.75	100.0	V	19.00	-6
2039.25	48.95	---	74.00	25.05	100.0	H	139.00	-5
2063.50	---	37.64	54.00	16.36	200.0	H	126.00	-5
2486.75	62.06	---	74.00	11.94	100.0	H	194.00	-4
2488.50	---	49.35	54.00	4.65	200.0	H	202.00	-4
2897.50	---	38.84	54.00	15.16	100.0	H	358.00	-3
2905.25	50.43	---	74.00	23.57	100.0	V	40.00	-3

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

802.11ax (HE20) CH1



Note: The signal beyond the limit is carrier.
Radiates Emission from 1GHz to 3GHz



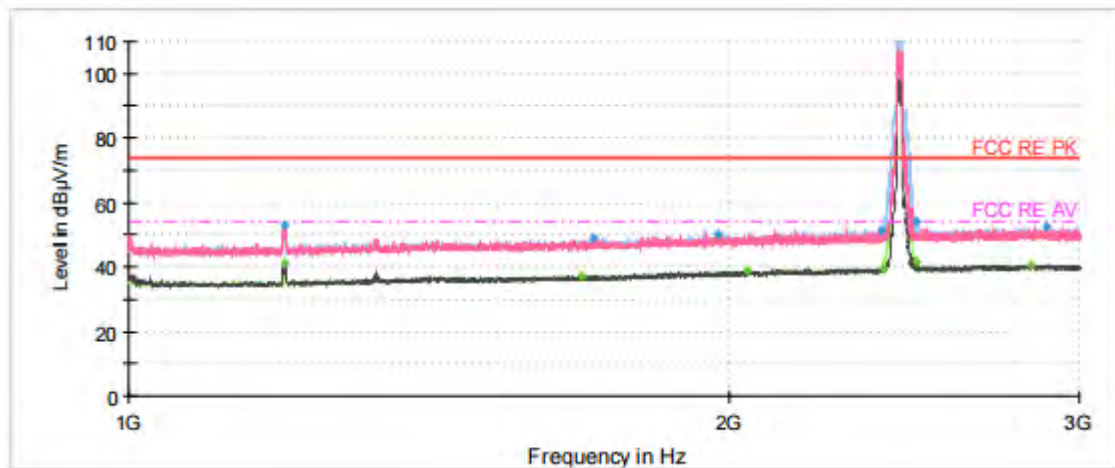
Radiates Emission from 3GHz to 18GHz



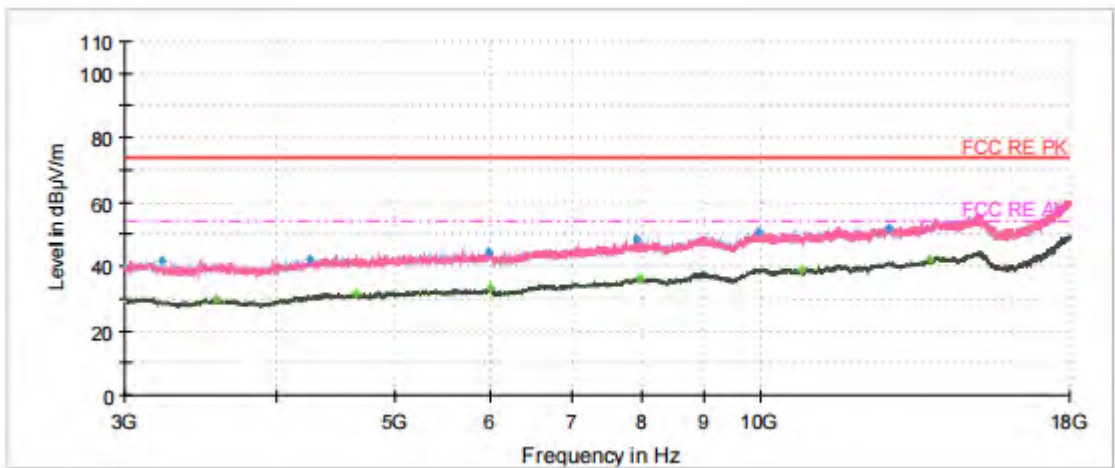
Frequency (MHz)	MaxPeak (dB μ V/m)	Average (dB μ V/m)	Limit (dB μ V/m)	Margin (dB)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
1198.75	---	40.63	54.00	13.37	200.0	V	46.00	-9
1198.75	53.18	---	74.00	20.82	200.0	V	46.00	-9
1326.75	50.13	---	74.00	23.87	200.0	V	338.00	-8
1328.25	---	37.70	54.00	16.30	200.0	V	344.00	-8
1682.50	48.53	---	74.00	25.47	100.0	H	335.00	-6
1699.00	---	37.28	54.00	16.72	200.0	H	0.00	-6
1975.25	49.96	---	74.00	24.04	200.0	H	5.00	-5
2077.00	---	38.60	54.00	15.40	100.0	H	276.00	-5
2389.25	---	48.01	54.00	5.99	100.0	H	356.00	-4
2389.75	62.11	---	74.00	11.89	100.0	H	358.00	-4
2853.50	52.82	---	74.00	21.18	200.0	H	7.00	-3
2865.00	---	40.85	54.00	13.15	200.0	H	40.00	-3

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

802.11ax (HE20) CH6



Note: The signal beyond the limit is carrier.
Radiates Emission from 1GHz to 3GHz



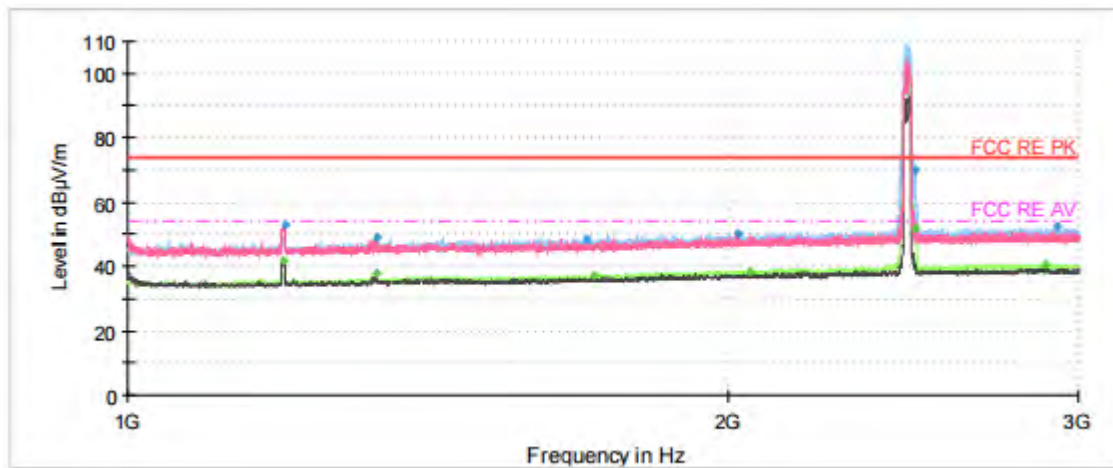
Radiates Emission from 3GHz to 18GHz



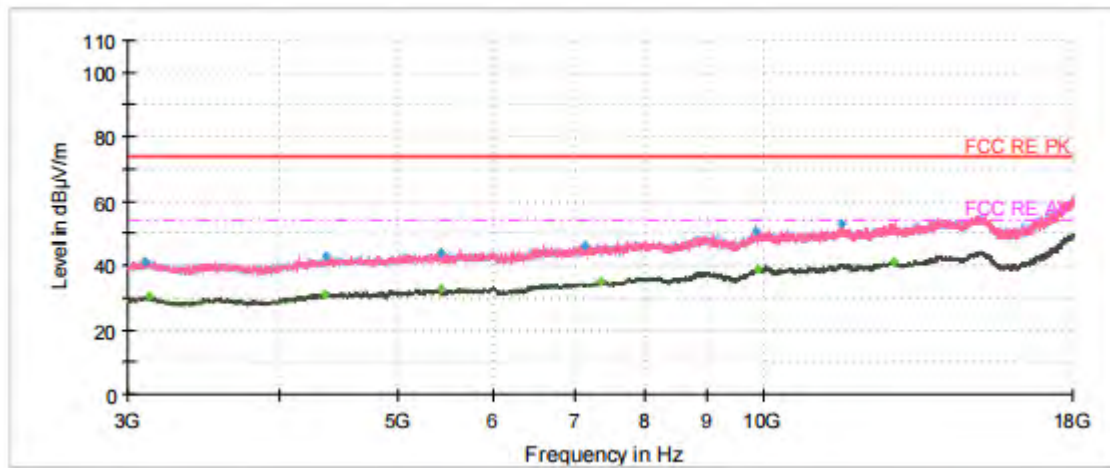
Frequency (MHz)	MaxPeak (dB μ V/m)	Average (dB μ V/m)	Limit (dB μ V/m)	Margin (dB)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
1196.50	53.08	---	74.00	20.92	200.0	V	49.00	-9
1196.75	---	41.05	54.00	12.95	100.0	V	0.00	-9
1686.50	---	37.25	54.00	16.75	200.0	H	4.00	-6
1712.25	48.95	---	74.00	25.05	100.0	V	120.00	-6
1975.75	50.11	---	74.00	23.89	100.0	H	92.00	-5
2041.75	---	38.65	54.00	15.35	100.0	V	6.00	-5
2387.50	51.38	---	74.00	22.62	200.0	H	195.00	-4
2389.75	---	39.72	54.00	14.28	100.0	H	276.00	-4
2484.50	53.95	---	74.00	20.05	200.0	H	208.00	-4
2484.50	---	41.78	54.00	12.22	100.0	H	192.00	-4
2839.00	---	40.84	54.00	13.16	100.0	V	22.00	-3
2886.75	52.23	---	74.00	21.77	200.0	H	6.00	-3

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

802.11ax (HE20) CH11



Note: The signal beyond the limit is carrier.
Radiates Emission from 1GHz to 3GHz

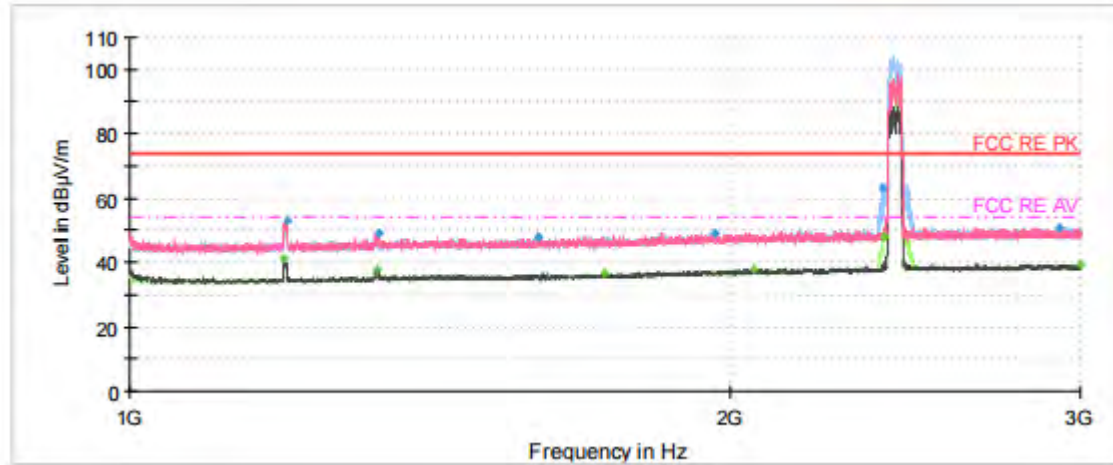


Radiates Emission from 3GHz to 18GHz

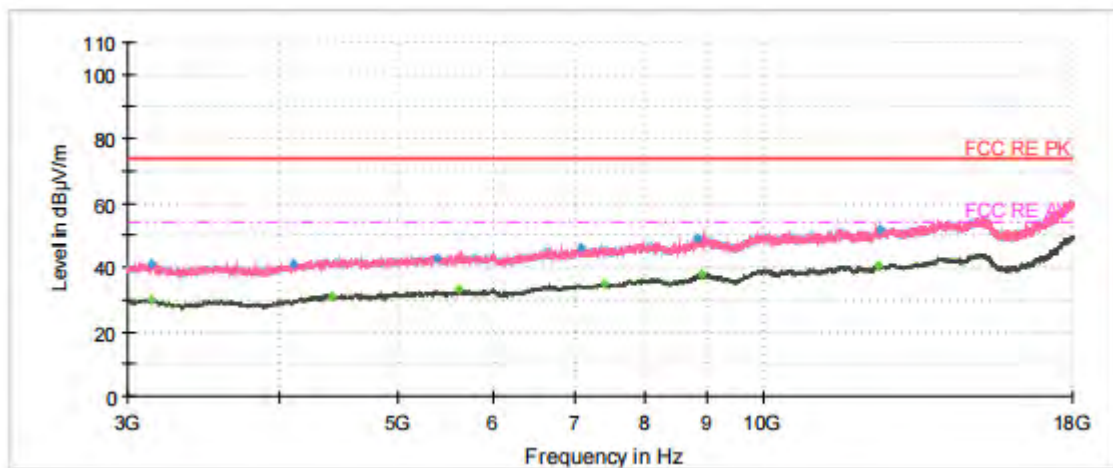
Frequency (MHz)	MaxPeak (dB μ V/m)	Average (dB μ V/m)	Limit (dB μ V/m)	Margin (dB)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
1196.00	---	41.66	54.00	12.34	200.0	V	0.00	-9
1199.25	52.96	---	74.00	21.04	100.0	V	0.00	-9
1331.75	---	37.65	54.00	16.35	200.0	V	344.00	-8
1332.50	49.07	---	74.00	24.93	100.0	V	199.00	-8
1699.50	48.64	---	74.00	25.36	100.0	H	358.00	-6
1713.00	---	37.37	54.00	16.63	100.0	H	325.00	-6
2025.00	50.48	---	74.00	23.52	100.0	H	274.00	-5
2052.25	---	38.60	54.00	15.40	200.0	H	26.00	-5
2484.00	69.77	---	74.00	4.23	200.0	H	195.00	-4
2484.00	---	52.10	54.00	1.90	200.0	H	195.00	-4
2889.25	---	40.77	54.00	13.23	200.0	H	125.00	-3
2927.75	52.32	---	74.00	21.68	200.0	H	108.00	-3

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

802.11ax (HE40) CH3



Note: The signal beyond the limit is carrier.
Radiates Emission from 1GHz to 3GHz



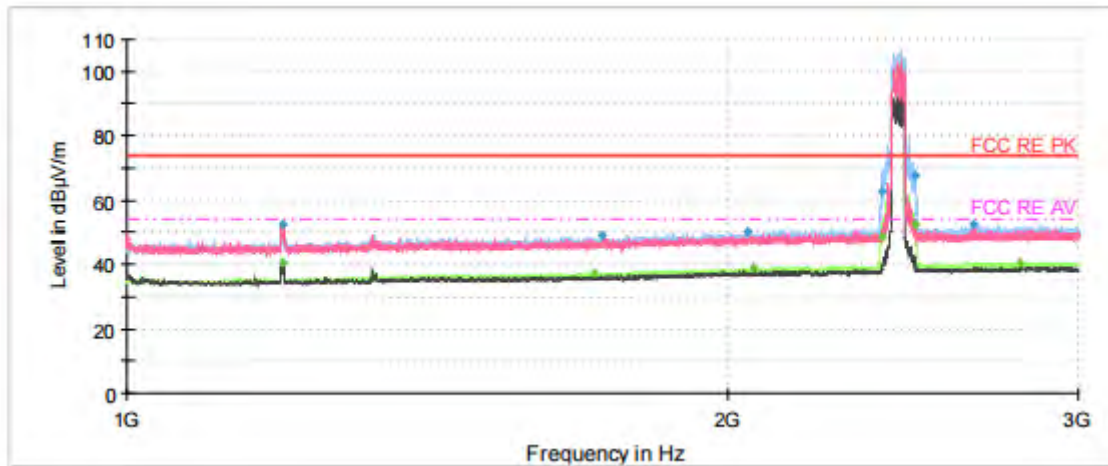
Radiates Emission from 3GHz to 18GHz



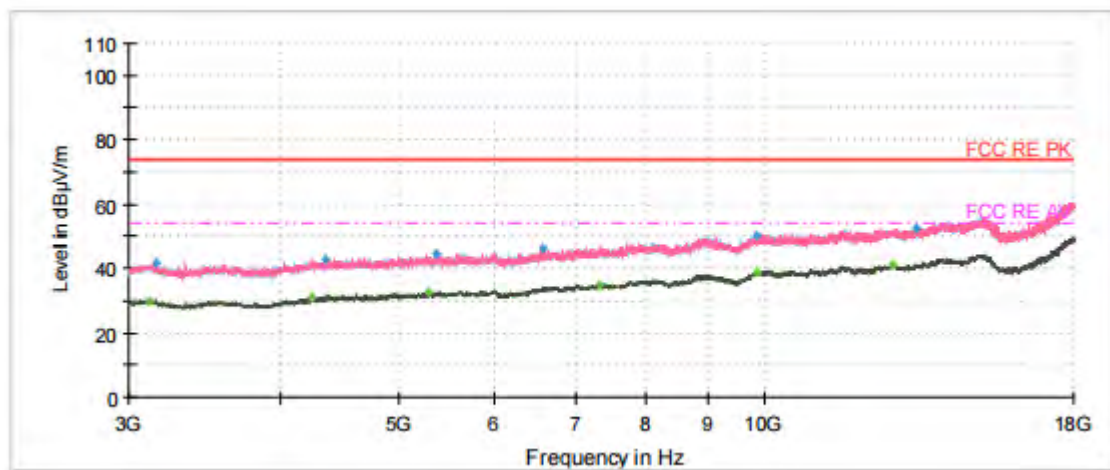
Frequency (MHz)	MaxPeak (dB μ V/m)	Average (dB μ V/m)	Limit (dB μ V/m)	Margin (dB)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
1195.25	---	41.06	54.00	12.94	200.0	V	359.00	-9
1199.25	52.76	---	74.00	21.24	200.0	V	46.00	-9
1329.75	---	37.93	54.00	16.07	200.0	V	337.00	-8
1332.50	49.34	---	74.00	24.66	200.0	V	337.00	-8
1602.00	47.93	---	74.00	26.07	200.0	V	222.00	-6
1730.50	---	36.43	54.00	17.57	200.0	V	37.00	-6
1968.25	48.94	---	74.00	25.06	200.0	V	347.00	-5
2058.25	---	37.66	54.00	16.34	100.0	V	160.00	-5
2387.50	63.04	---	74.00	10.96	200.0	H	192.00	-4
2388.50	---	47.87	54.00	6.13	200.0	H	200.00	-4
2924.75	50.66	---	74.00	23.34	100.0	H	293.00	-3
2997.75	---	39.29	54.00	14.71	200.0	V	288.00	-3

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

802.11ax (HE40) CH6



Note: The signal beyond the limit is carrier.
Radiates Emission from 1GHz to 3GHz



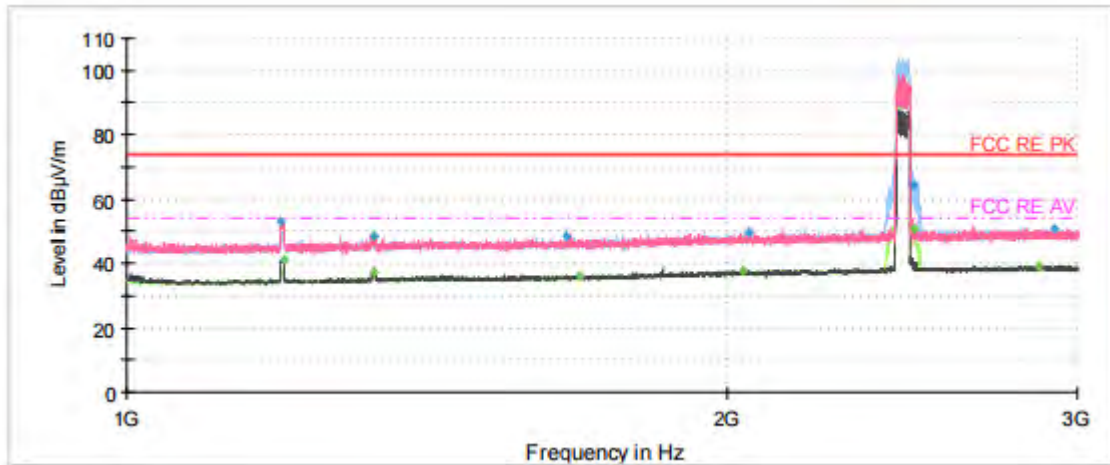
Radiates Emission from 3GHz to 18GHz



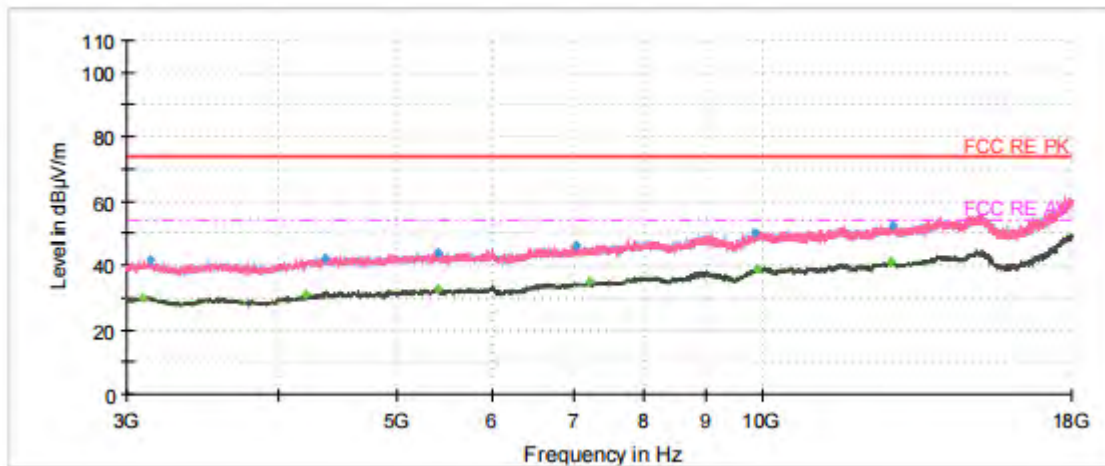
Frequency (MHz)	MaxPeak (dB μ V/m)	Average (dB μ V/m)	Limit (dB μ V/m)	Margin (dB)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
1196.25	52.52	---	74.00	21.48	200.0	V	0.00	-9
1197.50	---	40.68	54.00	13.32	100.0	V	6.00	-9
1715.00	---	37.20	54.00	16.80	200.0	H	16.00	-6
1728.75	48.92	---	74.00	25.08	100.0	H	259.00	-6
2049.75	50.10	---	74.00	23.90	200.0	H	0.00	-5
2059.75	---	38.75	54.00	15.25	200.0	H	36.00	-5
2389.25	62.79	---	74.00	11.21	100.0	H	0.00	-4
2389.50	---	48.40	54.00	5.60	100.0	H	0.00	-4
2483.75	67.91	---	74.00	6.09	200.0	H	193.00	-4
2484.00	---	52.71	54.00	1.29	200.0	H	193.00	-4
2656.00	52.48	---	74.00	21.52	200.0	V	348.00	-4
2805.75	---	40.58	54.00	13.42	200.0	H	4.00	-3

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



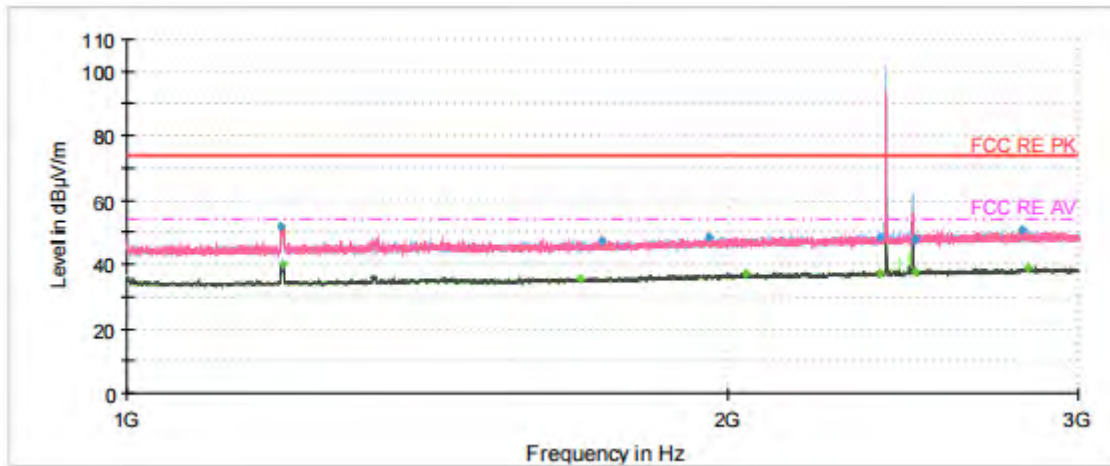
Radiates Emission from 3GHz to 18GHz



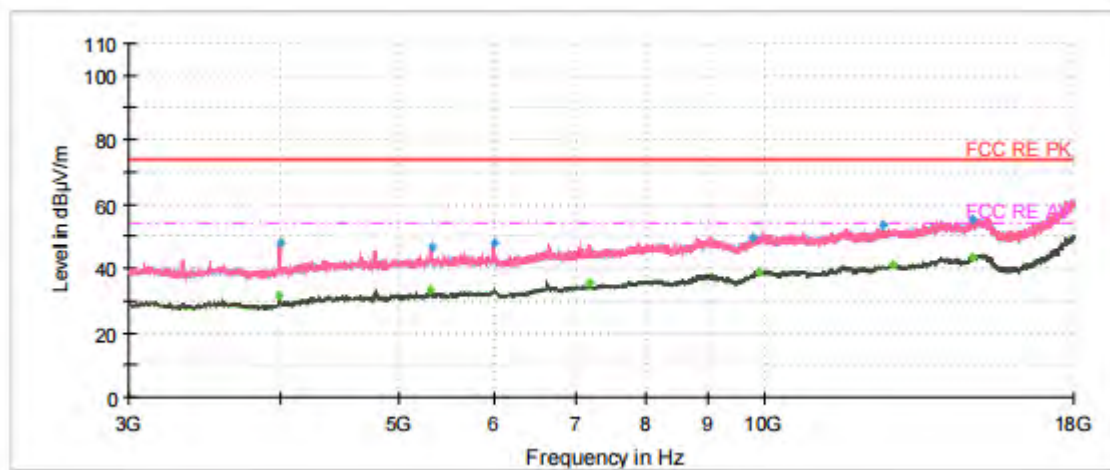
Frequency (MHz)	MaxPeak (dB μ V/m)	Average (dB μ V/m)	Limit (dB μ V/m)	Margin (dB)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
1194.25	52.86	---	74.00	21.14	200.0	V	351.00	-9
1198.50	---	41.23	54.00	12.77	200.0	V	351.00	-9
1330.25	---	37.26	54.00	16.74	200.0	H	4.00	-8
1330.75	48.75	---	74.00	25.25	200.0	H	23.00	-8
1661.00	48.30	---	74.00	25.70	200.0	H	124.00	-6
1688.50	---	36.26	54.00	17.74	200.0	H	1.00	-6
2039.25	---	37.87	54.00	16.13	100.0	V	0.00	-5
2052.75	49.39	---	74.00	24.61	200.0	V	282.00	-5
2485.25	---	50.85	54.00	3.15	200.0	H	191.00	-4
2485.50	64.50	---	74.00	9.50	200.0	H	191.00	-4
2865.00	---	38.82	54.00	15.18	200.0	H	18.00	-3
2920.50	50.65	---	74.00	23.35	200.0	V	249.00	-3

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

Bluetooth LE-Channel 0



Note: The signal beyond the limit is carrier.
Radiates Emission from 1GHz to 3GHz



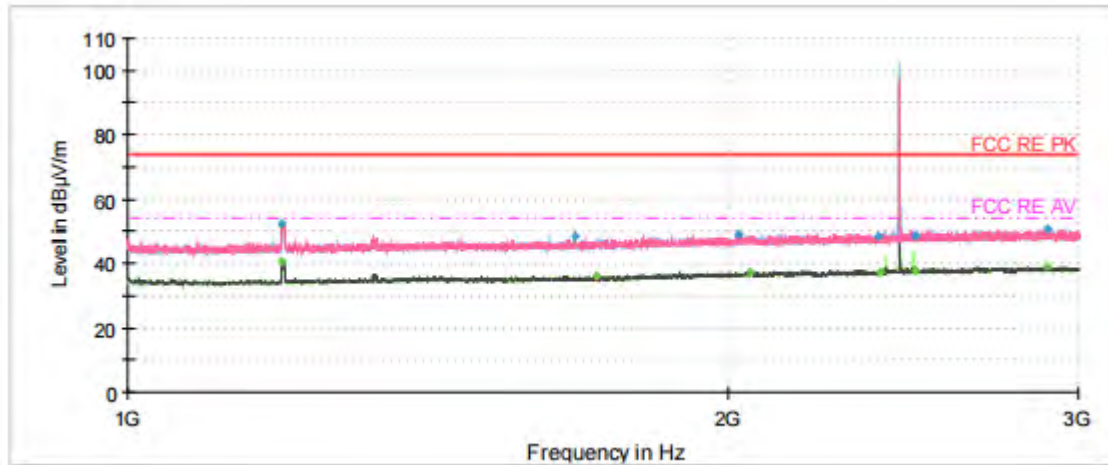
Radiates Emission from 3GHz to 18GHz



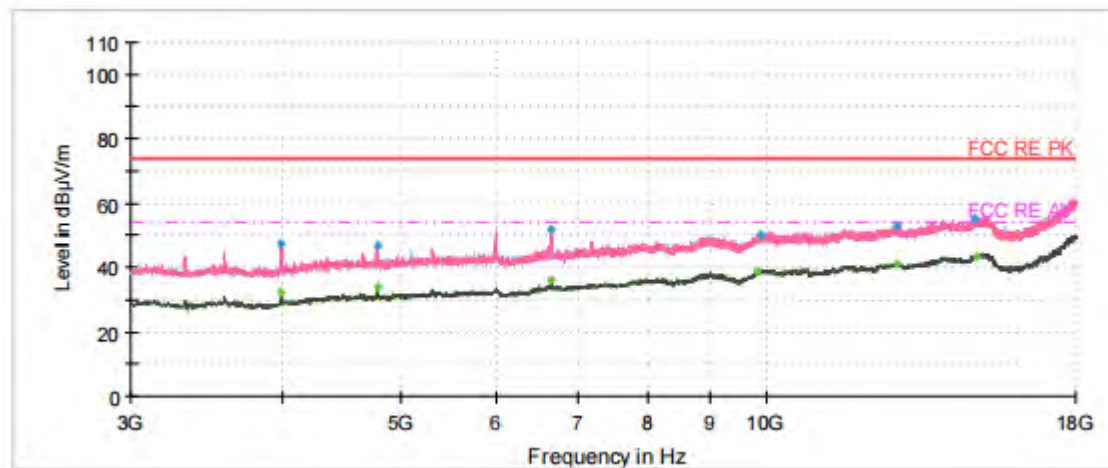
Frequency (MHz)	MaxPeak (dB μ V/m)	Average (dB μ V/m)	Limit (dB μ V/m)	Margin (dB)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
1195.00	51.98	---	74.00	22.02	200.0	V	20.00	-9
1196.00	---	39.93	54.00	14.07	200.0	V	20.00	-9
1687.75	---	35.76	54.00	18.24	200.0	V	124.00	-6
1732.00	47.45	---	74.00	26.55	100.0	V	264.00	-6
1959.75	48.60	---	74.00	25.40	200.0	V	132.00	-5
2041.50	---	37.12	54.00	16.88	200.0	V	346.00	-5
2385.00	---	37.37	54.00	16.63	100.0	V	0.00	-4
2386.25	48.49	---	74.00	25.51	100.0	H	334.00	-4
2483.75	---	37.71	54.00	16.29	200.0	V	302.00	-4
2484.50	48.21	---	74.00	25.79	100.0	V	58.00	-4
2808.50	50.53	---	74.00	23.47	100.0	H	301.00	-3
2828.75	---	38.97	54.00	15.03	200.0	H	25.00	-3

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

Bluetooth LE-Channel 19



Note: The signal beyond the limit is carrier.
Radiates Emission from 1GHz to 3GHz

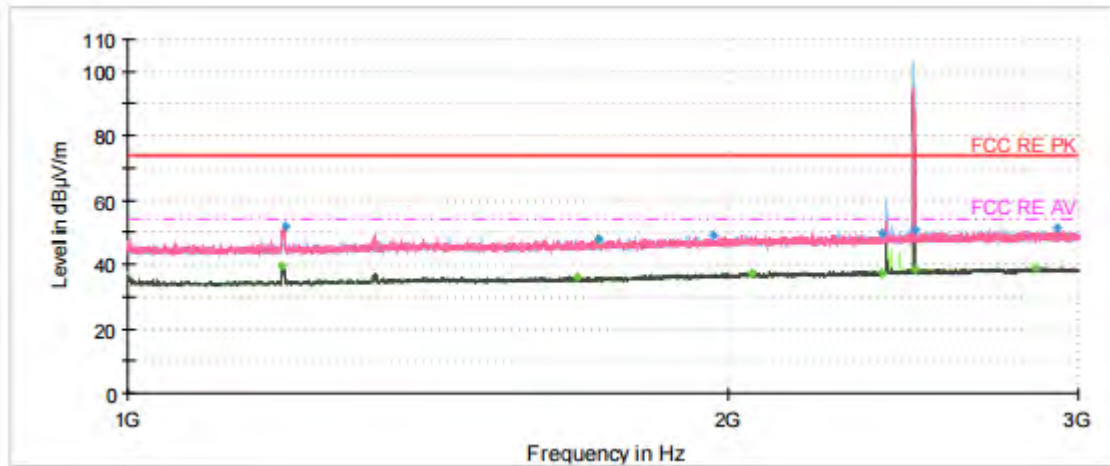


Radiates Emission from 3GHz to 18GHz

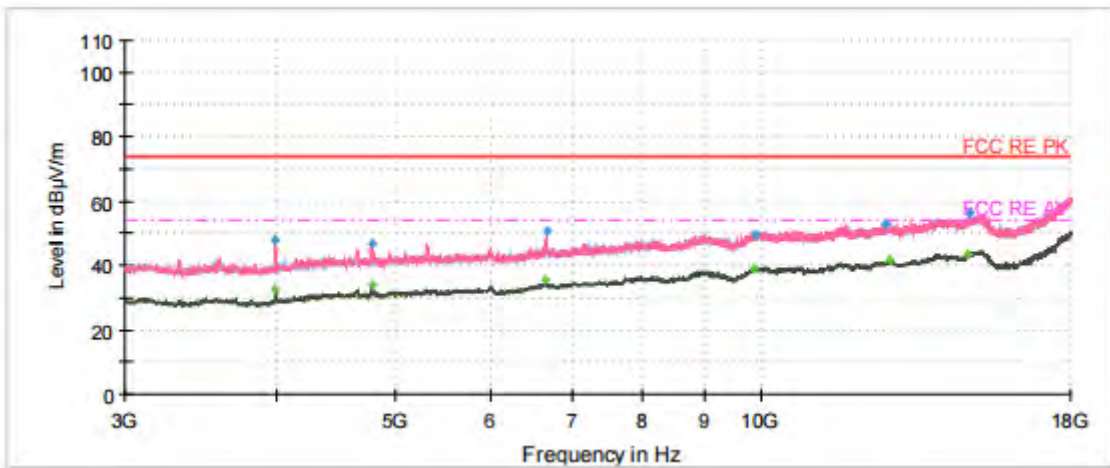
Frequency (MHz)	MaxPeak (dB μ V/m)	Average (dB μ V/m)	Limit (dB μ V/m)	Margin (dB)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
1194.75	52.69	---	74.00	21.31	200.0	V	59.00	-9
1195.00	---	40.36	54.00	13.64	200.0	V	59.00	-9
1677.75	48.46	---	74.00	25.54	200.0	H	344.00	-6
1720.25	---	36.03	54.00	17.97	200.0	V	297.00	-6
2025.75	48.94	---	74.00	25.06	200.0	V	15.00	-5
2052.50	---	37.33	54.00	16.67	200.0	V	306.00	-5
2381.75	48.48	---	74.00	25.52	100.0	V	12.00	-4
2384.25	---	37.47	54.00	16.53	200.0	V	15.00	-4
2485.00	48.75	---	74.00	25.25	100.0	H	0.00	-4
2485.25	---	37.82	54.00	16.18	100.0	H	354.00	-4
2894.50	---	39.00	54.00	15.00	200.0	H	354.00	-3
2896.00	50.50	---	74.00	23.50	200.0	H	359.00	-3

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

Bluetooth LE-Channel 39



Note: The signal beyond the limit is carrier.
Radiates Emission from 1GHz to 3GHz

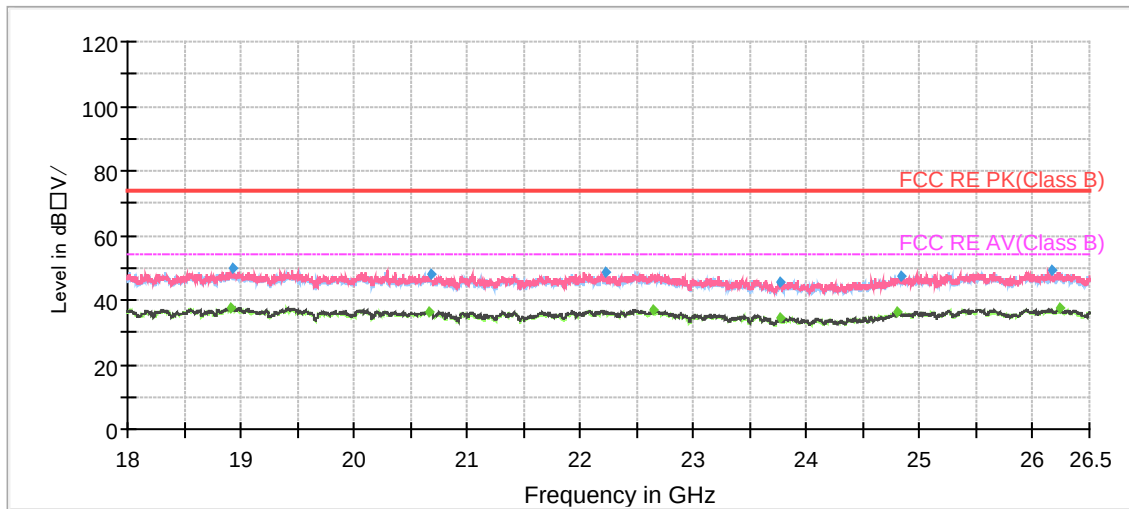


Radiates Emission from 3GHz to 18GHz

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)
1195.50	---	39.66	54.00	14.34	200.0	V	32.00	-9
1199.50	51.63	---	74.00	22.37	200.0	V	41.00	-9
1680.00	---	36.12	54.00	17.88	200.0	V	1.00	-6
1721.50	47.92	---	74.00	26.08	200.0	V	12.00	-6
1965.50	49.10	---	74.00	24.90	200.0	H	287.00	-5
2054.75	---	37.35	54.00	16.65	200.0	H	0.00	-5
2388.75	---	37.11	54.00	16.89	200.0	V	41.00	-4
2389.75	49.87	---	74.00	24.13	100.0	V	213.00	-4
2484.00	50.66	---	74.00	23.34	100.0	H	238.00	-4
2484.00	---	38.50	54.00	15.51	200.0	H	194.00	-4
2854.50	---	38.88	54.00	15.12	100.0	H	22.00	-3
2926.50	51.23	---	74.00	22.77	100.0	V	297.00	-3

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, 802.11ax (HE40) CH6 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

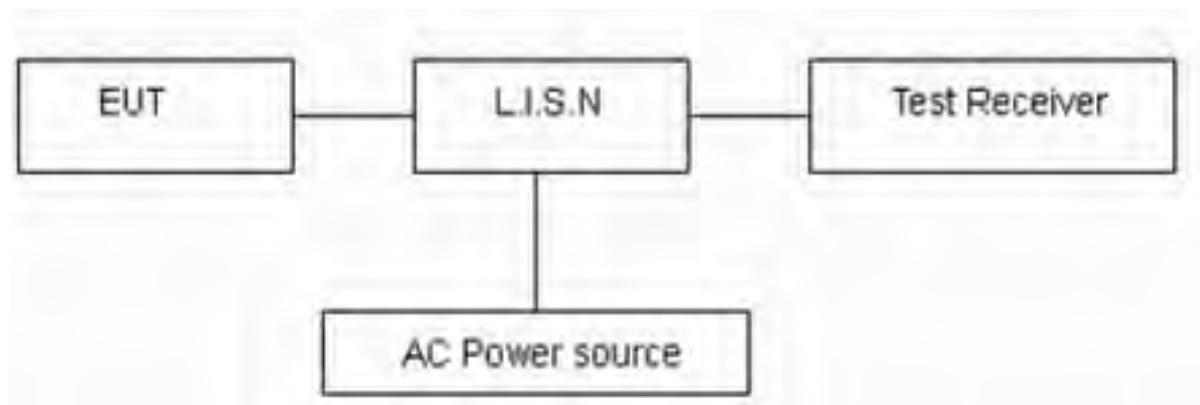
Ambient condition

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

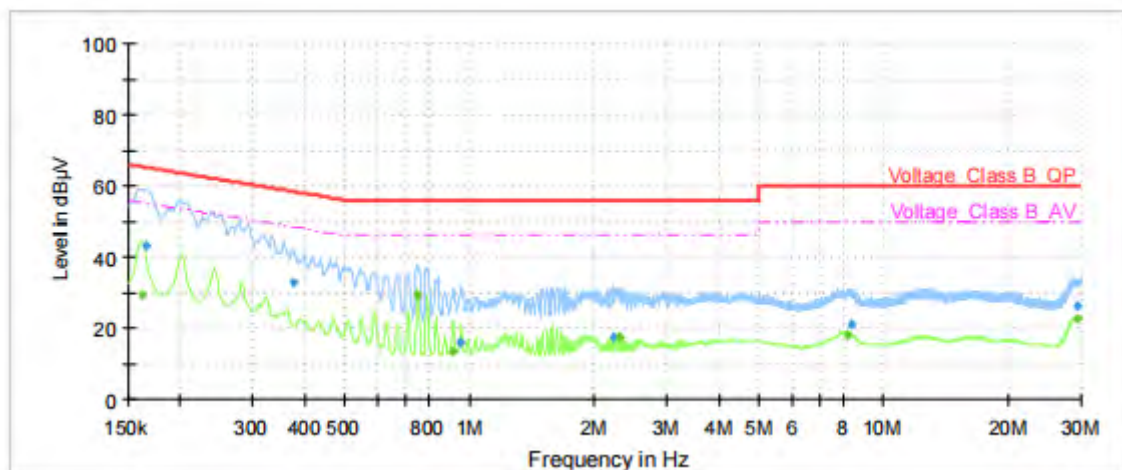
Frequency (MHz)	Conducted Limits(dBμV)	
	Quasi-peak	Average
0.15 - 0.5	66 to 56 *	56 to 46 *
0.5 - 5	56	46
5 - 30	60	50
*: Decreases with the logarithm of the frequency.		

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:

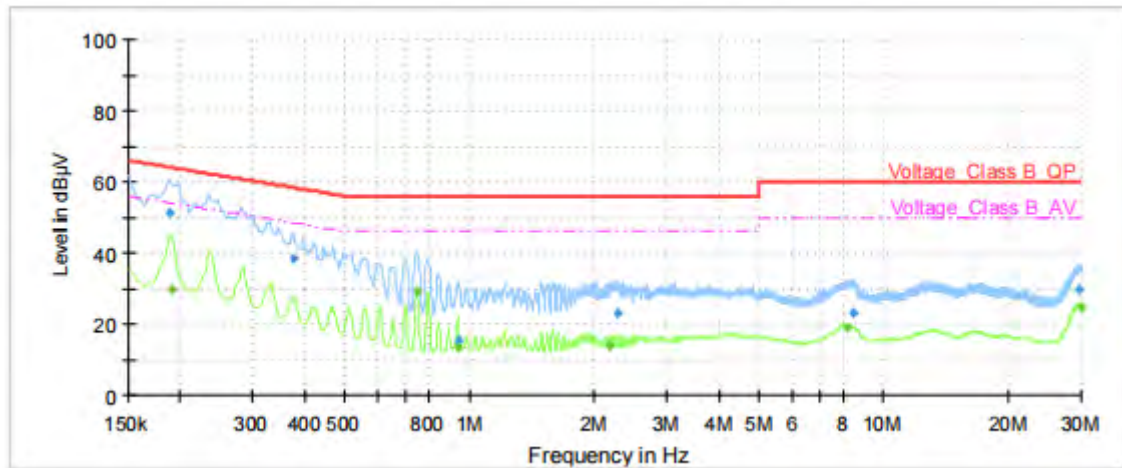
Following plots, Blue trace uses the peak detection and Green trace uses the average detection. During the test, the Conducted Emission was performed in all modes (WIFI 2.4G /Bluetooth LE) with all channels, 802.11ax HE40, Channel 6 are selected as the worst condition. The test data of the worst-case 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)
0.16	---	28.99	55.40	26.41	1000.00	9.000	L1	ON	21
0.17	42.85	---	65.17	22.32	1000.00	9.000	L1	ON	21
0.38	32.96	---	58.34	25.38	1000.00	9.000	L1	ON	21
0.75	---	29.09	46.00	16.91	1000.00	9.000	L1	ON	20
0.91	---	13.41	46.00	32.59	1000.00	9.000	L1	ON	20
0.96	15.79	---	56.00	40.21	1000.00	9.000	L1	ON	20
2.24	17.20	---	56.00	38.80	1000.00	9.000	L1	ON	19
2.29	---	17.55	46.00	28.45	1000.00	9.000	L1	ON	19
8.17	---	18.13	50.00	31.87	1000.00	9.000	L1	ON	20
8.39	21.08	---	60.00	38.92	1000.00	9.000	L1	ON	20
29.26	25.95	---	60.00	34.05	1000.00	9.000	L1	ON	20
29.29	---	22.62	50.00	27.38	1000.00	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)
0.19	51.25	---	64.11	12.86	1000.00	9.000	N	ON	21
0.19	---	29.80	54.02	24.22	1000.00	9.000	N	ON	21
0.38	38.37	---	58.39	20.02	1000.00	9.000	N	ON	21
0.75	---	28.99	46.00	17.01	1000.00	9.000	N	ON	20
0.94	---	13.46	46.00	32.54	1000.00	9.000	N	ON	20
0.94	15.27	---	56.00	40.73	1000.00	9.000	N	ON	20
2.19	---	13.95	46.00	32.05	1000.00	9.000	N	ON	20
2.29	23.28	---	56.00	32.72	1000.00	9.000	N	ON	20
8.19	---	19.23	50.00	30.77	1000.00	9.000	N	ON	20
8.41	23.08	---	60.00	36.92	1000.00	9.000	N	ON	20
29.79	29.78	---	60.00	30.22	1000.00	9.000	N	ON	20
29.96	---	24.77	50.00	25.23	1000.00	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
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	2020-08-11	2023-08-10
Horn Antenna	ETS-Lindgren	3160-09	00102643	2021-10-10	2024-10-09
EMI Test Receiver	R&S	ESR	101667	2021-05-16	2022-05-15
LISN	R&S	ENV216	101171	2020-12-13	2022-12-12
Spectrum Analyzer	Agilent	N9020A	MY54420163	2021-12-12	2022-12-11
Spectrum Analyzer	R&S	FSV40	100816	2021-05-15	2022-05-14
Power Sensor	R&S	NRP18S	101955	2021-05-15	2022-05-14
Software	R&S	EMC32	10.35.10	/	/

*****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.