TEST REPORT

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Test Report Number: SKT-RFC-230004
Date of issue: March 23, 2023

Applicant:	**AISOLUTION CO., LTD.** 28-4, Samyang-ro 29-gil, Gangbuk-gu, Seoul, 01194, South Korea
Manufacturer:	**AISOLUTION CO., LTD.** 28-4, Samyang-ro 29-gil, Gangbuk-gu, Seoul, 01194, South Korea
Product:	KDC380 Wireless Barcode Scanner
Model:	KDC380
FCC ID:	VH9-KDC380
Project number:	SKTEU22-1568
EUT received:	December 7, 2022
Applied standards:	ANSI C63.10-2020 ANSI C63.4-2014 and ANSI C63.4a-2017 558074 D01 15.247 Meas Guidance v05r02
Rule parts:	FCC 47 CFR Part 15 Subpart C - Intentional radiators
Equipment Class:	**DTS - Part 15 Digital Transmission System**
Remarks to the standards:	None

The above equipment has been tested by SK Tech Co., Ltd., and found compliance with the requirements set forth in the technical standards mentioned above. The results of testing in this report apply only to the product or system, which was tested.

Changwon Yang / **Testing Engineer**

Jongsoo Yoon / **Technical Manager**

Revision History of Test Report

Rev.	Revisions	Effect page	Approved by	Date
-	Initial issue	All	Jongsoo Yoon	Mar. 23, 2023

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1 Summary of test results

Requirement	CFR 47 Section	Result
Antenna Requirement	15.203, 15.247(b)(4)	Meets the requirements
6dB Bandwidth	15.247(a)(2)	Meets the requirements
Maximum Peak Output Power	15.247(b)(3), (4)	Meets the requirements
Spurious Emission, Band Edge, and Restricted bands	15.247(d), 15.205(a), 15.209(a)	Meets the requirements
Peak Power Spectral Density	15.247(e)	Meets the requirements
AC power line Conducted emission	15.207(a)	Meets the requirements

2 Description of equipment under test (EUT)

Product:	KDC380 Wireless Barcode Scanner
Model:	KDC380
Serial number:	None (prototype)
Hardware version:	prototype
Software version:	prototype

Model differences:

Model name	Difference	Tested (checked)
KDC380	fully tested model that was provided by the applicant	☒

Technical data:

Transmit frequency	WiFi: 2412 MHz to 2462 MHz Bluetooth Low Energy: 2402 MHz to 2480 MHz (NOTE 1) NFC: 13.56 MHz (NOTE 2)
Technologies	WiFi (802.11b/g/n(HT20)), Bluetooth Low Energy (1Mbps, 2Mbps), NFC
Antenna type	WiFi: Omni-directional antenna (3.02 dBi) Bluetooth Low Energy: Integral Chip antenna (3.14 dBi) NFC: Internal loop antenna
Power source	DC 3.7 V (Battery)
Operation temperature range	-20 °C to +50 °C

Note: *1. This test report did not contain the tests for the Bluetooth links, which is subject to FCC Part 15.*
2. This test report did not contain the tests for the NFC links, which is subject to FCC Part 15.

I/O port	Type	Q'ty	Remark
USB	USB (Type C)	1	

Modification of EUT during the compliance testing: none

3 Test and measurement conditions

3.1. Operating modes

Operating modes of the sample:

No.	Description
-	Normal operating mode: WiFi (802.11 b/g/n(HT20))

Operating modes used for the Test:

No.	Operating mode
1	Normal operating mode: (a) Two test samples were provided for the radiated measurements and for the conducted measurements. The measurements were taken in continuously transmitting the burst signals. For controlling the EUT, the test software (ZOC Terminal V8.05.1) and the control cable were provided by the applicant. All the tests were performed while the test sample was powered from the internal battery. (b) The tests were performed while transmitting at each frequency as below. (1) f_{LOW}: 2412 MHz (2) f_{MID}: 2437 MHz (3) f_{HIGH}: 2462 MHz (c) The tests were performed for each data rate and/or modulation.

3.2. Description of support units (accessory equipment)

The following support units or accessories were used to form a representative test configuration during the tests.

#	Equipment	Manufacturer	Model No.	Serial No.
1	PC(Laptop)	Lenovo	ThinkPad X13 Gen 2	PF-2J6LQR
2	AC Adapter (Laptop)	Lite-On Techonology (CHANG ZHOU) Co., Ltd	ADLX65YLC3D	N/A
3	PC(Desktop)	HP	HP 280 G3 MT Business PC	4CE7233RL1

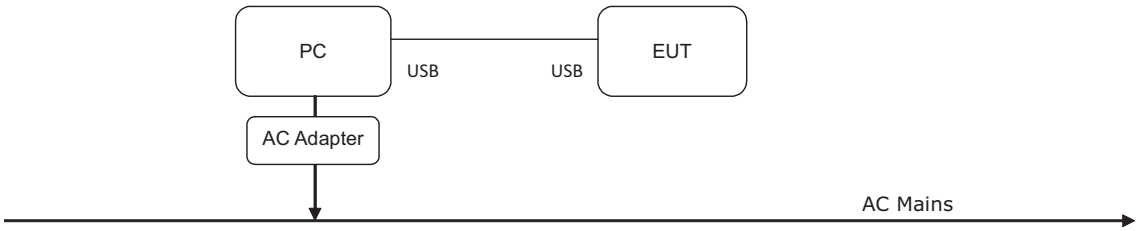
3.3. Interconnection and I/O cables

The following support units or accessories were used to form a representative test configuration during the tests.

#	Start		End		Cable	
	Name	I/O port	Name	I/O port	length (m)	shielded (Y/N)
1	EUT	USB	Notebook	USB	1.0	Y
2	PC	DC Input	AC Adapter	DC Output	1.7	N
3	AC Adapter	AC Input	AC Mains	AC Mains	1.8	N

Note: *All the operating conditions including the cable connection were selected by the applicant.*

3.4. Test configuration (arrangement of EUT)



3.5. Test date

Date Tested	January 31, 2023 - March 22, 2023

4 Facilities and accreditations

4.1. Facilities

All of the measurements described in this report were performed at SK Tech Co., Ltd.

Site I: 88, Geulgaeul-ro, 81beon-gil, Wabu-eup, Namyangju-si, Gyeonggi-do, Korea
Site II: 124-8, Geulgaeul-ro, Wabu-eup, Namyangju-si, Gyeonggi-do, Korea

The sites are constructed in conformance with the requirements of ANSI C63.4 and CISPR 16-1-4. The sites comply with the Normalized Site Attenuation requirements given in ANSI C63.4, and site VSWR requirements specified in CISPR 16-1-4. The FAR used for the radiated spurious emissions fulfills the NSA requirements specified in ETSI TS 102 321 V1.1.1 (2004-05) and ETSI TR 102 273-2 V1.2.1 (2001-12). The measuring apparatus and ancillary equipment conform to CISPR 16-1 series.

4.2. Accreditations

The laboratory has been also notified to FCC and ISED by RRA as a Conformity Assessment Body, and designated to perform compliance testing on equipment subject to Certification under Parts 15, 18, 22, 24, 25, 27, 74, 90, 95, 97 and 101 of the FCC Rules, and RSS-GEN, RSS-170, RSS-210, RSS-247, RSS-248, and RSS-102 (RF Exp.)[MEAS].

Designation No.	KR0007
Company Number (IC)	5429A

4.3. List of test and measurement instruments

4.3.1 Instruments for the conducted measurements

No	Description	Model	Manufacturer	Serial No.	Cal. due	Use
1	Spectrum Analyzer	E4440A	Agilent	MY46186322	2023.05.09	☒
2	Power Meter	E4417A	Agilent	MY450042B	2023.05.11	☐
3	Power Sensor	8485A	HP	3318A1396	2023.05.11	☐
4	Vector Signal Generator	SMBV100B	Rohde&Schwarz	101179	2023.05.10	☐
5	Signal Generator	SMB100A	Rohde&Schwarz	180704	2024.01.17	☐
6	EMI Test Receiver	PMM9010F	Narda	020WW40105	2024.01.03	☒
7	Pulse limiter	ESH3-Z2	Rohde&Schwarz	100604	2024.01.03	☒
8	AMN (LISN)	ENV 216	Rohde&Schwarz	102047	2024.01.03	☒
9	AMN (LISN)	FCC-LISN-50-32-2-01-480V	FCC	141455	2023.05.09	☐
10	Attenuator (10 dB)	8491B	HP	38067	2023.05.11	☒
11	Attenuator (6 dB, 5 W)	18N5W-06	API Technologies	1	2023.05.11	☐
12	Attenuator (6 dB, 5 W)	18N5W-06	API Technologies	2	2023.05.11	☐
13	Temperature Chamber	DJ-THC1000	DAE JIN ENG	22-002	2024.01.17	☐
14	Multimeter	17B+	FLUKE	32700017WS	2024.01.16	☒
15	Digital Thermo-Hygrometer	608-H1	Testo	41383411	2023.05.20	☒
16	Wideband power sensor	NRP-Z85	Rohde&Schwarz	101862	2023.08.22	☒

AC power line Conducted emissions measurement software: PMM Emission Suite Version: 2.31

4.3.2 Instruments for the radiated measurements

No	Description	Model	Manufacturer	Serial No.	Cal. due	Use
1	EMI Test Receiver	ESR26	Rohde&Schwarz	101441	2023.12.19	☐
2	EMI Test Receiver	ESIB40	Rohde&Schwarz	100277	2023.08.25	☒
3	Spectrum Analyzer	FSW67	Rohde&Schwarz	101371	2023.05.17	☐
4	PXI EMI Test Receiver	N9048B	Keysight	MY62220109	2023.09.15	☒
5	Vector Signal Generator	SMBV100B	Rohde&Schwarz	101179	2023.05.10	☐
6	Signal Generator	SMB100A	Rohde&Schwarz	180704	2024.01.17	☐
7	Loop Antenna (9 kHz - 30 MHz)	HFH2-Z2E	Rohde&Schwarz	100883	2023.12.16	☒
8	BiLog broadband Antenna (30 MHz - 1 GHz)	VULB9168	Schwarzbeck	9168-230	2023.06.08	☒
9	Horn Antenna (1 GHz - 18 GHz)	3117	ETS Lindgren	00205960	2024.06.07	☒
10	Horn Antenna (1 GHz - 18 GHz)	BBHA 9120D	Schwarzbeck	9120D-816	2024.04.26	☐
11	Horn Antenna (6.5 GHz - 18 GHz)	LB-65180-20-C-SF	A-INFO	2110054000021	2024.01.22	☒
12	Horn Antenna (18 GHz - 26.5 GHz)	20240-20	Flann microwave	273364	2023.12.08	☒
13	Horn Antenna (18 GHz - 26.5 GHz)	20240-20	Flann microwave	273363	2023.12.08	☐
14	Horn Antenna (26.5 GHz - 40 GHz)	22240-20	Flann microwave	274186	2023.12.10	☐
15	Horn Antenna (26.5 GHz - 40 GHz)	22240-20	Flann microwave	274185	2023.12.10	☐
16	Pre-amplifier (30 MHz - 1 GHz)	MLA-10K01-B01-27	TSJ	2005350	2023.05.11	☒
17	Pre-amplifier (1 GHz - 18 GHz)	MLA-0118-J01-40	TSJ	14879	2023.05.09	☒
18	Pre-amplifier (18 GHz - 40 GHz)	MLA-1840-A01-50	TSJ	2610050	2023.05.17	☒
19	Attenuator (10 dB)	50HFAR-010-2.9mm	JFW	-	2023.07.21	☒
20	High pass filter (3 GHz)	WHKX 3.0/18G-12SS	Wainwright	8	2023.05.11	☒
21	Multimeter	17B+	FLUKE	32700017WS	2024.01.16	☒
22	Digital Thermo-Hygrometer	608-H1	Testo	41383411	2023.05.20	☒

Radiated emission measurement software (9 kHz to 1 GHz): TEPTO-DV/RE_Version: 3.1.0044
Radiated emission measurement software (1 GHz to 26.5 GHz): TEPTO-DV/RE_Version: 3.1.0051

5 Test and measurements

5.1. Antenna requirement

5.1.1 Regulation

According to §15.203, an intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device. The use of a permanently attached antenna or of an antenna that uses a unique coupling to the intentional radiator shall be considered sufficient to comply with the provisions of this Section. The manufacturer may design the unit so that a broken antenna can be replaced by the user, but the use of a standard antenna jack or electrical connector is prohibited.

And according to §15.247(b)(4), the conducted output power limit specified in paragraph (b) of this section is based on the use of antennas with directional gains that do not exceed 6 dBi. Except as shown in paragraph (c) of this section, if transmitting antennas of directional gain greater than 6 dBi are used, the conducted output power from the intentional radiator shall be reduced below the stated values in paragraphs (b)(1), (b)(2), and (b)(3) of this section, as appropriate, by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

5.1.2 Result: PASS

The EUT has the internal PCB pattern antenna with the directional gain of 3.02 dBi, and meets the requirements of this section.

5.2. 6 dB bandwidth

5.2.1 Regulation

According to §15.247(a)(2), systems using digital modulation techniques may operate in the 902 - 928 MHz, 2400 - 2483.5 MHz, and 5725 - 5850 MHz bands. The minimum 6dB bandwidth shall be at least 500 kHz.

5.2.2 Test Procedure

The 6 dB bandwidth were measured with the following setting according to Subclause 11.8.1 of ANSI C63.10-2020.

a) Set RBW = 100 kHz.
b) Set the video bandwidth (VBW) ≥ 3 x RBW.
c) Detector = peak.
d) Trace mode = max hold.
e) Sweep = auto couple.
f) Allow the trace to stabilize.
g) Measure the maximum width of the emission that is constrained by the frequencies associated with the two outermost amplitude points (upper and lower frequencies) that are attenuated by 6 dB relative to the maximum level measured in the fundamental emission.

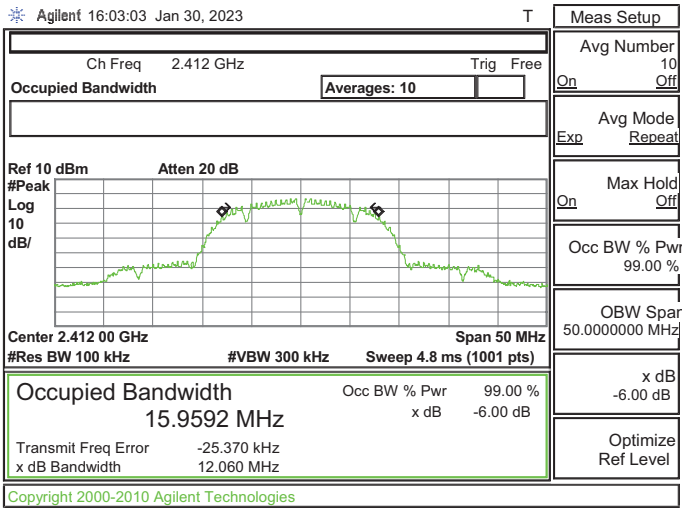
5.2.3 Result: PASS

Table 1: 6dB Bandwidth

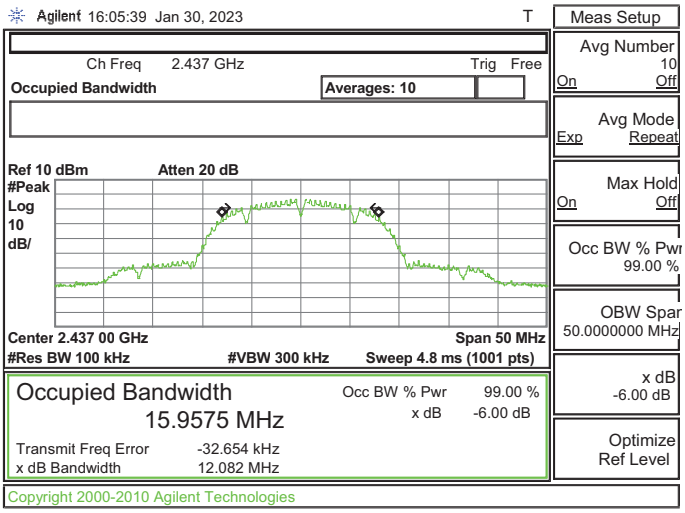
Mode	Rate	Transmitting frequency (MHz)	Occupied Bandwidth (99 %) (MHz)	6 dB Bandwidth (MHz)	LIMIT (kHz)
802.11b	1 Mbps	2412	15.9592	**12.060**	≥ 500
		2437	15.9575	12.082	≥ 500
		2462	15.9525	12.073	≥ 500
802.11g	6 Mbps	2412	16.2636	**15.608**	≥ 500
		2437	16.2785	15.639	≥ 500
		2462	16.2668	15.714	≥ 500
802.11n	MCS0	2412	17.2526	15.830	≥ 500
		2437	17.2390	15.716	≥ 500
		2462	17.2298	**15.659**	≥ 500

Figure 1. Plot of 6dB Bandwidth & Occupied Bandwidth (99%)

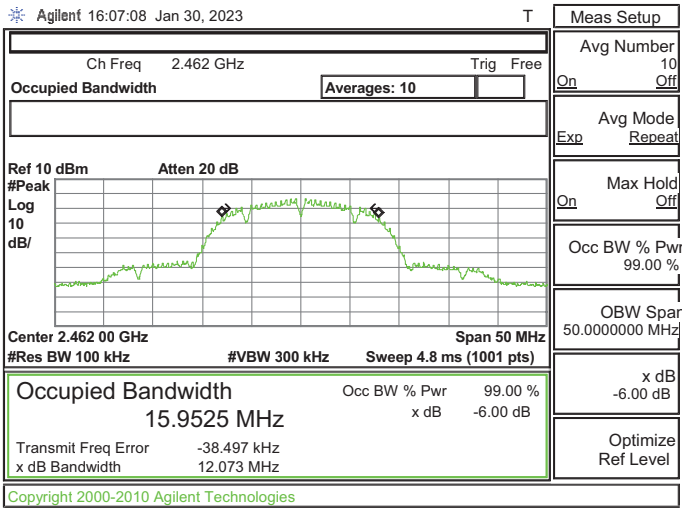
(802.11b, 1 Mbps) transmitting at f_{LOW}



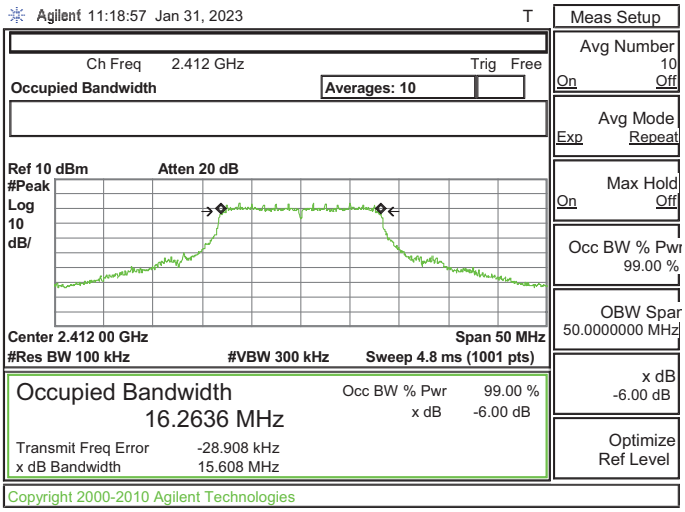
(802.11b, 1 Mbps) transmitting at f_{MID}



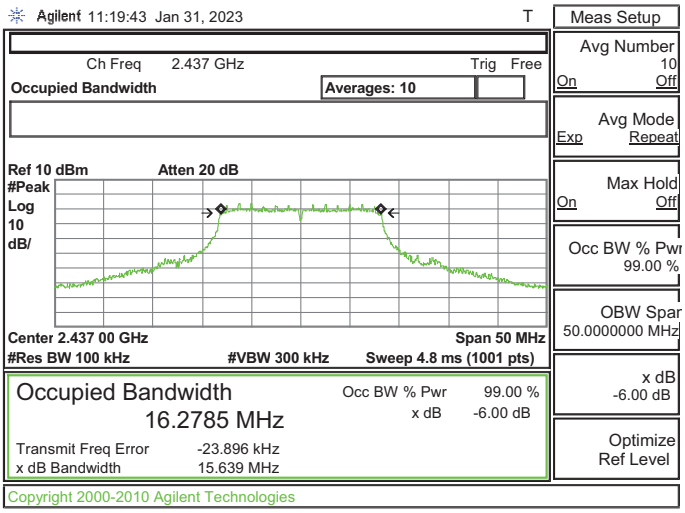
(802.11b, 1 Mbps) transmitting at f_{HIGH}



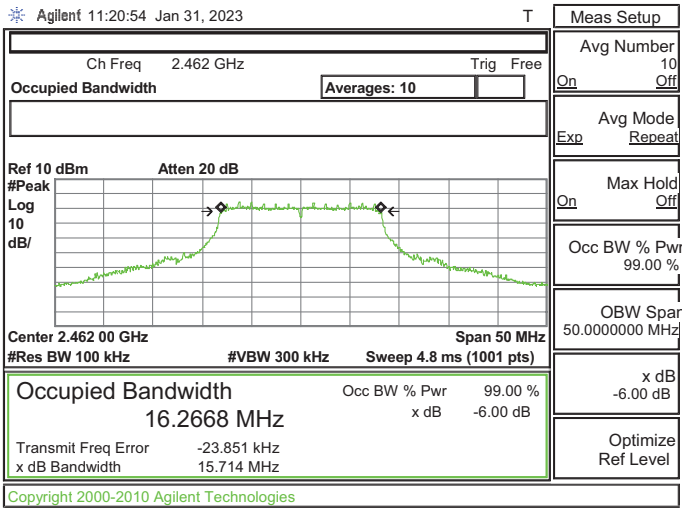
(802.11g, 6 Mbps) transmitting at f_{LOW}



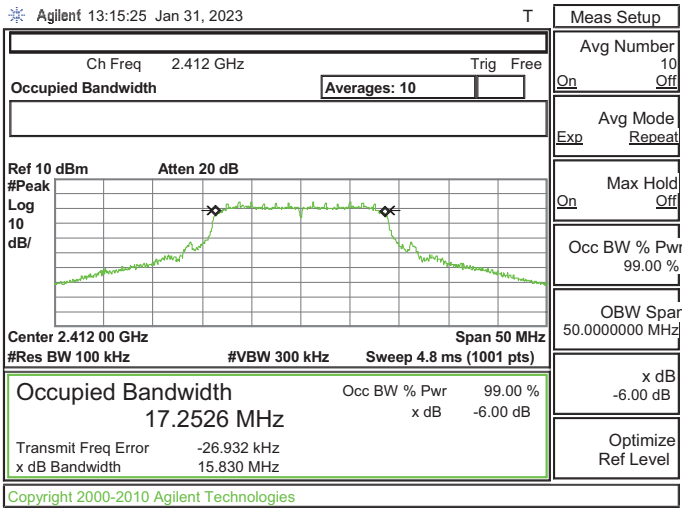
(802.11g, 6 Mbps) transmitting at f_{MID}



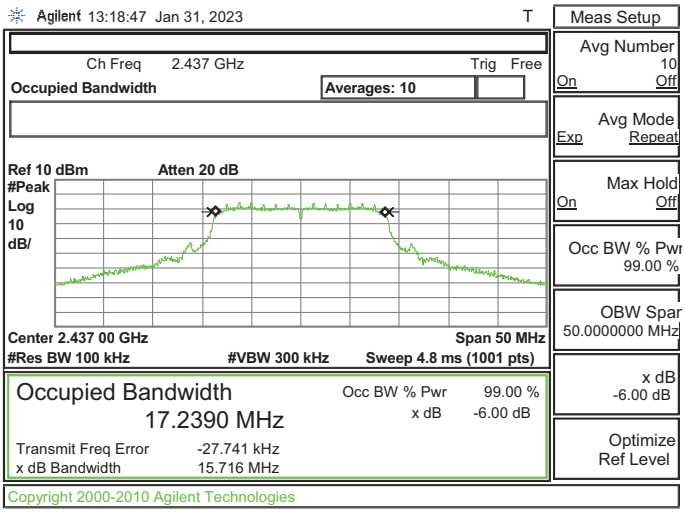
(802.11g, 6 Mbps) transmitting at f_{HIGH}



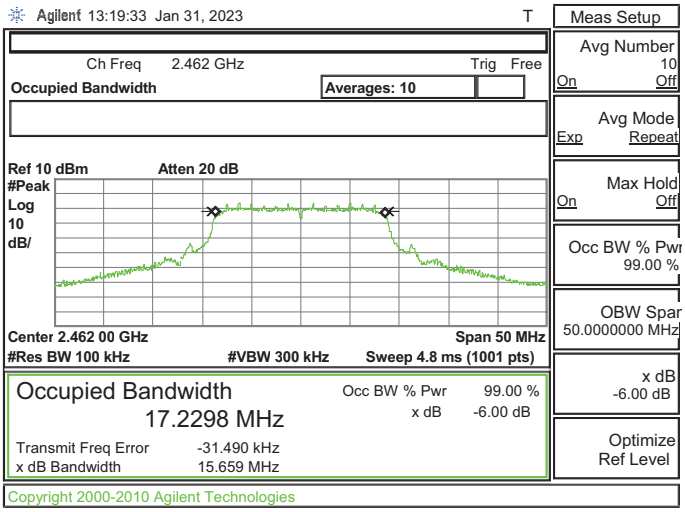
(802.11n, MCS0) transmitting at f_{LOW}



(802.11n, MCS0) transmitting at f_{MID}



(802.11n, MCS0) transmitting at f_{HIGH}



5.3. Maximum Peak Output Power

5.3.1 Regulation

According to §15.247(b)(3), for systems using digital modulation in the 902-928 MHz, 2400-2483.5 MHz, and 5725-5850 MHz bands: 1 Watt. As an alternative to a peak power measurement, compliance with the one Watt limit can be based on a measurement of the maximum conducted output power. Maximum Conducted Output Power is defined as the total transmit power delivered to all antennas and antenna elements averaged across all symbols in the signaling alphabet when the transmitter is operating at its maximum power control level. Power must be summed across all antennas and antenna elements. The average must not include any time intervals during which the transmitter is off or is transmitting at a reduced power level. If multiple modes of operation are possible (e.g., alternative modulation methods), the maximum conducted output power is the highest total transmit power occurring in any mode.

(4) The conducted output power limit specified in paragraph (b) of this section is based on the use of antennas with directional gains that do not exceed 6 dBi. Except as shown in paragraph (c) of this section, if transmitting antennas of directional gain greater than 6 dBi are used, the conducted output power from the intentional radiator shall be reduced below the stated values in paragraphs (b)(1), (b)(2), and (b)(3) of this section, as appropriate, by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

5.3.2 Test Procedure

The Maximum peak conducted output power were measured with the following setting according to Subclause 11.9.1.2 of ANSI C63.10-2020.

The maximum peak conducted output power may be measured using a broadband peak RF power meter. The power meter shall have a video bandwidth that is greater than or equal to the DTS bandwidth and shall use a fast responding diode detector.

Note: The worst-case mode was determined at continuous transmit mode(Highest duty cycle) since the difference of the output power for each transmission data rate was low.

5.3.3 Result: PASS

Table 2: Maximum Peak Conducted Output Power

Mode	Rate	Transmitting frequency (MHz)	Duty cycle		Average power		Peak power		LIMIT (W)
			(%)	Correction (dB) 1)	Reading (dBm)	Calculate (dBm) 2)	(dBm)	(W) 3)	
802.11b	1 Mbps	2412	99.6	0.02	5.65	5.67	8.52	0.007	1
		2437			5.27	5.29	7.98	0.006	1
		2462			4.85	4.87	7.59	0.006	1
	2 Mbps	2412	98.7	0.06	5.45	5.51	8.35	0.007	1
		2437			5.09	5.15	7.96	0.006	1
		2462			4.65	4.71	7.55	0.006	1
	5.5 Mbps	2412	96.7	0.15	5.45	5.60	8.31	0.007	1
		2437			5.06	5.21	7.95	0.006	1
		2462			4.62	4.77	7.53	0.007	1
	11 Mbps	2412	94.1	0.26	5.29	5.55	8.36	0.007	1
		2437			4.87	5.13	7.96	0.006	1
		2462			4.43	4.69	7.56	0.006	1

Mode	Rate	Transmitting frequency (MHz)	Duty cycle		Average power		Peak power		LIMIT (W)
			(%)	Correction (dB) 1)	Reading (dBm)	Calculate (dBm) 2)	(dBm)	(W) 3)	
802.11 g	6 Mbps	2412	97.6	0.11	5.24	5.35	15.25	0.034	1
		2437			4.98	5.09	15.09	0.032	
		2462			4.77	4.88	14.95	0.031	
	9 Mbps	2412	96.5	0.15	5.16	5.31	15.19	0.033	1
		2437			4.87	5.02	14.98	0.031	
		2462			4.71	4.86	14.88	0.031	
	12 Mbps	2412	91.8	0.37	5.11	5.48	15.03	0.032	1
		2437			4.83	5.20	14.85	0.031	
		2462			4.63	5.00	14.69	0.029	
	18 Mbps	2412	91.8	0.37	5.03	5.40	15.29	0.034	1
		2437			4.70	5.07	15.01	0.032	
		2462			4.54	4.91	14.89	0.031	
	24 Mbps	2412	88.8	0.52	4.66	5.18	15.22	0.033	1
		2437			4.54	5.06	15.17	0.033	
		2462			4.35	4.87	15.04	0.032	
	36 Mbps	2412	82.8	0.82	4.55	5.37	15.25	0.034	1
		2437			4.29	5.11	15.11	0.032	
		2462			4.19	5.01	15.03	0.032	
	48 Mbps	2412	85.1	0.70	4.38	5.08	15.38	0.035	1
		2437			4.06	4.76	15.09	0.032	
		2462			4.07	4.77	15.18	0.033	
	54 Mbps	2412	80.3	0.95	4.35	5.30	15.24	0.033	1
		2437			3.95	4.90	14.89	0.031	
		2462			4.93	4.89	14.96	0.031	

Note: *1) Duty correction = 10 x log(1/D), D is the Duty cycle*
2) Average power(Calculate) = Average power(Reading) + Duty correction
3) W = 10^(dBm/10)/1000

Mode	Rate	Transmitting frequency (MHz)	Duty cycle		Average power		Peak power		LIMIT (W)
			(%)	Correction (dB) 1)	Reading (dBm)	Calculate (dBm) 2)	(dBm)	(W) 3)	
802.11n	MCS0	2412	97.5	0.11	5.17	5.28	15.31	0.034	1
		2437			4.45	4.56	14.64	0.029	1
		2462			4.56	4.67	14.64	0.029	1
	MCS1	2412	96.3	0.16	5.15	5.31	15.18	0.033	1
		2437			4.42	4.58	14.64	0.029	1
		2462			4.52	4.68	14.64	0.029	1
	MCS2	2412	95.8	0.19	5.05	5.24	15.22	0.033	1
		2437			4.11	4.30	14.49	0.028	1
		2462			4.50	4.69	14.82	0.030	1
	MCS3	2412	96.0	0.18	5.03	5.21	14.84	0.030	1
		2437			4.06	4.24	14.04	0.025	1
		2462			4.47	4.65	14.42	0.028	1
	MCS4	2412	96.1	0.17	5.01	5.18	15.11	0.032	1
		2437			4.01	4.18	14.31	0.027	1
		2462			4.43	4.60	14.61	0.029	1
	MCS5	2412	96.4	0.16	4.99	5.15	14.68	0.029	1
		2437			3.97	4.13	13.83	0.024	1
		2462			4.38	4.54	14.19	0.026	1
	MCS6	2412	96.0	0.18	4.97	5.15	15.11	0.032	1
		2437			3.94	4.12	14.30	0.027	1
		2462			4.35	4.53	14.64	0.029	1
	MCS7	2412	97.3	0.12	4.93	5.05	14.71	0.030	1
		2437			3.94	4.06	13.89	0.024	1
		2462			4.29	4.41	14.19	0.026	1

Note: *1) Duty correction = 10 x log(1/D), D is the Duty cycle*

2) Average power(Calculate) = Average power(Reading) + Duty correction

3) W = 10^(dBm/10)/1000

5.4. Spurious emissions, Band edge, and Restricted bands

5.4.1 Regulation

According to §15.247(d), 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. Attenuation below the general limits specified in §15.209(a) is not required. 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)), the emissions from an intentional radiator shall not exceed the field strength levels specified in the following table:

Frequency (MHz)	Field strength limit (μV/m)	Field strength limit (dBμV/m)	Measurement distance (m)
0.009 - 0.490	2400/F (kHz)	48.5 - 13.8	300
0.490 - 1.705	24000/F (kHz)	33.6 - 23.0	30
1.705 - 30.0	30	29.5	30
30 – 88	100	40.0	3
88 – 216	150	43.5	3
216 – 960	200	46.0	3
Above 960	500	54.0	3

Except as provided in paragraph (g), fundamental emissions from intentional radiators operating under this section shall not be located in the frequency bands 54-72 MHz, 76-88 MHz, 174-216 MHz or 470-806 MHz. However, operation within these frequency bands is permltted under other sections of this part, e.g., §§15.231 and 15.241.

5.4.2 Test Procedure

The RF output power were measured with the following setting according to Subclause 6.10 of ANSI C63.10-2020.

1) Band-edge measurements for RF conducted emissions

1. Set the spectrum analyzer as follows:
   Span: wide enough to capture the peak level of the emission operating on the channel closest to the band-edge, as well as any modulation products which fall outside of the authorized band of operation
   RBW: 100 kHz
   VBW: 300 kHz
   Sweep = auto
   Detector function = peak
   Trace = max hold
2. Allow the trace to stabilize. Set the marker on the emission at the band-edge, or on the highest modulation product outside of the band, if this level is greater than that at the band-edge. Enable the marker-delta

function, and then use the marker-to-peak function to move the marker to the peak of the in-band emission.

3. Now, using the same instrument settings, enable the hopping function of the EUT. Allow the trace to stabilize. Follow the same procedure listed above to determine if any spurious emissions caused by the hopping function also comply with the specified limit.

2) Spurious RF Conducted Emissions:

1. Set the spectrum analyzer as follows:
   Span = wide enough to capture the peak level of the in-band emission and all spurious emissions (e.g., harmonics) from the lowest frequency generated in the EUT up through the 10th harmonic. Typically, several plots are required to cover this entire span.
   RBW = 100 kHz
   VBW ≥ 3 x RBW
   Sweep = auto
   Detector function = peak
   Trace = max hold
2. Allow the trace to stabilize. Set the marker on the peak of any spurious emission recorded.

3) Spurious Radiated Emissions:

1. The preliminary radiated measurements were performed to determine the frequency producing the maximum emissions in an anechoic chamber at a distance of 3 meters or 1 meter if applicable.
2. The EUT was placed on the top of the 0.8-meter height (or 1.5 meter height for above 1 GHz). To find the maximum emission levels, the height of a measuring antenna was changed and the turntable was rotated (0º to 360º).
3. The antenna polarization was also changed from vertical to horizontal. The spectrum was scanned from 9 kHz to 30 MHz using the loop antenna, from 30 to 1000 MHz using the Bilog broadband antenna, and from 1 GHz to tenth harmonic of the highest fundamental frequency using the horn antenna.
4. To increase the overall measurement sensitivity, the closer test distances and/or narrower bandwidths may be used. If the closer measurement distance (1 meter) were used, the beamwidth of the measuring antenna versus size of the EUT was taken into account.
5. To obtain the final measurement data, each frequency found during preliminary measurements was re-examined and investigated. The test receiver was set up to average, peak, and quasi-peak detector function with specified bandwidth. It was attempted to maximize the emission, by varying the configuration of the EUT and the cables routing.
6. The EUT is situated in three orthogonal planes (if appropriate)
7. If the emission on which a radiated measurement must be made is located at the edge of the authorized band of operation, then the alternative “marker-delta” method may be employed.

4) Marker-Delta Method at the edge of the authorized band of operation:

The marker-delta method, as described in ANSI C63.10, can be used to perform measurements of the radiated unwanted emissions level at the band-edges provided that the 99 % OBW of the fundamental emission is within 2 MHz of the authorized band edge.

1. Perform an in-band field strength measurement of the fundamental emission using the RBW and detector function required for the frequency being measured. For transmitters operating above 1 GHz, use a 1 MHz RBW, a 3 MHz VBW, and a peak detector, as required.56 Repeat the measurement with an average detector (or alternatively, a peak detector and reduced VBW).
2. Choose a spectrum analyzer span that encompasses both the peak of the fundamental emission and the band-edge emission under investigation. Set the instrument RBW to 1% of the total span (but never less than 30 kHz), with a VBW equal to or greater than three times the RBW. Record the peak levels of the fundamental emission and the relevant band-edge emission (i.e., run several sweeps in peak hold mode). Observe the stored trace and measure the amplitude delta between the peak of the fundamental and the peak of the band-edge emission. This is not an absolute field strength measurement; it is only a relative measurement to determine the amount by which the emission drops at the band-edge relative to the highest fundamental emission level.
3. Subtract the delta measured in step 2) from the field strengths measured in step 1). The resulting field strengths (CISPR QP, average, or peak, as appropriate) are then used to determine band-edge emissions compliance, where required.

5.4.3 Result: PASS

Table 3: Field Strength of Spurious Radiation (radiated emissions from 9 kHz to 30 MHz)

Test set-up:	Refer to the test configuration and photographs of the test setup. Test site: SAC Antenna distance: ☐ 10 m ☒ 3 m Rx antenna height: 1 m frequency range: 9 kHz to 30 MHz
Operating mode:	#1 (802.11b 1 Mbps / 802.11g 6 Mbps / 802.11n MCS0)

(The chart below shows the highest readings taken from the final data. The other emission levels were very low against the limit.)

Frequency (MHz)	Pol. (V/H)	Reading (dBμV)	AMP (dB)	AF (dB/m)	CL (dB)	Actual (dBμV/m)	Limit (dBμV/m)	Margin (dB)
No critical peaks found								

Note: *1) V/H: Vertical / Horizontal polarization*
2) AMP, AF and CL: pre-amplifier gain, antenna factor and cable loss
3) Actual = Reading - AMP + AF + CL
4) Margin = Limit - Actual

Table 4: Field Strength of Spurious Radiation (radiated emissions from 30 MHz to 1 GHz)

Test set-up:	Refer to the test configuration and photographs of the test setup. Test site: SAC Antenna distance: ☐ 10 m ☒ 3 m Rx antenna height: 1 m to 4 m frequency range: 30 MHz to 1 GHz
Operating mode:	#1 (802.11b 1 Mbps / 802.11g 6 Mbps / 802.11n MCS0)

(The chart below shows the highest readings taken from the final data. The other emission levels were very low against the limit.)

Frequency (MHz)	Pol. (V/H)	Height (m)	Reading (dBμV)	AMP (dB)	AF (dB/m)	CL (dB)	Actual (dBμV/m)	Limit (dBμV/m)	Margin (dB)
No critical peaks found									

Note: *1) V/H: Vertical / Horizontal polarization*
2) AMP, AF and CL: pre-amplifier gain, antenna factor and cable loss
3) Actual = Reading - AMP + AF + CL
4) Margin = Limit - Actual

Table 5: Field Strength of Spurious Radiation (radiated emissions from 1 GHz to 26.5 GHz)

Test set-up:	Refer to the test configuration and photographs of the test setup. Test site: FAR Antenna distance: ☒ 3 m ☐ 1 m Rx antenna height: 1 m to 4 m frequency range: 1 GHz to 3 GHz; 3 GHz to 6.5 GHz; 6.5 GHz to 18 GHz; 18 GHz to 26.5 GHz
Operating mode:	#1 (802.11b 1 Mbps / 802.11g 6 Mbps / 802.11n MCS0)

(The chart below shows the highest readings taken from the final data. The maximized peak measured value complies with the average limit, then it is unnecessary to perform an average measurement.)

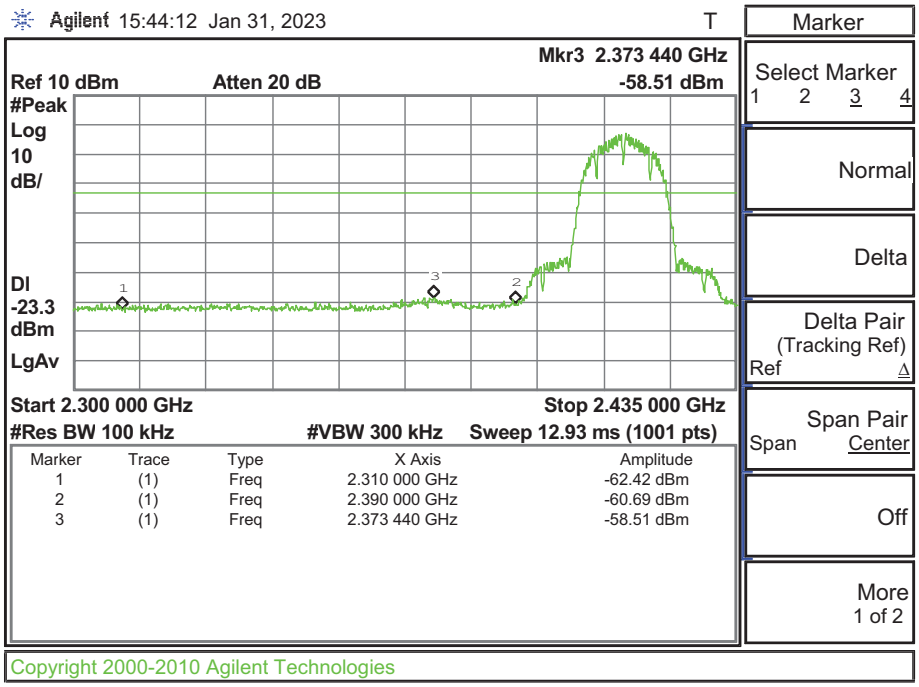
Freq. (MHz)	Pol. (V/H)	Height (m)	Reading (dBμV)		AMP (dB)	AF (dB/m)	CL (dB)	Actual (dBμV/m)		Limit (dBμV/m)		Margin (dB)	
			PK	AV				PK	AV	PK	AV	PK	AV
No critical peaks found													

Note: *1) V/H: Vertical / Horizontal polarization*
2) PK/AV: Peak / Average values
3) AMP, AF and CL: pre-amplifier gain, antenna factor and cable loss
4) Actual = Reading - AMP + AF + CL
5) Margin = Limit – Actual

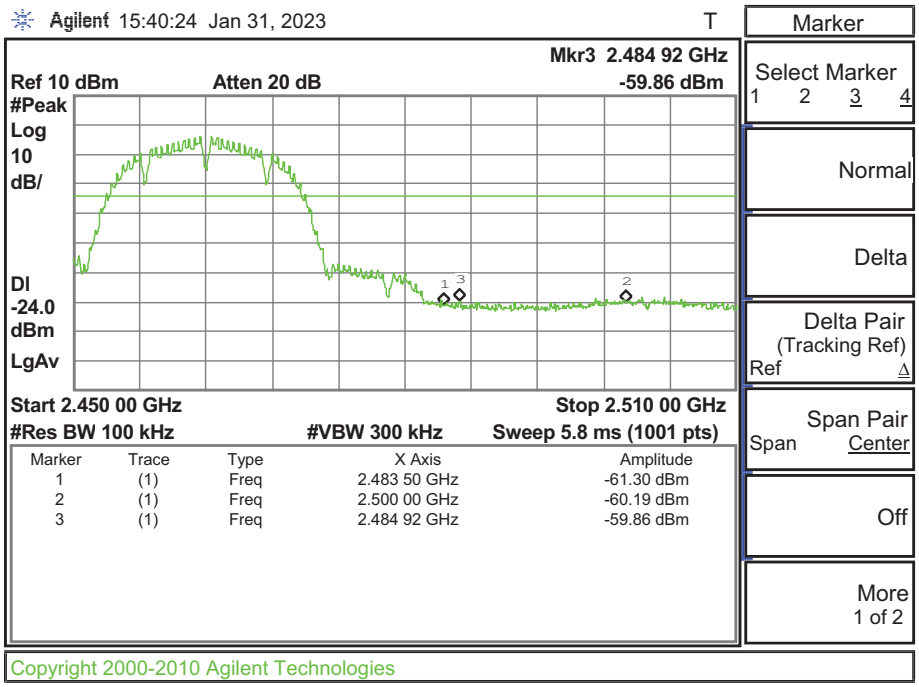
Figure 2. Plot of Band Edge (Conducted measurements)

During the measurements, the insertion loss of the cable loss and the external attenuator (10 dB) was corrected in the spectrum analyzer.

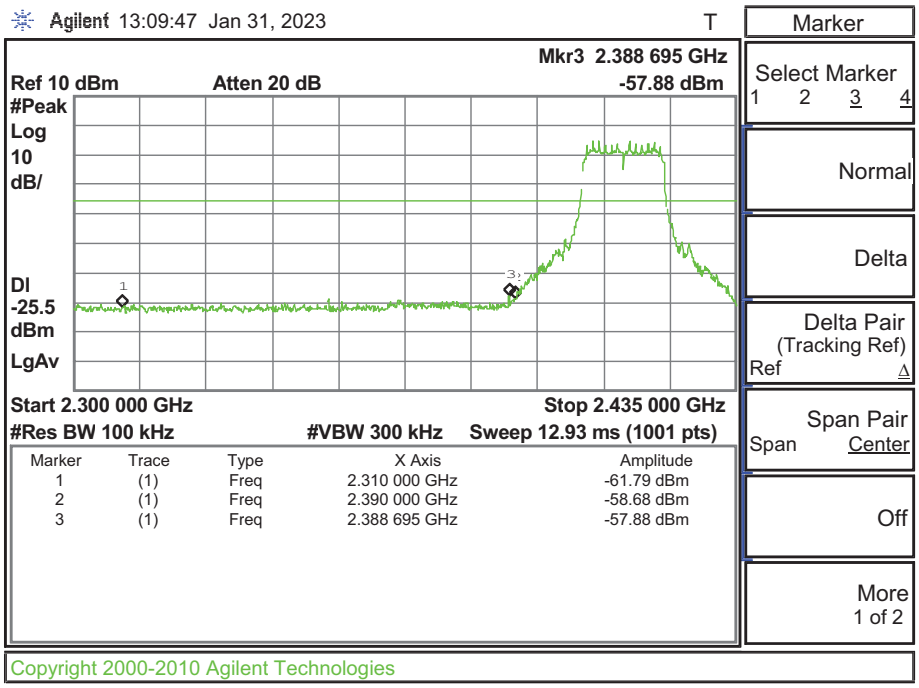
(802.11b, 1 Mbps) transmitting at f_{LOW}



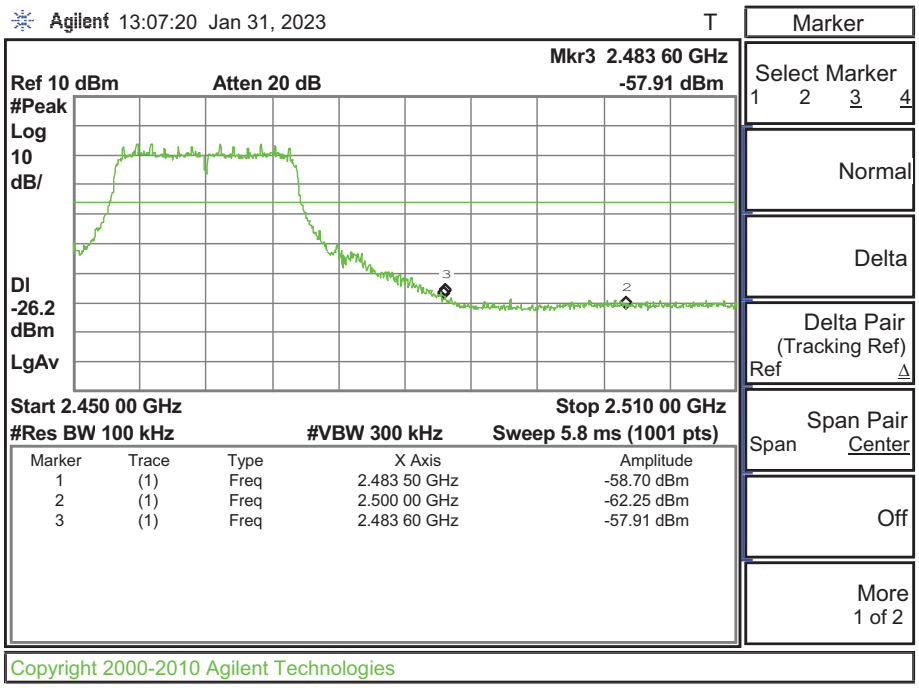
(802.11b, 1 Mbps) transmitting at f_{HIGH}



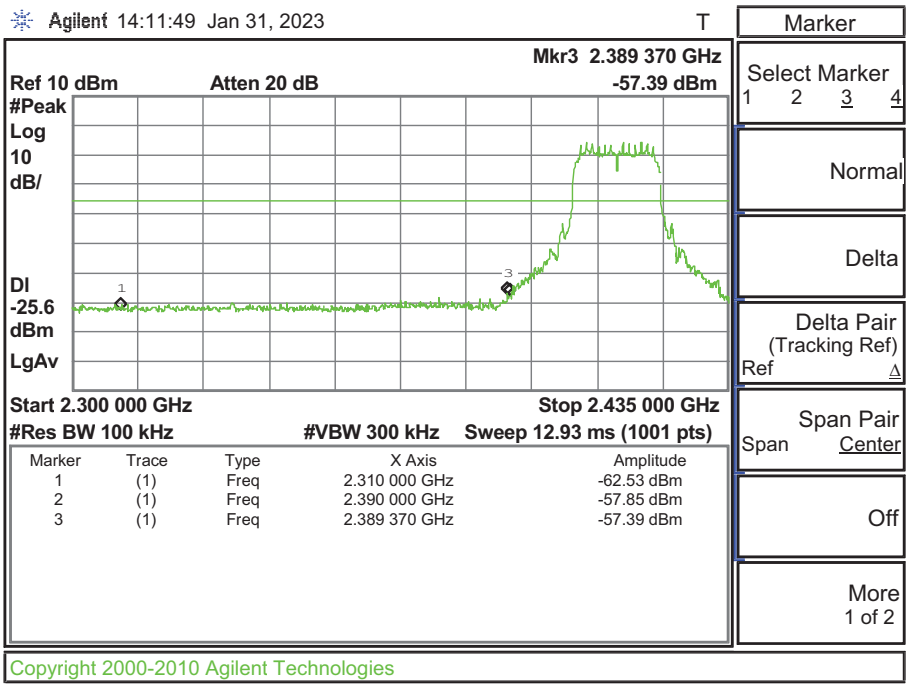
(802.11g, 6 Mbps) transmitting at f_{LOW}



(802.11g, 6 Mbps) transmitting at f_{HIGH}



(802.11n(HT20), MCS0) transmitting at f_{LOW}



(802.11n(HT20), MCS0) transmitting at f_{HIGH}

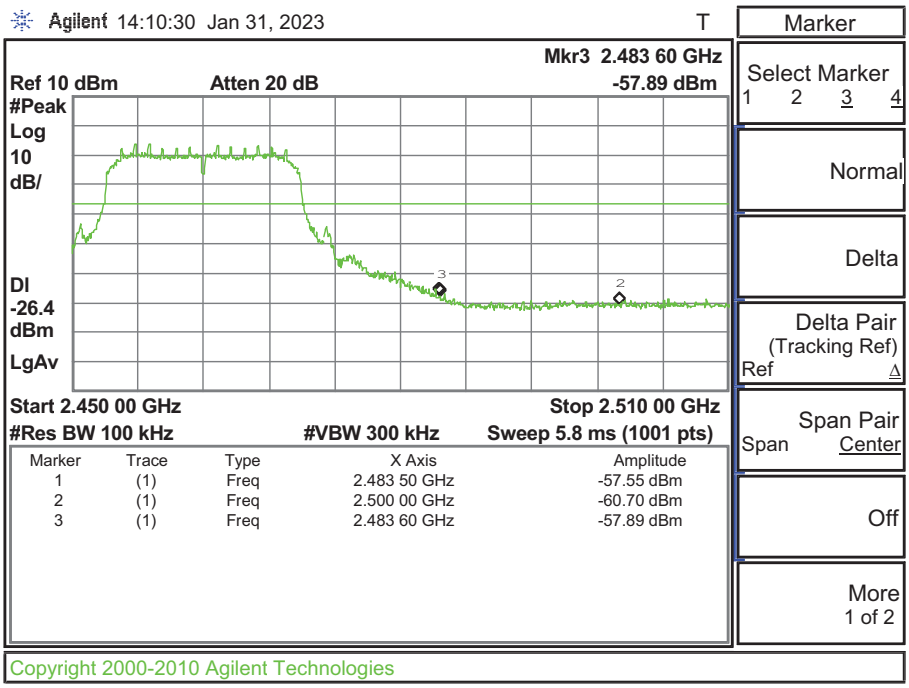
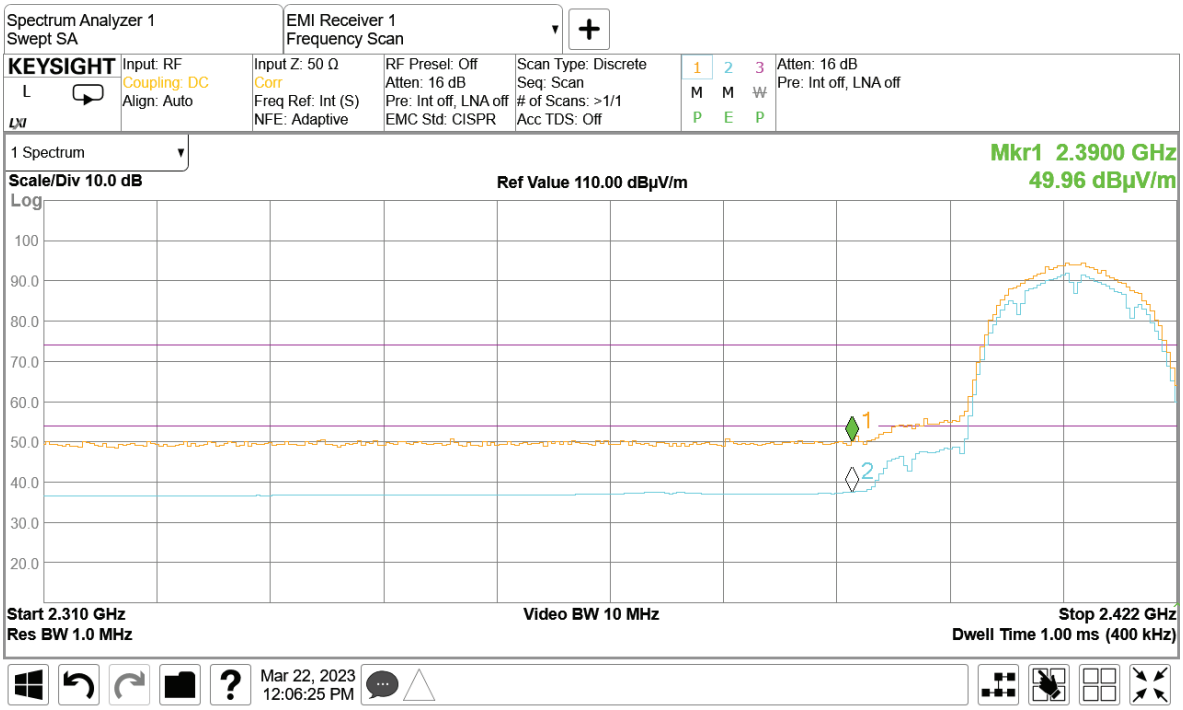


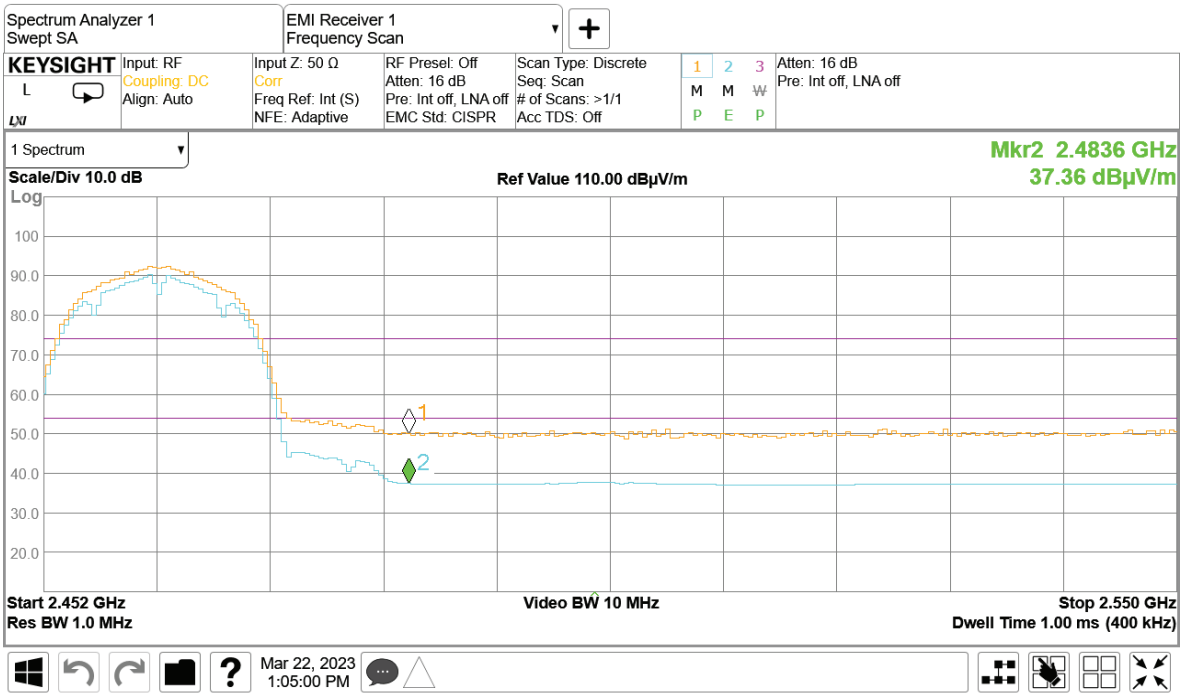
Figure 3. Plot of Band Edge (Radiated measurements; the measurement distance is 3 meters)

During the measurements, the correction factor (antenna factor, gain of pre-amplifier and cable loss) was included in the spectrum analyzer.

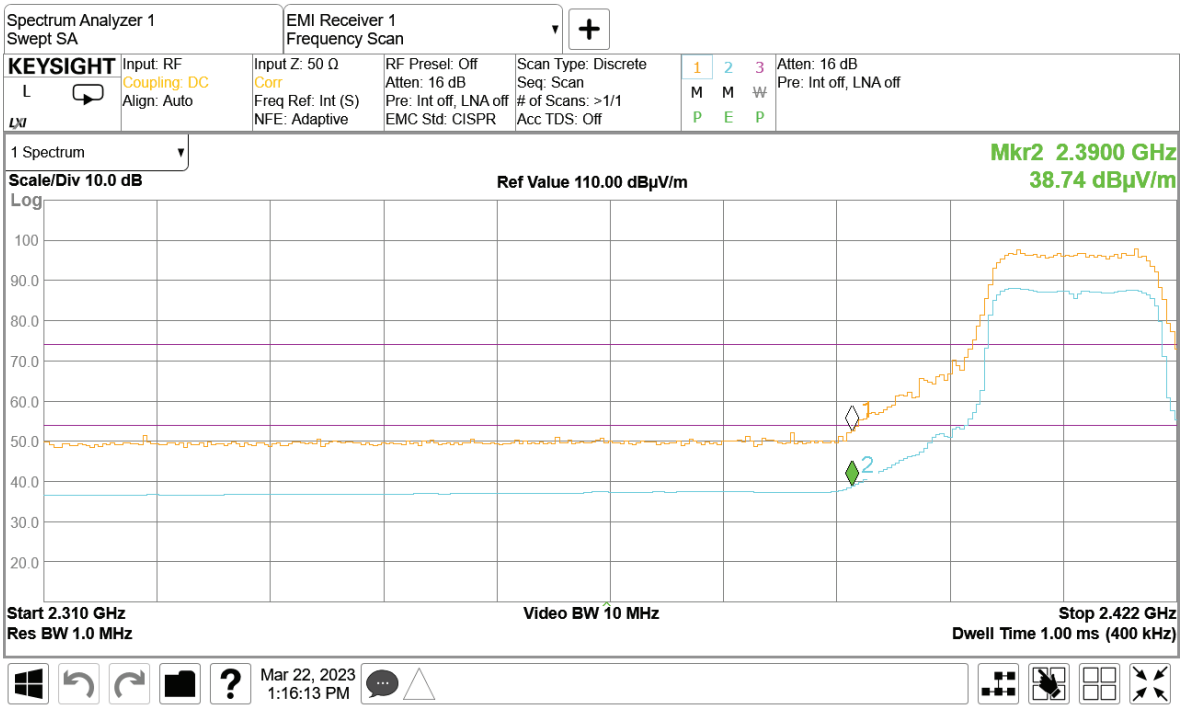
(802.11b, 1 Mbps) transmitting at f_{LOW}



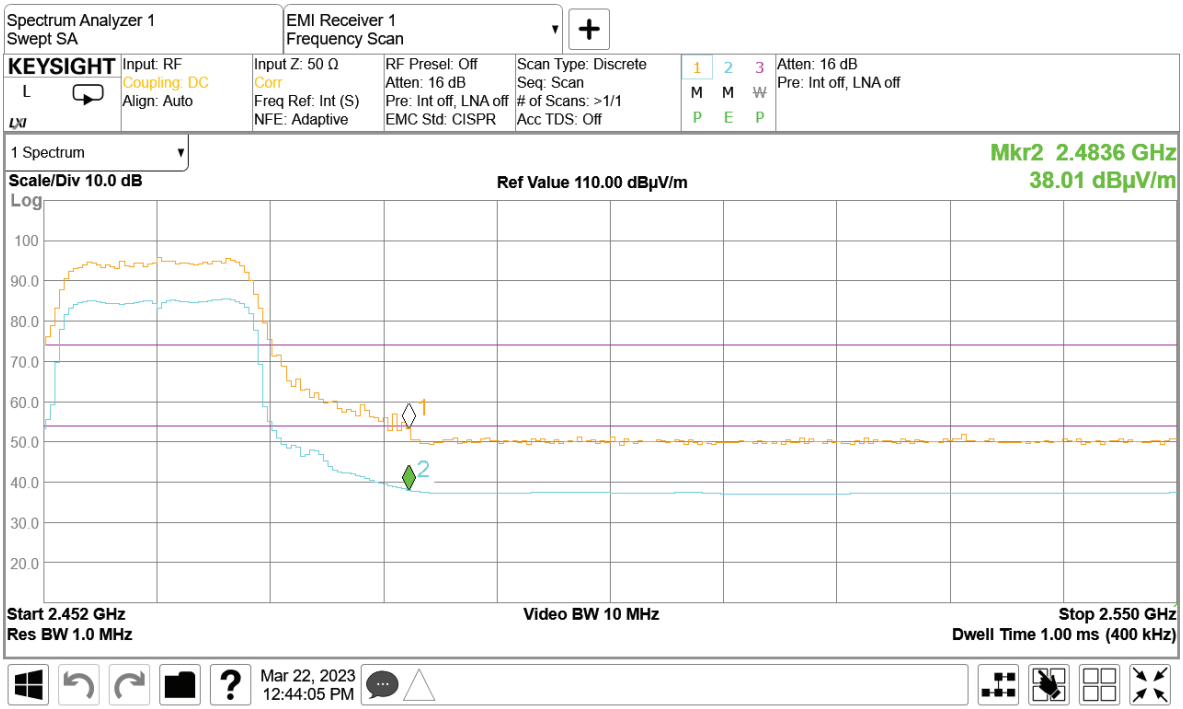
(802.11b, 1 Mbps) transmitting at f_{HIGH}



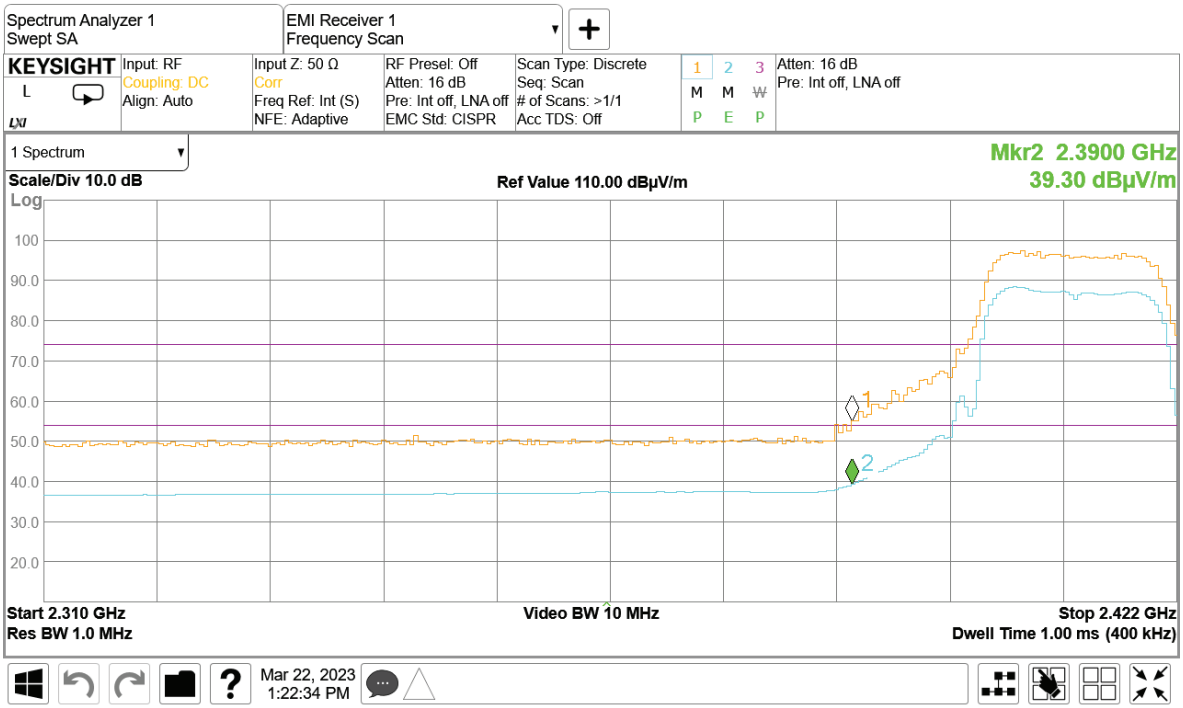
(802.11g, 6 Mbps) transmitting at f_{LOW}



(802.11g, 6 Mbps) transmitting at f_{HIGH}



(802.11n(HT20), MCS0) transmitting at f_{LOW}



(802.11n(HT20), MCS0) transmitting at f_{HIGH}

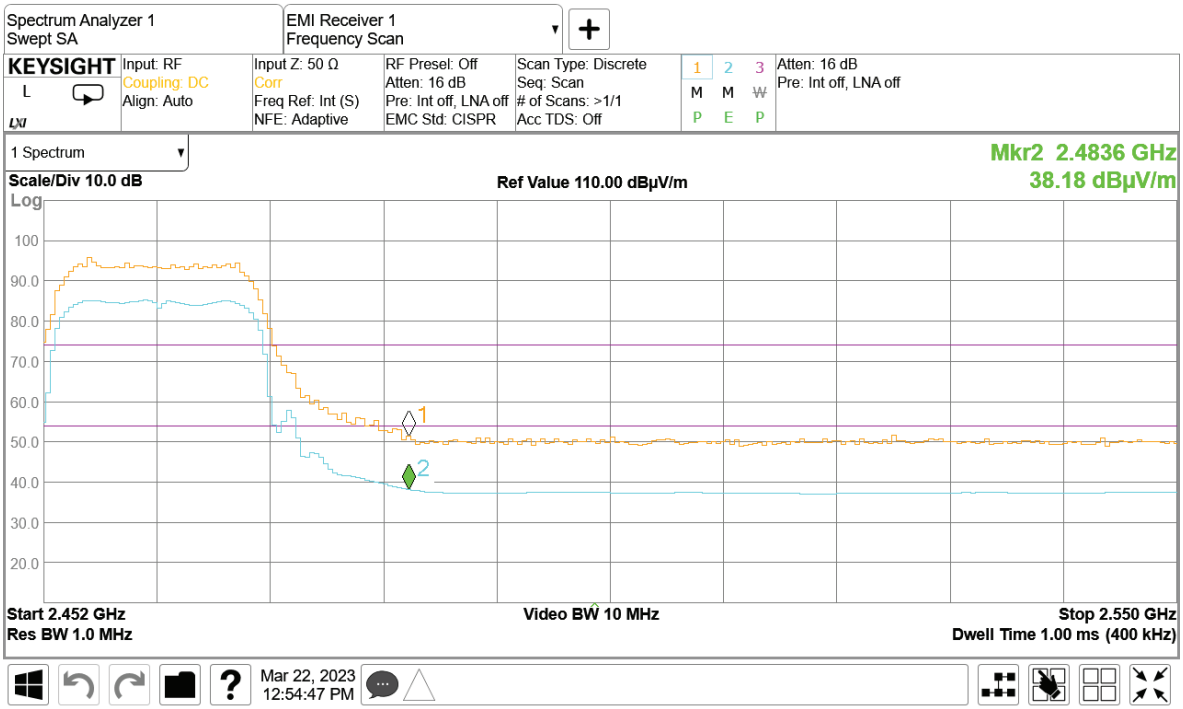
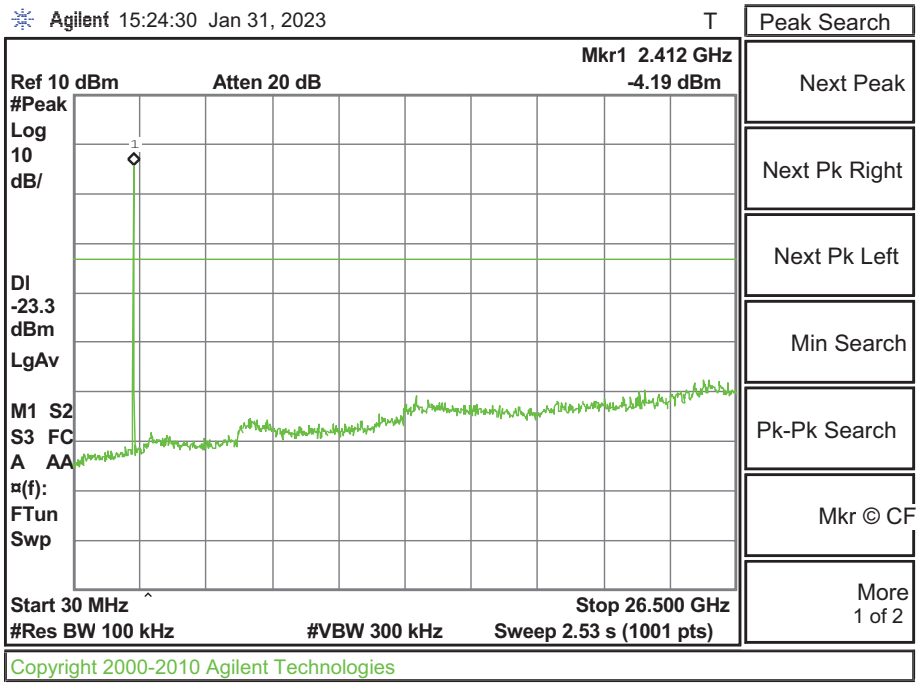


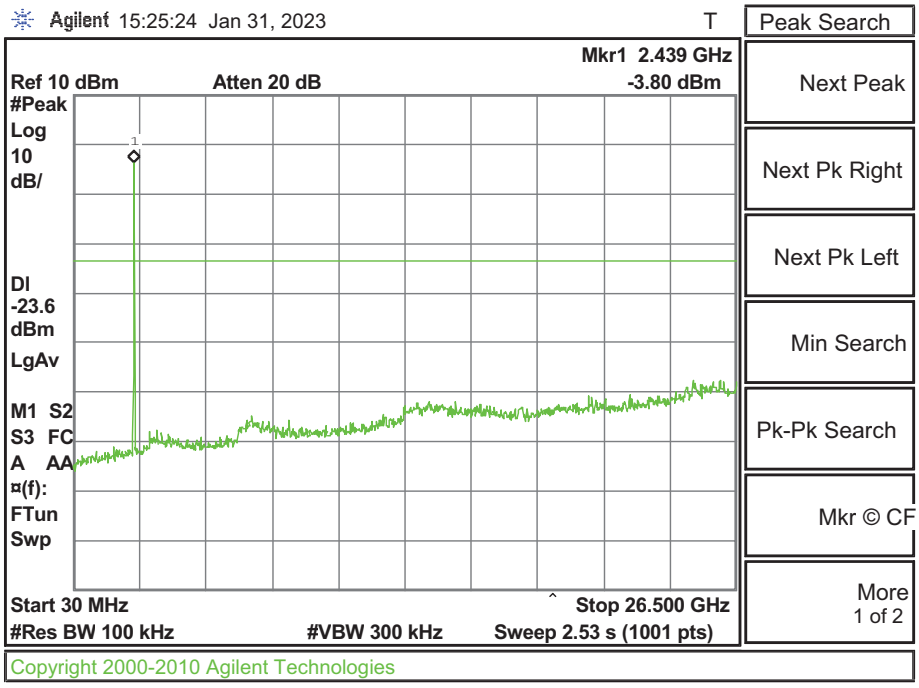
Figure 4. Spurious RF conducted emissions

During the measurements, the insertion loss of the cable loss and the external attenuator (10 dB) was corrected in the spectrum analyzer. The DL line on the plot was used as the limit 20 dB below the highest level of the desired power in the 100 kHz bandwidth.

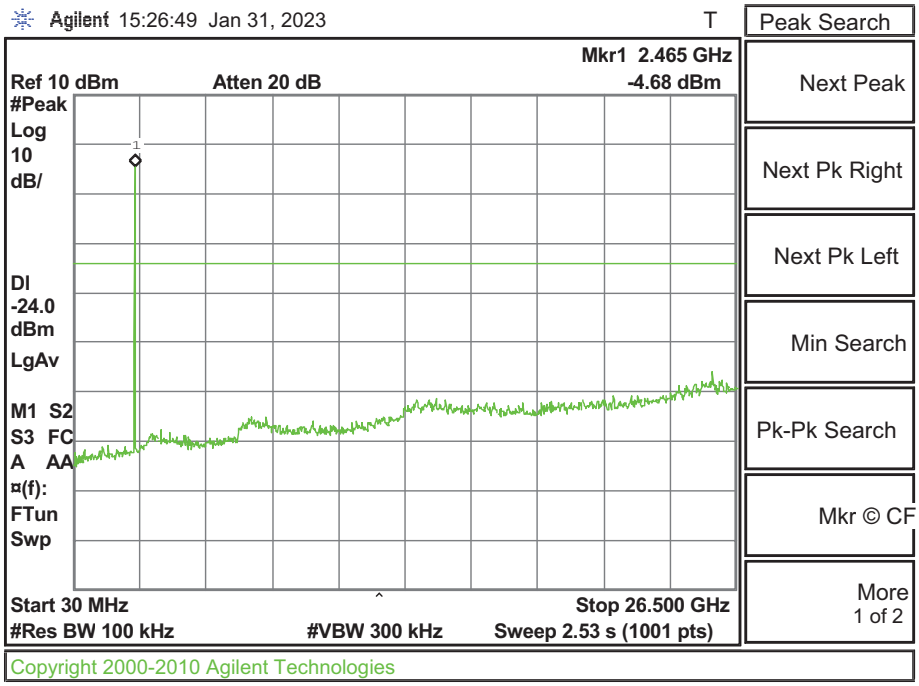
(802.11b, 1 Mbps) transmitting at f_{LOW}



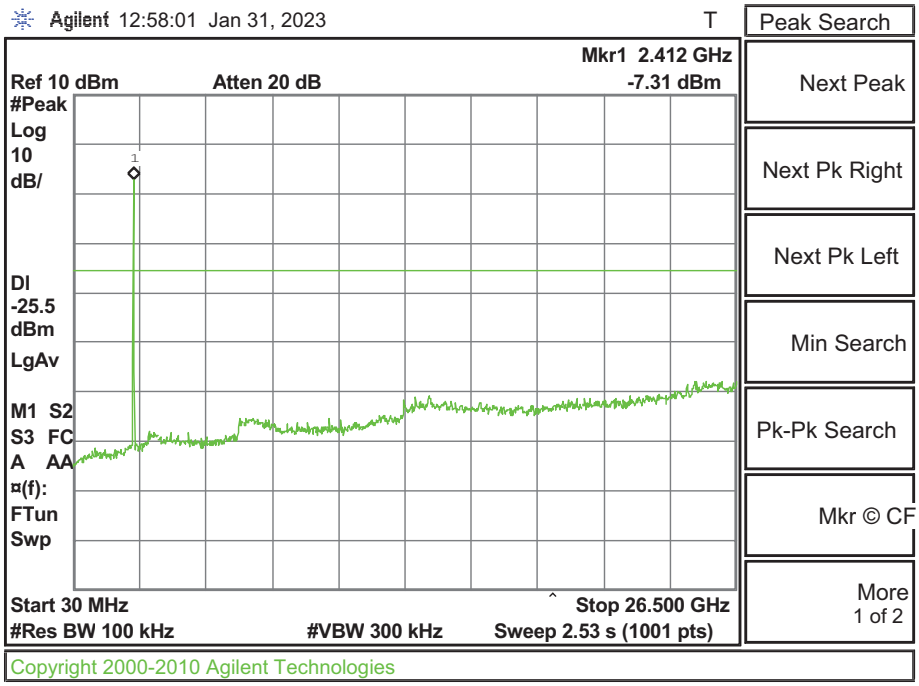
(802.11b, 1 Mbps) transmitting at f_{MID}



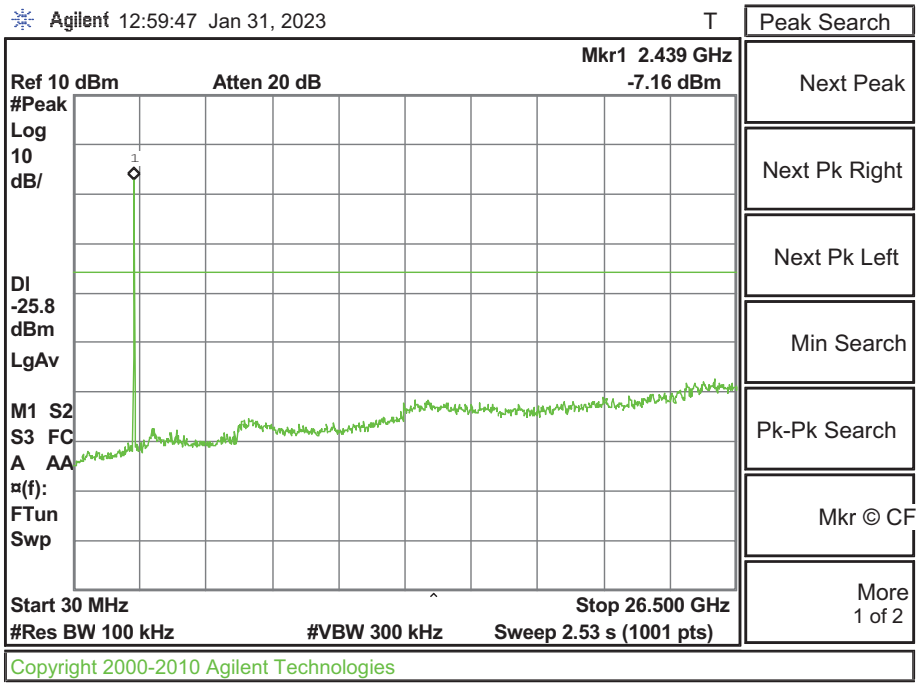
(802.11b, 1 Mbps) transmitting at f_{HIGH}



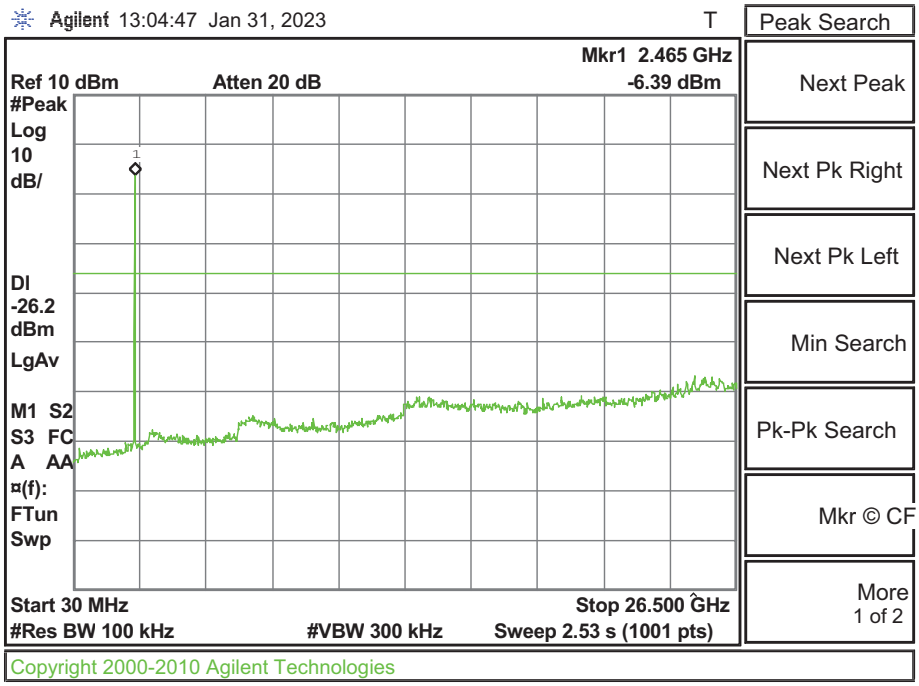
(802.11g, 6 Mbps) transmitting at f_{LOW}



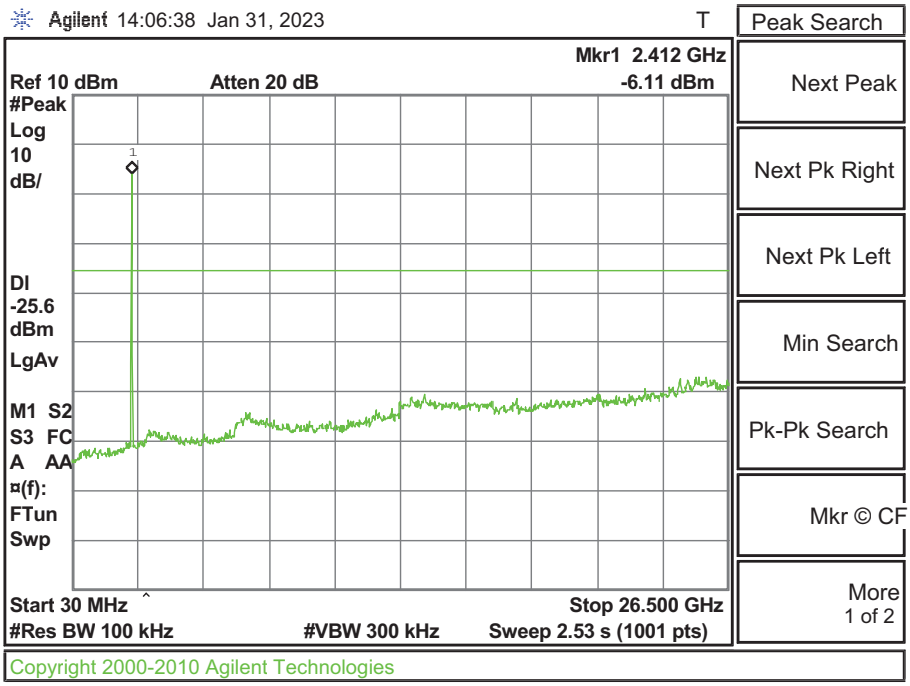
(802.11g, 6 Mbps) transmitting at f_{MID}



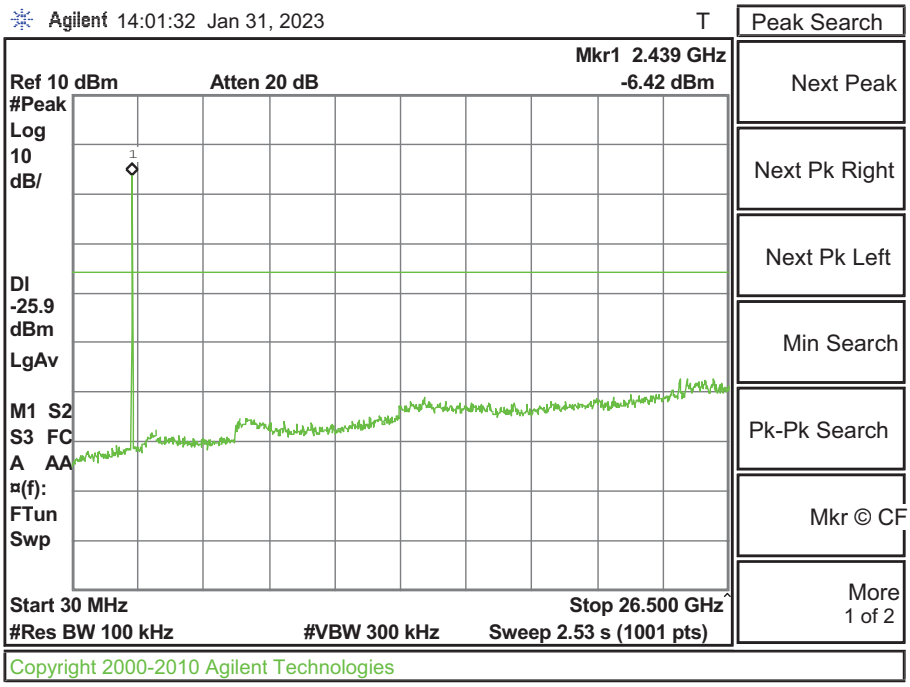
(802.11g, 6 Mbps) transmitting at f_{HIGH}



(802.11n(HT20), MCS0) transmitting at f_{LOW}



(802.11n(HT20), MCS0) transmitting at f_{MID}



(802.11n(HT20), MCS0) transmitting at f_{HIGH}

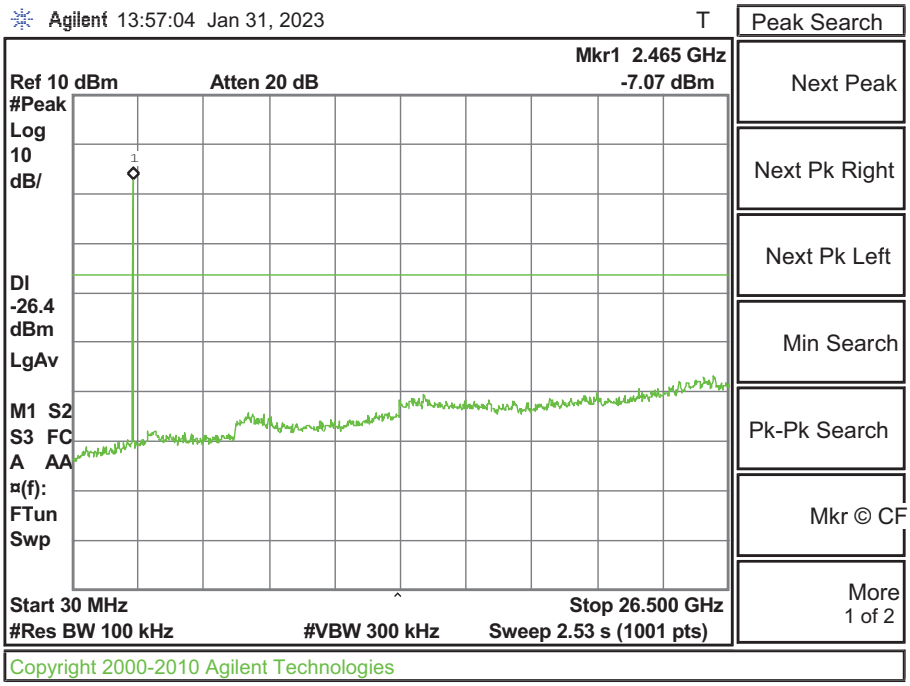
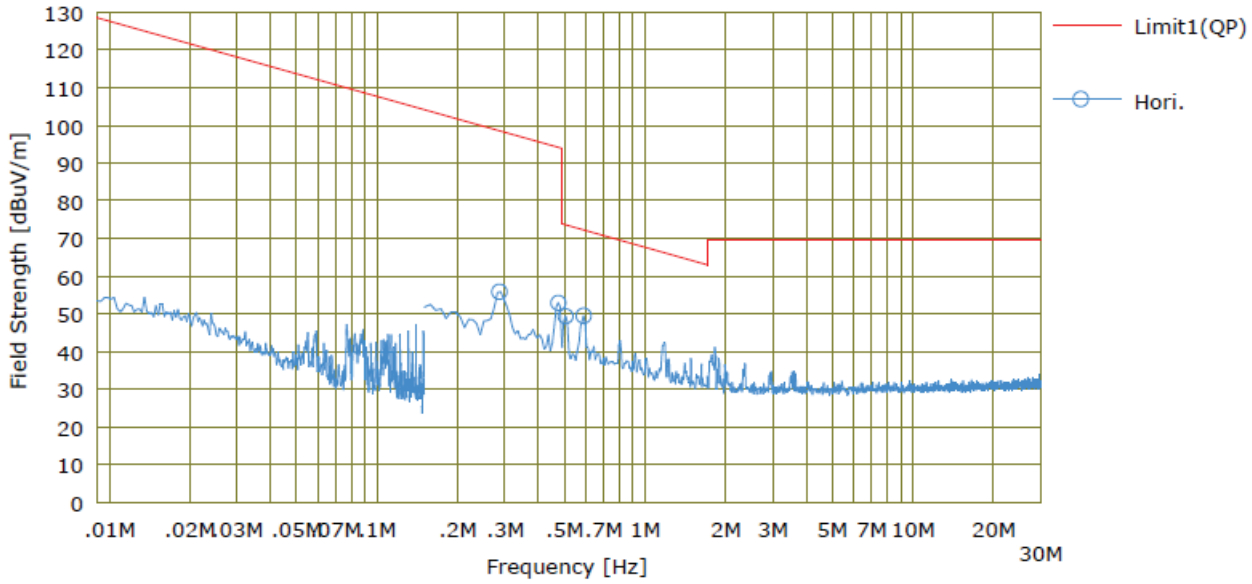
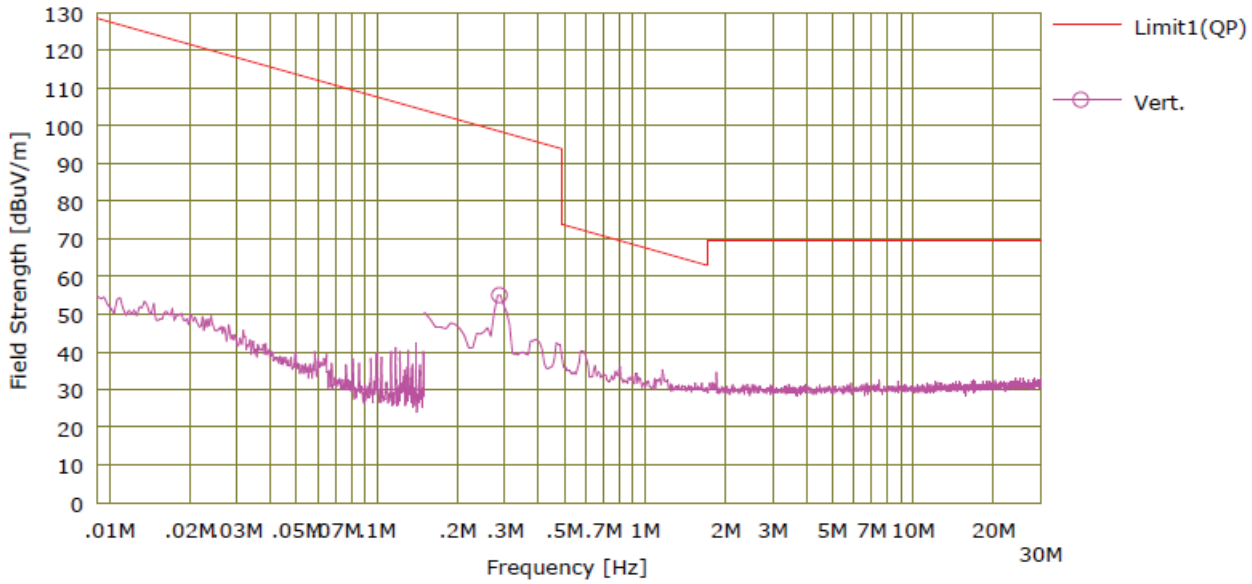


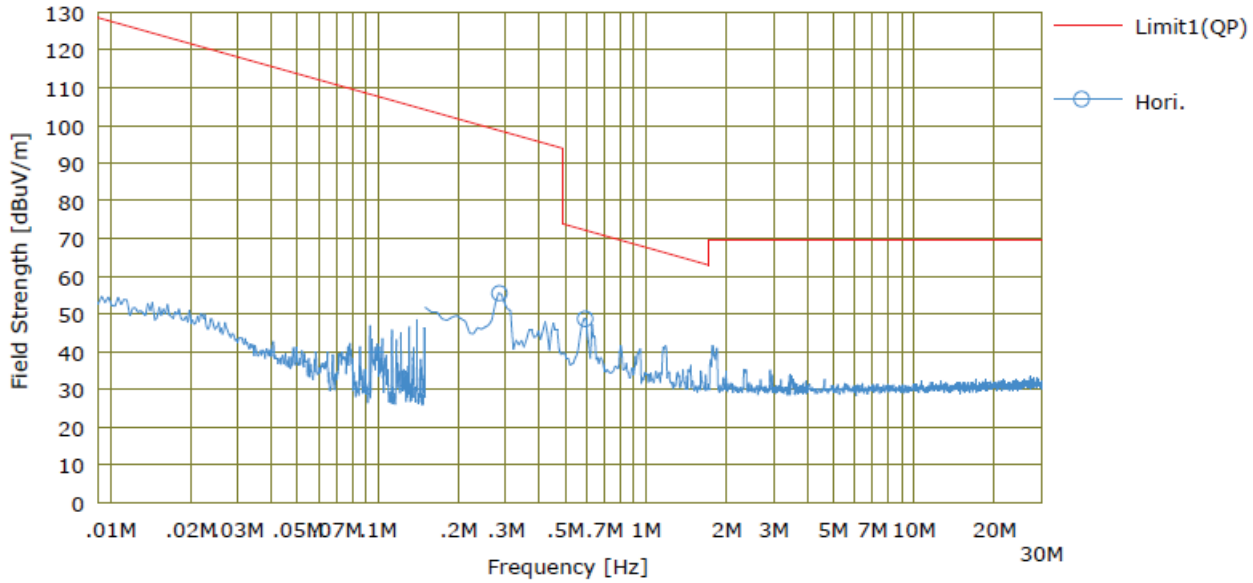
Figure 5. Plot of radiated spurious emissions (from9 kHz to 30 MHz)

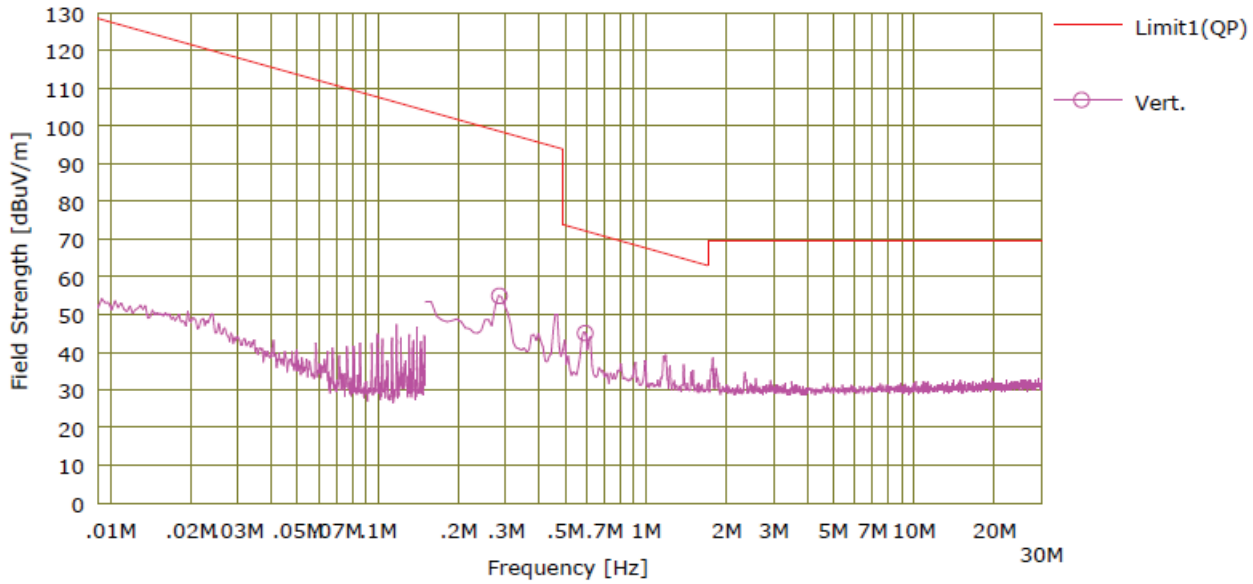
(802.11b, 1 Mbps) transmitting at f_{MID}



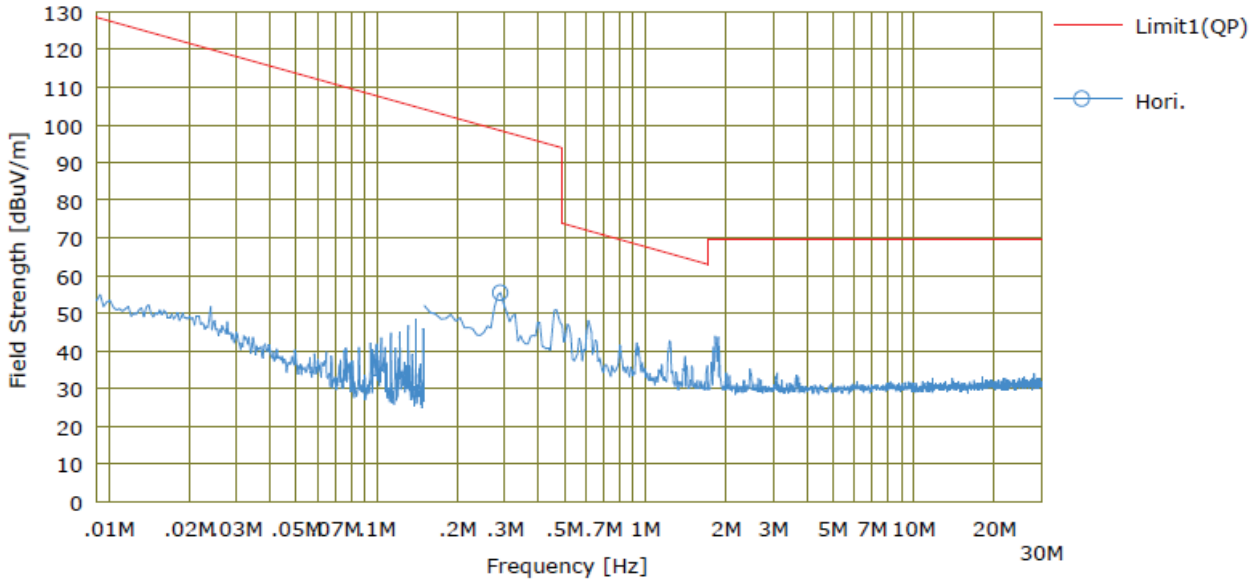


(802.11g, 6 Mbps) transmitting at f_{MID}





(802.11n(HT20), MCS0) transmitting at f_{MID}



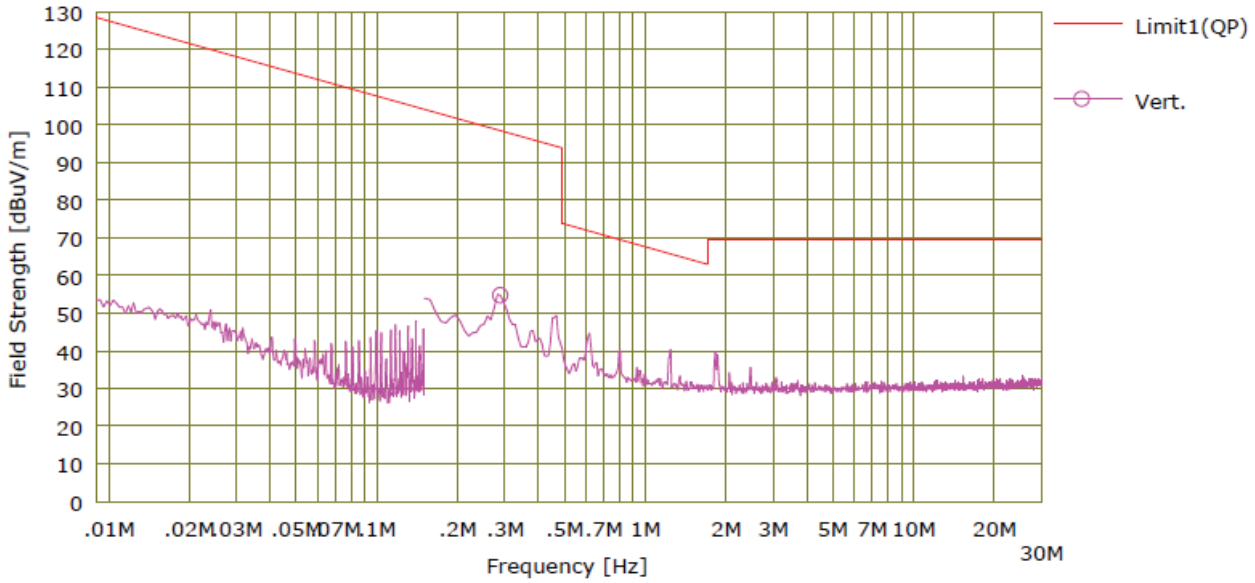
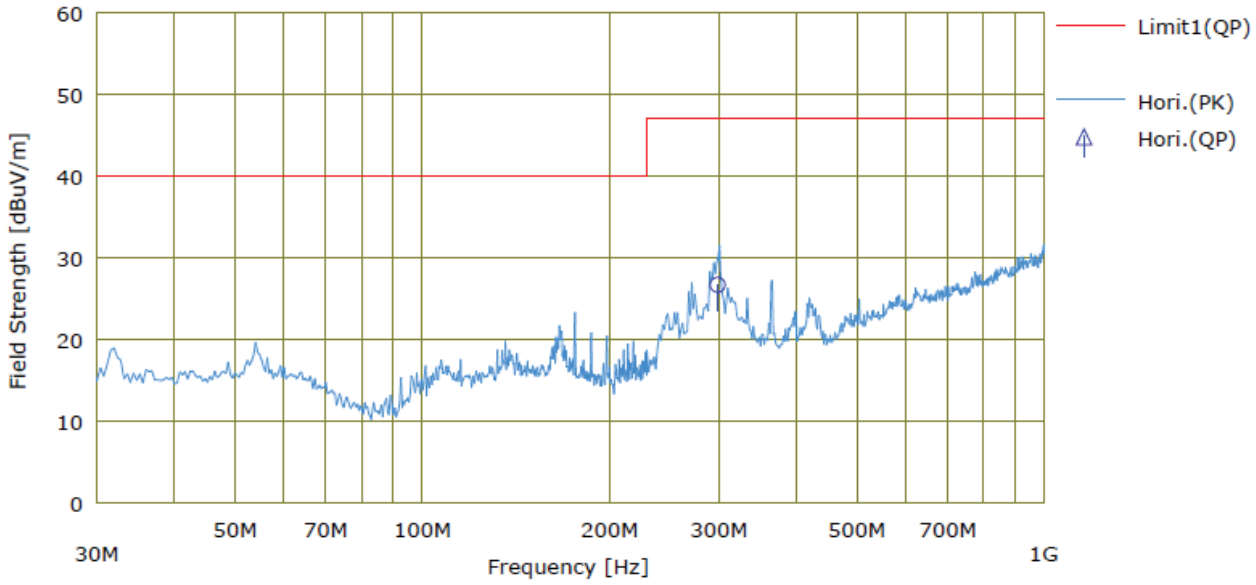
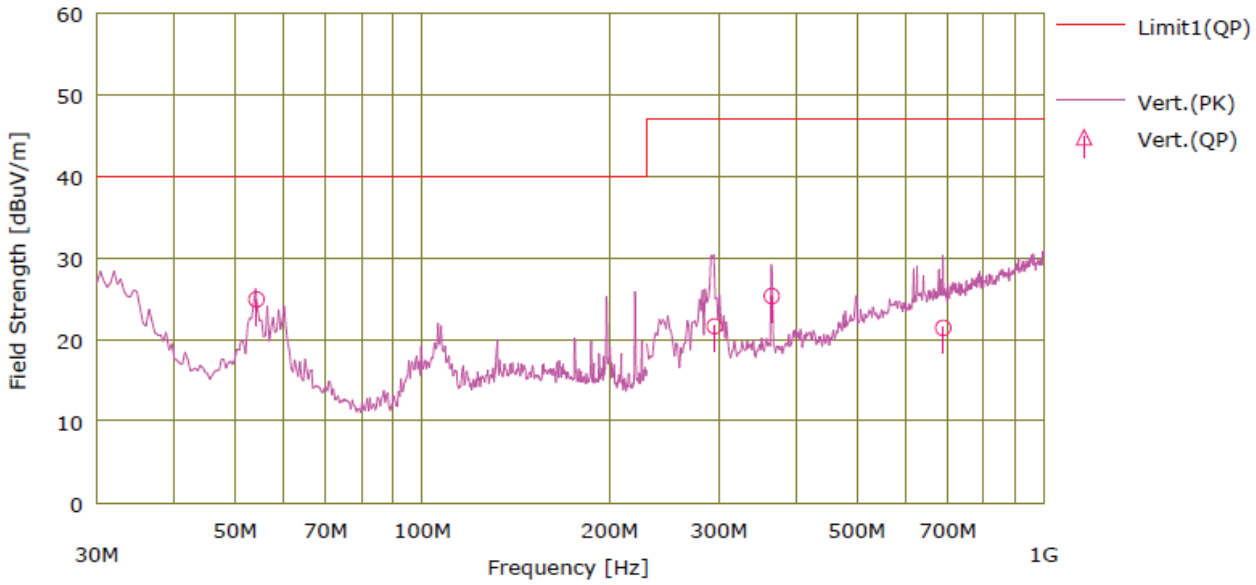


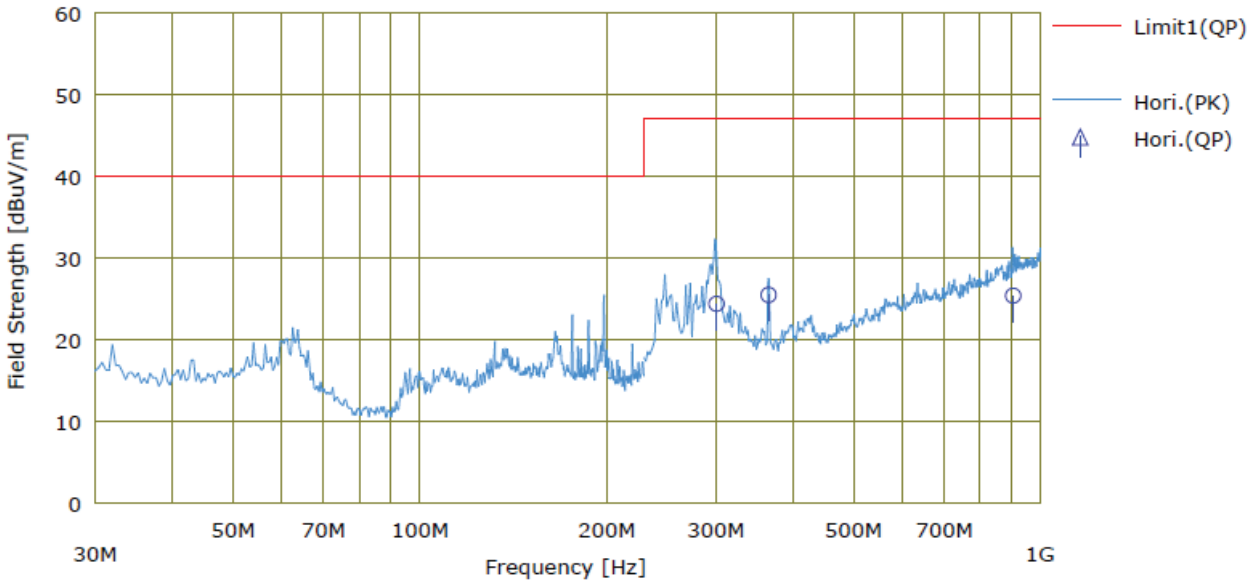
Figure 6. Plot of radiated spurious emissions (from30 MHz to 1 GHz)

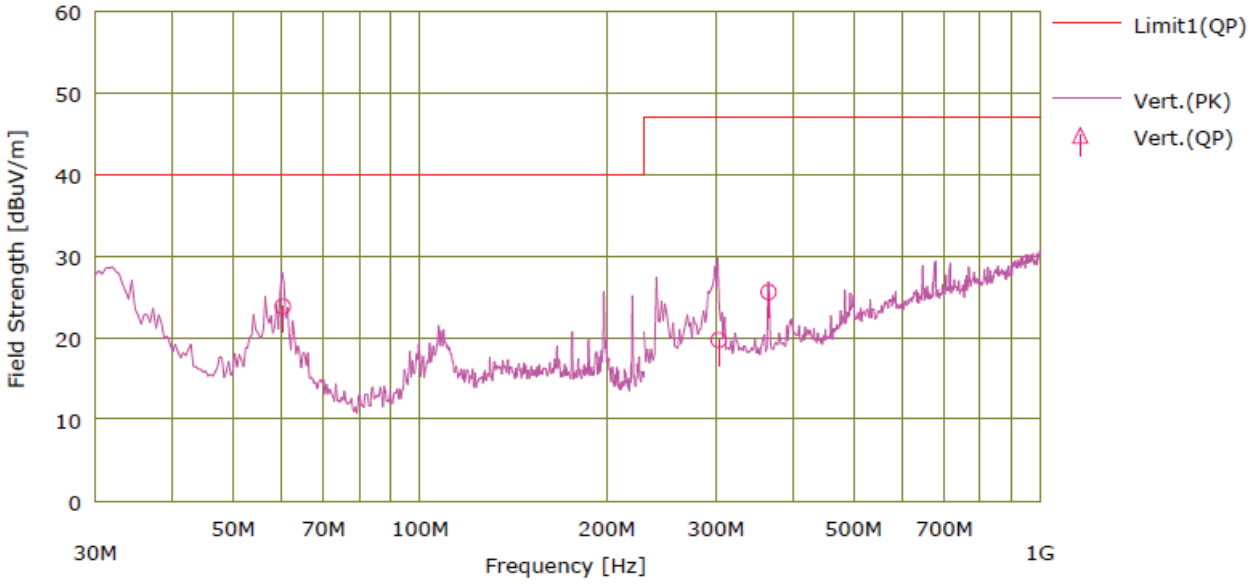
(802.11b, 1 Mbps) transmitting at f_{MID}





(802.11g, 6 Mbps) transmitting at f_{MID}





(802.11n(HT20), MCS0) transmitting at f_{MID}