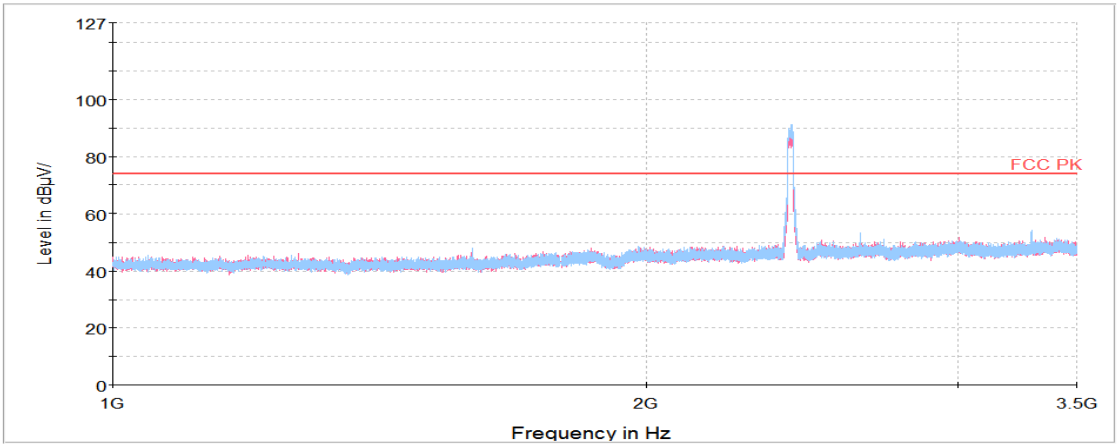
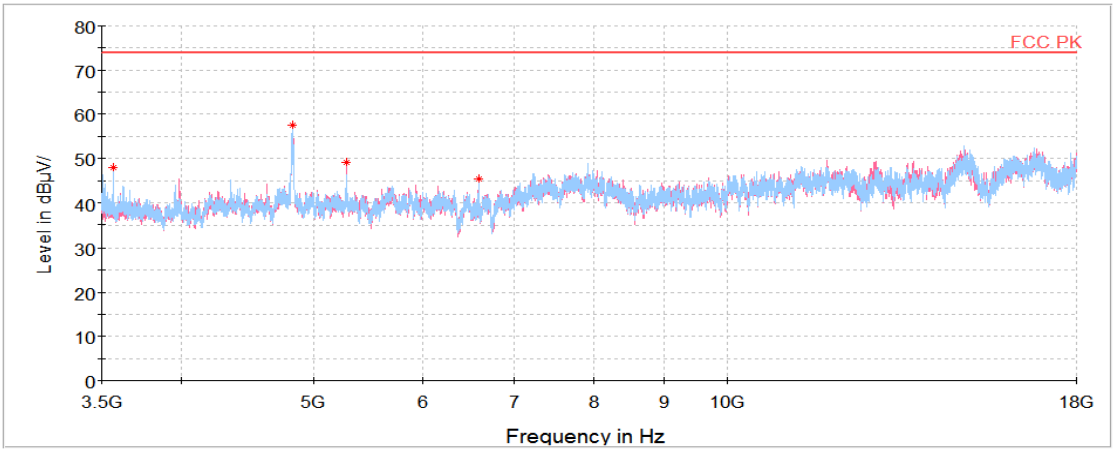
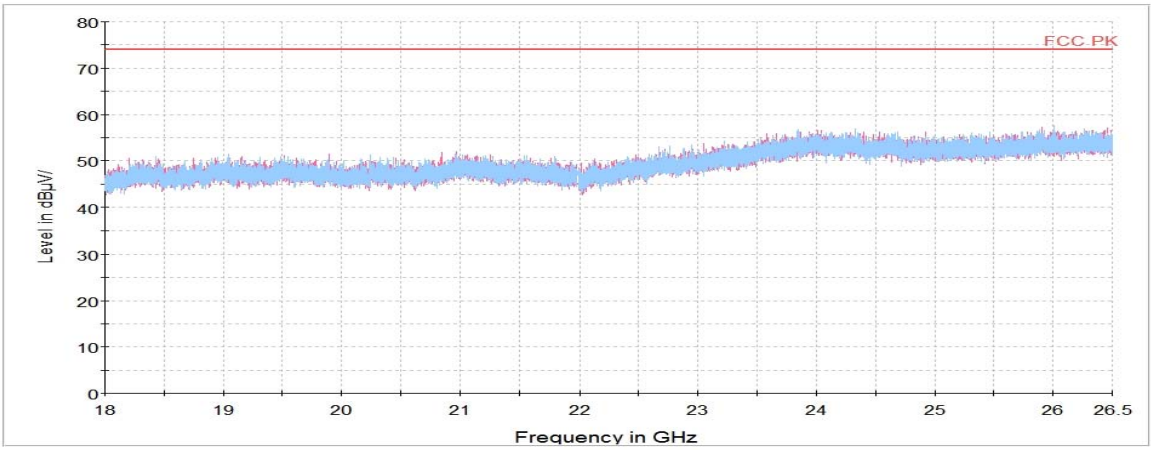


Horizontal/Vertical for 3.5 ㎓ ~ 18 ㎓



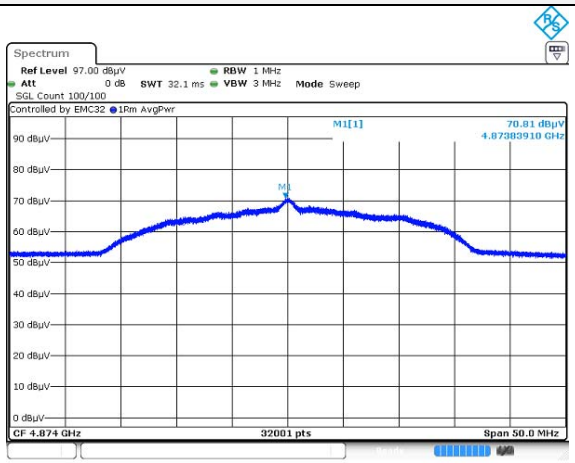
Horizontal/Vertical for 18 ㎓ ~ 26.5 ㎓



2 437 ㎒

Frequency	Pol.	Reading	Ant. Factor	Amp. + Cable	DCF	Result	Limit	Margin
(㎒)	(V/H)	(dB(㎶))	(dB)	(dB)	(dB)	(dB(㎶/m))	(dB(㎶/m))	(dB)
Peak data								
1 594.22[1)]	V	72.00	28.58	-50.31	-	50.27	74.00	23.73
2 639.92	H	69.61	32.21	-48.63	-	53.19	74.00	20.81
3 300.23	H	70.78	32.56	-47.73	-	55.61	74.00	18.39
4 349.61[1)]	H	67.58	33.56	-54.95	-	46.19	74.00	27.81
4 873.84[1)]	H	78.62	33.95	-54.99	-	57.58	74.00	16.42
5 280.78	V	71.45	34.45	-55.71	-	50.19	74.00	23.81
6 600.73	V	67.72	35.40	-54.60	-	48.52	74.00	25.48
Average Data								
4 873.84[1)]	H	70.81	33.95	-54.99	-	49.77	54.00	4.23

Average data



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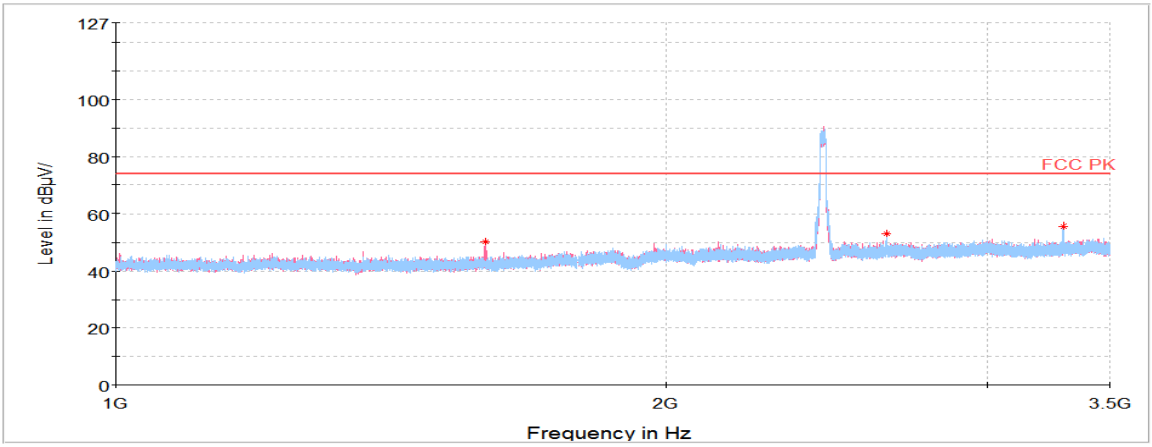
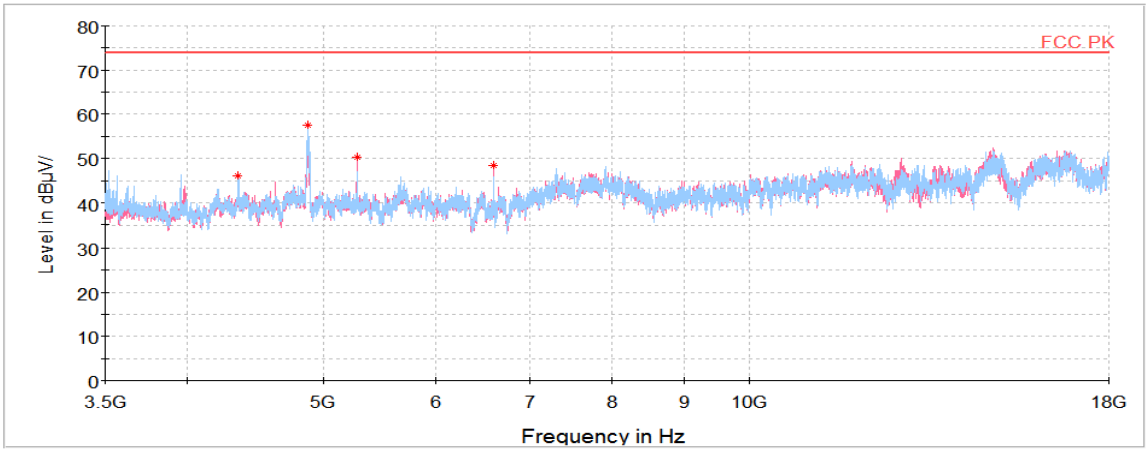
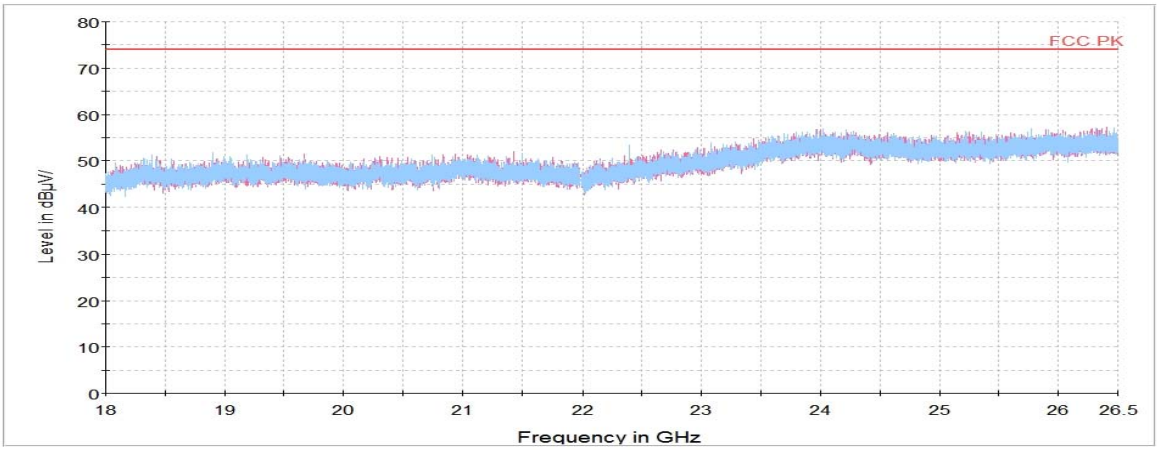
Horizontal/Vertical for 1 ㎓ ~ 3.5 ㎓



Horizontal/Vertical for 3.5 ㎓ ~ 18 ㎓



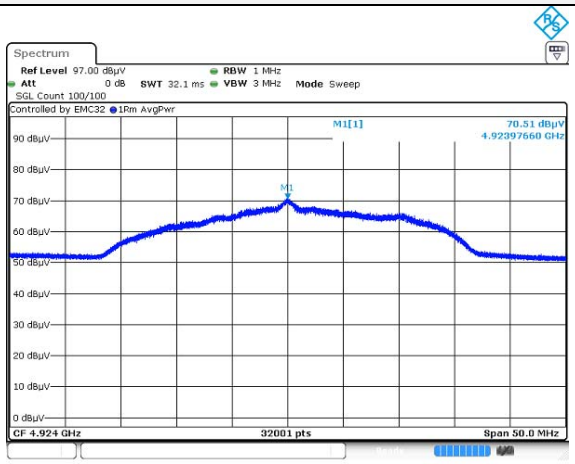
Horizontal/Vertical for 18 ㎓ ~ 26.5 ㎓



2 462 MHz

Frequency	Pol.	Reading	Ant. Factor	Amp. + Cable	DCF	Result	Limit	Margin
(MHz)	(V/H)	(dB(μV))	(dB)	(dB)	(dB)	(dB(μV/m))	(dB(μV/m))	(dB)
Peak data								
1 598.14[1)]	V	73.20	28.61	-50.30	-	51.51	74.00	22.49
2 640.23	V	69.99	32.21	-48.63	-	53.57	74.00	20.43
2 483.52[1)]	H	49.14	32.07	-29.21	-	52.00	74.00	22.00
2 547.54	H	48.67	32.14	-29.70	-	51.11	74.00	22.89
3 569.78	H	74.43	32.66	-56.39	-	50.70	74.00	23.30
4 923.98[1)]	V	77.57	33.97	-55.31	-	56.23	74.00	17.77
5 280.33	V	71.20	34.45	-55.70	-	49.95	74.00	24.05
6 599.38	V	69.70	35.40	-54.60	-	50.50	74.00	23.50
7 919.78	V	65.72	35.74	-50.24	-	51.22	74.00	22.78
Average Data								
4 923.98[1)]	V	70.51	33.97	-55.31	-	49.17	54.00	4.83

Average data



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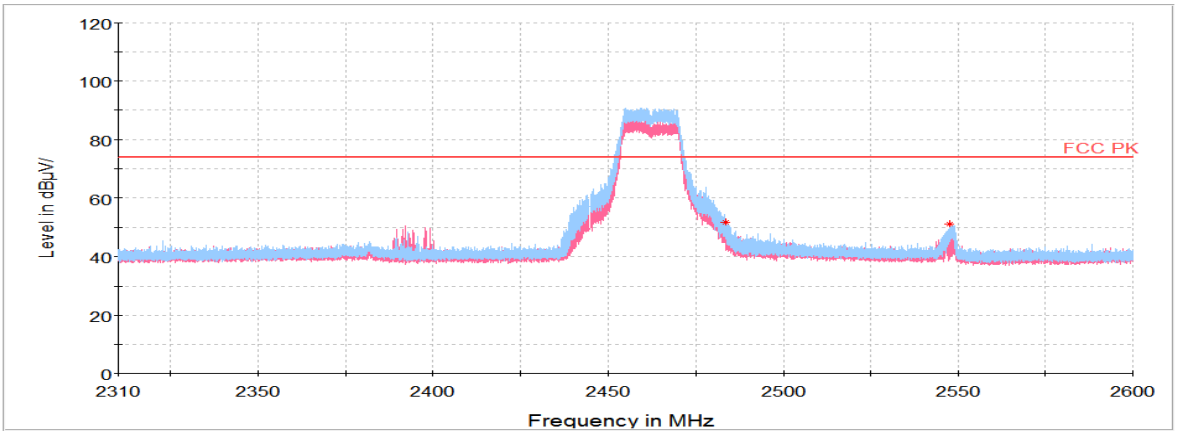
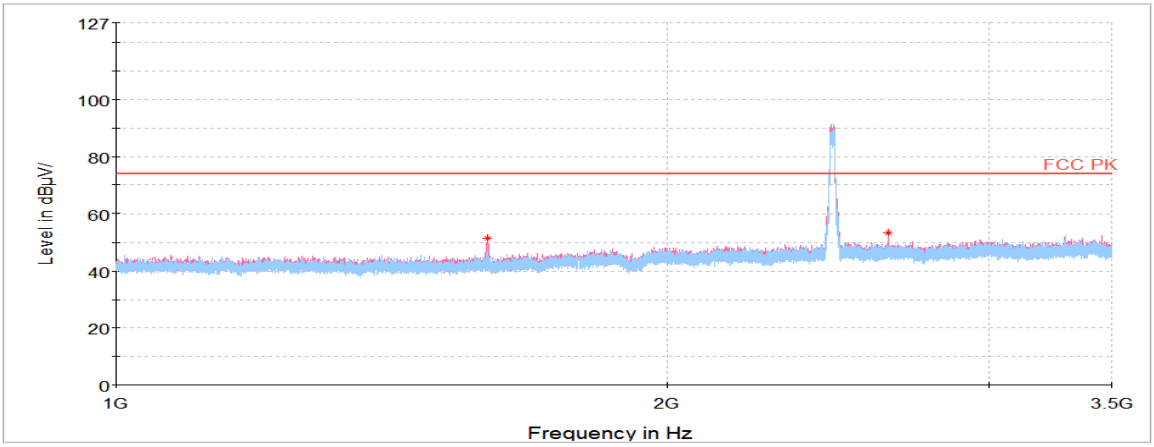
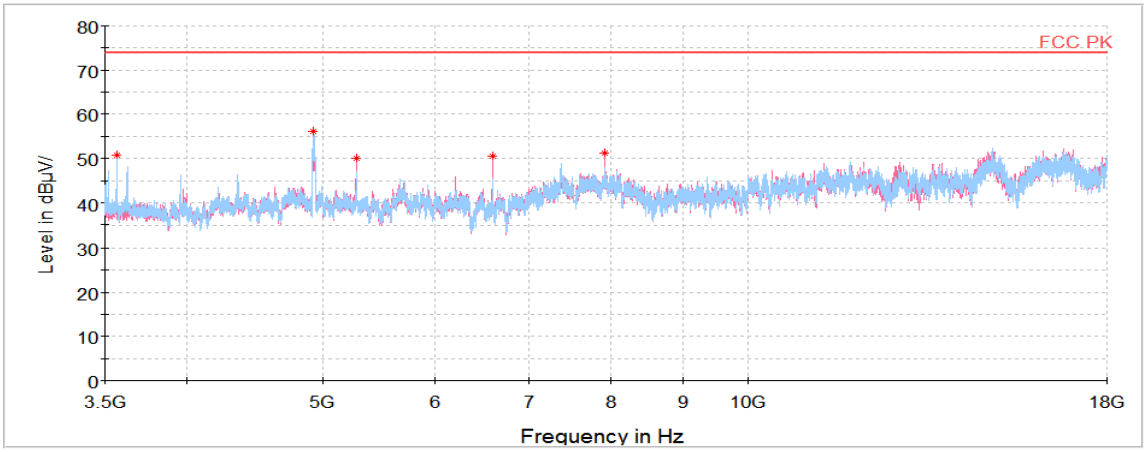
Horizontal/Vertical for Band-edge



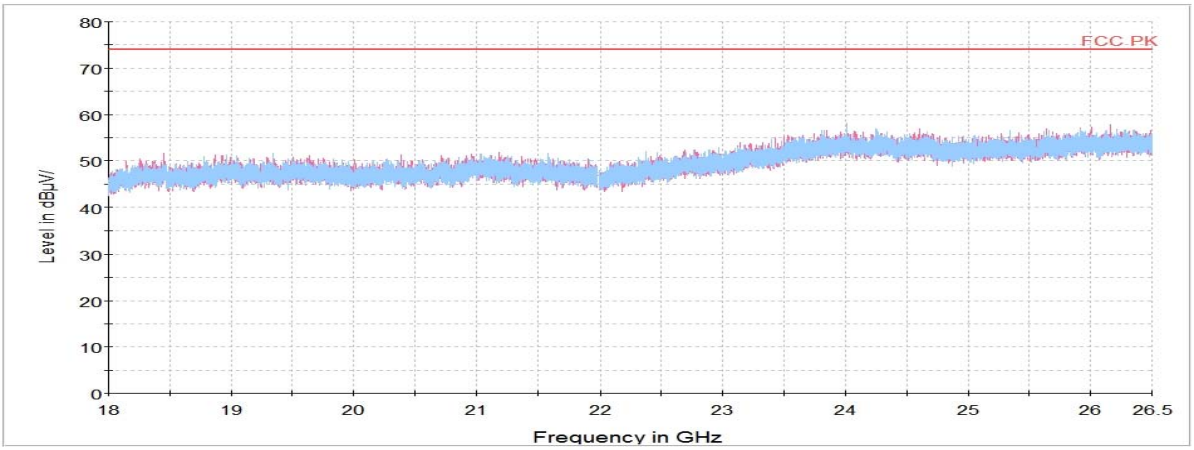
Horizontal/Vertical for 1 ㎓ ~ 3.5 ㎓



Horizontal/Vertical for 3.5 ㎓ ~ 18 ㎓



Horizontal/Vertical for 18 ㎓ ~ 26.5 ㎓

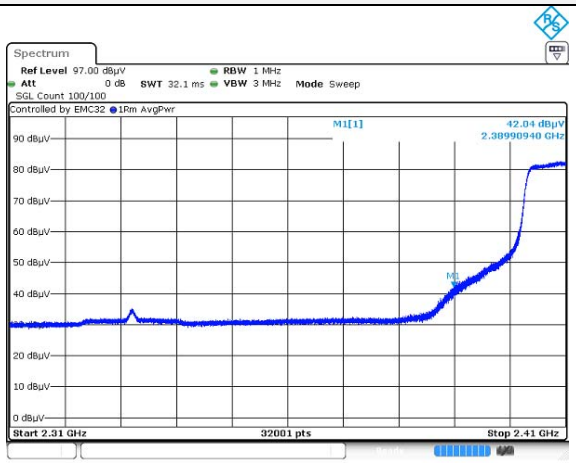


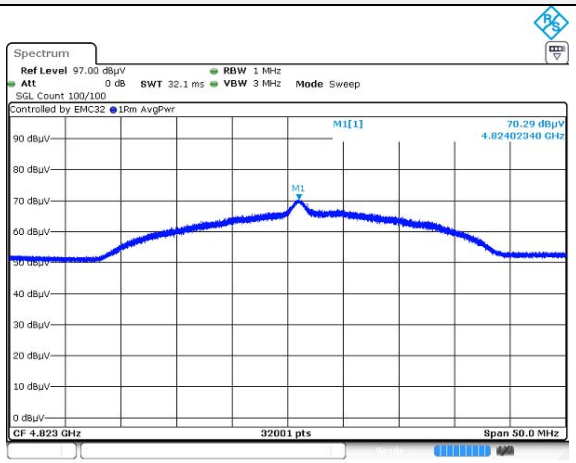
802.11n_HT20_PoE 48 V

2 412 ㎒

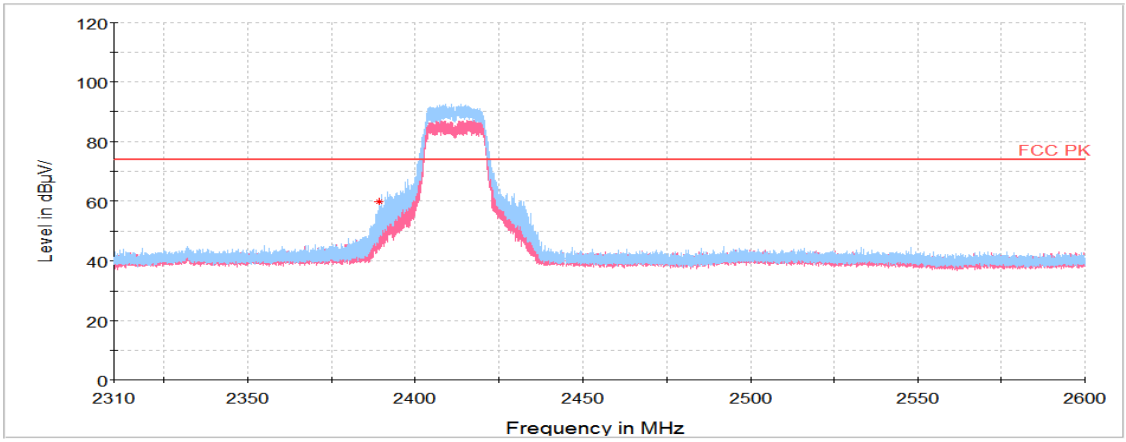
Frequency	Pol.	Reading	Ant. Factor	Amp. + Cable	DCF	Result	Limit	Margin
(㎒)	(V/H)	(dB(㎶))	(dB)	(dB)	(dB)	(dB(㎶/m))	(dB(㎶/m))	(dB)
Peak data								
2 389.91[1)]	H	56.78	31.88	-29.04	-	59.62	74.00	14.38
3 569.78	H	73.67	32.66	-56.39	-	49.94	74.00	24.06
4 824.02[1)]	H	76.85	33.93	-53.58	-	57.20	74.00	16.80
5 280.33	V	68.80	34.45	-55.70		47.55	74.00	26.45
7 227.41	H	65.92	35.40	-53.00	-	48.32	74.00	25.68
Average Data								
2 389.91[1)]	H	42.04	31.88	-29.04	-	44.88	54.00	9.12
4 824.02[1)]	H	70.29	33.93	-53.58		50.64	54.00	3.36

Average data

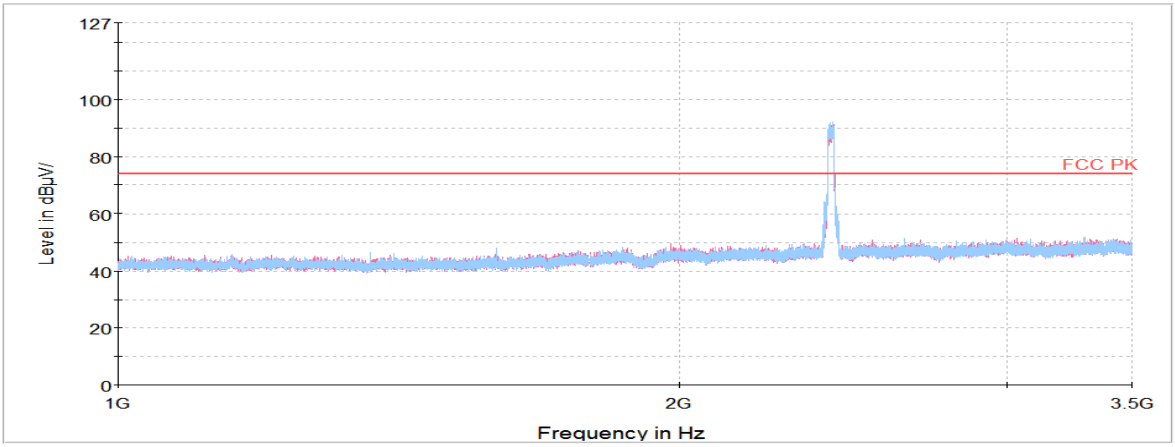




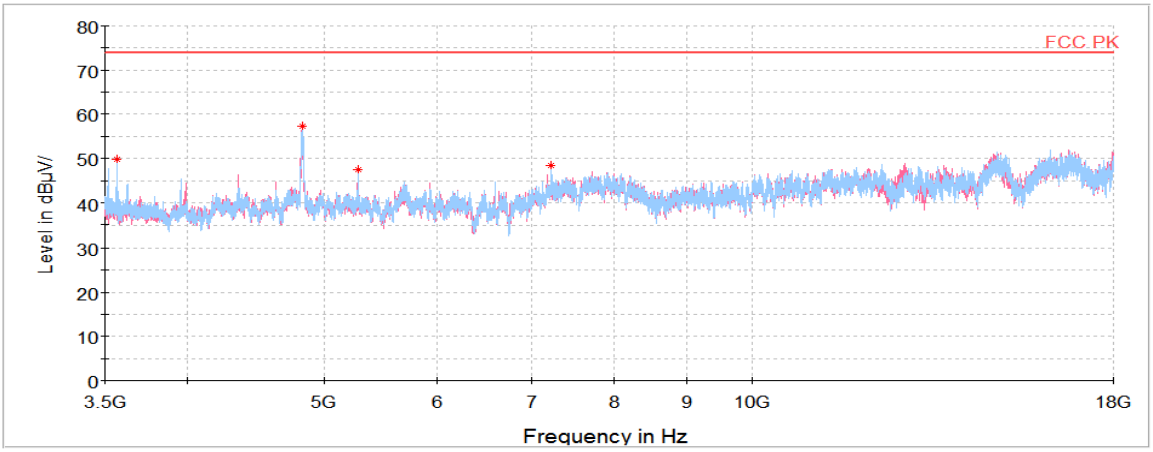
Horizontal/Vertical for Band-edge



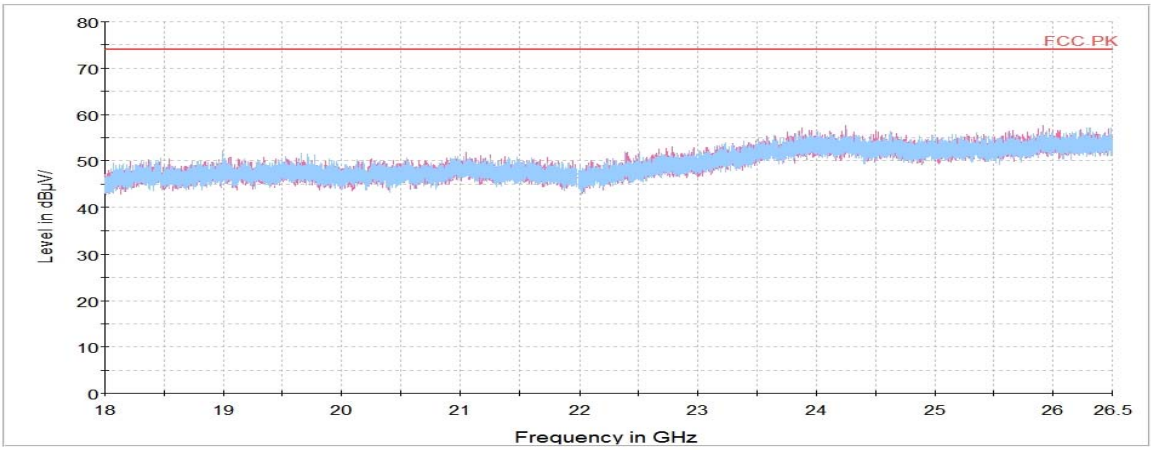
Horizontal/Vertical for 1 ㎓ ~ 3.5 ㎓



Horizontal/Vertical for 3.5 ㎓ ~ 18 ㎓



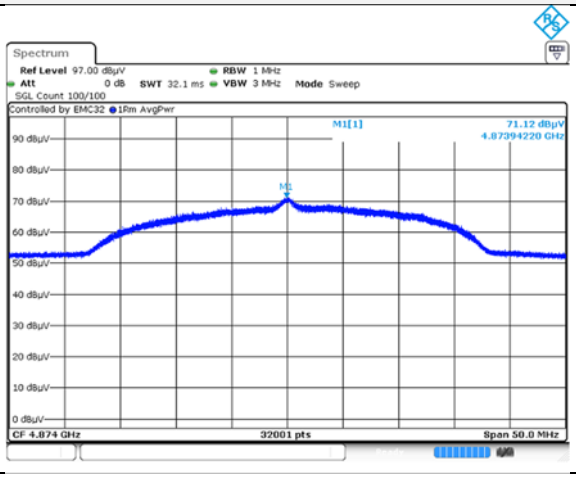
Horizontal/Vertical for 18 ㎓ ~ 26.5 ㎓



2 437 MHz

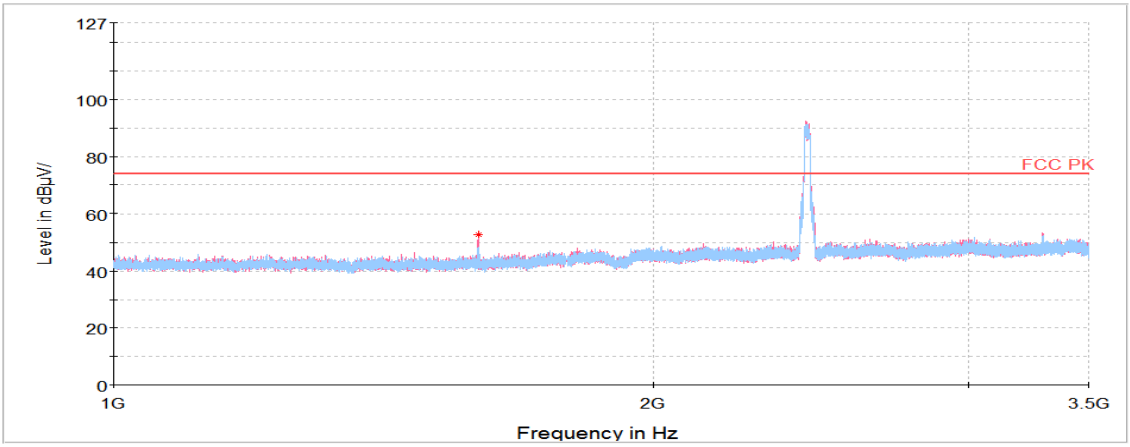
Frequency	Pol.	Reading	Ant. Factor	Amp. + Cable	DCF	Result	Limit	Margin
(MHz)	(V/H)	(dB(μV))	(dB)	(dB)	(dB)	(dB(μV/m))	(dB(μV/m))	(dB)
Peak data								
1 596.19[1)]	V	74.38	28.60	-50.30	-	52.68	74.00	21.32
4 873.94[1)]	H	80.24	33.95	-55.00	-	59.19	74.00	14.81
5 280.33	V	71.24	34.45	-55.70	-	49.99	74.00	24.01
7 299.91[1)]	H	66.24	35.40	-52.73	-	48.91	74.00	25.09
Average Data								
4 873.94[1)]	H	71.12	33.95	-55.00	-	50.07	54.00	3.93

Average data

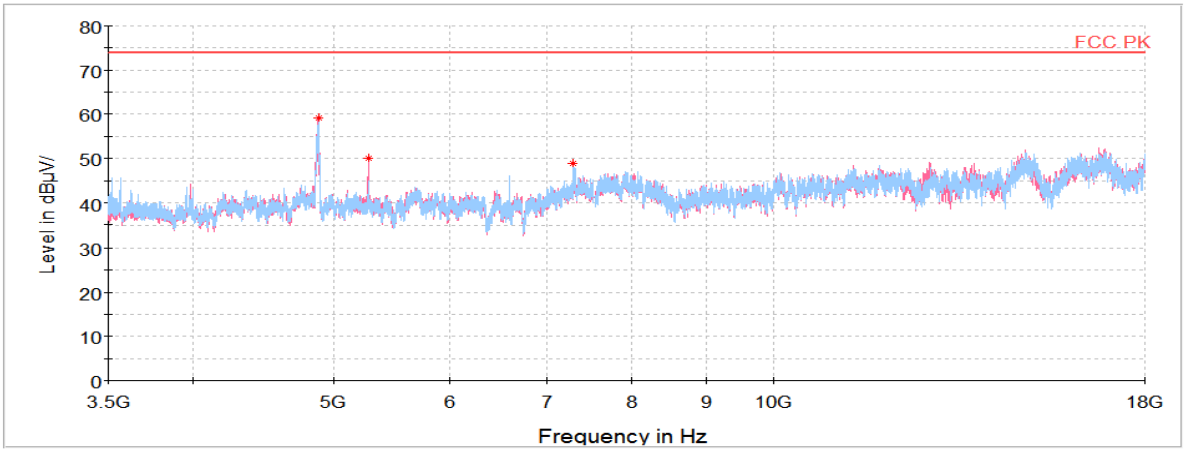


Blank

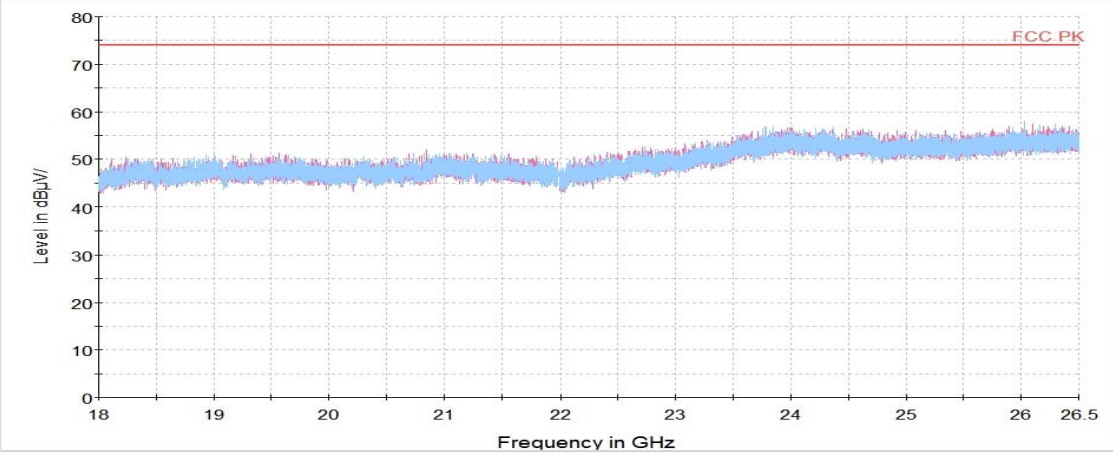
Horizontal/Vertical for 1 ㎓ ~ 3.5 ㎓



Horizontal/Vertical for 3.5 ㎓ ~ 18 ㎓



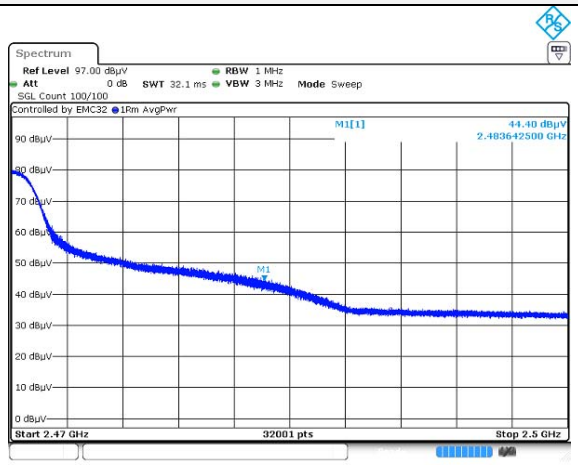
Horizontal/Vertical for 18 ㎓ ~ 26.5 ㎓

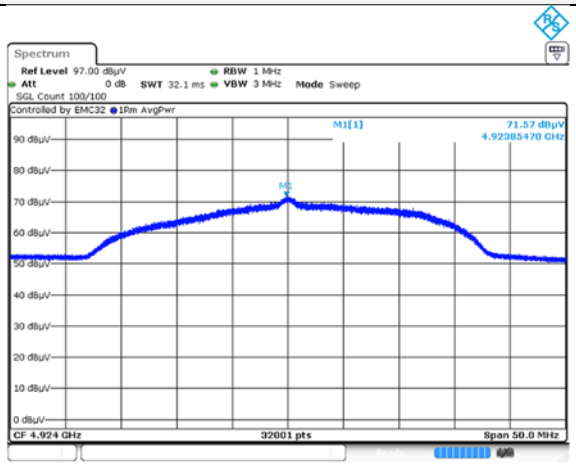


2 462 MHz

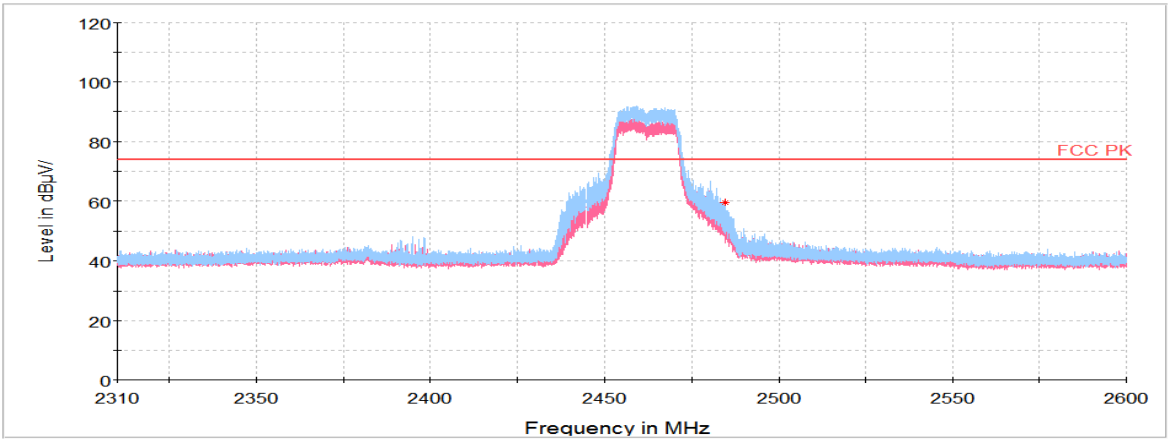
Frequency	Pol.	Reading	Ant. Factor	Amp. + Cable	DCF	Result	Limit	Margin
(MHz)	(V/H)	(dB(μV))	(dB)	(dB)	(dB)	(dB(μV/m))	(dB(μV/m))	(dB)
Peak data								
1 596.41[1)]	H	73.74	28.60	-50.30	-	52.04	74.00	21.96
2 483.64[1)]	H	56.40	32.07	-29.21	-	59.26	74.00	14.74
4 923.85[1)]	H	79.73	33.97	-55.31		58.39	74.00	15.61
5 279.88	V	72.85	34.45	-55.70		51.60	74.00	22.40
7 382.83[1)]	H	67.20	35.40	-52.42		50.18	74.00	23.82
Average Data								
2 483.64[1)]	H	44.40	32.07	-29.21	-	47.26	54.00	6.74
4 923.85[1)]	H	71.57	33.97	-55.31		50.23	54.00	3.77

Average data

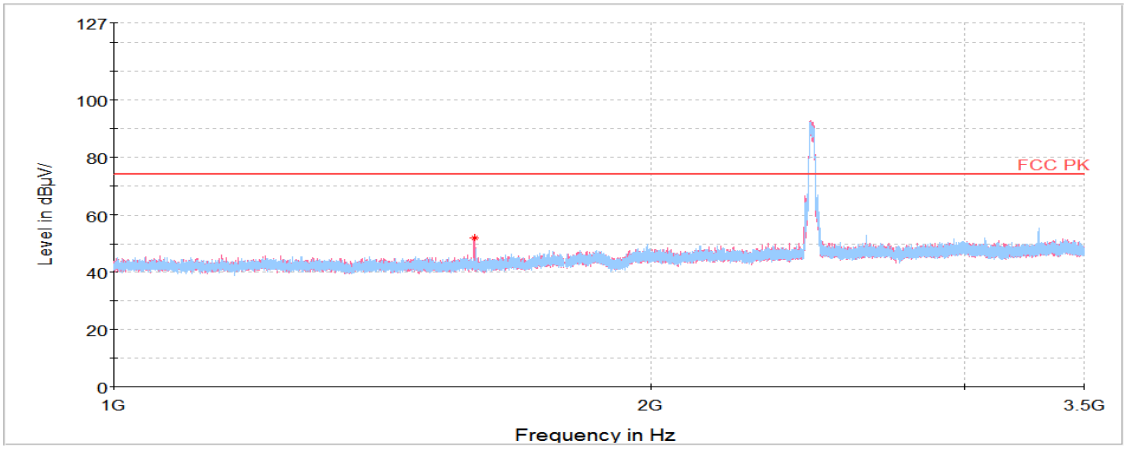




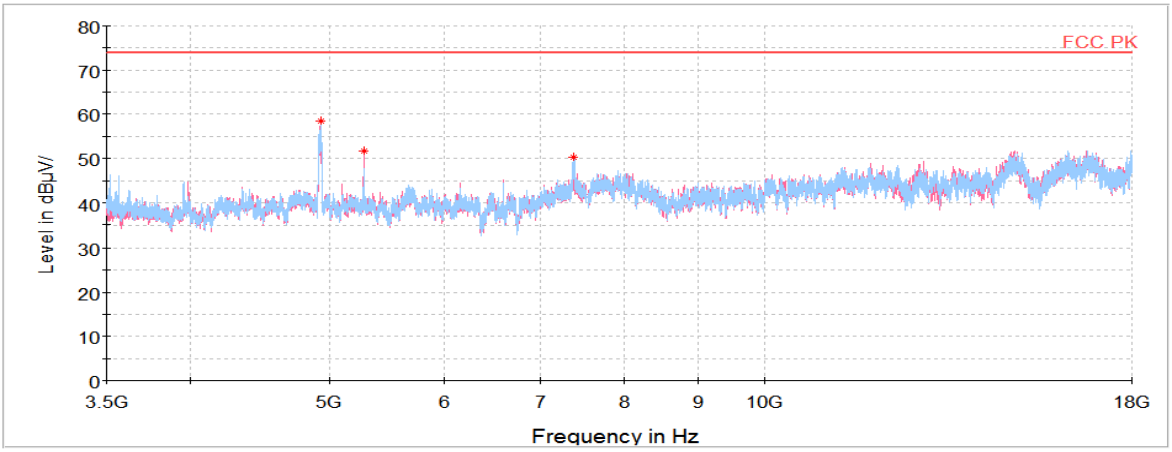
Horizontal/Vertical for Band-edge



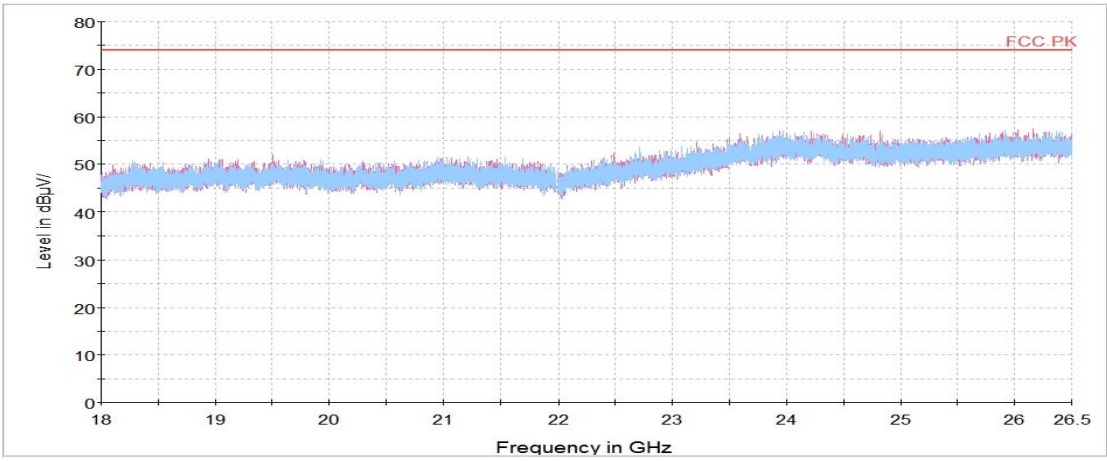
Horizontal/Vertical for 1 ㎓ ~ 3.5 ㎓



Horizontal/Vertical for 3.5 ㎓ ~ 18 ㎓



Horizontal/Vertical for 18 ㎓ ~ 26.5 ㎓

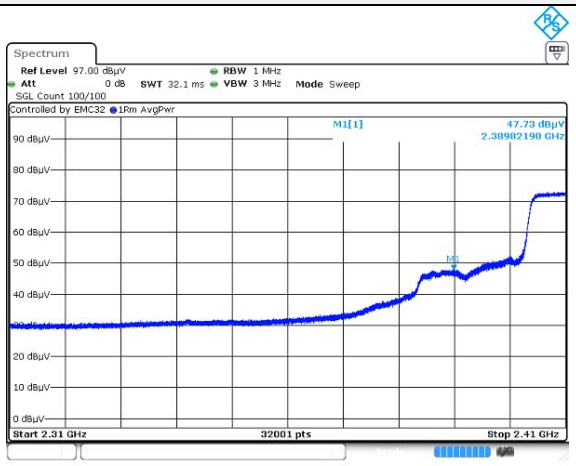


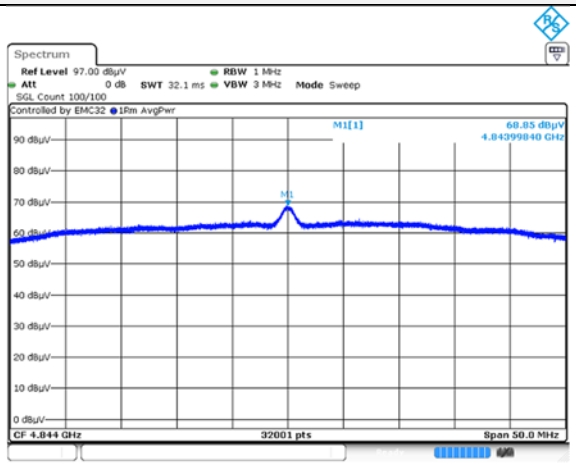
802.11n_HT40_PoE 48 V

2 422 ㎒

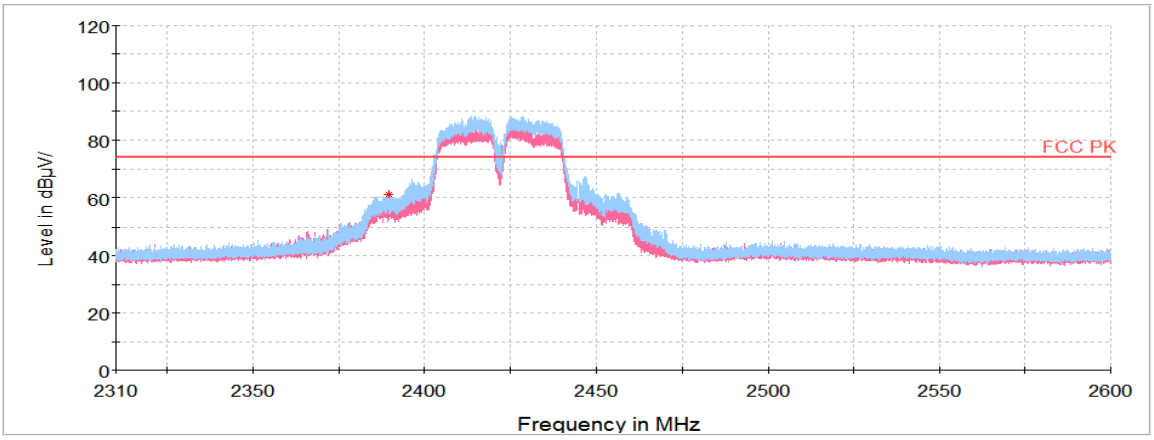
Frequency	Pol.	Reading	Ant. Factor	Amp. + Cable	DCF	Result	Limit	Margin
(㎒)	(V/H)	(dB(㎶))	(dB)	(dB)	(dB)	(dB(㎶/m))	(dB(㎶/m))	(dB)
Peak data								
1 597.29[1)]	V	73.56	28.60	-50.30	-	51.86	74.00	22.14
2 389.82[1)]	H	58.20	31.88	-29.04	-	61.04	74.00	12.96
2 639.92	H	70.03	32.21	-48.63	-	53.61	74.00	20.39
3 299.92	H	69.61	32.56	-47.74	-	54.43	74.00	19.57
4 844.00[1)]	V	74.42	33.94	-54.15	-	54.21	74.00	19.79
5 280.78	H	69.52	34.45	-55.71	-	48.26	74.00	25.74
6 208.78	V	65.64	35.40	-55.21	-	45.83	74.00	28.17
Average Data								
2 389.82[1)]	H	47.73	31.88	-29.04	-	50.57	54.00	3.43
4 844.00[1)]	V	68.85	33.94	-54.15	-	48.64	54.00	5.36

Average data

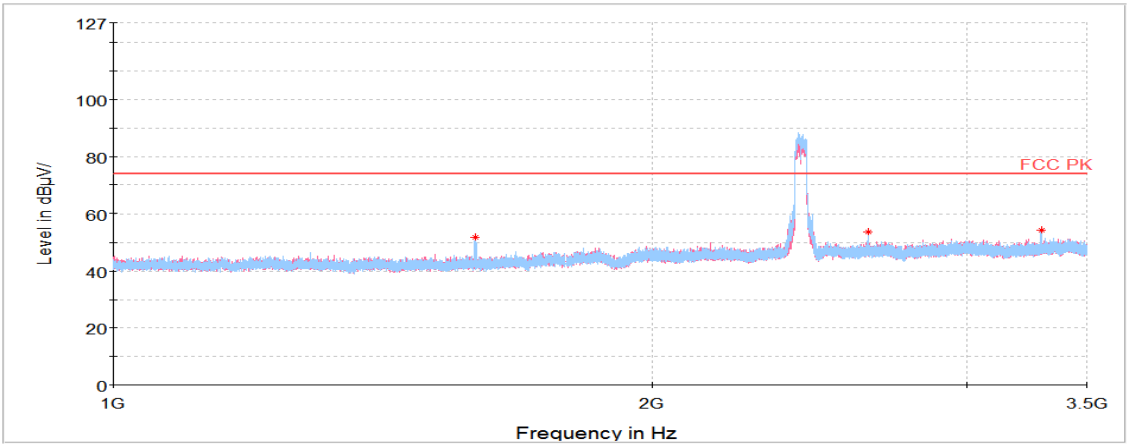




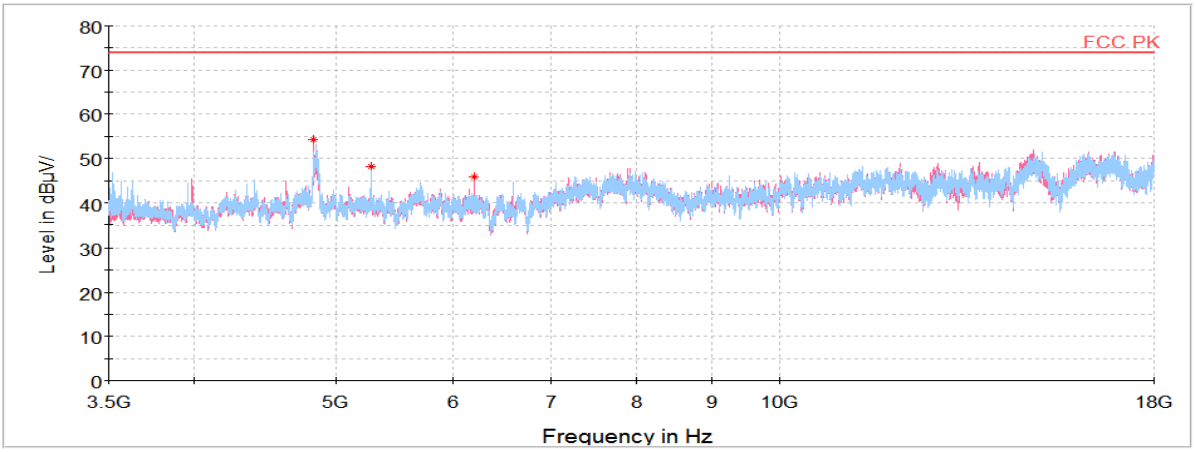
Horizontal/Vertical for Band-edge



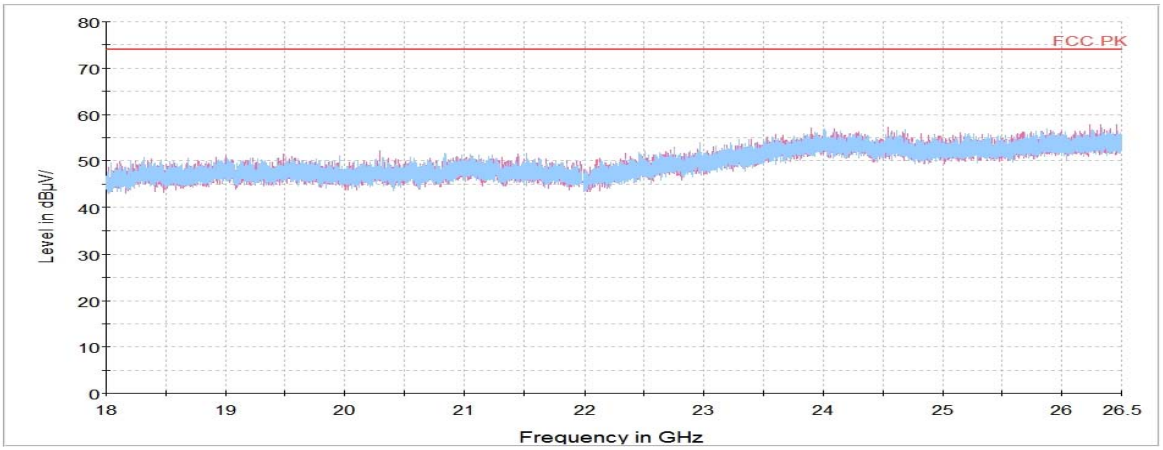
Horizontal/Vertical for 1 ㎓ ~ 3.5 ㎓



Horizontal/Vertical for 3.5 ㎓ ~ 18 ㎓



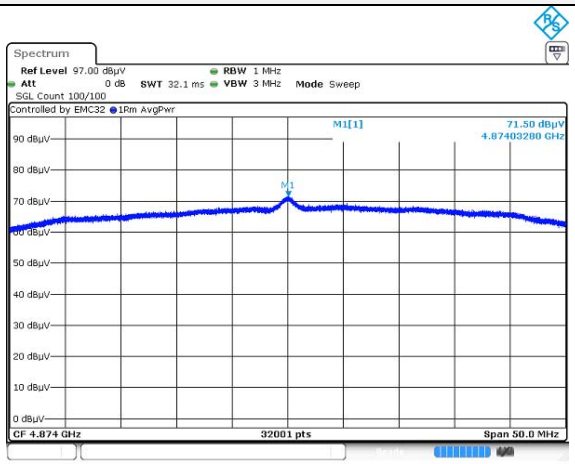
Horizontal/Vertical for 18 ㎓ ~ 26.5 ㎓



2 437 MHz

Frequency	Pol.	Reading	Ant. Factor	Amp. + Cable	DCF	Result	Limit	Margin
(MHz)	(V/H)	(dB(μV))	(dB)	(dB)	(dB)	(dB(μV/m))	(dB(μV/m))	(dB)
Peak data								
1 598.52	H	71.18	28.61	-50.30	-	49.49	74.00	24.51
2 640.08	H	69.55	32.21	-48.63	-	53.13	74.00	20.87
3 299.84	H	69.93	32.56	-47.74	-	54.75	74.00	19.25
4 874.03	H	77.50	33.95	-55.00	-	56.45	74.00	17.55
5 279.42	V	72.16	34.45	-55.70	-	50.91	74.00	23.09
6 598.47	V	66.25	35.40	-54.60	-	47.05	74.00	26.95
7 317.58	H	66.04	35.40	-52.66	-	48.78	74.00	25.22
7 919.33	H	65.00	35.74	-50.24	-	50.50	74.00	23.50
Average Data								
4 874.03[1)]	H	71.50	33.95	-55.00	-	50.45	54.00	3.55

Average data



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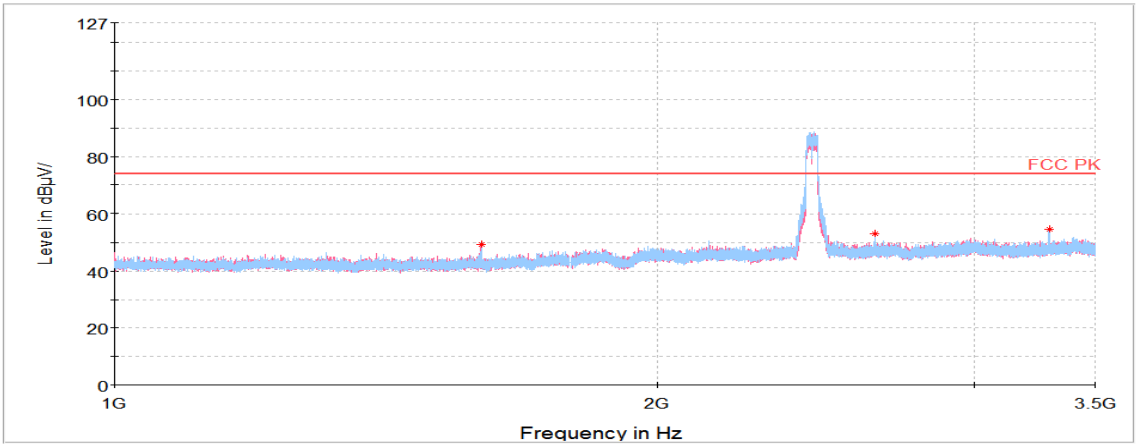
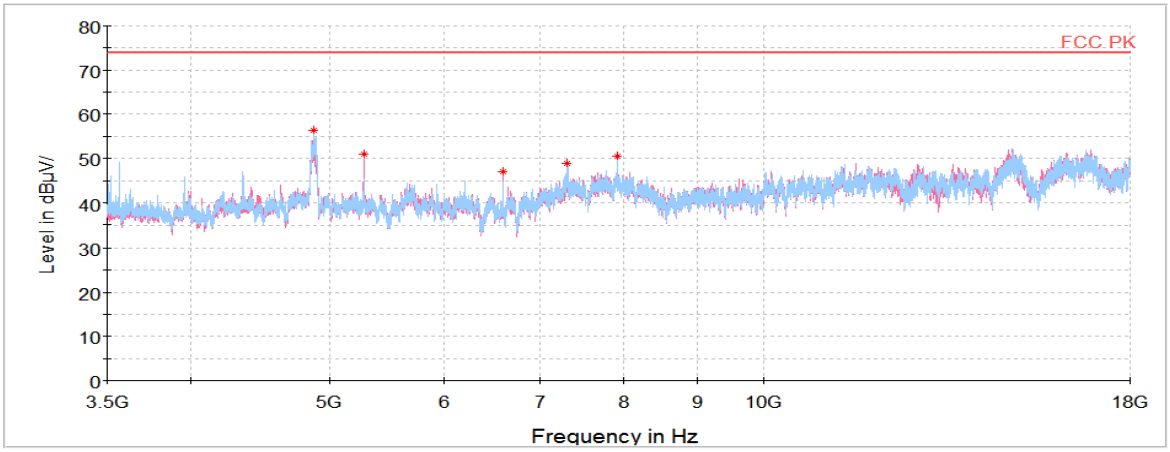
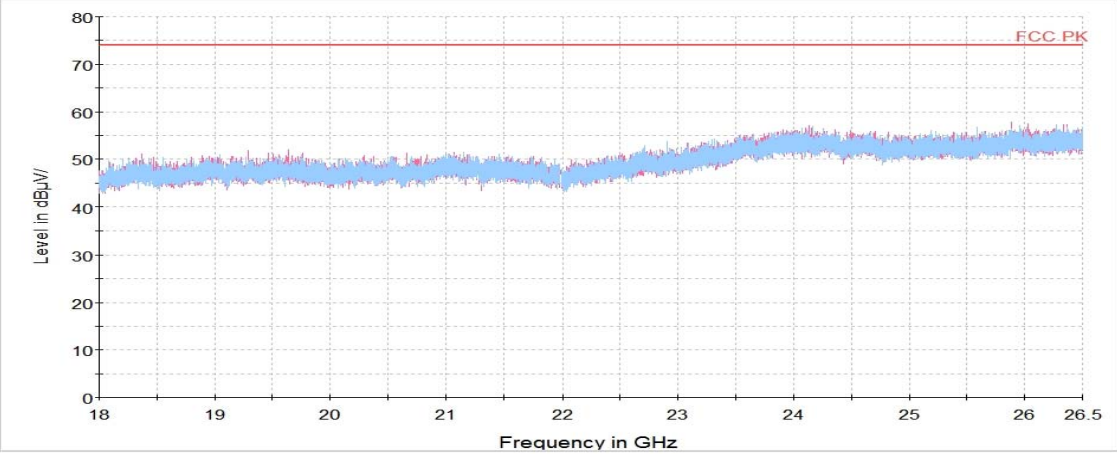
Horizontal/Vertical for 1 ㎓ ~ 3.5 ㎓



Horizontal/Vertical for 3.5 ㎓ ~ 18 ㎓



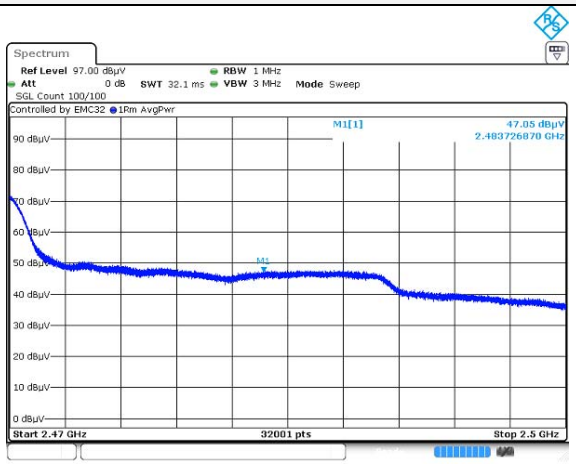
Horizontal/Vertical for 18 ㎓ ~ 26.5 ㎓

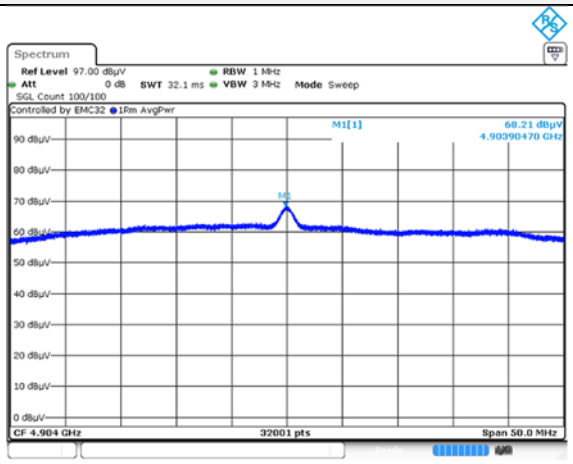


2 452 ㎒

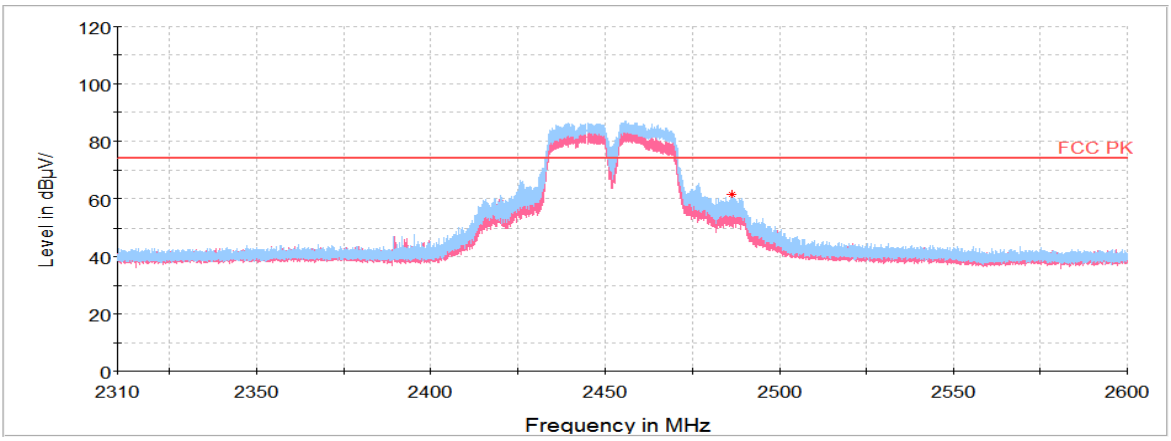
Frequency	Pol.	Reading	Ant. Factor	Amp. + Cable	DCF	Result	Limit	Margin
(㎒)	(V/H)	(dB(㎶))	(dB)	(dB)	(dB)	(dB(㎶/m))	(dB(㎶/m))	(dB)
Peak data								
1 592.97[1)]	H	71.15	28.58	-50.31	-	49.42	74.00	24.58
3 300.55	H	68.97	32.56	-47.73	-	53.80	74.00	20.20
2 483.73[1)]	H	58.49	32.07	-29.21	-	61.35	74.00	12.65
3 959.92[1)]	H	71.18	32.97	-56.83	-	47.32	74.00	26.68
4 903.90[1)]	V	72.76	33.96	-55.67	-	51.05	74.00	22.95
5 279.42	V	71.40	34.45	-55.70	-	50.15	74.00	23.85
6 599.38	V	68.17	35.40	-54.60	-	48.97	74.00	25.03
Average Data								
2 483.73[1)]	H	47.05	32.07	-29.21	-	49.91	54.00	4.09
4 903.90[1)]	V	68.21	33.96	-55.67	-	46.50	54.00	7.50

Average data

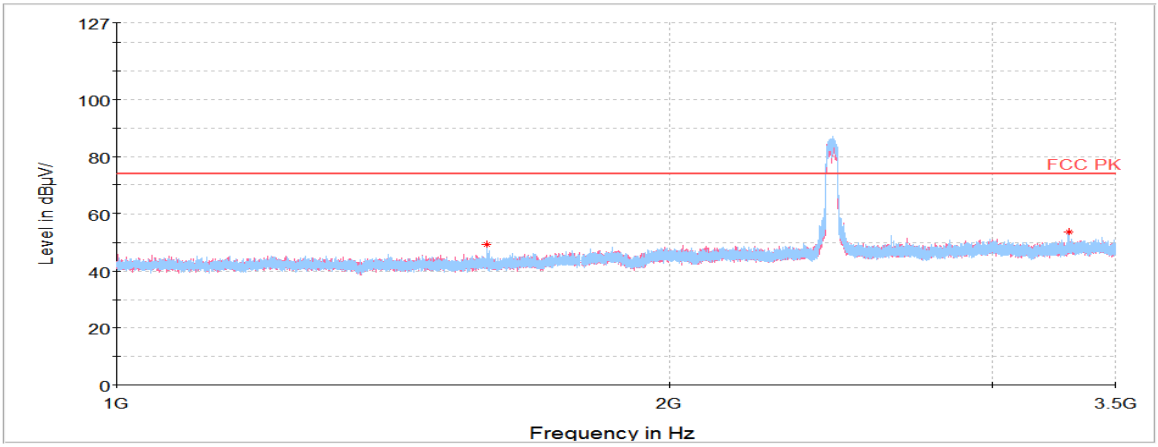




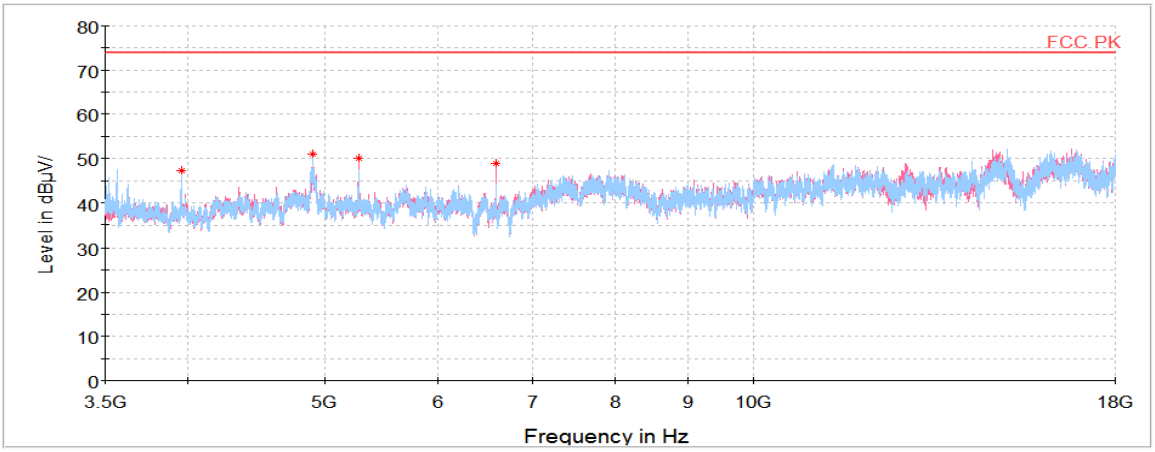
Horizontal/Vertical for Band-edge



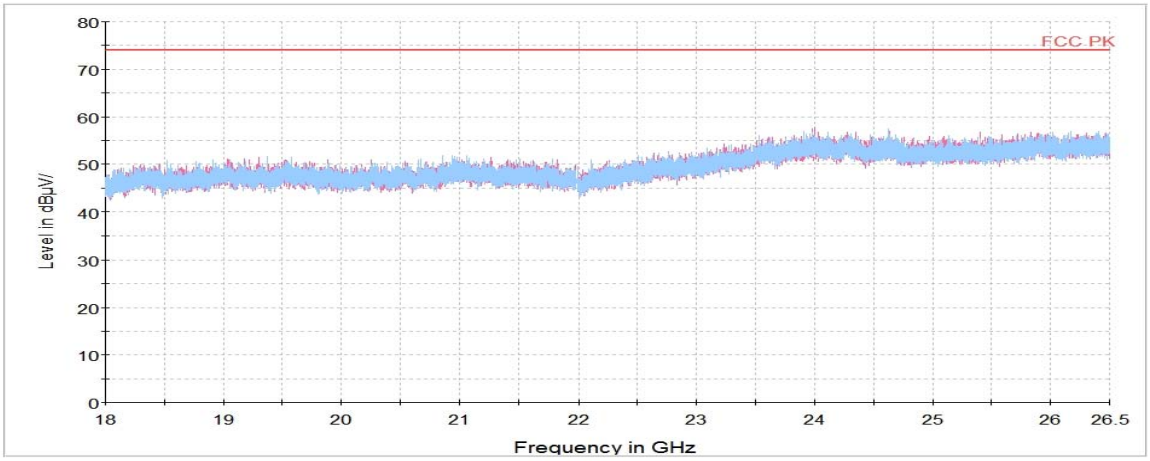
Horizontal/Vertical for 1 ㎓ ~ 3.5 ㎓



Horizontal/Vertical for 3.5 ㎓ ~ 18 ㎓

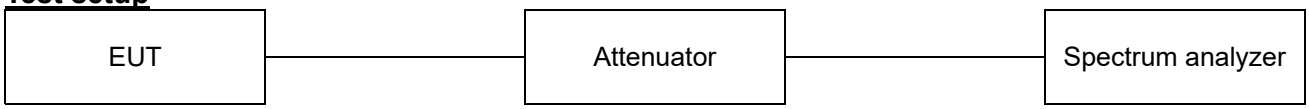


Horizontal/Vertical for 18 ㎓ ~ 26.5 ㎓



7.5. Conducted Spurious Emission

Test setup



Limit

In any 100 ㎑ bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operation, the radio frequency power that is produced by the intentional radiator shall be at least 20 ㏈ below that in the 100 ㎑ 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 averaging over a time interval, as permitted under paragraph (b)(3) of this section, the attenuation specified in §15.209(a) is not required. In addition, radiated emission limits specified in §15.209(a) (see §15.205(c)).
Limit : 20 ㏈c

Test procedure

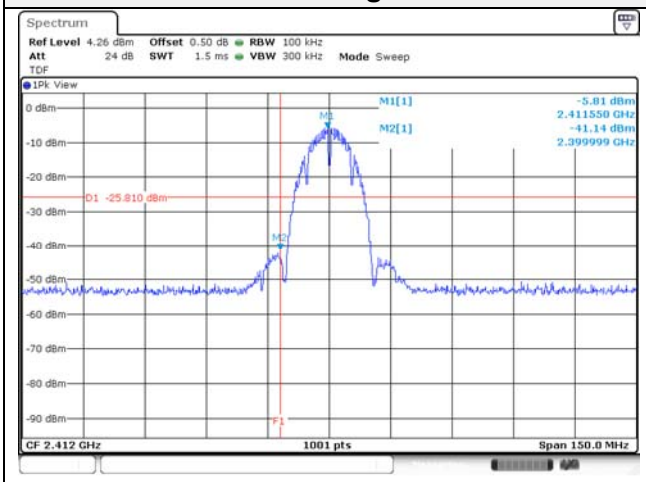
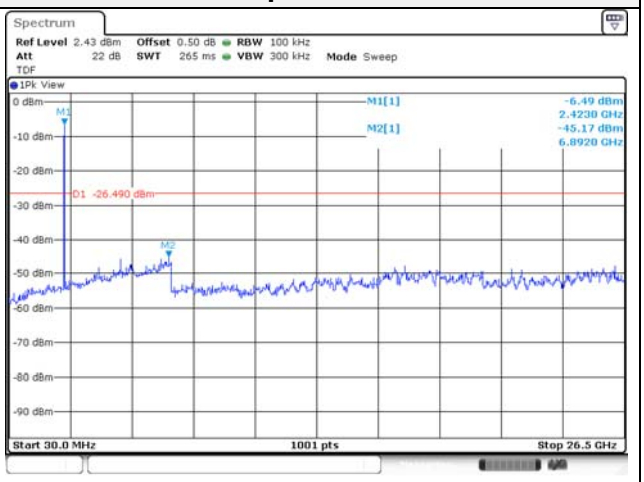
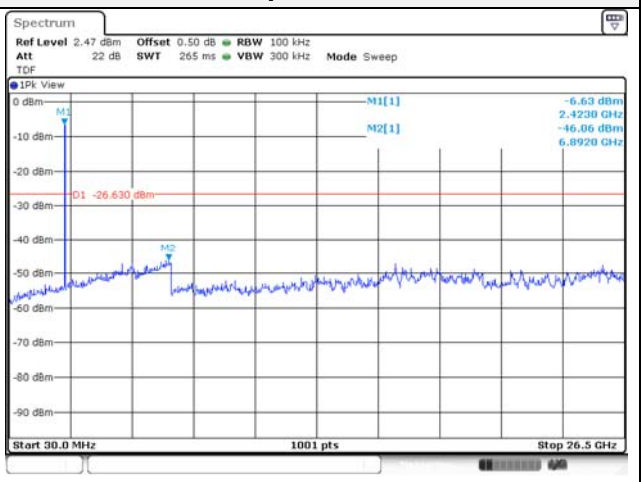
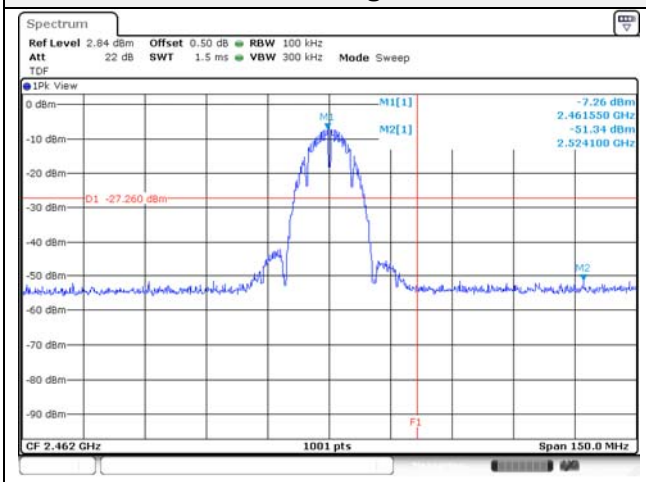
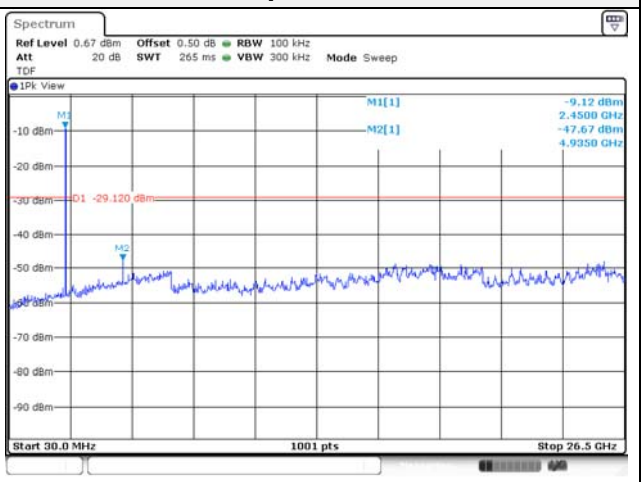
ANSI C63.10 - Section 11.11.3
558074 D01 v04 – Section 11.3

Test settings

Set the spectrum analyzer as follows:

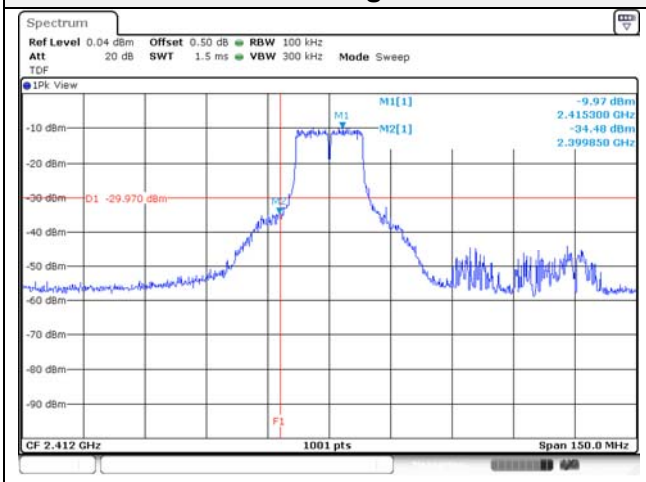
1) Span = wide enough to capture the peak level of the in-band emission and all spurious emissions (e.g., harmonics) from the lowest frequency generated in the EUT up through the 10th harmonic.
   Typically, several plots are required to cover this entire span.
2) RBW = 100 ㎑
3) VBW ≥ RBW
4) Sweep = auto
5) Detector function = peak
6) Trace = max hold
7) Allow the trace to stabilize. Set the marker on the peak of any spurious emission recorded.
8) Each frequency found during preliminary measurements was re-examined and investigated. The test-receiver system was set up to average, peak, and quasi-peak detector function with specified bandwidth.

Test results DC 12 V

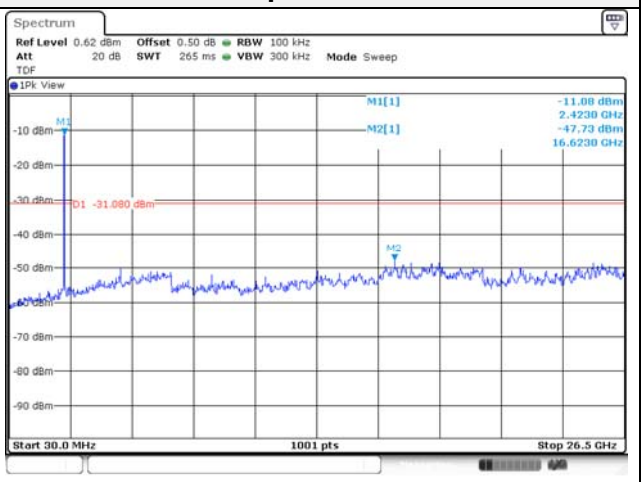
802.11b	
Conducted band-edge / 2 412 ㎒	**Conducted spurious / 2 412 ㎒**
	
Conducted band-edge / 2 437 ㎒	**Conducted spurious / 2 437 ㎒**
Blank	
Conducted band-edge / 2 462 ㎒	**Conducted spurious / 2 462 ㎒**
	

802.11g

Conducted band-edge / 2 412 ㎒



Conducted spurious / 2 412 ㎒



Conducted band-edge / 2 437 ㎒

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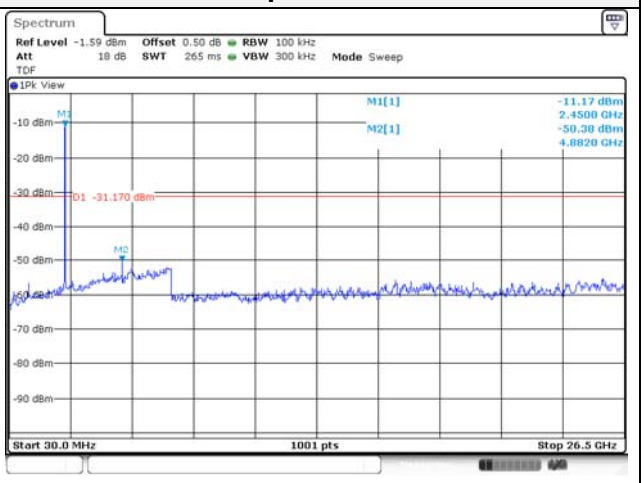
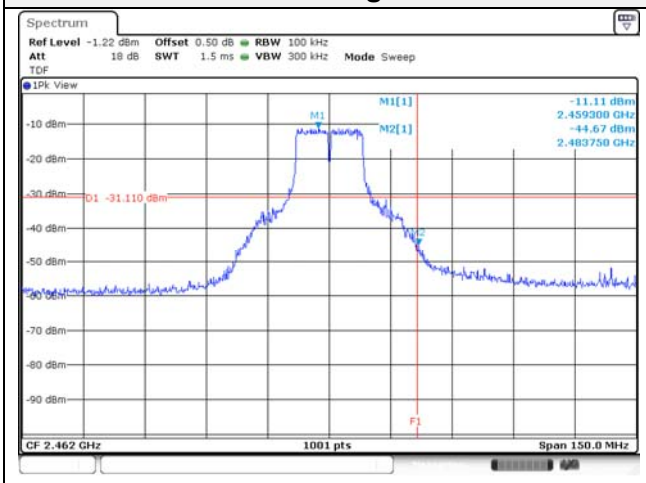
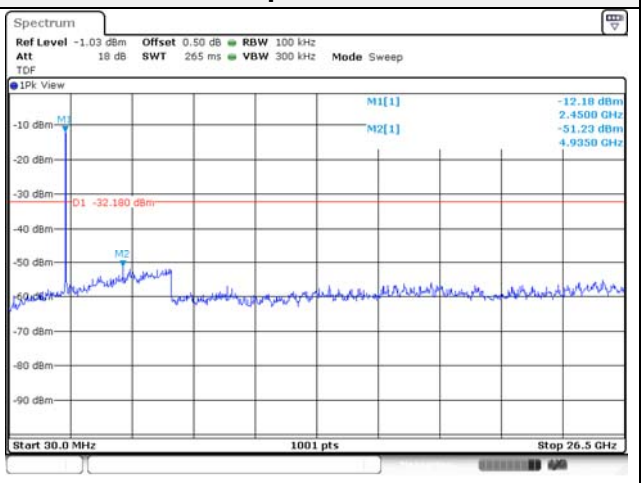
Conducted spurious / 2 437 ㎒



Conducted band-edge / 2 462 ㎒

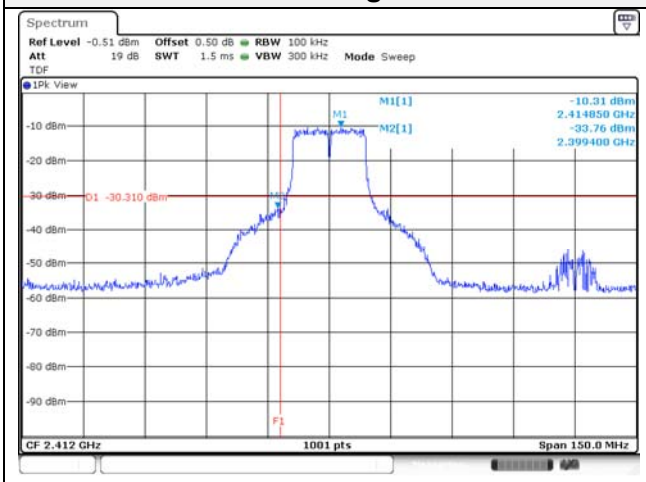


Conducted spurious / 2 462 ㎒

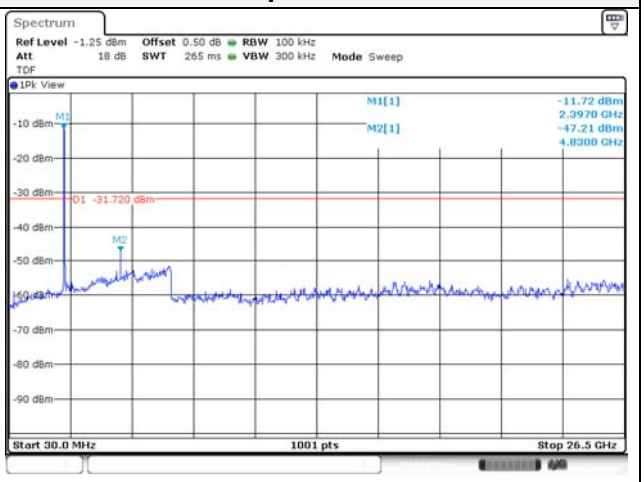


802.11n_HT20

Conducted band-edge / 2 412 ㎒



Conducted spurious / 2 412 ㎒



Conducted band-edge / 2 437 ㎒

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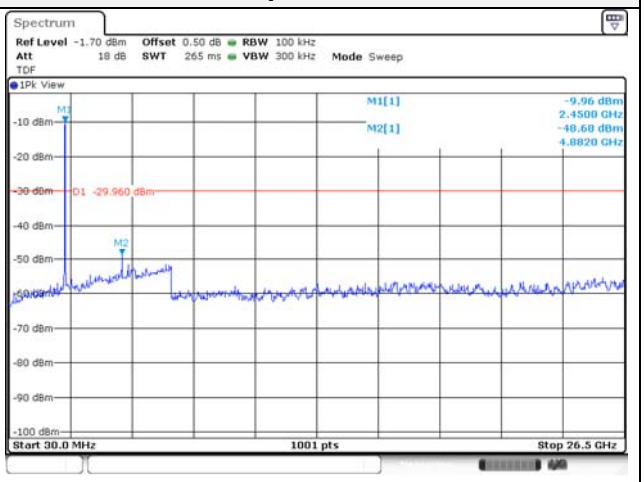
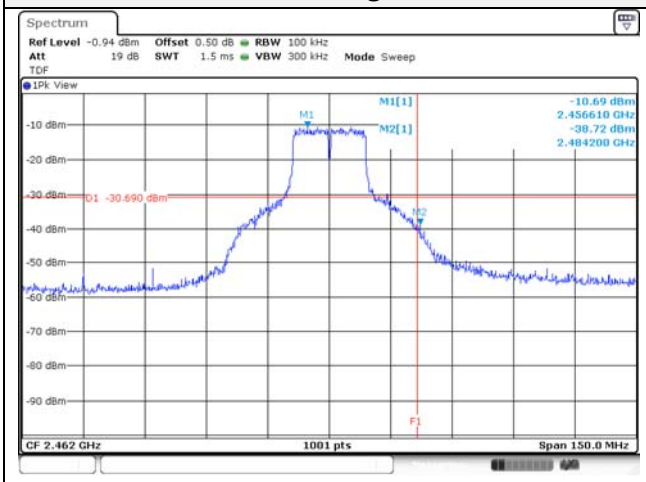
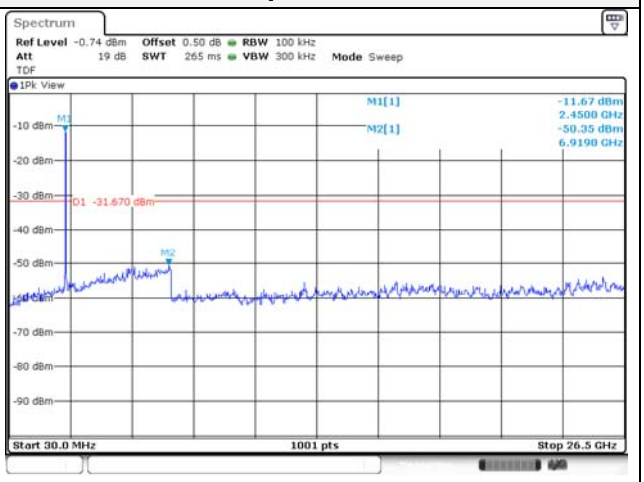
Conducted spurious / 2 437 ㎒



Conducted band-edge / 2 462 ㎒

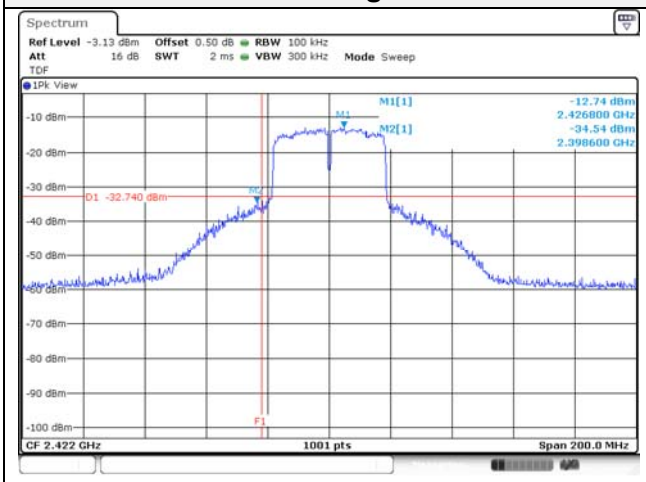


Conducted spurious / 2 462 ㎒

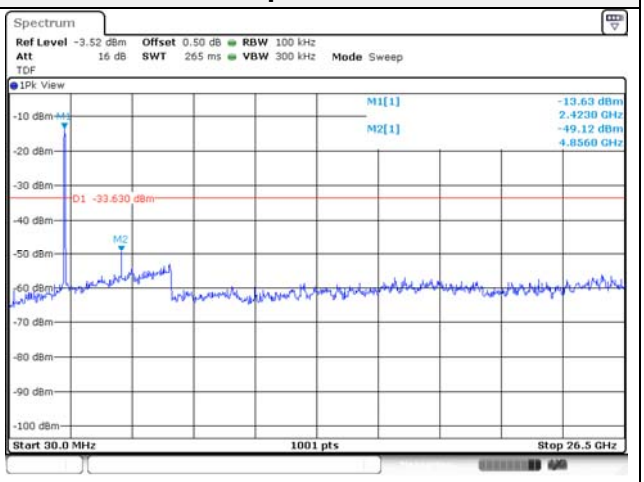


802.11n_HT40

Conducted band-edge / 2 422 ㎒



Conducted spurious / 2 422 ㎒



Conducted band-edge / 2 437 ㎒

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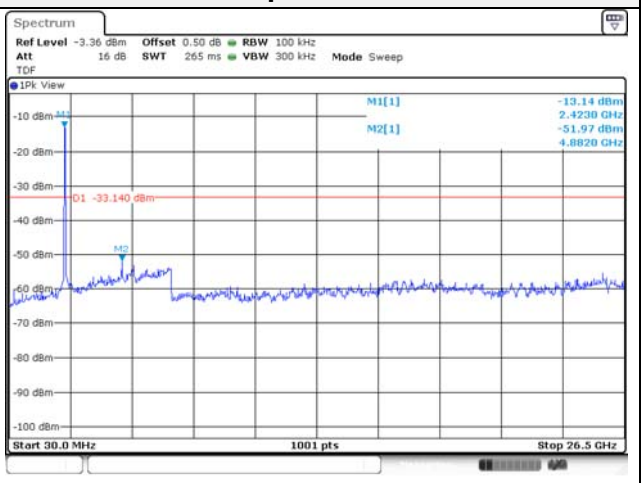
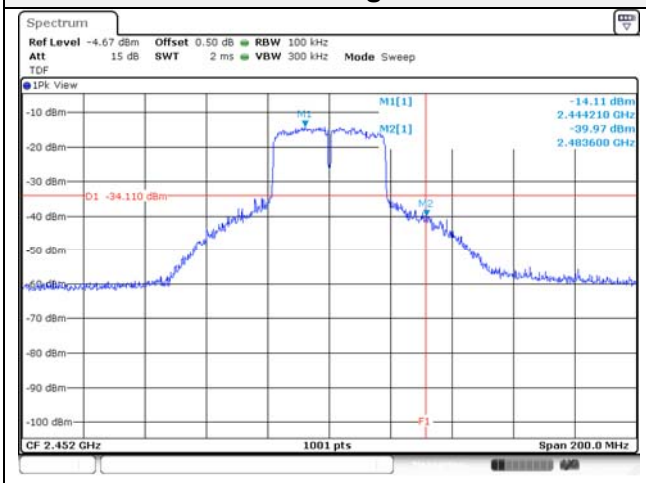
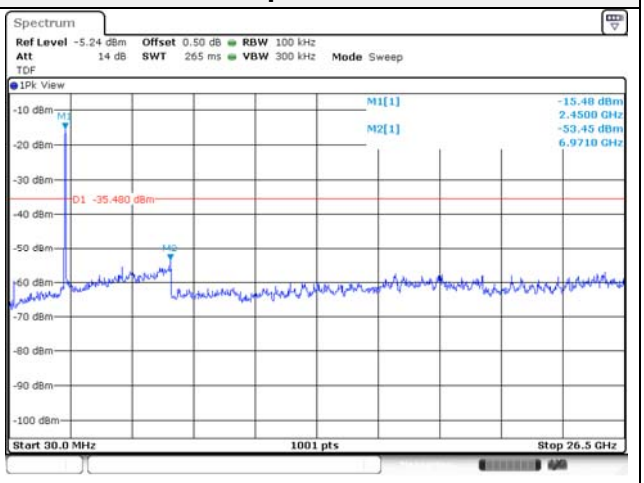
Conducted spurious / 2 437 ㎒



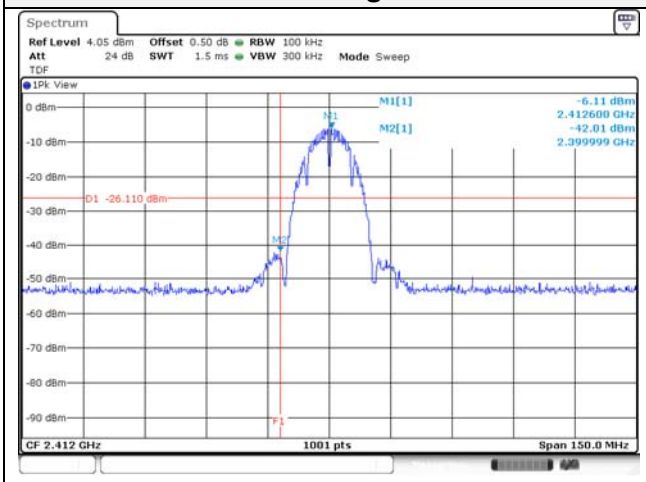
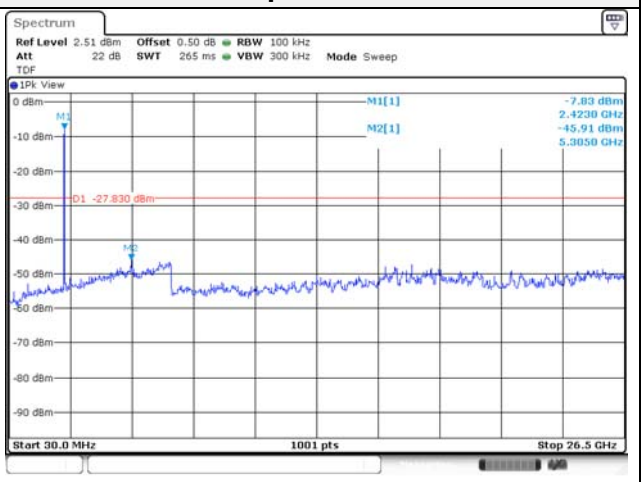
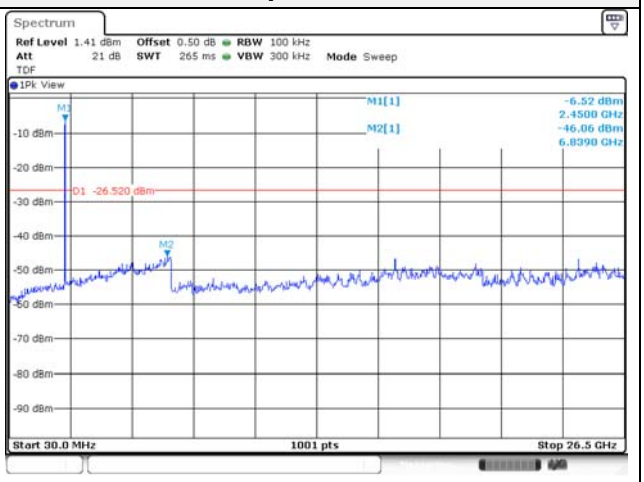
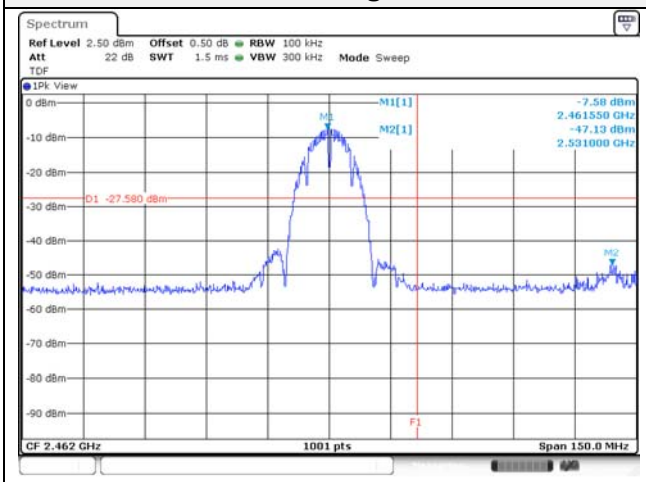
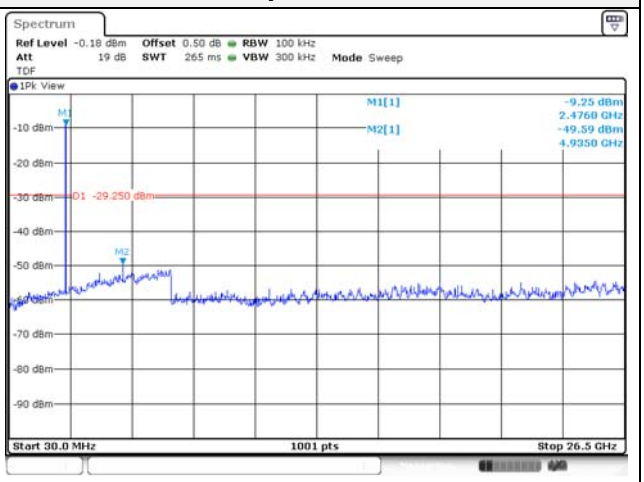
Conducted band-edge / 2 452 ㎒



Conducted spurious / 2 452 ㎒

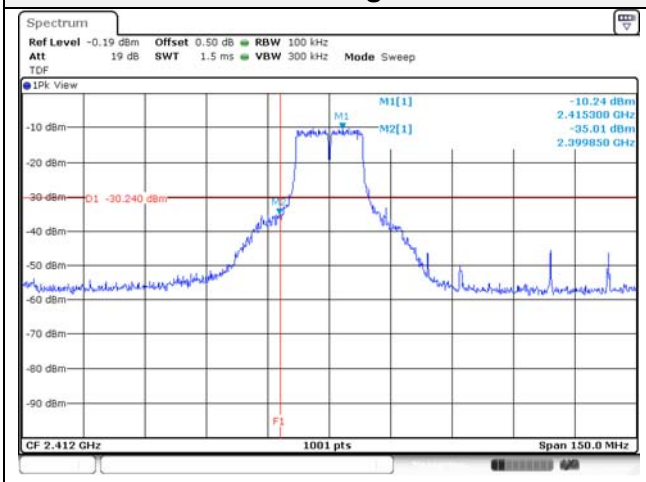


Test results PoE 48 V

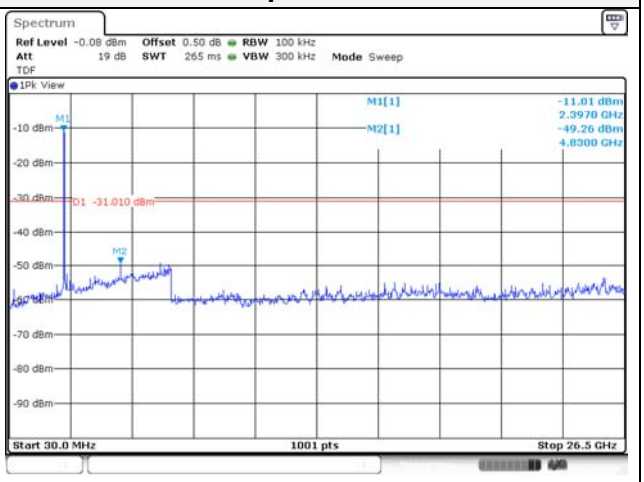
802.11b	
Conducted band-edge / 2 412 ㎒	**Conducted spurious / 2 412 ㎒**
	
Conducted band-edge / 2 437 ㎒	**Conducted spurious / 2 437 ㎒**
Blank	
Conducted band-edge / 2 462 ㎒	**Conducted spurious / 2 462 ㎒**
	

802.11g

Conducted band-edge / 2 412 ㎒



Conducted spurious / 2 412 ㎒



Conducted band-edge / 2 437 ㎒

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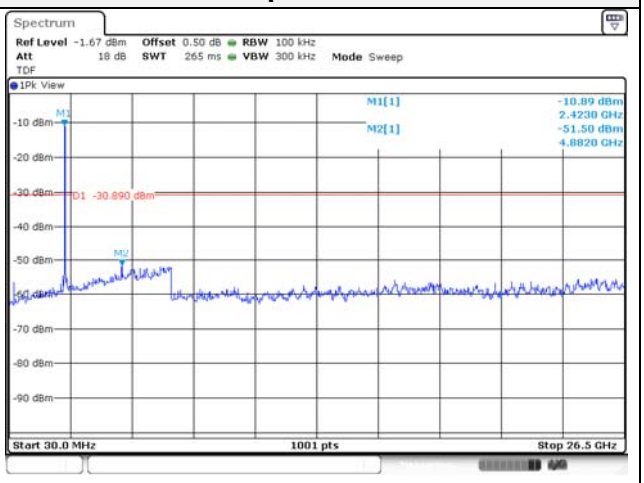
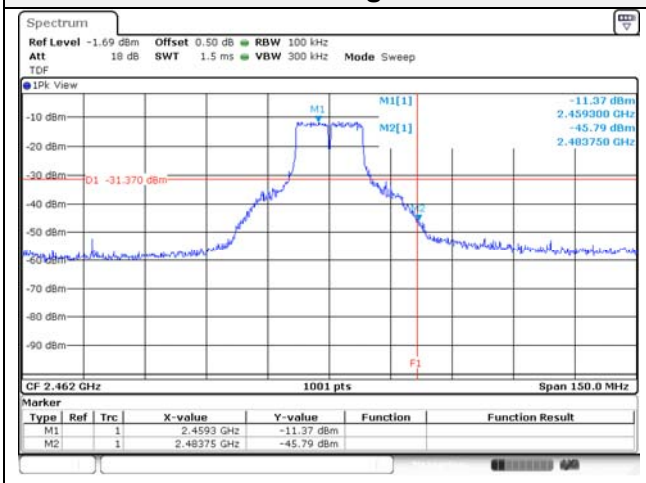
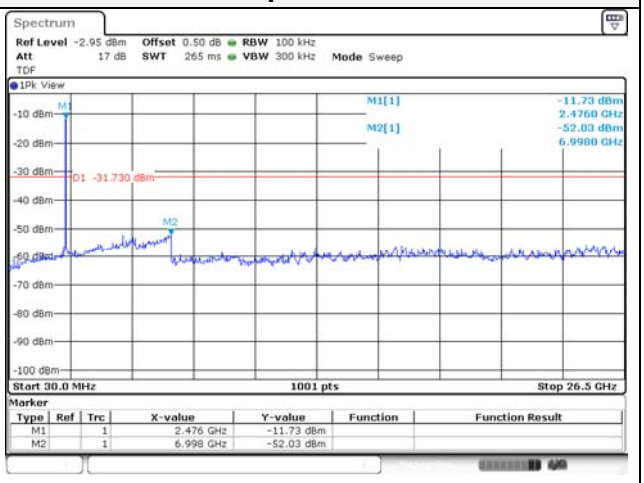
Conducted spurious / 2 437 ㎒



Conducted band-edge / 2 462 ㎒

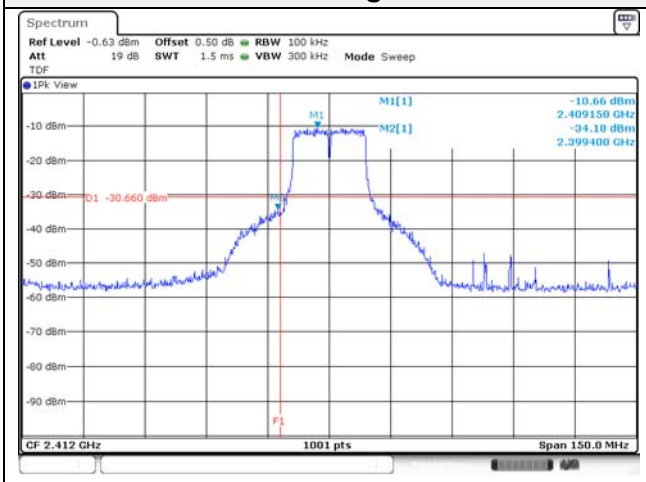


Conducted spurious / 2 462 ㎒

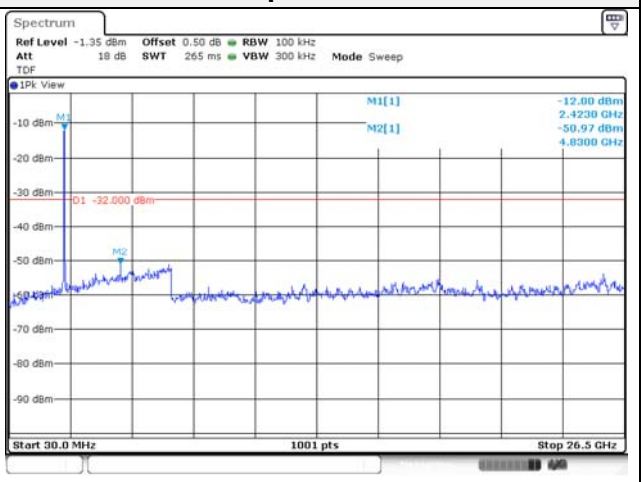


802.11n_HT20

Conducted band-edge / 2 412 ㎒



Conducted spurious / 2 412 ㎒



Conducted band-edge / 2 437 ㎒

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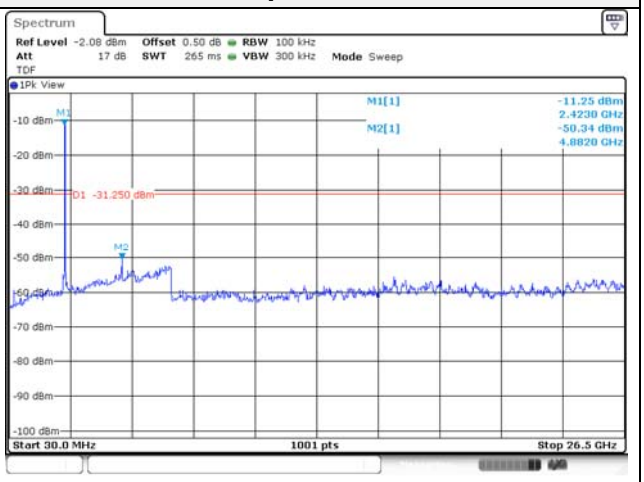
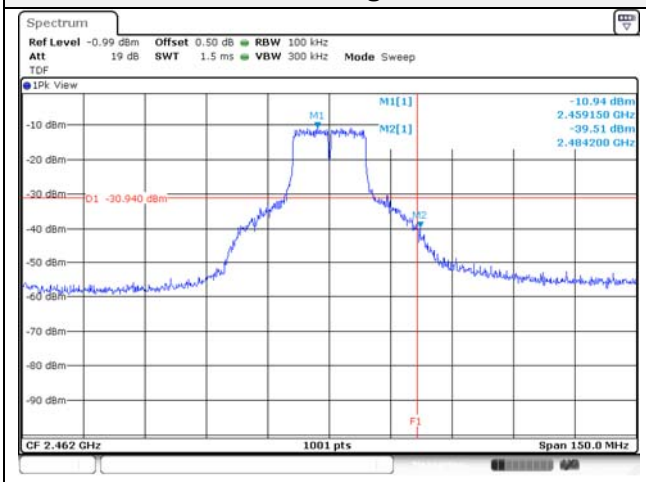
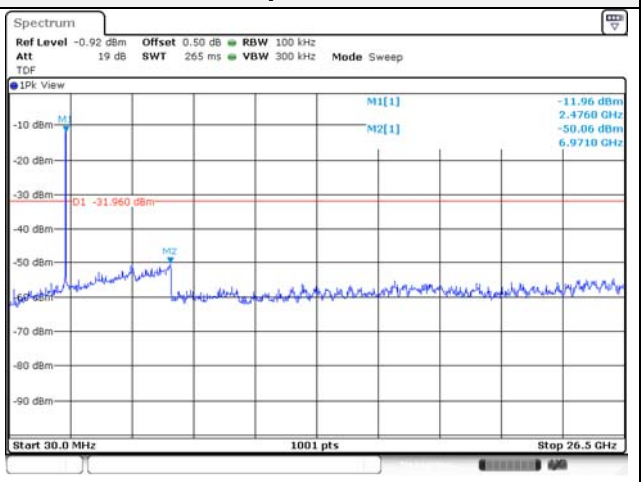
Conducted spurious / 2 437 ㎒



Conducted band-edge / 2 462 ㎒

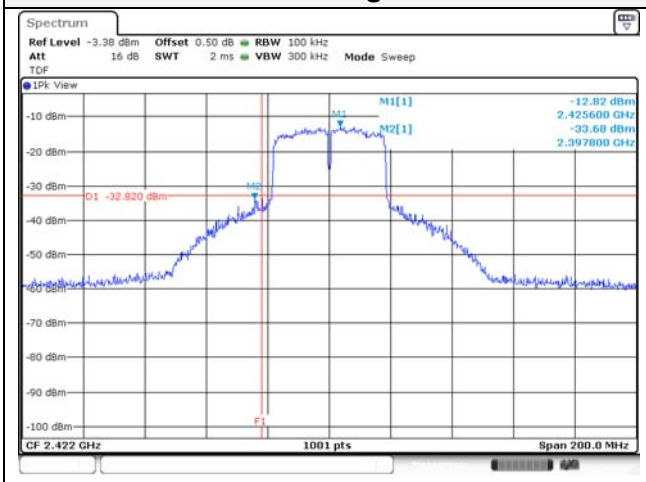


Conducted spurious / 2 462 ㎒

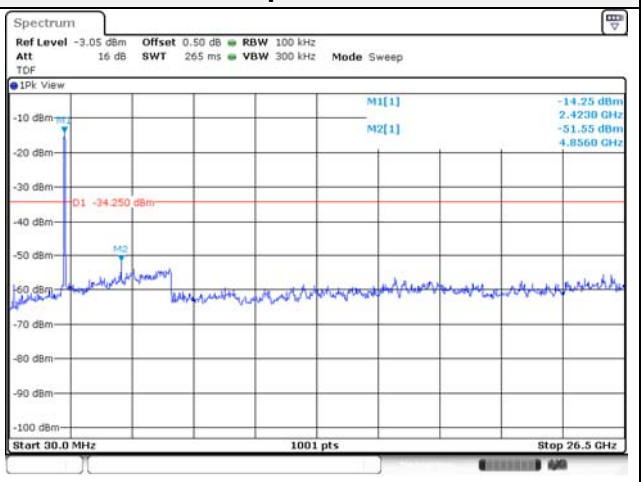


802.11n_HT40

Conducted band-edge / 2 422 ㎒



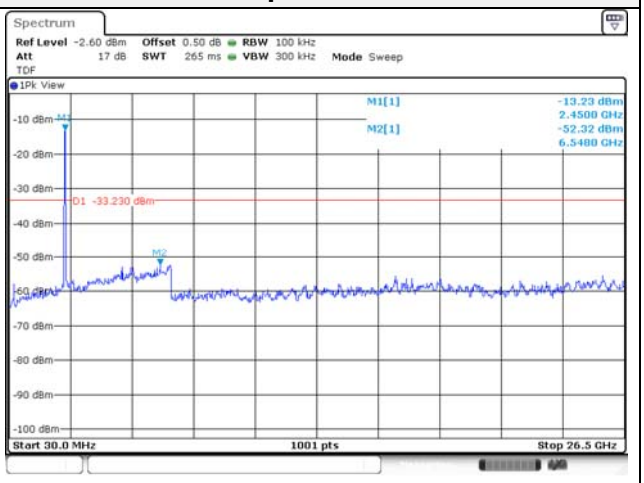
Conducted spurious / 2 422 ㎒



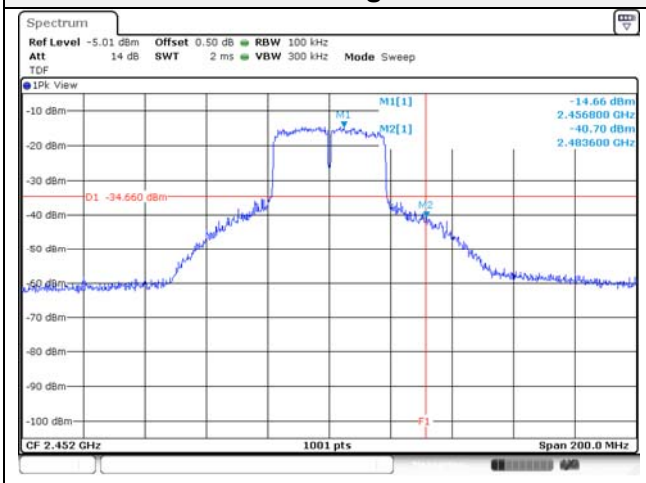
Conducted band-edge / 2 437 ㎒

Blank

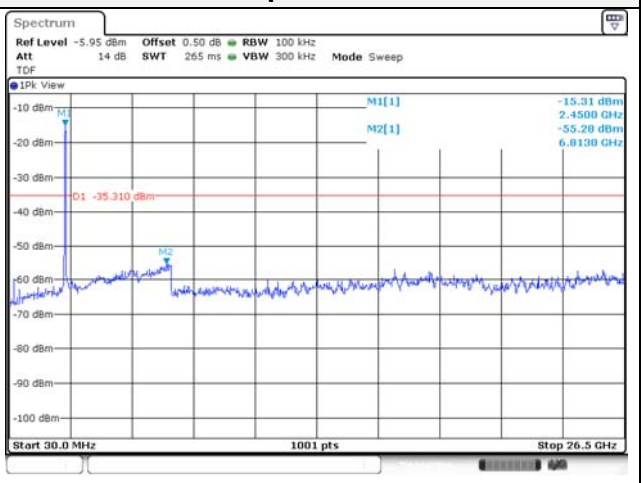
Conducted spurious / 2 437 ㎒



Conducted band-edge / 2 452 ㎒

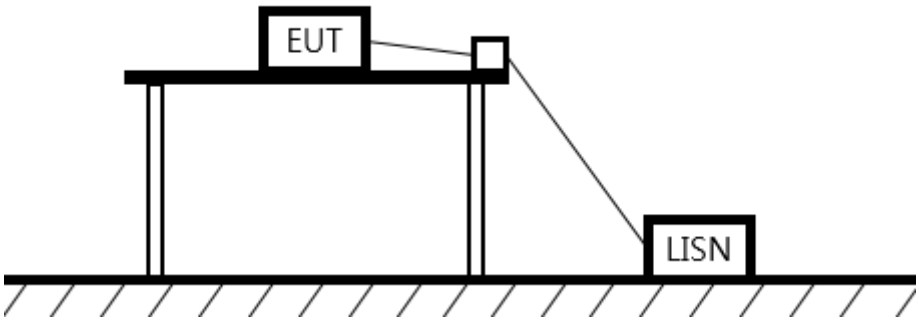


Conducted spurious / 2 452 ㎒



7.6. AC Conducted emission

Test setup



Limit

According to 15.207(a), for an intentional radiator that is designed to be connected to the public utility (AC) power line, the radio frequency voltage that is conducted back onto the AC power line on any frequency or frequencies, within the band 150 ㎑ to 30 ㎒, shall not exceed the limits in the following table, as measured using a 50uH/50 ohm line impedance stabilization network (LISN). Compliance with the provision of this paragraph shall on the measurement of the radio frequency voltage between each power line and ground at the power terminal. The lower applies at the boundary between the frequencies ranges.

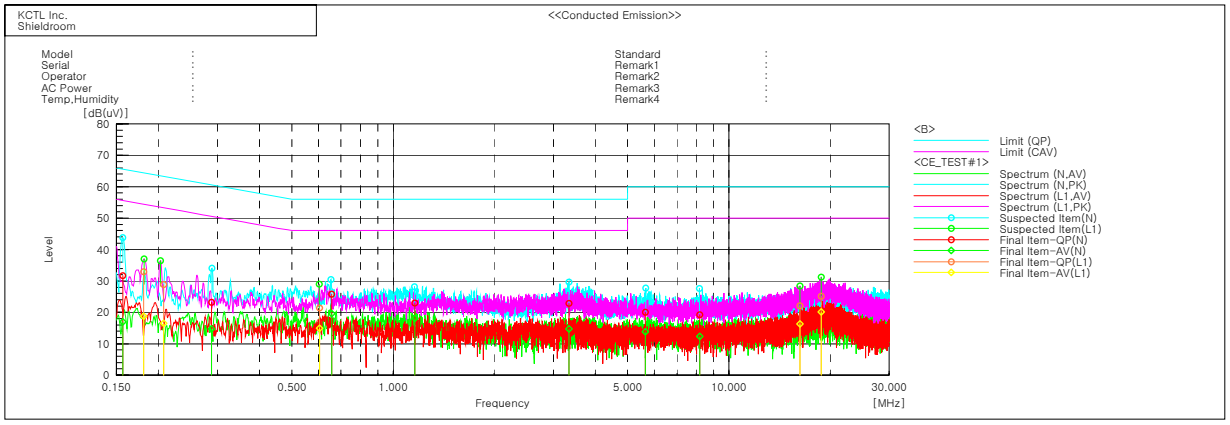
Frequency of Emission (㎒)	Conducted limit (dBμV/m)	
	Quasi-peak	Average
0.15 – 0.50	66 - 56*	56 - 46*
0.50 – 5.00	56	46
5.00 – 30.0	60	50

Measurement procedure

1. The EUT was placed on a wooden table of size, 1 m by 1.5 m, raised 80 ㎝ in which is located 40 ㎝ away from the vertical wall and 1.5m away from the side wall of the shielded room.
2. Each current-carrying conductor of the EUT power cord was individually connected through a 50Ω/50μH LISN, which is an input transducer to a spectrum analyzer or an EMI/Field Intensity ㅡ Meter, to the input power source.
3. Exploratory measurements were made to identify the frequency of the emission that had the highest amplitude relative to the limit by operating the EUT in a range of typical modes of operation, cable position, and with a typical system equipment configuration and arrangement. Based on the exploratory tests of the EUT, the one EUT cable configuration and arrangement and mode of operation that had produced the emission with the highest amplitude relative to the limit was selected for the final measurement.
4. The final test on all current-carrying conductors of all of the power cords to the equipment that comprises the EUT (but not the cords associated with other non-EUT equipment is the system) was then performed over the frequency range of 0.15 ㎒ to 30 ㎒.
5. The measurements were made with the detector set to peak amplitude within a bandwidth of 10 ㎑ or to quasi-peak and average within a bandwidth of 9 ㎑. The EUT was in transmitting mode during the measurements.

Test results

Worst case: 802.11g / 2 412 ㎒_ DC 12 V



Final Result

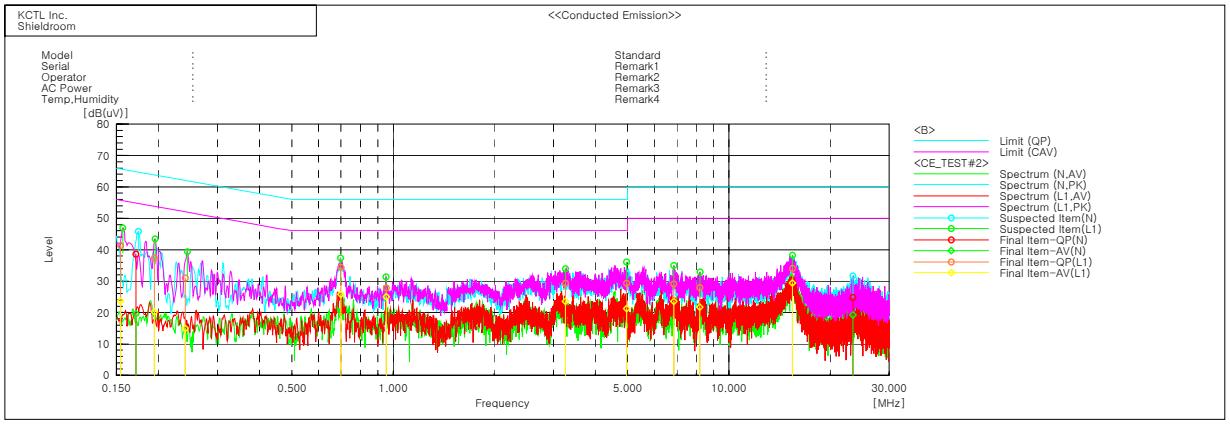
--- N Phase ---

No.	Frequency [MHz]	Reading QP [dB(uV)]	Reading CAV [dB(uV)]	c.f [dB]	Result QP [dB(uV)]	Result CAV [dB(uV)]	Limit QP [dB(uV)]	Limit AV [dB(uV)]	Margin QP [dB]	Margin CAV [dB]
1	0.15665	21.8	7.1	9.9	31.7	17.0	65.6	55.6	33.9	38.6
2	0.28826	13.5	5.0	9.7	23.2	14.7	60.6	50.6	37.4	35.9
3	0.6558	16.0	9.8	9.8	25.8	19.6	56.0	46.0	30.2	26.4
4	1.16078	13.2	8.4	9.7	22.9	18.1	56.0	46.0	33.1	27.9
5	3.34226	13.2	5.0	9.7	22.9	14.7	56.0	46.0	33.1	31.3
6	5.6467	10.4	4.1	9.7	20.1	13.8	60.0	50.0	39.9	36.2
7	8.18237	9.5	2.7	9.7	19.2	12.4	60.0	50.0	40.8	37.6

--- L1 Phase ---

No.	Frequency [MHz]	Reading QP [dB(uV)]	Reading CAV [dB(uV)]	c.f [dB]	Result QP [dB(uV)]	Result CAV [dB(uV)]	Limit QP [dB(uV)]	Limit AV [dB(uV)]	Margin QP [dB]	Margin CAV [dB]
1	0.18115	22.9	8.8	10.0	32.9	18.8	64.4	54.4	31.5	35.6
2	0.20752	18.9	6.6	9.9	28.8	16.5	63.3	53.3	34.5	36.8
3	0.60409	11.5	5.1	9.9	21.4	15.0	56.0	46.0	34.6	31.0
4	16.26093	12.1	6.3	10.0	22.1	16.3	60.0	50.0	37.9	33.7
5	18.83795	15.1	10.1	10.1	25.2	20.2	60.0	50.0	34.8	29.8

Worst case: 802.11g / 2 412 ㎒_ PoE 48 V



Final Result

--- N Phase ---

No.	Frequency [MHz]	Reading QP [dB(uV)]	Reading CAV [dB(uV)]	c.f [dB]	Result QP [dB(uV)]	Result CAV [dB(uV)]	Limit QP [dB(uV)]	Limit AV [dB(uV)]	Margin QP [dB]	Margin CAV [dB]
1	0.17141	28.6	9.5	10.0	38.6	19.5	64.9	54.9	26.3	35.4
2	23.42789	14.8	9.2	10.0	24.8	19.2	60.0	50.0	35.2	30.8

--- L1 Phase ---

No.	Frequency [MHz]	Reading QP [dB(uV)]	Reading CAV [dB(uV)]	c.f [dB]	Result QP [dB(uV)]	Result CAV [dB(uV)]	Limit QP [dB(uV)]	Limit AV [dB(uV)]	Margin QP [dB]	Margin CAV [dB]
1	0.15447	31.4	13.8	9.9	41.3	23.7	65.8	55.8	24.5	32.1
2	0.1946	27.3	10.3	10.0	37.3	20.3	63.8	53.8	26.5	33.5
3	0.24056	21.3	5.2	9.7	31.0	14.9	62.1	52.1	31.1	37.2
4	0.69889	24.5	15.9	9.9	34.4	25.8	56.0	46.0	21.6	20.2
5	0.95531	18.1	15.2	9.8	27.9	25.0	56.0	46.0	28.1	21.0
6	3.25848	19.5	13.7	9.8	29.3	23.5	56.0	46.0	26.7	22.5
7	4.95961	19.5	11.5	9.8	29.3	21.3	56.0	46.0	26.7	24.7
8	6.86161	19.2	13.7	9.8	29.0	23.5	60.0	50.0	31.0	26.5
9	8.19662	18.1	11.9	9.8	27.9	21.7	60.0	50.0	32.1	28.3
10	15.4817	24.1	19.5	10.0	34.1	29.5	60.0	50.0	25.9	20.5

8. Measurement equipment

Equipment Name	Manufacturer	Model No.	Serial No.	Next Cal. Date
Spectrum Analyzer	R&S	FSV30	100806	21.07.29
Spectrum Analyzer	R&S	FSV40	100988	21.01.03
Pulse Power Meter	ANRITSU	ML2495A	1608009	21.07.29
Pulse Power Sensor	ANRITSU	MA2411B	1726174	21.07.29
EMI TEST RECEIVER	R&S	ESCI7	100732	21.03.04
Bi-Log Antenna	Teseq GmbH	CBL6112D	37876	22.09.02
Amplifier	SONOMA INSTRUMENT	310N	284608	21.08.20
COAXIAL FIXED ATTENUATOR	Agilent	8491B-003	2708A18758	21.04.23
Horn antenna	ETS.lindgren	3117-PA	00161083	21.09.23
Horn antenna	ETS.lindgren	3116	86632	21.02.17
Attenuator	API Inmet	40AH2W-10	12	21.05.12
Broadband PreAmplifier	SCHWARZBECK	BBV9718	216	21.07.28
AMPLIFIER	L-3 Narda-MITEQ	AMF-7D-01001800 -22-10P	2031196	21.02.12
AMPLIFIER	L-3 Narda-MITEQ	JS44-18004000-33-8P	2000996	21.01.22
LOOP Antenna	R&S	HFH2-Z2	100355	22.08.21
Antenna Mast	Innco Systems	MA4640-XP-ET	-	-
Turn Table	Innco Systems	DT2000	79	-
Antenna Mast	Innco Systems	MA4000-EP	303	-
Turn Table	Innco Systems	DT2000	79	-
Highpass Filter	WT	WT-A1698-HS	WT160411001	21.05.11
Vector Signal Generator	R&S	SMBV100A	257566	21.07.13
Signal Generator	R&S	SMR40	100007	21.04.08
TWO-LINE V - NETWORK	R&S	ENV216	101584	21.04.06
EMI TEST RECEIVER	R&S	ESCI	101408	21.08.20

End of test report

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