

KCTL Inc.

65, Sinwon-ro, Yeongtong-gu,
Suwon-si, Gyeonggi-do, 16677, Korea
TEL: 82-31-285-0894 FAX: 82-505-299-8311
www.kctl.co.kr

Report No.:
KR19-SRF0173

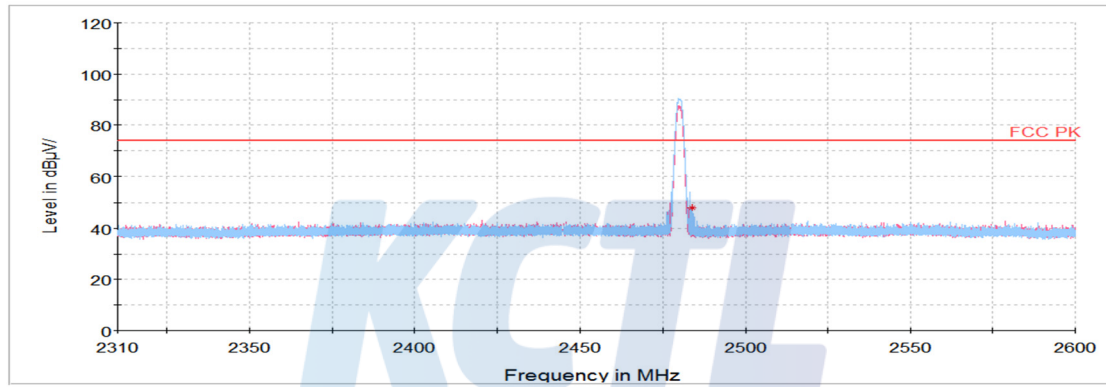
Page (40) of (59)



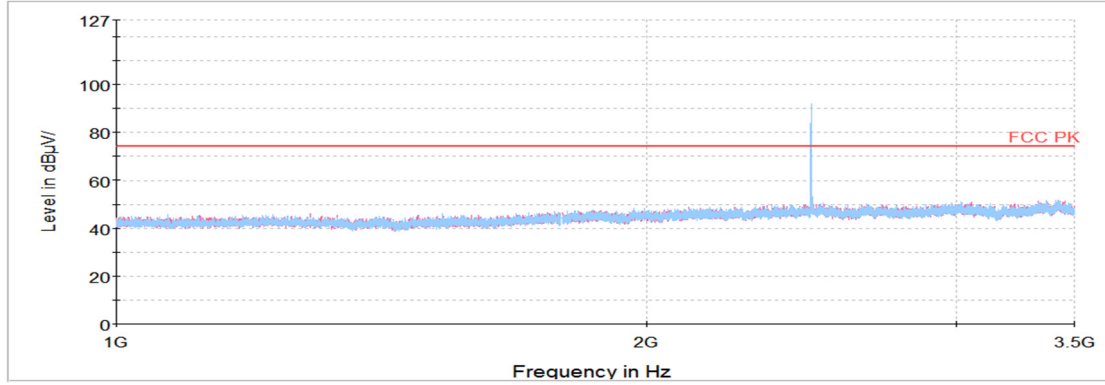
High Channel

Frequency	Pol.	Reading	Antenna Factor	Amp. + Cable	DCCF	Result	Limit	Margin
[MHz]	[V/H]	[dB(μV)]	[dB]	[dB]	[dB]	[dB(μV/m)]	[dB(μV/m)]	[dB]
Peak data								
2 484.00 ¹⁾	H	45.01	32.07	-29.22	-	47.86	74.00	26.14
4 959.52 ¹⁾	H	60.78	33.98	-54.81	-	39.95	74.00	34.05
7 440.38 ¹⁾	H	61.83	35.40	-50.86	-	46.37	74.00	27.63
Average Data								
No spurious emissions were detected within 20 dB of the limit.								

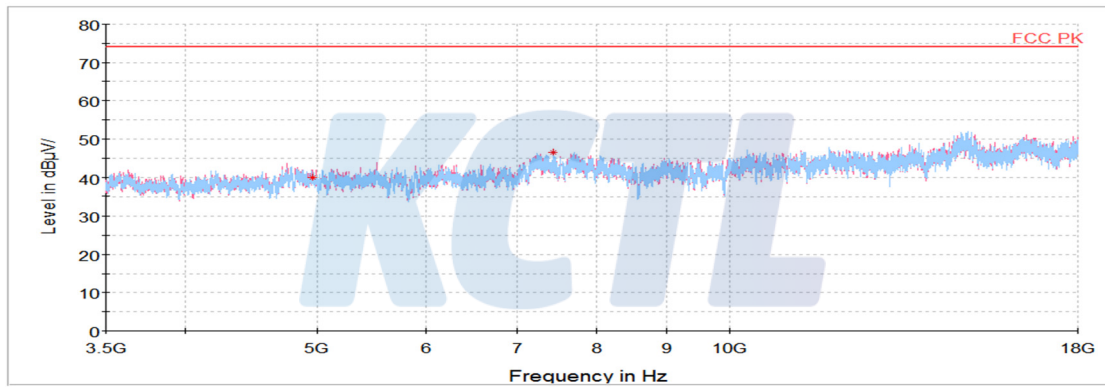
Horizontal/Vertical for Band-edge



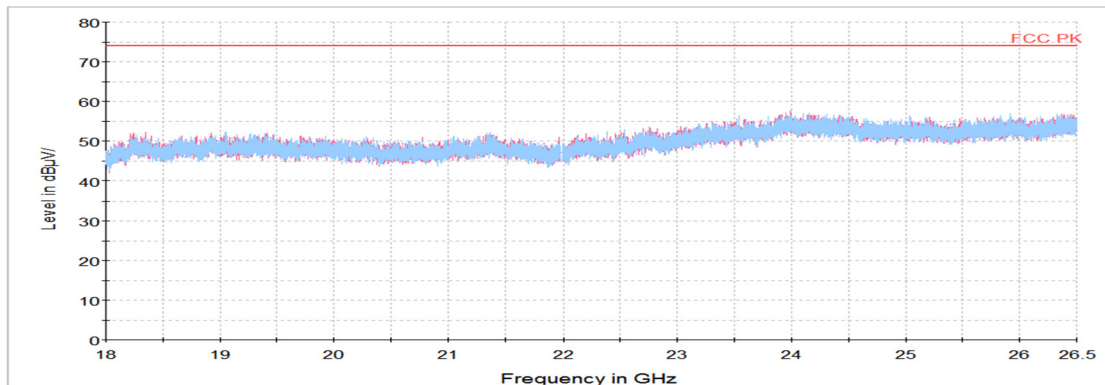
Horizontal/Vertical for 1 GHz ~ 3.5 GHz



Horizontal/Vertical for 3.5 GHz ~ 18 GHz



Horizontal/Vertical for 18 GHz ~ 26.5 GHz

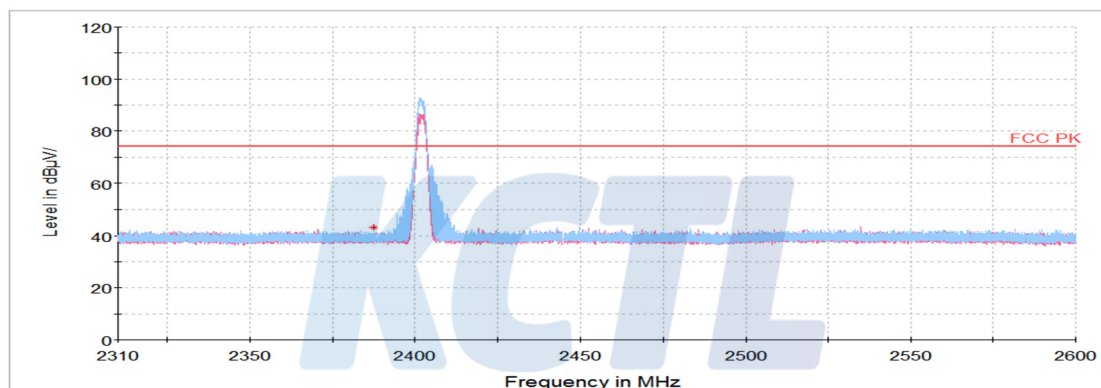


Test results (Above 1 000 MHz)_2 Mbits/s(37 Bytes)

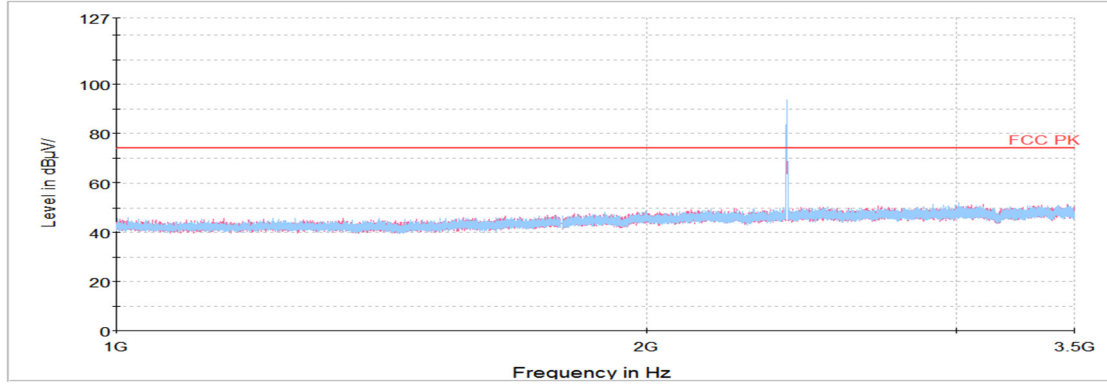
Low Channel

Frequency	Pol.	Reading	Antenna Factor	Amp. + Cable	DCCF	Result	Limit	Margin
[MHz]	[V/H]	[dB(μV)]	[dB]	[dB]	[dB]	[dB(μV/m)]	[dB(μV/m)]	[dB]
Peak data								
2 387.65 ¹⁾	H	40.23	31.88	-29.05	-	43.06	74.00	30.94
4 804.55 ¹⁾	V	57.11	33.92	-53.14	-	37.89	74.00	36.11
7 207.02 ¹⁾	H	62.83	35.40	-53.11	-	45.12	74.00	28.88
Average Data								
No spurious emissions were detected within 20 dB of the limit.								

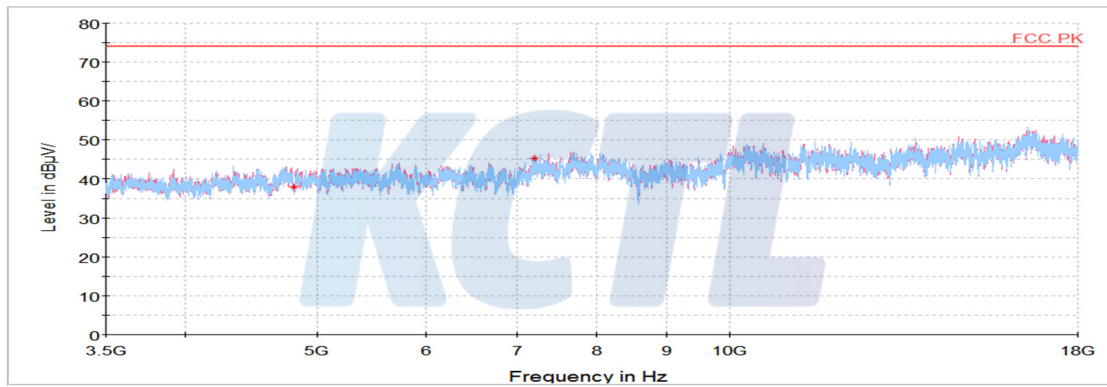
Horizontal/Vertical for Band-edge



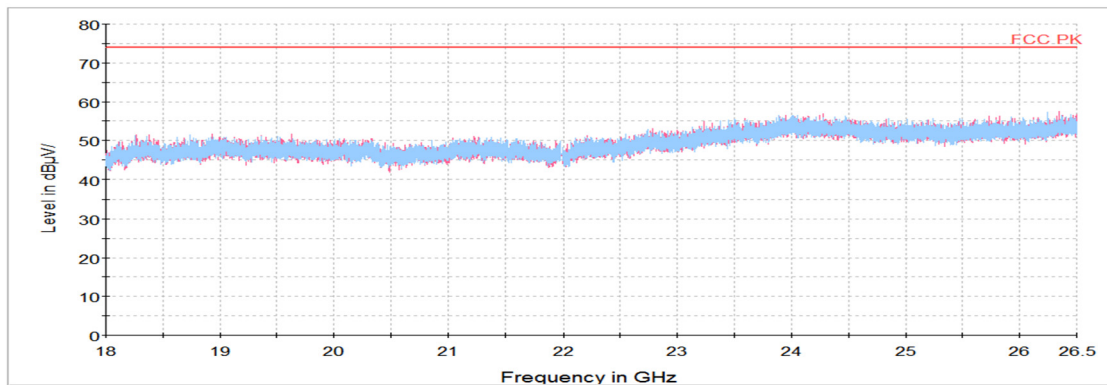
Horizontal/Vertical for 1 GHz ~ 3.5 GHz



Horizontal/Vertical for 3.5 GHz ~ 18 GHz



Horizontal/Vertical for 18 GHz ~ 26.5 GHz



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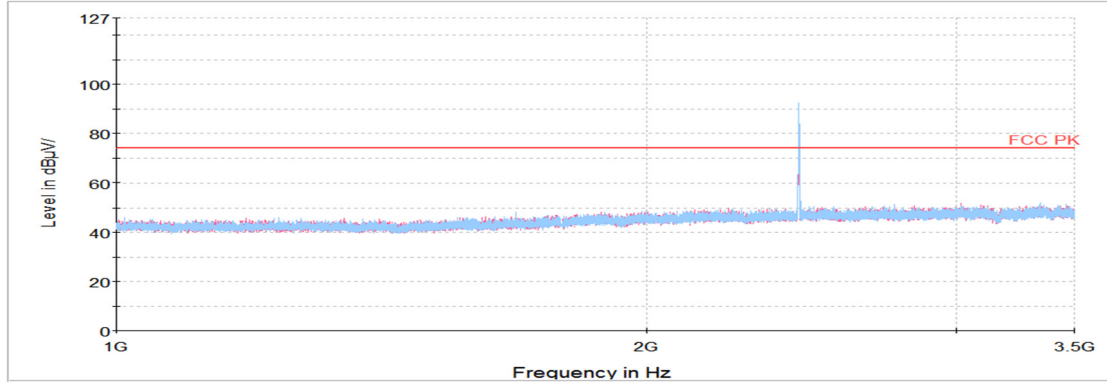
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KCTL**Middle Channel**

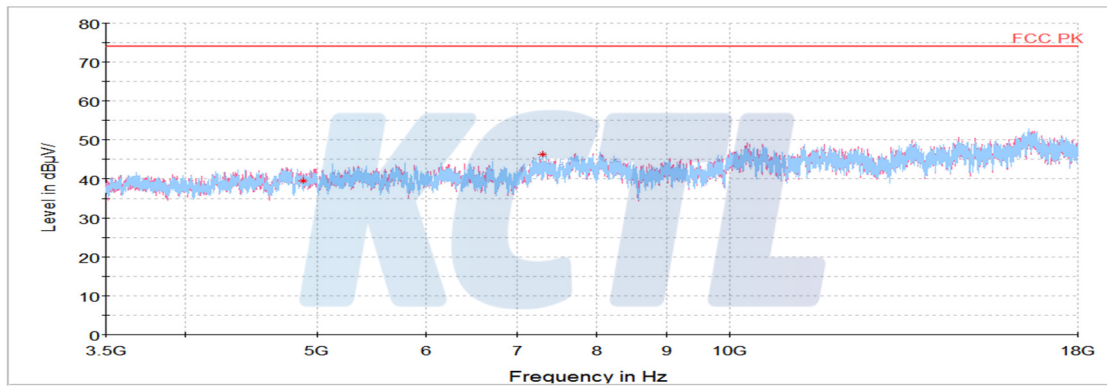
Frequency	Pol.	Reading	Antenna Factor	Amp. + Cable	DCCF	Result	Limit	Margin
[MHz]	[V/H]	[dB(μV)]	[dB]	[dB]	[dB]	[dB(μV/m)]	[dB(μV/m)]	[dB]
Peak data								
4 880.67 ¹⁾	H	59.96	33.95	-54.57	-	39.34	74.00	34.66
7 318.94 ¹⁾	H	63.32	35.40	-52.53	-	46.19	74.00	27.81
Average Data								
No spurious emissions were detected within 20 dB of the limit.								

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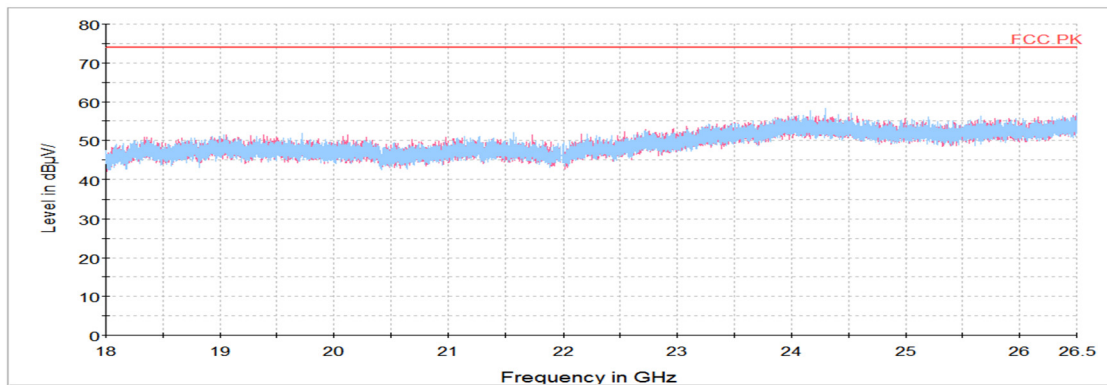
Horizontal/Vertical for 1 GHz ~ 3.5 GHz



Horizontal/Vertical for 3.5 GHz ~ 18 GHz



Horizontal/Vertical for 18 GHz ~ 26.5 GHz



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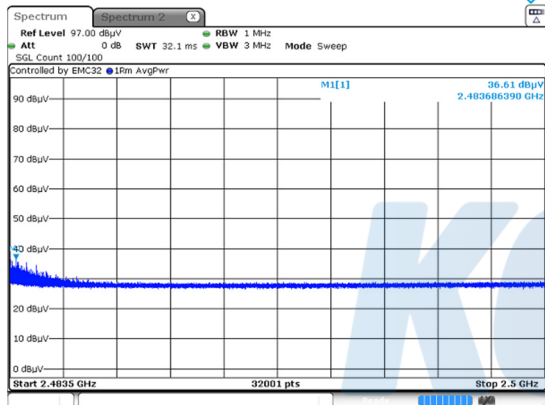
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High Channel

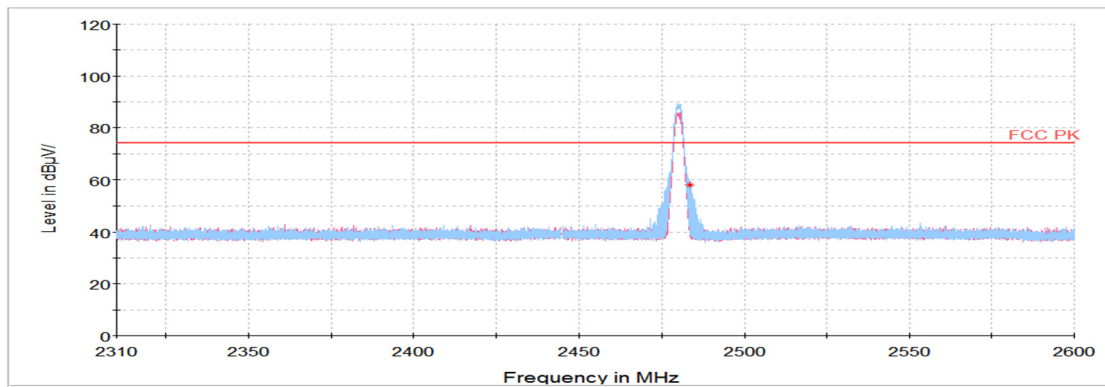
Frequency	Pol.	Reading	Antenna Factor	Amp. + Cable	DCCF	Result	Limit	Margin
[MHz]	[V/H]	[dB(μV)]	[dB]	[dB]	[dB]	[dB(μV/m)]	[dB(μV/m)]	[dB]
Peak data								
2 483.69 ¹⁾	H	54.92	32.07	-29.21	-	57.78	74.00	16.22
4 959.06 ¹⁾	V	61.74	33.98	-54.60	-	41.12	74.00	32.88
7 440.83 ¹⁾	H	64.28	35.40	-51.89	-	47.79	74.00	26.21
Average Data								
2 483.69 ¹⁾	H	36.61	32.07	-29.21	5.08	44.55	54.00	9.45

Average data

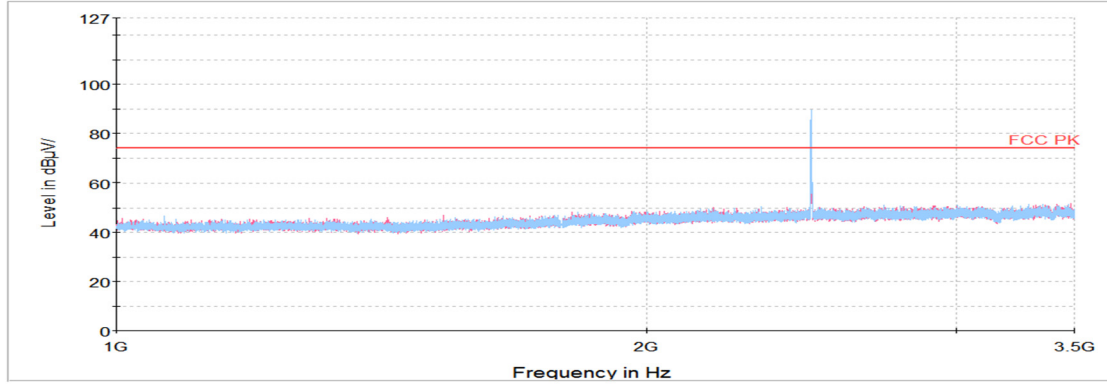


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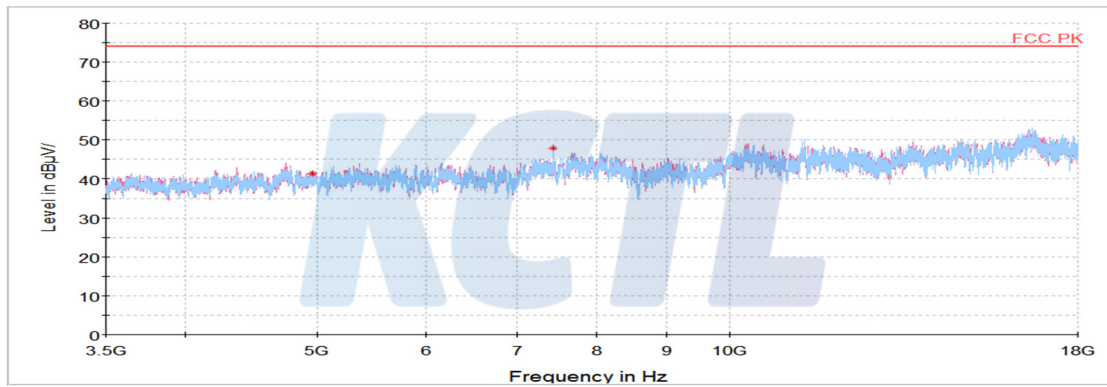
Horizontal/Vertical for Band-edge



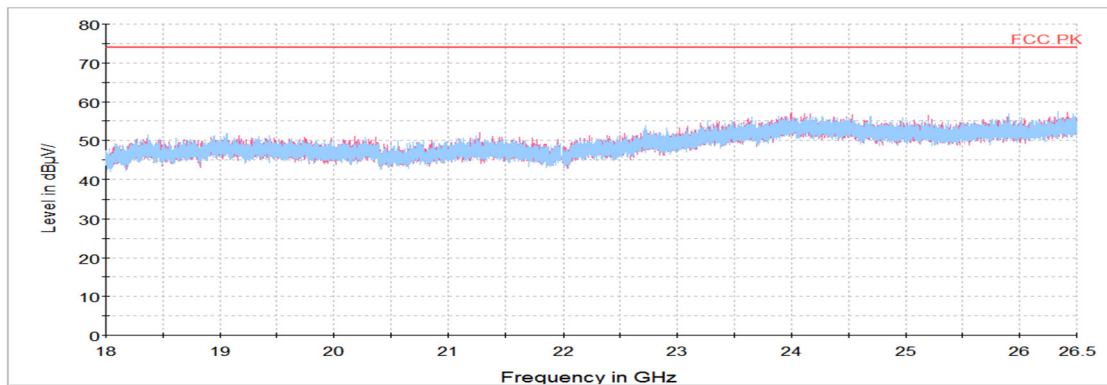
Horizontal/Vertical for 1 GHz ~ 3.5 GHz



Horizontal/Vertical for 3.5 GHz ~ 18 GHz



Horizontal/Vertical for 18 GHz ~ 26.5 GHz



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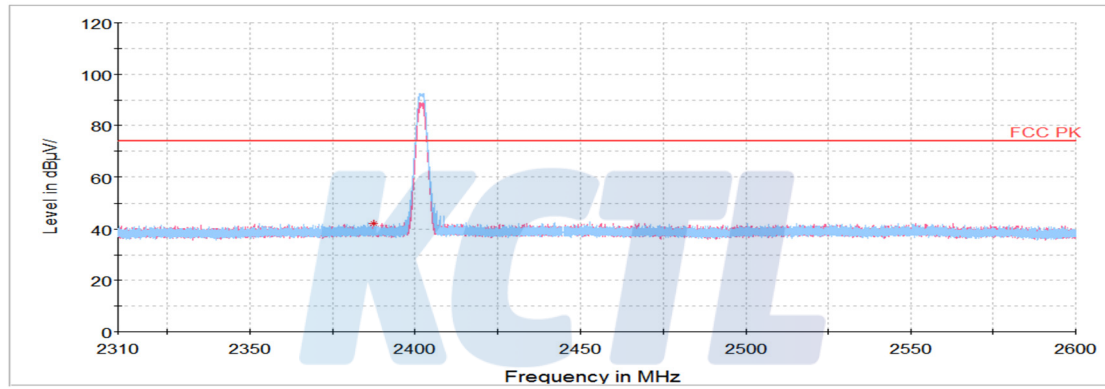


Test results (Above 1 000 MHz)_2 Mbits/s(255 Bytes)

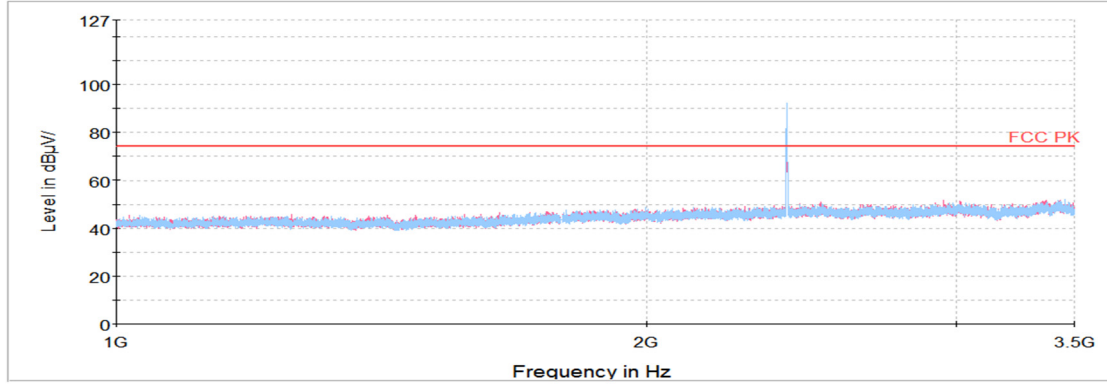
Low Channel

Frequency	Pol.	Reading	Antenna Factor	Amp. + Cable	DCCF	Result	Limit	Margin
[MHz]	[V/H]	[dB(μ V)]	[dB]	[dB]	[dB]	[dB(μ V/m)]	[dB(μ V/m)]	[dB]
Peak data								
2 387.70 ¹⁾	H	39.47	31.88	-29.05	-	42.30	74.00	31.70
4 804.09 ¹⁾	V	56.70	33.92	-52.28	-	38.34	74.00	35.66
7 206.11	H	61.19	35.40	-52.02	-	44.57	74.00	29.43
Average Data								
No spurious emissions were detected within 20 dB of the limit.								

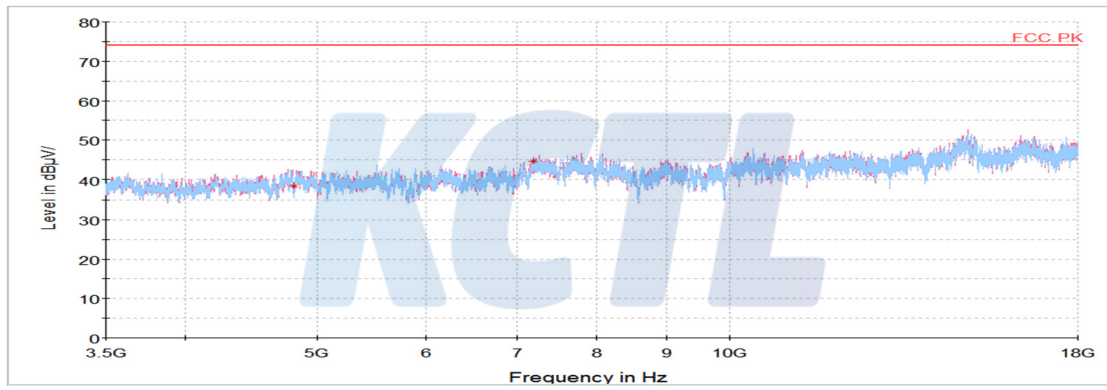
Horizontal/Vertical for Band-edge



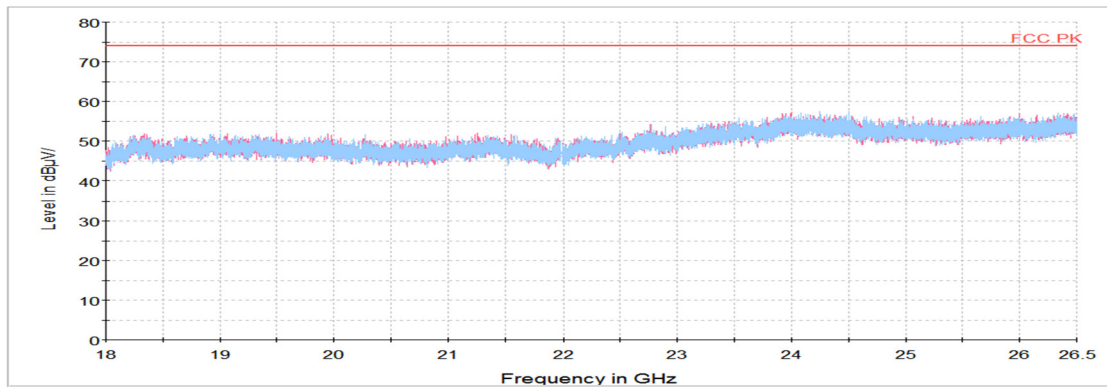
Horizontal/Vertical for 1 GHz ~ 3.5 GHz



Horizontal/Vertical for 3.5 GHz ~ 18 GHz



Horizontal/Vertical for 18 GHz ~ 26.5 GHz



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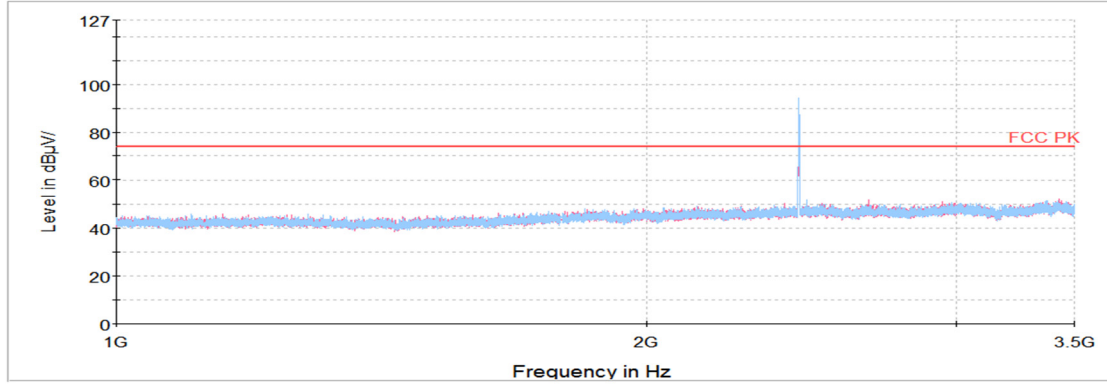
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**Middle Channel**

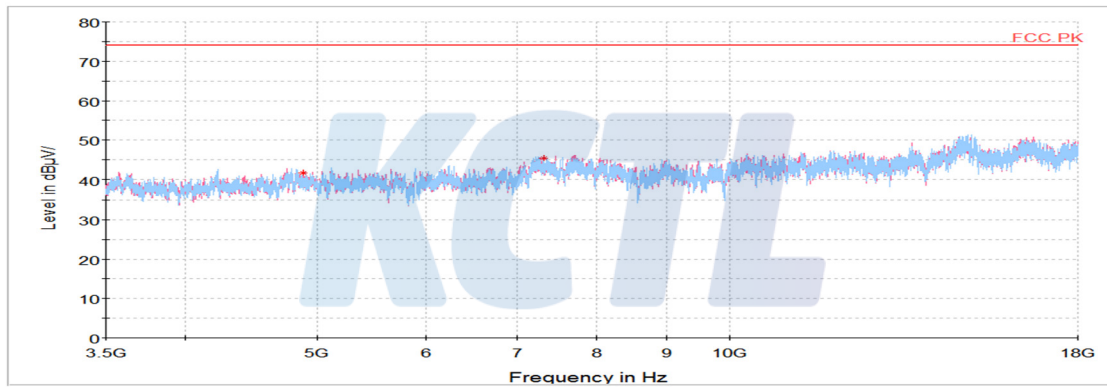
Frequency	Pol.	Reading	Antenna Factor	Amp. + Cable	DCCF	Result	Limit	Margin
[MHz]	[V/H]	[dB(μV)]	[dB]	[dB]	[dB]	[dB(μV/m)]	[dB(μV/m)]	[dB]
Peak data								
4 879.31 ¹⁾	V	62.15	33.95	-54.35	-	41.75	74.00	32.25
7 321.20 ¹⁾	H	61.44	35.40	-51.45	-	45.39	74.00	28.61
Average Data								
No spurious emissions were detected within 20 dB of the limit.								



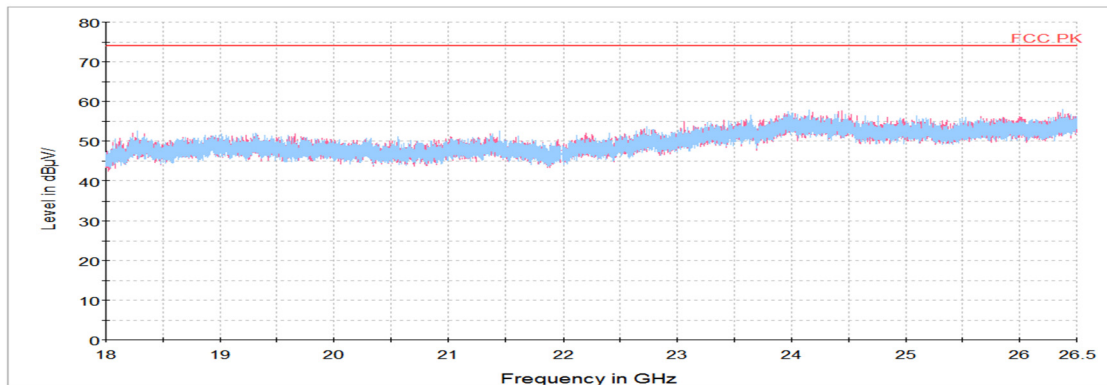
Horizontal/Vertical for 1 GHz ~ 3.5 GHz



Horizontal/Vertical for 3.5 GHz ~ 18 GHz



Horizontal/Vertical for 18 GHz ~ 26.5 GHz



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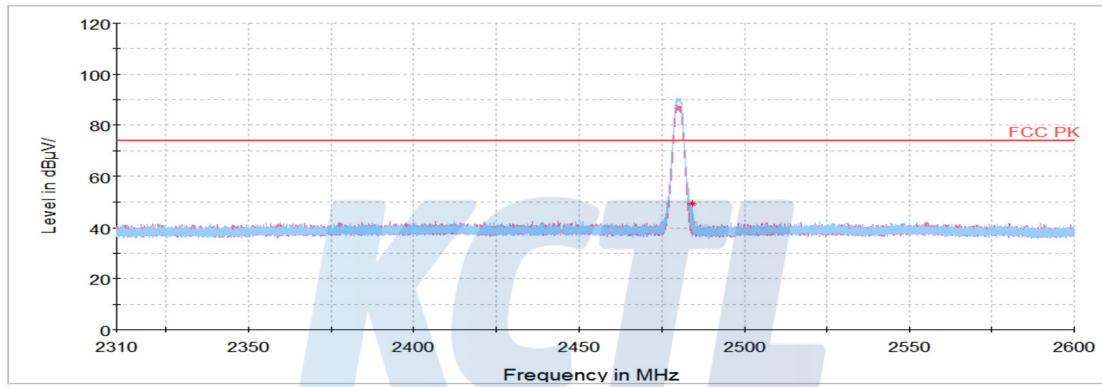
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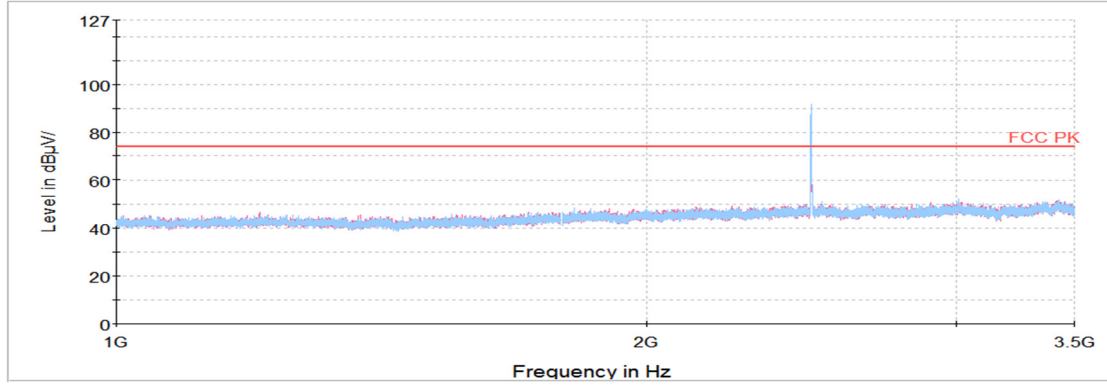
High Channel

Frequency	Pol.	Reading	Antenna Factor	Amp. + Cable	DCCF	Result	Limit	Margin
[MHz]	[V/H]	[dB(μV)]	[dB]	[dB]	[dB]	[dB(μV/m)]	[dB(μV/m)]	[dB]
Peak data								
2 484.09 ¹⁾	H	46.76	32.07	-29.22	-	49.61	74.00	24.39
4 959.97 ¹⁾	V	60.74	33.98	-54.80	-	39.92	74.00	34.08
7 440.83 ¹⁾	H	60.96	35.40	-50.86	-	45.50	74.00	28.50
Average Data								
No spurious emissions were detected within 20 dB of the limit.								

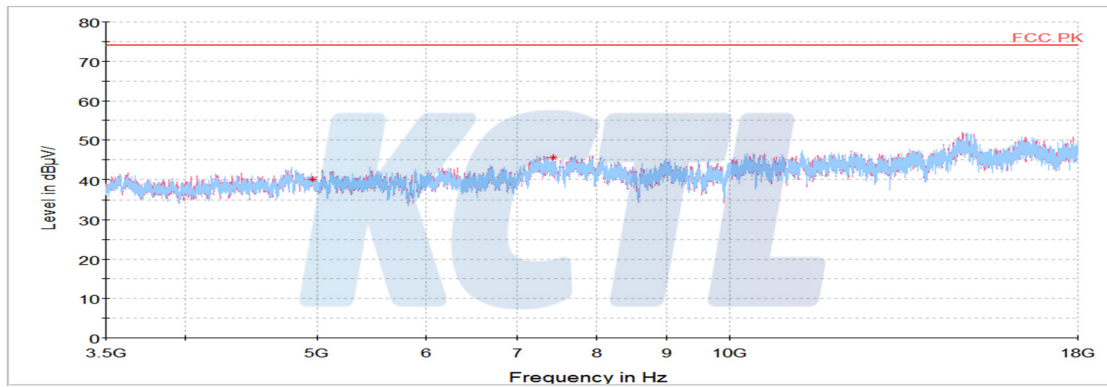
Horizontal/Vertical for Band-edge



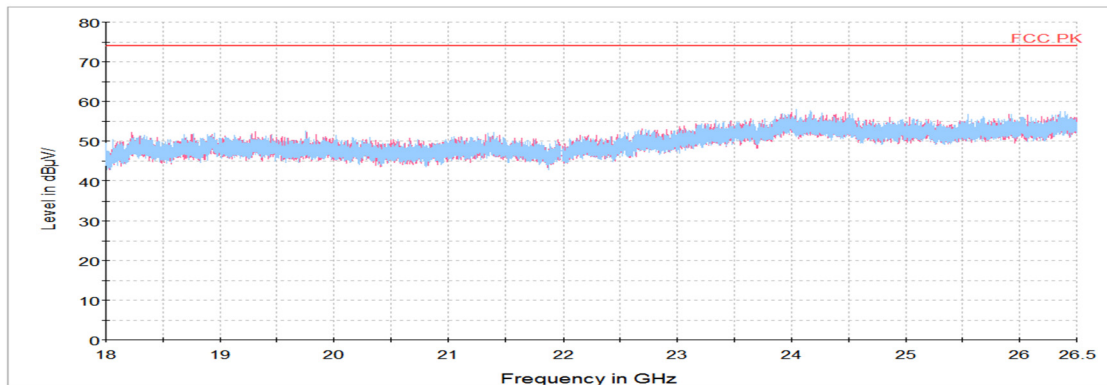
Horizontal/Vertical for 1 GHz ~ 3.5 GHz



Horizontal/Vertical for 3.5 GHz ~ 18 GHz

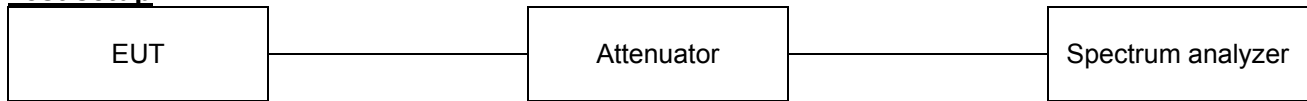


Horizontal/Vertical for 18 GHz ~ 26.5 GHz



7.5. Conducted Spurious Emission

Test setup



Limit

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 operation, 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 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 dBc

Test procedure

ANSI C63.10-2013 - Section 11.11.3, 14.3.3

Test settings

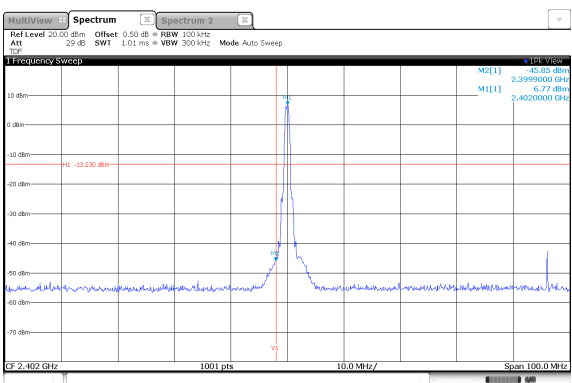
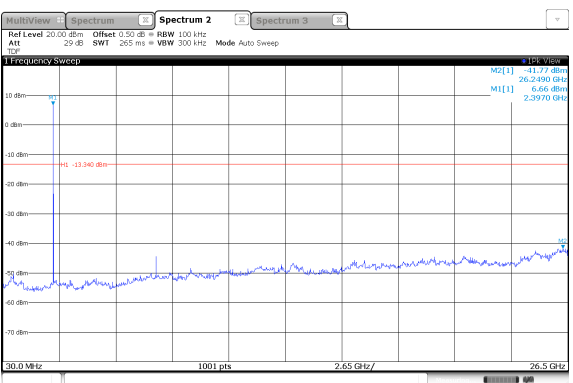
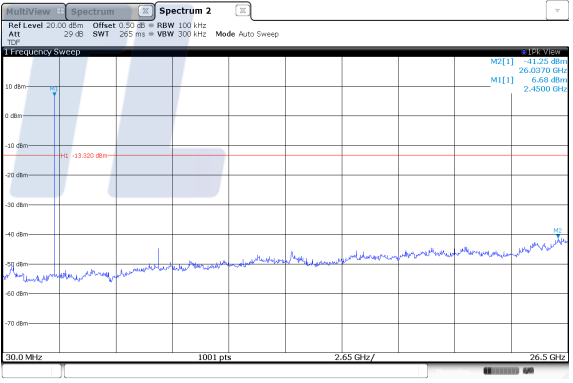
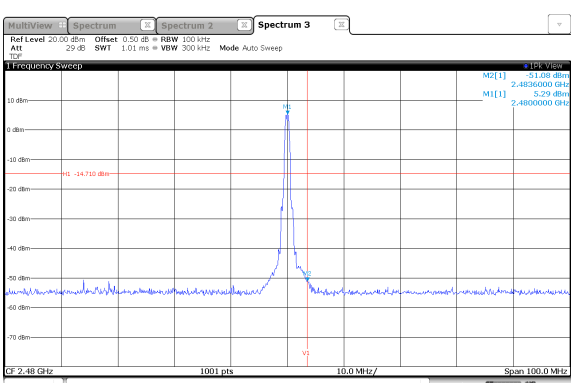
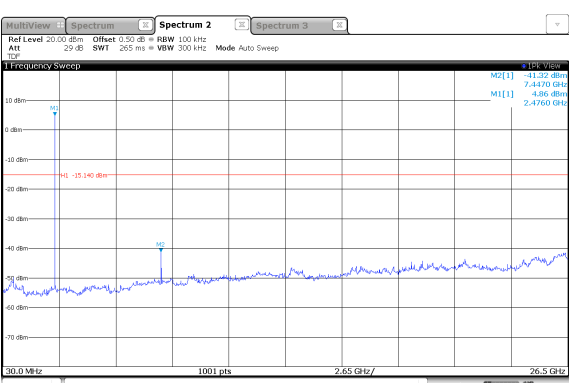
Establish an emission level by using the following procedure:

- 1) Set the center frequency and span to encompass frequency range to be measured.
- 2) Set the RBW = 100 kHz
- 3) Set the VBW $\geq [3 \times \text{RBW}]$
- 4) Detector = peak
- 5) Sweep time = auto couple
- 6) Trace mode = max hold
- 7) Allow trace to fully stabilize.
- 8) Use the peak marker function to determine the maximum amplitude level.

Ensure that the amplitude of all unwanted emissions outside of the authorized frequency band (excluding restricted frequency bands) is attenuated by at least the minimum requirements specified in 11.11. Report the three highest emissions relative to the limit.

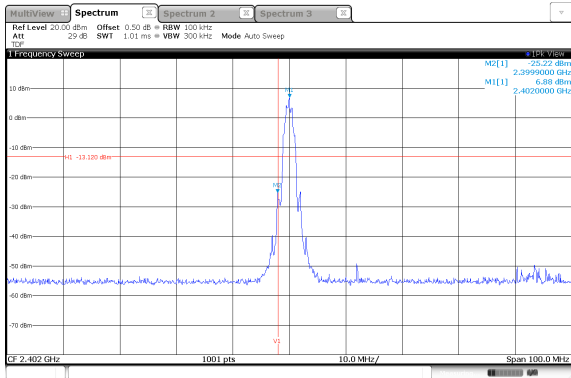
Test results

LE_1 MBit/s(37 Bytes)

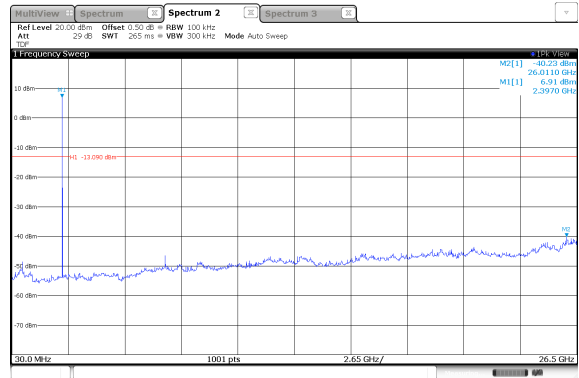
Conducted band-edge / Low ch.	Conducted spurious / Low ch.
 <p>MultiView : Spectrum Spectrum 2 RefLevel 20.00 dBm Offset 0.50 dB RBW 100 kHz Att 20 dB SWF 1.00 ms VBW 300 kHz Mode Auto Sweep Frequency Sweep M2[1] -13.230 dBm M1[1] 2.4020000 GHz M1[1] 2.4020000 GHz CF 2.402 GHz 1001 pts 10.0 MHz/ Span 100.0 MHz</p>	 <p>MultiView : Spectrum Spectrum 2 Spectrum 3 RefLevel 20.00 dBm Offset 0.50 dB RBW 100 kHz Att 20 dB SWF 300 ms VBW 300 kHz Mode Auto Sweep Frequency Sweep M2[1] -11.77 dBm M1[1] 26.2370 GHz M1[1] 5.66 dBm M1[1] 2.5970 GHz CF 2.402 GHz 1001 pts 26.5 GHz/ Span 26.5 GHz</p>
Conducted band-edge / Mid ch.	Conducted spurious / Mid ch.
<p>Blank</p>	 <p>MultiView : Spectrum Spectrum 2 RefLevel 20.00 dBm Offset 0.50 dB RBW 100 kHz Att 20 dB SWF 300 ms VBW 300 kHz Mode Auto Sweep Frequency Sweep M2[1] -13.200 dBm M1[1] 26.0270 GHz M1[1] 5.66 dBm M1[1] 2.4500 GHz CF 2.450 GHz 1001 pts 26.5 GHz/ Span 26.5 GHz</p>
Conducted band-edge / High ch.	Conducted spurious / High ch.
 <p>MultiView : Spectrum Spectrum 2 Spectrum 3 RefLevel 20.00 dBm Offset 0.50 dB RBW 100 kHz Att 20 dB SWF 3.00 ms VBW 300 kHz Mode Auto Sweep Frequency Sweep M2[1] -14.710 dBm M1[1] 2.4830000 GHz M1[1] 5.29 dBm M1[1] 2.4800000 GHz CF 2.48 GHz 1001 pts 10.0 MHz/ Span 100.0 MHz</p>	 <p>MultiView : Spectrum Spectrum 2 Spectrum 3 RefLevel 20.00 dBm Offset 0.50 dB RBW 100 kHz Att 20 dB SWF 300 ms VBW 300 kHz Mode Auto Sweep Frequency Sweep M2[1] -15.140 dBm M1[1] 7.4170 GHz M1[1] 4.96 dBm M1[1] 2.4760 GHz CF 2.476 GHz 1001 pts 26.5 GHz/ Span 26.5 GHz</p>

LE_2 MBit/s(37 Bytes)

Conducted band-edge / Low ch.



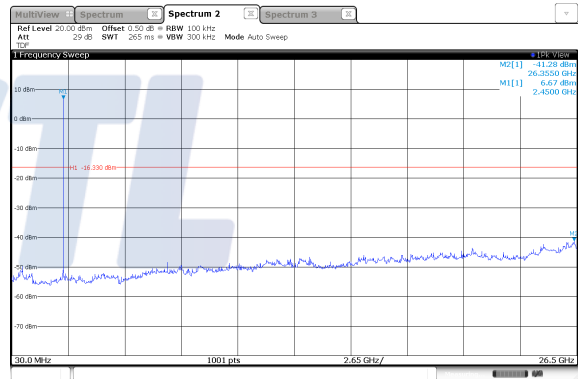
Conducted spurious / Low ch.



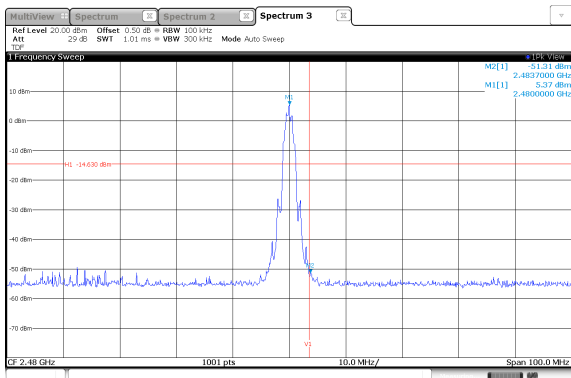
Conducted band-edge / Mid ch.

Blank

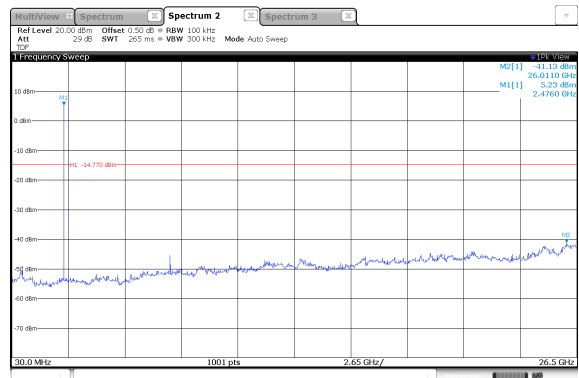
Conducted spurious / Mid ch.



Conducted band-edge / High ch.

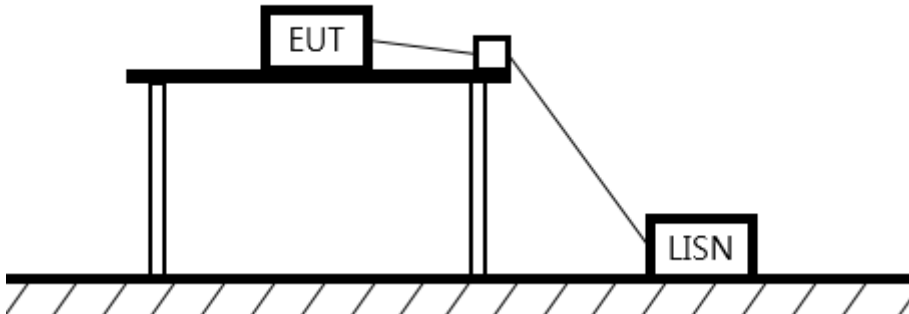


Conducted spurious / High ch.



7.5. 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 kHz to 30 MHz, shall not exceed the limits in the following table, as measured using a 50 μ H/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 (MHz)	Conducted limit (dB μ V/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 cm in which is located 40 cm 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 50 Ω /50 μ H LISN, which is an input transducer to a spectrum analyzer or an EMI/Field Intensity 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 MHz to 30 MHz.
5. The measurements were made with the detector set to peak amplitude within a bandwidth of 10 kHz or to quasi-peak and average within a bandwidth of 9 kHz. The EUT was in transmitting mode during the measurements.

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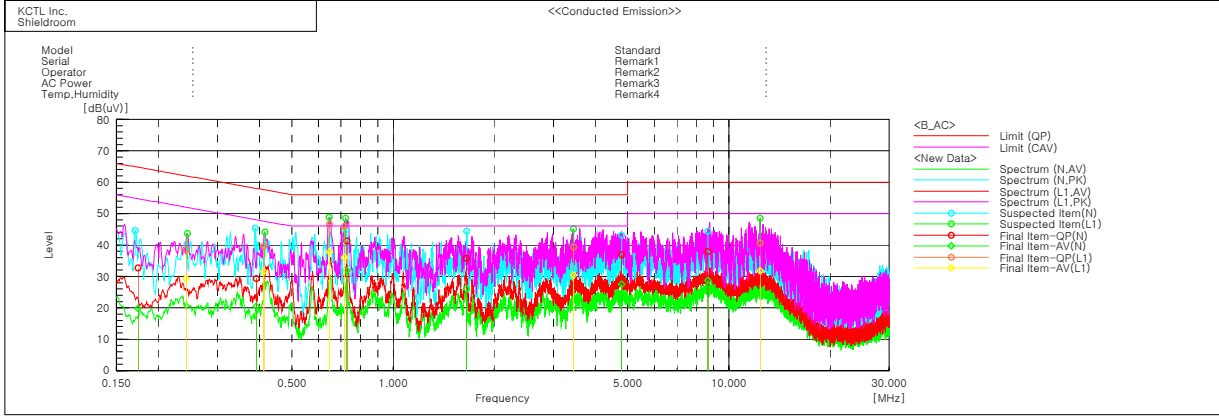
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Test results–Worst case: 2 MBits/s(37 Bytes) Lowest frequency



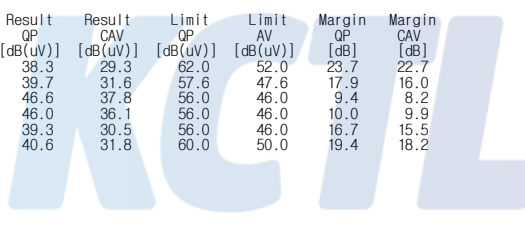
Final Result

--- 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	0.17423	22.6	9.7	10.1	32.7	19.8	64.8	54.8	32.1	35.0
2	0.39167	19.6	10.7	9.8	29.4	20.5	58.0	48.0	28.6	27.5
3	0.7283	31.4	22.1	9.8	41.2	31.9	56.0	46.0	14.8	14.1
4	1.6538	26.1	16.3	9.7	35.8	26.0	56.0	46.0	20.2	20.0
5	4.78869	27.3	17.8	9.6	36.9	27.4	56.0	46.0	19.1	18.6
6	8.66634	28.1	18.9	9.8	37.9	28.7	60.0	50.0	22.1	21.3

--- 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	0.24171	28.6	19.6	9.7	38.3	29.3	62.0	52.0	23.7	22.7
2	0.41219	29.9	21.8	9.8	39.7	31.6	57.6	47.6	17.9	16.0
3	0.64732	36.8	28.0	9.8	46.6	37.8	56.0	46.0	9.4	8.2
4	0.71714	36.2	26.3	9.8	46.0	36.1	56.0	46.0	10.0	9.9
5	3.44872	29.7	20.9	9.6	39.3	30.5	56.0	46.0	16.7	15.5
6	12.38518	30.7	21.9	9.9	40.6	31.8	60.0	50.0	19.4	18.2



8. Measurement equipment

Equipment Name	Manufacturer	Model No.	Serial No.	Next Cal. Date
Spectrum Analyzer	R&S	FSW50	101013	20.05.13
Spectrum Analyzer	R&S	FSV40	100988	20.01.04
Wideband Power Sensor	R&S	NRP-Z81	102398	20.01.25
ATTENUATOR	R&S	DNF Dämpfungsglied 10 dB in N-50 Ohm	31212	20.05.13
EMI TEST RECEIVER	R&S	ESC17	100732	20.08.22
Bi-Log Antenna	SCHWARZBECK	VULB 9168	583	20.05.04
Amplifier	SONOMA INSTRUMENT	310N	284608	20.08.22
COAXIAL FIXED ATTENUATOR	Agilent	8491B-003	2708A18758	20.05.04
Horn antenna	ETS.lindgren	3116	00086632	20.02.15
Horn antenna	ETS.lindgren	3117	155787	20.10.24
Attenuator	API Inmet	40AH2W-10	12	20.05.15
Broadband PreAmplifier	SCHWARZBECK	BBV9718	216	20.07.30
AMPLIFIER	L-3 Narda-MITEQ	AMF-7D-01001800 -22-10P	2031196	20.02.21
AMPLIFIER	L-3 Narda-MITEQ	JS44-18004000-33-8P	2000996	20.01.28
LOOP Antenna	R&S	HFH2-Z2	100355	20.08.24
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	20.05.14
TWO-LINE V - NETWORK	R&S	ENV216	101358	20.04.05
EMI TEST RECEIVER	R&S	ESCI	100001	20.08.22
Vector Signal Generator	R&S	SMBV100A	257566	20.01.04
Signal Generator	R&S	SMR40	100007	20.05.13
Cable Assembly	RadiAll	2301761768000PJ	1724.659	-
Cable Assembly	gigalane	RG-400	-	-
Cable Assembly	HUER+SUHNER	SUCOFLEX 104	MY4342/4	-

End of test report