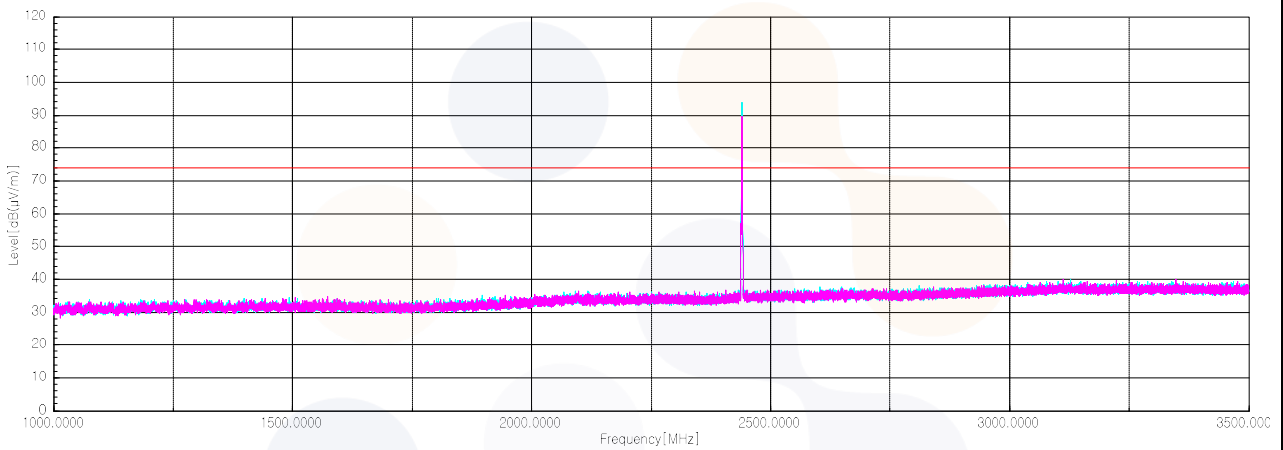


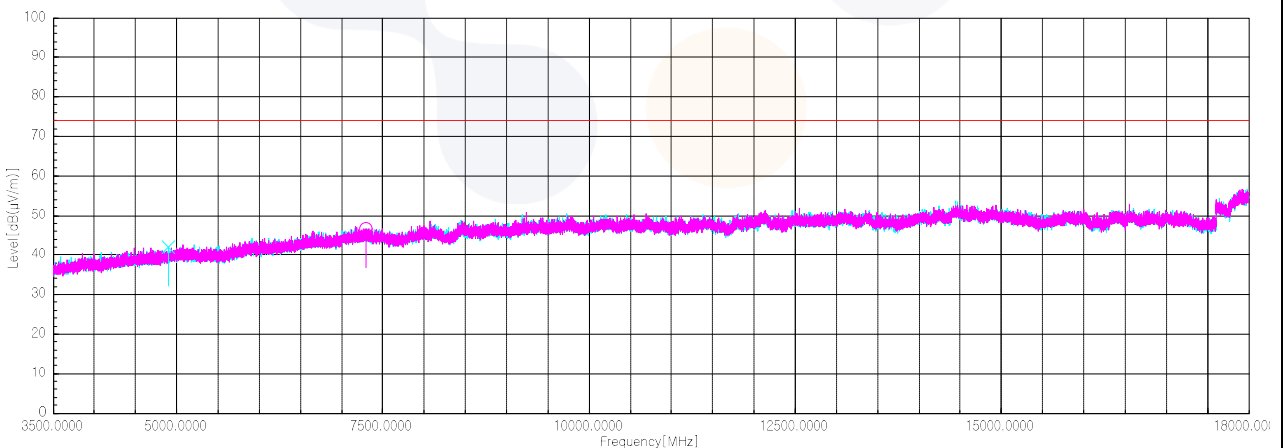
Middle Channel

Frequency	Pol.	Reading	Antenna Factor	Amp. + Cable	DCF	Result	Limit	Margin
[MHz]	[V/H]	[dB(μV)]	[dB]	[dB]	[dB]	[dB(μV/m)]	[dB(μV/m)]	[dB]
Peak data								
4 898.77 ¹⁾	V	52.90	32.60	-43.41	-	42.09	74.00	31.91
7 296.58 ¹⁾	H	51.30	36.89	-41.26	-	46.93	74.00	27.07
Average Data								
No spurious emissions were detected within 20 dB of the limit.								

Horizontal/Vertical for 1 GHz ~ 3.5 GHz



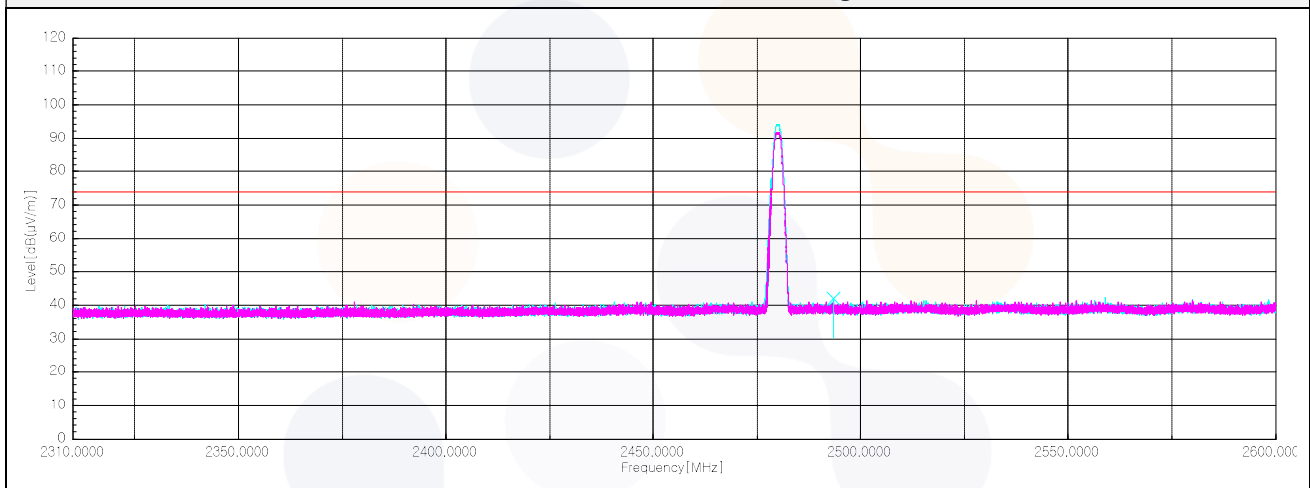
Horizontal/Vertical for 3.5 GHz ~ 18 GHz



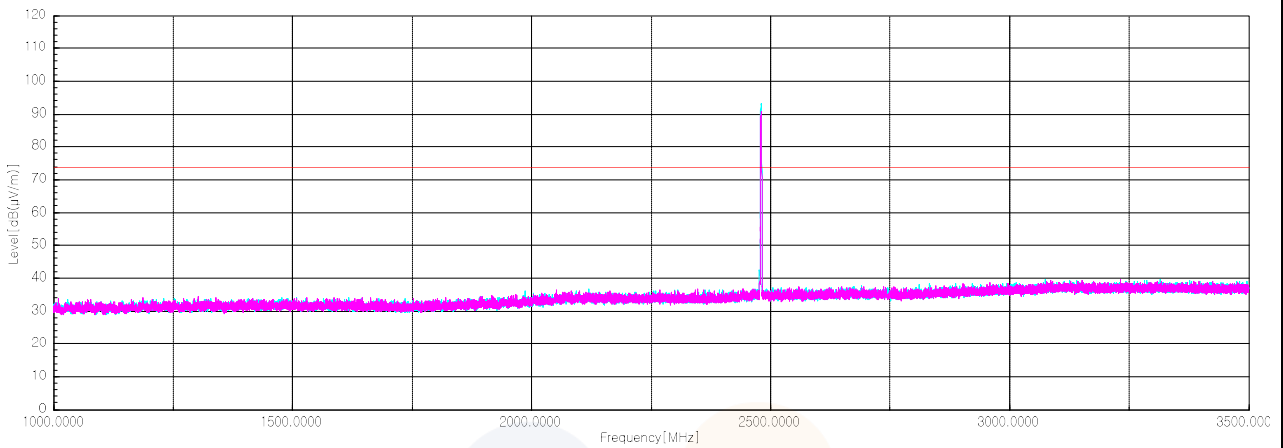
High Channel

Frequency	Pol.	Reading	Antenna Factor	Amp. + Cable	DCF	Result	Limit	Margin
[MHz]	[V/H]	[dB(μV)]	[dB]	[dB]	[dB]	[dB(μV/m)]	[dB(μV/m)]	[dB]
Peak data								
2 493.47 ¹⁾	V	44.60	27.50	-30.25	-	41.85	74.00	32.15
4 964.98 ¹⁾	H	52.30	32.66	-43.19	-	41.77	74.00	32.23
7 451.73 ¹⁾	V	51.70	36.19	-41.31	-	46.58	74.00	27.42
Average Data								
No spurious emissions were detected within 20 dB of the limit.								

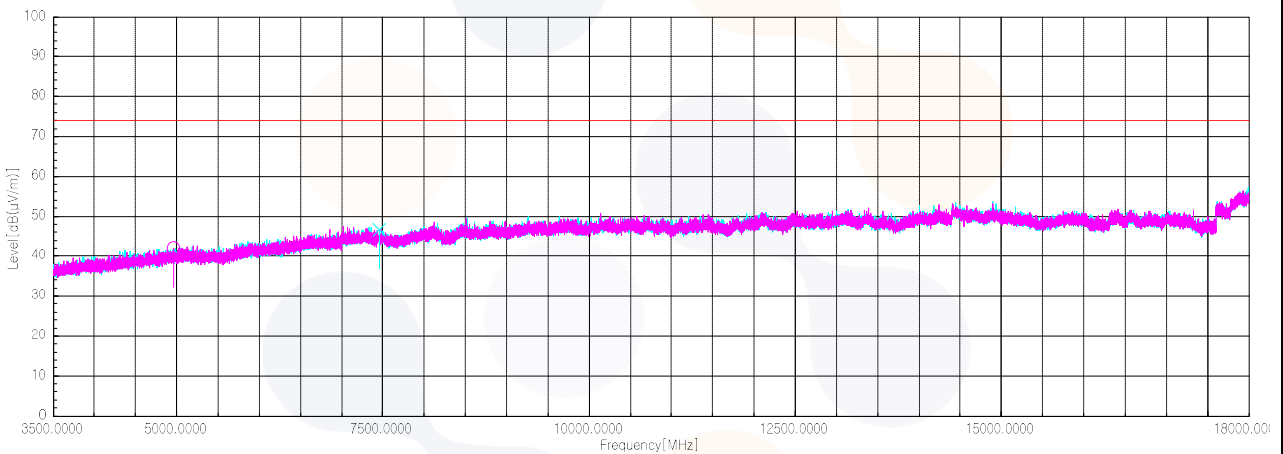
Horizontal/Vertical for Band-edge



Horizontal/Vertical for 1 GHz ~ 3.5 GHz



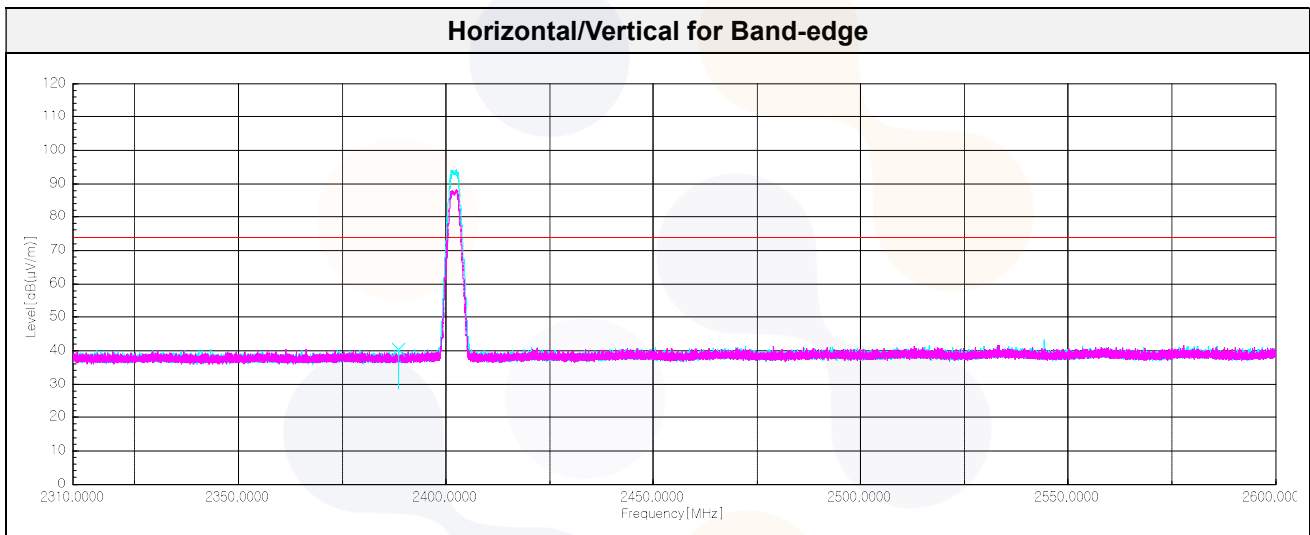
Horizontal/Vertical for 3.5 GHz ~ 18 GHz



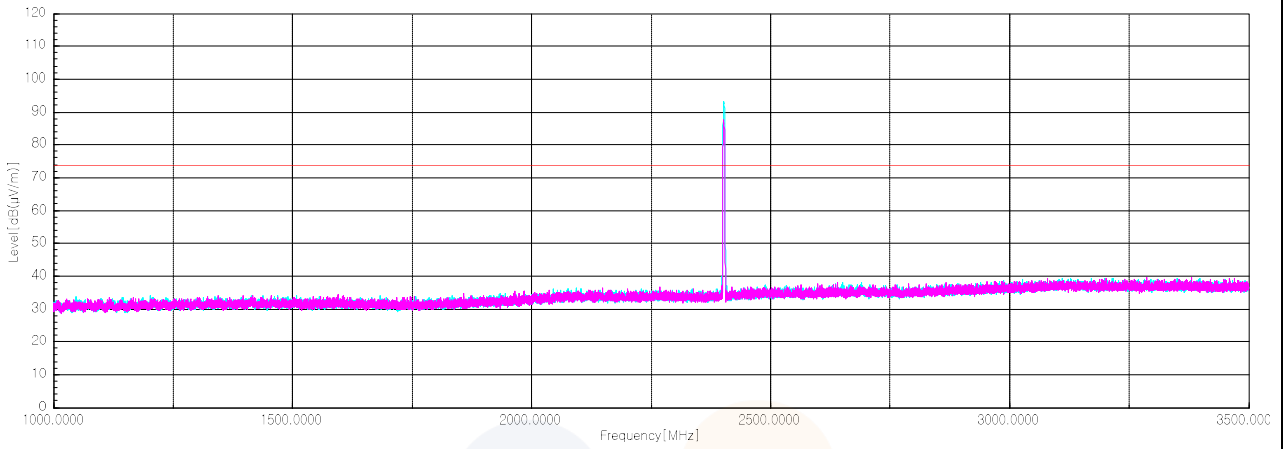
2 MBits/s(37 Bytes)

Low Channel

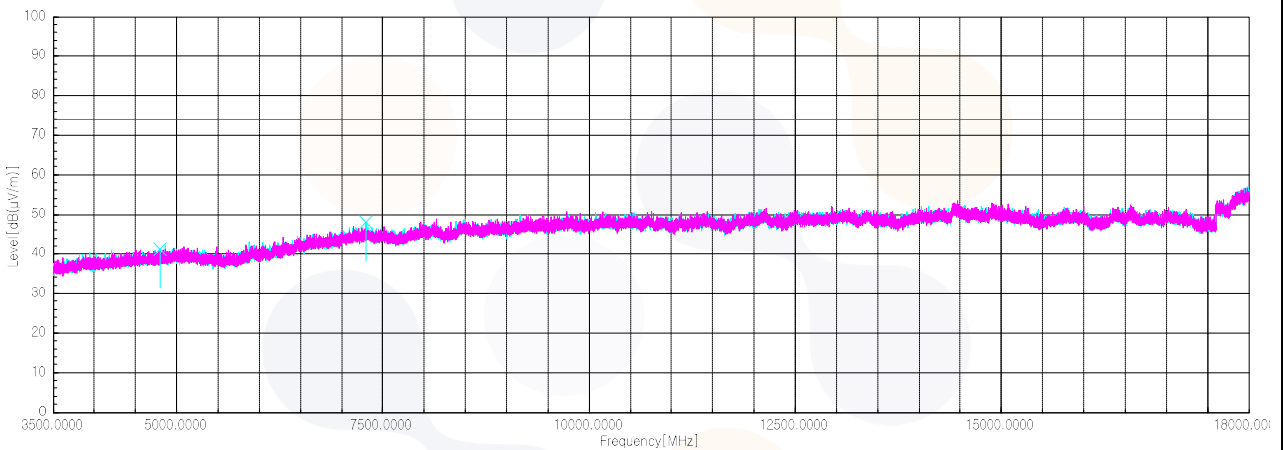
Frequency	Pol.	Reading	Antenna Factor	Amp. + Cable	DCF	Result	Limit	Margin
[MHz]	[V/H]	[dB(μV)]	[dB]	[dB]	[dB]	[dB(μV/m)]	[dB(μV/m)]	[dB]
Peak data								
2 388.56 ¹⁾	V	43.70	26.99	-30.36	-	40.33	74.00	33.67
4 798.23 ¹⁾	V	52.90	32.09	-43.85	-	41.14	74.00	32.86
7 299.97 ¹⁾	V	52.50	36.90	-41.25	-	48.15	74.00	25.85
Average Data								
No spurious emissions were detected within 20 dB of the limit.								



Horizontal/Vertical for 1 GHz ~ 3.5 GHz



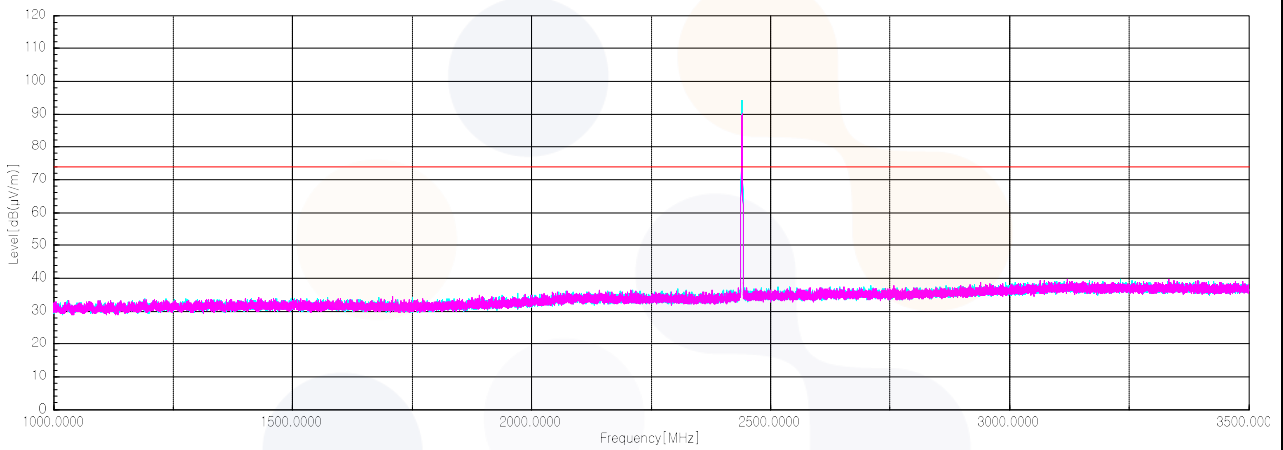
Horizontal/Vertical for 3.5 GHz ~ 18 GHz



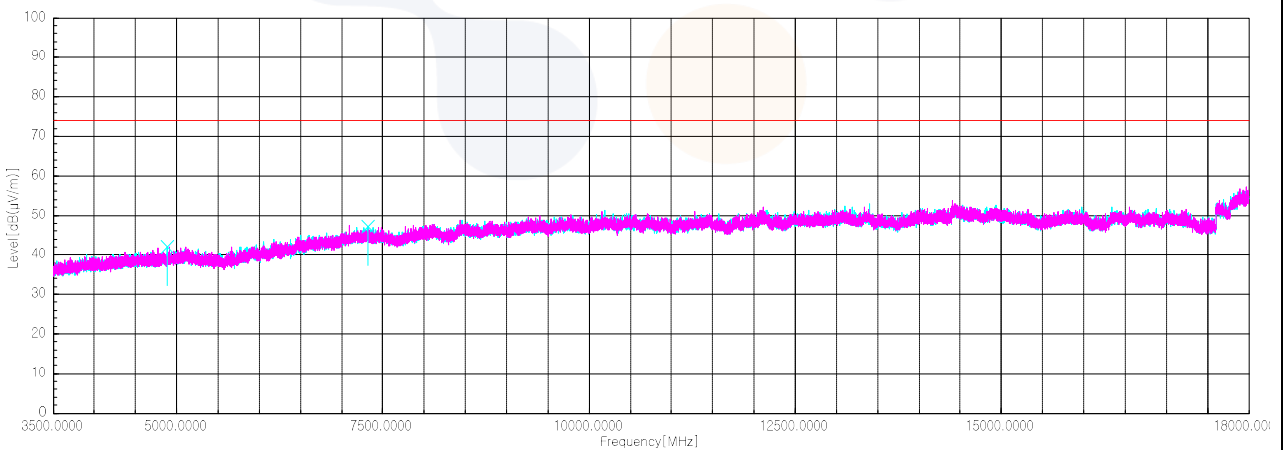
Middle Channel

Frequency	Pol.	Reading	Antenna Factor	Amp. + Cable	DCF	Result	Limit	Margin
[MHz]	[V/H]	[dB(μV)]	[dB]	[dB]	[dB]	[dB(μV/m)]	[dB(μV/m)]	[dB]
Peak data								
4 880.40 ¹⁾	V	53.00	32.52	-43.49	-	42.03	74.00	31.97
7 319.78 ¹⁾	V	51.70	36.66	-41.27	-	47.09	74.00	26.91
Average Data								
No spurious emissions were detected within 20 dB of the limit.								

Horizontal/Vertical for 1 GHz ~ 3.5 GHz



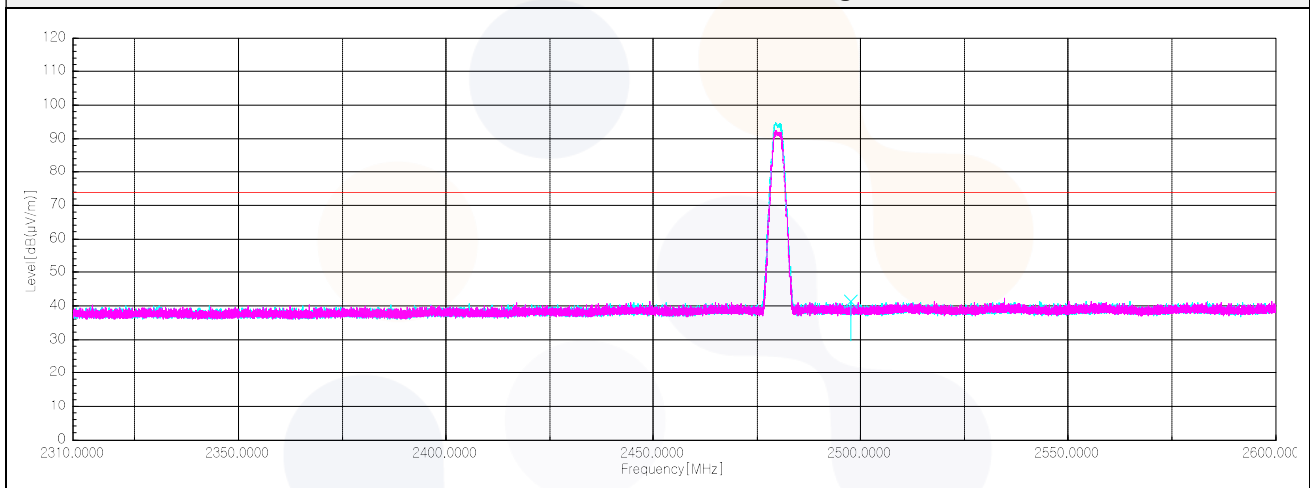
Horizontal/Vertical for 3.5 GHz ~ 18 GHz



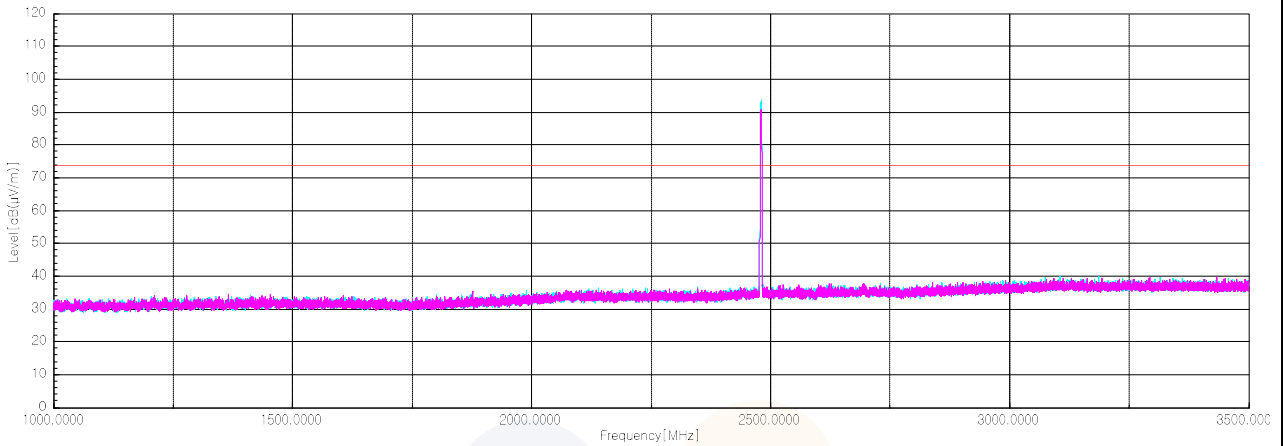
High Channel

Frequency	Pol.	Reading	Antenna Factor	Amp. + Cable	DCF	Result	Limit	Margin
[MHz]	[V/H]	[dB(μV)]	[dB]	[dB]	[dB]	[dB(μV/m)]	[dB(μV/m)]	[dB]
Peak data								
2 497.63 ¹⁾	V	43.80	27.50	-30.23	-	41.07	74.00	32.93
4 963.53 ¹⁾	V	51.60	32.65	-43.19	-	41.06	74.00	32.94
7 428.05 ¹⁾	H	51.30	36.34	-41.38	-	46.26	74.00	27.74
Average Data								
No spurious emissions were detected within 20 dB of the limit.								

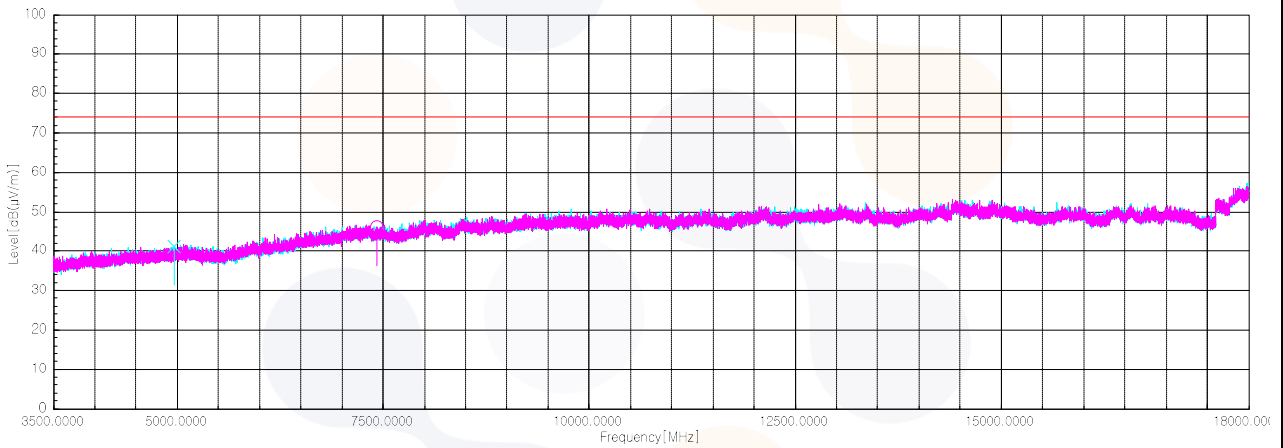
Horizontal/Vertical for Band-edge



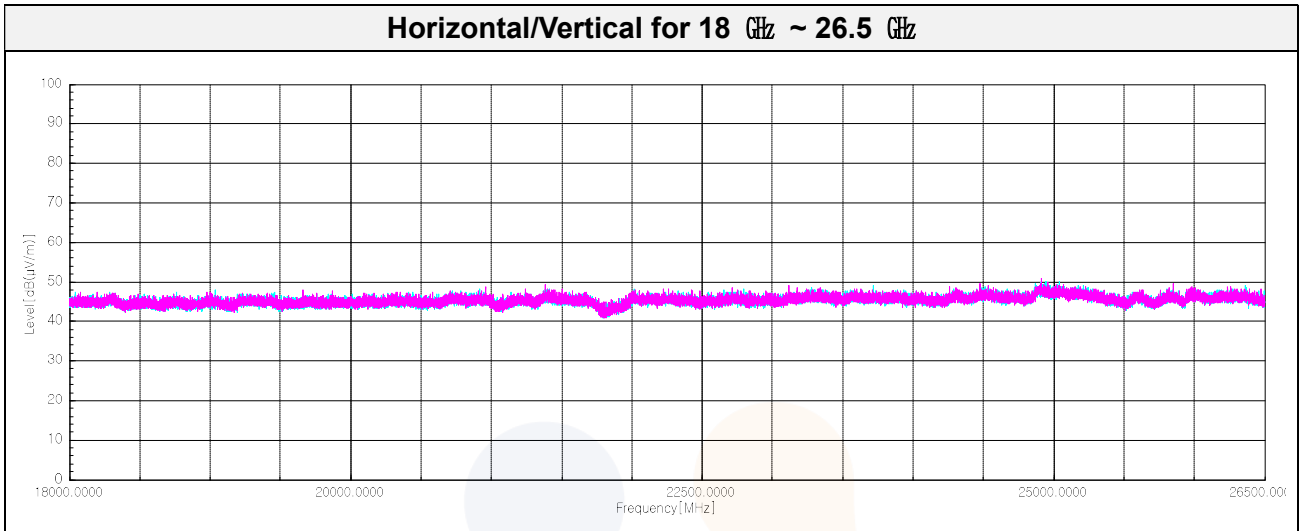
Horizontal/Vertical for 1 GHz ~ 3.5 GHz



Horizontal/Vertical for 3.5 GHz ~ 18 GHz



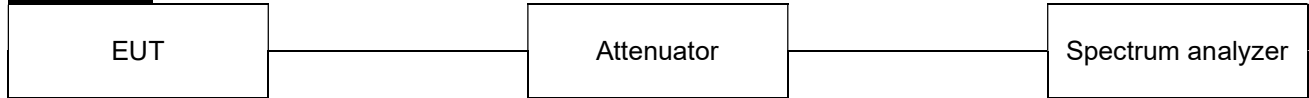
Test results (Above 18 GHz) – Worst case: 2 Mbits/s(37 Bytes) 2 402 MHz



Note: The Worst case was based on the lowest margin condition considering Harmonic and Spurious Emission

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
KDB 558074 D01 v05 - Section 8.5

Test settings

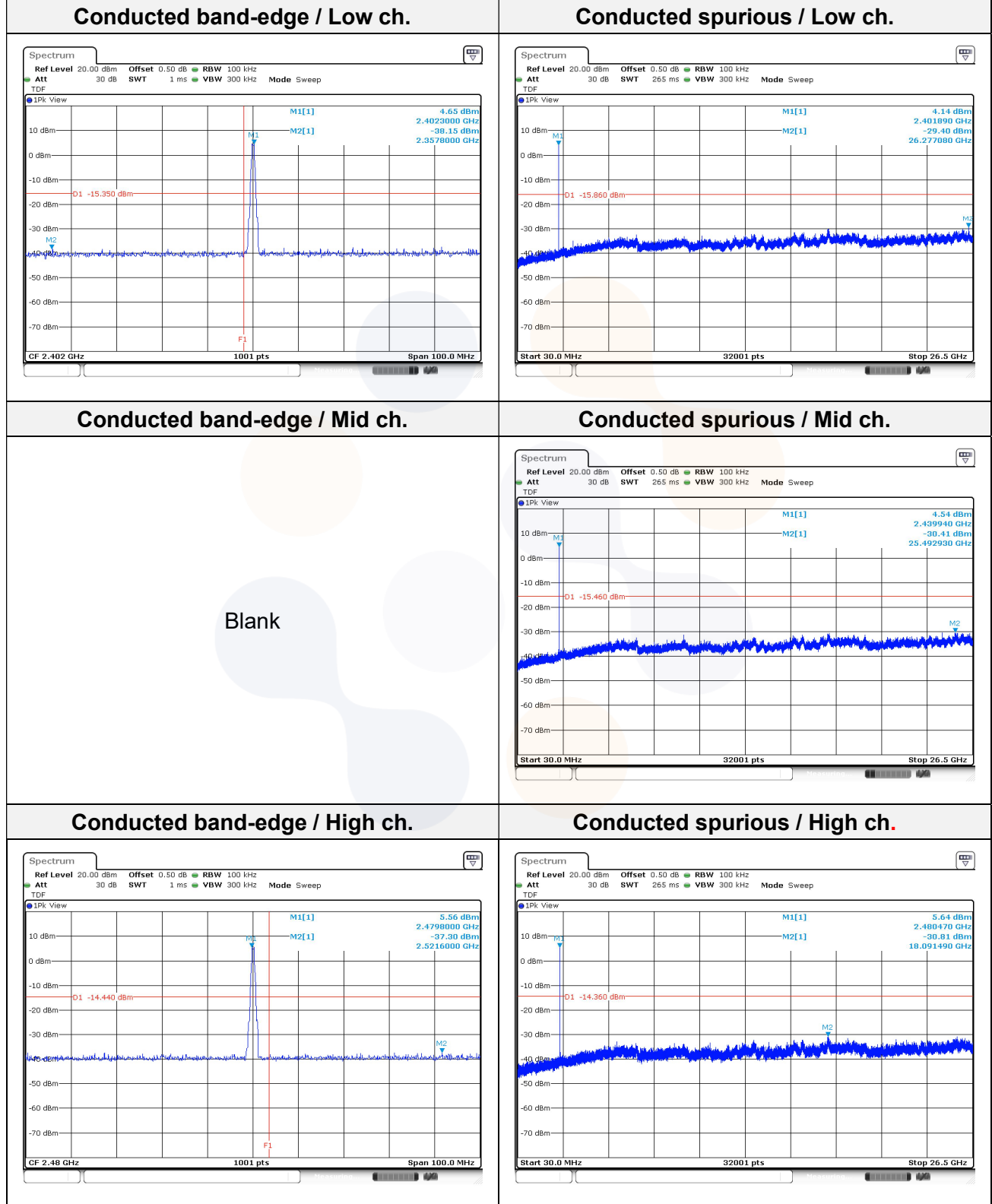
Establish an emission level by using the following procedure:

- 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 × 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.

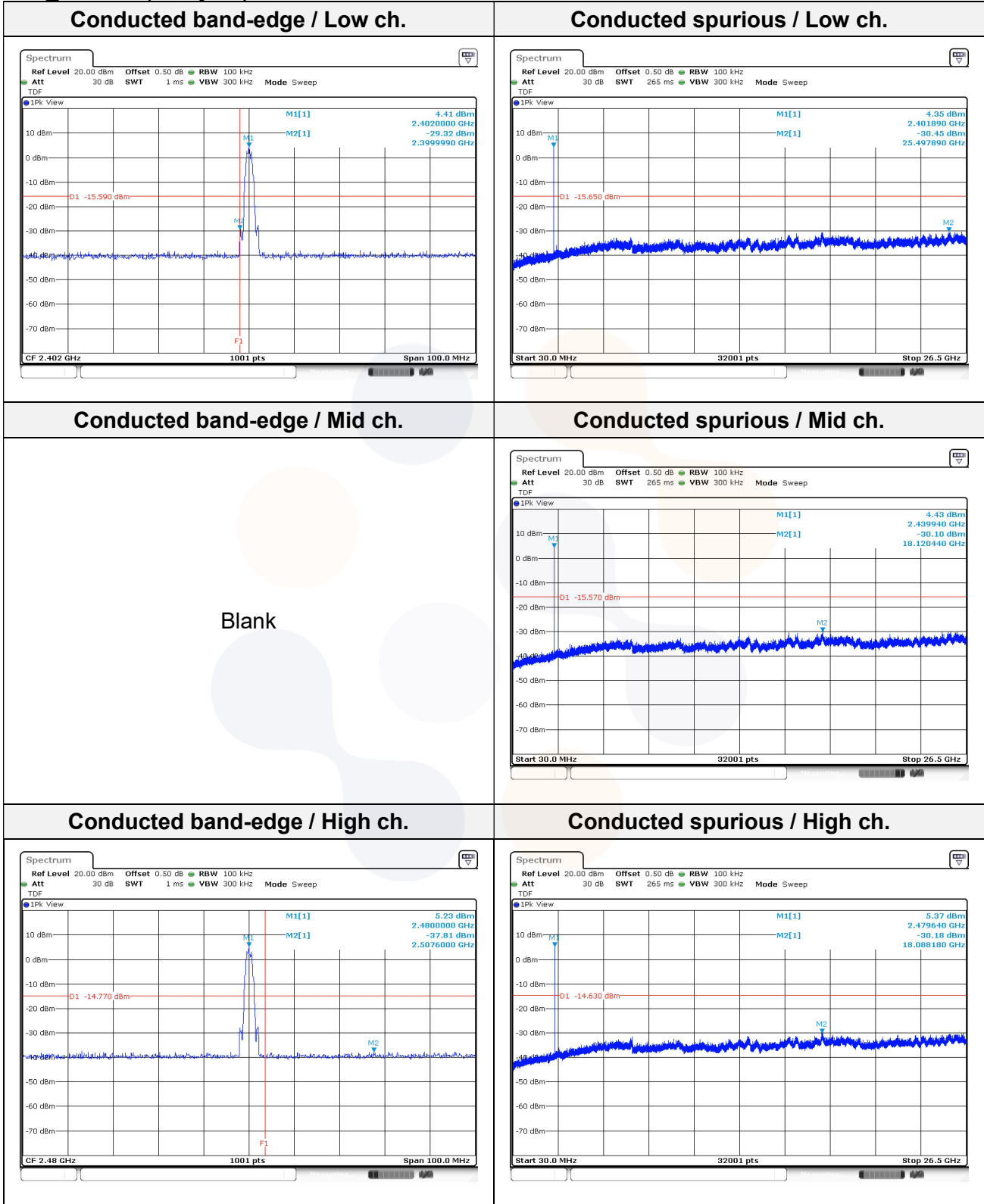
Ensure that the amplitude of all unwanted emissions outside of the authorized frequency band (excluding restricted frequency bands) is attenuated by at least the minimum requirements specified in 11.11. Report the three highest emissions relative to the limit.

Test results

BLE_1 MBit/s(37 Bytes)

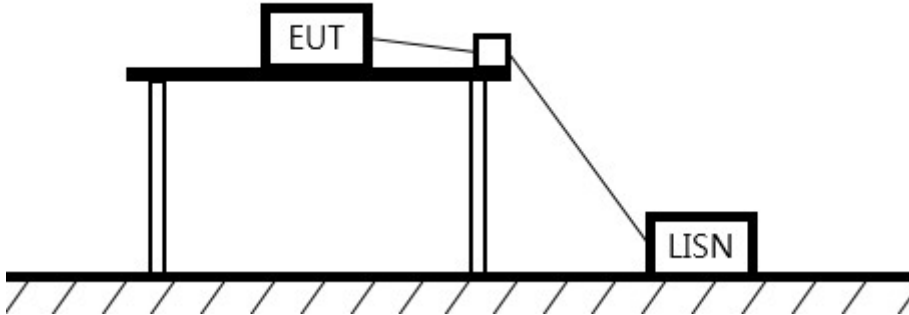


BLE_2 MBit/s(37 Bytes)



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 kHz to 30 MHz, 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.

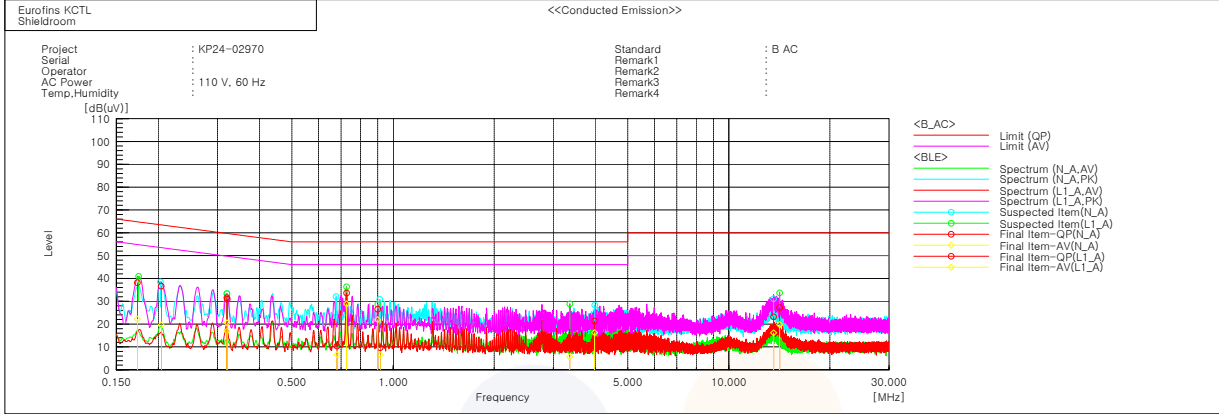
Frequency of Emission (MHz)	Conducted limit (dB μ V/m)	
	Quasi-peak	Average
0.15 – 0.50	66 - 56*	56 - 46*
0.50 – 5.00	56	46
5.00 – 30.0	60	50

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 in 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.

Test results

Worst case: 2 Mbits/s(37 Bytes) 2 402 MHz



Final Result

--- N_A Phase ---										
No.	Frequency [MHz]	Reading OP [dB(uV)]	Reading CAV [dB(uV)]	c.f [dB]	Result OP [dB(uV)]	Result CAV [dB(uV)]	Limit OP [dB(uV)]	Limit AV [dB(uV)]	Margin OP [dB]	Margin CAV [dB]
1	0.20385	26.4	9.4	10.2	36.6	19.6	63.5	53.5	26.9	33.9
2	0.31987	21.5	6.9	10.1	31.6	17.0	59.7	49.7	28.1	32.7
3	0.68072	0.2	-3.5	10.1	10.3	6.6	56.0	46.0	45.7	39.4
4	0.91539	-0.4	-3.4	10.0	9.6	6.6	56.0	46.0	46.4	39.4
5	3.98137	11.3	6.2	10.0	21.3	16.2	56.0	46.0	34.7	29.8
6	13.59141	12.4	5.3	10.8	23.2	16.1	60.0	50.0	36.8	33.9

--- L1_A Phase ---										
No.	Frequency [MHz]	Reading OP [dB(uV)]	Reading CAV [dB(uV)]	c.f [dB]	Result OP [dB(uV)]	Result CAV [dB(uV)]	Limit OP [dB(uV)]	Limit AV [dB(uV)]	Margin OP [dB]	Margin CAV [dB]
1	0.17316	27.7	11.7	10.4	38.1	22.1	64.8	54.8	26.7	32.7
2	0.32068	20.8	10.4	10.1	30.9	20.5	59.7	49.7	28.8	29.2
3	0.72748	23.6	18.9	10.0	33.6	28.9	56.0	46.0	22.4	17.1
4	0.89942	16.5	11.9	10.0	26.5	21.9	56.0	46.0	29.5	24.1
5	3.3558	1.3	-4.3	9.9	11.2	5.6	56.0	46.0	44.8	40.4
6	14.17325	16.3	8.8	10.9	27.2	19.7	60.0	50.0	32.8	30.3

8. Measurement equipment

Equipment Name	Manufacturer	Model No.	Serial No.	Next Cal. Date
Spectrum Analyzer	R&S	FSV30	100807	24.07.03
Spectrum Analyzer	R&S	FSV40	100988	24.07.03
PSA Spectrum Analyzer	Agilent	E4440A	MY44303500	24.07.04
EMI TEST RECEIVER	R&S	ESC13	101408	24.08.18
Signal Generator	R&S	SMB100A	176206	25.01.18
DC Power Supply	AGILENT	E3632A	MY51220373	24.07.03
DC Power Supply	POWERCOM	DCP-50100A	20220610-01	25.01.19
Attenuator	API Inmet	40AH2W-10	10	24.07.04
Attenuator	HP	8491A	29738	24.10.12
Power Sensor	R&S	NRP-Z81	1137.9009.02-106225-JM	25.04.24
Amplifier	SONOMA INSTRUMENT	310N	421910	24.10.12
Broadband PreAmplifier	SCHWARZBECK	BBV9718D	53	25.01.19
Low Noise Amplifier	TESTEK	TK-PA18H	220123-L	24.10.12
Low Noise Amplifier	TESTEK	TK-PA1840H	220234-L	24.10.17
Bilog Antenna	Teseq GmbH	CBL 6112D	61521	24.11.17
Loop Antenna	R&S	HFH2-Z2	100355	24.08.10
Horn Antenna	SCHWARZBECK	BBHA9120D	2764	24.10.18
Horn Antenna	SCHWARZBECK	BBHA9170	1266	24.10.16
High Pass Filter	Wainwright Instruments GmbH	WHKX12-2805-3000-18000-40SS	SN59	24.10.16
High Pass Filter	QOTANA TECHNOLOGIES	DBHF058004000A	23041800061	24.07.10
TWO-LINE V - NETWORK	R&S	ENV216	101358	24.09.27

End of test report