1) As an alternative, the detector and averaging type may be set for linear voltage averaging.
2) Some instruments require linear display mode to use linear voltage averaging. Log or dB averaging shall not be used.

7. Sweep time = auto.
8. Perform a trace average of at least 100 traces.
9. A correction factor shall be added to the measurement results prior to comparing with the emission limit to compute the emission level that would have been measured had the test been performed at 100% duty cycle. The correction factor is computed as follows:
   1) If power averaging (rms) mode was used in step f), then the applicable correction factor is [10 log (1 / D)], where D is the duty cycle.
   2) If linear voltage averaging mode was used in step f), then the applicable correction factor is [20 log (1 / D)], where D is the duty cycle.
   3) If a specific emission is demonstrated to be continuous (D ≥ 98%) rather than turning ON and OFF with the transmit cycle, then no duty cycle correction is required for that emission.

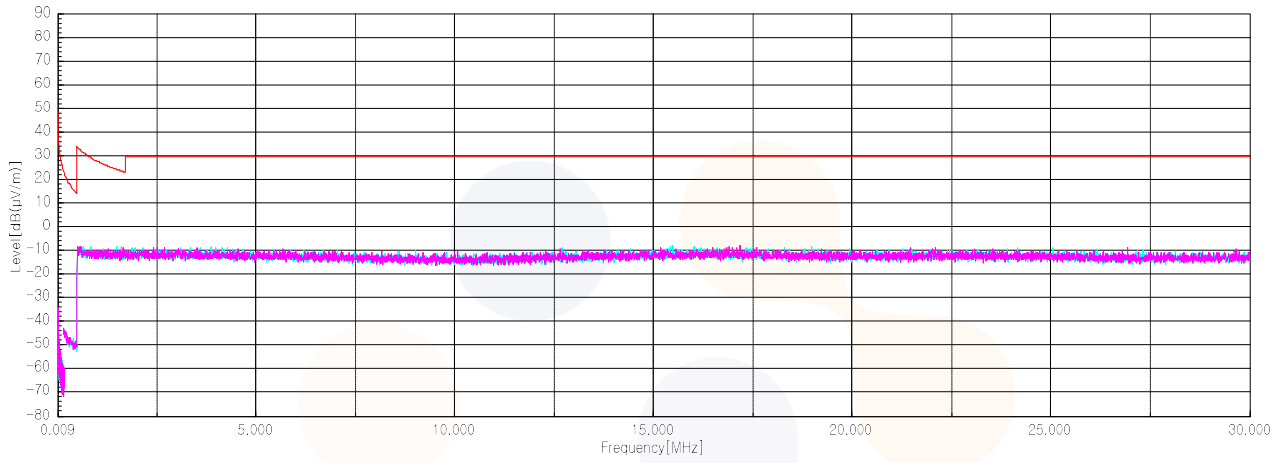
Notes:

1. *f* <30 ㎒, extrapolation factor of 40 dB/decade of distance. $F_d = 40\log(D_m/D_s)$
   f ≥30 ㎒, extrapolation factor of 20 dB/decade of distance. $F_d = 20\log(D_m/D_s)$
   Where:
   F_d= Distance factor in dB
   D_m= Measurement distance in meters
   D_s= Specification distance in meters
2. Factors(dB) = Antenna factor(dB/m) + Cable loss(dB) + or Amp. gain(dB) + or F_d(dB)
3. The worst-case emissions are reported however emissions whose levels were not within 20 dB of respective limits were not reported.
4. Average test would be performed if the peak result were greater than the average limit.
5. 1) means restricted band.
6. Above 1 ㎓ the worst results between two antenna polarizations (H and V) were documented in the test report.
7. Below 30 ㎒ frequency range, In order to search for the worst result, all orientations about parallel, perpendicular, and ground-parallel were investigated then reported. when the emission level was higher than 20 dB of the limit, then the following statement shall be made: “No spurious emissions were detected within 20 dB of the limit.”

Test results (Below 30 ㎒) – Worst case: 2 MBits/s(37 Bytes) 2 402 ㎒

Frequency	Pol.	Reading	Antenna Factor	Amp. + Cable	DCF	Result	Limit	Margin
(㎒)	(V/H)	(dB(㎶))	(dB)	(dB)	(dB)	(dB(㎶/m))	(dB(㎶/m))	(dB)
Quasi peak data								
No spurious emissions were detected within 20 ㏈ of the limit.								

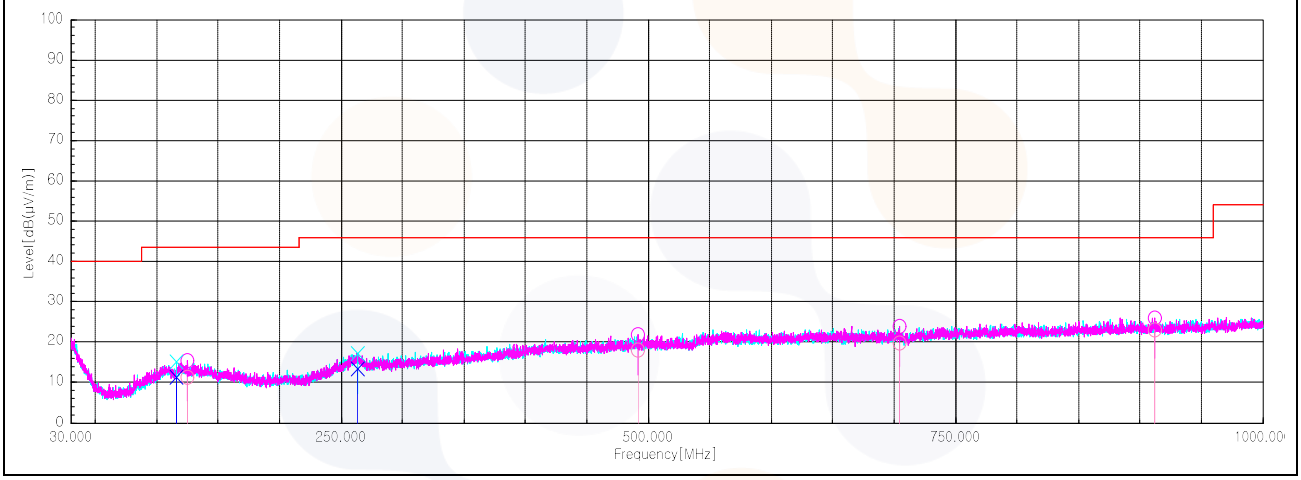
Horizontal/Vertical



Test results (Below 1 000 ㎒) –Worst case: 2 MBits/s(37 Bytes) 2 402 ㎒

Frequency	Pol.	Reading	Antenna Factor	Amp. + Cable	DCF	Result	Limit	Margin
(㎒)	(V/H)	(dB(㎶))	(dB)	(dB)	(dB)	(dB(㎶/m))	(dB(㎶/m))	(dB)
Quasi peak data								
116.45[1)]	V	25.10	17.75	-31.56	-	11.29	43.50	32.21
125.30[1)]	H	24.80	17.90	-31.33	-	11.37	43.50	32.13
263.89[1)]	V	24.30	20.01	-30.96	-	13.35	46.00	32.65
491.72	H	25.20	23.20	-30.54	-	17.86	46.00	28.14
704.27	H	25.20	24.80	-30.19	-	19.81	46.00	26.19
911.85	H	25.20	26.41	-28.65	-	22.96	46.00	23.04

Horizontal/Vertical

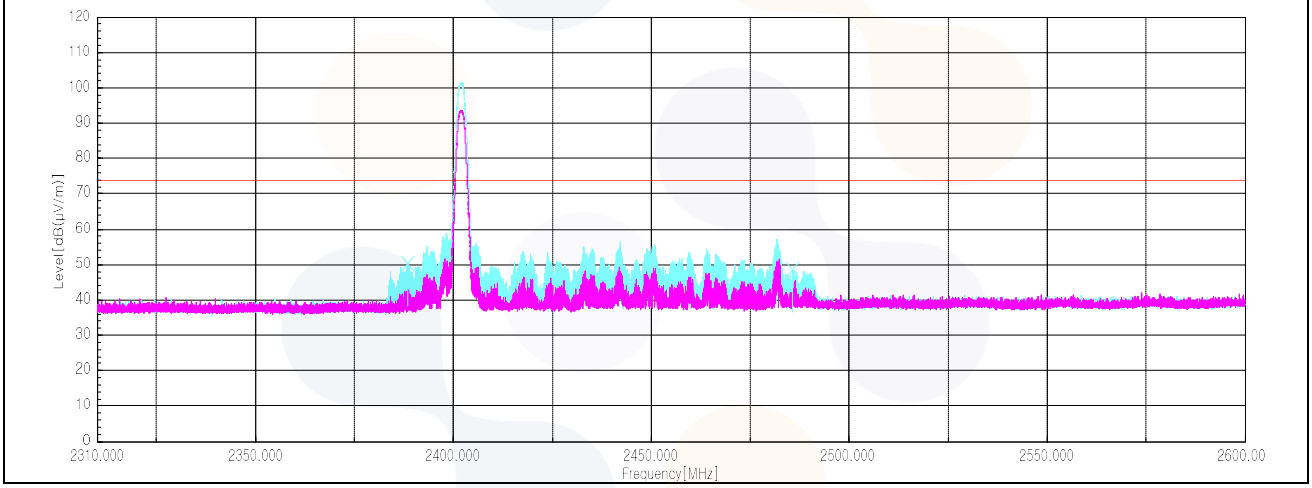


Test results (Above 1 000 ㎒)_1 MBits/s(37 Bytes)

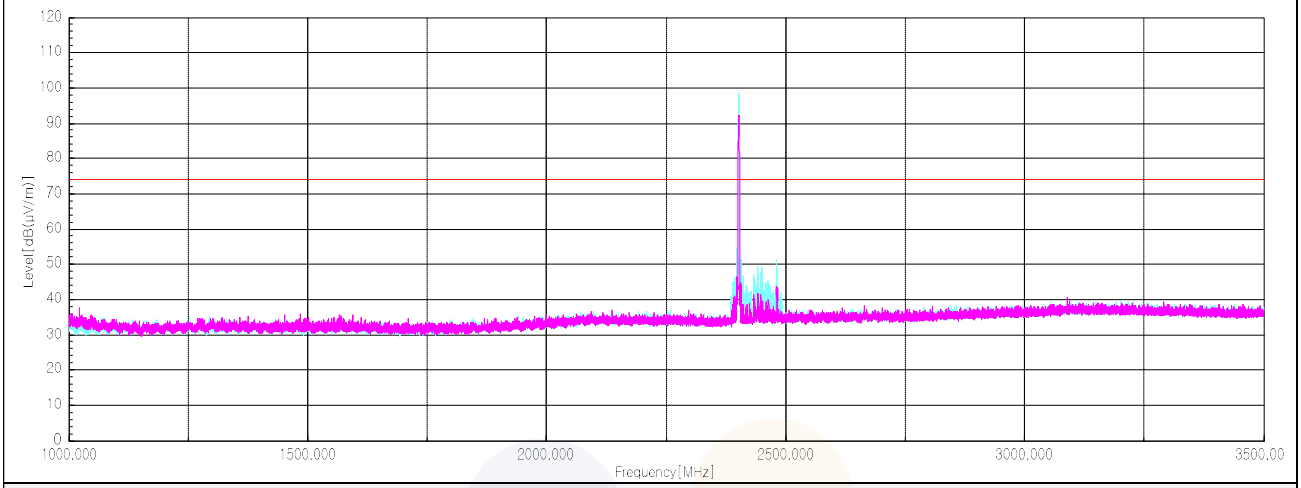
Low Channel

Frequency	Pol.	Reading	Antenna Factor	Amp. + Cable	DCF	Result	Limit	Margin
[㎒]	[V/H]	[dB(μV)]	[dB]	[dB]	[dB]	[dB(μV/m)]	[dB(μV/m)]	[dB]
Peak data								
2 388.42[1)]	V	53.50	27.10	-30.39	-	50.21	74.00	23.79
2 485.71[1)]	V	51.00	27.70	-30.23	-	48.47	74.00	25.53
4 800.17[1)]	H	54.30	32.30	-46.15	-	40.45	74.00	33.55
7 208.62	V	52.00	37.12	-44.31	-	44.81	74.00	29.19
Average Data								
No spurious emissions were detected within 20 ㏈ of the limit.								

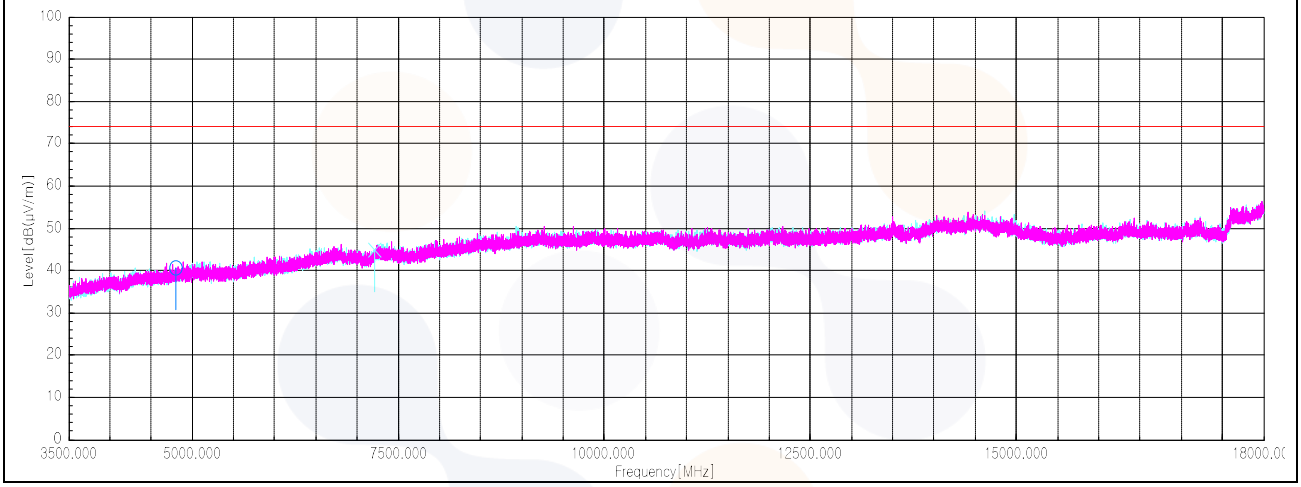
Horizontal/Vertical for Band-edge



Horizontal/Vertical for 1 ㎓ ~ 3.5 ㎓



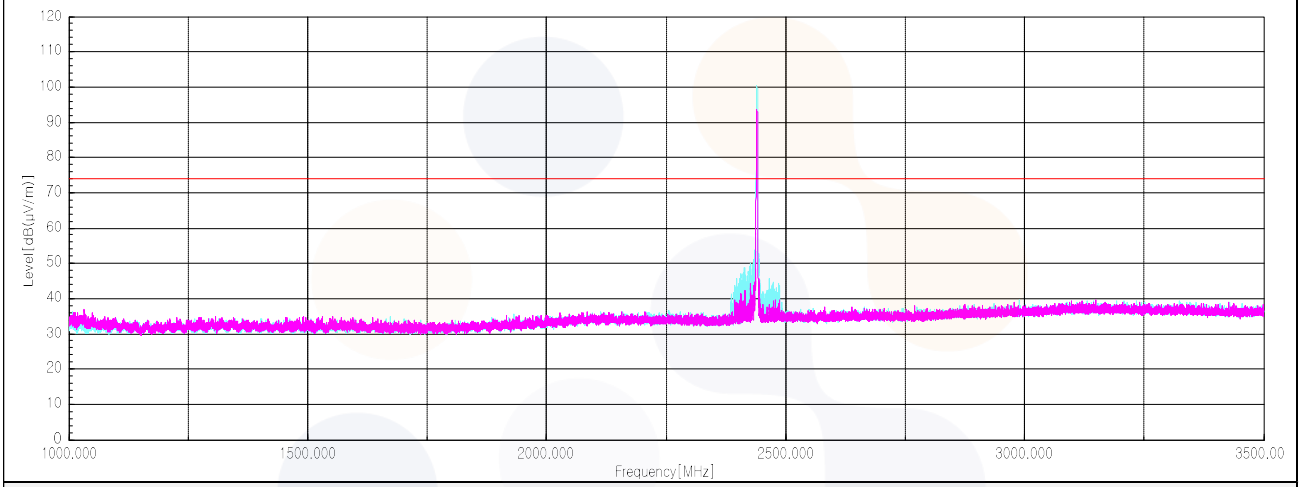
Horizontal/Vertical for 3.5 ㎓ ~ 18 ㎓



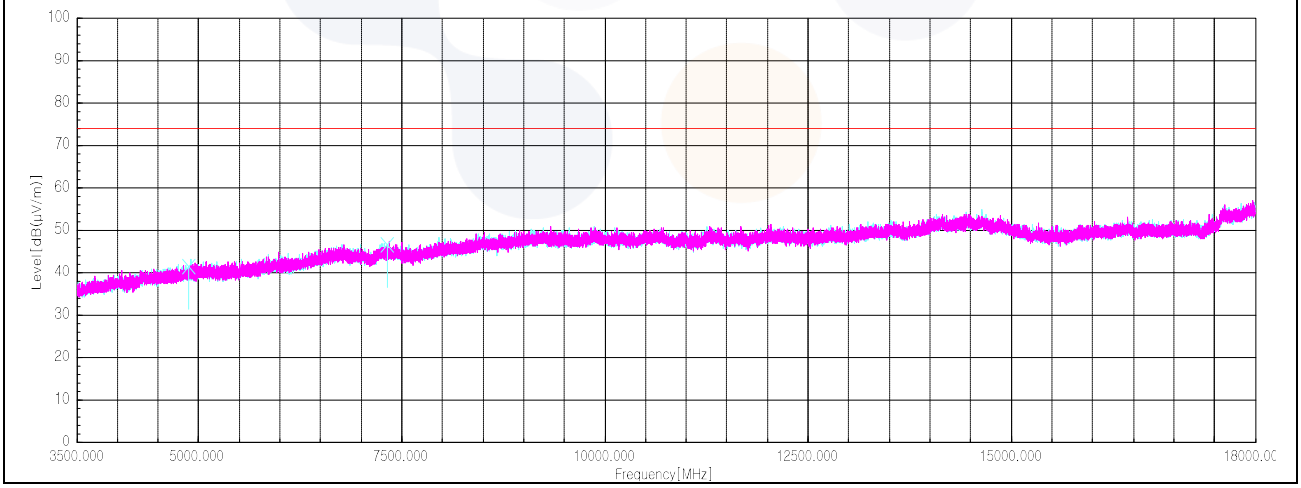
Middle Channel

Frequency	Pol.	Reading	Antenna Factor	Amp. + Cable	DCF	Result	Limit	Margin
[㎒]	[V/H]	[dB(μV)]	[dB]	[dB]	[dB]	[dB(μV/m)]	[dB(μV/m)]	[dB]
Peak data								
4 883.78[1)]	V	54.50	32.80	-45.77	-	41.53	74.00	32.47
7 320.27[1)]	V	53.60	37.02	-44.30	-	46.32	74.00	27.68
Average Data								
No spurious emissions were detected within 20 ㏈ of the limit.								

Horizontal/Vertical for 1 ㎓ ~ 3.5 ㎓



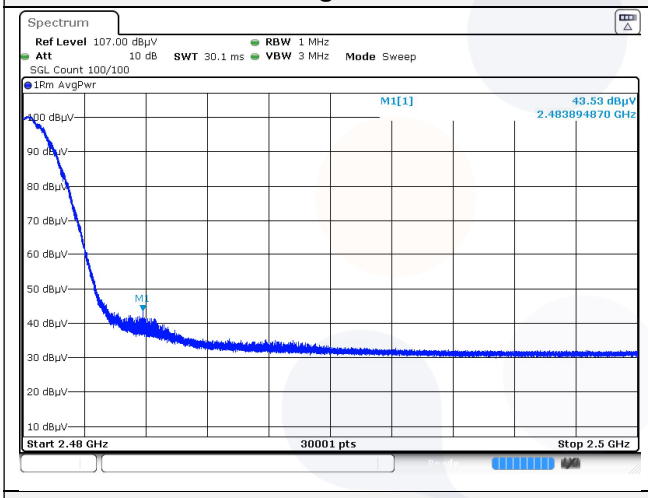
Horizontal/Vertical for 3.5 ㎓ ~ 18 ㎓



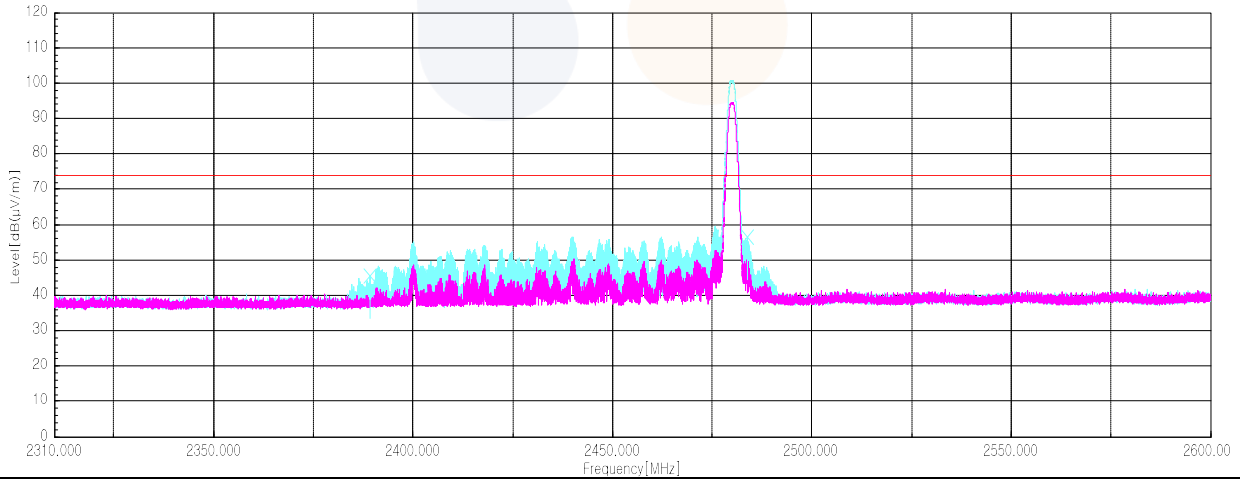
High Channel

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								
2 389.16[1)]	V	48.50	27.10	-30.39	-	45.21	74.00	28.79
2 483.89[1)]	V	58.70	27.70	-30.24	-	56.16	74.00	17.84
4 956.77[1)]	V	53.50	32.81	-45.44	-	40.87	74.00	33.13
7 433.37[1)]	H	53.30	36.83	-44.10	-	46.03	74.00	27.97
Average Data								
2 483.89[1)]	V	43.53	27.70	-30.24	2.15	43.14	54.00	10.86

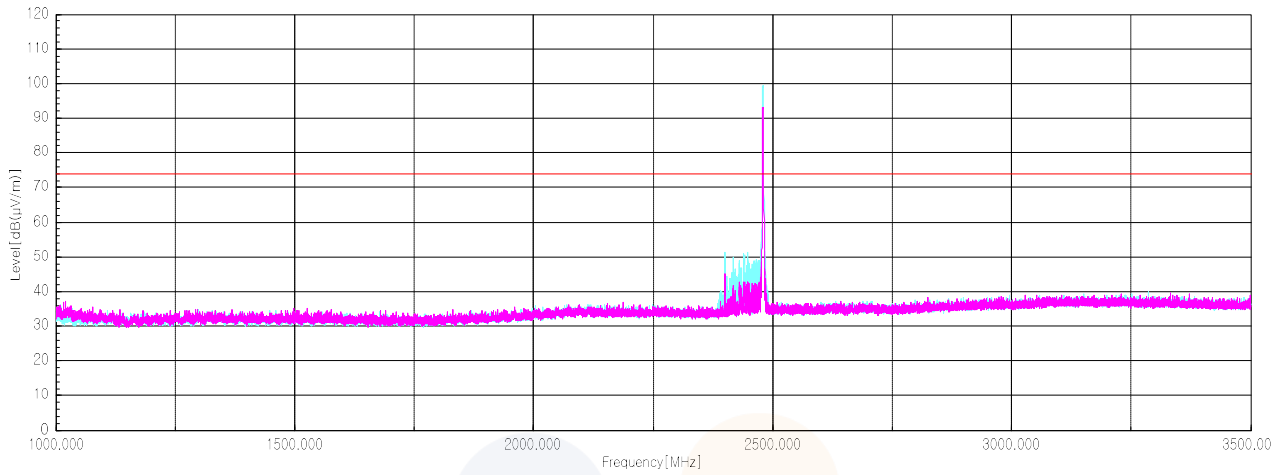
Average Data



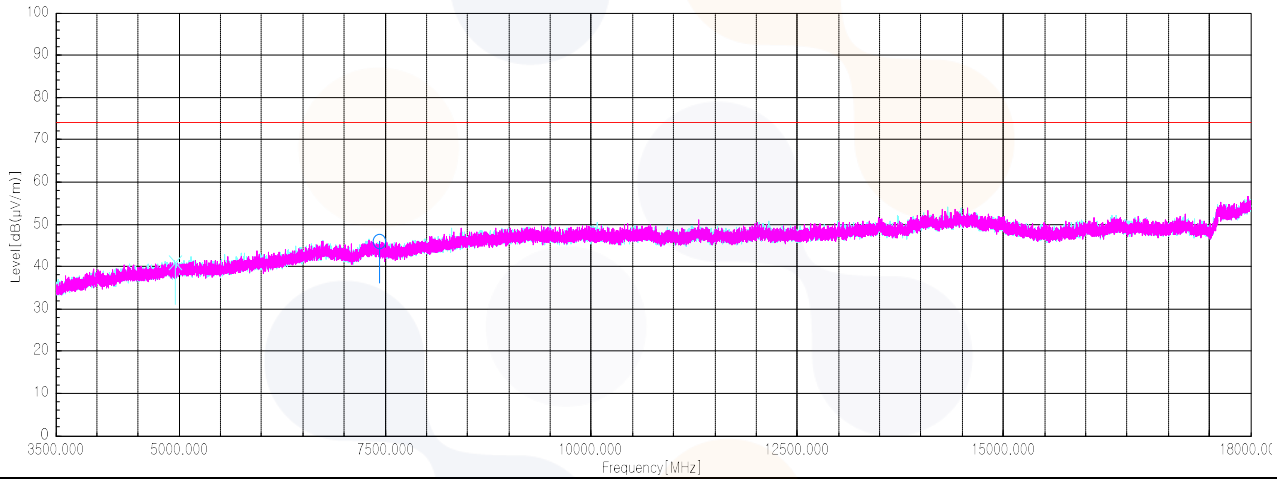
Horizontal/Vertical for Band-edge



Horizontal/Vertical for 1 ㎓ ~ 3.5 ㎓



Horizontal/Vertical for 3.5 ㎓ ~ 18 ㎓

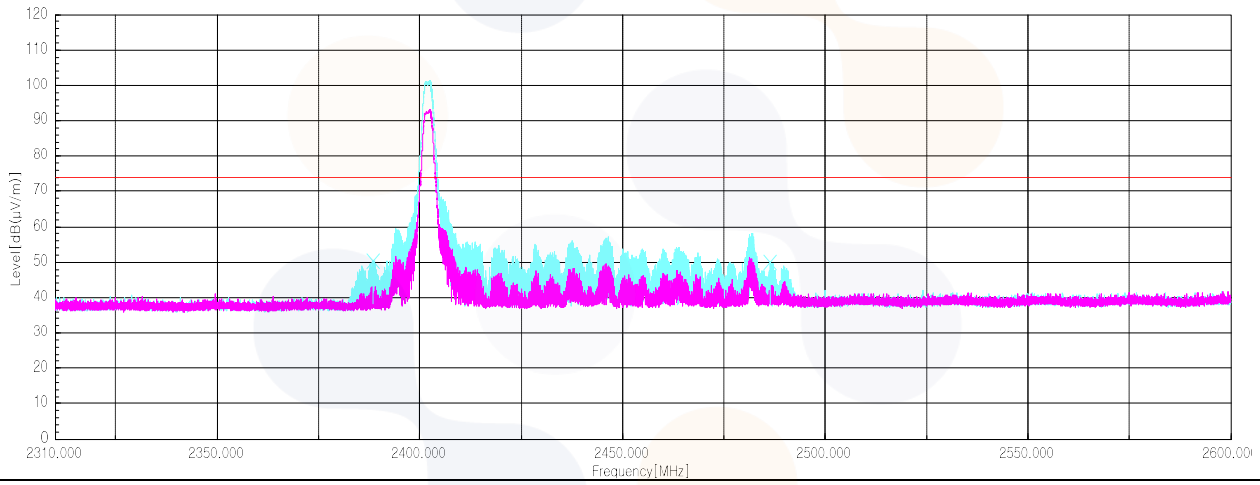


2 MBits/s(37 Bytes)

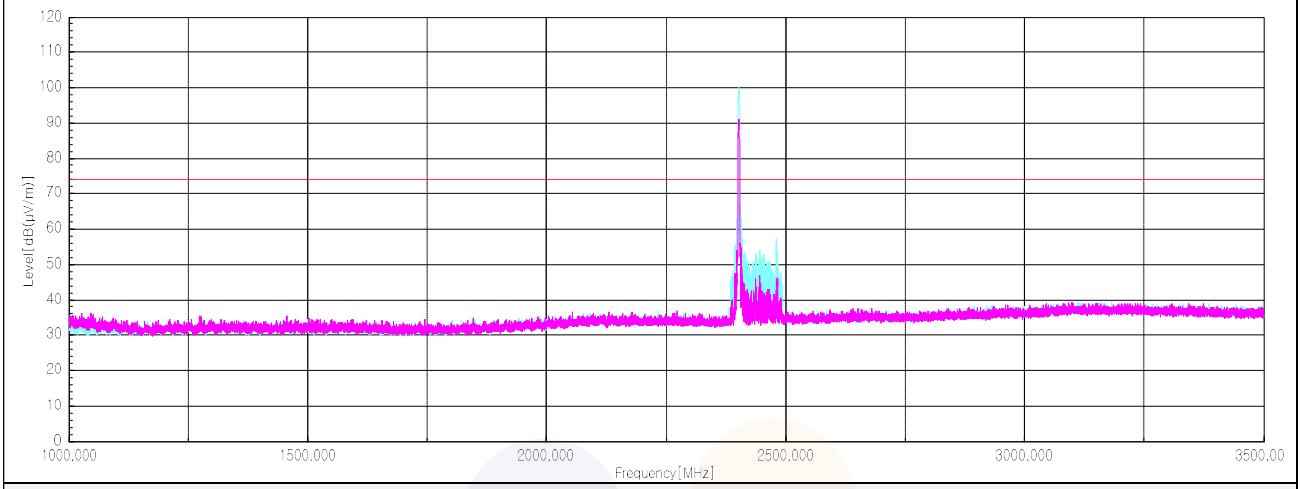
Low Channel

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								
2 388.37[1)]	V	53.50	27.10	-30.39	-	50.21	74.00	23.79
2 486.52[1)]	V	52.30	27.70	-30.23	-	49.77	74.00	24.23
4 802.58[1)]	H	53.80	32.32	-46.13	-	39.99	74.00	34.01
7 330.90[1)]	V	53.00	36.98	-44.28	-	45.70	74.00	28.30
Average Data								
No spurious emissions were detected within 20 dB of the limit.								

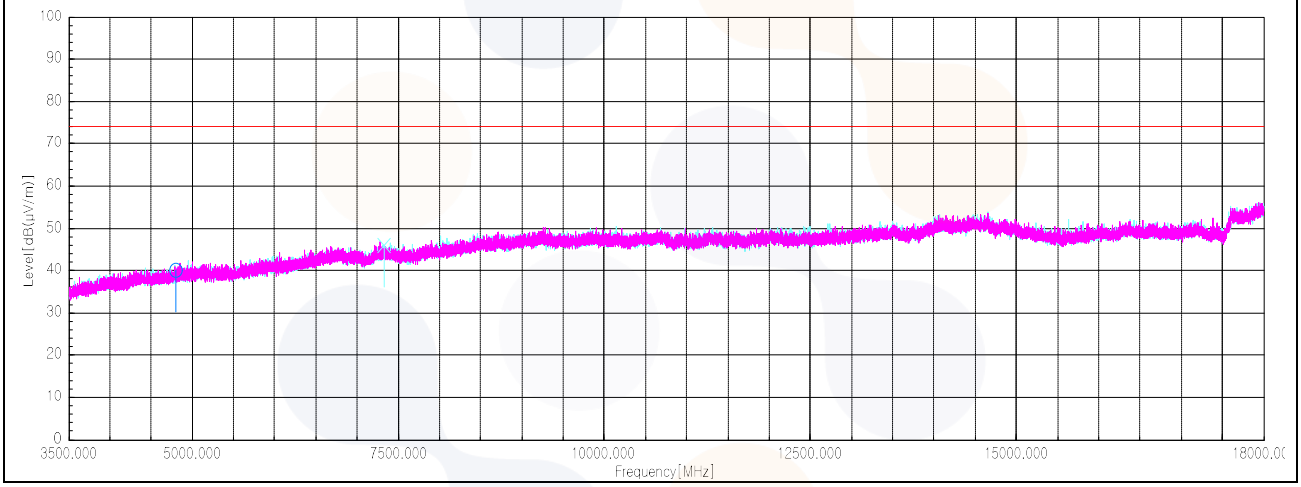
Horizontal/Vertical for Band-edge



Horizontal/Vertical for 1 ㎓ ~ 3.5 ㎓



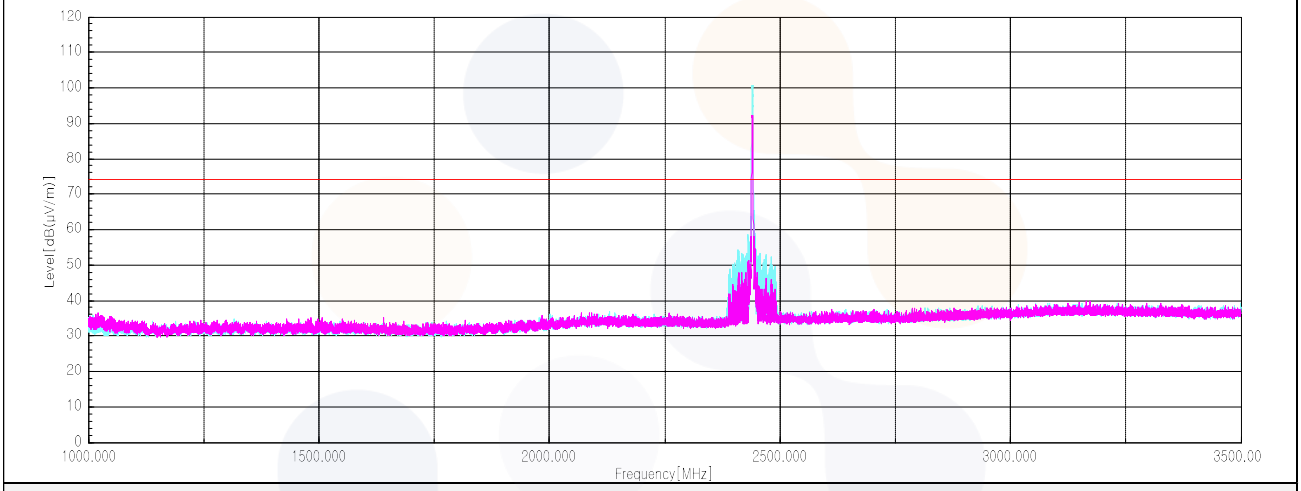
Horizontal/Vertical for 3.5 ㎓ ~ 18 ㎓



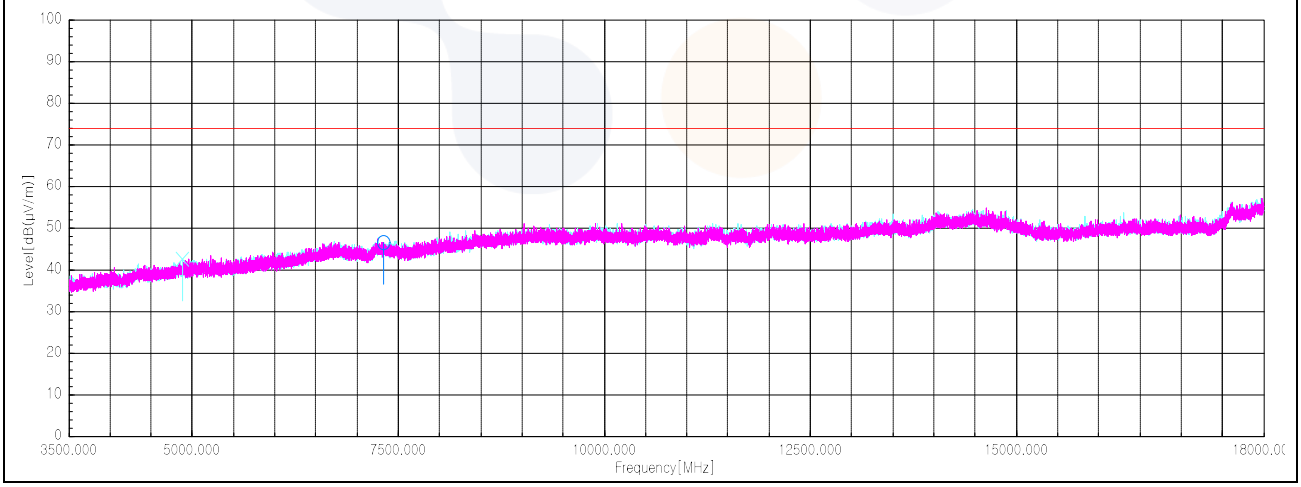
Middle Channel

Frequency	Pol.	Reading	Antenna Factor	Amp. + Cable	DCF	Result	Limit	Margin
[㎒]	[V/H]	[dB(㎶)]	[dB]	[dB]	[dB]	[dB(㎶/m)]	[dB(㎶/m)]	[dB]
Peak data								
4 879.43[1)]	V	55.50	32.78	-45.79	-	42.49	74.00	31.51
7 319.30[1)]	H	53.80	37.02	-44.30	-	46.52	74.00	27.48
Average Data								
No spurious emissions were detected within 20 ㏈ of the limit.								

Horizontal/Vertical for 1 ㎓ ~ 3.5 ㎓



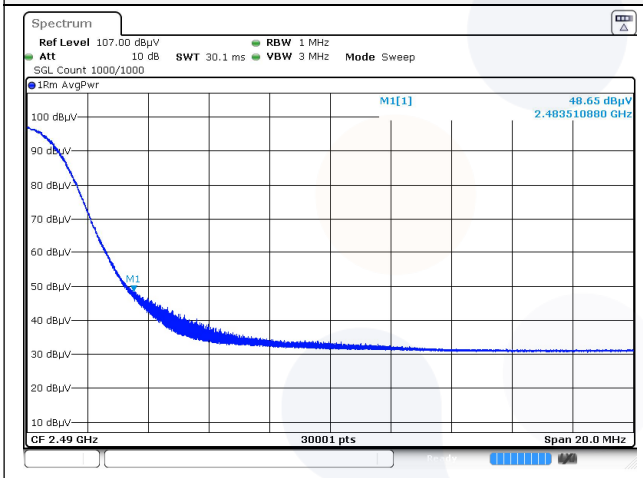
Horizontal/Vertical for 3.5 ㎓ ~ 18 ㎓



High Channel

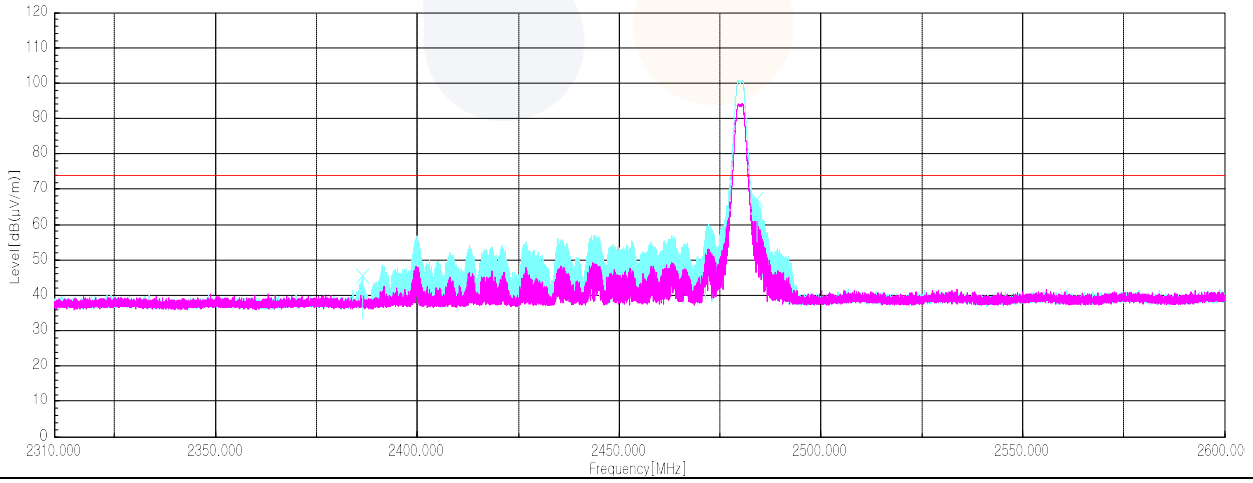
Frequency	Pol.	Reading	Antenna Factor	Amp. + Cable	DCF	Result	Limit	Margin
[MHz]	[V/H]	[dB(μV)]	[dB]	[dB]	[dB]	[dB(μV/m)]	[dB(μV/m)]	[dB]
Peak data								
2 386.38[1)]	V	48.60	27.10	-30.39	-	45.31	74.00	28.69
2 483.51[1)]	V	69.40	27.70	-30.24	-	66.86	74.00	7.14
4 956.77[1)]	V	54.50	32.81	-45.44	-	41.87	74.00	32.13
7 437.72[1)]	V	53.20	36.82	-44.10	-	45.92	74.00	28.08
Average Data								
2 483.51[1)]	V	48.65	27.70	-30.24	5.08	51.19	54.00	2.81

Average Data

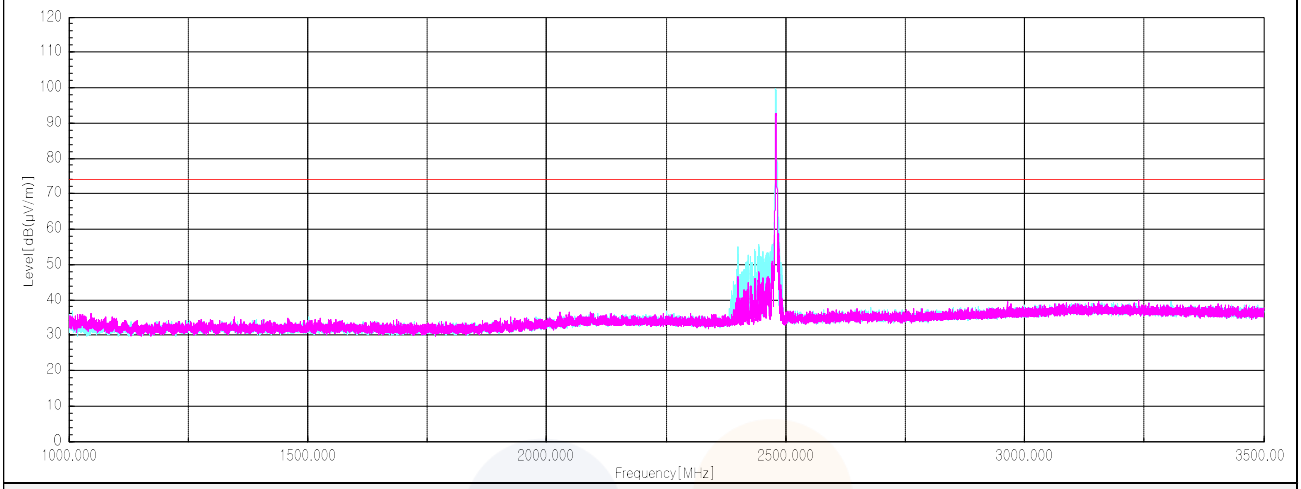


Blank

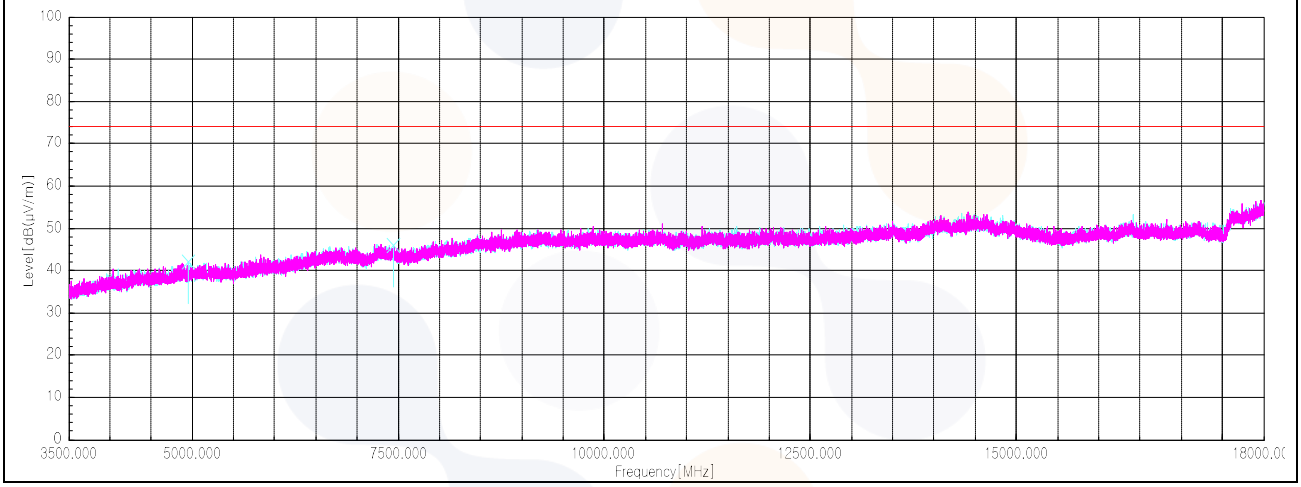
Horizontal/Vertical for Band-edge



Horizontal/Vertical for 1 ㎓ ~ 3.5 ㎓

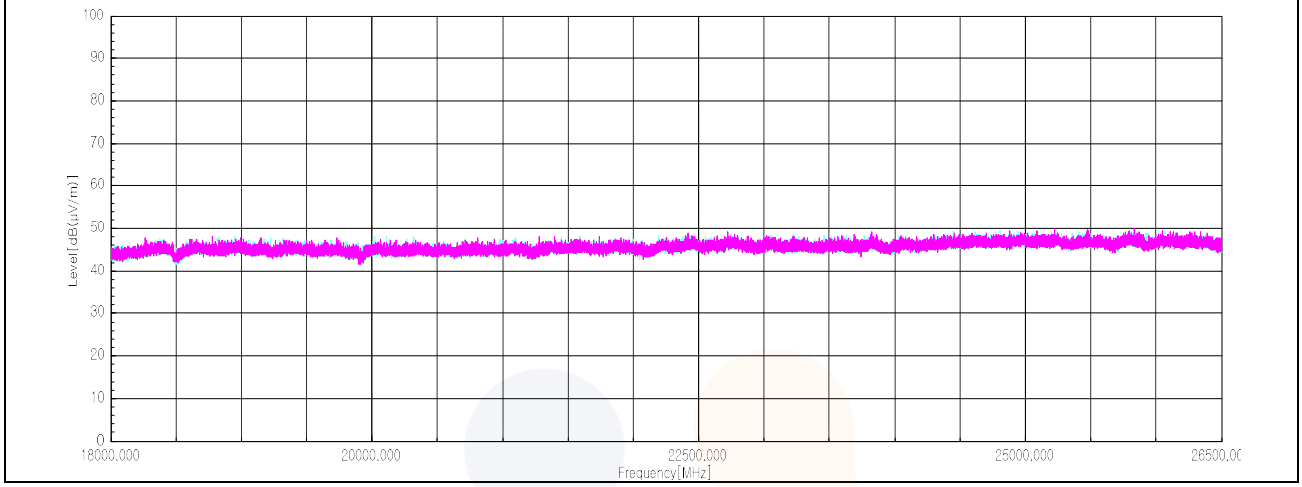


Horizontal/Vertical for 3.5 ㎓ ~ 18 ㎓



Test results (Above 18 ㎓) – Worst case: 2 MBits/s(37 Bytes) 2 480 ㎒

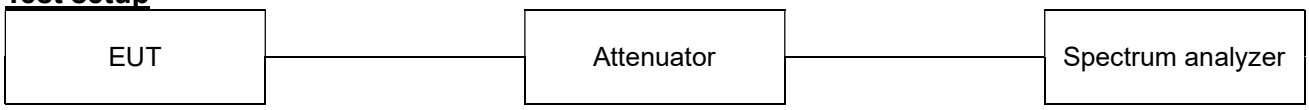
Horizontal/Vertical for 18 ㎓ ~ 26.5 ㎓



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 ㎑ 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 C63.10-2013 - Section 11.11.3
KDB 558074 D01 v05 - Section 8.5

Test settings

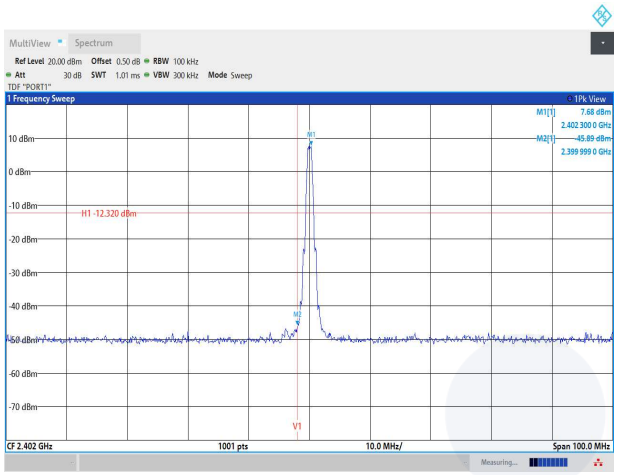
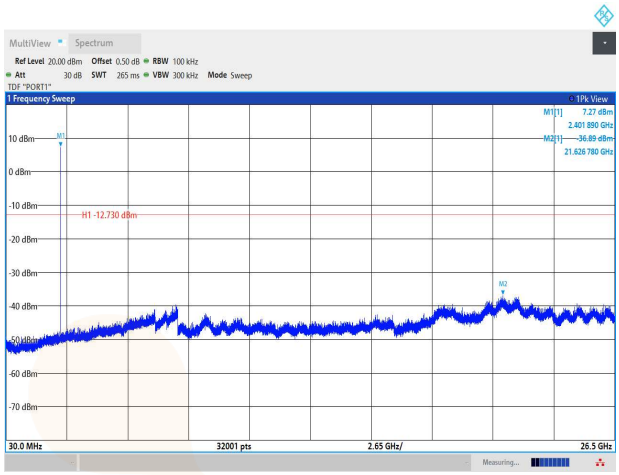
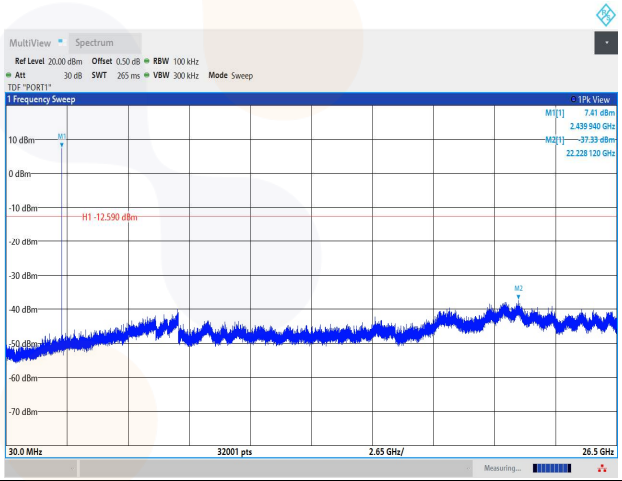
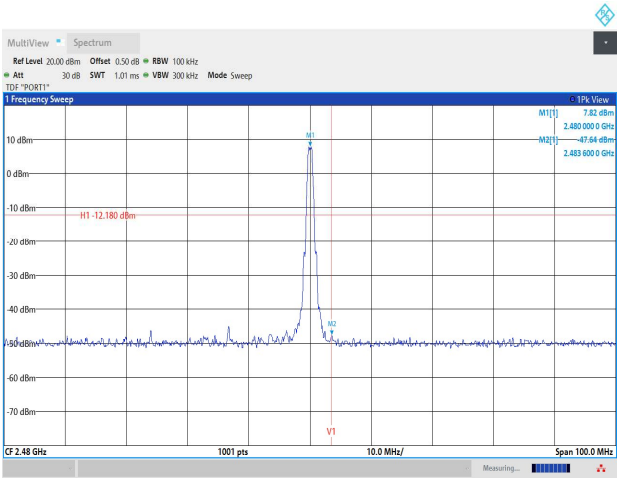
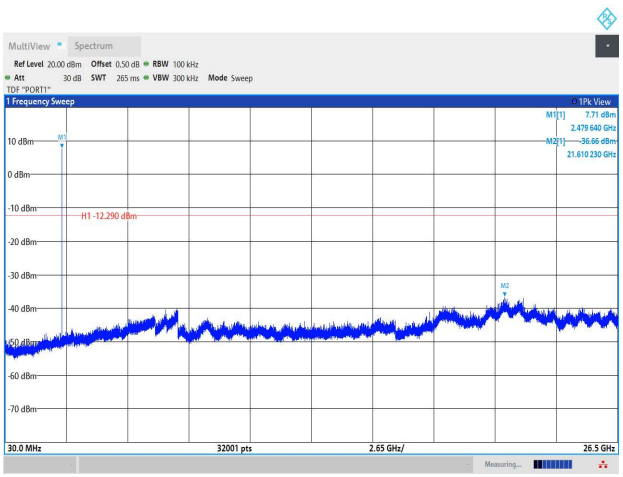
Establish an emission level by using the following procedure:

1) Set the center frequency and span to encompass frequency range to be measured.
2) Set the RBW = 100 ㎑
3) Set the VBW ≥ [3 x 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.

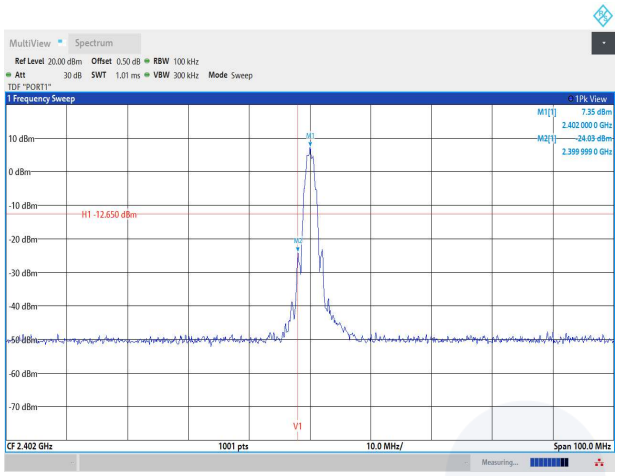
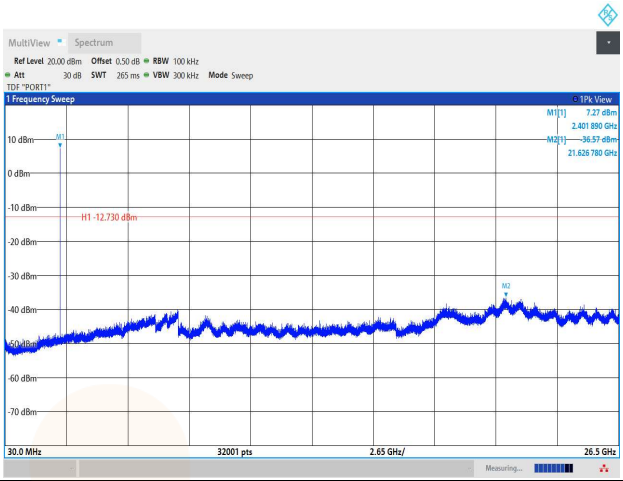
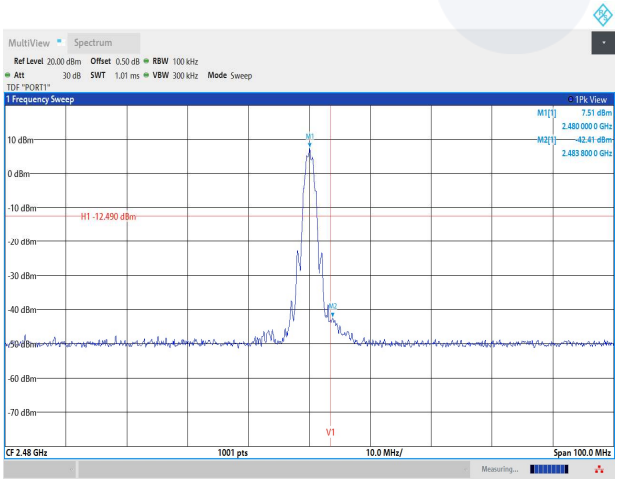
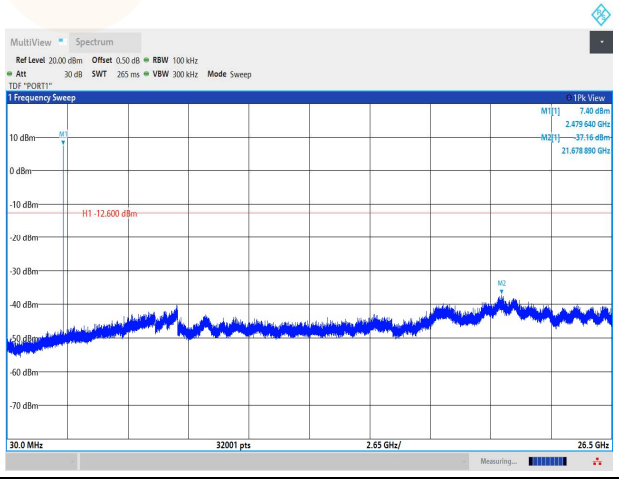
Ensure that the amplitude of all unwanted emissions outside of the authorized frequency band (excluding restricted frequency bands) is attenuated by at least the minimum requirements specified in 11.11. Report the three highest emissions relative to the limit.

Test results

BLE_1 MBit/s(37 Bytes)

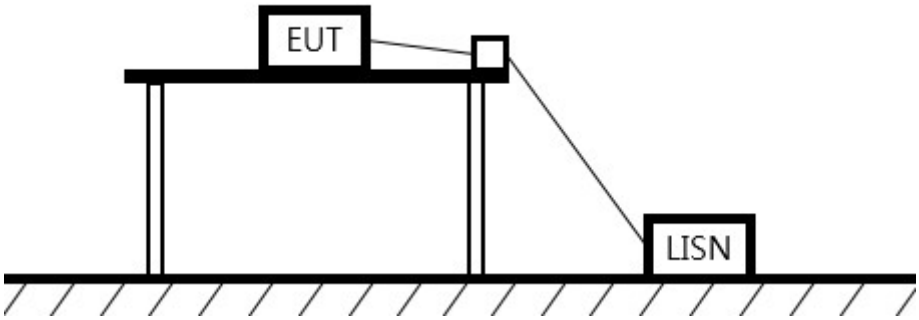
Conducted band-edge / Low ch.	Conducted spurious / Low ch.
	
Conducted band-edge / Mid ch.	**Conducted spurious / Mid ch.**
Blank	
Conducted band-edge / High ch.	**Conducted spurious / High ch.**
	

BLE_2 MBit/s(37 Bytes)

Conducted band-edge / Low ch.	Conducted spurious / Low ch.
	
Conducted band-edge / Mid ch.	**Conducted spurious / Mid ch.**
Blank	
Conducted band-edge / High ch.	**Conducted spurious / High ch.**
	

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.

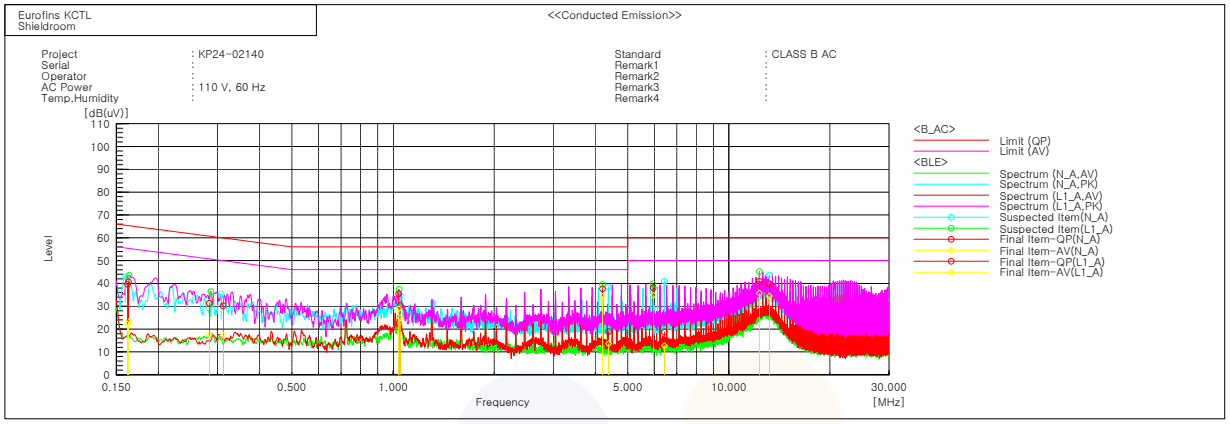
Frequency of Emission (㎒)	Conducted limit (dBμV/m)	
	Quasi-peak	Average
0.15 – 0.50	66 - 56*	56 - 46*
0.50 – 5.00	56	46
5.00 – 30.0	60	50

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 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: 2 MBits/s(37 Bytes) 2 402 ㎒



Final Result

--- N_A 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	0.16293	30.4	12.9	10.3	40.7	23.2	65.3	55.3	24.6	32.1
2	0.31202	20.1	7.1	10.1	30.2	17.2	59.9	49.9	29.7	32.7
3	1.04858	20.3	14.9	10.0	30.3	24.9	56.0	46.0	25.7	21.1
4	4.38162	8.9	3.6	10.0	18.9	13.6	56.0	46.0	37.1	32.4
5	6.42669	8.6	2.5	10.2	18.8	12.7	60.0	50.0	41.2	37.3
6	13.20453	29.1	23.7	10.8	39.9	34.5	60.0	50.0	20.1	15.5

--- L1_A 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	0.16179	29.3	12.0	10.3	39.6	22.3	65.4	55.4	25.8	33.1
2	0.2837	21.3	7.5	10.0	31.3	17.5	60.7	50.7	29.4	33.2
3	1.03844	25.4	18.9	10.0	35.4	28.9	56.0	46.0	20.6	17.1
4	4.20711	27.6	24.3	10.0	37.6	34.3	56.0	46.0	18.4	11.7
5	5.94902	28.0	24.8	10.1	38.1	34.9	60.0	50.0	21.9	15.1
6	12.33292	30.2	24.9	10.8	41.0	35.7	60.0	50.0	19.0	14.3

8. Measurement equipment

Equipment Name	Manufacturer	Model No.	Serial No.	Next Cal. Date
Spectrum Analyzer	R&S	FSV3040	101427	25.03.28
Signal Generator	R&S	SMB100A	176206	25.01.18
DC Power Supply	AGILENT	E3632A	MY40000265	24.04.27
Attenuator	API Inmet	40AH2W-10	11	24.05.03
Attenuator	R&S	DNF Dämpfungsglied 10 dB in N-50 Ohm	31211	24.04.25
Power Sensor	R&S	NRP-Z81	1137.9009.02-106224-tg	24.09.12
Spectrum Analyzer	R&S	FSVA40	101575	24.06.19
Spectrum Analyzer	R&S	FSV40	100988	24.07.03
PSA Spectrum Analyzer	Agilent	E4440A	MY44303500	24.07.04
EMI TEST RECEIVER	R&S	ESCI3	101428	24.08.18
TWO-LINE V - NETWORK	R&S	ENV216	101358	24.09.27
Broadband PreAmplifier	SCHWARZBECK	BBV9718D	57	25.01.19
Low Noise Amplifier	TESTEK	TK-PA18H	220124-L	24.10.12
Low Noise Amplifier	TESTEK	TK-PA1840H	220133-L	24.10.17
Amplifier	SONOMA INSTRUMENT	310N	421910	24.10.12
Bilog Antenna	Teseq GmbH	CBL 6112D	61521	24.11.17
Loop Antenna	R&S	HFH2-Z2	100355	24.08.10
Horn Antenna	SCHWARZBECK	BBHA9120D	2763	24.10.18
Horn Antenna	SCHWARZBECK	BBHA9170	1267	24.10.16
High Pass Filter	Wainwright Instruments GmbH	WHKX12-2805-3000-18000-40SS	SN58	24.10.16
High Pass Filter	QOTANA TECHNOLOGIES	DBHF0508004000A	23041800061	24.07.10

End of test report