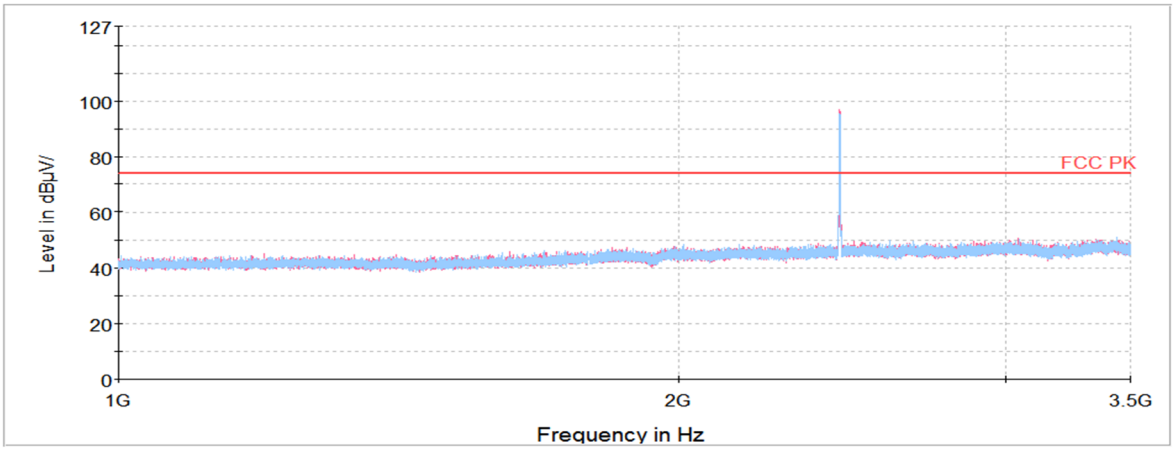
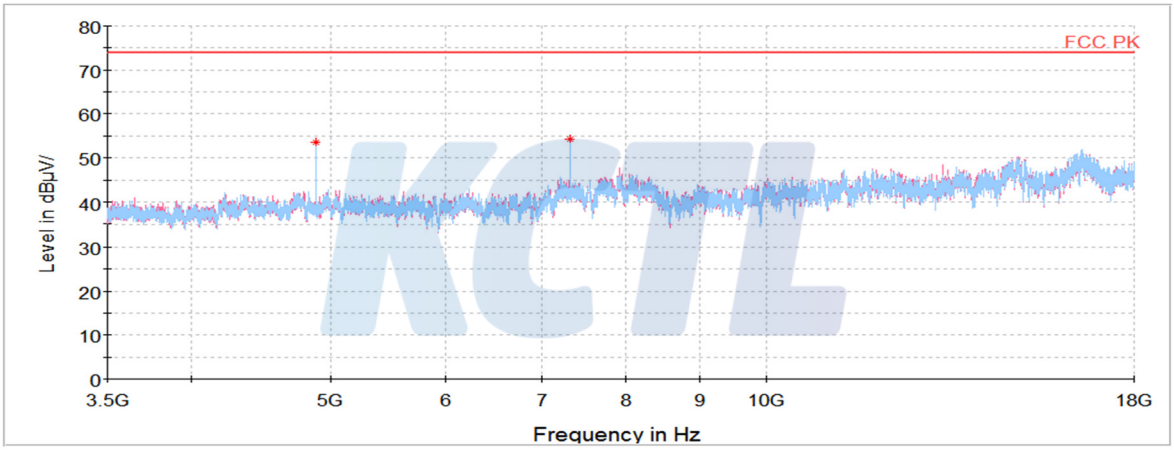
Middle Channel

Frequency	Pol.	Reading	Antenna Factor	Amp. + Cable	DCCF	Result	Limit	Margin
(㎒)	(V/H)	(dB(㎶))	(dB)	(dB)	(dB)	(dB(㎶/m))	(dB(㎶/m))	(dB)
Peak data								
4 882.03[1)]	H	74.90	33.95	-55.23	-	53.62	74.00	20.38
7 322.56[1)]	H	71.54	35.40	-52.65	-	54.29	74.00	19.71
Average Data								
7 322.56[1)]	H	71.54	35.40	-52.65	-22.50	31.79	54.00	22.21

Horizontal/Vertical for 1 ㎓ ~ 3.5 ㎓



Horizontal/Vertical for 3.5 ㎓ ~ 18 ㎓

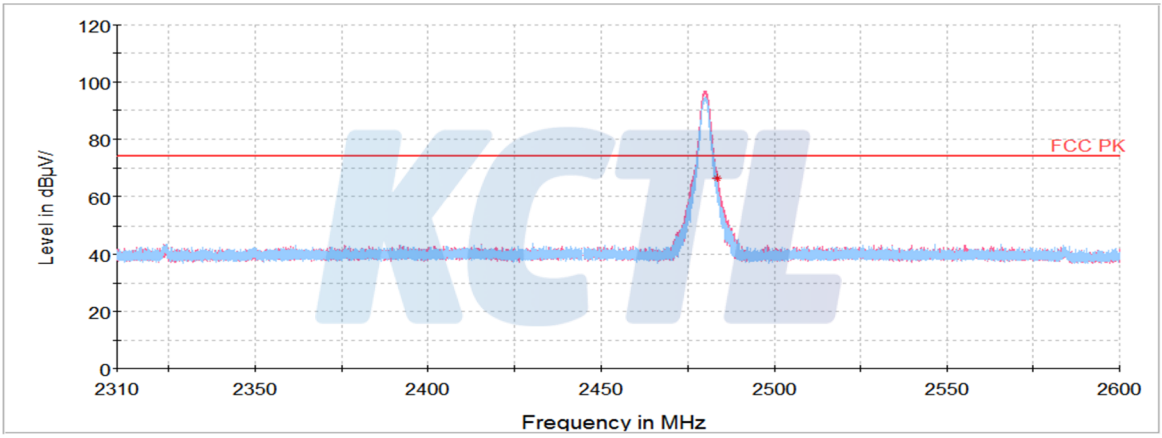


Horizontal/Vertical for 18 ㎓ ~ 26.5 ㎓

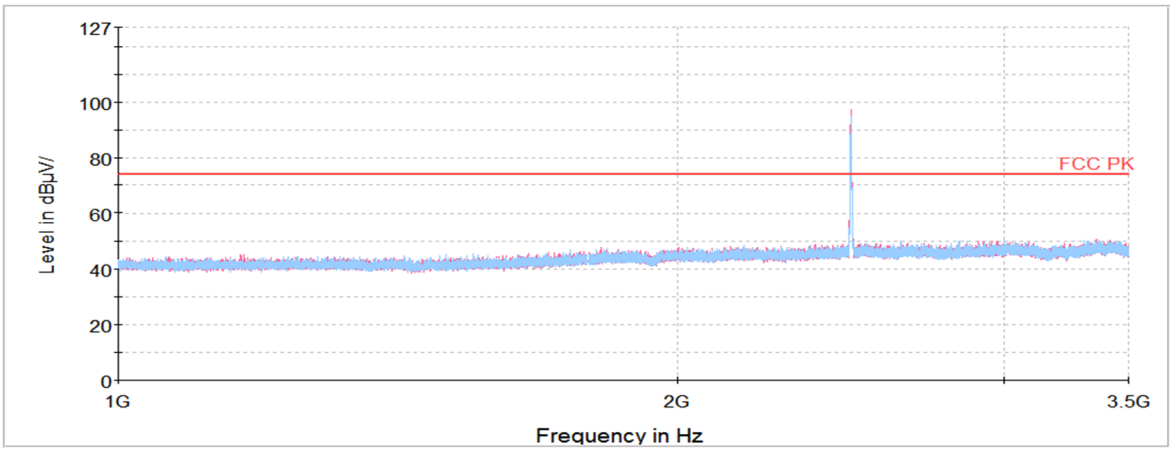
High Channel

Frequency	Pol.	Reading	Antenna Factor	Amp. + Cable	DCCF	Result	Limit	Margin
(㎒)	(V/H)	(dB(㎶))	(dB)	(dB)	(dB)	(dB(㎶/m))	(dB(㎶/m))	(dB)
Peak data								
2 483.50[1)]	V	63.38	32.07	-29.21	-	66.24	74.00	7.76
4 959.52[1)]	H	75.72	33.98	-54.67	-	55.03	74.00	18.97
7 439.92[1)]	H	73.75	35.40	-52.20	-	56.95	74.00	17.05
Average Data								
2 483.50[1)]	V	63.38	32.07	-29.21	-22.50	43.74	54.00	10.26
4 959.52[1)]	H	75.72	33.98	-54.67	-22.50	32.53	54.00	21.47
7 439.92[1)]	H	73.75	35.40	-52.20	-22.50	34.45	54.00	19.55

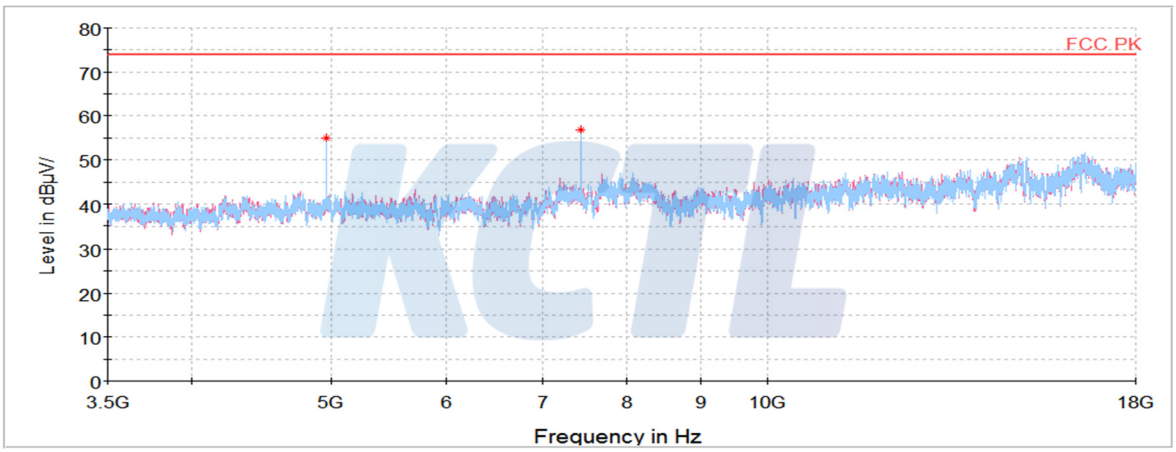
Horizontal/Vertical for Band-edge



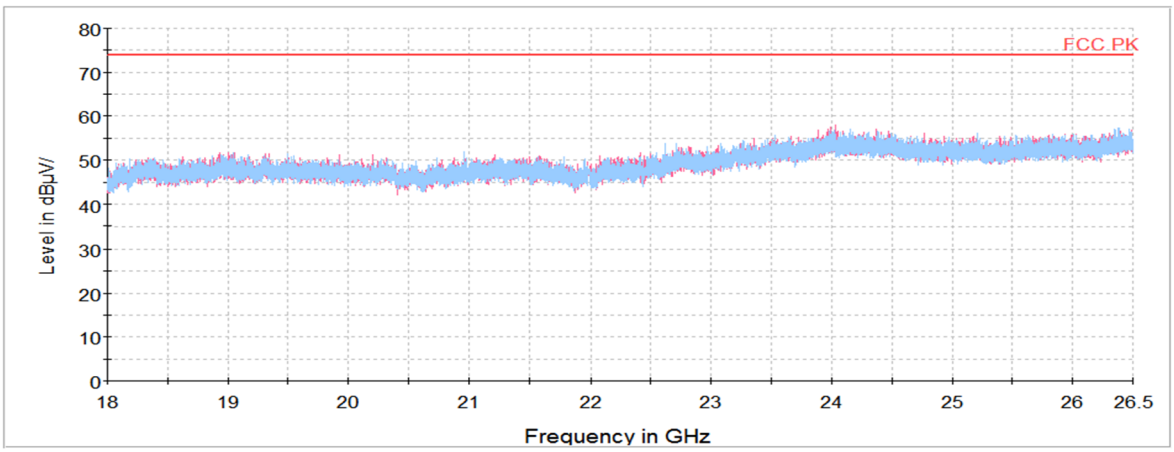
Horizontal/Vertical for 1 ㎓ ~ 3.5 ㎓



Horizontal/Vertical for 3.5 ㎓ ~ 18 ㎓



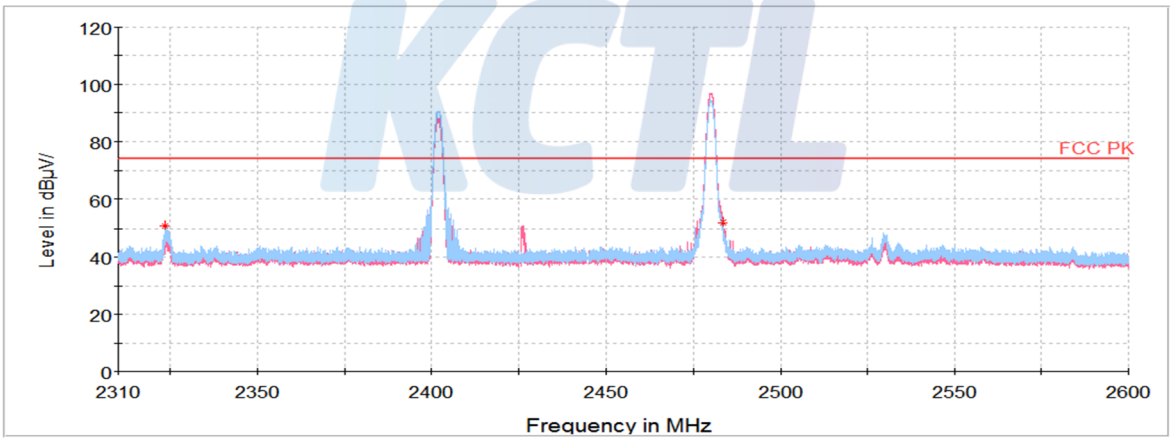
Horizontal/Vertical for 18 ㎓ ~ 26.5 ㎓



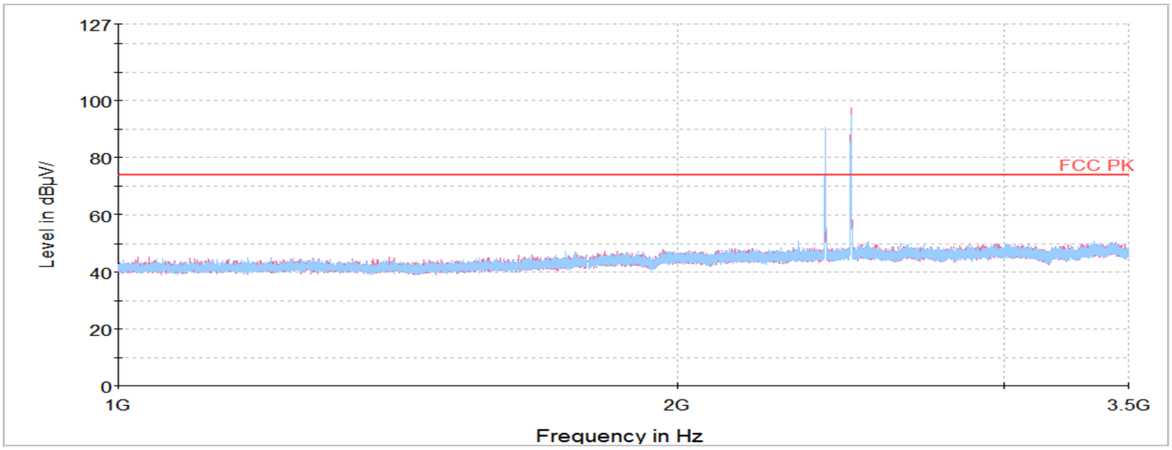
Simultaneously_BT,GFSK(2 480 ㎒)+ BLE,GFSK(2 402 ㎒)

Frequency	Pol.	Reading	Ant. Factor	Amp.+Cable	DCCF	Result	Limit	Margin
(㎒)	(V/H)	(dB(㎶))	(dB)	(dB)	(dB)	(dB(㎶/m))	(dB(㎶/m))	(dB)
Peak data								
2 323.53[1)]	H	48.62	31.75	-29.40	-	50.97	74.00	23.03
2 483.50[1)]	V	48.96	32.07	-29.21	-	51.82	74.00	22.18
4 804.09[1)]	V	62.09	33.92	-53.02	-	42.99	74.00	31.01
4 960.42[1)]	V	76.81	33.98	-54.66	-	56.13	74.00	17.87
7 206.56	H	62.73	35.40	-53.08	-	45.05	74.00	28.95
7 440.38[1)]	H	75.74	35.40	-52.20	-	58.94	74.00	15.06
12 399.38[1)]	V	63.24	39.08	-50.32	-	52.00	74.00	22.00
Average data								
4 960.42[1)]	H	76.81	33.98	-54.66	-22.50	33.63	54.00	20.37
7 440.38[1)]	H	75.74	35.40	-52.20	-22.50	36.44	54.00	17.56

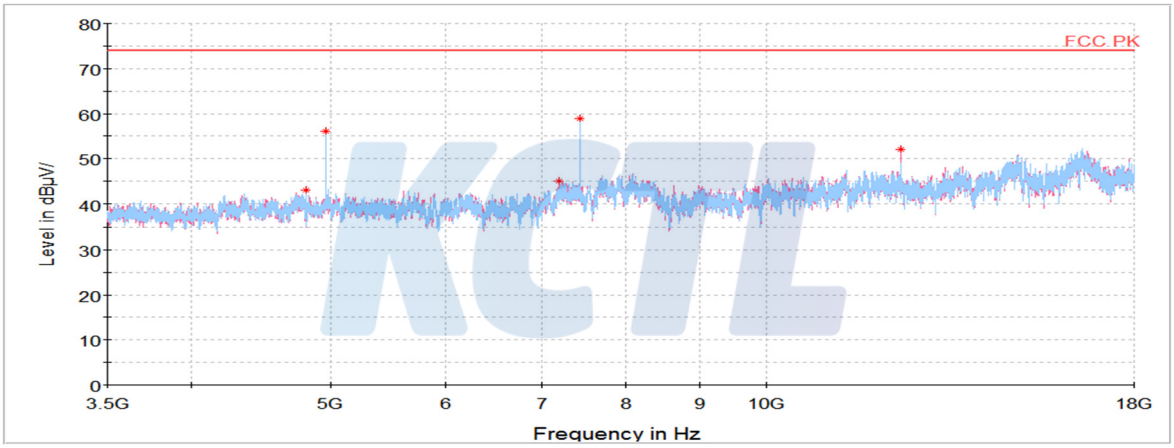
Horizontal/Vertical for BLE Band-edge



Horizontal/Vertical for 1 ㎓ ~ 3.5 ㎓



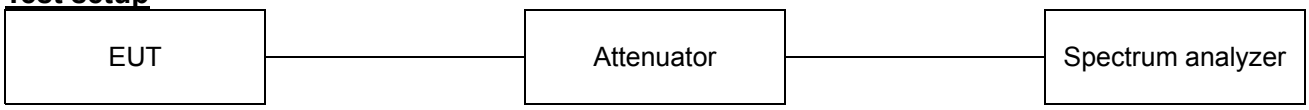
Horizontal/Vertical for 3.5 ㎓ ~ 18 ㎓



Horizontal/Vertical for 18 ㎓ ~ 26.5 ㎓

7.7. 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 6.10.4, 7.8.8

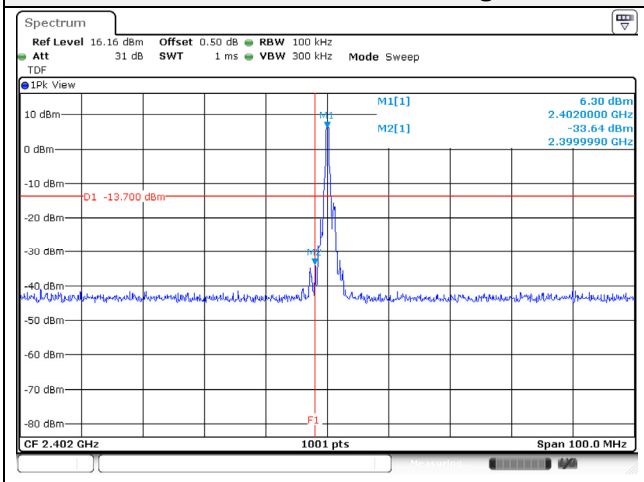
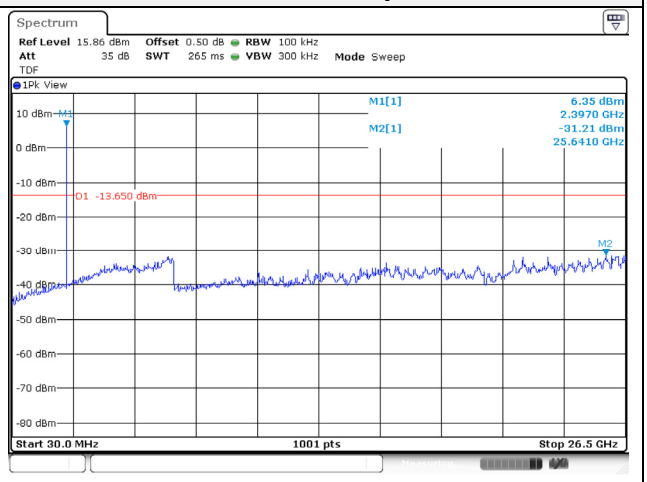
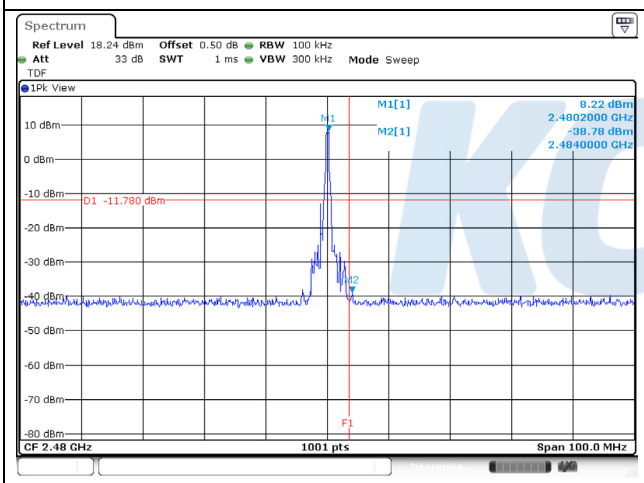
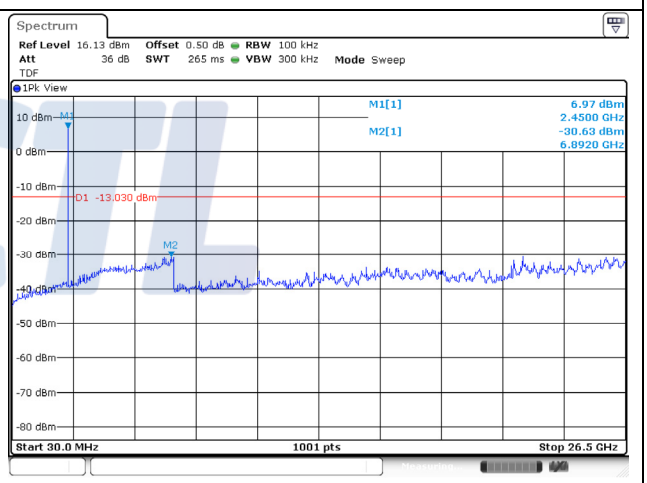
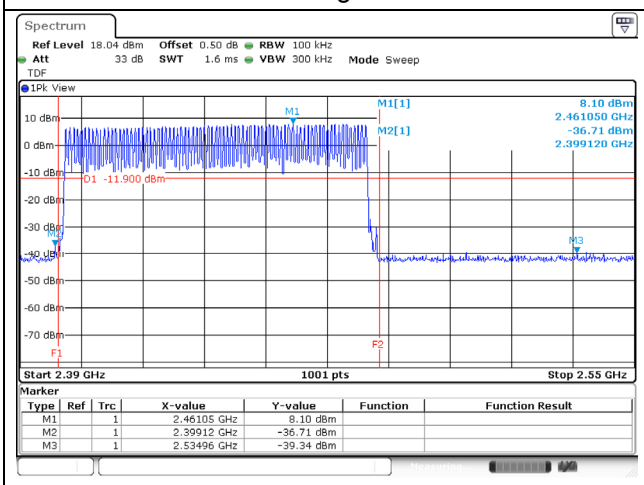
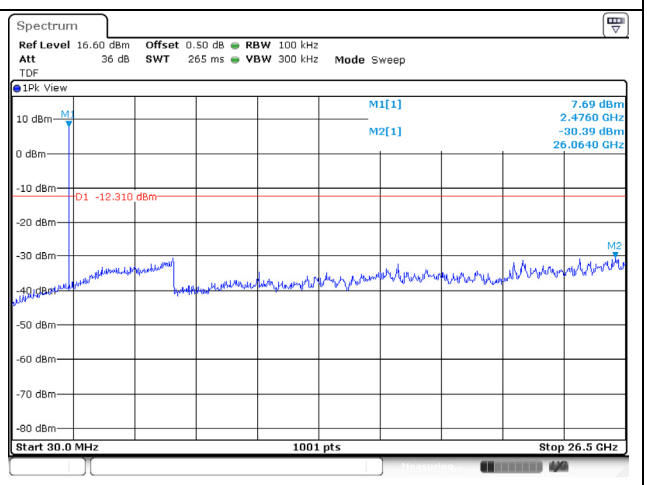
Test settings

- **Band-edge**
  1) Span : Wide enough to capture the peak level of the emission operating on the channel closest to the band edge, as well as any modulation products which fall outside of the authorized band of operation
  2) Reference level : As required to keep the signal from exceeding the maximum instrument input mixer level for linear operation. In general, the peak of the spectral envelope shall be more than [10 log(OBW/RBW)] below the reference level.
  3) Attenuation: Auto (at least 10 ㏈ preferred)
  4) Sweep time = Coupled
  5) RBW : 100 ㎑
  6) VBW : 300 ㎑
  7) Detector : Peak
  8) Trace : Max hold

- **Spurious emissions**
  1) Span : 30 ㎒ to 10 times the operating frequency in ㎓
  2) RBW : 100 ㎑
  3) VBW : 300 ㎑
  4) Sweep time : Coupled
  5) Detector : Peak

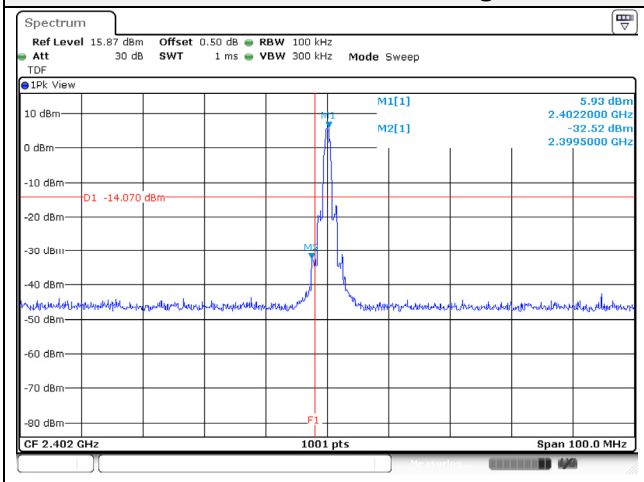
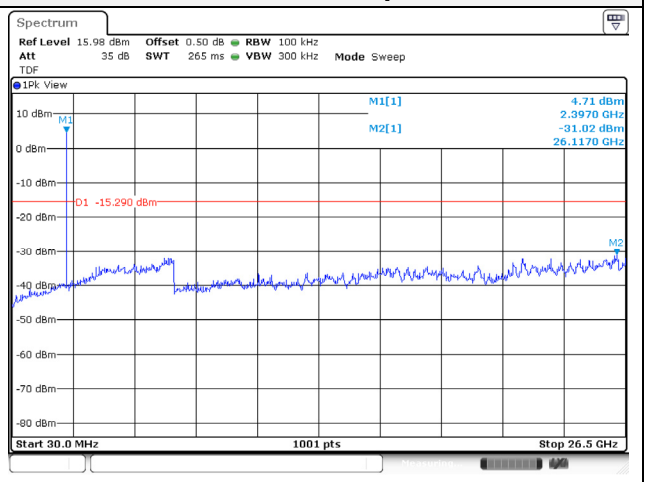
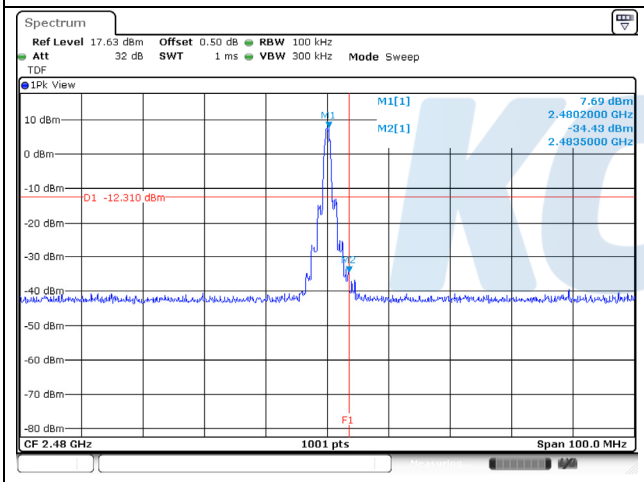
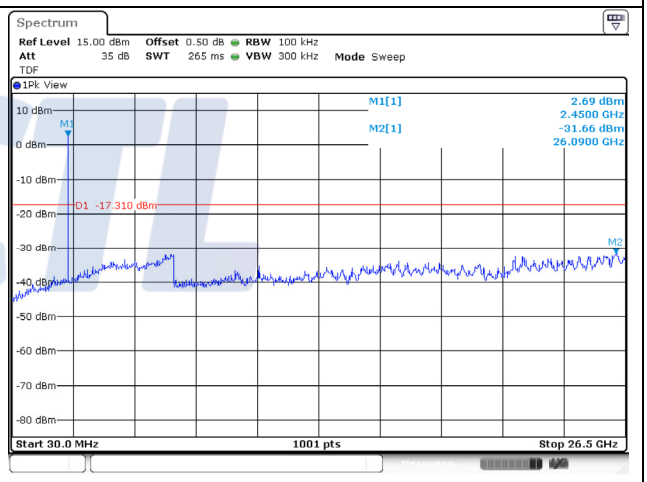
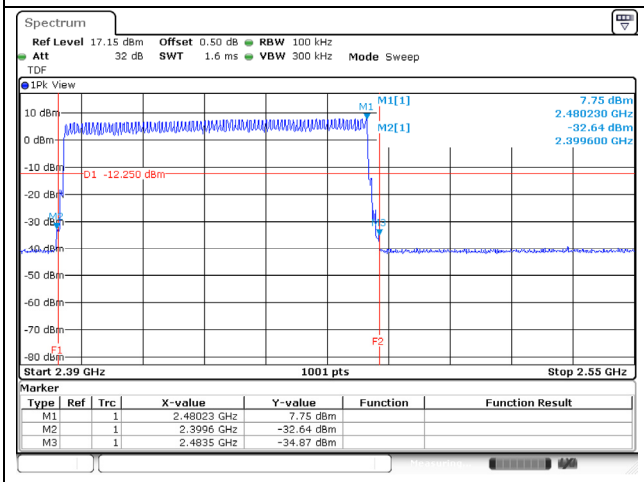
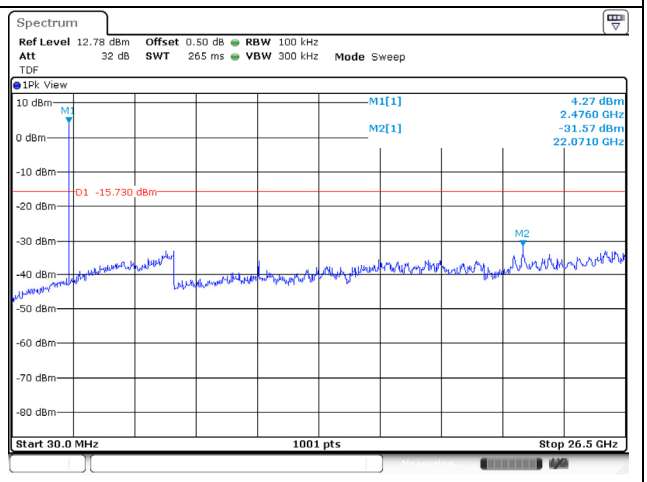
Test results

GFSK

Conducted band-edge	Conducted spurious
	
Lowest	Lowest
	
Highest	Middle
	
With Hopping Band-edge	Highest

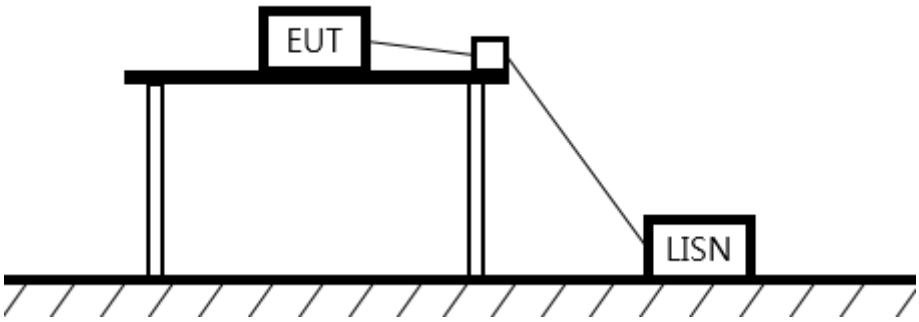
Test results

8DPSK

Conducted band-edge	Conducted spurious
	
Lowest	Lowest
	
Highest	Middle
	
With Hopping Band-edge	Highest

7.8. 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.

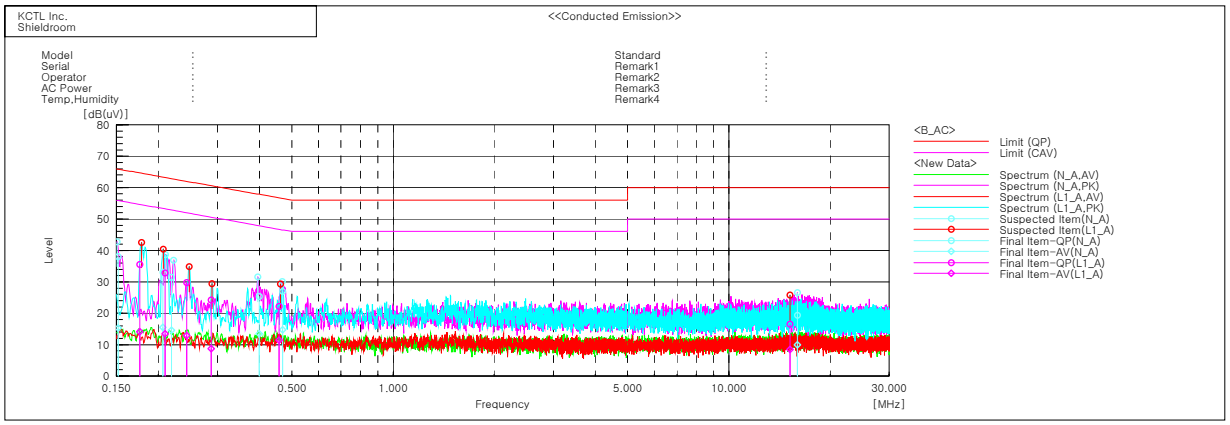
Frequency of Emission (㎒)	Conducted limit (dBμV/m)	
	Quasi-peak	Average
0.15 – 0.50	66 - 56*	56 - 46*
0.50 – 5.00	56	46
5.00 – 30.0	60	50

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: GFSK / Highest frequency



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	0.1517	28.0	5.3	10.0	38.0	15.3	65.9	55.9	27.9	40.6
2	0.20618	23.0	5.4	10.1	33.1	15.5	63.4	53.4	30.3	37.9
3	0.21898	21.4	4.6	10.0	31.4	14.6	62.9	52.9	31.5	38.3
4	0.39923	15.2	3.3	10.2	25.4	13.5	57.9	47.9	32.5	34.4
5	0.46905	16.8	4.5	10.2	27.0	14.7	56.5	46.5	29.5	31.8
6	15.99953	8.4	-1.0	11.0	19.4	10.0	60.0	50.0	40.6	40.0

--- 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	0.17637	25.2	3.8	10.3	35.5	14.1	64.7	54.7	29.2	40.6
2	0.20942	22.7	3.4	10.1	32.8	13.5	63.2	53.2	30.4	39.7
3	0.24322	19.8	3.0	9.9	29.7	12.9	62.0	52.0	32.3	39.1
4	0.28763	14.2	-1.3	10.0	24.2	8.7	60.6	50.6	36.4	41.9
5	0.4573	12.0	1.2	10.2	22.2	11.4	56.7	46.7	34.5	35.3
6	15.20149	5.6	-2.4	10.9	16.5	8.5	60.0	50.0	43.5	41.5

8. Measurement equipment

Equipment Name	Manufacturer	Model No.	Serial No.	Next Cal. Date
Spectrum Analyzer	R&S	FSV40	100988	21.01.03
Spectrum Analyzer	R&S	FSV30	100806	20.07.30
Pulse Power Meter	ANRITSU	ML2495A	1608009	20.07.31
Attenuator	API Inmet	40AH2W-10	17	20.05.15
EMI TEST RECEIVER	R&S	ESCI7	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	21.02.17*
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	21.02.12
AMPLIFIER	L-3 Narda-MITEQ	JS44-18004000-33-8P	2000996	21.01.22
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	20.07.16
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	-

*The equipment was used after finished calibration

End of test report