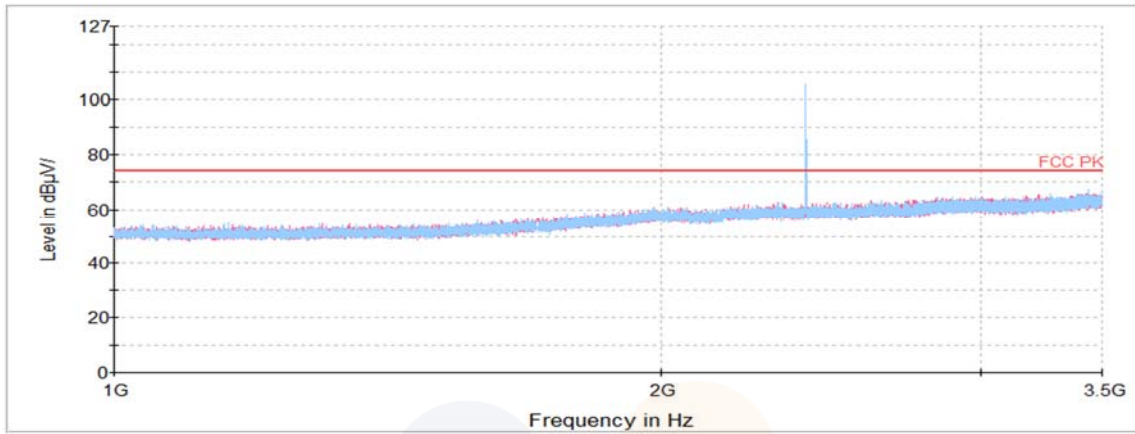
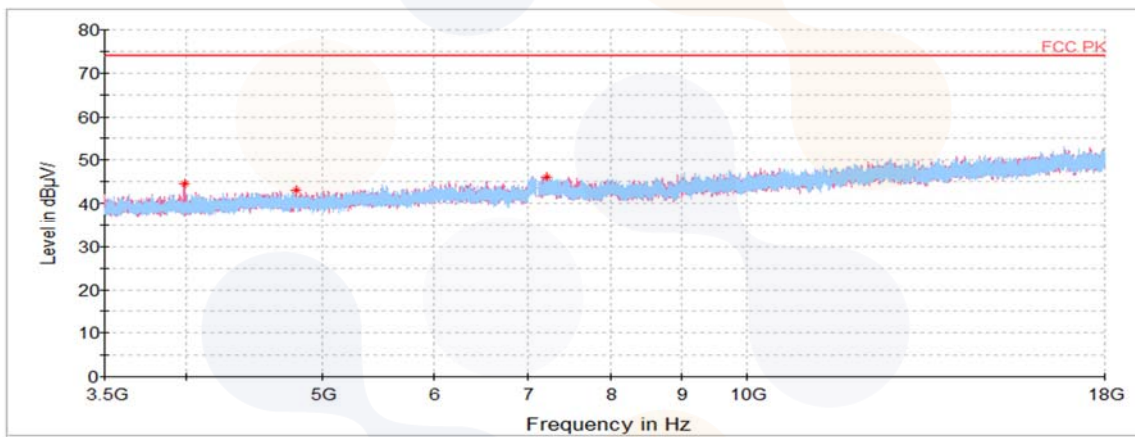


Horizontal/Vertical for 1 GHz ~ 3.5 GHz

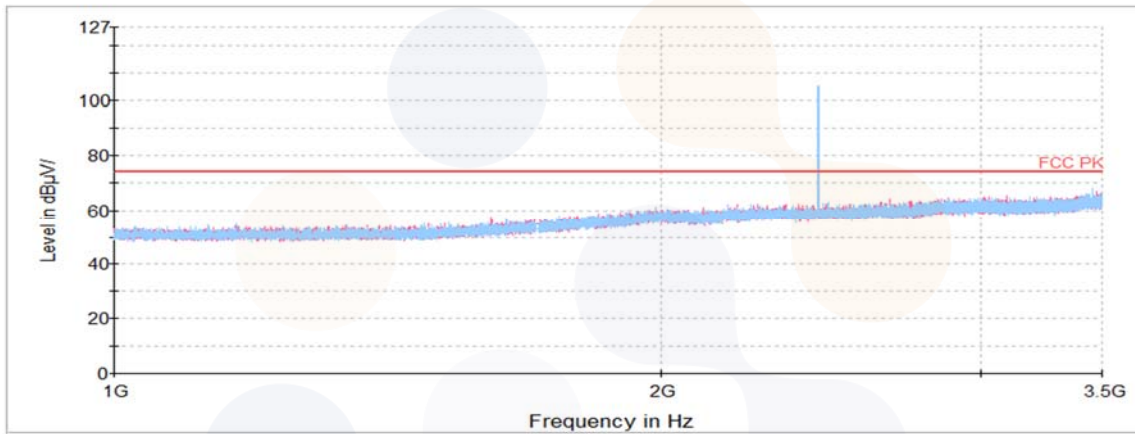
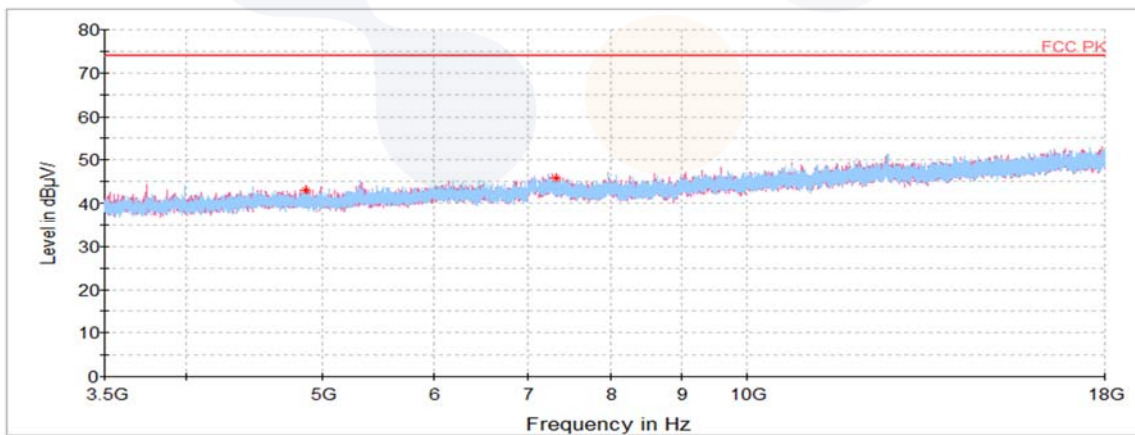


Horizontal/Vertical for 3.5 GHz ~ 18 GHz



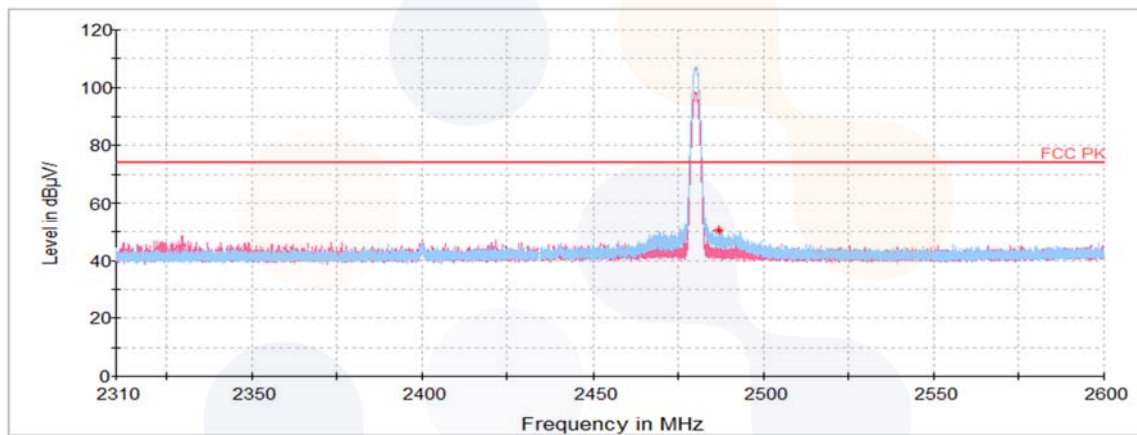
GFSK_Mid Channel

Frequency	Pol.	Reading	Ant. 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								
4 873.63 ¹⁾	H	64.64	34.05	-55.72	-	42.97	74.00	31.03
7 319.30 ¹⁾	H	62.04	35.80	-52.18	-	45.66	74.00	28.34
Average Data								
No spurious emissions were detected within 20 dB of the limit.								

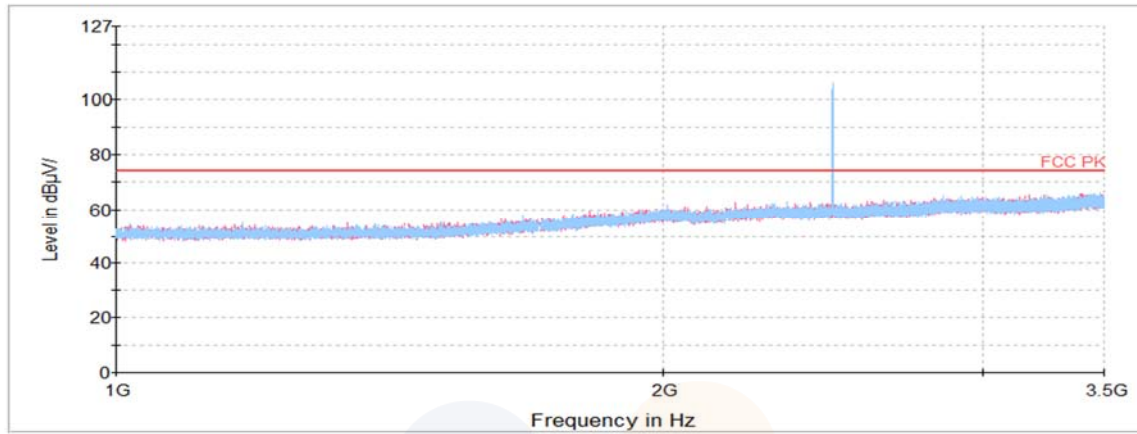
Horizontal/Vertical for 1 GHz ~ 3.5 GHz**Horizontal/Vertical for 3.5 GHz ~ 18 GHz**

GFSK_High Channel

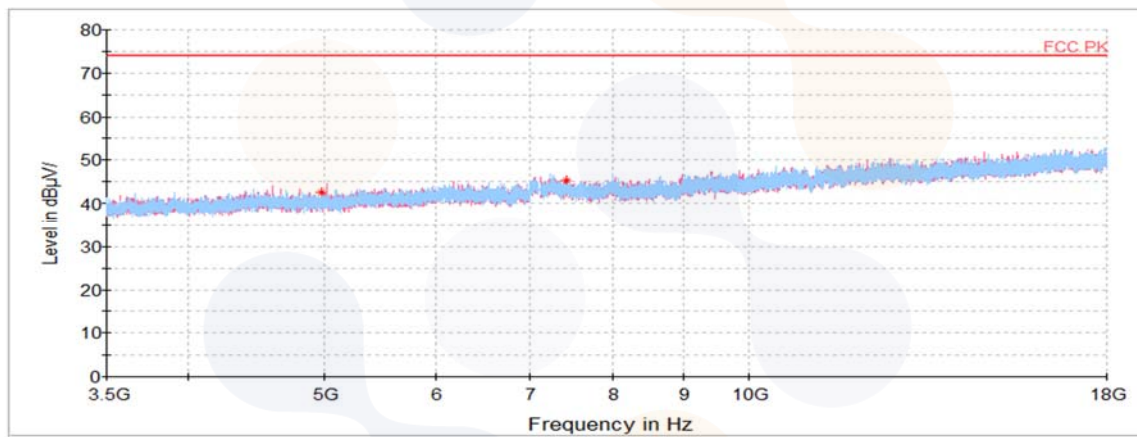
Frequency	Pol.	Reading	Ant. Factor	Amp. + Cable	DCCF	Result	Limit	Margin
(MHz)	(V/H)	(dB(μ V))	(dB)	(dB)	(dB)	(dB(μ V/m))	(dB(μ V/m))	(dB)
Peak data								
2 486.97 ¹⁾	H	45.93	32.19	-27.75	-	50.37	74.00	23.63
4 977.07 ¹⁾	V	64.09	34.09	-55.58	-	42.60	74.00	31.40
7 427.57 ¹⁾	H	61.80	35.80	-52.30	-	45.30	74.00	28.70
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

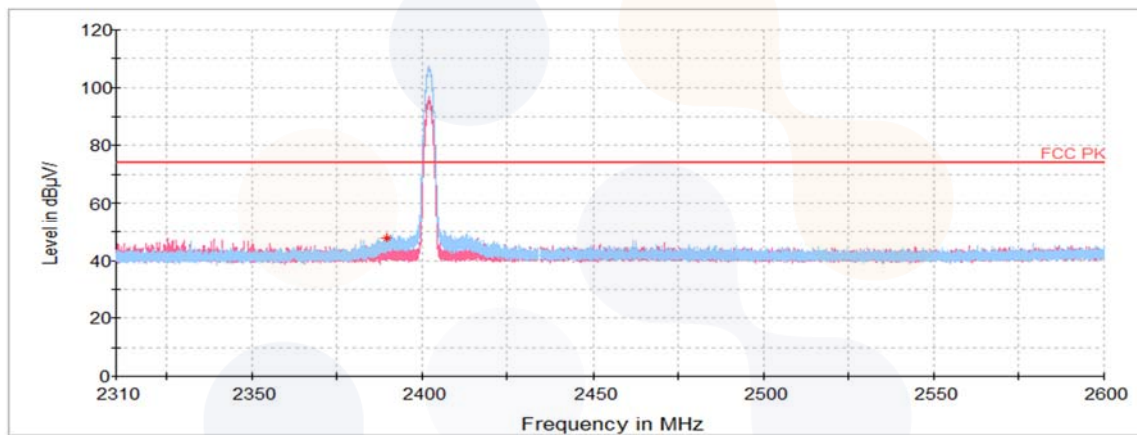


Horizontal/Vertical for 3.5 GHz ~ 18 GHz

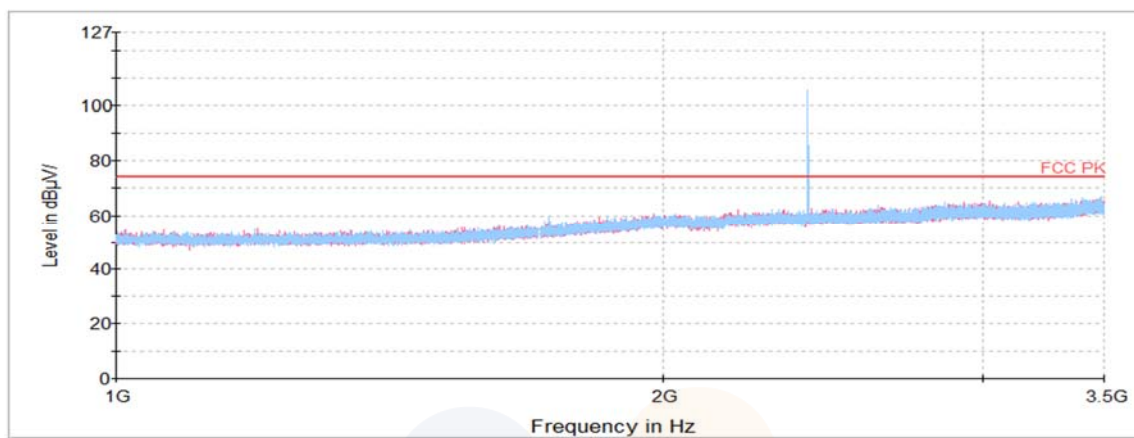


8DPSK_Low Channel

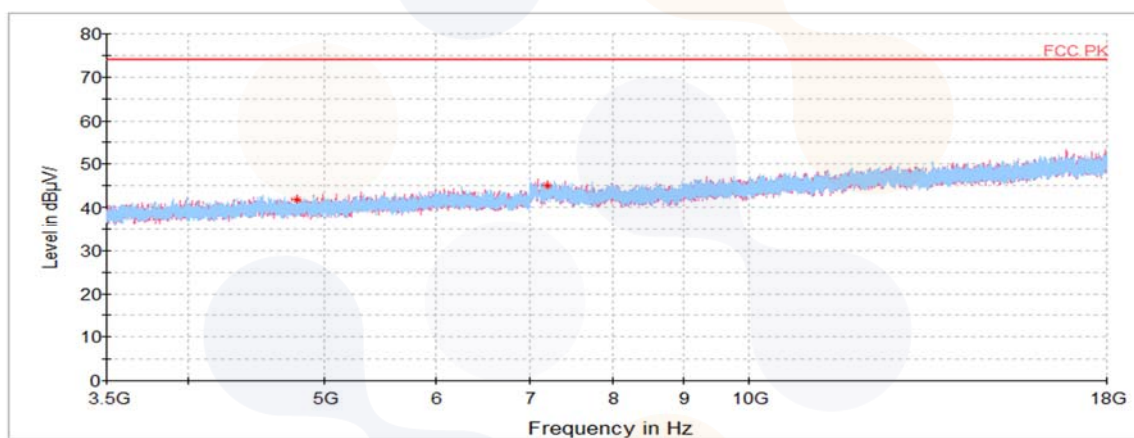
Frequency	Pol.	Reading	Ant. Factor	Amp. + Cable	DCCF	Result	Limit	Margin
(MHz)	(V/H)	(dB(μ V))	(dB)	(dB)	(dB)	(dB(μ V/m))	(dB(μ V/m))	(dB)
Peak data								
2 389.46 ¹⁾	H	43.75	32.09	-27.84	-	48.00	74.00	26.00
4 787.12 ¹⁾	V	63.59	34.01	-55.74	-	41.86	74.00	32.14
7 192.67	V	61.20	35.80	-52.05	-	44.95	74.00	29.05
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

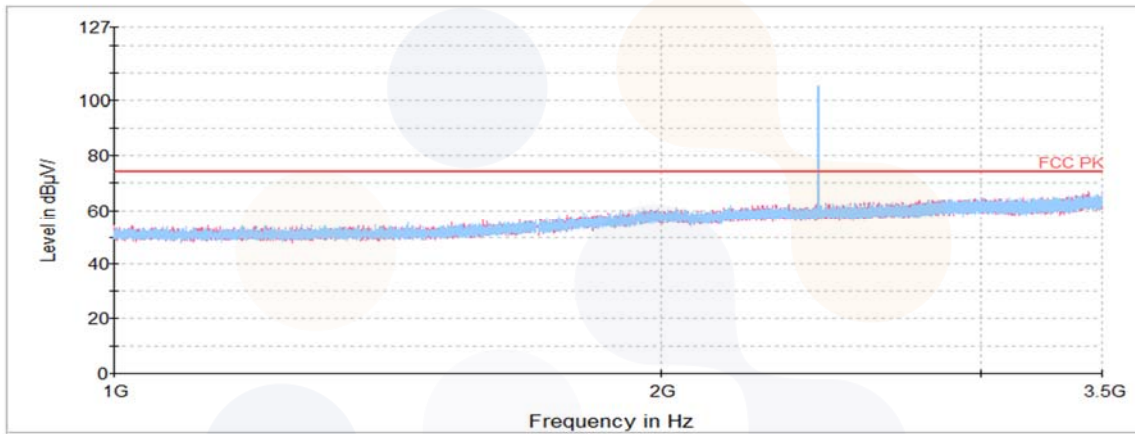
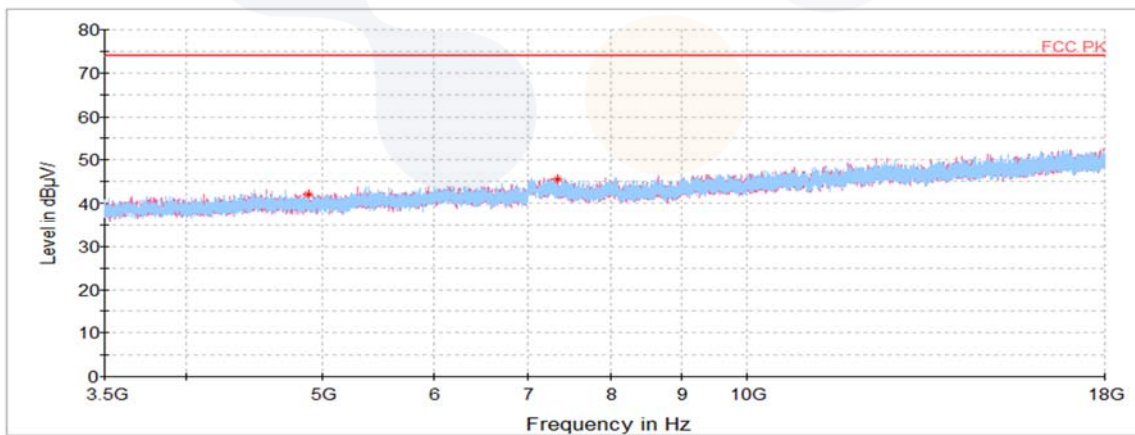


Horizontal/Vertical for 3.5 GHz ~ 18 GHz



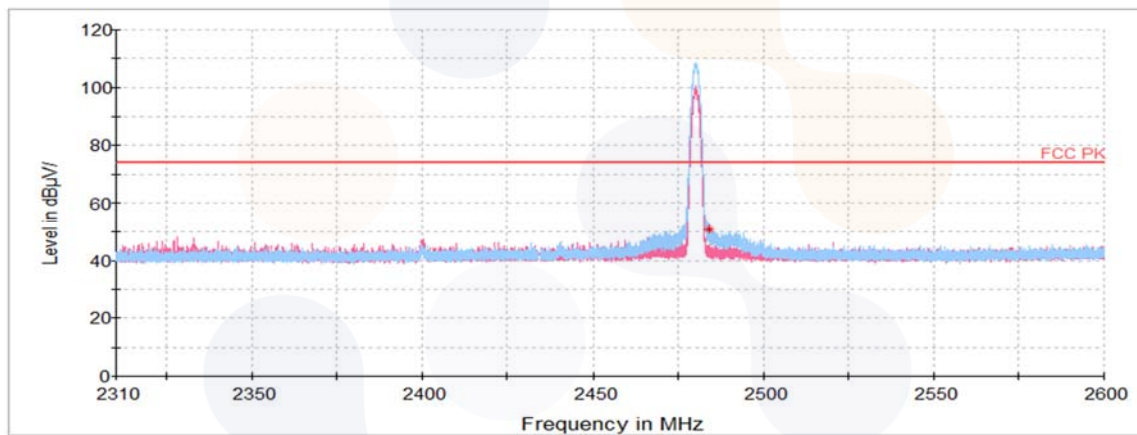
8DPSK_Mid Channel

Frequency	Pol.	Reading	Ant. 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								
4 893.45 ¹⁾	V	63.60	34.06	-55.73	-	41.93	74.00	32.07
7 341.05 ¹⁾	V	61.88	35.80	-52.21	-	45.47	74.00	28.53
Average Data								
No spurious emissions were detected within 20 dB of the limit.								

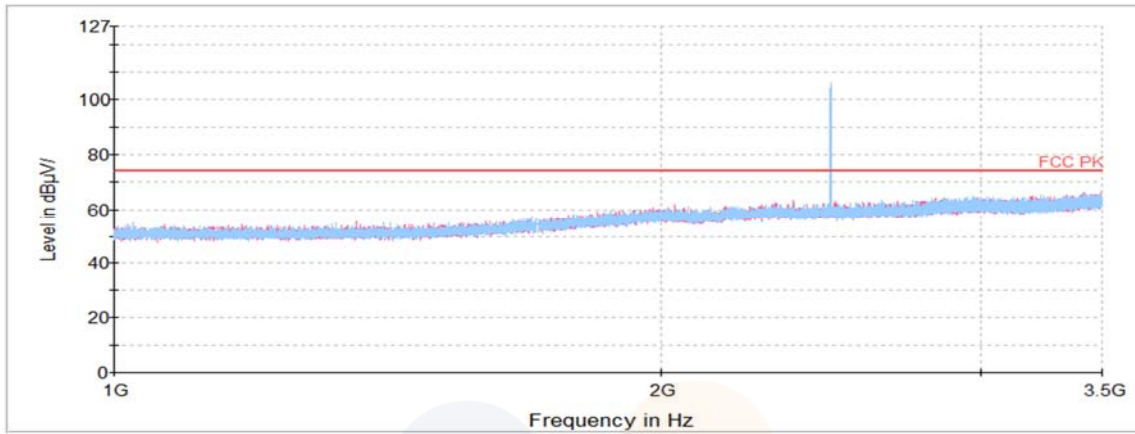
Horizontal/Vertical for 1 GHz ~ 3.5 GHz**Horizontal/Vertical for 3.5 GHz ~ 18 GHz**

8DPSK_High Channel

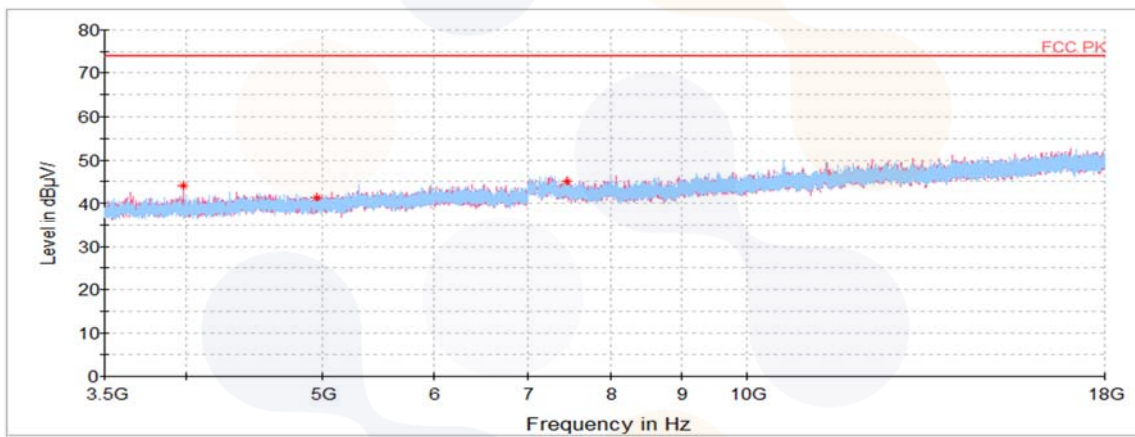
Frequency	Pol.	Reading	Ant. Factor	Amp. + Cable	DCCF	Result	Limit	Margin
(MHz)	(V/H)	(dB(μ V))	(dB)	(dB)	(dB)	(dB(μ V/m))	(dB(μ V/m))	(dB)
Peak data								
2 483.98 ¹⁾	H	46.37	32.18	-27.75	-	50.80	74.00	23.20
3 986.23 ¹⁾	V	67.57	33.29	-56.85	-	44.01	74.00	29.99
4 962.08 ¹⁾	V	62.78	34.08	-55.61	-	41.25	74.00	32.75
7 449.80 ¹⁾	V	61.64	35.80	-52.32	-	45.12	74.00	28.88
Average Data								
No spurious emissions were detected within 20 dB of the limit.								

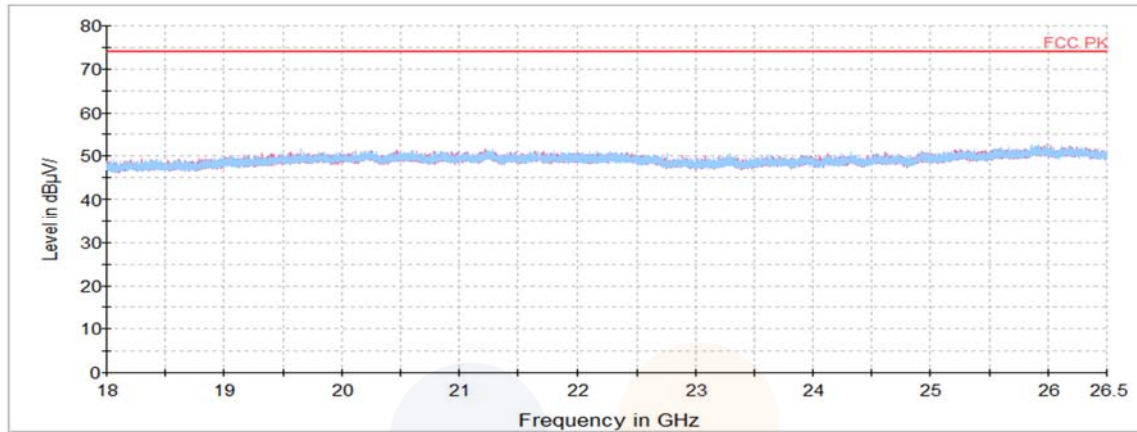
Horizontal/Vertical for Band-edge

Horizontal/Vertical for 1 GHz ~ 3.5 GHz



Horizontal/Vertical for 3.5 GHz ~ 18 GHz

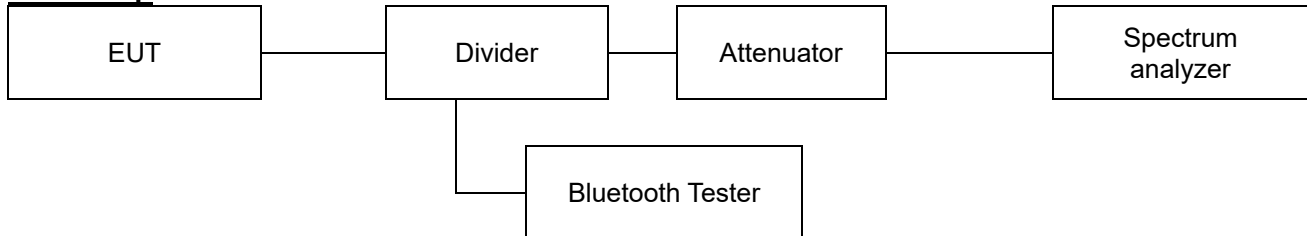


Test results (Above 18 GHz) – Worst case: 8DPSK 2 480 MHz**Horizontal/Vertical for 18 GHz ~ 26.5 GHz**

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

7.7. Conducted Spurious Emission

Test setup



Limit

According to §15.247(d) and RSS-247(5.5), 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 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 $[10 \log(\text{OBW}/\text{RBW})]$ below the reference level.
- 3) Attenuation: Auto (at least 10 dB preferred)
- 4) Sweep time = Coupled
- 5) RBW : 100 kHz
- 6) VBW : 300 kHz
- 7) Detector : Peak
- 8) Trace : Max hold

▪ Spurious emissions

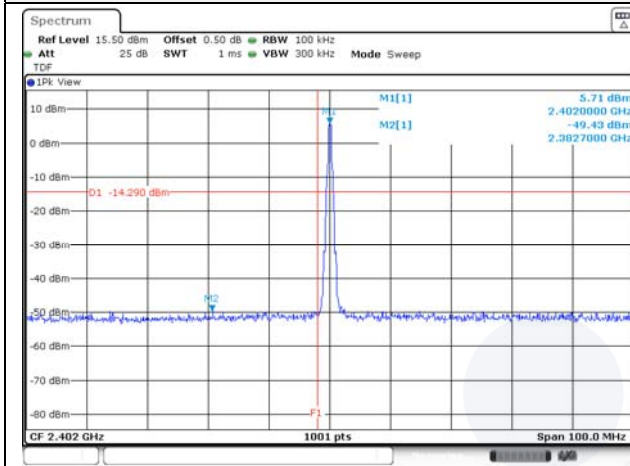
- 1) Span : 30 MHz to 10 times the operating frequency in GHz
- 2) RBW : 100 kHz
- 3) VBW : 300 kHz
- 4) Sweep time : Coupled
- 5) Detector : Peak

Test results

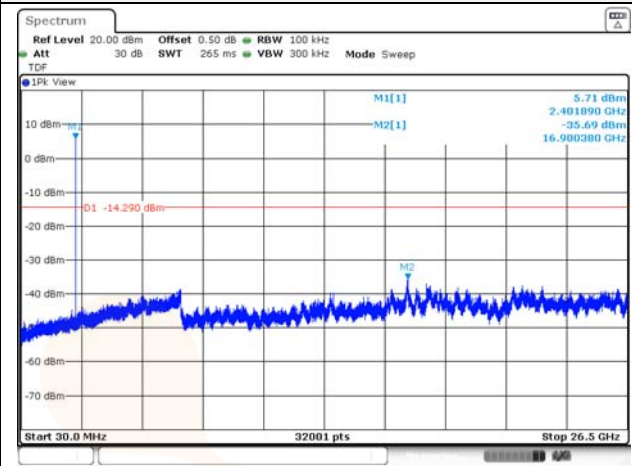
[DC 5 V]

GFSK

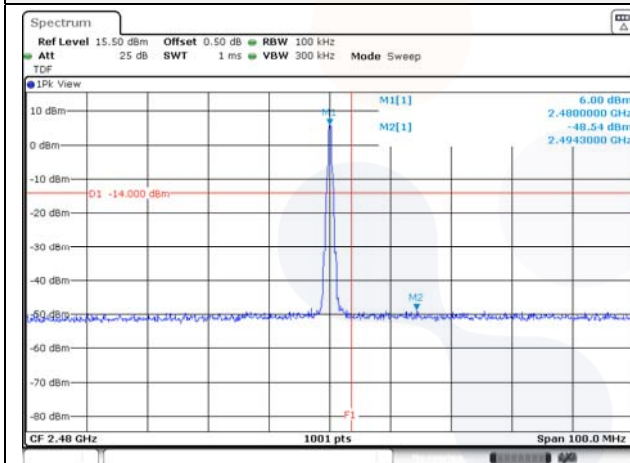
Conducted band-edge / Low ch.



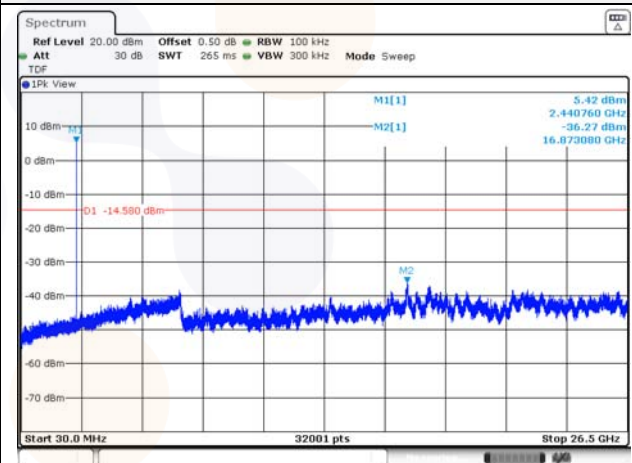
Conducted spurious / Low ch.



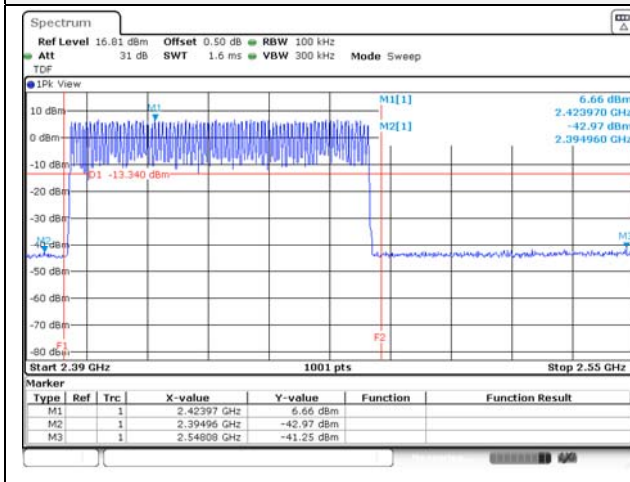
Conducted band-edge / High ch.



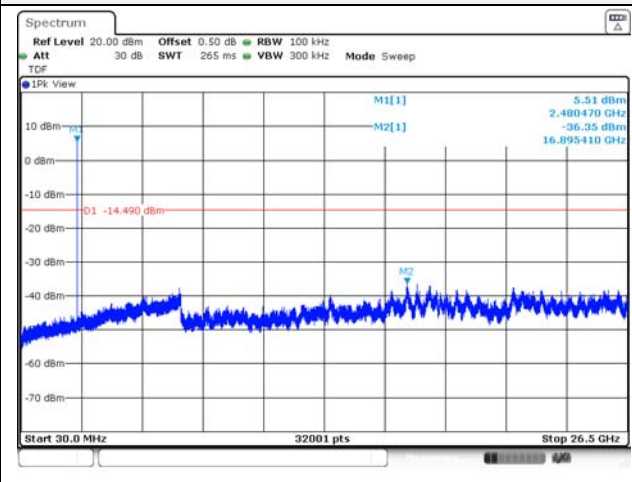
Conducted spurious / Mid ch.



Conducted band-edge / Hopping ch.

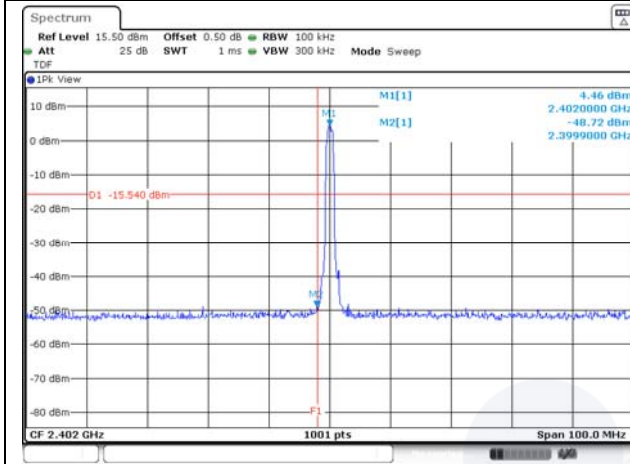


Conducted spurious / High ch.

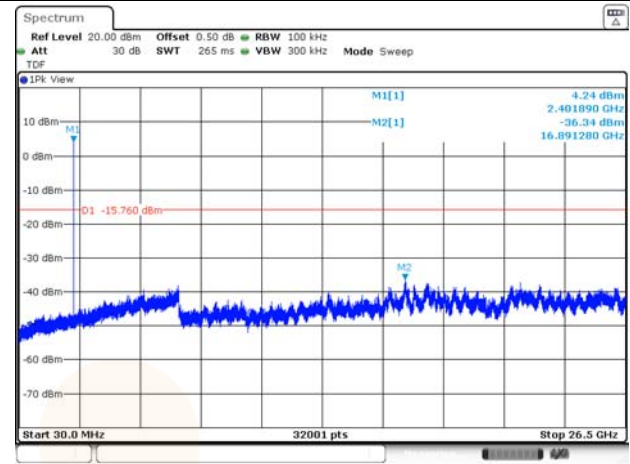


8DPSK

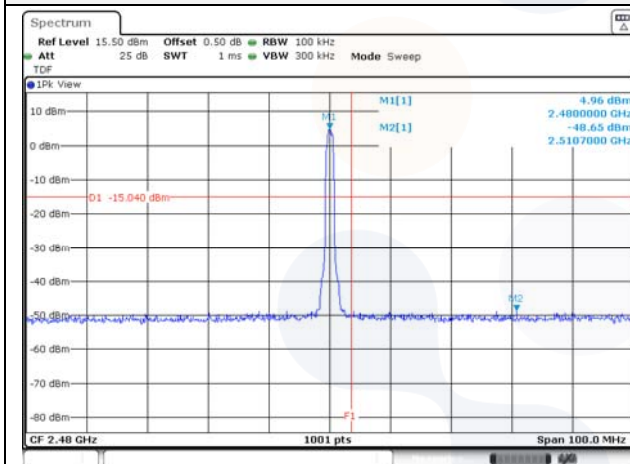
Conducted band-edge / Low ch.



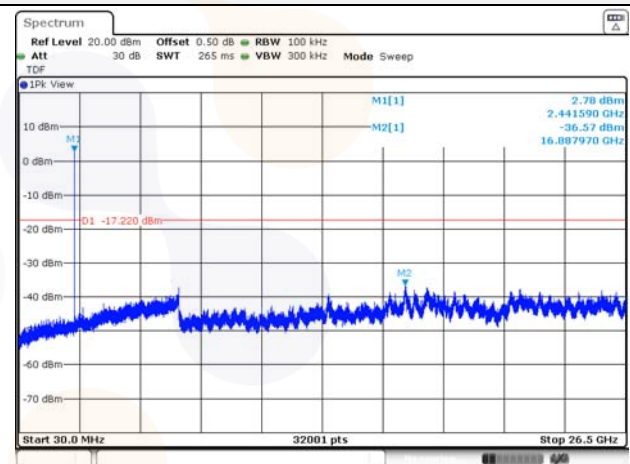
Conducted spurious / Low ch.



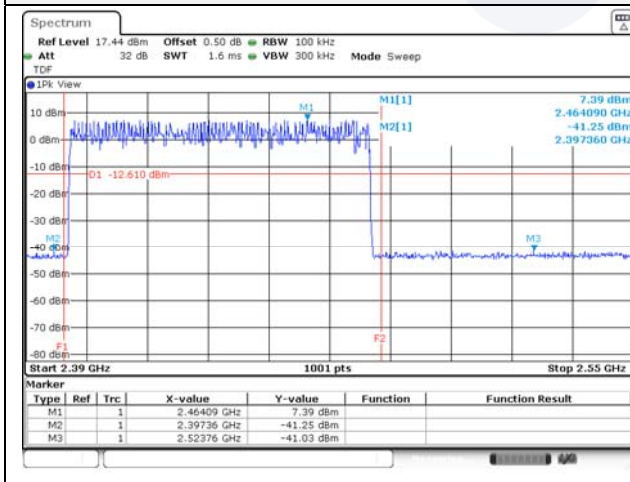
Conducted band-edge / High ch.



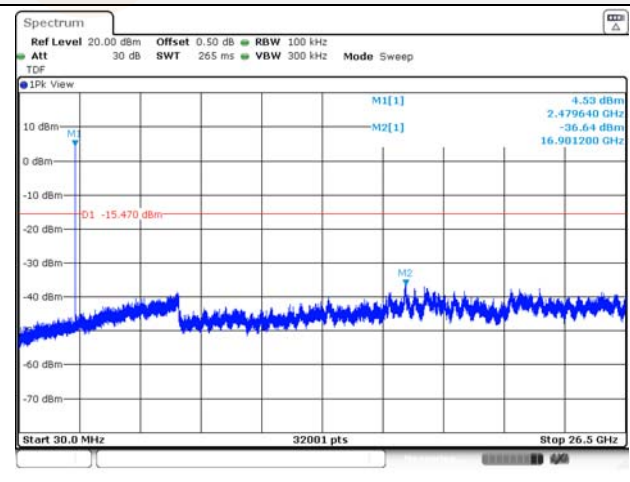
Conducted spurious / Mid ch.



Conducted band-edge / Hopping ch.



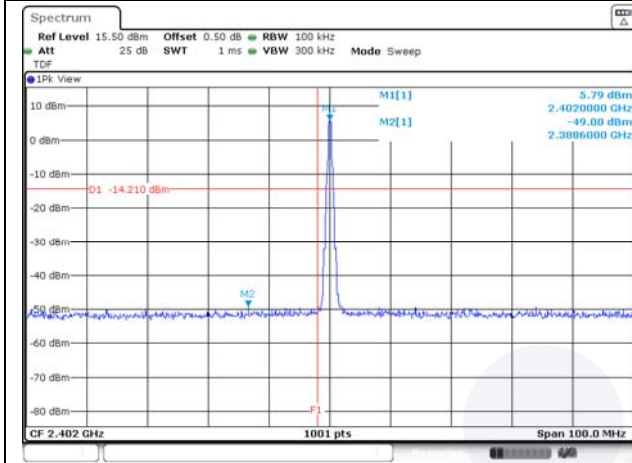
Conducted spurious / High ch.



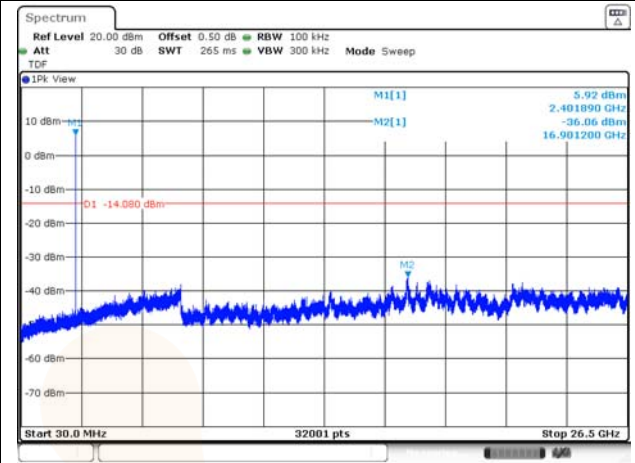
[DC 12 V]

GFSK

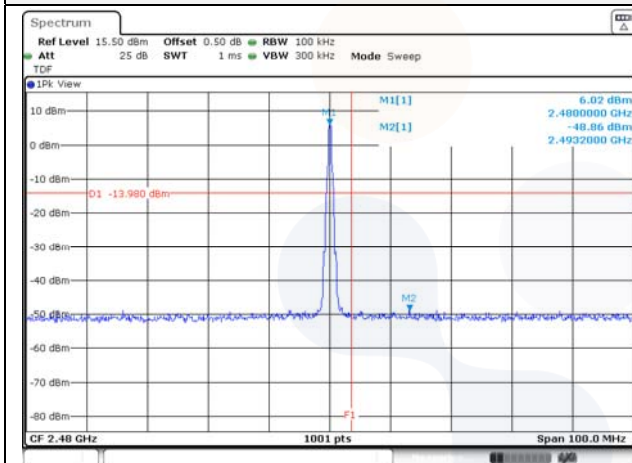
Conducted band-edge / Low ch.



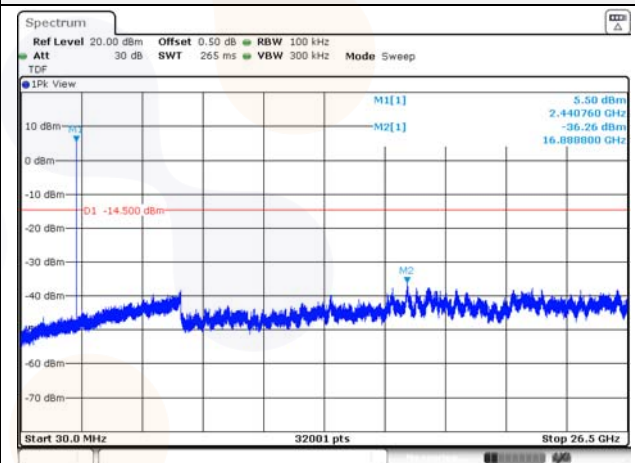
Conducted spurious / Low ch.



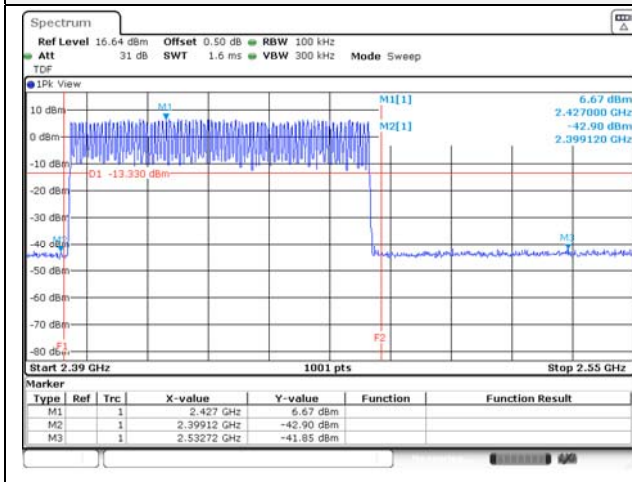
Conducted band-edge / High ch.



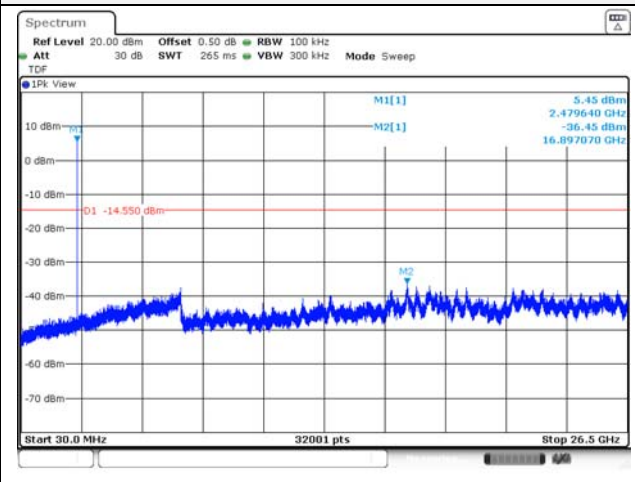
Conducted spurious / Mid ch.



Conducted band-edge / Hopping ch.

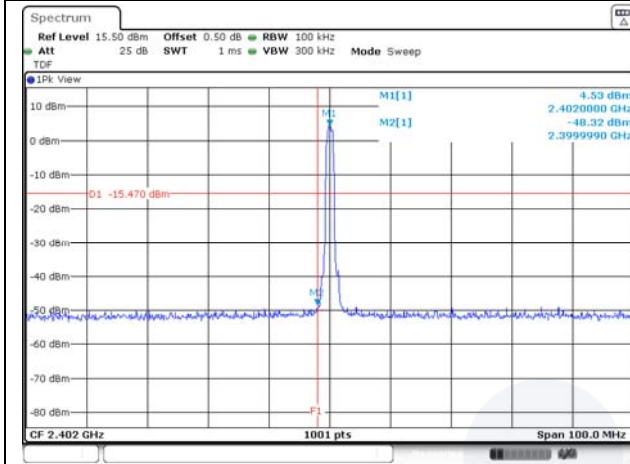


Conducted spurious / High ch.

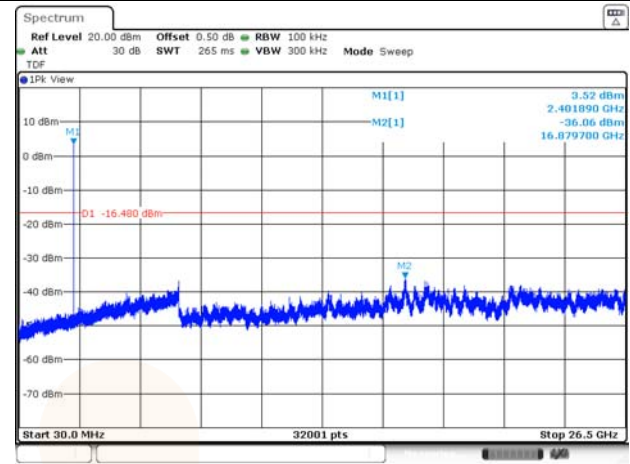


8DPSK

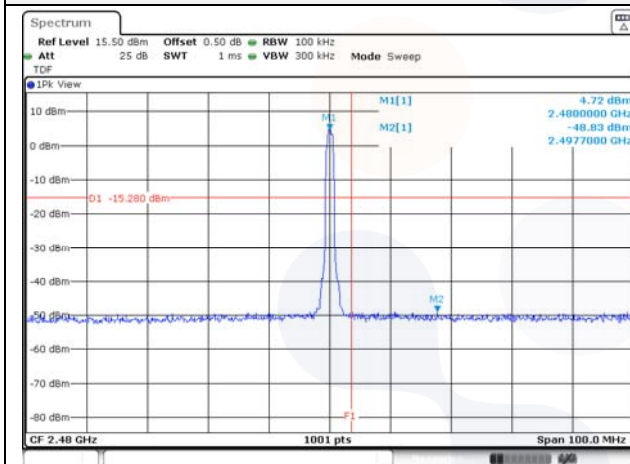
Conducted band-edge / Low ch.



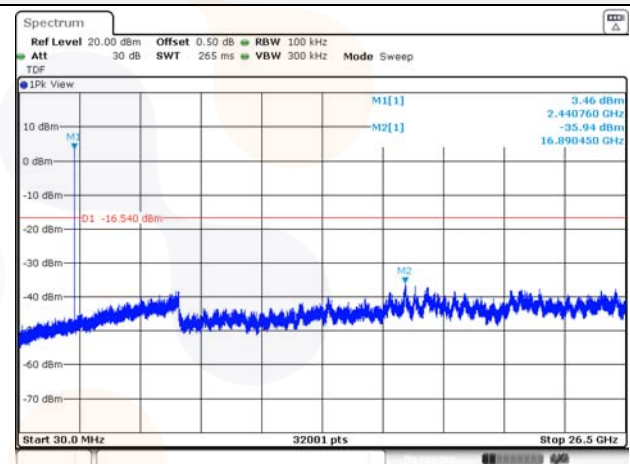
Conducted spurious / Low ch.



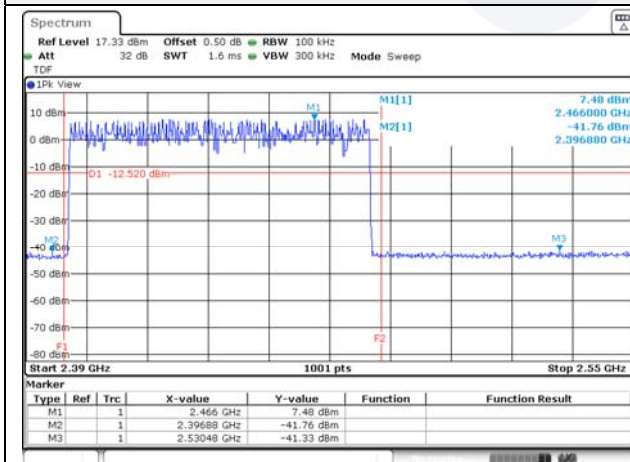
Conducted band-edge / High ch.



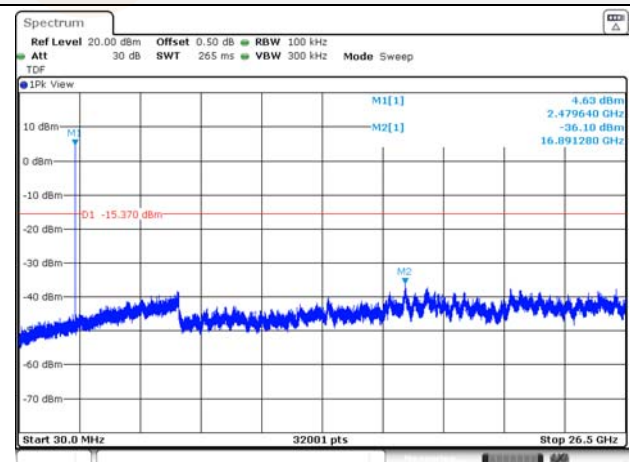
Conducted spurious / Mid ch.



Conducted band-edge / Hopping ch.

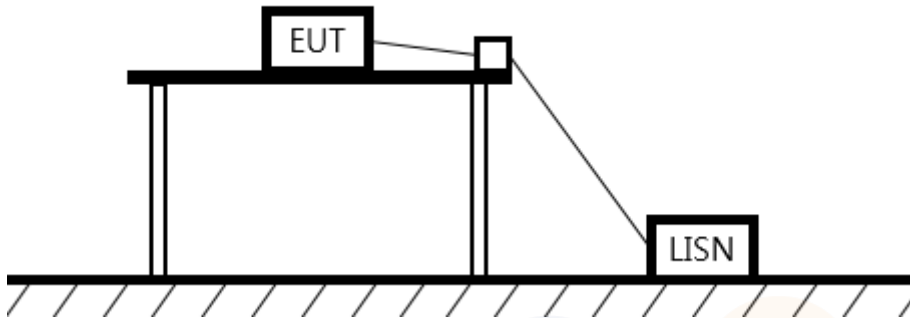


Conducted spurious / High ch.



7.8. AC Conducted emission

Test setup



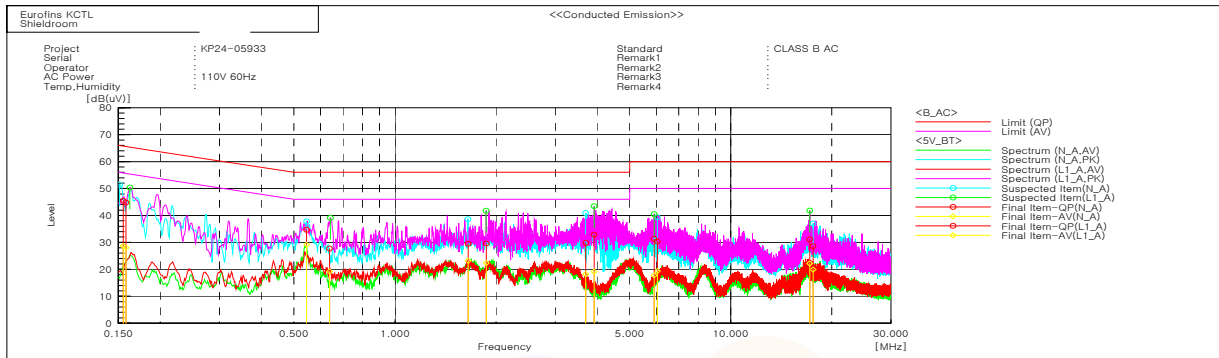
Limit

According to 15.207(a) and RSS-Gen(8.8), 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 be 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

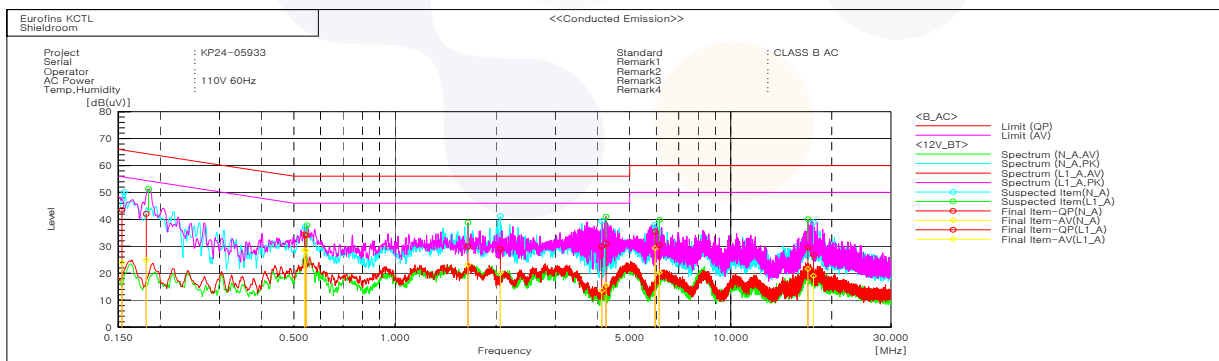
Measurement procedure

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.

Test results**[DC 5 V]****Worst case: 8DPSK 2 441 MHz****Final Result**

N_A Phase		Reading	Reading	c.f	Result	Result	Limit	Limit	Margin	Margin
No.	Frequency	QP	CAV		QP	CAV	QP	AV	QP	CAV
	[MHz]	[dB(uV)]	[dB(uV)]	[dB]	[dB(uV)]	[dB(uV)]	[dB(uV)]	[dB(uV)]	[dB]	[dB]
1	0.15523	35.5	18.7	9.9	45.4	28.6	65.7	55.7	20.3	27.1
2	0.54529	24.7	19.1	10.0	34.7	29.1	56.0	46.0	21.3	16.9
3	1.65324	19.6	13.3	9.9	29.5	23.2	56.0	46.0	26.5	22.8
4	3.70173	19.8	8.2	10.0	29.8	18.2	56.0	46.0	26.2	27.8
5	6.04499	20.2	9.3	10.1	30.3	19.4	60.0	50.0	29.7	30.6
6	17.605	18.0	9.3	10.6	28.6	19.9	60.0	50.0	31.4	30.1

L1_A Phase		Reading	Reading	c.f	Result	Result	Limit	Limit	Margin	Margin
No.	Frequency	QP	CAV		QP	CAV	QP	AV	QP	CAV
	[MHz]	[dB(uV)]	[dB(uV)]	[dB]	[dB(uV)]	[dB(uV)]	[dB(uV)]	[dB(uV)]	[dB]	[dB]
1	0.15908	34.8	18.1	10.0	44.8	28.1	65.6	55.6	20.8	27.5
2	0.63871	17.7	9.2	10.0	27.7	19.2	56.0	46.0	26.3	26.8
3	1.8715	19.7	12.5	9.9	29.6	22.4	56.0	46.0	26.4	23.6
4	3.91928	22.9	9.1	10.0	32.9	19.1	56.0	46.0	23.1	26.9
5	5.91596	21.2	7.6	10.1	31.3	17.7	60.0	50.0	28.7	32.3
6	17.19444	20.4	11.5	10.7	31.1	22.2	60.0	50.0	28.9	27.8

[DC 12 V]**Worst case: 8DPSK 2 441 MHz****Final Result**

N_A Phase		Reading	Reading	c.f	Result	Result	Limit	Limit	Margin	Margin
No.	Frequency	QP	CAV		QP	CAV	QP	AV	QP	CAV
	[MHz]	[dB(uV)]	[dB(uV)]	[dB]	[dB(uV)]	[dB(uV)]	[dB(uV)]	[dB(uV)]	[dB]	[dB]
1	0.15361	33.6	14.2	9.9	43.5	24.1	65.8	55.8	22.3	31.7
2	0.53849	24.4	18.6	10.0	34.4	28.6	56.0	46.0	21.6	17.4
3	2.06042	19.1	10.3	9.9	29.0	20.2	56.0	46.0	27.0	25.8
4	4.12812	20.0	3.6	10.0	30.0	13.6	56.0	46.0	26.0	32.4
5	5.95681	25.3	19.2	10.1	35.4	29.3	60.0	50.0	24.6	20.7
6	17.63002	16.2	8.4	10.6	26.8	19.0	60.0	50.0	33.2	31.0

L1_A Phase		Reading	Reading	c.f	Result	Result	Limit	Limit	Margin	Margin
No.	Frequency	QP	CAV		QP	CAV	QP	AV	QP	CAV
	[MHz]	[dB(uV)]	[dB(uV)]	[dB]	[dB(uV)]	[dB(uV)]	[dB(uV)]	[dB(uV)]	[dB]	[dB]
1	0.18169	31.9	14.8	10.1	42.0	24.9	64.4	54.4	22.4	29.5
2	0.54353	24.1	18.3	10.0	34.1	28.3	56.0	46.0	21.9	17.7
3	1.64943	20.0	13.4	9.9	29.9	23.3	56.0	46.0	26.1	22.7
4	4.25427	21.0	5.5	10.0	31.0	15.5	56.0	46.0	25.0	30.5
5	6.1318	20.4	10.2	10.1	30.5	20.3	60.0	50.0	29.5	29.7
6	16.98316	18.8	10.9	10.7	29.5	21.6	60.0	50.0	30.5	28.4

8. Measurement equipment

Equipment Name	Manufacturer	Model No.	Serial No.	Next Cal. Date
Spectrum Analyzer	R&S	FSV30	100808	25.07.01
Bluetooth Tester	TESCOM	TC-3000C	3000C000270	25.07.01
DC Power Supply	TOYOTECH	TL305TP	21040092	25.07.01
Attenuator	Weinschel ENGINEERING	56-10	51395	25.01.19
Power Sensor	R&S	NRP-Z81	1137.9009.02- 106223-bB	25.04.24
Attenuator	R&S	DNF	0006	25.01.18
Divider	Marki Microwave, Inc.	PD-0040	D0002	25.06.24
Vector Signal Generator	R&S	SMBV100A	257566	25.07.01
Signal Generator	R&S	SMB100A	176206	25.01.18
Spectrum Analyzer	R&S	FSV40	100989	25.10.10
Horn antenna	ETS.lindgren	3117	00251528	25.01.26
Horn antenna	ETS.lindgren	3116	00086635	25.01.25
AMPLIFIER	B&Z Technologies	BZRT-00504000- 481055-382525	26299-27735	25.06.24
AMPLIFIER	B&Z Technologies	BZR-0050400- 551028-252525	27736	25.06.24
Attenuator	API Inmet	40AH2W-10	12	25.04.30
High pass Filter	WT	WT-A1698-HS	WT160411001	25.04.25
High pass Filter	Qotana	DBHF058004000A	20070100016	25.06.24
EMI TEST RECEIVER	R&S	ESCI7	100732	25.02.28
Bi-Log Antenna	TESEQ	CBL 6112D	62438	25.05.25
Amplifier	SONOMA INSTRUMENT	310N	284608	25.08.13
ATTENUATOR	KEYSIGHT	8491B-6dB	MY39271082	25.05.25
LOOP Antenna	R&S	HFH2-Z2	100355	26.06.25
ISOLATION TRANSFORMER	ONETECH CO.,LTD	OT-IT500VA	OTR1-16026	25.03.21
EMI TEST RECEIVER	R&S	ESCI7	100732	25.02.28
TWO-LINE V - NETWORK	R&S	ENV216	101353	25.03.27
EMI TEST RECEIVER	R&S	ESCI3	100001	25.08.12
Antenna Mast	Innco Systems	MA4640/800-XP-ET	-	-
Turn Table	Innco Systems	DT2000	79	-
Antenna Mast	Innco Systems	MA4640-XP-ET	MA4000/396/30 810213/L	-
Controller	Innco Systems	CO3000	1175/45850319/ P	-

End of test report