

# 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](http://www.kctl.co.kr)

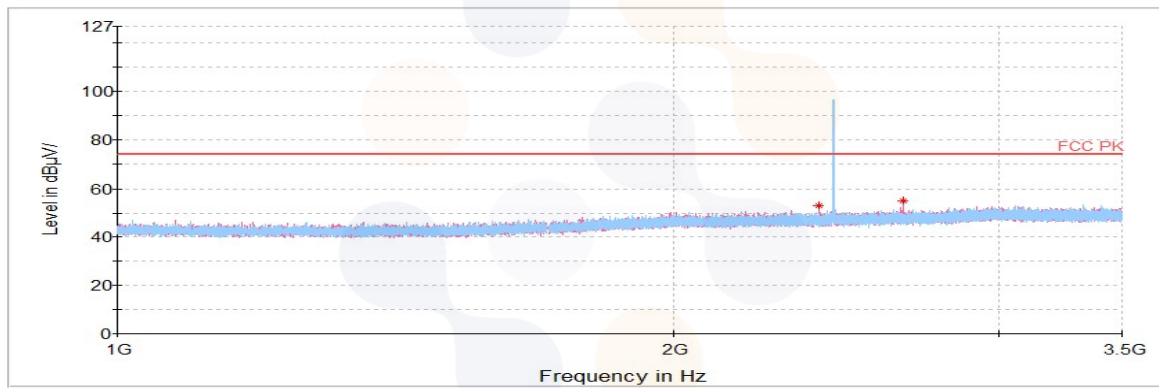
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KR22-SRF0033  
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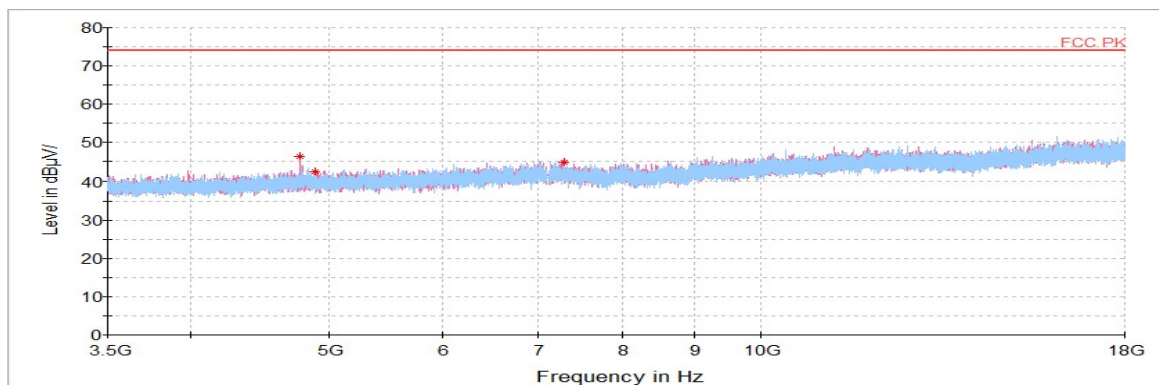
## 8DPSK\_Mid Channel

Frequency	Pol.	Reading	Ant. Factor	Amp. + Cable	DCCF	Result	Limit	Margin
(MHz)	(V/H)	(dB( $\mu$ V))	(dB)	(dB)	(dB)	(dB( $\mu$ V/m))	(dB( $\mu$ V/m))	(dB)
<b>Peak data</b>								
2 396.48	V	66.75	31.97	-45.63	-	53.09	74.00	20.91
2 661.80	V	67.60	32.46	-45.13	-	54.93	74.00	19.07
4 777.36 <sup>1)</sup>	V	64.21	33.64	-51.57	-	46.28	74.00	27.72
4 886.56 <sup>1)</sup>	H	60.21	33.62	-51.54	-	42.29	74.00	31.71
7 294.92 <sup>1)</sup>	V	59.16	35.38	-49.78	-	44.76	74.00	29.24
<b>Average Data</b>								
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



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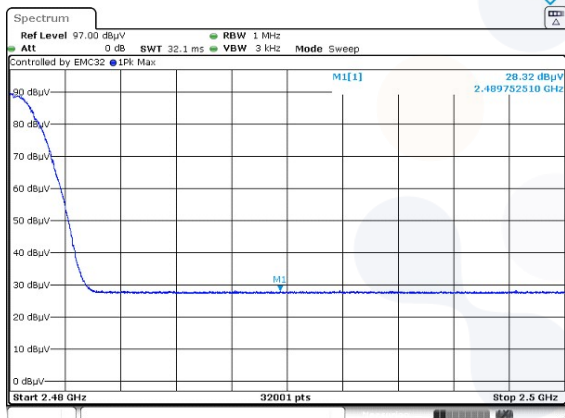
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## 8DPSK\_High Channel

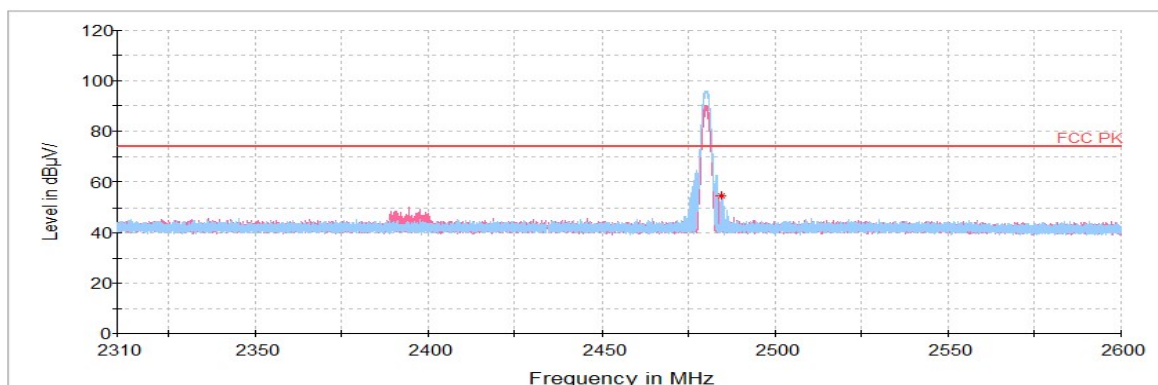
Frequency	Pol.	Reading	Ant. Factor	Amp. + Cable	DCCF	Result	Limit	Margin
(MHz)	(V/H)	(dB(μV))	(dB)	(dB)	(dB)	(dB(μV/m))	(dB(μV/m))	(dB)
<b>Peak data</b>								
2 489.75 <sup>1)</sup>	H	49.86	32.18	-27.22	-	54.82	74.00	19.18
2 654.84	V	65.97	32.45	-45.13	-	53.29	74.00	20.71
4 769.66 <sup>1)</sup>	H	61.66	33.65	-51.57	-	43.74	74.00	30.26
4 954.53 <sup>1)</sup>	H	60.46	33.61	-51.66	-	42.41	74.00	31.59
7 260.03 <sup>1)</sup>	V	60.03	35.40	-49.78	-	45.65	74.00	28.35
7 451.70 <sup>1)</sup>	V	58.34	35.32	-49.78	-	43.88	74.00	30.12
<b>Average Data</b>								
2 489.75 <sup>1)</sup>	H	28.32	32.18	-27.22	-	33.28	54.00	20.72

### Average data



Blank

### Horizontal/Vertical for Band-edge



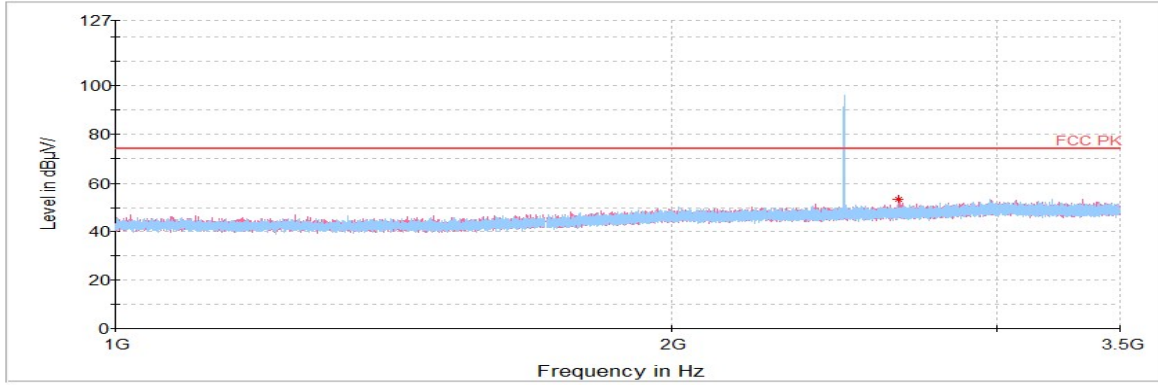
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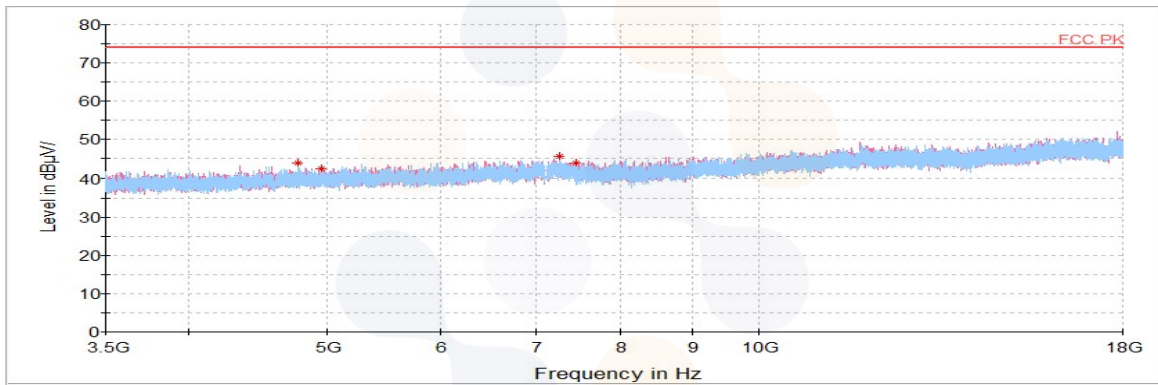
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## Horizontal/Vertical for 1 GHz ~ 3.5 GHz



## Horizontal/Vertical for 3.5 GHz ~ 18 GHz



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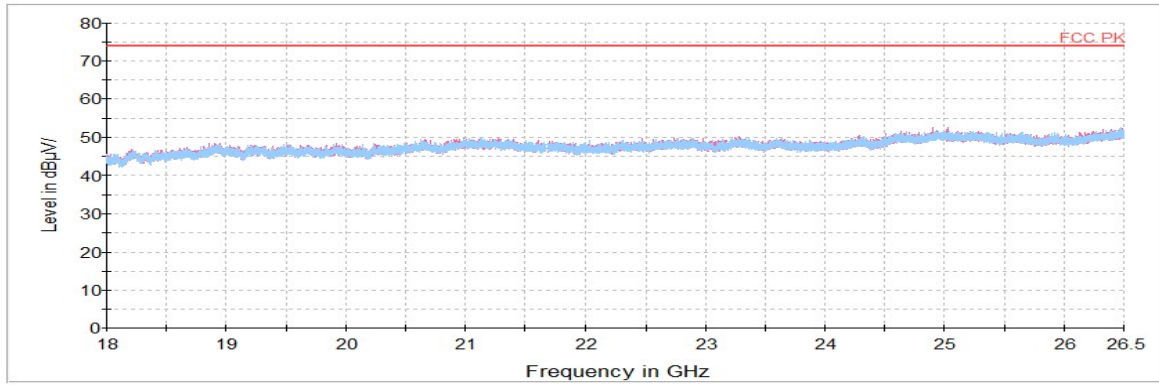
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## Test results (Above 18 GHz) – Worst case: GFSK 2 441 MHz

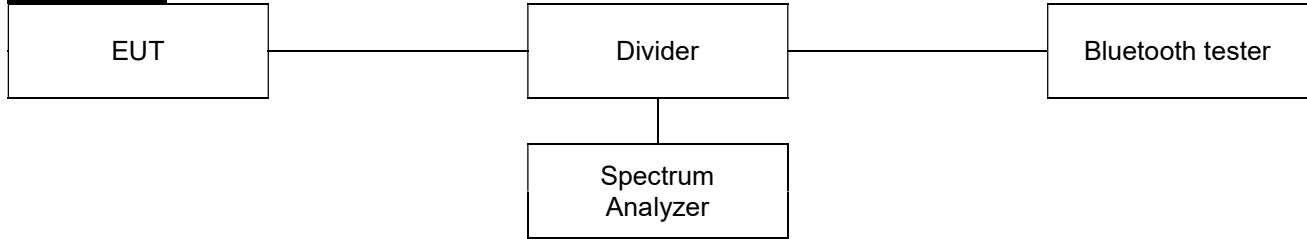
### Horizontal/Vertical for 18 GHz ~ 26.5 GHz



**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), 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

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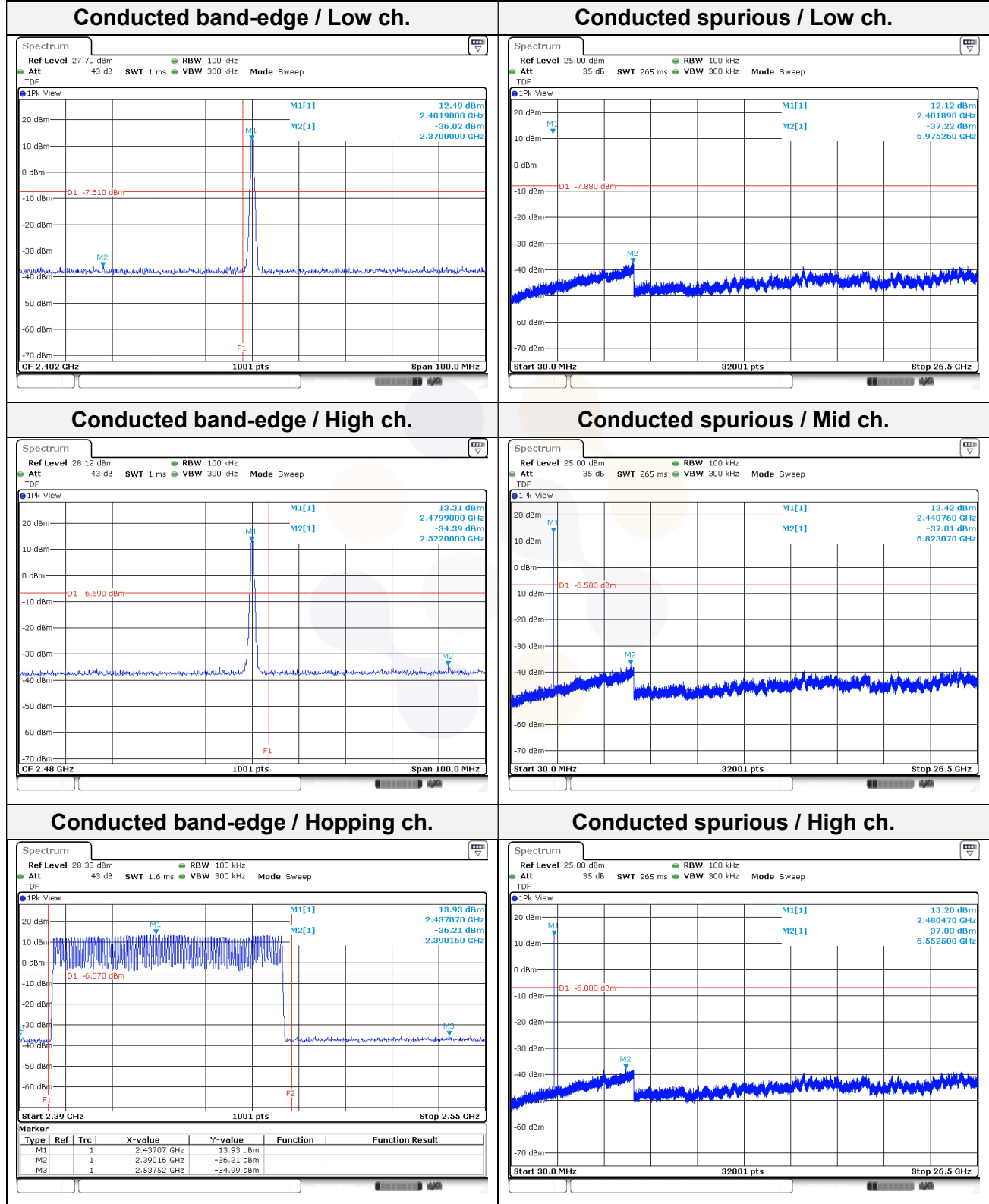
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## Test results

### GFSK



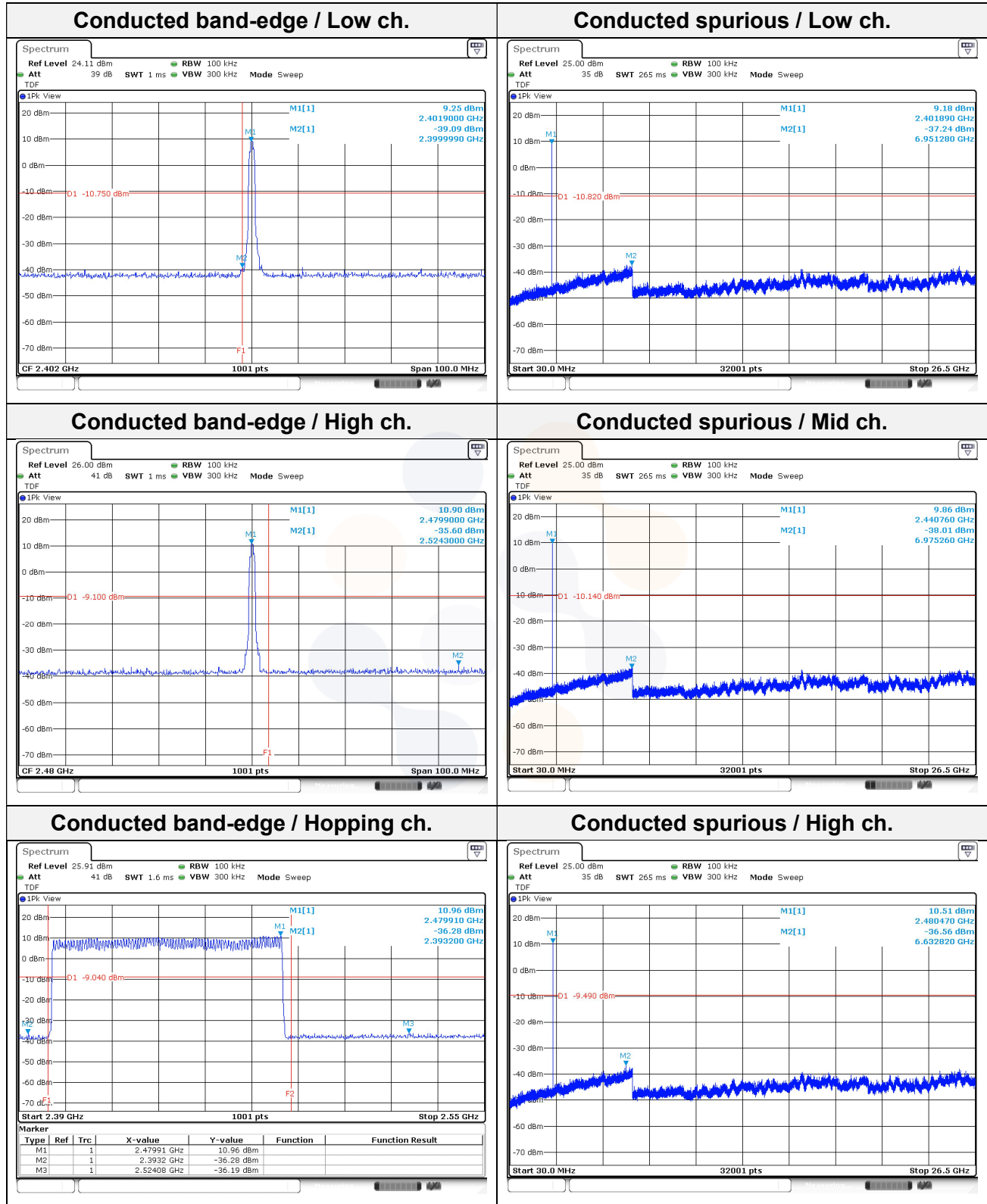
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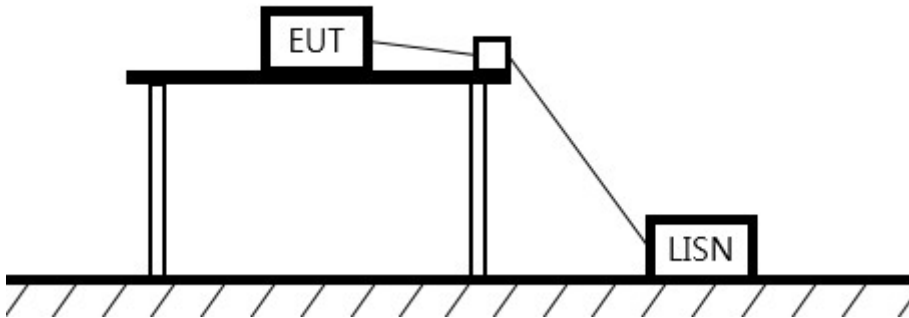
## 8DPSK





## 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 kHz to 30 MHz, shall not exceed the limits in the following table, as measured using a 50 $\mu$ 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 $\mu$ 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 $\Omega$ /50 $\mu$ 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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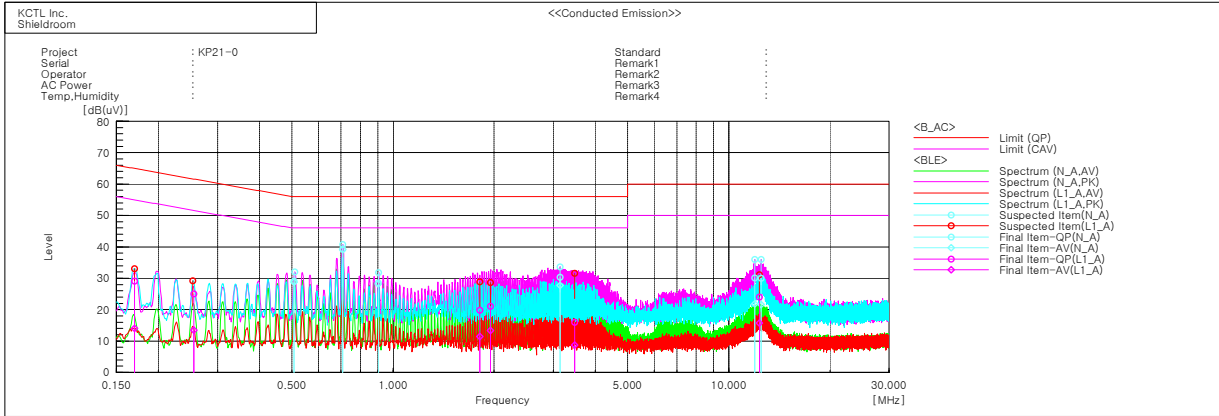
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## Test results

### Worst case: GFSK 2 441 MHz




#### 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	0.50753	19.1	18.9	9.9	29.0	28.8	56.0	46.0	27.0	17.2
2	0.70714	29.4	29.3	9.9	39.3	39.2	56.0	46.0	16.7	6.8
3	0.90356	18.8	18.3	9.8	28.6	28.1	56.0	46.0	27.4	17.9
4	3.14253	20.5	17.9	9.8	30.3	27.7	56.0	46.0	25.7	18.3
5	11.93771	19.8	11.6	10.3	30.1	21.9	60.0	50.0	29.9	28.1
6	12.49434	19.7	11.3	10.3	30.0	21.6	60.0	50.0	30.0	28.4

--- L_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	0.16969	19.0	3.9	10.1	29.1	14.0	65.0	55.0	35.9	41.0
2	0.25509	15.3	3.8	9.7	25.0	13.5	61.6	51.6	36.6	38.1
3	1.81074	10.0	1.6	9.8	19.8	11.4	56.0	46.0	36.2	34.6
4	1.94971	11.2	3.5	9.8	21.0	13.3	56.0	46.0	35.0	32.7
5	3.47439	6.1	-1.1	9.8	15.9	8.7	56.0	46.0	40.1	37.3
6	12.34049	13.6	5.3	10.4	24.0	15.7	60.0	50.0	36.0	34.3

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## 8. Measurement equipment

Equipment Name	Manufacturer	Model No.	Serial No.	Next Cal. Date
Signal & Spectrum Analyzer	R&S	FSV3030	1330.5000K30-101710-Wt	22.12.02
Attenuator	API Inmet	40AH2W-10	16	22.05.11
Signal Generator	R&S	SMB100A	176206	23.01.19
Vector Signal Generator	R&S	SMBV100A	257566	22.07.09
Bluetooth Tester	TESCOM	TC-3000C	3000C000270	22.07.28
Power Divider	Aeroflex/ Weinschel, Inc	1580-1	PE430	22.07.29
Power Sensor	R&S	NRP-Z81	1137.9009.02-106223-bB	22.05.11
Attenuator	R&S	DNF Dämpfungsglied 10 dB in N-50 Ohm	31210	22.05.11
DC Power Supply	AGILENT	E3632A	MY40017108	22.05.10
Spectrum Analyzer	R&S	FSV40	100989	22.12.21
EMI TEST RECEIVER	R&S	ESC17	100732	23.01.19
Bi-Log Antenna	TESEQ	CBL 6112D	55545	23.01.14
Amplifier	SONOMA INSTRUMENT	310N	284608	22.08.19
ATTENUATOR	KEYSIGHT	8491B-6dB	MY39271060	23.01.14
Horn antenna	ETS.lindgren	3117	155787	22.10.05
Horn antenna	ETS.lindgren	3116	00086635	22.05.17
Attenuator	API Inmet	40AH2W-10	12	22.05.11
Broadband PreAmplifier	SCHWARZBECK	BBV9718	216	22.07.27
AMPLIFIER	L-3 Narda-MITEQ	AMF-7D-01001800 -22-10P	2003683	22.08.19
AMPLIFIER	L-3 Narda-MITEQ	JS44-18004000-33-8P	2000996	23.01.21
LOOP Antenna	R&S	HFH2-Z2	100355	22.08.21
Antenna Mast	Innco Systems	MA4640-XP-ET	-	-
Turn Table	Innco Systems	CO3000	1175/45850319/P	-
Antenna Mast	Innco Systems	MA4000-EP	303	-
Turn Table	Innco Systems	CO3000	1175/45850319/P	-
Highpass Filter	WT	WT-A1698-HS	WT160411001	22.05.10
TWO-LINE V - NETWORK	R&S	ENV216	101358	22.09.29
EMI TEST RECEIVER	R&S	ESC13	100001	22.08.19
Cable Assembly	RadiAll	2301761768000PJ	1724.659	-
Cable Assembly	HUER+SUHNER	SUCOFLEX 104	MY4342/4	-
Cable Assembly	HUER+SUHNER	SUCOFLEX 102	804320/2	-

**End of test report**