



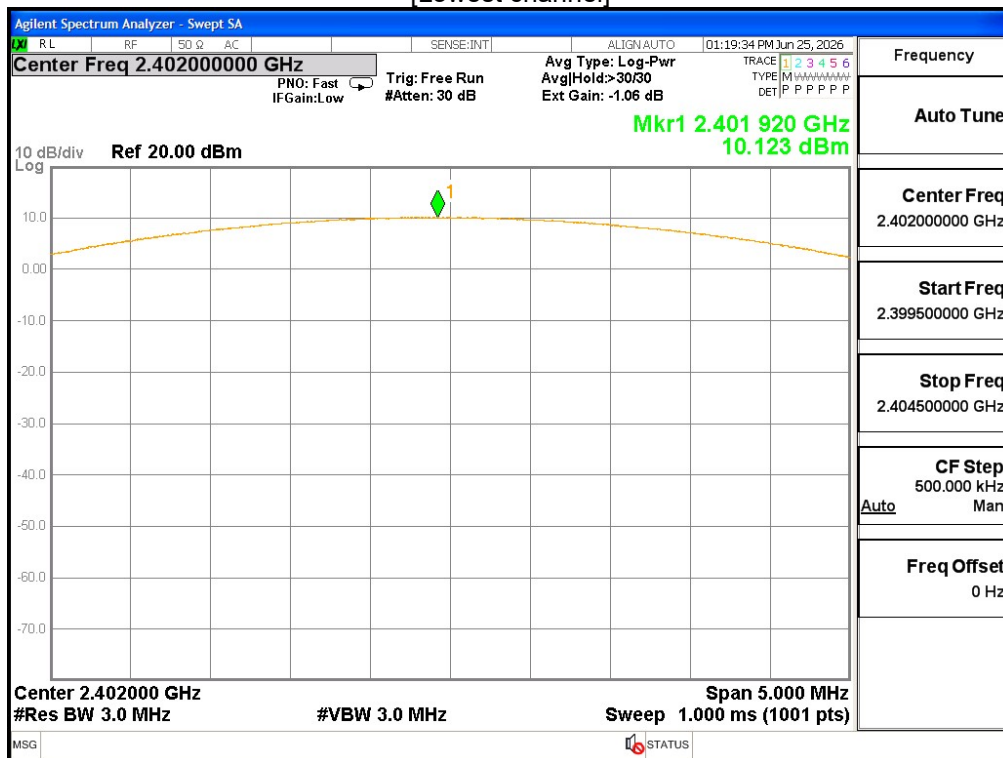
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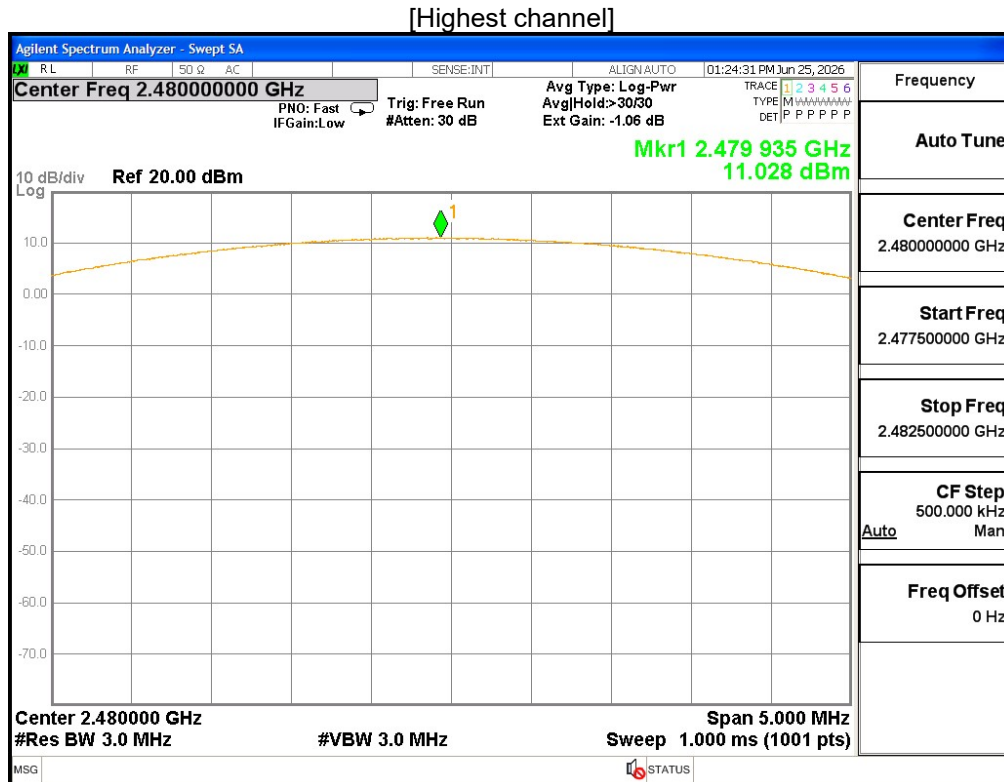
Test Mode : 8-DPSK

[Lowest channel]



[Middle channel]





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4.6 Unwanted Emissions (Conducted)

Test Procedures

ANSI C63.10-2020 - Section 7.8.7

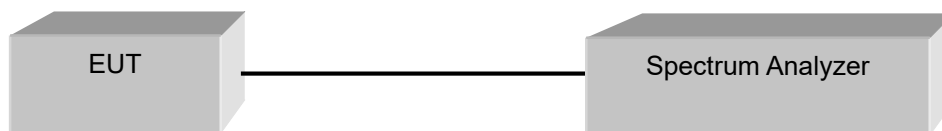
In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated device is operating, the RF power that is produced shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement, provided that the transmitter demonstrates compliance with the peak conducted power limits. If the transmitter complies with the conducted power limits based on the use of root-mean-square averaging over a time interval, as permitted under Section 5.4(4), the attenuation required shall be 30 dB instead of 20 dB.

The bandwidth at 20 dB down from the highest inband spectral density was measured with a spectrum analyzer connected to the antenna terminal, while EUT has its hopping function disabled at the highest, middle and the lowest available channels.

Test Settings:

Center frequency = the highest, middle and the lowest channels

- a) RBW = 100 kHz
- b) VBW $\geq 3 \times$ RBW
- c) Detector = peak
- d) Sweep time = No faster than coupled (auto) time.
- e) Trace mode = max hold
- f) Allow trace to fully stabilize
- g) Use the peak marker function to determine the maximum amplitude level.



Limit :

Emission Level > 20 dBc

Test Results : Complies

- All conducted emission in any 100 kHz bandwidth outside of the spread spectrum band was at least 20 dB lower than the highest in-band spectral density. Therefore the applying equipment meets the requirement.

See next pages for actual measured spectrum plots.



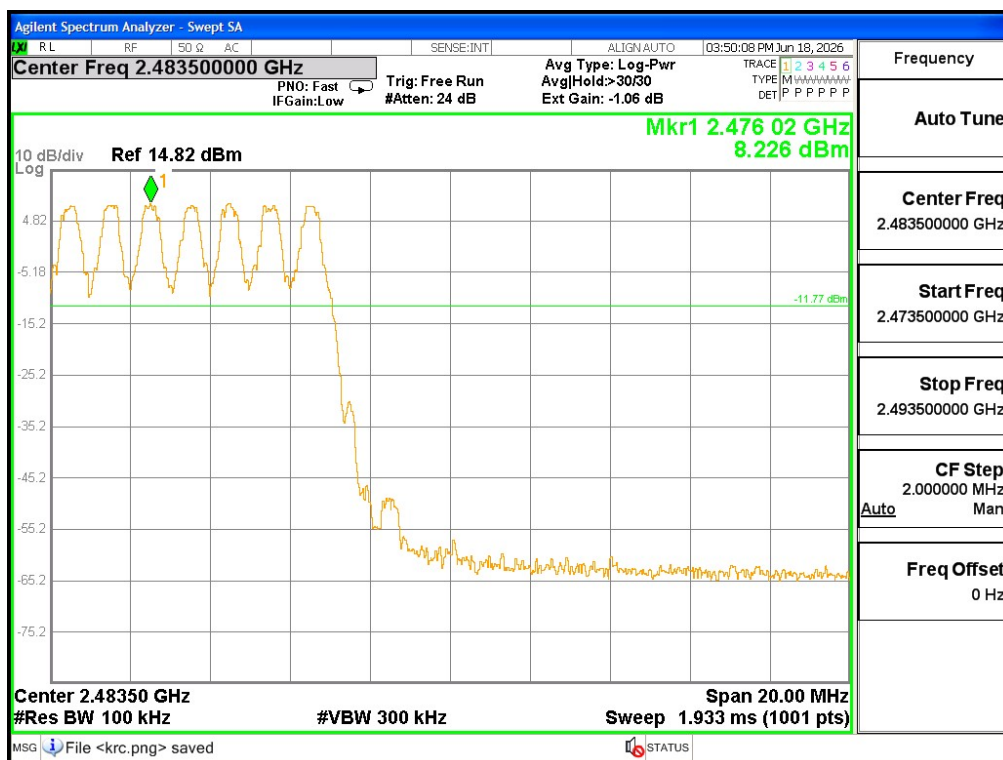
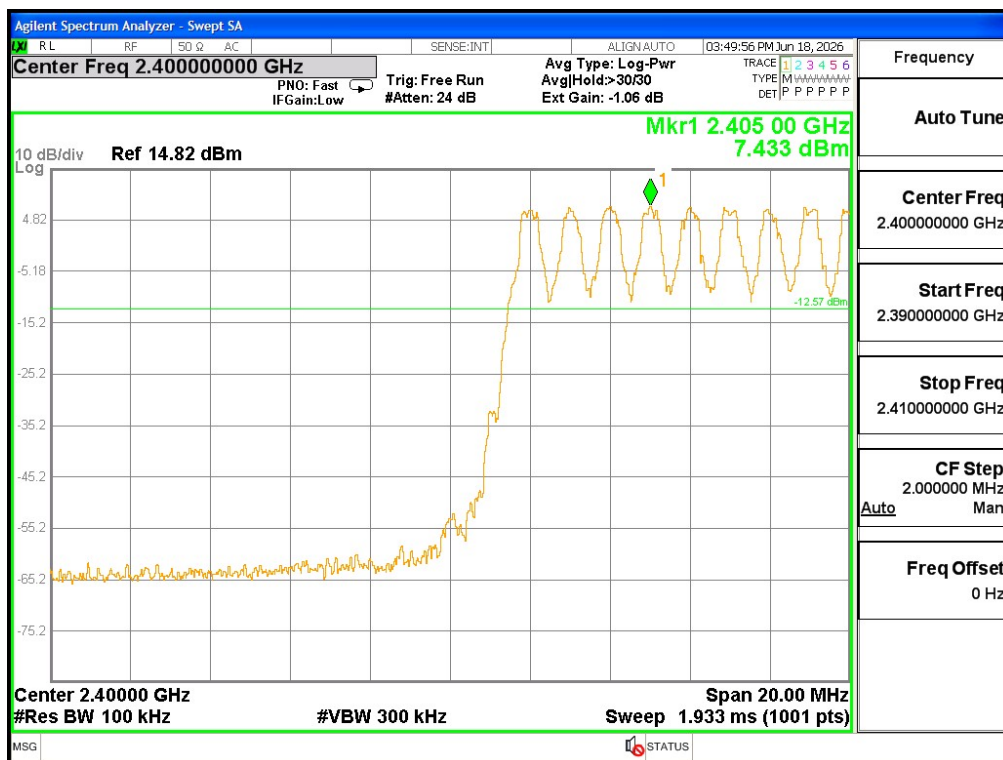
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Band Edge

Test Mode : Hopping mode, GFSK



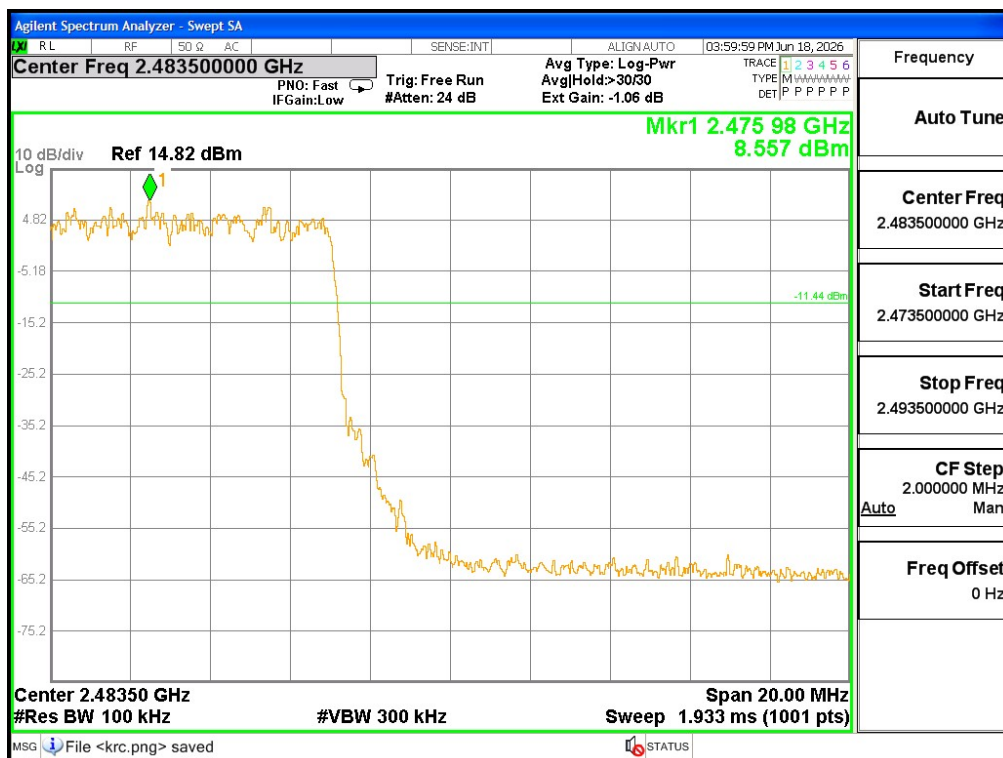
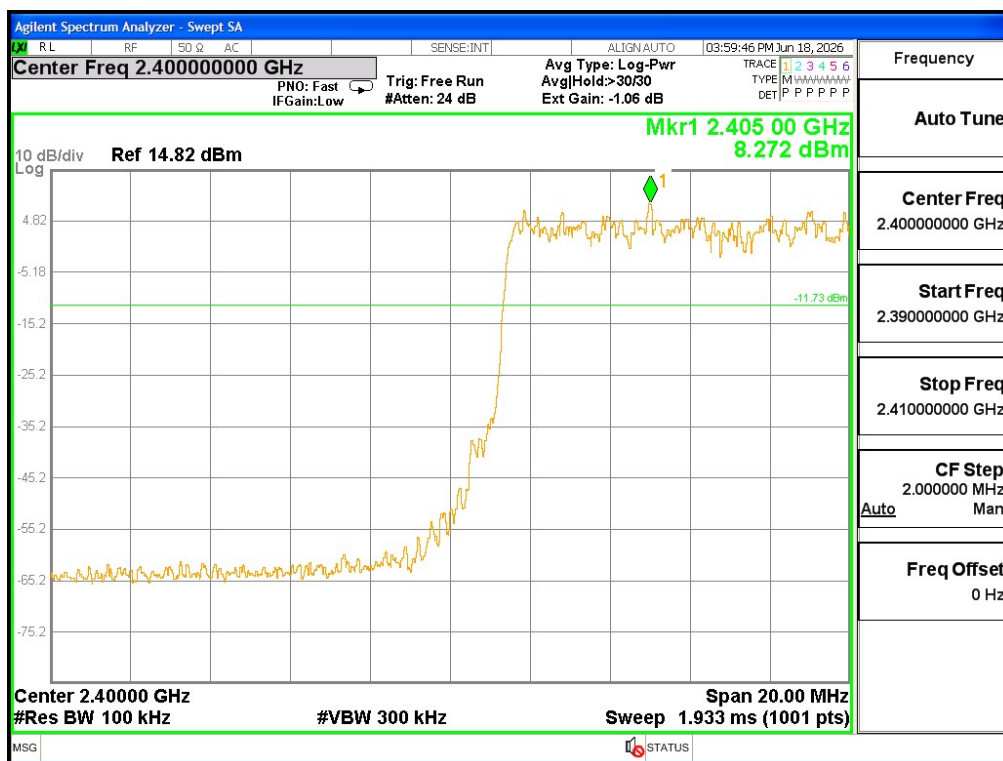


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Test Mode : Hopping mode, 8-DPSK



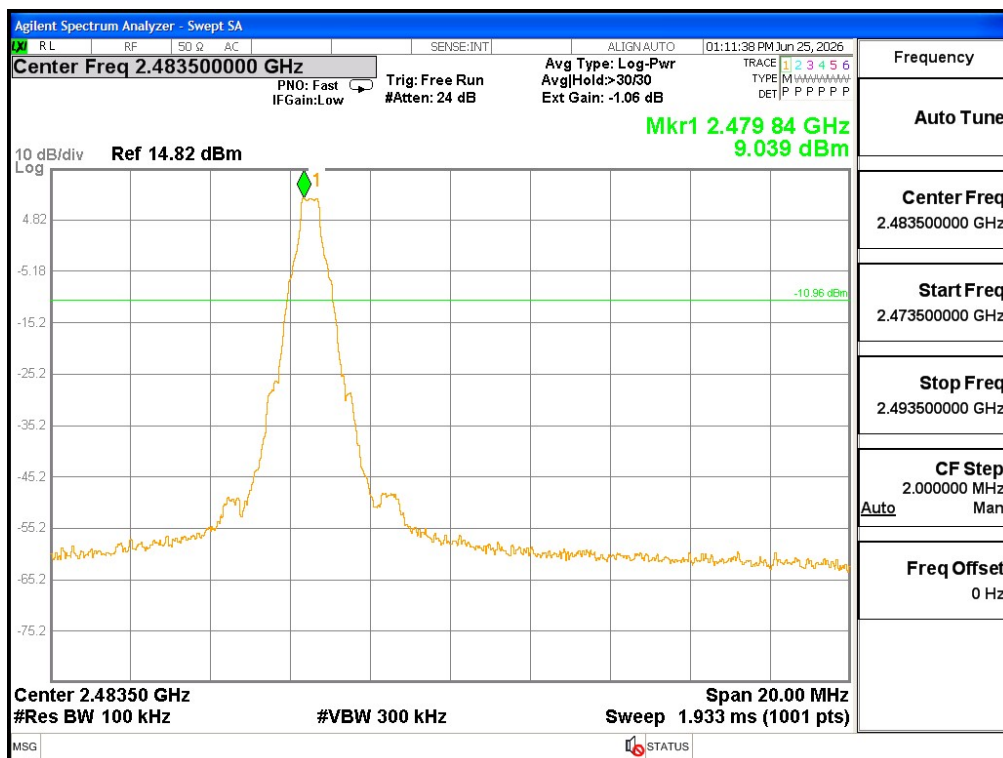
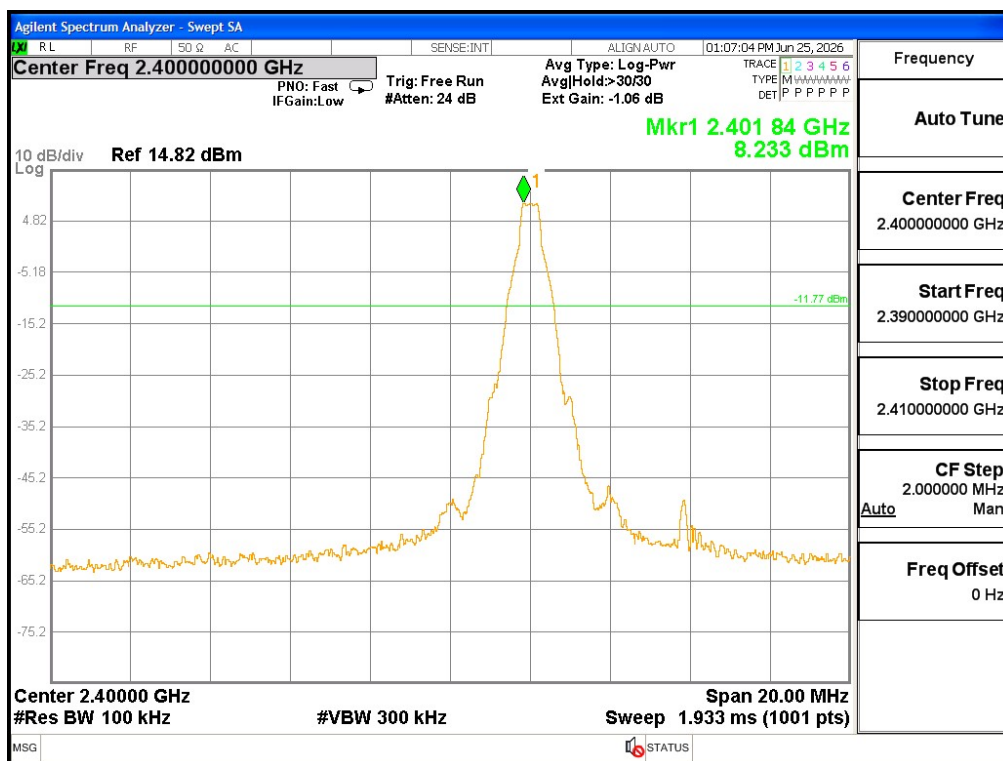


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Test Mode : Non-Hopping mode, GFSK



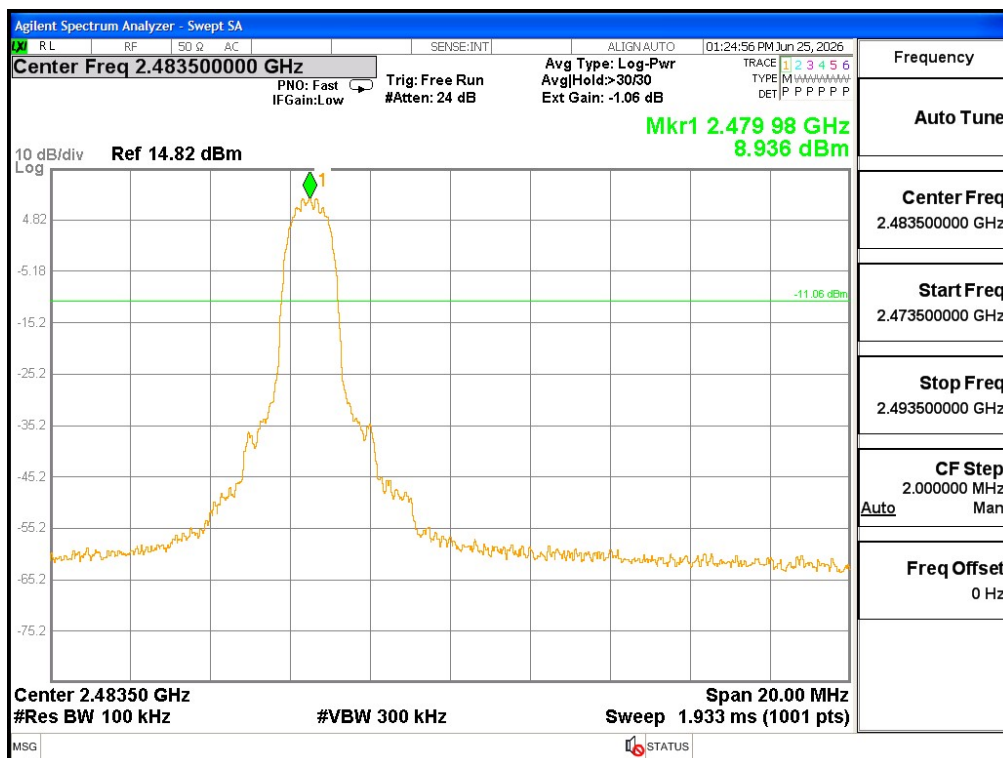
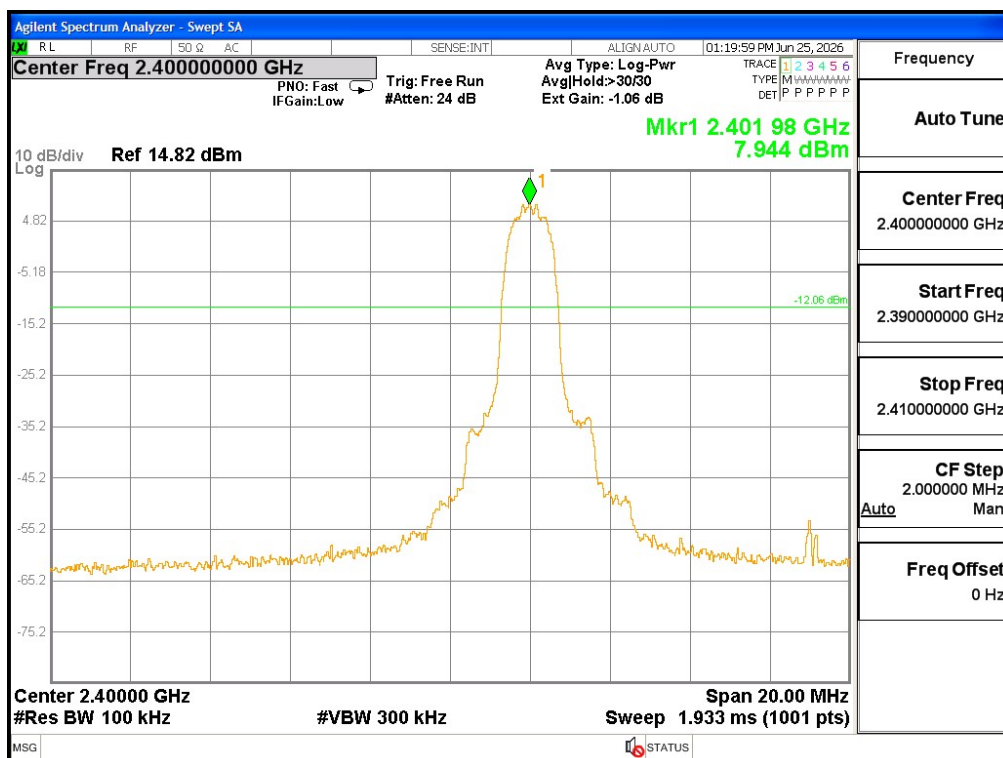


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Test Mode : Non-Hopping mode, 8-DPSK





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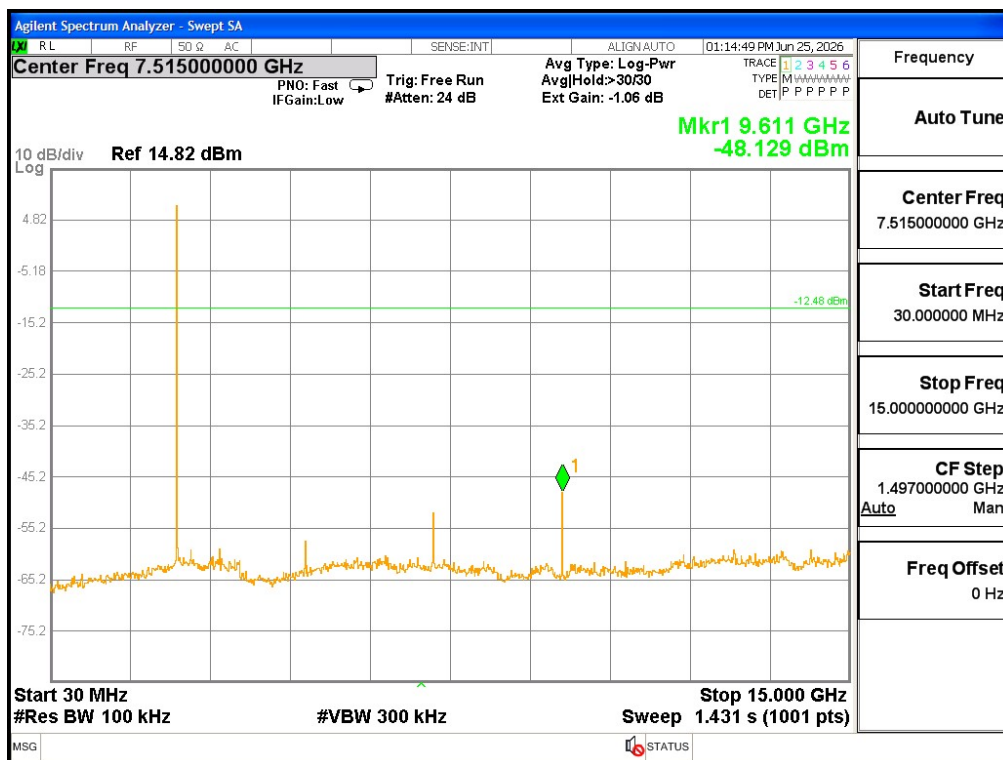
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Spurious Emission

Test Mode : GFSK

[Lowest channel]



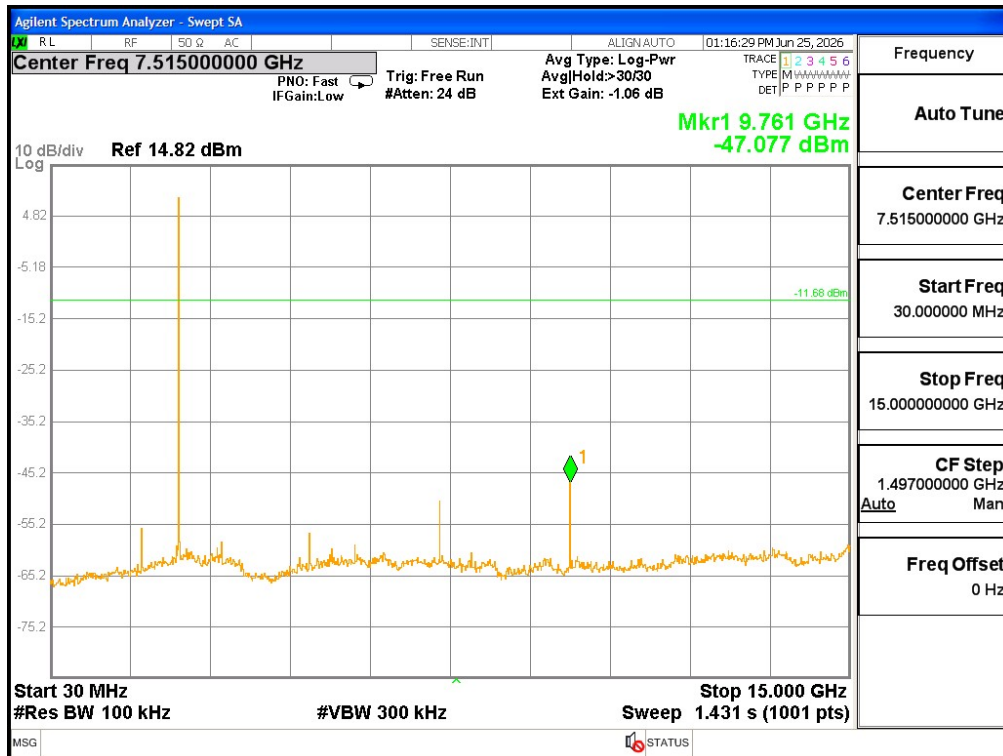


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[Middle Channel]



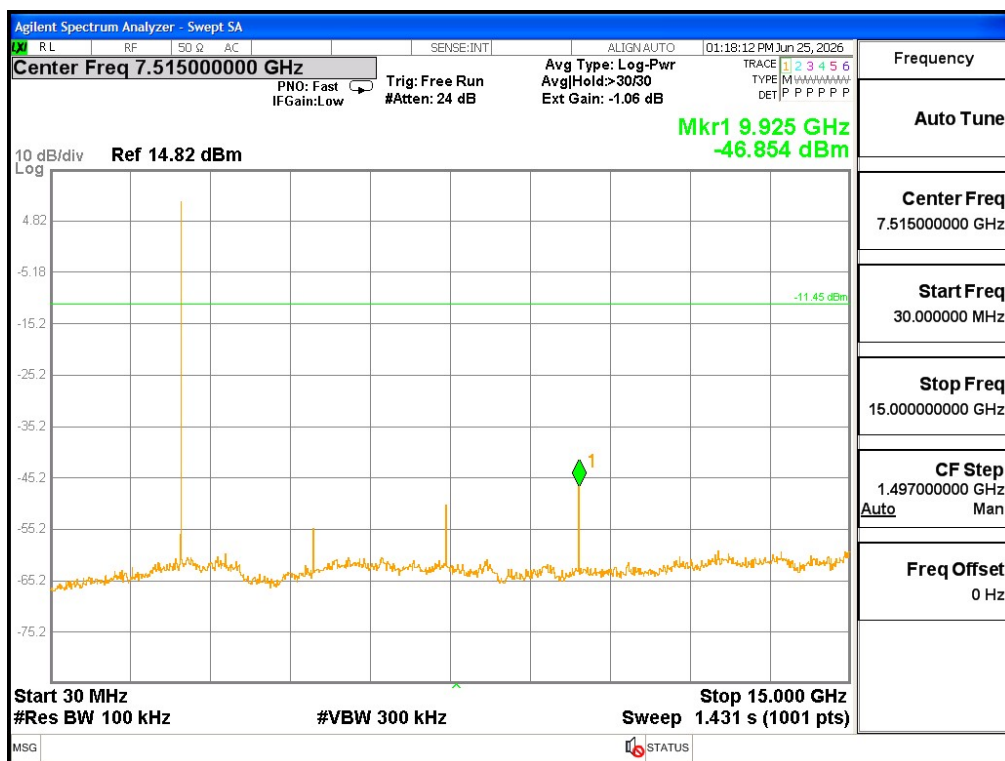


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[Highest Channel]





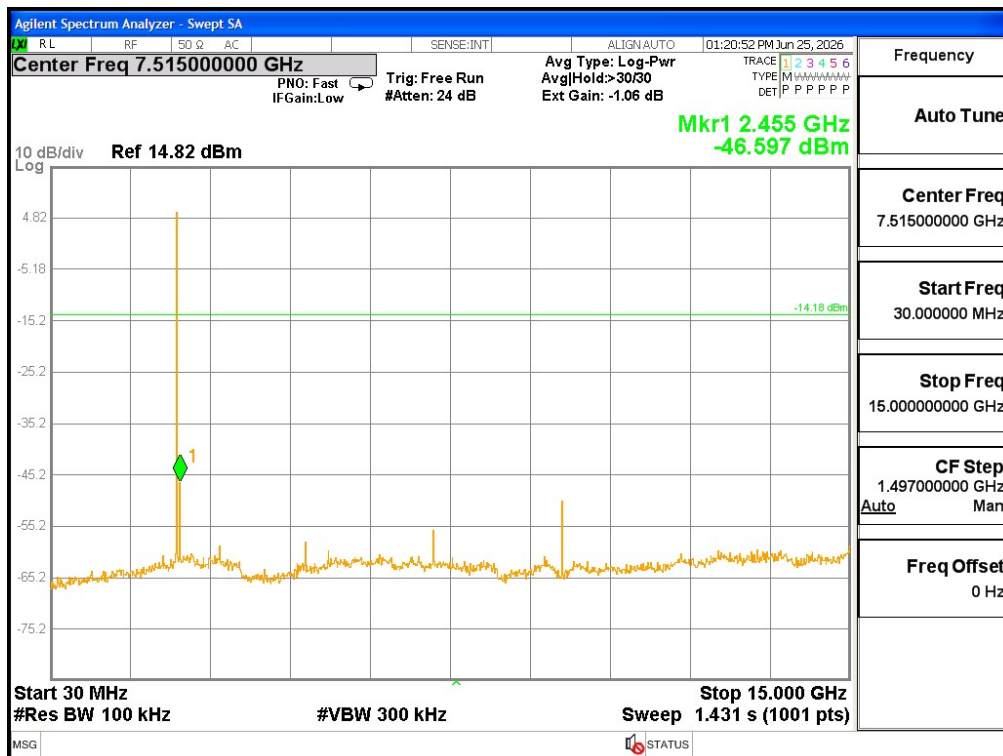
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Test Mode : 8-DPSK

[Lowest channel]



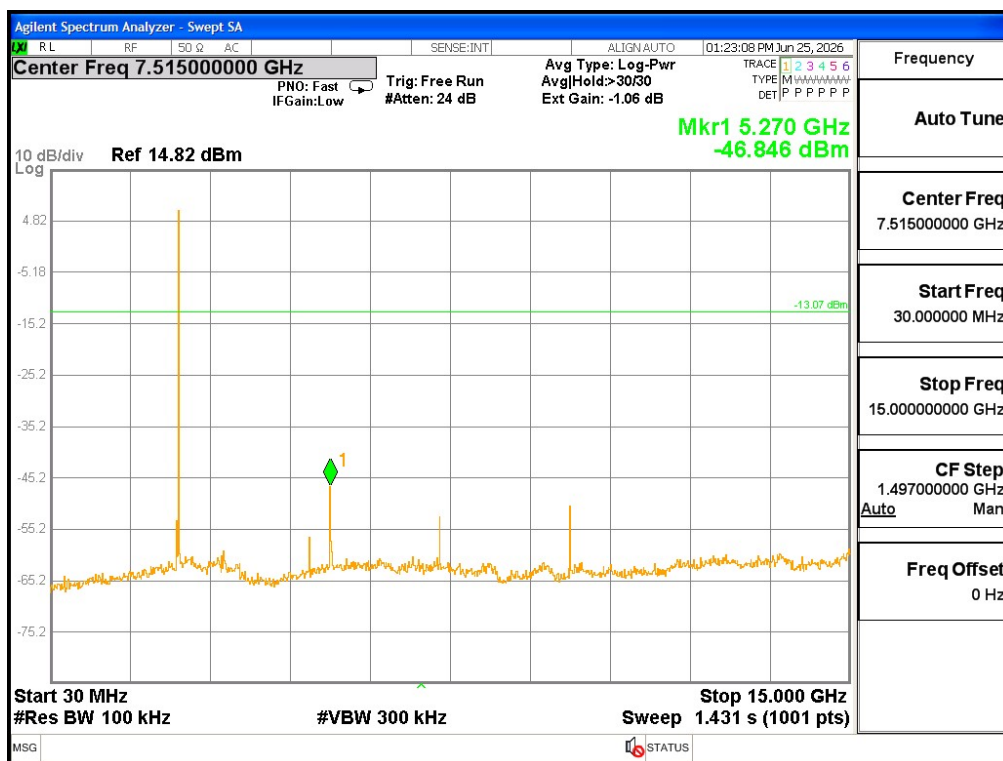


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[Middle Channel]



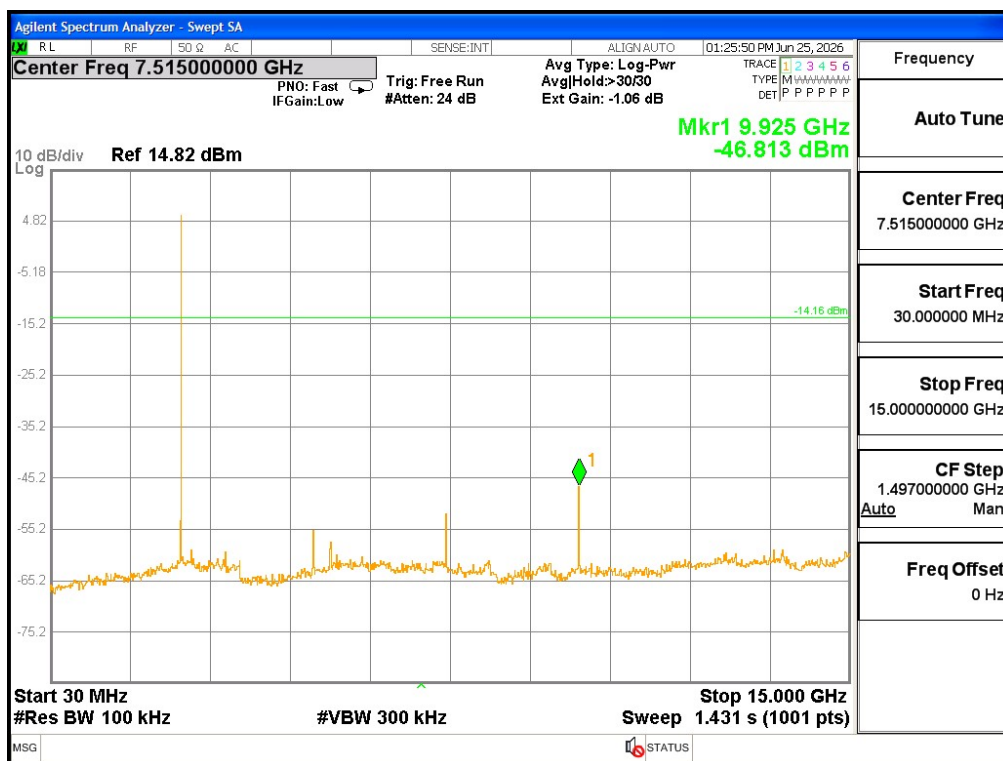


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[Highest Channel]



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4.7 Radiated Emission

Test Location

- ☒ 10 m SAC (test distance : ☐ 10 m, ☒ 3 m)
☒ 3 m SAC (test distance : 3 m)

Test Procedures

ANSI C63.10-2020 - Section 7.8.8

- 1) In the frequency range of 9 kHz to 30 MHz, magnetic field is measured with Loop Antenna. The center of the Loop Test Antenna is 1 m above the ground. During the measurement the Loop Test Antenna rotates about its vertical axis for maximum response at each azimuth about the EUT.
- 2) In the frequency range above 30 MHz, Bi-Log Test Antenna (30 MHz to 1 GHz) and Horn Test Antenna (above 1 GHz) are used. Test Antenna is 3 m away from the EUT. Test Antenna height is carried from 1 m to 4 m above the ground to determine the maximum value of the field strength. The emissions levels at both horizontal and vertical polarizations should be tested.

Test Settings:

Frequency Range = 9 kHz to 1 GHz

- a) RBW = 100 kHz for $f < 1$ GHz, 9 kHz for $f < 30$ MHz
b) VBW $\geq$ RBW
c) Detector = CISPR Quasi-peak
d) Sweep time = auto couple

- Peak

Frequency Range = 1 GHz to 26.5 GHz (2.4 GHz 10th harmonic)

- a) RBW = 1 MHz
b) VBW $\geq 3 \times$ RBW
c) Detector = peak
d) Sweep time = auto
e) Trace mode = max hold

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Limit :

FCC Part 15 § 15.205 (a) Except as shown in paragraph (d) of this section, only spurious emissions are permitted in any of the frequency bands listed below:

Table 1. Restricted Frequency Bands (FCC)

MHz	MHz	MHz	MHz	MHz	GHz
0.09-0.11	8.37626-8.38675	73-74.6	399.9-410	2690-2900	10.6-12.7
¹ 0.495-0.505	8.41425-8.41475	74.8-75.2	608-614	3260-3267	13.25-13.4
2.1735-2.1905	12.29-12.293	108-121.94	960-1240	3332-3339	14.47-14.5
4.125-4.128	12.51975-12.52025	123-138	1300-1427	3345.8-3358	15.35-16.2
4.17725-4.17775	12.57675-12.57725	149.9-150.05	1435-1626.5	3600-4400	17.7-21.4
4.20725-4.20775	13.36-13.41	156.52475-156.52525	1645.5-1646.5	4500-5150	22.01-23.12
6.215-6.218	16.42-16.423	156.7-156.9	1660-1710	5350-5460	23.6-24
6.26775-6.26825	16.69475-16.69525	162.0125-167.17	1718.8-1722.2	7250-7750	31.2-31.8
6.31175-6.31225	16.80425-16.80475	167.72-173.2	2200-2300	8025-8500	36.43-36.5
8.291-8.294	25.5-25.67	240-285	2310-2390	9000-9200	² Above 38.6
8.362-8.366	37.5-38.25	322-335.4	2483.5-2500	9300-9500	

¹ Until February 1, 1999, this restricted band shall be 0.490-0.510 MHz.

² Above 38.6

§ 15.205 (b) Except as provided in paragraphs (d) and (e), the field strength of emissions appearing within these frequency bands shall not exceed the limits shown in Section 15.209. At frequencies equal to or less than 1000 MHz, compliance with the limits in Section 15.209 shall be demonstrated using measurement instrumentation employing a CISPR quasi-peak detector. Above 1000 MHz, compliance with the emission limits in Section 15.209 shall be demonstrated based on the average value of the measured emissions.

The provisions in Section 15.35 apply to these measurements.

FCC Part 15 § 15.209(a) Except as provided elsewhere in this Subpart, the emissions from an intentional radiator shall not exceed the field strength levels specified in the following table 3 :

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Except when the requirements applicable to a given device state otherwise, emissions from licence-exempt transmitters shall comply with the field strength limits shown in Table 3. Additionally, the level of any transmitter emission shall not exceed the level of the transmitter's fundamental emission.

Table 3. General Field Strength Limits for Licence-Exempt Transmitters (FCC)

Frequency [MHz]	Magnetic Field Strength [uA/m]	Field Strength [uV/m]	Field Strength [dBuV/m]	Measurement Distance [meters]
0.009-0.490	6.37/F (F in kHz)	2400/F(kHz)	48.5-13.8	300
0.490-1.705	63.7/F (F in kHz)	24000/F(kHz)	33.8-23	30
1.705-30	0.08	30	29.5	30
30-88	-	100**	40	3
88-216	-	150**	43.5	3
216-960	-	200**	46	3
Above 960	-	500	54	3

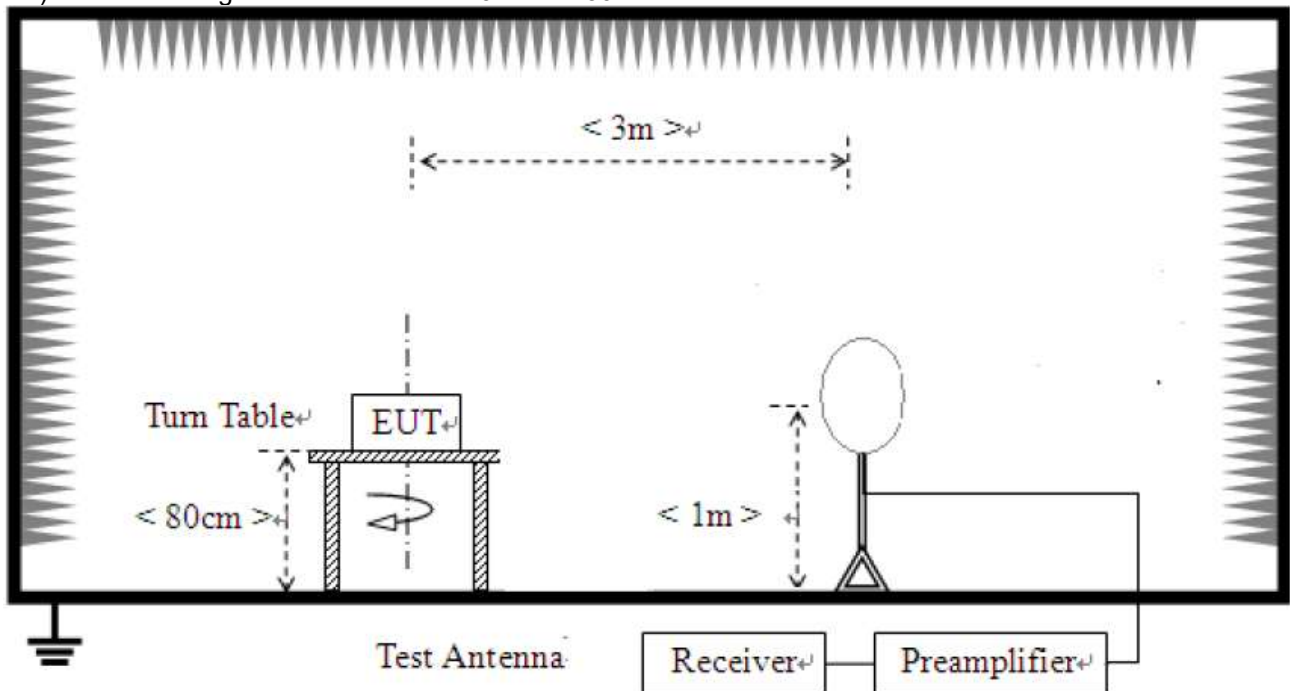
** Except as provided in 15.209(g). Fundamental emissions from intentional radiators operating under this Section shall not be located in the frequency bands 54-72 MHz, 76-88 MHz, 174-216 MHz, 470-806 MHz. However, operation within these frequency bands is permitted under other sections of this Part, e.g. 15.231 and 15.241.

Note :

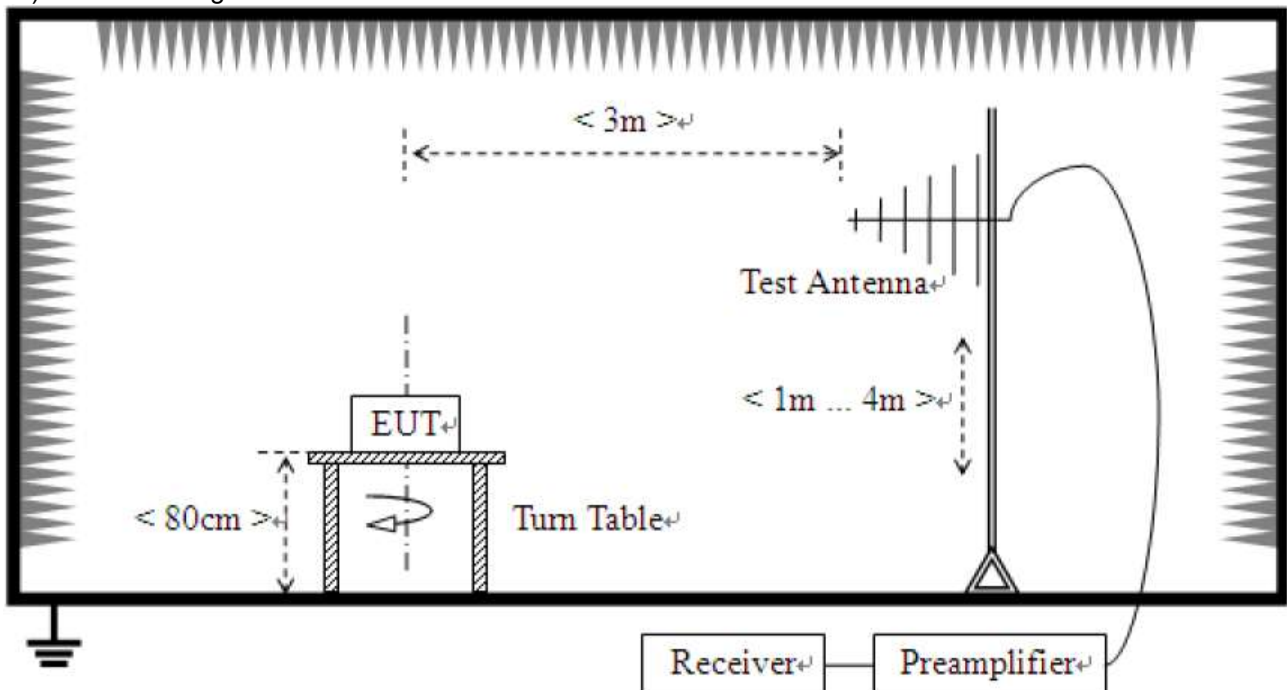
- 1) For above 1 GHz, the emission limit in this paragraph is based on measurement instrumentation employing an average detector, measurement using instrumentation with a peak detector function, corresponding to 20 dB above the maximum permitted average limit.
- 2) For above 1 GHz, limit field strength of harmonics : 54 dBuV/m@3 m (AV) and 74 dBuV/m@3 m (PK)
- 3) For measurement above 1 GHz, the resolution bandwidth is set to 1 MHz and video bandwidth is set to 3 MHz for peak measurement.

Test Setup :

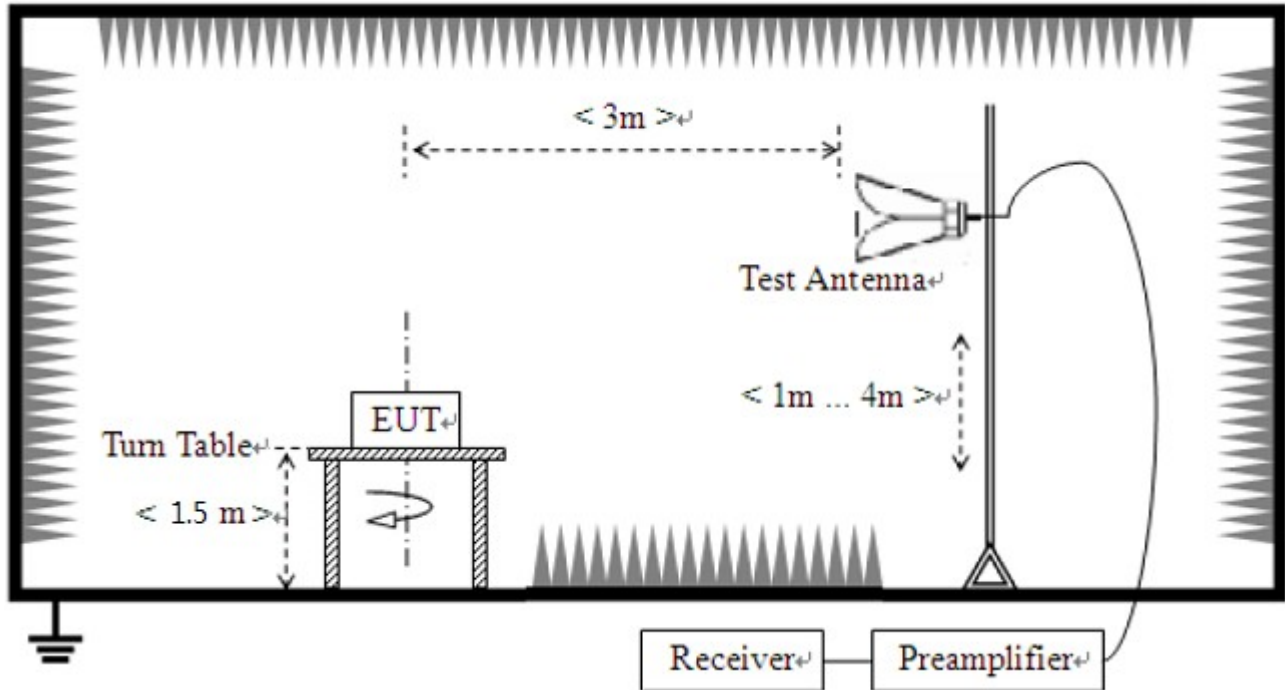
1) For field strength of emissions from 9 kHz to 30 MHz



2) For field strength of emissions from 30 MHz to 1 GHz



3) For field strength of emissions above 1 GHz





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Test Results :

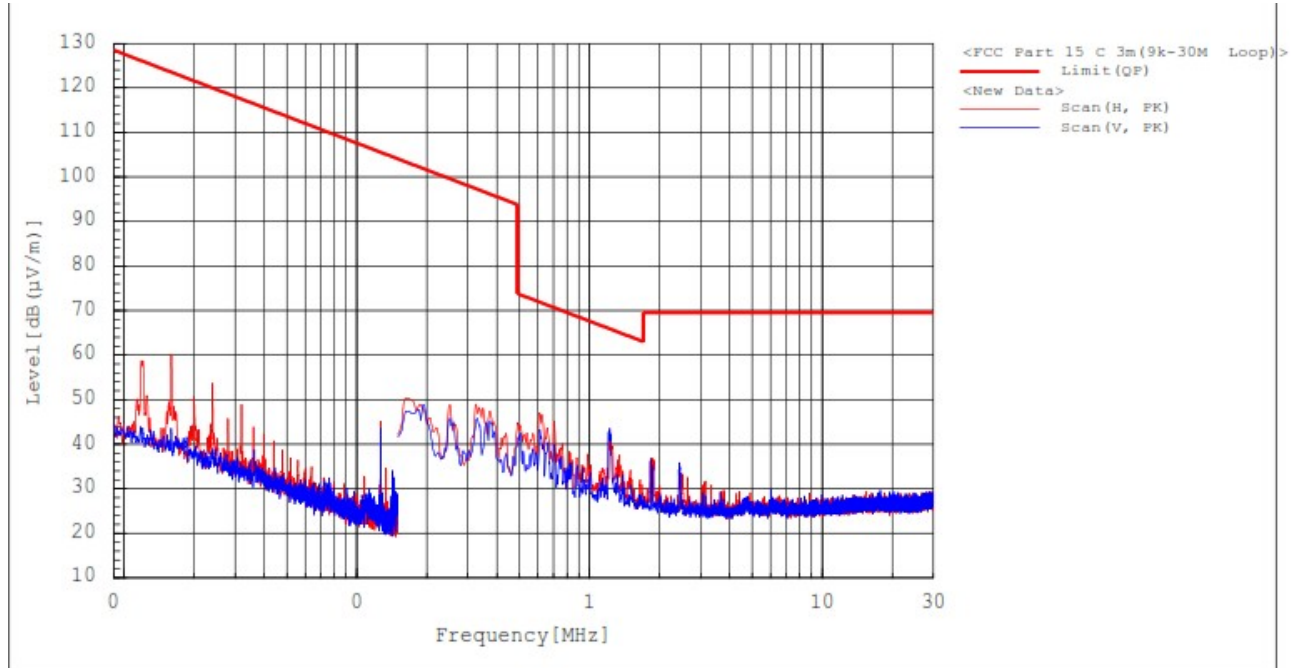
1) 9 kHz to 30 MHz

Test mode : Transmitter (Worst Case)

The requirements are:

☒ Complies

Test Data



Frequency [MHz]	(P)	Reading [dBuV]	c.f [dB(1/m)]	Level [dB(uV/m)]	Limit [dB(uV/m)]	Margin [dB]
-----------------	-----	----------------	---------------	------------------	------------------	-------------

The emissions 9 kHz to 30 MHz were 20 dB lower than the limit.

Remark :

1. Measuring position : The Unwanted emission was measured in the following position: EUT stand-up position (Z axis), lie-down position (X,Y axis). The worst emission was found in lie-down position (X axis) and the worst case was recorded.
2. Result = Reading + c.f (Correction factor)
3. Correction factor = Antenna factor + Cable loss + 6 dB attenuator
4. This data is the Peak (PK) value.



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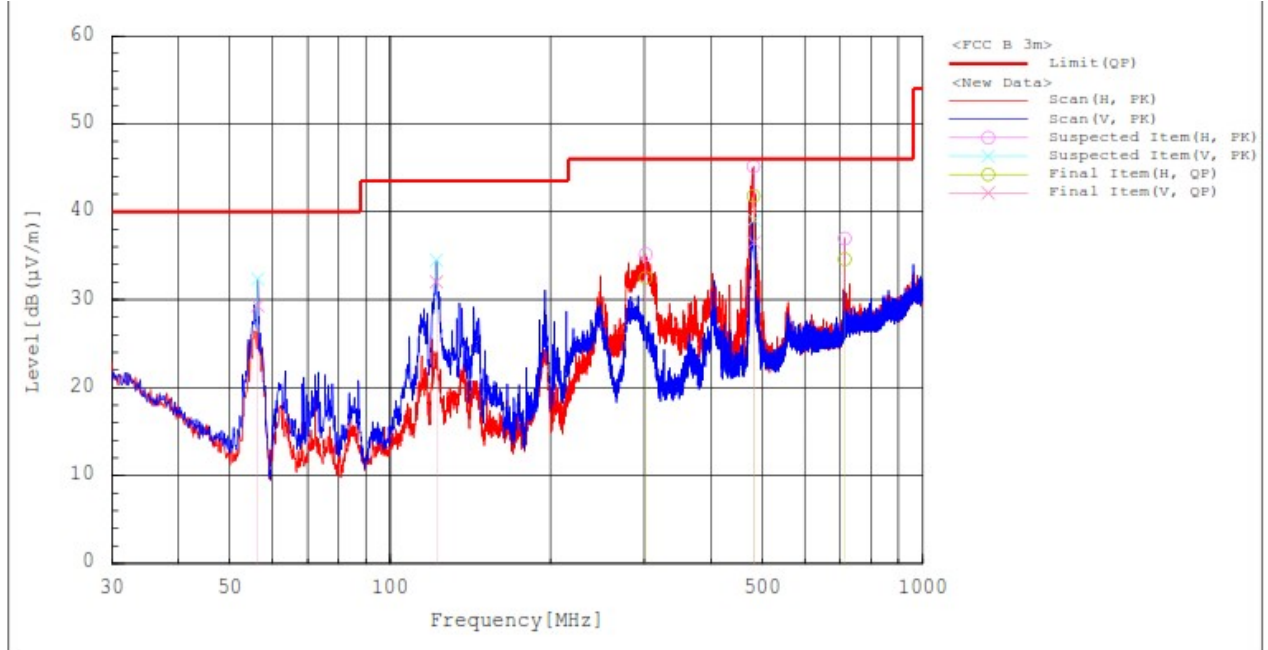
2) 30 MHz to 1 GHz

Test mode : Transmitter (Worst Case)

The requirements are:

☒ Complies

Test Data



Final Result

No.	Frequency [MHz]	Pol	Reading QP [dB(μV)]	c.f [dB(1/m)]	Result QP [dB(μV/m)]	Limit QP [dB(μV/m)]	Margin QP [dB]	Height [cm]	Angle [deg]
1	56.384	V	47.5	-18.2	29.3	40.0	10.7	100.0	207.5
2	122.247	V	45.1	-13.1	32.0	43.5	11.5	100.0	149.1
3	301.794	H	42.3	-9.8	32.5	46.0	13.5	99.9	227.3
4	481.147	H	46.0	-4.2	41.8	46.0	4.2	99.9	247.7
5	482.214	V	40.7	-4.2	36.5	46.0	9.5	100.0	313.0
6	713.753	H	34.9	-0.3	34.6	46.0	11.4	99.9	206.8

Remark :

1. Measuring position : The Unwanted emission was measured in the following position: EUT stand-up position (Z axis), lie-down position (X,Y axis). The worst emission was found in lie-down position (X axis) and the worst case was recorded.
2. Result = Reading + c.f (Correction factor)
3. Correction factor = Antenna factor + Cable loss + 6 dB attenuator - Amp gain



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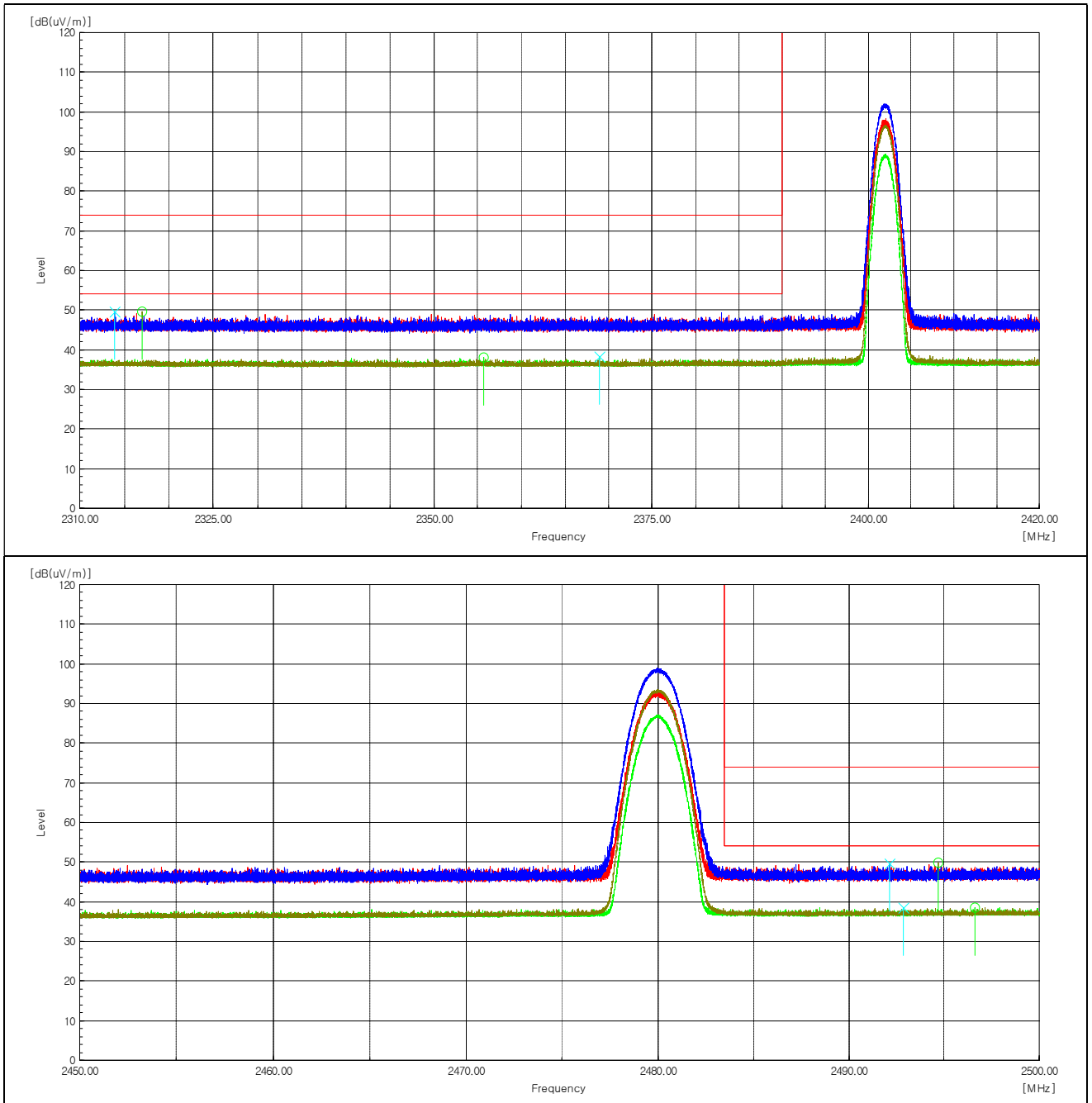
3) above 1 GHz

Test Mode : Transmitter (Worst Case)

The requirements are:

☒ Complies

Test Data :



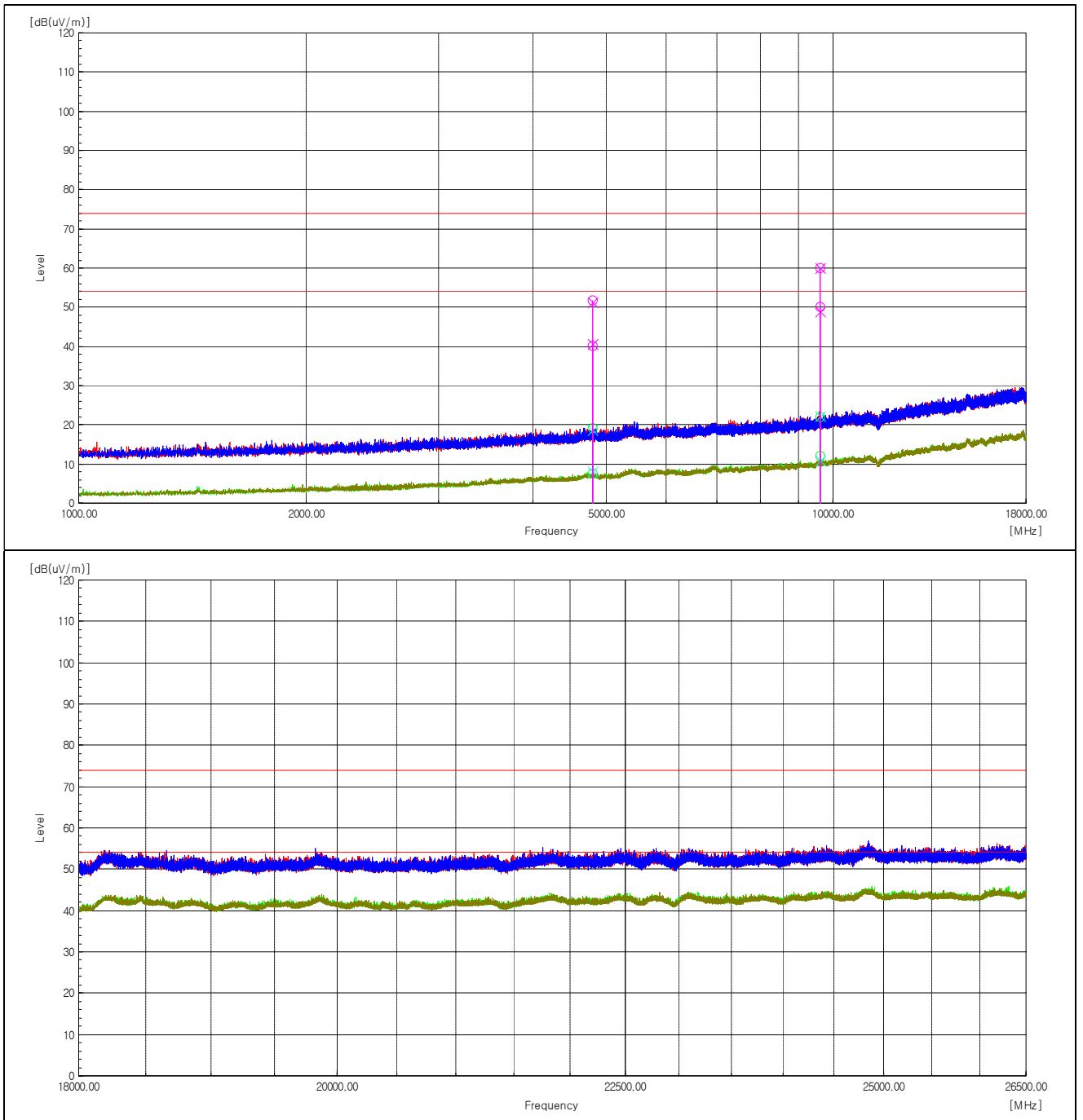


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Test Mode : Transmitter (Worst Case)



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Test mode : Transmitter (GFSK)

The requirements are:

☒ Complies

2 402 MHz

Frequency [MHz]	(P)	Reading [dBuV]	c.f [dB(1/m)]	Duty Cycle Factor [dB]	Level PK [dB(uV/m)]	Level AV [dB(uV/m)]	Limit PK [dB(uV/m)]	Limit AV [dB(uV/m)]	Margin PK [dB]	Margin AV [dB]	Note
2 368.7	H	53.8	-4.7	-----	49.1	-----	74.0	-----	24.9	-----	Peak
2 317.0	H	43.1	-4.8	1.12	-----	39.4	-----	54.0	-----	14.6	Average
2 314.6	V	54.3	-4.8	-----	49.5	-----	74.0	-----	24.5	-----	Peak
2 340.6	V	42.6	-4.8	1.12	-----	38.9	-----	54.0	-----	15.1	Average
4 804.1	H	47.1	3.3	-----	50.4	-----	74.0	-----	23.6	-----	Peak
4 804.1	H	37.3	3.3	1.12	-----	41.7	-----	54.0	-----	12.3	Average
4 804.1	V	49.3	3.3	-----	52.6	-----	74.0	-----	21.4	-----	Peak
4 804.1	V	37.6	3.3	1.12	-----	42.0	-----	54.0	-----	12.0	Average
9 608.5	H	49.3	10.9	-----	60.2	-----	74.0	-----	13.8	-----	Peak
9 608.5	H	39.0	10.9	1.12	-----	51.0	-----	54.0	-----	3.0	Average
9 608.5	V	48.6	10.9	-----	59.5	-----	74.0	-----	14.5	-----	Peak
9 607.8	V	37.9	11.0	1.12	-----	50.0	-----	54.0	-----	4.0	Average

2 441 MHz

Frequency [MHz]	(P)	Reading [dBuV]	c.f [dB(1/m)]	Duty Cycle Factor [dB]	Level PK [dB(uV/m)]	Level AV [dB(uV/m)]	Limit PK [dB(uV/m)]	Limit AV [dB(uV/m)]	Margin PK [dB]	Margin AV [dB]	Note
4 884.3	H	47.3	3.6	-----	50.9	-----	74.0	-----	23.1	-----	Peak
4 881.6	H	37.2	3.6	1.12	-----	41.9	-----	54.0	-----	12.1	Average
4 878.2	V	47.7	3.6	-----	51.3	-----	74.0	-----	22.7	-----	Peak
4 881.6	V	36.9	3.6	1.12	-----	41.6	-----	54.0	-----	12.4	Average
9 763.5	H	48.5	11.0	-----	59.5	-----	74.0	-----	14.5	-----	Peak
9 764.2	H	38.7	11.0	1.12	-----	50.8	-----	54.0	-----	3.2	Average
9 763.5	V	49.4	11.0	-----	60.4	-----	74.0	-----	13.6	-----	Peak
9 763.5	V	38.6	11.0	1.12	-----	50.7	-----	54.0	-----	3.3	Average

2 480 MHz

Frequency [MHz]	(P)	Reading [dBuV]	c.f [dB(1/m)]	Duty Cycle Factor [dB]	Level PK [dB(uV/m)]	Level AV [dB(uV/m)]	Limit PK [dB(uV/m)]	Limit AV [dB(uV/m)]	Margin PK [dB]	Margin AV [dB]	Note
2 487.8	H	53.5	-4.2	-----	49.3	-----	74.0	-----	24.7	-----	Peak
2 498.5	H	42.5	-4.0	1.12	-----	39.6	-----	54.0	-----	14.4	Average
2 483.6	V	54.6	-4.2	-----	50.4	-----	74.0	-----	23.6	-----	Peak
2 484.9	V	42.8	-4.2	1.12	-----	39.7	-----	54.0	-----	14.3	Average

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4 959.1	H	48.9	3.8	----	52.7	----	74.0	----	21.3	----	Peak
4 959.8	H	37.3	3.8	1.12	----	42.2	----	54.0	----	11.8	Average
4 957.8	V	46.9	3.8	----	50.7	----	74.0	----	23.3	----	Peak
4 959.8	V	36.6	3.8	1.12	----	41.5	----	54.0	----	12.5	Average
9 920.6	H	49.6	11.7	----	61.3	----	74.0	----	12.7	----	Peak
9 919.9	H	38.0	11.7	1.12	----	50.8	----	54.0	----	3.2	Average
9 919.2	V	49.3	11.7	----	61.0	----	74.0	----	13.0	----	Peak
9 919.9	V	39.0	11.7	1.12	----	51.8	----	54.0	----	2.2	Average

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Test mode : Transmitter (8-DPSK)

The requirements are:

☒ Complies

2 402 MHz

Frequency [MHz]	(P)	Reading [dBuV]	c.f [dB(1/m)]	Duty Cycle Factor [dB]	Level PK [dB(uV/m)]	Level AV [dB(uV/m)]	Limit PK [dB(uV/m)]	Limit AV [dB(uV/m)]	Margin PK [dB]	Margin AV [dB]	Note
2 317.1	H	54.4	-4.8	-----	49.6	-----	74.0	-----	24.4	-----	Peak
2 355.7	H	42.6	-4.7	1.13	-----	39.0	-----	54.0	-----	15.0	Average
2 313.9	V	54.5	-4.8	-----	49.7	-----	74.0	-----	24.3	-----	Peak
2 368.9	V	42.9	-4.7	1.13	-----	39.3	-----	54.0	-----	14.7	Average
4 800.0	H	48.4	3.3	-----	51.7	-----	74.0	-----	22.3	-----	Peak
4 804.1	H	36.9	3.3	1.13	-----	41.3	-----	54.0	-----	12.7	Average
4 800.0	V	48.0	3.3	-----	51.3	-----	74.0	-----	22.7	-----	Peak
4 804.1	V	37.3	3.3	1.13	-----	41.7	-----	54.0	-----	12.3	Average
9 608.5	H	49.0	10.9	-----	59.9	-----	74.0	-----	14.1	-----	Peak
9 608.5	H	39.1	10.9	1.13	-----	51.1	-----	54.0	-----	2.9	Average
9 603.0	V	49.0	11.0	-----	60.0	-----	74.0	-----	14.0	-----	Peak
9 607.8	V	37.8	11.0	1.13	-----	49.9	-----	54.0	-----	4.1	Average

2 441 MHz

Frequency [MHz]	(P)	Reading [dBuV]	c.f [dB(1/m)]	Duty Cycle Factor [dB]	Level PK [dB(uV/m)]	Level AV [dB(uV/m)]	Limit PK [dB(uV/m)]	Limit AV [dB(uV/m)]	Margin PK [dB]	Margin AV [dB]	Note
4 880.9	H	49.0	3.6	-----	52.6	-----	74.0	-----	21.4	-----	Peak
4 882.3	H	36.8	3.6	1.13	-----	41.5	-----	54.0	-----	12.5	Average
4 881.6	V	47.0	3.6	-----	50.6	-----	74.0	-----	23.4	-----	Peak
4 881.6	V	36.9	3.6	1.13	-----	41.6	-----	54.0	-----	12.4	Average
9 766.2	H	48.2	11.0	-----	59.2	-----	74.0	-----	14.8	-----	Peak
9 764.2	H	38.7	11.0	1.13	-----	50.8	-----	54.0	-----	3.2	Average
9 764.2	V	48.6	11.0	-----	59.6	-----	74.0	-----	14.4	-----	Peak
9 764.2	V	38.0	11.0	1.13	-----	50.1	-----	54.0	-----	3.9	Average

2 480 MHz

Frequency [MHz]	(P)	Reading [dBuV]	c.f [dB(1/m)]	Duty Cycle Factor [dB]	Level PK [dB(uV/m)]	Level AV [dB(uV/m)]	Limit PK [dB(uV/m)]	Limit AV [dB(uV/m)]	Margin PK [dB]	Margin AV [dB]	Note
2 494.7	H	54.0	-4.1	-----	49.9	-----	74.0	-----	24.1	-----	Peak
2 496.6	H	42.5	-4.0	1.13	-----	39.6	-----	54.0	-----	14.4	Average
2 492.1	V	53.7	-4.1	-----	49.6	-----	74.0	-----	24.4	-----	Peak
2 492.9	V	42.6	-4.1	1.13	-----	39.6	-----	54.0	-----	14.4	Average

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Remarks

1. Measuring position : The Unwanted emission was measured in the following position: EUT stand-up position (Z axis), lie-down position (X,Y axis). The worst emission was found in stand-up position (Z axis) and the worst case was recorded.
2. Peak result = Reading + c.f (Correction factor)
Average result = Reading + c.f (Correction factor) + Duty Cycle Factor
3. Correction factor = Antenna factor + Cable loss - Amp gain

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4.8 AC Power Line Conducted Emissions

A radio apparatus that is designed to be connected to the public utility (AC) power line shall ensure that the radio frequency voltage, which is conducted back onto the AC power line on any frequency or frequencies within the band 150 kHz-30 MHz, shall not exceed the limits.

Instrument Settings

IF Band Width: 9 kHz

Test Procedures

ANSI C63.10-2020 - Section 6.2

The EUT was placed on a non-metallic table 0.8 m above the metallic, grounded floor and 0.4 m from the reference ground plane wall. The distance to other metallic surfaces was at least 0.8 m. Amplitude measurements were performed with a quasi-peak detector and an average detector.

Limit :

- 15.207(a)

Frequency [MHz]	Conducted Limit [dBuV]	
	Quasi-peak	Average**
0.15 - 0.5	66 to 56*	56 to 46*
0.5 - 5	56	46
5 - 30	60	50

* The level decreases linearly with the logarithm of the frequency.

** A linear average detector is required.

Test Results :

The requirements are:

☒ Complies



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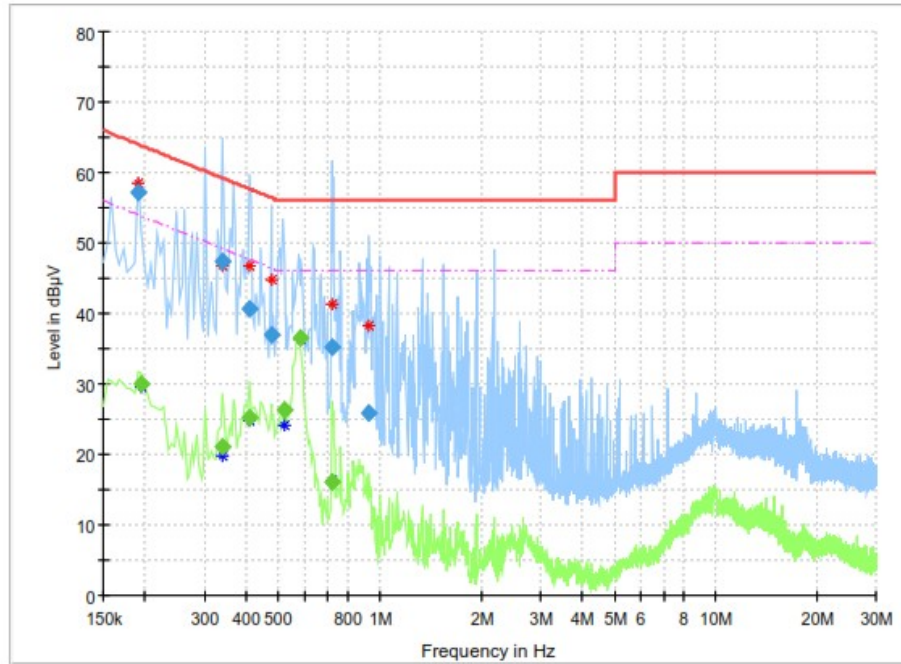
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Test Data

[LINE]

Full Spectrum



Final Result

Frequency (MHz)	QuasiPeak (dBµV)	CAverage (dBµV)	Limit (dBµV)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Line	Filter	Corr. (dB)
0.190500	57.13	---	64.02	6.89	15000.0	9.000	L1	ON	10.4
0.195000	---	30.09	53.82	23.73	15000.0	9.000	L1	ON	10.4
0.339000	---	20.98	49.23	28.25	15000.0	9.000	L1	ON	10.4
0.339000	47.47	---	59.23	11.75	15000.0	9.000	L1	ON	10.4
0.411000	---	25.15	47.63	22.48	15000.0	9.000	L1	ON	10.3
0.411000	40.73	---	57.63	16.90	15000.0	9.000	L1	ON	10.3
0.474000	36.96	---	56.44	19.49	15000.0	9.000	L1	ON	10.3
0.519000	---	26.32	46.00	19.68	15000.0	9.000	L1	ON	10.3
0.577500	---	36.42	46.00	9.58	15000.0	9.000	L1	ON	10.3
0.717000	35.16	---	56.00	20.84	15000.0	9.000	L1	ON	10.2
0.717000	---	16.03	46.00	29.97	15000.0	9.000	L1	ON	10.2
0.928500	25.76	---	56.00	30.24	15000.0	9.000	L1	ON	10.1



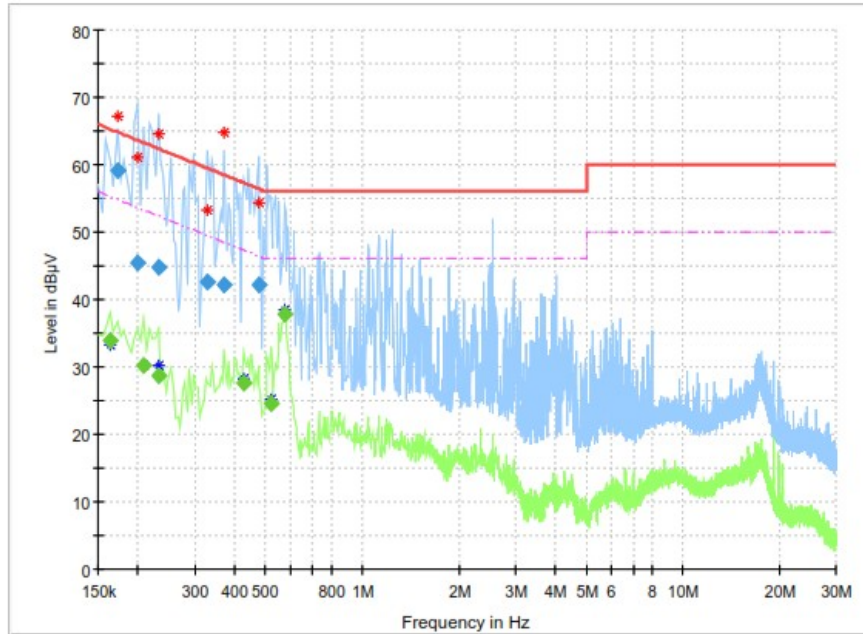
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[NEUTRAL]

Full Spectrum



Final Result

Frequency (MHz)	QuasiPeak (dBµV)	CAverage (dBµV)	Limit (dBµV)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Line	Filter	Corr. (dB)
0.163500	---	33.88	55.28	21.40	15000.0	9.000	N	ON	9.9
0.172500	59.16	---	64.84	5.68	15000.0	9.000	N	ON	9.9
0.199500	45.50	---	63.63	18.13	15000.0	9.000	N	ON	10.0
0.208500	---	30.18	53.27	23.09	15000.0	9.000	N	ON	10.0
0.231000	---	28.68	52.41	23.73	15000.0	9.000	N	ON	9.9
0.231000	44.79	---	62.41	17.63	15000.0	9.000	N	ON	9.9
0.330000	42.60	---	59.45	16.85	15000.0	9.000	N	ON	10.0
0.370500	42.15	---	58.49	16.34	15000.0	9.000	N	ON	10.1
0.429000	---	27.53	47.27	19.74	15000.0	9.000	N	ON	10.1
0.474000	42.17	---	56.44	14.27	15000.0	9.000	N	ON	10.1
0.519000	---	24.54	46.00	21.46	15000.0	9.000	N	ON	10.1
0.573000	---	37.77	46.00	8.23	15000.0	9.000	N	ON	10.1

4.9 Frequency Hopping System Requirements

Standard Applicable

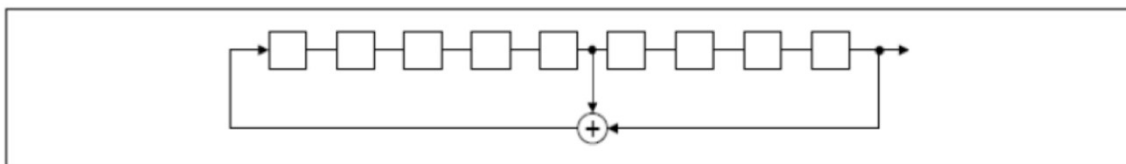
According to FCC Part 15.247(a)(1), The system shall hop to channel frequencies that are selected at the system hopping rate from a pseudo randomly ordered list of hopping frequencies. Each frequency must be used equally on the average by each transmitter. The system receivers shall have input bandwidths that match the hopping channel bandwidths of their corresponding transmitters and shall shift frequencies in synchronization with the transmitted signals.

(g) Frequency hopping spread spectrum systems are not required to employ all available hopping channels during each transmission. However, the system, consisting of both the transmitter and the receiver, must be designed to comply with all of the regulations in this section should the transmitter be presented with a continuous data (or information) stream. In addition, a system employing short transmission bursts must comply with the definition of a frequency hopping system and must distribute its transmissions over the minimum number of hopping channels specified in this section.

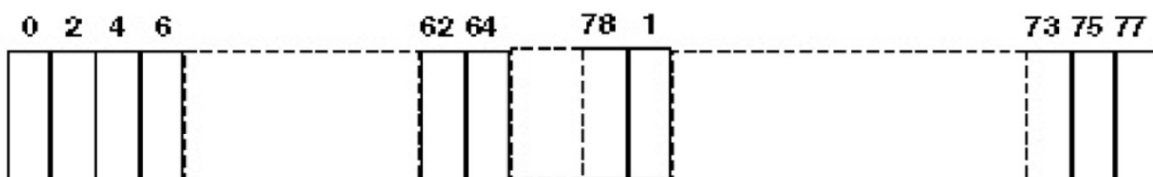
(h) The incorporation of intelligence within a frequency hopping spread spectrum system that permits the system to recognize other users within the spectrum band so that it individually and independently chooses and adapts its hopsets to avoid hopping on occupied channels is permitted. The coordination of frequency hopping systems in any other manner for the express purpose of avoiding the simultaneous occupancy of individual hopping frequencies by multiple transmitters is not permitted.

EUT Pseudorandom Frequency Hopping Sequence

The pseudo random sequence may be generated in a nine-stage shift register whose 5th and 9th stage outputs are added in a modulo-two addition stage, and the result is fed back to the input of the first stage. The sequence begins with the first ONE of 9 consecutive ONES; i.e. the shift register is initialized with nine ones. Number of shift register stages: 9 Length of pseudo-random sequence: $2^9 - 1 = 511$ bits Longest sequence of zeros: 8 (non-inverted signal)



Linear Feedback Shift Register for Generation of the PRBS sequence



Each frequency used equally on the average by each transmitter. The system receiver have input bandwidths that match the hopping channel bandwidths of their corresponding transmitters and shift frequencies in synchronization with the transmitted signals.

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Frequency Hopping System

This transmitter device is frequency hopping device, and complies with FCC part 15.247 rule. This device uses Bluetooth radio which operates in 2 400-2 483.5 MHz band. Bluetooth uses a radio technology called frequency-hopping spread spectrum, which chops up the data being sent and transmits chunks of it on up to 79 bands (1 MHz each; centred from 2 402 to 2 480 MHz) in the range 2 400-2 483.5 MHz. The transmitter switches hop frequencies 1,600 times per second to assure a high degree of data security. All Bluetooth devices participating in a given piconet are synchronized to the frequency-hopping channel for the piconet. The frequency hopping sequence is determined by the master's device address and the phase of the hopping sequence (the frequency to hop at a specific time) is determined by the master's internal clock. Therefore, all slaves in a piconet must know the master's device address and must synchronize their clocks with the master's clock.

Adaptive Frequency Hopping (AFH) was introduced in the Bluetooth specification to provide an effective way for a Bluetooth radio to counteract normal interference. AFH identifies "bad" channels, where either other wireless devices are interfering with the Bluetooth signal or the Bluetooth signal is interfering with another device. The AFH-enabled Bluetooth device will then communicate with other devices within its piconet to share details of any identified bad channels. The devices will then switch to alternative available "good" channels, away from the areas of interference, thus having no impact on the bandwidth used.

*Example for a Bluetooth device using channel numbers would be :

Ch 44, 35, 78, 03, 15, 21, 76, 40, 56, 13, 02, 19, 67, 39, 78, 20, 21, 64, 75 etc.

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APPENDIX A – Test Equipment Used For Tests

No.	Name of Equipment	Manufacturer	Model No.	Serial No.	Cal Date	Due Date
1	Signal Analyzer	Agilent	N9020A	MY50510324	2025-11-25	2026-11-25
2	Signal Generator	Rohde & Schwarz	SMB100A	175528	2026-03-12	2027-03-12
3	EMI TEST RECEIVER	Rohde & Schwarz	ESW44	102039	2026-04-27	2027-04-27
4	Active Loop Antenna	SCHWARZBECK	FMZB 1513	1513-125	2026-03-25	2028-03-25
5	Bilog Antenna	TESEQ	CBL6111D	60654	2025-08-21	2027-08-21
6	AMPLIFIER	SONOMA INSTRUMENT	310N	411011	2025-07-28	2026-07-28
7	ATTENUATOR	PASTERNAK	PE7AP006-06	L20210504000023	2025-07-28	2026-07-28
8	ATTENUATOR	NONE	6dB	190557	2025-09-18	2026-09-18
9	Preamplifier	Agilent	8449B	3008A00620	2026-03-11	2027-03-11
10	Double Ridged Guide Antenna	ETS-Lindgren	3115	00078895	2026-03-13	2027-03-13
11	Horn Antenna	SCHWARZBECK	BBHA9170	01153	2025-09-30	2026-09-30
12	Low Noise Amplifier	TESTEK	TK-PA1840H	210124-L	2025-09-30	2026-09-30
13	Band Reject Filter	Micro Tronics	BRM50702	G233	2025-11-25	2026-11-25
14	Spectrum Analyzer	Rohde & Schwarz	FSV40	101574	2026-01-13	2027-01-13
15	DC Power Supply	Agilent	E3632A	MY50370042	2025-07-04	2026-07-04
16	LISN	Rohde & Schwarz	ENV216	102698	2026-04-27	2027-04-27
17	EMI TEST RECEIVER	Rohde & Schwarz	ESR3	102826	2026-04-27	2027-04-27

No.	Cable	Manufacturer	Model No.	Serial No.	Check Date
1	RF Cable(conducted)	Junkosha Inc.	MWX221	2008S240	2026-05-18
2	RF Cable (Line Conducted)	Canare Corporation	L-5D2W	N/A	2026-04-16
3	RF Cable (9kHz-1GHz Radiated)	Canare Corporation	L-5D2W	N/A	2026-04-16
4	RF Cable (9kHz-1GHz Radiated)	HUBER+SUHNER	SUCOFLEX 104	MY27558/4	2026-04-16
5	RF Cable (1GHz-18GHz Radiated)	Junkosha Inc.	MWX221	2008S246	2025-02-21
6	RF Cable (1GHz-18GHz Radiated)	Junkosha Inc.	MWX221	J0970749	2025-02-21
7	RF Cable (1GHz-18GHz Radiated)	Sensorview Co., LTD	13A26	TPC2204060007	2025-02-21
8	RF Cable (18GHz-26.5GHz Radiated)	Junkosha Inc.	MWX221	J0970749	2025-02-21
9	RF Cable (18GHz-26.5GHz Radiated)	HUBER+SUHNER	SUCOFLEX 102	MY2371/2	2025-02-21
10	RF Cable (18GHz-26.5GHz Radiated)	Sensorview Co., LTD	9A40	TP210713-001	2025-02-21

-END-