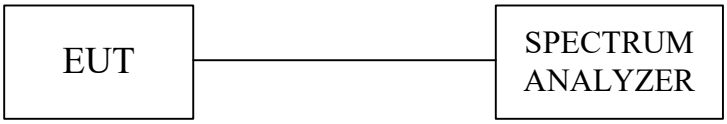
8.4 NUMBER OF HOPPING FREQUENCY USED

LIMIT

§15.247(a)(1)(iii) For frequency hopping systems in the 2400-2483.5 MHz band shall use at least 15 channels.

TEST SETUP



TEST PROCEDURE

1 Check the calibration of the measuring instrument (spectrum analyzer) using either an internal calibrator or a known signal from an external generator.
2 Position the EUT as shown in test setup without connection to measurement instrument. Turn on the EUT and connect its antenna terminal to measurement instrument via a low loss cable. Then set it to any one measured frequency within its operating range and make sure the instrument is operated in its linear range.
3 Set the spectrum analyzer on MaxHold Mode, and then keep the EUT in hopping mode. Record all the signals from each channel until each one has been recorded.
4 Set the spectrum analyzer on View mode and then plot the result on spectrum analyzer screen.
5 Repeat above procedures until all frequencies measured were complete.

TEST RESULTS

Model Name	AT-LP70XBT	Test By	Peter Chu
Temp & Humidity	22.5°C, 45%	Test Date	2023/12/27

Modulation Type: GFSK / DH5

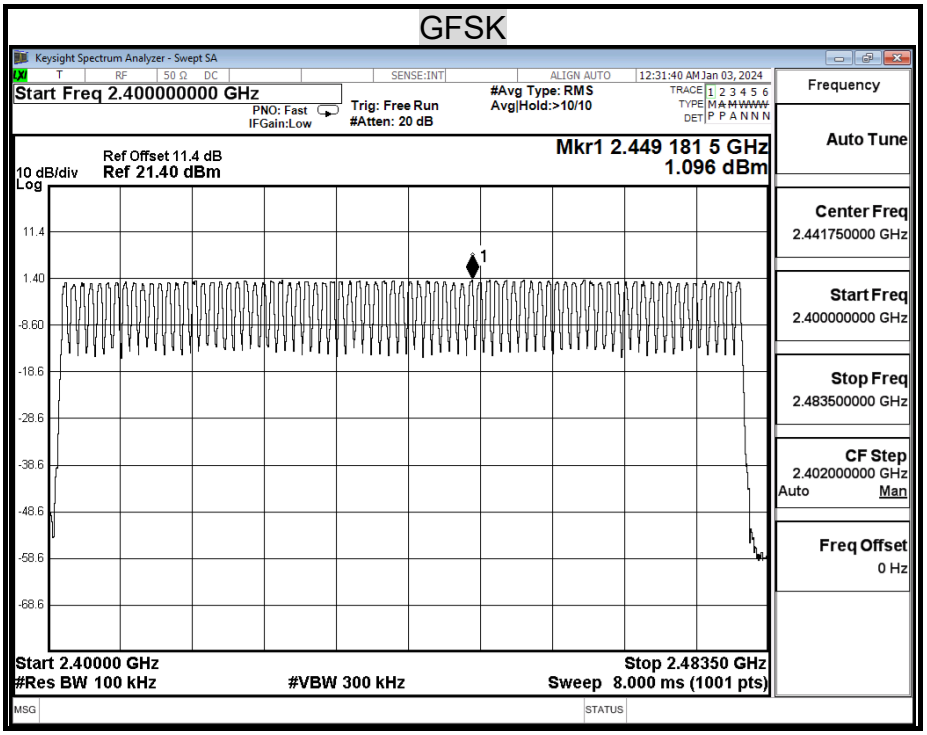
Result(No.of CH)	Limit(No.of CH)	Result
79	>15	PASS

Modulation Type: 8-DPSK / 3-DH5

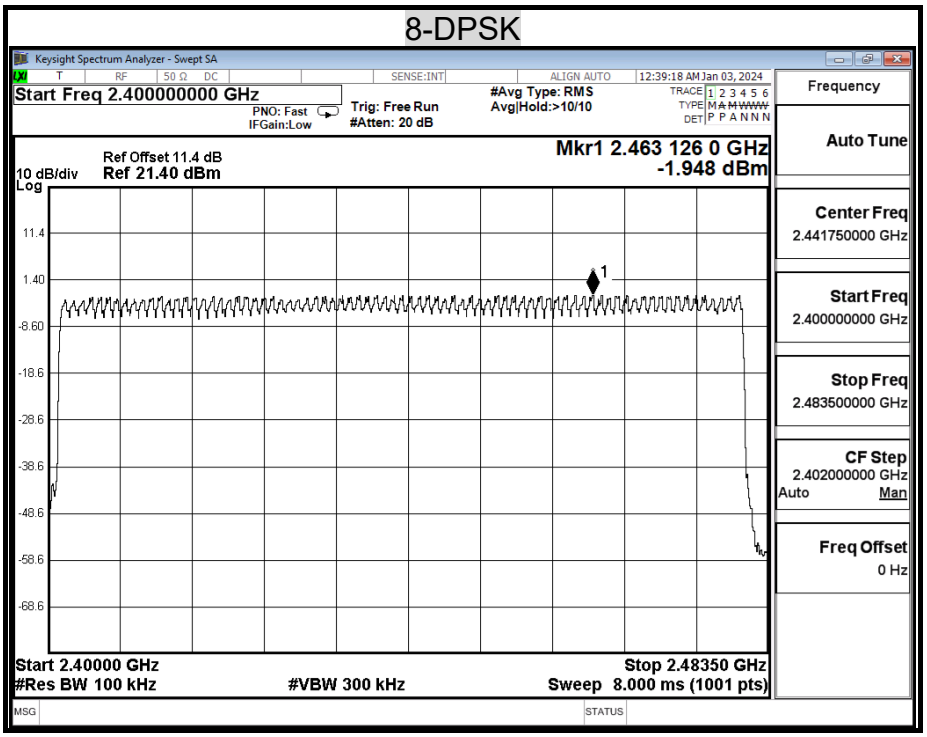
Result(No.of CH)	Limit(No.of CH)	Result
79	>15	PASS

NUMBER OF HOPPING FREQUENCY USED

GFSK



8-DPSK

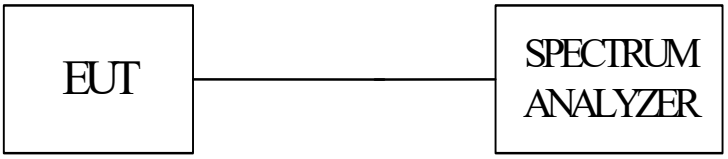


8.5 DWELL TIME ON EACH CHANNEL

LIMIT

§15.247(a)(1)(iii) For frequency hopping system operating in the 2400-2483.5MHz band, the average time of occupancy on any frequency shall not be greater than 0.4 second within a 31.6 second period.

TEST SETUP



TEST PROCEDURE

1. Check the calibration of the measuring instrument using either an internal calibrator or a known signal from an external generator.
2. Position the EUT as shown in test setup without connection to measurement instrument. Turn on the EUT and connect its antenna terminal to measurement instrument via a low loss cable. Then set it to any one measured frequency within its operating range and make sure the instrument is operated in its linear range.
3. Adjust the center frequency of spectrum analyzer on any frequency be measured and set spectrum analyzer to zero span mode. And then, set RBW and VBW of spectrum analyzer to proper value.
4. Measure the time duration of one transmission on the measured frequency. And then plot the result with time difference of this time duration.
5. Repeat above procedures until all frequencies measured were complete.
6. The Bluetooth Headset has 3 type of payload, DH1, DH3, DH5. The hopping rate is 1600 per second. The longer the payload is, the slower the hopping rate is.

TEST RESULTS

Time of occupancy on the TX channel in 31.6sec = time domain slot length × hop rate ÷ number of hop per channel × 31.6
Refer to the attached graph.
The hopping rates of Bluetooth devices change with different types of payload. The longer the payload is, the slower the hopping rate. The hopping rate scenario is defined in Bluetooth core specification.

Model Name	AT-LP70XBT	Test By	Peter Chu
Temp & Humidity	22.5°C, 45%	Test Date	2023/12/27

Modulation Type: GFSK / DH5

Transmitting Frequency	Packet type	Dwell time (ms)	Time of occupancy on the TX channel in 31.6sec (ms)	Limit for Time of occupancy on the TX channel in 31.6sec (ms)	Result
2441MHz	DH1	0.400	128.00	400	PASS
2441MHz	DH3	1.665	266.40	400	PASS
2441MHz	DH5	2.900	309.33	400	PASS
2441MHz	AFH	2.900	154.67	400	PASS

DH1 Dwell tine= 0.400 ms×(1600÷2)÷79×31.6= 128.00 (ms)
DH3 Dwell tine= 1.665 ms×(1600÷4)÷79×31.6= 266.40 (ms)
DH5 Dwell tine= 2.900 ms×(1600÷6)÷79×31.6= 309.33 (ms)
AFH Dwell tine= 2.900 ms×(800÷6)÷20×8= 154.67 (ms)

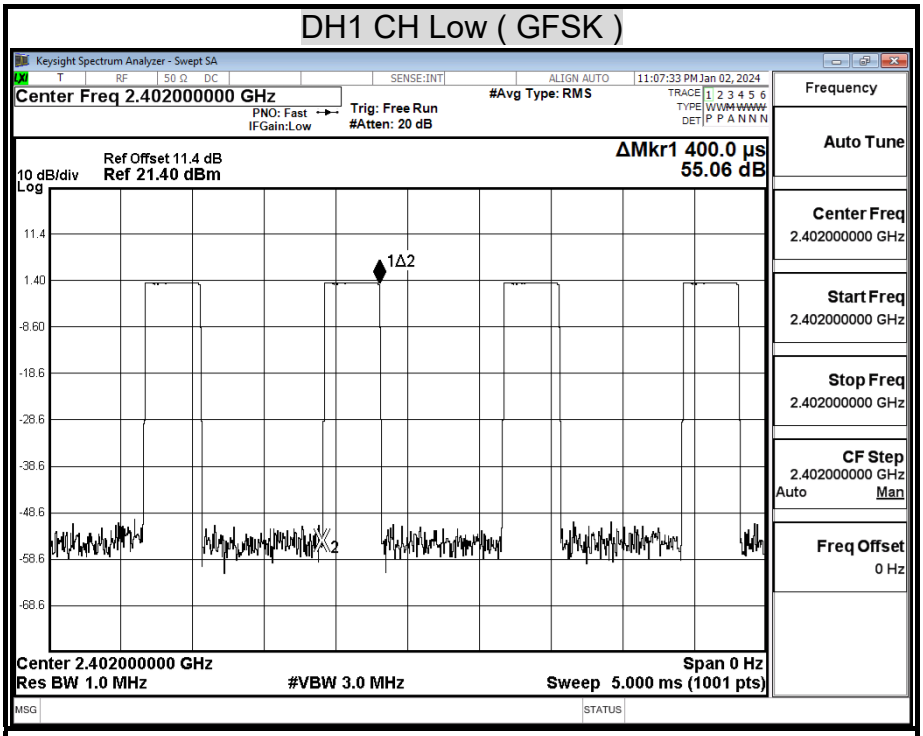
Modulation Type: 8-DPSK / 3-DH5

Transmitting Frequency	Packet type	Dwell time (ms)	Time of occupancy on the TX channel in 31.6sec (ms)	Limit for Time of occupancy on the TX channel in 31.6sec (ms)	Result
2441MHz	3DH1	0.400	128.00	400	PASS
2441MHz	3DH3	1.665	266.40	400	PASS
2441MHz	3DH5	2.900	309.33	400	PASS
2441MHz	AFH	2.900	154.67	400	PASS

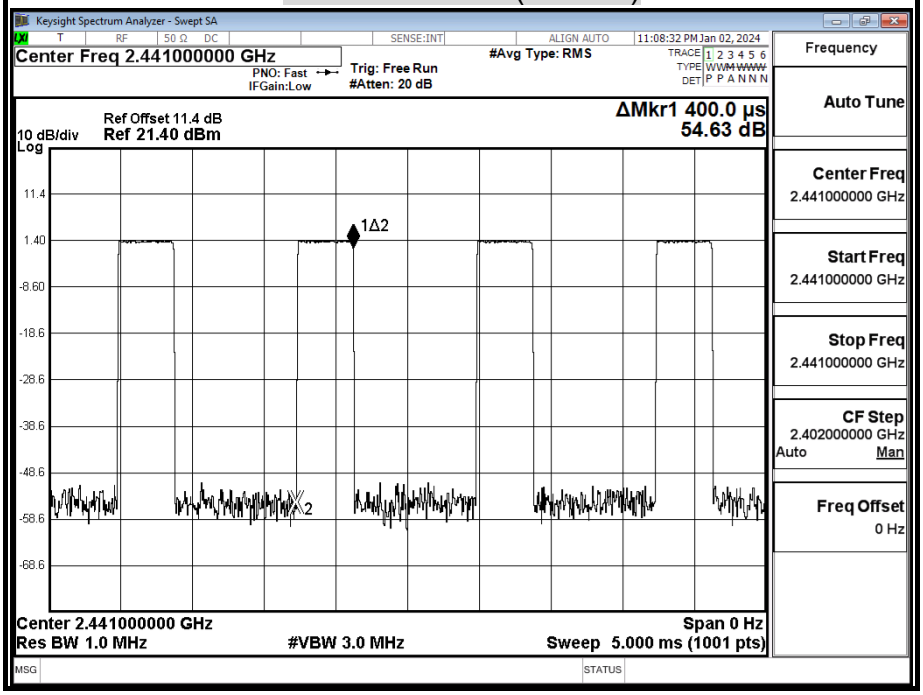
3DH1 Dwell tine= 0.400 ms×(1600÷2)÷79×31.6= 128.00 (ms)
3DH3 Dwell tine= 1.665 ms×(1600÷4)÷79×31.6= 266.40 (ms)
3DH5 Dwell tine= 2.900 ms×(1600÷6)÷79×31.6= 309.33 (ms)
AFH Dwell tine= 2.900 ms×(800÷6)÷20×8= 154.67 (ms)

DWELL TIME ON EACH PAYLOAD

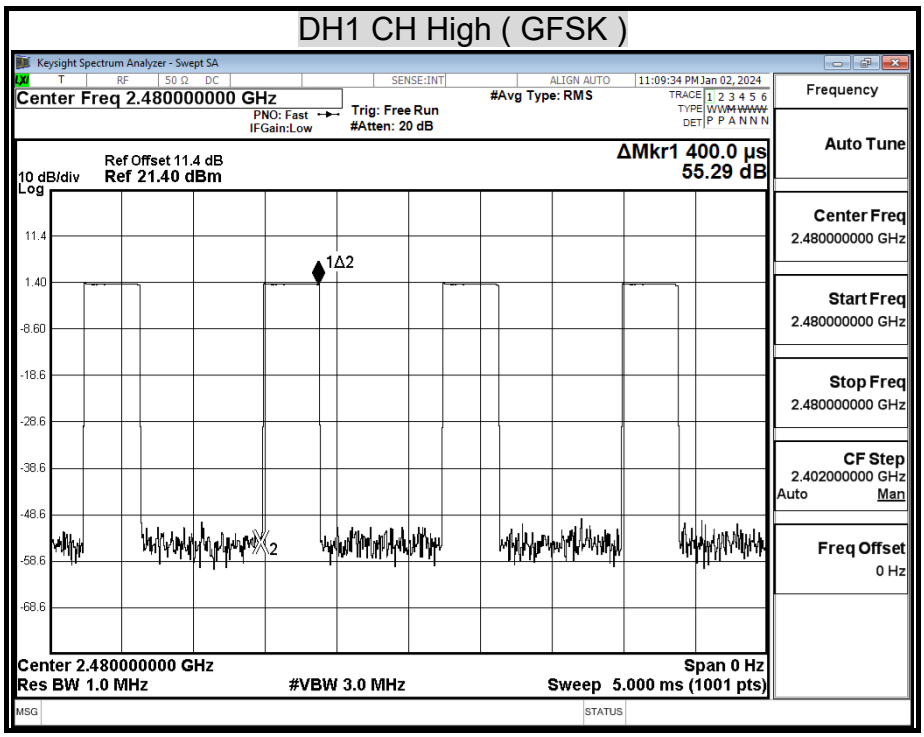
DH1 CH Low (GFSK)



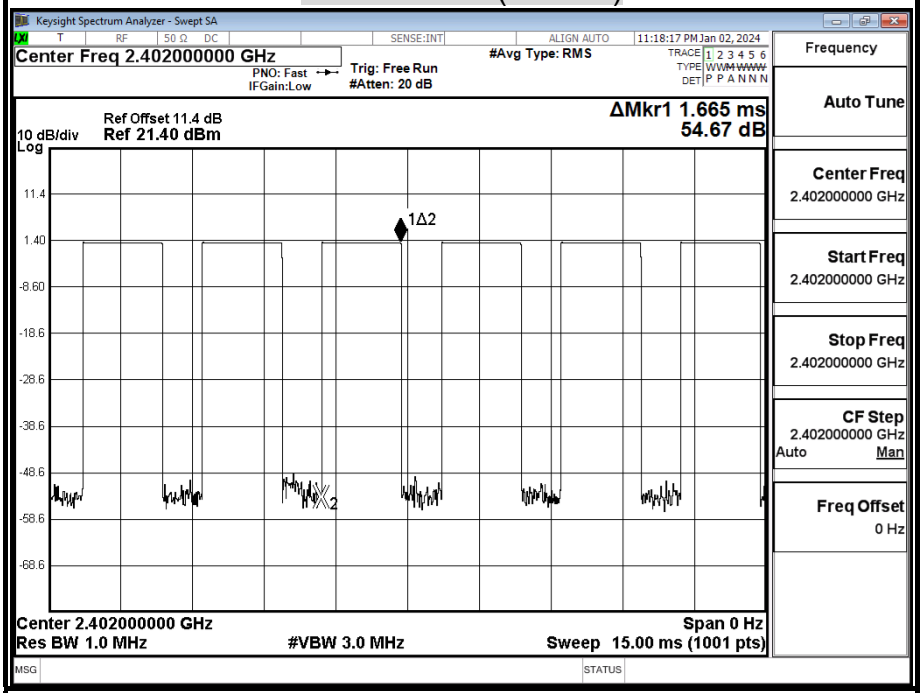
DH1 CH Middle (GFSK)



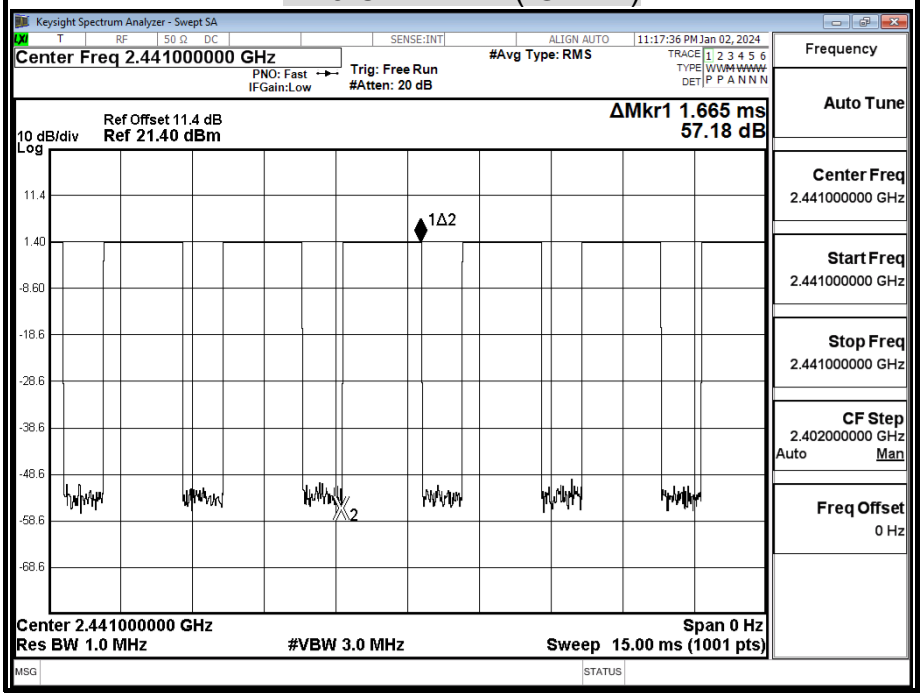
DH1 CH High (GFSK)



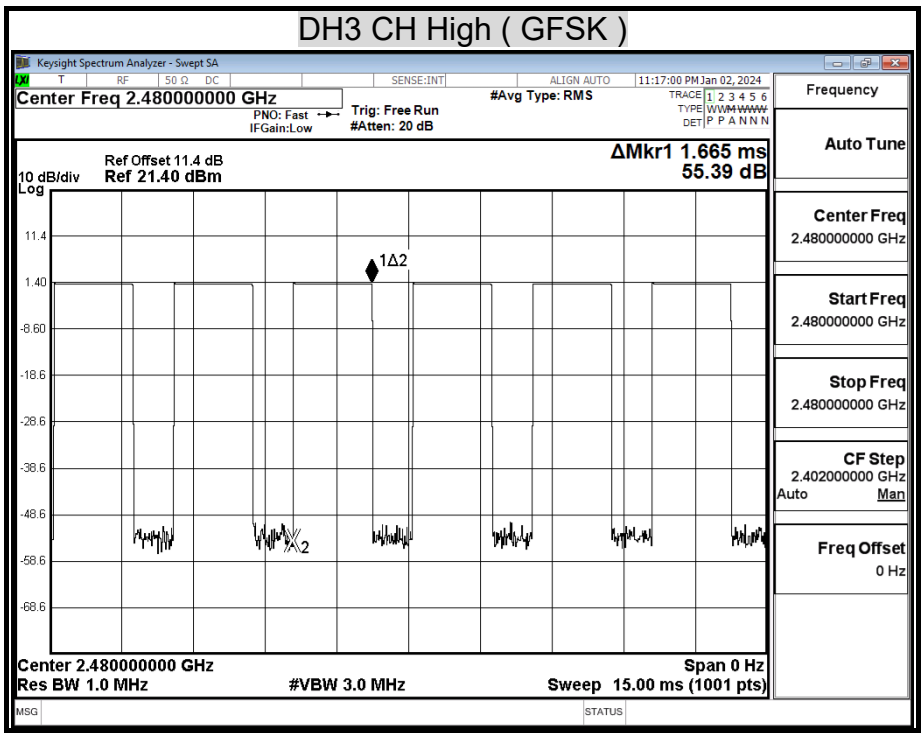
DH3 CH Low (GFSK)



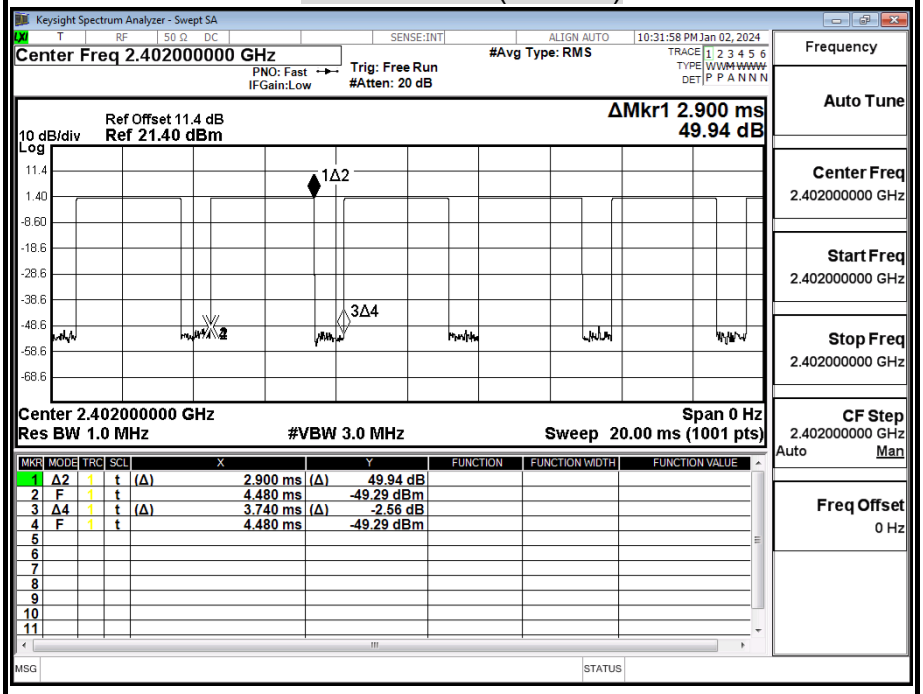
DH3 CH Middle (GFSK)



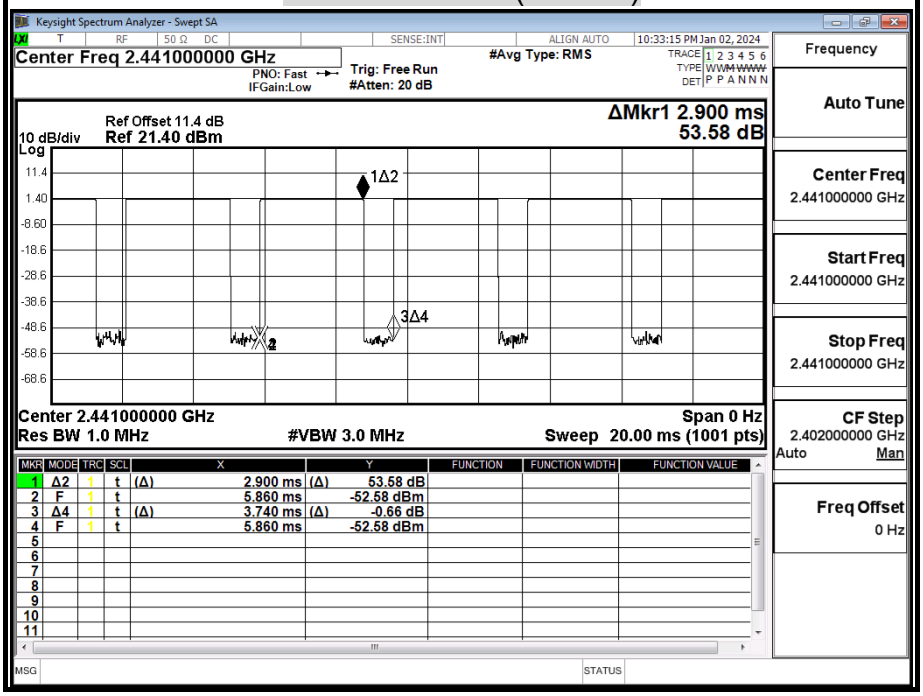
DH3 CH High (GFSK)



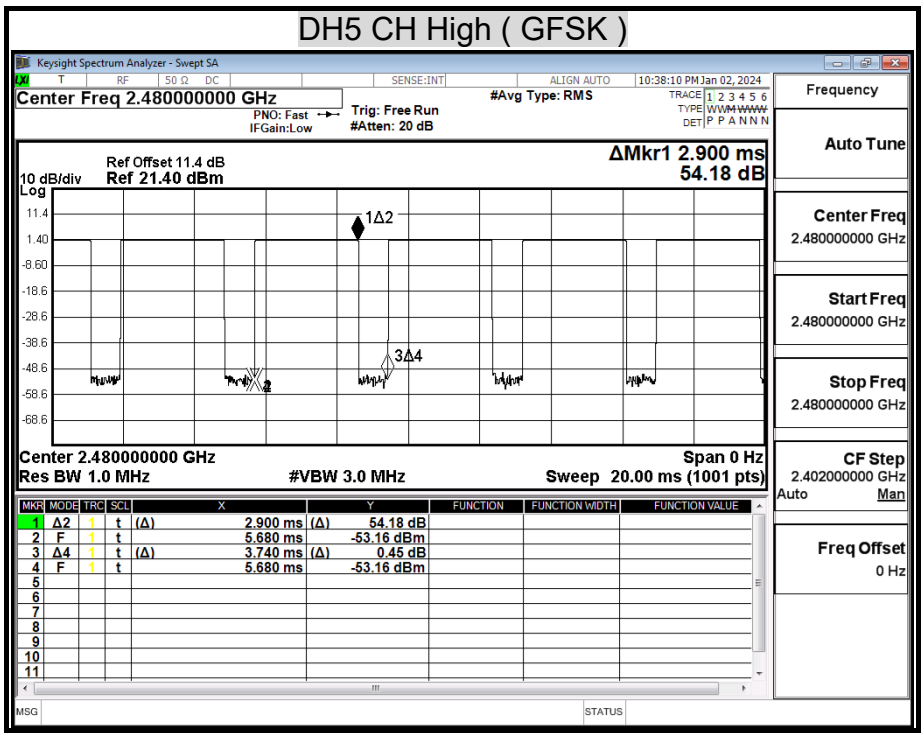
DH5 CH Low (GFSK)



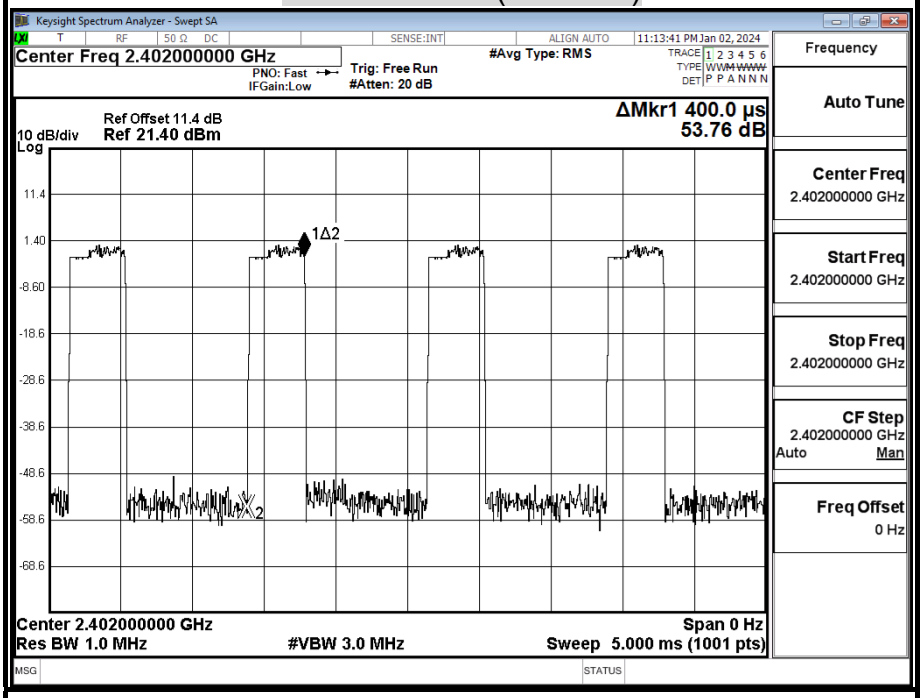
DH5 CH Middle (GFSK)



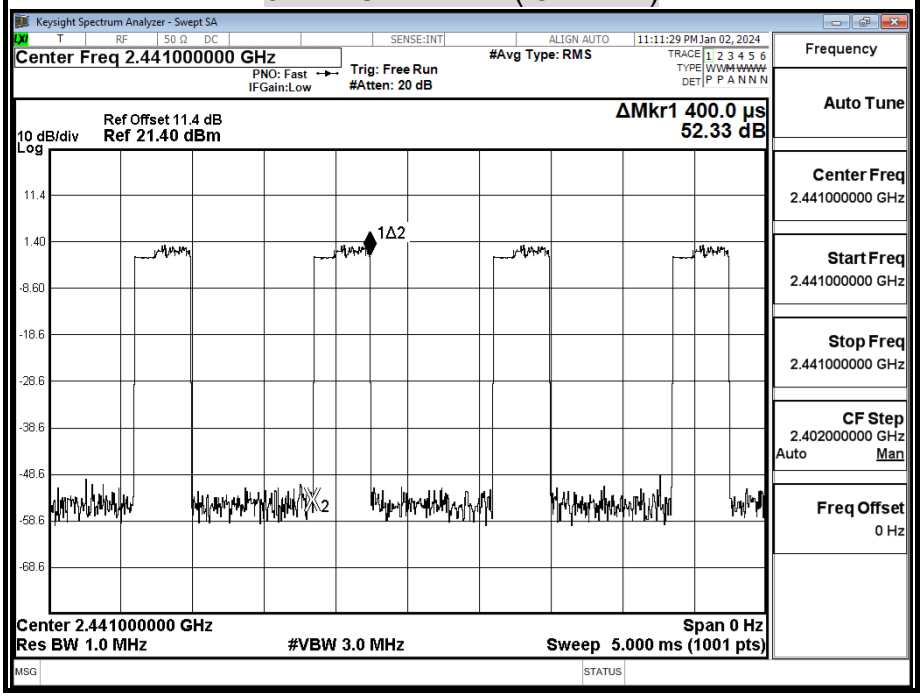
DH5 CH High (GFSK)



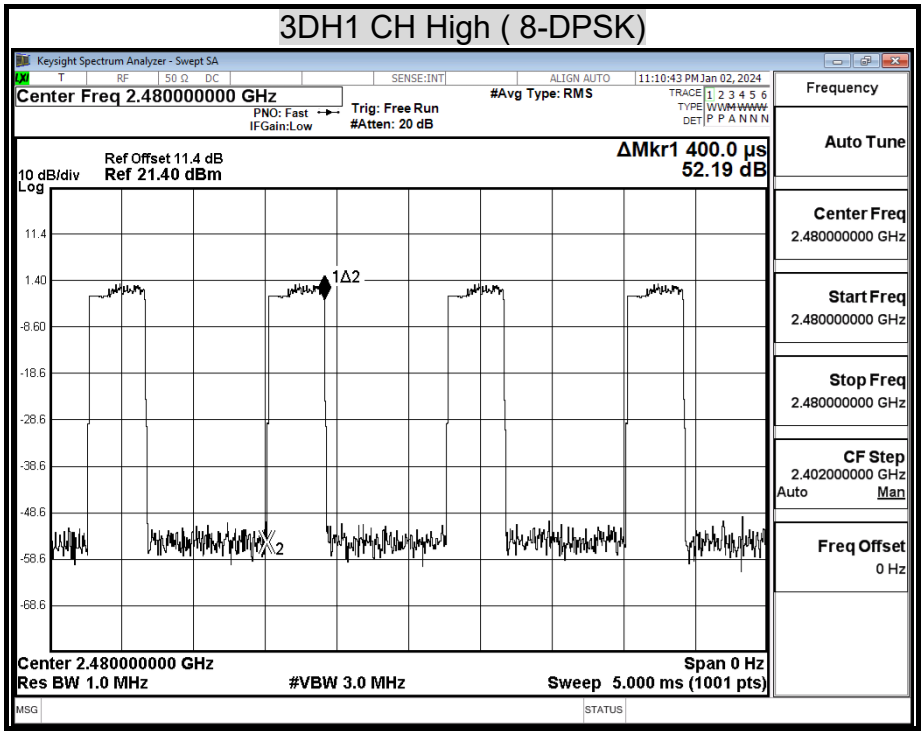
3DH1 CH Low (8-DPSK)



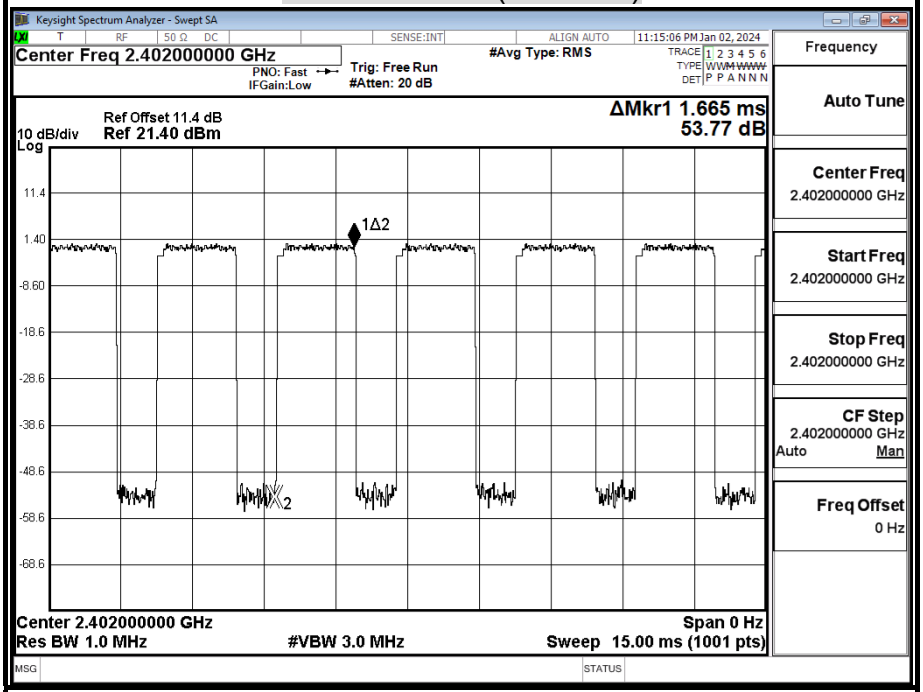
3DH1 CH Middle (8-DPSK)



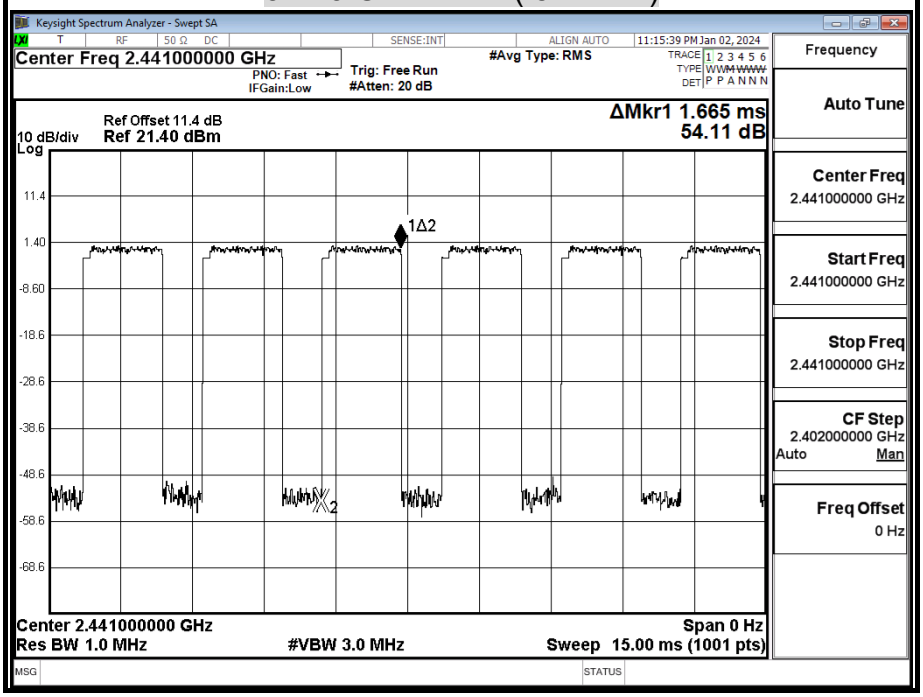
3DH1 CH High (8-DPSK)



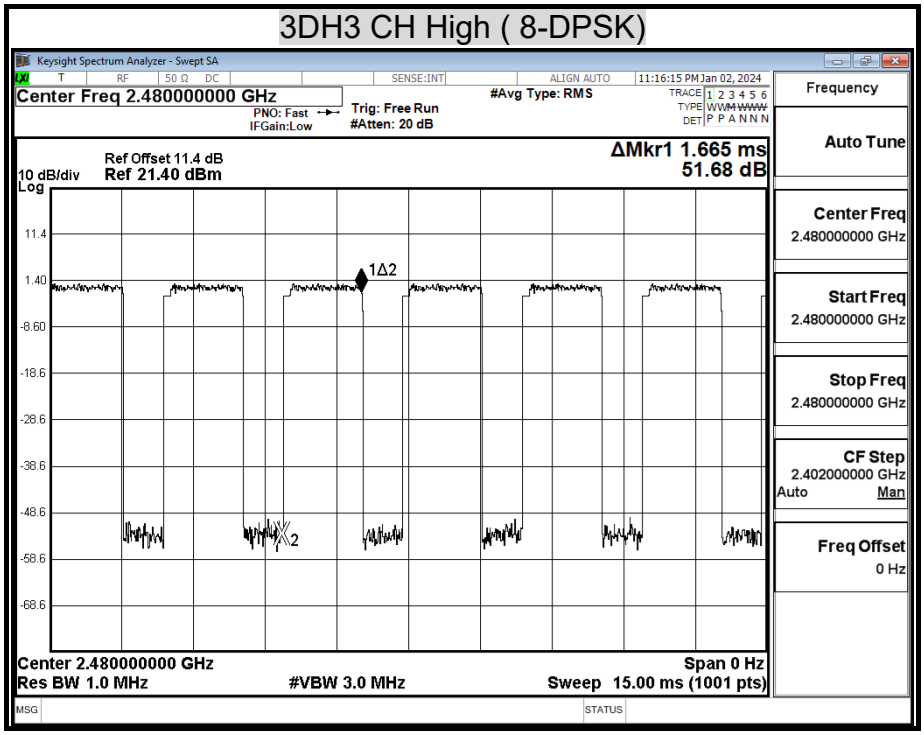
3DH3 CH Low (8-DPSK)



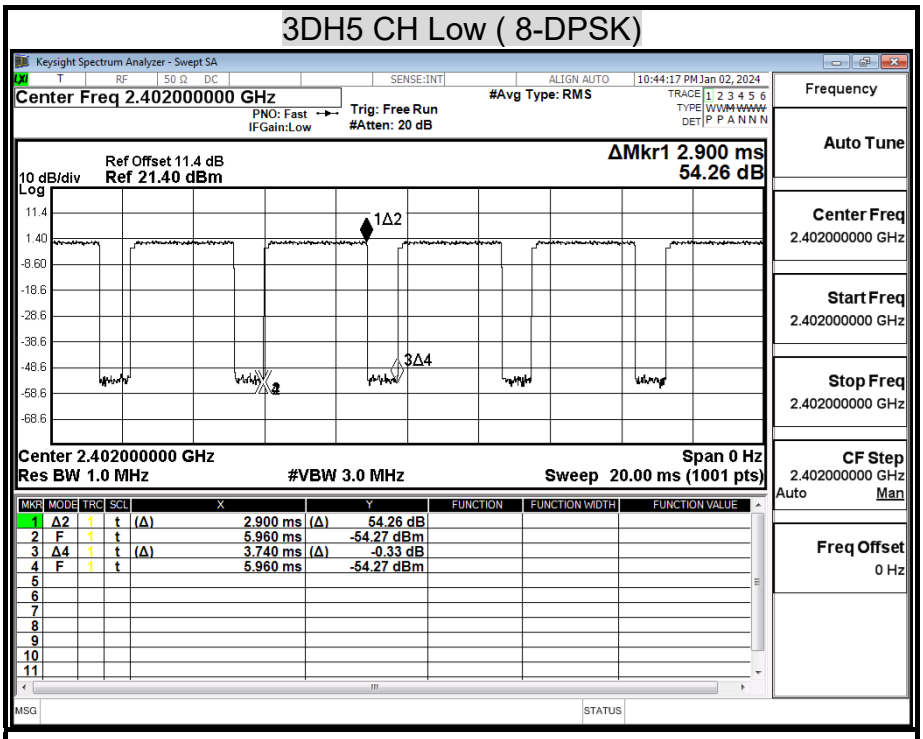
3DH3 CH Middle (8-DPSK)



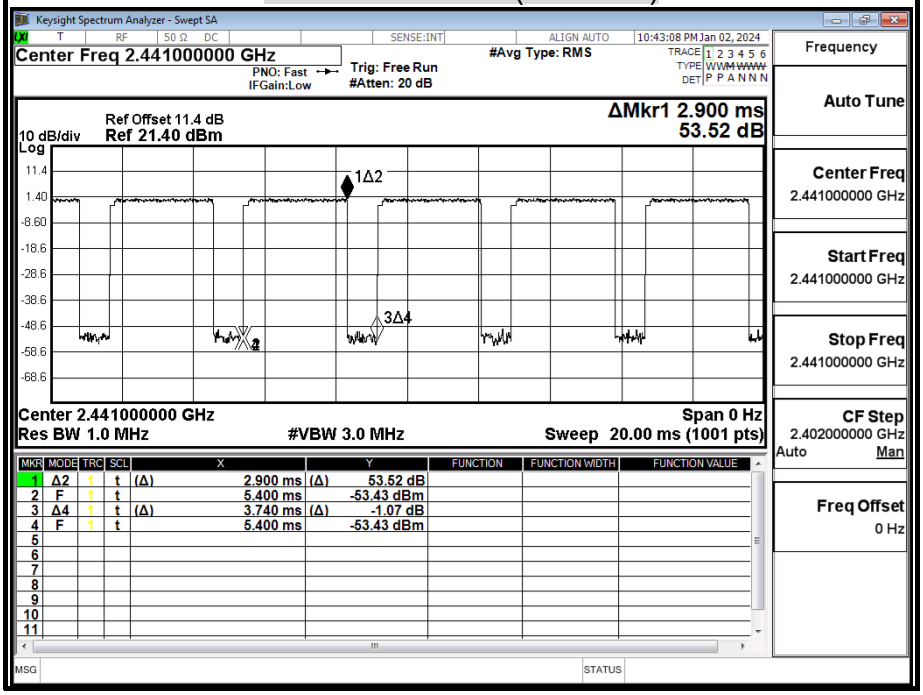
3DH3 CH High (8-DPSK)



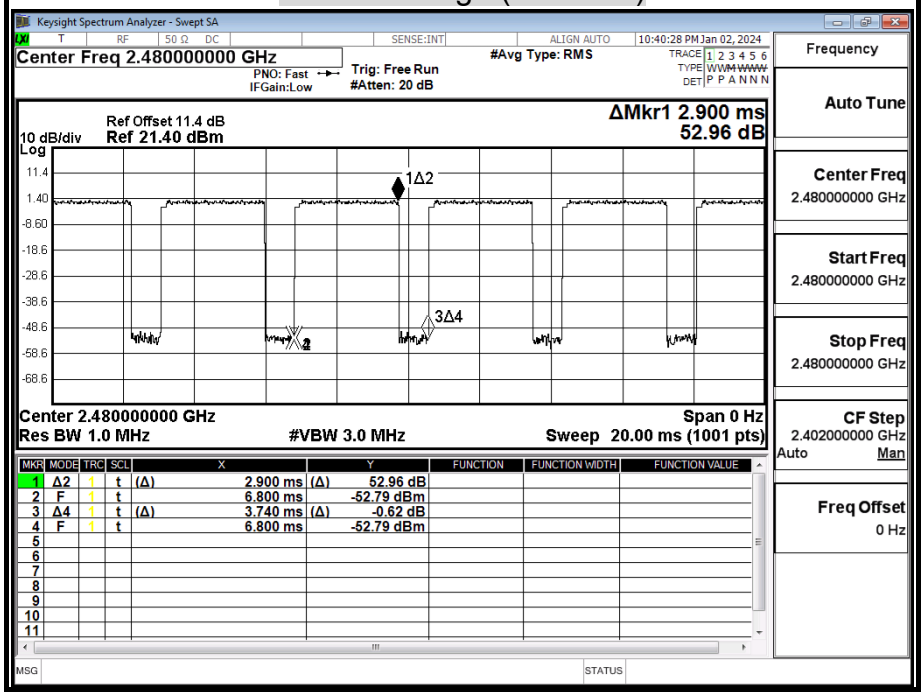
3DH5 CH Low (8-DPSK)



3DH5 CH Middle (8-DPSK)



3DH5 CH High (8-DPSK)

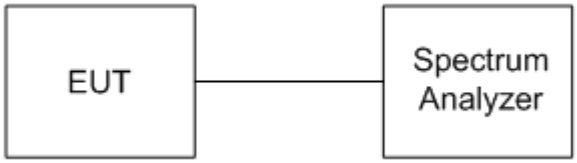


8.6 DUTY CYCLE

LIMIT

Nil (No dedicated limit specified in the Rules)

TEST SETUP



TEST PROCEDURE

1. Place the EUT on the table and set it in transmitting mode.
2. Remove the antenna from the EUT and then connect a low loss RF cable from the antenna port to the spectrum analyzer.
3. The zero-span mode on a spectrum analyzer or EMI receiver if the response time and spacing between bins on the sweep are sufficient to permit accurate measurements of the on and off times of the transmitted signal. Set the center frequency of the instrument to the center frequency of the transmission. Set RBW ≥ OBW if possible; otherwise, set RBW to the largest available value. Set VBW ≥ RBW. Set detector = peak or average. The zero-span measurement method shall not be used unless both RBW and VBW are > 50/T and the number of sweep points across duration T exceeds 100. (For example, if VBW and/or RBW are limited to 3 MHz, then the zero-span method of measuring duty cycle shall not be used if T ≤ 16.7 microseconds.)

TEST RESULTS

No non-compliance noted.

TEST DATA

Model Name	AT-LP70XBT	Test By	Peter Chu
Temp & Humidity	22.5°C, 45%	Test Date	2023/12/27

Modulation Type: GFSK / DH5

	us	Times	Ton(us)	Total Ton time(ms)
Ton1	2900	1	2900	
Ton2		0	0	
Ton3			0	2.9
Tp				3.74

Ton	2.90
Tp(Ton+Toff)	3.74
Duty Cycle	0.78
Duty Factor	1.10

Modulation Type: 8-DPSK / 3-DH5

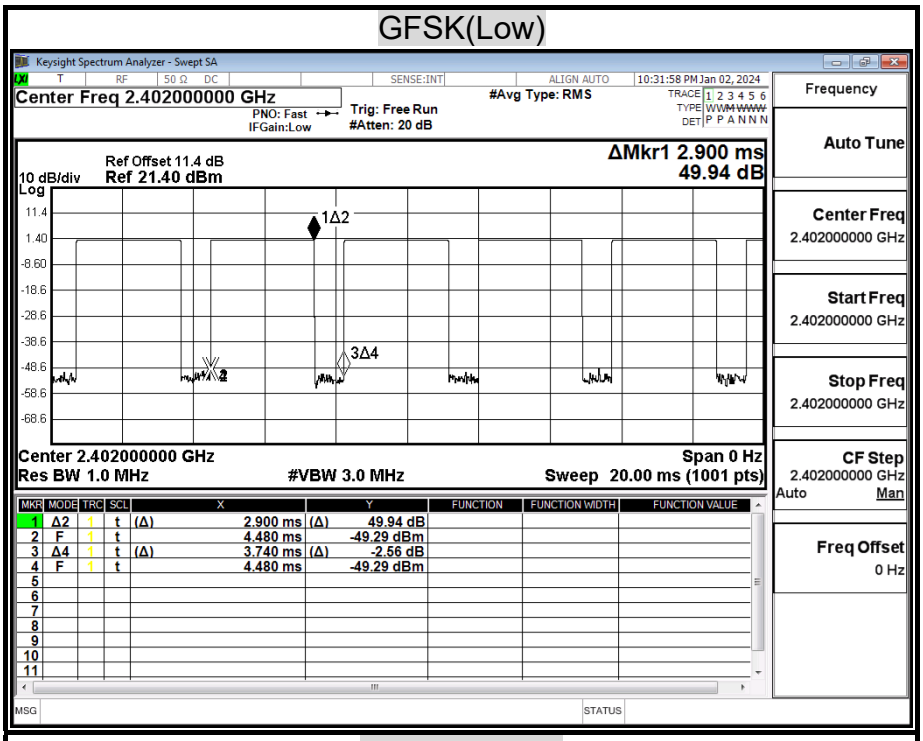
	us	Times	Ton(us)	Total Ton time(ms)
Ton1	2900	1	2900	
Ton2		0	0	
Ton3			0	2.9
Tp				3.74

Ton	2.90
Tp(Ton+Toff)	3.74
Duty Cycle	0.78
Duty Factor	1.10

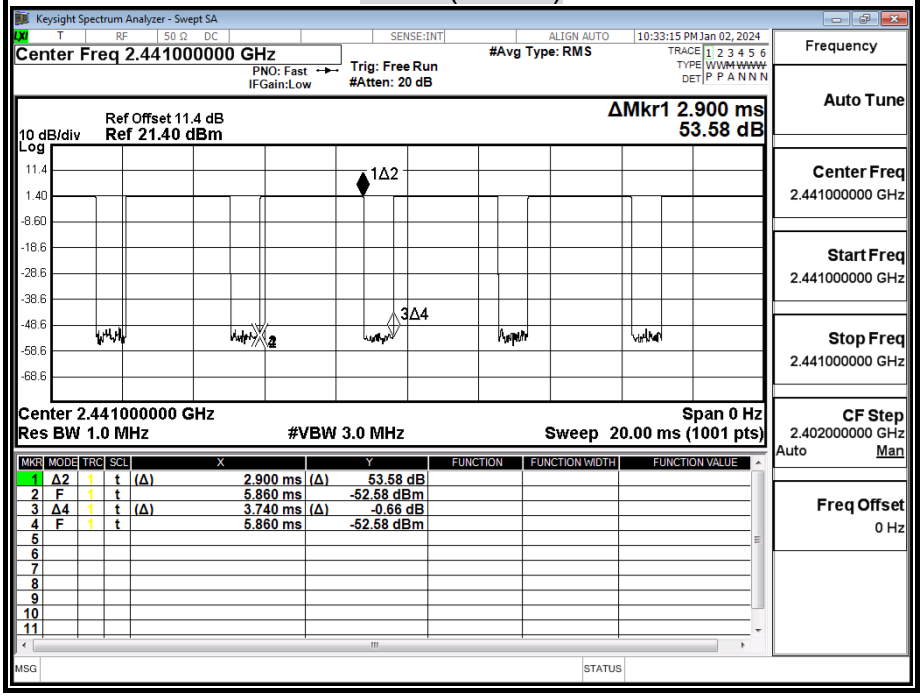
TEST PLOT

Duty Cycle

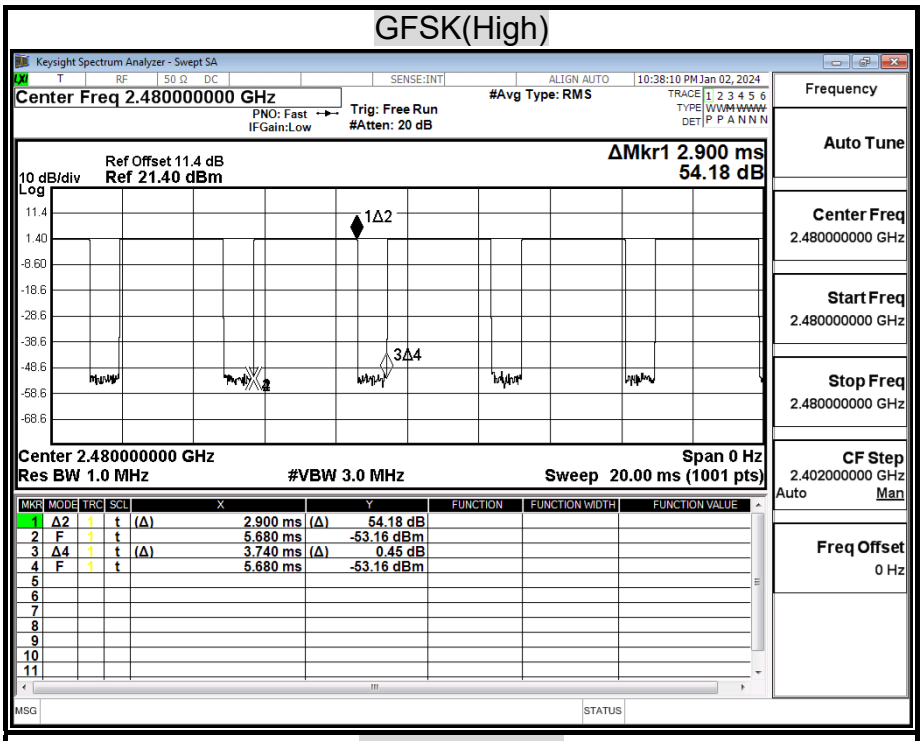
GFSK(Low)



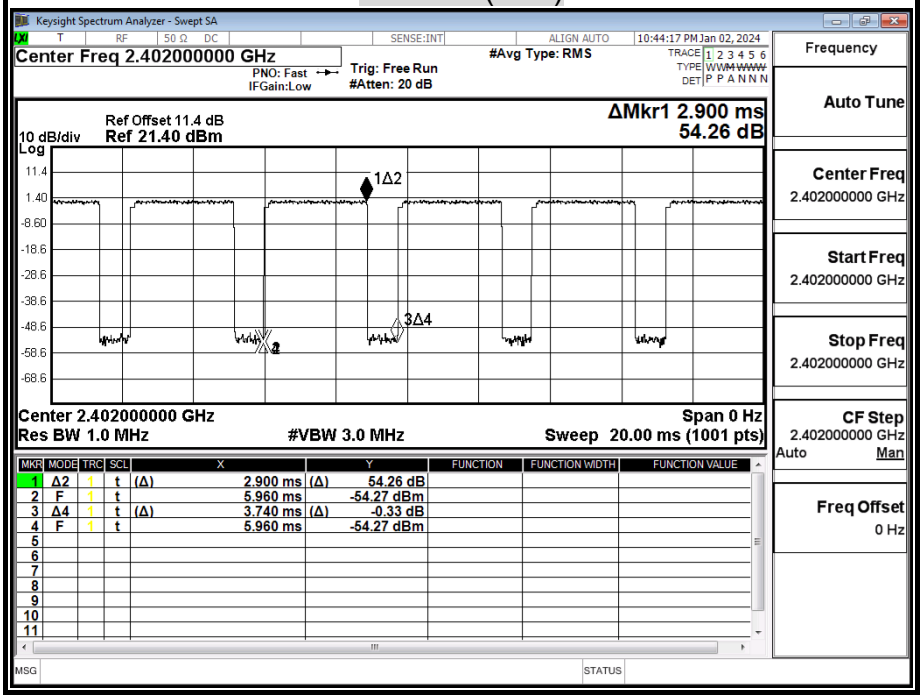
GFSK(Middle)



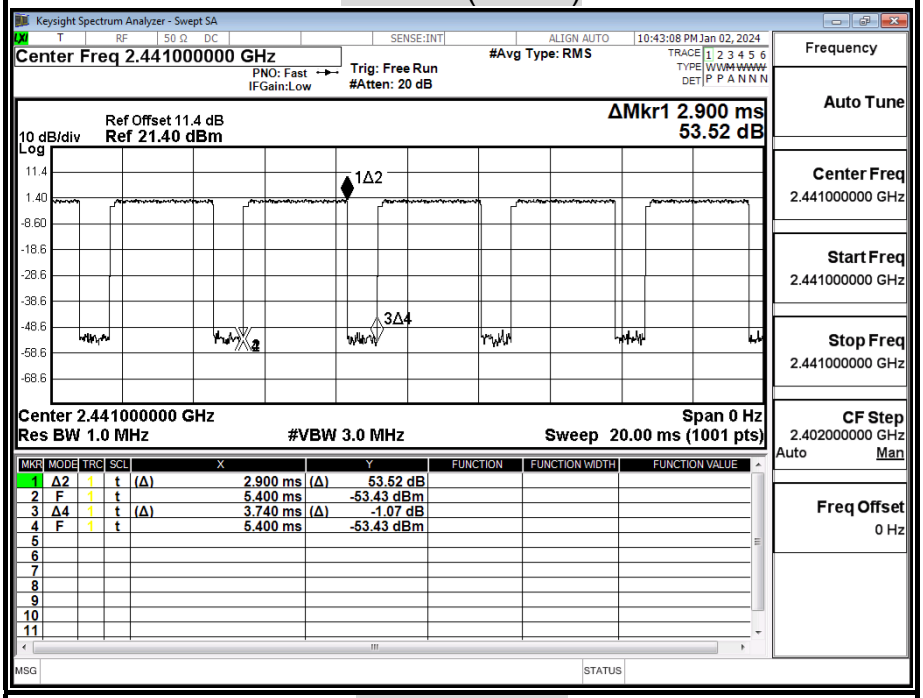
GFSK(High)



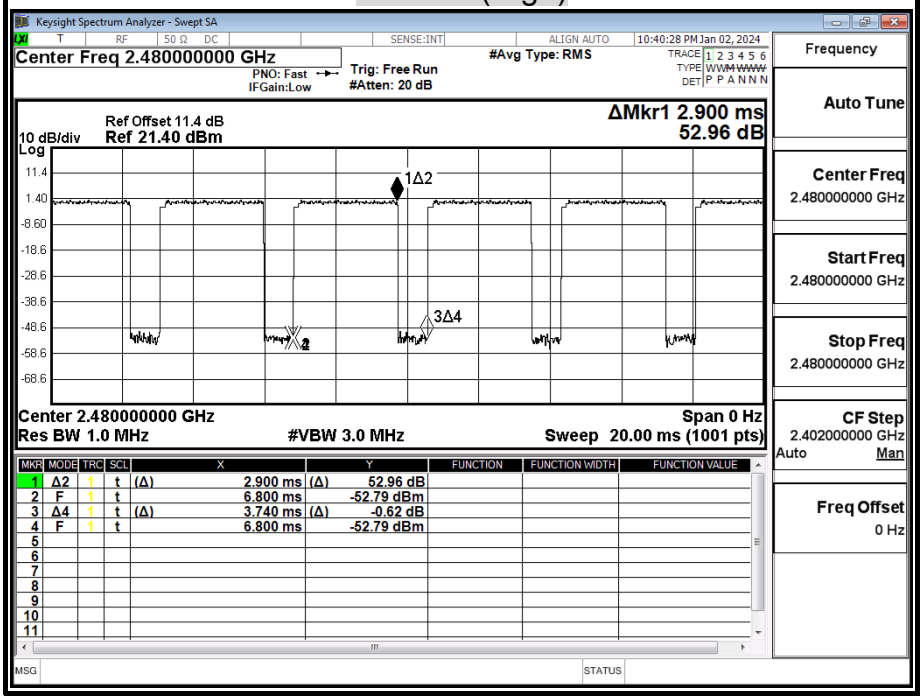
8-DPSK (Low)



8-DPSK (Middle)



8-DPSK (High)

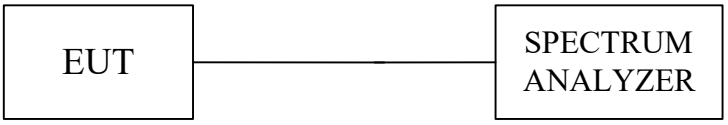


8.7 CONDUCTED SPURIOUS EMISSION

LIMITS

§ 15.247(d) In any 100 kHz bandwidth outside the frequency band in which the spread spectrum intentional radiator is operating, 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 and that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement. Attenuation below the general limits specified in § 15.209(a) is not required. In addition, radiated emissions which fall in the restricted bands, as defined in § 15.205(a), must also comply with the radiated emission limits specified in § 15.209(a) (see § 15.205(c)).

TEST SETUP



TEST PROCEDURE

The transmitter output is connected to a spectrum analyzer. The resolution bandwidth is set to 100 kHz. The video bandwidth is set to 300 kHz.

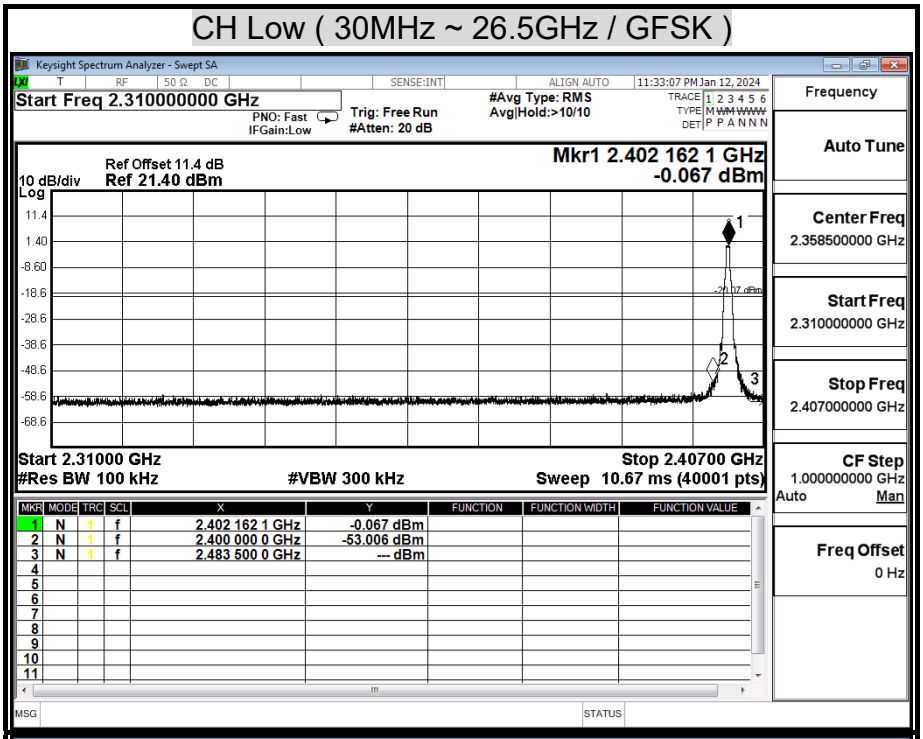
The spectrum from 30 MHz to 26.5 GHz is investigated with the transmitter set to the lowest, middle, and highest channels in the 2.4 GHz band.

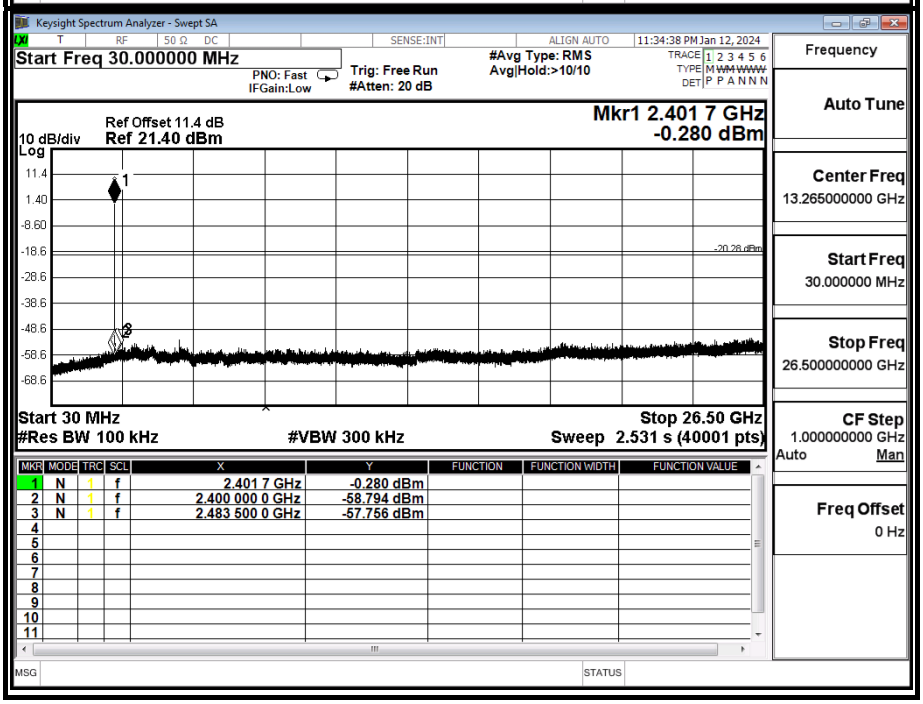
TEST RESULTS

Model Name	AT-LP70XBT	Test By	Peter Chu
Temp & Humidity	22.5°C, 45%	Test Date	2023/12/27

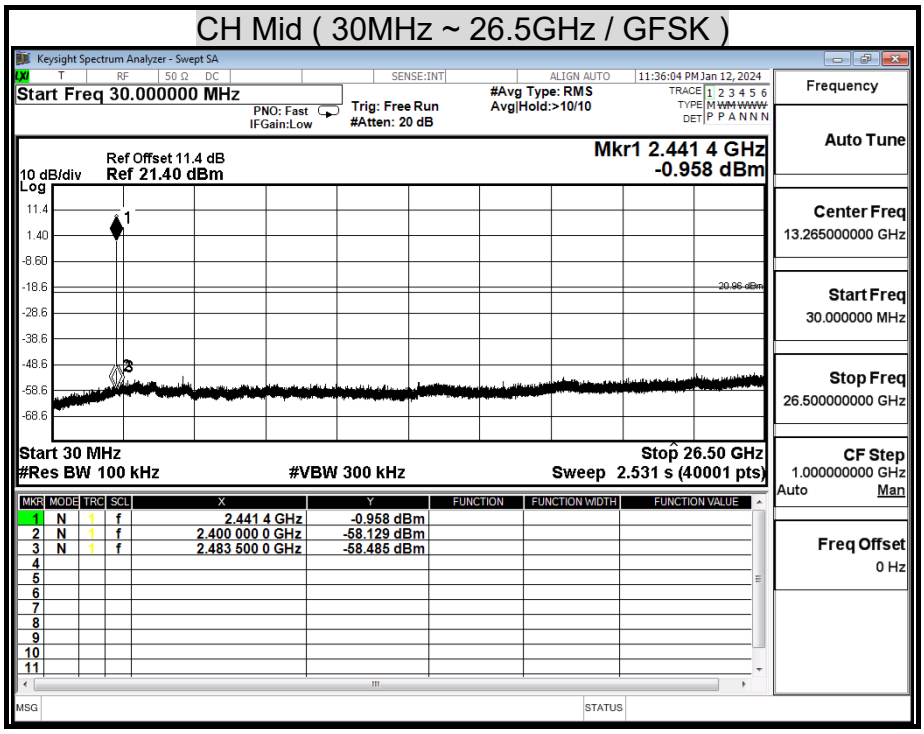
OUT-OF-BAND SPURIOUS EMISSIONS-CONDUCTED MEASUREMENT

CH Low (30MHz ~ 26.5GHz / GFSK)

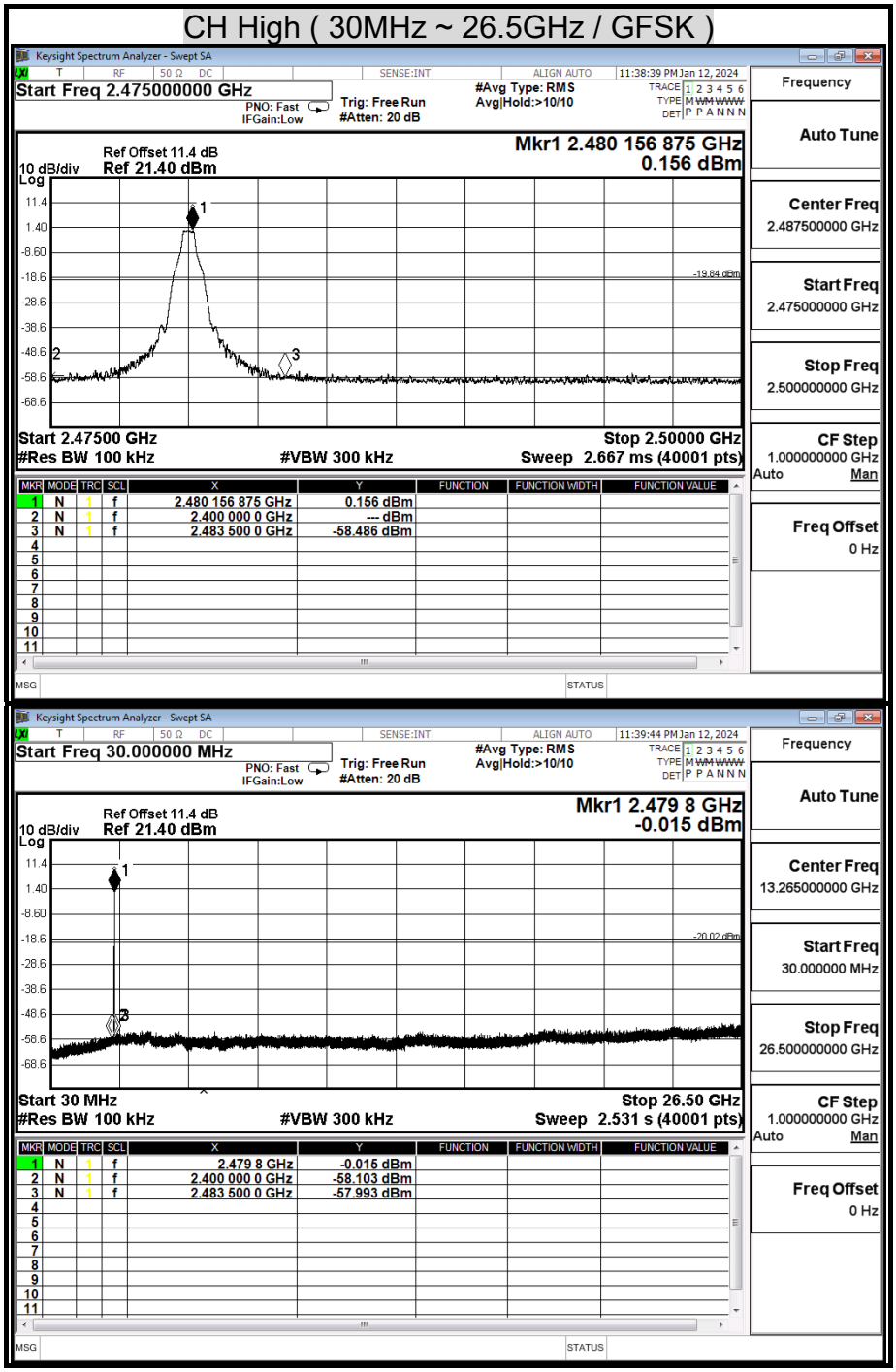




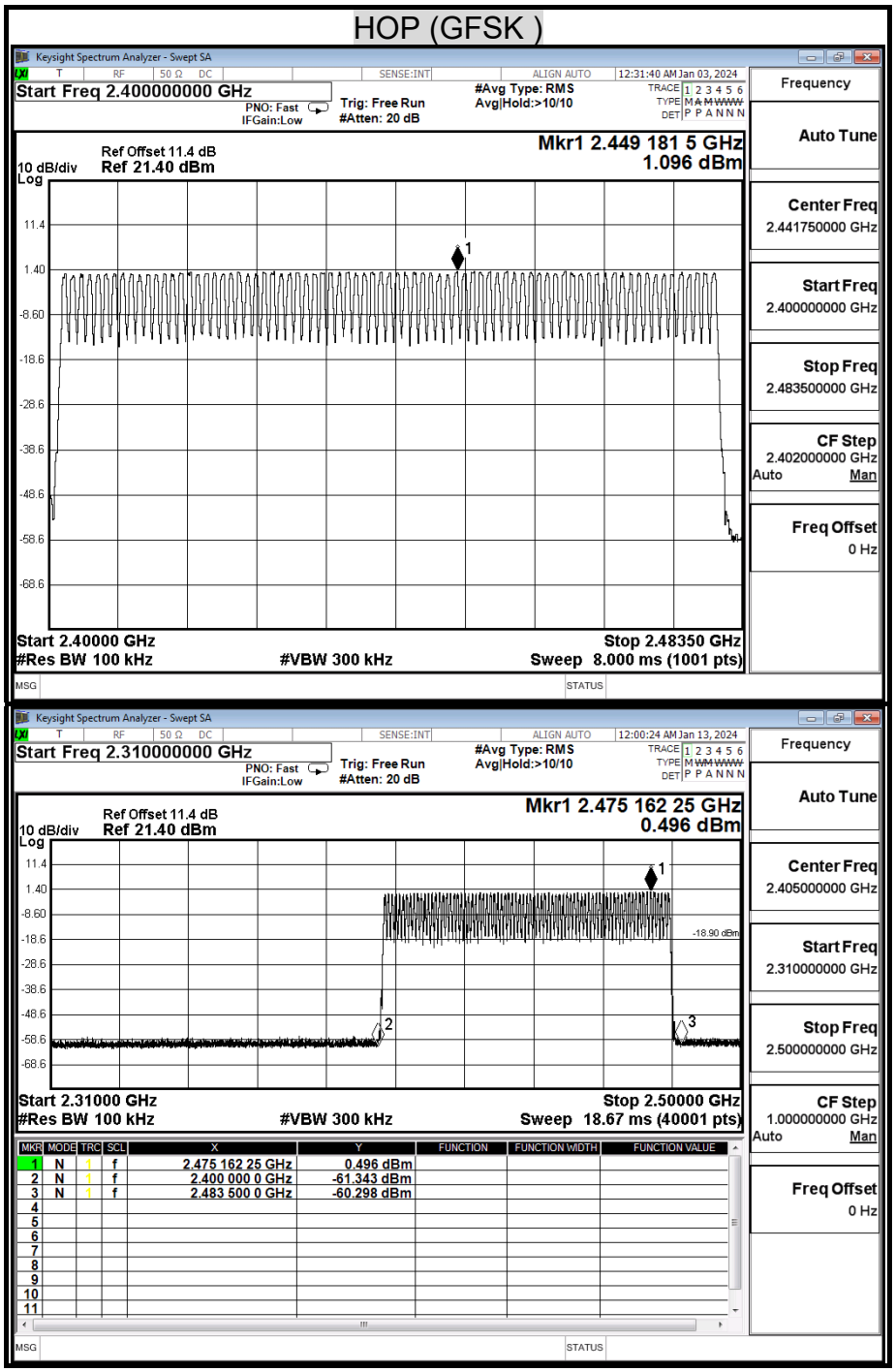
CH Mid (30MHz ~ 26.5GHz / GFSK)



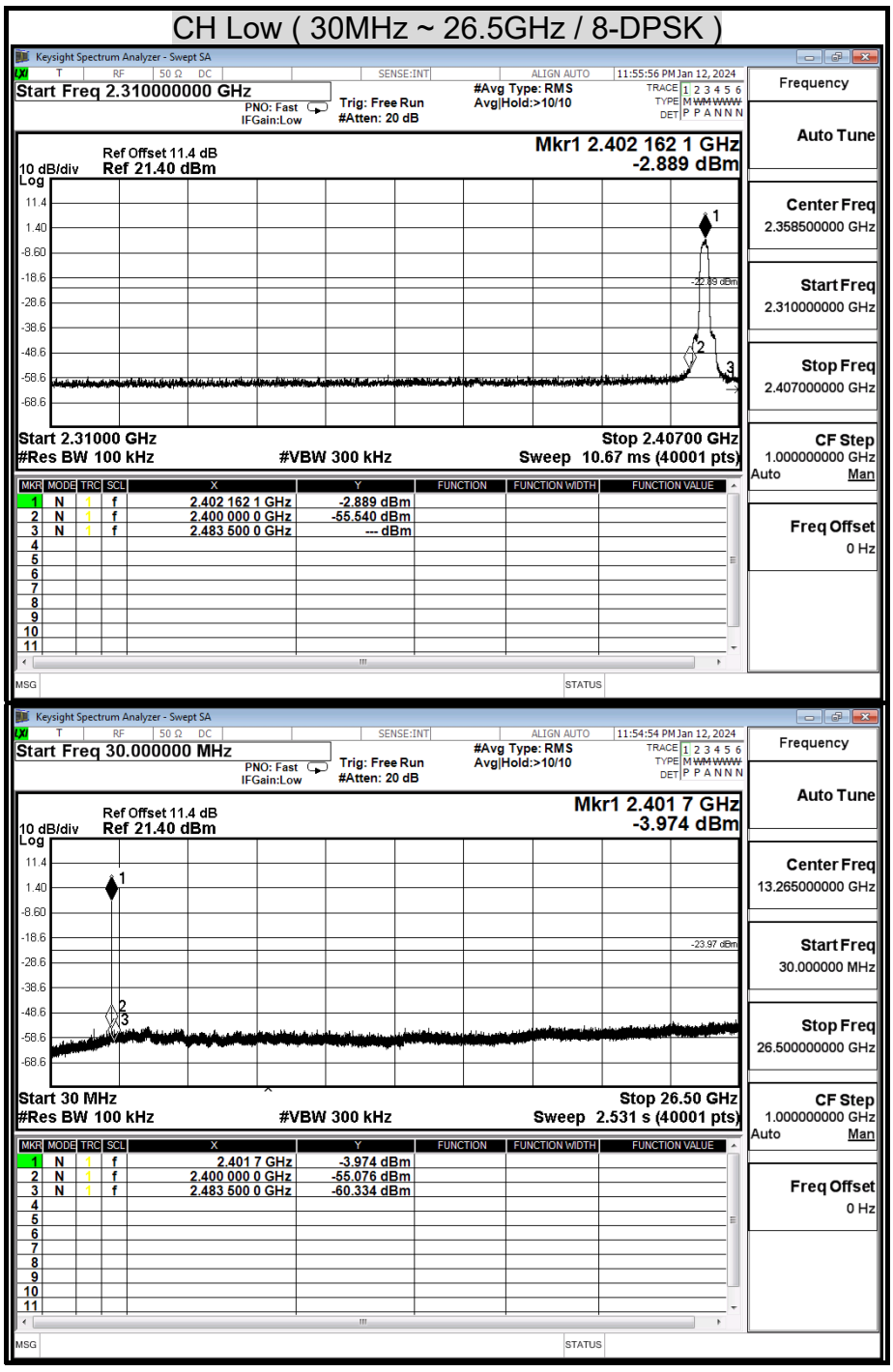
CH High (30MHz ~ 26.5GHz / GFSK)



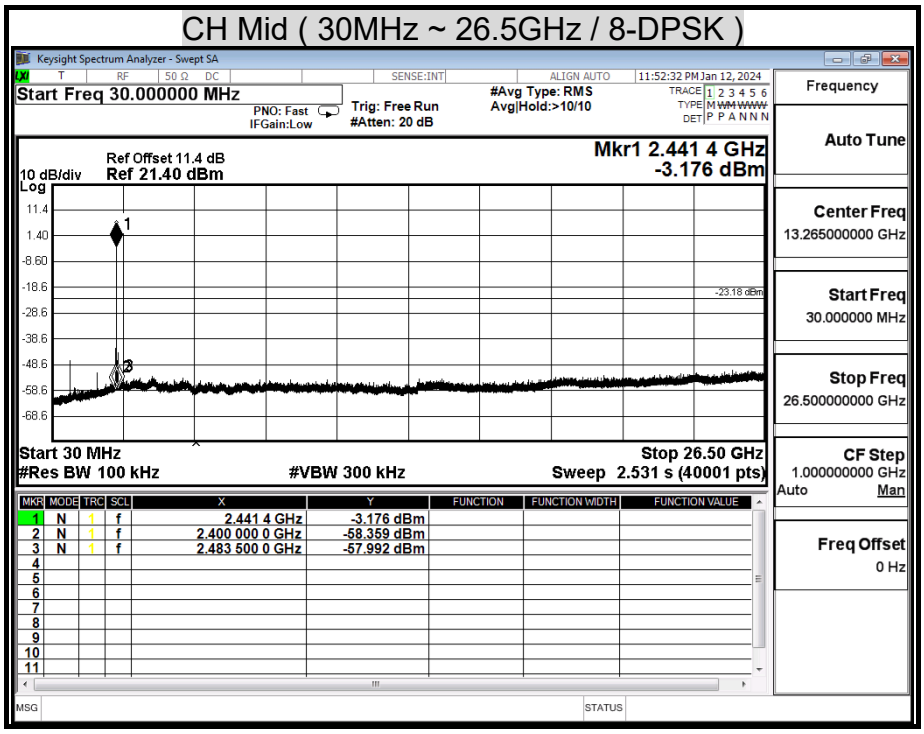
HOP (GFSK)



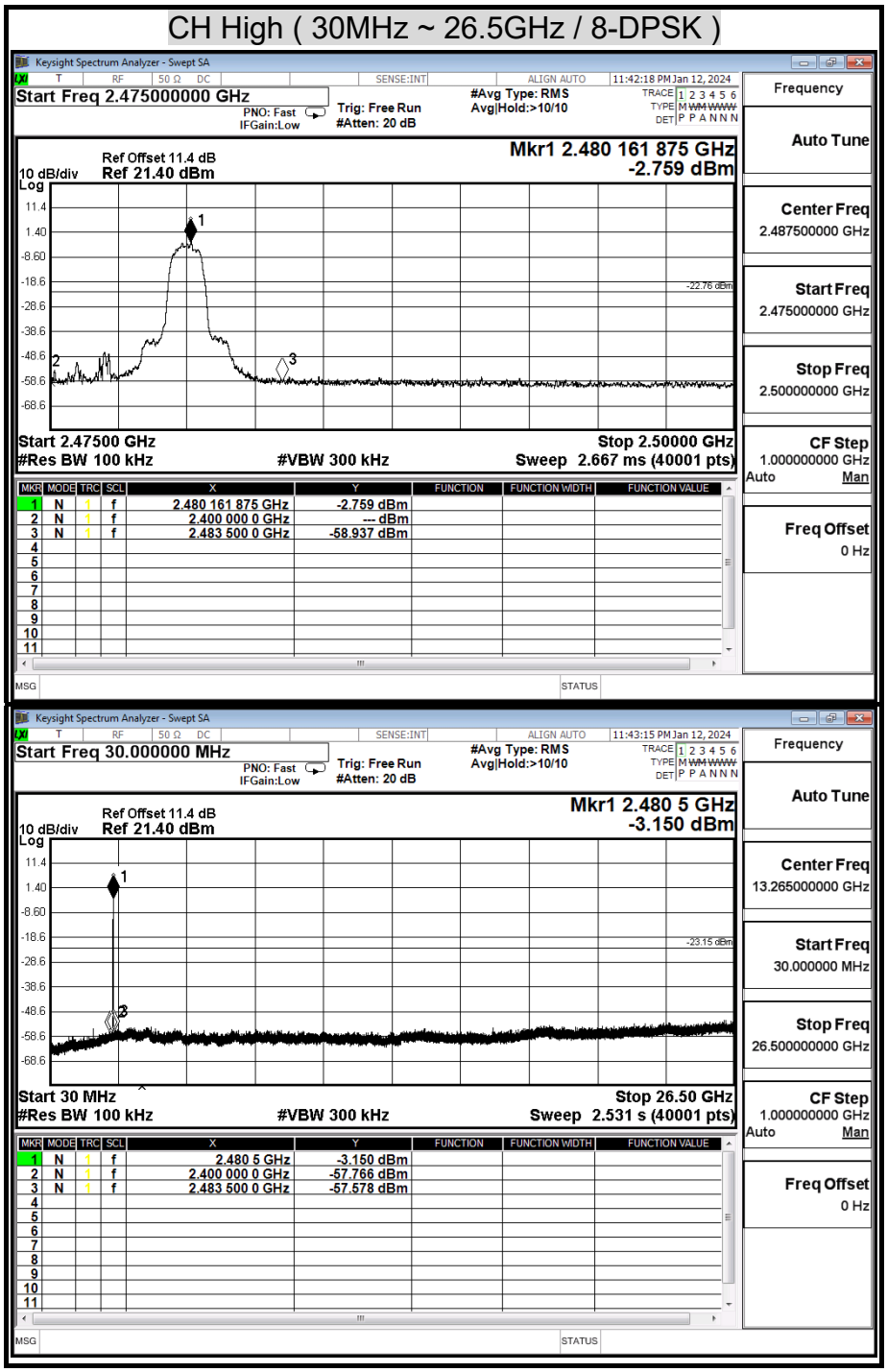
CH Low (30MHz ~ 26.5GHz / 8-DPSK)



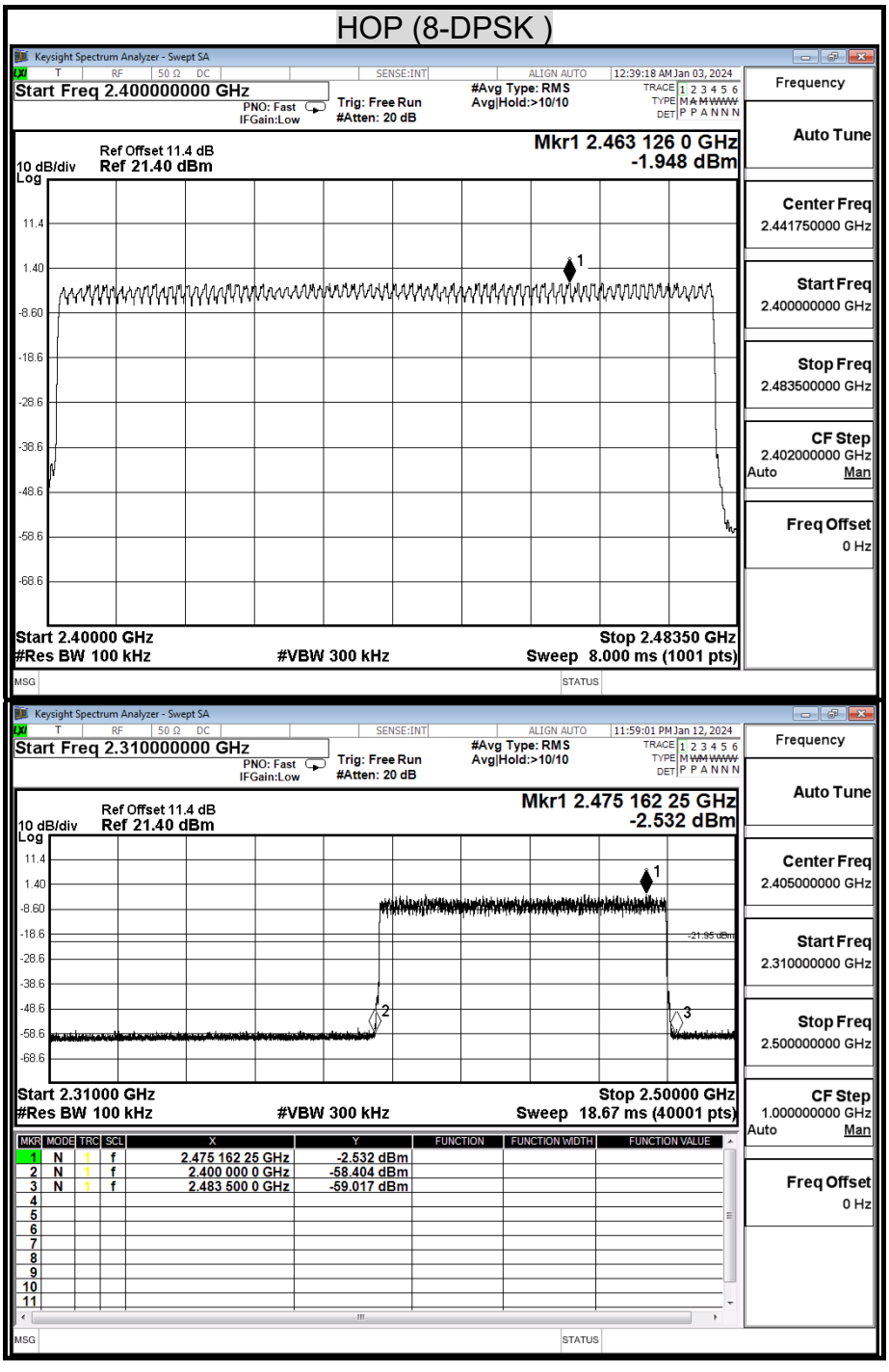
CH Mid (30MHz ~ 26.5GHz / 8-DPSK)



CH High (30MHz ~ 26.5GHz / 8-DPSK)

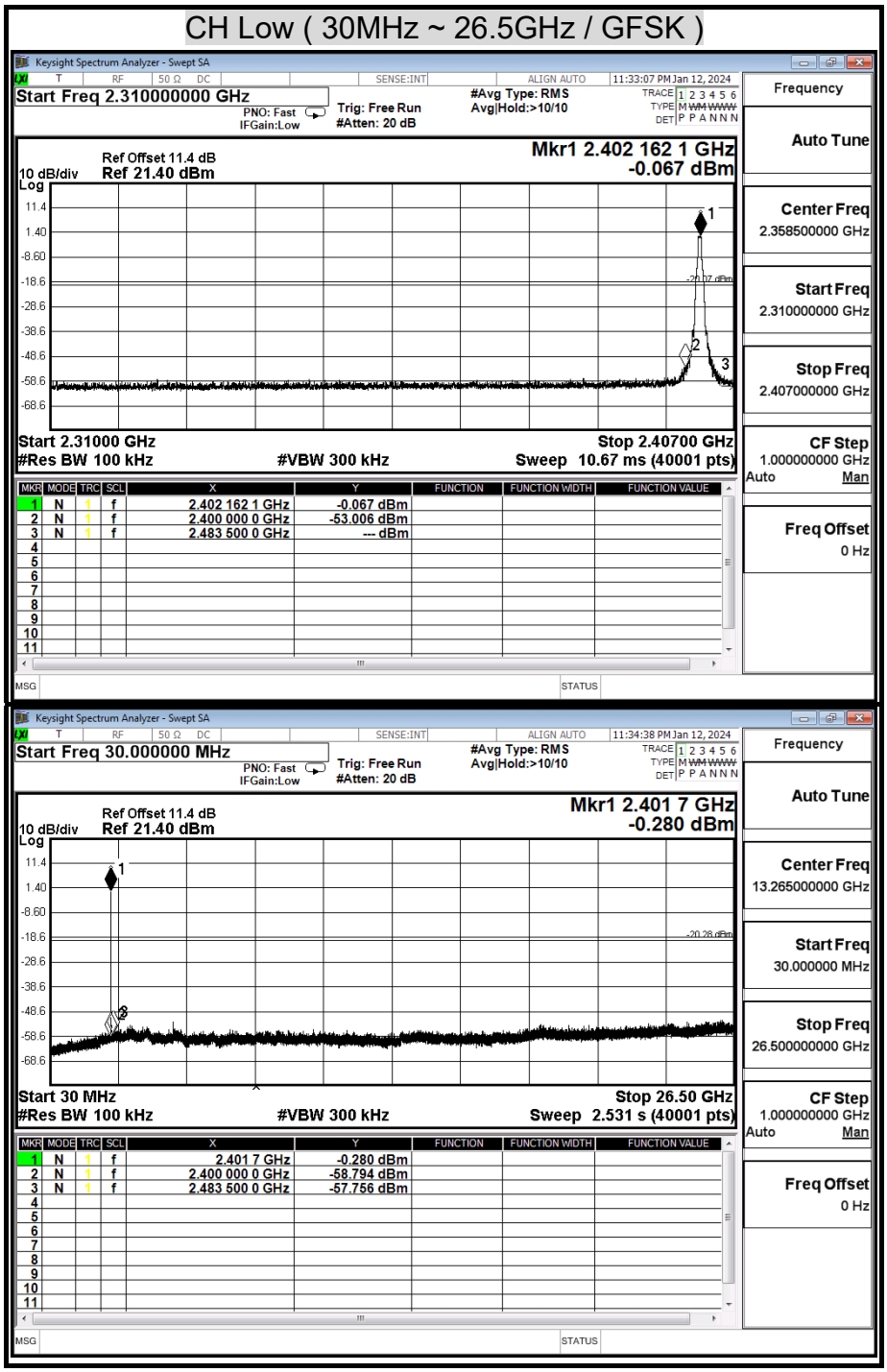


HOP (8-DPSK)

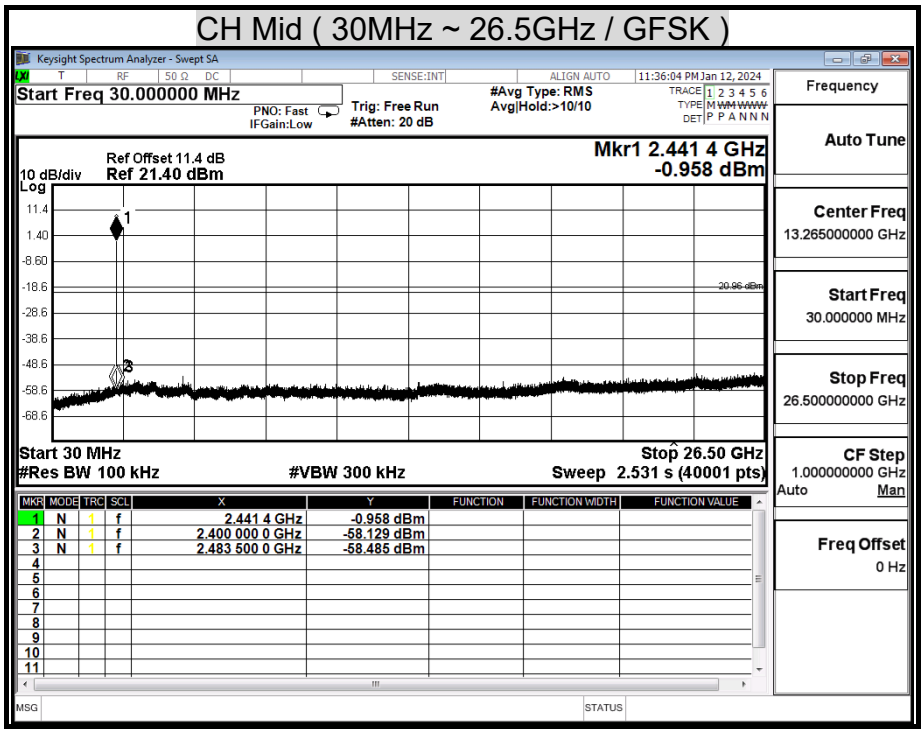


OUT-OF-BAND SPURIOUS EMISSIONS-CONDUCTED MEASUREMENT

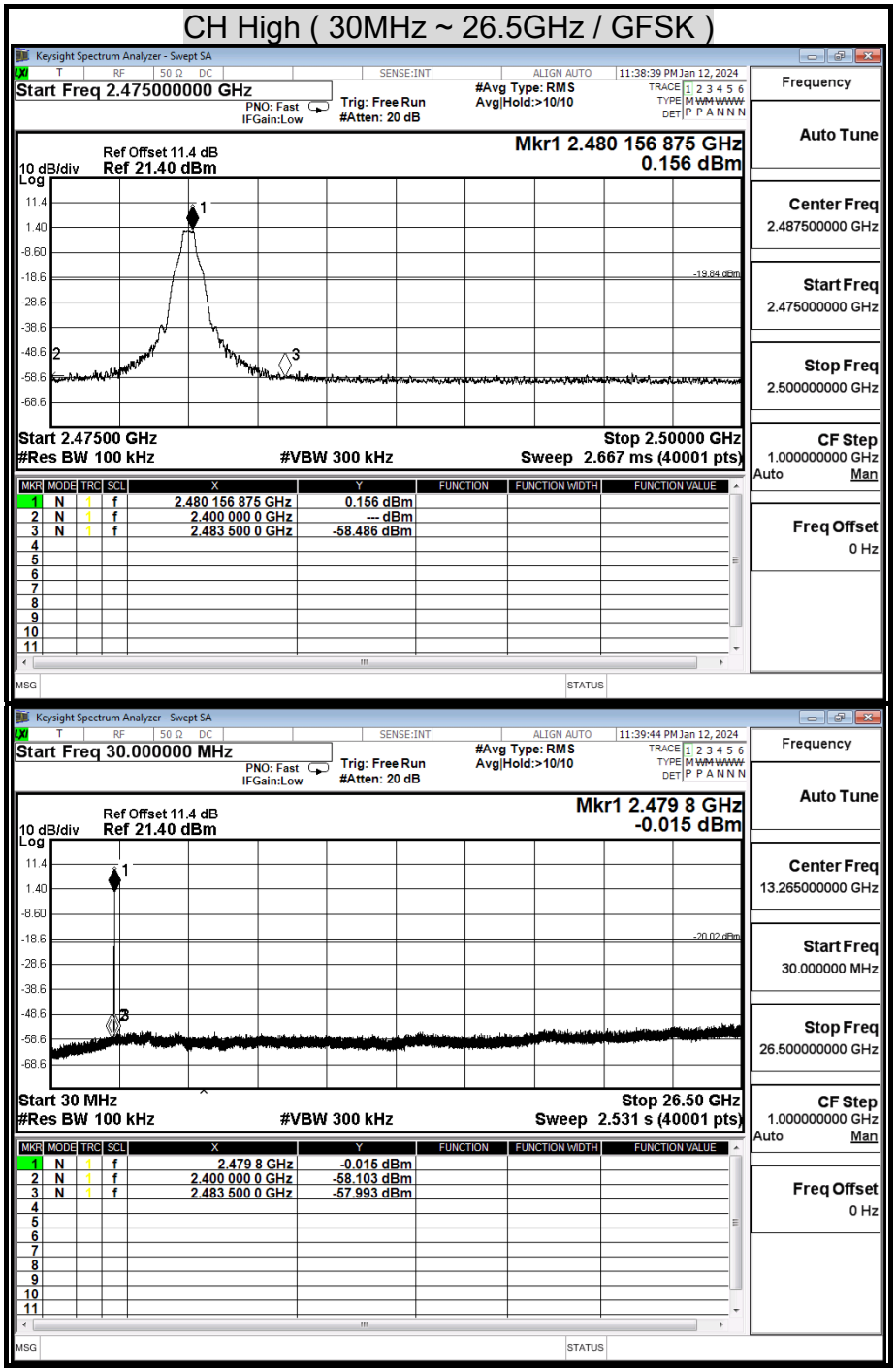
CH Low (30MHz ~ 26.5GHz / GFSK)



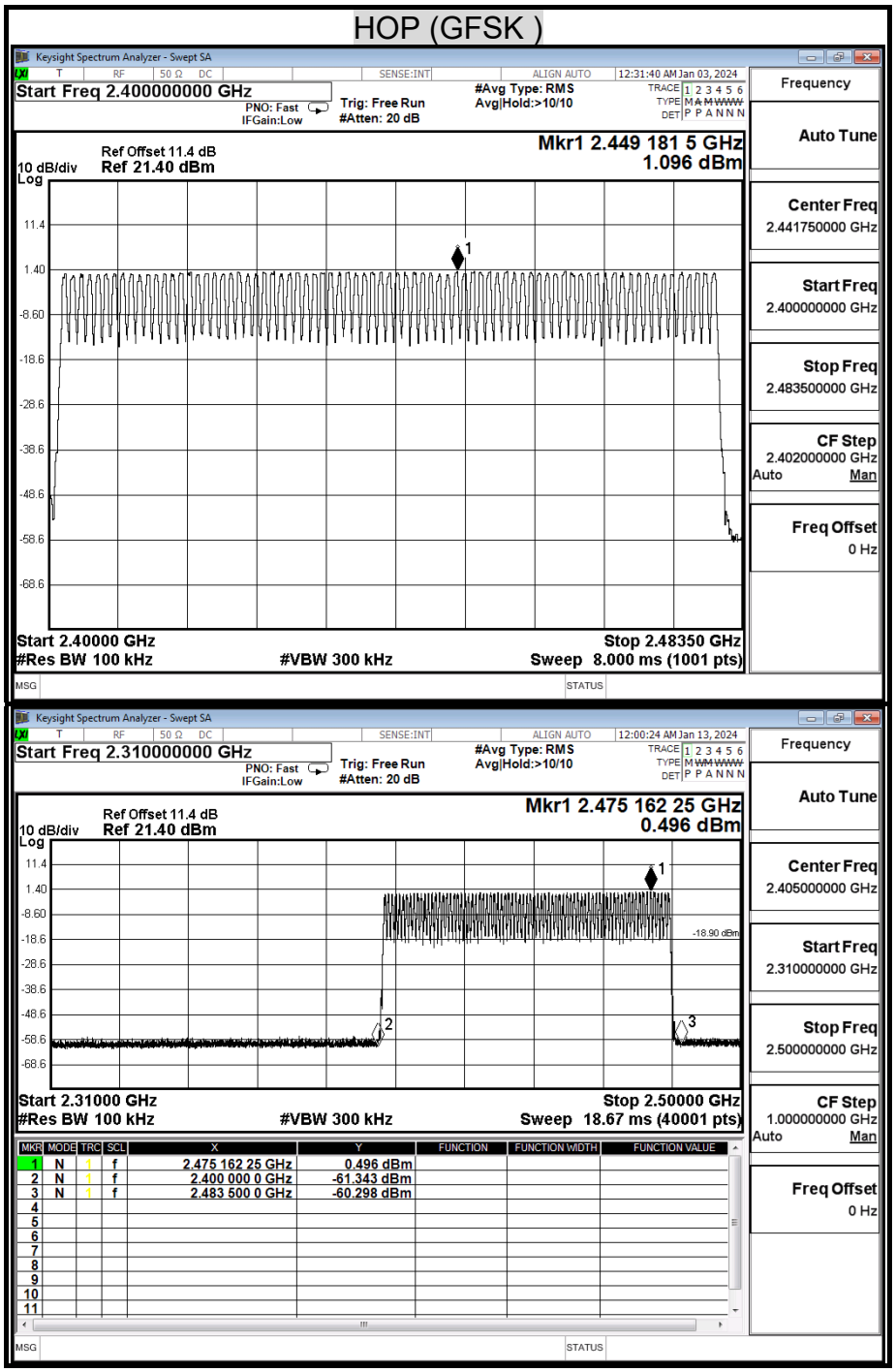
CH Mid (30MHz ~ 26.5GHz / GFSK)



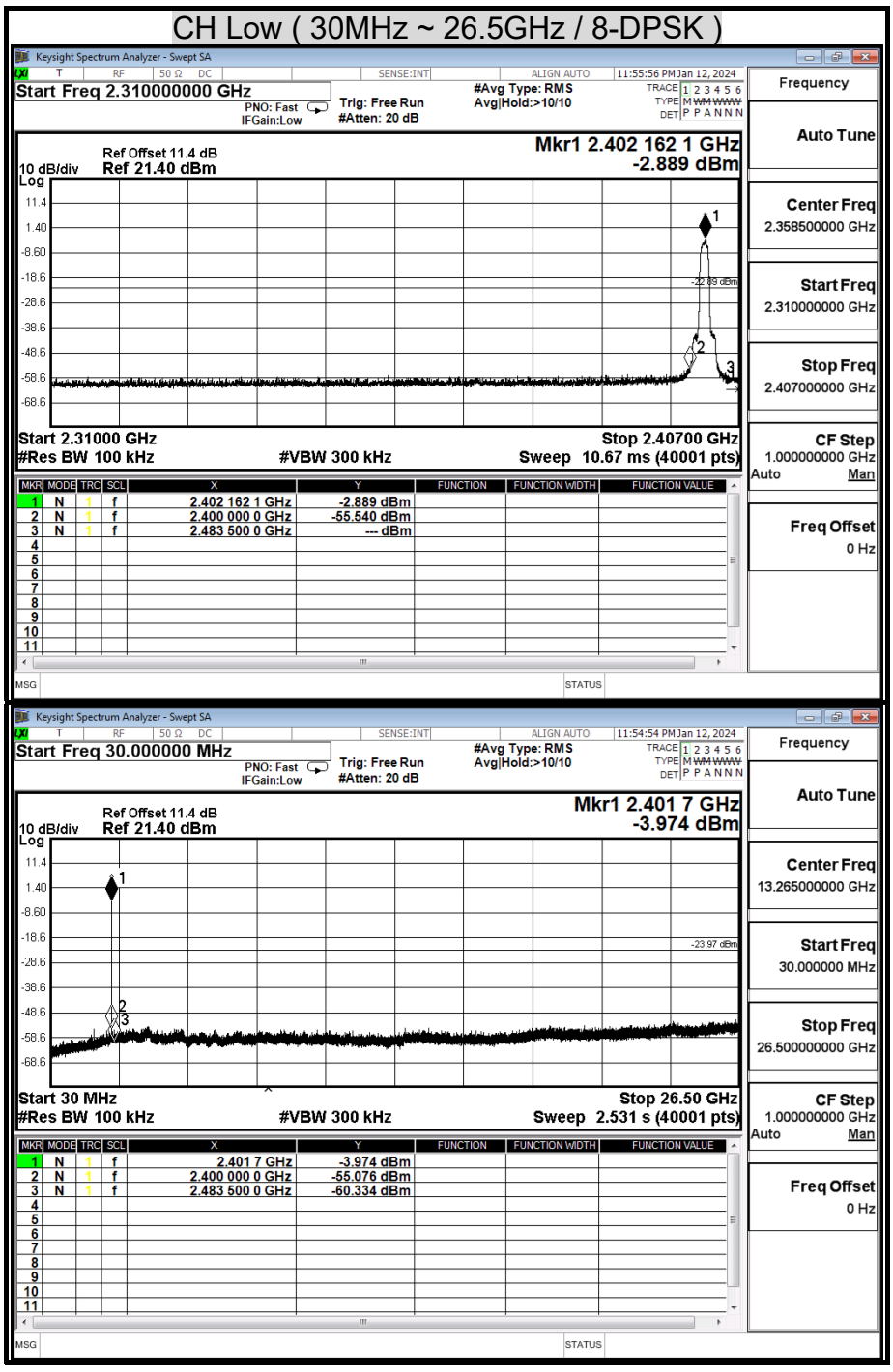
CH High (30MHz ~ 26.5GHz / GFSK)



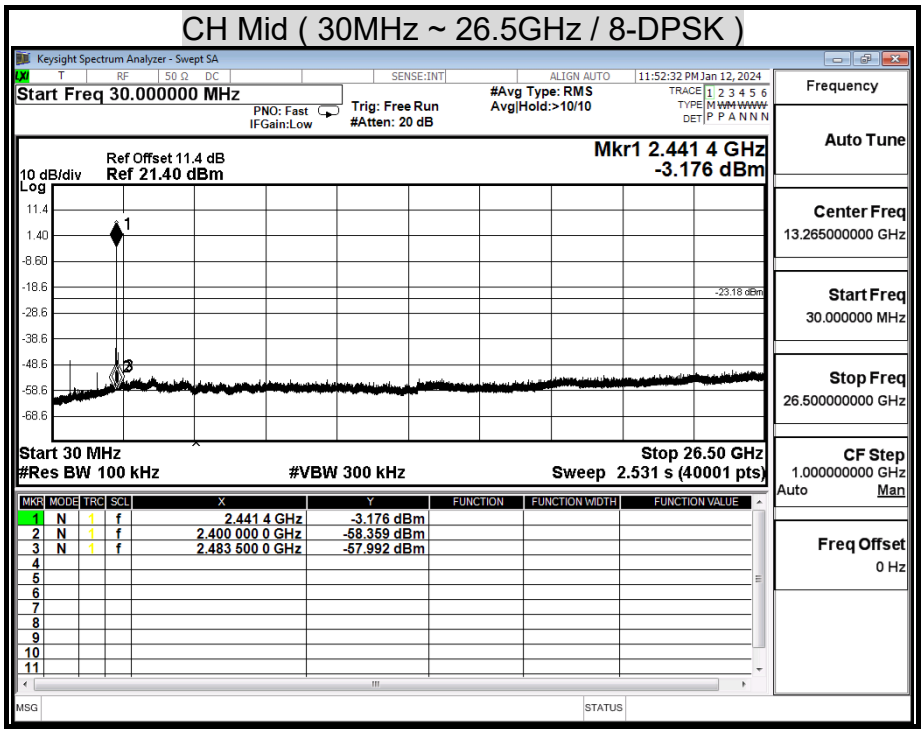
HOP (GFSK)



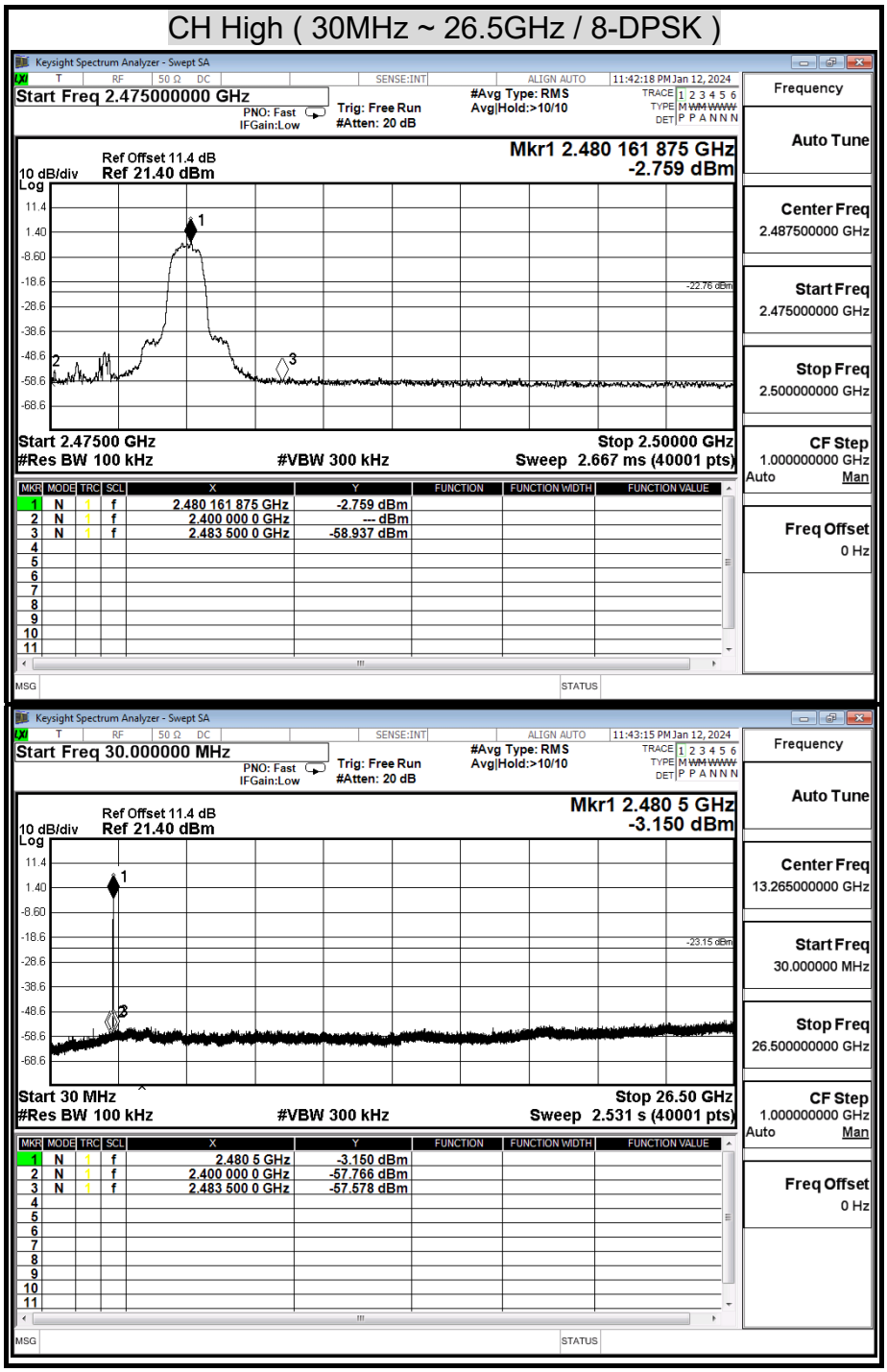
CH Low (30MHz ~ 26.5GHz / 8-DPSK)



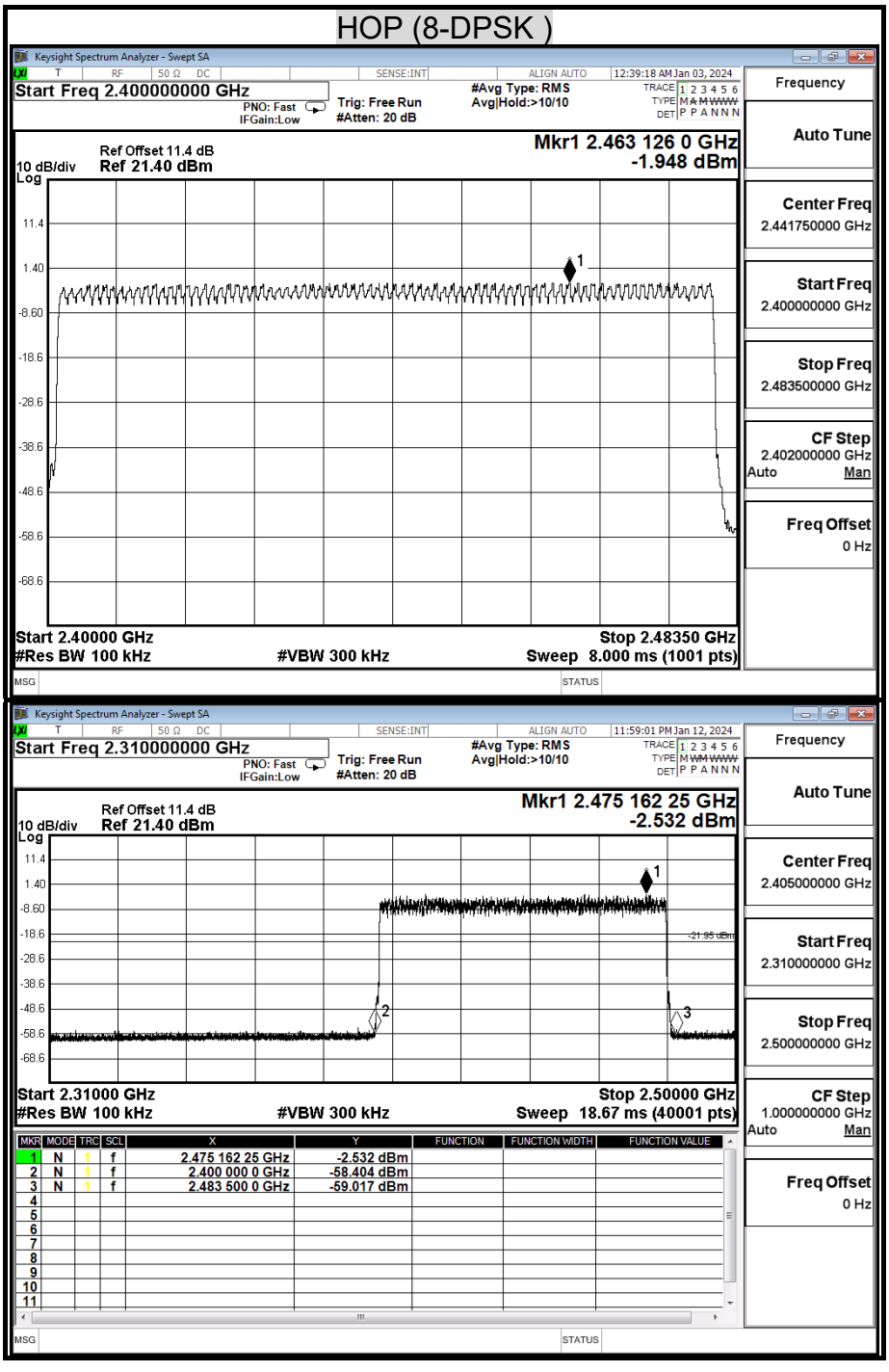
CH Mid (30MHz ~ 26.5GHz / 8-DPSK)



CH High (30MHz ~ 26.5GHz / 8-DPSK)



HOP (8-DPSK)



8.8 RADIATED EMISSIONS

8.8.1 TRANSMITTER RADIATED SUPURIOUS EMSSIONS

LIMITS

§ 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:

MHz	MHz	MHz	GHz
0.090 - 0.110	16.42 - 16.423	399.9 - 410	4.5 - 5.15
[1]0.495 - 0.505	16.69475 - 16.69525	608 - 614	5.35 - 5.46
2.1735 - 2.1905	16.80425 - 16.80475	960 - 1240	7.25 - 7.75
4.125 - 4.128	25.5 - 25.67	1300 - 1427	8.025 - 8.5
4.17725 - 4.17775	37.5 - 38.25	1435 - 1626.5	9.0 - 9.2
4.20725 - 4.20775	73 - 74.6	1645.5 - 1646.5	9.3 - 9.5
6.215 - 6.218	74.8 - 75.2	1660 -1710	10.6 -12.7
6.26775 - 6.26825	108 -121.94	1718.8 - 1722.2	13.25 -13.4
6.31175 - 6.31225	123 - 138	2200 - 2300	14.47 – 14.5
8.291 - 8.294	149.9 - 150.05	2310 - 2390	15.35 -16.2
8.362 - 8.366	156.52475 - 156.52525	2483.5 - 2500	17.7 - 21.4
8.37625 - 8.38675	156.7 - 156.9	2655 - 2900	22.01 - 23.12
8.41425 - 8.41475	162.0125 - 167.17	3260 - 3267	23.6 - 24.0
12.29 - 12.293	167.72 - 173.2	3332 - 3339	31.2 - 31.8
12.51975 - 12.52025	240 - 285	3345.8 - 3338	36.43 - 36.5
12.57675 - 12.57725	322 -335.4	3600 - 4400	([2])
13.36 - 13.41			

[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 is 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.

§ 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 :

Frequency (MHz)	Field Strength (microvolts/meter)	Measurement Distance (meters)
30 - 88	100 **	3
88 - 216	150 **	3
216 - 960	200 **	3
Above 960	500	3

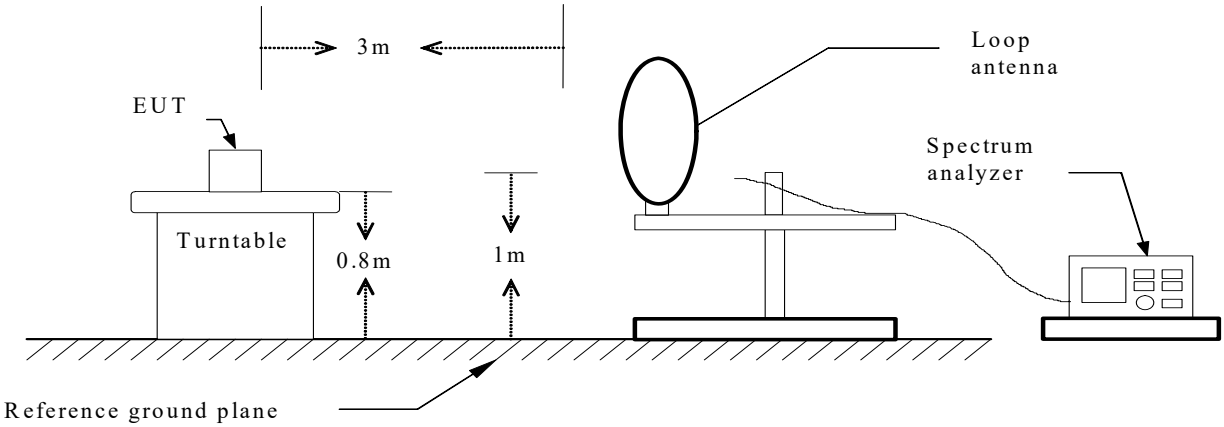
** Except as provided in paragraph (g), fundamental emissions from intentional radiators operating under this Section shall not be located in the frequency bands 54-72 MHz, 76-88 MHz, 174-216 MHz or 470-806 MHz, However, operation within these frequency bands is permitted under other sections of this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

§ 15.209 (b) In the emission table above, the tighter limit applies at the band edges.

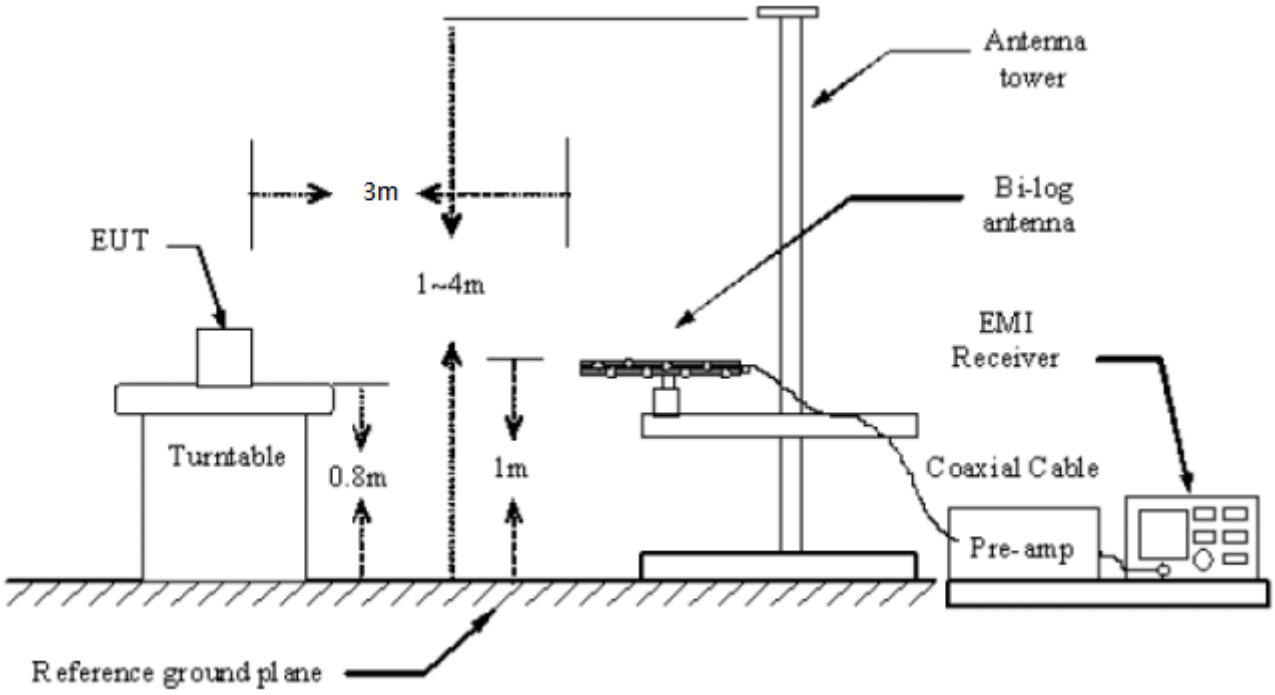
TEST SETUP

The diagram below shows the test setup that is utilized to make the measurements for emission from below 1GHz.

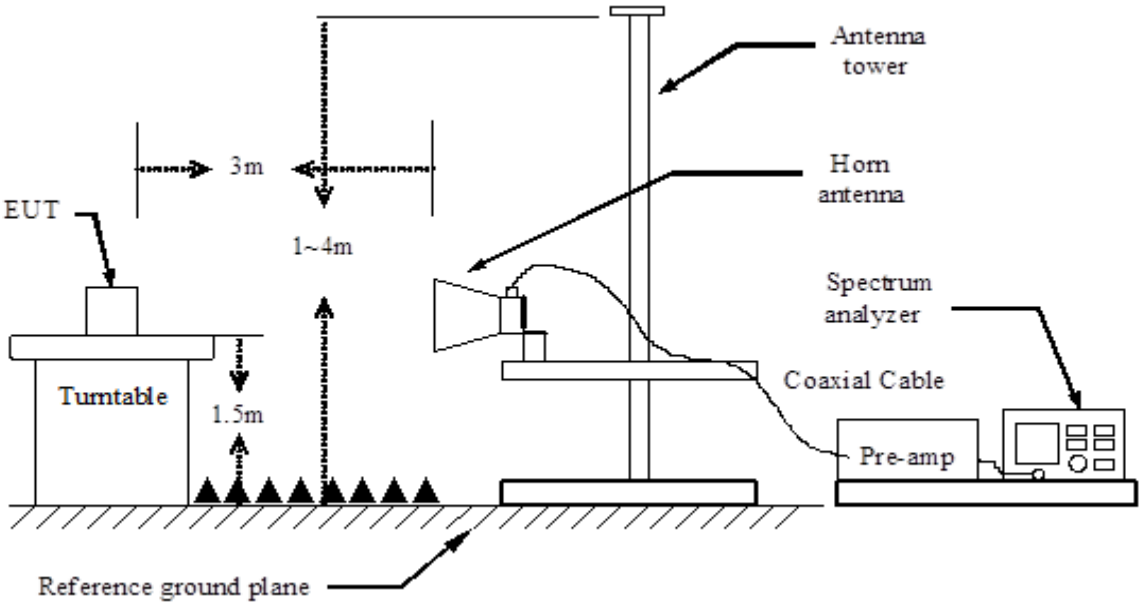
9kHz ~ 30MHz



30MHz ~ 1GHz



The diagram below shows the test setup that is utilized to make the measurements for emission above 1GHz.



TEST PROCEDURE

a. The EUT was placed on the top of a rotating table 0.8/1.5 meters above the ground at a 3 meter chamber test site. The table was rotated 360 degrees to determine the position of the highest radiation.

b. While measuring the radiated emission below 1GHz, the EUT was set 3 meters away from the interference-receiving antenna, which was mounted on the top of a variable-height antenna tower. While measuring the radiated emission above 1GHz, the EUT was set 3 meters away from the interference-receiving antenna

c. The antenna is a broadband antenna, and its height is varied from one meter to four meters above the ground to determine the maximum value of the field strength. Both horizontal and vertical polarization of the antenna are set to make the measurement.

d. For each suspected emission, the EUT was arranged to its worst case and then the antenna was tuned to heights from 1 meter to 4 meters and the table was turned from 0 degrees to 360 degrees to find the maximum reading.

e. The spectrum analyzer was set to Peak Detect Function and Specified Bandwidth with Maximum Hold Mode.

f. If the emission level of the EUT in peak mode was 10 dB lower than the limit specified, then testing could be stopped and the peak values of the EUT would be reported. Otherwise the emissions that did not have 10 dB margin would be re-tested one by one using peak, quasi-peak or average method as specified and then reported in a data sheet.

g. The tests were performed in accordance with 558074 D01 15.247 Meas Guidance v05Note：

NOTE:

1. The resolution bandwidth of test receiver is 200Hz for Quasi-peak detection (QP) at frequency 9~150(kHz).

2. The resolution bandwidth of test receiver is 9kHz for Quasi-peak detection (QP) at frequency 0.15~30(MHz).

3. The resolution bandwidth of test receiver is 120kHz for Quasi-peak detection (QP) at frequency 30~1000(MHz).

4. The resolution bandwidth and video bandwidth of test receiver/spectrum analyzer is 1 MHz for Peak detection and frequency above 1GHz.

5. The resolution bandwidth of test receiver/spectrum analyzer is 1 MHz and the video bandwidth ≦1/T for Average detection (AV) at frequency above 1GHz.

TEST RESULTS

No non-compliance noted

8.8.2 WORST-CASE RADIATED EMISSION BELOW 1 GHz

BELOW 1 GHz (9kHz ~ 30MHz)

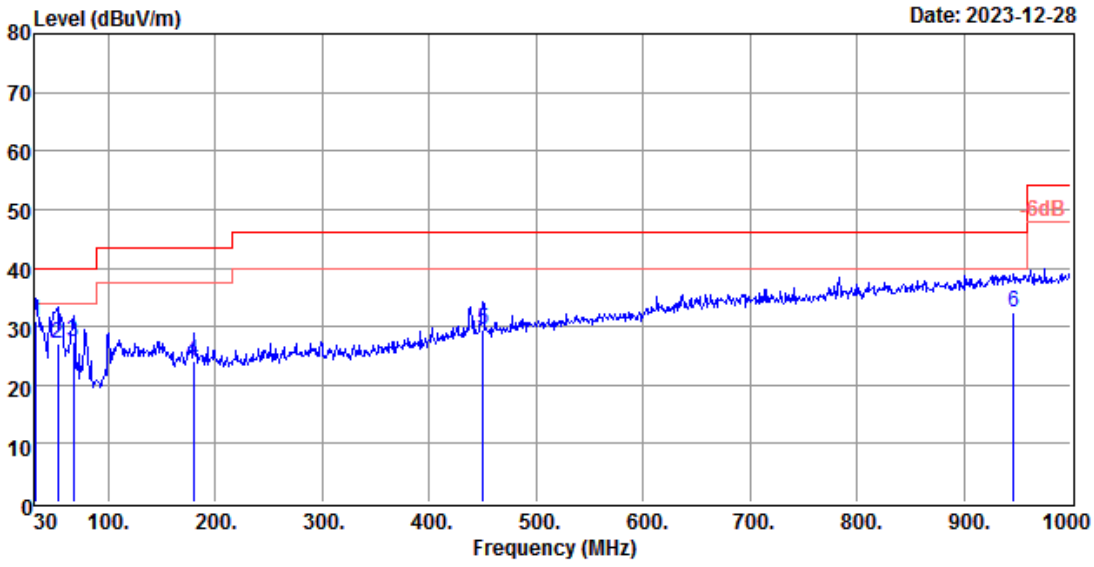
No emission found between lowest internal used/generated frequency to 30MHz.

BELOW 1 GHz (30MHz ~ 1GHz)

Test Voltage: AC 120V, 60Hz

Product Name	AUTOMATIC WIRELESS TURNTABLE	Test Date	2023/12/28
Model Name	AT-LP70XBT	Test By	Peter Chu
Test Mode	TX	Temp & Humidity	22.3°C, 49%

Vertical

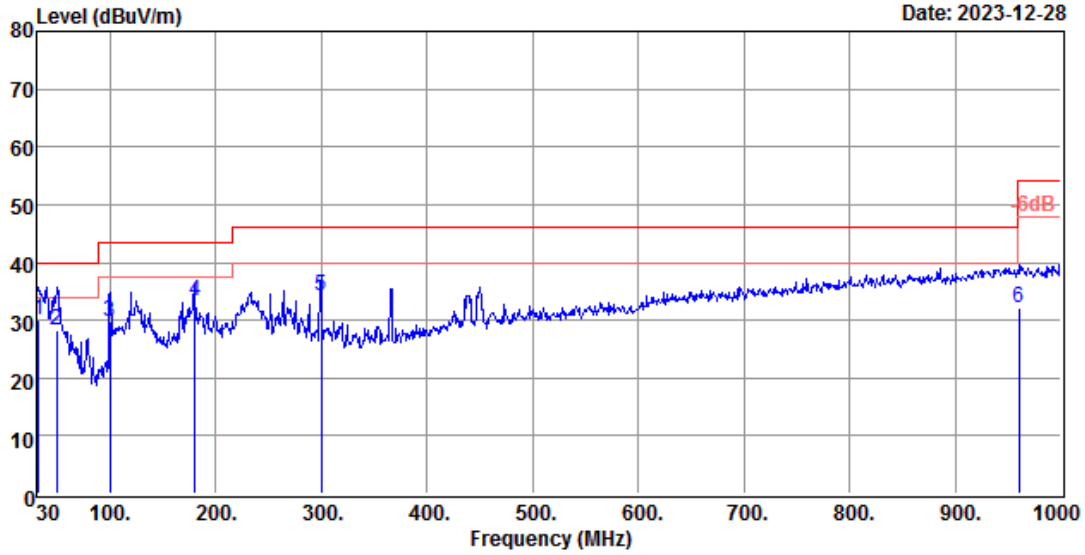


Freq	Reading	C.F	Result PK	Limit	Margin	Detector
MHz	dBuV	dB	dBuV/m	dBuV/m	dB	
31.940	4.62	26.30	30.92	40.00	-9.08	QP
52.310	12.75	14.41	27.16	40.00	-12.84	QP
66.860	12.30	15.10	27.40	40.00	-12.60	QP
179.380	4.46	19.50	23.96	43.50	-19.54	QP
450.010	3.00	26.59	29.59	46.00	-16.41	QP
946.650	-2.34	34.65	32.31	46.00	-13.69	QP

REMARK:
1.Test receiver setting QP(Qusai Peak): RBW=120kHz
2.C.F=Antenna Factor+Cable Loss
3.The result basic equation calculation is as follow:Result = Reading + C.F, Margin = Result-Limit
4.The other emission levels were 10dB below the limit
5.The test distance is 3m.

Product Name	AUTOMATIC WIRELESS TURNTABLE	Test Date	2023/12/28
Model Name	AT-LP70XBT	Test By	Peter Chu
Test Mode	TX	Temp & Humidity	22.3°C, 49%

Horizontal



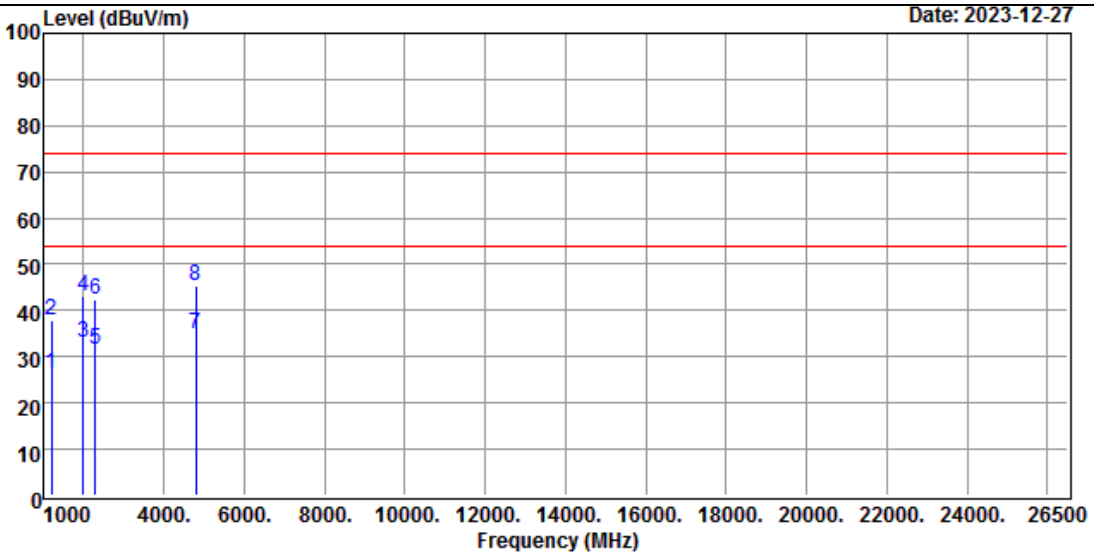
Freq	Reading	C.F	Result PK	Limit	Margin	Detector
MHz	dBuV	dB	dBuV/m	dBuV/m	dB	
31.910	3.65	26.31	29.96	40.00	-10.04	QP
49.400	13.42	14.93	28.35	40.00	-11.65	QP
99.770	11.67	17.96	29.63	43.50	-13.87	QP
180.060	13.76	19.49	33.25	43.50	-10.25	QP
299.370	11.73	22.33	34.06	46.00	-11.94	QP
960.230	-2.39	34.59	32.20	54.00	-21.80	QP

REMARK:
1.Test receiver setting QP(Qusai Peak): RBW=120kHz
2.C.F=Antenna Factor+Cable Loss
3.The result basic equation calculation is as follow:Result = Reading + C.F, Margin = Result-Limit
4.The other emission levels were 10dB below the limit
5.The test distance is 3m.

8.8.3 TRANSMITTER RADIATED EMISSION ABOVE 1 GHz

Product Name	AUTOMATIC WIRELESS TURNTABLE	Test Date	2023/12/27
Model	AT-LP70XBT	Test By	Peter Chu
Test Mode	CH Low TX / GFSK	TEMP& Humidity	21.8°C, 47%

Vertical

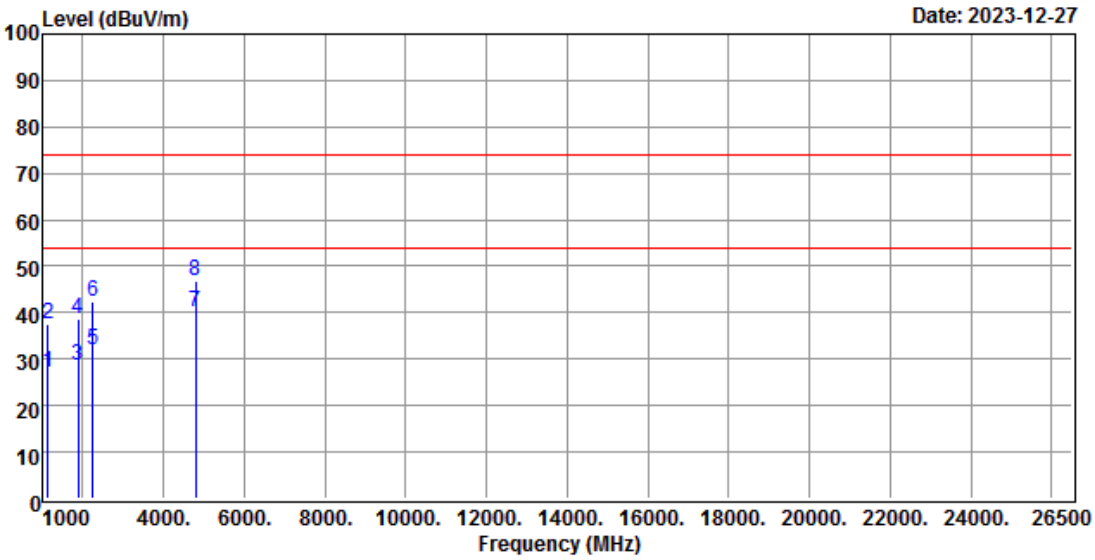


Freq	Reading	C.F	Result PK	Limit	Margin	Detector
MHz	dBuV	dB	dBuV/m	dBuV/m	dB	
1199.420	40.97	-14.46	26.51	54.00	-27.49	Average
1199.420	52.42	-14.46	37.96	74.00	-36.04	Peak
1998.400	42.63	-9.58	33.05	54.00	-20.95	Average
1998.400	52.76	-9.58	43.18	74.00	-30.82	Peak
2294.800	37.66	-6.16	31.50	54.00	-22.50	Average
2294.800	48.46	-6.16	42.30	74.00	-31.70	Peak
4803.940	35.10	-0.19	34.91	54.00	-19.09	Average
4803.940	45.43	-0.19	45.24	74.00	-28.76	Peak

REMARK:
1.Spectrum analyzer setting Peak: RBW=1MHz, VBW=3MHz,Average: RBW=1MHz, VBW≧1/T
2.C.F=Antenna Factor+Cable Loss-Preamplifier gain+2.4GHz~2.5GHz Filter Insertion Loss
3.The result basic equation calculation is as follow:Result = Reading + C.F, Margin = Result-Limit
4.The other emission levels were 10dB below the limit
5.The test distance is 3m.

Product Name	AUTOMATIC WIRELESS TURNTABLE	Test Date	2023/12/27
Model	AT-LP70XBT	Test By	Peter Chu
Test Mode	CH Low TX / GFSK	TEMP& Humidity	21.8°C, 47%

Horizontal



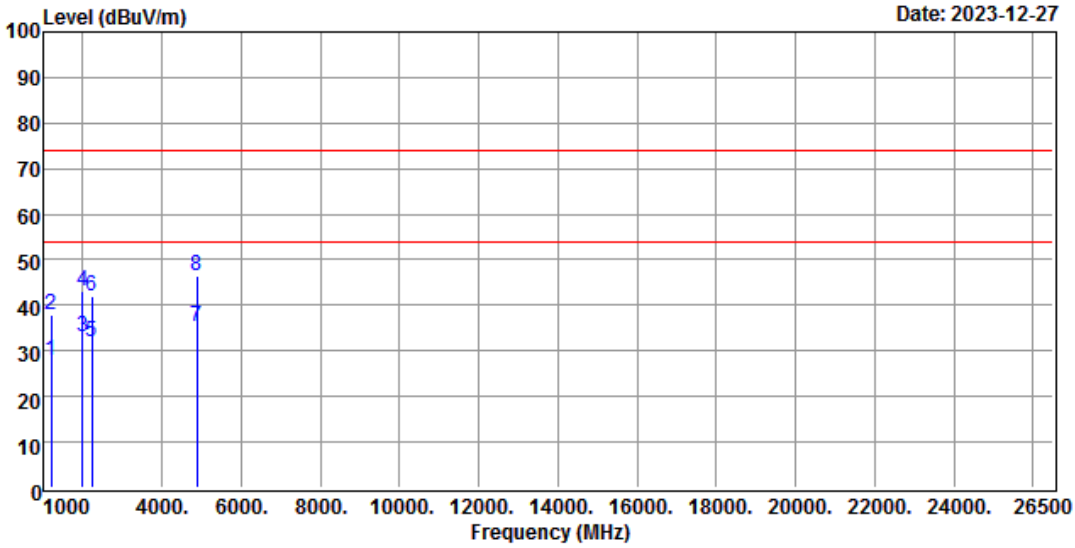
Freq	Reading	C.F	Result PK	Limit	Margin	Detector
MHz	dBuV	dB	dBuV/m	dBuV/m	dB	
1129.400	41.95	-14.96	26.99	54.00	-27.01	Average
1129.400	52.32	-14.96	37.36	74.00	-36.64	Peak
1879.600	39.44	-10.70	28.74	54.00	-25.26	Average
1879.600	49.34	-10.70	38.64	74.00	-35.36	Peak
2250.360	38.42	-6.30	32.12	54.00	-21.88	Average
2250.360	48.64	-6.30	42.34	74.00	-31.66	Peak
4803.510	40.28	-0.19	40.09	54.00	-13.91	Average
4803.510	47.14	-0.19	46.95	74.00	-27.05	Peak

REMARK:

1.Spectrum analyzer setting Peak: RBW=1MHz, VBW=3MHz,Average: RBW=1MHz, VBW≧1/T
2.C.F=Antenna Factor+Cable Loss-Preamplifier gain+2.4GHz~2.5GHz Filter Insertion Loss
3.The result basic equation calculation is as follow:Result = Reading + C.F, Margin = Result-Limit
4.The other emission levels were 10dB below the limit
5.The test distance is 3m.

Product Name	AUTOMATIC WIRELESS TURNTABLE	Test Date	2023/12/27
Model	AT-LP70XBT	Test By	Peter Chu
Test Mode	CH Mid TX / GFSK	TEMP& Humidity	21.8°C, 47%

Vertical



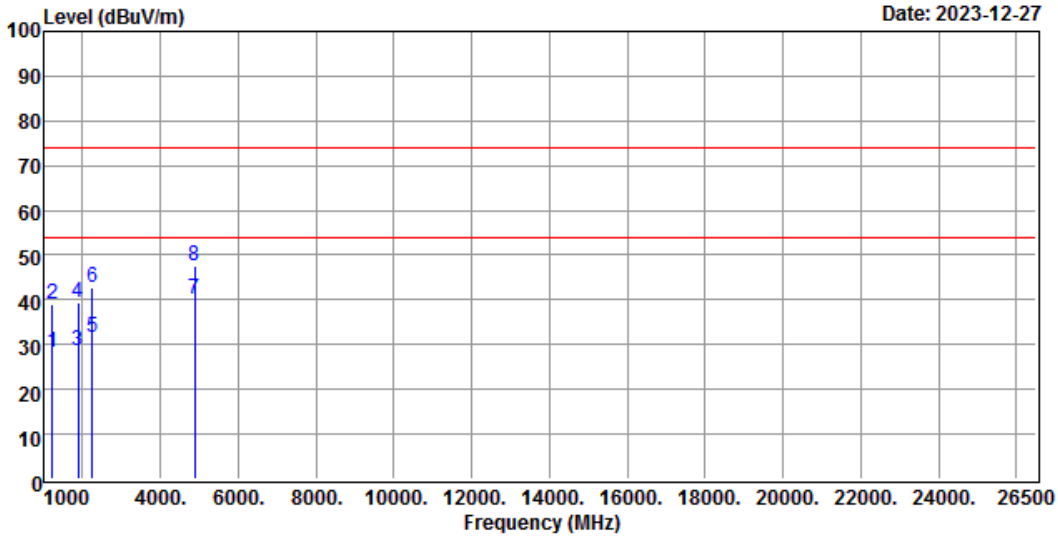
Freq	Reading	C.F	Result PK	Limit	Margin	Detector
MHz	dBuV	dB	dBuV/m	dBuV/m	dB	
1195.300	42.28	-14.43	27.85	54.00	-26.15	Average
1195.300	52.45	-14.43	38.02	74.00	-35.98	Peak
1985.630	42.70	-9.72	32.98	54.00	-21.02	Average
1985.630	52.94	-9.72	43.22	74.00	-30.78	Peak
2239.080	38.26	-6.35	31.91	54.00	-22.09	Average
2239.080	48.22	-6.35	41.87	74.00	-32.13	Peak
4881.870	35.05	0.09	35.14	54.00	-18.86	Average
4881.870	46.42	0.09	46.51	74.00	-27.49	Peak

REMARK:

1.Spectrum analyzer setting Peak: RBW=1MHz, VBW=3MHz,Average: RBW=1MHz, VBW≧1/T
2.C.F=Antenna Factor+Cable Loss-Preamplifier gain+2.4GHz~2.5GHz Filter Insertion Loss
3.The result basic equation calculation is as follow:Result = Reading + C.F, Margin = Result-Limit
4.The other emission levels were 10dB below the limit
5.The test distance is 3m.

Product Name	AUTOMATIC WIRELESS TURNTABLE	Test Date	2023/12/27
Model	AT-LP70XBT	Test By	Peter Chu
Test Mode	CH Mid TX / GFSK	TEMP& Humidity	21.8°C, 47%

Horizontal



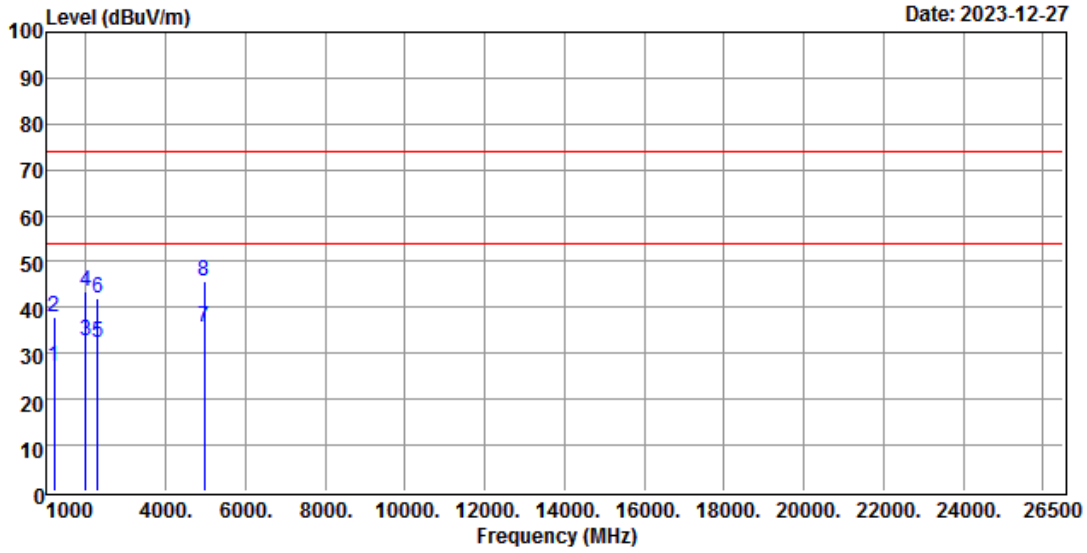
Freq	Reading	C.F	Result PK	Limit	Margin	Detector
MHz	dBuV	dB	dBuV/m	dBuV/m	dB	
1226.050	42.46	-14.20	28.26	54.00	-25.74	Average
1226.050	53.41	-14.20	39.21	74.00	-34.79	Peak
1887.060	39.43	-10.75	28.68	54.00	-25.32	Average
1887.060	50.27	-10.75	39.52	74.00	-34.48	Peak
2253.260	38.07	-6.31	31.76	54.00	-22.24	Average
2253.260	48.90	-6.31	42.59	74.00	-31.41	Peak
4881.910	39.93	0.09	40.02	54.00	-13.98	Average
4881.910	47.63	0.09	47.72	74.00	-26.28	Peak

REMARK:

1.Spectrum analyzer setting Peak: RBW=1MHz, VBW=3MHz,Average: RBW=1MHz, VBW≧1/T
2.C.F=Antenna Factor+Cable Loss-Preamplifier gain+2.4GHz~2.5GHz Filter Insertion Loss
3.The result basic equation calculation is as follow:Result = Reading + C.F, Margin = Result-Limit
4.The other emission levels were 10dB below the limit
5.The test distance is 3m.

Product Name	AUTOMATIC WIRELESS TURNTABLE	Test Date	2023/12/27
Model	AT-LP70XBT	Test By	Peter Chu
Test Mode	CH High TX / GFSK	TEMP& Humidity	21.8°C, 47%

Vertical



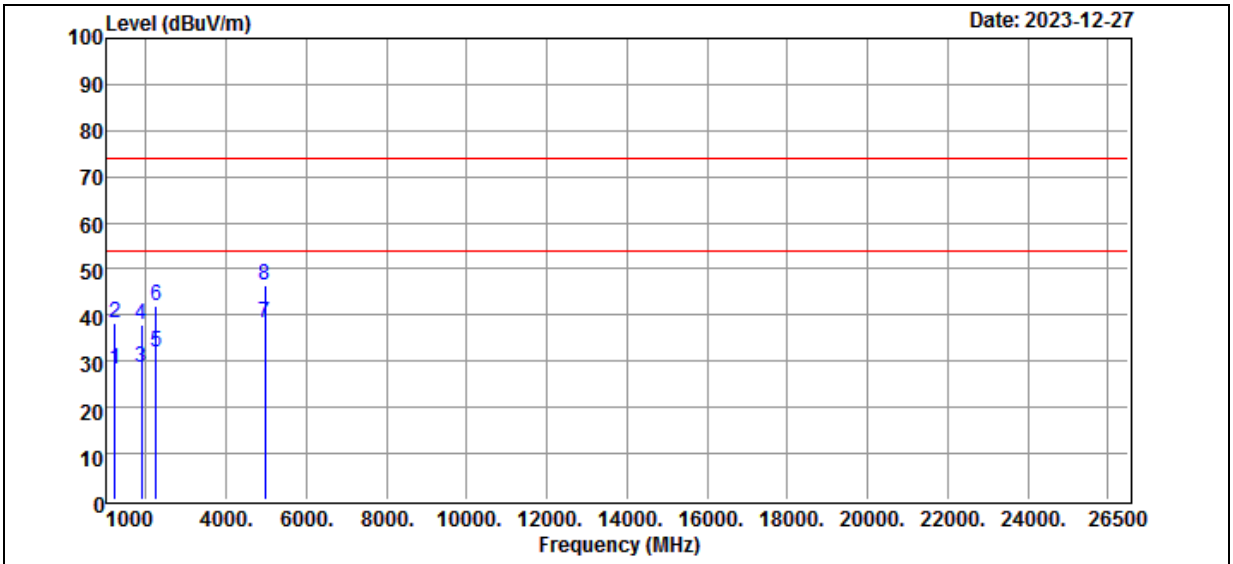
Freq	Reading	C.F	Result PK	Limit	Margin	Detector
MHz	dBuV	dB	dBuV/m	dBuV/m	dB	
1197.150	41.65	-14.44	27.21	54.00	-26.79	Average
1197.150	52.41	-14.44	37.97	74.00	-36.03	Peak
1984.520	42.29	-9.72	32.57	54.00	-21.43	Average
1984.520	53.22	-9.72	43.50	74.00	-30.50	Peak
2290.180	38.53	-6.19	32.34	54.00	-21.66	Average
2290.180	48.32	-6.19	42.13	74.00	-31.87	Peak
4960.050	35.04	0.50	35.54	54.00	-18.46	Average
4960.050	45.11	0.50	45.61	74.00	-28.39	Peak

REMARK:

1.Spectrum analyzer setting Peak: RBW=1MHz, VBW=3MHz,Average: RBW=1MHz, VBW≧1/T
2.C.F=Antenna Factor+Cable Loss-Preamplifier gain+2.4GHz~2.5GHz Filter Insertion Loss
3.The result basic equation calculation is as follow:Result = Reading + C.F, Margin = Result-Limit
4.The other emission levels were 10dB below the limit
5.The test distance is 3m.

Product Name	AUTOMATIC WIRELESS TURNTABLE	Test Date	2023/12/27
Model	AT-LP70XBT	Test By	Peter Chu
Test Mode	CH High TX / GFSK	TEMP& Humidity	21.8°C, 47%

Horizontal



Freq	Reading	C.F	Result PK	Limit	Margin	Detector
MHz	dBuV	dB	dBuV/m	dBuV/m	dB	
1226.520	42.48	-14.19	28.29	54.00	-25.71	Average
1226.520	52.33	-14.19	38.14	74.00	-35.86	Peak
1892.520	39.24	-10.66	28.58	54.00	-25.42	Average
1892.520	48.63	-10.66	37.97	74.00	-36.03	Peak
2258.260	38.40	-6.33	32.07	54.00	-21.93	Average
2258.260	48.24	-6.33	41.91	74.00	-32.09	Peak
4959.930	37.69	0.50	38.19	54.00	-15.81	Average
4959.930	45.95	0.50	46.45	74.00	-27.55	Peak

REMARK:

1.Spectrum analyzer setting Peak: RBW=1MHz, VBW=3MHz,Average: RBW=1MHz, VBW≧1/T

2.C.F=Antenna Factor+Cable Loss-Preamplifier gain+2.4GHz~2.5GHz Filter Insertion Loss

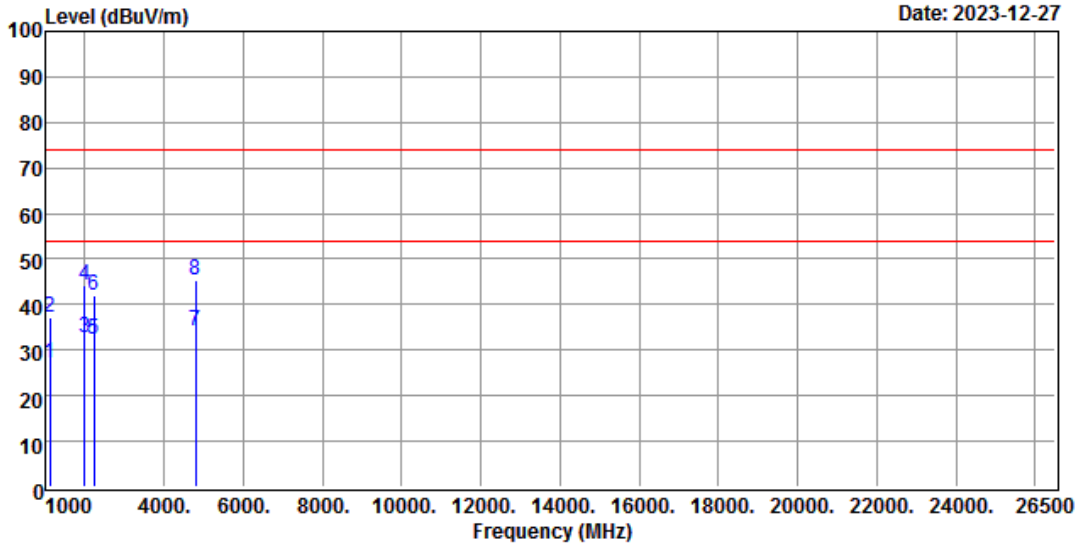
3.The result basic equation calculation is as follow:Result = Reading + C.F, Margin = Result-Limit

4.The other emission levels were 10dB below the limit

5.The test distance is 3m.

Product Name	AUTOMATIC WIRELESS TURNTABLE	Test Date	2023/12/27
Model	AT-LP70XBT	Test By	Peter Chu
Test Mode	CH Low TX / 8-DPSK	TEMP& Humidity	21.8°C, 47%

Vertical



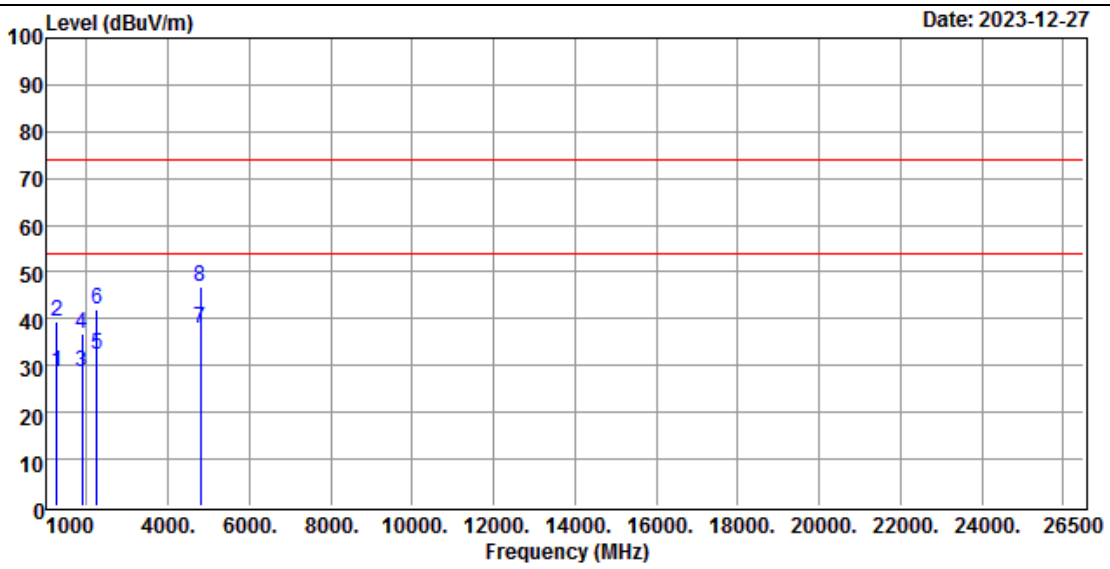
Freq	Reading	C.F	Result PK	Limit	Margin	Detector
MHz	dBuV	dB	dBuV/m	dBuV/m	dB	
1122.450	42.19	-14.99	27.20	54.00	-26.80	Average
1122.450	52.07	-14.99	37.08	74.00	-36.92	Peak
1988.140	42.34	-9.71	32.63	54.00	-21.37	Average
1988.140	54.08	-9.71	44.37	74.00	-29.63	Peak
2233.480	38.88	-6.39	32.49	54.00	-21.51	Average
2233.480	48.29	-6.39	41.90	74.00	-32.10	Peak
4804.140	34.53	-0.19	34.34	54.00	-19.66	Average
4804.140	45.38	-0.19	45.19	74.00	-28.81	Peak

REMARK:

1.Spectrum analyzer setting Peak: RBW=1MHz, VBW=3MHz,Average: RBW=1MHz, VBW≧1/T
2.C.F=Antenna Factor+Cable Loss-Preamplifier gain+2.4GHz~2.5GHz Filter Insertion Loss
3.The result basic equation calculation is as follow:Result = Reading + C.F, Margin = Result-Limit
4.The other emission levels were 10dB below the limit
5.The test distance is 3m.

Product Name	AUTOMATIC WIRELESS TURNTABLE	Test Date	2023/12/27
Model	AT-LP70XBT	Test By	Peter Chu
Test Mode	CH Low TX / 8-DPSK	TEMP& Humidity	21.8°C, 47%

Horizontal



Freq	Reading	C.F	Result PK	Limit	Margin	Detector
MHz	dBuV	dB	dBuV/m	dBuV/m	dB	
1272.400	42.45	-13.65	28.80	54.00	-25.20	Average
1272.400	53.08	-13.65	39.43	74.00	-34.57	Peak
1893.410	39.42	-10.64	28.78	54.00	-25.22	Average
1893.410	47.53	-10.64	36.89	74.00	-37.11	Peak
2251.450	38.49	-6.30	32.19	54.00	-21.81	Average
2251.450	48.42	-6.30	42.12	74.00	-31.88	Peak
4804.060	38.23	-0.19	38.04	54.00	-15.96	Average
4804.060	47.05	-0.19	46.86	74.00	-27.14	Peak

REMARK:

1.Spectrum analyzer setting Peak: RBW=1MHz, VBW=3MHz,Average: RBW=1MHz, VBW≧1/T

2.C.F=Antenna Factor+Cable Loss-Preamplifier gain+2.4GHz~2.5GHz Filter Insertion Loss

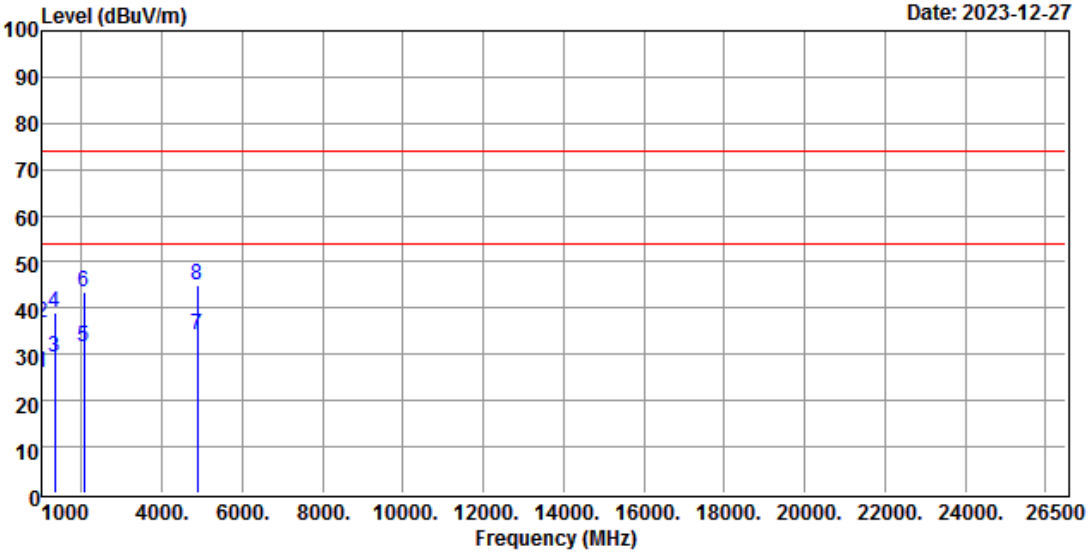
3.The result basic equation calculation is as follow:Result = Reading + C.F, Margin = Result-Limit

4.The other emission levels were 10dB below the limit

5.The test distance is 3m.

Product Name	AUTOMATIC WIRELESS TURNTABLE	Test Date	2023/12/27
Model	AT-LP70XBT	Test By	Peter Chu
Test Mode	CH Mid TX / 8-DPSK	TEMP& Humidity	21.8°C, 47%

Vertical



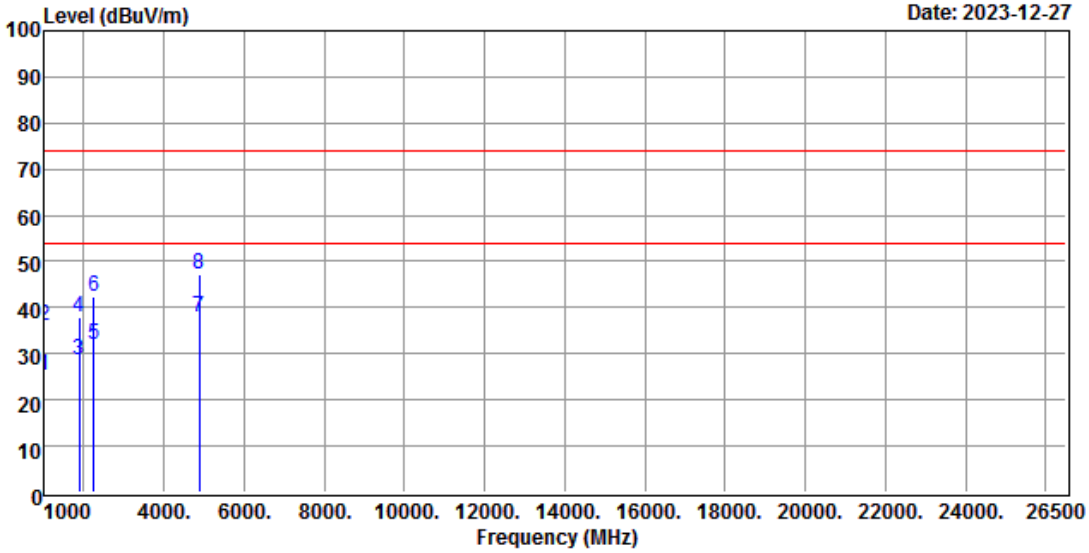
Freq	Reading	C.F	Result PK	Limit	Margin	Detector
MHz	dBuV	dB	dBuV/m	dBuV/m	dB	
1003.960	42.63	-16.44	26.19	54.00	-27.81	Average
1003.960	53.06	-16.44	36.62	54.00	-17.38	Average
1331.780	42.52	-13.13	29.39	54.00	-24.61	Average
1331.780	52.25	-13.13	39.12	74.00	-34.88	Peak
2054.530	40.73	-9.00	31.73	54.00	-22.27	Average
2054.530	52.62	-9.00	43.62	74.00	-30.38	Peak
4882.050	34.18	0.09	34.27	54.00	-19.73	Average
4882.050	45.07	0.09	45.16	74.00	-28.84	Peak

REMARK:

1.Spectrum analyzer setting Peak: RBW=1MHz, VBW=3MHz,Average: RBW=1MHz, VBW≧1/T
2.C.F=Antenna Factor+Cable Loss-Preamplifier gain+2.4GHz~2.5GHz Filter Insertion Loss
3.The result basic equation calculation is as follow:Result = Reading + C.F, Margin = Result-Limit
4.The other emission levels were 10dB below the limit
5.The test distance is 3m.

Product Name	AUTOMATIC WIRELESS TURNTABLE	Test Date	2023/12/27
Model	AT-LP70XBT	Test By	Peter Chu
Test Mode	CH Mid TX / 8-DPSK	TEMP& Humidity	21.8°C, 47%

Horizontal



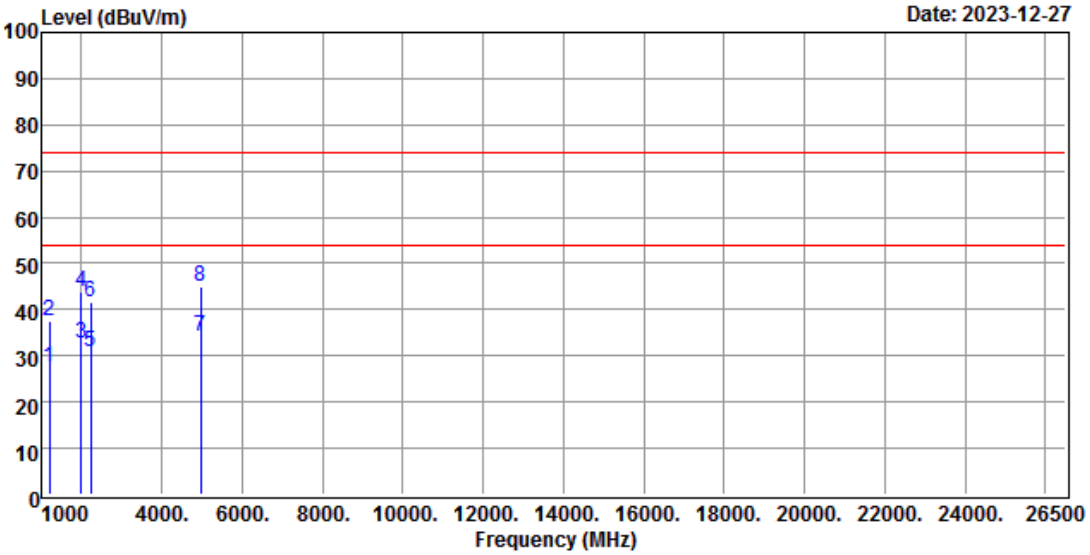
Freq	Reading	C.F	Result PK	Limit	Margin	Detector
MHz	dBuV	dB	dBuV/m	dBuV/m	dB	
1015.480	41.57	-16.39	25.18	54.00	-28.82	Average
1015.480	52.53	-16.39	36.14	74.00	-37.86	Peak
1892.420	39.41	-10.67	28.74	54.00	-25.26	Average
1892.420	48.55	-10.67	37.88	74.00	-36.12	Peak
2251.630	38.41	-6.30	32.11	54.00	-21.89	Average
2251.630	48.62	-6.30	42.32	74.00	-31.68	Peak
4881.850	37.69	0.09	37.78	54.00	-16.22	Average
4881.850	47.27	0.09	47.36	74.00	-26.64	Peak

REMARK:
1.Spectrum analyzer setting Peak: RBW=1MHz, VBW=3MHz,Average: RBW=1MHz, VBW≧1/T
2.C.F=Antenna Factor+Cable Loss-Preamplifier gain+2.4GHz~2.5GHz Filter Insertion Loss
3.The result basic equation calculation is as follow:Result = Reading + C.F, Margin = Result-Limit
4.The other emission levels were 10dB below the limit
5.The test distance is 3m.

Report No.: TMTN2312001596NR

Product Name	AUTOMATIC WIRELESS TURNTABLE	Test Date	2023/12/27
Model	AT-LP70XBT	Test By	Peter Chu
Test Mode	CH High TX / 8-DPSK	TEMP& Humidity	21.8°C, 47%

Vertical



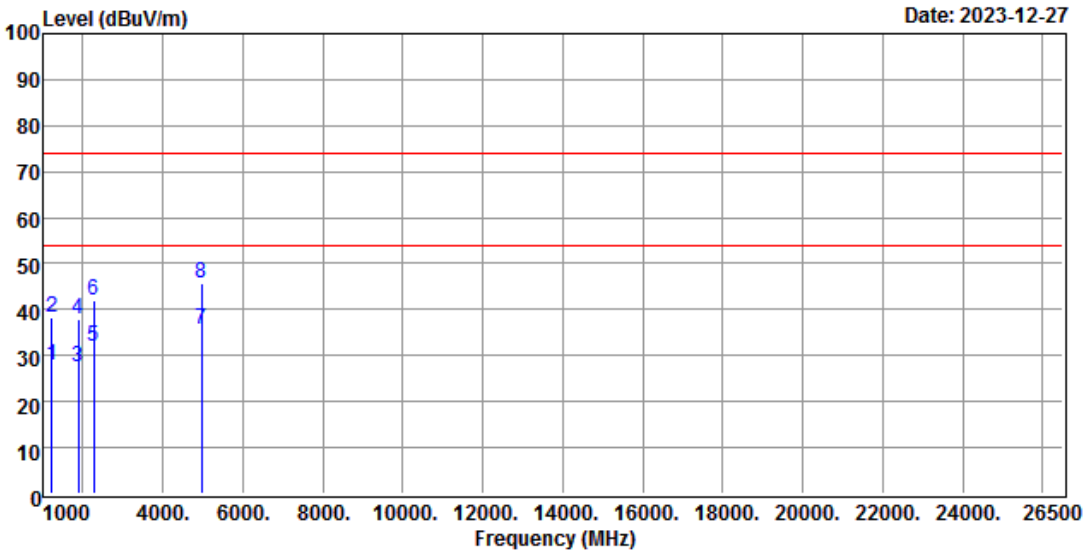
Freq	Reading	C.F	Result PK	Limit	Margin	Detector
MHz	dBuV	dB	dBuV/m	dBuV/m	dB	
1197.750	42.08	-14.45	27.63	54.00	-26.37	Average
1197.750	52.15	-14.45	37.70	74.00	-36.30	Peak
1988.260	42.28	-9.71	32.57	54.00	-21.43	Average
1988.260	53.48	-9.71	43.77	74.00	-30.23	Peak
2231.740	37.26	-6.40	30.86	54.00	-23.14	Average
2231.740	48.06	-6.40	41.66	74.00	-32.34	Peak
4959.840	33.82	0.50	34.32	54.00	-19.68	Average
4959.840	44.55	0.50	45.05	74.00	-28.95	Peak

REMARK:

1.Spectrum analyzer setting Peak: RBW=1MHz, VBW=3MHz,Average: RBW=1MHz, VBW≧1/T
2.C.F=Antenna Factor+Cable Loss-Preamplifier gain+2.4GHz~2.5GHz Filter Insertion Loss
3.The result basic equation calculation is as follow:Result = Reading + C.F, Margin = Result-Limit
4.The other emission levels were 10dB below the limit
5.The test distance is 3m.

Product Name	AUTOMATIC WIRELESS TURNTABLE	Test Date	2023/12/27
Model	AT-LP70XBT	Test By	Peter Chu
Test Mode	CH High TX / 8-DPSK	TEMP& Humidity	21.8°C, 47%

Horizontal



Freq	Reading	C.F	Result PK	Limit	Margin	Detector
MHz	dBuV	dB	dBuV/m	dBuV/m	dB	
1222.520	42.04	-14.24	27.80	54.00	-26.20	Average
1222.520	52.65	-14.24	38.41	74.00	-35.59	Peak
1889.270	38.28	-10.75	27.53	54.00	-26.47	Average
1889.270	48.54	-10.75	37.79	74.00	-36.21	Peak
2263.440	38.18	-6.30	31.88	54.00	-22.12	Average
2263.440	48.26	-6.30	41.96	74.00	-32.04	Peak
4959.960	35.29	0.50	35.79	54.00	-18.21	Average
4959.960	45.26	0.50	45.76	74.00	-28.24	Peak

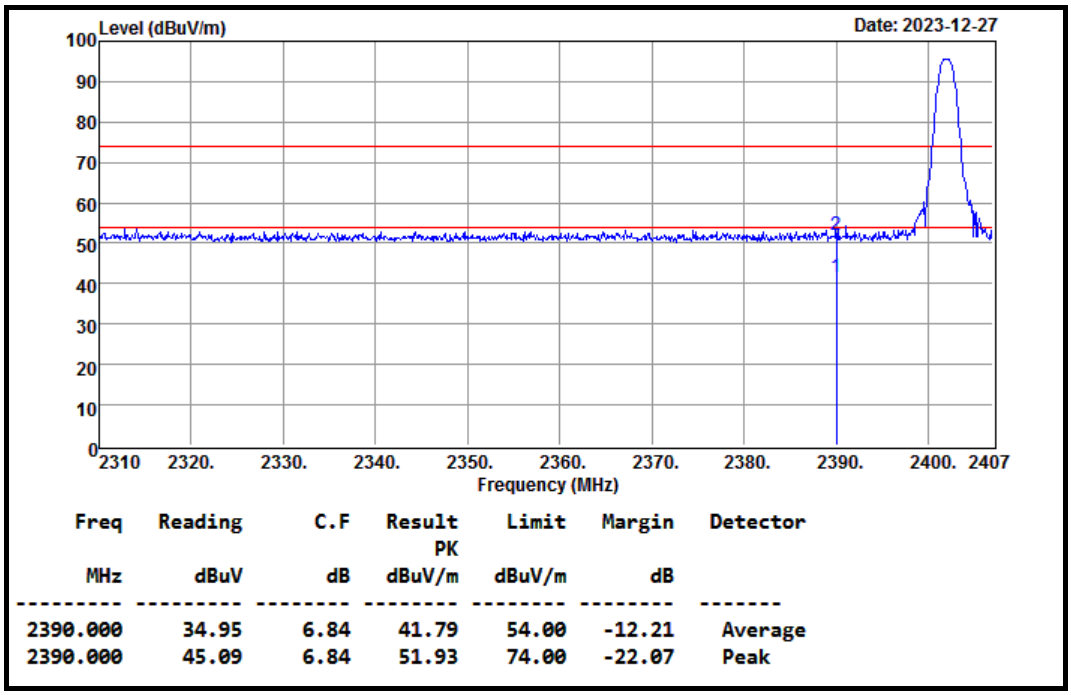
REMARK:

1.Spectrum analyzer setting Peak: RBW=1MHz, VBW=3MHz,Average: RBW=1MHz, VBW≧1/T
2.C.F=Antenna Factor+Cable Loss-Preamplifier gain+2.4GHz~2.5GHz Filter Insertion Loss
3.The result basic equation calculation is as follow:Result = Reading + C.F, Margin = Result-Limit
4.The other emission levels were 10dB below the limit
5.The test distance is 3m.

8.8.4 RESTRICTED BAND EDGES

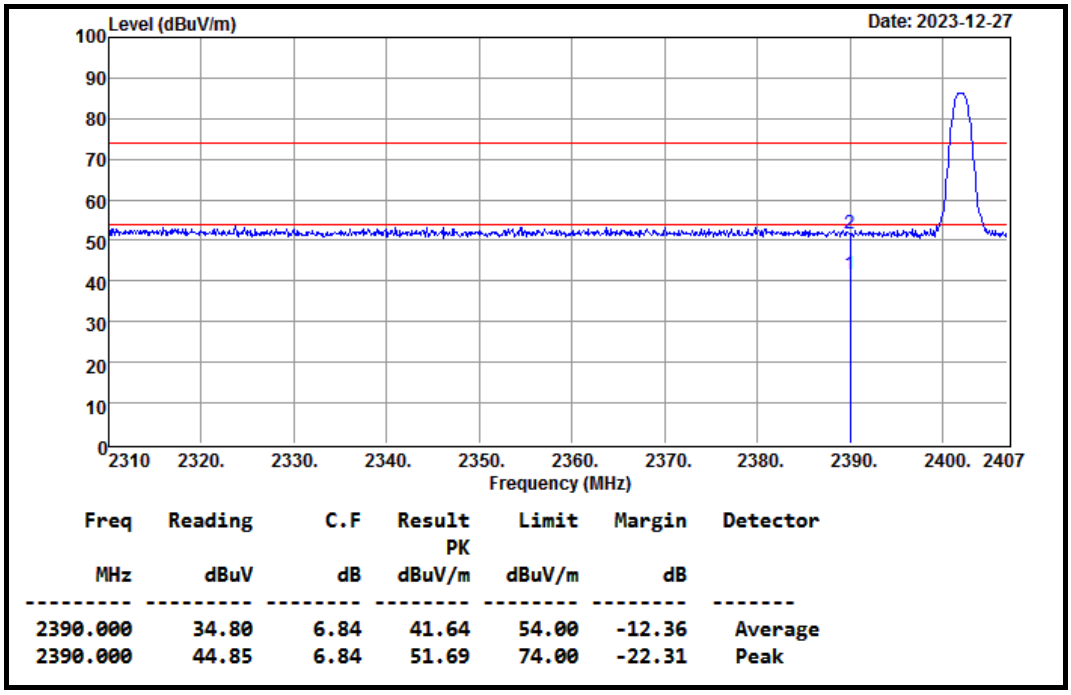
Product Name	AUTOMATIC WIRELESS TURNTABLE	Test Date	2023/12/27
Model	AT-LP70XBT	Test By	Peter Chu
Test Mode	CH Low TX / GFSK	TEMP& Humidity	21.8°C, 47%

Horizontal



Freq	Reading	C.F	Result PK	Limit	Margin	Detector
MHz	dBuV	dB	dBuV/m	dBuV/m	dB	
2390.000	34.95	6.84	41.79	54.00	-12.21	Average
2390.000	45.09	6.84	51.93	74.00	-22.07	Peak

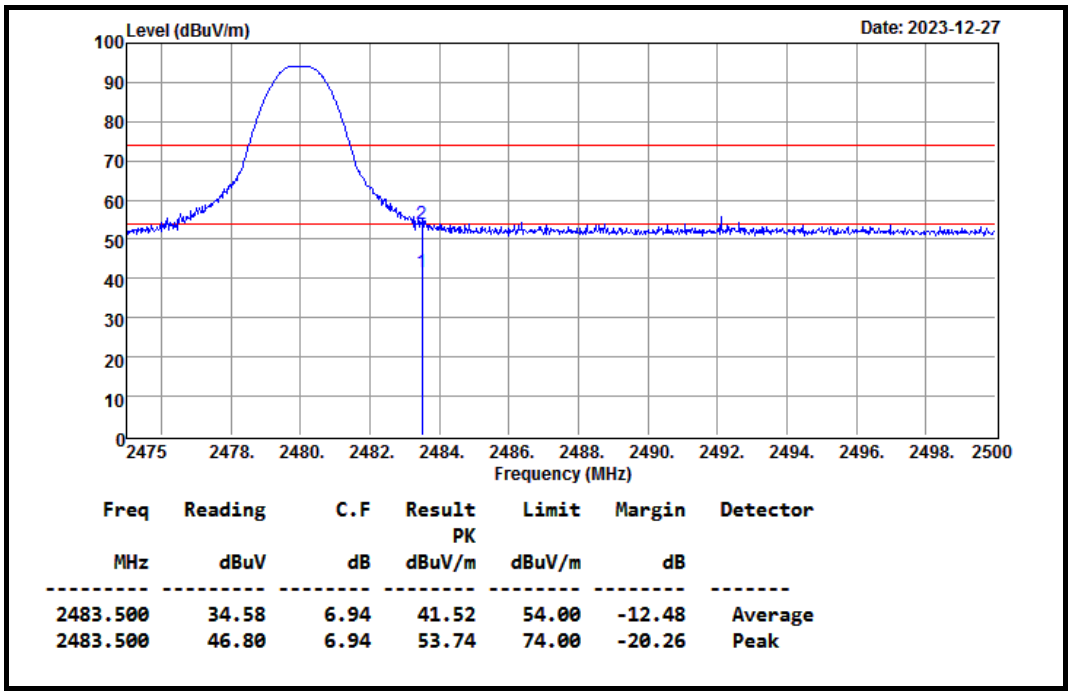
Vertical



Freq	Reading	C.F	Result PK	Limit	Margin	Detector
MHz	dBuV	dB	dBuV/m	dBuV/m	dB	
2390.000	34.80	6.84	41.64	54.00	-12.36	Average
2390.000	44.85	6.84	51.69	74.00	-22.31	Peak

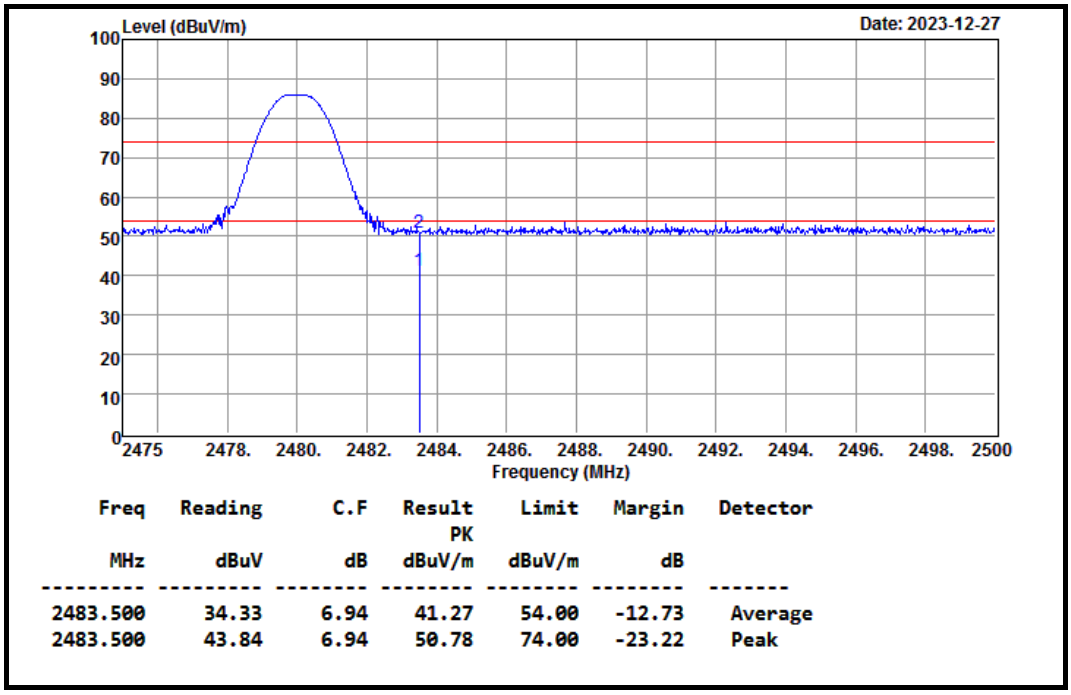
Product Name	AUTOMATIC WIRELESS TURNTABLE	Test Date	2023/12/27
Model	AT-LP70XBT	Test By	Peter Chu
Test Mode	CH High TX / GFSK	TEMP& Humidity	21.8°C, 47%

Horizontal



Freq	Reading	C.F	Result PK	Limit	Margin	Detector
MHz	dBuV	dB	dBuV/m	dBuV/m	dB	
2483.500	34.58	6.94	41.52	54.00	-12.48	Average
2483.500	46.80	6.94	53.74	74.00	-20.26	Peak

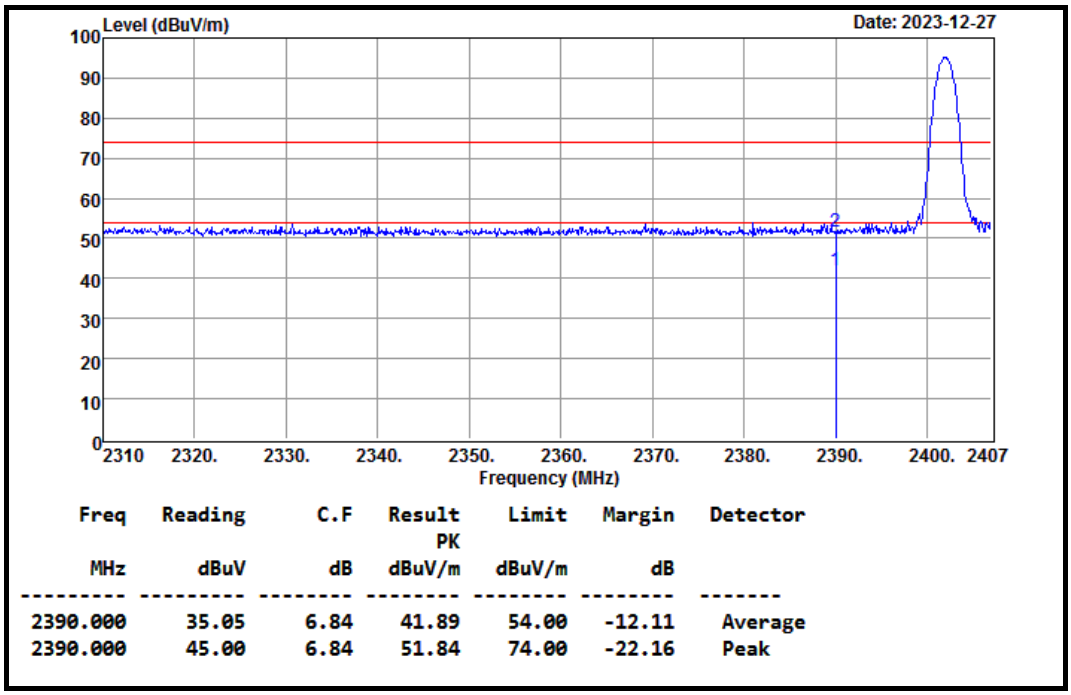
Vertical



Freq	Reading	C.F	Result PK	Limit	Margin	Detector
MHz	dBuV	dB	dBuV/m	dBuV/m	dB	
2483.500	34.33	6.94	41.27	54.00	-12.73	Average
2483.500	43.84	6.94	50.78	74.00	-23.22	Peak

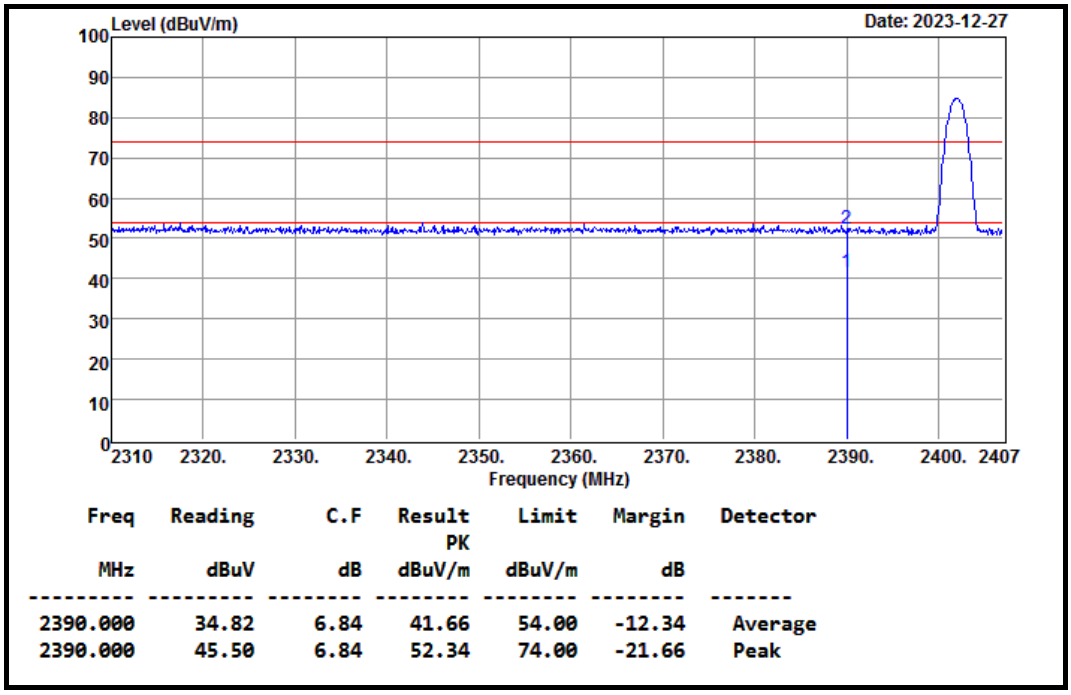
Product Name	AUTOMATIC WIRELESS TURNTABLE	Test Date	2023/12/27
Model	AT-LP70XBT	Test By	Peter Chu
Test Mode	CH Low TX / 8-DPSK	TEMP& Humidity	21.8°C, 47%

Horizontal



Freq	Reading	C.F	Result PK	Limit	Margin	Detector
MHz	dBuV	dB	dBuV/m	dBuV/m	dB	
2390.000	35.05	6.84	41.89	54.00	-12.11	Average
2390.000	45.00	6.84	51.84	74.00	-22.16	Peak

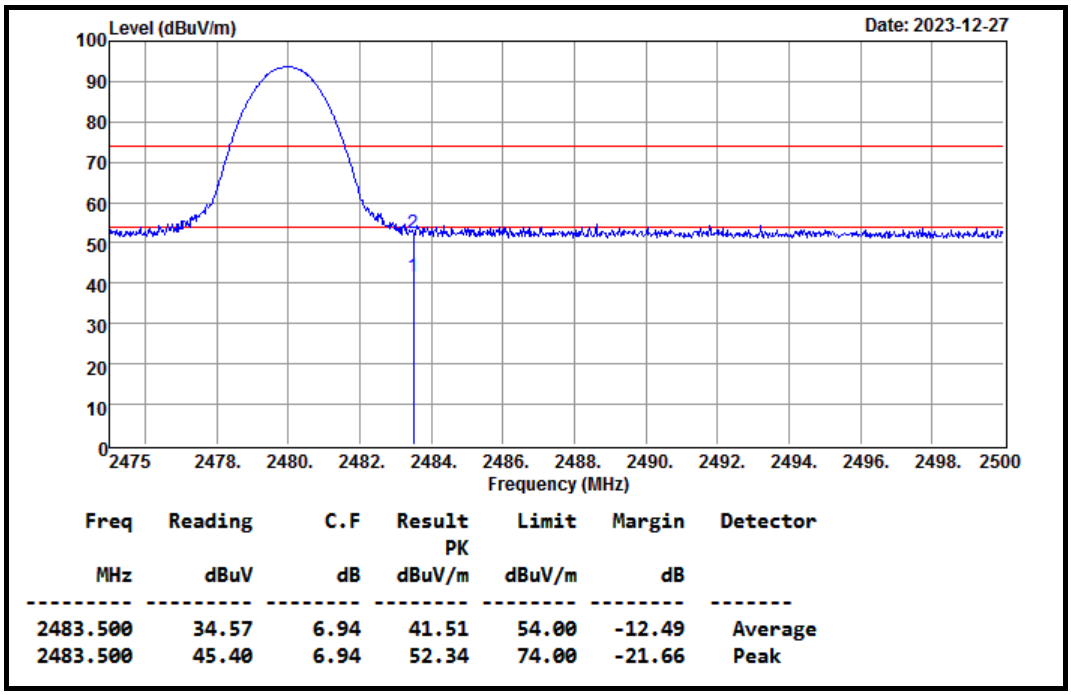
Vertical



Freq	Reading	C.F	Result PK	Limit	Margin	Detector
MHz	dBuV	dB	dBuV/m	dBuV/m	dB	
2390.000	34.82	6.84	41.66	54.00	-12.34	Average
2390.000	45.50	6.84	52.34	74.00	-21.66	Peak

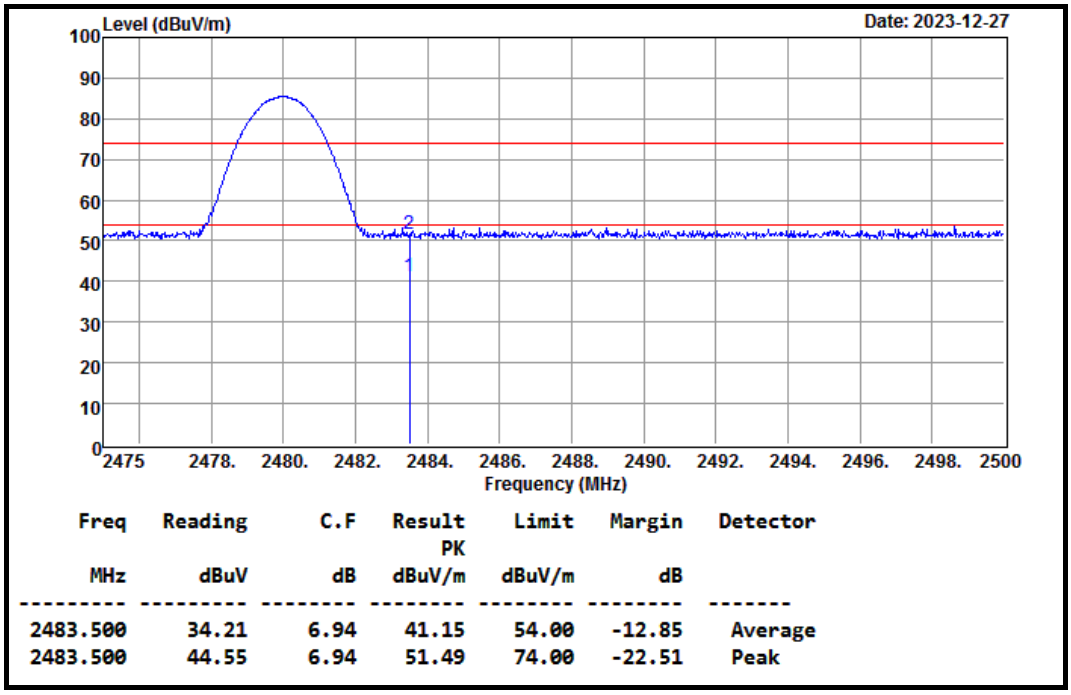
Product Name	AUTOMATIC WIRELESS TURNTABLE	Test Date	2023/12/27
Model	AT-LP70XBT	Test By	Peter Chu
Test Mode	CH High TX / 8-DPSK	TEMP& Humidity	21.8°C, 47%

Horizontal



Freq	Reading	C.F	Result PK	Limit	Margin	Detector
MHz	dBuV	dB	dBuV/m	dBuV/m	dB	
2483.500	34.57	6.94	41.51	54.00	-12.49	Average
2483.500	45.40	6.94	52.34	74.00	-21.66	Peak

Vertical



Freq	Reading	C.F	Result PK	Limit	Margin	Detector
MHz	dBuV	dB	dBuV/m	dBuV/m	dB	
2483.500	34.21	6.94	41.15	54.00	-12.85	Average
2483.500	44.55	6.94	51.49	74.00	-22.51	Peak

8.9 POWERLINE CONDUCTED EMISSIONS

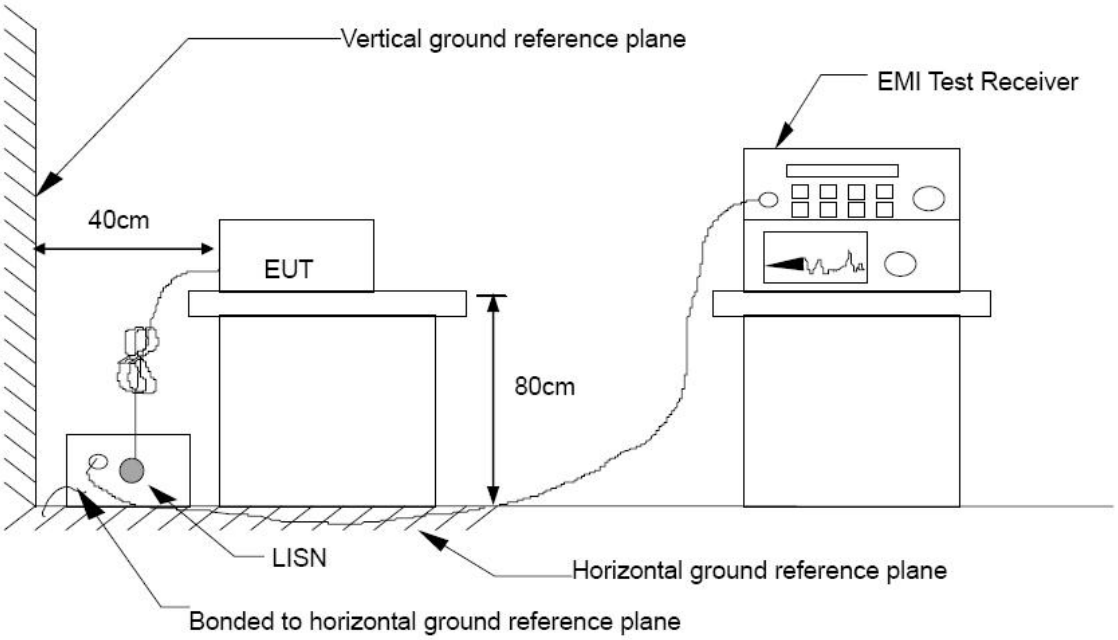
LIMITS

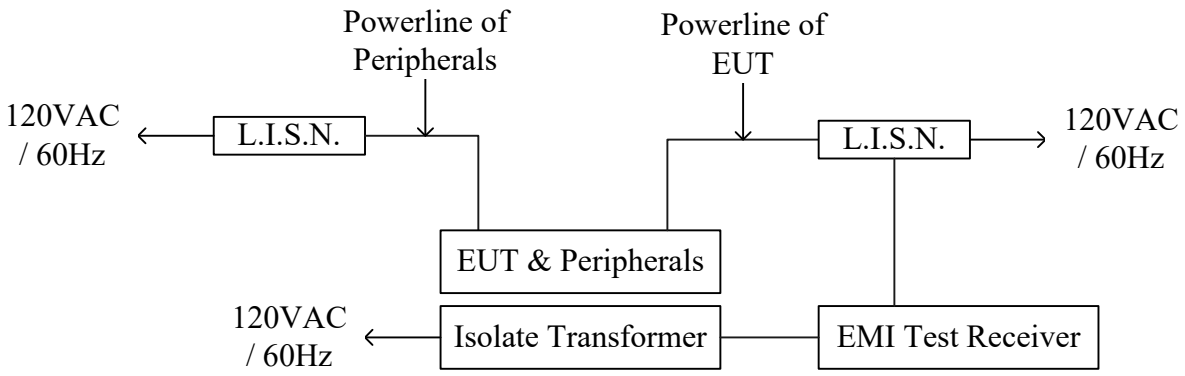
§ 15.207 (a) Except as shown in paragraph (b) and (c) this section, for an intentional radiator that is designed to be connected to the public utility (AC) power line, the radio frequency voltage that is conducted back onto the AC power line on any frequency or frequencies within the band 150 kHz to 30 MHz shall not exceed the limits in the following table, as measured using a 50 μH/50 ohms line impedance stabilization network (LISN). Compliance with the provisions of this paragraph shall be based on the measurement of the radio frequency voltage between each power line and ground at the power terminal.

The lower limit applies at the boundary between the frequency ranges.

Frequency of Emission (MHz)	Conducted limit (dBμv)	
	Quasi-peak	Average
0.15 - 0.5	66 to 56	56 to 46
0.5 - 5	56	46
5 - 30	60	50

TEST SETUP





TEST PROCEDURE

The EUT is placed on a non-conducting table 40 cm from the vertical ground plane and 80cm above the horizontal ground plane. The EUT IS CONFIGURED IN ACCORDANCE WITH ANSI C63.10 : 2013.

The resolution bandwidth is set to 9 kHz for both quasi-peak detection and average detection measurements.

Line conducted data is recorded for both NEUTRAL and LINE.

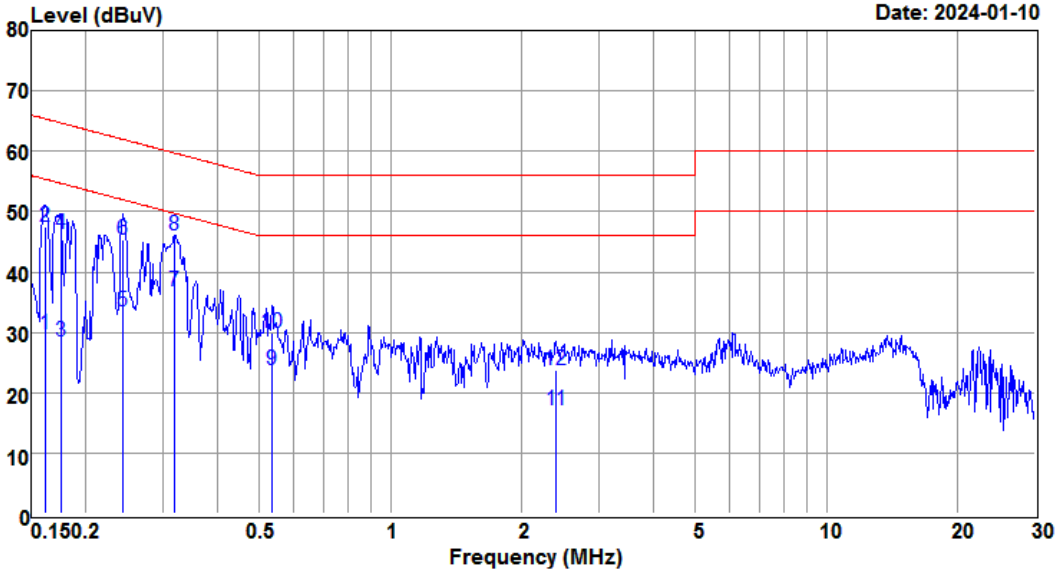
TEST RESULTS

Test Voltage: AC 120V, 60Hz

Model No.	AT-LP70XBT	**Test Mode**	Normal Operation
Environmental Conditions	26.5℃, 44% RH	**Resolution Bandwidth**	9 kHz
Tested by	Jeremy Zhong		

LINE

(The chart below shows the highest readings taken from the final data.)

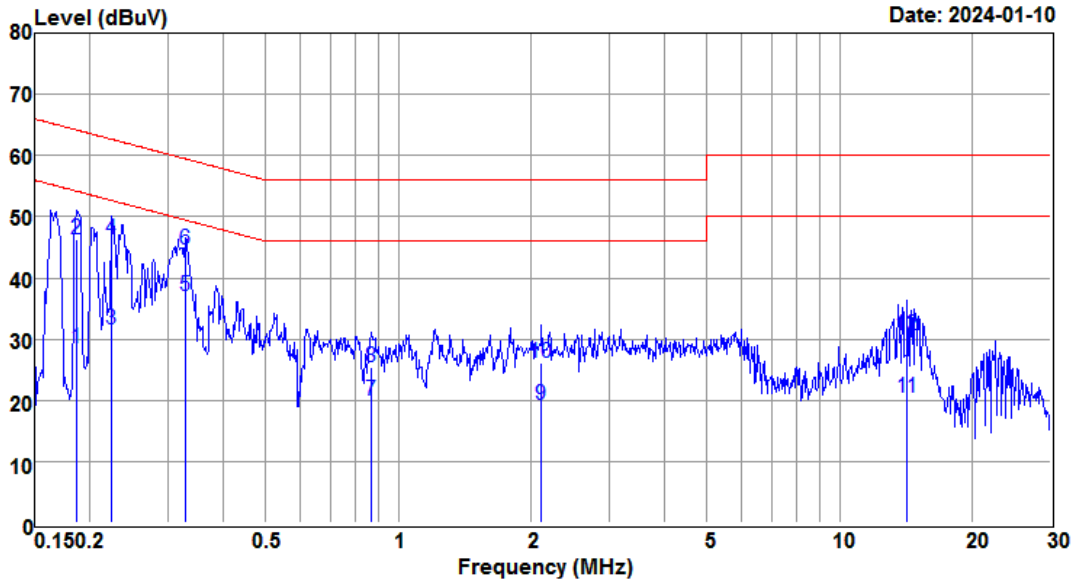


Freq	Reading Level	C.F	Result	Limit	Over Limit	Detector
MHz	dBuV	dB	dBuV	dBuV	dB	
0.162	19.35	10.43	29.78	55.38	-25.60	Average
0.162	37.02	10.43	47.45	65.38	-17.93	QP
0.175	18.19	10.42	28.61	54.71	-26.10	Average
0.175	35.77	10.42	46.19	64.71	-18.52	QP
0.244	23.15	10.43	33.58	51.95	-18.37	Average
0.244	34.95	10.43	45.38	61.95	-16.57	QP
0.320	26.37	10.47	36.84	49.71	-12.87	Average
0.320	35.66	10.47	46.13	59.71	-13.58	QP
0.535	13.23	10.51	23.74	46.00	-22.26	Average
0.535	19.42	10.51	29.93	56.00	-26.07	QP
2.396	6.22	10.82	17.04	46.00	-28.96	Average
2.396	12.95	10.82	23.77	56.00	-32.23	QP

Model No.	AT-LP70XBT	Test Mode	Normal Operation
Environmental Conditions	26.5℃, 44% RH	Resolution Bandwidth	9 kHz
Tested by	Jeremy Zhong		

NEUTRAL

(The chart below shows the highest readings taken from the final data.)



Freq	Reading Level	C.F	Result	Limit	Over Limit	Detector
MHz	dBuV	dB	dBuV	dBuV	dB	
0.187	18.22	10.38	28.60	54.15	-25.55	Average
0.187	35.94	10.38	46.32	64.15	-17.83	QP
0.223	21.24	10.39	31.63	52.69	-21.06	Average
0.223	35.99	10.39	46.38	62.69	-16.31	QP
0.329	26.67	10.44	37.11	49.49	-12.38	Average
0.329	34.28	10.44	44.72	59.49	-14.77	QP
0.866	9.43	10.54	19.97	46.00	-26.03	Average
0.866	14.83	10.54	25.37	56.00	-30.63	QP
2.110	8.41	10.75	19.16	46.00	-26.84	Average
2.110	15.48	10.75	26.23	56.00	-29.77	QP
14.213	5.26	15.12	20.38	50.00	-29.62	Average
14.213	15.48	15.12	30.60	60.00	-29.40	QP

=== END of Report ===