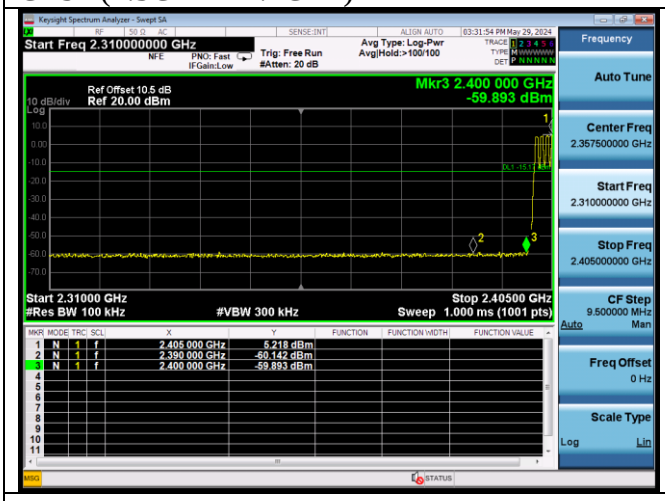
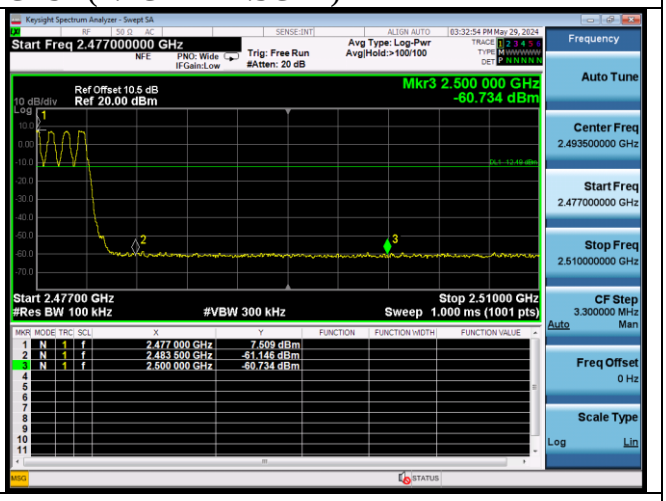
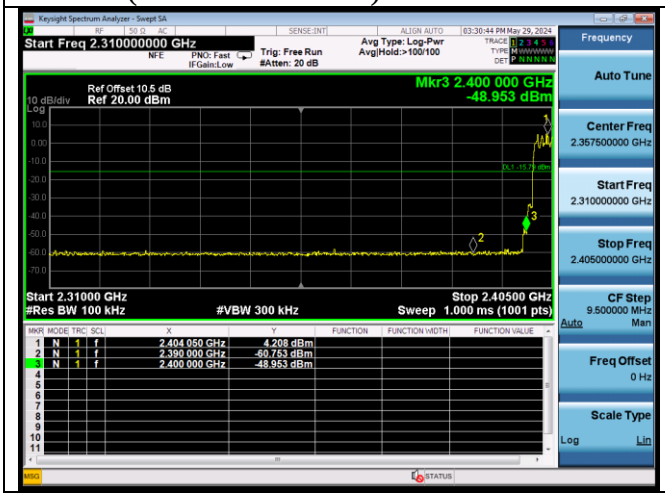
Hopping on	
GFSK(2.3GHz – 2.4GHz)	GFSK(2.4GHz – 2.5GHz)
	
8-DPSK(2.3GHz – 2.4GHz)	8-DPSK(2.4GHz – 2.5GHz)
	

6. 20 DB & 99% BANDWIDTH TEST

6.1. Limit

Intentional radiators operating under the alternative provisions to the general emission limits, as contained in §§ 15.217 through 15.257 and in Subpart E of this part, must be designed to ensure that the 20 dB bandwidth of the emission, or whatever bandwidth may otherwise be specified in the specific rule section under which the equipment operates, is contained within the frequency band designated in the rule section under which the equipment is operated.

6.2. Test Procedure

Use the test method descried in ANSI C63.10 clause 7.8.7:

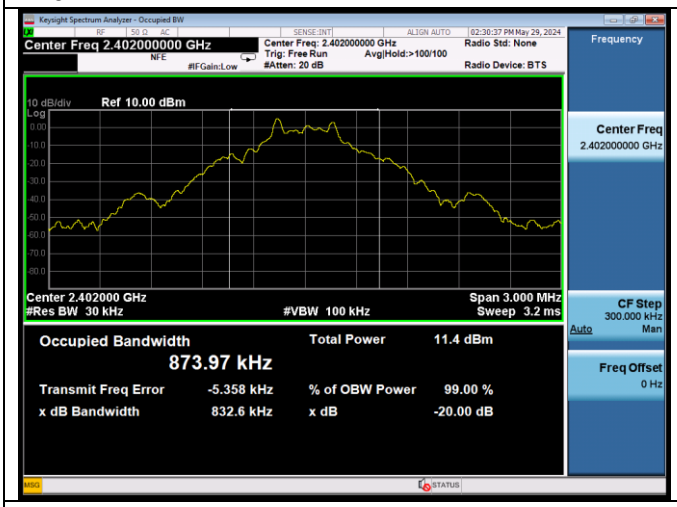
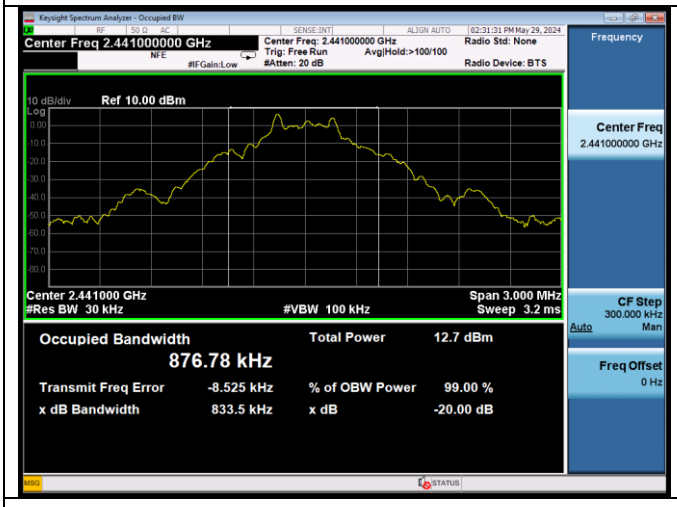
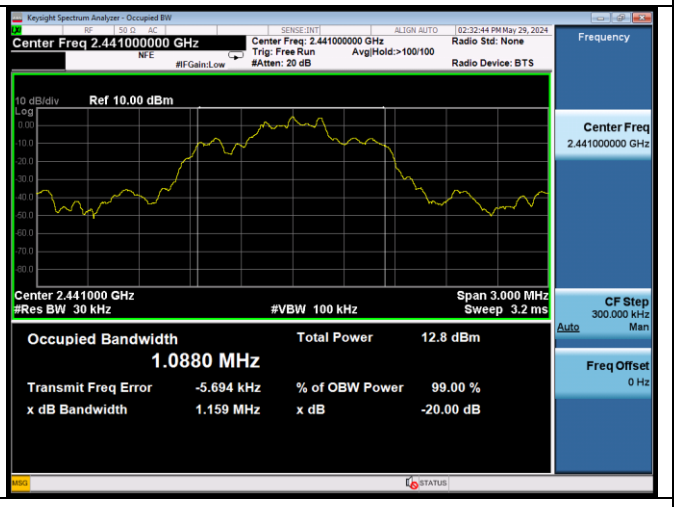
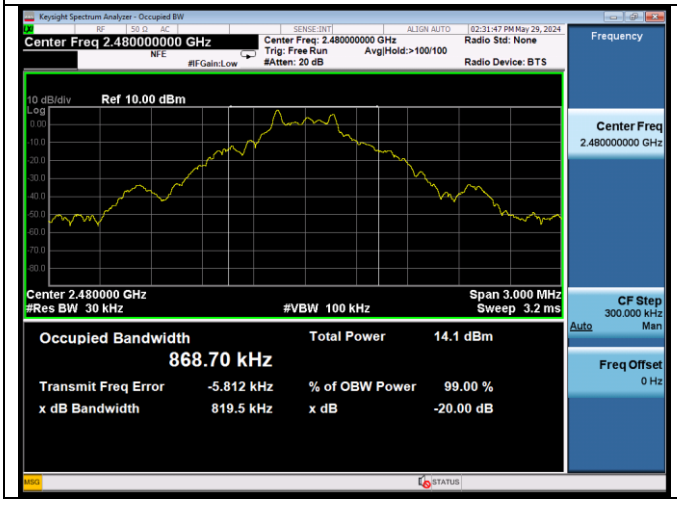
1. Connect the antenna port of the EUT to the spectrum analyzer.
2. Let the EUT transmit at Low/ Mid/ High channel with test software.
3. Setting of SA is following as: RBW: 30kHz / VBW: 100kHz
   Sweep Mode: Continuous sweep
   Detect mode: Positive peak
   Trace mode: Max hold.
4. Use the occupied bandwidth function of the SA measure the 20dB bandwidth directly.

6.3.Test Results

EUT: Tablet PC		
M/N: 8188G		
Date: 2024-05-29	Pressure: 101.3±1.0 kpa	Humidity: 52.4±3.0%
Tested by: lili	Test Site: RF site	Temperature:23.1±0.6℃

Test Mode	CH	-20dBBandwidth (KHz)	Limit (KHz)
GFSK	CH0	832.6	N/A
	CH39	833.5	
	CH78	819.5	
8-DPSK	CH0	1156	N/A
	CH39	1159	
	CH78	1159	
Conclusion：PASS			

Test Mode	CH	99%Bandwidth (KHz)	Limit (KHz)
GFSK	CH0	873.97	N/A
	CH39	876.78	
	CH78	868.70	
8-DPSK	CH0	1089.1	N/A
	CH39	1088.0	
	CH78	1088.0	
Conclusion: Pass			

GFSK	8-DPSK
2402MHz	2402MHz
	
2441MHz	2441MHz
	
2480MHz	2480MHz
	

7. CARRIER FREQUENCY SEPARATION TEST

7.1.Limit

Frequency hopping systems shall have hopping channel carrier frequency separated by a minimum of 25kHz or the 20dB bandwidth of the hopping channel, whichever is greater. Alternatively, frequency hopping systems operating in the 2400-2483.5 MHz band may have hopping channel carrier frequencies that are separated by 25 kHz or two-thirds of the 20 dB bandwidth of the hopping channel, whichever is greater, provided the systems operate with an output power no greater than 125 mW.

7.2.Test Procedure

Use the test method descried in ANSI C63.10 clause 7.8.2:
1. Connect the antenna port of the EUT to the Spectrum analyzer.
2. Let the EUT transmit at Low/ Mid/ High channel.
3. Setting of SA is following as: RBW: 100kHz / VBW: 300kHz.Span: 5MHz
4. Use the mark Delta function of the SA measure out the channel separation.

7.3.Test Results.

EUT: Tablet PC		
M/N: 8188G		
Test date: 2024-05-29	Pressure: 101.3±1.0 kpa	Humidity: 52.4±3.0%
Tested by: Lili	Test site: RF site	Temperature: 23.1±0.6℃

Test Mode	Channel separation	Limit(KHz)	Conclusion
GFSK	1.0MHz	557.3	PASS
8-DPSK	1.0MHz	772.7	PASS

GFSK	8-DPSK
	

8. NUMBER OF HOPPING FREQUENCY TEST

8.1.Limit

Frequency hopping systems in the 2400-2483.5 MHz band shall use at least 15 channels

8.2.Test Procedure

Use the test method descried in ANSI C63.10 clause 7.8.3:

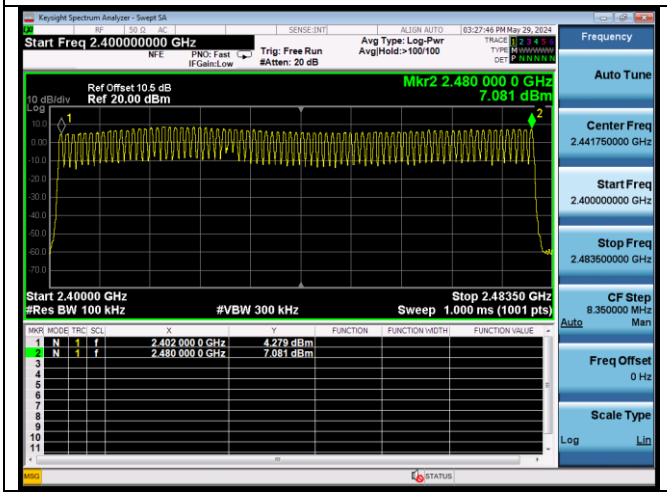
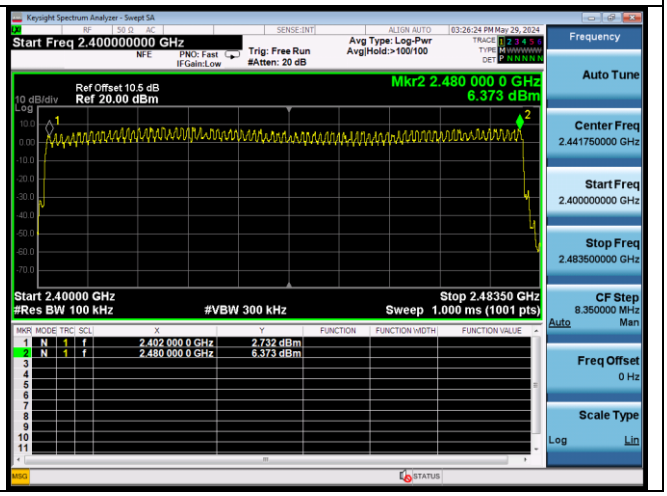
1. Connect the antenna of the EUT to Spectrum analyzer and let the EUT working at hopping mode.
2. Setting of SA is following as: RBW: 100kHz / VBW: 300kHz，
   Start frequency: 2390MHz
   Stop frequency: 2483.5MHz

And waiting for the hopping trace until stability, count out the number of the hopping.

8.3.Test Results

EUT: Tablet PC		
M/N: 8188G		
Test date: 2024-05-29	Pressure: 101.3±1.0 kpa	Humidity: 52.4±3.0%
Tested by: Lili	Test site: RF site	Temperature: 23.1±0.6℃

Test Mode	Number of channel	Limit	Conclusion
GFSK	79	≥15	PASS
8-DPSK	79	≥15	PASS

GFSK	8-DPSK
	

9. DWELL TIME

9.1.Limit

The average time of occupancy on any channel shall not be greater than 0.4 seconds within a period of 0.4 seconds multiplied by the number of hopping channels employed.

9.2.Test Procedure

Use the test method descried in ANSI C63.10 clause 7.8.4:

1. Connect the antenna of the EUT to Spectrum analyzer and let the EUT working at hopping mode.
2. Setting of SA is following as:
   RBW: 100kHz / VBW: 300kHz
   Sweep Mode: Single
   Detect mode: Positive peak
   Trace mode: Auto
   Span: 0Hz
   Sweep time: 5s and big enough to measure one hopping signal
3. Use below formula calculate the Dwell time
   Dwell time=Hopping number per second*0.4*channel number*Pulse bandwidth per hopping.

9.3.Test Results

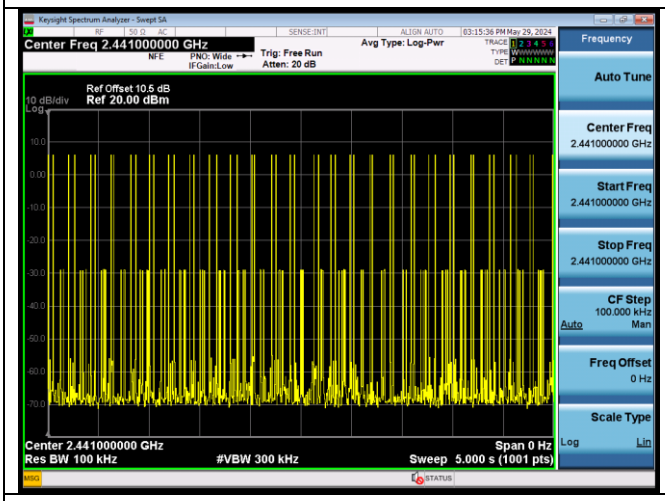
EUT: Tablet PC		
M/N: 8188G		
Test date: 2024-05-29	Pressure: 101.3±1.0 kpa	Humidity: 52.4±3.0%
Tested by: Lili	Test site: RF site	Temperature: 23.1±0.6℃

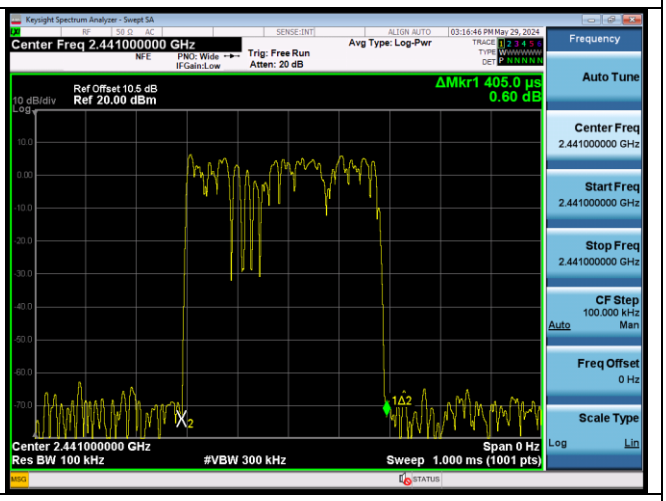
Mode		dwell time	Limit	Conclusion
GFSK	DH1	51 hops/5s*0.4s*79chanels* 0.405 ms =130.540ms	≦400ms	PASS
	DH3	21 hops/5s*0.4s*79chanels* 1.665 ms =220.979ms	≦400ms	PASS
	DH5	12 hops/5s*0.4s*79chanels* 2.915 ms =221.074ms	≦400ms	PASS
8-DPSK	3-DH1	48 hops/5s*0.4s*79chanels* 0.411 ms =124.681ms	≦400ms	PASS
	3-DH3	26 hops/5s*0.4s*79chanels* 1.671 ms =274.579ms	≦400ms	PASS
	3-DH5	20 hops/5s*0.4s*79chanels* 2.925 ms =369.720ms	≦400ms	PASS

Note: All the lower levels were signaled from receiver and should not be considered in here.

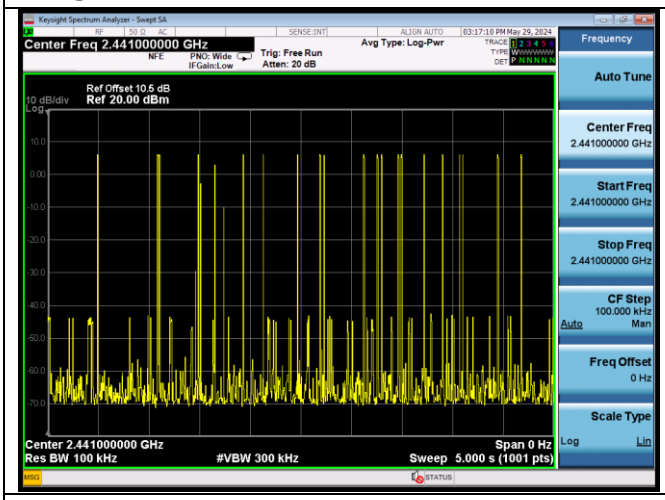
GFSK

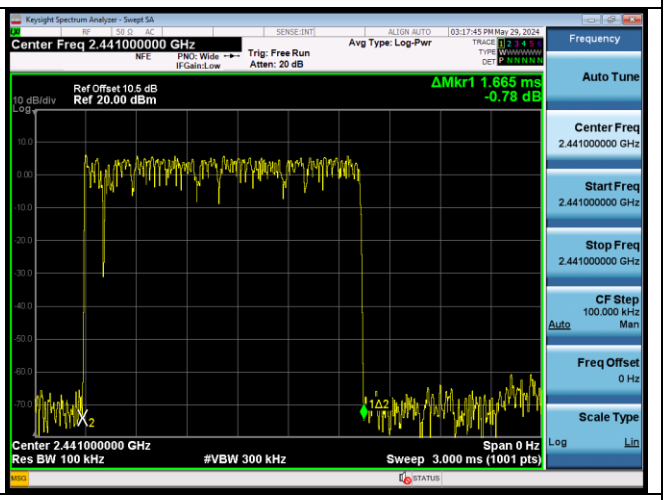
DH 1



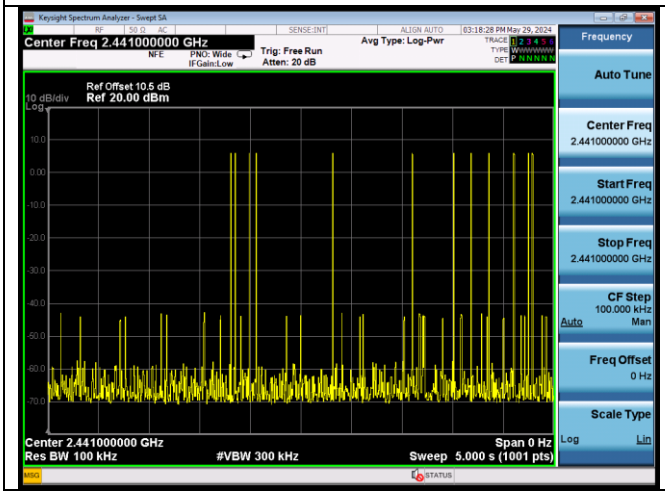


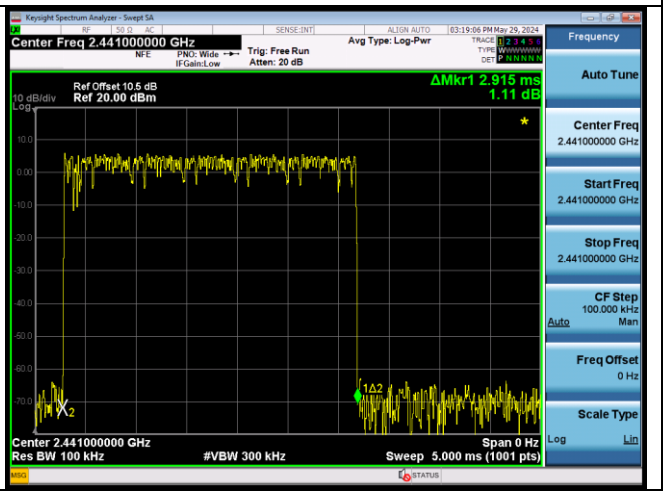
DH 3





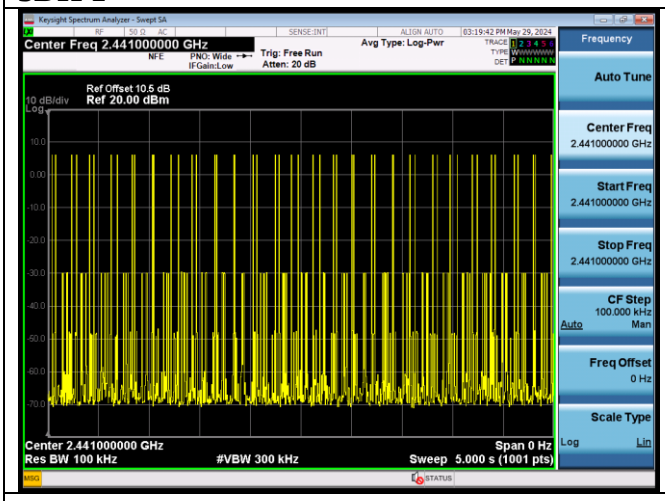
DH 5

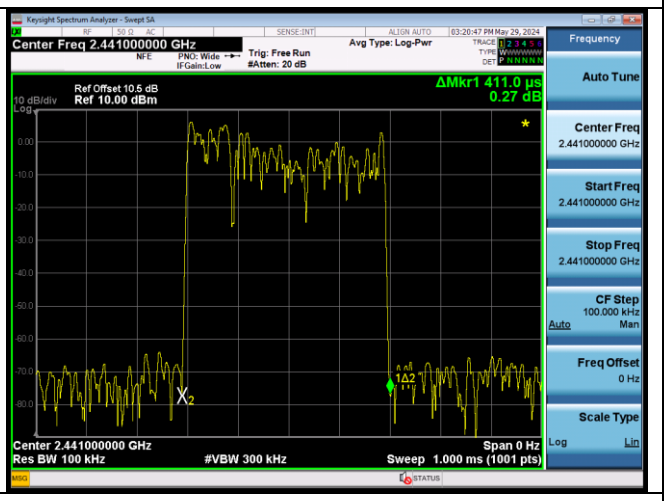




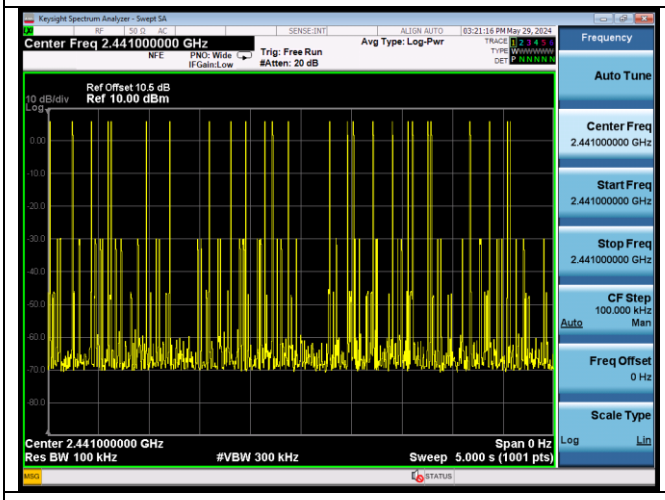
8-DPSK

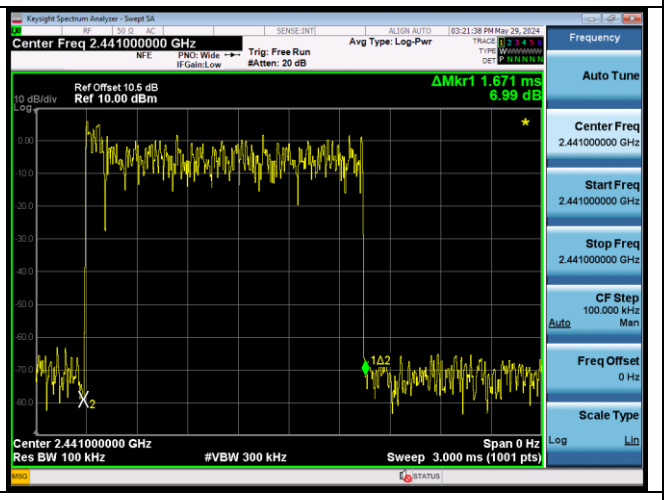
3DH 1



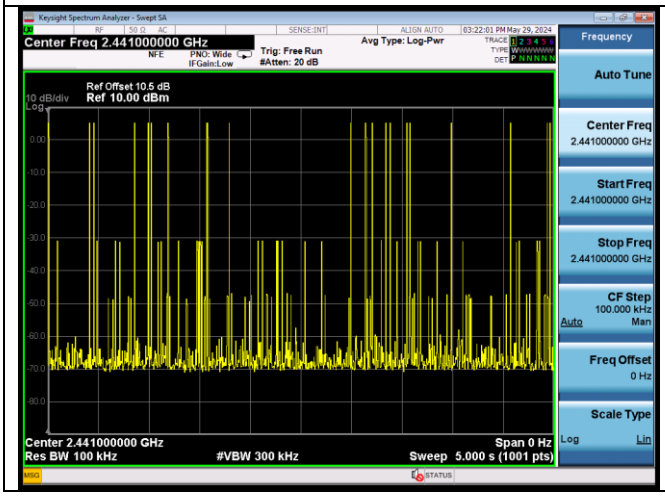


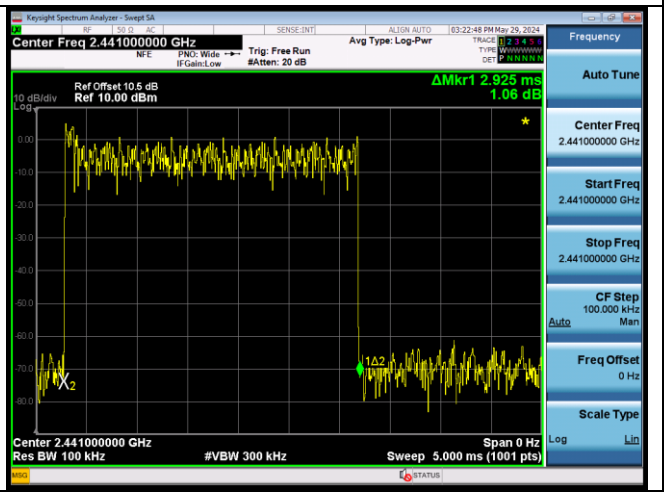
3DH 3





3DH 5





10. MAXIMUM PEAK OUTPUT POWER TEST

10.1. Limit

For frequency hopping systems operating in the 2400-2483.5 MHz band employing at least 75 non-overlapping hopping channels, and all frequency hopping systems in the 5725-5850 MHz band: 1 watt. For all other frequency hopping systems in the 2400-2483.5 MHz band:0.125 watts

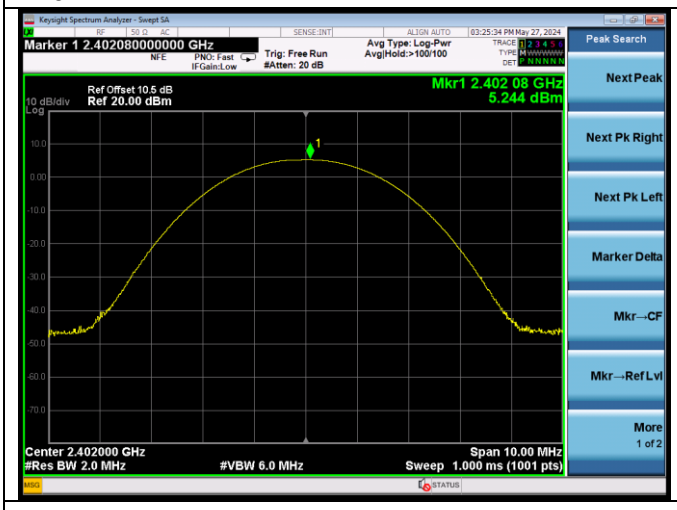
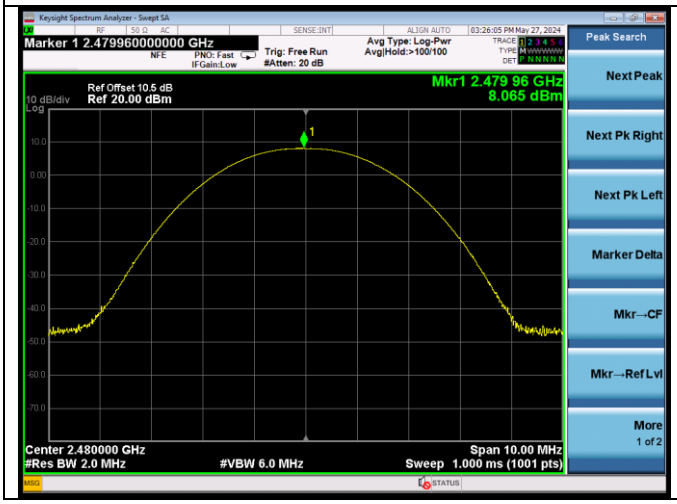
10.2. Test Procedure

Use the test method descried in ANSI C63.10 clause 7.8.5:
For Peak output power: Connected the EUT's Antenna port to PXA signal analyzer;
For Average power: Connected the EUT's Antenna port to Power sensor and power meter;

10.3. Test Results

EUT: Tablet PC		
M/N: 8188G		
Date: 2024-05-27	Pressure: 102.4±1.0 kpa	Humidity: 54.7±3.0%
Tested by: lili	Test Site: RF site	Temperature:23.6±0.6℃

Test Mode	CH	Power Setting	Peak Output Power (dBm)	Limit (dBm)
GFSK	CH0	9	5.244	21
	CH39	9	6.472	
	CH78	9	8.065	
8-DPSK	CH0	9	5.393	21
	CH39	9	6.698	
	CH78	9	8.301	

GFSK	8-DPSK
2402MHz	2402MHz
	
2441MHz	2441MHz
	
2480MHz	2480MHz
	

11.BAND EDGE COMPLIANCE TEST

11.1.Limit

All the lower and upper band-edges emissions appearing within 2310MHz to 2390MHz and 2483.5MHz to 2500MHz restricted frequency bands shall not exceed the limits shown in 15.209, all the other emissions outside operation frequency band 2400MHz to 2483.5MHz shall be at least 20dB below the fundamental emissions, or comply with 15.209 limits.

11.2.Test Produce

Use the test method descried in ANSI C63.10 clause 7.8.6:

For upper band emissions that are up to two bandwidths(2MHz) away (2483.5MHz to 2485.5MHz） from the band-edge use below produce:

1. Choose a spectrum analyzer span that encompasses both the peak of the fundamental emission and the band-edge emission under investigation. Set the analyzer RBW to 100KHz and with a video bandwidth 300KHz. Record the peak levels of the fundamental emission and the relevant band-edge emission, Observe the stored trace and measure the amplitude delta between the peak of the fundamental and the peak of the band-edge emission. This is not a field strength measurement, it is only a relative measurement to determine the amount by which the emission drops at the band edge relative to the highest fundamental emission level.
2. Subtract the delta measured in step (1) from the maximum field strengths measured in clause 4 .The resultant field strengths are then used to determine band-edge compliance as required by Section 15.205

For emissions above two bandwidths away from the band-edge use below produce:

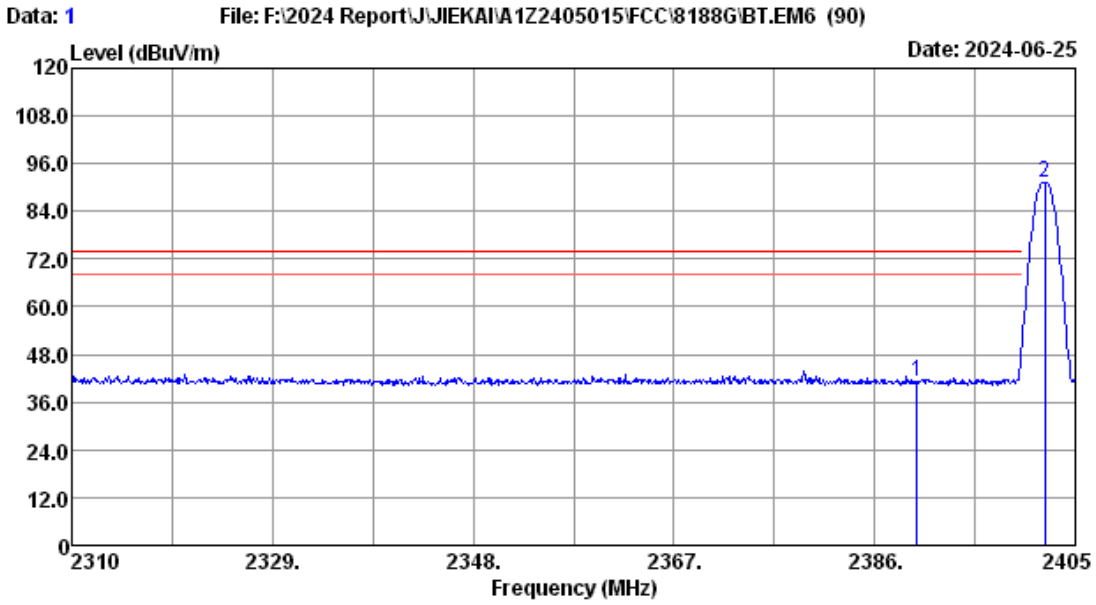
1. The EUT is placed on a insulating material (up to 12mm thick) worked at highest radiated power.
2. The turntable was rotated for 360 degrees to determine the position of maximum emission level.
3. EUT is set 3m away from the receiving antenna, which is varied from 1m to 4m to find out the highest emission.

4. Set the spectrum analyzer in the following setting in order to capture the lower and upperband-edges of the emission:
   (a) PEAK: RBW=1MHz ;VBW=3MHz, PK detector, Sweep=AUTO
   (b) This is pulse Modulation device a duty cycle factor was used to calculate average level based measured peak level.

11.3. Test Results

Pass (The testing data was attached in the next pages.)

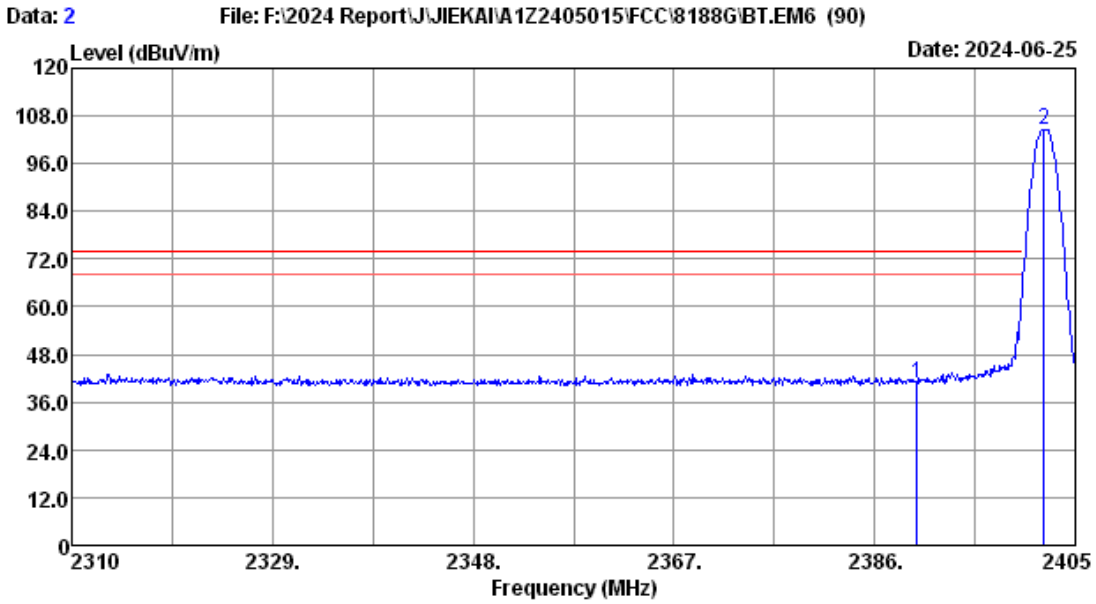
Note: If the PK measured levels comply with average limit, then the average level were deemed to comply with average limit.



Site no. : 3m Chamber Data no. : 1
Dis. / Ant. : 3m 2023 MCTD1209-3006 Ant. pol. : VERTICAL
Limit : FCC PART 15C PEAK
Env. / Ins. : 23.2*C/52.5% Engineer : winter
Test Mode : BT3.0 GFSK 2402MHz TX Mode

No.	Freq. (MHz)	Ant. Factor (dB/m)	Cable Loss (dB)	Reading (dBuV)	Amp factor (dB)	Emission Level (dBuV/m)	Limits (dBuV/m)	Margin (dB)	Remark
1	2390.00	27.62	2.83	42.64	31.70	41.39	74.00	32.61	Peak
2	2402.15	27.61	2.84	92.60	31.70	91.35	------	------	Peak

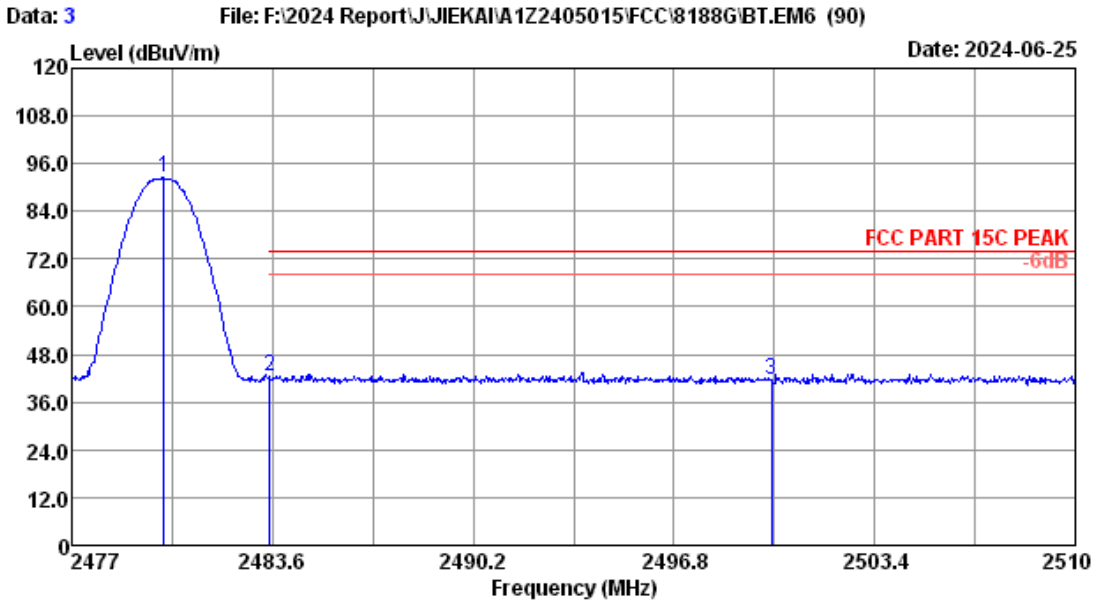
Remarks: 1. Emission Level= Antenna Factor + Cable Loss + Reading -Amp factor.
2. The emission levels that are 20dB below the official limit are not reported.



Site no. : 3m Chamber Data no. : 2
Dis. / Ant. : 3m 2023 MCTD1209-3006 Ant. pol. : HORIZONTAL
Limit : FCC PART 15C PEAK
Env. / Ins. : 23.2*C/52.5% Engineer : winter
Test Mode : BT3.0 GFSK 2402MHz TX Mode

No.	Freq. (MHz)	Ant. Factor (dB/m)	Cable Loss (dB)	Reading (dBuV)	Amp factor (dB)	Emission Level (dBuV/m)	Limits (dBuV/m)	Margin (dB)	Remark
1	2390.00	27.62	2.83	42.05	31.70	40.80	74.00	33.20	Peak
2	2402.06	27.61	2.84	105.92	31.70	104.67	------	------	Peak

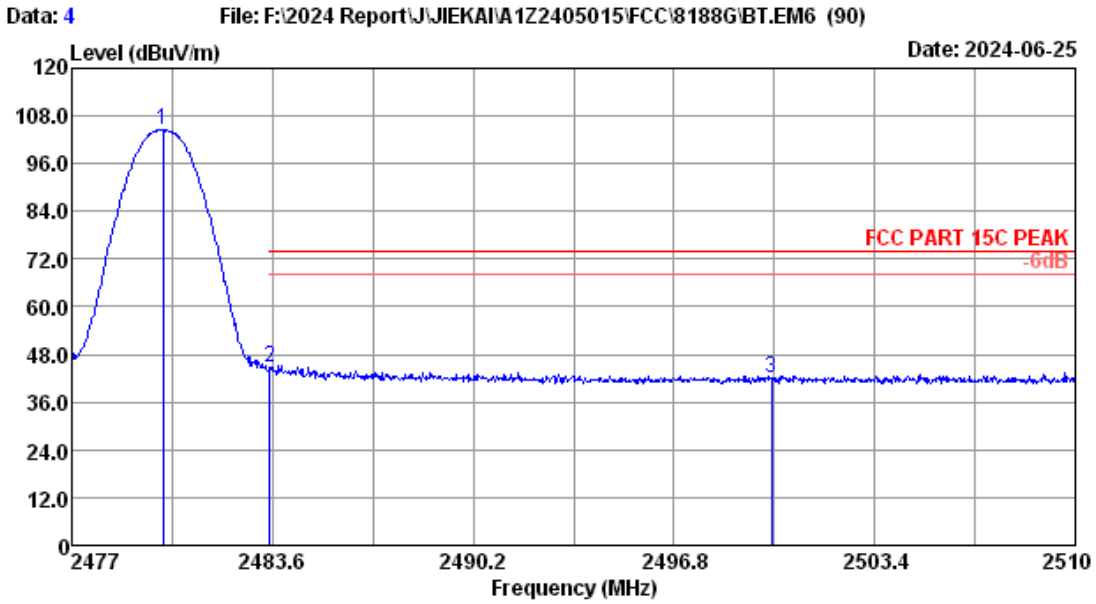
Remarks: 1. Emission Level= Antenna Factor + Cable Loss + Reading -Amp factor.
2. The emission levels that are 20dB below the official limit are not reported.



Site no. : 3m Chamber Data no. : 3
Dis. / Ant. : 3m 2023 MCTD1209-3006 Ant. pol. : VERTICAL
Limit : FCC PART 15C PEAK
Env. / Ins. : 23.2*C/52.5% Engineer : winter
Test Mode : BT3.0 GFSK 2480MHz TX Mode

No.	Freq. (MHz)	Ant. Factor (dB/m)	Cable Loss (dB)	Reading (dBuV)	Amp factor (dB)	Emission Level (dBuV/m)	Limits (dBuV/m)	Margin (dB)	Remark
1	2480.04	27.80	2.88	93.33	31.66	92.35	------	------	Peak
2	2483.50	27.80	2.88	43.30	31.66	42.32	74.00	31.68	Peak
3	2500.00	27.80	2.88	42.47	31.65	41.50	74.00	32.50	Peak

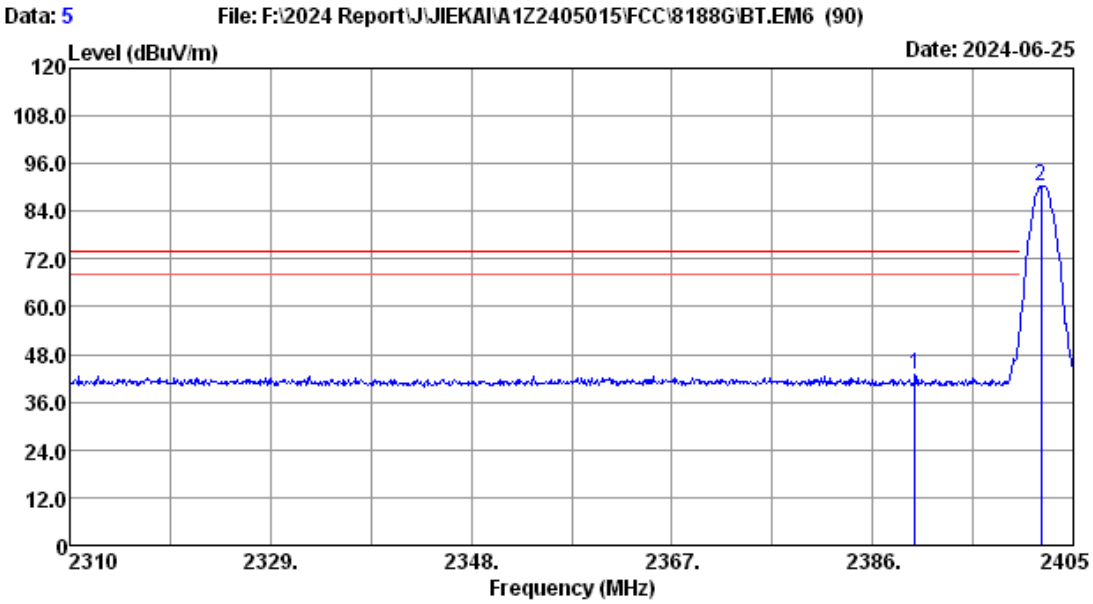
Remarks: 1. Emission Level= Antenna Factor + Cable Loss + Reading -Amp factor.
2. The emission levels that are 20dB below the official limit are not reported.



Site no. : 3m Chamber Data no. : 4
Dis. / Ant. : 3m 2023 MCTD1209-3006 Ant. pol. : HORIZONTAL
Limit : FCC PART 15C PEAK
Env. / Ins. : 23.2*C/52.5% Engineer : winter
Test Mode : BT3.0 GFSK 2480MHz TX Mode

No.	Freq. (MHz)	Ant. Factor (dB/m)	Cable Loss (dB)	Reading (dBuV)	Amp factor (dB)	Emission Level (dBuV/m)	Limits (dBuV/m)	Margin (dB)	Remark
1	2480.00	27.80	2.88	105.42	31.66	104.44	------	------	Peak
2	2483.50	27.80	2.88	45.61	31.66	44.63	74.00	29.37	Peak
3	2500.00	27.80	2.88	43.03	31.65	42.06	74.00	31.94	Peak

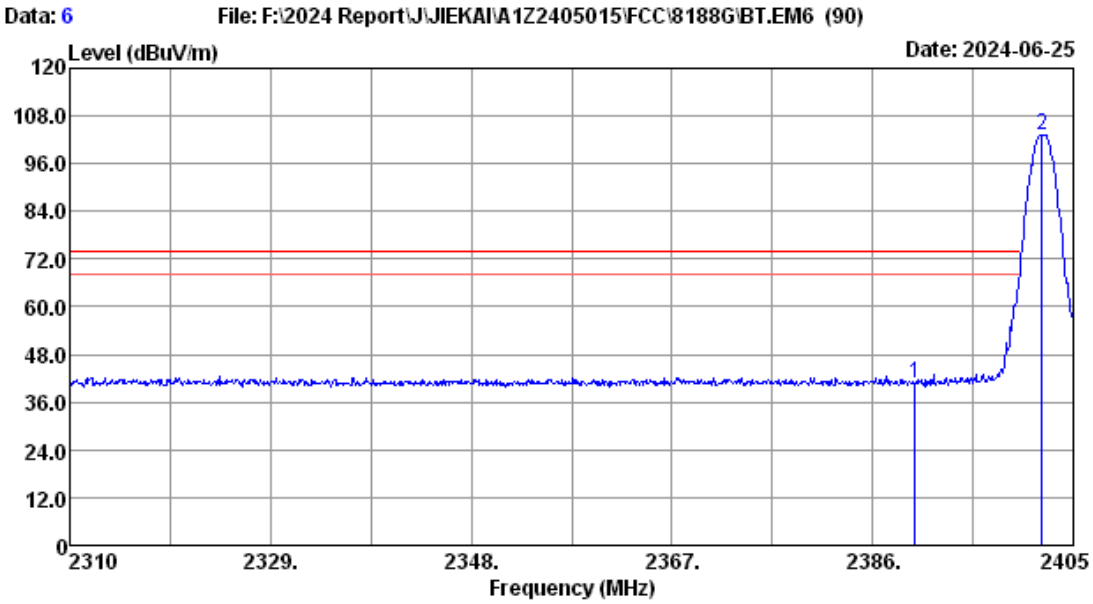
Remarks: 1. Emission Level= Antenna Factor + Cable Loss + Reading -Amp factor.
2. The emission levels that are 20dB below the official limit are not reported.



Site no. : 3m Chamber Data no. : 5
Dis. / Ant. : 3m 2023 MCTD1209-3006 Ant. pol. : VERTICAL
Limit : FCC PART 15C PEAK
Env. / Ins. : 23.2*C/52.5% Engineer : winter
Test Mode : BT3.0 8-DPSK 2402MHz TX Mode

No.	Freq. (MHz)	Ant. Factor (dB/m)	Cable Loss (dB)	Reading (dBuV)	Amp factor (dB)	Emission Level (dBuV/m)	Limits (dBuV/m)	Margin (dB)	Remark
1	2390.00	27.62	2.83	44.01	31.70	42.76	74.00	31.24	Peak
2	2401.96	27.61	2.84	91.61	31.70	90.36	------	------	Peak

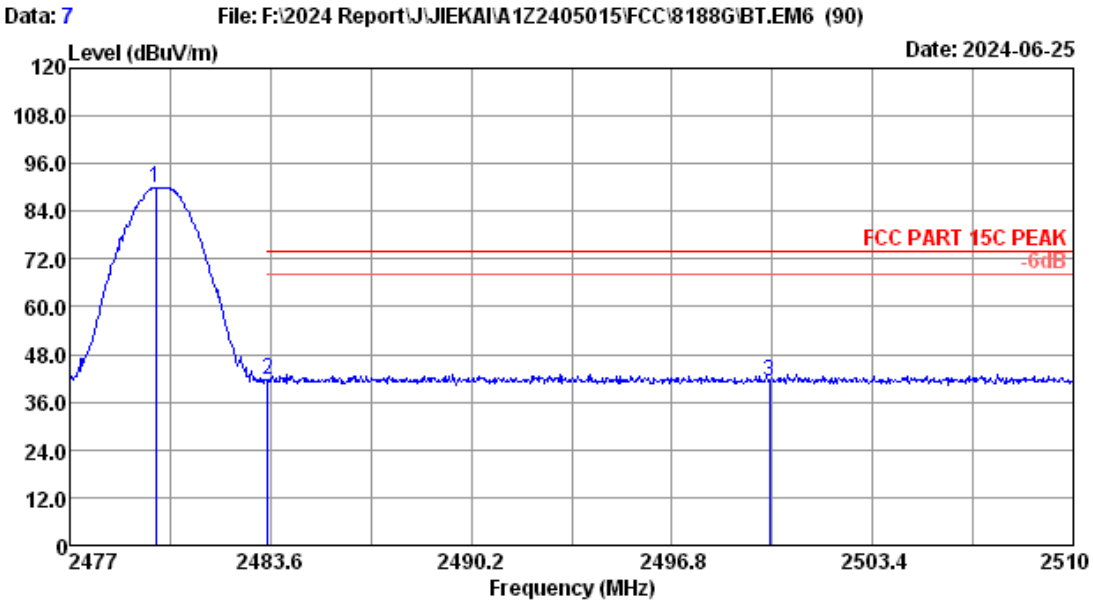
Remarks: 1. Emission Level= Antenna Factor + Cable Loss + Reading -Amp factor.
2. The emission levels that are 20dB below the official limit are not reported.



Site no. : 3m Chamber Data no. : 6
Dis. / Ant. : 3m 2023 MCTD1209-3006 Ant. pol. : HORIZONTAL
Limit : FCC PART 15C PEAK
Env. / Ins. : 23.2*C/52.5% Engineer : winter
Test Mode : BT3.0 8-DPSK 2402MHz TX Mode

No.	Freq. (MHz)	Ant. Factor (dB/m)	Cable Loss (dB)	Reading (dBuV)	Amp factor (dB)	Emission Level (dBuV/m)	Limits (dBuV/m)	Margin (dB)	Remark
1	2390.00	27.62	2.83	42.08	31.70	40.83	74.00	33.17	Peak
2	2402.06	27.61	2.84	104.64	31.70	103.39	------	------	Peak

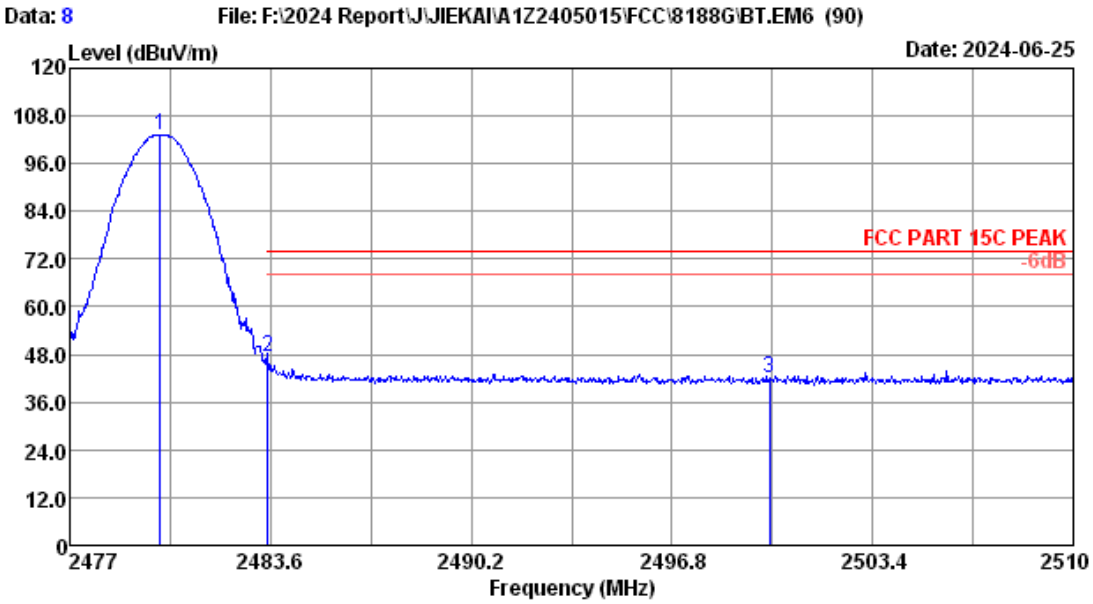
Remarks: 1. Emission Level= Antenna Factor + Cable Loss + Reading -Amp factor.
2. The emission levels that are 20dB below the official limit are not reported.



Site no. : 3m Chamber Data no. : 7
Dis. / Ant. : 3m 2023 MCTD1209-3006 Ant. pol. : VERTICAL
Limit : FCC PART 15C PEAK
Env. / Ins. : 23.2*C/52.5% Engineer : winter
Test Mode : BT3.0 8-DPSK 2480MHz TX Mode

No.	Freq. (MHz)	Ant. Factor (dB/m)	Cable Loss (dB)	Reading (dBuV)	Amp factor (dB)	Emission Level (dBuV/m)	Limits (dBuV/m)	Margin (dB)	Remark
1	2479.84	27.80	2.88	91.05	31.66	90.07	------	------	Peak
2	2483.50	27.80	2.88	42.39	31.66	41.41	74.00	32.59	Peak
3	2500.00	27.80	2.88	42.22	31.65	41.25	74.00	32.75	Peak

Remarks: 1. Emission Level= Antenna Factor + Cable Loss + Reading -Amp factor.
2. The emission levels that are 20dB below the official limit are not reported.



Site no. : 3m Chamber Data no. : 8
Dis. / Ant. : 3m 2023 MCTD1209-3006 Ant. pol. : HORIZONTAL
Limit : FCC PART 15C PEAK
Env. / Ins. : 23.2*C/52.5% Engineer : winter
Test Mode : BT3.0 8-DPSK 2480MHz TX Mode

No.	Freq. (MHz)	Ant. Factor (dB/m)	Cable Loss (dB)	Reading (dBuV)	Amp factor (dB)	Emission Level (dBuV/m)	Limits (dBuV/m)	Margin (dB)	Remark
1	2479.97	27.80	2.88	104.18	31.66	103.20	------	------	Peak
2	2483.50	27.80	2.88	48.41	31.66	47.43	74.00	26.57	Peak
3	2500.00	27.80	2.88	42.99	31.65	42.02	74.00	31.98	Peak

Remarks: 1. Emission Level= Antenna Factor + Cable Loss + Reading -Amp factor.
2. The emission levels that are 20dB below the official limit are not reported.

12. ANTENNA REQUIREMENT

12.1. Standard Applicable

For intentional device, according to FCC 47 CFR Section 15.203, an intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device. And according to FCC 47 CFR Section 15.247 (b), if transmitting antennas of directional gain greater than 6dBi are used, the power shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6dBi.

12.2. Antenna Connected Construction

The antennas used for this product is PIFA Antenna that no antenna other than that furnished by the responsible party shall be used with the device, the maximum peak gain of the transmit antenna is 1.92dBi max.

13. DEVIATION TO TEST SPECIFICATIONS

[NONE]