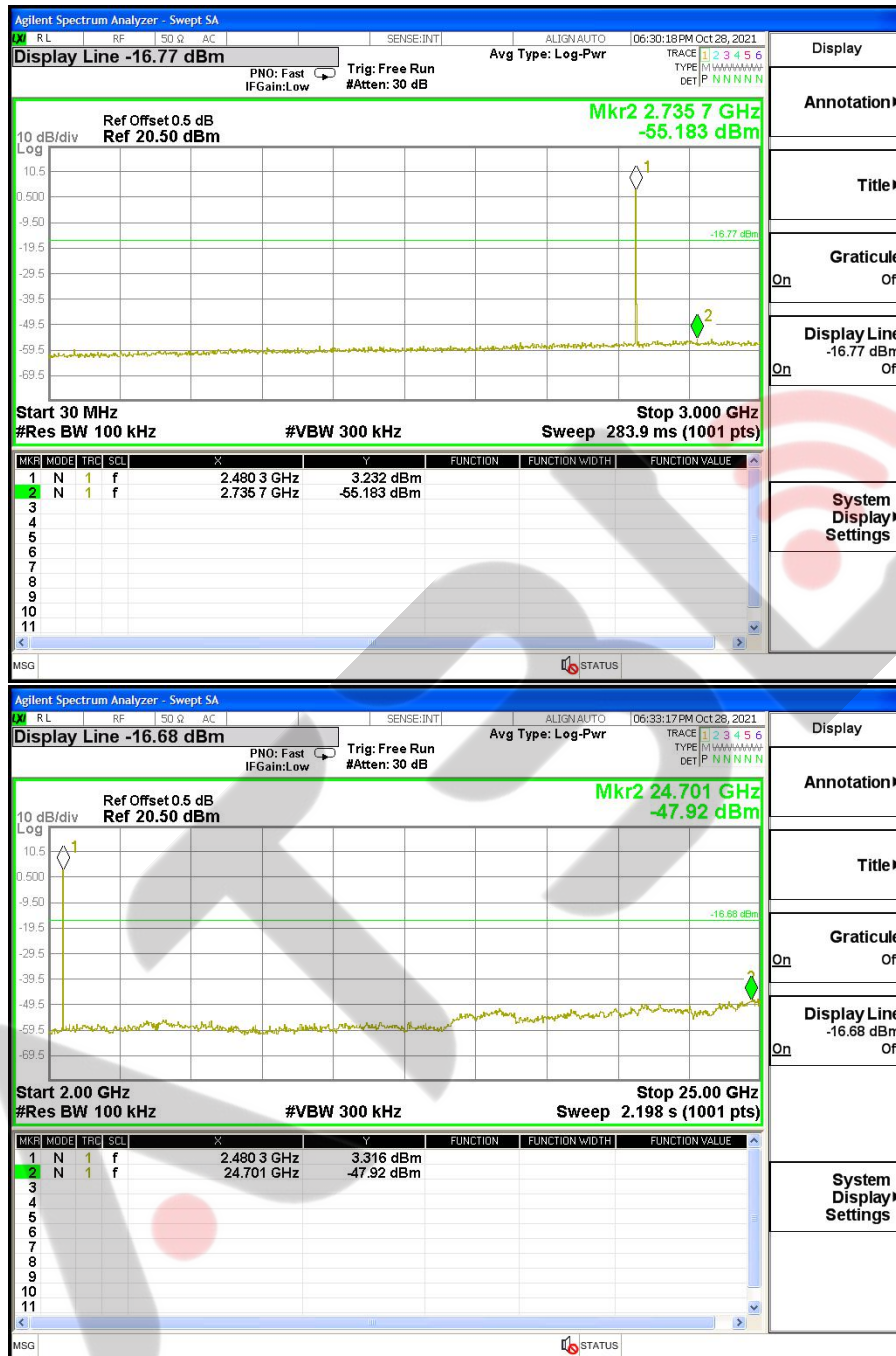
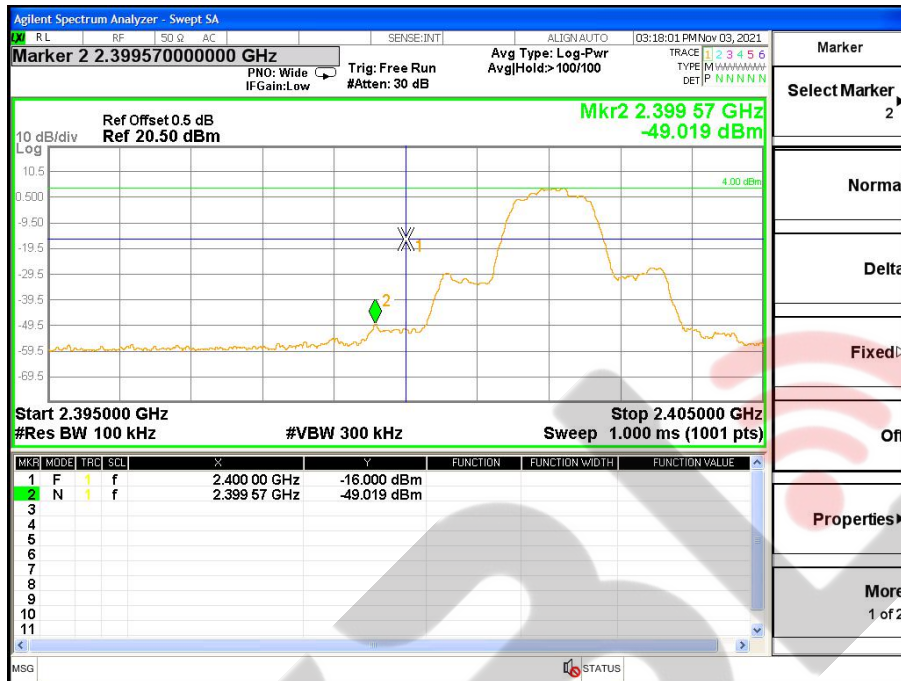


CH 78

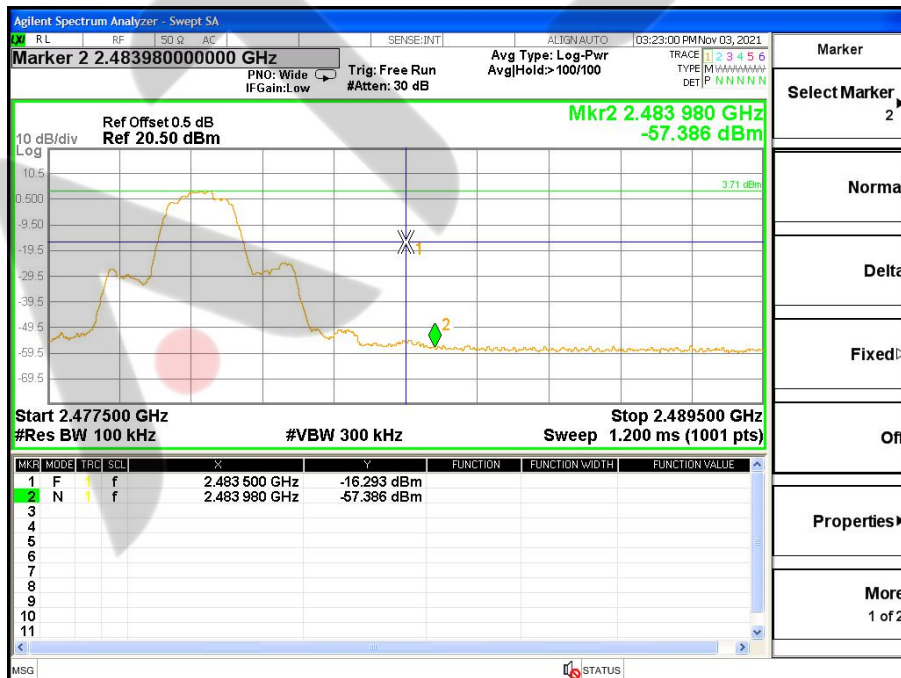


For Band edge(it's also the reference level for conducted spurious emission)

CH 00

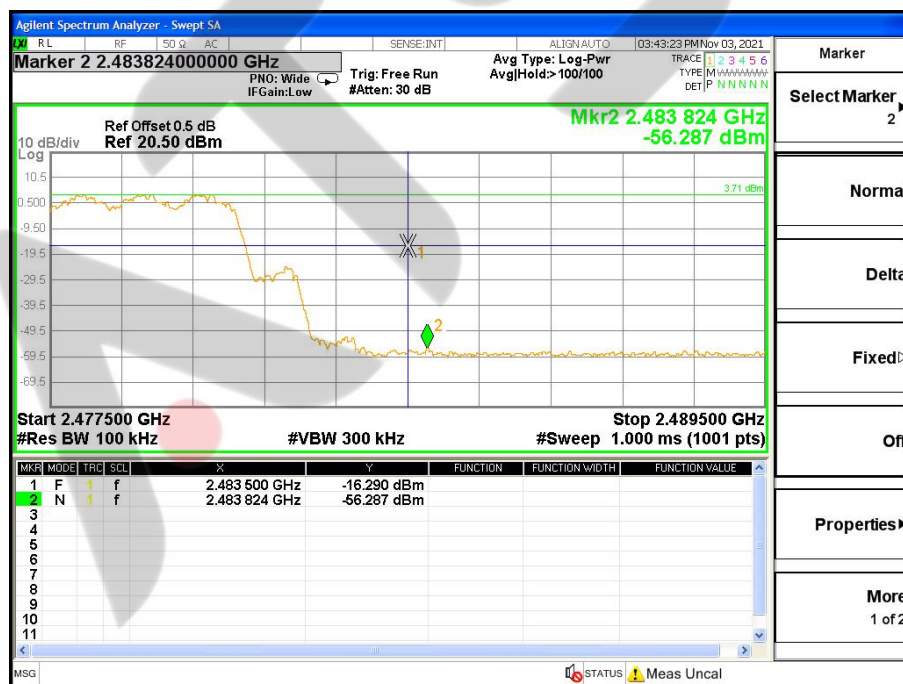
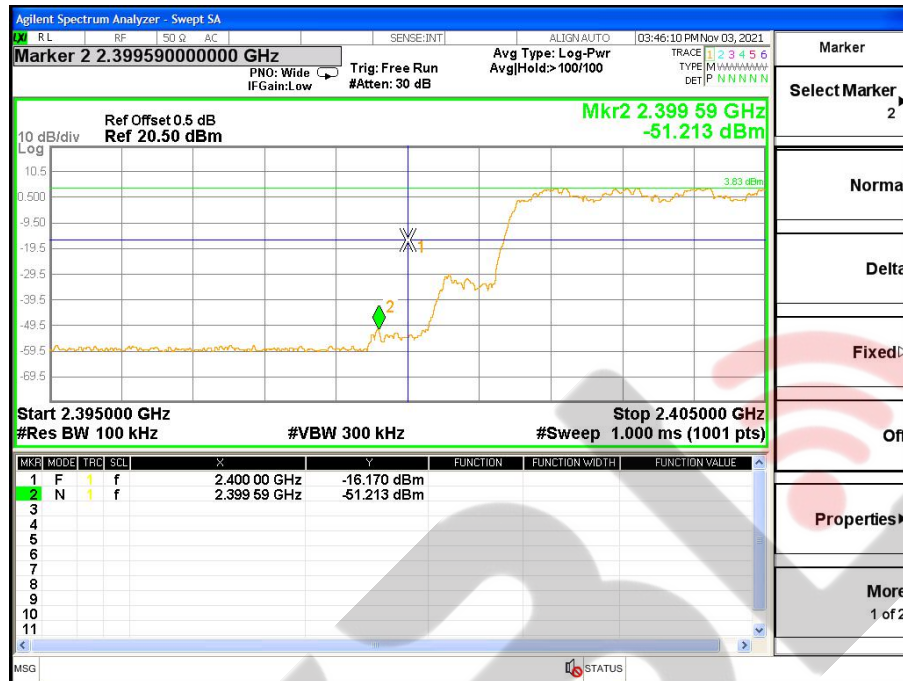


CH 78



For Hopping Band edge

8DPSK



5. NUMBER OF HOPPING CHANNEL

5.1 LIMIT

FCC Part 15.247, Subpart C				
Section	Test Item	Limit	FrequencyRange (MHz)	Result
15.247 (a)(1)(iii)	Number of Hopping Channel	≥ 15	2400-2483.5	PASS

Spectrum Parameters	Setting
Attenuation	Auto
Span Frequency	> Operating FrequencyRange
RB	300KHz
VB	300KHz
Detector	Peak
Trace	Max Hold
Sweep Time	Auto

5.2 TEST PROCEDURE

- The EUT was directly connected to the spectrum analyzer and antenna output port as show in the block diagram below.
- Spectrum Setting: RBW= 300KHz, VBW=300KHz, Sweep time = Auto.

5.3 TEST SETUP



5.4 EUT OPERATION CONDITIONS

Please refer to section 3.1.4 of this report.

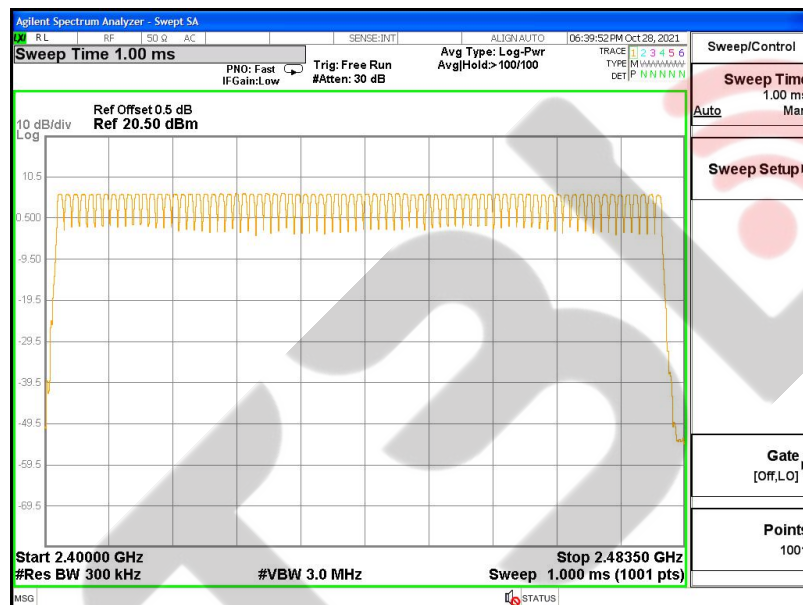
5.5 TEST RESULTS

Temperature:	25°C	Relative Humidity:	60%
Test Mode:	Hopping Mode -GFSK Mode	Test Voltage:	AC 120V

Number of Hopping Channel

79

Hopping channel



6. AVERAGE TIME OF OCCUPANCY

6.1 LIMIT

FCC Part 15.247, Subpart C				
Section	Test Item	Limit	Frequency Range (MHz)	Result
15.247 (a)(1)(iii)	Average Time of Occupancy	0.4sec	2400-2483.5	PASS

6.2 TEST PROCEDURE

- The transmitter output (antenna port) was connected to the spectrum analyzer.
- Set RBW = 1MHz/VBW = 3MHz.
- Use a video trigger with the trigger level set to enable triggering only on full pulses.
- Sweep Time is more than once pulse time.
Set the center frequency on any frequency would be measure and set the frequency span to zero span.
- Measure the maximum time duration of one single pulse.
- Set the EUT for DH5, DH3 and DH1 packet transmitting.
- Measure the maximum time duration of one single pulse.
- DH5 Packet permit maximum $1600 / 79 / 6 = 3.37$ hops per second in each channel (5 time slots RX, 1 time slot TX). So the dwell time is the time duration of the pulse times $3.37 \times 31.6 = 106.6$ within 31.6 seconds.
- DH3 Packet permit maximum $1600 / 79 / 4 = 5.06$ hops per second in each channel (3 time slots RX, 1 time slot TX). So the dwell time is the time duration of the pulse times $5.06 \times 31.6 = 160$ within 31.6 seconds.
- DH1 Packet permit maximum $1600 / 79 / 2 = 10.12$ hops per second in each channel (1 time slot RX, 1 time slot TX). So the dwell time is the time duration of the pulse times $10.12 \times 31.6 = 320$ within 31.6 seconds.

6.3 TEST SETUP



6.4 EUT OPERATION CONDITIONS

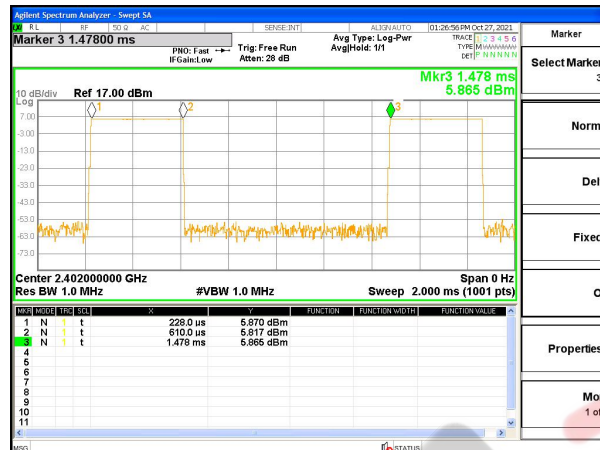
Please refer to section 3.1.4 of this report.

6.5 TEST RESULTS

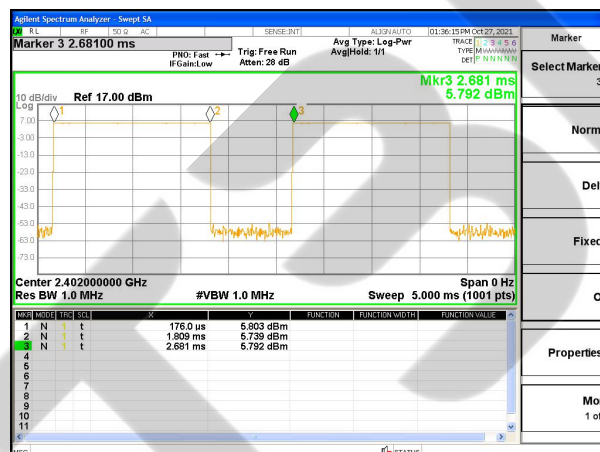
Temperature:	25℃	Relative Humidity:	50%
Test Mode:	GFSK(1Mbps)-DH1/DH3/DH5	Test Voltage:	AC 120V

Data Packet	Channel	pulse time(ms)	Dwell Time(s)	Limits(s)
DH1	Low	0.382	0.041	0.4
DH3	Low	1.714	0.183	0.4
DH5	Low	2.889	0.308	0.4

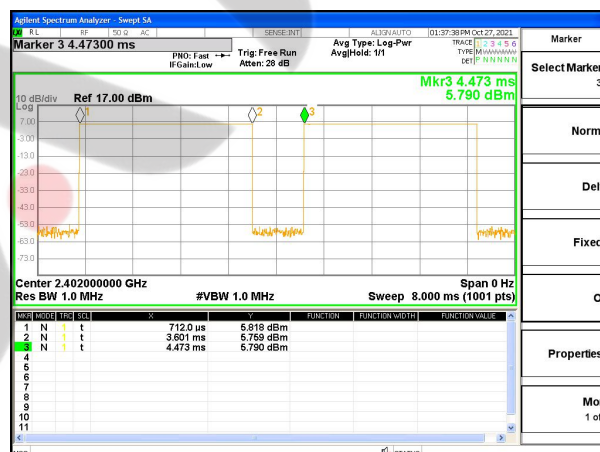
CH00-DH1



CH00-DH3



CH00-DH5

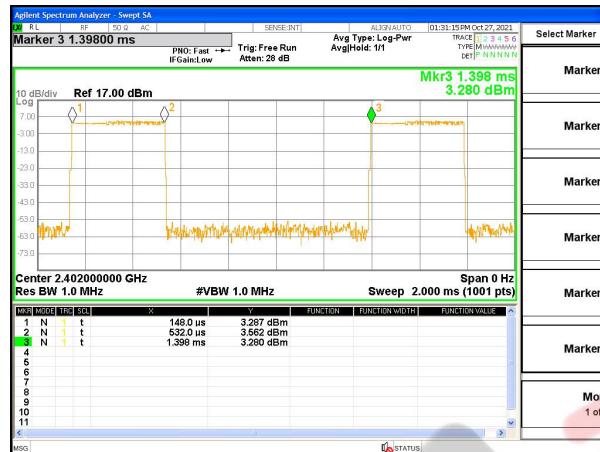


Temperature:	25℃	Relative Humidity:	50%
Test Mode:	$\pi/4$ -DQPSK(2Mbps)– 2DH1/2DH3/2DH5	Test Voltage:	AC 120V

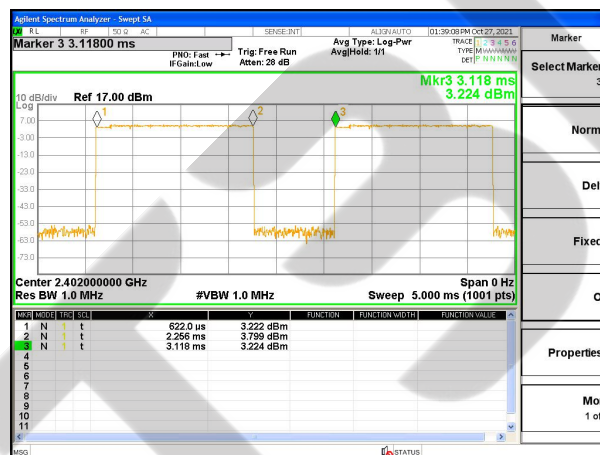
Data Packet	Channel	pulse time(ms)	Dwell Time(s)	Limits(s)
2DH1	Low	0.384	0.041	0.4
2DH3	Low	1.634	0.174	0.4
2DH5	Low	2.882	0.307	0.4



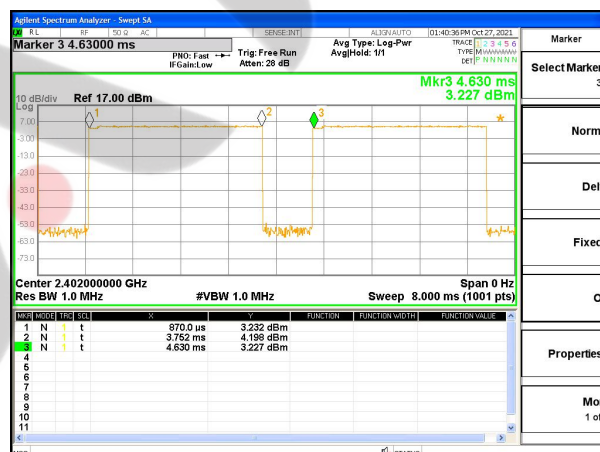
CH00-2DH1



CH00-2DH3



CH00-2DH5

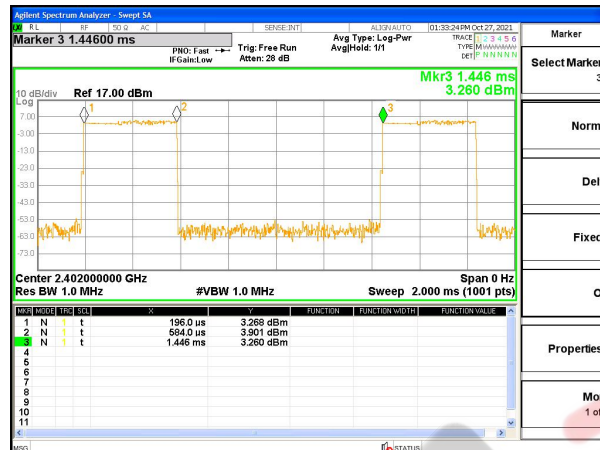


Temperature:	25℃	Relative Humidity:	50%
Test Mode:	8DPSK(3Mbps)– 3DH1/3DH3/3DH5	Test Voltage:	AC 120V

Data Packet	Channel	pulse time(ms)	Dwell Time(s)	Limits(s)
3DH1	Low	0.388	0.041	0.4
3DH3	Low	1.642	0.175	0.4
3DH5	Low	2.868	0.306	0.4



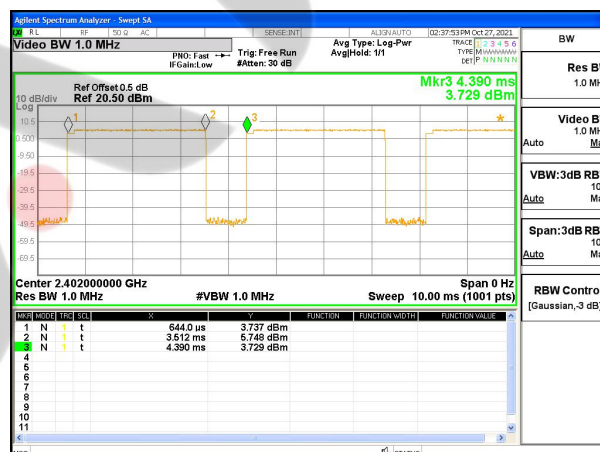
CH00-3DH1



CH00-3DH3



CH00-3DH5



7. HOPPING CHANNEL SEPARATION MEASUREMENT

7.1 LIMIT

Frequency hopping systems shall have hopping channel carrier frequencies separated by a minimum of 25 kHz or the 20 dB 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.

Spectrum Parameter	Setting
Attenuation	Auto
Span Frequency	> 20 dB Bandwidth or Channel Separation
RB	30 kHz (20dB Bandwidth) / 30 kHz (Channel Separation)
VB	100 kHz (20dB Bandwidth) / 100 kHz (Channel Separation)
Detector	Peak
Trace	Max Hold
Sweep Time	Auto

7.2 TEST PROCEDURE

- The transmitter output (antenna port) was connected to the spectrum analyser in peak hold mode.
- The resolution bandwidth of 30 kHz and the video bandwidth of 100 kHz were utilised for 20 dB bandwidth measurement.
- The resolution bandwidth of 30 kHz and the video bandwidth of 100 kHz were utilised for channel separation measurement.

7.3 TEST SETUP



7.4 EUT OPERATION CONDITIONS

The EUT was programmed to be in continuously transmitting mode.

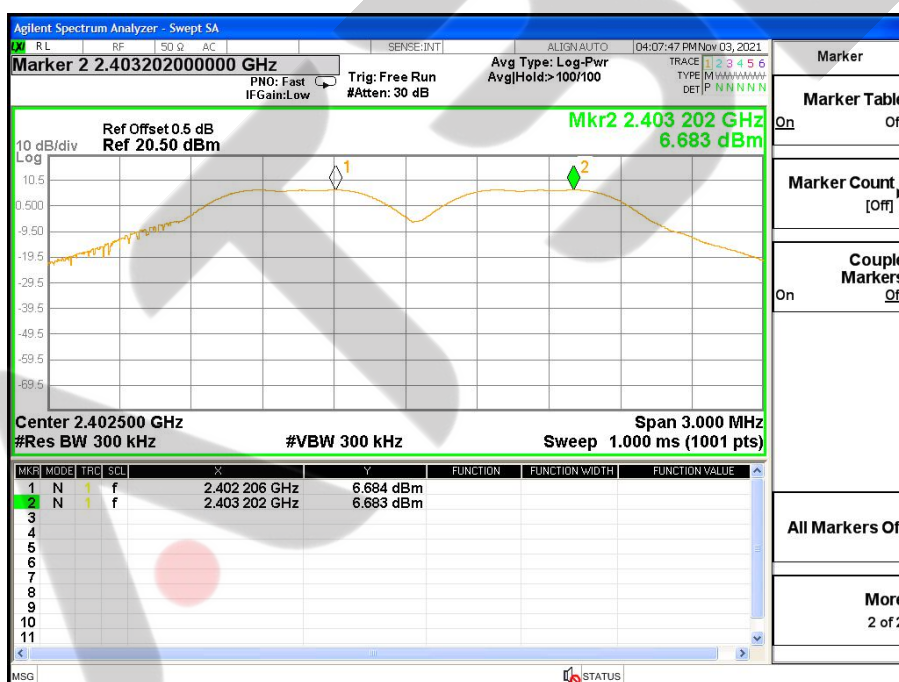
7.5 TEST RESULTS

Temperature:	25°C	Relative Humidity:	50%
Test Mode:	CH00 / CH39 / CH78 (GFSK(1Mbps) Mode)	Test Voltage:	AC 120V

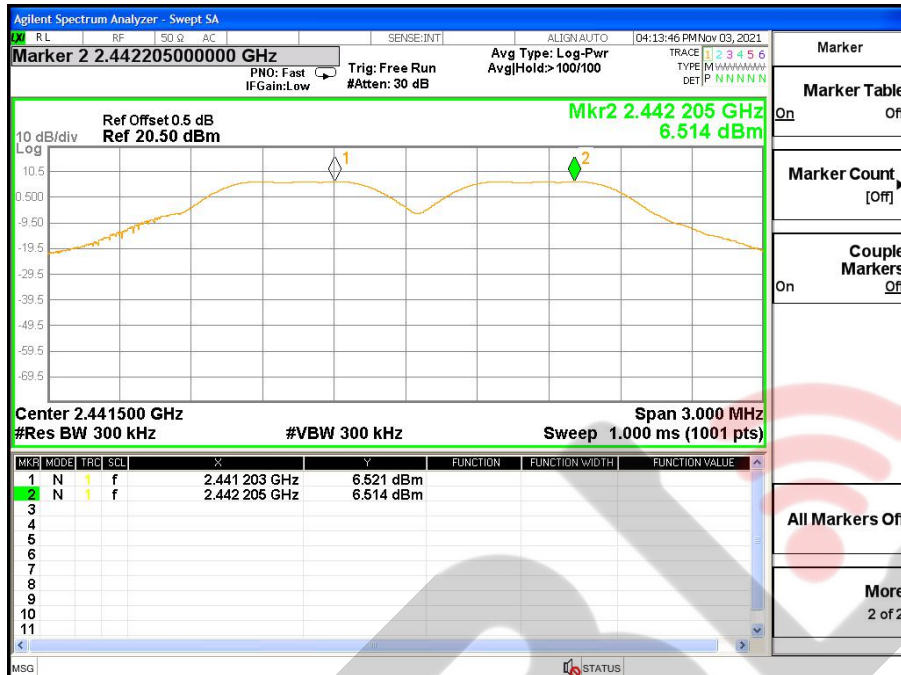
Frequency	Mark1 Frequency (MHz)	Mark2 Frequency (MHz)	Ch. Separation (MHz)	Limit (MHz)	Result
2402 MHz	2402.206	2403.202	0.996	0.651	Complies
2441 MHz	2441.203	2442.205	1.002	0.680	Complies
2480 MHz	2479.215	2480.220	1.005	0.682	Complies

For GFSK: Ch. Separation Limits: > 20dB bandwidth

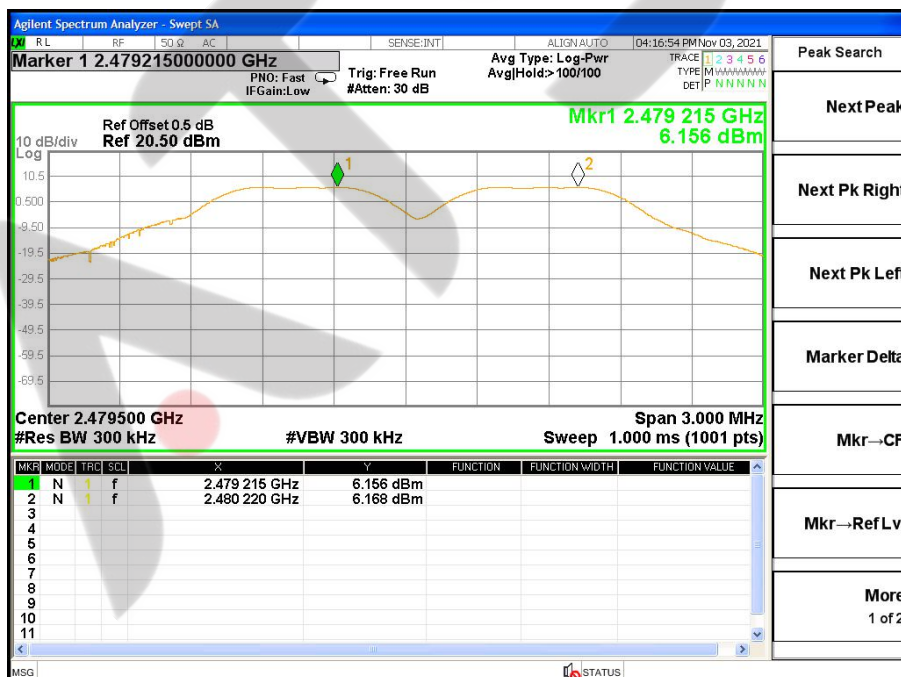
CH00 -1Mbps



CH39 -1Mbps



CH78 -1Mbps

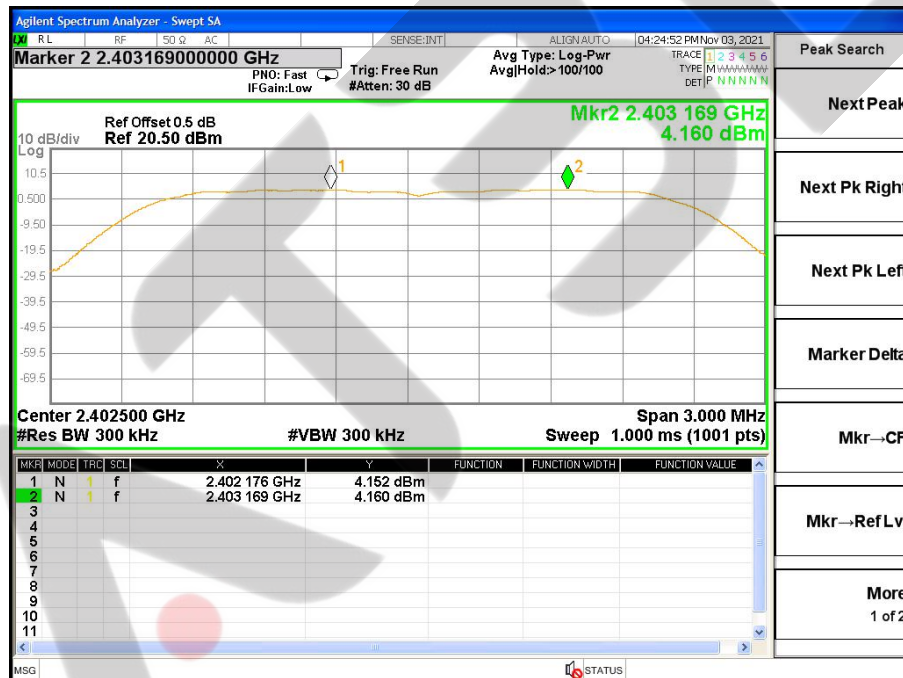


Temperature:	25°C	Relative Humidity:	50%
Test Mode:	CH00 / CH39 /CH78 ($\pi/4$ -DQPSK(2Mbps) Mode)	Test Voltage:	AC 120V

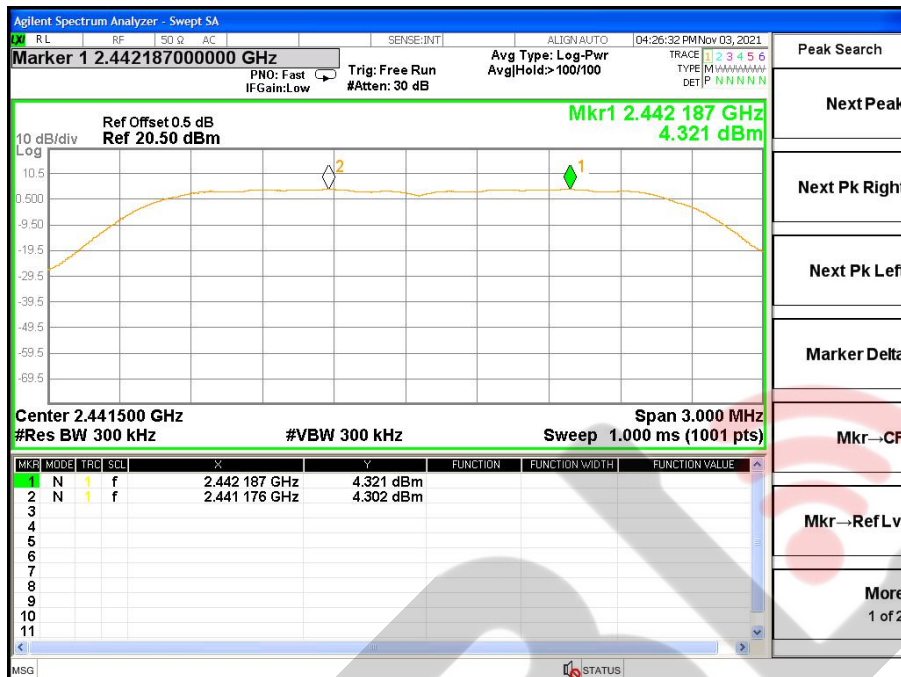
Frequency	Mark1 Frequency (MHz)	Mark2 Frequency (MHz)	Ch. Separation (MHz)	Limit (MHz)	Result
2402 MHz	2402.176	2403.169	0.993	0.909	Complies
2441 MHz	2441.176	2442.187	1.011	0.909	Complies
2480 MHz	2479.173	2480.184	1.011	0.910	Complies

For $\pi/4$ -DQPSK(2Mbps): Ch. Separation Limits: > two-thirds 20dB bandwidth

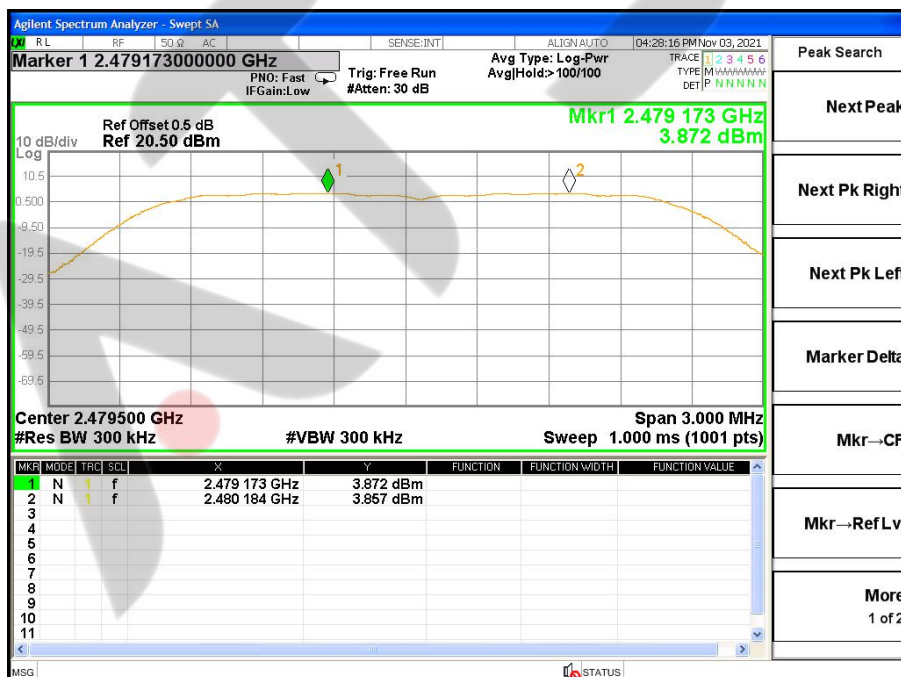
CH00 -2Mbps



CH39 -2Mbps



CH78 -2Mbps

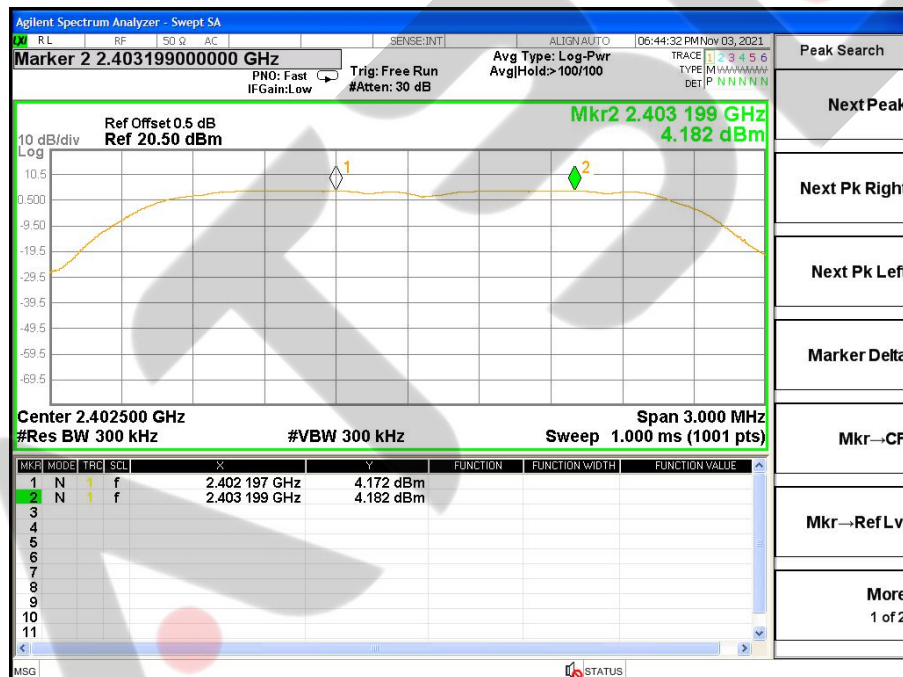


Temperature:	25℃	Relative Humidity:	50%
Test Mode:	CH00 / CH39 /CH78 (8DPSK(3Mbps)Mode)	Test Voltage:	AC 120V

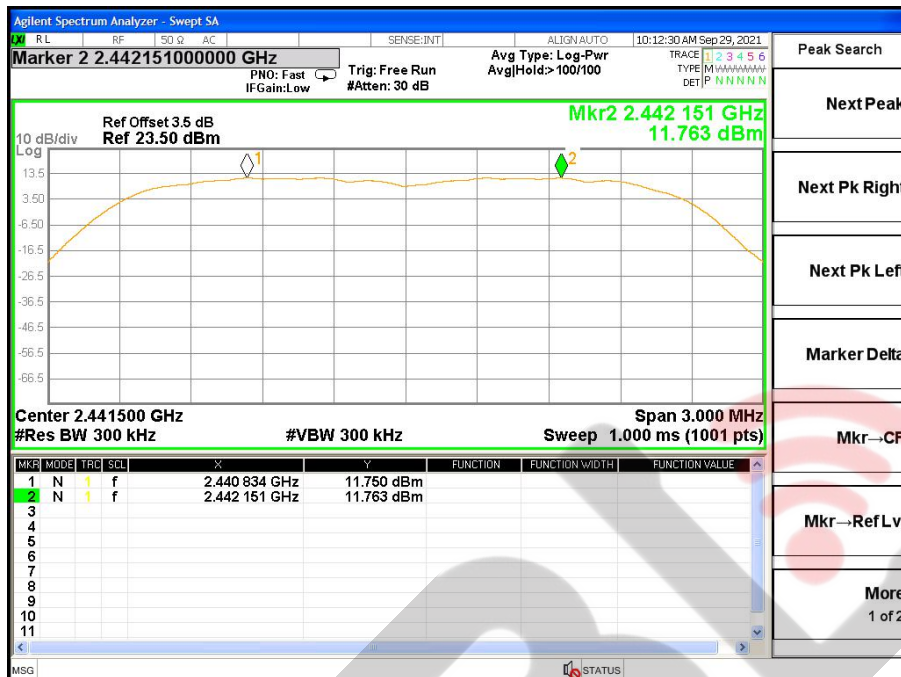
Frequency	Mark1 Frequency (MHz)	Mark2 Frequency (MHz)	Ch. Separation (MHz)	Limit (MHz)	Result
2402 MHz	2402.197	2403.199	1.002	0.890	Complies
2441 MHz	2440.834	2442.151	1.317	0.892	Complies
2480 MHz	2478.882	2479.890	1.008	0.889	Complies

For 8DPSK(3Mbps):Ch. Separation Limits: > two-thirds 20dB bandwidth

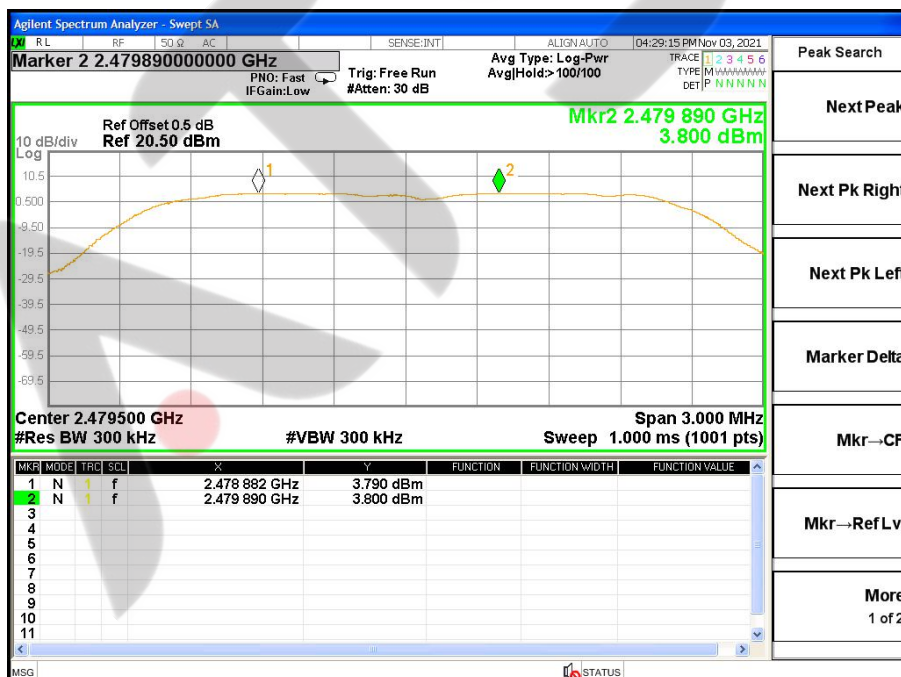
CH00 -3Mbps



CH39 -3Mbps



CH78 -3Mbps



8. BANDWIDTH TEST

8.1 LIMIT

FCC Part15 15.247,Subpart C				
Section	Test Item	Limit	FrequencyRange (MHz)	Result
15.247(a)(1)	Bandwidth	N/A	2400-2483.5	PASS

Spectrum Parameter	Setting
Attenuation	Auto
Span Frequency	> Measurement Bandwidth or Channel Separation
RB	30 kHz (20dB Bandwidth) / 30 kHz (Channel Separation)
VB	100 kHz (20dB Bandwidth) / 100 kHz (Channel Separation)
Detector	Peak
Trace	Max Hold
Sweep Time	Auto

8.2 TEST PROCEDURE

- The EUT was directly connected to the spectrum analyzer and antenna output port as show in the block diagram below.
- Spectrum Setting: RBW= 30KHz, VBW=100KHz, Sweep time = Auto.

8.3 TEST SETUP



8.4 EUT OPERATION CONDITIONS

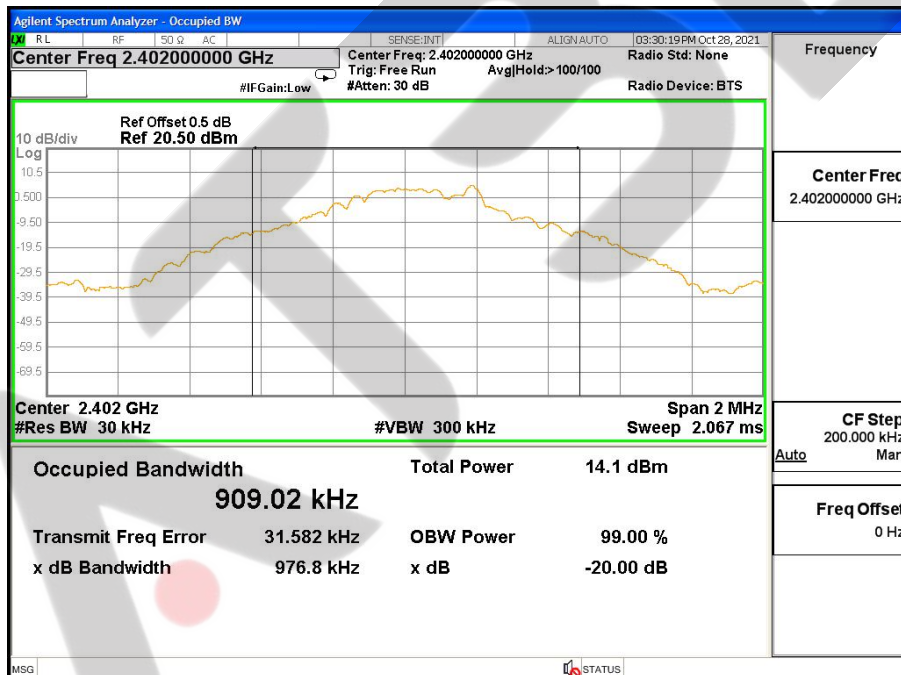
Please refer to section 3.1.4 of this report.

8.5 TEST RESULTS

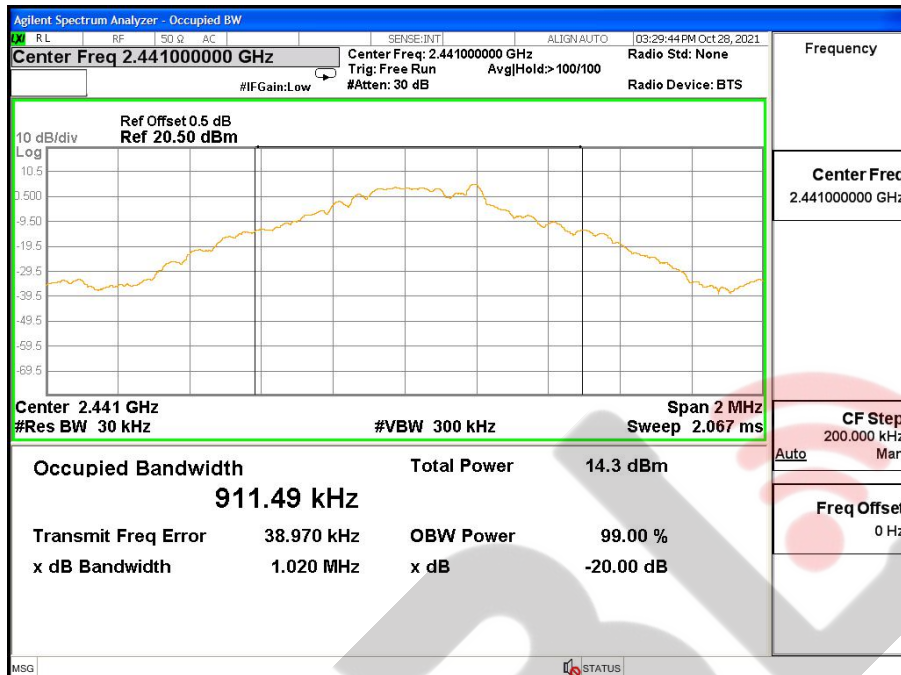
Temperature:	25°C	Relative Humidity:	50%
Test Mode:	GFSK(1Mbps) CH00 / CH39 /CH78	Test Voltage:	AC 120V

Frequency	20dB Bandwidth (MHz)	Result
2402 MHz	0.977	PASS
2441 MHz	1.020	PASS
2480 MHz	1.023	PASS

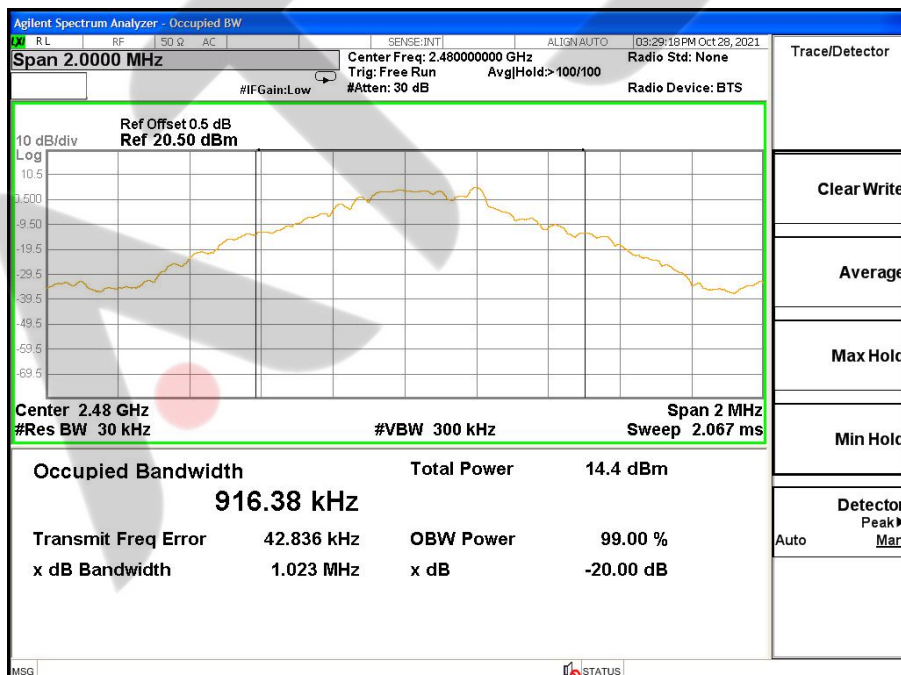
CH00 -1Mbps



CH39 -1Mbps



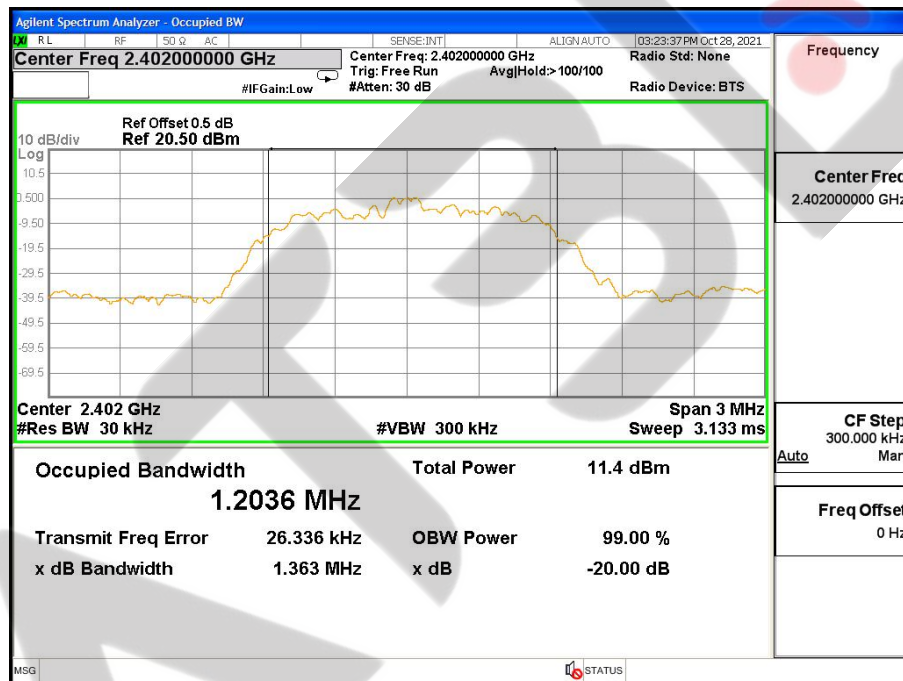
CH78 -1Mbps



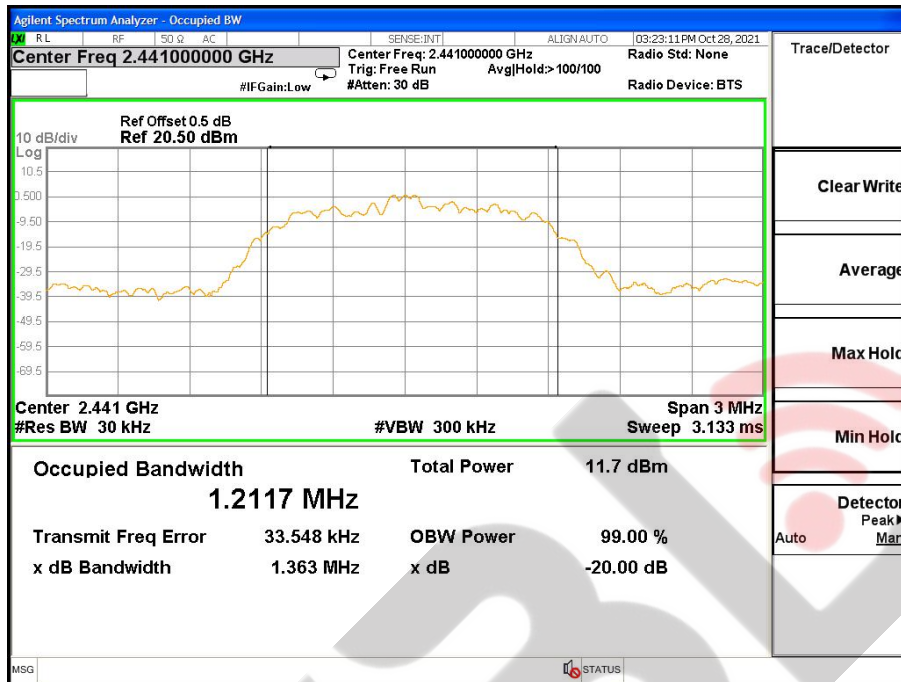
Temperature:	25°C	Relative Humidity:	50%
Test Mode:	$\pi/4$ -DQPSK(2Mbps) CH00 / CH39 / CH78	Test Voltage:	AC 120V

Frequency	20dB Bandwidth (MHz)	Result
2402 MHz	1.363	PASS
2441 MHz	1.363	PASS
2480 MHz	1.365	PASS

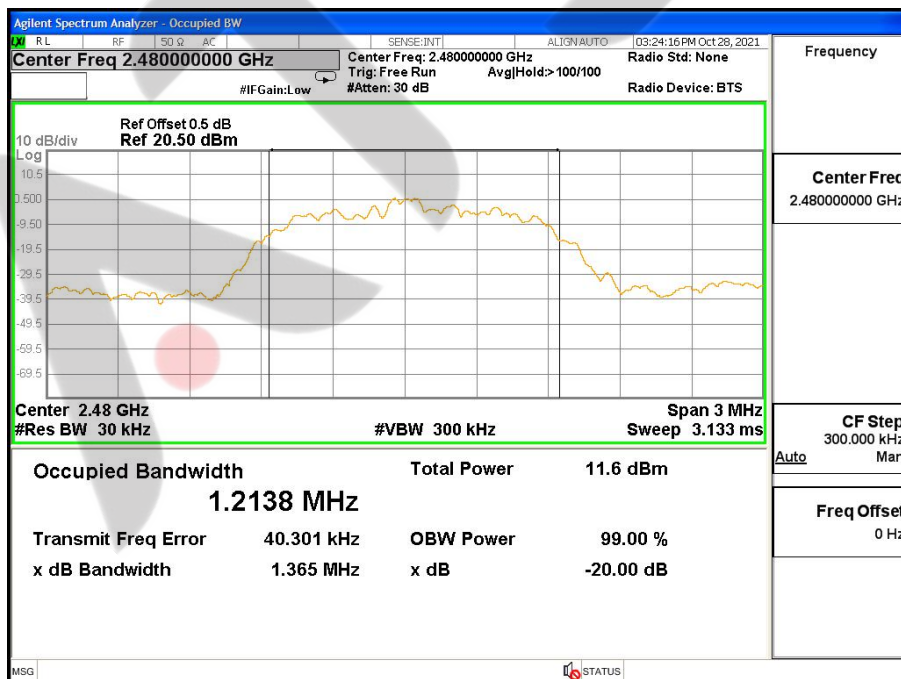
CH00 -2Mbps



CH39 -2Mbps



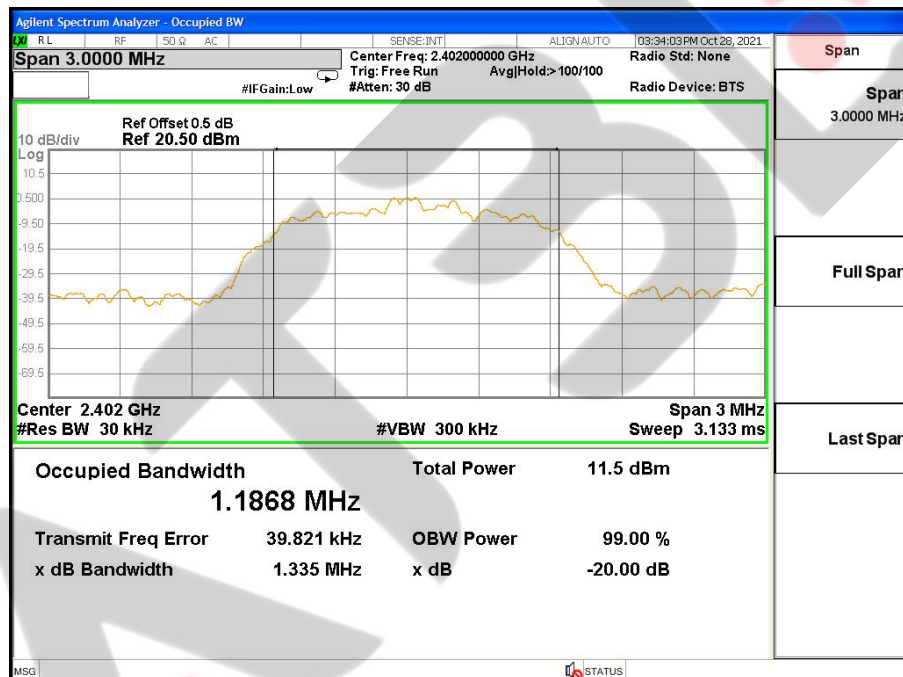
CH78 -2Mbps



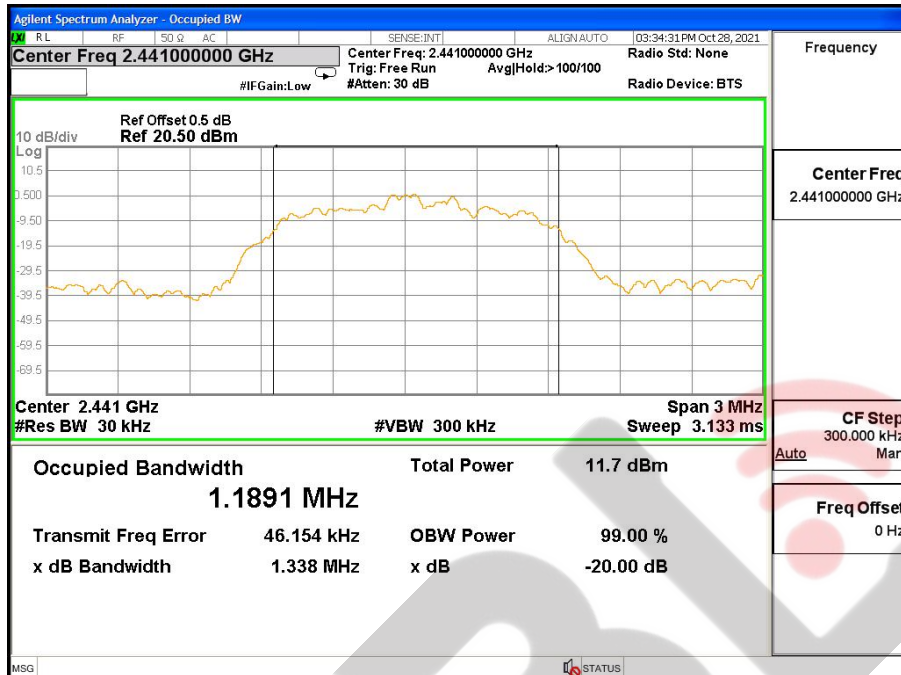
Temperature:	25°C	Relative Humidity:	50%
Test Mode:	8DPSK(3Mbps) CH00 / CH39 / CH78	Test Voltage:	AC 120V

Frequency	20dB Bandwidth (MHz)	Result
2402 MHz	1.335	PASS
2441 MHz	1.338	PASS
2480 MHz	1.334	PASS

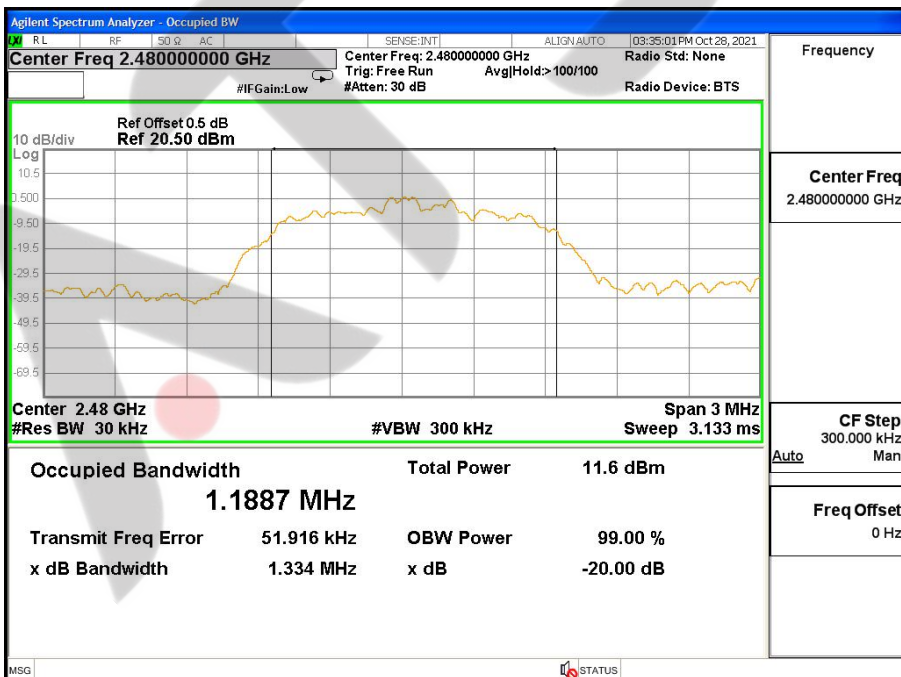
CH00 -3Mbps



CH39 -3Mbps



CH78 -3Mbps



9. OUTPUT POWER TEST

9.1 LIMIT

FCC Part 15.247				
Section	Test Item	Limit	FrequencyRange (MHz)	Result
15.247 (a)(1)&(b)(1)	Output Power	1 W or 0.125W	2400-2483.5	PASS
		if channel separation > 2/3 bandwidth provided the systems operate with an output power no greater than 125 mW (20.97dBm)		

9.2 TEST PROCEDURE

This is an RF-conducted test to evaluate maximum peak output power. Use a direct connection between the antenna port of the unlicensed wireless device and the spectrum analyzer, through suitable attenuation. The hopping shall be disabled for this test:

a) Use the following spectrum analyzer settings:

- 1) Span: Approximately five times the 20 dB bandwidth, centered on a hopping channel.
- 2) RBW > 20 dB bandwidth of the emission being measured.
- 3) VBW ≥ RBW.
- 4) Sweep: Auto.
- 5) Detector function: Peak.
- 6) Trace: Max hold.

b) Allow trace to stabilize.

c) Use the marker-to-peak function to set the marker to the peak of the emission.

d) The indicated level is the peak output power, after any corrections for external attenuators and cables.

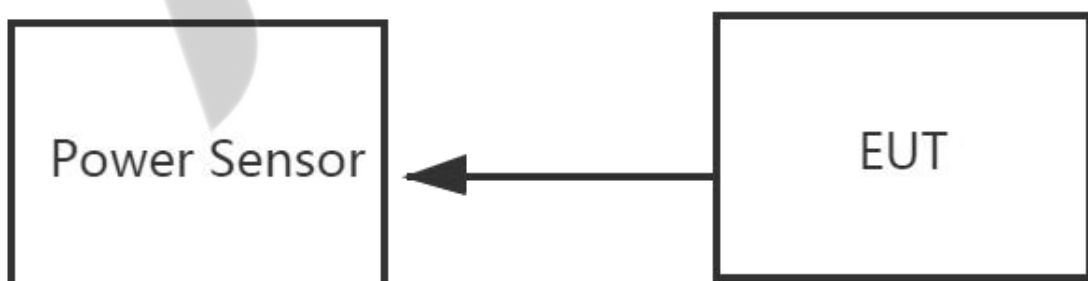
e) A plot of the test results and setup description shall be included in the test report.

NOTE—A peak responding power meter may be used, where the power meter and sensor system video bandwidth is greater than the occupied bandwidth of the unlicensed wireless device, rather than a spectrum analyzer.

PKPM1 Peak power meter method:

The maximum peak conducted output power may be measured using a broadband peak RF power meter. The power meter shall have a video bandwidth that is greater than or equal to the DSS bandwidth and shall use a fast-responding diode detector.

9.3 TEST SETUP



9.4 EUT OPERATION CONDITIONS

Please refer to section 3.1.4 of this report.

9.5 TEST RESULTS

Temperature:	25℃	Relative Humidity:	60%
Test Voltage:	AC 120V		

Mode	Channel Number	Frequency (MHz)	Peak Power	Average Power	Limit
			(dBm)	(dBm)	(dBm)
GFSK(1M)	0	2402	6.46	6.25	30.00
	39	2441	6.86	6.26	30.00
	78	2480	6.89	6.61	30.00

Note:the channel separation >20dB bandwidth

Mode	Channel Number	Frequency (MHz)	Peak Power	Average Power	Limit
			(dBm)	(dBm)	(dBm)
$\pi/4$ -DQPSK(2M)	0	2402	5.81	4.05	20.97
	39	2441	5.91	4.11	20.97
	78	2480	5.96	4.13	20.97

Note:the channel separation >2/3 20dB bandwidth

Mode	Channel Number	Frequency (MHz)	Peak Power	Average Power	Limit
			(dBm)	(dBm)	(dBm)
8-DPSK(3M)	0	2402	6.02	4.13	20.97
	39	2441	6.08	4.26	20.97
	78	2480	6.18	4.37	20.97

Note:the channel separation >2/3 20dB bandwidth

10. ANTENNA REQUIREMENT

10.1 STANDARD REQUIREMENT

15.203 requirement: For intentional device, according to 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.

10.2 EUT ANTENNA

The EUT antenna is FPC Antenna. It comply with the standard requirement.



APPENDIX-PHOTOS OF TEST SETUP

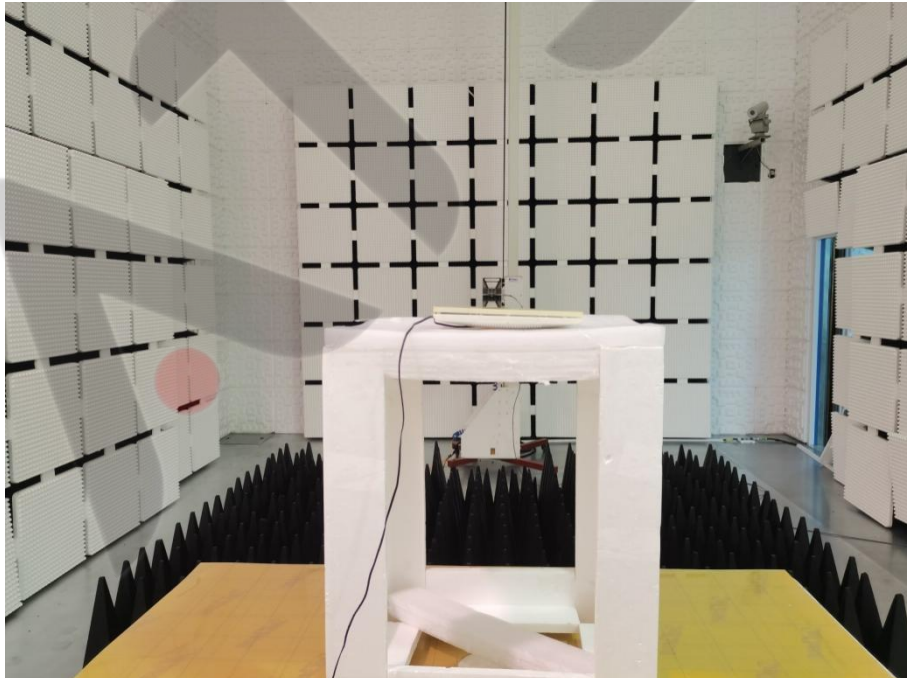
Note: See test photos in setup photo document for the actual connections between Product and support equipment.

Radiated Photos

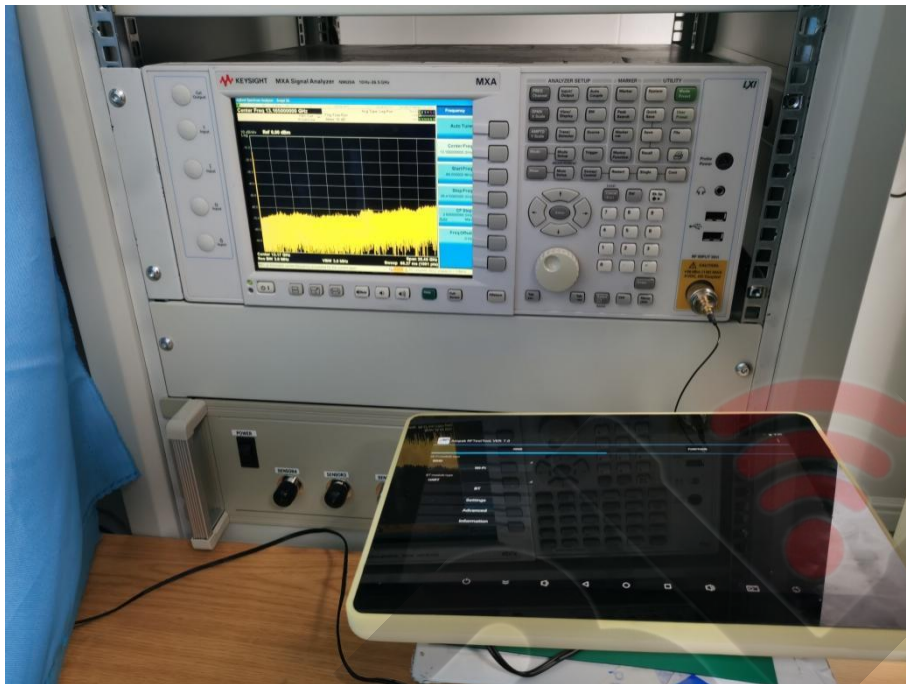
30MHz-1000MHz



1GHz-18GHz



Conducted Photos



*****END OF THE REPORT*****