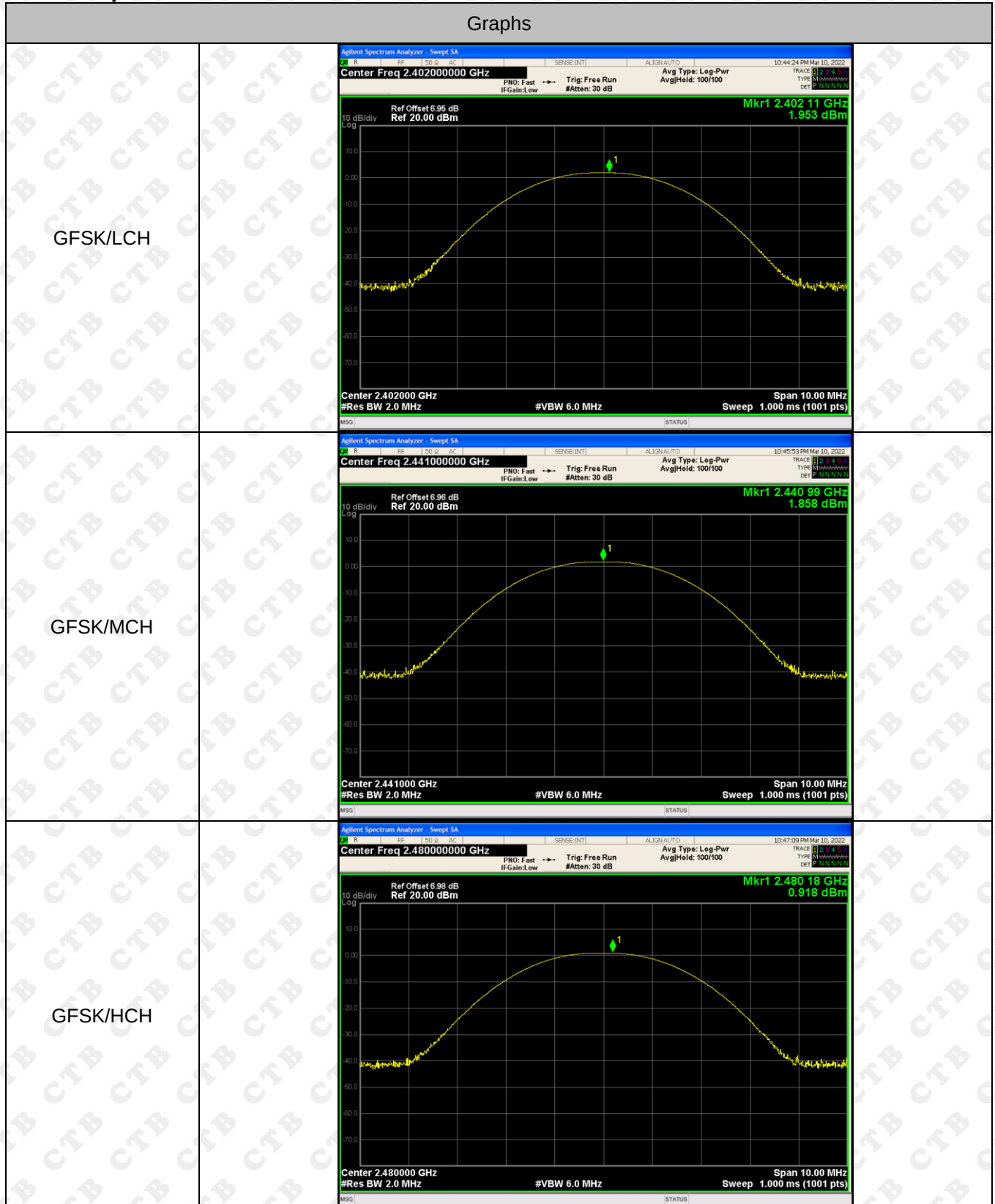
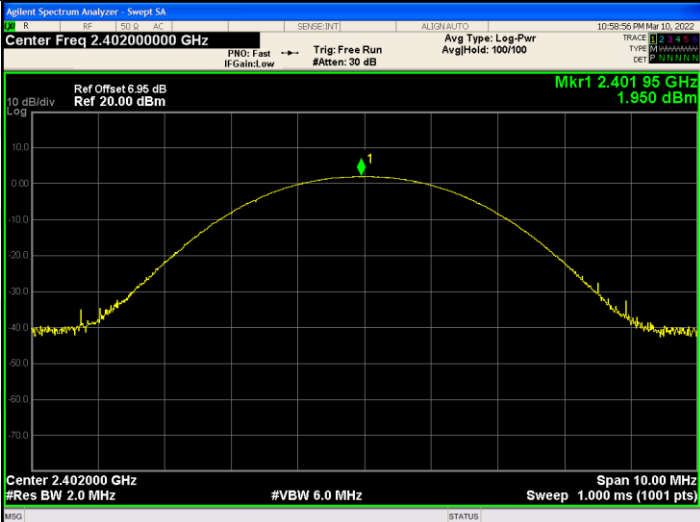
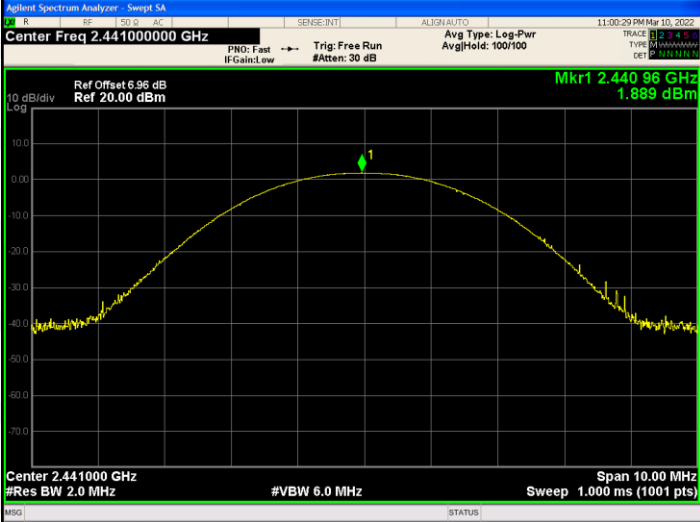
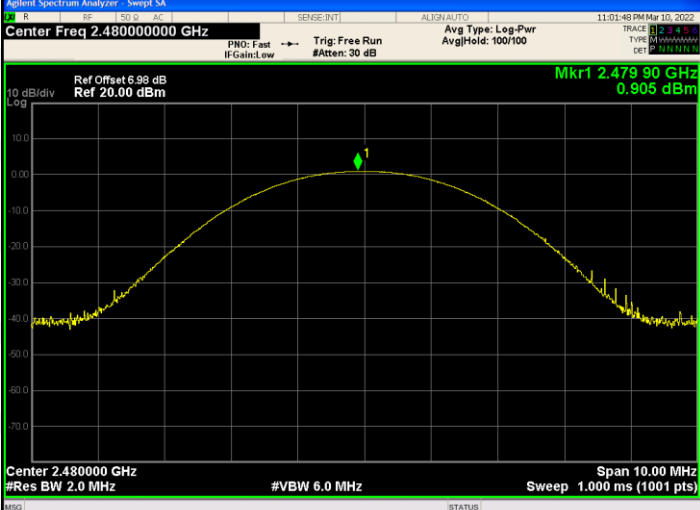


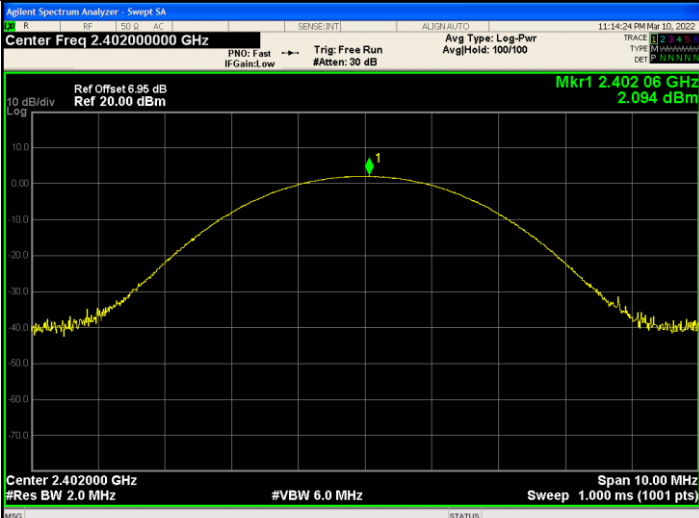
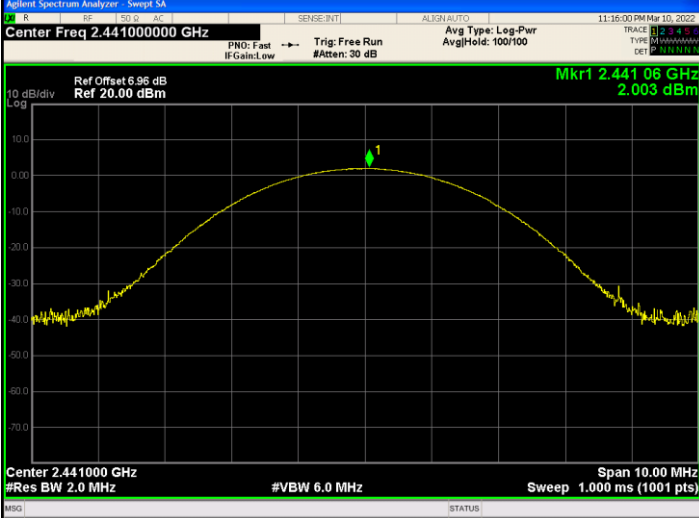
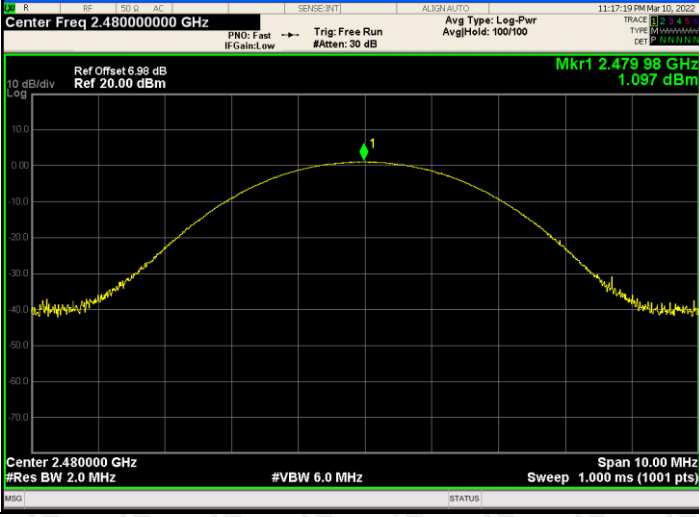
9.4 Test Result

Mode	Channel.	Maximum Peak Output Power [dBm]	Verdict
EDR mode (GFSK)	LCH	1.953	PASS
	MCH	1.858	PASS
	HCH	0.918	PASS
EDR mode ($\pi/4$ DQPSK)	LCH	1.95	PASS
	MCH	1.889	PASS
	HCH	0.905	PASS
EDR mode (8DPSK)	LCH	2.094	PASS
	MCH	2.003	PASS
	HCH	1.097	PASS

Test Graph:

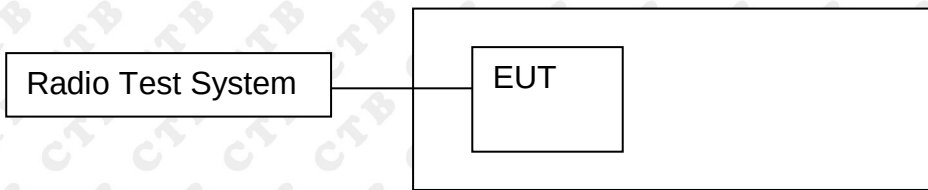


$\pi/4$ DQPSK/LCH	 Agilent Spectrum Analyzer - Sweep SA Center Freq 2.40200000 GHz Ref Offset 6.95 dB Ref 20.00 dBm Mkr1 2.401 95 GHz 1.950 dBm Center 2.402000 GHz #Res BW 2.0 MHz #VBW 6.0 MHz Span 10.00 MHz Sweep 1.000 ms (1001 pts)
$\pi/4$ DQPSK/MCH	 Agilent Spectrum Analyzer - Sweep SA Center Freq 2.44100000 GHz Ref Offset 6.95 dB Ref 20.00 dBm Mkr1 2.440 96 GHz 1.889 dBm Center 2.441000 GHz #Res BW 2.0 MHz #VBW 6.0 MHz Span 10.00 MHz Sweep 1.000 ms (1001 pts)
$\pi/4$ DQPSK/HCH	 Agilent Spectrum Analyzer - Sweep SA Center Freq 2.48000000 GHz Ref Offset 6.98 dB Ref 20.00 dBm Mkr1 2.479 90 GHz 0.905 dBm Center 2.480000 GHz #Res BW 2.0 MHz #VBW 6.0 MHz Span 10.00 MHz Sweep 1.000 ms (1001 pts)

8DPSK/LCH	 Agilent Spectrum Analyzer - Sweep SA Center Freq 2.40200000 GHz #Res BW 2.0 MHz #VBW 6.0 MHz Span 10.00 MHz Sweep 1.000 ms (1001 pts) Ref Offset 6.96 dB Ref 20.00 dBm Mkr1 2.40206 GHz 2.094 dBm
8DPSK /MCH	 Agilent Spectrum Analyzer - Sweep SA Center Freq 2.44100000 GHz #Res BW 2.0 MHz #VBW 6.0 MHz Span 10.00 MHz Sweep 1.000 ms (1001 pts) Ref Offset 6.96 dB Ref 20.00 dBm Mkr1 2.44106 GHz 2.003 dBm
8DPSK /HCH	 Agilent Spectrum Analyzer - Sweep SA Center Freq 2.48000000 GHz #Res BW 2.0 MHz #VBW 6.0 MHz Span 10.00 MHz Sweep 1.000 ms (1001 pts) Ref Offset 6.96 dB Ref 20.00 dBm Mkr1 2.47998 GHz 1.097 dBm

10. 20DB OCCUPIED BANDWIDTH

10.1 Block Diagram Of Test Setup



10.2 Limit

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

10.3 Test procedure

1. Rem1. Set RBW = 30 kHz.
2. Set the video bandwidth (VBW) $\geq 3 \times$ RBW.
3. Detector = Peak.
4. Trace mode = max hold.
5. Sweep = auto couple.
6. Allow the trace to stabilize.
7. Measure the maximum width of the emission that is constrained by the frequencies associated with the two outermost amplitude points (upper and lower frequencies) that are attenuated by 6 dB relative to the maximum level measured in the fundamental emission.

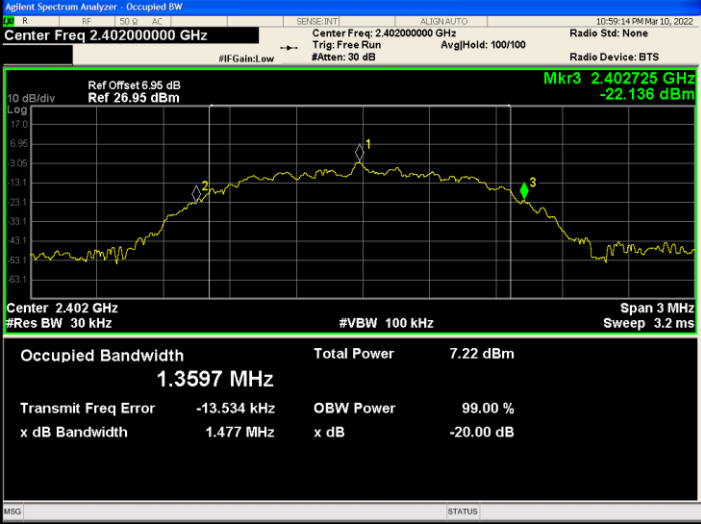
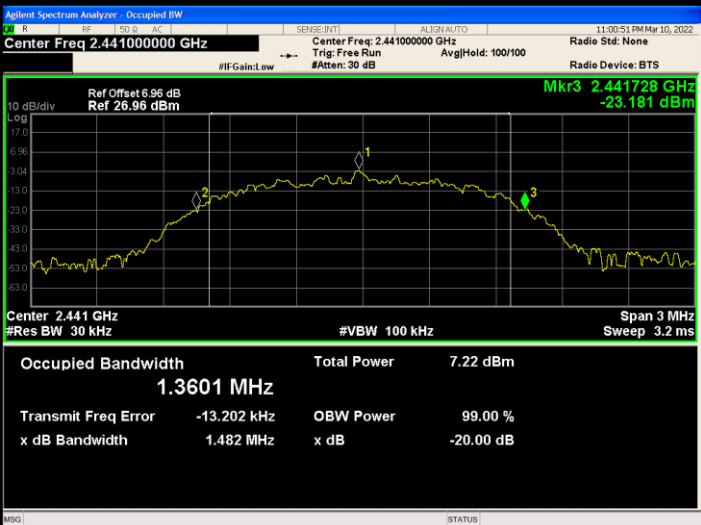
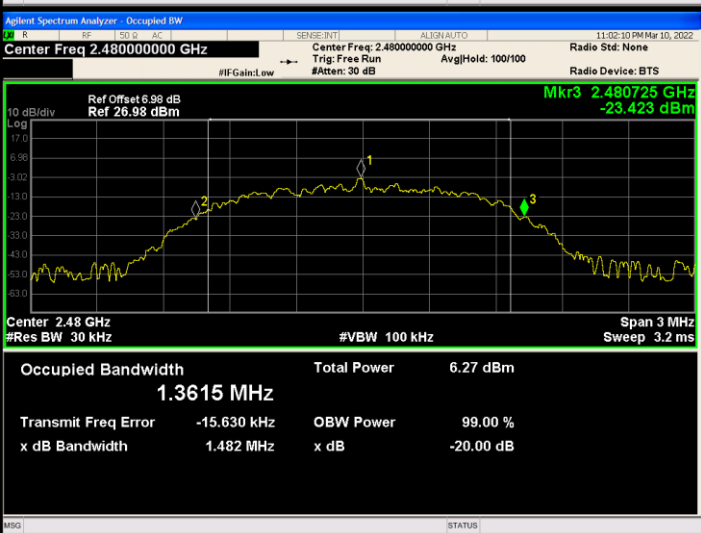
10.4 Test Result

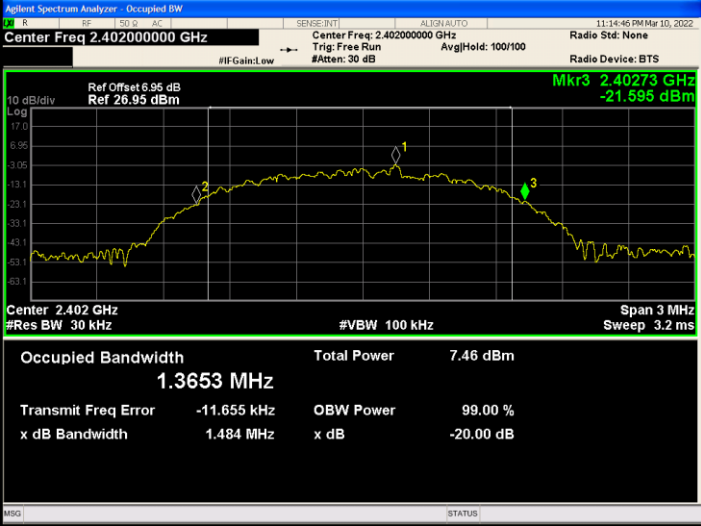
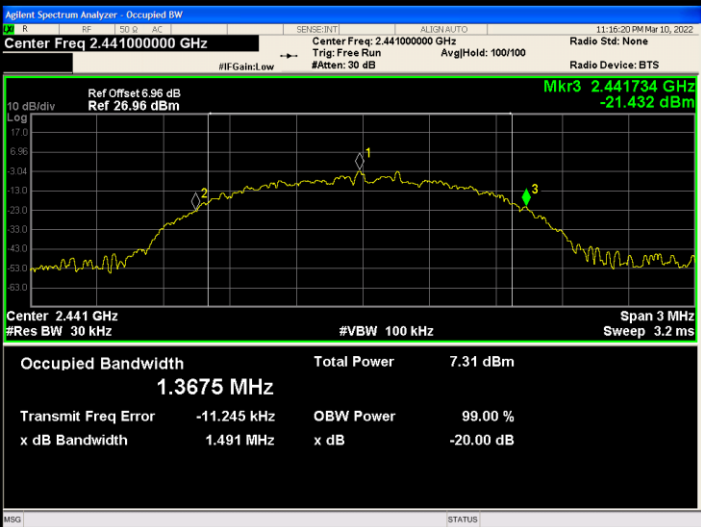
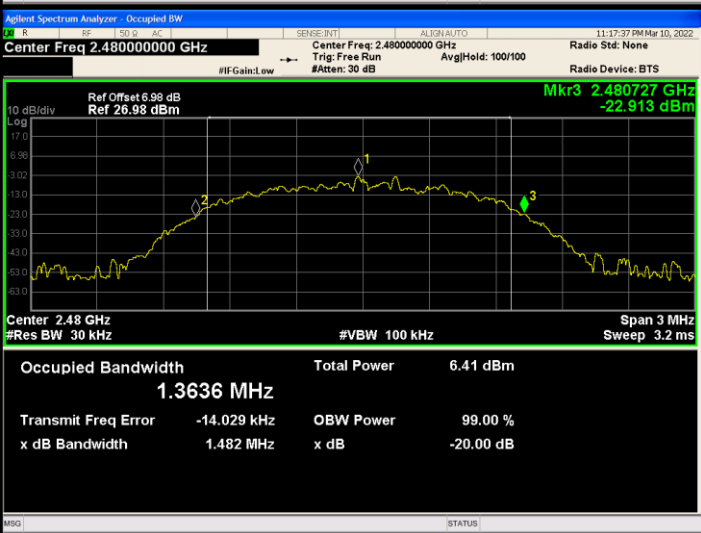
Test Mode	Frequency	20dB Bandwidth (MHz)	Result
GFSK	Low channel	0.912	PASS
	Mid channel	0.94	PASS
	High channel	0.932	PASS
$\pi/4$ DQPSK	Low channel	1.477	PASS
	Mid channel	1.482	PASS
	High channel	1.482	PASS
8DPSK	Low channel	1.484	PASS
	Mid channel	1.491	PASS
	High channel	1.482	PASS

Note: All modes of operation were Pre-scan and the worst-case emissions are reported.

Test Graph:

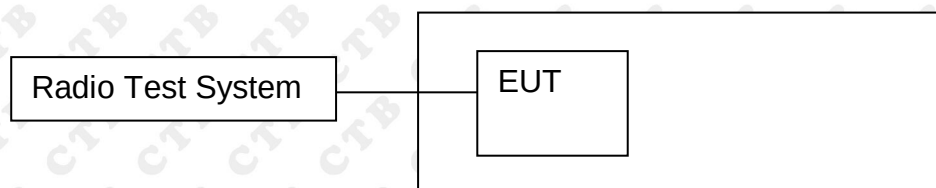
GFSK Low channel	Agilent Spectrum Analyzer - Occupied BW Center Freq: 2.40200000 GHz Trig: Free Run #Att: 30 dB Avg/Hold: 100/100 Radio Std: None Radio Device: BTS Ref Offset: 6.95 dB Ref: 26.95 dBm Mkr3: 2.402443 GHz -20.099 dBm Center: 2.402 GHz #Res BW: 30 kHz #VBW: 100 kHz Span: 3 MHz Sweep: 3.2 ms Occupied Bandwidth: 844.78 kHz Total Power: 8.38 dBm Transmit Freq Error: -12.485 kHz OBW Power: 99.00 % x dB Bandwidth: 911.7 kHz x dB: -20.00 dB
GFSK Mid channel	Agilent Spectrum Analyzer - Occupied BW Center Freq: 2.44100000 GHz Trig: Free Run #Att: 30 dB Avg/Hold: 100/100 Radio Std: None Radio Device: BTS Ref Offset: 6.95 dB Ref: 26.95 dBm Mkr3: 2.441459 GHz -21.059 dBm Center: 2.441 GHz #Res BW: 30 kHz #VBW: 100 kHz Span: 3 MHz Sweep: 3.2 ms Occupied Bandwidth: 860.26 kHz Total Power: 8.05 dBm Transmit Freq Error: -11.328 kHz OBW Power: 99.00 % x dB Bandwidth: 939.7 kHz x dB: -20.00 dB
GFSK High channel	Agilent Spectrum Analyzer - Occupied BW Center Freq: 2.48000000 GHz Trig: Free Run #Att: 30 dB Avg/Hold: 100/100 Radio Std: None Radio Device: BTS Ref Offset: 6.95 dB Ref: 26.95 dBm Mkr1: 2.479979 GHz -1.4310 dBm Center: 2.48 GHz #Res BW: 30 kHz #VBW: 100 kHz Span: 3 MHz Sweep: 3.2 ms Occupied Bandwidth: 855.74 kHz Total Power: 7.36 dBm Transmit Freq Error: -13.578 kHz OBW Power: 99.00 % x dB Bandwidth: 931.7 kHz x dB: -20.00 dB

$\pi/4$-DQPSK Low channel	 Agilent Spectrum Analyzer - Occupied BW Center Freq: 2.402000000 GHz Ref Offset: 6.95 dB Ref: 26.95 dBm Mkr3: 2.402725 GHz -22.136 dBm Center: 2.402 GHz #Res BW: 30 kHz #VBW: 100 kHz Span: 3 MHz Sweep: 3.2 ms Occupied Bandwidth: 1.3597 MHz Total Power: 7.22 dBm Transmit Freq Error: -13.534 kHz OBW Power: 99.00 % x dB Bandwidth: 1.477 MHz x dB: -20.00 dB
$\pi/4$-DQPSK Mid channel	 Agilent Spectrum Analyzer - Occupied BW Center Freq: 2.441000000 GHz Ref Offset: 6.96 dB Ref: 26.96 dBm Mkr3: 2.441728 GHz -23.181 dBm Center: 2.441 GHz #Res BW: 30 kHz #VBW: 100 kHz Span: 3 MHz Sweep: 3.2 ms Occupied Bandwidth: 1.3601 MHz Total Power: 7.22 dBm Transmit Freq Error: -13.202 kHz OBW Power: 99.00 % x dB Bandwidth: 1.482 MHz x dB: -20.00 dB
$\pi/4$-DQPSK High channel	 Agilent Spectrum Analyzer - Occupied BW Center Freq: 2.480000000 GHz Ref Offset: 6.98 dB Ref: 26.98 dBm Mkr3: 2.480725 GHz -23.423 dBm Center: 2.48 GHz #Res BW: 30 kHz #VBW: 100 kHz Span: 3 MHz Sweep: 3.2 ms Occupied Bandwidth: 1.3615 MHz Total Power: 6.27 dBm Transmit Freq Error: -15.630 kHz OBW Power: 99.00 % x dB Bandwidth: 1.482 MHz x dB: -20.00 dB

8DPSK Low channel		
8DPSK Mid channel		
8DPSK High channel		

11. CARRIER FREQUENCIES SEPARATION

11.1 Block Diagram Of Test Setup



11.2 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 0.125W.

11.3 Test procedure

1. Remove the antenna from the EUT and then connect a low RF cable from the antenna port to the spectrum.
2. Set the spectrum analyzer: RBW = 30kHz. VBW = 100kHz , Span = 2MHz. Sweep = auto; Detector Function = Peak. Trace = Max hold.
3. Allow the trace to stabilize. Use the marker-delta function to determine the separation between the peaks of the adjacent channels. The limit is specified in one of the subparagraphs of this Section Submit this plot.

11.4 Test Result

Mode	Channel.	Carrier Frequency Separation [MHz]	Verdict
GFSK	LCH	1.000	PASS
GFSK	MCH	1.002	PASS
GFSK	HCH	1.002	PASS
$\pi/4$ DQPSK	LCH	1.000	PASS
$\pi/4$ DQPSK	MCH	1.000	PASS
$\pi/4$ DQPSK	HCH	1.000	PASS
8DPSK	LCH	1.000	PASS
8DPSK	MCH	1.000	PASS
8DPSK	HCH	1.000	PASS

Test Graph

Graphs

GFSK/LCH



GFSK/MCH

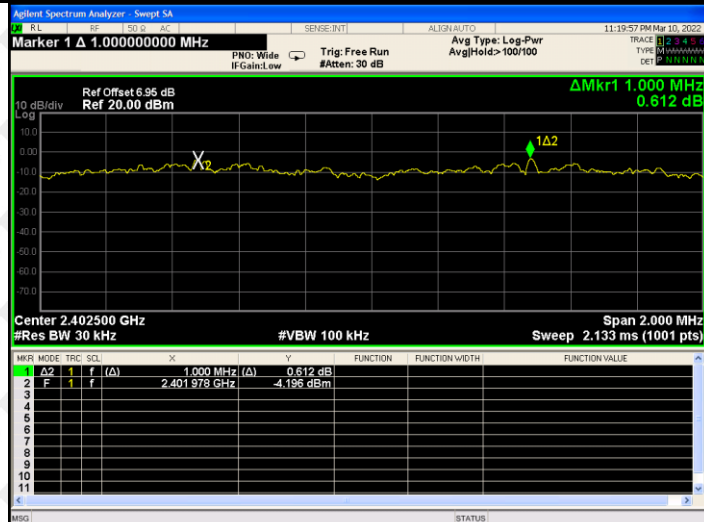


GFSK/HCH

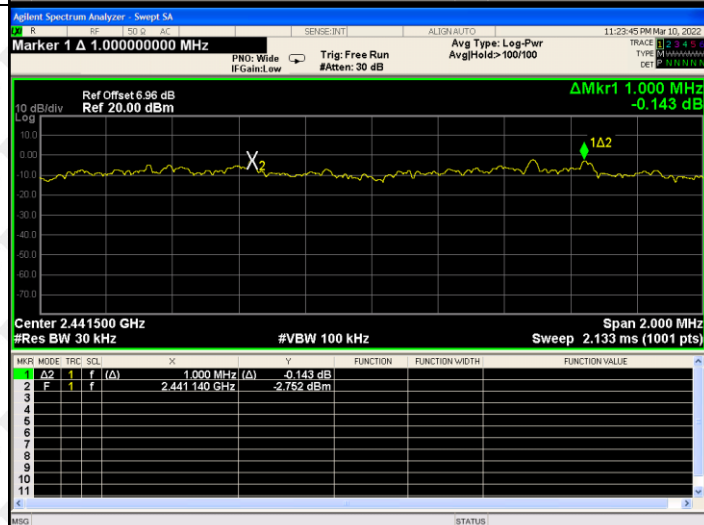


$\pi/4$ DQPSK/LCH	Agilent Spectrum Analyzer - Sweep SA Marker 1 Δ 1.000000000 MHz Ref Offset 6.96 dB Ref 20.00 dBm ΔMkr1 1.000 MHz -0.263 dB Center 2.402500 GHz #Res BW 30 kHz #VBW 100 kHz Span 2.000 MHz Sweep 2.133 ms (1001 pts) <table><tr><th>MNR</th><th>MODE</th><th>TRC</th><th>SQL</th><th>X</th><th>Y</th><th>FUNCTION</th><th>FUNCTION WIDTH</th><th>FUNCTION VALUE</th></tr><tr><td>1</td><td>A2</td><td>1</td><td>f</td><td>(A)</td><td>1.000 MHz (A)</td><td>-0.263 dB</td><td></td><td></td></tr><tr><td>2</td><td>F</td><td>1</td><td>f</td><td></td><td>2.401992 GHz</td><td>-3.457 dBm</td><td></td><td></td></tr></table>	MNR	MODE	TRC	SQL	X	Y	FUNCTION	FUNCTION WIDTH	FUNCTION VALUE	1	A2	1	f	(A)	1.000 MHz (A)	-0.263 dB			2	F	1	f		2.401992 GHz	-3.457 dBm			
MNR	MODE	TRC	SQL	X	Y	FUNCTION	FUNCTION WIDTH	FUNCTION VALUE																					
1	A2	1	f	(A)	1.000 MHz (A)	-0.263 dB																							
2	F	1	f		2.401992 GHz	-3.457 dBm																							
$\pi/4$ DQPSK/MCH	Agilent Spectrum Analyzer - Sweep SA Marker 1 Δ 1.000000000 MHz Ref Offset 6.96 dB Ref 20.00 dBm ΔMkr1 1.000 MHz -1.214 dB Center 2.441500 GHz #Res BW 30 kHz #VBW 100 kHz Span 2.000 MHz Sweep 2.133 ms (1001 pts) <table><tr><th>MNR</th><th>MODE</th><th>TRC</th><th>SQL</th><th>X</th><th>Y</th><th>FUNCTION</th><th>FUNCTION WIDTH</th><th>FUNCTION VALUE</th></tr><tr><td>1</td><td>A2</td><td>1</td><td>f</td><td>(A)</td><td>1.000 MHz (A)</td><td>-1.214 dB</td><td></td><td></td></tr><tr><td>2</td><td>F</td><td>1</td><td>f</td><td></td><td>2.440988 GHz</td><td>-2.243 dBm</td><td></td><td></td></tr></table>	MNR	MODE	TRC	SQL	X	Y	FUNCTION	FUNCTION WIDTH	FUNCTION VALUE	1	A2	1	f	(A)	1.000 MHz (A)	-1.214 dB			2	F	1	f		2.440988 GHz	-2.243 dBm			
MNR	MODE	TRC	SQL	X	Y	FUNCTION	FUNCTION WIDTH	FUNCTION VALUE																					
1	A2	1	f	(A)	1.000 MHz (A)	-1.214 dB																							
2	F	1	f		2.440988 GHz	-2.243 dBm																							
$\pi/4$ DQPSK/HCH	Agilent Spectrum Analyzer - Sweep SA Marker 1 Δ 1.000000000 MHz Ref Offset 6.98 dB Ref 20.00 dBm ΔMkr1 1.000 MHz 1.542 dB Center 2.479500 GHz #Res BW 30 kHz #VBW 100 kHz Span 2.000 MHz Sweep 2.133 ms (1001 pts) <table><tr><th>MNR</th><th>MODE</th><th>TRC</th><th>SQL</th><th>X</th><th>Y</th><th>FUNCTION</th><th>FUNCTION WIDTH</th><th>FUNCTION VALUE</th></tr><tr><td>1</td><td>A2</td><td>1</td><td>f</td><td>(A)</td><td>1.000 MHz (A)</td><td>1.542 dB</td><td></td><td></td></tr><tr><td>2</td><td>F</td><td>1</td><td>f</td><td></td><td>2.478976 GHz</td><td>-5.119 dBm</td><td></td><td></td></tr></table>	MNR	MODE	TRC	SQL	X	Y	FUNCTION	FUNCTION WIDTH	FUNCTION VALUE	1	A2	1	f	(A)	1.000 MHz (A)	1.542 dB			2	F	1	f		2.478976 GHz	-5.119 dBm			
MNR	MODE	TRC	SQL	X	Y	FUNCTION	FUNCTION WIDTH	FUNCTION VALUE																					
1	A2	1	f	(A)	1.000 MHz (A)	1.542 dB																							
2	F	1	f		2.478976 GHz	-5.119 dBm																							

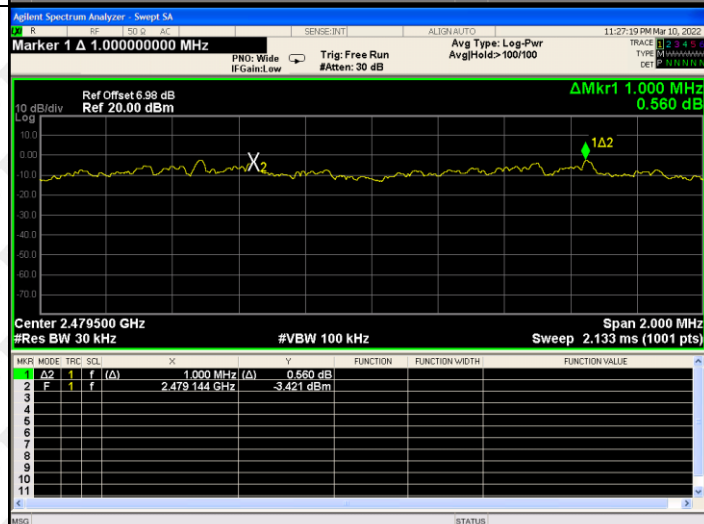
8DPSK/LCH



8DPSK /MCH

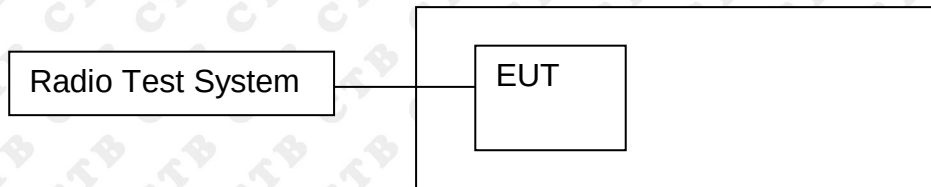


8DPSK /HCH



12. HOPPING CHANNEL NUMBER

12.1 Block Diagram Of Test Setup



12.2 Limit

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

12.3 Test procedure

1. Remove the antenna from the EUT and then connect a low RF cable from the antenna port to the spectrum.
2. Set the spectrum analyzer: RBW = 100kHz. VBW = 300kHz. Sweep = auto; Detector Function = Peak. Trace = Max hold.
3. Allow the trace to stabilize. It may prove necessary to break the span up to sections. in order to clearly show all of the hopping frequencies. The limit is specified in one of the subparagraphs of this Section.
4. Set the spectrum analyzer: Start Frequency = 2.4GHz, Stop Frequency = 2.4835GHz. Sweep=auto;

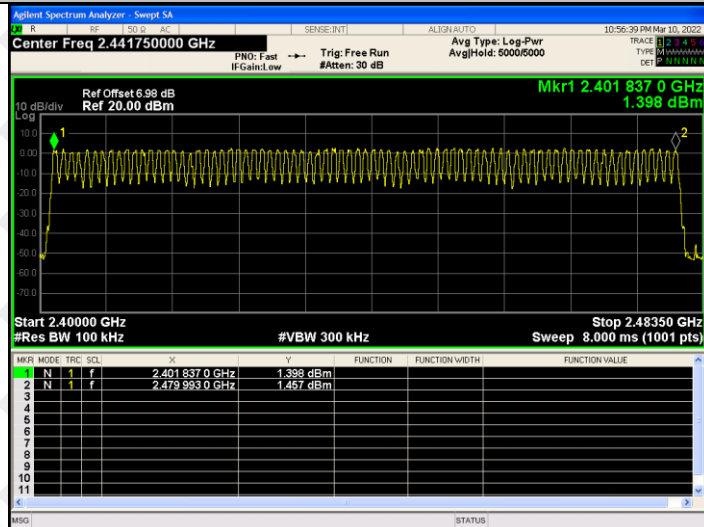
12.4 Test Result

Mode	Channel.	Number of Hopping Channel	Verdict
GFSK	Hop	79	PASS
$\pi/4$ DQPSK	Hop	79	PASS
8DPSK	Hop	79	PASS

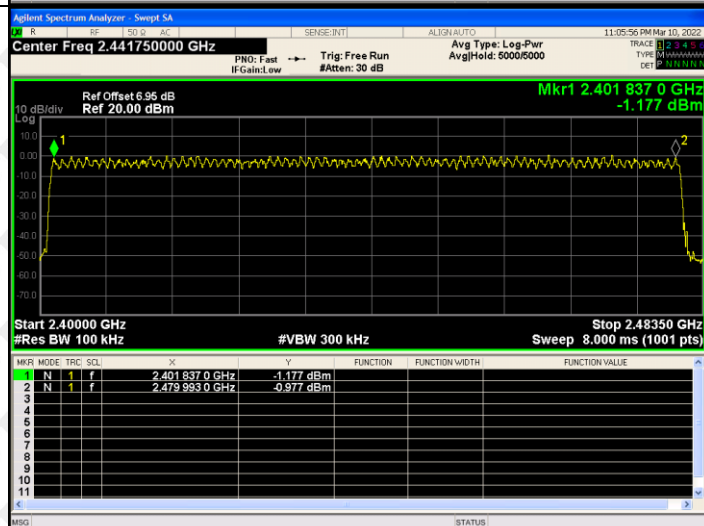
Test Graph

Graphs

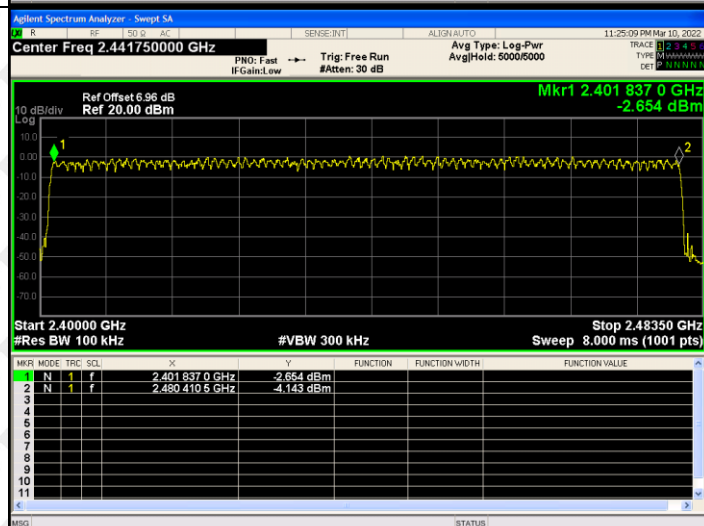
GFSK/Hop



$\pi/4$ DQPSK/Hop

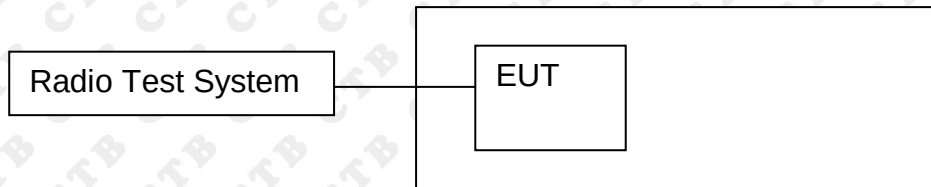


8DPSK/Hop



13. DWELL TIME

13.1 Block Diagram Of Test Setup



13.2 Limit

Frequency hopping systems in the 2400-2483.5 MHz band shall use at least 15 channels. 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. Frequency hopping systems may avoid or suppress transmissions on a particular hopping frequency provided that a minimum of 15 channels are used.

13.3 Test procedure

1. Remove the antenna from the EUT and then connect a low RF cable from the antenna port to the spectrum.
2. Set spectrum analyzer span = 0. Centred on a hopping channel;
3. Set RBW = 1MHz and VBW = 3MHz. Sweep = as necessary to capture the entire dwell time per hopping channel. Set the EUT for DH5, DH3 and DH1 packet transmitting.
4. Use the marker-delta function to determine the dwell time. If this value varies with different modes of operation (e.g.. data rate. modulation format. etc.). repeat this test for each variation. The limit is specified in one of the subparagraphs of this Section. Submit this plot(s).

13.4 Test Result

Mode	Packet	Channel	Pulse Time (ms)	Total Dwell Time (ms)	Limit (ms)	Verdict
GFSK	DH1	LCH	0.381	121.92	400	PASS
	DH1	MCH	0.381	121.92	400	PASS
	DH1	HCH	0.381	121.92	400	PASS
	DH3	LCH	1.642	262.72	400	PASS
	DH3	MCH	1.642	262.72	400	PASS
	DH3	HCH	1.641	262.56	400	PASS
	DH5	LCH	2.891	308.373	400	PASS
	DH5	MCH	2.891	308.373	400	PASS
	DH5	HCH	2.891	308.373	400	PASS

Remark: DH5 Packet permit maximum 1600 / 79 / 6 hops per second in each channel (5 time slots RX, 1 time slot TX).

DH3 Packet permit maximum 1600 / 79 / 4 hops per second in each channel (3 time slots RX, 1 time slot TX).

DH1 Packet permit maximum 1600 / 79 / 2 hops per second in each channel (1 time slot RX, 1 time slot TX). So, the Dwell Time can be calculated as follows:

DH5: $1600/79/6 \times 0.4 \times 79 \times (\text{MkrDelta})/1000$

DH3: $1600/79/4 \times 0.4 \times 79 \times (\text{MkrDelta})/1000$

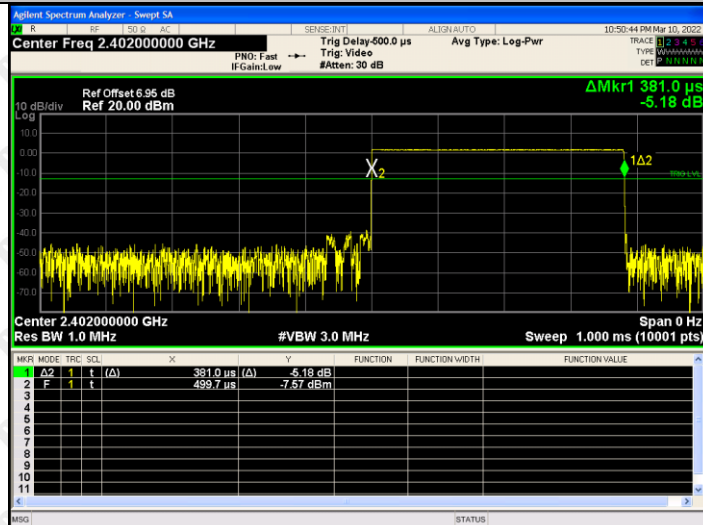
DH1: $1600/79/2 \times 0.4 \times 79 \times (\text{MkrDelta})/1000$

Remark: Mkr Delta is once pulse time.

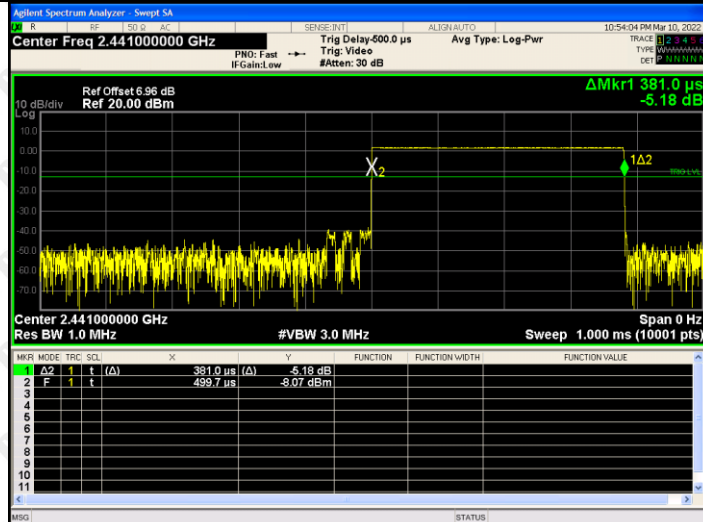
Test Graph

Graphs

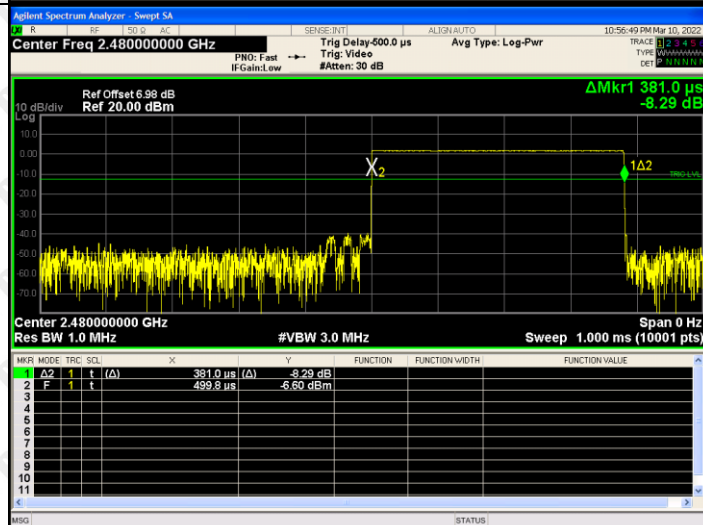
GFSK_DH1/LCH



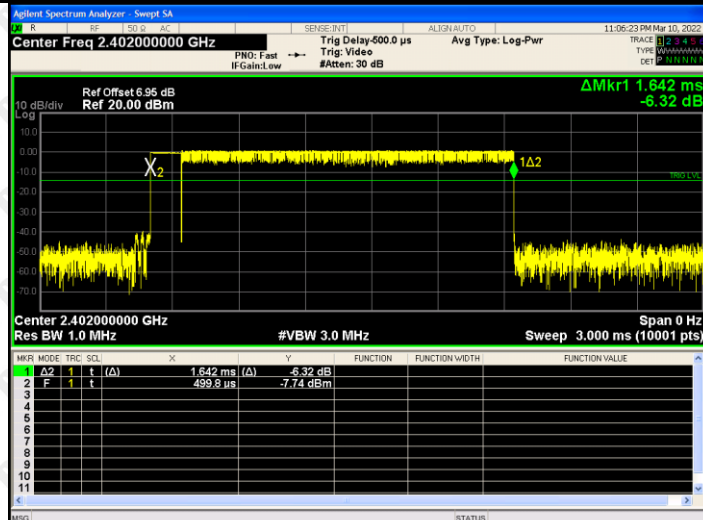
GFSK_DH1/MCH



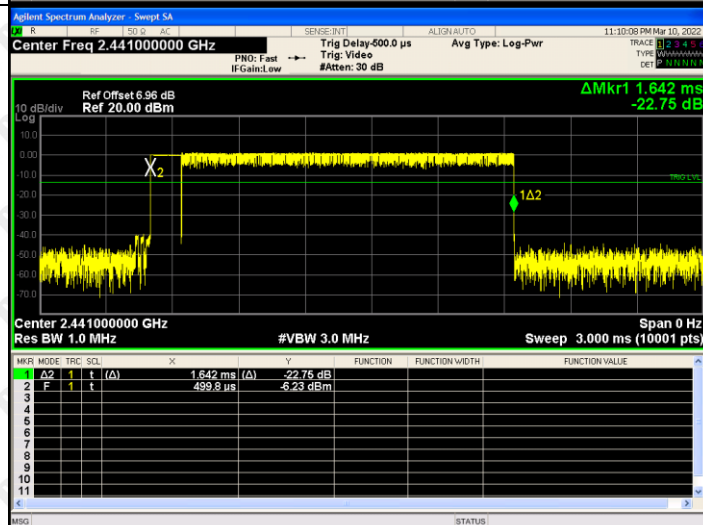
GFSK_DH1/HCH



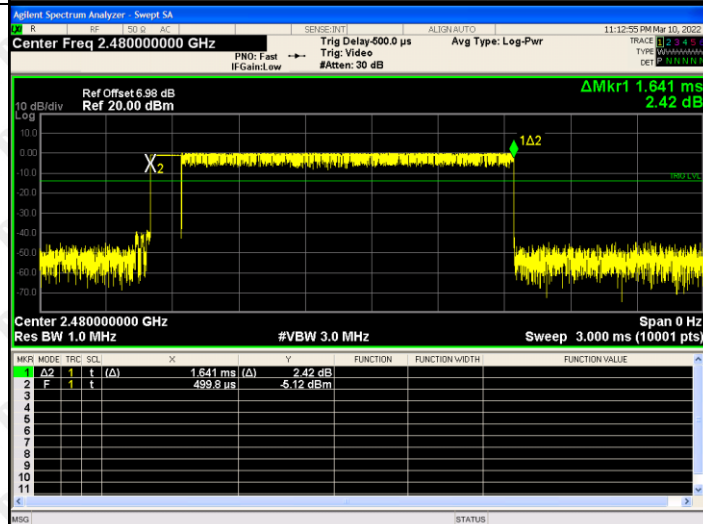
GFSK_DH3/LCH



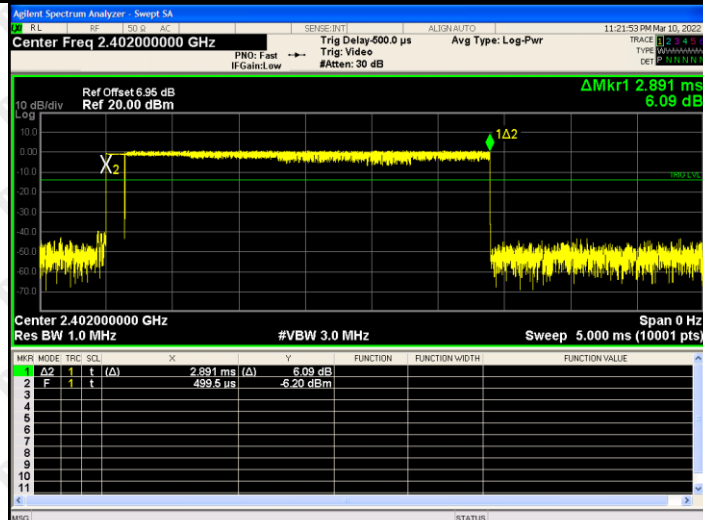
GFSK_DH3/MCH



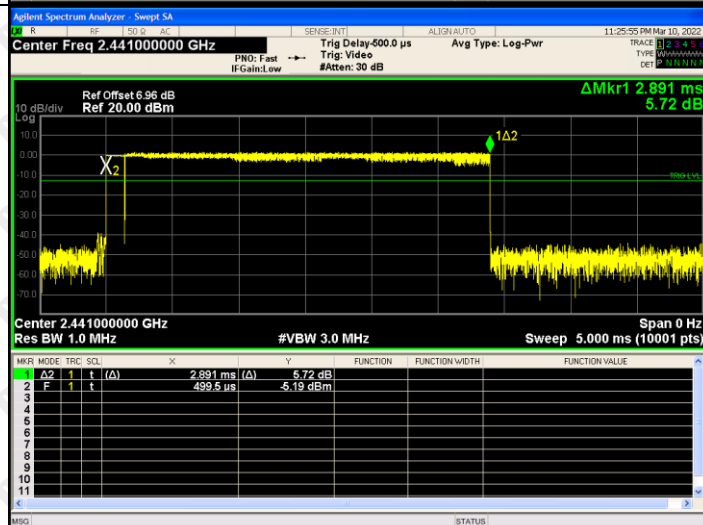
GFSK_DH3/HCH



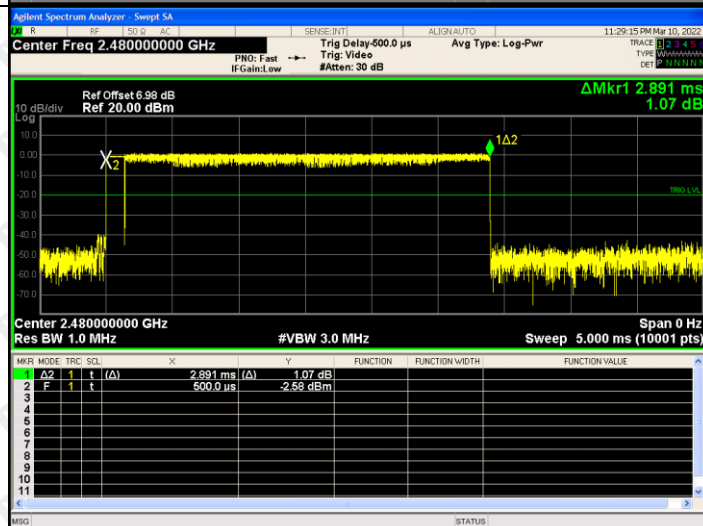
GFSK_DH5/LCH



GFSK_DH5/MCH



GFSK_DH5/HCH



14. PSEUDORANDOM FREQUENCY

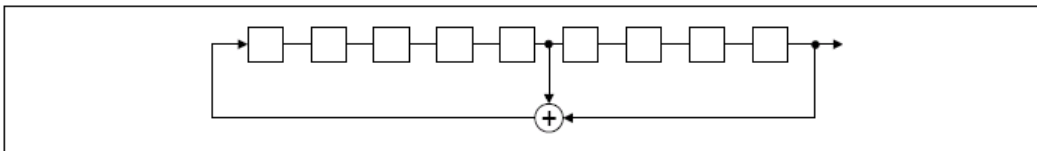
14.1 Limit

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. The system shall hop to channel frequencies that are selected at the system hopping rate from a Pseudorandom 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.

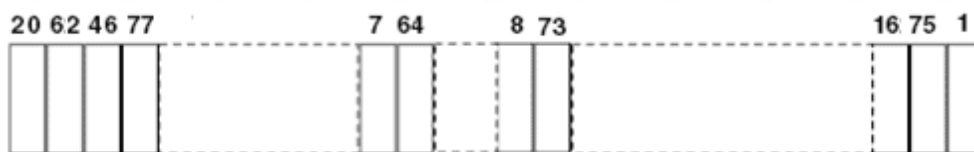
14.2 Test procedure

The pseudorandom 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)



An example of Pseudorandom Frequency Hopping Sequence as follow:



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

14.3 Test Result

The device does not have the ability to be coordinated with other FHSS systems in an effort to avoid the simultaneous occupancy of individual hopping frequencies by multiple transmitters.

15. ANTENNA REQUIREMENT

15.203 requirement:

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. The use of a permanently attached antenna or of an antenna that uses a unique coupling to the intentional radiator, the manufacturer may design the unit so that a broken antenna can be replaced by the user, but the use of a standard antenna jack or electrical connector is prohibited.

15.247(b) (4) requirement:

The conducted output power limit specified in paragraph (b) of this section is based on the use of antennas with directional gains that do not exceed 6 dBi. Except as shown in paragraph (c) of this section, if transmitting antennas of directional gain greater than 6 dBi are used, the conducted output power from the intentional radiator shall be reduced below the stated values in paragraphs (b)(1), (b)(2), and (b)(3) of this section, as appropriate, by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

EUT Antenna:

The antenna is Internal antenna. The best case gain of the antenna is 1dBi.

16. EUT PHOTOGRAPHS

EUT Photo 1

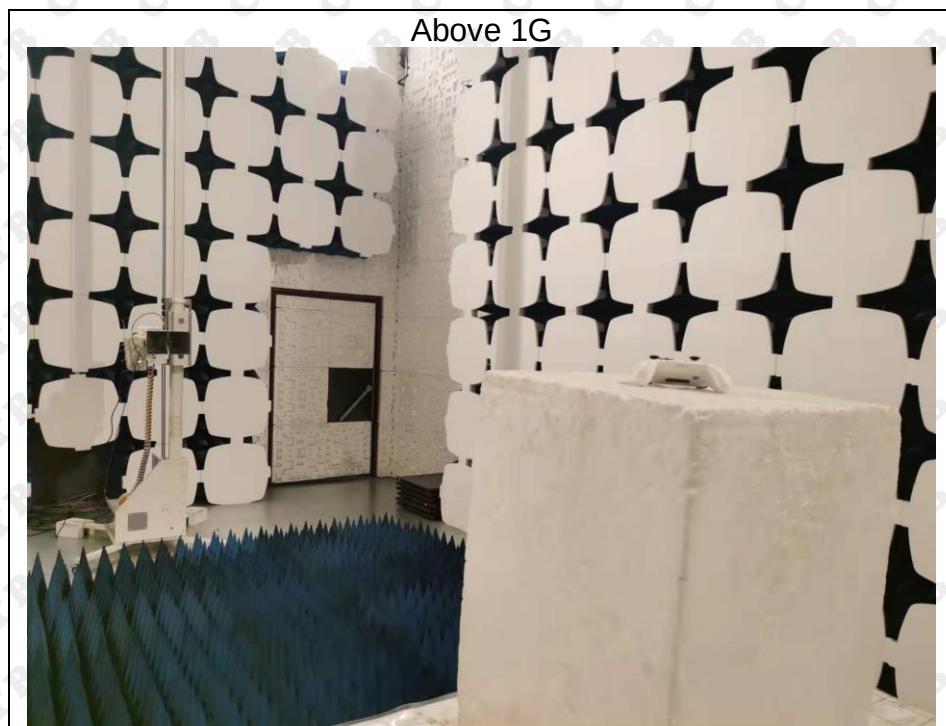
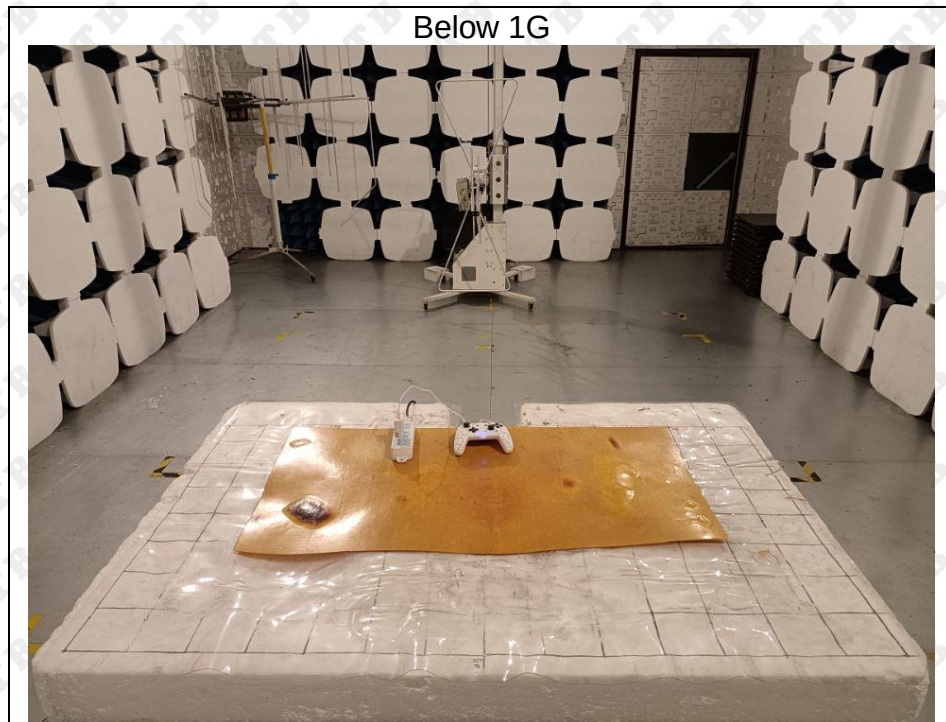


EUT Photo 2



17. EUT TEST SETUP PHOTOGRAPHS

Radiated Emission



Conducted emissions



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