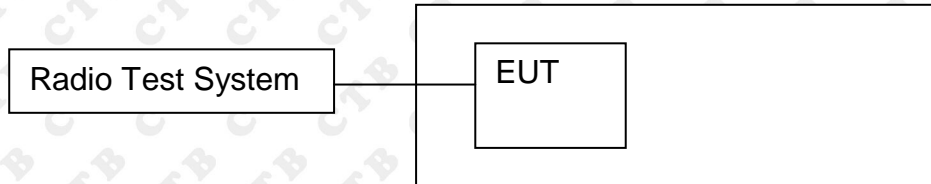


<p>$\pi/4$-DQPSK Low channel</p>	<p>Agilent Spectrum Analyzer - Occupied BW</p> <p>Center Freq: 2.40200000 GHz</p> <p>Ref Offset 6.76 dB Ref 26.76 dBm</p> <p>Mkr3 2.402627 GHz -22.837 dBm</p> <p>Center 2.402 GHz #Res BW 30 kHz</p> <p>Occupied Bandwidth 1.1602 MHz</p> <p>Total Power 4.54 dBm</p> <p>Transmit Freq Error -1.818 kHz</p> <p>x dB Bandwidth 1.257 MHz</p> <p>OBW Power 99.00 %</p> <p>x dB -20.00 dB</p>
<p>$\pi/4$-DQPSK Mid channel</p>	<p>Agilent Spectrum Analyzer - Occupied BW</p> <p>Center Freq: 2.44100000 GHz</p> <p>Ref Offset 6.83 dB Ref 26.83 dBm</p> <p>Mkr3 2.441612 GHz -24.742 dBm</p> <p>Center 2.441 GHz #Res BW 30 kHz</p> <p>Occupied Bandwidth 1.1512 MHz</p> <p>Total Power 4.73 dBm</p> <p>Transmit Freq Error -2.922 kHz</p> <p>x dB Bandwidth 1.230 MHz</p> <p>OBW Power 99.00 %</p> <p>x dB -20.00 dB</p>
<p>$\pi/4$-DQPSK High channel</p>	<p>Agilent Spectrum Analyzer - Occupied BW</p> <p>Center Freq: 2.48000000 GHz</p> <p>Ref Offset 6.8 dB Ref 26.80 dBm</p> <p>Mkr3 2.480607 GHz -24.054 dBm</p> <p>Center 2.48 GHz #Res BW 30 kHz</p> <p>Occupied Bandwidth 1.1577 MHz</p> <p>Total Power 3.91 dBm</p> <p>Transmit Freq Error -2.081 kHz</p> <p>x dB Bandwidth 1.219 MHz</p> <p>OBW Power 99.00 %</p> <p>x dB -20.00 dB</p>

<p>8DPSK Low channel</p>	<p>Agilent Spectrum Analyzer - Occupied BW</p> <p>Center Freq 2.40200000 GHz</p> <p>Center Freq: 2.40200000 GHz</p> <p>Trig: Free Run</p> <p>Avg/Hold: 100/100</p> <p>Radio Std: None</p> <p>Radio Device: BTS</p> <p>Ref Offset 6.76 dB</p> <p>Ref 26.76 dBm</p> <p>Mkr3 2.402656 GHz</p> <p>-27.902 dBm</p> <p>Center 2.402 GHz</p> <p>#Res BW 30 kHz</p> <p>#VBW 100 kHz</p> <p>Span 2 MHz</p> <p>Sweep 2.667 ms</p> <p>Occupied Bandwidth 1.1825 MHz</p> <p>Total Power 3.43 dBm</p> <p>Transmit Freq Error 1.541 kHz</p> <p>OBW Power 99.00 %</p> <p>x dB Bandwidth 1.309 MHz</p> <p>x dB -20.00 dB</p>
<p>8DPSK Mid channel</p>	<p>Agilent Spectrum Analyzer - Occupied BW</p> <p>Center Freq 2.44100000 GHz</p> <p>Center Freq: 2.44100000 GHz</p> <p>Trig: Free Run</p> <p>Avg/Hold: 100/100</p> <p>Radio Std: None</p> <p>Radio Device: BTS</p> <p>Ref Offset 6.83 dB</p> <p>Ref 26.83 dBm</p> <p>Mkr3 2.441619 GHz</p> <p>-24.201 dBm</p> <p>Center 2.441 GHz</p> <p>#Res BW 30 kHz</p> <p>#VBW 100 kHz</p> <p>Span 2 MHz</p> <p>Sweep 2.667 ms</p> <p>Occupied Bandwidth 1.1544 MHz</p> <p>Total Power 4.78 dBm</p> <p>Transmit Freq Error 2.733 kHz</p> <p>OBW Power 99.00 %</p> <p>x dB Bandwidth 1.232 MHz</p> <p>x dB -20.00 dB</p>
<p>8DPSK High channel</p>	<p>Agilent Spectrum Analyzer - Occupied BW</p> <p>Center Freq 2.48000000 GHz</p> <p>Center Freq: 2.48000000 GHz</p> <p>Trig: Free Run</p> <p>Avg/Hold: 100/100</p> <p>Radio Std: None</p> <p>Radio Device: BTS</p> <p>Ref Offset 6.8 dB</p> <p>Ref 26.80 dBm</p> <p>Mkr3 2.480599 GHz</p> <p>-20.905 dBm</p> <p>Center 2.48 GHz</p> <p>#Res BW 30 kHz</p> <p>#VBW 100 kHz</p> <p>Span 2 MHz</p> <p>Sweep 2.667 ms</p> <p>Occupied Bandwidth 1.1523 MHz</p> <p>Total Power 4.34 dBm</p> <p>Transmit Freq Error -611 Hz</p> <p>OBW Power 99.00 %</p> <p>x dB Bandwidth 1.200 MHz</p> <p>x dB -20.00 dB</p>

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 = 3.0MHz. 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	0.999	PASS
GFSK	MCH	0.999	PASS
GFSK	HCH	0.996	PASS
$\pi/4$ DQPSK	LCH	0.999	PASS
$\pi/4$ DQPSK	MCH	0.999	PASS
$\pi/4$ DQPSK	HCH	0.999	PASS
8DPSK	LCH	0.999	PASS
8DPSK	MCH	0.999	PASS
8DPSK	HCH	0.999	PASS

Test Graph

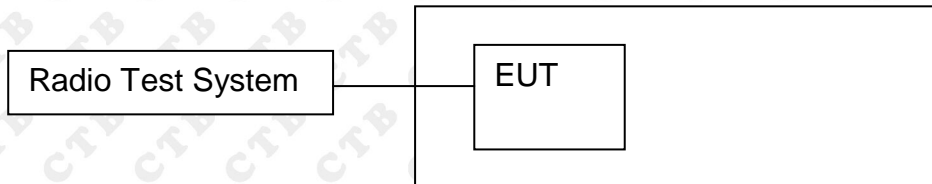


<p>$\pi/4$DQPSK/LCH</p>	
<p>$\pi/4$DQPSK/MCH</p>	
<p>$\pi/4$DQPSK/HCH</p>	

<p>8DPSK/LCH</p>	<p>Agilent Spectrum Analyzer - Swept SA</p> <p>Marker 1 Δ 999.000000 kHz</p> <p>Ref Offset 6.76 dB Ref 20.00 dBm</p> <p>Center 2.402500 GHz #Res BW 100 kHz</p> <p>Span 3.000 MHz #VBW 300 kHz Sweep 1.000 ms (1001 pts)</p> <table border="1"> <thead> <tr> <th>MKR</th> <th>MODE</th> <th>TRC</th> <th>SCL</th> <th>X</th> <th>Y</th> <th>FUNCTION</th> <th>FUNCTION WIDTH</th> <th>FUNCTION VALUE</th> </tr> </thead> <tbody> <tr> <td>1</td> <td>Δ</td> <td>f</td> <td>(Δ)</td> <td>999 kHz</td> <td>-0.024 dB</td> <td></td> <td></td> <td></td> </tr> <tr> <td>2</td> <td>F</td> <td>f</td> <td></td> <td>2.401 649 GHz</td> <td>-0.949 dBm</td> <td></td> <td></td> <td></td> </tr> </tbody> </table>	MKR	MODE	TRC	SCL	X	Y	FUNCTION	FUNCTION WIDTH	FUNCTION VALUE	1	Δ	f	(Δ)	999 kHz	-0.024 dB				2	F	f		2.401 649 GHz	-0.949 dBm			
MKR	MODE	TRC	SCL	X	Y	FUNCTION	FUNCTION WIDTH	FUNCTION VALUE																				
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<p>8DPSK /MCH</p>	<p>Agilent Spectrum Analyzer - Swept SA</p> <p>Marker 1 Δ 999.000000 kHz</p> <p>Ref Offset 6.83 dB Ref 20.00 dBm</p> <p>Center 2.441500 GHz #Res BW 100 kHz</p> <p>Span 3.000 MHz #VBW 300 kHz Sweep 1.000 ms (1001 pts)</p> <table border="1"> <thead> <tr> <th>MKR</th> <th>MODE</th> <th>TRC</th> <th>SCL</th> <th>X</th> <th>Y</th> <th>FUNCTION</th> <th>FUNCTION WIDTH</th> <th>FUNCTION VALUE</th> </tr> </thead> <tbody> <tr> <td>1</td> <td>Δ</td> <td>f</td> <td>(Δ)</td> <td>999 kHz</td> <td>0.054 dB</td> <td></td> <td></td> <td></td> </tr> <tr> <td>2</td> <td>F</td> <td>f</td> <td></td> <td>2.440 858 GHz</td> <td>-1.050 dBm</td> <td></td> <td></td> <td></td> </tr> </tbody> </table>	MKR	MODE	TRC	SCL	X	Y	FUNCTION	FUNCTION WIDTH	FUNCTION VALUE	1	Δ	f	(Δ)	999 kHz	0.054 dB				2	F	f		2.440 858 GHz	-1.050 dBm			
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<p>8DPSK /HCH</p>	<p>Agilent Spectrum Analyzer - Swept SA</p> <p>Marker 1 Δ 999.000000 kHz</p> <p>Ref Offset 6.8 dB Ref 20.00 dBm</p> <p>Center 2.479500 GHz #Res BW 30 kHz</p> <p>Span 3.000 MHz #VBW 100 kHz Sweep 3.200 ms (1001 pts)</p> <table border="1"> <thead> <tr> <th>MKR</th> <th>MODE</th> <th>TRC</th> <th>SCL</th> <th>X</th> <th>Y</th> <th>FUNCTION</th> <th>FUNCTION WIDTH</th> <th>FUNCTION VALUE</th> </tr> </thead> <tbody> <tr> <td>1</td> <td>Δ</td> <td>f</td> <td>(Δ)</td> <td>999 kHz</td> <td>0.831 dB</td> <td></td> <td></td> <td></td> </tr> <tr> <td>2</td> <td>F</td> <td>f</td> <td></td> <td>2.478 855 GHz</td> <td>-3.283 dBm</td> <td></td> <td></td> <td></td> </tr> </tbody> </table>	MKR	MODE	TRC	SCL	X	Y	FUNCTION	FUNCTION WIDTH	FUNCTION VALUE	1	Δ	f	(Δ)	999 kHz	0.831 dB				2	F	f		2.478 855 GHz	-3.283 dBm			
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1	Δ	f	(Δ)	999 kHz	0.831 dB																							
2	F	f		2.478 855 GHz	-3.283 dBm																							

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

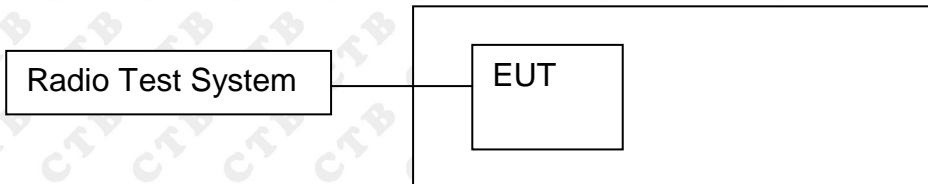
Test Graph

Graphs



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	0.372	119.04	400	PASS
	DH1	MCH	0.372	119.04	400	PASS
	DH1	HCH	0.372	119.04	400	PASS
	DH3	LCH	1.637	261.92	400	PASS
	DH3	MCH	1.632	261.12	400	PASS
	DH3	HCH	1.632	261.12	400	PASS
	DH5	LCH	2.888	308.063	400	PASS
	DH5	MCH	2.882	307.413	400	PASS
	DH5	HCH	2.882	307.413	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: $1600/79/6*0.4*79*(MkrDelta \text{ ms})$

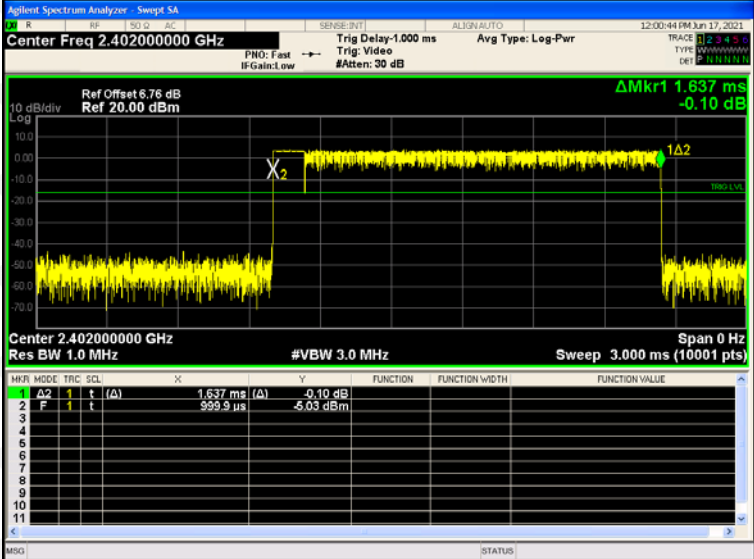
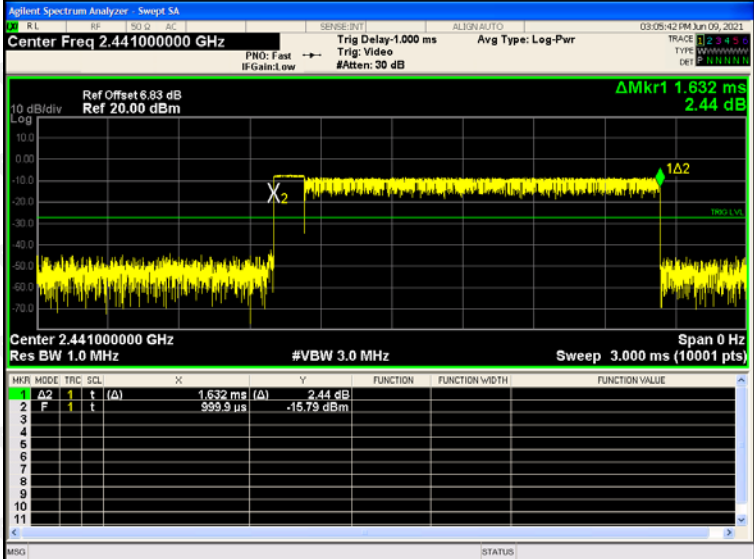
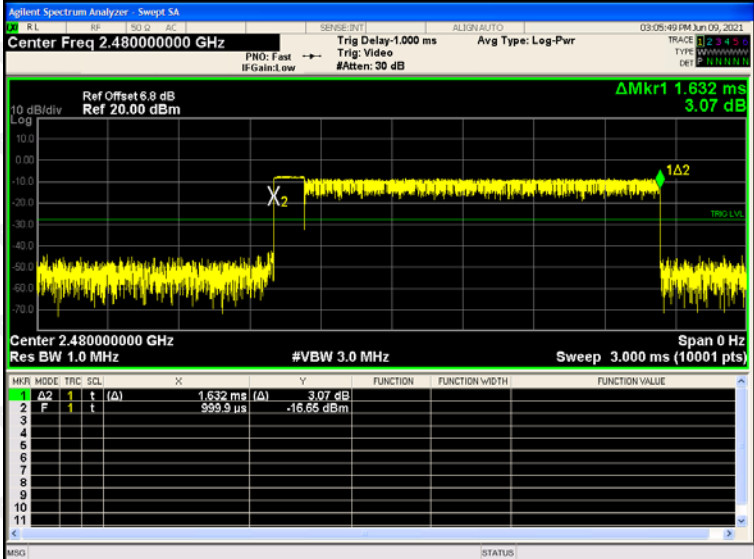
DH3: $1600/79/4*0.4*79*(MkrDelta \text{ ms})$

DH1: $1600/79/2*0.4*79*(MkrDelta \text{ ms})$

Remark: Mkr Delta is once pulse time.

Test Graph



<p>GFSK_DH3/LCH</p>	 <p>Agilent Spectrum Analyzer - Swept SA</p> <p>Center Freq 2.40200000 GHz</p> <p>Ref Offset 6.76 dB Ref 20.00 dBm</p> <p>Trig Delay-1.000 ms Trig: Video #Atten: 30 dB</p> <p>ΔMkr1 1.637 ms -0.10 dB</p> <p>Center 2.40200000 GHz Res BW 1.0 MHz #VBW 3.0 MHz Span 0 Hz Sweep 3.000 ms (10001 pts)</p> <table border="1"> <thead> <tr> <th>MNR</th> <th>MODE</th> <th>TRIG</th> <th>SCL</th> <th>X</th> <th>Y</th> <th>FUNCTION</th> <th>FUNCTION WIDTH</th> <th>FUNCTION VALUE</th> </tr> </thead> <tbody> <tr> <td>1</td> <td>Δ2</td> <td>1</td> <td>t</td> <td>(Δ)</td> <td>1.637 ms</td> <td>(Δ)</td> <td></td> <td>-0.10 dB</td> </tr> <tr> <td>2</td> <td>F</td> <td>1</td> <td>t</td> <td></td> <td>999.9 μs</td> <td></td> <td></td> <td>-5.03 dBm</td> </tr> </tbody> </table>	MNR	MODE	TRIG	SCL	X	Y	FUNCTION	FUNCTION WIDTH	FUNCTION VALUE	1	Δ2	1	t	(Δ)	1.637 ms	(Δ)		-0.10 dB	2	F	1	t		999.9 μs			-5.03 dBm
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<p>GFSK_DH3/HCH</p>	 <p>Agilent Spectrum Analyzer - Swept SA</p> <p>Center Freq 2.48000000 GHz</p> <p>Ref Offset 6.8 dB Ref 20.00 dBm</p> <p>Trig Delay-1.000 ms Trig: Video #Atten: 30 dB</p> <p>ΔMkr1 1.632 ms 3.07 dB</p> <p>Center 2.48000000 GHz Res BW 1.0 MHz #VBW 3.0 MHz Span 0 Hz Sweep 3.000 ms (10001 pts)</p> <table border="1"> <thead> <tr> <th>MNR</th> <th>MODE</th> <th>TRIG</th> <th>SCL</th> <th>X</th> <th>Y</th> <th>FUNCTION</th> <th>FUNCTION WIDTH</th> <th>FUNCTION VALUE</th> </tr> </thead> <tbody> <tr> <td>1</td> <td>Δ2</td> <td>1</td> <td>t</td> <td>(Δ)</td> <td>1.632 ms</td> <td>(Δ)</td> <td></td> <td>3.07 dB</td> </tr> <tr> <td>2</td> <td>F</td> <td>1</td> <td>t</td> <td></td> <td>999.9 μs</td> <td></td> <td></td> <td>-16.65 dBm</td> </tr> </tbody> </table>	MNR	MODE	TRIG	SCL	X	Y	FUNCTION	FUNCTION WIDTH	FUNCTION VALUE	1	Δ2	1	t	(Δ)	1.632 ms	(Δ)		3.07 dB	2	F	1	t		999.9 μs			-16.65 dBm
MNR	MODE	TRIG	SCL	X	Y	FUNCTION	FUNCTION WIDTH	FUNCTION VALUE																				
1	Δ2	1	t	(Δ)	1.632 ms	(Δ)		3.07 dB																				
2	F	1	t		999.9 μs			-16.65 dBm																				



14. PSEUDORANDOM FREQUENCY

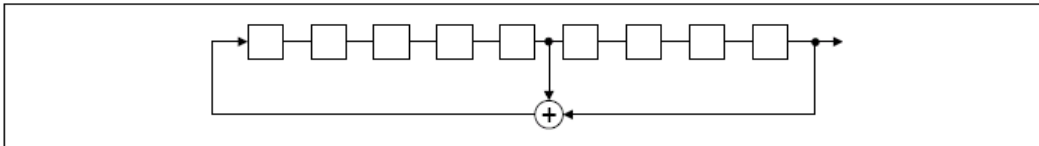
14.1 Limit

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.

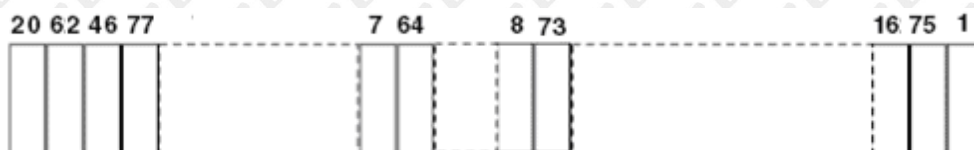
14.2 Test procedure

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

Below 1G



Above 1G



Conducted emissions



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