5.8. Pseudorandom Frequency Hopping Sequence

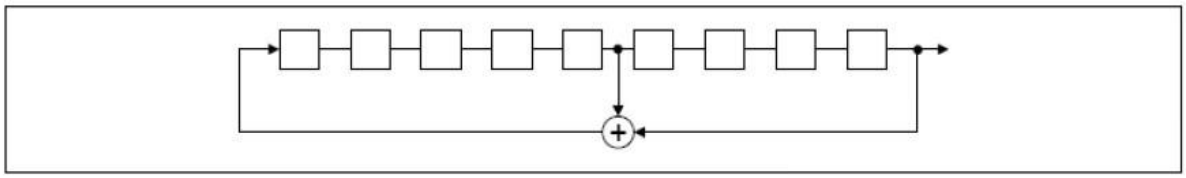
LIMIT

FCC CFR Title 47 Part 15 Subpart C Section 15.247 (a)(1):Frequency hopping systems shall have hopping channel carrier fre-quencies separated by a minimum of 25 kHz or the 20 dB bandwidth of the hop-ping channel, whichever is greater. Al-ternatively, frequency hopping systems operating in the 2400–2483.5 MHz band may have hopping channel carrier fre-quencies 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 chan-nel frequencies that are selected at the system hopping rate from a pseudo ran-domly ordered list of hopping fre-quencies. Each frequency must be used equally on the average by each trans-mitter. The system receivers shall have input bandwidths that match the hop-ping channel bandwidths of their cor-responding transmitters and shall shift frequencies in synchronization with the transmitted signals.

TEST RESULTS

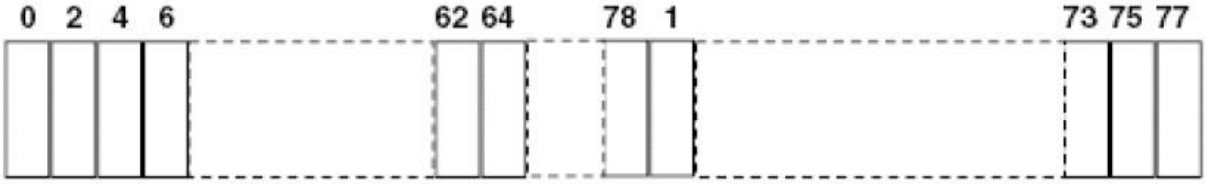
The pseudorandom frequency hopping sequence may be generated in a nice-stage shift register whose 5th and 9th stage outputs are added in a modulo-two addition stage.And the result is fed back to the input of the friststage.The sequence begins with the frist one of 9 consecutive ones,forexample:the shift register is initialized with nine ones.

- Number of shift register stages: 9
- Length of pseudo-random sequence:29-1=511 bits
- Longest sequence of zeros: 8 (non-inverted signal)



Linear Feedback Shift Register for Generation of the PRBS sequence

An explame of pseudorandom frequency hopping sequence as follows:



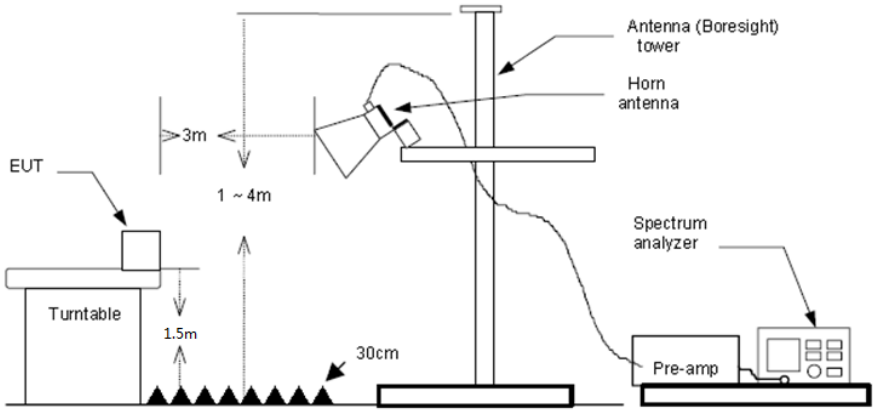
Each frequency used equally one the average by each transmitter.
The system receiver have input bandwidths that match the hopping channel bandwidths of their corresponding transmitter and shift frequencies in synchronization with the transmitted signals.

5.9. Restricted band (radiated)

LIMIT

FCC CFR Title 47 Part 15 Subpart C Section 15.247 (d):
In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, Radiated Emissions which fall in the restricted bands, as defined in §15.205(a), must also comply with the Radiated Emissions limits specified in §15.209(a) (see §15.205(c)).

TEST CONFIGURATION



TEST PROCEDURE

1. The EUT was setup and tested according to ANSI C63.10:2013 for compliance to FCC 47CFR 15.247 requirements.
2. The EUT is placed on a turn table which is 1.5 meter above ground. The turn table is rotated 360 degrees to determine the position of the maximum emission level.
3. The EUT waspositioned such that the distance from antenna to the EUT was 3 meters.
4. The antenna is scanned from 1 meter to 4 meters to find out the maximum emission level. Thisis repeated for both horizontal and vertical polarization of the antenna. In order to find the maximum emission, all of the interface cables were manipulated according to ANSI C63.10:2013 on radiated measurement.
5. The receiver set as follow:
   RBW=1 MHz, VBW=3 MHz Peak detector for Peak value
   RBW=1 MHz, VBW=10 Hz Peak detector for Average value.

TEST MODE:
Please refer to the clause 3.3

TEST RESULTS

☒ **Passed** ☐ **Not Applicable**

Note:
1) Final level= Read level + Antenna Factor+ Cable Loss- Preamp Factor
2) Have pre-scan all modulation mode, found the GFSK modulation which it was worst case, so only the worst case's data on the test report.
3) The peak level is lower than average limit(54 dBuV/m), this data is the too weak instrument of signal is unable to test.

CH00									
Frequency (MHz)	Read Level (dBuV)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Factor (dB)	Level (dBuV/m)	Limit Line (dBuV/m)	Over Limit (dB)	Polarization	Test value
2310.00	35.13	28.05	6.62	37.65	32.15	74.00	-41.85	Horizontal	Peak
2390.03	34.08	27.65	6.75	37.87	30.61	74.00	-43.39	Horizontal	Peak
2310.00	34.64	28.05	6.62	37.65	31.66	74.00	-42.34	Vertical	Peak
2390.03	34.30	27.65	6.75	37.87	30.83	74.00	-43.17	Vertical	Peak
2310.00	23.24	28.05	6.62	37.65	20.26	54.00	-33.74	Horizontal	Average
2390.03	22.89	27.65	6.75	37.87	19.42	54.00	-34.58	Horizontal	Average
2310.00	23.24	28.05	6.62	37.65	20.26	54.00	-33.74	Vertical	Average
2390.03	22.89	27.65	6.75	37.87	19.42	54.00	-34.58	Vertical	Average

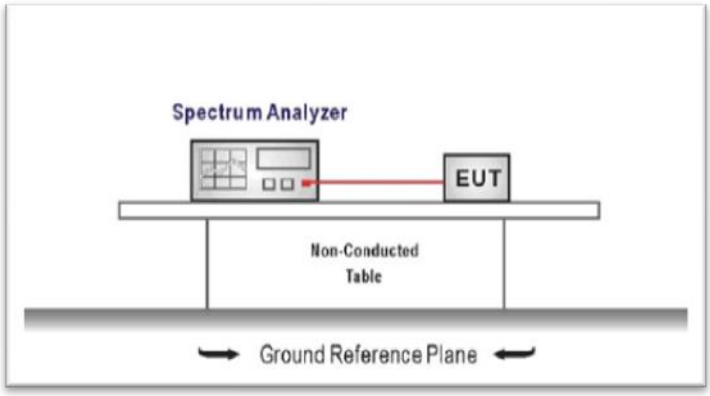
CH78									
Frequency (MHz)	Read Level (dBuV)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Factor (dB)	Level (dBuV/m)	Limit Line (dBuV/m)	Over Limit (dB)	Polarization	Test value
2483.50	56.41	27.26	6.83	37.87	52.63	74.00	-21.37	Horizontal	Peak
2500.00	32.66	27.20	6.84	37.87	28.83	74.00	-45.17	Horizontal	Peak
2483.50	55.25	27.26	6.83	37.87	51.47	74.00	-22.53	Vertical	Peak
2500.00	33.06	27.20	6.84	37.87	29.23	74.00	-44.77	Vertical	Peak
2483.50	29.81	27.26	6.83	37.87	26.03	54.00	-27.97	Horizontal	Average
2500.00	20.69	27.20	6.84	37.87	16.86	54.00	-37.14	Horizontal	Average
2483.50	28.42	27.26	6.83	37.87	24.64	54.00	-29.36	Vertical	Average
2500.00	20.72	27.20	6.84	37.87	16.89	54.00	-37.11	Vertical	Average

5.10. Band edge and Spurious Emissions (conducted)

LIMIT

FCC CFR Title 47 Part 15 Subpart C Section 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 band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement.

TEST CONFIGURATION



TEST PROCEDURE

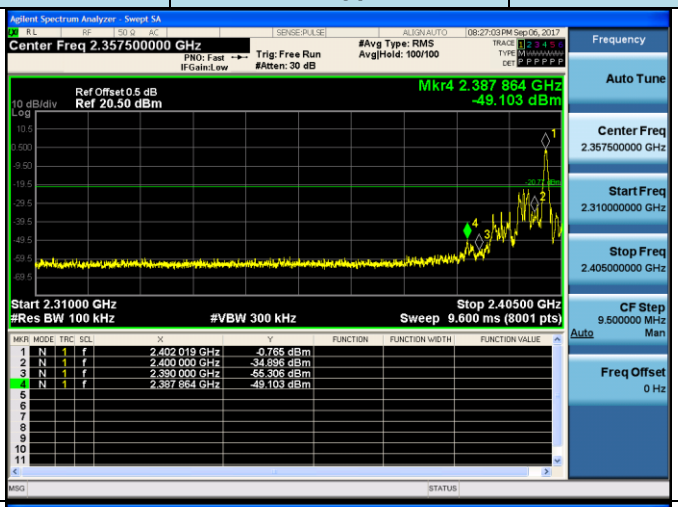
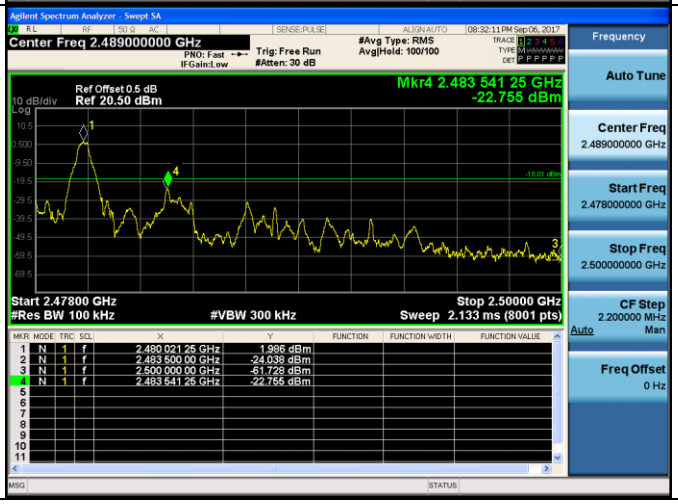
1. The transmitter output was connected to the spectrum analyzer through an attenuator, the path loss was compensated to the results for each measurement.
2. Set to the maximum power setting and enable the EUT transmit continuously
3. Use the following spectrum analyzer settings:
   RBW = 100 kHz, VBW ≥ RBW
   Sweep = auto, Detector function = peak, Trace = max hold
4. Measure and record the results in the test report.

TEST MODE:

Please refer to the clause 3.3

TEST RESULTS

☒ **Passed** ☐ **Not Applicable**

Test Item:	Band edge	Modulation type:	GFSK
CH00 No hopping mode		
CH00 Hopping mode		
CH78 No hopping mode		

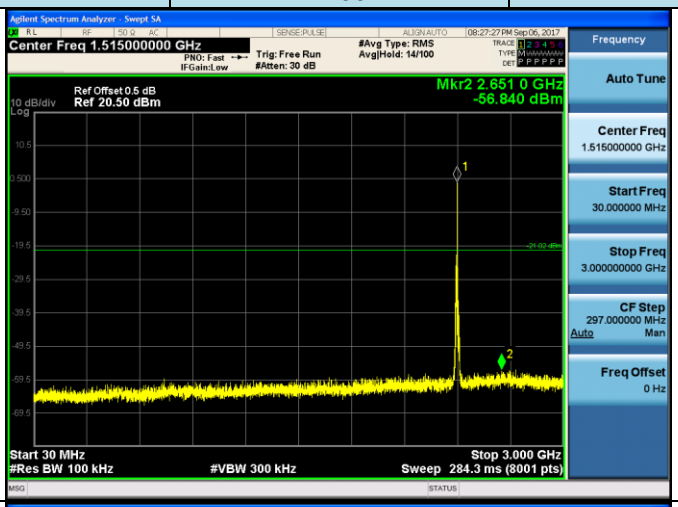
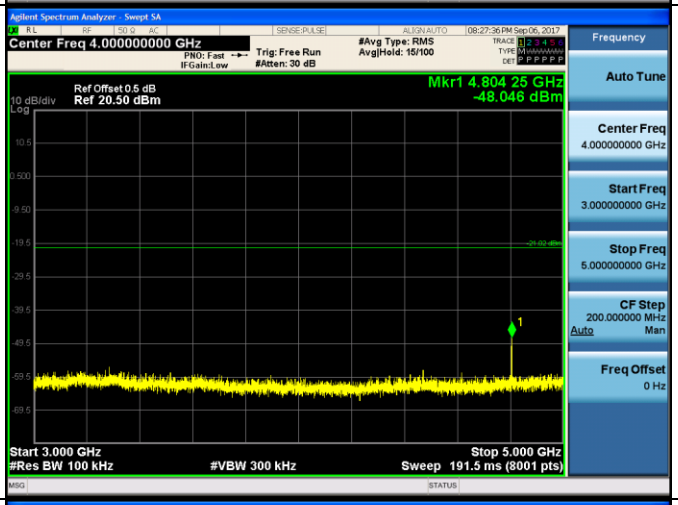
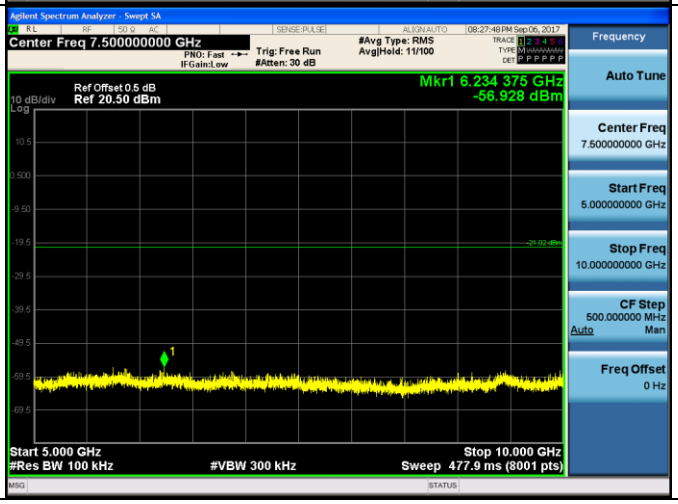
CH78 Hopping mode		

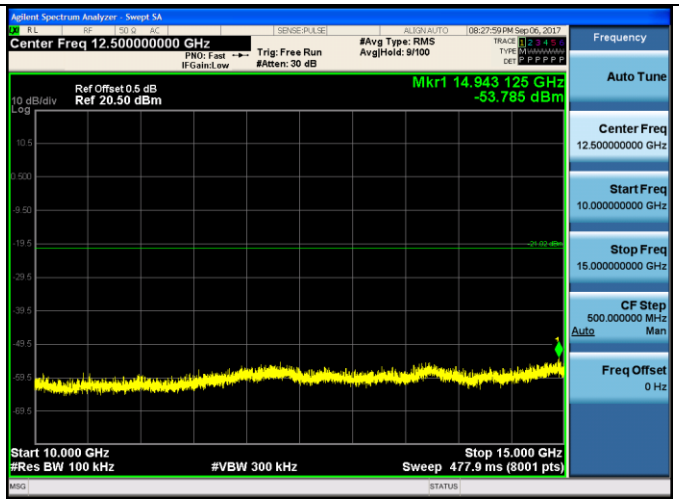
Test Item:	Band edge	Modulation type:	π/4DQPSK
CH00 No hopping mode			
CH00 Hopping mode			
CH78 No hopping mode			

CH78 Hopping mode		

Test Item:	Band edge	Modulation type:	8DPSK
CH00 No hopping mode		
CH00 Hopping mode		
CH78 No hopping mode		

CH78 Hoppig mode		

Test Item:	SE	Modulation type:	GFSK
CH00 30MHz~3GHz		
CH00 3GHz~5GHz		
CH00 5GHz~10GHz		

CH00 10GHz~15GHz		
CH00 15GHz~25GHz		
CH39 30MHz~3GHz