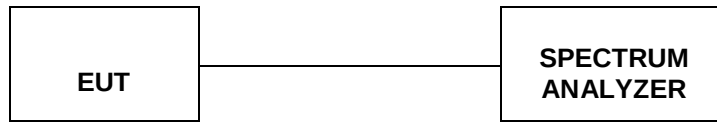


4.7. Spurious RF Conducted Emission

TEST CONFIGURATION



TEST PROCEDURE

The Spurious RF conducted emissions compliance of RF radiated emission should be measured by following the guidance in ANSI C63.10-2013 with respect to maximizing the emission by rotating the EUT, measuring the emission while the EUT is situated in three orthogonal planes (if appropriate), adjusting the measurement antenna height and polarization etc. Set RBW=100kHz and VBW= 300kHz to measure the peak field strength, and measure frequency range from 9kHz to 25GHz.

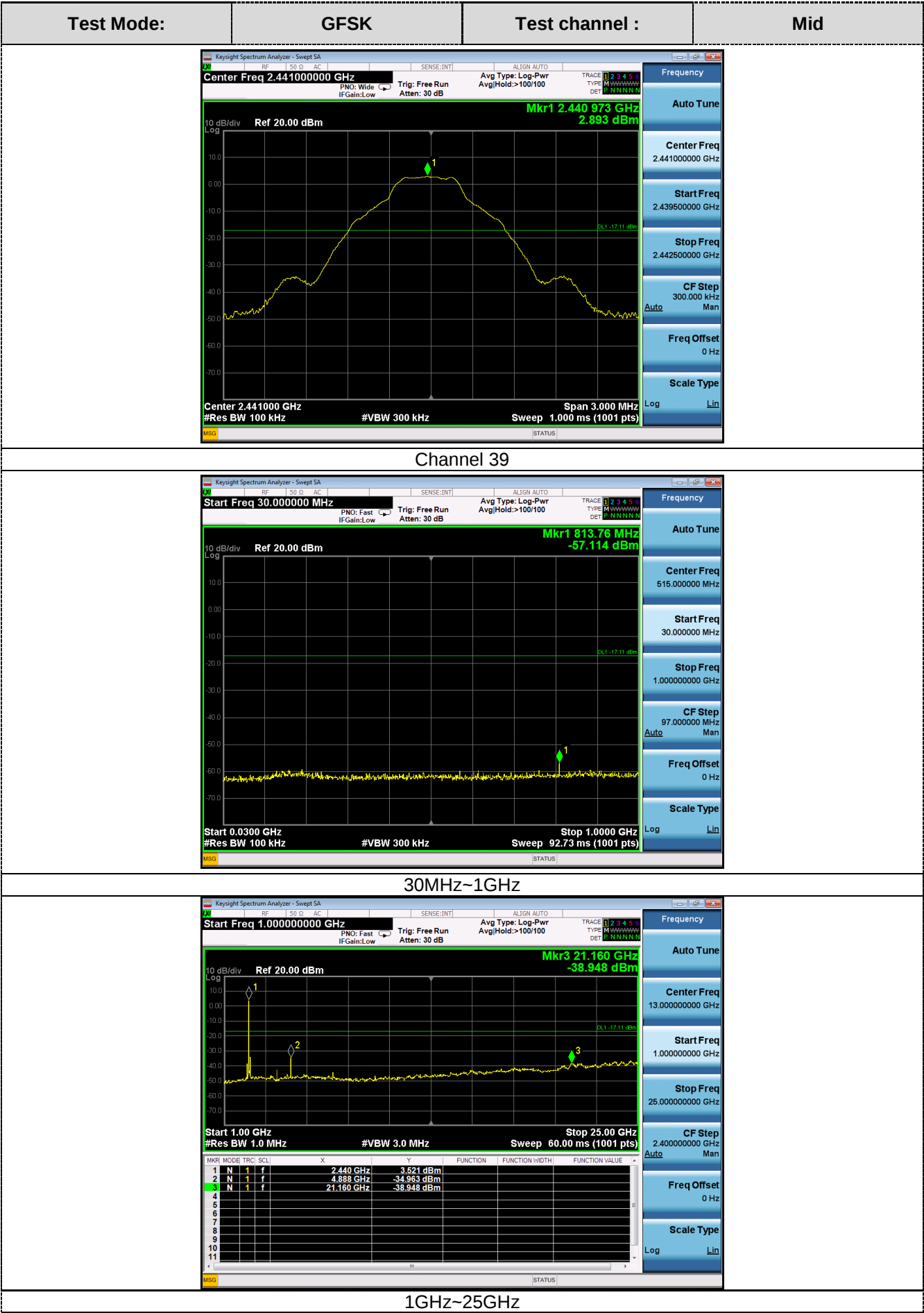
LIMIT

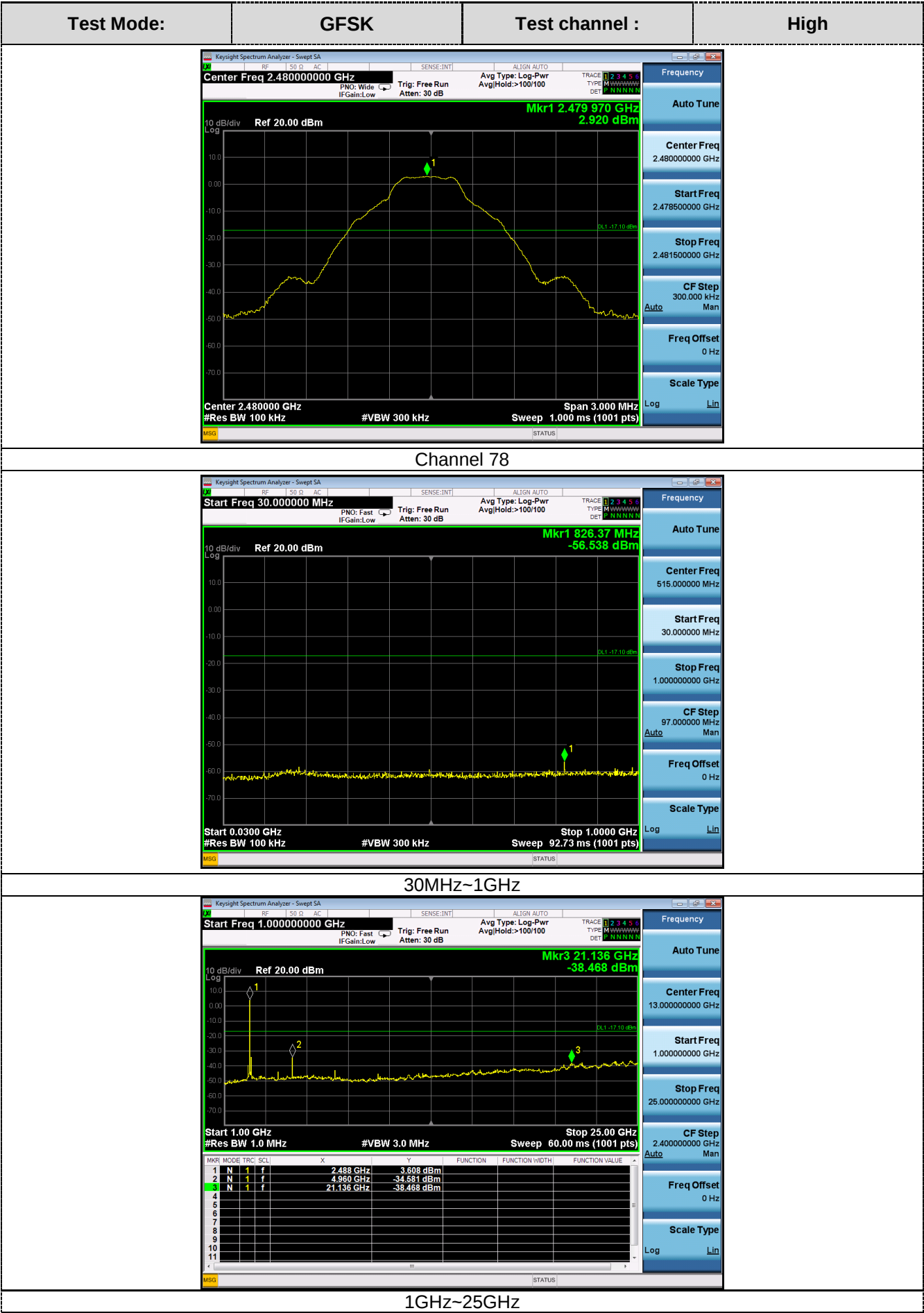
1. Below -20dB of the highest emission level in operating band.
2. Fall in the restricted bands listed in section 15.205. The maximum permitted average field strength is listed in section 15.209.
3. For below 30MHz, For 9kHz-150kHz, 150K-10MHz, We use the RBW 1kHz, 10kHz, So the limit need to be calculated by " $10\lg(BW1/BW2)$ ". for example For 9kHz-150kHz, RBW 1kHz, The Limit= the highest emission level-20-10log(100/1)= the highest emission level-40.

TEST RESULTS

Remark: The measurement frequency range is from 9kHz to the 10th harmonic of the fundamental frequency. The lowest, middle and highest channels are tested to verify the spurious emissions and band edge measurement data.

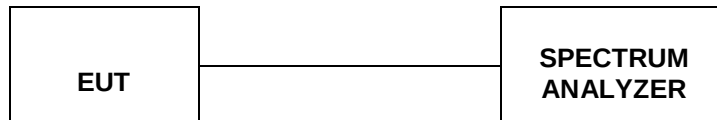






4.8. Number of hopping frequency

TEST CONFIGURATION



TEST PROCEDURE

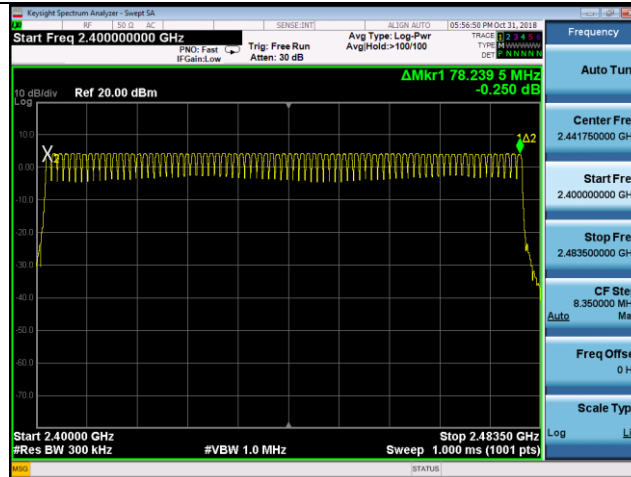
The transmitter output was connected to the spectrum analyzer through an attenuator. Set spectrum analyzer start 2400MHz to 2483.5MHz with RBW=1MHz and VBW=3MHz.

LIMIT

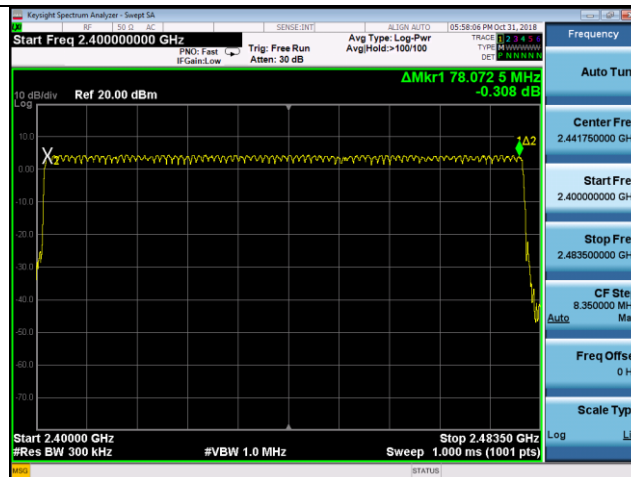
Frequency hopping systems in the 2400–2483.5MHz band shall use at least 15 channels.

Modulation	Number of Hopping Channel	Limit	Result
GFSK	79	≥15	Pass
$\pi/4$ DQPSK	79		
8DPSK	79		

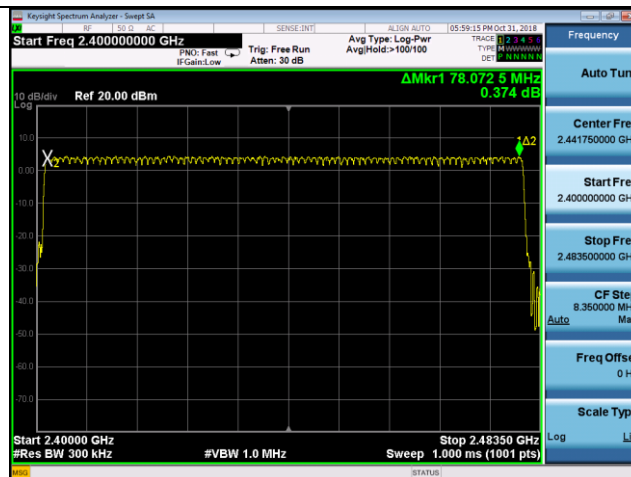
GFSK Modulation



$\pi/4$ DQPSK Modulation

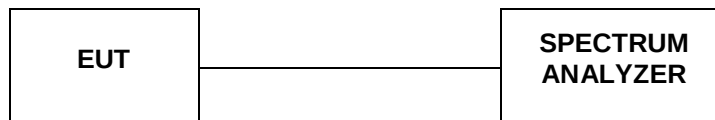


8DPSK Modulation



4.9. Time Of Occupancy(Dwell Time)

TEST CONFIGURATION



TEST PROCEDURE

The transmitter output was connected to the spectrum analyzer through an attenuator. Set center frequency of spectrum analyzer=operating frequency with RBW=1MHz and VBW=3MHz, Span=0Hz.

LIMIT

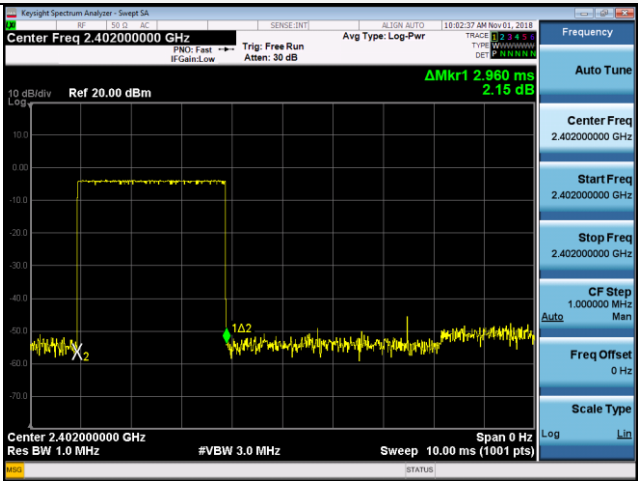
The average time of occupancy on any channel shall not be greater than 0.4 seconds within a period of 0.4 seconds multiplied by the number of hopping channels employed.

TEST RESULTS

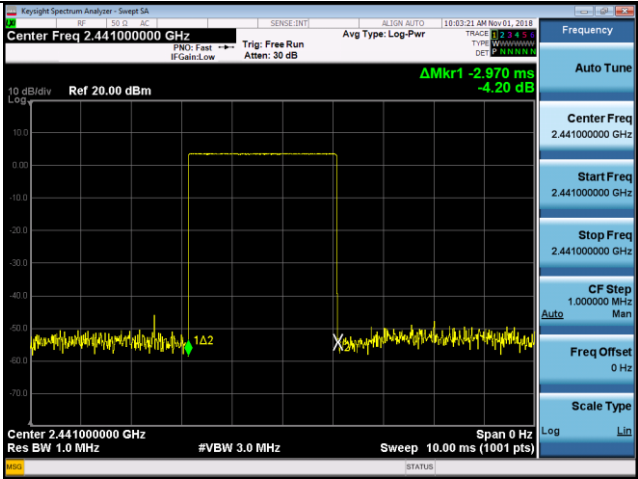
Type	Modulation	CH	Pulse time(ms)	Dwell Time(ms)	Limit(ms)	Result
Dwell Time	GFSK	Low	2.96	315.733	400	Pass
		Mid	2.97	316.800	400	Pass
		High	2.97	316.800	400	Pass
	π/4DQPSK	Low	2.99	318.933	400	Pass
		Mid	2.96	315.733	400	Pass
		High	2.98	317.867	400	Pass
	8DPSK	Low	2.99	318.933	400	Pass
		Mid	2.96	315.733	400	Pass
		High	2.95	314.667	400	Pass
Note:Dwell time=Pulse time(ms)*(1600/6/79)*31.6						

Note:The worst case at DH5/3DH5.

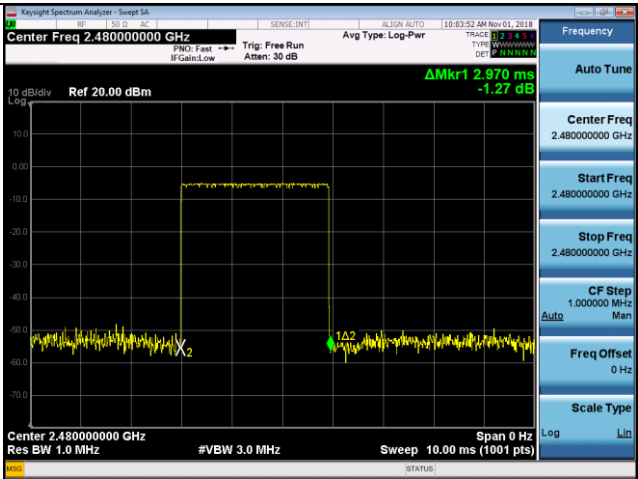
GFSK Modulation



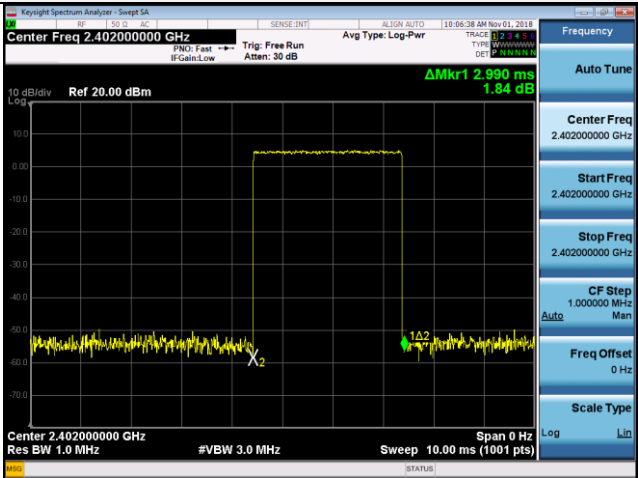
Low



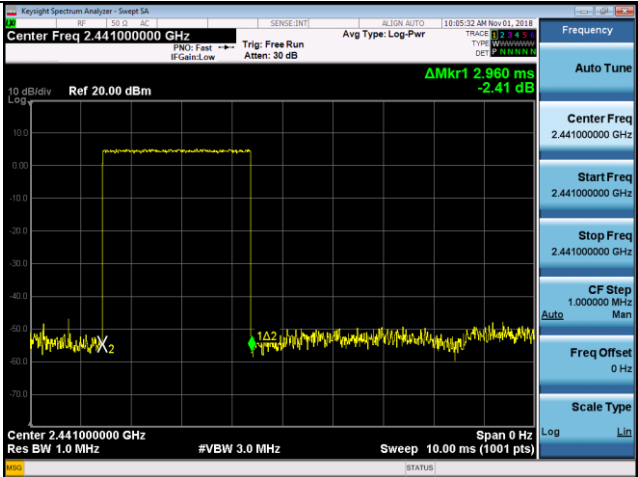
Mid



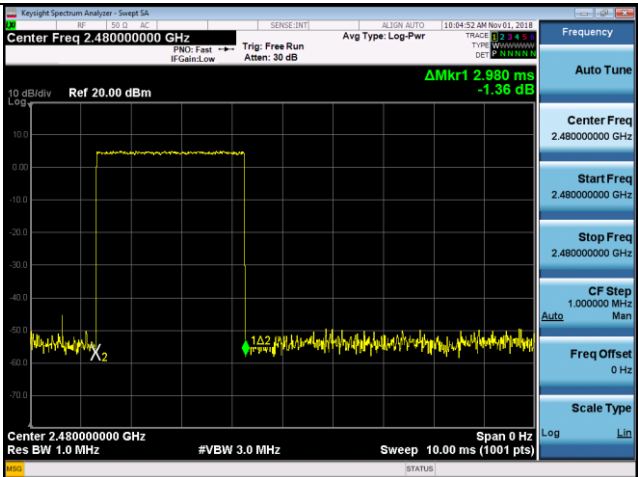
$\pi/4$ DQPSK Modulation



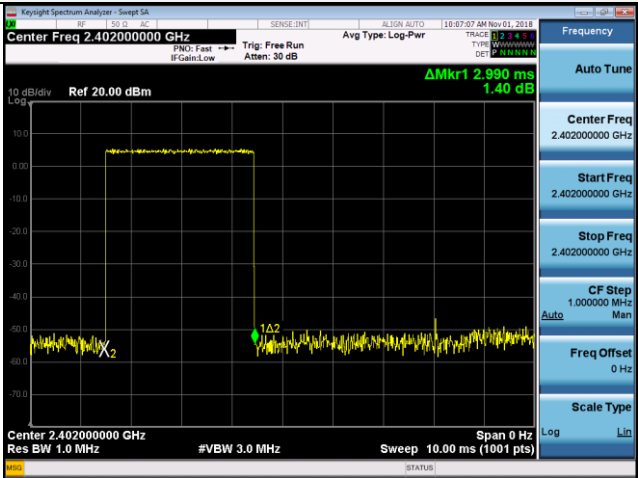
Low



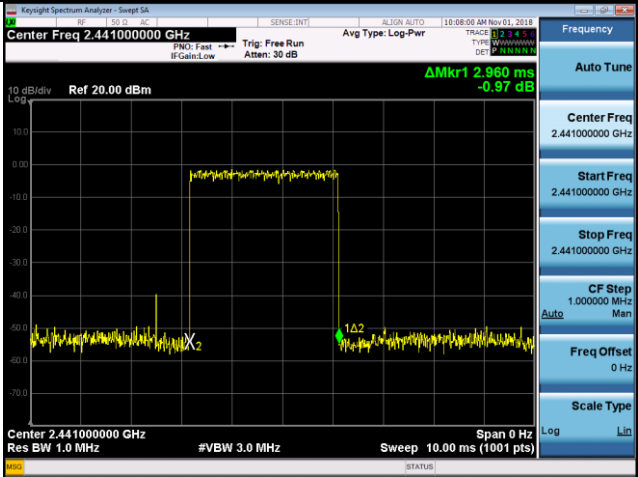
Mid



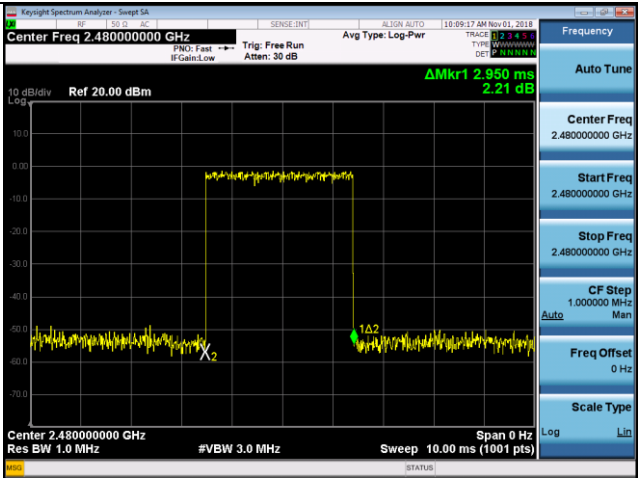
8DPSK Modulation



Low



Mid



4.10. Pseudorandom Frequency Hopping Sequence

TEST APPLICABLE

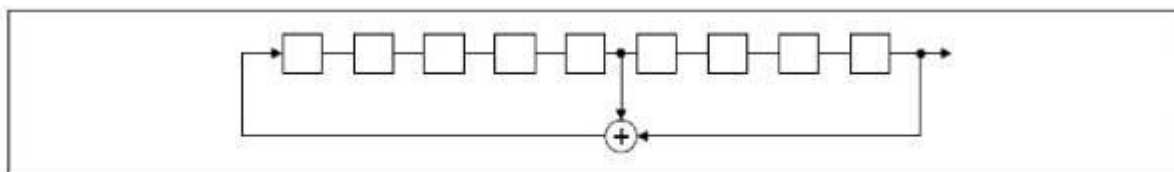
For 47 CFR Part 15C section 15.247 (a)(1) requirement:

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 pseudo randomly 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.

EUT Pseudorandom Frequency Hopping Sequence Requirement

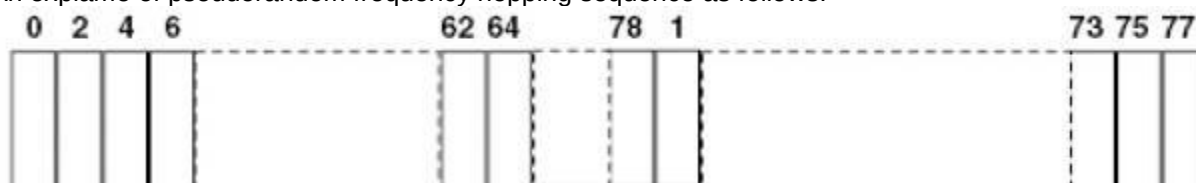
The pseudorandom frequency hopping sequence may be generated in a nine-stage shift register whose 5th and 9th stage outputs are added in a modulo-two addition stage. And the result is fed back to the input of the first stage. The sequence begins with the first one of 9 consecutive ones, for example: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



Linear Feedback Shift Register for Generation of the PRBS sequence

An example 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.

4.11. Antenna Requirement

Standard Applicable

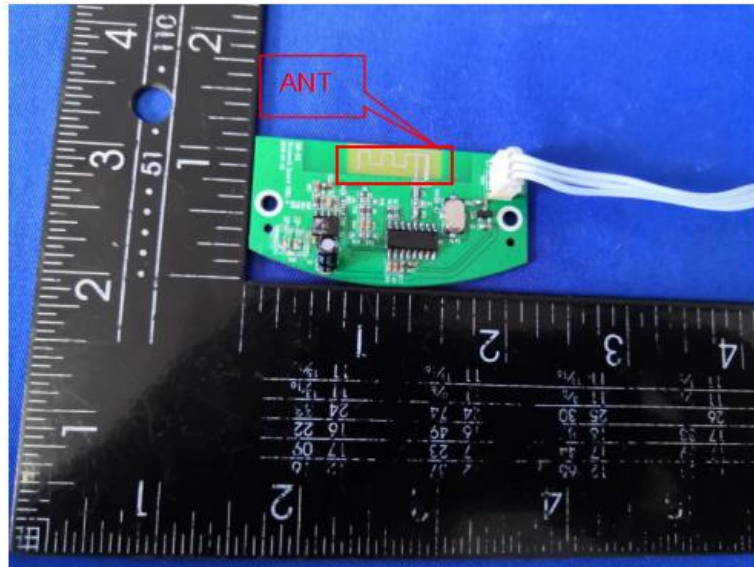
For intentional device, according to FCC 47 CFR Section 15.203, an intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device.

And according to FCC 47 CFR Section 15.247 (c), 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.

Antenna Information

The PCB antenna for BT, The directional gains of antenna used for transmitting is 2.2dBi.

ANT



5. Test Setup Photos of the EUT

Radiated Emission
(Below 1G)



Radiated Emission
(Above 1G)



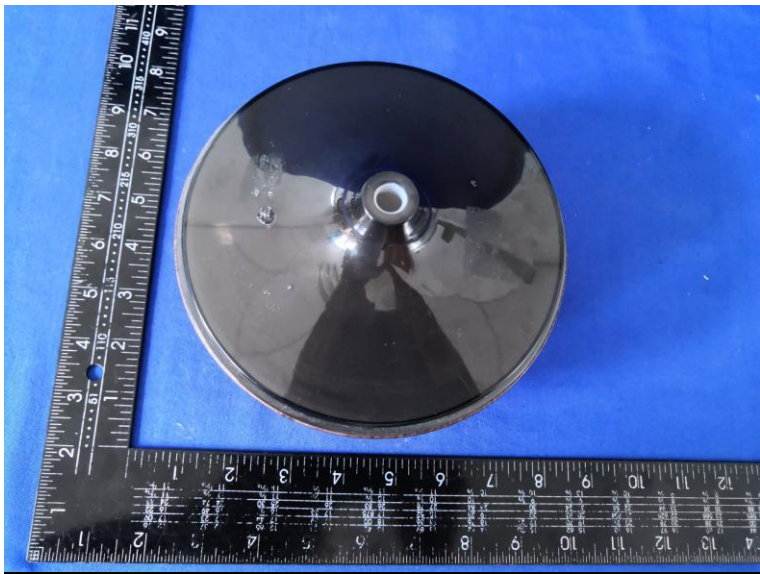
Conducted Emission



6. External and Internal Photos of the EUT

External Photos







Internal Photos

