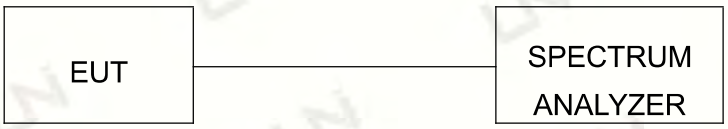
9. CONDUCTED BANDEGE MEASUREMENT

9.1 Test Setup



9.2 Test Procedure

1. The EUT was placed on a turn table which is 0.8m above ground plane.
2. Set EUT as TX operation and connect directly to the spectrum analyzer.
3. Based on FCC Part15 C Section 15.247: RBW=100KHz, VBW=300KHz.
4. Set detected by the spectrum analyzer with peak detector.

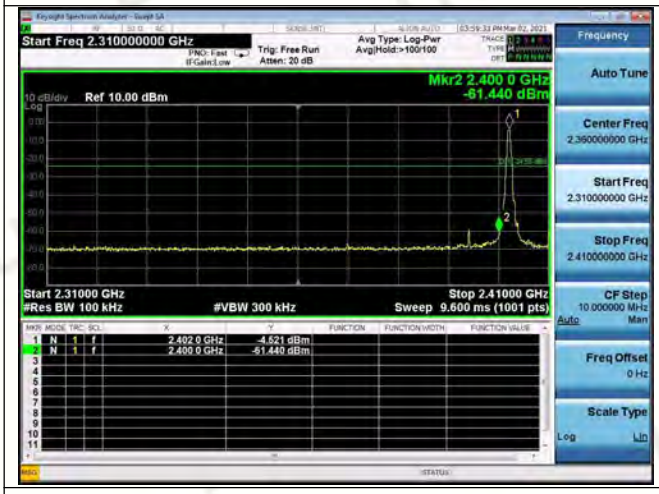
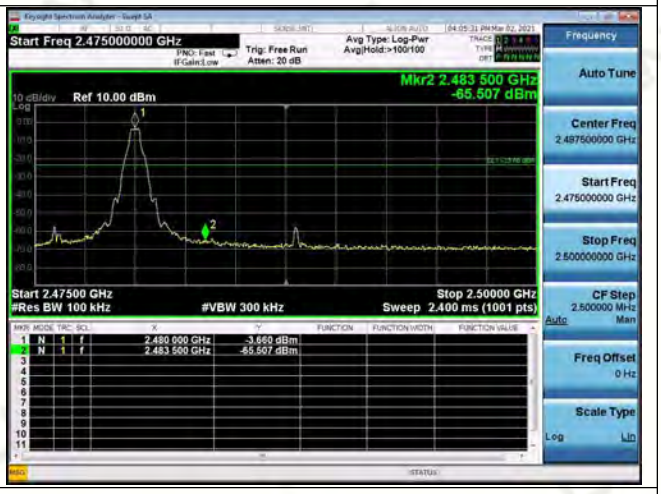
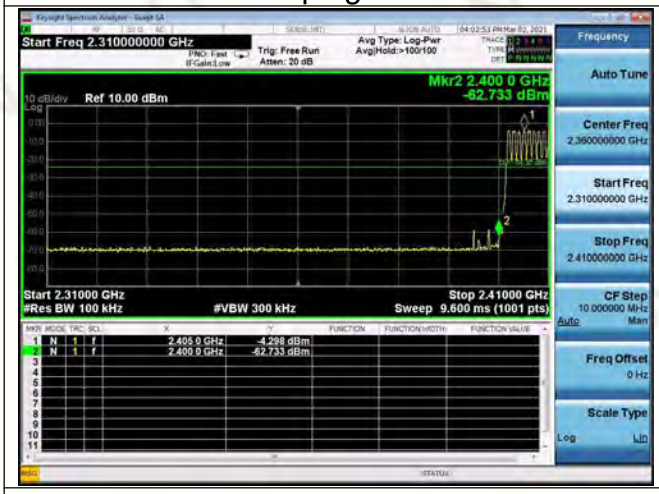
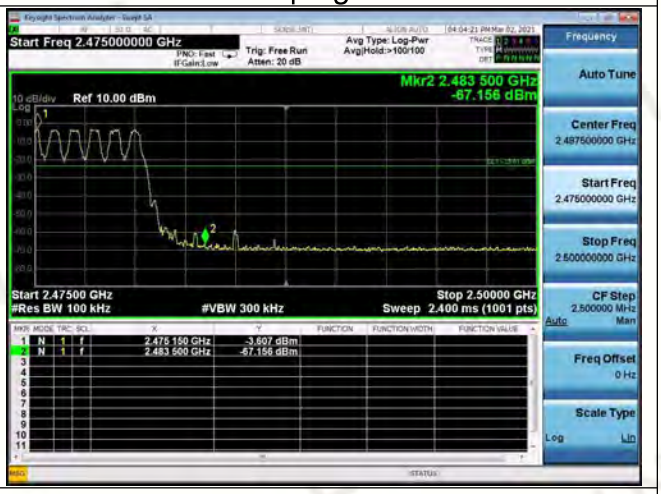
9.3 Limit

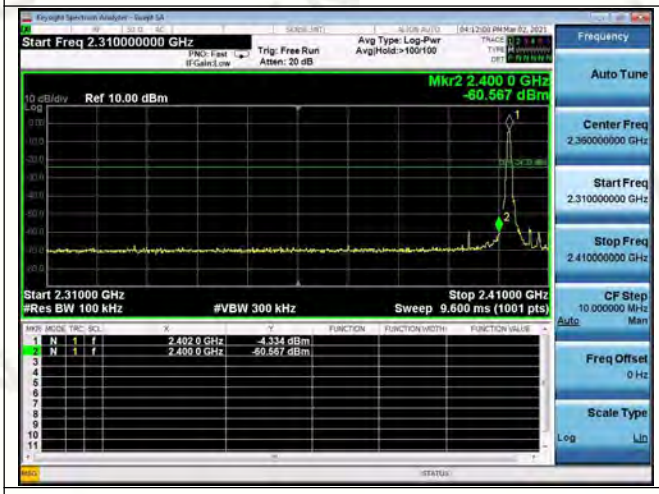
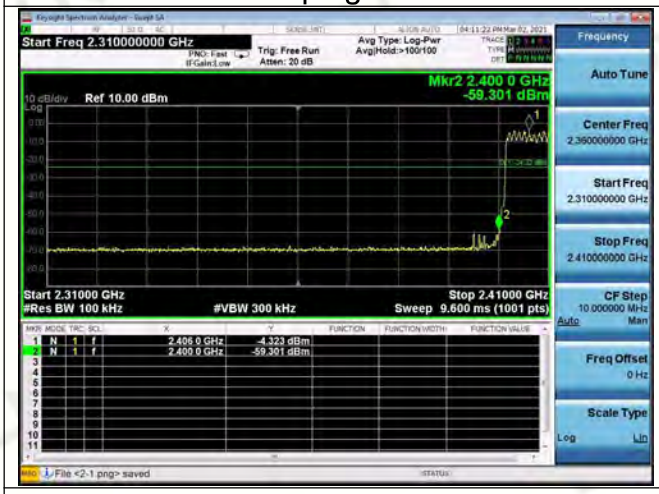
In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement, provided the transmitter demonstrates compliance with the peak conducted power limits. If the transmitter complies with the conducted power limits based on the use of RMS averaging over a time interval, as permitted under paragraph (b)(3) of this section, the attenuation required under this paragraph shall be 30 dB instead of 20dB.

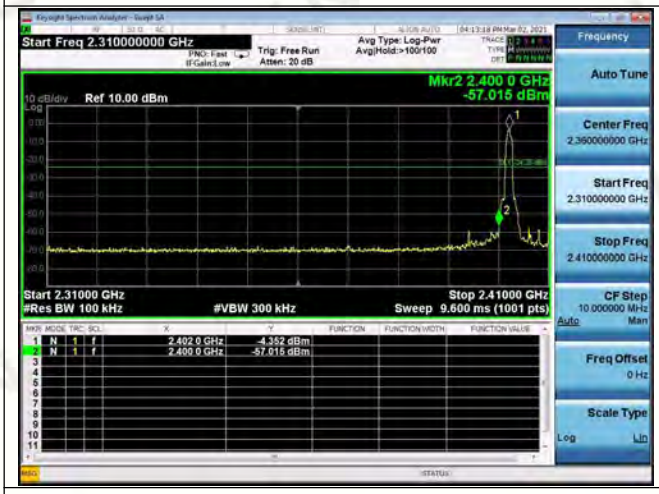
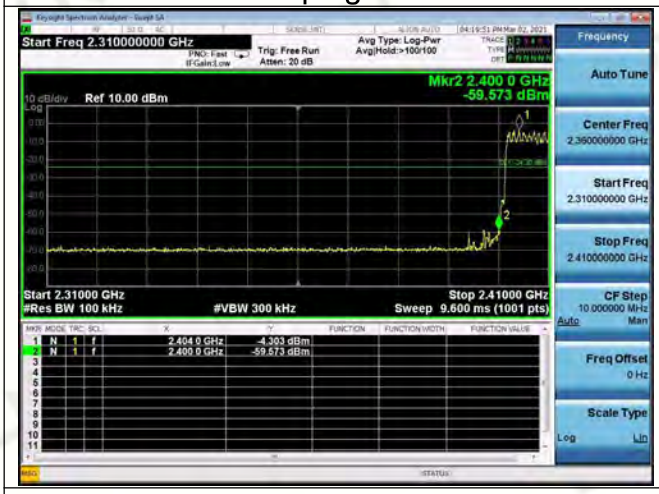
9.4 Test Result

PASS

Modulation		Frequency Band	Delta Peak to band emission (dBc)	＞Limit (dBc)	Result
GFSK	Non-hopping	Left Band	65.96	20	Pass
		Right Band	69.17	20	Pass
	hopping	Left Band	67.03	20	Pass
		Right Band	70.76	20	Pass
π/4DQPSK	Non-hopping	Left Band	64.90	20	Pass
		Right Band	68.17	20	Pass
	hopping	Left Band	63.62	20	Pass
		Right Band	67.43	20	Pass
8DPSK	Non-hopping	Left Band	61.37	20	Pass
		Right Band	65.10	20	Pass
	hopping	Left Band	63.88	20	Pass
		Right Band	66.16	20	Pass

GFSK	
2402MHz	2480MHz
	
Hoping Off	Hoping Off
	
Hoping On	Hoping On

π /4DQPSK	
2402MHz	2480MHz
	
Hoping Off	Hoping Off
	
Hoping On	Hoping On

8DPSK	
2402MHz	2480MHz
	
Hoping Off	Hoping Off
	
Hoping On	Hoping On

10. SPURIOUS RF CONDUCTED EMISSION

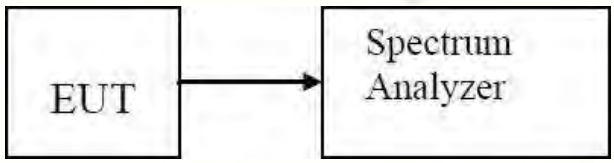
10.1 Test Limit

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 calculated by "10lg(BW1/BW2)". for example For9KHz-150kHz,RBW 1KHz, The Limit= the highest emission level-20-10log(100/1)= the highest emission level-40.

10.2 Test Procedure

The Spurious RF conducted emissions compliance of RF radiated emission should be measured by following the guidance in ANSI C63.10-2013, For 9KHz-150kHz, Set RBW=1kHz and VBW= 3KHz; For 150KHz-10MHz, Set RBW=10kHz and VBW= 30KHz:For 10MHz-25GHz ,Set RBW=100kHz and VBW= 300KHz in order to measure the peak field strength, and mwasure frequeny range from 9KHz to 25GHz.

10.3 Test Setup



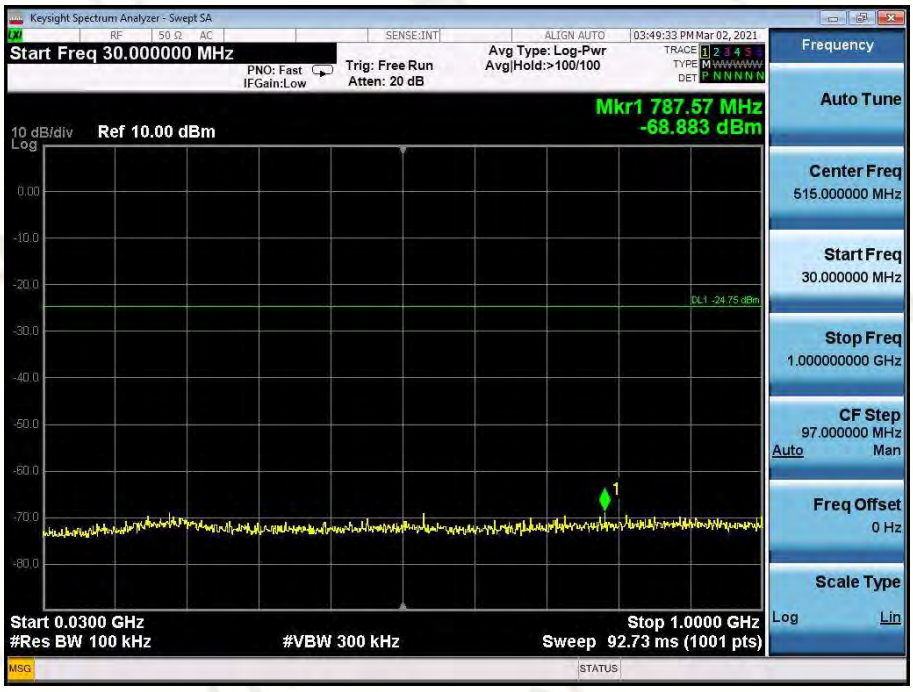
10.4 Test Result

PASS

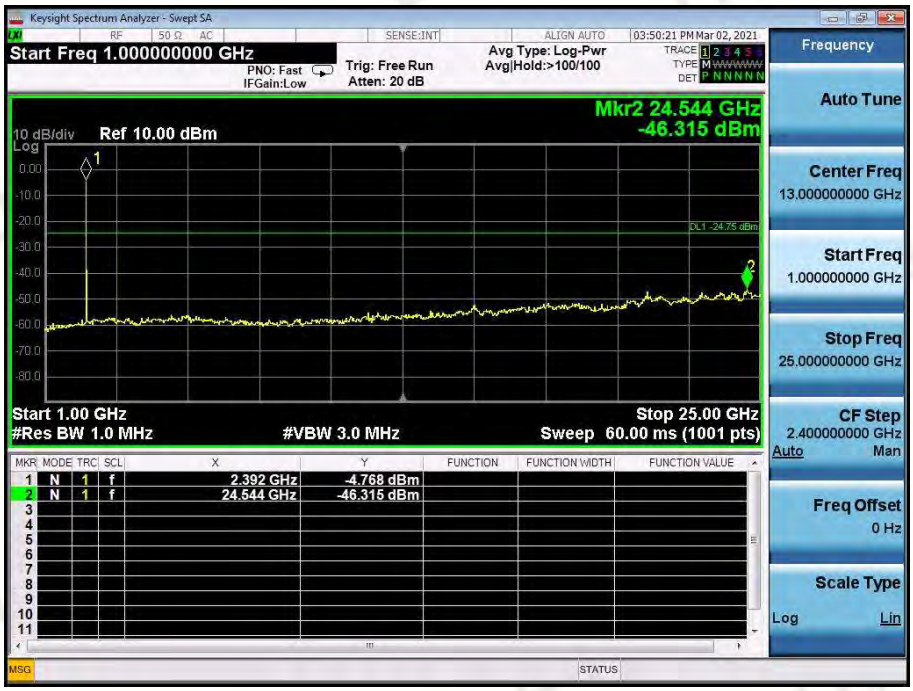
Remark: All modes of GFSK, π/4 DQPSK, 8DPSK were tested, only the worst result of GFSK was reported as below:

GFSK

CH: 2402MHz

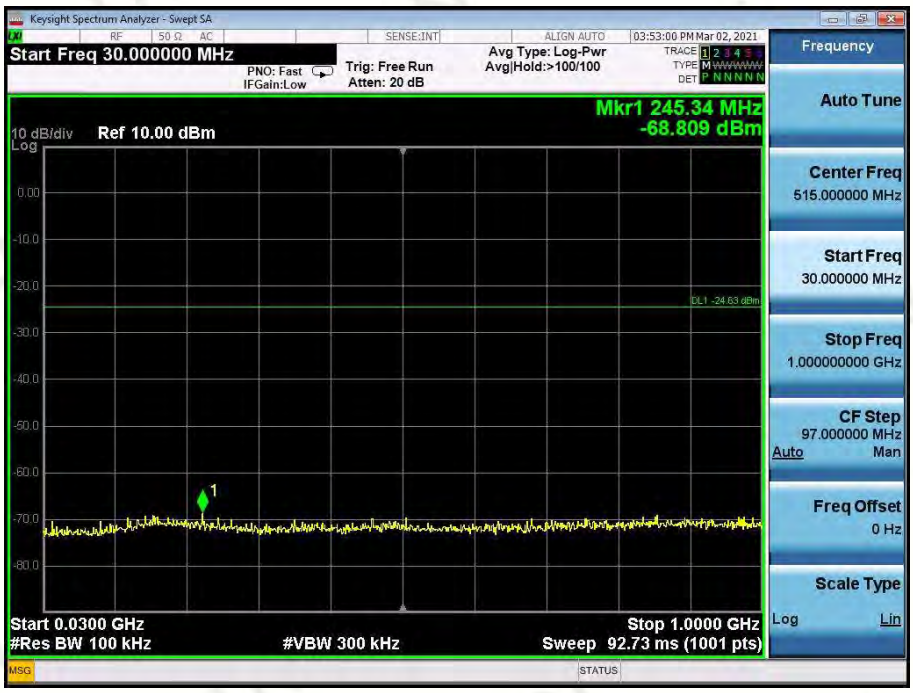


30MHz~1GHz

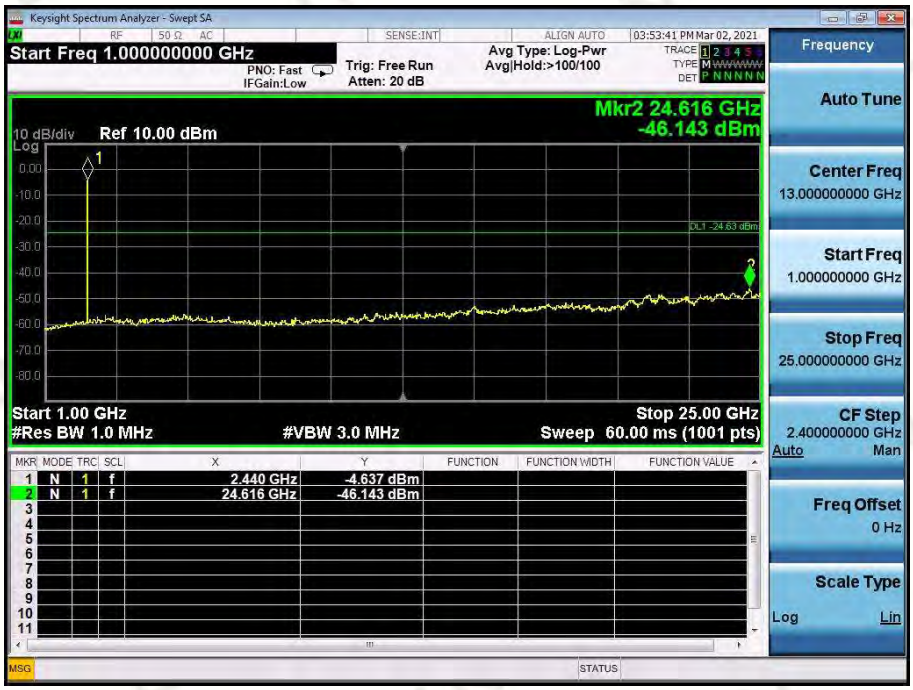


1GHz~25GHz

CH: 2441MHz

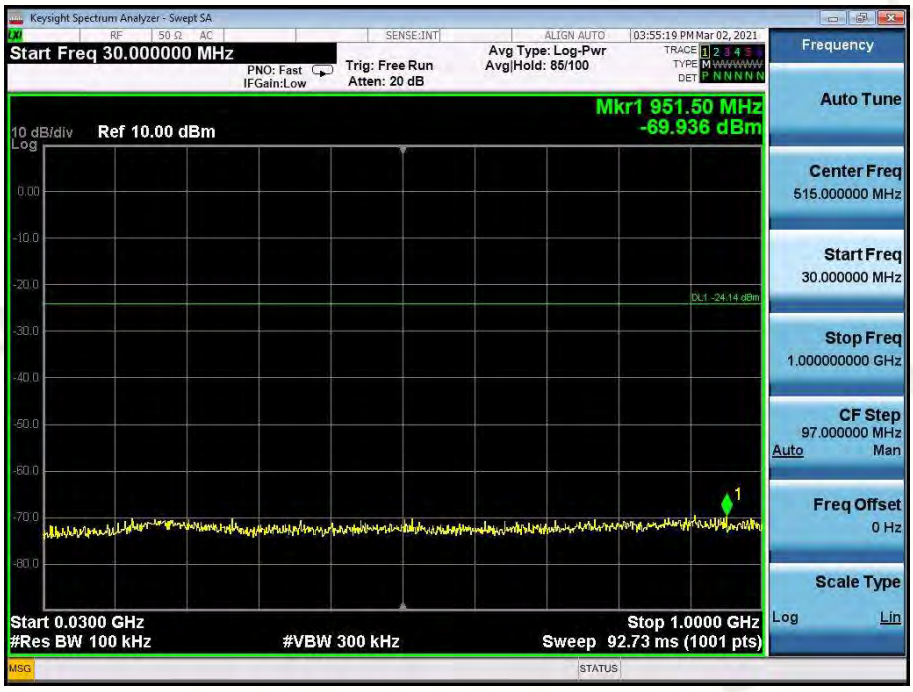


30MHz~1GHz

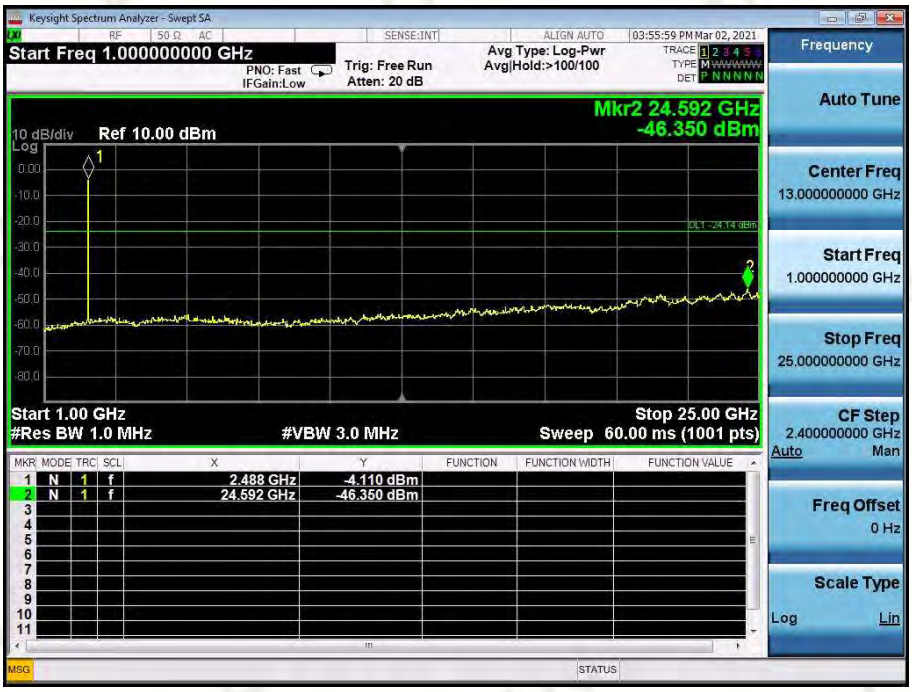


1GHz~25GHz

CH: 2480MHz



30MHz~1GHz


Keysight Spectrum Analyzer - Swept SA
Start Freq 1.000000000 GHz
PNO: Fast
IFGain:Low
Trig: Free Run
Atten: 20 dB
Avg Type: Log-Pwr
Avg|Hold:>100/100
03:55:59 PM Mar 02, 2021
Mkr2 24.592 GHz
-46.350 dBm
10 dB/div
Ref 10.00 dBm
Log
Start 1.00 GHz
#Res BW 1.0 MHz
#VBW 3.0 MHz
Stop 25.00 GHz
Sweep 60.00 ms (1001 pts)
1 N 1 f 2.488 GHz -4.110 dBm
2 N 1 f 24.592 GHz -46.360 dBm
Frequency
Auto Tune
Center Freq
13.000000000 GHz
Start Freq
1.000000000 GHz
Stop Freq
25.000000000 GHz
CF Step
2.400000000 GHz
Auto
Man
Freq Offset
0 Hz
Scale Type
Log
Lin
MSG
STATUS

1GHz~25GHz

11. NUMBER OF HOPPING FREQUENCY

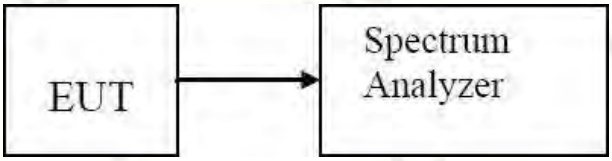
11.1 Test Limit

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

11.2 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.

11.3 Test Setup



11.4 Test Result

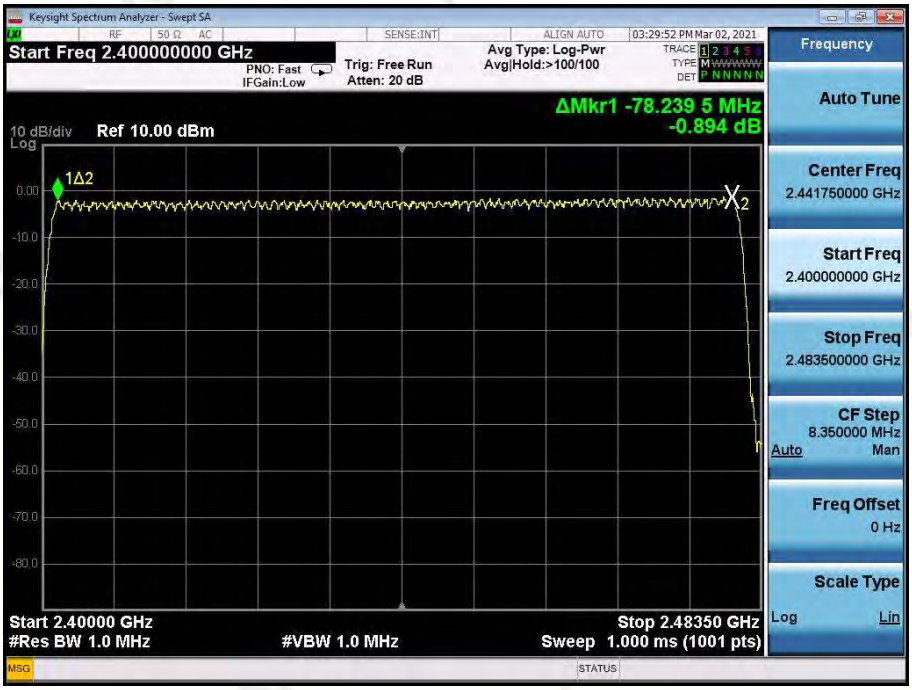
PASS

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

GFSK

π/4DQPSK

8DPSK



12. TIME OF OCCUPANCY(DWELL TIME)

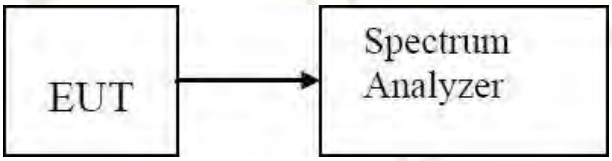
12.1 Test Limit

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

12.2 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.

12.3 Test Setup

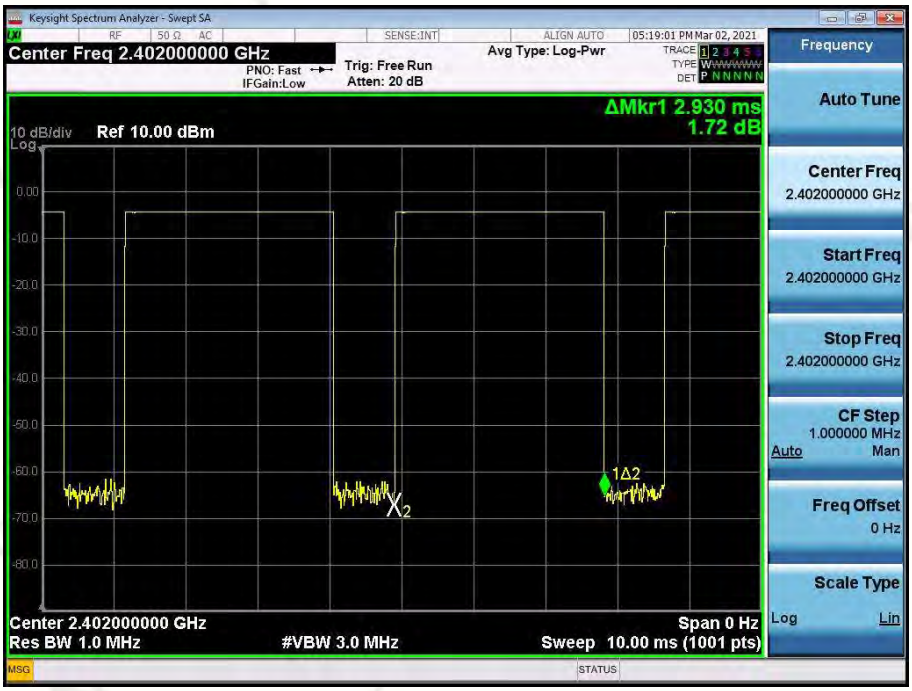


12.4 Test Result

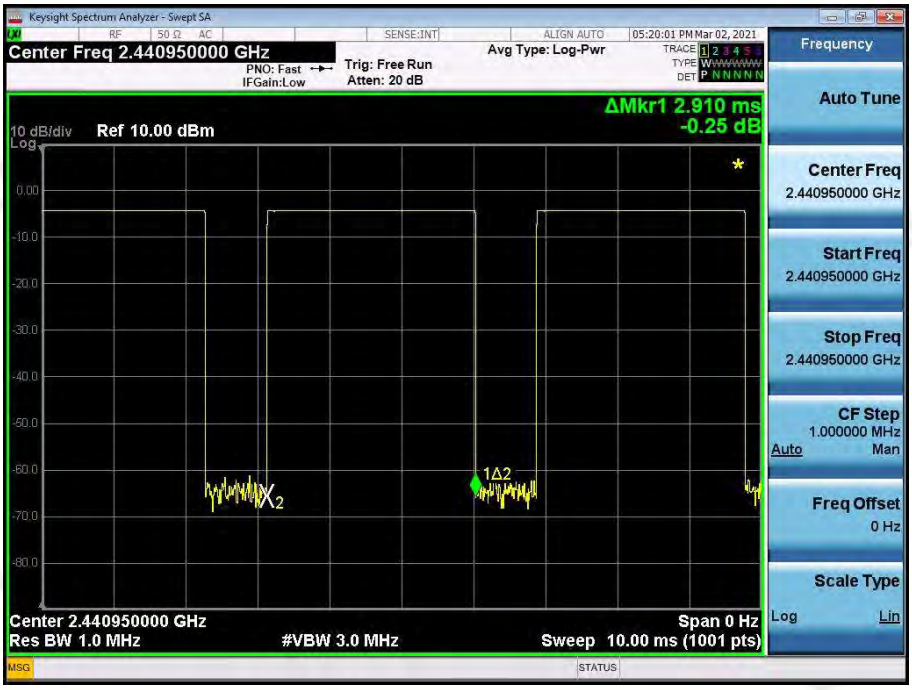
PASS

Type	Modulation	CH	Pulse time(ms)	Dwell Time(ms)	Limit(ms)	Result
Dwell Time	GFSK	Low	2.93	312.53	400	Pass
		Mid	2.91	310.40	400	Pass
		High	2.94	313.60	400	Pass

CH: 2402MHz



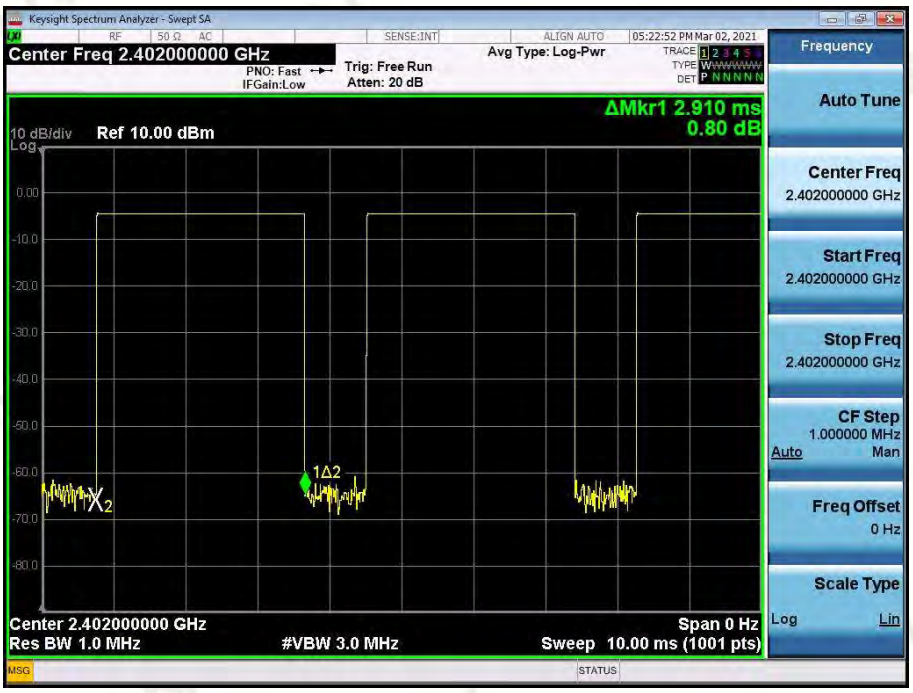
CH: 2441MHz



CH: 2480MHz

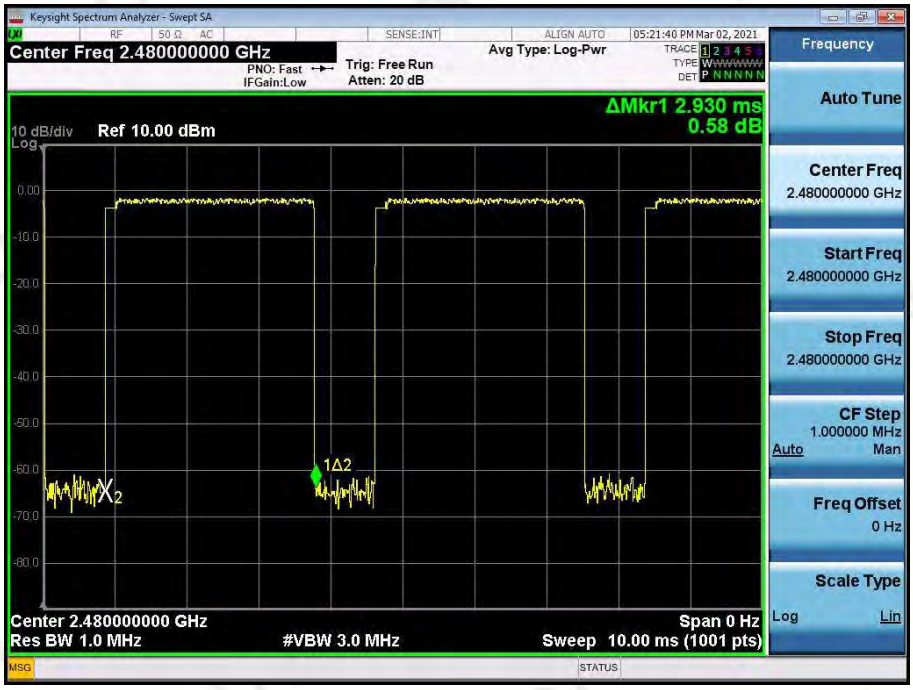
Type	Modulation	CH	Pulse time(ms)	Dwell Time(ms)	Limit(ms)	Result
Dwell Time	π/4DQPSK	Low	2.91	310.40	400	Pass
		Mid	2.91	310.40	400	Pass
		High	2.93	312.53	400	Pass

CH: 2402MHz



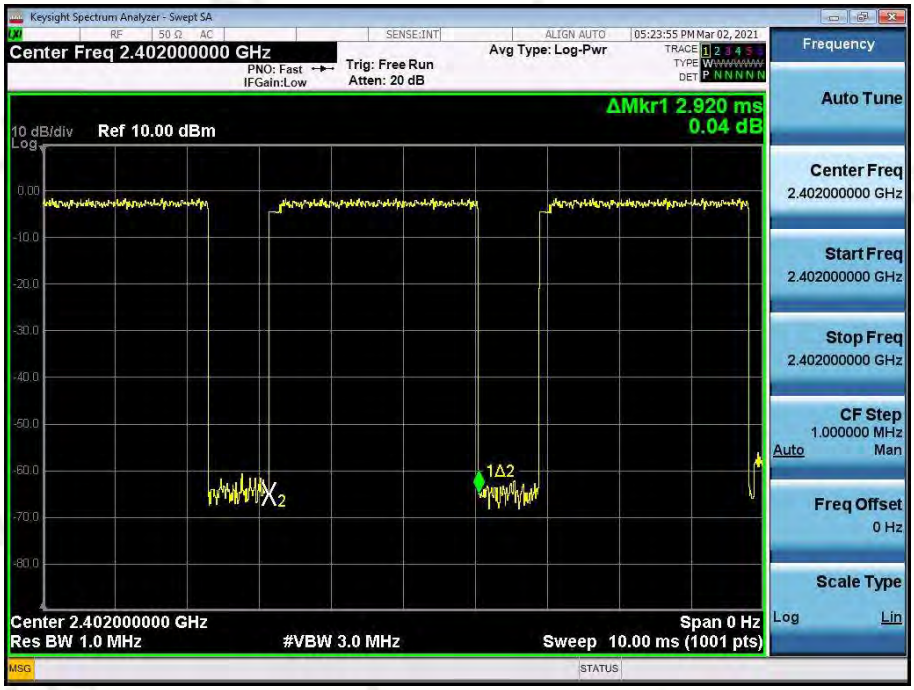
CH: 2441MHz

CH: 2480MHz



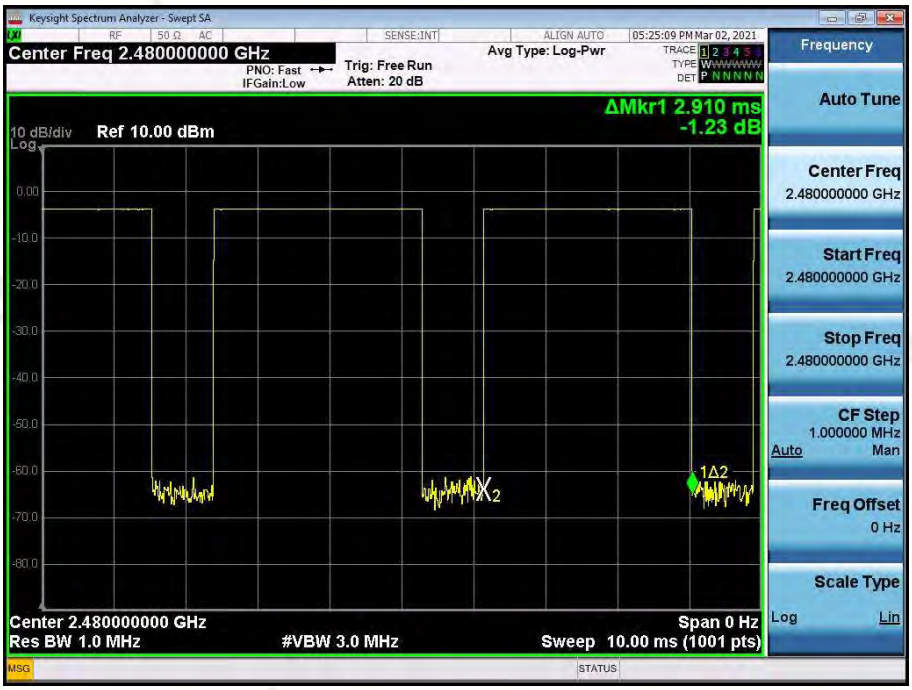
Type	Modulation	CH	Pulse time(ms)	Dwell Time(ms)	Limit(ms)	Result
Dwell Time	8DPSK	Low	2.92	311.47	400	Pass
		Mid	2.92	311.47	400	Pass
		High	2.91	310.40	400	Pass

CH: 2402MHz



CH: 2441MHz

CH: 2480MHz



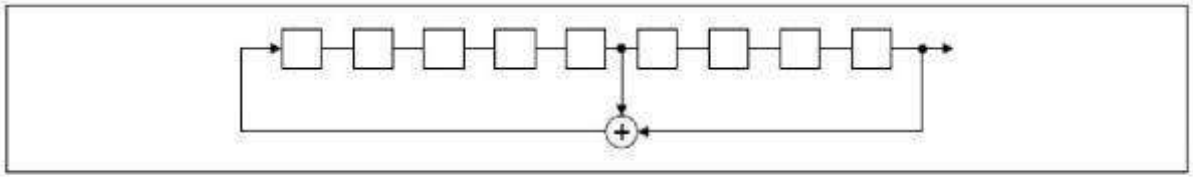
13. PSEUDORANDOM FREQUENCY HPPPING SEQUENCE

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

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 shal l 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.

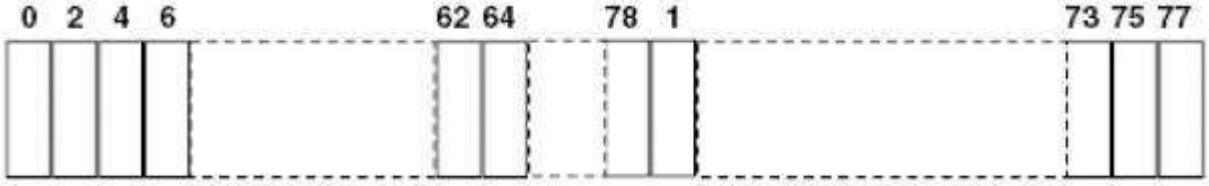
TEUT Pseudorandom Frequency Hopping Sequence Requirement

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 frist stage.The sequence begins with the frist 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: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:



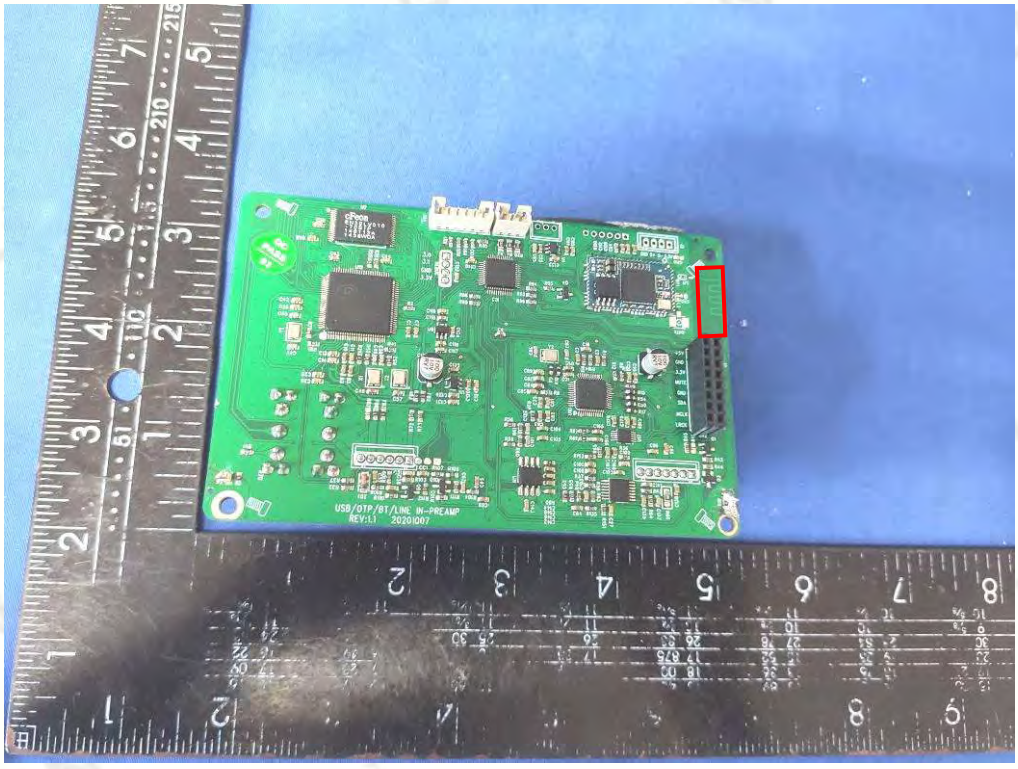
Each frequency used equally one the average by each transmitter.
The system receiver have input bandwidths that match the hopping channel bandwidths of their corresponding transmitter and shift frequencies in synchronization with the transmitted signals.

14. 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.

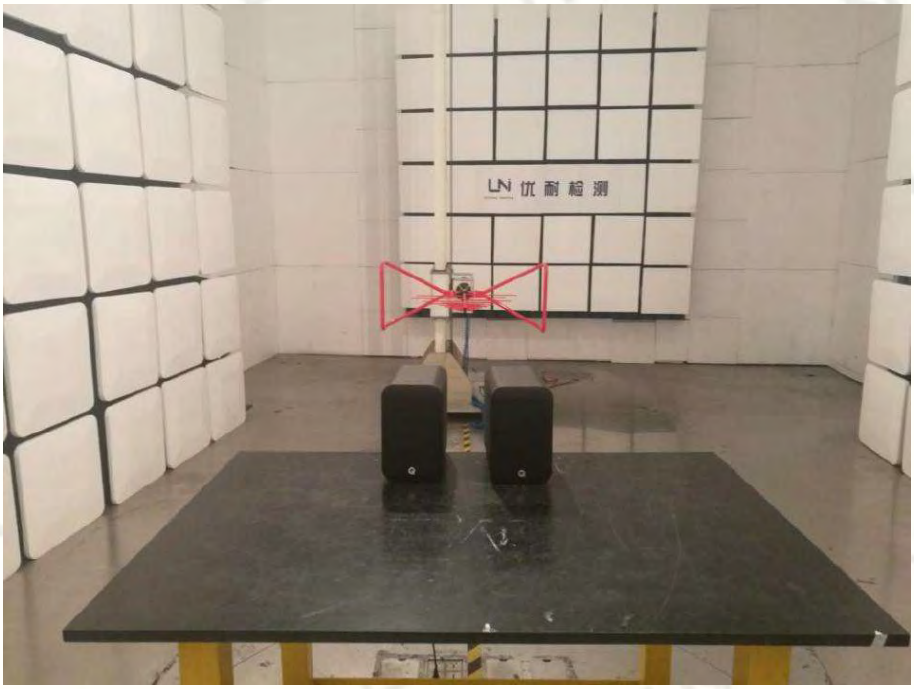
Antenna Connected Construction
The antenna used in this product is an Internal Antenna, The directional gains of antenna used for transmitting is 0dBi.

BT ANTENNA:



15. PHOTOGRAPH OF TEST

Radiated Emission
(Below 1G)



Radiated Emission
(Above 1G)

Conducted Emission

End of Report