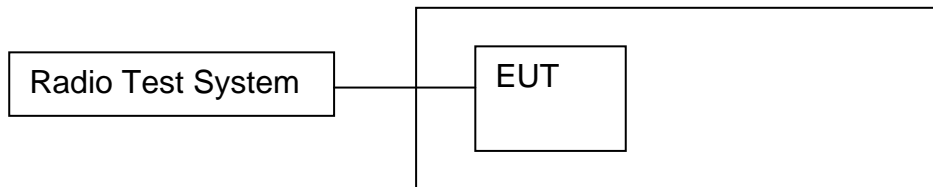




## 11. HOPPING CHANNEL SEPARATION

### 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

Modulation	Test Channel	Separation (MHz)	Limit(MHz)	Result
GFSK	Low	1.000	0.867	PASS
GFSK	Middle	1.004	0.889	PASS
GFSK	High	1.002	0.884	PASS
Pi/4 DQPSK	Low	1.006	0.881	PASS
Pi/4 DQPSK	Middle	1.004	0.879	PASS
Pi/4 DQPSK	High	1.004	0.885	PASS
8DPSK	Low	1.004	0.888	PASS
8DPSK	Middle	1.008	0.867	PASS
8DPSK	High	1.004	0.891	PASS

Test plots  
GFSK Low Channel





### GFSK Middle Channel

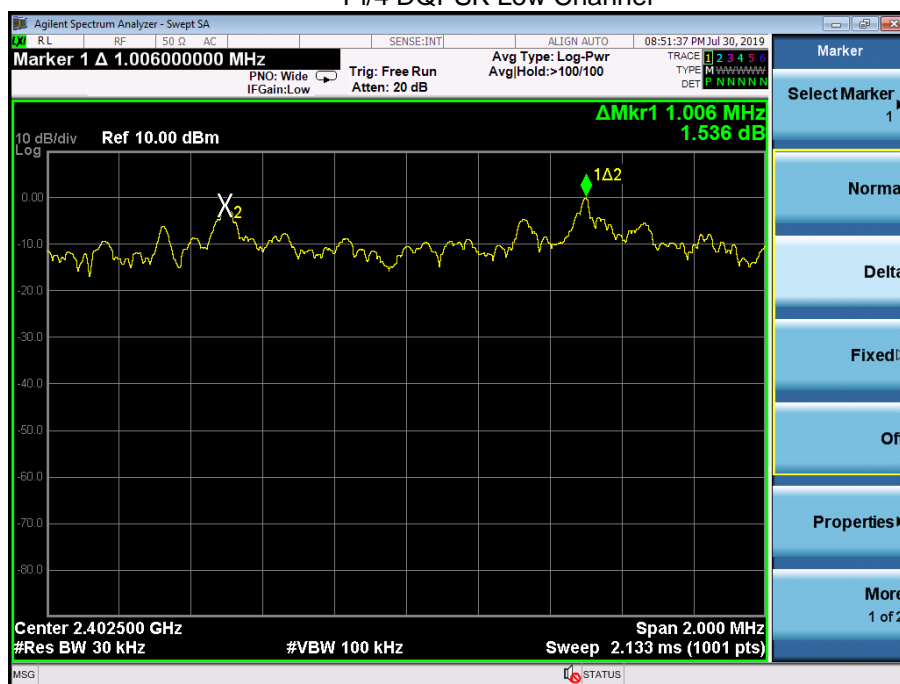


### GFSK High Channel

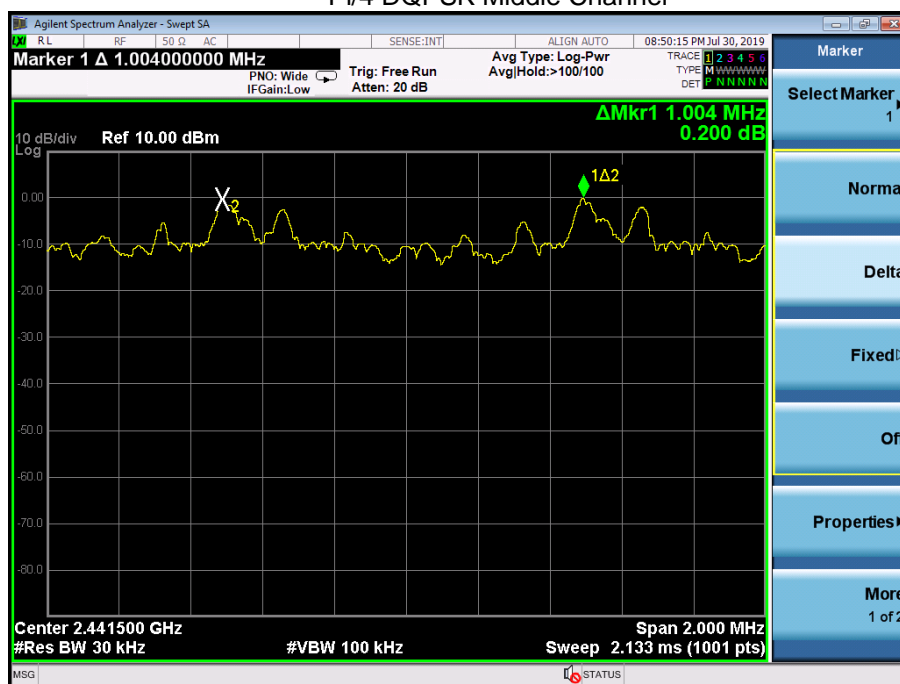




Pi/4 DQPSK Low Channel



Pi/4 DQPSK Middle Channel





### Pi/4 DQPSK High Channel



### 8DPSK Low Channel





### 8DPSK Middle Channel



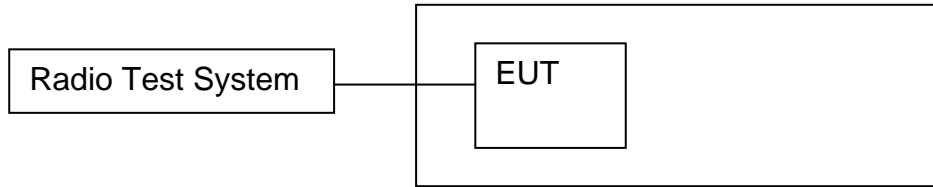
### 8DPSK High Channel





## 12. NUMBER OF HOPPING FREQUENCY

### 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.

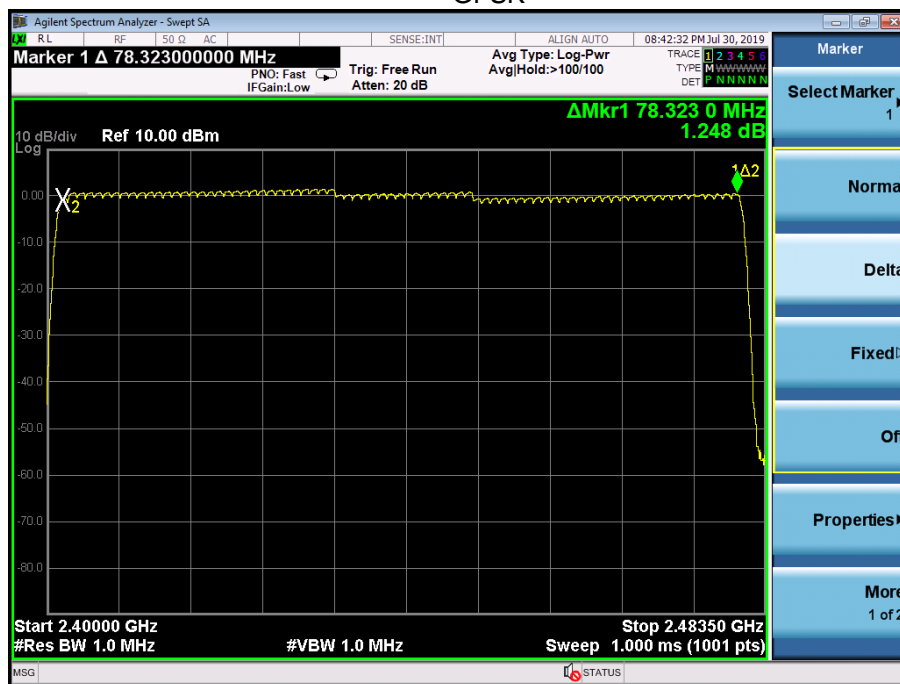
### 12.3 Test procedure

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 = 1MHz. VBW = 1MHz. 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;

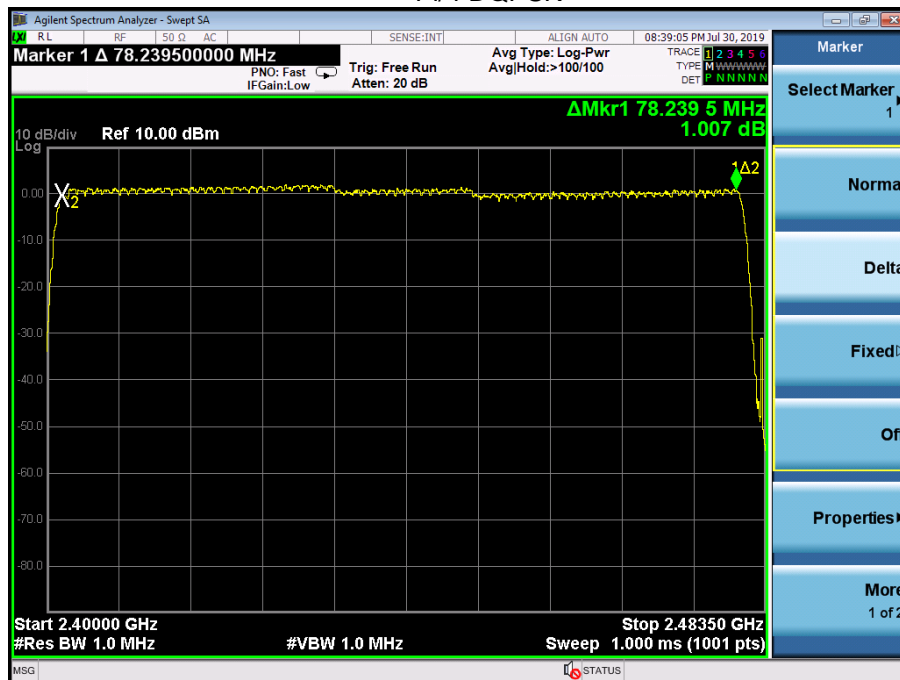


## 12.4 Test Result

### Test Plots: 79 Channels in total GFSK



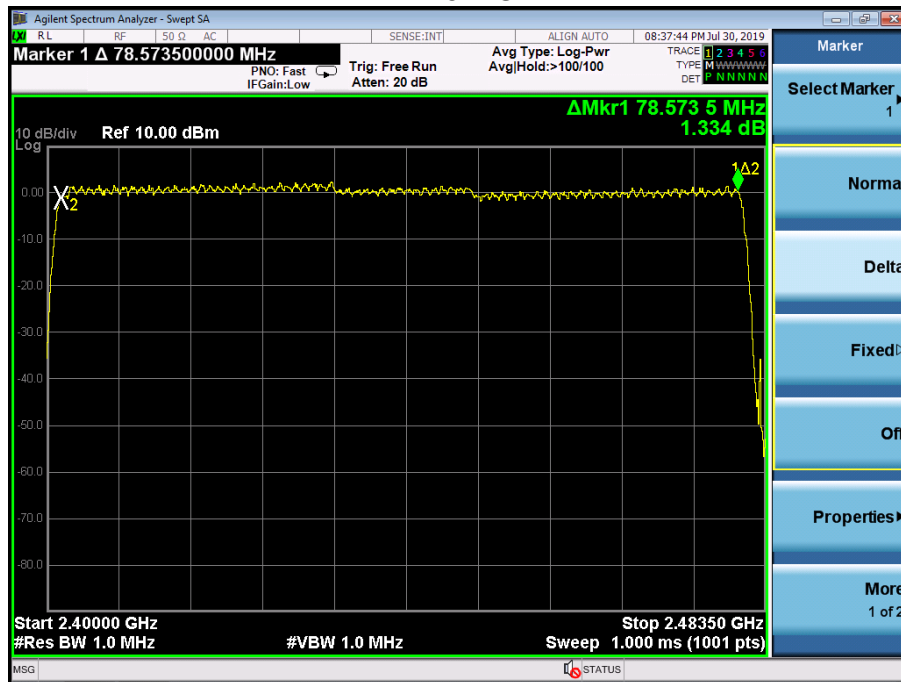
### Pi/4 DQPSK







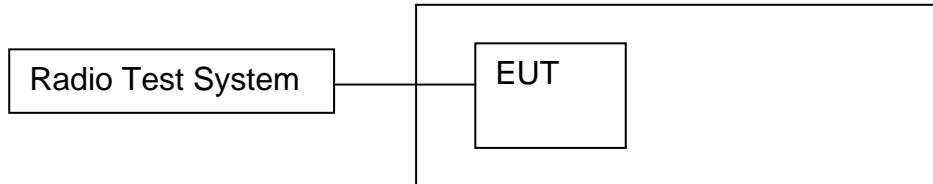
8DPSK





## 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

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

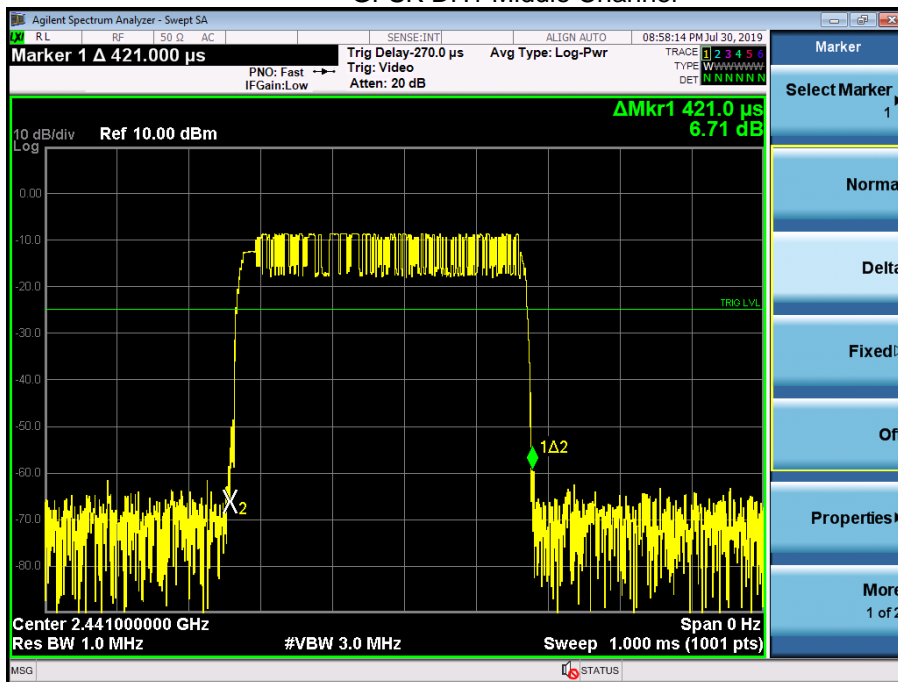
DH1:  $1600/79/2 \times 0.4 \times 79 \times (\text{MkrDelta})/1000$

Remark: Mkr Delta is once pulse time.

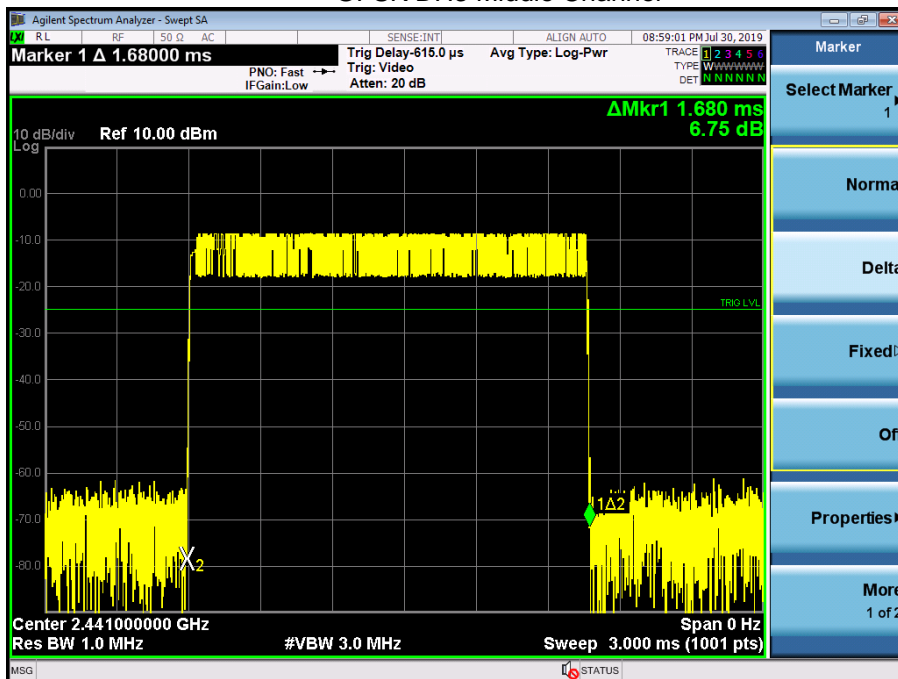
Modulation	Channel Data	Packet	pulse time(ms)	Dwell Time(s)	Limits(s)
GFSK	Middle	DH1	0.421	0.135	0.4
		DH3	1.680	0.269	0.4
		DH5	2.940	0.314	0.4
Pi/4DQPSK	Middle	DH1	0.438	0.140	0.4
		DH3	1.695	0.271	0.4
		DH5	2.952	0.315	0.4
8DPSK	Middle	DH1	0.441	0.141	0.4
		DH3	1.695	0.271	0.4
		DH5	2.946	0.314	0.4



Test Plots  
GFSK DH1 Middle Channel

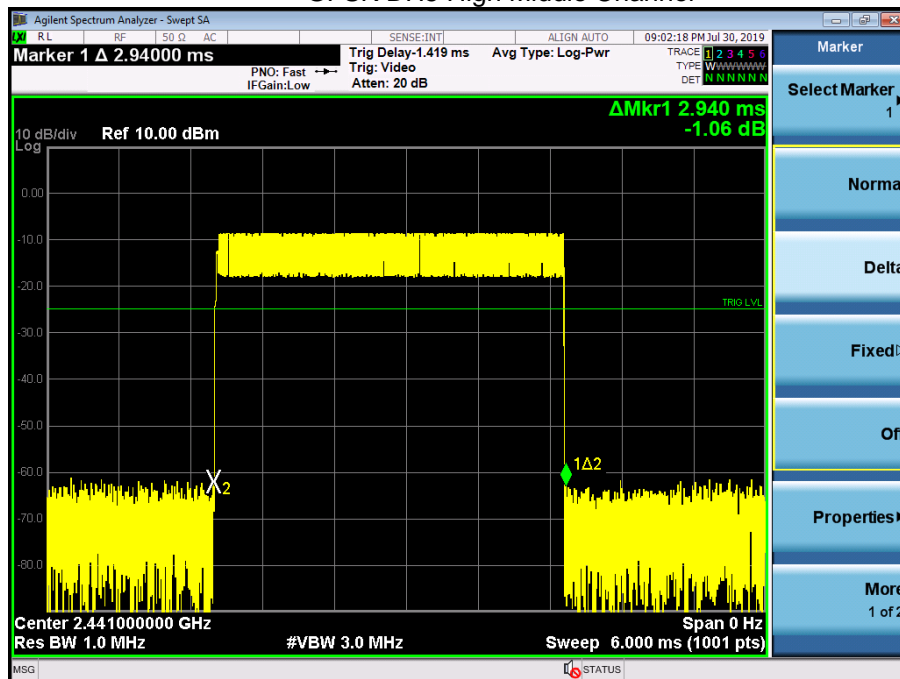


GFSK DH3 Middle Channel

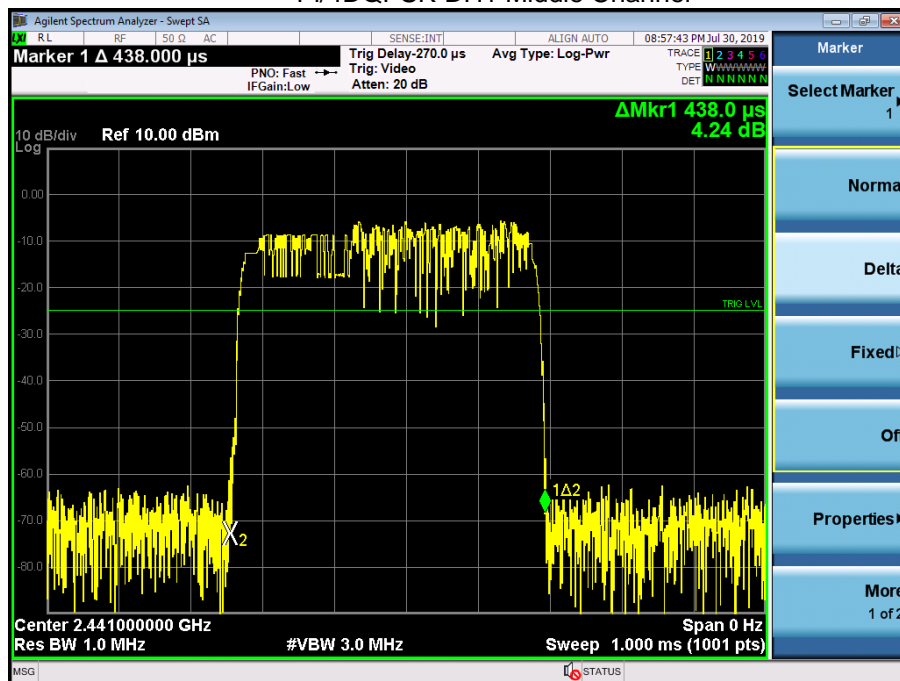




### GFSK DH5 High Middle Channel

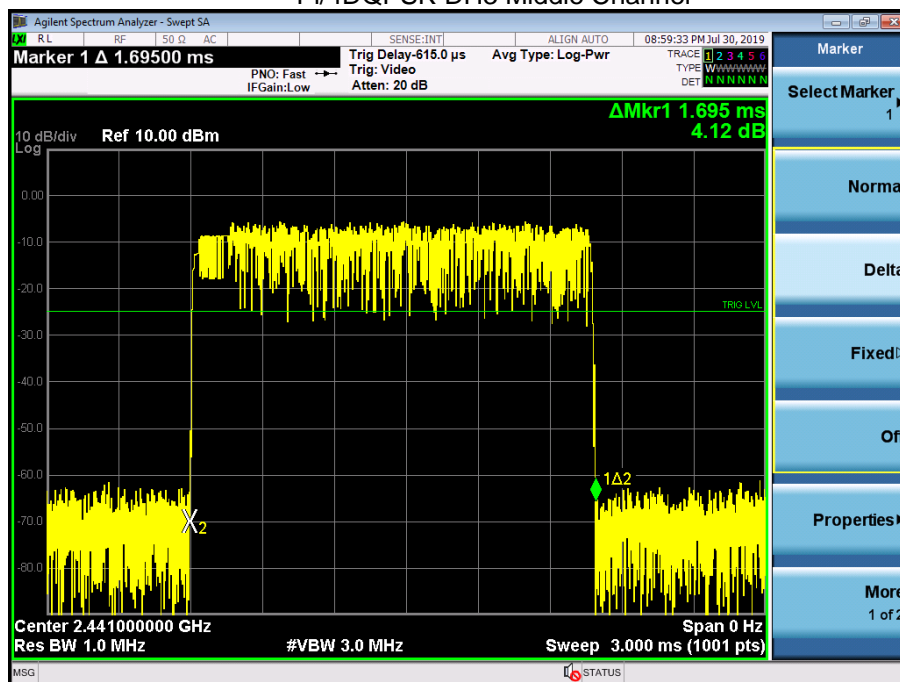


### Pi/4DQPSK DH1 Middle Channel

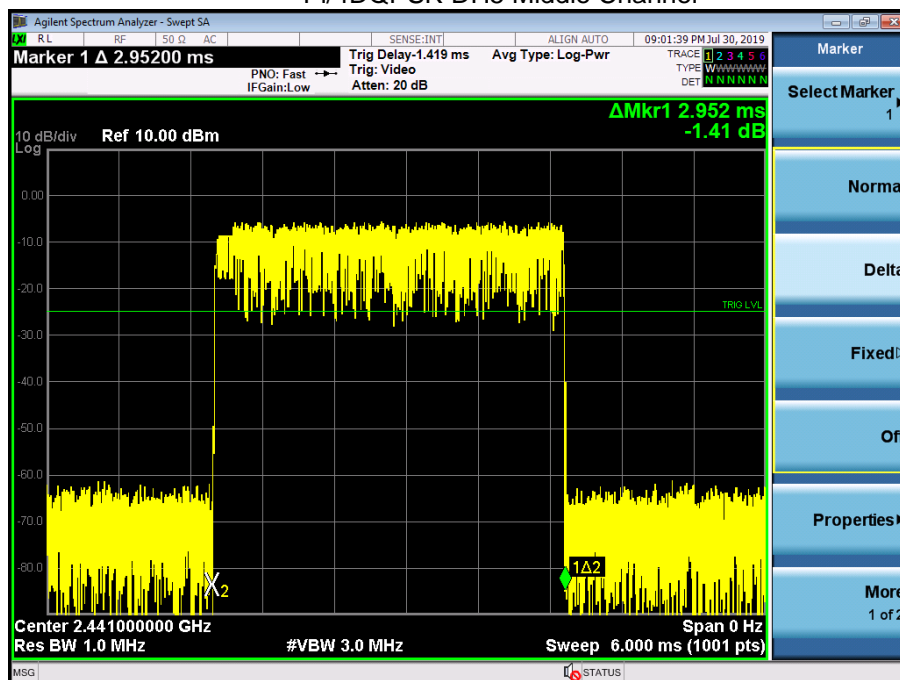




Pi/4DQPSK DH3 Middle Channel

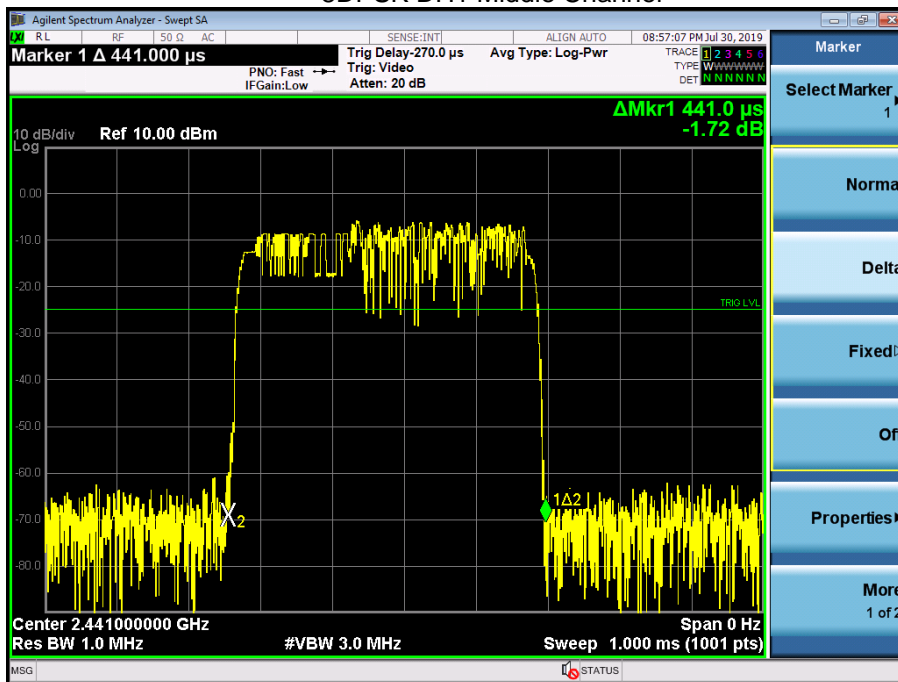


Pi/4DQPSK DH5 Middle Channel

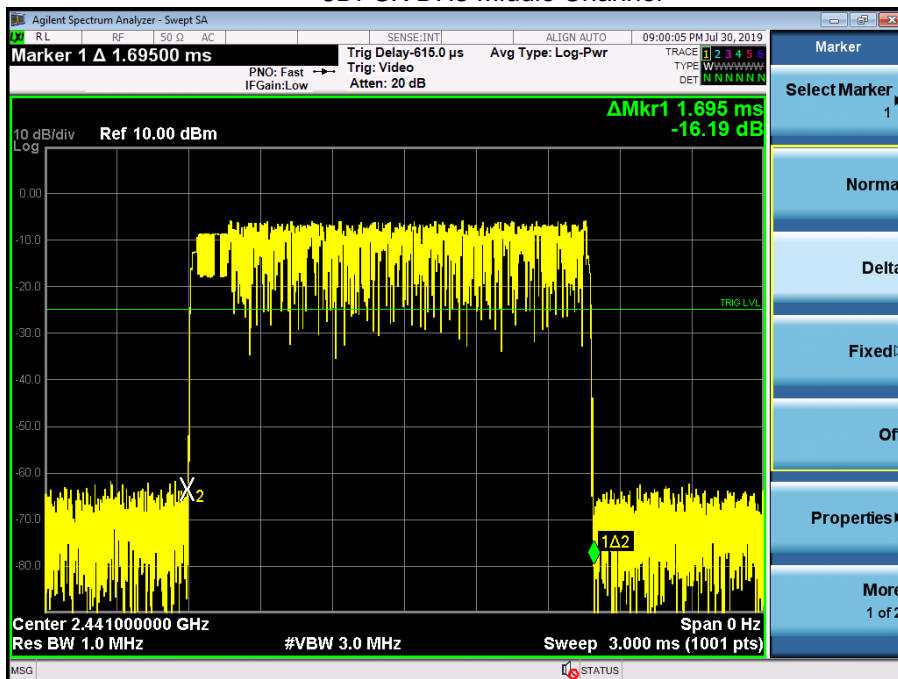




8DPSK DH1 Middle Channel



8DPSK DH3 Middle Channel





8DPSK DH5 Middle Channel







## 14. ANTENNA REQUIREMENT

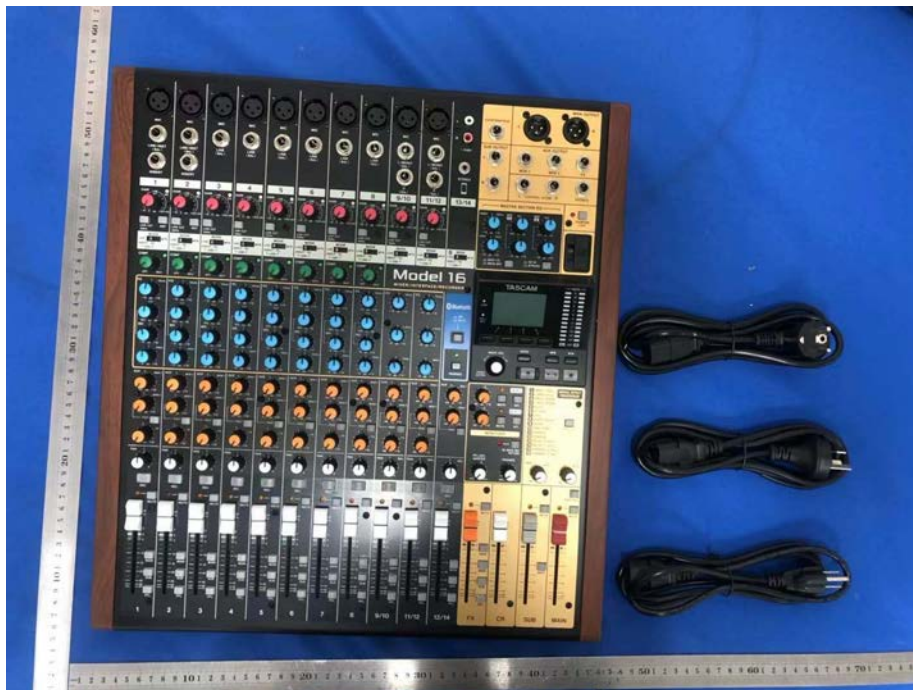
An intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device. The use of a permanently attached antenna or of an antenna that uses a unique coupling to the intentional radiator shall be considered sufficient to comply with the provisions of this section. 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. This requirement does not apply to carrier current devices or to devices operated under the provisions of §15.211, §15.213, §15.217, §15.219, or §15.221. Further, this requirement does not apply to intentional radiators that must be professionally installed, such as perimeter protection systems and some field disturbance sensors, or to other intentional radiators which, in accordance with §15.31(d), must be measured at the installation site. However, the installer shall be responsible for ensuring that the proper antenna is employed so that the limits in this part are not exceeded.

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.

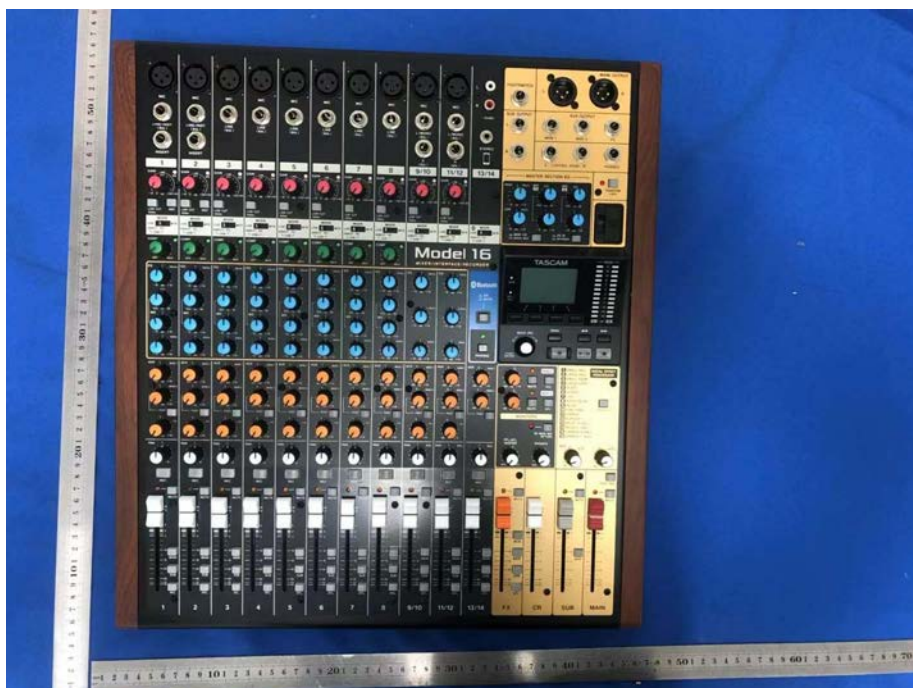
The EUT antenna is FPCB Antenna, antenna Gain -0.15dBi. It comply with the standard requirement.

## 15. EUT PHOTOGRAPHS

EUT Photo 1

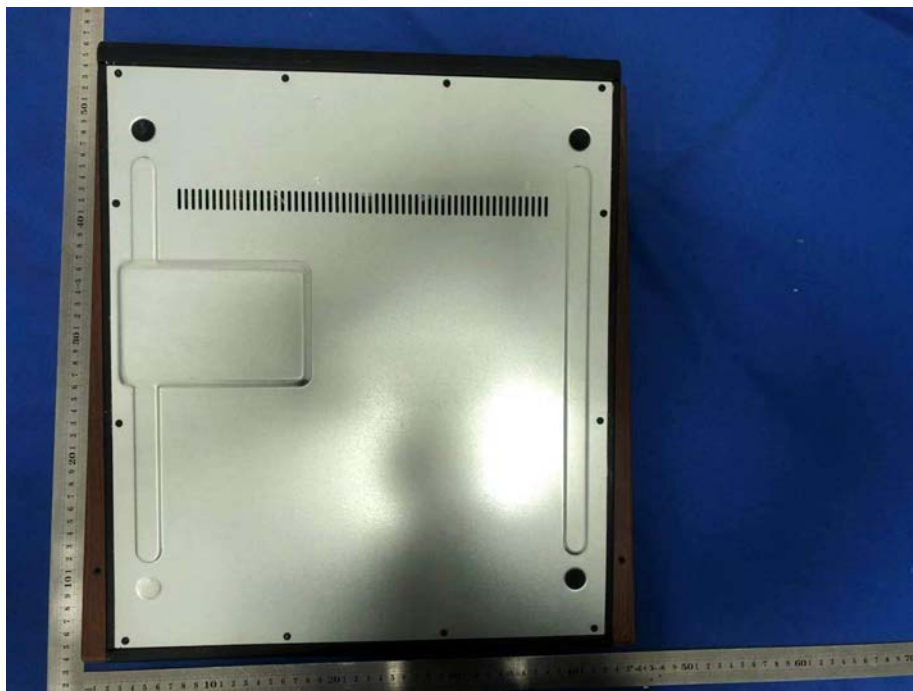


EUT Photo 2



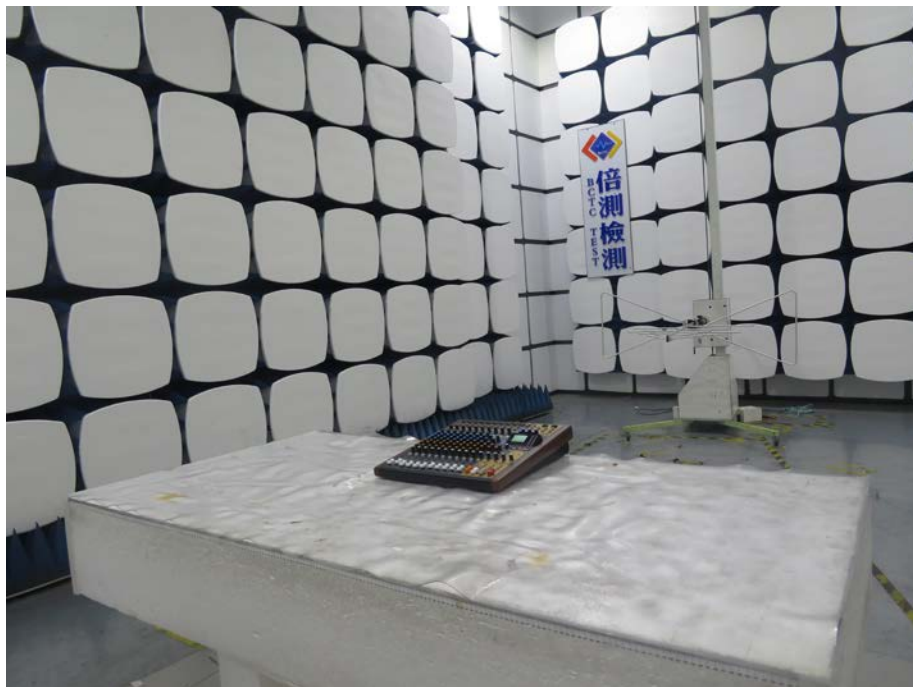


### EUT Photo 3



## 16. EUT TEST SETUP PHOTOGRAPHS

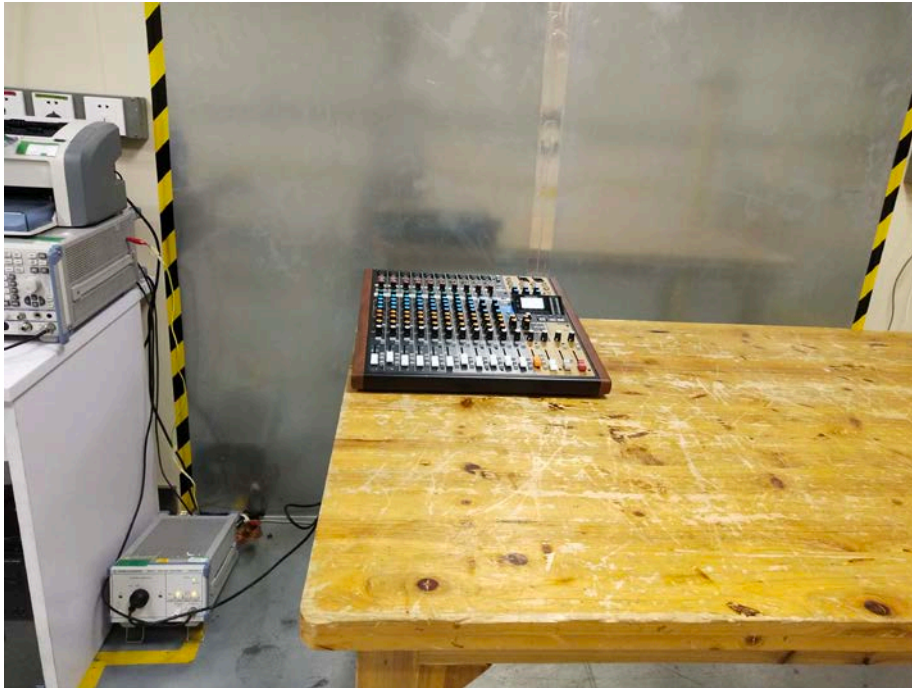
Spurious emissions







## Conducted emissions



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