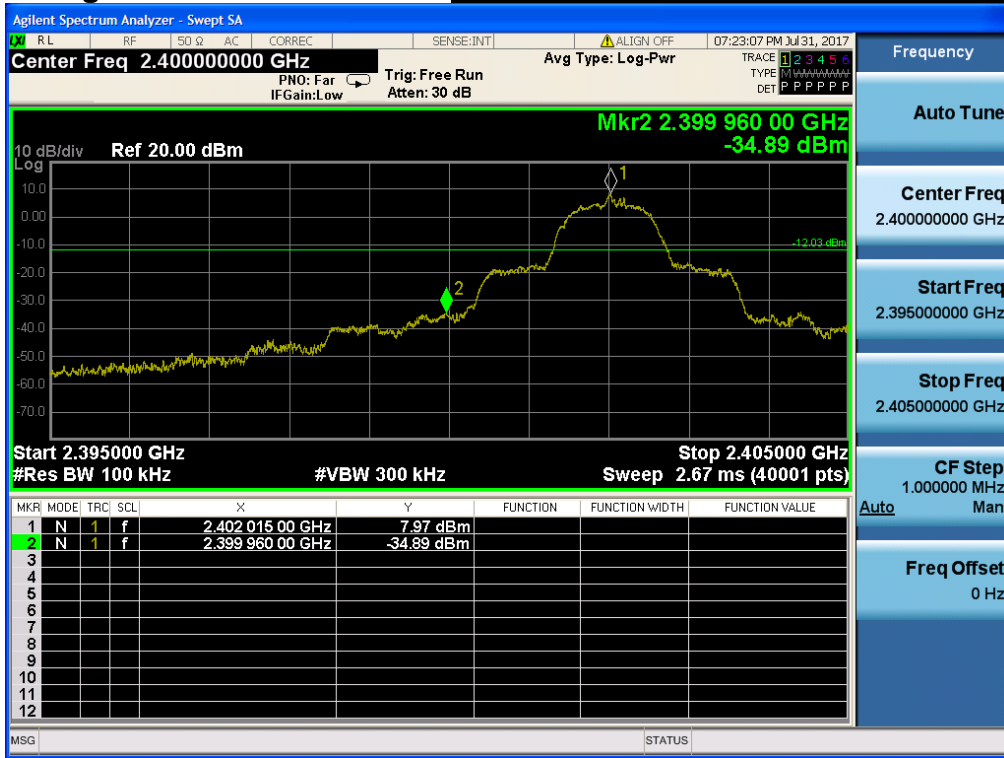


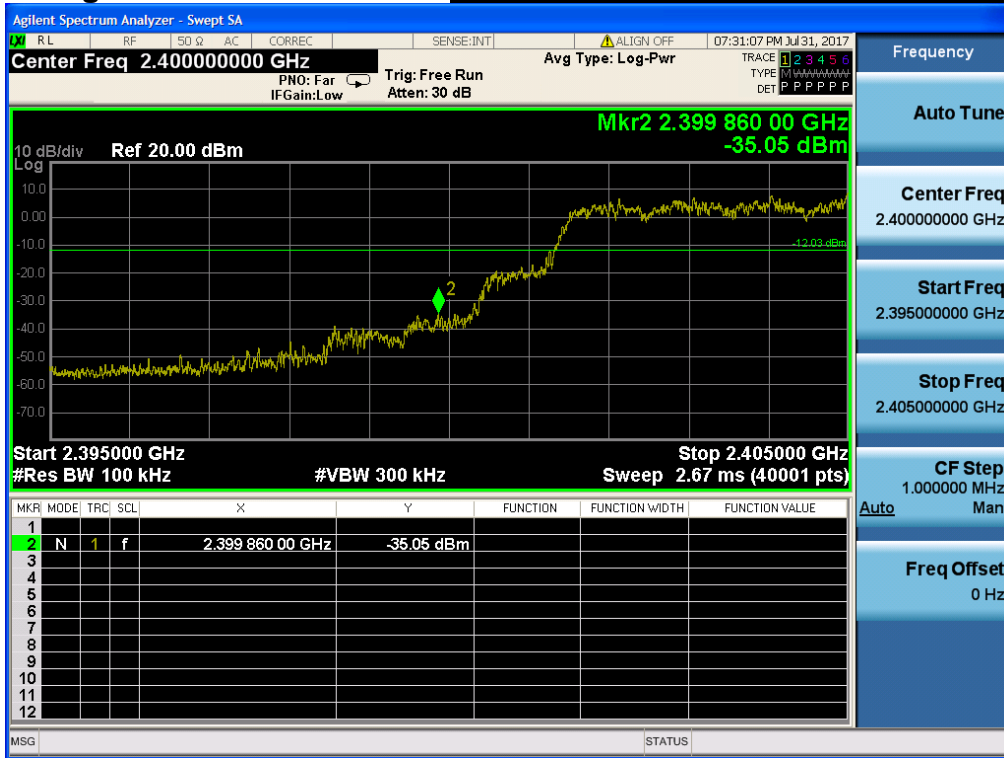
Low Band-edge

Lowest Channel & Modulation :  $\pi/4$ DQPSK

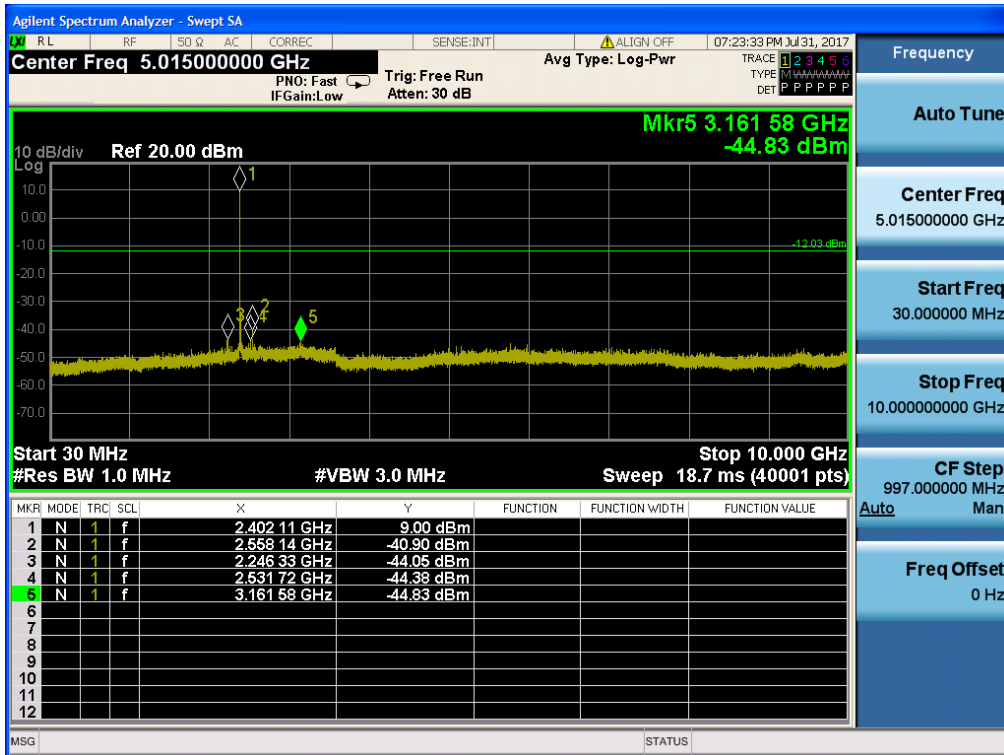
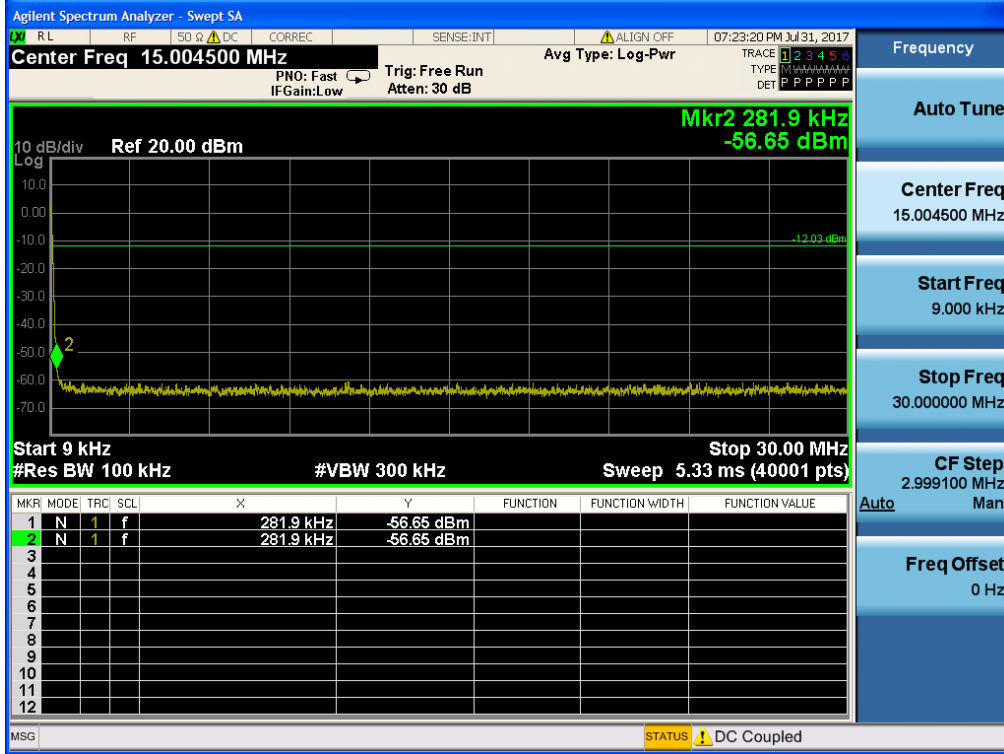


Low Band-edge

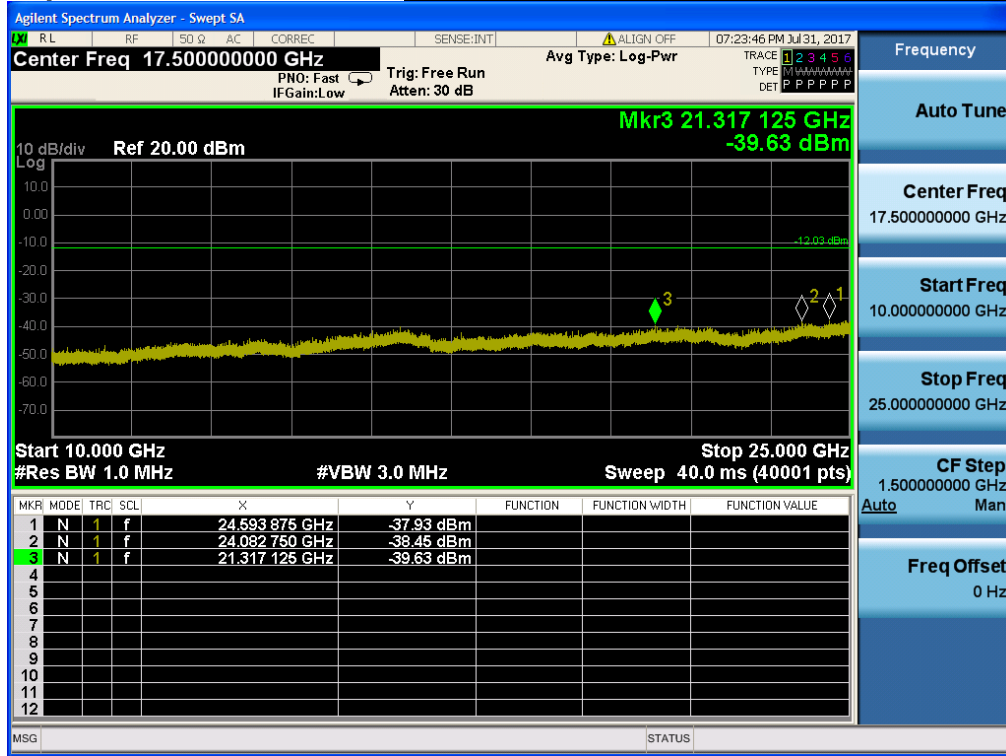
Hopping mode & Modulation :  $\pi/4$ DQPSK



Conducted Spurious Emissions **Lowest Channel & Modulation :  $\pi/4$ DQPSK**

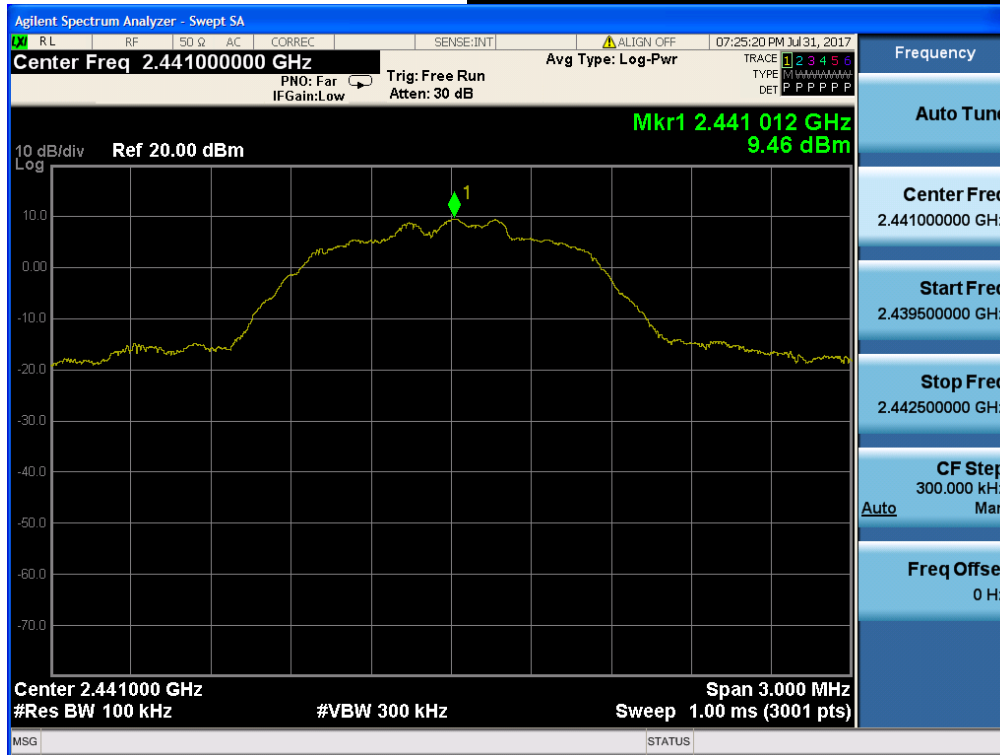


**Conducted Spurious Emissions**      ***Lowest Channel & Modulation :  $\pi/4$ DQPSK***



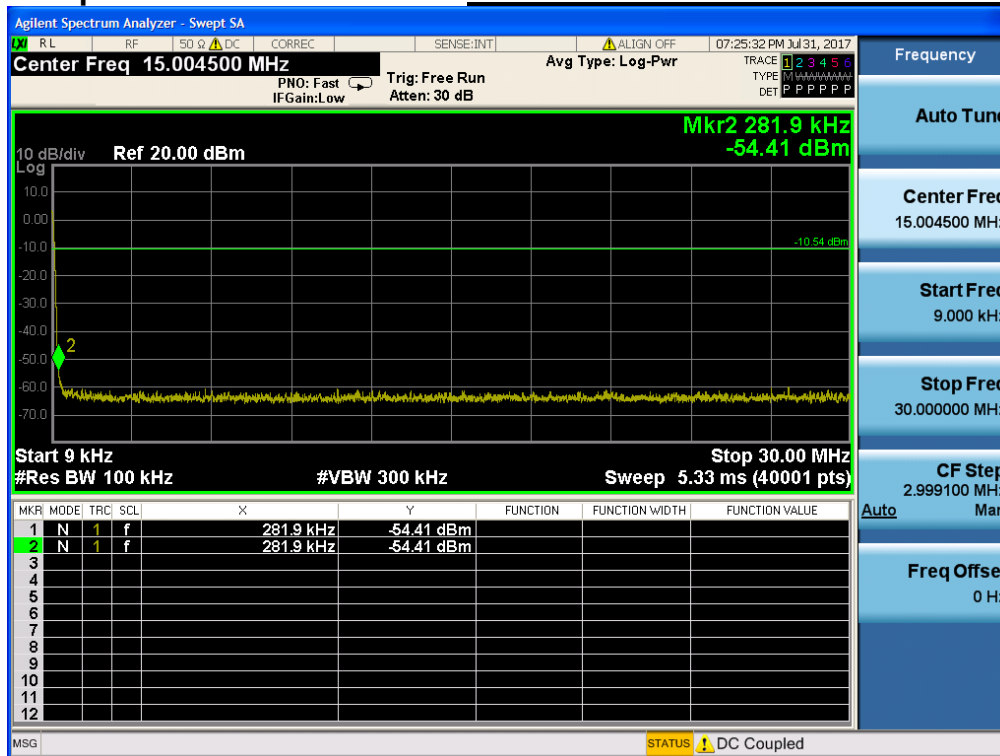
Reference for limit

Middle Channel & Modulation :  $\pi/4$ DQPSK



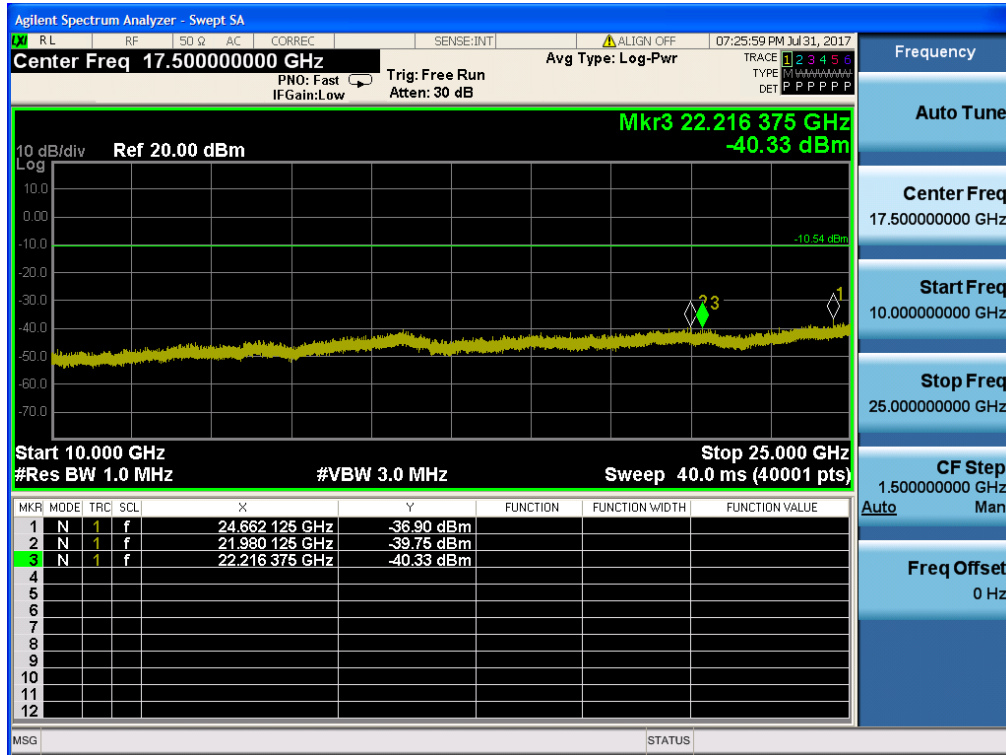
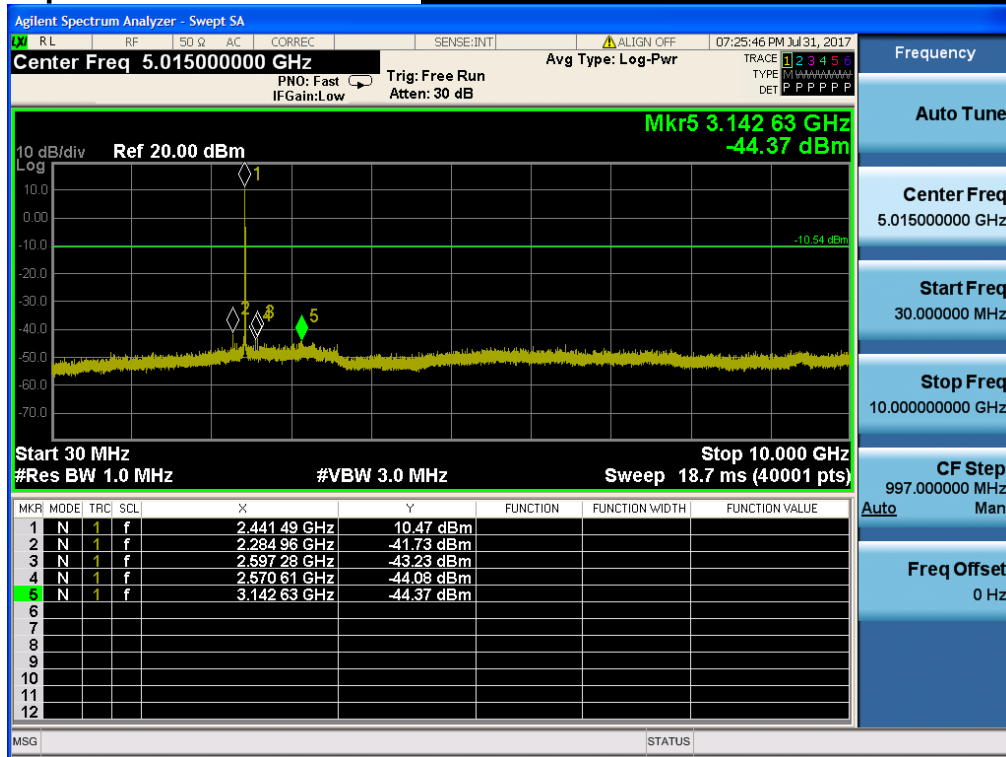
Conducted Spurious Emissions

Middle Channel & Modulation :  $\pi/4$ DQPSK



Conducted Spurious Emissions

Middle Channel & Modulation :  $\pi/4$ DQPSK



High Band-edge

Highest Channel & Modulation :  $\pi/4$ DQPSK



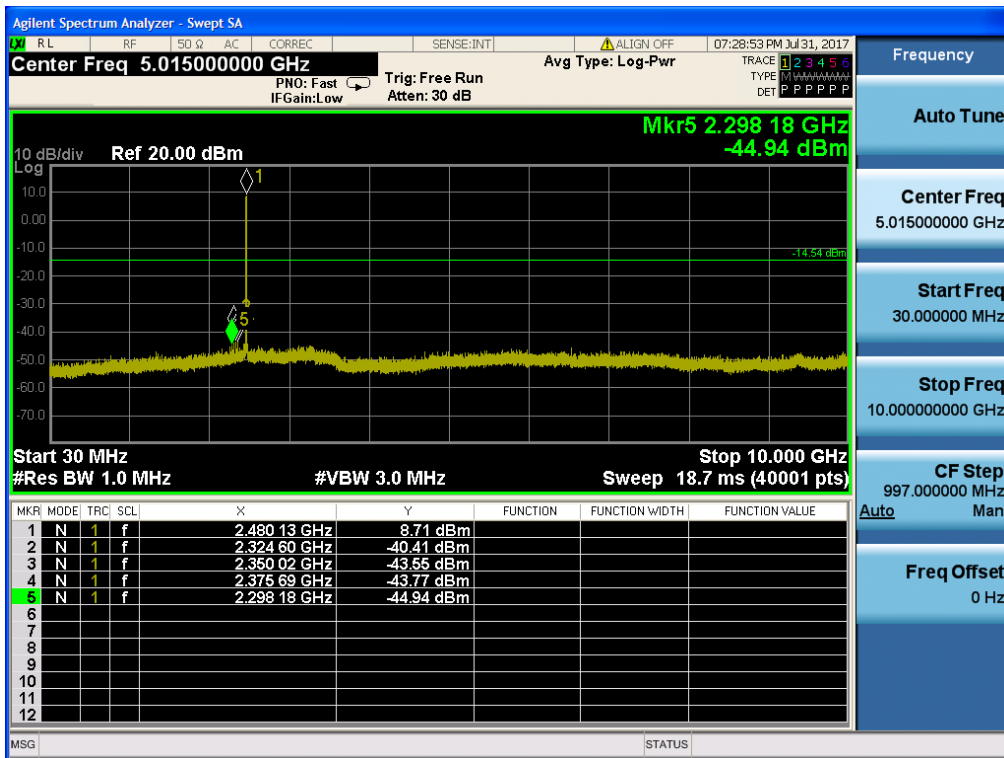
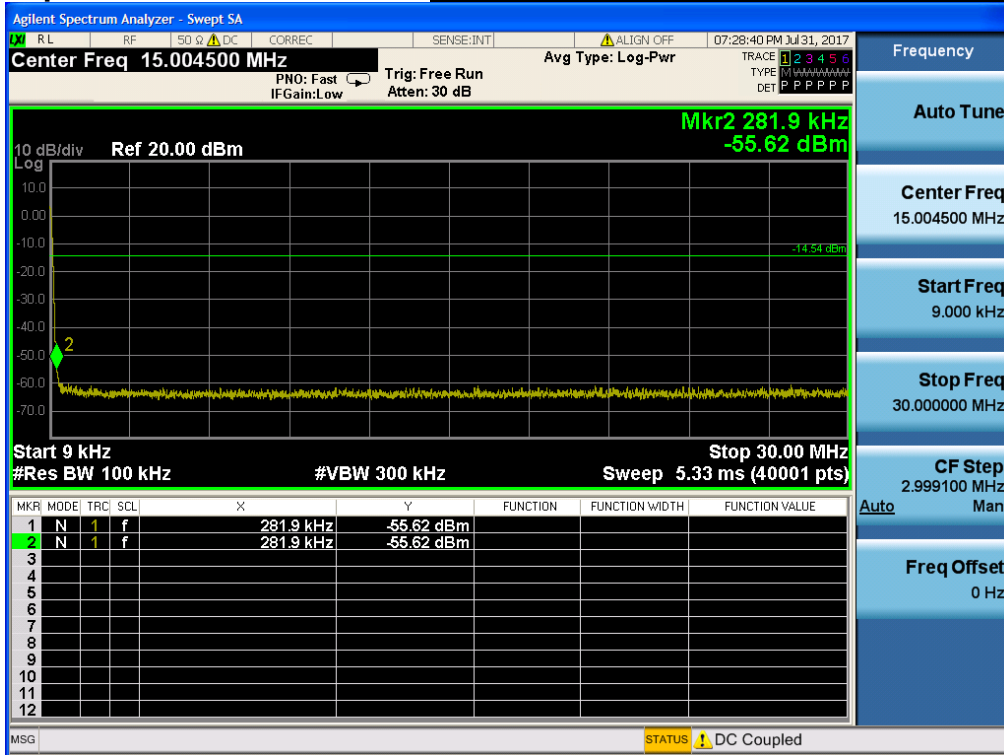
High Band-edge

Hopping mode & Modulation :  $\pi/4$ DQPSK



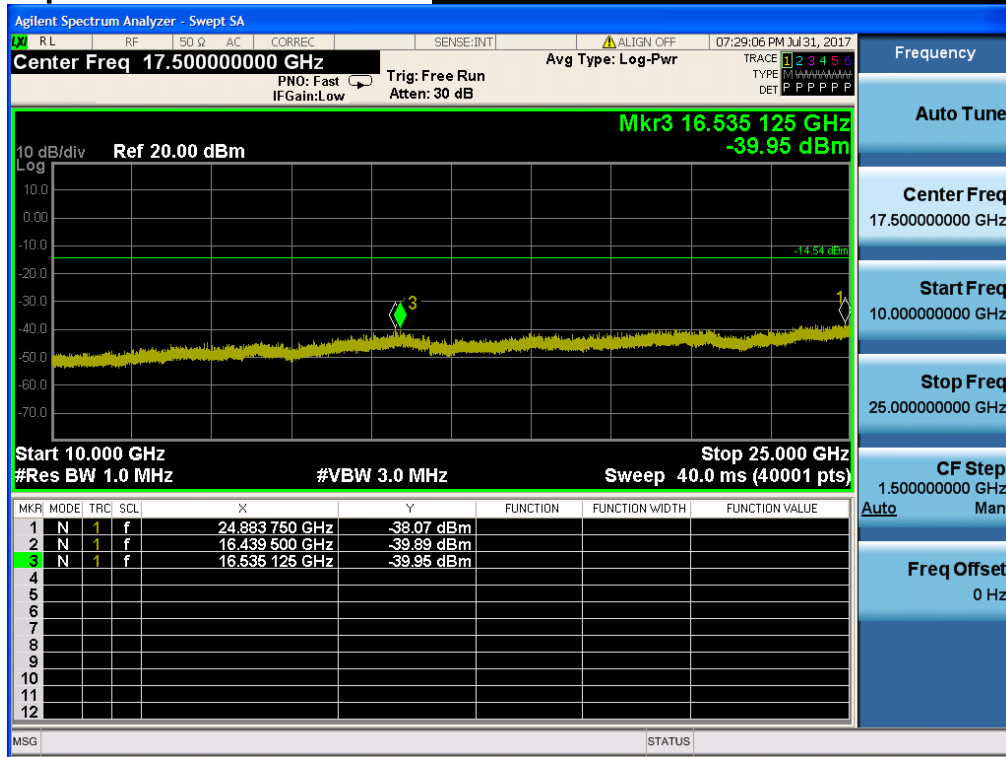
Conducted Spurious Emissions

*Highest Channel & Modulation :  $\pi/4$ DQPSK*



Conducted Spurious Emissions

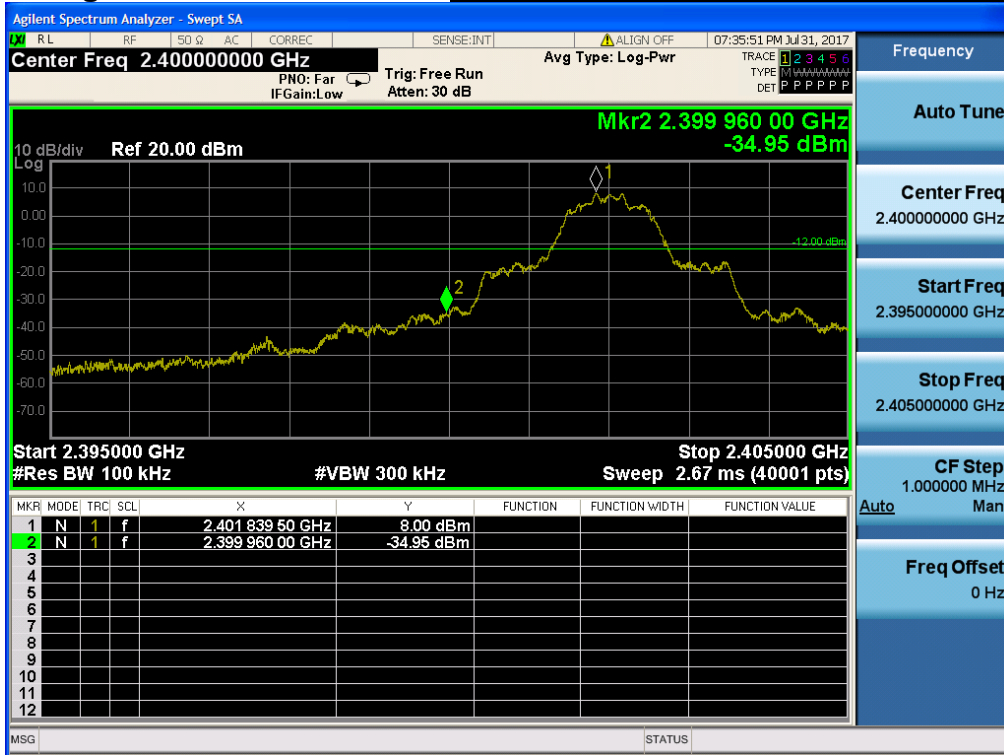
*Highest Channel & Modulation :  $\pi/4$ DQPSK*





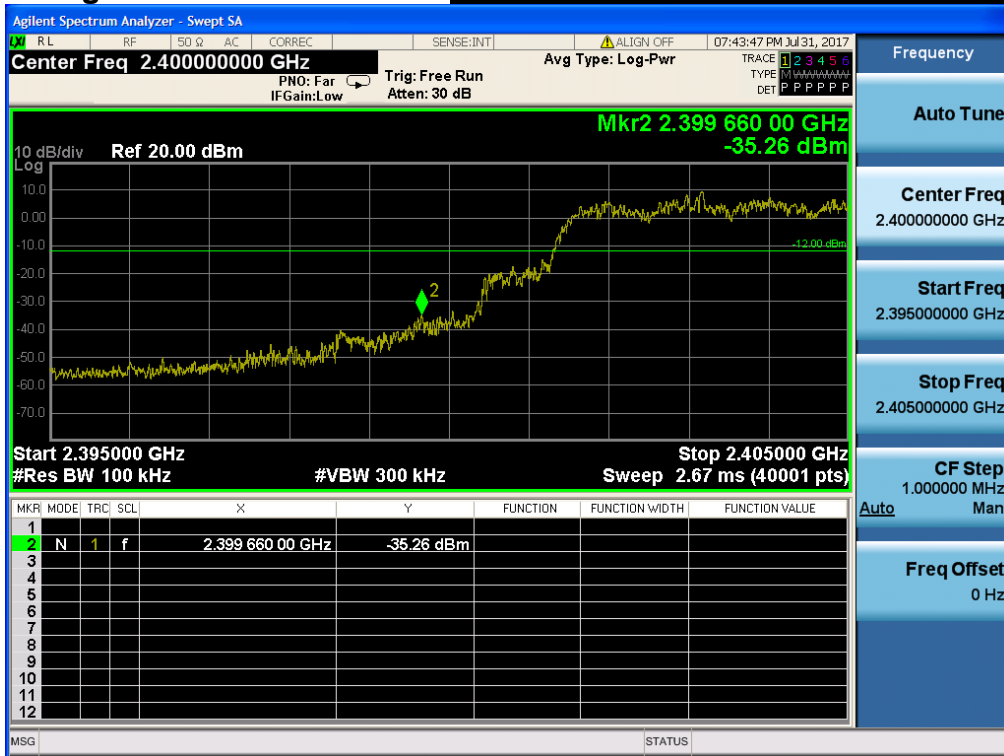
Low Band-edge

Lowest Channel & Modulation : 8DPSK



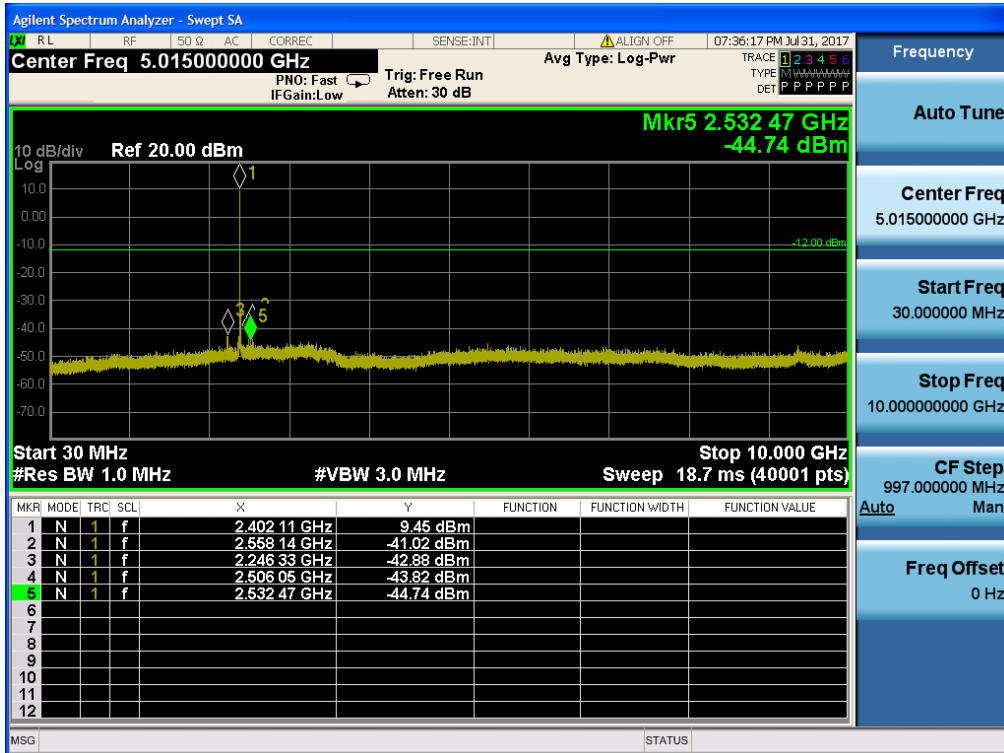
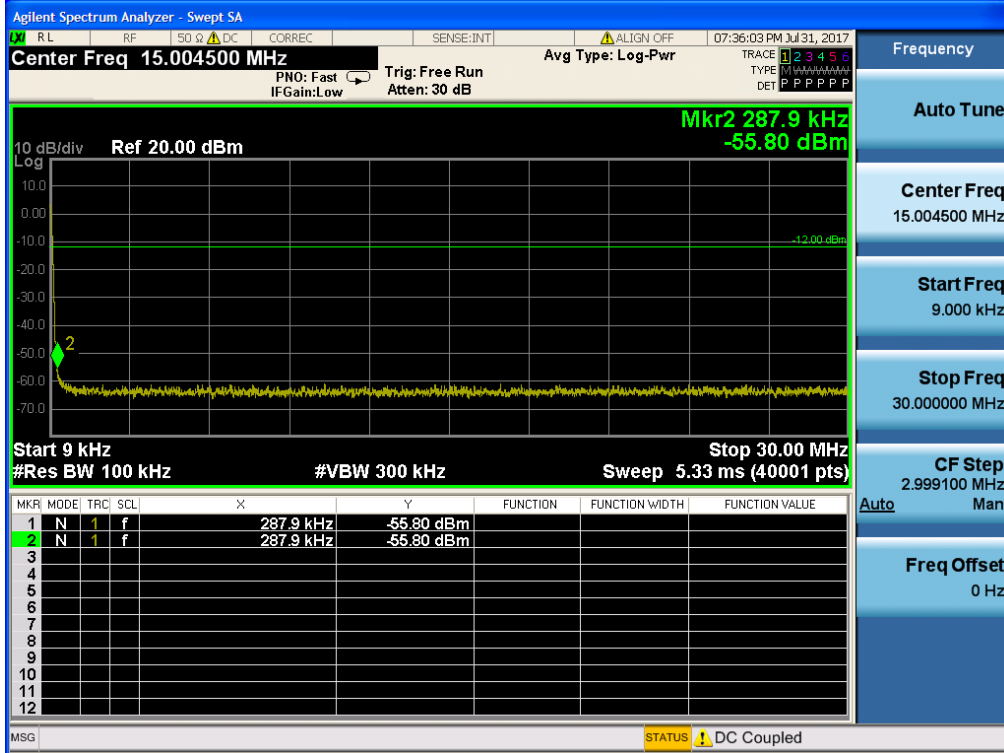
Low Band-edge

Hopping mode & Modulation : 8DPSK



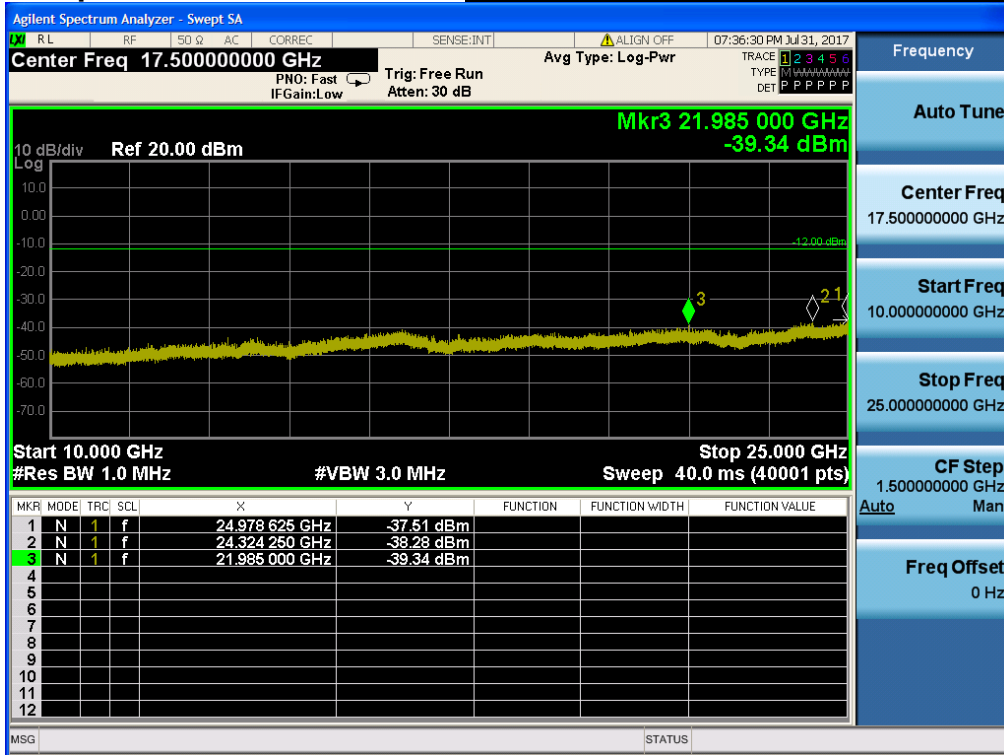
Conducted Spurious Emissions

Lowest Channel & Modulation : 8DPSK



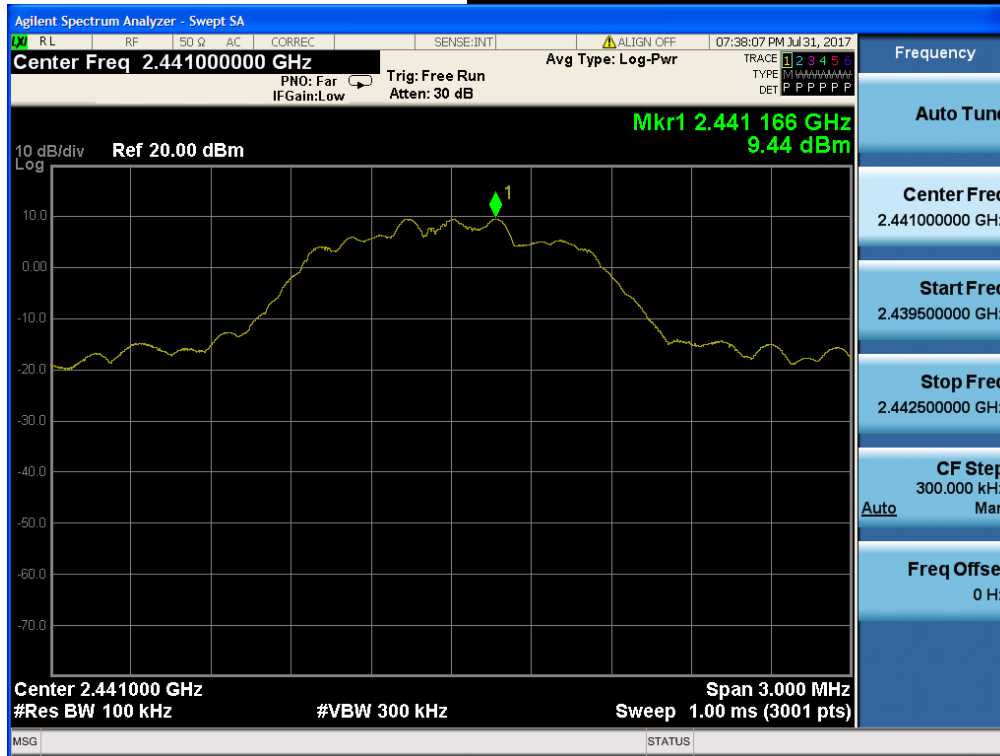
Conducted Spurious Emissions

Lowest Channel & Modulation : 8DPSK



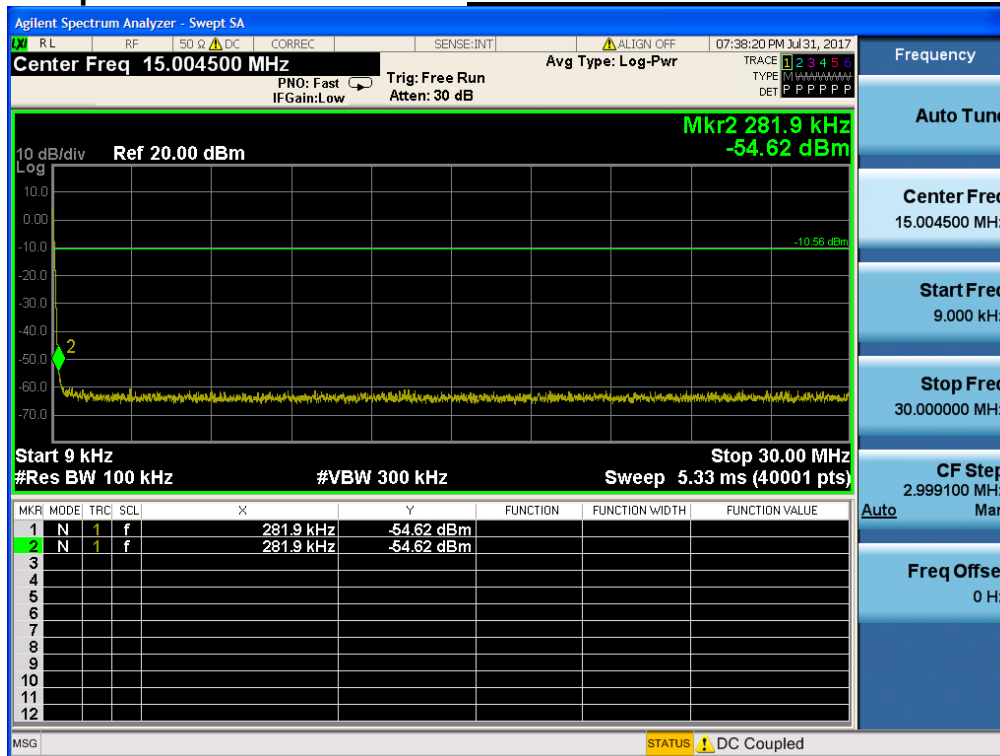
Reference for limit

**Middle Channel & Modulation : 8DPSK**



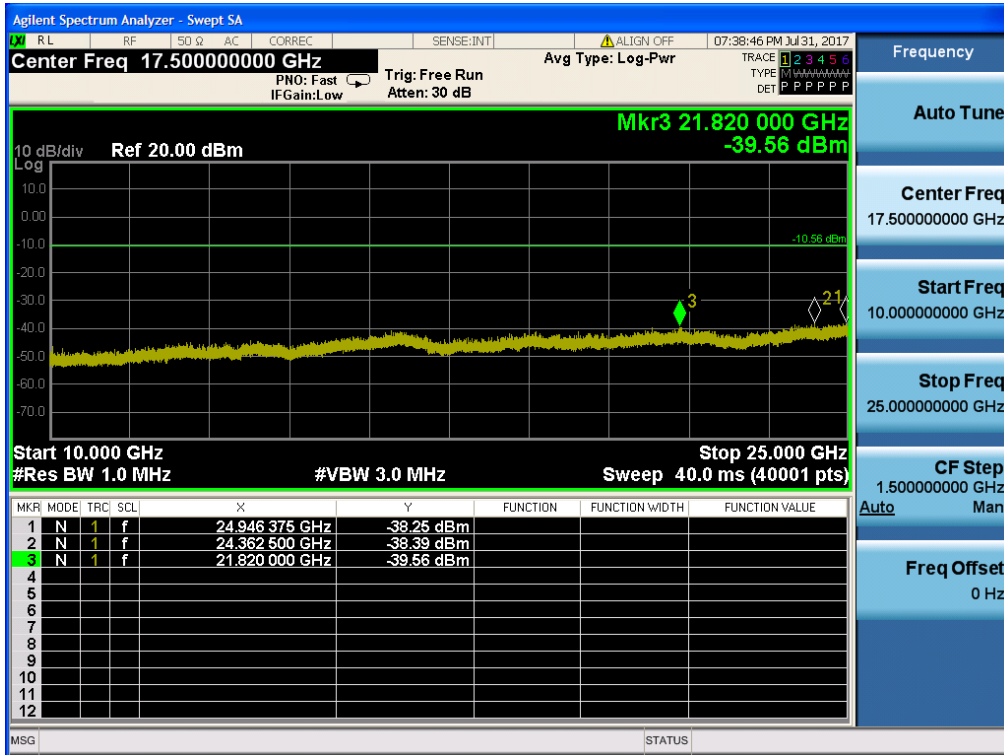
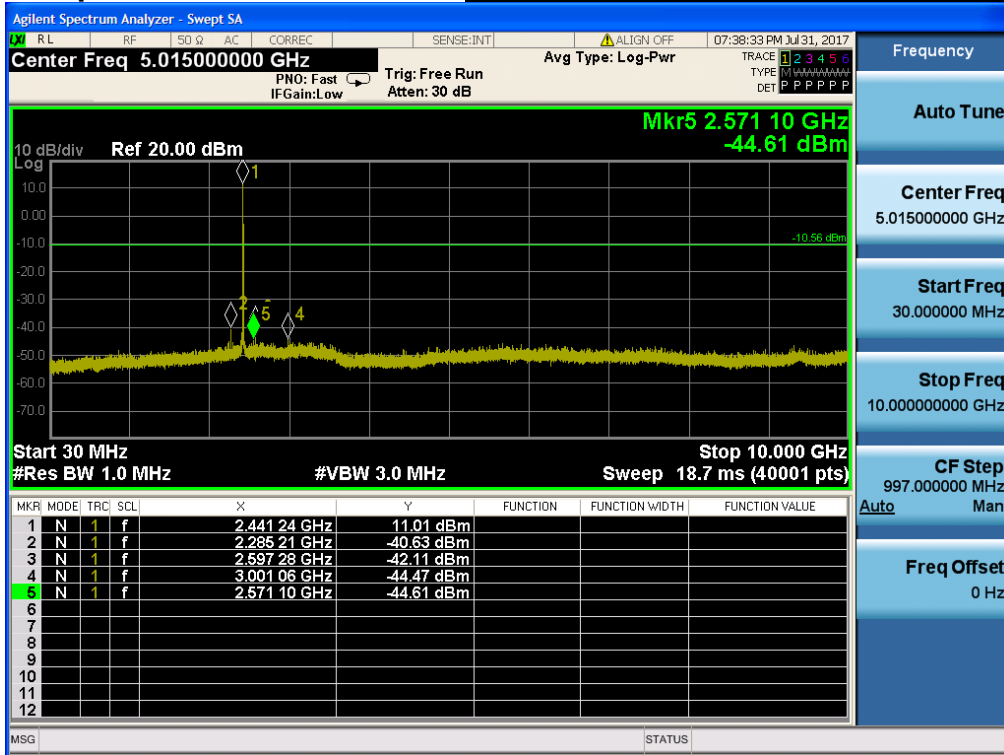
Conducted Spurious Emissions

**Middle Channel & Modulation : 8DPSK**



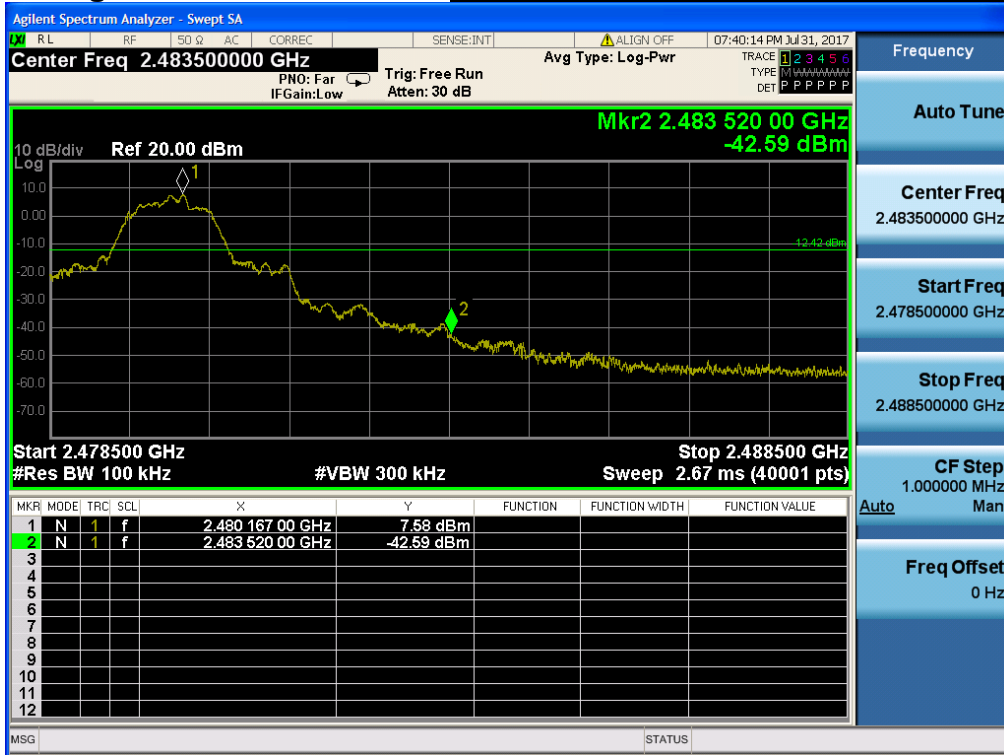
Conducted Spurious Emissions

Middle Channel & Modulation : 8DPSK



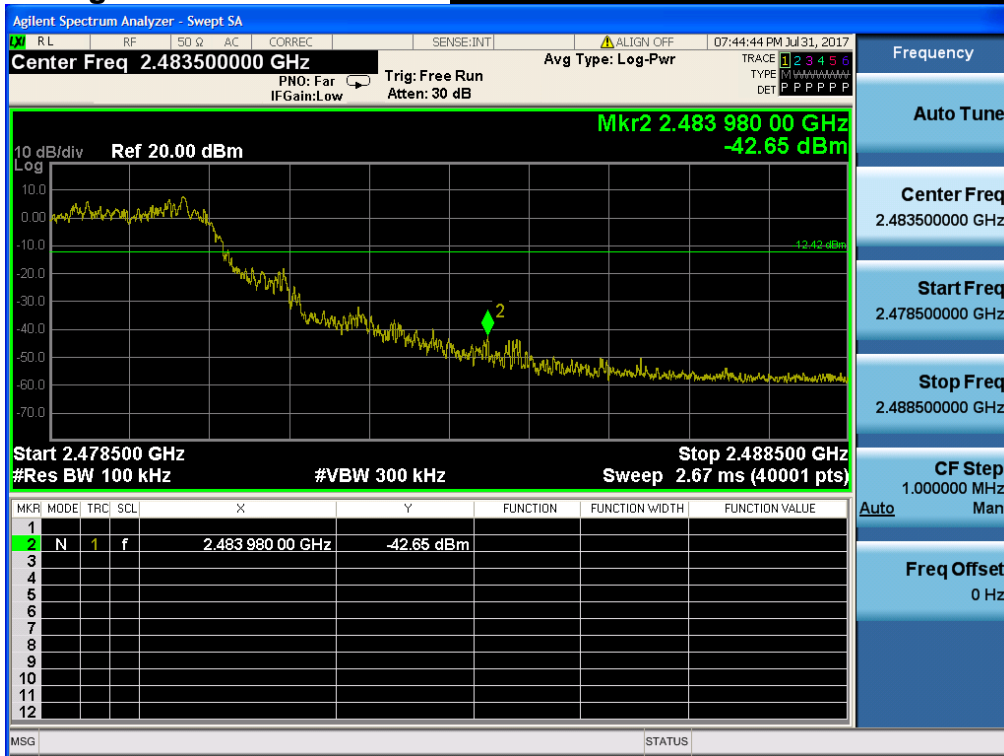
High Band-edge

**Highest Channel & Modulation : 8DPSK**



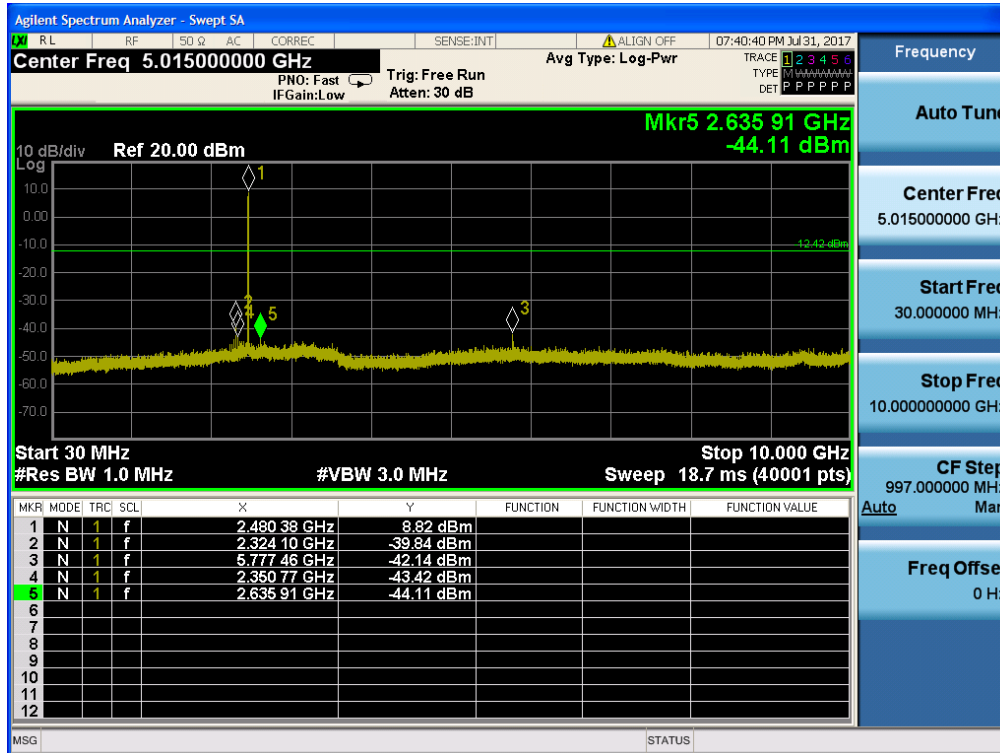
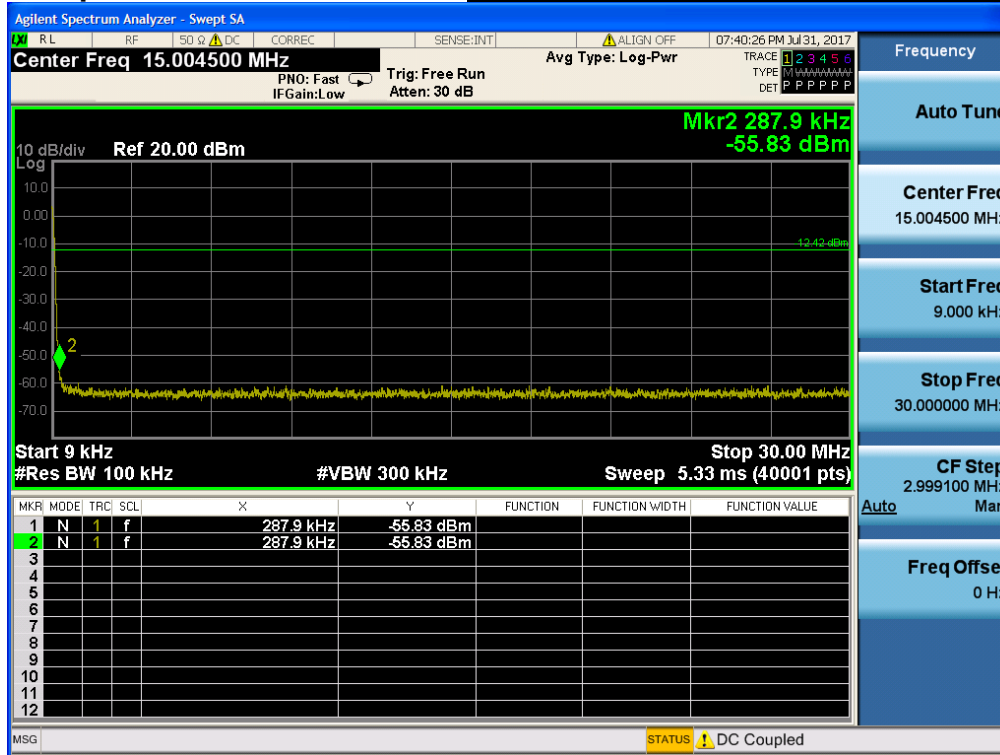
High Band-edge

**Hopping mode & Modulation : 8DPSK**



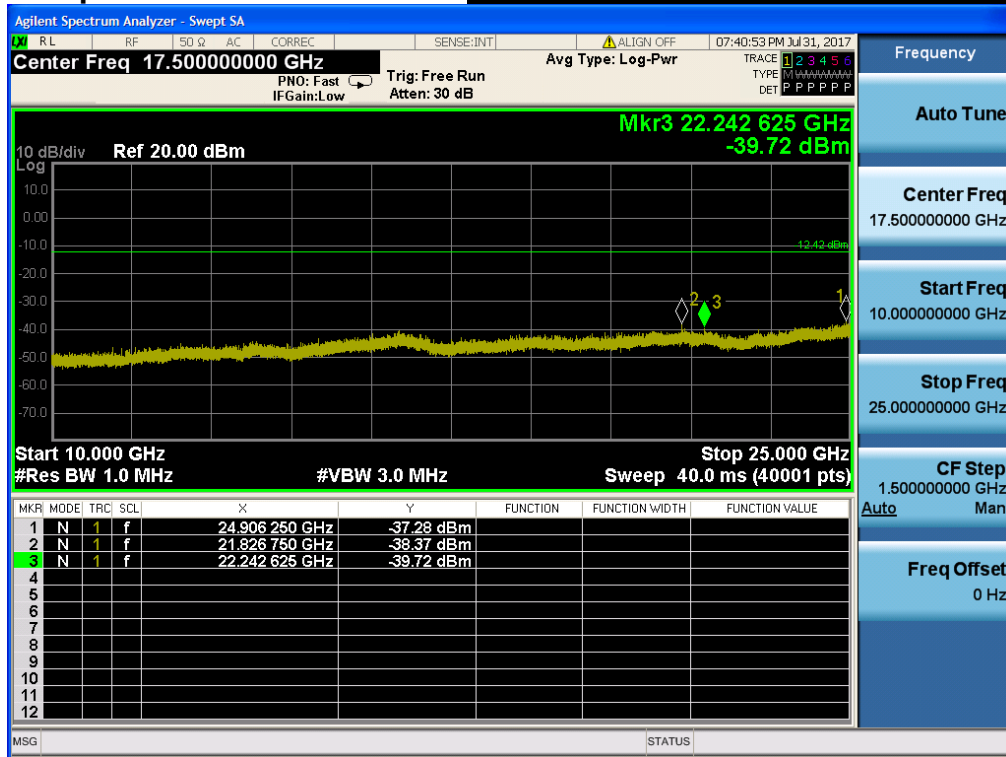
Conducted Spurious Emissions

**Highest Channel & Modulation : 8DPSK**



Conducted Spurious Emissions

Highest Channel & Modulation : 8DPSK

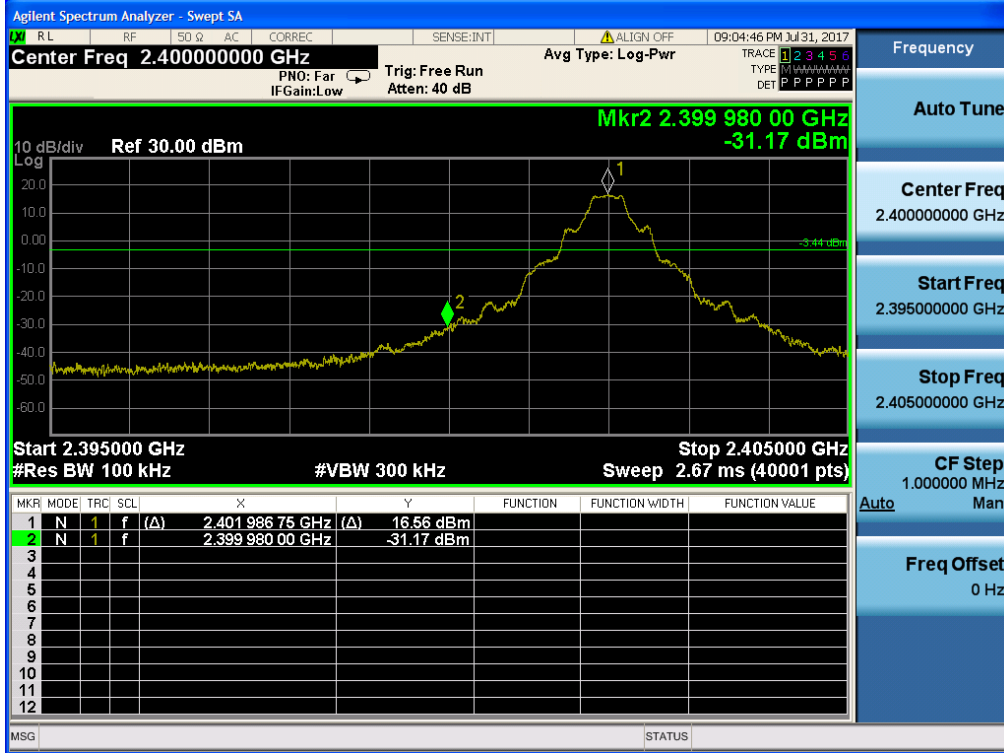




7.4.3.2 Conducted Spurious Emissions\_Module 1

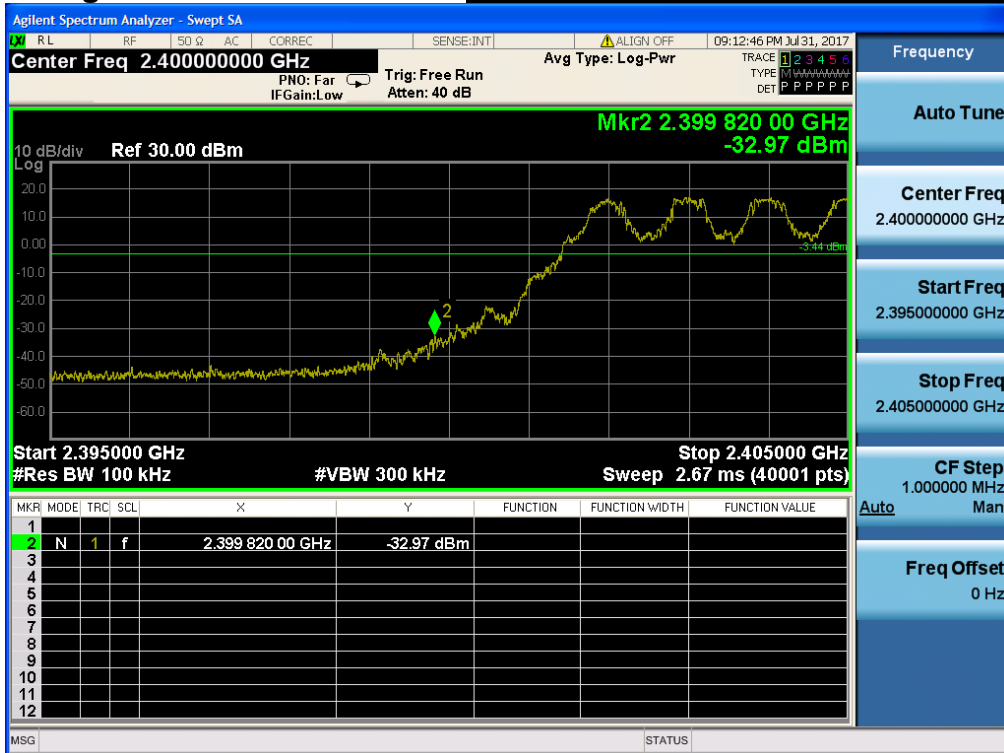
Low Band-edge

**Lowest Channel & Modulation : GFSK**

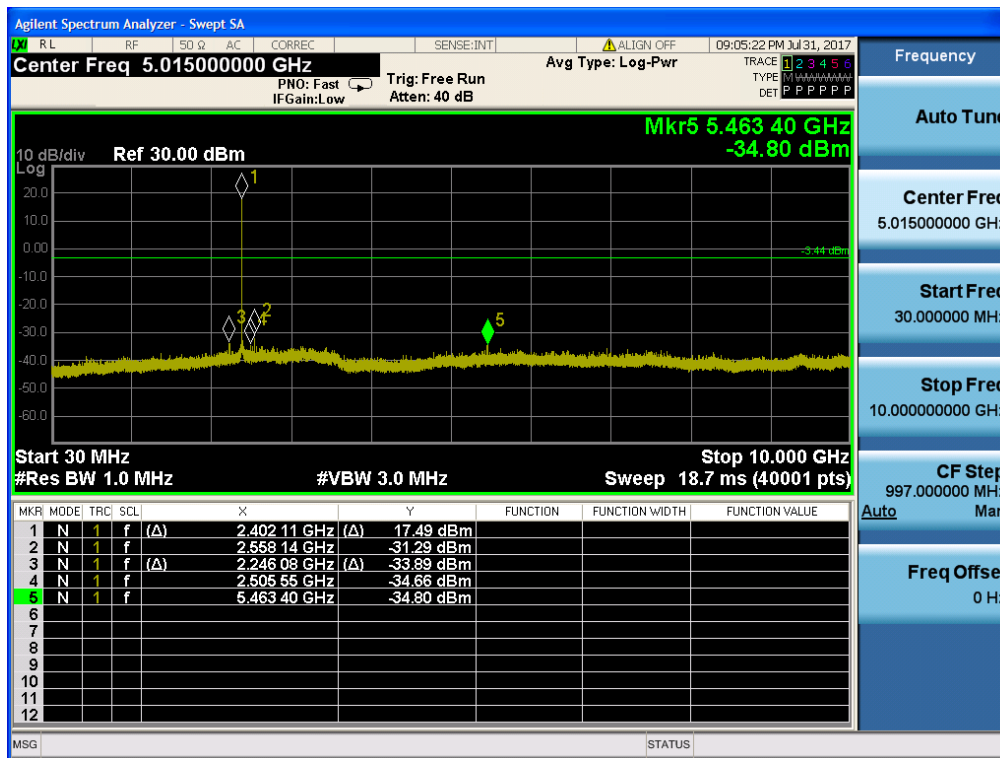
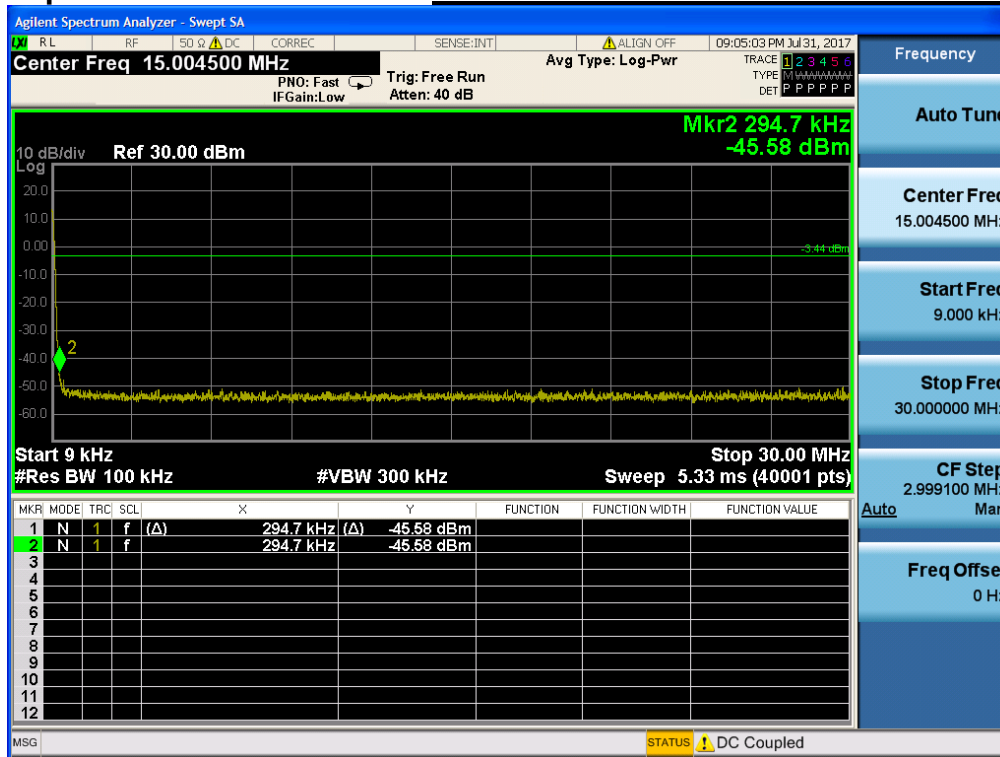


Low Band-edge

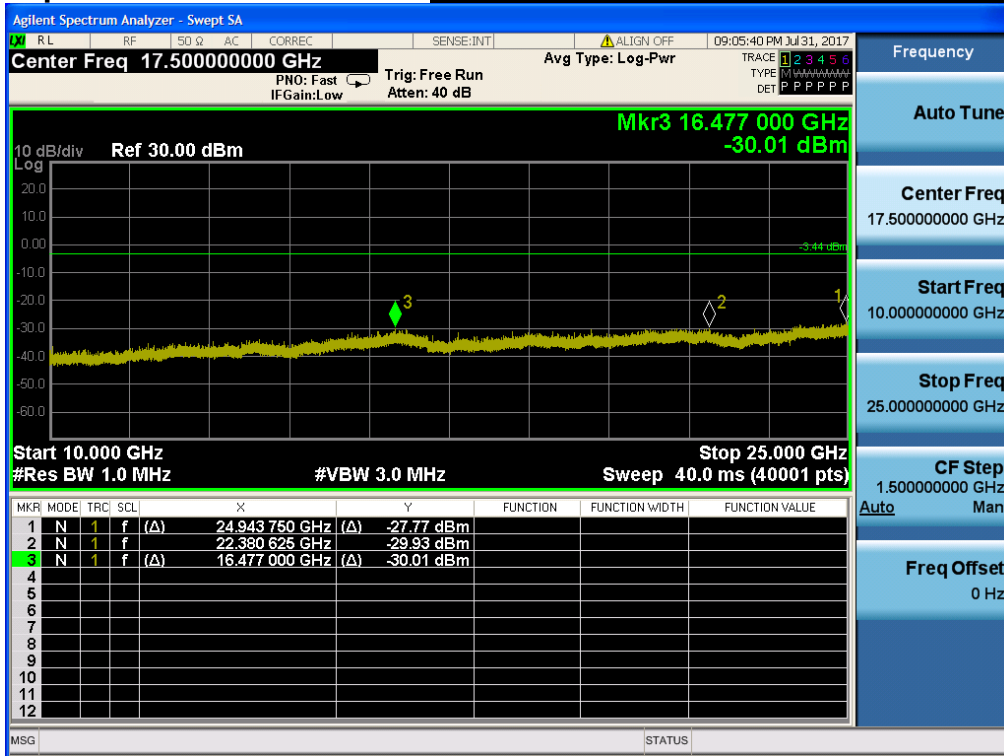
**Hopping mode & Modulation : GFSK**



**Conducted Spurious Emissions** *Lowest Channel & Modulation : GFSK*

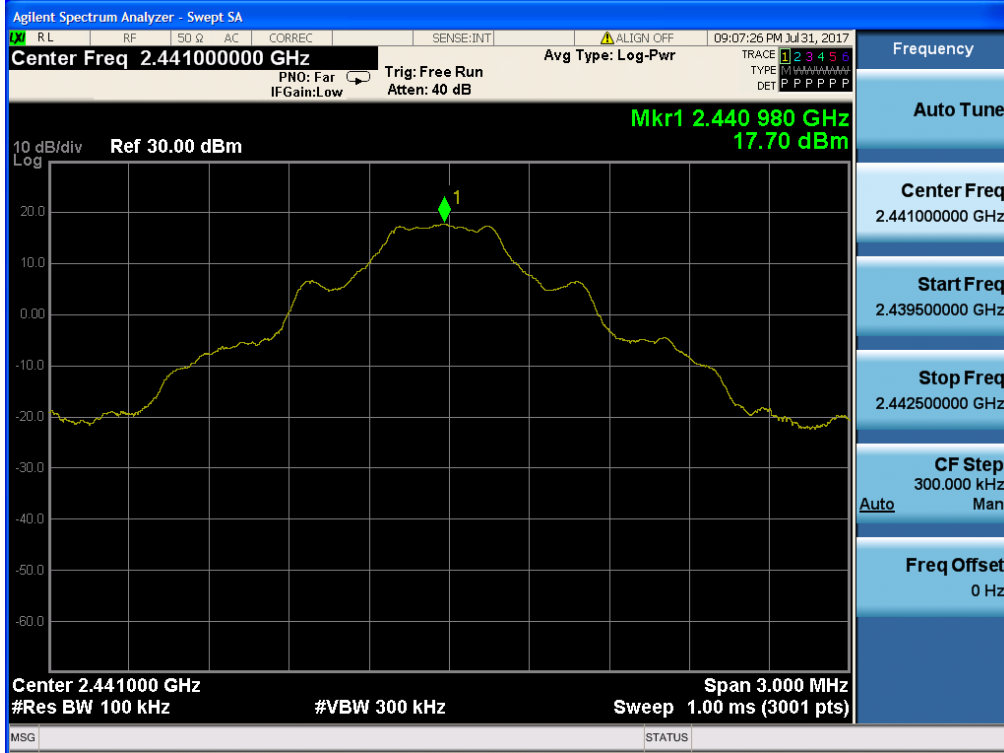


Conducted Spurious Emissions *Lowest Channel & Modulation : GFSK*



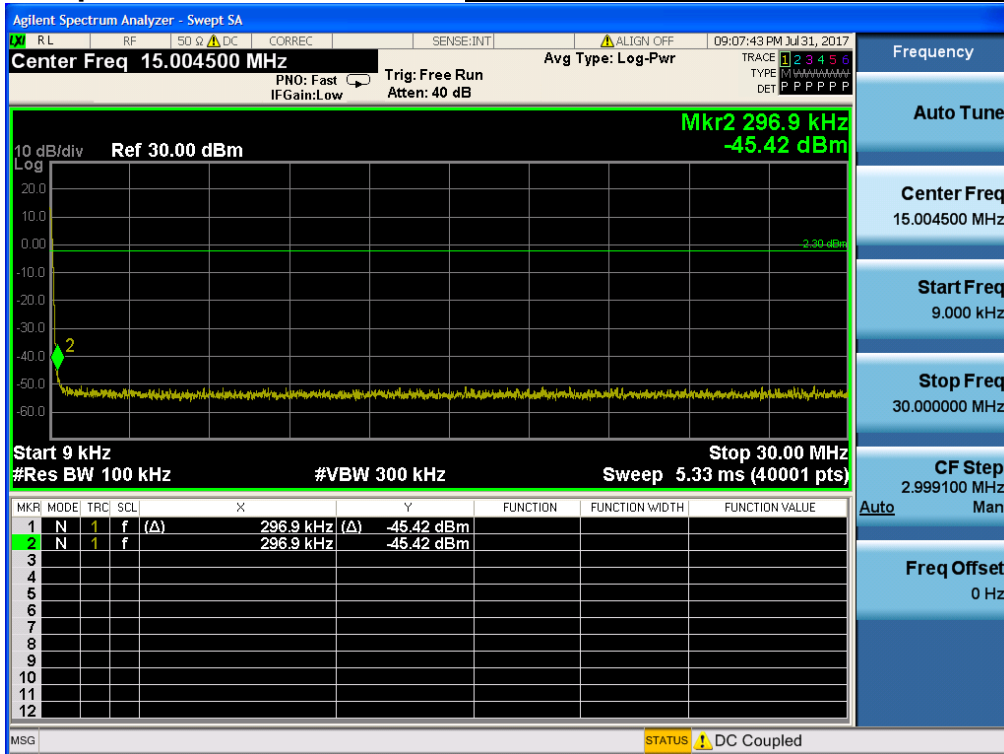
Reference for limit

Middle Channel & Modulation : GFSK



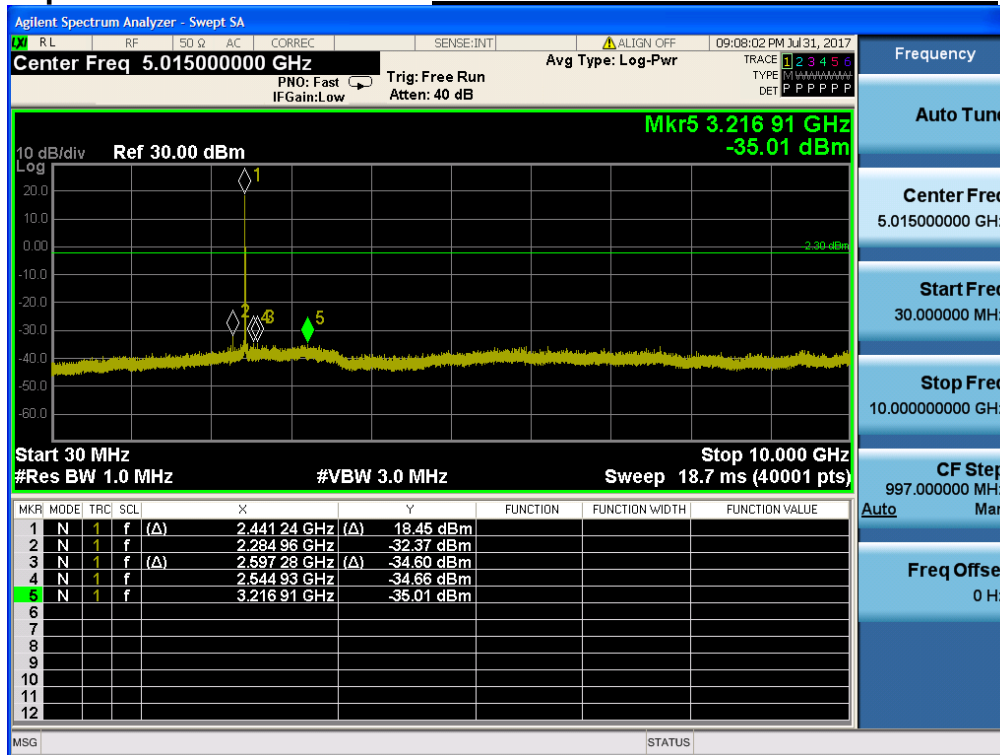
Conducted Spurious Emissions

Middle Channel & Modulation : GFSK



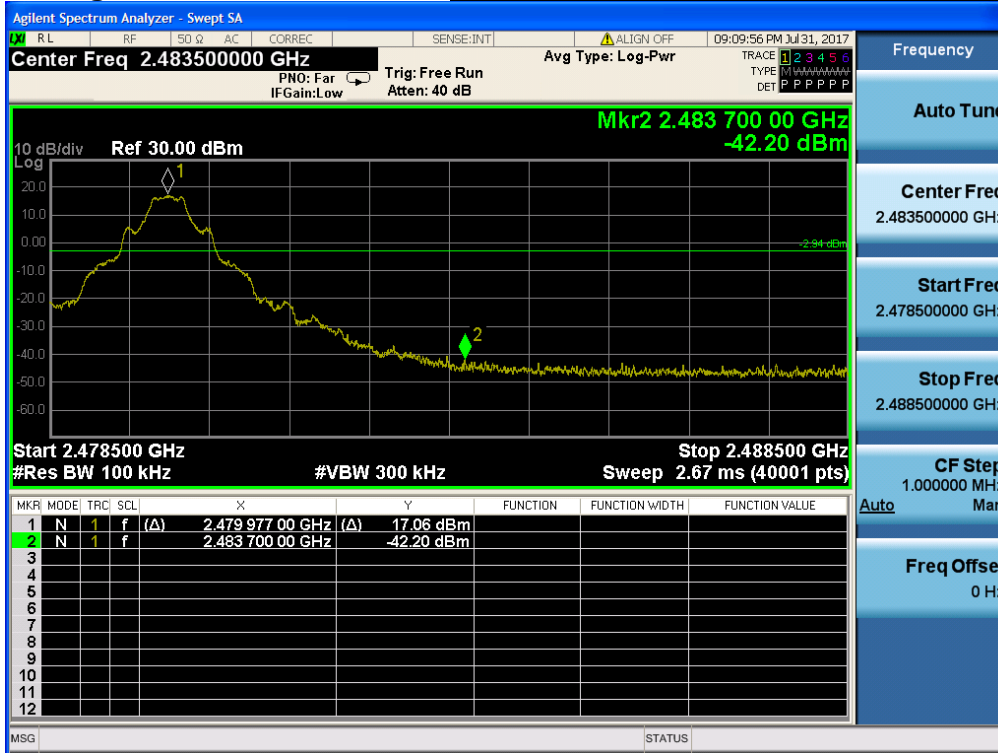
Conducted Spurious Emissions

Middle Channel & Modulation : GFSK



High Band-edge

Highest Channel & Modulation : GFSK

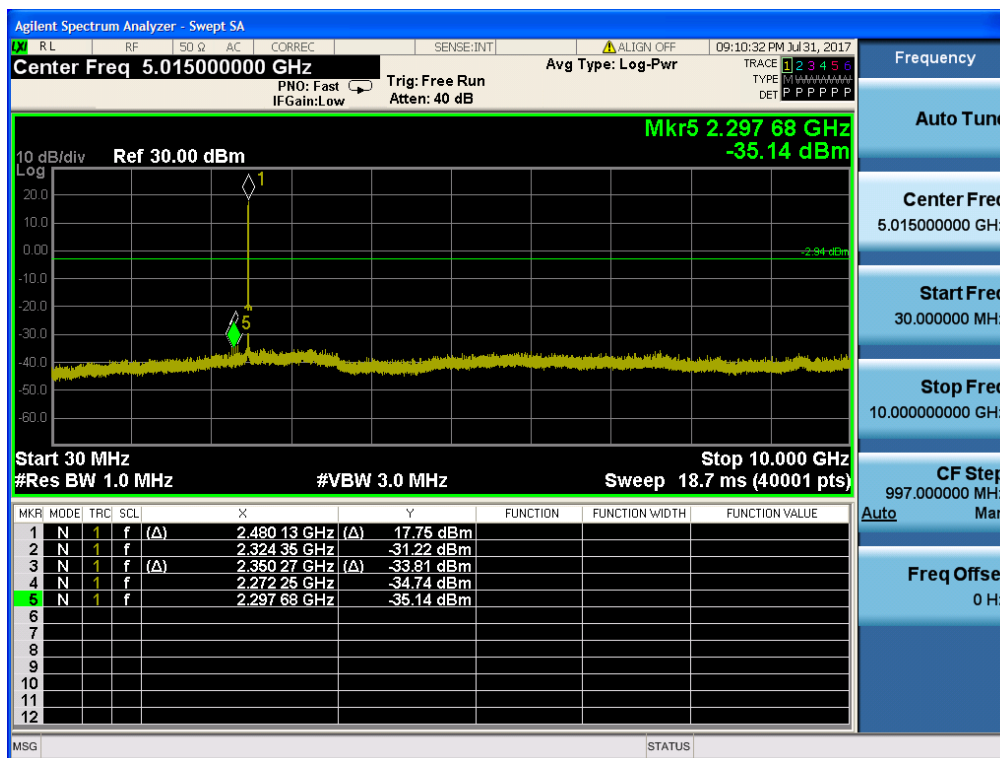
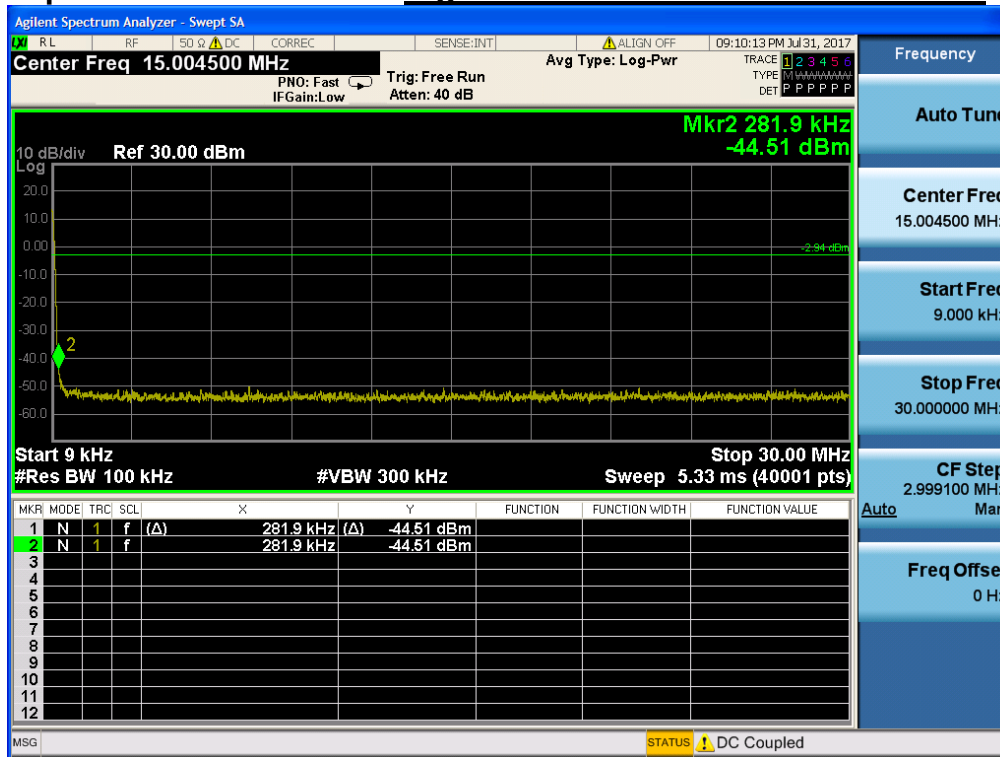


High Band-edge

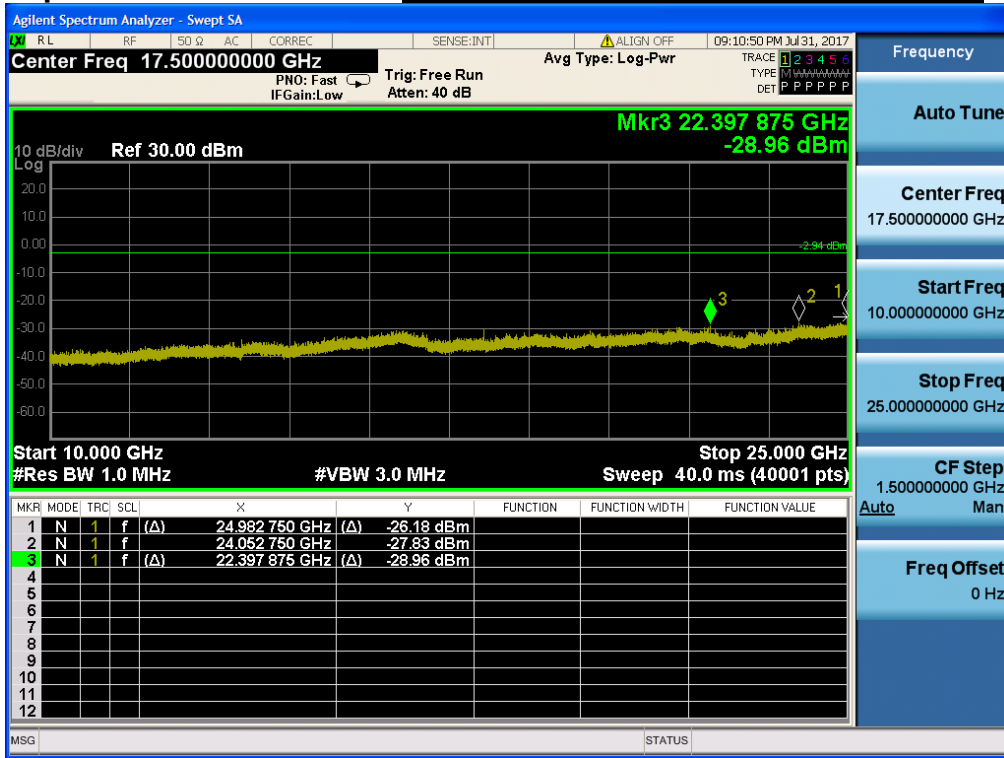
Hopping mode & Modulation : GFSK



**Conducted Spurious Emissions**      **Highest Channel & Modulation : GFSK**



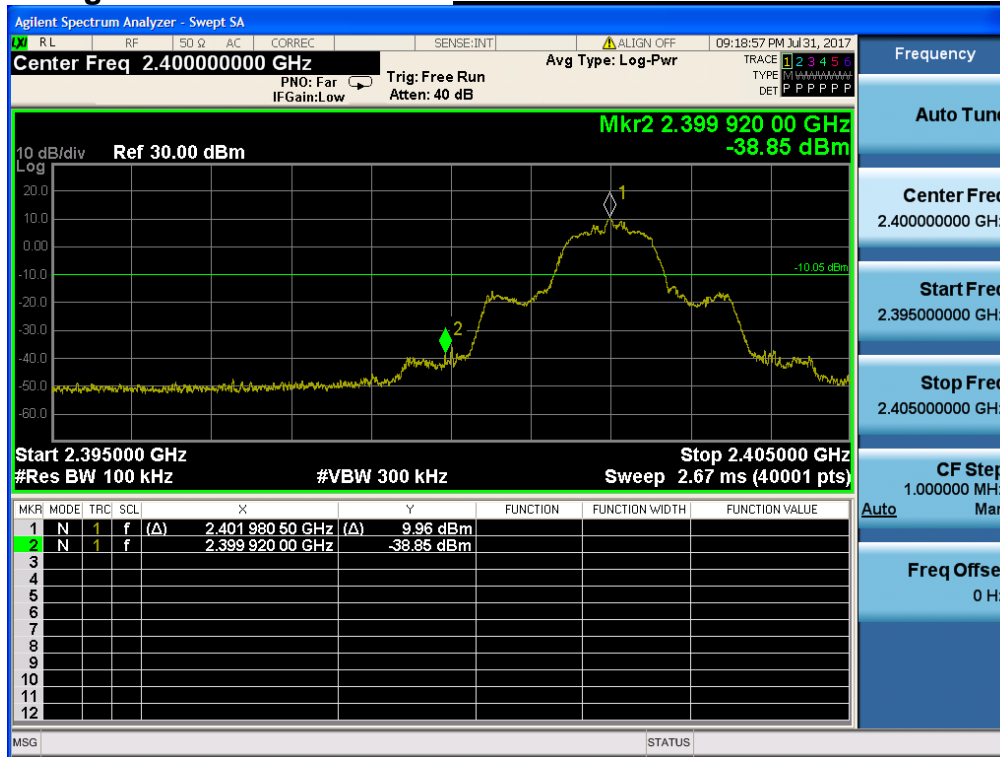
**Conducted Spurious Emissions**      **Highest Channel & Modulation : GFSK**





Low Band-edge

Lowest Channel & Modulation :  $\pi/4$ DQPSK

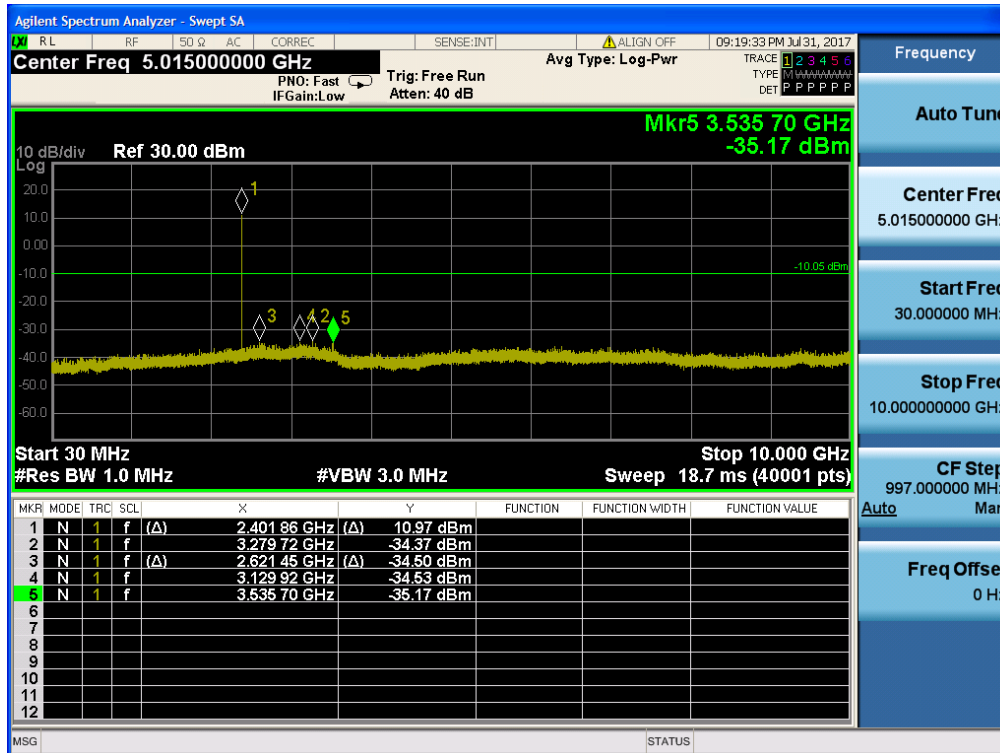
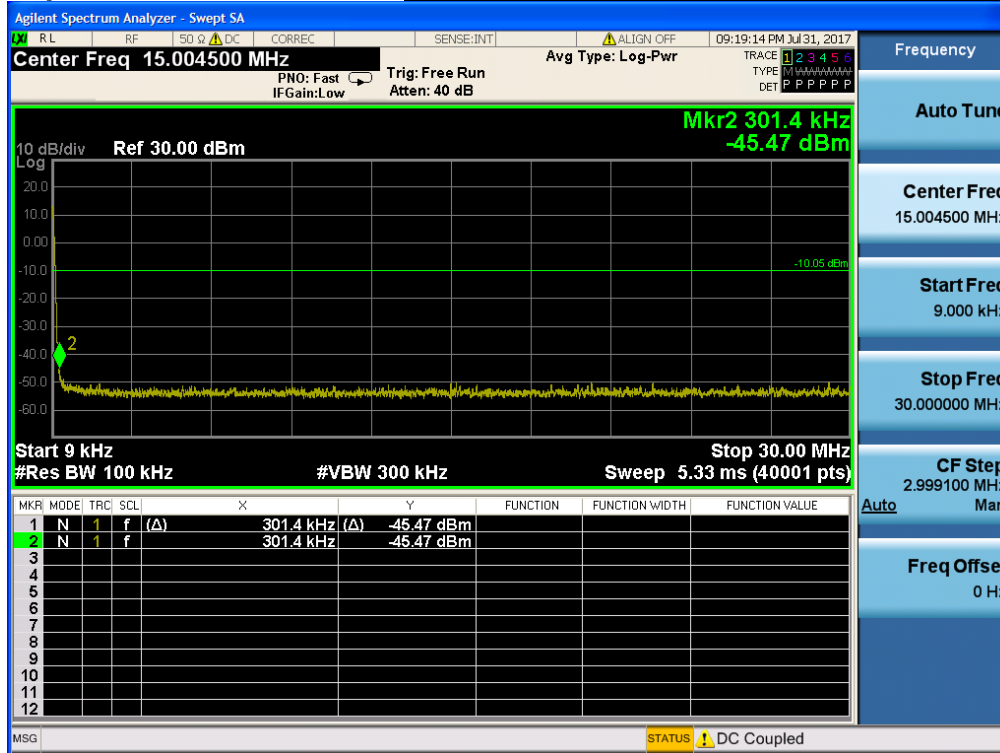


Low Band-edge

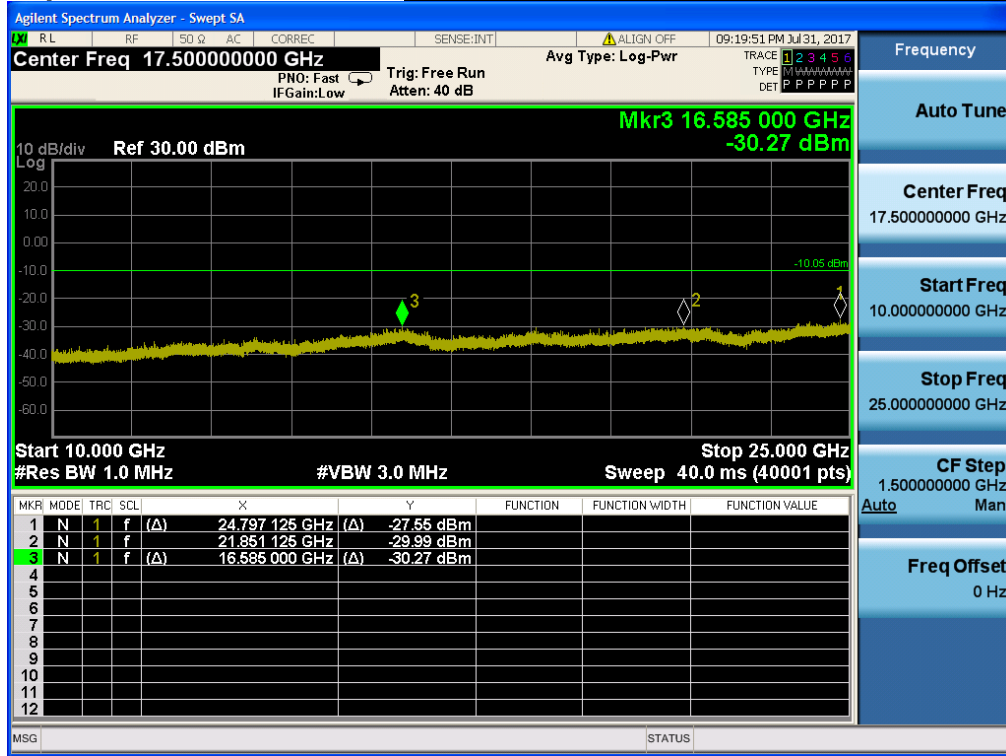
Hopping mode & Modulation :  $\pi/4$ DQPSK



**Conducted Spurious Emissions**      ***Lowest Channel & Modulation :  $\pi/4$ DQPSK***

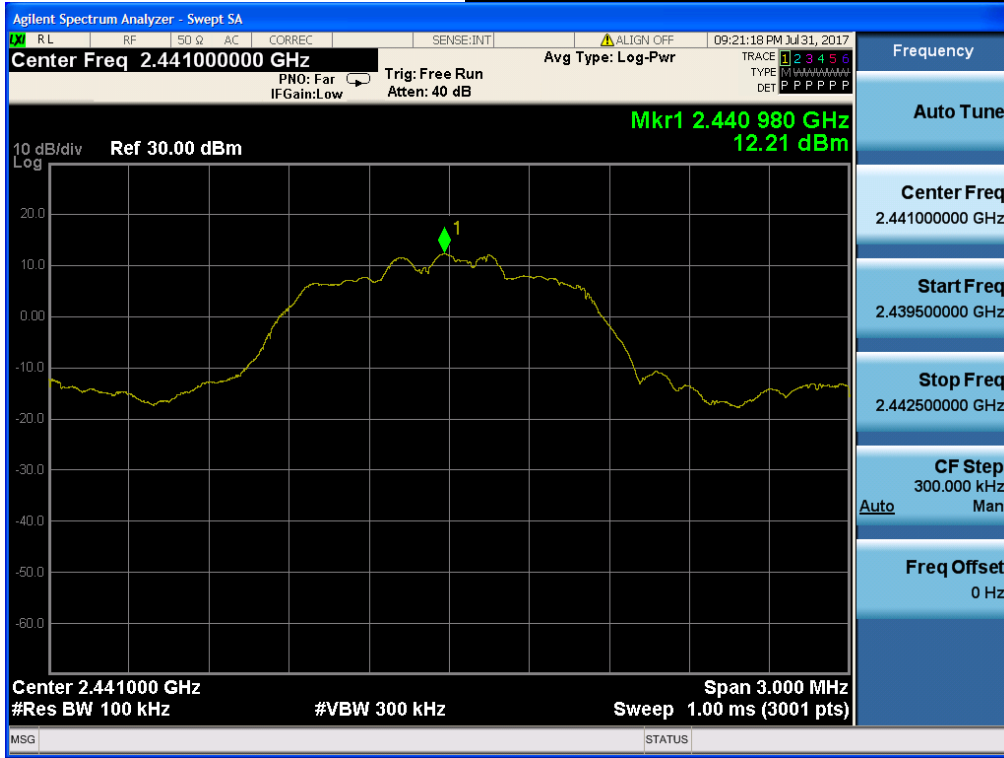


**Conducted Spurious Emissions**      ***Lowest Channel & Modulation :  $\pi/4$ DQPSK***



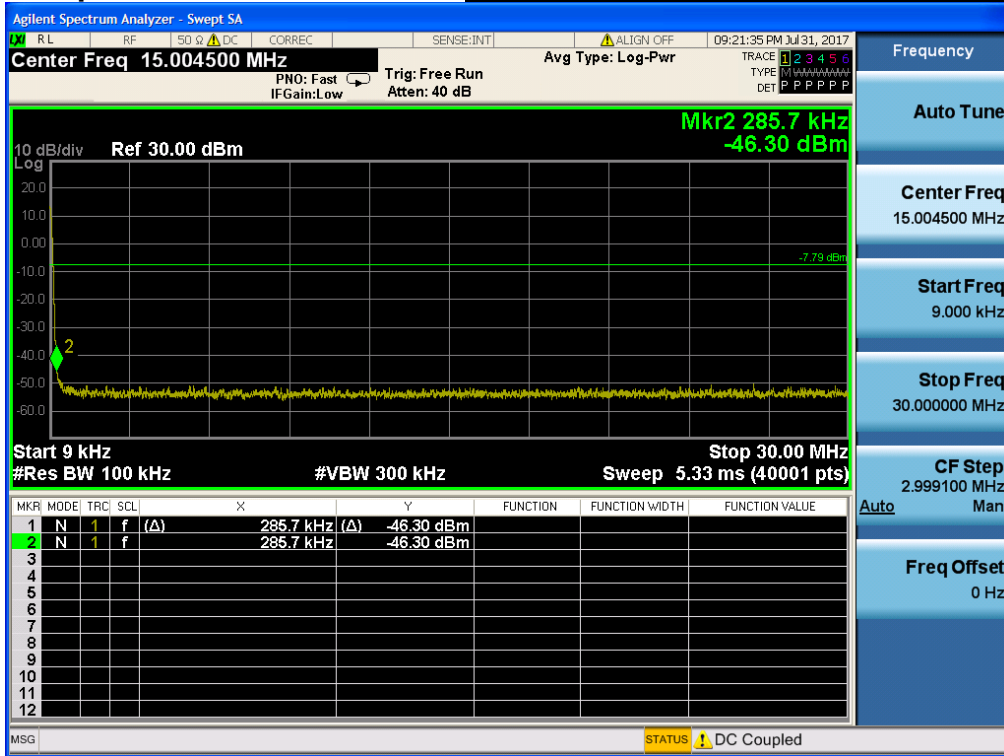
Reference for limit

Middle Channel & Modulation :  $\pi/4$ DQPSK

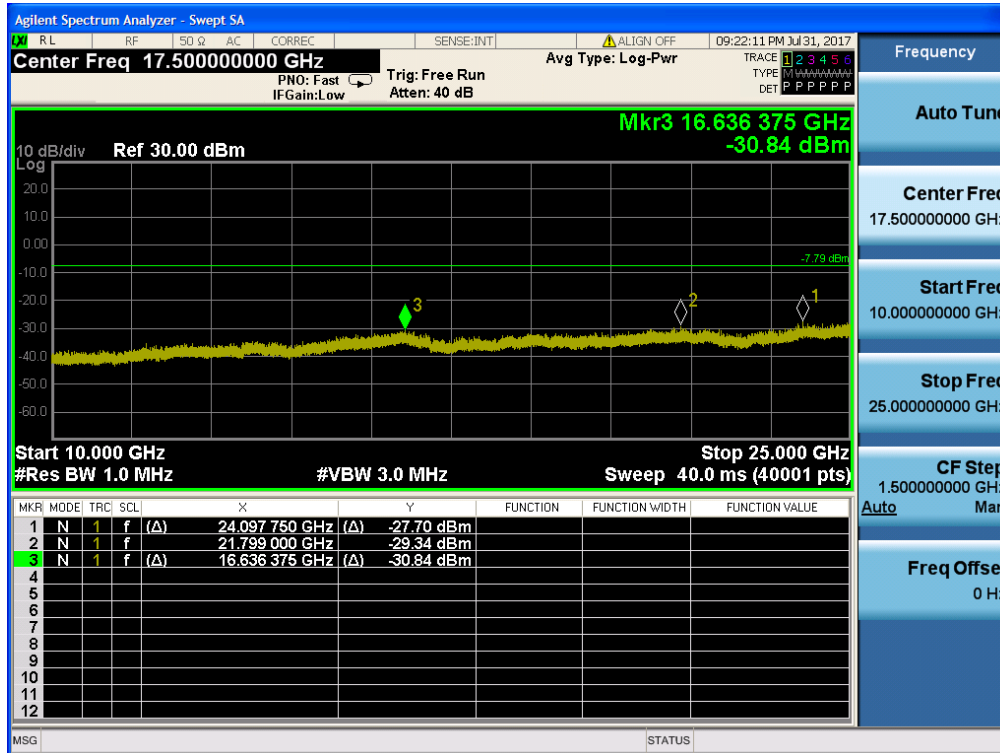
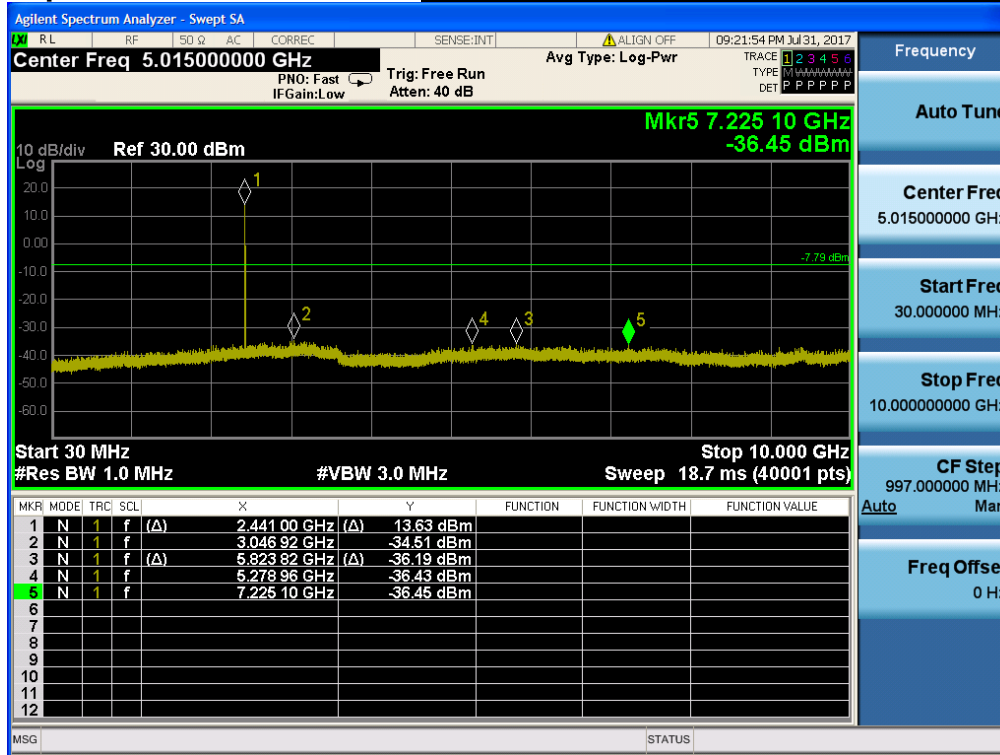


Conducted Spurious Emissions

Middle Channel & Modulation :  $\pi/4$ DQPSK

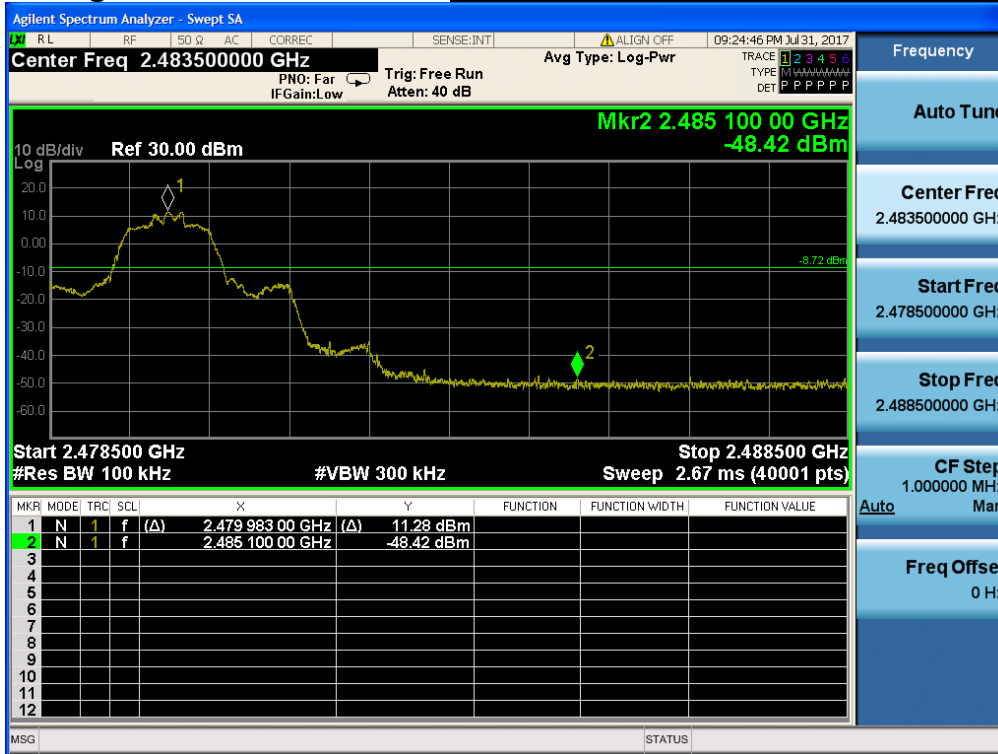


Conducted Spurious Emissions *Middle Channel & Modulation :  $\pi/4$ DQPSK*



High Band-edge

Highest Channel & Modulation :  $\pi/4$ DQPSK



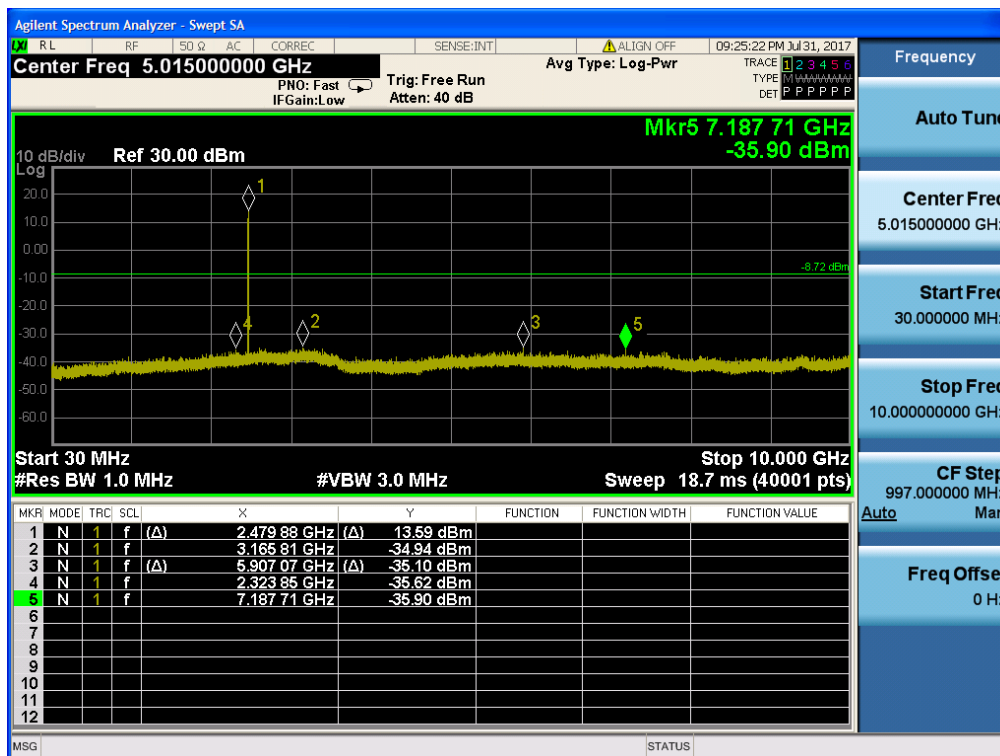
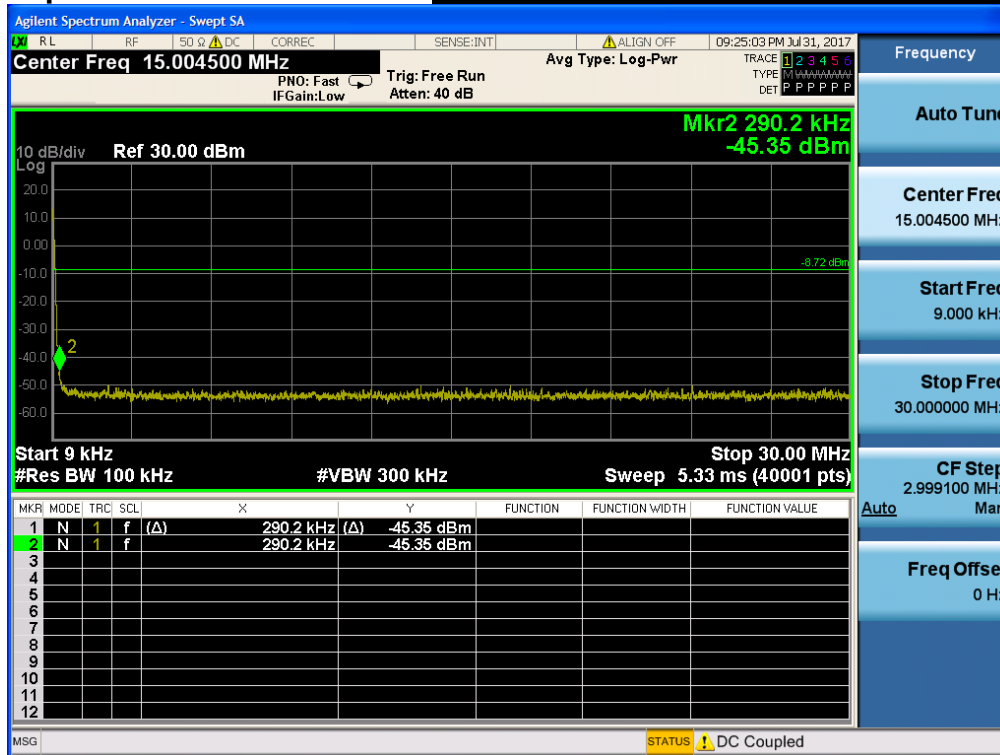
High Band-edge

Hopping mode & Modulation :  $\pi/4$ DQPSK



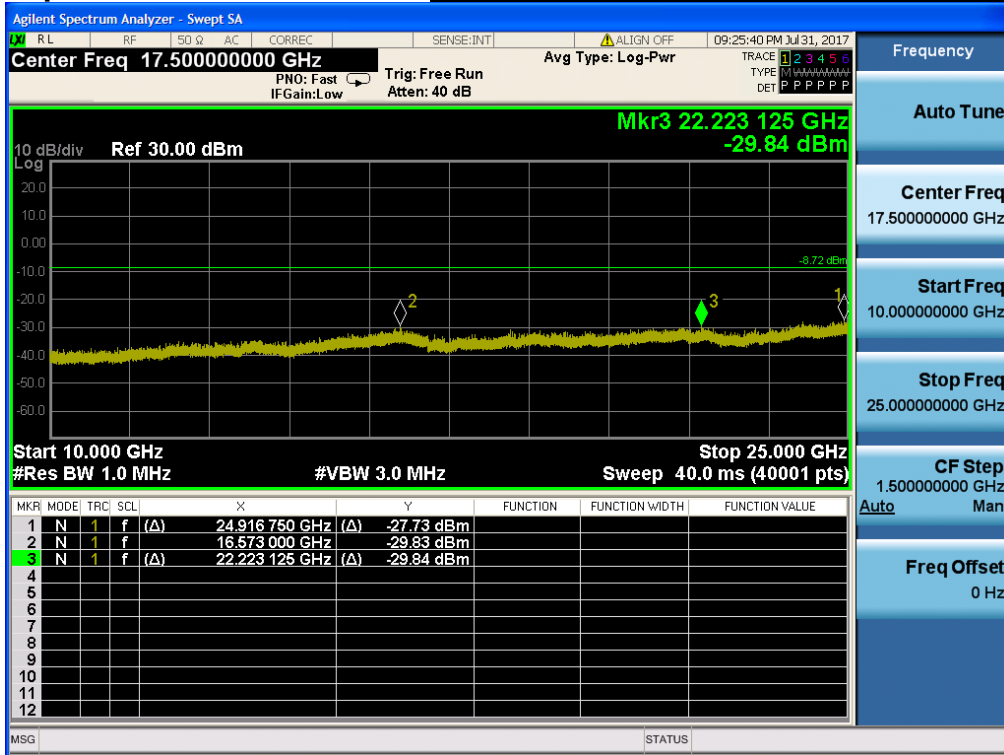
Conducted Spurious Emissions

*Highest Channel & Modulation :  $\pi/4$ DQPSK*



Conducted Spurious Emissions

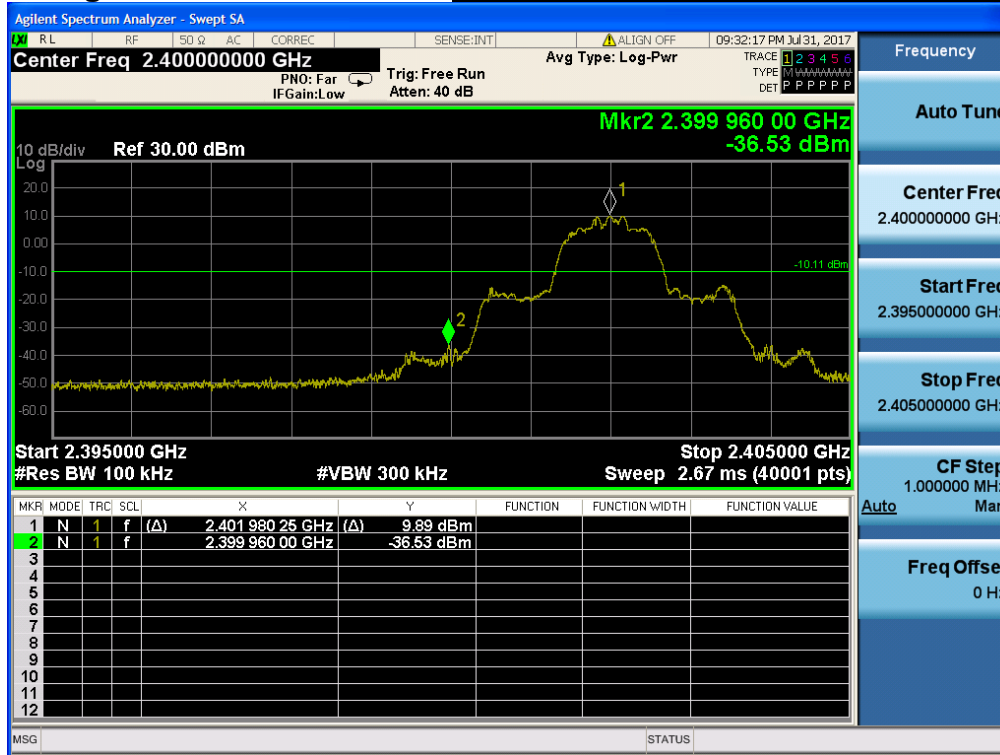
*Highest Channel & Modulation :  $\pi/4$ DQPSK*





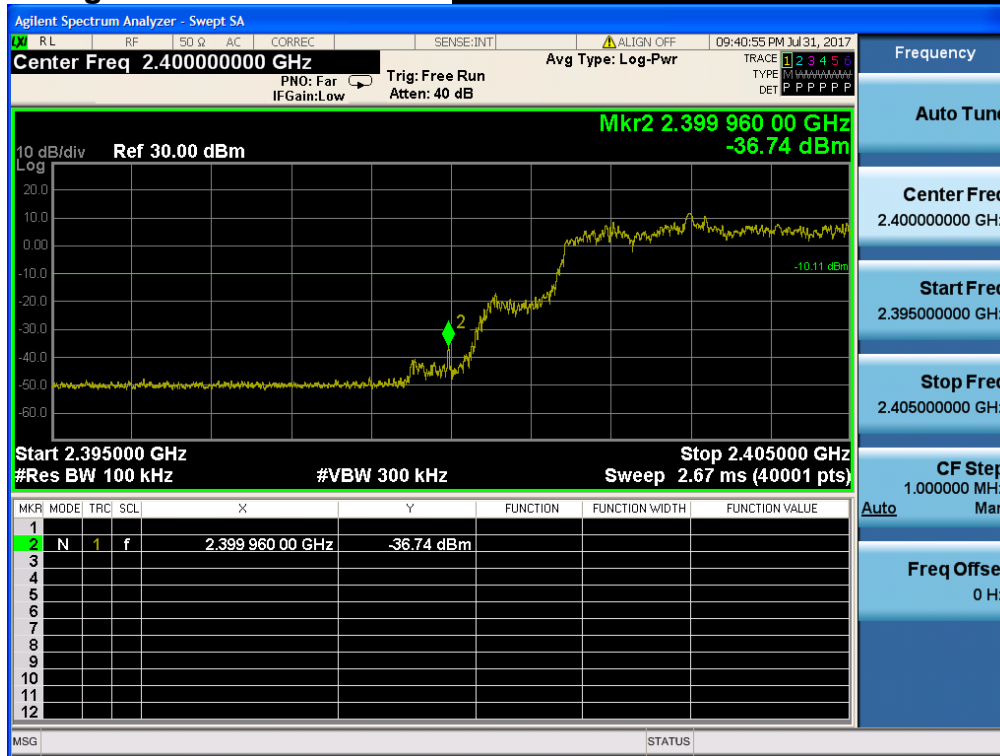
Low Band-edge

Lowest Channel & Modulation : 8DPSK



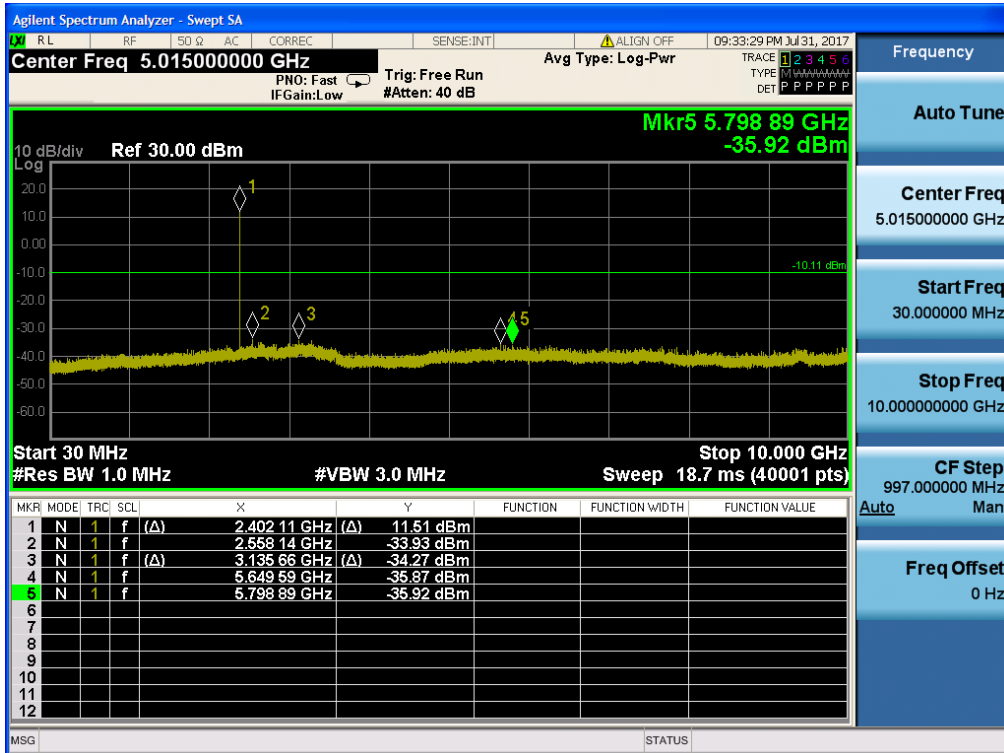
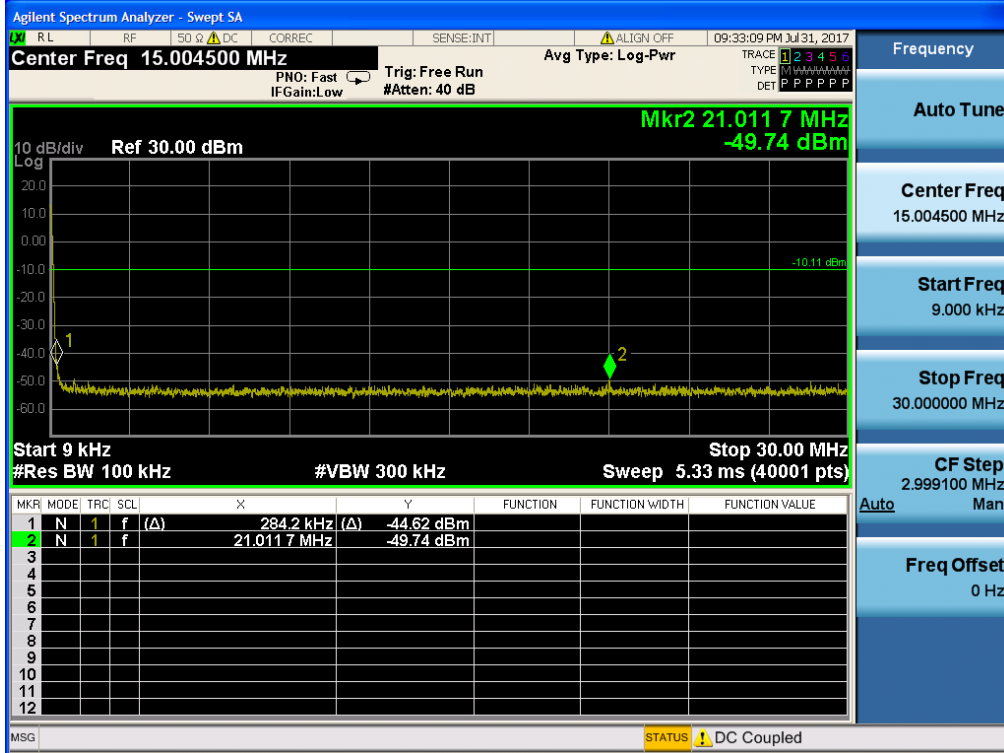
Low Band-edge

Hopping mode & Modulation : 8DPSK



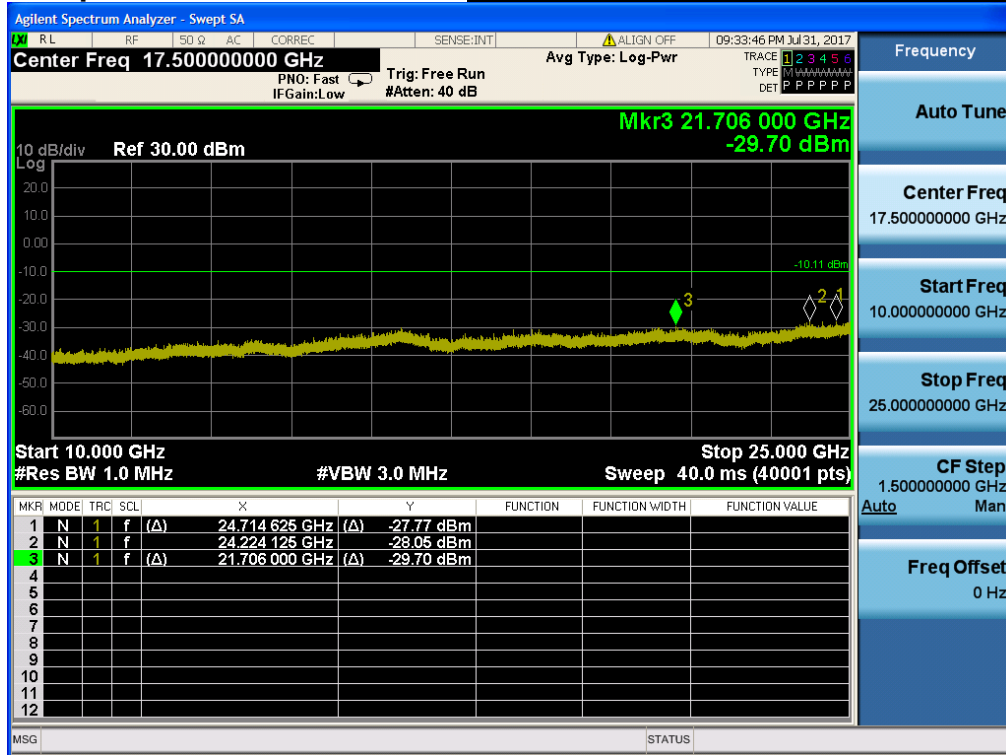
Conducted Spurious Emissions

Lowest Channel & Modulation : 8DPSK



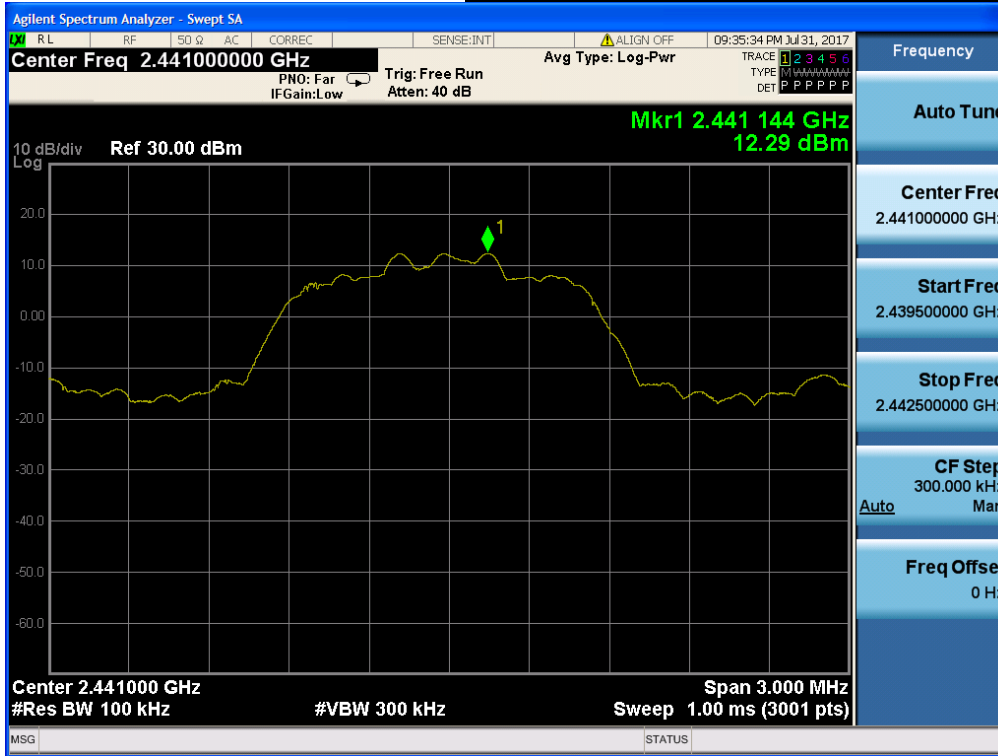
Conducted Spurious Emissions

Lowest Channel & Modulation : 8DPSK



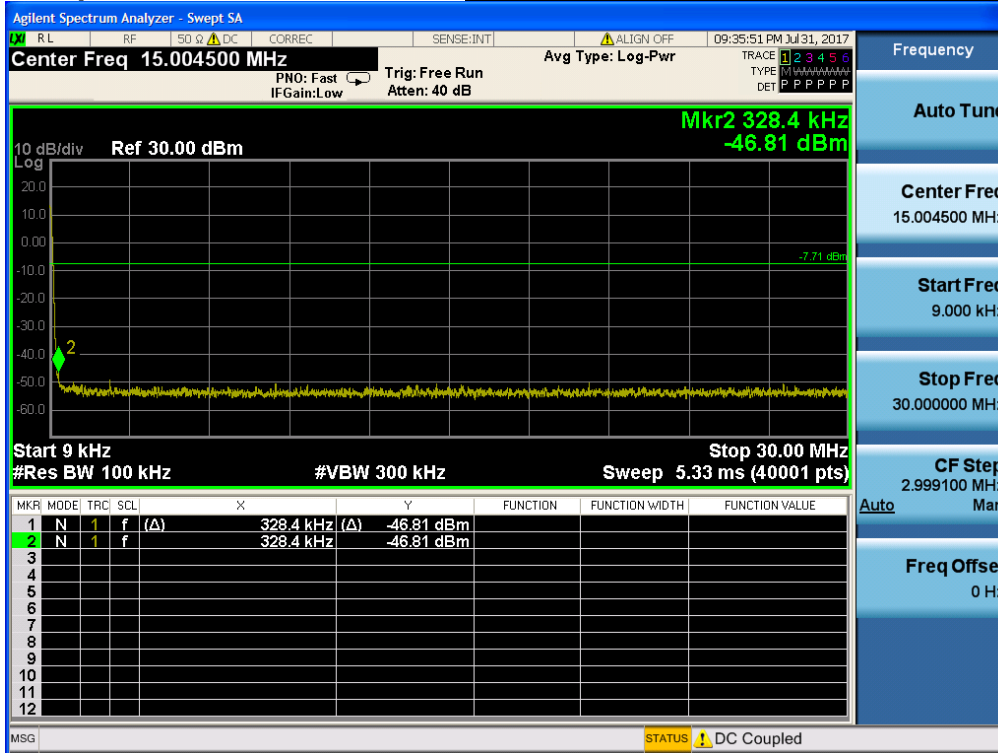
Reference for limit

Middle Channel & Modulation : 8DPSK



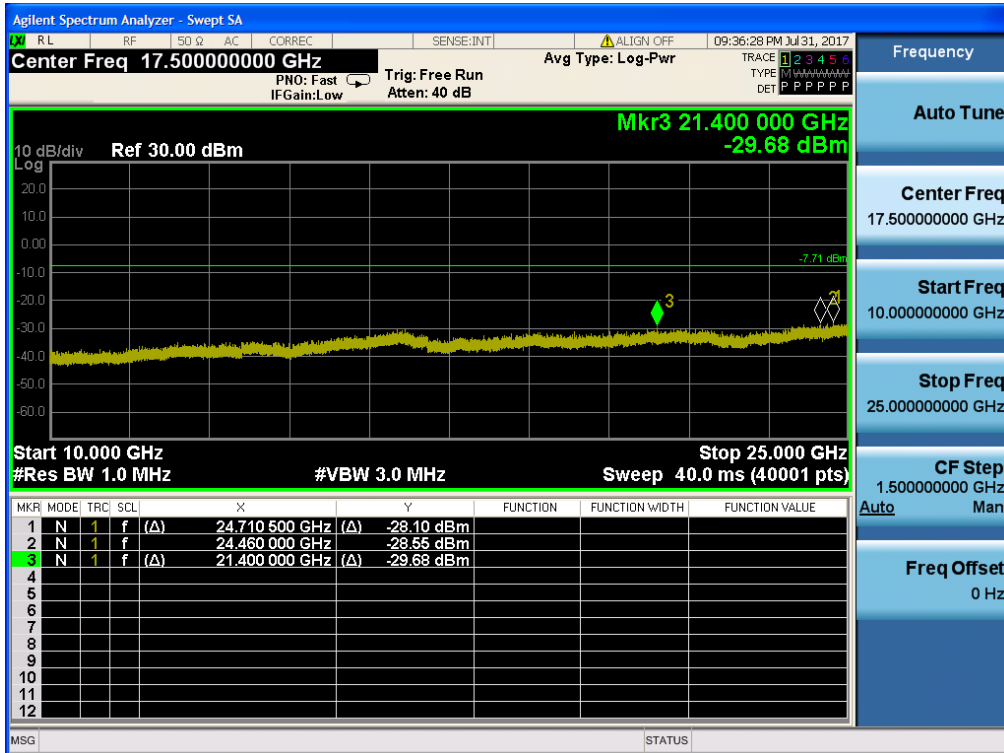
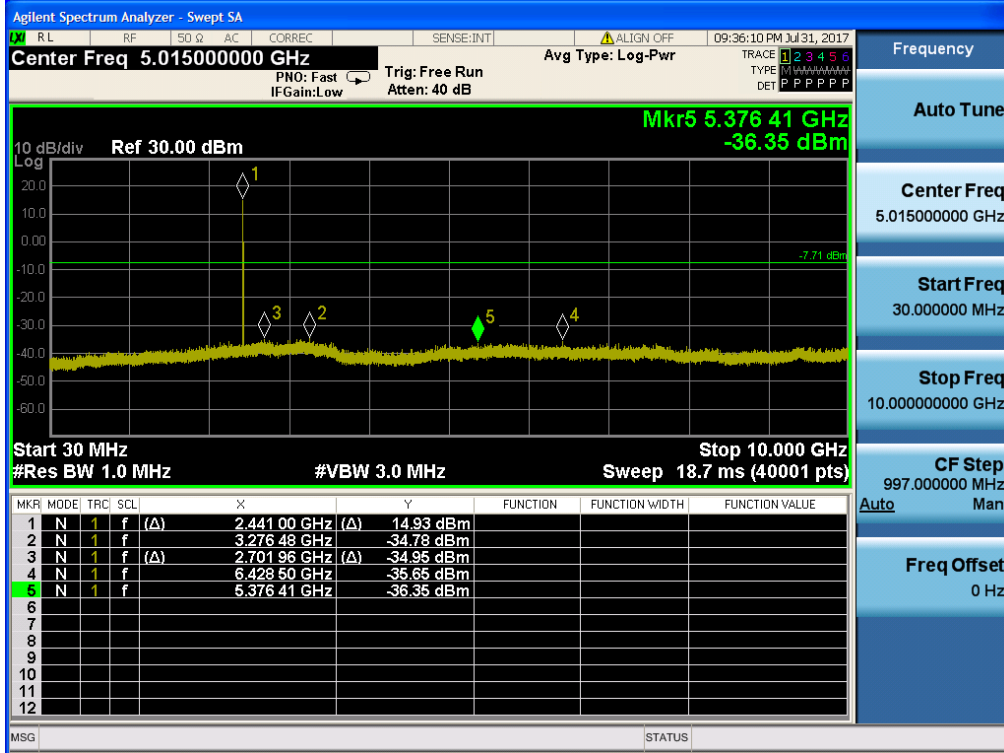
Conducted Spurious Emissions

Middle Channel & Modulation : 8DPSK



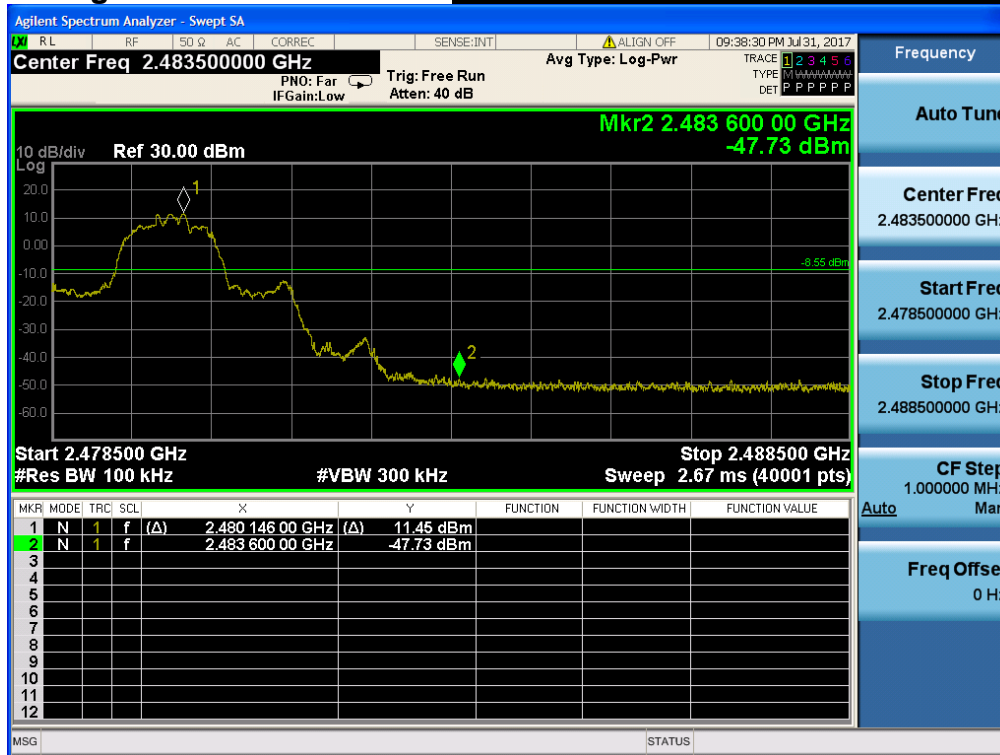
Conducted Spurious Emissions

Middle Channel & Modulation : 8DPSK



High Band-edge

**Highest Channel & Modulation : 8DPSK**



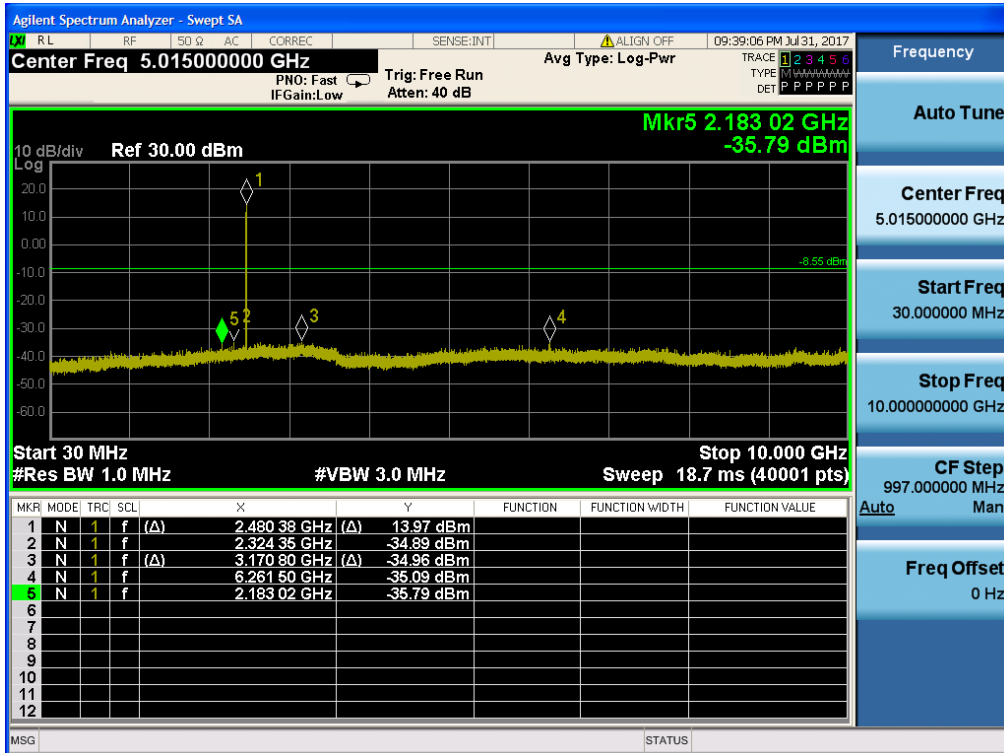
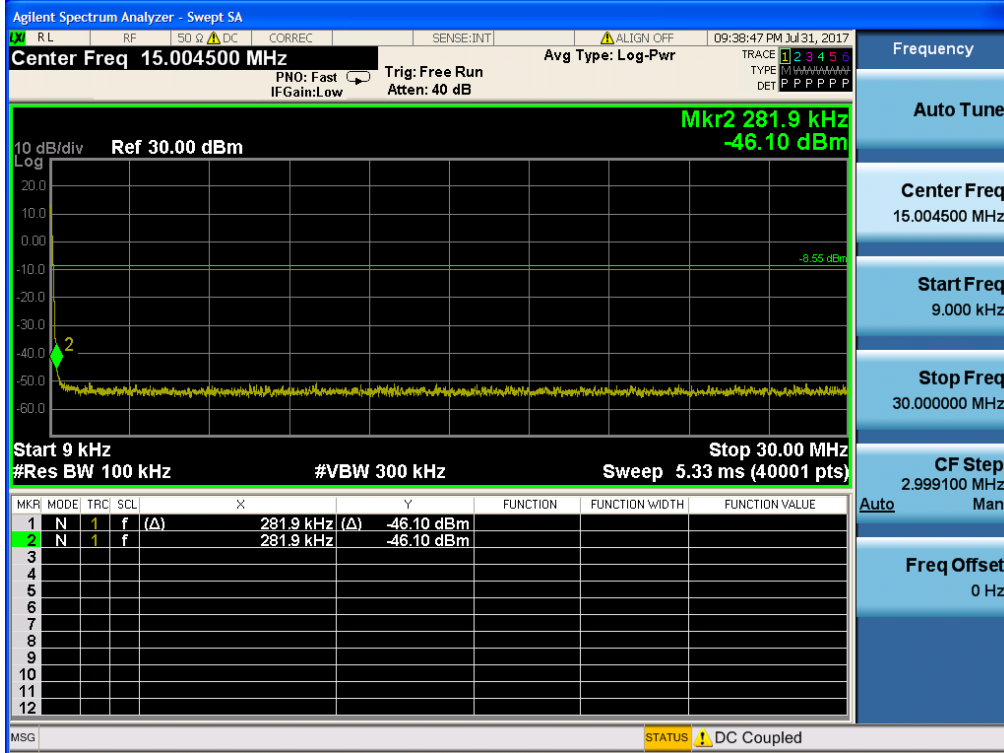
High Band-edge

**Hopping mode & Modulation : 8DPSK**



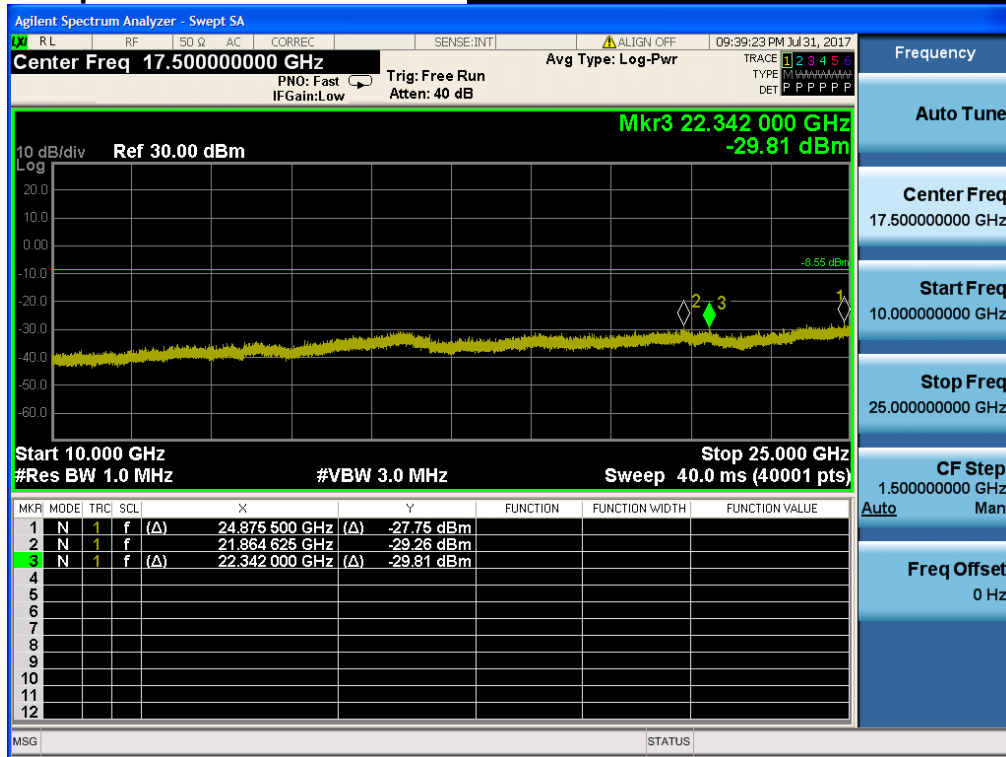
Conducted Spurious Emissions

Highest Channel & Modulation : 8DPSK



Conducted Spurious Emissions

Highest Channel & Modulation : 8DPSK





## 8. Transmitter AC Power Line Conducted Emission

### 8.1 Test Setup

NA

### 8.2 Limit

According to §15.207(a) for an intentional radiator that is designed to be connected to the public utility (AC) power line, the radio frequency voltage that is conducted back onto the AC power line on any frequency or frequencies, within the band 150 kHz to 30 MHz, shall not exceed the limits in the following table, as measured using a 50 uH/50 ohm line impedance stabilization network (LISN).

Compliance with the provision of this paragraph shall on the measurement of the radio frequency voltage between each power line and ground at the power terminal. The lower applies at the boundary between the frequency ranges.

Frequency Range (MHz)	Conducted Limit (dBuV)	
	Quasi-Peak	Average
0.15 ~ 0.5	66 to 56 *	56 to 46 *
0.5 ~ 5	56	46
5 ~ 30	60	50

\* Decreases with the logarithm of the frequency

### 8.3 Test Procedures

Conducted emissions from the EUT were measured according to the ANSI C63.10.

1. The test procedure is performed in a 6.5 m × 3.5 m × 3.5 m (L × W × H) shielded room. The EUT along with its peripherals were placed on a 1.0 m (W) × 1.5 m (L) and 0.8 m in height wooden table and the EUT was adjusted to maintain a 0.4 meter space from a vertical reference plane.
2. The EUT was connected to power mains through a line impedance stabilization network (LISN) which provides 50 ohm coupling impedance for measuring instrument and the chassis ground was bounded to the horizontal ground plane of shielded room.
3. All peripherals were connected to the second LISN and the chassis ground also bounded to the horizontal ground plane of shielded room.
4. The excess power cable between the EUT and the LISN was bundled. The power cables of peripherals were unbundled. All connecting cables of EUT and peripherals were moved to find the maximum emission.

### 8.4 Test Results

NA

## 9. Antenna Requirement

Describe how the EUT complies with the requirement that either its antenna is permanently attached, or that it employs a unique antenna connector, for every antenna proposed for use with the EUT.

**Conclusion: Comply**

### Module 0

**Model : SENA\_003**

**The antenna type is a Chip antenna.(Refer to Internal Photo file.)**

### Module 1

**ANT1\_ Model : SENA-DP02-19**

**The antenna is printed to the external PCB (Refer to Internal Photo file.)**

**Therefore this E.U.T Complies with the requirement of §15.203.**

### - Minimum Standard :

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.

## 10. Occupied Bandwidth (99 %)

### 10.1 Test Setup

Refer to the APPENDIX I.

### 10.2 Limit

Limit : Not Applicable

### 10.3 Test Procedure

The 99 % power bandwidth was measured with a calibrated spectrum analyzer.

The resolution bandwidth (RBW) shall be in the range of 1 % to 5 % of the occupied bandwidth (OBW) and video bandwidth (VBW) shall be approximately  $3 \times$  RBW.

Spectrum analyzer plots are included on the following pages.

### 10.4 Test Results

<Module 0>

Modulation	Tested Channel	Test Results (MHz)
<b><u>GFSK</u></b>	Lowest	1.043
	Middle	1.044
	Highest	<b>1.045</b>
<b><u><math>\pi/4</math>DQPSK</u></b>	Lowest	<b>1.323</b>
	Middle	1.322
	Highest	1.322
<b><u>8DPSK</u></b>	Lowest	1.287
	Middle	<b>1.289</b>
	Highest	1.288

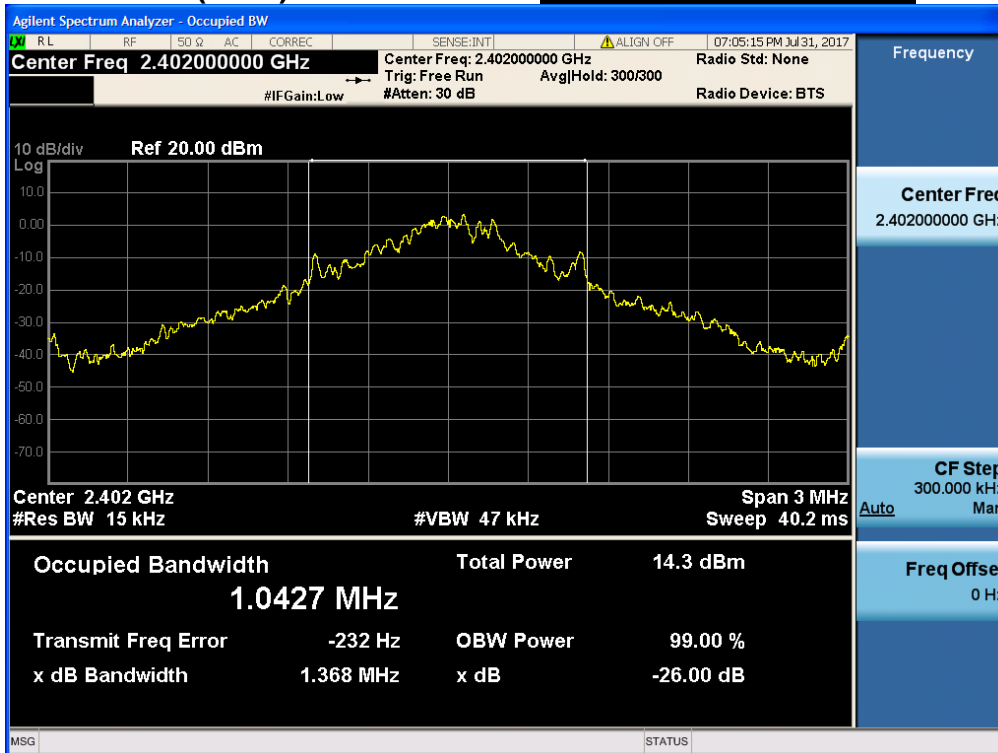
**<Module 1>**

Modulation	Tested Channel	Test Results (MHz)
<b><u>GFSK</u></b>	Lowest	1.053
	Middle	<b>1.087</b>
	Highest	1.064
<b><u><math>\pi/4</math>DQPSK</u></b>	Lowest	1.206
	Middle	<b>1.230</b>
	Highest	1.220
<b><u>8DPSK</u></b>	Lowest	1.195
	Middle	<b>1.221</b>
	Highest	1.215

<Module 0>

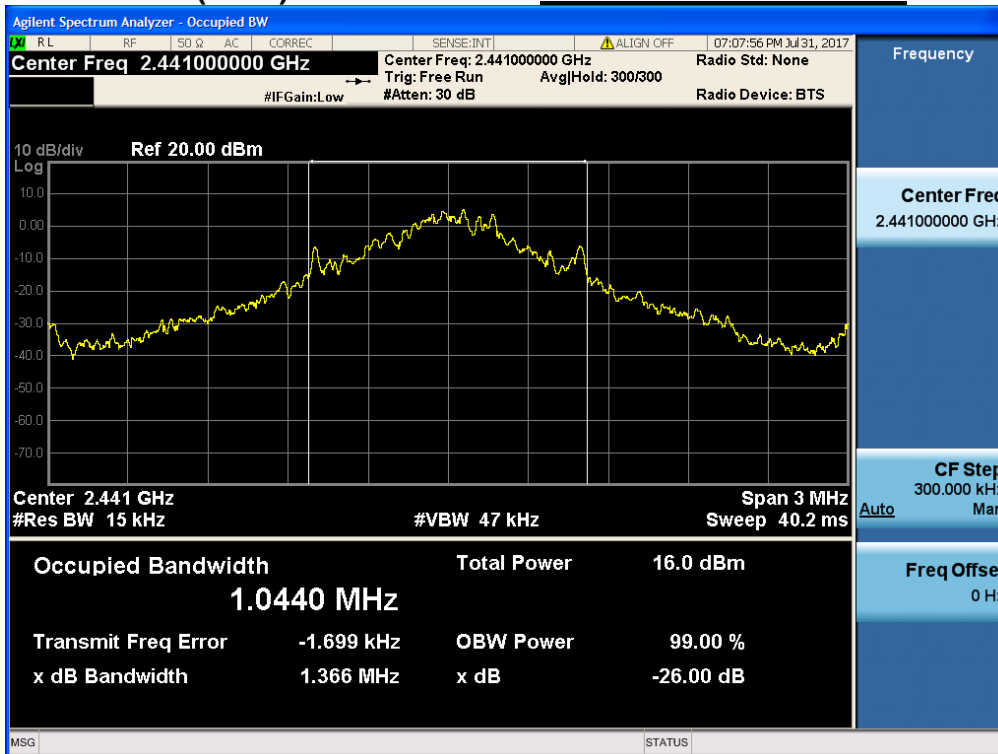
Occupied Bandwidth (99 %)

**Lowest Channel & GFSK**



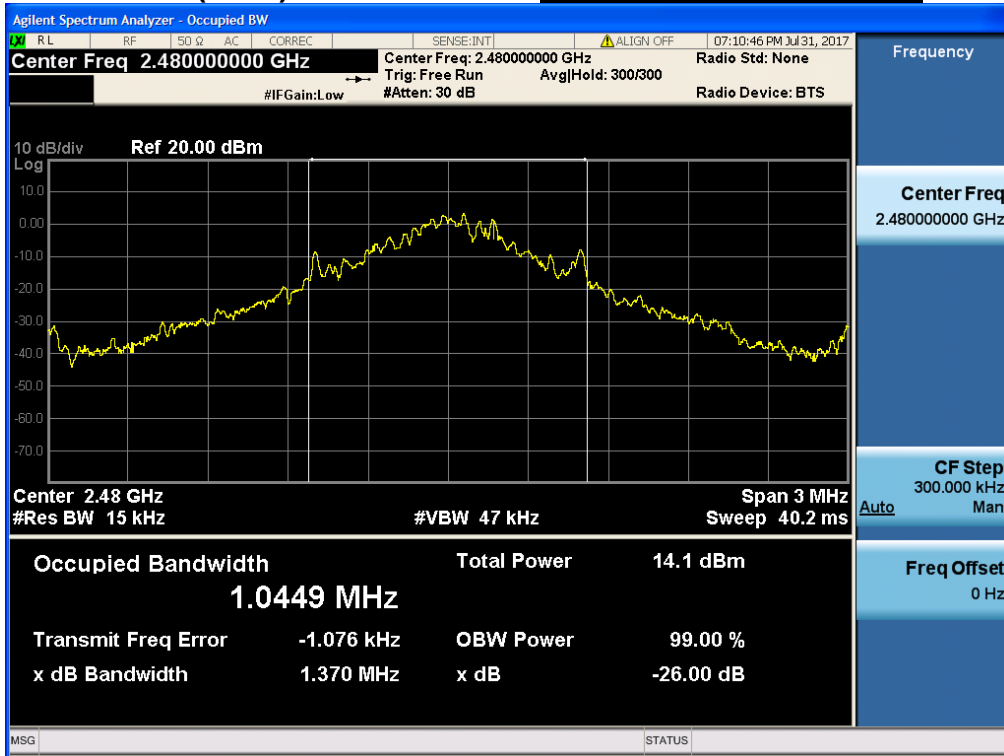
Occupied Bandwidth (99 %)

**Middle Channel & GFSK**



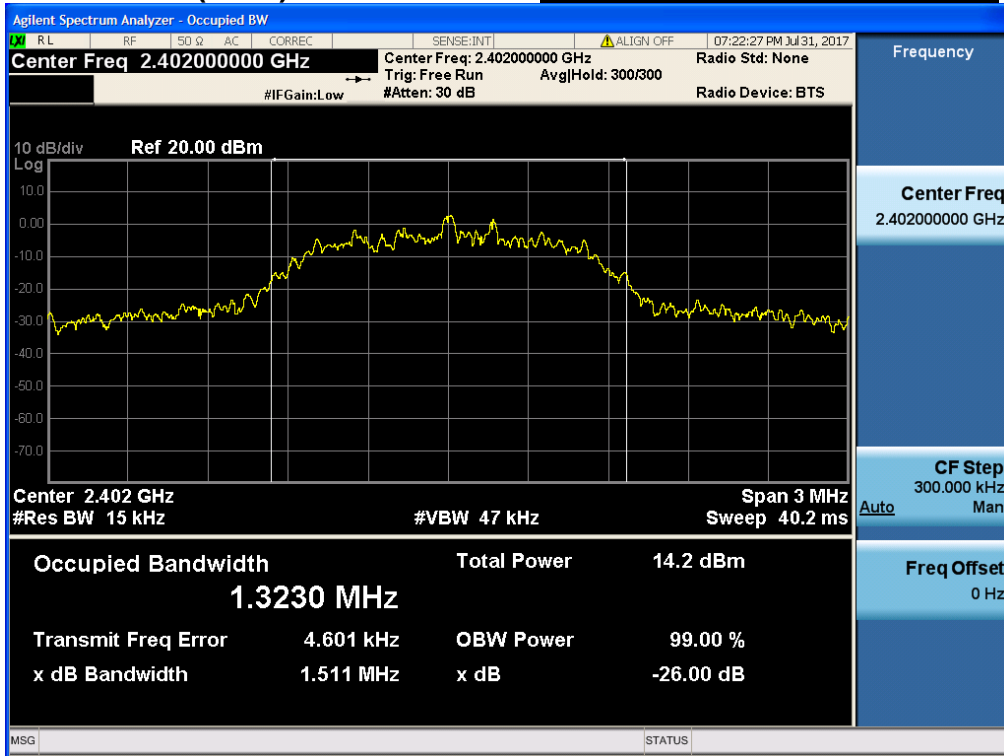
Occupied Bandwidth (99 %)

**Highest Channel & GFSK**



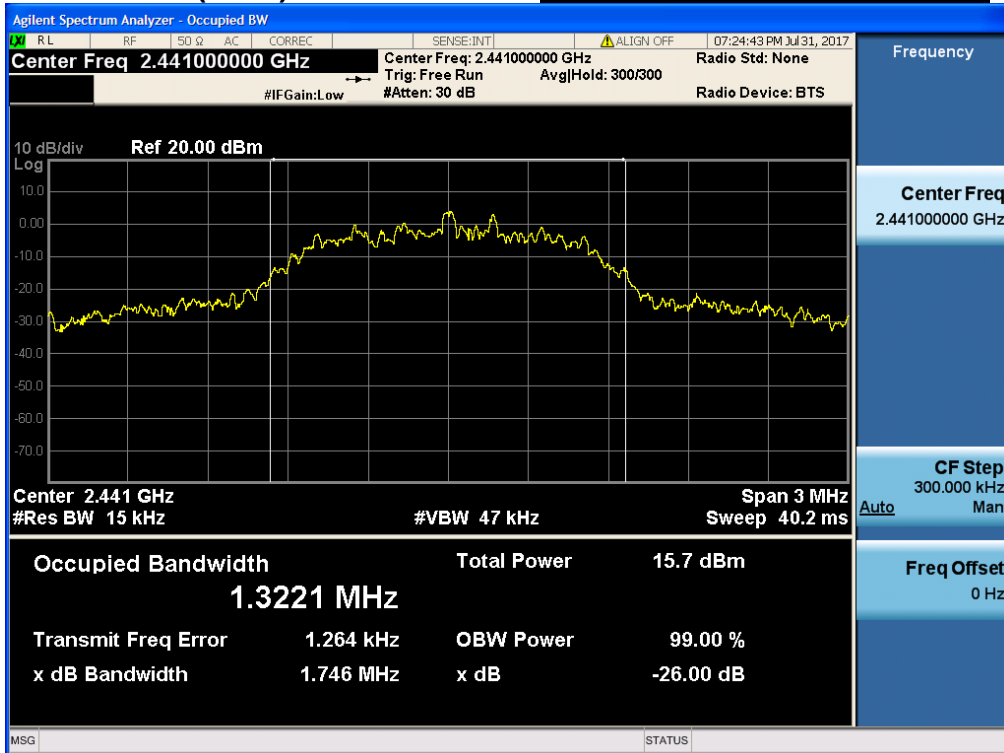
Occupied Bandwidth (99 %)

*Lowest Channel &  $\pi/4$  DQPSK*



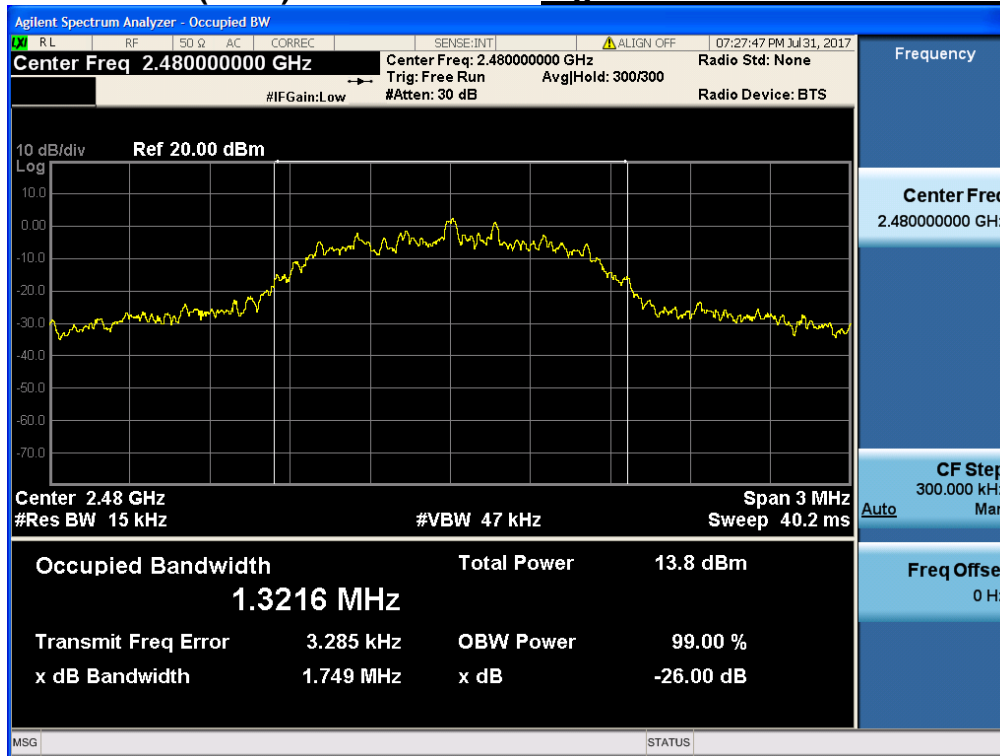
Occupied Bandwidth (99 %)

*Middle Channel &  $\pi/4$  DQPSK*



Occupied Bandwidth (99 %)

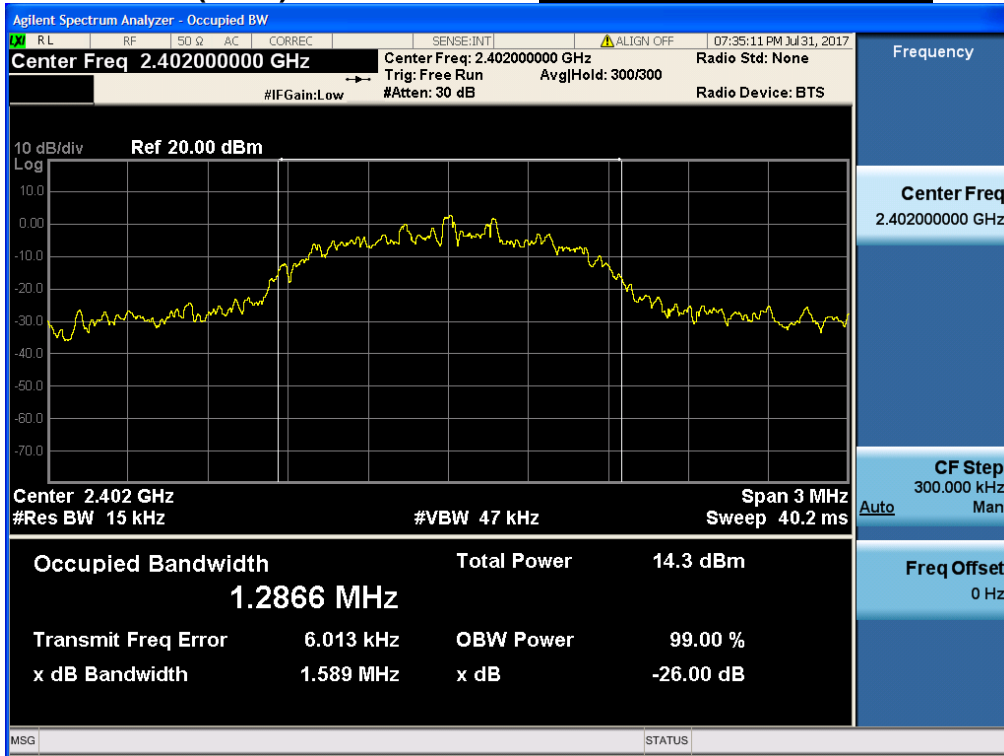
Highest Channel &  $\pi/4$  DQPSK





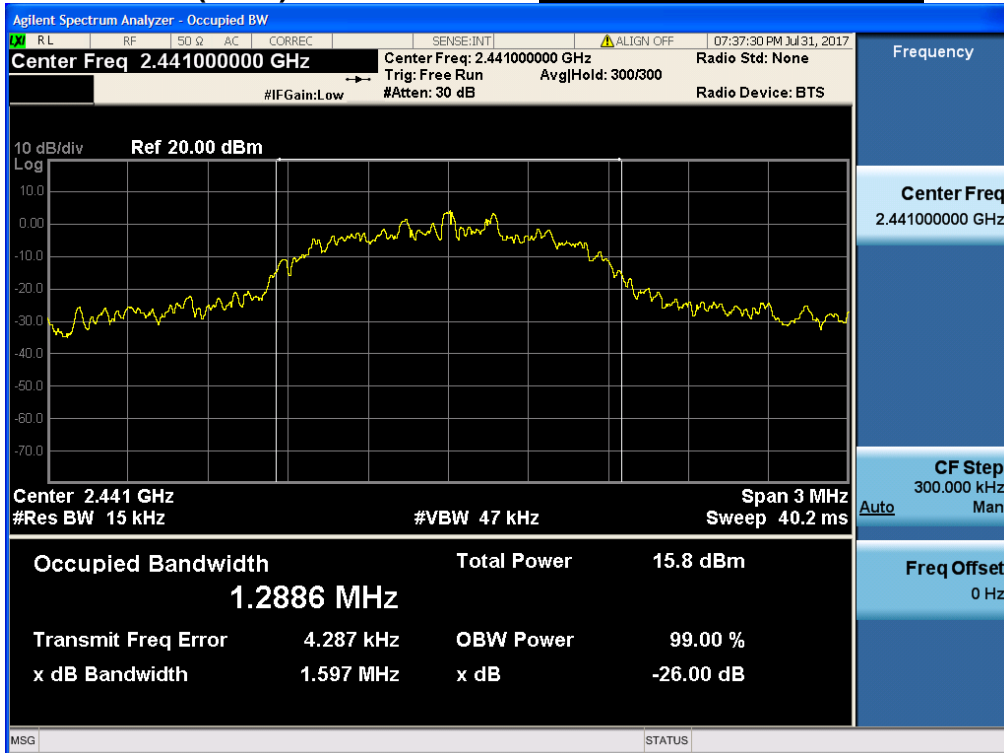
Occupied Bandwidth (99 %)

***Lowest Channel & 8DPSK***



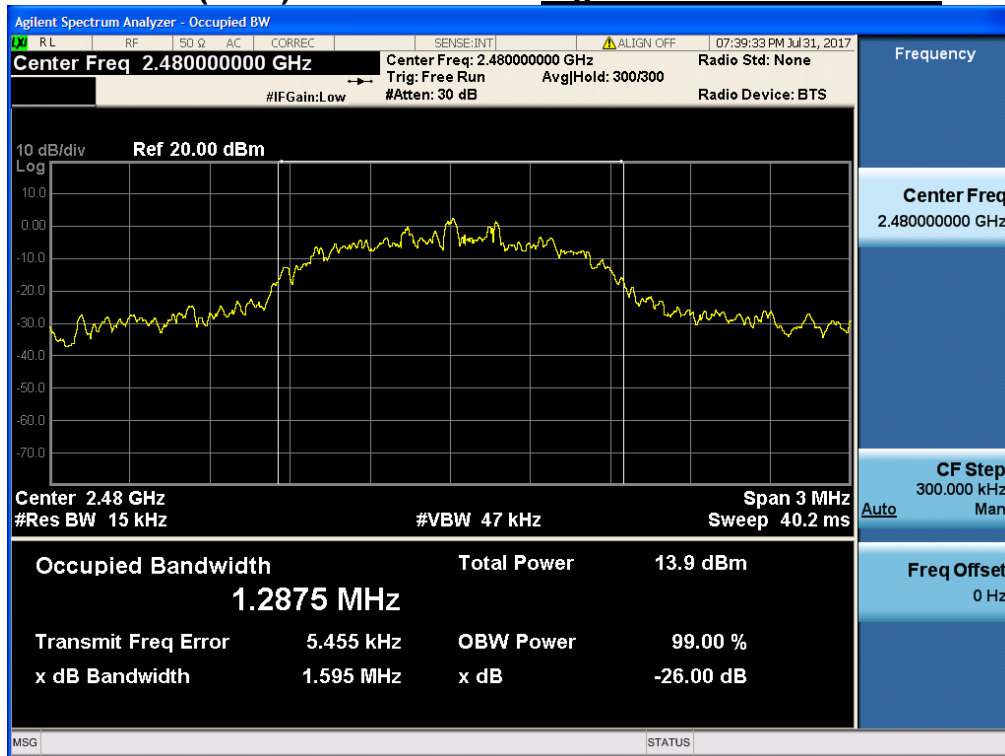
Occupied Bandwidth (99 %)

***Middle Channel & 8DPSK***



Occupied Bandwidth (99 %)

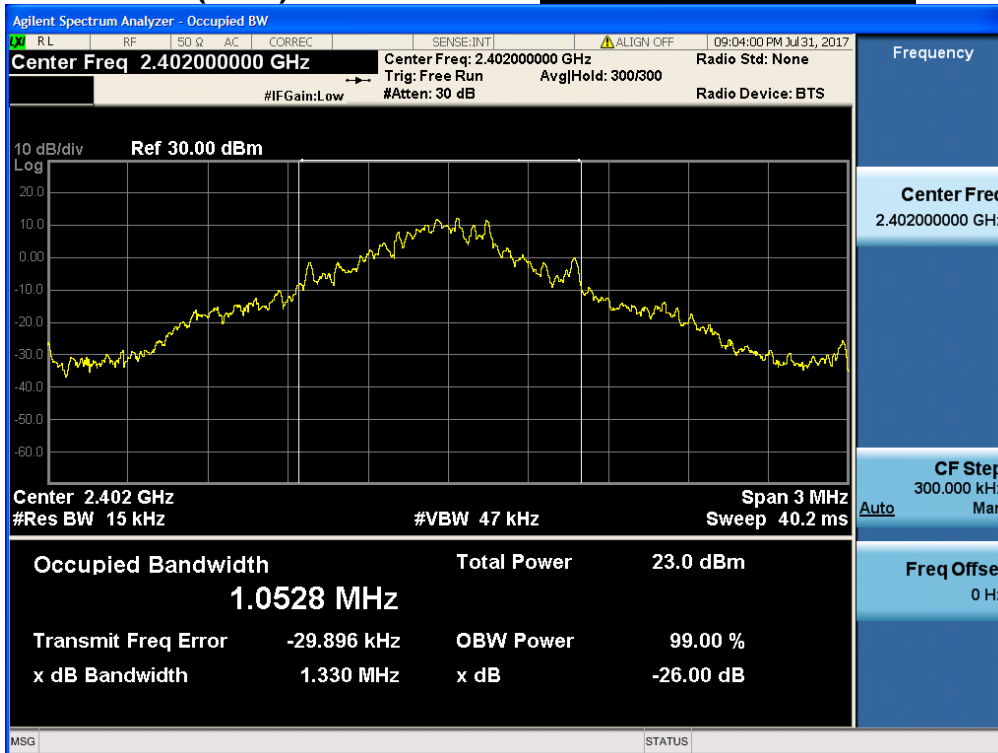
**Highest Channel & 8DPSK**



<Module 1>

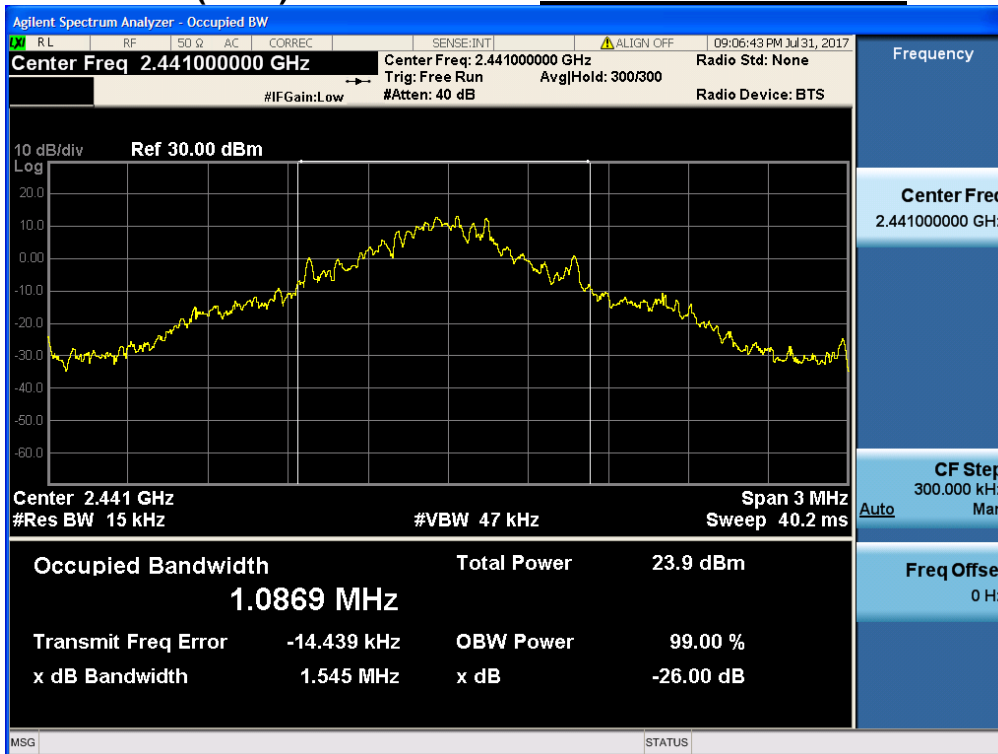
Occupied Bandwidth (99 %)

**Lowest Channel & GFSK**



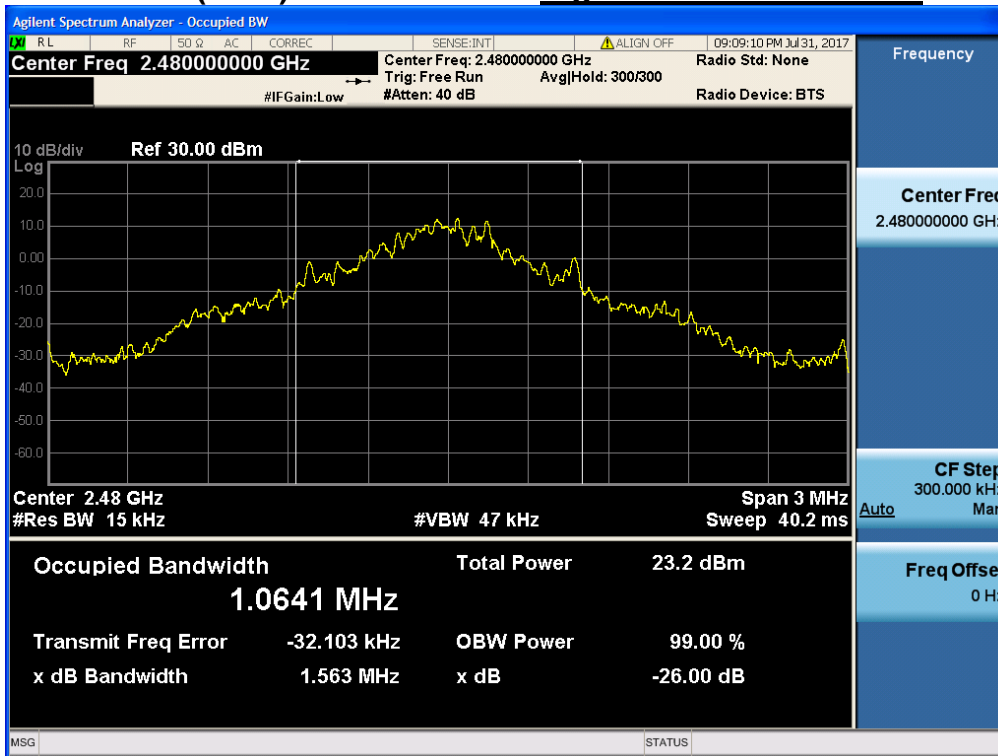
Occupied Bandwidth (99 %)

**Middle Channel & GFSK**



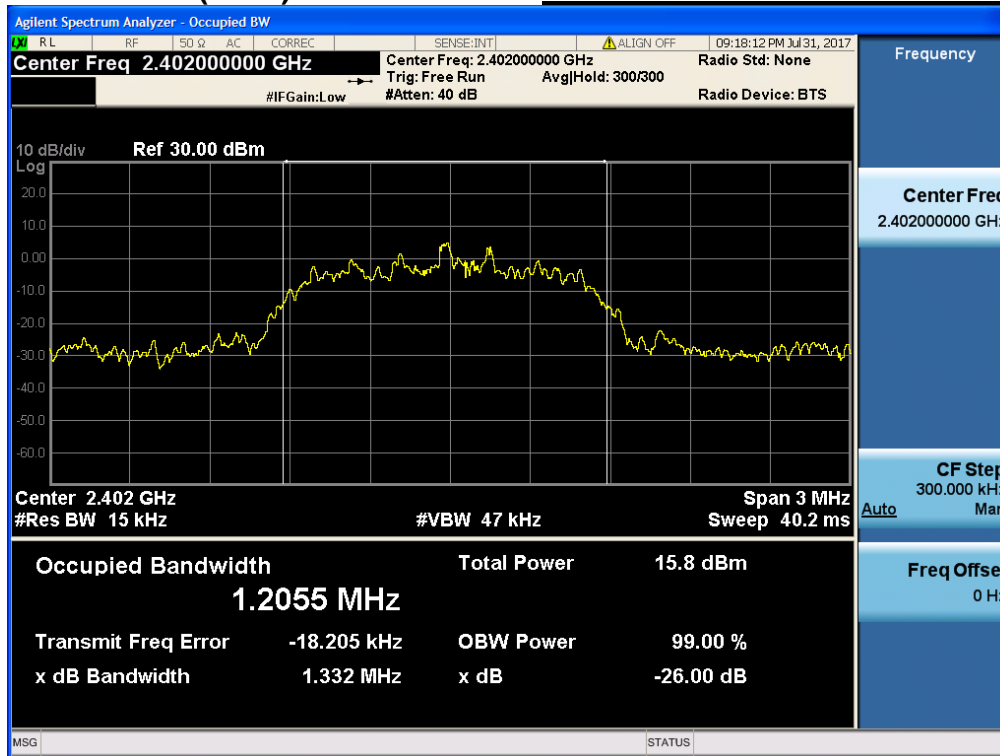
Occupied Bandwidth (99 %)

**Highest Channel & GFSK**



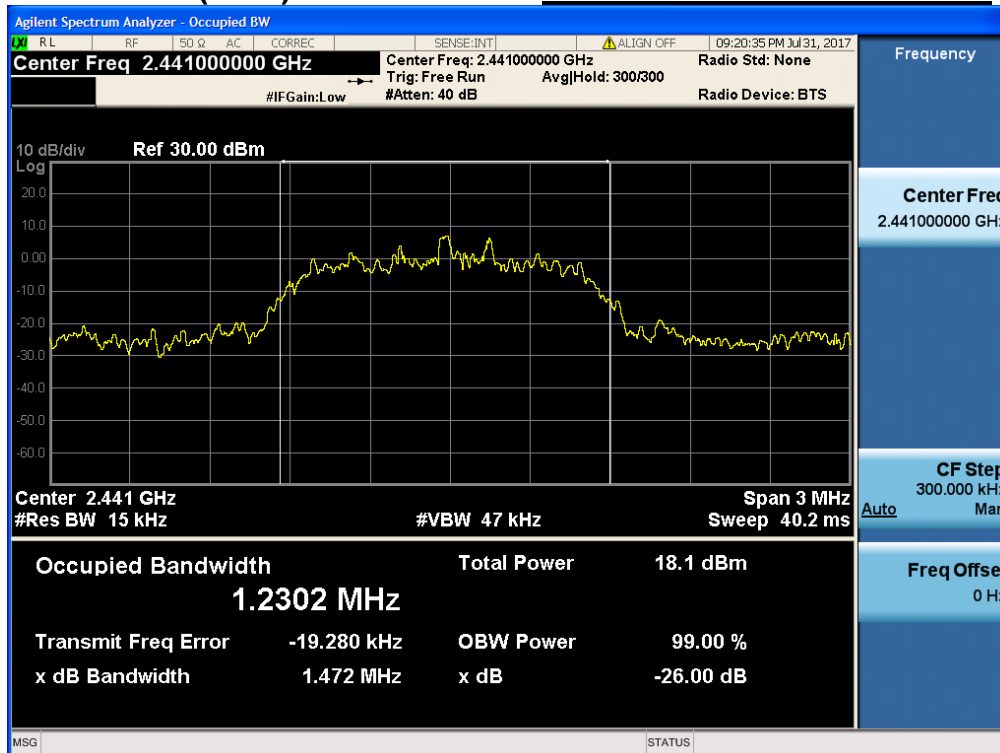
Occupied Bandwidth (99 %)

**Lowest Channel &  $\pi/4$  DQPSK**



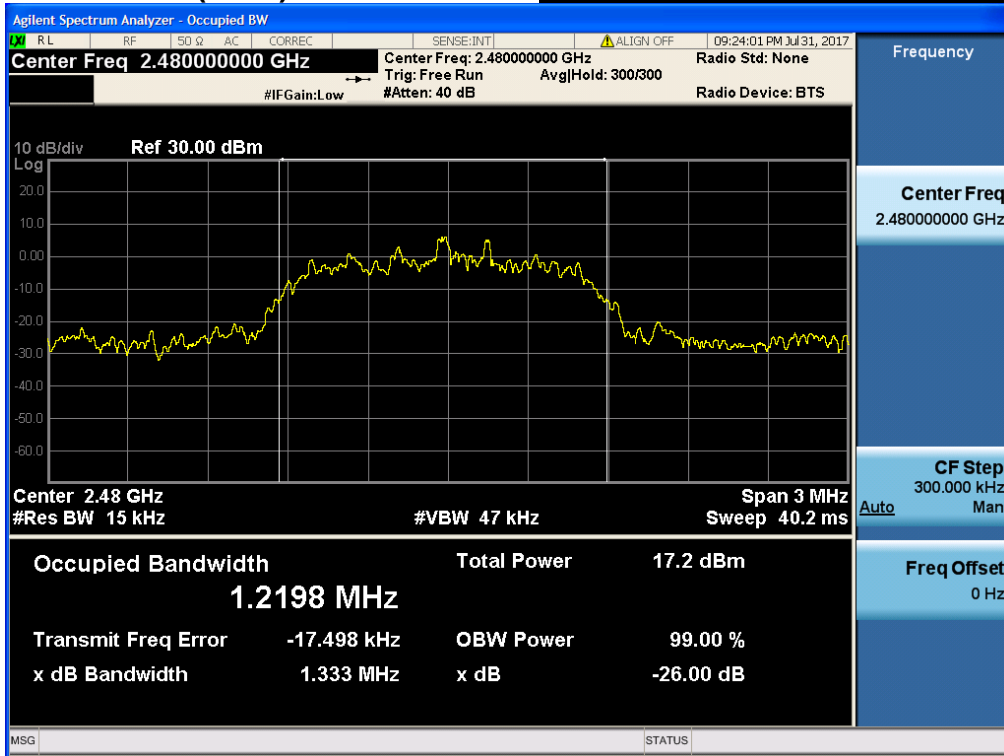
Occupied Bandwidth (99 %)

**Middle Channel &  $\pi/4$  DQPSK**



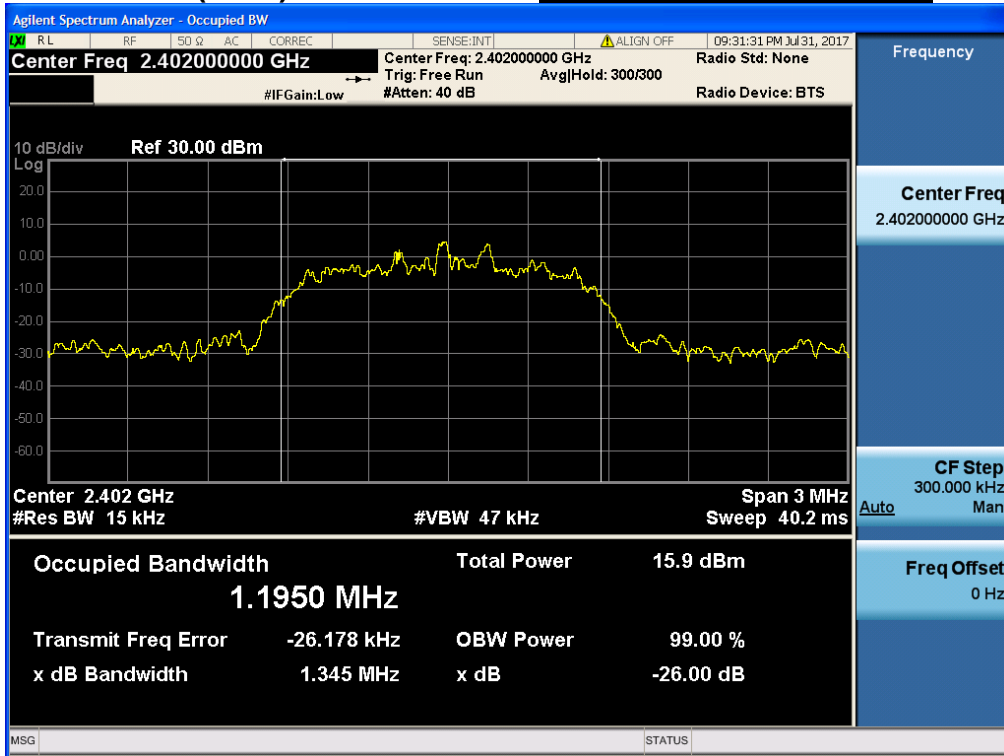
Occupied Bandwidth (99 %)

Highest Channel &  $\pi/4$  DQPSK



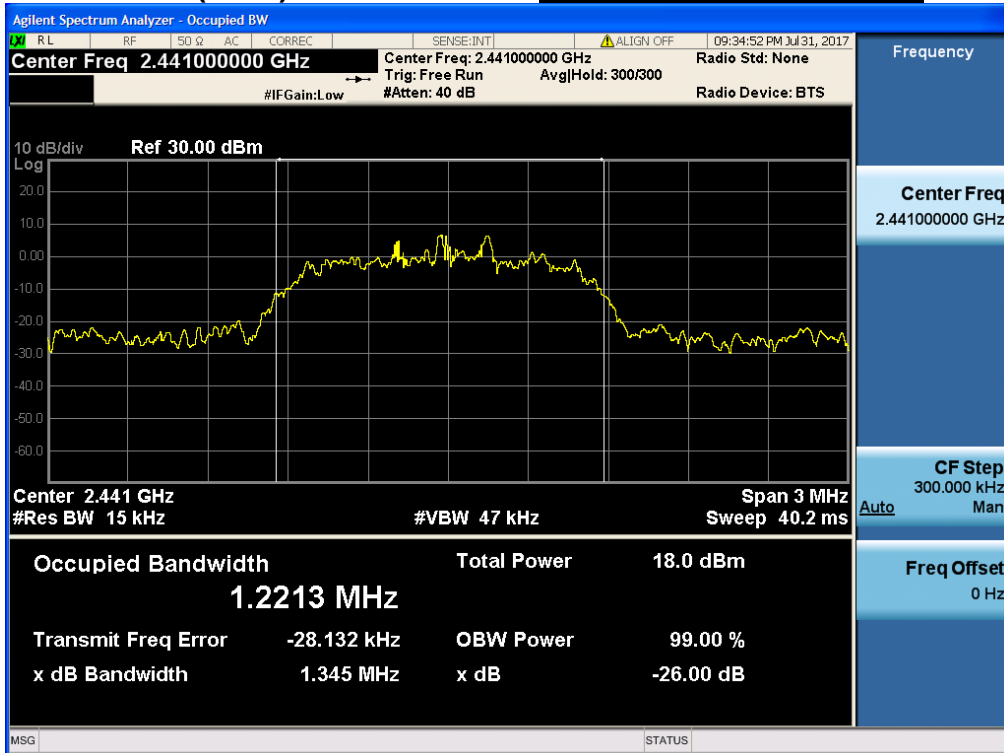
Occupied Bandwidth (99 %)

Lowest Channel & 8DPSK



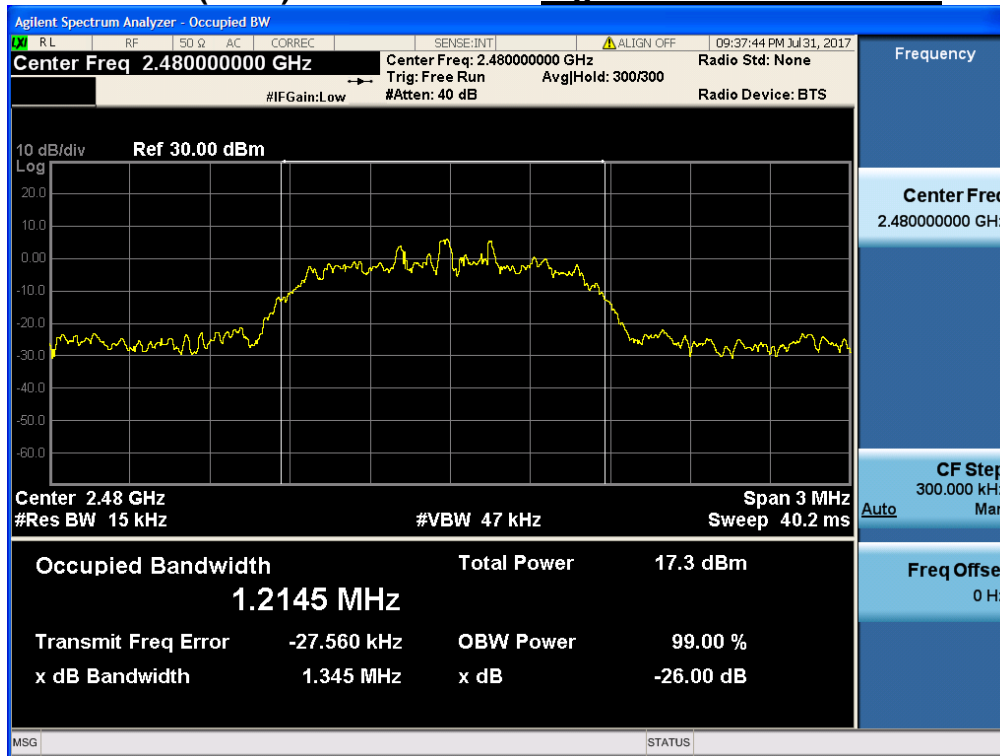
Occupied Bandwidth (99 %)

Middle Channel & 8DPSK



Occupied Bandwidth (99 %)

**Highest Channel & 8DPSK**

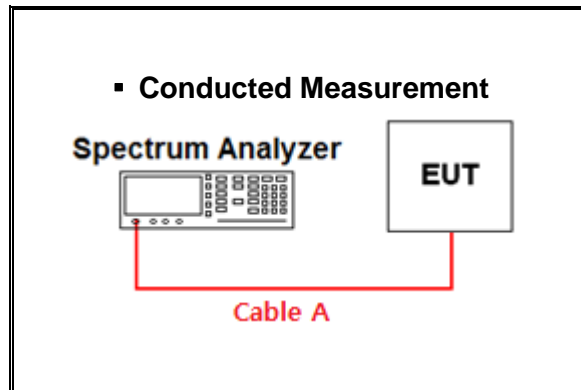
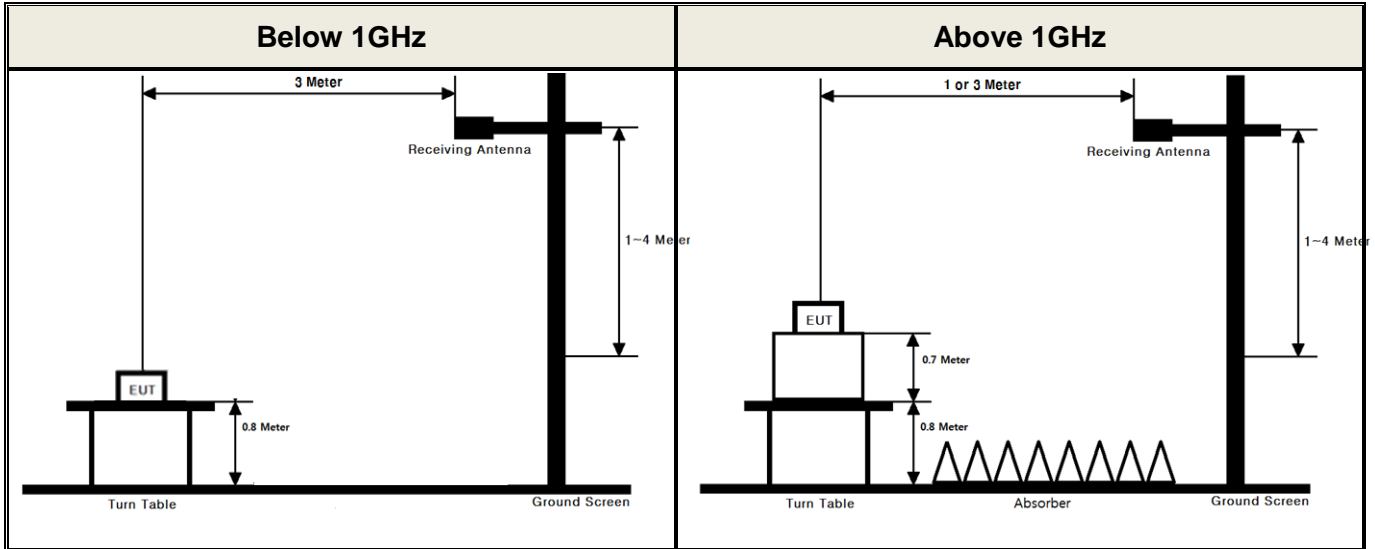




## APPENDIX I

### Test set up diagrams

#### ▪ Radiated Measurement



Path loss information

Frequency (GHz)	Path Loss (dB)	Frequency (GHz)	Path Loss (dB)
0.03	0.01	15	0.70
1	0.17	20	0.86
2.402 & 2.441 & 2.480	0.29	25	0.88
5	0.31	-	-
10	0.50	-	-

Note 1 : The path loss from EUT to Spectrum analyzer were measured and used for test.

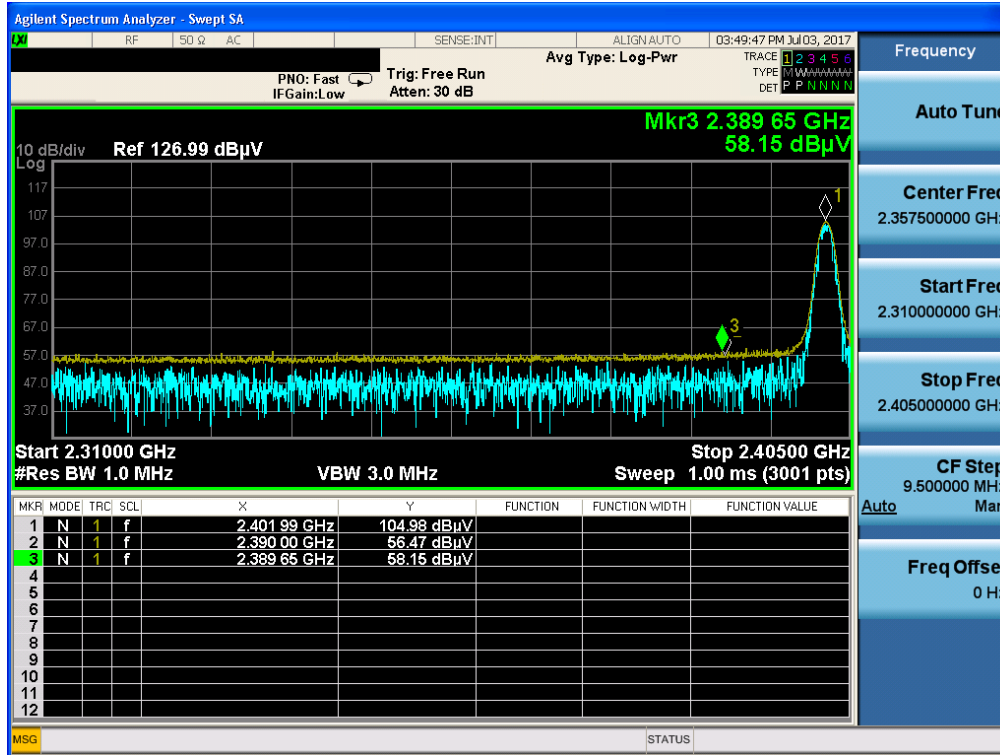
Path loss ( S/A's Correction factor) = Cable A

## APPENDIX II

### Unwanted Emissions (Radiated) Test Plot\_Module 0

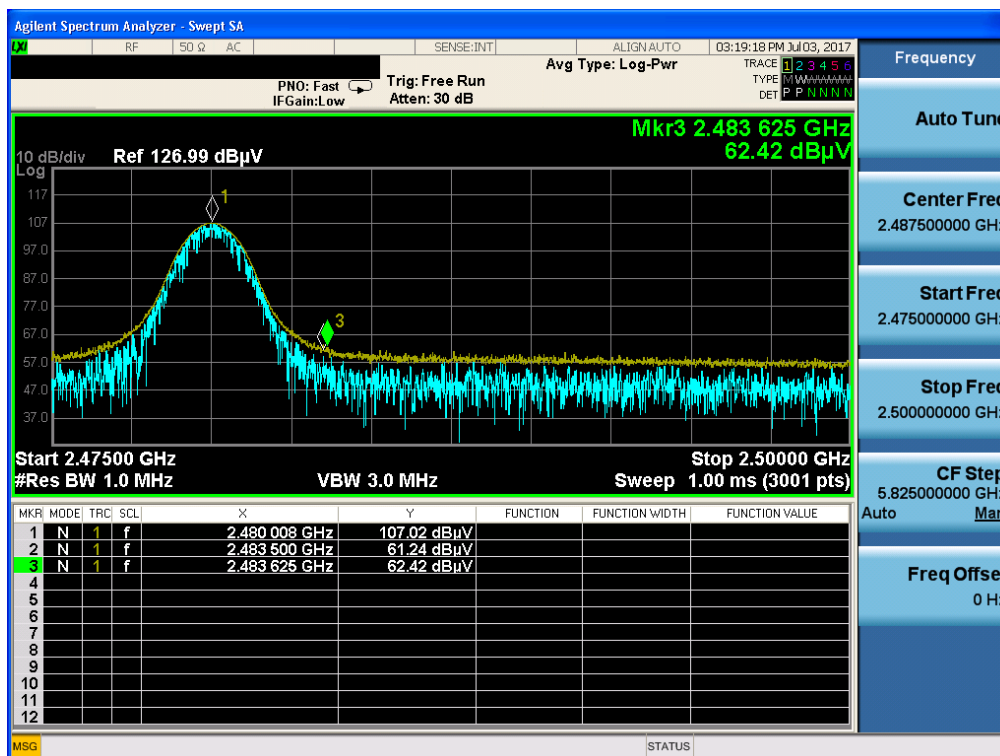
GFSK & Lowest & Z & Hor

Detector Mode : PK



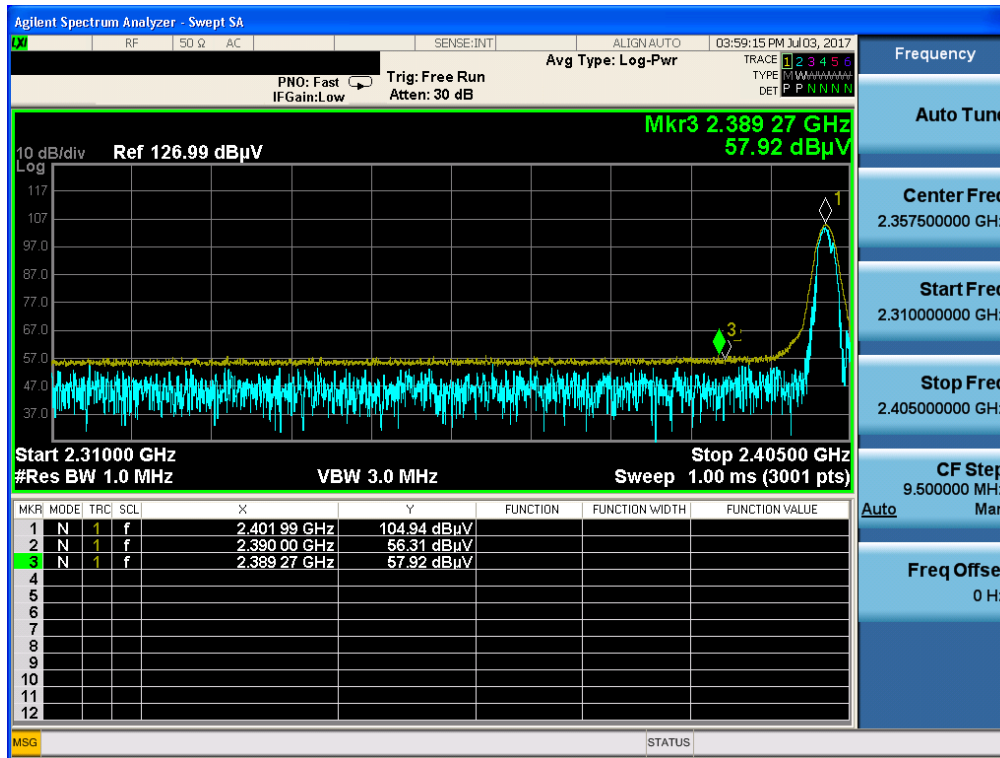
GFSK & Highest & Z & Hor

Detector Mode : PK



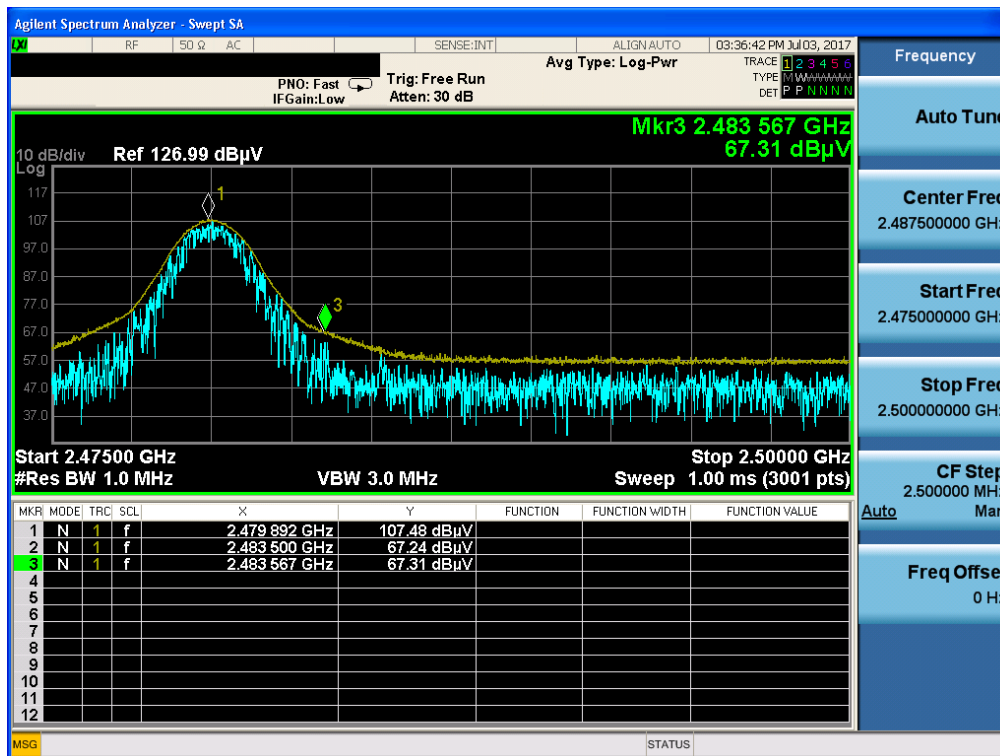
$\pi/4$ DQPSK & Lowest & Z & Hor

Detector Mode : PK



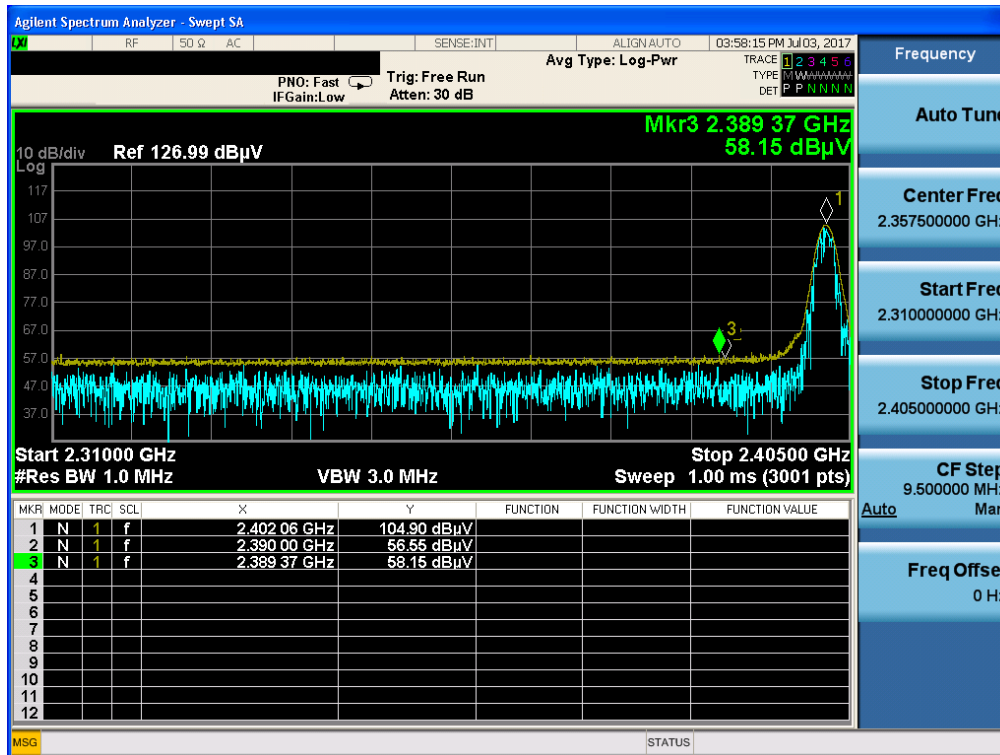
$\pi/4$ DQPSK & Highest & Z & Hor

Detector Mode : PK



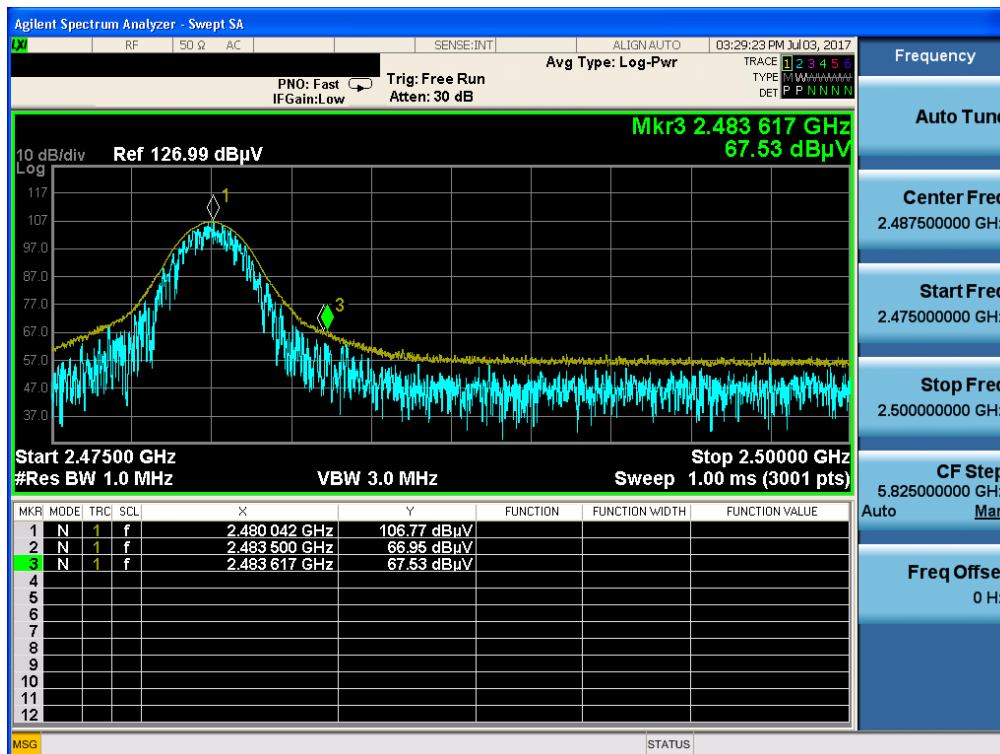
8DPSK & Lowest & Z & Hor

Detector Mode : PK



8DPSK & Highest & Z & Hor

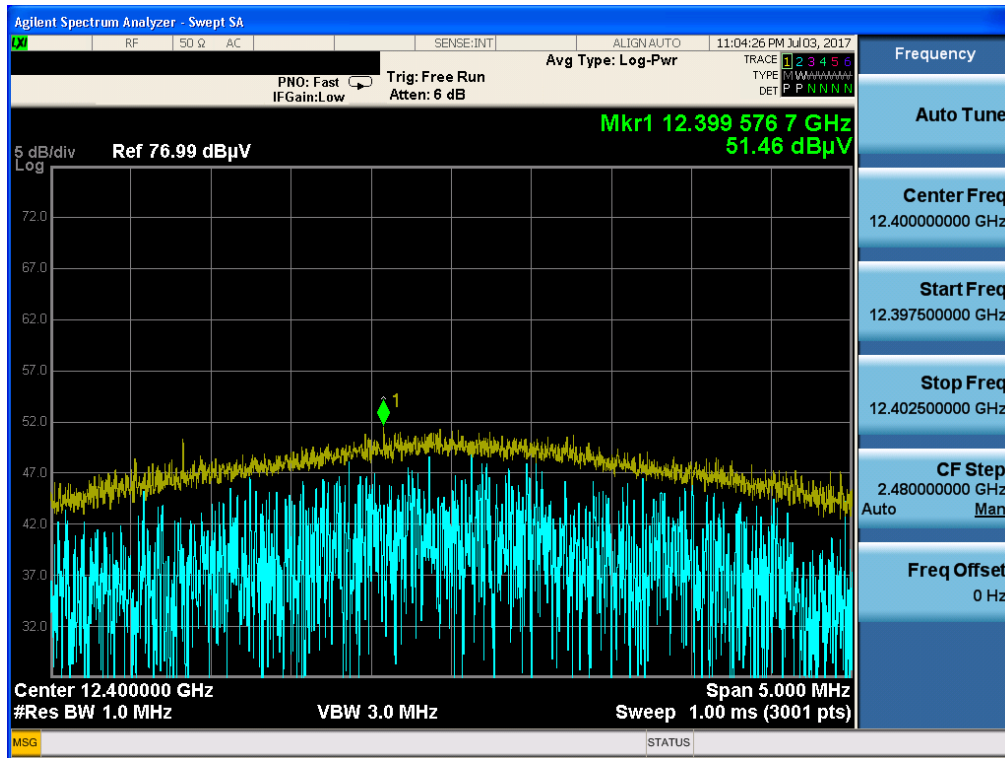
Detector Mode : PK





8DPSK & Highest & X & Ver

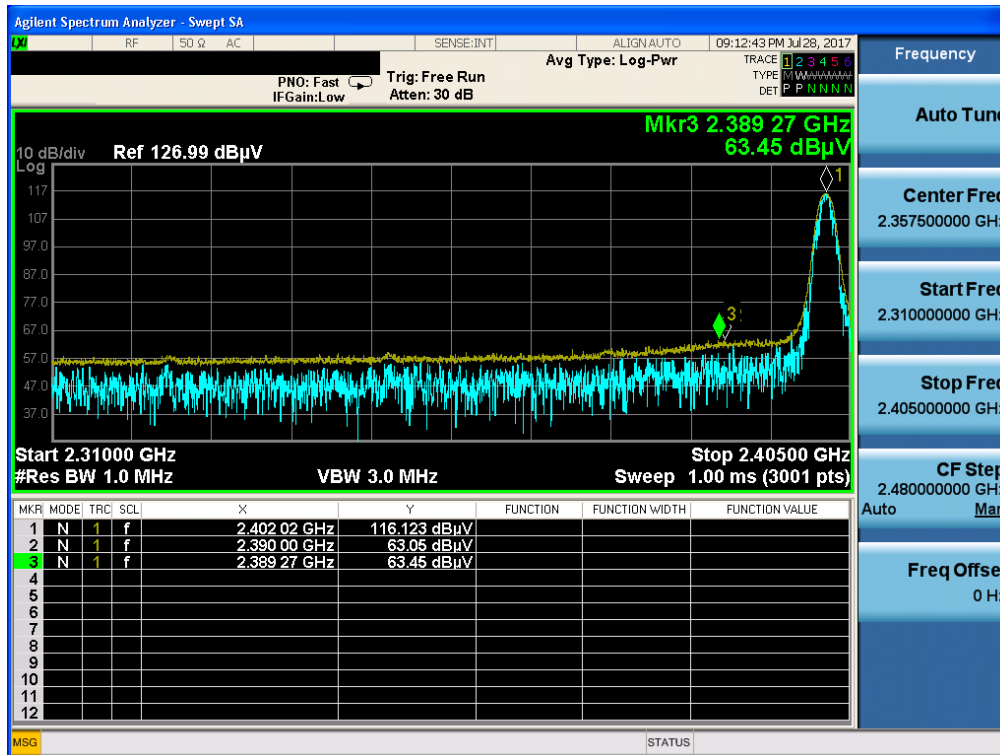
Detector Mode : PK



### Unwanted Emissions (Radiated) Test Plot\_Module 1

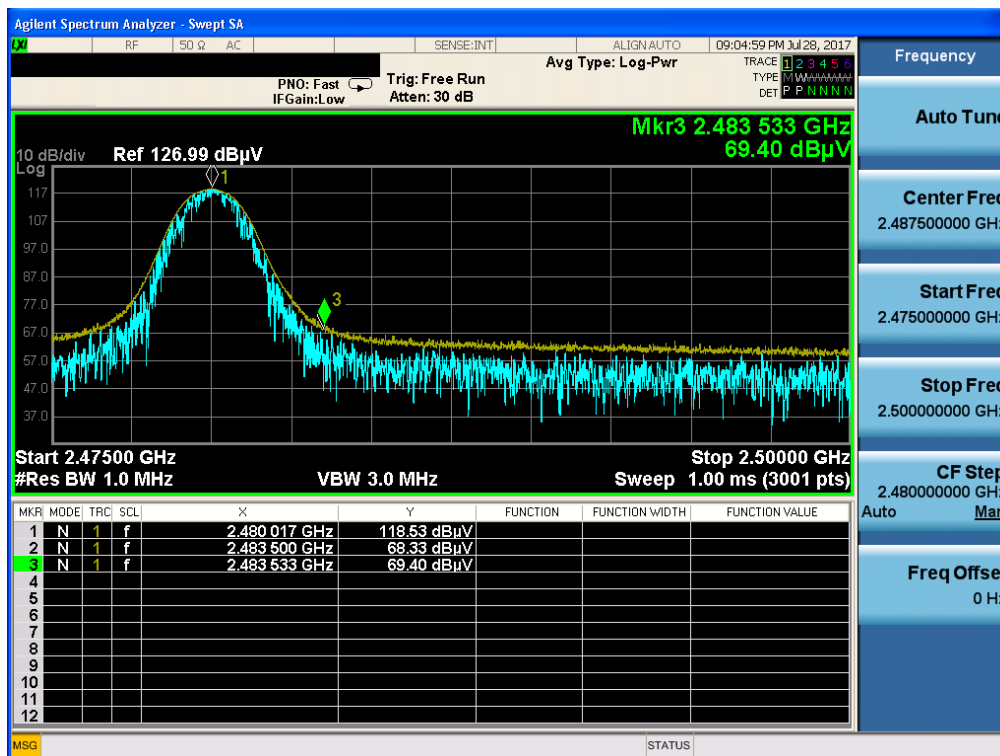
GFSK & Lowest & Z & Hor

Detector Mode : PK



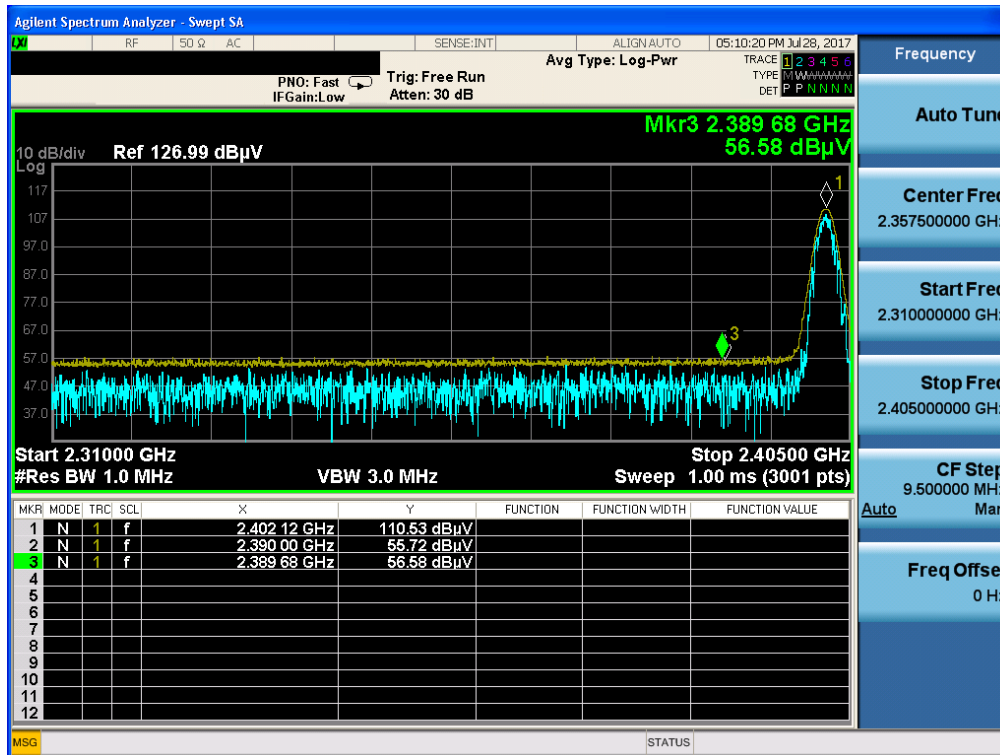
GFSK & Highest & Z & Hor

Detector Mode : PK



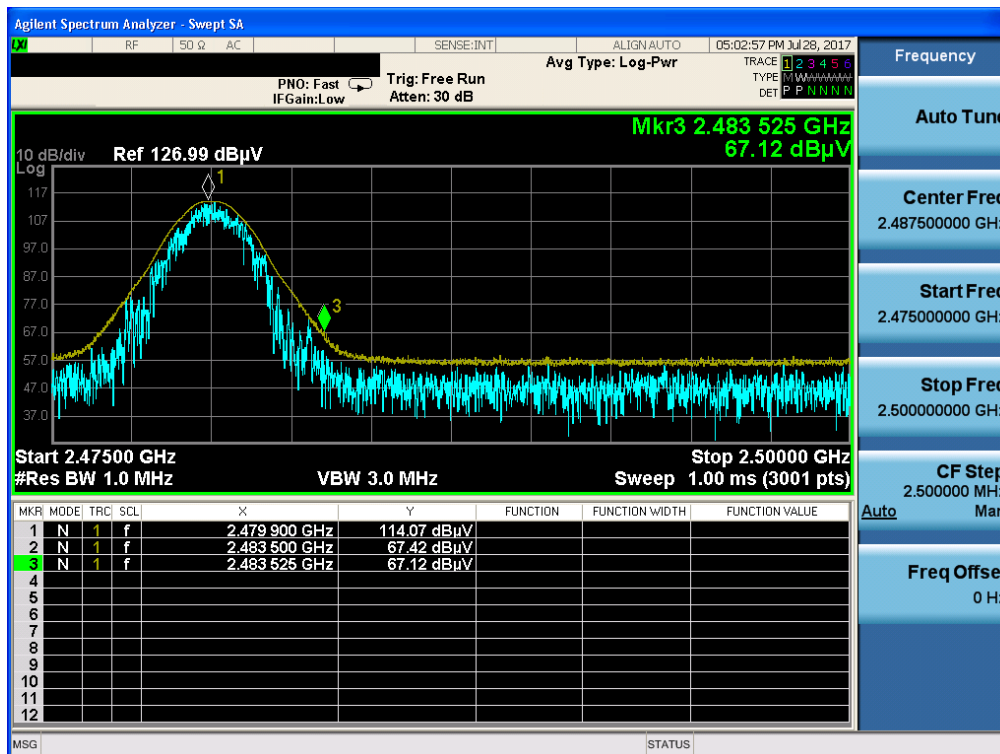
$\pi/4$ DQPSK & Lowest & Z & Hor

Detector Mode : PK



$\pi/4$ DQPSK & Highest & Z & Hor

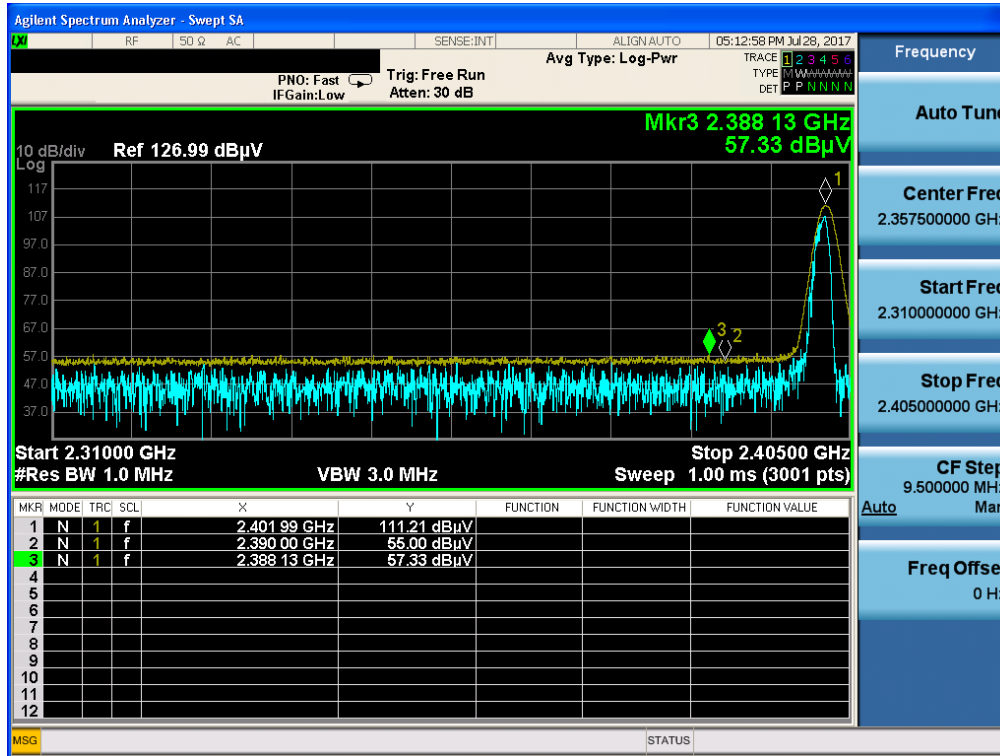
Detector Mode : PK





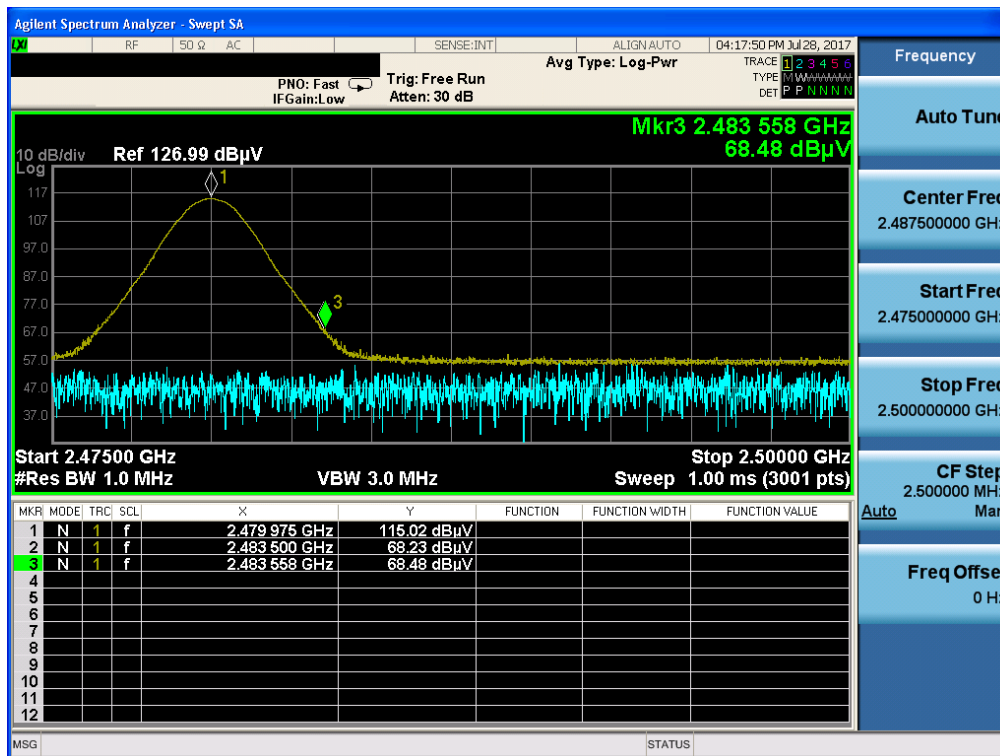
8DPSK & Lowest & Z & Hor

Detector Mode : PK



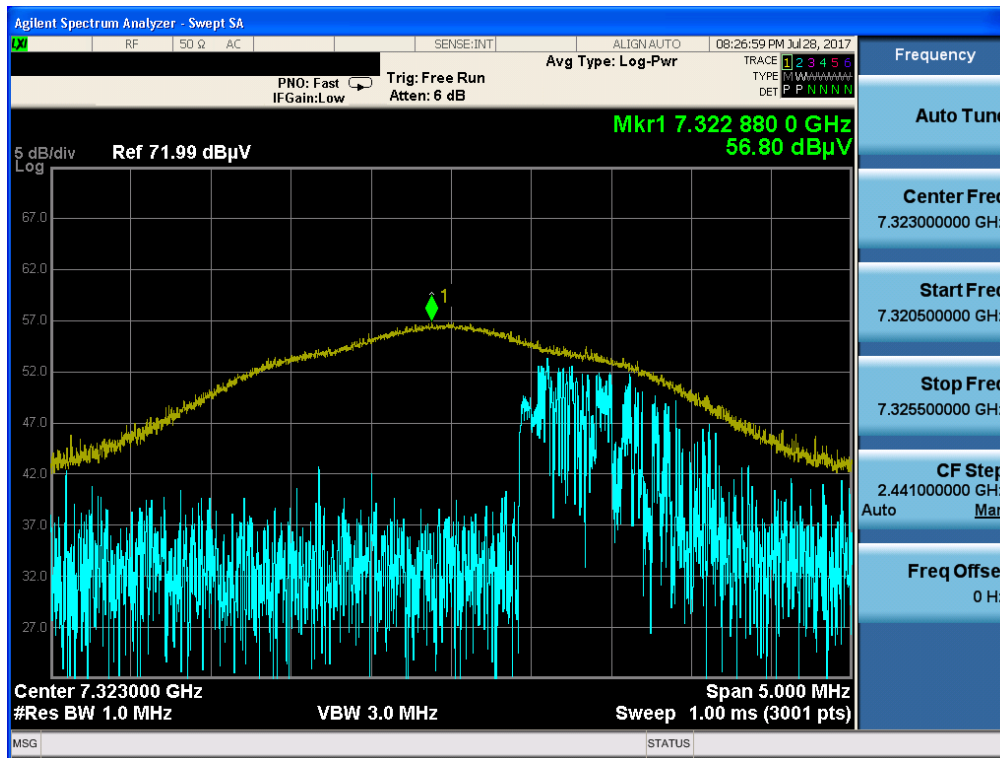
8DPSK & Highest & Z & Hor

Detector Mode : PK



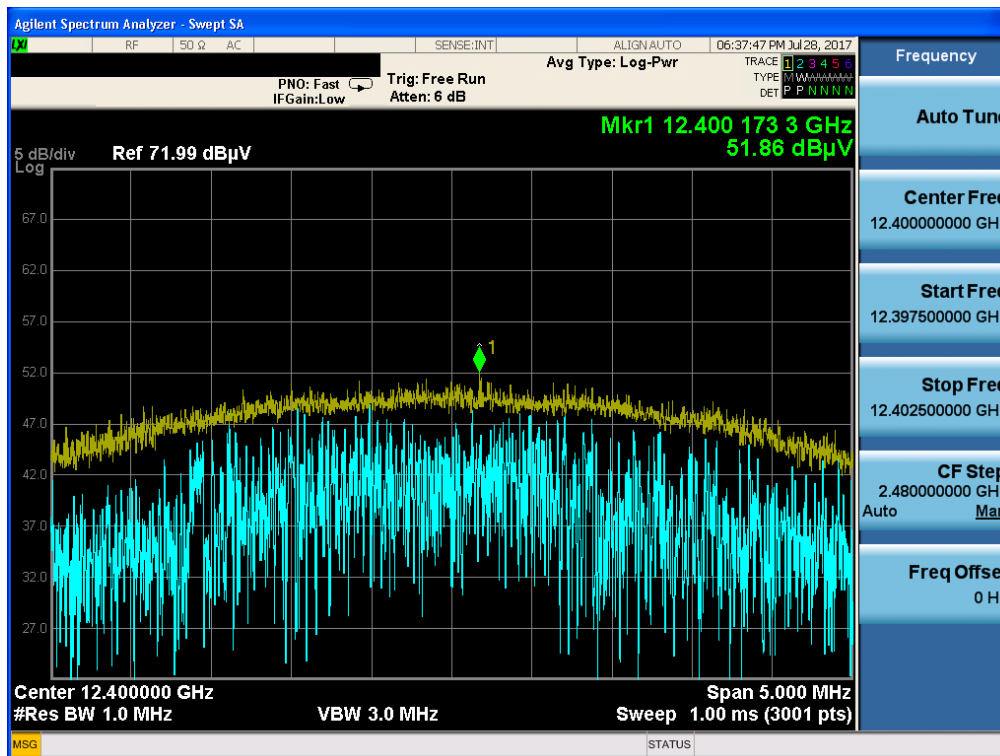
GFSK & Middle & Z & Hor

Detector Mode : PK



$\pi/4$ DQPSK & Highest & Y & Hor

Detector Mode : PK



8DPSK & Highest & Y & Hor

Detector Mode : PK

