8. Transmitter AC Power Line Conducted Emission

8.1 Test Setup

See test photographs for the actual connections between EUT and support equipment.

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

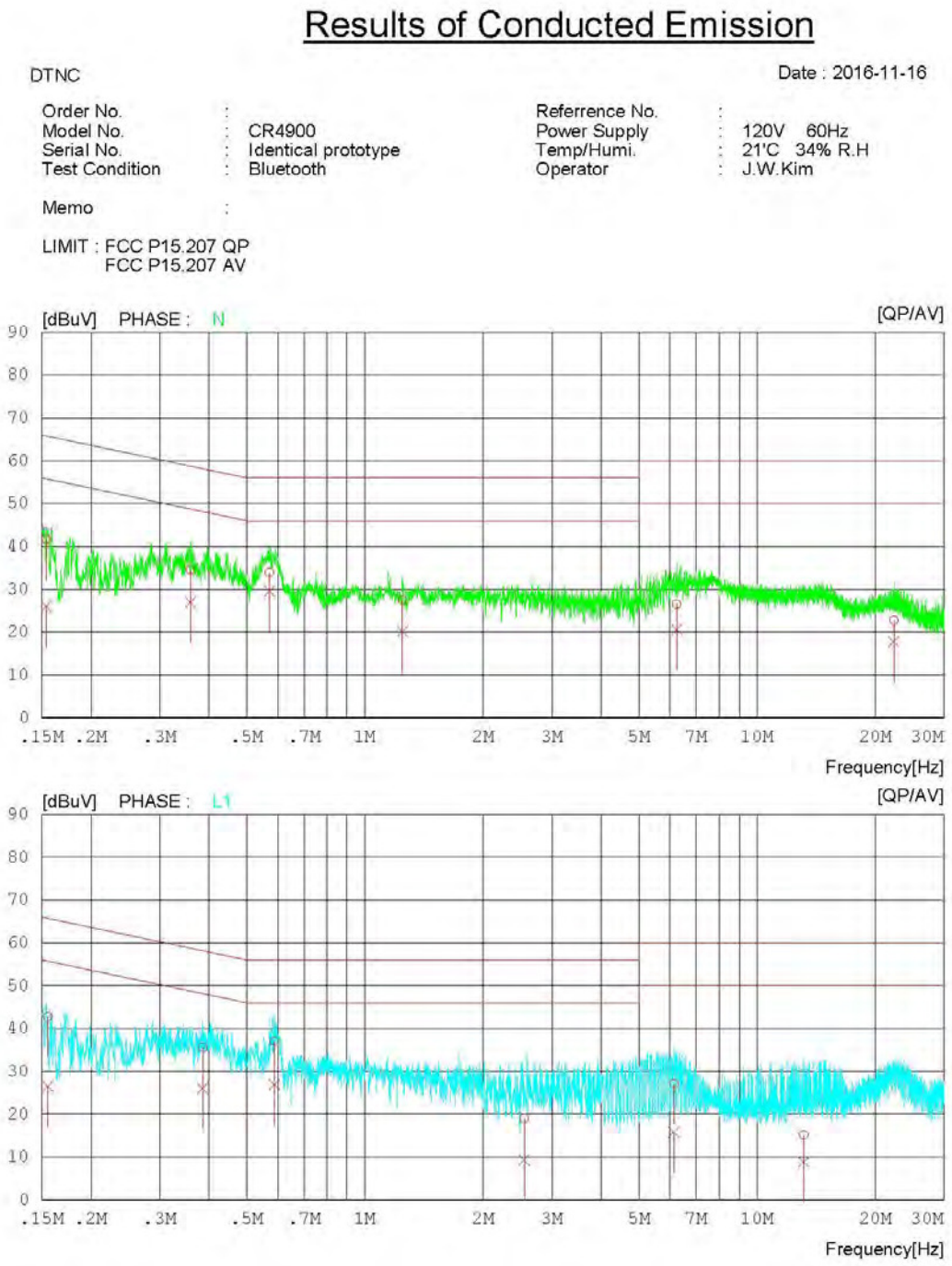
8.3 Test Procedures

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

AC Line Conducted Emissions (Graph) = Modulation : ***GFSK***



AC Line Conducted Emissions (List) = Modulation : ***GFSK***

Results of Conducted Emission

DTNC

Date : 2016-11-16

Order No.	:		Referrence No.	:
Model No.	:	CR4900	Power Supply	: 120V 60Hz
Serial No.	:	Identical prototype	Temp/Humi.	: 21'C 34% R.H
Test Condition	:	Bluetooth	Operator	: J.W.Kim

Memo :

LIMIT : FCC P15.207 QP
FCC P15.207 AV

NO	FREQ	READING		C.FACTOR	RESULT		LIMIT		MARGIN		PHASE
		QP	AV		QP	AV	QP	AV	QP	AV	
	[MHz]	[dBuV]	[dBuV]	[dB]	[dBuV]	[dBuV]	[dBuV]	[dBuV]	[dBuV]	[dBuV]	
1	0.15410	31.6	15.9	10.1	41.7	26.0	65.8	55.8	24.1	29.8	N
2	0.35871	24.4	16.9	10.1	34.5	27.0	58.8	48.8	24.3	21.8	N
3	0.57145	23.8	19.5	10.1	33.9	29.6	56.0	46.0	22.1	16.4	N
4	1.24580	17.3	10.0	10.2	27.5	20.2	56.0	46.0	28.5	25.8	N
5	6.24200	16.0	10.1	10.5	26.5	20.6	60.0	50.0	33.5	29.4	N
6	22.34040	11.2	6.2	11.6	22.8	17.8	60.0	50.0	37.2	32.2	N
7	0.15538	32.7	16.5	10.0	42.7	26.5	65.7	55.7	23.0	29.2	L1
8	0.38588	25.5	16.0	10.1	35.6	26.1	58.2	48.2	22.6	22.1	L1
9	0.58675	26.8	16.8	10.1	36.9	26.9	56.0	46.0	19.1	19.1	L1
10	2.54760	8.7	-0.9	10.2	18.9	9.3	56.0	46.0	37.1	36.7	L1
11	6.14440	16.5	5.2	10.5	27.0	15.7	60.0	50.0	33.0	34.3	L1
12	13.16720	4.0	-2.2	11.0	15.0	8.8	60.0	50.0	45.0	41.2	L1

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

The internal antenna is attached on the main PCB using the special spring tension. (Refer to Internal Photo file.)

- **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.

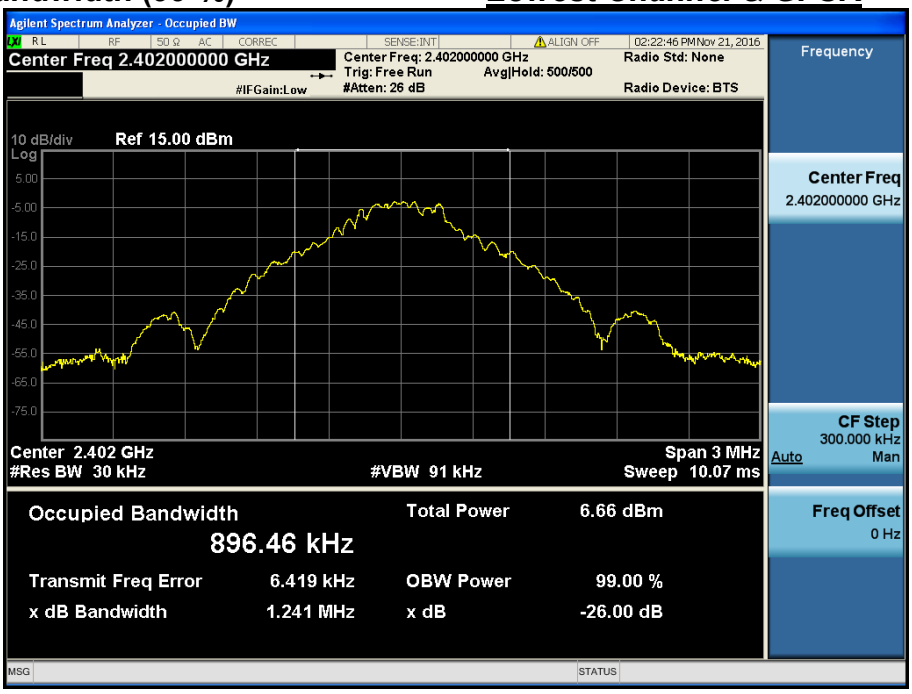
The resolution bandwidth (RBW) shall be in the range of 1 % to 5 % of the occupied bandwidth (OBW) and video bandwidth (VBW) shall be approximately 3 × RBW.

Spectrum analyzer plots are included on the following pages.

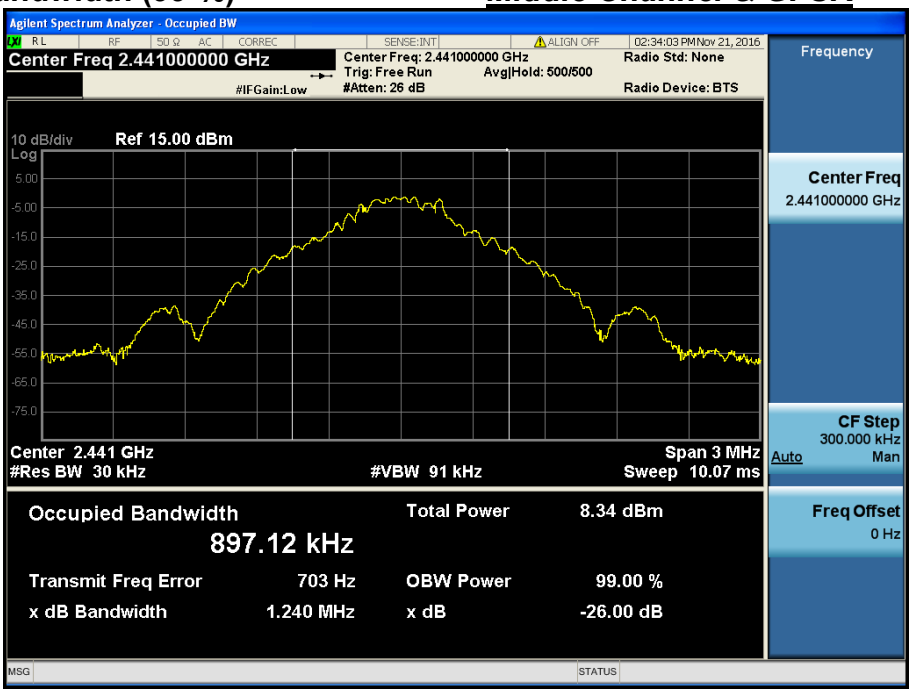
10.4 Test Results

Modulation	Tested Channel	Test Results (MHz)
GFSK	**Lowest**	0.896
	Middle	0.897
	Highest	**0.900**
π/4DQPSK	**Lowest**	1.172
	Middle	1.173
	Highest	**1.174**
8DPSK	**Lowest**	1.171
	Middle	1.177
	Highest	**1.178**

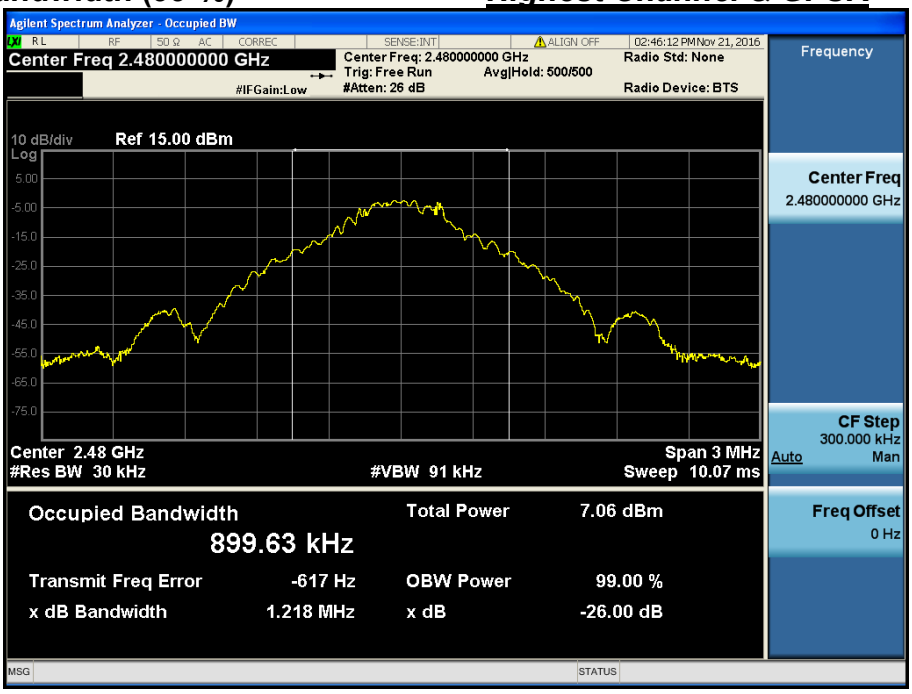
Occupied Bandwidth (99 %) *Lowest Channel & GFSK*



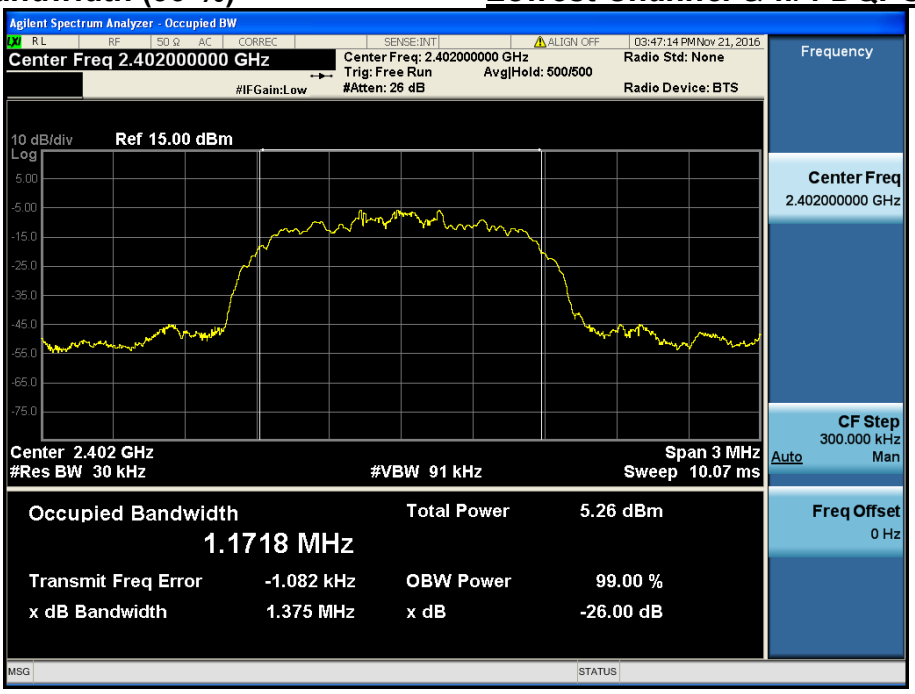
Occupied Bandwidth (99 %) *Middle Channel & GFSK*



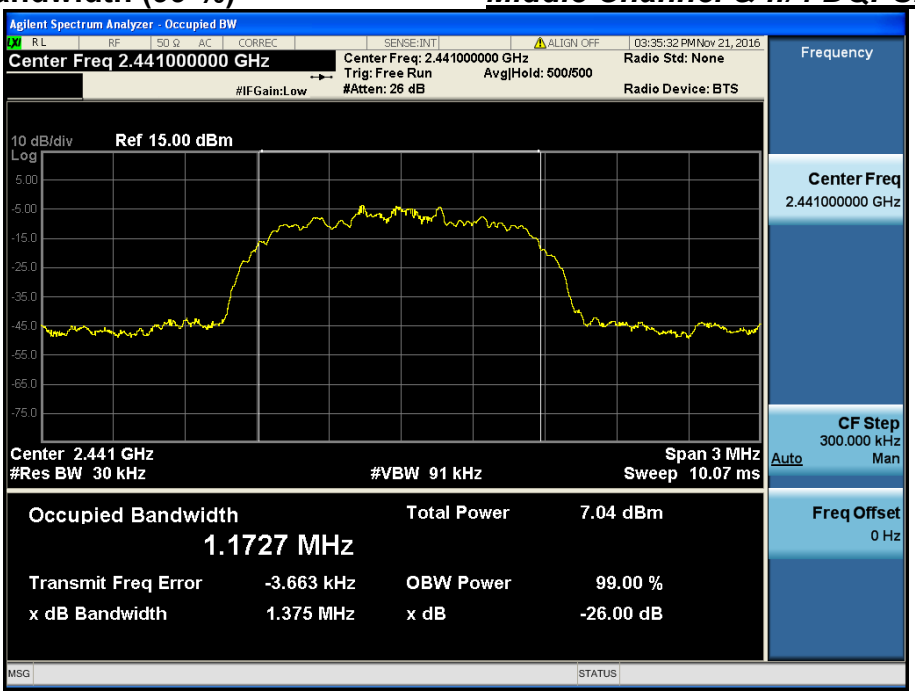
Occupied Bandwidth (99 %) ***Highest Channel & GFSK***



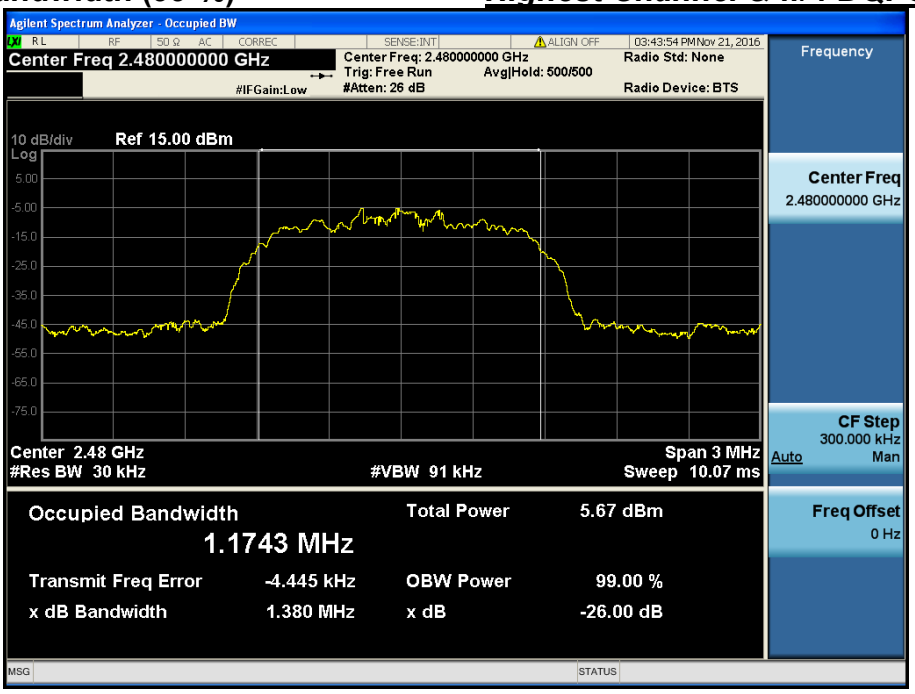
Occupied Bandwidth (99 %) ***Lowest Channel & π/4 DQPSK***



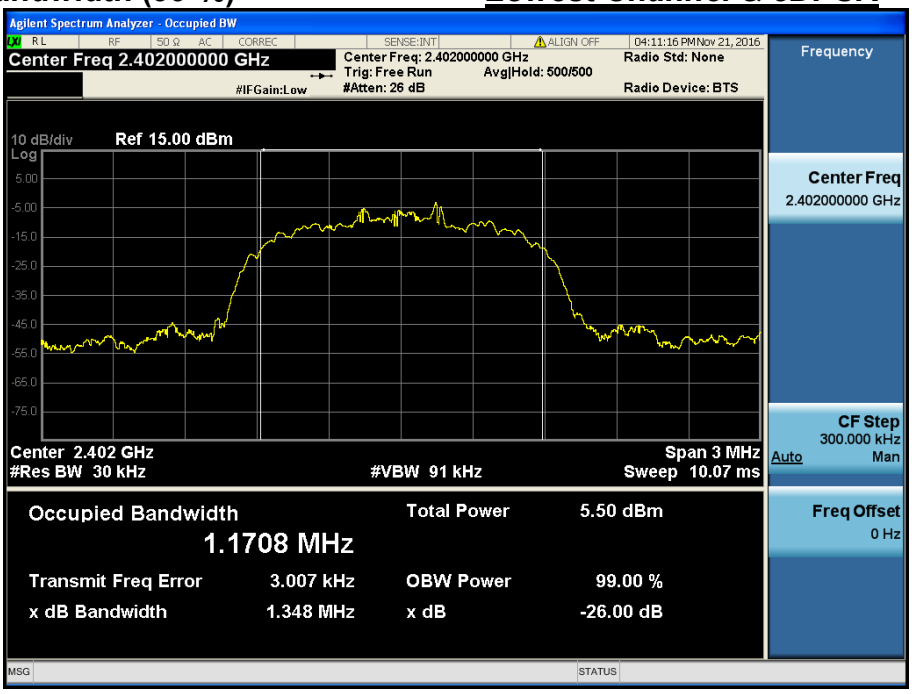
Occupied Bandwidth (99 %) ***Middle Channel & π/4 DQPSK***



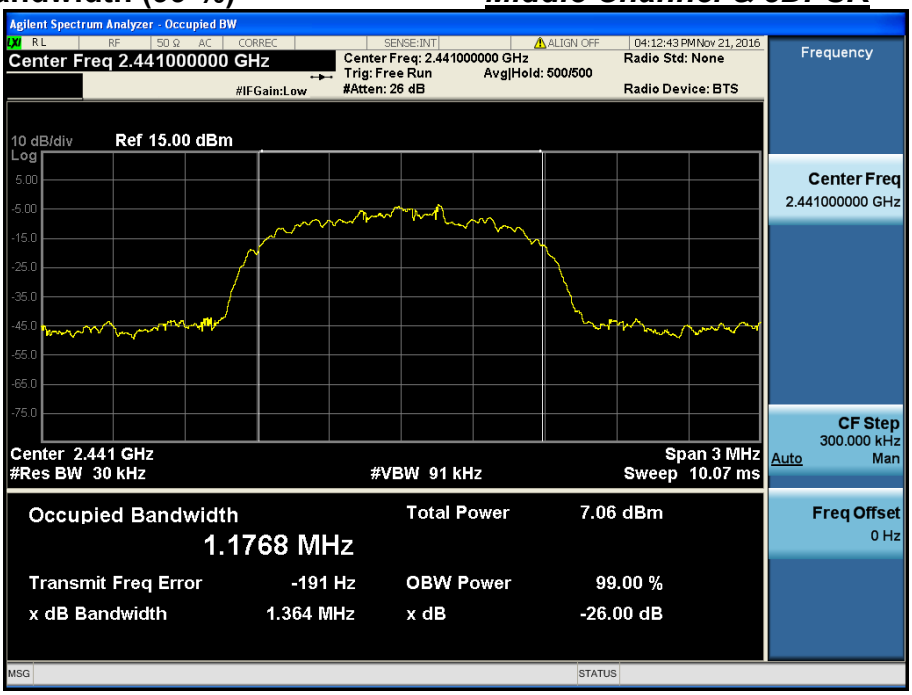
Occupied Bandwidth (99 %) ***Highest Channel & π/4 DQPSK***



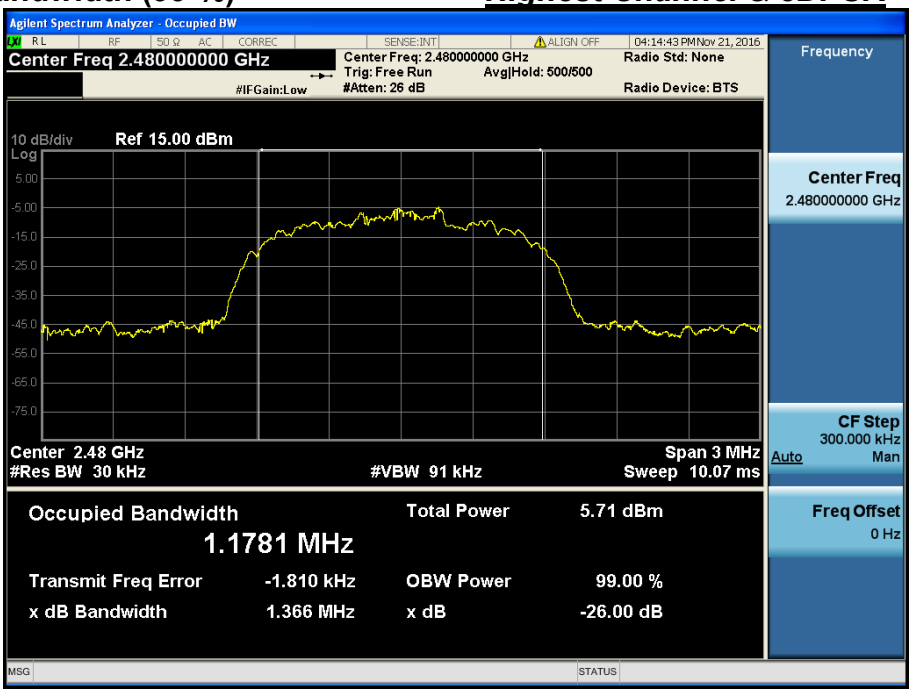
Occupied Bandwidth (99 %) ***Lowest Channel & 8DPSK***



Occupied Bandwidth (99 %) ***Middle Channel & 8DPSK***



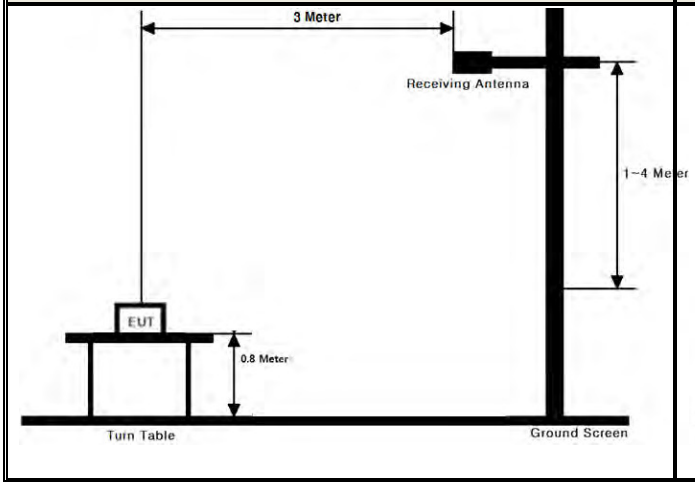
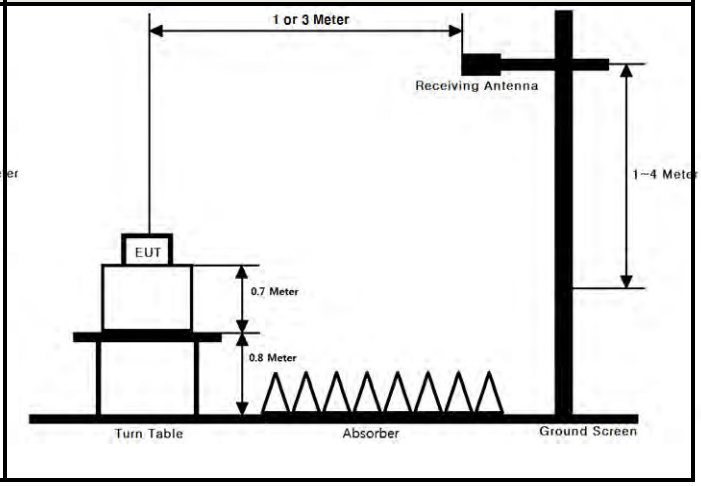
Occupied Bandwidth (99 %) ***Highest Channel & 8DPSK***



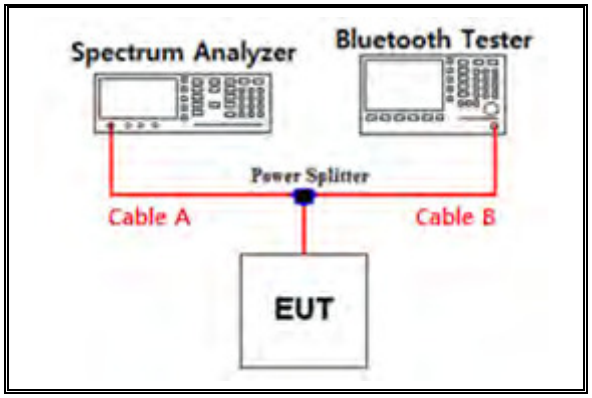
APPENDIX I

Test set up diagrams

- **Radiated Measurement**

Below 1GHz	Above 1GHz
	

- **Conducted Measurement**



Path loss information

Frequency (GHz)	Path Loss (dB)	Frequency (GHz)	Path Loss (dB)
0.03	6.09	15	9.78
1	6.88	20	11.08
2.402 & 2.441 & 2.480	7.37	25	11.74
5	7.97	-	-
10	8.63	-	-

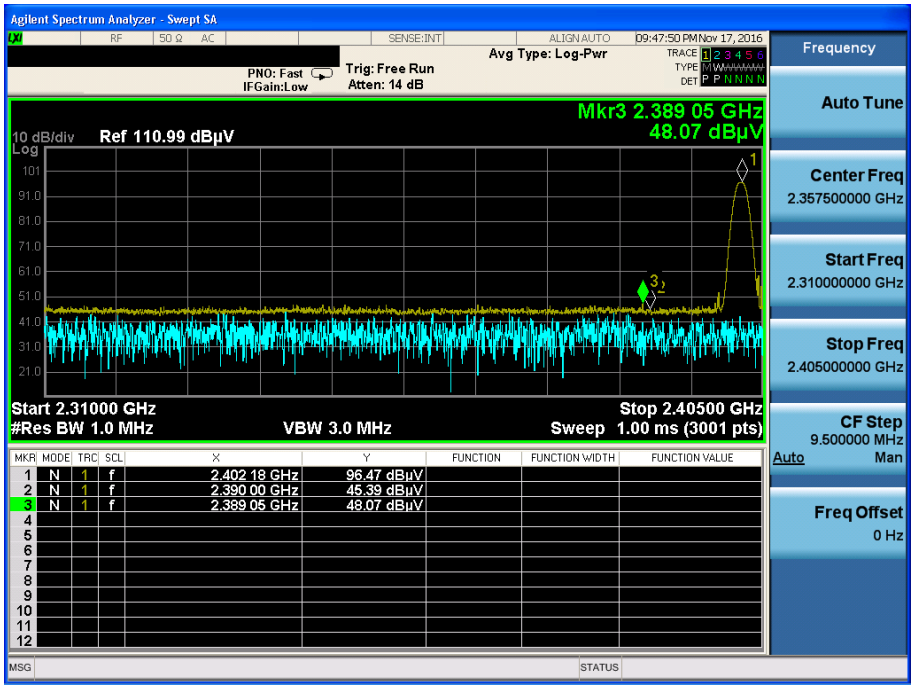
Note 1 : The path loss from EUT to Spectrum analyzer were measured and used for test.

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

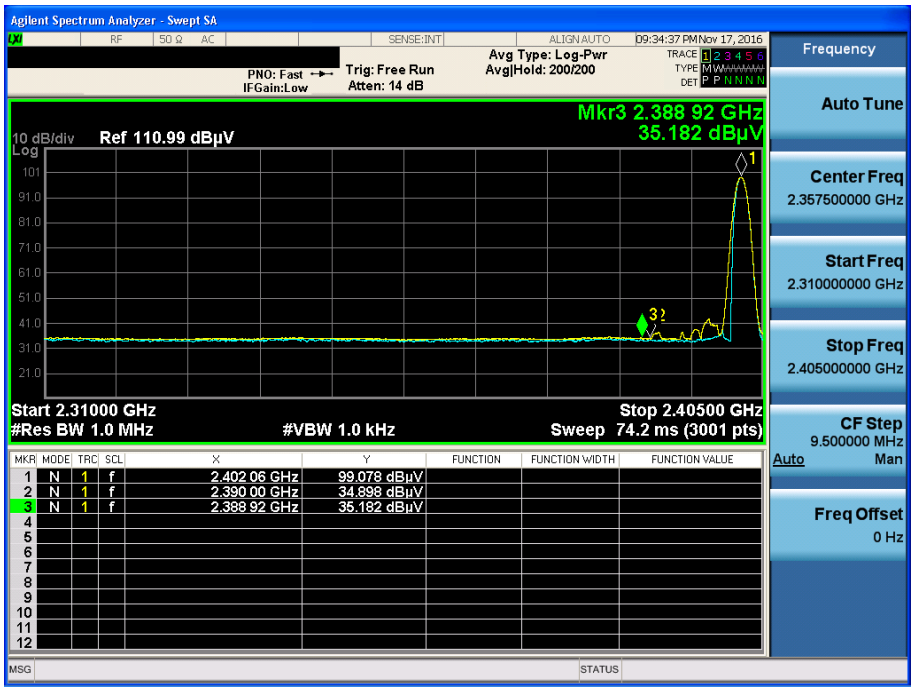
APPENDIX II

Unwanted Emissions (Radiated) Test Plot

GFSK & Lowest & X & Hor — Detector Mode : PK

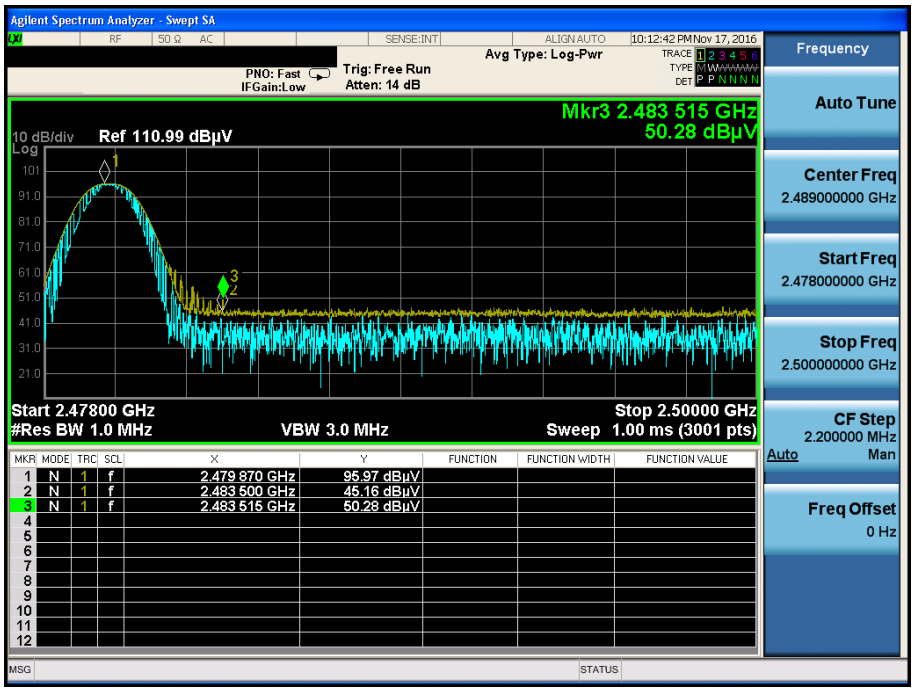


GFSK & Lowest & X & Hor — Detector Mode : AV



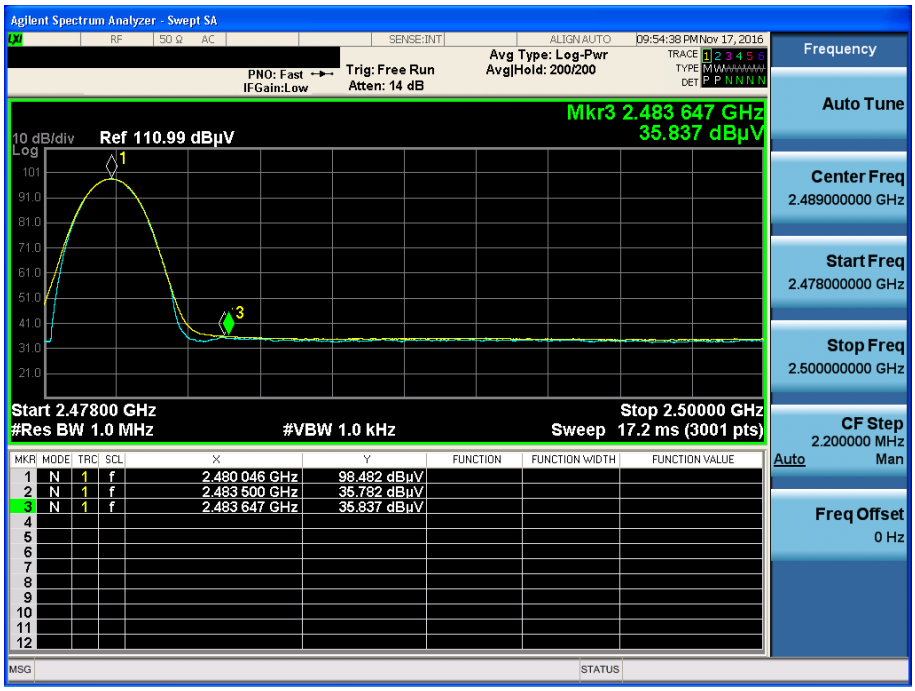
GFSK & Highest & X & Hor

Detector Mode : PK

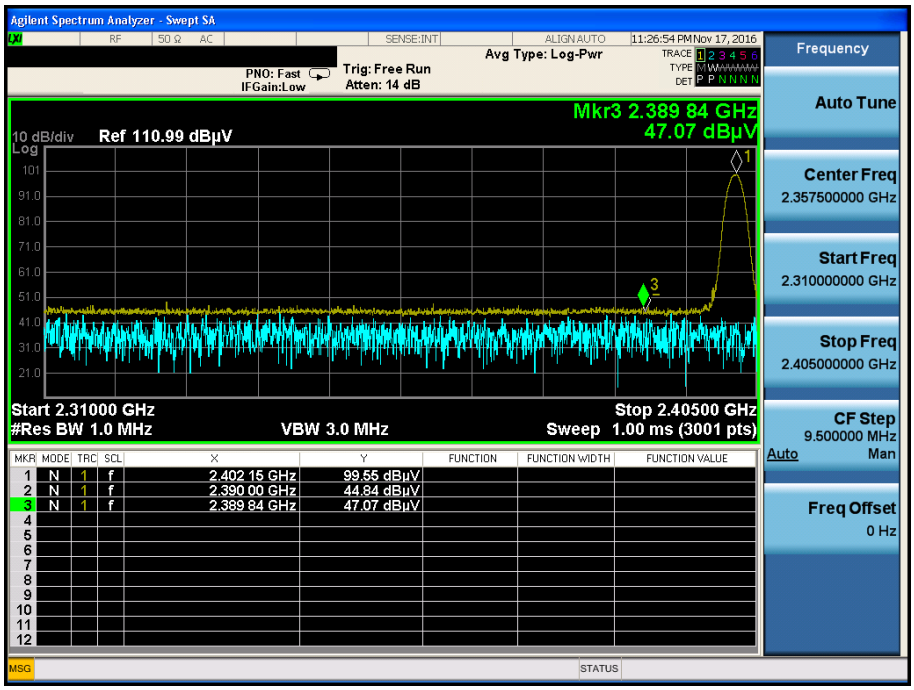


GFSK & Highest & X & Hor

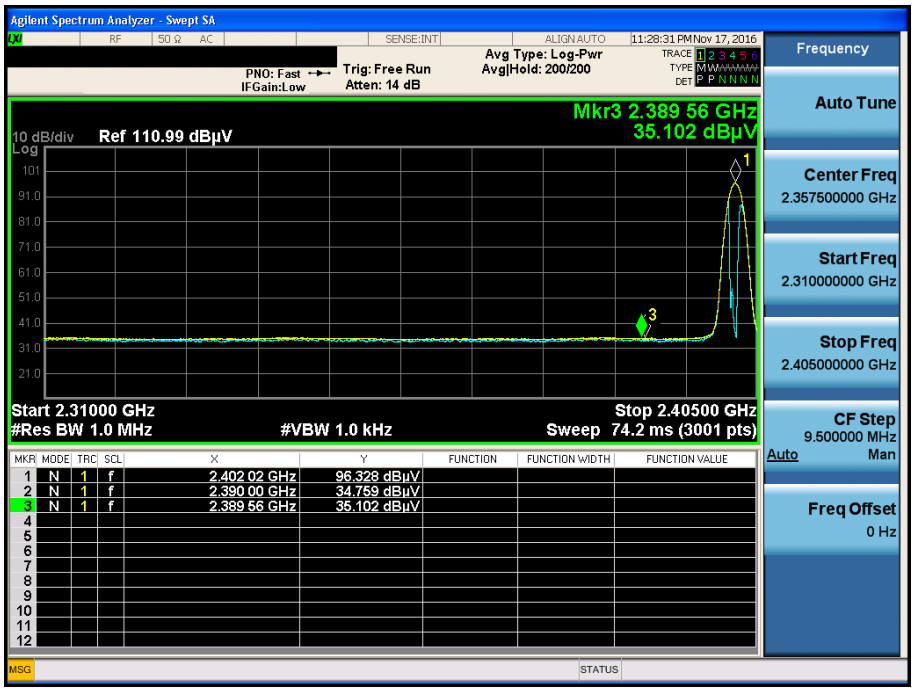
Detector Mode : AV



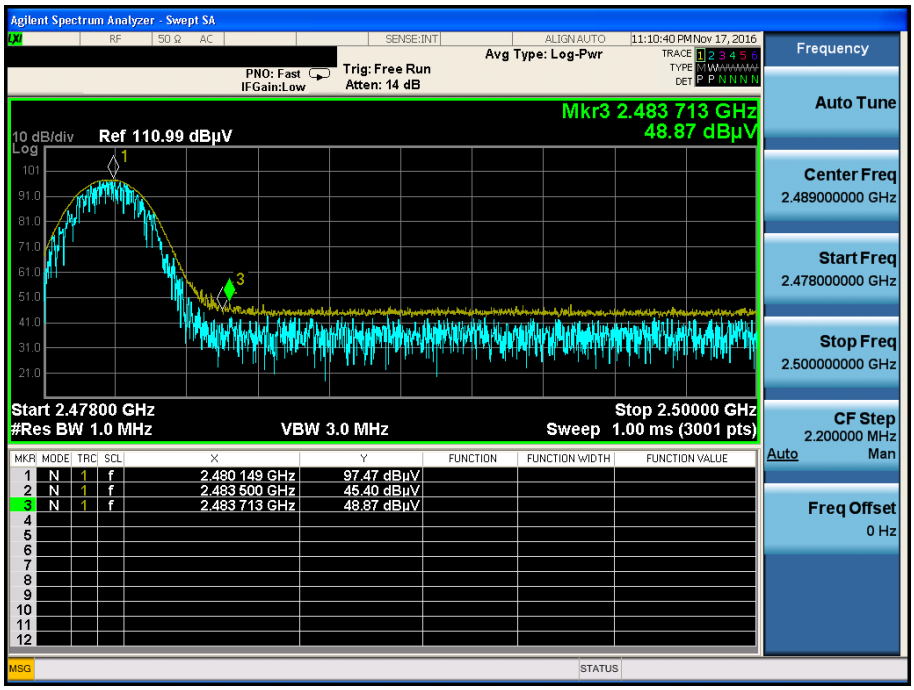
π/4DQPSK & Lowest & X & Hor — Detector Mode : PK



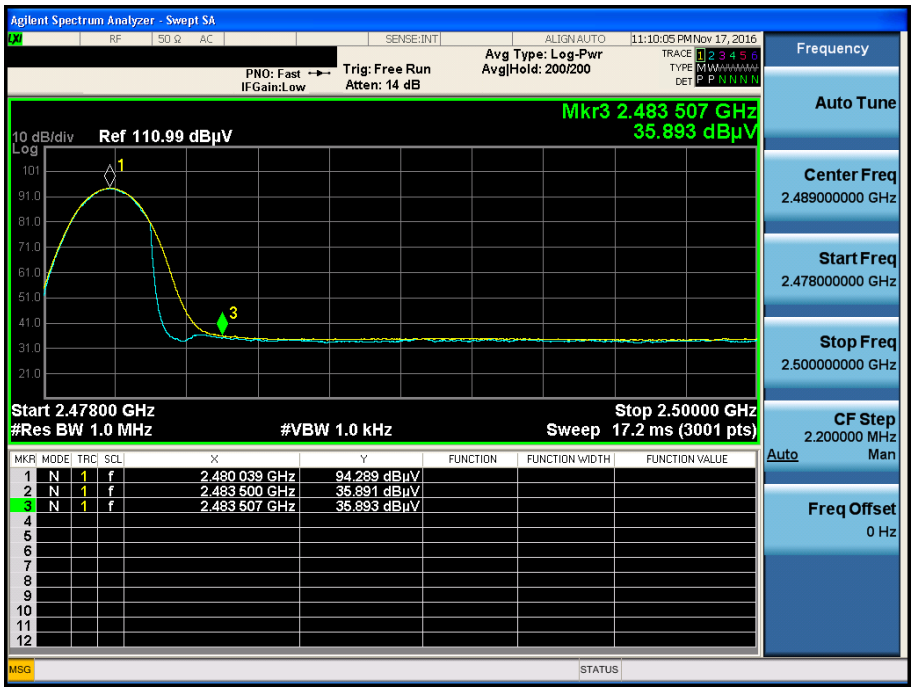
π/4DQPSK & Lowest & X & Hor — Detector Mode : AV



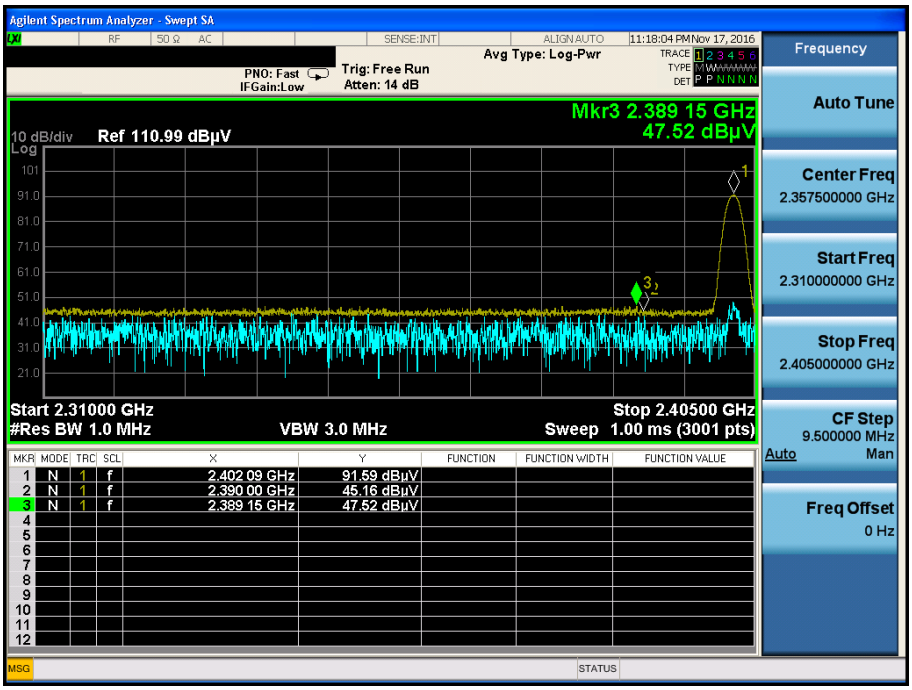
π/4DQPSK & Highest & X & Hor — Detector Mode : PK



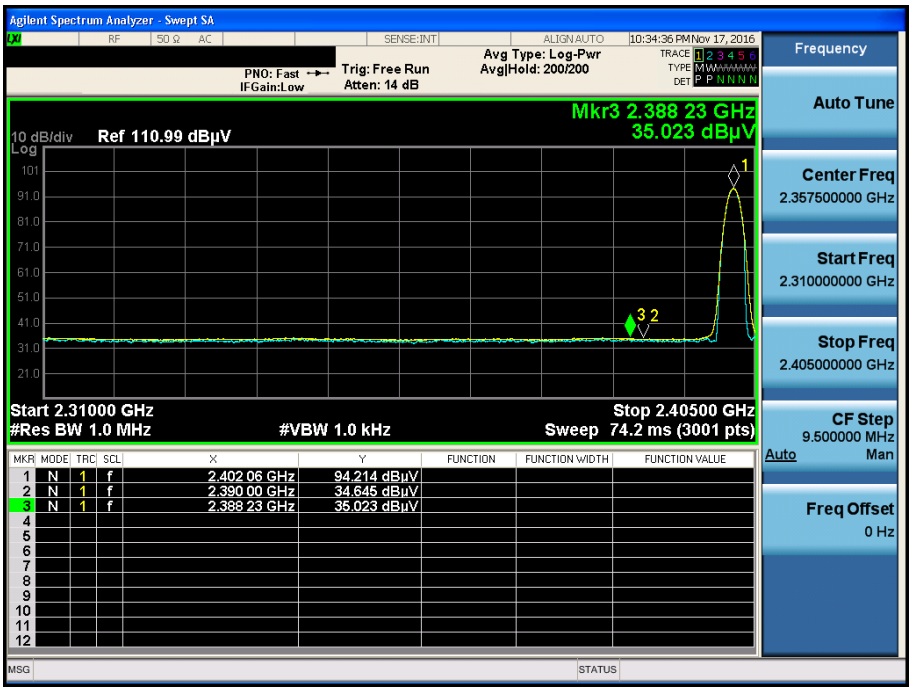
π/4DQPSK & Highest & X & Hor — Detector Mode : AV



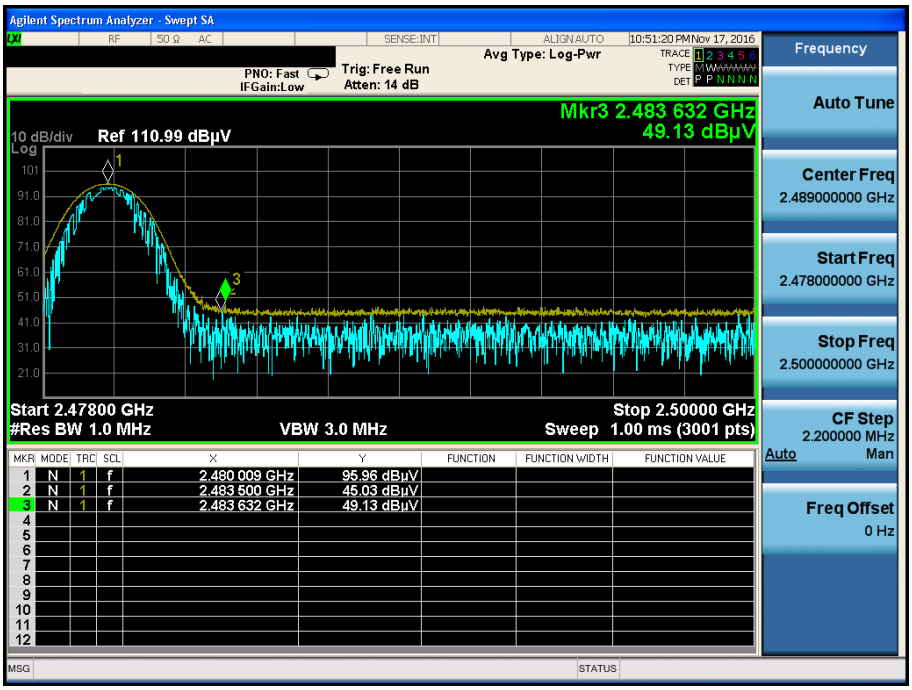
8DPSK & Lowest & X & Hor — Detector Mode : PK



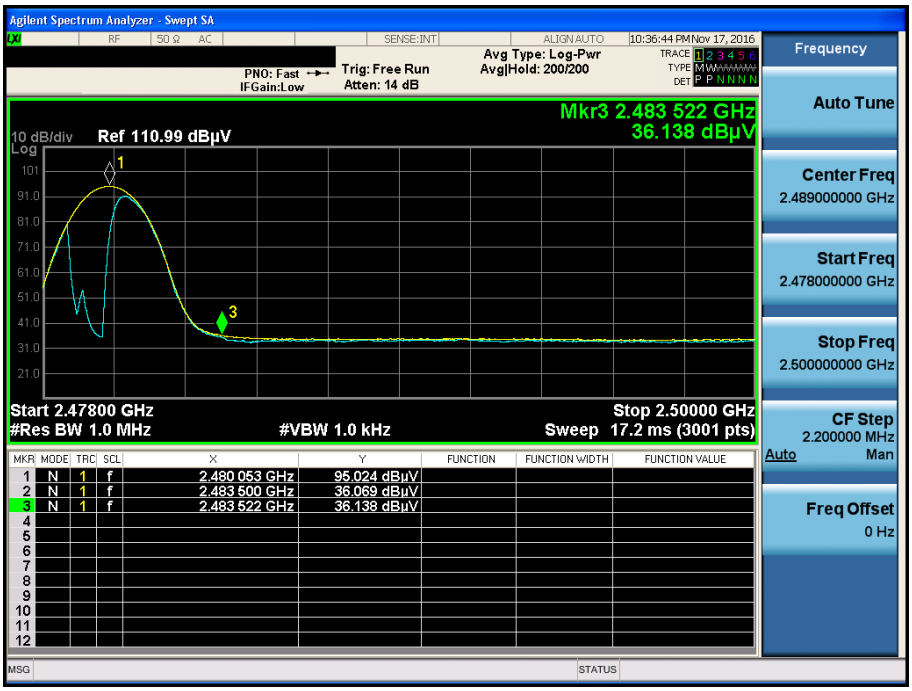
8DPSK & Lowest & X & Hor — Detector Mode : AV



8DPSK & Highest & X & Hor — Detector Mode : PK

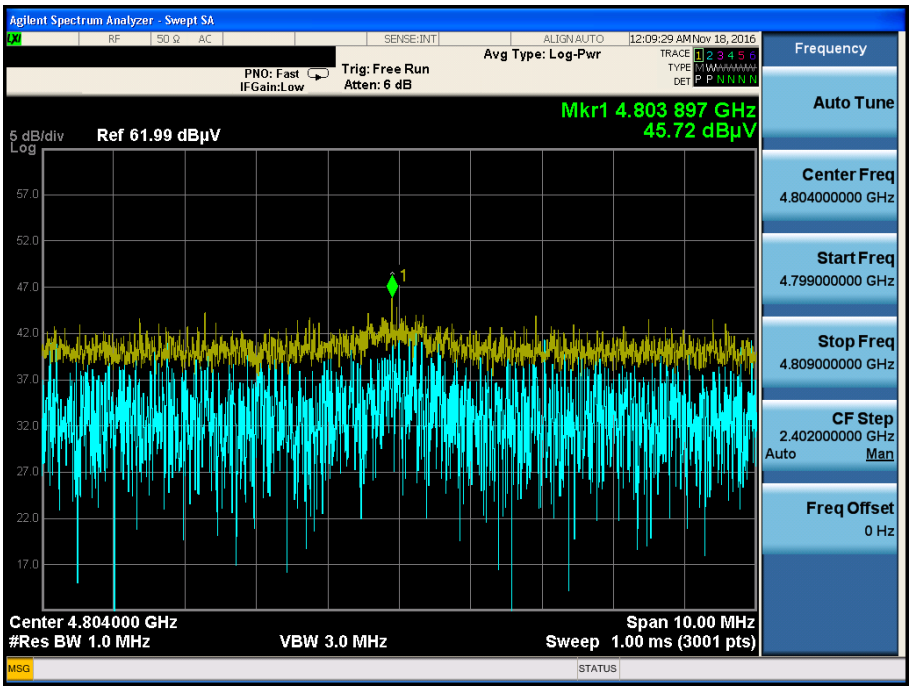


8DPSK & Highest & X & Hor — Detector Mode : AV



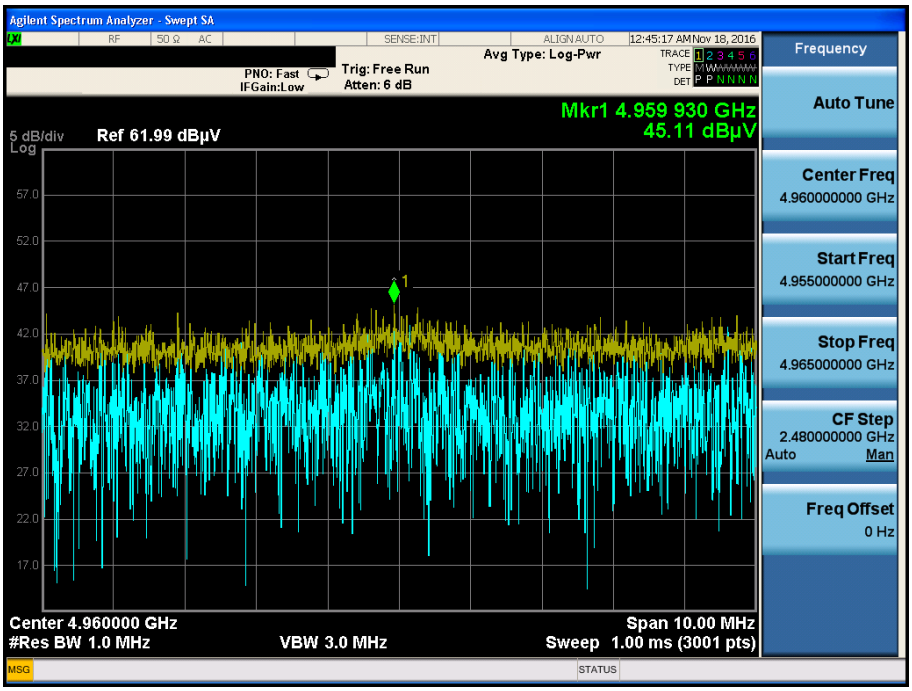
GFSK & Lowest & Y & Hor

Detector Mode : PK

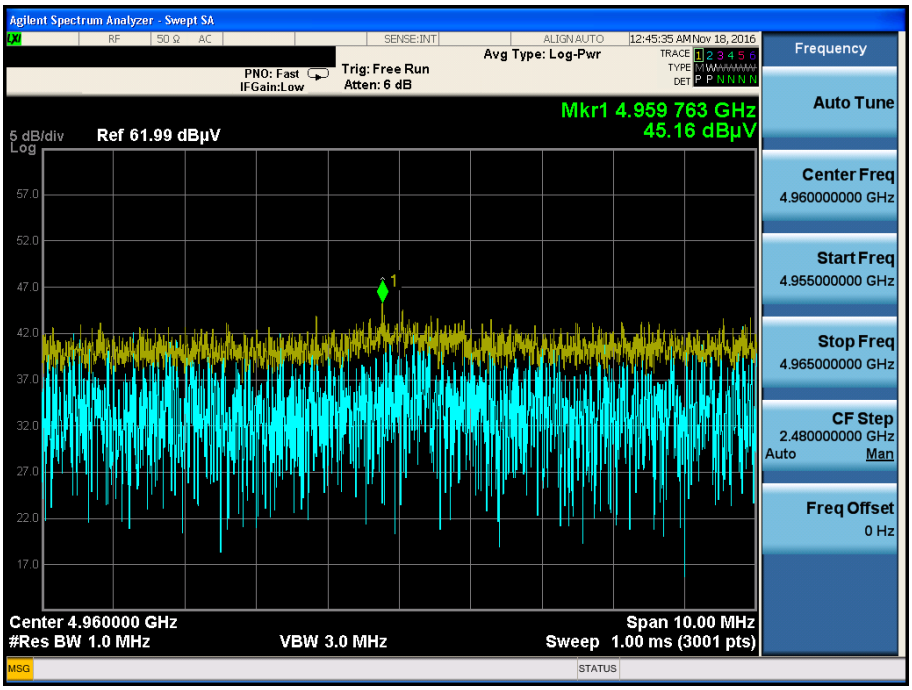


π/4DQPSK & Highest & Y & Hor

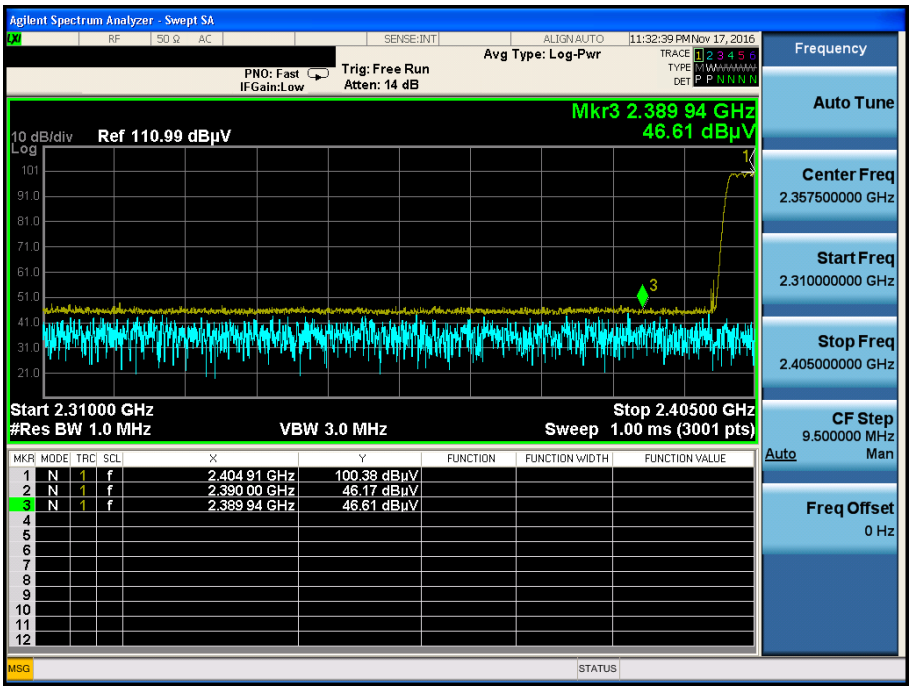
Detector Mode : PK



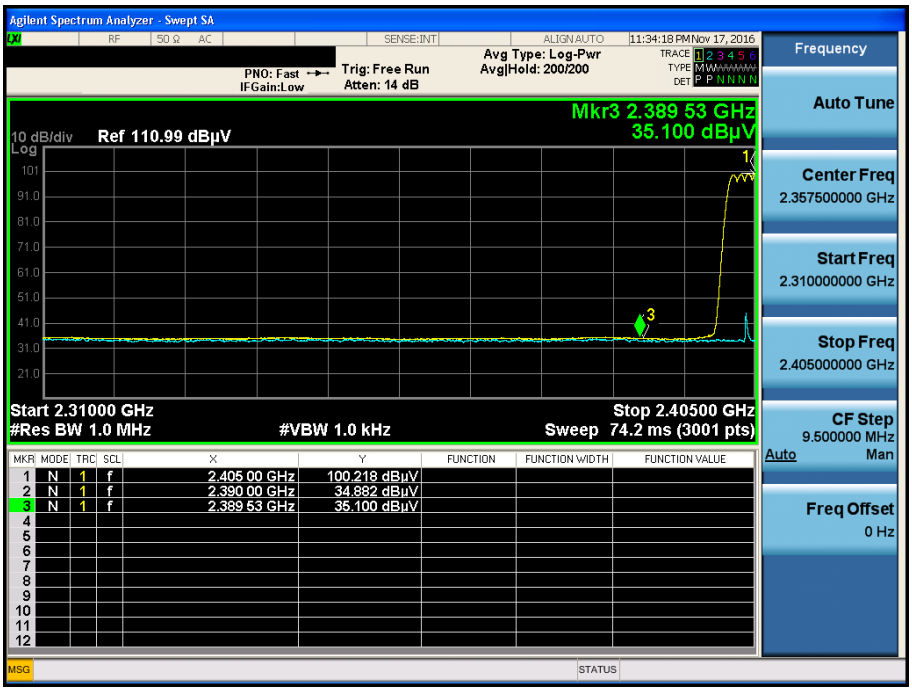
8DPSK & Highest & Y & Hor **Detector Mode : PK**



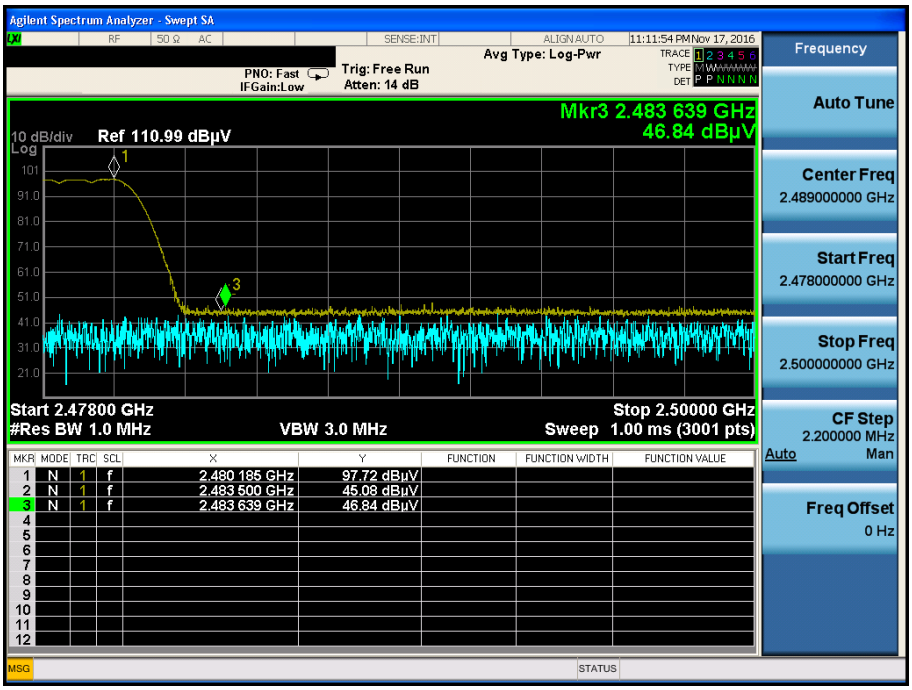
GFSK & Hopping mode & X & Hor — Detector Mode : PK



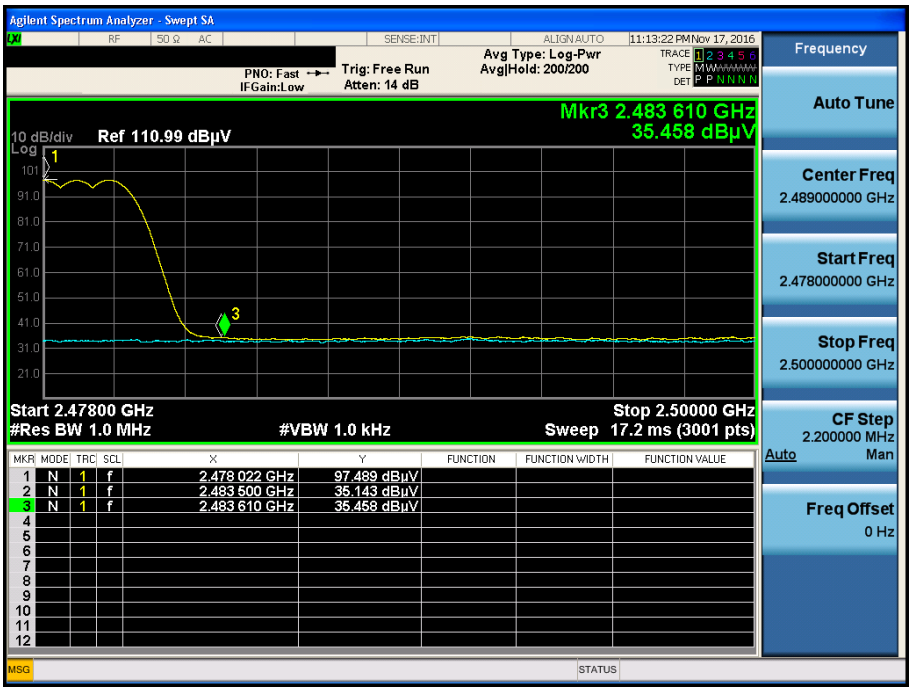
GFSK & Hopping mode & X & Hor — Detector Mode : AV



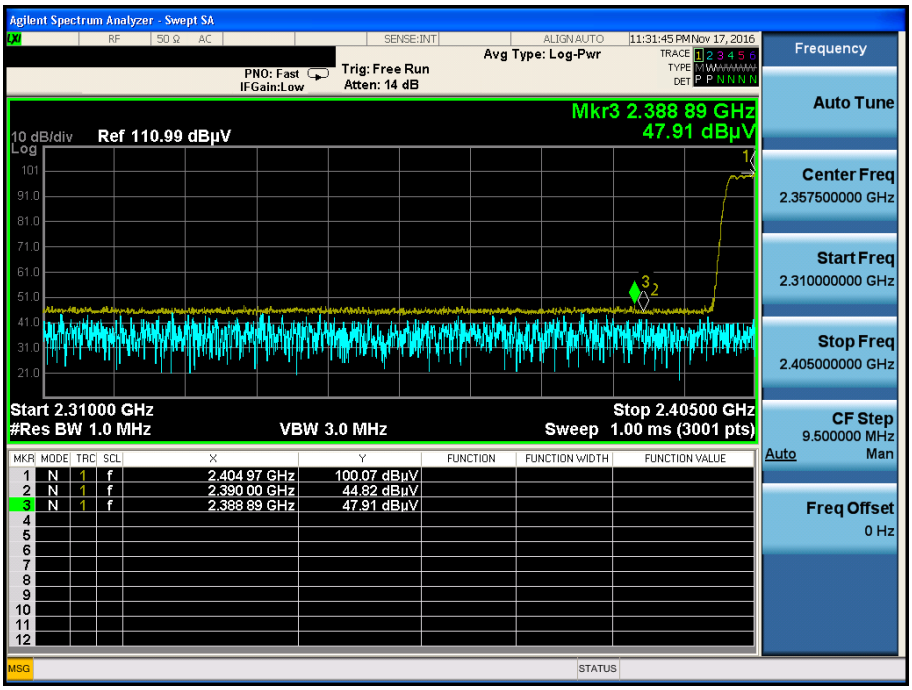
GFSK & Hopping mode & X & Hor — Detector Mode : PK



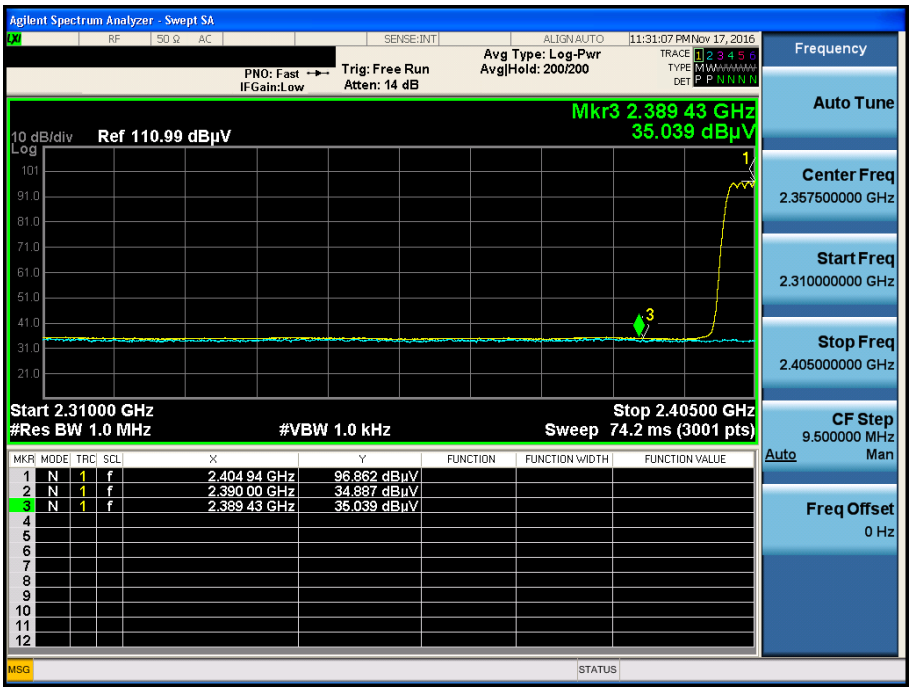
GFSK & Hopping mode & X & Hor — Detector Mode : AV



π/4DQPSK & Hopping mode & X & Hor — Detector Mode : PK



π/4DQPSK & Hopping mode & X & Hor — Detector Mode : AV



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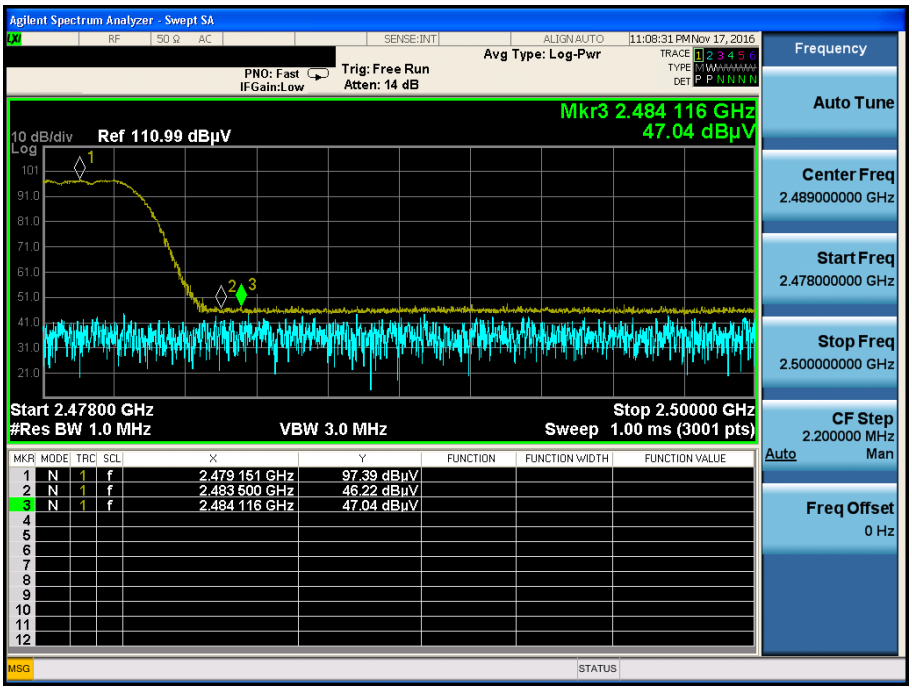

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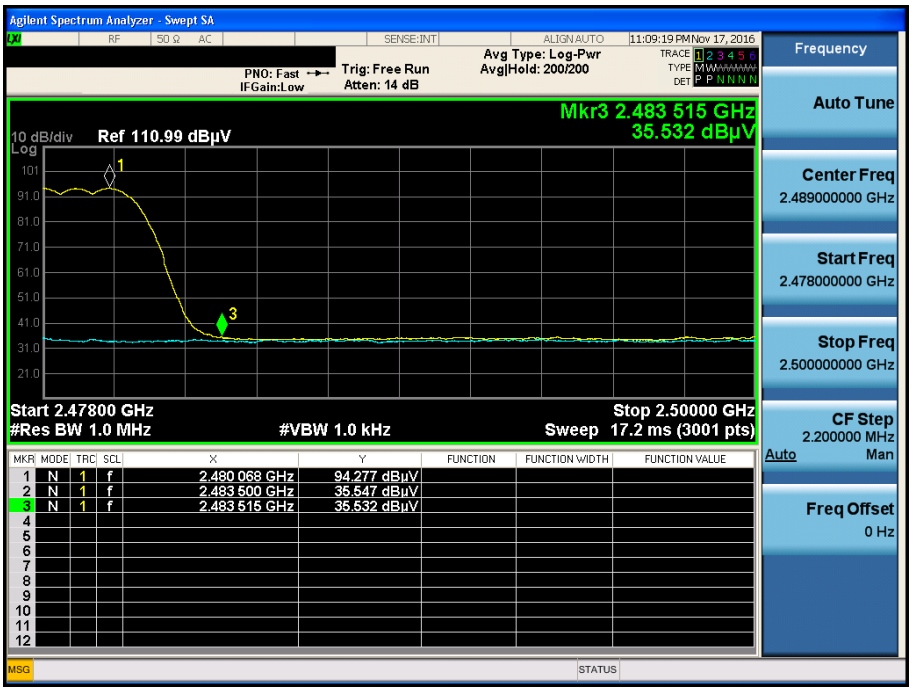
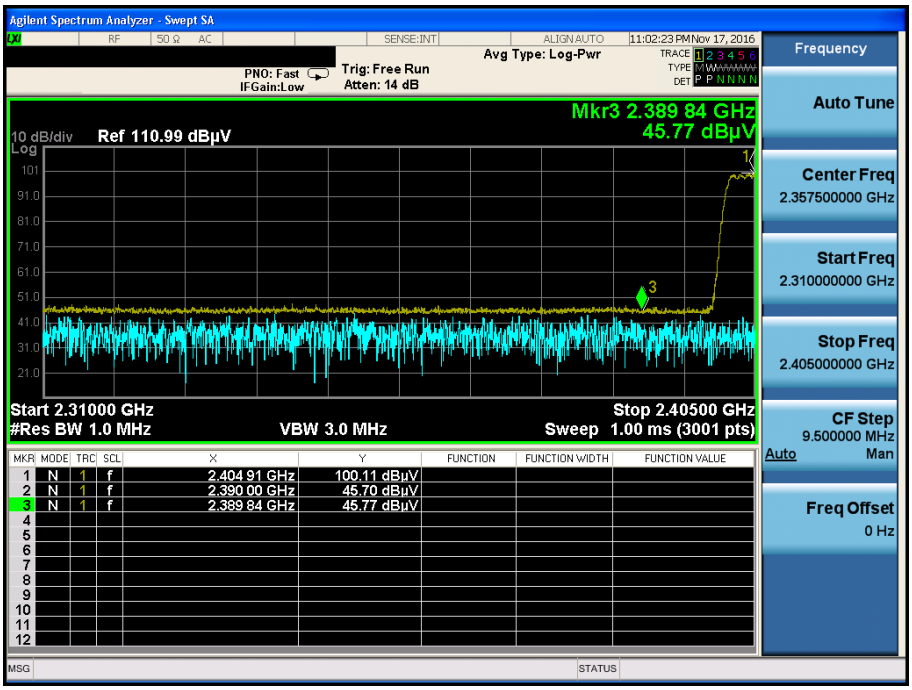
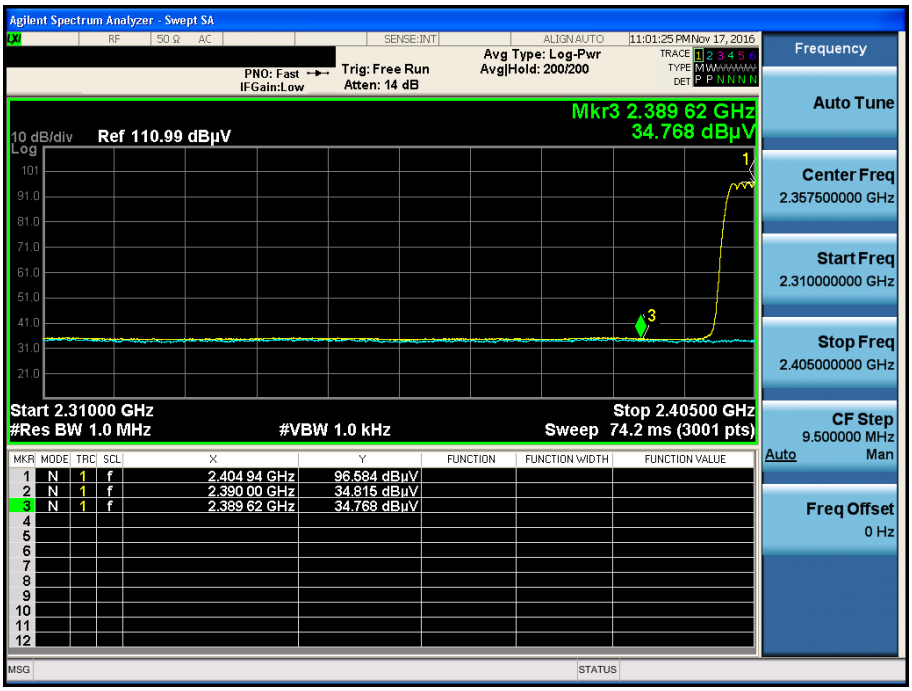


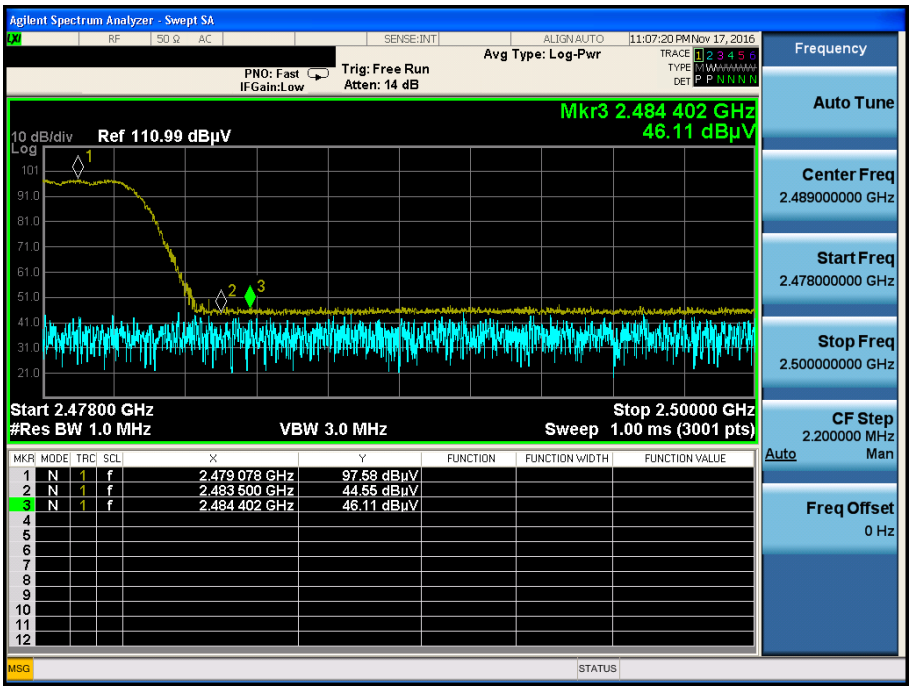
8DPSK & Hopping mode & X & Hor — Detector Mode : PK



8DPSK & Hopping mode & X & Hor — Detector Mode : AV



8DPSK & Hopping mode & X & Hor — Detector Mode : PK



8DPSK & Hopping mode & X & Hor — Detector Mode : AV