

8.5 Radiated spurious emissions

■ Test Requirements and limit, §15.247(d), §15.205, §15.209

In any 100 kHz bandwidth outside the operating frequency band, 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. In case the emission fall within the restricted band specified on 15.205(a) and (b), then the 15.209(a) limit in the table below has to be followed

▪ FCC Part 15.209(a) and (b)

Frequency (MHz)	Limit (uV/m)	Measurement Distance (meter)
0.009 – 0.490	2400/F (kHz)	300
0.490 – 1.705	24000/F (kHz)	30
1.705 – 30.0	30	30
30 ~ 88	100 **	3
88 ~ 216	150 **	3
216 ~ 960	200 **	3
Above 960	500	3

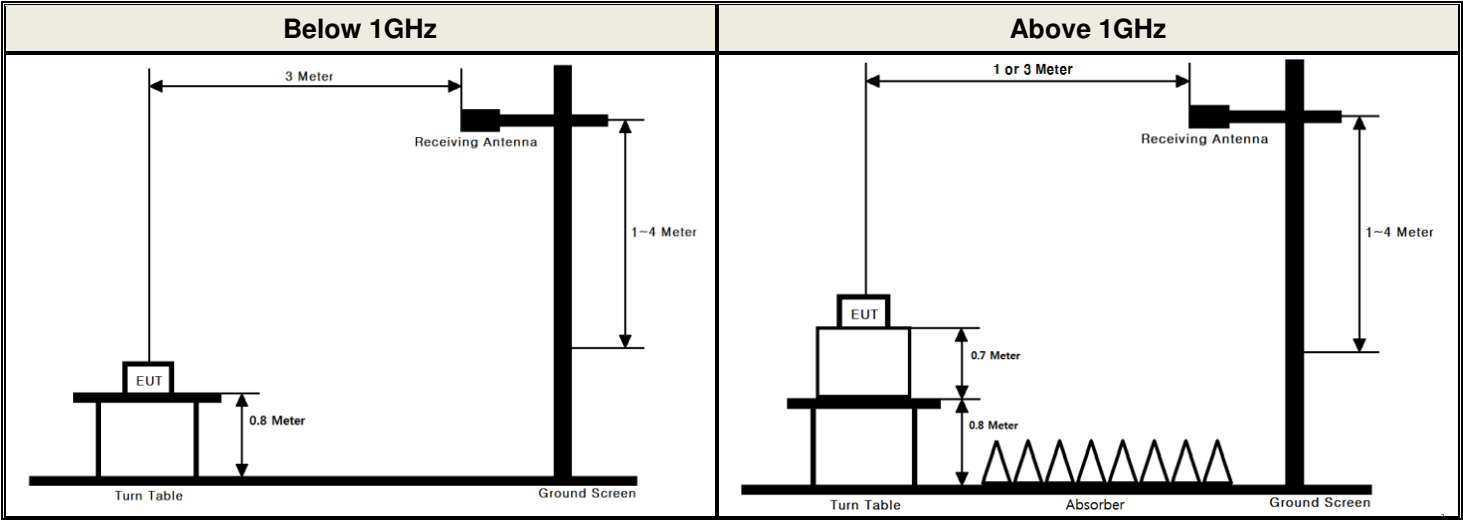
** Except as provided in 15.209(g), fundamental emissions from intentional radiators operating under this Section shall not be located in the frequency bands 54-72 MHz, 76-88 MHz, 174-216 MHz or 470-806 MHz. However, operation within these frequency bands is permitted under other sections of this Part, e.g. 15.231 and 15.241.

▪ FCC Part 15.205 (a): Only spurious emissions are permitted in any of the frequency bands listed below:

MHz	MHz	MHz	MHz	GHz	GHz
0.009 ~ 0.110	8.41425 ~ 8.41475	108 ~ 121.94	1300 ~ 1427	4.5 ~ 5.15	14.47 ~ 14.5
0.495 ~ 0.505	12.29 ~ 12.293	123 ~ 138	1435 ~ 1626.5	5.35 ~ 5.46	15.35 ~ 16.2
2.1735 ~ 2.1905	12.51975 ~ 12.52025	149.9 ~ 150.05	1645.5 ~ 1646.5	7.25 ~ 7.75	17.7 ~ 21.4
4.125 ~ 4.128	12.57675 ~ 12.57725	156.52475 ~	1660 ~ 1710	8.025 ~ 8.5	22.01 ~ 23.12
4.17725 ~ 4.17775	13.36 ~ 13.41	156.52525	1718.8 ~ 1722.2	9.0 ~ 9.2	23.6 ~ 24.0
4.20725 ~ 4.20775	16.42 ~ 16.423	156.7 ~ 156.9	2200 ~ 2300	9.3 ~ 9.5	31.2 ~ 31.8
6.215 ~ 6.218	16.69475 ~ 16.69525	162.0125 ~ 167.17	2310 ~ 2390	10.6 ~ 12.7	36.43 ~ 36.5
6.26775 ~ 6.26825	16.80425 ~ 16.80475	167.72 ~ 173.2	2483.5 ~ 2500	13.25 ~ 13.4	Above 38.6
6.31175 ~ 6.31225	25.5 ~ 25.67	240 ~ 285	2655 ~ 2900		
8.291 ~ 8.294	37.5 ~ 38.25	322 ~ 335.4	3260 ~ 3267		
8.362 ~ 8.366	73 ~ 74.6	399.90 ~ 410	3332 ~ 3339		
8.37625 ~ 8.38675	74.8 ~ 75.2	608 ~ 614	3345.8 ~ 3358		
		960 ~ 1240	3600 ~ 4400		

▪ **FCC Part 15.205(b):** The field strength of emissions appearing within these frequency bands shall not exceed the limits shown in §15.209. At frequencies equal to or less than 1000 MHz, compliance with the limits in §15.209 shall be demonstrated using measurement instrumentation employing a CISPR quasi-peak detector. Above 1000 MHz, compliance with the emission limits in §15.209 shall be demonstrated based on the average value of the measured emissions. The provisions in §15.35 apply to these measurements.

■ **Test Configuration**



■ **Test Procedure**

1. The EUT is placed on a non-conductive table, emission measurements at below 1 GHz, the table height is 80 cm and above 1 GHz, the table height is 1.5 m.
2. The turntable shall be rotated for 360 degrees to determine the position of maximum emission level.
3. EUT is set 1 or 3 m away from the receiving antenna, which is varied from 1 m to 4 m to find out the highest emissions.
4. Maximum procedure was performed on the six highest emissions to ensure EUT compliance.
5. And also, each emission was to be maximized by changing the polarization of receiving antenna both horizontal and vertical.
6. Repeat above procedures until the measurements for all frequencies are complete.

■ Measurement Instrument Setting for Radiated Emission Measurements.

The radiated emission was tested according to the section 6.3, 6.4, 6.5 and 6.6 of the ANSI C63.10-2013 with following settings.

Peak Measurement

RBW = As specified in below table, VBW $\geq 3 \times$ RBW, Sweep = Auto, Detector = Peak, Trace mode = Max Hold until the trace stabilizes.

Frequency	RBW
9-150 kHz	200-300 Hz
0.15-30 MHz	9-10 kHz
30-1000 MHz	100-120 kHz
> 1000 MHz	1 MHz

Average Measurement:

1. RBW = 1 MHz (unless otherwise specified).
2. VBW $\geq 3 \times$ RBW.
3. Detector = RMS (Number of points $\geq 2 \times$ Span / RBW)
4. Averaging type = power. (i.e., RMS)
5. Sweep time = auto.
6. Perform a trace average of at least 100 traces.
7. A correction factor shall be added to the measurement results prior to comparing to the emission limit in order to compute the emission level that would have been measured had the test been performed at 100 percent duty cycle. The correction factor is computed as follows:
 - 1) If power averaging (RMS) mode was used in step 4, then the applicable correction factor is $10 \log(1/x)$, where x is the duty cycle.
 - 2) If linear voltage averaging mode was used in step 4, then the applicable correction factor is $20 \log(1/x)$, where x is the duty cycle.
 - 3) If a specific emission is demonstrated to be continuous (≥ 98 percent duty cycle) rather than turning on and off with the transmit cycle, then no duty cycle correction is required for that emission.

Duty Cycle Corrections (Refer to appendix II for duty cycle measurement procedure and plots)

Test Mode	Date rate	Duty Cycle (%)	Duty Cycle Correction Factor (dB)
TM 1	1 Mbps	98.78	0.05
TM 2	6 Mbps	98.66	0.06
TM 3	MCS 0	98.56	0.06
TM 4	MCS 0	97.21	0.12
TM 5	MCS 8	97.33	0.12
TM 6	MCS 8	95.01	0.23

Note: Please refer to Appendix I for detailed information.

Radiated Spurious Emissions data(9 kHz ~ 25 GHz) : Test Mode 1(TM 1)

Tested Frequency	Frequency (MHz)	ANT Pol	EUT Position (Axis)	Detector Mode	Reading (dBuV)	T.F (dB/m)	DCF (dB)	Distance F (dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Test Ant of Worst data ^{Note2}
Lowest	2386.37	Y	H	PK	54.21	3.54	N/A	N/A	57.75	74.00	16.25	Ant 1
	2385.82	Y	H	AV	47.28	3.54	N/A	N/A	50.82	54.00	3.18	Ant 1
	7234.60	Y	H	PK	44.59	14.13	N/A	N/A	58.72	74.00	15.28	Ant 1
	7235.20	Y	H	AV	35.30	14.13	N/A	N/A	49.43	54.00	4.57	Ant 1
	2387.36	Y	H	PK	54.30	3.54	N/A	N/A	57.84	74.00	16.16	Ant 2
	2387.80	Y	H	AV	47.22	3.54	N/A	N/A	50.76	54.00	3.24	Ant 2
	4823.90	Y	H	PK	44.50	9.59	N/A	N/A	54.09	74.00	19.91	Ant 2
	4824.12	Y	H	AV	35.74	9.59	N/A	N/A	45.33	54.00	8.67	Ant 2
Middle	7312.56	Y	H	PK	46.11	14.05	N/A	N/A	60.16	74.00	13.84	Ant 1
	7311.88	Y	H	AV	36.62	14.05	N/A	N/A	50.67	54.00	3.33	Ant 1
	4873.92	Y	H	PK	46.13	9.80	N/A	N/A	55.93	74.00	18.07	Ant 2
	4874.04	Y	H	AV	39.77	9.80	N/A	N/A	49.57	54.00	4.43	Ant 2
Highest	2483.75	Y	H	PK	53.45	3.70	N/A	N/A	57.15	74.00	16.85	Ant 1
	2483.50	Y	H	AV	46.42	3.70	N/A	N/A	50.12	54.00	3.88	Ant 1
	7385.32	Y	H	PK	44.83	14.27	N/A	N/A	59.10	74.00	14.90	Ant 1
	7384.78	Y	H	AV	33.85	14.27	N/A	N/A	48.12	54.00	5.88	Ant 1
	2486.20	Y	H	PK	52.59	3.70	N/A	N/A	56.29	74.00	17.71	Ant 2
	2486.15	Y	H	AV	46.03	3.70	N/A	N/A	49.73	54.00	4.27	Ant 2
	4924.38	Y	H	PK	44.72	9.83	N/A	N/A	54.55	74.00	19.45	Ant 2
	4923.72	Y	H	AV	36.00	9.83	N/A	N/A	45.83	54.00	8.17	Ant 2

Note.

1. No other spurious and harmonic emissions were found greater than listed emissions on above table.
2. This device was tested under single transmitting(Ant 1, 2) and the worst case data are reported in the table above.
3. Sample Calculation.
 $\text{Margin} = \text{Limit} - \text{Result}$ / $\text{Result} = \text{Reading} + \text{T.F} + \text{DCCF} + \text{DCF}$ / $\text{T.F} = \text{AF} + \text{CL} - \text{AG}$
 Where, T.F = Total Factor, AF = Antenna Factor, CL = Cable Loss, AG = Amplifier Gain,
 DCCF = Duty Cycle Correction Factor, DCF = Distance Correction Factor
4. Measurement Distance = 3 m for below 10 GHz, Measurement Distance = 1 m for above 10 GHz.
 Therefore Distance Correction Factor(DCF) : $-9.54 \text{ dB} = 20 \cdot \log(1\text{m}/3\text{m})$

Radiated Spurious Emissions data(9 kHz ~ 25 GHz) : Test Mode 2(TM 2)

Tested Frequency	Frequency (MHz)	ANT Pol	EUT Position (Axis)	Detector Mode	Reading (dBuV)	T.F (dB/m)	DCF (dB)	Distance F (dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Test Ant of Worst data ^{Note2}
Lowest	2389.40	Y	H	PK	58.05	3.54	N/A	N/A	61.59	74.00	12.41	Ant 1
	2389.66	Y	H	AV	46.75	3.54	N/A	N/A	50.29	54.00	3.71	Ant 1
	4823.29	Y	H	PK	44.93	9.59	N/A	N/A	54.52	74.00	19.48	Ant 1
	4823.01	Y	H	AV	33.86	9.59	N/A	N/A	43.45	54.00	10.55	Ant 1
	2389.04	Y	H	PK	57.78	3.54	N/A	N/A	61.32	74.00	12.68	Ant 2
	2390.00	Y	H	AV	46.86	3.54	N/A	N/A	50.40	54.00	3.60	Ant 2
	4823.00	Y	H	PK	43.73	9.59	N/A	N/A	53.32	74.00	20.68	Ant 2
	4824.48	Y	H	AV	33.67	9.59	N/A	N/A	43.26	54.00	10.74	Ant 2
Middle	4874.90	Y	H	PK	43.92	9.80	N/A	N/A	53.72	74.00	20.28	Ant 1
	4874.00	Y	H	AV	33.90	9.80	N/A	N/A	43.70	54.00	10.30	Ant 1
	4872.44	Y	H	PK	46.69	9.80	N/A	N/A	56.49	74.00	17.51	Ant 2
	4872.44	Y	H	AV	35.21	9.80	N/A	N/A	45.01	54.00	8.99	Ant 2
Highest	2483.75	Y	H	PK	58.95	3.70	N/A	N/A	62.65	74.00	11.35	Ant 1
	2483.58	Y	H	AV	46.80	3.70	N/A	N/A	50.50	54.00	3.50	Ant 1
	4923.18	Y	H	PK	44.11	9.83	N/A	N/A	53.94	74.00	20.06	Ant 1
	4923.43	Y	H	AV	34.04	9.83	N/A	N/A	43.87	54.00	10.13	Ant 1
	2483.50	Y	H	PK	60.04	3.70	N/A	N/A	63.74	74.00	10.26	Ant 2
	2483.50	Y	H	AV	46.80	3.70	N/A	N/A	50.50	54.00	3.50	Ant 2
	4924.60	Y	H	PK	45.28	9.83	N/A	N/A	55.11	74.00	18.89	Ant 2
	4923.26	Y	H	AV	33.91	9.83	N/A	N/A	43.74	54.00	10.26	Ant 2

Note.

- No other spurious and harmonic emissions were found greater than listed emissions on above table.
- This device was tested under single transmitting(Ant 1, 2) and the worst case data are reported in the table above.
- Sample Calculation.
 $\text{Margin} = \text{Limit} - \text{Result}$ / $\text{Result} = \text{Reading} + \text{T.F} + \text{DCCF} + \text{DCF}$ / $\text{T.F} = \text{AF} + \text{CL} - \text{AG}$
 Where, T.F = Total Factor, AF = Antenna Factor, CL = Cable Loss, AG = Amplifier Gain,
 DCCF = Duty Cycle Correction Factor, DCF = Distance Correction Factor
- Measurement Distance = 3 m for below 10 GHz, Measurement Distance = 1 m for above 10 GHz.
 Therefore Distance Correction Factor(DCF) : $-9.54 \text{ dB} = 20 \cdot \log(1\text{m}/3\text{m})$

Radiated Spurious Emissions data(9 kHz ~ 25 GHz) : Test Mode 3(TM 3)

Tested Frequency	Frequency (MHz)	ANT Pol	EUT Position (Axis)	Detector Mode	Reading (dBuV)	T.F (dB/m)	DCF (dB)	Distance F (dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Test Ant of Worst data ^{Note2}
Lowest	2389.52	Y	H	PK	58.53	3.54	N/A	N/A	62.07	74.00	11.93	Ant 1
	2390.00	Y	H	AV	46.61	3.54	N/A	N/A	50.15	54.00	3.85	Ant 1
	4823.76	Y	H	PK	43.88	9.59	N/A	N/A	53.47	74.00	20.53	Ant 1
	4824.66	Y	H	AV	33.65	9.59	N/A	N/A	43.24	54.00	10.76	Ant 1
	2389.04	Y	H	PK	60.41	3.54	N/A	N/A	63.95	74.00	10.05	Ant 2
	2390.00	Y	H	AV	46.50	3.54	N/A	N/A	50.04	54.00	3.96	Ant 2
	4825.74	Y	H	PK	43.81	9.59	N/A	N/A	53.40	74.00	20.60	Ant 2
	4824.92	Y	H	AV	34.00	9.59	N/A	N/A	43.59	54.00	10.41	Ant 2
Middle	4874.12	Y	H	PK	44.50	9.80	N/A	N/A	54.30	74.00	19.70	Ant 1
	4872.78	Y	H	AV	34.06	9.80	N/A	N/A	43.86	54.00	10.14	Ant 1
	4872.66	Y	H	PK	46.67	9.80	N/A	N/A	56.47	74.00	17.53	Ant 2
	4874.76	Y	H	AV	35.32	9.80	N/A	N/A	45.12	54.00	8.88	Ant 2
Highest	2483.55	Y	H	PK	58.49	3.70	N/A	N/A	62.19	74.00	11.81	Ant 1
	2483.53	Y	H	AV	46.44	3.70	N/A	N/A	50.14	54.00	3.86	Ant 1
	4923.20	Y	H	PK	44.04	9.83	N/A	N/A	53.87	74.00	20.13	Ant 1
	4923.89	Y	H	AV	33.85	9.83	N/A	N/A	43.68	54.00	10.32	Ant 1
	2484.00	Y	H	PK	60.48	3.70	N/A	N/A	64.18	74.00	9.82	Ant 2
	2483.66	Y	H	AV	46.41	3.70	N/A	N/A	50.11	54.00	3.89	Ant 2
	4924.20	Y	H	PK	44.32	9.83	N/A	N/A	54.15	74.00	19.85	Ant 2
	4923.12	Y	H	AV	34.06	9.83	N/A	N/A	43.89	54.00	10.11	Ant 2

Note.

- No other spurious and harmonic emissions were found greater than listed emissions on above table.
- This device was tested under single transmitting(Ant 1, 2) and multiple transmitting(Ant 1+2) and the worst case data are reported in the table above.
- Sample Calculation.
 $\text{Margin} = \text{Limit} - \text{Result}$ / $\text{Result} = \text{Reading} + \text{T.F} + \text{DCCF} + \text{DCF}$ / $\text{T.F} = \text{AF} + \text{CL} - \text{AG}$
 Where, T.F = Total Factor, AF = Antenna Factor, CL = Cable Loss, AG = Amplifier Gain,
 DCCF = Duty Cycle Correction Factor, DCF = Distance Correction Factor
- Measurement Distance = 3 m for below 10 GHz, Measurement Distance = 1 m for above 10 GHz.
 Therefore Distance Correction Factor(DCF) : $-9.54 \text{ dB} = 20 \cdot \log(1\text{m}/3\text{m})$

Radiated Spurious Emissions data(9 kHz ~ 25 GHz) : Test Mode 4(TM 4)

Tested Frequency	Frequency (MHz)	ANT Pol	EUT Position (Axis)	Detector Mode	Reading (dBuV)	T.F (dB/m)	DCF (dB)	Distance F (dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Test Ant of Worst data ^{Note2}
Lowest	2389.72	Y	H	PK	56.30	3.54	N/A	N/A	59.84	74.00	14.16	Ant 1
	2387.82	Y	H	AV	46.08	3.54	0.12	N/A	49.74	54.00	4.26	Ant 1
	4843.73	Y	H	PK	43.70	9.59	N/A	N/A	53.29	74.00	20.71	Ant 1
	4843.89	Y	H	AV	33.64	9.59	0.12	N/A	43.35	54.00	10.65	Ant 1
	2389.72	Y	H	PK	56.69	3.54	N/A	N/A	60.23	74.00	13.77	Ant 2
	2389.30	Y	H	AV	46.17	3.54	0.12	N/A	49.83	54.00	4.17	Ant 2
	4843.97	Y	H	PK	43.65	9.59	N/A	N/A	53.24	74.00	20.76	Ant 2
	4844.56	Y	H	AV	33.72	9.59	0.12	N/A	43.43	54.00	10.57	Ant 2
Middle	4875.60	Y	H	PK	44.51	9.80	N/A	N/A	54.31	74.00	19.69	Ant 1
	4873.80	Y	H	AV	33.95	9.80	0.12	N/A	43.87	54.00	10.13	Ant 1
	4873.60	Y	H	PK	44.79	9.80	N/A	N/A	54.59	74.00	19.41	Ant 2
	4873.18	Y	H	AV	34.22	9.80	0.12	N/A	44.14	54.00	9.86	Ant 2
Highest	2484.13	Y	H	PK	56.81	3.70	N/A	N/A	60.51	74.00	13.49	Ant 1
	2483.50	Y	H	AV	44.99	3.70	0.12	N/A	48.81	54.00	5.19	Ant 1
	4903.72	Y	H	PK	44.11	9.83	N/A	N/A	53.94	74.00	20.06	Ant 1
	4903.40	Y	H	AV	33.69	9.83	0.12	N/A	43.64	54.00	10.36	Ant 1
	2483.85	Y	H	PK	57.16	3.70	N/A	N/A	60.86	74.00	13.14	Ant 2
	2483.58	Y	H	AV	46.02	3.70	0.12	N/A	49.84	54.00	4.16	Ant 2
	4904.15	Y	H	PK	43.70	9.83	N/A	N/A	53.53	74.00	20.47	Ant 2
	4904.68	Y	H	AV	33.57	9.83	0.12	N/A	43.52	54.00	10.48	Ant 2

Note.

- No other spurious and harmonic emissions were found greater than listed emissions on above table.
- This device was tested under single transmitting(Ant 1, 2) and multiple transmitting(Ant 1+2) and the worst case data are reported in the table above.
- Sample Calculation.
 $\text{Margin} = \text{Limit} - \text{Result}$ / $\text{Result} = \text{Reading} + \text{T.F} + \text{DCCF} + \text{DCF}$ / $\text{T.F} = \text{AF} + \text{CL} - \text{AG}$
 Where, T.F = Total Factor, AF = Antenna Factor, CL = Cable Loss, AG = Amplifier Gain,
 DCCF = Duty Cycle Correction Factor, DCF = Distance Correction Factor
- Measurement Distance = 3 m for below 10 GHz, Measurement Distance = 1 m for above 10 GHz.
 Therefore Distance Correction Factor(DCF) : $-9.54 \text{ dB} = 20 \cdot \log(1\text{m}/3\text{m})$

Radiated Spurious Emissions data(9 kHz ~ 25 GHz) : Test Mode 5(TM 5)

Tested Frequency	Frequency (MHz)	ANT Pol	EUT Position (Axis)	Detector Mode	Reading (dBuV)	T.F (dB/m)	DCF (dB)	Distance F (dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Test Ant of Worst data ^{Note2}
Lowest	2389.28	H	Y	PK	59.11	3.54	N/A	N/A	62.65	74.00	11.35	Ant 1+Ant 2
	2389.54	H	Y	AV	46.52	3.54	0.12	N/A	50.18	54.00	3.82	Ant 1+Ant 2
	4823.20	H	Y	PK	44.88	9.59	N/A	N/A	54.47	74.00	19.53	Ant 1+Ant 2
	4823.79	H	Y	AV	33.56	9.59	0.12	N/A	43.27	54.00	10.73	Ant 1+Ant 2
Middle	4873.90	H	Y	PK	45.77	9.80	N/A	N/A	55.57	74.00	18.43	Ant 1+Ant 2
	4873.74	H	Y	AV	35.54	9.80	0.12	N/A	45.46	54.00	8.54	Ant 1+Ant 2
Highest	2483.60	H	Y	PK	59.24	3.70	N/A	N/A	62.94	74.00	11.06	Ant 1+Ant 2
	2483.50	H	Y	AV	46.43	3.70	0.12	N/A	50.25	54.00	3.75	Ant 1+Ant 2
	4924.20	H	Y	PK	44.12	9.83	N/A	N/A	53.95	74.00	20.05	Ant 1+Ant 2
	4923.63	H	Y	AV	33.76	9.83	0.12	N/A	43.71	54.00	10.29	Ant 1+Ant 2

Note.

- No other spurious and harmonic emissions were found greater than listed emissions on above table.
- This device was tested under single transmitting(Ant 1, 2) and multiple transmitting(Ant 1+2) and the worst case data are reported in the table above.
- Sample Calculation.

$$\text{Margin} = \text{Limit} - \text{Result} \quad / \quad \text{Result} = \text{Reading} + \text{T.F} + \text{DCCF} + \text{DCF} \quad / \quad \text{T.F} = \text{AF} + \text{CL} - \text{AG}$$

Where, T.F = Total Factor, AF = Antenna Factor, CL = Cable Loss, AG = Amplifier Gain,
DCCF = Duty Cycle Correction Factor, DCF = Distance Correction Factor
- Measurement Distance = 3 m for below 10 GHz, Measurement Distance = 1 m for above 10 GHz.
Therefore Distance Correction Factor(DCF) : $-9.54 \text{ dB} = 20 \cdot \log(1\text{m}/3\text{m})$

Radiated Spurious Emissions data(9 kHz ~ 25 GHz) : Test Mode 6(TM 6)

Tested Frequency	Frequency (MHz)	ANT Pol	EUT Position (Axis)	Detector Mode	Reading (dBuV)	T.F (dB/m)	DCF (dB)	Distance F (dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Test Ant of Worst data ^{Note2}
Lowest	2390.00	H	Y	PK	57.89	3.54	N/A	N/A	61.43	74.00	12.57	Ant 1+Ant 2
	2389.80	H	Y	AV	46.09	3.54	0.23	N/A	49.86	54.00	4.14	Ant 1+Ant 2
	4844.53	H	Y	PK	45.34	9.59	N/A	N/A	54.93	74.00	19.07	Ant 1+Ant 2
	4843.11	H	Y	AV	34.24	9.59	0.23	N/A	44.06	54.00	9.94	Ant 1+Ant 2
Middle	4873.44	H	Y	PK	44.55	9.80	N/A	N/A	54.35	74.00	19.65	Ant 1+Ant 2
	4874.25	H	Y	AV	34.49	9.80	0.23	N/A	44.52	54.00	9.48	Ant 1+Ant 2
Highest	2484.20	H	Y	PK	58.06	3.70	N/A	N/A	61.76	74.00	12.24	Ant 1+Ant 2
	2483.92	H	Y	AV	45.98	3.70	0.23	N/A	49.91	54.00	4.09	Ant 1+Ant 2
	4923.66	H	Y	PK	44.84	9.83	N/A	N/A	54.67	74.00	19.33	Ant 1+Ant 2
	4924.88	H	Y	AV	34.50	9.83	0.23	N/A	44.56	54.00	9.44	Ant 1+Ant 2

Note.

- No other spurious and harmonic emissions were found greater than listed emissions on above table.
- This device was tested under single transmitting(Ant 1, 2) and multiple transmitting(Ant 1+2) and the worst case data are reported in the table above.
- Sample Calculation.
 $\text{Margin} = \text{Limit} - \text{Result}$ / $\text{Result} = \text{Reading} + \text{T.F} + \text{DCCF} + \text{DCF}$ / $\text{T.F} = \text{AF} + \text{CL} - \text{AG}$
 Where, T.F = Total Factor, AF = Antenna Factor, CL = Cable Loss, AG = Amplifier Gain,
 DCCF = Duty Cycle Correction Factor, DCF = Distance Correction Factor
- Measurement Distance = 3 m for below 10 GHz, Measurement Distance = 1 m for above 10 GHz.
 Therefore Distance Correction Factor(DCF) : $-9.54 \text{ dB} = 20 \cdot \log(1\text{m}/3\text{m})$

8.6 Power-line conducted emissions

■ Test Requirements and limit, §15.207

For an intentional radiator which 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

Compliance with this provision shall be based on the measurement of the radio frequency voltage between each power line (LINE and NEUTRAL) and ground at the power terminals.

■ Test Procedure

1. The EUT is placed on a wooden table 80 cm above the reference ground plane.
2. The EUT is connected via LISN to the test power supply.
3. The measurement results are obtained as described below:
4. Detectors – Quasi Peak and Average Detector.

■ Test Results: **Comply**(Refer to next page.)

The worst data was reported.

RESULT PLOTS**AC Line Conducted Emissions (Graph)**

Test mode 1(TM 1) & Middle

Results of Conducted Emission

DTNC

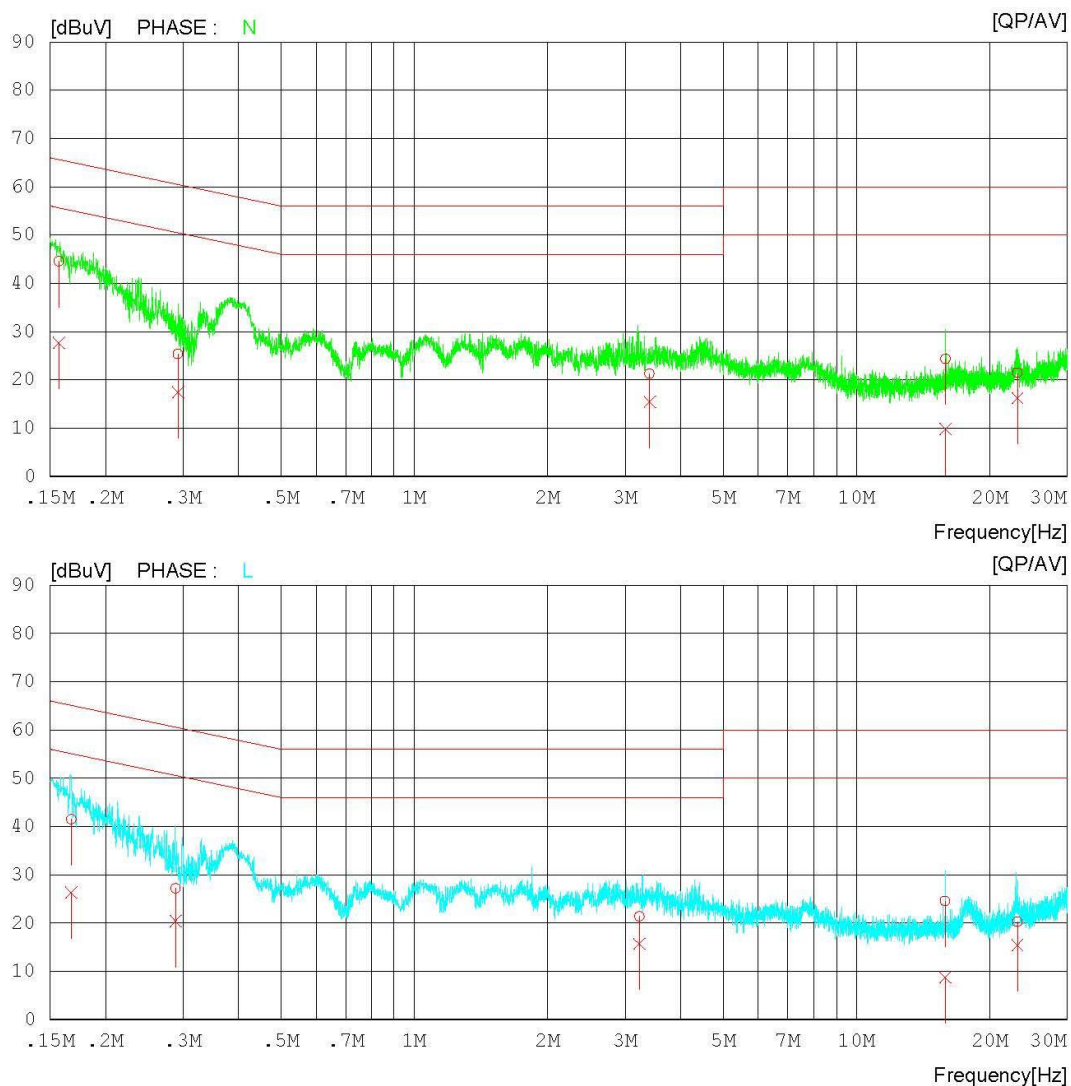
Date : 2015-11-25

Order No. :
Model No. : LG14Z96
Serial No. : Identical prototype
Test Condition : 802.11b / 2437MHz

Reference No. :
Power Supply : 120V / 60Hz
Temp/Humi. : 21 °C / 42 % R.H.
Operator : I.H.BAE

Memo :

LIMIT : CISPR22_B QP
CISPR22_B AV



AC Line Conducted Emissions (List)

Test mode 1(TM 1) & Middle

Results of Conducted Emission

DTNC

Date : 2015-11-25

Order No. :
 Model No. : LG14Z96
 Serial No. : Identical prototype
 Test Condition : 802.11b / 2437MHz

Reference No. :
 Power Supply : 120V / 60Hz
 Temp/Humi. : 21 °C / 42 % R.H.
 Operator : I.H.BAE

Memo :

LIMIT : CISPR22_B QP
 CISPR22_B AV

NO	FREQ [MHz]	READING		C.FACTOR [dB]	RESULT		LIMIT		MARGIN		PHASE
		QP [dBuV]	AV [dBuV]		QP [dBuV]	AV [dBuV]	QP [dBuV]	AV [dBuV]	QP [dBuV]	AV [dBuV]	
1	0.15712	34.4	17.6	10.1	44.5	27.7	65.6	55.6	21.1	27.9	N
2	0.29191	15.3	7.3	10.1	25.4	17.4	60.5	50.5	35.1	33.1	N
3	3.40360	11.0	5.2	10.2	21.2	15.4	56.0	46.0	34.8	30.6	N
4	15.89180	13.7	-0.7	10.6	24.3	9.9	60.0	50.0	35.7	40.1	N
5	23.12700	10.6	5.3	10.9	21.5	16.2	60.0	50.0	38.5	33.8	N
6	0.16751	31.3	16.2	10.1	41.4	26.3	65.1	55.1	23.7	28.8	L
7	0.28840	17.1	10.2	10.1	27.2	20.3	60.6	50.6	33.4	30.3	L
8	3.23160	11.1	5.4	10.2	21.3	15.6	56.0	46.0	34.7	30.4	L
9	15.87660	13.7	-2.0	10.8	24.5	8.8	60.0	50.0	35.5	41.2	L
10	23.13440	9.1	4.2	11.1	20.2	15.3	60.0	50.0	39.8	34.7	L

8.7 Occupied Bandwidth

Test Requirements, RSS-Gen [4.6.1]

When an occupied bandwidth value is not specified in the applicable RSS, the transmitted signal bandwidth to be reported is to be its 99 % emission bandwidth, as calculated or measured.

■ TEST CONFIGURATION

Refer to the APPENDIX I.

■ TEST PROCEDURE

The resolution bandwidth shall be set to as close to 1% of the selected span as is possible without being below 1 %. The video bandwidth shall be set to 3 times the resolution bandwidth. Video averaging is not permitted. Where practical a sampling detector shall be used given that a peak or peak hold may produce a wider bandwidth than actual.

■ TEST RESULTS: **Comply**

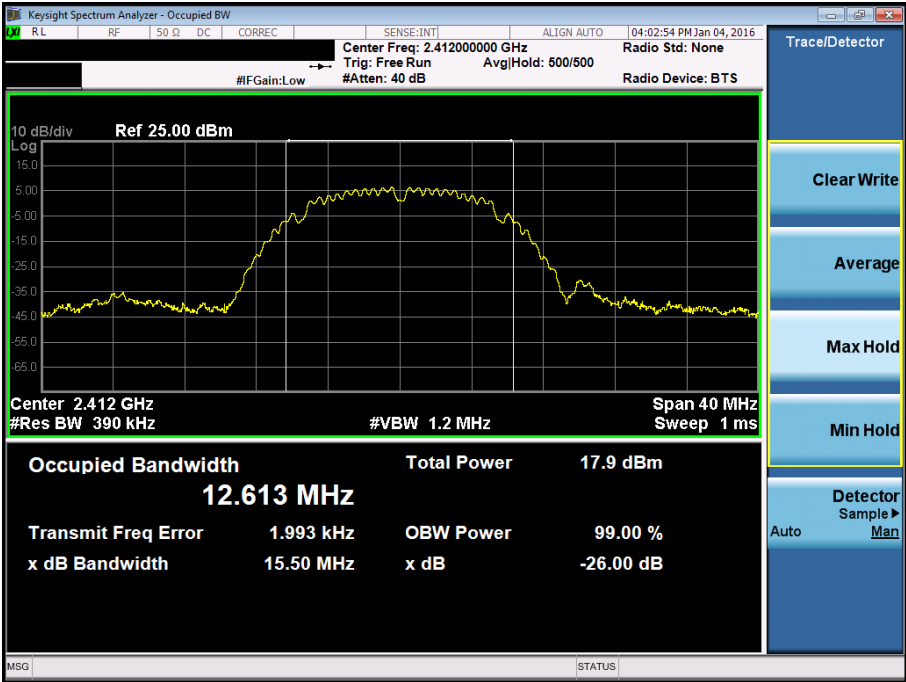
Test Mode	Frequency	Test Results[MHz]	
		ANT 1	ANT 2
TM 1	Lowest	12.613	12.579
	Middle	13.109	12.747
	Highest	12.797	12.667
TM 2	Lowest	16.828	16.705
	Middle	17.298	17.466
	Highest	16.866	16.759
TM 3	Lowest	17.971	17.864
	Middle	18.452	18.332
	Highest	17.946	17.892
TM 4	Lowest	36.193	36.184
	Middle	36.691	36.565
	Highest	36.176	36.165
TM 5	Lowest	17.948	17.769
	Middle	18.365	18.116
	Highest	17.878	17.760
TM 6	Lowest	36.162	36.093
	Middle	36.666	36.356
	Highest	36.182	36.147



RESULT PLOTS

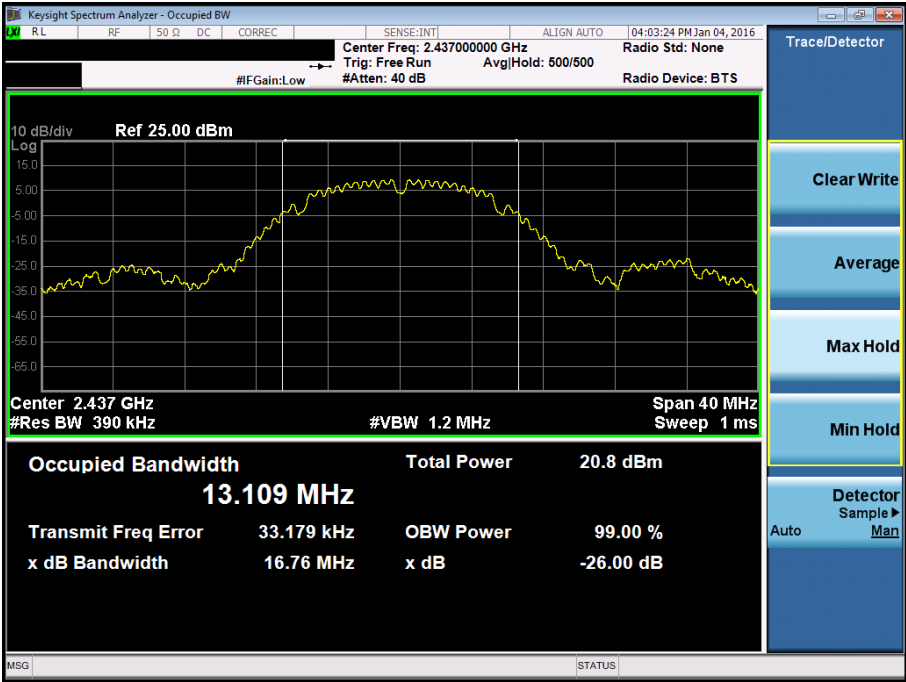
Occupied Bandwidth

TM 1 & ANT 1 & Lowest



Occupied Bandwidth

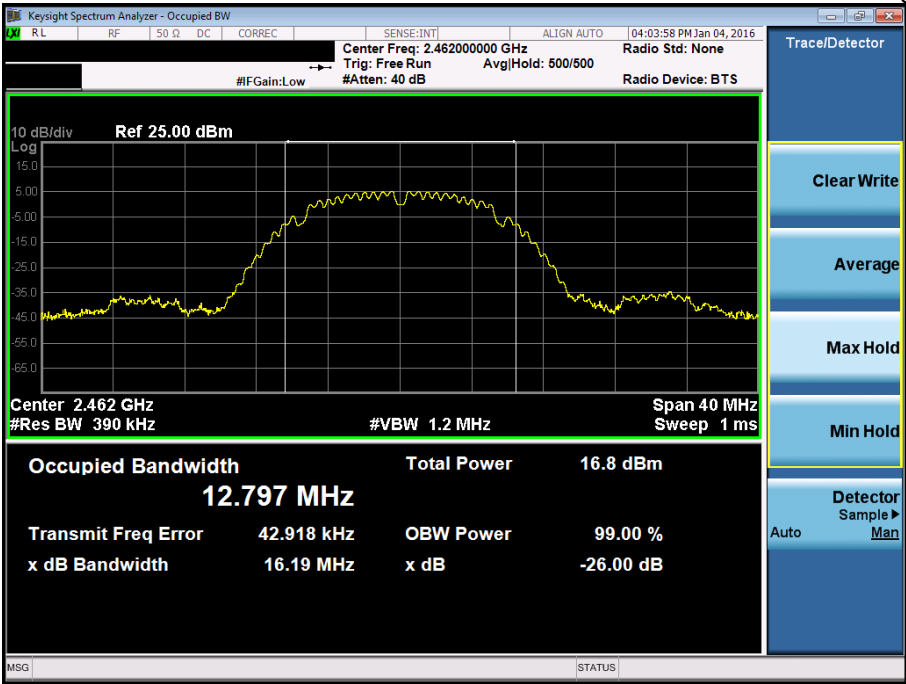
TM 1 & ANT 1 & Middle





Occupied Bandwidth

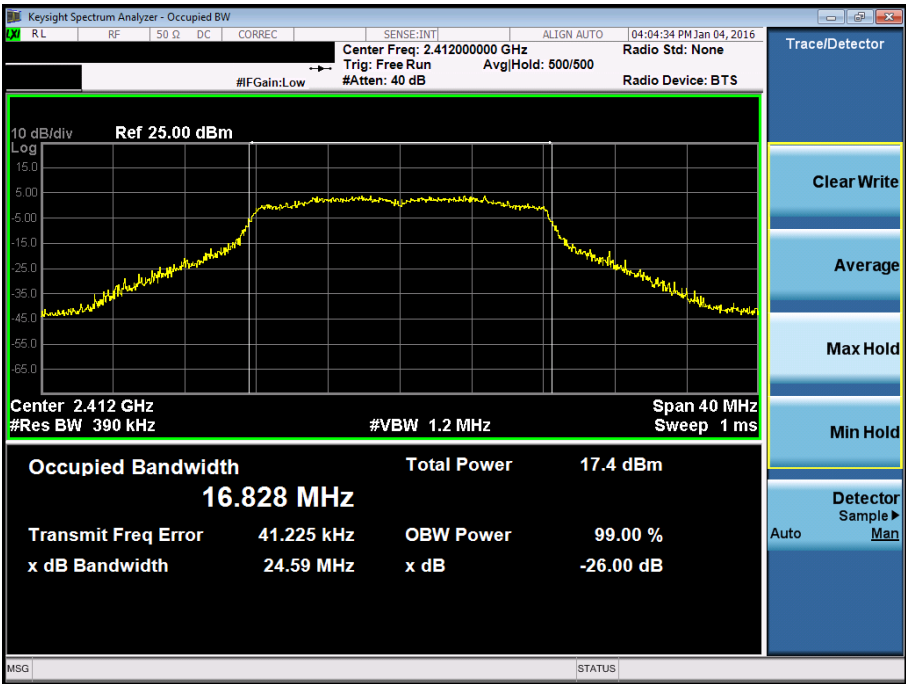
TM 1 & ANT 1 & Highest





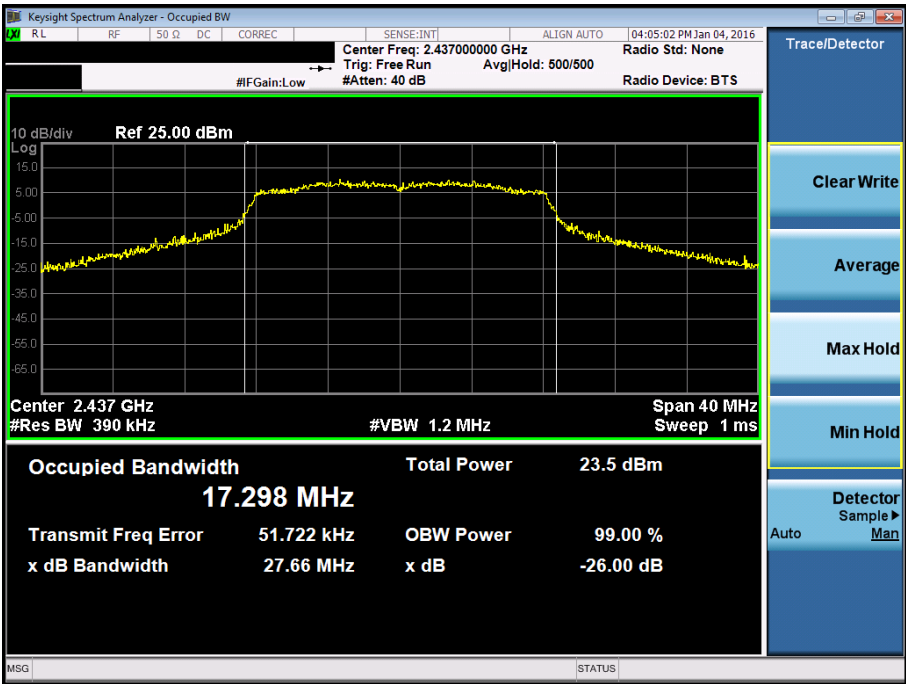
Occupied Bandwidth

TM 2 & ANT 1 & Lowest



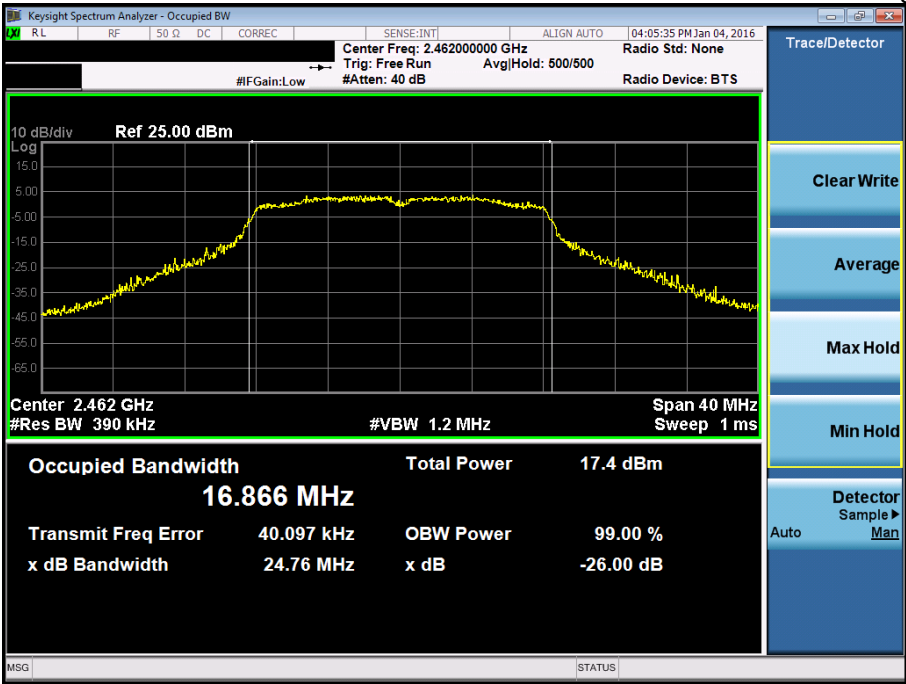
Occupied Bandwidth

TM 2 & ANT 1 & Middle





Occupied Bandwidth TM 2 & ANT 1 & Highest





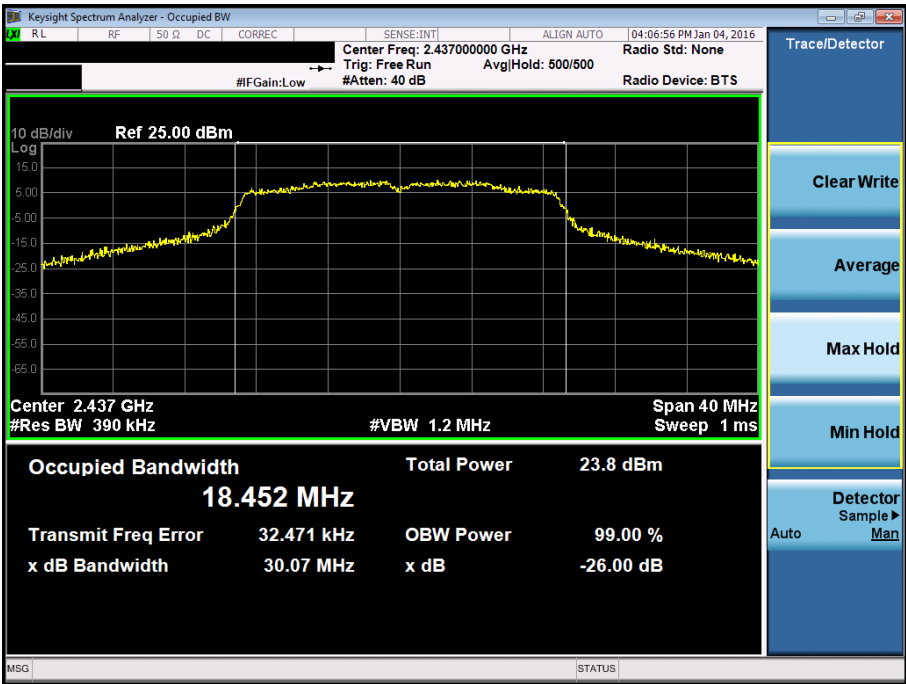
Occupied Bandwidth

TM 3 & ANT 1 & Lowest



Occupied Bandwidth

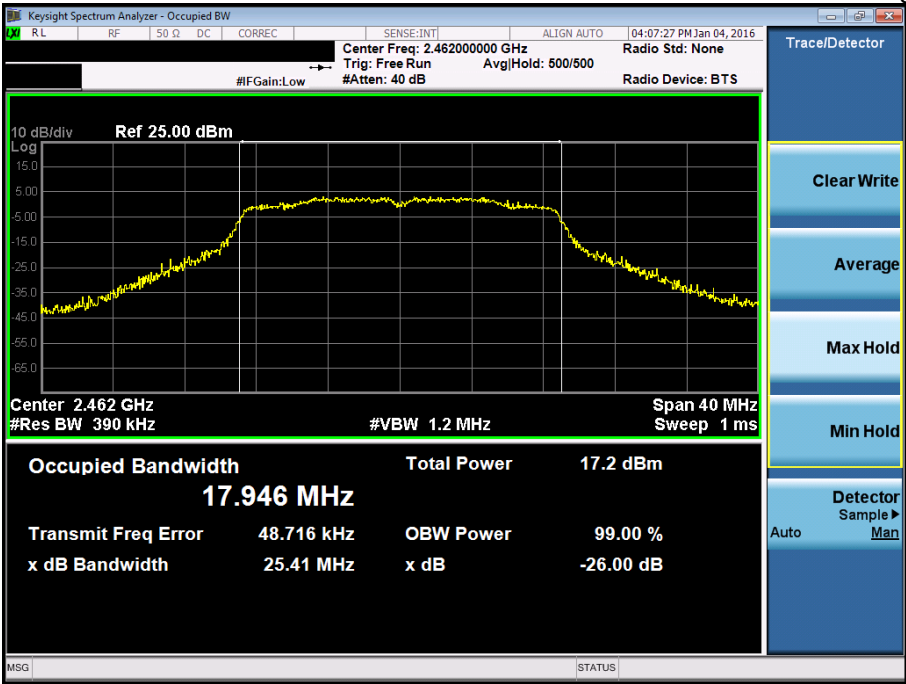
TM 3 & ANT 1 & Middle





Occupied Bandwidth

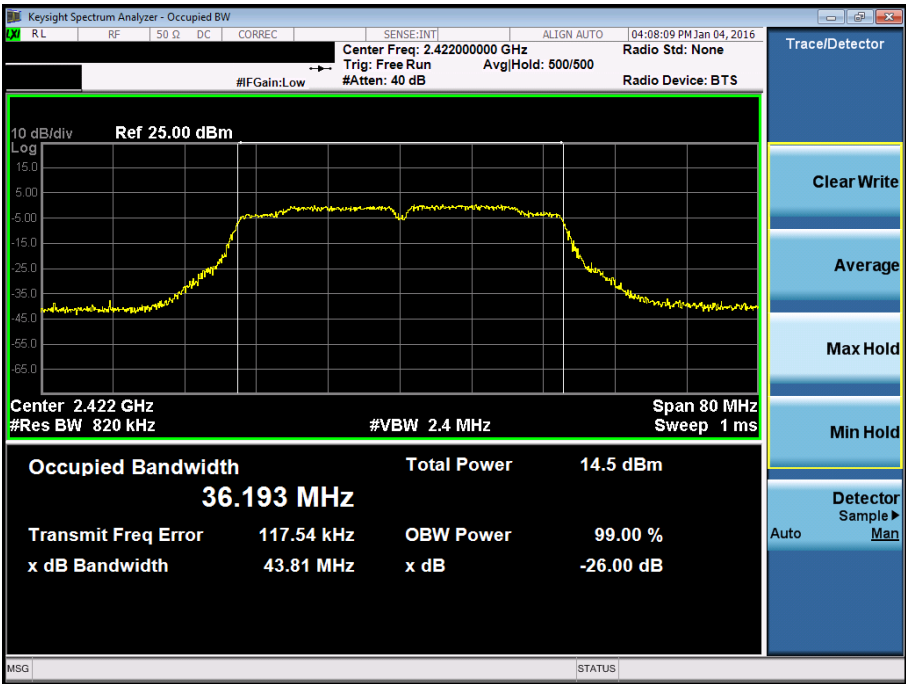
TM 3 & ANT 1 & Highest





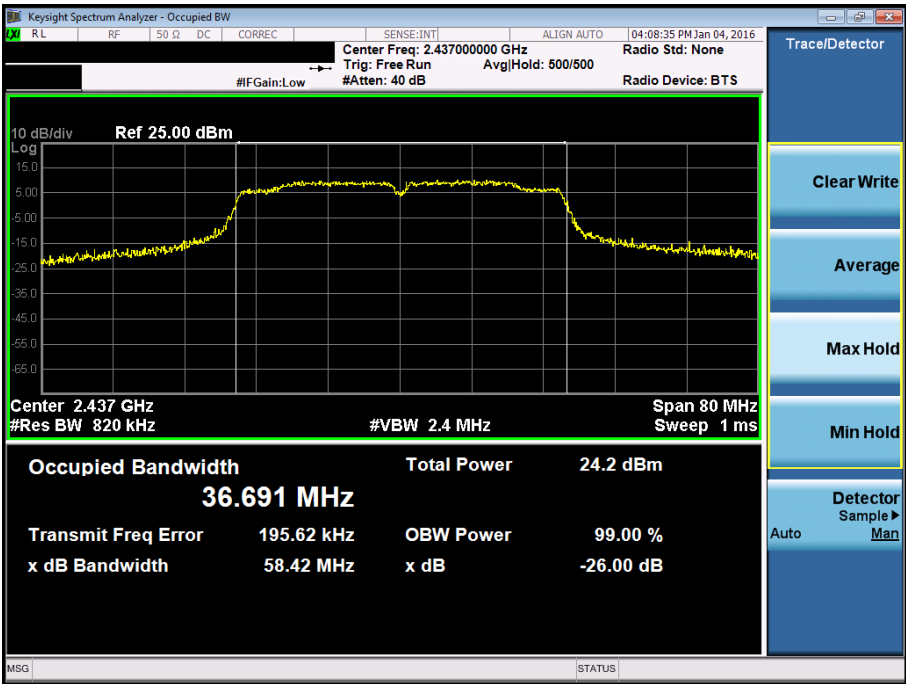
Occupied Bandwidth

TM 4 & ANT 1 & Lowest



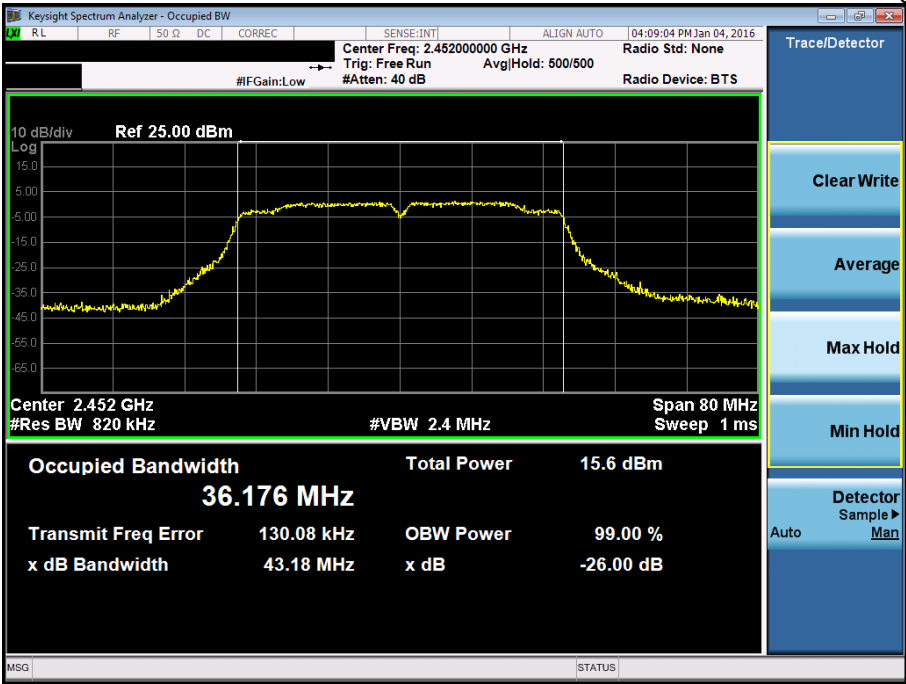
Occupied Bandwidth

TM 4 & ANT 1 & Middle





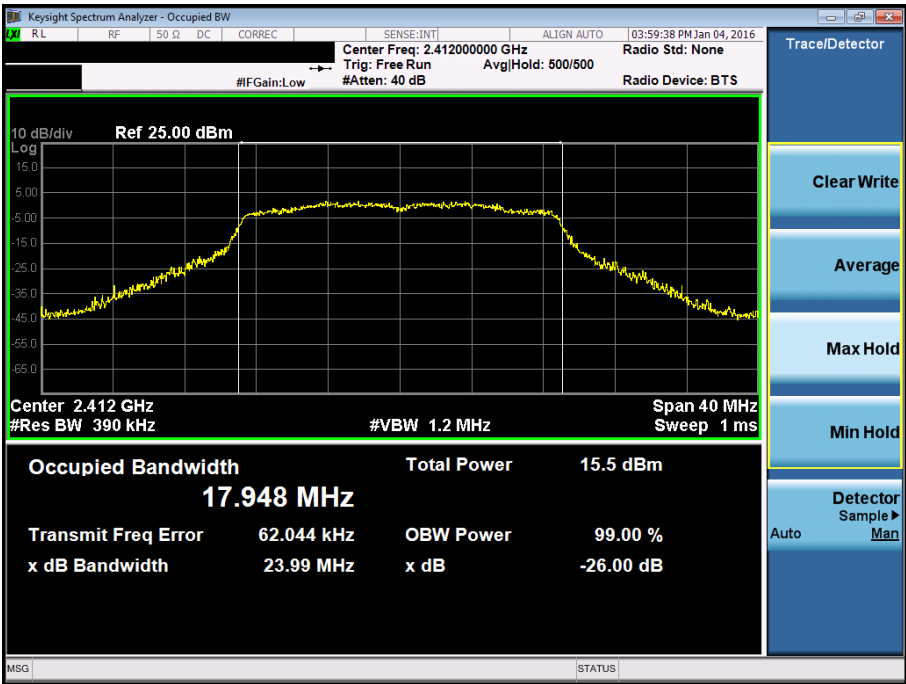
Occupied Bandwidth TM 4 & ANT 1 & Highest





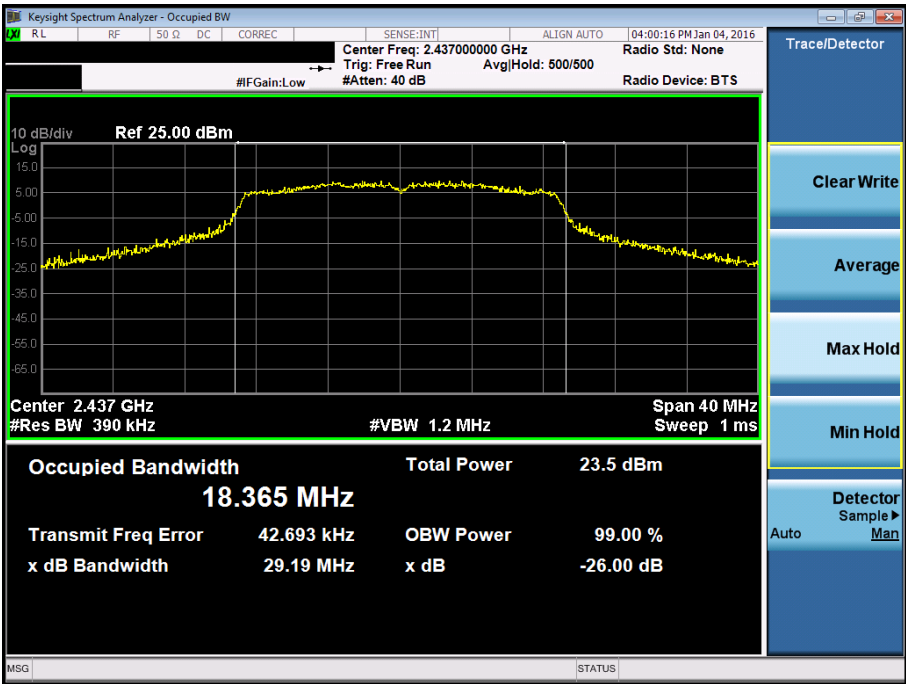
Occupied Bandwidth

TM 5 & ANT 1 & Lowest



Occupied Bandwidth

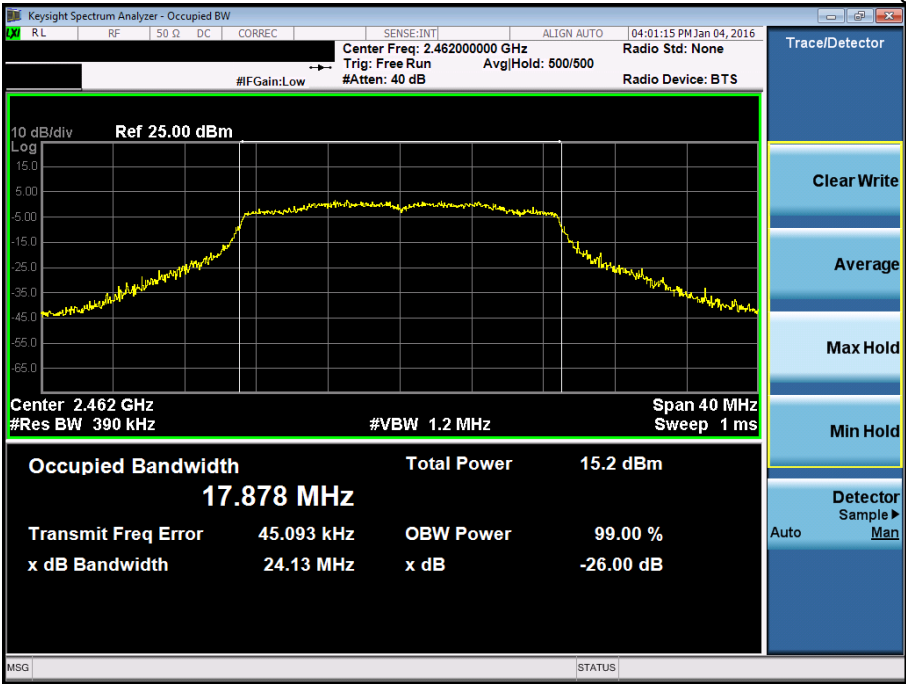
TM 5 & ANT 1 & Middle





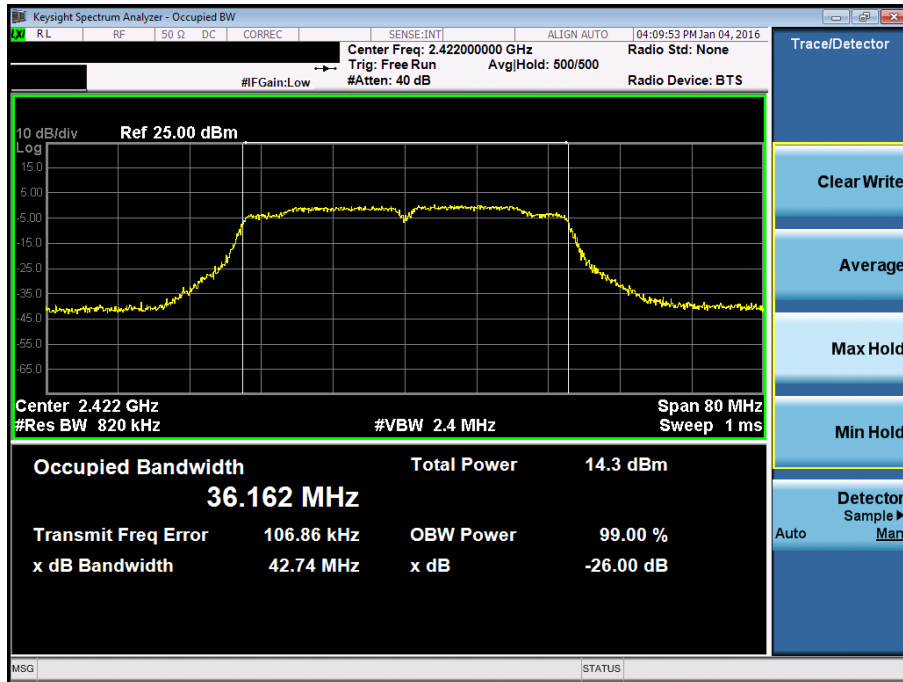
Occupied Bandwidth

TM 5 & ANT 1 & Highest



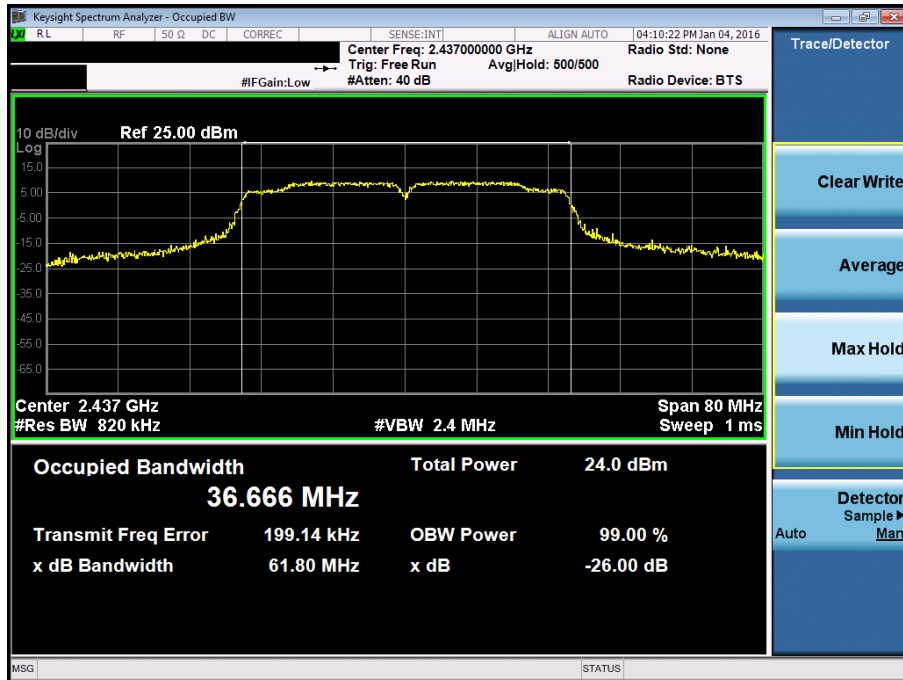
Occupied Bandwidth

TM 6 & ANT 1 & Lowest



Occupied Bandwidth

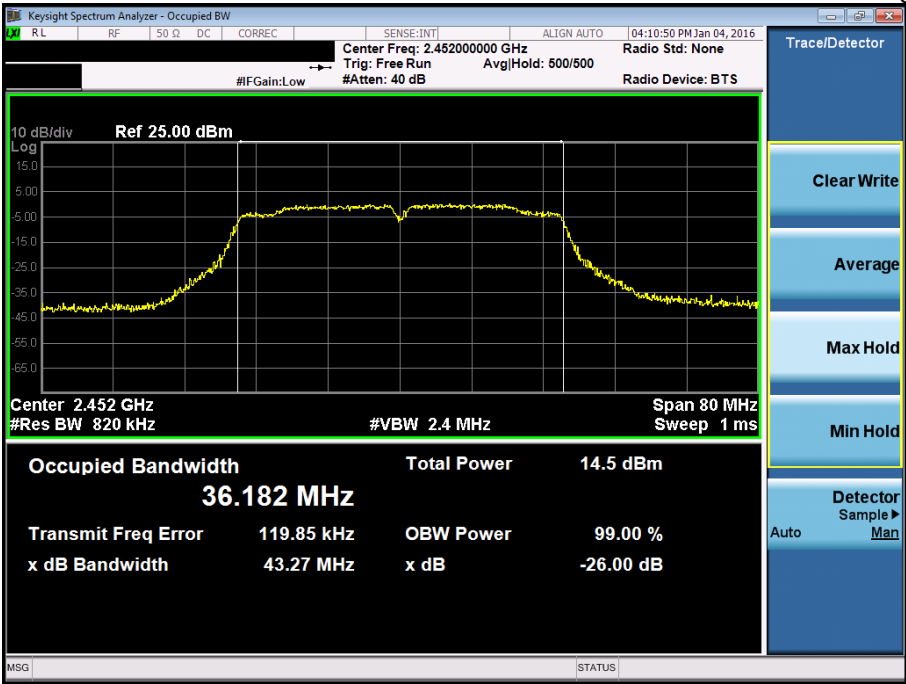
TM 6 & ANT 1 & Middle





Occupied Bandwidth

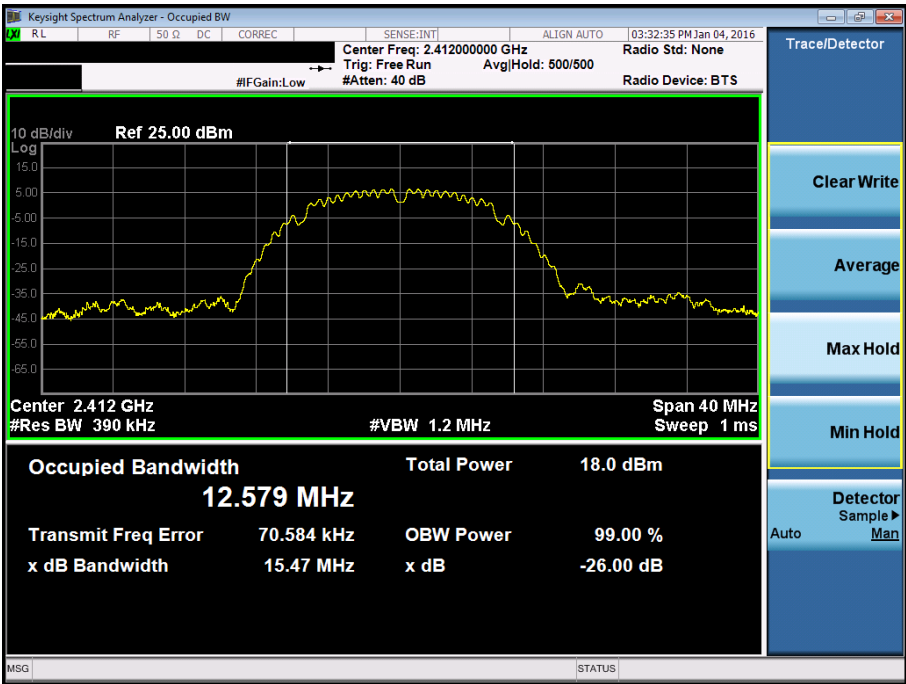
TM 6 & ANT 1 & Highest





Occupied Bandwidth

TM 1 & ANT 2 & Lowest



Occupied Bandwidth

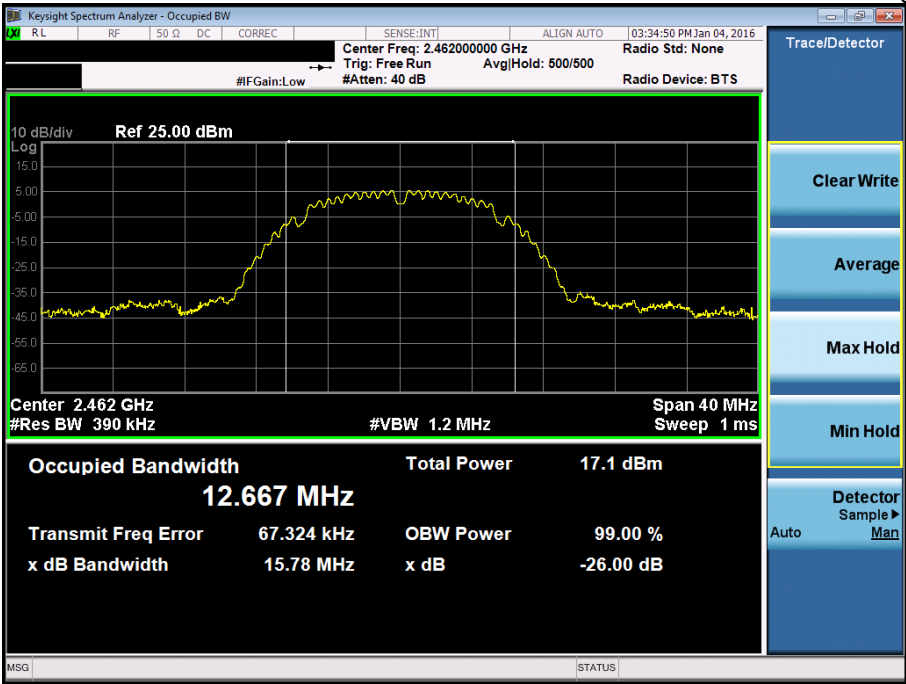
TM 1 & ANT 2 & Middle





Occupied Bandwidth

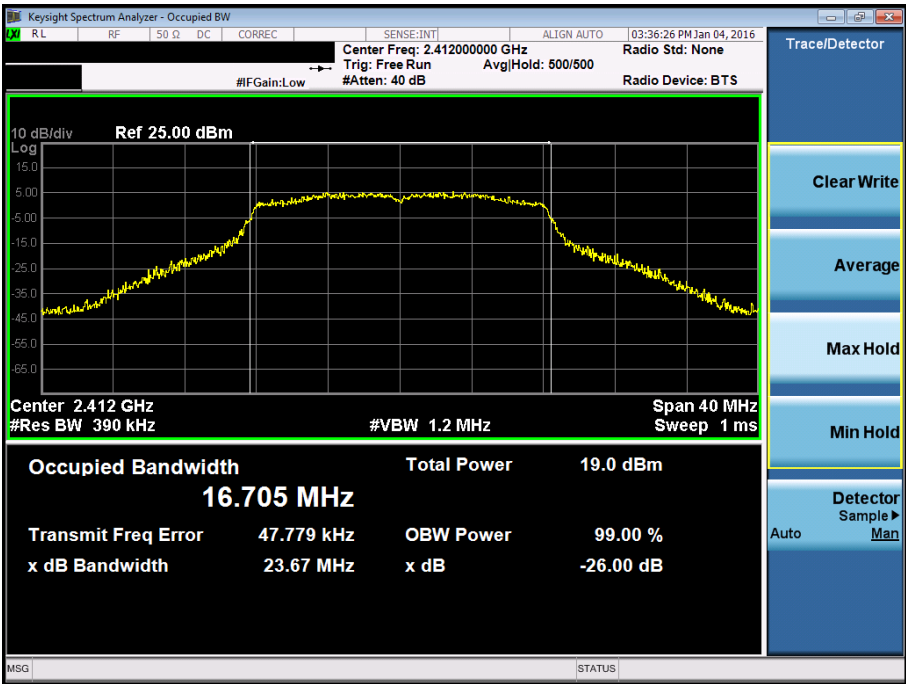
TM 1 & ANT 2 & Highest





Occupied Bandwidth

TM 2 & ANT 2 & Lowest



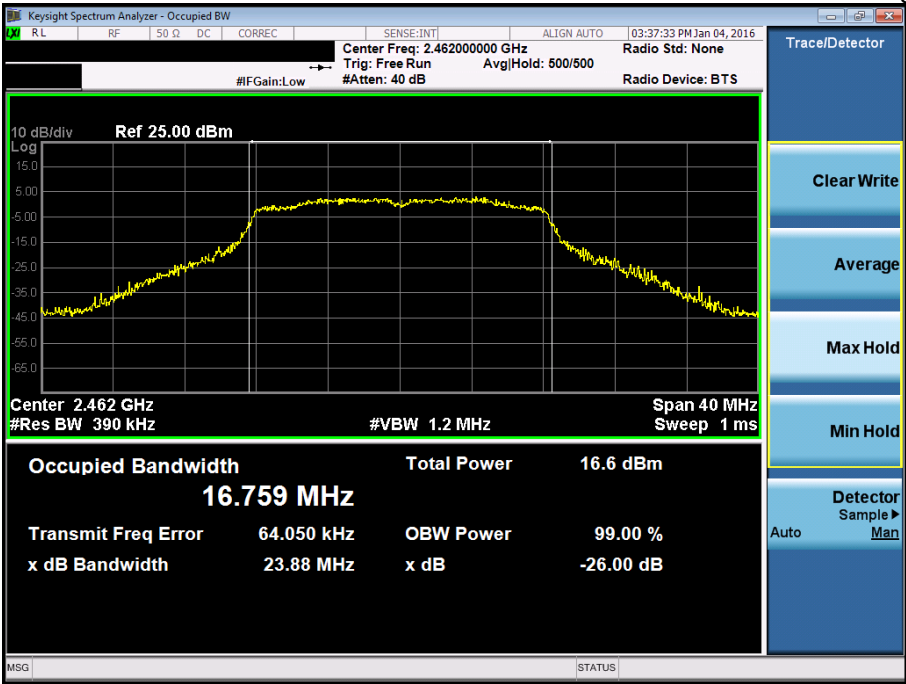
Occupied Bandwidth

TM 2 & ANT 2 & Middle





Occupied Bandwidth TM 2 & ANT 2 & Highest





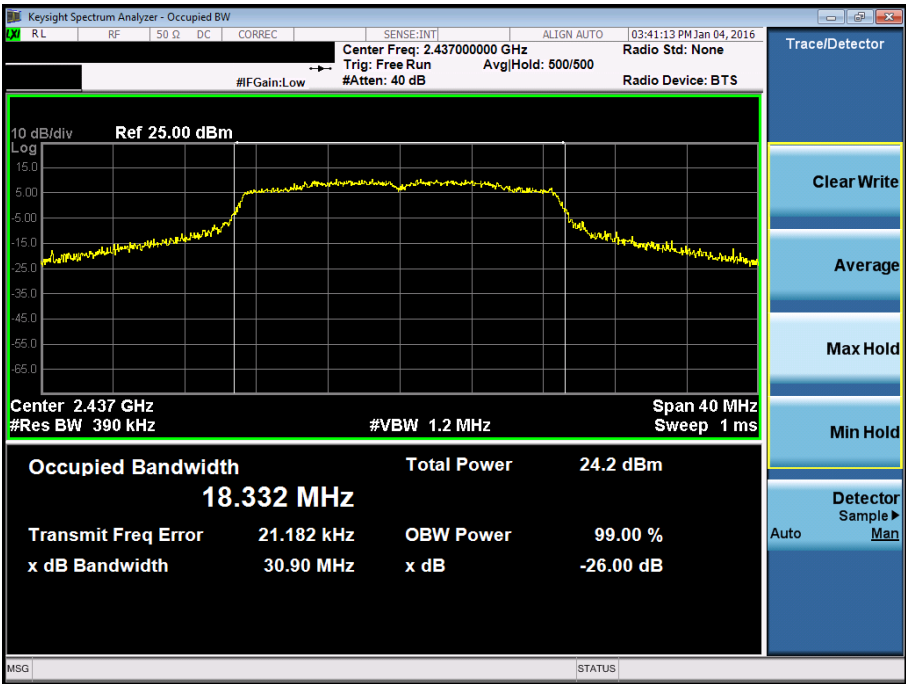
Occupied Bandwidth

TM 3 & ANT 2 & Lowest



Occupied Bandwidth

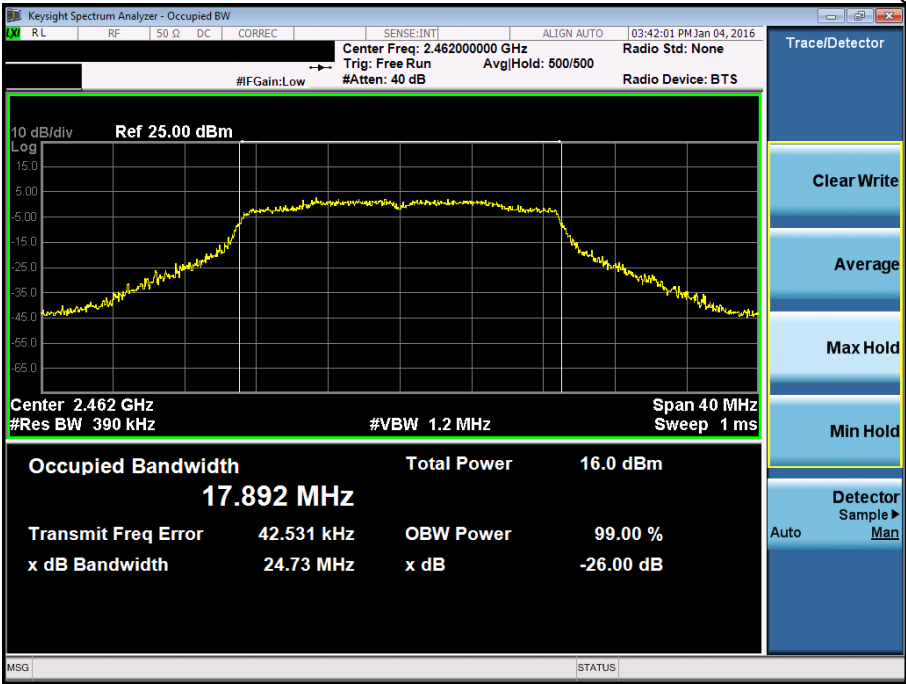
TM 3 & ANT 2 & Middle





Occupied Bandwidth

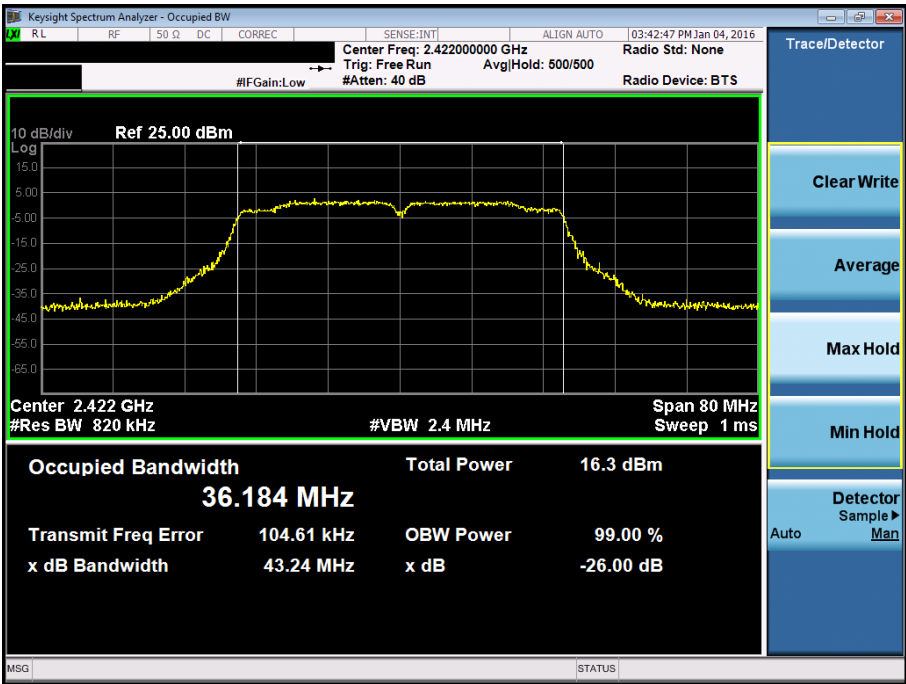
TM 3 & ANT 2 & Highest





Occupied Bandwidth

TM 4 & ANT 2 & Lowest



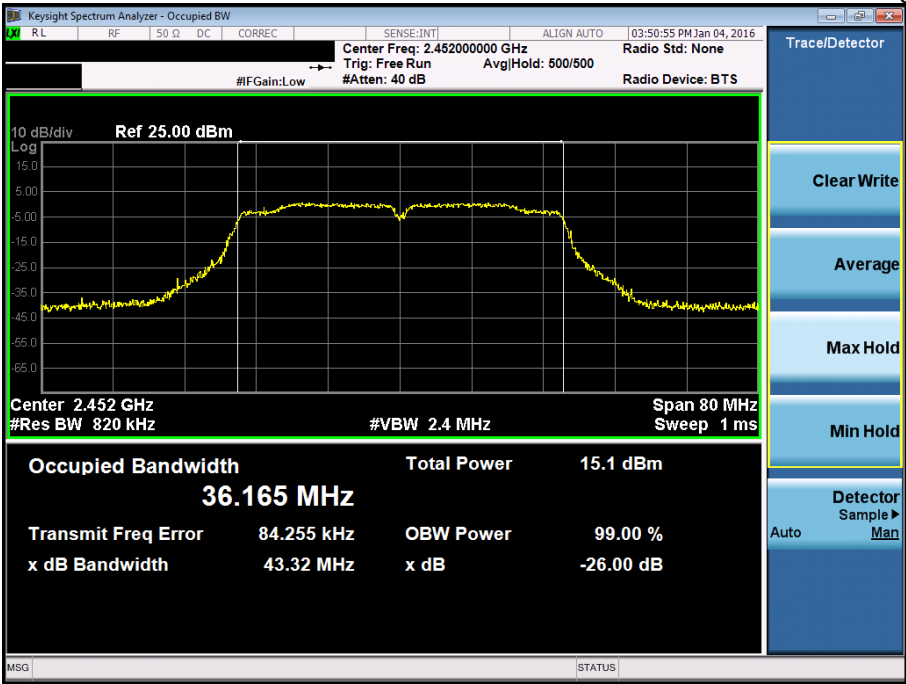
Occupied Bandwidth

TM 4 & ANT 2 & Middle





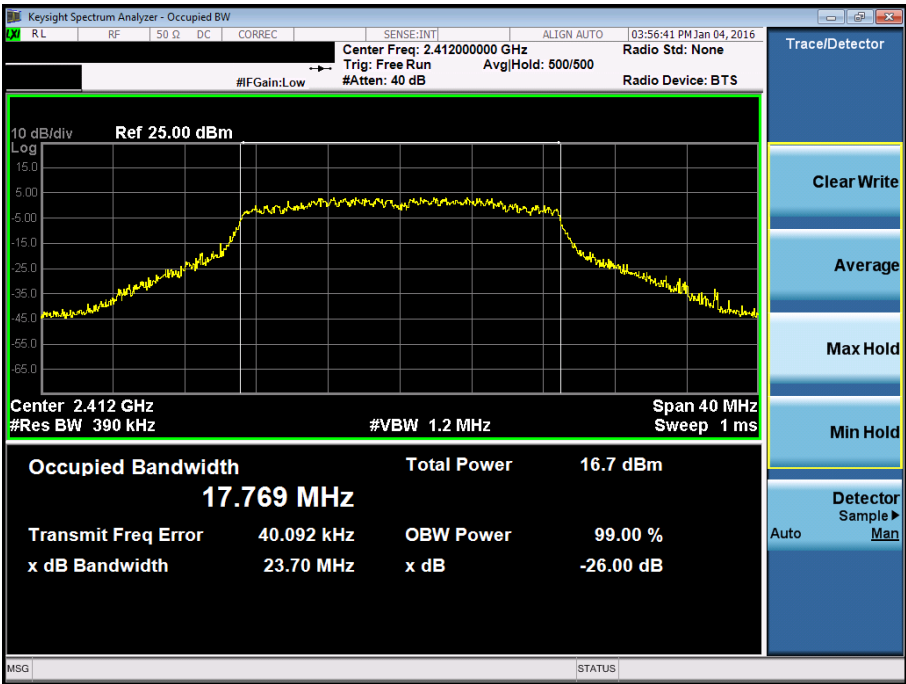
Occupied Bandwidth TM 4 & ANT 2 & Highest





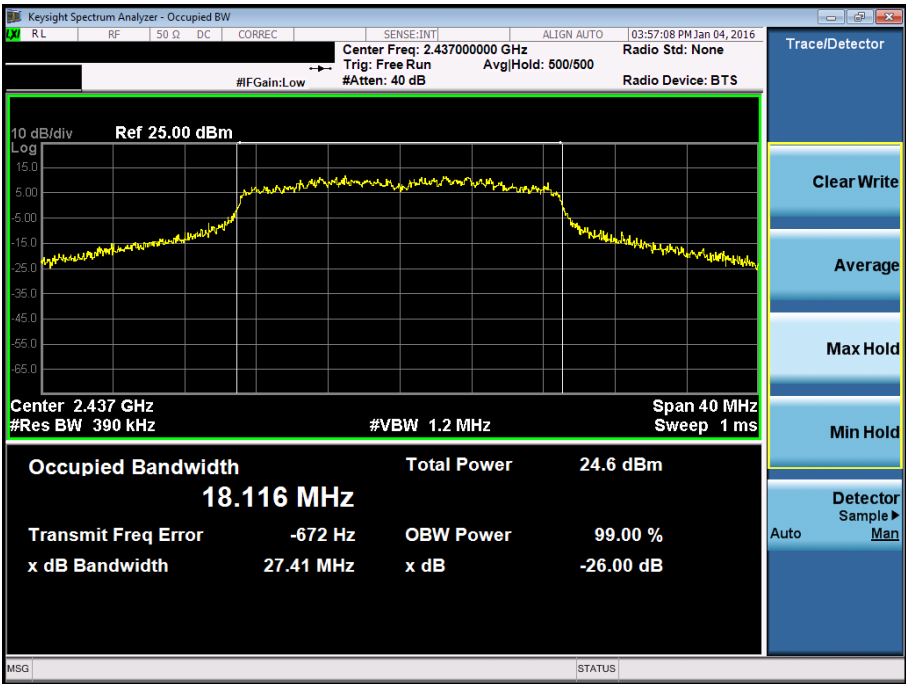
Occupied Bandwidth

TM 5 & ANT 2 & Lowest



Occupied Bandwidth

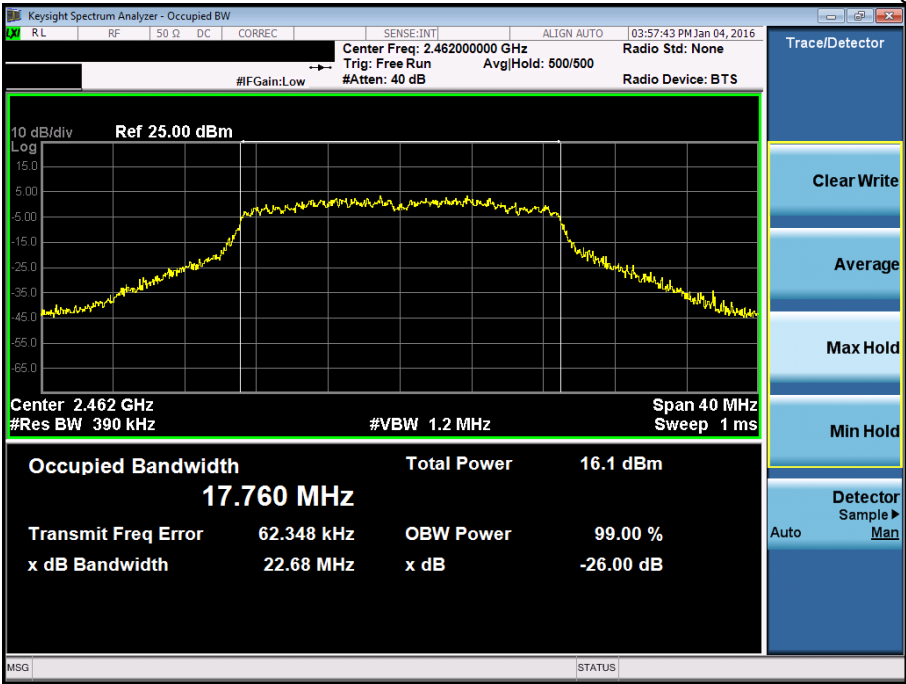
TM 5 & ANT 2 & Middle





Occupied Bandwidth

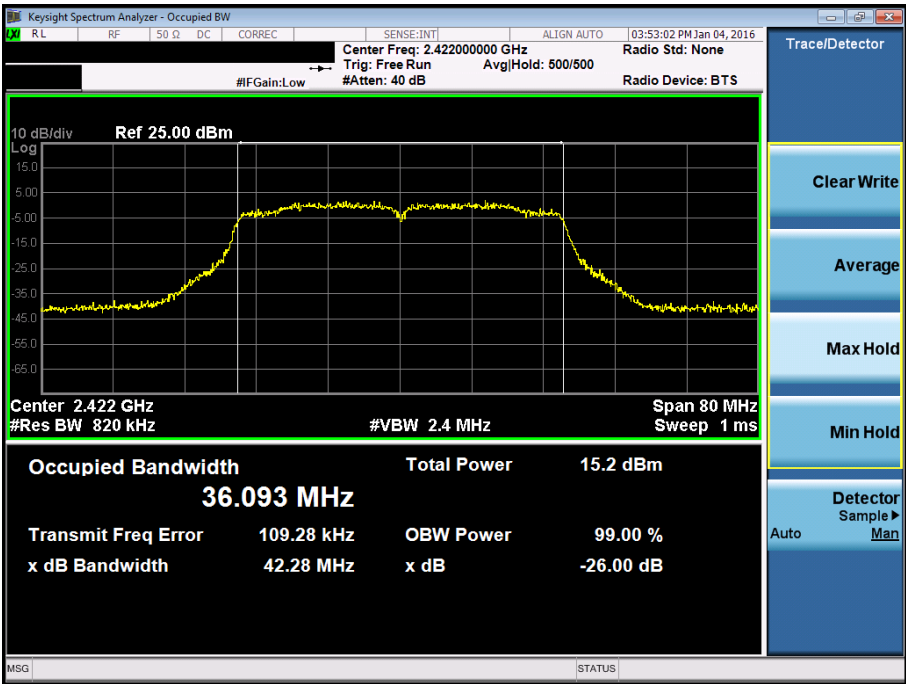
TM 5 & ANT 2 & Highest





Occupied Bandwidth

TM 6 & ANT 2 & Lowest



Occupied Bandwidth

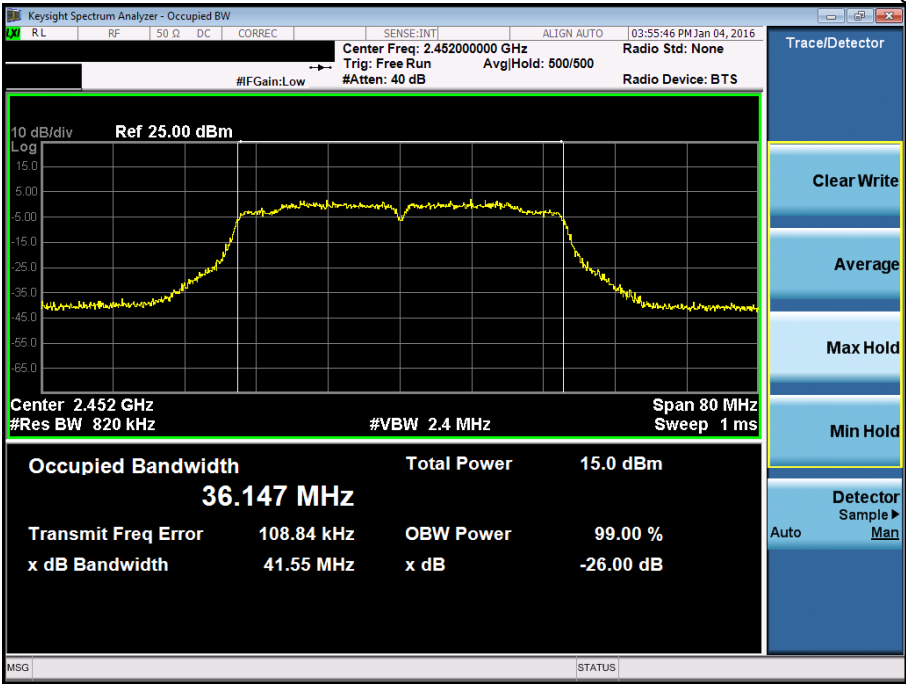
TM 6 & ANT 2 & Middle





Occupied Bandwidth

TM 6 & ANT 2 & Highest



9. LIST OF TEST EQUIPMENT

Type	Manufacturer	Model	Cal.Date (yy/mm/dd)	Next.Cal.Date (yy/mm/dd)	S/N
Spectrum Analyzer	Agilent Technologies	N9030A	15/10/19	16/10/19	MY53310140
Spectrum Analyzer	Agilent Technologies	N9020A	15/08/18	16/08/18	MY50200867
Dynamic Measurement DC Source	Agilent Technologies	66332A	15/01/22	16/01/22	US37471368
Power Meter & Wide Bandwidth Sensor	Anritsu	ML2496A / MA2411B	15/06/25	16/06/25	1338004 / 1306053
Temp & Humi Test Chamber	SJ Science	SJ-TH-S50	15/10/19	16/10/19	SJ-TH-S50-130930
Thermohygrometer	BODYCOM	BJ5478	15/02/26	16/02/26	1209
Signal Generator	Rohde Schwarz	SMF100A	15/06/29	16/06/29	102341
Vector Signal Generator	Rohde Schwarz	SMBV100A	15/01/06	16/01/06	255571
			16/01/05	17/01/05	
Digital Multimeter	Agilent Technologies	34401A	15/01/06	16/01/06	MY41037027
			16/01/05	17/01/05	
Loop Antenna	Schwarzbeck	FMZB1513	14/04/29	16/04/29	1513-128
TRILOG Broadband Test- Antenna	Schwarzbeck	VULB 9160	14/04/30	16/04/30	3358
Double-Ridged Guide Antenna	ETS-Lindgren	3117	14/05/12	16/05/12	140394
Horn Antenna	A.H.Systems Inc.	SAS-574	15/04/30	17/04/30	154
Highpass Filter	Wainwright Instruments	WHKX12-2580- 3000-18000-80SS	15/09/23	16/09/23	3
PreAmplifier	TSJ	MLA-010K01-B01- 27	15/04/09	16/04/09	1844539
PreAmplifier	Agilent	8449B	15/02/26	16/02/26	3008A00370
EMI Test Receiver	Rohde Schwarz	DSR7	15/10/19	16/10/19	101109
EMI Test Receiver	Rohde Schwarz	ESCI	15/02/25	16/02/25	100364
Single-Phase Master	NF	4420	15/09/09	16/09/09	3.04935E+12
Artificial Mains Network	Narda S.T.S. / PMM	PMM L2-16B	15/06/26	16/06/26	000WX20305

APPENDIX I

Duty cycle information

■ Test Procedure

Duty cycle measured using **section 6.0 b) of KDB 558074 D01 DTS Meas. Guidance v03r2** :

The zero-span mode on a spectrum analyzer or EMI receiver if the response time and spacing between bins on the sweep are sufficient to permit accurate measurements of the on and off times of the transmitted signal.

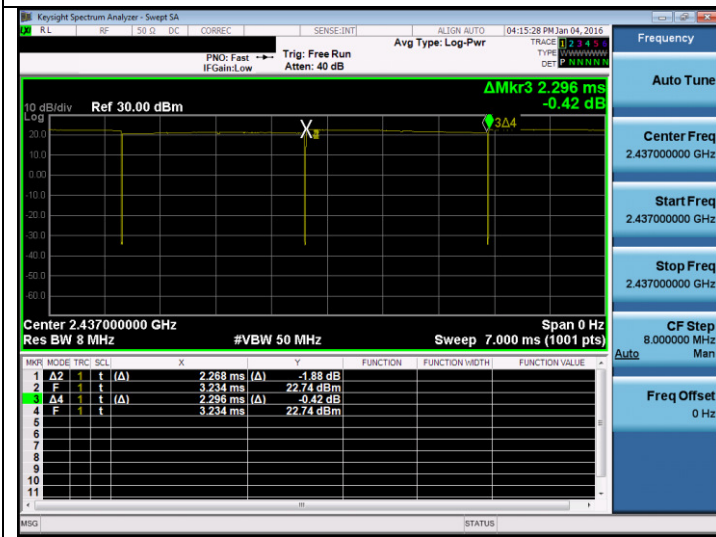
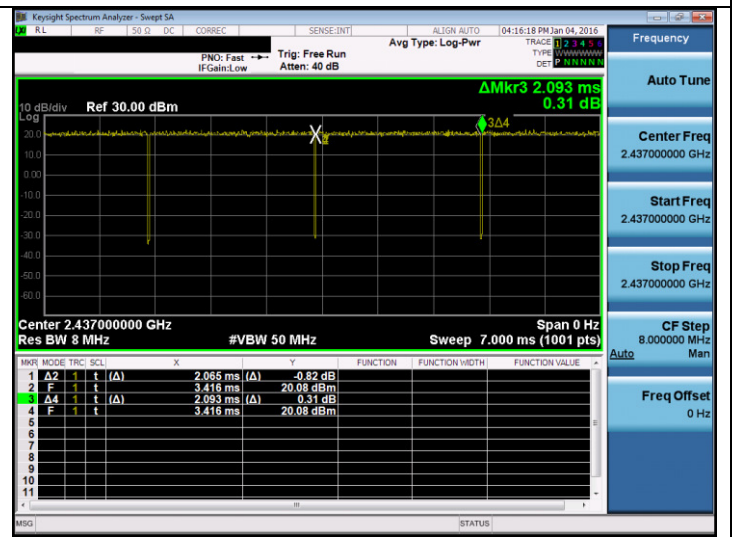
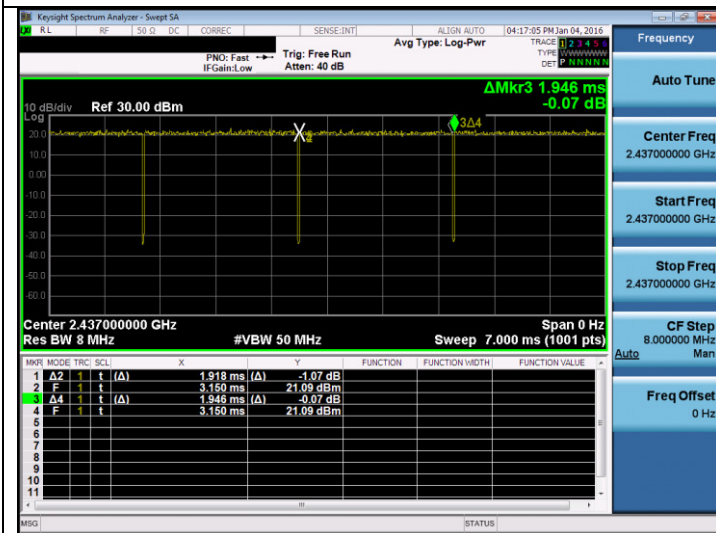
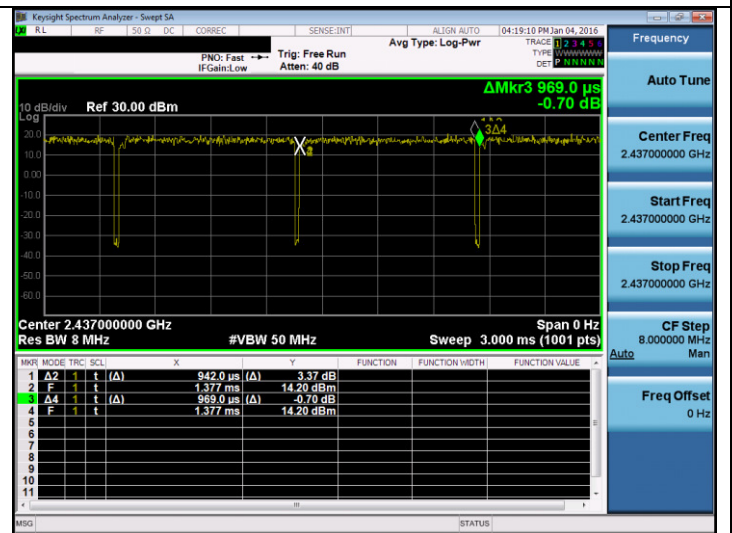
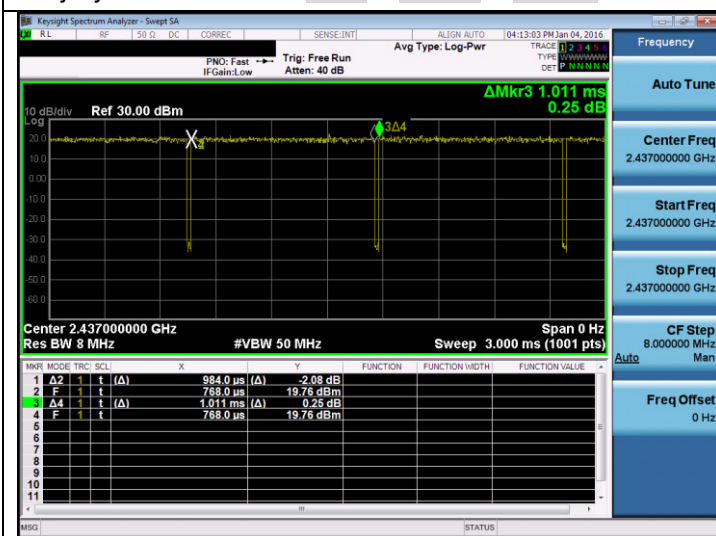
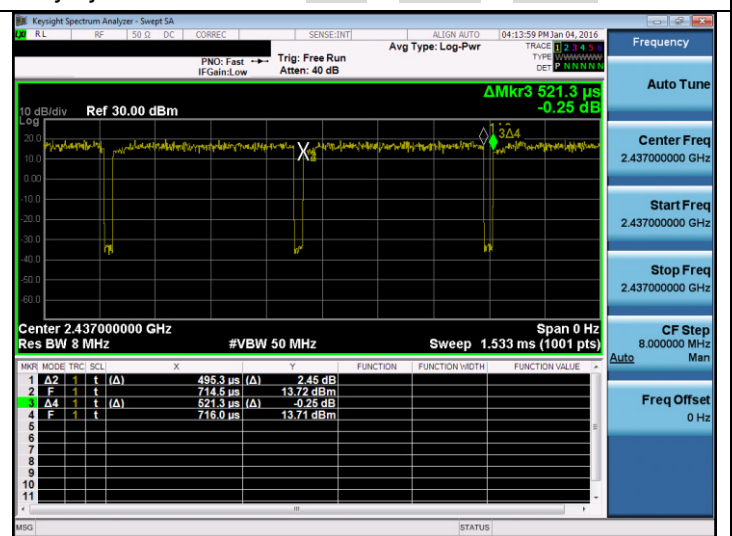
Set the center frequency of the instrument to the center frequency of the transmission. Set $RBW \geq OBW$ if possible; otherwise, set RBW to the largest available value. Set $VBW \geq RBW$. Set detector = peak or average.

The zero-span measurement method shall not be used unless both RBW and VBW are $> 50/T$ and the number of sweep points across duration T exceeds 100. (For example, if VBW and/or RBW are limited to 3 MHz, then the zero-span method of measuring duty cycle shall not be used if $T \leq 16.7$ microseconds.)

■ Test Data

Test Mode	Date rate	Tested frequency	T _{ON} (ms)	T _{ON+OFF} (ms)	Duty Cycle (%)	Duty Cycle Correction Factor(dB)
TM 1	1 Mbps	Middle	2.268	2.296	98.78	0.05
TM 2	6 Mbps	Middle	2.065	2.093	98.66	0.06
TM 3	MCS 0	Middle	1.918	1.946	98.56	0.06
TM 4	MCS 0	Middle	0.942	0.969	97.21	0.12
TM 5	MCS 8	Middle	0.984	1.011	97.33	0.12
TM 6	MCS 8	Middle	0.495	0.521	95.01	0.23

Result Plots

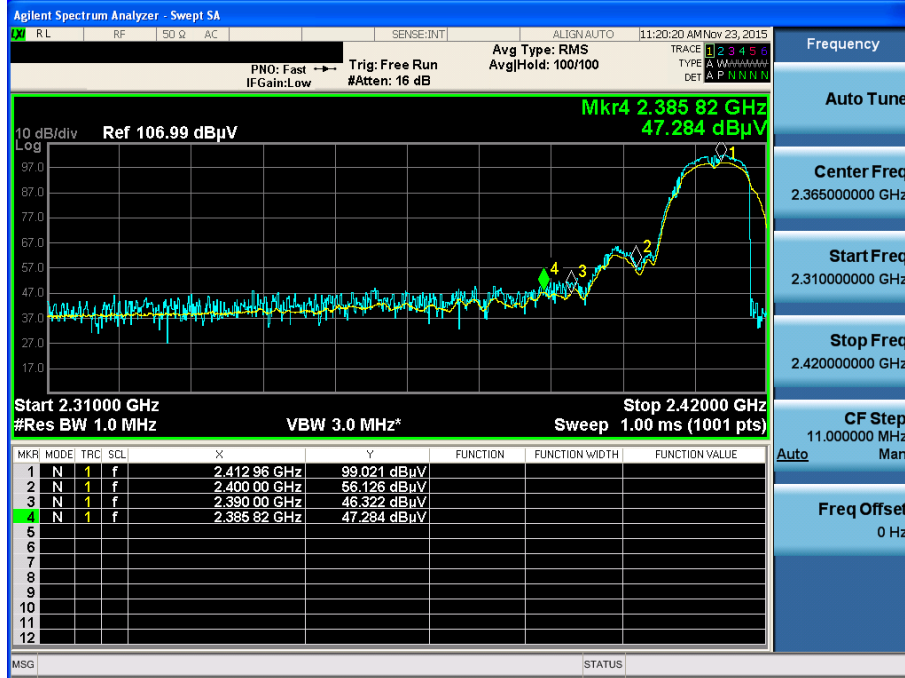
Duty cycle data : **TM 1 & 1 Mbps & Middle**Duty cycle data : **TM 2 & 6 Mbps & Middle**Duty cycle data : **TM 3 & MCS 0 & Middle**Duty cycle data : **TM 4 & MCS 0 & Middle**Duty cycle data : **TM 5 & MCS 8 & Middle**Duty cycle data : **TM 6 & MCS 8 & Middle**

APPENDIX II

Unwanted Emissions (Radiated) Test Plot

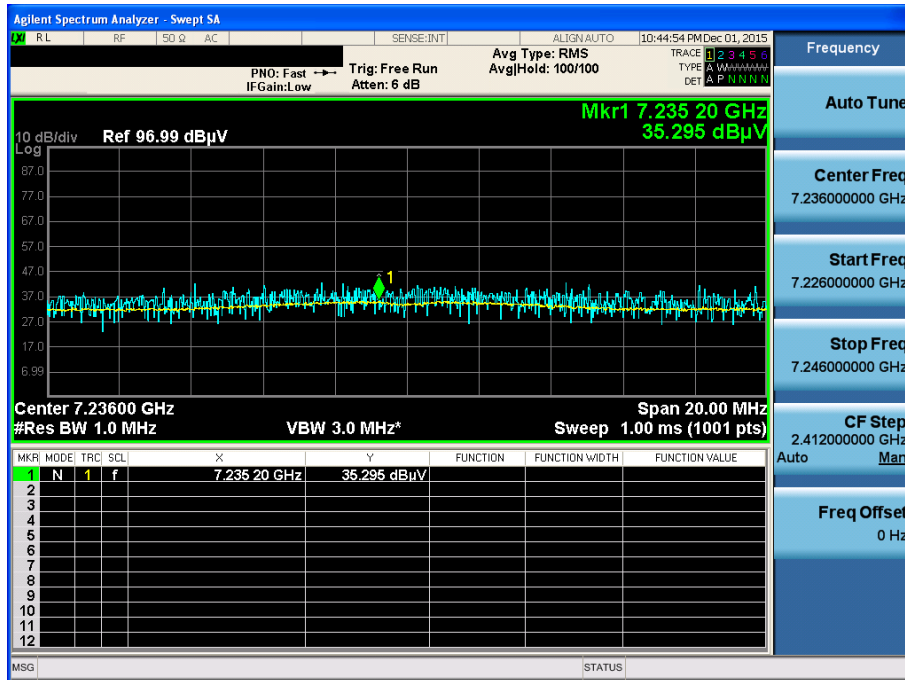
TM 1 & Lowest & Y axis & Hor & ANT 1

Detector Mode : AV



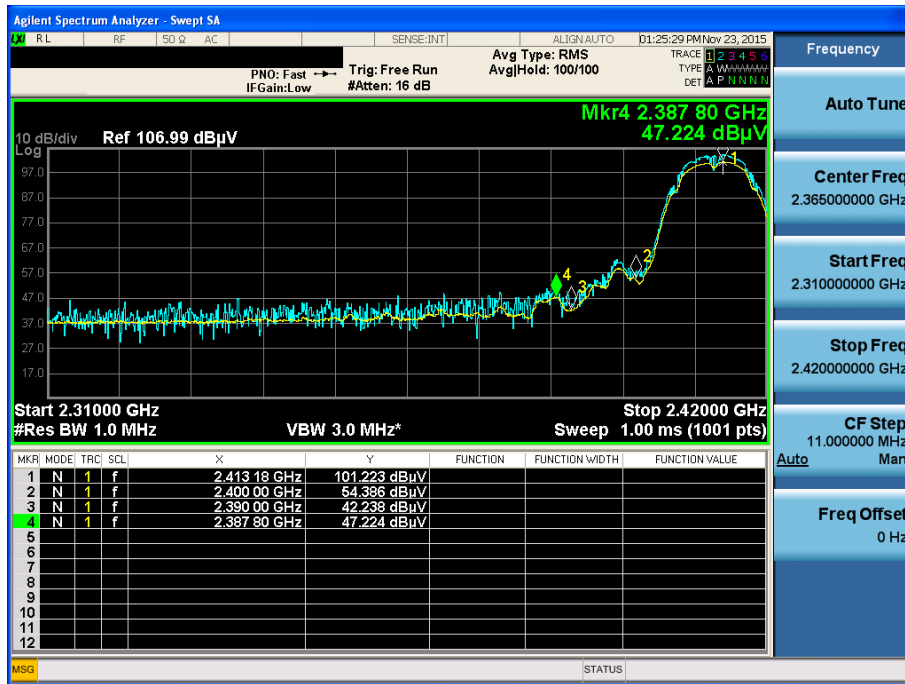
TM 1 & Lowest & Y axis & Hor & ANT 1

Detector Mode : AV



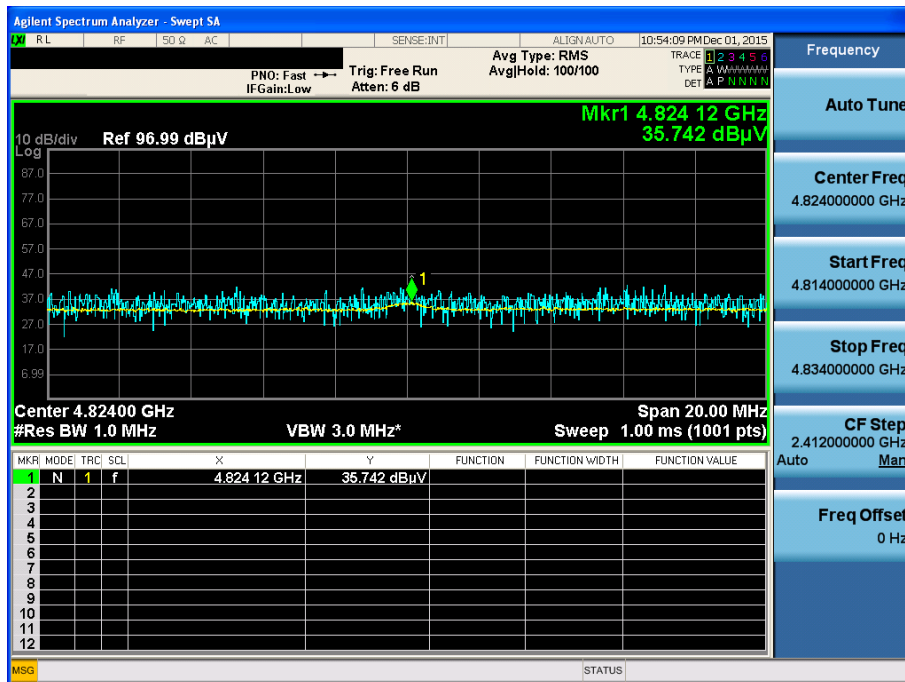
TM 1 & Lowest & Y axis & Hor & ANT 2

Detector Mode : AV



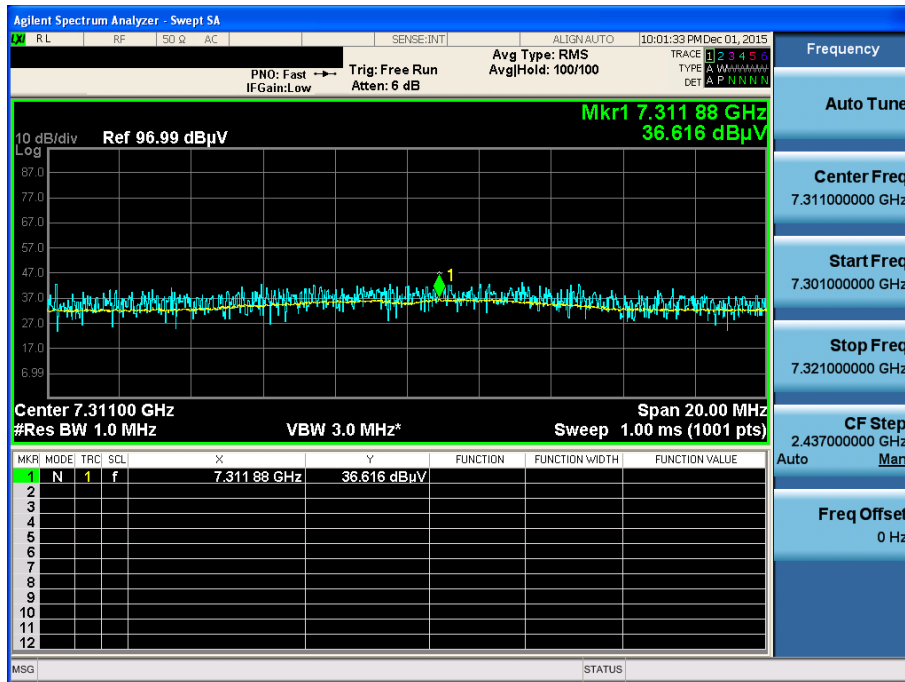
TM 1 & Lowest & Y axis & Hor & ANT 2

Detector Mode : AV



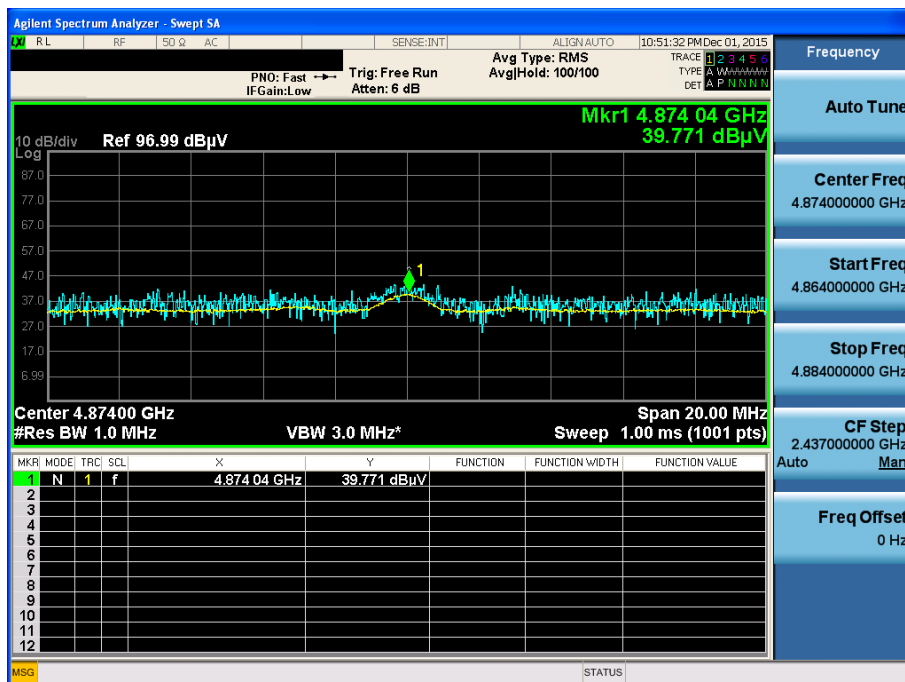
TM 1 & Middle & Y axis & Hor & ANT 1

Detector Mode : AV



TM 1 & Middle & Y axis & Hor & ANT 2

Detector Mode : AV



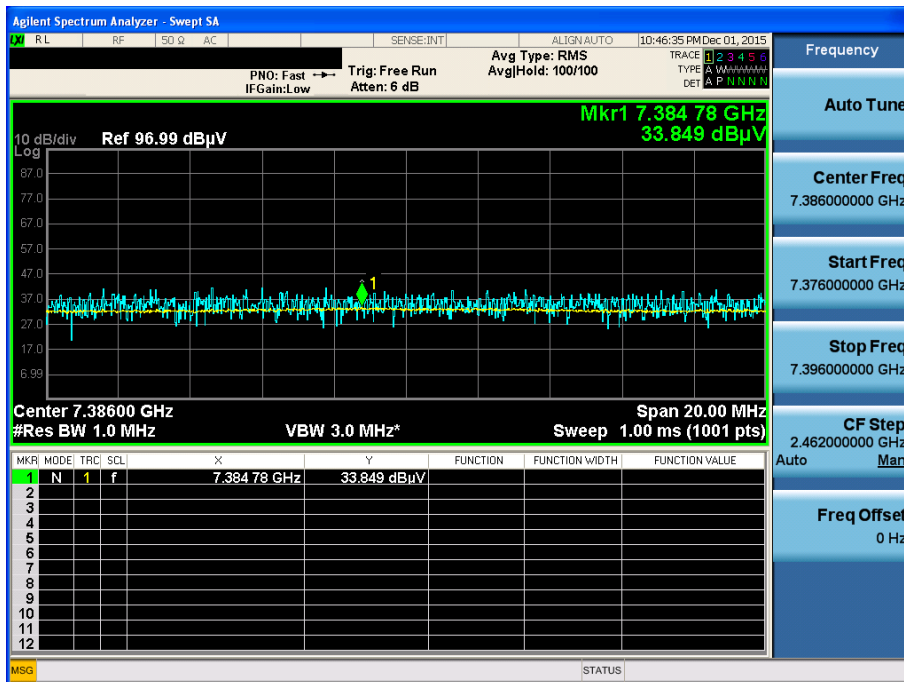
TM 1 & Highest & Y axis & Hor & ANT 1

Detector Mode : AV



TM 1 & Highest & Y axis & Hor & ANT 1

Detector Mode : AV



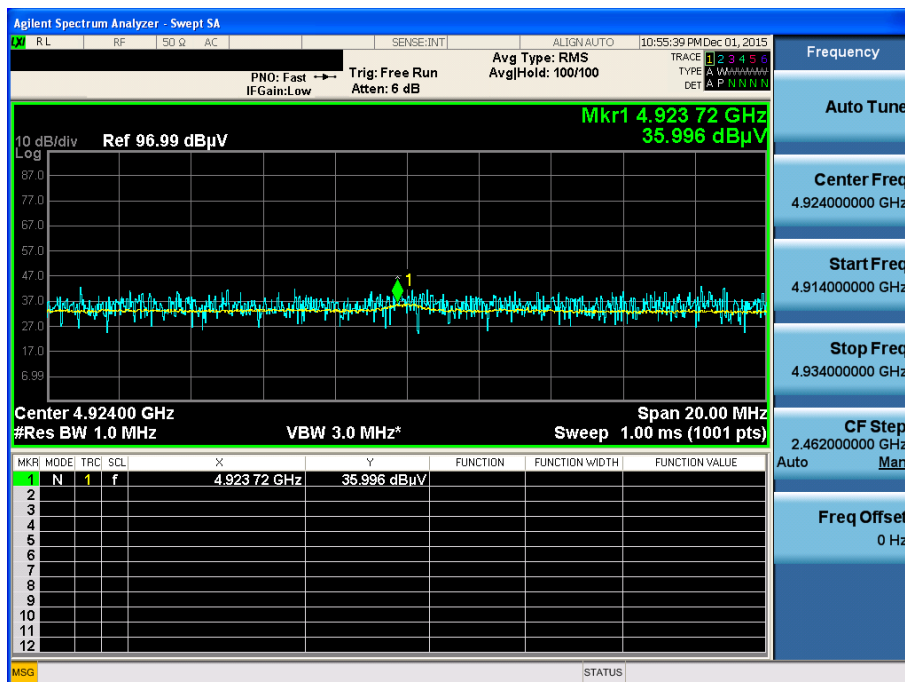
TM 1 & Highest & Y axis & Hor & ANT 2

Detector Mode : AV



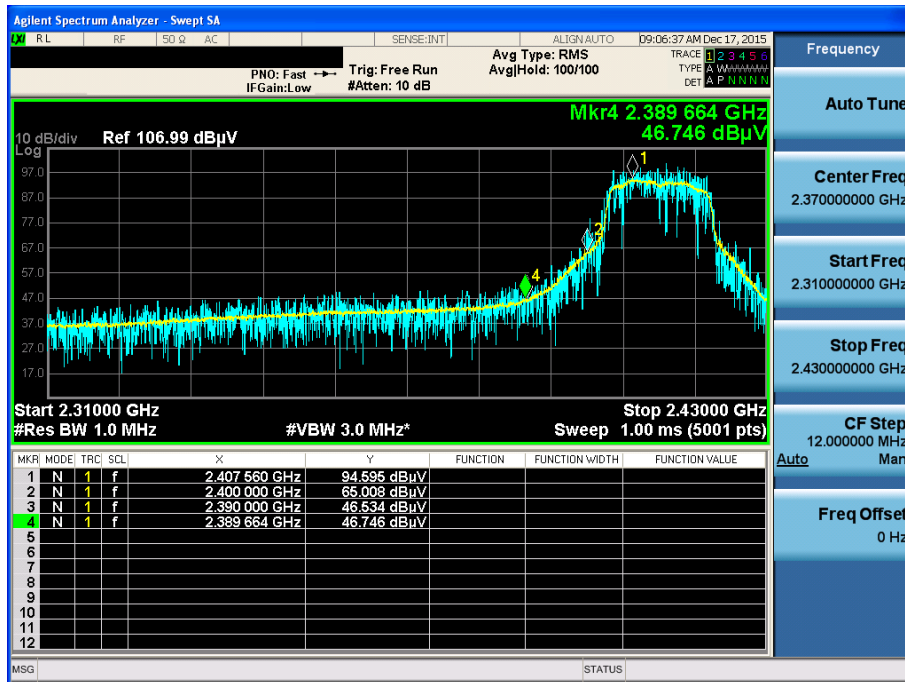
TM 1 & Highest & Y axis & Hor & ANT 2

Detector Mode : AV



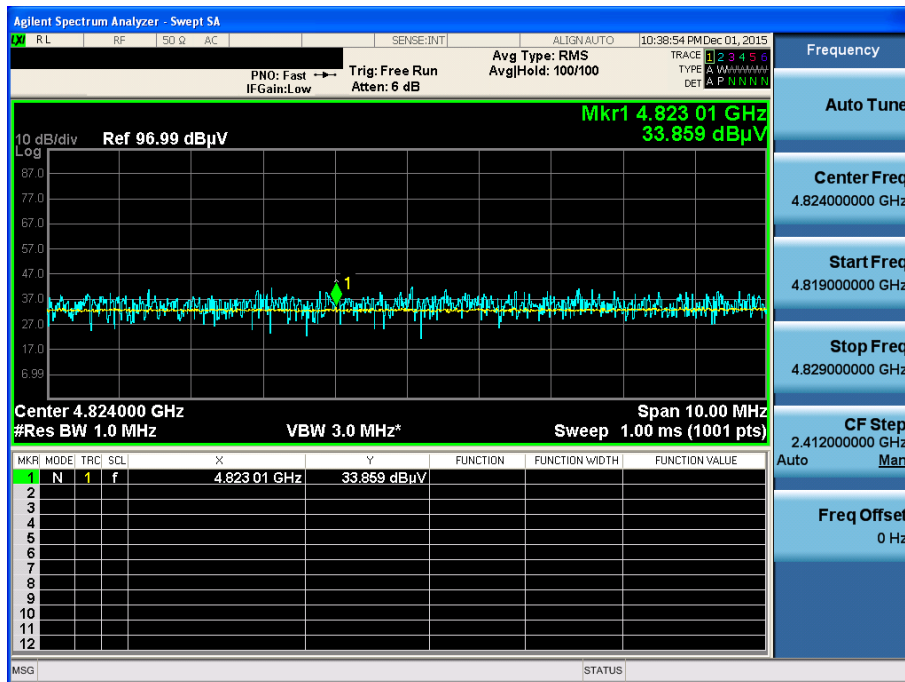
TM 2 & Lowest & Y axis & Hor & ANT 1

Detector Mode : AV



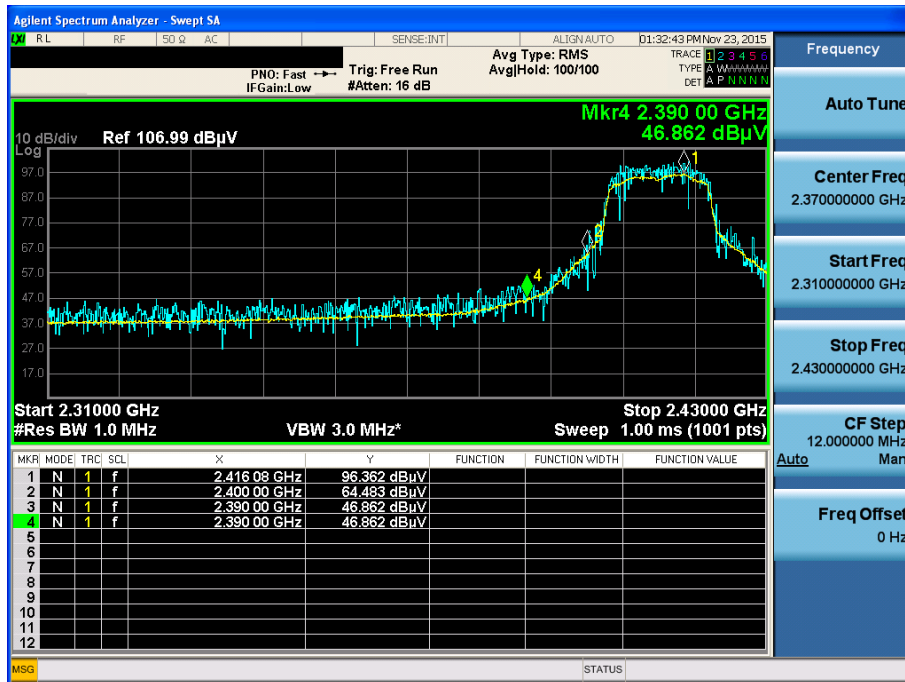
TM 2 & Lowest & Y axis & Hor & ANT 1

Detector Mode : AV



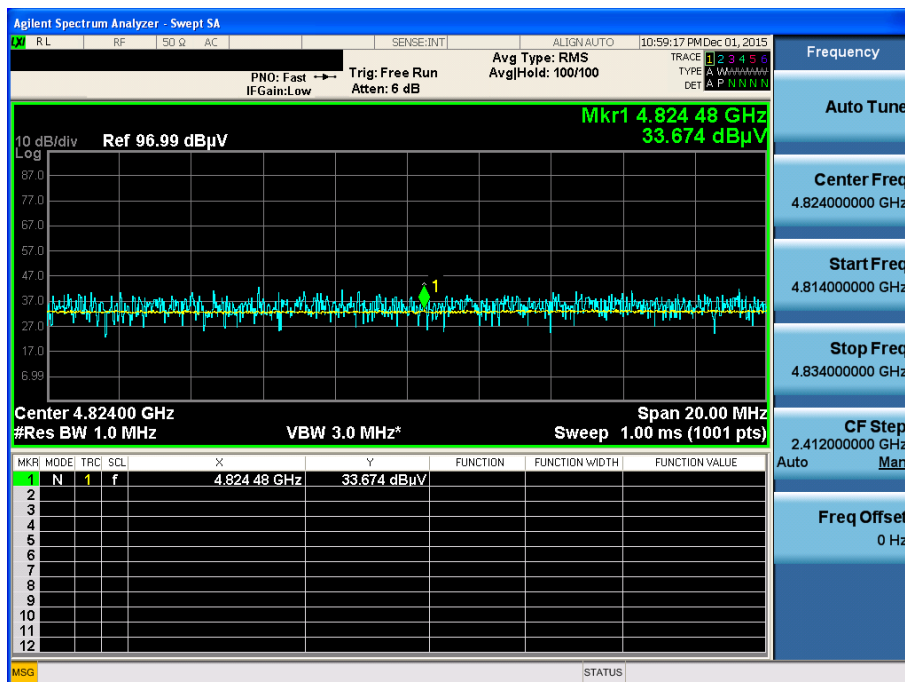
TM 2 & Lowest & Y axis & Hor & ANT 2

Detector Mode : AV



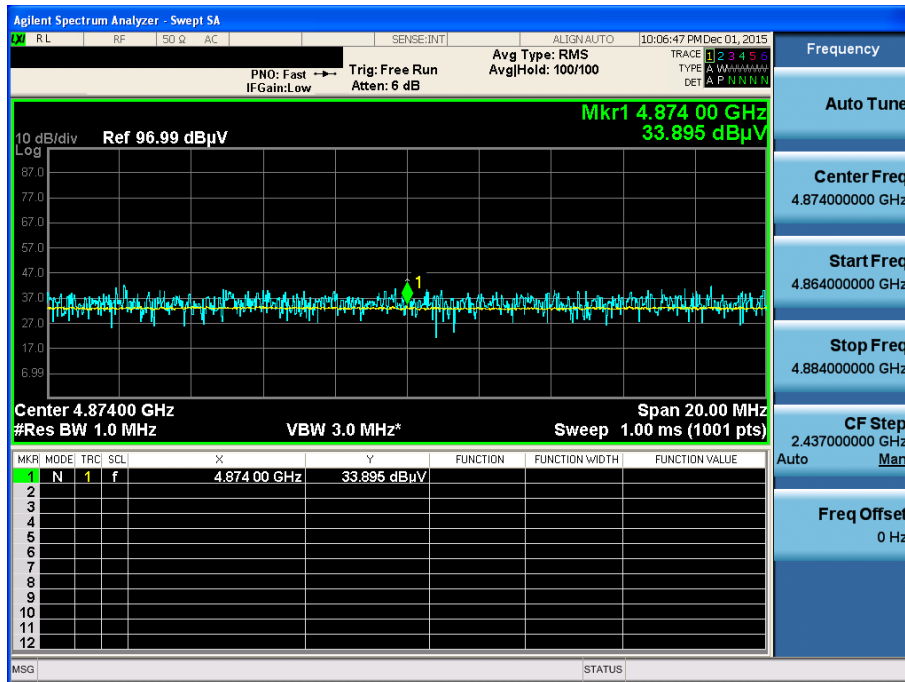
TM 2 & Lowest & Y axis & Hor & ANT 2

Detector Mode : AV



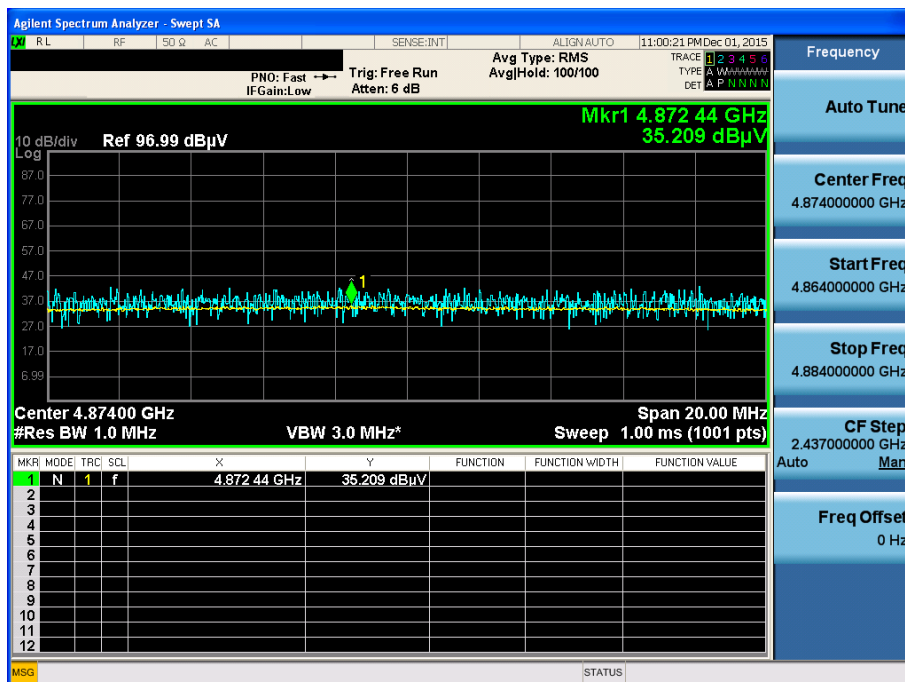
TM 2 & Middle & Y axis & Hor & ANT 1

Detector Mode : AV



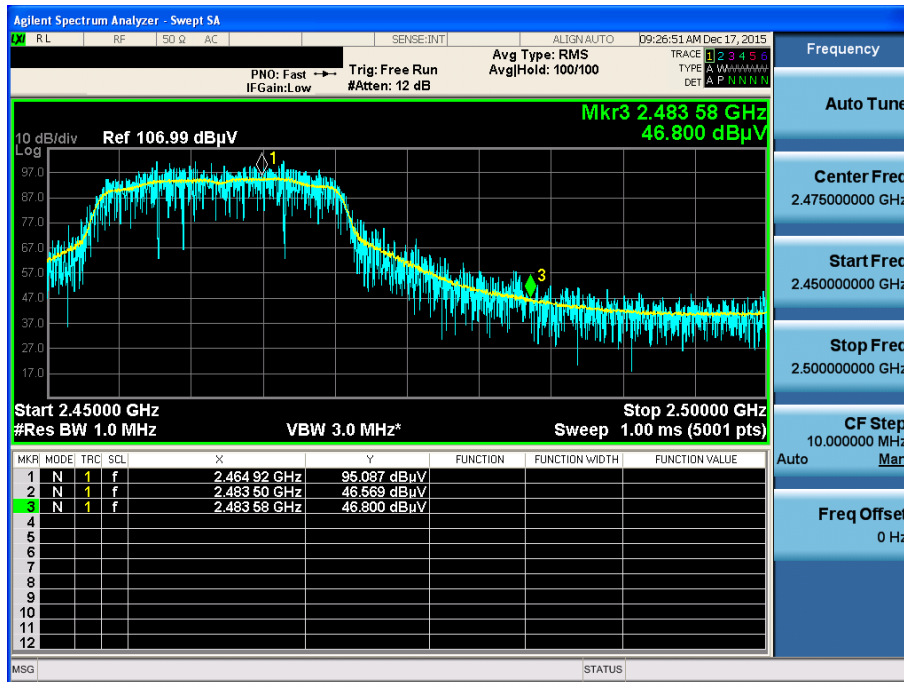
TM 2 & Middle & Y axis & Hor & ANT 2

Detector Mode : AV



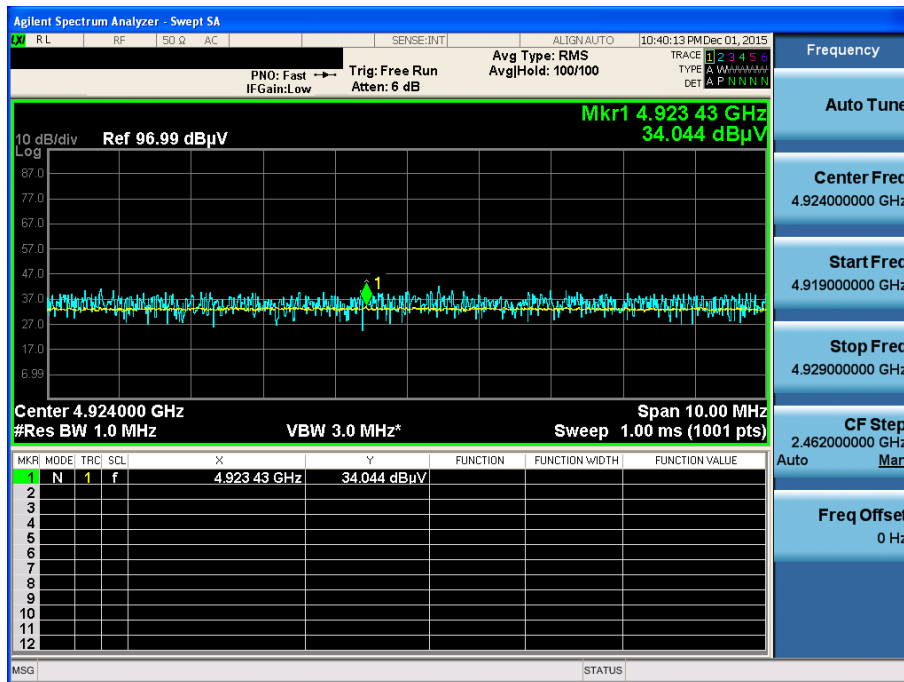
TM 2 & Highest & Y axis & Hor & ANT 1

Detector Mode : AV



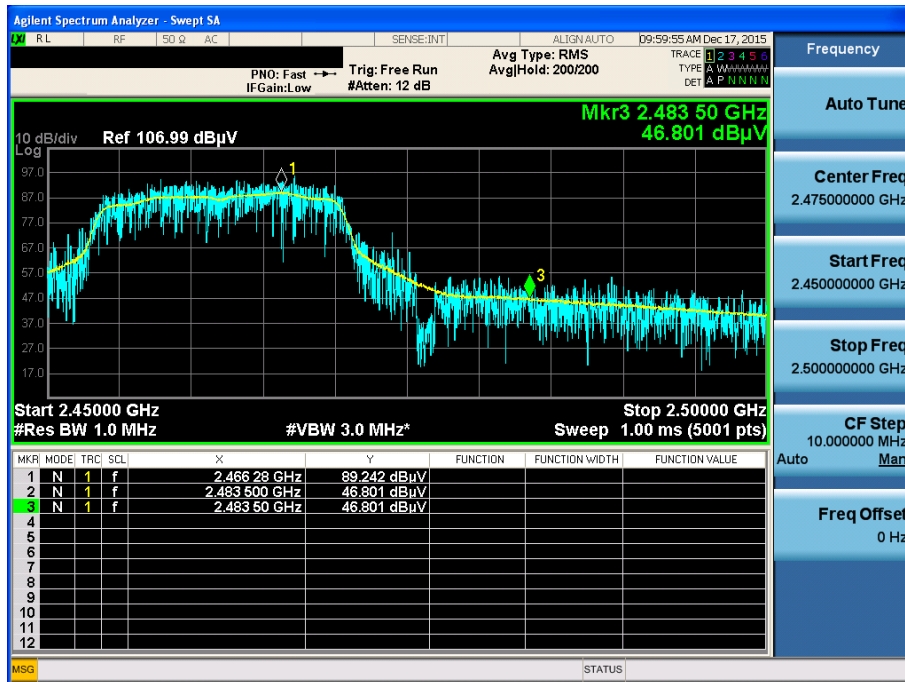
TM 2 & Highest & Y axis & Hor & ANT 1

Detector Mode : AV



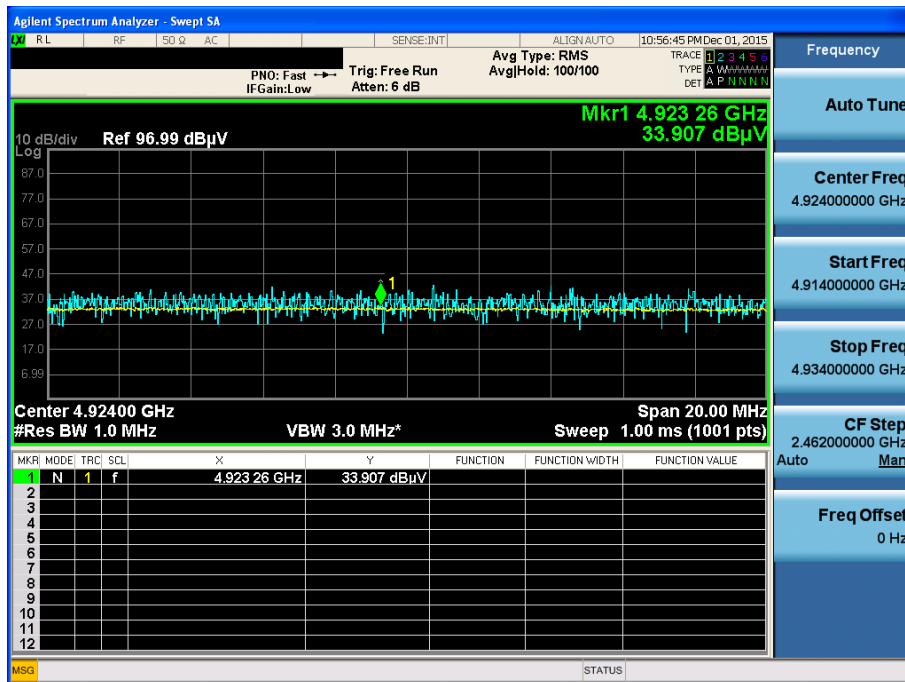
TM 2 & Highest & Y axis & Hor & ANT 2

Detector Mode : AV



TM 2 & Highest & Y axis & Hor & ANT 2

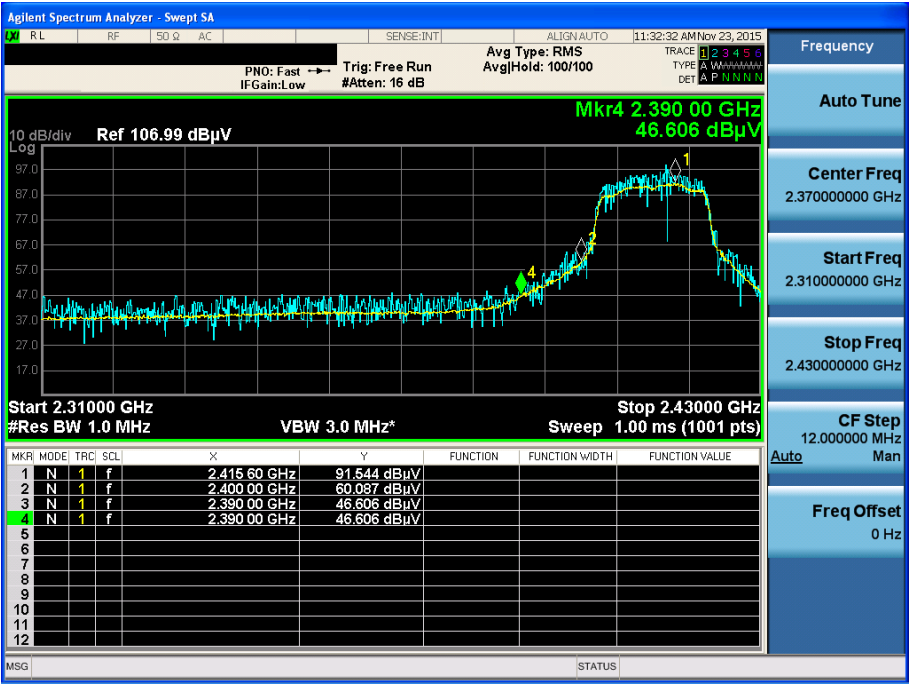
Detector Mode : AV





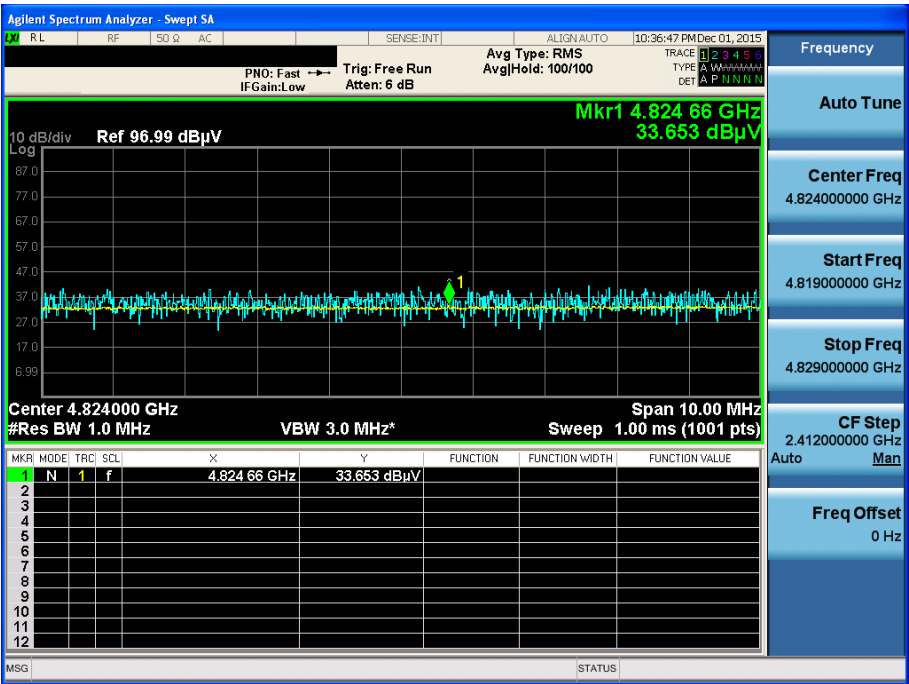
TM 3 & Lowest & Y axis & Hor & ANT 1

Detector Mode : AV



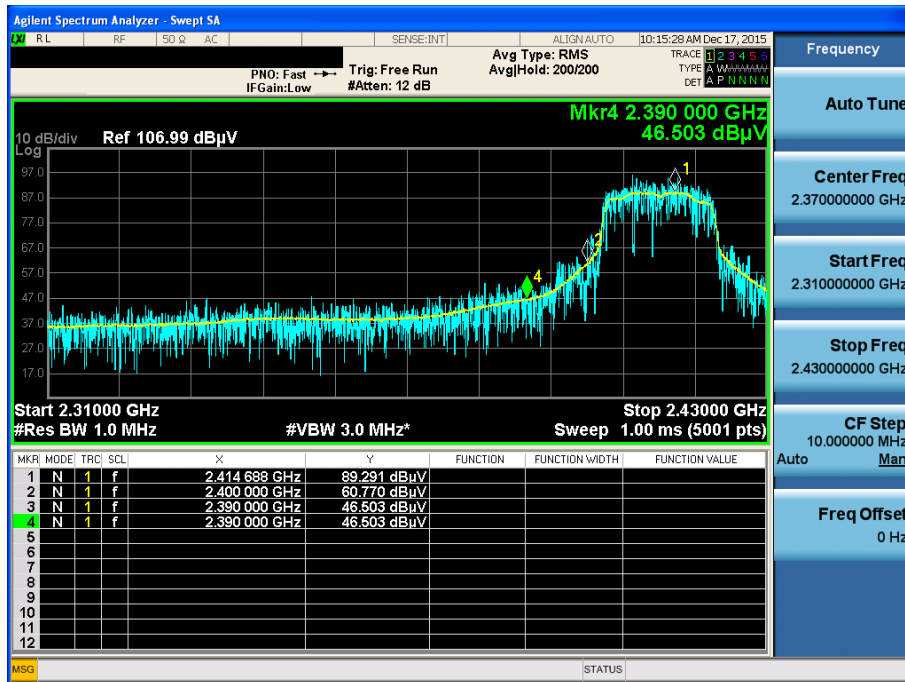
TM 3 & Lowest & Y axis & Hor & ANT 1

Detector Mode : AV



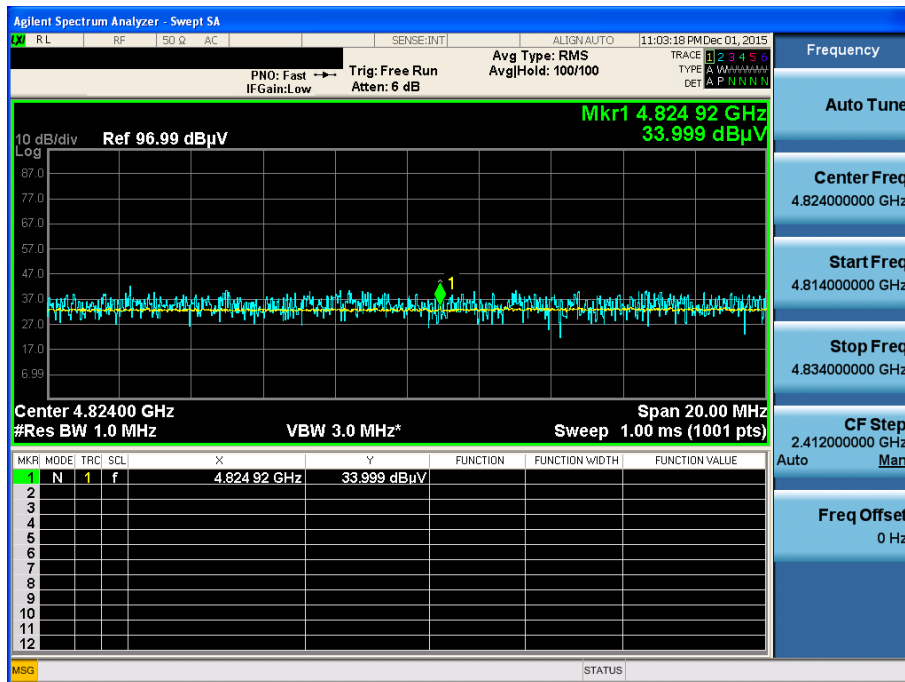
TM 3 & Lowest & Y axis & Hor & ANT 2

Detector Mode : AV



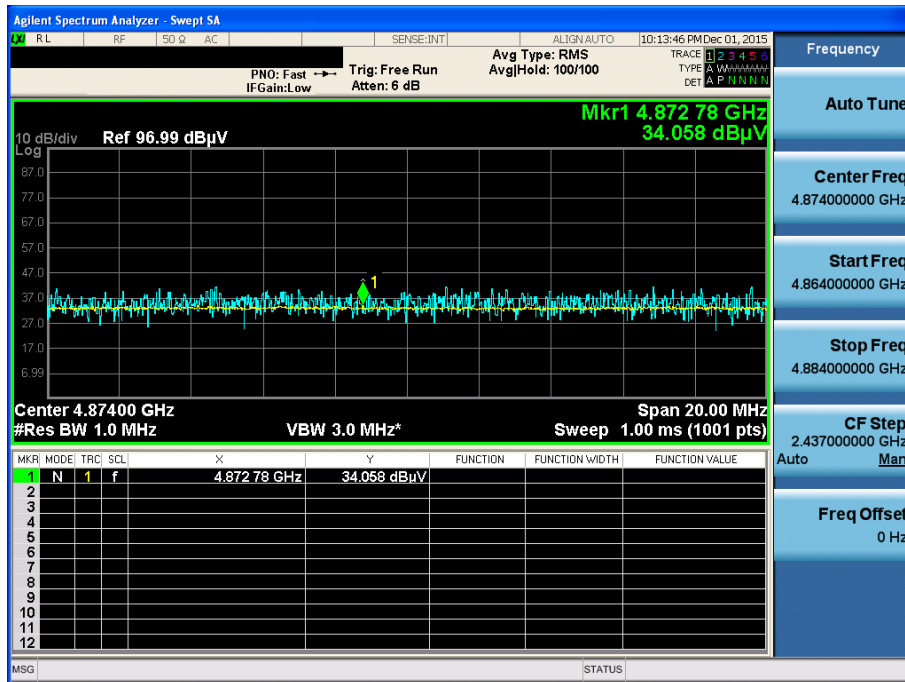
TM 3 & Lowest & Y axis & Hor & ANT 2

Detector Mode : AV



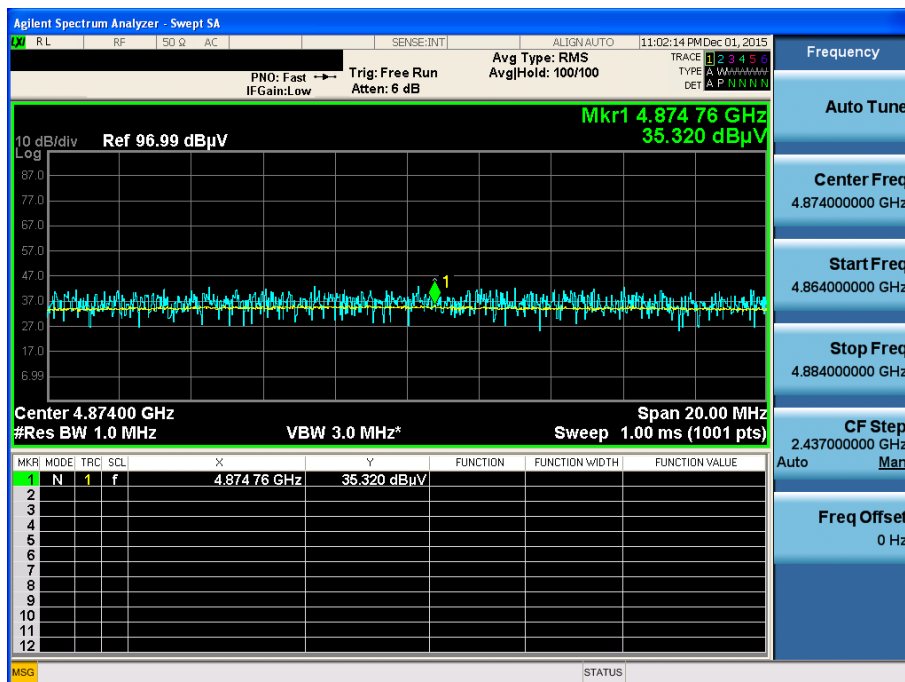
TM 3 & Middle & Y axis & Hor & ANT 1

Detector Mode : AV



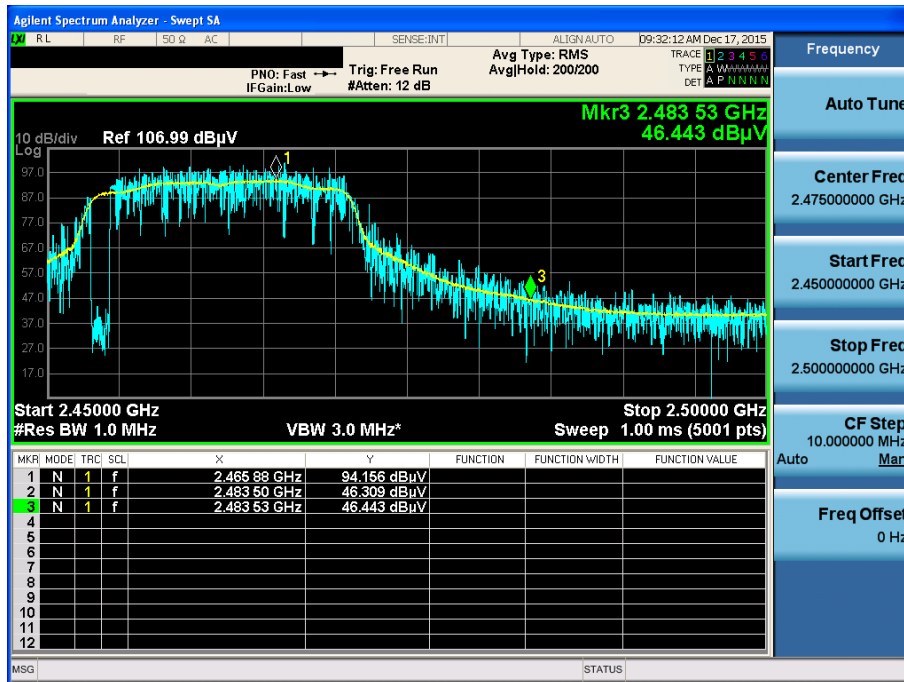
TM 3 & Middle & Y axis & Hor & ANT 2

Detector Mode : AV



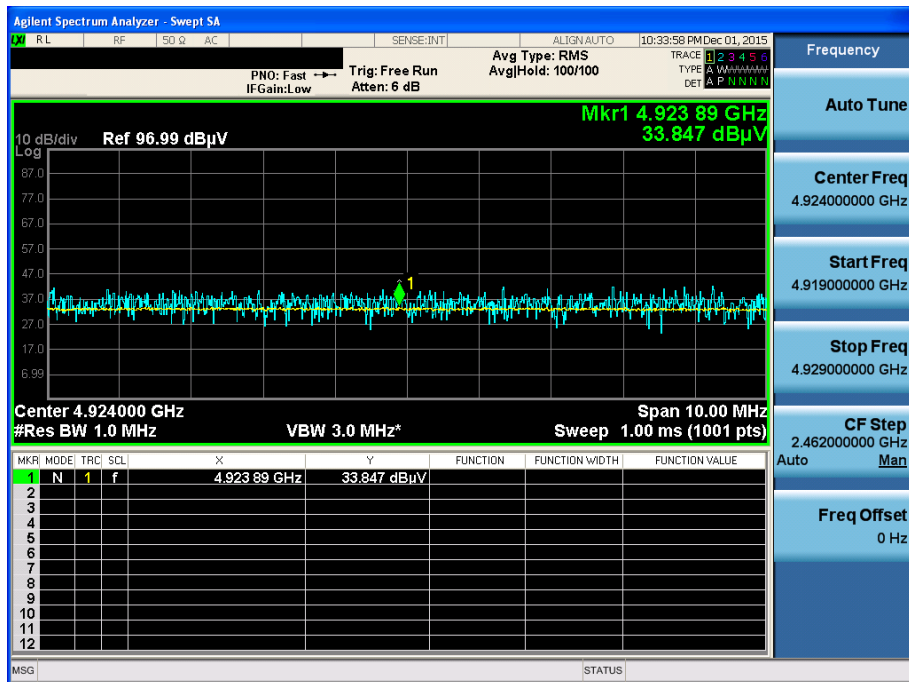
TM 3 & Highest & Y axis & Hor & ANT 1

Detector Mode : AV



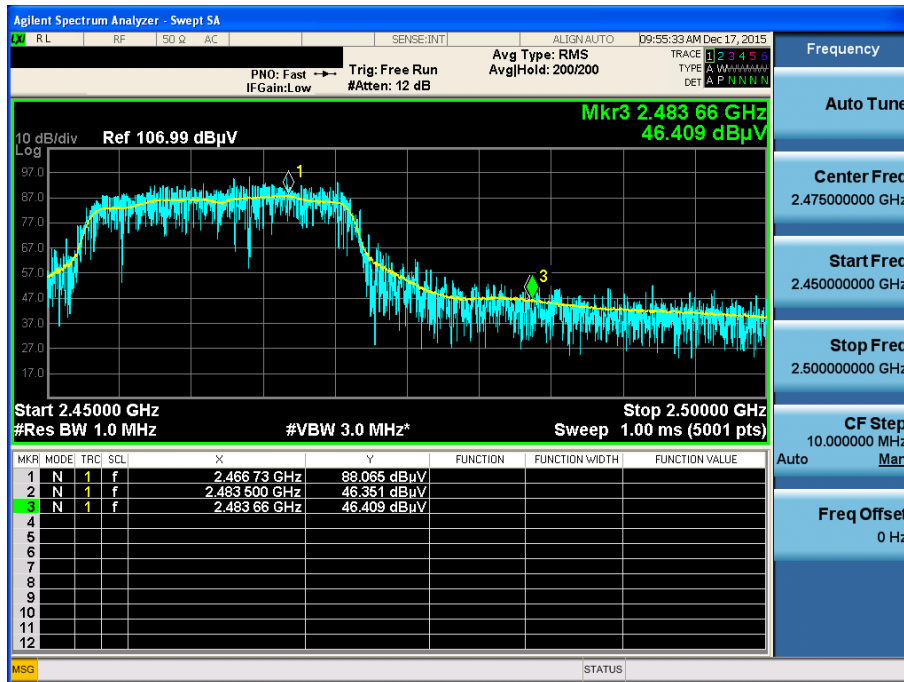
TM 3 & Highest & Y axis & Hor & ANT 1

Detector Mode : AV



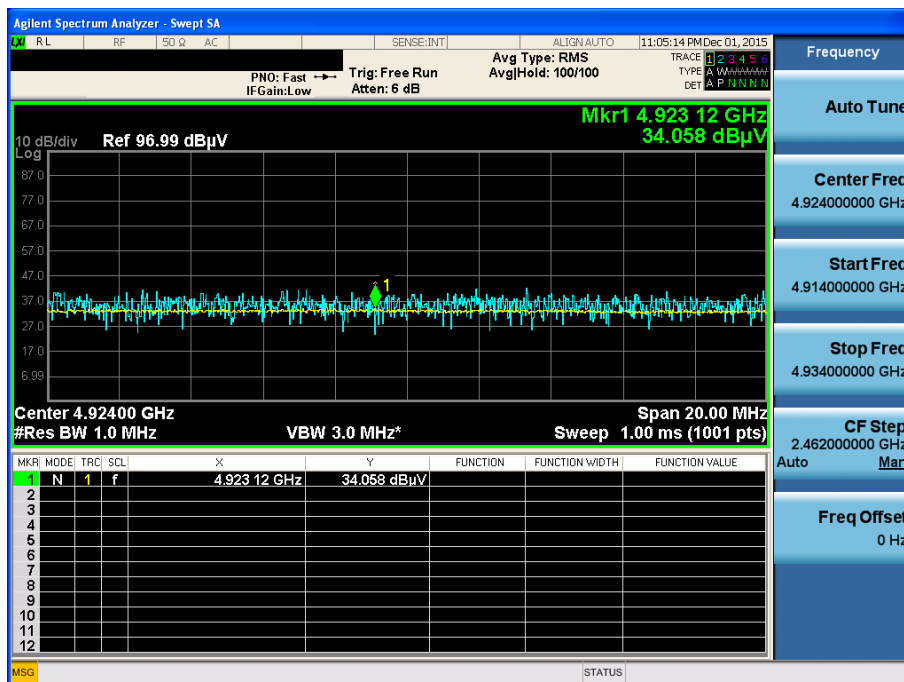
TM 3 & Highest & Y axis & Hor & ANT 2

Detector Mode : AV



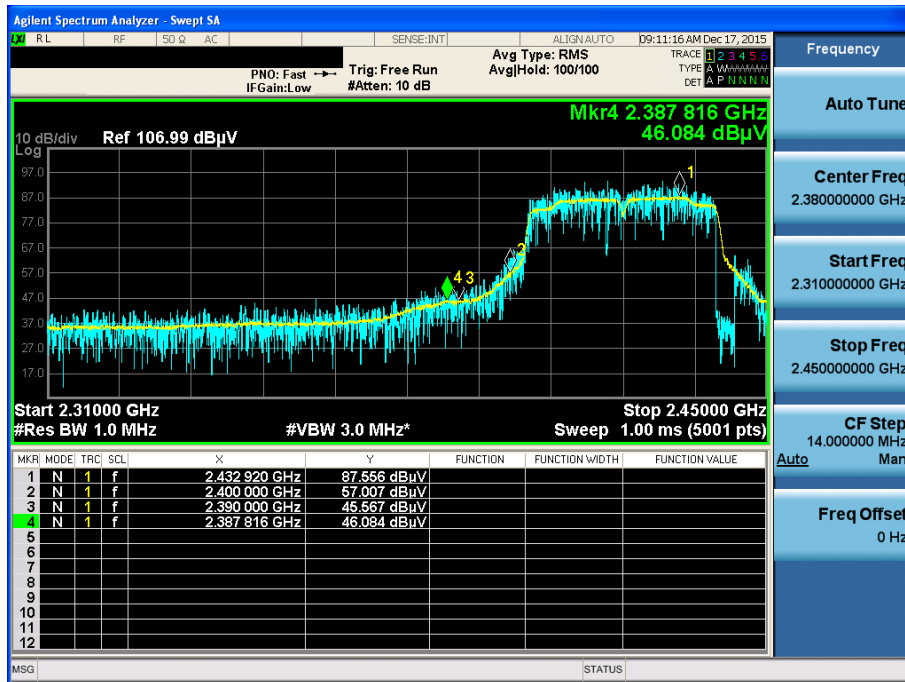
TM 3 & Highest & Y axis & Hor & ANT 2

Detector Mode : AV



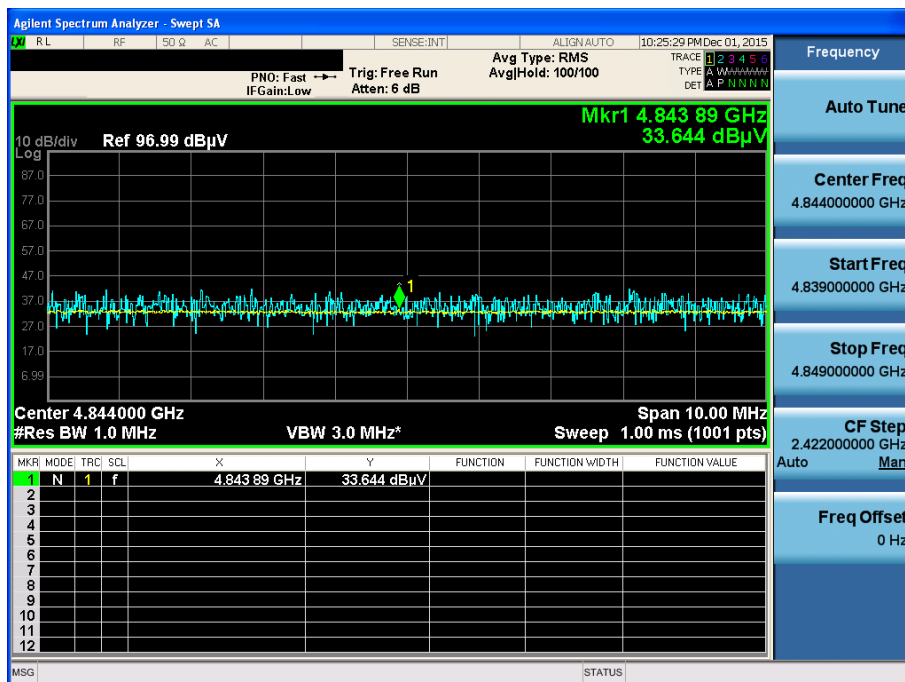
TM 4 & Lowest & Y axis & Hor & ANT 1

Detector Mode : AV



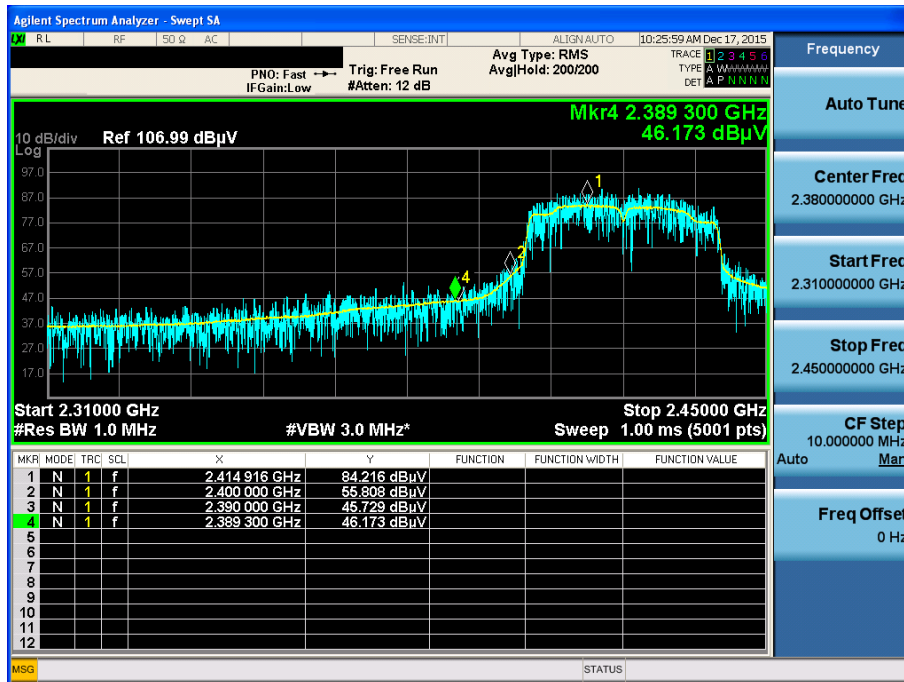
TM 4 & Lowest & Y axis & Hor & ANT 1

Detector Mode : AV



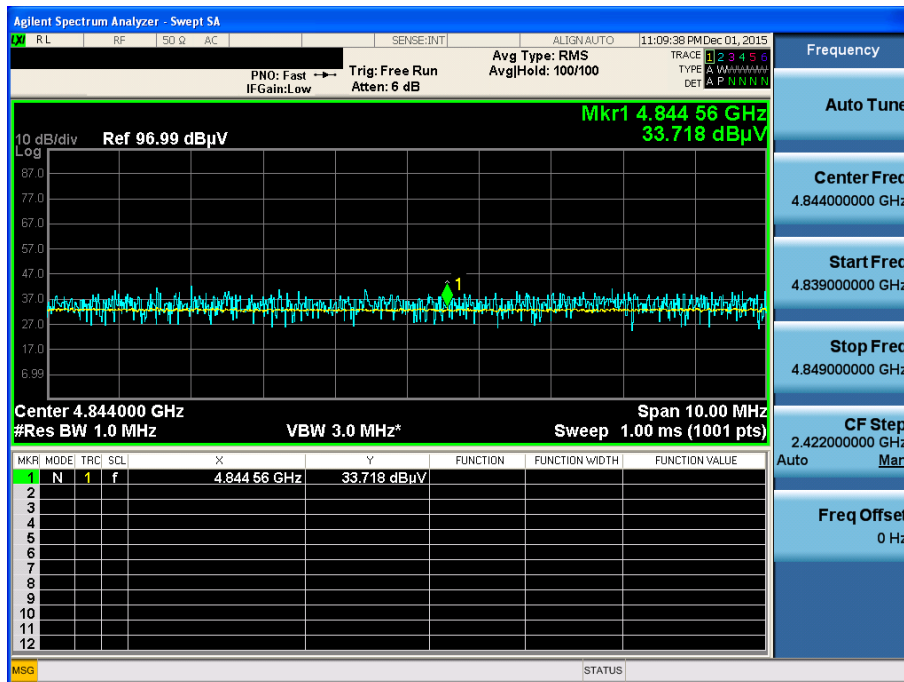
TM 4 & Lowest & Y axis & Hor & ANT 2

Detector Mode : AV



TM 4 & Lowest & Y axis & Hor & ANT 2

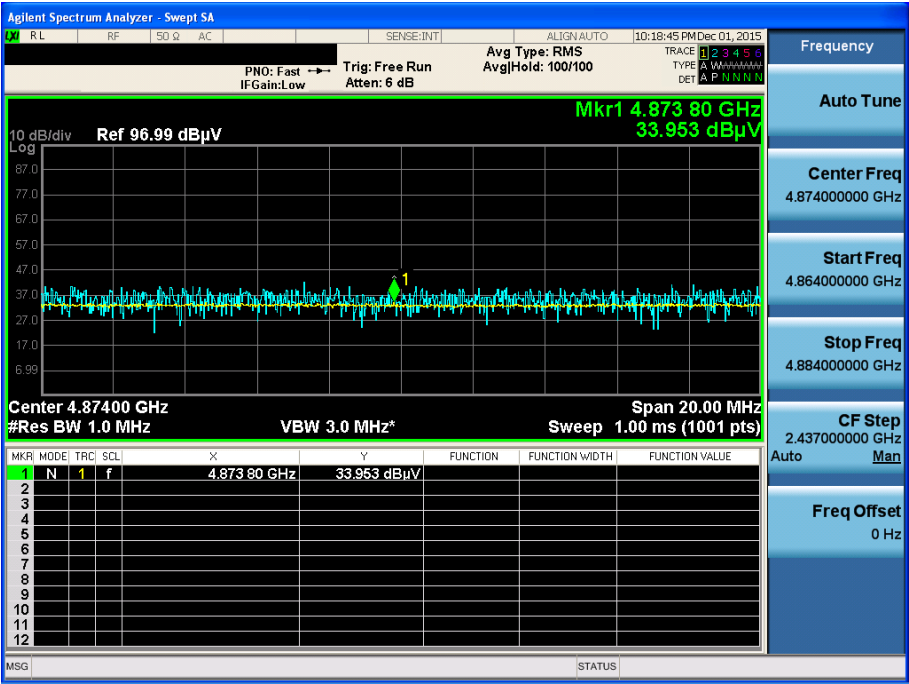
Detector Mode : AV





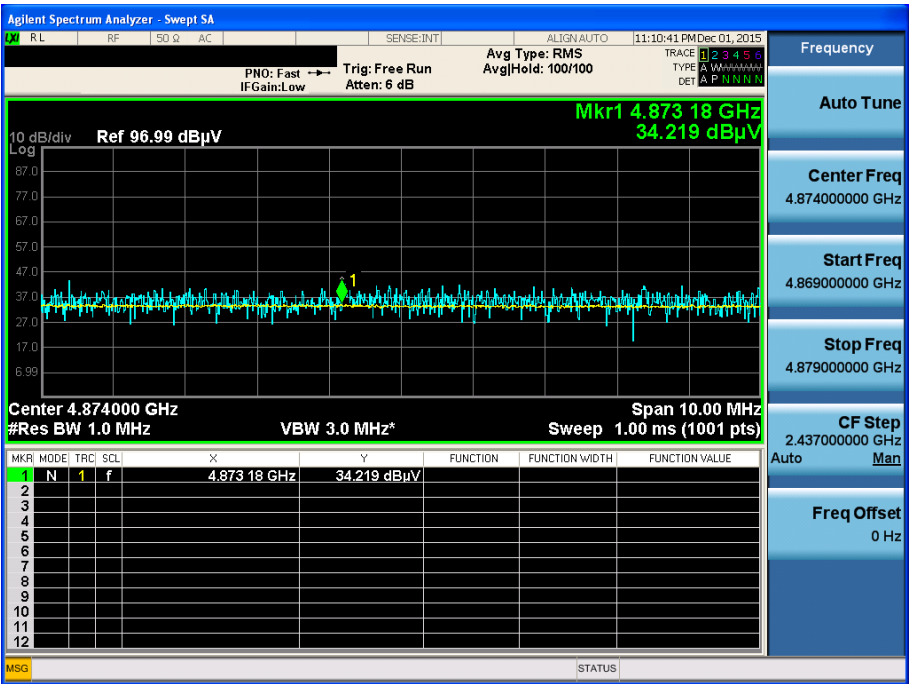
TM 4 & Middle & Y axis & Hor & ANT 1

Detector Mode : AV



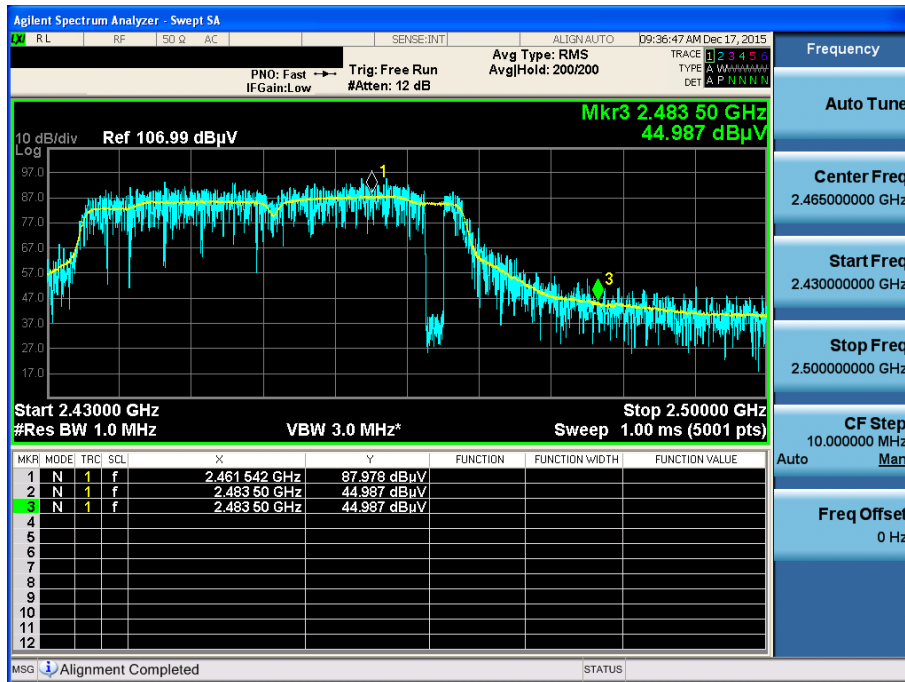
TM 4 & Middle & Y axis & Hor & ANT 2

Detector Mode : AV



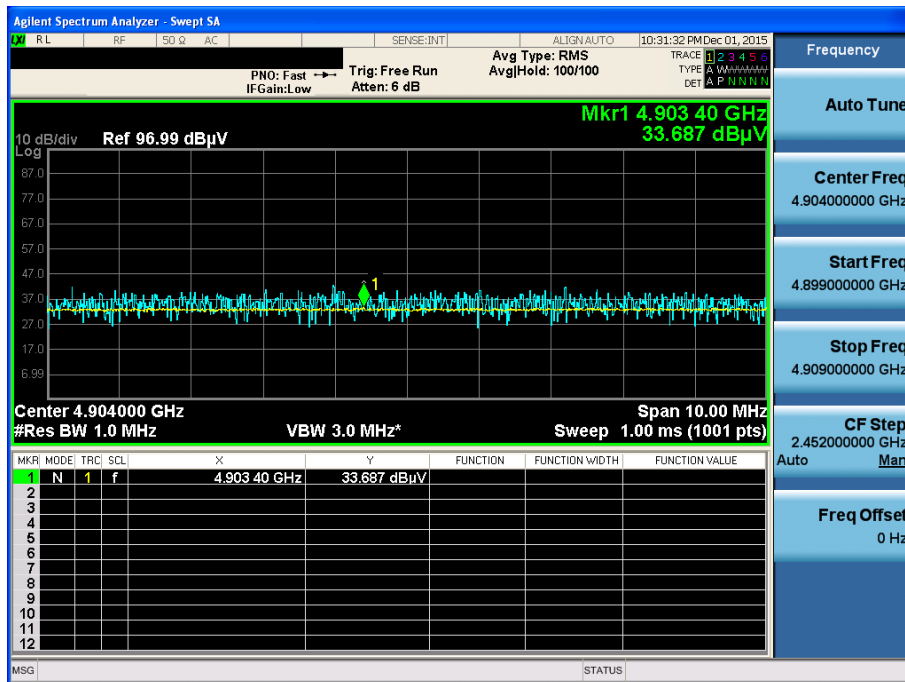
TM 4 & Highest & Y axis & Hor & ANT 1

Detector Mode : AV



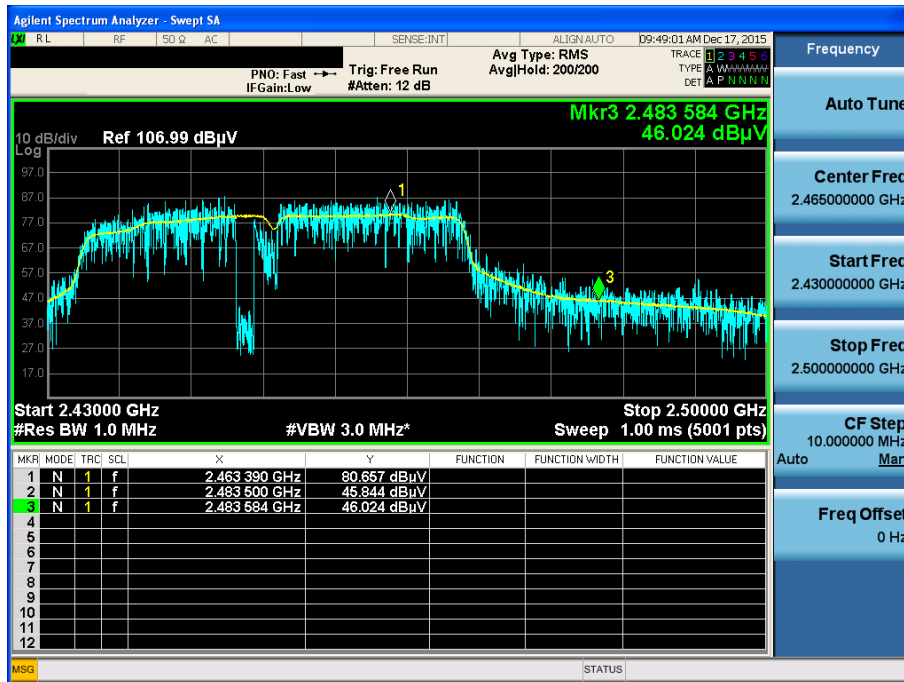
TM 4 & Highest & Y axis & Hor & ANT 1

Detector Mode : AV



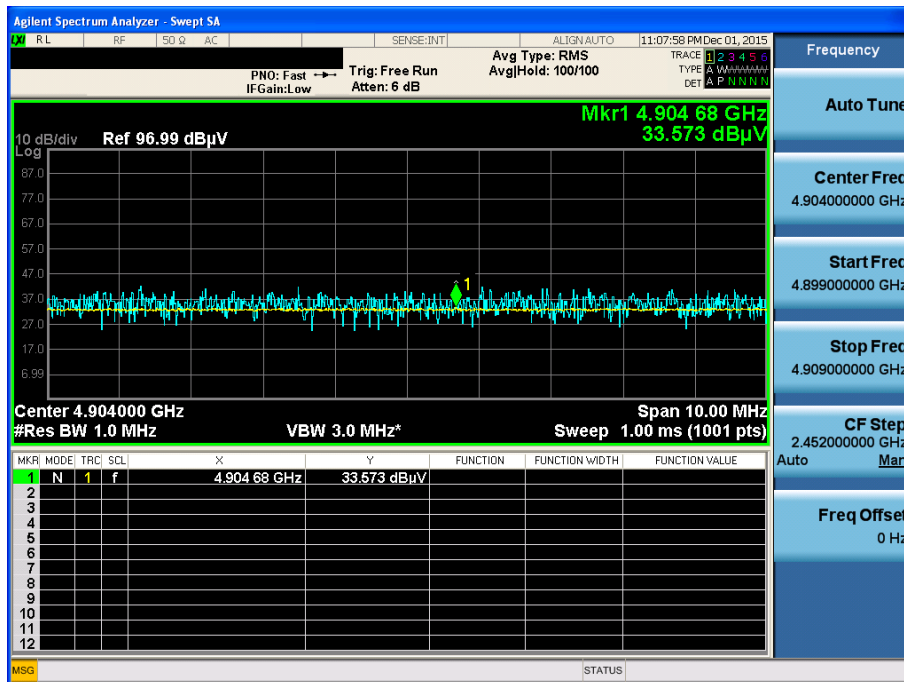
TM 4 & Highest & Y axis & Hor & ANT 2

Detector Mode : AV



TM 4 & Highest & Y axis & Hor & ANT 2

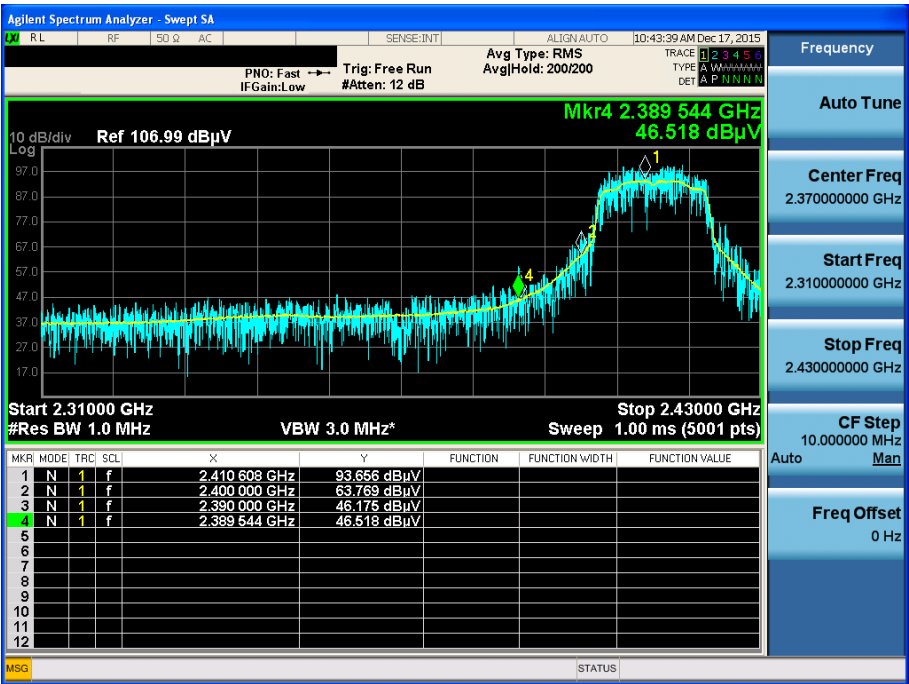
Detector Mode : AV





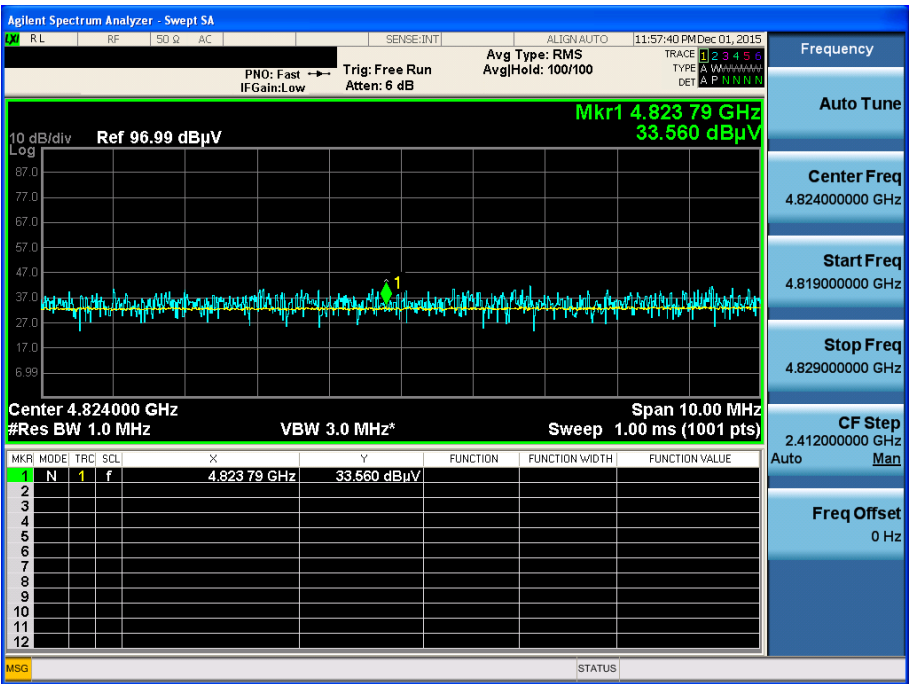
TM 5 & Lowest & Y axis & Hor

Detector Mode : AV



TM 5 & Lowest & Y axis & Hor

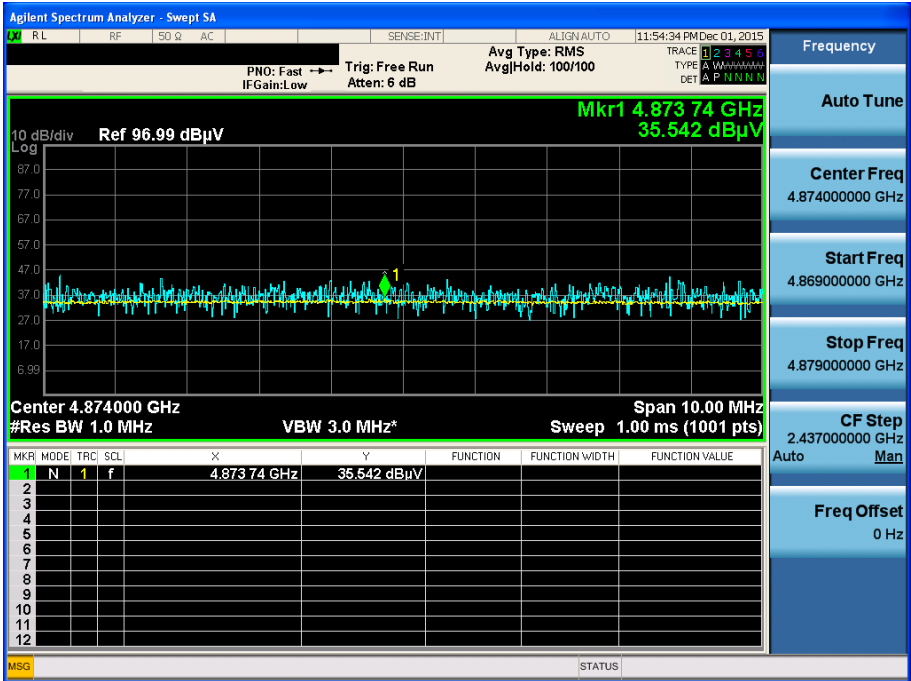
Detector Mode : AV





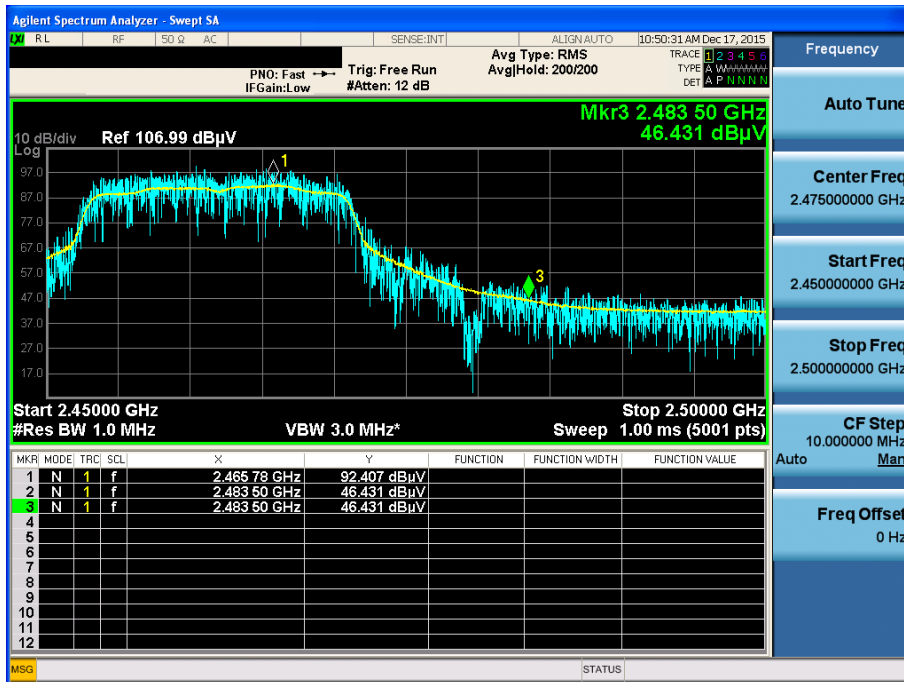
TM 5 & Middle & Y axis & Hor

Detector Mode : AV



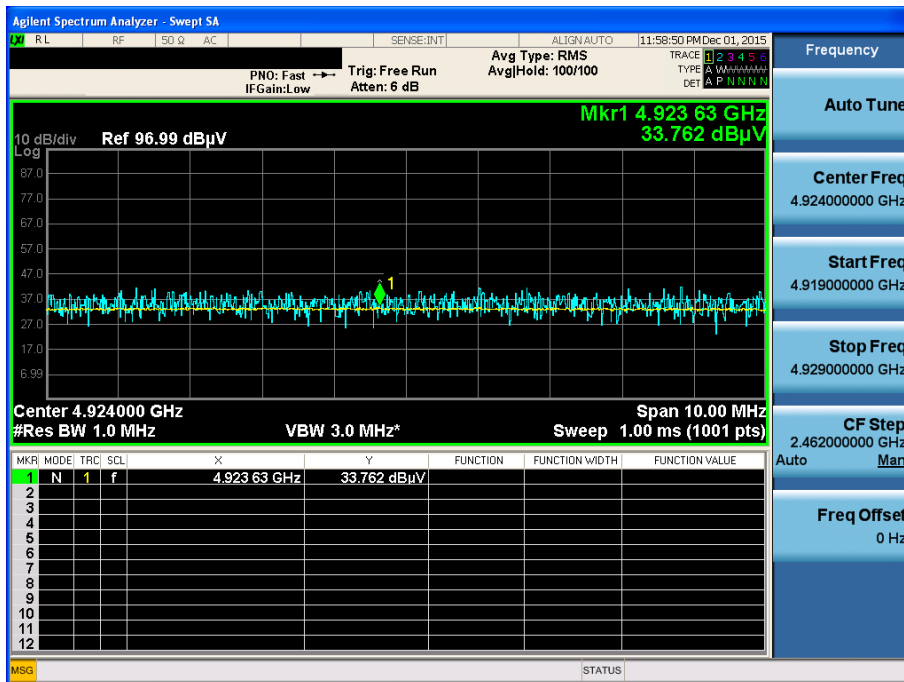
TM 5 & Highest & Y axis & Hor

Detector Mode : AV



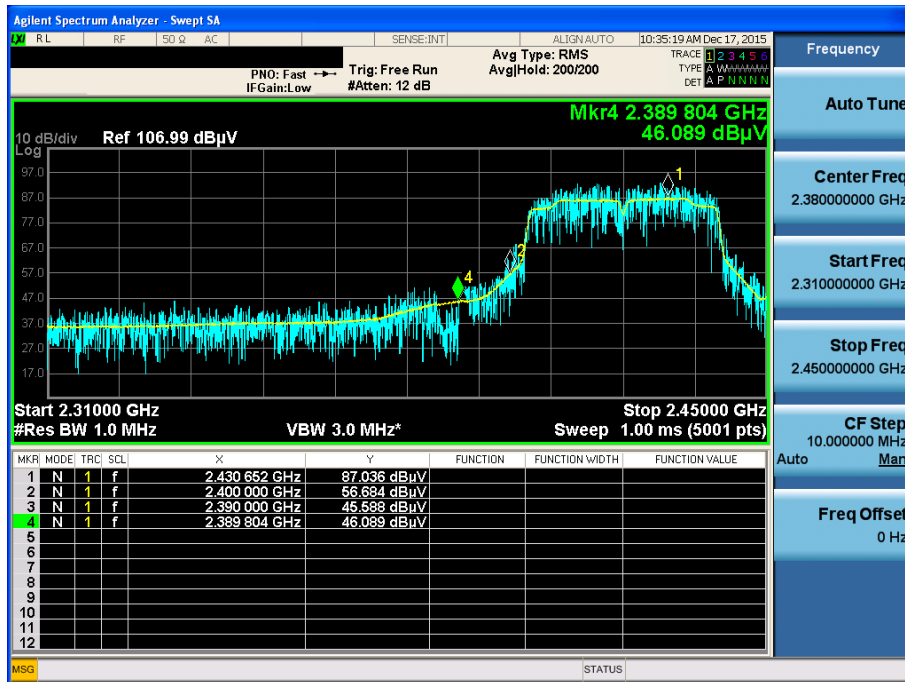
TM 5 & Highest & Y axis & Hor

Detector Mode : AV



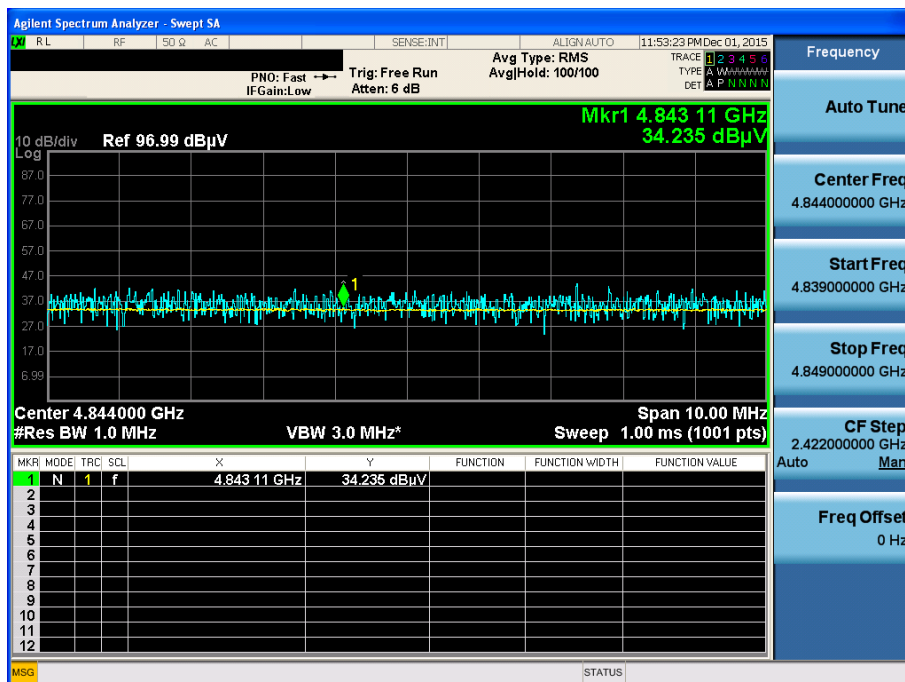
TM 6 & Lowest & Y axis & Hor

Detector Mode : AV



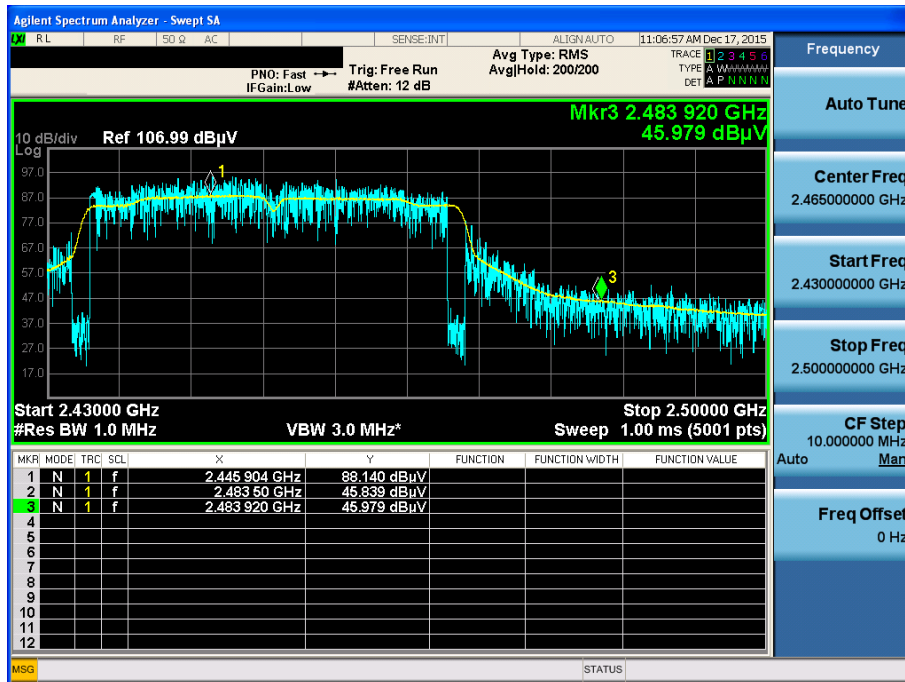
TM 6 & Lowest & Y axis & Hor

Detector Mode : AV



TM 6 & Highest & Y axis & Hor

Detector Mode : AV



TM 6 & Highest & Y axis & Hor

Detector Mode : AV

