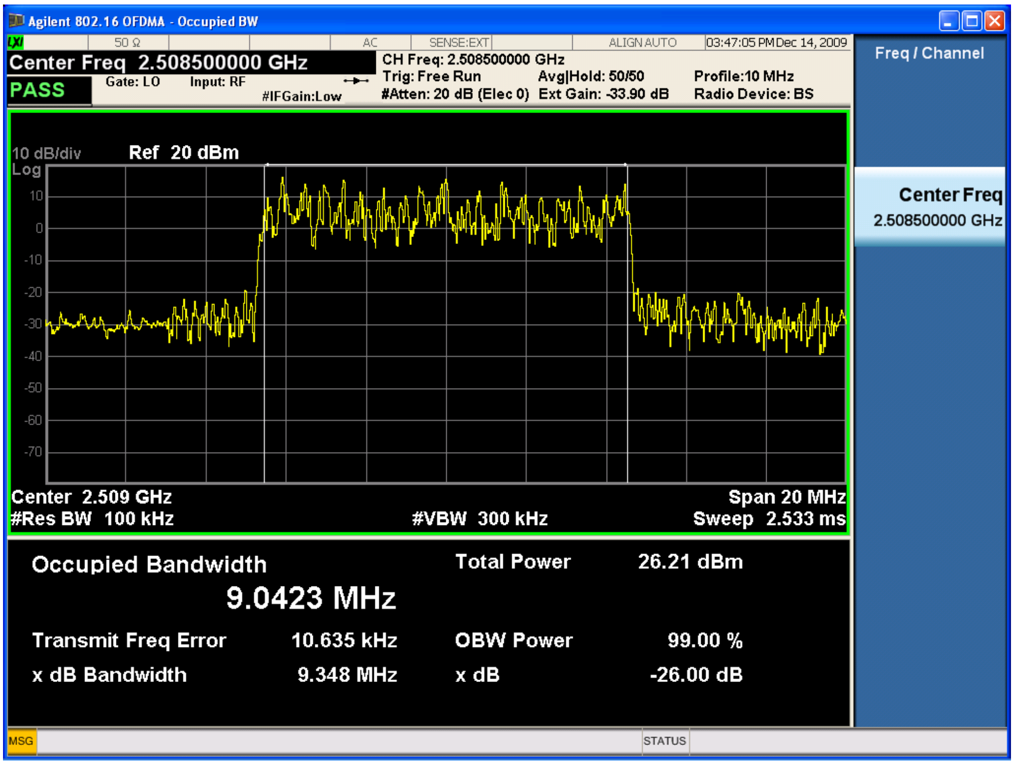
(64QAM High Channel)



7. BAND EDGES

7.1. Applicable Standard

According to §27.53(m), the power of any emission outside of the authorized operating frequency ranges must be attenuated below the transmitting power (p) by a factor of at least 43 + 10 log (p) dB.

7.2. Test Equipment List and Details

Manufacturer	Model / Equipment	Serial No.	Calibration Due
Agilent	6674A / DC Power Supply	3501A00901	05/14/2010
Agilent	8498A / Attenuator	51161	04/14/2010
Agilent	8498A / Attenuator	51162	12/24/2009
WEINSCHEL	67-30-33 / Attenuator	BU5347	01/13/2010
WEINSCHEL	67-30-33 / Attenuator	BR0530	02/03/2010
WEINSCHEL	AF117A-69-43 / STEP ATTENUATOR	20623	02/06/2010
WEINSCHEL	AF117A-69-43 / STEP ATTENUATOR	21207	01/13/2010
Agilent	N9020A / MXA Signal Analyzer	US46220219	02/19/2010

7.3. Test Procedure

The RF output of the transmitter was connected to the input of the spectrum analyzer through sufficient attenuation. 3

The center of the spectrum analyzer was set to block edge frequency.

The EUT provides the MIMO function which is able to transmit on the same channel with same data simultaneously therefore a combiner is used to sum the individual transmitter output power.

The test data is shown as a combined output in the report.

7.3.1. Environmental Conditions

Temperature:	21 °C
Relative Humidity:	36 %

7.4. Test Result

: PASS

7.4.1. Test data at Output 0

Modulation	Channel	Measured Frequency (MHz)	Max. Measured Value (dBm)	Limit (dBm)
QPSK	Low	2508.5	-26.651	-13.0
	High	2683.5	-19.874	
16QAM	Low	2508.5	-24.939	
	High	2683.5	-19.839	
64QAM	Low	2508.5	-25.782	
	High	2683.5	-19.939	

7.4.2. Test data at Output 1

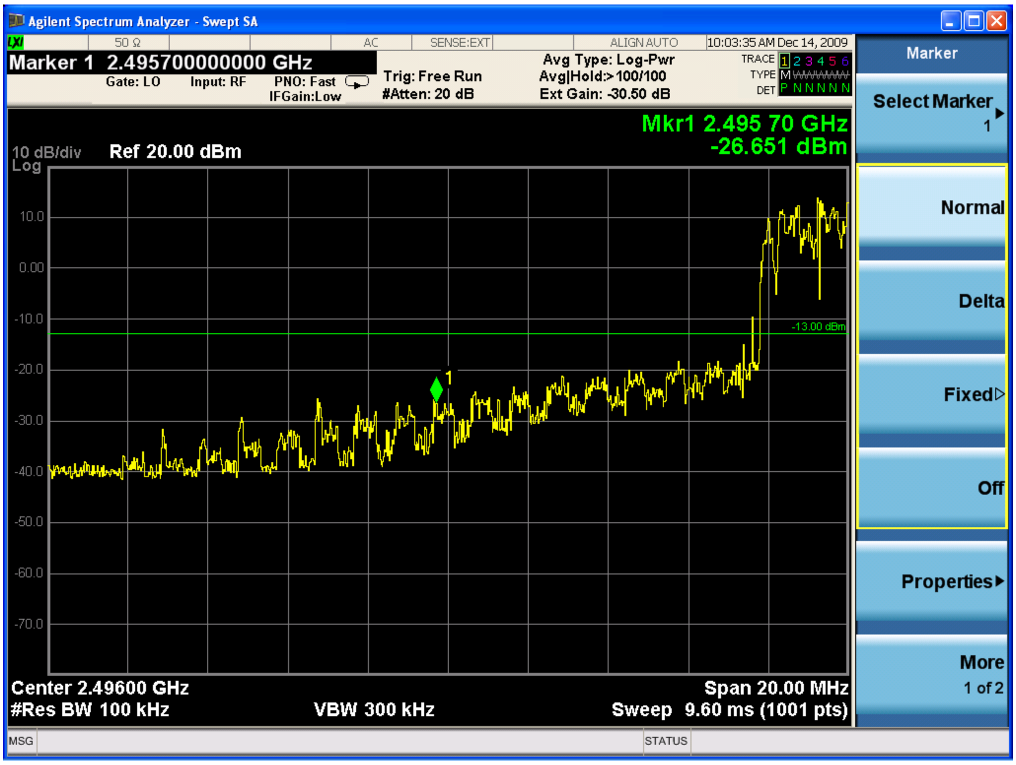
Modulation	Channel	Measured Frequency (MHz)	Max. Measured Value (dBm)	Limit (dBm)
QPSK	Low	2508.5	-33.536	-13.0
	High	2683.5	-21.970	
16QAM	Low	2508.5	-32.968	
	High	2683.5	-19.365	
64QAM	Low	2508.5	-32.661	
	High	2683.5	-19.217	

7.4.3. Combined Test data at Output

Modulation	Channel	Measured Frequency (MHz)	Max. Measured Value (dBm)	Limit (dBm)
QPSK	Low	2508.5	-21.200	-13.0
	High	2683.5	-21.984	
16QAM	Low	2508.5	-20.527	
	High	2683.5	-23.135	
64QAM	Low	2508.5	-22.811	
	High	2683.5	-20.369	

7.4.4. Plot Data at Output 0

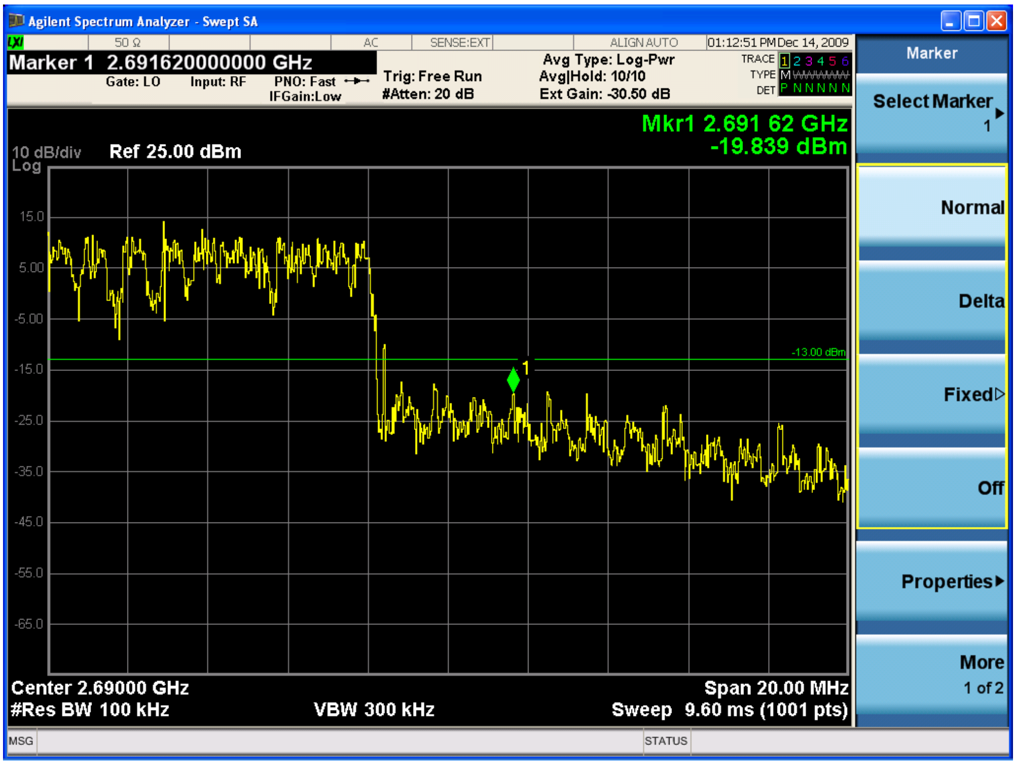
(QPSK Low Channel)



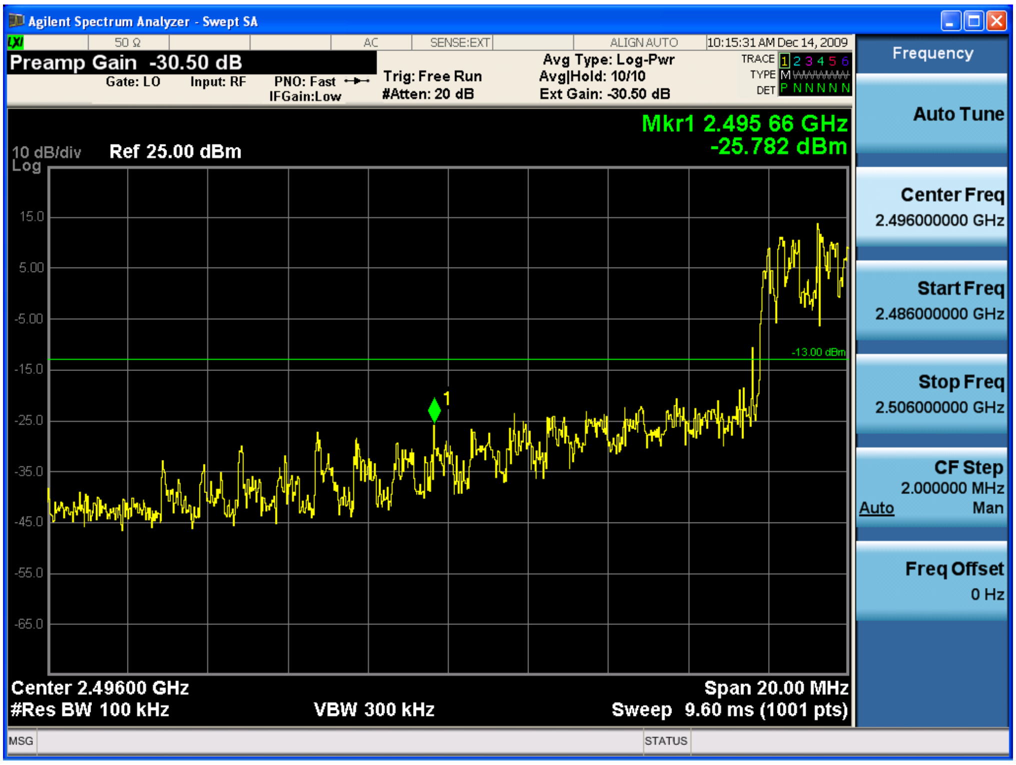
(QPSK High Channel)

(16QAM Low Channel)

(16QAM High Channel)



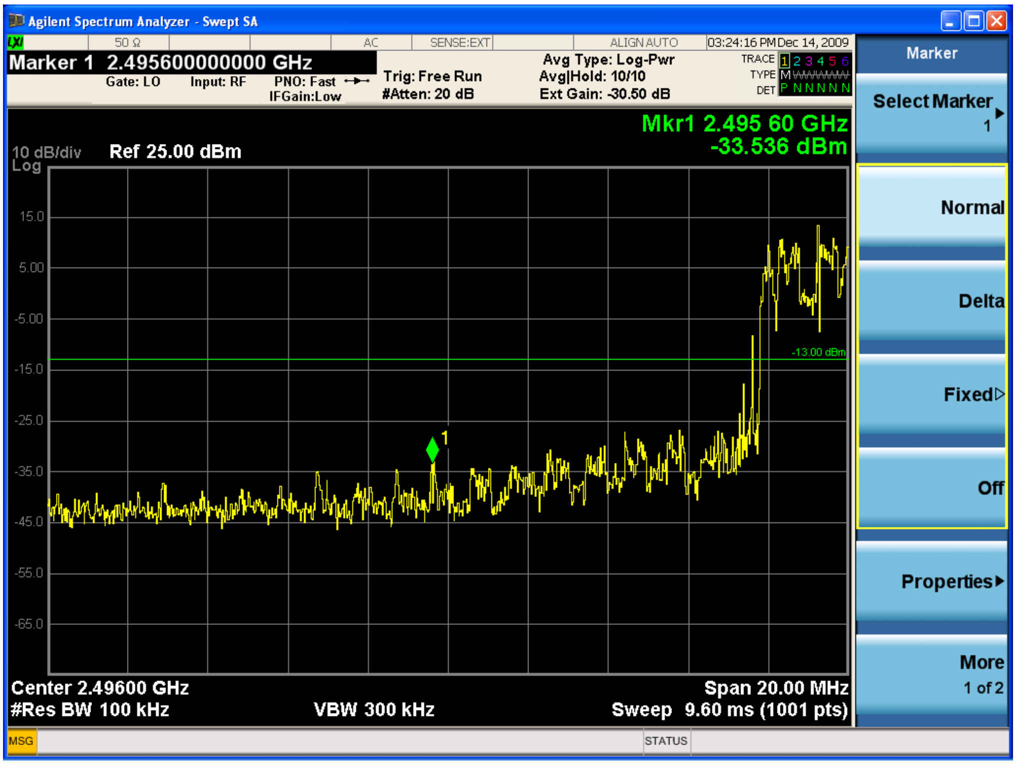
(64QAM Low Channel)



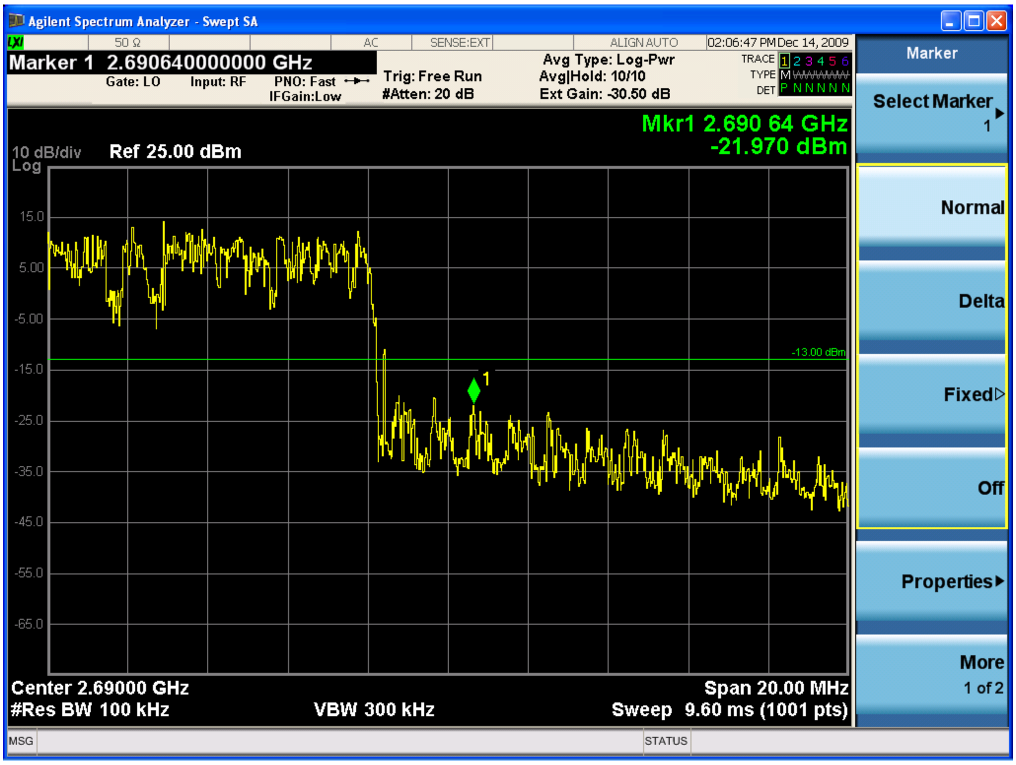
(64QAM High Channel)

7.4.5. Plot Data at Output 1

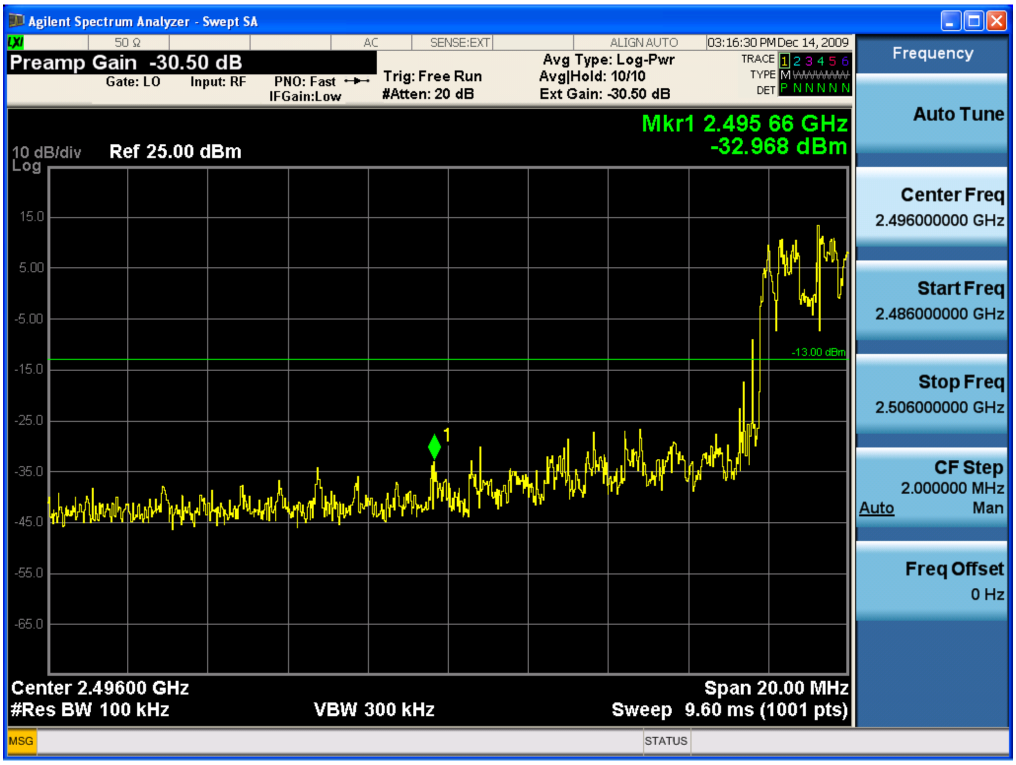
(QPSK Low Channel)



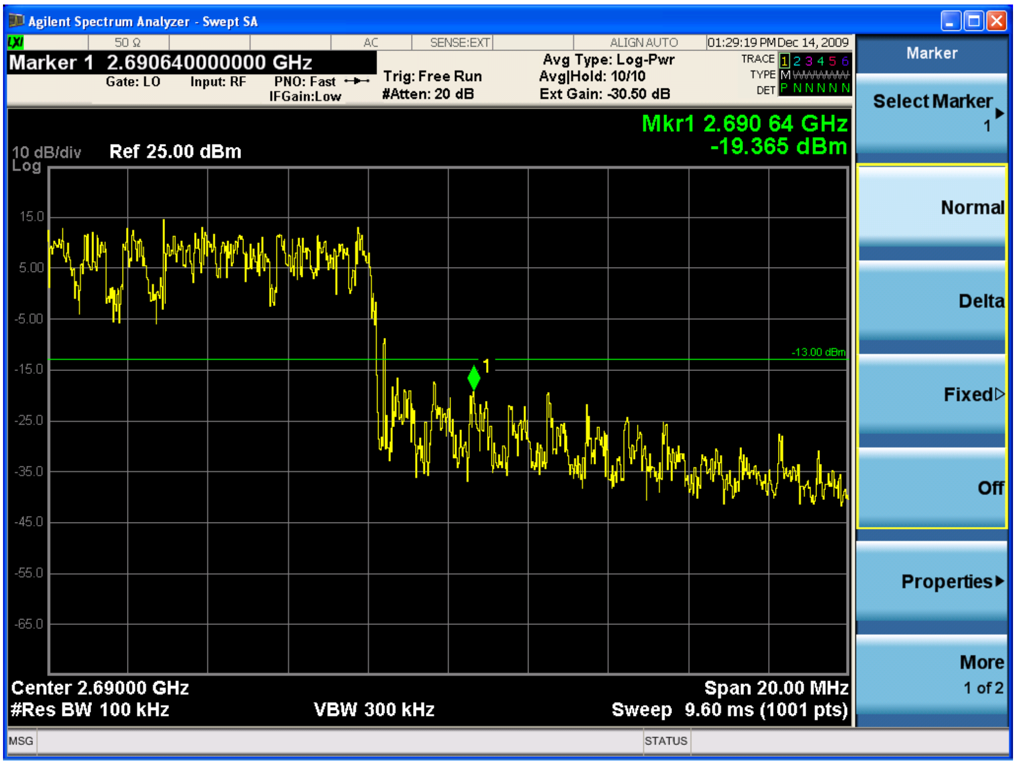
(QPSK High Channel)



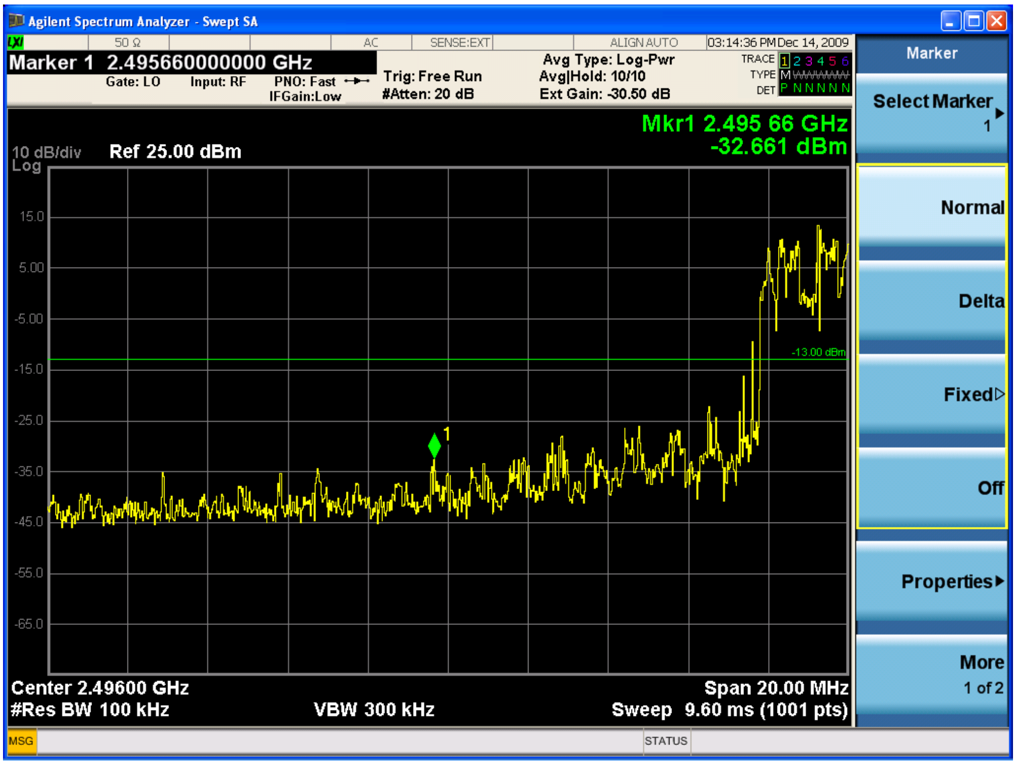
(16QAM Low Channel)



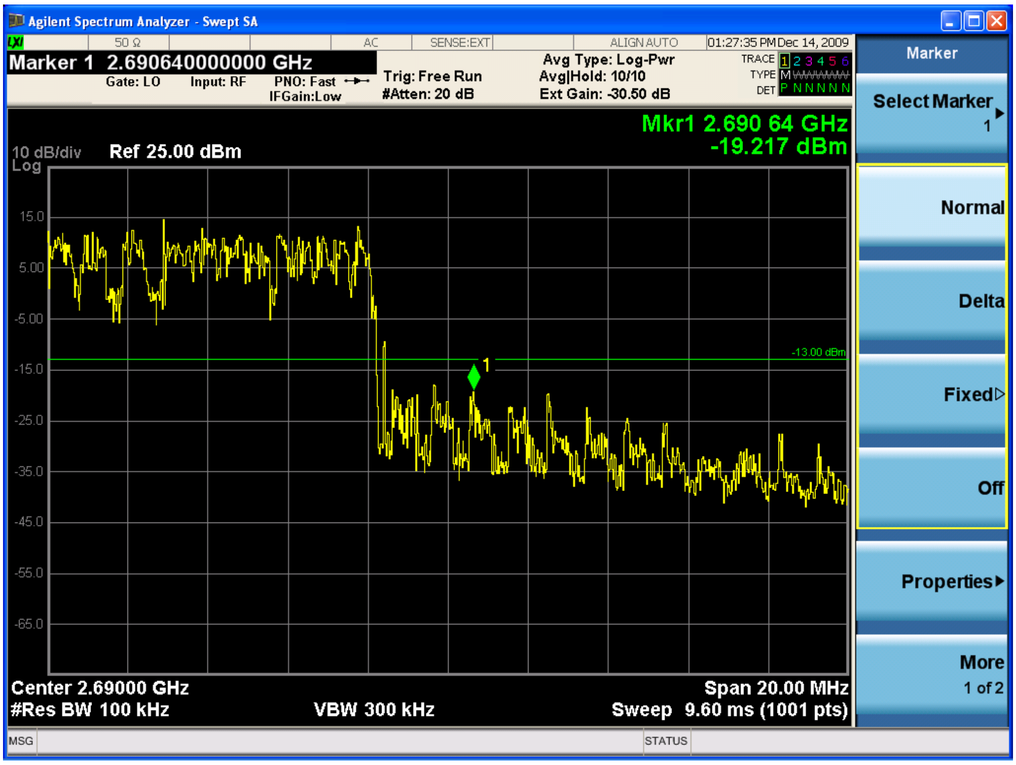
(16QAM High Channel)



(64QAM Low Channel)

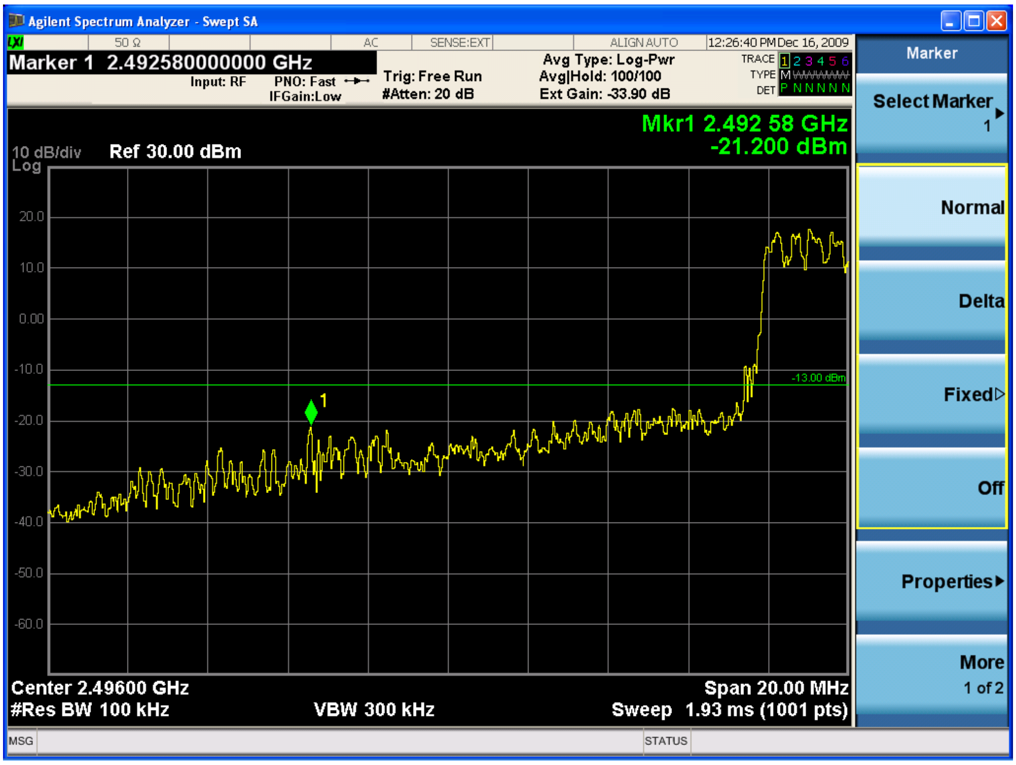


(64QAM High Channel)

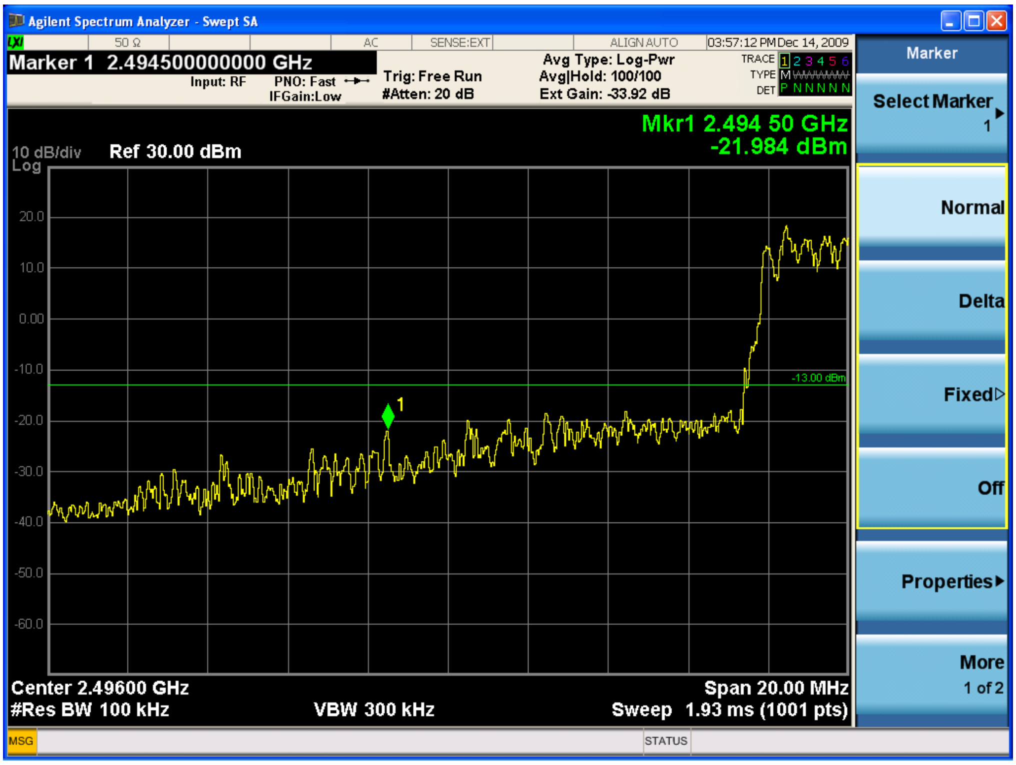


7.4.6. Combined Plot Data at Output

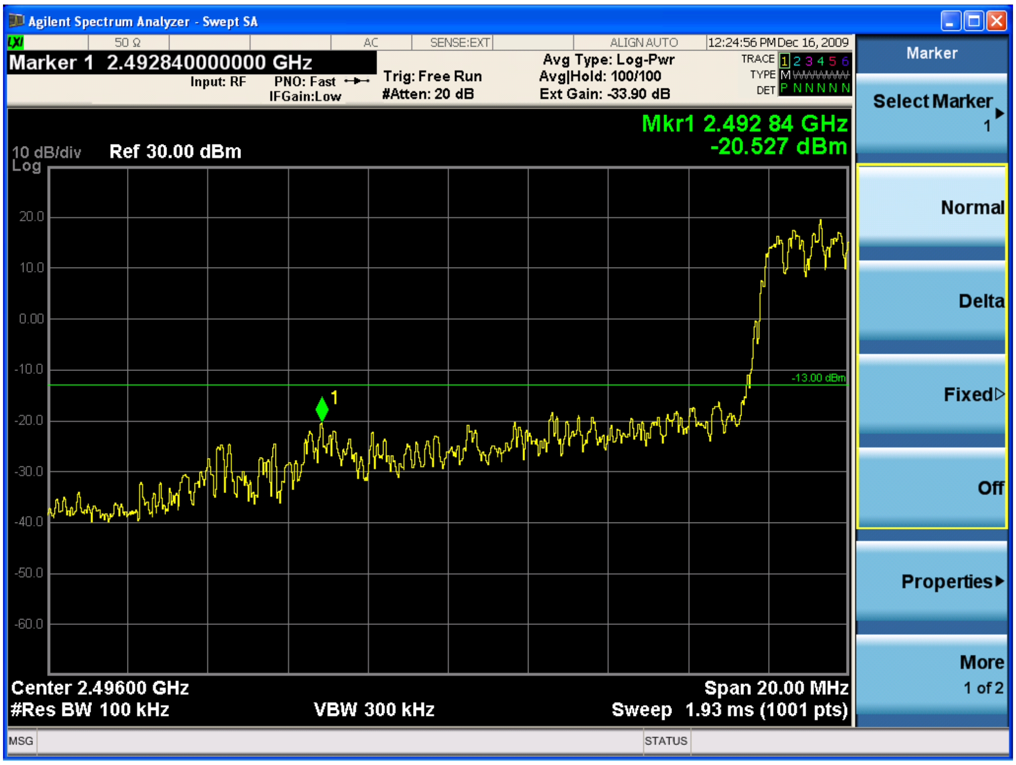
(QPSK Low Channel)



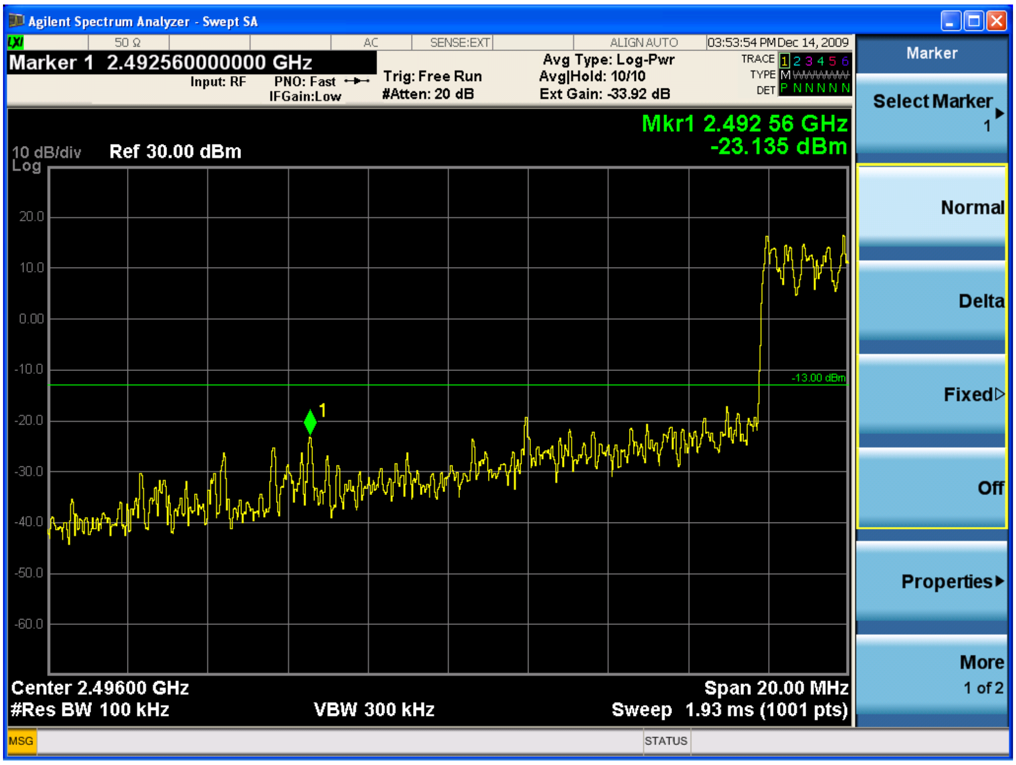
(QPSK High Channel)



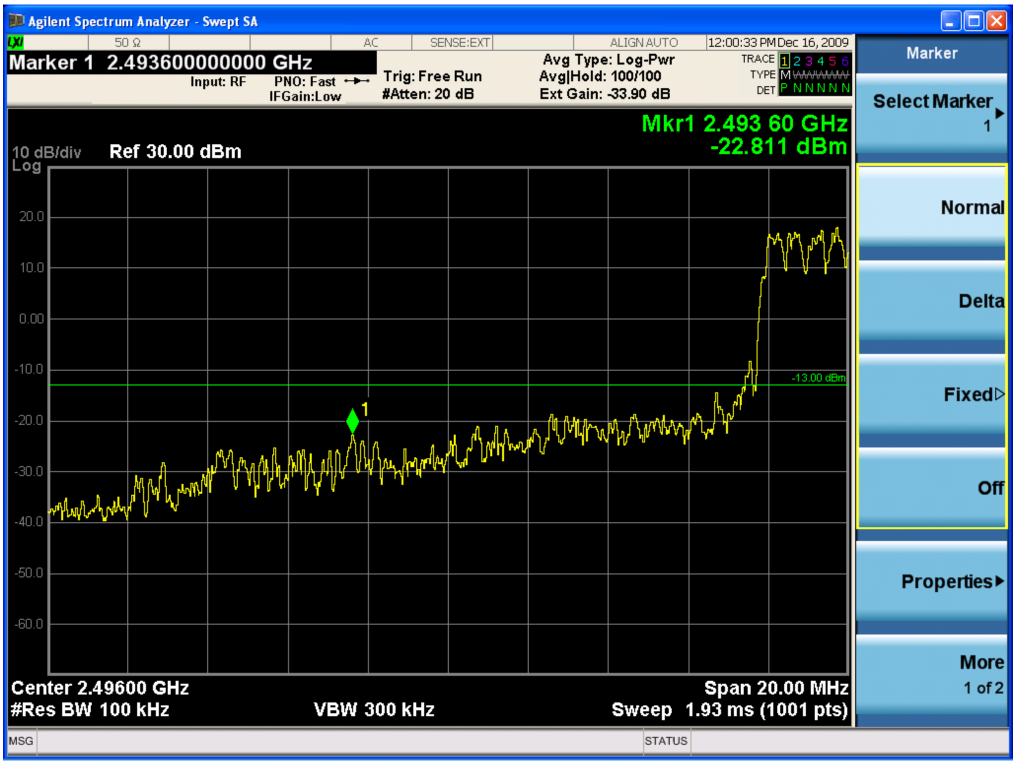
(16QAM Low Channel)



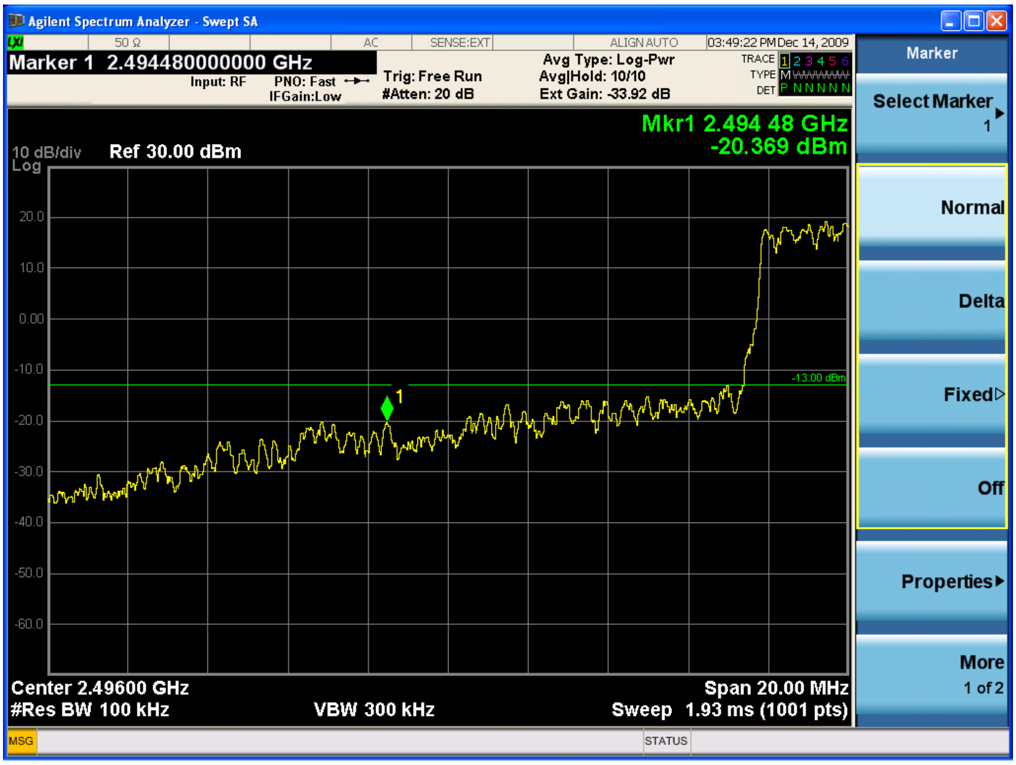
(16QAM High Channel)



(64QAM Low Channel)



(64QAM High Channel)



8. SPURIOUS EMISSION AT ANTENNA TERMINAL

8.1. Applicable Standard

: CFR 47§2.1051, §27.53

The spectrum was to be investigated to the tenth harmonics of the highest fundamental frequency as specified in §2.1051

8.2. Test Equipment List and Details

Manufacturer	Model / Equipment	Serial No.	Calibration Due
Agilent	6674A / DC Power Supply	3501A00901	05/14/2010
Agilent	8498A / Attenuator	51161	04/14/2010
Agilent	8498A / Attenuator	51162	12/24/2009
WEINSCHEL	67-30-33 / Attenuator	BU5347	01/13/2010
WEINSCHEL	67-30-33 / Attenuator	BR0530	02/03/2010
WEINSCHEL	AF117A-69-43 / STEP ATTENUATOR	20623	02/06/2010
WEINSCHEL	AF117A-69-43 / STEP ATTENUATOR	21207	01/13/2010
Agilent	N9020A / MXA Signal Analyzer	US46220219	02/19/2010

8.3. Test Procedure

The RF output of the transceiver was connected to a spectrum analyzer through appropriate attenuation.

The resolution bandwidth of the spectrum analyzer was set at 1MHz. Sufficient scans were taken to show any out of band emissions up to 10th harmonic.

The EUT provides the MIMO function which is able to transmit on the same channel with same data simultaneously therefore a combiner is used to sum the individual transmitter output power.

The test data is shown as a combined output in the report.

8.3.1 Environmental Conditions:

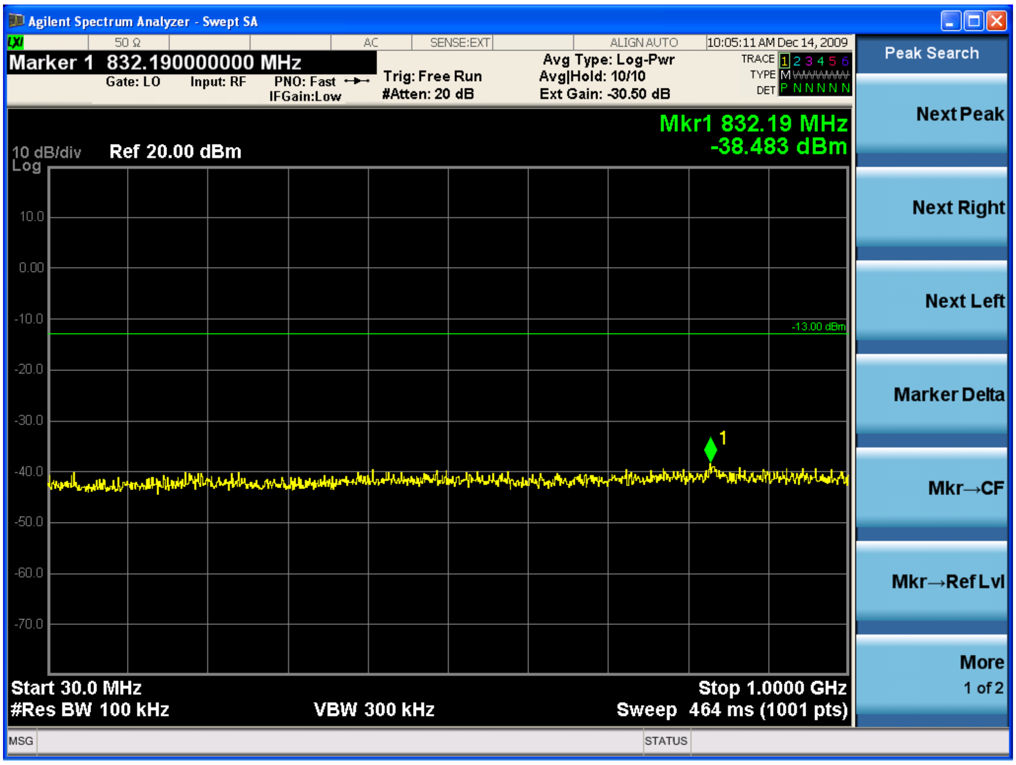
Temperature:	18 °C
Relative Humidity:	33 %

8.4. Test Result

: Pass

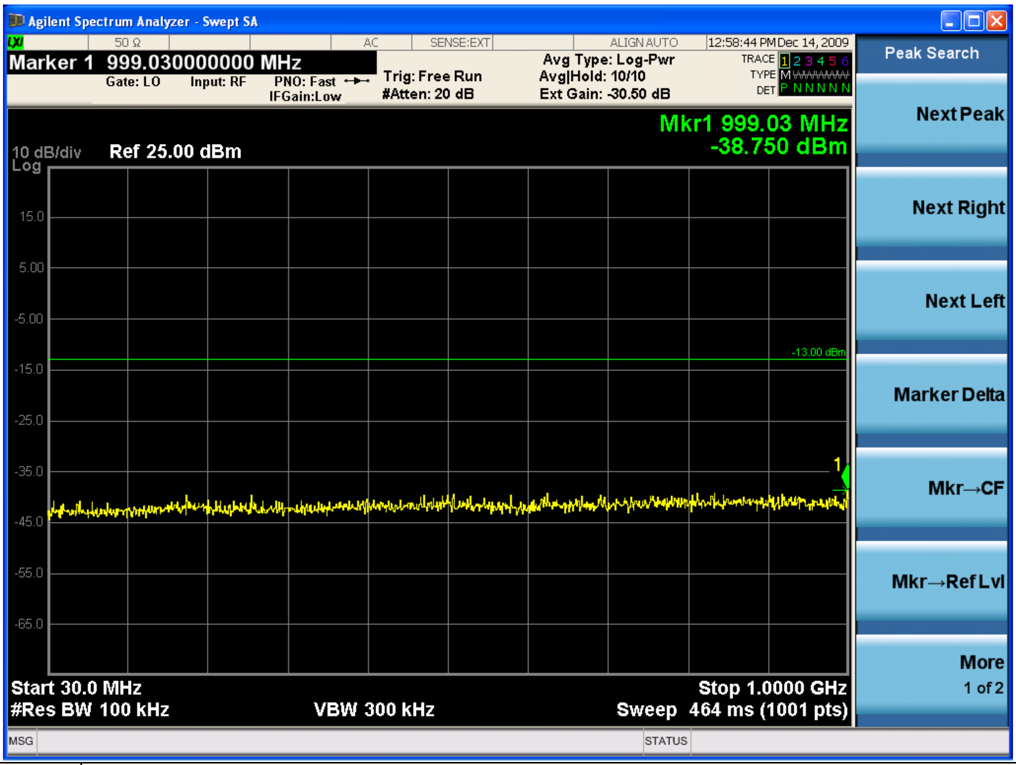
8.4.1. Plot Data at Output 0

(QPSK Low Channel)



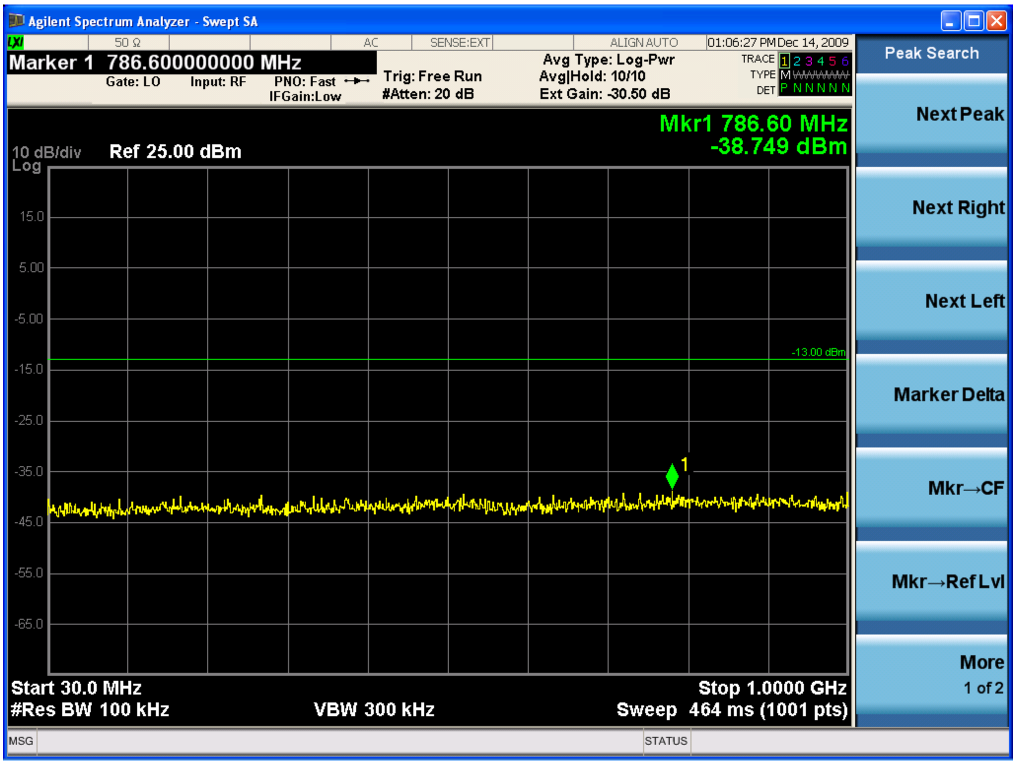
(30 MHz ~ 1 GHz)

(QPSK Middle Channel)



(30 MHz ~ 1 GHz)

(QPSK High Channel)



(30 MHz ~ 1 GHz)

(QPSK Low Channel)

(1 GHz ~ 26.5 GHz)

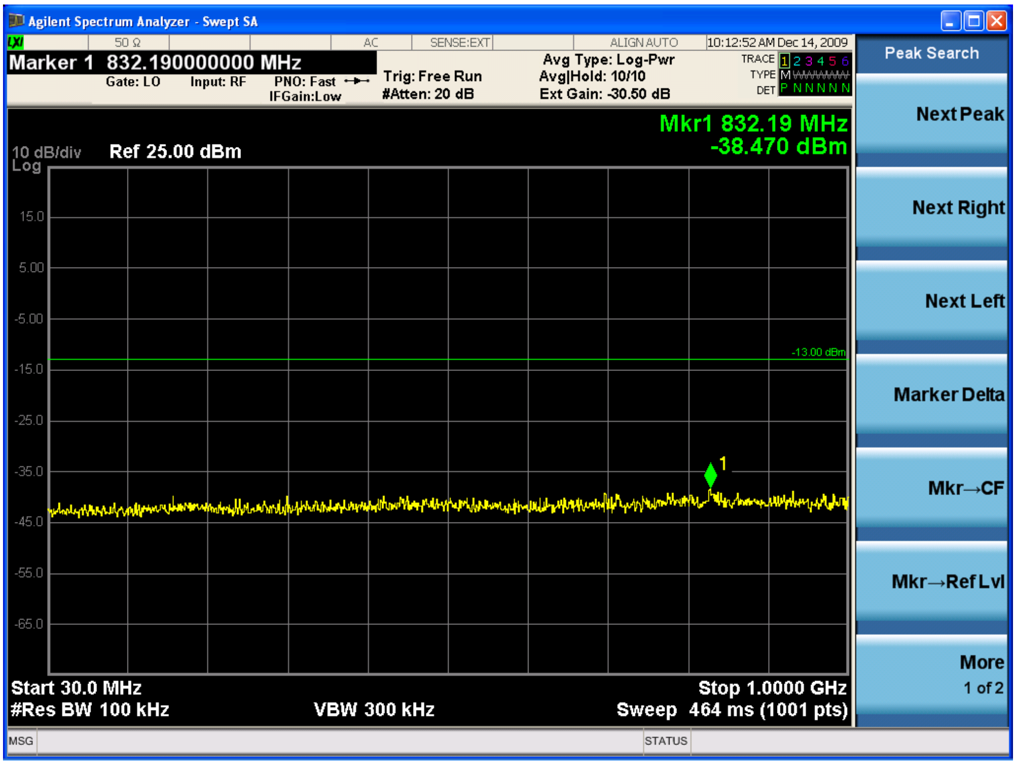
(QPSK Middle Channel)

(1 GHz ~ 26.5 GHz)

(QPSK High Channel)

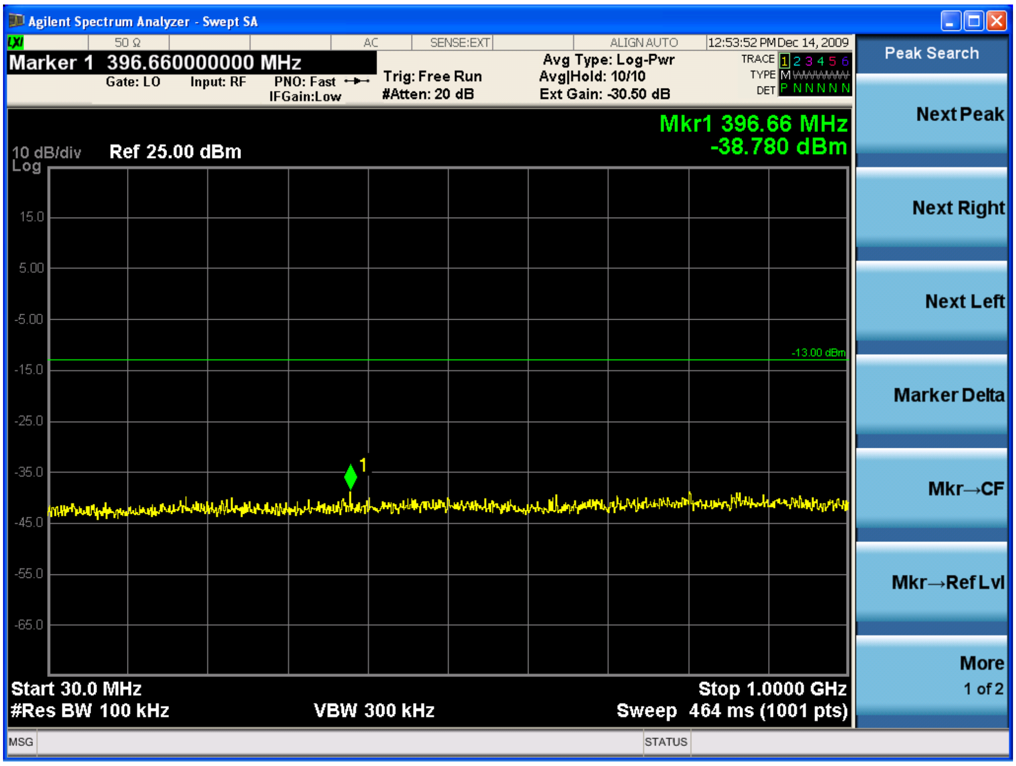
(1 GHz ~ 26.5 GHz)

(16QAM LOW Channel)



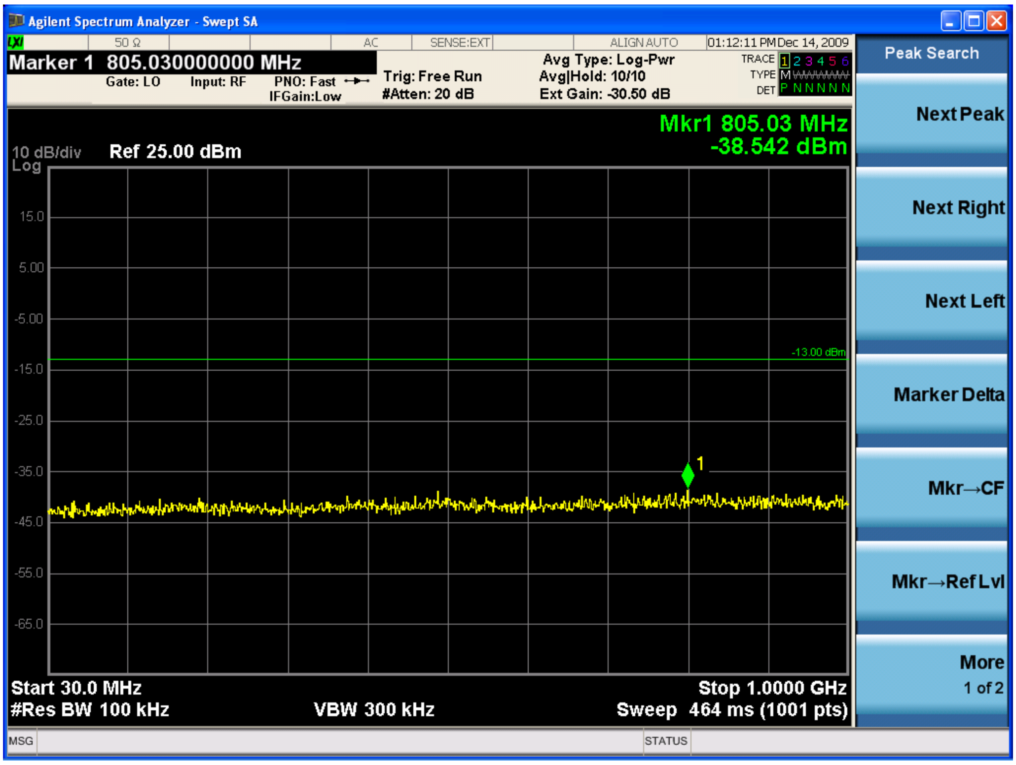
(30 MHz ~ 1 GHz)

(16QAM Middle Channel)



(30 MHz ~ 1 GHz)

(16QAM High Channel)



(30 MHz ~ 1 GHz)

(16QAM LOW Channel)

(1 GHz ~ 26.5 GHz)

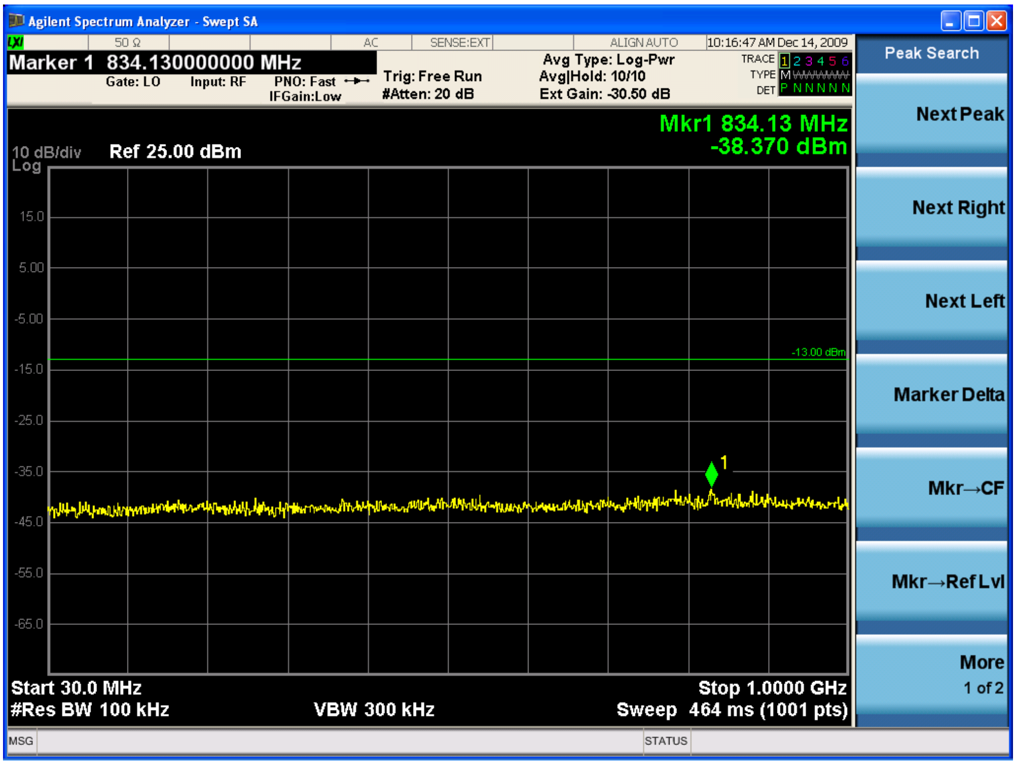
(16QAM Middle Channel)

(1 GHz ~ 26.5 GHz)

(16QAM High Channel)

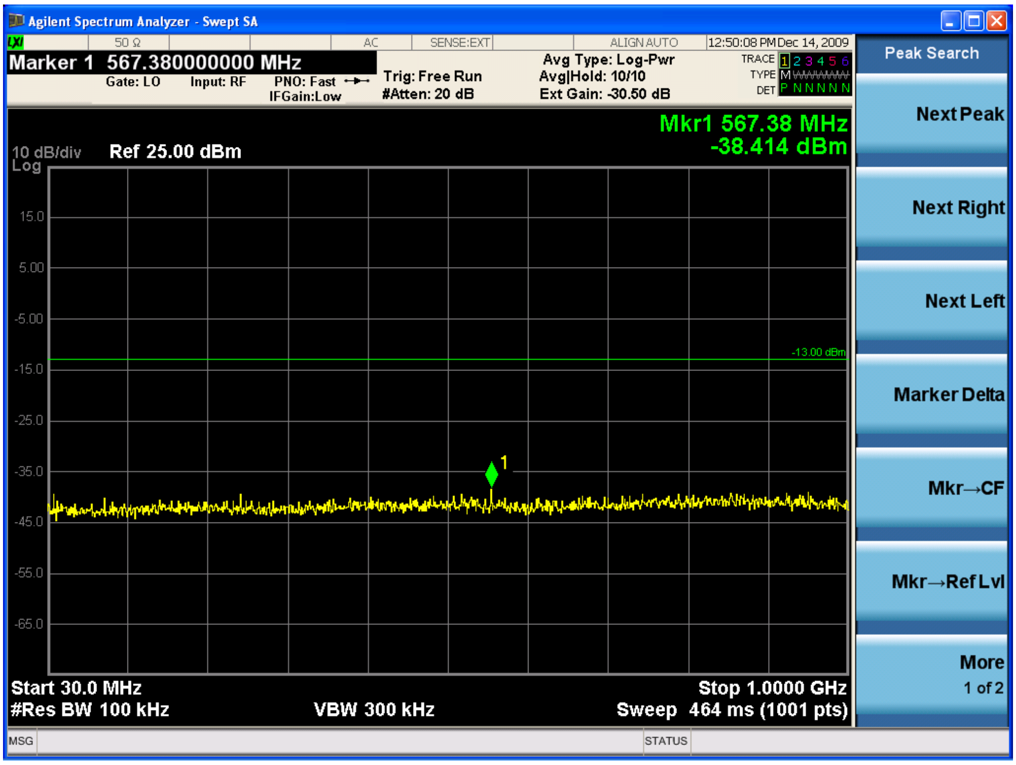
(1 GHz ~ 26.5 GHz)

(64QAM Low Channel)



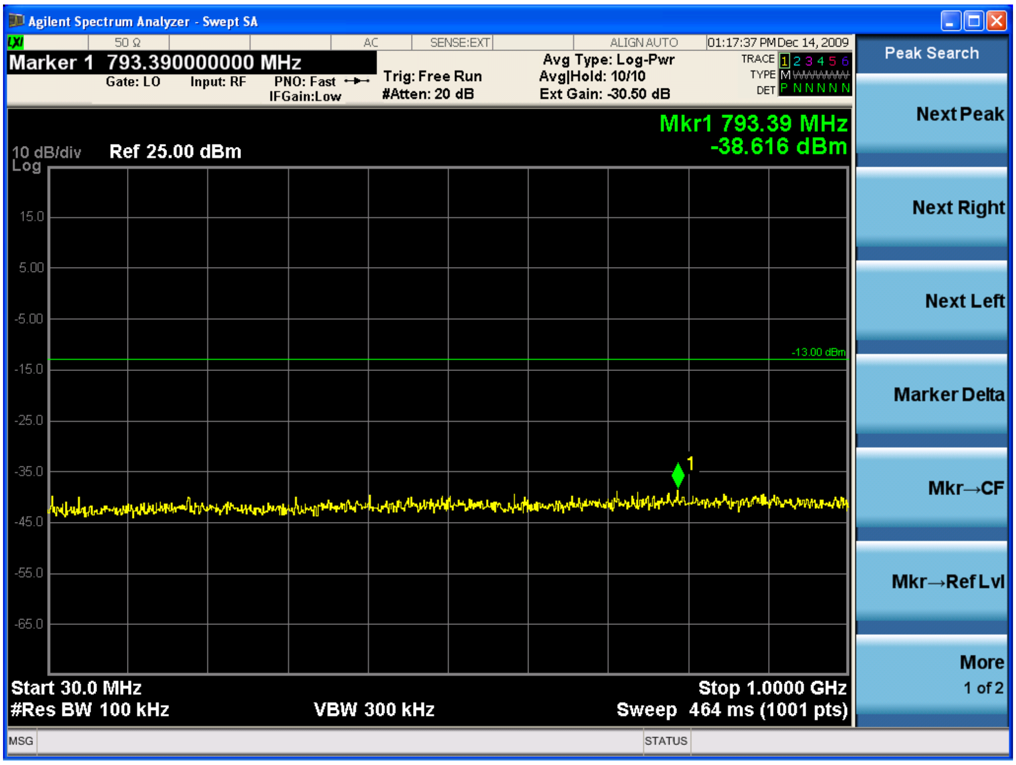
(30 MHz ~ 1 GHz)

(64QAM Middle Channel)



(30 MHz ~ 1 GHz)

(64QAM High Channel)



(30 MHz ~ 1 GHz)

(64QAM Low Channel)

(1 GHz ~ 26.5 GHz)

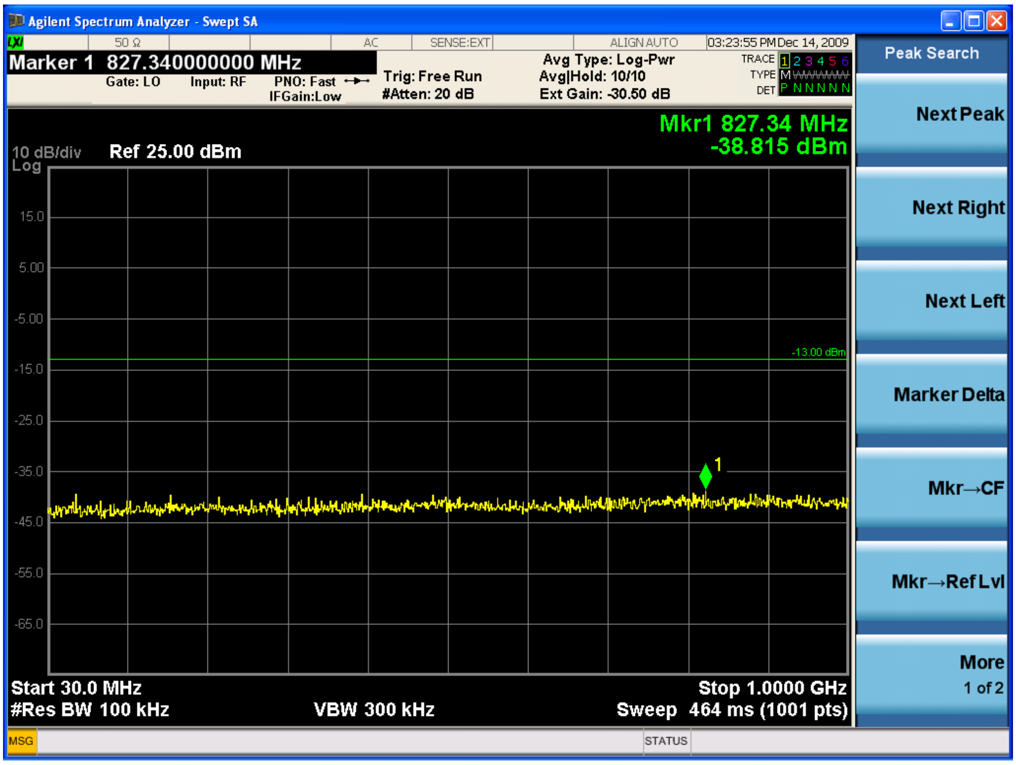
(64QAM Middle Channel)

(1 GHz ~ 26.5 GHz)

(64QAM High Channel)

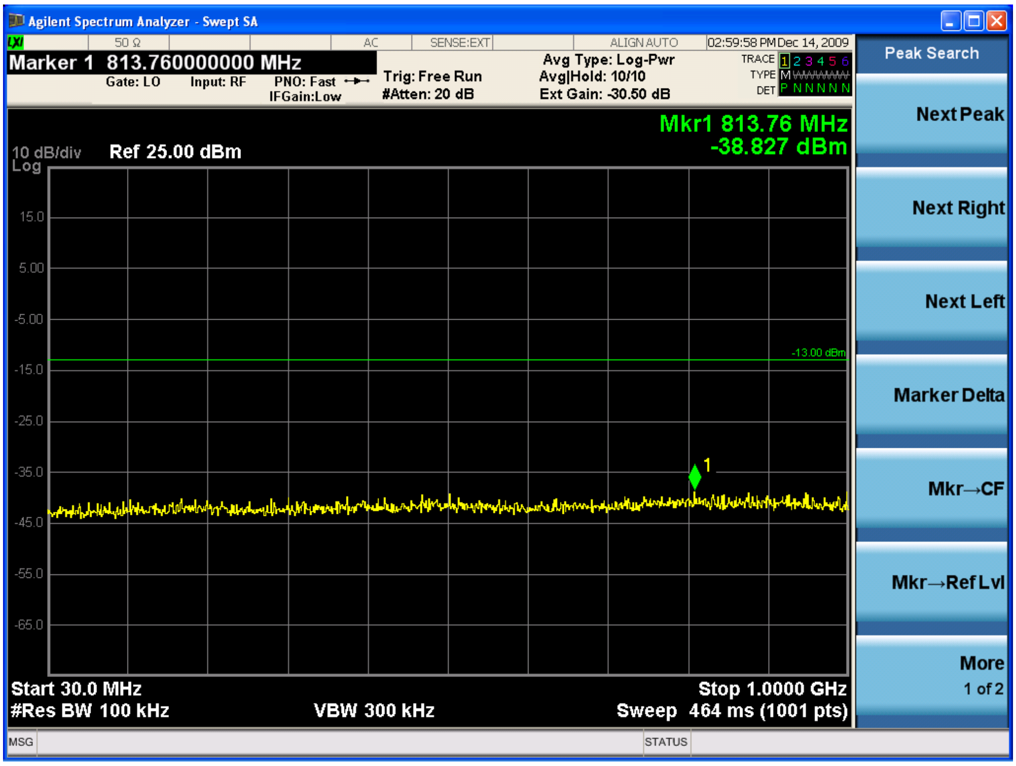
8.4.2. Plot Data at Output 1

(QPSK Low Channel)



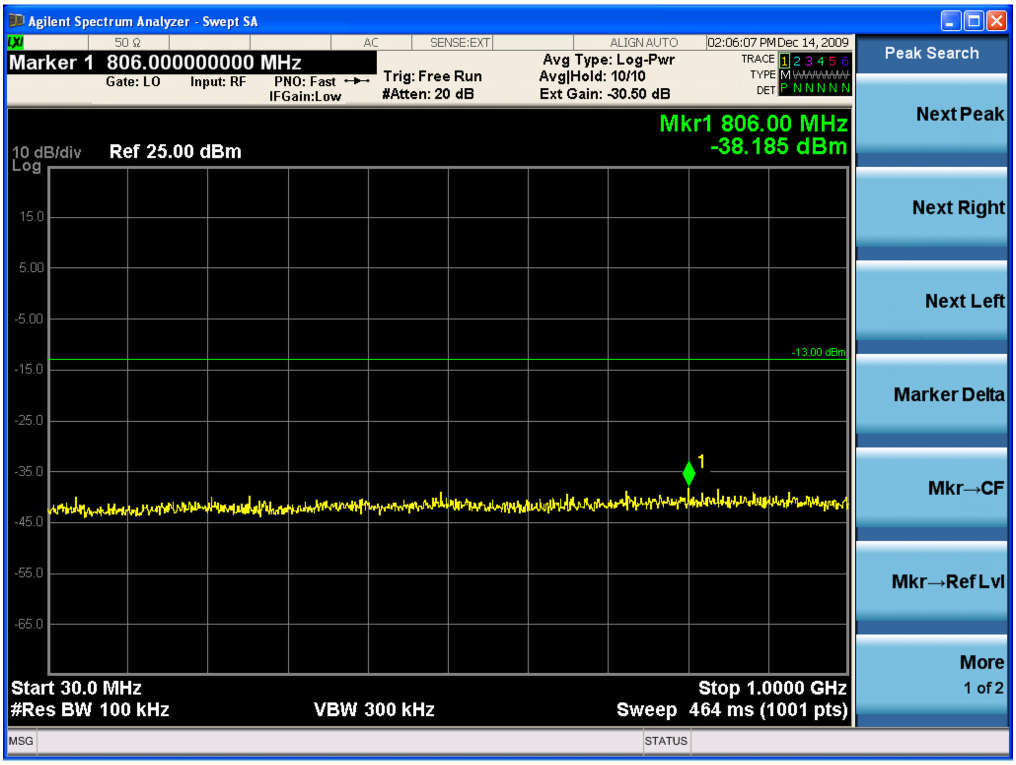
(30 MHz ~ 1 GHz)

(QPSK Middle Channel)



(30 MHz ~ 1 GHz)

(QPSK High Channel)



(30 MHz ~ 1 GHz)

(QPSK Low Channel)

(1 GHz ~ 26.5 GHz)

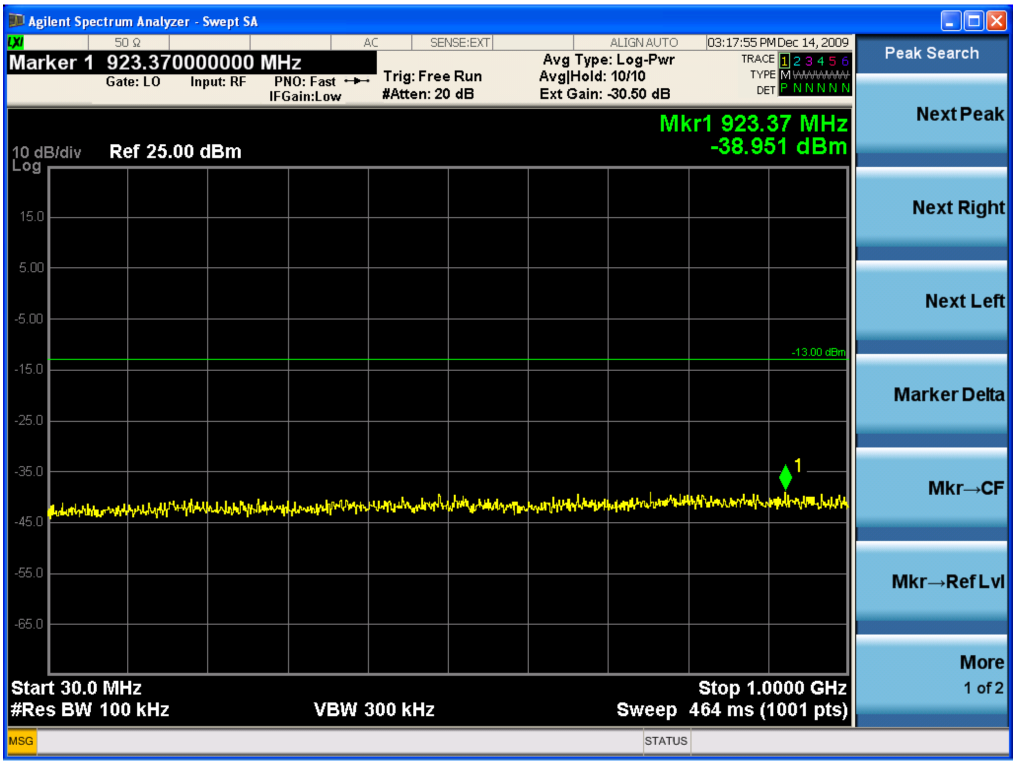
(QPSK Middle Channel)

(1 GHz ~ 26.5 GHz)

(QPSK High Channel)

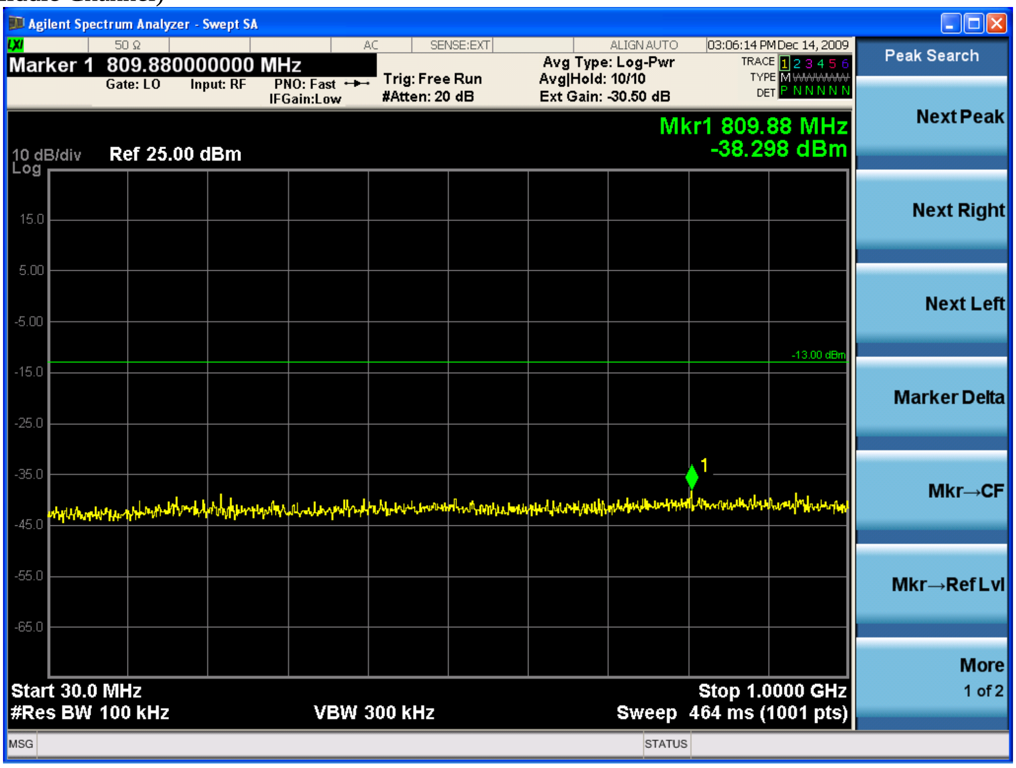
(1 GHz ~ 26.5 GHz)

(16QAM LOW Channel)



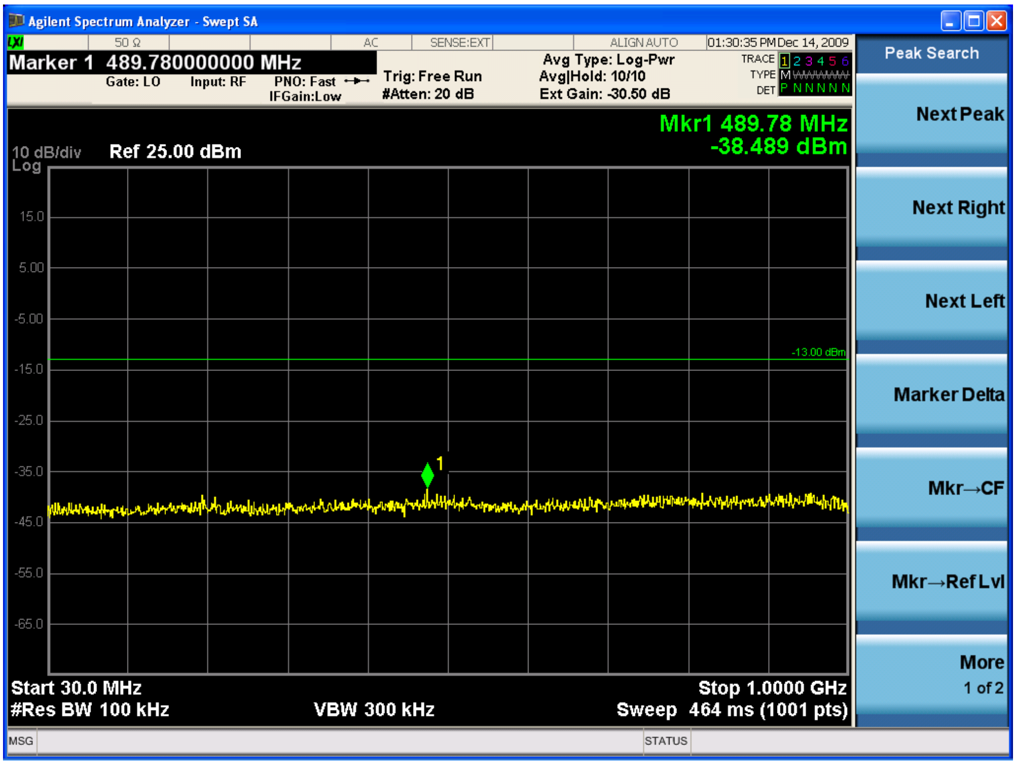
(30 MHz ~ 1 GHz)

(16QAM Middle Channel)



(30 MHz ~ 1 GHz)

(16QAM High Channel)



(30 MHz ~ 1 GHz)

(16QAM LOW Channel)

(1 GHz ~ 26.5 GHz)

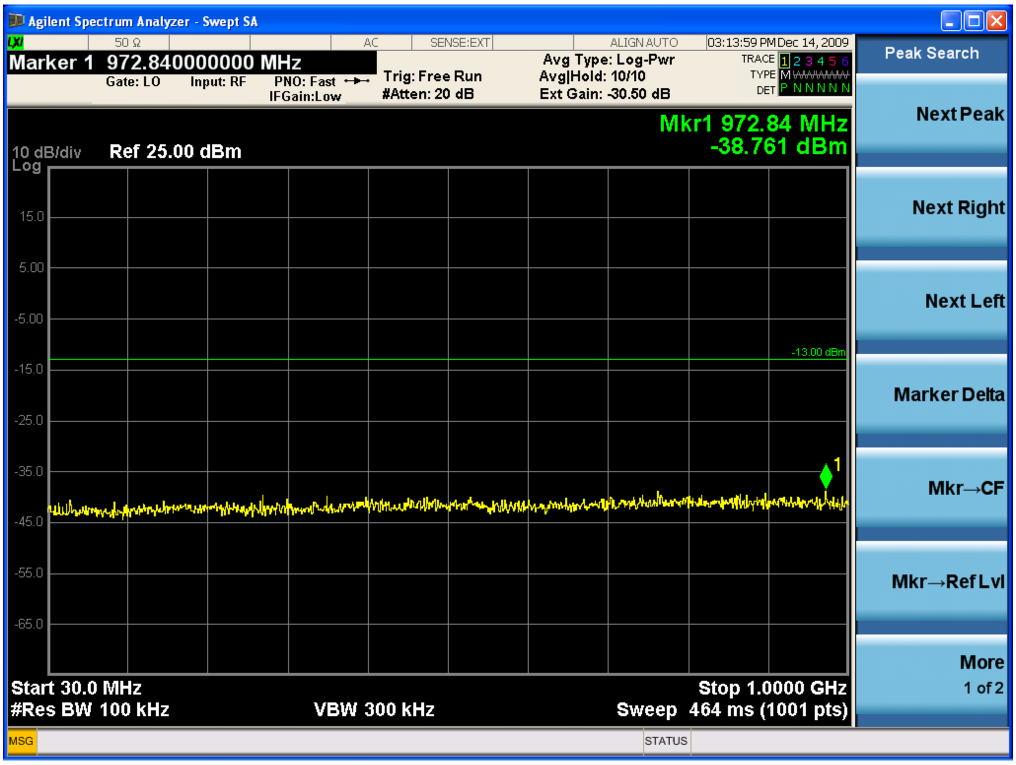
(16QAM Middle Channel)

(1 GHz ~ 26.5 GHz)

(16QAM High Channel)

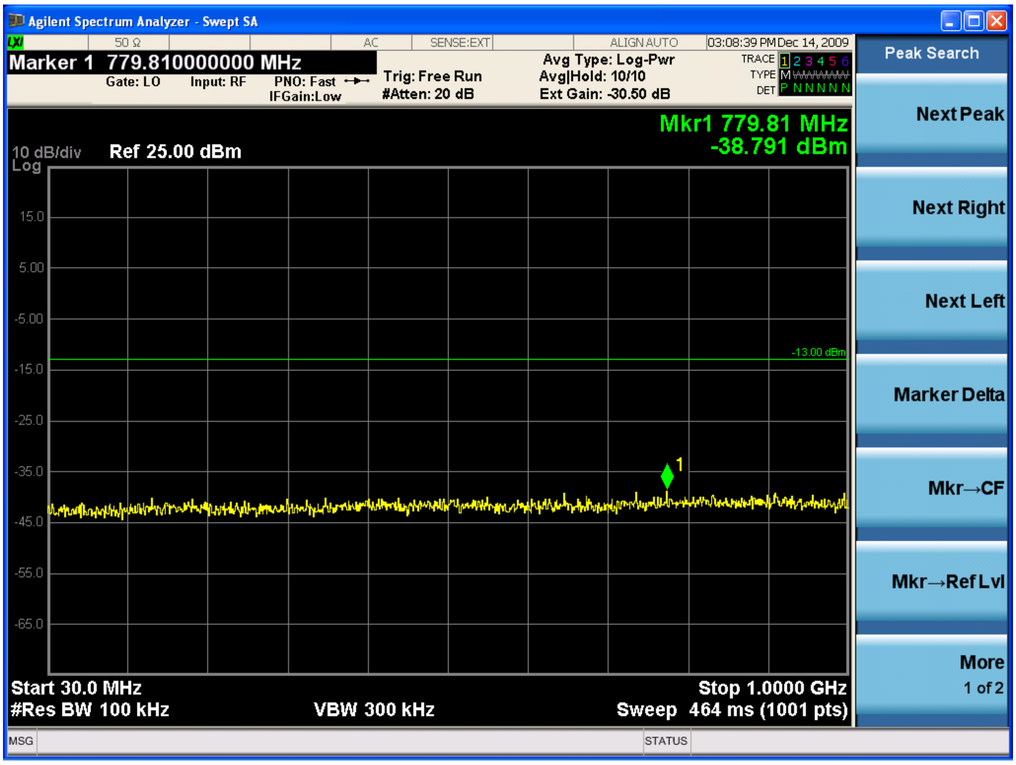
(1 GHz ~ 26.5 GHz)

(64QAM Low Channel)



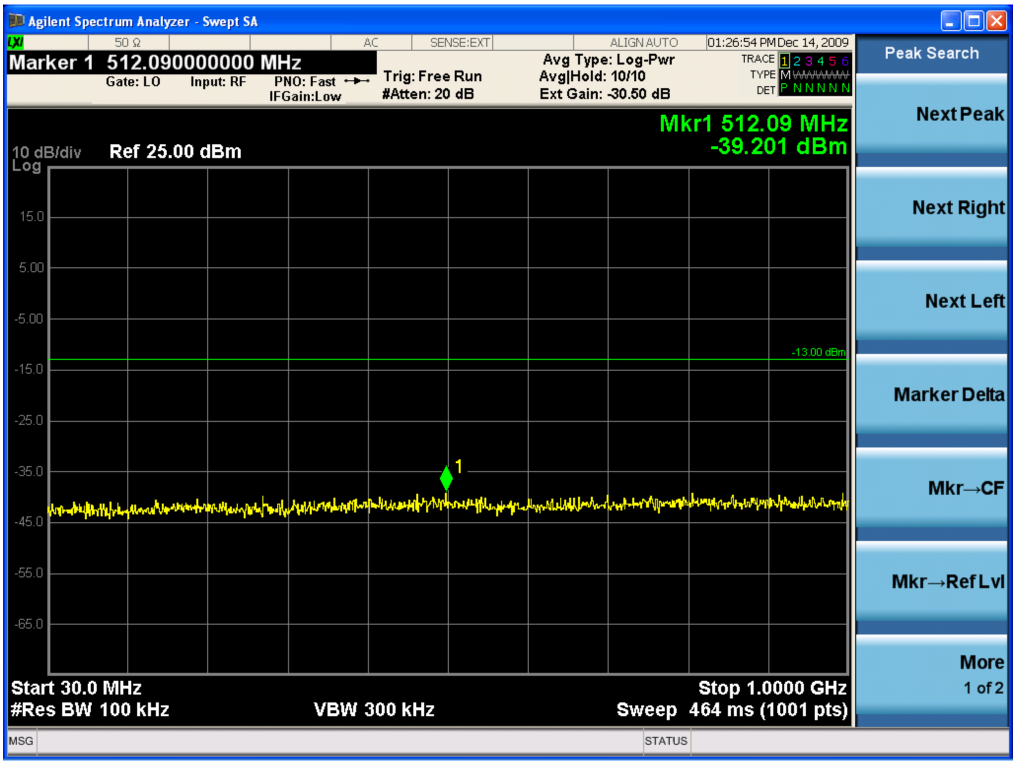
(30 MHz ~ 1 GHz)

(64QAM Middle Channel)



(30 MHz ~ 1 GHz)

(64QAM High Channel)



(30 MHz ~ 1 GHz)

(64QAM Low Channel)

(1 GHz ~ 26.5 GHz)

(64QAM Middle Channel)

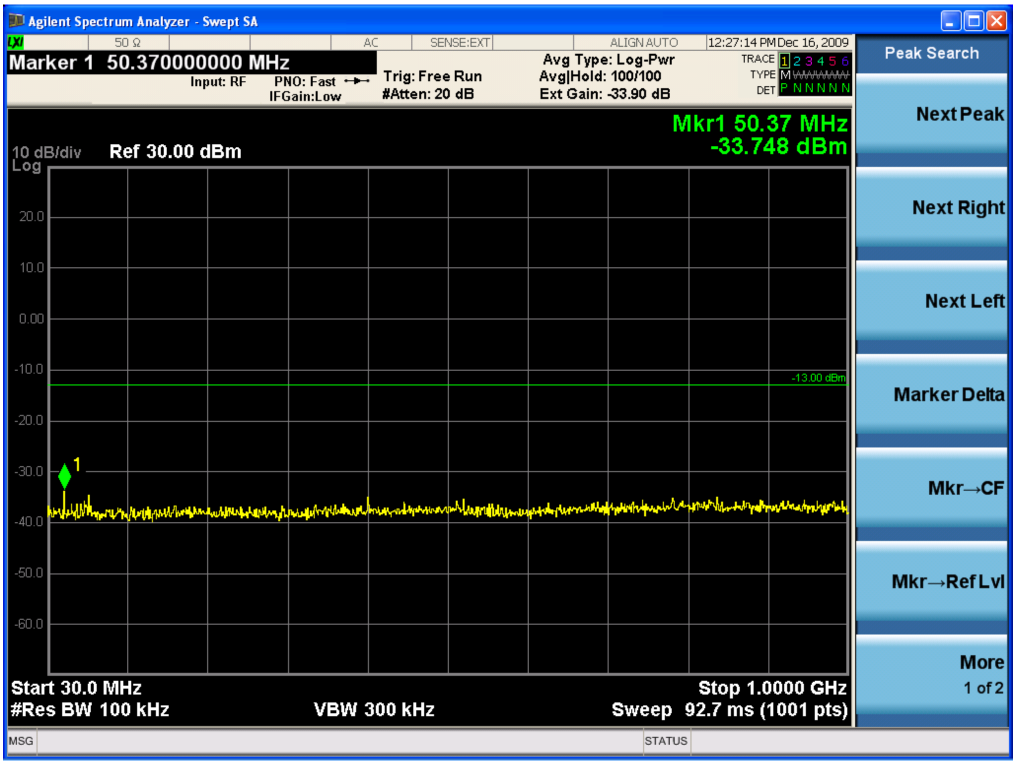
(1 GHz ~ 26.5 GHz)

(64QAM High Channel)

(1 GHz ~ 26.5 GHz)

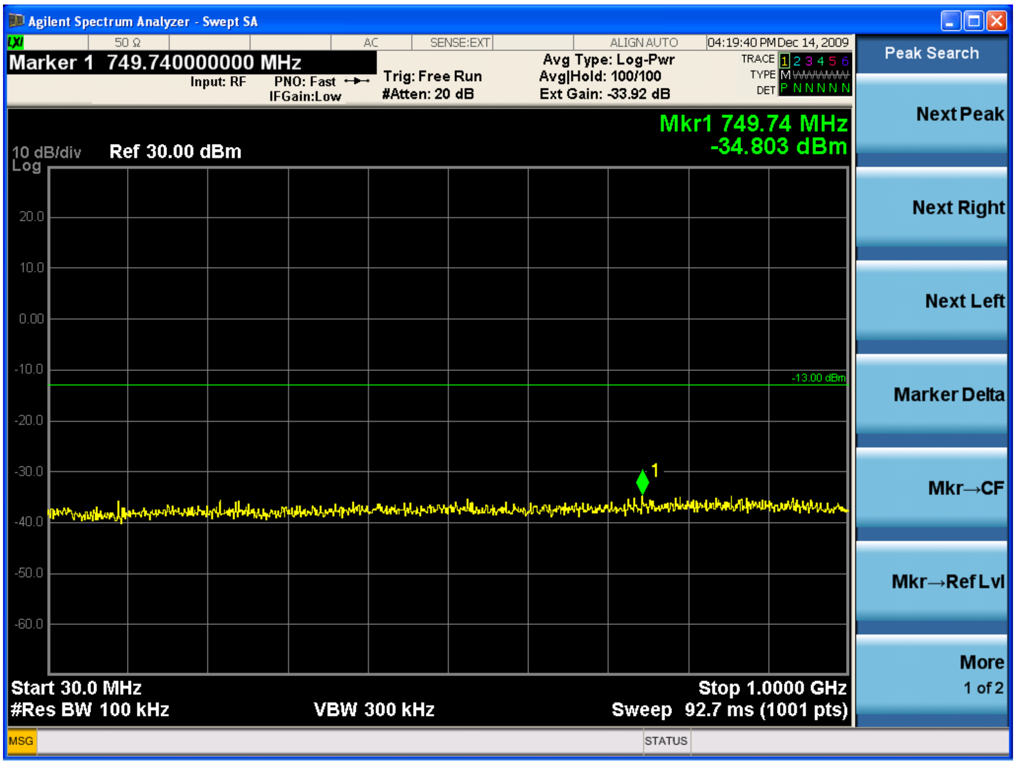
8.4.3. Combined Plot Data at Output

(QPSK Low Channel)



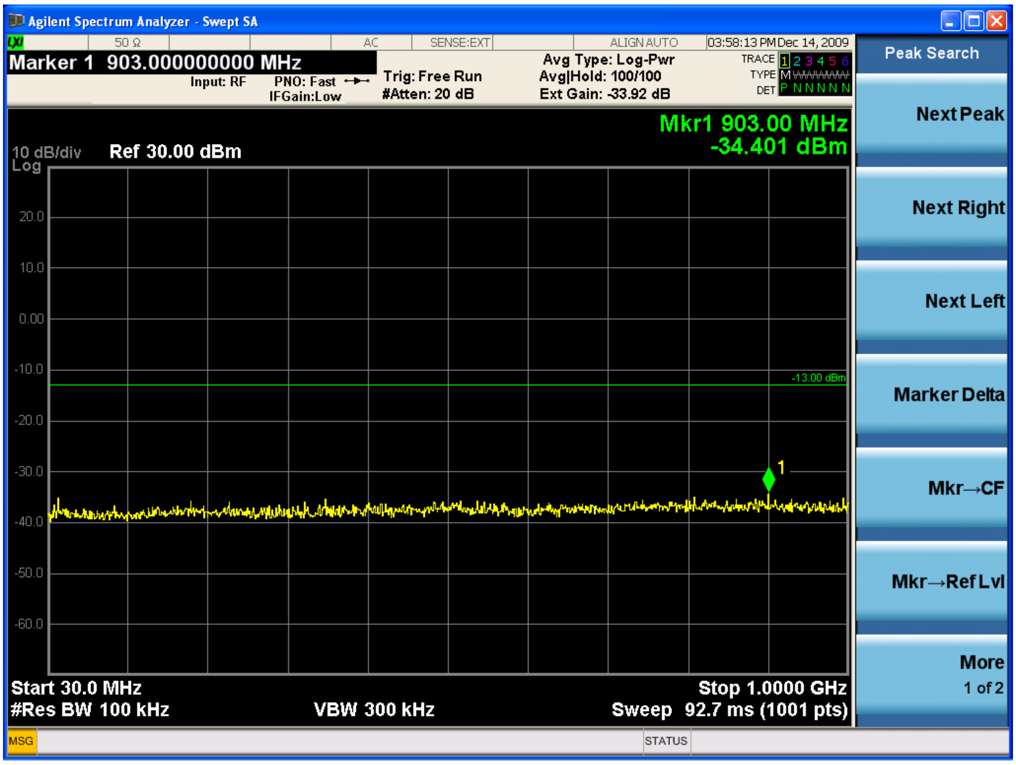
(30 MHz ~ 1 GHz)

(QPSK Middle Channel)



(30 MHz ~ 1 GHz)

(QPSK High Channel)



(30 MHz ~ 1 GHz)

(QPSK Low Channel)

(1 GHz ~ 26.5 GHz)

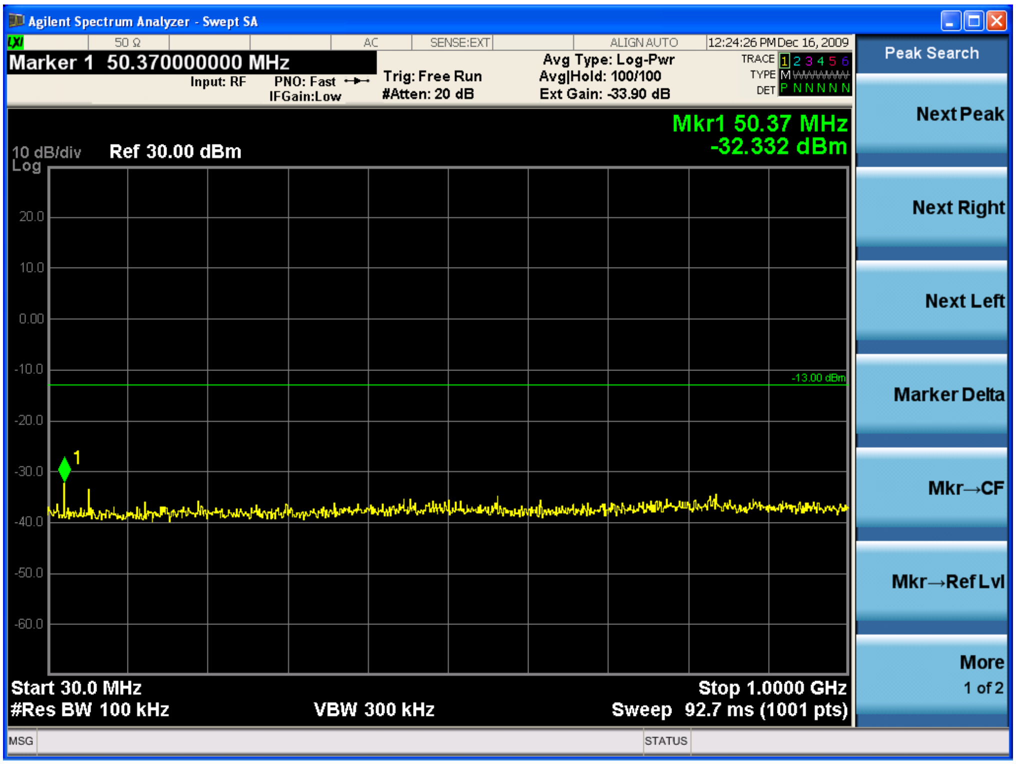
(QPSK Middle Channel)

(1 GHz ~ 26.5 GHz)

(QPSK High Channel)

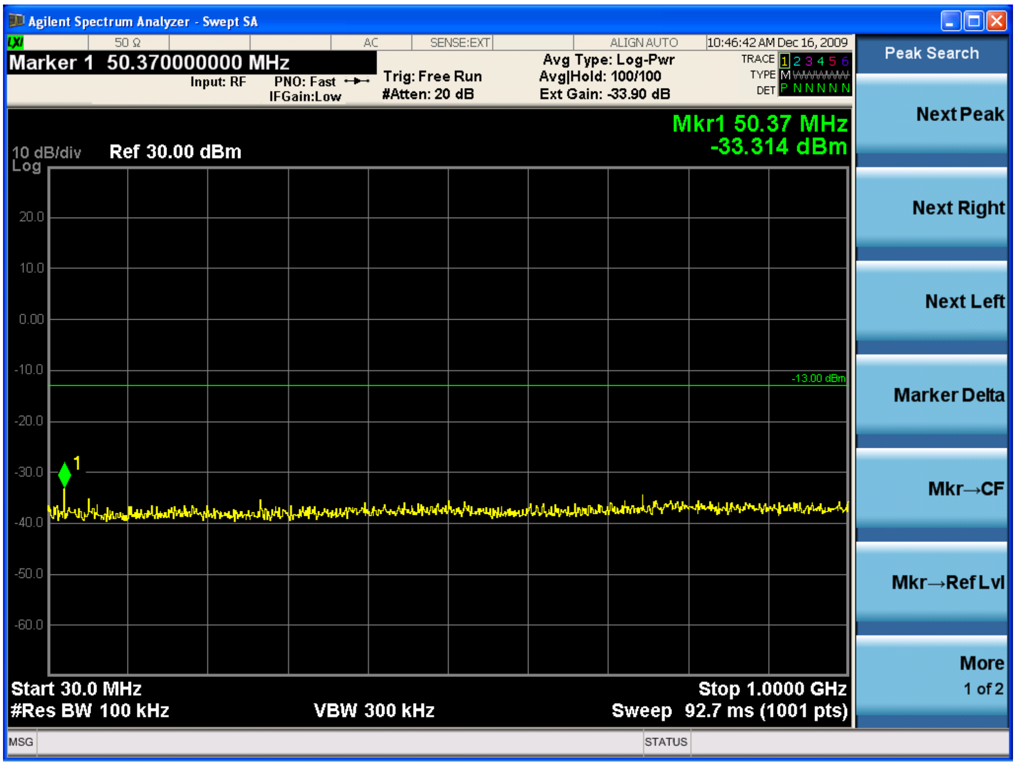
(1 GHz ~ 26.5 GHz)

(16QAM LOW Channel)



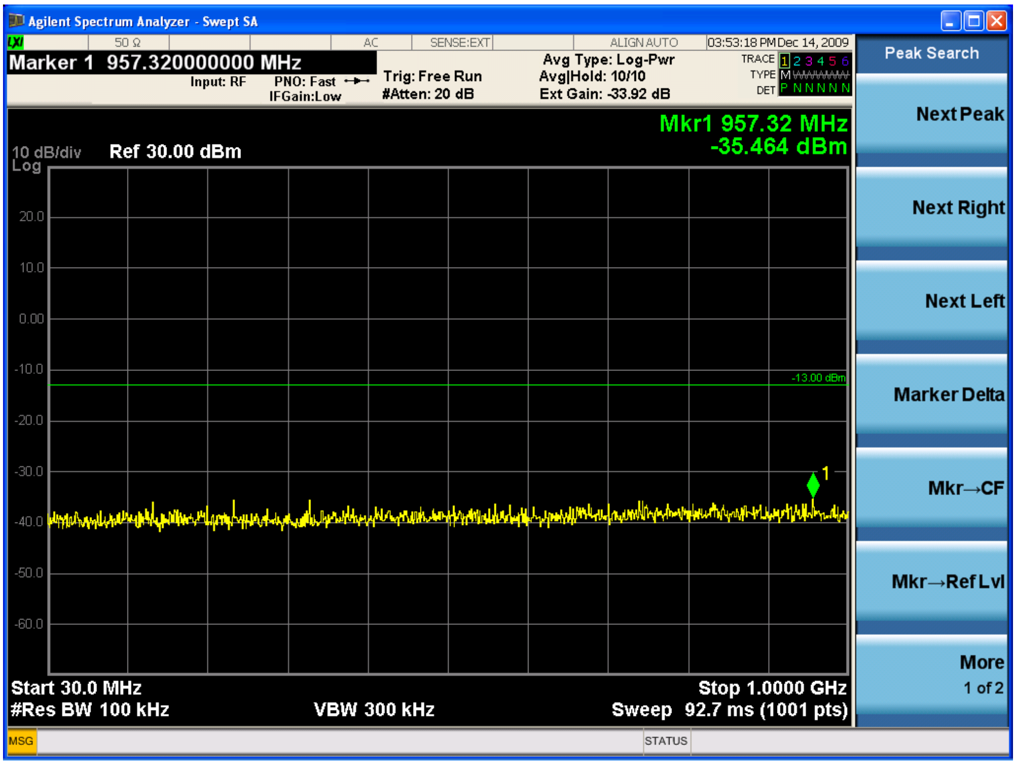
(30 MHz ~ 1 GHz)

(16QAM Middle Channel)



(30 MHz ~ 1 GHz)

(16QAM High Channel)



(30 MHz ~ 1 GHz)

(16QAM LOW Channel)

(1 GHz ~ 26.5 GHz)

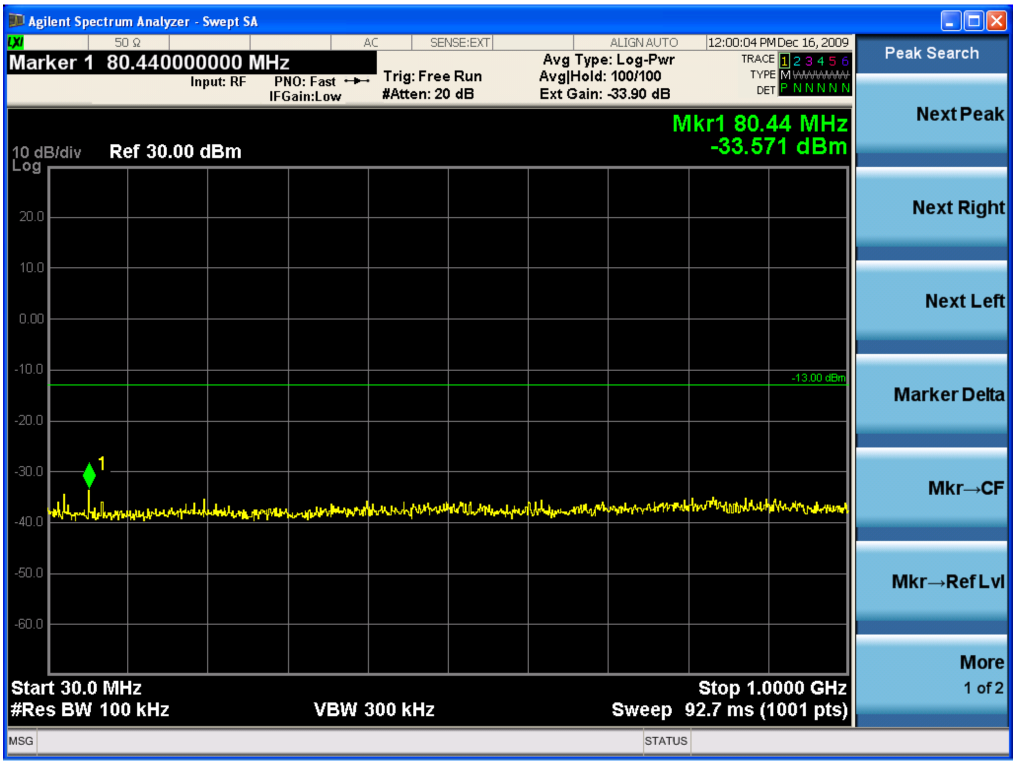
(16QAM Middle Channel)

(1 GHz ~ 26.5 GHz)

(16QAM High Channel)

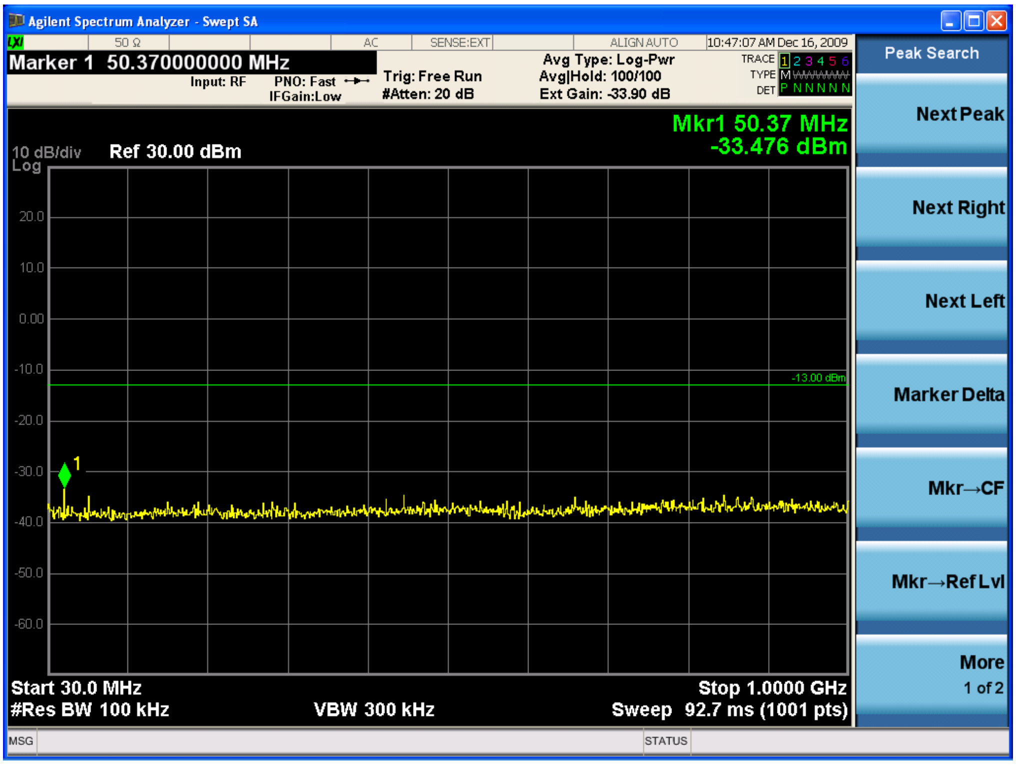
(1 GHz ~ 26.5 GHz)

(64QAM Low Channel)



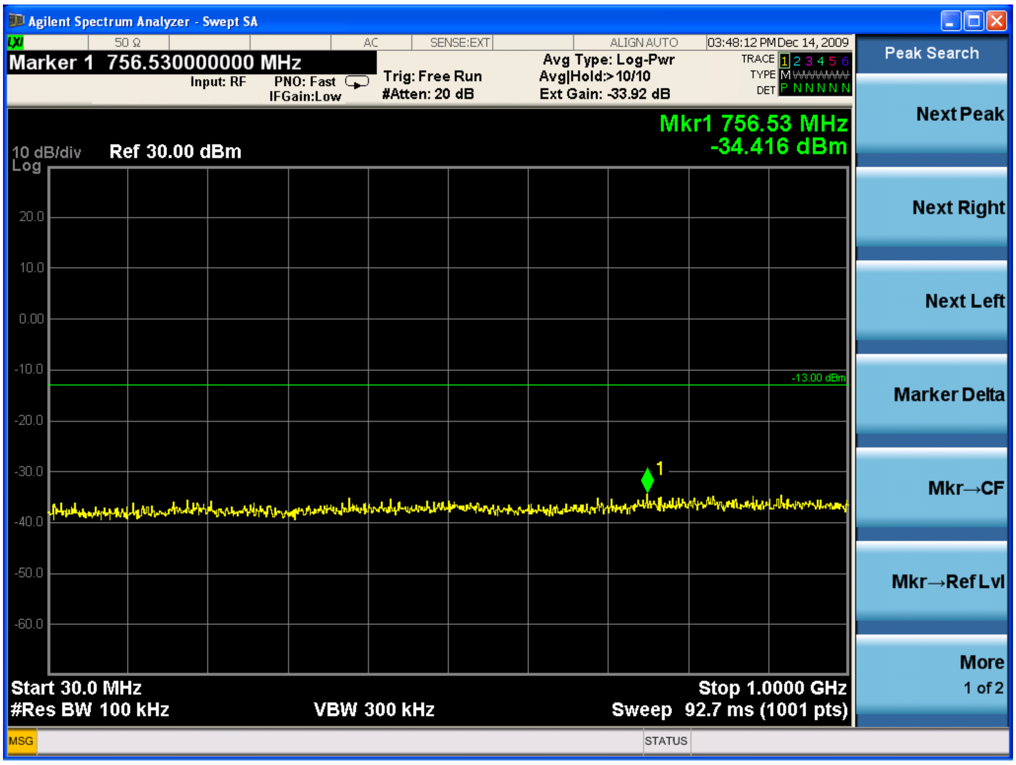
(30 MHz ~ 1 GHz)

(64QAM Middle Channel)



(30 MHz ~ 1 GHz)

(64QAM High Channel)



(30 MHz ~ 1 GHz)

(64QAM Low Channel)

(1 GHz ~ 26.5 GHz)

(64QAM Middle Channel)

(1 GHz ~ 26.5 GHz)

(64QAM High Channel)

(1 GHz ~ 26.5 GHz)

9. RADIATED SPURIOUS EMISSION

9.1 Applicable Standard

Requirements: CFR 47, §2.1053 (a) Measurements shall be made to detect spurious emissions that may be radiated directly from the cabinet, control circuits, power leads, or intermediate circuit elements under normal conditions of installation and operation. Curves or equivalent data shall be supplied showing the magnitude of each harmonic and other spurious emission. For this test, single sideband, independent sideband, and controlled carrier transmitters shall be modulated under the conditions specified in paragraph (c) of §2.1049, as appropriate. For equipment operating on frequencies below 890 MHz, an open field test is normally required, with the measuring instrument antenna located in the far-field at all test frequencies. In the event it is either impractical or impossible to make open field measurements (e.g. a broadcast transmitter installed in a building) measurements will be accepted of the equipment as installed. Such measurements must be accompanied by a description of the site where the measurements were made showing the location of any possible source of reflections which might distort the field strength measurements. Information submitted shall include the relative radiated power of each spurious emission with reference to the rated power output of the transmitter, assuming all emissions are radiated from halfwave dipole antennas.

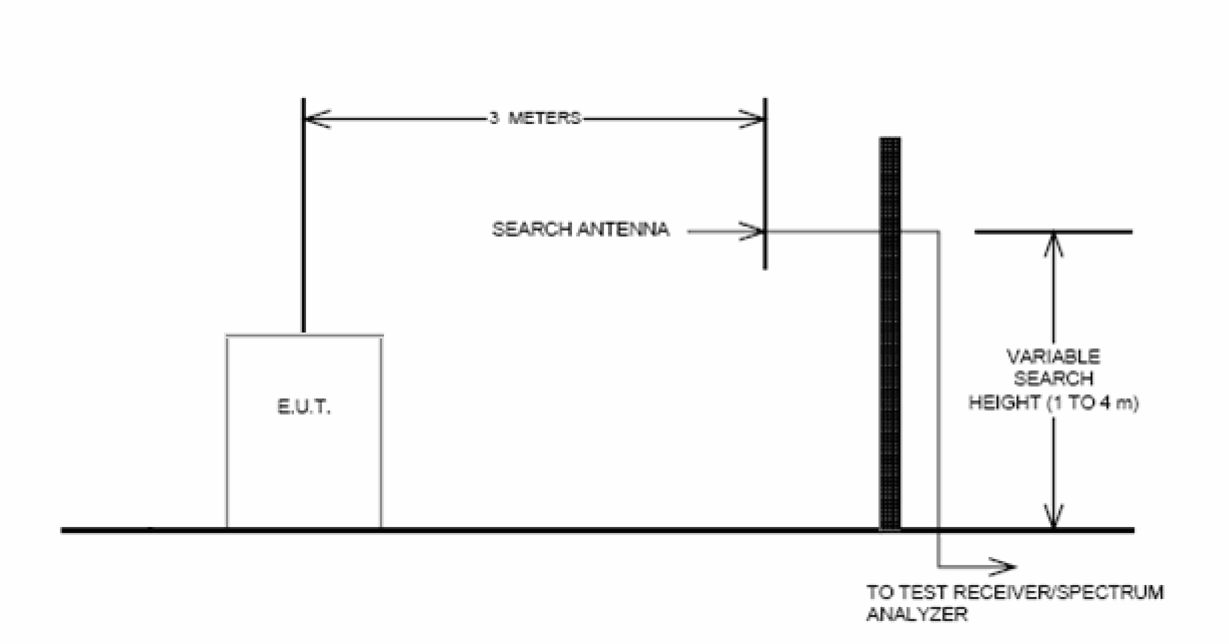
9.2 Test Equipment List and Details

Manufacturer	Model / Equipment	Serial No.	Calibration Due
Schwarzbeck	BBHA 9120D /Double Ridged Horn Antenna	296	09/23/2010
Schwarzbeck	BBHA 9120D /Double Ridged Horn Antenna	147	03/26/2010
Schwarzbeck	VULB 9160/ TRILOG Antenna	9160-3150	12/18/2010
Schwarzbeck	VULB 9160/ TRILOG Antenna	3125	05/06/2011
HD	MA240/ Antenna Position Tower	556	N/A
EMCO	1050/ Turn Table	114	N/A
HD GmbH	HD 100/ Controller	13	N/A
HD GmbH	KMS 560/ SlideBar	12	N/A
MITEQ	AMF-60-0010 1800-35-20P	1200937	05/20/2010
Schwarzbeck	BBHA9170/ SHF-EHF Horn Antenna	BBHA9170342	03/20/2011
R&S	ESI40 / EMI TEST Receiver	831564/003	10/30/2010

9.3 Test Procedure

Radiated emission measurements were performed at an open Site.
The EUT was set at a distance of 3m from the receiving antenna. The EUT's RF ports were terminated to 50ohm load. The EUT was set to transmit at the low, mid and high channels of the transmitter frequency range at its maximum power level. The EUT was rotated about 360^0 and the receiving antenna scanned from 1-4m in order to capture the maximum emission.
A calibrated antenna source was positioned in place of the EUT and the previously recorded signal was duplicated.
The maximum EIRP of the emission was calculated by adding the forward power to the calibrated source plus its appropriate gain value. These steps were carried out with the receiving antenna in both vertical and horizontal polarization. Harmonic emissions up to the 10th or 40GHz, whichever was the lesser, were investigated.
Preliminary Test was performed each mode. The final test was performed the worst case mode only.
(Combined, QPSK)

9.3.1 Radiated Spurious Emissions Test Setup



9.3.2 Environmental Conditions:

Temperature:	23 °C
Relative Humidity:	40 %

9.4 Test Result

: PASS

(QPSK Low CH)

Frequency	Freq.(MHz)	Measured Level [dBm]	Ant. Gain (dBd)	Substitute Level [dBm]	C.L	Pol.	ERP (dBm)	Margin (dB)
2508.5	5017	−53.17	12.41	−65.38	4.50	V	−57.47	−44.47
	5017	−54.25	12.41	−66.46	4.50	H	−58.55	−45.5
	7526	−68.61	11.59	−71.77	6.09	H	−66.27	−53.27
2608.0	5202	−67.94	12.51	−70.08	4.56	V	−62.13	−49.13
	5202	−67.81	12.51	−69.91	4.56	H	−62.00	−49.00
	7803	−54.41	11.66	−60.17	6.62	H	−51.08	−38.08
2683.5	5362	−54.71	12.60	−66.90	4.60	V	−58.90	−45.90
	5362	−53.70	12.60	−65.89	4.60	H	−57.89	−44.89
	8052	−54.90	11.23	−55.72	7.08	H	−51.57	−38.57

10. FREQUECNY STABILITY

10.1 Applicable Standard

Requirements: FCC § 2.1055 (a), Part27.54 following: The frequency stability shall be sufficient to ensure that the fundamental emissions stay

10.2 Test Equipment List and Details

Manufacturer	Model / Equipment	Serial No.	Calibration Due
Agilent	6674A / DC Power Supply	3501A00901	05/14/2010
WEINSCHEL	67-30-33 / Attenuator	BR0530	02/03/2010
WEINSCHEL	AF117A-69-43 / STEP ATTENUATOR	20623	02/06/2010
Agilent	N9020A / MXA Signal Analyzer	US46220219	02/19/2010

10.3 Test Procedure

Frequency Stability over Temperature variation:
The equipment under test was connected to an external AC-DC power supply and the RF output was connected to a Spectrum Analyzer via feed-through attenuators. The EUT was placed inside the temperature chamber. RF output cable exited the chamber through an opening made for the purpose.
After the temperature stabilized for approximately 30 minutes, the frequency output was recorded from the VSA8960 S/W via MXA Signal Analyzer.
Frequency stability over Voltage variation:
An external variable AC-DC power supply Source. The voltage was set to 85% and 115% of the nominal value. The output frequency was recorded for each voltage.

10.3.1. Environmental conditions

Temperature:	24 ° C
Relative Humidity:	37 %

10.4. Test Result

: Pass

10.4.1. Frequency Stability over Temperature and Voltage variation

Modulation: QPSK

Reference: 110 V at 20°C **Freq.** = 2608,000,000 MHz

Temperature (Celsius)	Measured Freq (MHz)	Drift (ppm)
50	2,607,999,987	-0.004984663
40	2,607,999,985	-0.005751534
30	2,607,999,991	-0.003565951
20	**Reference**	
10	2,607,999,986	-0.005368098
0	2,607,999,990	-0.003834356
-10	2,607,999,991	-0.00345092
-20	2,608,000,016	0.006134969
-30	2,607,999,985	-0.005751534

Reference: 110 V at 20°C **Freq.** = 2608,000,000 MHz

Voltage(dc) +/-15% Ref	Measured Freq (MHz)	Drift (ppm)
93.5	2,607,999,987	-0.004984663
126.5	2,607,999,982	-0.00690184

(Output Port0 Middle CH)

Modulation: 16QAM

Reference: 110 V at 20°C **Freq.** = 2608,000,000 MHz

Temperature (Celsius)	Measured Freq (MHz)	Drift (ppm)
50	2,607,999,986	-0.005368098
40	2,607,999,976	-0.009202454
30	2,607,999,988	-0.004601227
20	**Reference**	
10	2,607,999,985	-0.005751534
0	2,607,999,988	-0.004601227
-10	2,607,999,983	-0.006518405
-20	2,607,999,987	-0.004984663
-30	2,607,999,985	-0.005751534

Reference: 110 V at 20°C **Freq.** = 2608,000,000 MHz

Voltage(dc) +/-15% Ref	Measured Freq (MHz)	Drift (ppm)
93.5	2,607,999,986	-0.005368098
126.5	2,607,999,990	-0.003834356

(Output Port1 Middle CH)

Modulation: 64QAM

Reference: - 110 V at 20°C **Freq.** = 2608,000,000 MHz

Temperature (Celsius)	Measured Freq (MHz)	Drift (ppm)
50	2,607,999,989	-0.004217791
40	2,607,999,990	-0.003834356
30	2,607,999,991	-0.00345092
20	**Reference**	
10	2,607,999,988	-0.004601227
0	2,607,999,990	-0.003834356
-10	2,607,999,991	-0.00345092
-20	2,607,999,990	-0.003834356
-30	2,607,999,989	-0.004217791

Reference: 110 V at 20°C **Freq.** = 2608,000,000 MHz

Voltage(dc) +/-15% Ref	Measured Freq (MHz)	Drift (ppm)
93.5	2,607,999,987	-0.004984663
126.5	2,607,999,988	-0.004601227

(Output Port0 Middle CH)

11. RF EXPOSURE STATEMENT

1. LIMITS

According to §1.1310 and §2.1091 RF exposure is calculated.

(B) Limits for General Population/Uncontrolled Exposures

Frequency range (MHz)	Electric field Strength (V/m)	Magnetic field Strength (A/m)	Power density (mW/cm^2)	Averaging time (minutes)
0.3 - 1.34......................................	614	1.63	*(100)	30
1.34 - 30......................................	824/f	2.19/f	*(180/ f^2)	30
30 - 300......................................	27.5	0.073	0.2	30
300 - 1500...................................	....	....	f/1500	30
1500 - 100.000................................	....	....	1.0	30

F = frequency in MHz

* = Plane-wave equivalent power density

2. MAXIMUM PERMISSIBLE EXPOSURE Prediction

Prediction of MPE limit at a given distance

Equation from page 18 of OET Bulletin 65, Edition 97-01

$$\mathbf{S = PG/4\pi R^2}$$

S = Power density

P = power input to antenna

G = power gain of the antenna in the direction of interest relative to an isotropic radiator

R = distance to the center of radiation of the antenna

Max Peak output Power at antenna input terminal	26.21000	dBm
Max Peak output Power at antenna input terminal	417.83037	mW
Prediction distance	20.00000	cm
Prediction frequency	2683.50000	MHz
Antenna Gain(typical)	5.60300	dBi
Antenna Gain(numeric)	3.63329	-
Power density at prediction frequency (S)	0.30202	mW/cm^2
MPE limit for uncontrolled exposure at prediction frequency	1.00000	mW/cm^2

3. RESULTS

The power density level at 20 cm is 0.30202 mW/cm^2, which is below the uncontrolled exposure limit of 1.0 mW/cm^2 at 2683.5 MHz.