

7. BAND EDGES

7.1. Applicable Standard

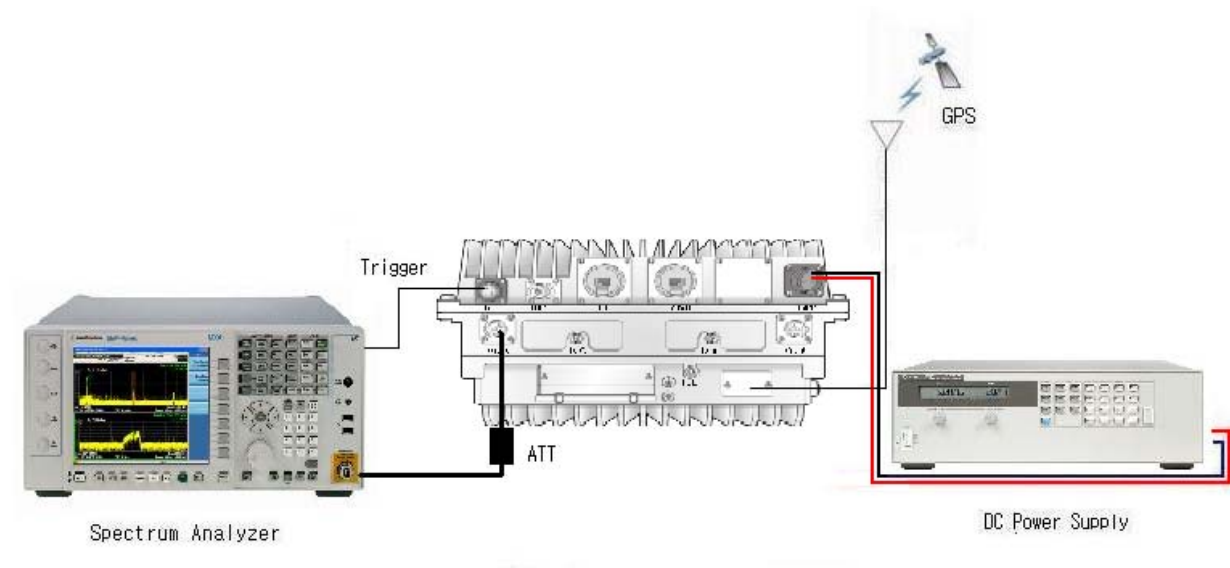
According to §27.53(m), the power of any emission outside of the authorized operating frequency ranges must be attenuated below the transmitting power (p) by a factor of at least $43 + 10 \log (p)$ dB.

7.2. Test Equipment List and Details

Manufacturer	Model / Equipment	Serial No.	Calibration Due
Agilent	6674A / DC Power Supply	3501A00901	05/14/2011
WEINSCHEL	67-30-33 / Attenuator	BU5347	01/06/2011
WEINSCHEL	67-30-33 / Attenuator	BR0530	01/14/2011
Agilent	N9020A / MXA Signal Analyzer	US46220219	03/03/2011
Agilent	11636B / Power Divider	11377	12/24/2010

7.3. Test Procedure

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



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.

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7.4. Test Result

: PASS

7.4.1. Test data at Output 1

Modulation	Channel	Measured Frequency (MHz)	Max. Measured Value (dBm)	Limit (dBm)
QPSK	Low	2499.00	-38.928	-13.0
	High	2686.75	-40.561	
16QAM	Low	2499.00	-39.378	
	High	2686.75	-40.424	
64QAM	Low	2499.00	-39.728	
	High	2686.75	-41.260	

7.4.2. Test data at Output 2

Modulation	Channel	Measured Frequency (MHz)	Max. Measured Value (dBm)	Limit (dBm)
QPSK	Low	2499.00	-39.506	-13.0
	High	2686.75	-41.759	
16QAM	Low	2499.00	-39.878	
	High	2686.75	-42.175	
64QAM	Low	2499.00	-39.879	
	High	2686.75	-42.125	

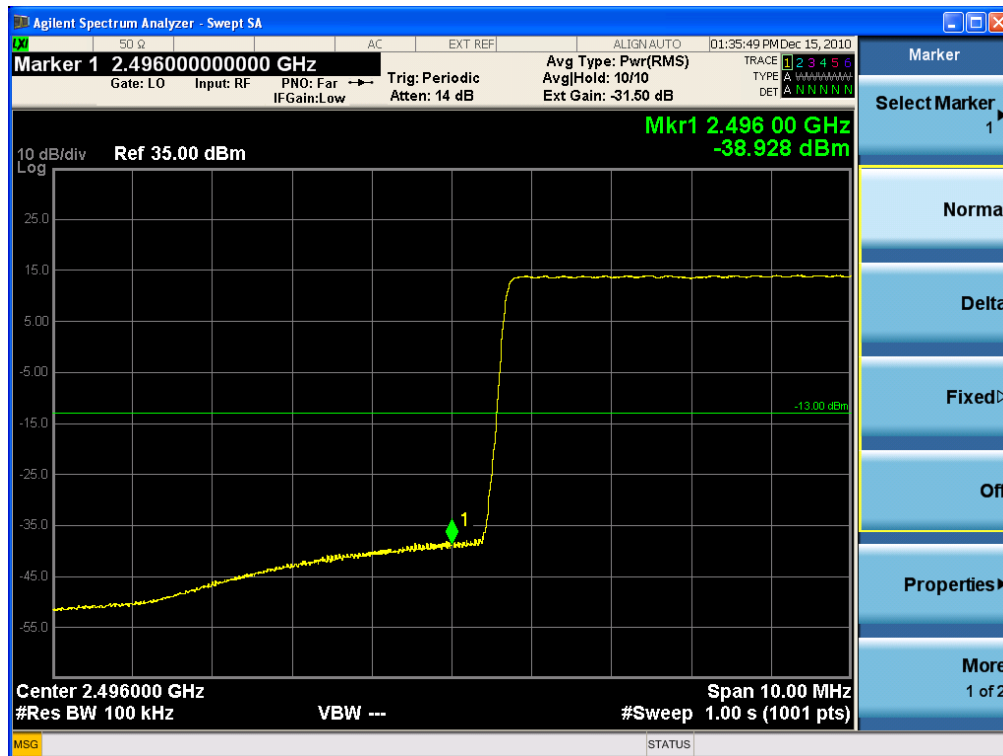
7.4.3. Combined Test data at Output

Modulation	Channel	Measured Frequency (MHz)	Max. Measured Value (dBm)	Limit (dBm)
QPSK	Low	2499.00	-38.265	-13.0
	High	2686.75	-40.814	
16QAM	Low	2499.00	-38.276	
	High	2686.75	-40.586	
64QAM	Low	2499.00	-38.269	
	High	2686.75	-39.983	

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7.4.4. Plot Data at Output 1

(QPSK Low Channel)

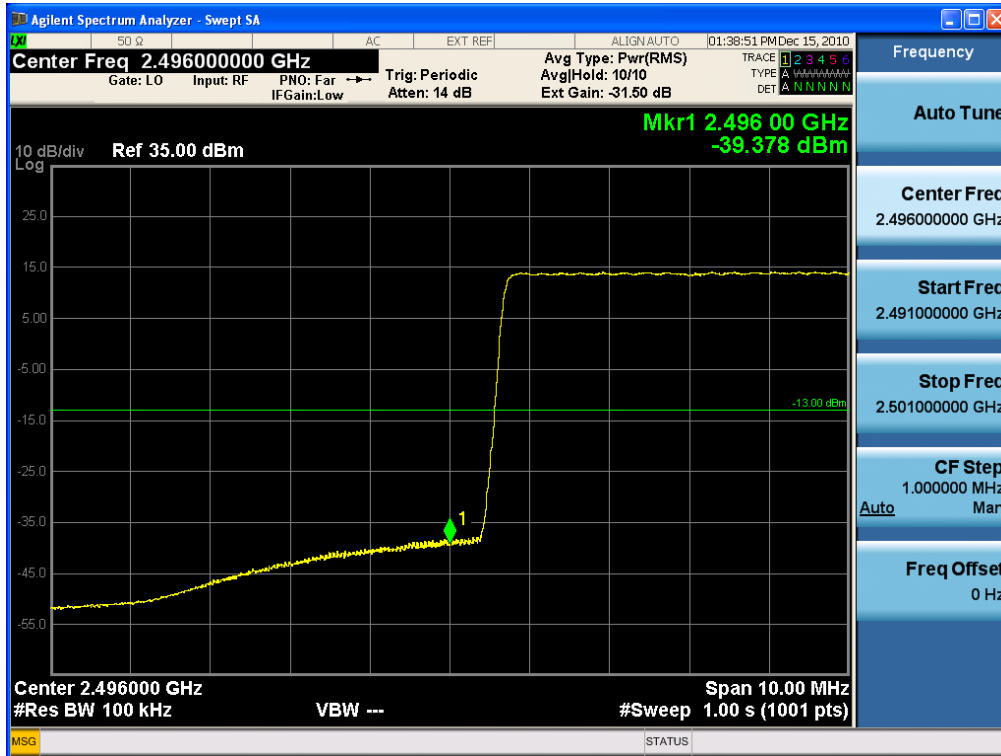


(QPSK High Channel)

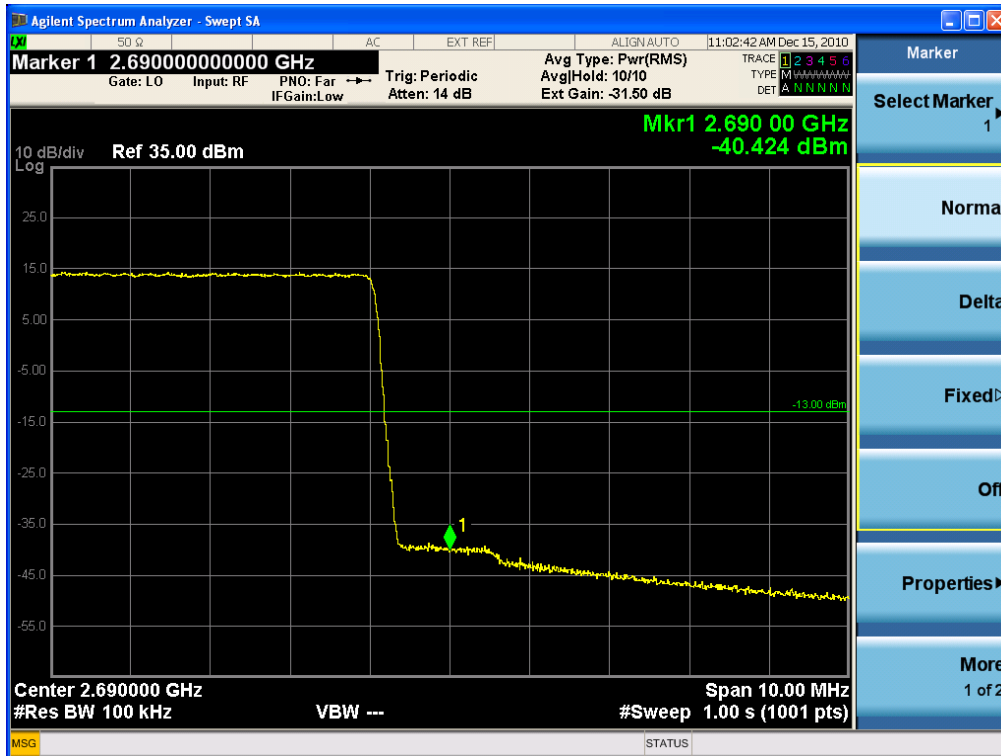


FCC PT.27 TEST REPORT	FCC CERTIFICATION REPORT			HCT PT.27 TEST REPORT
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(16QAM Low Channel)

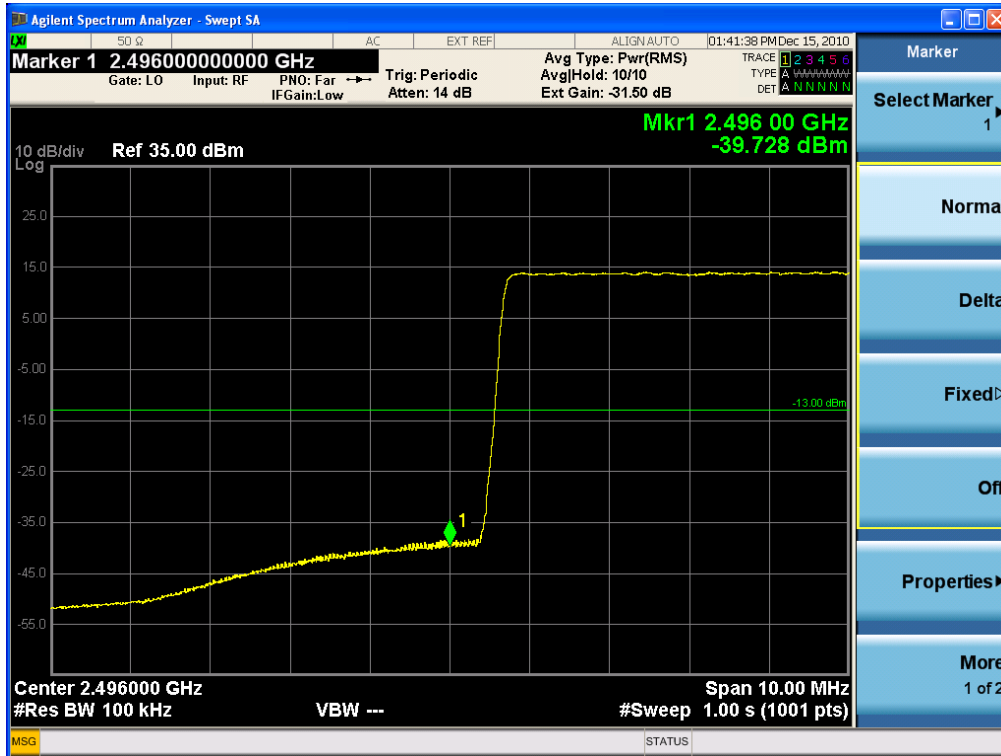


(16QAM High Channel)

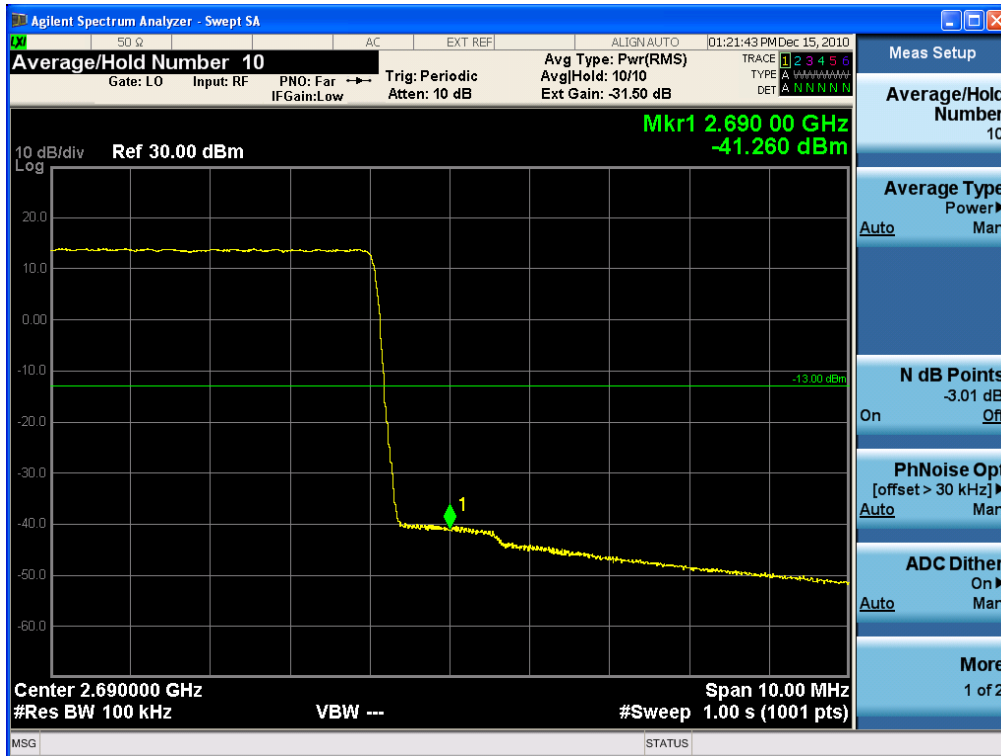


FCC PT.27 TEST REPORT	FCC CERTIFICATION REPORT			HCT PT.27 TEST REPORT
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(64QAM Low Channel)



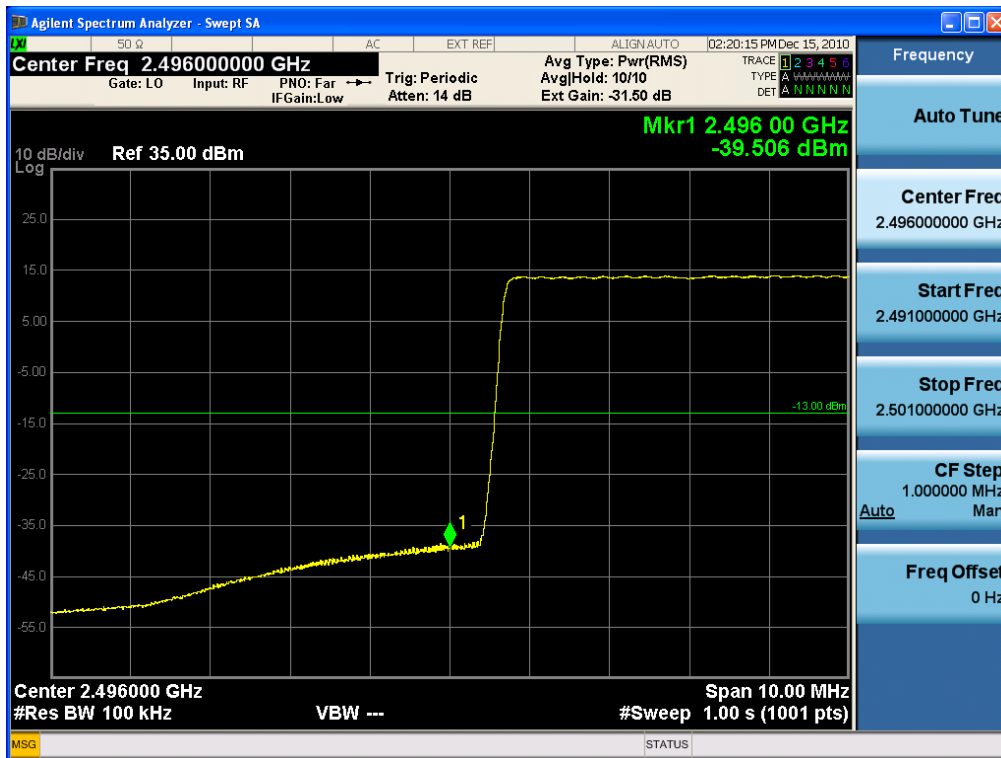
(64QAM High Channel)



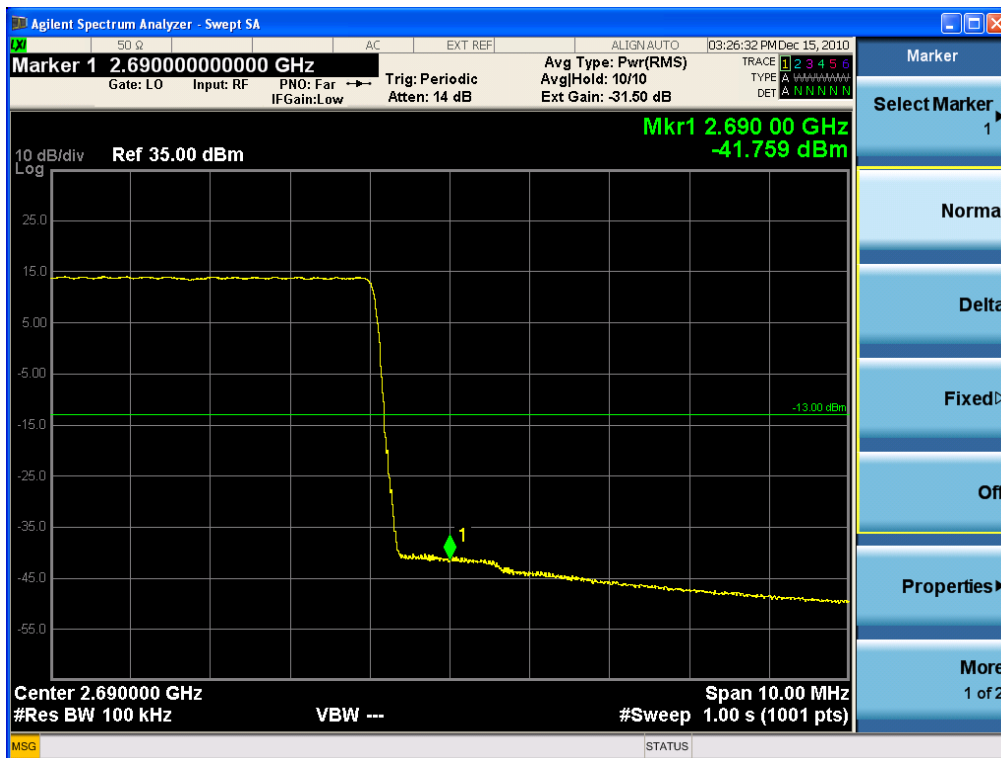
FCC PT.27 TEST REPORT	FCC CERTIFICATION REPORT			HCT PT.27 TEST REPORT
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7.4.5. Plot Data at Output 2

(QPSK Low Channel)

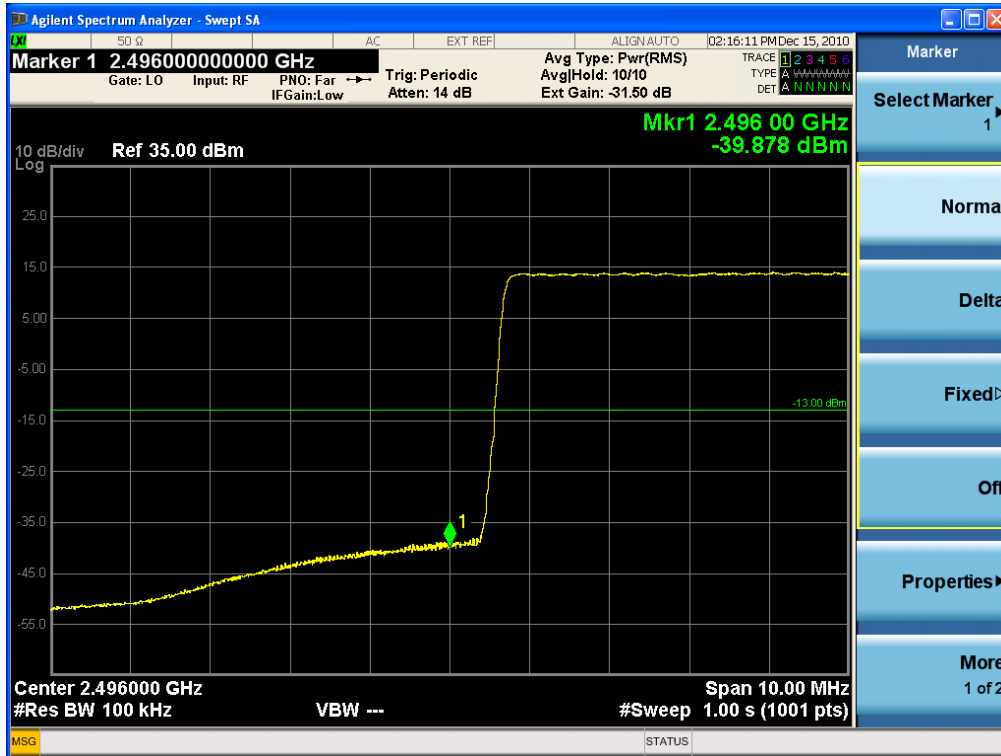


(QPSK High Channel)

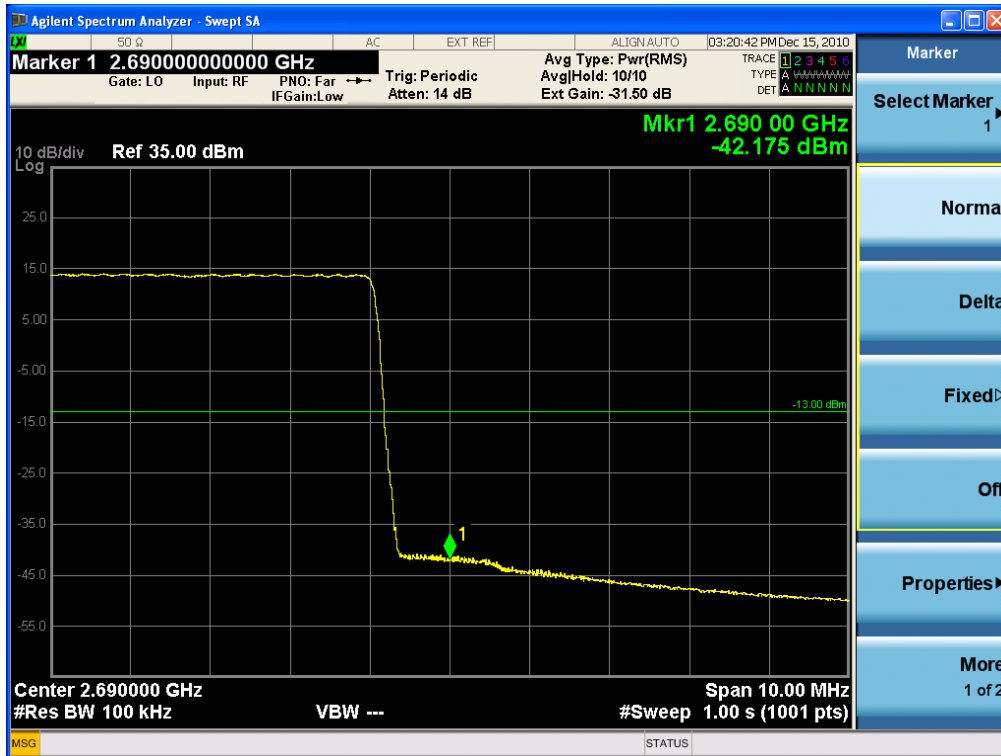


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(16QAM Low Channel)

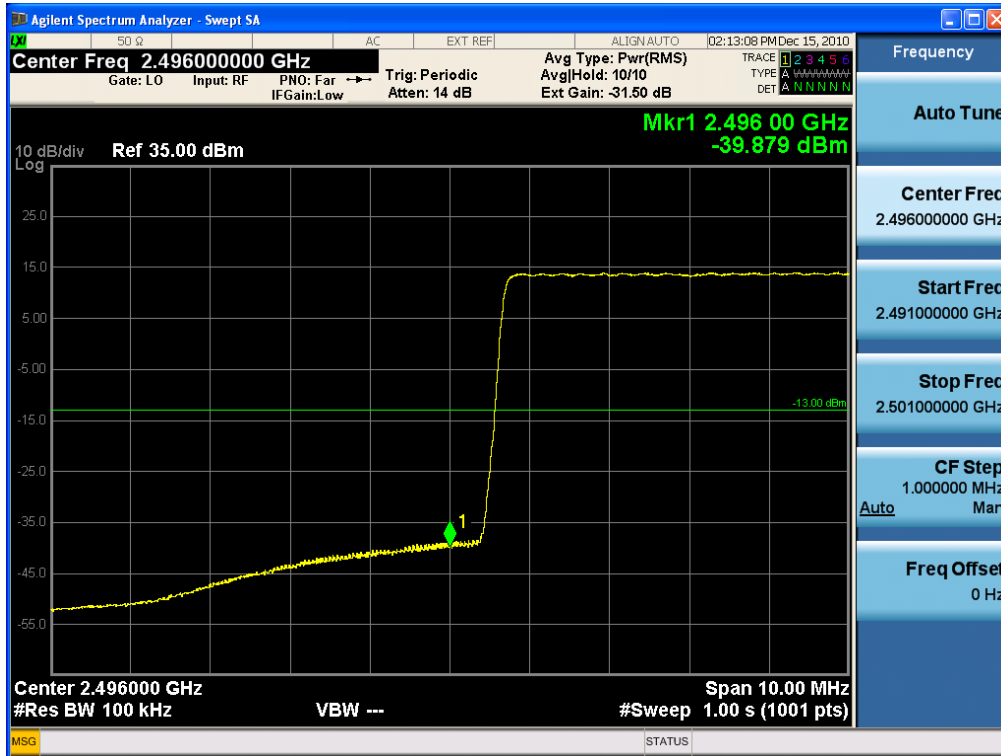


(16QAM High Channel)

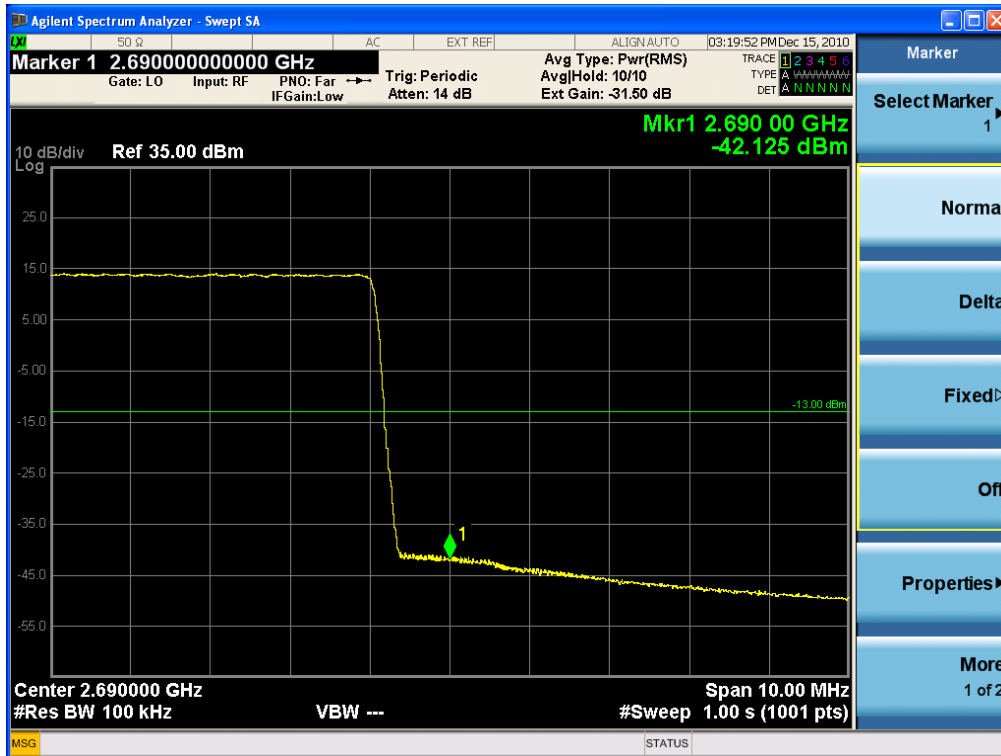


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(64QAM Low Channel)



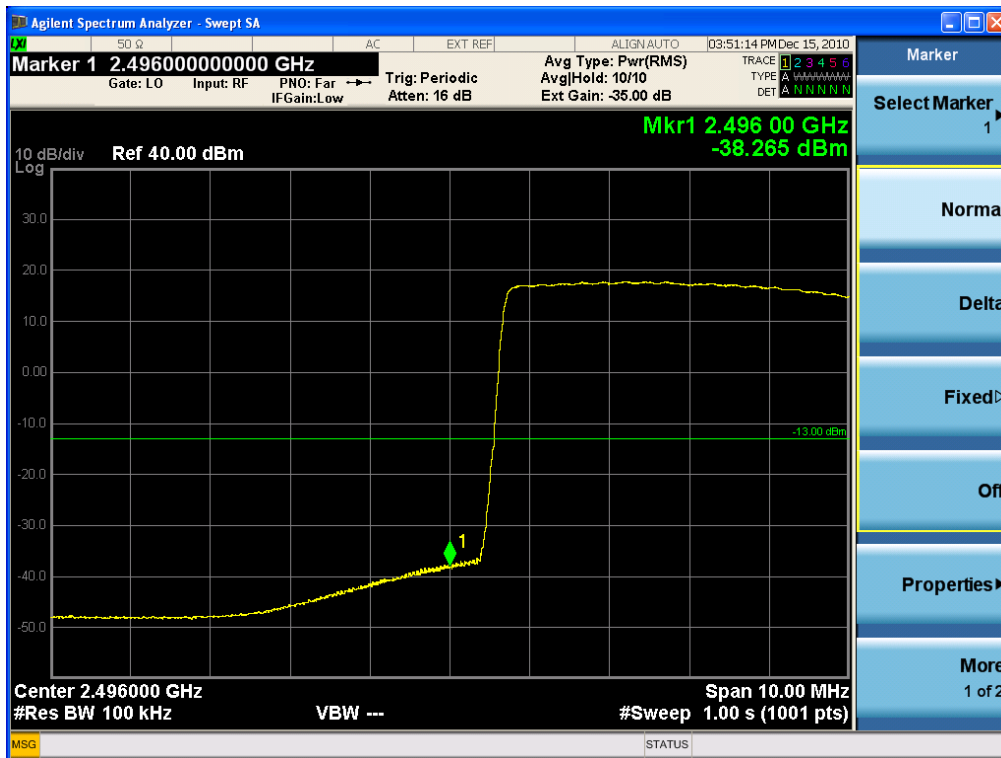
(64QAM High Channel)



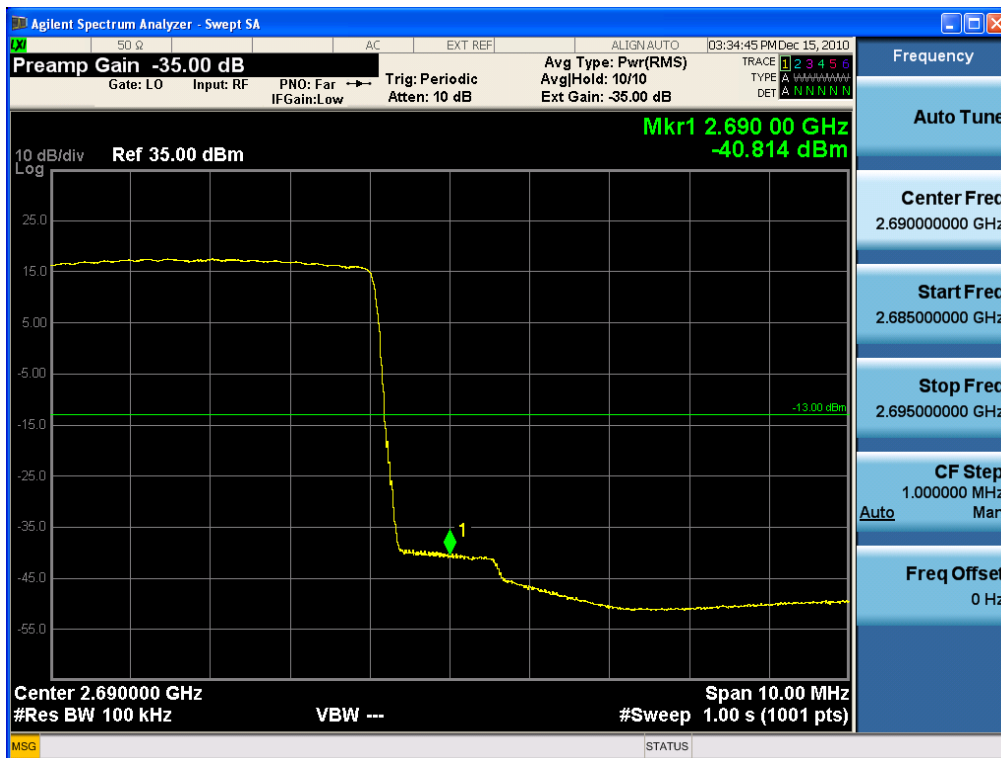
FCC PT.27 TEST REPORT	FCC CERTIFICATION REPORT			HCT PT.27 TEST REPORT
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7.4.6. Combined Plot Data at Output

(QPSK Low Channel)

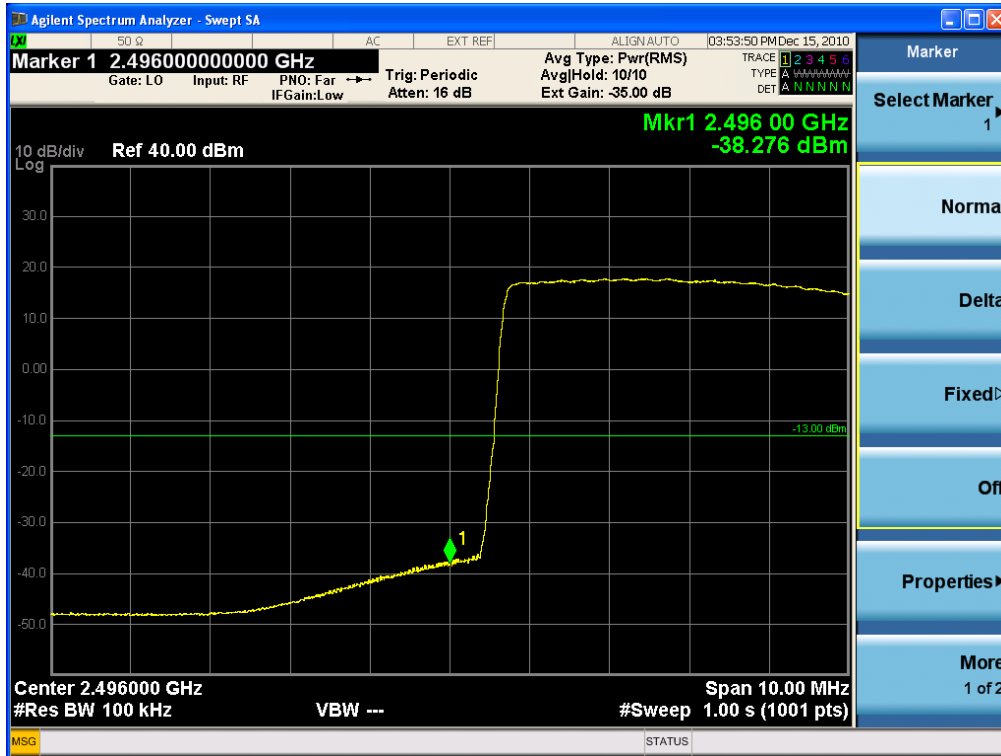


(QPSK High Channel)

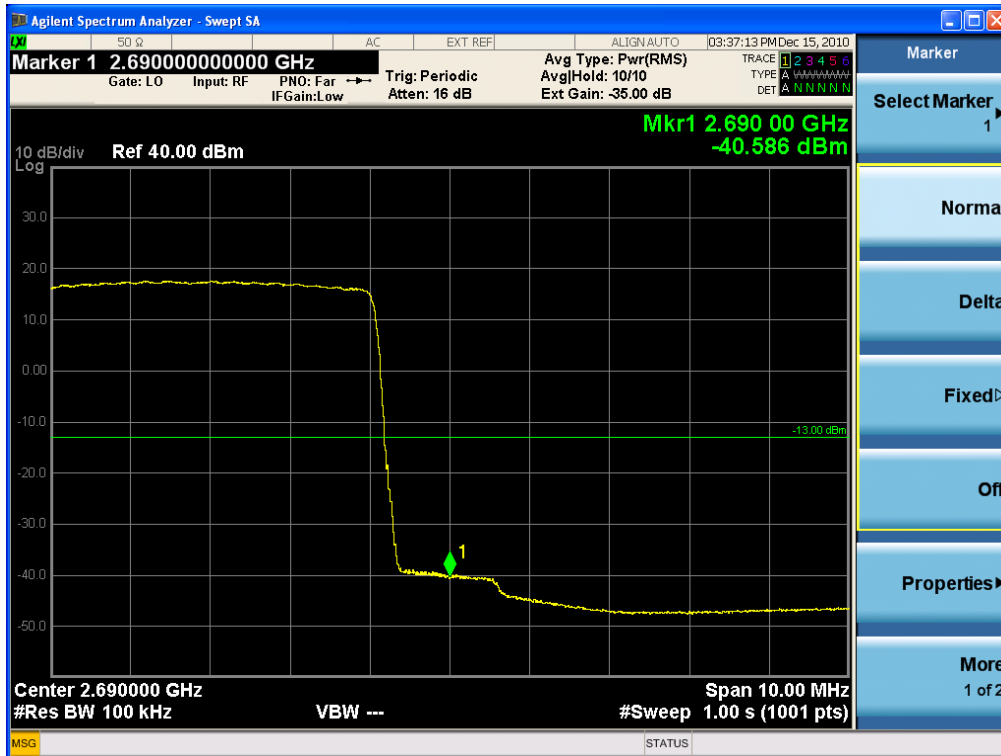


FCC PT.27 TEST REPORT	FCC CERTIFICATION REPORT			HCT PT.27 TEST REPORT
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(16QAM Low Channel)

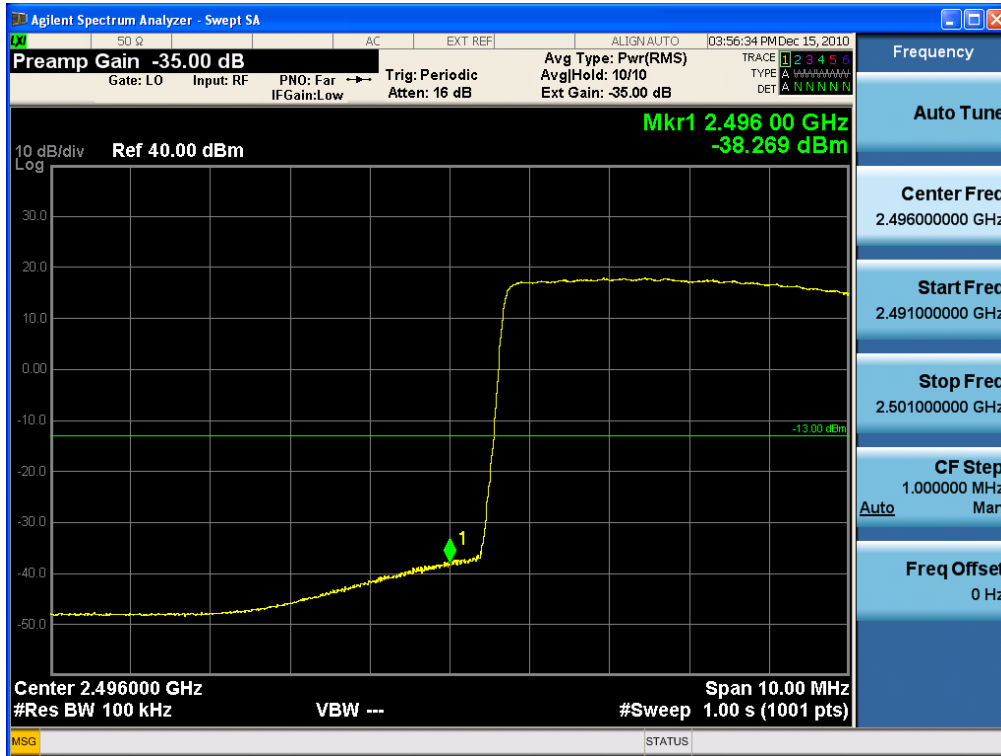


(16QAM High Channel)

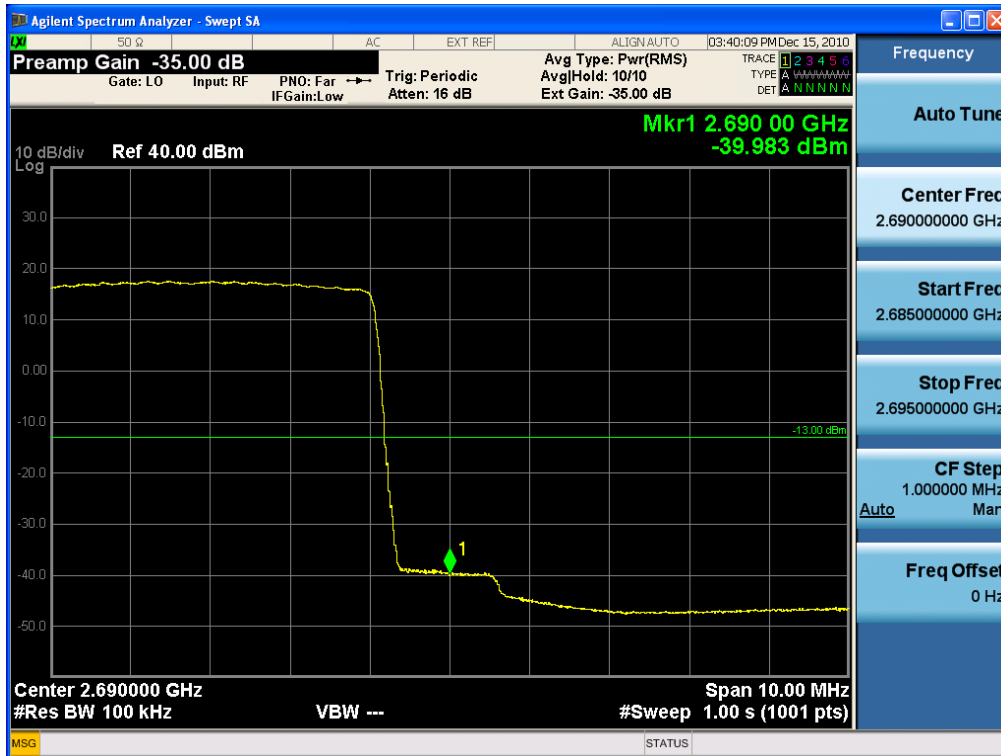


FCC PT.27 TEST REPORT	FCC CERTIFICATION REPORT			HCT PT.27 TEST REPORT
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(64QAM Low Channel)



(64QAM High Channel)



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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	05/14/2011
WEINSCHTEL	67-30-33 / Attenuator	BU5347	01/06/2011
WEINSCHTEL	67-30-33 / Attenuator	BR0530	01/14/2011
Agilent	N9020A / MXA Signal Analyzer	US46220219	03/03/2011
Agilent	11636B / Power Divider	11377	12/24/2010

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.

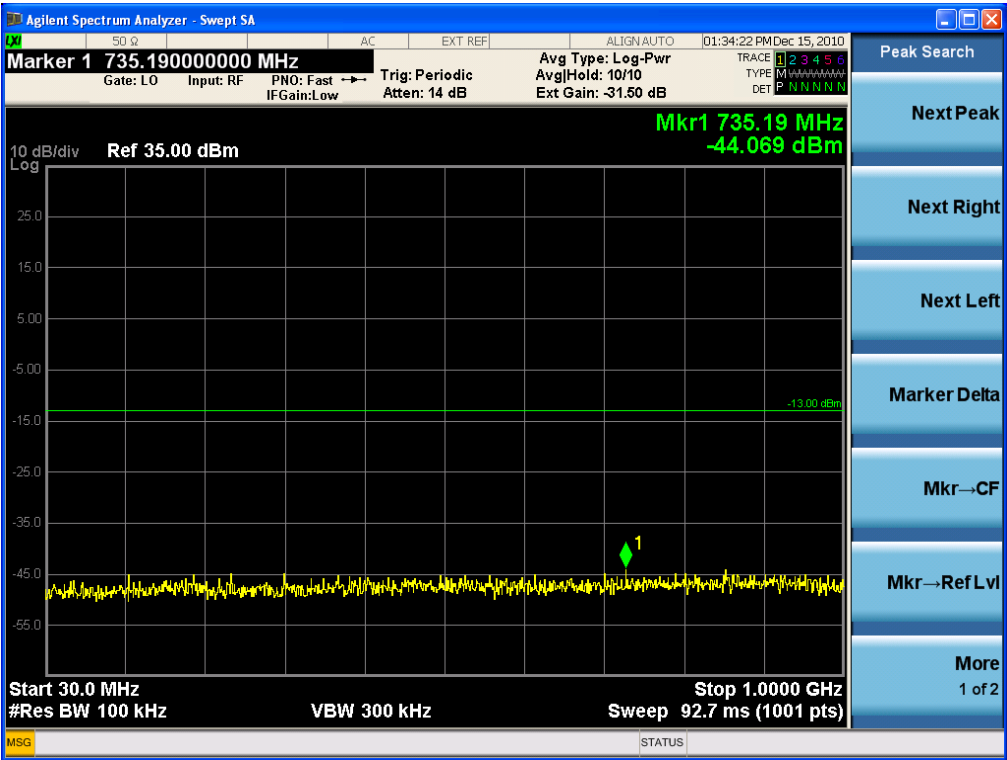
The test data is shown as a combined output in the report.

8.4. Test Result

: Pass

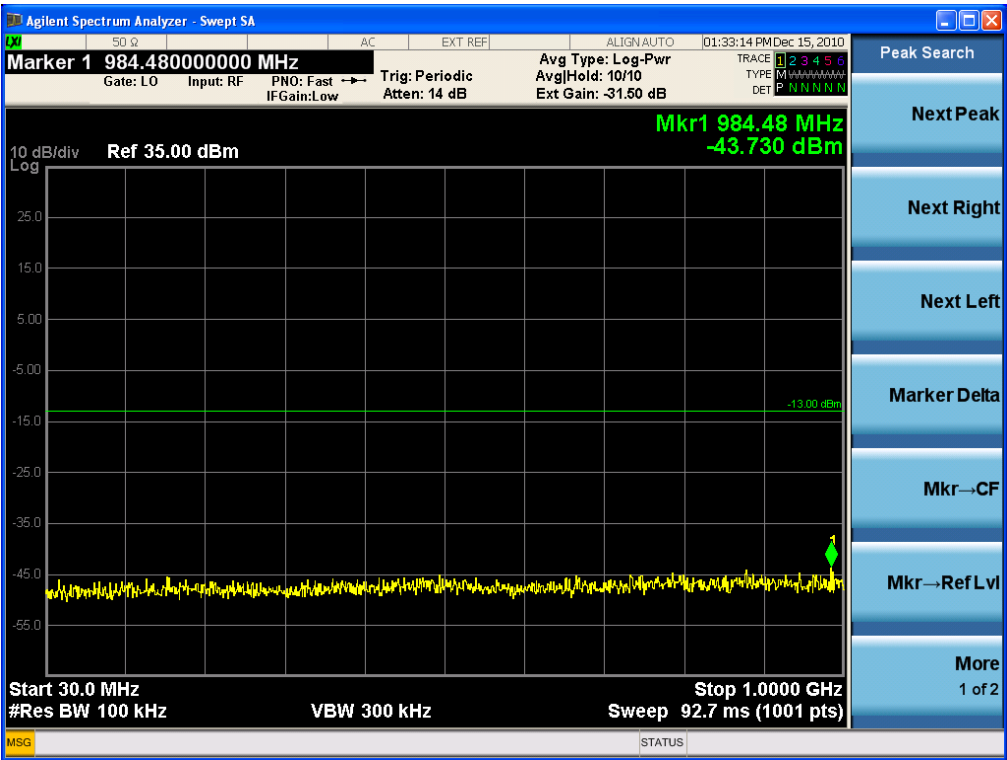
FCC PT.27 TEST REPORT	FCC CERTIFICATION REPORT			HCT PT.27 TEST REPORT
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8.4.1. Plot Data at Output Port 1
(QPSK Low Channel)



(30 MHz ~ 1 GHz)

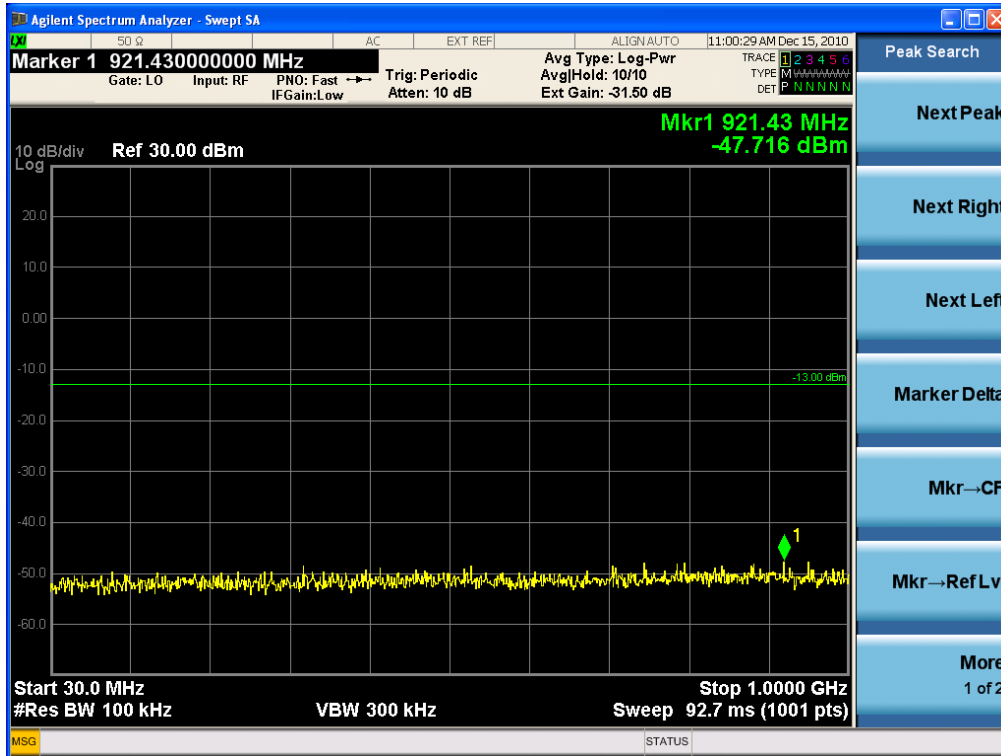
(QPSK Middle Channel)



(30 MHz ~ 1 GHz)

FCC PT.27 TEST REPORT	FCC CERTIFICATION REPORT			HCT PT.27 TEST REPORT
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(QPSK High Channel)



(30 MHz ~ 1 GHz)

(QPSK Low Channel)



(1 GHz ~ 26.5 GHz)

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(QPSK Middle Channel)



(1 GHz ~ 26.5 GHz)

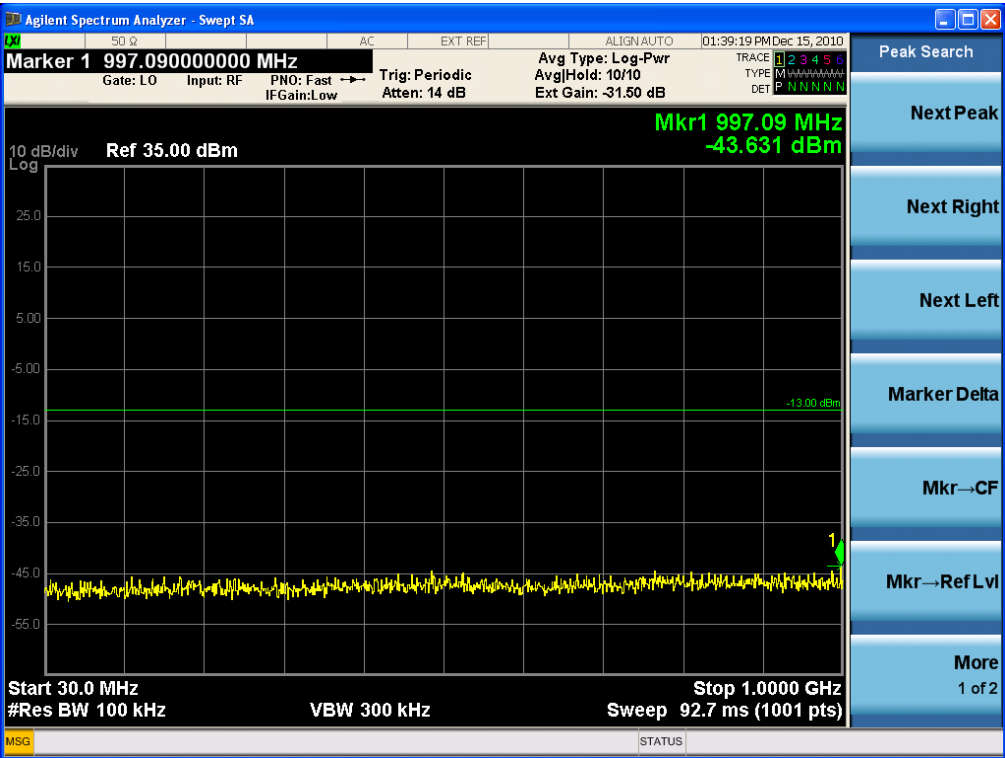
(QPSK High Channel)



(1 GHz ~ 26.5 GHz)

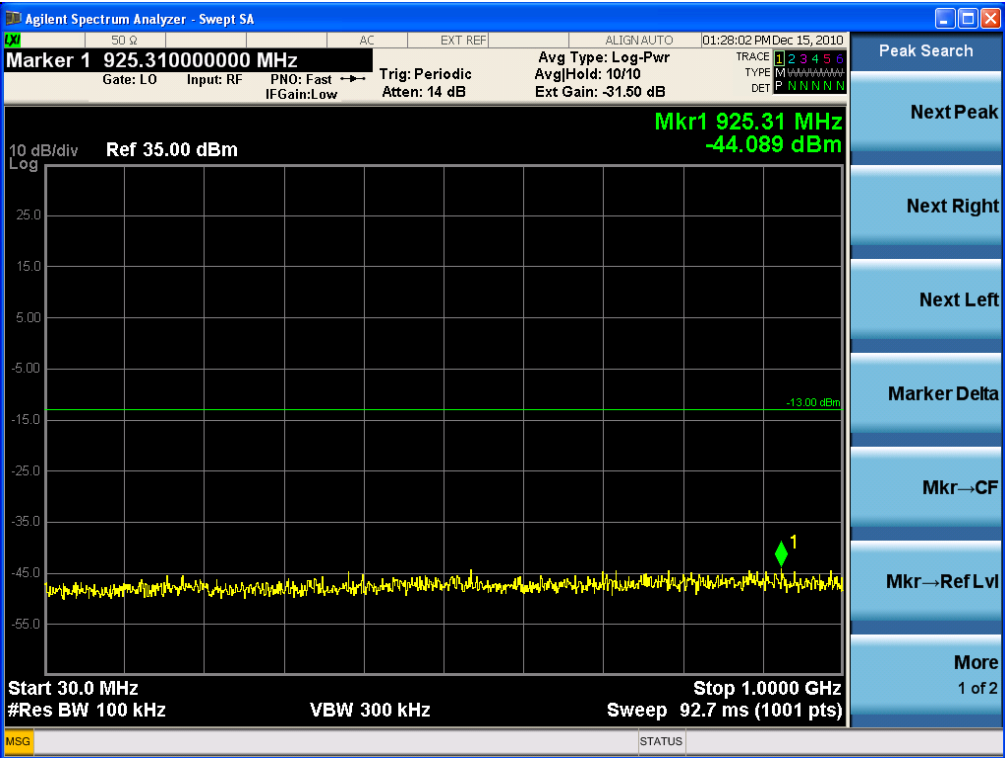
FCC PT.27 TEST REPORT	FCC CERTIFICATION REPORT			HCT PT.27 TEST REPORT
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(16QAM LOW Channel)



(30 MHz ~ 1 GHz)

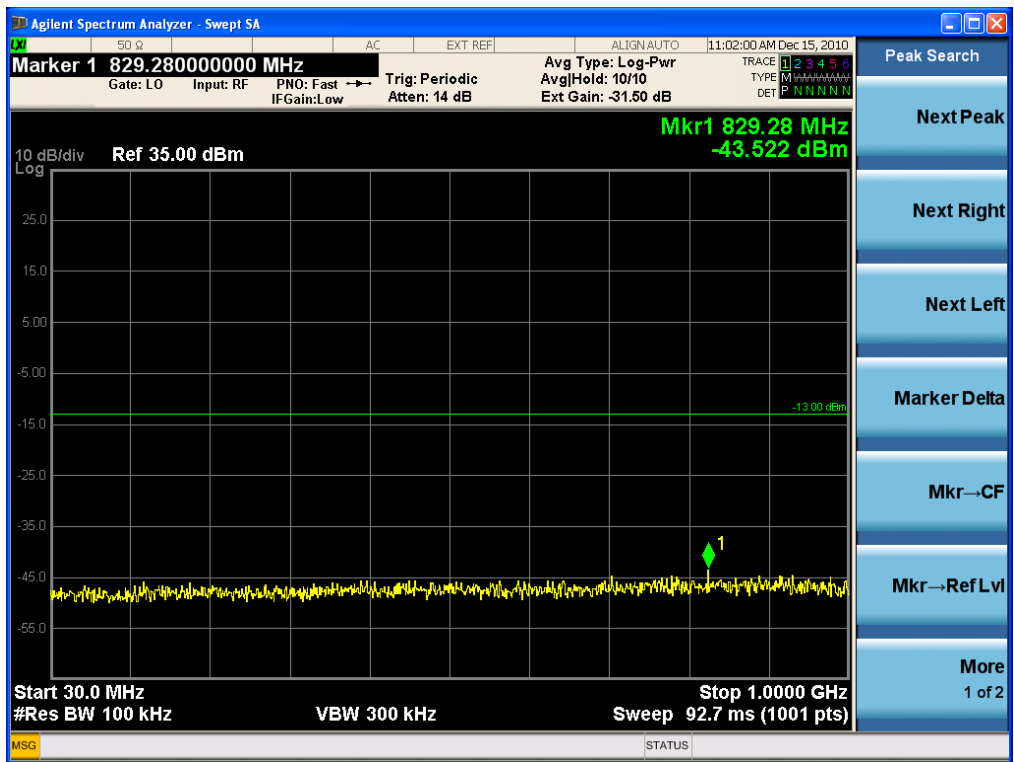
(16QAM Middle Channel)



(30 MHz ~ 1 GHz)

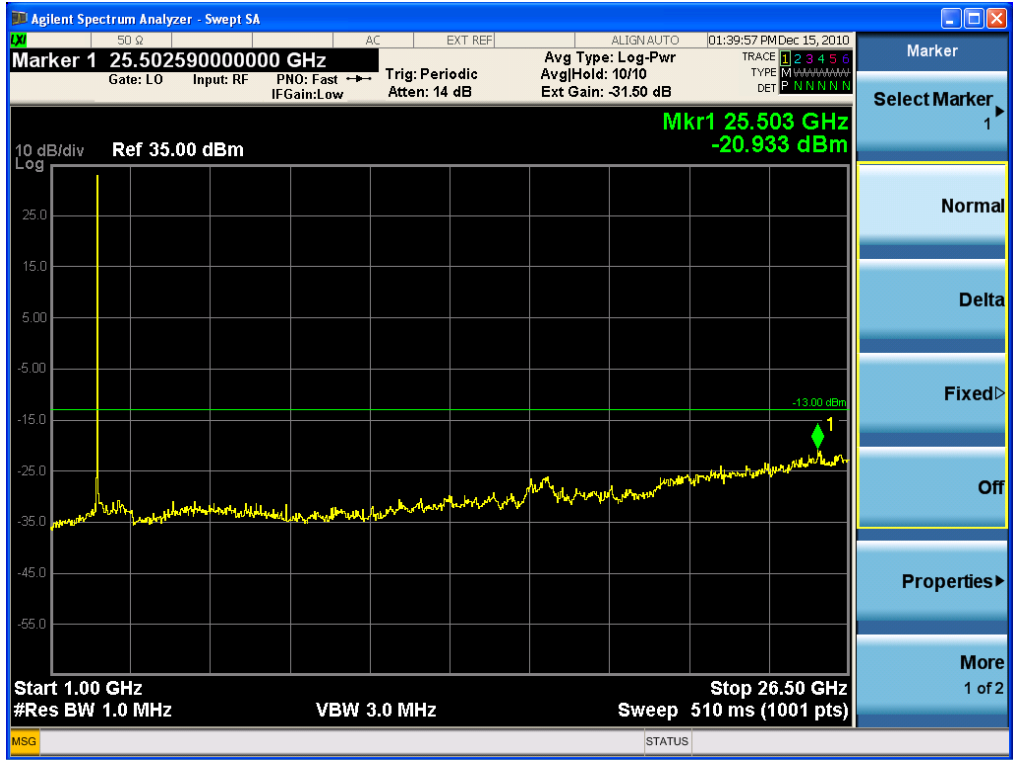
FCC PT.27 TEST REPORT	FCC CERTIFICATION REPORT			HCT PT.27 TEST REPORT
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(16QAM High Channel)



(30 MHz ~ 1 GHz)

(16QAM LOW Channel)



(1 GHz ~ 26.5 GHz)

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Test Report No. HCTR1012FR17	Date of Issue: December 22, 2010	EUT Type: Mobile WiMAX Outdoor RAS	FCC ID: A3LSPI-2L10022500	Page 65 of 95

(16QAM Middle Channel)



(1 GHz ~ 26.5 GHz)

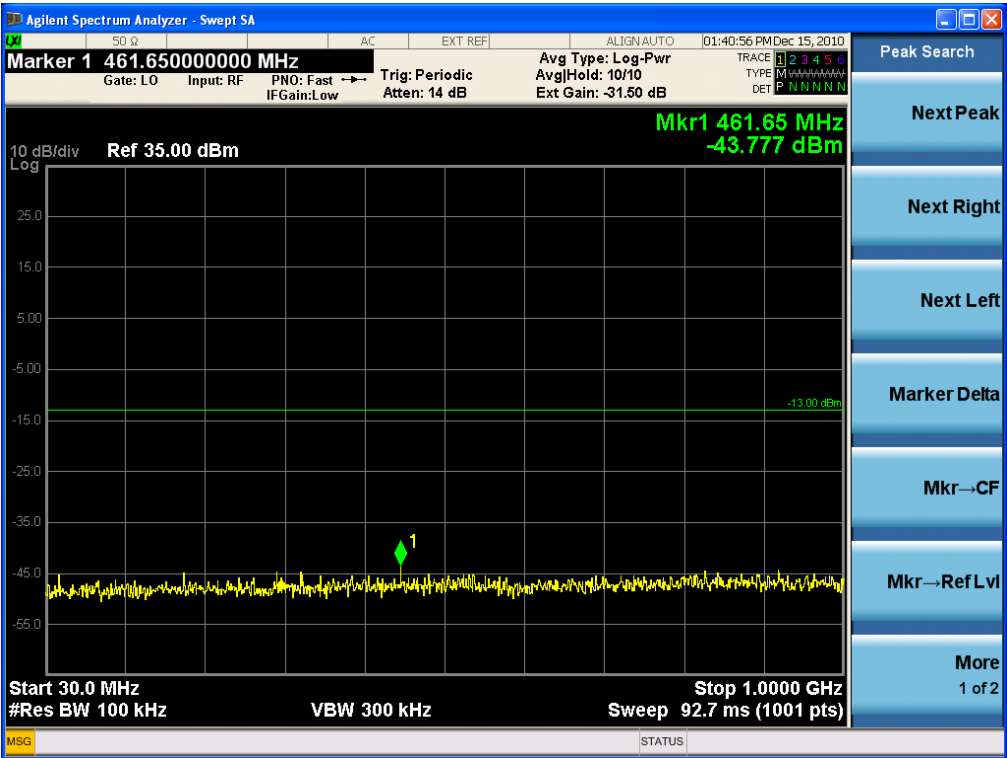
(16QAM High Channel)



(1 GHz ~ 26.5 GHz)

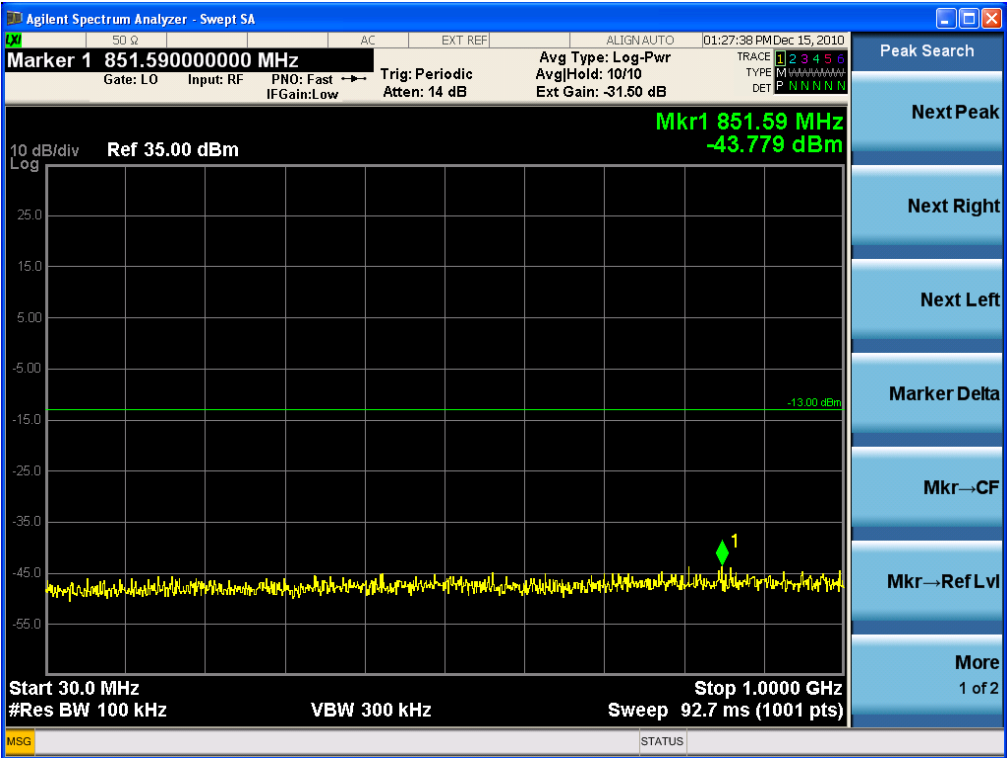
FCC PT.27 TEST REPORT	FCC CERTIFICATION REPORT			HCT PT.27 TEST REPORT
Test Report No. HCTR1012FR17	Date of Issue: December 22, 2010	EUT Type: Mobile WiMAX Outdoor RAS	FCC ID: A3LSPI-2L10022500	Page 66 of 95

(64QAM Low Channel)



(30 MHz ~ 1 GHz)

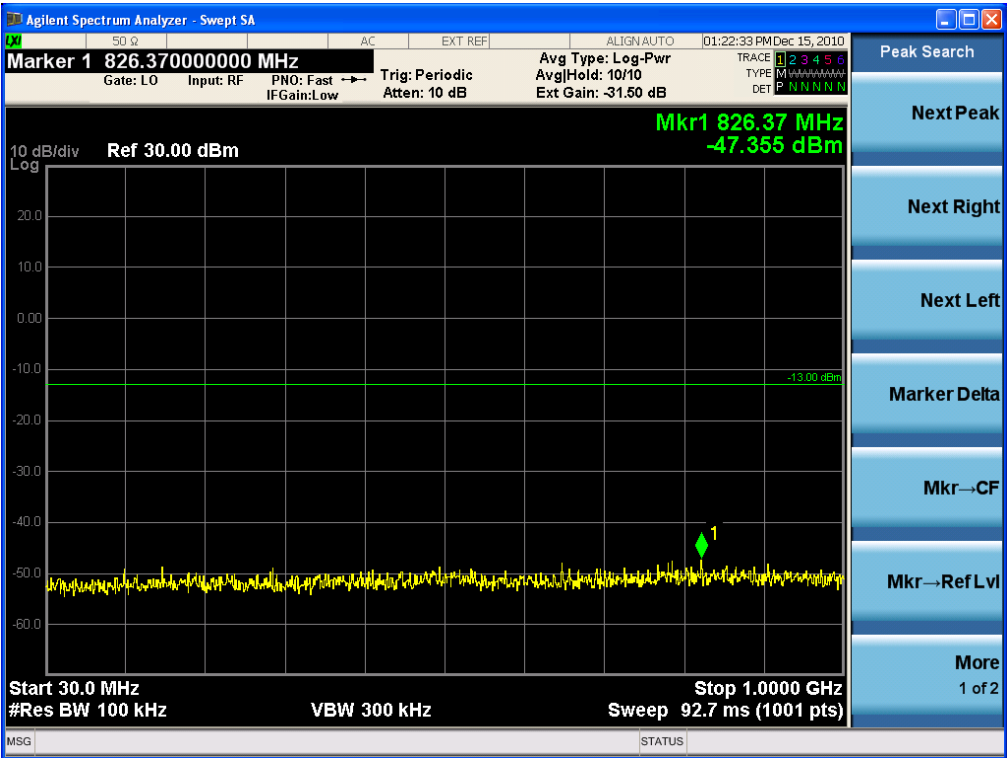
(64QAM Middle Channel)



(30 MHz ~ 1 GHz)

FCC PT.27 TEST REPORT	FCC CERTIFICATION REPORT			HCT PT.27 TEST REPORT
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(64QAM High Channel)



(30 MHz ~ 1 GHz)

(64QAM Low Channel)



(1 GHz ~ 26.5 GHz)

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(64QAM Middle Channel)



(1 GHz ~ 26.5 GHz)

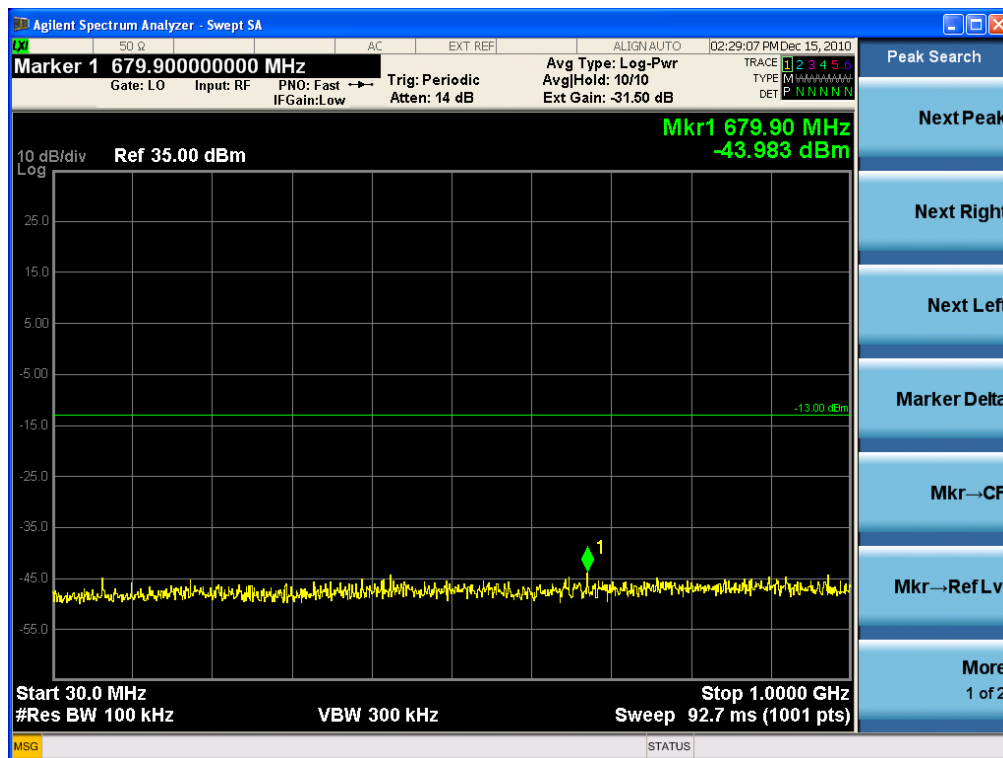
(64QAM High Channel)



(1 GHz ~ 26.5 GHz)

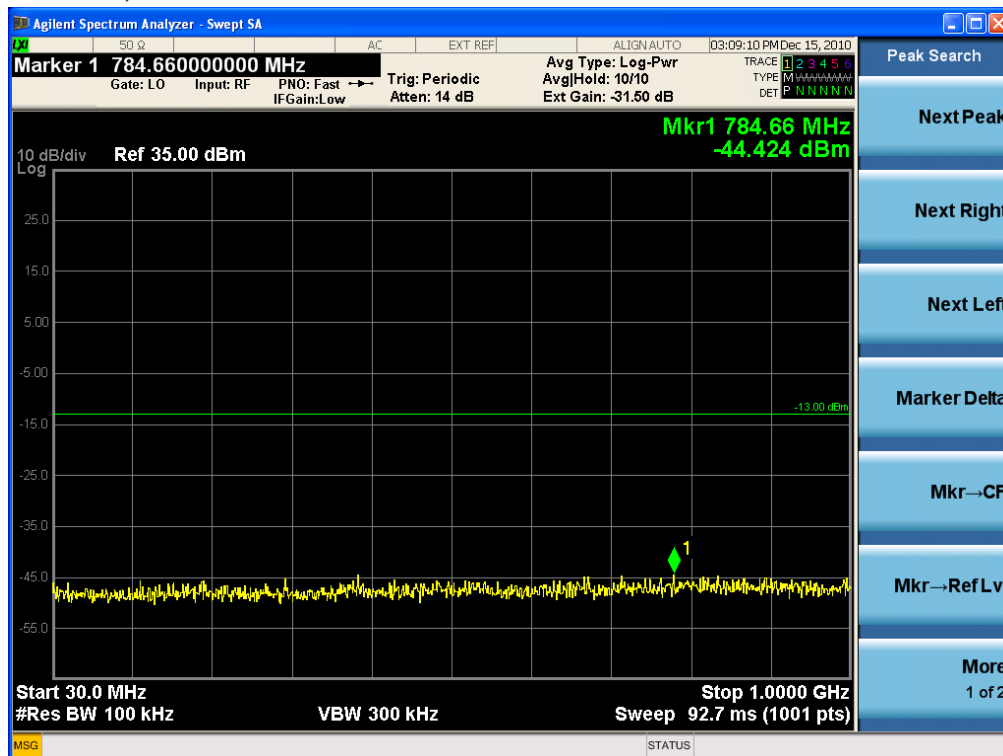
FCC PT.27 TEST REPORT	FCC CERTIFICATION REPORT			HCT PT.27 TEST REPORT
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8.4.2. Plot Data at Output Port 2
(QPSK Low Channel)



(30 MHz ~ 1 GHz)

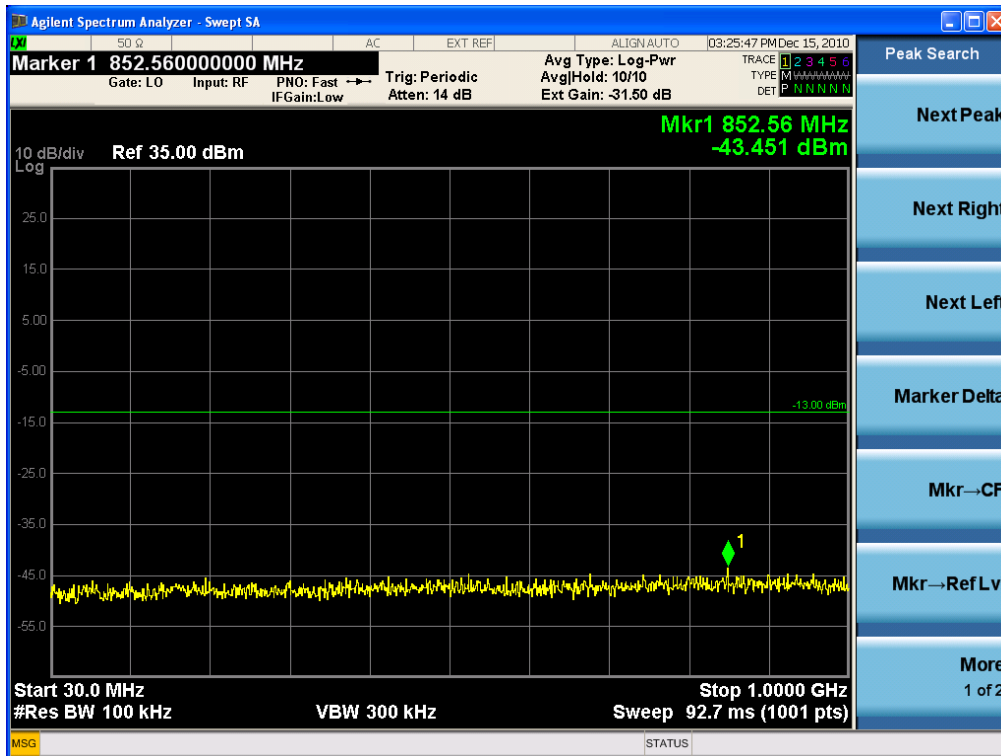
(QPSK Middle Channel)



(30 MHz ~ 1 GHz)

FCC PT.27 TEST REPORT	FCC CERTIFICATION REPORT			HCT PT.27 TEST REPORT
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(QPSK High Channel)



(30 MHz ~ 1 GHz)

(QPSK Low Channel)



(1 GHz ~ 26.5 GHz)

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(QPSK Middle Channel)



(1 GHz ~ 26.5 GHz)

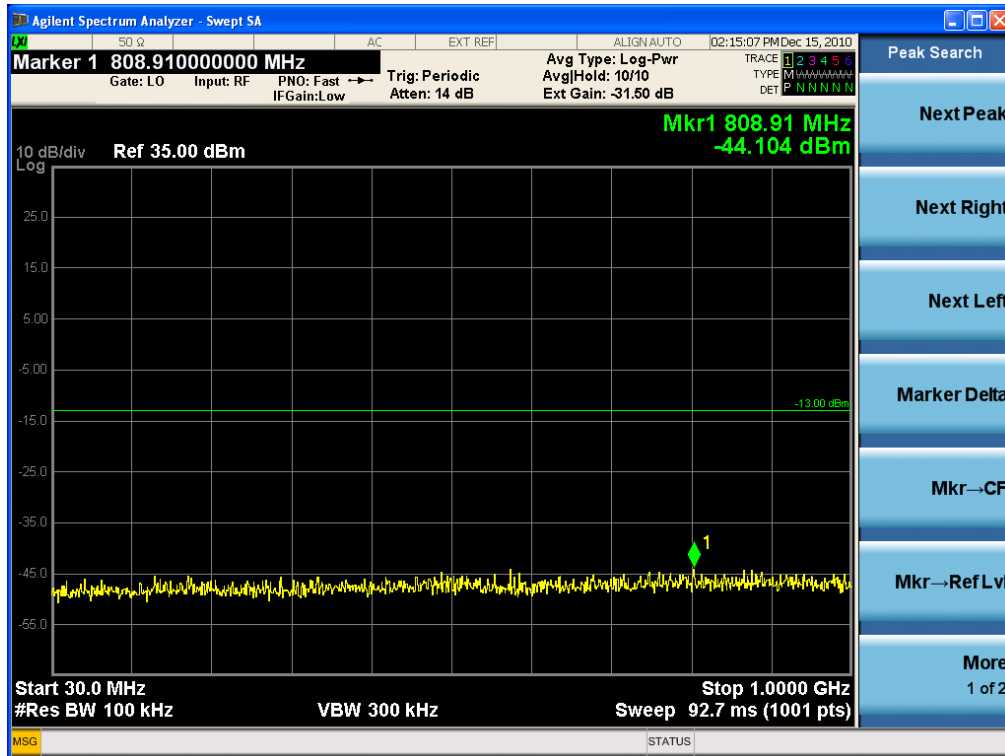
(QPSK High Channel)



(1 GHz ~ 26.5 GHz)

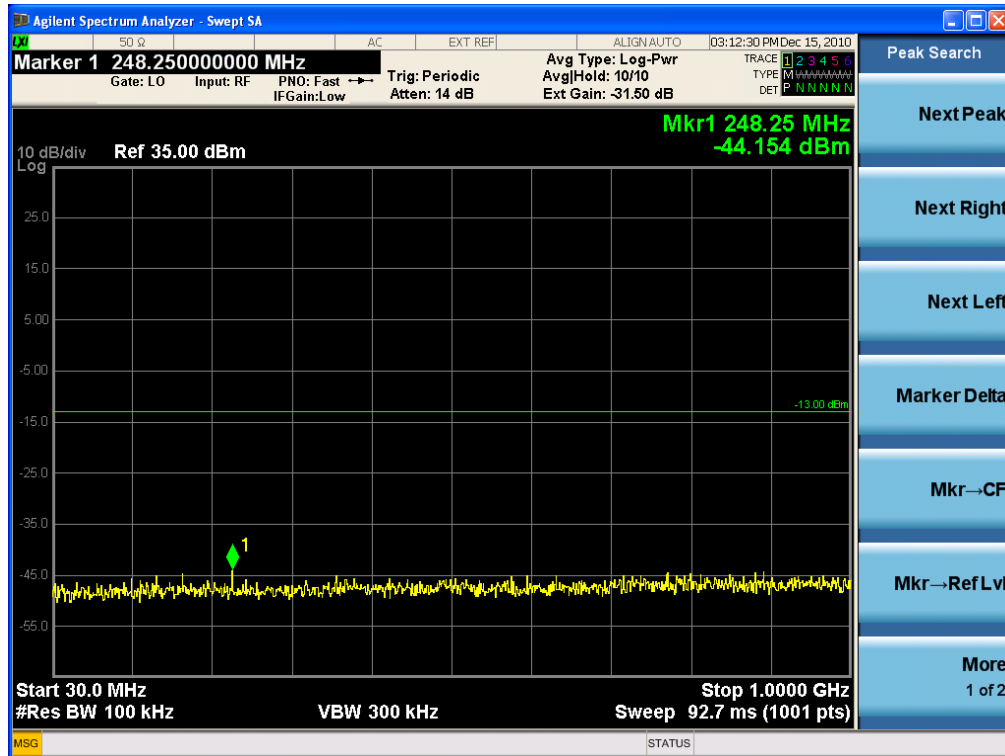
FCC PT.27 TEST REPORT	FCC CERTIFICATION REPORT			HCT PT.27 TEST REPORT
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(16QAM LOW Channel)



(30 MHz ~ 1 GHz)

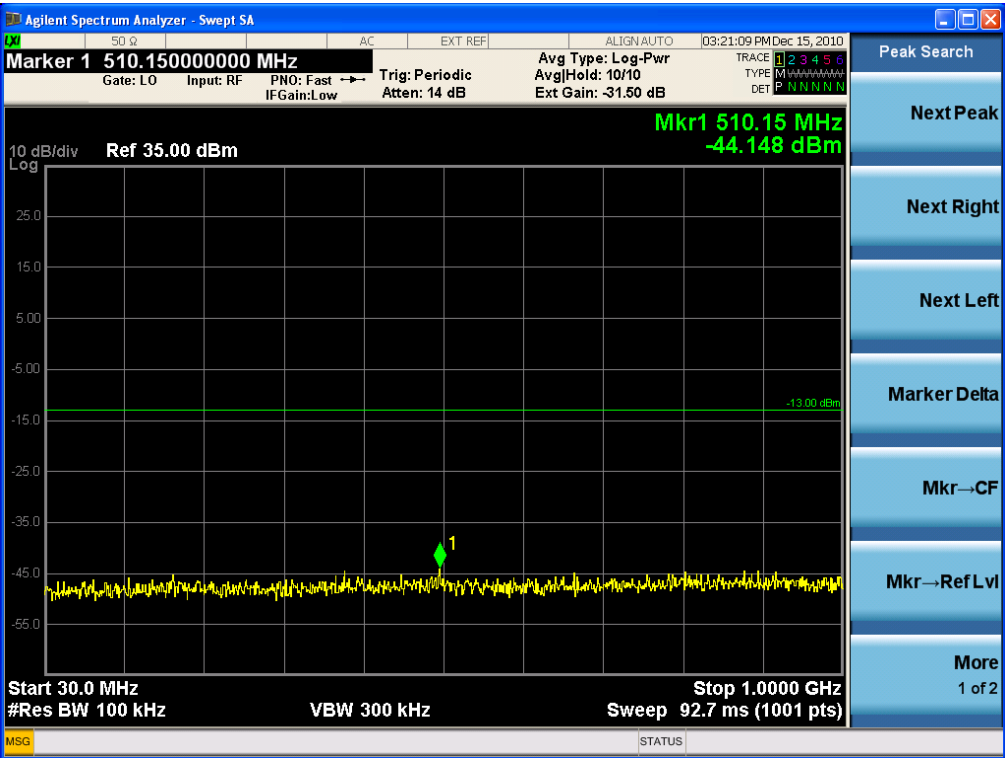
(16QAM Middle Channel)



(30 MHz ~ 1 GHz)

FCC PT.27 TEST REPORT	FCC CERTIFICATION REPORT			HCT PT.27 TEST REPORT
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(16QAM High Channel)



(30 MHz ~ 1 GHz)

(16QAM LOW Channel)



(1 GHz ~ 26.5 GHz)

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(16QAM Middle Channel)



(1 GHz ~ 26.5 GHz)

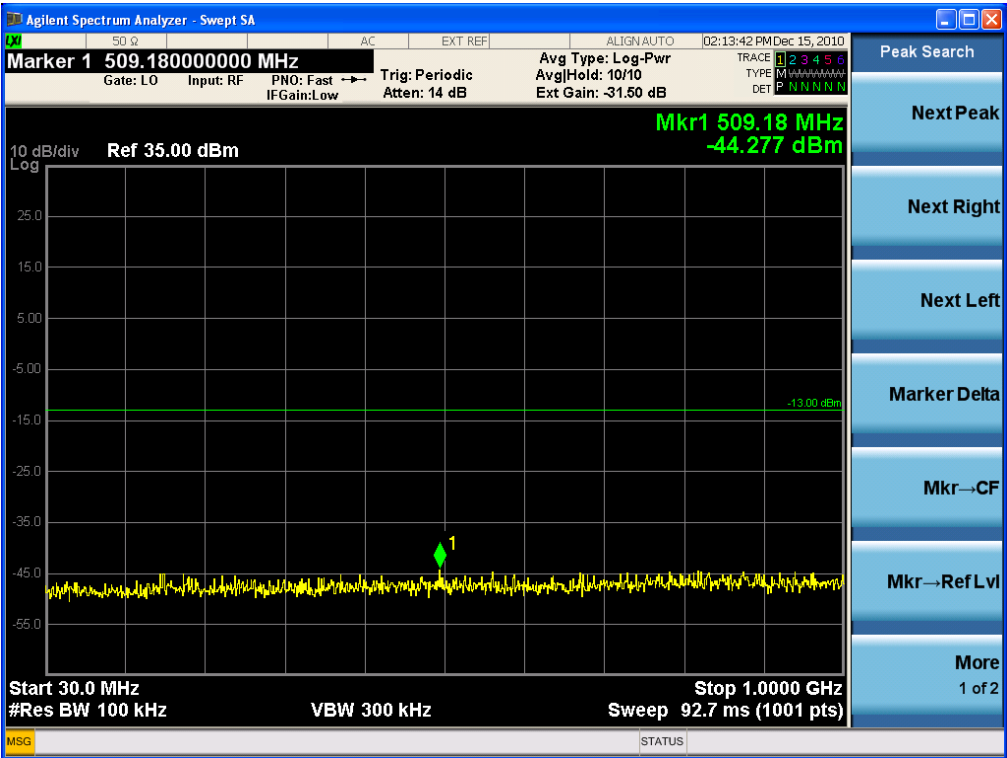
(16QAM High Channel)



(1 GHz ~ 26.5 GHz)

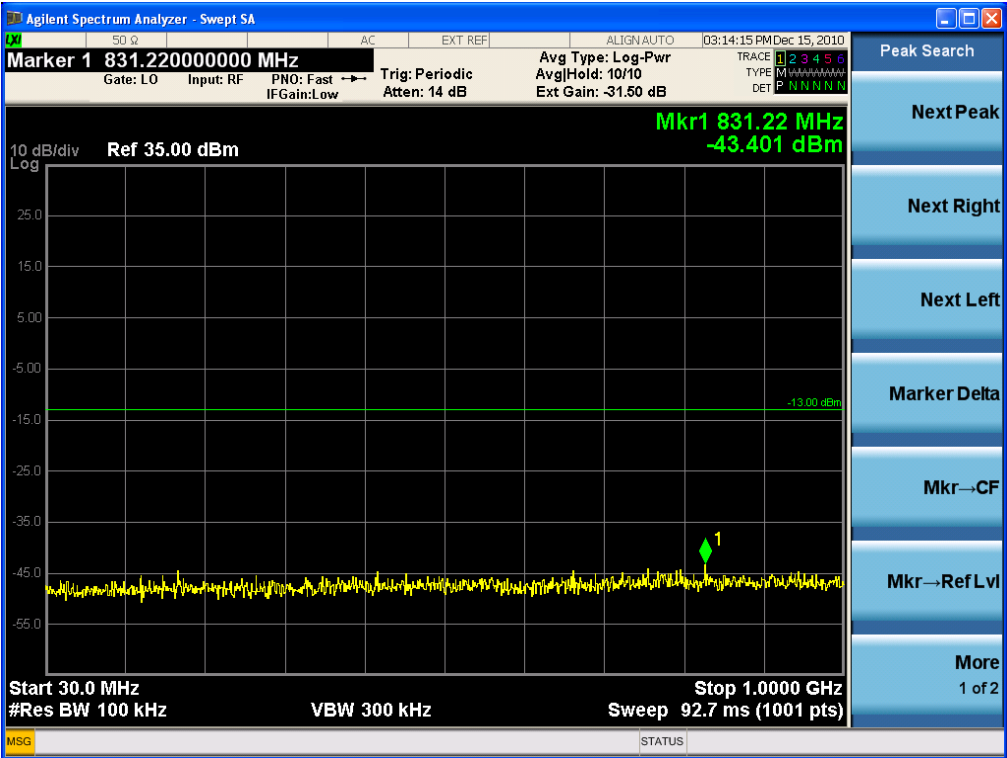
FCC PT.27 TEST REPORT	FCC CERTIFICATION REPORT			HCT PT.27 TEST REPORT
Test Report No. HCTR1012FR17	Date of Issue: December 22, 2010	EUT Type: Mobile WiMAX Outdoor RAS	FCC ID: A3LSPI-2L10022500	Page 75 of 95

(64QAM Low Channel)



(30 MHz ~ 1 GHz)

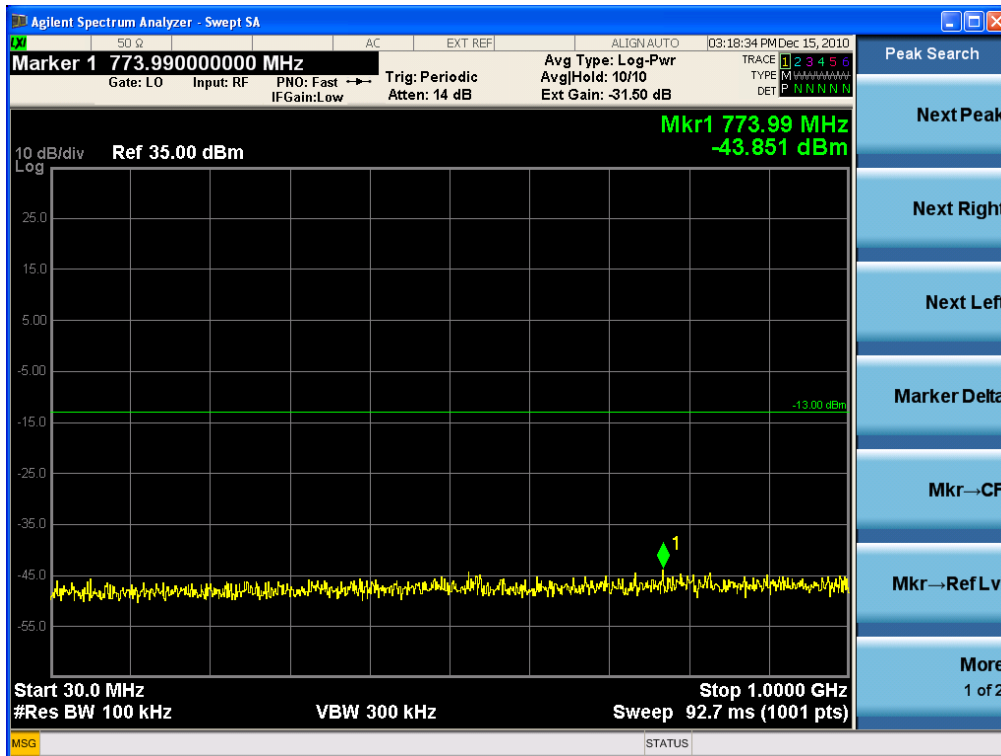
(64QAM Middle Channel)



(30 MHz ~ 1 GHz)

FCC PT.27 TEST REPORT	FCC CERTIFICATION REPORT			HCT PT.27 TEST REPORT
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(64QAM High Channel)



(30 MHz ~ 1 GHz)

(64QAM Low Channel)



(1 GHz ~ 26.5 GHz)

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(64QAM Middle Channel)



(1 GHz ~ 26.5 GHz)

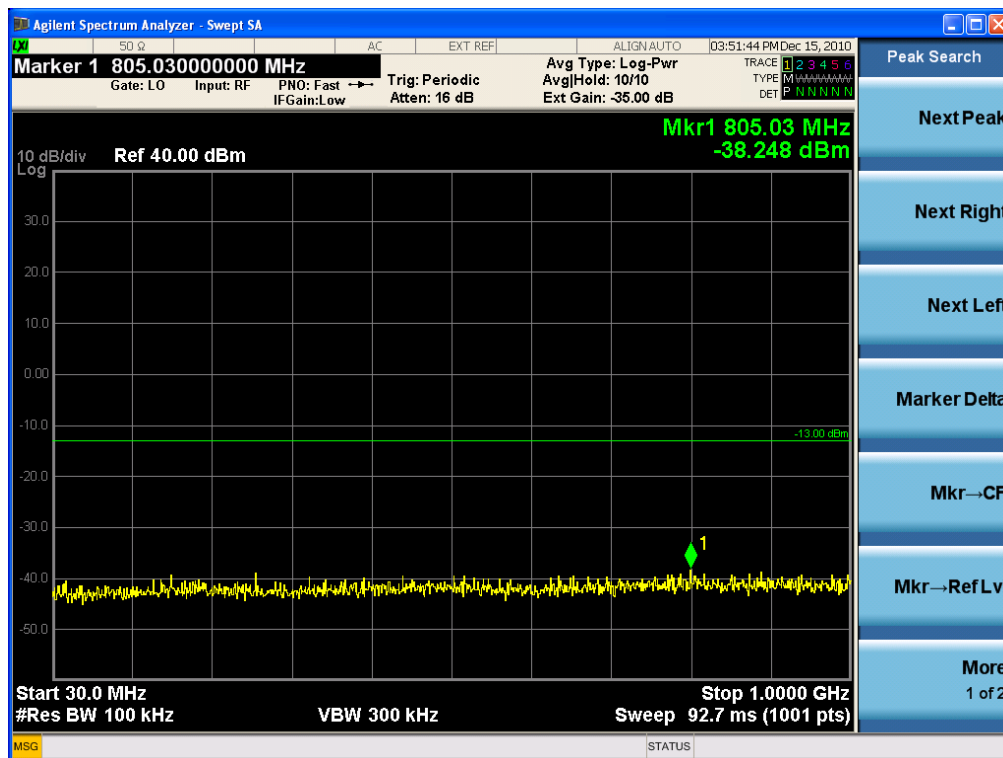
(64QAM High Channel)



(1 GHz ~ 26.5 GHz)

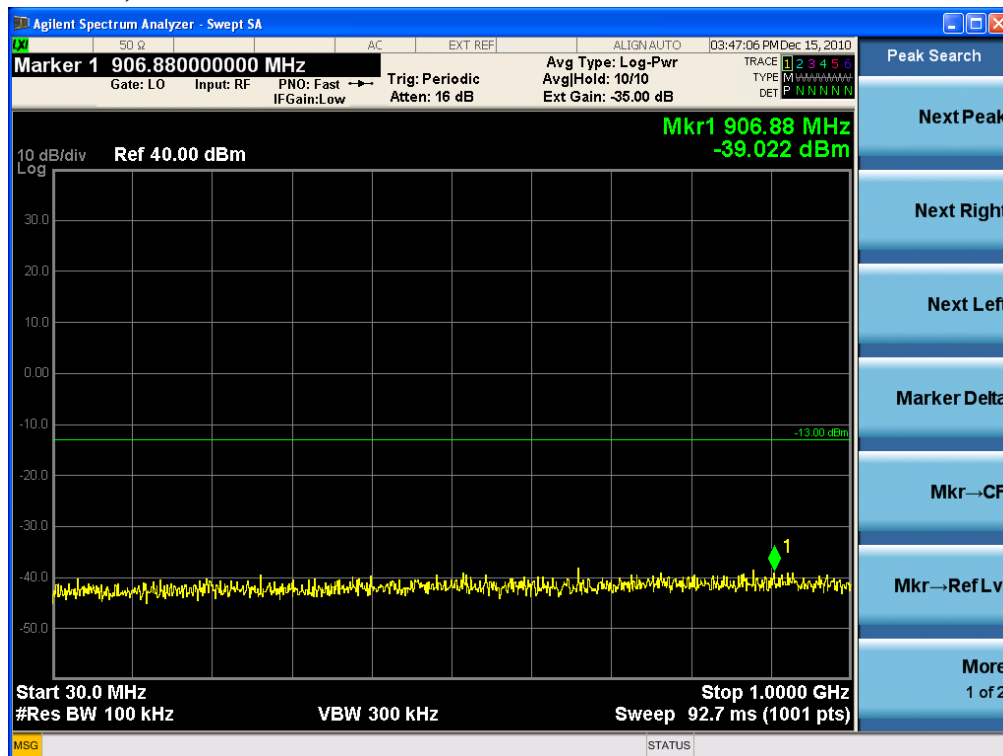
FCC PT.27 TEST REPORT	FCC CERTIFICATION REPORT			HCT PT.27 TEST REPORT
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8.4.3. Combined Plot Data at Output (QPSK Low Channel)



(30 MHz ~ 1 GHz)

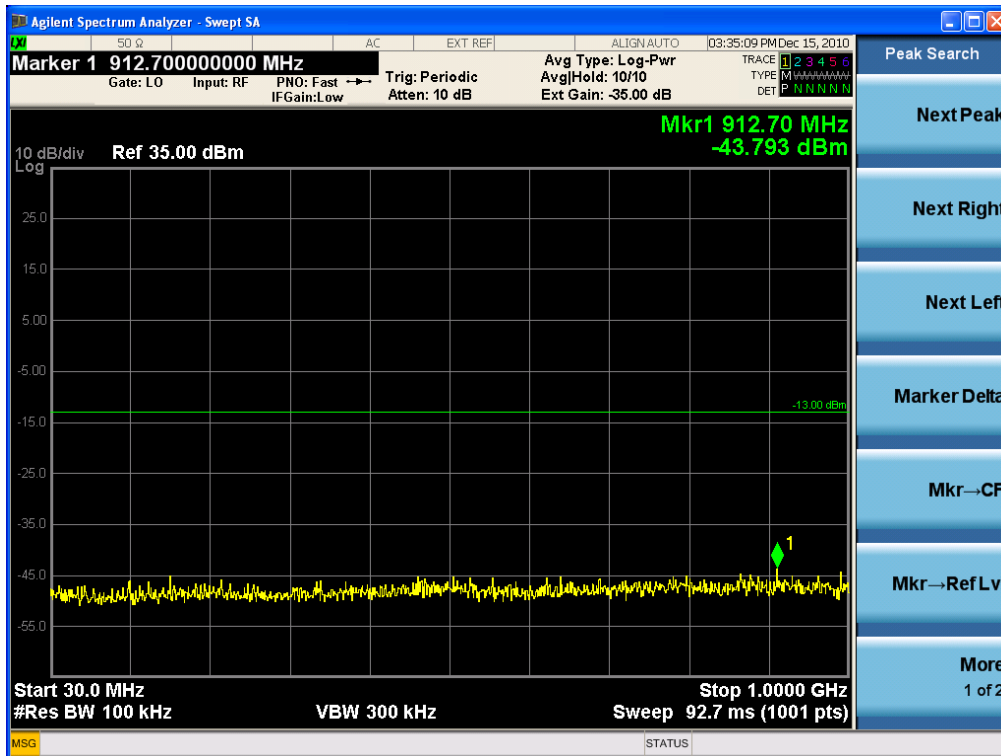
(QPSK Middle Channel)



(30 MHz ~ 1 GHz)

FCC PT.27 TEST REPORT	FCC CERTIFICATION REPORT			HCT PT.27 TEST REPORT
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(QPSK High Channel)



(30 MHz ~ 1 GHz)

(QPSK Low Channel)



(1 GHz ~ 26.5 GHz)

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(QPSK Middle Channel)



(1 GHz ~ 26.5 GHz)

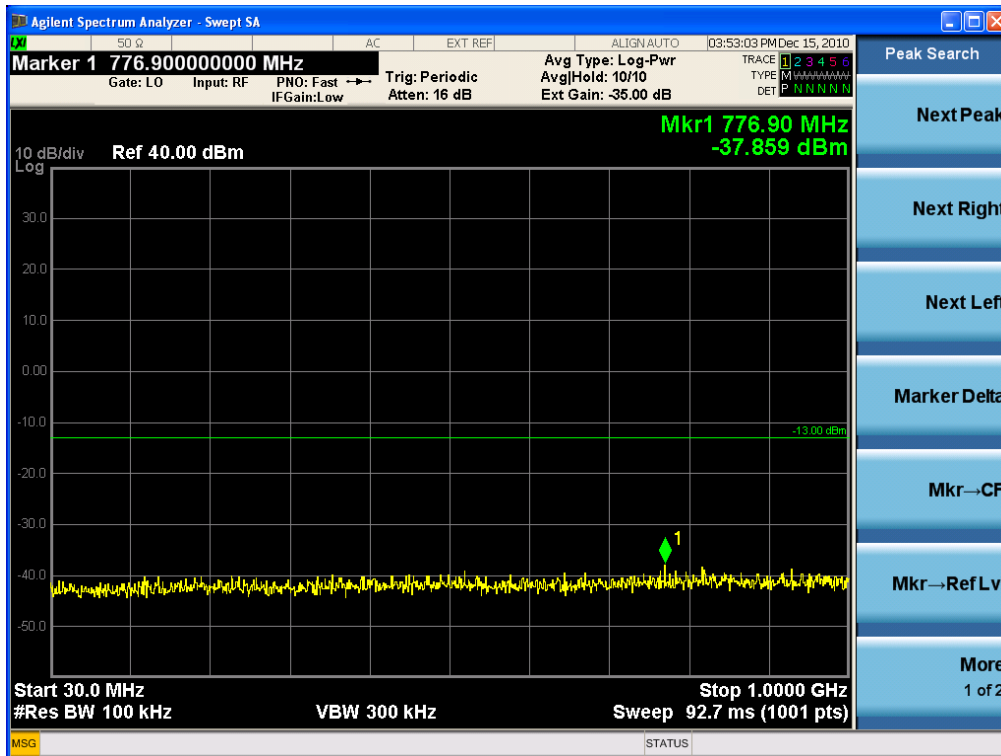
(QPSK High Channel)



(1 GHz ~ 26.5 GHz)

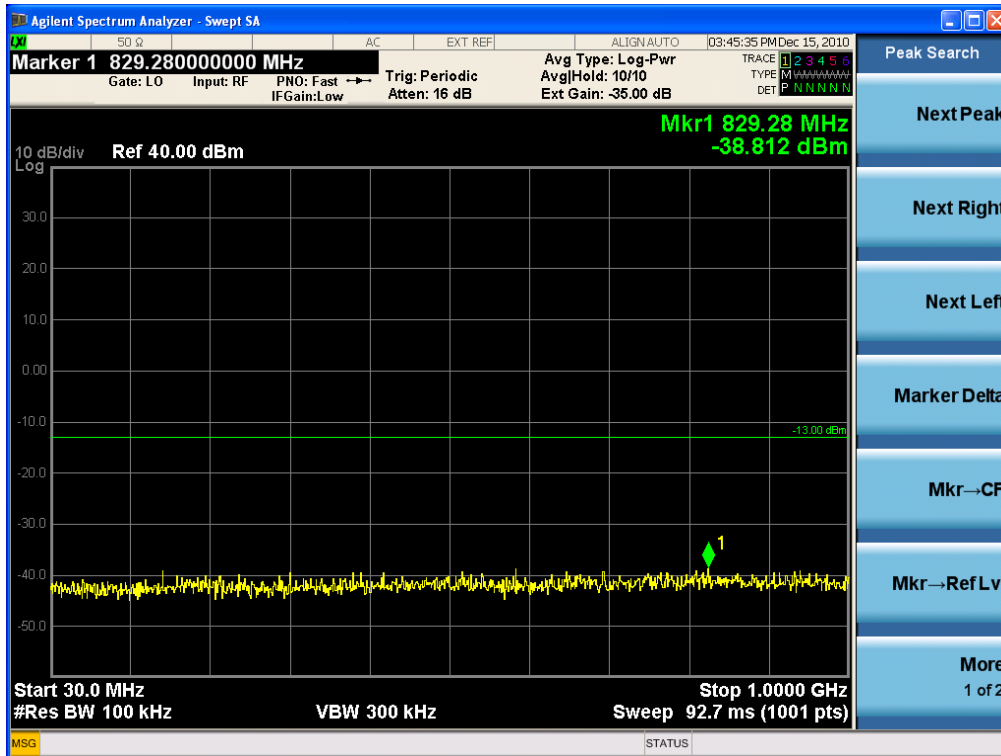
FCC PT.27 TEST REPORT	FCC CERTIFICATION REPORT			HCT PT.27 TEST REPORT
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(16QAM LOW Channel)



(30 MHz ~ 1 GHz)

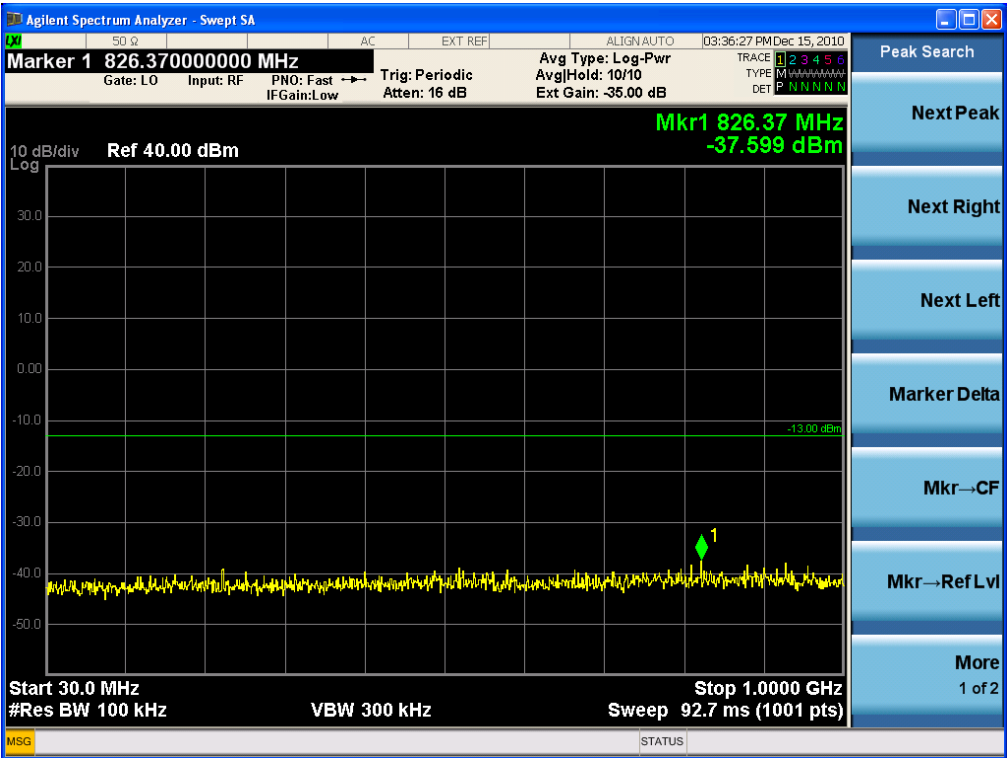
(16QAM Middle Channel)



(30 MHz ~ 1 GHz)

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(16QAM High Channel)



(30 MHz ~ 1 GHz)

(16QAM LOW Channel)



(1 GHz ~ 26.5 GHz)

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(16QAM Middle Channel)



(1 GHz ~ 26.5 GHz)

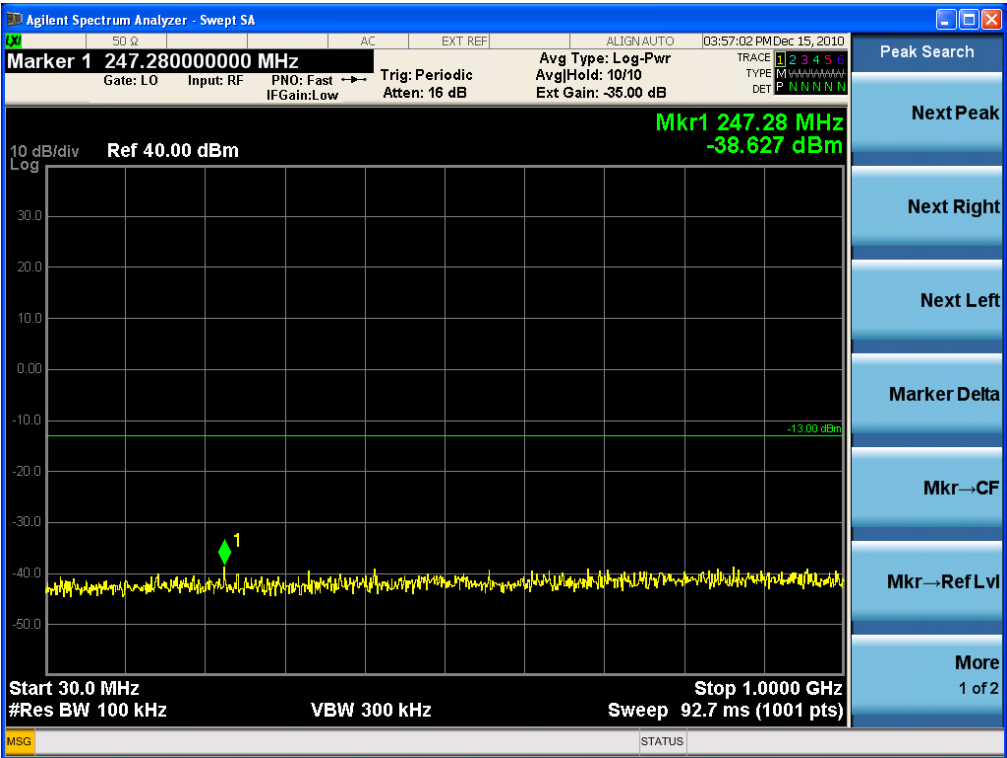
(16QAM High Channel)



(1 GHz ~ 26.5 GHz)

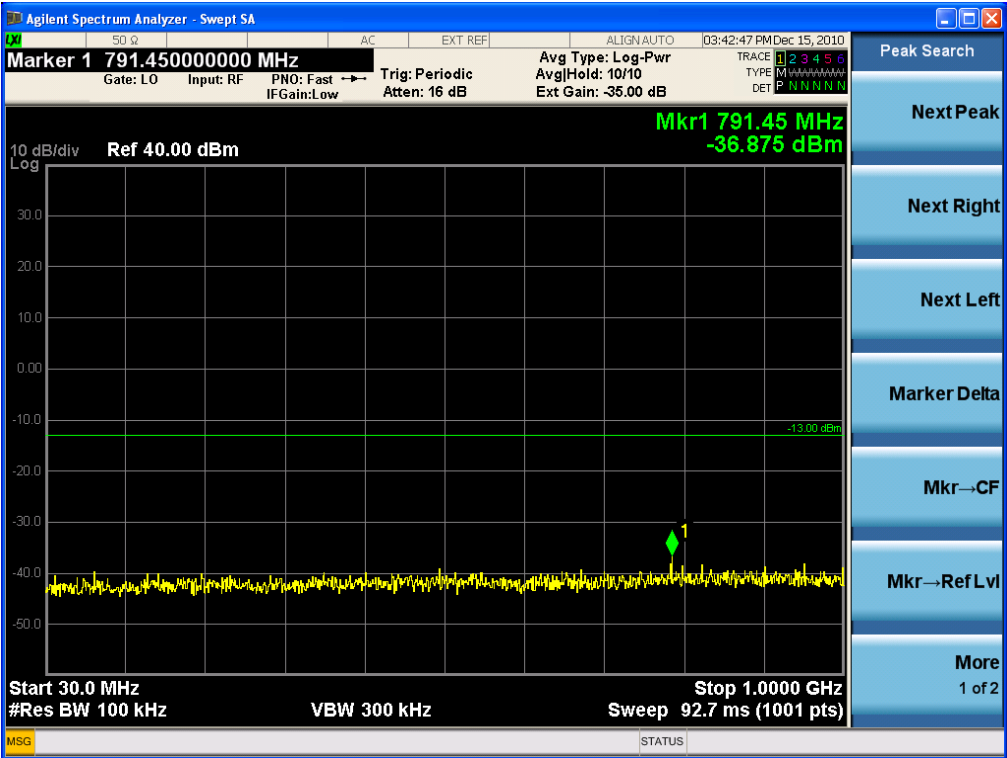
FCC PT.27 TEST REPORT	FCC CERTIFICATION REPORT			HCT PT.27 TEST REPORT
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(64QAM Low Channel)



(30 MHz ~ 1 GHz)

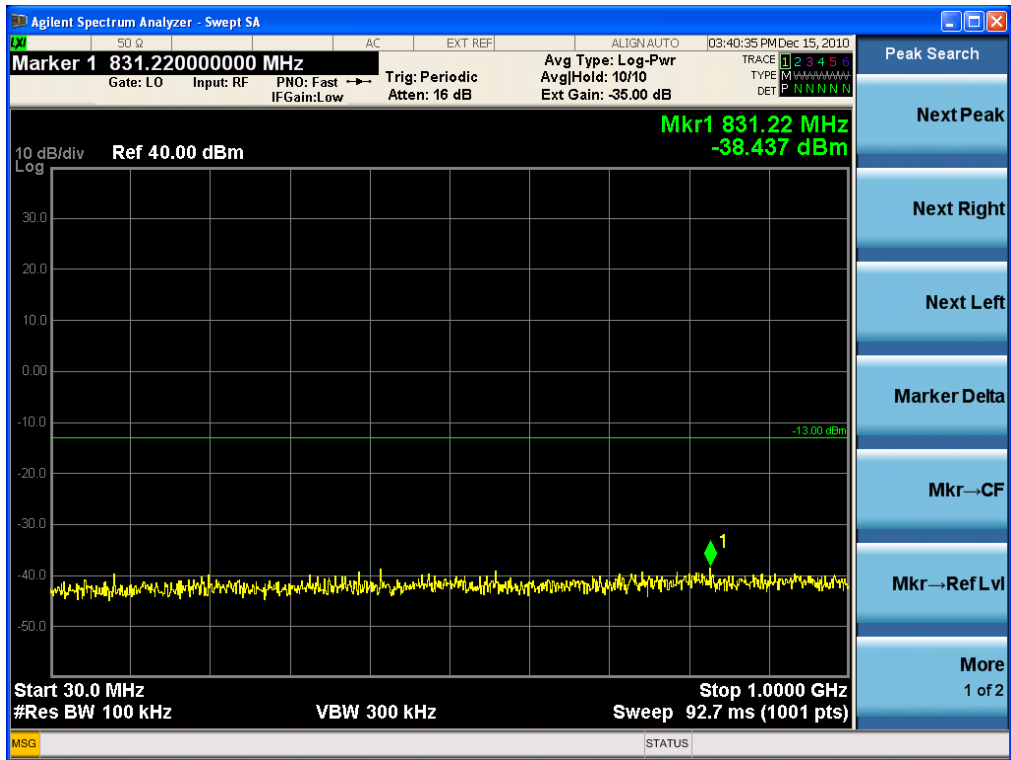
(64QAM Middle Channel)



(30 MHz ~ 1 GHz)

FCC PT.27 TEST REPORT	FCC CERTIFICATION REPORT			HCT PT.27 TEST REPORT
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(64QAM High Channel)



(30 MHz ~ 1 GHz)

(64QAM Low Channel)



(1 GHz ~ 26.5 GHz)

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(64QAM Middle Channel)



(1 GHz ~ 26.5 GHz)

(64QAM High Channel)



(1 GHz ~ 26.5 GHz)

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9. RADIATED SPURIOUS EMISSION

9.1 Applicable Standard

(1) For BRS and EBS stations, the power of any emissions outside the licensee's frequency bands of operation shall be attenuated below the transmitter power (P) measured in watts. (2) For fixed and temporary fixed digital stations, the attenuation shall be not less than $43 + 10 \log (P)$ dB, unless a documented interference complaint is received from an adjacent channel licensee. Provided that the complaint cannot be mutually resolved between the parties, both licensees of existing and new systems shall reduce their out-of-band emissions by at least $67 + 10 \log (P)$ dB measured at 3 MHz from their channel's edges for distances between stations exceeding 1.5 km.

9.2 Test Equipment List and Details

Manufacturer	Model / Equipment	Serial No.	Calibration Due
Schwarzbeck	BBHA 9120D /Double Ridged Horn Antenna	296	09/23/2011
Schwarzbeck	BBHA 9120D /Double Ridged Horn Antenna	147	04/13/2011
Schwarzbeck	VULB 9168/ TRILOG Antenna	9168-200	01/06/2011
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	AFS44-00102650-42-10P44-PS	1532439	04/05/2011
EMCO	6502/Loop Antenna	9009-2536	01/13/2012
R&S	ESI40 / EMI TEST Receiver	831564/003	10/30/2011

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9.3 Test Procedure

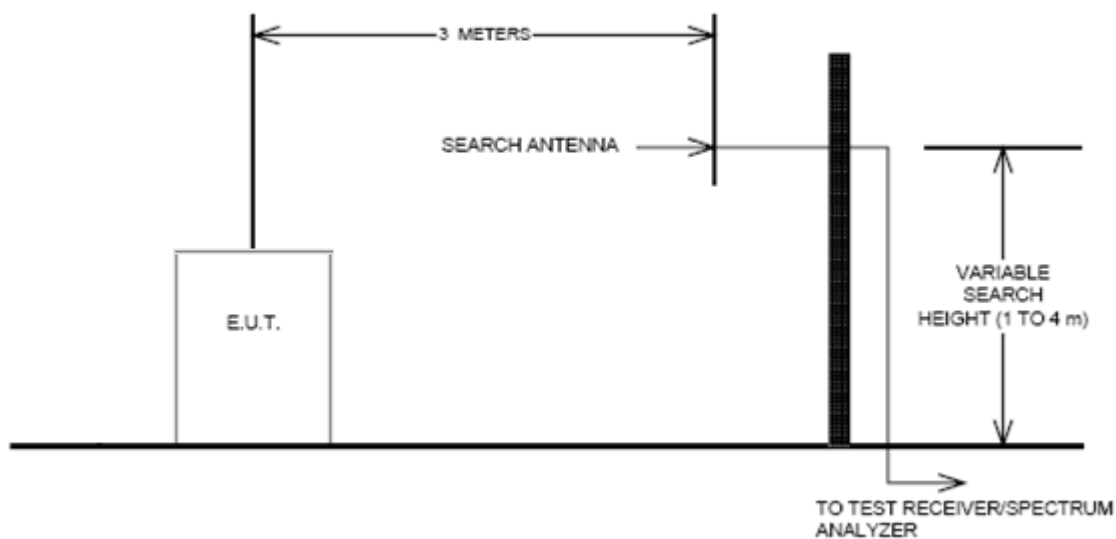
Radiated emission measurements were performed at an semi-anechoic chamber.

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° 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.

9.3.1 Radiated Spurious Emissions Test Setup



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9.4 Test Result

: PASS (There were no emissions detected above the noise floor which was at least 20 dB below the limit.)

Frequency	Freq.(MHz)	<u>Substitute Level</u> [dBm]	Ant. Gain (dBd)	C.L	Pol.	ERP (dBm)	Margin (dB)
2593.0	5186.0	-52.5	10.35	4.40	H	-46.55	-33.55
	7779.0	-50.9	9.25	6.58	H	-48.23	-35.23

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10. FREQUENCY STABILITY

10.1 Applicable Standard

Requirements: FCC § 2.1055 (a), Part 27.54 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	05/14/2011
WEINSCHEL	67-30-33 / Attenuator	BR0530	01/14/2011
Agilent	N9020A / MXA Signal Analyzer	US46220219	03/03/2011

10.3 Test Procedure

Frequency Stability over Temperature variation:

The equipment under test was connected to an external 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 DC power supply Source. The voltage was set to 85% and 115% of the nominal value. The output frequency was recorded for each voltage.

10.4. Test Result

: Pass

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10.4.1. Frequency Stability over Temperature and Voltage variation

Modulation: QPSK

Reference: - 48 Vdc at 20°C **Freq.** = 2593,000,000 MHz

Voltage (%)	Temp. (°C)	Frequency (Hz)	Frequency Error (Hz)	Deviation (Hz)	ppm
100%	+20(Ref)	2593 000 001	1.3	0.0	0.0000
	-30	2593 000 003	3.0	1.7	0.0007
	-20	2593 000 002	2.1	0.8	0.0003
	-10	2593 000 004	4.1	2.8	0.0011
	0	2592 999 999	-0.6	-1.9	-0.0007
	+10	2592 999 999	-1.0	-2.3	-0.0009
	+30	2593 000 003	2.5	1.2	0.0005
	+40	2593 000 003	2.9	1.6	0.0006
	+50	2593 000 001	1.0	-0.3	-0.0001
115%	+20	2593 000 002	1.5	0.2	0.0001
85%	+20	2593 000 001	1.3	0.0	0.0000

(Output Port 1)

Modulation: 16QAM

Reference: - 48 Vdc at 20°C **Freq.** = 2593,000,000 MHz

Voltage (%)	Temp. (°C)	Frequency (Hz)	Frequency Error (Hz)	Deviation (Hz)	ppm
100%	+20(Ref)	2593 000 004	4.2	0.0	0.0000
	-30	2593 000 002	1.6	-2.6	-0.0010
	-20	2593 000 003	2.5	-1.7	-0.0007
	-10	2592 999 999	-0.6	-4.8	-0.0019
	0	2592 999 997	-3.0	-7.2	-0.0028
	+10	2592 999 999	-1.3	-5.5	-0.0021
	+30	2593 000 001	0.6	-3.6	-0.0014
	+40	2593 000 002	2.1	-2.1	-0.0008
	+50	2593 000 004	4.2	0.0	0.0000
115%	+20	2593 000 000	0.3	-3.9	-0.0015
85%	+20	2593 000 002	1.5	-2.7	-0.0010

(Output Port 2)

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Modulation: 64QAM**Reference: - 48 Vdc at 20°C Freq. = 2593,000,000 MHz**

Voltage (%)	Temp. (°C)	Frequency (Hz)	Frequency Error (Hz)	Deviation (Hz)	ppm
100%	+20(Ref)	2593 000 000	0.2	0.0	0.0000
	-30	2593 000 000	0.4	0.2	0.0001
	-20	2593 000 000	0.3	0.1	0.0000
	-10	2593 000 002	1.7	1.5	0.0006
	0	2593 000 002	1.5	1.3	0.0005
	+10	2593 000 002	2.3	2.1	0.0008
	+30	2593 000 003	2.9	2.7	0.0010
	+40	2593 000 001	1.4	1.2	0.0005
	+50	2593 000 004	3.7	3.5	0.0013
115%	+20	2593 000 003	2.7	2.5	0.0010
85%	+20	2593 000 000	-0.2	-0.4	-0.0002

(Output Port 1)

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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

$$S = PG/4\pi R^2$$

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

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Max Peak output Power at antenna input terminal	30.08000	dBm
Max Peak output Power at antenna input terminal	1018.59139	mW
Prediction distance	300.00000	cm
Prediction frequency	2593.00000	MHz
Antenna Gain(typical)	17.00000	dBi
Antenna Gain(numeric)	50.11872	–
Power density at prediction frequency (S)	0.18055	mW/cm ²
MPE limit for uncontrolled exposure at prediction frequency	1.00000	mW/cm ²

3. RESULTS

The power density level at 300 cm is 0.18055 mW/cm², which is below the uncontrolled exposure limit of 1.0 mW/cm² at 2593 MHz.

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