HCT CO.,LTD
74, Seoicheon-ro 578beon-gil, Majang-myeon, Icheon-si, Gyeonggi-do, Korea
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REPORT

FCC Certification

Applicant Name:
SAMSUNG Electronics Co., Ltd.

Address:
129, Samsung-ro, Yeongtong-gu Suwon-si, Gyeonggi-do, 443-742 Rep. of Korea

Date of Issue:
December 23, 2014

Test Site/Location:
HCT CO., LTD., 74, Seoicheon-ro 578beon-gil, Majang-myeon, Icheon-si, Gyeonggi-do, Korea

Report No.: HCT-R-1412-F054

HCT FRN: 0005866421

FCC ID: A3LSME500M

APPLICANT: SAMSUNG Electronics Co., Ltd.

FCC Model(s): SM-E500M/DS
Additional FCC Model(s): SM-E500M
EUT Type: Mobile Phone
FCC Classification: Licensed Portable Transmitter Held to Ear (PCE)
FCC Rule Part(s): §2 , §27

Mode (MHz)	Tx Frequency (MHz)	Emission Designator	Modulation	ERP	
				Max. Power (W)	Max. Power (dBm)
LTE – Band17 (5)	706.5 – 713.5	4M49G7D	QPSK	0.107	20.28
		4M50W7D	16QAM	0.086	19.34
LTE – Band17 (10)	709.0 – 711.0	8M98G7D	QPSK	0.083	19.19
		8M95W7D	16QAM	0.083	19.19
LTE – Band4 (1.4)	1710.7 – 1754.3	1M09G7D	QPSK	0.359	25.55
		1M09W7D	16QAM	0.368	25.66
LTE – Band4 (3)	1711.5 – 1753.5	2M71G7D	QPSK	0.362	25.59
		2M71W7D	16QAM	0.366	25.63
LTE – Band4 (5)	1712.5 – 1752.5	4M50G7D	QPSK	0.352	25.46
		4M50W7D	16QAM	0.337	25.27
LTE – Band4 (10)	1715.0 – 1750.0	8M99G7D	QPSK	0.365	25.62
		8M97W7D	16QAM	0.372	25.70
LTE – Band4 (15)	1717.5 – 1747.5	13M5G7D	QPSK	0.379	25.79
		13M5W7D	16QAM	0.384	25.84
LTE – Band4 (20)	1720.0 – 1745.0	18M0G7D	QPSK	0.395	25.97
		18M0W7D	16QAM	0.364	25.61

The measurements shown in this report were made in accordance with the procedures specified in §2.947. I assume full responsibility for the accuracy and completeness of these measurements, and for the qualifications of all persons taking them.

HCT CO., LTD. Certifies that no party to this application has subject to a denial of Federal benefits that includes FCC benefits pursuant to section 5301 of the Anti-Drug Abuse Act of 1998,21 U.S. C.853(a)

Report prepared by
: Kyoung Houn Seo
Test engineer of RF Team

Approved by
: Chang Seok Choi
Manager of RF Team

Version

TEST REPORT NO.	DATE	DESCRIPTION
HCT-R-1412-F054	December 23, 2014	- First Approval Report

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MEASUREMENT REPORT

1. GENERAL INFORMATION

Applicant Name:	SAMSUNG Electronics Co., Ltd.
Address:	129, Samsung-ro, Yeongtong-gu Suwon-si, Gyeonggi-do, 443-742 Rep. of Korea
FCC ID:	A3LSME500M
Application Type:	Certification
FCC Classification:	Licensed Portable Transmitter Held to Ear (PCE)
FCC Rule Part(s):	§2 , §27
EUT Type:	Mobile Phone
FCC Model(s):	SM-E500M/DS
Additional FCC Model(s):	SM-E500M
Tx Frequency:	706.5 MHz – 713.5 MHz (LTE – Band 17 (5 MHz)) 709.0 MHz – 711.0 MHz (LTE – Band 17 (10 MHz)) 1710.7 MHz – 1754.3 MHz (LTE – Band 4 (1.4 MHz)) 1711.5 MHz – 1753.5 MHz (LTE – Band 4 (3 MHz)) 1712.5 MHz – 1752.5 MHz (LTE – Band 4 (5 MHz)) 1715.0 MHz – 1750.0 MHz (LTE – Band 4 (10 MHz)) 1717.5 MHz – 1747.5 MHz (LTE – Band 4 (15 MHz)) 1720.0 MHz – 1745.0 MHz (LTE – Band 4 (20 MHz))
Max. RF Output Power:	Band 17 (5 MHz) : 0.107 W (QPSK) (20.28 dBm) 0.086 W (16-QAM) (19.34 dBm) Band 17 (10 MHz) : 0.083 W (QPSK) (19.19 dBm) 0.083 W (16-QAM) (19.19 dBm) Band 4 (1.4 MHz): 0.359 W (QPSK) (25.55 dBm) 0.368 W (16-QAM) (25.66 dBm) Band 4 (3 MHz): 0.362 W (QPSK) (25.59 dBm) 0.366 W (16-QAM) (25.63 dBm) Band 4 (5 MHz): 0.352 W (QPSK) (25.46 dBm) 0.337 W (16-QAM) (25.27 dBm) Band 4 (10 MHz): 0.365 W (QPSK) (25.62 dBm) 0.372 W (16-QAM) (25.70 dBm) Band 4 (15 MHz): 0.379 W (QPSK) (25.79 dBm) 0.384 W (16-QAM) (25.84 dBm) Band 4 (20 MHz): 0.395 W (QPSK) (25.97 dBm) 0.364 W (16-QAM) (25.61 dBm)
Emission Designator(s):	Band 17 (5 MHz) : 4M49G7D (QPSK) / 4M50W7D (16-QAM) Band 17 (10 MHz) : 8M98G7D (QPSK) / 8M95W7D (16-QAM) Band 4 (1.4 MHz): 1M09G7D (QPSK) / 1M09W7D (16-QAM) Band 4 (3 MHz): 2M71G7D (QPSK) / 2M71W7D (16-QAM) Band 4 (5 MHz): 4M50G7D (QPSK) / 4M50W7D (16-QAM) Band 4 (10 MHz): 8M99G7D (QPSK) / 8M97W7D (16-QAM) Band 4 (15 MHz): 13M5G7D (QPSK) / 13M5W7D (16-QAM) Band 4 (20 MHz): 18M0G7D (QPSK) / 18M0W7D (16-QAM)
Date(s) of Tests:	December 10, 2014 ~ December 22, 2014
Antenna Specification	Manufacturer: PARTRON Antenna type: INTENNA Peak Gain: Band 17: -5.25 dBi / Peak Gain: Band 4: -4.55 dBi

2. INTRODUCTION

2.1. EUT DESCRIPTION

The SAMSUNG Electronics Co., Ltd. SM-E500M/DS Mobile Phone consists of LTE 4, 17.

2.2. MEASURING INSTRUMENT CALIBRATION

The measuring equipment, which was utilized in performing the tests documented herein, has been calibrated in accordance with the manufacturer's recommendations for utilizing calibration equipment, which is traceable to recognized national standards.

2.3. TEST FACILITY

The Fully-anechoic chamber and conducted measurement facility used to collect the radiated data are located at the **74, Seoicheon-ro 578beon-gil, Majang-myeon, Icheon-si, Gyeonggi-do, Korea**.

3. DESCRIPTION OF TESTS

3.1 ERP/EIRP RADIATED POWER AND RADIATED SPURIOUS EMISSIONS

Note: ERP(Effective Radiated Power), EIRP(Effective Isotropic Radiated Power)

Test Procedure

Radiated emission measurements are performed in the Fully-anechoic chamber. The equipment under test is placed on a non-conductive table 3-meters away from the receive antenna in accordance with ANSI/TIA-603-C-2004 Clause 2.2.17. The turntable is rotated through 360 degrees, and the receiving antenna scans in order to determine the level of the maximized emission. The level and position of the maximized emission is recorded with the spectrum analyzer using a positive peak detector.
A half wave dipole is then substituted in place of the EUT. For emissions above 1GHz, a horn antenna is substituted in place of the EUT. The substitute antenna is driven by a signal generator and the previously recorded signal was duplicated.
The power is calculated by the following formula;

$$P_{d(dBm)} = Pg_{(dBm)} - \text{cable loss}_{(dB)} + \text{antenna gain}_{(dB)}$$

Where: P_d is the dipole equivalent power and P_g is the generator output power into the substitution antenna.

The maximum EIRP is calculated by adding the forward power to the calibrated source plus its appropriate gain value. These steps are repeated with the receiving antenna in both vertical and horizontal polarization. the difference between the gain of the horn and an isotropic antenna are taken into consideration

Radiated spurious emissions

: Frequency Range : 30 MHz ~ 10th Harmonics of highest channel fundamental frequency.

3.2 PEAK-AVERAGE RATIO.

Test Procedure

Peak to Average Power Ratio is tested in accordance with KDB971168 D01 Power Meas License Digital Systems v02r02, October 17, 2014, Section 5.7.

- Section 5.7.1 CCDF Procedure

a) Set resolution/measurement bandwidth ≥ signal's occupied bandwidth;
b) Set the number of counts to a value that stabilizes the measured CCDF curve;
c) Set the measurement interval as follows:
   1) for continuous transmissions, set to 1 ms,
   2) for burst transmissions, employ an external trigger that is synchronized with the EUT burst timing sequence, or use the internal burst trigger with a trigger level that allows the burst to stabilize and set the measurement interval to a time that is less than or equal to the burst duration.
d) Record the maximum PAPR level associated with a probability of 0.1%.

- Section 5.7.2 Alternate Procedure

Use one of the procedures presented in 5.1 to measure the total peak power and record as P_{Pk}. Use one of the applicable procedures presented 5.2 to measure the total average power and record as P_{Avg}. Determine the P.A.R. from: $P.A.R_{(dB)} = P_{Pk\ (dBm)} - P_{Avg\ (dBm)}$ (P_{Avg} = Average Power + Duty cycle Factor)

5.1.1 Peak power measurements with a spectrum/signal analyzer or EMI receiver

The following procedure can be used to determine the total peak output power.

a) Set the RBW ≥ OBW.
b) Set VBW ≥ 3 × RBW.
c) Set span ≥ 2 x RBW
d) Sweep time = auto couple.
e) Detector = peak.
f) Ensure that the number of measurement points ≥ span/RBW.
g) Trace mode = max hold.
h) Allow trace to fully stabilize.
i) Use the peak marker function to determine the peak amplitude level.

5.2.2 Procedures for use with a spectrum/signal analyzer when EUT cannot be configured to transmit continuously and sweep triggering/signal gating cannot be properly implemented

If the EUT cannot be configured to transmit continuously (burst duty cycle < 98%), then one of the following procedures can be used. The selection of the applicable procedure will depend on the characteristics of the measured burst duty cycle.

Measure the burst duty cycle with a spectrum/signal analyzer or EMC receiver can be used in zero-span mode if the response time and spacing between bins on the sweep are sufficient to permit accurate measurement of the burst on/off time of the transmitted signal.

5.2.2.2 Constant burst duty cycle

If the measured burst duty cycle is constant (i.e., duty cycle variations are less than ± 2 percent), then:

a) Set span to at least 1.5 times the OBW.

b) Set RBW = 1-5% of the OBW, not to exceed 1 MHz.

c) Set VBW ≥ 3 x RBW.

d) Number of points in sweep ≥ 2 × span / RBW. (This gives bin-to-bin spacing ≤ RBW/2, so that narrowband signals are not lost between frequency bins.)

e) Sweep time = auto.

f) Detector = RMS (power averaging).

g) Set sweep trigger to “free run”.

h) Trace average at least 100 traces in power averaging (i.e., RMS) mode.

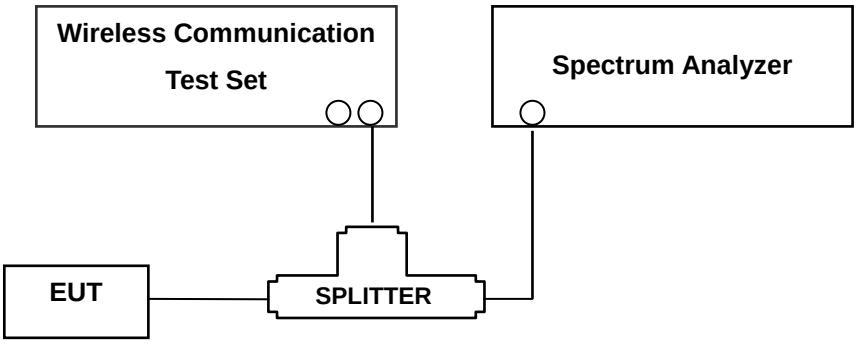
i) Compute power by integrating the spectrum across the OBW of the signal using the instrument’s band power measurement function with band limits set equal to the OBW band edges. If the instrument does not have a band power function, sum the spectrum levels (in power units) at intervals equal to the RBW extending across the entire OBW of the spectrum.

j) Add 10 log (1/x), where x is the duty cycle, to the measured power in order to compute the average power during the actual transmission times (because the measurement represents an average over both the on and off times of the transmission).

For example, add 10 log (1/0.25) = 6 dB if the duty cycle is a constant 25%.

3.3 OCCUPIED BANDWIDTH.

Test set-up



(Configuration of conducted Emission measurement)

The width of a frequency band such that, below the lower and above the upper frequency limits, the mean powers emitted are each equal to a specified percentage 0.5 % of the total mean power of a given emission.

Test Procedure

OBW is tested in accordance with KDB971168 D01 Power Meas License Digital Systems v02r02, October 17, 2014, Section 4.2.

The EUT makes a call to the communication simulator. The power was measured with R&S Spectrum Analyzer. All measurements were done at 3 channels(low, middle and high operational range.)

The conducted occupied bandwidth used the power splitter via EUT RF power connector between simulation base station and spectrum analyzer.

The communication simulator station system controlled a EUT to export maximum output power under transmission mode and specific channel frequency. Use OBW measurement function of Spectrum analyzer to measure 99 % occupied bandwidth

3.4 BLOCK B FREQUENCY RANGE (704 – 710 and 734 – 740 MHz, 777 – 792 MHz)

§27.5(c)

698-746 MHz Band. The following frequencies are available for licensing pursuant to this part in the 698–746 MHz band: (1) Three paired channel blocks of 12 MHz each are available for assignment as follows :

Block A : 698 – 704 MHz and 728 – 734 MHz ;

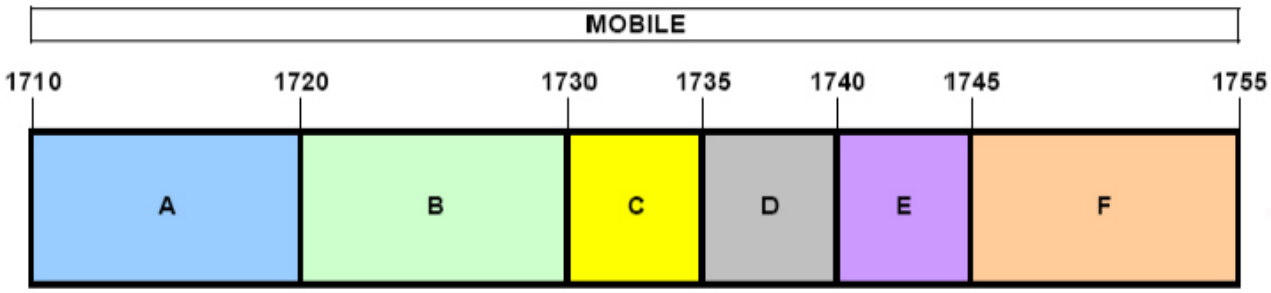
Block B : 704 – 710 MHz and 734 – 740 MHz ; and

Block C : 710 – 716 MHz and 740 – 746 MHz.

The EUT is only being authorized for operation in Blocks B and C.

3.5 AWS – MOBILE FREQUENCY BLOCKS (1710 – 1755 MHz)

§27.5(h)



BLOCK 1: 1710 – 1720 MHz (A)

BLOCK 2: 1720 – 1730 MHz (B)

BLOCK 3: 1730 – 1735 MHz (C)

BLOCK 4: 1735 – 1740 MHz (D)

BLOCK 5: 1740 – 1745 MHz (E)

BLOCK 6: 1745 – 1755 MHz (F)

3.6 SPURIOUS AND HARMONIC EMISSIONS AT ANTENNA TERMINAL.

Test Procedure

Spurious and harmonic emissions at antenna terminal is tested in accordance with KDB971168 D01 Power Meas License Digital Systems v02r02, October 17, 2014, Section 6.0.

The level of the carrier and the various conducted spurious and harmonic frequencies is measured by means of a calibrated spectrum analyzer.

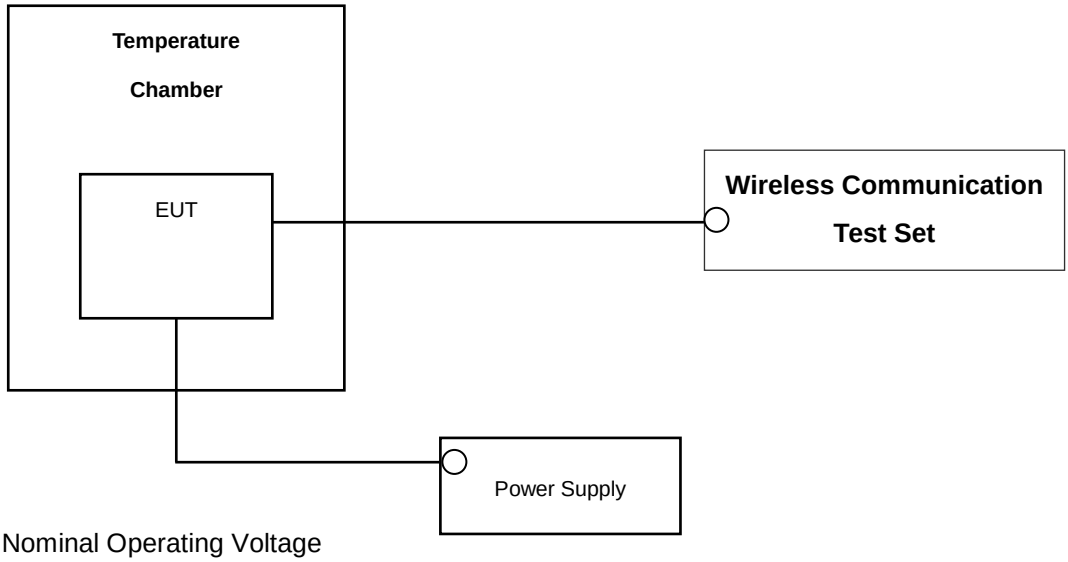
The spectrum is scanned from the lowest frequency generated in the equipment up to a frequency including its 10th harmonic. On any frequency outside a licensee's frequency block, the power of any emission shall be attenuated below the transmitter power (P) by at least 43 + 10 log(P) dB. Compliance with these provisions is based on the use of measurement instrumentation employing a resolution bandwidth of 1 MHz or greater. However, in the 100 kHz bands immediately outside and adjacent to the frequency block a resolution bandwidth of at least 30kHz bandwidth may be employed. The emission bandwidth is defined as the width of the signal between two points, one below the carrier center frequency and one above the carrier center frequency

NOTES: The analyzer plot offsets were determined by below conditions.

- For LTE Band 17, total offset 26.5 dB = 20 dB attenuator + 6 dB Divider + 0.5 dB RF cables.
- For LTE Band 4, total offset 27.2 dB = 20 dB attenuator + 6 dB Divider + 1.2 dB RF cables.

3.7 FREQUENCY STABILITY / VARIATION OF AMBIENT TEMPERATURE

Test Set-up



* Nominal Operating Voltage

Test Procedure

Frequency stability is tested in accordance with ANSI/TIA-603-C-2004 section 2.2.2

The frequency stability of the transmitter is measured by:
a.) **Temperature:** The temperature is varied from - 30 °C to + 50 °C using an environmental chamber.

b.) **Primary Supply Voltage:** The primary supply voltage is varied from the end point to 115 % of the voltage normally at the input to the device or at the power supply terminals if cables are not normally supplied.

Specification **—** the frequency stability shall be sufficient to ensure that the fundamental emission stays within the authorized frequency block(LTE Band4). The frequency stability of the transmitter shall be maintained within ± 0.000 25 %(± 2.5 ppm) of the center frequency(LTE Band17).

Time Period and Procedure:

The carrier frequency of the transmitter is measured at room temperature (20°C to provide a reference).
1. The equipment is turned on in a “standby” condition for one minute before applying power to the transmitter. Measurement of the carrier frequency of the transmitter is made within one minute after applying power to the transmitter.

2. Frequency measurements are made at 10°C intervals ranging from -30°C to +50°C. A period of at least one half-hour is provided to allow stabilization of the equipment at each temperature level.

4. LIST OF TEST EQUIPMENT

Manufacture	Model/ Equipment	Serial Number	Calibration Interval	Calibration Due
Agilent	N1921A/ Power Sensor	MY45241059	Annual	07/09/2015
Agilent	N1911A/ Power Meter	MY45100523	Annual	01/24/2015
MITEQ	AMF-6D-001180-35-20P/AMP	1081666	Annual	09/04/2015
Wainwright	WHK1.2/15G-10EF/H.P.F	4	Annual	06/17/2015
Wainwright	WRCJV2400/2483.5-2370/2520-60/12SS / B.R.F.	1	Annual	06/17/2015
Wainwright	WHK3.3/18G-10EF/H.P.F	2	Annual	06/17/2015
Hewlett Packard	11667B / Power Splitter	10545	Annual	02/22/2015
Hewlett Packard	11667B / Power Splitter	11275	Annual	05/19/2015
Digital	EP-3010/ Power Supply	3110117	Annual	10/29/2015
Schwarzbeck	UHAP/ Dipole Antenna	557	Biennial	03/05/2015
Schwarzbeck	UHAP/ Dipole Antenna	558	Biennial	05/03/2015
Korea Engineering	KR-1005L / Chamber	KRAC05063-3CH	Annual	10/29/2015
Schwarzbeck	BBHA 9120D/ Horn Antenna	147	Biennial	09/01/2016
Schwarzbeck	BBHA 9120D/ Horn Antenna	1151	Biennial	10/05/2015
Schwarzbeck	BBHA 9170/ Horn Antenna(15~40GHz)	BBHA9170541	Biennial	07/05/2015
Agilent	E4440A/Spectrum Analyzer	US45303008	Annual	04/09/2015
WEINSCHEL	ATTENUATOR	BR0592	Annual	10/22/2015
REOHDE&SCHWARZ	FSV40/Spectrum Analyzer	1307.9002K40-100931-NK	Annual	06/09/2015
Agilent	8960 (E5515C)/ Base Station	MY48360222	Annual	08/26/2015
Anritsu Corp.	MT8820C/Wideband Radio Communication Tester	6200863156	Annual	04/01/2015

5. SUMMARY OF TEST RESULTS

FCC Part Section(s)	Test Description	Test Limit	Test Condition	Test Result
2.1049	Occupied Bandwidth	N/A	CONDUCTED	PASS
2.1051, 27.53(g), 27.53(h)	Band Edge / Spurious and Harmonic Emissions at Antenna Terminal.	< 43 +10 $\log_{10}$ (P[Watts]) at Band Edge and for all-of-band emissions		PASS
27.50(d)(5)	Peak-Average Ratio	< 13 dB		PASS
2.1046	Conducted Output Power	N/A		PASS
2.1055, 27.54	Frequency stability / variation of ambient temperature	< 2.5 ppm		PASS
27.50(c)(10)	Effective Radiated Power (Band 17)	< 3 Watts max. ERP	RADIATED	PASS
27.50(d)(4)	Equivalent Isotropic Radiated Power (Band 4)	< 1 Watts max. EIRP		PASS
				PASS
2.1053, 27.53(g), 27.53(h)	Undesirable Out-of-Band Emissions	< 43 +10 $\log_{10}$ (P[Watts]) for all out-of-band emissions		PASS

*: See SAR Report

6. SAMPLE CALCULATION

A. ERP Sample Calculation

Mode	Ch./ Freq.		Measured Level(dBm)	Substitude LEVEL(dBm)	Ant. Gain (dBd)	C.L	Pol.	ERP	
	channel	Freq.(MHz)						W	dBm
LTE Band4	20175	1,732.50	-15.75	18.45	9.90	1.76	H	0.456	26.59

ERP = SubstitudeLEVEL(dBm) + Ant. Gain – CL(Cable Loss)

1) The EUT mounted on a wooden tripod is 0.8 meter above test site ground level.
2) During the test , the turn table is rotated and the antenna height is found.
3) Record the field strength meter's level.
4) Replace the EUT with dipole/Horn antenna that is connected to a calibrated signal generator.
5) Increase the signal generator output till the field strength meter's level is equal to the item (3).
6) The signal generator output level with Ant. Gain and cable loss are the rating of effective radiated power (**ERP**).

B. Emission Designator

QPSK Modulation

Emission Designator = 4M48G7D

LTE BW = 4.48 MHz

G = Phase Modulation

7 = Quantized/Digital Info

D = Data transmission; telemetry; telecommand

16QAM Modulation

Emission Designator = 4M48W7D

LTE BW = 4.48 MHz

W = main carrier modulated in a combination of two
or more of the following modes;
amplitude, angle, pulse

7 = Quantized/Digital Info

D = Data transmission; telemetry; telecommand

7. TEST DATA

7.1 EFFECTIVE RADIATED POWER OUTPUT (Band 17)

Freq (MHz)	Bandwidth	Modulation	Measured Level (dBm)	Substitude Level (dBm)	Ant. Gain(dBd)	C.L	Pol	ERP	
								W	dBm
706.5	5 MHz	QPSK	-30.76	30.27	-10.21	1.08	V	0.079	18.98
		16-QAM	-30.58	30.45	-10.21	1.08	V	0.082	19.16
710.0		QPSK	-30.33	30.34	-10.22	1.09	V	0.080	19.03
		16-QAM	-30.24	30.43	-10.22	1.09	V	0.082	19.12
713.5		QPSK	-29.25	31.60	-10.24	1.08	V	0.107	20.28
		16-QAM	-30.19	30.66	-10.24	1.08	V	0.086	19.34

Effective Radiated Power Data (Band 17 – 5 MHz)

Note: Worst case is 1 resource block

Freq (MHz)	Bandwidth	Modulation	Measured Level (dBm)	Substitude Level (dBm)	Ant. Gain(dBd)	C.L	Pol	ERP	
								W	dBm
709.0	10 MHz	QPSK	-30.71	30.21	-10.22	1.09	V	0.078	18.90
		16-QAM	-30.50	30.42	-10.22	1.09	V	0.081	19.11
710.0		QPSK	-30.65	30.02	-10.22	1.09	V	0.074	18.71
		16-QAM	-30.75	29.92	-10.22	1.09	V	0.073	18.61
711.0		QPSK	-30.09	30.50	-10.23	1.08	V	0.083	19.19
		16-QAM	-30.09	30.50	-10.23	1.08	V	0.083	19.19

Effective Radiated Power Data (Band 17 – 10 MHz)

Note: Worst case is 1 resource block.

NOTES:

Effective Radiated Power Output Measurements by Substitution Method

according to ANSI/TIA/EIA-603-C-2004, Aug. 17, 2004:

The EUT was placed on a non-conductive styrofoam resin table 3-meters from the receive antenna. The receive antenna height and turntable rotation was adjusted for the highest reading on the receive spectrum analyzer.
A half-wave dipole was substituted in place of the EUT. This dipole antenna was driven by a signal generator and the level of the signal generator was adjusted to obtain the same receive spectrum analyzer reading. The conducted power at the terminals of the dipole is measured. The ERP is recorded.

Also, we have done x, y, z planes in EUT and horizontal and vertical polarization in detecting antenna. The worst case of the EUT is y plane in LTE mode. Also worst case of detecting Antenna is vertical polarization in LTE mode.

7.2 EQUIVALENT ISOTROPIC RADIATED POWER OUTPUT (Band 4)

Freq (MHz)	Bandwidth	Modulation	Measured Level (dBm)	Substitude Level (dBm)	Ant. Gain(dBi)	C.L	Pol	EIRP	
								W	dBm
1710.7	1.4 MHz	QPSK	-17.43	16.80	9.87	1.77	H	0.309	24.90
		16-QAM	-17.54	16.69	9.87	1.77	H	0.301	24.79
1732.5		QPSK	-16.79	17.41	9.90	1.76	H	0.359	25.55
		16-QAM	-16.68	17.52	9.90	1.76	H	0.368	25.66
1754.3		QPSK	-17.11	16.99	10.01	1.81	H	0.330	25.19
		16-QAM	-17.20	16.90	10.01	1.81	H	0.324	25.10

Equivalent Isotropic Radiated Power Data (Band 4 – 1.4 MHz)

Note: Worst case is 1 resource block.

Freq (MHz)	Bandwidth	Modulation	Measured Level (dBm)	Substitude Level (dBm)	Ant. Gain(dBi)	C.L	Pol	EIRP	
								W	dBm
1711.5	3 MHz	QPSK	-17.88	16.35	9.87	1.77	H	0.279	24.45
		16-QAM	-17.85	16.38	9.87	1.77	H	0.281	24.48
1732.5		QPSK	-16.75	17.45	9.90	1.76	H	0.362	25.59
		16-QAM	-16.71	17.49	9.90	1.76	H	0.366	25.63
1753.5		QPSK	-17.03	17.07	10.01	1.81	H	0.337	25.27
		16-QAM	-17.25	16.85	10.01	1.81	H	0.320	25.05

Equivalent Isotropic Radiated Power Data (Band 4 – 3 MHz)

Note: Worst case is 1 resource block.

Freq (MHz)	Bandwidth	Modulation	Measured Level (dBm)	Substitude Level (dBm)	Ant. Gain(dBi)	C.L	Pol	EIRP	
								W	dBm
1712.5	5 MHz	QPSK	-17.71	16.38	9.87	1.77	H	0.281	24.48
		16-QAM	-17.67	16.42	9.87	1.77	H	0.283	24.52
1732.5		QPSK	-16.88	17.32	9.90	1.76	H	0.352	25.46
		16-QAM	-17.10	17.10	9.90	1.76	H	0.334	25.24
1752.5		QPSK	-18.36	15.74	10.01	1.81	H	0.248	23.94
		16-QAM	-17.03	17.07	10.01	1.81	H	0.337	25.27

Equivalent Isotropic Radiated Power Data (Band 4 – 5 MHz)

Note: Worst case is 1 resource block.

Freq (MHz)	Bandwidth	Modulation	Measured Level (dBm)	Substitude Level (dBm)	Ant. Gain(dBi)	C.L	Pol	EIRP	
								W	dBm
1715.0	10 MHz	QPSK	-18.17	16.06	9.87	1.77	H	0.261	24.16
		16-QAM	-17.72	16.51	9.87	1.77	H	0.289	24.61
1732.5		QPSK	-17.25	16.95	9.90	1.76	H	0.323	25.09
		16-QAM	-17.06	17.14	9.90	1.76	H	0.337	25.28
1750.0		QPSK	-16.68	17.42	10.01	1.81	H	0.365	25.62
		16-QAM	-16.60	17.50	10.01	1.81	H	0.372	25.70

Equivalent Isotropic Radiated Power Data (Band 4 – 10 MHz)

Note: Worst case is 1 resource block.

Freq (MHz)	Bandwidth	Modulation	Measured Level (dBm)	Substitude Level (dBm)	Ant. Gain(dBi)	C.L	Pol	EIRP	
								W	dBm
1717.5	15 MHz	QPSK	-18.04	16.18	9.88	1.77	H	0.269	24.29
		16-QAM	-18.15	16.07	9.88	1.77	H	0.262	24.18
1732.5		QPSK	-17.32	16.88	9.90	1.76	H	0.318	25.02
		16-QAM	-17.50	16.70	9.90	1.76	H	0.305	24.84
1747.5		QPSK	-16.51	17.60	9.99	1.80	H	0.379	25.79
		16-QAM	-16.46	17.65	9.99	1.80	H	0.384	25.84

Equivalent Isotropic Radiated Power Data (Band 4 – 15 MHz)

Note: Worst case is 1 resource block.

Freq (MHz)	Bandwidth	Modulation	Measured Level (dBm)	Substitude Level (dBm)	Ant. Gain(dBi)	C.L	Pol	EIRP	
								W	dBm
1720.0	20 MHz	QPSK	-17.76	16.46	9.88	1.77	H	0.286	24.57
		16-QAM	-18.15	16.07	9.88	1.77	H	0.262	24.18
1732.5		QPSK	-17.61	16.57	9.90	1.76	H	0.296	24.71
		16-QAM	-17.55	16.63	9.90	1.76	H	0.300	24.77
1745.0		QPSK	-16.50	17.80	9.96	1.79	H	0.395	25.97
		16-QAM	-16.86	17.44	9.96	1.79	H	0.364	25.61

Equivalent Isotropic Radiated Power Data (Band 4 – 20 MHz)

Note: Worst case is 1 resource block.

NOTES:

Equivalent Isotropic Radiated Power Measurements by Substitution Method

according to ANSI/TIA/EIA-603-C-2004, Aug. 17, 2004:

The EUT was placed on a non-conductive styrofoam resin table 3-meters from the receive antenna. The receive antenna height and turntable rotation was adjusted for the highest reading on the receive spectrum analyzer.
A Horn antenna was substituted in place of the EUT. This Horn antenna was driven by a signal generator and the level of the signal generator was adjusted to obtain the same receive spectrum analyzer reading. The conducted power at the terminals of the Horn antenna is measured. The difference between the gain of the horn and an isotropic antenna is taken into consideration and the EIRP is recorded.

Also, we have done x, y, z planes in EUT and horizontal and vertical polarization in detecting antenna. The worst case of the EUT is x plane in LTE mode. Also worst case of detecting Antenna is horizontal polarization in LTE mode.

7.3 RADIATED SPURIOUS EMISSIONS

7.3.1 RADIATED SPURIOUS EMISSIONS (Band 17) 5 MHz

▣ OPERATING FREQUENCY : 713.5 MHz

▣ MEASURED OUTPUT POWER: 20.28 dBm = 0.107 W

▣ MODULATION SIGNAL: 5 MHz QPSK

▣ DISTANCE: 3 meters

▣ LIMIT: 43 + 10 lo_{g10} (W) = 33.28 dBc

Ch	Freq (MHz)	Measured Level (dBm)	Ant. Gain (dBd)	Substitude Level (dBm)	C.L	Pol	ERP (dBm)	dBc
23755 (706.50)	1,413.0	-55.42	7.80	-59.11	1.58	V	-52.89	73.17
	2,119.5	-55.41	9.55	-58.83	1.99	H	-51.27	71.55
	2,826.0	-58.32	10.84	-60.94	2.31	H	-52.41	72.69
23790 (710.00)	1,420.0	-55.66	7.86	-59.99	1.59	V	-53.72	74.00
	2,130.0	-57.81	9.49	-60.97	1.99	V	-53.47	73.75
	2,840.0	-58.15	10.90	-60.66	2.30	V	-52.06	72.34
23825 (713.50)	1,427.0	-54.83	7.90	-58.38	1.60	H	-52.08	72.36
	2,140.5	-57.50	9.42	-60.44	1.98	V	-53.00	73.28
	2,854.0	-58.29	10.94	-61.00	2.31	V	-52.37	72.65

NOTES: 1. Radiated Spurious Emission Measurements at 3 meters by Substitution Method according to ANSI/TIA/EIA-603-C-2004, Aug. 17, 2004:

2. We are performed all frequency to 10^{th} harmonics from 30 MHz. Measurements above show only up to 3 maximum emissions noted, or would be lesser if no specific emissions from the EUT are recorded (ie: margin > 20 dB from the applicable limit) and considered that's already beyond the background noise floor.

3. we have done x, y, z planes in EUT and horizontal and vertical polarization in detecting antenna.

4. Worst case is 1 resource block.

7.3.2 RADIATED SPURIOUS EMISSIONS (Band 17) 10 MHz

▣ OPERATING FREQUENCY : 711.0 MHz

▣ MEASURED OUTPUT POWER: 19.19 dBm = 0.083 W

▣ MODULATION SIGNAL: 10 MHz QPSK

▣ DISTANCE: 3 meters

▣ LIMIT: 43 + 10 lo_{g10} (W) = 32.19 dBc

Ch	Freq (MHz)	Measured Level (dBm)	Ant. Gain (dBd)	Substitude Level (dBm)	C.L	Pol	ERP (dBm)	dBc
23780 (709.00)	1,418.0	-55.06	7.84	-58.79	1.58	V	-52.53	71.72
	2,127.0	-55.09	9.55	-58.31	1.99	V	-50.75	69.94
	2,836.0	-55.11	10.88	-57.60	2.30	H	-49.02	68.21
23790 (710.00)	1,420.0	-55.18	7.86	-59.51	1.59	V	-53.24	72.43
	2,130.0	-55.82	9.49	-58.98	1.99	V	-51.48	70.67
	2,840.0	-58.15	10.90	-60.66	2.30	V	-52.06	71.25
23800 (711.00)	1,422.0	-57.01	7.86	-61.34	1.59	V	-55.07	74.26
	2,133.0	-57.48	9.49	-60.64	1.99	H	-53.14	72.33
	2,844.0	-57.80	10.90	-60.31	2.30	V	-51.71	70.90

NOTES: 1. Radiated Spurious Emission Measurements at 3 meters by Substitution Method according to ANSI/TIA/EIA-603-C-2004, Aug. 17, 2004:

2. We are performed all frequency to 10th harmonics from 30 MHz. Measurements above show only up to 3 maximum emissions noted, or would be lesser if no specific emissions from the EUT are recorded (ie: margin > 20 dB from the applicable limit) and considered that's already beyond the background noise floor.

3. we have done x, y, z planes in EUT and horizontal and vertical polarization in detecting antenna.

4. Worst case is 1 resource block.

7.3.3 RADIATED SPURIOUS EMISSIONS (Band 4) 1.4 MHz

▣ OPERATING FREQUENCY : 1732.50 MHz

▣ MEASURED OUTPUT POWER: 25.66 dBm = 0.368 W

▣ MODULATION SIGNAL: 1.4 MHz 16-QAM

▣ DISTANCE: 3 meters

▣ LIMIT: 43 + 10 lo_{g10} (W) = 38.66 dBc

Ch	Freq (MHz)	Measured Level (dBm)	Ant. Gain (dBi)	Substitude Level (dBm)	C.L	Pol	EIRP (dBm)	dBc
19957 (1710.7)	3,421.40	-54.32	12.36	-57.77	2.52	H	-47.93	73.59
	5,132.10	-56.02	12.34	-52.18	3.18	V	-43.02	68.68
	6,842.80	-57.59	12.17	-48.71	3.85	H	-40.39	66.05
20175 (1732.5)	3,465.00	-54.75	12.27	-57.60	2.56	H	-47.89	73.55
	5,197.50	-54.90	12.63	-51.21	3.23	H	-41.81	67.47
	6,930.00	-58.72	11.87	-48.89	4.02	V	-41.04	66.70
20393 (1754.3)	3,508.60	-55.89	12.15	-58.03	2.61	H	-48.49	74.15
	5,262.90	-53.70	12.91	-47.52	3.26	H	-37.87	63.53
	7,017.20	-56.93	11.59	-46.68	4.07	H	-39.16	64.82

NOTES: 1. Radiated Spurious Emission Measurements at 3 meters by Substitution Method according to ANSI/TIA/EIA-603-C-2004, Aug. 17, 2004:

2. We are performed all frequency to 10th harmonics from 30 MHz. Measurements above show only up to 3 maximum emissions noted, or would be lesser if no specific emissions from the EUT are recorded (ie: margin > 20 dB from the applicable limit) and considered that's already beyond the background noise floor.

3. we have done x, y, z planes in EUT and horizontal and vertical polarization in detecting antenna.

4. Worst case is 1 resource block.

7.3.4 RADIATED SPURIOUS EMISSIONS (Band 4) 3 MHz

▣ OPERATING FREQUENCY : 1732.50 MHz

▣ MEASURED OUTPUT POWER: 25.63 dBm = 0.366 W

▣ MODULATION SIGNAL: 3 MHz 16-QAM

▣ DISTANCE: 3 meters

▣ LIMIT: 43 + 10 lo_{g10} (W) = 38.63 dBc

Ch	Freq (MHz)	Measured Level (dBm)	Ant. Gain (dBi)	Substitude Level (dBm)	C.L	Pol	EIRP (dBm)	dBc
19965 (1711.5)	3,423.00	-56.31	12.36	-59.76	2.52	H	-49.92	75.55
	5,134.50	-58.07	12.35	-54.24	3.18	H	-45.07	70.70
	6,846.00	-58.10	12.16	-49.21	3.85	H	-40.90	66.53
20175 (1732.5)	3,465.00	-54.97	12.27	-57.82	2.56	H	-48.11	73.74
	5,197.50	-55.90	12.63	-52.21	3.23	H	-42.81	68.44
	6,930.00	-57.45	11.87	-47.62	4.02	H	-39.77	65.40
20385 (1753.5)	3,507.00	-56.78	12.15	-58.92	2.61	H	-49.38	75.01
	5,260.50	-56.47	12.90	-50.28	3.26	H	-40.64	66.27
	7,014.00	-57.89	11.59	-47.66	4.05	H	-40.12	65.75

NOTES:

1. Radiated Spurious Emission Measurements at 3 meters by Substitution Method according to ANSI/TIA/EIA-603-C-2004, Aug. 17, 2004:
2. We are performed all frequency to 10th harmonics from 30 MHz. Measurements above show only up to 3 maximum emissions noted, or would be lesser if no specific emissions from the EUT are recorded (ie: margin > 20 dB from the applicable limit) and considered that's already beyond the background noise floor.
3. we have done x, y, z planes in EUT and horizontal and vertical polarization in detecting antenna.
4. Worst case is 1 resource block.

7.3.5 RADIATED SPURIOUS EMISSIONS (Band 4) 5 MHz

▣ OPERATING FREQUENCY : 1732.50 MHz

▣ MEASURED OUTPUT POWER: 25.46 dBm = 0.352 W

▣ MODULATION SIGNAL: 5 MHz QPSK

▣ DISTANCE: 3 meters

▣ LIMIT: 43 + 10 lo_{g10} (W) = 38.46 dBc

Ch	Freq (MHz)	Measured Level (dBm)	Ant. Gain (dBi)	Substitude Level (dBm)	C.L	Pol	EIRP (dBm)	dBc
19975 (1712.5)	3,425.00	-55.67	12.35	-59.09	2.54	H	-49.28	74.74
	5,137.50	-57.30	12.36	-53.45	3.21	H	-44.30	69.76
	6,850.00	-56.98	12.15	-48.30	3.85	H	-40.00	65.46
20175 (1732.5)	3,465.00	-55.49	12.27	-58.34	2.56	H	-48.63	74.09
	5,197.50	-54.68	12.63	-50.99	3.23	H	-41.59	67.05
	6,930.00	-58.81	11.87	-48.98	4.02	H	-41.13	66.59
20375 (1752.5)	3,505.00	-56.65	12.15	-58.80	2.60	H	-49.25	74.71
	5,257.50	-56.58	12.90	-50.38	3.27	H	-40.75	66.21
	7,010.00	-58.21	11.61	-48.00	4.09	H	-40.48	65.94

NOTES: 1. Radiated Spurious Emission Measurements at 3 meters by Substitution Method according to ANSI/TIA/EIA-603-C-2004, Aug. 17, 2004:

2. We are performed all frequency to 10th harmonics from 30 MHz. Measurements above show only up to 3 maximum emissions noted, or would be lesser if no specific emissions from the EUT are recorded (ie: margin > 20 dB from the applicable limit) and considered that's already beyond the background noise floor.

3. we have done x, y, z planes in EUT and horizontal and vertical polarization in detecting antenna.

4. Worst case is 1 resource block.

7.3.6 RADIATED SPURIOUS EMISSIONS (Band 4) 10 MHz

▣ OPERATING FREQUENCY : 1750.00 MHz

▣ MEASURED OUTPUT POWER: 25.70 dBm = 0.372 W

▣ MODULATION SIGNAL: 10 MHz 16-QAM

▣ DISTANCE: 3 meters

▣ LIMIT: 43 + 10 lo_{g10} (W) = 38.70 dBc

Ch	Freq (MHz)	Measured Level (dBm)	Ant. Gain (dBi)	Substitude Level (dBm)	C.L	Pol	EIRP (dBm)	dBc
20000 (1715.0)	3,430.00	-56.93	12.34	-63.10	2.55	H	-53.31	79.01
	5,145.00	-56.35	12.38	-60.41	1.97	H	-50.00	75.70
	6,860.00	-57.06	12.11	-48.32	3.76	H	-39.97	65.67
20175 (1732.5)	3,465.00	-55.79	12.27	-58.64	2.56	H	-48.93	74.63
	5,197.50	-54.95	12.63	-51.26	3.23	H	-41.86	67.56
	6,930.00	-59.47	11.87	-49.64	4.02	H	-41.79	67.49
20350 (1750.0)	3,500.00	-56.43	12.15	-58.59	2.59	H	-49.03	74.73
	5,250.00	-58.43	12.87	-53.22	3.28	H	-43.63	69.33
	7,000.00	-59.12	11.65	-49.30	4.03	H	-41.68	67.38

NOTES: 1. Radiated Spurious Emission Measurements at 3 meters by Substitution Method according to ANSI/TIA/EIA-603-C-2004, Aug. 17, 2004:

2. We are performed all frequency to 10th harmonics from 30 MHz. Measurements above show only up to 3 maximum emissions noted, or would be lesser if no specific emissions from the EUT are recorded (ie: margin > 20 dB from the applicable limit) and considered that's already beyond the background noise floor.

3. we have done x, y, z planes in EUT and horizontal and vertical polarization in detecting antenna.

4. Worst case is 1 resource block.

7.3.7 RADIATED SPURIOUS EMISSIONS (Band 4) 15 MHz

▣ OPERATING FREQUENCY : 1747.50 MHz

▣ MEASURED OUTPUT POWER: 25.84 dBm = 0.384 W

▣ MODULATION SIGNAL: 15 MHz 16-QAM

▣ DISTANCE: 3 meters

▣ LIMIT: 43 + 10 lo_{g10} (W) = 38.84 dBc

Ch	Freq (MHz)	Measured Level (dBm)	Ant. Gain (dBi)	Substitude Level (dBm)	C.L	Pol	EIRP (dBm)	dBc
20025 (1717.5)	3,435.00	-55.26	12.34	-57.44	3.55	H	-48.65	74.49
	5,152.50	-59.63	12.40	-56.17	3.24	H	-47.01	72.85
	6,870.00	-56.28	12.08	-47.24	3.90	H	-39.06	64.90
20175 (1732.5)	3,465.00	-55.07	12.27	-57.92	2.56	H	-48.21	74.05
	5,197.50	-53.81	12.63	-50.12	3.23	H	-40.72	66.56
	6,930.00	-58.33	11.87	-48.50	4.02	H	-40.65	66.49
20325 (1747.5)	3,495.00	-55.98	12.17	-58.17	2.58	H	-48.58	74.42
	5,242.50	-54.90	12.83	-50.13	3.29	H	-40.59	66.43
	6,990.00	-58.08	11.68	-47.76	4.03	H	-40.11	65.95

NOTES: 1. Radiated Spurious Emission Measurements at 3 meters by Substitution Method according to ANSI/TIA/EIA-603-C-2004, Aug. 17, 2004:

2. We are performed all frequency to 10th harmonics from 30 MHz. Measurements above show only up to 3 maximum emissions noted, or would be lesser if no specific emissions from the EUT are recorded (ie: margin > 20 dB from the applicable limit) and considered that's already beyond the background noise floor.

3. we have done x, y, z planes in EUT and horizontal and vertical polarization in detecting antenna.

4. Worst case is 1 resource block.

7.3.8 RADIATED SPURIOUS EMISSIONS (Band 4) 20 MHz

▣ OPERATING FREQUENCY : 1745.00 MHz

▣ MEASURED OUTPUT POWER: 25.97 dBm = 0.395 W

▣ MODULATION SIGNAL: 20 MHz QPSK

▣ DISTANCE: 3 meters

▣ LIMIT: 43 + 10 lo_{g10} (W) = 38.97 dBc

Ch	Freq (MHz)	Measured Level (dBm)	Ant. Gain (dBi)	Substitude Level (dBm)	C.L	Pol	EIRP (dBm)	dBc
20050 (1720.0)	3,440.0	-53.81	12.33	-56.97	2.56	H	-47.20	73.17
	5,160.0	-56.46	12.44	-52.92	3.20	H	-43.68	69.65
	6,880.0	-57.88	12.04	-48.66	3.91	H	-40.53	66.50
20175 (1732.5)	3,465.0	-54.62	12.27	-57.47	2.56	H	-47.76	73.73
	5,197.5	-54.45	12.63	-50.76	3.23	H	-41.36	67.33
	6,930.0	-57.03	11.87	-47.20	4.02	H	-39.35	65.32
20300 (1745.0)	3,490.0	-59.38	12.18	-62.09	2.57	H	-52.48	78.45
	5,235.0	-59.61	12.81	-54.84	3.27	H	-45.30	71.27
	6,980.0	-60.55	11.71	-50.54	4.05	H	-42.88	68.85

NOTES:

1. Radiated Spurious Emission Measurements at 3 meters by Substitution Method according to ANSI/TIA/EIA-603-C-2004, Aug. 17, 2004:
2. We are performed all frequency to 10th harmonics from 30 MHz. Measurements above show only up to 3 maximum emissions noted, or would be lesser if no specific emissions from the EUT are recorded (ie: margin > 20 dB from the applicable limit) and considered that's already beyond the background noise floor.
3. we have done x, y, z planes in EUT and horizontal and vertical polarization in detecting antenna.
4. Worst case is 1 resource block.

7.4 PEAK-TO-AVERAGE RATIO

Band	Band Width	Frequency (MHz)	Modulation	Resource Block Size	Resource Block Offset	Data (dB)
Band 4	1.4 MHz	1732.5	QPSK	6	0	4.49
			16-QAM	6	0	5.39
	3 MHz	1732.5	QPSK	15	0	4.79
			16-QAM	15	0	5.58
	5 MHz	1732.5	QPSK	25	0	4.80
			16-QAM	25	0	5.66
	10 MHz	1732.5	QPSK	50	0	4.76
			16-QAM	50	0	5.49
	15 MHz	1732.5	QPSK	75	0	4.66
			16-QAM	75	0	5.47
	20 MHz	1732.5	QPSK	100	0	4.66
			16-QAM	100	0	5.48

- Plots of the EUT's Peak- to- Average Ratio are shown Page 52 ~ 57.

7.5 OCCUPIED BANDWIDTH

Band	Band Width (MHz)	Frequency (MHz)	Modulation	Resource Block Size	Resource Block Offset	Data (MHz)
Band 17	5	710.0	QPSK	25	0	4.4940
			16-QAM	25	0	4.4973
	10	710.0	QPSK	50	0	8.9849
			16-QAM	50	0	8.9536

Band	Band Width (MHz)	Frequency (MHz)	Modulation	Resource Block Size	Resource Block Offset	Data (MHz)
Band 4	1.4	1732.5	QPSK	6	0	1.0916
			16-QAM	6	0	1.0901
	3	1732.5	QPSK	15	0	2.7071
			16-QAM	15	0	2.7066
	5	1732.5	QPSK	25	0	4.5005
			16-QAM	25	0	4.4958
	10	1732.5	QPSK	50	0	8.9917
			16-QAM	50	0	8.9698
	15	1732.5	QPSK	75	0	13.5020
			16-QAM	75	0	13.4850
	20	1732.5	QPSK	100	0	17.9830
			16-QAM	100	0	17.9730

- Plots of the EUT's Occupied Bandwidth are shown Page 44 ~ 51.

7.6 CONDUCTED SPURIOUS EMISSIONS

Band	Band Width (MHz)	Frequency (MHz)	Modulation	Resource Block Size	Resource Block Offset	Frequency of Maximum Harmonic (GHz)	Maximum Data [dBm]
Band 17	5	706.5	QPSK	1	0	6.832250	-26.37
		710.0		1	0	6.385250	-26.15
		713.5		1	0	6.984750	-26.76
	10	709.0		1	0	6.980250	-26.14
		710.0		1	0	8.852250	-26.75
		711.0		1	0	6.378250	-25.50

Band	Band Width (MHz)	Frequency (MHz)	Modulation	Resource Block Size	Resource Block Offset	Frequency of Maximum Harmonic (GHz)	Maximum Data [dBm]
Band 4	1.4	1710.7	QPSK	1	0	6.900010	-26.87
		1732.5		1	0	6.994720	-25.79
		1754.3		1	0	6.978410	-25.79
	3	1711.5		1	0	6.949410	-25.93
		1732.5		1	0	6.388820	-26.81
		1753.5		1	0	6.870550	-25.86
	5	1712.5		1	0	6.563300	-26.20
		1732.5		1	0	6.963910	-26.41
		1752.5		1	0	6.997900	-26.05
	10	1715.0		1	0	6.973430	-24.55
		1732.5		1	0	6.667070	-26.41
		1750.0		1	0	6.712850	-25.65
	15	1717.5		1	0	6.952130	-25.73
		1732.5		1	0	6.894570	-26.16
		1747.5		1	0	6.989290	-26.05
	20	1720.0		1	0	6.993370	-26.36
		1732.5		1	0	6.995180	-26.20
		1745.0		1	0	6.978410	-26.01

- Plots of the EUT's Conducted Spurious Emissions are shown Page 82~ 105.

7.6.1 BAND EDGE

- Plots of the EUT's Band Edge are shown Page 58 ~ 81

7.7 FREQUENCY STABILITY / VARIATION OF AMBIENT TEMPERATURE

7.7.1 FREQUENCY STABILITY (LTE Band 17) 5 MHz

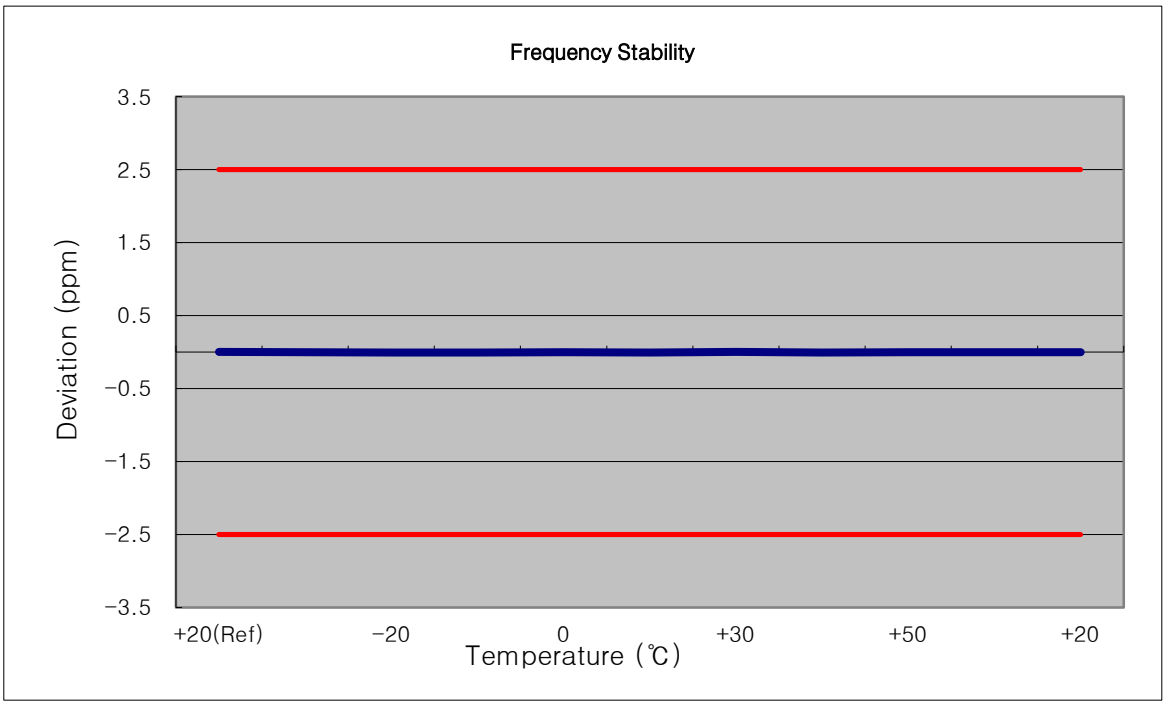
▣ OPERATING FREQUENCY: 710,000,000 Hz

▣ CHANNEL: 23790 (5 MHz)

▣ REFERENCE VOLTAGE: 3.8 VDC

▣ DEVIATION LIM IT: -

Voltage (%)	Power (VDC)	Temp. (℃)	Frequency (Hz)	Frequency Error (Hz)	Deviation (%)	ppm
100%	3.80	+20(Ref)	710 000 003	0	0.000 000	0.000
100%		-30	709 999 999	-3.40	0.000 000	-0.005
100%		-20	709 999 999	-4.20	-0.000 001	-0.006
100%		-10	709 999 999	-3.80	-0.000 001	-0.005
100%		0	710 000 000	-2.80	0.000 000	-0.004
100%		+10	709 999 999	-3.80	-0.000 001	-0.005
100%		+30	710 000 005	2.20	0.000 000	0.003
100%		+40	709 999 999	-3.80	-0.000 001	-0.005
100%		+50	710 000 000	-2.90	0.000 000	-0.004
115%	4.37	+20	710 000 000	-3.20	0.000 000	-0.005
85%	3.23	+20	710 000 000	-2.30	0.000 000	-0.003



7.7.2 FREQUENCY STABILITY (LTE Band 17) 10 MHz

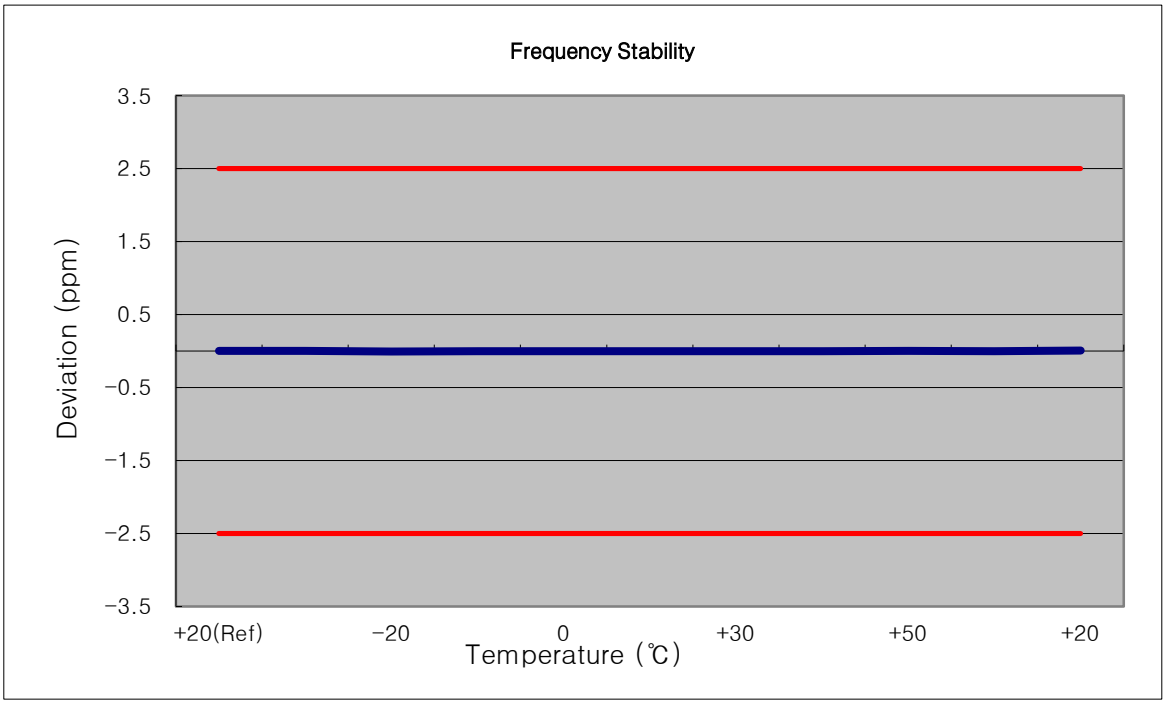
▣ OPERATING FREQUENCY: 710,000,000 Hz

▣ CHANNEL: 23790 (10 MHz)

▣ REFERENCE VOLTAGE: 3.8 VDC

▣ DEVIATION LIM IT: -

Voltage (%)	Power (VDC)	Temp. (℃)	Frequency (Hz)	Frequency Error (Hz)	Deviation (%)	ppm
100%	3.80	+20(Ref)	709 999 998	0	0.000 000	0.000
100%		-30	710 000 000	2.40	0.000 000	0.003
100%		-20	709 999 994	-4.10	-0.000 001	-0.006
100%		-10	709 999 995	-2.80	0.000 000	-0.004
100%		0	709 999 996	-2.50	0.000 000	-0.004
100%		+10	709 999 995	-3.00	0.000 000	-0.004
100%		+30	709 999 996	-2.00	0.000 000	-0.003
100%		+40	709 999 995	-2.90	0.000 000	-0.004
100%		+50	710 000 000	2.00	0.000 000	0.003
115%	4.37	+20	709 999 996	-2.30	0.000 000	-0.003
85%	3.23	+20	710 000 001	3.00	0.000 000	0.004



7.7.3 FREQUENCY STABILITY (LTE Band 4) 1.4 MHz

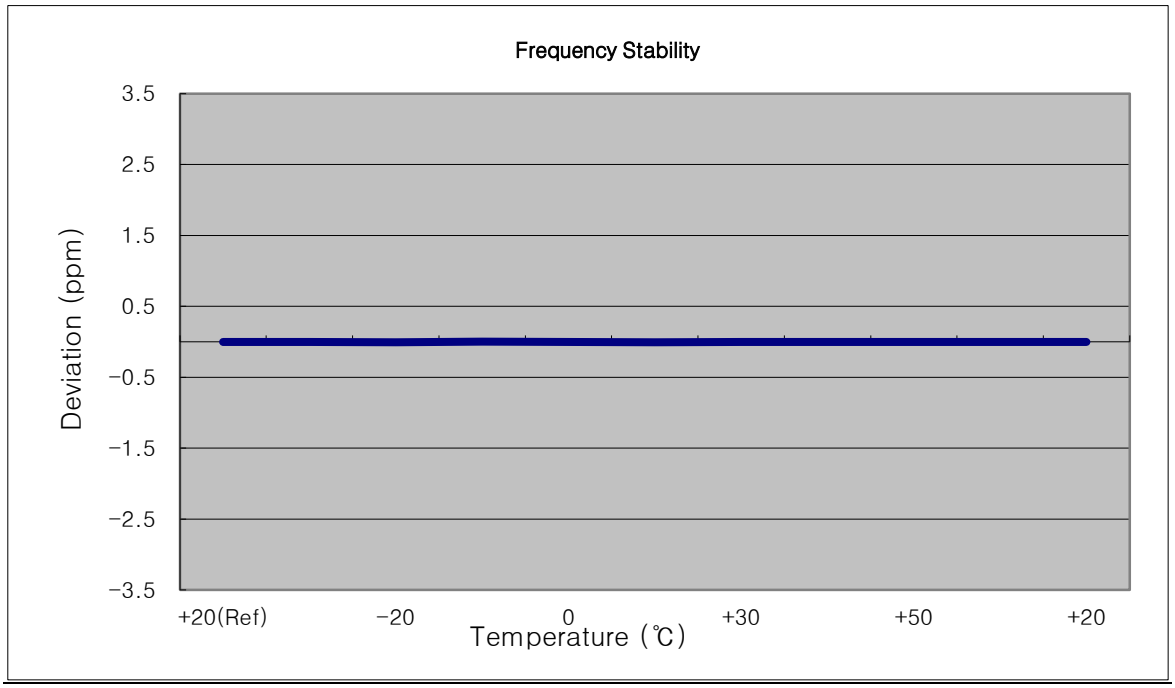
▣ OPERATING FREQUENCY: 1732,500,000 Hz

▣ CHANNEL: 20175 (1.4 MHz)

▣ REFERENCE VOLTAGE: 3.8 VDC

▣ DEVIATION LIM IT: -

Voltage (%)	Power (VDC)	Temp. (℃)	Frequency (Hz)	Frequency Error (Hz)	Deviation (%)	ppm
100%	3.80	+20(Ref)	1732 500 005	0	0.000 000	0.000
100%		-30	1732 500 001	-4.20	0.000 000	-0.002
100%		-20	1732 499 996	-9.10	-0.000 001	-0.005
100%		-10	1732 500 010	5.30	0.000 000	0.003
100%		0	1732 500 000	-5.40	0.000 000	-0.003
100%		+10	1732 499 996	-8.60	0.000 000	-0.005
100%		+30	1732 499 999	-5.50	0.000 000	-0.003
100%		+40	1732 499 997	-7.70	0.000 000	-0.004
100%		+50	1732 500 000	-4.70	0.000 000	-0.003
115%	4.37	+20	1732 500 000	-5.00	0.000 000	-0.003
85%	3.23	+20	1732 499 999	-5.70	0.000 000	-0.003



7.7.4 FREQUENCY STABILITY (LTE Band 4) 3 MHz

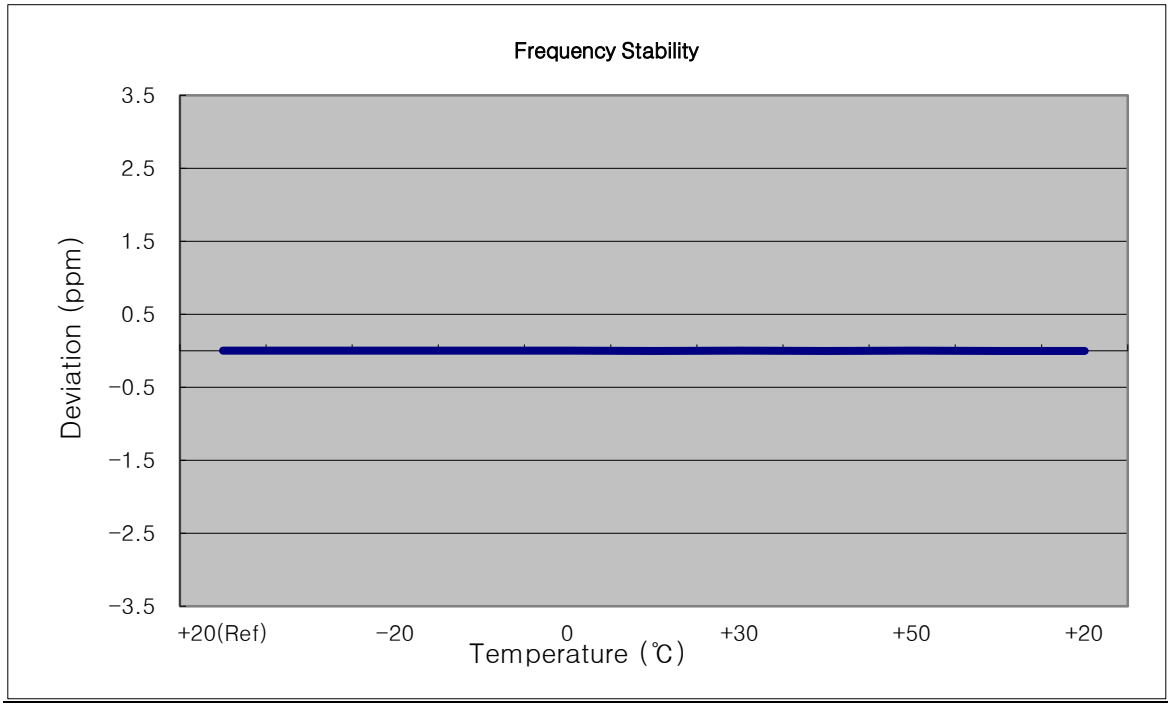
▣ OPERATING FREQUENCY: 1732,500,000 Hz

▣ CHANNEL: 20175 (3 MHz)

▣ REFERENCE VOLTAGE: 3.8 VDC

▣ DEVIATION LIM IT: -

Voltage (%)	Power (VDC)	Temp. (℃)	Frequency (Hz)	Frequency Error (Hz)	Deviation (%)	ppm
100%	3.80	+20(Ref)	1732 499 995	0	0.000 000	0.000
100%		-30	1732 500 000	5.40	0.000 000	0.003
100%		-20	1732 500 000	4.60	0.000 000	0.003
100%		-10	1732 499 998	3.30	0.000 000	0.002
100%		0	1732 500 001	6.00	0.000 000	0.003
100%		+10	1732 499 989	-5.60	0.000 000	-0.003
100%		+30	1732 500 000	5.10	0.000 000	0.003
100%		+40	1732 499 989	-6.00	0.000 000	-0.003
100%		+50	1732 499 999	3.80	0.000 000	0.002
115%	4.37	+20	1732 499 989	-6.10	0.000 000	-0.004
85%	3.23	+20	1732 499 989	-5.60	0.000 000	-0.003



7.7.5 FREQUENCY STABILITY (LTE Band 4) 5 MHz

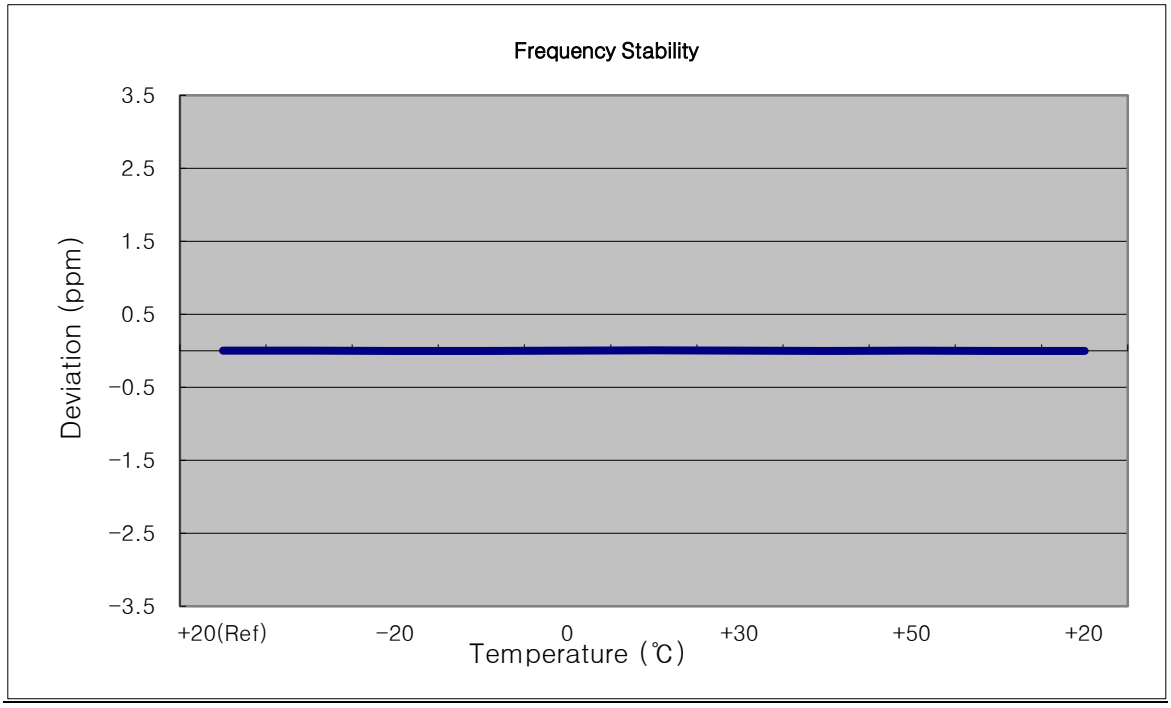
▣ OPERATING FREQUENCY: 1732,500,000 Hz

▣ CHANNEL: 20175 (5 MHz)

▣ REFERENCE VOLTAGE: 3.8 VDC

▣ DEVIATION LIM IT: -

Voltage (%)	Power (VDC)	Temp. (℃)	Frequency (Hz)	Frequency Error (Hz)	Deviation (%)	ppm
100%	3.80	+20(Ref)	1732 499 996	0	0.000 000	0.000
100%		-30	1732 500 000	4.00	0.000 000	0.002
100%		-20	1732 499 993	-3.80	0.000 000	-0.002
100%		-10	1732 499 994	-2.50	0.000 000	-0.001
100%		0	1732 500 001	4.20	0.000 000	0.002
100%		+10	1732 500 004	7.60	0.000 000	0.004
100%		+30	1732 500 000	3.60	0.000 000	0.002
100%		+40	1732 499 992	-4.40	0.000 000	-0.003
100%		+50	1732 500 002	5.30	0.000 000	0.003
115%	4.37	+20	1732 499 992	-4.40	0.000 000	-0.003
85%	3.23	+20	1732 499 991	-5.30	0.000 000	-0.003



7.7.6 FREQUENCY STABILITY (LTE Band 4) 10 MHz

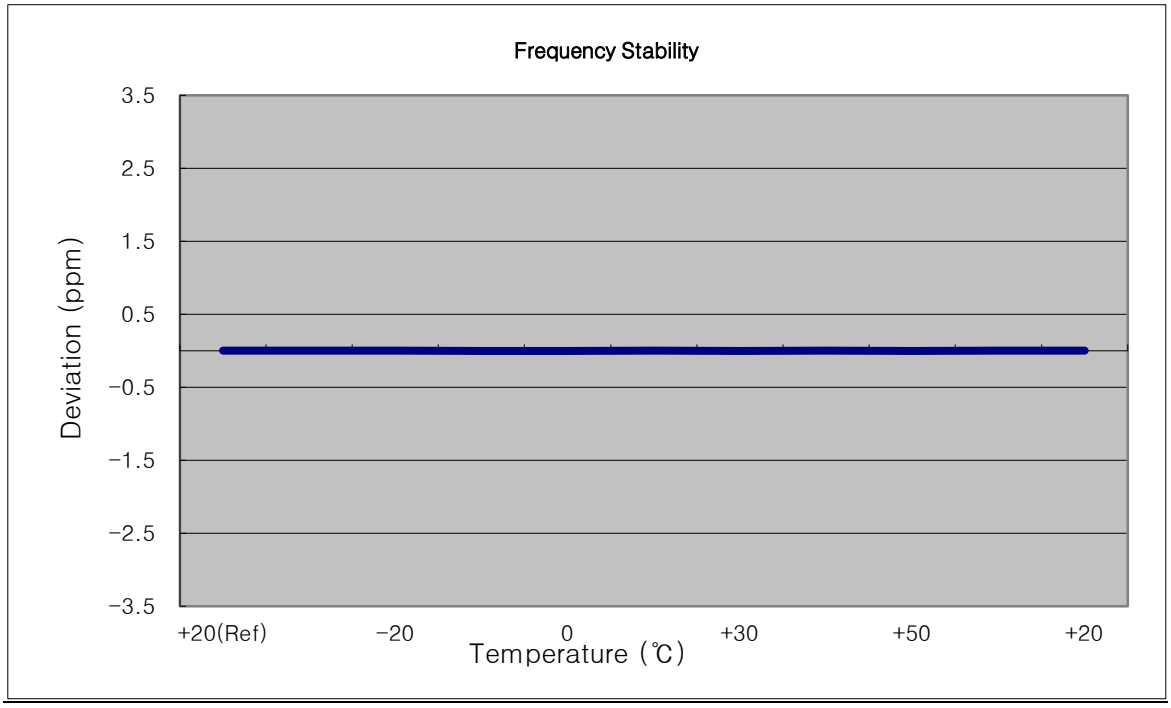
▣ OPERATING FREQUENCY: 1732,500,000 Hz

▣ CHANNEL: 20175 (10 MHz)

▣ REFERENCE VOLTAGE: 3.8 VDC

▣ DEVIATION LIM IT: -

Voltage (%)	Power (VDC)	Temp. (℃)	Frequency (Hz)	Frequency Error (Hz)	Deviation (%)	ppm
100%	3.80	+20(Ref)	1732 499 997	0	0.000 000	0.000
100%		-30	1732 500 000	3.00	0.000 000	0.002
100%		-20	1732 500 000	3.60	0.000 000	0.002
100%		-10	1732 499 992	-4.20	0.000 000	-0.002
100%		0	1732 499 992	-5.10	0.000 000	-0.003
100%		+10	1732 500 002	5.60	0.000 000	0.003
100%		+30	1732 499 993	-3.20	0.000 000	-0.002
100%		+40	1732 500 000	3.40	0.000 000	0.002
100%		+50	1732 499 992	-4.50	0.000 000	-0.003
115%	4.37	+20	1732 500 000	3.80	0.000 000	0.002
85%	3.23	+20	1732 500 001	4.20	0.000 000	0.002



7.7.7 FREQUENCY STABILITY (LTE Band 4) 15 MHz

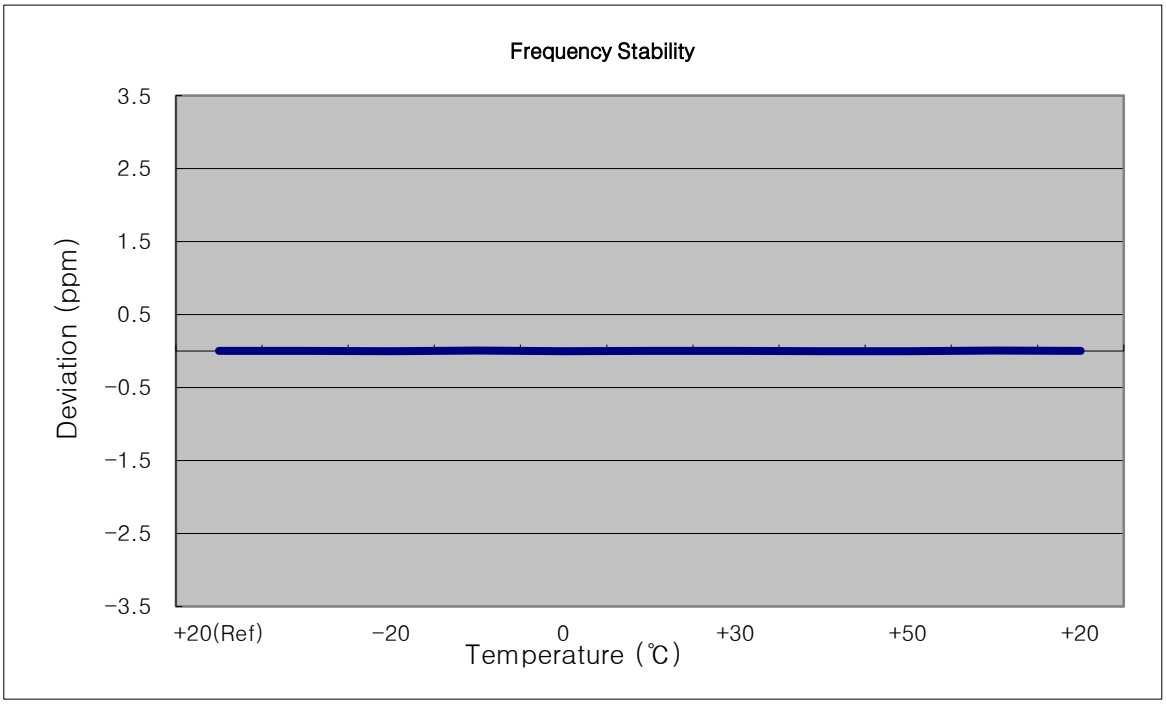
▣ OPERATING FREQUENCY: 1732,500,000 Hz

▣ CHANNEL: 20175 (15 MHz)

▣ REFERENCE VOLTAGE: 3.8 VDC

▣ DEVIATION LIM IT: -

Voltage (%)	Power (VDC)	Temp. (℃)	Frequency (Hz)	Frequency Error (Hz)	Deviation (%)	ppm
100%	3.80	+20(Ref)	1732 499 994	0	0.000 000	0.000
100%		-30	1732 499 998	3.40	0.000 000	0.002
100%		-20	1732 499 990	-4.10	0.000 000	-0.002
100%		-10	1732 500 002	8.20	0.000 000	0.005
100%		0	1732 499 989	-4.70	0.000 000	-0.003
100%		+10	1732 499 998	4.30	0.000 000	0.002
100%		+30	1732 499 999	4.70	0.000 000	0.003
100%		+40	1732 499 987	-7.40	0.000 000	-0.004
100%		+50	1732 499 989	-5.10	0.000 000	-0.003
115%	4.37	+20	1732 500 002	7.80	0.000 000	0.005
85%	3.23	+20	1732 499 999	4.60	0.000 000	0.003



7.7.8 FREQUENCY STABILITY (LTE Band 4) 20 MHz

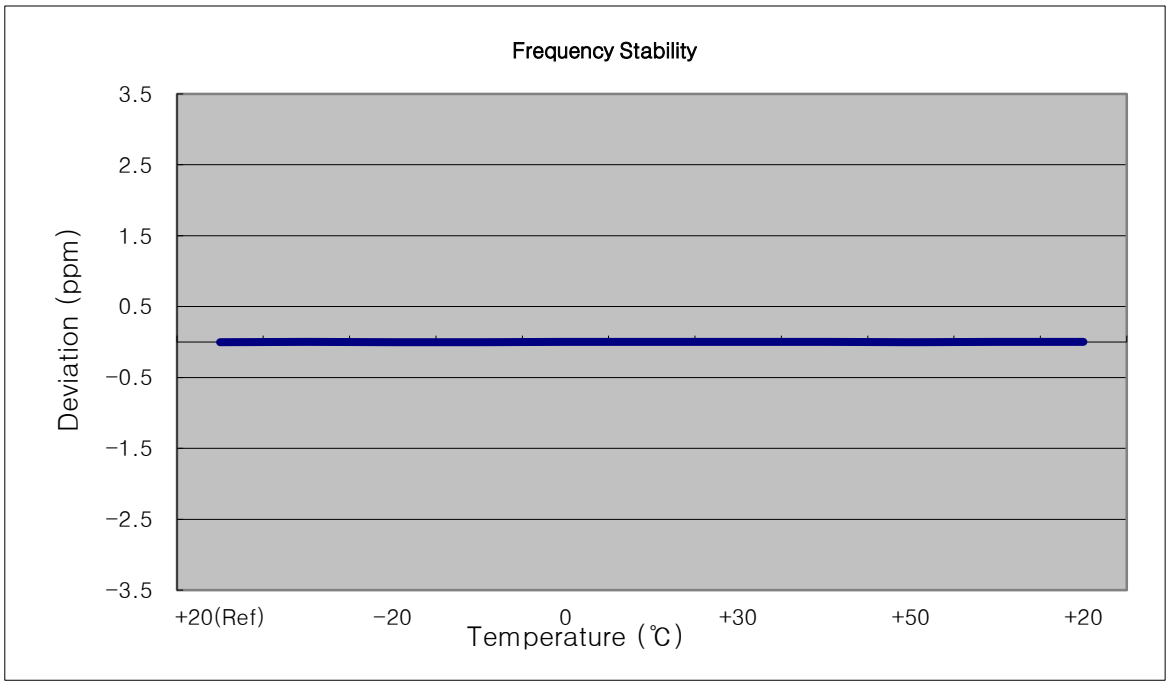
▣ OPERATING FREQUENCY: 1732,500,000 Hz

▣ CHANNEL: 20175 (20 MHz)

▣ REFERENCE VOLTAGE: 3.8 VDC

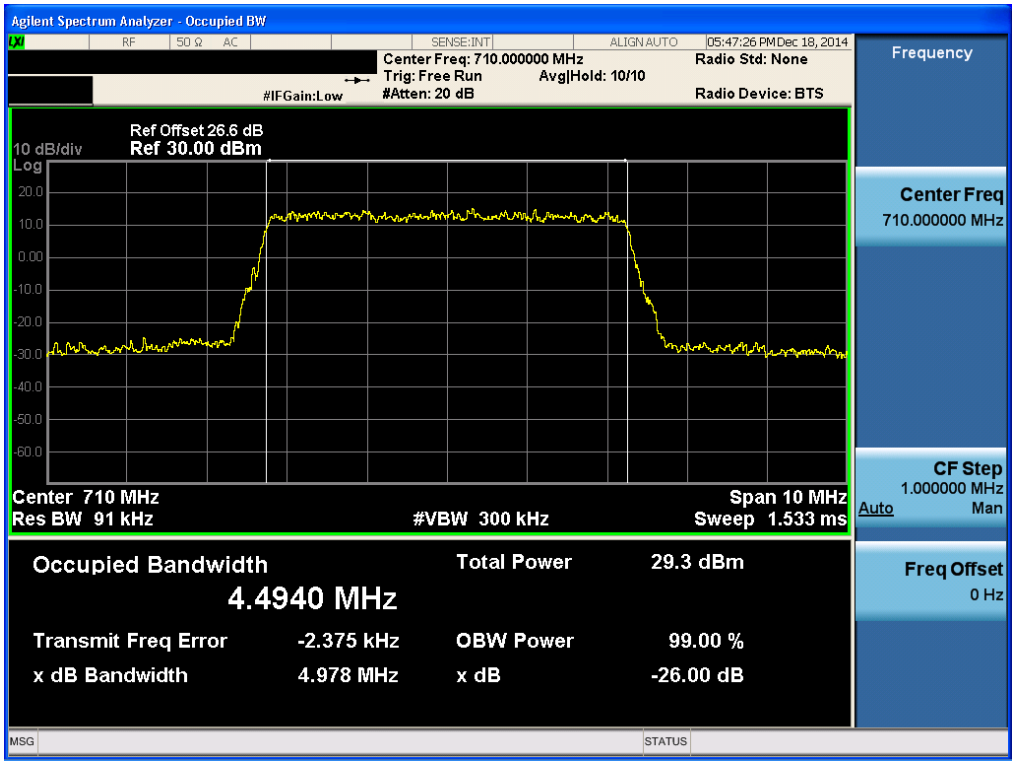
▣ DEVIATION LIM IT: -

Voltage (%)	Power (VDC)	Temp. (℃)	Frequency (Hz)	Frequency Error (Hz)	Deviation (%)	ppm
100%	3.80	+20(Ref)	1732 499 994	0	0.000 000	0.000
100%		-30	1732 499 997	3.30	0.000 000	0.002
100%		-20	1732 499 990	-4.10	0.000 000	-0.002
100%		-10	1732 499 990	-4.30	0.000 000	-0.002
100%		0	1732 499 999	4.60	0.000 000	0.003
100%		+10	1732 499 997	3.30	0.000 000	0.002
100%		+30	1732 499 998	4.20	0.000 000	0.002
100%		+40	1732 499 999	4.70	0.000 000	0.003
100%		+50	1732 499 990	-4.20	0.000 000	-0.002
115%	4.37	+20	1732 499 999	5.30	0.000 000	0.003
85%	3.23	+20	1732 499 999	5.00	0.000 000	0.003

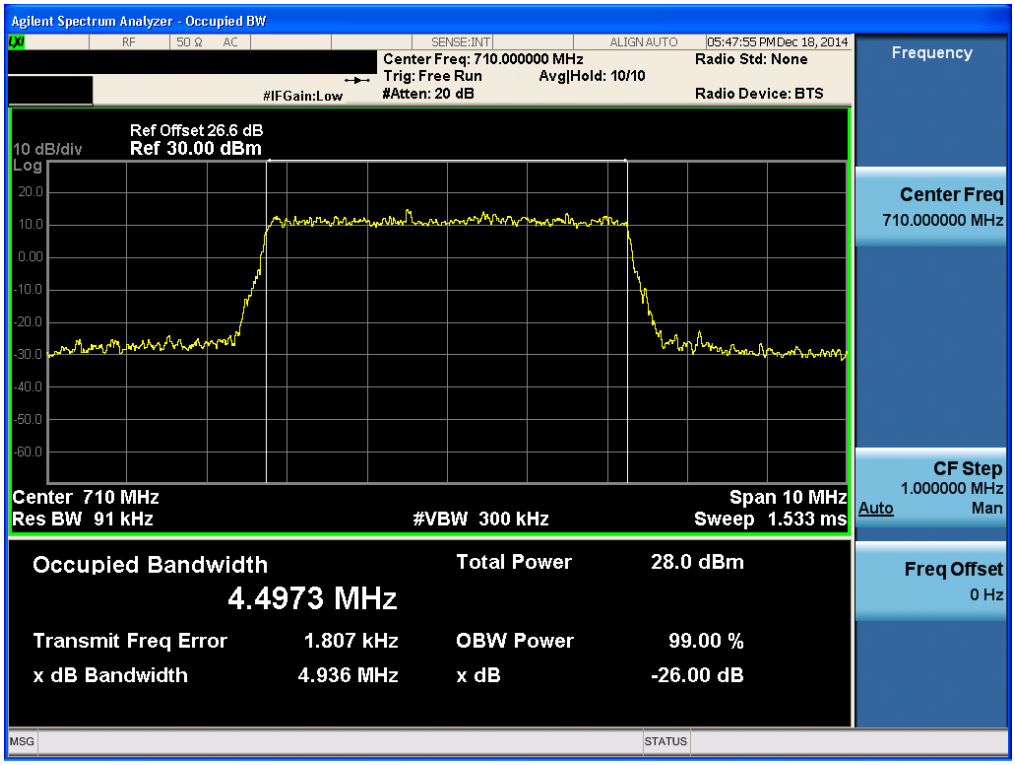


8. TEST PLOTS

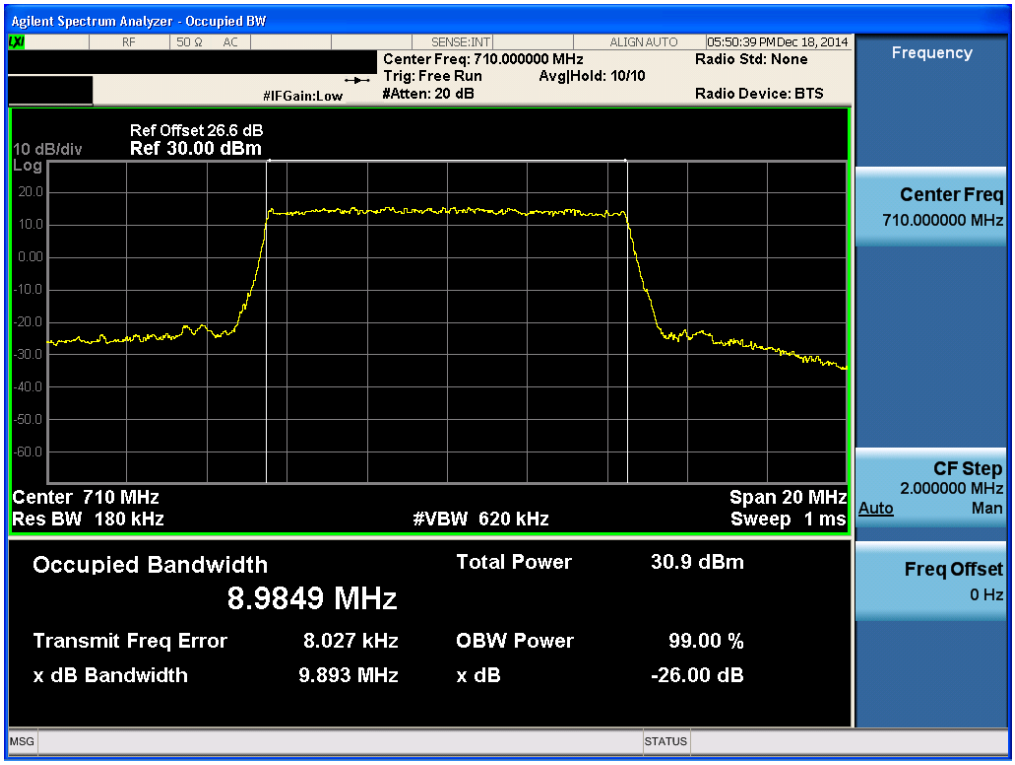
BAND 17. Occupied Bandwidth Plot (5M BW Ch.23790 QPSK RB 25)



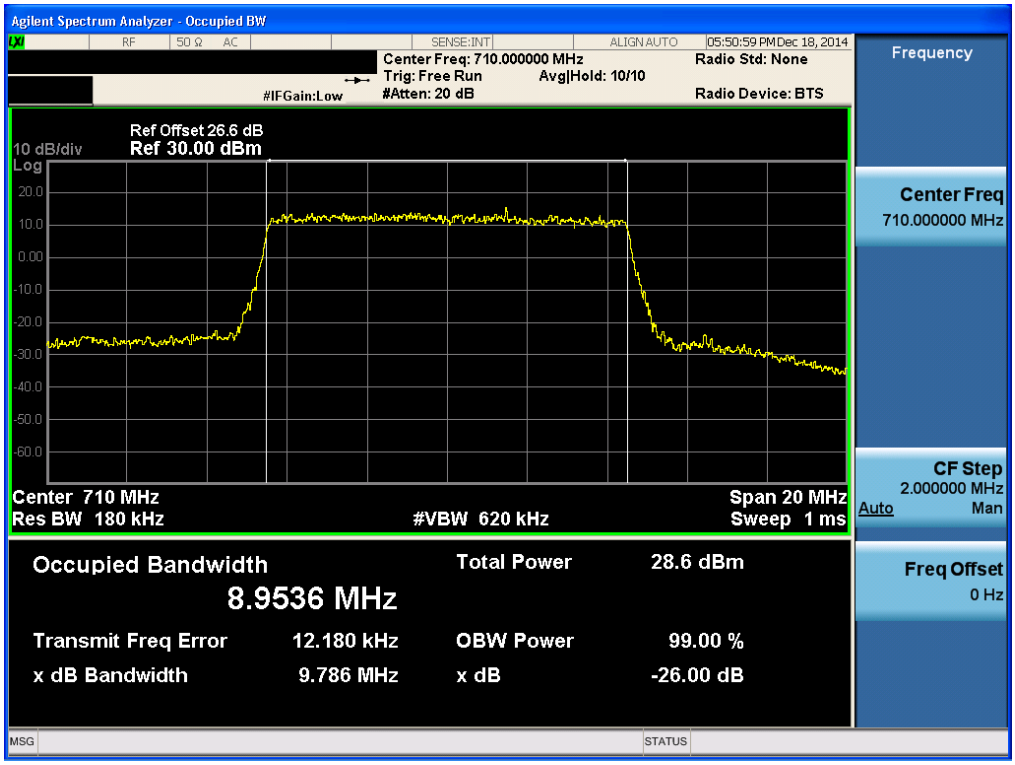
BAND 17. Occupied Bandwidth Plot (5M BW Ch.23790 16QAM RB 25)



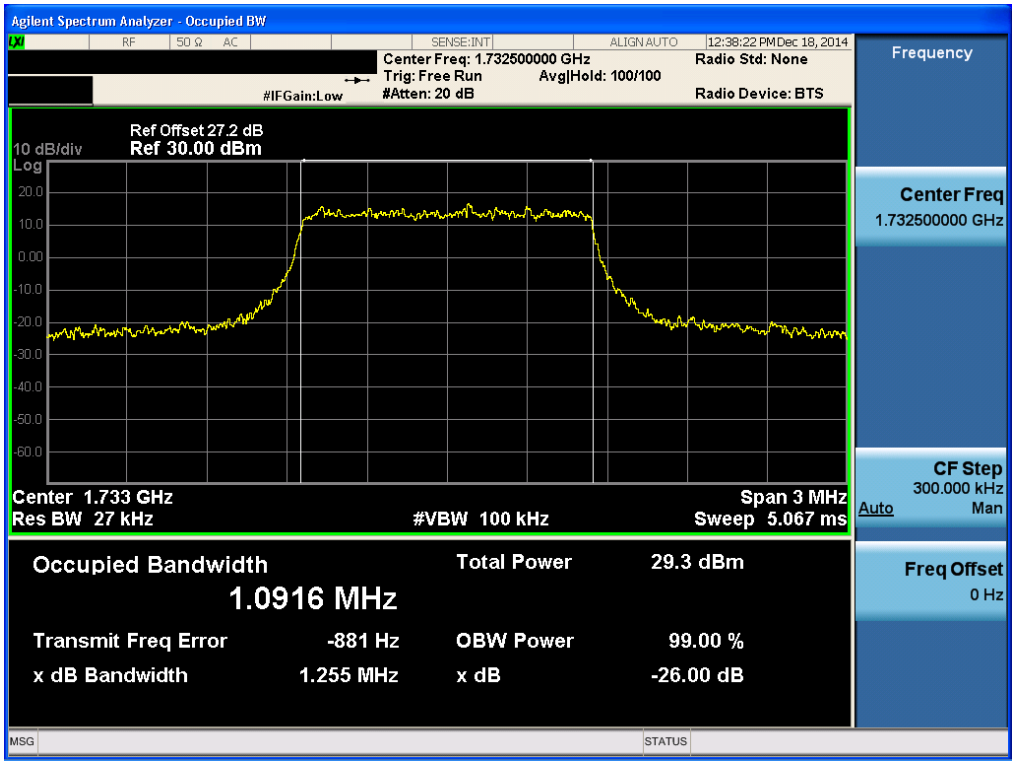
BAND 17. Occupied Bandwidth Plot (10M BW Ch.23790 QPSK RB 50)



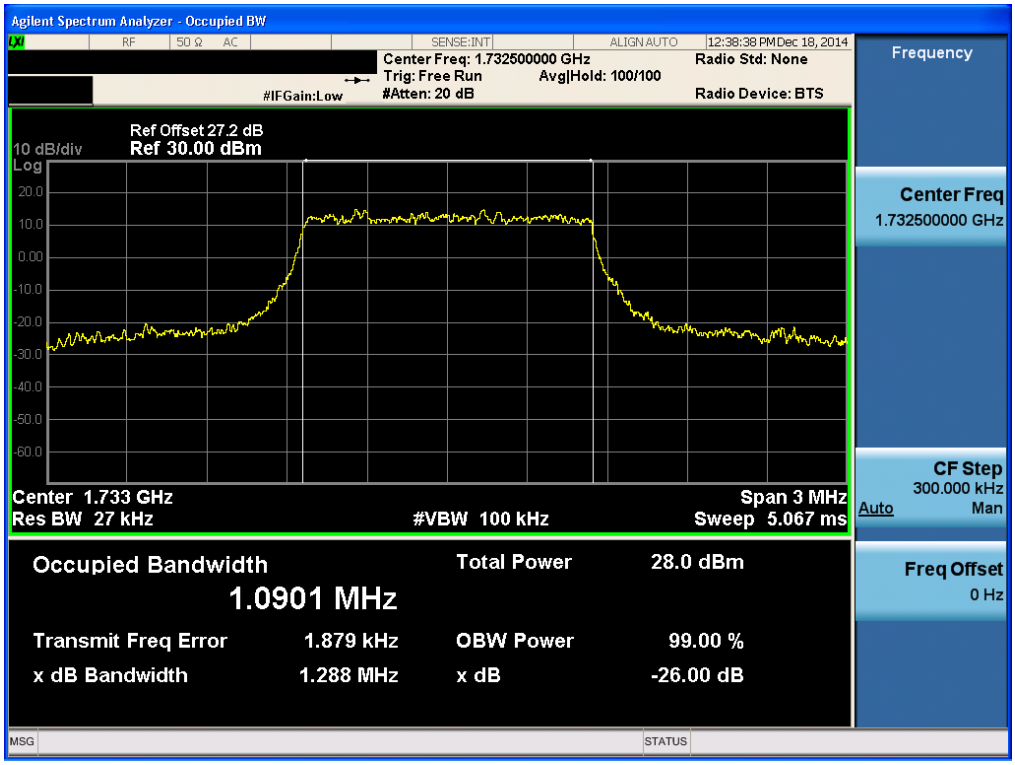
BAND 17. Occupied Bandwidth Plot (10M BW Ch.23790 16QAMRB 50)



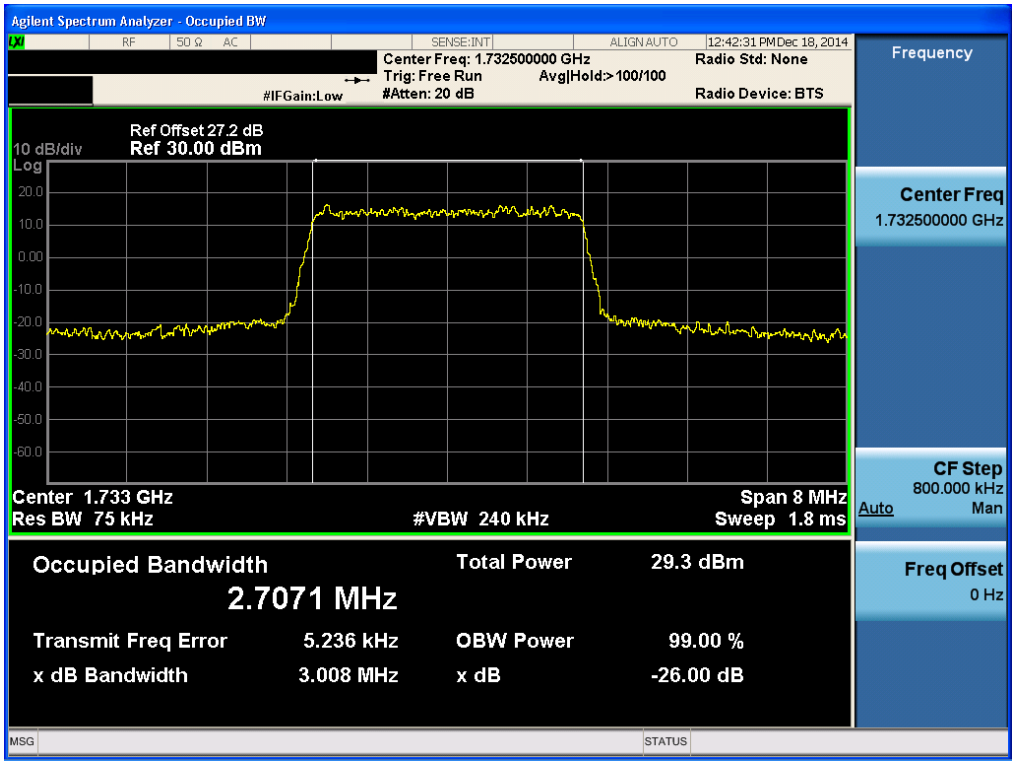
BAND 4. Occupied Bandwidth Plot (1.4M BW Ch.20175 QPSK RB 6)



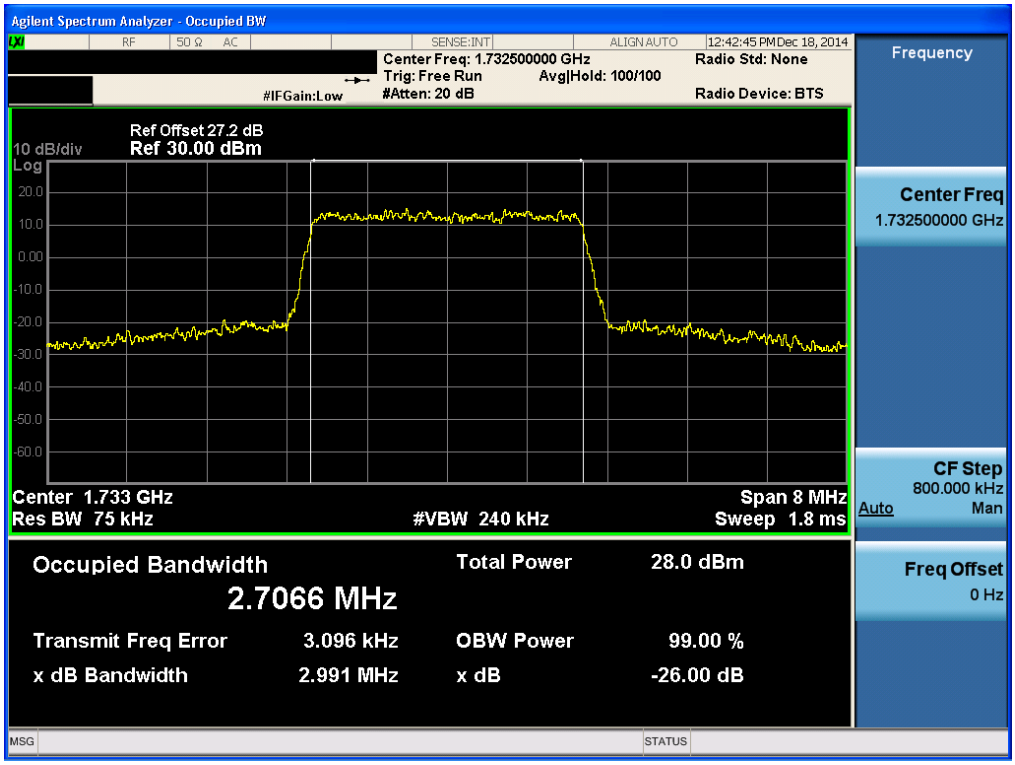
BAND 4. Occupied Bandwidth Plot (1.4M BW Ch.20175 16QAM RB 6)



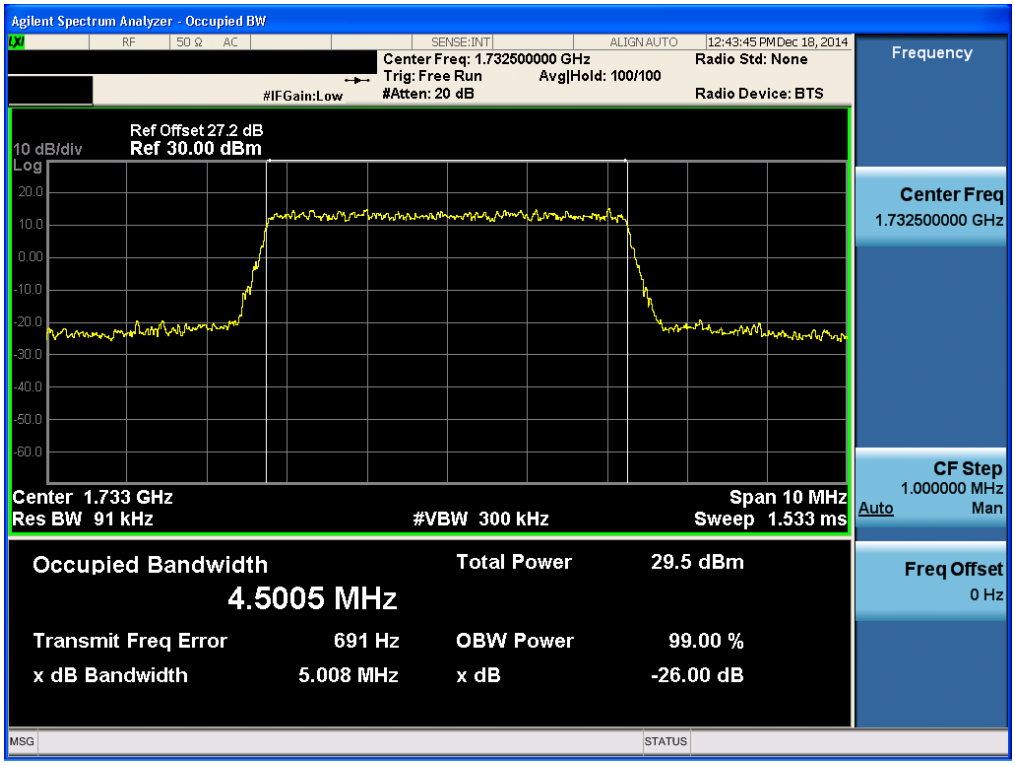
BAND 4. Occupied Bandwidth Plot (3M BW Ch.20175 QPSK RB 15)



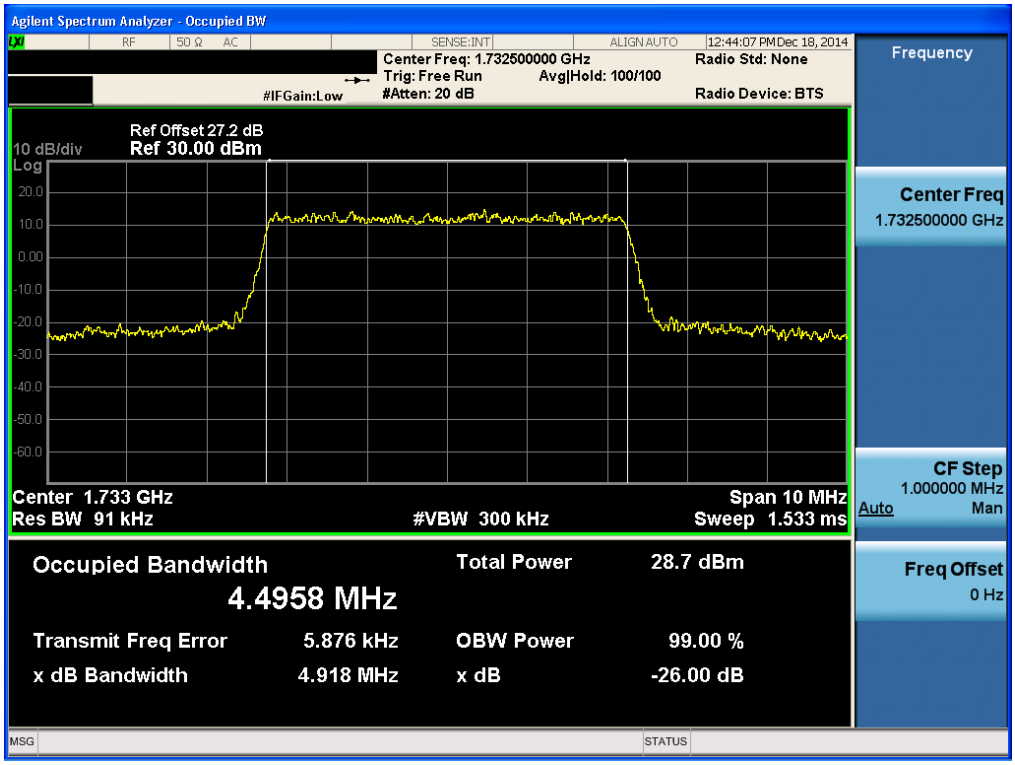
BAND 4. Occupied Bandwidth Plot (3M BW Ch.20175 16QAM RB 15)



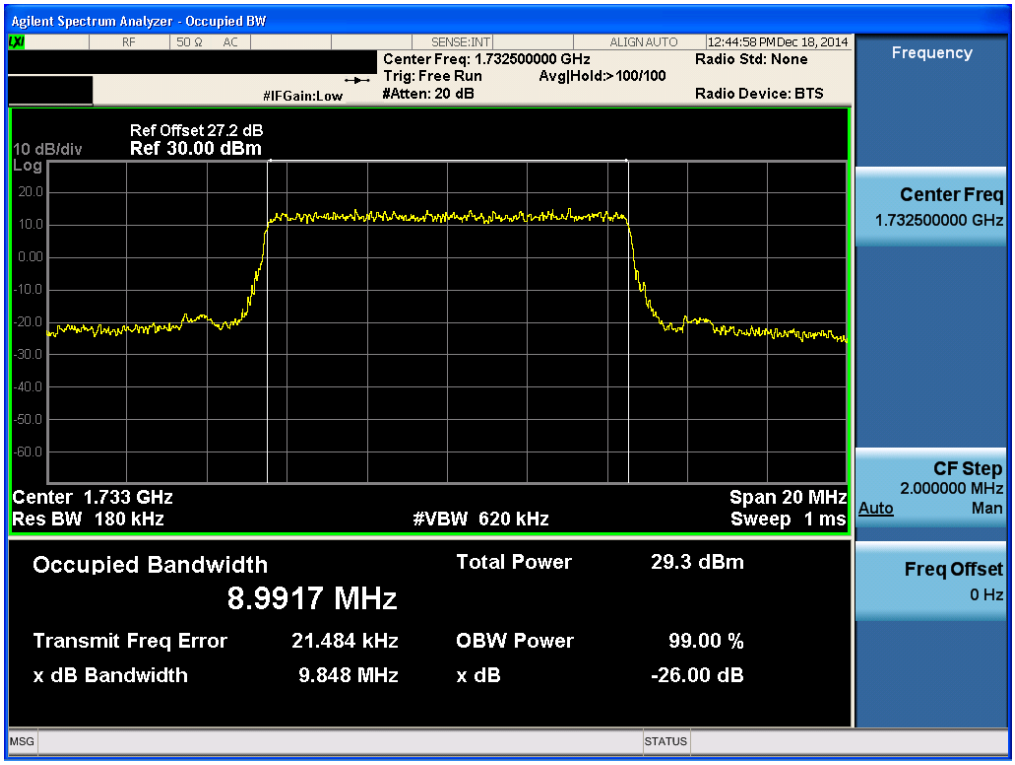
BAND 4. Occupied Bandwidth Plot (5M BW Ch.20175 QPSK RB 25)



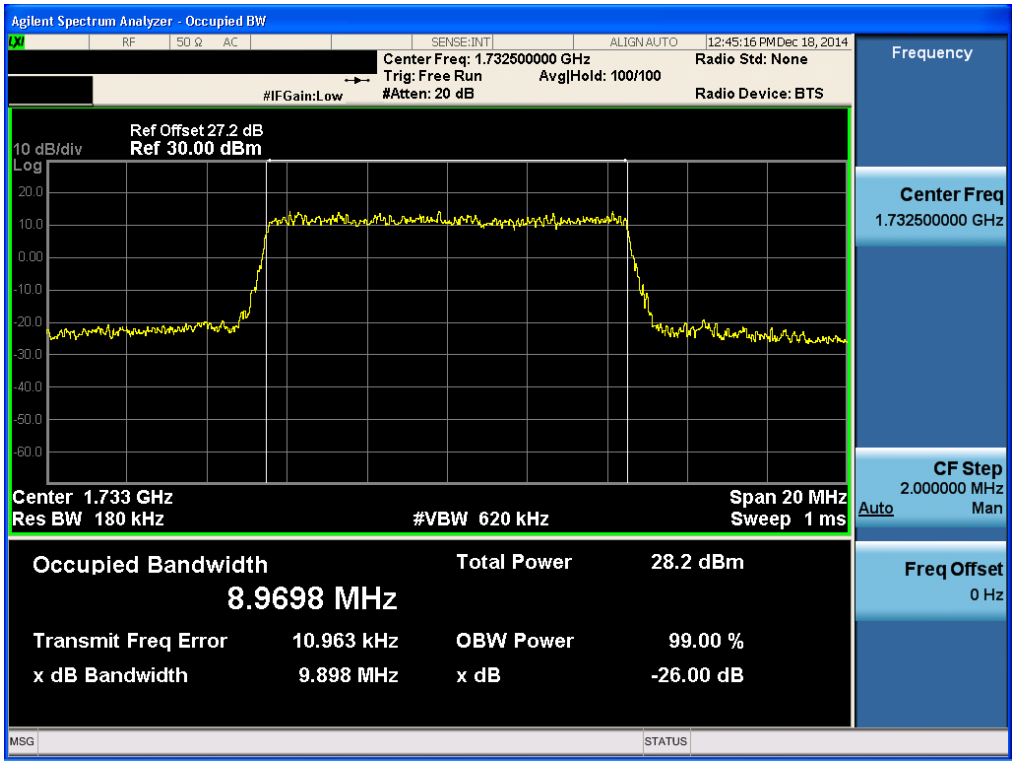
BAND 4. Occupied Bandwidth Plot (5M BW Ch.20175 16QAM RB 25)



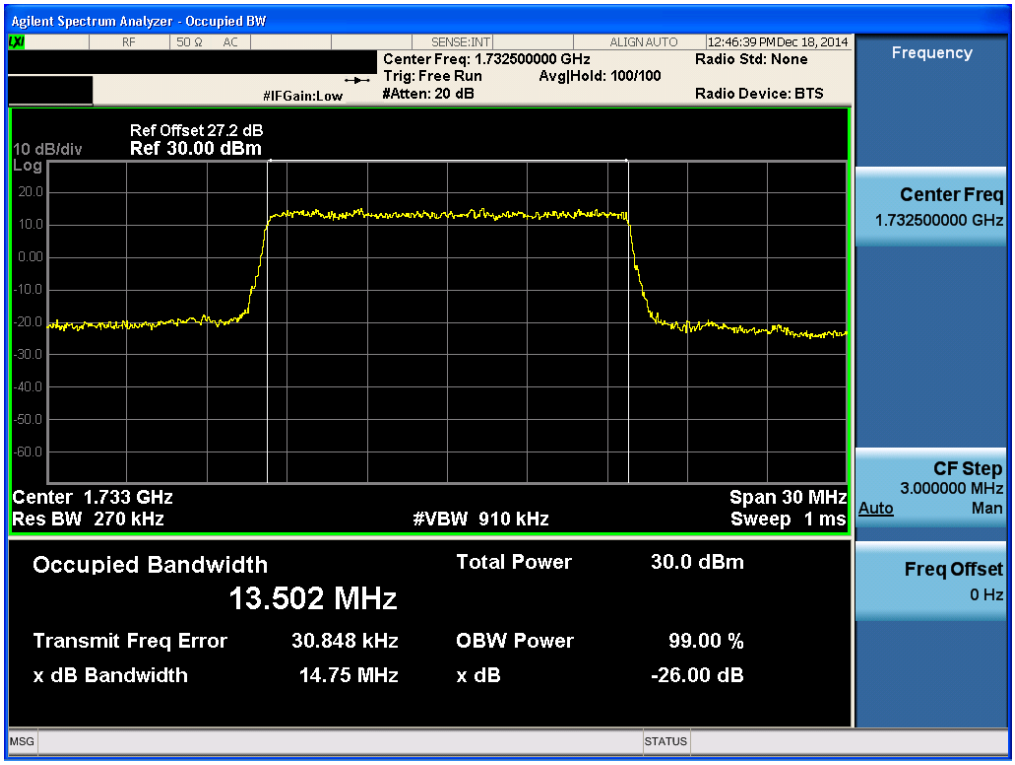
BAND 4. Occupied Bandwidth Plot (10M BW Ch.20175 QPSK RB 50)



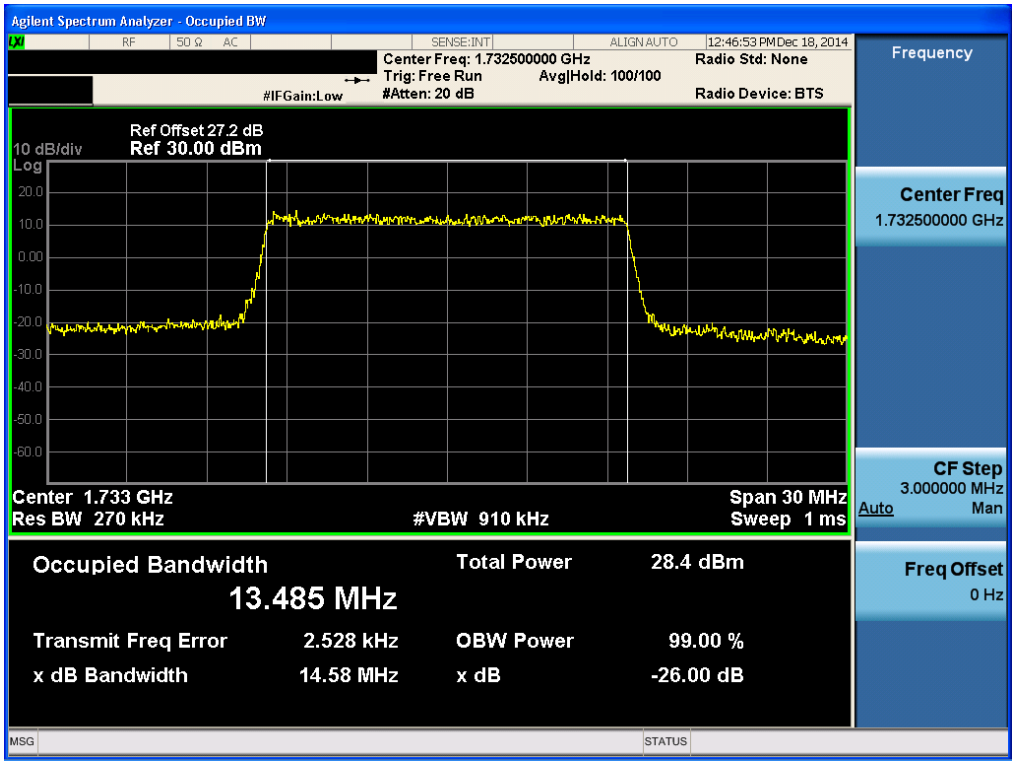
BAND 4. Occupied Bandwidth Plot (10M BW Ch.20175 16QAM RB 50)



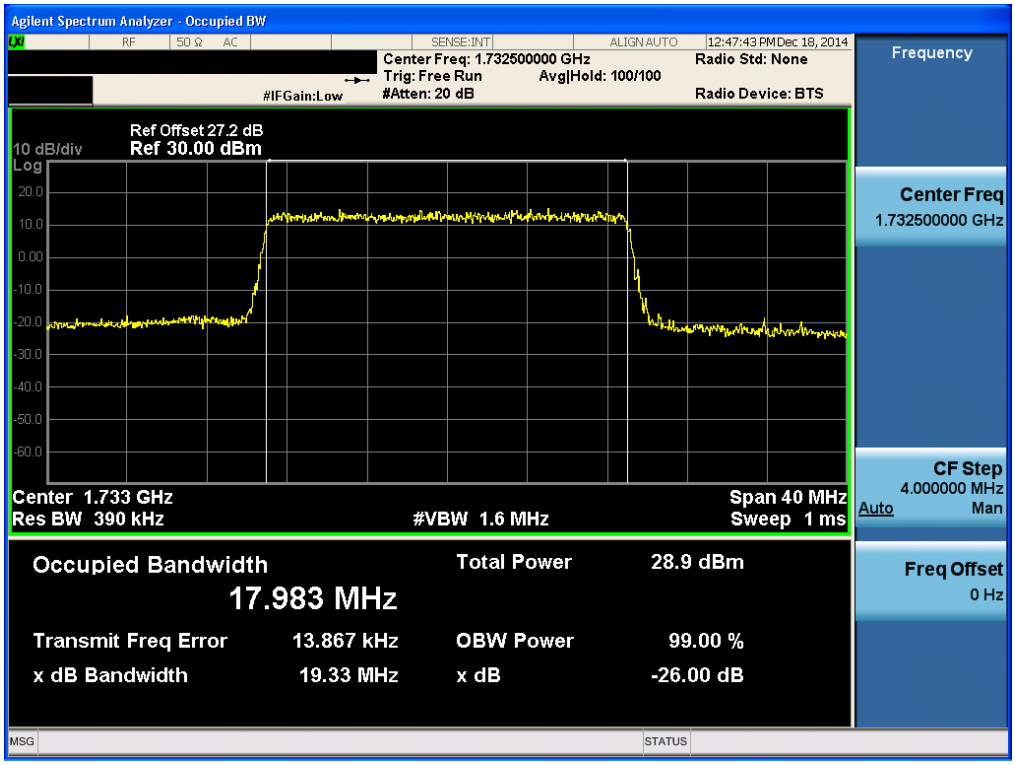
BAND 4. Occupied Bandwidth Plot (15M BW Ch.20175 QPSK RB 75)



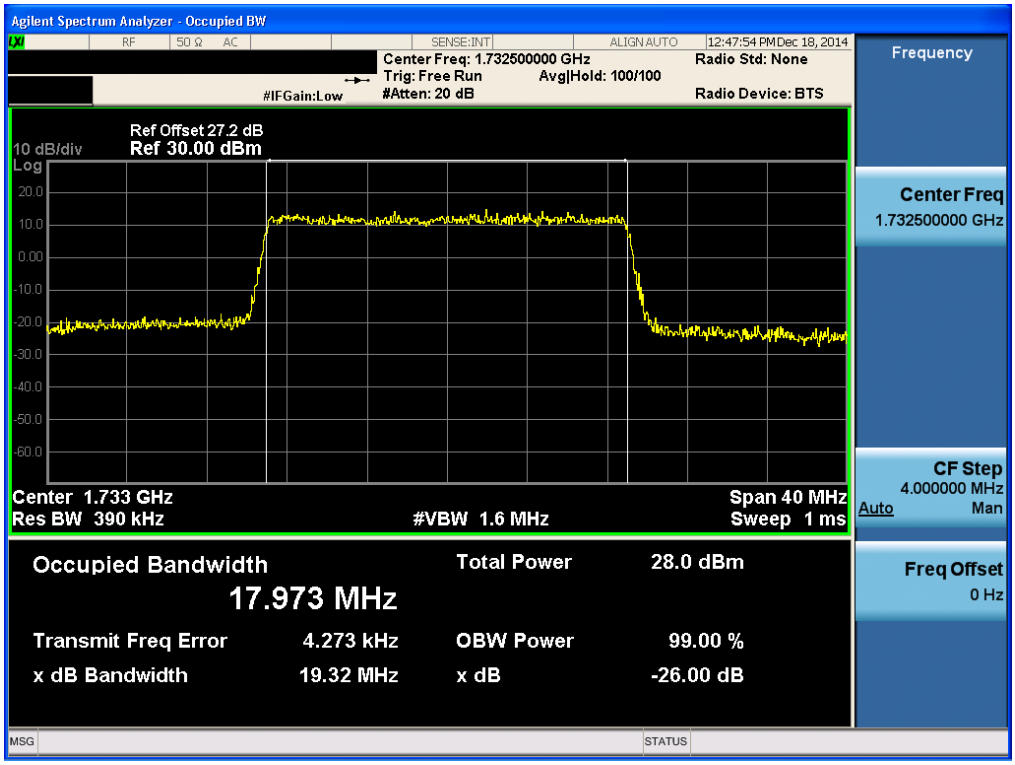
BAND 4. Occupied Bandwidth Plot (15M BW Ch.20175 16QAM RB 75)



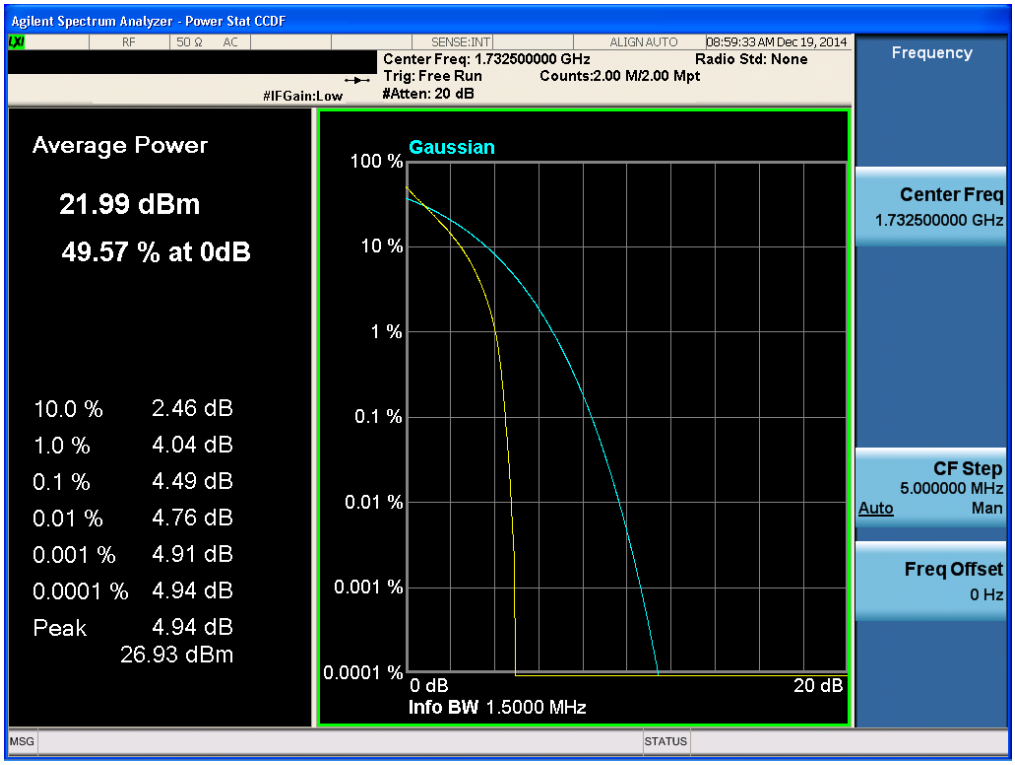
BAND 4. Occupied Bandwidth Plot (20M BW Ch.20175 QPSK RB 100)



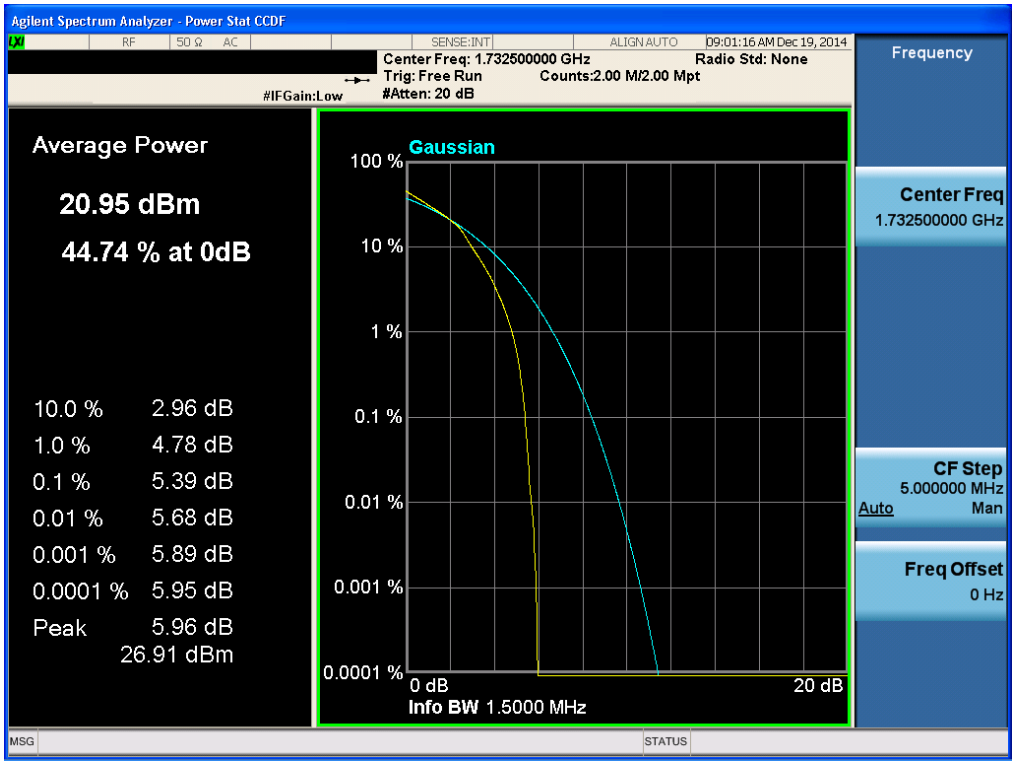
BAND 4. Occupied Bandwidth Plot (20M BW Ch.20175 16QAM RB 100)



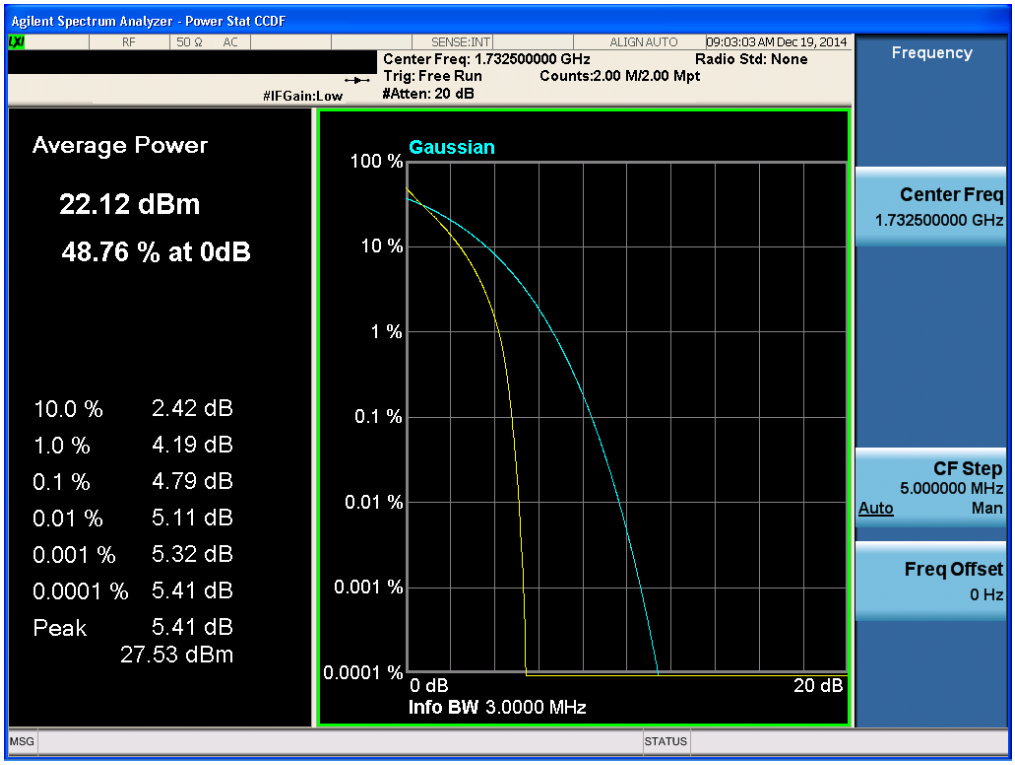
BAND 4. PAR Plot (1.4M BW_Ch.20175_QPSK_RB6_0)



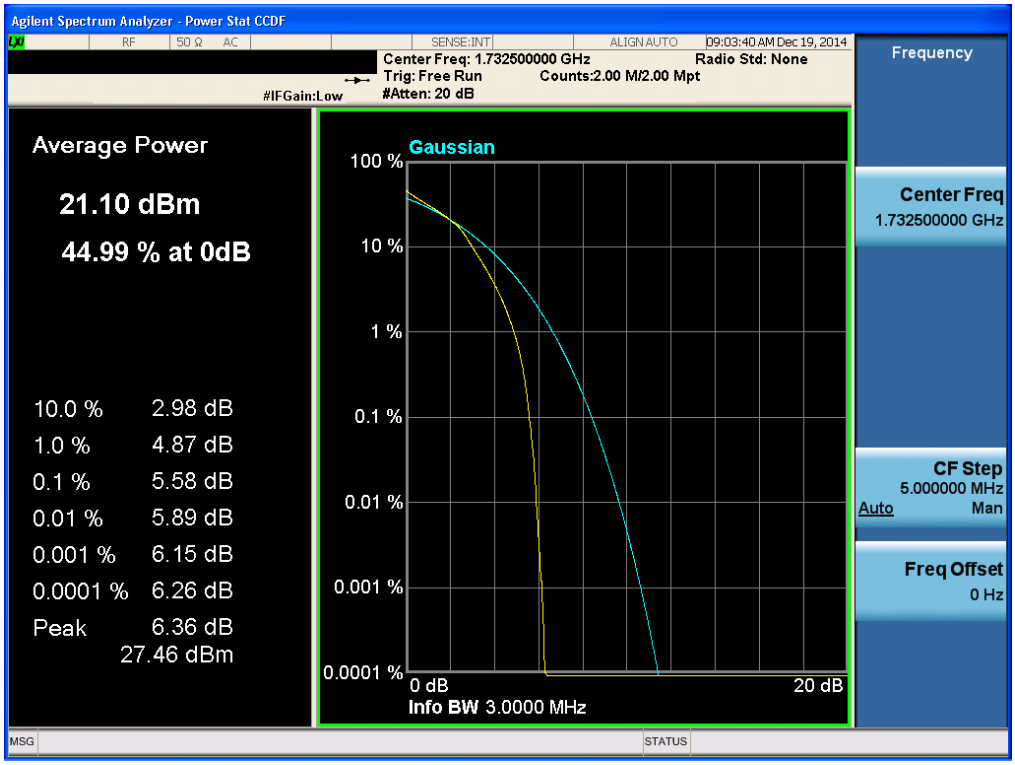
BAND 4. PAR Plot (1.4M BW_Ch.20175_16QAM_RB6_0)



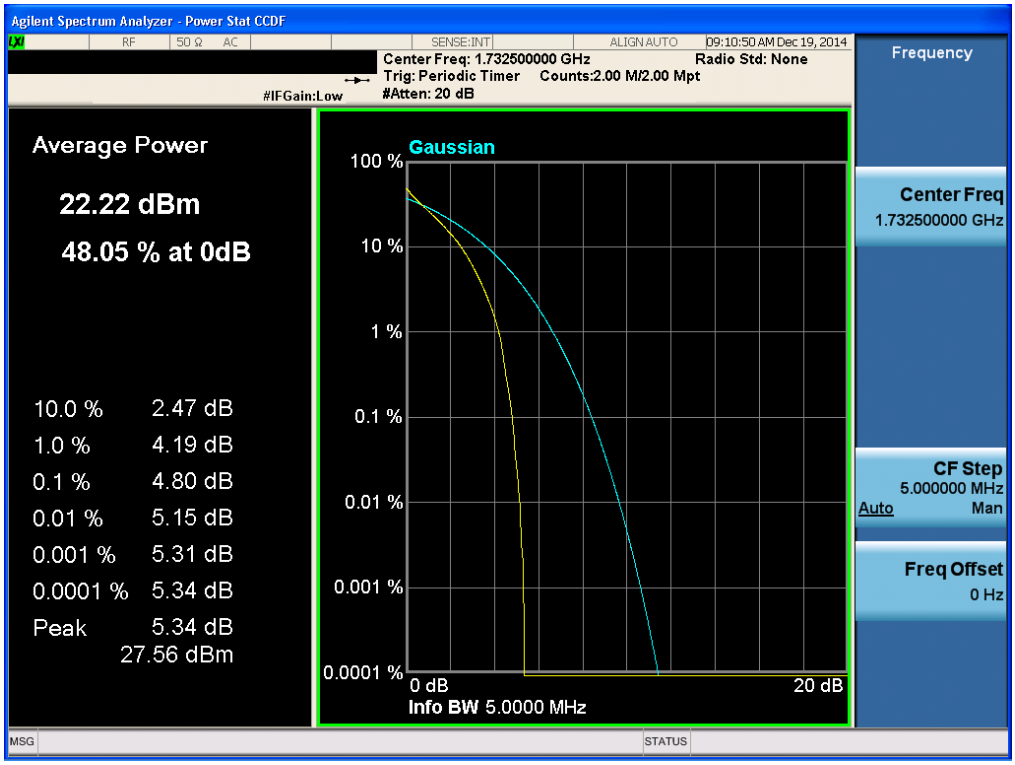
BAND 4. PAR Plot (3M BW_Ch.20175_QPSK_RB6_0)



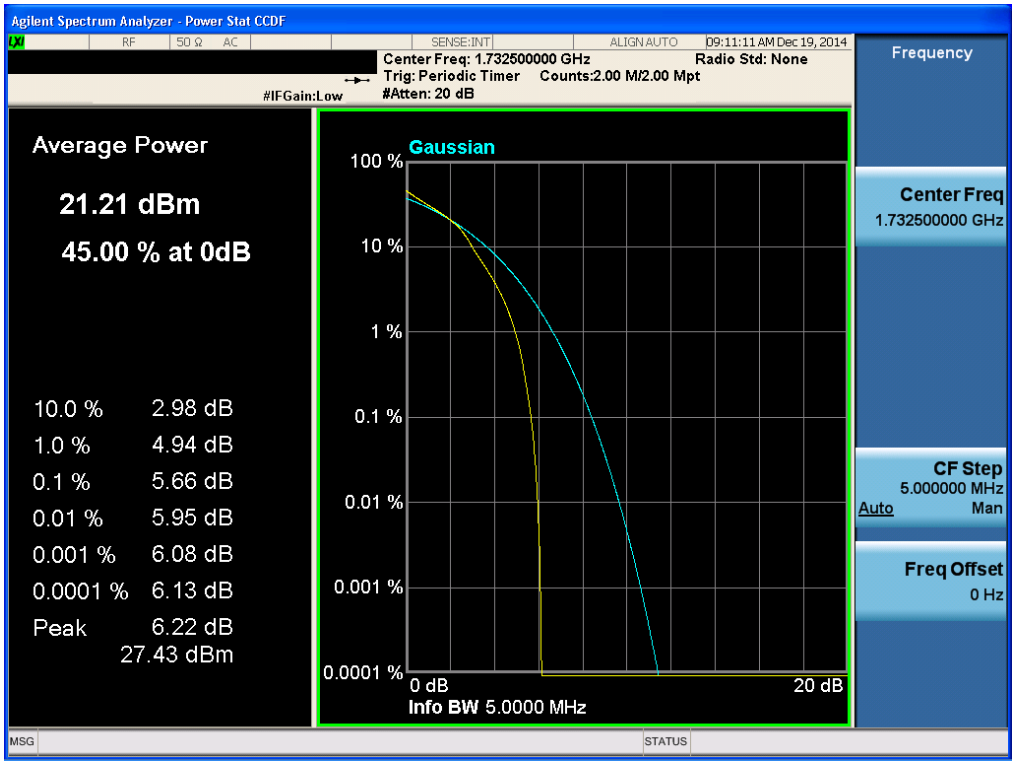
BAND 4. PAR Plot (3M BW_Ch.20175_16QAM_RB6_0)



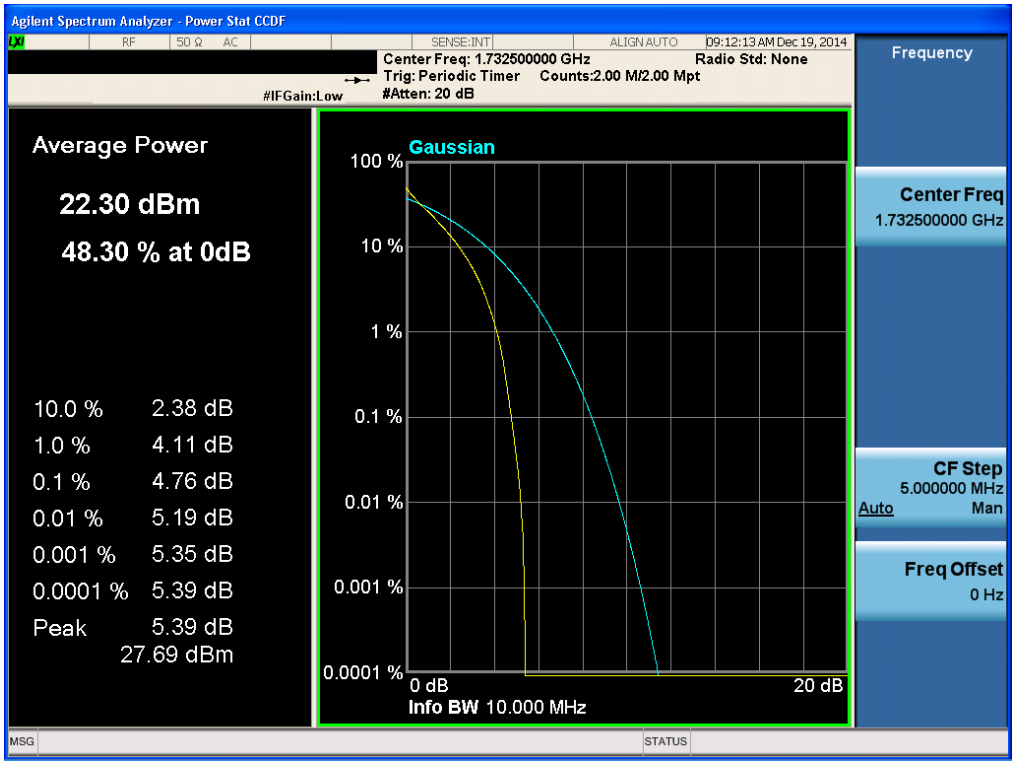
BAND 4. PAR Plot (5M BW_Ch.20175_QPSK_RB6_0)



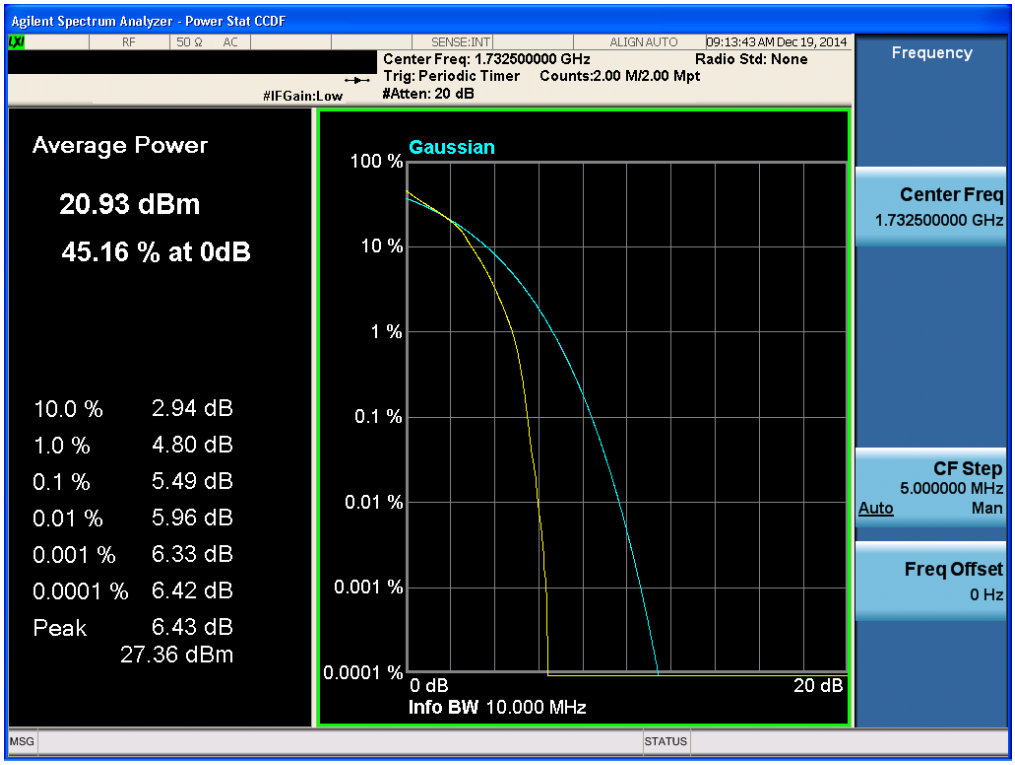
BAND 4. PAR Plot (5M BW_Ch.20175_16QAM_RB6_0)



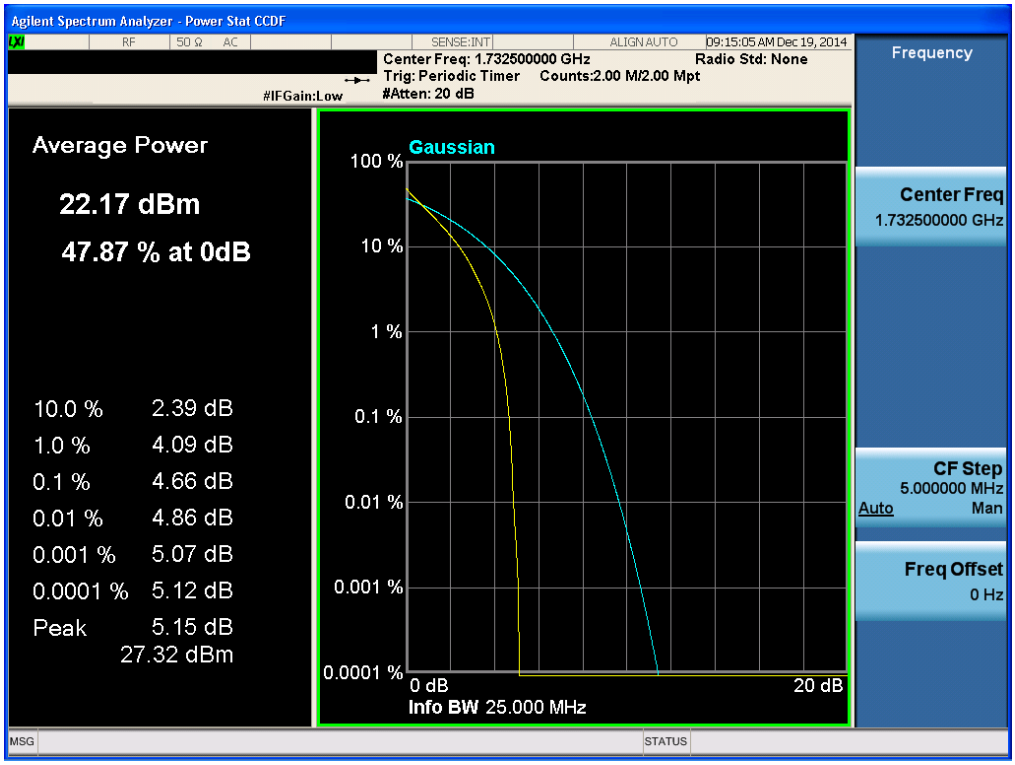
BAND 4. PAR Plot (10M BW_Ch.20175_QPSK_RB6_0)



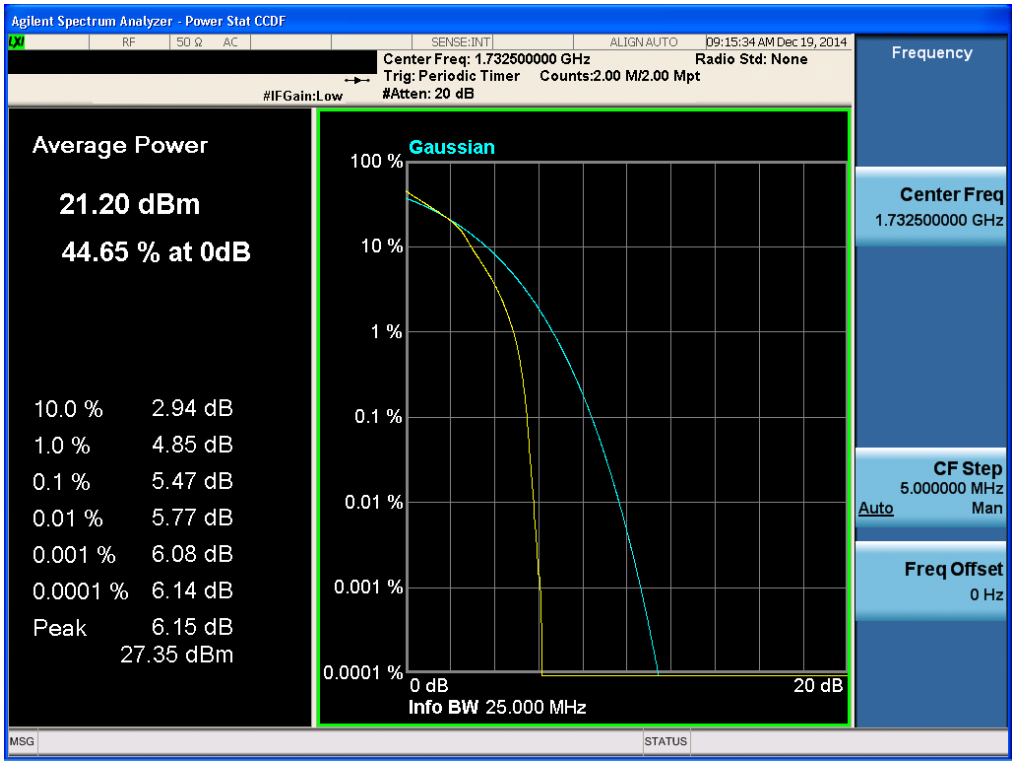
BAND 4. PAR Plot (10M BW_Ch.20175_16QAM_RB6_0)



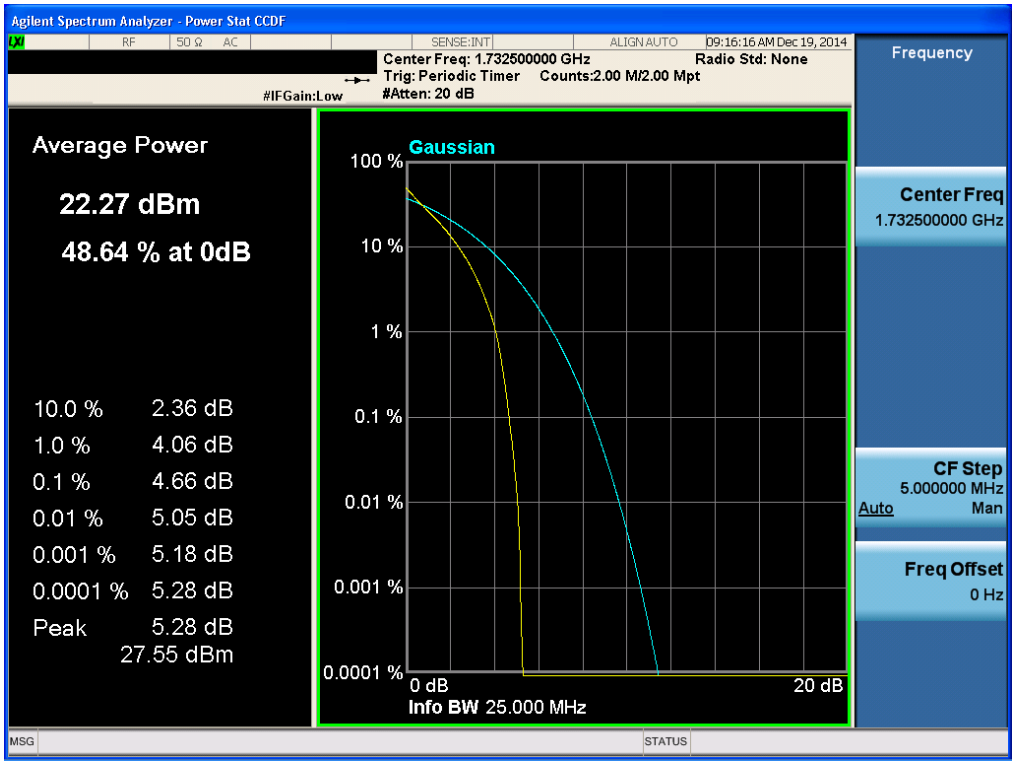
BAND 4. PAR Plot (15M BW_Ch.20175_QPSK_RB6_0)



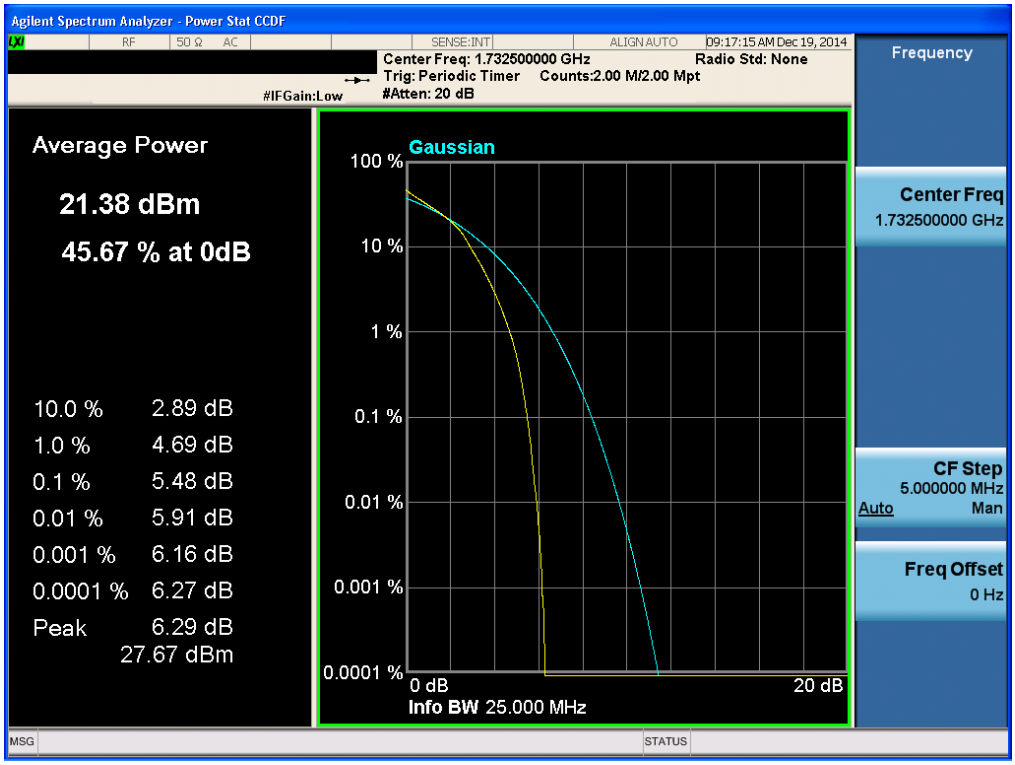
BAND 4. PAR Plot (15M BW_Ch.20175_16QAM_RB6_0)



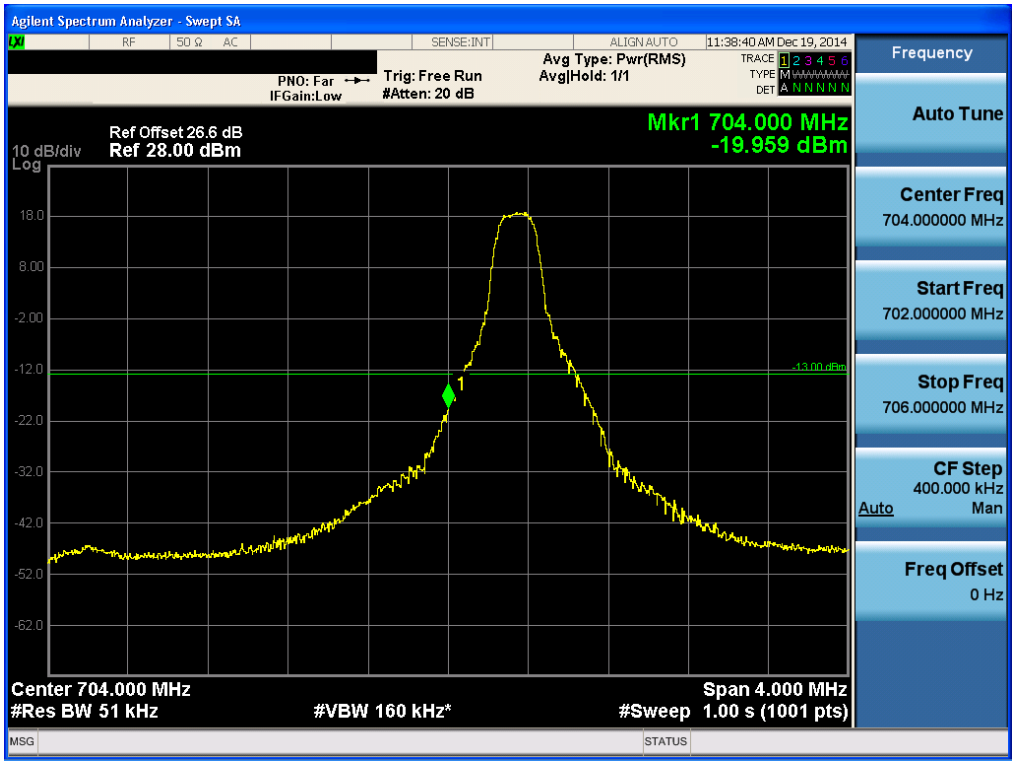
BAND 4. PAR Plot (20M BW_Ch.20175_QPSK_RB6_0)



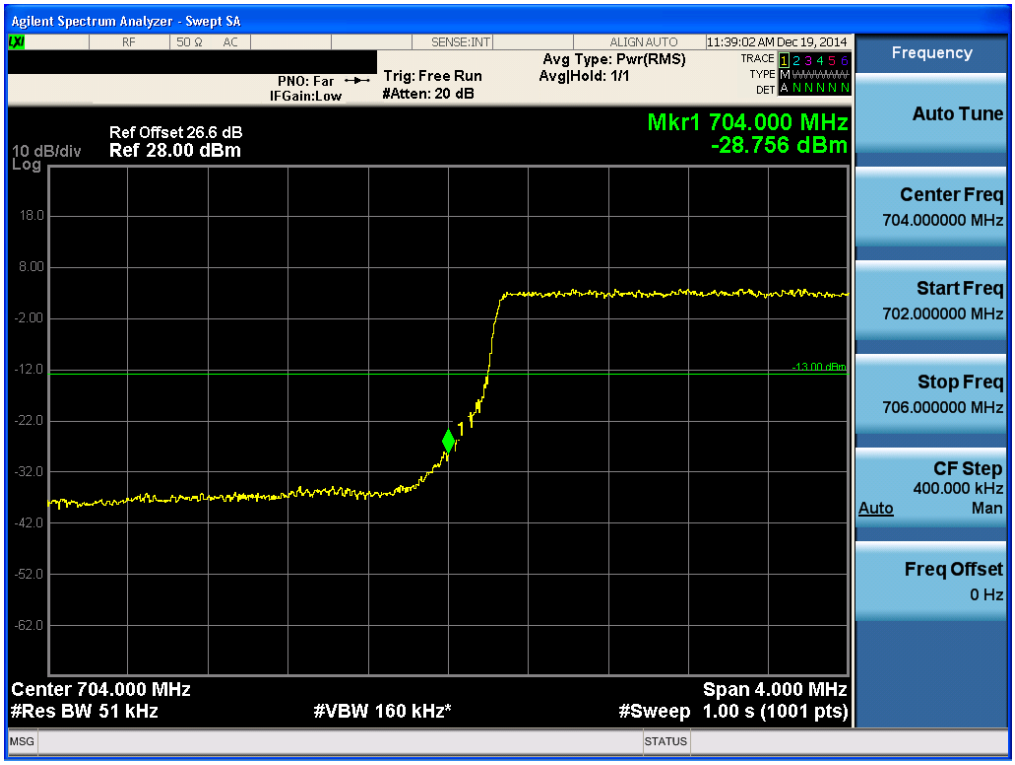
BAND 4. PAR Plot (20M BW_Ch.20175_16QAM_RB6_0)



Band 17 Lower Band Edge Plot (5M BW Ch.23755 QPSK_RB OFFSET0)

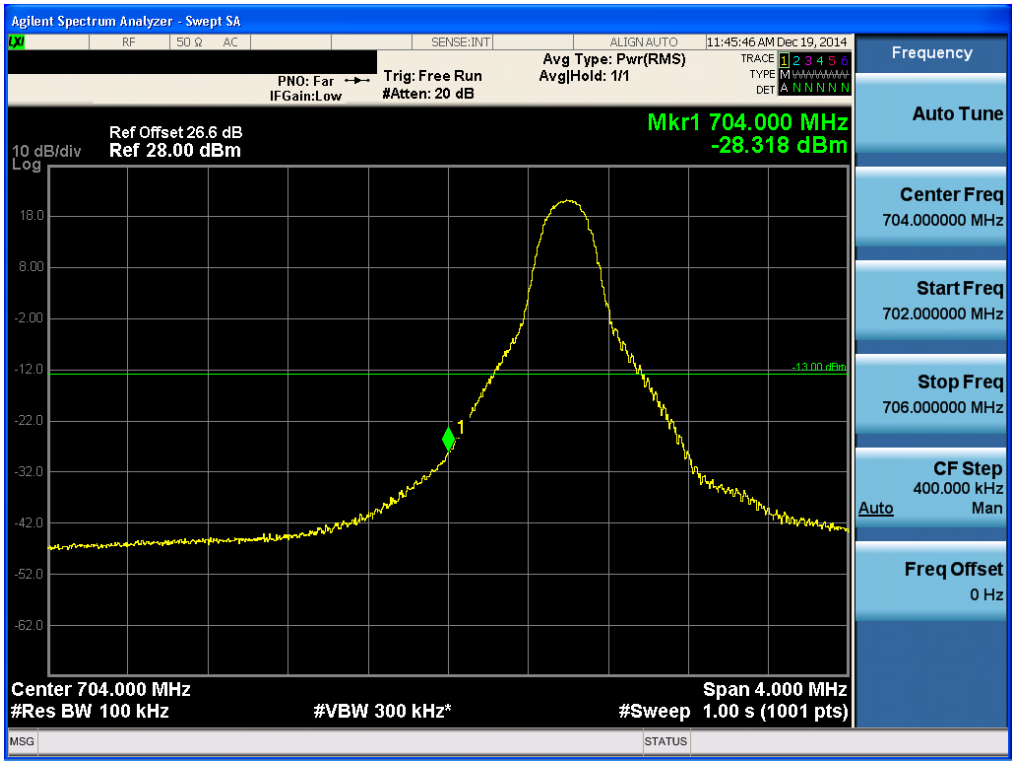


Band 17 Lower Band Edge Plot (5M BW Ch.23755 QPSK_RB50)

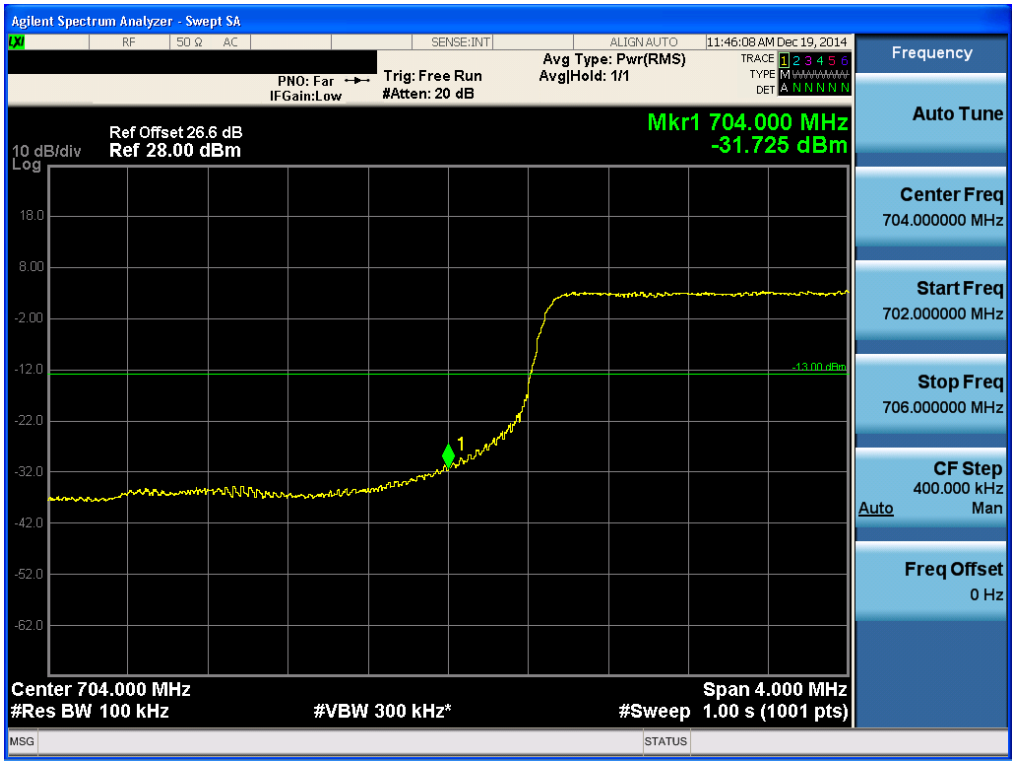


Band 17 Lower Extended Band Edge Plot (5M BW Ch.23755 QPSK_RB25_0)

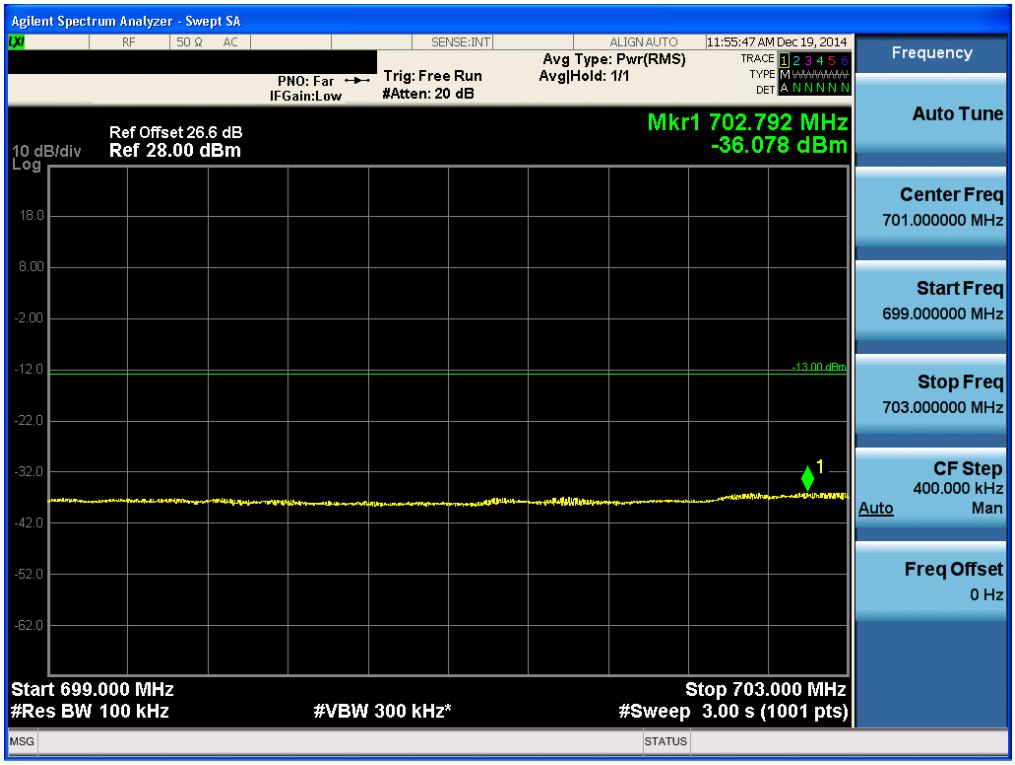
Band 17 Lower Band Edge Plot (10M BW Ch.23780 QPSK_RB1 49)



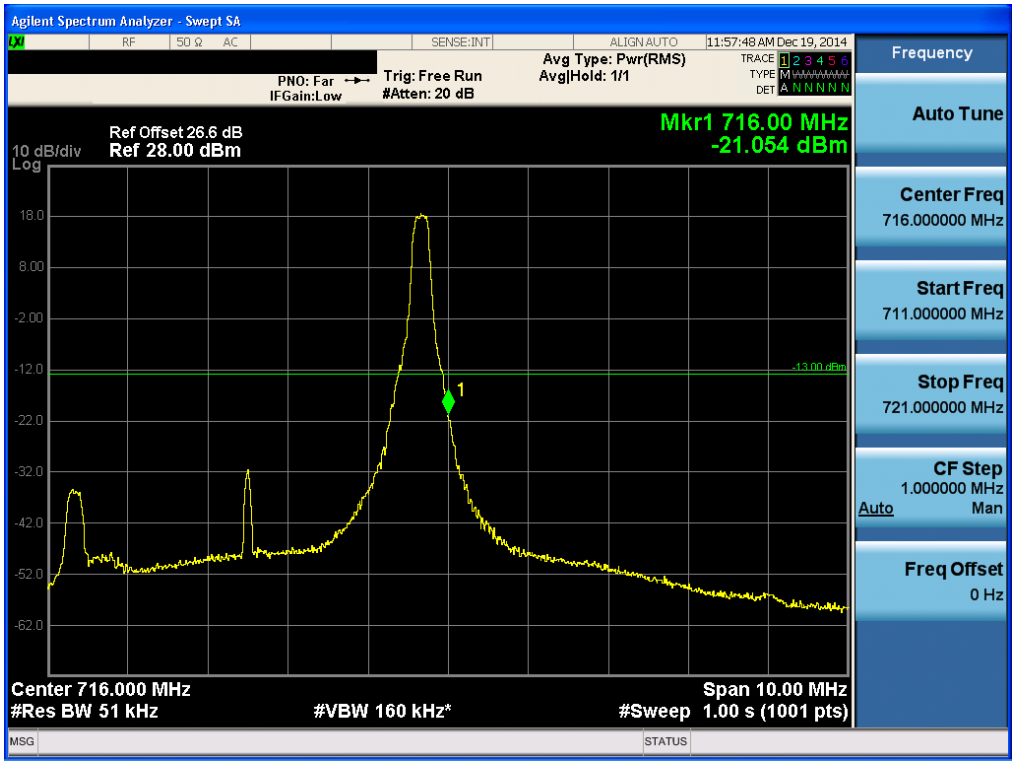
Band 17 Lower Band Edge Plot (10M BW Ch.23780 QPSK_RB50 0)



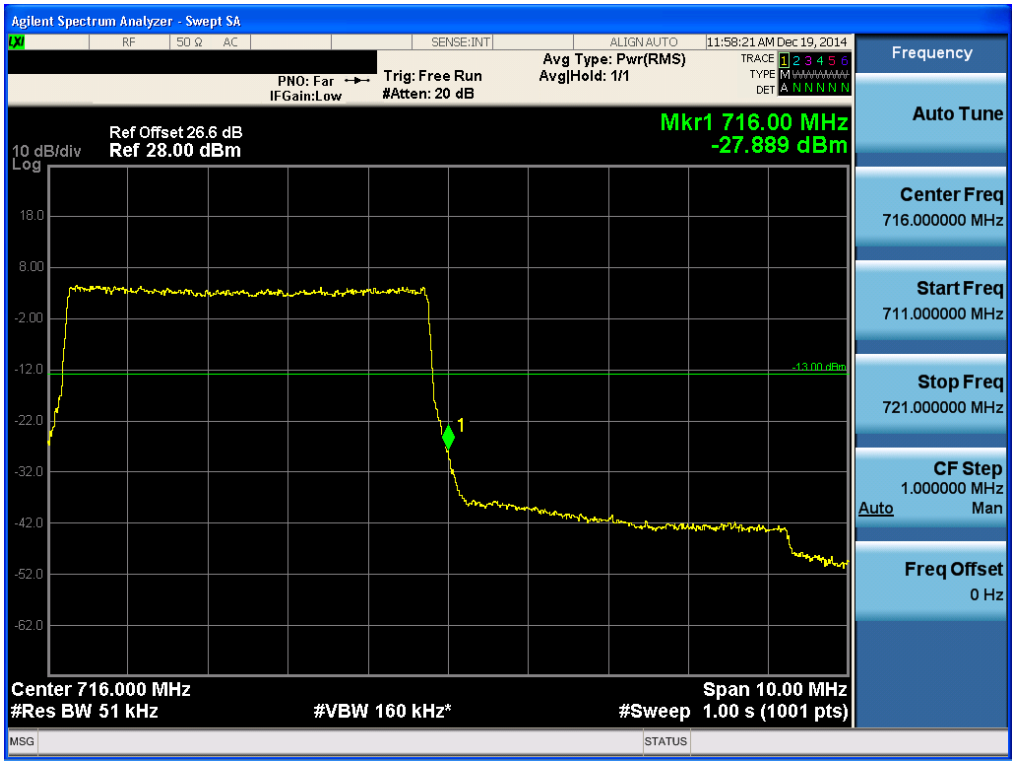
Band 17 Lower Extended Band Edge Plot (10M BW Ch.23780 QPSK_RB50_0)



Band 17 Upper Band Edge Plot (5M BW Ch.23825 QPSK_RB1_Offset 24)

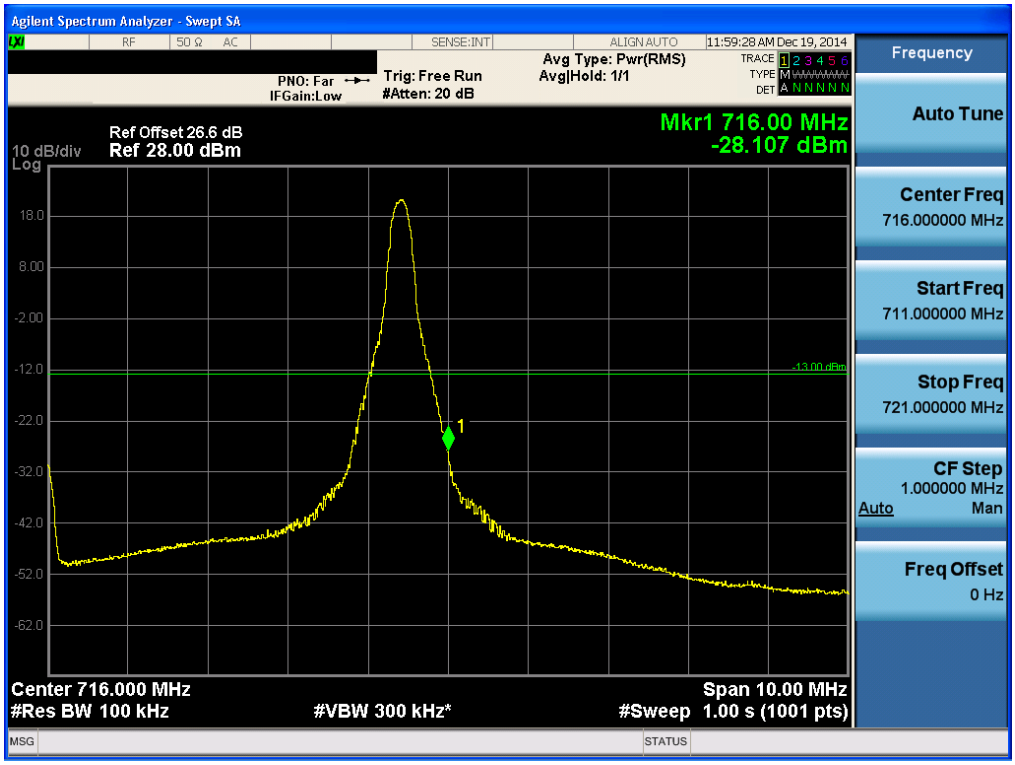


Band 17 Upper Band Edge Plot (5M BW Ch.23825 QPSK_RB25)

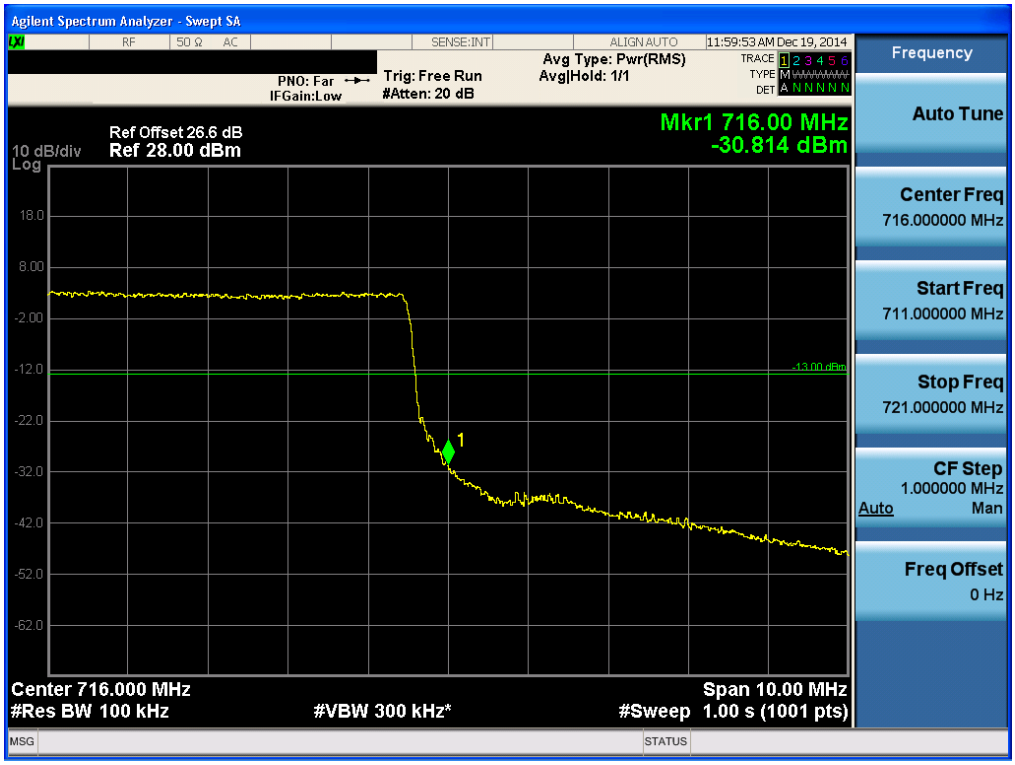


Band 17 Upper Extended Band Edge Plot (5M BW Ch.23825 QPSK_RB25_0)

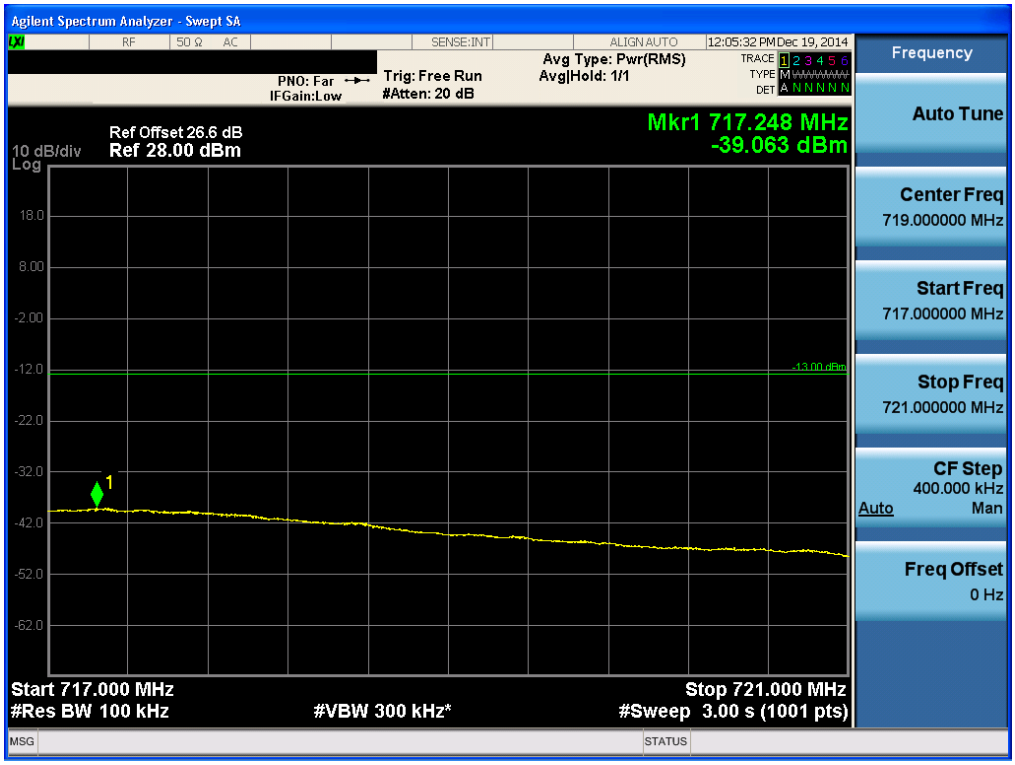
Band 17 Upper Band Edge Plot (10M BW Ch.23800 QPSK_RB1_Offset 49)



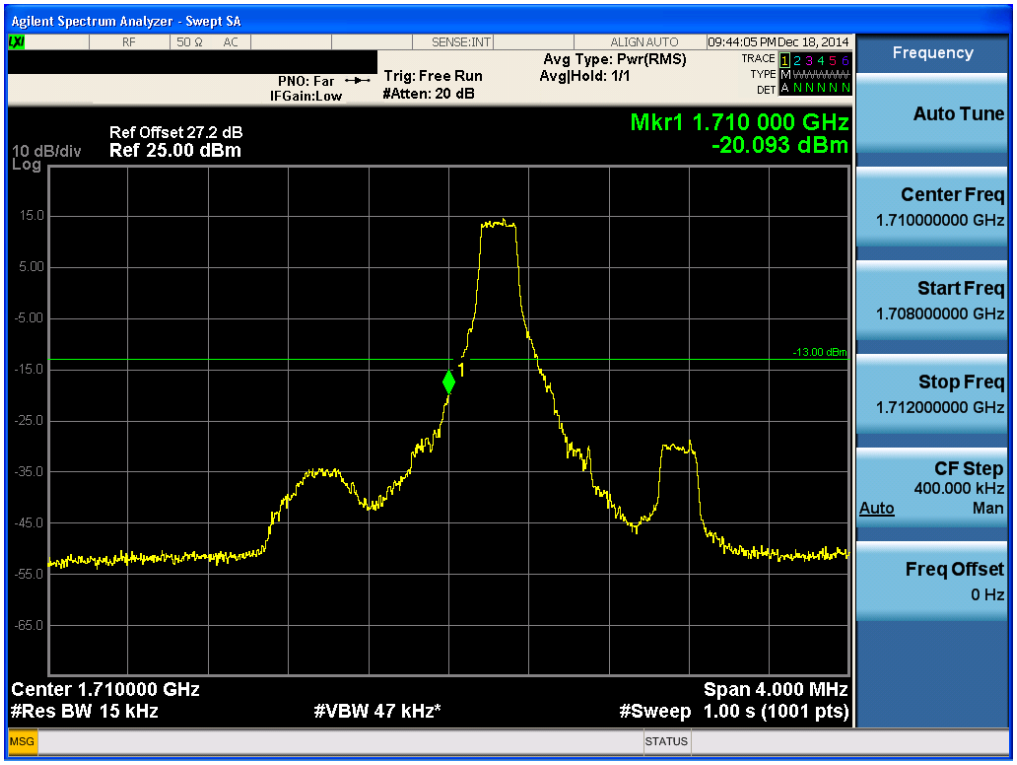
Band 17 Upper Band Edge Plot (10M BW Ch.23800 QPSK_RB50)



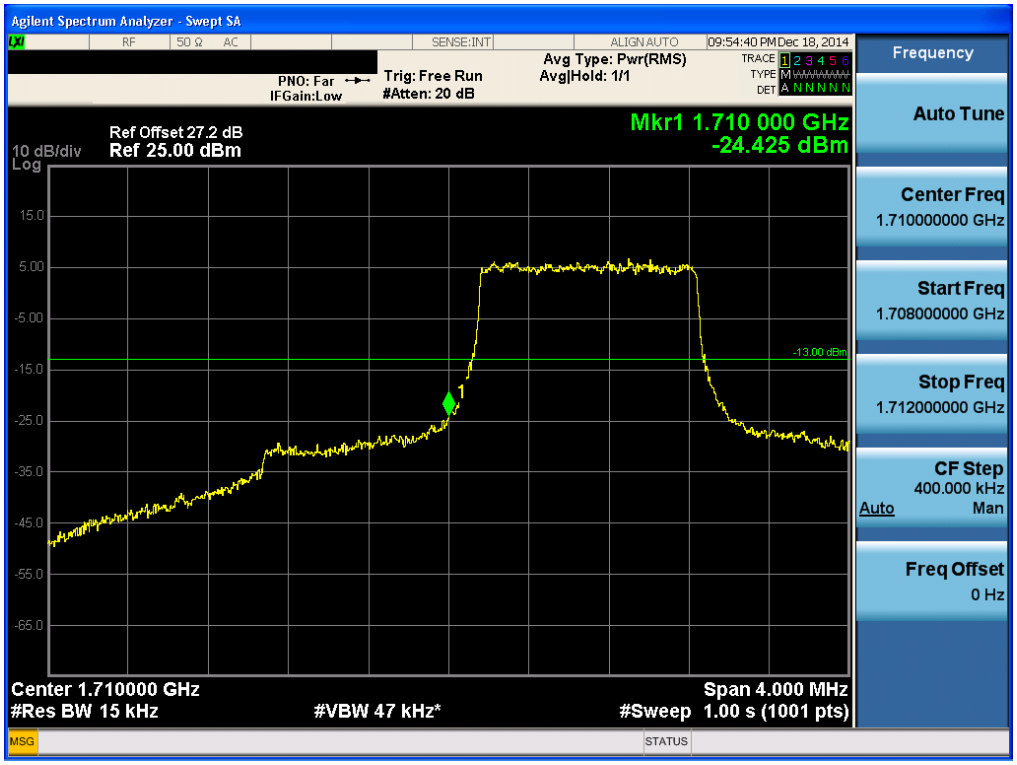
Band 17 Upper Extended Band Edge Plot (10M BW Ch.23800 QPSK_RB50_0)



BAND 4. Lower Band Edge Plot (1.4M BW Ch.19957 QPSK RB 1, Offset 0) -1

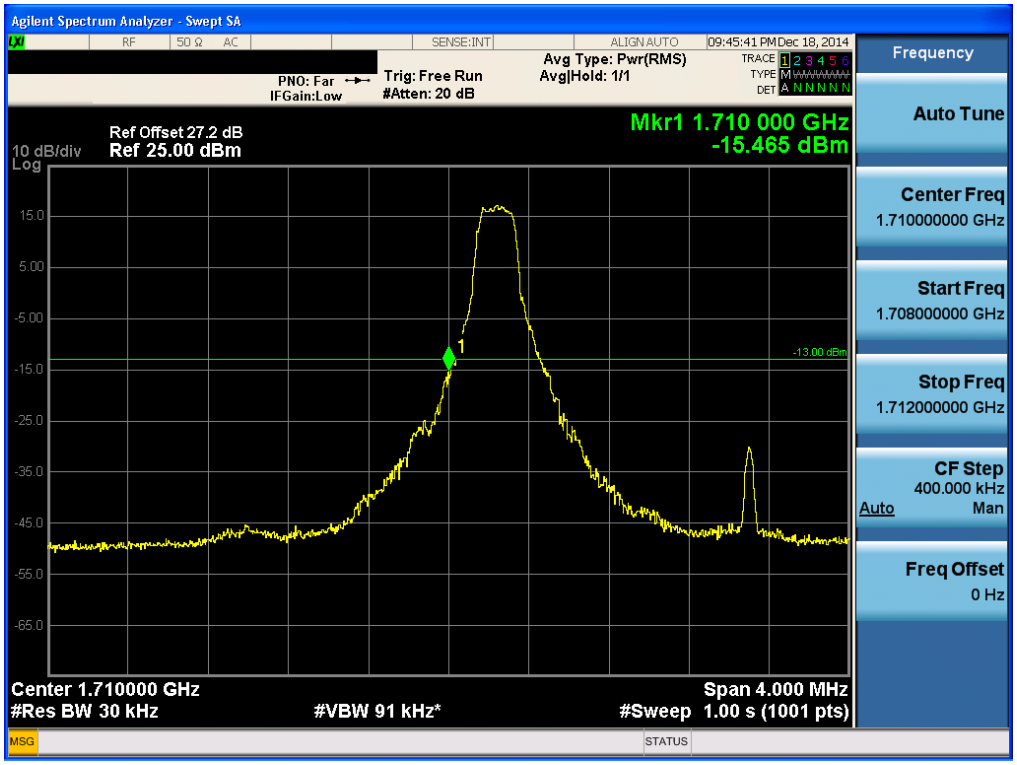


BAND 4. Lower Band Edge Plot (1.4M BW Ch.19957 QPSK RB 6) -2

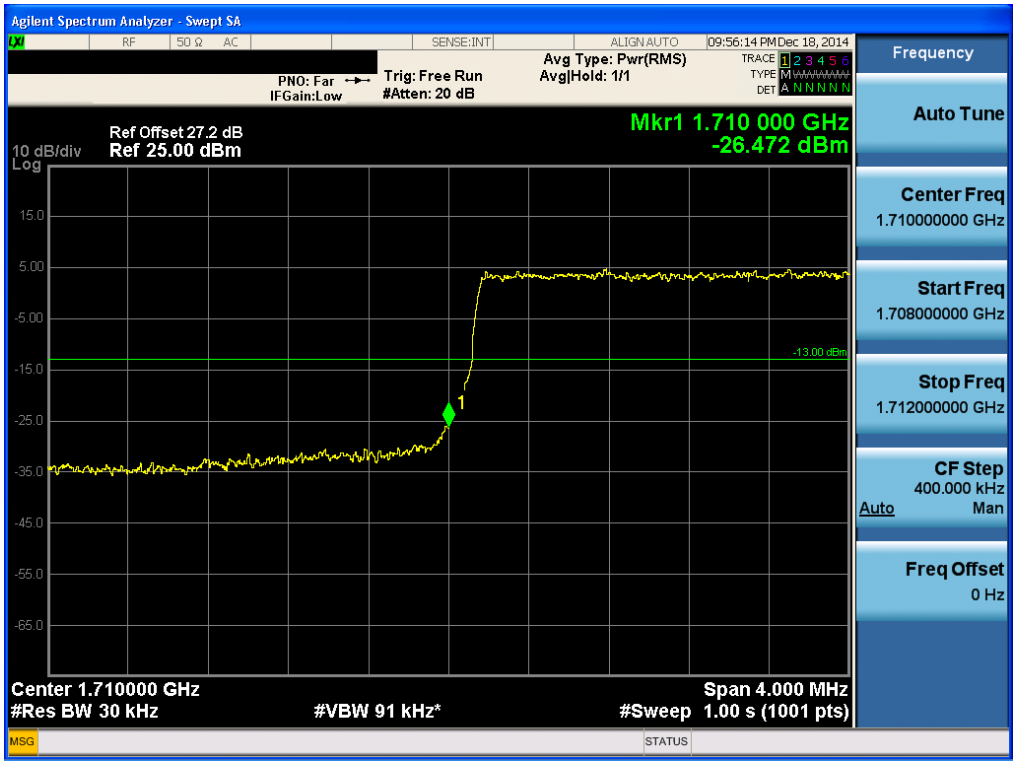


BAND 4. Lower Extended Band Edge Plot (1.4M BW Ch.18607 QPSK_RB6_0) -3

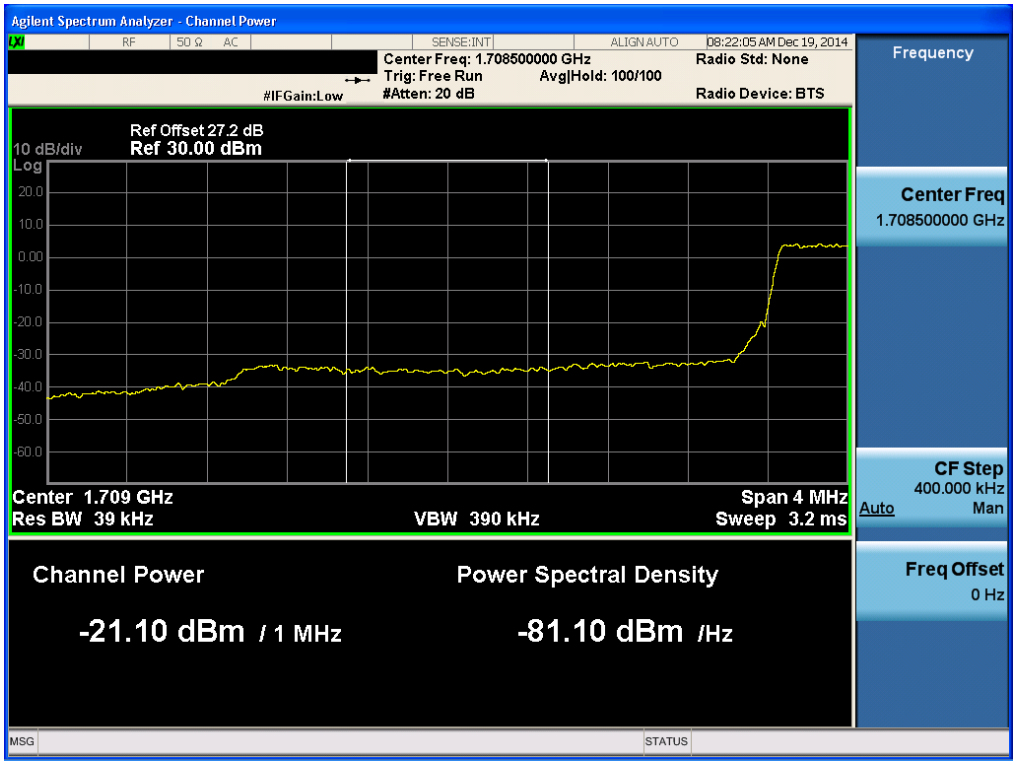
BAND 4. Lower Band Edge Plot (3M BW Ch.19965 QPSK RB 1, Offset 0) -1



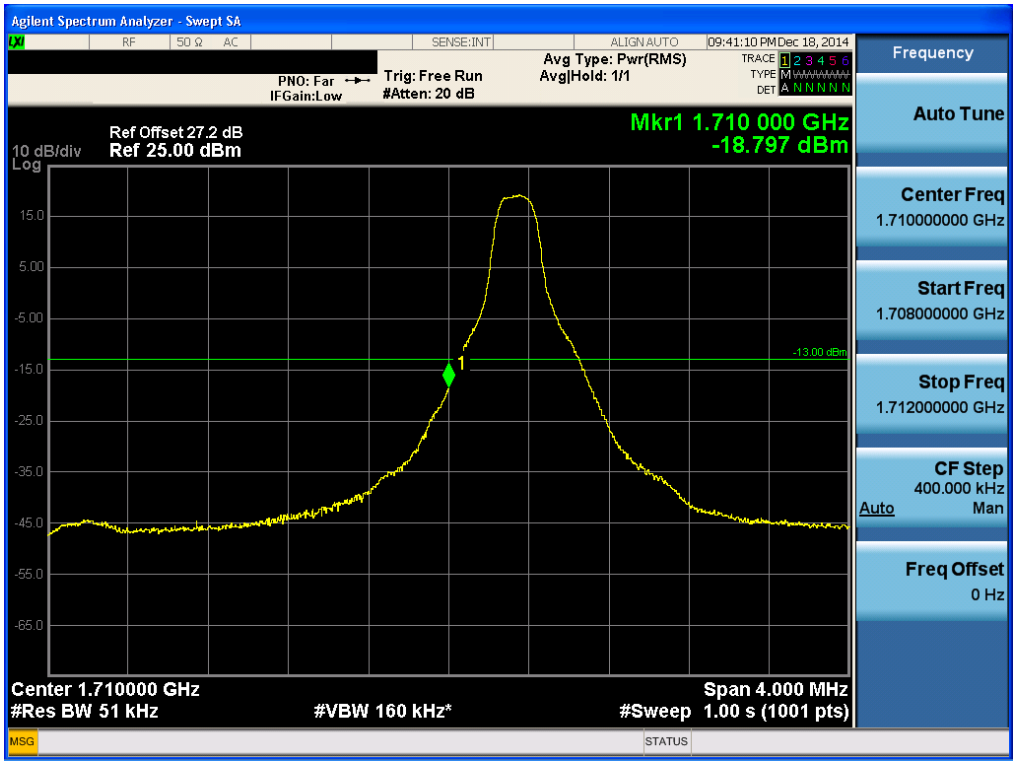
BAND 4. Lower Band Edge Plot (3M BW Ch.19965 QPSK RB 15) -2



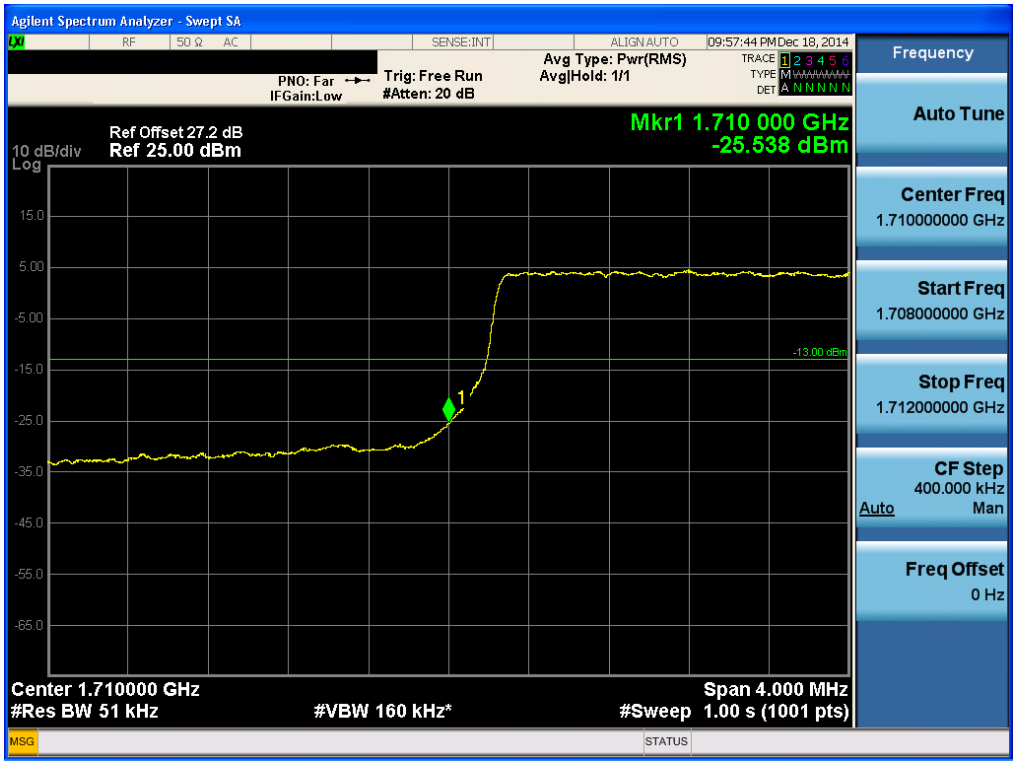
BAND 4. Lower Extended Band Edge Plot (3M BW Ch.19965 QPSK_RB15_0) -3



BAND 4. Lower Band Edge Plot (5M BW Ch.19975 QPSK RB 1, Offset 0) -1

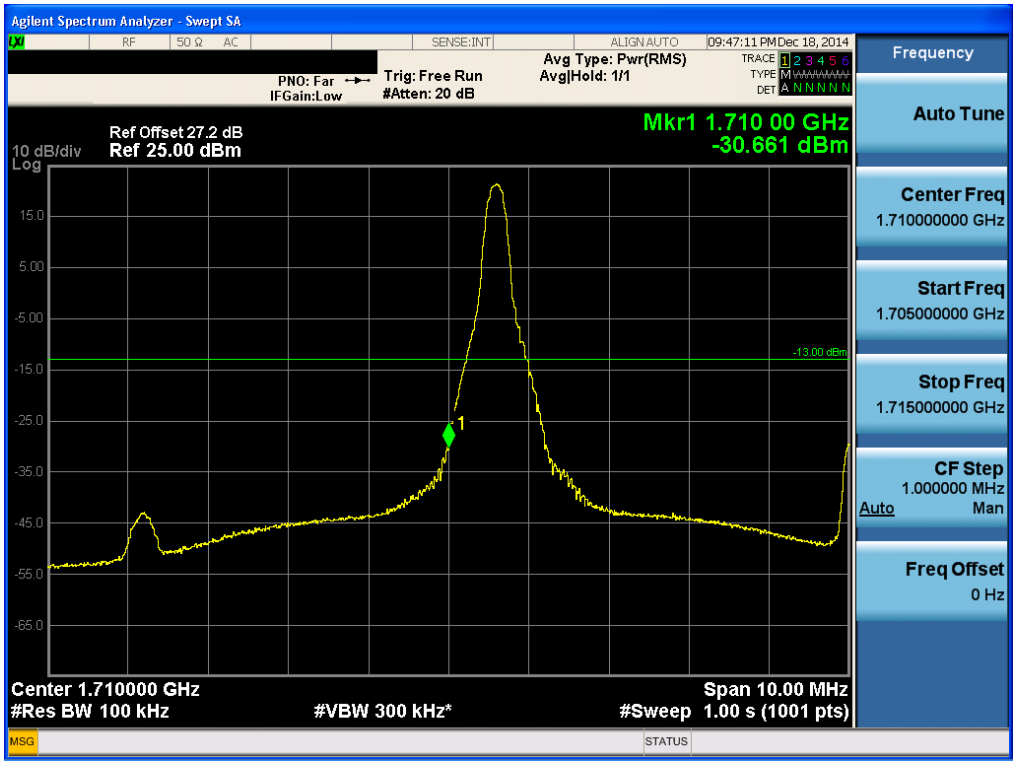


BAND 4. Lower Band Edge Plot (5M BW Ch.19975 QPSK RB 25) -2

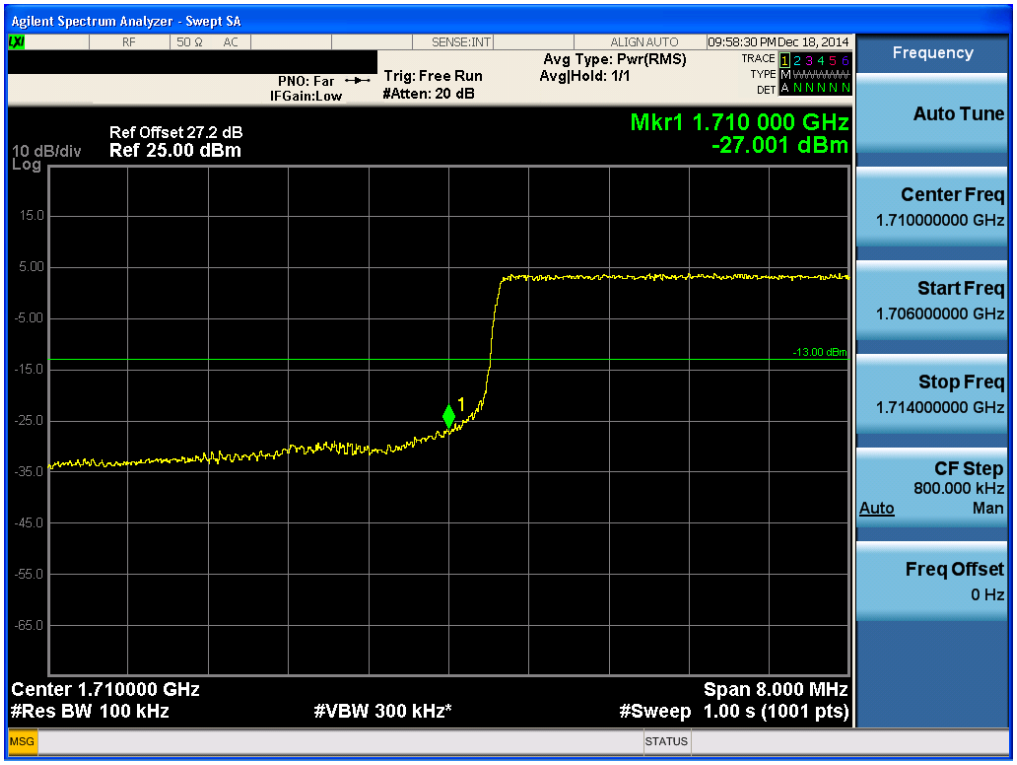


BAND 4. Lower Extended Band Edge Plot (5M BW Ch.19975 QPSK_RB25_0) -3

BAND 4. Lower Band Edge Plot (10M BW Ch.20000 QPSK RB 1, Offset 0) -1

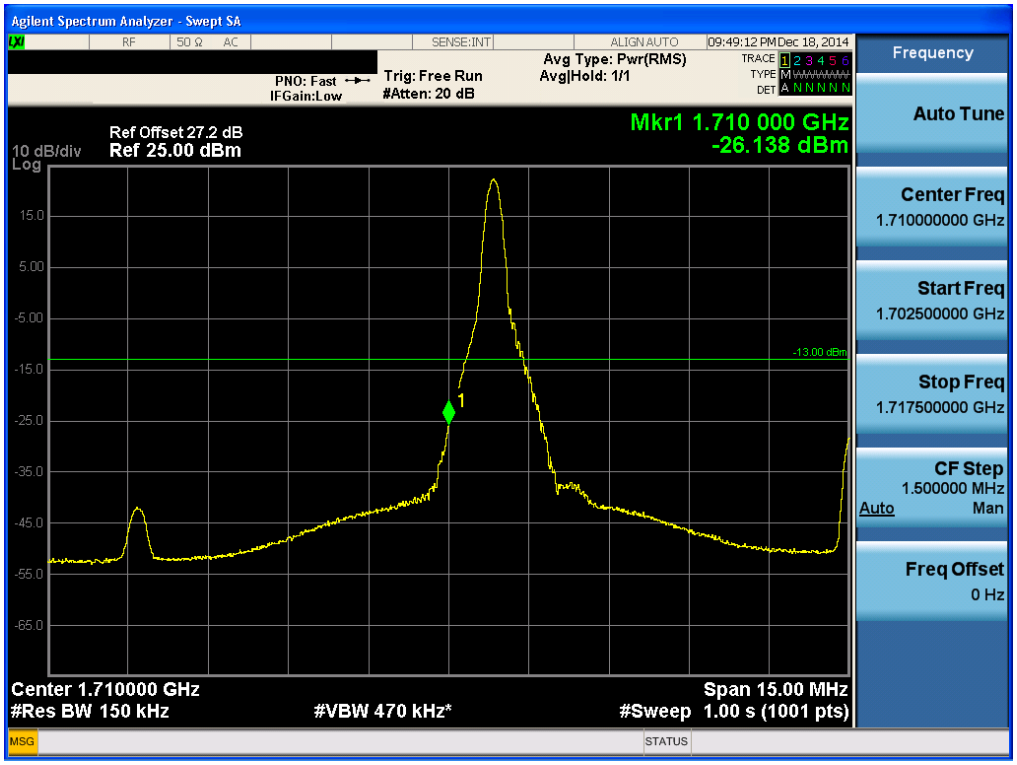


BAND 4. Lower Band Edge Plot (10M BW Ch.20000 QPSK RB 50) -2

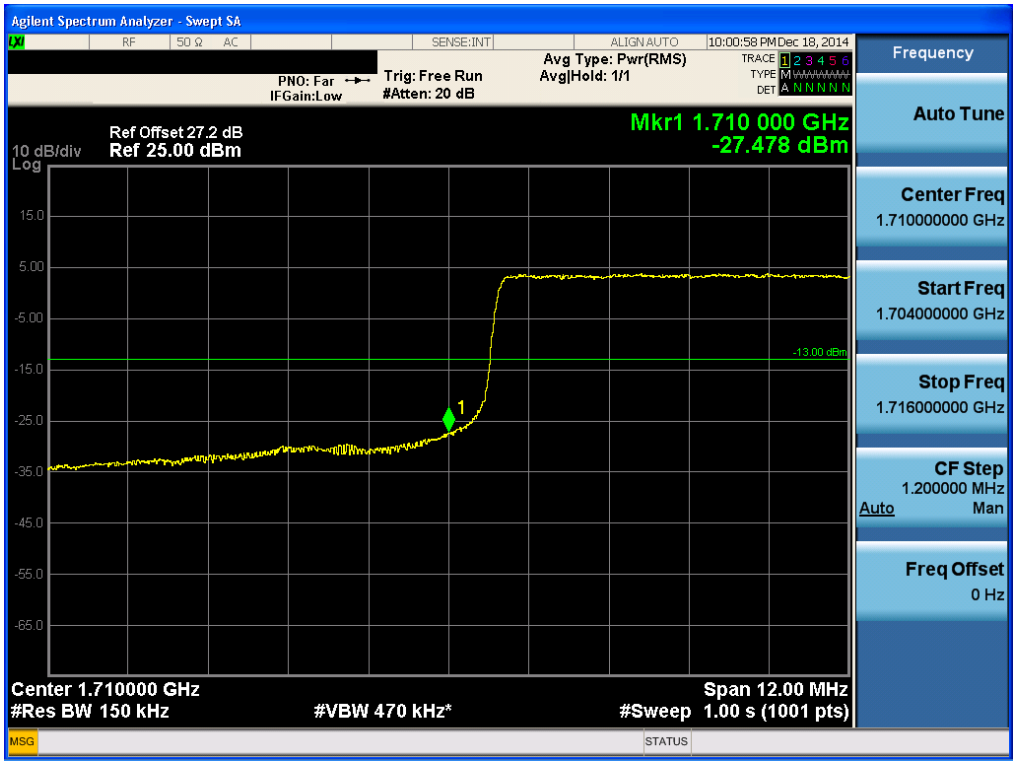


BAND 4. Lower Extended Band Edge Plot (10M BW Ch.20000 QPSK_RB50_0) -3

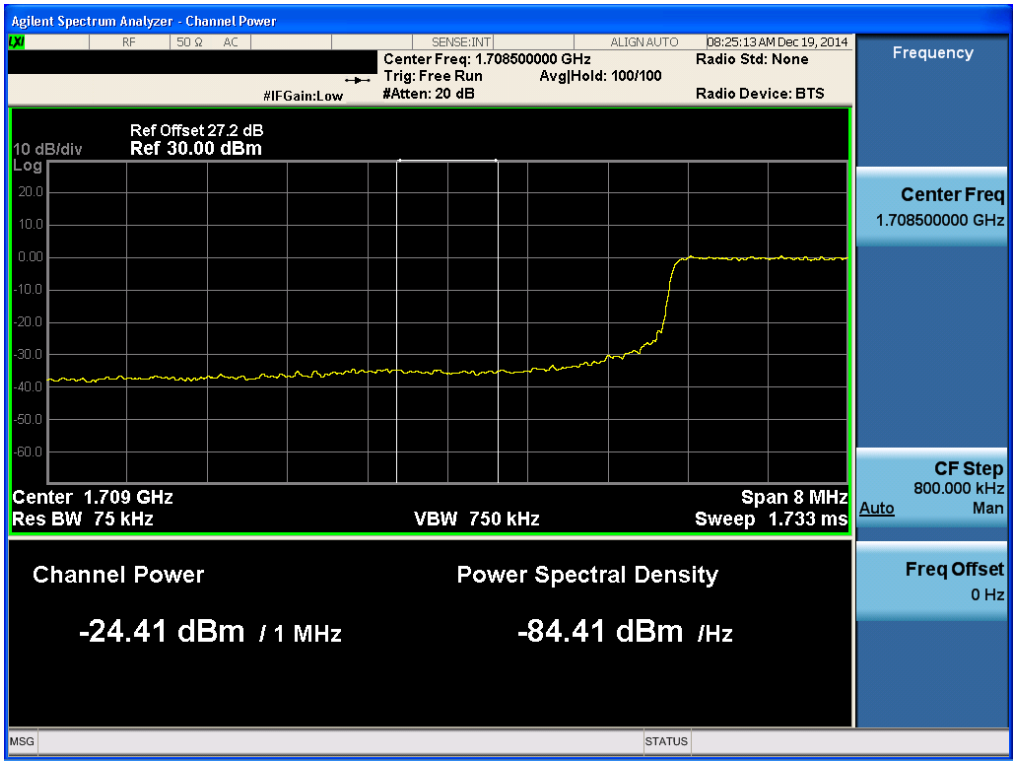
BAND 4. L Lower Band Edge Plot (15M BW Ch.20025 QPSK RB 1, Offset 0) -1



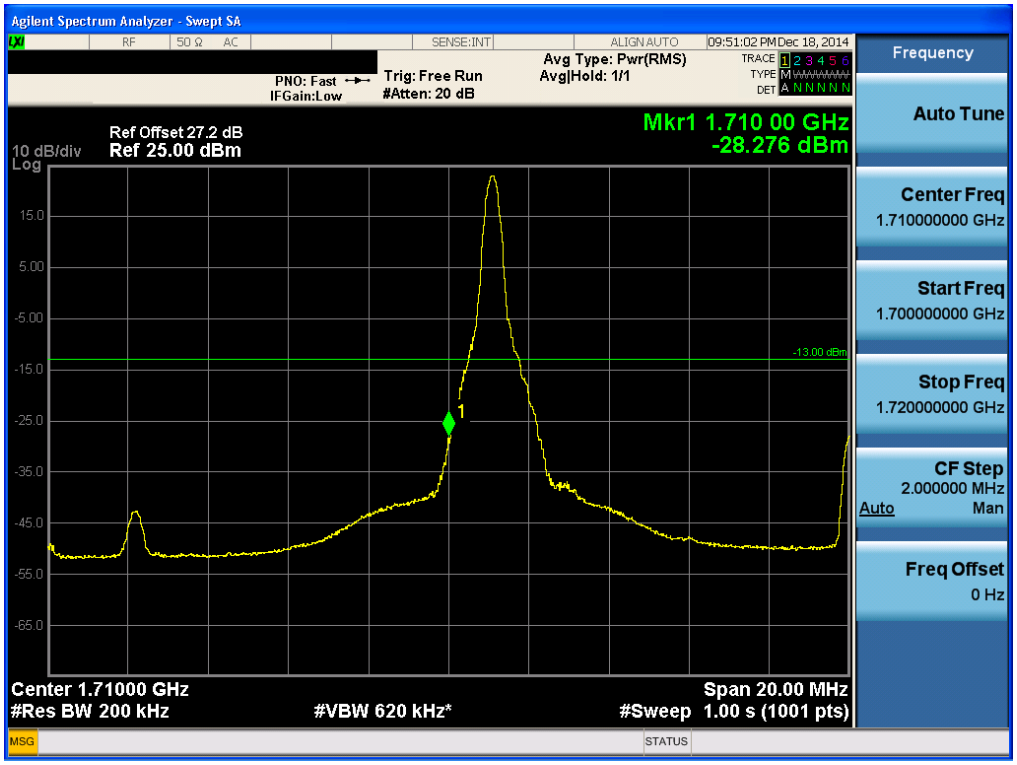
BAND 4. Lower Band Edge Plot (15M BW Ch.20025 QPSK RB 75) -2



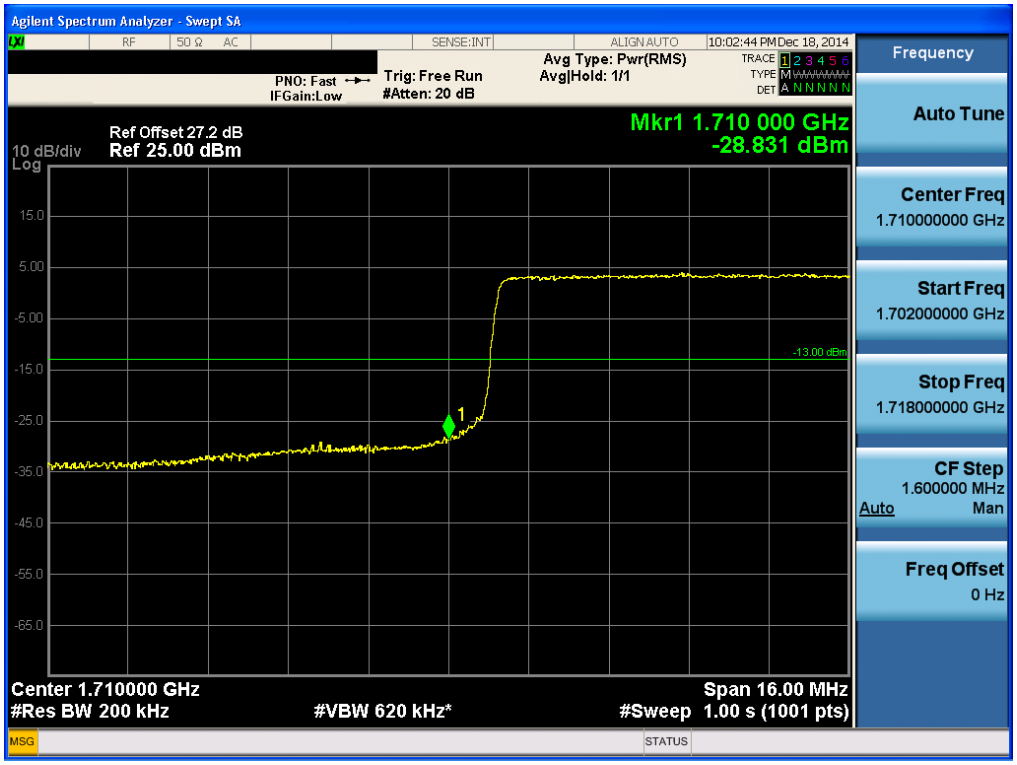
BAND 4. Lower Extended Band Edge Plot (15M BW Ch.20025 QPSK_RB75_0) -3



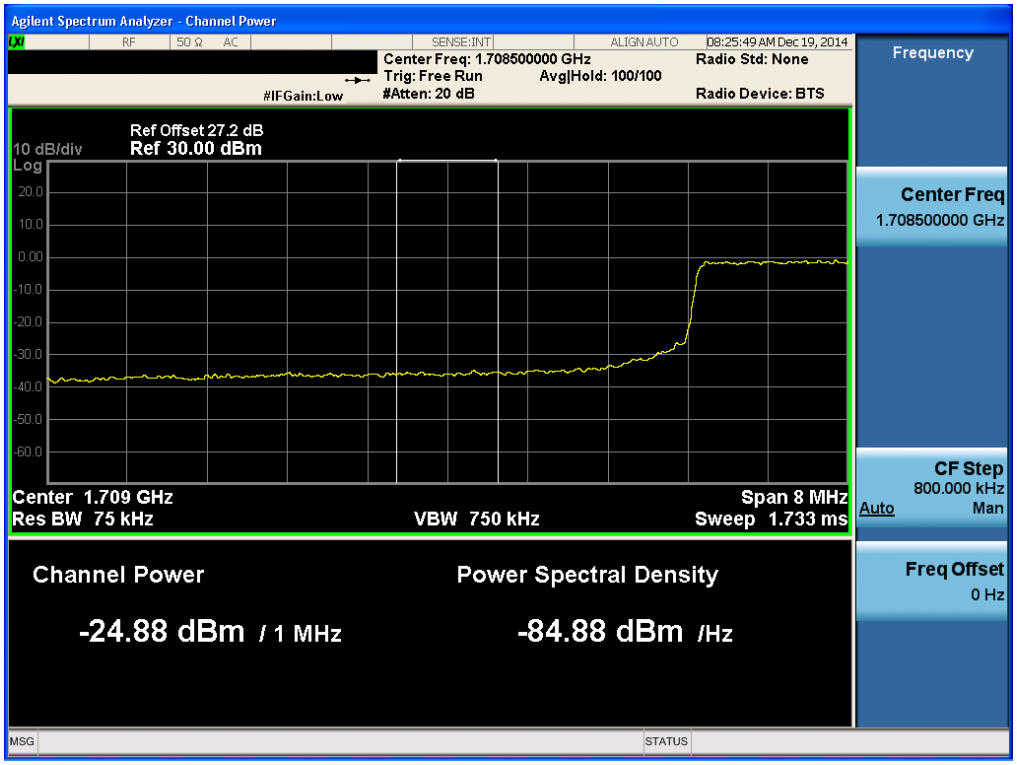
BAND 4. L Lower Band Edge Plot (20M BW Ch.20050 QPSK RB 1, Offset 0) -1



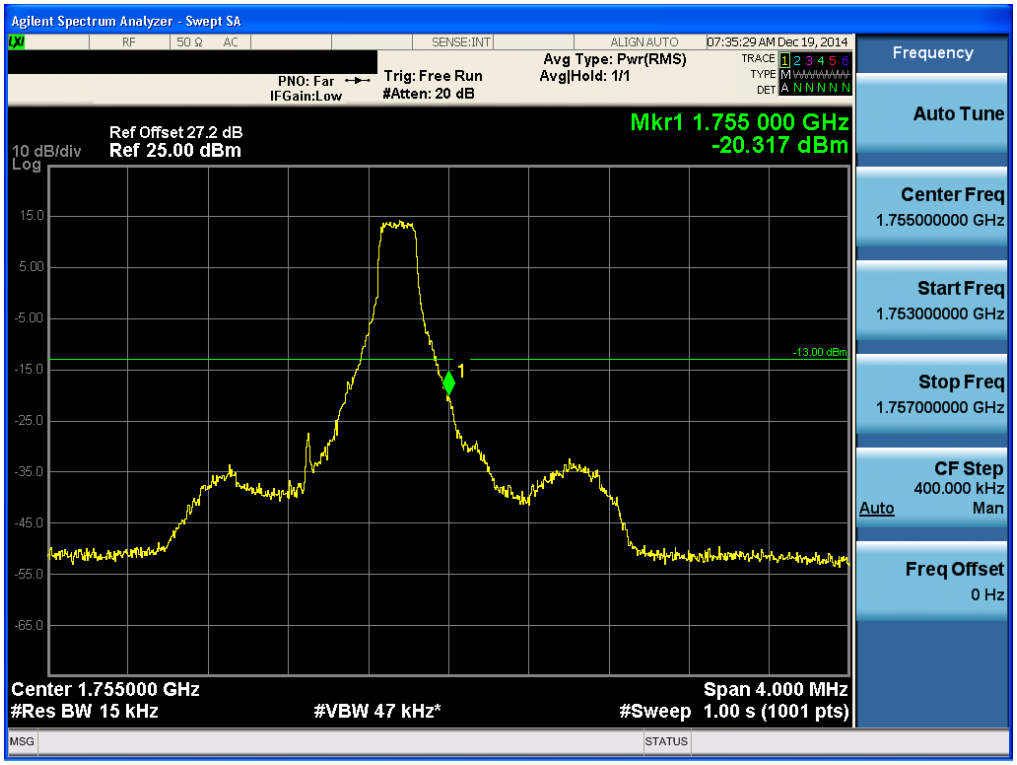
BAND 4. Lower Band Edge Plot (20M BW Ch.20050 QPSK RB 100) -2



BAND 4. Lower Extended Band Edge Plot (20M BW Ch.20050 QPSK_RB100_0) -3

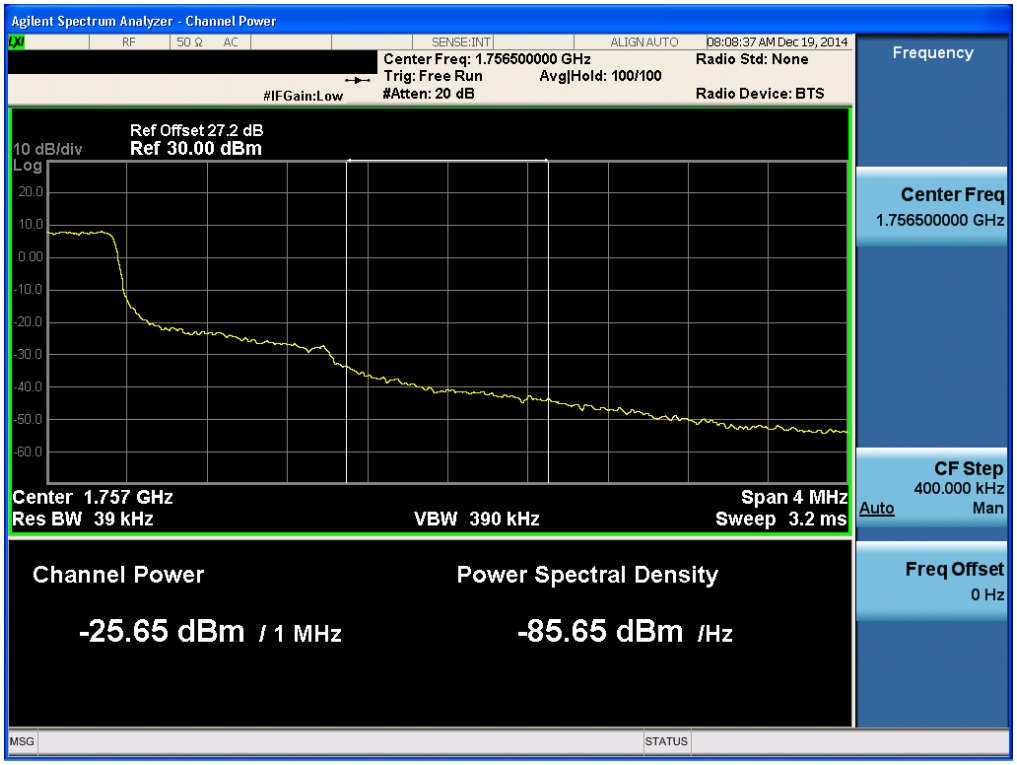


BAND 4. Upper Band Edge Plot (1.4M BW Ch.20393 QPSK_RB1_Offset -1

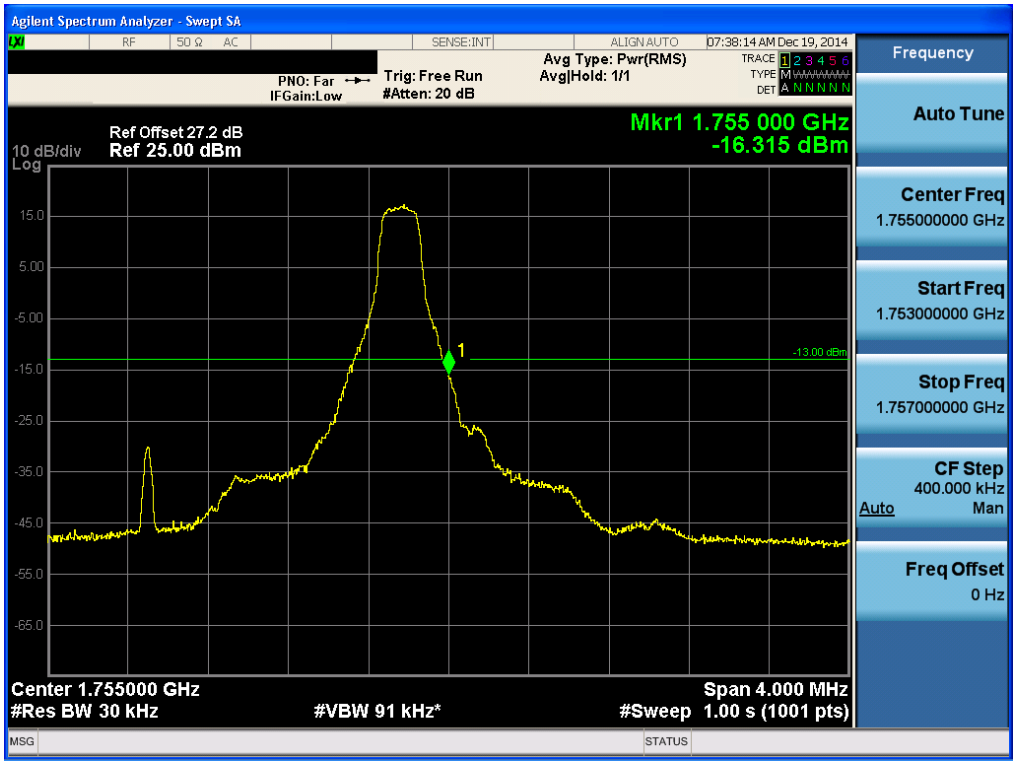


BAND 4. Upper Band Edge Plot (1.4M BW Ch.20393 QPSK_RB6 -2

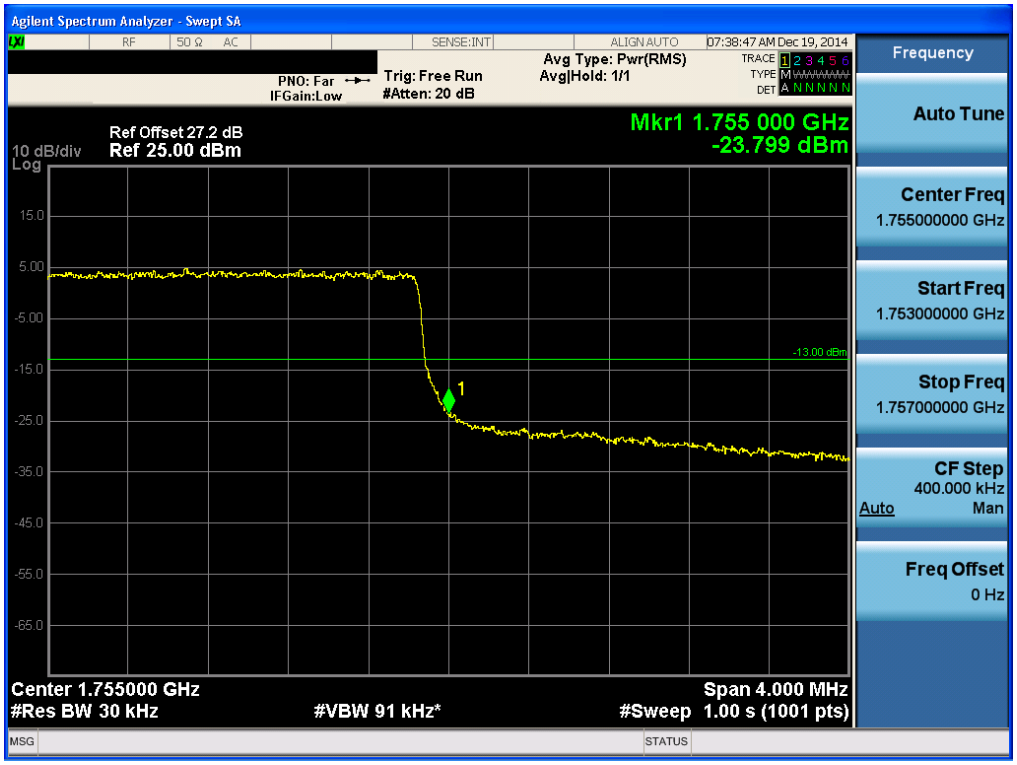
BAND 4. Upper Extended Band Edge Plot (1.4M BW Ch.19193 QPSK_RB6_0) -3



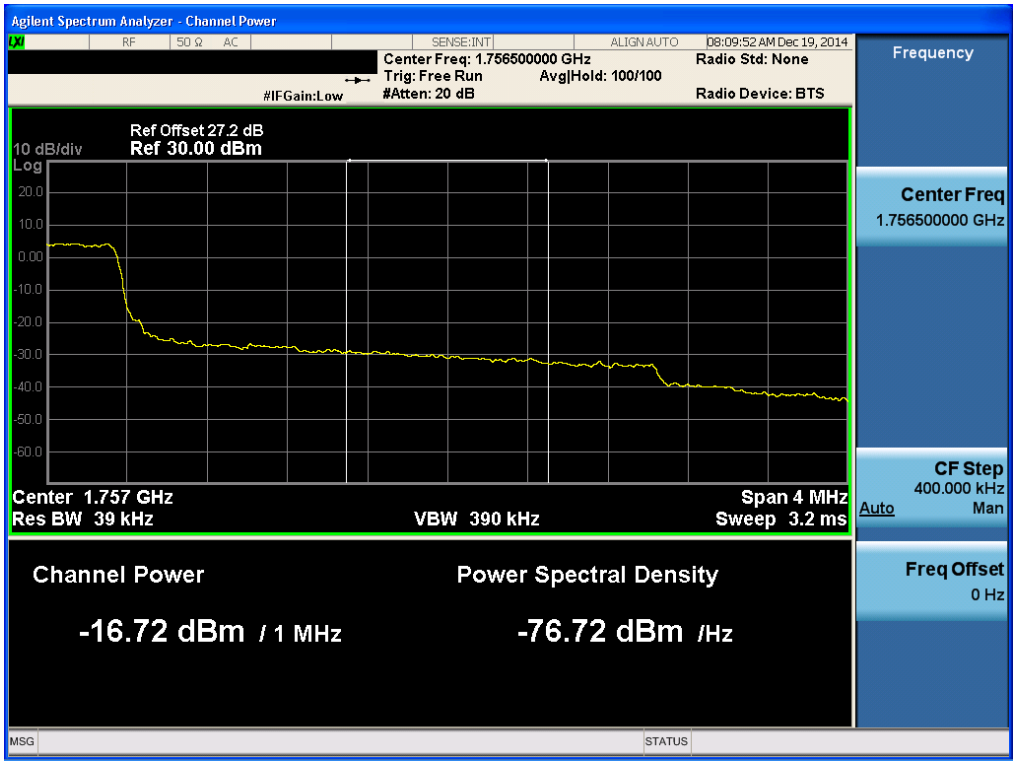
BAND 4. Upper Band Edge Plot (3M BW Ch.20385 QPSK_RB1_Offset 14) -1



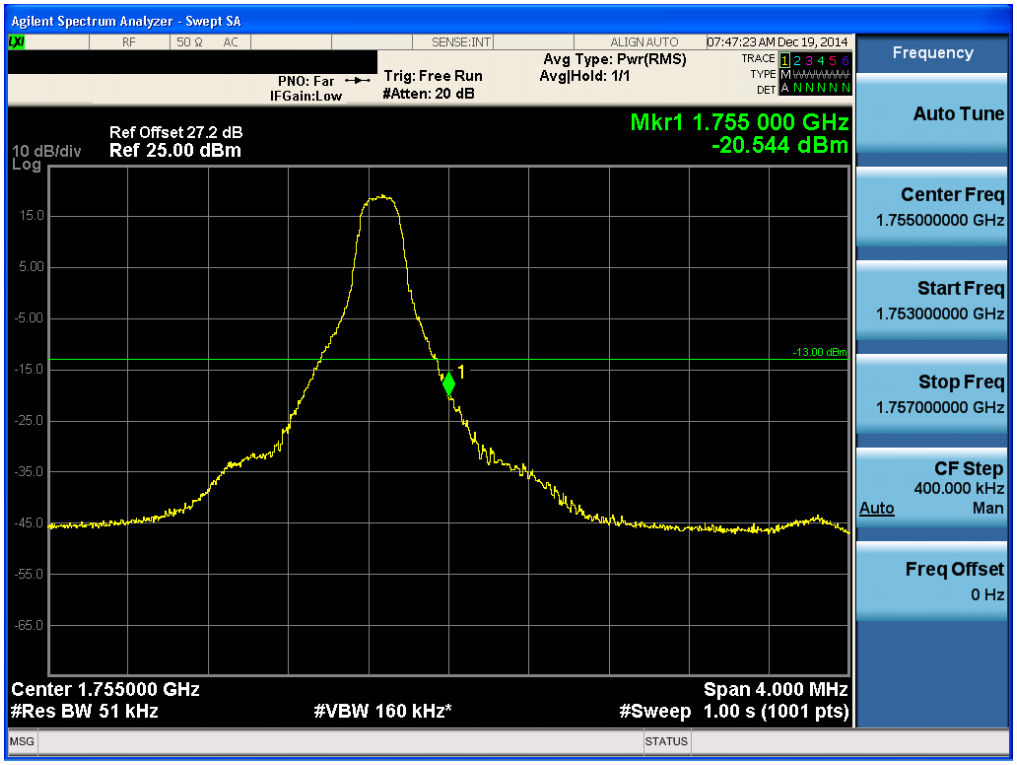
BAND 4. Upper Band Edge Plot (3M BW Ch.20385 QPSK_RB15) -2



BAND 4. Upper Extended Band Edge Plot (3M BW Ch.20385 QPSK_RB15_0) -3



BAND 4. Upper Band Edge Plot (5M BW Ch.20375 QPSK_RB1_Offset 24) -1



BAND 4. Upper Band Edge Plot (5M BW Ch.20375 QPSK_RB25) -2