HCT CO.,LTD

74, Seoicheon-ro 578beon-gil, Majang-myeon, Icheon-si, Gyeonggi-do, 17383, Rep. of KOREA
TEL: +82-31-645-6300 FAX: +82-31-645-6401

FCC LTE REPORT

FCC Certification

Applicant Name:
Franklin Technology Inc.

Address:
906(Gasan-Dong, JEI Platz), 186, Gasan digital 1-ro, Geumcheon-gu, Seoul, Korea(08502)

Date of Issue:
November 26, 2015

Location:
HCT CO., LTD.,
74, Seoicheon-ro 578beon-gil, Majang-myeon, Icheon-si, Gyeonggi-do, 17383, Rep. of KOREA

Report No.: HCT-R-1511-F024
HCT FRN: 0005866421

MODEL: XHG-R850

APPLICANT: Franklin Technology Inc.

FCC Model(s): R850
EUT Type: LTE Mobile Router
FCC Classification: PCS Licensed Transmitter (PCB)
FCC Rule Part(s): §22.917, §2

Mode (MHz)	Tx Frequency (MHz)	Emission Designator	Modulation	ERP	
				Max. Power (W)	Max. Power (dBm)
LTE - Band26 (1.4)	824.7 – 848.3	1M10G7D	QPSK	0.127	21.03
		1M10W7D	16QAM	0.113	20.52
LTE - Band26 (3)	825.5 – 847.5	2M71G7D	QPSK	0.133	21.23
		2M70W7D	16QAM	0.113	20.54
LTE - Band26 (5)	826.5 – 846.5	4M51G7D	QPSK	0.129	21.09
		4M50W7D	16QAM	0.111	20.46
LTE - Band26 (10)	829.0 – 844.0	9M00G7D	QPSK	0.092	19.63
		8M98W7D	16QAM	0.079	18.95
LTE - Band26 (15)	831.5 – 841.5	13M5G7D	QPSK	0.131	21.17
		13M5W7D	16QAM	0.118	20.73

The measurements shown in this report were made in accordance with the procedures specified inCFR47 section§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
: Ki Hyun Kim
Test engineer of RF Team

Approved by
: Sang Jun Lee
Manager of RF Team

Report Revision

TEST REPORT NO.	DATE	DESCRIPTION
HCT-R-1511-F024	November 26, 2015	- First Approval Report

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MEASUREMENT REPORT

1. GENERAL INFORMATION

Applicant Name:	Franklin Technology Inc.
Address:	906(Gasan-Dong, JEI Platz), 186, Gasan digital 1-ro, Geumcheon-gu, Seoul, Korea(08502)
FCC ID:	XHG-R850
Application Type:	Certification
FCC Classification:	PCS Licensed Transmitter (PCB)
FCC Rule Part(s):	§22.917, §2
EUT Type:	LTE Mobile Router
FCC Model(s):	R850
Tx Frequency:	824.7MHz – 848.3 MHz (LTE – Band 26 (1.4 MHz)) 825.5 MHz – 847.5 MHz (LTE – Band 26 (3 MHz)) 826.5 MHz – 846.5 MHz (LTE – Band 26 (5MHz)) 829.0 MHz – 844.0 MHz (LTE – Band 26 (10MHz)) 831.5 MHz – 841.5 MHz (LTE – Band26 (15 MHz))
Max. RF Output Power:	Band 26 (1.4 MHz) : 0.127 W (QPSK) (21.03dBm) 0.113 W (16-QAM) (20.52dBm) Band 26 (3 MHz) : 0.133 W (QPSK) (21.23dBm) 0.113 W (16-QAM) (20.54dBm) Band 26 (5 MHz) : 0.129 W (QPSK) (21.09dBm) 0.111 W (16-QAM) (20.46dBm) Band 26 (10 MHz) : 0.092 W (QPSK) (19.63dBm) 0.079 W (16-QAM) (18.95dBm) Band 26 (15 MHz) : 0.131 W (QPSK) (21.17dBm) 0.118 W (16-QAM) (20.73dBm)
Emission Designator(s):	Band 26 (1.4 MHz) : 1M10G7D (QPSK) / 1M10W7D (16-QAM) Band 26 (3 MHz) : 2M71G7D (QPSK) / 2M70W7D (16-QAM) Band 26 (5 MHz) : 4M51G7D (QPSK) / 4M50W7D (16-QAM) Band 26 (10 MHz) : 9M00G7D (QPSK) / 8M98W7D (16-QAM) Band 26 (15 MHz) : 13M5G7D (QPSK) / 13M5W7D (16-QAM)
Date(s) of Tests:	October 20, 2015 ~ November 25, 2015
Antenna Specification	Manufacturer: Hutec Antenna type: Internal Antenna Peak Gain: Band 26 : 0.88dBi

2. INTRODUCTION

2.1. EUT DESCRIPTION

The Franklin Technology Inc.R850LTE Mobile Router consists of LTE 26.

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, 17383, Rep. of KOREA**.

3. DESCRIPTION OF TESTS

3.1 ERP RADIATED POWER AND RADIATED SPURIOUS EMISSIONS

Note: ERP(Effective 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-D-2010 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 RMS 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;

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

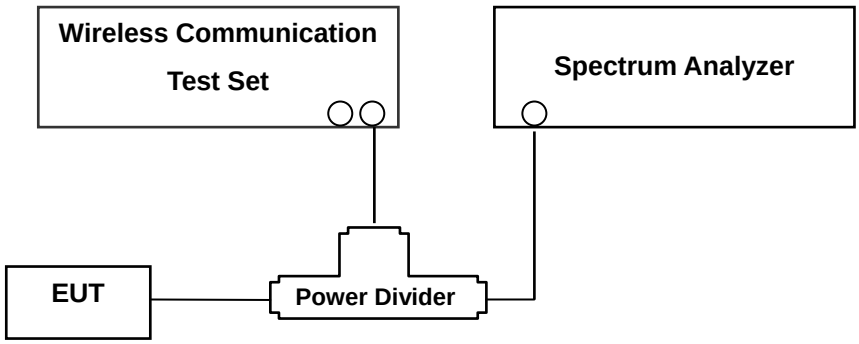
Where: $P_d$is the dipole equivalent power and $P_g$is the generator output power into the substitution antenna.

Radiated spurious emissions

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

3.2OCCUPIED 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.

3.3 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 10^{th} harmonic.

All out of band emissions are measured with a spectrum analyzer connected to the antenna terminal of the EUT while the EUT is operating at its maximum duty cycle, at maximum power, and at the appropriate frequencies. All data rates were investigated to determine the worst case configuration. All modes of operation were investigated and the worst case configuration results are reported in this section.

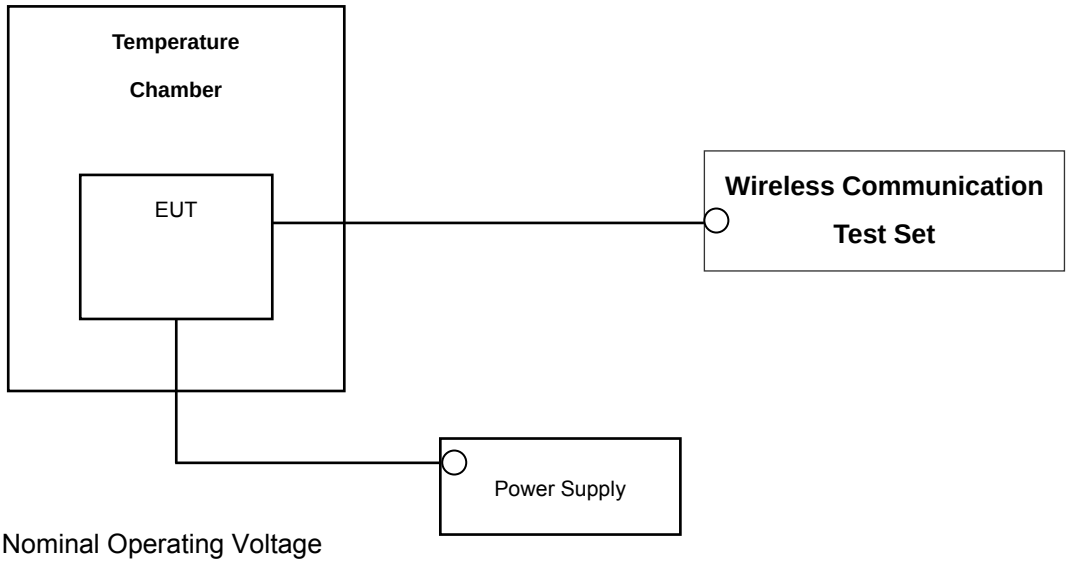
The minimum permissible attenuation level of any spurious emission is43 + $10Log_{10}(P_{[Watts]})$, where P is the transmitter power in Watts.

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

- For LTE Band 26, total offset 26.3dBm = 20 dBm attenuator + 6 dBm Divider + 0.3dBm RF cables.

3.4 FREQUENCY STABILITY / VARIATION OF AMBIENT TEMPERATURE

Test Set-up



* Nominal Operating Voltage

Test Procedure

Frequency stability is tested in accordance with ANSI/TIA-603-D-2010 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 100 % 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 of the transmitter shall be maintained within ± 0.000 25 %(± 2.5 ppm) of the center frequency.

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.

NOTE: The EUT is tested down to the battery endpoint.

4. LIST OF TEST EQUIPMENT

Manufacture	Model/ Equipment	Serial Number	Calibration Interval	Calibration Due
Agilent	N1921A/ Power Sensor	MY45241059	Annual	07/09/2016
Agilent	N1911A/ Power Meter	MY45100523	Annual	07/09/2016
CERNEX	CBLU1183540B-01/POWER AMP	25540	Annual	05/21/2016
Wainwright	WHKX 10-900-1000-15000-40SS/H.P.F	5	Annual	08/11/2016
Wainwright	WHKX10-2700-3000-18000-40SS/H.P.F	3	Annual	08/05/2016
Hewlett Packard	11667B / Power Splitter	10545	Annual	02/16/2016
Hewlett Packard	11667B / Power Splitter	11275	Annual	04/29/2016
ITECH	IT6720/ Power Supply	0100215626700119	Annual	11/02/2016
Schwarzbeck	UHAP/ Dipole Antenna	557	Biennial	03/23/2017
Schwarzbeck	UHAP/ Dipole Antenna	558	Biennial	03/23/2017
EXP	EX-TH400/ Chamber	None	Annual	05/29/2016
Schwarzbeck	BBHA 9120D/ Horn Antenna	9210D-1298	Biennial	10/16/2016
Schwarzbeck	BBHA 9120D/ Horn Antenna	9210D-1299	Biennial	10/16/2016
Schwarzbeck	BBHA 9170/ Horn Antenna(15~40GHz)	BBHA9170342	Biennial	04/30/2017
Schwarzbeck	BBHA 9170/ Horn Antenna(15~35GHz)	BBHA9170124	Biennial	04/30/2017
Agilent	N9020A/Signal Analyzer	MY51110063	Annual	04/29/2016
Hewlett Packard	8493C/ATTENUATOR	17280	Annual	06/29/2016
REOHDE&SCHWARZ	FSV40-N/Signal Analyzer	101068-SZ	Annual	09/23/2016
REOHDE&SCHWARZ	FSV40/Spectrum Analyzer	1307.9002K40-100931-NK	Annual	06/04/2016
Agilent	8960 (E5515C)/ Base Station	MY48360800	Annual	10/30/2016
Anritsu Corp.	MT8820C/Wideband Radio Communication Tester	6200863156	Annual	03/24/2016

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, 22.917(a)	Band Edge / Spurious and Harmonic Emissions at Antenna Terminal.	<43 + 10log$_{10}$ (P[Watts]) at Band Edge and for all out-of-band emissions		PASS
2.1046	*Conducted Output Power	N/A		PASS
2.1055, 22.355	Frequency stability / variation of ambient temperature	< 2.5 ppm		PASS
22.913(a)(2)	Effective Radiated Power	<7 Watts	RADIATED	PASS
2.1053, 22.917(a)	Undesirable Emissions	< 43 + 10log$_{10}$ (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 Band26	26865	831.5	-33.04	28.94	-10.56	0.89	V	0.056	17.49

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

1) The EUT mounted on a wooden tripod is 2.5 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

5MHz Bandwidth
Emission Designator = 4M48G7D
LTE BW = 4.48 MHz
G = Phase Modulation
7 = Quantized/Digital Info
D = Data transmission; telemetry; telecommand

10MHz Bandwidth
Emission Designator = 8M95G7D
LTE BW = 8.95 MHz
G = Phase Modulation
7 = Quantized/Digital Info
D = Data transmission; telemetry; telecommand

16QAM Modulation

5MHz Bandwidth
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

10MHz Bandwidth
Emission Designator = 8M95W7D
LTE BW = 8.95 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 (Band 26)

Freq (MHz)	Bandwidth	Modulation	Measured Level (dBm)	Substitude Level (dBm)	Ant. Gain(dBd)	C.L	Pol	ERP	
								W	dBm
824.7	1.4 MHz	QPSK	-32.76	28.92	-10.23	0.88	H	0.060	17.81
		16-QAM	-33.46	28.22	-10.23	0.88	H	0.051	17.11
836.5		QPSK	-29.31	32.12	-10.20	0.89	H	0.127	21.03
		16-QAM	-29.82	31.61	-10.20	0.89	H	0.113	20.52
848.3		QPSK	-31.28	29.68	-10.49	0.89	H	0.068	18.30
		16-QAM	-32.01	28.95	-10.49	0.89	H	0.057	17.57

Effective Radiated Power Data (1.4 MHz Band 26 LTE)

Note: All of RB size has been tested for emissions and ERP, with the 1RB configuration observed as the worst case

Freq (MHz)	Bandwidth	Modulation	Measured Level (dBm)	Substitude Level (dBm)	Ant. Gain(dBd)	C.L	Pol	ERP	
								W	dBm
825.5	3 MHz	QPSK	-32.77	28.92	-10.22	0.88	H	0.060	17.82
		16-QAM	-33.39	28.30	-10.22	0.88	H	0.052	17.20
836.5		QPSK	-29.11	32.32	-10.20	0.89	H	0.133	21.23
		16-QAM	-29.80	31.63	-10.20	0.89	H	0.113	20.54
847.5		QPSK	-30.96	30.11	-10.50	0.89	H	0.074	18.72
		16-QAM	-31.67	29.40	-10.50	0.89	H	0.063	18.01

Effective Radiated Power Data (3 MHz Band 26 LTE)

Note: All of RB size has been tested for emissions and ERP, with the 1RB configuration observed as the worst case

Freq (MHz)	Bandwidth	Modulation	Measured Level (dBm)	Substitude Level (dBm)	Ant. Gain(dBd)	C.L	Pol	ERP	
								W	dBm
826.5	5 MHz	QPSK	-33.05	28.63	-10.22	0.88	H	0.057	17.53
		16-QAM	-33.91	27.77	-10.22	0.88	H	0.046	16.67
836.5		QPSK	-29.25	32.18	-10.20	0.89	H	0.129	21.09
		16-QAM	-29.88	31.55	-10.20	0.89	H	0.111	20.46
846.5		QPSK	-33.23	28.16	-10.51	0.89	H	0.047	16.76
		16-QAM	-33.90	27.49	-10.51	0.89	H	0.041	16.09

Effective Radiated Power Data (5 MHz Band 26 LTE)

Note: All of RB size has been tested for emissions and ERP, with the 1RB configuration observed as the worst case

Freq (MHz)	Bandwidth	Modulation	Measured Level (dBm)	Substitude Level (dBm)	Ant. Gain(dBd)	C.L	Pol	ERP	
								W	dBm
829.0	10 MHz	QPSK	-33.01	28.64	-10.21	0.88	H	0.057	17.55
		16-QAM	-33.88	27.77	-10.21	0.88	H	0.047	16.68
836.5		QPSK	-30.71	30.72	-10.20	0.89	H	0.092	19.63
		16-QAM	-31.39	30.04	-10.20	0.89	H	0.079	18.95
844.0		QPSK	-32.59	28.93	-10.52	0.89	H	0.056	17.52
		16-QAM	-33.13	28.39	-10.52	0.89	H	0.050	16.98

Effective Radiated Power Data (10 MHz Band 26 LTE)

Note: All of RB size has been tested for emissions and ERP, with the 1RB configuration observed as the worst case

Freq (MHz)	Bandwidth	Modulation	Measured Level (dBm)	Substitude Level (dBm)	Ant. Gain(dBd)	C.L	Pol	ERP	
								W	dBm
831.5	15 MHz	QPSK	-32.93	28.59	-10.21	0.89	H	0.056	17.49
		16-QAM	-33.67	27.85	-10.21	0.89	H	0.047	16.75
836.5		QPSK	-32.78	28.65	-10.20	0.89	H	0.057	17.56
		16-QAM	-33.47	27.96	-10.20	0.89	H	0.049	16.87
841.5		QPSK	-29.10	32.60	-10.54	0.89	H	0.131	21.17
		16-QAM	-29.54	32.16	-10.54	0.89	H	0.118	20.73

Effective Radiated Power Data (15 MHz Band 26 LTE)

Note: All of RB size has been tested for emissions and ERP, with the 1RB configuration observed as the worst case

NOTES:

Effective Radiated Power Output Measurements by Substitution Method according to ANSI/TIA/EIA-603-D-2010June 24, 2010:

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.For LTE signals, RBW = 1-5% of the OBW,not to exceed 1MHz, VBW ≥ 3 x RBW, Detector = RMS. A half-wave dipole was substituted in place of the EUT. This dipole antenna was driven by a signal generator and thelevel of the signal generator was adjusted to obtain the same receive spectrum analyzer reading. The conducted powerat 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 ofthe EUT is z plane in LTE mode. Also worst case of detecting Antenna is horizontal polarization in LTE mode.

7.2RADIATED SPURIOUS EMISSIONS

7.2.1 RADIATED SPURIOUS EMISSIONS (1.4 MHz Band 26 LTE)

▣OPERATING FREQUENTY: 836.50 MHz

▣ MEASURED OUTPUT POWER: 21.03dBm = 0.127 W

▣ MODULATION SIGNAL: 1.4 MHz QPSK

▣ DISTANCE: 3 meters

▣ LIMIT: 43 + 10 lo_{g10} (W) = 34.03dBc

Ch	Freq (MHz)	Measured Level (dBm)	Ant. Gain (dBd)	Substitude Level (dBm)	C.L	Pol	ERP (dBm)	dBc
26797 (824.7)	1,649.40	-40.68	9.16	-52.90	1.38	V	-45.12	66.15
	2,474.10	-45.47	10.92	-54.35	1.69	H	-45.12	66.15
	3,298.80	-52.00	11.94	-59.25	1.98	H	-49.29	70.32
26915 (836.5)	1,673.00	-45.47	9.21	-58.04	1.39	V	-50.22	71.25
	2,509.50	-43.56	10.96	-52.72	1.69	V	-43.45	64.48
	3,346.00	-51.75	12.03	-59.65	1.95	V	-49.57	70.60
27033 (848.3)	1,696.60	-45.50	9.32	-58.12	1.40	H	-50.20	71.23
	2,544.90	-44.04	10.99	-53.03	1.72	V	-43.76	64.79
	3,393.20	-50.46	12.13	-57.76	1.99	V	-47.62	68.65

NOTES:

1. Radiated Spurious Emission Measurements at 3 meters by Substitution Method according to ANSI/TIA/EIA-603-D-2010June 24, 2010:
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. All of RB size has been tested for emissions and ERP, with the 1RB configuration observed as the worst case
5. We are performed 16QAM and QPSK modulations. The worst case data are reported in the table above.

7.2.2 RADIATED SPURIOUS EMISSIONS (3 MHz Band 26 LTE)

▣OPERATING FREQUENTY: 836.50 MHz

▣ MEASURED OUTPUT POWER: 21.23dBm = 0.133 W

▣ MODULATION SIGNAL: 3 MHz QPSK

▣ DISTANCE: 3 meters

▣ LIMIT: 43 + 10 lo_{g10} (W) = 34.23dBc

Ch	Freq (MHz)	Measured Level (dBm)	Ant. Gain (dBd)	Substitude Level (dBm)	C.L	Pol	ERP (dBm)	dBc
26805 (825.5)	1,651.00	-41.09	9.16	-53.33	1.38	V	-45.55	66.78
	2,476.50	-45.58	10.93	-54.55	1.69	V	-45.31	66.54
	3,302.00	-51.99	11.94	-59.31	1.98	V	-49.35	70.58
26915 (836.5)	1,673.00	-47.22	9.21	-59.79	1.39	H	-51.97	73.20
	2,509.50	-40.94	10.96	-50.10	1.69	H	-40.83	62.06
	3,346.00	-49.75	12.03	-57.65	1.95	V	-47.57	68.80
27025 (847.5)	1,695.00	-47.47	9.32	-60.09	1.40	H	-52.17	73.40
	2,542.50	-41.10	10.98	-50.08	1.72	V	-40.82	62.05
	3,390.00	-47.72	12.13	-55.02	1.99	V	-44.88	66.11

NOTES:

1. Radiated Spurious Emission Measurements at 3 meters by Substitution Method according to ANSI/TIA/EIA-603-D-2010June 24, 2010:
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. All of RB size has been tested for emissions and ERP, with the 1RB configuration observed as the worst case
5. We are performed 16QAM and QPSK modulations. The worst case data are reported in the table above.

7.2.3 RADIATED SPURIOUS EMISSIONS (5 MHz Band 26 LTE)

▣OPERATING FREQUENTY: 836.50 MHz

▣ MEASURED OUTPUT POWER: 21.09dBm = 0.129 W

▣ MODULATION SIGNAL: 5 MHz QPSK

▣ DISTANCE: 3 meters

▣ LIMIT: 43 + 10 lo_{g10} (W) = 34.09dBc

Ch	Freq (MHz)	Measured Level (dBm)	Ant. Gain (dBd)	Substitude Level (dBm)	C.L	Pol	ERP (dBm)	dBc
26815 (826.5)	1,653.00	-40.91	9.17	-53.20	1.38	V	-45.41	66.50
	2,479.50	-45.49	10.93	-54.58	1.69	V	-45.34	66.43
	3,306.00	-50.11	11.95	-57.58	1.99	H	-47.62	68.71
26915 (836.5)	1,673.00	-47.66	9.21	-60.23	1.39	H	-52.41	73.50
	2,509.50	-39.60	10.96	-48.76	1.69	V	-39.49	60.58
	3,346.00	-48.37	12.03	-56.27	1.95	H	-46.19	67.28
27015 (846.5)	1,693.00	-42.76	9.30	-55.20	1.40	H	-47.30	68.39
	2,539.50	-42.03	10.98	-51.11	1.72	H	-41.85	62.94
	3,386.00	-52.99	12.12	-60.39	1.99	H	-50.26	71.35

NOTES:

1. Radiated Spurious Emission Measurements at 3 meters by Substitution Method according to ANSI/TIA/EIA-603-D-2010June 24, 2010:
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. All of RB size has been tested for emissions and ERP, with the 1RB configuration observed as the worst case
5. We are performed 16QAM and QPSK modulations. The worst case data are reported in the table above.

7.2.4 RADIATED SPURIOUS EMISSIONS (10 MHz Band 26 LTE)

▣OPERATING FREQUENTY: 836.50 MHz

▣ MEASURED OUTPUT POWER: 19.63dBm = 0.092 W

▣ MODULATION SIGNAL: 10 MHz QPSK

▣ DISTANCE: 3 meters

▣ LIMIT: 43 + 10 lo_{g10} (W) = 32.63dBc

Ch	Freq (MHz)	Measured Level (dBm)	Ant. Gain (dBd)	Substitude Level (dBm)	C.L	Pol	ERP (dBm)	dBc
26840 (829.0)	1,658.00	-40.32	9.15	-52.62	1.38	V	-44.85	64.48
	2,487.00	-44.99	10.92	-53.80	1.69	V	-44.57	64.20
	3,316.00	-52.21	11.93	-59.45	1.98	V	-49.50	69.13
26915 (836.5)	1,673.00	-43.36	9.21	-55.93	1.39	H	-48.11	67.74
	2,509.50	-40.90	10.96	-50.06	1.69	H	-40.79	60.42
	3,346.00	-52.25	12.03	-60.15	1.95	H	-50.07	69.70
26990 (844.0)	1,688.00	-41.50	9.30	-53.94	1.40	V	-46.04	65.67
	2,532.00	-48.01	10.98	-56.45	1.71	V	-47.18	66.81
	3,376.00	-52.06	12.11	-59.55	1.99	H	-49.43	69.06

NOTES:

1. Radiated Spurious Emission Measurements at 3 meters by Substitution Method according to ANSI/TIA/EIA-603-D-2010June 24, 2010:
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. All of RB size has been tested for emissions and ERP, with the 1RB configuration observed as the worst case
5. We are performed 16QAM and QPSK modulations. The worst case data are reported in the table above.

7.2.5 RADIATED SPURIOUS EMISSIONS (15 MHz Band 26 LTE)

▣OPERATING FREQUENTY: 841.50 MHz

▣ MEASURED OUTPUT POWER: 21.17dBm = 0.131 W

▣ MODULATION SIGNAL: 15 MHz QPSK

▣ DISTANCE: 3 meters

▣ LIMIT: 43 + 10 lo_{g10} (W) = 34.17dBc

Ch	Freq (MHz)	Measured Level (dBm)	Ant. Gain (dBd)	Substitude Level (dBm)	C.L	Pol	ERP (dBm)	dBc
26865 (831.5)	1,663.00	-40.73	9.21	-53.28	1.39	V	-45.46	66.63
	2,494.50	-45.16	10.94	-53.90	1.69	H	-44.65	65.82
	3,326.00	-52.67	11.99	-60.46	1.99	H	-50.46	71.63
26915 (836.5)	1,673.00	-43.00	9.21	-55.57	1.39	V	-47.75	68.92
	2,509.50	-46.10	10.96	-55.26	1.69	V	-45.99	67.16
	3,346.00	-53.01	12.03	-60.91	1.95	H	-50.83	72.00
26965 (841.5)	1,683.00	-47.63	9.27	-60.19	1.40	H	-52.32	73.49
	2,524.50	-41.22	10.97	-49.85	1.71	V	-40.59	61.76
	3,366.00	-49.93	12.09	-57.58	1.95	V	-47.44	68.61

NOTES:

1. Radiated Spurious Emission Measurements at 3 meters by Substitution Method according to ANSI/TIA/EIA-603-D-2010June 24, 2010:
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. All of RB size has been tested for emissions and ERP, with the 1RB configuration observed as the worst case
5. We are performed 16QAM and QPSK modulations. The worst case data are reported in the table above.

7.3OCCUPIED BANDWIDTH

Band	Band Width	Frequency (MHz)	Modulation	Resource Block Size	Resource Block Offset	Data (MHz)
Band 26	1.4 MHz	836.5	QPSK	6	0	1.0973
			16-QAM	6	0	1.0960
	3 MHz		QPSK	15	0	2.7051
			16-QAM	15	0	2.7012
	5 MHz		QPSK	25	0	4.5056
			16-QAM	25	0	4.5015
	10 MHz		QPSK	50	0	9.0032
			16-QAM	50	0	8.9771
	15 MHz		QPSK	75	0	13.5140
			16-QAM	75	0	13.5020

- Plots of the EUT's Occupied Bandwidth are shown Page 29~ 33.

7.4CONDUCTED SPURIOUS EMISSIONS

Band	Band Width (MHz)	Frequency (MHz)	Modulation	Resource Block Size	Resource Block Offset	Frequency of Maximum Harmonic (GHz)	Maximum Data [dBm]
Band 26	1.4	824.7	QPSK	1	0	3.174519	-32.266
		836.5				2.684974	-31.764
		848.3				3.058718	-32.020
	3	825.5				9.406000	-32.315
		836.5				5.819000	-33.035
		847.5				3.063191	-32.383
	5	826.5				9.346500	-32.361
		836.5				2.669567	-32.380
		846.5				3.161597	-32.153
	10	829.0				2.651178	-32.157
		836.5				3.243105	-31.760
		844.0				3.031383	-32.299
	15	831.5				3.154639	-31.942
		836.5				3.165076	-32.382
		841.5				2.551281	-32.372

- Plots of the EUT's Conducted Spurious Emissions are shown Page 49 ~ 63.

7.4.1 BAND EDGE

- Plots of the EUT's Band Edge are shown Page 34 ~ 48.

7.5 FREQUENCY STABILITY / VARIATION OF AMBIENT TEMPERATURE

7.5.1 FREQUENCY STABILITY (1.4 MHz Band 26 LTE)

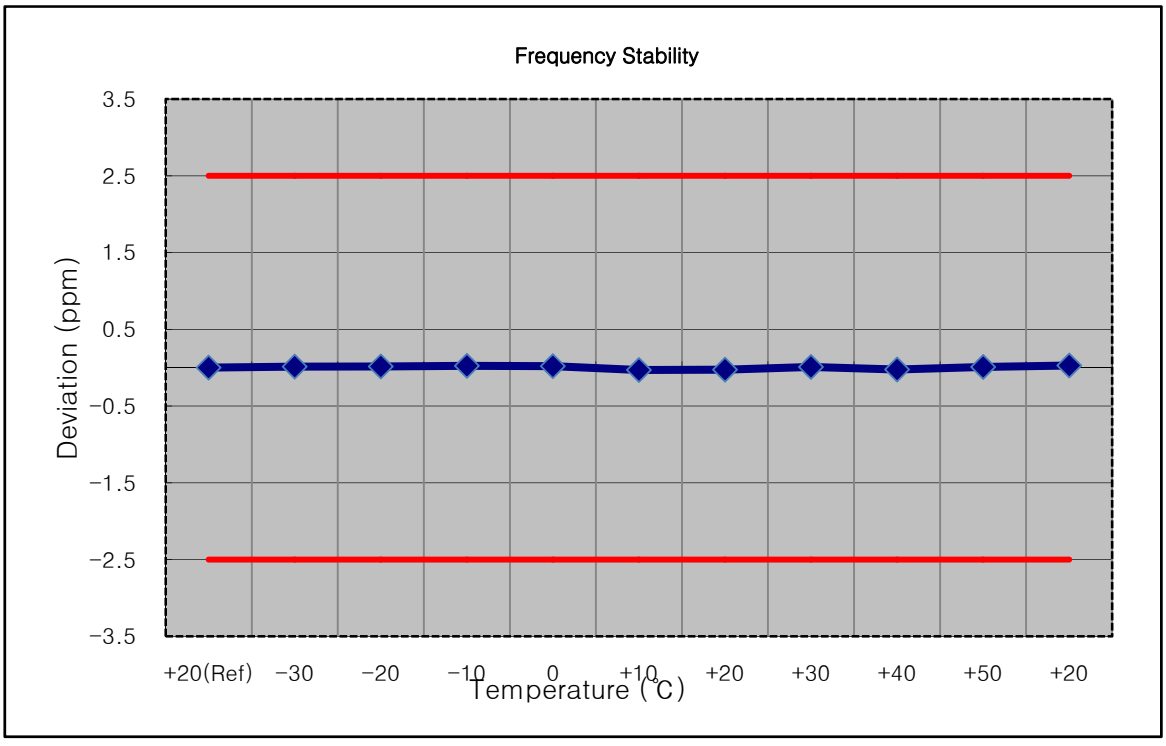
▣OPERATING FREQUENCY: 836,500,000 Hz

▣CHANNEL: 26915(1.4 MHz)

▣REFERENCE VOLTAGE: 4.00 VDC

▣DEVIATION LIMIT: ± 0.000 25 % or 2.5 ppm

Voltage (%)	Power (VDC)	Temp. (℃)	Frequency (Hz)	Frequency Error (Hz)	Deviation (%)	ppm
100%	4.00	+20(Ref)	836 500 023	0.0	0.000 000	0.000
100%		-30	836 500 035	11.8	0.000 001	0.014
100%		-20	836 500 037	13.1	0.000 002	0.016
100%		-10	836 500 043	19.6	0.000 002	0.023
100%		0	836 500 039	15.7	0.000 002	0.019
100%		+10	836 499 997	-26.0	-0.000 003	-0.031
100%		+30	836 500 001	-22.5	-0.000 003	-0.027
100%		+40	836 500 032	8.5	0.000 001	0.010
100%		+50	836 500 004	-19.5	-0.000 002	-0.023
Batt. Endpoint	3.75	+20	836 500 032	8.2	0.000 001	0.010



7.5.2 FREQUENCY STABILITY (3 MHz Band 26 LTE)

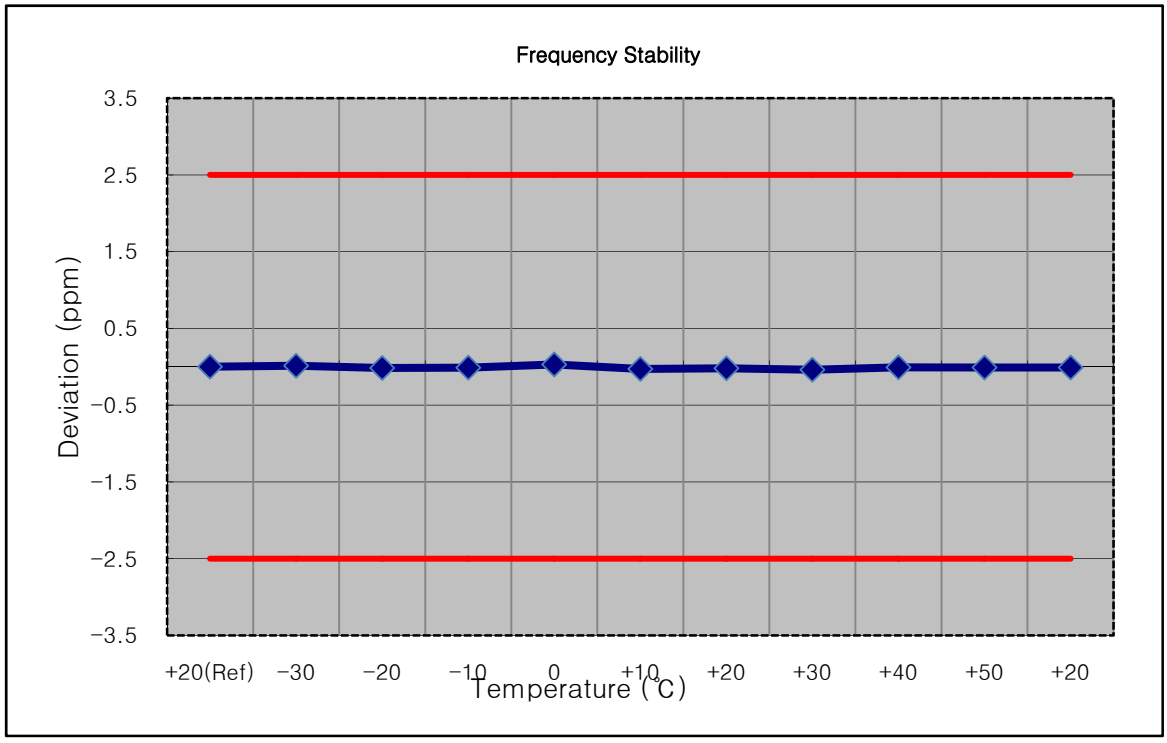
▣OPERATING FREQUENCY: 836,500,000 Hz

▣CHANNEL: 26915(3 MHz)

▣REFERENCE VOLTAGE: 4.00 VDC

▣DEVIATION LIMIT: ± 0.000 25 % or 2.5 ppm

Voltage (%)	Power (VDC)	Temp. (℃)	Frequency (Hz)	Frequency Error (Hz)	Deviation (%)	ppm
100%	4.00	+20(Ref)	836 499 968	0.0	0.000 000	0.000
100%		-30	836 499 980	11.5	0.000 001	0.014
100%		-20	836 499 956	-12.5	-0.000 001	-0.015
100%		-10	836 499 958	-10.3	-0.000 001	-0.012
100%		0	836 499 993	24.7	0.000 003	0.030
100%		+10	836 499 945	-23.4	-0.000 003	-0.028
100%		+30	836 499 951	-17.2	-0.000 002	-0.021
100%		+40	836 499 935	-32.8	-0.000 004	-0.039
100%		+50	836 499 962	-6.6	-0.000 001	-0.008
Batt. Endpoint	3.75	+20	836 499 961	-7.7	-0.000 001	-0.009



7.5.3

7.5.3 FREQUENCY STABILITY (5 MHz Band 26 LTE)

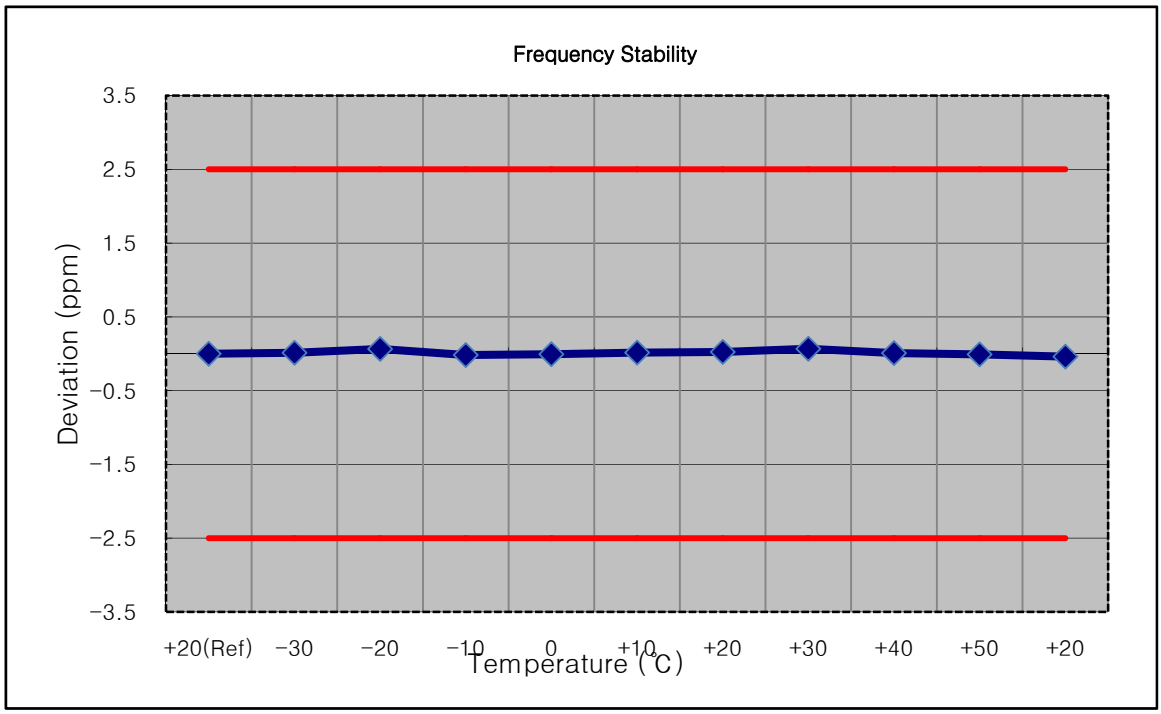
▣OPERATING FREQUENCY: 836,500,000 Hz

▣CHANNEL: 26915(5 MHz)

▣REFERENCE VOLTAGE: 4.00 VDC

▣DEVIATION LIMIT: ± 0.000 25 % or 2.5 ppm

Voltage (%)	Power (VDC)	Temp. (℃)	Frequency (Hz)	Frequency Error (Hz)	Deviation (%)	ppm
100%	4.00	+20(Ref)	836 500 068	0.0	0.000 000	0.000
100%		-30	836 500 078	10.5	0.000 001	0.013
100%		-20	836 500 122	54.7	0.000 007	0.065
100%		-10	836 500 054	-13.4	-0.000 002	-0.016
100%		0	836 500 063	-4.4	-0.000 001	-0.005
100%		+10	836 500 080	12.2	0.000 001	0.015
100%		+30	836 500 088	20.7	0.000 002	0.025
100%		+40	836 500 124	56.1	0.000 007	0.067
100%		+50	836 500 075	7.0	0.000 001	0.008
Batt. Endpoint	3.75	+20	836 500 060	-7.3	-0.000 001	-0.009



7.5.4 FREQUENCY STABILITY (10 MHz Band 26 LTE)

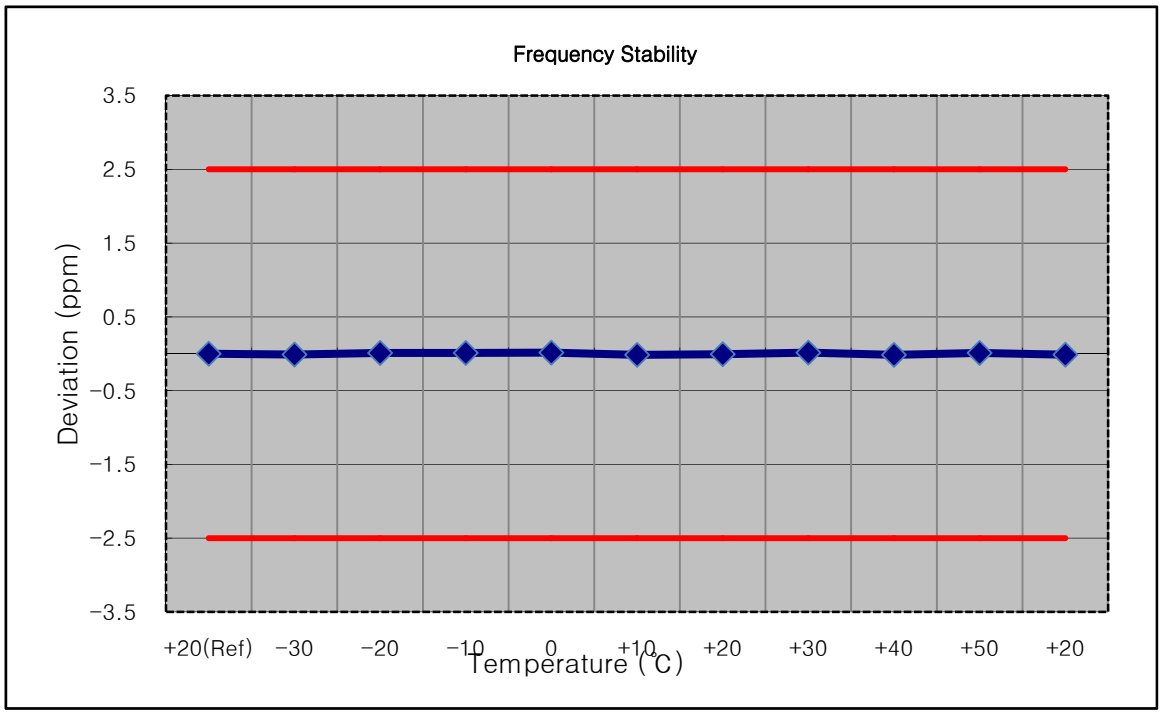
▣OPERATING FREQUENCY: 836,500,000 Hz

▣CHANNEL: 26915(10 MHz)

▣REFERENCE VOLTAGE: 4.00 VDC

▣DEVIATION LIMIT: ± 0.000 25 % or 2.5 ppm

Voltage (%)	Power (VDC)	Temp. (℃)	Frequency (Hz)	Frequency Error (Hz)	Deviation (%)	ppm
100%	4.00	+20(Ref)	836 499 984	0.0	0.000 000	0.000
100%		-30	836 499 975	-8.3	-0.000 001	-0.010
100%		-20	836 499 993	9.0	0.000 001	0.011
100%		-10	836 499 994	9.8	0.000 001	0.012
100%		0	836 499 996	12.5	0.000 001	0.015
100%		+10	836 499 972	-11.7	-0.000 001	-0.014
100%		+30	836 499 978	-5.3	-0.000 001	-0.006
100%		+40	836 499 997	12.9	0.000 002	0.015
100%		+50	836 499 971	-12.5	-0.000 001	-0.015
Batt. Endpoint	3.75	+20	836 499 993	9.5	0.000 001	0.011



7.5.5 FREQUENCY STABILITY (15 MHz Band 26 LTE)

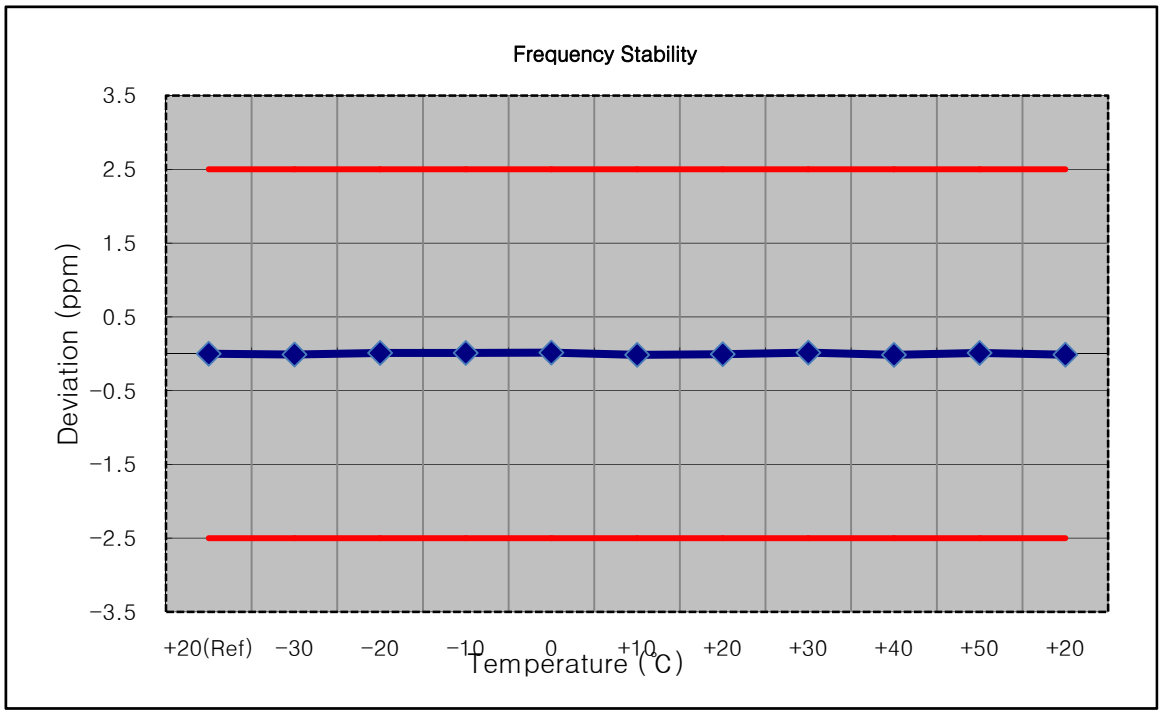
▣OPERATING FREQUENCY: 836,500,000 Hz

▣CHANNEL: 26915 (15 MHz)

▣REFERENCE VOLTAGE: 4.00 VDC

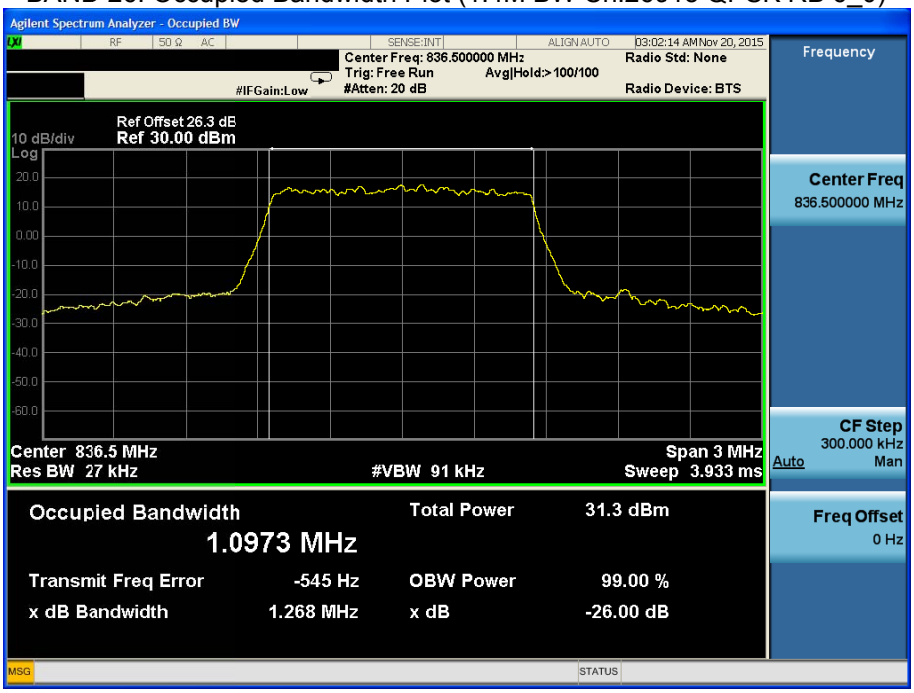
▣DEVIATION LIMIT: ± 0.000 25 % or 2.5 ppm

Voltage (%)	Power (VDC)	Temp. (℃)	Frequency (Hz)	Frequency Error (Hz)	Deviation (%)	ppm
100%	4.00	+20(Ref)	836 499 969	0.0	0.000 000	0.000
100%		-30	836 499 975	5.9	0.000 001	0.007
100%		-20	836 499 977	7.8	0.000 001	0.009
100%		-10	836 499 959	-10.1	-0.000 001	-0.012
100%		0	836 499 959	-10.0	-0.000 001	-0.012
100%		+10	836 499 963	-6.5	-0.000 001	-0.008
100%		+30	836 499 978	9.1	0.000 001	0.011
100%		+40	836 499 950	-19.3	-0.000 002	-0.023
100%		+50	836 499 955	-13.9	-0.000 002	-0.017
Batt. Endpoint	3.75	+20	836 499 981	12.2	0.000 001	0.015



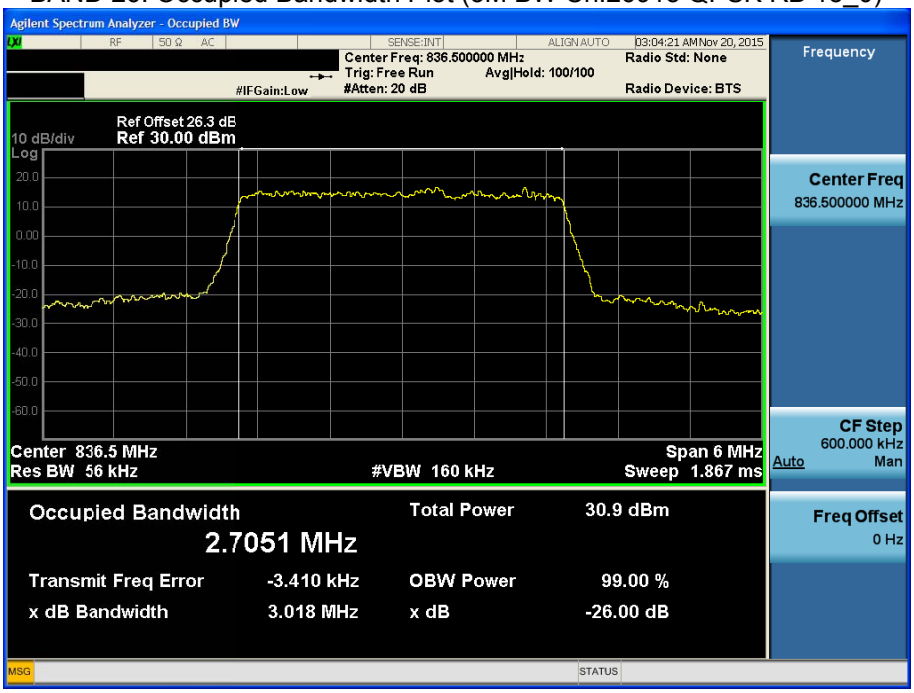
8. TEST PLOTS

BAND 26. Occupied Bandwidth Plot (1.4M BW Ch.26915 QPSK RB 6_0)

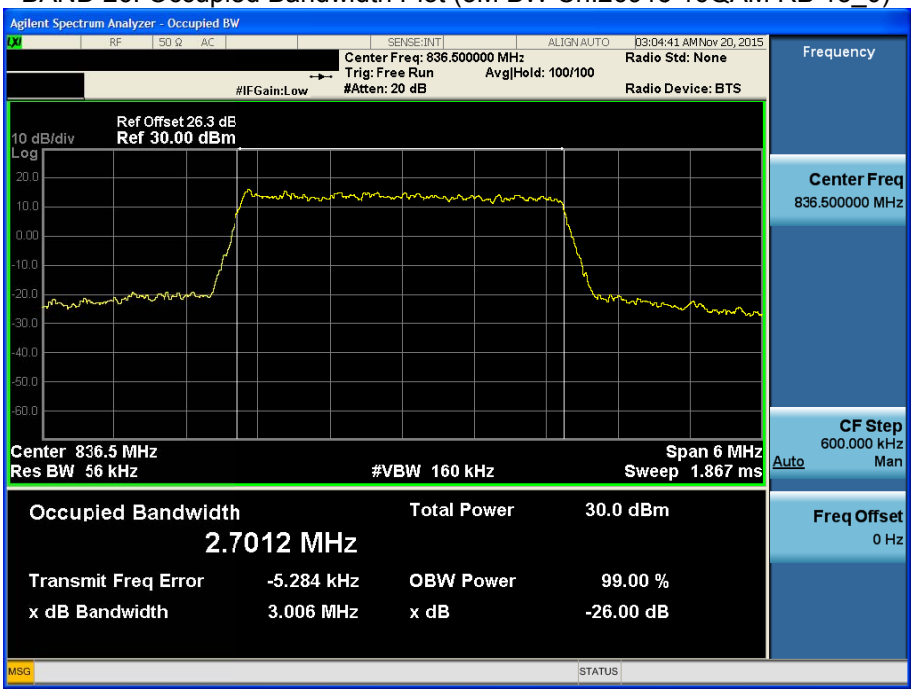


BAND 26. Occupied Bandwidth Plot (1.4M BW Ch.26915 16QAM RB 6_0)

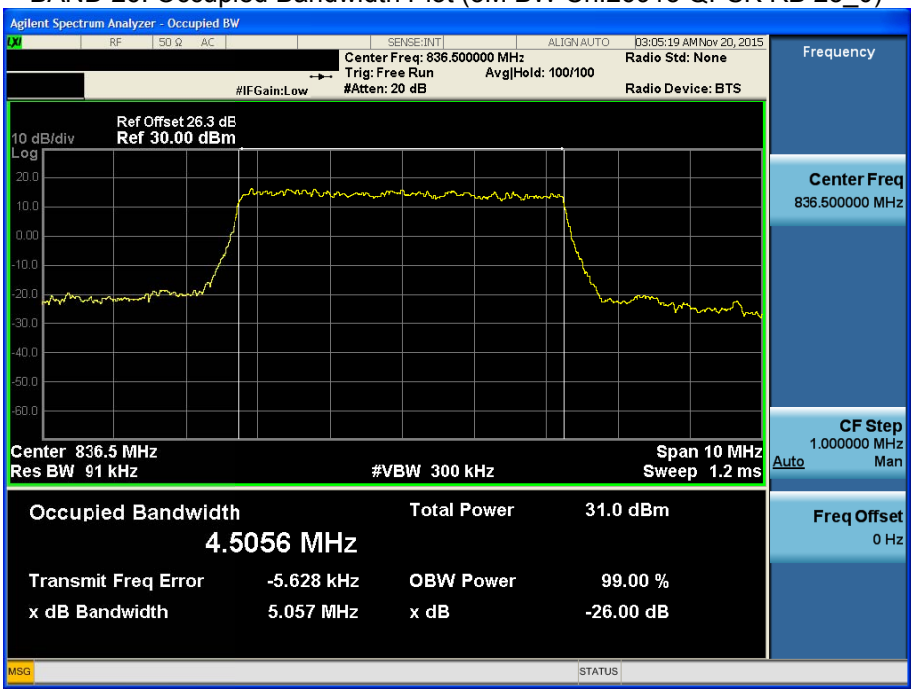
BAND 26. Occupied Bandwidth Plot (3M BW Ch.26915 QPSK RB 15_0)



BAND 26. Occupied Bandwidth Plot (3M BW Ch.26915 16QAM RB 15_0)



BAND 26. Occupied Bandwidth Plot (5M BW Ch.26915 QPSK RB 25_0)



BAND 26. Occupied Bandwidth Plot (5M BW Ch.26915 16QAM RB 25_0)

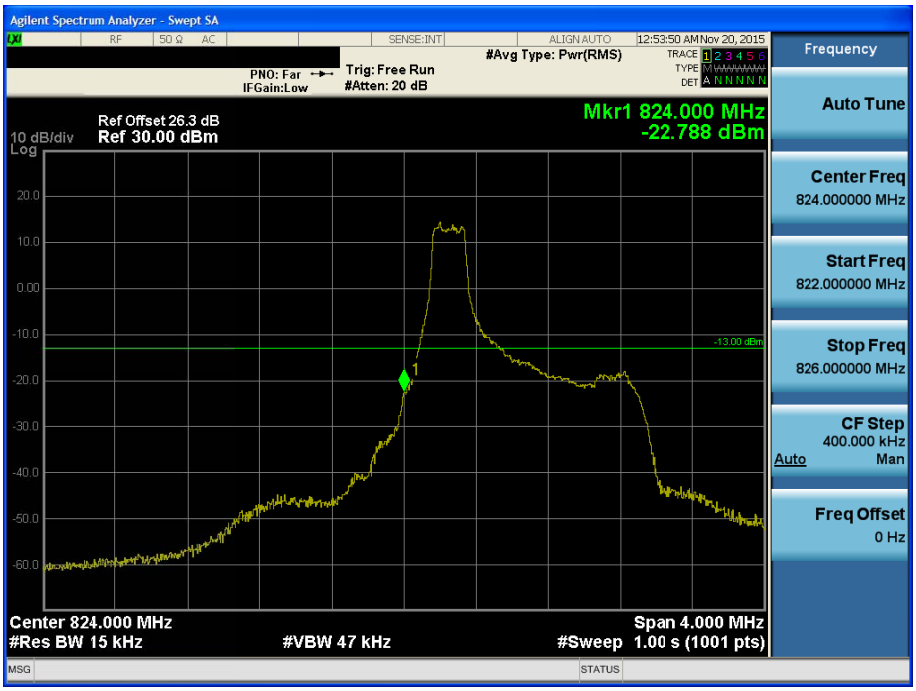
BAND 26. Occupied Bandwidth Plot (10M BW Ch.26915 QPSK RB 50_0)

BAND 26. Occupied Bandwidth Plot (10M BW Ch.26915 16QAM RB 50_0)

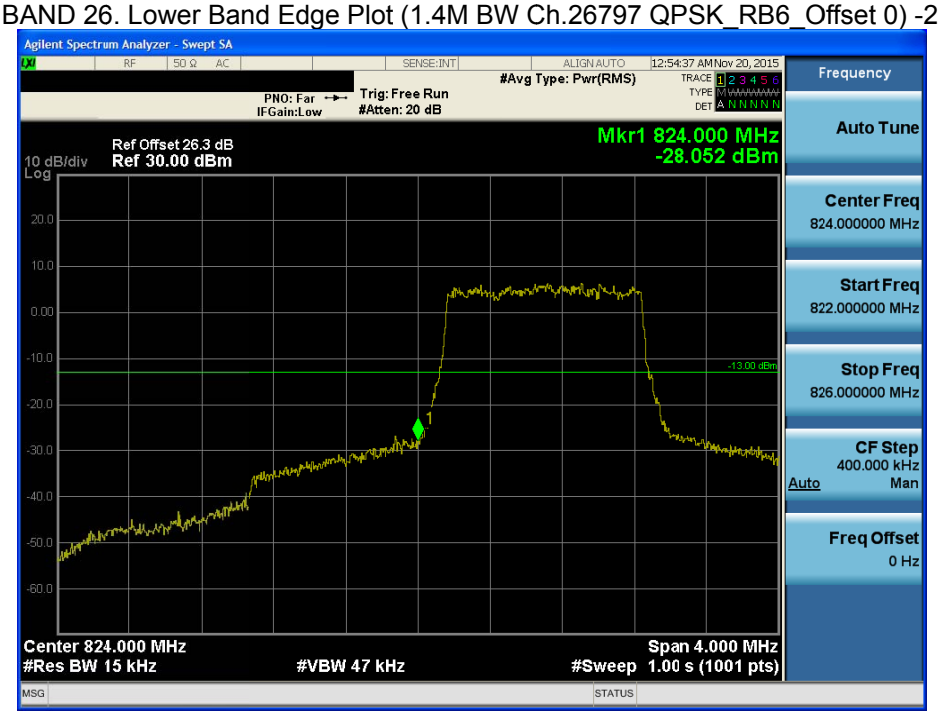
BAND 26. Occupied Bandwidth Plot (15M BW Ch.26915 QPSK RB 75_0)

BAND 26. Occupied Bandwidth Plot (15M BW Ch. 26915 16QAM RB 75_0)

BAND 26. Lower Band Edge Plot (1.4M BW Ch.26797 QPSK_RB1_Offset 0) -1

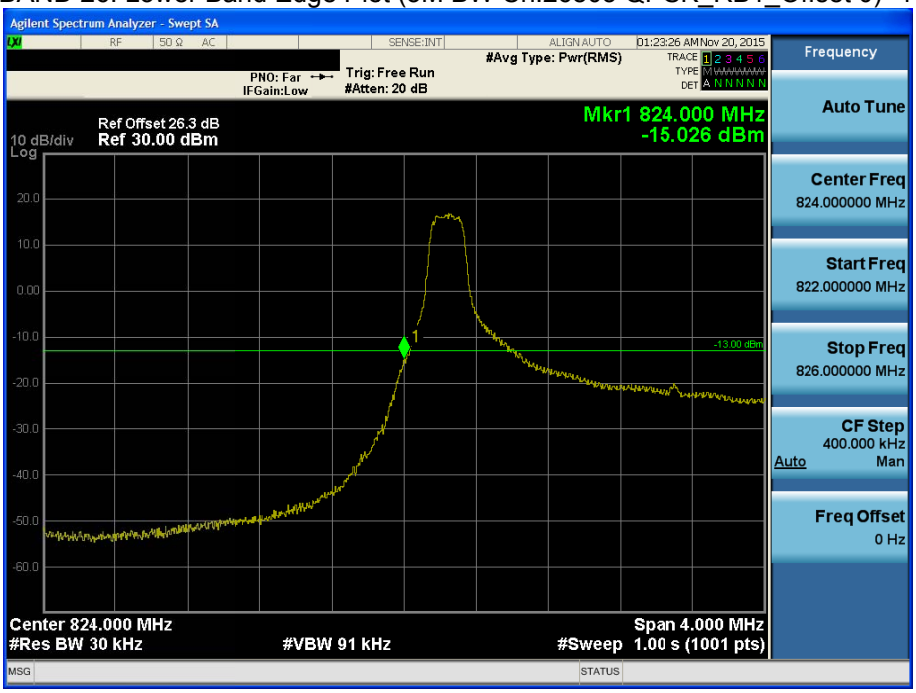


BAND 26. Lower Band Edge Plot (1.4M BW Ch.26797 QPSK_RB6_Offset 0) -2



BAND 26. Lower Extended Band Edge Plot (1.4M BW Ch.26797 QPSK_RB6_0) -3

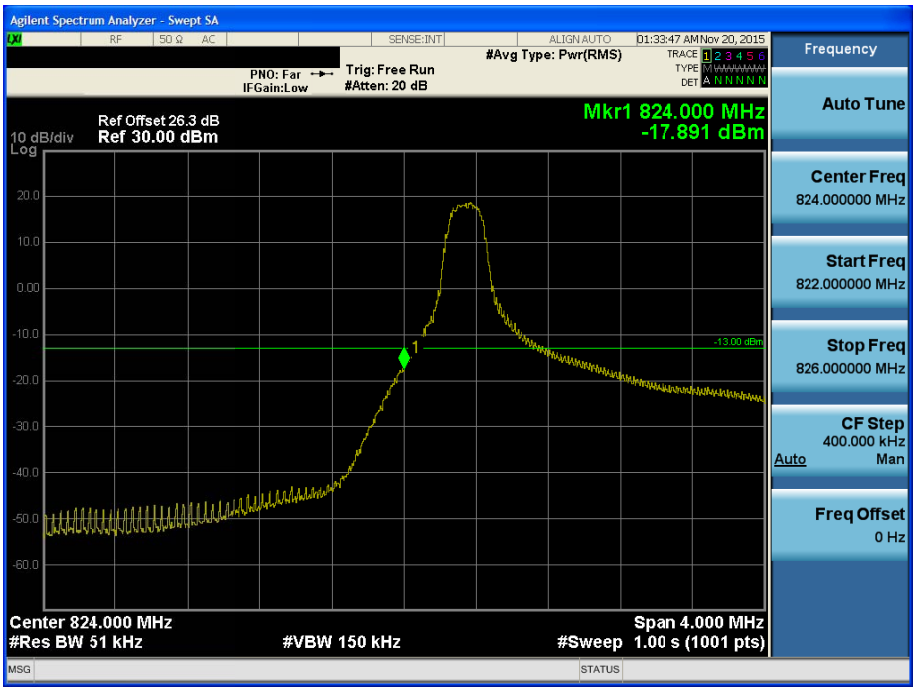
BAND 26. Lower Band Edge Plot (3M BW Ch.26805 QPSK_RB1_Offset 0) -1



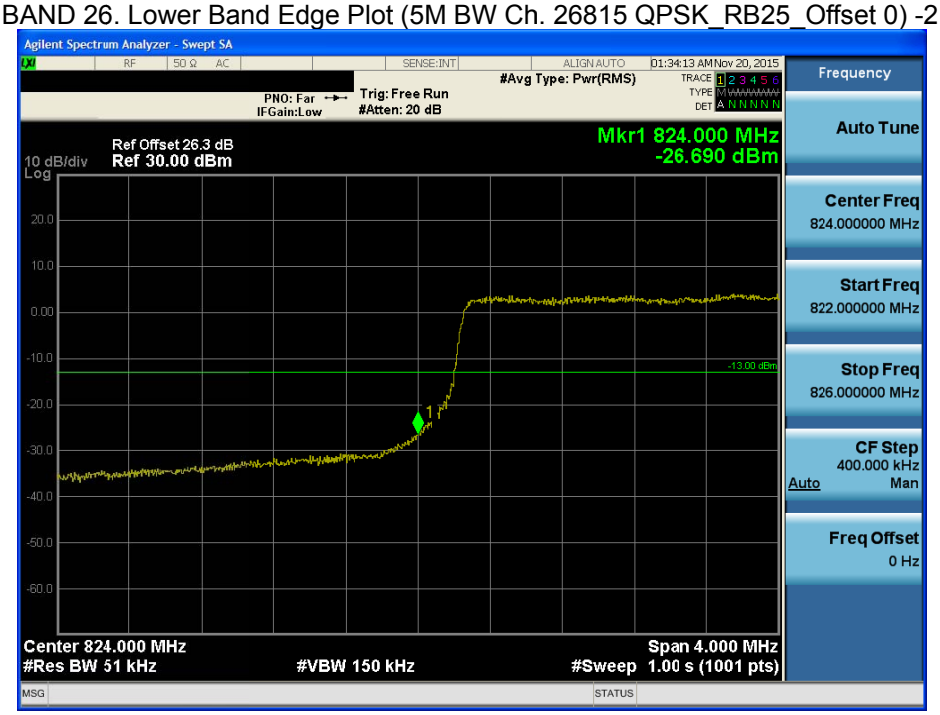
BAND 26. Lower Band Edge Plot (3M BW Ch. 26805 QPSK_RB15_Offset 0) -2

BAND 26. Lower Extended Band Edge Plot (3M BW Ch. 26805 QPSK_RB15_0) -3

BAND 26. Lower Band Edge Plot (5M BW Ch.26815 QPSK_RB1_Offset 0) -1

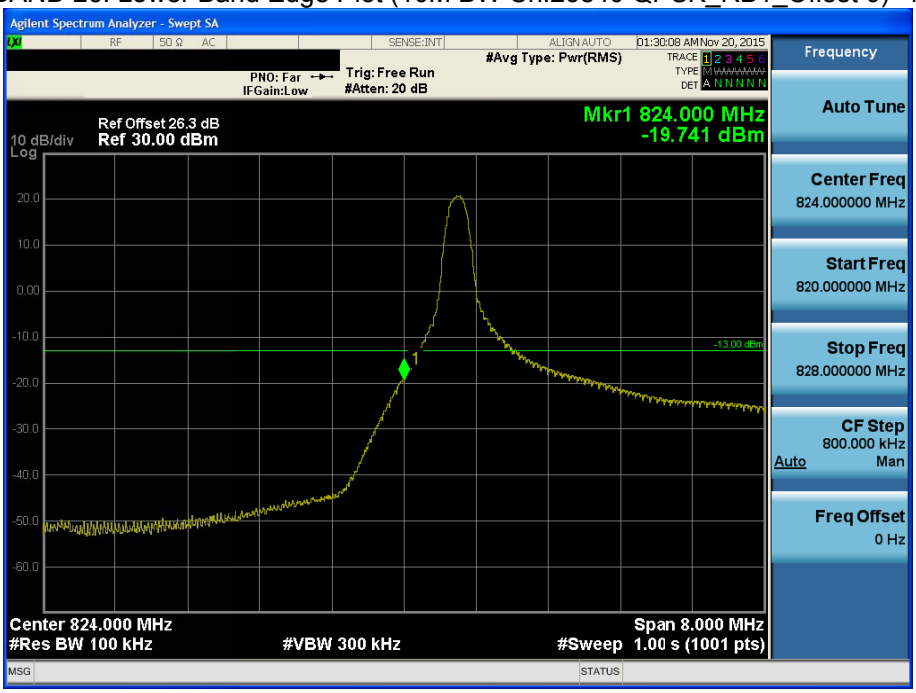


BAND 26. Lower Band Edge Plot (5M BW Ch. 26815 QPSK_RB25_Offset 0) -2

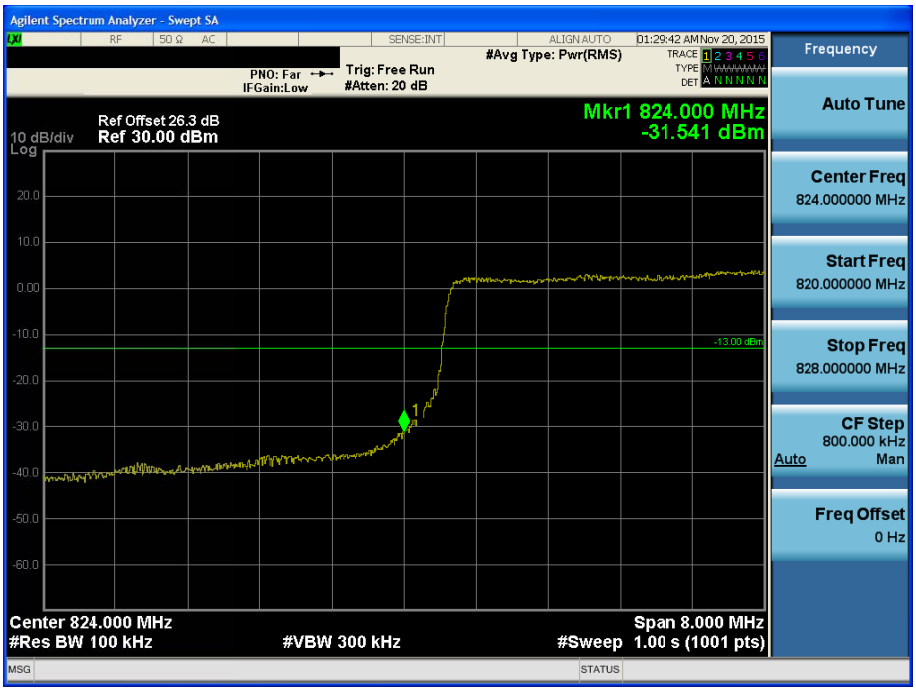


BAND 26. Lower Extended Band Edge Plot (5M BW Ch. 26815 QPSK_RB25_0) -3

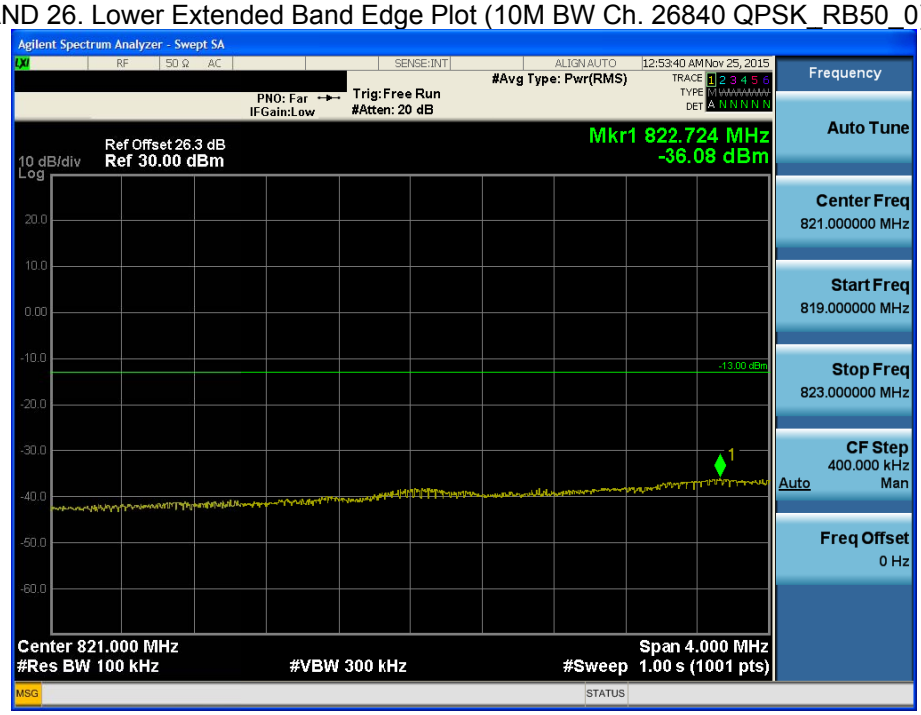
BAND 26. Lower Band Edge Plot (10M BW Ch.26840 QPSK_RB1_Offset 0) -1



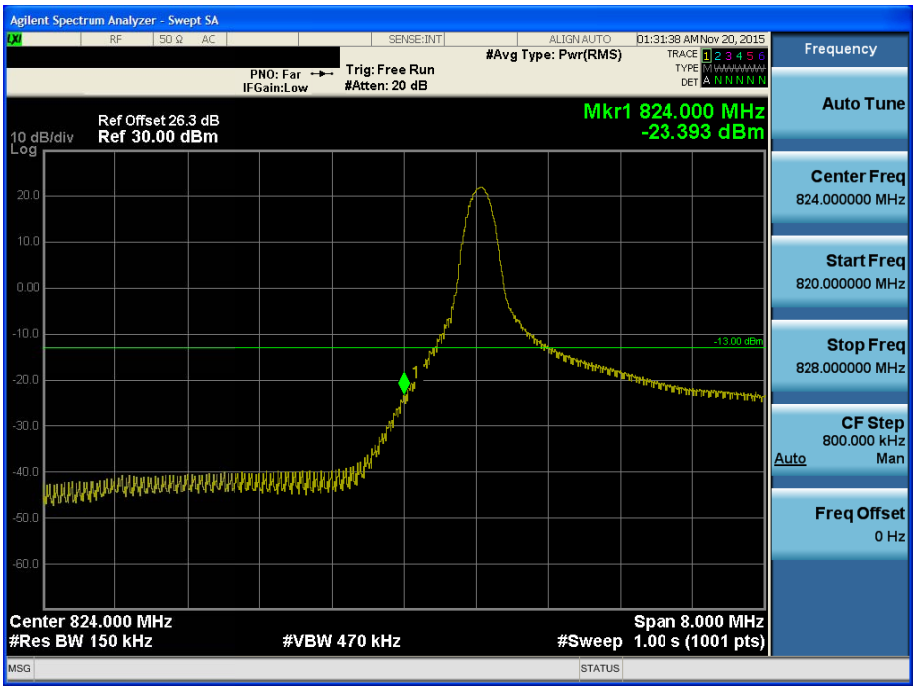
BAND 26. Lower Band Edge Plot (10M BW Ch. 26840 QPSK_RB50_Offset 0) -2



BAND 26. Lower Extended Band Edge Plot (10M BW Ch. 26840 QPSK_RB50_0) -3



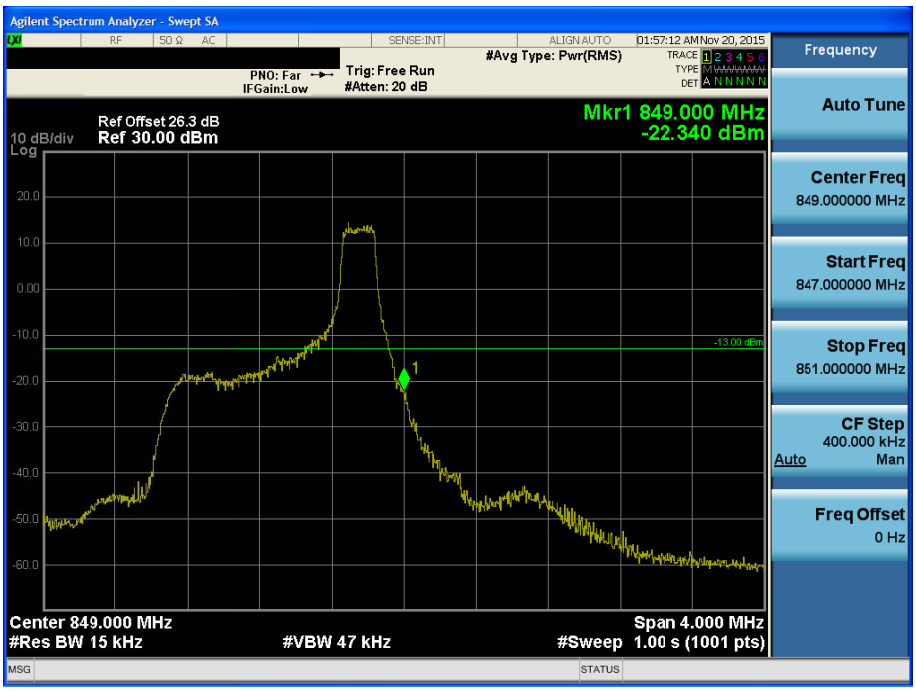
BAND 26. Lower Band Edge Plot (15M BW Ch.26865 QPSK_RB75_Offset 0) -1



BAND 26. Lower Band Edge Plot (15M BW Ch. 26865 QPSK_RB75_Offset 0) -2

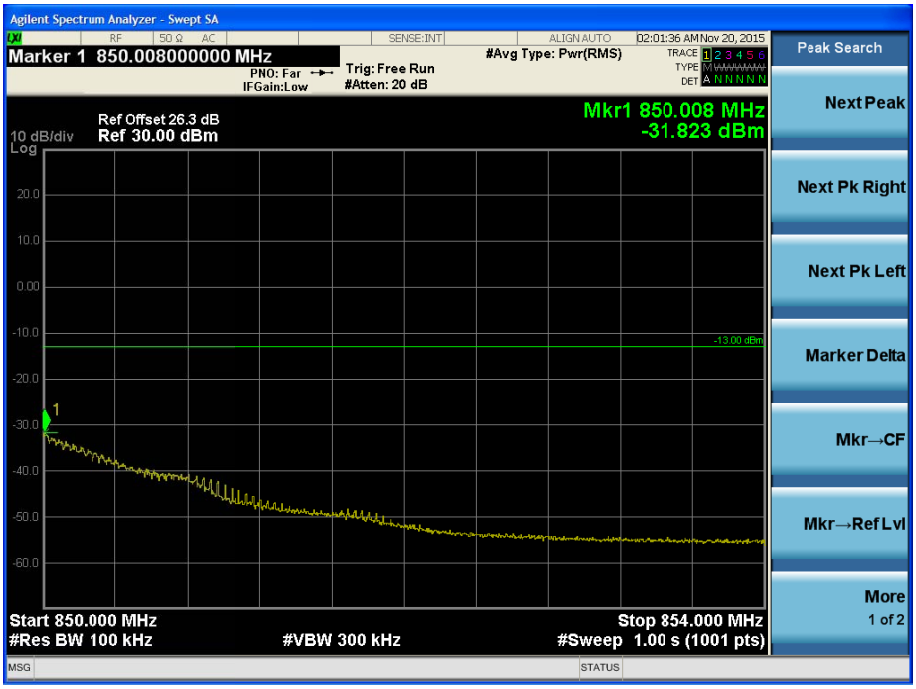
BAND 26. Lower Extended Band Edge Plot (15M BW Ch. 26865 QPSK_RB75_0) -3

BAND 26. Upper Band Edge Plot (1.4M BW Ch.27033 QPSK_RB1_Offset 5) -1

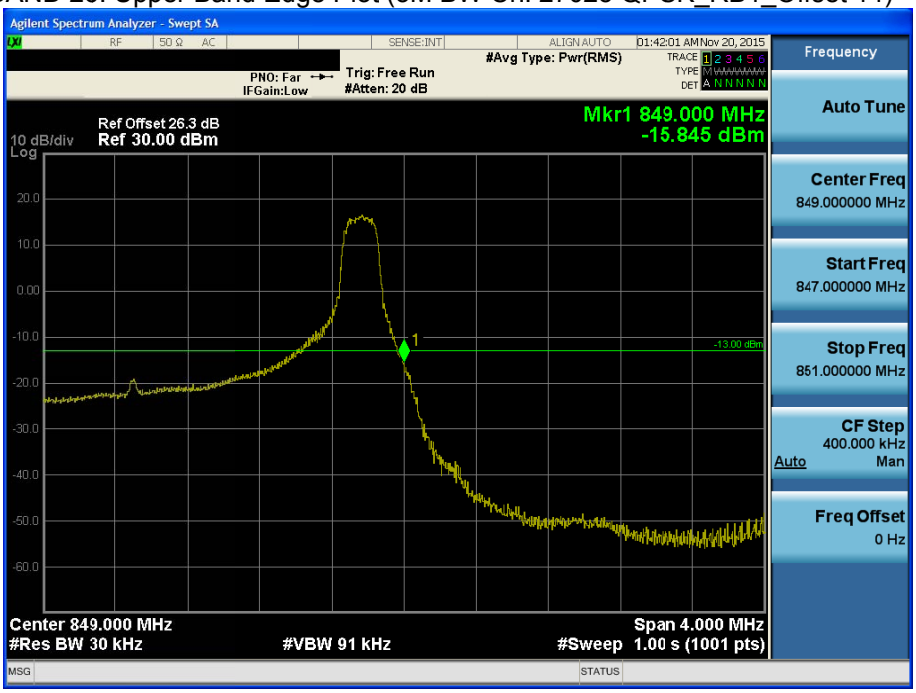


BAND 26. Upper Band Edge Plot (1.4M BW Ch. 27033 QPSK_RB6_Offset 0) -2

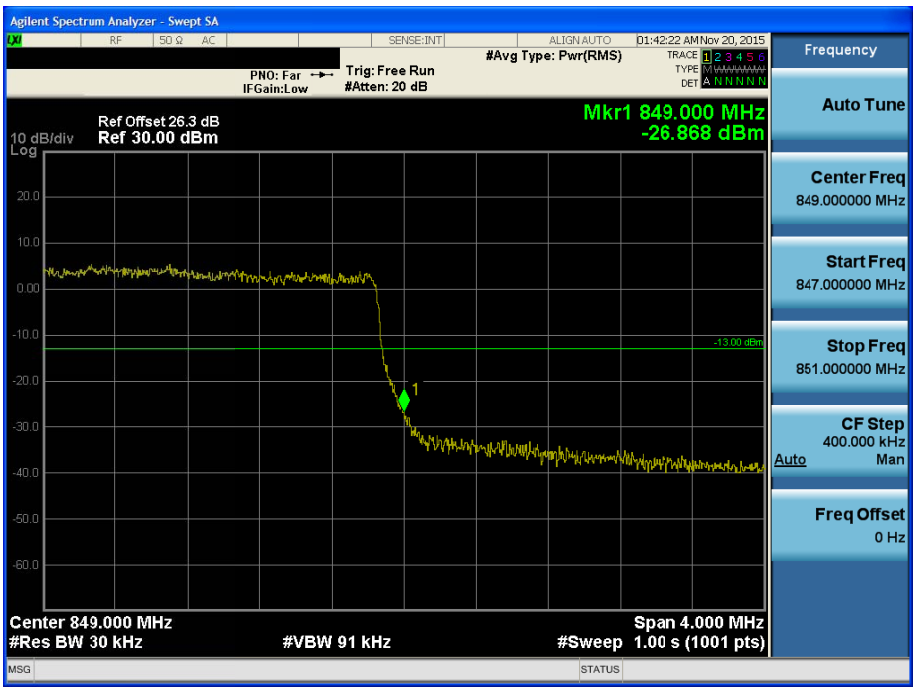
BAND 26. Upper Extended Band Edge Plot (1.4M BW Ch. 27033 QPSK_RB6_0) -3



BAND 26. Upper Band Edge Plot (3M BW Ch. 27025 QPSK_RB1_Offset 14) -1

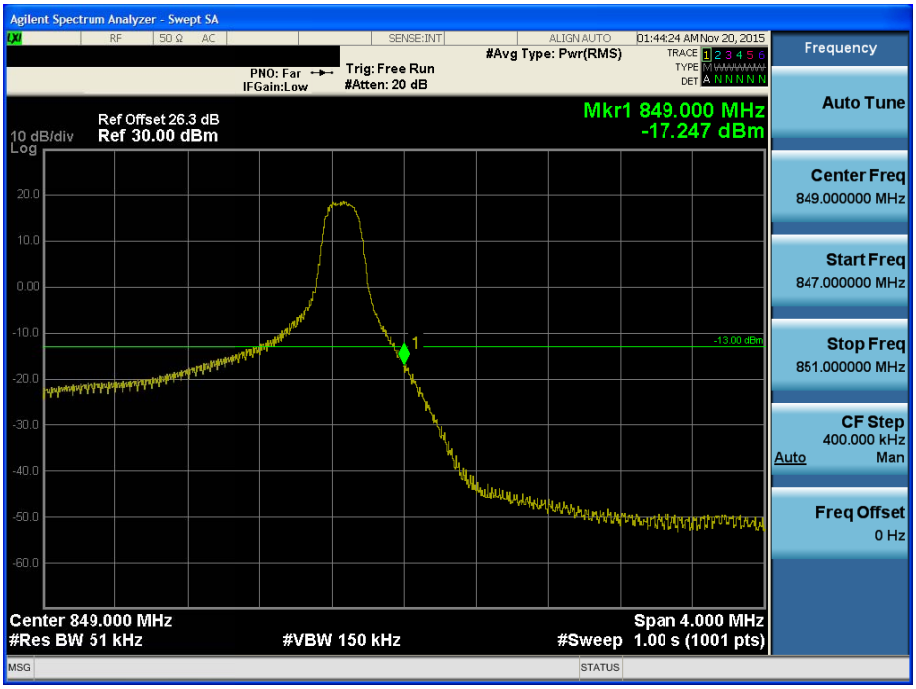


BAND 26. Upper Band Edge Plot (3M BW Ch. 27025 QPSK_RB15_Offset 0) -2



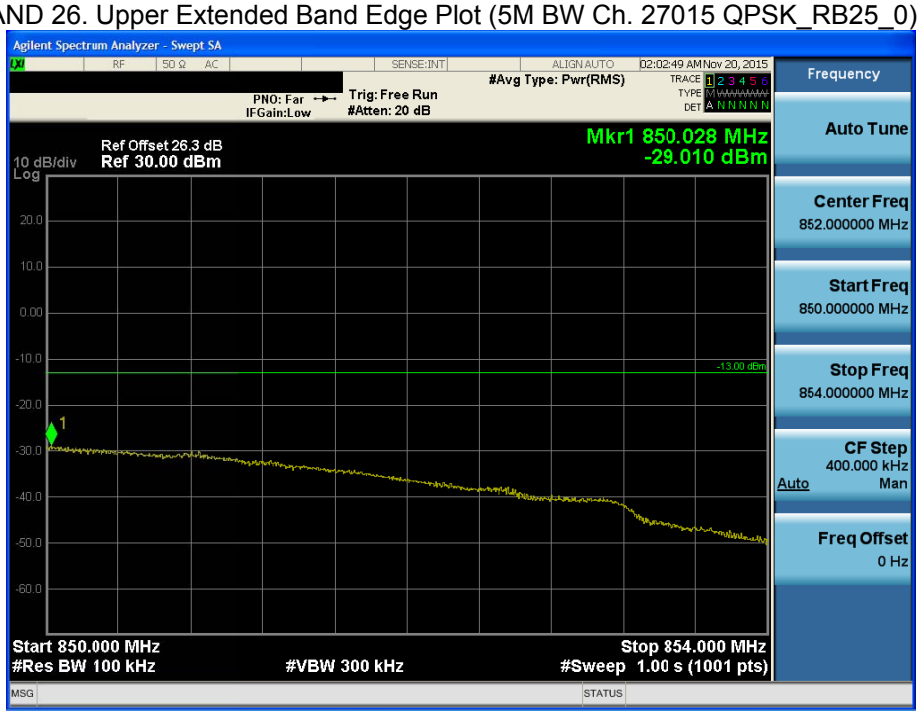
BAND 26. Upper Extended Band Edge Plot (3M BW Ch. 27025 QPSK_RB15 0) -3

BAND 26. Upper Band Edge Plot (5M BW Ch. 27015 QPSK_RB1_Offset 24) -1

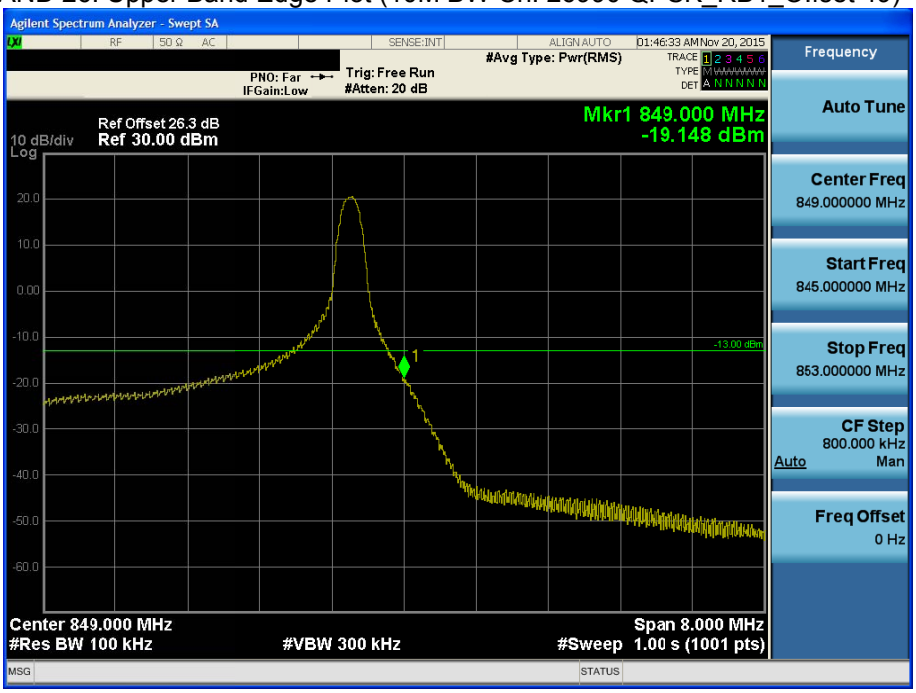


BAND 26. Upper Band Edge Plot (5M BW Ch. 27015 QPSK_RB25_Offset 0) -2

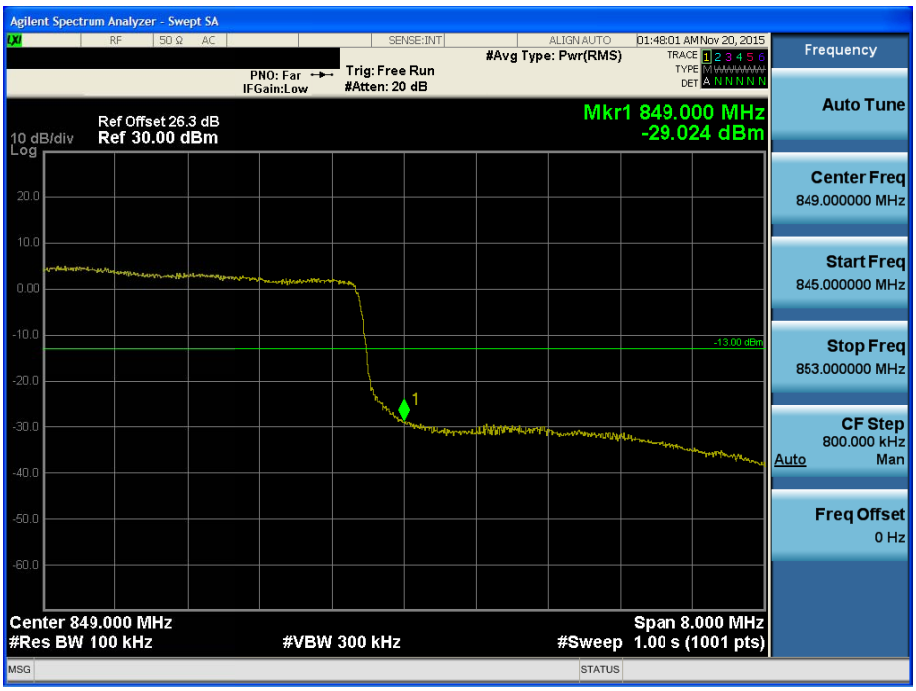
BAND 26. Upper Extended Band Edge Plot (5M BW Ch. 27015 QPSK_RB25_0) -3



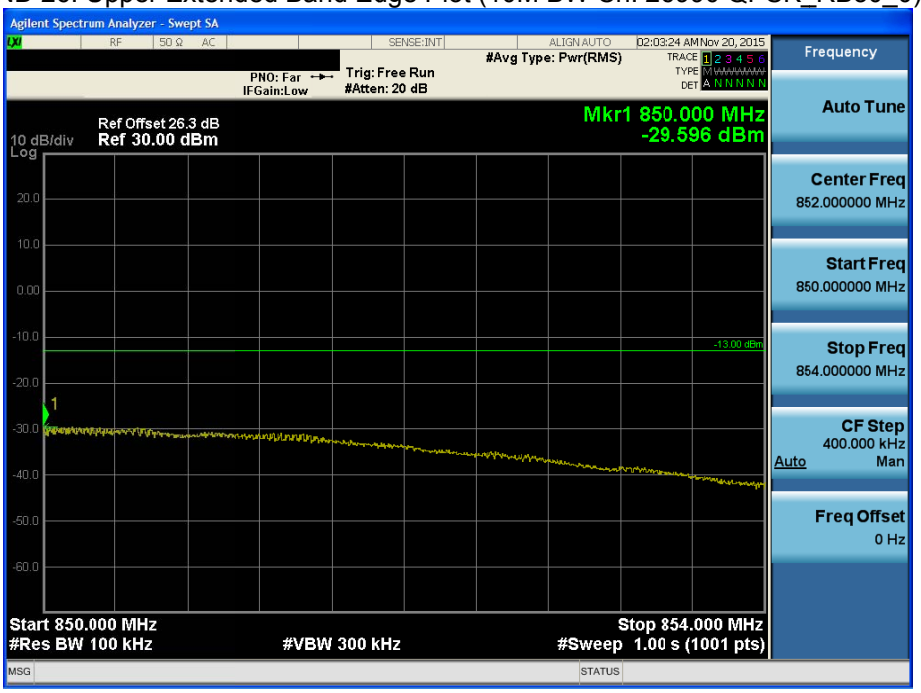
BAND 26. Upper Band Edge Plot (10M BW Ch. 26990 QPSK_RB1_Offset 49) -1



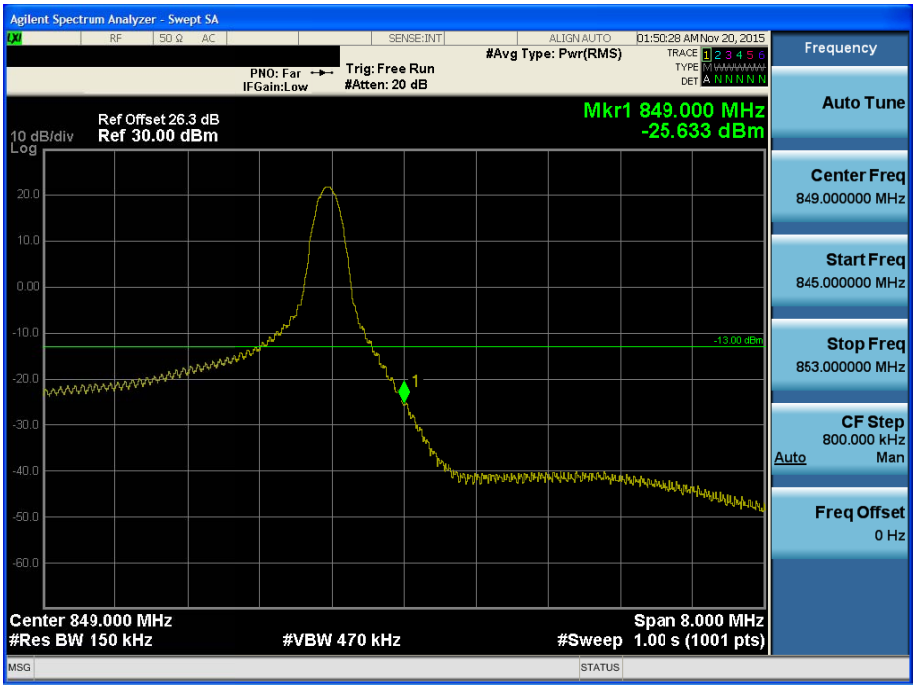
BAND 26. Upper Band Edge Plot (10M BW Ch. 26990 QPSK_RB50_Offset 0) -2



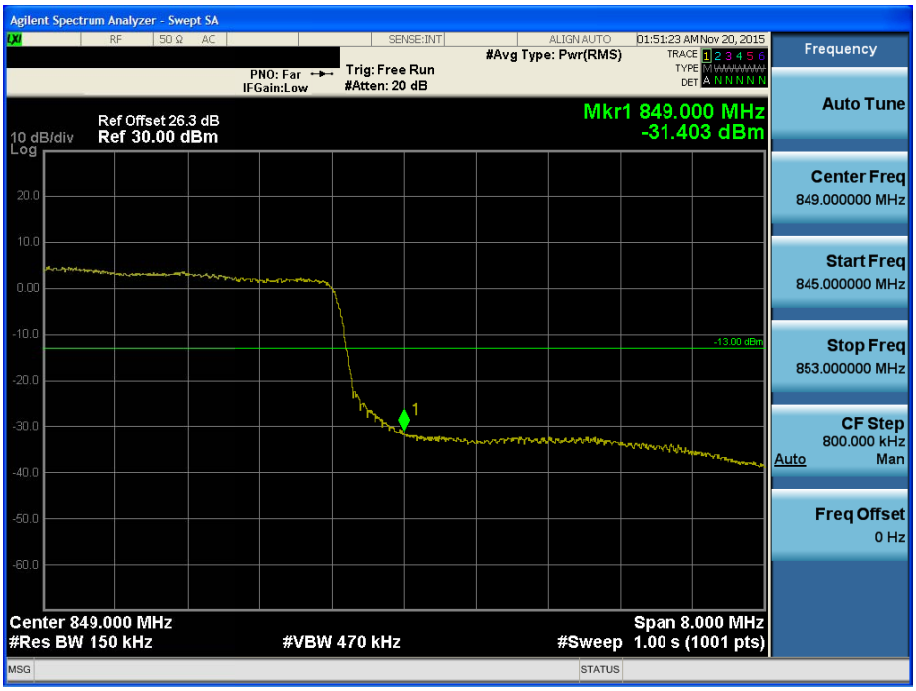
BAND 26. Upper Extended Band Edge Plot (10M BW Ch. 26990 QPSK_RB50_0) -3



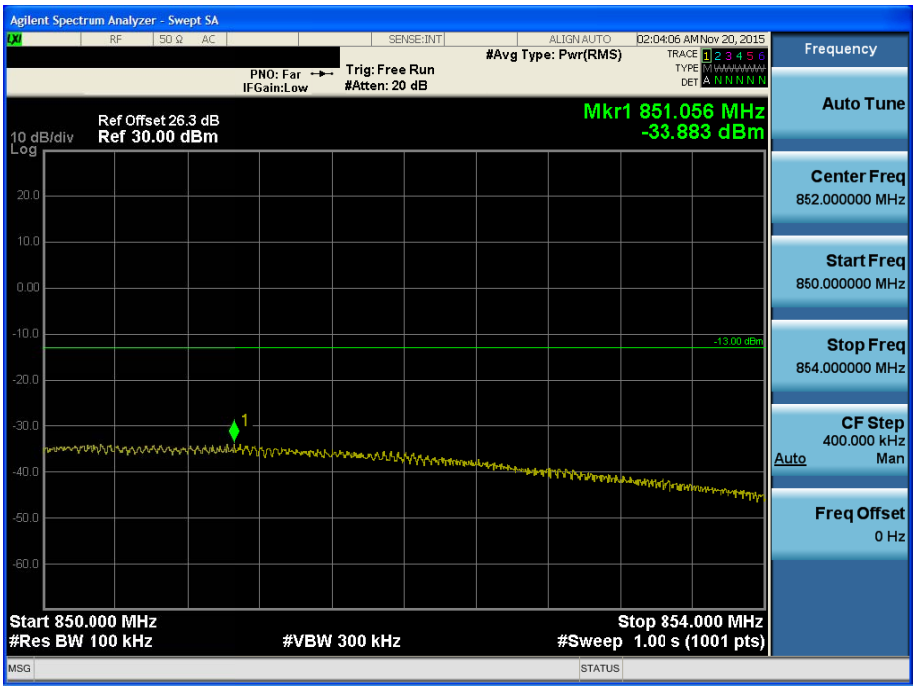
BAND 26. Upper Band Edge Plot (15M BW Ch.26965 QPSK_RB1_Offset 74) -1



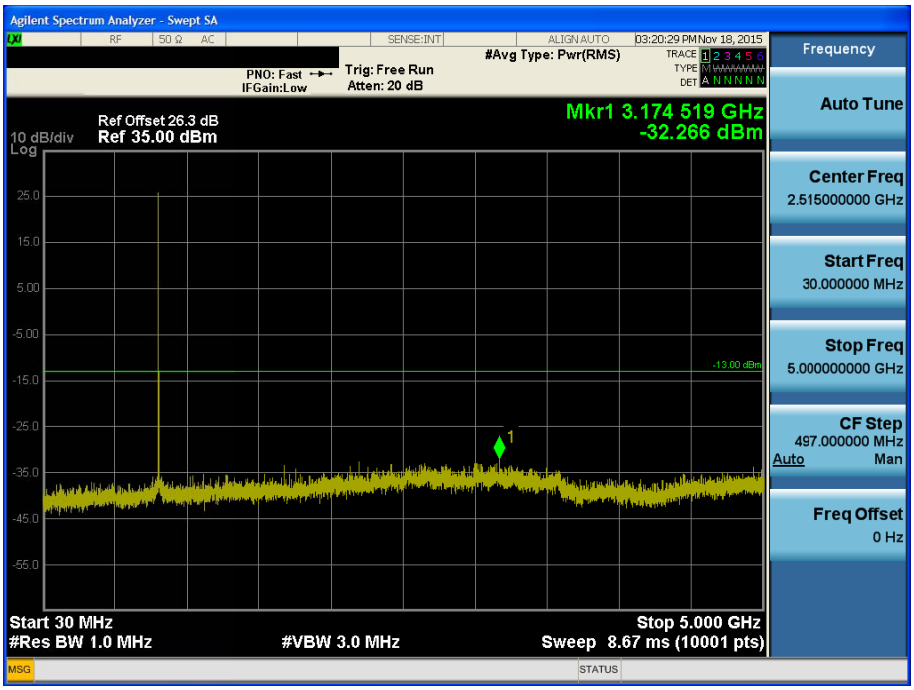
BAND 26. Upper Band Edge Plot (15M BW Ch. 26965 QPSK_RB75_Offset 0) -2



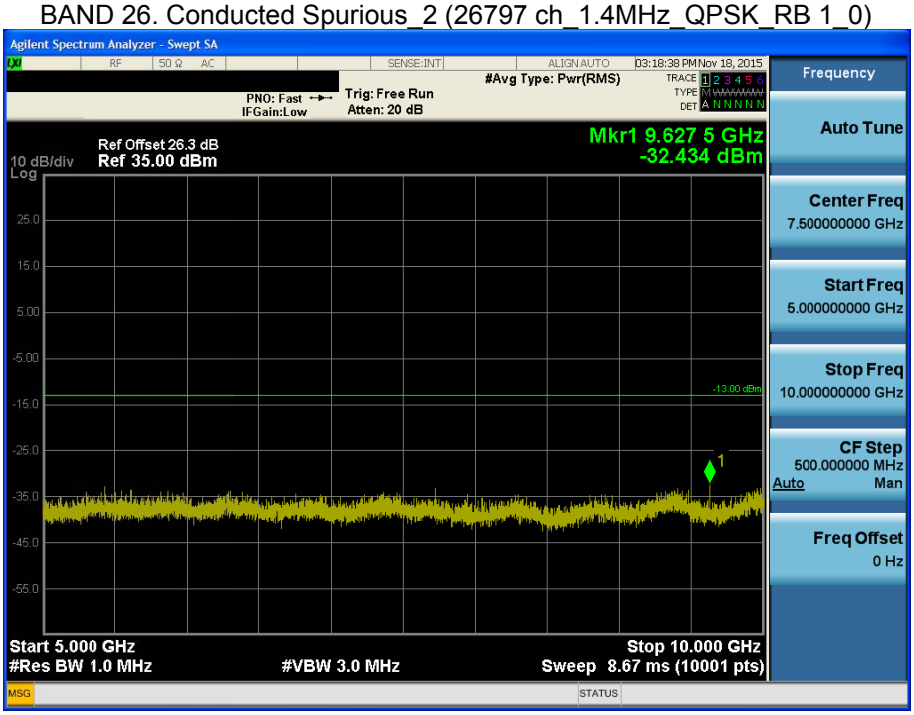
BAND 26. Upper Extended Band Edge Plot (15M BW Ch. 26965 QPSK_RB75_0) -3



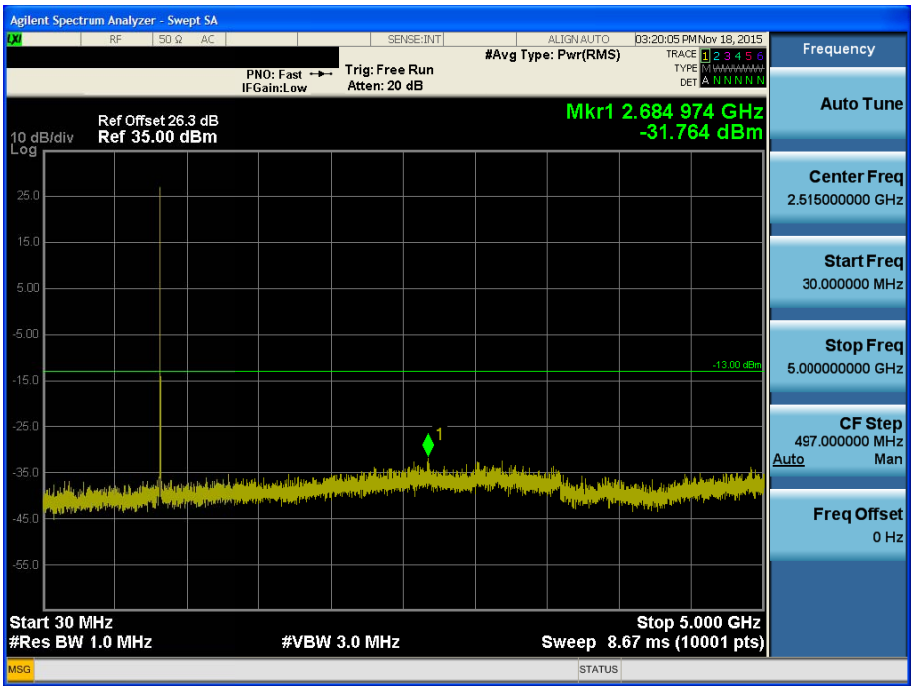
BAND 26. Conducted Spurious_1 (26797 ch_1.4MHz_QPSK_RB 1_0)



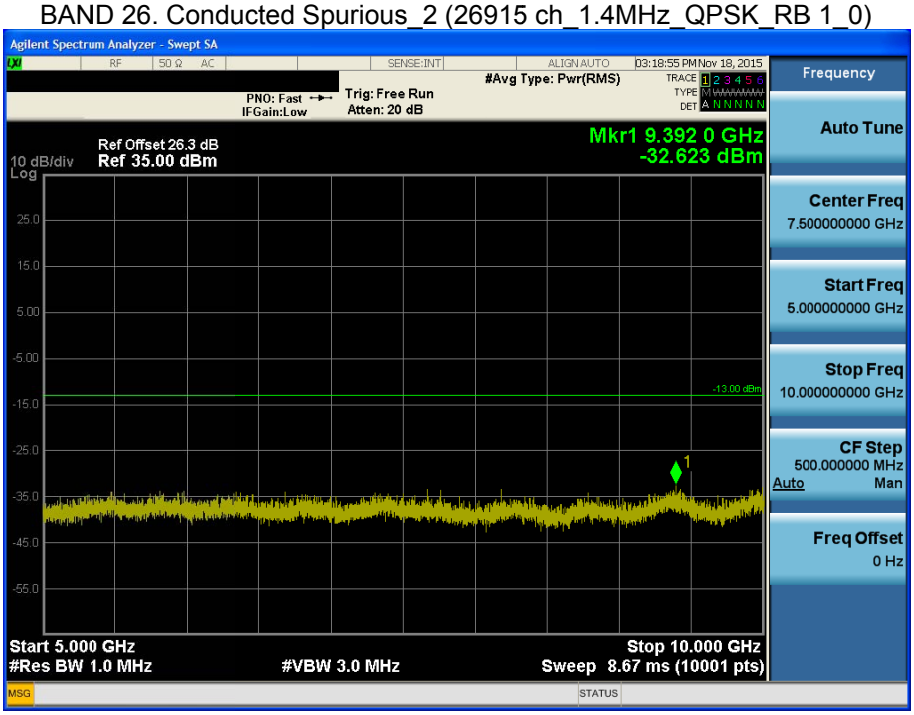
BAND 26. Conducted Spurious_2 (26797 ch_1.4MHz_QPSK_RB 1_0)



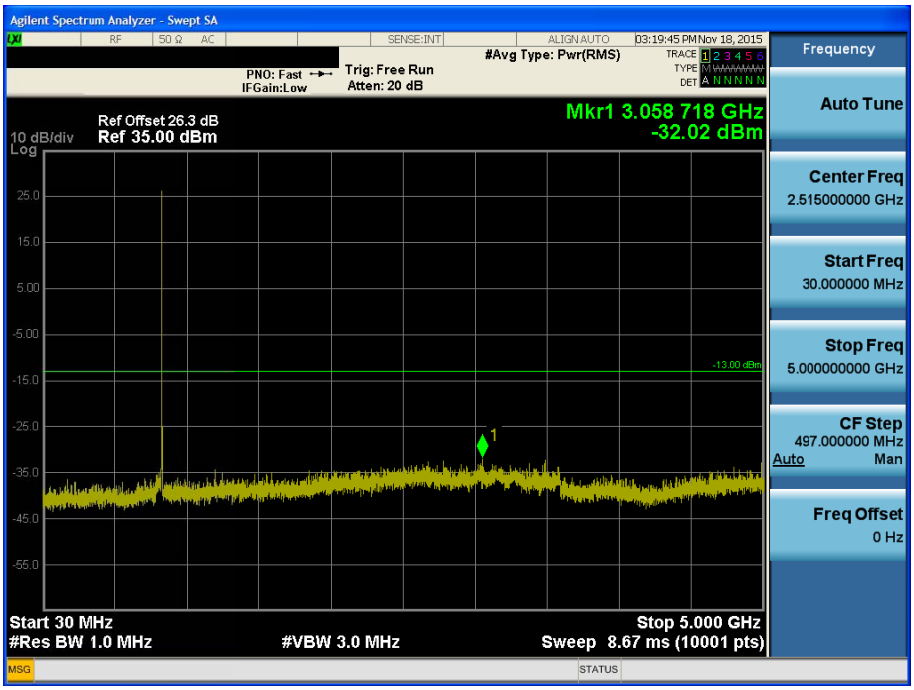
BAND 26. Conducted Spurious_1 (26915 ch_1.4MHz_QPSK_RB 1_0)



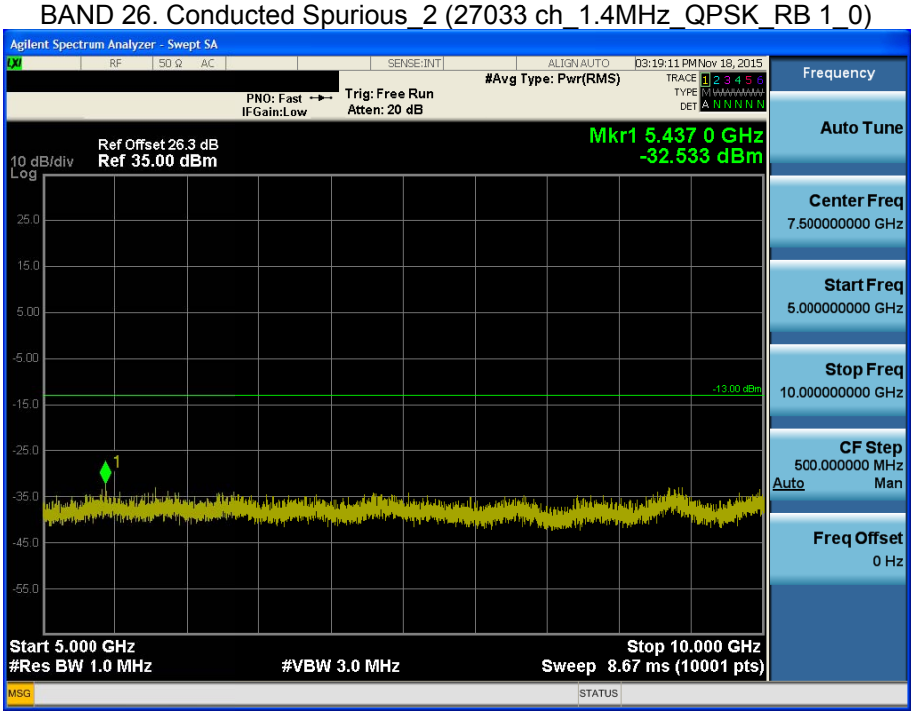
BAND 26. Conducted Spurious_2 (26915 ch_1.4MHz_QPSK_RB 1_0)



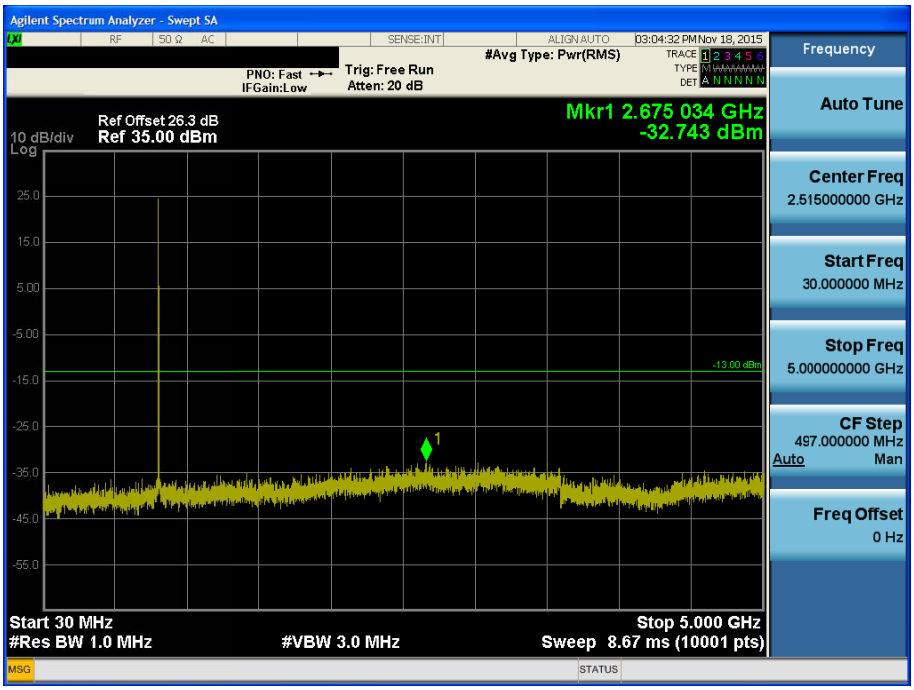
BAND 26. Conducted Spurious_1 (27033 ch_1.4MHz_QPSK_RB 1_0)



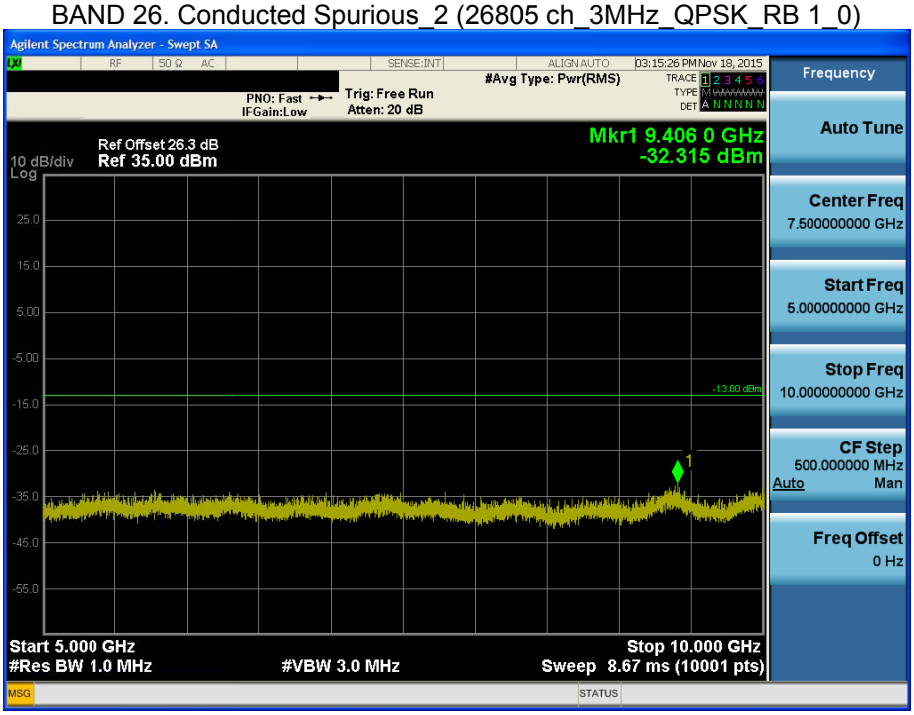
BAND 26. Conducted Spurious_2 (27033 ch_1.4MHz_QPSK_RB 1_0)



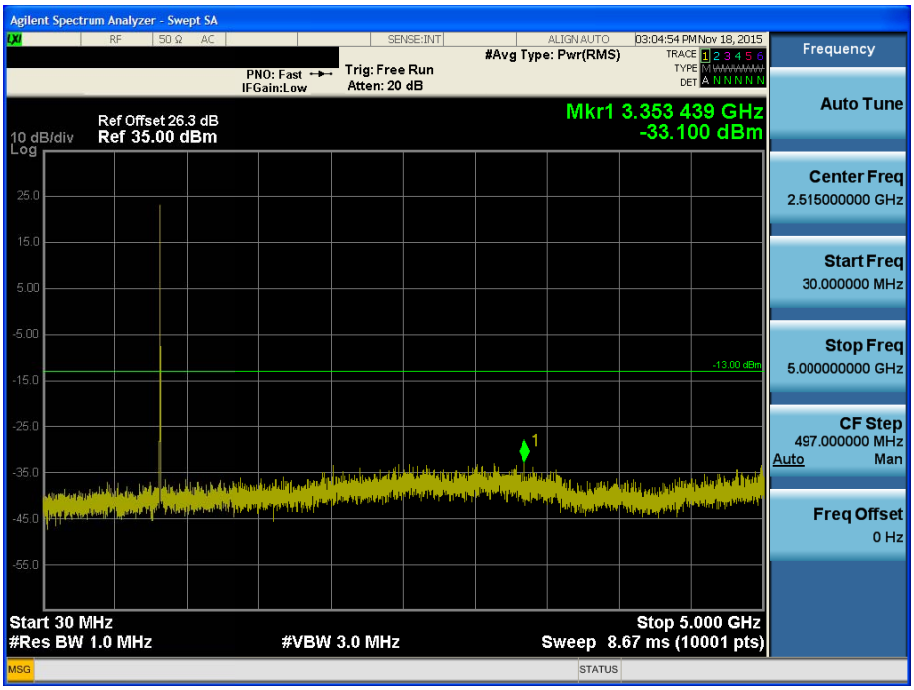
BAND 26. Conducted Spurious_1 (26805 ch_3MHz_QPSK_RB 1_0)



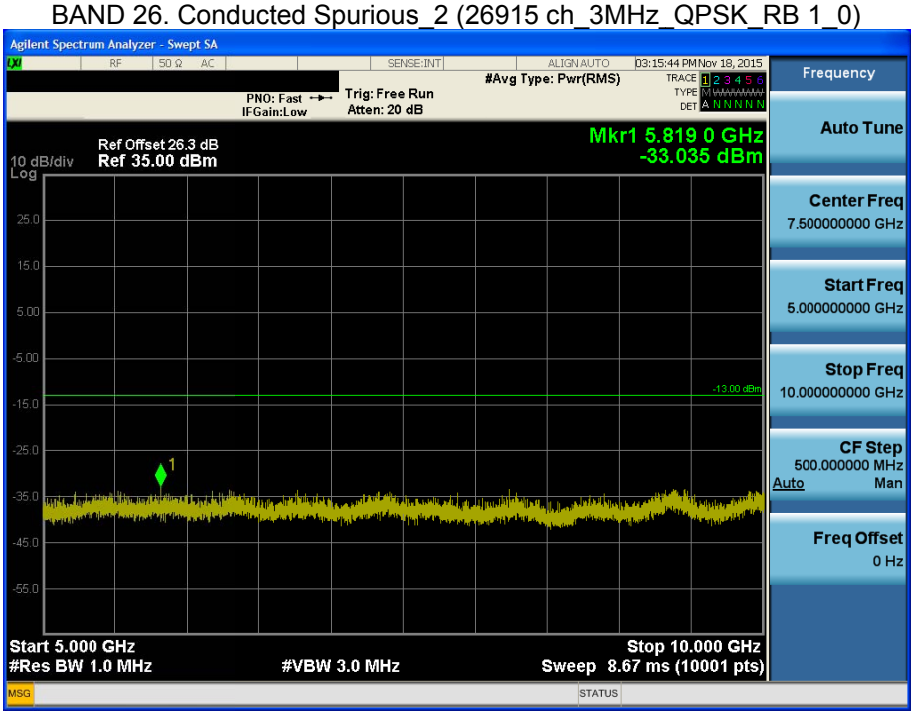
BAND 26. Conducted Spurious_2 (26805 ch_3MHz_QPSK_RB 1_0)



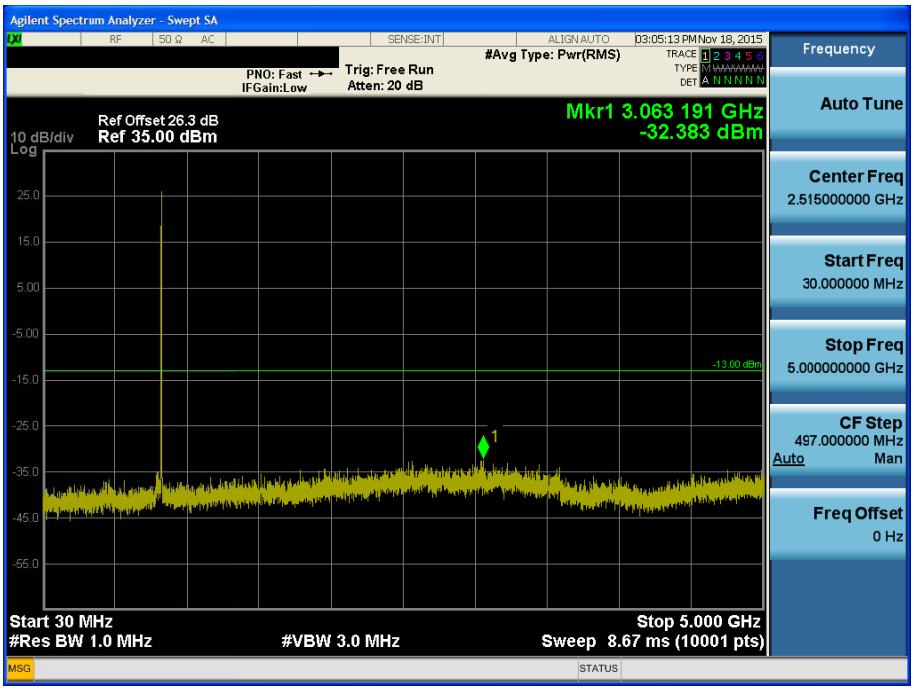
BAND 26. Conducted Spurious_1 (26915 ch_3MHz_QPSK_RB 1_0)



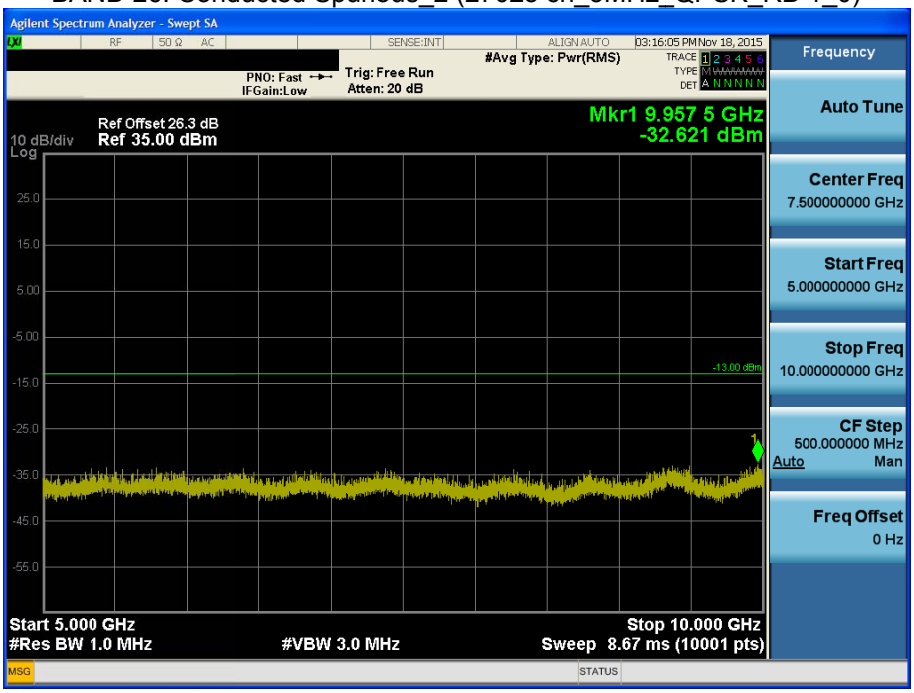
BAND 26. Conducted Spurious_2 (26915 ch_3MHz_QPSK_RB 1_0)



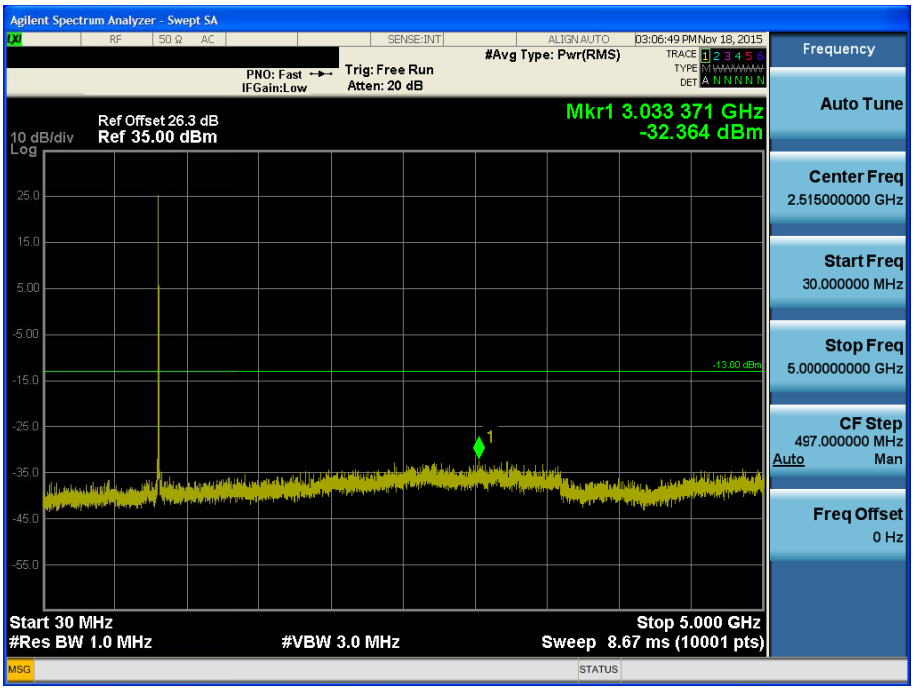
BAND 26. Conducted Spurious_1 (27025 ch_3MHz_QPSK_RB 1_0)



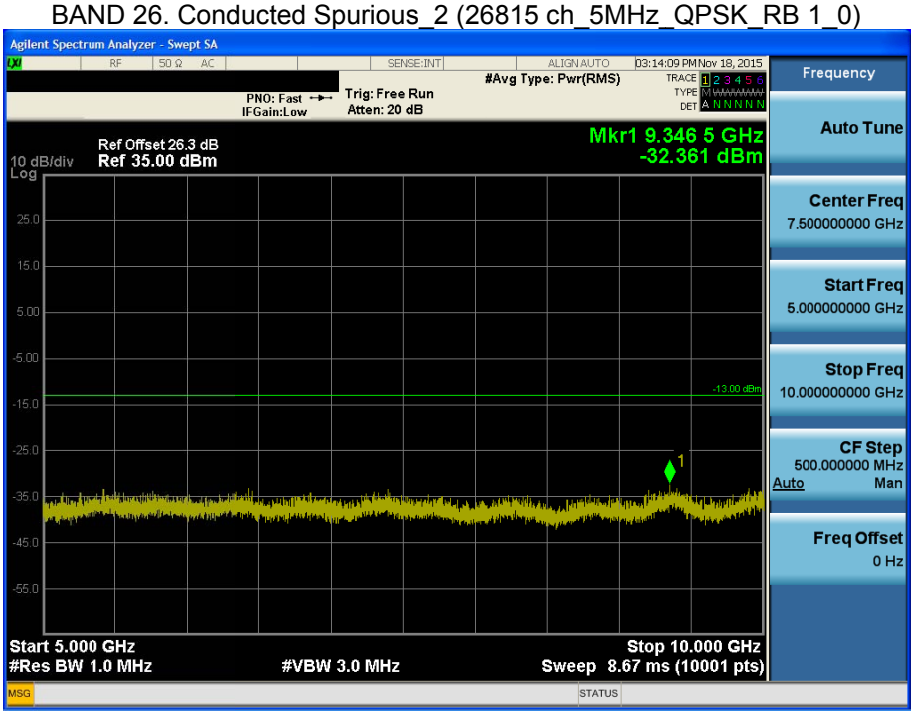
BAND 26. Conducted Spurious_2 (27025 ch_3MHz_QPSK_RB 1_0)



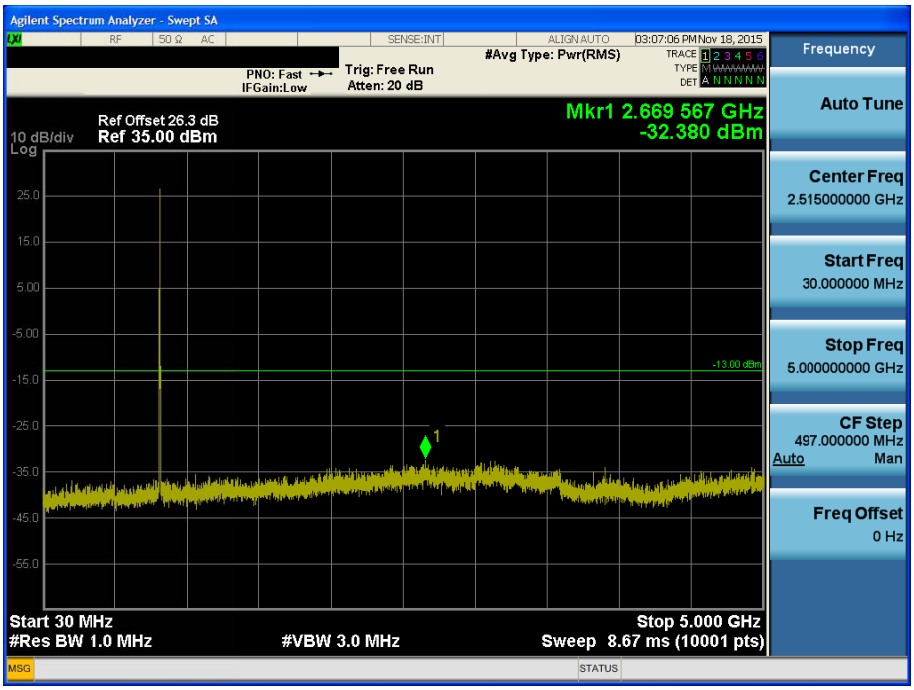
BAND 26. Conducted Spurious_1 (26815 ch_5MHz_QPSK_RB 1_0)



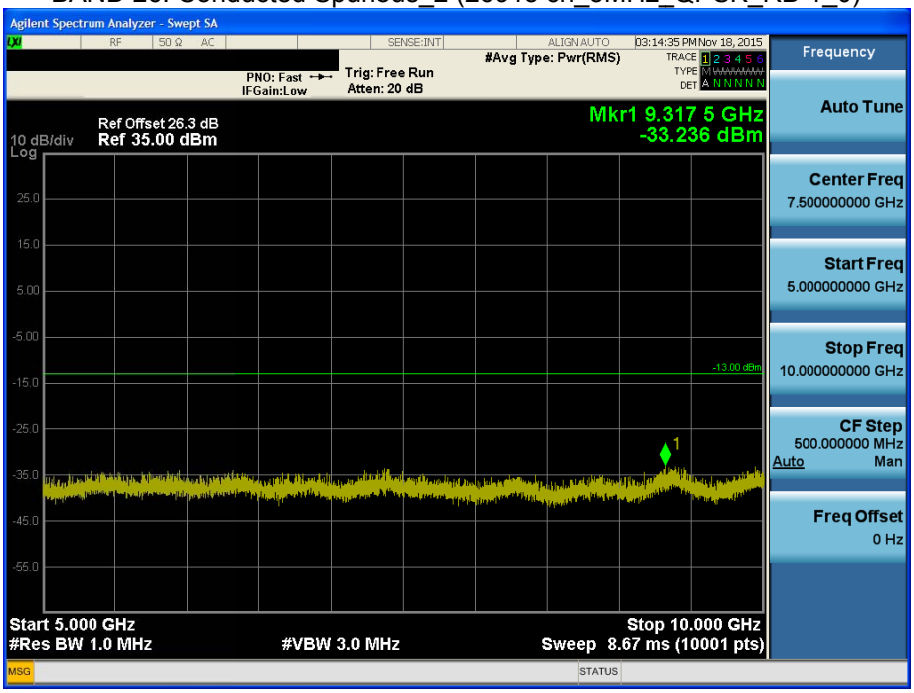
BAND 26. Conducted Spurious_2 (26815 ch_5MHz_QPSK_RB 1_0)



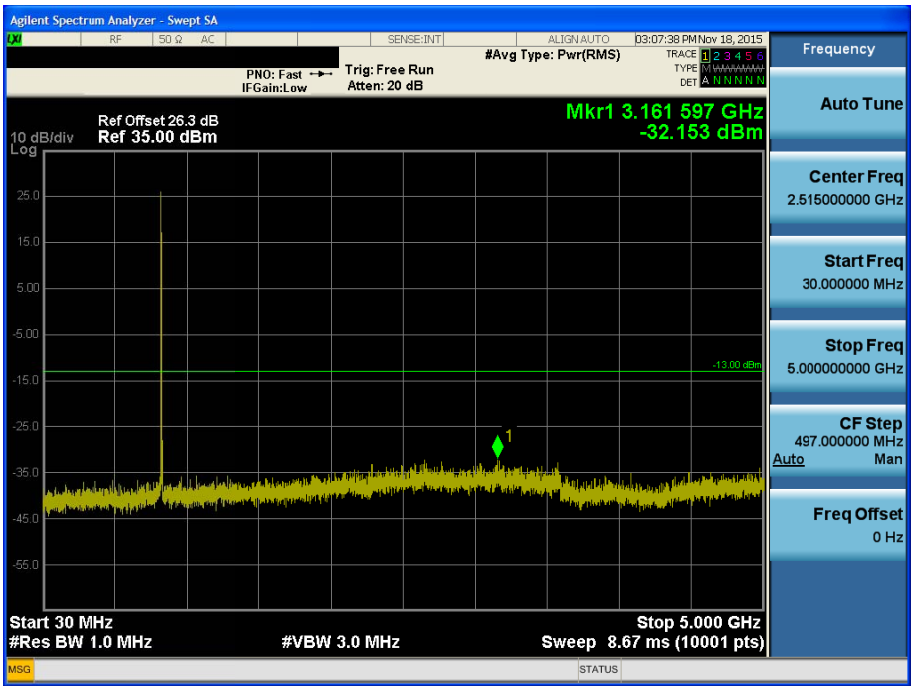
BAND 26. Conducted Spurious_1 (26915 ch_5MHz_QPSK_RB 1_0)



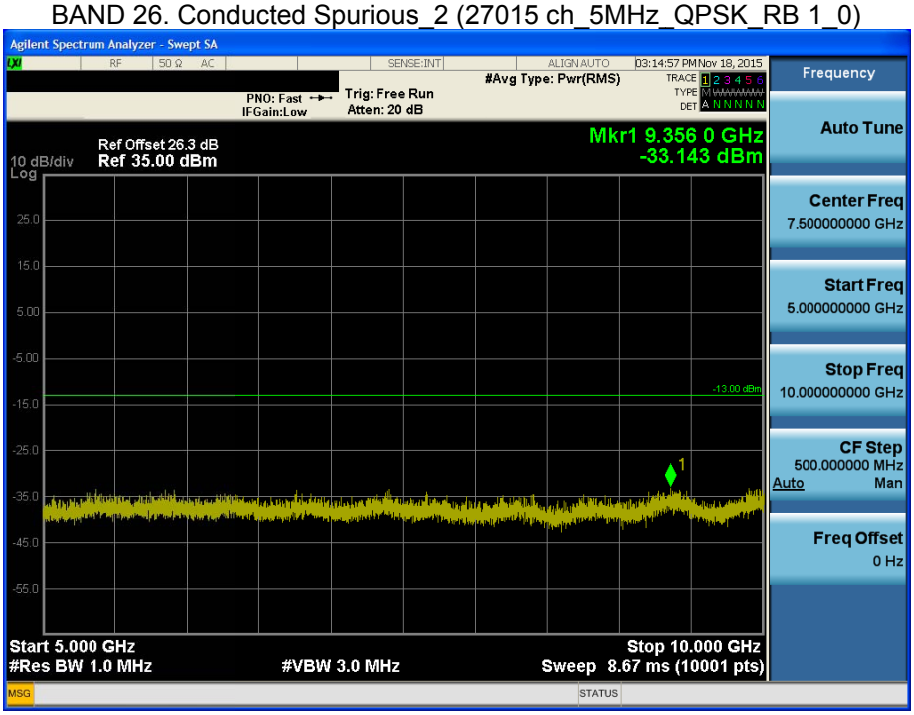
BAND 26. Conducted Spurious_2 (26915 ch_5MHz_QPSK_RB 1_0)



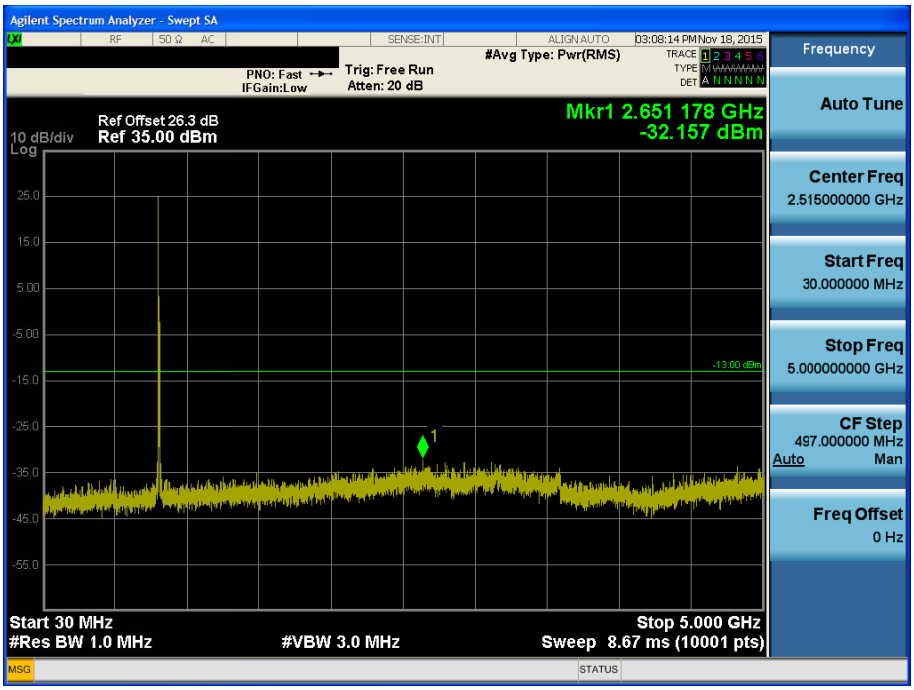
BAND 26. Conducted Spurious_1 (20715 ch_5MHz_QPSK_RB 1_0)



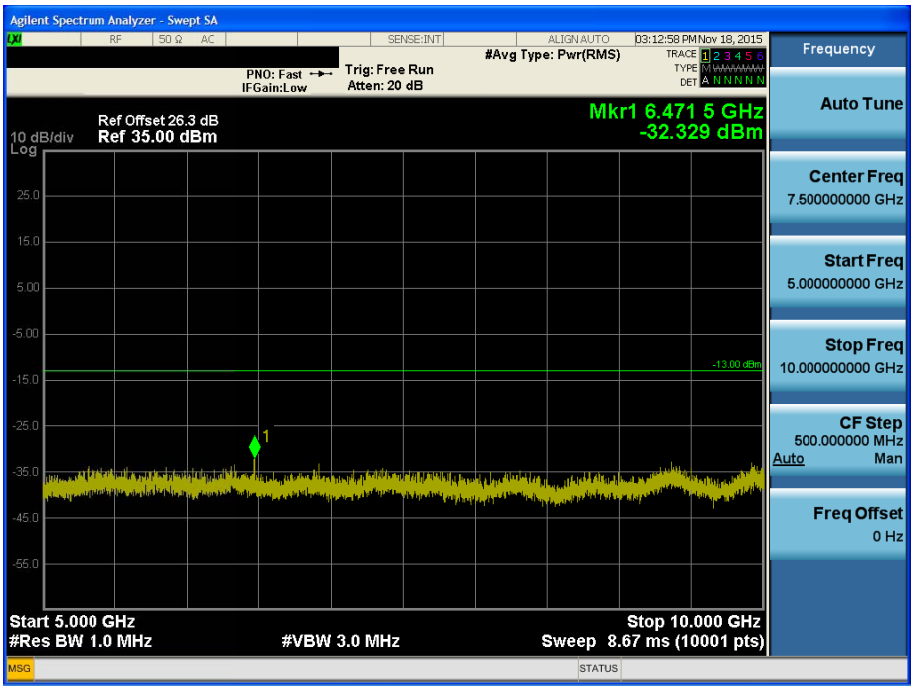
BAND 26. Conducted Spurious_2 (27015 ch_5MHz_QPSK_RB 1_0)



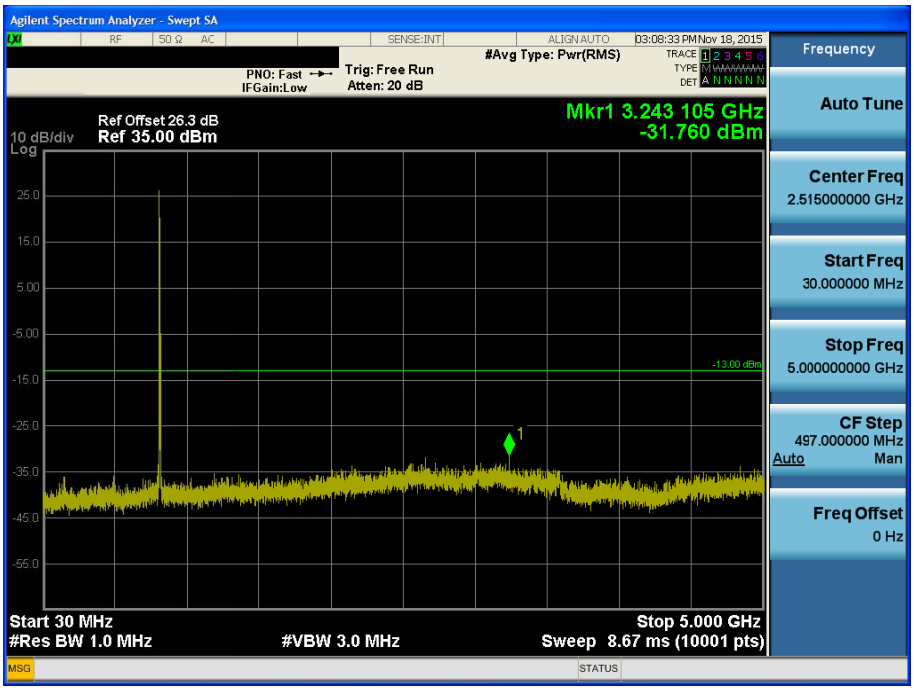
BAND 26. Conducted Spurious_1 (26840 ch_10MHz_QPSK_RB 1_0)



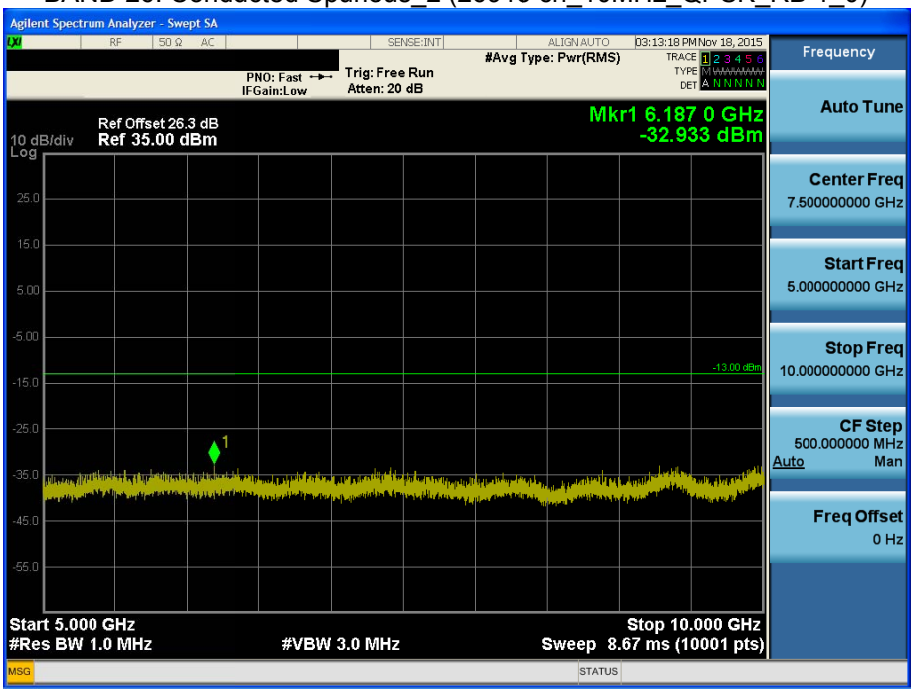
BAND 26. Conducted Spurious_2 (26840 ch_10MHz_QPSK_RB 1_0)



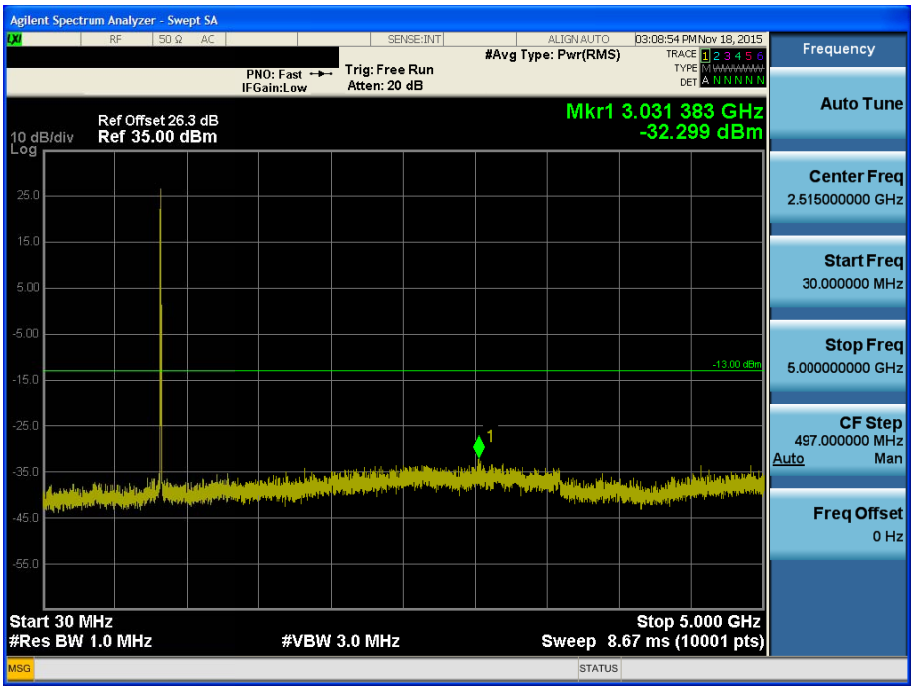
BAND 26. Conducted Spurious_1 (26915 ch_10MHz_QPSK_RB 1_0)



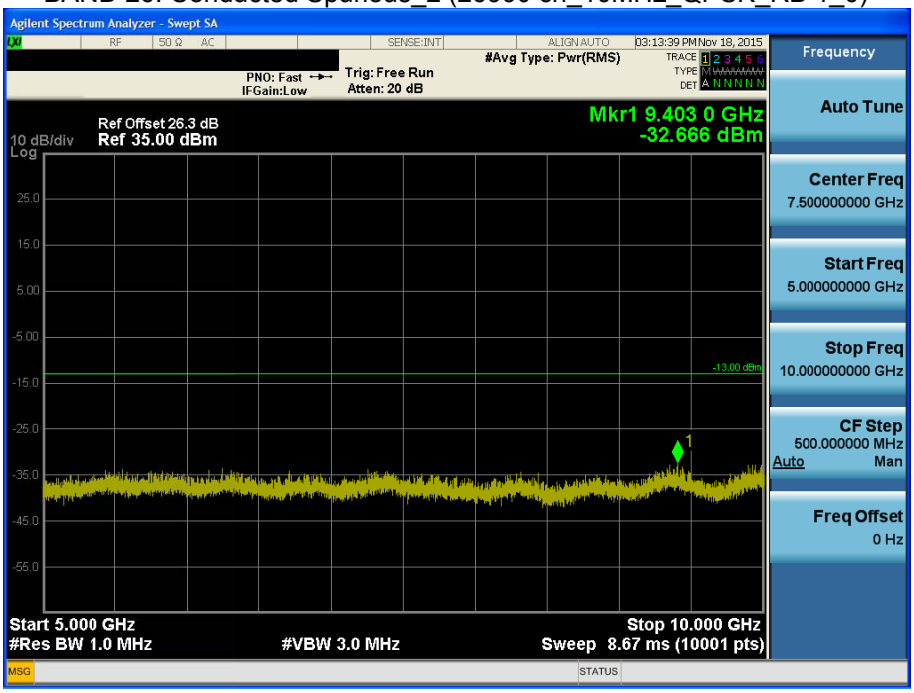
BAND 26. Conducted Spurious_2 (26915 ch_10MHz_QPSK_RB 1_0)



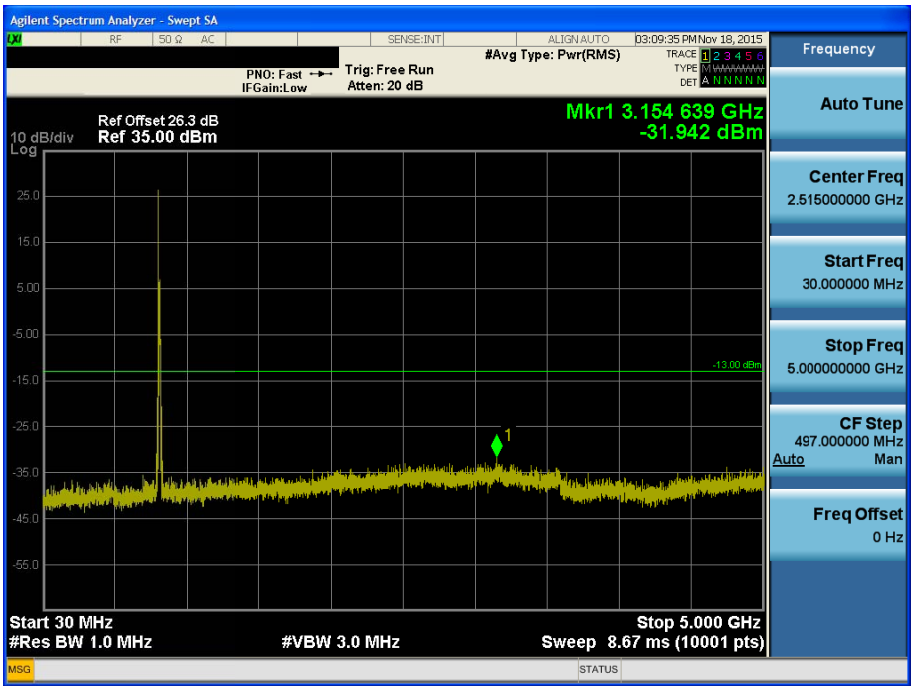
BAND 26. Conducted Spurious_1 (26990 ch_10MHz_QPSK_RB 1_0)



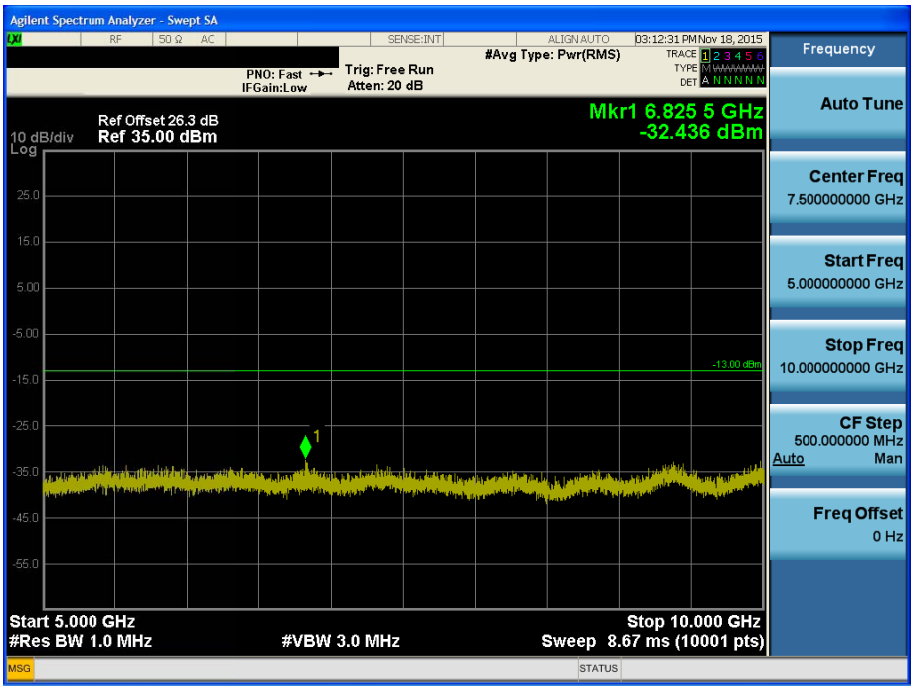
BAND 26. Conducted Spurious_2 (26990 ch_10MHz_QPSK_RB 1_0)



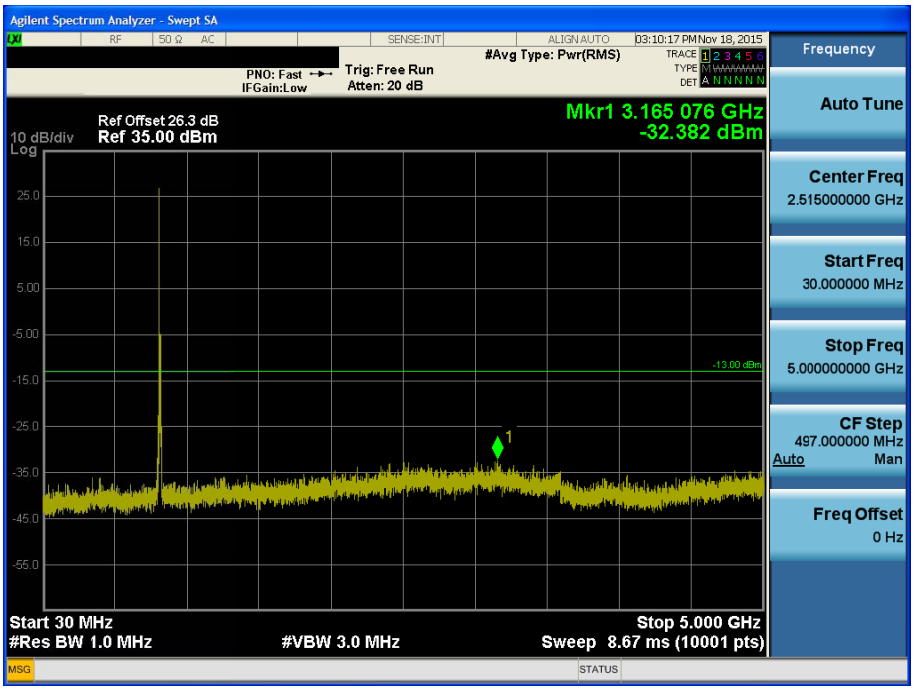
BAND 26. Conducted Spurious_1 (26865 ch_15MHz_QPSK_RB 1_0)



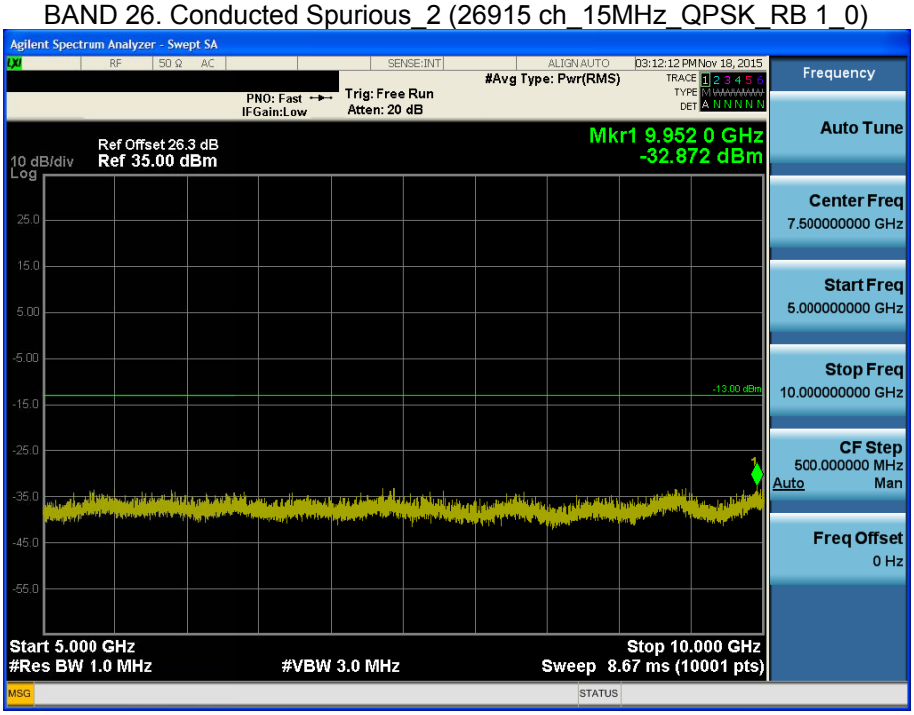
BAND 26. Conducted Spurious_2 (26865 ch_15MHz_QPSK_RB 1_0)



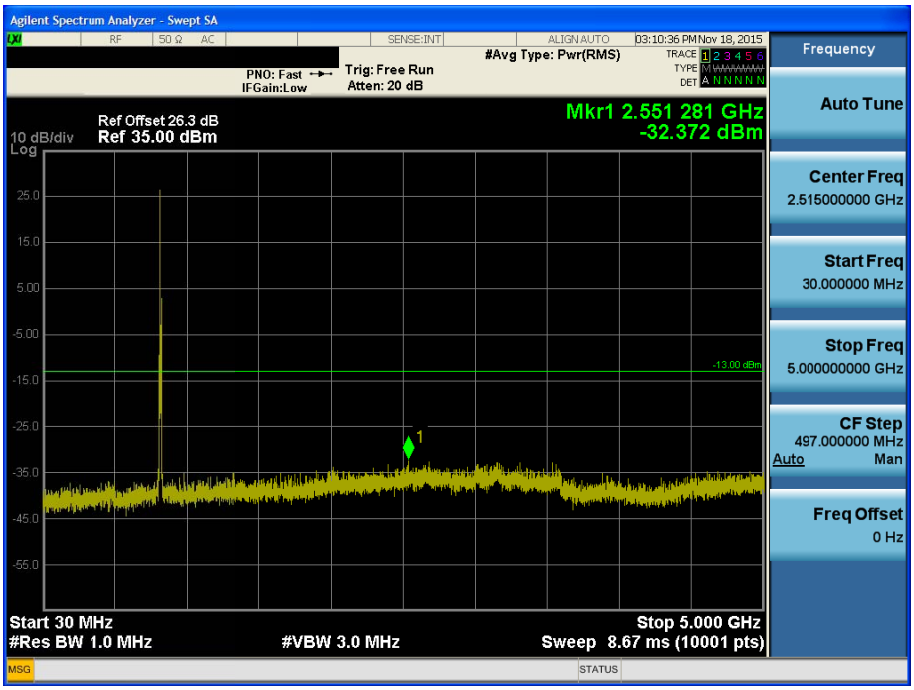
BAND 26. Conducted Spurious_1 (26915 ch_15MHz_QPSK_RB 1_0)



BAND 26. Conducted Spurious_2 (26915 ch_15MHz_QPSK_RB 1_0)



BAND 26. Conducted Spurious_1 (26965 ch_15MHz_QPSK_RB 1_0)



BAND 26. Conducted Spurious_2 (26965 ch_15MHz_QPSK_RB 1_0)