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MEASUREMENT REPORT
FCC Part 27 LTE

Applicant Name:
Samsung Electronics Co., Ltd.
129, Samsung-ro, Maetan dong,
Yeongtong-gu, Suwon-si
Gyeonggi-do 443-742, Korea

Date of Testing:
02/16 - 03/06/15
Test Site/Location:
PCTEST Lab., Columbia, MD, USA
Test Report Serial No.:
0Y1502160469.A3L

FCC ID : A3LSC05G

APPLICANT: SAMSUNG ELECTRONICS CO., LTD.

Application Type: Certification
FCC Classification: PCS Licensed Transmitter Held to Ear (PCE)
FCC Rule Part(s): §2; §27
Test Procedure(s): ANSI/TIA-603-C-2004, KDB 971168 v02r02, KDB 648474 D03 v01r02
EUT Type: Portable Handset
Model(s): SC-05G
Test Device Serial No.: *identical prototype* [S/N: 14047, 14016, 1403C]

Mode	Tx Frequency (MHz)	Emission Designator	Modulation	ERP/EIRP	
				Max. Power (W)	Max. Power (dBm)
LTE Band 17	706.5 - 713.5	4M52G7D	QPSK	0.054	17.33
LTE Band 17	706.5 - 713.5	4M51W7D	16QAM	0.044	16.46
LTE Band 17	709 - 711	8M99G7D	QPSK	0.047	16.72
LTE Band 17	709 - 711	8M99W7D	16QAM	0.039	15.89
LTE Band 13	779.5 - 784.5	4M50G7D	QPSK	0.042	16.23
LTE Band 13	779.5 - 784.5	4M50W7D	16QAM	0.034	15.34
LTE Band 13	782	8M96G7D	QPSK	0.039	15.92
LTE Band 13	782	8M99W7D	16QAM	0.032	15.03
LTE Band 41	2498.5 - 2687.5	4M49G7D	QPSK	0.007	8.65
LTE Band 41	2498.5 - 2687.5	4M49W7D	16QAM	0.006	8.02
LTE Band 41	2501 - 2685	8M97G7D	QPSK	0.007	8.67
LTE Band 41	2501 - 2685	8M97W7D	16QAM	0.005	7.38
LTE Band 41	2503.5 - 2682.5	13M5G7D	QPSK	0.008	9.04
LTE Band 41	2503.5 - 2682.5	13M5W7D	16QAM	0.006	7.88
LTE Band 41	2506 - 2680	18M0G7D	QPSK	0.008	8.78
LTE Band 41	2506 - 2680	18M0W7D	16QAM	0.006	7.86

This equipment has been shown to be capable of compliance with the applicable technical standards as indicated in the measurement report and was tested in accordance with the measurement procedures specified in §2.947. Test results reported herein relate only to the item(s) tested.

I attest to the accuracy of data. All measurements reported herein were performed by me or were made under my supervision and are correct to the best of my knowledge and belief. I assume full responsibility for the completeness of these measurements and vouch for the qualifications of all persons taking them.

Randy Ortanez
President

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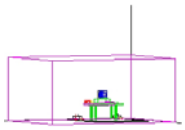
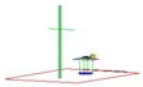


MEASUREMENT REPORT
FCC Part 27



§2.1033 General Information

APPLICANT:	Samsung Electronics Co., Ltd.
APPLICANT ADDRESS:	129, Samsung-ro, Maetan dong,
	Yeongtong-gu, Suwon-si, Gyeonggi-do 443-742, Korea
TEST SITE:	PCTEST ENGINEERING LABORATORY, INC.
TEST SITE ADDRESS:	7185 Oakland Mills Road, Columbia, MD 21045 USA
FCC RULE PART(S):	§2; §27
BASE MODEL:	SC-05G
FCC ID:	A3LSC05G
FCC CLASSIFICATION:	PCS Licensed Transmitter Held to Ear (PCE)
FREQUENCY TOLERANCE:	±0.00025 % (2.5 ppm)
Test Device Serial No.:	14047, 14016, 1403C ☐ Production ☒ Pre-Production ☐ Engineering
DATE(S) OF TEST:	02/16 - 03/06/15
TEST REPORT S/N:	0Y1502160469.A3L

Test Facility / Accreditations

Measurements were performed at PCTEST Engineering Lab located in Columbia, MD 21046, U.S.A.

- PCTEST facility is an FCC registered (PCTEST Reg. No. 159966) test facility with the site description report on file and has met all the requirements specified in Section 2.948 of the FCC Rules and Industry Canada (2451B-1).
- PCTEST Lab is accredited to ISO 17025 by U.S. National Institute of Standards and Technology (NIST) under the National Voluntary Laboratory Accreditation Program (NVLAP Lab code: 100431-0) in EMC, FCC and Telecommunications.
- PCTEST Lab is accredited to ISO 17025-2005 by the American Association for Laboratory Accreditation (A2LA) in Specific Absorption Rate (SAR) testing, Hearing Aid Compatibility (HAC) testing, CTIA Test Plans, and wireless testing for FCC and Industry Canada Rules.
- PCTEST Lab is a recognized U.S. Conformity Assessment Body (CAB) in EMC and R&TTE (n.b. 0982) under the U.S.-EU Mutual Recognition Agreement (MRA).
- PCTEST TCB is a Telecommunication Certification Body (TCB) accredited to ISO/IEC Guide 65 by the American National Standards Institute (ANSI) in all scopes of FCC Rules and Industry Canada Standards (RSS).
- PCTEST facility is an IC registered (2451B-1) test laboratory with the site description on file at Industry Canada.
- PCTEST is a CTIA Authorized Test Laboratory (CATL) for AMPS, CDMA, and EvDO wireless devices and for Over-the-Air (OTA) Antenna Performance testing for AMPS, CDMA, GSM, GPRS, EGPRS, UMTS (W-CDMA), CDMA 1xEVDO, and CDMA 1xRTT.

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1.0 INTRODUCTION

1.1 Scope

Measurement and determination of electromagnetic emissions (EME) of radio frequency devices including intentional and/or unintentional radiators for compliance with the technical rules and regulations of the Federal Communications Commission and the Industry Canada Certification and Engineering Bureau.

1.2 Testing Facility

The map below shows the location of the PCTEST LABORATORY, its proximity to the FCC Laboratory, the Columbia vicinity, the Baltimore-Washington Internt'l (BWI) airport, the city of Baltimore and the Washington, DC area. (*See Figure 1-1*).

These measurement tests were conducted at the PCTEST Engineering Laboratory, Inc. facility located at 7185 Oakland Mills Road, Columbia, MD 21046. The site coordinates are 39° 10'23" N latitude and 76° 49'50" W longitude. The facility is 0.4 miles North of the FCC laboratory, and the ambient signal and ambient signal strength are approximately equal to those of the FCC laboratory. The detailed description of the measurement facility was found to be in compliance with the requirements of § 2.948 according to ANSI C63.4-2009 on February 15, 2012.

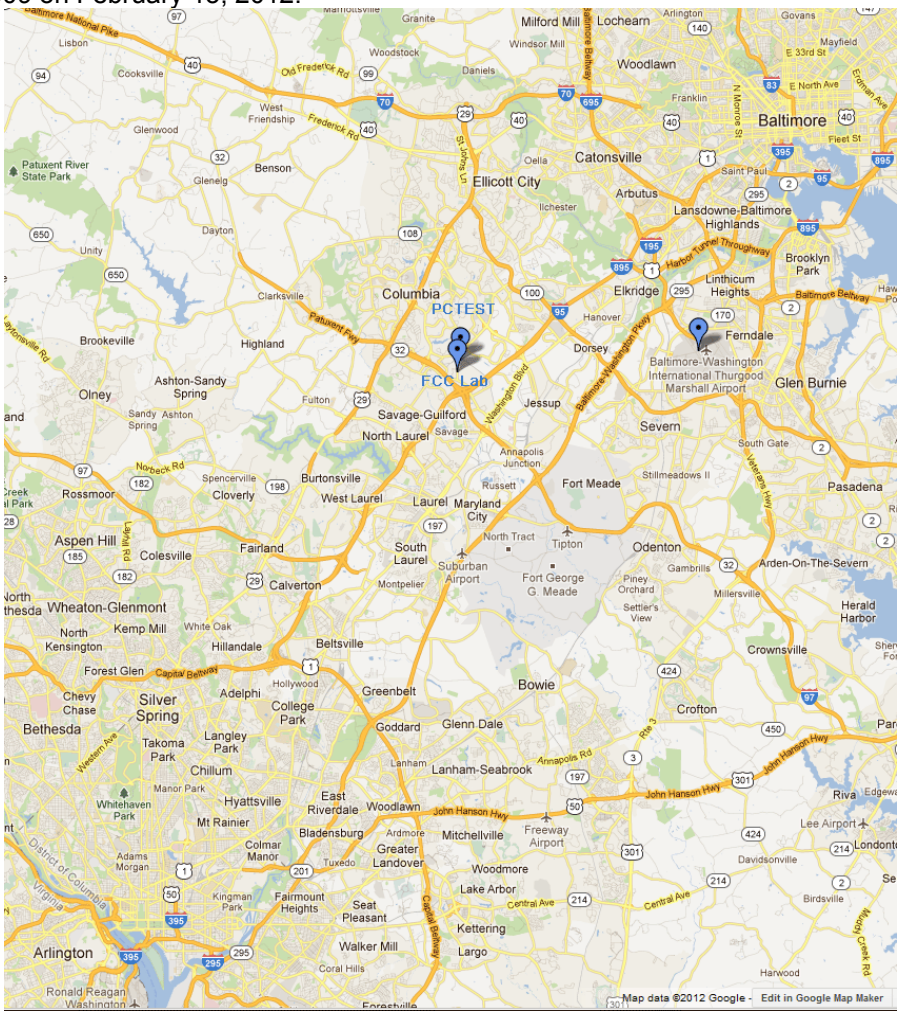

Figure 1-1. Map of the Greater Baltimore and Metropolitan Washington, D.C. area

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2.0 PRODUCT INFORMATION

2.1 Equipment Description

The Equipment Under Test (EUT) is the **Samsung Portable Handset FCC ID: A3LSC05G**. The test data contained in this report pertains only to the emissions due to the EUT's LTE function.

2.2 Device Capabilities

This device contains the following capabilities:

850/1900 GSM/GPRS/EDGE, 850 WCDMA/HSPA, Multi-band LTE, 802.11b/g/n WLAN, 802.11a/n/ac UNII, Bluetooth (1x, EDR, LE), NFC, ANT+

2.3 Test Configuration

The Samsung Portable Handset FCC ID: A3LSC05G was tested per the guidance of ANSI/TIA-603-C-2004 and KDB 971168 v02r02. See Section of this test report for a description of the radiated and antenna port conducted emissions tests.

This device supports wireless charging capability and, thus, is subject to the test requirements of KDB 648474 D03 v01r02. Additional radiated spurious emission measurements were performed with the EUT lying flat on a certified wireless charging pad while operating under normal conditions in a simulated call or data transmission configuration. The worst case radiated emissions data is shown in this report.

2.4 EMI Suppression Device(s)/Modifications

No EMI suppression device(s) were added and no modifications were made during testing.

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3.0 DESCRIPTION OF TESTS

3.1 Measurement Procedure

The measurement procedures described in the document titled "Land Mobile FM or PM – Communications Equipment – Measurements and Performance Standards" (ANSI/TIA-603-C-2004) and "Procedures for Compliance Measurement of the Fundamental Emission Power of Licensed Wideband (> 1 MHz) Digital Transmission Systems" (KDB 971168) were used in the measurement of the **Samsung Portable Handset FCC ID: A3LSC05G.**

3.1 Block C Frequency Range

§27.5(b)(3)

Two paired channels of 11 megahertz each are available for assignment in Block C in the 746-757 MHz and 776-787 MHz bands. In the event that no licenses for two channels in this Block C are assigned based on the results of the first auction in which such licenses were offered because the auction results do not satisfy the applicable reserve price, the spectrum in the 746-757 MHz and 776-787 MHz bands will instead be made available for assignment at a subsequent auction as follows: (i) Two paired channels of 6 megahertz each available for assignment in Block C1 in the 746-752 MHz and 776-782 MHz bands. (ii) Two paired channels of 5 megahertz each available for assignment in Block C2 in the 752-757 MHz and 782-787 MHz bands.

3.2 Block A Frequency Range

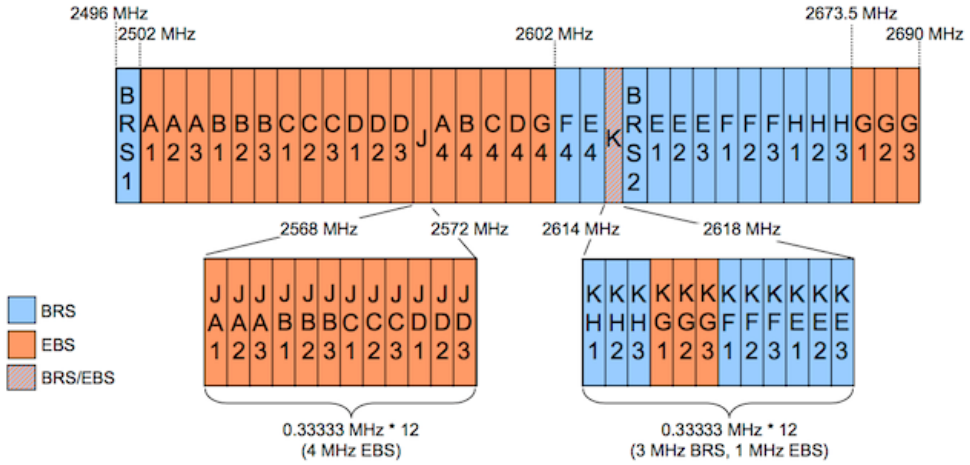
§27.5(c)

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 megahertz 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.

3.3 BRS/EBS Frequency Block

§27.5



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3.4 Radiated Power and Radiated Spurious Emissions

§2.1053 §27.50(b.10) §27.50(c.10) §27.53(f) §27.53(g)

The radiated test facilities consisted of an indoor 3 meter semi-anechoic chamber used for final measurements and exploratory measurements, when necessary. The measurement area is contained within the semi-anechoic chamber which is shielded from any ambient interference. The test site inside the chamber is a 6m x 5.2m elliptical, obstruction-free area in accordance with Clause 5, Figure 5.7 of ANSI C63.4-2009. For measurements above 1GHz absorbers are arranged on the floor between the turn table and the antenna mast in such a way so as to maximize the reduction of reflections. For measurements below 1GHz, the absorbers are removed. An ETS Lindgren Model 2188 raised turntable is used for radiated measurement. It is a continuously rotatable, remote-controlled, metallic turntable and 2 meters (6.56 ft.) in diameter. The turn table is flush with the raised floor of the chamber in order to maintain its function as a ground plane. A 78cm high PVC support structure is placed on top of the turntable. A ¾" (~1.9cm) sheet of high density polyethylene is used as the table top and is placed on top of the PVC supports to bring the total height of the table to 80cm.

The equipment under test was transmitting while connected to its integral antenna and is placed on a wooden turntable 80cm above the ground plane and 3 meters from the receive antenna. The receive antenna height is adjusted between 1 and 4 meter height, the turntable is rotated through 360 degrees, and the EUT is manipulated through all orthogonal planes representative of its typical use to achieve the highest reading on the receive spectrum analyzer. Radiated power levels are also investigated with the receive antenna horizontally and vertically polarized. The maximized power level is recorded using the spectrum analyzer "Channel Power" function with the integration band set to the emissions' occupied bandwidth, a RMS detector, RBW = 100kHz, VBW = 300kHz, and a 1 second sweep time over a minimum of 10 sweeps, per the guidelines of KDB 971168.

Per the guidance of ANSI/TIA-603-C-2004, 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 with the level of the signal generator being adjusted to obtain the same receive spectrum analyzer level previously recorded from the spurious emission from the EUT. The power of the emission is calculated using the following formula:

$$P_{d\,[dBm]} = P_{g\,[dBm]} - \text{cable loss}_{\,[dB]} + \text{antenna gain}_{\,[dBd/dBi]}$$

Where, P_d is the dipole equivalent power, P_g is the generator output into the substitution antenna, and the antenna gain is the gain of the substitute antenna used relative to either a half-wave dipole (dBd) or an isotropic source (dBi). The substitute level is equal to $P_{g\,[dBm]}$ – cable loss $_{[dB]}$.

The calculated P_d levels are then compared to the absolute spurious emission limit of -13dBm which is equivalent to the required minimum attenuation of 43 + $10\log_{10}$(Power $_{[Watts]}$). For Band 41, the calculated P_d levels are compared to the absolute spurious emission limit of -25dBm which is equivalent to the required minimum attenuation of 55 + $10\log_{10}$(Power $_{[Watts]}$).

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4.0 TEST EQUIPMENT CALIBRATION DATA

Test Equipment Calibration is traceable to the National Institute of Standards and Technology (NIST).

Manufacturer	Model	Description	Cal Date	Cal Interval	Cal Due	Serial Number
-	LTx3	LIcensed Transmitter Cable Set	10/15/2014	Annual	10/15/2015	N/A
-	RE1	Radiated Emissions Cable Set (UHF/EHF)	5/29/2014	Annual	5/29/2015	N/A
Agilent	8447D	Broadband Amplifier	5/30/2014	Annual	5/30/2015	2443A01900
Agilent	N9020A	MXA Signal Analyzer	10/27/2014	Annual	10/27/2015	US46470561
Agilent	N9030A	PXA Signal Analyzer (44GHz)	5/8/2014	Annual	5/8/2015	MY52350166
Com-Power	AL-130	9kHz - 30MHz Loop Antenna	6/26/2013	Biennial	6/26/2015	121034
Emco	3115	Horn Antenna (1-18GHz)	1/30/2014	Biennial	1/30/2016	9704-5182
Espec	ESX-2CA	Environmental Chamber	4/16/2014	Annual	4/16/2015	17620
ETS Lindgren	3160-09	18-26.5 GHz Standard Gain Horn	6/17/2014	Biennial	6/17/2016	135427
ETS Lindgren	3164-08	Quad Ridge Horn Antenna	3/12/2014	Biennial	3/12/2016	128337
K & L	11SH10-3075/U18000	High Pass Filter	5/2/2014	Annual	5/2/2015	2
K & L	13SH10-1000/U1000	N Type High Pass Filter	5/22/2014	Annual	5/22/2015	2
Mini-Circuits	PWR-SENS-4RMS	USB Power Sensor	4/17/2014	Annual	4/17/2015	11210140001
Mini-Circuits	SSG-4000HP	USB Synthesized Signal Generator	N/A			11208010032
Mini-Circuits	TVA-11-422	RF Power Amp	N/A			QA1303002
Rohde & Schwarz	CMW500	Radio Communication Tester	N/A			102060
Rohde & Schwarz	ESU26	EMI Test Receiver (26.5GHz)	3/27/2014	Annual	3/27/2015	100342
Rohde & Schwarz	TS-PR18	1-18 GHz Pre-Amplifier	3/5/2014	Annual	3/5/2015	100071
Rohde & Schwarz	TS-PR26	18-26.5 GHz Pre-Amplifier	3/12/2014	Annual	3/12/2015	100040
Schwarzbeck	UHA 9105	Dipole Antenna (400 - 1GHz) Rx	11/21/2013	Biennial	11/21/2015	9105-2404
Seekonk	NC-100	Torque Wrench 5/16", 8" lbs	3/18/2014	Biennial	3/18/2016	N/A
Sunol	JB5	Bi-Log Antenna (30M - 5GHz)	1/28/2014	Biennial	1/28/2016	A051107
VWR	62344-734	Thermometer with Clock	2/20/2014	Biennial	2/20/2016	140140420

Table 4-1. Test Equipment

Notes:

1. For equipment listed above that has a calibration due date that falls within the test date range, care was taken to ensure that this equipment was used after the calibration date and before the calibration due date.

2. Equipment with a calibration date of “N/A” shown in this list was not used to make direct calibrated measurements.

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5.0 SAMPLE CALCULATIONS

Emission Designator

QPSK Modulation

Emission Designator = 8M62G7D

LTE BW = 8.62 MHz
G = Phase Modulation
7 = Quantized/Digital Info
D = Data transmission, telemetry, telecommand

16QAM Modulation

Emission Designator = 8M45W7D

LTE BW = 8.45 MHz
W = Amplitude/Angle Modulated
7 = Quantized/Digital Info
D = Data transmission, telemetry, telecommand

Spurious Radiated Emission – LTE Band

Example: Middle Channel LTE Mode 2nd Harmonic (1564 MHz)

The average spectrum analyzer reading at 3 meters with the EUT on the turntable was –81.0 dBm. The gain of the substituted antenna is 8.1 dBi. The signal generator connected to the substituted antenna terminals is adjusted to produce a reading of –81.0 dBm on the spectrum analzyer. The loss of the cable between the signal generator and the terminals of the substituted antenna is 2.0 dB at 1564 MHz. So 6.1 dB is added to the signal generator reading of –30.9 dBm yielding –24.80 dBm. The fundamental EIRP was 25.501 dBm so this harmonic was 25.501 dBm – (-24.80).

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6.0 TEST RESULTS

6.1 Summary

Company Name: Samsung Electronics Co., Ltd.
FCC ID: A3LSC05G
FCC Classification: PCS Licensed Transmitter Held to Ear (PCE)
Mode(s): LTE

FCC Part Section(s)	Test Description	Test Limit	Test Condition	Result	Reference
TRANSMITTER MODE (TX)					
2.1049	Occupied Bandwidth	N/A	CONDUCTED	PASS	Section 6.2
2.1051 27.53(c) 27.53(g)	Out of Band Emissions (Band 13, 17)	> 43 + 10log$_{10}$ (P[Watts]) at Band Edge and for all out-of-band emissions		PASS	Section 6.3, 6.4
27.53(m)	Out of Band Emissions (Band 41)	> 40 + 10log$_{10}$ (P[Watts]) at channel edge > 43 + 10log$_{10}$ (P[Watts]) at 5.5MHz away and at 2490.5-2496MHz > 55 + 10log$_{10}$ (P[Watts]) at frequencies more than X-MHz away or less than 2495MHz		PASS	Section 6.3, 6.4
2.1046	Transmitter Conducted Output Power	N/A		PASS	See RF Exposure Report
2.1055. 27.54	Frequency Stability	Fundamental emissions stay within authorized frequency block (Part 24, 27)		PASS	Section 6.7
27.50(b.10) 27.50(c.10)	Effective Radiated Power (Band 13, 17)	< 3 Watts max. ERP	RADIATED	PASS	Section 6.5
27.50(h.2)	Equivalent Isotropic Radiated Power (Band 41)	< 2 Watts max. EIRP		PASS	Section 6.5
2.1053 27.53(c) 27.53(g)	Undesirable Emissions (Band 13, 17)	> 43 + 10log$_{10}$ (P[Watts]) for all out-of-band emissions		PASS	Section 6.6
27.53(f)	Undesirable Emissions (Band 13)	< -70 dBW/MHz (for wideband signals) < -80 dBW (for discrete emissions less than 700Hz BW) For all emissions in the band 1559 – 1610 MHz		PASS	Section 6.6
27.53(m)	Undesirable Emissions (Band 41)	> 40 + 10log$_{10}$ (P[Watts]) at channel edge > 43 + 10log$_{10}$ (P[Watts]) at 5.5MHz away and at 2490.5-2496MHz > 55 + 10log$_{10}$ (P[Watts]) at frequencies more than X-MHz away or less than 2495MHz		PASS	Section 6.6

Table 6-1. Summary of Test Results

Notes:

1) All modes of operation and data rates were investigated. The test results shown in the following sections represent the worst case emissions.
2) The analyzer plots (Sections 6.2, 6.3, 6.4) were all taken with a correction table loaded into the analyzer. The correction table was used to account for the losses of the cables, directional couplers, and attenuators used as part of the system to maintain a link between the call box and the EUT at all frequencies of interest.
3) All antenna port conducted emissions testing was performed on a test bench with the antenna port of the EUT connected to the spectrum analyzer through calibrated cables, attenuators, and couplers.
4) For conducted spurious emissions, automated test software was used to measure emissions and capture the corresponding plots necessary to show compliance. The measurement software utilized is PCTEST "LTE Automation", Version 2.8.

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6.2 Occupied Bandwidth

§2.1049

Test Overview

The occupied bandwidth, that is the frequency bandwidth such that, below its lower and above its upper frequency limits, the mean powers radiated are each equal to 0.5 percent of the total mean power radiated by a given emission shall be measured. All modes of operation were investigated and the worst case configuration results are reported in this section.

Test Procedure Used

KDB 971168 v02r02 – Section 4.2

Test Settings

1. The signal analyzer's automatic bandwidth measurement capability was used to perform the 99% occupied bandwidth and the 26dB bandwidth. The bandwidth measurement was not influenced by any intermediate power nulls in the fundamental emission.
2. RBW = 1 – 5% of the expected OBW
3. VBW ≥ 3 x RBW
4. Detector = Peak
5. Trace mode = max hold
6. Sweep = auto couple
7. The trace was allowed to stabilize
8. If necessary, steps 2 – 7 were repeated after changing the RBW such that it would be within 1 – 5% of the 99% occupied bandwidth observed in Step 7

Test Setup

The EUT and measurement equipment were set up as shown in the diagram below.

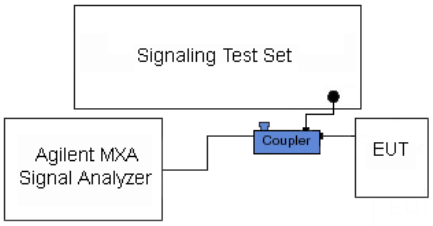

Figure 6-1. Test Instrument & Measurement Setup

Test Notes

None.

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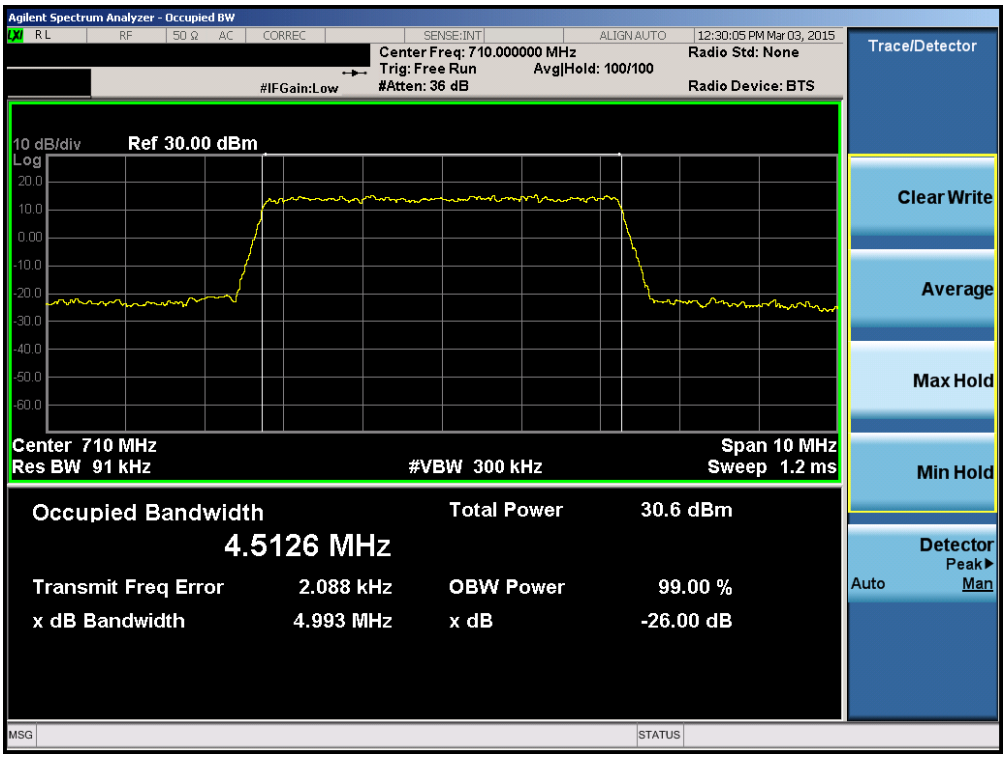
Plot 6-1. Occupied Bandwidth Plot (Band 17 – 5.0MHz QPSK – RB Size 25)



Plot 6-2. Occupied Bandwidth Plot (Band 17 – 5.0MHz 16-QAM – RB Size 25)

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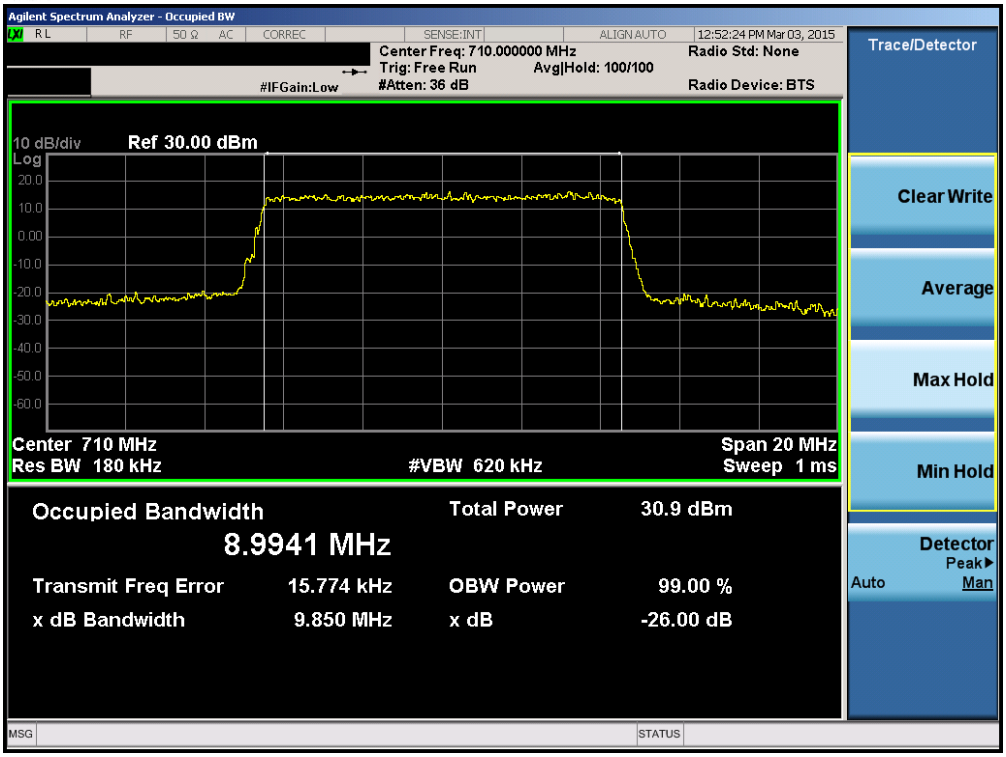
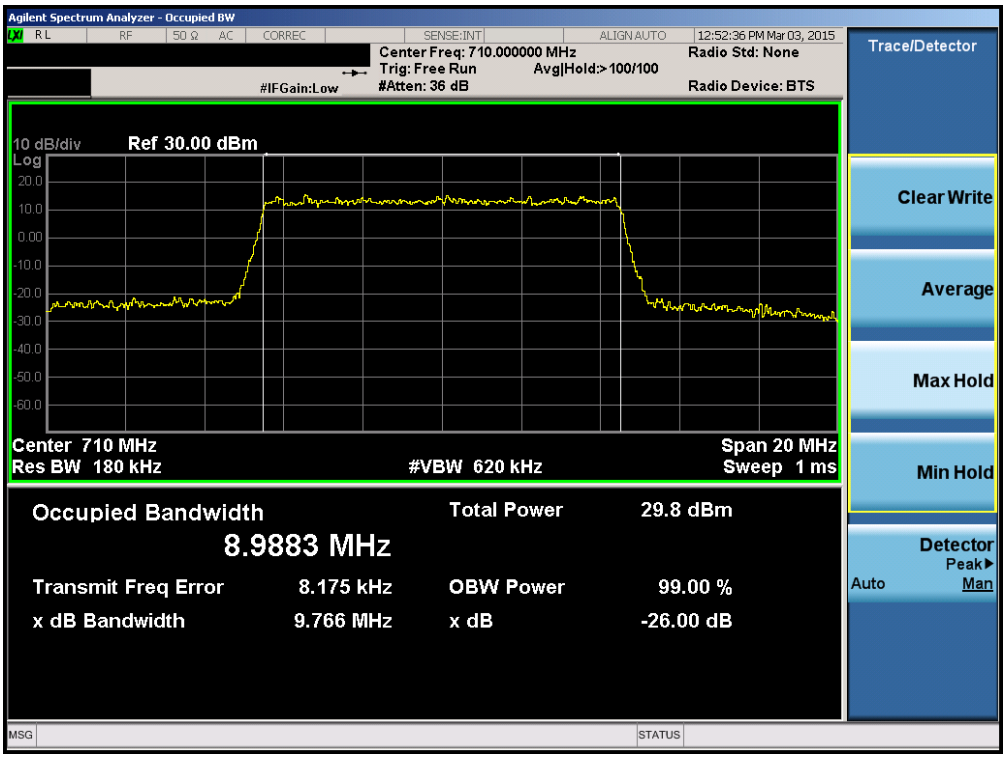


Plot 6-3. Occupied Bandwidth Plot (Band 17 – 10.0MHz QPSK – RB Size 50)



Plot 6-4. Occupied Bandwidth Plot (Band 17 – 10.0MHz 16-QAM – RB Size 50)

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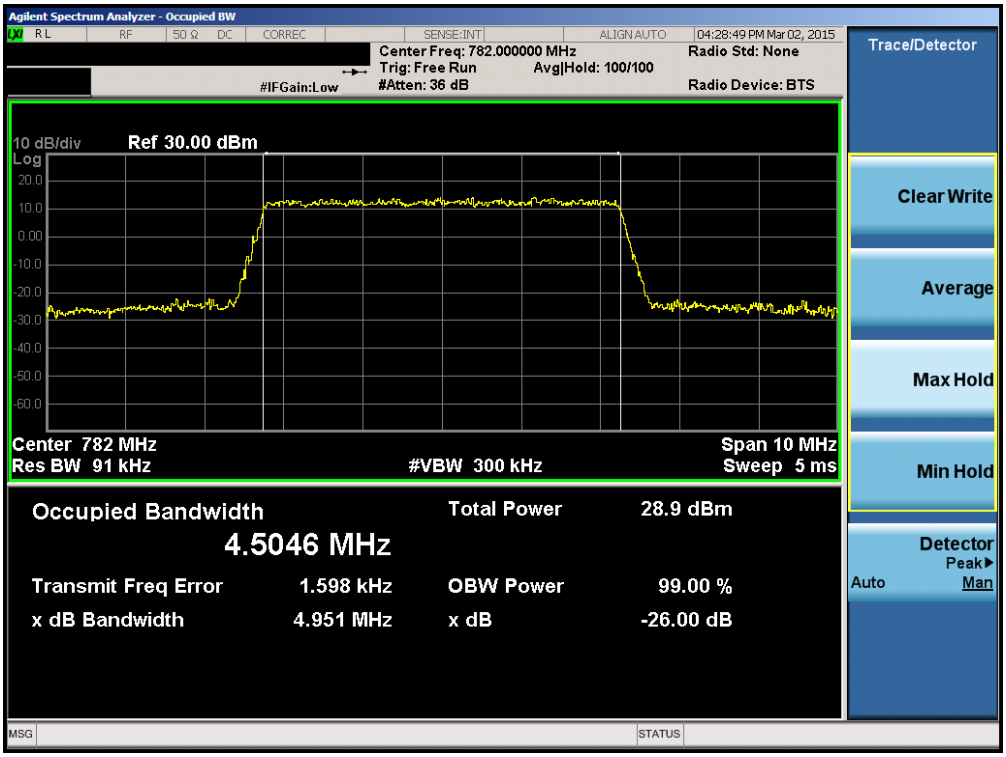
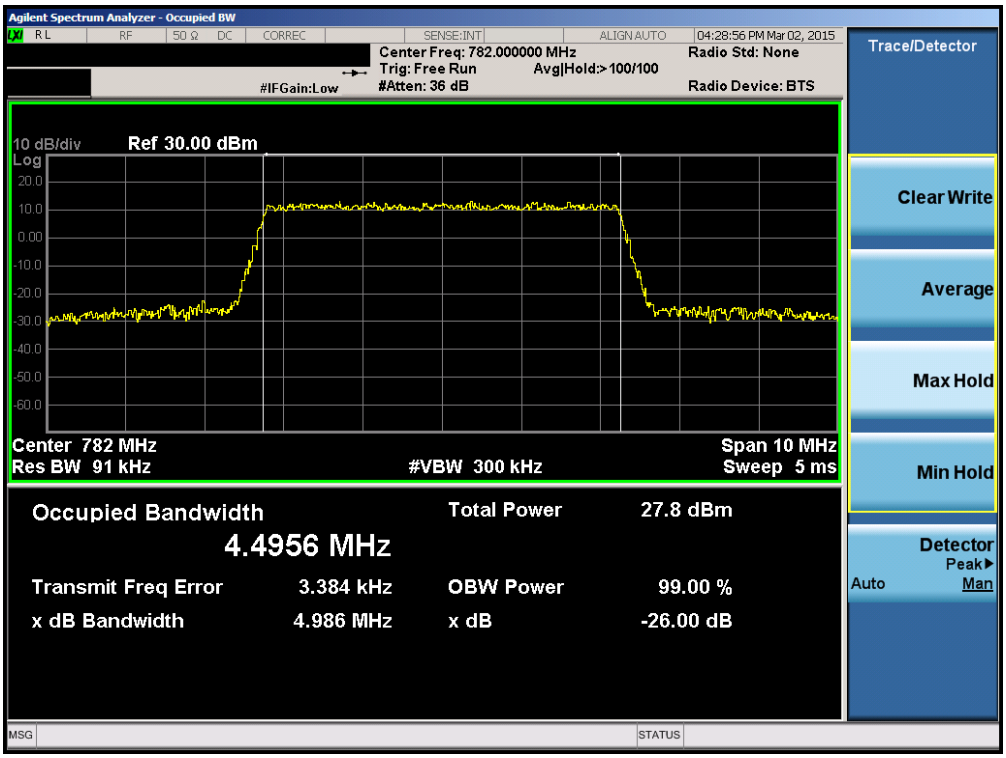


Plot 6-5. Occupied Bandwidth Plot (Band 13 – 5.0MHz QPSK – RB Size 25)



Plot 6-6. Occupied Bandwidth Plot (Band 13 – 5.0MHz 16-QAM – RB Size 25)

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Plot 6-7. Occupied Bandwidth Plot (Band 13 – 10.0MHz QPSK – RB Size 50)

Plot 6-8. Occupied Bandwidth Plot (Band 13 – 10.0MHz 16-QAM – RB Size 50)

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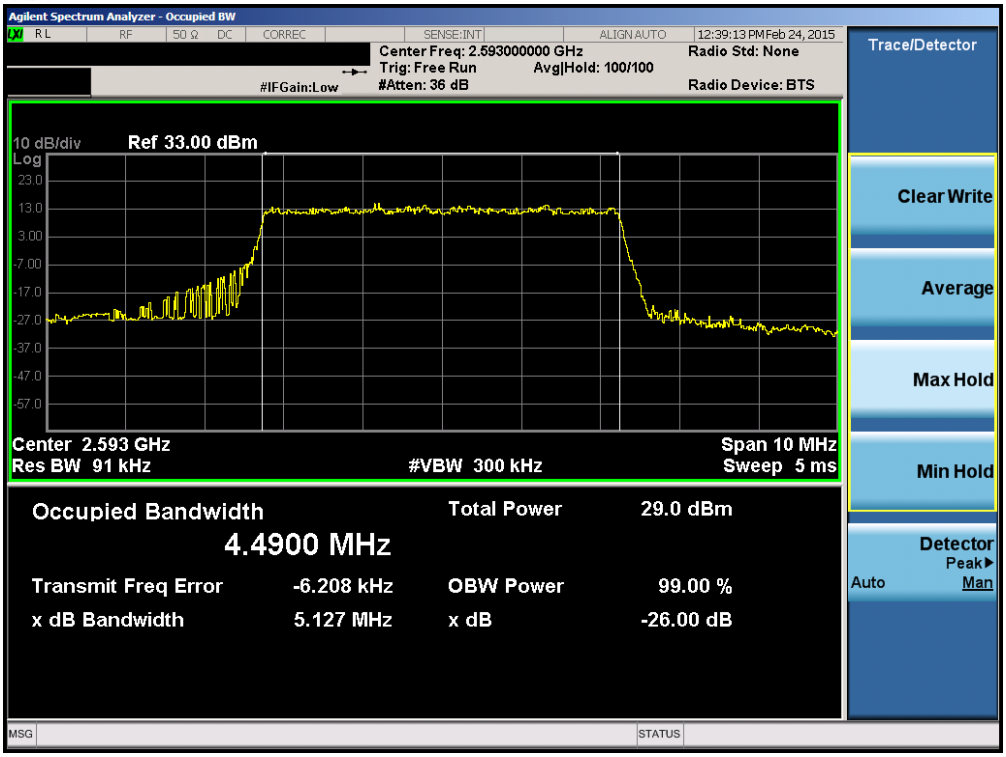
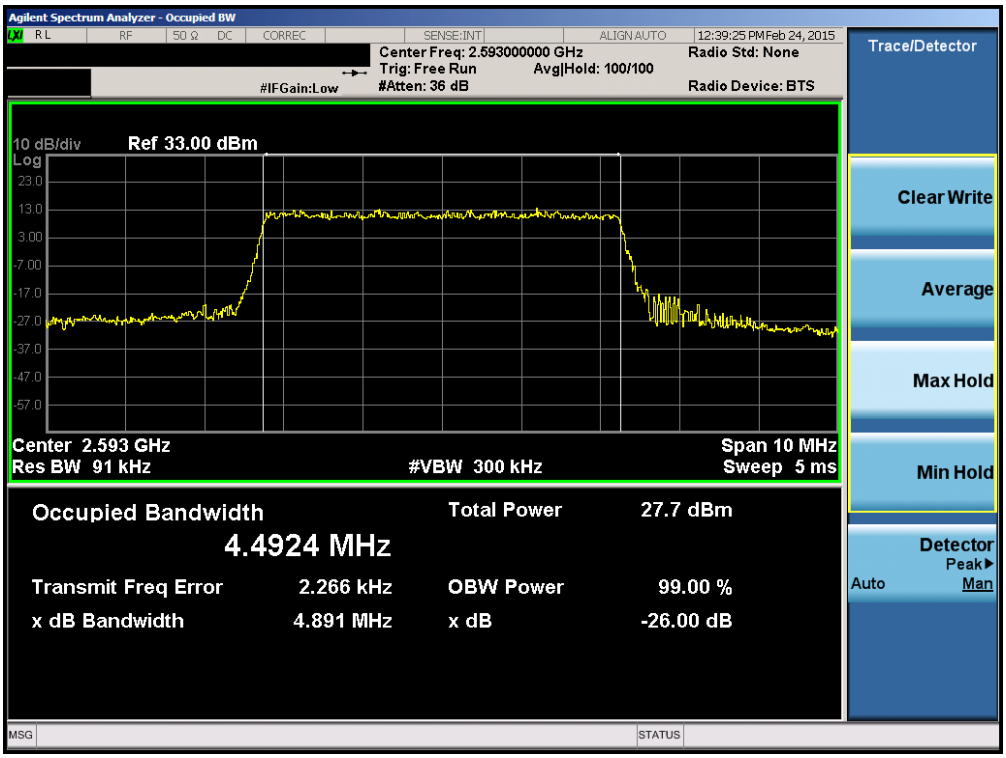


Plot 6-9. Occupied Bandwidth Plot (Band 41 – 5.0MHz QPSK – RB Size 25)



Plot 6-10. Occupied Bandwidth Plot (Band 41 – 5.0MHz 16-QAM – RB Size 25)

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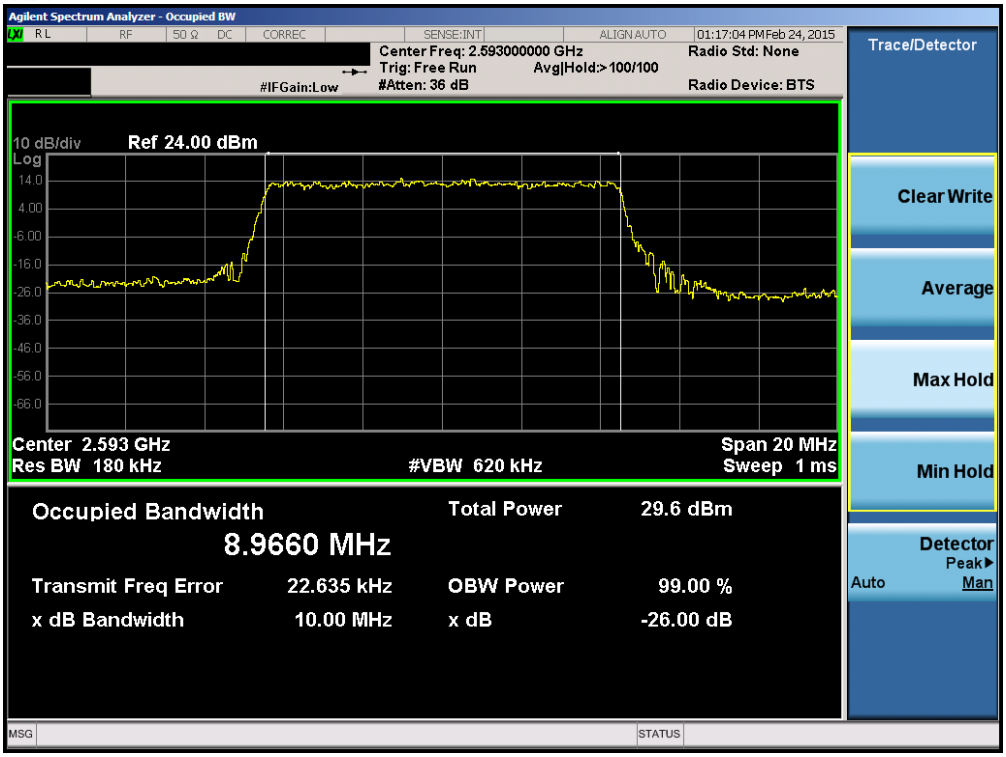
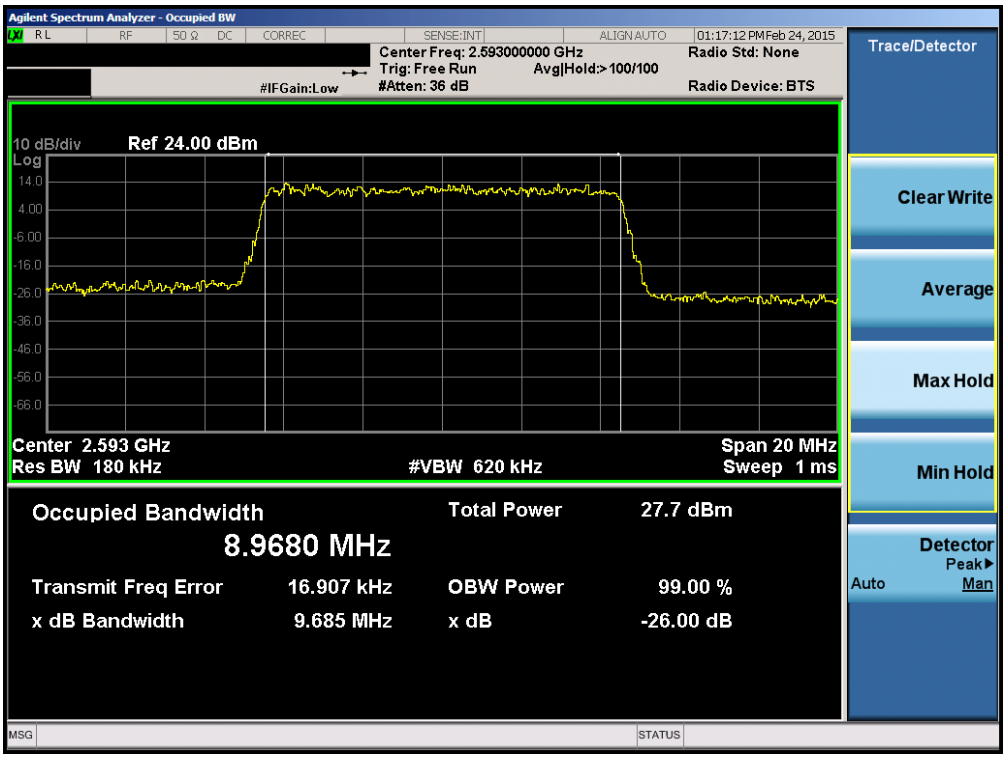


Plot 6-11. Occupied Bandwidth Plot (Band 41 – 10.0MHz QPSK – RB Size 50)



Plot 6-12. Occupied Bandwidth Plot (Band 41 – 10.0MHz 16-QAM – RB Size 50)

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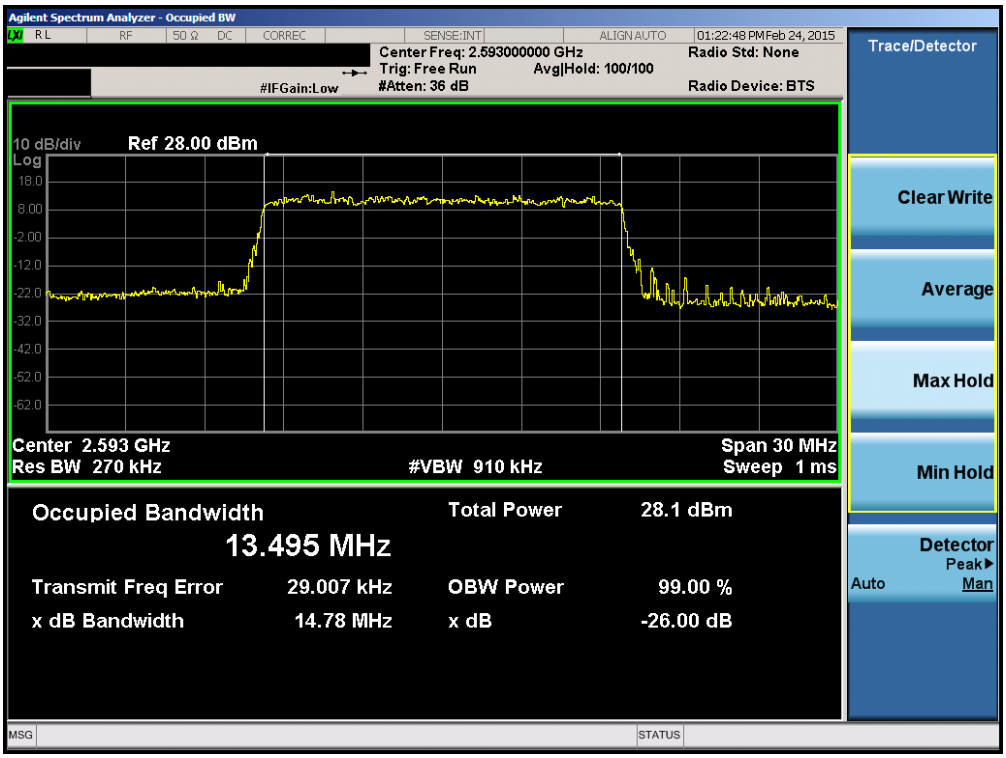
Plot 6-13. Occupied Bandwidth Plot (Band 41 – 15.0MHz QPSK – RB Size 75)



Plot 6-14. Occupied Bandwidth Plot (Band 41 – 15.0MHz 16-QAM – RB Size 75)

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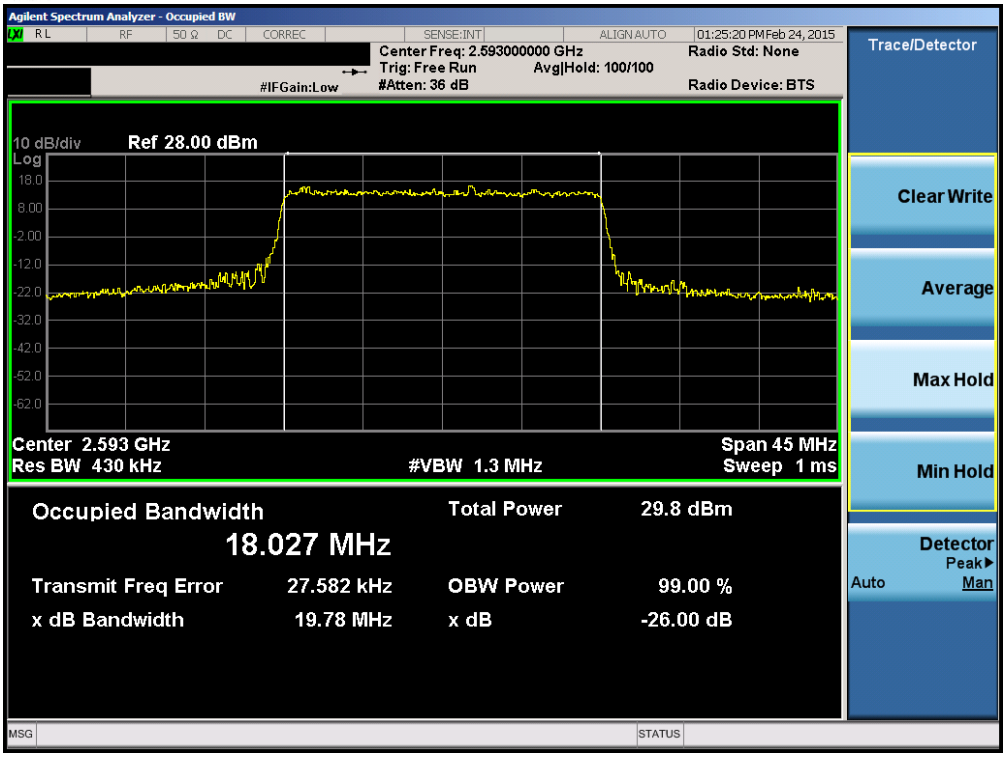
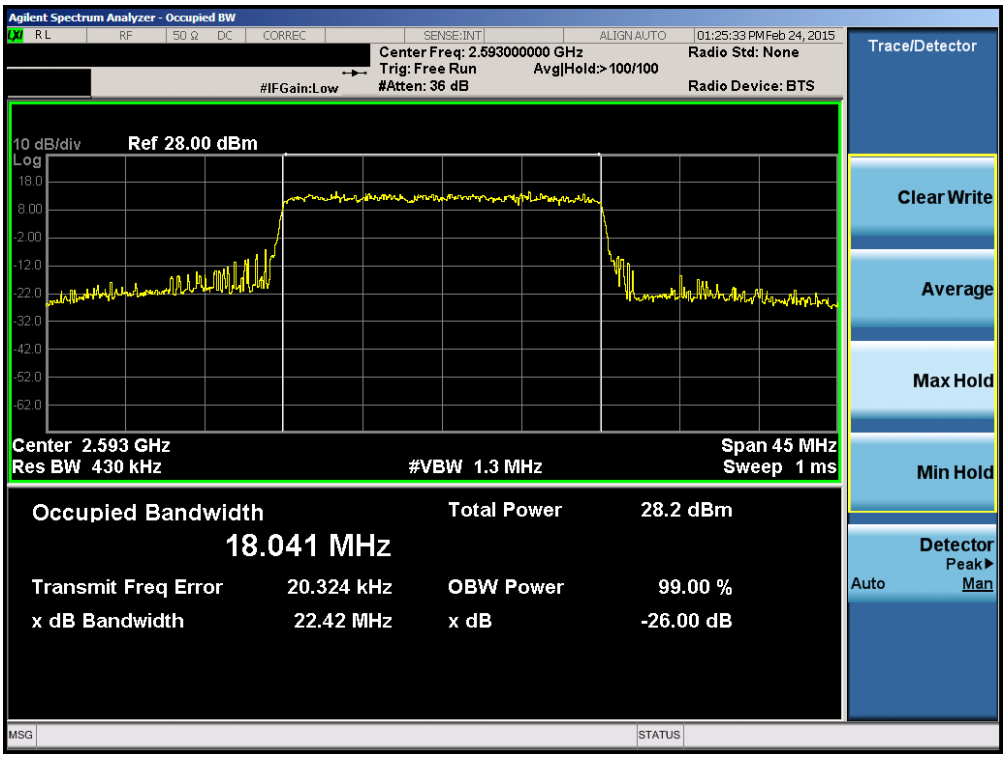


Plot 6-15. Occupied Bandwidth Plot (Band 41 – 20.0MHz QPSK – RB Size 100)



Plot 6-16. Occupied Bandwidth Plot (Band 41 – 20.0MHz 16-QAM – RB Size 100)

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6.3 Spurious and Harmonic Emissions at Antenna Terminal

§2.1051 §27.53(c.2) §27.53(g) §27.53(m)

Test Overview

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. 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 is 43 + $\log_{10}(P_{[Watts]})$, where P is the transmitter power in Watts. For Band 41, the minimum permissible attenuation level of any spurious emission is 55 + $\log_{10}(P_{[Watts]})$.

Test Procedure Used

KDB 971168 v02r02 – Section 6.0

Test Settings

1. Start frequency was set to 30MHz and stop frequency was set to at least 10 * the fundamental frequency (separated into at least two plots per channel)
2. Detector = RMS
3. Trace mode = Trace Averaging (RMS)
4. Sweep time = auto couple
5. The trace was allowed to stabilize
6. Please see test notes below for RBW and VBW settings

Test Setup

The EUT and measurement equipment were set up as shown in the diagram below.

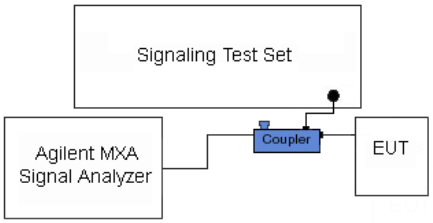

Figure 6-2. Test Instrument & Measurement Setup

Test Notes

Compliance with the applicable limits is based on the use of measurement instrumentation employing a resolution bandwidth of 100 kHz or greater for frequencies less than 1 GHz and 1 MHz or greater for frequencies greater than 1 GHz. However, in the 1 MHz bands immediately outside and adjacent to the frequency block a resolution bandwidth of at least one percent of the emission bandwidth of the fundamental emission of the transmitter 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, outside of which all emission are attenuated at least 26 dB below the transmitter power.

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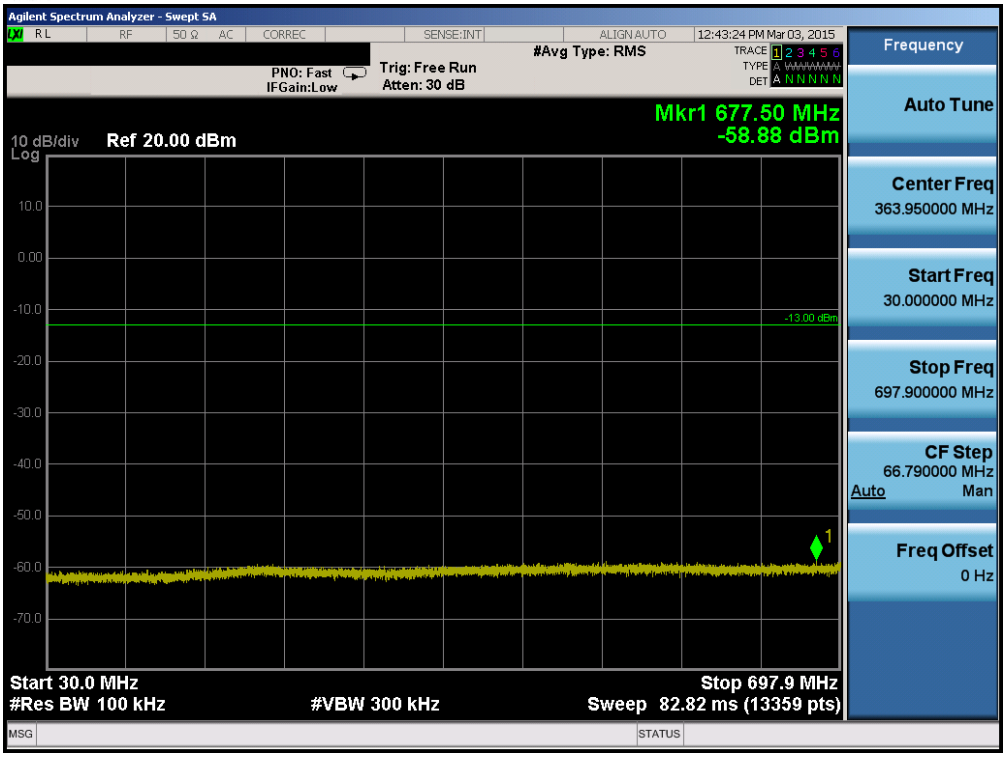
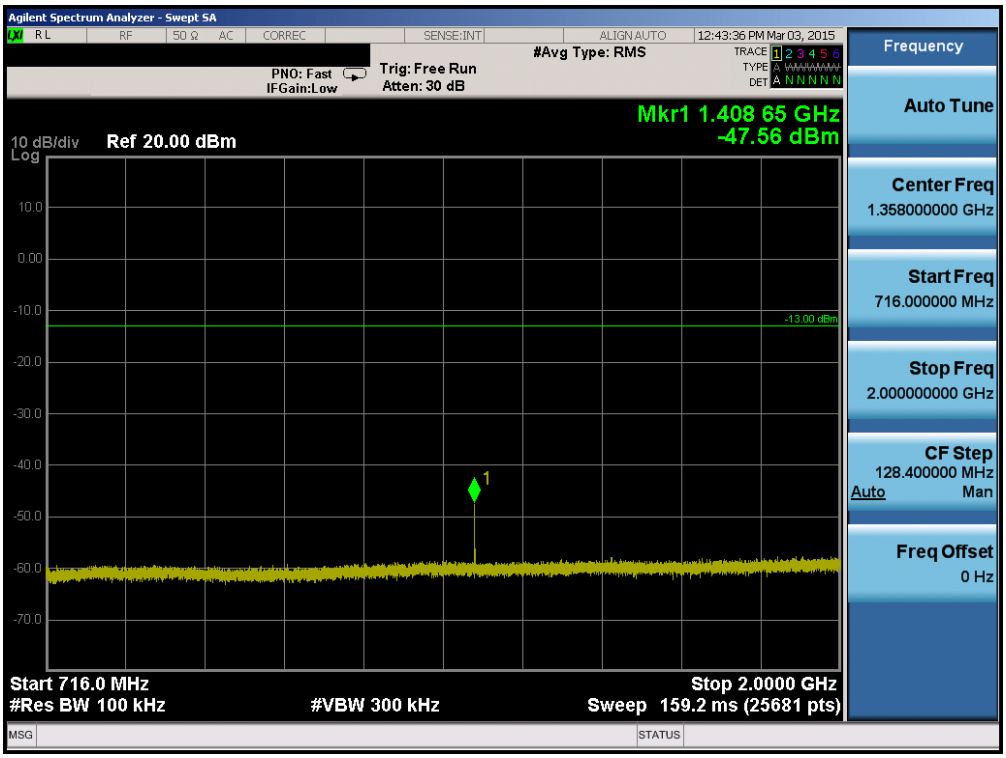


Plot 6-17. Conducted Spurious Plot (Band 17 – 5.0MHz QPSK – RB Size 1, RB Offset 0 – Low Channel)



Plot 6-18. Conducted Spurious Plot (Band 17 – 5.0MHz QPSK – RB Size 1, RB Offset 0 – Low Channel)

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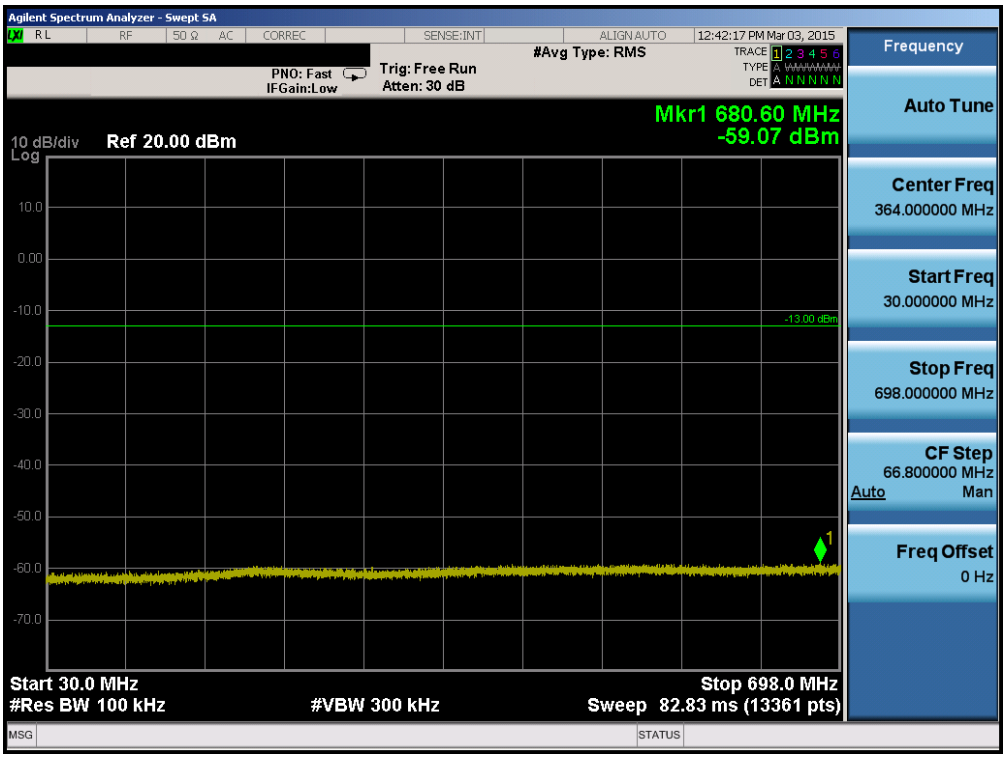
Plot 6-19. Conducted Spurious Plot (Band 17 – 5.0MHz QPSK – RB Size 1, RB Offset 0 – Low Channel)



Plot 6-20. Conducted Spurious Plot (Band 17 – 5.0MHz QPSK – RB Size 1, RB Offset 0 – Mid Channel)

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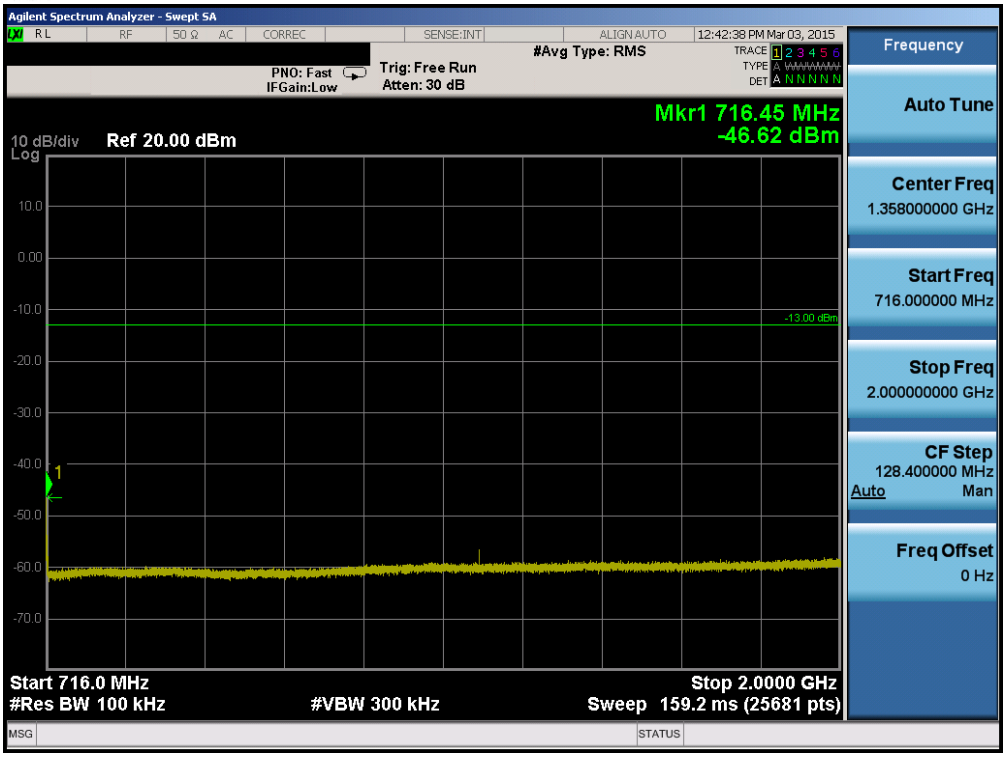
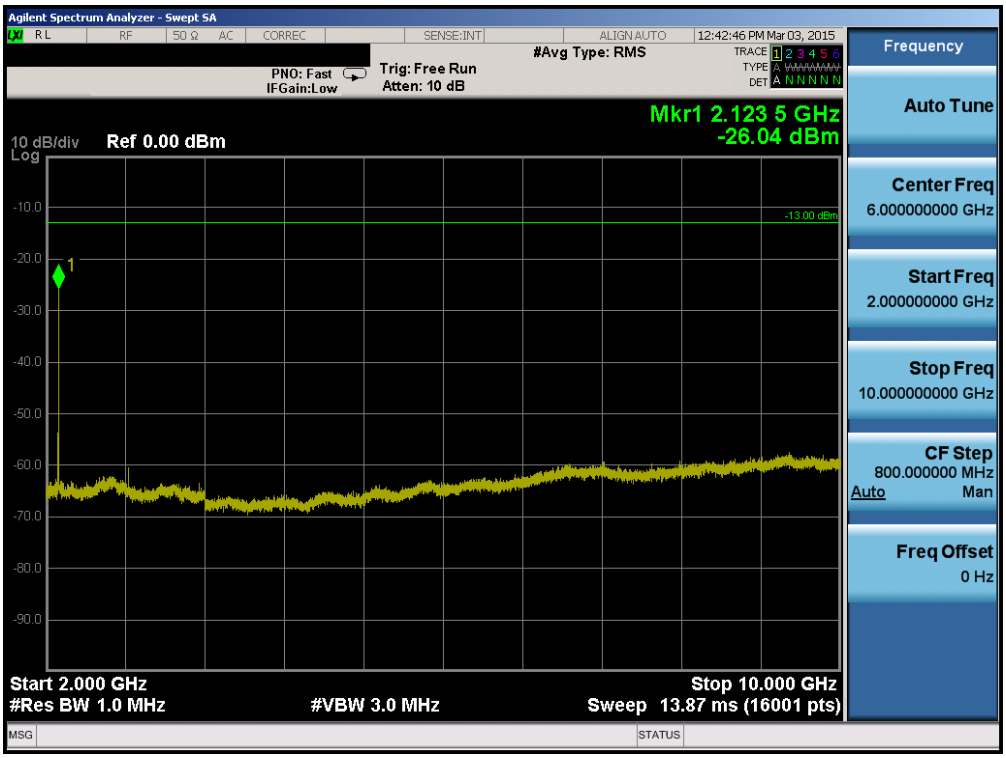


Plot 6-21. Conducted Spurious Plot (Band 17 – 5.0MHz QPSK – RB Size 1, RB Offset 0 – Mid Channel)



Plot 6-22. Conducted Spurious Plot (Band 17 – 5.0MHz QPSK – RB Size 1, RB Offset 0 – Mid Channel)

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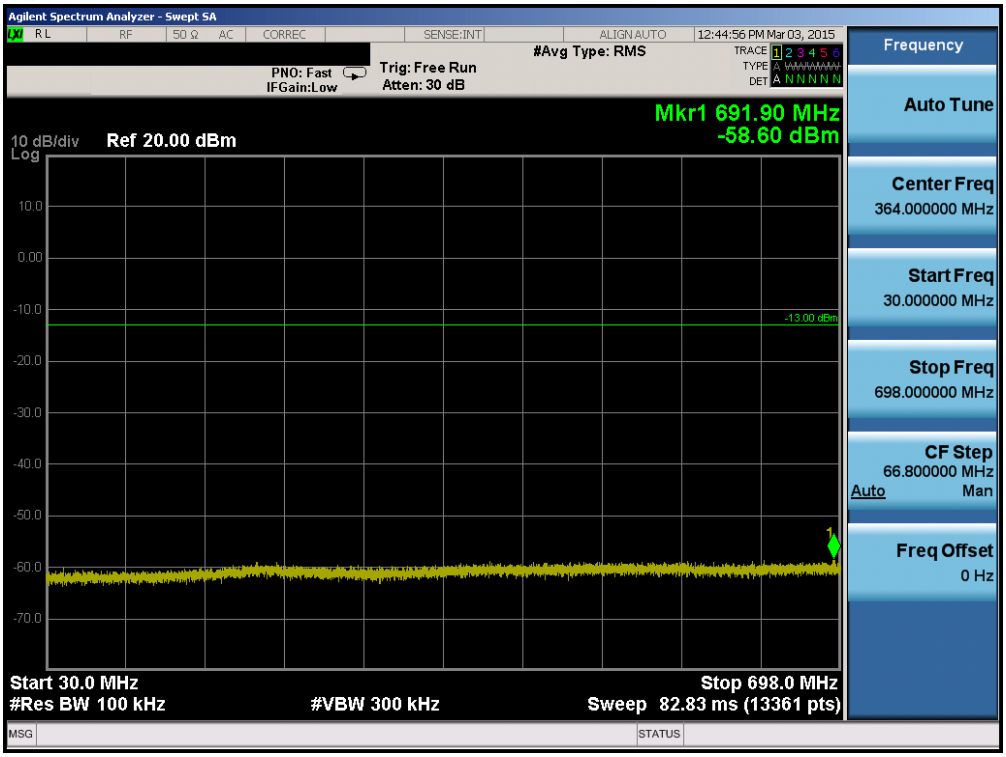
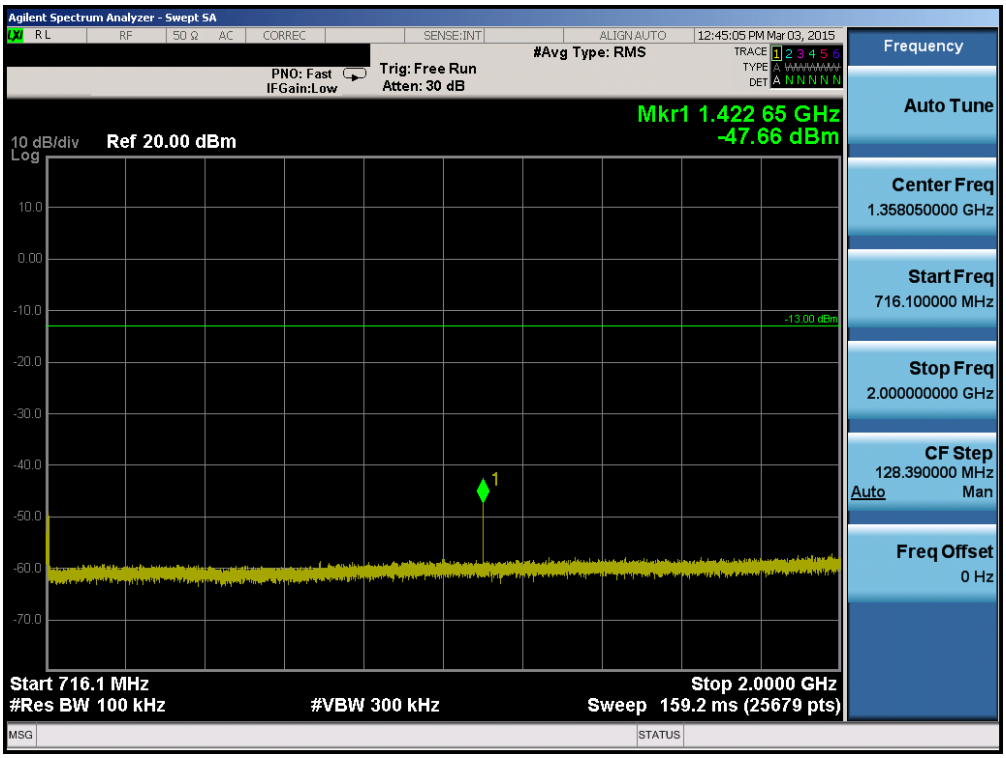


Plot 6-23. Conducted Spurious Plot (Band 17 – 5.0MHz QPSK – RB Size 1, RB Offset 0 – High Channel)



Plot 6-24. Conducted Spurious Plot (Band 17 – 5.0MHz QPSK – RB Size 1, RB Offset 0 – High Channel)

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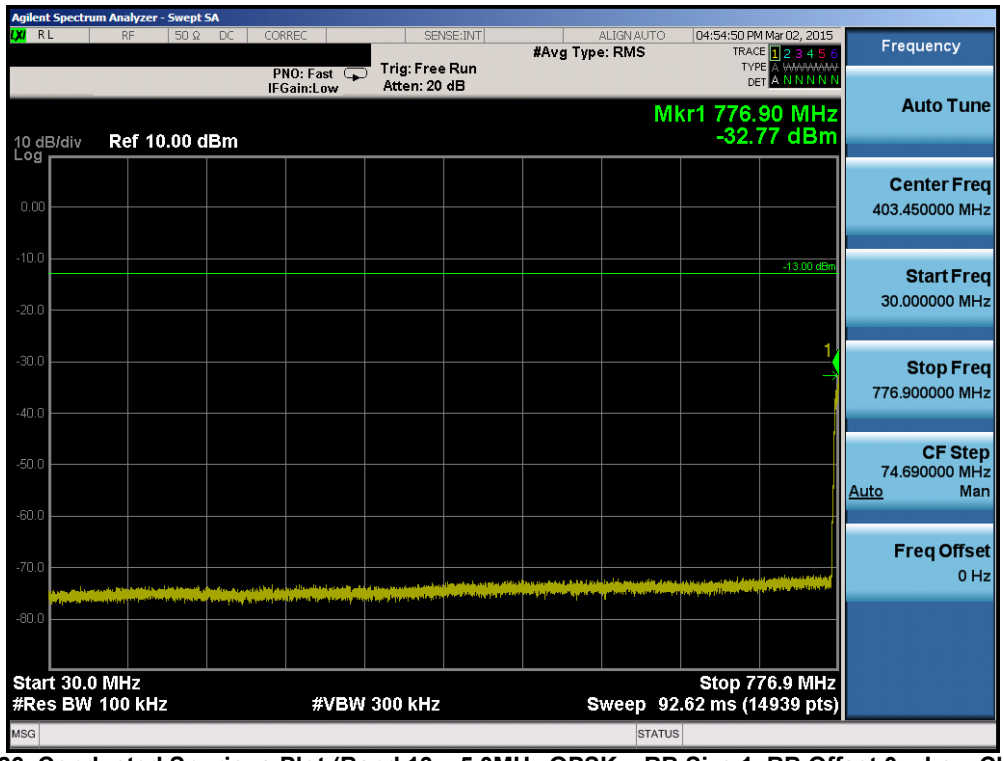
Plot 6-25. Conducted Spurious Plot (Band 17 – 5.0MHz QPSK – RB Size 1, RB Offset 0 – High Channel)



Plot 6-26. Conducted Spurious Plot (Band 13 – 5.0MHz QPSK – RB Size 1, RB Offset 0 – Low Channel)

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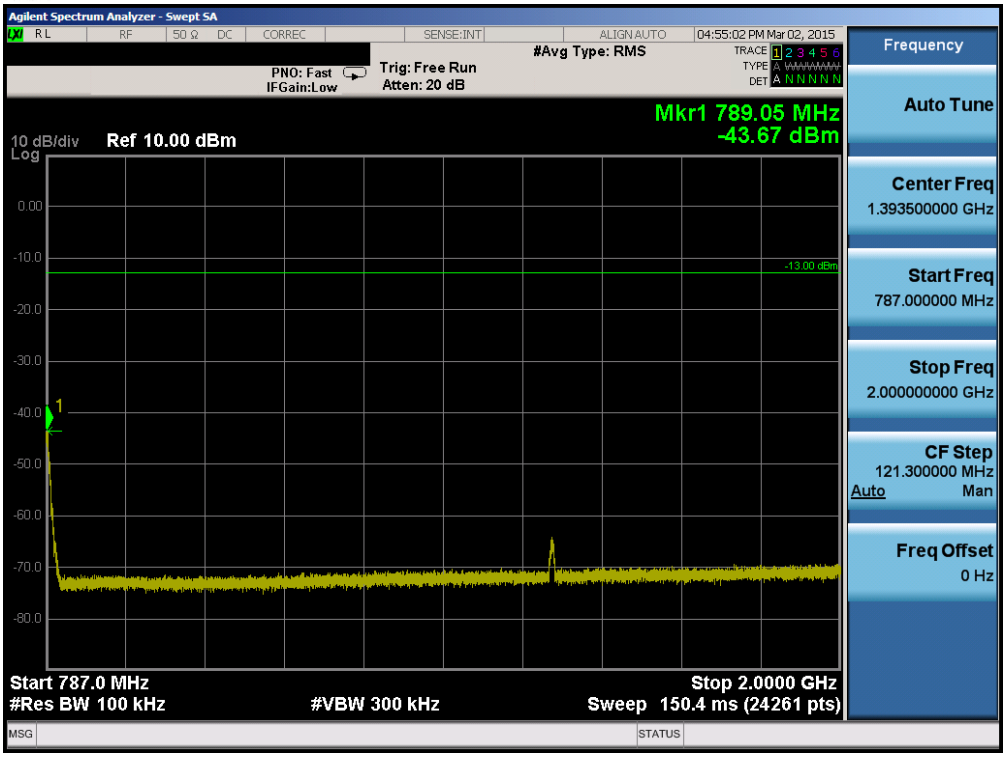
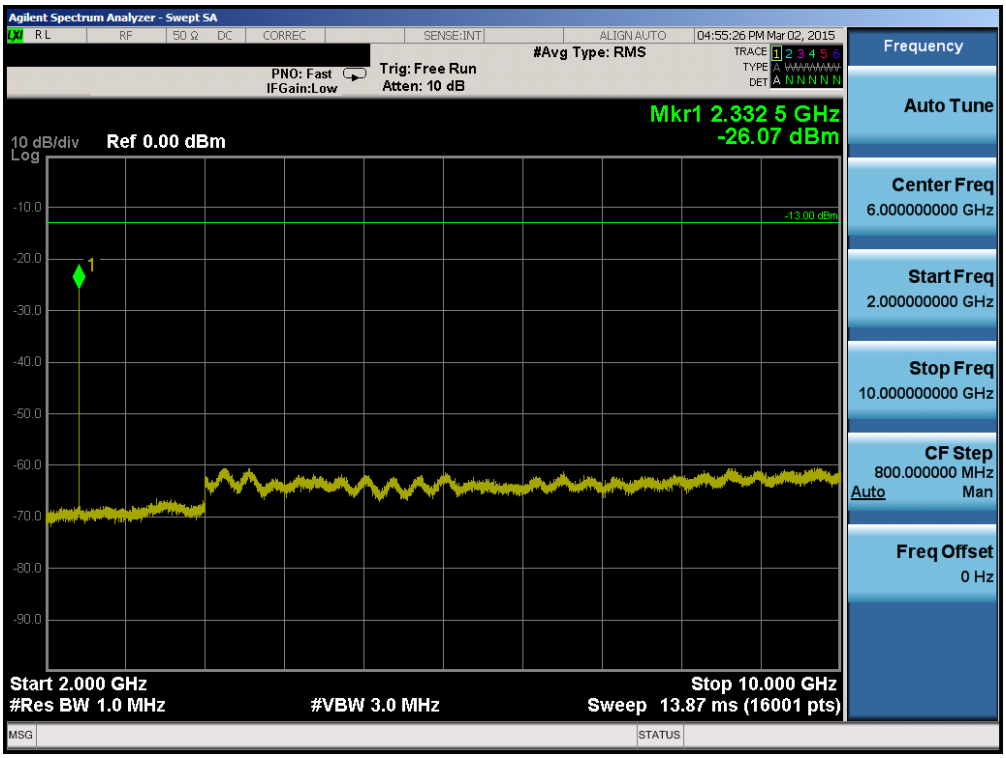


Plot 6-27. Conducted Spurious Plot (Band 13 – 5.0MHz QPSK – RB Size 1, RB Offset 0 – Low Channel)



Plot 6-28. Conducted Spurious Plot (Band 13 – 5.0MHz QPSK – RB Size 1, RB Offset 0 – Low Channel)

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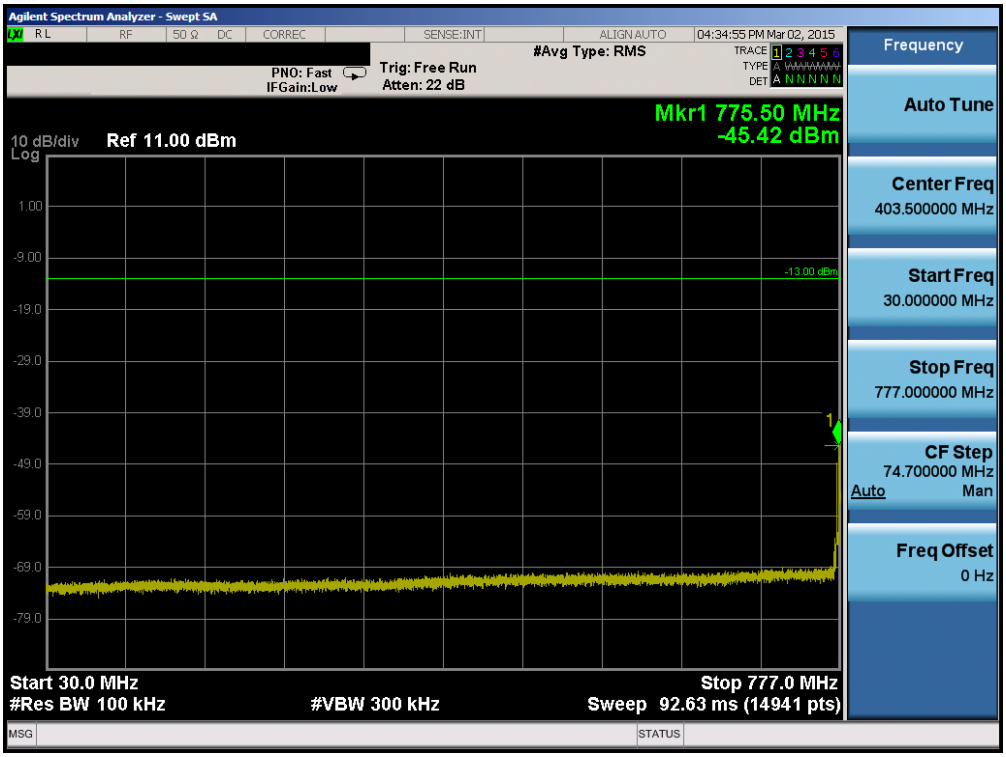
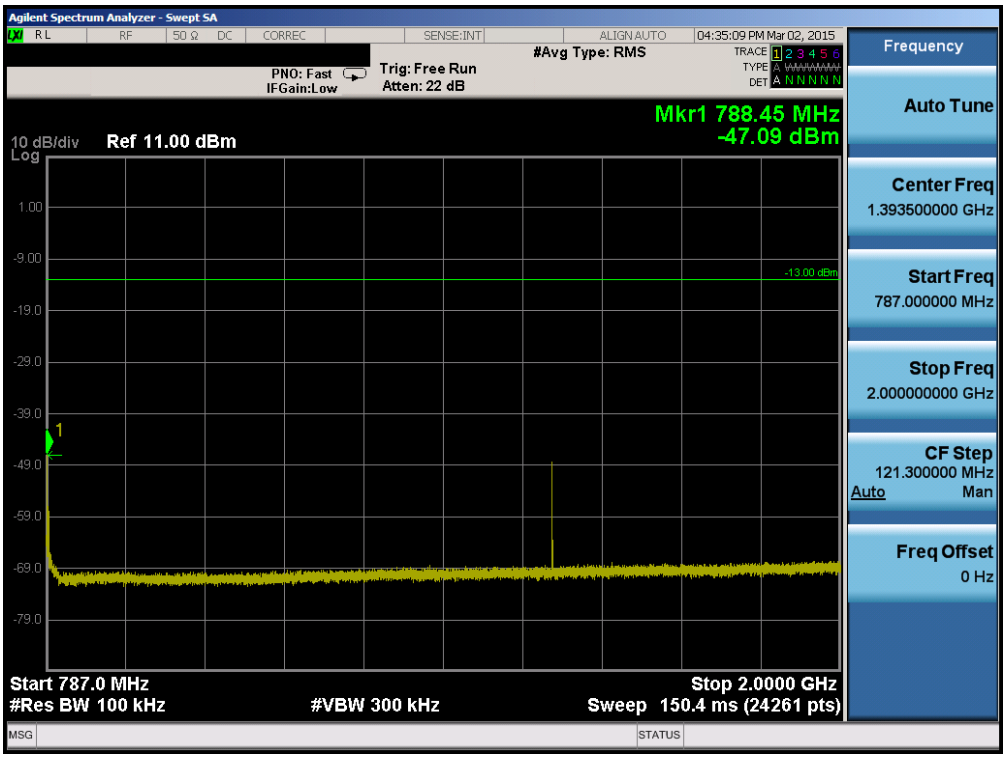


Plot 6-29. Conducted Spurious Plot (Band 13 – 5.0MHz QPSK – RB Size 1, RB Offset 0 – Mid Channel)



Plot 6-30. Conducted Spurious Plot (Band 13 – 5.0MHz QPSK – RB Size 1, RB Offset 0 – Mid Channel)

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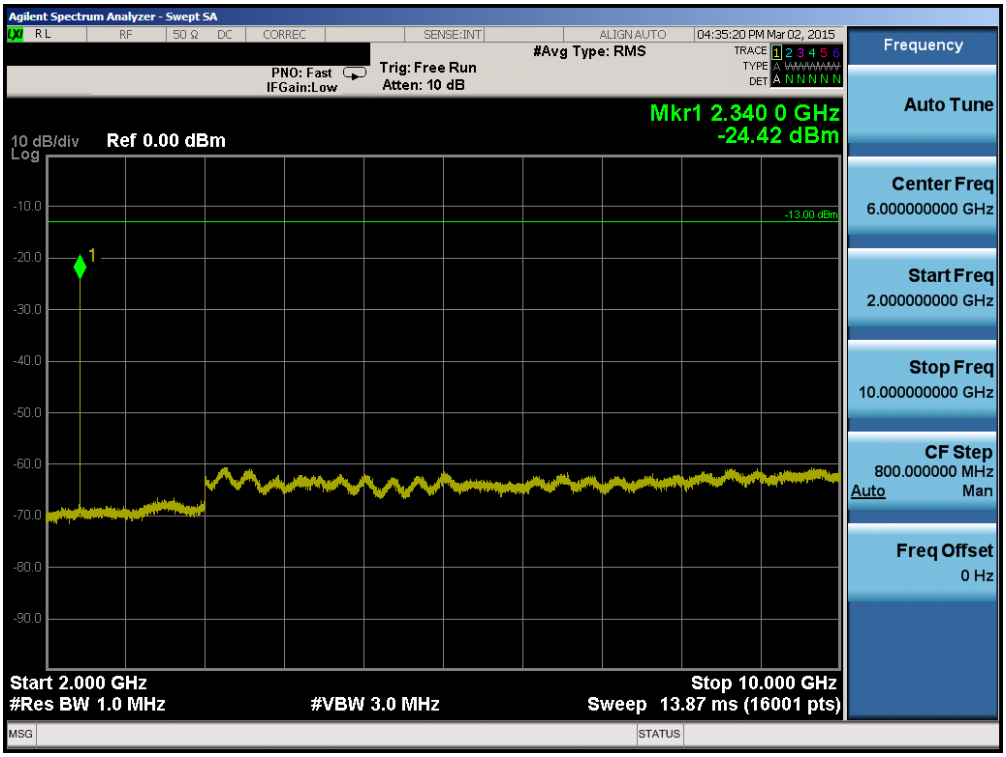
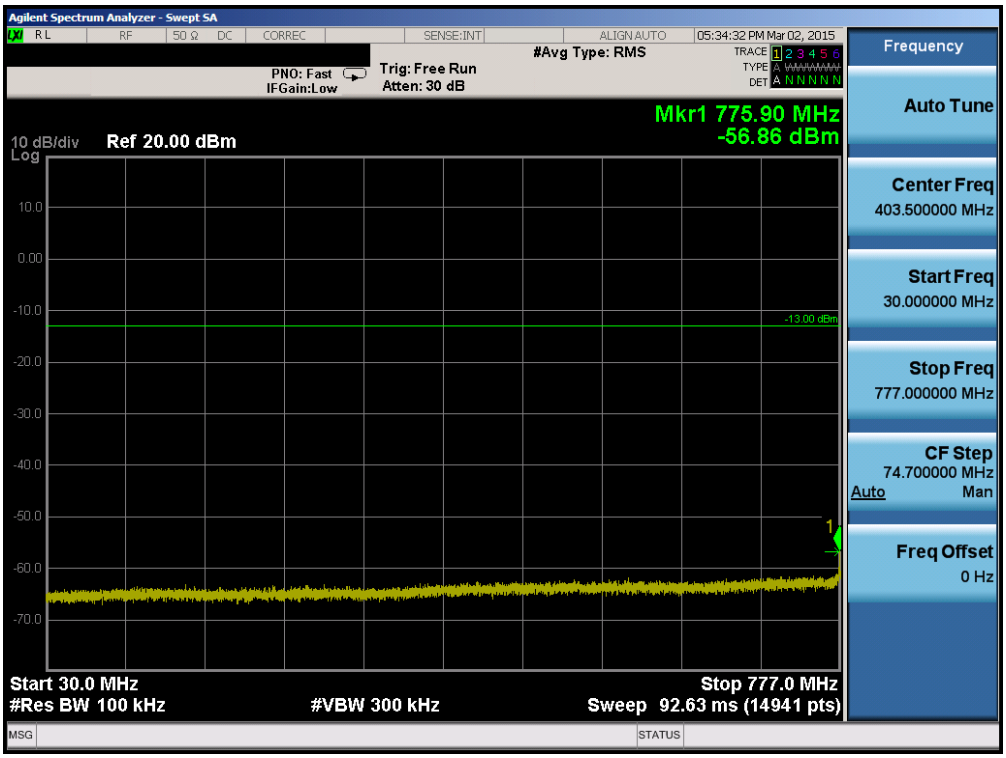


Plot 6-31. Conducted Spurious Plot (Band 13 – 5.0MHz QPSK – RB Size 1, RB Offset 0 – Mid Channel)



Plot 6-32. Conducted Spurious Plot (Band 13 – 5.0MHz QPSK – RB Size 1, RB Offset 0 – High Channel)

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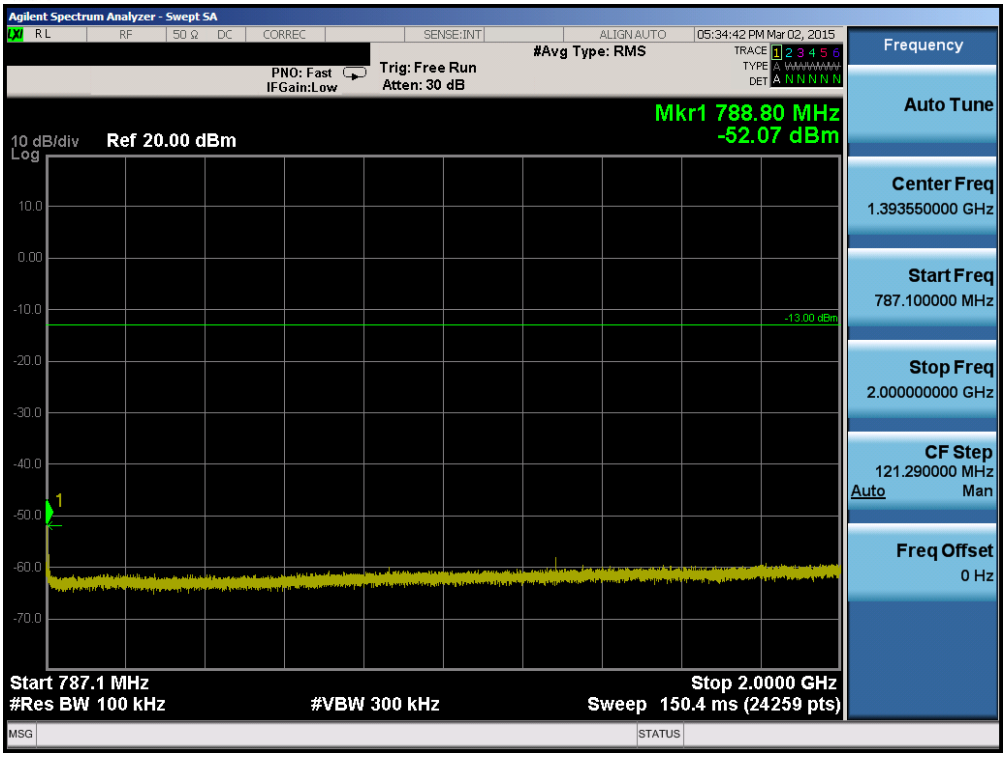
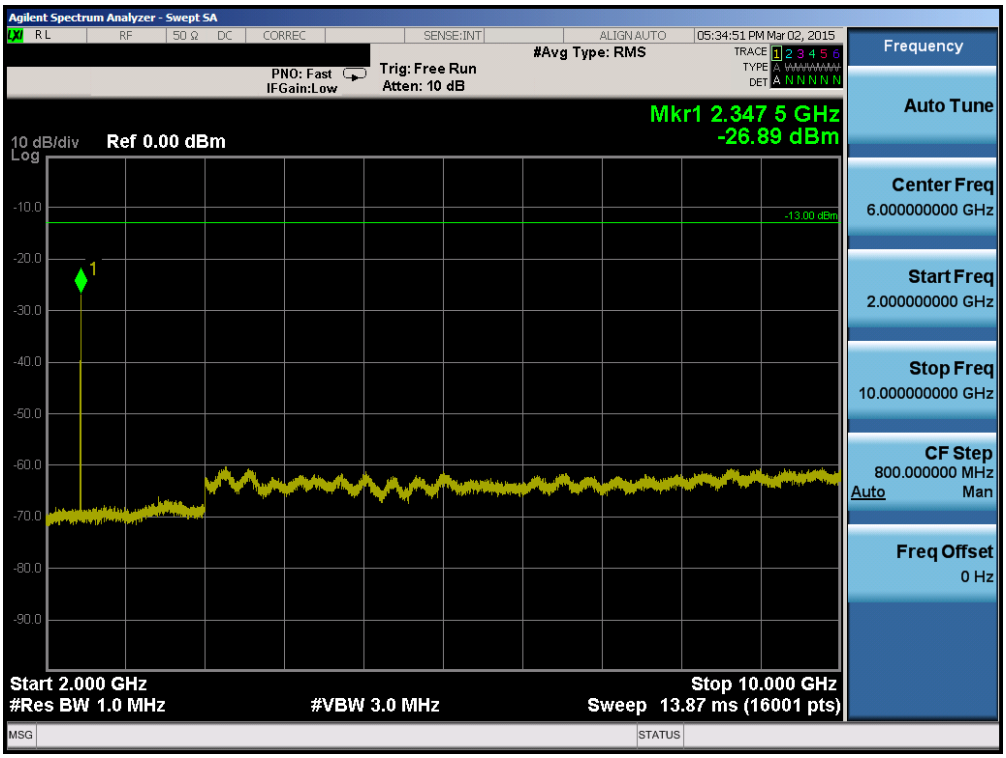


Plot 6-33. Conducted Spurious Plot (Band 13 – 5.0MHz QPSK – RB Size 1, RB Offset 0 – High Channel)



Plot 6-34. Conducted Spurious Plot (Band 13 – 5.0MHz QPSK – RB Size 1, RB Offset 0 – High Channel)

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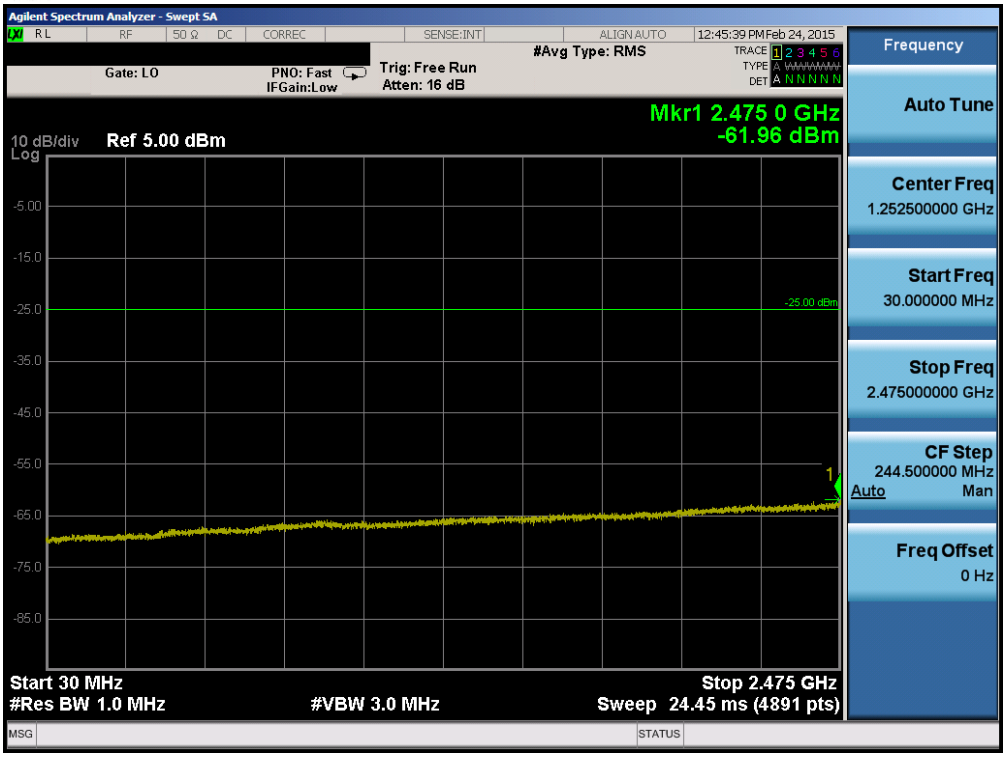
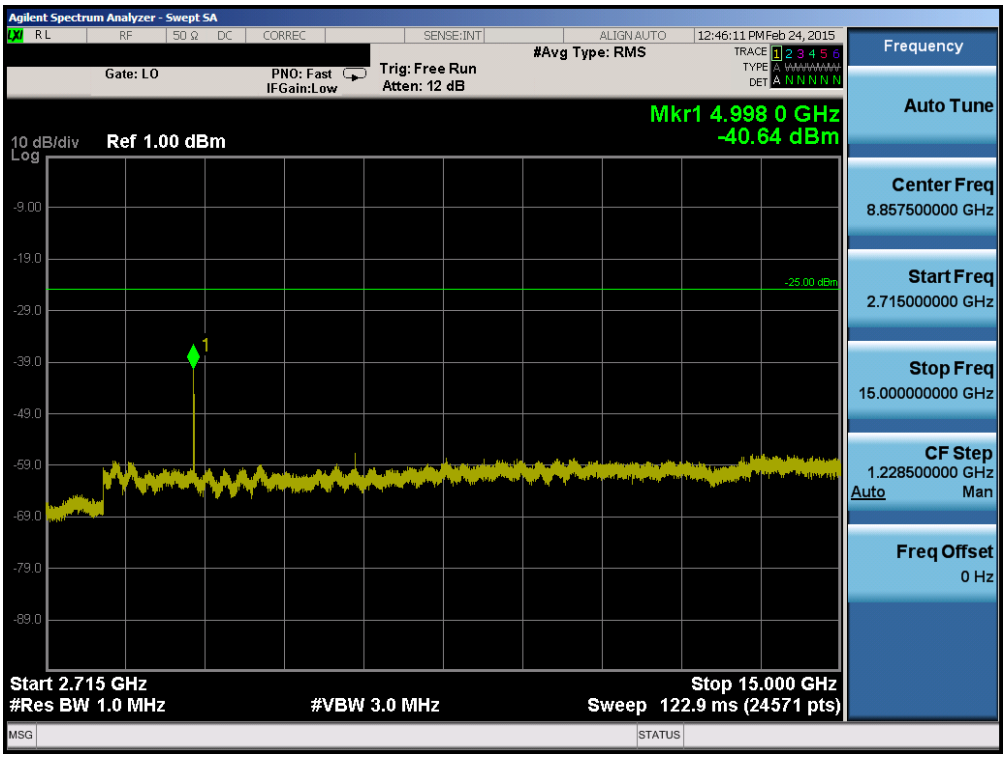


Plot 6-35. Conducted Spurious Plot (Band 41 – 5.0MHz QPSK – RB Size 1, RB Offset 0 – Low Channel)



Plot 6-36. Conducted Spurious Plot (Band 41 – 5.0MHz QPSK – RB Size 1, RB Offset 0 – Low Channel)

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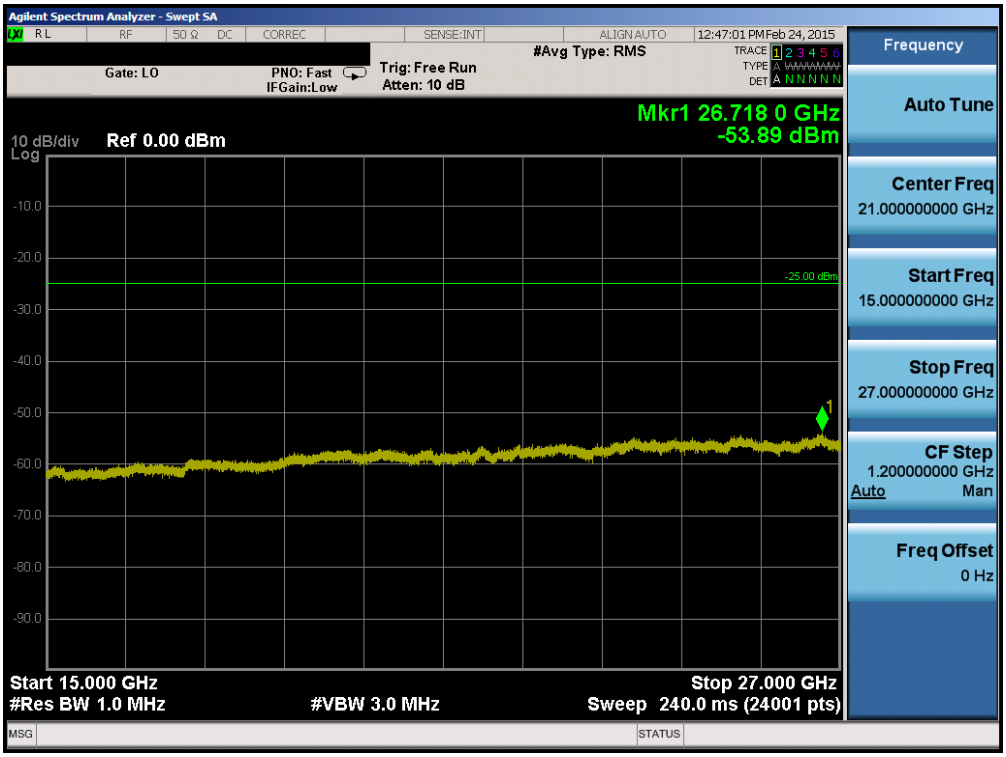
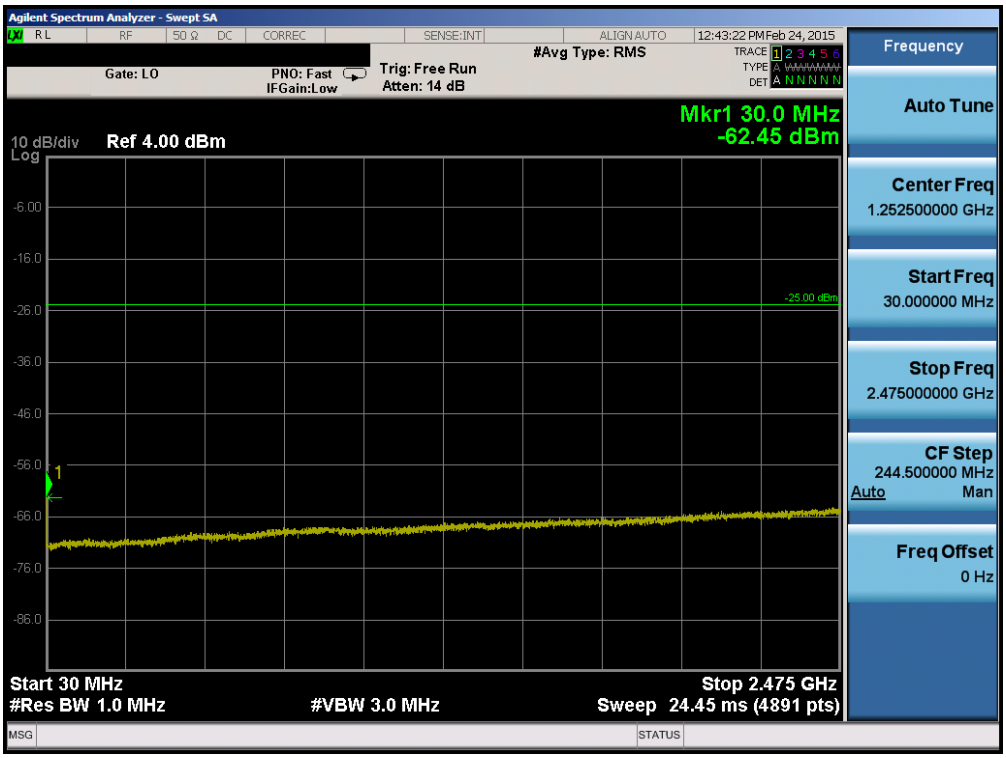


Plot 6-37. Conducted Spurious Plot (Band 41 – 5.0MHz QPSK – RB Size 1, RB Offset 0 – Low Channel)



Plot 6-38. Conducted Spurious Plot (Band 41 – 5.0MHz QPSK – RB Size 1, RB Offset 0 – Mid Channel)

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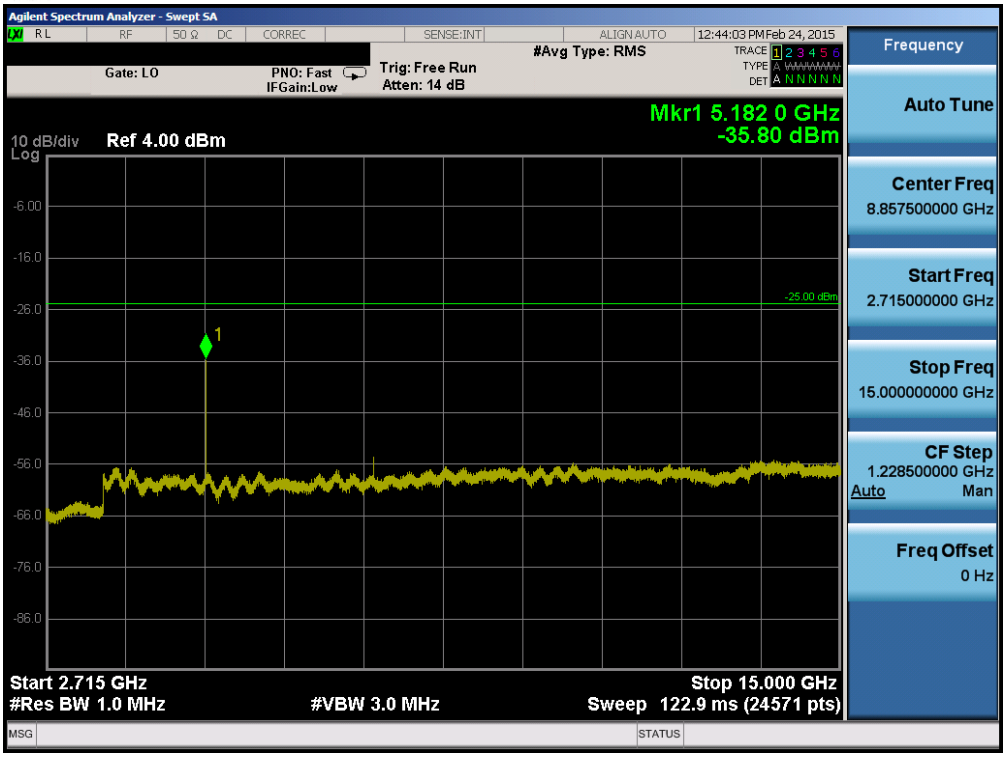
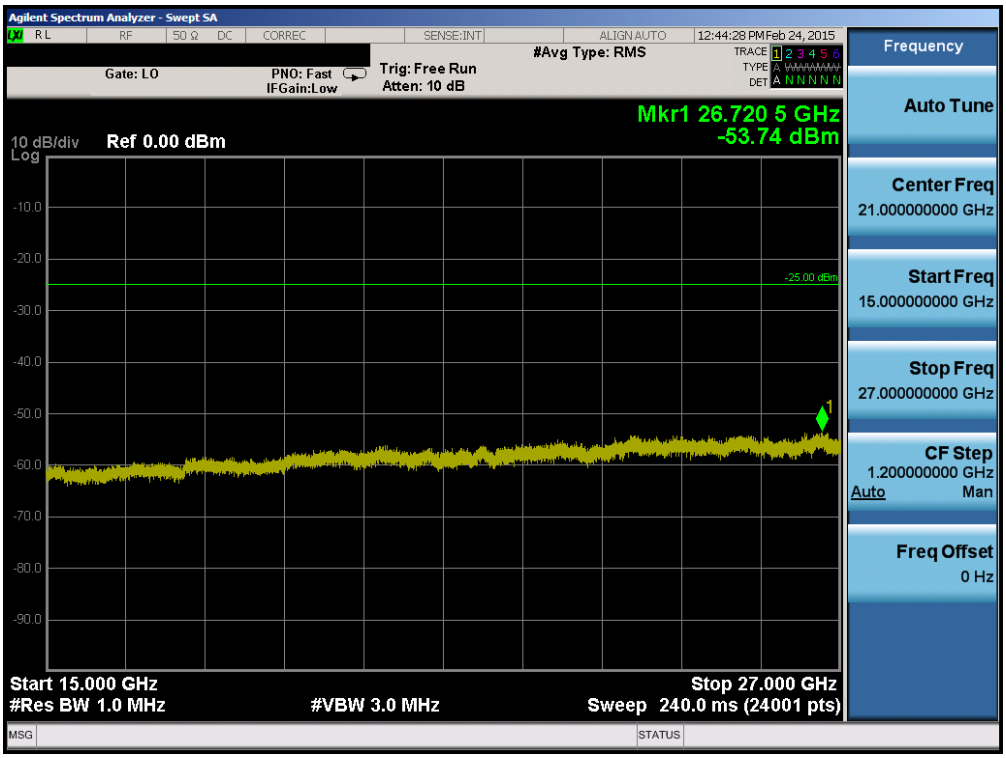


Plot 6-39. Conducted Spurious Plot (Band 41 – 5.0MHz QPSK – RB Size 1, RB Offset 0 – Mid Channel)



Plot 6-40. Conducted Spurious Plot (Band 41 – 5.0MHz QPSK – RB Size 1, RB Offset 0 – Mid Channel)

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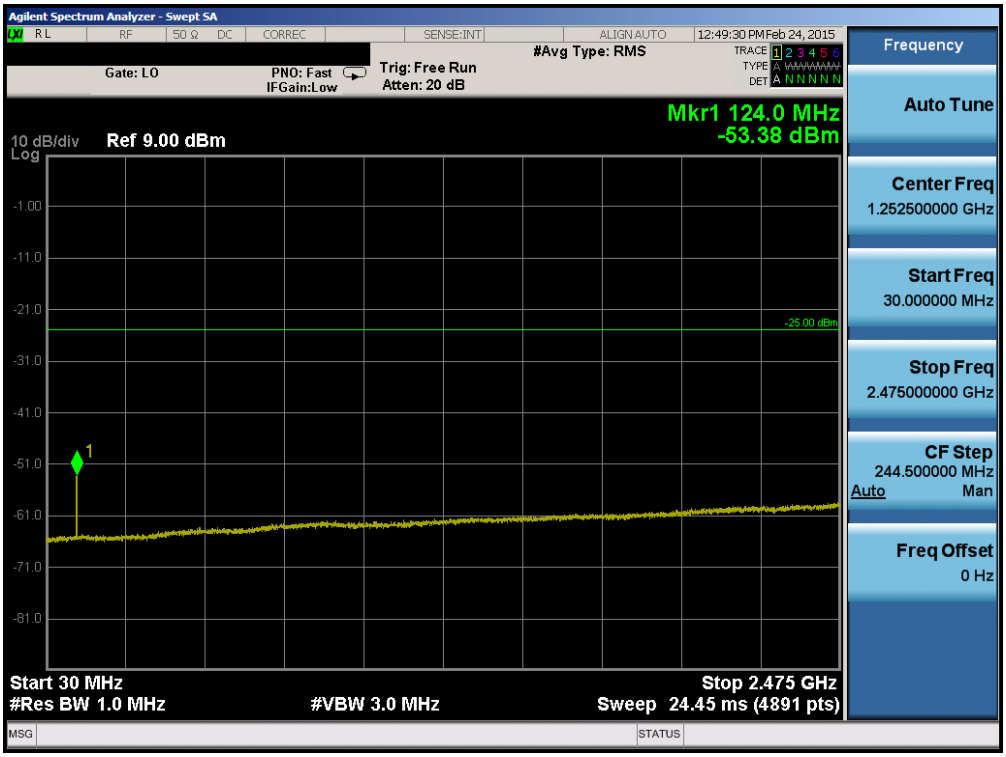
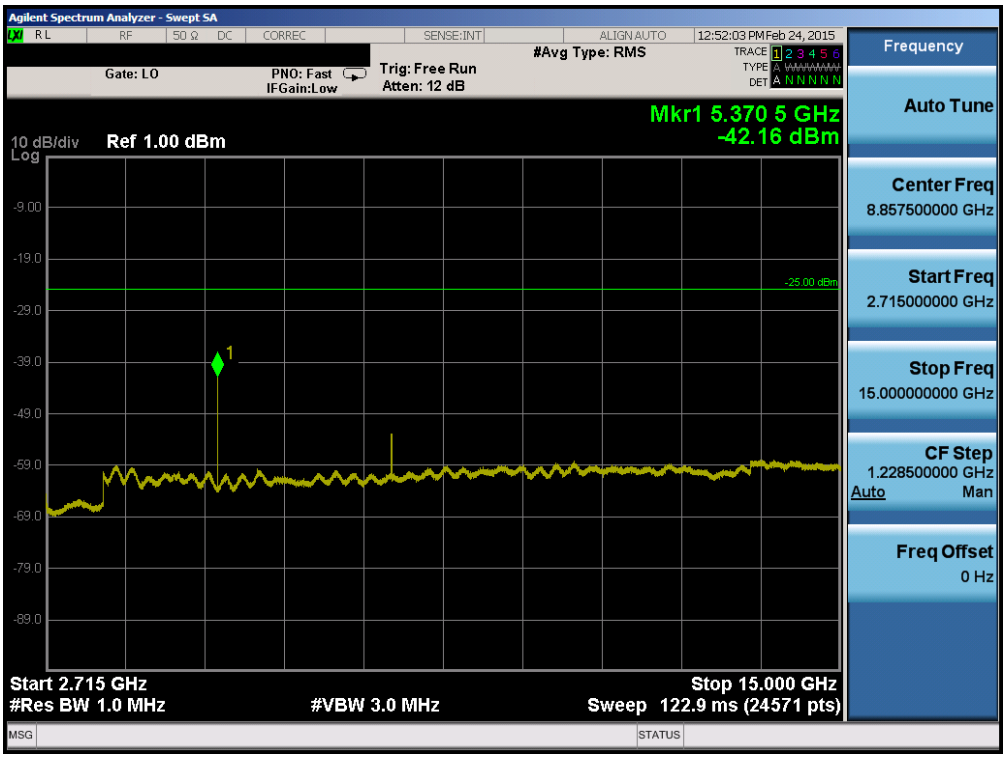


Plot 6-41. Conducted Spurious Plot (Band 41 – 5.0MHz QPSK – RB Size 1, RB Offset 0 – High Channel)



Plot 6-42. Conducted Spurious Plot (Band 41 – 5.0MHz QPSK – RB Size 1, RB Offset 0 – High Channel)

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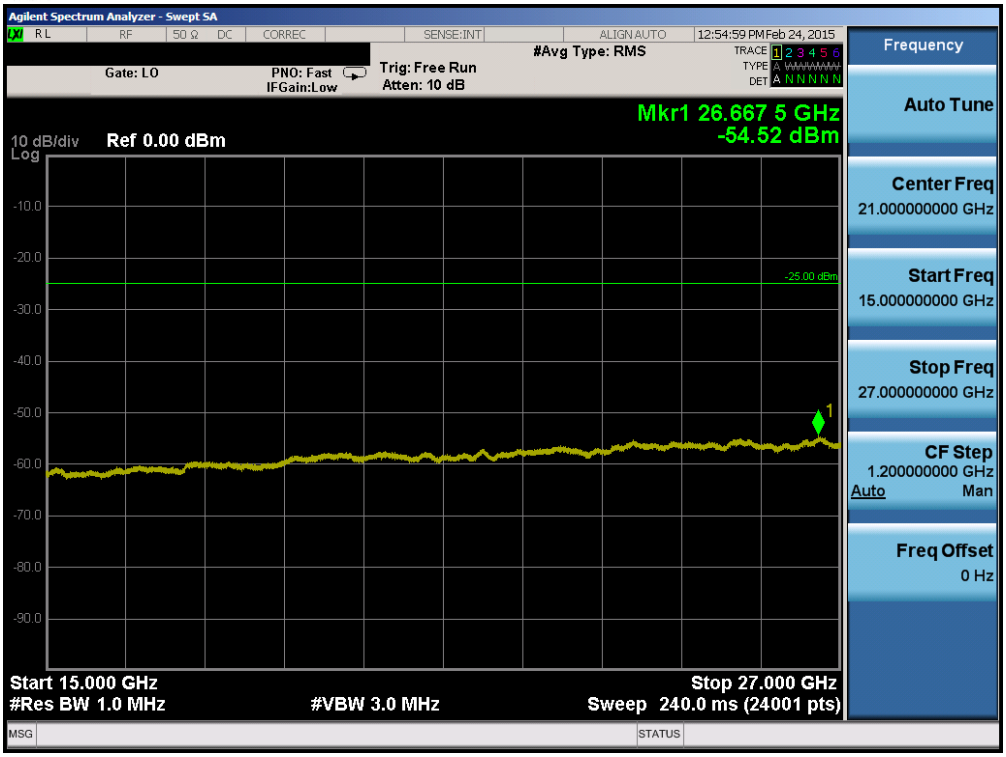

Plot 6-43. Conducted Spurious Plot (Band 41 – 5.0MHz QPSK – RB Size 1, RB Offset 0 – High Channel)

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6.4 Band Edge Emissions at Antenna Terminal

§2.1051 §27.53(c) §27.53(g) §27.53(m)

Test Overview

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 is 43 + $\log_{10}(P_{[Watts]})$, where P is the transmitter power in Watts.

The minimum permissible attenuation level for Band 41 is > 40 + $10\log_{10}$ (P[Watts])on all frequiences between the channel edge and 5MHz from the channel edge, > 43 + $10\log_{10}$ (P[Watts]) on all frequencies between 5MHz and X MHz from the channel edge and between 2490.5-2496MHz, and > 55 + $10\log_{10}$ (P[Watts]) on all frequencies more than X MHz from the channel edge and on all frequiences below 2495MHz, where X is the greater of 6MHz or the emission bandwidth.

Test Procedure Used

KDB 971168 v02r02 – Section 6.0

Test Settings

1. Start and stop frequency were set such that the band edge would be placed in the center of the plot
2. Span was set large enough so as to capture all out of band emissions near the band edge
3. RBW ≥ 1% of the emission bandwidth
4. VBW ≥ 3 x RBW
5. Detector = RMS
6. Number of sweep points ≥ 2 x Span/RBW
7. Trace mode = max hold
8. Sweep time = auto couple
9. The trace was allowed to stabilize

Test Setup

The EUT and measurement equipment were set up as shown in the diagram below.

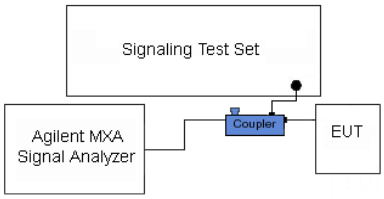

Figure 6-3. Test Instrument & Measurement Setup

Test Notes

1. Per 22.917(b) in the 1 MHz bands immediately outside and adjacent to the frequency block a resolution bandwidth of at least one percent of the emission bandwidth of the fundamental emission of the transmitter may be employed to demonstrate compliance with the out-of-band emissions limit. 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, outside of which all emission are attenuated at least 26 dB below the transmitter power.

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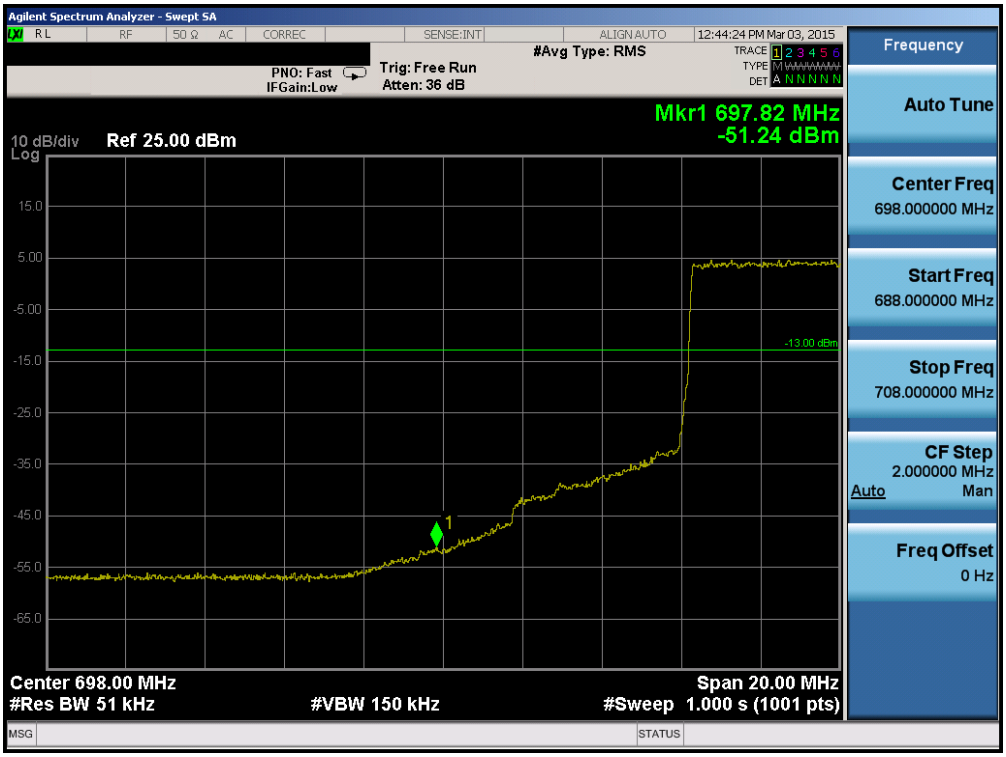
Test Notes (cont'd)

2. Per 27.53(g) for operations in the 698-746 MHz band, in the 100 kHz bands immediately outside and adjacent to the frequency block a resolution bandwidth of at least 30 kHz may be employed to demonstrate compliance with the out-of-band emissions limit.

3. Per 27.53(c.5) for operations in the 776-788 MHz band, in the 100 kHz bands immediately outside and adjacent to the frequency block a resolution bandwidth of at least 30 kHz may be employed to demonstrate compliance with the out-of-band emissions limit.

4. Per 27.53(c.4) For all plots showing emissions in the 763 – 775MHz and 793 – 805MHz band, the FCC limit per 27.53(c.4) is 65 + $10\log_{10}(P)$ = -35dBm in a 6.25kHz bandwidth.

5. Per 27.53(m.6) for mobile digital stations, in the 1 megahertz bands immediately outside and adjacent to the frequency block a resolution bandwidth of at least two percent may be employed, except when the 1 megahertz band is 2495-2496 MHz, in which case a resolution bandwidth of at least one percent may be employed.



Plot 6-44. Lower Band Edge Plot (Band 17 – 5.0MHz QPSK – RB Size 25)

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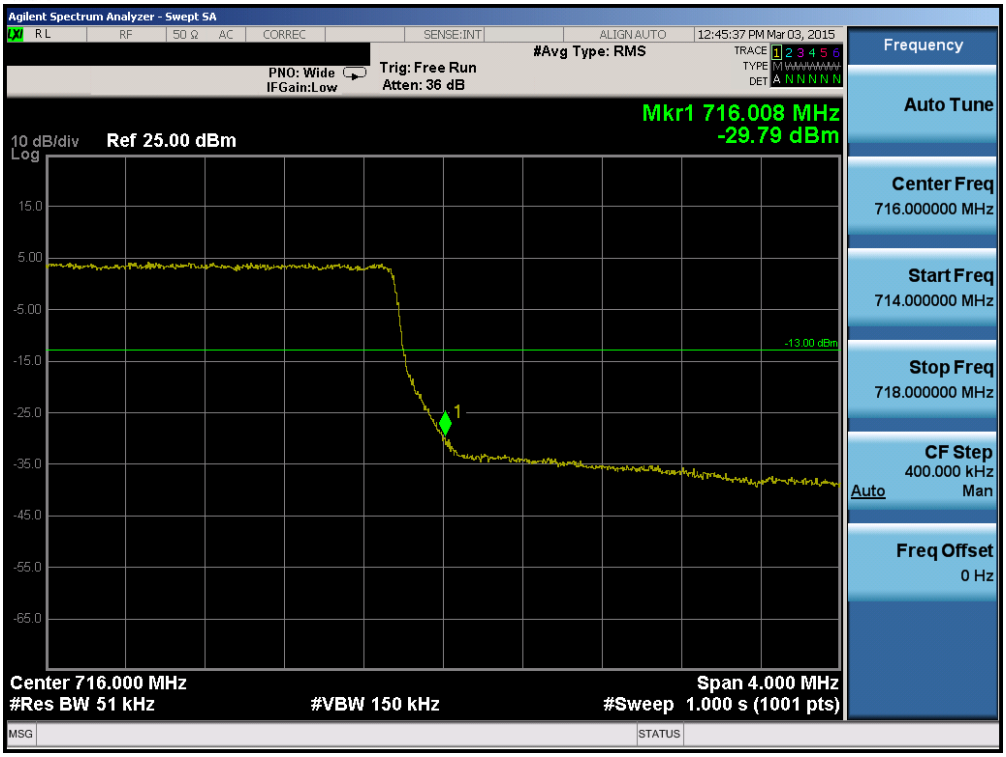
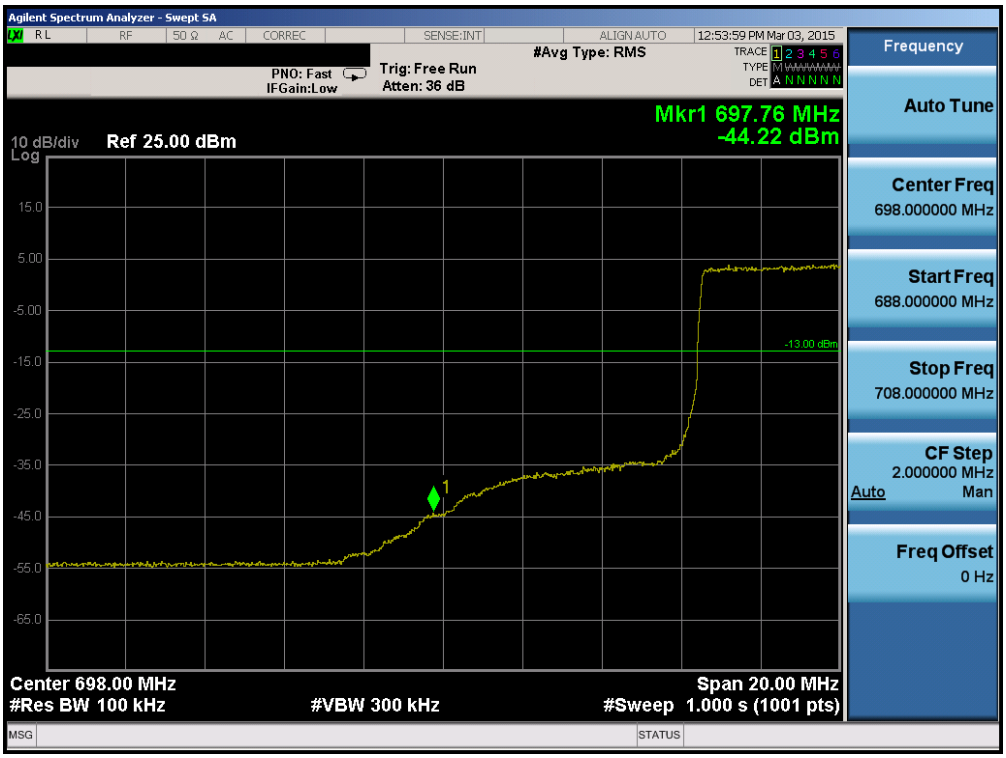


Plot 6-45. Upper Band Edge Plot (Band 17 – 5.0MHz QPSK – RB Size 25)



Plot 6-46. Lower Band Edge Plot (Band 17 – 10.0MHz QPSK – RB Size 50)

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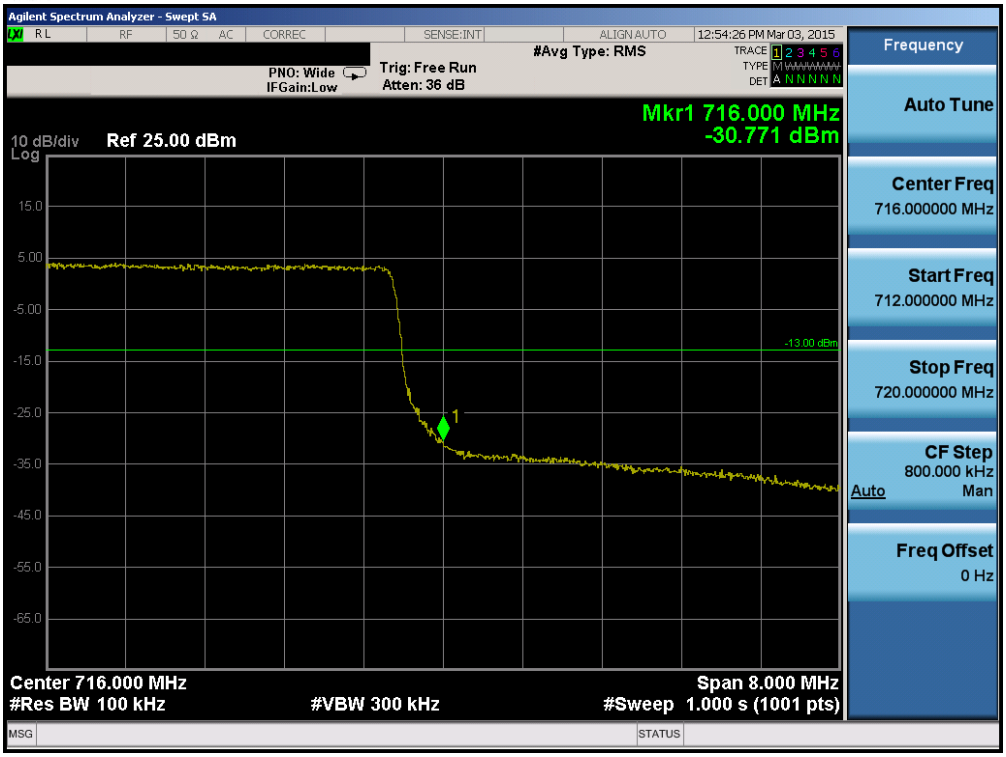
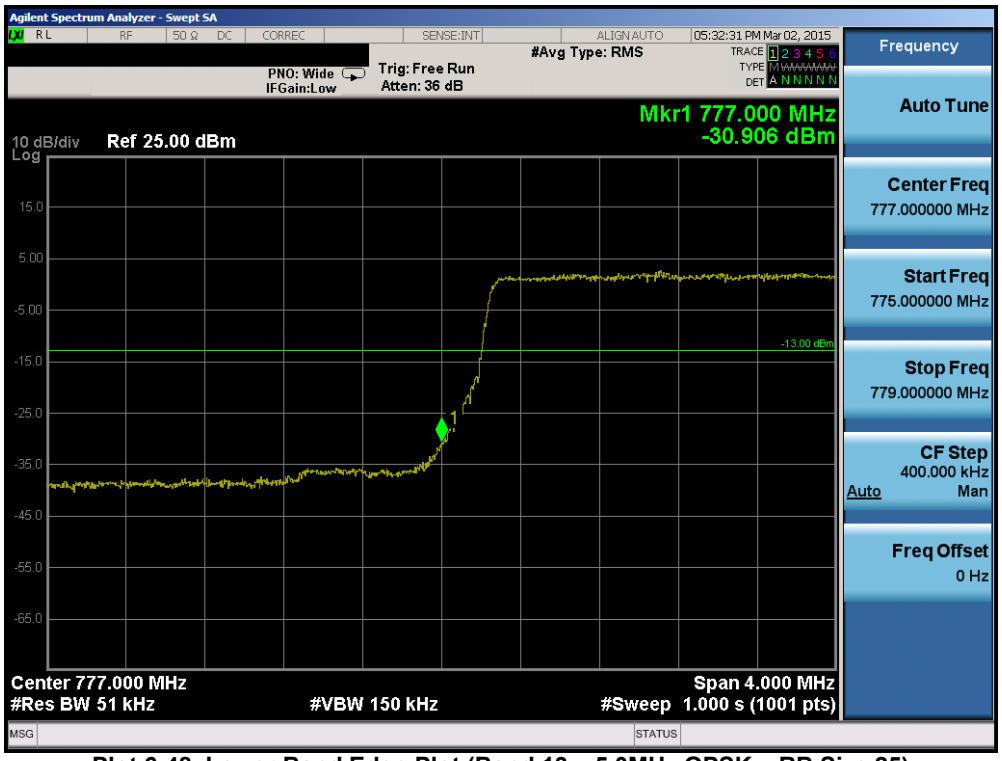


Plot 6-47. Upper Band Edge Plot (Band 17 – 10.0MHz QPSK – RB Size 50)



Plot 6-48. Lower Band Edge Plot (Band 13 – 5.0MHz QPSK – RB Size 25)

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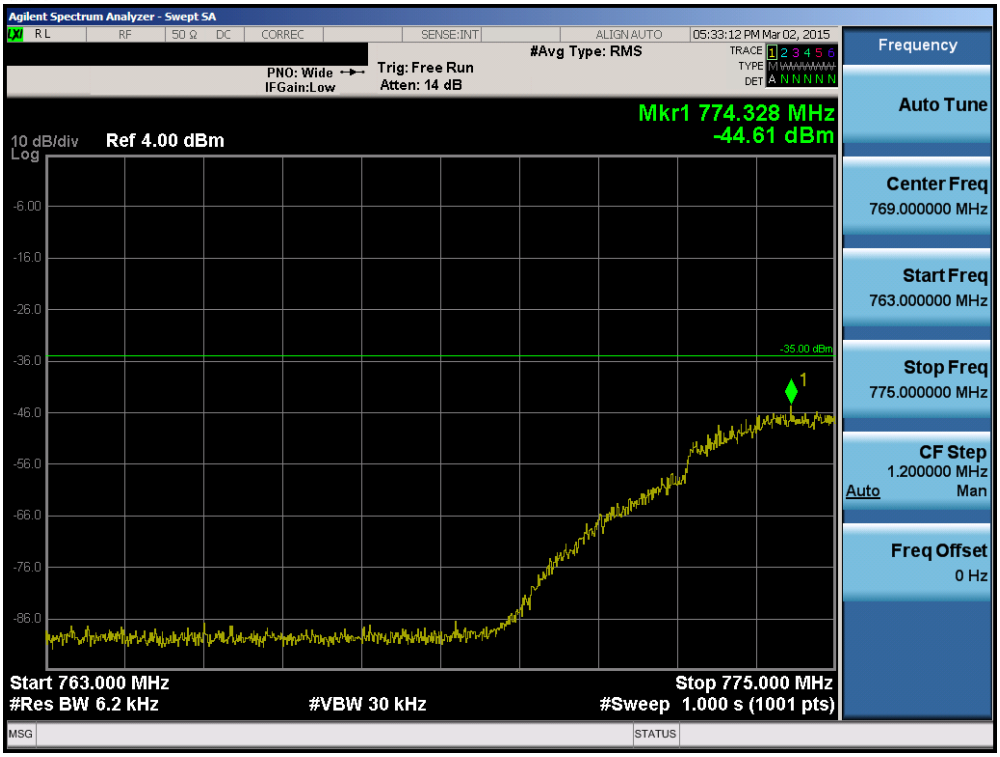
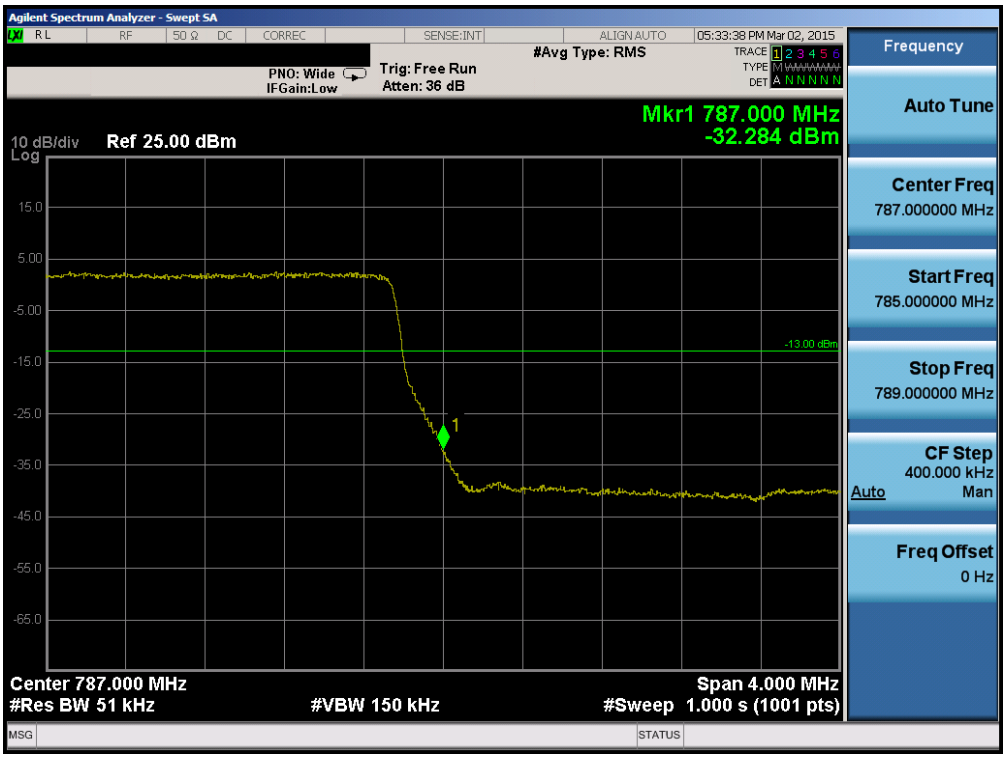


Plot 6-49. Lower Emission Mask Plot (Band 13 – 5.0MHz QPSK – RB Size 25)



Plot 6-50. Upper Band Edge Plot (Band 13 – 5.0MHz QPSK – RB Size 25)

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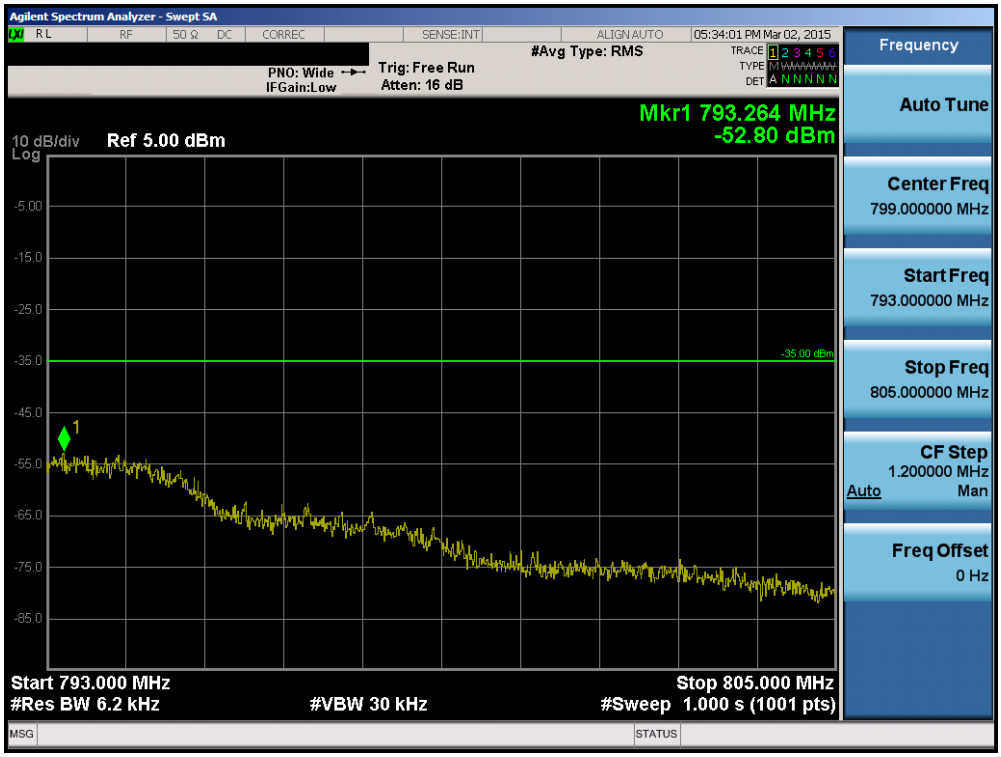
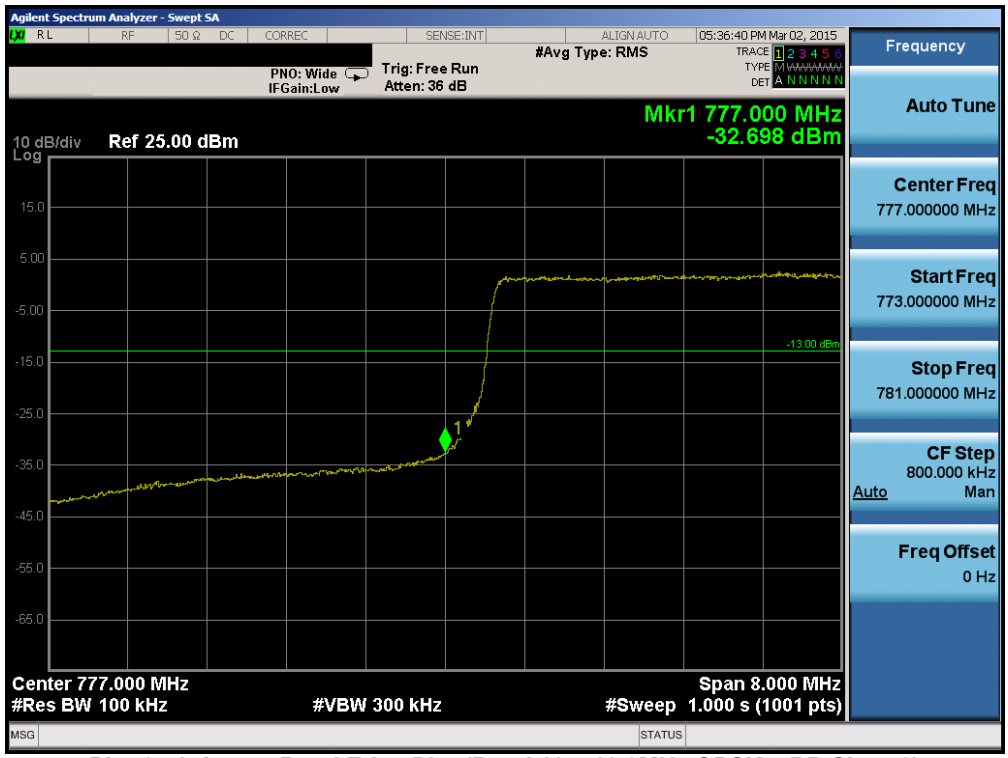


Plot 6-51. Upper Emission Mask Plot (Band 13 – 5.0MHz QPSK – RB Size 25)



Plot 6-52. Lower Band Edge Plot (Band 13 – 10.0MHz QPSK – RB Size 50)

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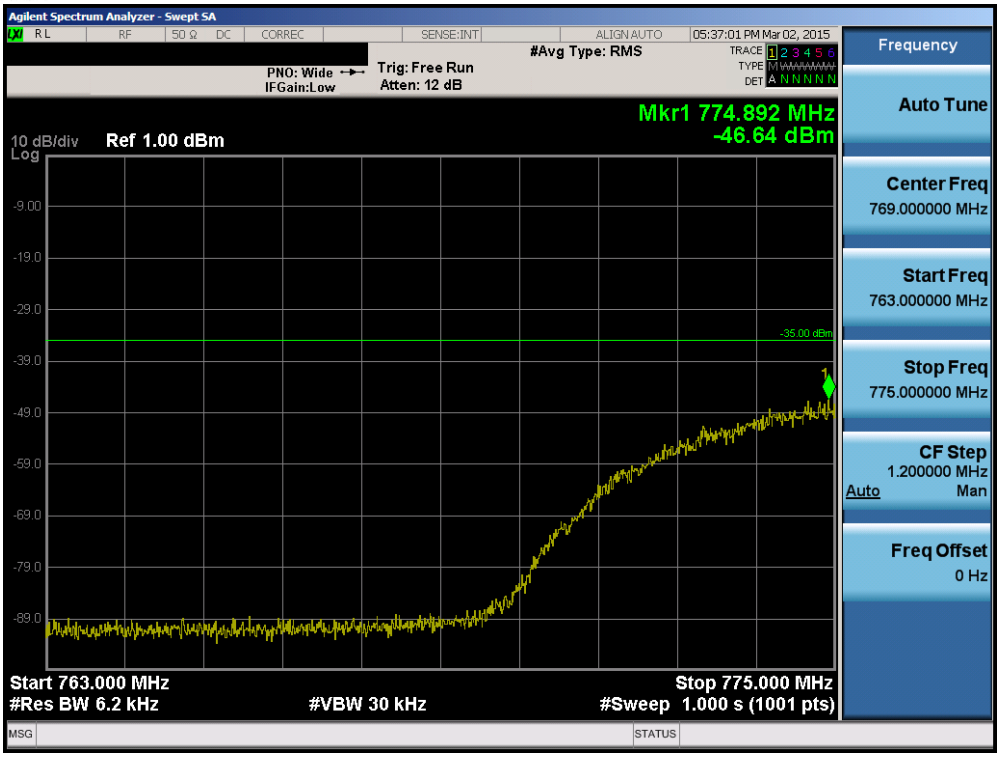
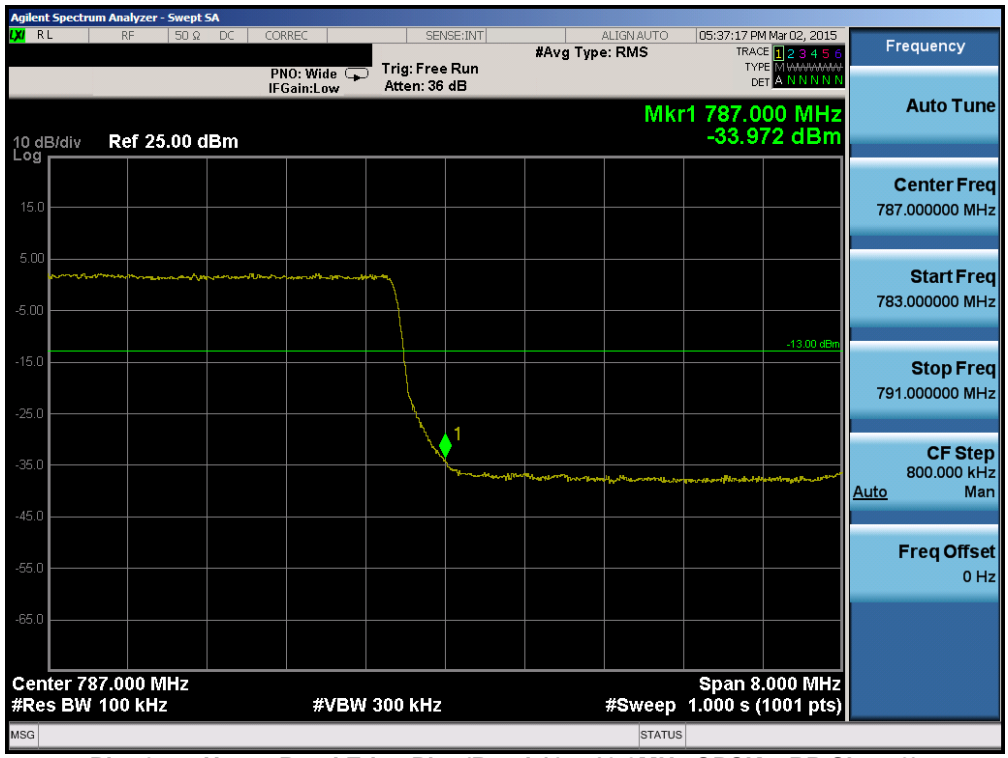


Plot 6-53. Lower Emission Mask Plot (Band 13 – 10.0MHz QPSK – RB Size 25)



Plot 6-54. Upper Band Edge Plot (Band 13 – 10.0MHz QPSK – RB Size 50)

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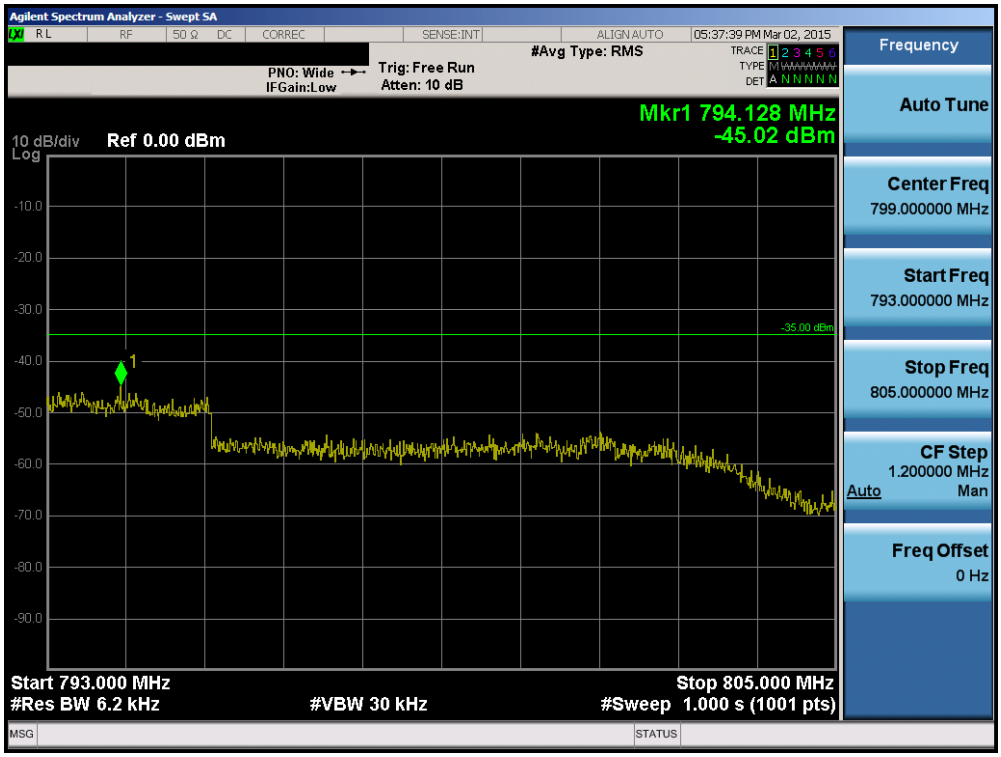
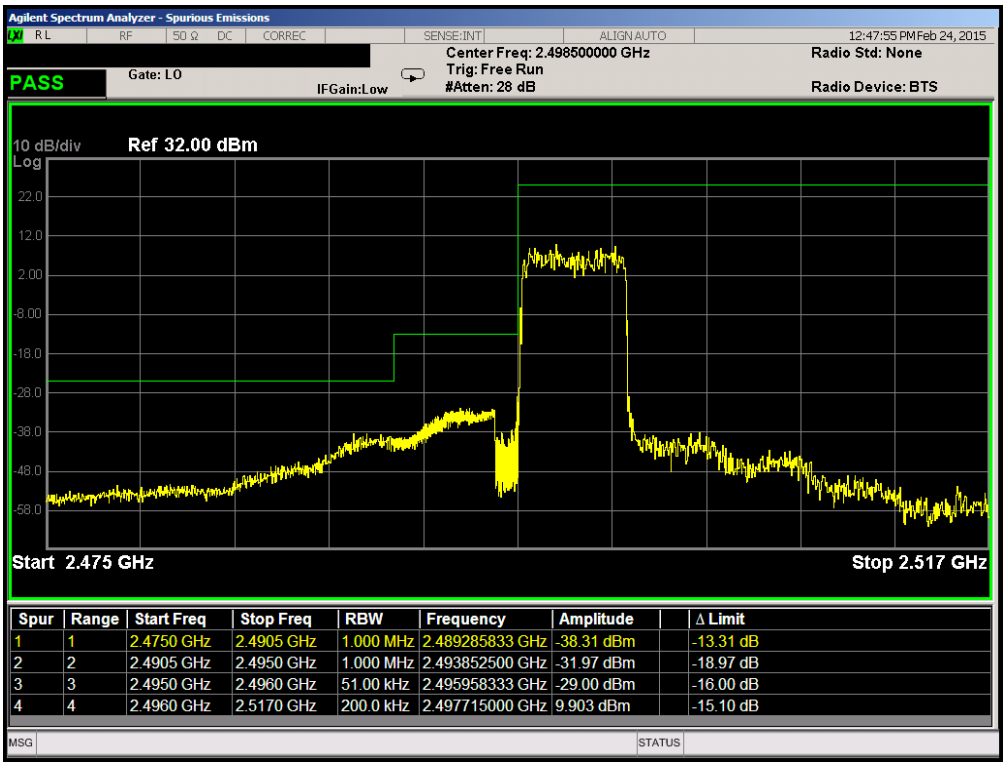


Plot 6-55. Upper Emission Mask Plot (Band 13 – 10.0MHz QPSK – RB Size 25)



Spur	Range	Start Freq	Stop Freq	RBW	Frequency	Amplitude		Δ Limit
1	1	2.4750 GHz	2.4905 GHz	1.000 MHz	2.489285833 GHz	-38.31 dBm		-13.31 dB
2	2	2.4905 GHz	2.4950 GHz	1.000 MHz	2.493852500 GHz	-31.97 dBm		-18.97 dB
3	3	2.4950 GHz	2.4960 GHz	51.00 kHz	2.495958333 GHz	-29.00 dBm		-16.00 dB
4	4	2.4960 GHz	2.5170 GHz	200.0 kHz	2.497715000 GHz	9.903 dBm		-15.10 dB

Plot 6-56. Lower ACP Plot (Band 41 – 5.0MHz QPSK – RB Size 25)

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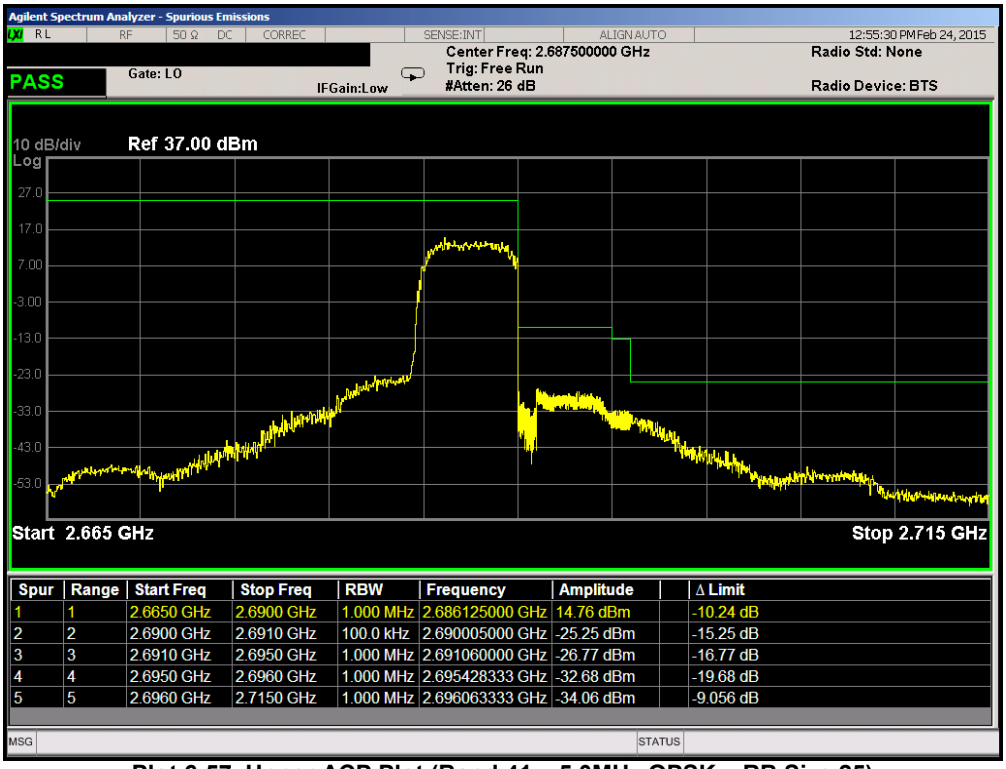
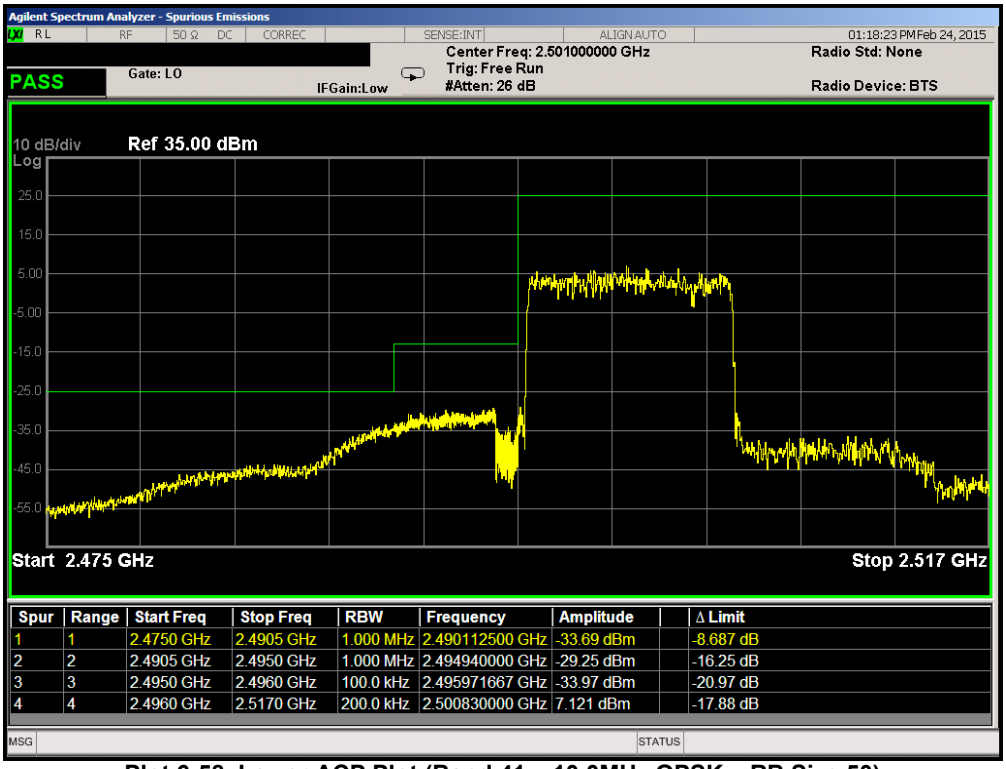


Plot 6-57. Upper ACP Plot (Band 41 – 5.0MHz QPSK – RB Size 25)



Plot 6-58. Lower ACP Plot (Band 41 – 10.0MHz QPSK – RB Size 50)

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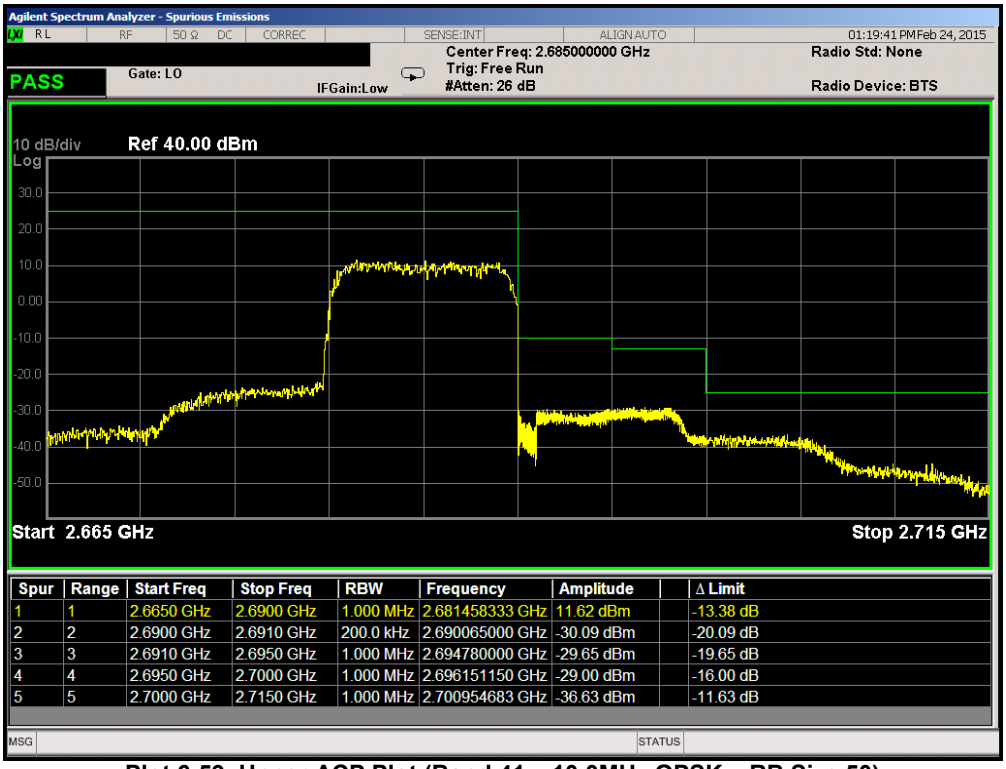
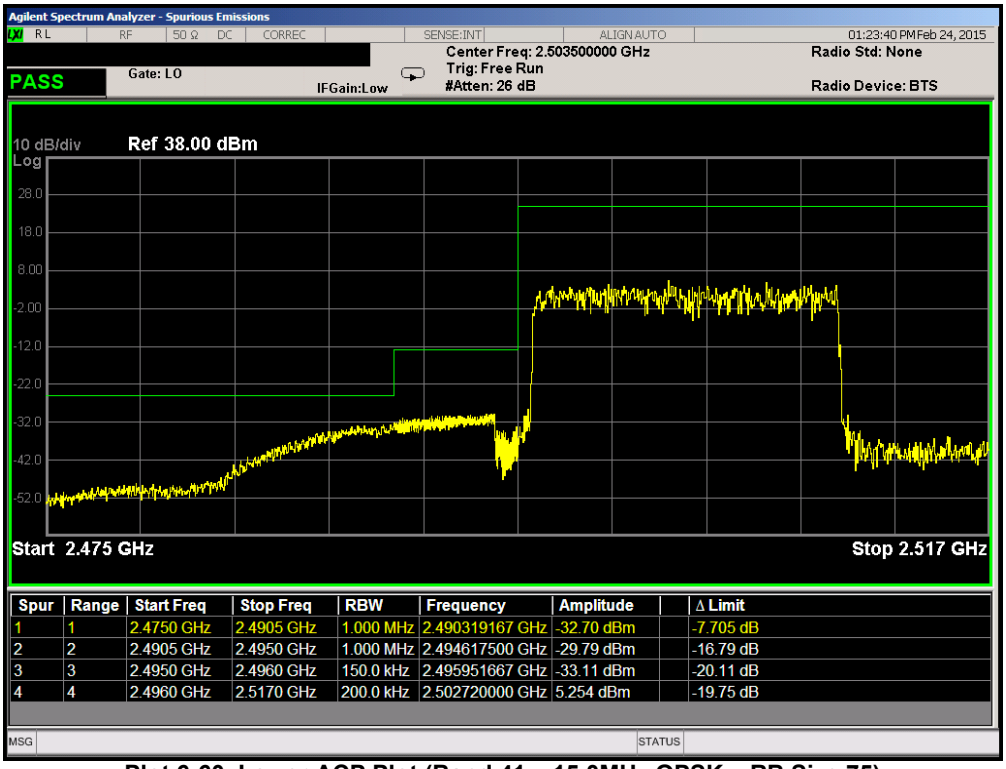


Plot 6-59. Upper ACP Plot (Band 41 – 10.0MHz QPSK – RB Size 50)



Plot 6-60. Lower ACP Plot (Band 41 – 15.0MHz QPSK – RB Size 75)

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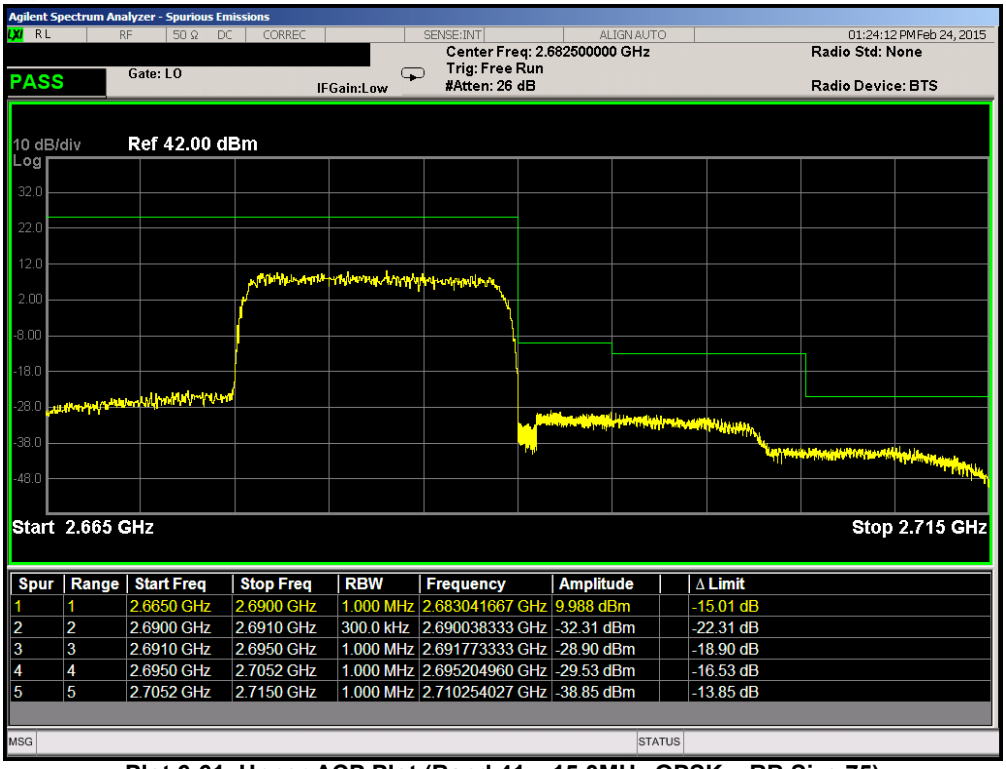
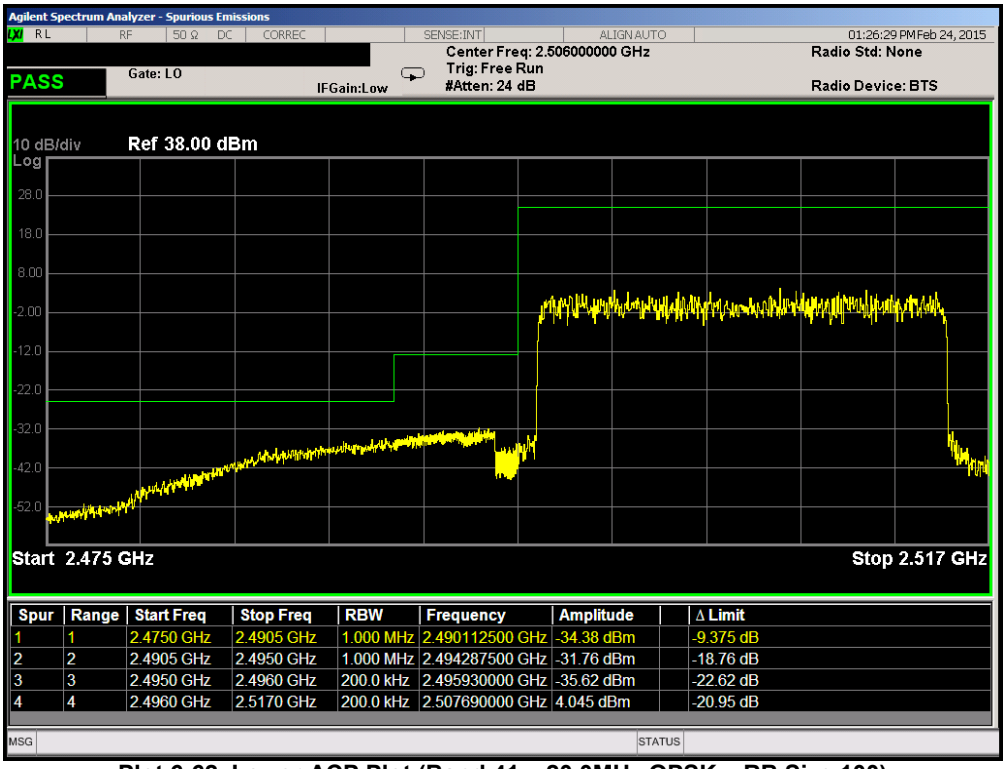


Spur	Range	Start Freq	Stop Freq	RBW	Frequency	Amplitude	Δ Limit
1	1	2.6650 GHz	2.6900 GHz	1.000 MHz	2.683041667 GHz	9.988 dBm	-15.01 dB
2	2	2.6900 GHz	2.6910 GHz	300.0 kHz	2.690038333 GHz	-32.31 dBm	-22.31 dB
3	3	2.6910 GHz	2.6950 GHz	1.000 MHz	2.691773333 GHz	-28.90 dBm	-18.90 dB
4	4	2.6950 GHz	2.7052 GHz	1.000 MHz	2.695204960 GHz	-29.53 dBm	-16.53 dB
5	5	2.7052 GHz	2.7150 GHz	1.000 MHz	2.710254027 GHz	-38.85 dBm	-13.85 dB

Plot 6-61. Upper ACP Plot (Band 41 – 15.0MHz QPSK – RB Size 75)



Spur	Range	Start Freq	Stop Freq	RBW	Frequency	Amplitude	Δ Limit
1	1	2.4750 GHz	2.4905 GHz	1.000 MHz	2.490112500 GHz	-34.38 dBm	-9.375 dB
2	2	2.4905 GHz	2.4950 GHz	1.000 MHz	2.494287500 GHz	-31.76 dBm	-18.76 dB
3	3	2.4950 GHz	2.4960 GHz	200.0 kHz	2.495930000 GHz	-35.62 dBm	-22.62 dB
4	4	2.4960 GHz	2.5170 GHz	200.0 kHz	2.507690000 GHz	4.045 dBm	-20.95 dB

Plot 6-62. Lower ACP Plot (Band 41 – 20.0MHz QPSK – RB Size 100)

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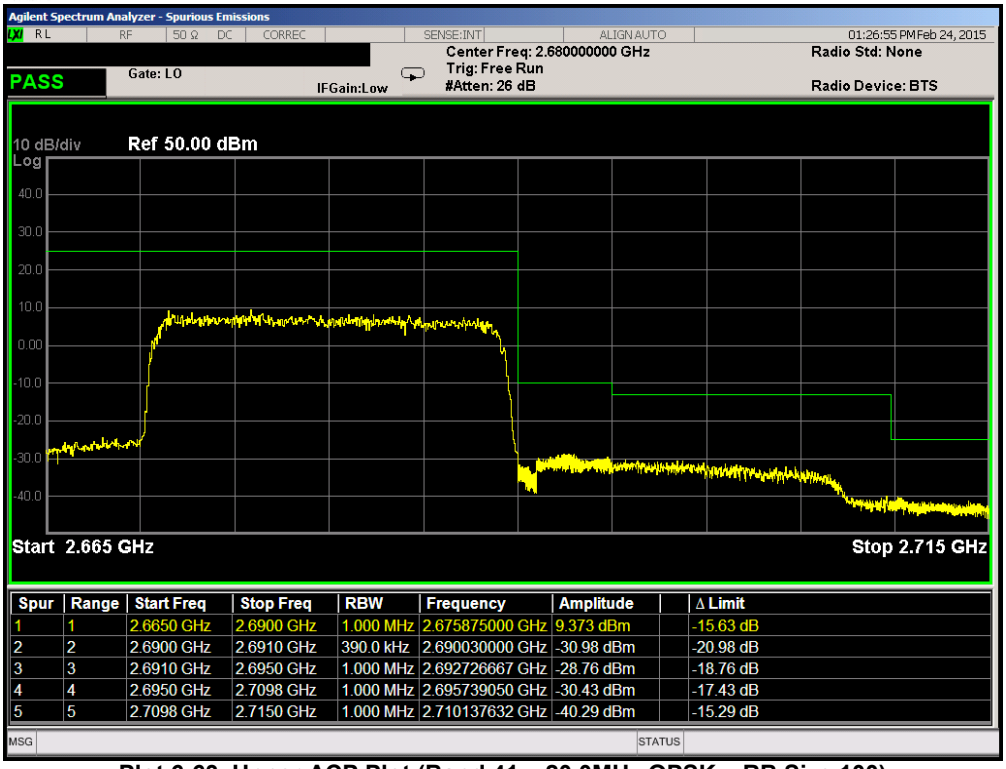

Spur	Range	Start Freq	Stop Freq	RBW	Frequency	Amplitude	Δ Limit
1	1	2.6650 GHz	2.6900 GHz	1.000 MHz	2.675875000 GHz	9.373 dBm	-15.63 dB
2	2	2.6900 GHz	2.6910 GHz	390.0 kHz	2.690030000 GHz	-30.98 dBm	-20.98 dB
3	3	2.6910 GHz	2.6950 GHz	1.000 MHz	2.692726667 GHz	-28.76 dBm	-18.76 dB
4	4	2.6950 GHz	2.7098 GHz	1.000 MHz	2.695739050 GHz	-30.43 dBm	-17.43 dB
5	5	2.7098 GHz	2.7150 GHz	1.000 MHz	2.710137632 GHz	-40.29 dBm	-15.29 dB

Plot 6-63. Upper ACP Plot (Band 41 – 20.0MHz QPSK – RB Size 100)

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6.5 Radiated Power (ERP/EIRP)

§24.232(c.2) §27.50(h.2) §27.50(b.10) §27.50(c.10)

Test Overview

Effective Radiated Power (ERP) and Equivalent Isotropic Radiated Power (EIRP) measurements are performed using the substitution method described in ANSI/TIA-603-C-2004 with the EUT transmitting into an integral antenna. Measurements on signals operating below 1GHz are performed using vertically polarized tuned dipole antennas. Measurements on signals operating above 1GHz are performed using vertically polarized broadband horn antennas. All measurements are performed as RMS average measurements while the EUT is operating at its maximum duty cycle, at maximum power, and at the appropriate frequencies.

Test Procedures Used

KDB 971168 v02r02 – Section 5.2.1

ANSI/TIA-603-C-2004 – Section 2.2.17

Test Settings

1. Radiated power measurements are performed using the signal analyzer's "channel power" measurement capability for signals with continuous operation. For signals with burst transmission, the signal analyzer's "time domain power" measurement capability is used
2. RBW = 1 – 5% of the expected OBW, not to exceed 1MHz
3. VBW ≥ 3 x RBW
4. Span = 1.5 times the OBW
5. No. of sweep points ≥ 2 x span / RBW
6. Detector = RMS
7. Trigger is set to "free run" for signals with continuous operation with the sweep times set to "auto". Trigger is set to enable triggering only on full power bursts with the sweep time set less than or equal to the transmission burst duration
8. The integration bandwidth was roughly set equal to the measured OBW of the signal for signals with continuous operation. For signals with burst transmission, the "gating" function was enabled to ensure that measurements are performed during times in which the transmitter is operating at its maximum power
9. Trace mode = trace averaging (RMS) over 100 sweeps
10. The trace was allowed to stabilize

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Test Setup

The EUT and measurement equipment were set up as shown in the diagram below.

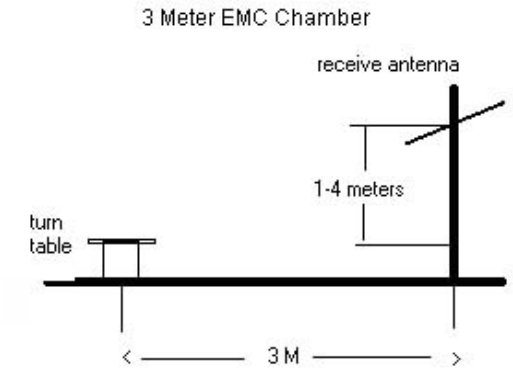

Figure 6-4. Test Instrument & Measurement Setup

Test Notes

1) The EUT was tested in three orthogonal planes and in all possible test configurations and positioning. The worst case emissions are reported with the EUT positioning, modulations, RB sizes and offsets, and channel bandwidth configurations shown in the tables below.

2) This unit was tested with its standard battery.

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Frequency [MHz]	Channel Bandwidth [MHz]	Mod.	Battery Cover	RB Size/Offset	Substitute Level [dBm]	Ant. Gain [dBd]	Ant. Pol. [H/V]	ERP [dBm]	ERP Limit [dBm]	Margin [dB]
706.50	5	QPSK	Standard	1 / 0	15.91	1.05	V	16.96	34.77	-17.81
710.00	5	QPSK	Standard	1 / 0	15.99	1.12	V	17.11	34.771	-17.66
713.50	5	QPSK	Standard	1 / 0	16.14	1.19	V	17.33	34.771	-17.44
706.50	5	16-QAM	Standard	1 / 0	15.14	1.05	V	16.19	34.771	-18.58
710.00	5	16-QAM	Standard	1 / 0	15.20	1.12	V	16.32	34.771	-18.45
713.50	5	16-QAM	Standard	1 / 0	15.27	1.19	V	16.46	34.771	-18.31
709.00	10	QPSK	Standard	1 / 0	15.39	1.10	V	16.49	34.77	-18.28
710.00	10	QPSK	Standard	1 / 0	15.43	1.12	V	16.55	34.771	-18.22
711.00	10	QPSK	Standard	1 / 0	15.58	1.14	V	16.72	34.771	-18.05
709.00	10	16-QAM	Standard	1 / 0	14.57	1.10	V	15.67	34.771	-19.10
710.00	10	16-QAM	Standard	1 / 0	14.63	1.12	V	15.75	34.771	-19.02
711.00	10	16-QAM	Standard	1 / 0	14.75	1.14	V	15.89	34.771	-18.88

Table 6-2. ERP Data (Band 17)

Frequency [MHz]	Channel Bandwidth [MHz]	Mod.	Battery Cover	RB Size/Offset	Substitute Level [dBm]	Ant. Gain [dBd]	Ant. Pol. [H/V]	ERP [dBm]	ERP Limit [dBm]	Margin [dB]
779.50	5	QPSK	Standard	1 / 24	13.51	2.47	V	15.98	34.771	-18.79
782.00	5	QPSK	Standard	1 / 0	13.61	2.51	V	16.12	34.771	-18.65
784.50	5	QPSK	Standard	1 / 0	13.67	2.56	V	16.23	34.771	-18.54
779.50	5	16QAM	Standard	1 / 24	12.85	2.47	V	15.32	34.771	-19.45
782.00	5	16QAM	Standard	1 / 0	12.79	2.51	V	15.30	34.771	-19.47
784.50	5	16QAM	Standard	1 / 0	12.78	2.56	V	15.34	34.771	-19.43
782.00	10	QPSK	Standard	25 / 12	13.41	2.51	V	15.92	34.771	-18.85
782.00	10	16QAM	Standard	25 / 12	12.52	2.51	V	15.03	34.771	-19.74

Table 6-3. ERP Data (Band 13)

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Frequency [MHz]	Channel Bandwidth [MHz]	Mod.	Battery Cover	RB Size/Offset	Substitute Level [dBm]	Ant. Gain [dBi]	Ant. Pol. [H/V]	EIRP [dBm]	EIRP Limit [dBm]	Margin [dB]
2498.50	5	QPSK	Standard	1 / 0	-1.44	7.09	V	5.65	33.010	-27.36
2593.00	5	QPSK	Standard	1 / 0	0.79	7.55	V	8.34	33.010	-24.67
2687.50	5	QPSK	Standard	1 / 0	0.83	7.82	V	8.65	33.010	-24.36
2498.50	5	16-QAM	Standard	1 / 0	-2.49	7.09	V	4.60	33.010	-28.41
2593.00	5	16-QAM	Standard	1 / 0	-0.01	7.55	V	7.54	33.010	-25.47
2687.50	5	16-QAM	Standard	1 / 0	0.20	7.82	V	8.02	33.010	-24.99
2501.00	10	QPSK	Standard	1 / 25	-0.88	7.08	V	6.20	33.010	-26.81
2593.00	10	QPSK	Standard	1 / 0	0.89	7.55	V	8.44	33.010	-24.57
2685.00	10	QPSK	Standard	1 / 25	0.86	7.81	V	8.67	33.010	-24.34
2501.00	10	16-QAM	Standard	1 / 25	-2.08	7.08	V	5.00	33.010	-28.01
2593.00	10	16-QAM	Standard	1 / 0	-0.60	7.55	V	6.95	33.010	-26.06
2685.00	10	16-QAM	Standard	1 / 25	-0.43	7.81	V	7.38	33.010	-25.63
2503.50	15	QPSK	Standard	1 / 37	-0.59	7.10	V	6.51	33.010	-26.50
2593.00	15	QPSK	Standard	1 / 0	1.01	7.55	V	8.55	33.010	-24.46
2682.50	15	QPSK	Standard	1 / 37	1.23	7.81	V	9.04	33.010	-23.97
2503.50	15	16-QAM	Standard	1 / 37	-1.89	7.10	V	5.21	33.010	-27.80
2593.00	15	16-QAM	Standard	1 / 0	-0.35	7.55	V	7.20	33.010	-25.81
2682.50	15	16-QAM	Standard	1 / 37	0.07	7.81	V	7.88	33.010	-25.13
2506.00	20	QPSK	Standard	1 / 0	-0.72	7.11	V	6.39	33.010	-26.62
2593.00	20	QPSK	Standard	1 / 0	1.23	7.55	V	8.78	33.010	-24.23
2680.00	20	QPSK	Standard	1 / 0	0.74	7.80	V	8.54	33.010	-24.47
2506.00	20	16-QAM	Standard	1 / 0	-1.82	7.11	V	5.29	33.010	-27.72
2593.00	20	16-QAM	Standard	1 / 0	0.28	7.55	V	7.83	33.010	-25.18
2680.00	20	16-QAM	Standard	1 / 0	0.06	7.80	V	7.86	33.010	-25.15

Table 6-4. EIRP Data (Band 41)

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6.6 Radiated Spurious Emissions Measurements

§2.1053 §27.53(c) §27.53(f) §27.53(g) §27.53(m)

Test Overview

Radiated spurious emissions measurements are performed using the substitution method described in ANSI/TIA-603-C-2004 with the EUT transmitting into an integral antenna. Measurements on signals operating below 1GHz are performed using vertically and horizontally polarized tuned dipole antennas. Measurements on signals operating above 1GHz are performed using vertically and horizontally polarized broadband horn antennas. All measurements are performed as peak measurements while the EUT is operating at its maximum duty cycle, at maximum power, and at the appropriate frequencies.

Test Procedures Used

KDB 971168 v02r02 – Section 5.8

ANSI/TIA-603-C-2004 – Section 2.2.12

Test Settings

1. RBW = 100kHz for emissions below 1GHz and 1MHz for emissions above 1GHz
2. VBW ≥ 3 x RBW
3. Span = 1.5 times the OBW
4. No. of sweep points ≥ 2 x span / RBW
5. Detector = Peak
6. Trace mode = max hold
7. The trace was allowed to stabilize

Test Setup

The EUT and measurement equipment were set up as shown in the diagram below.

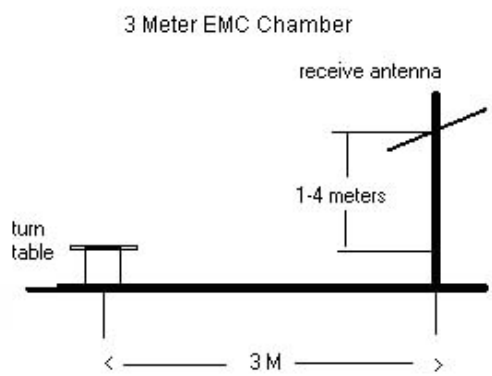

Figure 6-5. Test Instrument & Measurement Setup

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Test Notes

1) The EUT was tested in three orthogonal planes and in all possible test configurations and positioning. The worst case emissions are reported with the EUT positioning, modulations, RB sizes and offsets, and channel bandwidth configurations shown in the tables below.

2) This unit was tested with its standard battery.

3) The spectrum is measured from 9kHz to the 10th harmonic of the fundamental frequency of the transmitter. The worst-case emissions are reported.

4) Emissions below 18GHz were measured at a 3 meter test distance while emissions above 18GHz were measured at a 1 meter test distance with the application of a distance correction factor.

OPERATING FREQUENCY:	706.50	MHz			
CHANNEL:	23755				
MEASURED OUTPUT POWER:	16.96	dBm	=	0.050	W
MODULATION SIGNAL:	QPSK				
BANDWIDTH:	5.0	MHz			
DISTANCE:	3	meters			
LIMIT:	43 + 10 $\log_{10}$ (W) =	29.96	dBc		

Frequency [MHz]	Level at Antenna Terminals [dBm]	Substitute Antenna Gain [dBd]	Spurious Emission Level [dBm]	Ant. Pol. [H/V]	[dBc]
1413.00	-54.17	5.72	-48.45	H	65.4
2119.50	-60.26	6.71	-53.55	H	70.5
2826.00	-66.01	7.81	-58.20	H	75.2

Table 6-5. Radiated Spurious Data (Band 17 – Low Channel)

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OPERATING FREQUENCY: 710.00 MHz
CHANNEL: 23790
MEASURED OUTPUT POWER: 17.11 dBm = 0.051 W
MODULATION SIGNAL: QPSK
BANDWIDTH: 5.0 MHz
DISTANCE: 3 meters
LIMIT: 43 + 10 $\log_{10}$ (W) = 30.11 dBc

Frequency [MHz]	Level at Antenna Terminals [dBm]	Substitute Antenna Gain [dBd]	Spurious Emission Level [dBm]	Ant. Pol. [H/V]	[dBc]
1420.00	-50.46	5.76	-44.70	H	61.8
2130.00	-59.67	6.77	-52.89	H	70.0
2840.00	-64.99	7.78	-57.20	H	74.3

Table 6-6. Radiated Spurious Data (Band 17 – Mid Channel)

OPERATING FREQUENCY: 713.50 MHz
CHANNEL: 23825
MEASURED OUTPUT POWER: 17.33 dBm = 0.054 W
MODULATION SIGNAL: QPSK
BANDWIDTH: 5.0 MHz
DISTANCE: 3 meters
LIMIT: 43 + 10 $\log_{10}$ (W) = 30.33 dBc

Frequency [MHz]	Level at Antenna Terminals [dBm]	Substitute Antenna Gain [dBd]	Spurious Emission Level [dBm]	Ant. Pol. [H/V]	[dBc]
1427.00	-54.72	5.80	-48.93	H	66.3
2140.50	-60.15	6.83	-53.32	H	70.6
2854.00	-65.28	7.76	-57.51	H	74.8

Table 6-7. Radiated Spurious Data (Band 17 – High Channel)

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OPERATING FREQUENCY: 713.50 MHz
CHANNEL: 23825
MEASURED OUTPUT POWER: 17.33 dBm = 0.054 W
MODULATION SIGNAL: QPSK
BANDWIDTH: 5.0 MHz
DISTANCE: 3 meters
LIMIT: 43 + 10 $\log_{10}$ (W) = 30.33 dBc

Frequency [MHz]	Level at Antenna Terminals [dBm]	Substitute Antenna Gain [dBd]	Spurious Emission Level [dBm]	Ant. Pol. [H/V]	[dBc]
1427.00	-57.62	5.80	-51.83	H	69.2
2140.50	-61.87	6.83	-55.04	H	72.4
2854.00	-65.37	7.76	-57.60	H	74.9
3567.50	-63.29	7.60	-55.69	H	73.0

Table 6-8. Radiated Spurious Data with WCP (Band 17 – High Channel)

OPERATING FREQUENCY: 779.50 MHz
CHANNEL: 23205
MEASURED OUTPUT POWER: 15.98 dBm = 0.040 W
MODULATION SIGNAL: QPSK
BANDWIDTH: 5.0 MHz
DISTANCE: 3 meters
LIMIT: 43 + 10 $\log_{10}$ (W) = 28.98 dBc

Frequency [MHz]	Level at Antenna Terminals [dBm]	Substitute Antenna Gain [dBd]	Spurious Emission Level [dBm]	Ant. Pol. [H/V]	[dBc]
2338.50	-68.41	7.25	-61.15	V	77.1
3118.00	-71.09	7.26	-63.83	V	79.8

Table 6-9. Radiated Spurious Data (Band 13 – Low Channel)

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OPERATING FREQUENCY: 782.00 MHz
CHANNEL: 23230
MEASURED OUTPUT POWER: 16.12 dBm = 0.041 W
MODULATION SIGNAL: QPSK
BANDWIDTH: 5.0 MHz
DISTANCE: 3 meters
LIMIT: 43 + 10 $\log_{10}$ (W) = 29.12 dBc

Frequency [MHz]	Level at Antenna Terminals [dBm]	Substitute Antenna Gain [dBd]	Spurious Emission Level [dBm]	Ant. Pol. [H/V]	[dBc]
2346.00	-67.52	7.24	-60.28	V	76.4
3128.00	-70.81	7.27	-63.54	V	79.7

Table 6-10. Radiated Spurious Data (Band 13 – Mid Channel)

OPERATING FREQUENCY: 784.50 MHz
CHANNEL: 23255
MEASURED OUTPUT POWER: 16.23 dBm = 0.042 W
MODULATION SIGNAL: QPSK
BANDWIDTH: 5.0 MHz
DISTANCE: 3 meters
LIMIT: 43 + 10 $\log_{10}$ (W) = 29.23 dBc

Frequency [MHz]	Level at Antenna Terminals [dBm]	Substitute Antenna Gain [dBd]	Spurious Emission Level [dBm]	Ant. Pol. [H/V]	[dBc]
2353.50	-67.09	7.23	-59.87	V	76.1
3138.00	-71.35	7.28	-64.06	V	80.3

Table 6-11. Radiated Spurious Data (Band 13 – High Channel)

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OPERATING FREQUENCY: 782.00 MHz
CHANNEL: 23230
MEASURED OUTPUT POWER: 16.12 dBm = 0.041 W
MODULATION SIGNAL: QPSK
DISTANCE: 3 meters
NARROWBAND EMISSION LIMIT: -50 dBm
WIDEBAND EMISSION LIMIT: -40 dBm/MHz

Frequency [MHz]	Level at Antenna Terminals [dBm]	Substitute Antenna Gain [dBd]	Spurious Emission Level [dBm]	Ant. Pol. [H/V]	Margin [dB]
1564.00	-58.48	6.48	-52.00	V	-12.0

Table 6-12. Radiated Spurious Data (Band 13 – 1559-1610MHz Band)

OPERATING FREQUENCY: 784.50 MHz
CHANNEL: 23255
MEASURED OUTPUT POWER: 16.23 dBm = 0.042 W
MODULATION SIGNAL: QPSK
BANDWIDTH: 5.0 MHz
DISTANCE: 3 meters
LIMIT: 43 + 10 $\log_{10}$ (W) = 29.23 dBc

Frequency [MHz]	Level at Antenna Terminals [dBm]	Substitute Antenna Gain [dBd]	Spurious Emission Level [dBm]	Ant. Pol. [H/V]	[dBc]
2353.50	-66.78	7.23	-59.56	H	75.8
3138.00	-72.19	7.28	-64.90	H	81.1

Table 6-13. Radiated Spurious Data with WCP (Band 13 – High Channel)

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OPERATING FREQUENCY: 2503.50 MHz
CHANNEL: 39725
MEASURED OUTPUT POWER: 6.51 dBm = 0.004 W
MODULATION SIGNAL: QPSK
BANDWIDTH: 15.0 MHz
DISTANCE: 3 meters
LIMIT: 55 + 10 log10 (W) = 31.51 dBc

Frequency [MHz]	Level at Antenna Terminals [dBm]	Substitute Antenna Gain [dBi]	Spurious Emission Level [dBm]	Ant. Pol. [H/V]	[dBc]
5007.00	-48.71	10.93	-37.78	H	44.3
7510.50	-57.65	10.92	-46.73	H	53.2
10014.00	-53.97	12.02	-41.95	H	48.5
12517.50	-57.32	13.37	-43.95	H	50.5

Table 6-14. Radiated Spurious Data (Band 41 – Low Channel)

OPERATING FREQUENCY: 2593.00 MHz
CHANNEL: 40620
MEASURED OUTPUT POWER: 8.55 dBm = 0.007 W
MODULATION SIGNAL: QPSK
BANDWIDTH: 15.0 MHz
DISTANCE: 3 meters
LIMIT: 55 + 10 log10 (W) = 33.55 dBc

Frequency [MHz]	Level at Antenna Terminals [dBm]	Substitute Antenna Gain [dBi]	Spurious Emission Level [dBm]	Ant. Pol. [H/V]	[dBc]
5186.00	-46.23	10.60	-35.62	H	44.2
7779.00	-56.96	11.22	-45.74	H	54.3
10372.00	-56.76	12.36	-44.41	H	53.0
12965.00	-57.66	13.16	-44.50	H	53.1

Table 6-15. Radiated Spurious Data (Band 41 – Mid Channel)

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OPERATING FREQUENCY: 2682.50 MHz
CHANNEL: 41515
MEASURED OUTPUT POWER: 9.04 dBm = 0.008 W
MODULATION SIGNAL: QPSK
BANDWIDTH: 15.0 MHz
DISTANCE: 3 meters
LIMIT: 55 + 10 log10 (W) = 34.04 dBc

Frequency [MHz]	Level at Antenna Terminals [dBm]	Substitute Antenna Gain [dBi]	Spurious Emission Level [dBm]	Ant. Pol. [H/V]	[dBc]
5365.00	-47.46	10.58	-36.88	H	45.9
8047.50	-56.81	11.10	-45.71	H	54.7
10730.00	-54.53	12.60	-41.94	H	51.0
13412.50	-54.86	12.38	-42.47	H	51.5

Table 6-16. Radiated Spurious Data (Band 41 – High Channel)

OPERATING FREQUENCY: 2682.50 MHz
CHANNEL: 41515
MEASURED OUTPUT POWER: 8.65 dBm = 0.007 W
MODULATION SIGNAL: QPSK
BANDWIDTH: 15.0 MHz
DISTANCE: 3 meters
LIMIT: 55 + 10 log10 (W) = 33.65 dBc

Frequency [MHz]	Level at Antenna Terminals [dBm]	Substitute Antenna Gain [dBi]	Spurious Emission Level [dBm]	Ant. Pol. [H/V]	[dBc]
5365.00	-47.35	10.58	-36.77	H	45.4
8047.50	-56.64	11.10	-45.54	H	54.2
10730.00	-53.81	12.60	-41.22	H	49.9
13412.50	-54.79	12.38	-42.40	H	51.1

Table 6-17. Radiated Spurious Data with WCP (Band 12 – High Channel)

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6.7 Frequency Stability / Temperature Variation

§2.1055 §27.54

Test Overview and Limit

Frequency stability testing is performed in accordance with the guidelines of ANSI/TIA-603-C-2004. The frequency stability of the transmitter is measured by:

a.) **Temperature:** The temperature is varied from -30°C to +50°C in 10°C increments using an environmental chamber.

b.) **Primary Supply Voltage:** The primary supply voltage is varied from 85% to 115% of the nominal value for non hand-carried battery and AC powered equipment. For hand-carried, battery-powered equipment, primary supply voltage is reduced to the battery operating end point which shall be specified by the manufacturer.

Per Part 27, the frequency stability shall be sufficient to ensure that the fundamental emission stays within the authorized frequency block.

Test Procedure Used

ANSI/TIA-603-C-2004

Test Settings

1. The carrier frequency of the transmitter is measured at room temperature (20°C to provide a reference).
2. The equipment is turned on in a "standby" condition for fifteen minutes 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.
3. 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.

Test Setup

The EUT was connected via an RF cable to a spectrum analyzer with the EUT placed inside an environmental chamber.

Test Notes

None

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Band 17 Frequency Stability Measurements

§2.1055 §27.54

OPERATING FREQUENCY: 710,000,000 Hz

CHANNEL: 23090

REFERENCE VOLTAGE: 3.85 VDC

VOLTAGE (%)	POWER (VDC)	TEMP (°C)	FREQUENCY (Hz)	Freq. Dev. (Hz)	Deviation (%)
100 %	3.85	+ 20 (Ref)	709,999,907	-93	-0.0000131
100 %		- 30	710,000,096	96	0.0000135
100 %		- 20	709,999,712	-288	-0.0000406
100 %		- 10	709,999,867	-133	-0.0000187
100 %		0	709,999,808	-192	-0.0000270
100 %		+ 10	710,000,113	113	0.0000159
100 %		+ 20	710,000,125	125	0.0000176
100 %		+ 30	710,000,125	125	0.0000176
100 %		+ 40	710,000,045	45	0.0000063
100 %		+ 50	709,999,840	-160	-0.0000225
BATT. ENDPOINT	3.45	+ 20	710,000,222	222	0.0000313

Table 6-18. Frequency Stability Data (Band 17)

Note:

Based on the results of the frequency stability test at the center channel the frequency deviation results measured are very small. As such it is determined that the channels at the band edge would remain in-band when the maximum measured frequency deviation noted during the frequency stability tests is applied. Therefore the device is determined to remain operating in band over the temperature and voltage range as tested.

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Band 17 Frequency Stability Measurements

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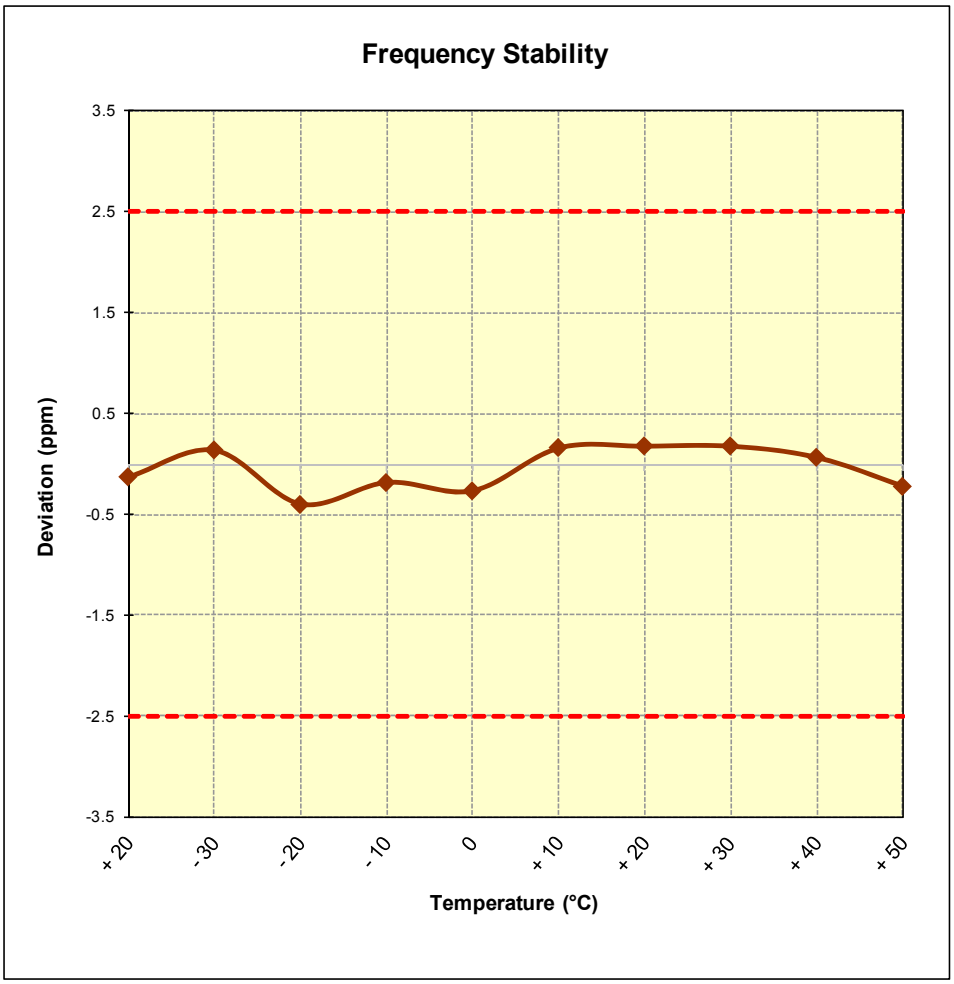

Figure 6-6. Frequency Stability Graph (Band 17)

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Band 13 Frequency Stability Measurements

§2.1055 §27.54

OPERATING FREQUENCY: 782,000,000 Hz

CHANNEL: 23230

REFERENCE VOLTAGE: 3.85 VDC

VOLTAGE (%)	POWER (VDC)	TEMP (°C)	FREQUENCY (Hz)	Freq. Dev. (Hz)	Deviation (%)
100 %	3.85	+ 20 (Ref)	781,999,725	-275	-0.0000352
100 %		- 30	782,000,079	79	0.0000101
100 %		- 20	782,000,143	143	0.0000183
100 %		- 10	781,999,738	-262	-0.0000335
100 %		0	781,999,742	-258	-0.0000330
100 %		+ 10	782,000,152	152	0.0000194
100 %		+ 20	781,999,797	-203	-0.0000260
100 %		+ 30	781,999,889	-111	-0.0000142
100 %		+ 40	782,000,133	133	0.0000170
100 %		+ 50	781,999,813	-187	-0.0000239
BATT. ENDPOINT	3.45	+ 20	781,999,920	-80	-0.0000102

Table 6-19. Frequency Stability Data (Band 13)

Note:

Based on the results of the frequency stability test at the center channel the frequency deviation results measured are very small. As such it is determined that the channels at the band edge would remain in-band when the maximum measured frequency deviation noted during the frequency stability tests is applied. Therefore the device is determined to remain operating in band over the temperature and voltage range as tested.

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Band 13 Frequency Stability Measurements

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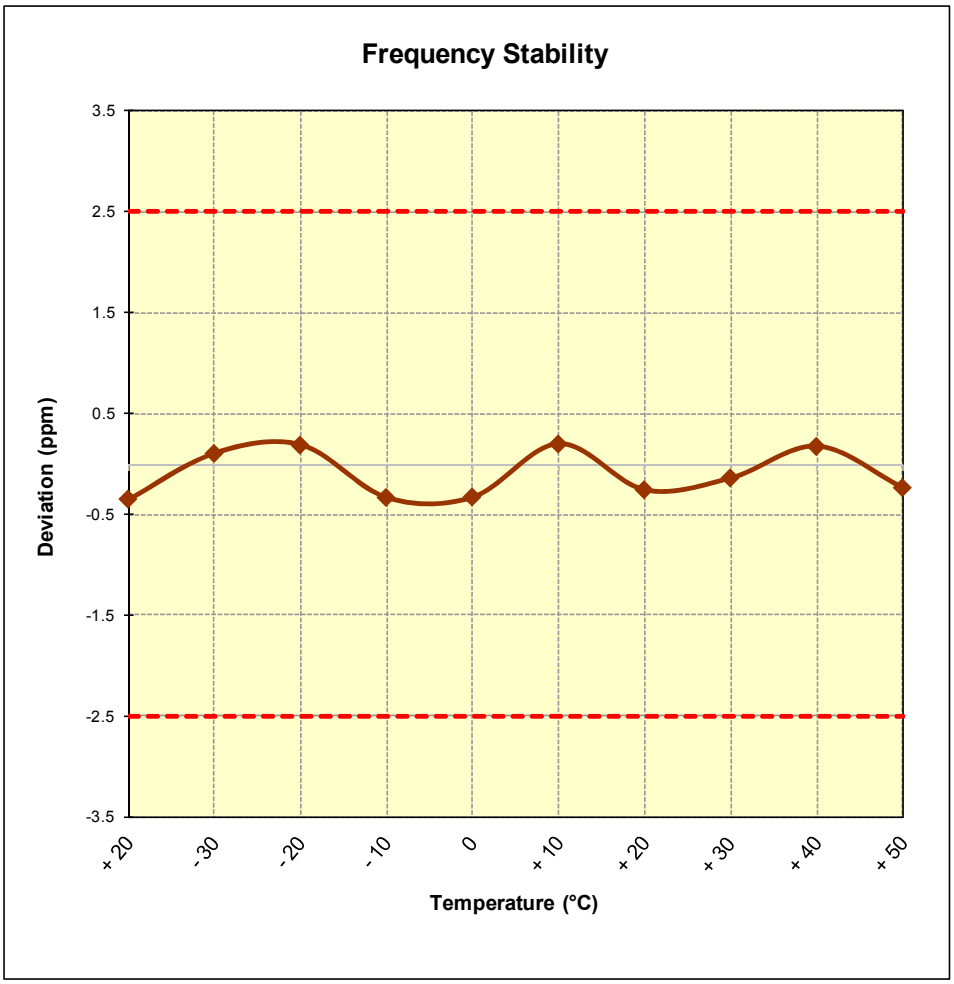

Figure 6-7. Frequency Stability Graph (Band 13)

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Band 41 Frequency Stability Measurements

§2.1055 §27.54

OPERATING FREQUENCY: 2,593,000,000 Hz

CHANNEL: 40620

REFERENCE VOLTAGE: 3.85 VDC

VOLTAGE (%)	POWER (VDC)	TEMP (°C)	FREQUENCY (Hz)	Freq. Dev. (Hz)	Deviation (%)
100 %	3.85	+ 20 (Ref)	2,593,000,154	154	0.0000059
100 %		- 30	2,593,000,160	160	0.0000062
100 %		- 20	2,592,999,806	-194	-0.0000075
100 %		- 10	2,592,999,870	-130	-0.0000050
100 %		0	2,592,999,721	-279	-0.0000108
100 %		+ 10	2,592,999,777	-223	-0.0000086
100 %		+ 20	2,592,999,971	-29	-0.0000011
100 %		+ 30	2,593,000,072	72	0.0000028
100 %		+ 40	2,592,999,947	-53	-0.0000020
100 %		+ 50	2,592,999,720	-280	-0.0000108
BATT. ENDPOINT	3.45	+ 20	2,592,999,942	-58	-0.0000022

Table 6-20. Frequency Stability Data (Band 41)

Note:

Based on the results of the frequency stability test at the center channel the frequency deviation results measured are very small. As such it is determined that the channels at the band edge would remain in-band when the maximum measured frequency deviation noted during the frequency stability tests is applied. Therefore the device is determined to remain operating in band over the temperature and voltage range as tested.

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Band 41 Frequency Stability Measurements

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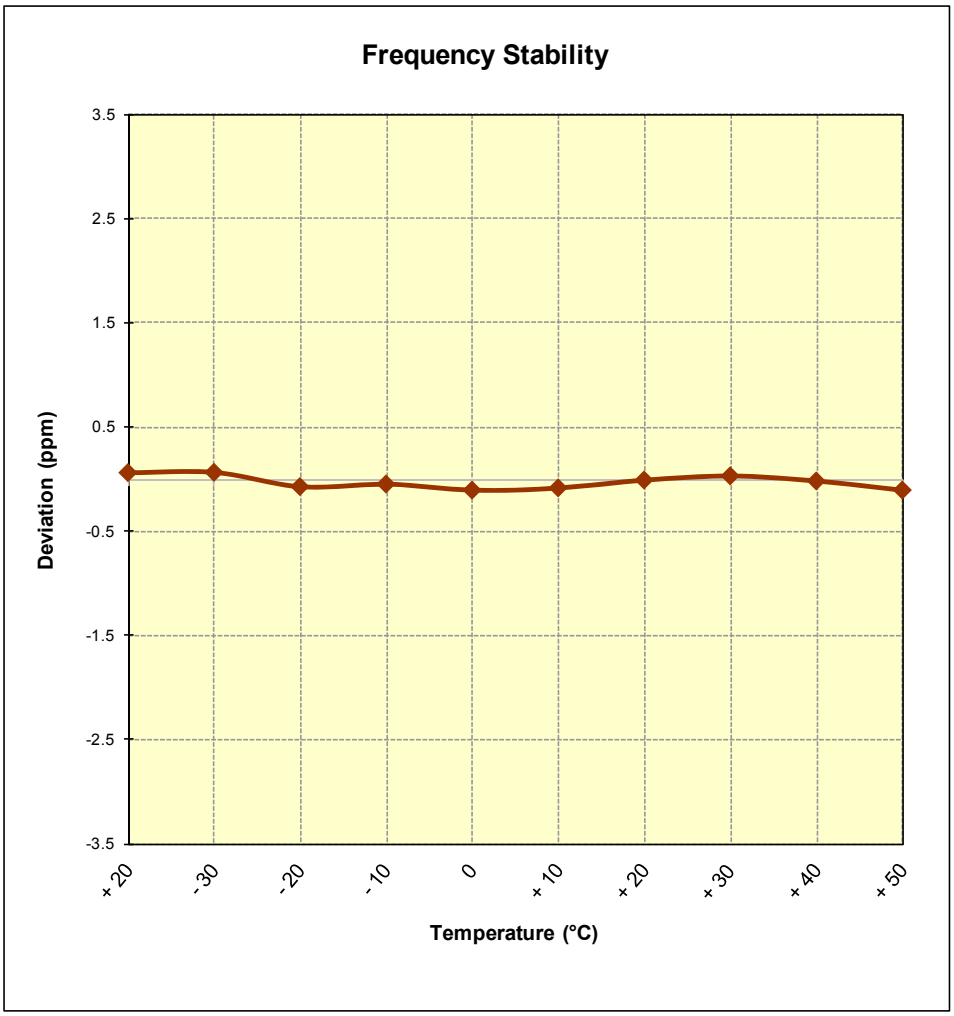

Figure 6-8. Frequency Stability Graph (Band 41)

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7.0 CONCLUSION

The data collected relate only to the item(s) tested and show that the **Samsung Portable Handset FCC ID: A3LSC05G** complies with all the requirements of Part 27 of the FCC rules for LTE operation only.

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