PCTEST ENGINEERING LABORATORY, INC.
7185 Oakland Mills Road, Columbia, MD 21046 USA
Tel. 410.290.6652 / Fax 410.290.6654
http://www.pctestlab.com

MEASUREMENT REPORT
FCC Part 27 LTE

Applicant Name:
Harris Corporation
221 Jefferson Ridge Parkway
Lynchburg, VA 24501
United States

Date of Testing:
8/11 - 8/19/15
Test Site/Location:
PCTEST Lab., Columbia, MD, USA
Test Report Serial No.:
0Y1508111546.BV8

FCC ID : **BV8BBPBM214**

APPLICANT: **HARRIS CORPORATION**

Application Type: Certification
FCC Classification: Licensed Non-Broadcast Transmitter (TNB)
FCC Rule Part(s): §2; §27
Test Procedure(s): ANSI/TIA-603-C-2004, KDB 971168 v02r02
EUT Type: Wireless Module
Model(s): PBM-214
Test Device Serial No.: *identical prototype* [S/N: 355389060001284]

Mode	Tx Frequency (MHz)	Emission Designator	Modulation	Cond. PWR	
				Max. Power (W)	Max. Power (dBm)
LTE Band 13	779.5 - 784.5	8M95G7D	QPSK	0.282	24.50
LTE Band 13	779.5 - 784.5	8M97W7D	16QAM	0.236	23.73
LTE Band 4	1712.5 - 1752.5	4M51G7D	QPSK	0.282	24.51
LTE Band 4	1712.5 - 1752.5	4M50W7D	16QAM	0.307	24.87
LTE Band 4	1715 - 1750	8M97G7D	QPSK	0.284	24.53
LTE Band 4	1715 - 1750	8M98W7D	16QAM	0.294	24.68
LTE Band 4	1717.5 - 1747.5	13M5G7D	QPSK	0.282	24.50
LTE Band 4	1717.5 - 1747.5	13M4W7D	16QAM	0.281	24.49
LTE Band 4	1720 - 1745	17M9G7D	QPSK	0.287	24.58
LTE Band 4	1720 - 1745	18M0W7D	16QAM	0.296	24.72

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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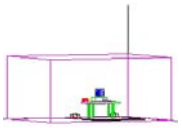
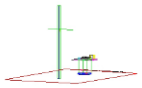


MEASUREMENT REPORT
FCC Part 27



§2.1033 General Information

APPLICANT:	Harris Corporation
APPLICANT ADDRESS:	221 Jefferson Ridge Parkway
	Lynchburg, VA 24501, United States
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:	PBM-214
FCC ID:	BV8BBPBM214
FCC CLASSIFICATION:	Licensed Non-Broadcast Transmitter (TNB)
FREQUENCY TOLERANCE:	±0.00025 % (2.5 ppm)
Test Device Serial No.:	355389060001284 ☐ Production ☒ Pre-Production ☐ Engineering
DATE(S) OF TEST:	8/11 - 8/19/15
TEST REPORT S/N:	0Y1508111546.BV8

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.

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 39º 10'23" N latitude and 76º 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.

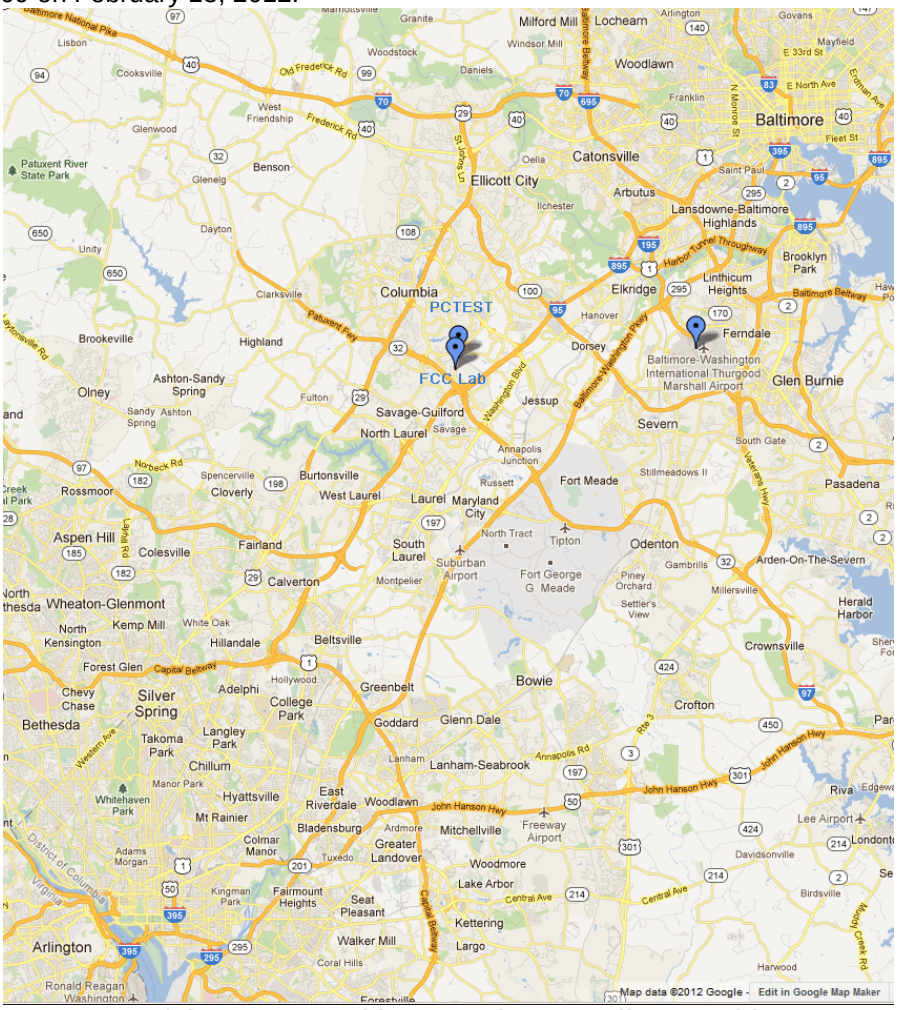


Figure 1-1. Map of the Greater Baltimore and Metropolitan Washington, D.C. area

2.0 PRODUCT INFORMATION

2.1 Equipment Description

The Equipment Under Test (EUT) is the **Harris Wireless Module FCC ID: BV8BBPBM214**. 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:

Multi-band LTE

2.3 Test Configuration

The Harris Wireless Module FCC ID: BV8BBPBM214 was tested per the guidance of ANSI/TIA-603-C-2004 and KDB 971168 v02r02. See Section 6.0 of this test report for a description of the radiated and antenna port conducted emissions tests.

2.4 EMI Suppression Device(s)/Modifications

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

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 **Harris Wireless Module FCC ID: BV8BBPBM214.**

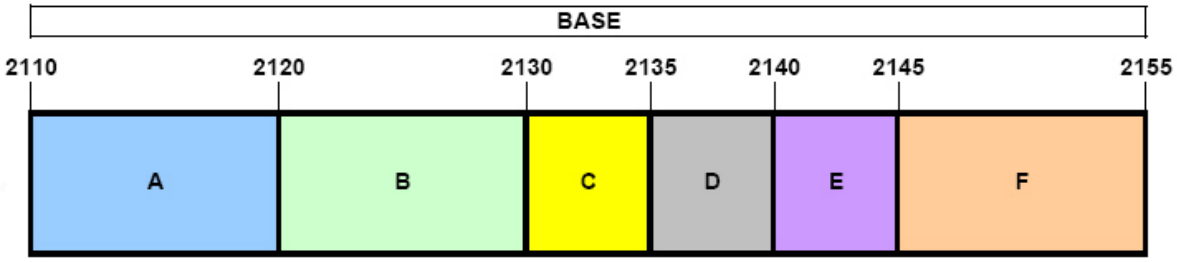
3.1 Block C Frequency Range

§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 AWS - Base Frequency Blocks

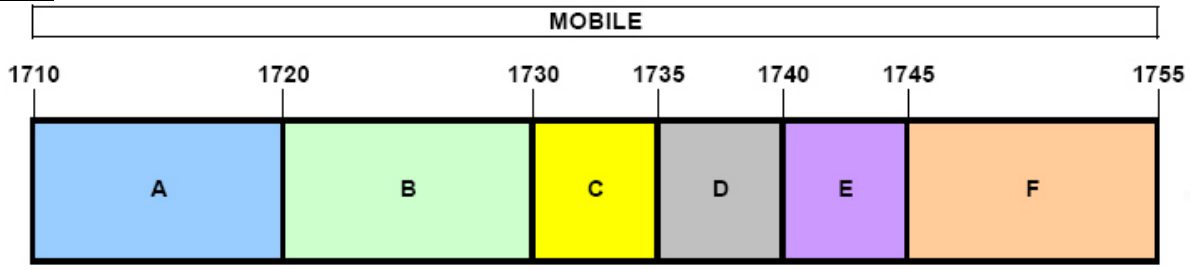
§27.5(h)



BLOCK 1: 2110 – 2120 MHz (A)
BLOCK 2: 2120 – 2130 MHz (B)
BLOCK 3: 2130 – 2135 MHz (C)
BLOCK 4: 2135 – 2140 MHz (D)
BLOCK 5: 2140 – 2145 MHz (E)
BLOCK 6: 2145 – 2155 MHz (F)

3.3 AWS - Mobile Frequency Blocks

§27.5(h)



BLOCK 1: 1710 – 1720 MHz (A)
BLOCK 2: 1720 – 1730 MHz (B)
BLOCK 3: 1730 – 1735 MHz (C)
BLOCK 4: 1735 – 1740 MHz (D)
BLOCK 5: 1740 – 1745 MHz (E)
BLOCK 6: 1745 – 1755 MHz (F)

3.4 Radiated Power and Radiated Spurious Emissions

§2.1053 §27.50(b.10) §27.50(d.4) §27.53(f) §27.53(h)

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 $43 + 10\log_{10}(\text{Power}_{[Watts]})$.

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
-	LTx1	Licensed Transmitter Cable Set	4/16/2015	Annual	4/16/2016	N/A
-	RE3	Radiated Emissions Cable Set	4/29/2015	Annual	4/29/2016	N/A
Agilent	8447D	Broadband Amplifier	6/12/2015	Annual	6/12/2016	2443A01900
Agilent	E4448A	PSA (3Hz-50GHz) Spectrum Analyzer	3/19/2015	Annual	3/19/2016	US42510244
Agilent	N9020A	MXA Signal Analyzer	10/27/2014	Annual	10/27/2015	US46470561
Agilent	N9030A	PXA Signal Analyzer (44GHz)	3/24/2015	Annual	3/24/2016	MY52350166
Com-Power	AL-130	9kHz - 30MHz Loop Antenna	7/30/2015	Biennial	7/30/2017	121034
ETS Lindgren	3117	1-18 GHz DRG Horn (Medium)	4/8/2014	Biennial	4/8/2016	125518
ETS Lindgren	3164-08	Quad Ridge Horn Antenna	10/22/2014	Biennial	10/22/2016	128338
K & L	13SH10-1000/U1000	N Type High Pass Filter	12/1/2014	Annual	12/1/2015	2
K & L	11SH10-3075/U18000	High Pass Filter	12/1/2014	Annual	12/1/2015	2
Rhode & Schwarz	TS-PR18	Pre-Amplifier	3/5/2015	Annual	3/5/2016	101622
Rohde & Schwarz	CMW500	Radio Communication Tester	10/3/2014	Annual	10/3/2015	100976
Rohde & Schwarz	TS-PR26	18-26.5 GHz Pre-Amplifier	3/3/2015	Annual	3/3/2016	100040
Rohde & Schwarz	ESU40	EMI Test Receiver (40GHz)	7/17/2015	Annual	7/17/2016	100348
Schwarzbeck	UHA 9105	Dipole Antenna (400 - 1GHz) Rx	11/1/2013	Biennial	11/1/2015	91052523RX
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	140140336

Table 4-1. Test Equipment

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).

6.0 TEST RESULTS

6.1 Summary

Company Name: Harris Corporation
FCC ID: BV8BBPBM214
FCC Classification: Licensed Non-Broadcast Transmitter (TNB)
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 6.3
2.1051 27.53(c) 27.53(g) 27.53(h)	Out of Band Emissions	> 43 + 10log$_{10}$ (P[Watts]) at Band Edge and for all out-of-band emissions		PASS	Section 6.4, 6.5
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 27)		PASS	Section 6.7
2.1053 27.53(c) 27.53(g) 27.53(h)	Undesirable Emissions	> 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

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 6.3, 6.4, 6.5) 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 3.9.

6.2 Conducted Power Output Data

The **Harris Wireless Module FCC ID: BV8BBPBM214** was powered by a DC Power supply through a test PCB. Via RF Cable, the Main Antenna port of the EUT was connected to a spectrum analyzer while the CMW500 LTE Callbox was used only to establish a connection. Transmit power readings were taken from the spectrum analyzer per Section 5.2.1 of KDB 971168v02r02.

Instrument settings:

a.) Span set to > 1.5 times the OBW.
b.) RBW set to 1 – 5% of OBW (not more than 1MHz)
c.) VBW set to 3MHz.
d.) Number of sweep points set to 5000 (>2*span/RBW)
e.) Sweep time set to auto couple
f.) Detector set to RMS
g.) Trace averaged at least 100 traces in RMS power averaging mode.
h.) Since duty cycle of >98% (measured using zero span on spectrum analyzer with sufficient response time and spacing between bins to permit accurate measurement of burst on/off time per Section 5.2.2 of KDB971168) cannot be achieved, signal gating was implemented by the spectrum analyzer to ensure that power was measured only when the EUT is actively transmitting at full power.
i.) Channel Power Function utilized to integrate power across the OBW

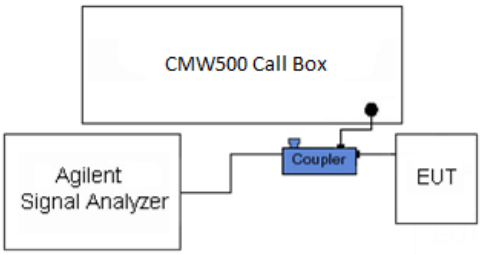


Figure 6-1. Conducted Output Power Test Setup Diagram

Freq. [MHz]	MCS Level	Mod.	BW	RB Size	RB Offset	Maximum Average Power [dBm]
782	0	QPSK	5MHz	1	0	24.5
782	0	QPSK	5MHz	1	49	24.49
782	0	QPSK	5MHz	25	12	23.54
782	0	QPSK	5MHz	50	0	23.22
782	11	16QAM	5MHz	1	0	23.73
782	11	16QAM	5MHz	1	49	23.71
782	11	16QAM	5MHz	25	12	22.54
782	11	16QAM	5MHz	50	0	22.3

Table 6-1. Maximum Average Conducted Output Power Band 13

Freq. [MHz]	MCS Level	Mod.	BW	RB Size	RB Offset	Maximum Average Power [dBm]	Freq. [MHz]	MCS Level	Mod.	BW	RB Size	RB Offset	Maximum Average Power [dBm]
1712.5	0	QPSK	5MHz	1	0	24.31	1712.5	11	16QAM	5MHz	1	0	24.57
1712.5	0	QPSK	5MHz	1	24	24.49	1712.5	11	16QAM	5MHz	1	24	24.87
1712.5	0	QPSK	5MHz	12	6	24.35	1712.5	11	16QAM	5MHz	12	6	23.15
1712.5	0	QPSK	5MHz	25	0	24.08	1712.5	11	16QAM	5MHz	25	0	23.17
1732.5	0	QPSK	5MHz	1	0	24.08	1732.5	11	16QAM	5MHz	1	0	24.38
1732.5	0	QPSK	5MHz	1	24	24.04	1732.5	11	16QAM	5MHz	1	24	24.18
1732.5	0	QPSK	5MHz	12	6	24.51	1732.5	11	16QAM	5MHz	12	6	23.46
1732.5	0	QPSK	5MHz	25	0	24.17	1732.5	11	16QAM	5MHz	25	0	23.29
1752.5	0	QPSK	5MHz	1	0	24.17	1752.5	11	16QAM	5MHz	1	0	24.67
1752.5	0	QPSK	5MHz	1	24	24.09	1752.5	11	16QAM	5MHz	1	24	24.59
1752.5	0	QPSK	5MHz	12	6	24.39	1752.5	11	16QAM	5MHz	12	6	23.55
1752.5	0	QPSK	5MHz	25	0	24.14	1752.5	11	16QAM	5MHz	25	0	23.4
1715	0	QPSK	10MHz	1	0	24.24	1715	11	16QAM	10MHz	1	0	24.3
1715	0	QPSK	10MHz	1	49	24.53	1715	11	16QAM	10MHz	1	49	24.56
1715	0	QPSK	10MHz	25	12	24.17	1715	11	16QAM	10MHz	25	12	23.23
1715	0	QPSK	10MHz	50	0	24.28	1715	11	16QAM	10MHz	50	0	23.42
1732.5	0	QPSK	10MHz	1	0	24.45	1732.5	11	16QAM	10MHz	1	0	24.62
1732.5	0	QPSK	10MHz	1	49	24.4	1732.5	11	16QAM	10MHz	1	49	24.51
1732.5	0	QPSK	10MHz	25	12	24.47	1732.5	11	16QAM	10MHz	25	12	23.45
1732.5	0	QPSK	10MHz	50	0	24.35	1732.5	11	16QAM	10MHz	50	0	23.46
1750	0	QPSK	10MHz	1	0	24.43	1750	11	16QAM	10MHz	1	0	24.49
1750	0	QPSK	10MHz	1	49	24.39	1750	11	16QAM	10MHz	1	49	24.44
1750	0	QPSK	10MHz	25	12	24.32	1750	11	16QAM	10MHz	25	12	24.68
1750	0	QPSK	10MHz	50	0	24.23	1750	11	16QAM	10MHz	50	0	23.48
1717.5	0	QPSK	15MHz	1	0	24.13	1717.5	11	16QAM	15MHz	1	0	24.35
1717.5	0	QPSK	15MHz	1	74	24.44	1717.5	11	16QAM	15MHz	1	74	24.47
1717.5	0	QPSK	15MHz	36	15	24.47	1717.5	11	16QAM	15MHz	36	15	24.32
1717.5	0	QPSK	15MHz	75	0	24.41	1717.5	11	16QAM	15MHz	75	0	23.53
1732.5	0	QPSK	15MHz	1	0	24.35	1732.5	11	16QAM	15MHz	1	0	24.49
1732.5	0	QPSK	15MHz	1	74	23.99	1732.5	11	16QAM	15MHz	1	74	24.49
1732.5	0	QPSK	15MHz	36	15	24.48	1732.5	11	16QAM	15MHz	36	15	23.52
1732.5	0	QPSK	15MHz	75	0	24.48	1732.5	11	16QAM	15MHz	75	0	23.56
1747.5	0	QPSK	15MHz	1	0	24.31	1747.5	11	16QAM	15MHz	1	0	24.4
1747.5	0	QPSK	15MHz	1	74	24.2	1747.5	11	16QAM	15MHz	1	74	24.4
1747.5	0	QPSK	15MHz	36	15	24.5	1747.5	11	16QAM	15MHz	36	15	23.55
1747.5	0	QPSK	15MHz	75	0	24.42	1747.5	11	16QAM	15MHz	75	0	23.63
1720	0	QPSK	20MHz	1	0	24.14	1720	11	16QAM	20MHz	1	0	24.58
1720	0	QPSK	20MHz	1	99	24.55	1720	11	16QAM	20MHz	1	99	24.72
1720	0	QPSK	20MHz	50	25	24.54	1720	11	16QAM	20MHz	50	25	23.53
1720	0	QPSK	20MHz	100	0	24.16	1720	11	16QAM	20MHz	100	0	23.36
1732.5	0	QPSK	20MHz	1	0	24.52	1732.5	11	16QAM	20MHz	1	0	24.58
1732.5	0	QPSK	20MHz	1	99	24.32	1732.5	11	16QAM	20MHz	1	99	24.53
1732.5	0	QPSK	20MHz	50	25	24.56	1732.5	11	16QAM	20MHz	50	25	23.51
1732.5	0	QPSK	20MHz	100	0	24.4	1732.5	11	16QAM	20MHz	100	0	23.53
1745	0	QPSK	20MHz	1	0	24.4	1745	11	16QAM	20MHz	1	0	24.65
1745	0	QPSK	20MHz	1	99	24.33	1745	11	16QAM	20MHz	1	99	24.55
1745	0	QPSK	20MHz	50	25	24.58	1745	11	16QAM	20MHz	50	25	24.53
1745	0	QPSK	20MHz	100	0	24.19	1745	11	16QAM	20MHz	100	0	23.49

Table 6-2. Maximum Average Conducted Output Power Band 4

6.3 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.

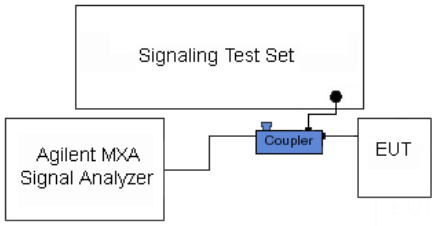
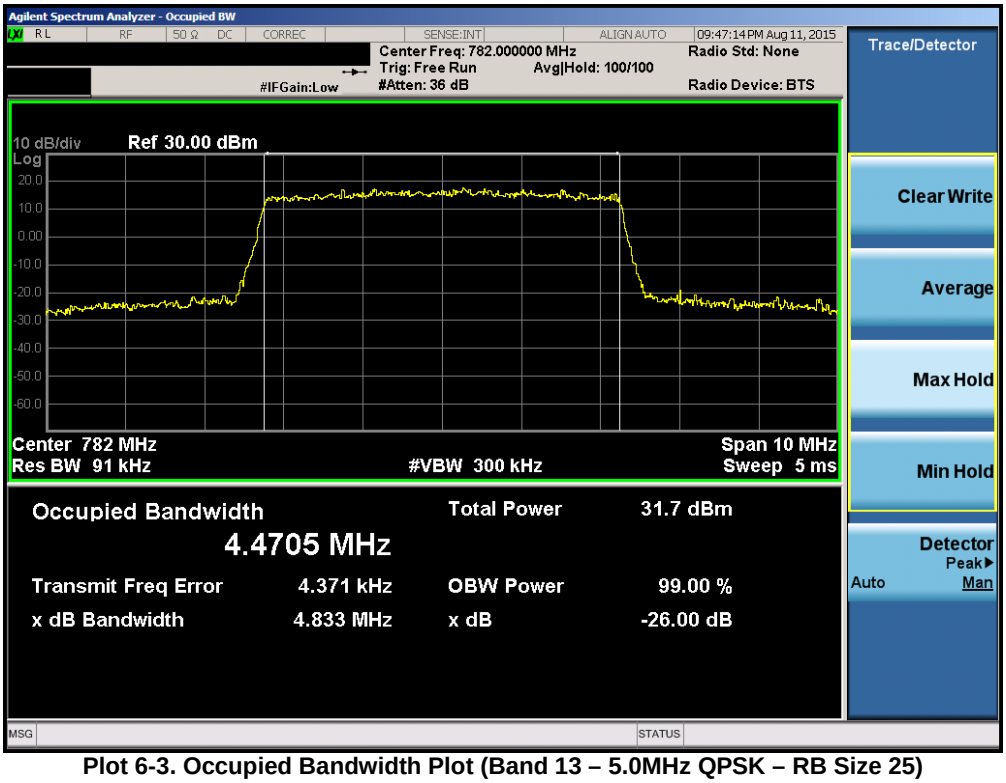


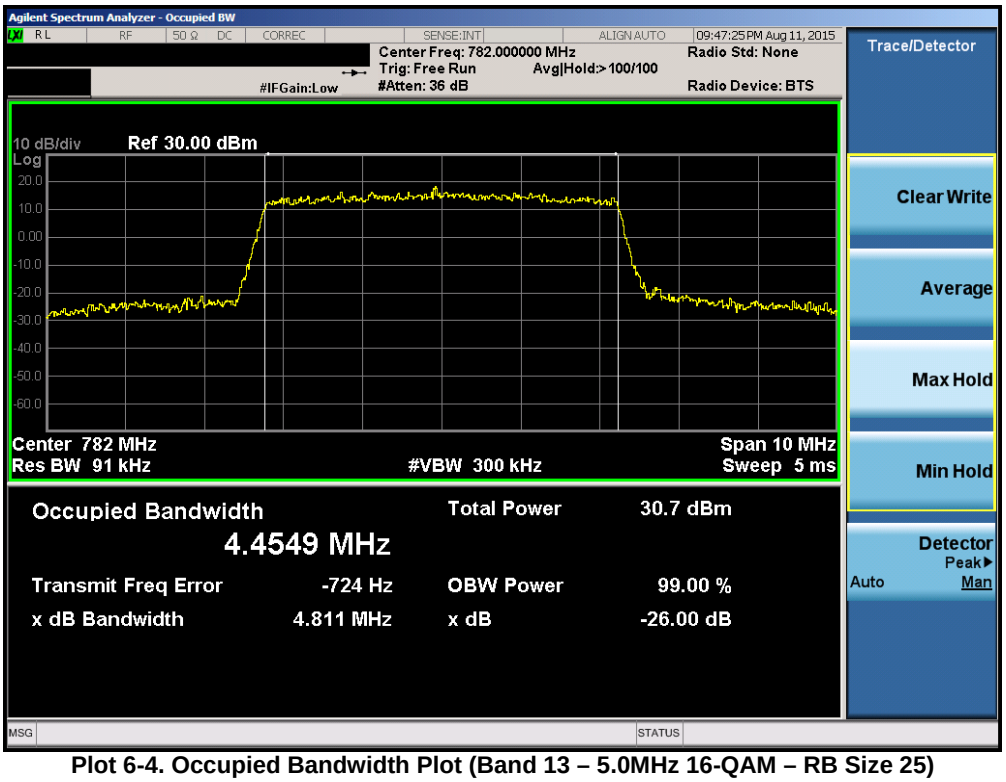
Figure 6-2. Test Instrument & Measurement Setup

Test Notes

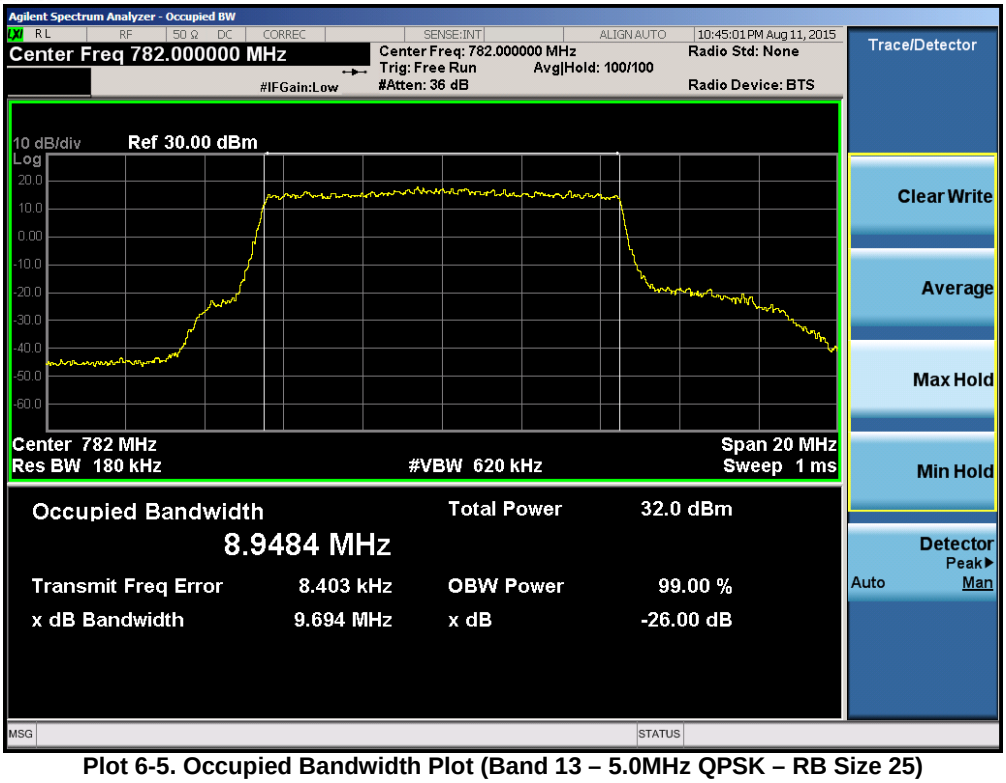
None.



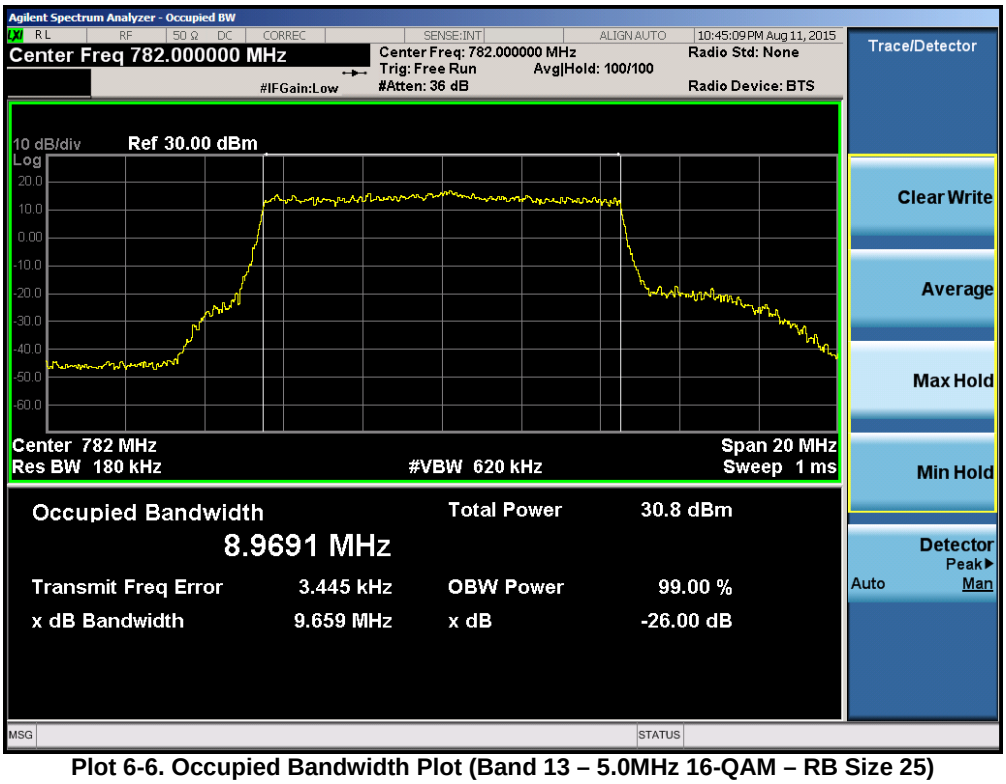
Plot 6-3. Occupied Bandwidth Plot (Band 13 – 5.0MHz QPSK – RB Size 25)



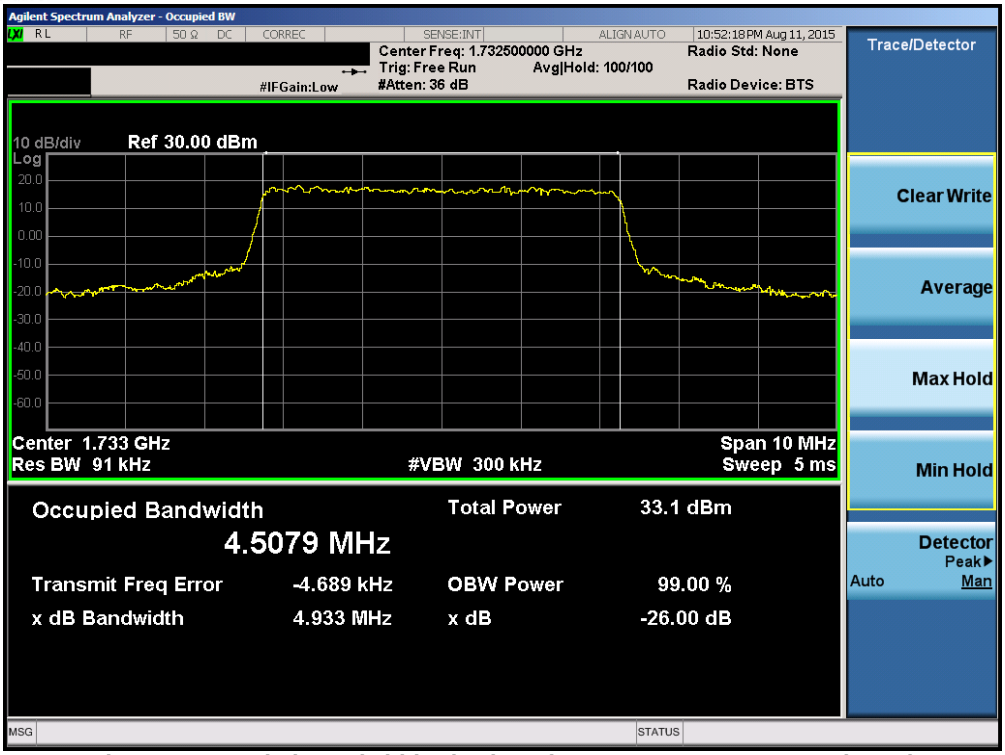
Plot 6-4. Occupied Bandwidth Plot (Band 13 – 5.0MHz 16-QAM – RB Size 25)



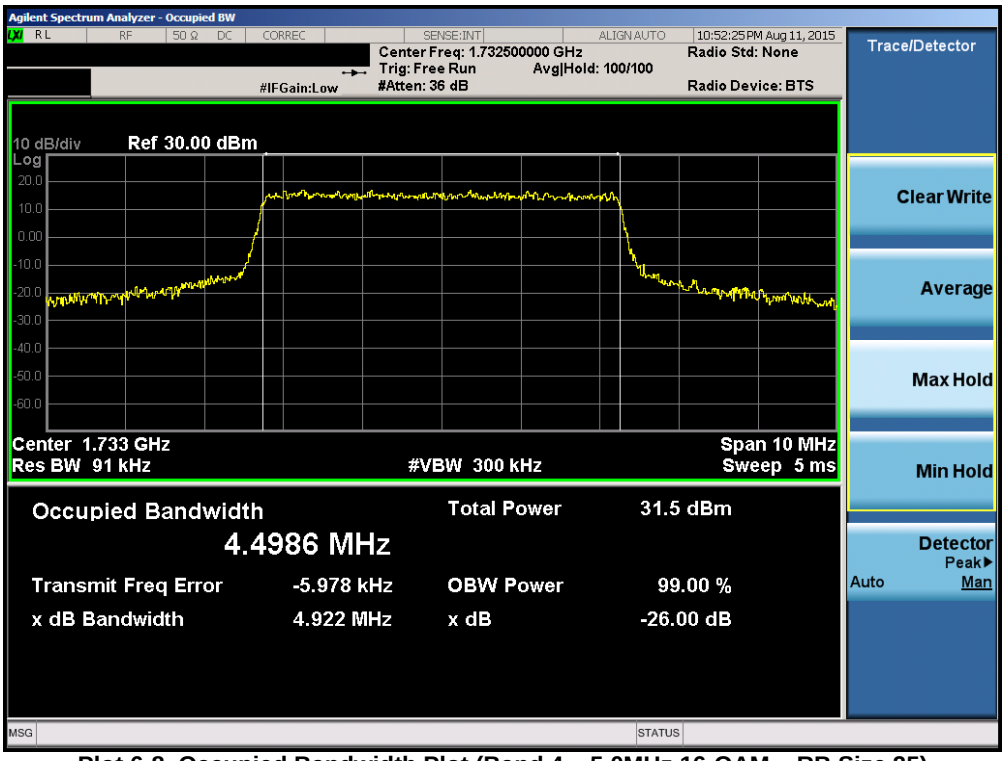
Plot 6-5. Occupied Bandwidth Plot (Band 13 – 5.0MHz QPSK – RB Size 25)



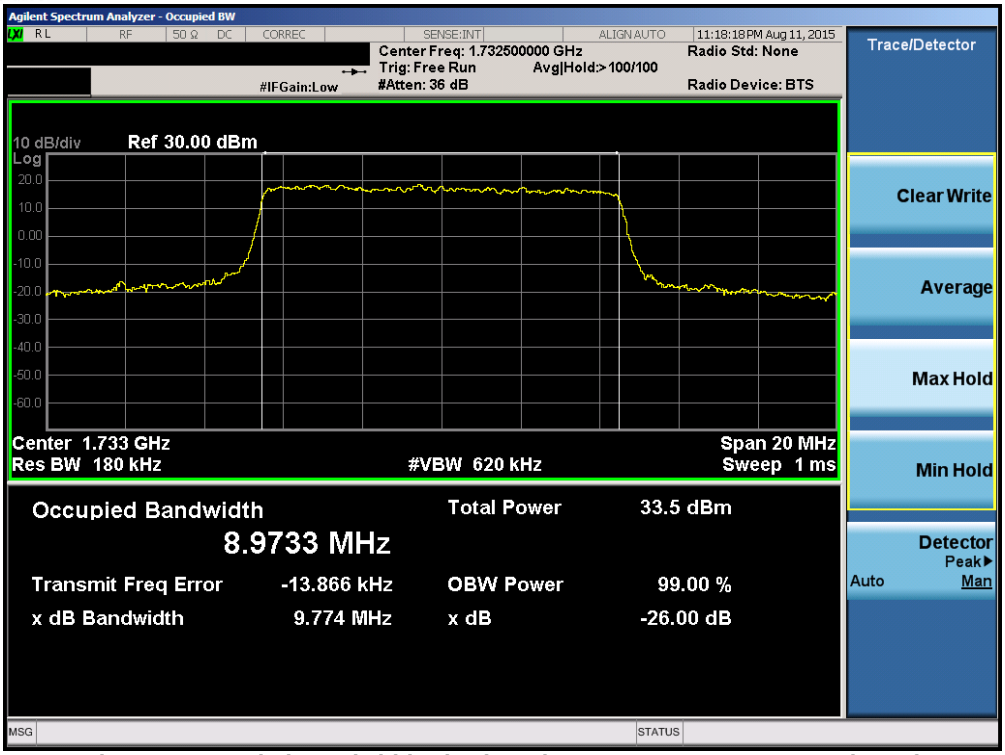
Plot 6-6. Occupied Bandwidth Plot (Band 13 – 5.0MHz 16-QAM – RB Size 25)



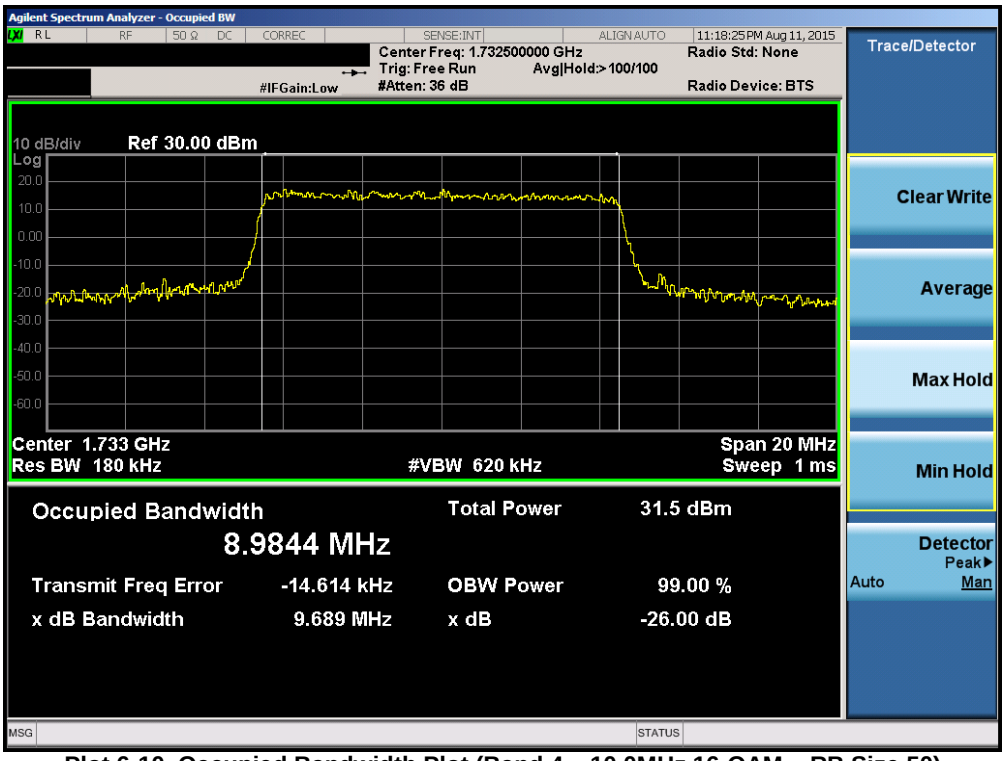
Plot 6-7. Occupied Bandwidth Plot (Band 4 – 5.0MHz QPSK – RB Size 25)



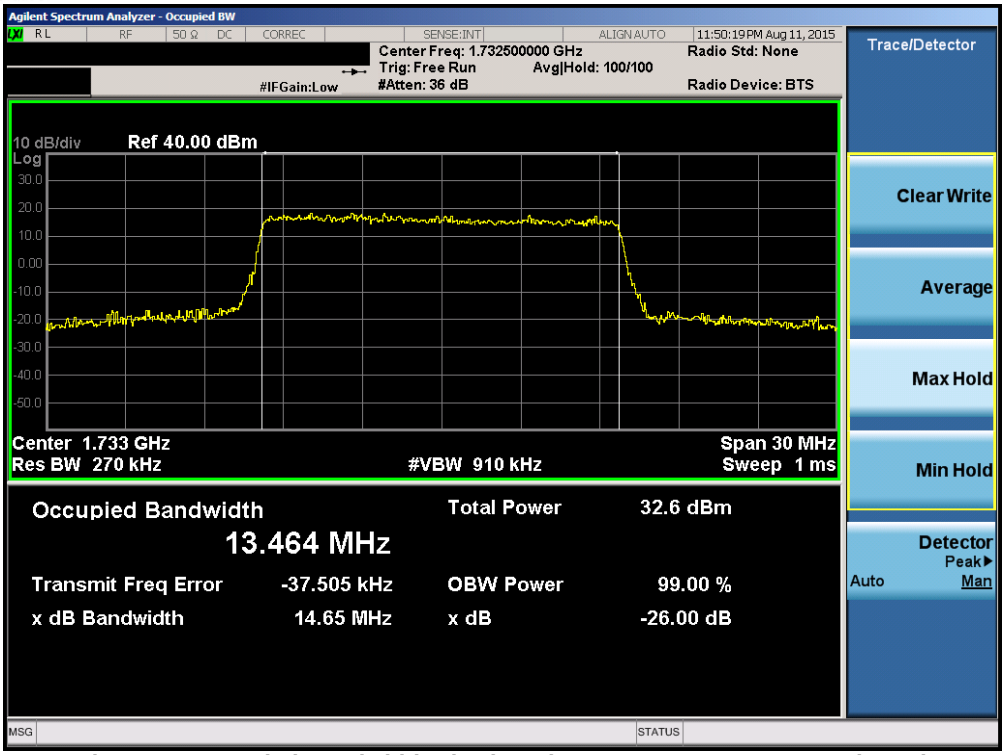
Plot 6-8. Occupied Bandwidth Plot (Band 4 – 5.0MHz 16-QAM – RB Size 25)



Plot 6-9. Occupied Bandwidth Plot (Band 4 – 10.0MHz QPSK – RB Size 50)



Plot 6-10. Occupied Bandwidth Plot (Band 4 – 10.0MHz 16-QAM – RB Size 50)



Plot 6-11. Occupied Bandwidth Plot (Band 4 – 15.0MHz QPSK – RB Size 75)

Plot 6-12. Occupied Bandwidth Plot (Band 4 – 15.0MHz 16-QAM – RB Size 75)

Plot 6-13. Occupied Bandwidth Plot (Band 4 – 20.0MHz QPSK – RB Size 100)

Plot 6-14. Occupied Bandwidth Plot (Band 4 – 20.0MHz 16-QAM – RB Size 100)

6.4 Spurious and Harmonic Emissions at Antenna Terminal

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

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.

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 average
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.

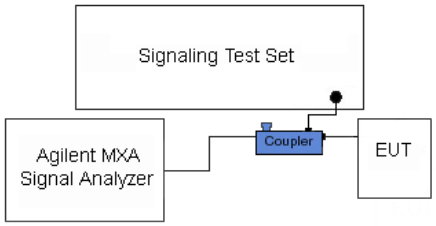
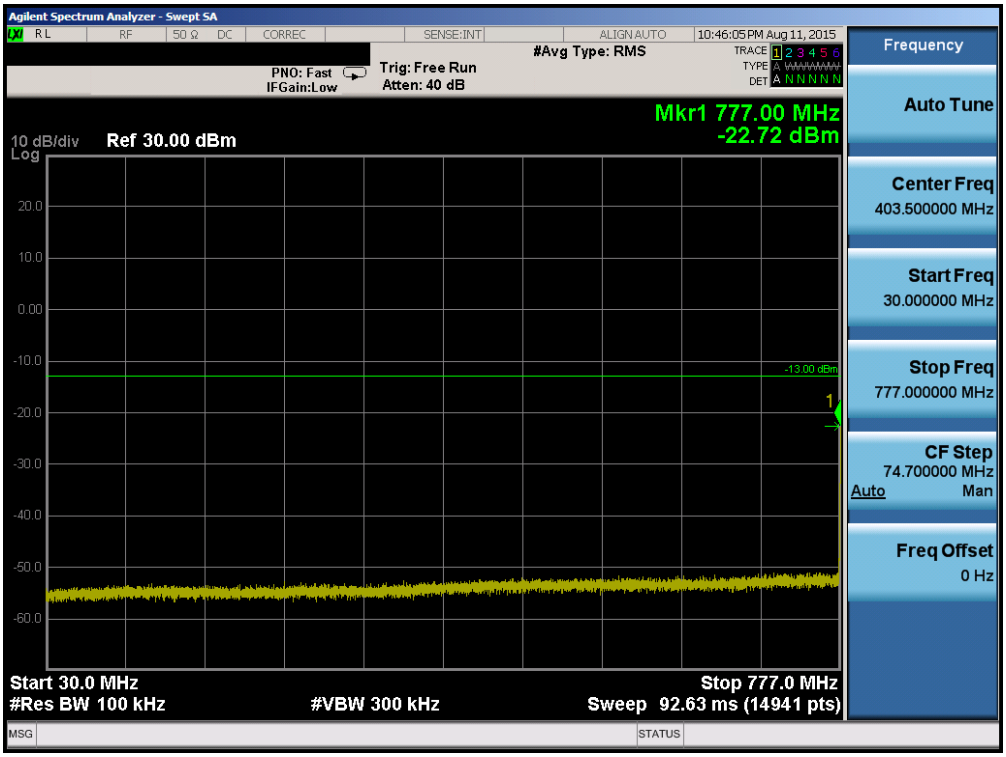


Figure 6-3. Test Instrument & Measurement Setup

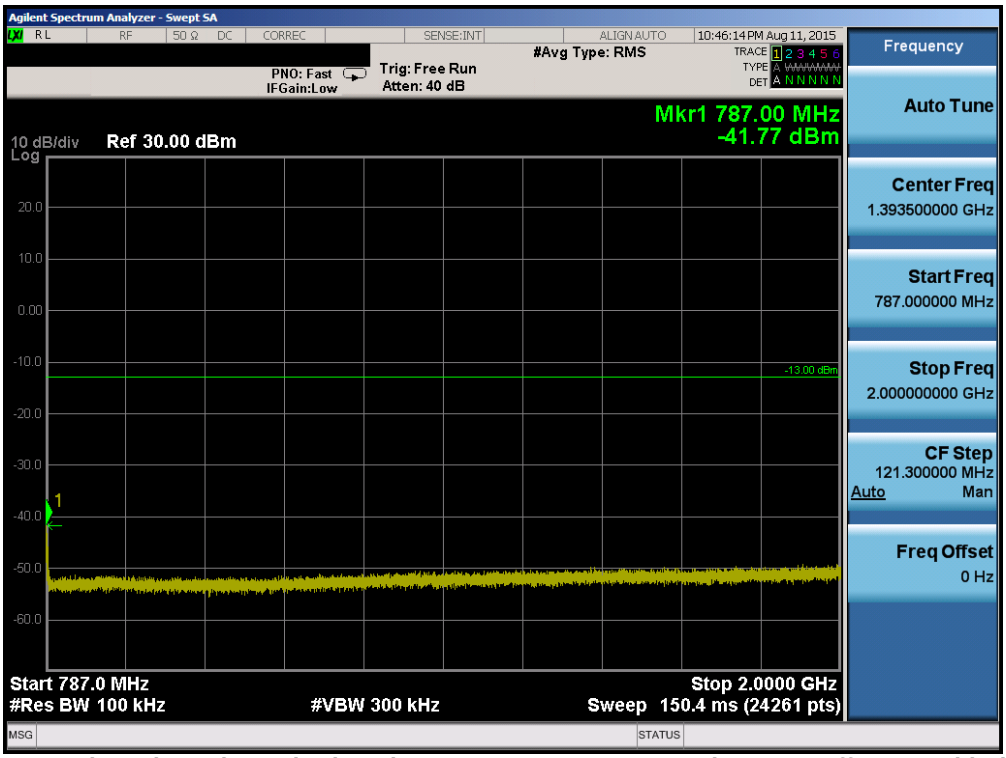
Test Notes

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.

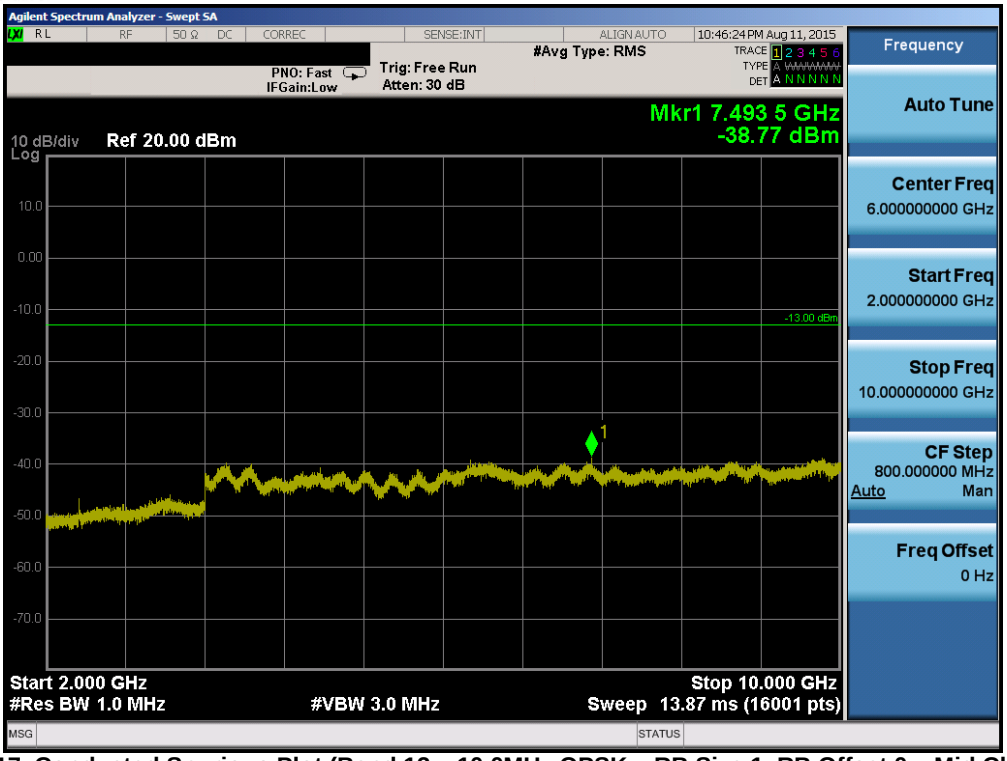
Additionally, plots 6-17 and 6-18 were added to bridge the gap between the stop frequency of plot 6-16 (1708MHz) and 1710MHz. These two plots integrate the band edge emission using a 1MHz integration bandwidth.



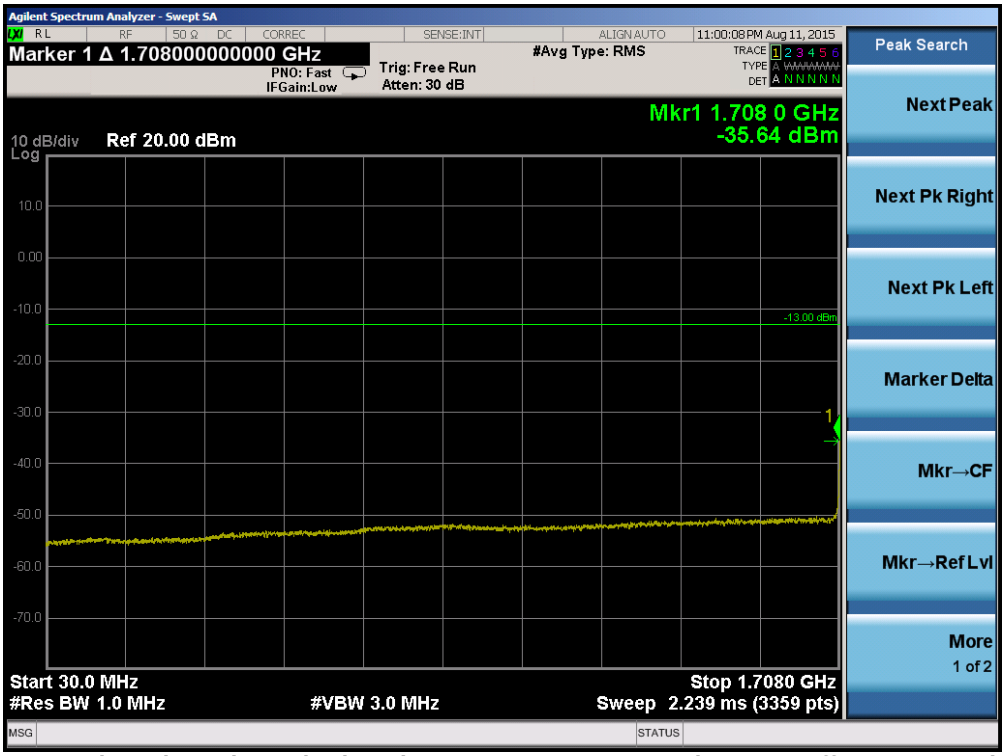
Plot 6-15. Conducted Spurious Plot (Band 13 – 10.0MHz QPSK – RB Size 1, RB Offset 0 – Mid Channel)



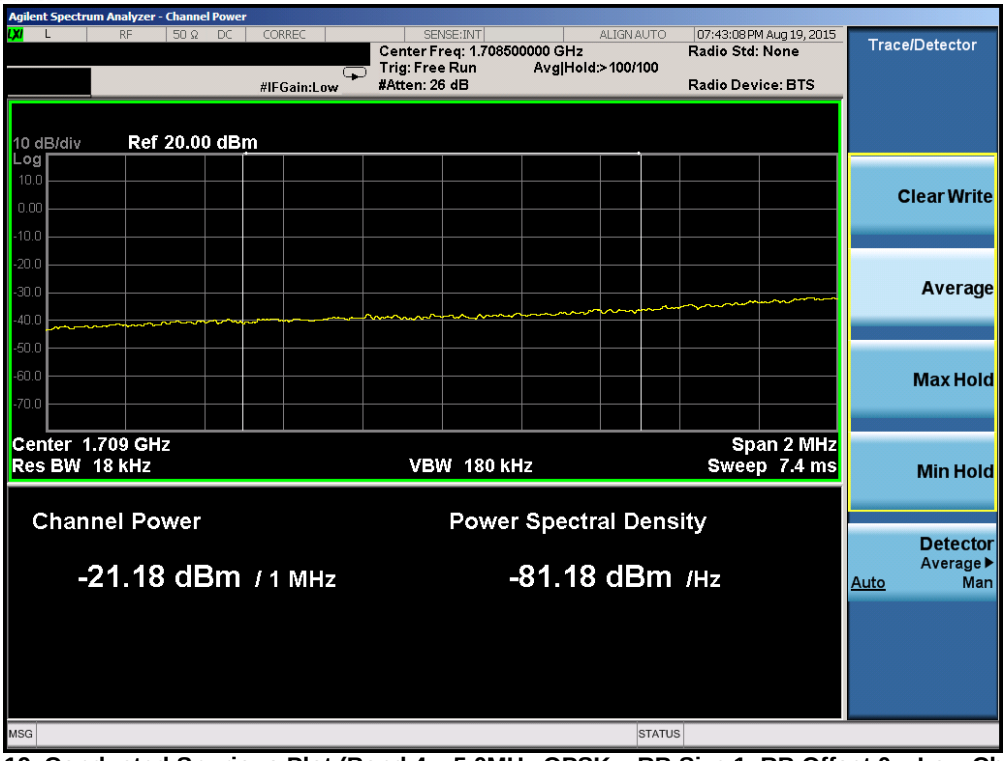
Plot 6-16. Conducted Spurious Plot (Band 13 – 10.0MHz QPSK – RB Size 1, RB Offset 0 – Mid Channel)



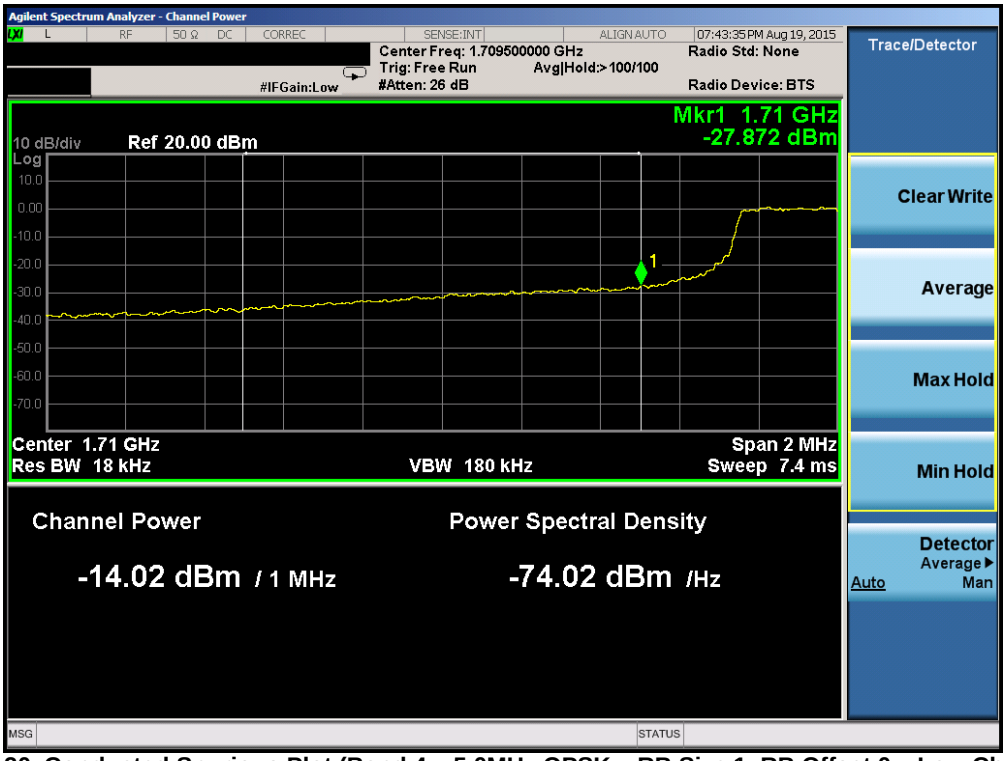
Plot 6-17. Conducted Spurious Plot (Band 13 – 10.0MHz QPSK – RB Size 1, RB Offset 0 – Mid Channel)



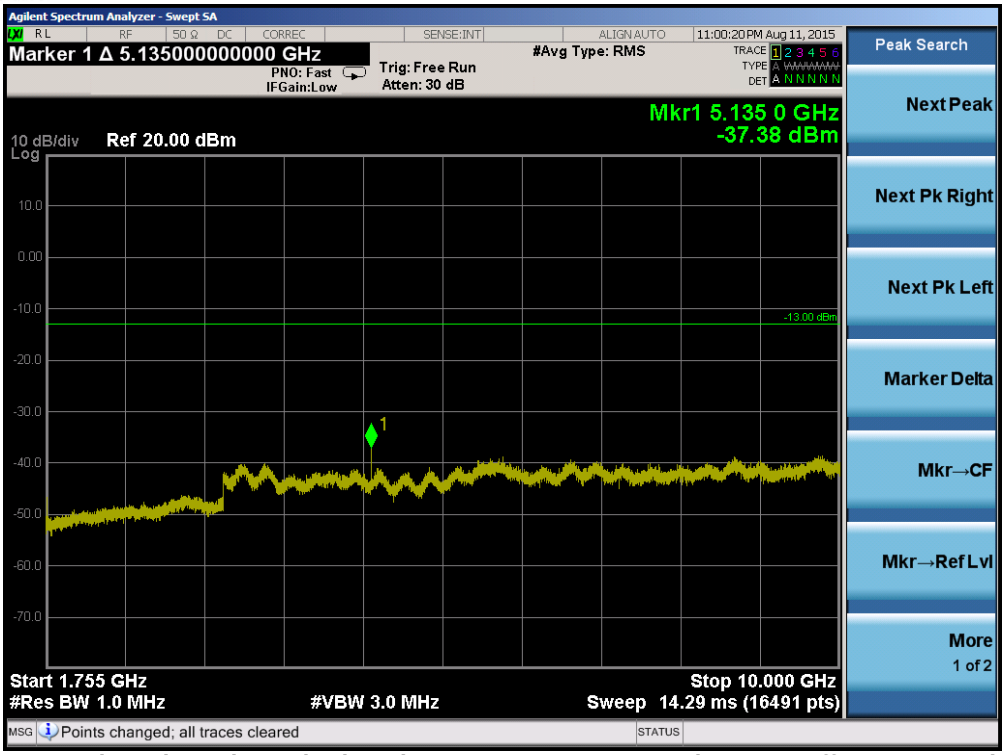
Plot 6-18. Conducted Spurious Plot (Band 4 – 5.0MHz QPSK – RB Size 1, RB Offset 0 – Low Channel)



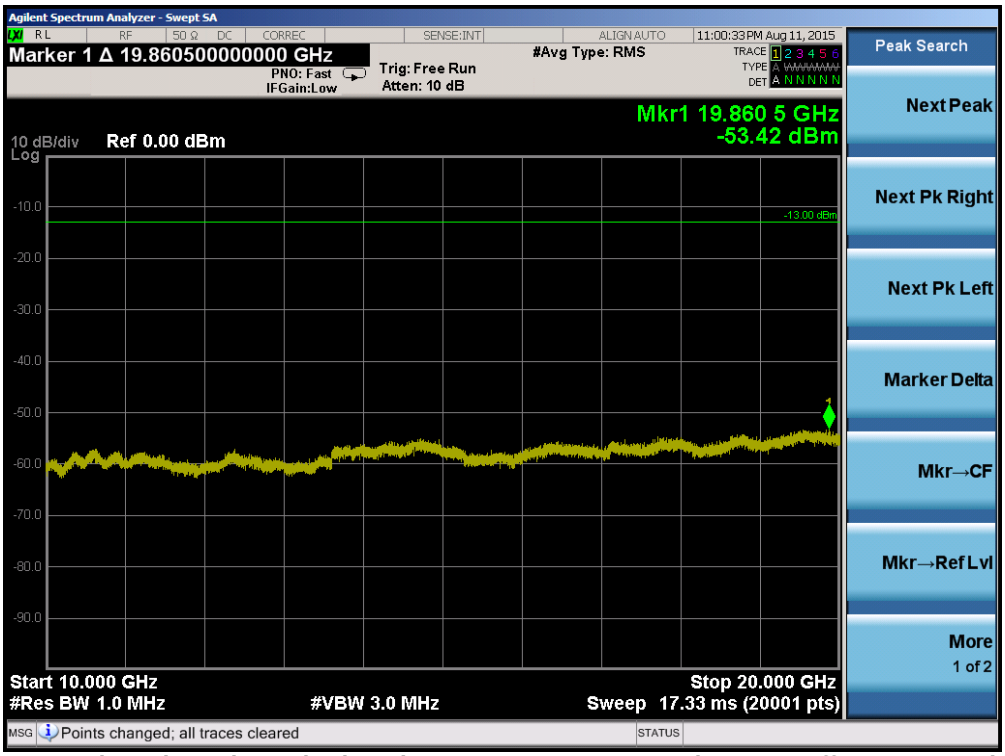
Plot 6-19. Conducted Spurious Plot (Band 4 – 5.0MHz QPSK – RB Size 1, RB Offset 0 – Low Channel)



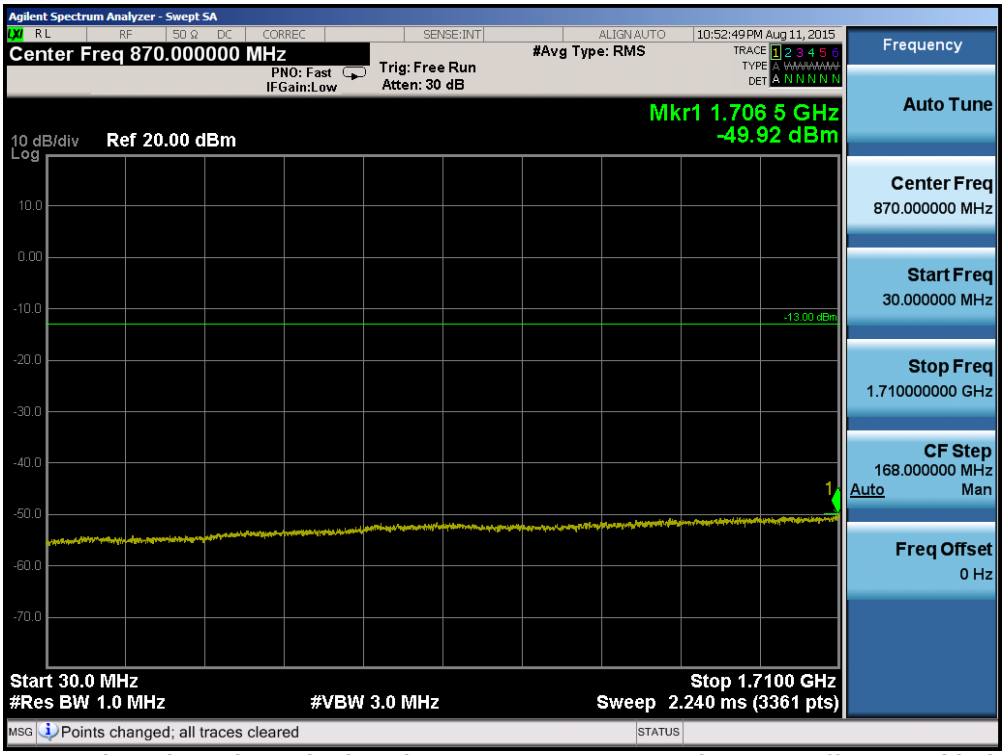
Plot 6-20. Conducted Spurious Plot (Band 4 – 5.0MHz QPSK – RB Size 1, RB Offset 0 – Low Channel)



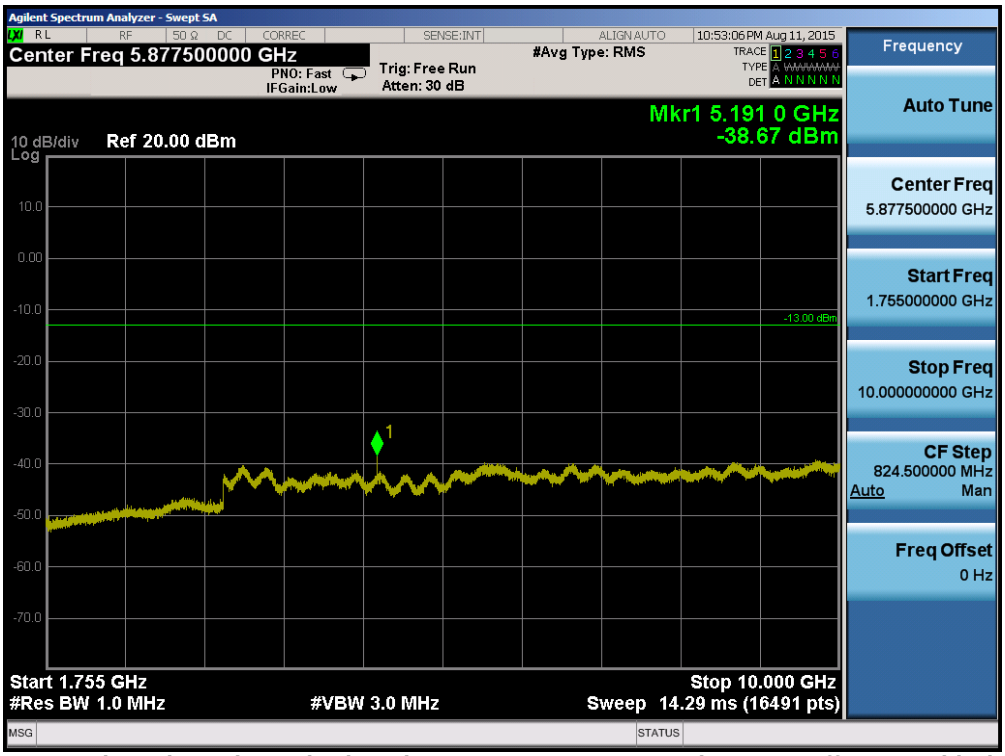
Plot 6-21. Conducted Spurious Plot (Band 4 – 5.0MHz QPSK – RB Size 1, RB Offset 0 – Low Channel)



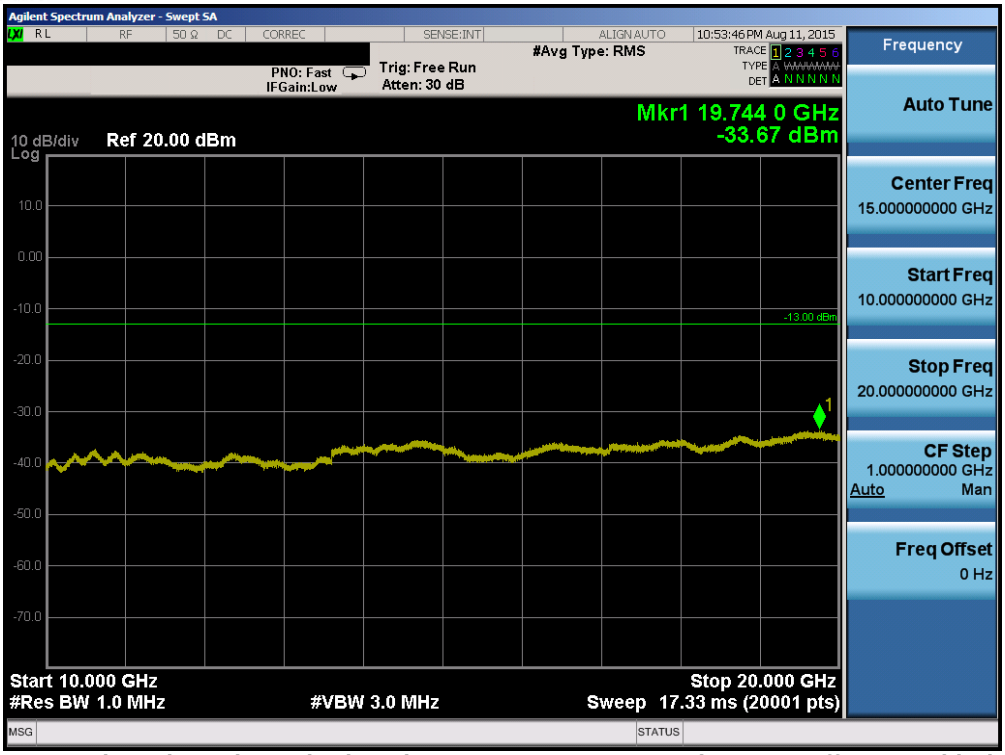
Plot 6-22. Conducted Spurious Plot (Band 4 – 5.0MHz QPSK – RB Size 1, RB Offset 0 – Low Channel)



Plot 6-23. Conducted Spurious Plot (Band 4 – 5.0MHz QPSK – RB Size 1, RB Offset 0 – Mid Channel)

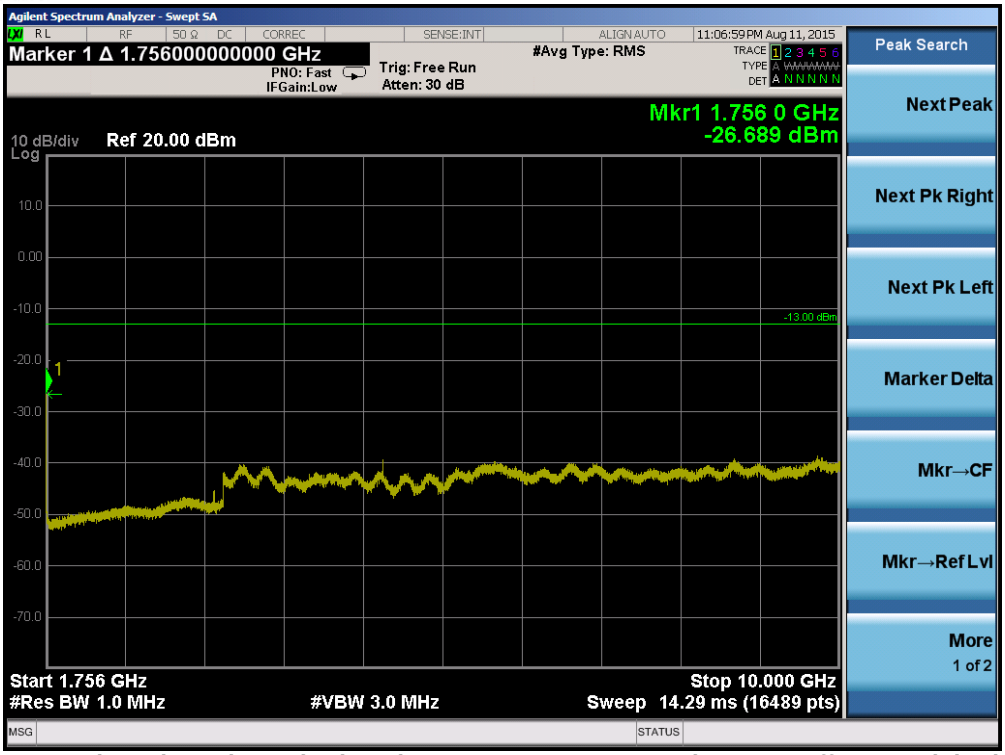


Plot 6-24. Conducted Spurious Plot (Band 4 – 5.0MHz QPSK – RB Size 1, RB Offset 0 – Mid Channel)

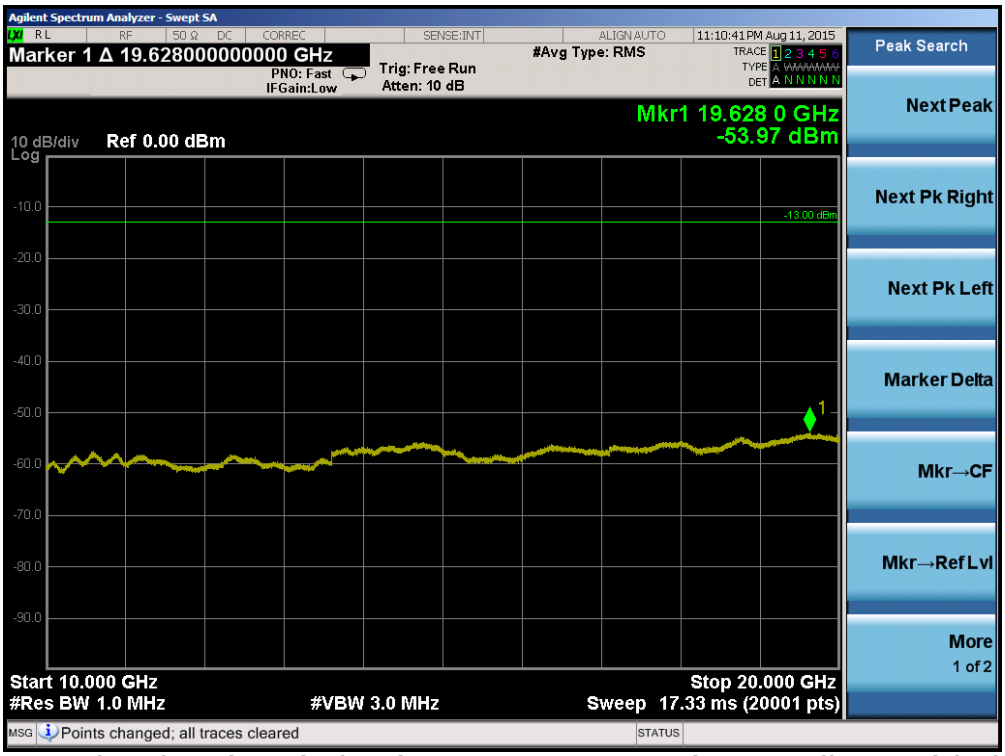


Plot 6-25. Conducted Spurious Plot (Band 4 – 5.0MHz QPSK – RB Size 1, RB Offset 0 – Mid Channel)

Plot 6-26. Conducted Spurious Plot (Band 4 – 5.0MHz QPSK – RB Size 1, RB Offset 0 – High Channel)



Plot 6-27. Conducted Spurious Plot (Band 4 – 5.0MHz QPSK – RB Size 1, RB Offset 0 – High Channel)



Plot 6-28. Conducted Spurious Plot (Band 4 – 5.0MHz QPSK – RB Size 1, RB Offset 0 – High Channel)

6.5 Band Edge Emissions at Antenna Terminal

§2.1051 §27.53(c) §27.53(g) §27.53(h)

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.

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 = trace average
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.

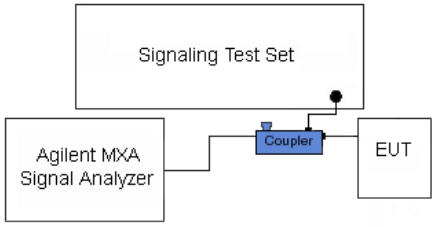


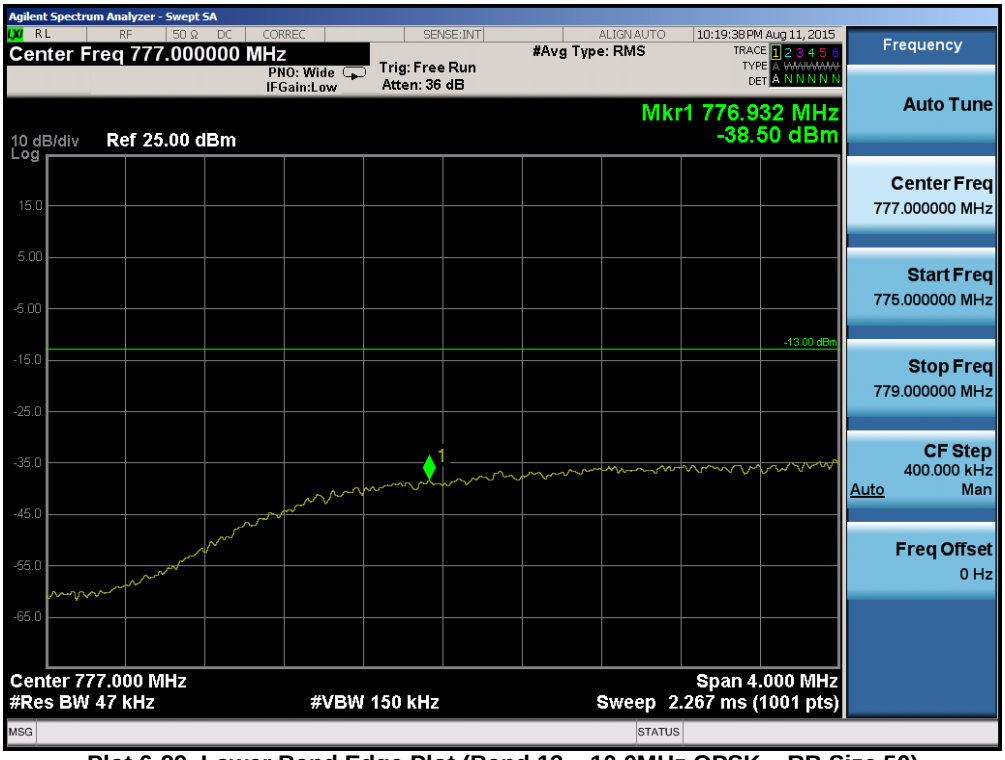
Figure 6-4. Test Instrument & Measurement Setup

Test Notes

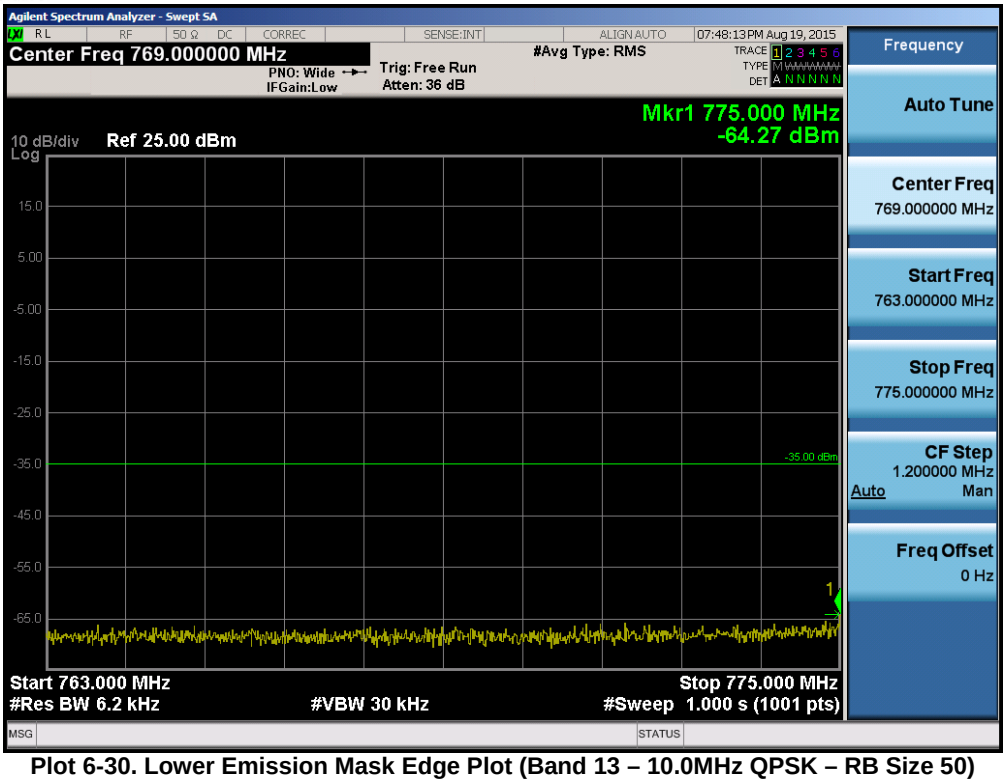
Per 27.53(h) in the 1 MHz bands immediately outside and adjacent to the frequency block a resolution bandwidth of at least one percent of the emission bandwidth of the fundamental emission of the transmitter may be employed to demonstrate compliance with the out-of-band emissions limit. The emission 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.

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.

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.

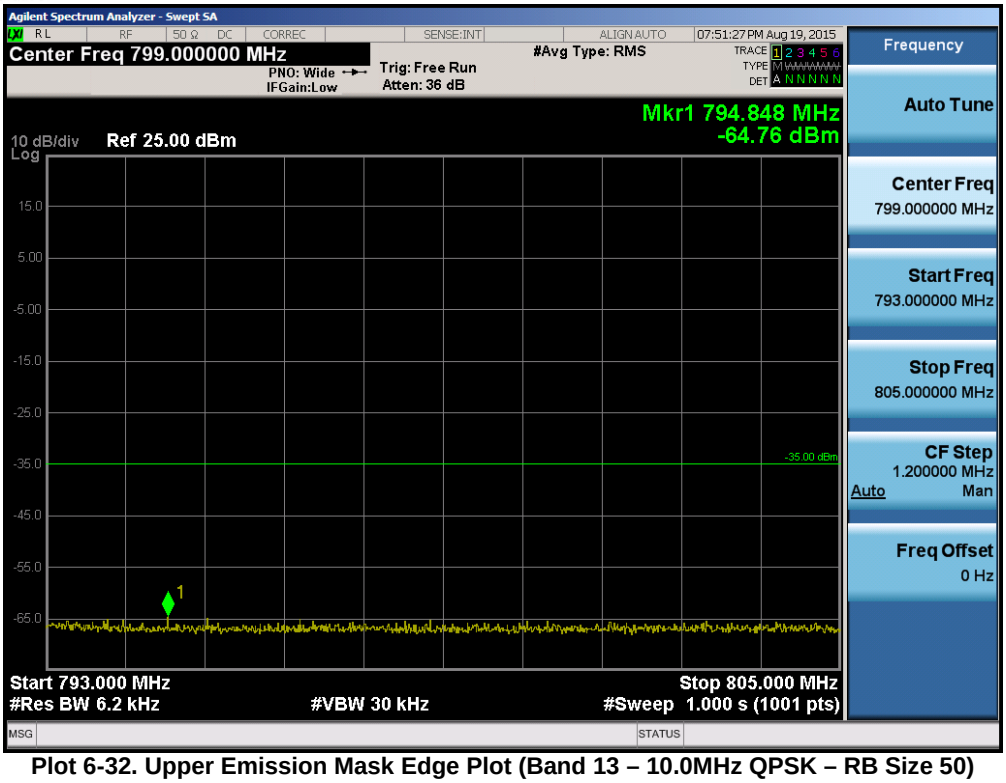


Plot 6-29. Lower Band Edge Plot (Band 13 – 10.0MHz QPSK – RB Size 50)

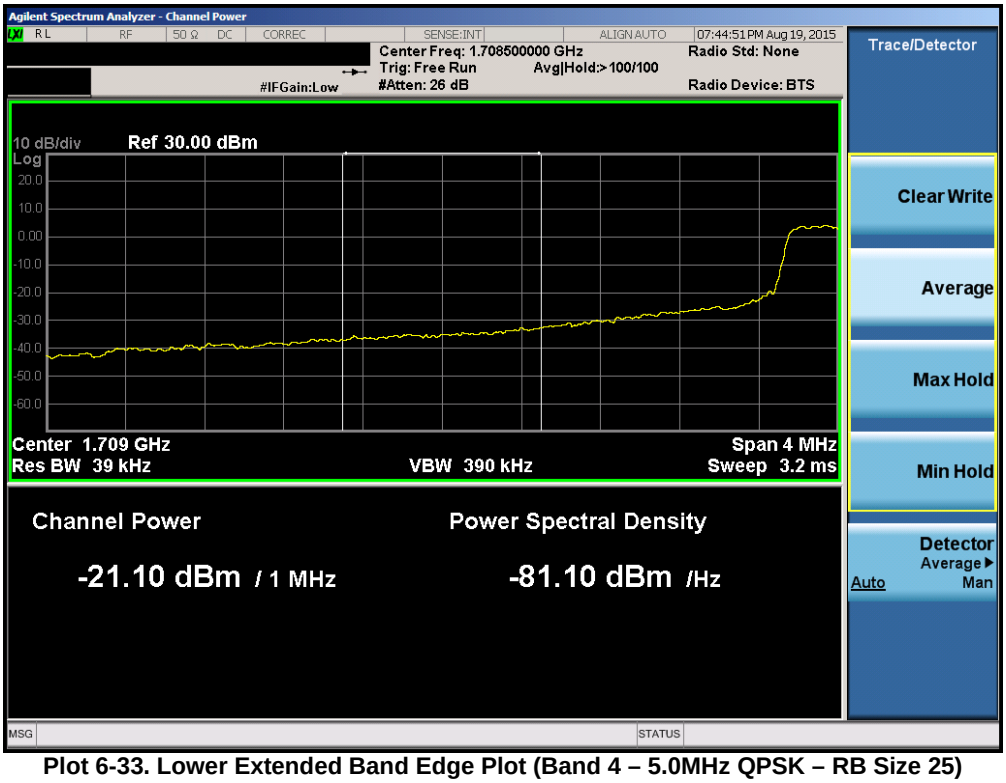


Plot 6-30. Lower Emission Mask Edge Plot (Band 13 – 10.0MHz QPSK – RB Size 50)

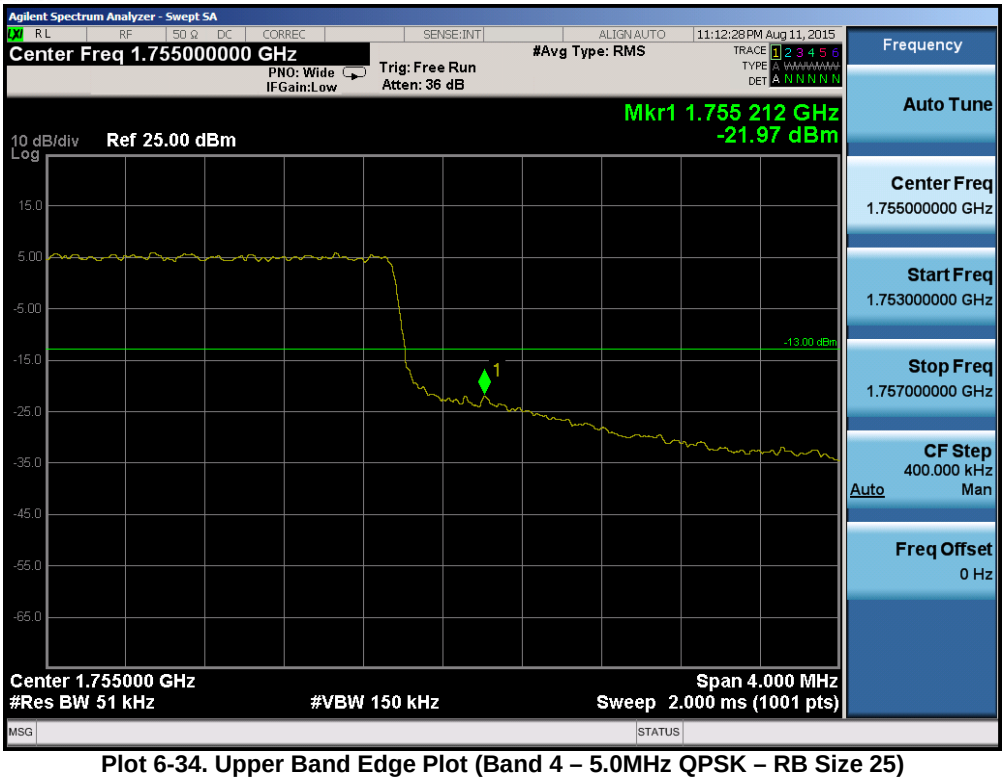
Plot 6-31. Upper Band Edge Plot (Band 13 – 10.0MHz QPSK – RB Size 50)



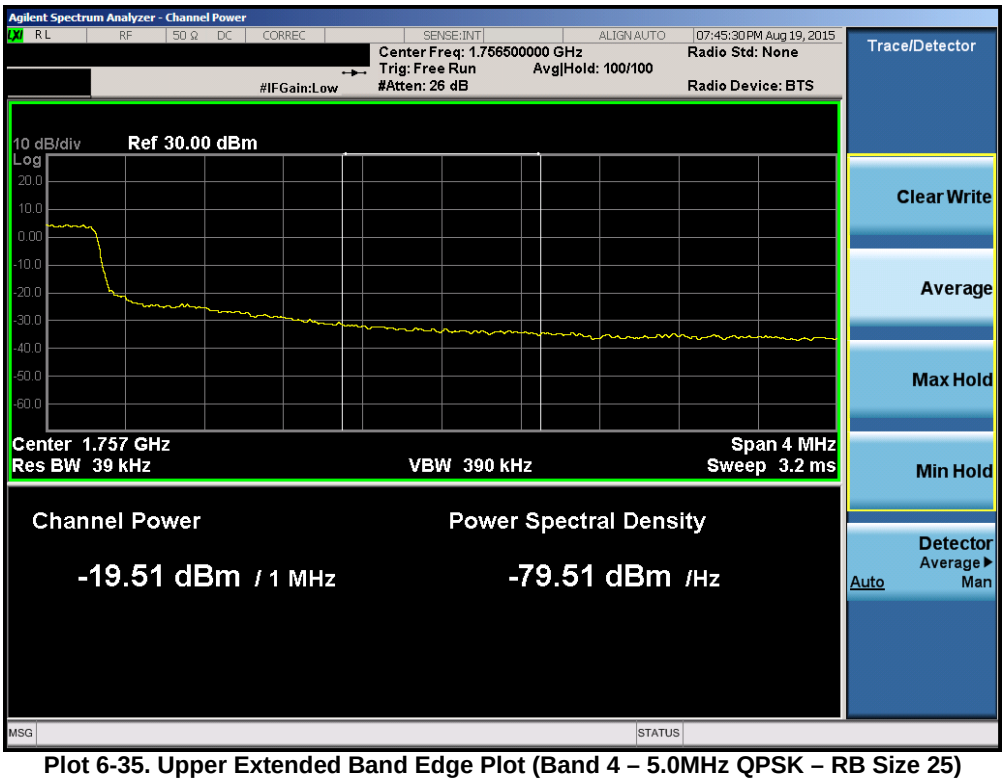
Plot 6-32. Upper Emission Mask Edge Plot (Band 13 – 10.0MHz QPSK – RB Size 50)



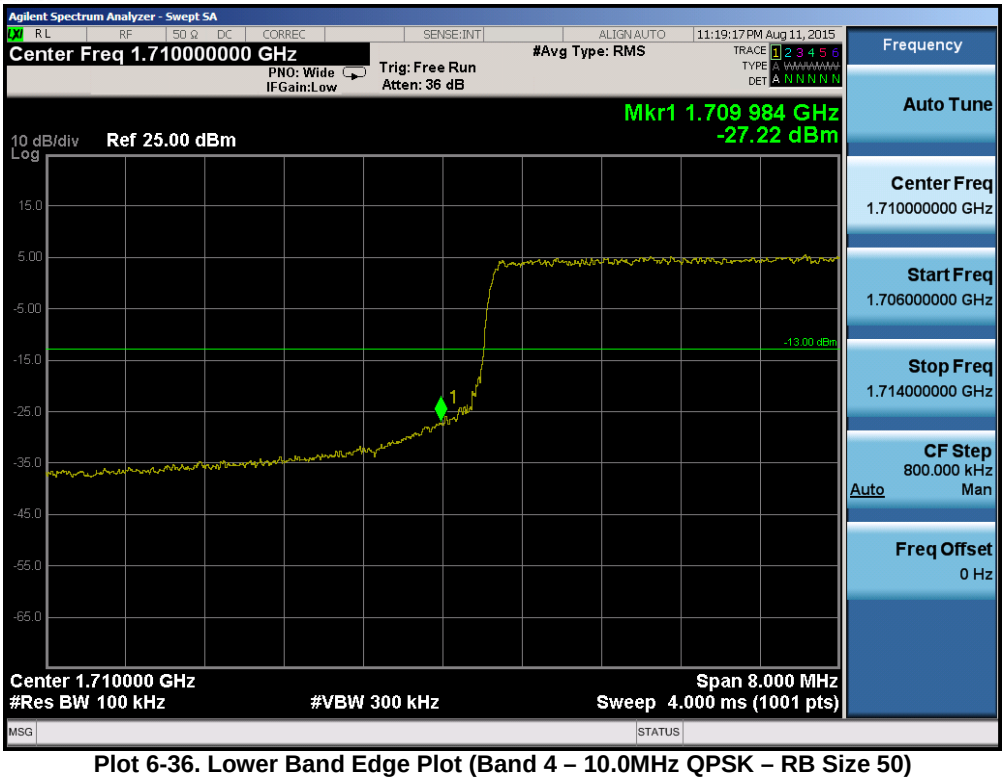
Plot 6-33. Lower Extended Band Edge Plot (Band 4 – 5.0MHz QPSK – RB Size 25)



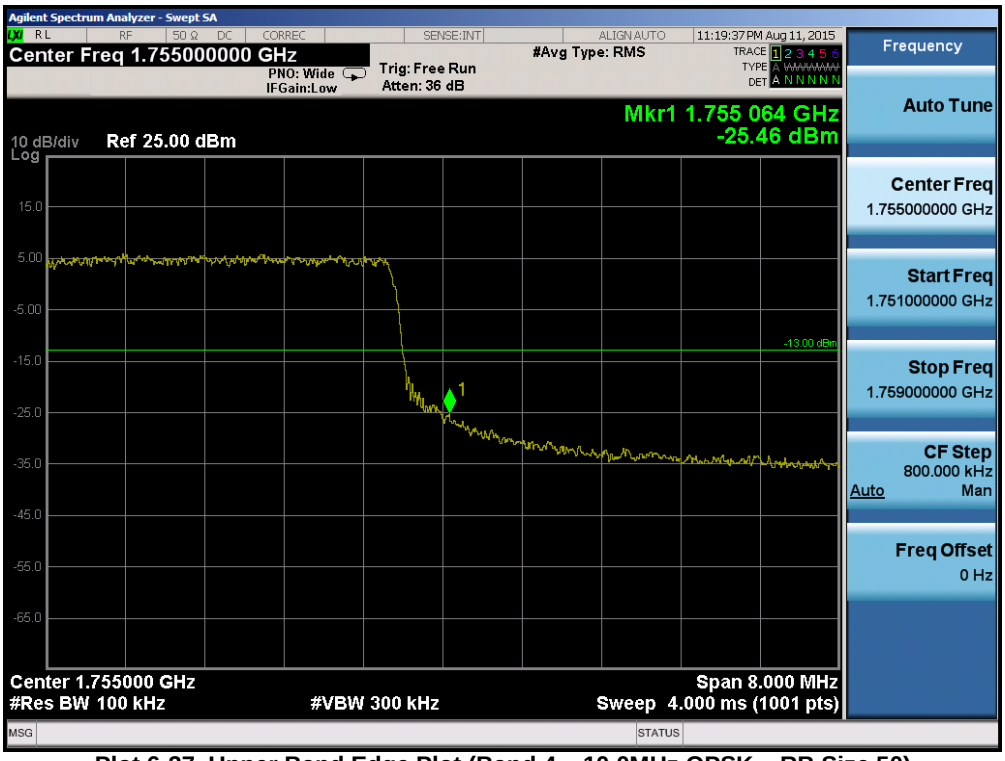
Plot 6-34. Upper Band Edge Plot (Band 4 – 5.0MHz QPSK – RB Size 25)



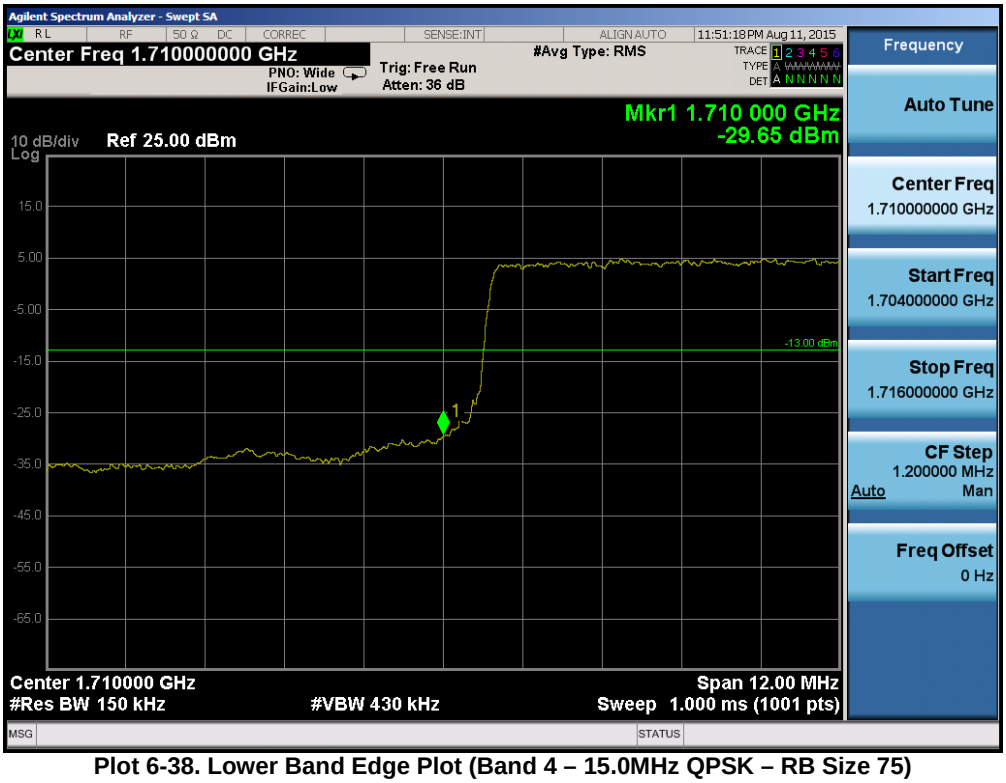
Plot 6-35. Upper Extended Band Edge Plot (Band 4 – 5.0MHz QPSK – RB Size 25)



Plot 6-36. Lower Band Edge Plot (Band 4 – 10.0MHz QPSK – RB Size 50)

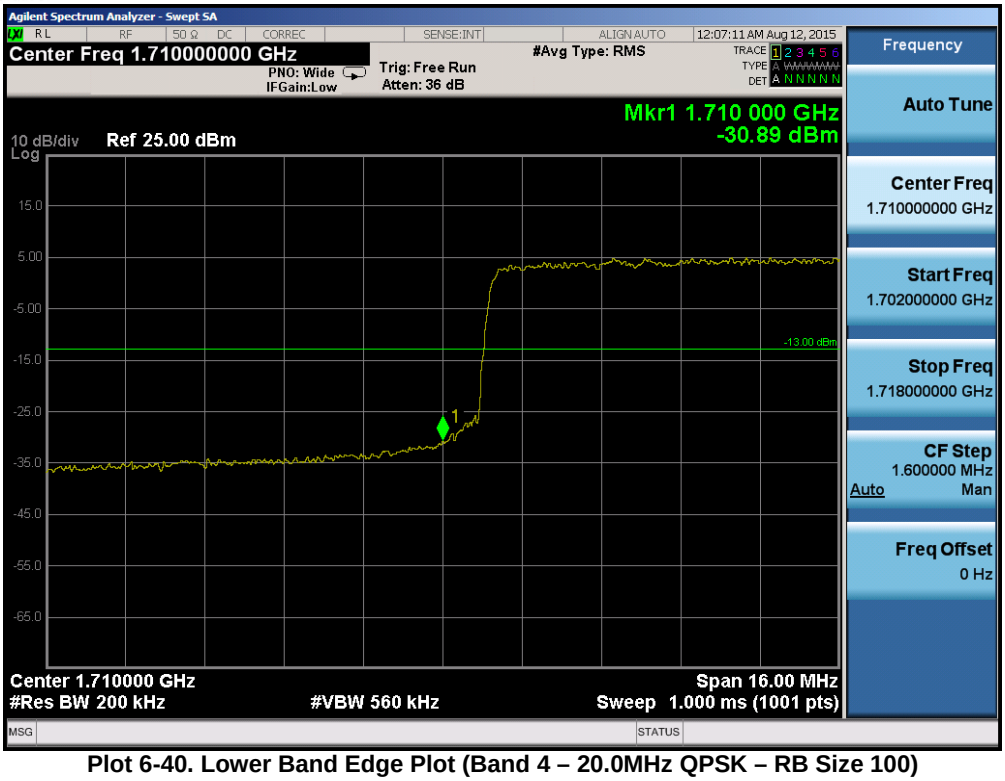


Plot 6-37. Upper Band Edge Plot (Band 4 – 10.0MHz QPSK – RB Size 50)



Plot 6-38. Lower Band Edge Plot (Band 4 – 15.0MHz QPSK – RB Size 75)

Plot 6-39. Upper Band Edge Plot (Band 4 – 15.0MHz QPSK – RB Size 75)



Plot 6-40. Lower Band Edge Plot (Band 4 – 20.0MHz QPSK – RB Size 100)

Plot 6-41. Upper Band Edge Plot (Band 4 – 20.0MHz QPSK – RB Size 100)

6.6 Radiated Spurious Emissions Measurements

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

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.

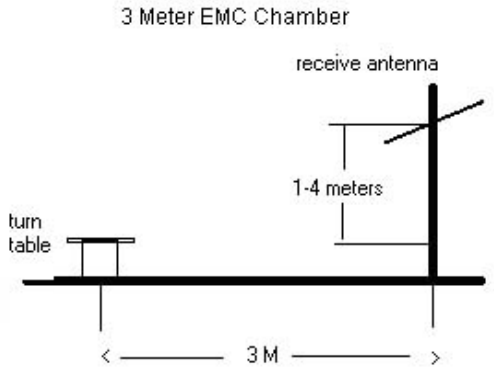


Figure 6-5. Test Instrument & Measurement Setup

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 while powered by an DC power source.

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:	782.00	MHz
CHANNEL:	23230	
MODULATION SIGNAL:	QPSK	
BANDWIDTH:	10.0	MHz
DISTANCE:	3	meters
LIMIT:	-13.00	dBm

Frequency [MHz]	Level at Antenna Terminals [dBm]	Substitute Antenna Gain [dBd]	Spurious Emission Level [dBm]	Ant. Pol. [H/V]	Margin [dB]
2346.00	-52.18	3.67	-48.51	H	-35.5
3128.00	-58.61	5.17	-53.44	H	-40.4

Table 6-2. Radiated Spurious Data (Band 13 – Mid Channel)

OPERATING FREQUENCY:	782.00	MHz
CHANNEL:	23230	
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	-51.96	3.69	-48.27	H	-8.3

Table 6-3. Radiated Spurious Data (Band 13 – 1559-1610MHz Band)

OPERATING FREQUENCY:	1720.00	MHz
CHANNEL:	20050	
MODULATION SIGNAL:	QPSK	
BANDWIDTH:	20.0	MHz
DISTANCE:	3	meters
LIMIT:	-13.00	dBm

Frequency [MHz]	Level at Antenna Terminals [dBm]	Substitute Antenna Gain [dBi]	Spurious Emission Level [dBm]	Ant. Pol. [H/V]	Margin [dB]
3440.00	-46.07	8.20	-37.86	H	-24.9
5160.00	-46.85	10.30	-36.55	H	-23.6
6880.00	-57.35	11.43	-45.92	H	-32.9

Table 6-4. Radiated Spurious Data (Band 4 – Low Channel)

OPERATING FREQUENCY:	1732.50	MHz
CHANNEL:	20175	
MODULATION SIGNAL:	QPSK	
BANDWIDTH:	20.0	MHz
DISTANCE:	3	meters
LIMIT:	-13.00	dBm

Frequency [MHz]	Level at Antenna Terminals [dBm]	Substitute Antenna Gain [dBi]	Spurious Emission Level [dBm]	Ant. Pol. [H/V]	Margin [dB]
3465.00	-52.77	8.29	-44.49	H	-31.5
5197.50	-51.22	10.35	-40.87	H	-27.9
6930.00	-56.47	11.49	-44.98	H	-32.0

Table 6-5. Radiated Spurious Data (Band 4 – Mid Channel)

OPERATING FREQUENCY:	1745.00	MHz
CHANNEL:	20300	
MODULATION SIGNAL:	QPSK	
BANDWIDTH:	20.0	MHz
DISTANCE:	3	meters
LIMIT:	-13.00	dBm

Frequency [MHz]	Level at Antenna Terminals [dBm]	Substitute Antenna Gain [dBi]	Spurious Emission Level [dBm]	Ant. Pol. [H/V]	Margin [dB]
3490.00	-49.62	8.37	-41.25	H	-28.3
5235.00	-49.01	10.35	-38.65	H	-25.7
6980.00	-51.91	11.53	-40.38	H	-27.4
8725.00	-55.25	13.02	-42.23	H	-29.2
10470.00	-54.43	13.05	-41.38	H	-28.4

Table 6-6. Radiated Spurious Data (Band 4 – High Channel)

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.

For and 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

Band 13 Frequency Stability Measurements

§2.1055 §27.54

OPERATING FREQUENCY: 782,000,000 Hz

CHANNEL: 23230

REFERENCE VOLTAGE: 3.3 VDC

VOLTAGE (%)	POWER (VDC)	TEMP (°C)	FREQUENCY (Hz)	Freq. Dev. (Hz)	Deviation (%)
100 %	3.30	+ 20 (Ref)	781,999,980	-20	-0.0000026
100 %		- 30	781,999,536	-464	-0.0000593
100 %		- 20	782,000,027	27	0.0000035
100 %		- 10	781,999,778	-222	-0.0000284
100 %		0	782,000,422	422	0.0000540
100 %		+ 10	781,999,612	-388	-0.0000496
100 %		+ 20	781,999,730	-270	-0.0000345
100 %		+ 30	782,000,041	41	0.0000052
100 %		+ 40	782,000,074	74	0.0000095
100 %		+ 50	781,999,637	-363	-0.0000464
85 %	2.81	+ 20	781,999,707	-293	-0.0000375
115 %	3.80	+ 20	782,000,312	312	0.0000399

Table 6-7. 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.

Band 13 Frequency Stability Measurements

§2.1055 §27.54

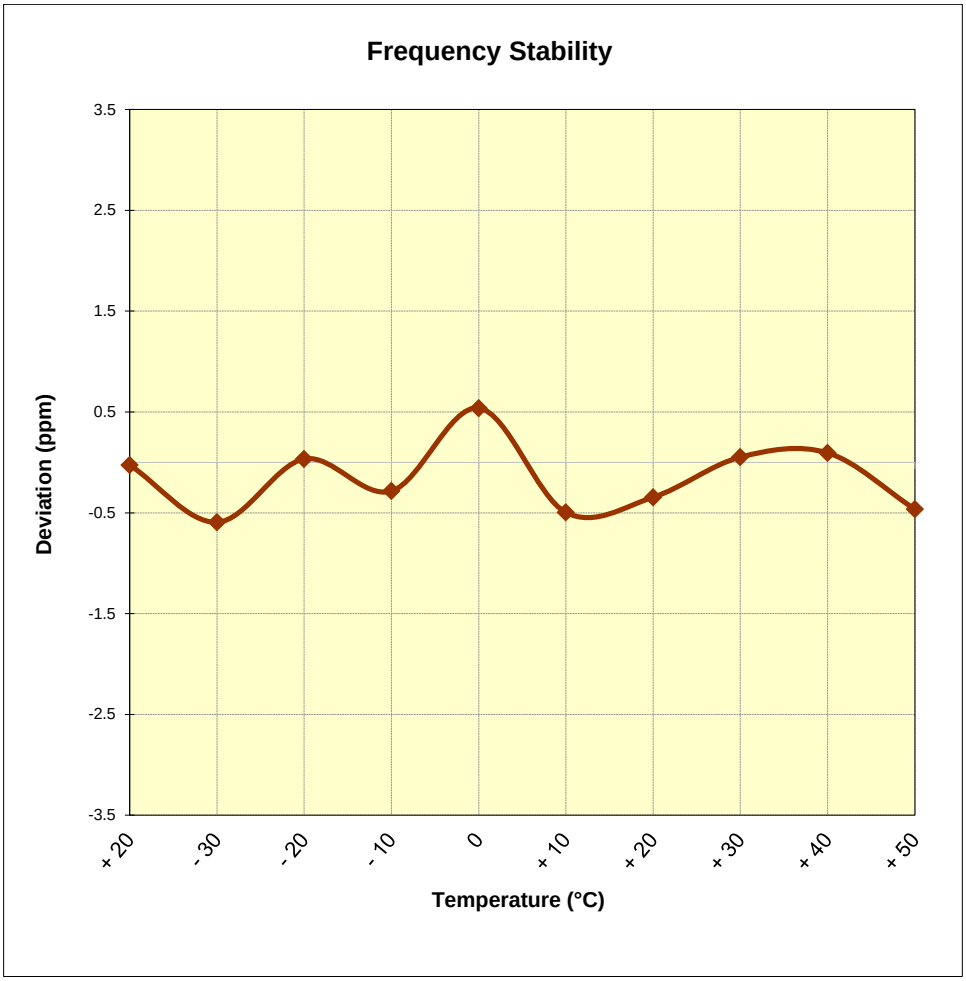


Figure 6-6. Frequency Stability Graph (Band 13)

Band 4 Frequency Stability Measurements

§2.1055 §§27.54

OPERATING FREQUENCY: 1,732,500,000 Hz

CHANNEL: 20175

REFERENCE VOLTAGE: 3.3 VDC

VOLTAGE (%)	POWER (VDC)	TEMP (°C)	FREQUENCY (Hz)	Freq. Dev. (Hz)	Deviation (%)
100 %	3.30	+ 20 (Ref)	1,732,499,582	-418	-0.0000241
100 %		- 30	1,732,500,199	199	0.0000115
100 %		- 20	1,732,499,872	-128	-0.0000074
100 %		- 10	1,732,500,183	183	0.0000106
100 %		0	1,732,499,966	-34	-0.0000020
100 %		+ 10	1,732,499,752	-248	-0.0000143
100 %		+ 20	1,732,499,577	-423	-0.0000244
100 %		+ 30	1,732,499,681	-319	-0.0000184
100 %		+ 40	1,732,499,845	-155	-0.0000089
100 %		+ 50	1,732,500,367	367	0.0000212
85 %	2.81	+ 20	1,732,500,158	158	0.0000091
BATT. ENDPOINT	3.80	+ 20	1,732,500,331	331	0.0000191

Table 6-8. Frequency Stability Data (Band 4)

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.

Band 4 Frequency Stability Measurements

§2.1055 §§27.54

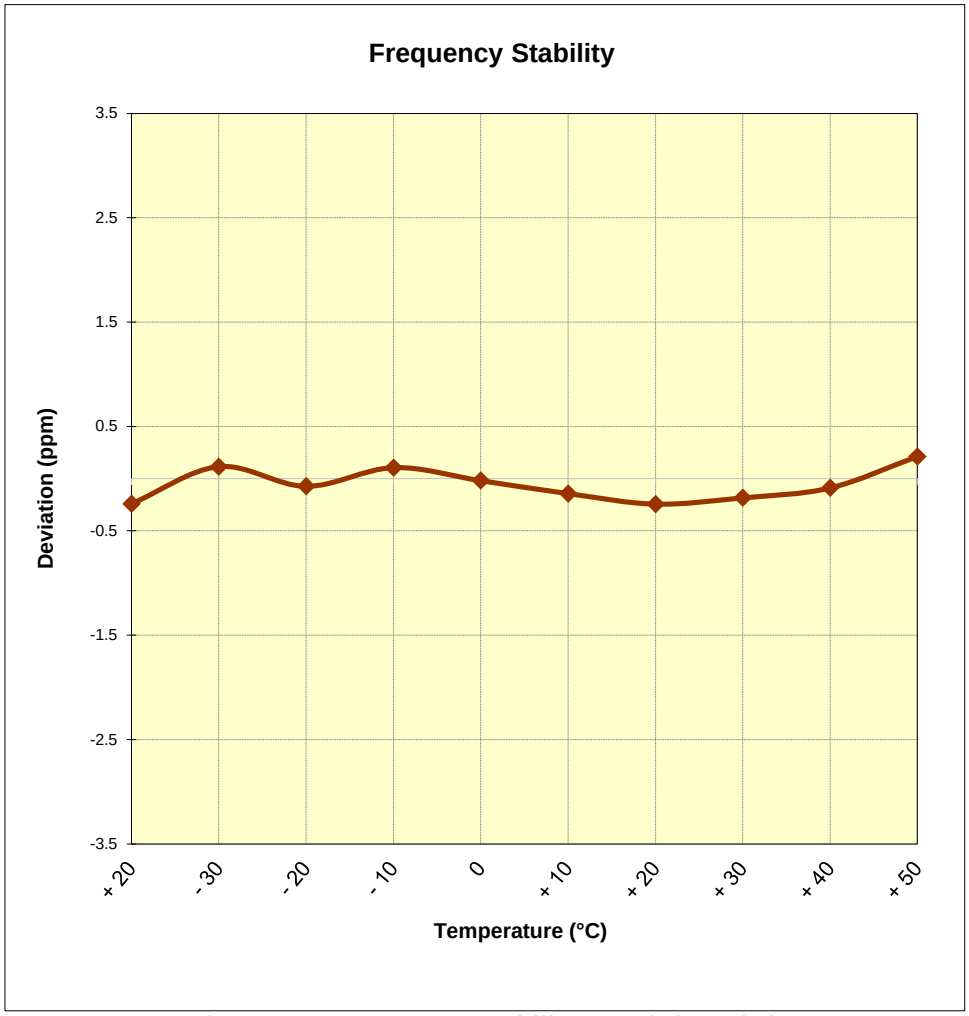


Figure 6-7. Frequency Stability Graph (Band 4)

7.0 CONCLUSION

The data collected relate only to the item(s) tested and show that the **Harris Wireless Module FCC ID: BV8BBPBM214** complies with all the requirements of Part 27 of the FCC rules for LTE operation only.