

**MEASUREMENT REPORT
 FCC Part 27 LTE**

Applicant Name:
 Panasonic Corporation of North America
 Two Riverfront Plaza, 9th Floor
 Newark, NJ 07102-5490
 United States

Date of Testing:
 10/28-10/29/2015
Test Site/Location:
 PCTEST Lab., Columbia, MD, USA
Test Report Serial No.:
 0Y1510271889.ACJ


FCC ID :	ACJEB3910A
APPLICANT:	PANASONIC CORPORATION OF NORTH AMERICA

Application Type: Class II Permissive Change
FCC Classification: PCS Licensed Transmitter (PCB)
FCC Rule Part(s): §2; §27
Test Procedure(s): ANSI/TIA-603-C-2004, KDB 971168 v02r02
EUT Type: Toughpad
Model(s): FZ-X1, FZ-X1V1
Test Device Serial No.: *identical prototype* [S/N: 990004640021931]
Class II Permissive Change: Please see FCC change document
Original Grant Date: 2/25/2014



Mode	Tx Frequency (MHz)	Emission Designator	Modulation	EIRP	
				Max. Power (W)	Max. Power (dBm)
LTE Band 4	1717.5 - 1747.5	13M4G7D	QPSK	0.096	19.83
LTE Band 4	1717.5 - 1747.5	13M4W7D	16QAM	0.069	18.37
LTE Band 4	1720 - 1745	18M0G7D	QPSK	0.109	20.38
LTE Band 4	1720 - 1745	18M0W7D	16QAM	0.080	19.04

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

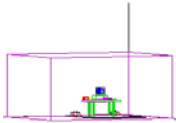


FCC ID: ACJEB3910A		FCC Pt. 27 LTE MEASUREMENT REPORT (CLASS II PERMISSIVE CHANGE)		Reviewed by: Quality Manager
Test Report S/N: 0Y1510271889.ACJ	Test Dates: 10/28-10/29/2015	EUT Type: Toughpad	Page 1 of 36	

T A B L E O F C O N T E N T S

FCC PART 27 MEASUREMENT REPORT		3
1.0 INTRODUCTION		4
1.1 Scope.....		4
1.2 Testing Facility.....		4
2.0 PRODUCT INFORMATION.....		5
2.1 Equipment Description.....		5
2.2 Device Capabilities		5
2.3 Test Configuration.....		5
2.4 EMI Suppression Device(s)/Modifications.....		5
3.0 DESCRIPTION OF TESTS		6
3.1 Measurement Procedure.....		6
3.2 AWS - Base Frequency Blocks.....		6
3.3 AWS - Mobile Frequency Blocks.....		6
3.4 Radiated Power and Radiated Spurious Emissions.....		7
4.0 MEASUREMENT UNCERTAINTY		8
5.0 TEST EQUIPMENT CALIBRATION DATA		9
6.0 SAMPLE CALCULATIONS		10
7.0 TEST RESULTS		11
7.1 Summary.....		11
7.2 Occupied Bandwidth.....		12
7.3 Spurious and Harmonic Emissions at Antenna Terminal.....		15
7.4 Band Edge Emissions at Antenna Terminal.....		21
7.5 Radiated Power (EIRP).....		26
7.6 Radiated Spurious Emissions Measurements.....		29
7.7 Frequency Stability / Temperature Variation.....		33
8.0 CONCLUSION.....		36

FCC ID: ACJEB3910A	 <small>ENGINEERING LABORATORY, INC.</small>	FCC Pt. 27 LTE MEASUREMENT REPORT (CLASS II PERMISSIVE CHANGE)		Reviewed by: Quality Manager
Test Report S/N: 0Y1510271889.ACJ	Test Dates: 10/28-10/29/2015	EUT Type: Toughpad		Page 2 of 36



MEASUREMENT REPORT

FCC Part 27



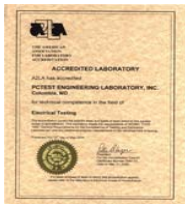
§2.1033 General Information



APPLICANT: Panasonic Corporation of North America
APPLICANT ADDRESS: Two Riverfront Plaza, 9th Floor
 Newark, NJ 07102-5490, 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: FZ-X1
FCC ID: ACJEB3910A
FCC CLASSIFICATION: PCS Licensed Transmitter (PCB)
FREQUENCY TOLERANCE: ±0.00025 % (2.5 ppm)
Test Device Serial No.: 990004640021931 Production Pre-Production Engineering
DATE(S) OF TEST: 10/28-10/29/2015
TEST REPORT S/N: 0Y1510271889.ACJ

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.



FCC ID: ACJEB3910A		FCC Pt. 27 LTE MEASUREMENT REPORT (CLASS II PERMISSIVE CHANGE)		Reviewed by: Quality Manager
Test Report S/N: 0Y1510271889.ACJ	Test Dates: 10/28-10/29/2015	EUT Type: Toughpad	Page 3 of 36	

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 Intern't'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 C63.4-2014 on January 22, 2015.

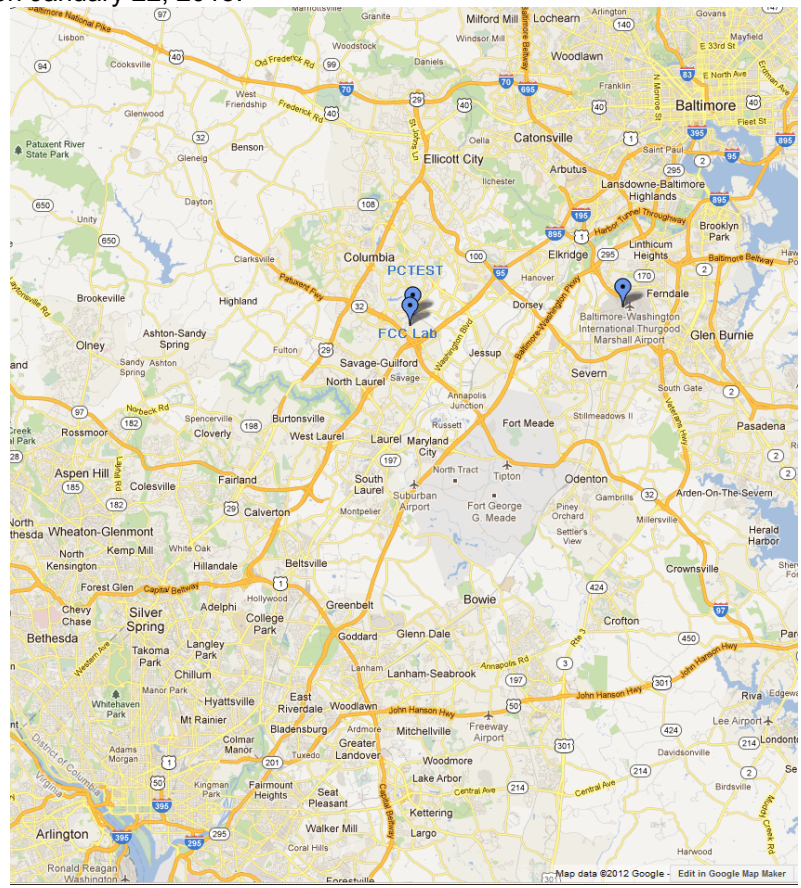




Figure 1-1. Map of the Greater Baltimore and Metropolitan Washington, D.C. area

FCC ID: ACJEB3910A		 FCC Pt. 27 LTE MEASUREMENT REPORT (CLASS II PERMISSIVE CHANGE)			Reviewed by: Quality Manager
Test Report S/N: 0Y1510271889.ACJ	Test Dates: 10/28-10/29/2015	EUT Type: Toughpad		Page 4 of 36	

2.0 PRODUCT INFORMATION

2.1 Equipment Description

The Equipment Under Test (EUT) is the **Panasonic Toughpad FCC ID: ACJEB3910A**. 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, 850/1900 WCDMA/HSPA, 850/1900 CDMA, Multiband LTE, 802.11b/g/n WLAN, 802.11a/n/ac UNII, Bluetooth (1x, EDR, LE), NFC

2.3 Test Configuration

The Panasonic Toughpad FCC ID: ACJEB3910A was tested per the guidance of ANSI/TIA-603-C-2004 and KDB 971168 v02r02. See Section 7.0 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.

FCC ID: ACJEB3910A		FCC Pt. 27 LTE MEASUREMENT REPORT (CLASS II PERMISSIVE CHANGE)		Reviewed by: Quality Manager
Test Report S/N: 0Y1510271889.ACJ	Test Dates: 10/28-10/29/2015	EUT Type: Toughpad		Page 5 of 36

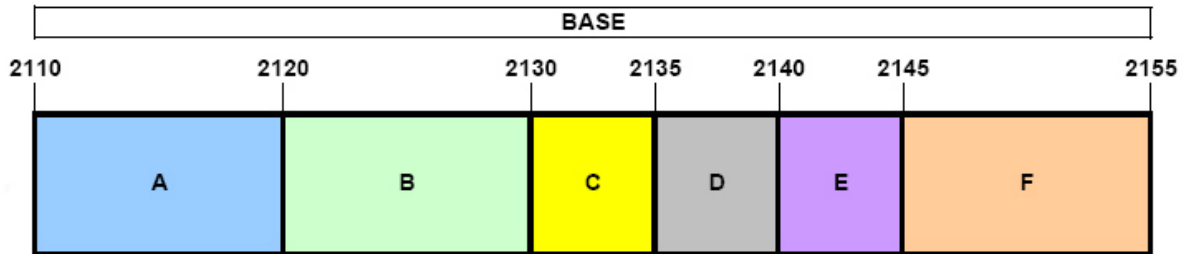
3.0 DESCRIPTION OF TESTS

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 v02r02) were used in the measurement of the **Panasonic Toughpad FCC ID: ACJEB3910A**.

3.2 AWS - Base Frequency Blocks

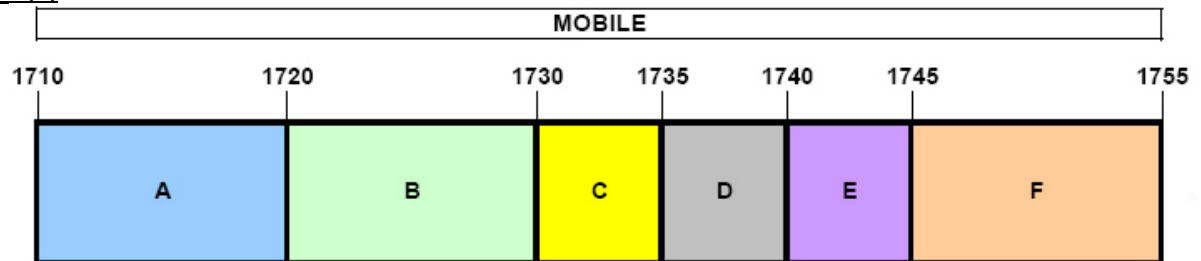
§27.5(h)





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

3.3 AWS - Mobile Frequency Blocks

§27.5(h)



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

FCC ID: ACJEB3910A		FCC Pt. 27 LTE MEASUREMENT REPORT (CLASS II PERMISSIVE CHANGE)		Reviewed by: Quality Manager
Test Report S/N: 0Y1510271889.ACJ	Test Dates: 10/28-10/29/2015	EUT Type: Toughpad		Page 6 of 36

3.4 Radiated Power and Radiated Spurious Emissions

§2.1053 §27.50(d.4) §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 Figure 5.7 of Clause 5 in ANSI C63.4-2014. A 72cm high PVC support structure is placed on top of the turntable. A 3" (~7.6cm) sheet of high density polystyrene 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. 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.



The equipment under test was transmitting while connected to its integral antenna and is placed on a turntable 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:

$$P_d \text{ [dBm]} = P_g \text{ [dBm]} - \text{cable loss [dB]} + \text{antenna gain [dBd/dBi]}$$

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 $P_g \text{ [dBm]} - \text{cable loss [dB]}$.



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

FCC ID: ACJEB3910A		FCC Pt. 27 LTE MEASUREMENT REPORT (CLASS II PERMISSIVE CHANGE)		Reviewed by: Quality Manager
Test Report S/N: 0Y1510271889.ACJ	Test Dates: 10/28-10/29/2015	EUT Type: Toughpad	Page 7 of 36	

4.0 MEASUREMENT UNCERTAINTY

The measurement uncertainties shown below were calculated in accordance with the requirements of ANSI C63.4-2014. All measurement uncertainty values are shown with a coverage factor of $k = 2$ to indicate a 95% level of confidence. The measurement data shown herein meets or exceeds the U_{CISPR} measurement uncertainty values specified in CISPR 16-4-2 and, thus, can be compared directly to specified limits to determine compliance.

Contribution	Expanded Uncertainty (\pm dB)
Conducted Bench Top Measurements	1.13
Radiated Disturbance (<1GHz)	4.98
Radiated Disturbance (>1GHz)	5.07
Radiated Disturbance (>18GHz)	5.09

FCC ID: ACJEB3910A		FCC Pt. 27 LTE MEASUREMENT REPORT (CLASS II PERMISSIVE CHANGE)		Reviewed by: Quality Manager
Test Report S/N: 0Y1510271889.ACJ	Test Dates: 10/28-10/29/2015	EUT Type: Toughpad		Page 8 of 36

5.0 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	LTX1
-	RE3	Radiated Emissions Cable Set	4/29/2015	Annual	4/29/2016	RE3
Agilent	N9030A	PXA Signal Analyzer (44GHz)	3/24/2015	Annual	3/24/2016	MY52350166
Agilent	N9038A	MXE EMI Receiver	3/24/2015	Annual	3/24/2016	MY51210133
Espec	ESX-2CA	Environmental Chamber	3/17/2015	Annual	3/17/2016	17620
ETS Lindgren	3117	1-18 GHz DRG Horn (Medium)	4/8/2014	Biennial	4/8/2016	125518
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	10/22/2014	Biennial	10/22/2016	128338
K & L	11SH10-3075/U18000	High Pass Filter	12/1/2014	Annual	12/1/2015	11SH10-3075/U18000-1
Mini Circuits	PWR-SEN-4GHS	USB Power Sensor	3/11/2015	Annual	3/11/2016	11401010036
Mini Circuits	TVA-11-422	RF Power Amp	N/A			QA1317001
Mini-Circuits	SSG-4000HP	Synthesized Signal Generator	N/A			11403100002
Rhode & Schwarz	TS-PR18	Pre-Amplifier	3/5/2015	Annual	3/5/2016	101622
Rohde & Schwarz	CMW500	Radio Communication Tester	10/13/2015	Annual	10/13/2016	100976
Rohde & Schwarz	ESU40	EMI Test Receiver (40GHz)	7/17/2015	Annual	7/17/2016	100348
Rohde & Schwarz	TS-PR26	18-26.5 GHz Pre-Amplifier	3/3/2015	Annual	3/3/2016	100040

Table 5-1. Test Equipment

Note:

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

FCC ID: ACJEB3910A	 FCC Pt. 27 LTE MEASUREMENT REPORT (CLASS II PERMISSIVE CHANGE)			Reviewed by: Quality Manager
Test Report S/N: 0Y1510271889.ACJ	Test Dates: 10/28-10/29/2015	EUT Type: Toughpad	Page 9 of 36	

6.0 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 analyzer. 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).

FCC ID: ACJEB3910A		FCC Pt. 27 LTE MEASUREMENT REPORT (CLASS II PERMISSIVE CHANGE)		Reviewed by: Quality Manager
Test Report S/N: 0Y1510271889.ACJ	Test Dates: 10/28-10/29/2015	EUT Type: Toughpad	Page 10 of 36	

7.0 TEST RESULTS

7.1 Summary



Company Name: Panasonic Corporation of North America
 FCC ID: ACJEB3910A
 FCC Classification: PCS Licensed Transmitter (PCB)
 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 7.2
2.1051 27.53(h)	Out of Band Emissions	> 43 + 10log ₁₀ (P[Watts]) at Band Edge and for all out-of-band emissions		PASS	Section 7.3, 7.4
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 7.7
27.50(d.4)	Equivalent Isotropic Radiated Power (Band 4)	< 1 Watts max. EIRP	RADIATED	PASS	Section 7.5
2.1053 27.53(h)	Undesirable Emissions	> 43 + 10log ₁₀ (P[Watts]) for all out-of-band emissions		PASS	Section 7.6

Table 7-1. 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 7.2, 7.3, 7.4) 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 4.0.

FCC ID: ACJEB3910A		FCC Pt. 27 LTE MEASUREMENT REPORT (CLASS II PERMISSIVE CHANGE)		Reviewed by: Quality Manager
Test Report S/N: 0Y1510271889.ACJ	Test Dates: 10/28-10/29/2015	EUT Type: Toughpad	Page 11 of 36	

7.2 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 \geq 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.

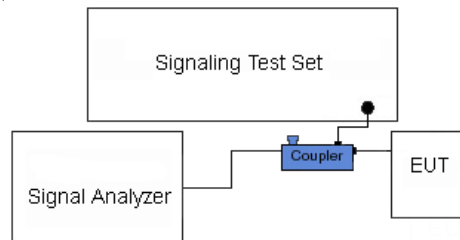


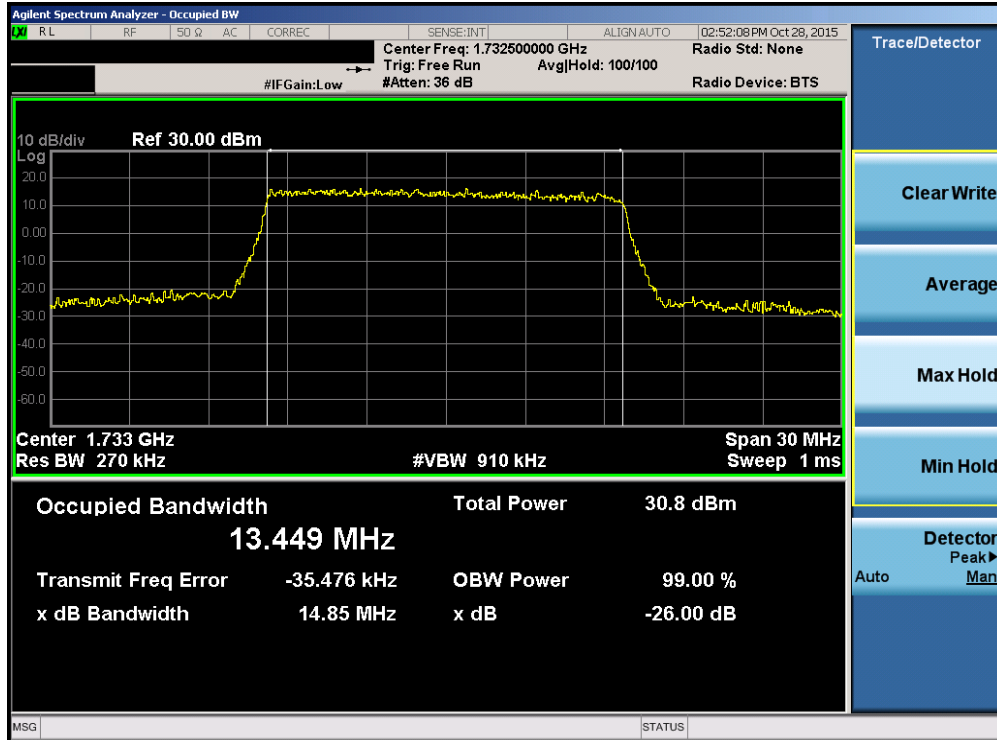


Figure 7-1. Test Instrument & Measurement Setup

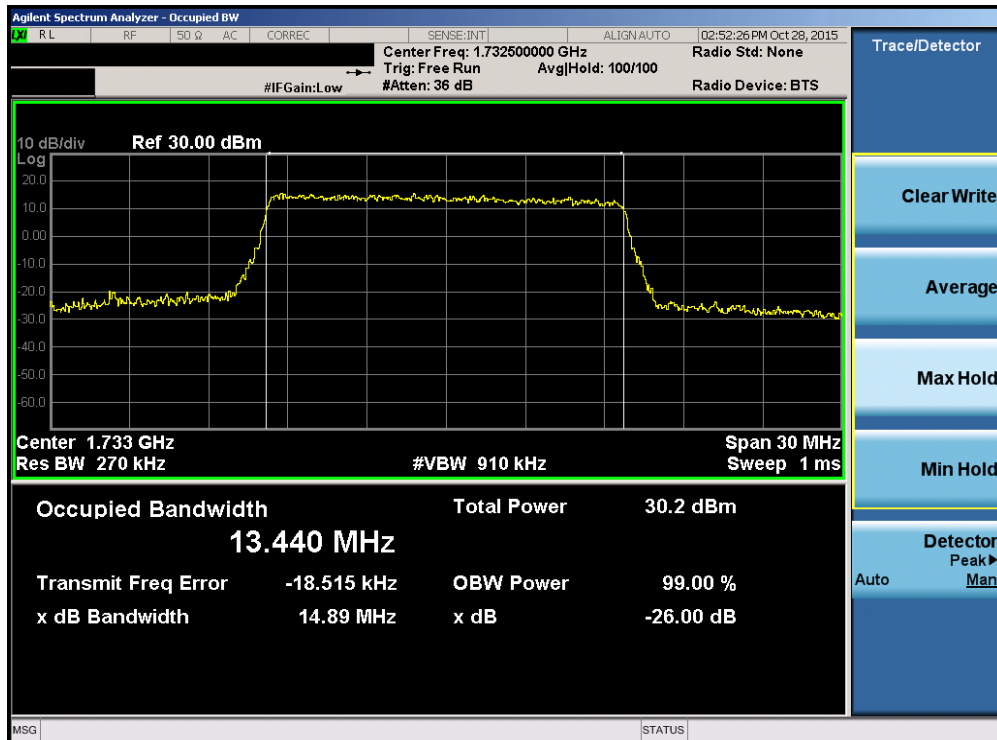
Test Notes

None.

FCC ID: ACJEB3910A		FCC Pt. 27 LTE MEASUREMENT REPORT (CLASS II PERMISSIVE CHANGE)		Reviewed by: Quality Manager
Test Report S/N: 0Y1510271889.ACJ	Test Dates: 10/28-10/29/2015	EUT Type: Toughpad	Page 12 of 36	

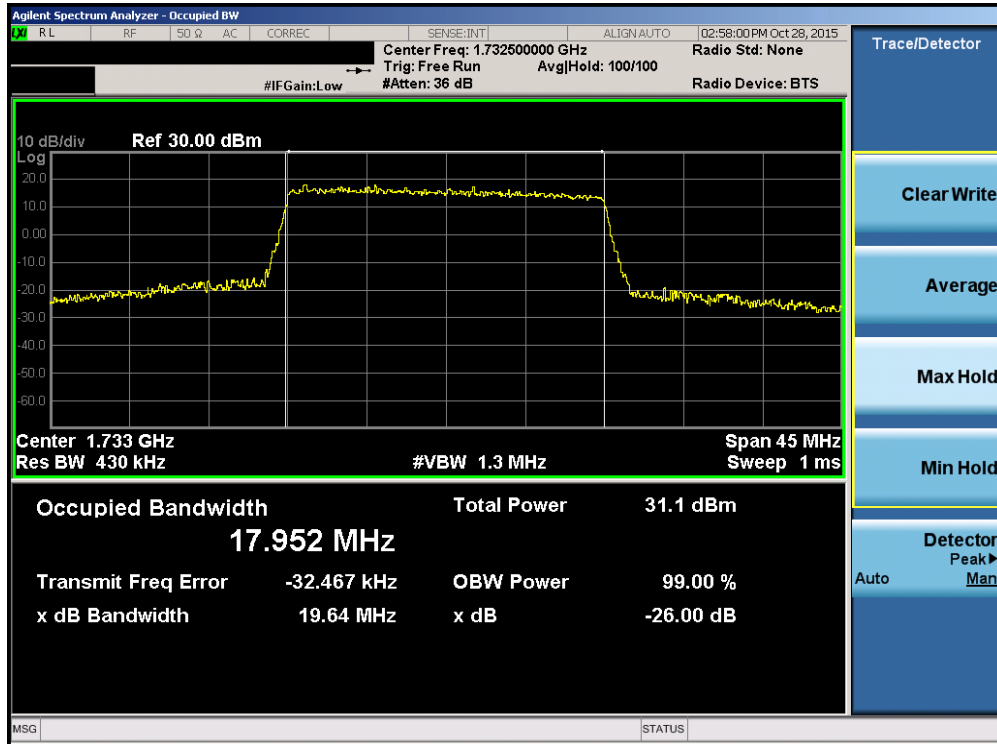


Plot 7-1. Occupied Bandwidth Plot (Band 4 – 15.0MHz QPSK – RB Size 75)

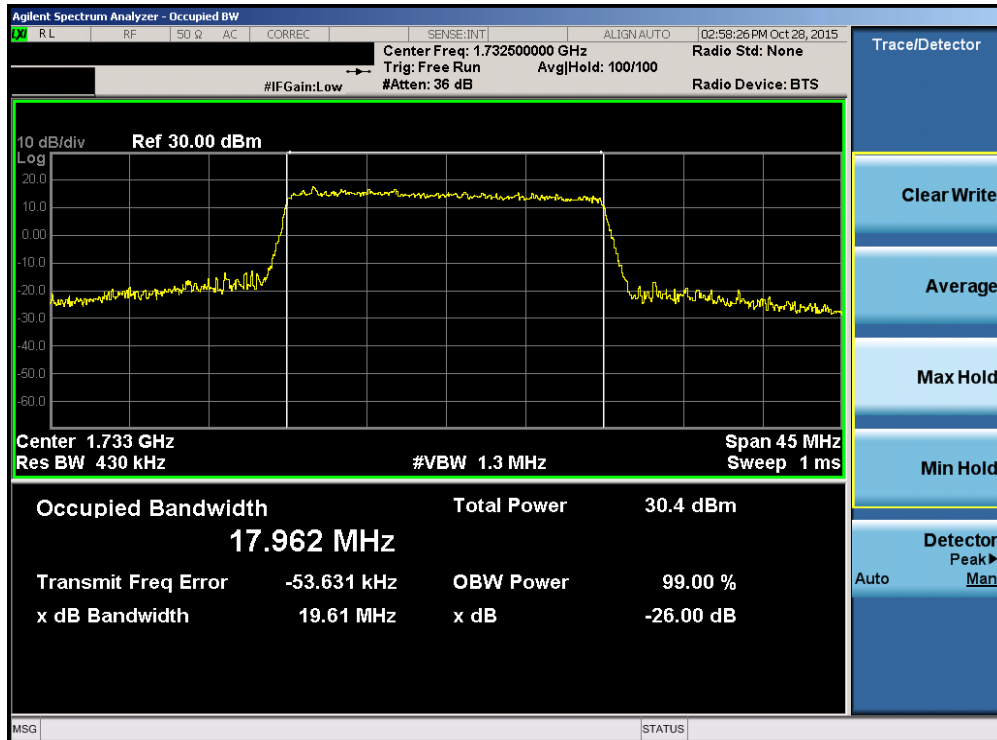


Plot 7-2. Occupied Bandwidth Plot (Band 4 – 15.0MHz 16-QAM – RB Size 75)

FCC ID: ACJEB3910A		FCC Pt. 27 LTE MEASUREMENT REPORT (CLASS II PERMISSIVE CHANGE)		Reviewed by: Quality Manager
Test Report S/N: 0Y1510271889.ACJ	Test Dates: 10/28-10/29/2015	EUT Type: Toughpad		Page 13 of 36



Plot 7-3. Occupied Bandwidth Plot (Band 4 – 20.0MHz QPSK – RB Size 100)



Plot 7-4. Occupied Bandwidth Plot (Band 4 – 20.0MHz 16-QAM – RB Size 100)

FCC ID: ACJEB3910A		FCC Pt. 27 LTE MEASUREMENT REPORT (CLASS II PERMISSIVE CHANGE)		Reviewed by: Quality Manager
Test Report S/N: 0Y1510271889.ACJ	Test Dates: 10/28-10/29/2015	EUT Type: Toughpad		Page 14 of 36

7.3 Spurious and Harmonic Emissions at Antenna Terminal

§2.1051 §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.

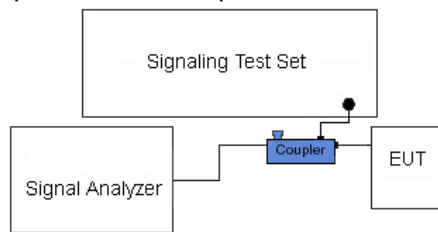


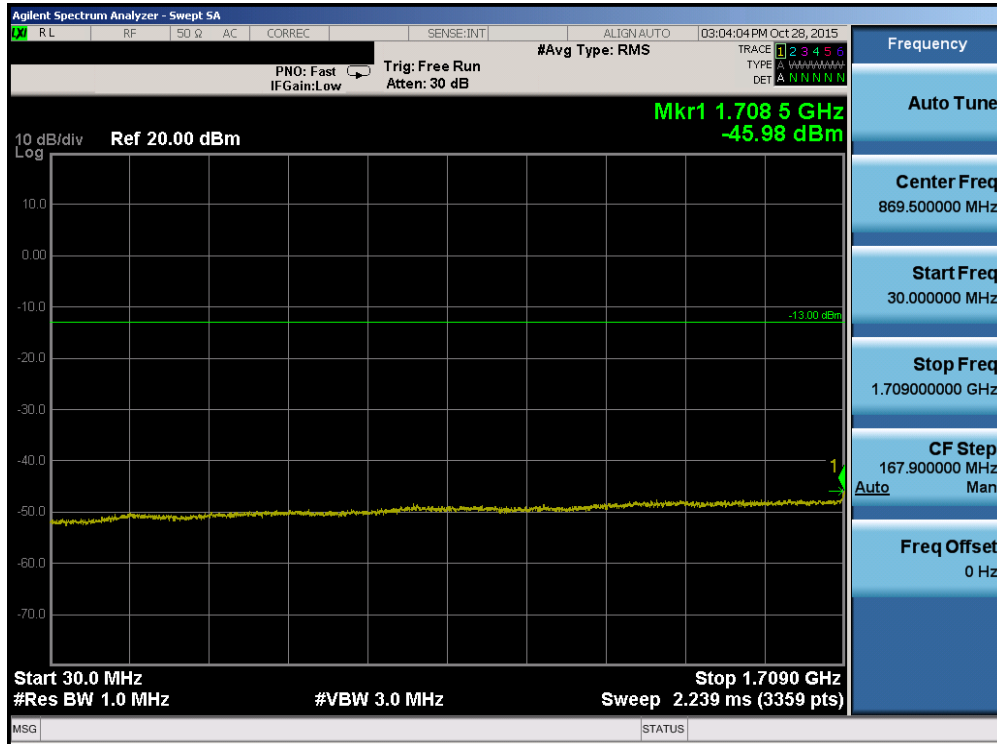


Figure 7-2. Test Instrument & Measurement Setup

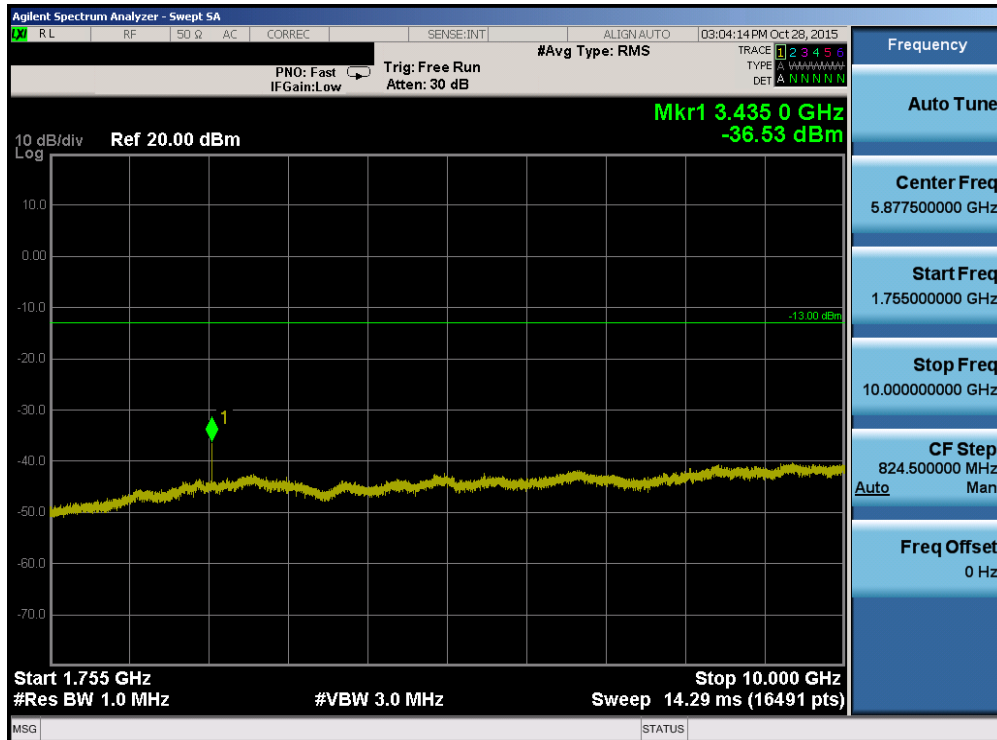
Test Notes

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.

FCC ID: ACJEB3910A		FCC Pt. 27 LTE MEASUREMENT REPORT (CLASS II PERMISSIVE CHANGE)		Reviewed by: Quality Manager
Test Report S/N: 0Y1510271889.ACJ	Test Dates: 10/28-10/29/2015	EUT Type: Toughpad	Page 15 of 36	

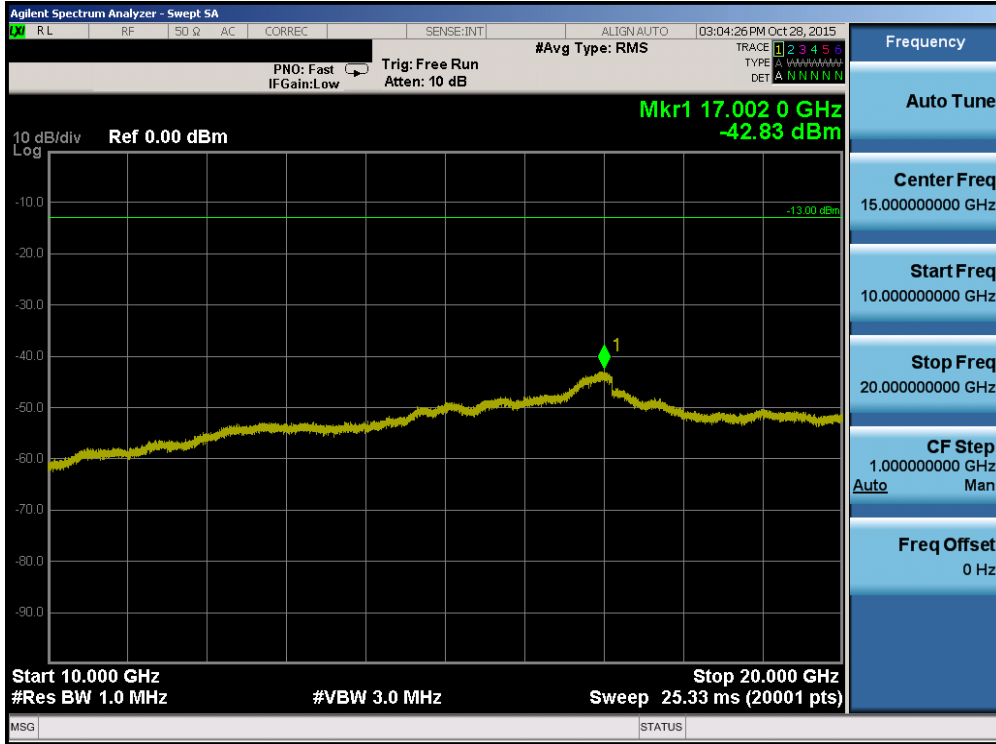


Plot 7-5. Conducted Spurious Plot (Band 4 – 15.0MHz QPSK – RB Size 1, RB Offset 0 – Low Channel)

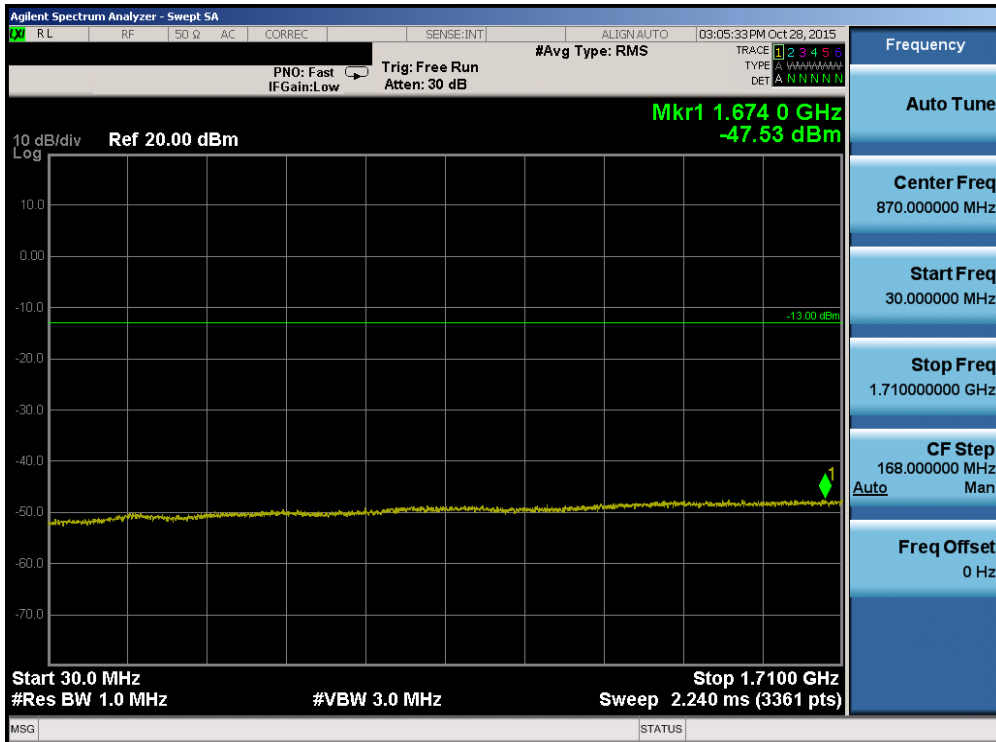


Plot 7-6. Conducted Spurious Plot (Band 4 – 15.0MHz QPSK – RB Size 1, RB Offset 0 – Low Channel)

FCC ID: ACJEB3910A		FCC Pt. 27 LTE MEASUREMENT REPORT (CLASS II PERMISSIVE CHANGE)		Reviewed by: Quality Manager
Test Report S/N: 0Y1510271889.ACJ	Test Dates: 10/28-10/29/2015	EUT Type: Toughpad		Page 16 of 36

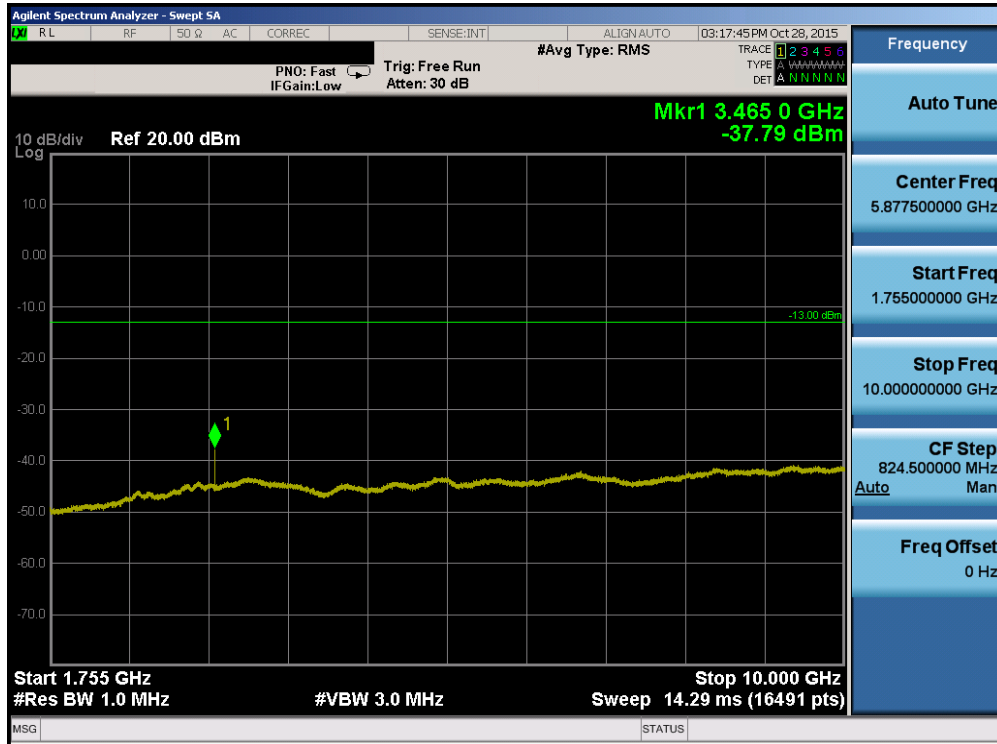


Plot 7-7. Conducted Spurious Plot (Band 4 – 15.0MHz QPSK – RB Size 1, RB Offset 0 – Low Channel)

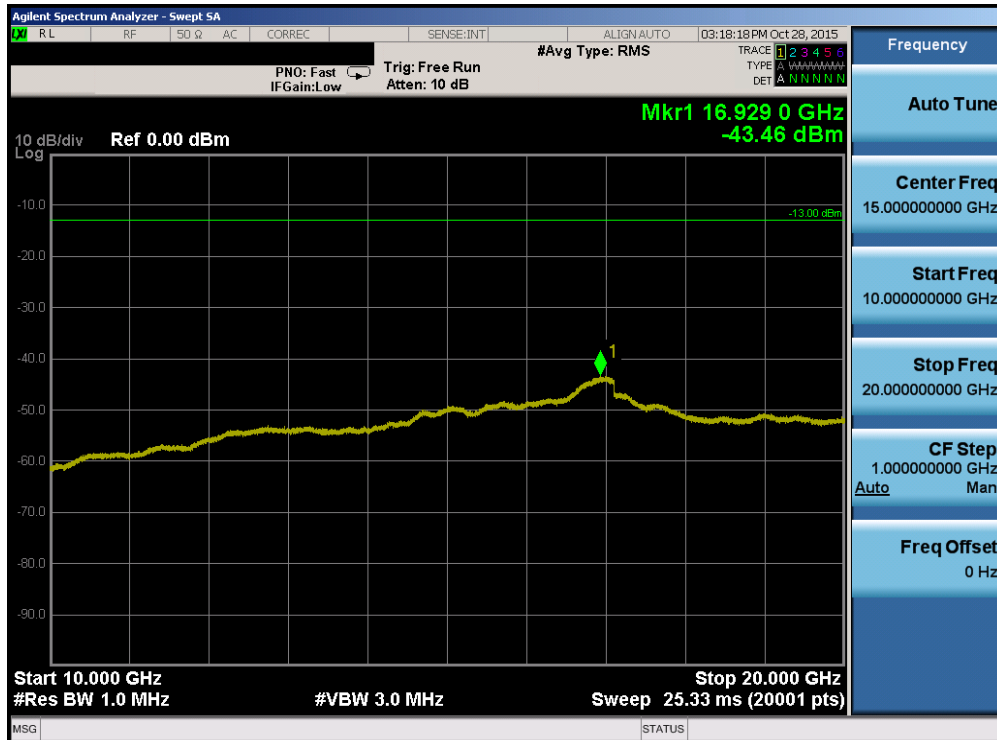


Plot 7-8. Conducted Spurious Plot (Band 4 – 15.0MHz QPSK – RB Size 1, RB Offset 0 – Mid Channel)

FCC ID: ACJEB3910A		FCC Pt. 27 LTE MEASUREMENT REPORT (CLASS II PERMISSIVE CHANGE)		Reviewed by: Quality Manager
Test Report S/N: 0Y1510271889.ACJ	Test Dates: 10/28-10/29/2015	EUT Type: Toughpad		Page 17 of 36

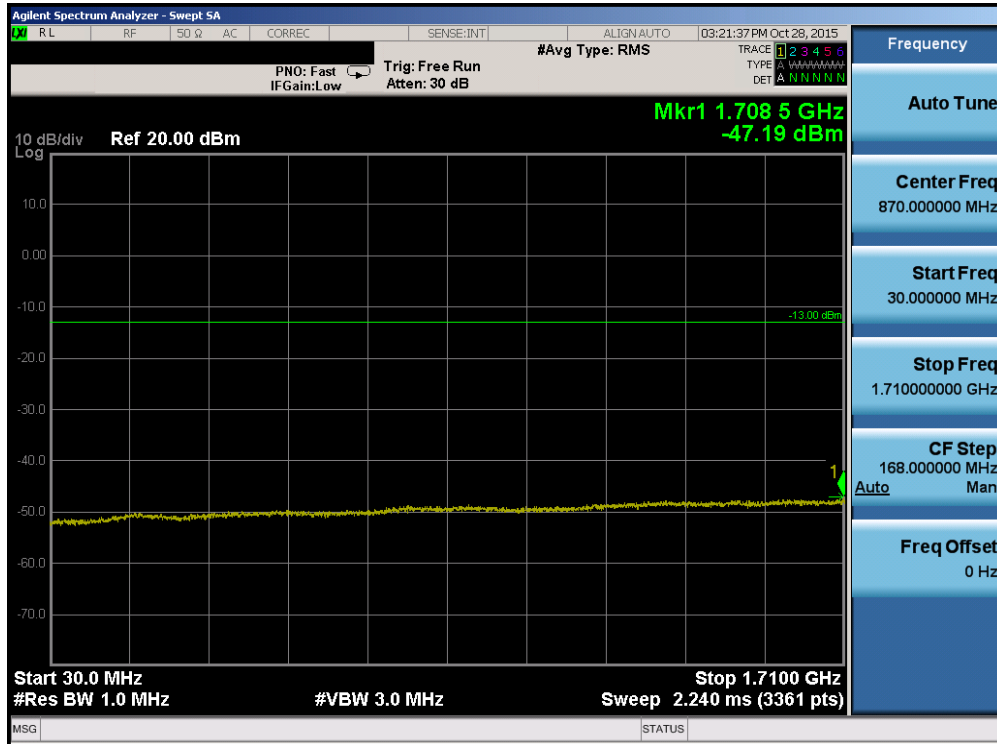


Plot 7-9. Conducted Spurious Plot (Band 4 – 15.0MHz QPSK – RB Size 1, RB Offset 0 – Mid Channel)

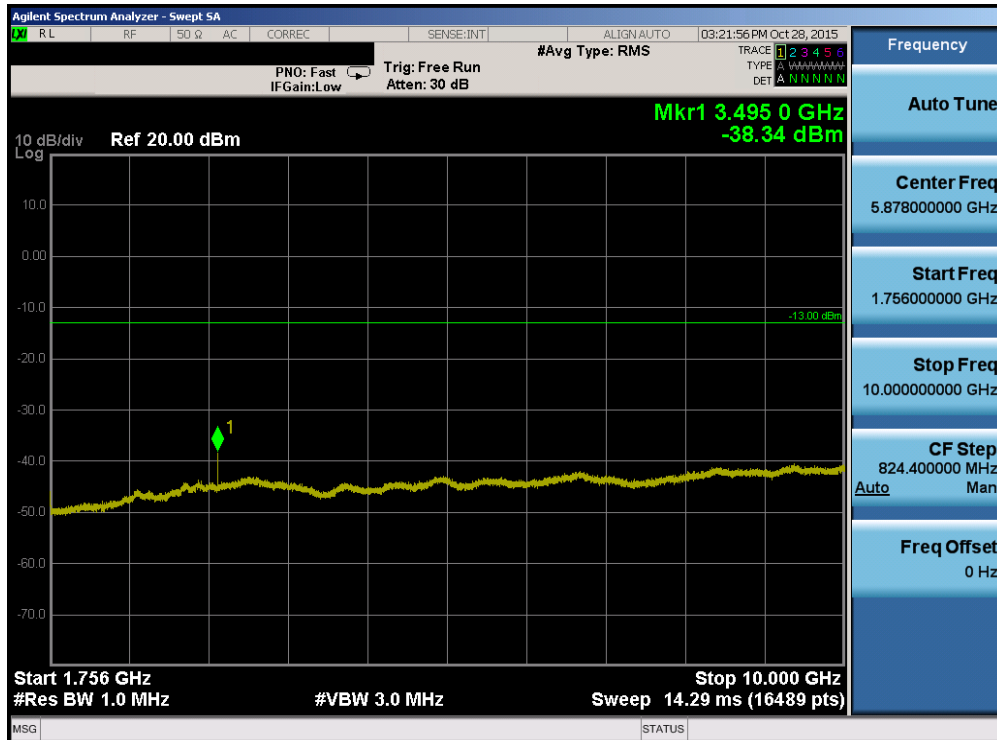


Plot 7-10. Conducted Spurious Plot (Band 4 – 15.0MHz QPSK – RB Size 1, RB Offset 0 – Mid Channel)

FCC ID: ACJEB3910A		FCC Pt. 27 LTE MEASUREMENT REPORT (CLASS II PERMISSIVE CHANGE)		Reviewed by: Quality Manager
Test Report S/N: 0Y1510271889.ACJ	Test Dates: 10/28-10/29/2015	EUT Type: Toughpad		Page 18 of 36

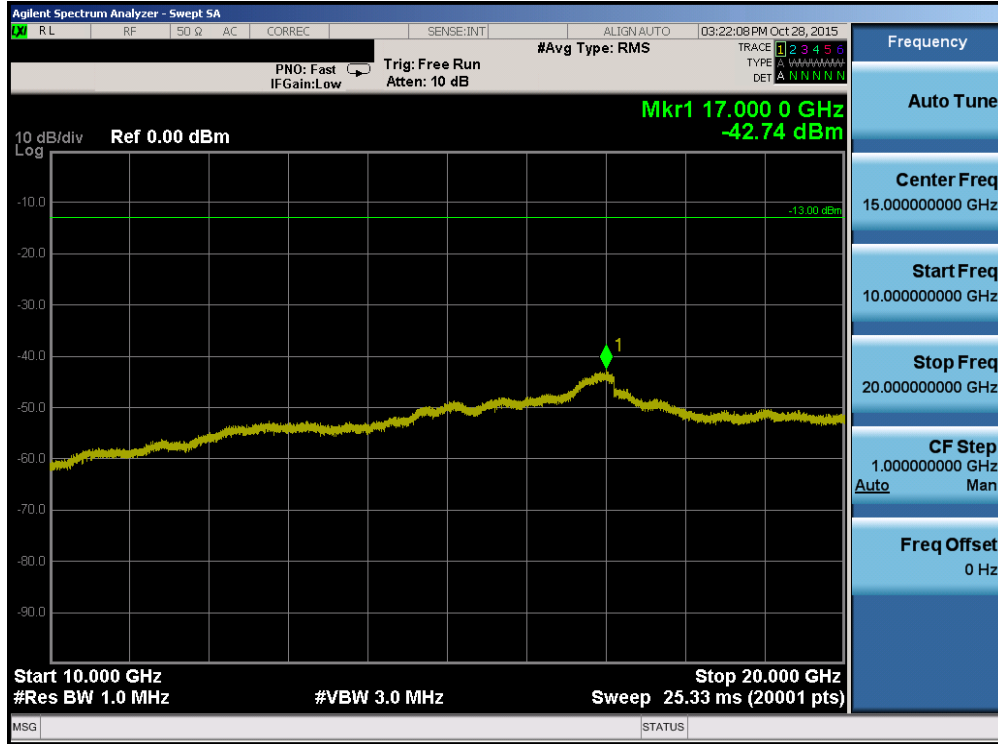


Plot 7-11. Conducted Spurious Plot (Band 4 – 15.0MHz QPSK – RB Size 1, RB Offset 0 – High Channel)



Plot 7-12. Conducted Spurious Plot (Band 4 – 15.0MHz QPSK – RB Size 1, RB Offset 0 – High Channel)

FCC ID: ACJEB3910A		FCC Pt. 27 LTE MEASUREMENT REPORT (CLASS II PERMISSIVE CHANGE)		Reviewed by: Quality Manager
Test Report S/N: 0Y1510271889.ACJ	Test Dates: 10/28-10/29/2015	EUT Type: Toughpad		Page 19 of 36



Plot 7-13. Conducted Spurious Plot (Band 4 – 15.0MHz QPSK – RB Size 1, RB Offset 0 – High Channel)

FCC ID: ACJEB3910A		FCC Pt. 27 LTE MEASUREMENT REPORT (CLASS II PERMISSIVE CHANGE)		Reviewed by: Quality Manager
Test Report S/N: 0Y1510271889.ACJ	Test Dates: 10/28-10/29/2015	EUT Type: Toughpad		Page 20 of 36

7.4 Band Edge Emissions at Antenna Terminal

§2.1051 §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 \geq 1% of the emission bandwidth
4. VBW \geq 3 x RBW
5. Detector = RMS
6. Number of sweep points \geq 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.

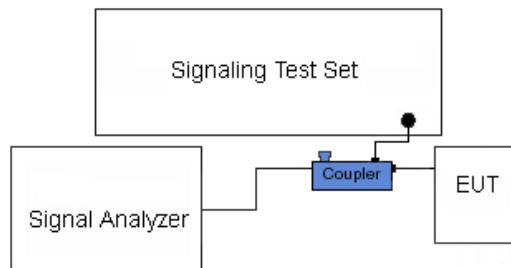


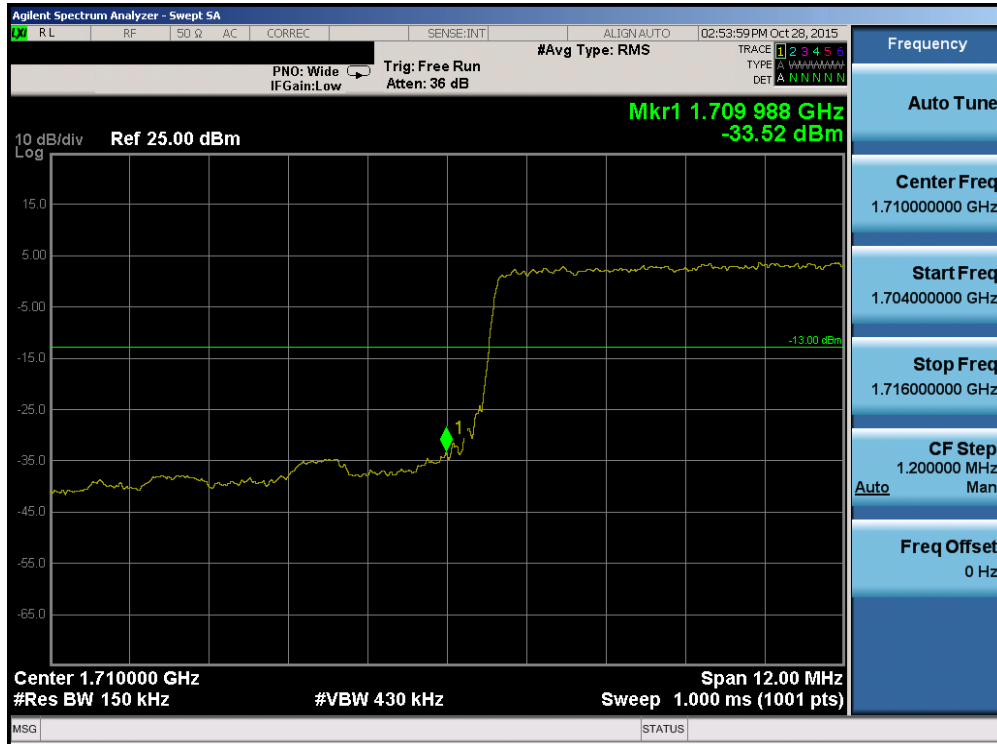


Figure 7-3. Test Instrument & Measurement Setup

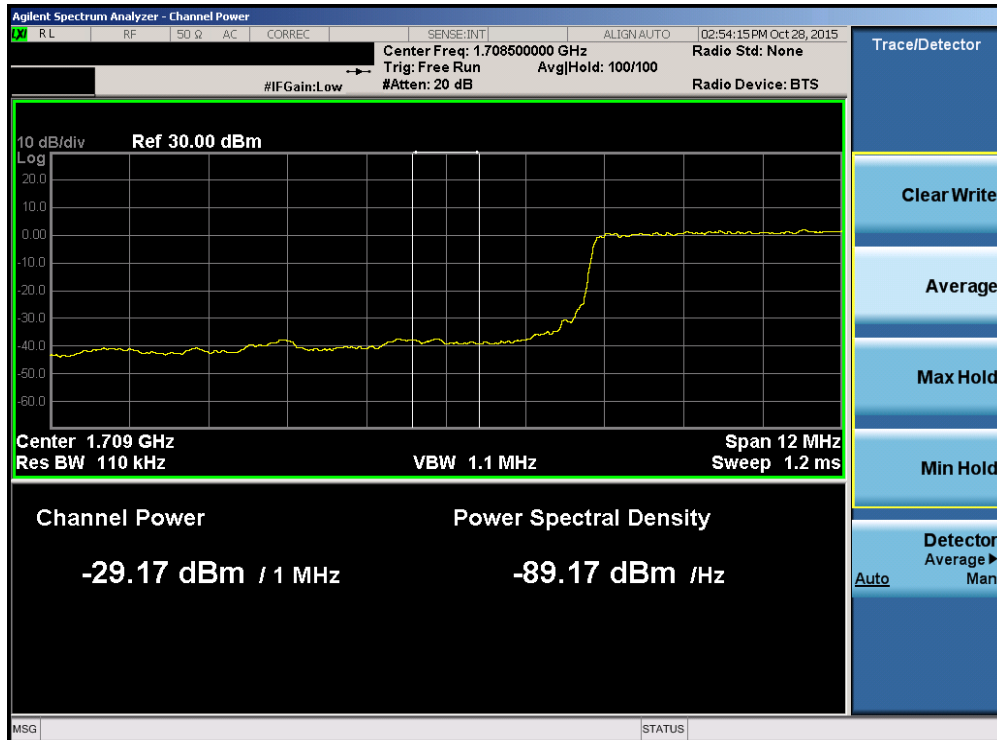
Test Notes

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.

FCC ID: ACJEB3910A		FCC Pt. 27 LTE MEASUREMENT REPORT (CLASS II PERMISSIVE CHANGE)		Reviewed by: Quality Manager
Test Report S/N: 0Y1510271889.ACJ	Test Dates: 10/28-10/29/2015	EUT Type: Toughpad	Page 21 of 36	

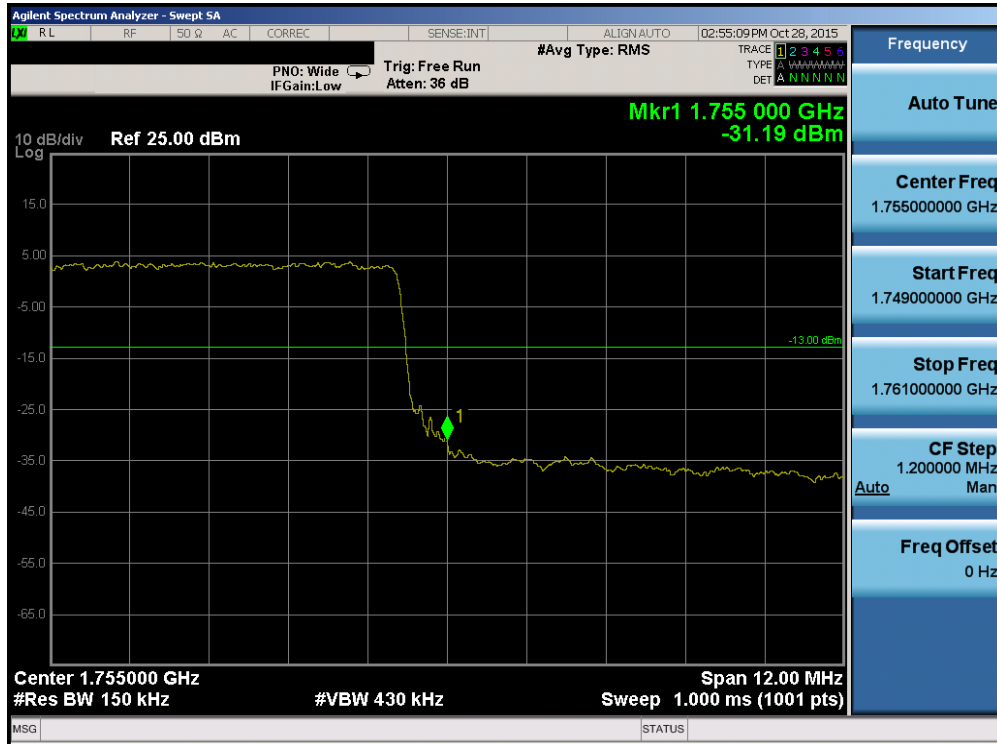


Plot 7-14. Lower Band Edge Plot (Band 4 – 15.0MHz QPSK – RB Size 75)

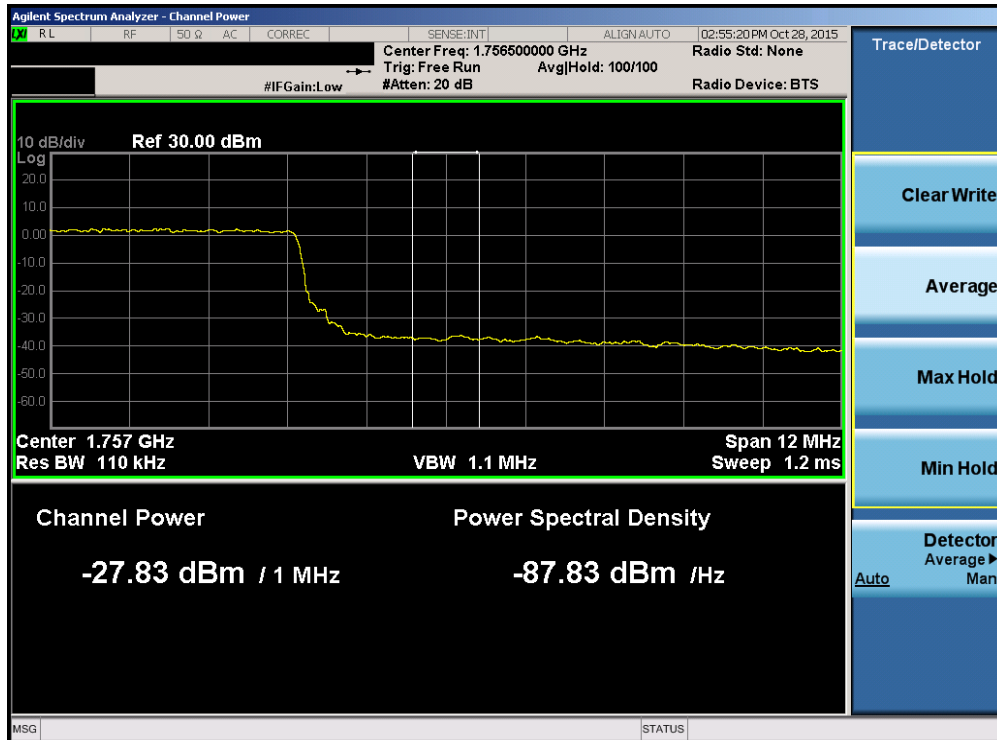


Plot 7-15. Lower Extended Band Edge Plot (Band 4 – 15.0MHz QPSK – RB Size 75)

FCC ID: ACJEB3910A		FCC Pt. 27 LTE MEASUREMENT REPORT (CLASS II PERMISSIVE CHANGE)		Reviewed by: Quality Manager
Test Report S/N: 0Y1510271889.ACJ	Test Dates: 10/28-10/29/2015	EUT Type: Toughpad		Page 22 of 36

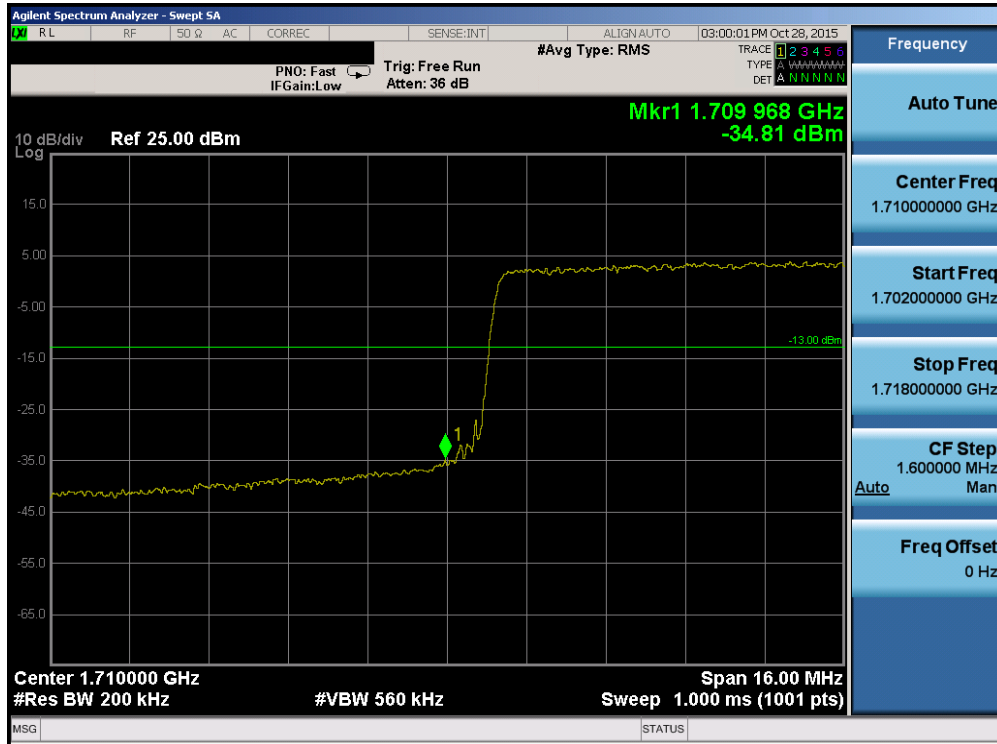


Plot 7-16. Upper Band Edge Plot (Band 4 – 15.0MHz QPSK – RB Size 75)

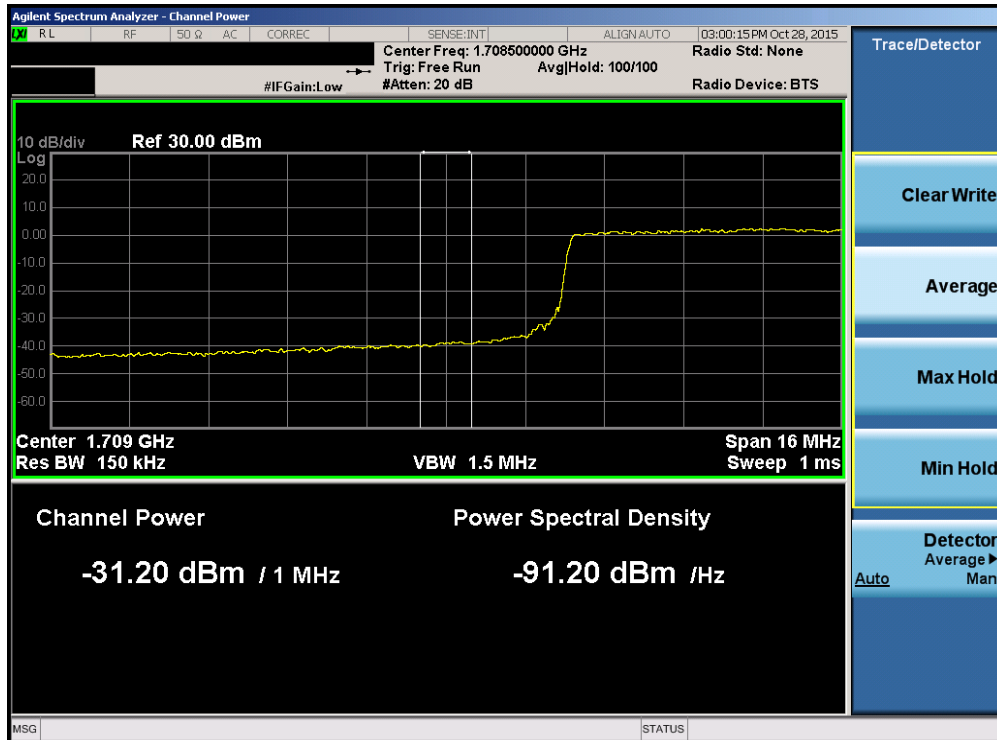


Plot 7-17. Upper Extended Band Edge Plot (Band 4 – 15.0MHz QPSK – RB Size 75)

FCC ID: ACJEB3910A		FCC Pt. 27 LTE MEASUREMENT REPORT (CLASS II PERMISSIVE CHANGE)		Reviewed by: Quality Manager
Test Report S/N: 0Y1510271889.ACJ	Test Dates: 10/28-10/29/2015	EUT Type: Toughpad		Page 23 of 36

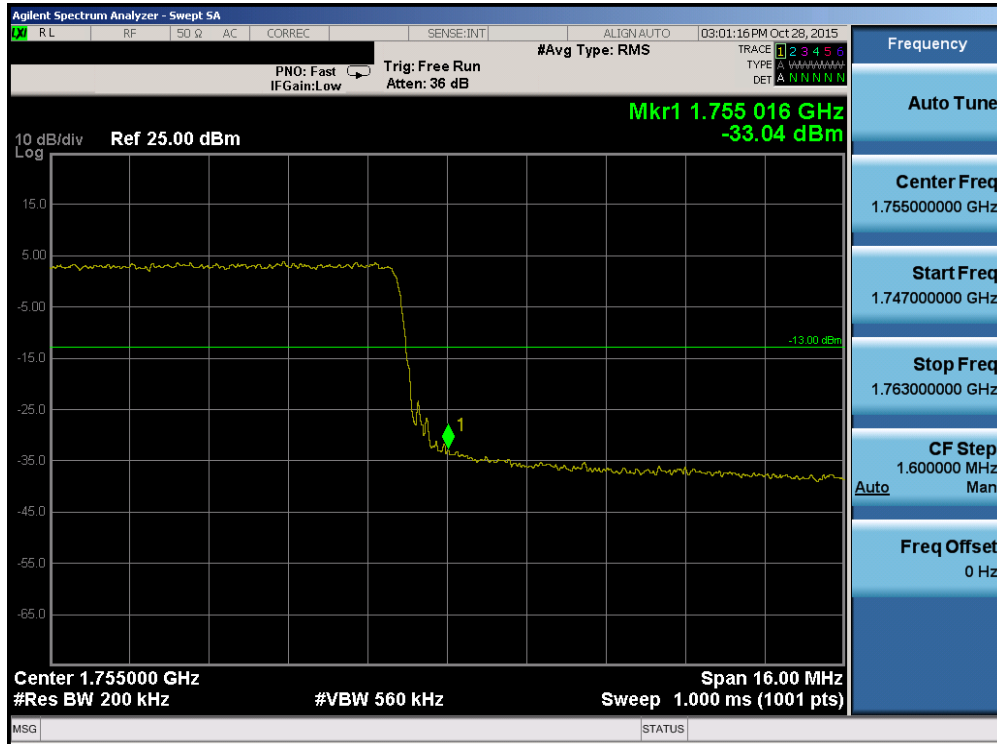


Plot 7-18. Lower Band Edge Plot (Band 4 – 20.0MHz QPSK – RB Size 100)

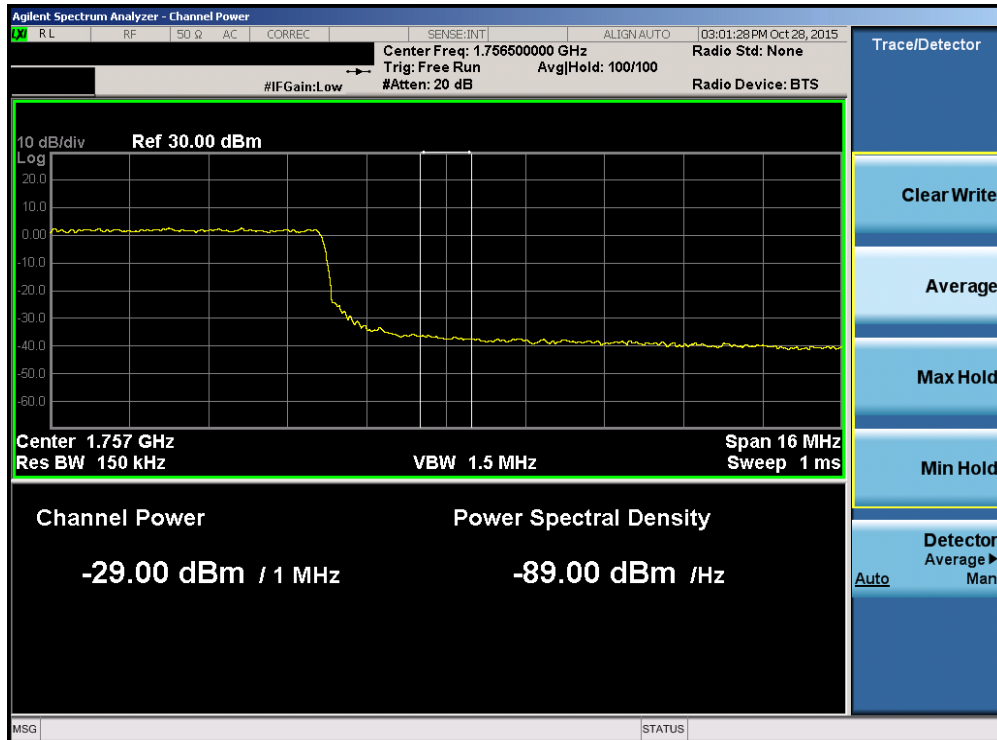


Plot 7-19. Lower Extended Band Edge Plot (Band 4 – 20.0MHz QPSK – RB Size 100)

FCC ID: ACJEB3910A		FCC Pt. 27 LTE MEASUREMENT REPORT (CLASS II PERMISSIVE CHANGE)		Reviewed by: Quality Manager
Test Report S/N: 0Y1510271889.ACJ	Test Dates: 10/28-10/29/2015	EUT Type: Toughpad		Page 24 of 36



Plot 7-20. Upper Band Edge Plot (Band 4 – 20.0MHz QPSK – RB Size 100)



Plot 7-21. Upper Extended Band Edge Plot (Band 4 – 20.0MHz QPSK – RB Size 100)

FCC ID: ACJEB3910A		FCC Pt. 27 LTE MEASUREMENT REPORT (CLASS II PERMISSIVE CHANGE)		Reviewed by: Quality Manager
Test Report S/N: 0Y1510271889.ACJ	Test Dates: 10/28-10/29/2015	EUT Type: Toughpad		Page 25 of 36

7.5 Radiated Power (EIRP)

§27.50(d.4)

Test Overview

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.
2. RBW = 1 – 5% of the expected OBW, not to exceed 1MHz
3. VBW \geq 3 x RBW
4. Span = 1.5 times the OBW
5. No. of sweep points \geq 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".
8. The integration bandwidth was roughly set equal to the measured OBW of the signal for signals with continuous operation.
9. Trace mode = trace averaging (RMS) over 100 sweeps
10. The trace was allowed to stabilize

FCC ID: ACJEB3910A		FCC Pt. 27 LTE MEASUREMENT REPORT (CLASS II PERMISSIVE CHANGE)		Reviewed by: Quality Manager
Test Report S/N: 0Y1510271889.ACJ	Test Dates: 10/28-10/29/2015	EUT Type: Toughpad	Page 26 of 36	

Test Setup

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

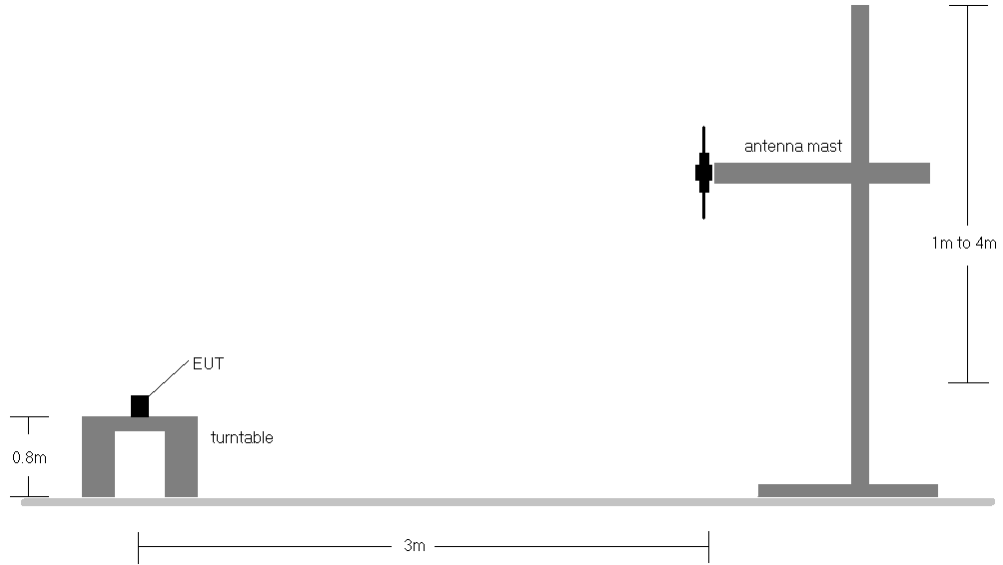


Figure 7-4. Radiated Test Setup <1GHz

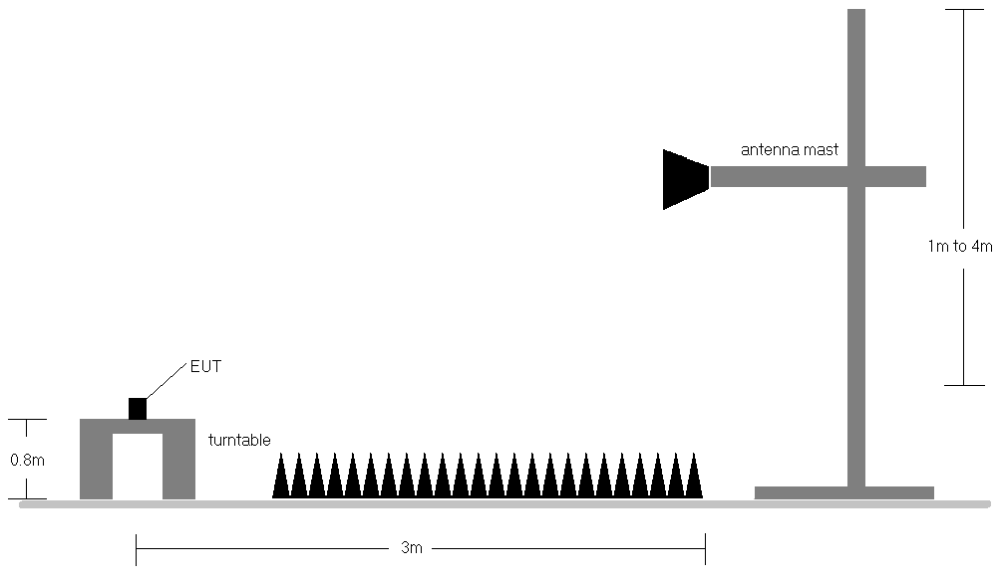




Figure 7-5. Radiated Test Setup >1GHz



FCC ID: ACJEB3910A		FCC Pt. 27 LTE MEASUREMENT REPORT (CLASS II PERMISSIVE CHANGE)		Reviewed by: Quality Manager
Test Report S/N: 0Y1510271889.ACJ	Test Dates: 10/28-10/29/2015	EUT Type: Toughpad		Page 27 of 36

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.

Frequency [MHz]	Channel Bandwidth [MHz]	Mod.	Ant. Pol. [H/V]	Antenna Height [m]	Turntable Azimuth [degree]	RB Size/Offset	Substitute Level [dBm]	Ant. Gain [dBi]	EIRP [dBm]	EIRP Limit [dBm]
1717.50	15	QPSK	V	1.37	278.30	1 / 0	10.63	9.19	19.82	30.00
1732.50	15	QPSK	V	1.37	278.30	1 / 0	10.68	9.00	19.68	30.00
1747.50	15	QPSK	V	1.33	283.00	1 / 0	11.03	8.80	19.83	30.00
1717.50	15	16-QAM	V	1.37	278.30	1 / 74	8.27	9.19	17.46	30.00
1732.50	15	16-QAM	V	1.37	278.30	1 / 74	8.76	9.00	17.76	30.00
1747.50	15	16-QAM	V	1.33	283.00	1 / 0	9.57	8.80	18.37	30.00
1720.00	20	QPSK	V	1.40	-24.84	1 / 99	11.22	9.16	20.38	30.00
1732.50	20	QPSK	V	1.40	307.80	1 / 0	10.77	9.00	19.77	30.00
1745.00	20	QPSK	V	1.34	308.50	1 / 99	11.49	8.83	20.32	30.00
1720.00	20	16-QAM	V	1.40	-24.84	1 / 99	9.86	9.16	19.02	30.00
1732.50	20	16-QAM	V	1.40	307.80	1 / 0	9.36	9.00	18.36	30.00
1745.00	20	16-QAM	V	1.34	308.50	1 / 99	10.21	8.83	19.04	30.00

Table 7-2. EIRP Data (Band 4)

FCC ID: ACJEB3910A		FCC Pt. 27 LTE MEASUREMENT REPORT (CLASS II PERMISSIVE CHANGE)		Reviewed by: Quality Manager
Test Report S/N: 0Y1510271889.ACJ	Test Dates: 10/28-10/29/2015	EUT Type: Toughpad	Page 28 of 36	

7.6 Radiated Spurious Emissions Measurements

§2.1053 §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 \geq 3 x RBW
3. Span = 1.5 times the OBW
4. No. of sweep points \geq 2 x span / RBW
5. Detector = Peak
6. Trace mode = max hold
7. The trace was allowed to stabilize

FCC ID: ACJEB3910A		FCC Pt. 27 LTE MEASUREMENT REPORT (CLASS II PERMISSIVE CHANGE)		Reviewed by: Quality Manager
Test Report S/N: 0Y1510271889.ACJ	Test Dates: 10/28-10/29/2015	EUT Type: Toughpad		Page 29 of 36

Test Setup

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

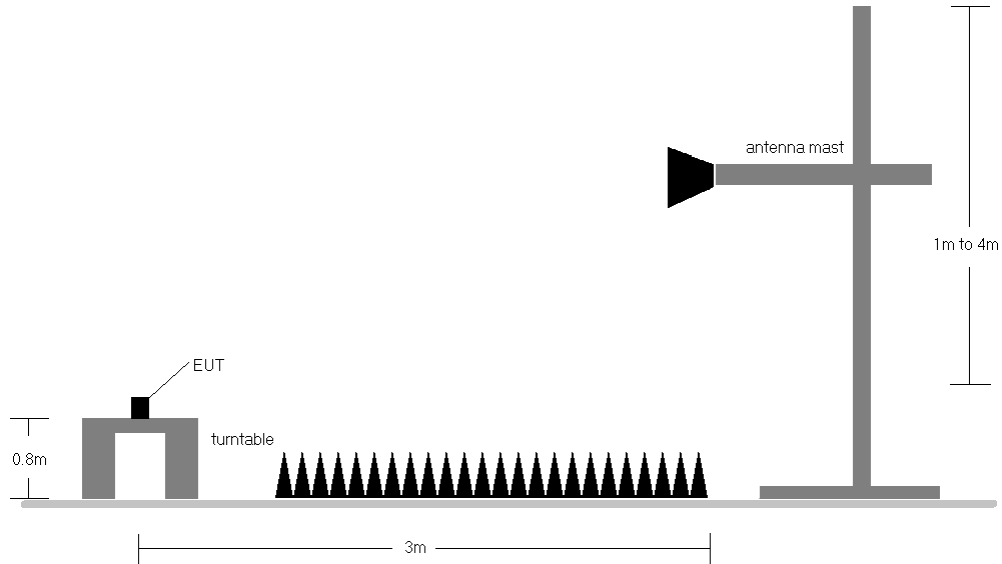




Figure 7-6. Test Instrument & Measurement Setup

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.
- 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.

FCC ID: ACJEB3910A		FCC Pt. 27 LTE MEASUREMENT REPORT (CLASS II PERMISSIVE CHANGE)		Reviewed by: Quality Manager
Test Report S/N: 0Y1510271889.ACJ	Test Dates: 10/28-10/29/2015	EUT Type: Toughpad		Page 30 of 36

OPERATING FREQUENCY: 1720.00 MHz
 CHANNEL: 20050
 MEASURED OUTPUT POWER: 20.38 dBm = 0.109 W
 MODULATION SIGNAL: QPSK
 BANDWIDTH: 20.0 MHz
 DISTANCE: 3 meters
 LIMIT: $43 + 10 \log_{10}(W) =$ 33.38 dBc



Frequency [MHz]	Ant. Pol. [H/V]	Antenna Height [m]	Turntable Azimuth [degree]	Level at Antenna Terminals [dBm]	Substitute Antenna Gain [dBi]	Spurious Emission Level [dBm]	[dBc]
3440.00	H	2.08	133	-47.29	8.20	-39.09	59.5
5160.00	H	1.28	205	-47.65	10.30	-37.35	57.7
6880.00	H	1.00	0	-55.25	11.43	-43.82	64.2

Table 7-3. Radiated Spurious Data (Band 4 – Low Channel)

OPERATING FREQUENCY: 1732.50 MHz
 CHANNEL: 20175
 MEASURED OUTPUT POWER: 19.77 dBm = 0.095 W
 MODULATION SIGNAL: QPSK
 BANDWIDTH: 20.0 MHz
 DISTANCE: 3 meters
 LIMIT: $43 + 10 \log_{10}(W) =$ 32.77 dBc

Frequency [MHz]	Ant. Pol. [H/V]	Antenna Height [m]	Turntable Azimuth [degree]	Level at Antenna Terminals [dBm]	Substitute Antenna Gain [dBi]	Spurious Emission Level [dBm]	[dBc]
3465.00	H	2.18	128	-45.40	8.29	-37.12	56.9
5197.50	H	1.37	158	-46.03	10.35	-35.68	55.4
6930.00	H	1.00	0	-54.58	11.49	-43.10	62.9



Table 7-4. Radiated Spurious Data (Band 4 – Mid Channel)

FCC ID: ACJEB3910A		FCC Pt. 27 LTE MEASUREMENT REPORT (CLASS II PERMISSIVE CHANGE)		Reviewed by: Quality Manager
Test Report S/N: 0Y1510271889.ACJ	Test Dates: 10/28-10/29/2015	EUT Type: Toughpad		Page 31 of 36

OPERATING FREQUENCY: 1745.00 MHz
 CHANNEL: 20300
 MEASURED OUTPUT POWER: 20.32 dBm = 0.108 W
 MODULATION SIGNAL: QPSK
 BANDWIDTH: 20.0 MHz
 DISTANCE: 3 meters
 LIMIT: $43 + 10 \log_{10}(W) =$ 33.32 dBc

Frequency [MHz]	Ant. Pol. [H/V]	Antenna Height [m]	Turntable Azimuth [degree]	Level at Antenna Terminals [dBm]	Substitute Antenna Gain [dBi]	Spurious Emission Level [dBm]	[dBc]
3490.00	H	2.23	128	-47.28	8.37	-38.91	59.2
5235.00	H	1.41	184	-55.80	10.35	-45.45	65.8
6980.00	H	1.00	0	-56.01	11.53	-44.47	64.8

Table 7-5. Radiated Spurious Data (Band 4 – High Channel)

FCC ID: ACJEB3910A		FCC Pt. 27 LTE MEASUREMENT REPORT (CLASS II PERMISSIVE CHANGE)		Reviewed by: Quality Manager
Test Report S/N: 0Y1510271889.ACJ	Test Dates: 10/28-10/29/2015	EUT Type: Toughpad		Page 32 of 36

7.7 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 Part 24 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

FCC ID: ACJEB3910A		FCC Pt. 27 LTE MEASUREMENT REPORT (CLASS II PERMISSIVE CHANGE)		Reviewed by: Quality Manager
Test Report S/N: 0Y1510271889.ACJ	Test Dates: 10/28-10/29/2015	EUT Type: Toughpad	Page 33 of 36	

Band 4 Frequency Stability Measurements

§2.1055 §§27.54



OPERATING FREQUENCY: 1,732,500,000 Hz
 CHANNEL: 20175
 REFERENCE VOLTAGE: 3.80 VDC

VOLTAGE (%)	POWER (VDC)	TEMP (°C)	FREQUENCY (Hz)	Freq. Dev. (Hz)	Deviation (%)
100 %	3.80	+ 20 (Ref)	1,732,499,944	-56	-0.0000032
100 %		- 30	1,732,499,976	-24	-0.0000014
100 %		- 20	1,732,499,997	-3	-0.0000002
100 %		- 10	1,732,500,089	89	0.0000051
100 %		0	1,732,500,003	3	0.0000002
100 %		+ 10	1,732,500,041	41	0.0000024
100 %		+ 20	1,732,500,054	54	0.0000031
100 %		+ 30	1,732,499,985	-15	-0.0000009
100 %		+ 40	1,732,500,228	228	0.0000132
100 %		+ 50	1,732,500,076	76	0.0000044
BATT. ENDPOINT	3.40	+ 20	1,732,499,741	-259	-0.0000149

Table 7-6. 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.

FCC ID: ACJEB3910A		FCC Pt. 27 LTE MEASUREMENT REPORT (CLASS II PERMISSIVE CHANGE)		Reviewed by: Quality Manager
Test Report S/N: 0Y1510271889.ACJ	Test Dates: 10/28-10/29/2015	EUT Type: Toughpad		Page 34 of 36

Band 4 Frequency Stability Measurements
§2.1055 §§27.54

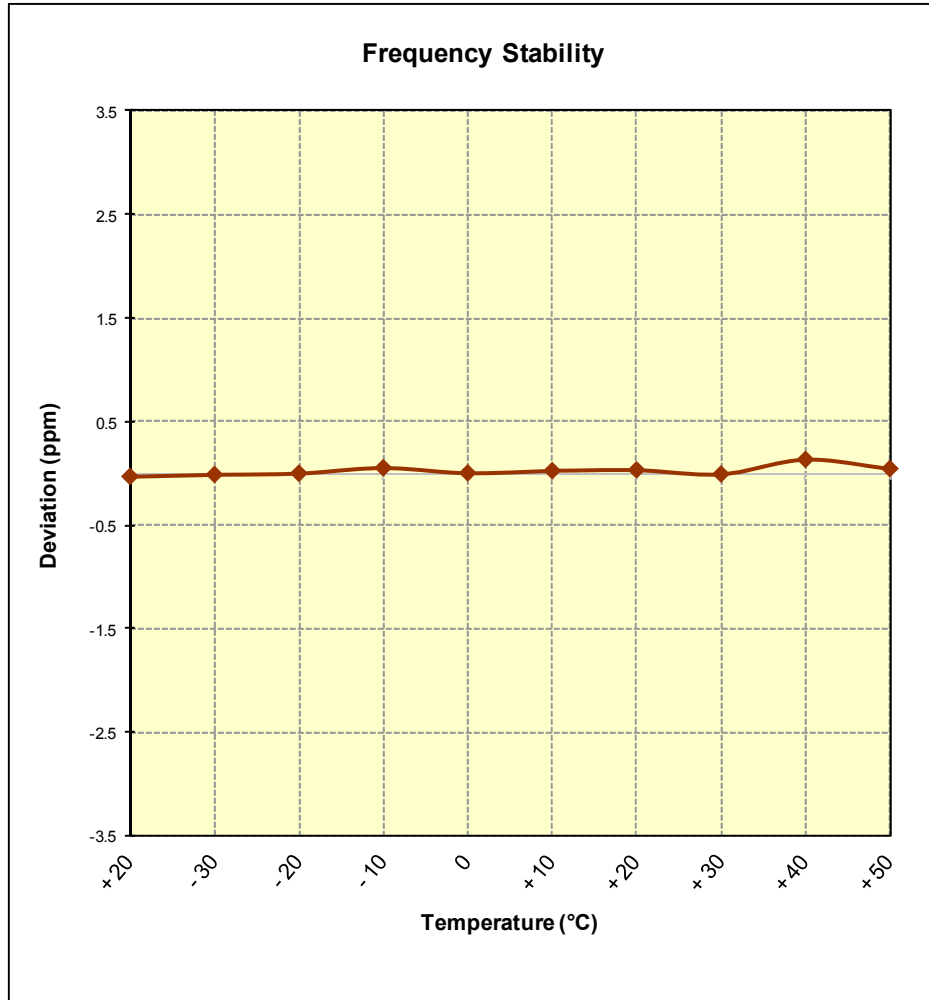




Figure 7-7. Frequency Stability Graph (Band 4)

FCC ID: ACJEB3910A		FCC Pt. 27 LTE MEASUREMENT REPORT (CLASS II PERMISSIVE CHANGE)		Reviewed by: Quality Manager
Test Report S/N: 0Y1510271889.ACJ	Test Dates: 10/28-10/29/2015	EUT Type: Toughpad		Page 35 of 36

8.0 CONCLUSION

The data collected relate only to the item(s) tested and show that the **Panasonic Toughpad FCC ID: ACJEB3910A** complies with all the requirements of Parts 27 of the FCC rules for LTE operation only.

FCC ID: ACJEB3910A		FCC Pt. 27 LTE MEASUREMENT REPORT (CLASS II PERMISSIVE CHANGE)		Reviewed by: Quality Manager
Test Report S/N: 0Y1510271889.ACJ	Test Dates: 10/28-10/29/2015	EUT Type: Toughpad	Page 36 of 36	