



# PCTEST ENGINEERING LABORATORY, INC.

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## MEASUREMENT REPORT FCC Part 27 Certification

**Applicant Name:**  
IP Wireless  
Unit 7 Greenways Business Park  
Bellinger Close, Chippenham  
Wiltshire SN15 1BN

**Date of Testing:**  
May 23 - July 1, 2011  
**Test Site/Location:**  
PCTEST Lab., Columbia, MD, USA  
**Test Report Serial No.:**  
0Y1011041796.PKT

<b>FCC ID:</b>	<b>PKTNODEBAMF</b>
<b>APPLICANT:</b>	<b>IP WIRELESS</b>

**Application Type:** Certification  
**FCC Classification:** Licensed Non-Broadcast Transmitter (TNB)  
**FCC Rule Part(s):** §2; §27 Subpart M  
**EUT Type:** 2.5GHz Band Single Channel Shelf  
**Model(s):** AMF  
**Tx Frequency Range:** 2563MHz  
**Max. RF Output Power:** 5.458 W (37.37 dBm) QPSK  
4.519 W (36.55 dBm) 16QAM  
4.295 W (36.33 dBm) 64QAM  
**Emission Designator(s):** 8M25G7D (QPSK) / 8M28W7D (16QAM) / 8M28W7D (64QAM)  
**Test Device Serial No.:** *identical prototype* [S/N: N/A]

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.

**Grant Conditions:** Power output listed is conducted for Part 27.

*PCTEST certifies that no party to this application has been subject to a denial of Federal benefits that includes FCC benefits pursuant to Section 5301 of the Anti-Drug Abuse Act of 1988, 21 U.S.C. 862.*



Randy Ortanez  
President



<b>FCC ID:</b> PKTNODEBAMF	<b>PCTEST</b> ENGINEERING LABORATORY, INC.	<b>FCC Pt. 27 / 802.16e TD-CDMA MEASUREMENT REPORT (CERTIFICATION)</b>	<b>IPWireless</b>	<b>Reviewed by:</b> Quality Manager
<b>Test Report S/N:</b> 0Y1011041796.PKT	<b>Test Dates:</b> May 23 - July 1, 2011	<b>EUT Type:</b> 2.5GHz Band Single Channel Shelf		Page 1 of 40

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

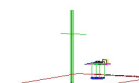
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# MEASUREMENT REPORT

## FCC Part 27



### §2.1033 General Information



**APPLICANT:** IP Wireless  
**APPLICANT ADDRESS:** Unit 7 Greenways Business Park  
 Bellinger Close, Chippenham, Wiltshire SN15 1BN  
**TEST SITE:** PCTEST ENGINEERING LABORATORY, INC.  
**TEST SITE ADDRESS:** 6660-B Dobbin Road, Columbia, MD 21045 USA  
**FCC RULE PART(S):** §2; §27(M)  
**BASE MODEL:** AMF  
**FCC ID:** PKTNODEBAMF  
**FCC CLASSIFICATION:** Licensed Non-Broadcast Transmitter (TNB)  
**EMISSION DESIGNATOR(S):** 8M25G7D (QPSK) / 8M28W7D (16QAM) / 8M28W7D (64QAM)  
**MODE:** TD-CDMA  
**FREQUENCY TOLERANCE:** Emission must remain in band  
**Test Device Serial No.:** N/A       Production     Pre-Production     Engineering  
**DATE(S) OF TEST:** May 23 - July 1, 2011  
**TEST REPORT S/N:** 0Y1011041796.PKT

### Test Facility / Accreditations

Measurements were performed at PCTEST Engineering Lab. located in Columbia, MD 21045, U.S.A.

- PCTEST facility is an FCC registered (PCTEST Reg. No. 90864) 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 (IC-2451).
- 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 (IC-2451) test laboratory with the site description on file at Industry Canada.
- PCTEST is a CTIA Authorized Test Laboratory (CATL) for AMPS, CDMA, and EvDO wireless devices and for Over-the-Air (OTA) Antenna Performance testing for AMPS, CDMA, GSM, GPRS, EGPRS, UMTS (W-CDMA), CDMA 1xEVDO, and CDMA 1xRTT.

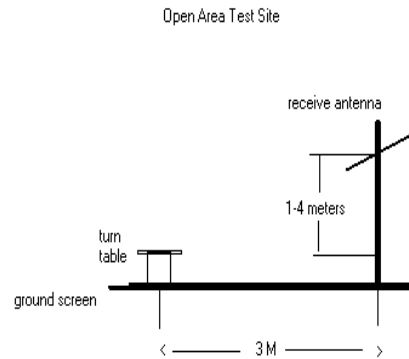


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<b>Test Report S/N:</b> 0Y1011041796.PKT	<b>Test Dates:</b> May 23 - July 1, 2011	<b>EUT Type:</b> 2.5GHz Band Single Channel Shelf	Page 3 of 40	

## 1.0 INTRODUCTION

### 1.1 Measurement Procedure

The radiated spurious measurements were made outdoors at a 3-meter test range (see Figure 1-1). The equipment under test is placed on a wooden turntable 3-meters from the receive antenna. The receive antenna height and turntable rotations were adjusted for the highest reading on the receive spectrum analyzer. A half-wave dipole was substituted in place of the EUT. This dipole antenna was driven by a signal generator and the level of the signal generator was adjusted to obtain the same receive spectrum analyzer reading. This level is recorded. For readings above 1GHz, the above procedure is repeated using horn antennas and the difference between the gain of the horn and an isotropic antenna are taken into consideration.



Deviation from Measurement Procedure.....None

Figure 1-1. Diagram of 3-meter outdoor test range

### 1.2 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.

### 1.3 Testing Facility

These measurements were conducted at the PCTEST Engineering Laboratory, Inc. facility in New Concept Business Park, Guilford Industrial Park, Columbia, Maryland. The site address is 6660-B Dobbin Road, Columbia, MD 21045. The test site is one of the highest points in the Columbia area with an elevation of 390 feet above mean sea level. The site coordinates are 39° 11'15" N latitude and 76° 49'38" W longitude. The facility is 1.5 miles North of the FCC laboratory, and the ambient signal and ambient signal strength are approximately equal to those of the FCC laboratory. There are no FM or TV transmitters within 15 miles of the site. The detailed description of the measurement facility was found to be in compliance with the requirements of § 2.948 according to ANSI C63.4-2003 on January 27, 2006 and Industry Canada.

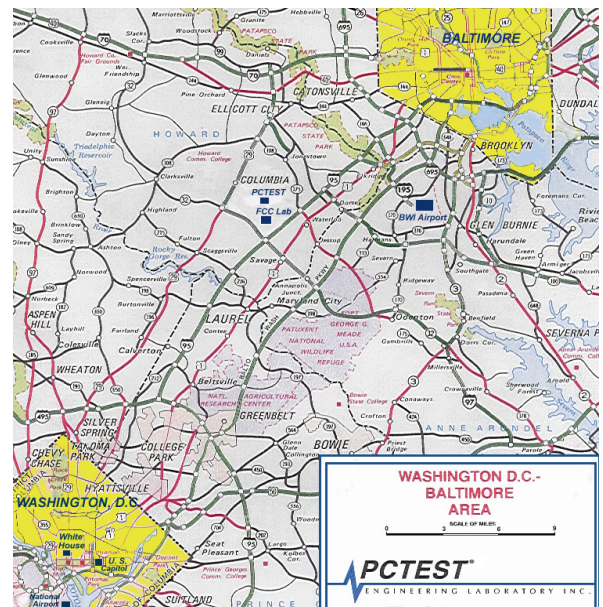


Figure 1-2. Map of the Greater Baltimore and Metropolitan Washington, D.C. area.

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## 2.0 PRODUCT INFORMATION

### 2.1 Equipment Description

The Equipment Under Test (EUT) is the **IP Wireless 2.5GHz Band Single Channel Shelf FCC ID: PKTNODEBAMF**. The test data contained in this report pertains only to the emissions due to the EUT's TD-CDMA function. The EUT consisted of the following component(s):

Trade Name / Base Model	FCC ID	Description
IP Wireless / Model: AMF	PKTNODEBAMF	2.5GHz Band Single Channel Shelf

**Table 2-1. EUT Equipment Description**

The EUT was set to transmit at full power through test software installed in a laptop computer. Each of the three available types of modulations was tested to determine the configuration producing the worst case emissions.

Modulation Supported: QPSK, 16QAM and 64QAM  
 Antenna Connector: 7/16 female  
 Chip Rate: 7.68 Mcps  
 Channel Bandwidth: 11 MHz  
 Single Channel: 2563 MHz

### 2.2 EMI Suppression Device(s)/Modifications

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

### 2.3 Labeling Requirements

Per 2.925

The FCC identifier shall be permanently affixed to the equipment and shall be readily visible to the purchaser at the time of purchase.



Per 15.19; Docket 95-19

In addition to this requirement, a device subject to certification shall be labeled as follows:

*This device complies with part 15 of the FCC Rules. Operation is subject to the following two conditions: (1) This device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.*

The label shall be permanently affixed at a conspicuous location on the device; instruction manual or pamphlet supplied to the user and be readily visible to the purchaser at the time of purchase. However, when the device is so small wherein placement of the label with specified statement is not practical, only the trade name and FCC ID must be displayed on the device per Section 15.19(b)(2).

Please see attachment for FCC ID label and label location.

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### 3.0 DESCRIPTION OF TESTS

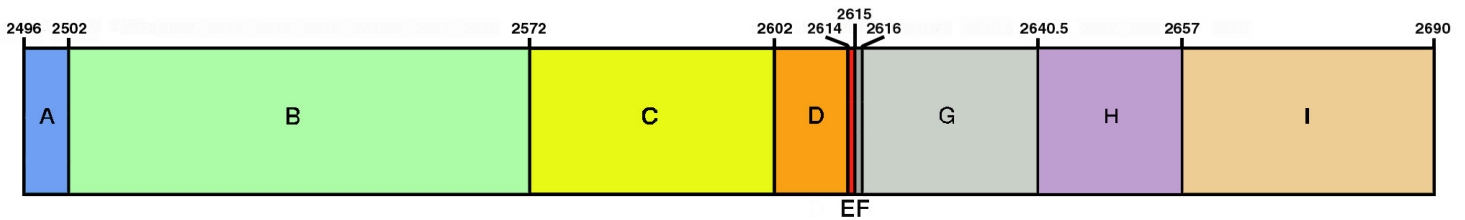
#### 3.1 Occupied Bandwidth Emission Limits

§2.1049, §27.53(l)(6)



- a. On any frequency outside but within 5.5MHz from the band edge of a licensee’s frequency block, the power of any emission shall be attenuated below the transmitter power (P) by at least  $43 + 10 \log(P)$  dB. At frequencies greater than 5.5MHz from any in-band channel edge, the transmitter power (P) shall be attenuated by at least  $55 + 10 \log(P)$  dB.
- b. Compliance with these provisions is based on the use of measurement instrumentation employing a resolution bandwidth of 1 MHz or greater. 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.
- c. When measuring the emission limits, the nominal carrier frequency shall be adjusted as close to the licensee’s frequency block edges, both upper and lower, as the design permits.
- d. The measurement of emission power can be expressed in peak or average values, provided they are expressed in the same parameters as the transmitter power.

#### 3.2 EBS/BRS - Frequency Blocks

§27.5(i)



<b>BLOCK A: 2496MHz – 2502MHz</b> (BRS)	<b>BLOCK B: 2502MHz – 2572MHz</b> (EBS)	<b>BLOCK C: 2572MHz – 2602MHz</b> (EBS)
<b>BLOCK D: 2602MHz – 2614MHz</b> (BRS)	<b>BLOCK E: 2614MHz – 2615MHz</b> (BRS)	<b>BLOCK F: 2615MHz – 2616MHz</b> (EBS)
<b>BLOCK G: 2616MHz – 2640.5MHz</b> (BRS)	<b>BLOCK H: 2640.5MHz – 2657MHz</b> (EBS)	<b>BLOCK A: 2657MHz – 2690MHz</b> (BRS)

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### 3.3 Spurious and Harmonic Emissions at Antenna Terminal

§2.1051, §27.53(l)(4)(6)

The level of the carrier and the various conducted spurious and harmonic frequencies is measured by means of a calibrated spectrum analyzer. The spectrum is scanned from the lowest frequency generated in the equipment up to a frequency including its 10<sup>th</sup> harmonic.

### 3.4 Radiated Spurious and Harmonic Emissions

§2.1053, §27.53(l)(4)(6)

Spurious and harmonic radiated emissions are measured outdoors at our 3-meter test range. The equipment under test is placed on a wooden turntable 3-meters from the receive antenna. The receive antenna height and turntable rotations were adjusted for the highest reading on the receive spectrum analyzer. The spectrum is scanned from the lowest frequency generated in the equipment up to a frequency including its 10<sup>th</sup> harmonic. A half-wave dipole was substituted in place of the EUT. This dipole antenna was driven by a signal generator with the level of the signal generator being adjusted to obtain the same receive spectrum analyzer reading. This level is recorded. For readings above 1 GHz, the above procedure is repeated using horn antennas and the difference between the gain of the horn and an isotropic or dipole antenna are taken into consideration. This device was tested under all configurations and the worst case is reported with BAMC 16QAM modulation. The spurious emissions reported were measured while the EUT was transmitting from both antenna ports simultaneously as this was the worst case. Since there were no antennas provided, case radiated spurious emissions were investigated with both antennas terminated with a 50W load.

### 3.5 Frequency Stability / Temperature Variation

§2.1055, §27.54


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 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.

*Specification – The frequency stability shall be sufficient to ensure that the fundamental emission stays within the authorized frequency block.*

#### Time Period and Procedure:

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 one minute before applying power to the transmitter. Measurement of the carrier frequency of the transmitter is made within one minute after applying power to the transmitter.
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.

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## 4.0 TEST EQUIPMENT CALIBRATION DATA

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

Manufacturer	Model	Description	Cal Date	Cal Interval	Cal Due	Serial Number
-	No.166	(1000-26500MHz) Microwave RF Cable	N/A		N/A	N/A
Agilent	8449B	(1-26.5GHz) Pre-Amplifier	2/8/2011	Annual	2/8/2012	3008A00985
Agilent	85650A	Quasi-Peak Adapter	4/7/2011	Annual	4/7/2012	3303A01872
Agilent	8566B	(100Hz-22GHz) Spectrum Analyzer	4/7/2011	Annual	4/7/2012	3638A08713
Agilent	8648D	(9kHz-4GHz) Signal Generator	10/13/2010	Annual	10/13/2011	3613A00315
Agilent	E4407B	ESA Spectrum Analyzer	4/5/2011	Annual	4/5/2012	US39210313
Agilent	E4448A	PSA (3Hz-50GHz) Spectrum Analyzer	11/30/2010	Annual	11/30/2011	US42510244
Agilent	E8257D	(250kHz-20GHz) Signal Generator	4/8/2011	Annual	4/8/2012	MY45470194
Agilent	E8267C	Vector Signal Generator	10/11/2010	Annual	10/11/2011	US42340152
Agilent	N9020A	MXA Signal Analyzer	9/8/2010	Annual	9/8/2011	US46470561
Agilent	E5515C	Wireless Communications Test Set	2/8/2011	Annual	2/8/2012	GB45360985
Anritsu	ML2495A	Power Meter	10/13/2010	Annual	10/13/2011	941001
Anritsu	MA2411B	Pulse Sensor	N/A	Annual		1027293
Emco	3115	Horn Antenna (1-18GHz)	10/14/2009	Biennial	10/14/2011	9704-5182
Emco	3115	Horn Antenna (1-18GHz)	4/8/2010	Biennial	4/8/2012	9205-3874
Espec	ESX-2CA	Environmental Chamber	2/8/2011	Annual	2/8/2012	17620
Gigatronics	80701A	(0.05-18GHz) Power Sensor	10/11/2010	Annual	10/11/2011	1833460
Gigatronics	8651A	Universal Power Meter	10/11/2010	Annual	10/11/2011	8650319
K & L	11SH10	Band Pass Filter	N/A	Annual	N/A	1300/4000
K & L	11SH10	Band Pass Filter	N/A	Annual	N/A	4000/12000
MiniCircuits	VHF-1300+	High Pass Filter	N/A		N/A	30716
MiniCircuits	VHF-3100+	High Pass Filter	N/A		N/A	30721
Pasternack	PE2208-6	Bidirectional Coupler	N/A		N/A	N/A
Rohde & Schwarz	FSQ 26	Spectrum Analyzer	8/28/2010	Annual	8/28/2011	200452
Schwarzbeck	UHA9105	Dipole Antenna (400 - 1GHz) Rx	7/17/2009	Biennial	7/17/2011	9105-2404
Schwarzbeck	UHA9105	Dipole Antenna (400 - 1GHz) Tx	7/17/2009	Biennial	7/17/2011	9105-2403
Sunol	DRH-118	Horn Antenna (1 - 18GHz)	6/14/2009	Biennial	6/14/2011	A050307
Sunol	JB5	Bi-Log Antenna (30M - 5GHz)	7/17/2009	Biennial	7/17/2011	A051107

**Table 4-1. Test Equipment**

**Note:**

All items that appear in the equipment list above that are out of their calibration interval were calibrated at the time they were used to perform the measurements shown in this report.

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## 5.0 SAMPLE CALCULATIONS

### Emission Designator

#### QPSK Modulation

**Emission Designator = 9M62G7D**

TD-CDMA BW = 9.62 MHz  
 G = Phase Modulation  
 7 = Quantized/Digital Info  
 D = Amplitude/Angle Modulated

#### 16QAM Modulation


**Emission Designator = 9M45W7D**

TD-CDMA BW = 9.45 MHz  
 W = Amplitude/Angle Modulated  
 7 = Quantized/Digital Info  
 D = Combination (Audio/Data)

### Spurious Radiated Emission – TD-CDMA Band

#### **Example: Middle Channel TD-CDMA Mode 2<sup>nd</sup> Harmonic (5200 MHz)**

The receive 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 receive analyzer. The loss of the cable between the signal generator and the terminals of the substituted antenna is 3.2 dB at 5200 MHz. So 4.9 dB is added to the signal generator reading of -30.00 dBm yielding -25.1 dBm. The fundamental EIRP was 25.501 dBm so this harmonic was 25.501 dBm - (-25.1) = 50.6 dBc.

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## 6.0 TEST RESULTS

### 6.1 Summary

Company Name: IP Wireless  
 FCC ID: PKTNODEBAMF  
 FCC Classification: Licensed Non-Broadcast Transmitter (TNB)  
 Mode(s): TD-CDMA

FCC Part Section(s)	Test Description	Test Limit	Test Condition	Test Result	Reference
<b>TRANSMITTER MODE (Tx)</b>					
2.1049	Occupied Bandwidth	N/A	CONDUCTED	PASS	Section 7.0
2.1051, 27.53(m)(v)	Band Edge	$< 43 + 10\log_{10}(P[\text{Watts}])$		PASS	Section 7.0
2.1051, 27.53(m)(v)	Conducted Spurious Emissions	$< 43 + 10\log_{10}(P[\text{Watts}])$		PASS	Section 7.0
2.1046, 27.50(h)(1)	Transmitter Conducted Output Power Measurements	N/A		PASS	Section 6.2
2.1051, 27.53(m)(v)	Simultaneous Tx Conducted Spurious Emissions	$< 43 + 10\log_{10}(P[\text{Watts}])$		PASS	Section 6.3
2.1055, 27.54	Frequency Stability	Fundamental emissions must stay within the allotted band		PASS	Section 6.5
2.1053, 27.53(m)(2)(v)	Undesirable Emissions	$< 43 + 10\log_{10}(P[\text{Watts}])$ for all out-of-band emissions	RADIATED	PASS	Section 6.4
2.1053, 27.50(h)(1)	EIRP	$< 33\text{dBW} + 10\log_{10}(X/Y)$ Y = 5.5 MHz		N/A	N/A

**Table 6-1. Summary of Test Results**

FCC ID: PKTNODEBAMF	 PCTEST ENGINEERING LABORATORY, INC.	FCC Pt. 27 / 802.16e TD-CDMA MEASUREMENT REPORT (CERTIFICATION)	 IPWireless	Reviewed by: Quality Manager
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## 6.2 Transmitter Conducted Output Power

### §2.1046

A laptop computer was used to set the EUT “on” and to transmit at full power. The conducted power was measured for each of the three available types of modulations with the use of a power meter whose gating function was enabled only during the transmitters’ “on” time. The TD-CDMA conducted powers are reported below as well as a test setup diagram.

This device is capable of simultaneous transmission from both antennas. Compliance for MIMO transmission is shown by measuring the power of each transmit chain and then adding  $10\log(N)$  where  $N$  is the number of outputs (i.e.  $N = 2$ , in this case), per the guidance from the April 2011 FCC workshop. In Table 6-2 below, the power of each individual transmit chain is shown as well as a calculation adding  $10\log(N) = 3\text{dB}$  to the maximum power between the two chains to account for the worst case simultaneous transmit power.

Antenna Port	Frequency [MHz]	QPSK		16QAM		64QAM	
		Average	Peak	Average	Peak	Average	Peak
		[dBm]	[dBm]	[dBm]	[dBm]	[dBm]	[dBm]
1	2563.00	37.05	41.62	36.01	40.83	36.13	39.94
2	2563.00	37.37	42.79	36.55	42.31	36.33	41.97
1+2	2563.00	40.37	45.79	39.55	45.31	39.33	44.97

Table 6-2. TD-CDMA Conducted Output Power

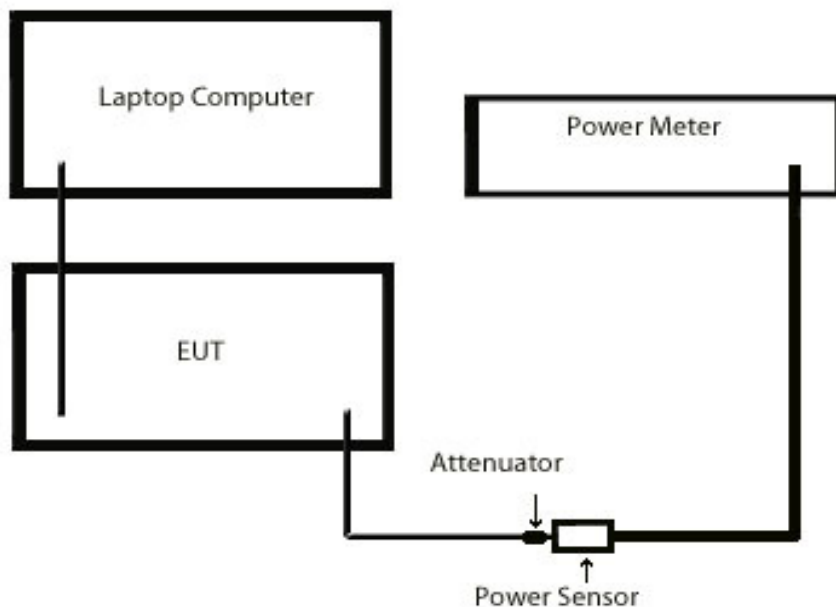




Figure 6-1. TD-CDMA Conducted Power Test Setup Diagram

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### 6.3 Out of Band Spurious Emissions (Simultaneous Transmission) §27.53(m)(v)

Compliance with all out of band spurious emissions must also be shown taking into account simultaneous transmission. Per the guidance from the April 2011 FCC workshop, all out of band spurious emissions shall be adjusted by a factor of  $10\log(N) = 3\text{dB}$  (where  $N = 2$  for the case of this EUT) to show compliance while transmitting from both antenna ports.

The following tables show numerical calculations of all the out-of-band spurious emissions measured on the individual chains (as shown in Section 7.0) adjusted by a factor of 3dB to account for simultaneous transmission.

Freq [MHz]	Modulation	Antenna Port	Highest Out of Band CSE [dBm]	10 log (N) [dB]	Corrected CSE Level [dBm]	Spurious Emission Limit [dBm]	Margin [dB]
2563	QPSK	1	-22.22	3.01	-19.21	-13	-6.21
		2	-22.02	3.01	-19.01	-13	-6.01
	16-QAM	1	-21.80	3.01	-18.79	-13	-5.79
		2	-22.10	3.01	-19.09	-13	-6.09
	64-QAM	1	-21.87	3.01	-18.86	-13	-5.86
		2	-22.16	3.01	-19.15	-13	-6.15

Table 6-3. Simultaneous Tx Out of Band Conducted Spurious Emissions

Freq [MHz]	Modulation	Antenna Port	Band Edge	Channel Edge Level [dBm]	10 log (N) [dB]	Corrected Ch. Edge Level [dBm]	Spurious Emission Limit [dBm]	Margin [dB]
2563	QPSK	1	Lower	-20.69	3.01	-17.68	-13	-4.68
			Upper	-20.23	3.01	-17.22	-13	-4.22
		2	Lower	-25.02	3.01	-22.01	-13	-9.01
			Upper	-23.07	3.01	-20.06	-13	-7.06
	16-QAM	1	Lower	-24.09	3.01	-21.08	-13	-8.08
			Upper	-20.69	3.01	-17.68	-13	-4.68
		2	Lower	-20.58	3.01	-17.57	-13	-4.57
			Upper	-21.57	3.01	-18.56	-13	-5.56
	64-QAM	1	Lower	-25.68	3.01	-22.67	-13	-9.67
			Upper	-24.95	3.01	-21.94	-13	-8.94
		2	Lower	-25.58	3.01	-22.57	-13	-9.57
			Upper	-24.95	3.01	-21.94	-13	-8.94

Table 6-4. Simultaneous Tx Conducted Channel Edge Emissions

**Out of Band Spurious Emissions (Simultaneous Transmission) (Cont'd)**  
§27.53(m)(v)

Freq [MHz]	Modulation	Antenna Port	Band Edge	Highest Out of Band CSE [dBm]	10 log (N) [dB]	Corrected CSE Level [dBm]	Spurious Emission Limit [dBm]	Margin [dB]
2563	QPSK	1	Lower	-20.97	3.01	-17.96	-13	-4.96
			Upper	-23.51	3.01	-20.50	-13	-7.50
		2	Lower	-29.41	3.01	-26.40	-13	-13.40
			Upper	-30.91	3.01	-27.90	-13	-14.90
	16-QAM	1	Lower	-20.62	3.01	-17.61	-13	-4.61
			Upper	-21.30	3.01	-18.29	-13	-5.29
		2	Lower	-31.54	3.01	-28.53	-13	-15.53
			Upper	-30.59	3.01	-27.58	-13	-14.58
	64-QAM	1	Lower	-20.03	3.01	-17.02	-13	-4.02
			Upper	-22.76	3.01	-19.75	-13	-6.75
		2	Lower	-31.49	3.01	-28.48	-13	-15.48
			Upper	-30.57	3.01	-27.56	-13	-14.56

**Table 6-5. Simultaneous Tx Out of Band Conducted Spurious Emissions (1MHz from Band Edge)**

## 6.4 TD-CDMA Radiated Measurements

### §2.1053, §27.53(l)(4)

#### Field Strength of SPURIOUS Radiation

OPERATING FREQUENCY: 2563.00 MHz  
 MODULATION SIGNAL: QPSK  
 DISTANCE: 3 meters  
 LIMIT: -13.00 dBm

FREQ. (MHz)	LEVEL @ ANTENNA TERMINALS (dBm)	SUBSTITUTE ANTENNA GAIN (dBi)	SPURIOUS EMISSION LEVEL (dBm)	POL (H/V)	Margin (dB)
5126.00	-49.10	11.20	-37.90	H	-24.90
7689.00	-82.51	12.64	-69.87	H	-56.87
10252.00	-74.54	12.80	-61.74	H	-48.74
12815.00	-65.59	12.42	-53.17	H	-40.17
15378.00	-64.50	11.64	-52.86	H	-39.86



**Table 6-6. Radiated Spurious Data (TD-CDMA Mode) QPSK**

#### NOTES:

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

The EUT was placed on a wooden turn table 3-meters from the receive antenna. The receive antenna height and turntable rotation was adjusted for the highest reading on the receive spectrum analyzer. For TD-CDMA signals, a peak detector is used, with RBW = VBW = 1 MHz. A Horn antenna was substituted in place of the EUT. This Horn antenna was driven by a signal generator and the level of the signal generator was adjusted to obtain the same receive spectrum analyzer reading. The conducted power at the terminals of the Horn antenna is measured. The difference between the gain of the horn and an isotropic antenna is taken into consideration and the EIRP is recorded.

This device was tested under all configurations and the worst case is reported with BAMC 16QAM modulation. The spurious emissions reported were measured while the EUT was transmitting from both antenna ports simultaneously as this was the worst case. Since there were no antennas provided, case radiated spurious emissions were investigated with both antennas terminated with a 50W load. This unit was tested while powered over ethernet.

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**TD-CDMA Radiated Measurements (Cont'd)**  
**§2.1053, §27.53(l)(4)**

**Field Strength of SPURIOUS Radiation**

OPERATING FREQUENCY: 2563.00 MHz  
 MODULATION SIGNAL: 16-QAM  
 DISTANCE: 3 meters  
 LIMIT: -13.00 dBm

FREQ. (MHz)	LEVEL @ ANTENNA TERMINALS (dBm)	SUBSTITUTE ANTENNA GAIN (dBi)	SPURIOUS EMISSION LEVEL (dBm)	POL (H/V)	Margin (dB)
5126.00	-47.73	11.20	-36.53	H	-23.53
7689.00	-82.51	12.64	-69.87	H	-56.87
10252.00	-74.54	12.80	-61.74	H	-48.74
12815.00	-65.59	12.42	-53.17	H	-40.17
15378.00	-68.99	14.98	-54.00	H	-41.00

**Table 6-7. Radiated Spurious Data (TD-CDMA Mode) 16QAM**

**NOTES:**

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

The EUT was placed on a wooden turn table 3-meters from the receive antenna. The receive antenna height and turntable rotation was adjusted for the highest reading on the receive spectrum analyzer. For TD-CDMA signals, a peak detector is used, with RBW = VBW = 1 MHz. A Horn antenna was substituted in place of the EUT. This Horn antenna was driven by a signal generator and the level of the signal generator was adjusted to obtain the same receive spectrum analyzer reading. The conducted power at the terminals of the Horn antenna is measured. The difference between the gain of the horn and an isotropic antenna is taken into consideration and the EIRP is recorded.

This device was tested under all configurations and the worst case is reported with BAMC 16QAM modulation. The spurious emissions reported were measured while the EUT was transmitting from both antenna ports simultaneously as this was the worst case. Since there were no antennas provided, case radiated spurious emissions were investigated with both antennas terminated with a 50W load. This unit was tested while powered over ethernet.

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**TD-CDMA Radiated Measurements (Cont'd)**  
§2.1053, §27.53(l)(4)

**Field Strength of SPURIOUS Radiation**

OPERATING FREQUENCY: 2563.00 MHz  
 MODULATION SIGNAL: 64-QAM  
 DISTANCE: 3 meters  
 LIMIT: -13.00 dBm

FREQ. (MHz)	LEVEL @ ANTENNA TERMINALS (dBm)	SUBSTITUTE ANTENNA GAIN (dBi)	SPURIOUS EMISSION LEVEL (dBm)	POL (H/V)	Margin (dB)
5126.00	-49.05	11.20	-37.85	H	-24.85
7689.00	-82.51	12.64	-69.87	H	-56.87
10252.00	-74.54	12.80	-61.74	H	-48.74
12815.00	-65.59	12.42	-53.17	H	-40.17
15378.00	-69.69	16.17	-53.52	H	-40.52


**Table 6-8. Radiated Spurious Data (TD-CDMA Mode) 64QAM**

**NOTES:**

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

The EUT was placed on a wooden turn table 3-meters from the receive antenna. The receive antenna height and turntable rotation was adjusted for the highest reading on the receive spectrum analyzer. For TD-CDMA signals, a peak detector is used, with RBW = VBW = 1 MHz. A Horn antenna was substituted in place of the EUT. This Horn antenna was driven by a signal generator and the level of the signal generator was adjusted to obtain the same receive spectrum analyzer reading. The conducted power at the terminals of the Horn antenna is measured. The difference between the gain of the horn and an isotropic antenna is taken into consideration and the EIRP is recorded.

This device was tested under all configurations and the worst case is reported with BAMC 16QAM modulation. The spurious emissions reported were measured while the EUT was transmitting from both antenna ports simultaneously as this was the worst case. Since there were no antennas provided, case radiated spurious emissions were investigated with both antennas terminated with a 50W load. This unit was tested while powered over ethernet.

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## 6.5 TD-CDMA Frequency Stability Measurements

\$2.1055, \$27.54

OPERATING FREQUENCY: 2,563,000,000 Hz


REFERENCE VOLTAGE: 48 VDC

VOLTAGE (%)	POWER (VDC)	TEMP (°C)	FREQ. (Hz)	Freq. Dev. (Hz)	Deviation (%)
100 %	48	+ 20 (Ref)	2,563,000,293	293	0.000011
100 %		- 30	2,563,000,291	291	0.000011
100 %		- 20	2,563,000,286	286	0.000011
100 %		- 10	2,563,000,288	288	0.000011
100 %		0	2,563,000,297	297	0.000012
100 %		+ 10	2,563,000,285	285	0.000011
100 %		+ 20	2,563,000,293	293	0.000011
100 %		+ 30	2,563,000,301	301	0.000012
100 %		+ 40	2,563,000,282	282	0.000011
100 %		+ 50	2,563,000,279	279	0.000011
115 %	55.20	+ 20	2,563,000,298	298	0.000012
85 %	40.80	+ 20	2,563,000,301	301	0.000012

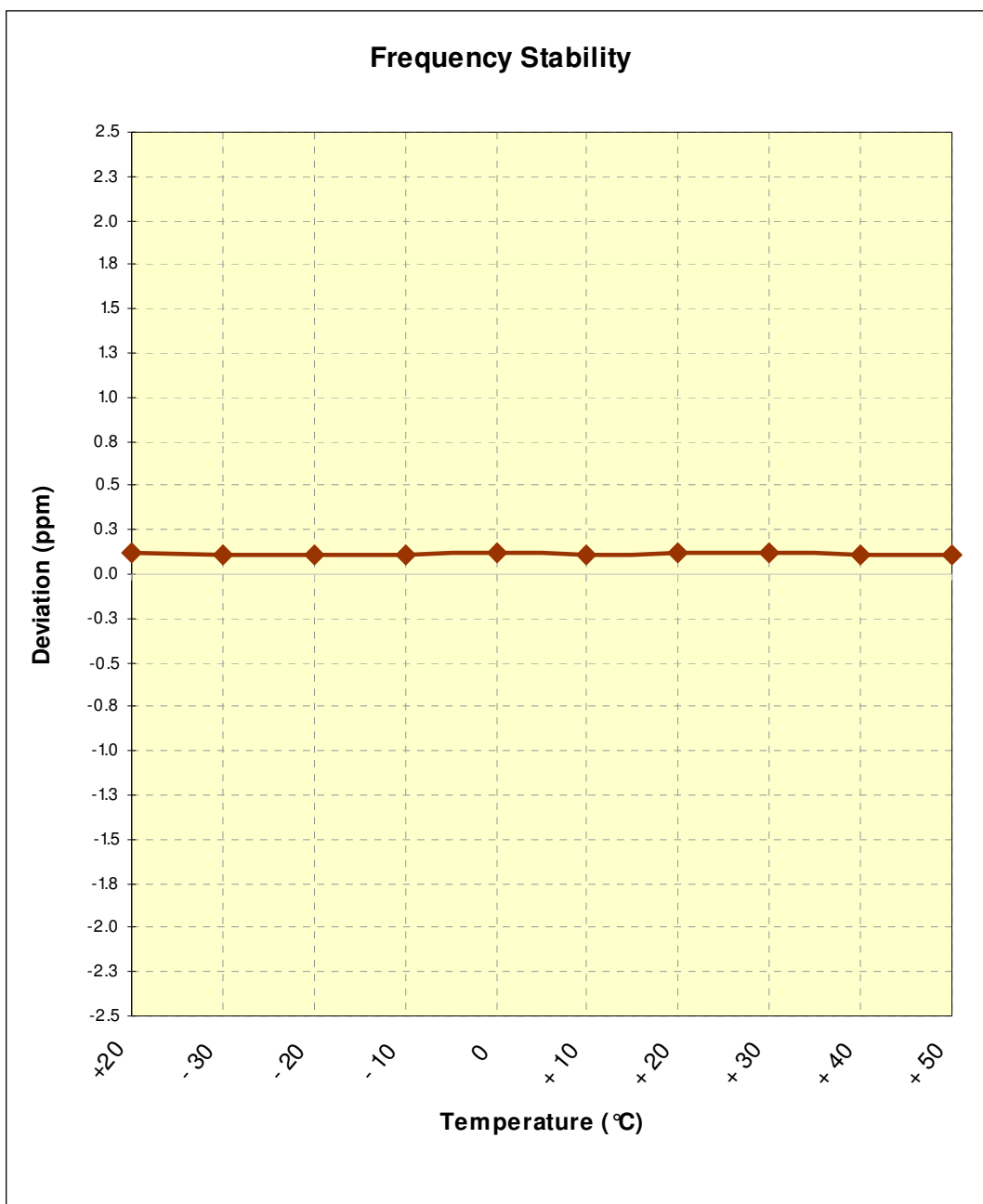
**Table 6-9. Frequency Stability Data (TD-CDMA Mode)**

**Note:**

The frequency deviation was measured to ensure that the channels emissions remained within the authorized band with varying temperature and voltage.

FCC ID: PKTNOBAMF		FCC Pt. 27 / 802.16e TD-CDMA MEASUREMENT REPORT (CERTIFICATION)		Reviewed by: Quality Manager
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**TD-CDMA Frequency Stability Measurements (Cont'd)**  
§2.1055, §27.54



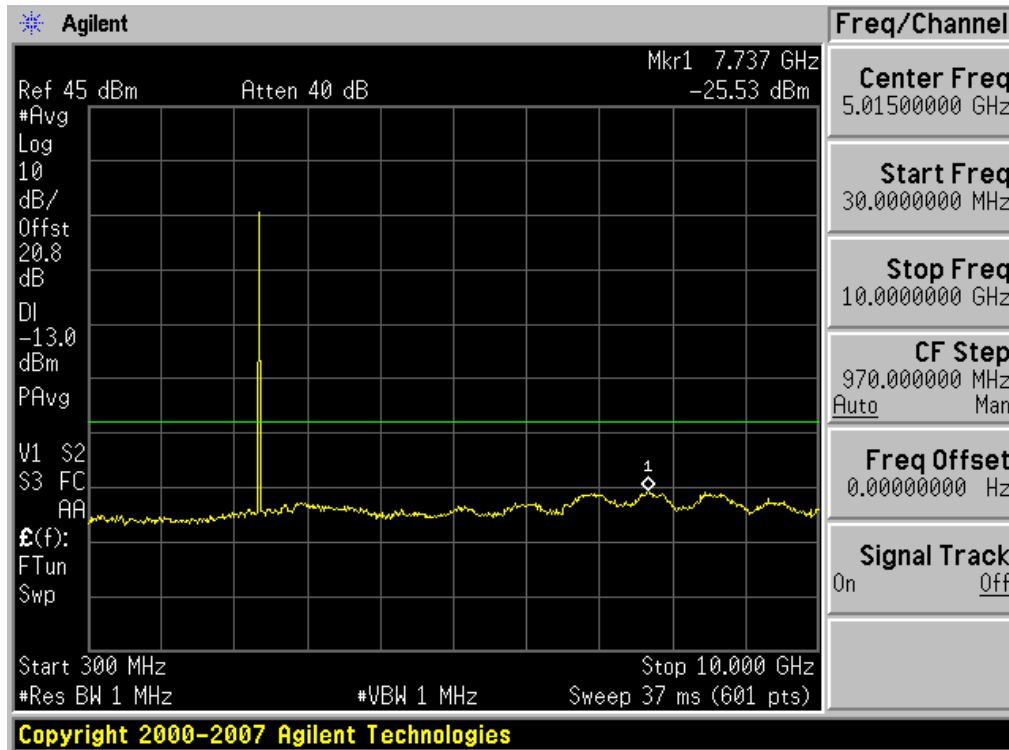
**Figure 6-2. Frequency Stability Graph (TD-CDMA Mode)**

**Note:**

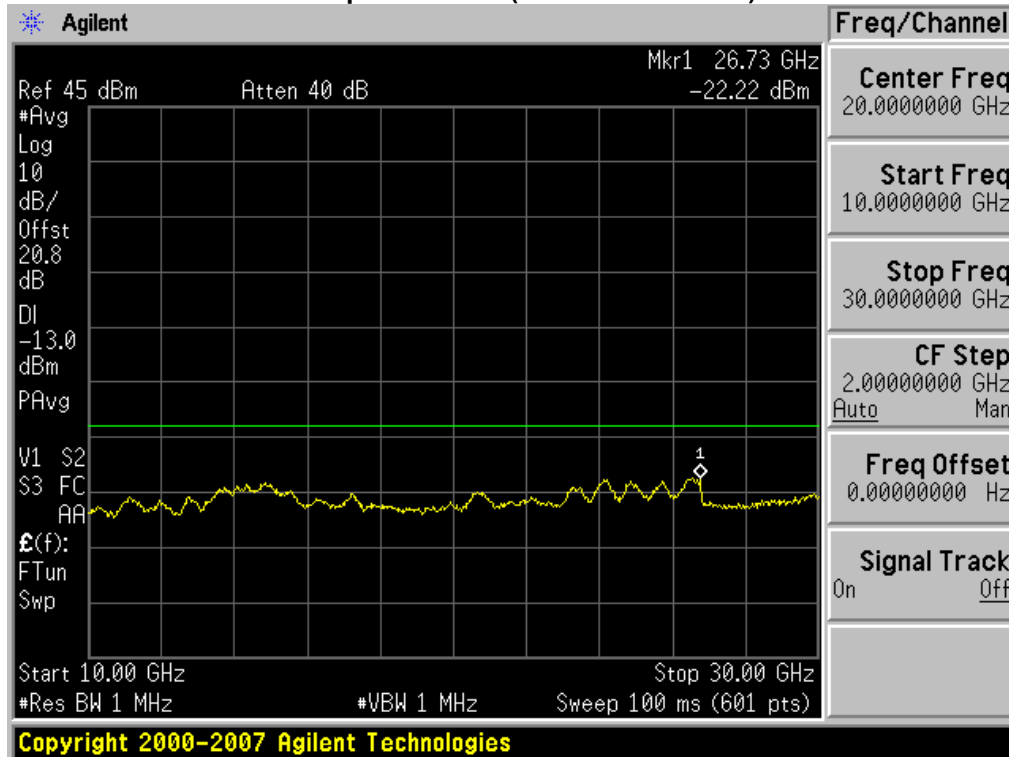
The frequency deviation was measured to ensure that the channels emissions remained within the authorized band with varying temperature and voltage.

FCC ID: PKTNODEBAMF		FCC Pt. 27 / 802.16e TD-CDMA MEASUREMENT REPORT (CERTIFICATION)	 Reviewed by: Quality Manager
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## 7.0 PLOT(S) OF EMISSIONS – TD-CDMA

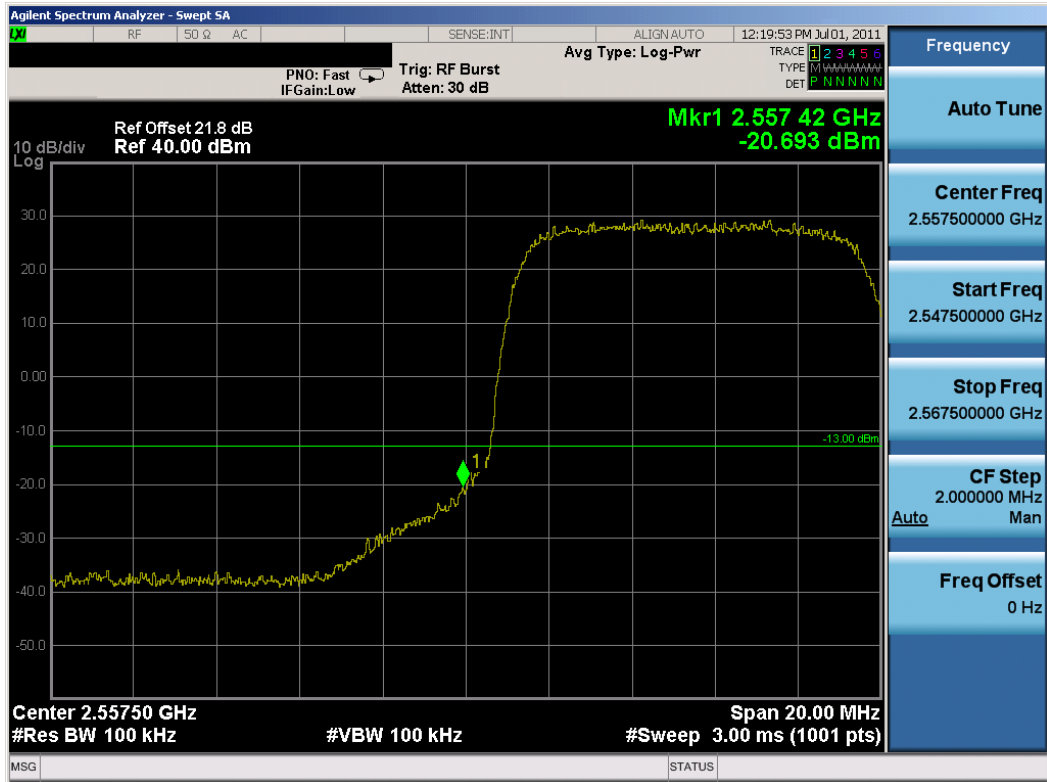


**Plot 7-1. Conducted Spurious Plot (TD-CDMA – QPSK) Antenna Port 1**

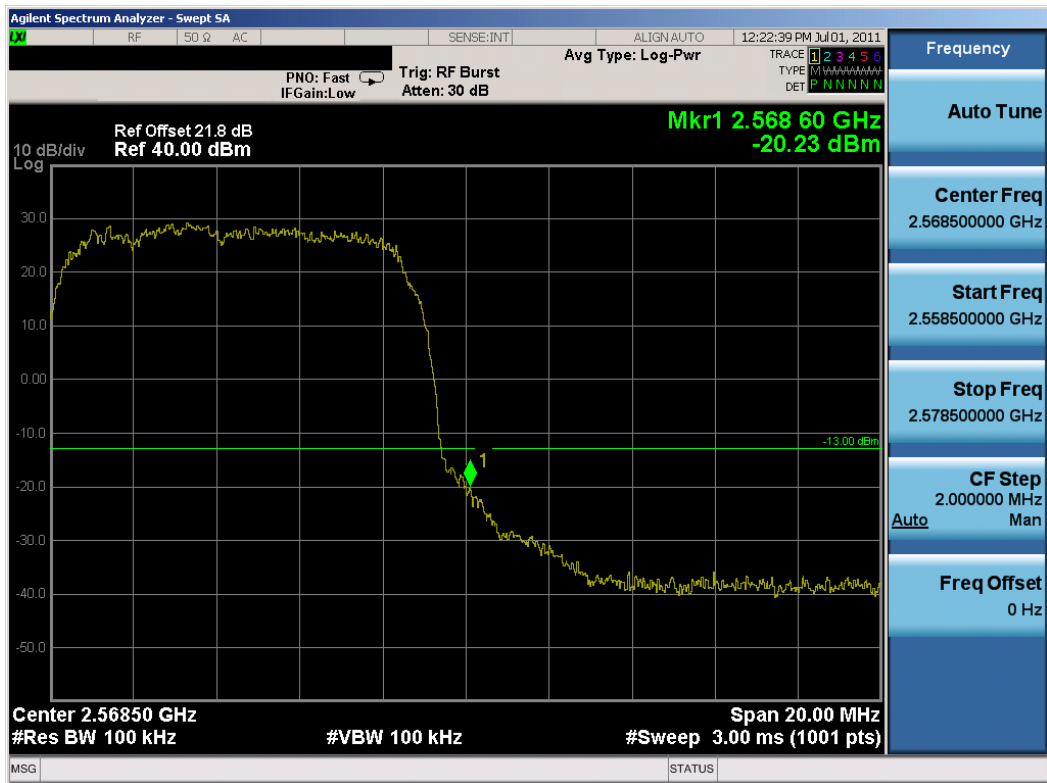


**Plot 7-2. Conducted Spurious Plot (TD-CDMA – QPSK) Antenna Port 1**

FCC ID: PKTNODEBAMF	<b>PCTEST</b> ENGINEERING LABORATORY, INC.	FCC Pt. 27 / 802.16e TD-CDMA MEASUREMENT REPORT (CERTIFICATION)	<b>IPWireless</b>	Reviewed by: Quality Manager
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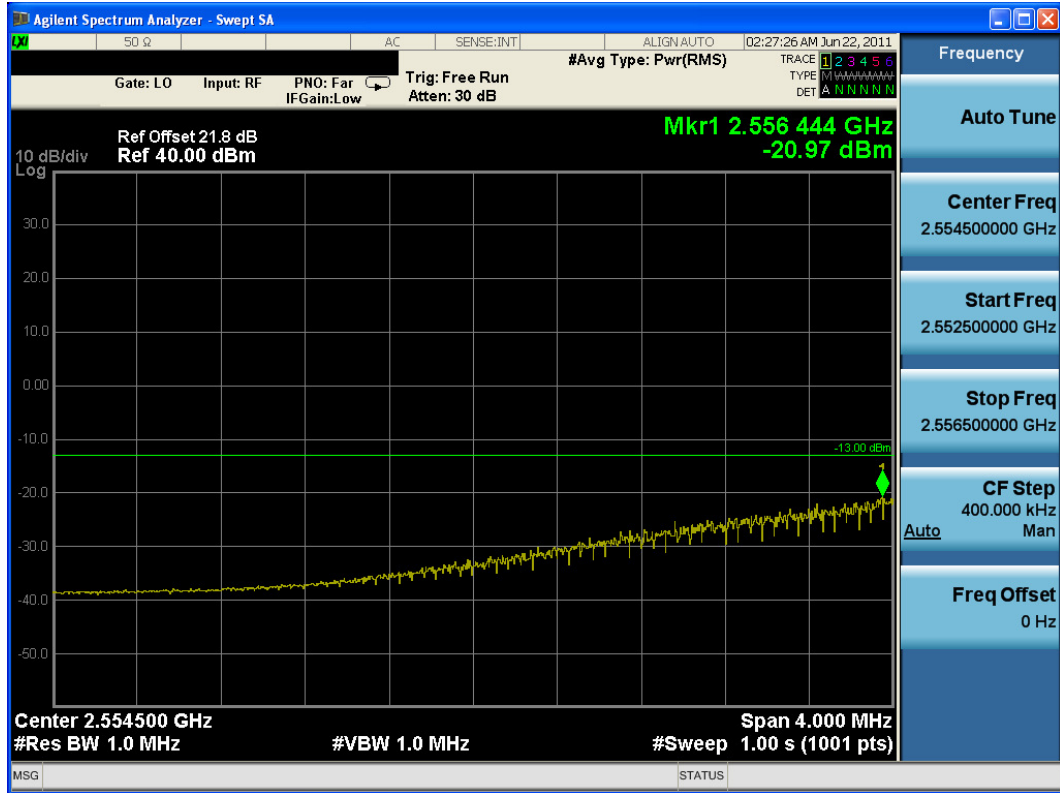
Plot 7-3. Channel Edge Plot (TD-CDMA QPSK ) Antenna Port 1



Plot 7-4. Channel Edge Plot (TD-CDMA QPSK) Antenna Port 1

FCC ID: PKTNODEBAMF	<b>PCTEST</b> ENGINEERING LABORATORY, INC.	FCC Pt. 27 / 802.16e TD-CDMA MEASUREMENT REPORT (CERTIFICATION)	<b>IPWireless</b>	Reviewed by: Quality Manager
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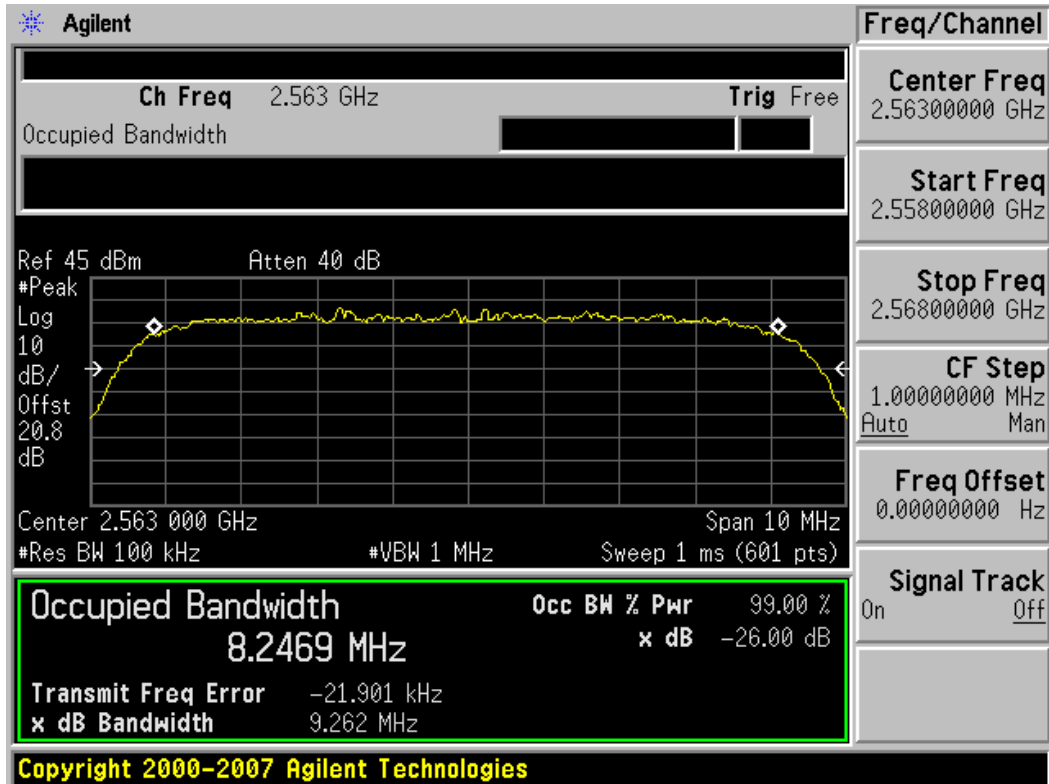


Plot 7-5. Lo 4MHz Plot (TD-CDMA QPSK) Antenna Port 1

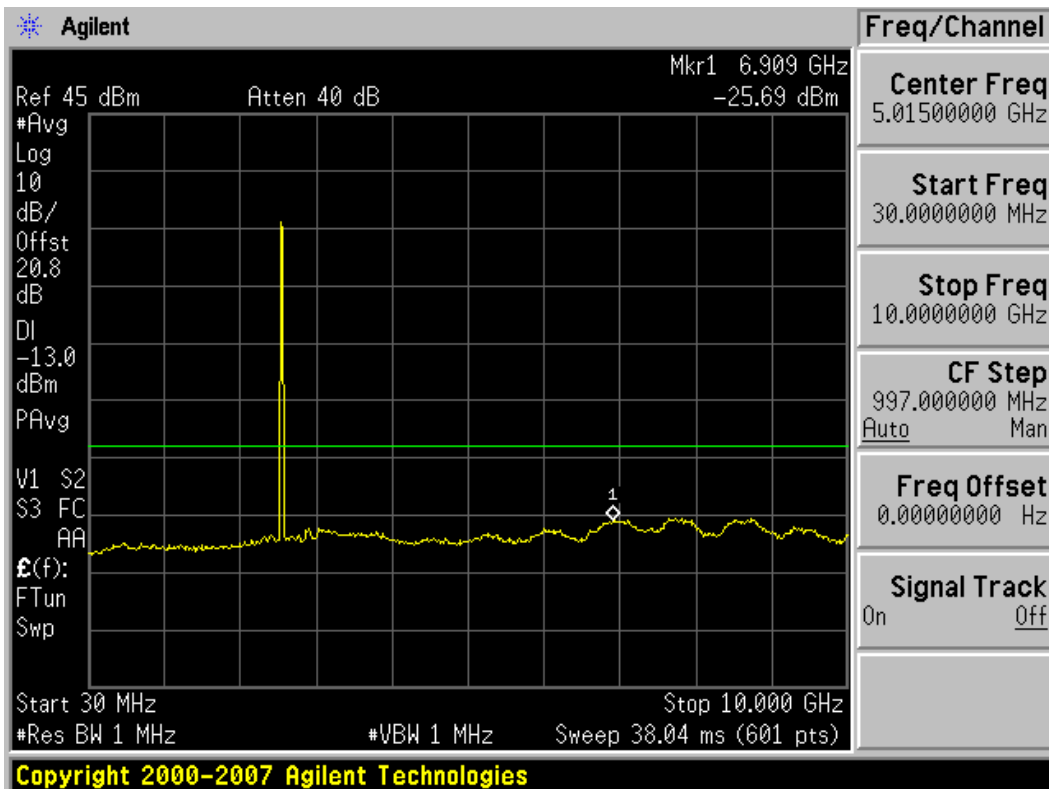


Plot 7-6. Hi 4MHz Plot (TD-CDMA - QPSK) Antenna Port 1

FCC ID: PKTNOBAMF	<b>PCTEST</b> ENGINEERING LABORATORY, INC.	FCC Pt. 27 / 802.16e TD-CDMA MEASUREMENT REPORT (CERTIFICATION)	<b>IPWireless</b>	Reviewed by: Quality Manager
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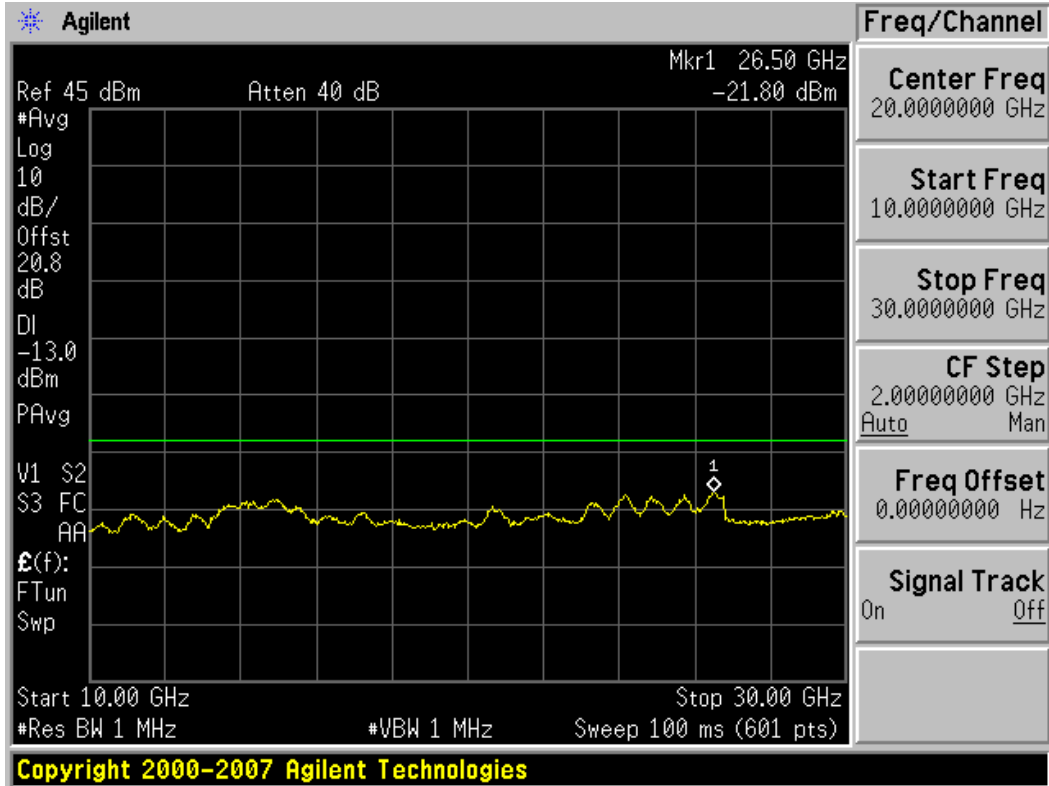


Plot 7-7. Occupied Bandwidth Plot (TD-CDMA QPSK) Antenna Port 1

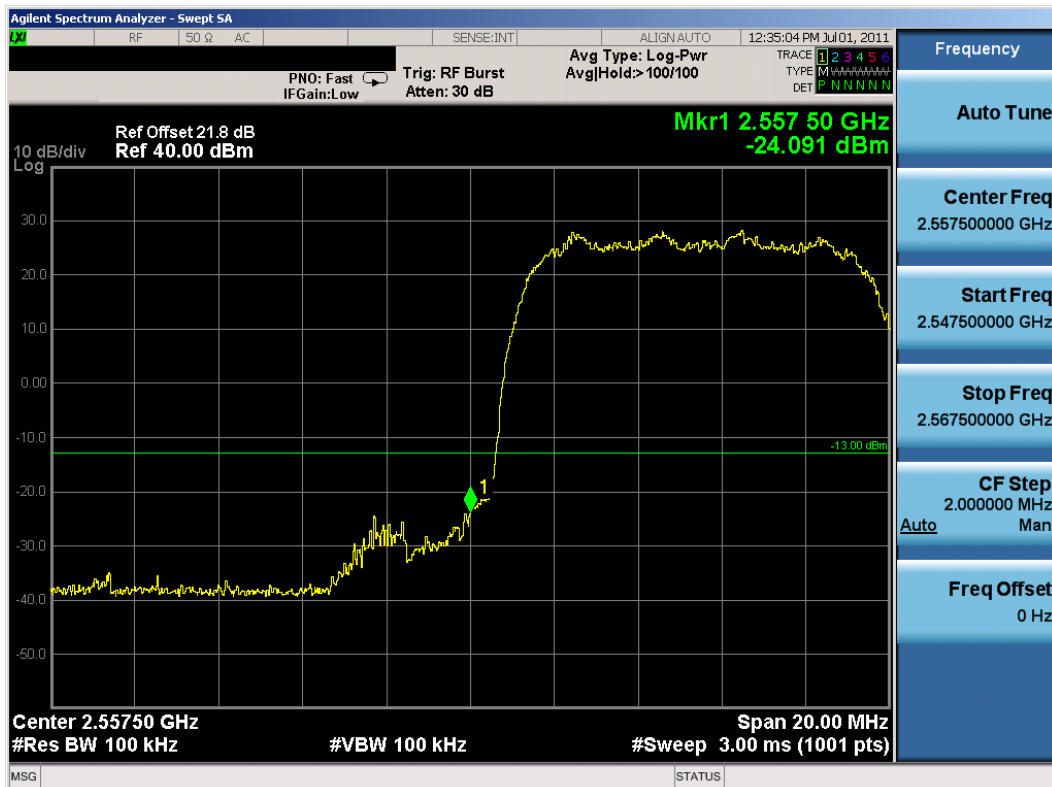


Plot 7-8. Conducted Spurious Plot (TD-CDMA - 16QAM) Antenna Port 1

FCC ID: PKTNODEBAMF	<b>PCTEST</b> ENGINEERING LABORATORY, INC.	FCC Pt. 27 / 802.16e TD-CDMA MEASUREMENT REPORT (CERTIFICATION)	<b>IPWireless</b>	Reviewed by: Quality Manager
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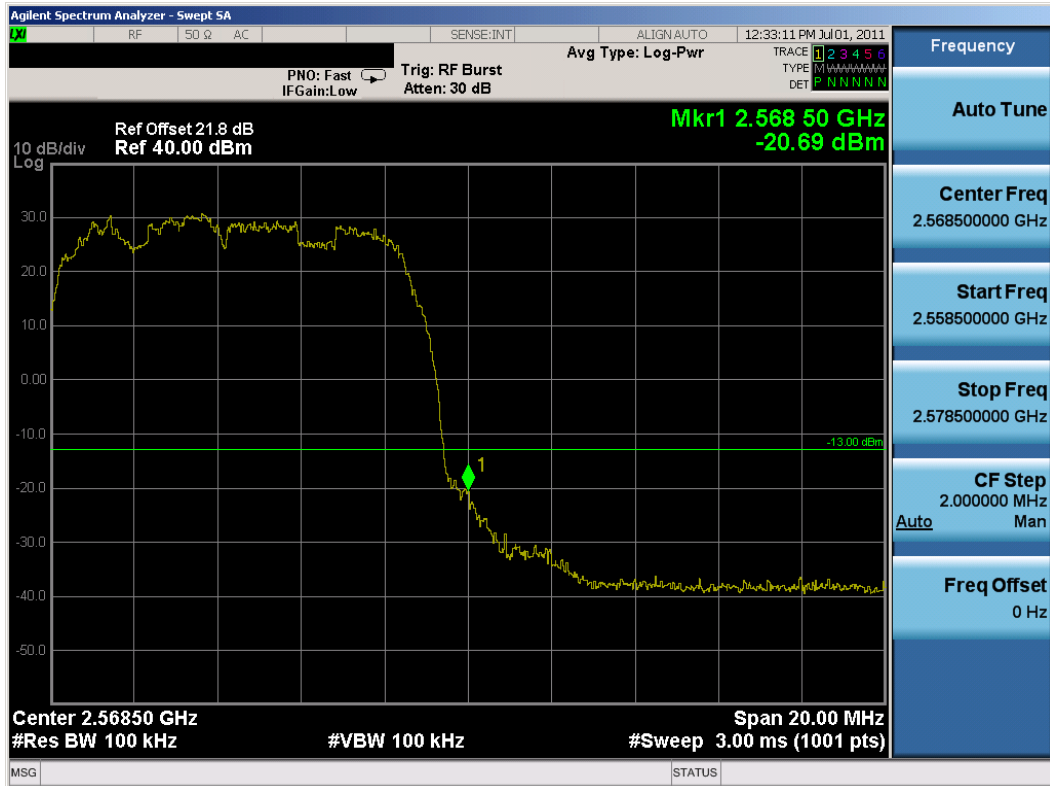


Plot 7-9. Conducted Spurious Plot (TD-CDMA – 16QAM) Antenna Port 1

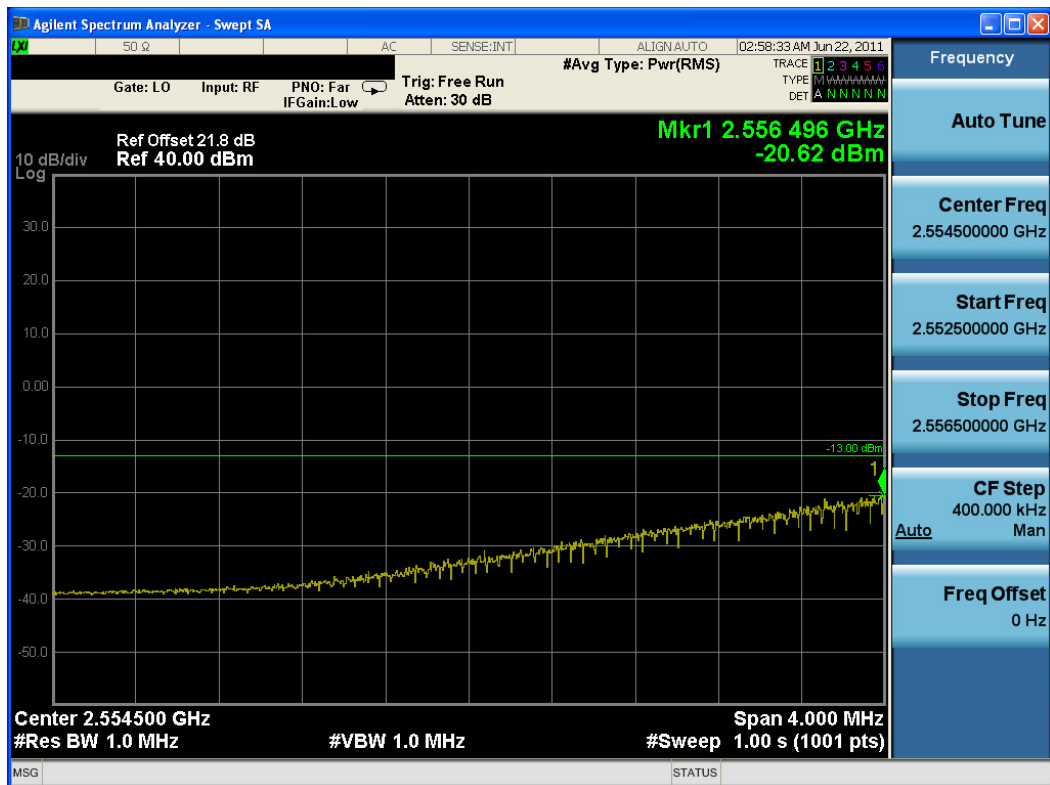


Plot 7-10. Channel Edge Plot (TD-CDMA 16QAM) Antenna Port 1

FCC ID: PKTNODEBAMF	<b>PCTEST</b> ENGINEERING LABORATORY, INC.	FCC Pt. 27 / 802.16e TD-CDMA MEASUREMENT REPORT (CERTIFICATION)	<b>IPWireless</b>	Reviewed by: Quality Manager
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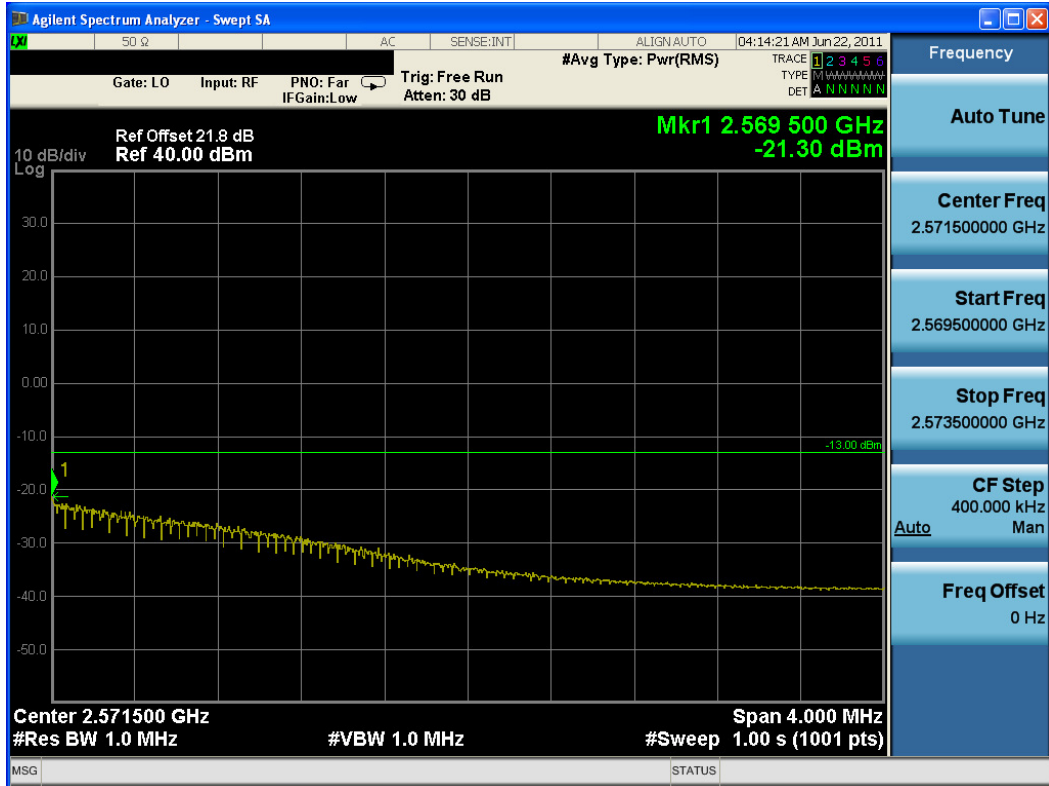


Plot 7-11. Channel Edge Plot (TD-CDMA 16QAM) Antenna Port 1

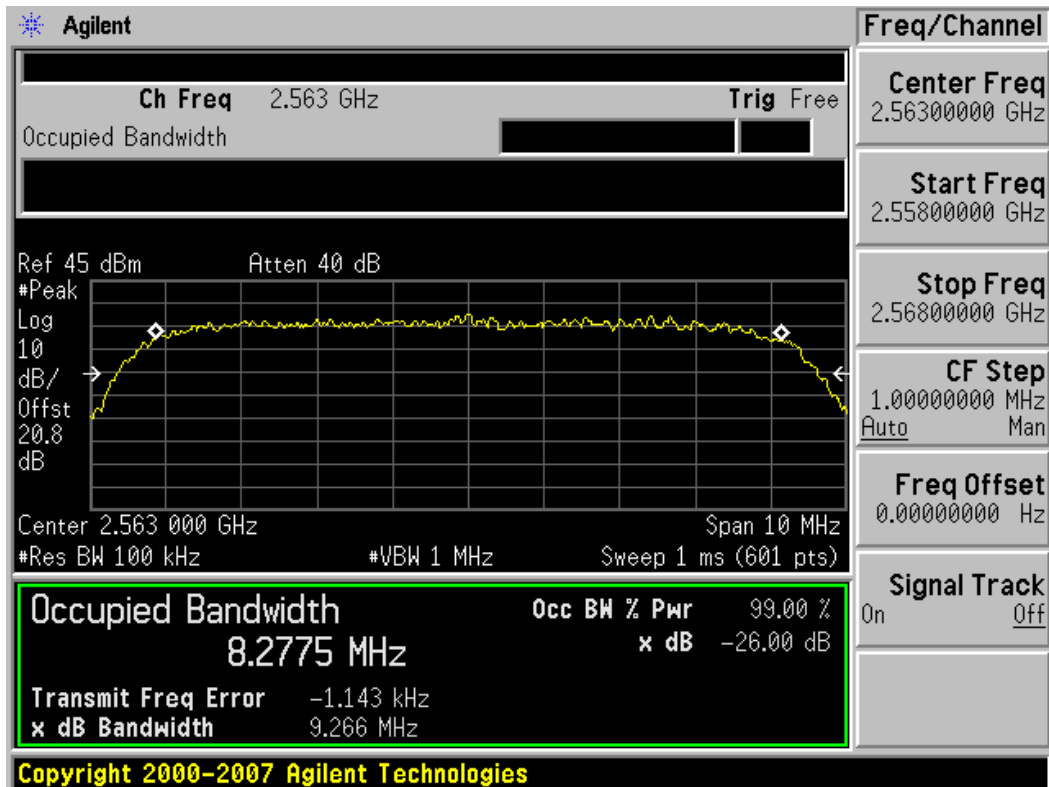


Plot 7-12. Lo 4MHz Plot (TD-CDMA 16-QAM) Antenna Port 1

FCC ID: PKTNODEBAMF	<b>PCTEST</b> ENGINEERING LABORATORY, INC.	FCC Pt. 27 / 802.16e TD-CDMA MEASUREMENT REPORT (CERTIFICATION)	<b>IPWireless</b>	Reviewed by: Quality Manager
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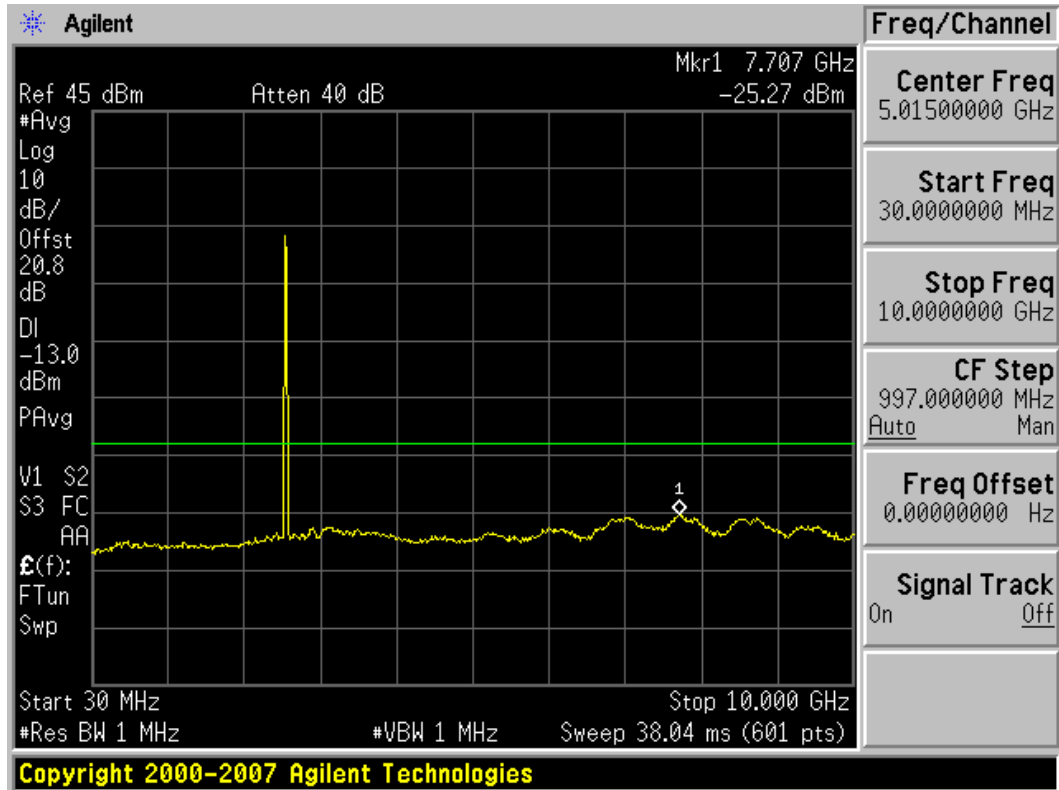


Plot 7-13. Hi 4MHz Plot (TD-CDMA 16-QAM) Antenna Port 1

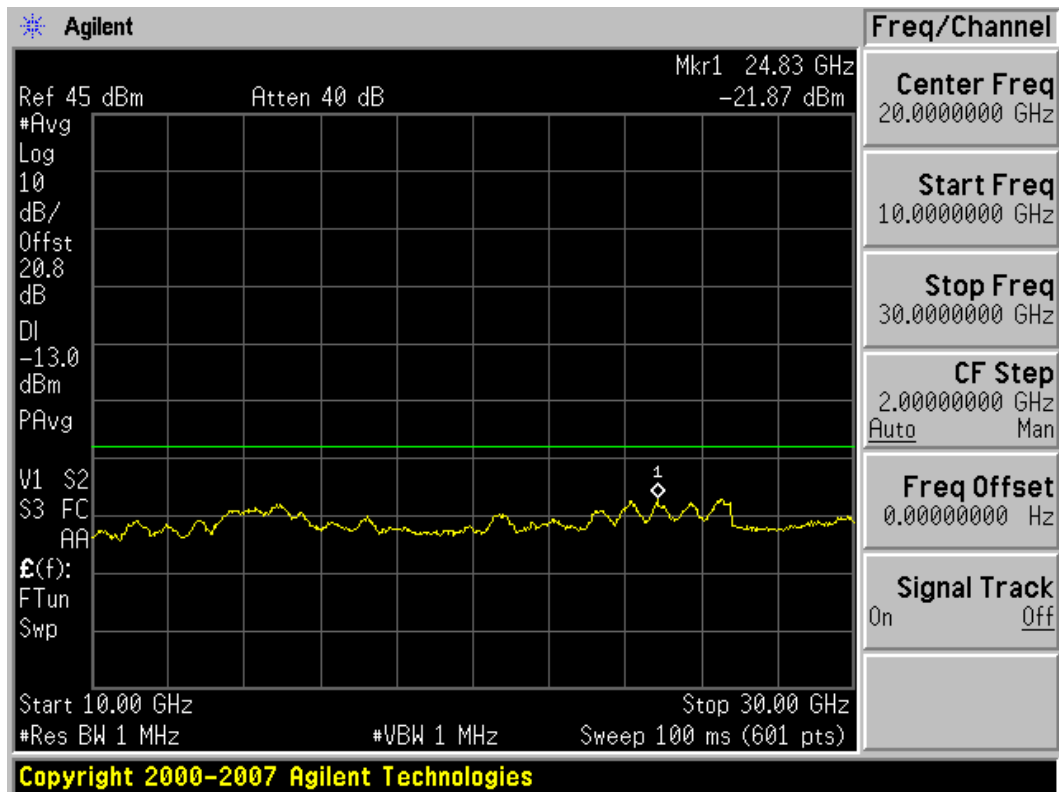


Plot 7-14. Occupied Bandwidth Plot (TD-CDMA 16QAM) Antenna Port 1

FCC ID: PKTNODEBAMF	<b>PCTEST</b> ENGINEERING LABORATORY, INC.	FCC Pt. 27 / 802.16e TD-CDMA MEASUREMENT REPORT (CERTIFICATION)	<b>IPWireless</b>	Reviewed by: Quality Manager
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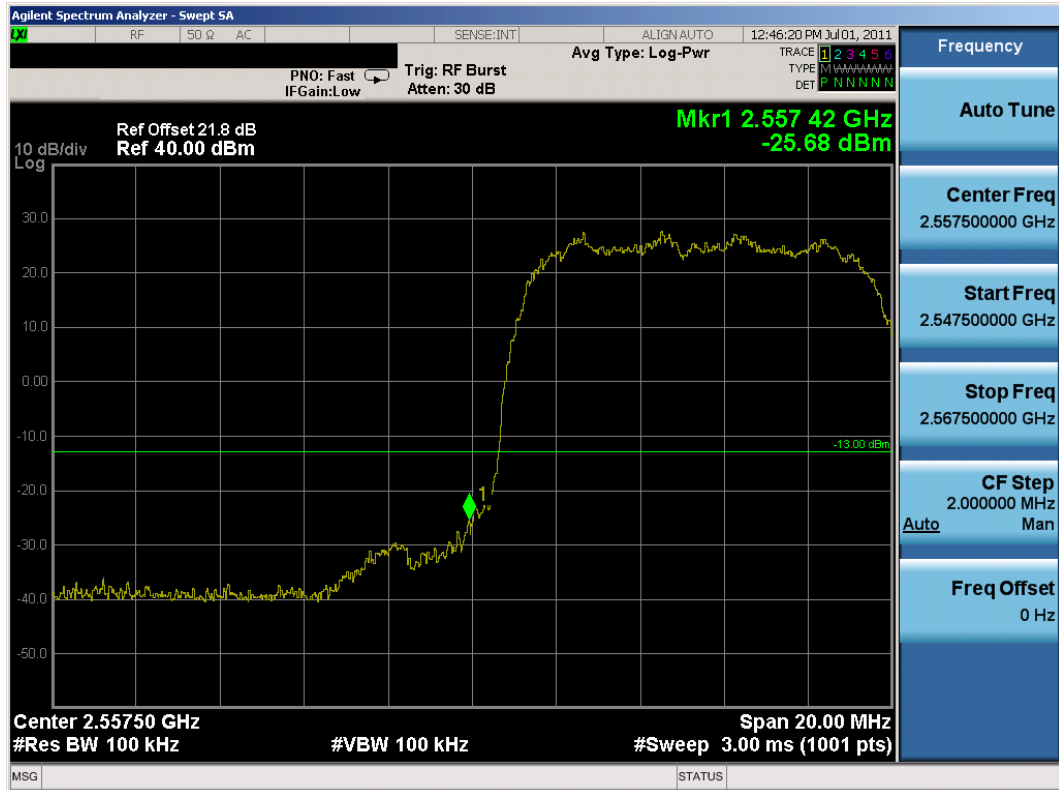
Plot 7-15. Conducted Spurious Plot (TD-CDMA -64QAM) Antenna Port 1



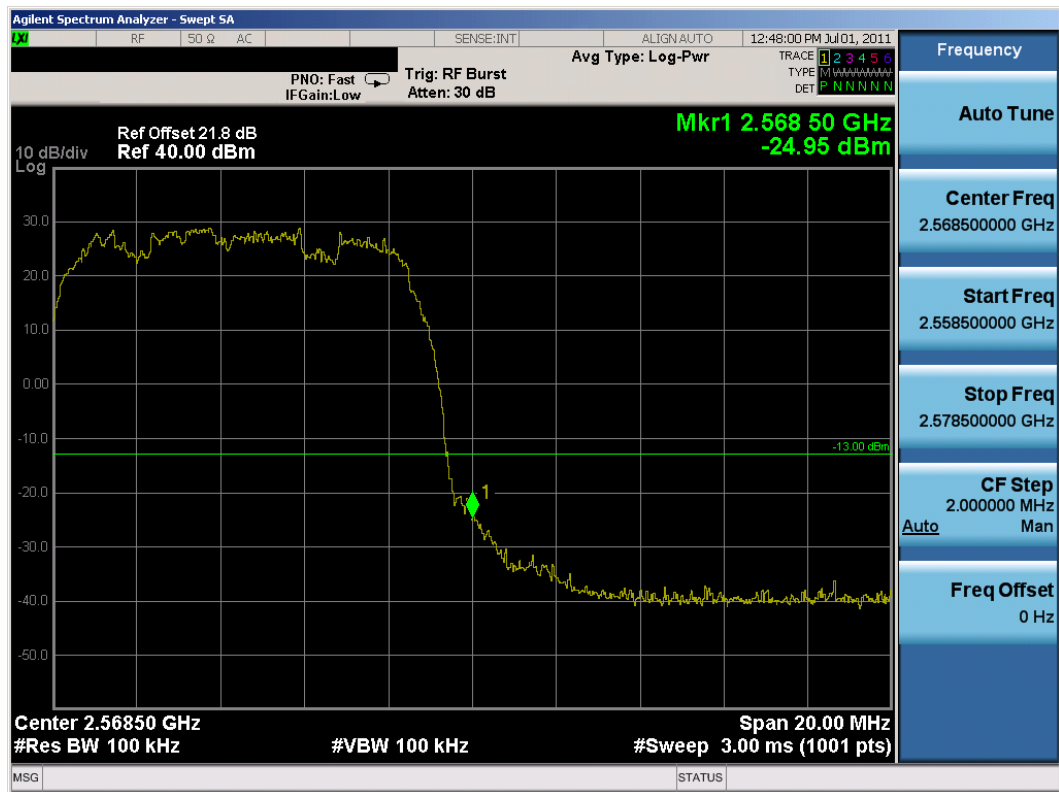
Plot 7-16. Conducted Spurious Plot (TD-CDMA -64QAM) Antenna Port 1

FCC ID: PKTNODEBAMF	PCTEST ENGINEERING LABORATORY, INC.	FCC Pt. 27 / 802.16e TD-CDMA MEASUREMENT REPORT (CERTIFICATION)	IPWireless	Reviewed by: Quality Manager
Test Report S/N: 0Y1011041796.PKT	Test Dates: May 23 - July 1, 2011	EUT Type: 2.5GHz Band Single Channel Shelf		Page 26 of 40



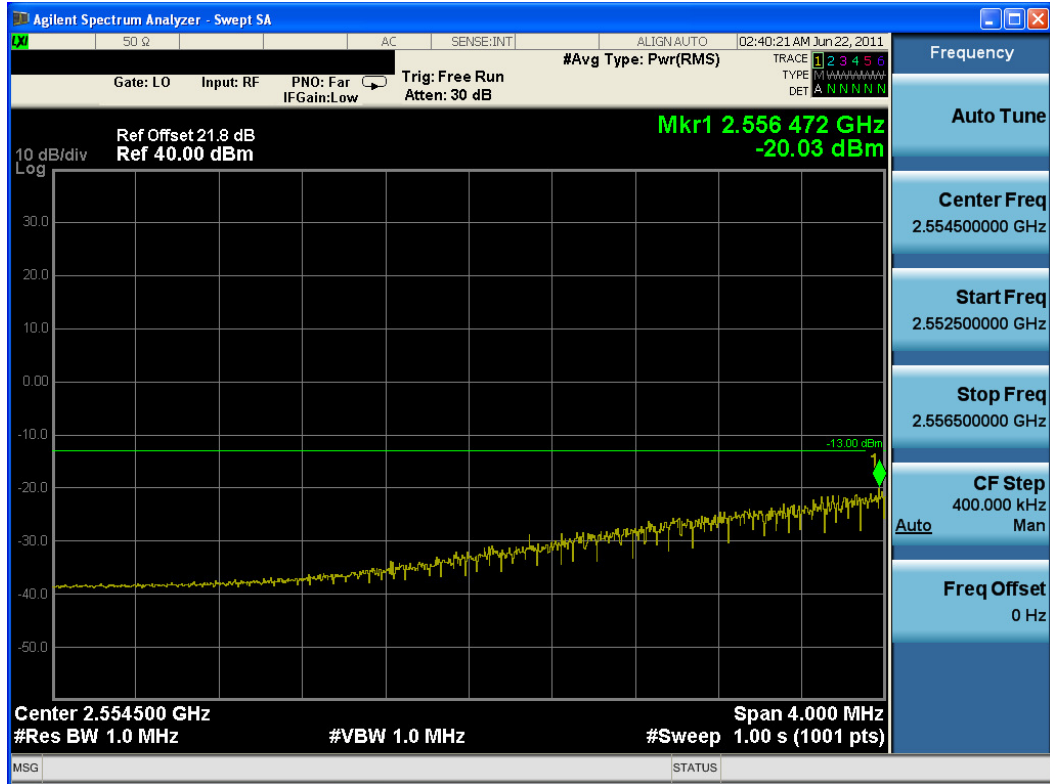


Plot 7-17. Channel Edge Plot (TD-CDMA 64QAM) Antenna Port 1



Plot 7-18. Channel Edge Plot (TD-CDMA 64QAM) Antenna Port 1

FCC ID: PKTNODEBAMF	<b>PCTEST</b> ENGINEERING LABORATORY, INC.	FCC Pt. 27 / 802.16e TD-CDMA MEASUREMENT REPORT (CERTIFICATION)	<b>IPWireless</b>	Reviewed by: Quality Manager
Test Report S/N: 0Y1011041796.PKT	Test Dates: May 23 - July 1, 2011	EUT Type: 2.5GHz Band Single Channel Shelf		Page 27 of 40

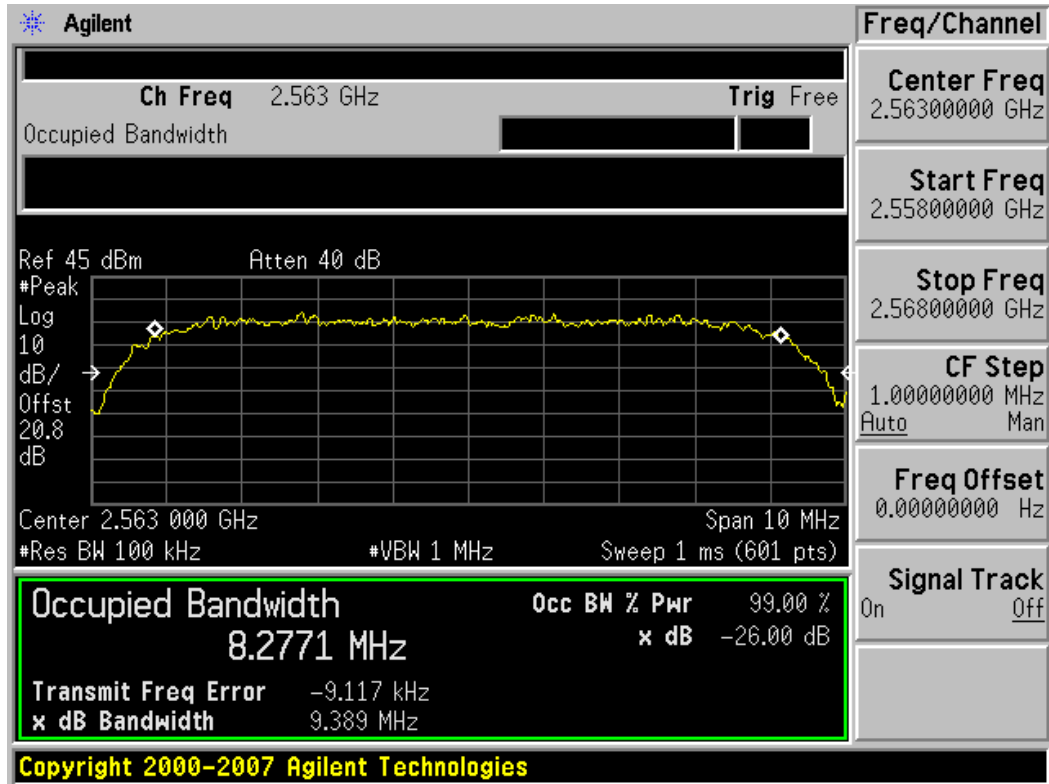


**Plot 7-19. Lo 4MHz Plot (TD-CDMA 64-QAM) Antenna Port 1**

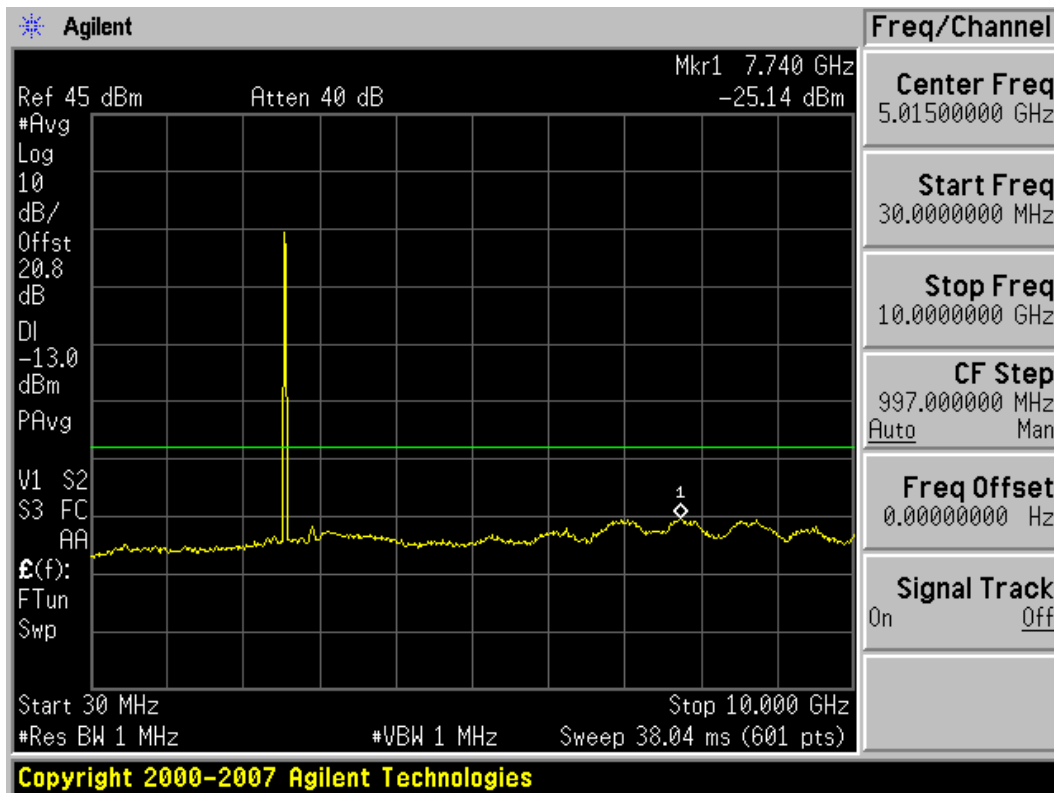


**Plot 7-20. Hi 4MHz Plot (TD-CDMA 64-QAM) Antenna Port 1**

FCC ID: PKTNODEBAMF	PCTEST ENGINEERING LABORATORY, INC.	FCC Pt. 27 / 802.16e TD-CDMA MEASUREMENT REPORT (CERTIFICATION)	IPWireless	Reviewed by: Quality Manager
Test Report S/N: 0Y1011041796.PKT	Test Dates: May 23 - July 1, 2011	EUT Type: 2.5GHz Band Single Channel Shelf		Page 28 of 40

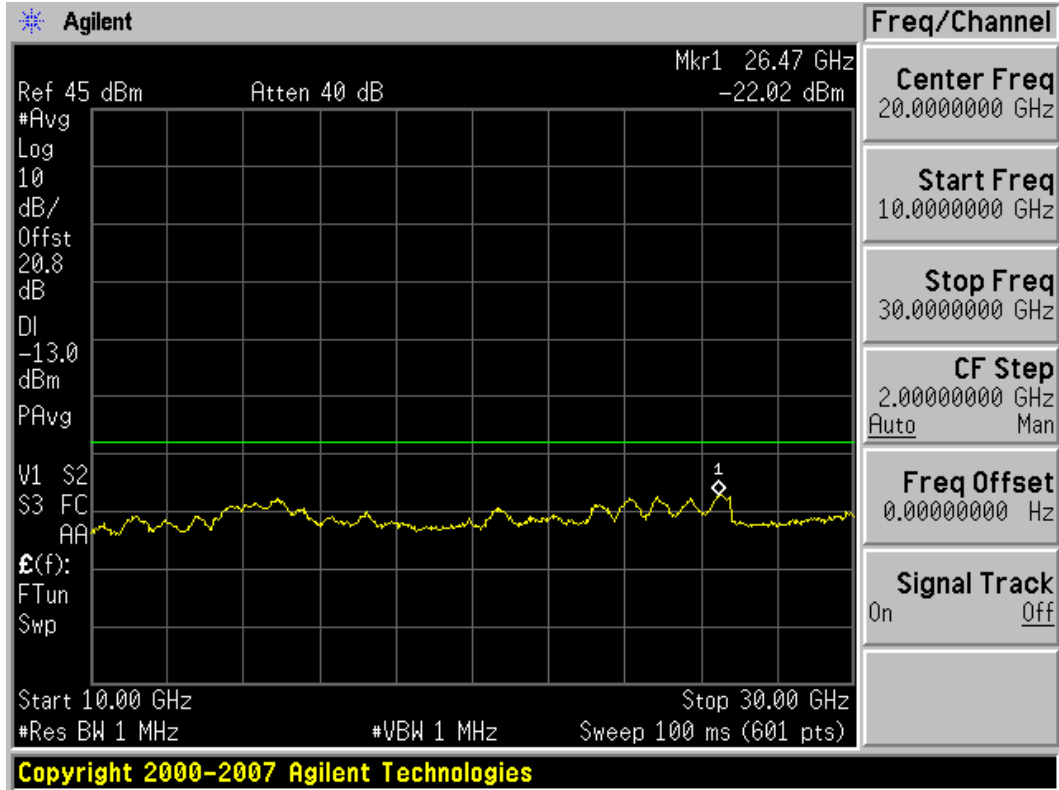


Plot 7-21. Occupied Bandwidth Plot (TD-CDMA 64QAM) Antenna Port 1

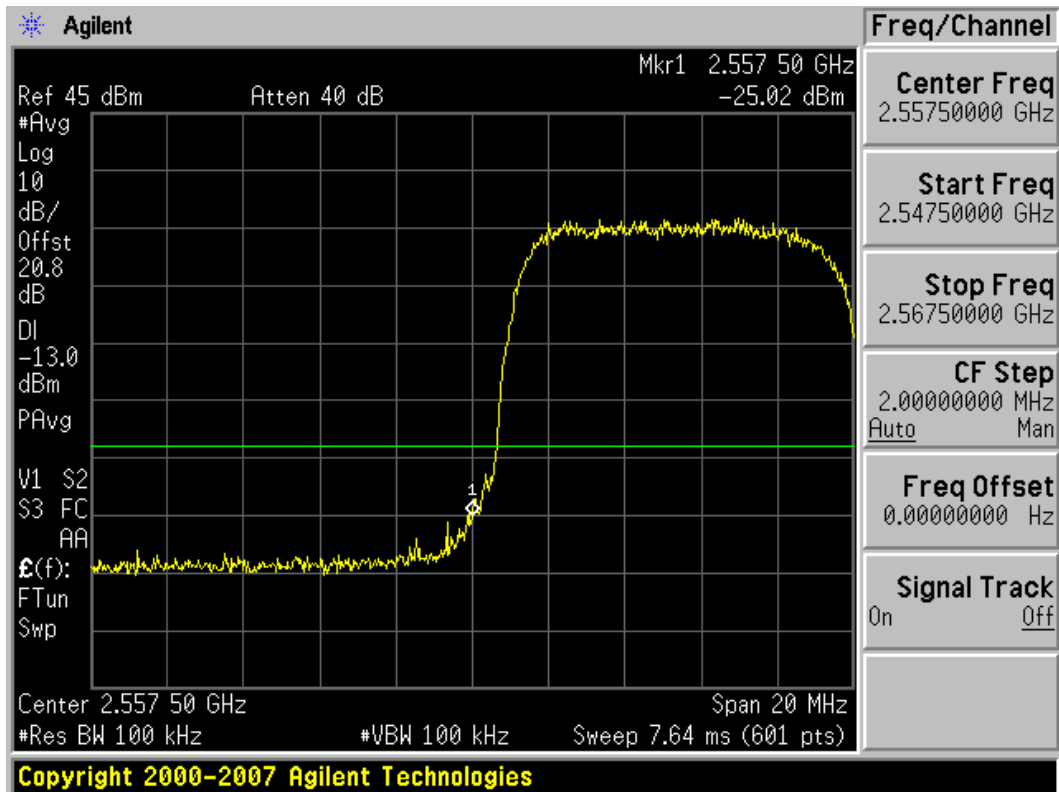


Plot 7-22. Conducted Spurious Plot (TD-CDMA - QPSK) Antenna Port 2

FCC ID: PKTNODEBAMF	<b>PCTEST</b> ENGINEERING LABORATORY, INC.	FCC Pt. 27 / 802.16e TD-CDMA MEASUREMENT REPORT (CERTIFICATION)	<b>IPWireless</b>	Reviewed by: Quality Manager
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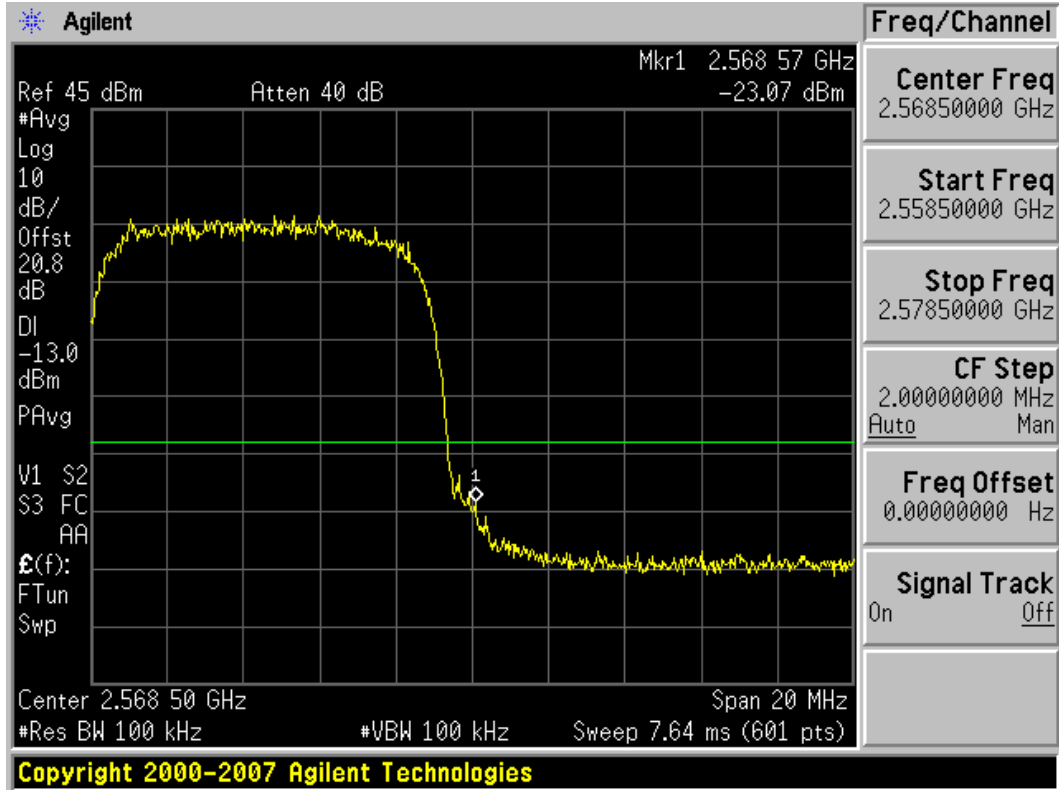


Plot 7-23. Conducted Spurious Plot (TD-CDMA – QPSK) Antenna Port 2



Plot 7-24. Channel Edge Plot (TD-CDMA QPSK ) Antenna Port 2

FCC ID: PKTNODEBAMF	PCTEST ENGINEERING LABORATORY, INC.	FCC Pt. 27 / 802.16e TD-CDMA MEASUREMENT REPORT (CERTIFICATION)	IPWireless	Reviewed by: Quality Manager
Test Report S/N: 0Y1011041796.PKT	Test Dates: May 23 - July 1, 2011	EUT Type: 2.5GHz Band Single Channel Shelf		Page 30 of 40



Plot 7-25. Channel Edge Plot (TD-CDMA QPSK) Antenna Port 2

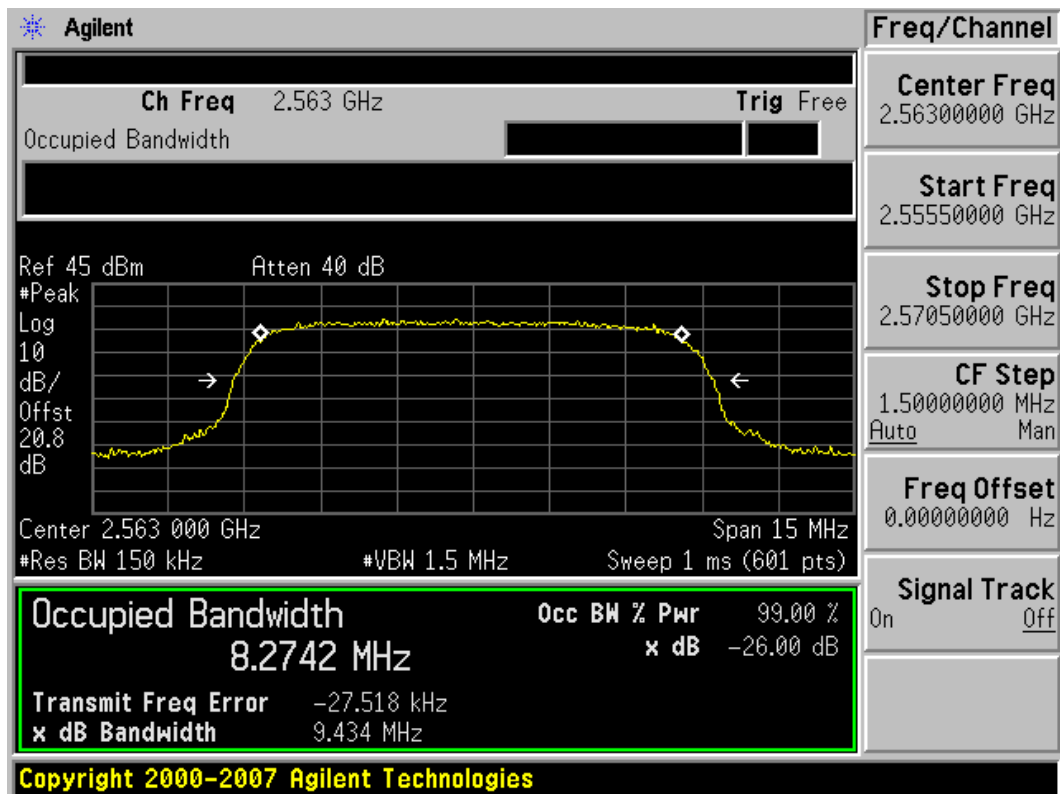


Plot 7-26. Lo 4MHz Plot (TD-CDMA QPSK) Antenna Port 2

FCC ID: PKTNODEBAMF	<b>PCTEST</b> ENGINEERING LABORATORY, INC.	FCC Pt. 27 / 802.16e TD-CDMA MEASUREMENT REPORT (CERTIFICATION)	<b>IPWireless</b>	Reviewed by: Quality Manager
Test Report S/N: 0Y1011041796.PKT	Test Dates: May 23 - July 1, 2011	EUT Type: 2.5GHz Band Single Channel Shelf		Page 31 of 40

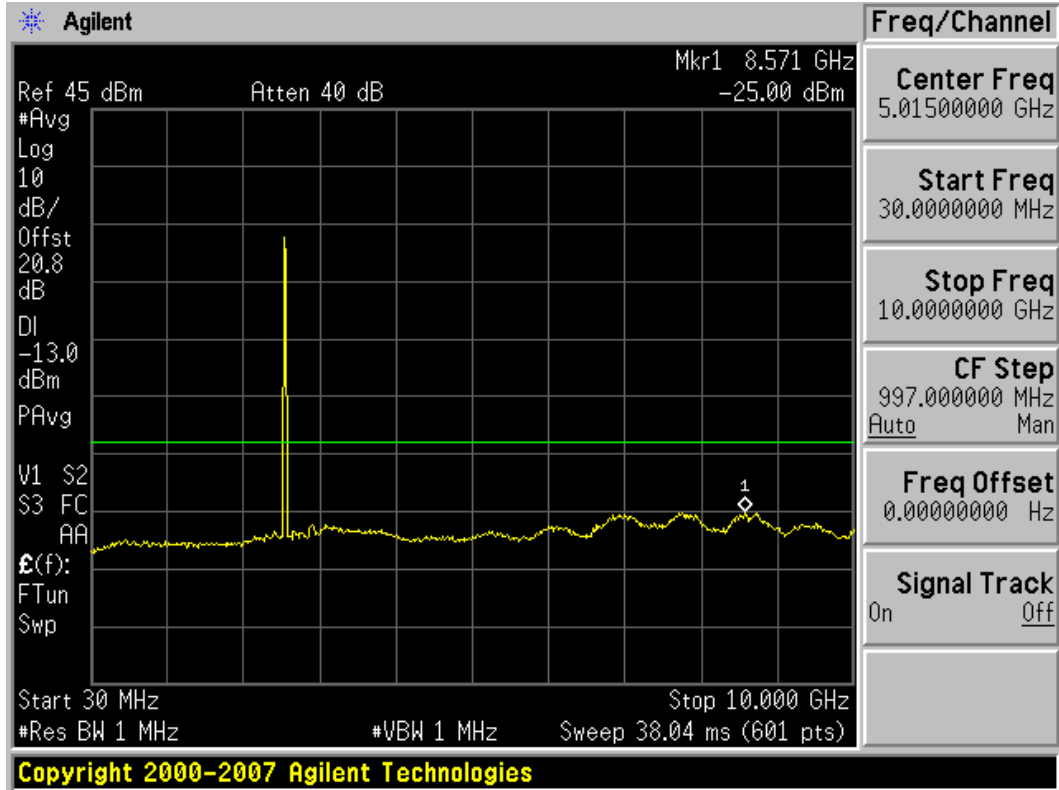


Plot 7-27. Hi 4MHz Plot (TD-CDMA – QPSK) Antenna Port 2

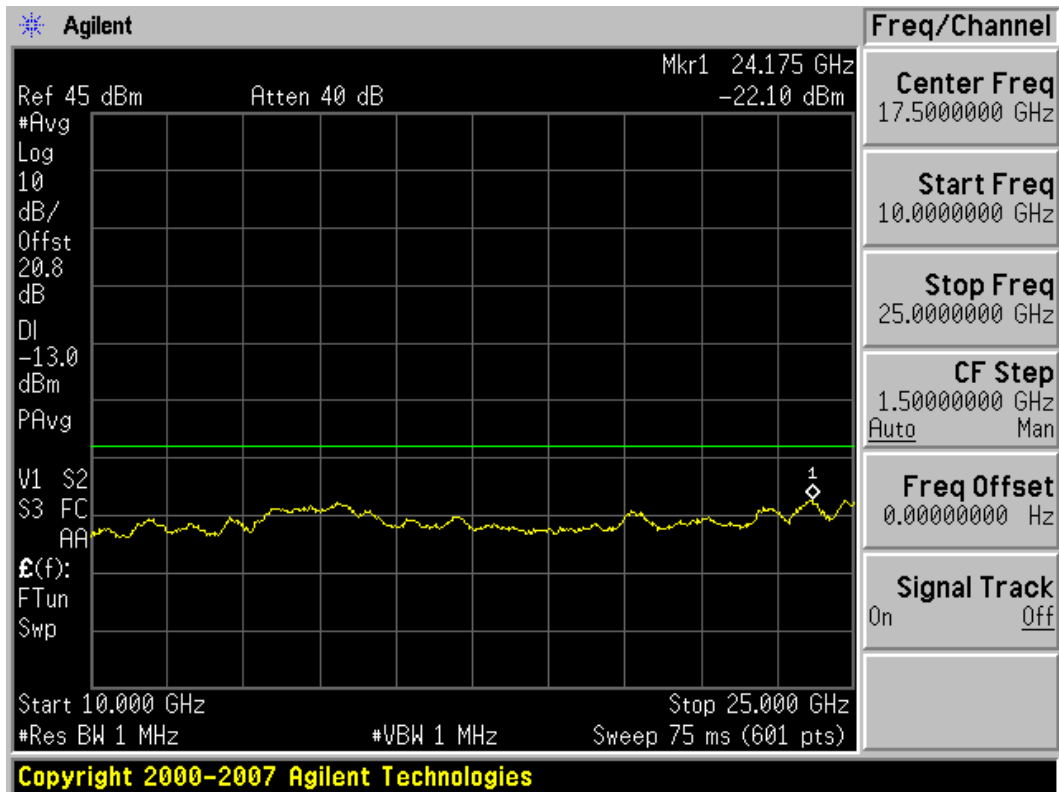


Plot 7-28. Occupied Bandwidth Plot (TD-CDMA QPSK) Antenna Port 2

FCC ID: PKTNODEBAMF	<b>PCTEST</b> ENGINEERING LABORATORY, INC.	FCC Pt. 27 / 802.16e TD-CDMA MEASUREMENT REPORT (CERTIFICATION)	<b>IPWireless</b>	Reviewed by: Quality Manager
Test Report S/N: 0Y1011041796.PKT	Test Dates: May 23 - July 1, 2011	EUT Type: 2.5GHz Band Single Channel Shelf		Page 32 of 40

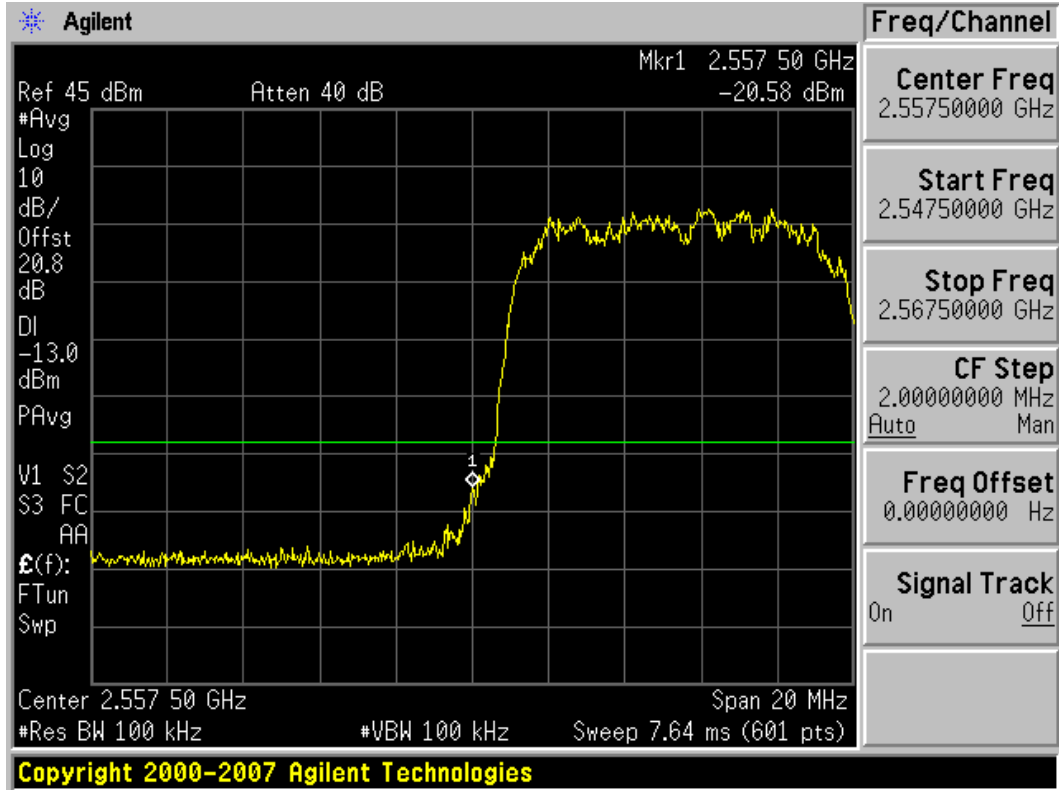


Plot 7-29. Conducted Spurious Plot (TD-CDMA – 16QAM) Antenna Port 2

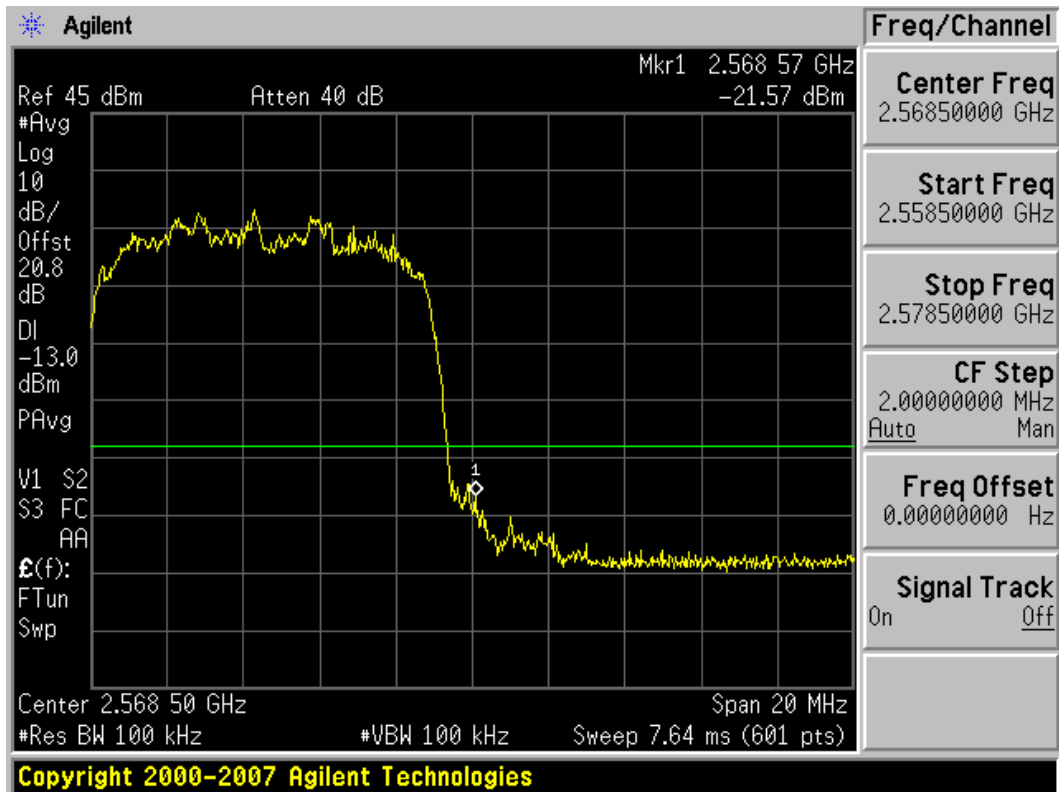


Plot 7-30. Conducted Spurious Plot (TD-CDMA – 16QAM) Antenna Port 2

FCC ID: PKTNODEBAMF	PCTEST	FCC Pt. 27 / 802.16e TD-CDMA MEASUREMENT REPORT (CERTIFICATION)		Reviewed by: Quality Manager
Test Report S/N: 0Y1011041796.PKT	Test Dates: May 23 - July 1, 2011	EUT Type: 2.5GHz Band Single Channel Shelf		Page 33 of 40



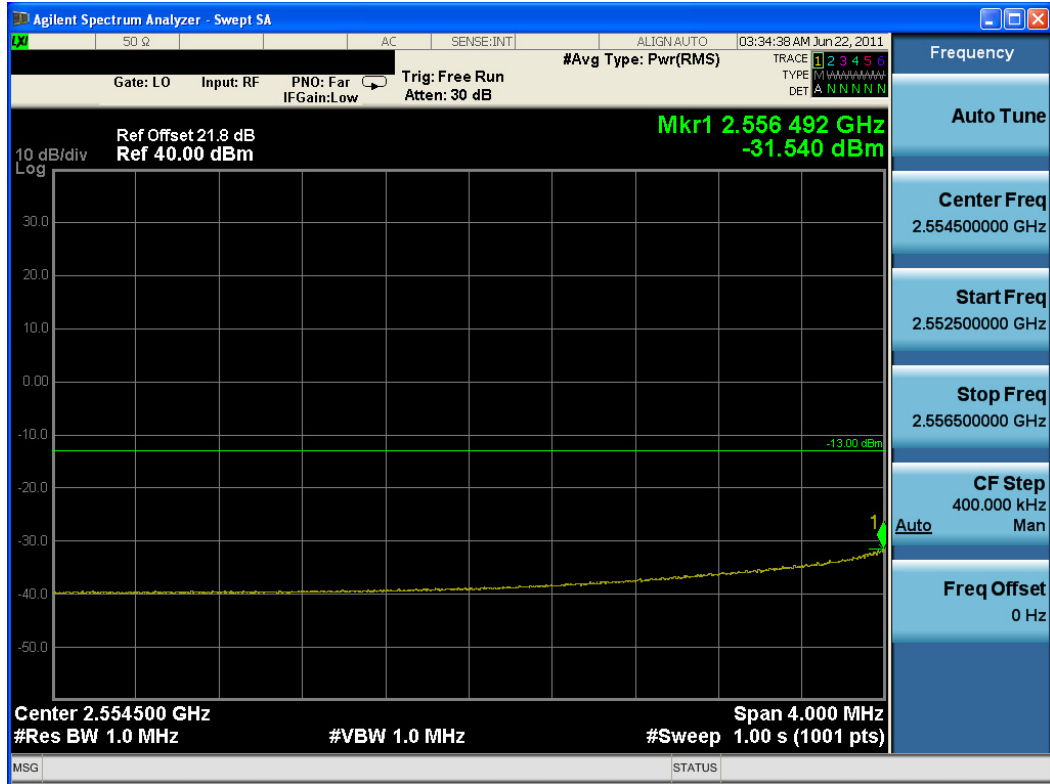
Plot 7-31. Channel Edge Plot (TD-CDMA 16QAM) Antenna Port 2



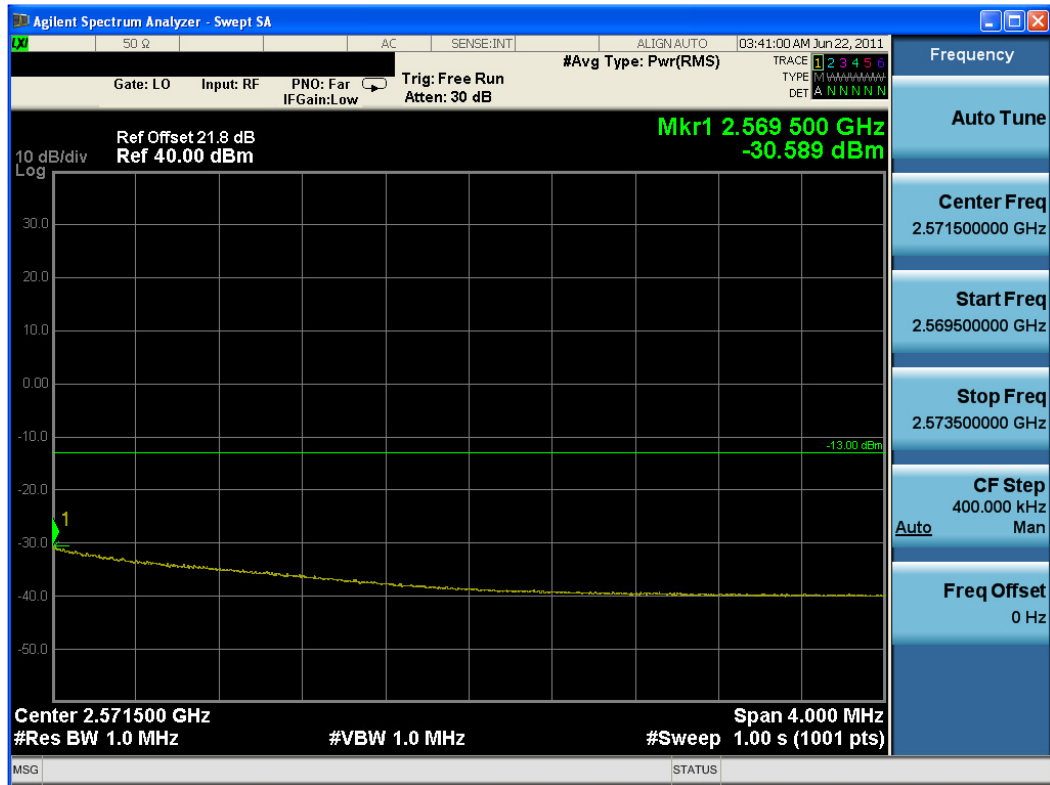
Plot 7-32. Channel Edge Plot (TD-CDMA 16QAM) Antenna Port 2

FCC ID: PKTNODEBAMF	PCTEST ENGINEERING LABORATORY, INC.	FCC Pt. 27 / 802.16e TD-CDMA MEASUREMENT REPORT (CERTIFICATION)	IPWireless	Reviewed by: Quality Manager
Test Report S/N: 0Y1011041796.PKT	Test Dates: May 23 - July 1, 2011	EUT Type: 2.5GHz Band Single Channel Shelf		Page 34 of 40



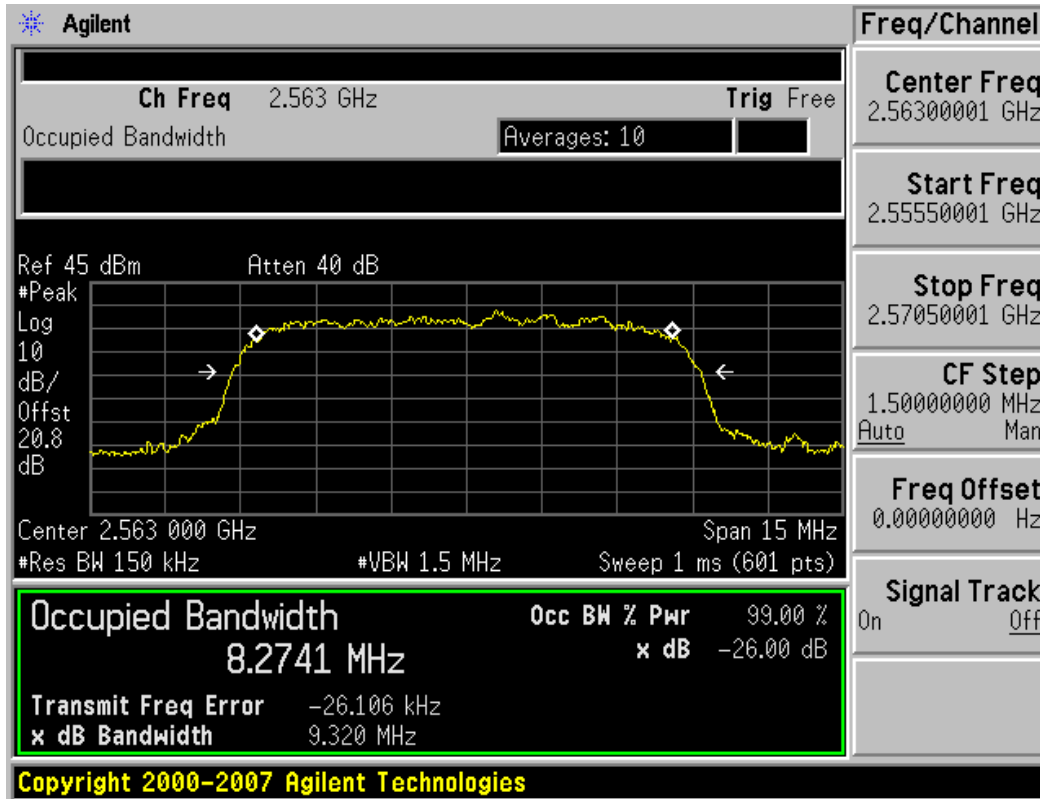


**Plot 7-33. Lo 4MHz Plot (TD-CDMA 16QAM) Antenna Port 2**

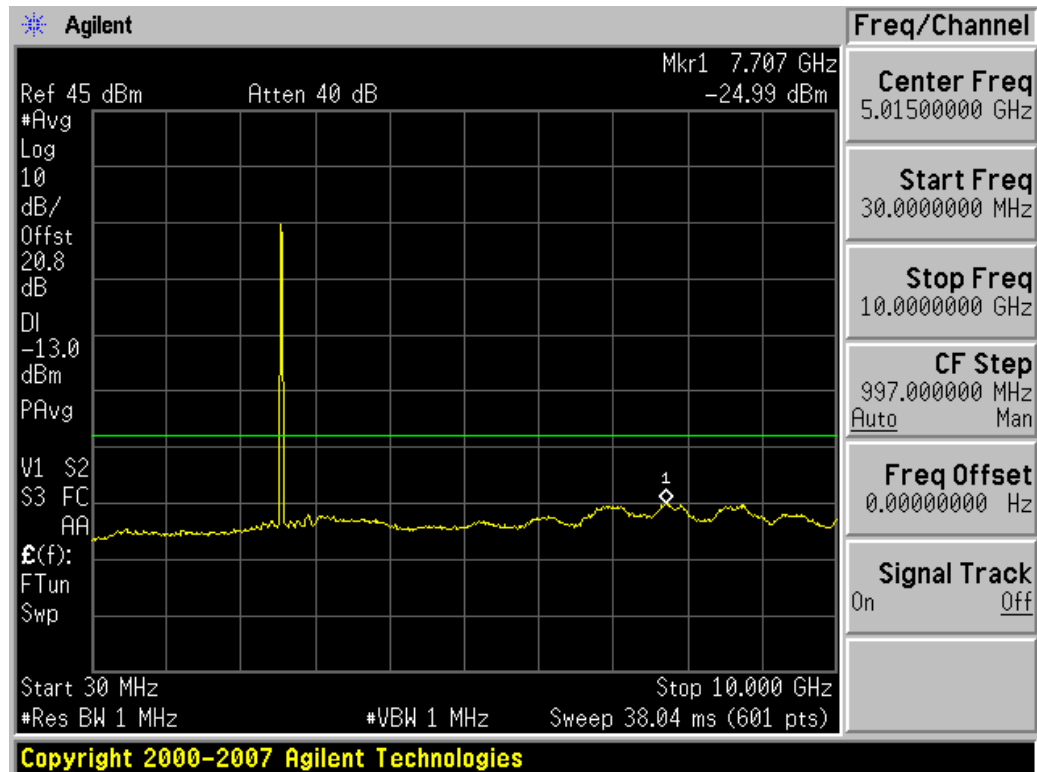


**Plot 7-34. Hi 4MHz Plot (TD-CDMA – 16QAM) Antenna Port 2**

FCC ID: PKTNODEBAMF	<b>PCTEST</b> ENGINEERING LABORATORY, INC.	FCC Pt. 27 / 802.16e TD-CDMA MEASUREMENT REPORT (CERTIFICATION)	<b>IPWireless</b>	Reviewed by: Quality Manager
Test Report S/N: 0Y1011041796.PKT	Test Dates: May 23 - July 1, 2011	EUT Type: 2.5GHz Band Single Channel Shelf		Page 35 of 40

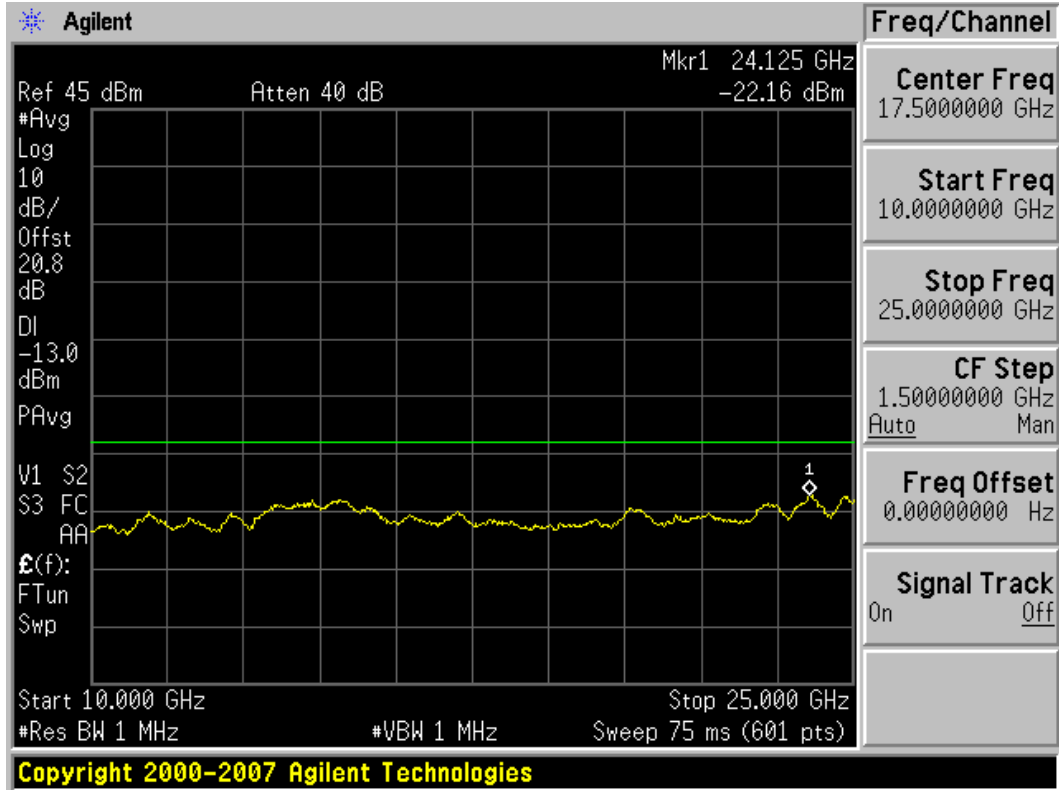


Plot 7-35. Occupied Bandwidth Plot (TD-CDMA 16QAM) Antenna Port 2

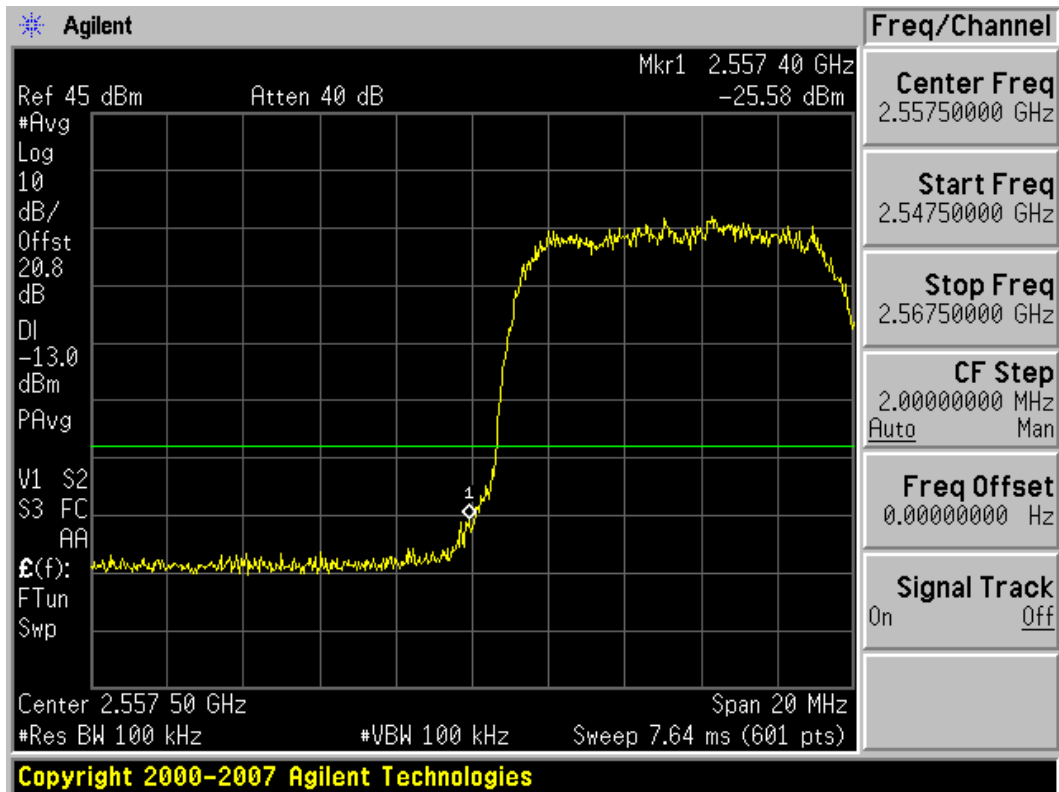


Plot 7-36. Conducted Spurious Plot (TD-CDMA -64QAM) Antenna Port 2

FCC ID: PKTNODEBAMF	<b>PCTEST</b> ENGINEERING LABORATORY, INC.	FCC Pt. 27 / 802.16e TD-CDMA MEASUREMENT REPORT (CERTIFICATION)	<b>IPWireless</b>	Reviewed by: Quality Manager
Test Report S/N: 0Y1011041796.PKT	Test Dates: May 23 - July 1, 2011	EUT Type: 2.5GHz Band Single Channel Shelf		Page 36 of 40

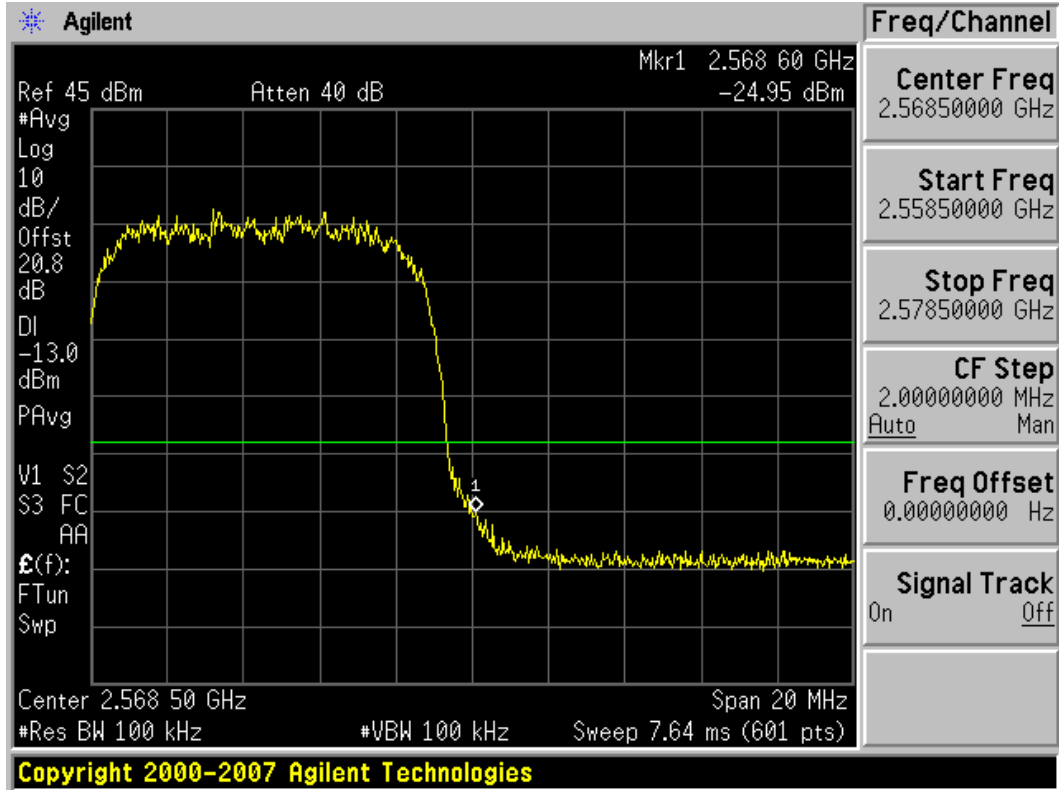


Plot 7-37. Conducted Spurious Plot (TD-CDMA – 64QAM) Antenna Port 2



Plot 7-38. Channel Edge Plot (TD-CDMA 64QAM) Antenna Port 2

FCC ID: PKTNODEBAMF	<b>PCTEST</b> ENGINEERING LABORATORY, INC.	FCC Pt. 27 / 802.16e TD-CDMA MEASUREMENT REPORT (CERTIFICATION)	<b>IPWireless</b>	Reviewed by: Quality Manager
Test Report S/N: 0Y1011041796.PKT	Test Dates: May 23 - July 1, 2011	EUT Type: 2.5GHz Band Single Channel Shelf		Page 37 of 40

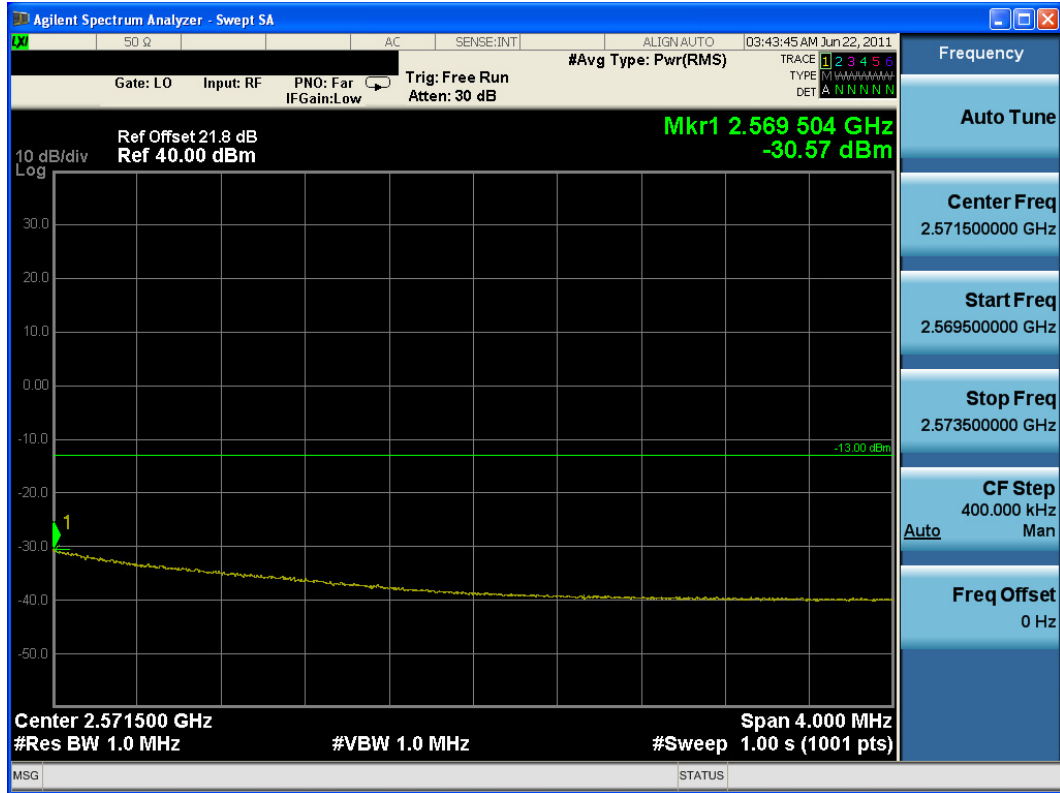


Plot 7-39. Channel Edge Plot (TD-CDMA 64QAM) Antenna Port 2

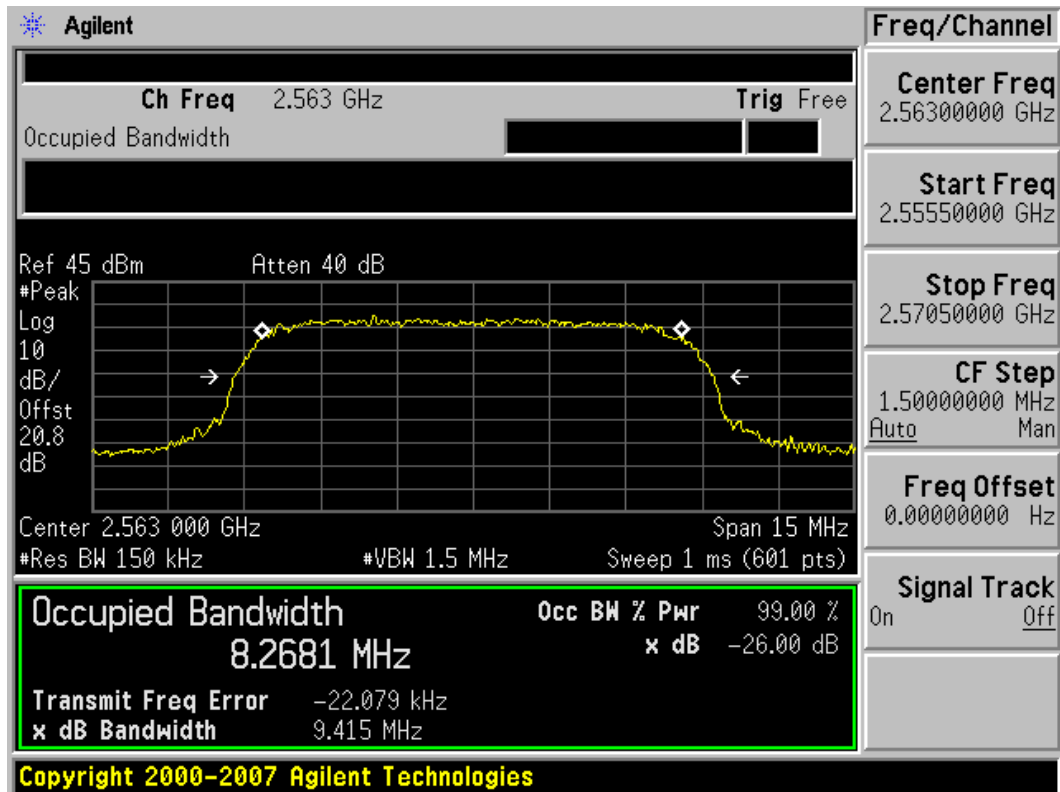


Plot 7-40. Lo 4MHz Plot (TD-CDMA 64QAM) Antenna Port 2

FCC ID: PKTNODEBAMF	<b>PCTEST</b> ENGINEERING LABORATORY, INC.	FCC Pt. 27 / 802.16e TD-CDMA MEASUREMENT REPORT (CERTIFICATION)	<b>IPWireless</b>	Reviewed by: Quality Manager
Test Report S/N: 0Y1011041796.PKT	Test Dates: May 23 - July 1, 2011	EUT Type: 2.5GHz Band Single Channel Shelf		Page 38 of 40



Plot 7-41. Hi 4MHz Plot (TD-CDMA – 64QAM) Antenna Port 2




Plot 7-42. Occupied Bandwidth Plot (TD-CDMA 64QAM) Antenna Port 2

FCC ID: PKTNODEBAMF	<b>PCTEST</b> ENGINEERING LABORATORY, INC.	FCC Pt. 27 / 802.16e TD-CDMA MEASUREMENT REPORT (CERTIFICATION)	<b>IPWireless</b>	Reviewed by: Quality Manager
Test Report S/N: 0Y1011041796.PKT	Test Dates: May 23 - July 1, 2011	EUT Type: 2.5GHz Band Single Channel Shelf		Page 39 of 40

## 8.0 CONCLUSION

The data collected relate only to the item(s) tested and show that the **IP Wireless 2.5GHz Band Single Channel Shelf FCC ID: PKTNODEBAMF** complies with all the requirements of Parts 2 and 27 of the FCC rules.

FCC ID: PKTNODEBAMF	 <b>PCTEST</b> <small>ENGINEERING LABORATORY, INC.</small>	FCC Pt. 27 / 802.16e TD-CDMA MEASUREMENT REPORT (CERTIFICATION)	 <b>Reviewed by:</b> Quality Manager
Test Report S/N: 0Y1011041796.PKT	Test Dates: May 23 - July 1, 2011	EUT Type: 2.5GHz Band Single Channel Shelf	Page 40 of 40