

# FCC PART 22H & 24E MEASUREMENT AND TEST REPORT

For

## Chengdu NTS Technology Co., Ltd.

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**FCC ID: P6HZ11M**  
**Model Number: Z11M**

<b>Report Type:</b> Original Report	<b>Product Type:</b> Smarter RF Pico (Bi-Direction Repeater)
<b>Test Engineer:</b> Jack Wu	<i>Jack . Wu</i>
<b>Report Number:</b> RSC120802001	
<b>Report Date:</b> 2012-09-19	
<b>Reviewed By:</b> EMC Engineer	<i>Darren . dai</i>
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**Note:** This test report is prepared for the customer shown above and for the device described herein. It may not be duplicated or used in part without prior written consent from Bay Area Compliance Laboratories Corp. (Chengdu).

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## 1 - GENERAL INFORMATION

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### 1.1 Product Description for Equipment under Test (EUT)

The *Chengdu NTS Technology Co., Ltd.*'s product, model number: *Z11M (FCC ID: P6HZ11M)* or the "EUT" as referred to in this report is a *Smarter RF Pico (Bi-Direction Repeater)*, rated input voltage: DC 5V.

### 1.2 Mechanical Description of EUT

The EUT is measured approximately 210 mm L x 130 mm W x 25 mm H.

Adapter Information: Switching Power Supply

Model: FY0503000

Input: AC 100-240V~, 1.2A, 50/60Hz

Output: DC 5V 3.0A

Frequency Range:

Cellular Band: 824-849 MHz (Uplink); 869-894 MHz (Downlink)

PCS Band: 1850-1910 MHz (Uplink); 1930-1990 MHz (Downlink)

Modulation Type:

GSM, EDGE, CDMA, WCDMA

Emission Designator:

GXW, G7W, F9W

*All measurement and test data in this report was gathered from production sample serial number: 120802001 (Assigned by BACL, Chengdu). The EUT was received on 2012-08-02.*

### 1.3 Objective

This type approval report is prepared on behalf of *Chengdu NTS Technology Co., Ltd.* in accordance with Part 2-Subpart J, Part 22 Subpart H, and Part 24 Subpart E of the Federal Communication Commissions rules.

The objective is to determine compliance with FCC rules for output power, occupied bandwidth, and spurious emission at antenna terminal, spurious radiated emission, and band edge.

### 1.4 Related Submittal(s)/Grant(s)

N/A.

## 1.5 Test Methodology

All tests and measurements indicated in this document were performed in accordance with the Code of Federal Regulations Title 47 Part 2, Sub-part J as well as the following parts:

Part 22 Subpart H - Public Mobile Services

Part 24 Subpart E - Personal Communication Services

Applicable Standards: TIA/EIA 603-C, ANSI C63.4-2009.

All radiated and conducted emissions measurements were performed at Bay Area Compliance Laboratories Corp. The radiated testing was performed at an antenna-to-EUT distance of 3 meters.

The uncertainty of any RF tests which use conducted method measurement is 0.96 dB, the uncertainty of any radiation on emissions measurement is 4.0 dB

## 1.6 Test Facility

The test site used by Bay Area Compliance Laboratories Corp. (ChengDu) to collect test data is located in 5040, HuiLong Wan Plaza, No.1, ShaWan Road, JinNiu District, Chengdu, China

Test site at Bay Area Compliance Laboratories Corp. (Chengdu) has been fully described in reports submitted to the Federal Communication Commission (FCC). The details of these reports have been found to be in compliance with the requirements of Section 2.948 of the FCC Rules on November 21, 2007. The facility also complies with the radiated and AC line conducted test site criteria set forth in ANSI C63.4-2003.

The Federal Communications Commission has the reports on file and is listed under FCC Registration No.: 560332. The test site has been approved by the FCC for public use and is listed in the FCC Public Access Link (PAL) database.

## 2 - SYSTEM TEST CONFIGURATION

### 2.1 Description of Test Configuration

The EUT was configured for testing according to TIA/EIA-603-C.

The final qualification test was performed with the EUT operating at normal mode.

### 2.2 Equipment Modifications

No modification was made to the unit tested.

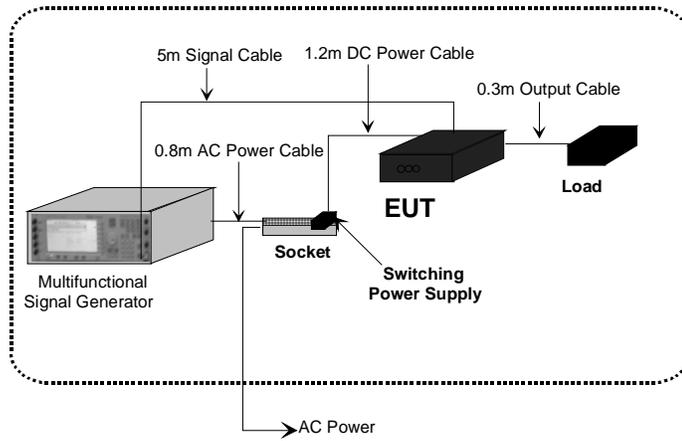
### 2.3 Local Support Equipment List and Details

Description	Manufacturer	Model	Serial Number
Signal Generator	Agilent	E4438C	MY45093864
Load	BACL	KW50	11590000001-3
Switching Power Supply	NTS	FY0503000	N/A

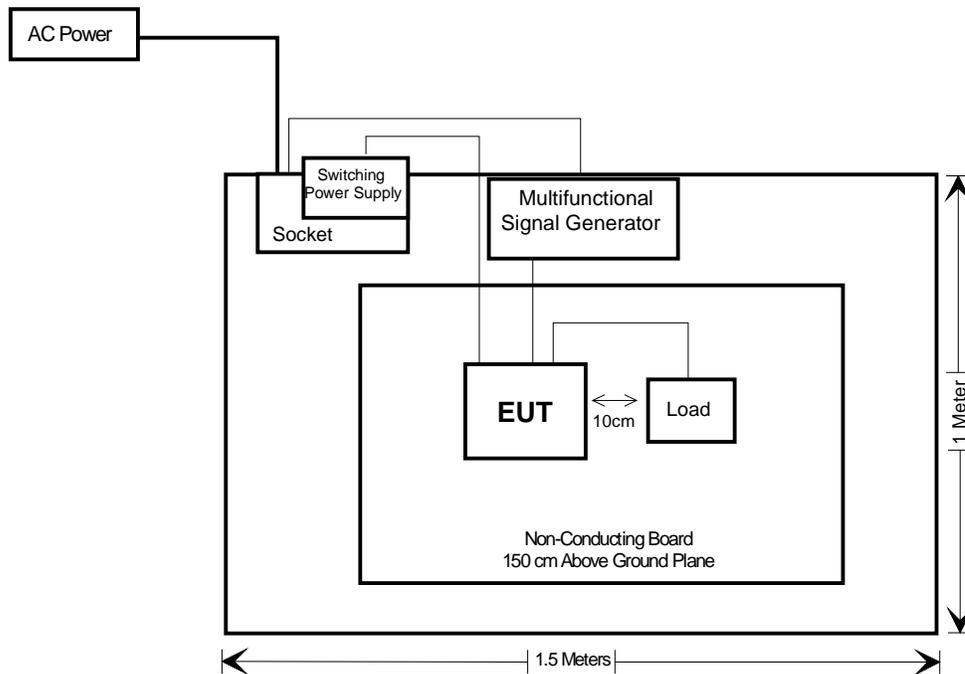
### 2.4 External I/O Cable

Cable Description	Length (m)	From/Port	To
Shielded Detachable Signal Cable	5.0	EUT	Signal Generator
Shielded Detachable Output Cable	0.3	Load	EUT

### 2.5 Configuration of Test Setup



### 2.6 Block Diagram of Test Setup



### 3 - SUMMARY OF TEST RESULTS

FCC Rules	Description of Test	Result
§1.1307 (b)(1), §2.1091	Maximum Permissible Exposure (MPE)	Compliance
§2.1046; §22.913 (a); §24.232 (a)	RF Output Power	Compliance
§2.1047	Modulation Characteristics	N/A
§2.1049; §22.905 §22.917; §24.238	Occupied Bandwidth	Compliance
§2.1051, §22.917 (a); §24.238 (a)	Spurious Emissions at Antenna Terminal	Compliance
§2.1053, § 22.917 (a); §24.238 (a)	Field Strength of Spurious Radiation	Compliance
§22.917 (a); §24.238 (a)	Out of band emission, Band Edge	Compliance
§ 2.1055, §22.355; §24.235	Frequency stability vs. temperature Frequency stability vs. voltage	N/A*

N/A\*: This device is a repeater.

## 4 - FCC §1.1307 & §2.1091 - MAXIMUM PERMISSIBLE EXPOSURE (MPE)

### 4.1 Applicable Standard

According to subpart FCC §1.1307 (b)(1) and §2.1091 systems operating under the provisions of this section shall be operated in a manner that ensures the public is not exposed to RF energy level in excess of the communication guidelines.

Limits for General Population/Uncontrolled Exposure (§1.1310, §2.1091)

(B) Limits for General Population/Uncontrolled Exposure				
Frequency Range (MHz)	Electric Field Strength (V/m)	Magnetic Field Strength (A/m)	Power Density (mW/cm <sup>2</sup> )	Averaging Time (minutes)
0.3–1.34	614	1.63	*(100)	30
1.34–30	824/f	2.19/f	*(180/f <sup>2</sup> )	30
30–300	27.5	0.073	0.2	30
300–1500	/	/	f/1500	30
1500–100,000	/	/	1.0	30

f = frequency in MHz;

\* = Plane-wave equivalent power density;

According to §1.1310 and §2.1091 RF exposure is calculated.

### 4.2 MPE Calculation

The MPE is predicated at a given distance using the following formulary

$$S = PG/4\pi R^2$$

Where:

S = power density (in appropriate units, e.g. mW/cm<sup>2</sup>);

P = power input to the antenna (in appropriate units, e.g., mW);

G = Antenna Gain;

R = distance to the center of radiation of the antenna (appropriate units, e.g., cm);

### CDMA:

Frequency Band	Frequency (MHz)	Antenna Gain		Conducted Output Power		Evaluation Distance (cm)	Power Density (mW/cm <sup>2</sup> )	MPE Limit (mW/cm <sup>2</sup> )
		(dBi)	(numeric)	(dBm)	(mW)			
Cellular Band								
Uplink	836.52	6	3.98	23.1	204.17	76.2	0.01115	0.558
Downlink	881.52	5	3.16	23.39	218.27	38.1	0.03786	0.588
PCS Band								
Uplink	1880	6	3.98	23.31	214.29	76.2	0.01170	1.0
Downlink	1960	5	3.16	24.67	293.09	38.1	0.05083	1.0

**GSM:**

Frequency Band	Frequency (MHz)	Antenna Gain		Conducted Output Power		Evaluation Distance (cm)	Power Density (mW/cm <sup>2</sup> )	MPE Limit (mW/cm <sup>2</sup> )
		(dBi)	(numeric)	(dBm)	(mW)			
Cellular Band								
Uplink	836.6	6	3.98	24.71	295.80	76.2	0.01615	0.558
Downlink	881.6	5	3.16	26.73	470.98	38.1	0.08169	0.588
PCS Band								
Uplink	1880	6	3.98	24.81	302.69	76.2	0.01652	1.0
Downlink	1960	5	3.16	24.47	279.90	38.1	0.04855	1.0

**EDGE:**

Frequency Band	Frequency (MHz)	Antenna Gain		Conducted Output Power		Evaluation Distance (cm)	Power Density (mW/cm <sup>2</sup> )	MPE Limit (mW/cm <sup>2</sup> )
		(dBi)	(numeric)	(dBm)	(mW)			
Cellular Band								
Uplink	836.6	6	3.98	25.44	349.95	76.2	0.01910	0.558
Downlink	881.6	5	3.16	25.99	397.19	38.1	0.06889	0.588
PCS Band								
Uplink	1880	6	3.98	24.99	315.50	76.2	0.01722	1.0
Downlink	1960	5	3.16	24.36	272.90	38.1	0.04733	1.0

**WCDMA:**

Frequency Band	Frequency (MHz)	Antenna Gain		Conducted Output Power		Evaluation Distance (cm)	Power Density (mW/cm <sup>2</sup> )	MPE Limit (mW/cm <sup>2</sup> )
		(dBi)	(numeric)	(dBm)	(mW)			
Cellular Band								
Uplink	836.6	6	3.98	25.08	322.11	76.2	0.01758	0.558
Downlink	881.6	5	3.16	25.75	375.84	38.1	0.06519	0.588
PCS Band								
Uplink	1880	6	3.98	26.18	414.95	76.2	0.02265	1.0
Downlink	1960	5	3.16	23.82	240.99	38.1	0.04180	1.0

**Note:** Manufacturer declares that the maximum antenna gains are: 6 dBi for uplink (outdoor), 5 dBi for downlink (indoor).

Manufacturer declares that the nearest distance between human and the EUT are 15 inches for indoor and 30 inches for outdoor.

**Result:** Compliance

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## **5 - FCC §2.1047 - MODULATION CHARACTERISTIC**

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According to FCC §2.1047(d), Part 22H and 24E, there is no specific requirement for digital modulation, therefore modulation characteristic is not presented.

## 6 - FCC §2.1046, §22.913(a) & §24.232(c) - RF OUTPUT POWER

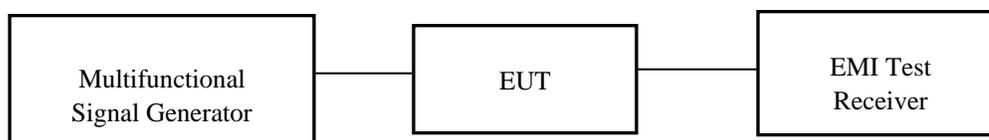
### 6.1 Applicable Standard

According to FCC §2.1046, §22.913 (a) and §24.232 (a)

### 6.2 Test Procedure

*Conducted method:*

The RF output of the transmitter was connected to the wireless test set and the spectrum analyzer through sufficient attenuation.



### 6.3 Test Equipment List and Details

Description	Manufacturer	Model Number	Serial Number	Calibration Date	Calibration Due Date
EMI Test Receiver	Rohde & Schwarz	ESCI	10028	2012-05-24	2013-05-23
Attenuator	Weinschel Engineering	1	AB1165	2012-07-08	2013-07-07
Signal Generator	Agilent	E4438C	MY45093864	2012-03-22	2013-03-21

### 6.4 Test Results

#### Test Environmental Conditions

<b>Temperature:</b>	25 °C
<b>Relative Humidity:</b>	58 %
<b>ATM Pressure:</b>	94.5 kPa

*The testing was performed by Jack Wu on 2012-09-18.*

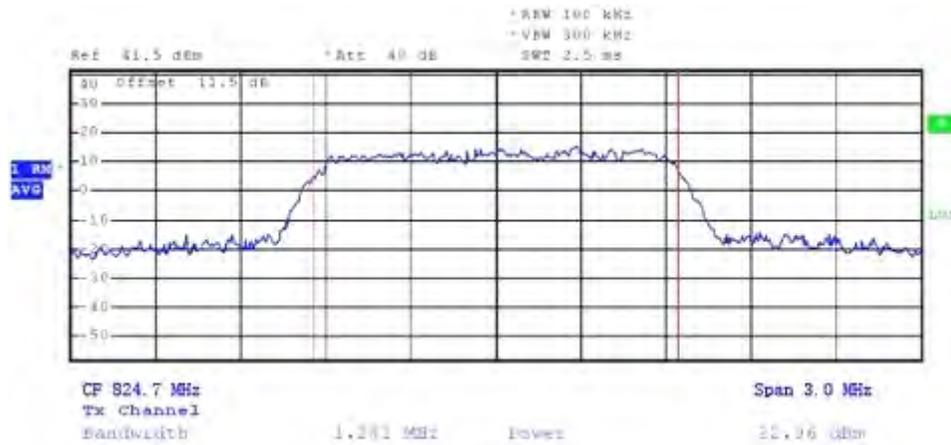
**Conducted Power:****CDMA:**

Frequency Band	Channel	Frequency (MHz)	Input Power (dBm)	Output Power (dBm)
Cellular Band (Part 22H)				
Uplink (824-849 MHz)	Low	824.70	-30.1	22.96
	Middle	836.52	-30.2	23.10
	High	848.31	-31.5	22.11
Downlink (869-894 MHz)	Low	869.70	-35.2	22.78
	Middle	881.52	-34.7	23.39
	High	893.31	-33.8	24.40
PCS Band (Part 24E)				
Uplink (1850-1910 MHz)	Low	1851.25	-31.2	22.47
	Middle	1800.00	-28.4	24.67
	High	1908.75	-30.9	22.38
Downlink (1930-1990 MHz)	Low	1931.25	-37.2	21.03
	Middle	1960.00	-35.1	23.31
	High	1988.75	-36.5	22.28

Please see the below plots.

### Cellular Band

#### Uplink, Low Channel



#### Uplink, Middle Channel



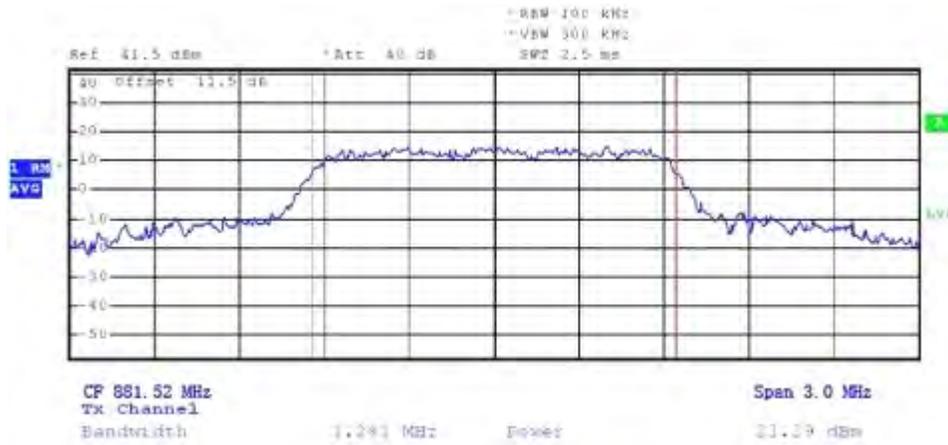
### Uplink, High Channel



### Downlink, Low Channel



### Downlink, Middle Channel



### Downlink, High Channel

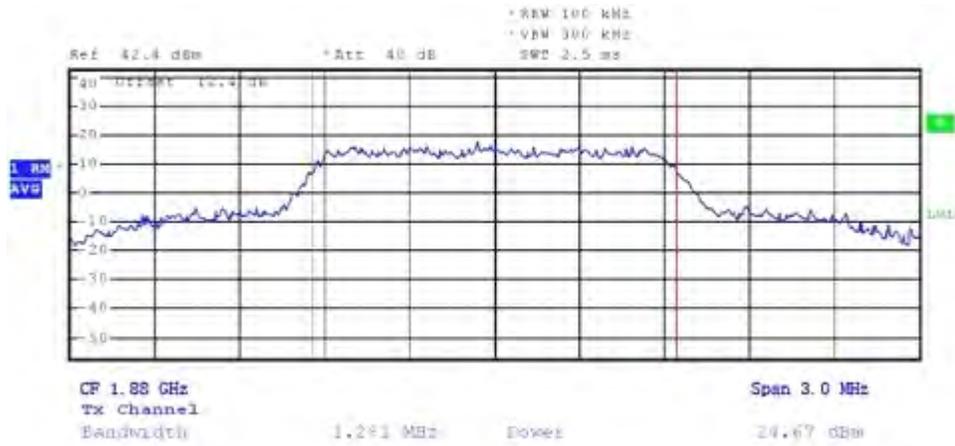


PCS Band

Uplink, Low Channel



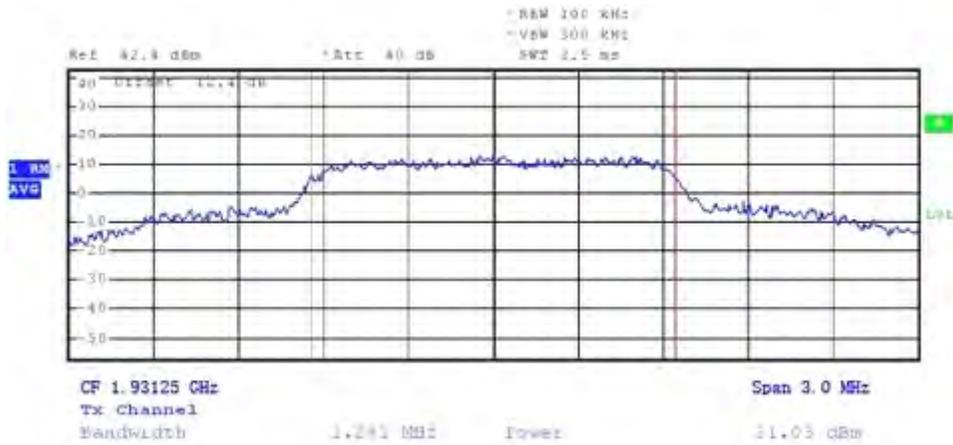
Uplink, Middle Channel



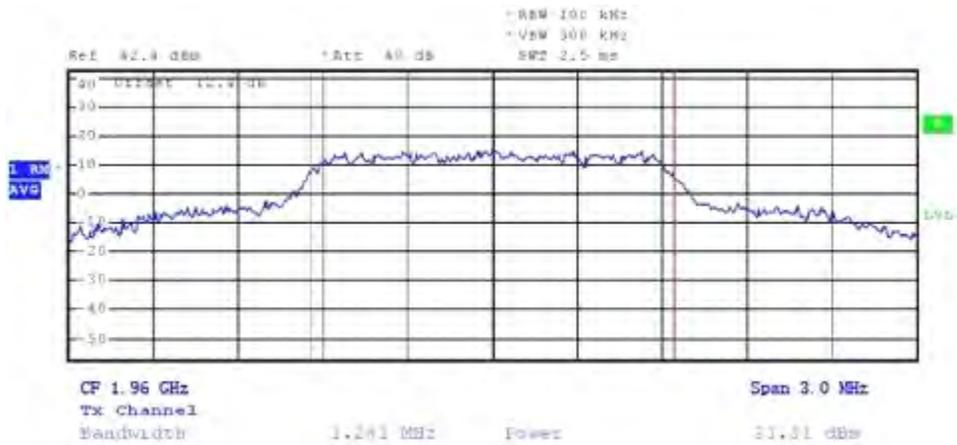
### Uplink, High Channel



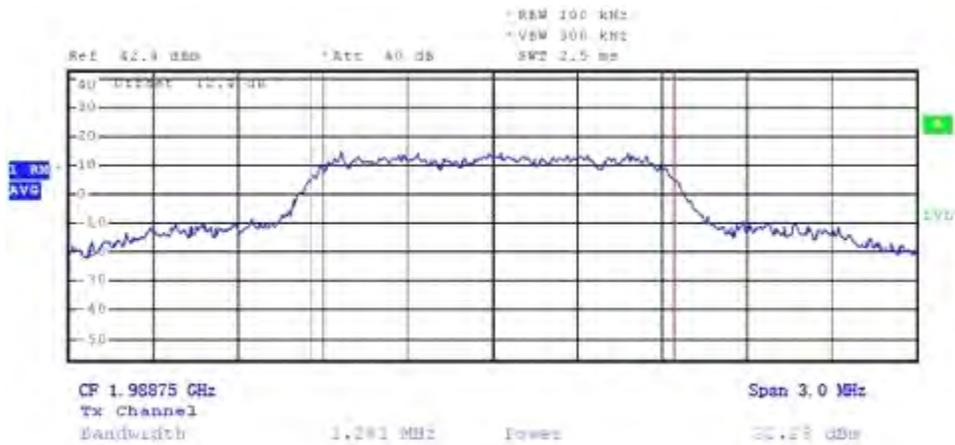
### Downlink, Low Channel



### Downlink, Middle Channel



### Downlink, High Channel



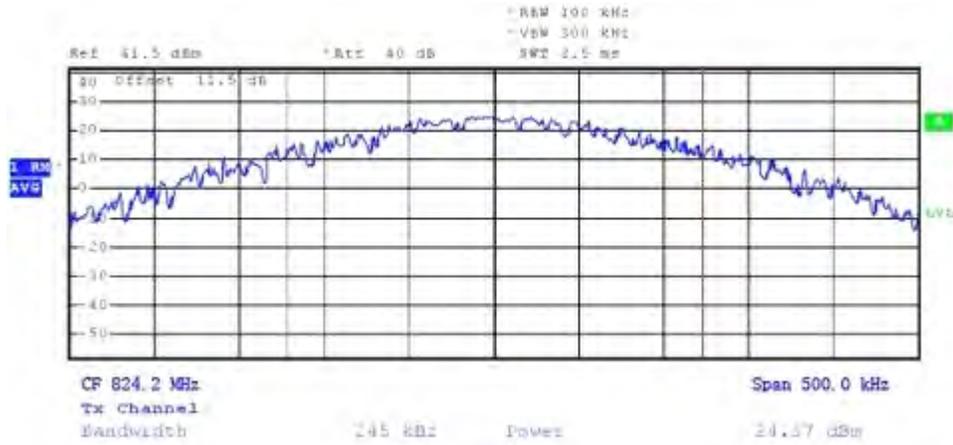
**GSM:**

Frequency Band	Channel	Frequency (MHz)	Input Power (dBm)	Output Power (dBm)
Cellular Band (Part 22H)				
Uplink (824-849 MHz)	Low	824.2	-28.6	24.37
	Middle	836.6	-28.3	24.71
	High	848.8	-30.7	22.30
Downlink (869-894 MHz)	Low	869.2	-32.9	25.11
	Middle	881.6	-31.2	26.73
	High	893.8	-32.1	25.83
PCS Band (Part 24E)				
Uplink (1850-1910 MHz)	Low	1850.2	-28.1	24.86
	Middle	1880.0	-28.2	24.81
	High	1909.8	-29.1	23.86
Downlink (1930-1990 MHz)	Low	1930.2	-36.9	21.06
	Middle	1960.0	-33.5	24.47
	High	1989.8	-34.1	24.00

Please see the below plots.

### Cellular Band

#### Uplink, Low Channel



#### Uplink, Middle Channel



### Uplink, High Channel



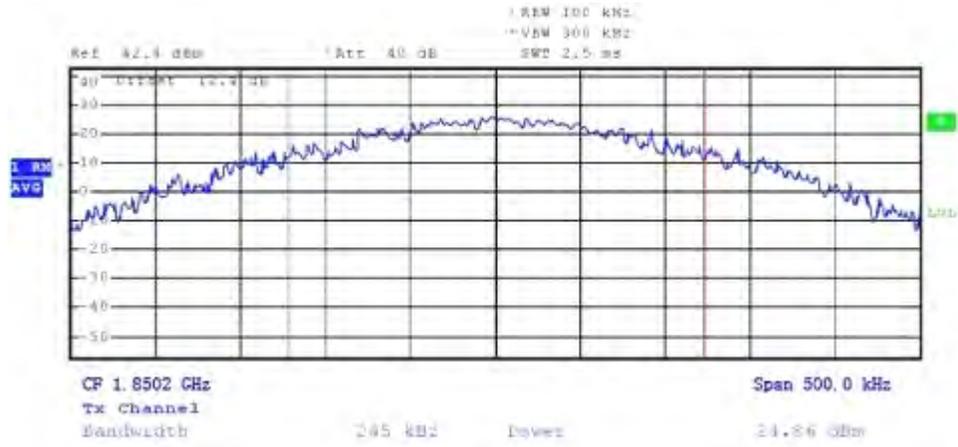
### Downlink, Low Channel





### PCS Band

#### Uplink, Low Channel



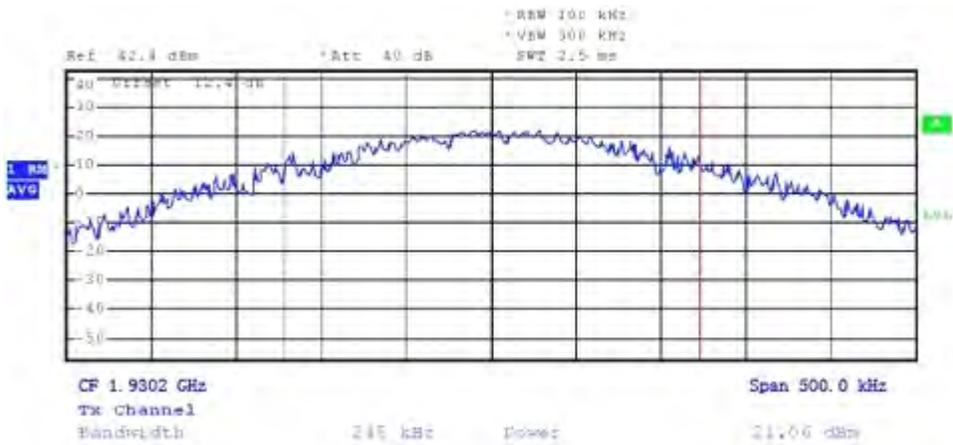
#### Uplink, Middle Channel



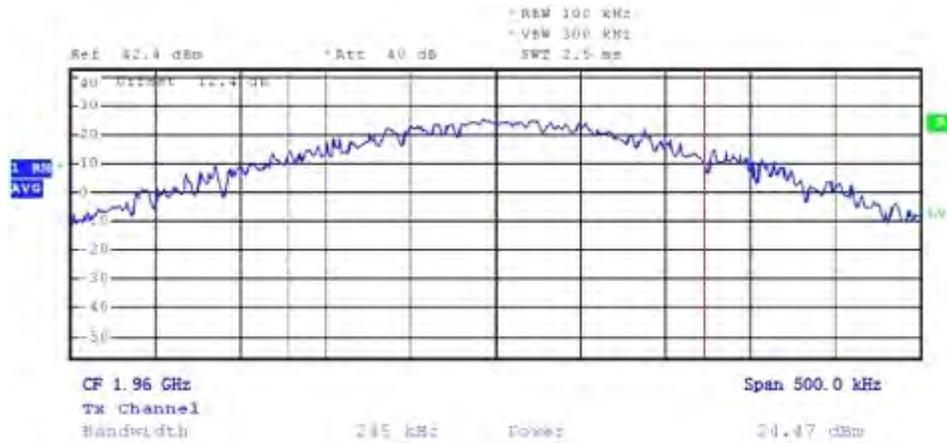
### Uplink, High Channel



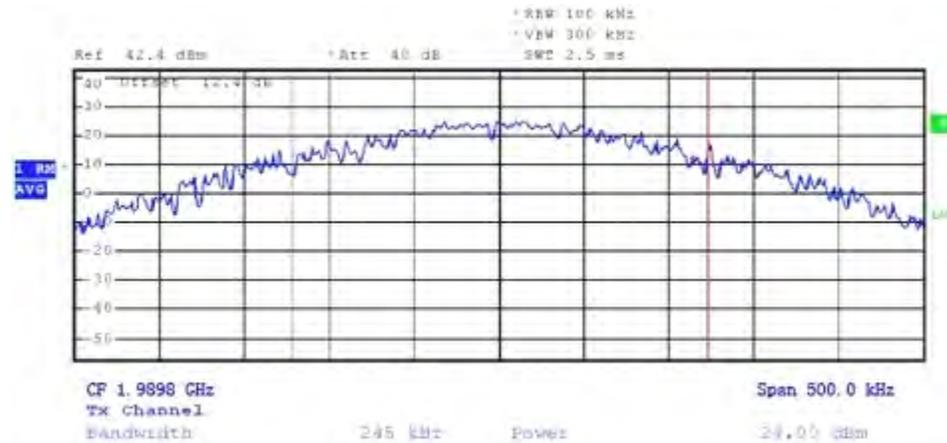
### Downlink, Low Channel



### Downlink, Middle Channel



### Downlink, High Channel



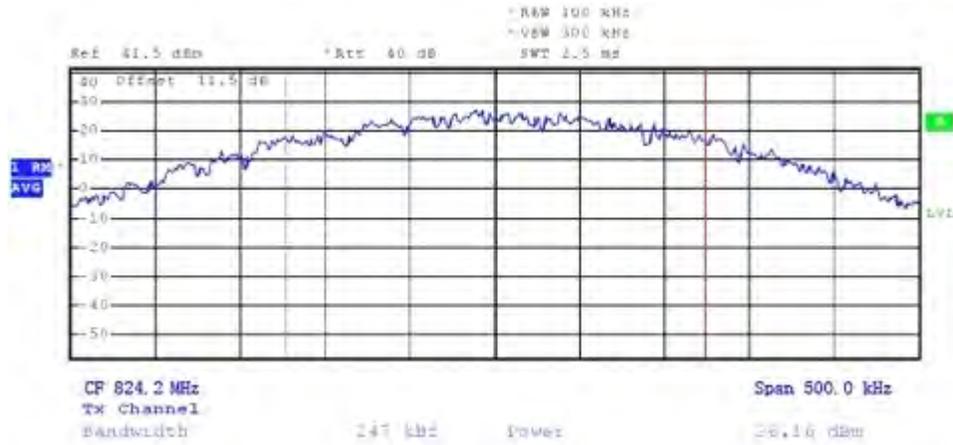
**EDGE:**

Frequency Band	Channel	Frequency (MHz)	Input Power (dBm)	Output Power (dBm)
Cellular Band (Part 22H)				
Uplink (824-849 MHz)	Low	824.2	-26.8	26.16
	Middle	836.6	-28.5	25.44
	High	848.8	-31.7	22.13
Downlink (869-894 MHz)	Low	869.2	-34.6	23.71
	Middle	881.6	-32.3	25.99
	High	893.8	-33.2	24.72
PCS Band (Part 24E)				
Uplink (1850-1910 MHz)	Low	1850.2	-29.8	24.07
	Middle	1880.0	-28.7	24.99
	High	1909.8	-31.2	22.72
Downlink (1930-1990 MHz)	Low	1930.2	-36.5	21.96
	Middle	1960.0	-34.6	24.36
	High	1989.8	-34.8	23.62

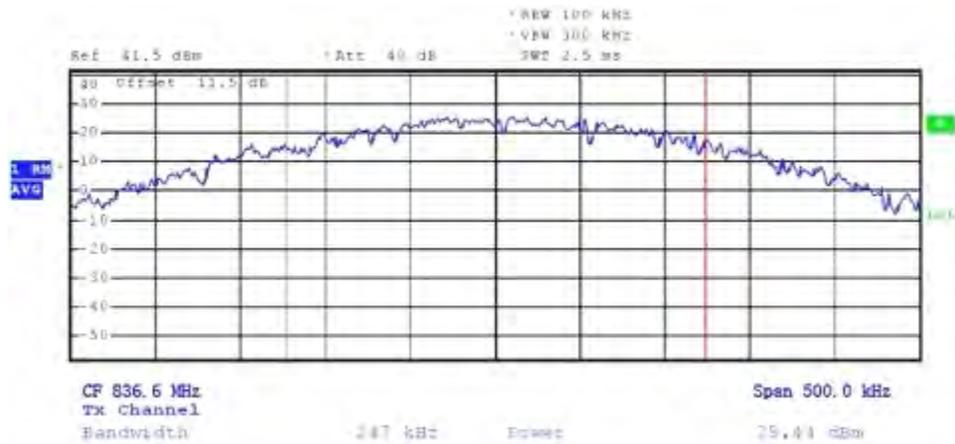
Please see the below plots.

### Cellular Band

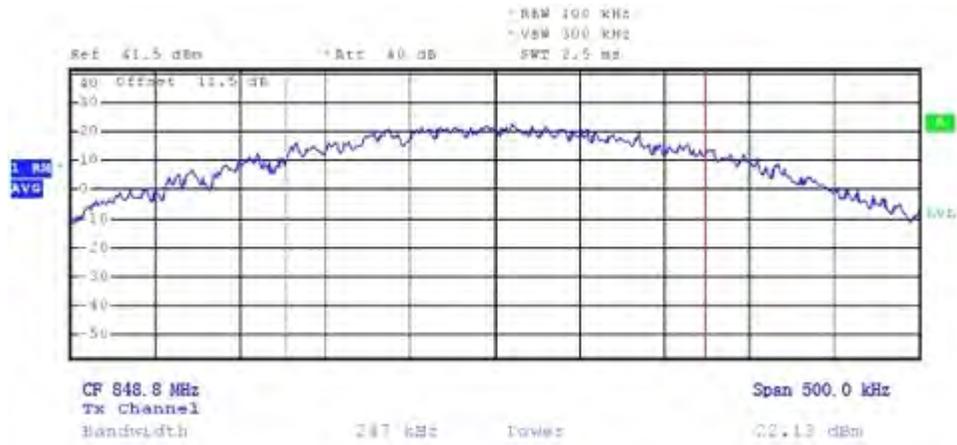
#### Uplink, Low Channel



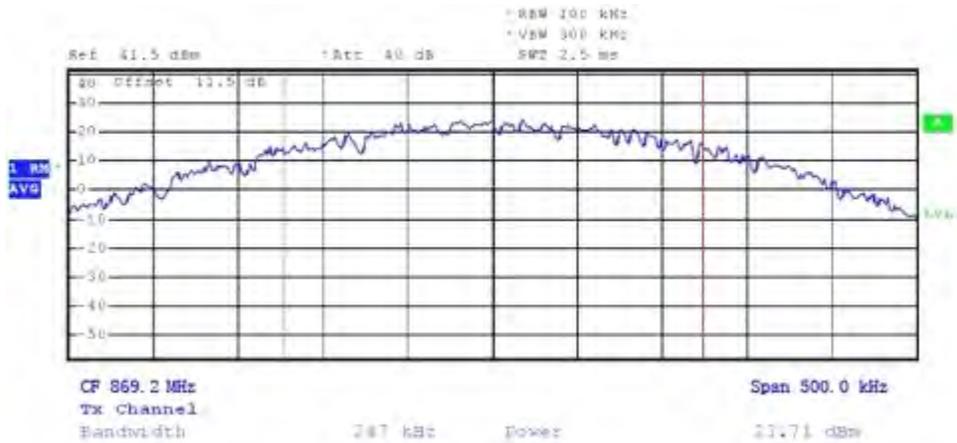
#### Uplink, Middle Channel



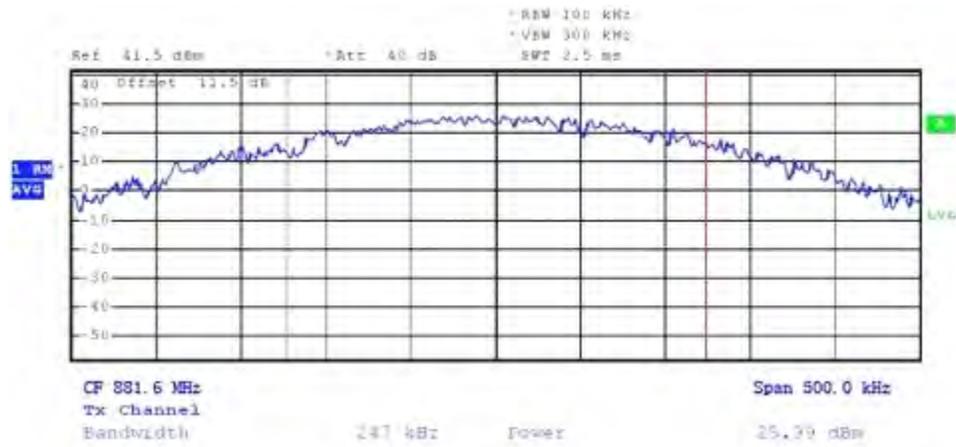
### Uplink, High Channel



### Downlink, Low Channel



### Downlink, Middle Channel

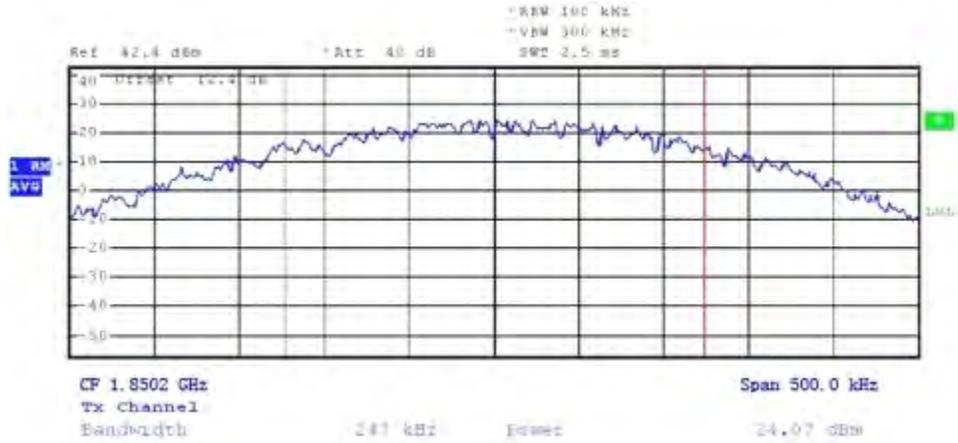


### Downlink, High Channel



PCS Band

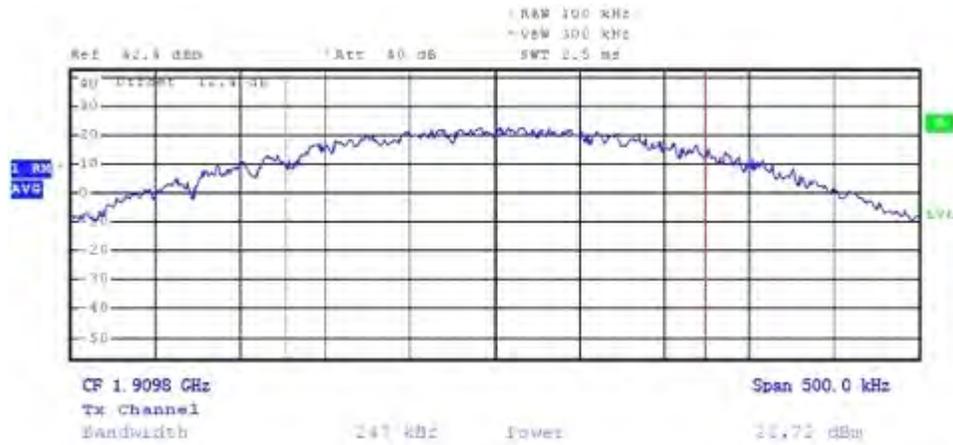
Uplink, Low Channel



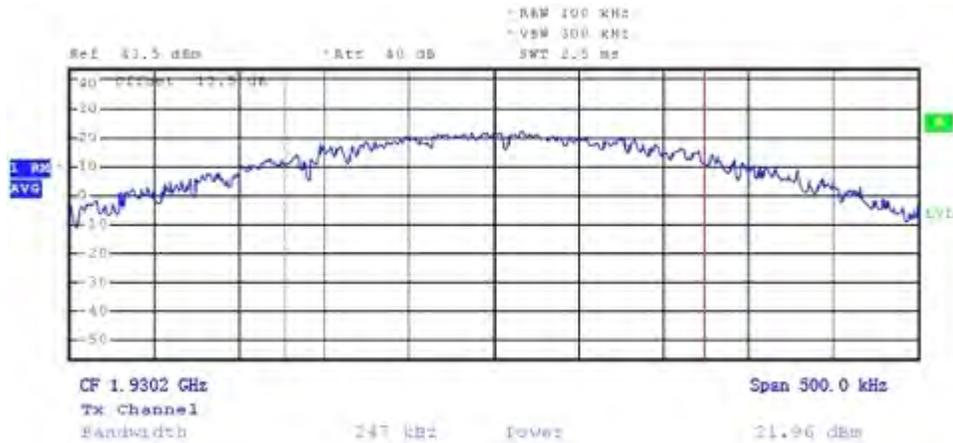
Uplink, Middle Channel



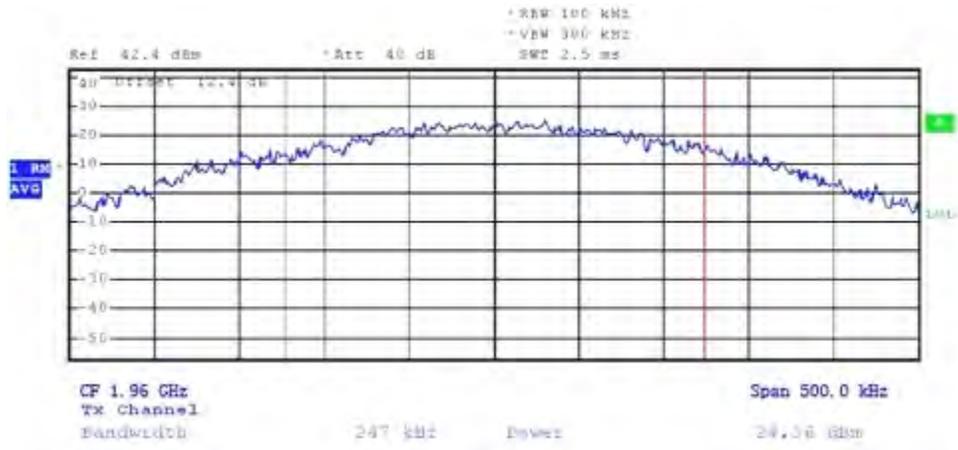
### Uplink, High Channel



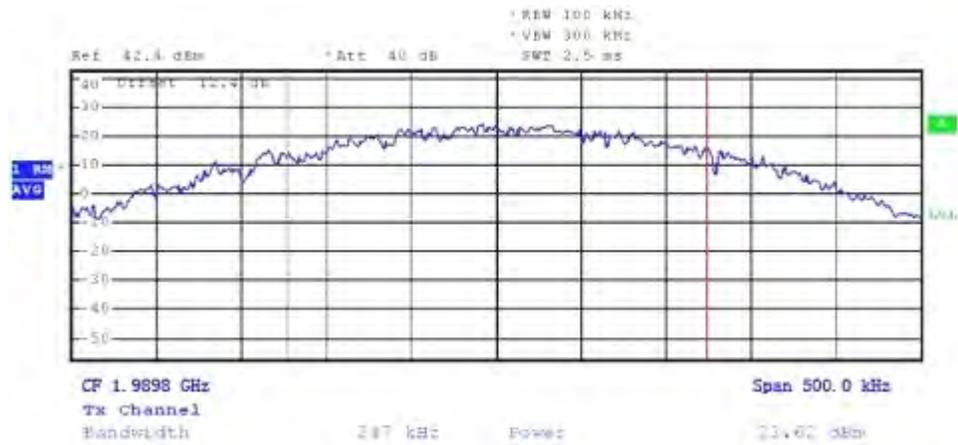
### Downlink, Low Channel



### Downlink, Middle Channel



### Downlink, High Channel



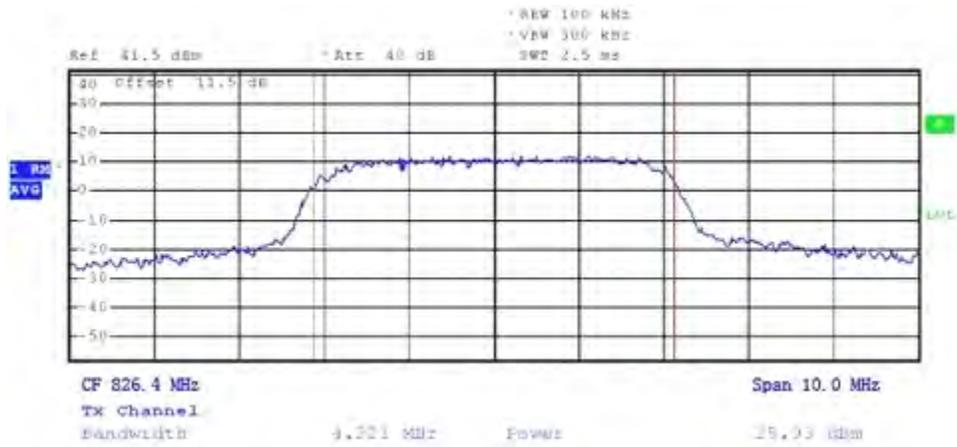
**WCDMA:**

Frequency Band	Channel	Frequency (MHz)	Input power (dBm)	Output Power (dBm)
Cellular Band (Part 22H)				
Uplink (824-849 MHz)	Low	826.4	-27.1	25.93
	Middle	836.6	-28.1	25.08
	High	846.6	-28.8	23.06
Downlink (869-894 MHz)	Low	871.4	-34.5	24.29
	Middle	881.6	-32.6	25.75
	High	891.6	-33.2	24.56
PCS Band (Part 24E)				
Uplink (1850-1910 MHz)	Low	1852.4	-28.8	24.21
	Middle	1880.0	-26.9	26.18
	High	1907.6	-29.7	23.36
Downlink (1930-1990 MHz)	Low	1932.4	-36.1	21.79
	Middle	1960.0	-34.4	23.82
	High	1987.6	-34.7	23.34

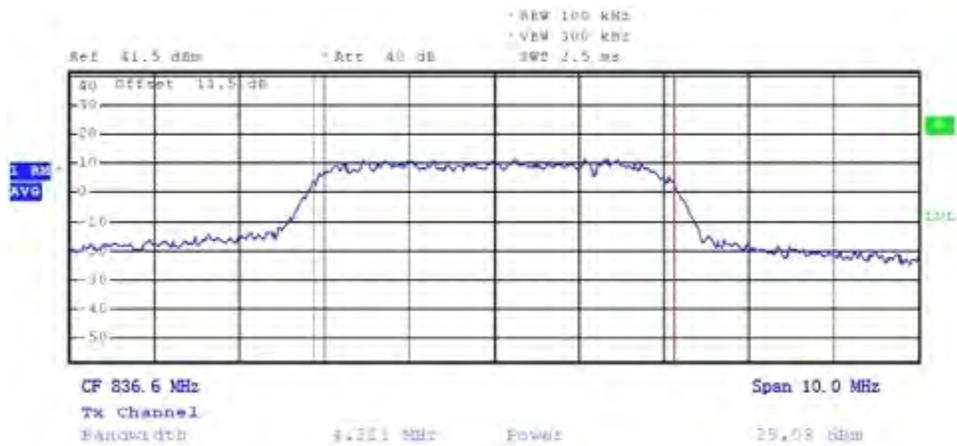
Please see the below plots.

### Cellular Band

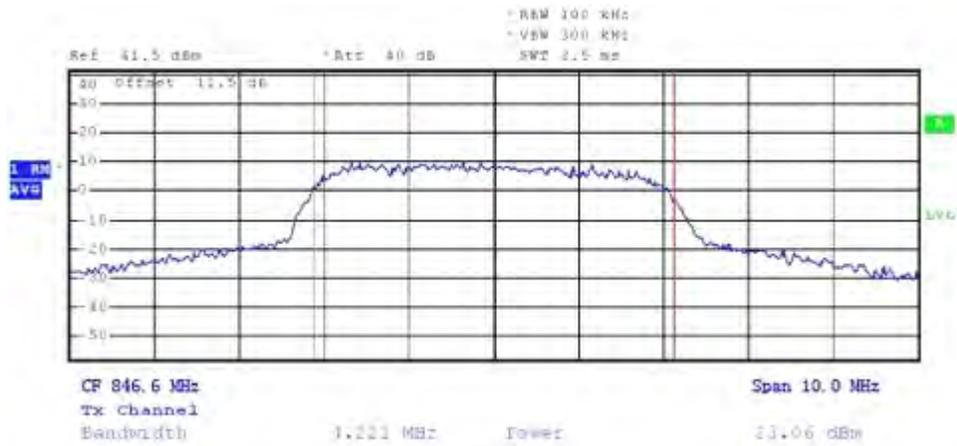
#### Uplink, Low Channel



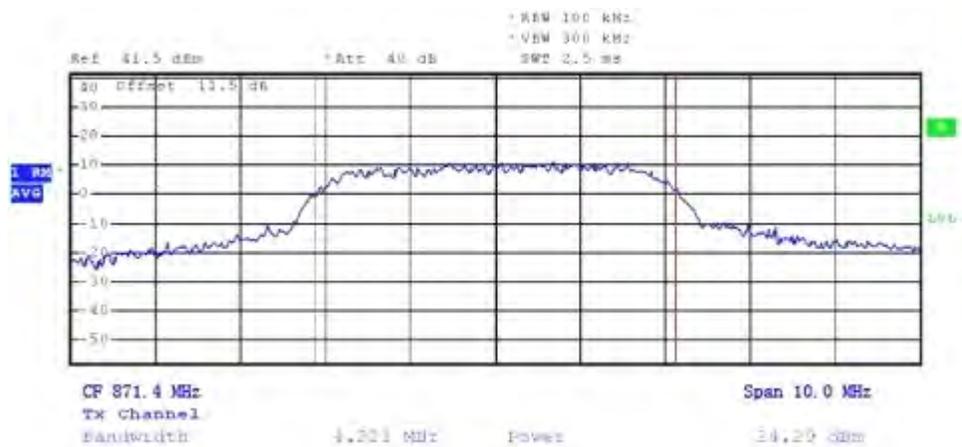
#### Uplink, Middle Channel



### Uplink, High Channel



### Downlink, Low Channel



### Downlink, Middle Channel

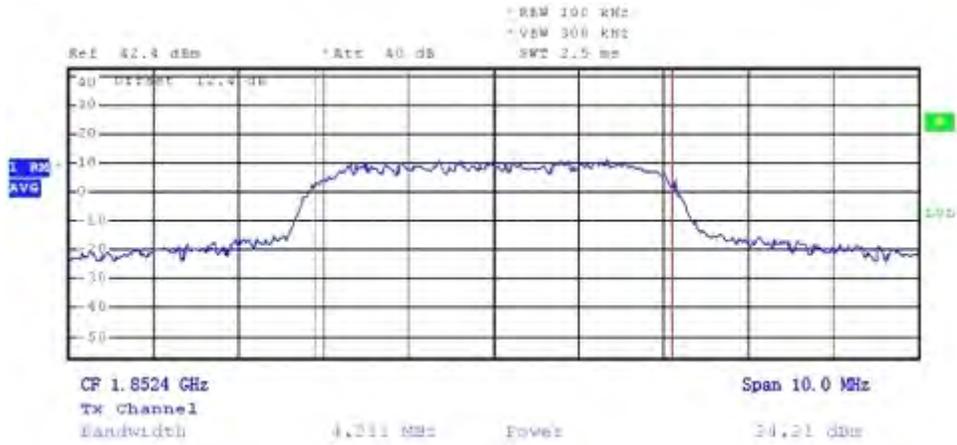


### Downlink, High Channel

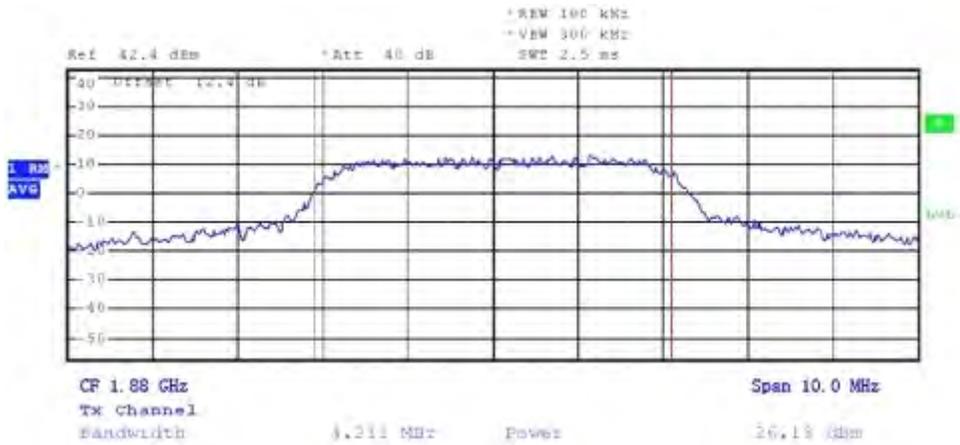


### PCS Band

#### Uplink, Low Channel



#### Uplink, Middle Channel



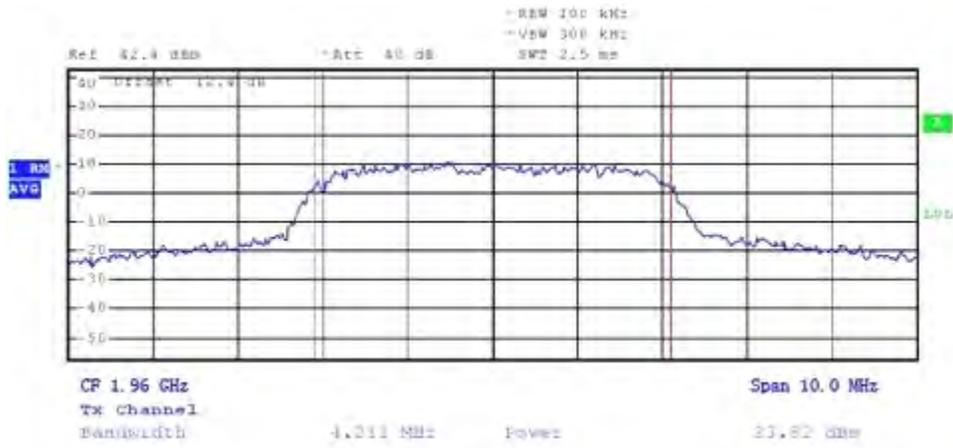
### Uplink, High Channel



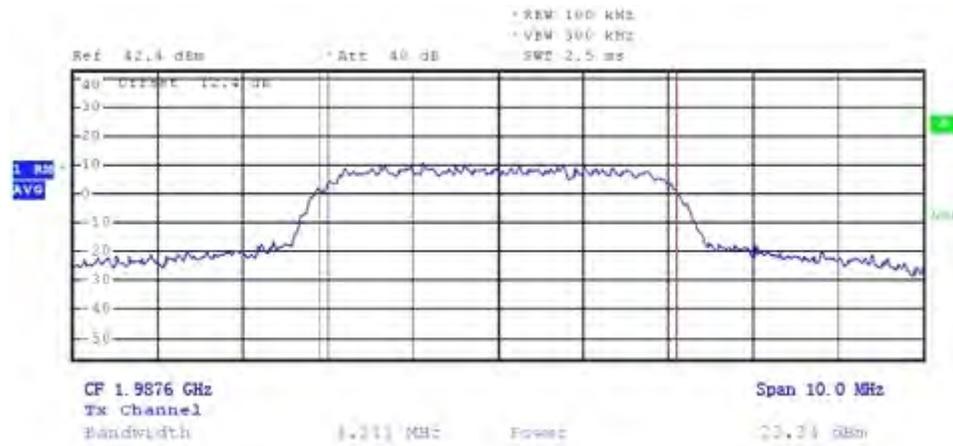
### Downlink, Low Channel



### Downlink, Middle Channel



### Downlink, High Channel



## 7 - FCC §2.1049, §22.917, §22.905 & §24.238 - OCCUPIED BANDWIDTH

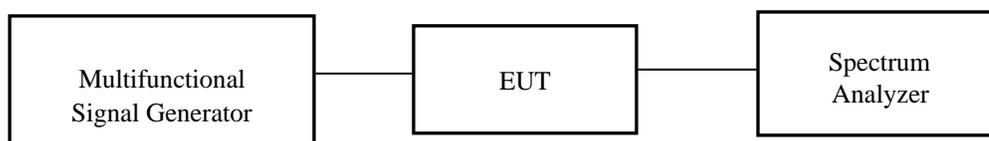
### 7.1 Applicable Standards

FCC §2.1049, §22.917, §22.905 and §24.238.

### 7.2 Test Procedure

The RF output of the transmitter was connected to the simulator and the spectrum analyzer through sufficient attenuation.

The resolution bandwidth of the spectrum analyzer was the 26 dB & 99% bandwidth was recorded.



### 7.3 Test Equipment List and Details

Description	Manufacturer	Model Number	Serial Number	Calibration Date	Calibration Due Date
Spectrum Analyzer	R & S	FSL18	100180	2012-05-10	2013-05-09
Attenuator	Weinschel Engineering	1	AB1165	2012-07-08	2013-07-07
Signal Generator	Agilent	E4438C	MY45093864	2012-03-22	2013-03-21

### 7.4 Test Results

#### Test Environmental Conditions

Temperature:	25 °C
Relative Humidity:	55 %
ATM Pressure:	94 kPa

The testing was performed by Jack Wu on 2012-08-11 to 2012-08-13.

**CDMA:**

Frequency Band	Frequency (MHz)	99% Bandwidth Input (MHz)	99% Bandwidth output (MHz)	26 dB Bandwidth Input (MHz)	26 dB Bandwidth Output (MHz)
Cellular Band (Part 22H)					
Uplink (824-849 MHz)	836.52	1.2754	1.2874	1.4251	1.4371
Downlink (869-894 MHz)	881.52	1.2754	1.2814	1.4371	1.4311
PCS Band (Part 24E)					
Uplink (1850-1910 MHz)	1880	1.2754	1.2814	1.4371	1.4371
Downlink (1930-1990 MHz)	1960	1.2874	1.2814	1.4371	1.4431

**GSM:**

Frequency Band	Frequency (MHz)	99% Bandwidth Input (MHz)	99% Bandwidth output (MHz)	26 dB Bandwidth Input (MHz)	26 dB Bandwidth Output (MHz)
Cellular Band (Part 22H)					
Uplink (824-849 MHz)	836.52	245.5	243.5	313.4	315.4
Downlink (869-894 MHz)	881.52	245.5	245.5	313.4	315.4
PCS Band (Part 24E)					
Uplink (1850-1910 MHz)	1880	245.5	245.5	313.4	315.4
Downlink (1930-1990 MHz)	1960	245.5	245.5	315.4	313.4

**EDGE:**

Frequency Band	Frequency (MHz)	99% Bandwidth Input (MHz)	99% Bandwidth output (MHz)	26 dB Bandwidth Input (MHz)	26 dB Bandwidth Output (MHz)
Cellular Band (Part 22H)					
Uplink (824-849 MHz)	836.52	247.5	249.5	313.4	311.4
Downlink (869-894 MHz)	881.52	247.5	247.5	313.4	315.4
PCS Band (Part 24E)					
Uplink (1850-1910 MHz)	1880	249.5	243.5	315.4	311.4
Downlink (1930-1990 MHz)	1960	251.4	251.4	319.4	319.4

**WCDMA:**

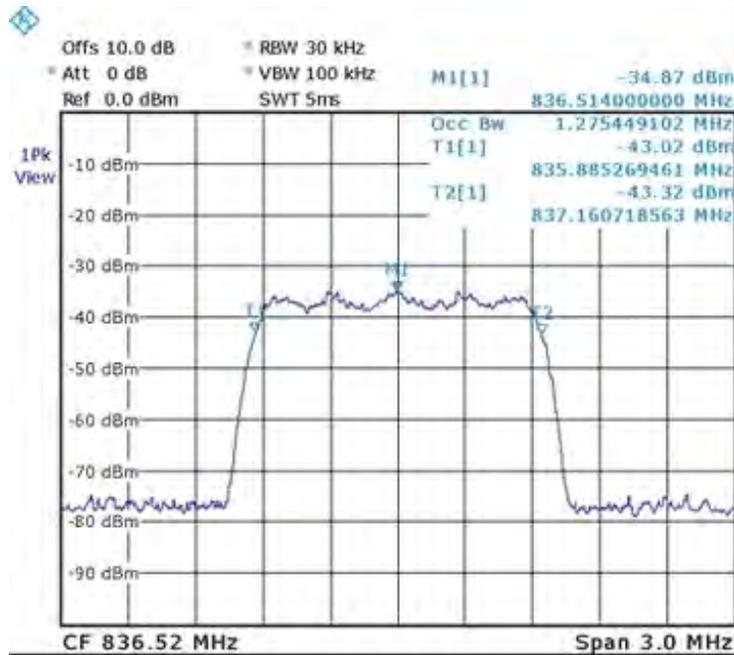
Frequency Band	Frequency (MHz)	99% Bandwidth Input (MHz)	99% Bandwidth output (MHz)	26 dB Bandwidth Input (MHz)	26 dB Bandwidth Output (MHz)
Cellular Band (Part 22H)					
Uplink (824-849 MHz)	836.52	4.1716	4.2315	4.7110	4.7310
Downlink (869-894 MHz)	881.52	4.1916	4.1716	4.7110	4.7310
PCS Band (Part 24E)					
Uplink (1850-1910 MHz)	1880	4.2514	4.2115	4.7500	4.7110
Downlink (1930-1990 MHz)	1960	4.3113	4.1916	4.7500	4.7310

Please refer to the following plots.

**Cellular Band (Part 22H), Uplink:**

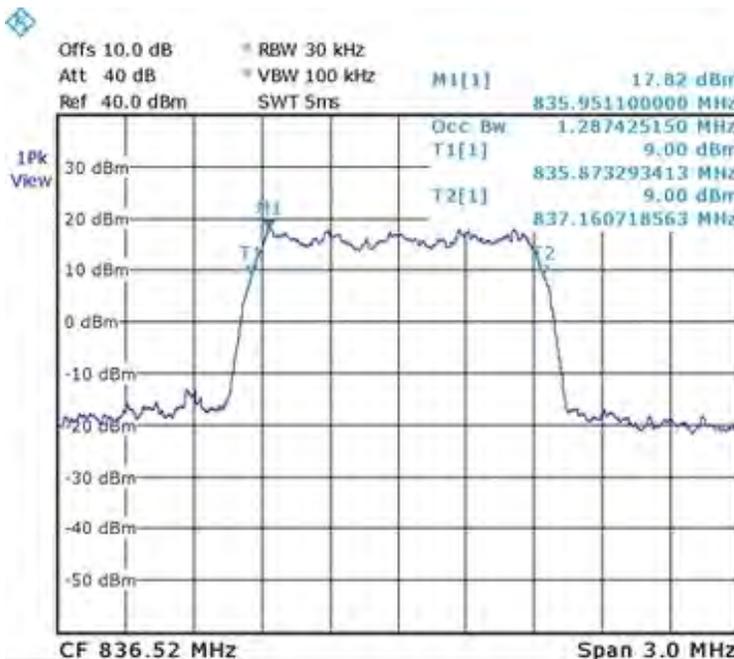
**CDMA (Middle Channel)**

**Input Signal, 99% Bandwidth**



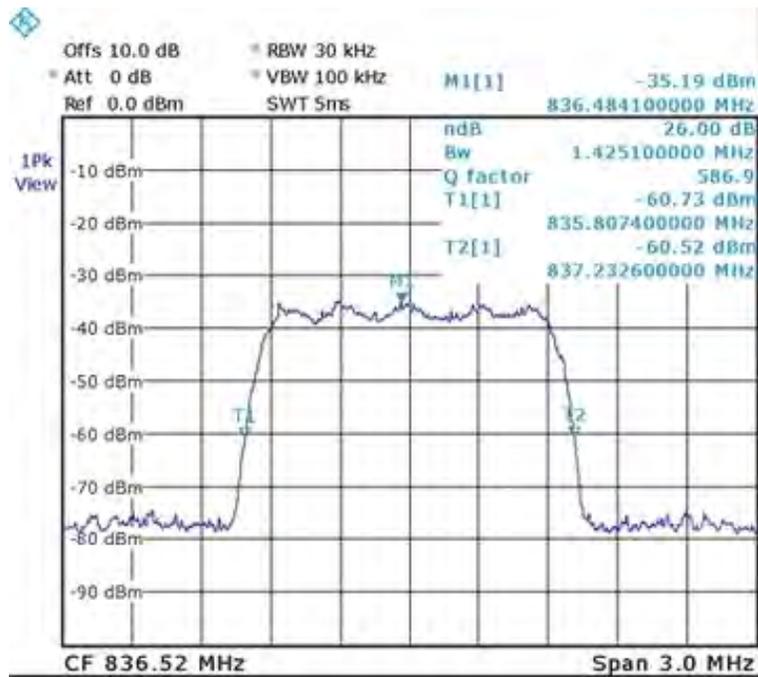
Date: 11.AUG.2012 13:29:05

**Output Signal, 99% Bandwidth**



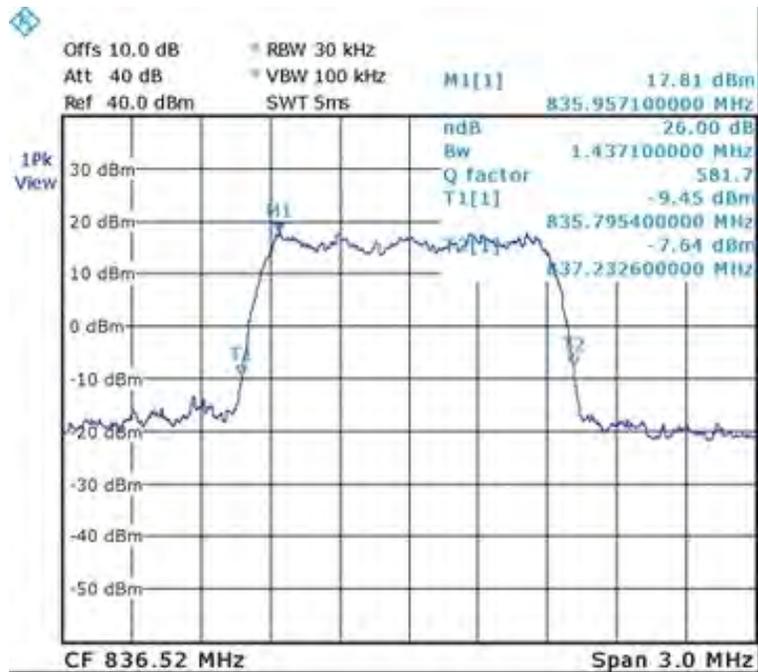
Date: 11.AUG.2012 12:55:02

### Input Signal, 26 dB Bandwidth



Date: 11.AUG.2012 13:30:81

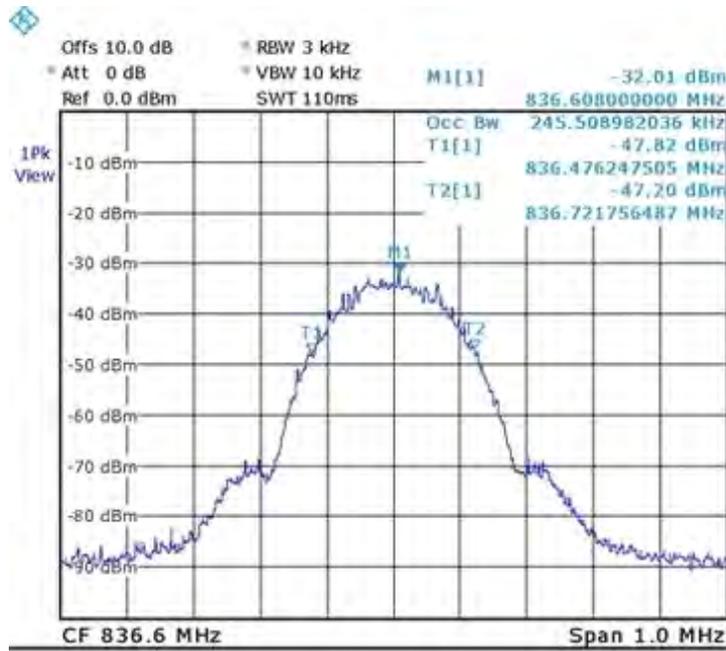
### Output Signal, 26 dB Bandwidth



Date: 11.AUG.2012 12:56:59

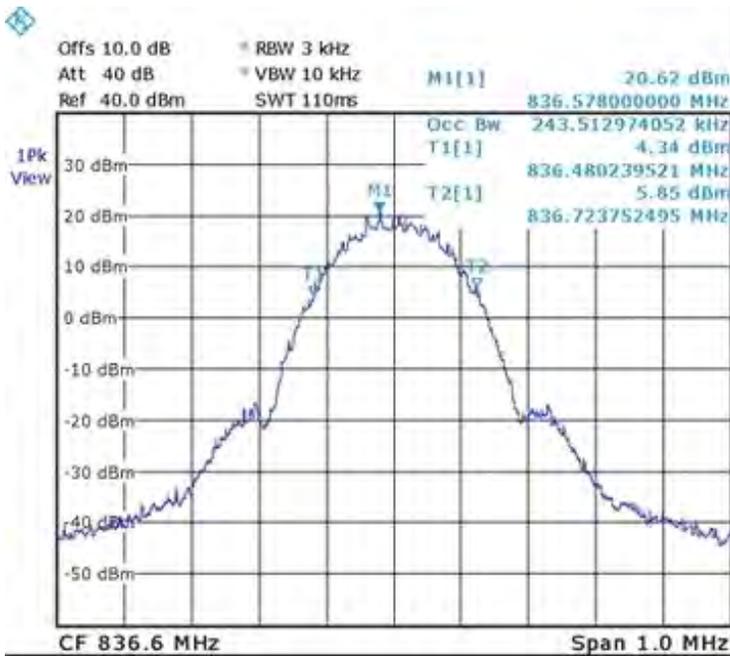
### GSM (Middle Channel)

#### Input Signal, 99% Bandwidth



Date: 13.AUG.2012 06:11:04

#### Output Signal, 99% Bandwidth

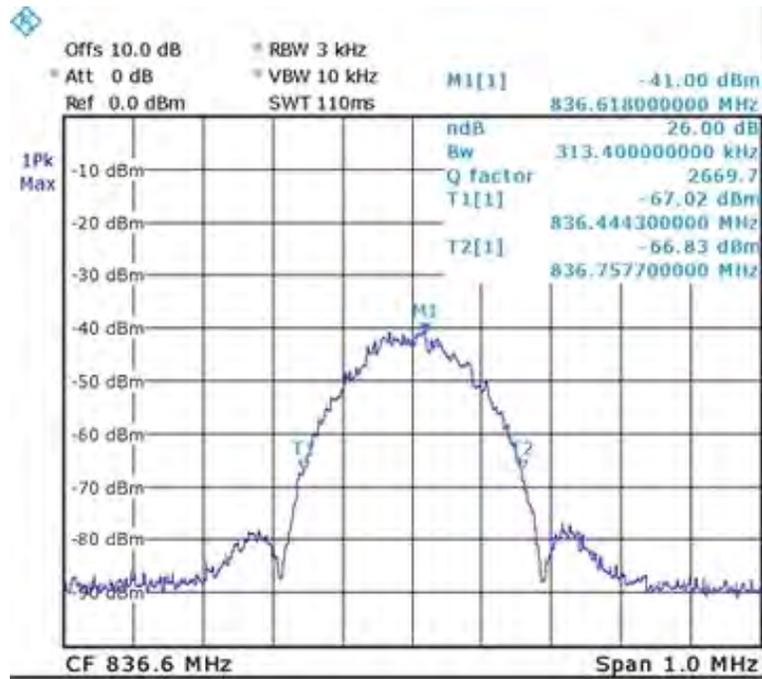


Date: 13.AUG.2012 08:44:08



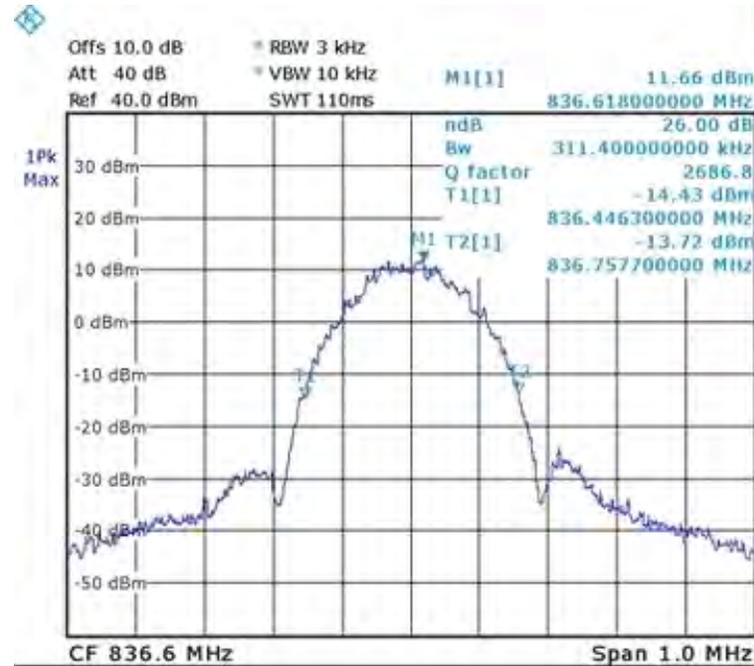


### Input Signal, 26 dB Bandwidth



Date: 13.AUG.2012 11:29:48

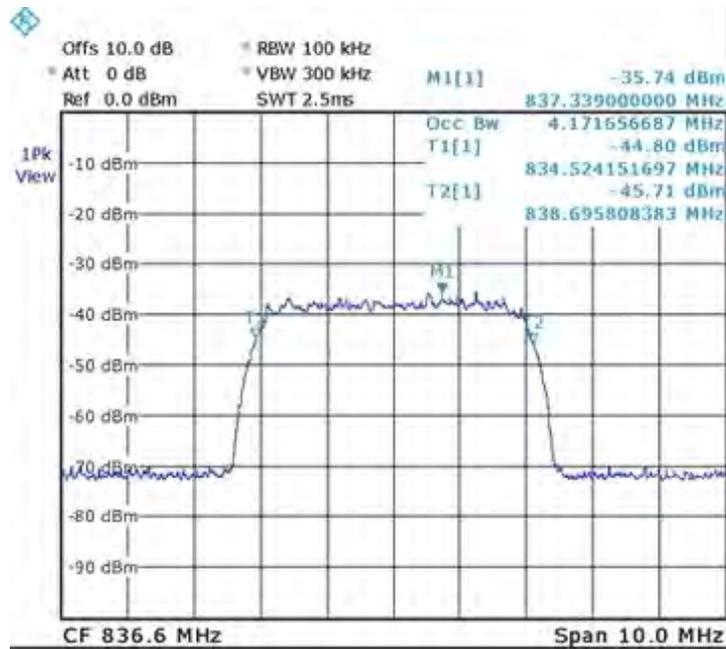
### Output Signal, 26 dB Bandwidth



Date: 13.AUG.2012 11:29:04

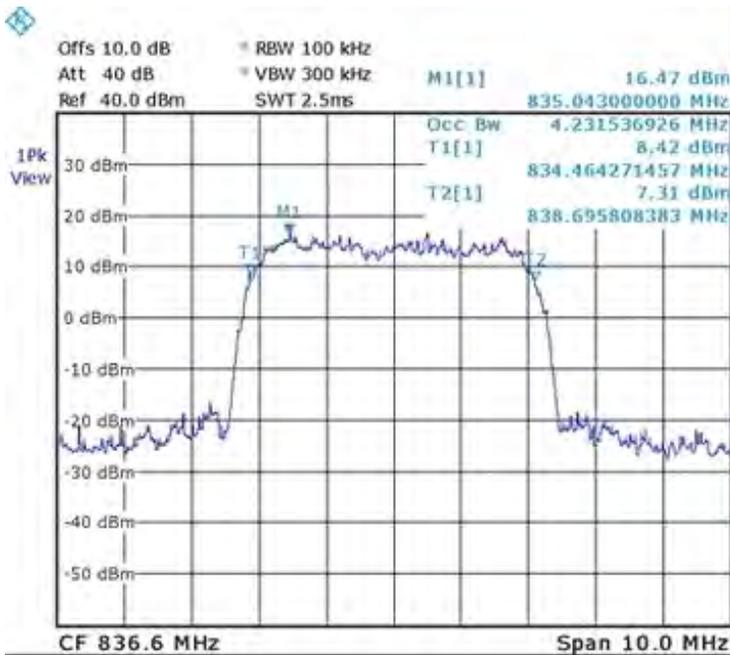
### WCDMA (Middle Channel)

#### Input Signal, 99% Bandwidth



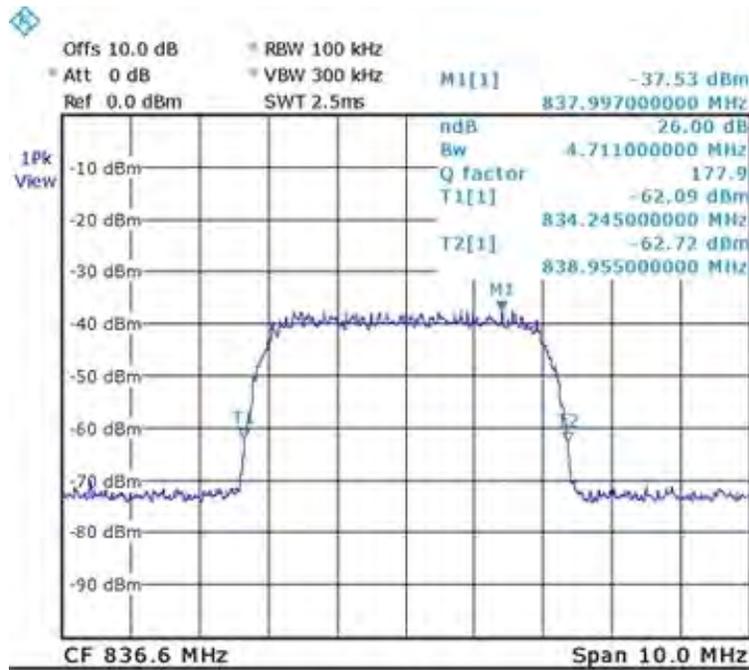
Date: 12.AUG.2012 11:29:46

#### Output Signal, 99% Bandwidth



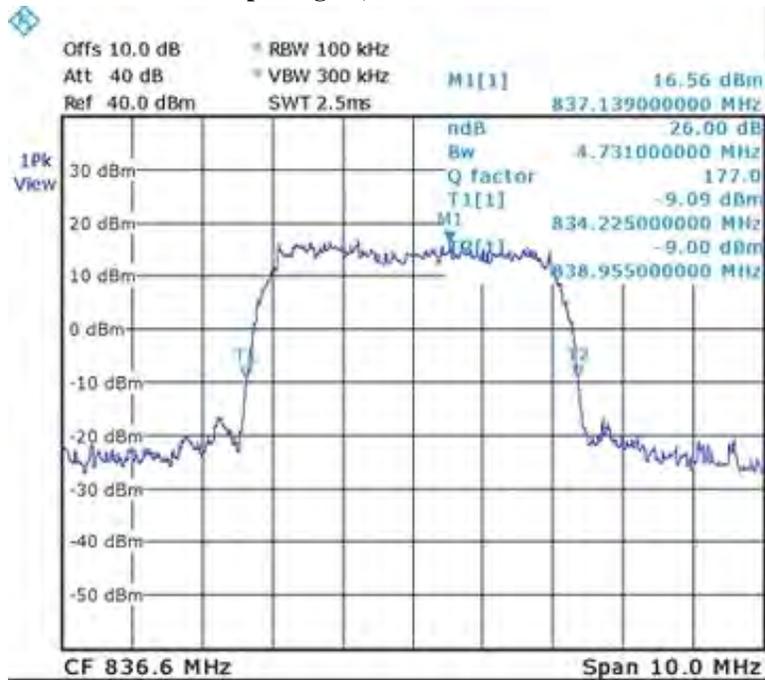
Date: 12.AUG.2012 10:05:02

### Input Signal, 26 dB Bandwidth



Date: 12.AUG.2012 11:51:04

### Output Signal, 26 dB Bandwidth

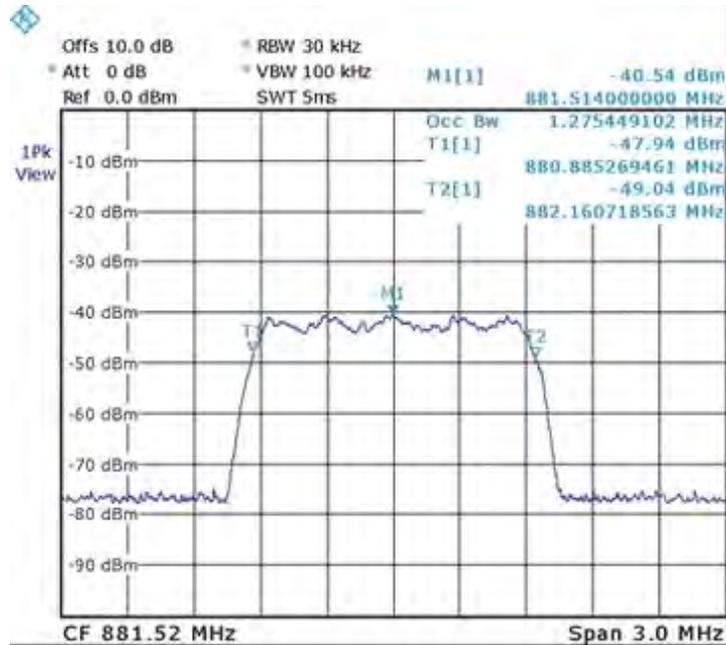


Date: 12.AUG.2012 10:10:42

**Cellular Band (Part 22H), Downlink:**

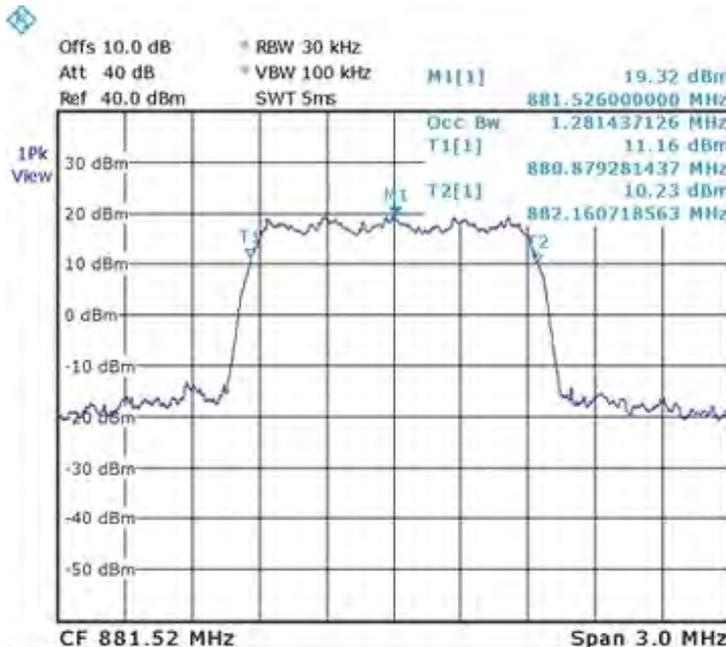
**CDMA (Middle Channel)**

**Input Signal, 99% Bandwidth**



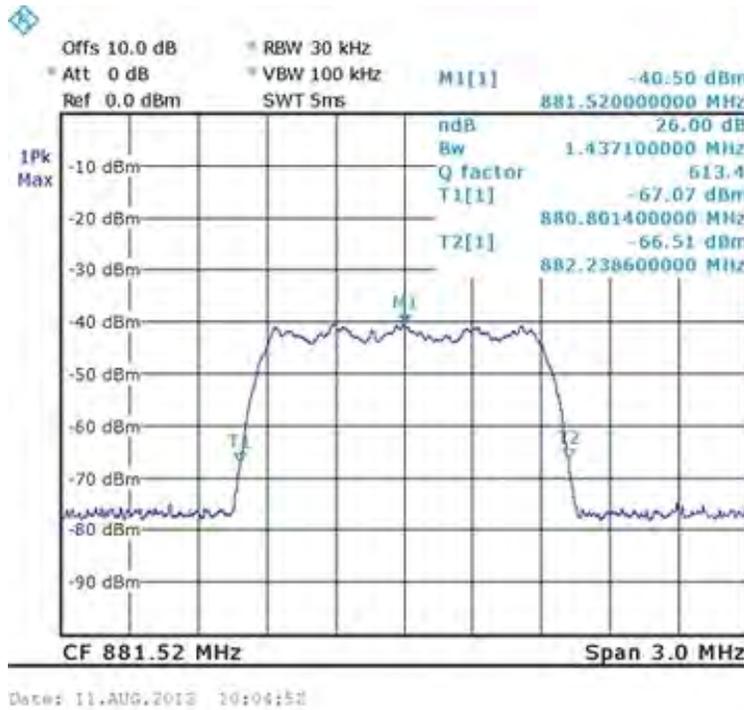
Date: 11.AUG.2012 10:10:25

**Output Signal, 99% Bandwidth**

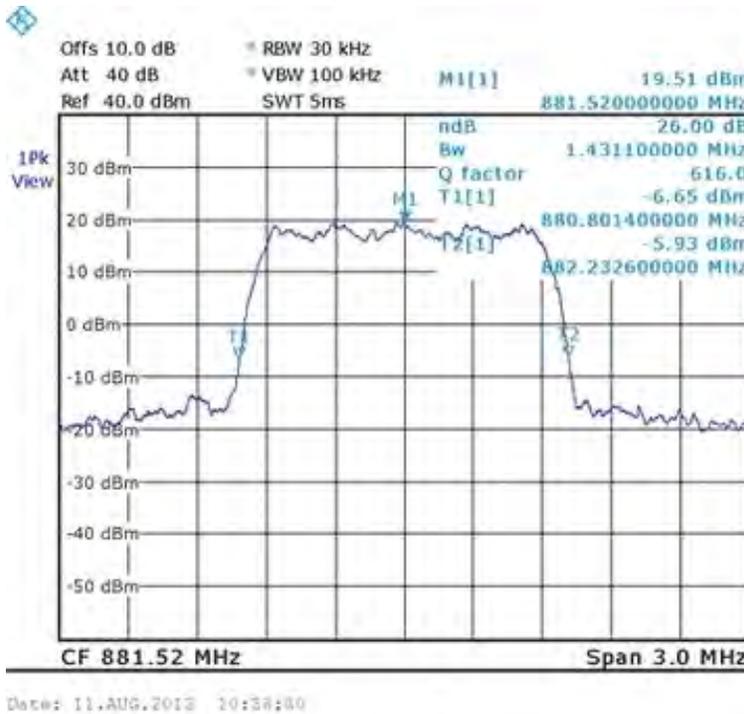


Date: 11.AUG.2012 10:27:48

### Input Signal, 26 dB Bandwidth

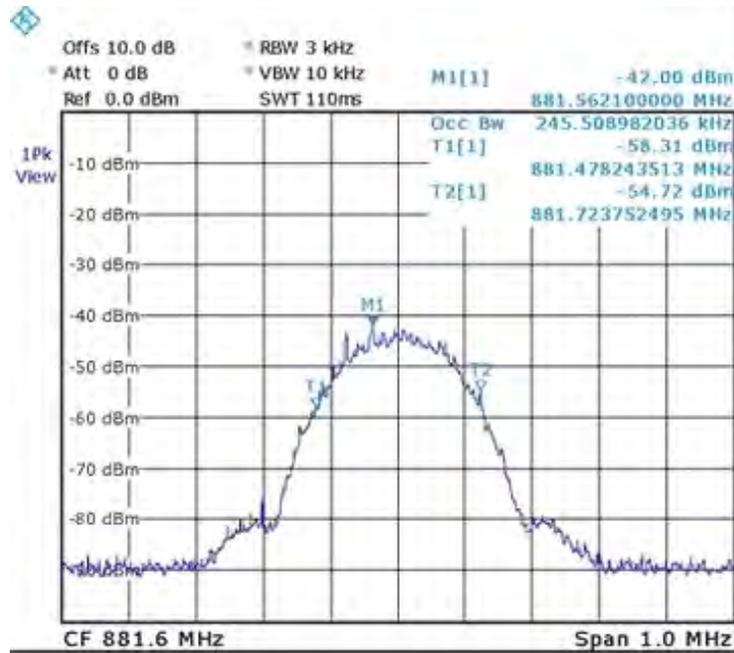


### Output Signal, 26 dB Bandwidth



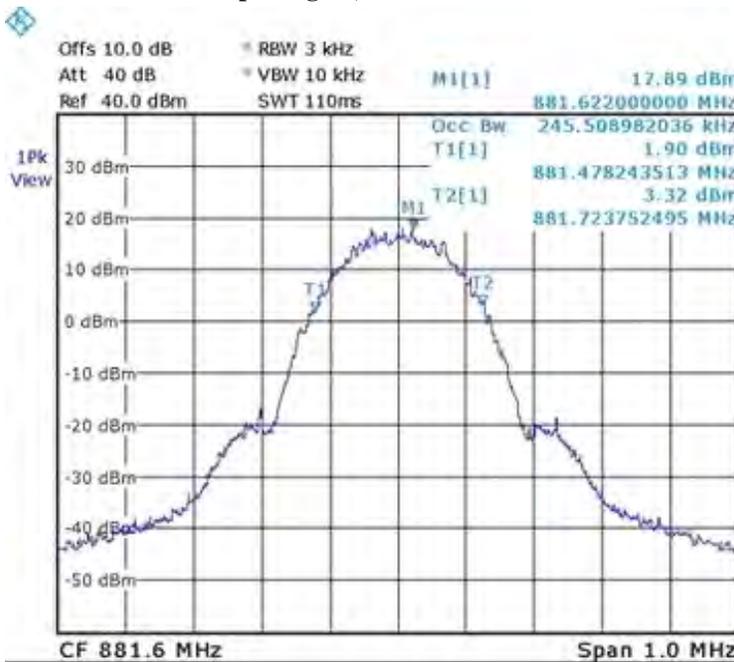
### GSM (Middle Channel)

#### Input Signal, 99% Bandwidth



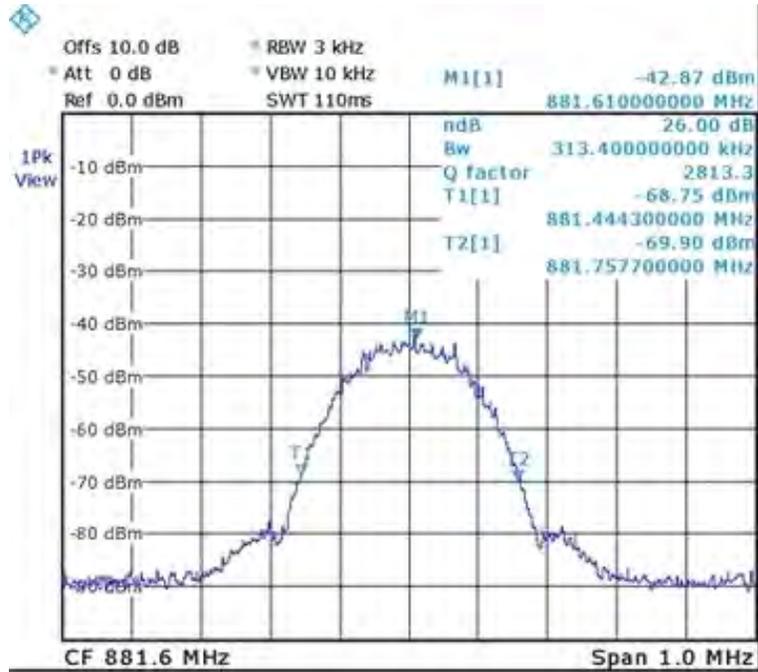
Date: 12.AUG.2012 13:28:27

#### Output Signal, 99% Bandwidth



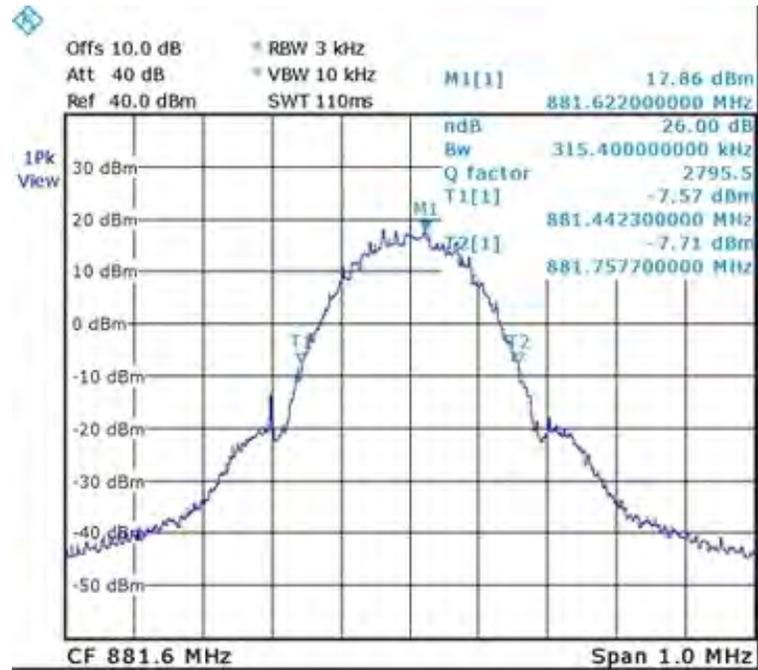
Date: 12.AUG.2012 12:48:01

**Input Signal, 26 dB Bandwidth**



Date: 12.AUG.2012 13:29:34

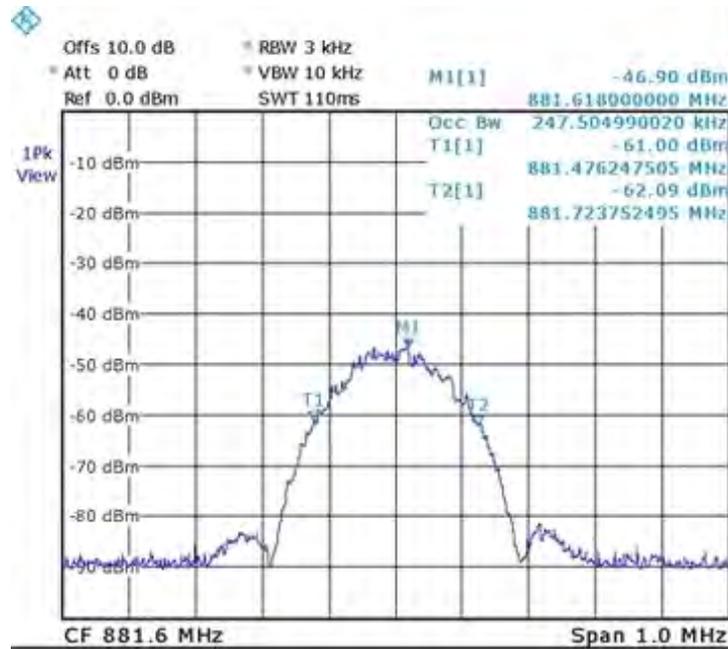
**Output Signal, 26 dB Bandwidth**



Date: 12.AUG.2012 12:46:09

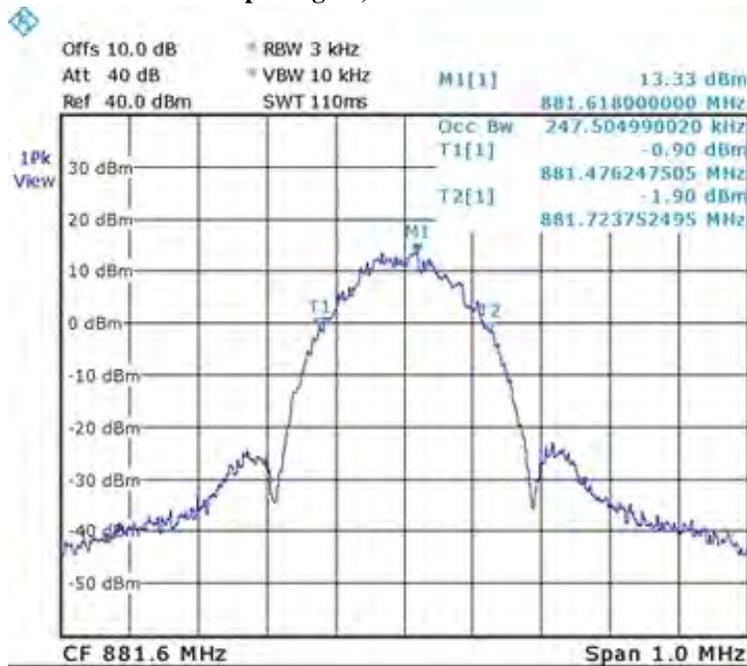
### EDGE (Middle Channel)

#### Input Signal, 99% Bandwidth



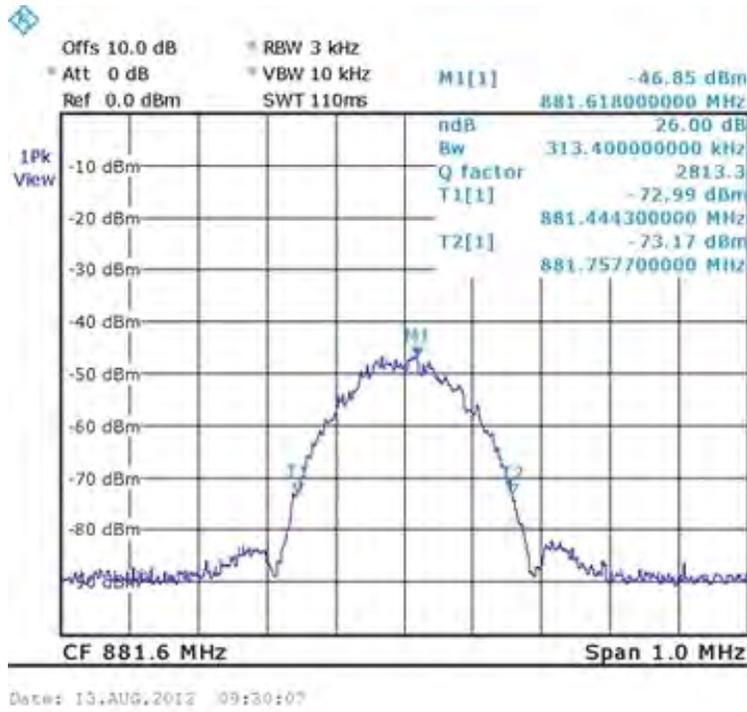
Date: 13.AUG.2012 09:29:13

#### Output Signal, 99% Bandwidth

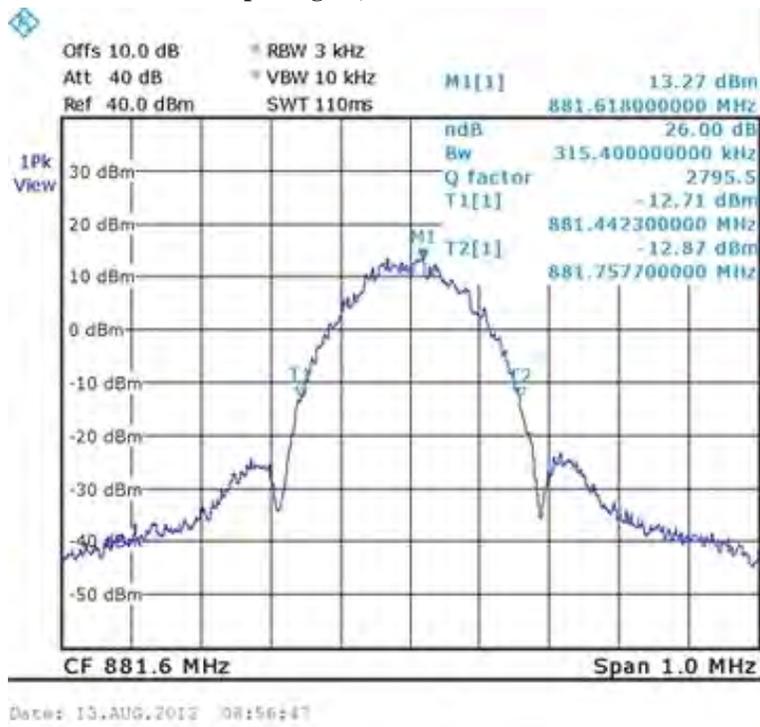


Date: 13.AUG.2012 09:55:24

**Input Signal, 26 dB Bandwidth**

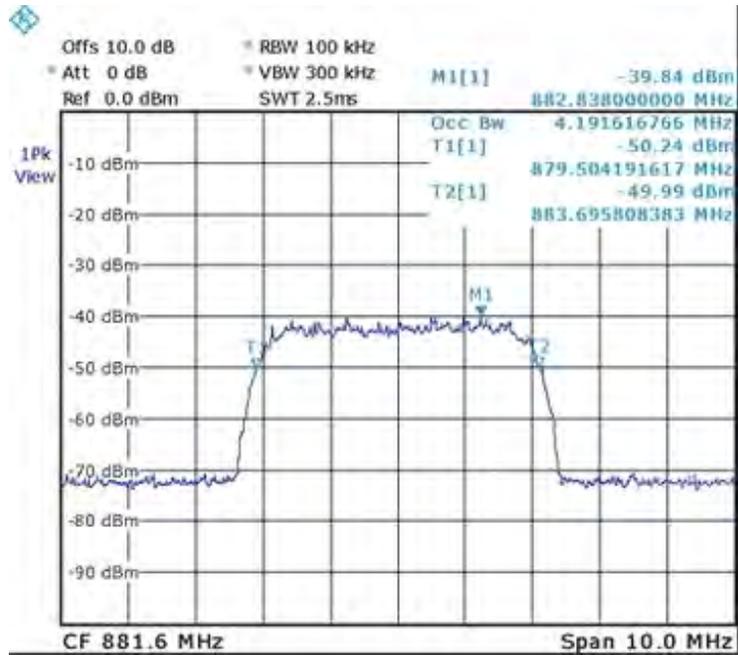


**Output Signal, 26 dB Bandwidth**



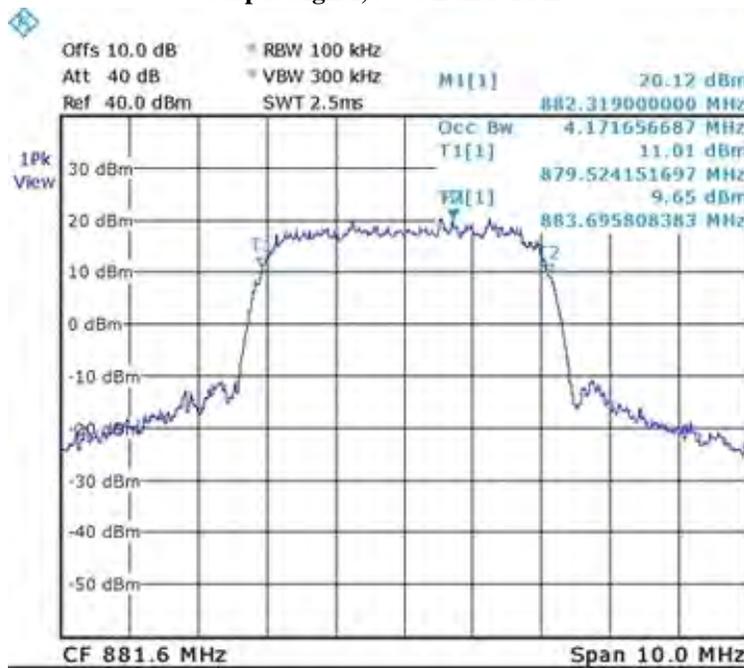
### WCDMA (Middle Channel)

#### Input Signal, 99% Bandwidth



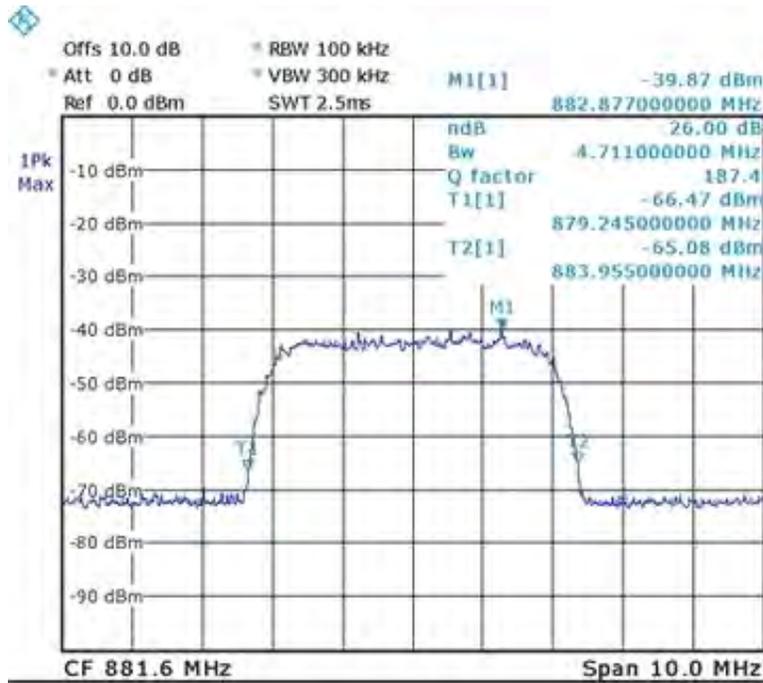
Date: 12.AUG.2012 09:22:21

#### Output Signal, 99% Bandwidth



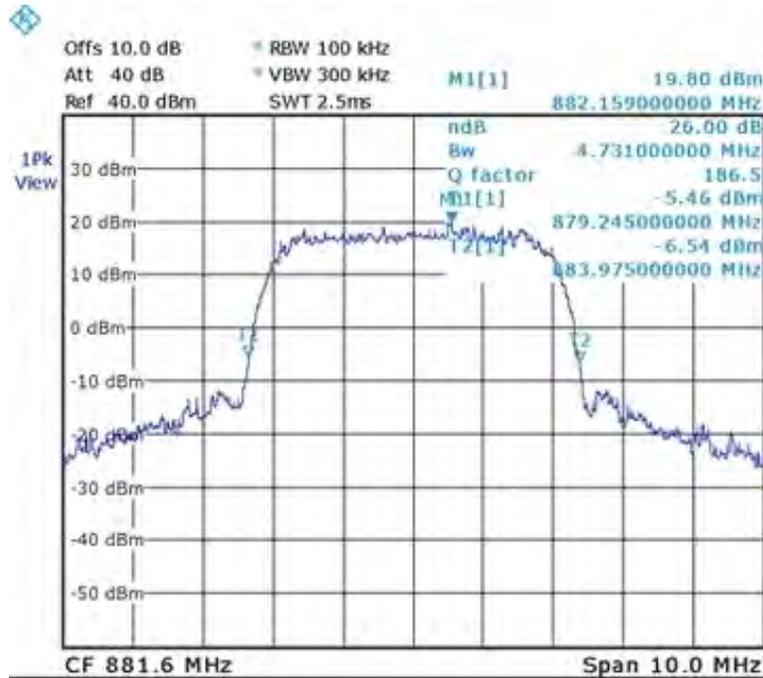
Date: 12.AUG.2012 06:29:41

### Input Signal, 26 dB Bandwidth



Date: 12.AUG.2012 09:34:28

### Output Signal, 26 dB Bandwidth

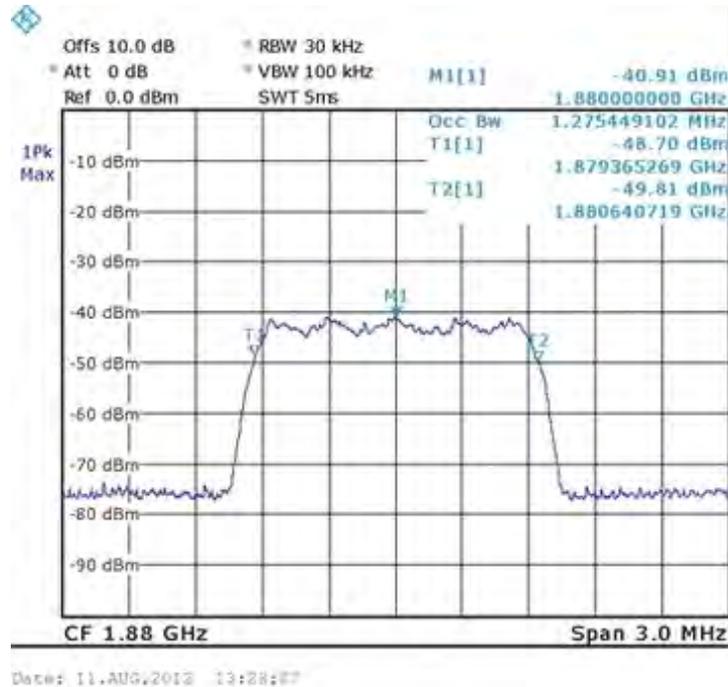


Date: 12.AUG.2012 06:30:46

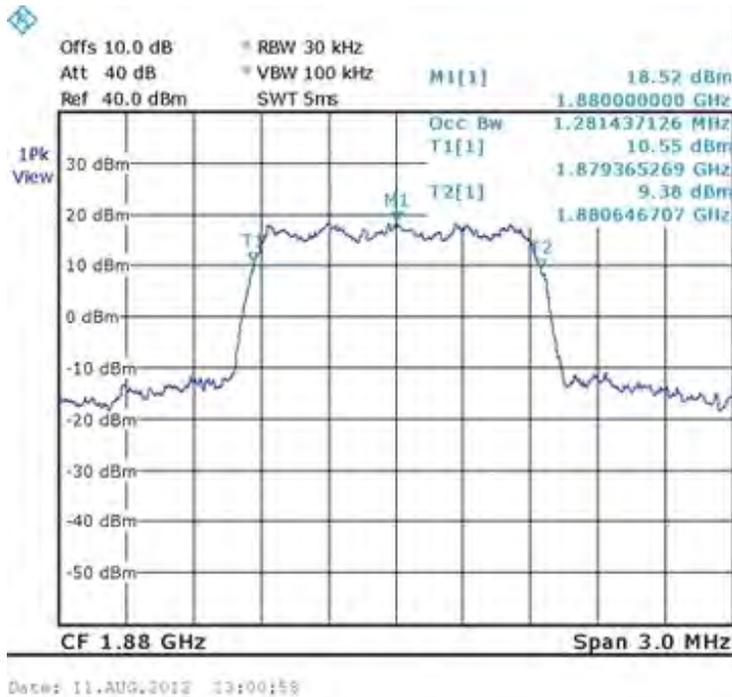
**PCS Band (Part 24E), Uplink:**

**CDMA (Middle Channel)**

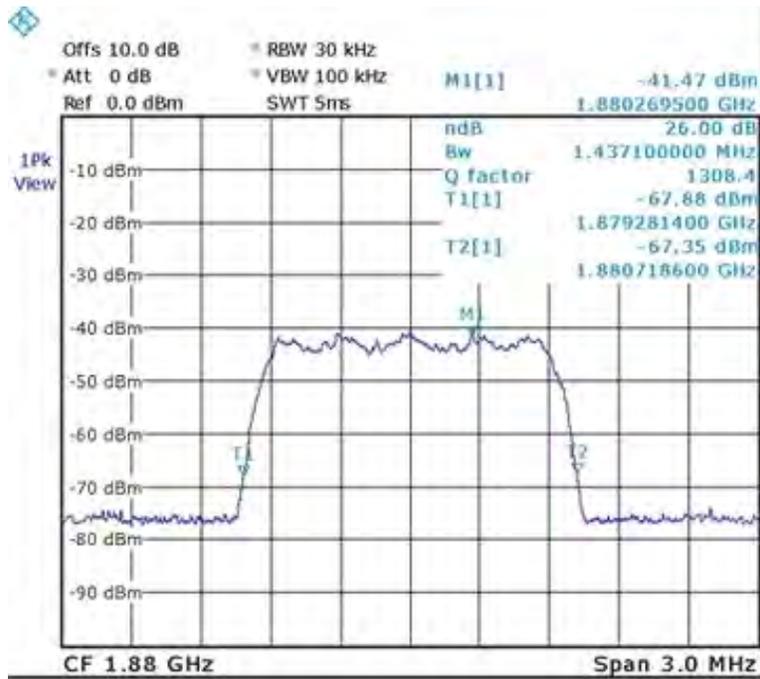
**Input Signal, 99% Bandwidth**



**Output Signal, 99% Bandwidth**

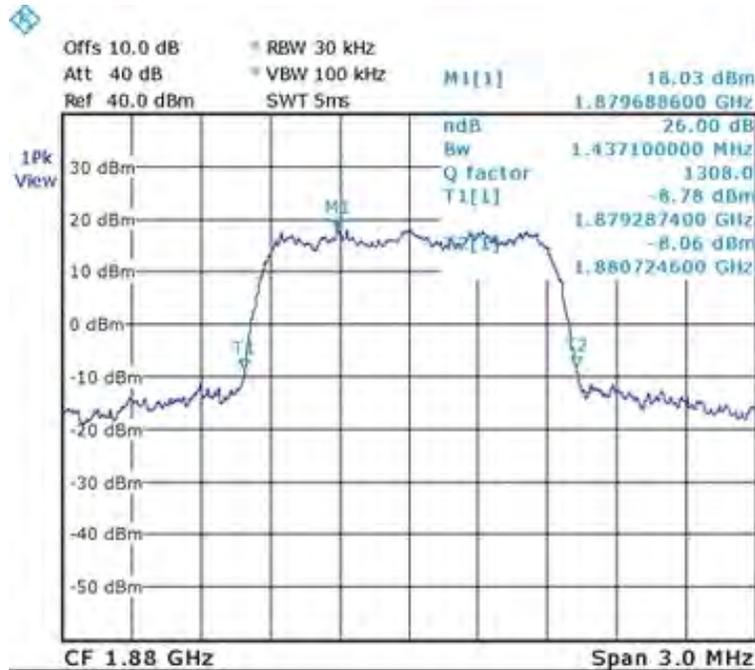


### Input Signal, 26 dB Bandwidth



Date: 11.AUG.2012 13:27:23

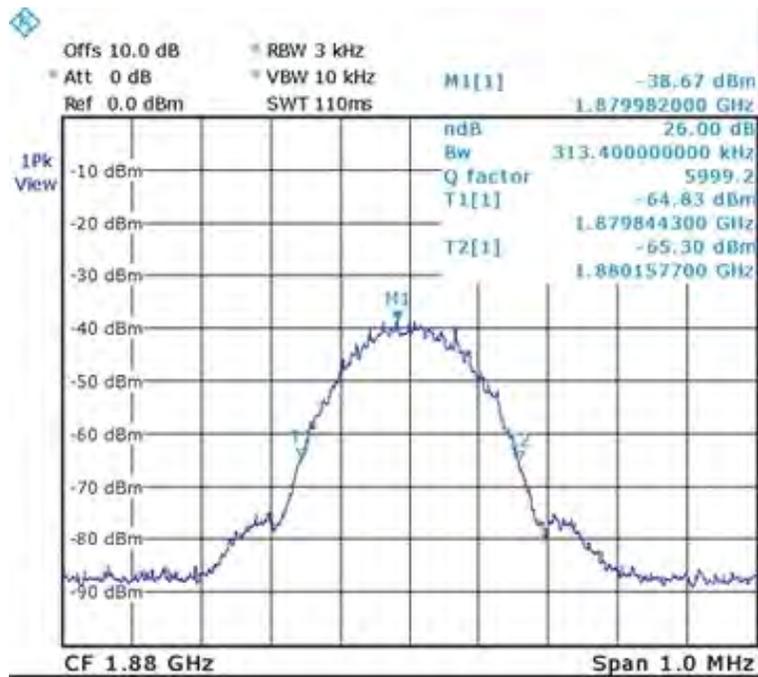
### Output Signal, 26 dB Bandwidth



Date: 11.AUG.2012 12:59:49

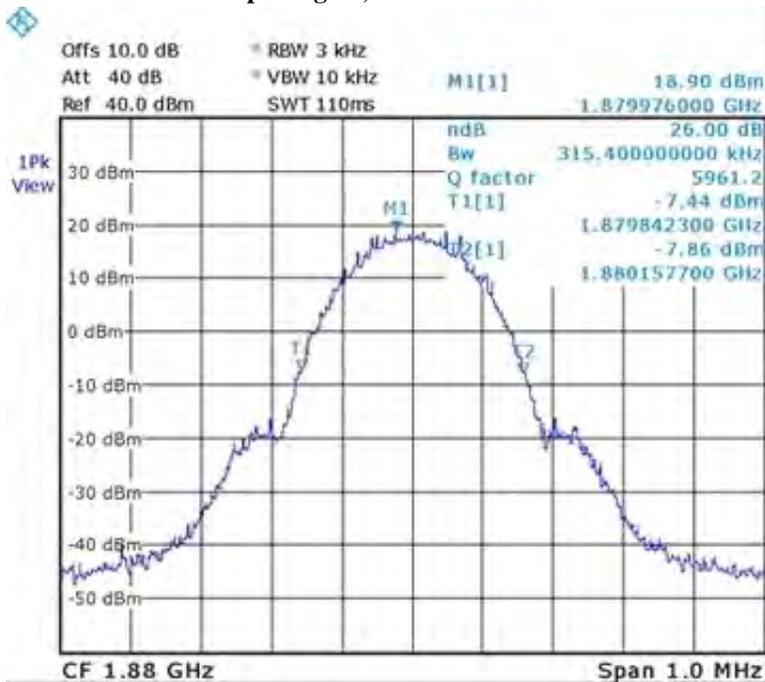


### Input Signal, 26 dB Bandwidth



Date: 13.AUG.2012 06:25:12

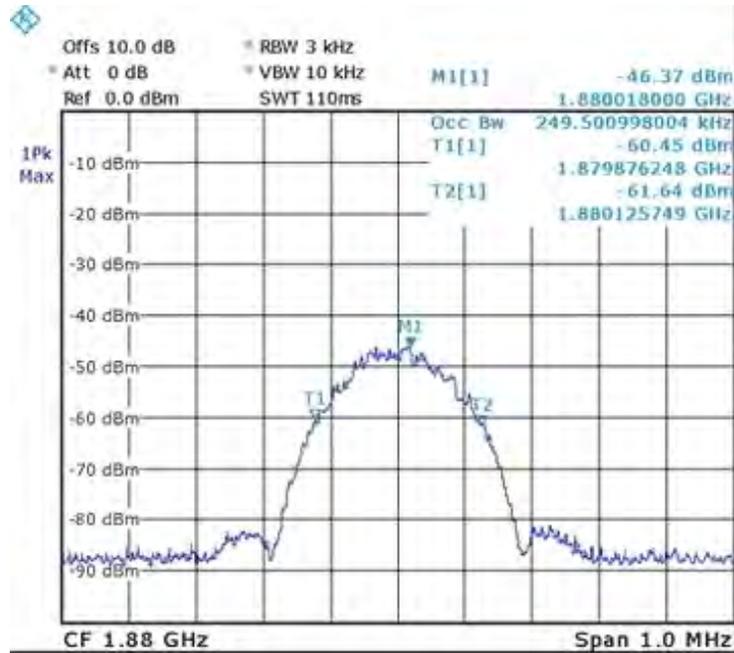
### Output Signal, 26 dB Bandwidth



Date: 13.AUG.2012 06:40:18

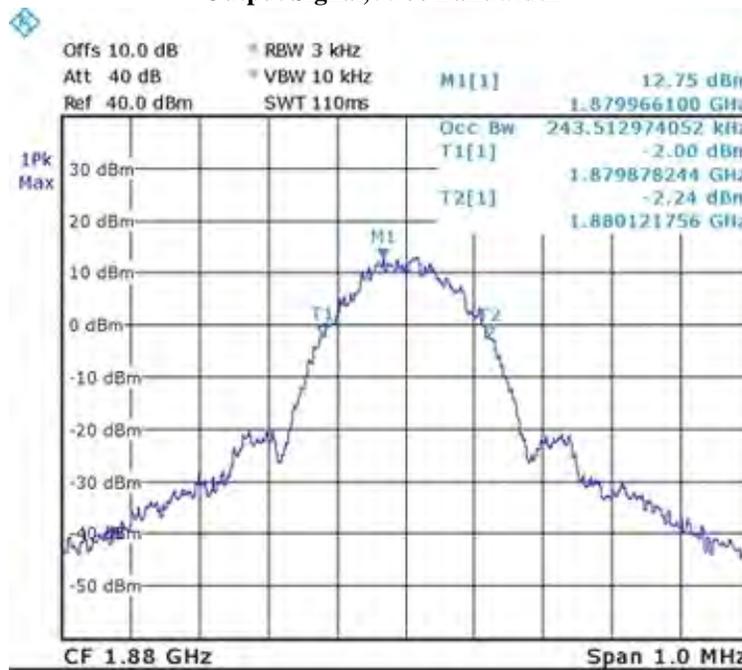
### EDGE (Middle Channel)

#### Input Signal, 99% Bandwidth



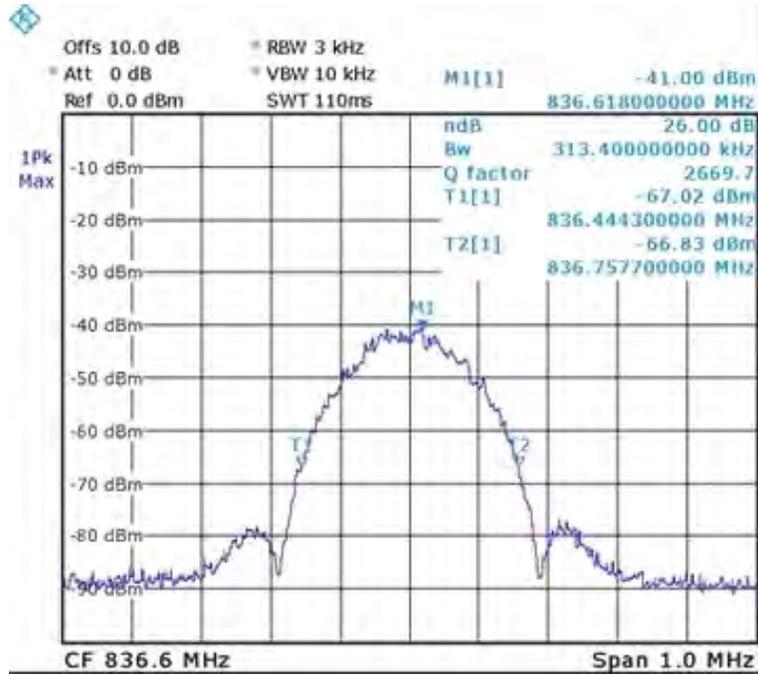
Date: 13.AUG.2012 11:31:19

#### Output Signal, 99% Bandwidth



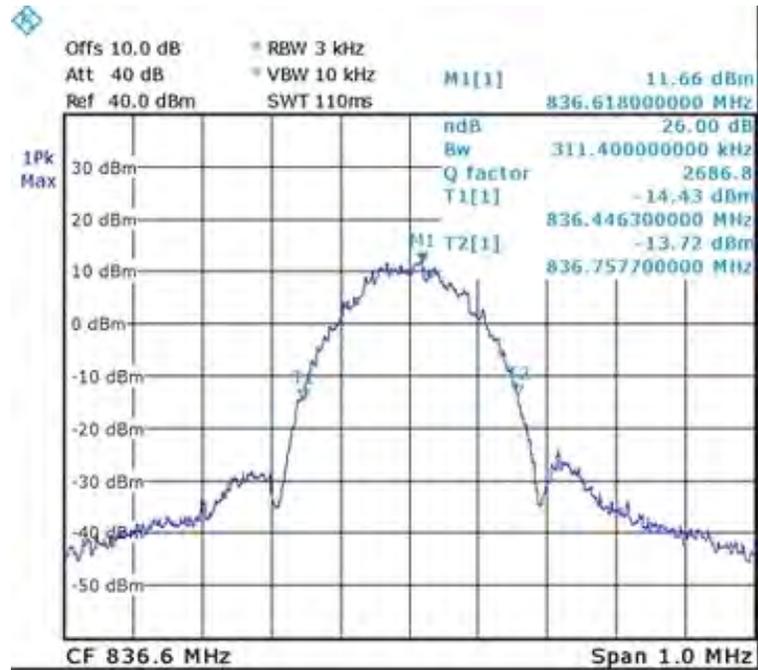
Date: 13.AUG.2012 11:32:04

**Input Signal, 26 dB Bandwidth**



Date: 13.AUG.2012 11:29:48

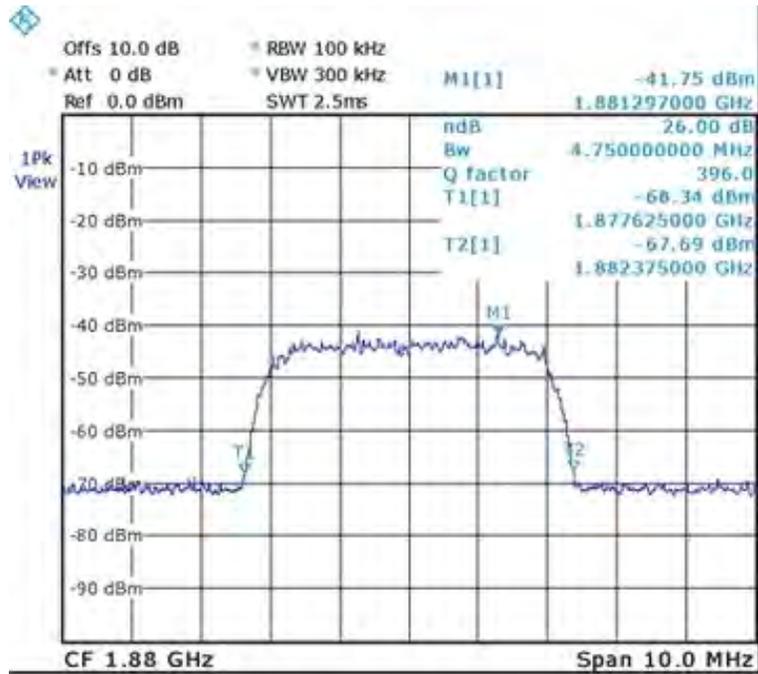
**Output Signal, 26 dB Bandwidth**



Date: 13.AUG.2012 11:29:04

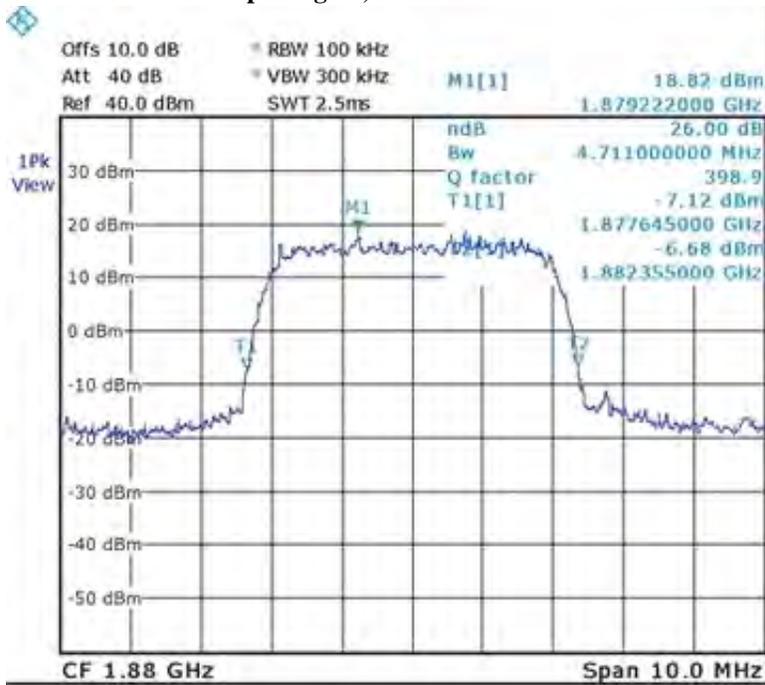


### Input Signal, 26 dB Bandwidth



Date: 12.AUG.2012 11:33:04

### Output Signal, 26 dB Bandwidth

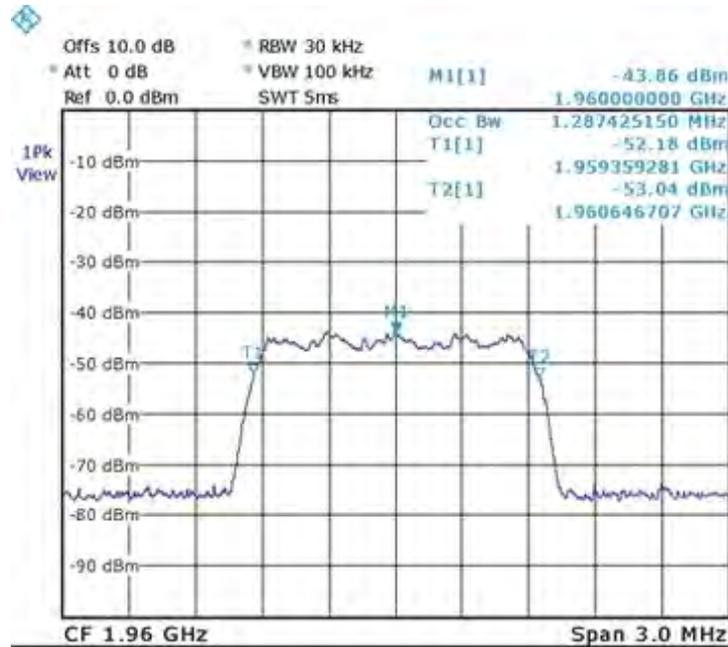


Date: 12.AUG.2012 10:03:04

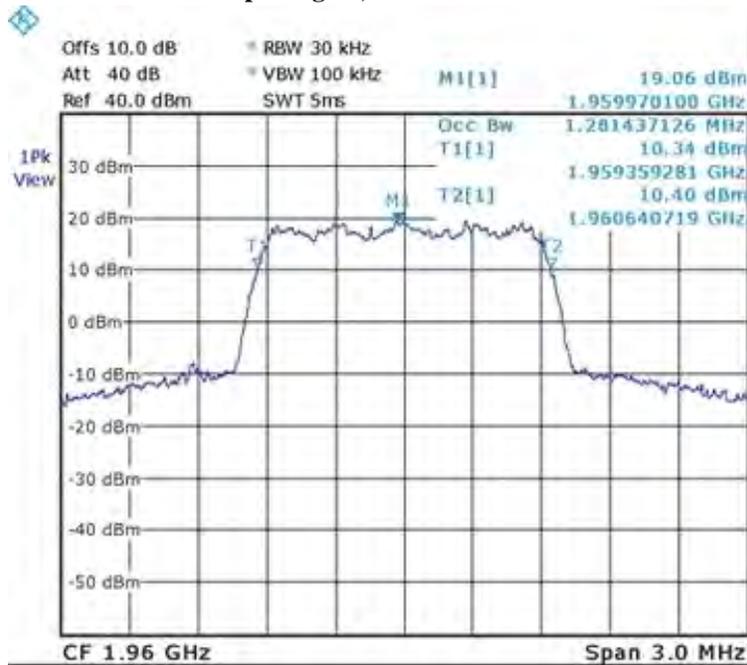
**PCS Band (Part 24E), Downlink:**

**CDMA (Middle Channel)**

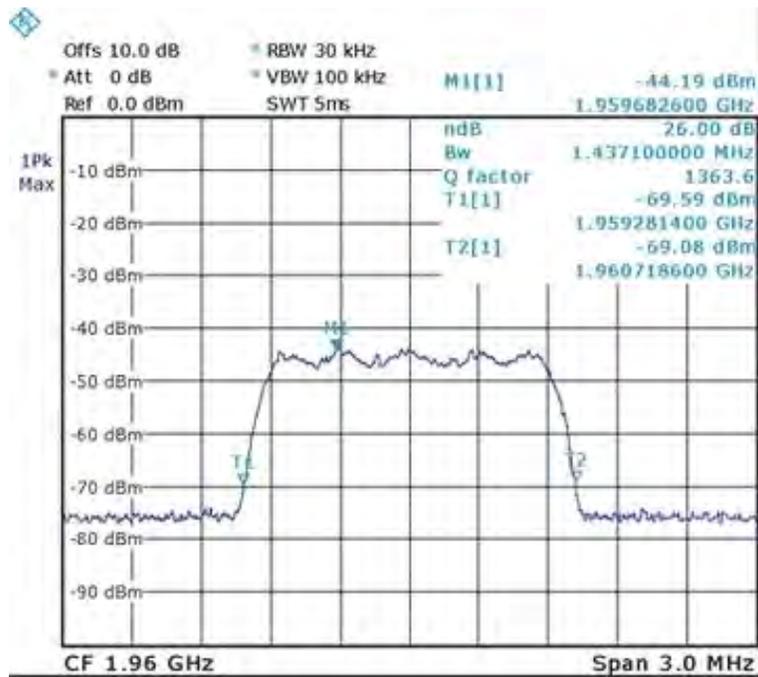
**Input Signal, 99% Bandwidth**



**Output Signal, 99% Bandwidth**

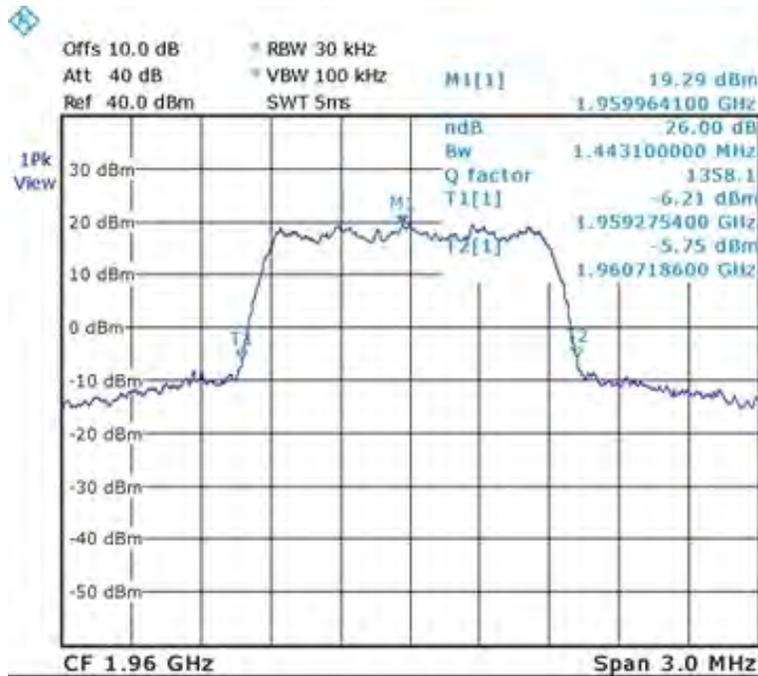


### Input Signal, 26 dB Bandwidth



Date: 11.AUG.2013 10:05:05

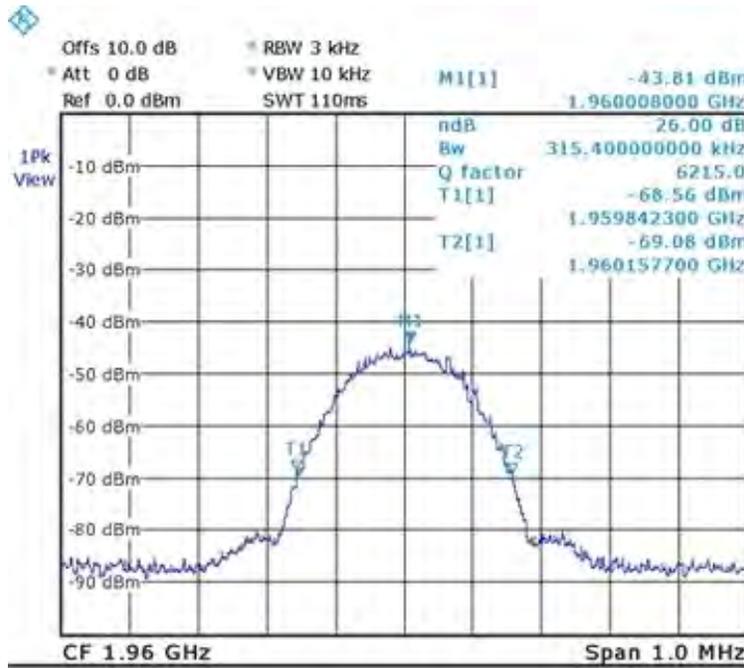
### Output Signal, 26 dB Bandwidth



Date: 11.AUG.2013 10:31:50

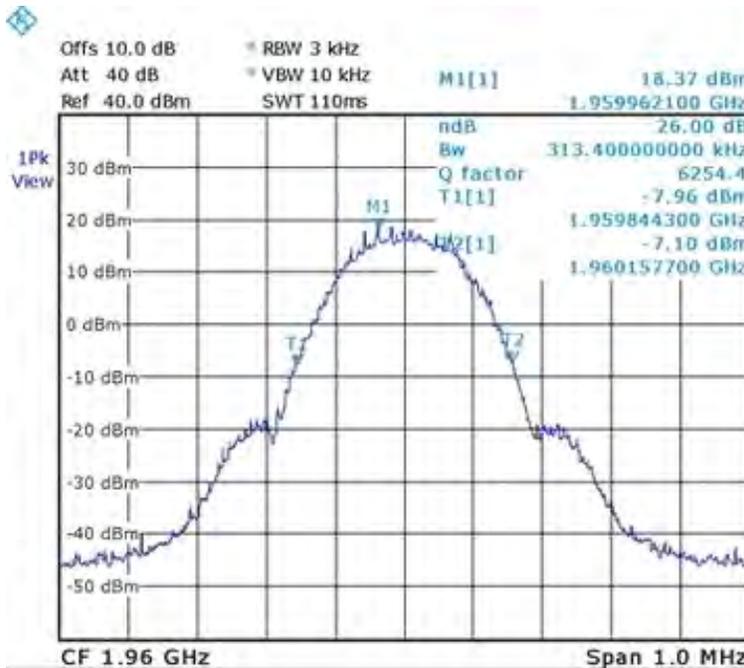


### Input Signal, 26 dB Bandwidth



Date: 12.AUG.2012 13:30:59

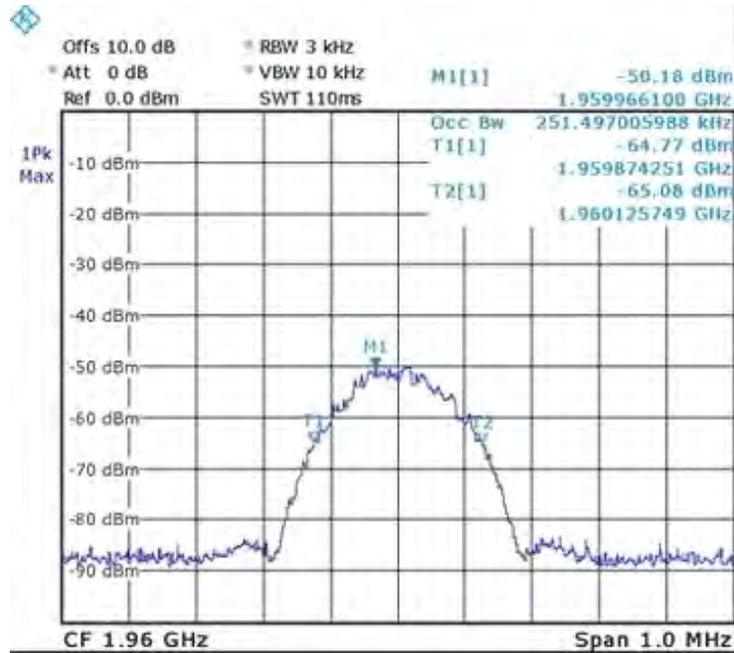
### Output Signal, 26 dB Bandwidth



Date: 12.AUG.2012 12:51:01

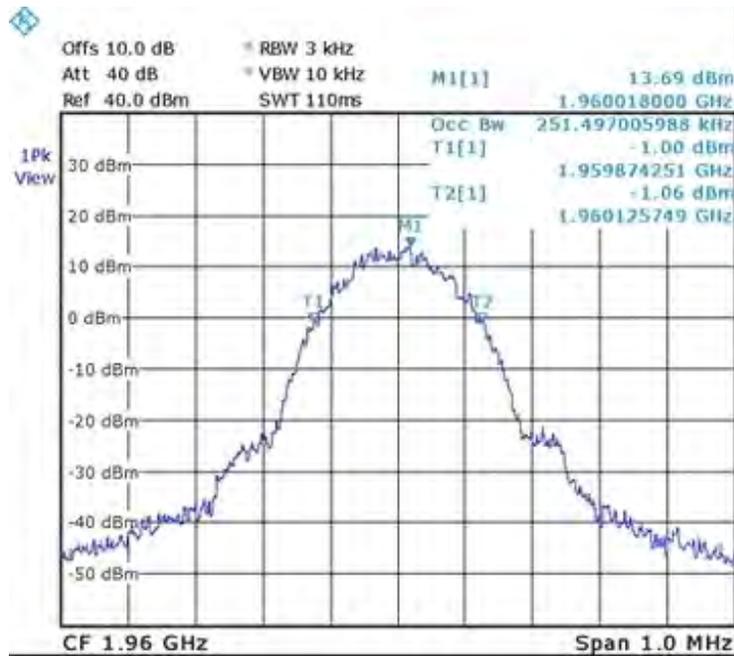
### EDGE (Middle Channel)

#### Input Signal, 99% Bandwidth



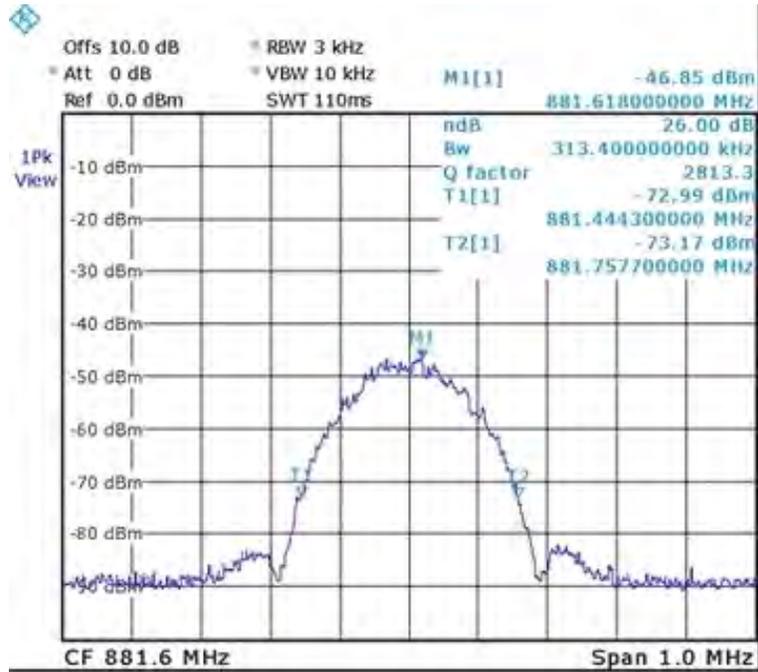
Date: 13.AUG.2012 09:33:50

#### Output Signal, 99% Bandwidth



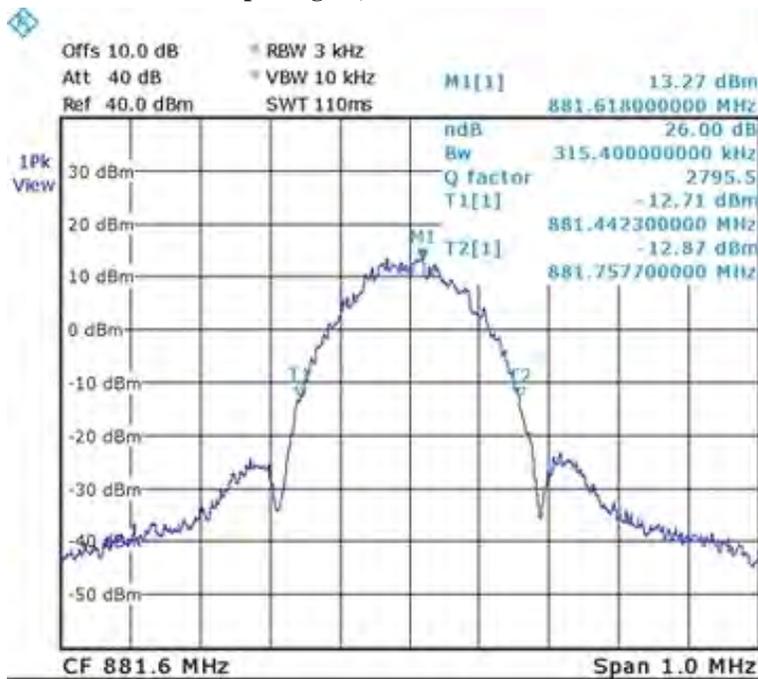
Date: 13.AUG.2012 09:02:01

### Input Signal, 26 dB Bandwidth



Date: 13.AUG.2012 09:30:07

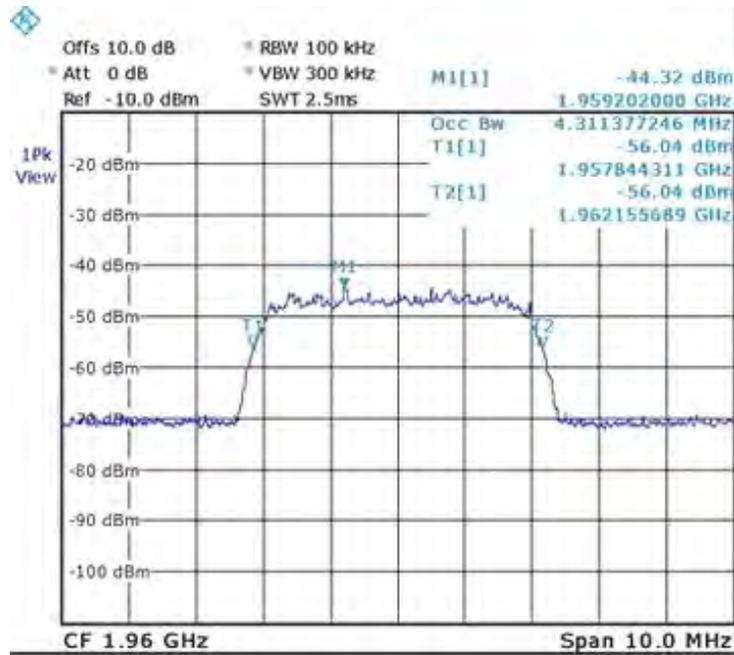
### Output Signal, 26 dB Bandwidth



Date: 13.AUG.2012 08:56:47

### WCDMA (Middle Channel)

#### Input Signal, 99% Bandwidth



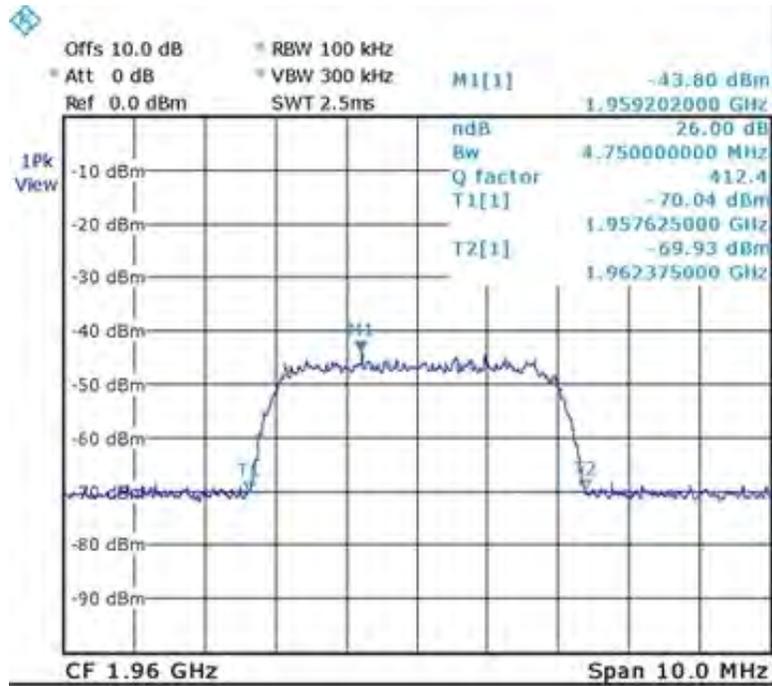
Date: 12.AUG.2012 09:28:29

#### Output Signal, 99% Bandwidth



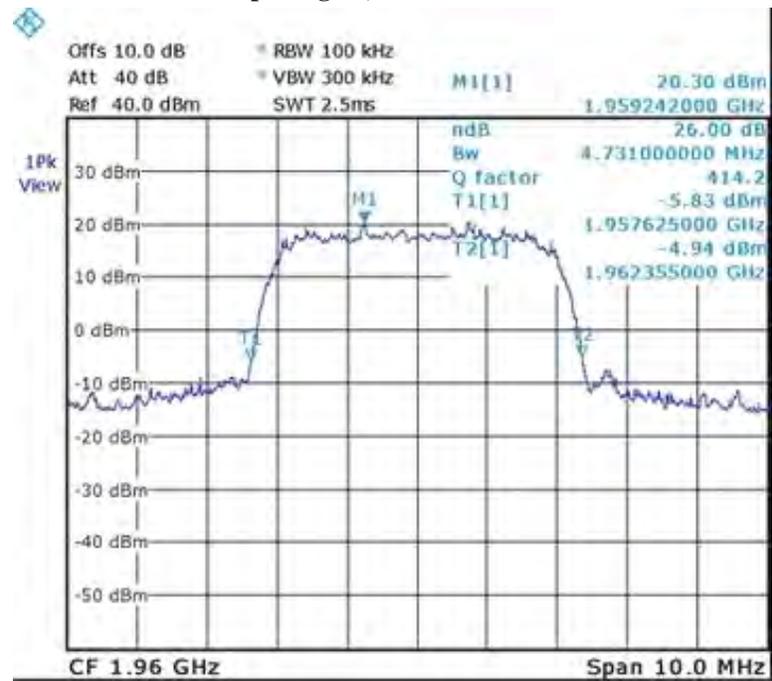
Date: 12.AUG.2012 09:27:17

### Input Signal, 26 dB Bandwidth



Date: 12.AUG.2012 09:33:17

### Output Signal, 26 dB Bandwidth



Date: 12.AUG.2012 06:24:05

## 8 - FCC §2.1051, §22.917(a) & §24.238(a) - SPURIOUS EMISSIONS AT ANTENNA TERMINALS

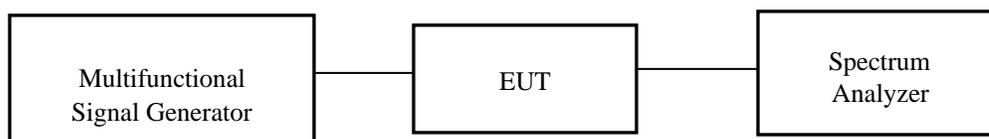
### 8.1 Applicable Standards

FCC §2.1051, §22.917(a) and §24.238(a).

The spectrum was to be investigated to the tenth harmonics of the highest fundamental frequency as specified in § 2.1051.

### 8.2 Test Procedure

The RF output of the transceiver was connected to a spectrum analyzer and simulator through appropriate attenuation. Sufficient scans were taken to show any out of band emissions up to 10<sup>th</sup> harmonic.



### 8.3 Test Equipment List and Details

Description	Manufacturer	Model Number	Serial Number	Calibration Date	Calibration Due Date
Spectrum Analyzer	R & S	FSL18	100180	2012-05-10	2013-05-09
Spectrum Analyzer	Agilent	N9020A	MY49100787	2012-06-10	2013-06-09
Attenuator	Weinschel Engineering	1	AB1165	2012-07-08	2013-07-07
Signal Generator	Agilent	N5182A	MY47420718	2012-04-22	2013-04-21
Signal Generator	Agilent	N5182A	MY47420673	2012-04-22	2013-04-21

### 8.4 Test Results

#### Test Environmental Conditions

Temperature:	23-25 °C
Relative Humidity:	50-59 %
ATM Pressure:	94.5 kPa

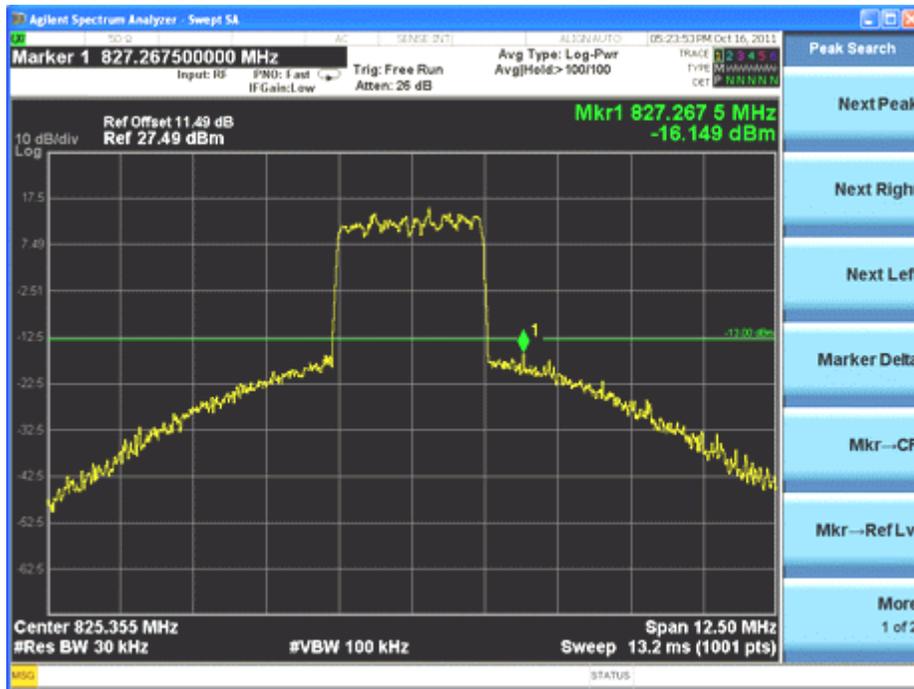
*The testing was performed by Jack Wu on 2012-08-15 to 2012-08-17.*

Please refer to the following plots.

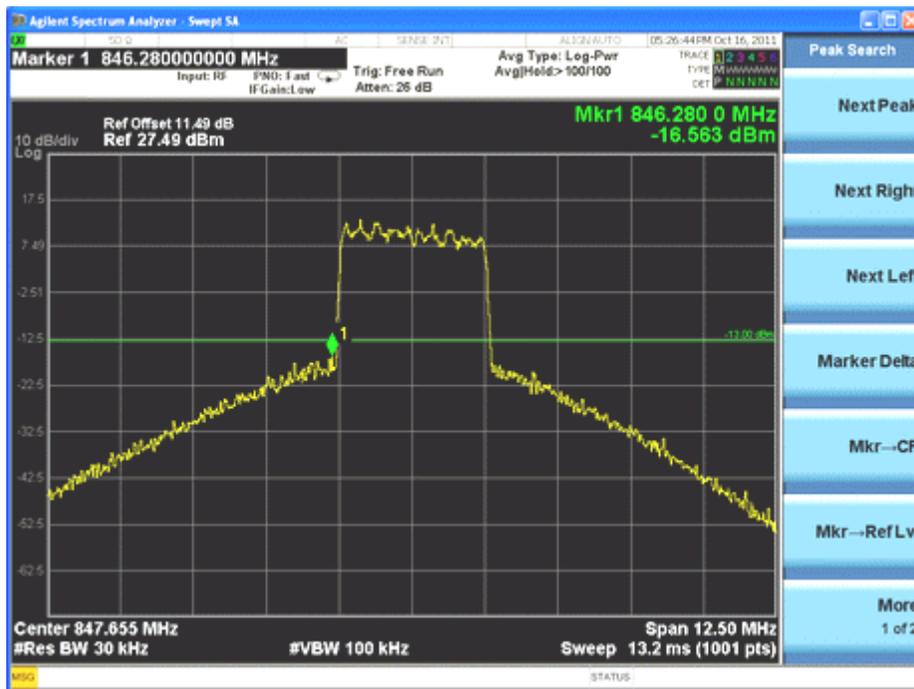
CDMA:

### Cellular Band (Part 22H)

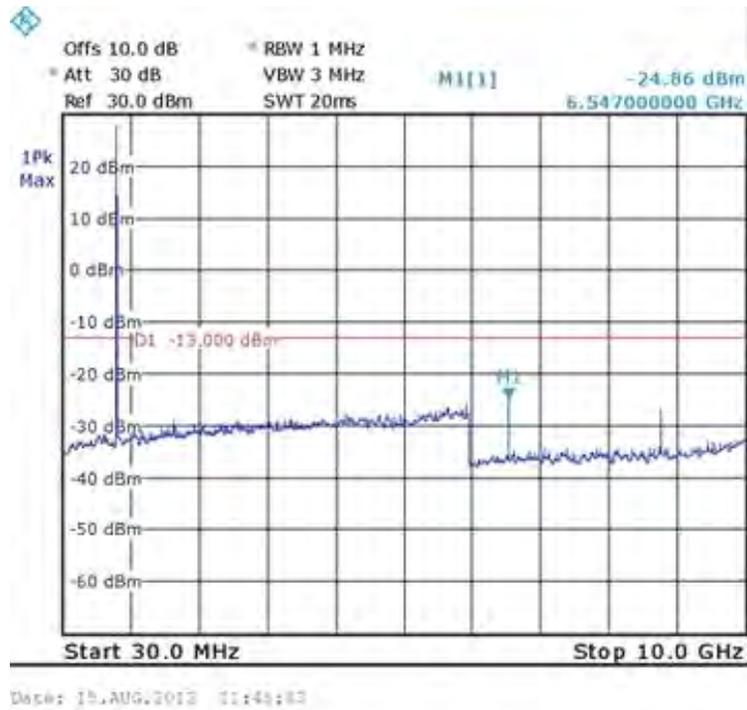
#### Uplink, Inter-modulation, Low-band edge



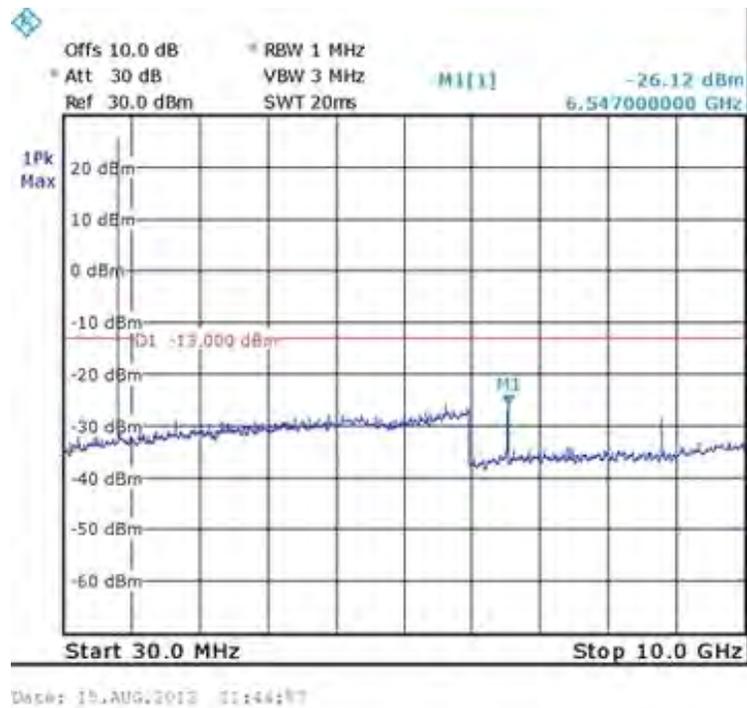
#### Uplink, Inter-modulation, High-band edge



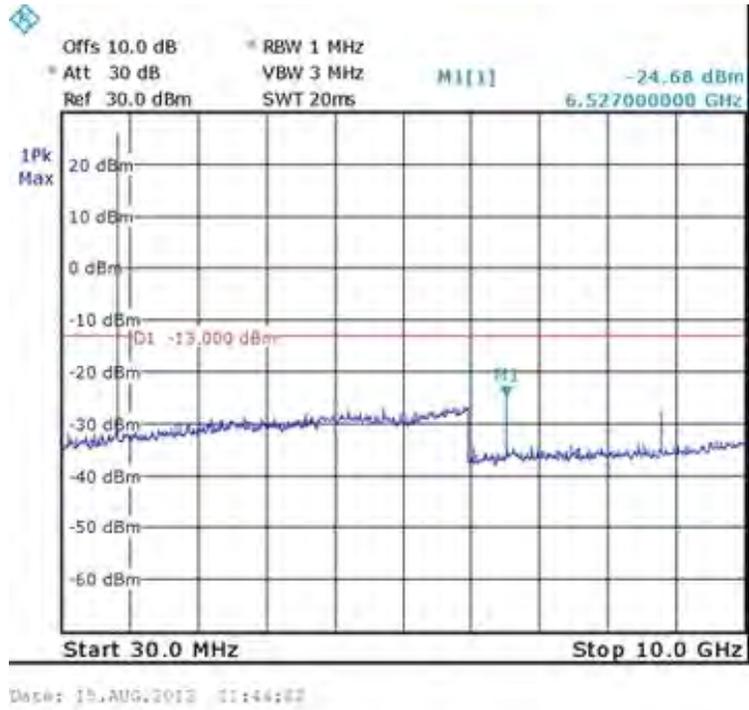
### Uplink, Spurious Emissions at Antenna Terminal, Low Channel



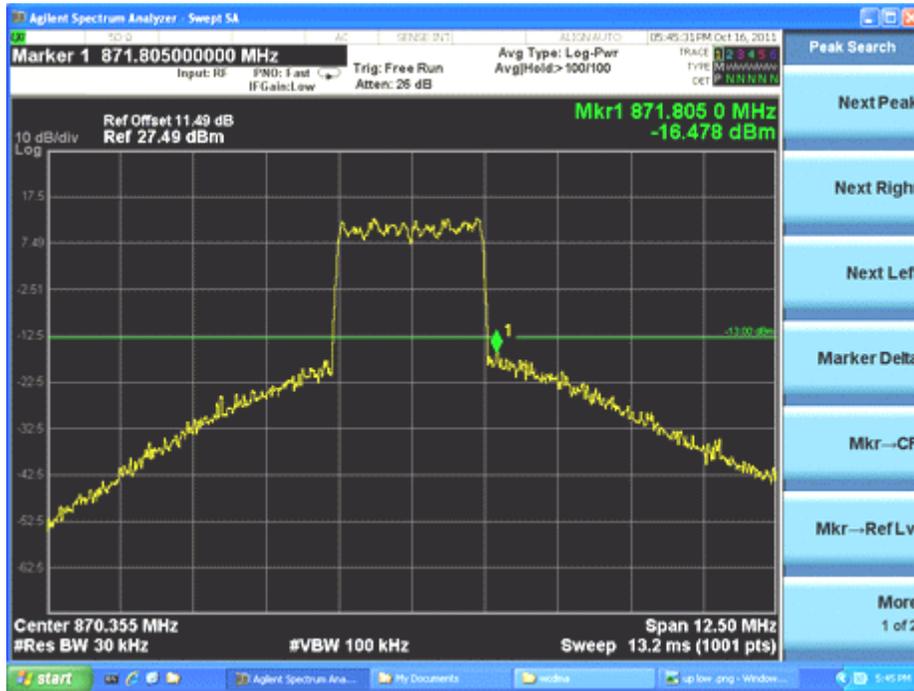
### Uplink, Spurious Emissions at Antenna Terminal, Middle Channel



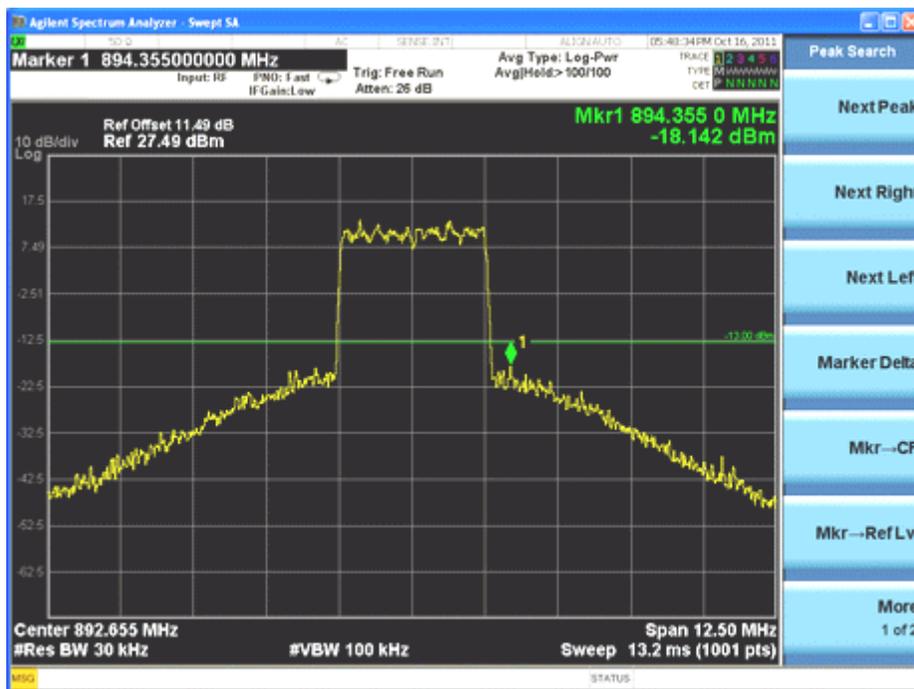
### Uplink, Spurious Emissions at Antenna Terminal, High Channel



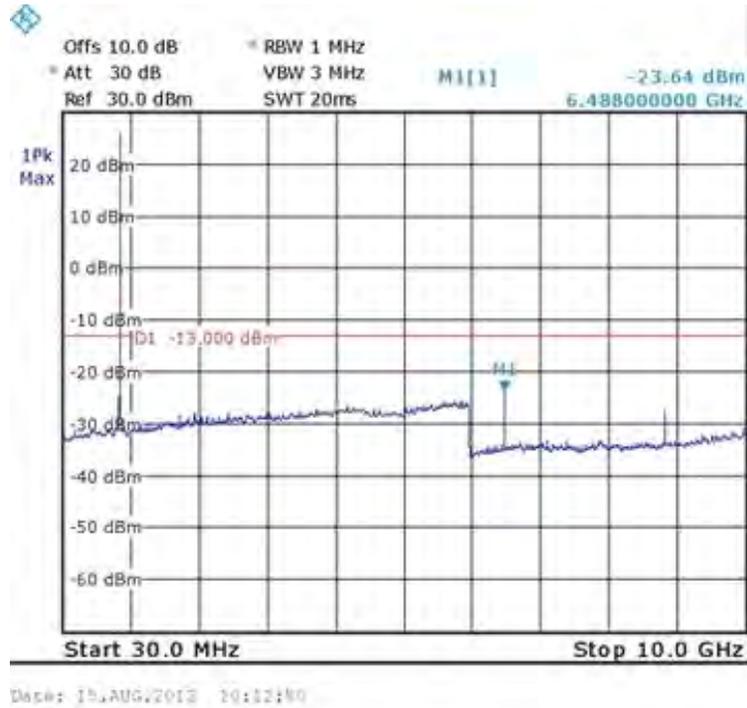
### Downlink, Inter-modulation, Low-band edge



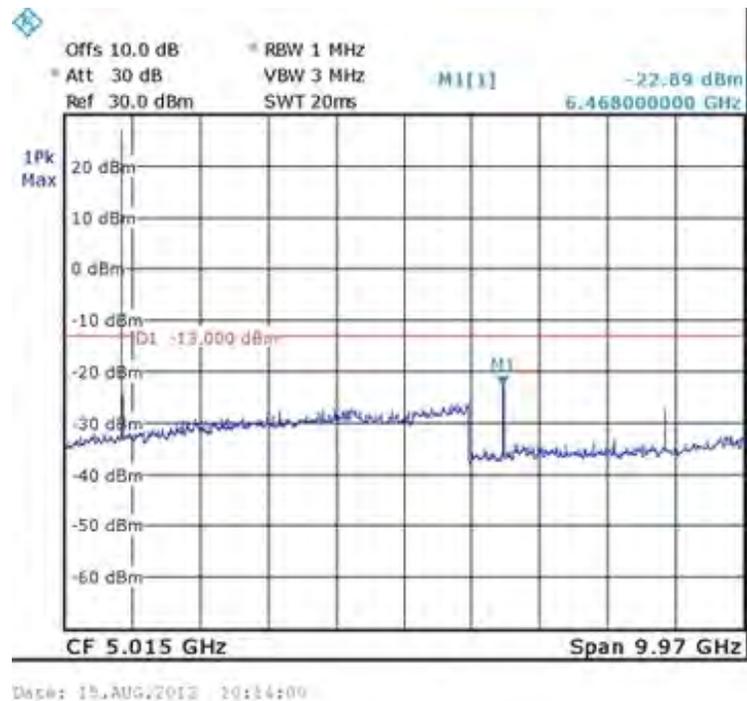
### Downlink, Inter-modulation, High-band edge



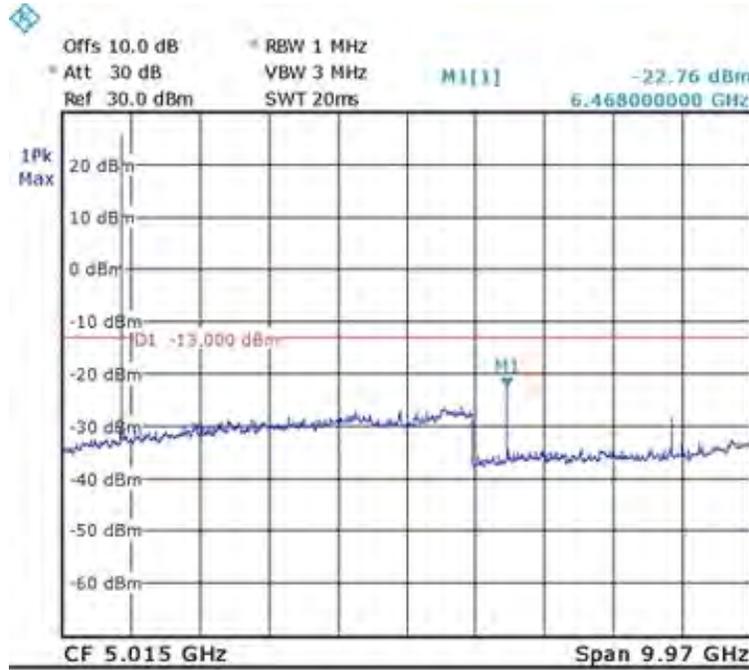
### Downlink, Spurious Emissions at Antenna Terminal, Low Channel



### Downlink, Spurious Emissions at Antenna Terminal, Middle Channel



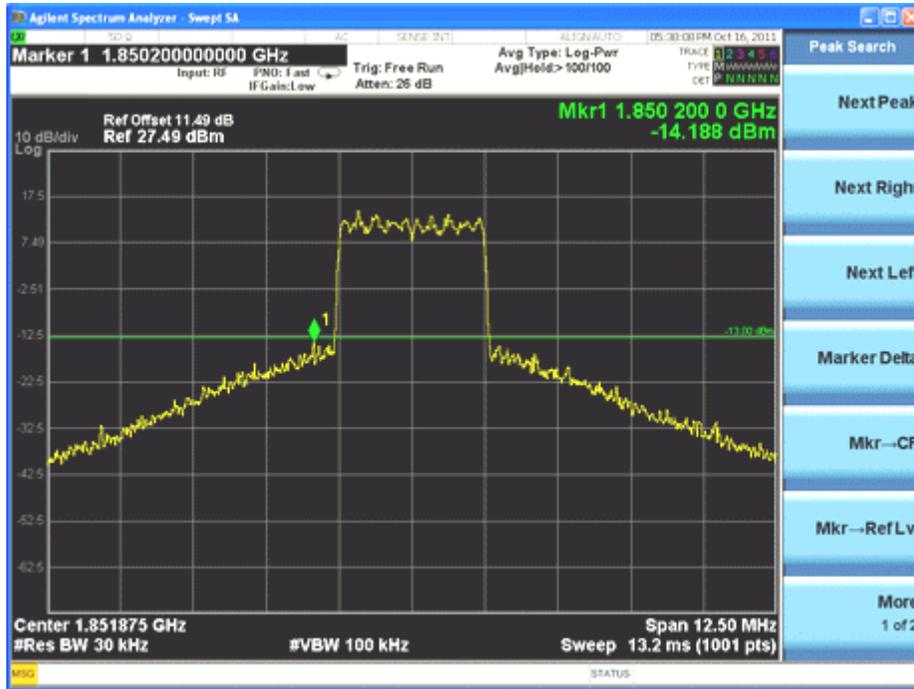
**Downlink, Spurious Emissions at Antenna Terminal, High Channel**



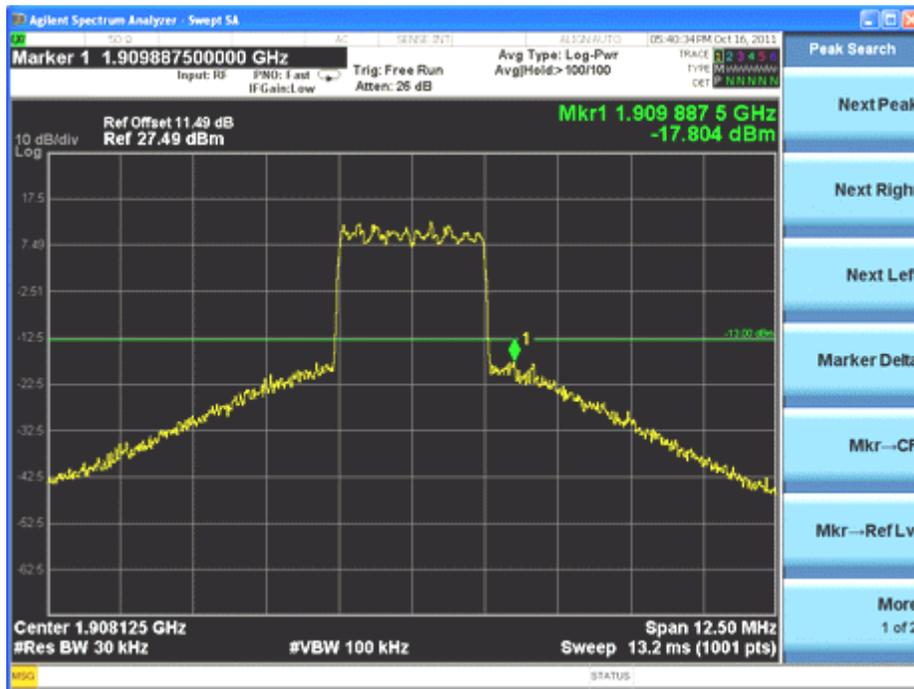
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### PCS Band (Part 24E)

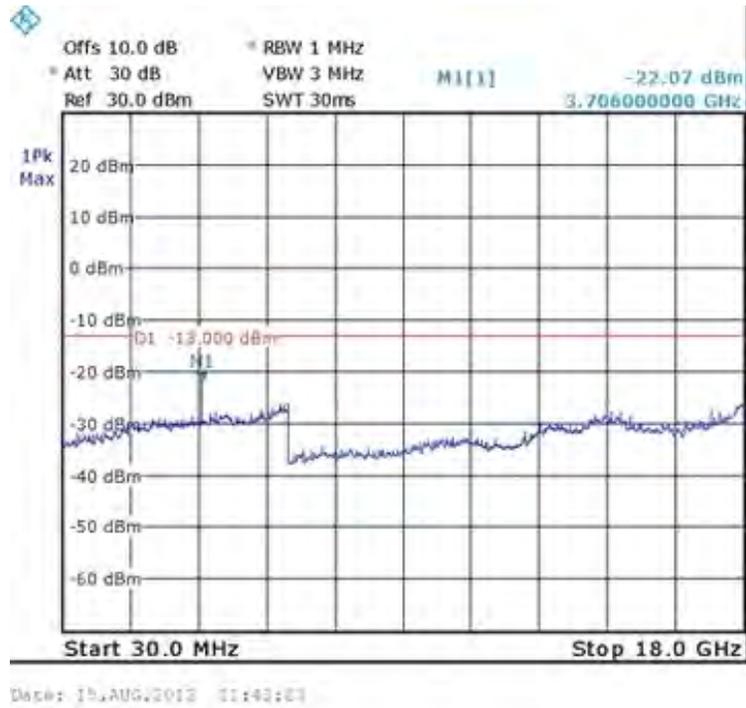
#### Uplink, Inter-modulation, Low-band edge



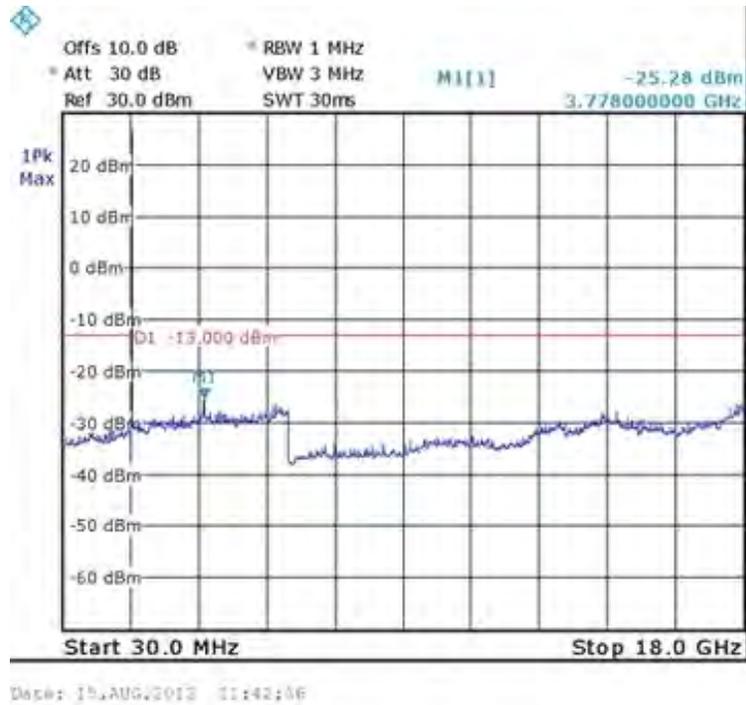
#### Uplink, Inter-modulation, High-band edge



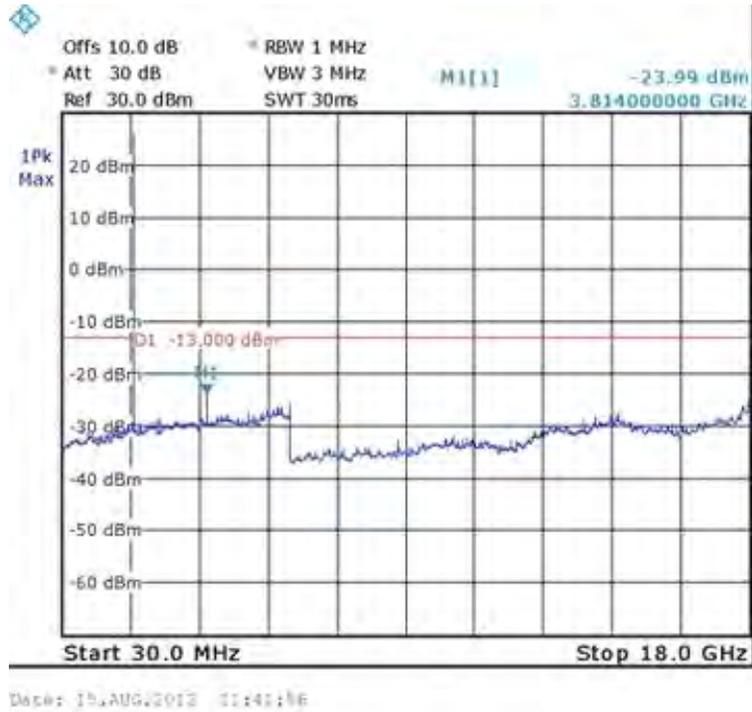
### Uplink, Spurious Emissions at Antenna Terminal, Low Channel



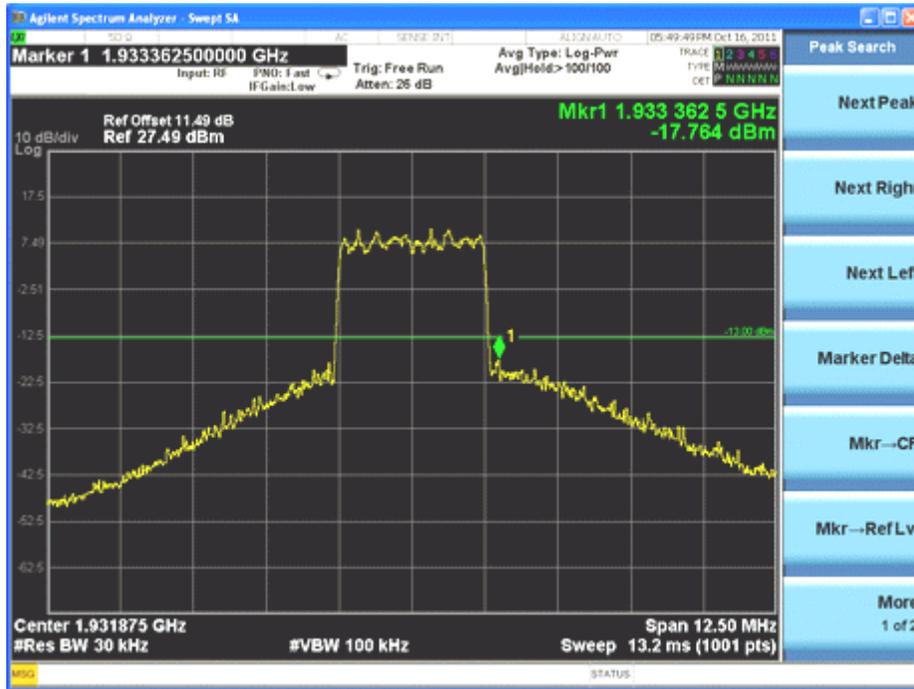
### Uplink, Spurious Emissions at Antenna Terminal, Middle Channel



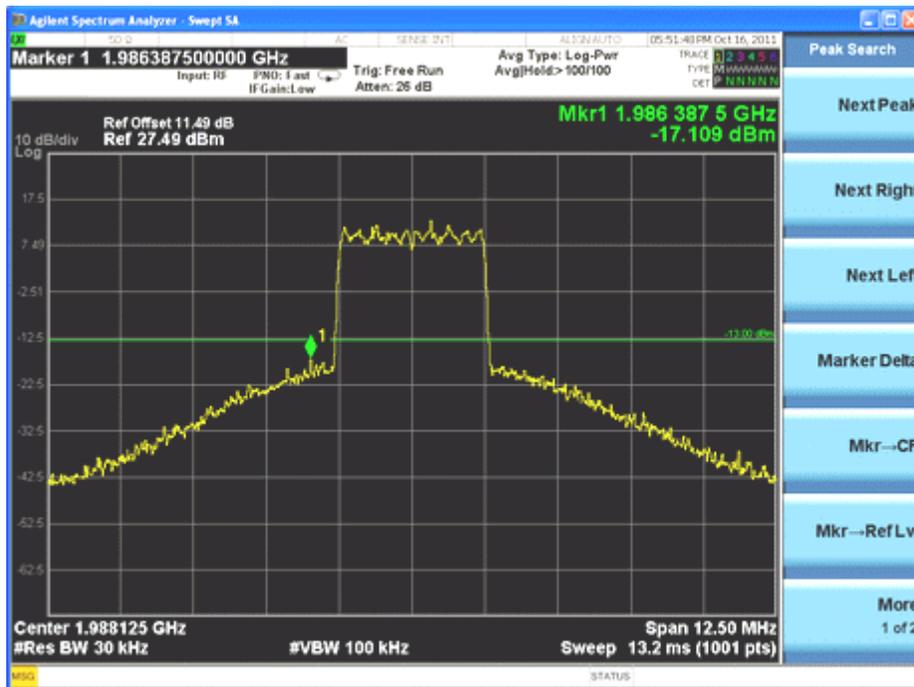
### Uplink, Spurious Emissions at Antenna Terminal, High Channel



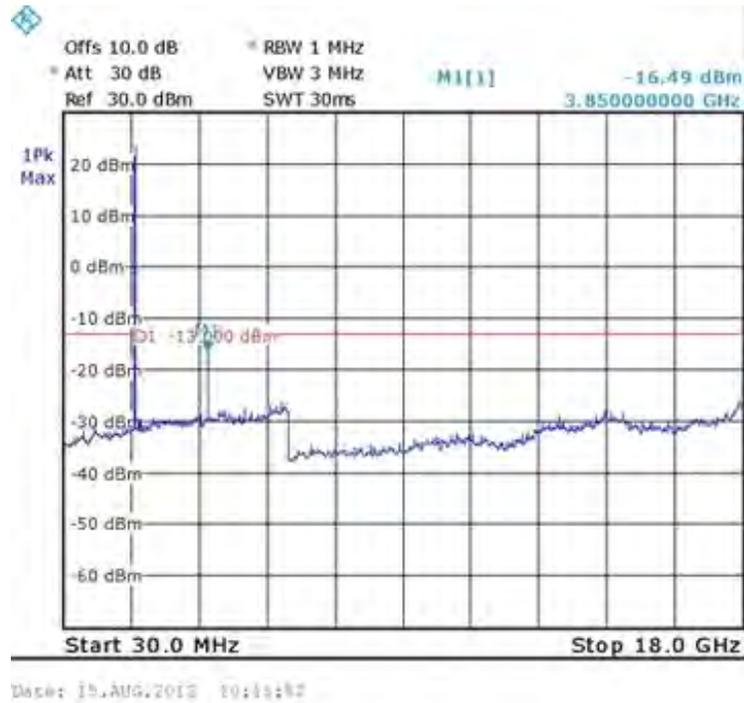
### Downlink, Inter-modulation, Low-band edge



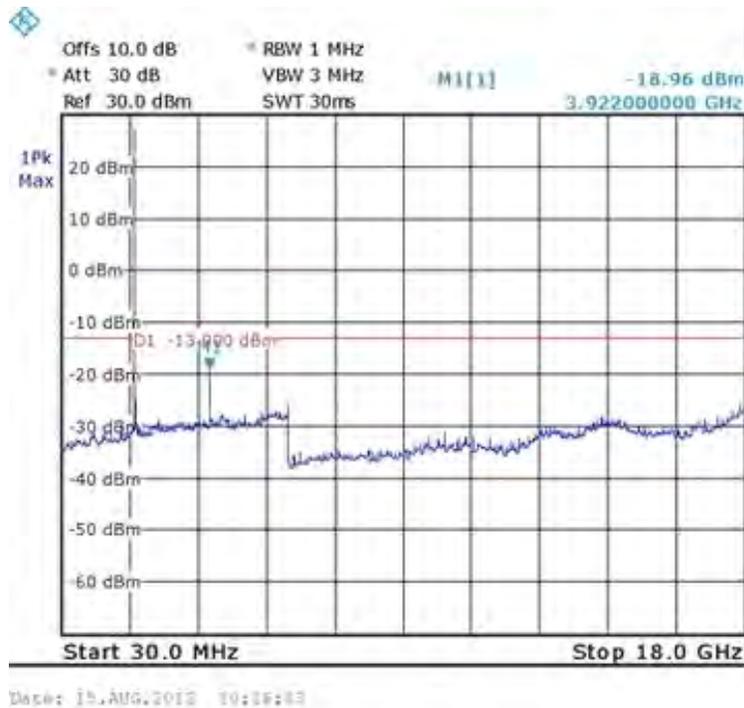
### Downlink, Inter-modulation, High-band edge



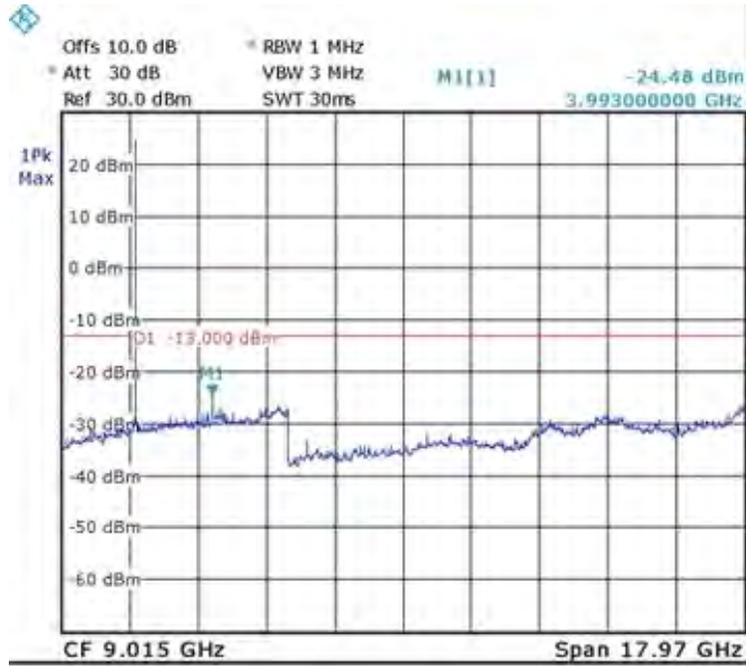
### Downlink, Spurious Emissions at Antenna Terminal, Low Channel



### Downlink, Spurious Emissions at Antenna Terminal, Middle Channel



**Downlink, Spurious Emissions at Antenna Terminal, High Channel**

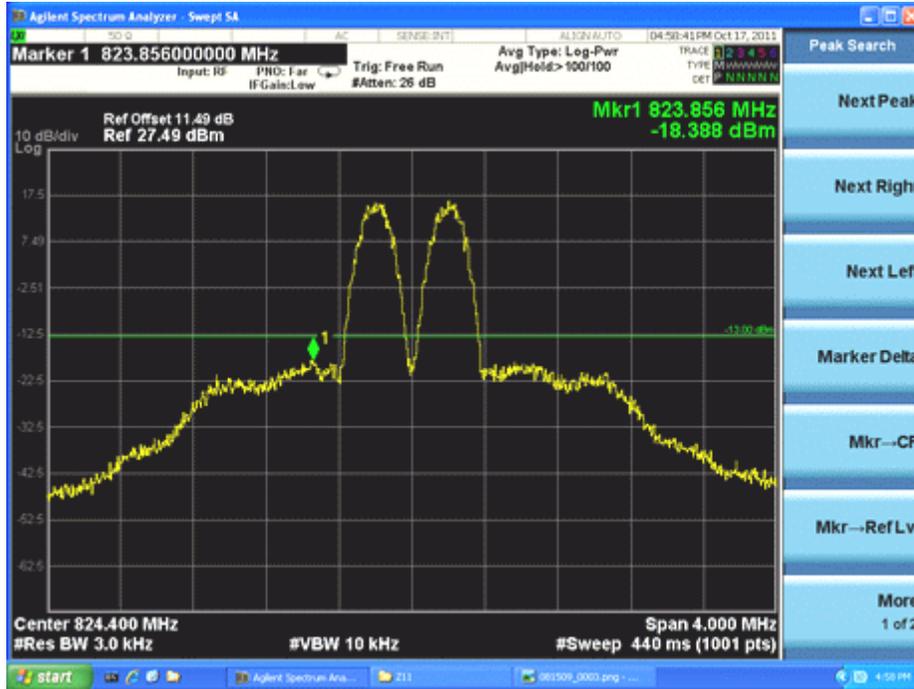


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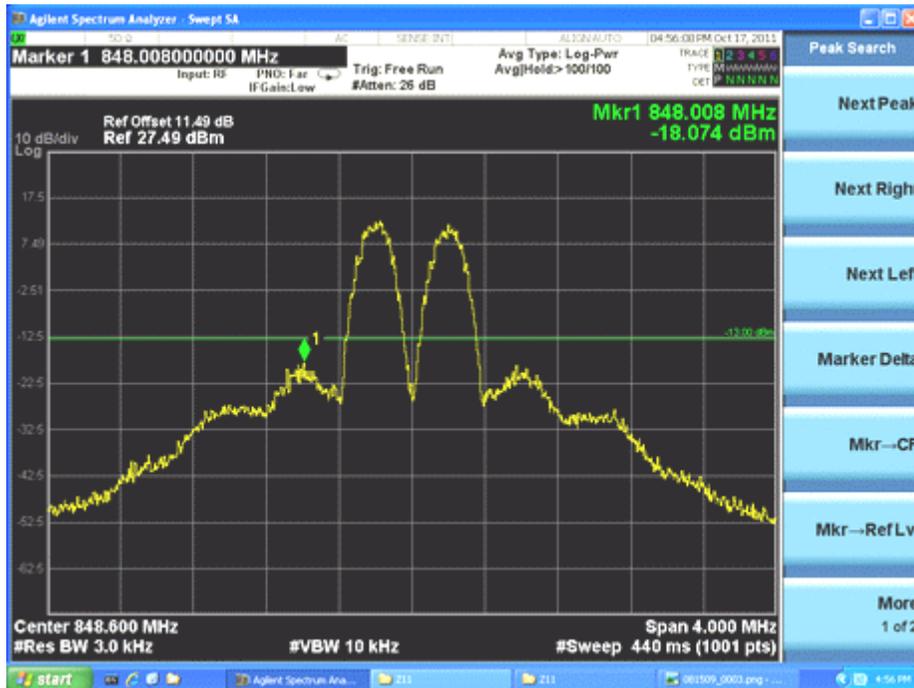
GSM:

### Cellular Band (Part 22H)

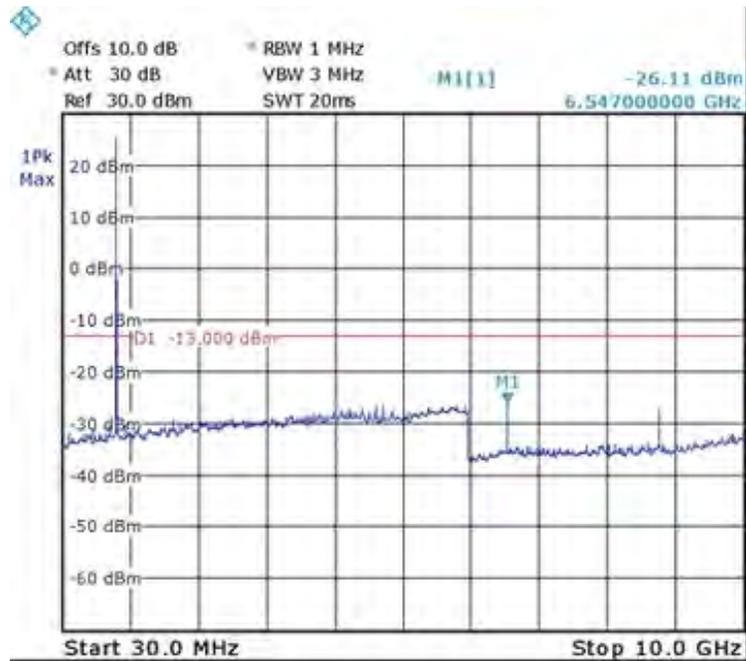
#### Uplink, Inter-modulation, Low-band edge



#### Uplink, Inter-modulation, High-band edge

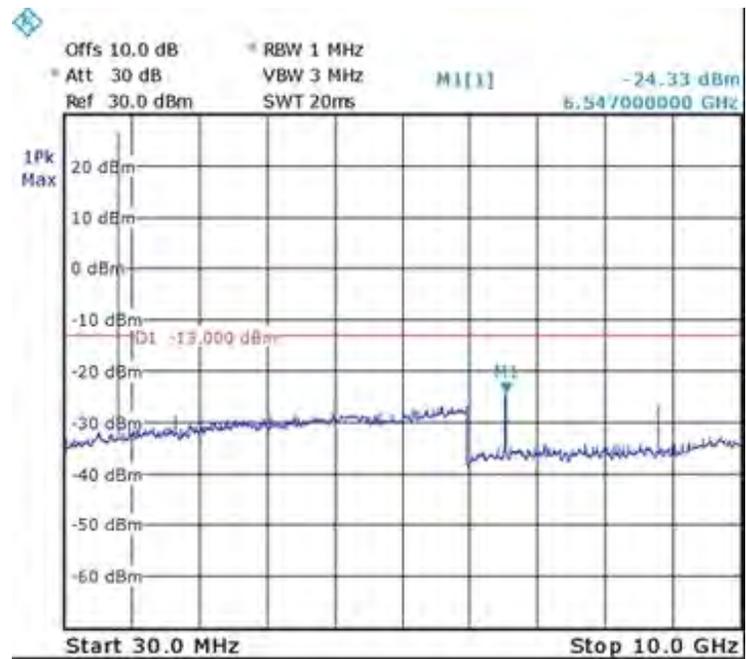


### Uplink, Spurious Emissions at Antenna Terminal, Low Channel



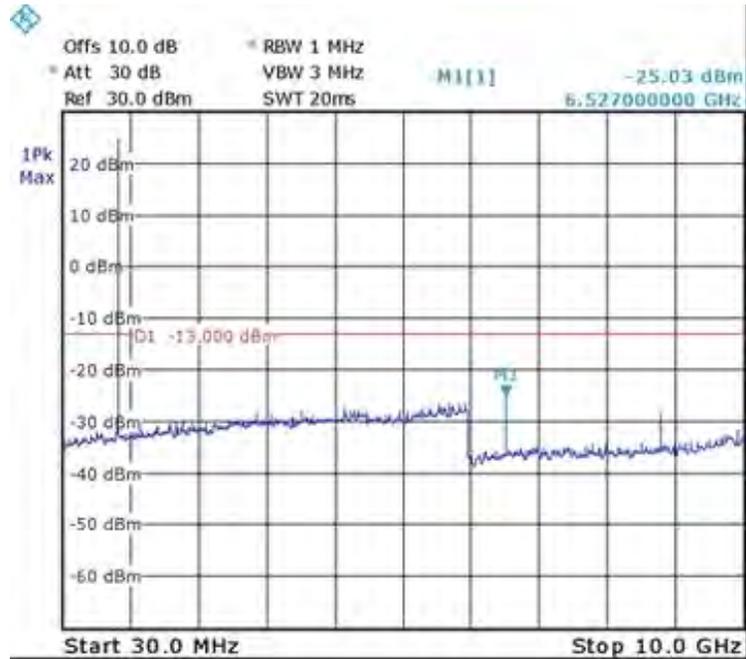
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### Uplink, Spurious Emissions at Antenna Terminal, Middle Channel



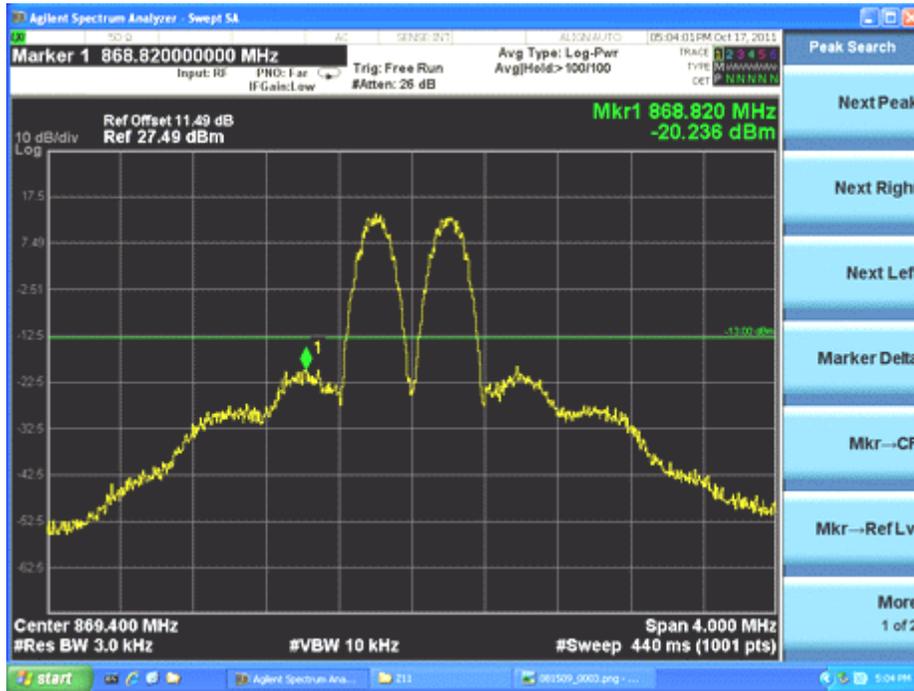
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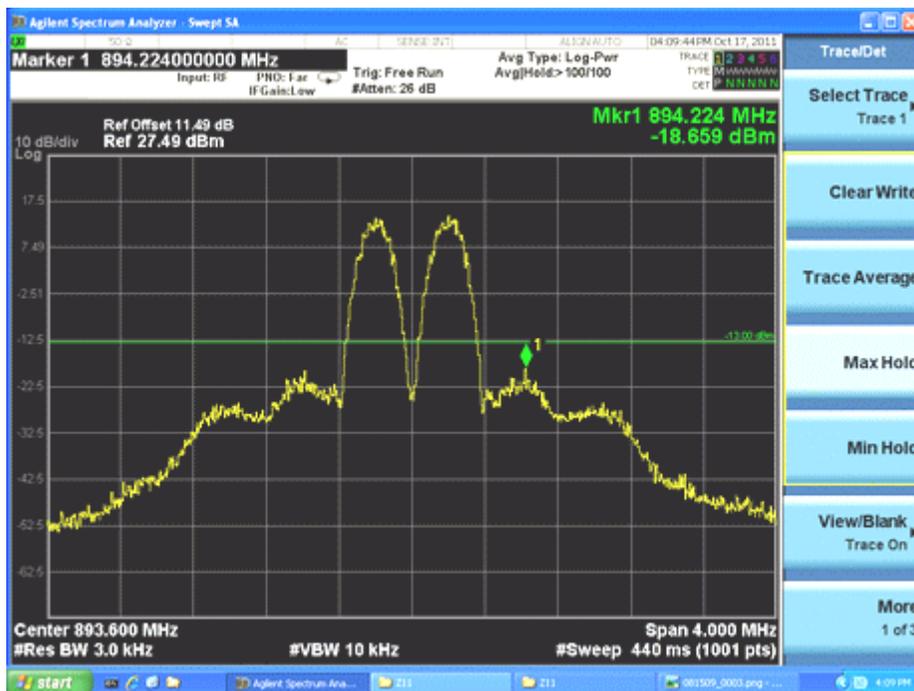


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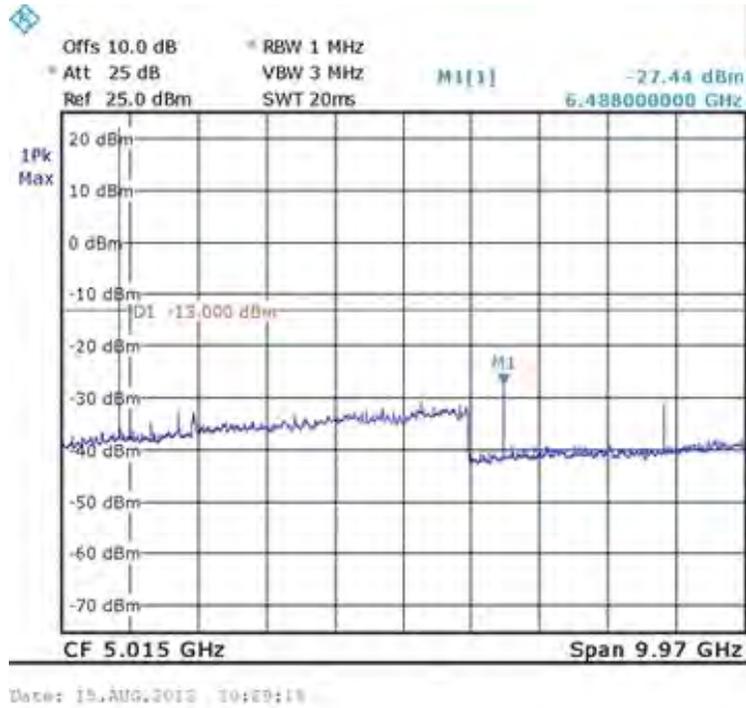
### Downlink, Inter-modulation, Low-band edge



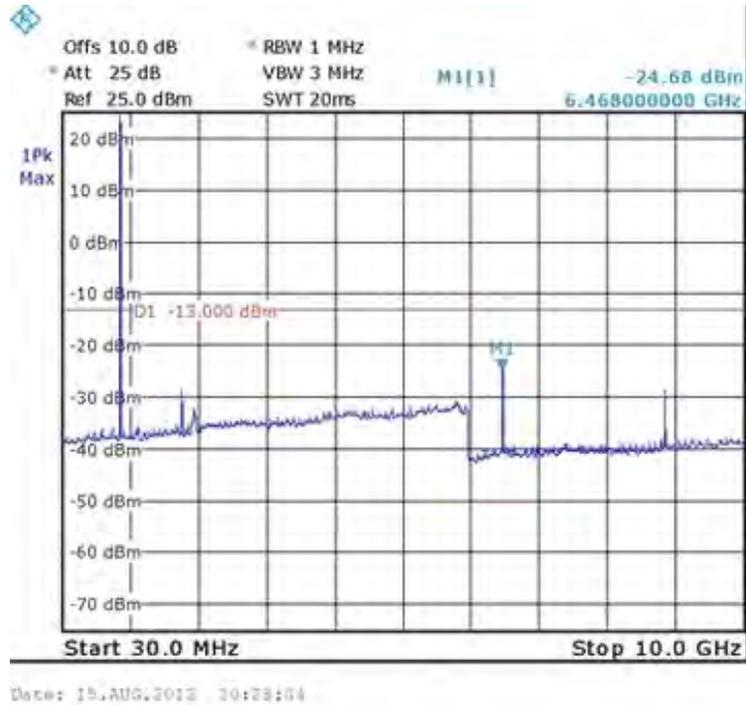
### Downlink, Inter-modulation, High-band edge



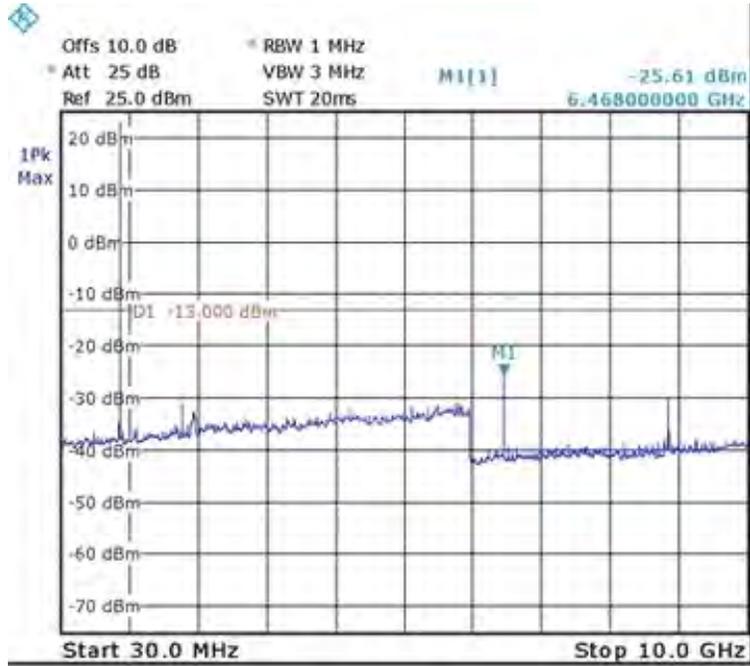
### Downlink, Spurious Emissions at Antenna Terminal, Low Channel



### Downlink, Spurious Emissions at Antenna Terminal, Middle Channel



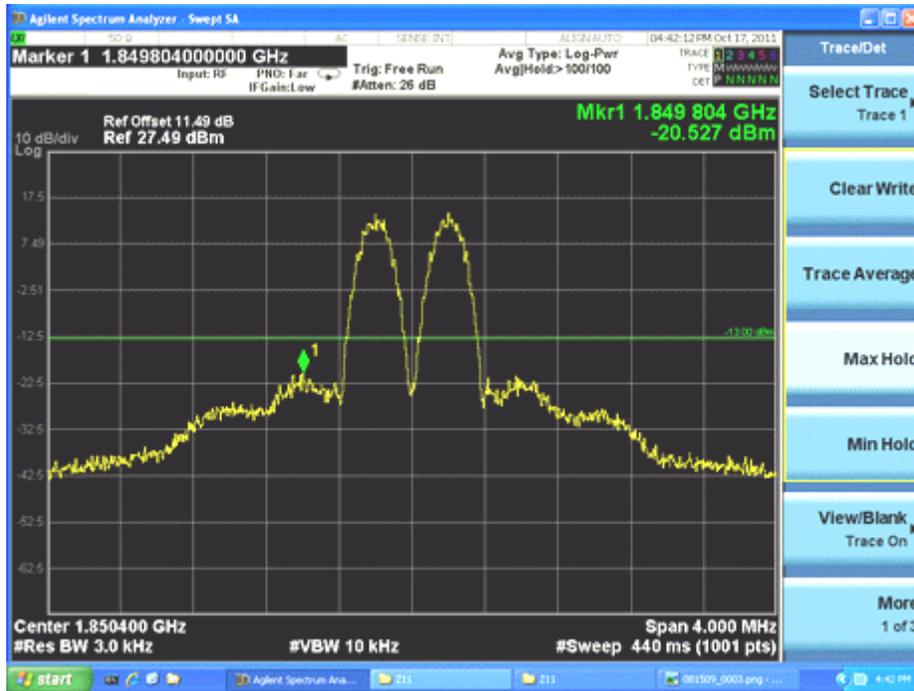
**Downlink, Spurious Emissions at Antenna Terminal, High Channel**



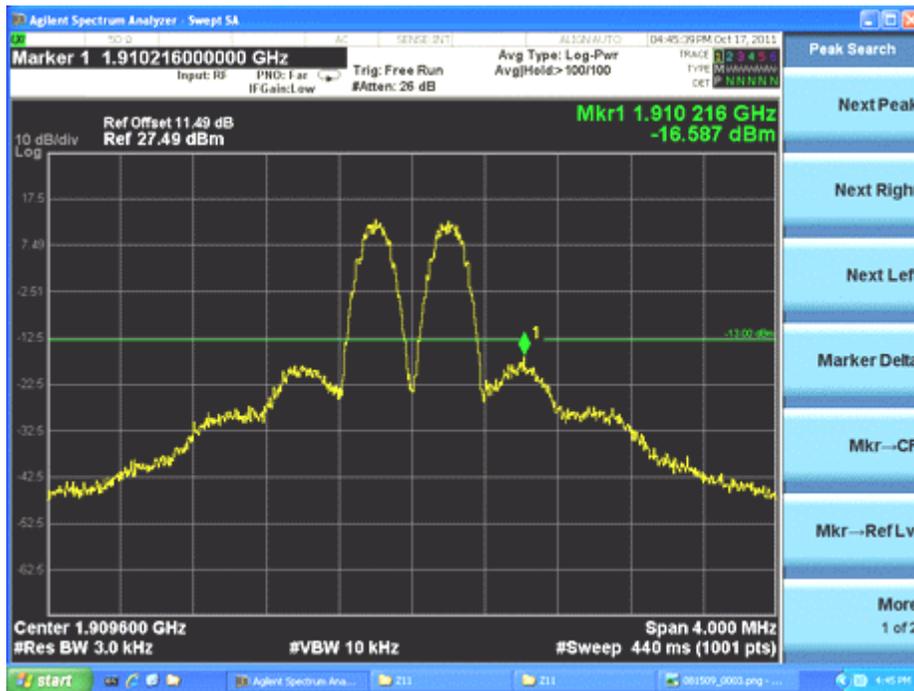
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### PCS Band (Part 24E)

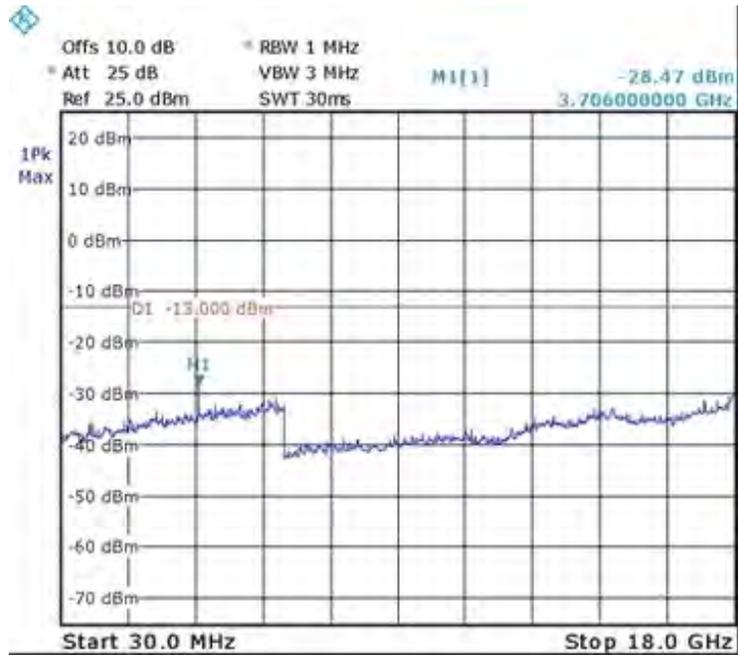
#### Uplink, Inter-modulation, Low-band edge



#### Uplink, Inter-modulation, High-band edge

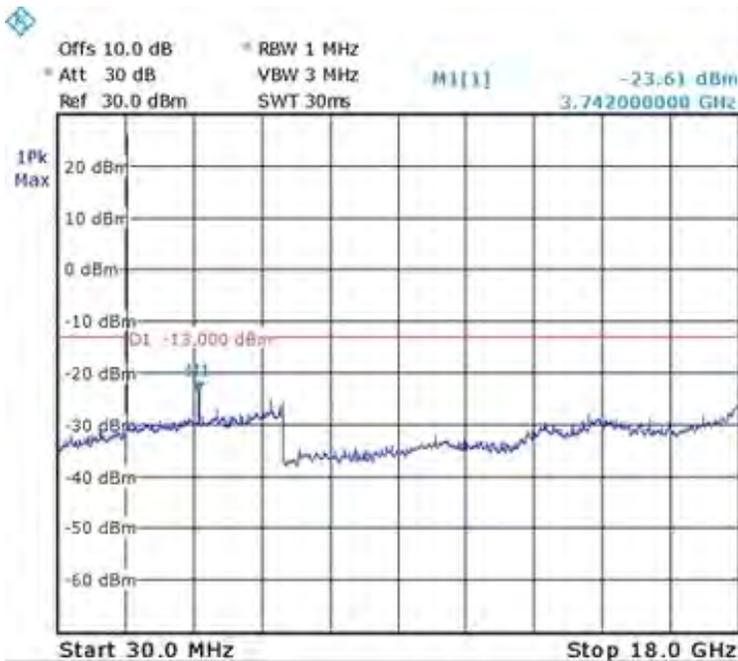


### Uplink, Spurious Emissions at Antenna Terminal, Low Channel



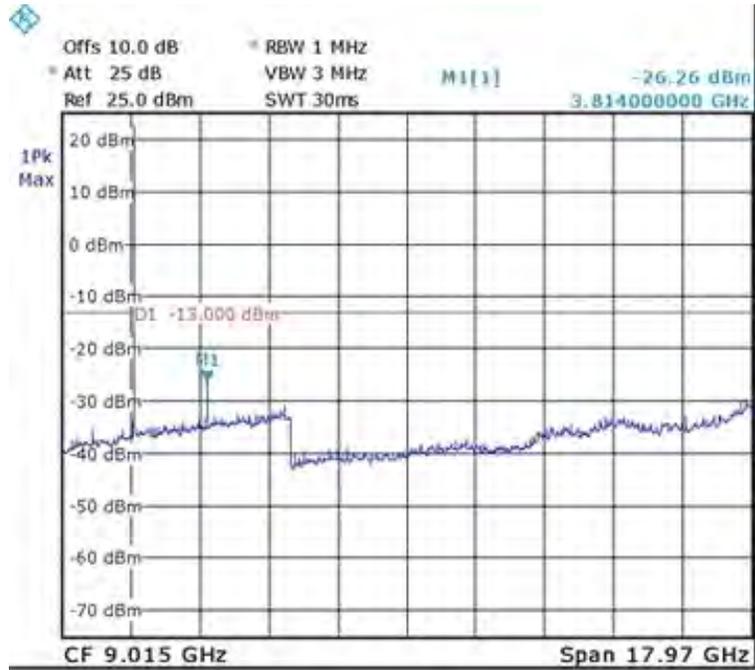
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### Uplink, Spurious Emissions at Antenna Terminal, Middle Channel



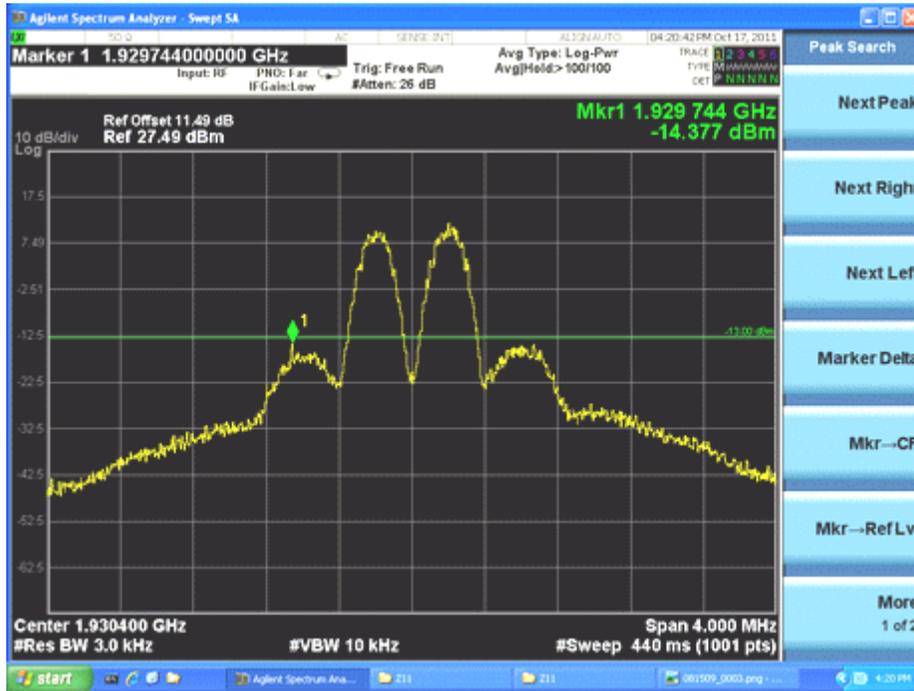
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### Uplink, Spurious Emissions at Antenna Terminal, High Channel

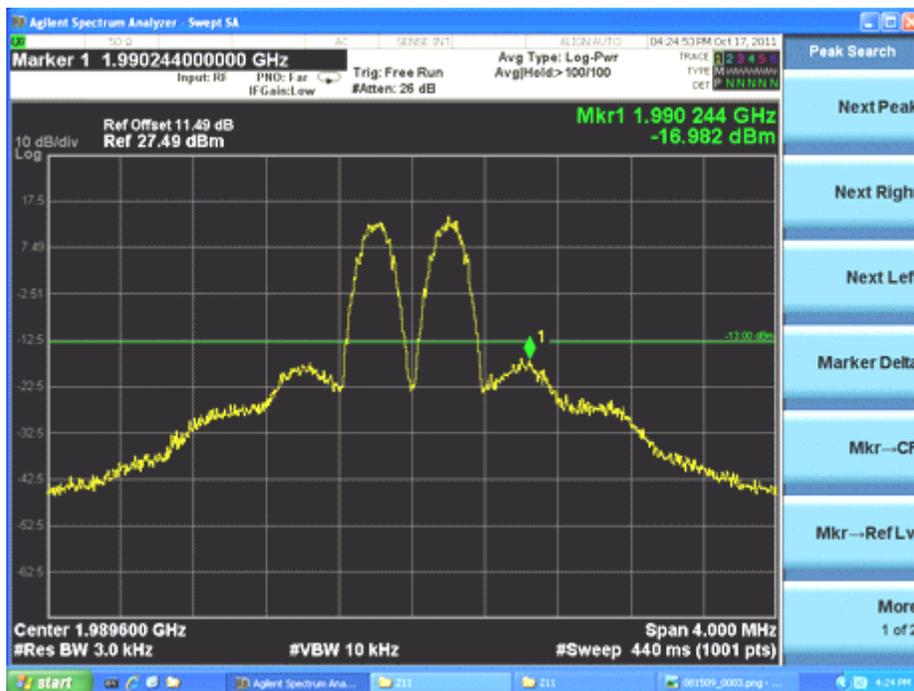


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### Downlink, Inter-modulation, Low-band edge

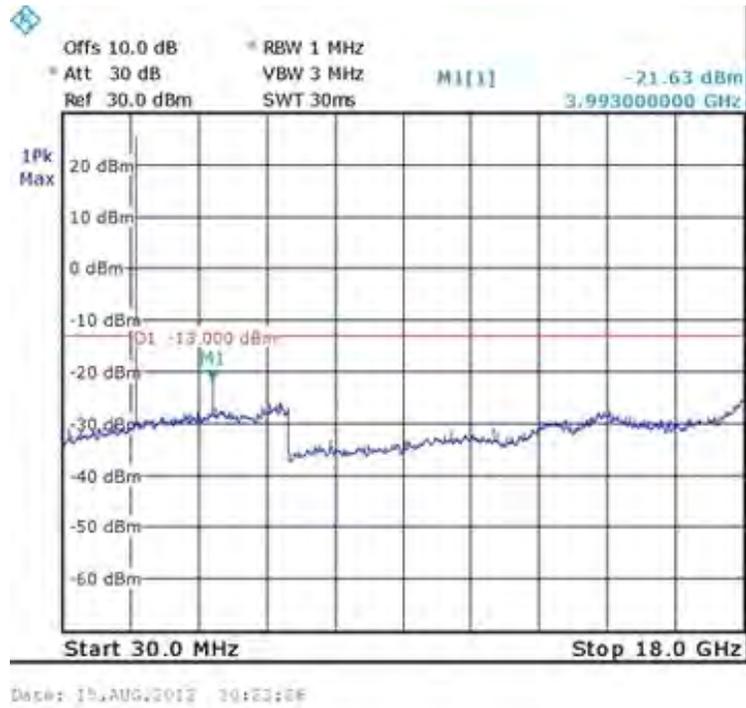


### Downlink, Inter-modulation, High-band edge





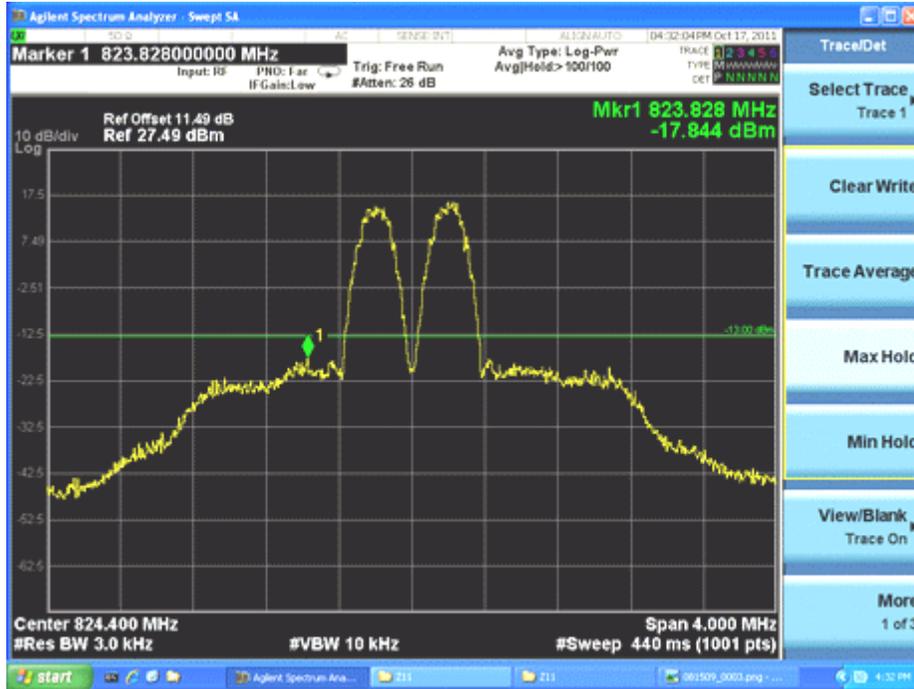
**Downlink, Spurious Emissions at Antenna Terminal, High Channel**



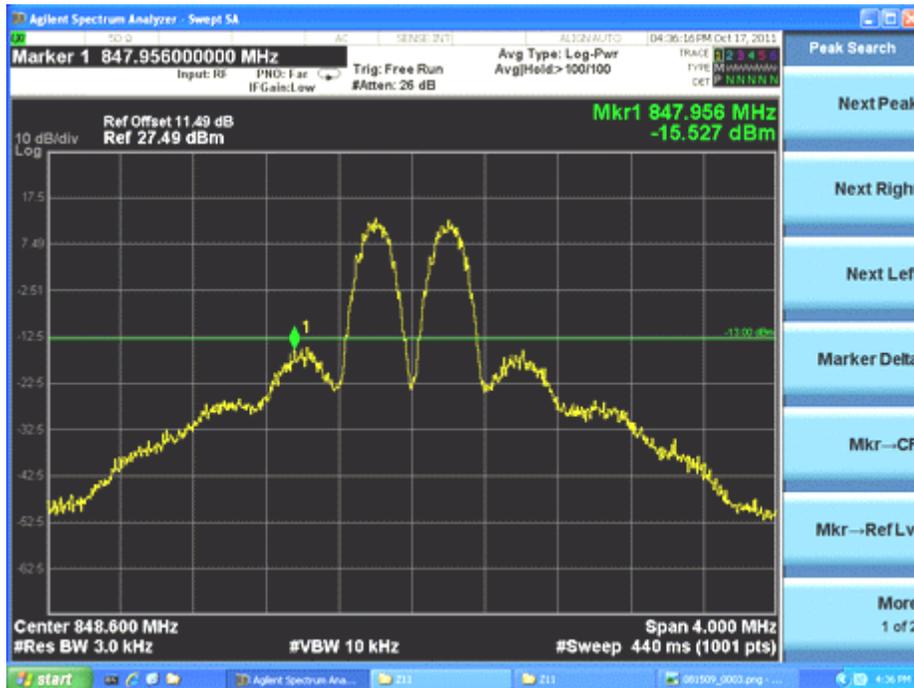
EDGE:

### Cellular Band (Part 22H)

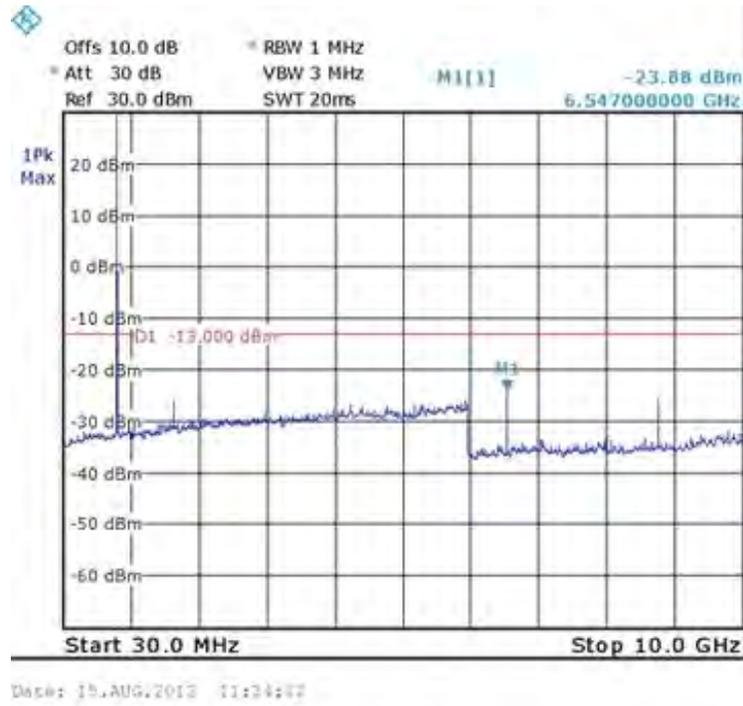
#### Uplink, Inter-modulation, Low-band edge



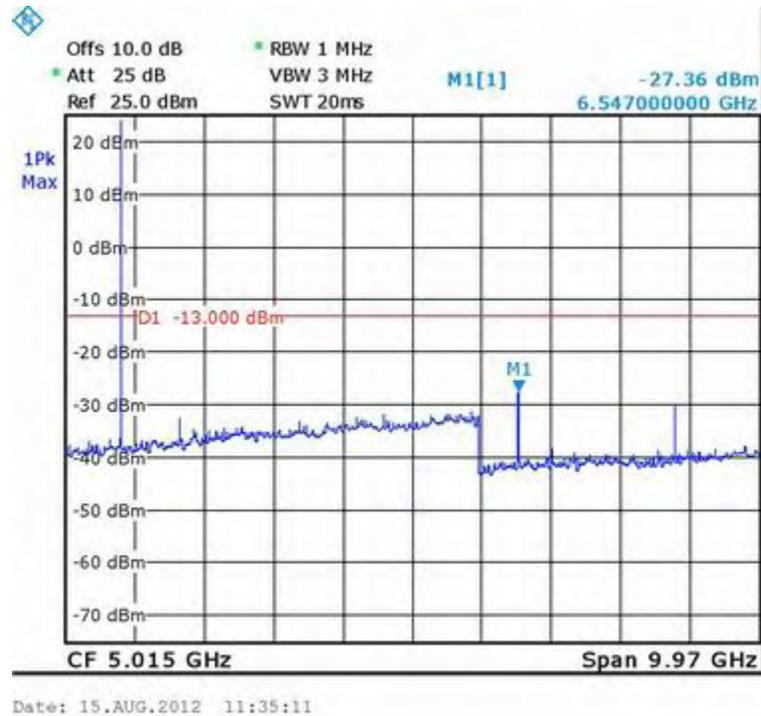
#### Uplink, Inter-modulation, High-band edge



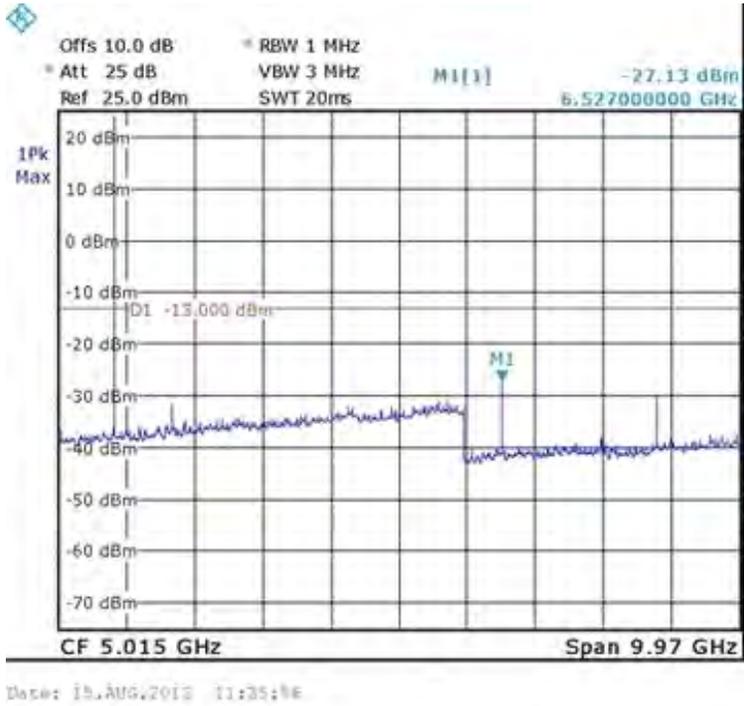
### Uplink, Spurious Emissions at Antenna Terminal, Low Channel



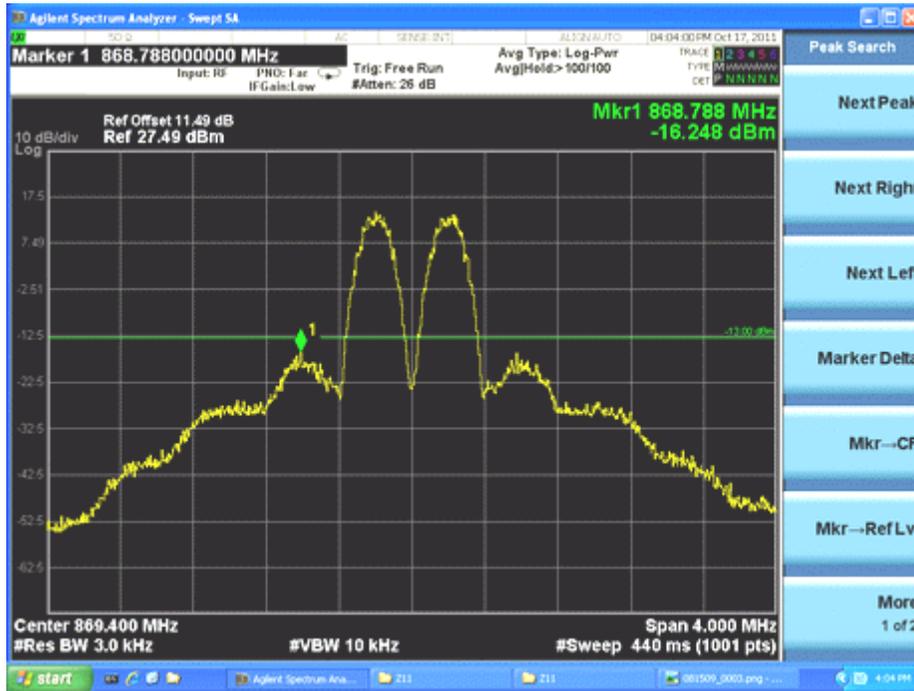
### Uplink, Spurious Emissions at Antenna Terminal, Middle Channel



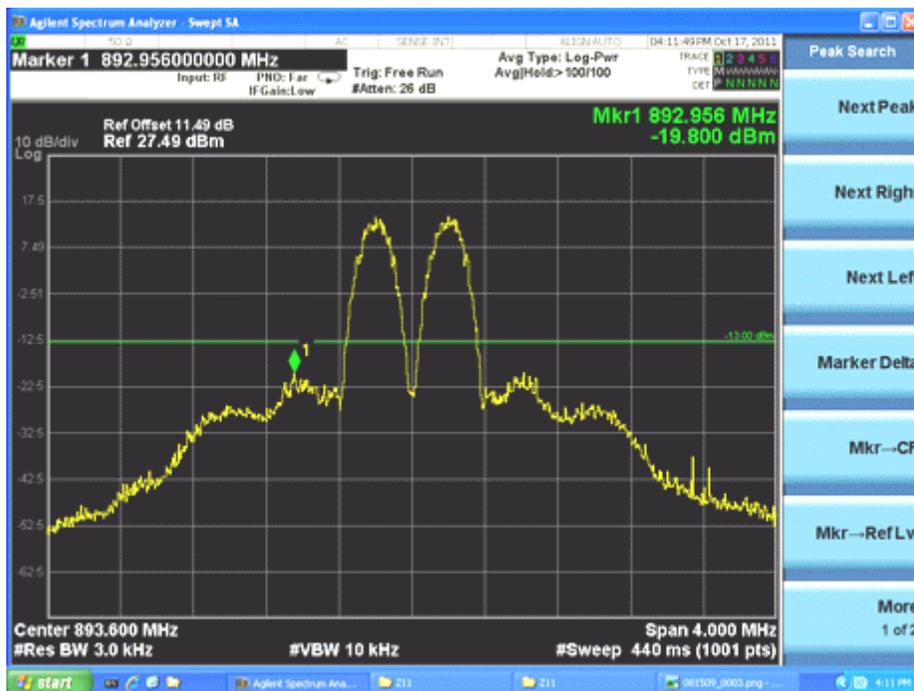
### Uplink, Spurious Emissions at Antenna Terminal, High Channel



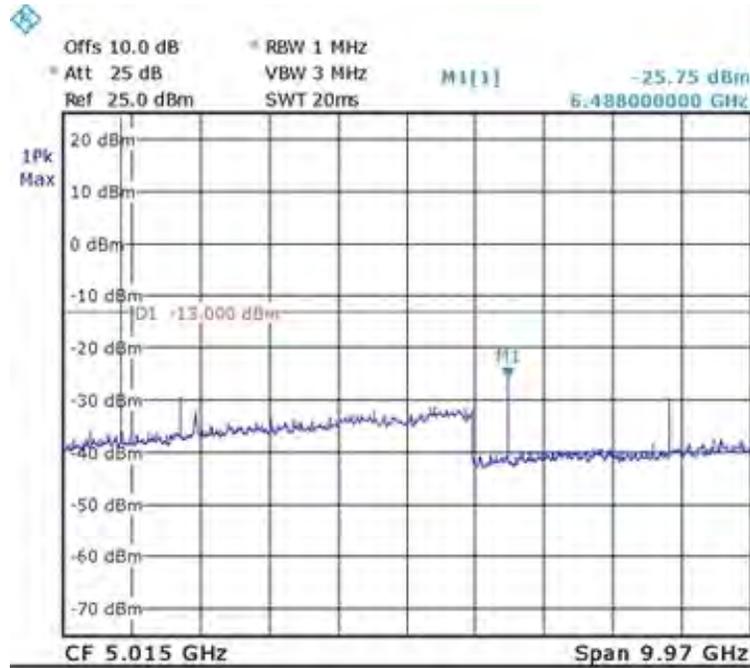
### Downlink, Inter-modulation, Low-band edge



### Downlink, Inter-modulation, High-band edge

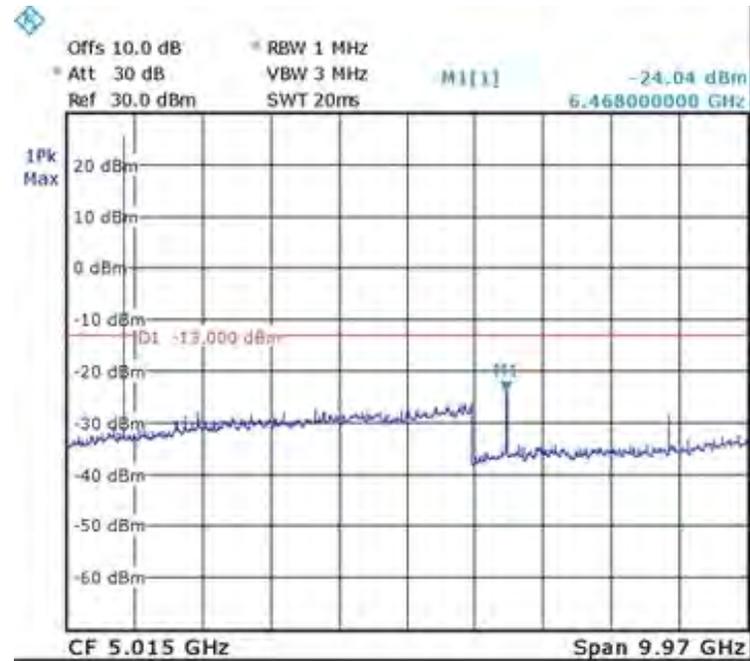


### Downlink, Spurious Emissions at Antenna Terminal, Low Channel



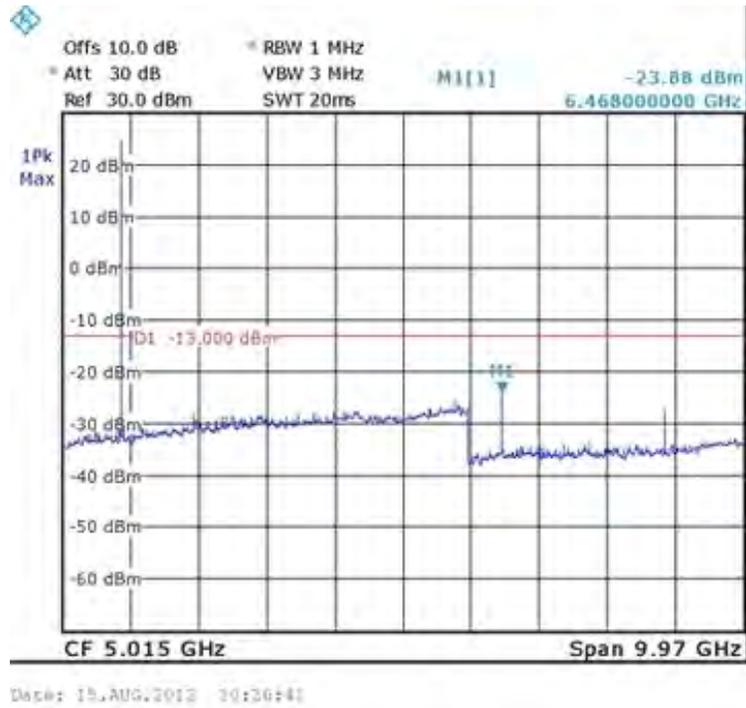
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### Downlink, Spurious Emissions at Antenna Terminal, Middle Channel



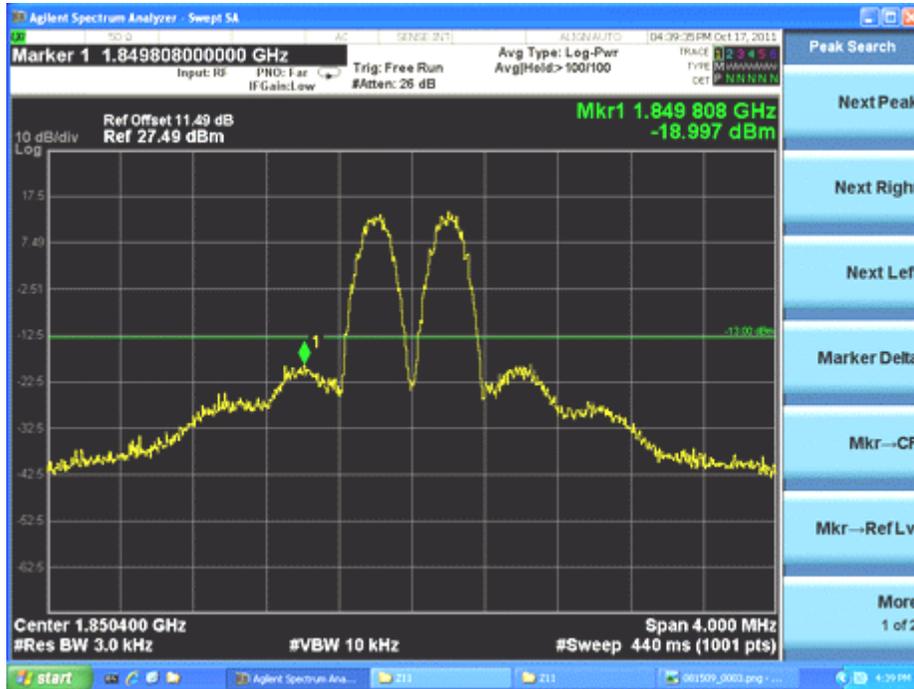
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**Downlink, Spurious Emissions at Antenna Terminal, High Channel**

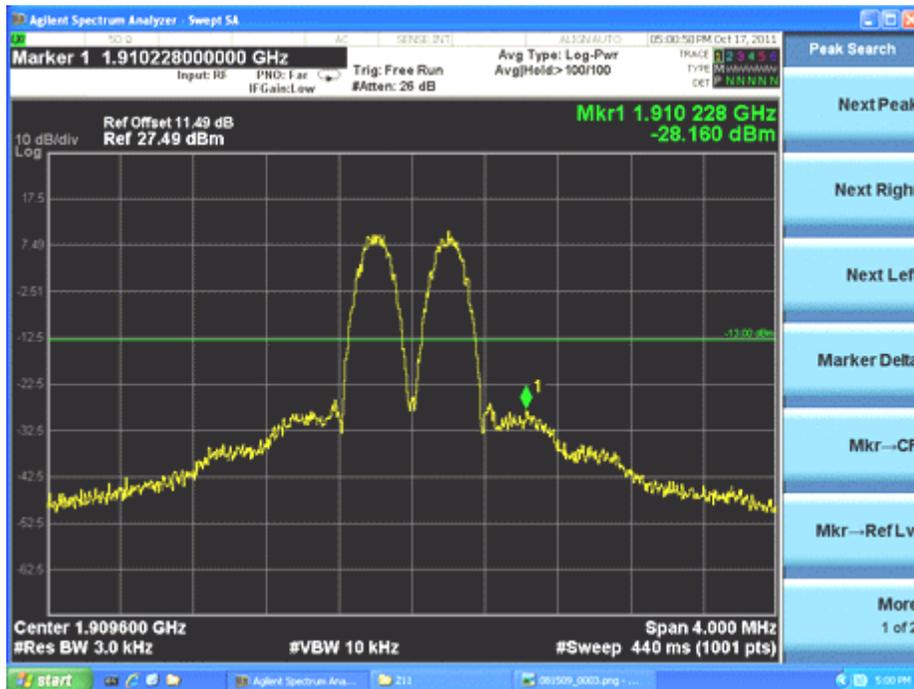


### PCS Band (Part 24E)

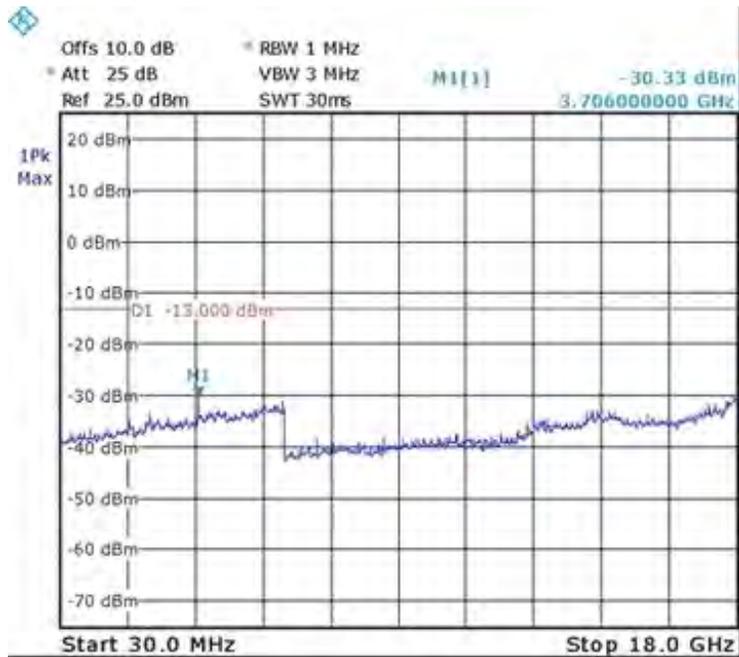
#### Uplink, Inter-modulation, Low-band edge



#### Uplink, Inter-modulation, High-band edge

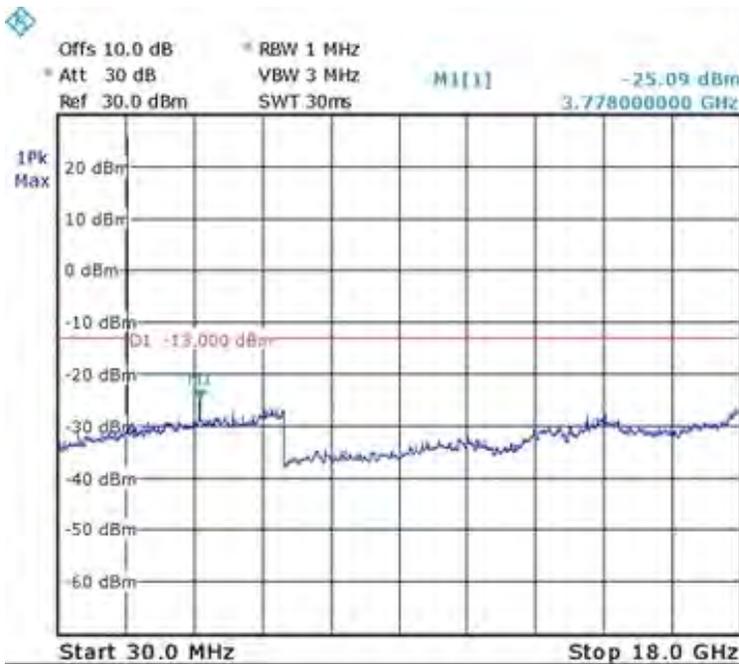


### Uplink, Spurious Emissions at Antenna Terminal, Low Channel



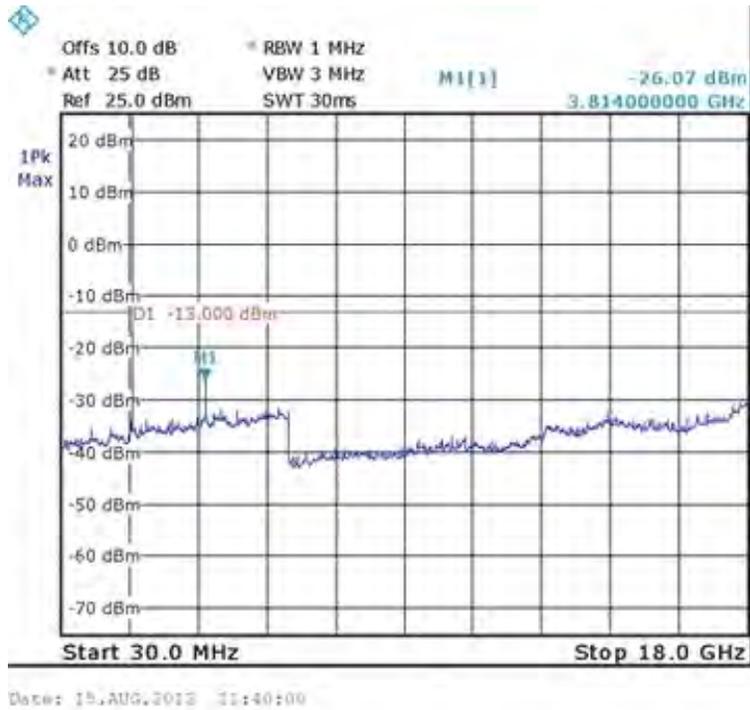
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### Uplink, Spurious Emissions at Antenna Terminal, Middle Channel

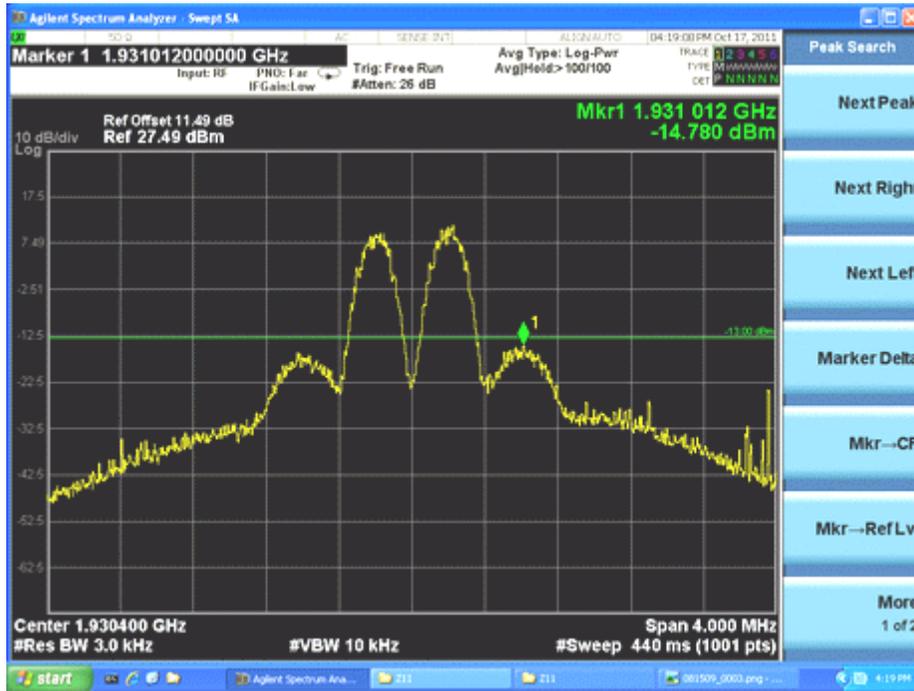


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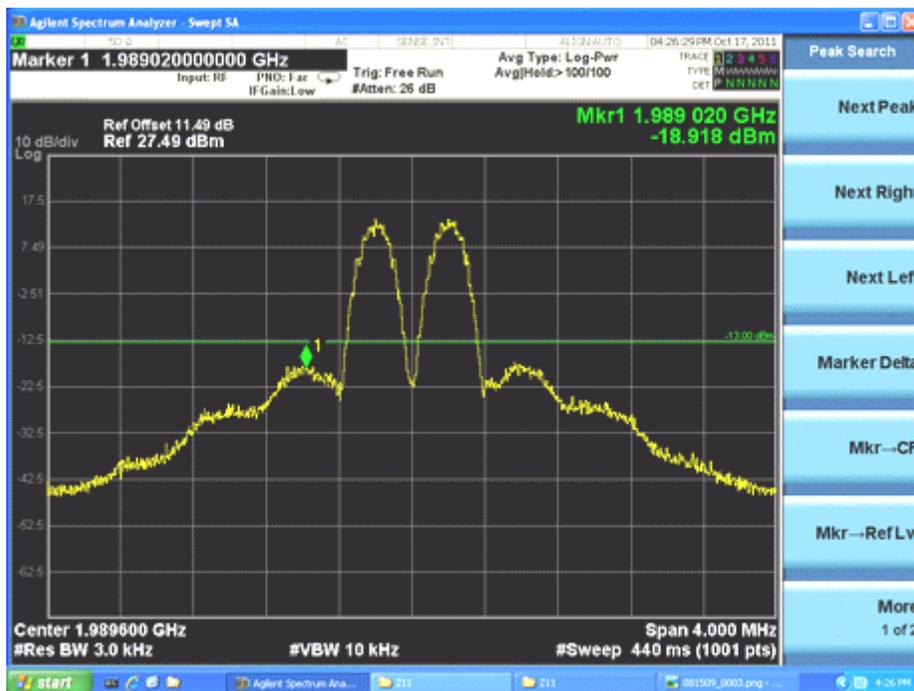
### Uplink, Spurious Emissions at Antenna Terminal, High Channel



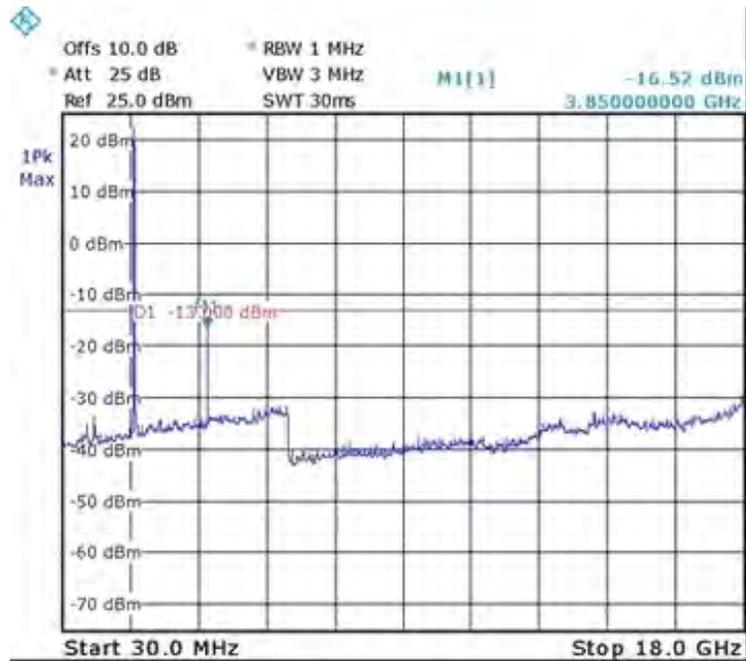
### Downlink, Inter-modulation, Low-band edge



### Downlink, Inter-modulation, High-band edge

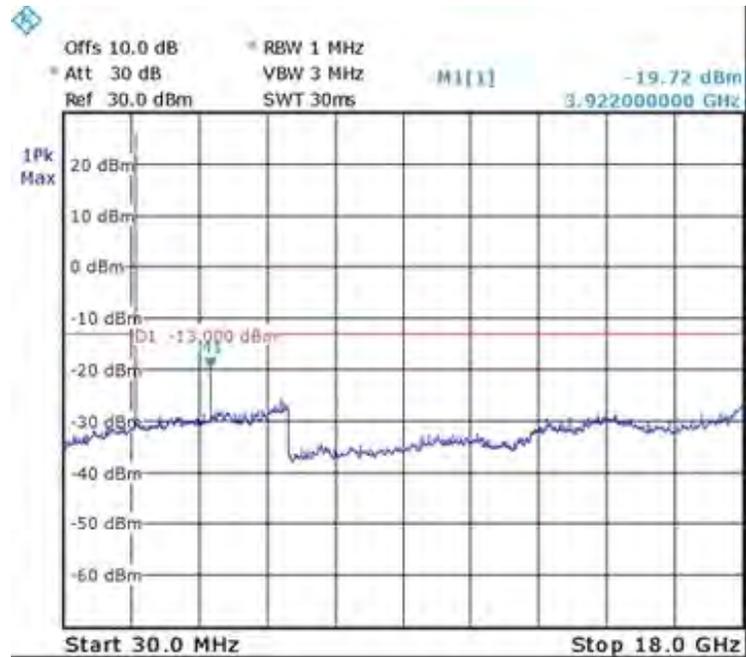


### Downlink, Spurious Emissions at Antenna Terminal, Low Channel



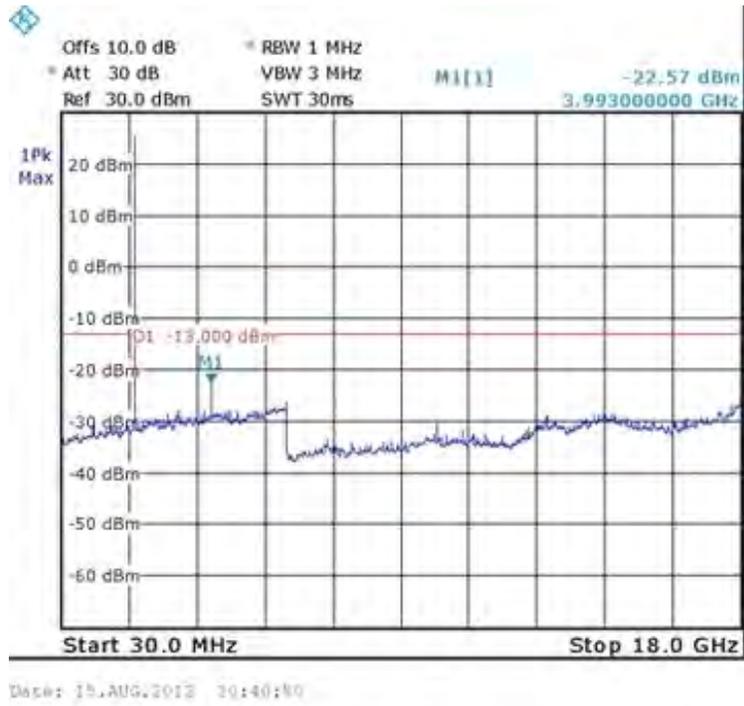
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### Downlink, Spurious Emissions at Antenna Terminal, Middle Channel



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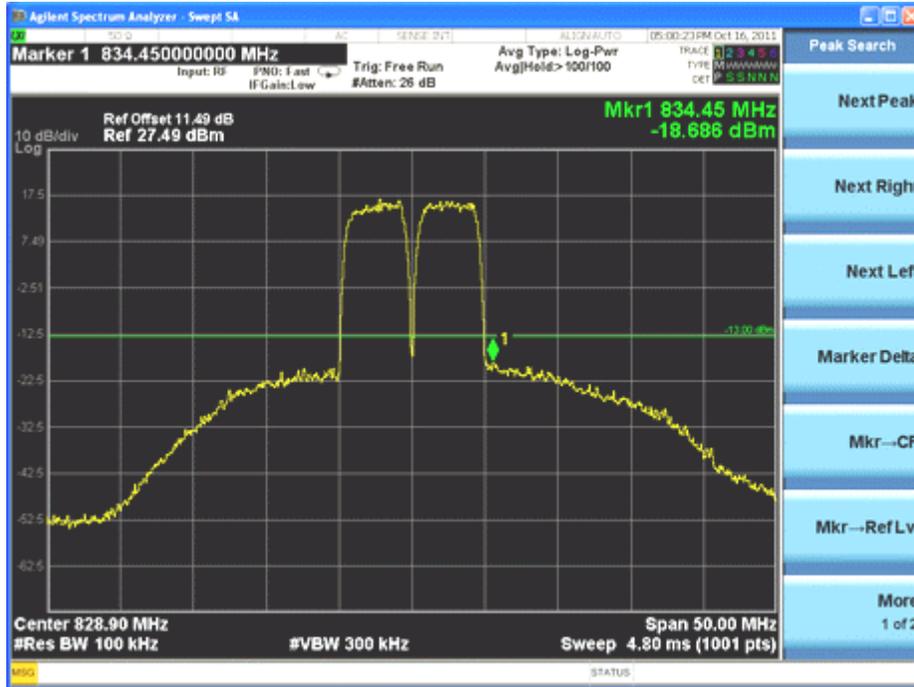
### Downlink, Spurious Emissions at Antenna Terminal, High Channel



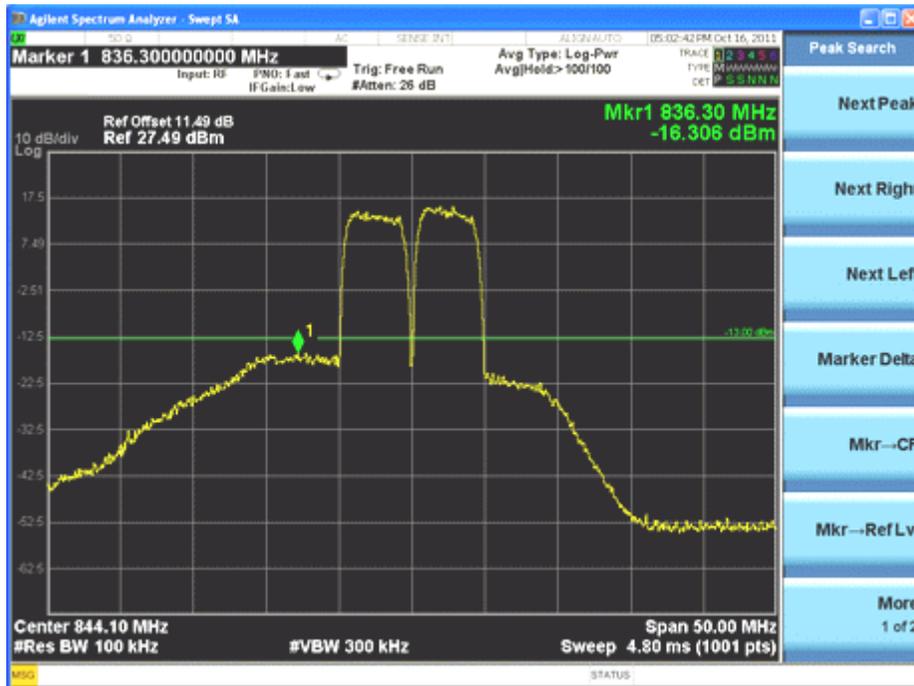
WCDMA:

### Cellular Band (Part 22H)

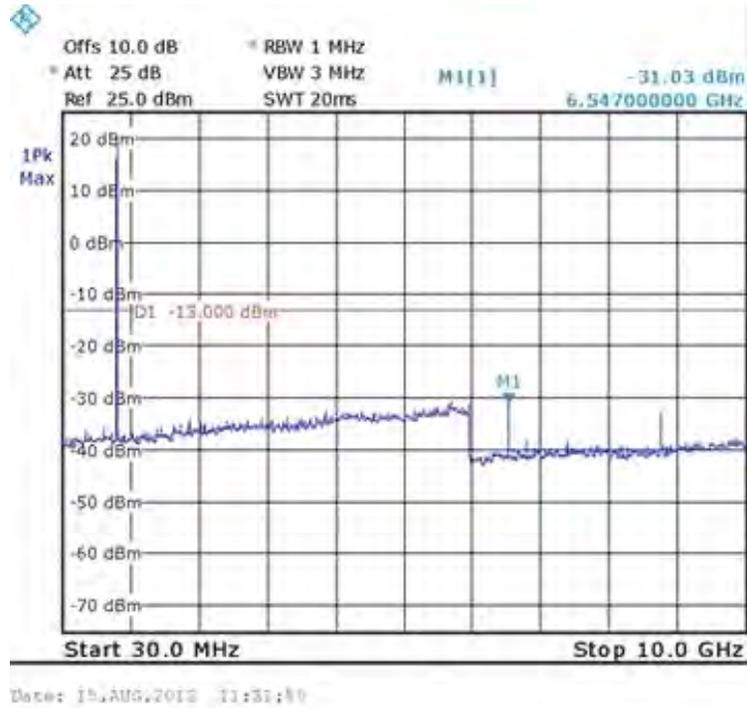
#### Uplink, Inter-modulation, Low-band edge



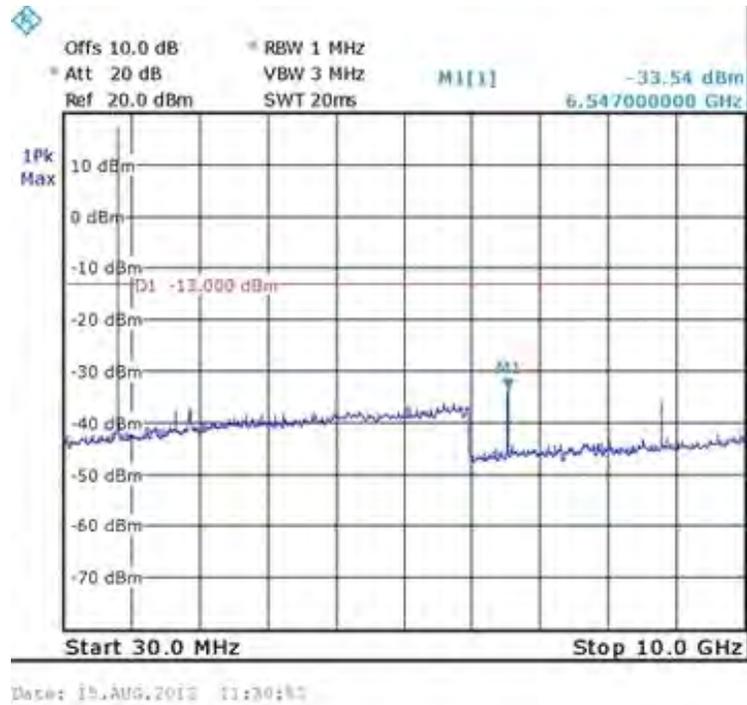
#### Uplink, Inter-modulation, High-band edge



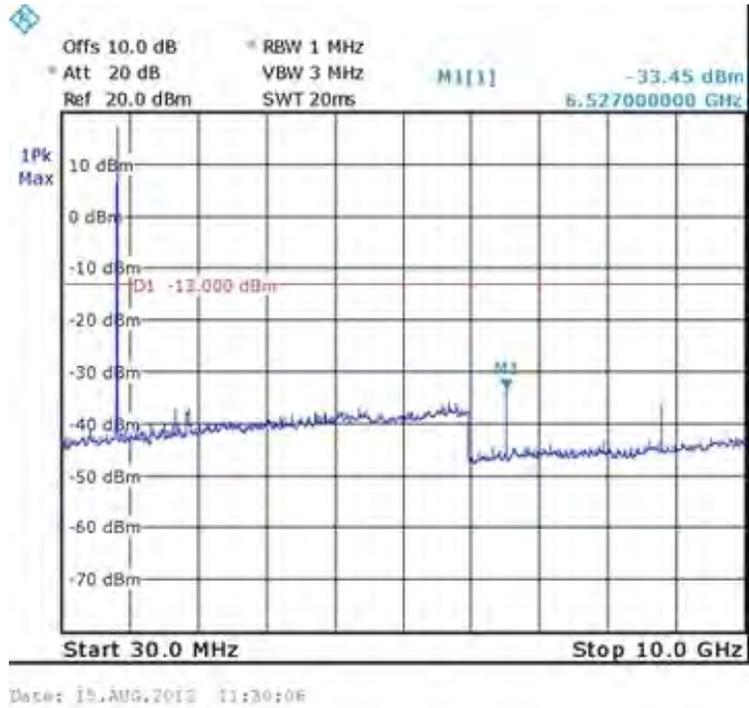
### Uplink, Spurious Emissions at Antenna Terminal, Low Channel



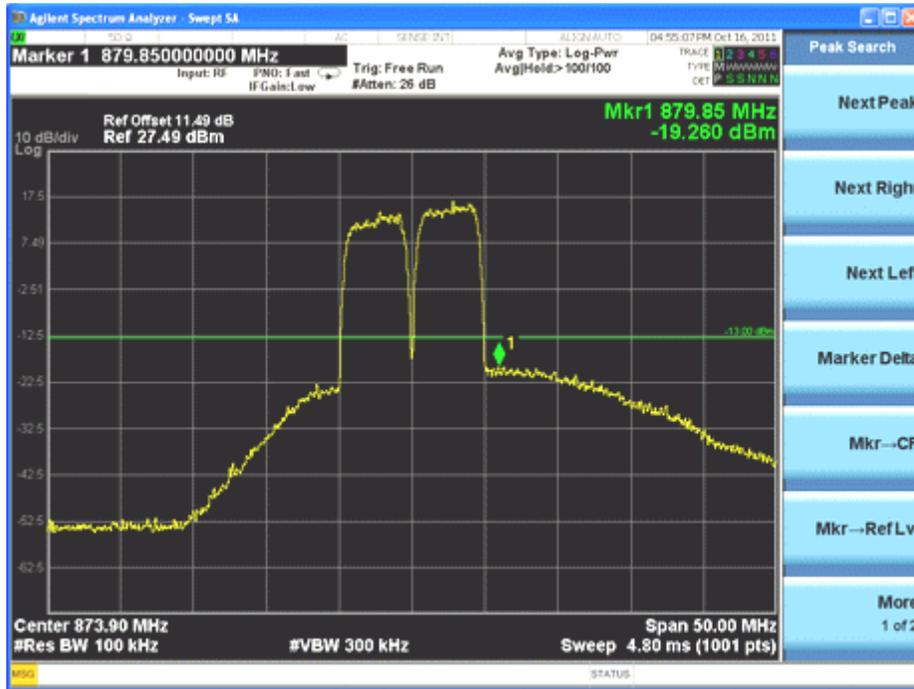
### Uplink, Spurious Emissions at Antenna Terminal, Middle Channel



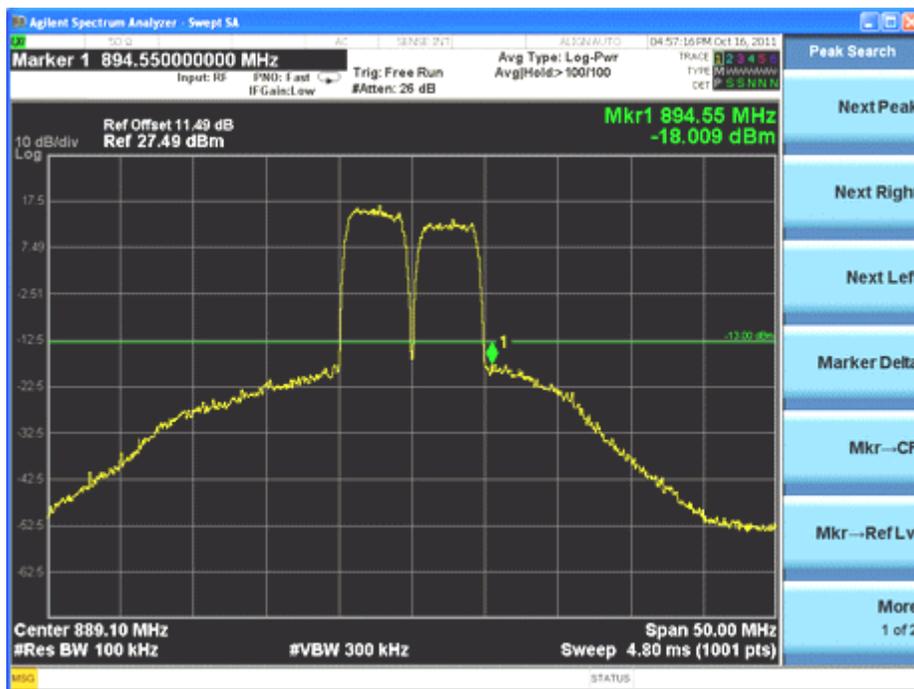
### Uplink, Spurious Emissions at Antenna Terminal, High Channel



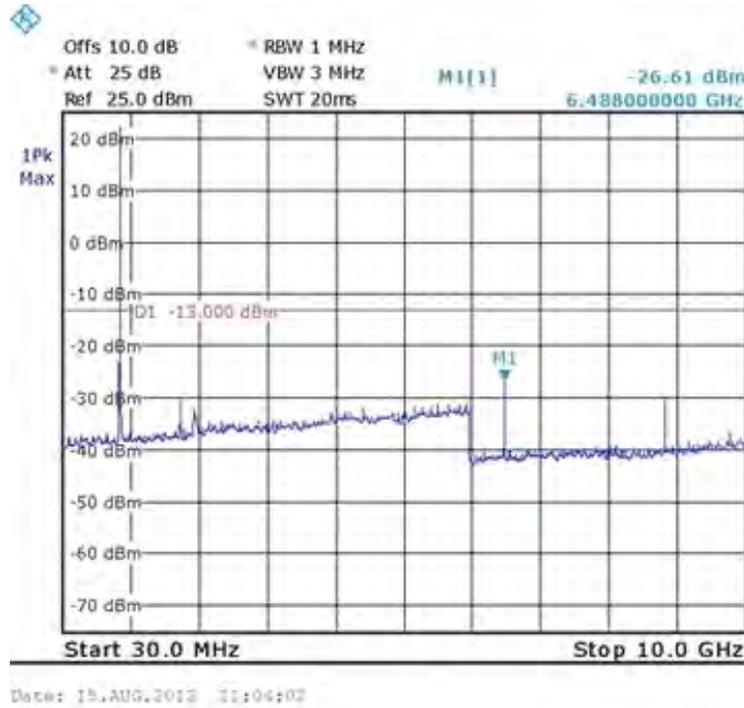
### Downlink, Inter-modulation, Low-band edge



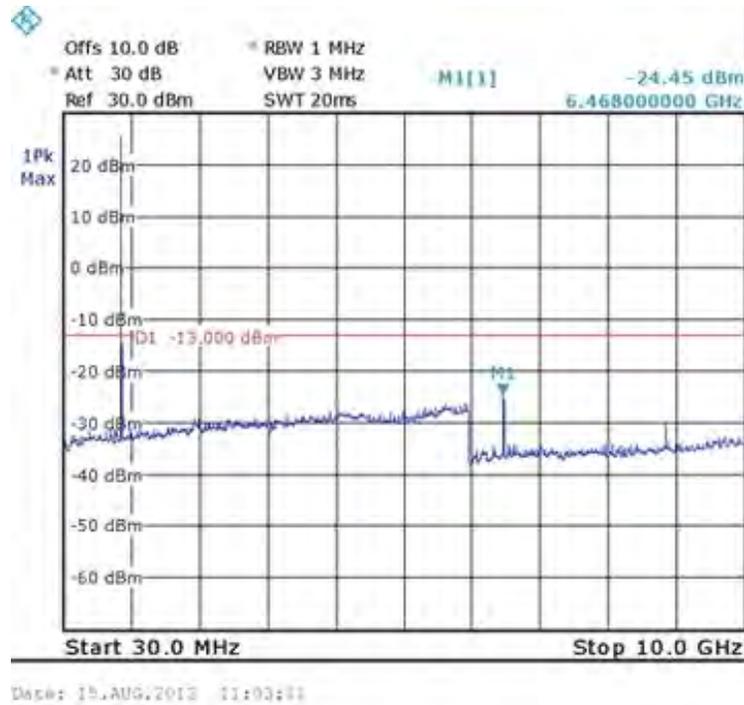
### Downlink, Inter-modulation, High-band edge



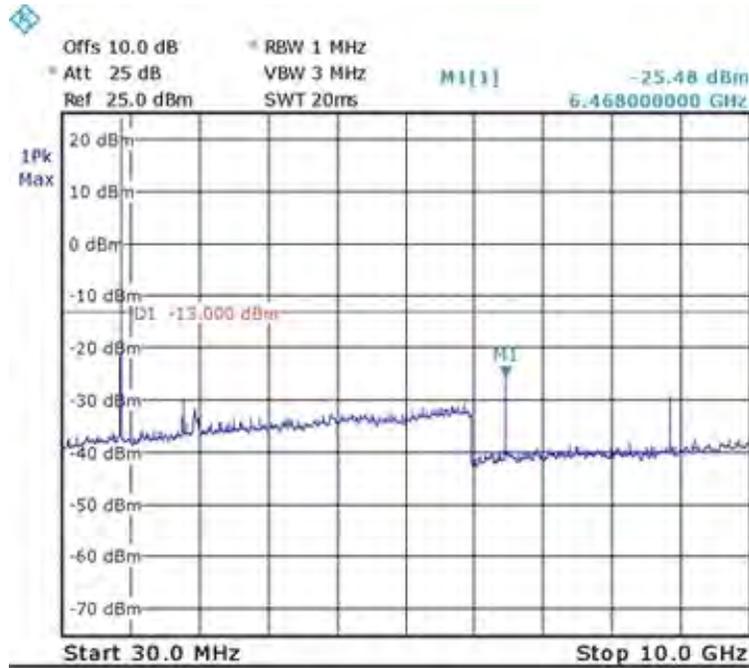
### Downlink, Spurious Emissions at Antenna Terminal, Low Channel



### Downlink, Spurious Emissions at Antenna Terminal, Middle Channel



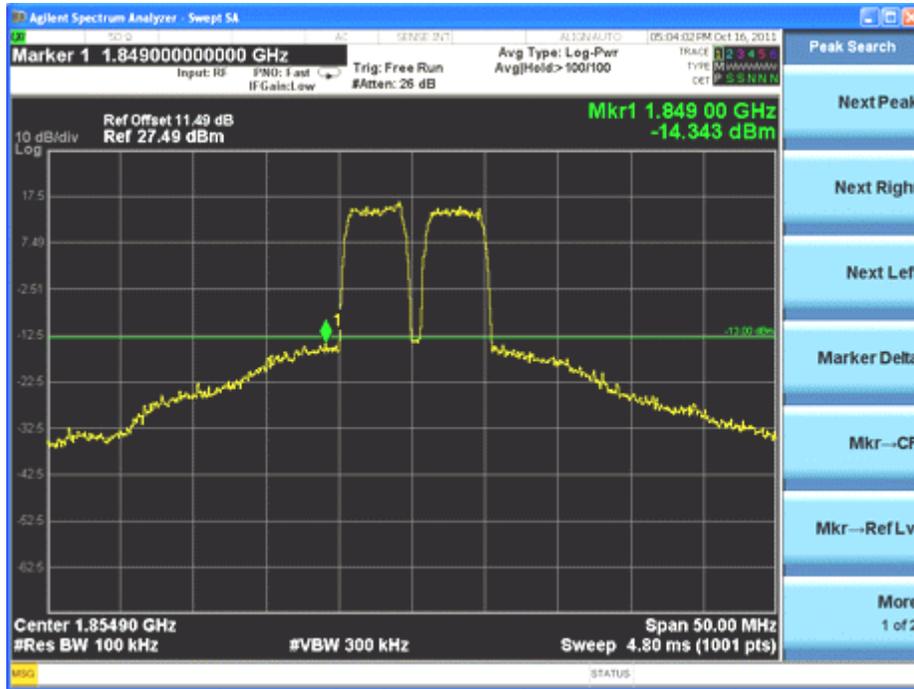
**Downlink, Spurious Emissions at Antenna Terminal, High Channel**



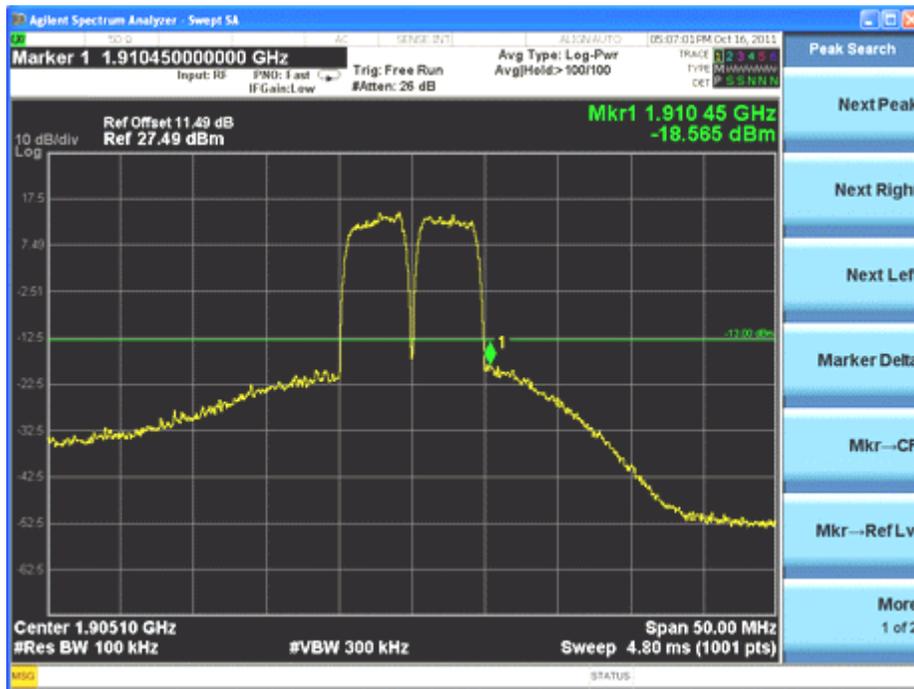
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### PCS Band (Part 24E)

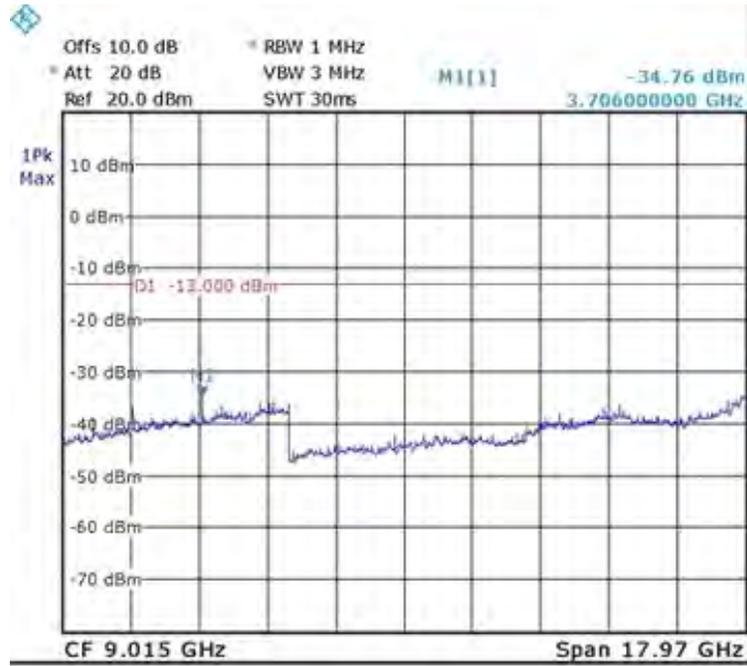
#### Uplink, Inter-modulation, Low-band edge



#### Uplink, Inter-modulation, High-band edge

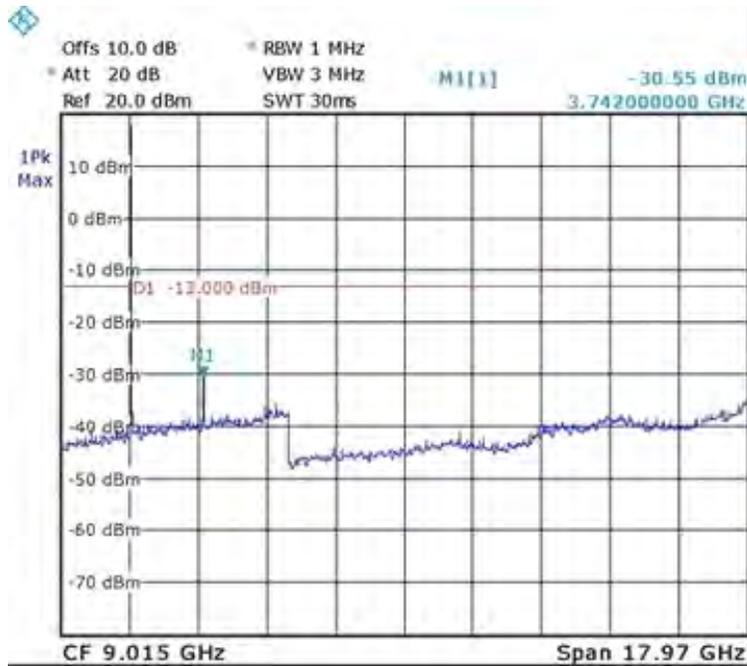


### Uplink, Spurious Emissions at Antenna Terminal, Low Channel



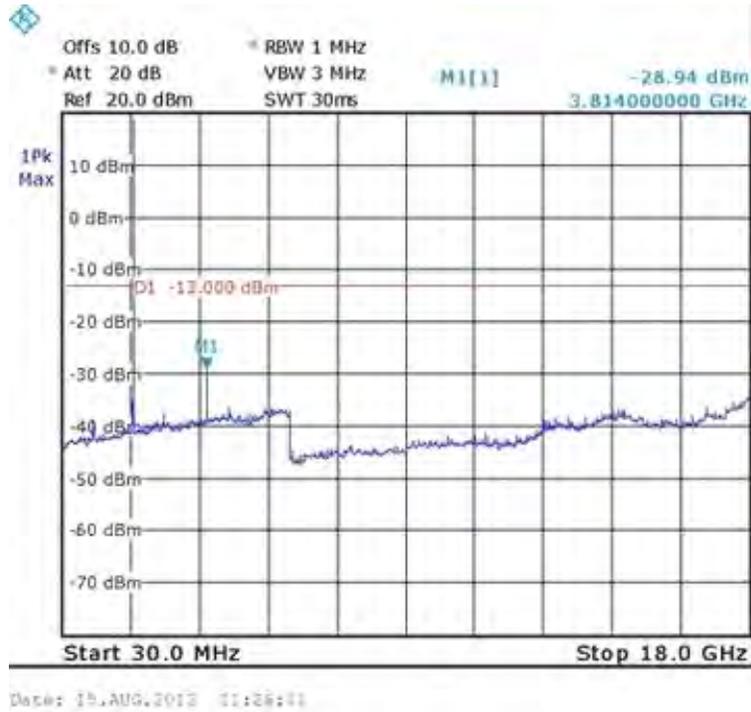
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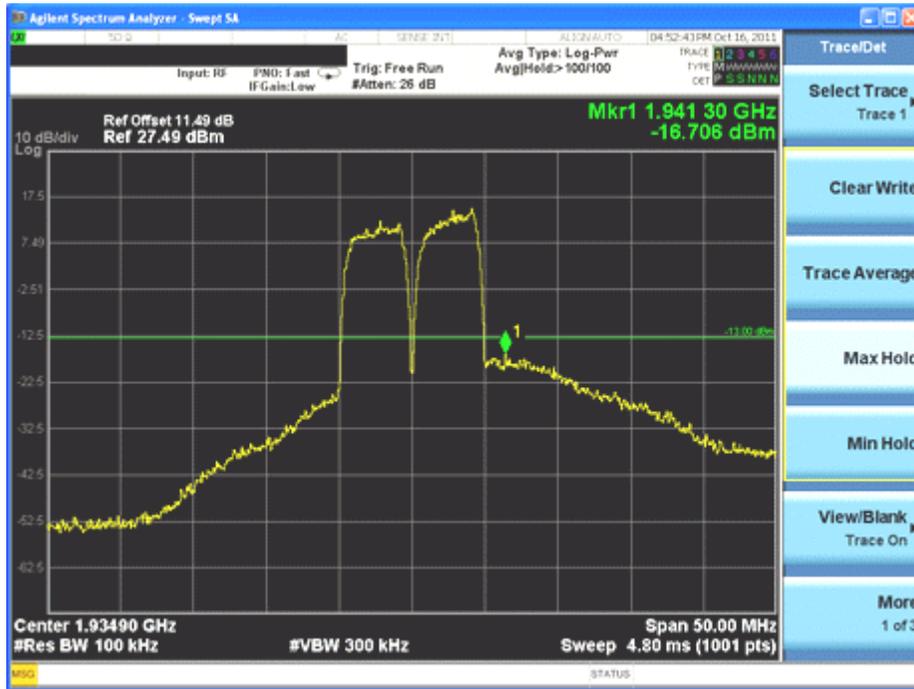


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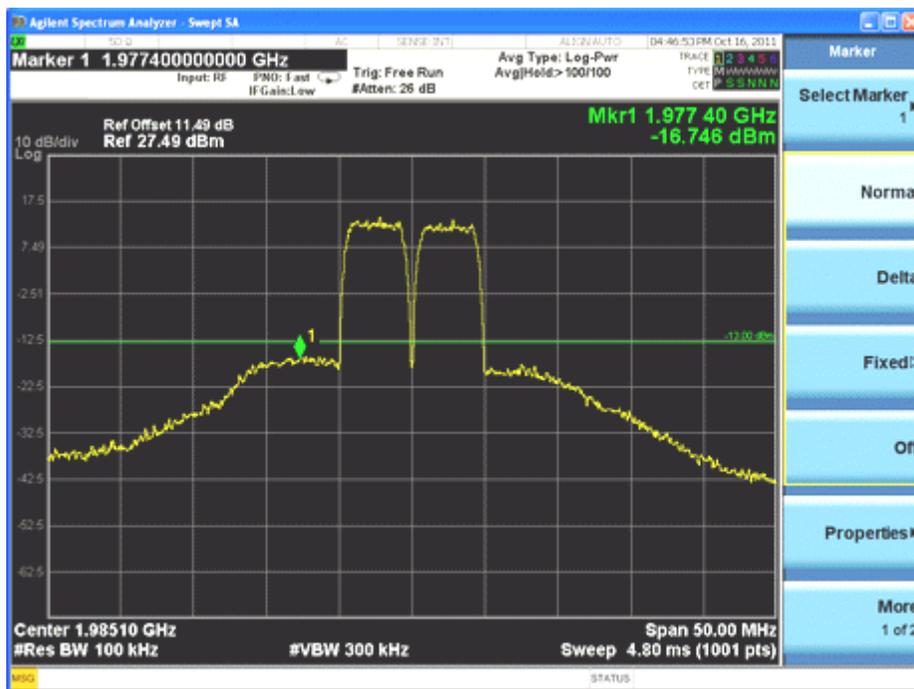
### Uplink, Spurious Emissions at Antenna Terminal, High Channel



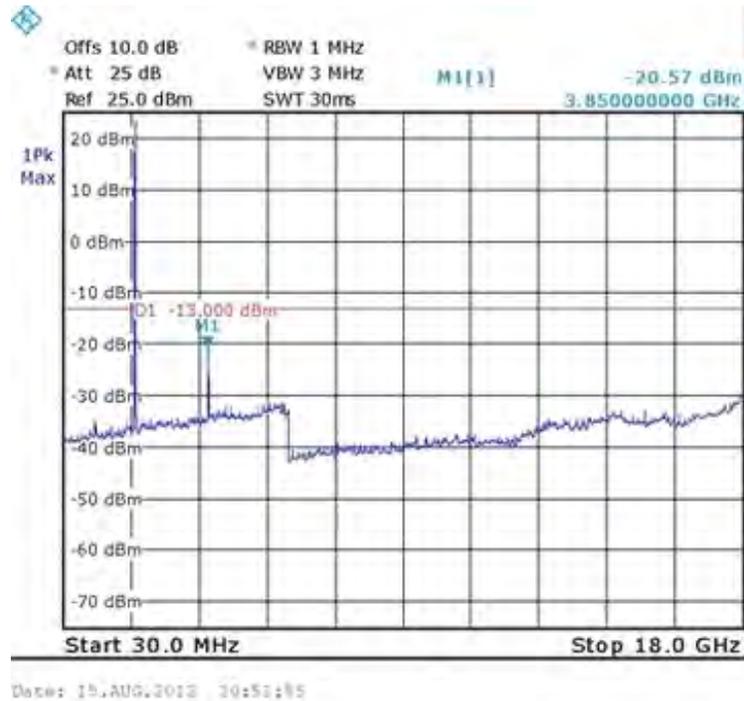
### Downlink, Inter-modulation, Low-band edge



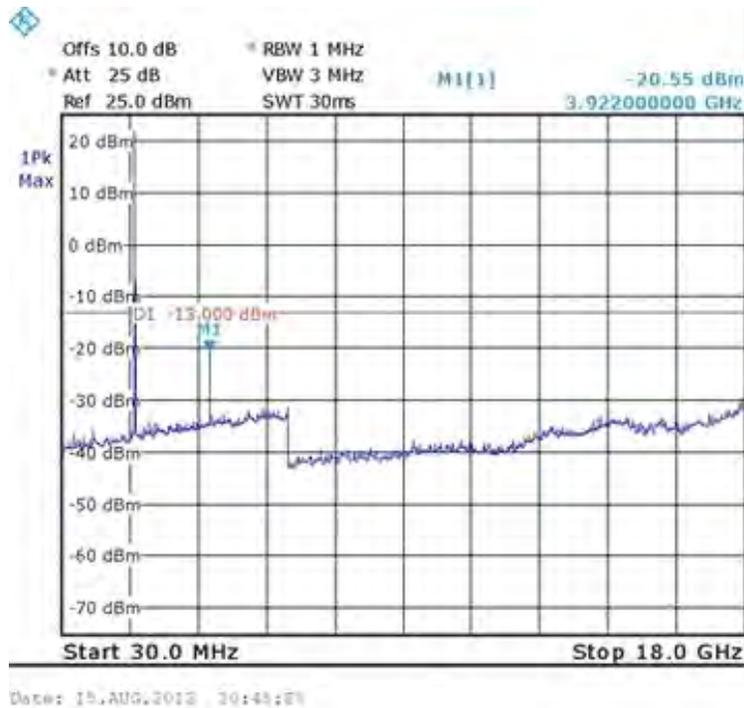
### Downlink, Inter-modulation, High-band edge



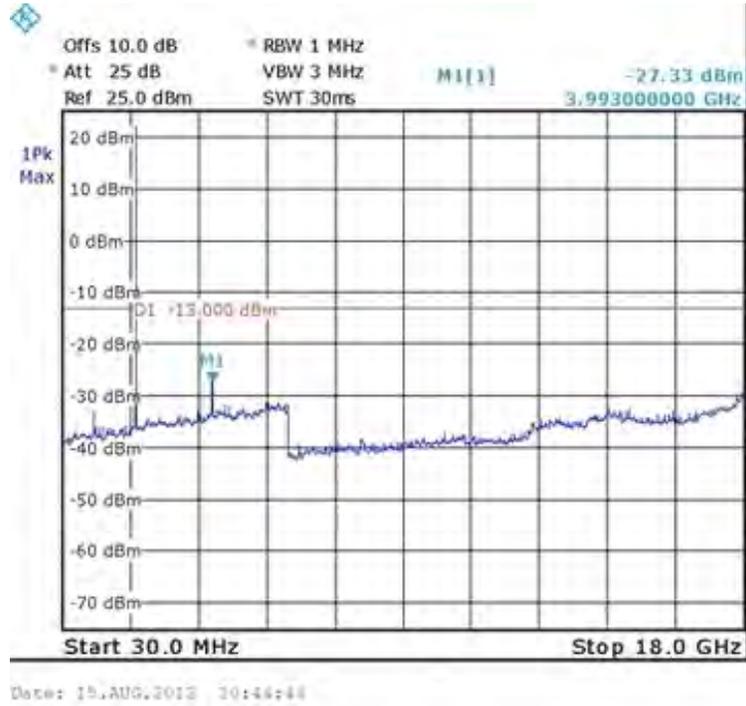
### Downlink, Spurious Emissions at Antenna Terminal, Low Channel



### Downlink, Spurious Emissions at Antenna Terminal, Middle Channel



**Downlink, Spurious Emissions at Antenna Terminal, High Channel**



## **9 - FCC §2.1053, §22.917& §24.238 - SPURIOUS RADIATED EMISSIONS**

### **9.1 Applicable Standards**

FCC § 2.1053, §22.917 and § 24.238.

### **9.2 Test Procedure**

The transmitter was placed on a wooden turntable, and it was transmitting into a non-radiating load which was also placed on the turntable.

The measurement antenna was placed at a distance of 3 meters from the EUT. During the tests, the antenna height and polarization as well as EUT azimuth were varied in order to identify the maximum level of emissions from the EUT. The test was performed by placing the EUT on 3-orthogonal axis.

The frequency range up to tenth harmonic of the fundamental frequency was investigated.

Remove the EUT and replace it with substitution antenna. A signal generator was connected to the substitution antenna by a non-radiating cable. The absolute levels of the spurious emissions were measured by the substitution.

Spurious emissions in dB = 10 lg (TXpwr in Watts/0.001) – the absolute level

Spurious attenuation limit in dB = 43 + 10 Log<sub>10</sub> (power out in Watts)

### **9.3 Test Equipment List and Details**

<b>Description</b>	<b>Manufacturer</b>	<b>Model Number</b>	<b>Serial Number</b>	<b>Calibration Date</b>	<b>Calibration Due Date</b>
Amplifier	Agilent	8447D	2944A10442	2011-11-15	2012-11-14
EMI Test Receiver	Rohde & Schwarz	ESCI	10028	2011-10-16	2012-10-15
Broadband Antenna	Sunol Sciences	JB3	A101808	2012-08-14	2013-08-13
Spectrum Analyzer	R & S	FSL18	100180	2012-05-10	2013-05-09
Horn Antenna	AVT	OMCDH10180	10279001B	2012-05-05	2013-05-04
Amplifier	HP	8449B	3008A00277	2011-09-12	2012-09-11
Turntable Antenna Controller	MATURO	MCU	2851008	2012-07-12	2013-07-11
Horn Antenna	EMCO	3115	9607-4897	2012-07-08	2013-07-07
Swept Frequency Synthesizer	WILTRON	6737B-20	213001	2011-10-28	2012-10-27
Splitter/Composite	MINI-CIRCUITS	ZFSC-2-372-S+	N/A	2011-11-15	2012-11-14
Signal Generator	Agilent	E4432B	GB40051703	2011-10-28	2012-10-27

## 9.4 Test Results

### Test Environmental Conditions

<b>Temperature:</b>	25 °C
<b>Relative Humidity:</b>	58 %
<b>ATM Pressure:</b>	94.5 kPa

\*The testing was performed by Jack Wu on 2012-08-18.

### Cellular Band (Part 22H)

30 MHz to 10 GHz (with CW signal)

Indicated		Table Angle Degree	Test Antenna		Substituted				Absolute Level (dBm)	Limit (dBm)	Margin (dB)
Frequency (MHz)	S.A. Reading (dBμV)		Height (m)	Polar (H/V)	Frequency (MHz)	Level (dBm)	Ant. Gain (dB)	Cable Loss (dB)			
Middle Channel (Uplink)											
49.4	45.92	250	1.5	V	49.4	-49.1	0	0.2	-49.3	-13	36.3
93.5	41.71	265	1.4	H	93.5	-53.1	0	0.4	-53.5	-13	40.5
1673.2	40.16	255	2.0	H	1673.2	-66.1	9.1	1.2	-58.2	-13	45.2
1673.2	53.48	5	1.7	V	1673.2	-53.5	9.1	1.2	-45.6	-13	32.6
1673.2	40.16	255	2.0	H	1673.2	-66.1	9.1	1.2	-58.2	-13	45.2
2509.8	66.79	335	1.7	V	2509.8	-38.2	10.2	2.0	-30.0	-13	17.0
2509.8	56.87	270	1.2	H	2509.8	-48.1	10.2	2.0	-39.9	-13	26.9
Middle Channel (Downlink)											
52.3	46.40	335	1.4	V	52.3	-48.5	0	0.3	-48.8	-13	35.8
93.7	42.95	225	1.5	H	93.7	-51.8	0	0.4	-52.2	-13	39.2
2644.8	62.88	360	1.7	V	2644.8	-42.1	9.8	2.1	-34.4	-13	21.4
2644.8	61.79	345	1.9	H	2644.8	-43.2	9.8	2.1	-35.5	-13	22.5
3526.4	47.49	25	1.0	V	3526.4	-57.5	10.1	2.9	-50.3	-13	47.3
3526.4	59.47	235	2.0	H	3526.4	-45.5	10.1	2.9	-38.3	-13	25.3

**PCS Band (Part 24E)**

30 MHz to 20 GHz (with CW signal)

Indicated		Table Angle Degree	Test Antenna		Substituted				Absolute Level (dBm)	Limit (dBm)	Margin (dB)
Frequency (MHz)	S.A. Reading (dB $\mu$ V)		Height (m)	Polar (H/V)	Frequency (MHz)	Level (dBm)	Ant. Gain (dB)	Cable Loss (dB)			
Middle Channel (Uplink)											
51.82	45.14	330	1.7	V	51.82	-50.3	0	0.3	-50.6	-13	37.6
94.5	43.90	320	1.2	H	94.5	-50.9	0	0.4	-51.3	-13	38.3
3758.5	51.19	320	1.2	V	3758.5	-53.8	10.1	2.5	-46.2	-13	33.2
3758.5	47.78	310	1.1	H	3758.5	-57.2	10.1	2.5	49.6	-13	36.6
Middle Channel (Downlink)											
93.0	43.01	320	1.5	H	93.0	-51.7	0	0.4	-52.1	-13	39.1
49.4	46.01	330	1.7	V	49.4	-48.8	0	0.3	-49.1	-13	36.1
3919.9	48.07	290	1.0	V	3919.9	-56.9	9.4	3.1	-50.6	-13	37.6
3919.9	47.08	305	1.2	H	3919.9	-57.9	9.4	3.1	-51.6	-13	38.6

## 10 - FCC §22.917(a) & §24.238(a) - BAND EDGES

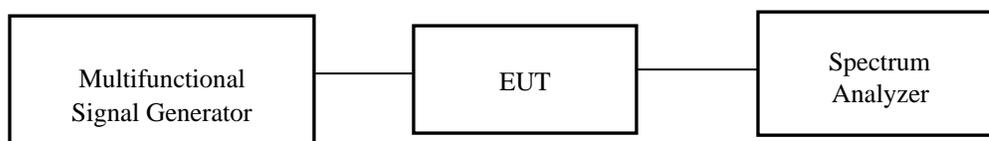
### 10.1 Applicable Standards

According to FCC § 22.917(a), the power of any emissions outside of the authorized operating frequency ranges must be attenuated below the transmitting power (P) by a factor of at least  $43 + 10 \log(P)$  dB.

According to FCC §24.238(a), the power of any emissions outside of the authorized operating frequency ranges must be attenuated below the transmitting power (P) by a factor of at least  $43 + 10 \log(P)$  dB.

### 10.2 Test Procedure

The RF output of the transmitter was connected to the input of the spectrum analyzer through sufficient attenuation.



### 10.3 Test Equipment List and Details

Description	Manufacturer	Model Number	Serial Number	Calibration Date	Calibration Due Date
Spectrum Analyzer	R & S	FSL18	100180	2012-05-10	2013-05-09
Attenuator	Weinschel Engineering	1	AB1165	2012-07-08	2013-07-07
Signal Generator	Agilent	E4438C	MY45093864	2012-03-22	2013-03-21

### 10.4 Test Results

#### Test Environmental Conditions

Temperature:	22-25 °C
Relative Humidity:	58 %
ATM Pressure:	94.5 kPa

*The testing was performed by Jack Wu on 2012-08-11 to 2012-08-13.*

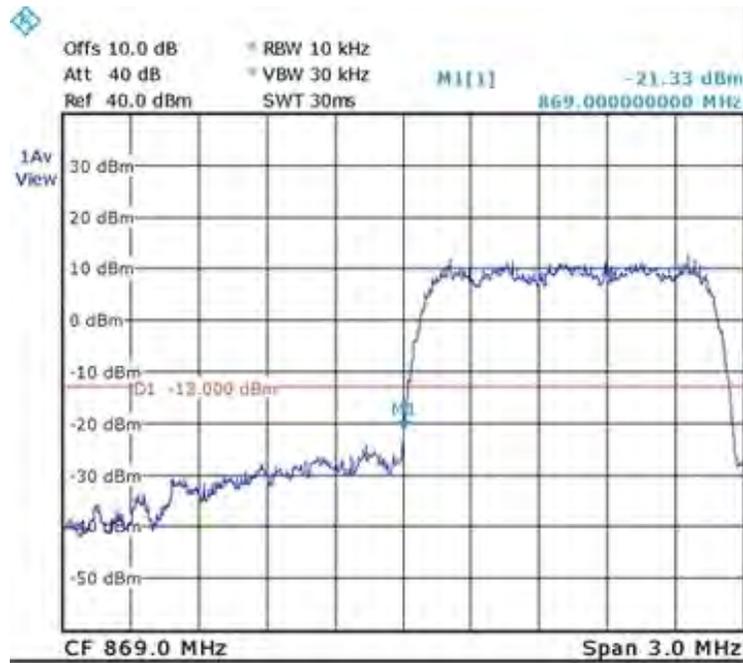
**CDMA:**

Frequency Band	Channel	Frequency (MHz)	Emissions (dBm)	Limit (dBm)
Cellular Band (Part 22H)				
Uplink (824-849 MHz)	Left	824	-16.56	-13
	Right	849	-16.44	-13
Downlink (869-894 MHz)	Left	869	-21.33	-13
	Right	894	-17.72	-13
PCS Band (Part 24E)				
Uplink (1850-1910 MHz)	Left	1850	-17.06	-13
	Right	1910	-20.21	-13
Downlink (1930-1990 MHz)	Left	1930	-25.08	-13
	Right	1990	-19.41	-13

Please see the below plots.

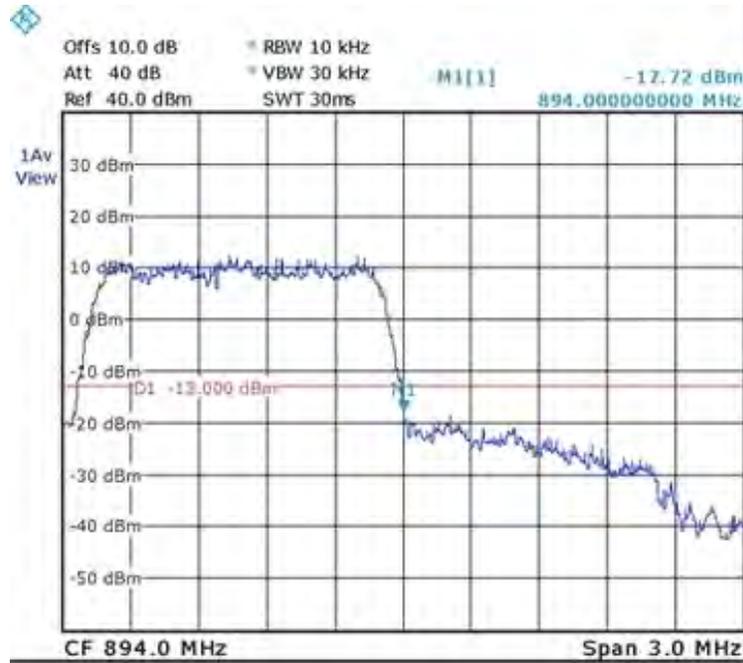


### Downlink, Left Bandage



Date: 11.AUG.2012 11:29:06

### Downlink, Right Bandage



Date: 11.AUG.2012 11:30:05





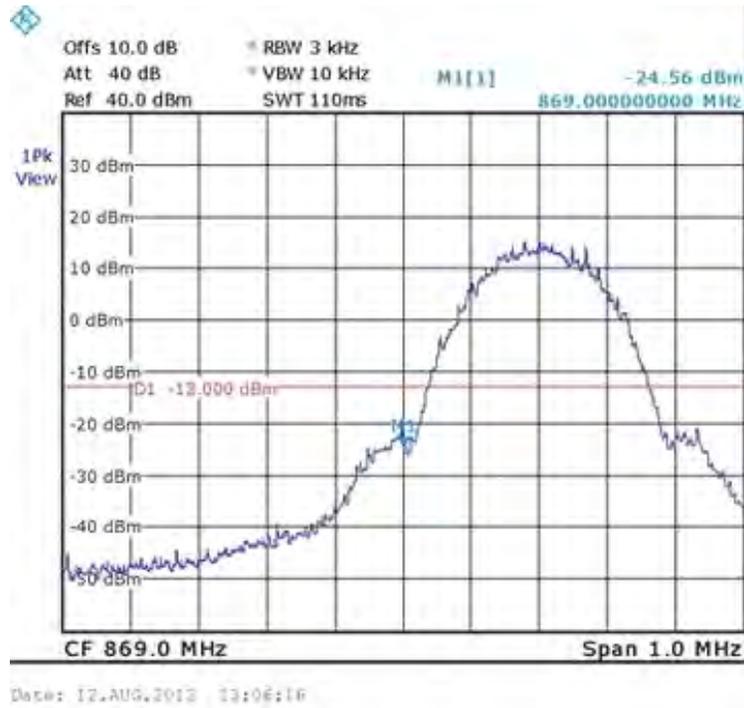
**GSM:**

Frequency Band	Channel	Frequency (MHz)	Emissions (dBm)	Limit (dBm)
Cellular Band (Part 22H)				
Uplink (824-849 MHz)	Left	824	-21.33	-13
	Right	849	-22.61	-13
Downlink (869-894 MHz)	Left	869	-24.56	-13
	Right	894	-23.91	-13
PCS Band (Part 24E)				
Uplink (1850-1910 MHz)	Left	1850	-22.79	-13
	Right	1910	-23.42	-13
Downlink (1930-1990 MHz)	Left	1930	-23.34	-13
	Right	1990	-20.75	-13

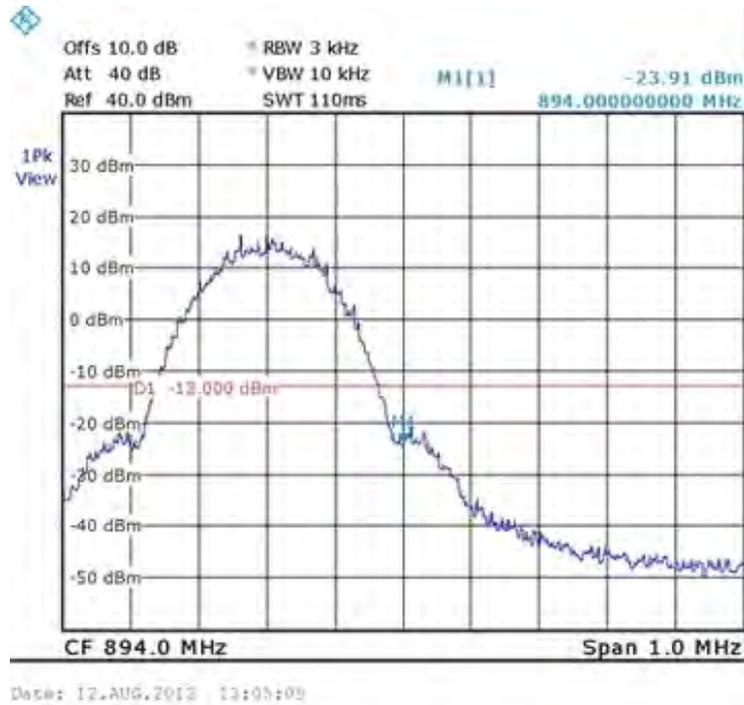
Please see the below plots.



### Downlink, Left Bandage

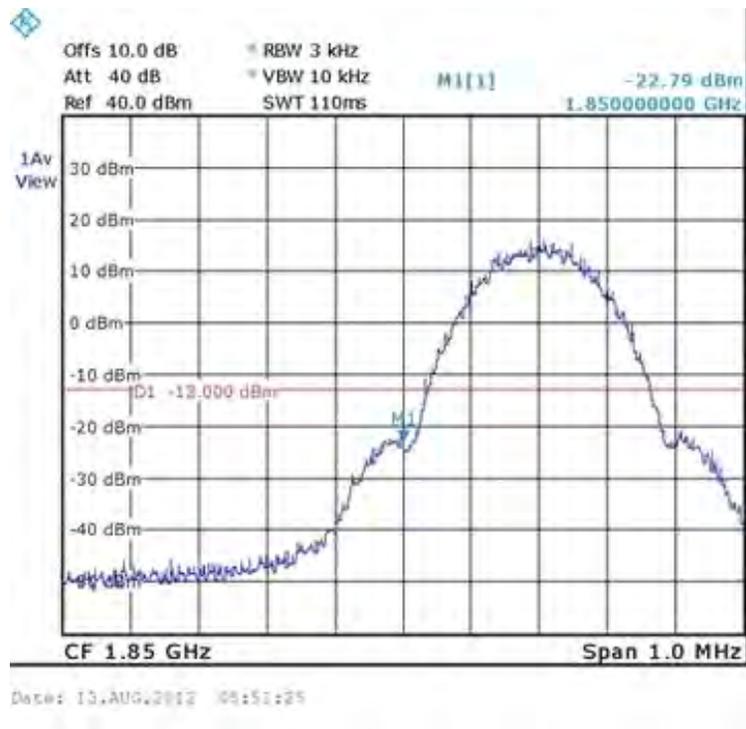


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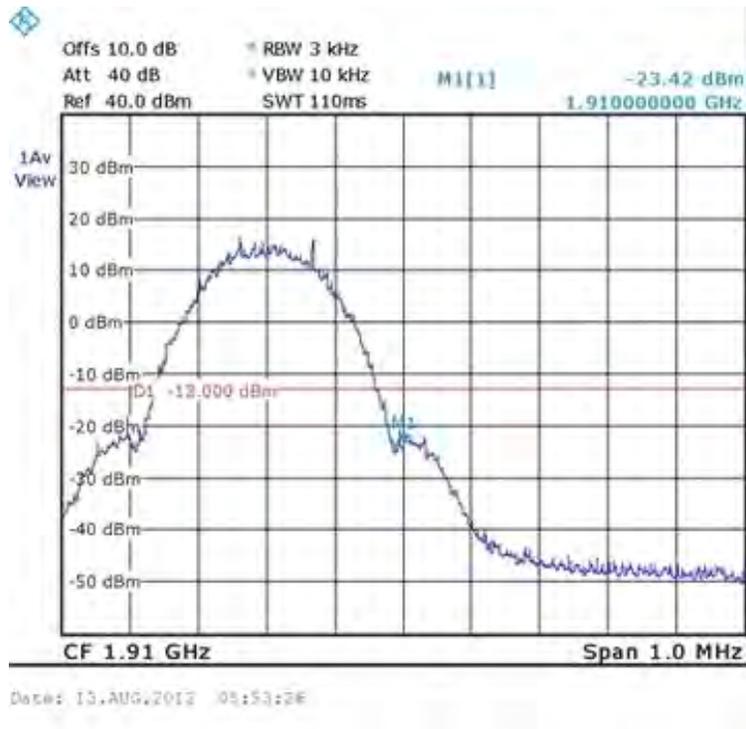


### PCS Band (Part 24E)

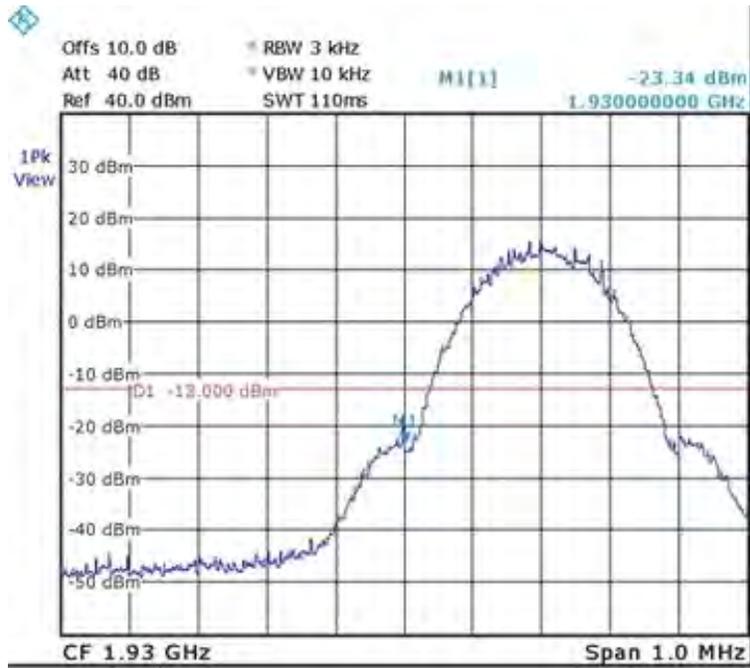
#### Uplink, Left Bandage



#### Uplink, Right Bandage

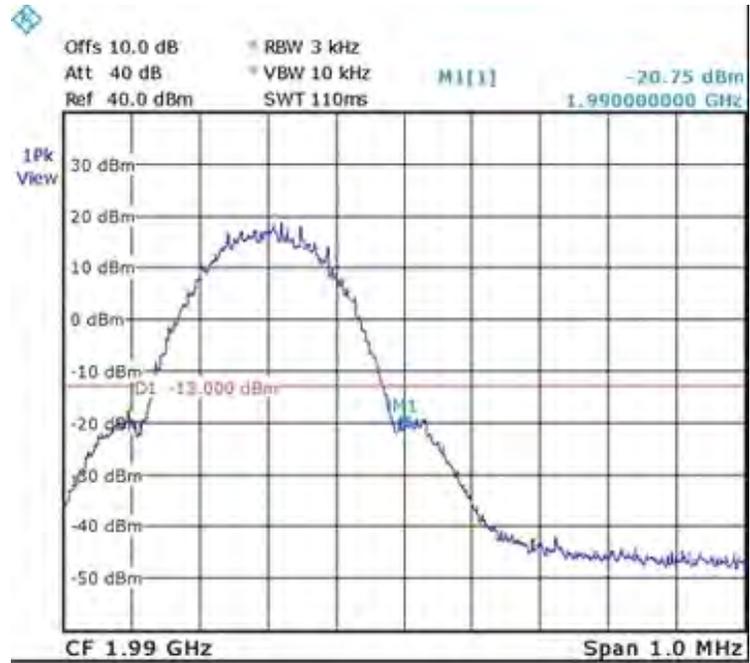


### Downlink, Left Bandage



Date: 12.AUG.2012 13:03:43

### Downlink, Right Bandage



Date: 12.AUG.2012 13:02:14

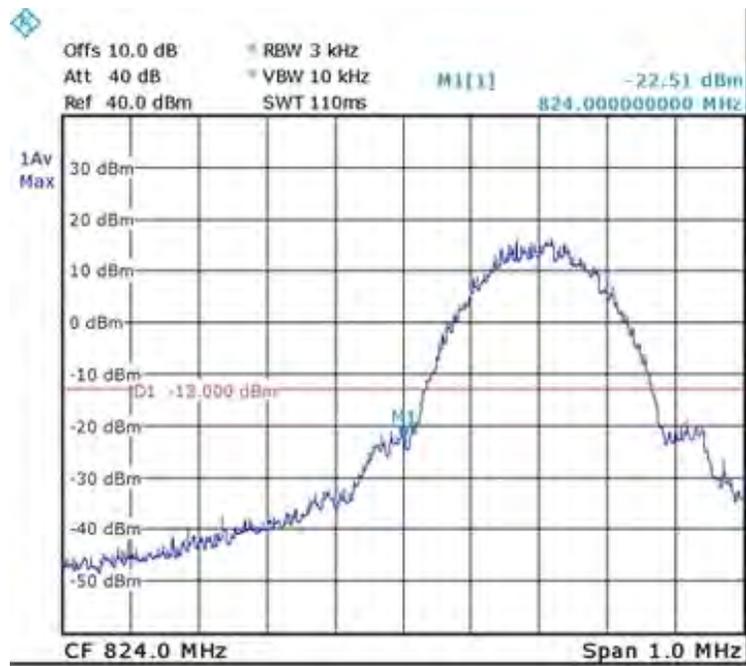
**EDGE:**

Frequency Band	Channel	Frequency (MHz)	Emissions (dBm)	Limit (dBm)
Cellular Band (Part 22H)				
Uplink (824-849 MHz)	Left	824	-22.51	-13
	Right	849	-33.68	-13
Downlink (869-894 MHz)	Left	869	-31.19	-13
	Right	894	-31.95	-13
PCS Band (Part 24E)				
Uplink (1850-1910 MHz)	Left	1850	-25.31	-13
	Right	1910	-26.47	-13
Downlink (1930-1990 MHz)	Left	1930	-32.90	-13
	Right	1990	-25.75	-13

Please see the below plots.

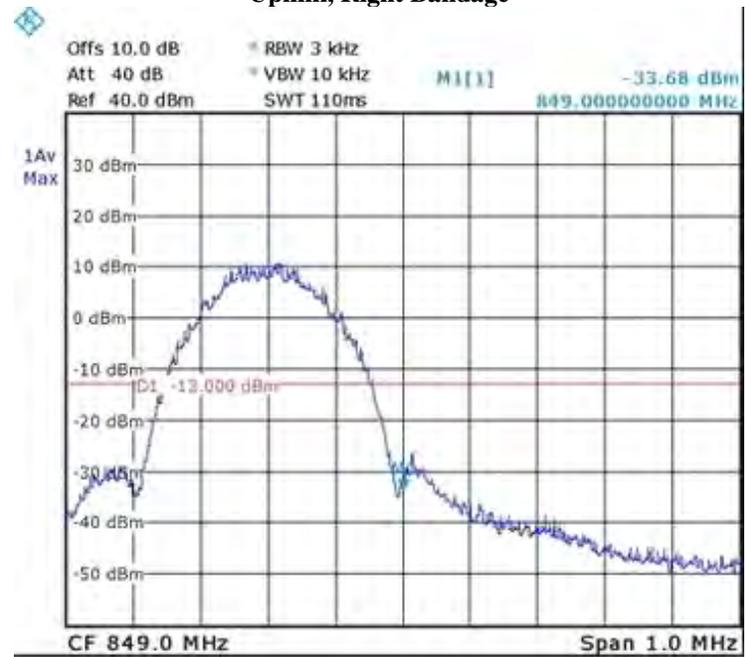
### Cellular Band (Part 22H)

#### Uplink, Left Bandage



Date: 13.AUG.2012 11:16:06

#### Uplink, Right Bandage

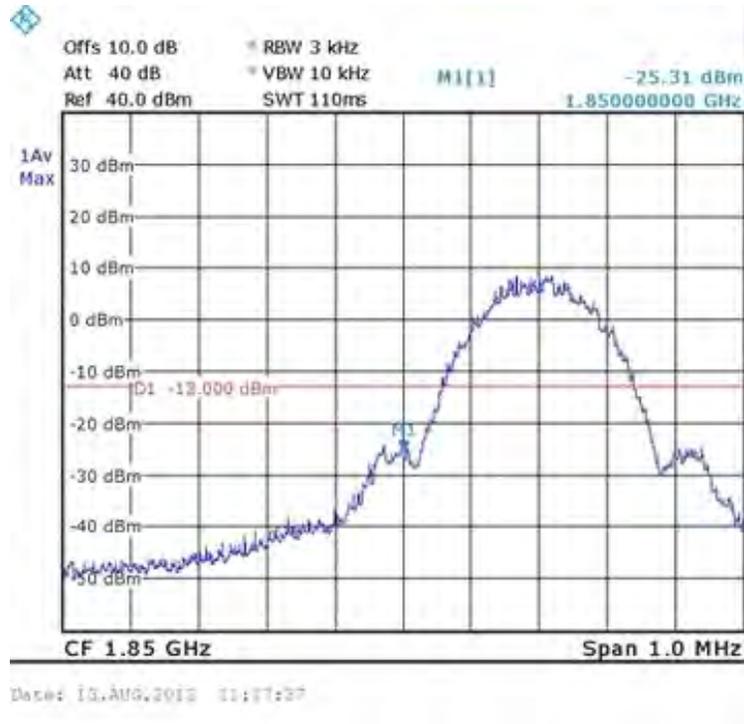


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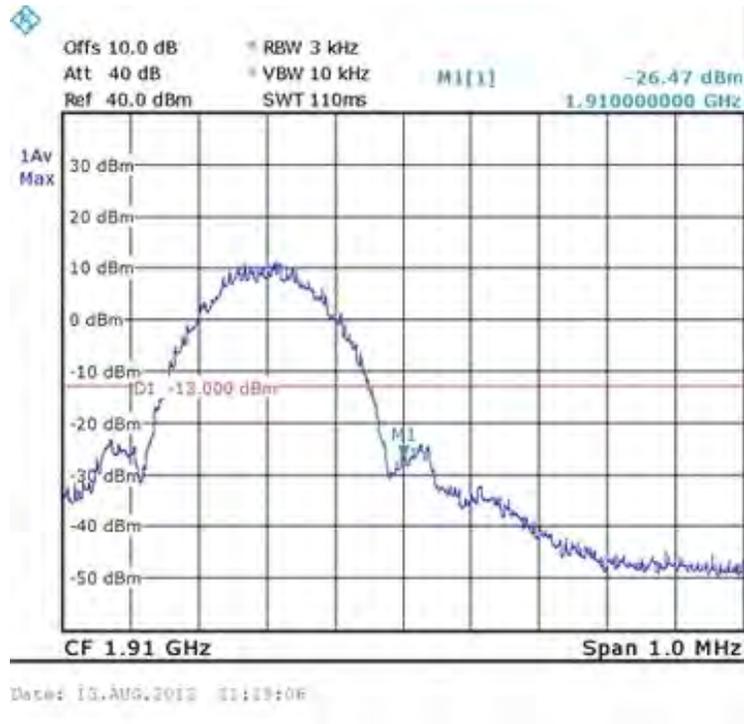


### PCS Band (Part 24E)

#### Uplink, Left Bandage



#### Uplink, Right Bandage





**WCDMA:**

Frequency Band	Channel	Frequency (MHz)	Emissions (dBm)	Limit (dBm)
Cellular Band (Part 22H)				
Uplink (824-849 MHz)	Left	824	-15.00	-13
	Right	849	-18.04	-13
Downlink (869-894 MHz)	Left	869	-15.60	-13
	Right	894	-15.19	-13
PCS Band (Part 24E)				
Uplink (1850-1910 MHz)	Left	1850	-14.62	-13
	Right	1910	-15.25	-13
Downlink (1930-1990 MHz)	Left	1930	-18.09	-13
	Right	1990	-14.77	-13

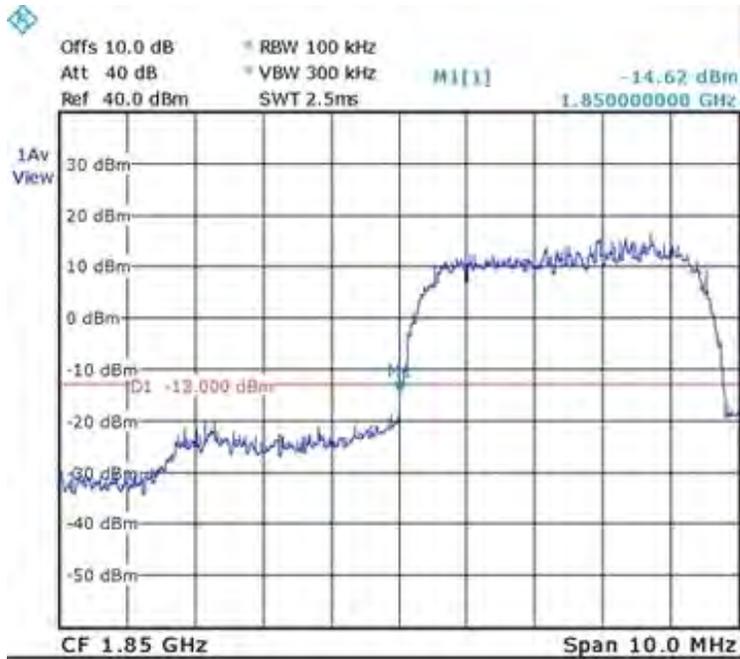
Please see the below plots.





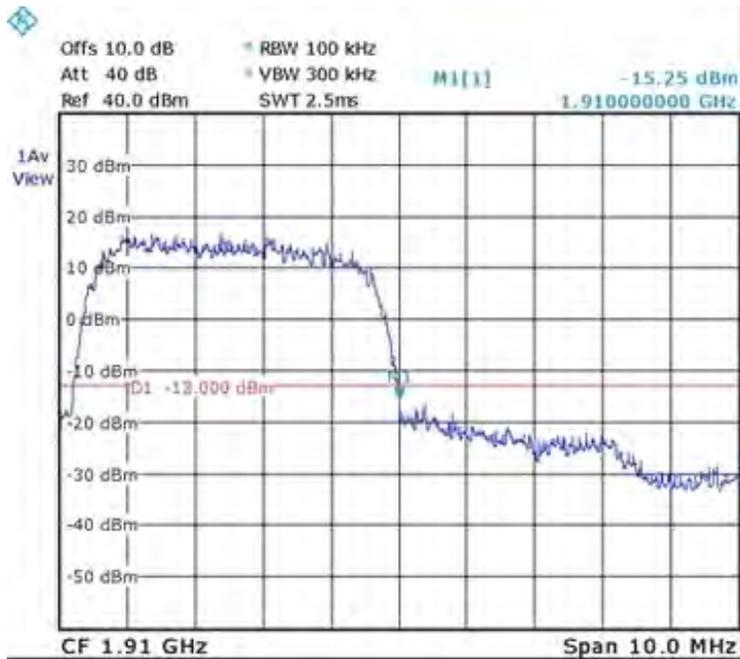
### PCS Band (Part 24E)

#### Uplink, Left Bandage



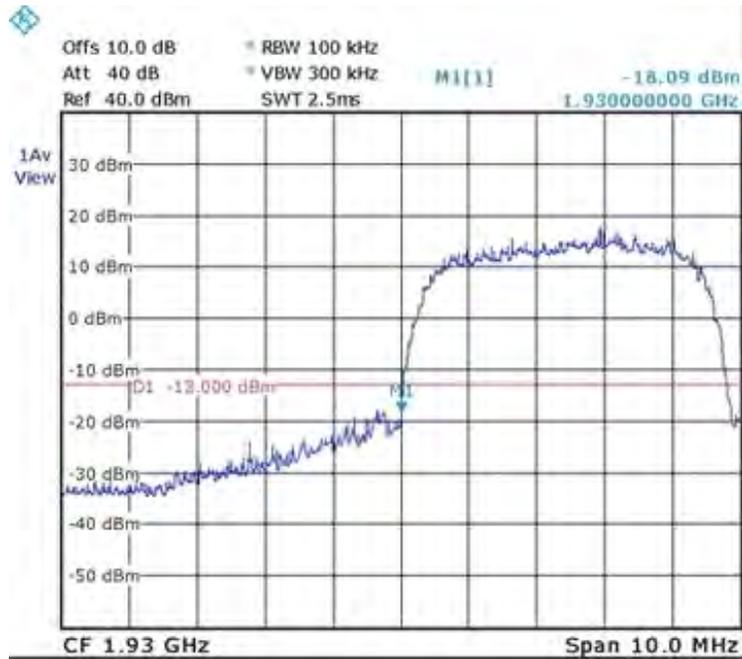
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#### Uplink, Right Bandage



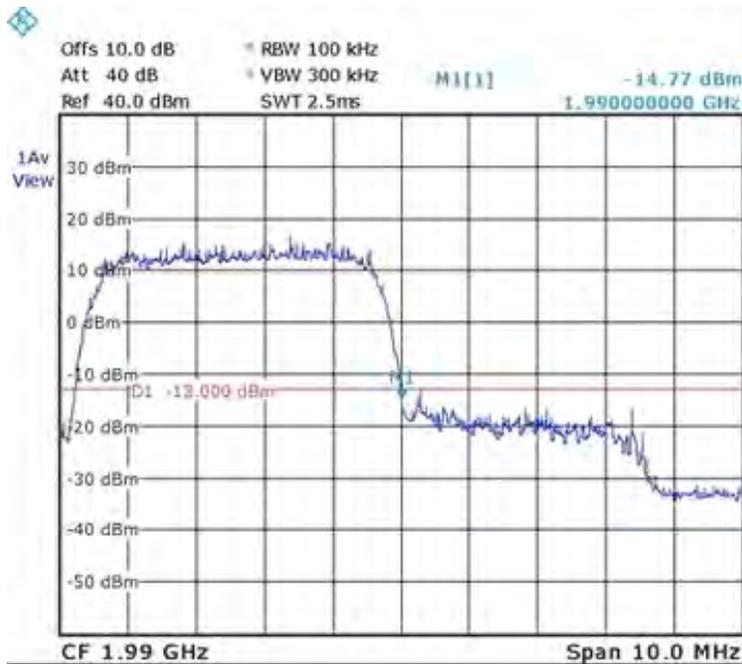
Date: 12.AUG.2013 11:01:44

### Downlink, Left Bandage



Date: 12.AUG.2012 08:55:08

### Downlink, Right Bandage



Date: 12.AUG.2012 09:05:08

\*\*\*\*\* END OF REPORT \*\*\*\*\*