

**TELCOSAT INC. TEST REPORT FOR THE RBB-  
850 REPEATER,**

**FCC  
PART 22**

**July 8th , 2013**

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## INTRODUCTION

### 1.1 PURPOSE

The purpose of this document is to demonstrate compliance of the RBB-850 to FCC Part 22 and the equivalent sections of Industry Canada's RSS 131

## TEST EUT DESCRIPTION

### Description of EUT

EUT	Name	Model	Revision	Serial Number
	RBB-850	RBB-850		000001

**Classification** Cellular Repeater (Base Station)

**Frequency Range** Uplink 824-849 MHz  
Downlink 869-894 MHz

**Transmitter duty cycle** 100%

**Operating Temperature** -40°C to +50°C

**Output power** 25.0 dBm – based on two tone

**Functional Description** Cellular repeater

## METHOD OF OPERATION DURING TESTS

Unless otherwise noted in the test report the EUT was tested while in a continuous transmit mode. The EUT was tuned to a low, middle, and high channel to perform power, occupied bandwidth, and spurious/harmonic tests. For conducted emissions the device was tuned to its center frequency. While transmitting the EUT was setup to operate at the intended maximum power output available to the end user. For all test cases pre-scans were completed in all modes to determine worst case levels.

### **3 SUMMARY OF TEST RESULTS**

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<b>Description of Test</b>	<b>Specification</b>	<b>Results</b>
RF Power Output	FCC §2.1046, §22.913	Pass
Mean Output Power	RSS 131 Issue 2 (2003) Section 6.2	Pass
Input and Output Plots	FCC §2.1049(i)	Pass
Block Edge	FCC §2.1049(i)	Pass
Spurious Emissions at Antenna Terminal	FCC §22.917(a)	Pass
Field Strength of Spurious Radiation	FCC §22.917(a)	Pass
99% Bandwidth	RSS-131 Issue 2 (2003) Section 6.3	Pass
Passband Gain and Bandwidth	RSS 131 Issue 2 ( 2003) Section 6.1	Pass
Frequency Stability	FCC §2.1055, §22.355	Pass

### **CONDITIONS DURING TESTING**

No modifications to the Equipment Under Test (EUT) were necessary during testing.

### **EQUIPMENT UNDER TEST (EUT) DESCRIPTION**

The customer declares the EUT tested was representative of a production unit. The Telcosat RBB-850 repeater increases the coverage and capacity of existing cellular wireless networks. The customer declares the EUT tested was representative of a production unit. The Telcosat RBB-850 Repeater increases the coverage and capacity of existing cellular wireless networks. It simultaneously supports 3G and 4G communications protocols and multiple RF carriers using advanced processing. The repeaters are designed to increase the coverage and capacity of existing wireless networks for both indoor and outdoor use. GSM, EDGE and WCDMA protocols can operate simultaneously on the same unit. Key features include support for multiple GSM/EDGE carriers and WCDMA support in the 900MHz operating band.

The Telcosat RBB-850 also provides feedback cancellation to effectively increase antenna isolation and enable greater operating gain without oscillation. Remote control and supervision is supported through direct IP connection.

There are no end user internal adjustments or firmware adjustments. Factory firmware is not supplied to the end user.

The following model has been tested, Model Number RBB-850, Serial number 000001.

## EQUIPMENT UNDER TEST

### Telcosat RBB-850 Repeater

**Manufacturer:** Telcosat Inc.      **Model:** RBB-850      **Serial:** 000001

**FCC ID: UDIRRBB850**

**IC ID:5842A-RBB850**

## LIST OF TEST EQUIPMENT USED DURING TESTING.

Equipment	Manufacturer	Model#	Serial#	Cal Date	Cal Due
Spectrum Analyzer	Agilent	E4405B	US41441250	20-Mar-13	20-Mar-14
Spectrum Analyzer	Agilent	E4404B	MY44220519	26-Feb-13	26-Feb-14
Signal Generator	Agilent	E4437B	US39230102	11-Jan-12	11-Jan-14
Power Meter	Agilent	E4416A	GB41293089	3-Aug-11	19-Oct-13
Power Sensor	Agilent	E9322A	MY52140010	26-Apr-12	1-Nov-13
Frequency Counter	Agilent	53132	MY40006238	14-Jun-13	14-Jun-15

## TEST ENVIRONMENT

All tests were performed under the following environmental conditions:

Temperature Range : 20°C - 23°C

Humidity Range : 50 - 75%

Pressure Range : 86 - 106kPa

Power Supply Range :  $\pm 5\%$  of rated voltages

**FCC 2.1033(c)(3) USER'S MANUAL**

The necessary information is contained in a separate document.

**FCC 2.1033 (c)(4) TYPE OF EMISSIONS**

G7W, GXW, F9W

**FCC 2.1033 (c)(5) FREQUENCY RANGE**

824-849MHz Uplink, 869-894MHz Downlink

**FCC 2.1033 (c)(6) OPERATING POWER**

+25dBm

**FCC 2.1033 (c)(7) MAXIMUM POWER RATING**

1 watts peak

**FCC 2.1033 (c)(8) DC VOLTAGES**

The necessary information is contained in a separate document.

**FCC 2.1033 (c)(9) TUNE-UP PROCEDURE**

The necessary information is contained in a separate document.

**FCC 2.1033(c)(10) SCHEMATICS AND CIRCUITRY DESCRIPTION**

The necessary information is contained in a separate document.

**FCC 2.1033(c)(11) LABEL AND PLACEMENT**

The necessary information is contained in a separate document.

**FCC 2.1033(c)(12) SUBMITTAL PHOTOS**

The necessary information is contained in a separate document.

**FCC 2.1033 (c)(13) MODULATION INFORMATION**

EDGE, GSM, WCDMA

## **4 FCC §2.1046 - RF POWER OUTPUT**

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### **4.1 Applicable standard**

FCC §22.913(a)

### **4.2 Test Equipment**

<b>Equipment</b>	<b>Manufacturer</b>	<b>Model #</b>	<b>Serial #</b>	<b>Cal Date</b>	<b>Cal Due</b>
EPM Power Meter	Agilent	E4416A	GB41293089	03-Aug-2011	19-Oct-2013
Power Sensor	Agilent	E9322A	MY52140010	26-Apr-2012	1-Nov-2013
Signal Generator	Agilent	E4437B	US39230102	11-Jan-2012	11-Jan-2014

### **4.3 Test Procedure (FCC REQUIREMENTS/ COMPLIANCE RULES)**

The effective radiated power (ERP) of transmitters in the Cellular Radiotelephone Service must not exceed the limits in this section.

(a) Maximum ERP. In general, the effective radiated power (ERP) of base transmitters and cellular repeaters must not exceed 500 Watts (57dBm). However, for those systems operating in areas more than 72 km (45 miles) from international borders that:

- (1) Are located in counties with population densities of 100 persons or fewer per square mile, based upon the most recently available population statistics from the Bureau of the Census; or,
- (2) Extend coverage on a secondary basis into cellular unserved areas, as those areas are defined in § 22.949, the ERP of base transmitters and cellular repeaters of such systems must not exceed 1000 Watts (60dBm). The ERP of mobile transmitters and auxiliary test transmitters must not exceed 7 Watts (38.45dBm).

NOTE: Telcosat product model RBB850 is a fixed stationary device.

For Downlink configuration, Donor antenna port is connected to Signal Generator and Area Fill antenna port is connected to Peak Power Meter through 20dB attenuator. For uplink configuration, Donor antenna port is connected to Peak Power Meter through 20dB attenuator and Area Fill antenna port is connected to Signal Generator.

## 4.4 Test Results

WCDMA

Frequency Band	Channel	Frequency (MHz)	Input Power (dBm)	Output Power (dBm)	Limit (dBm)
Downlink	Low	871.4	-47	+27.55	+57
	Middle	881.4	-47	+29.10	+57
	High	891.6	-47	+28.66	+57
Uplink	Low	826.4	-47	+26.53	+57
	Middle	836.4	-47	+27.87	+57
	High	846.6	-47	+27.47	+57

GSM

Frequency Band	Channel	Frequency (MHz)	Input Power (dBm)	Output Power (dBm)	Limit (dBm)
Downlink	Low	869.2	-47	+21.86	+57
	Middle	881.6	-47	+24.74	+57
	High	893.8	-47	+25.19	+57
Uplink	Low	824.2	-47	+22.01	+57
	Middle	836.6	-47	+23.61	+57
	High	848.8	-47	+23.48	+57

EDGE

Frequency Band	Channel	Frequency (MHz)	Input Power (dBm)	Output Power (dBm)	Limit (dBm)
Downlink	Low	869.2	-47	+25.01	+57
	Middle	881.6	-47	+29.03	+57
	High	893.8	-47	+28.31	+57
Uplink	Low	824.2	-47	+25.24	+57
	Middle	836.6	-47	+26.67	+57
	High	848.8	-47	+26.29	+57

The maximum antenna gain to be used on the Downlink path is 27.9dBd.

If transmitting antennas of directional gain greater than 27.9dBd are used , the Downlink output power shall be reduced accordingly.

The maximum antenna gain to be used on the Uplink path is 29.13dBd.

If transmitting antennas of directional gain greater than 29.13dBd are used , the Uplink output power shall be reduced accordingly.

## **5 RSS 131 SECTION 6.2 - RF POWER OUTPUT**

### **5.1 Applicable Standard**

RAA-131 Issue 2(2003) Section 6.2

### **5.2 Test Equipment**

Equipment	Manufacturer	Model #	Serial #	Cal Date	Cal Due
Spectrum Analyzer	Agilent	E4404B	MY44220519	26-Feb-2013	26-Feb-2014
Signal Generator	Agilent	E4437B	US39230102	11-Jan-2012	11-Jan-2014

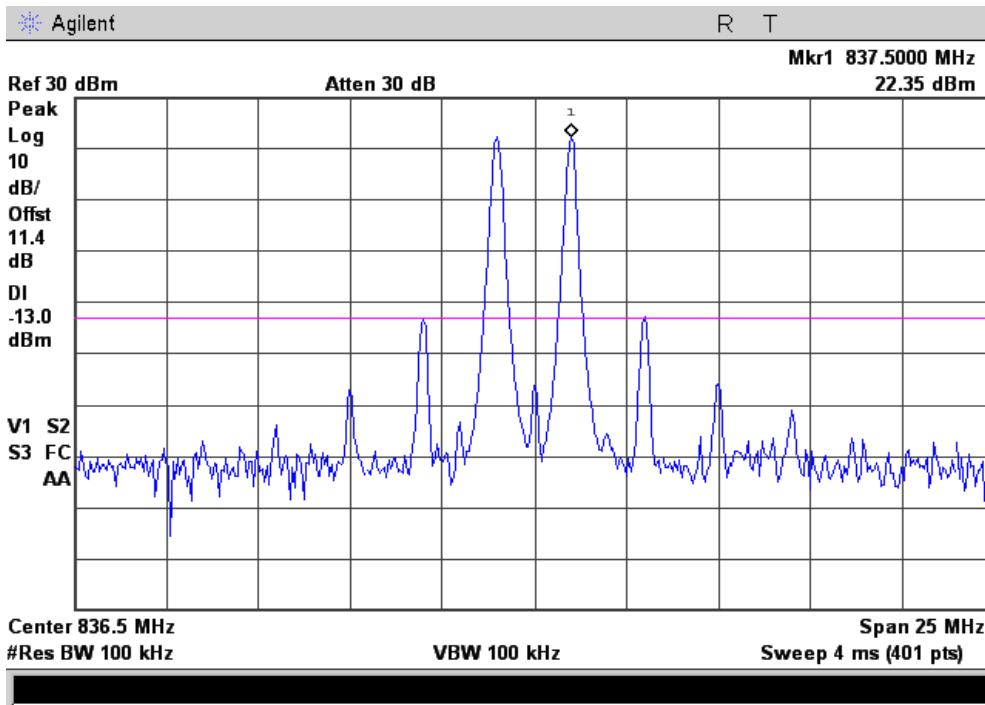
### **5.3 Test Procedure**

For Downlink configuration, Donor antenna port is connected to Signal Generator and Area Fill antenna port is connected to Spectrum Analyzer through 20dB attenuator. For Uplink configuration, Donor antenna port is connected to Spectrum Analyzer through 20dB attenuator and Area Fill antenna port is connected to an Signal Generator .

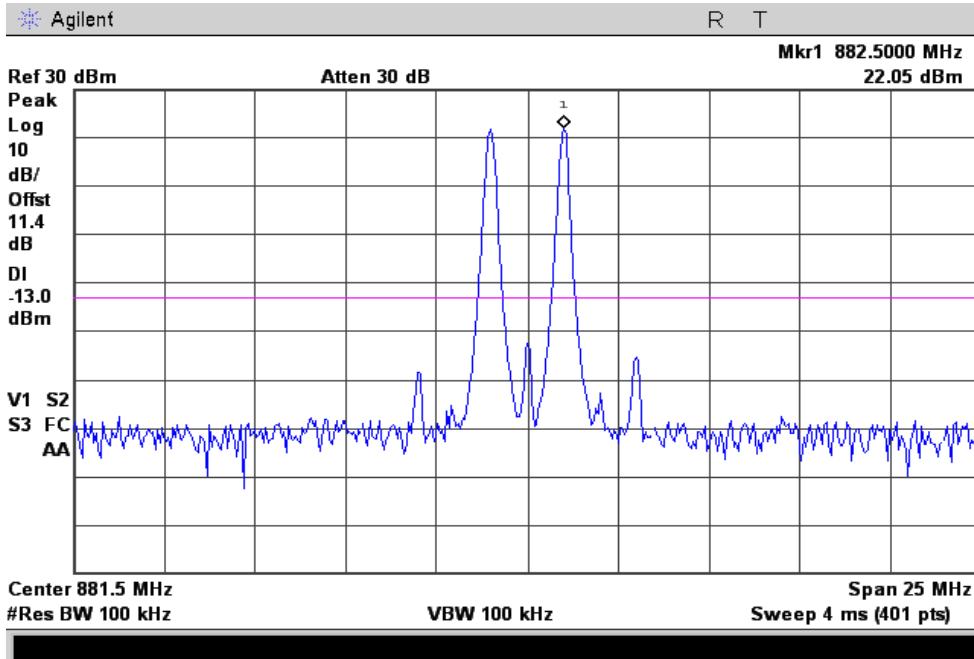
RF signal measured at the output antenna port in accordance with RSS 131, 4.3.1 requirement.

## 5.4 Test Results

### 5.4.1 Uplink



### 5.4.2. Downlink



Highest Measured  $P_{01}$ =+22.35dBm

$$P_{\text{mean}} = P_{01} + 3\text{dB} = 22.35 + 3 = 25.35 \text{ dBm}$$

## **6 FCC 2.1049(i)- INPUT/OUTPUT PLOTS**

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### **6.1 Applicable Standard**

FCC §2.1033(c)/2.1049(i)

### **6.2 Test Equipment**

<b>Equipment</b>	<b>Manufacturer</b>	<b>Model #</b>	<b>Serial #</b>	<b>Cal Date</b>	<b>Cal Due</b>
Spectrum Analyzer	Agilent	E4404B	MY44220519	26-Feb-2013	26-Feb-2014
Signal Generator	Agilent	E4437B	US39230102	11-Jan-2012	11-Jan-2014

### **6.3 Test Procedure**

For downlink configuration, Donor antenna port is connected to Signal Generator and Area Fill antenna port is connected to a Spectrum Analyzer through 20dB attenuator. For uplink configuration, Donor antenna port is connected to Spectrum Analyzer through 20dB attenuator and Area Fill antenna port is connected to Signal Generator.

Output waveform is recorded with a spectrum analyzer at the Antenna port of the device. Input waveform is recorded with a spectrum analyzer at the RF out of the Signal Generator.

#### **Uplink**

Frequency: 824 - 849MHz

Modulation: EDGE, GSM and WCDMA

Power : 25dBm

#### **Downlink**

Frequency: 869 - 894MHz

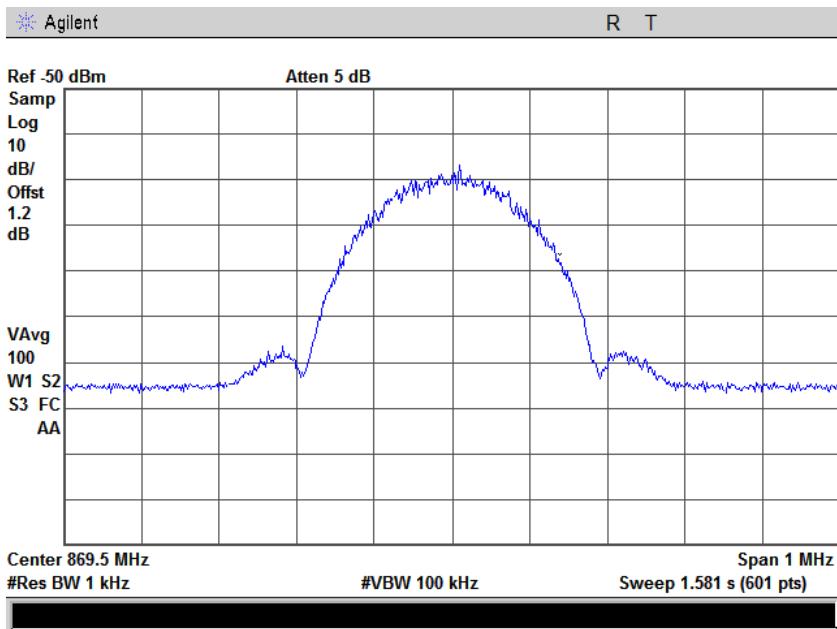
Modulation: EDGE, GSM and WCDMA

Power : 25dBm

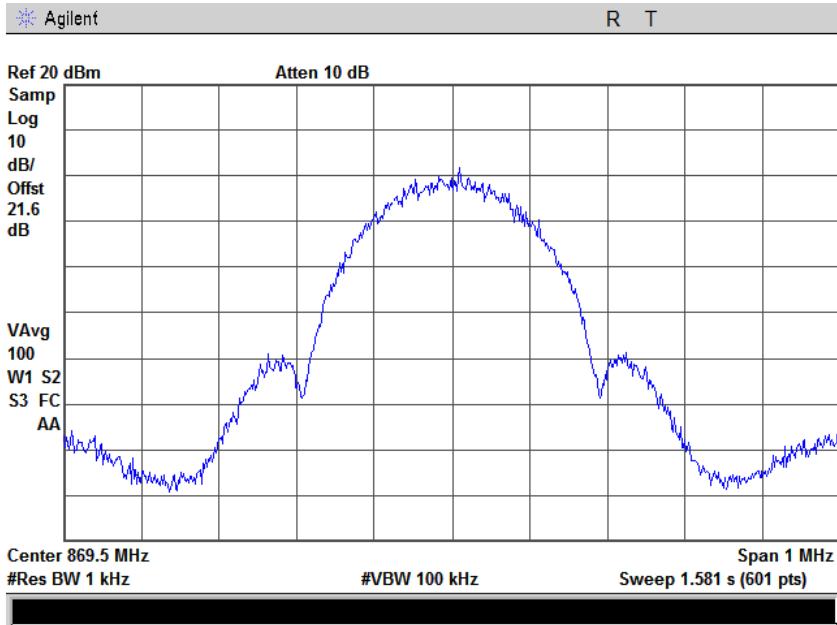
## 6.4 Test Results

### 6.4.1 EDGE

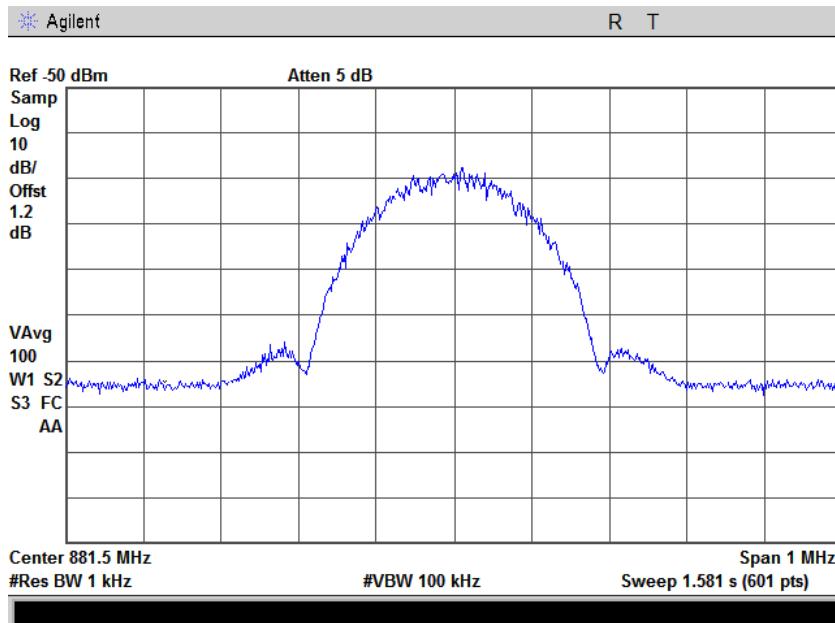
#### INPUT PLOT DOWNLINK - EDGE 869 MHz



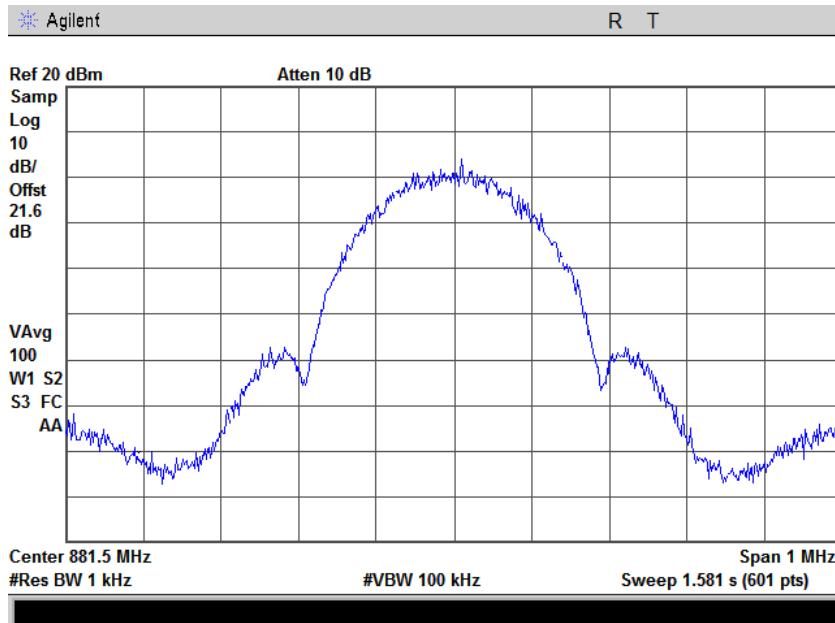
#### OUTPUT PLOT DOWNLINK - EDGE 869 MHz



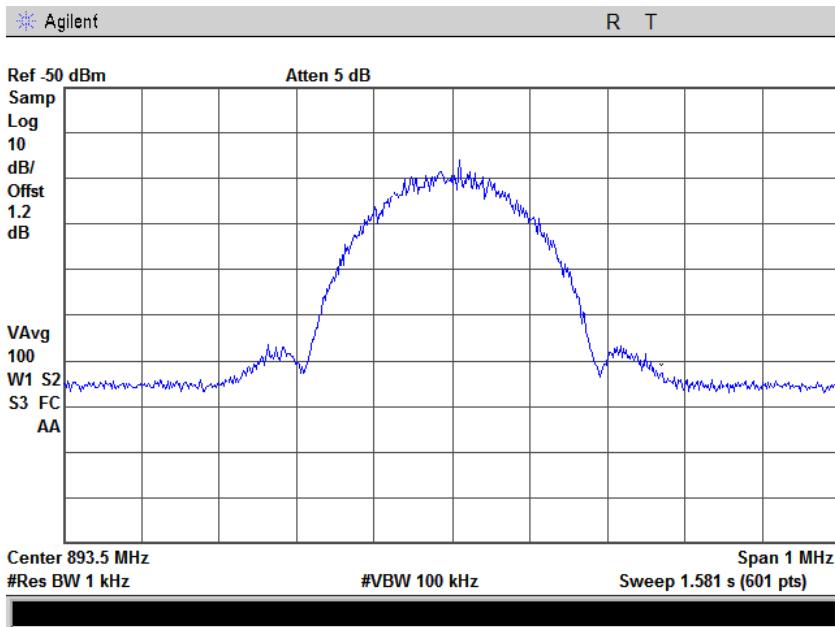
## INPUT PLOT DOWNLINK - EDGE 881 MHz



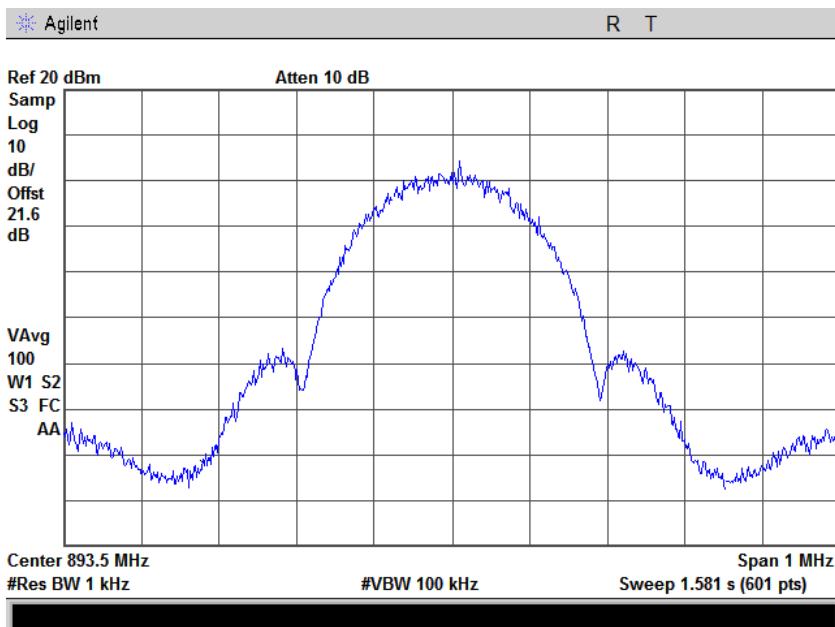
## OUTPUT PLOT DOWNLINK - EDGE 881 MHz



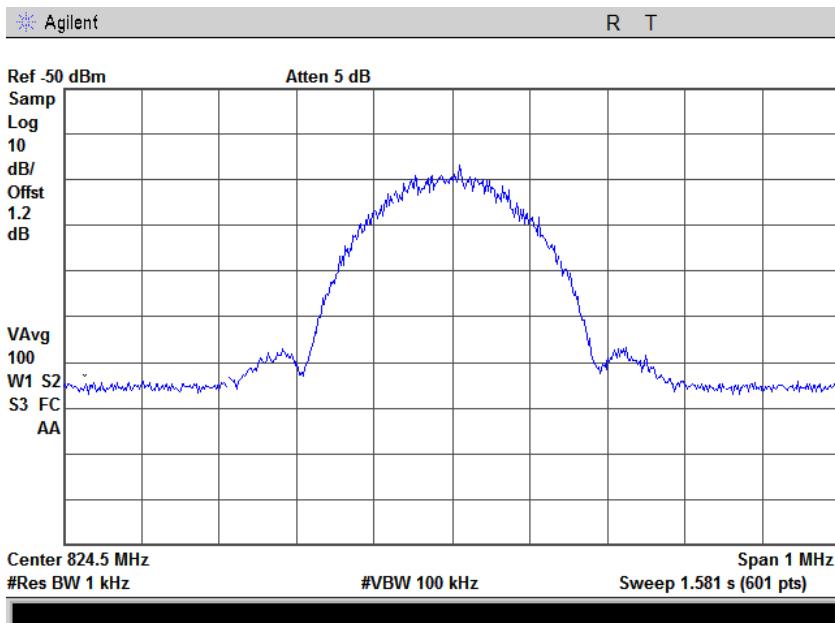
## INPUT PLOT DOWNLINK - EDGE 893 MHz



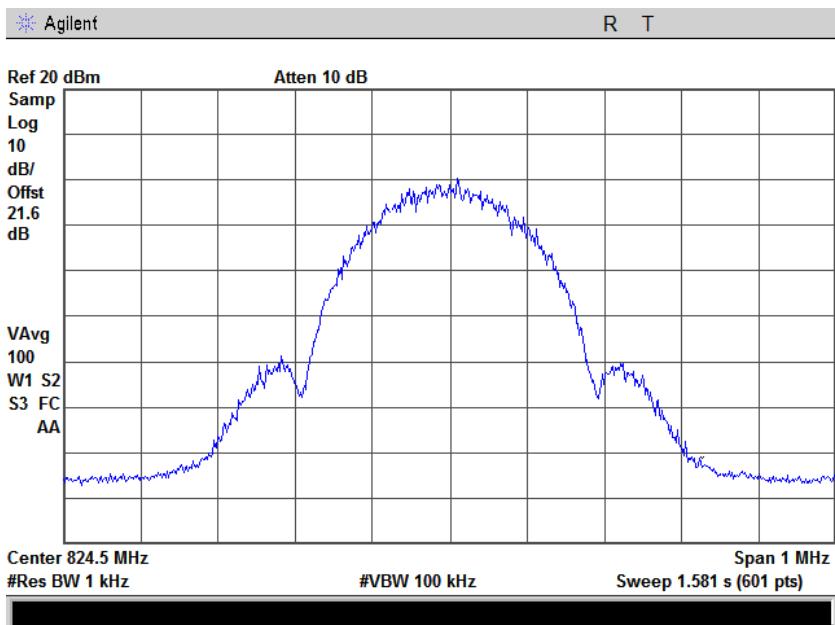
## OUTPUT PLOT DOWNLINK - EDGE 893 MHz



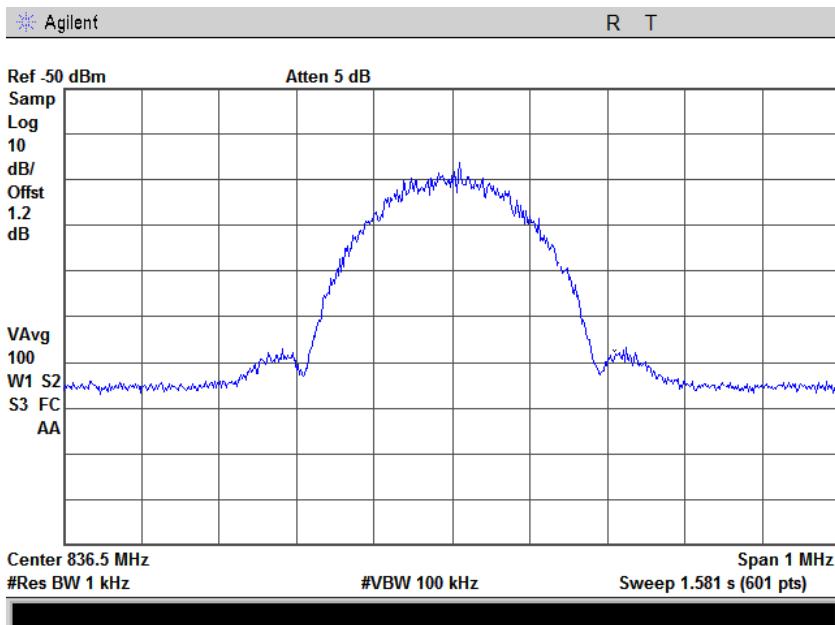
## INPUT PLOT UPLINK - EDGE 824 MHz



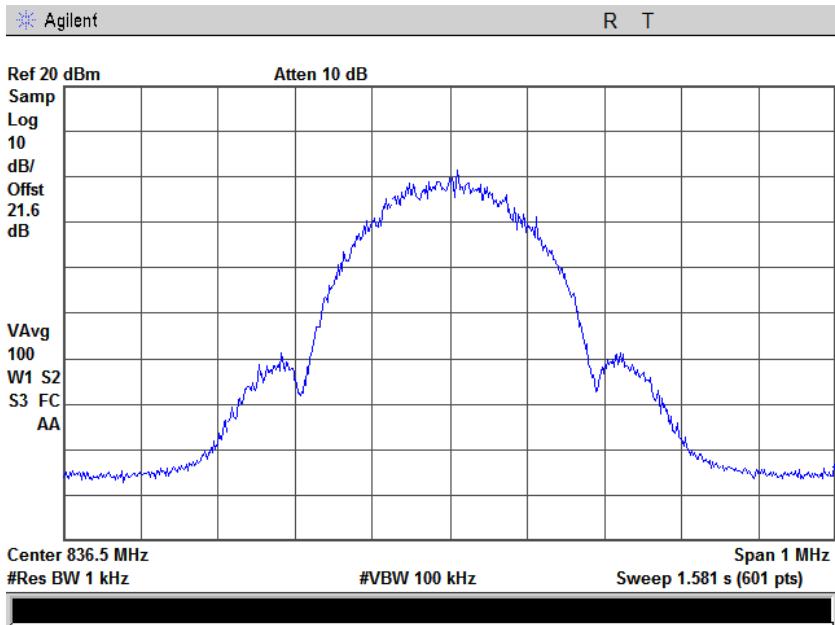
## OUTPUT PLOT UPLINK - EDGE 824 MHz



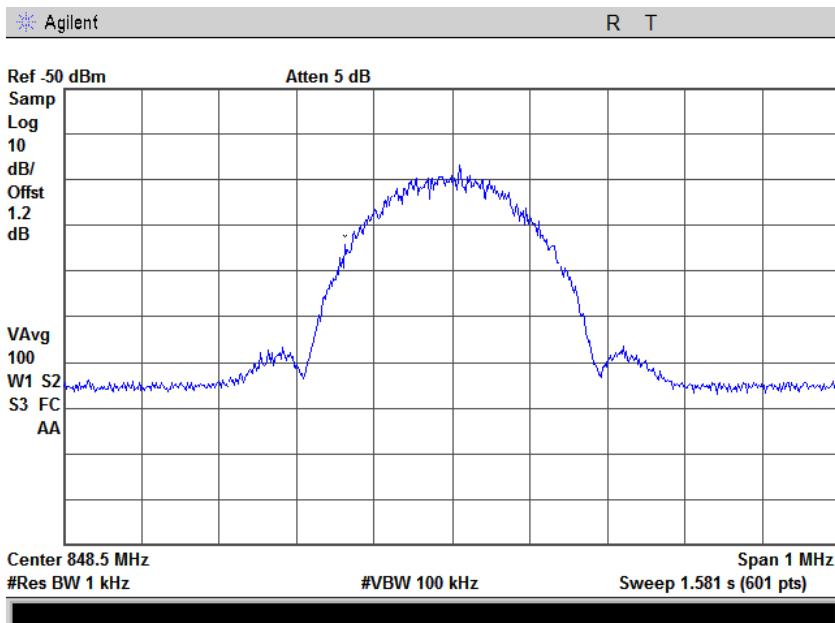
## INPUT PLOT UPLINK - EDGE 836 MHz



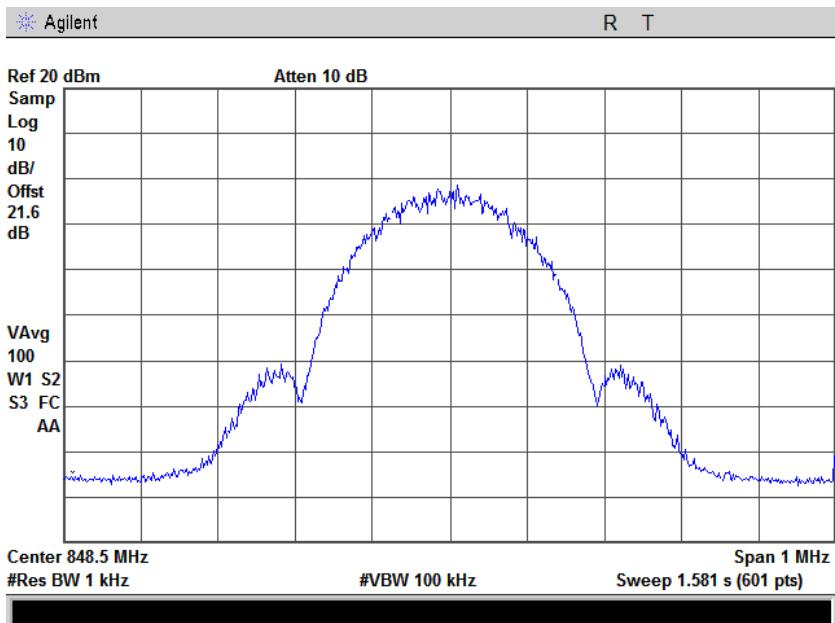
## OUTPUT PLOT UPLINK - EDGE 836 MHz



## INPUT PLOT UPLINK - EDGE 849 MHz

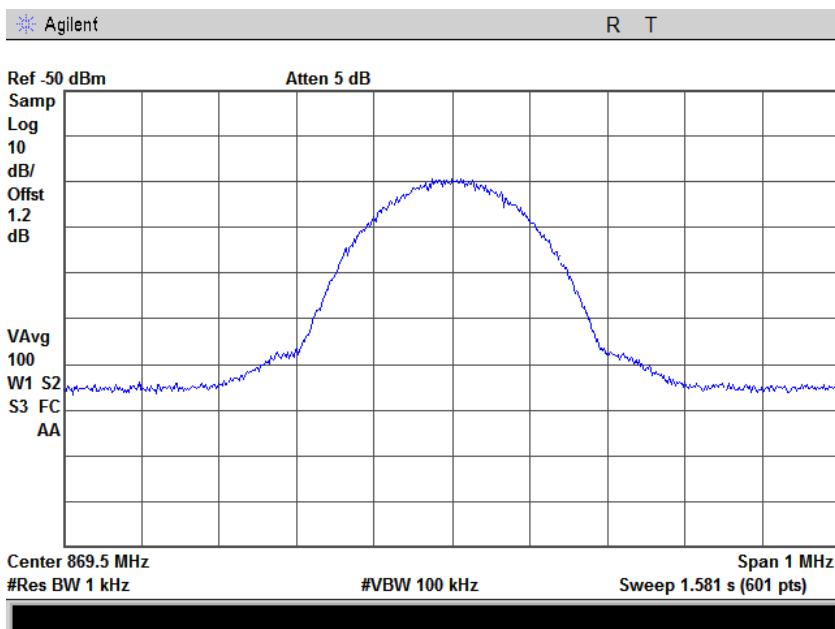


## OUTPUT PLOT UPLINK - EDGE 849 MHz

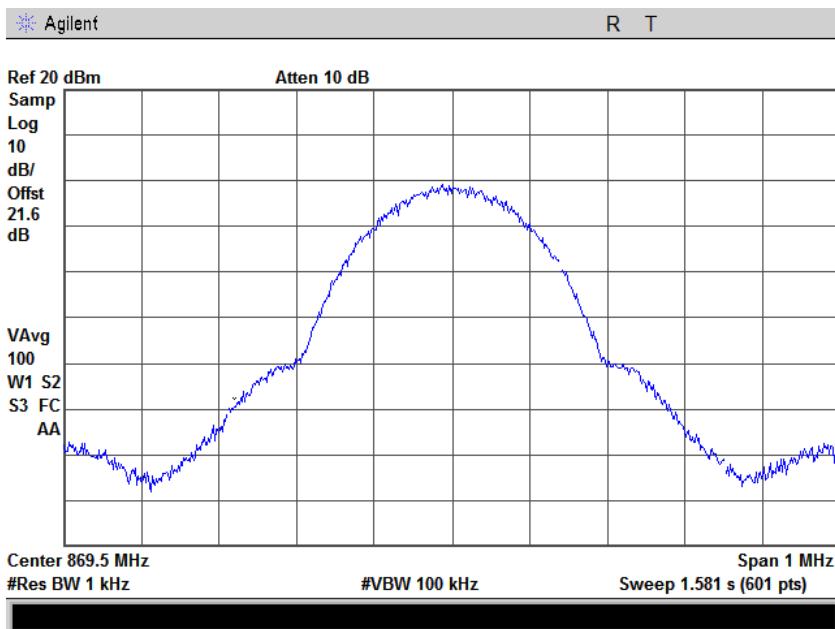


## 6.4.2 GSM

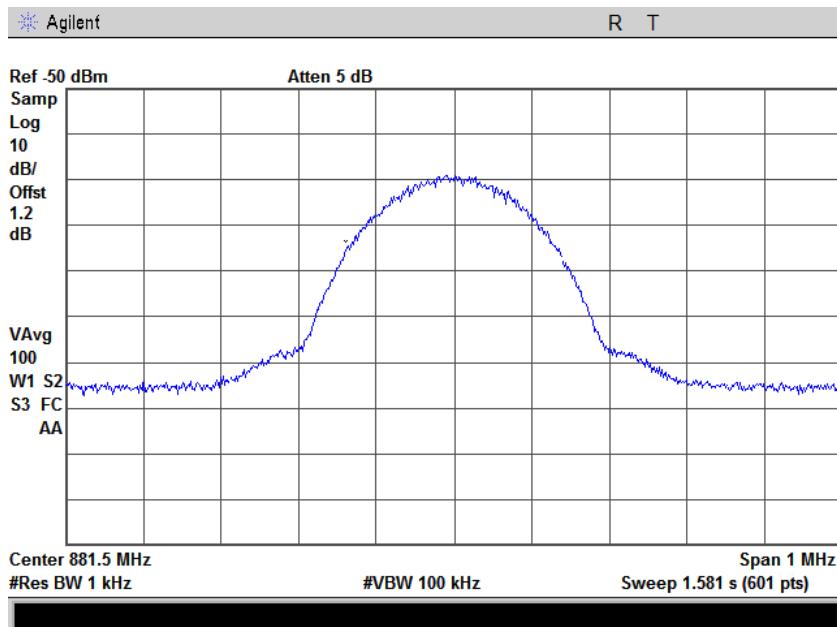
### INPUT PLOT DOWNLINK - GSM 869 MHz



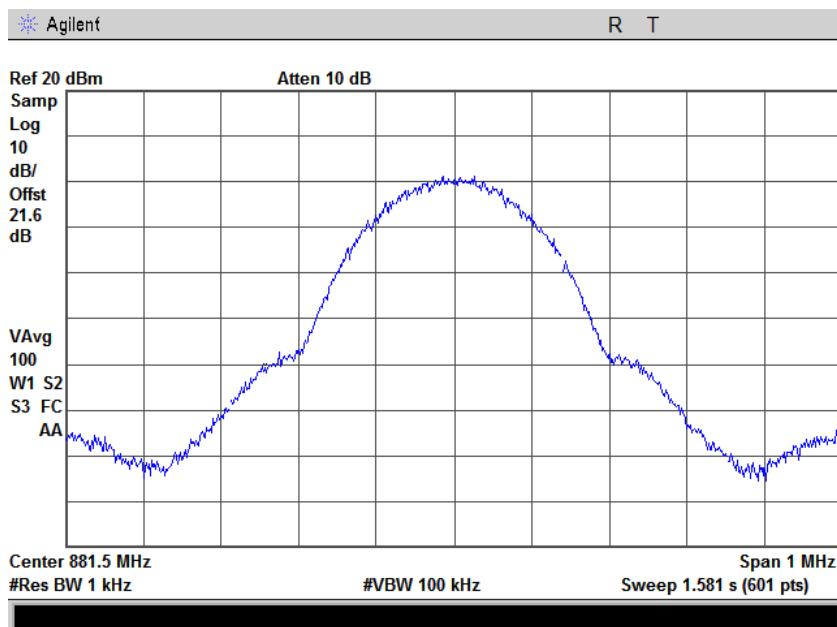
### OUTPUT PLOT DOWNLINK - GSM 869 MHz



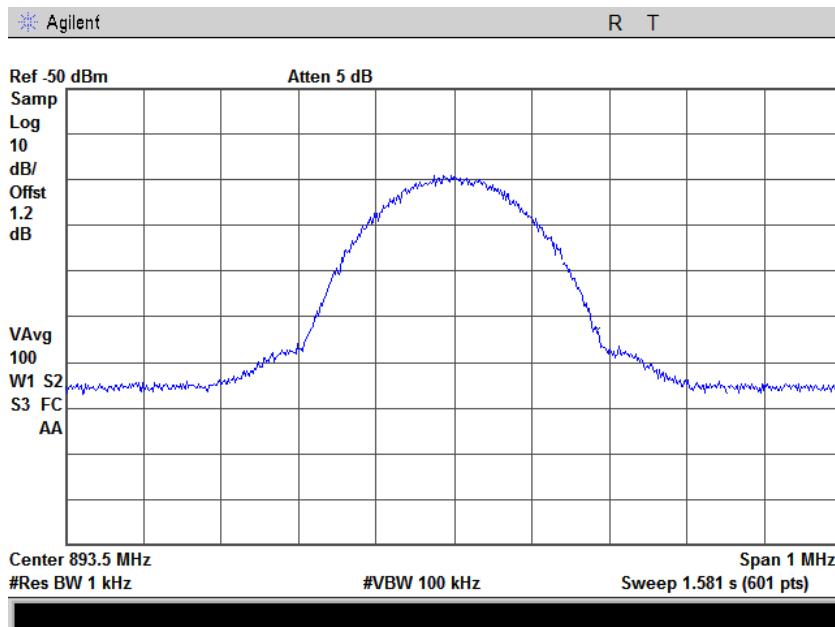
## INPUT PLOT DOWNLINK - GSM 881 MHz



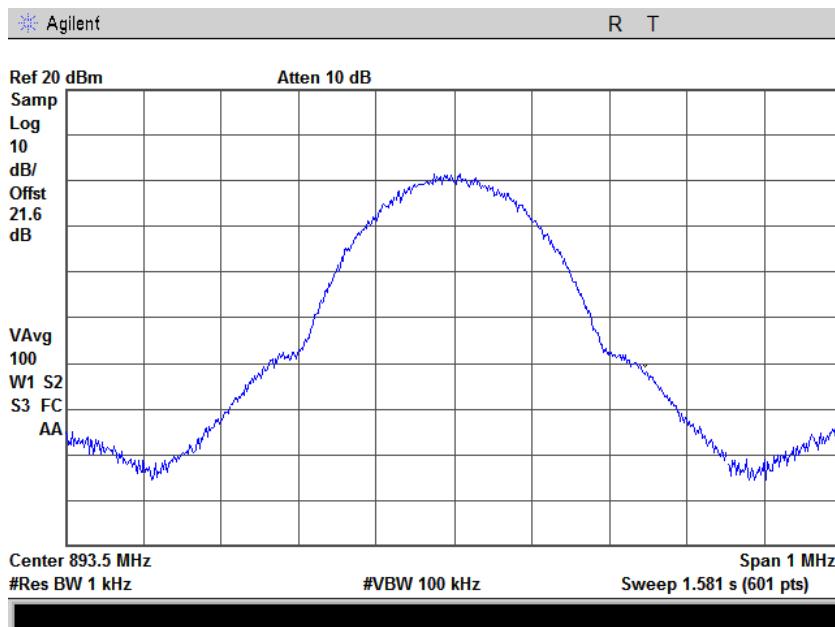
## OUTPUT PLOT DOWNLINK - GSM 881 MHz



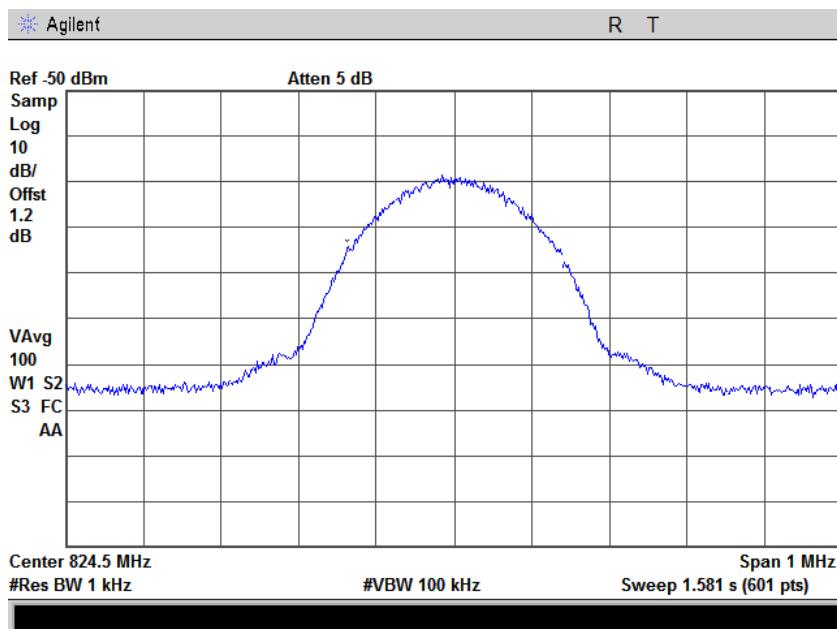
## INPUT PLOT DOWNLINK - GSM 893 MHz



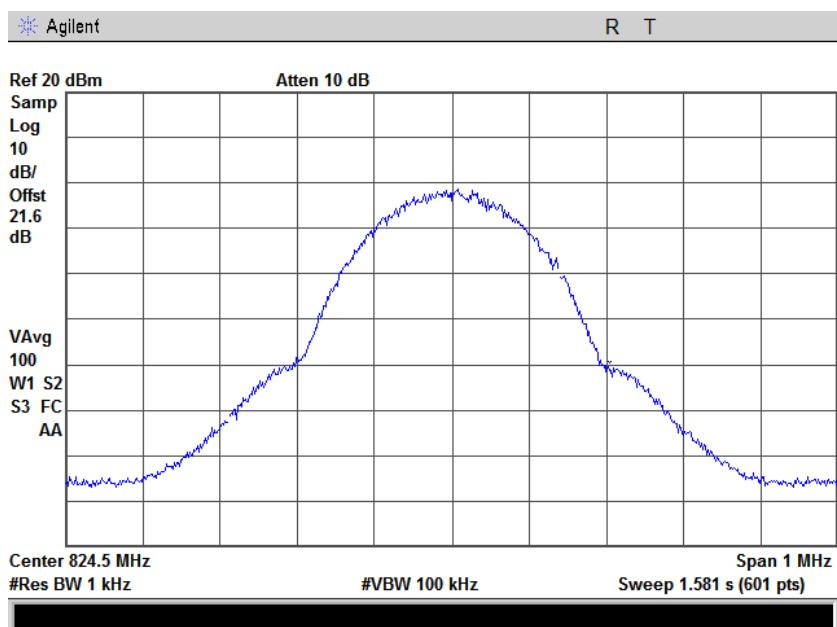
## OUTPUT PLOT DOWNLINK - GSM 893 MHz



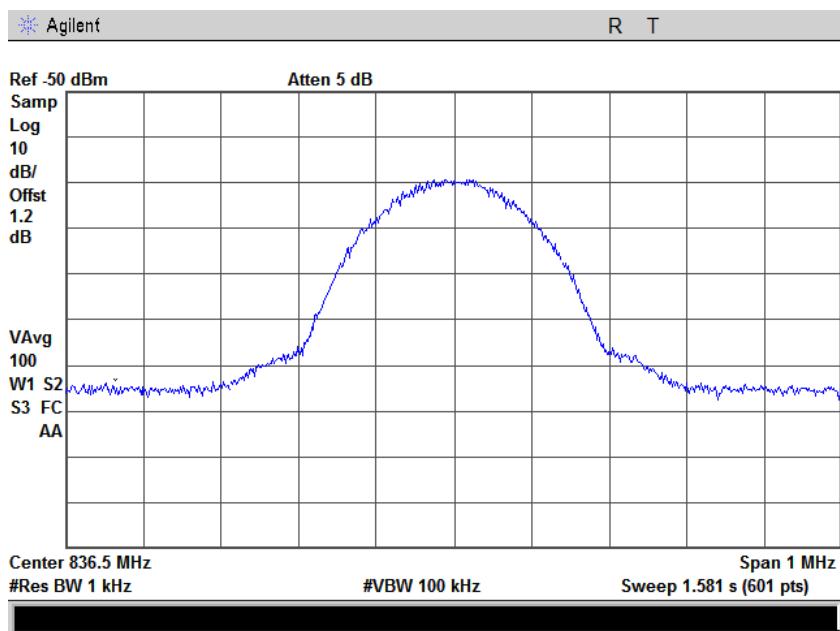
## INPUT PLOT UPLINK - GSM 824 MHz



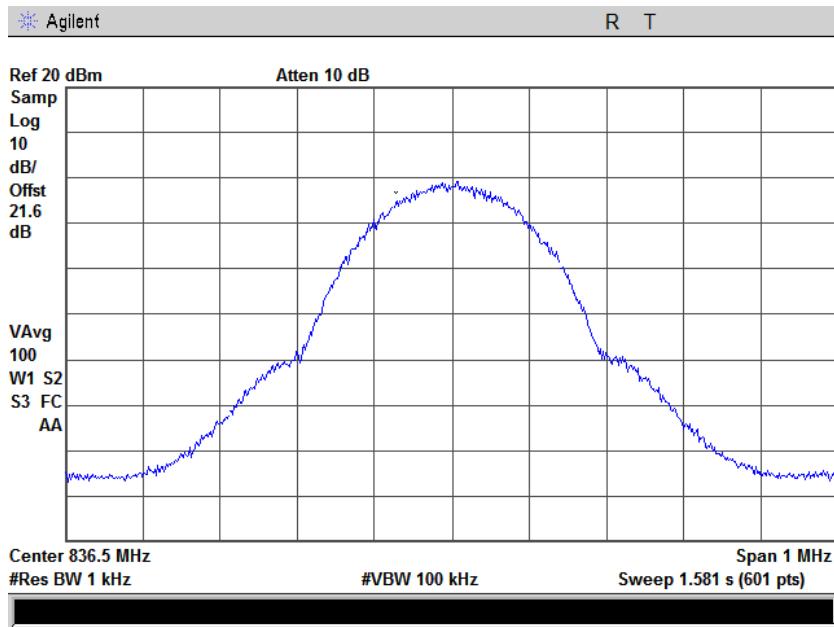
## OUTPUT PLOT UPLINK - GSM 824 MHz



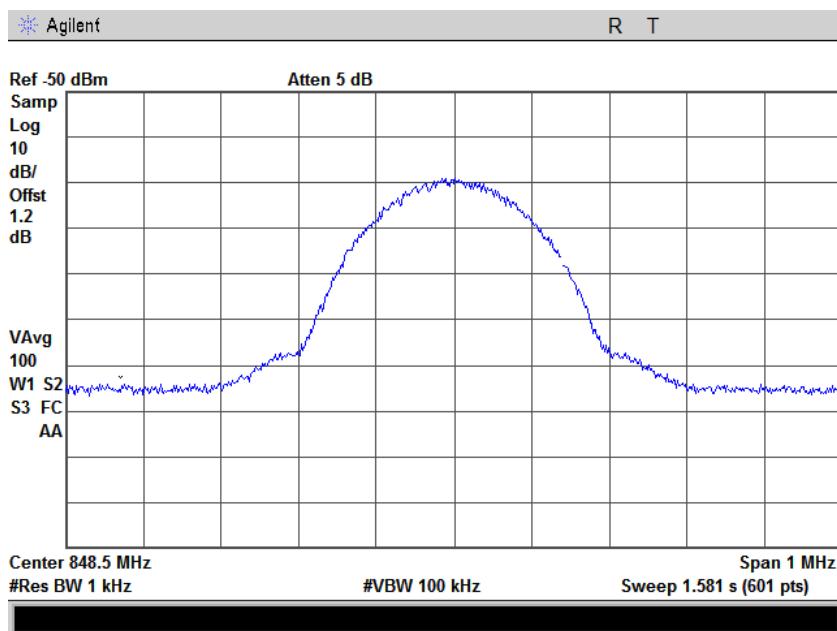
## INPUT PLOT UPLINK - GSM 836 MHz



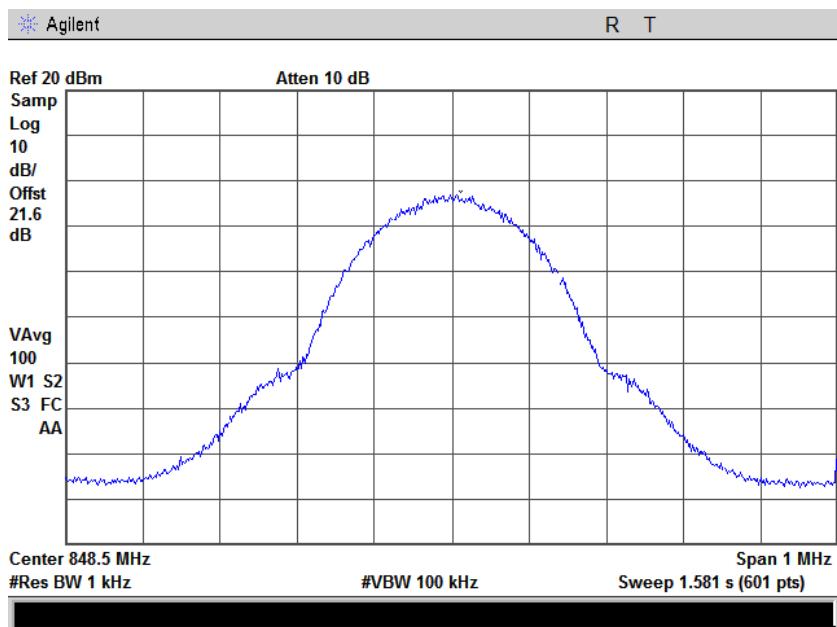
## OUTPUT PLOT UPLINK - GSM 836 MHz



## INPUT PLOT UPLINK - GSM 849 MHz

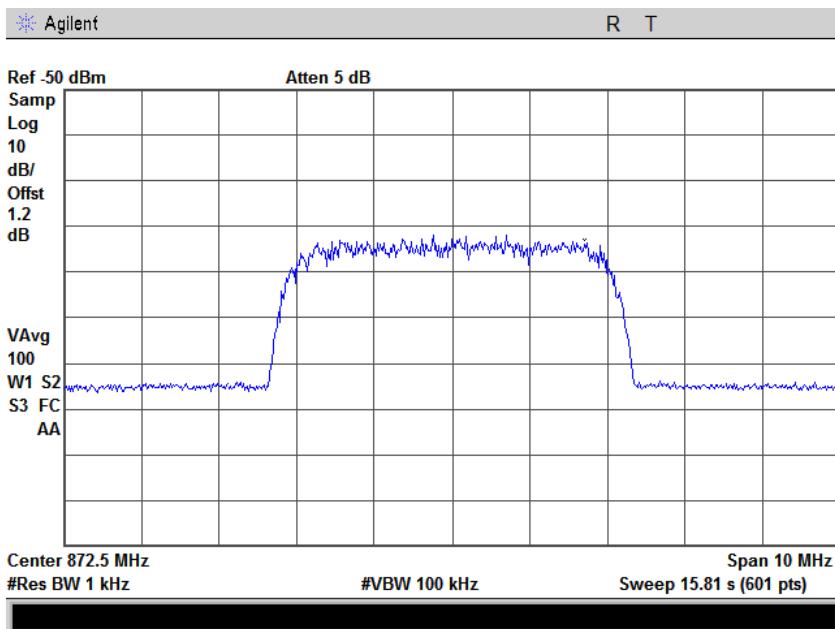


## OUTPUT PLOT UPLINK - GSM 849 MHz

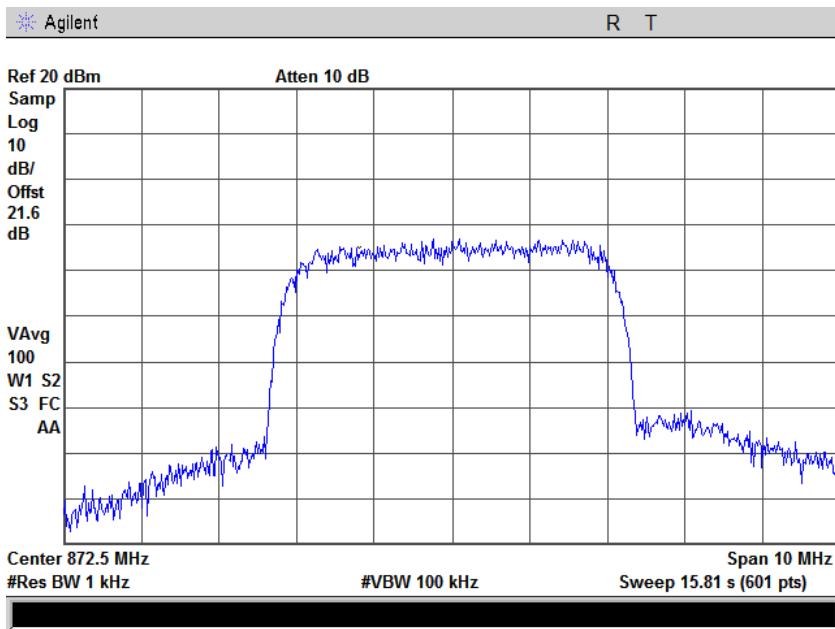


### 6.4.3 WCDMA

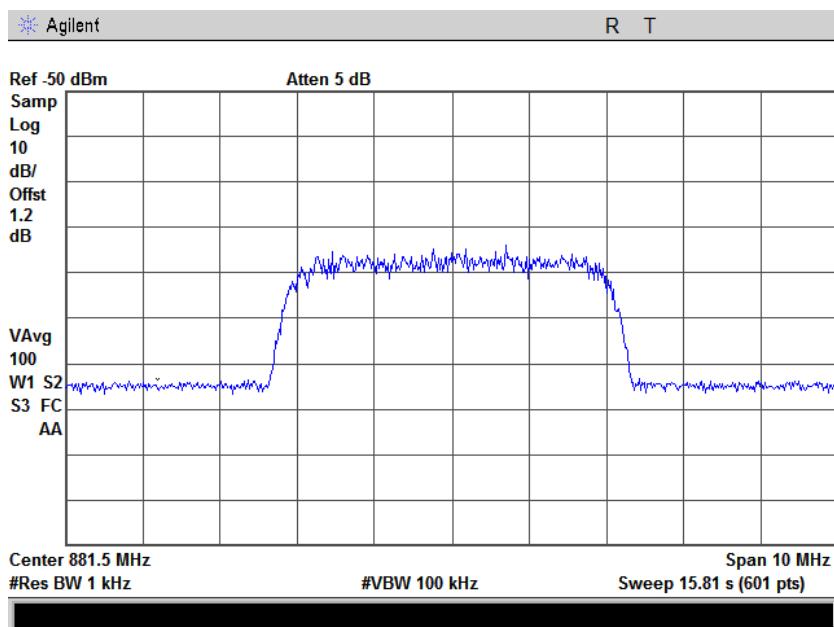
#### INPUT PLOT DOWNLINK - WCDMA 869 MHz



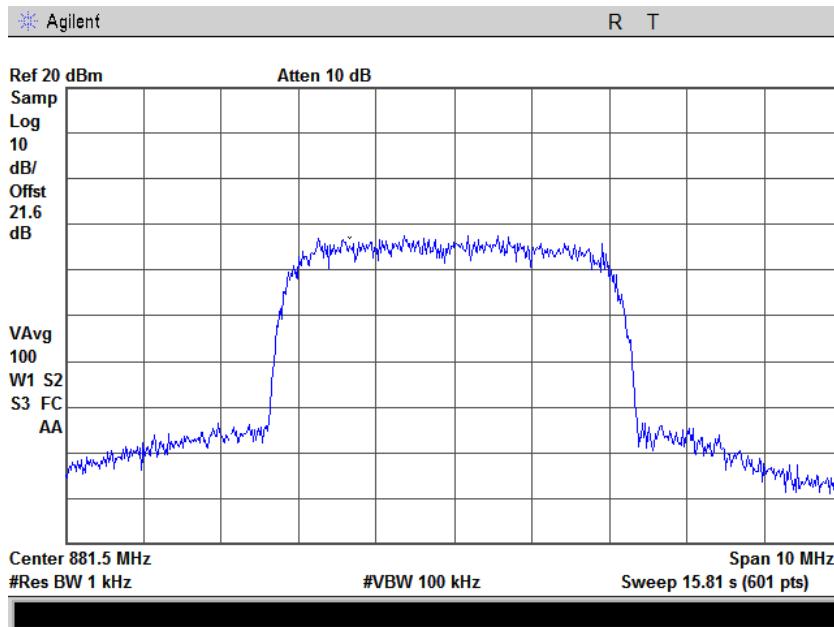
#### OUTPUT PLOT DOWNLINK - WCDMA 869 MHz



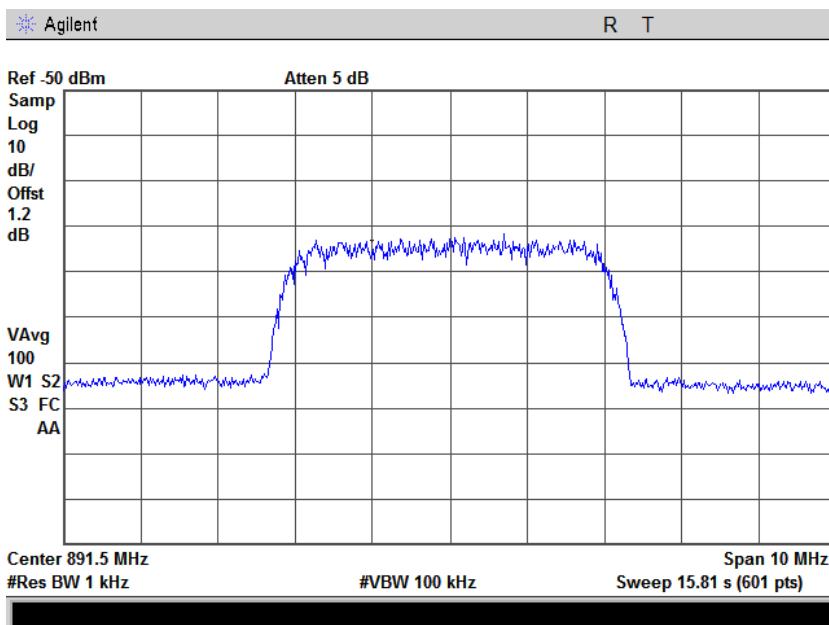
## INPUT PLOT DOWNLINK - WCDMA 881 MHz



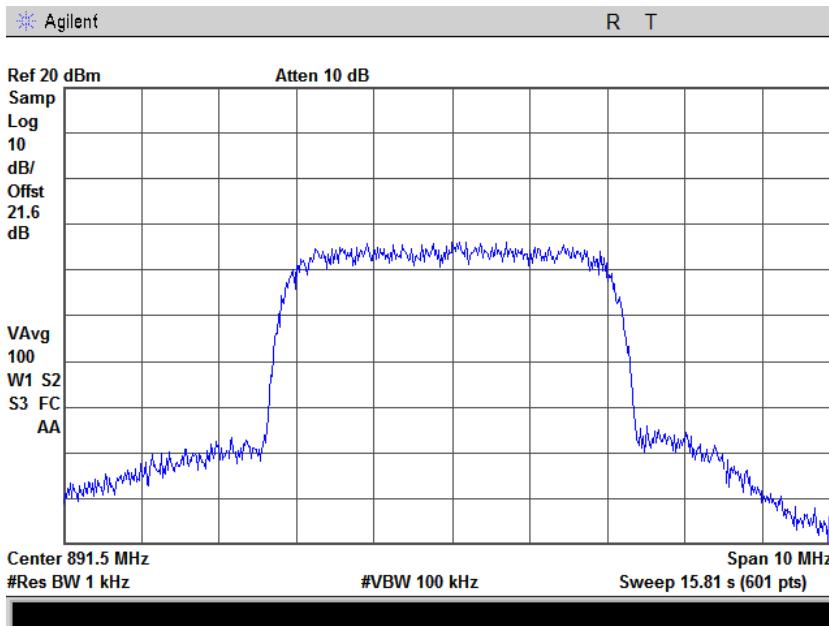
## OUTPUT PLOT DOWNLINK - WCDMA 881 MHz



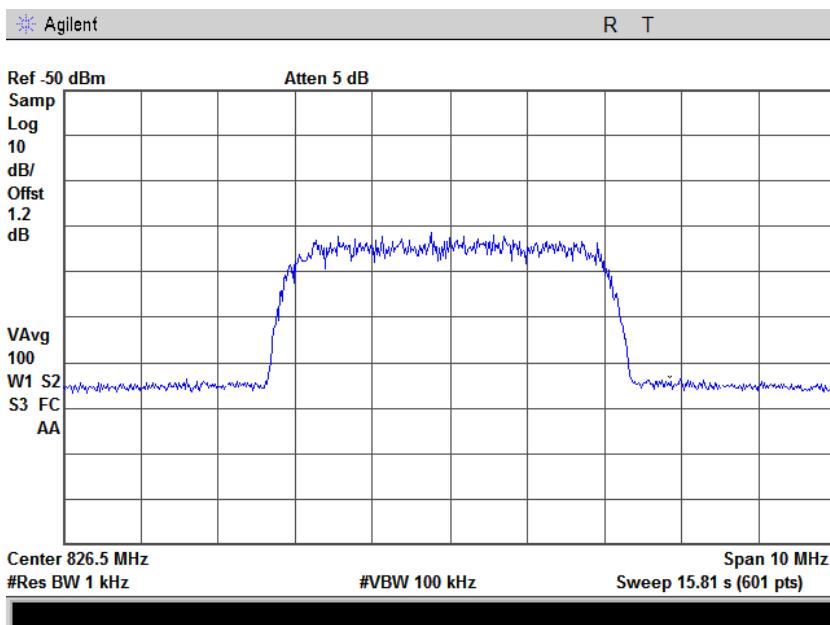
## INPUT PLOT DOWNLINK - WCDMA 894 MHz



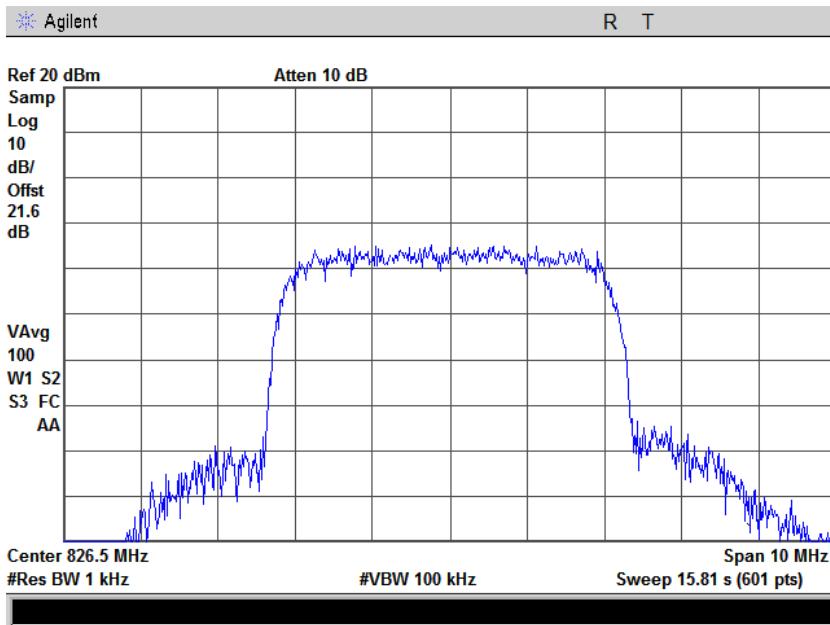
## OUTPUT PLOT DOWNLINK - WCDMA 894 MHz



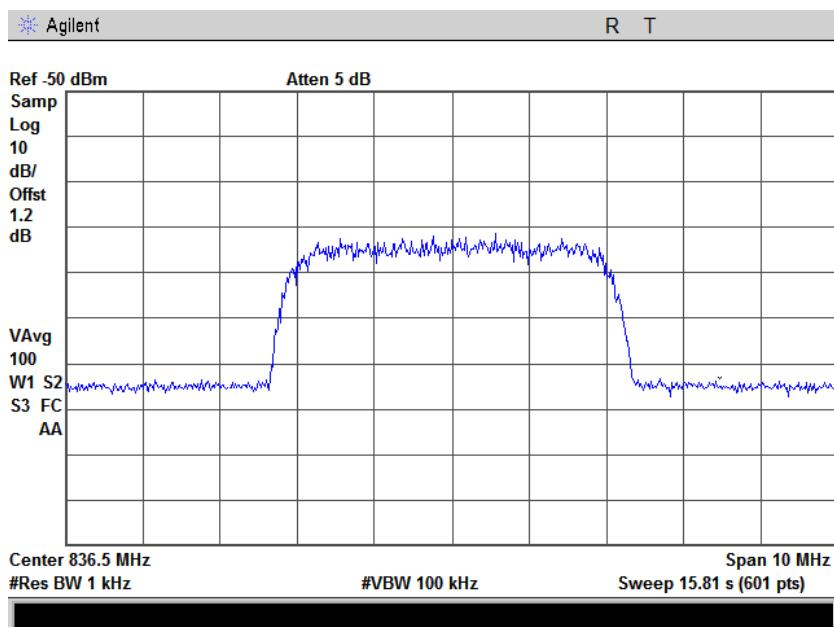
## INPUT PLOT UPLINK - WCDMA 824 MHz



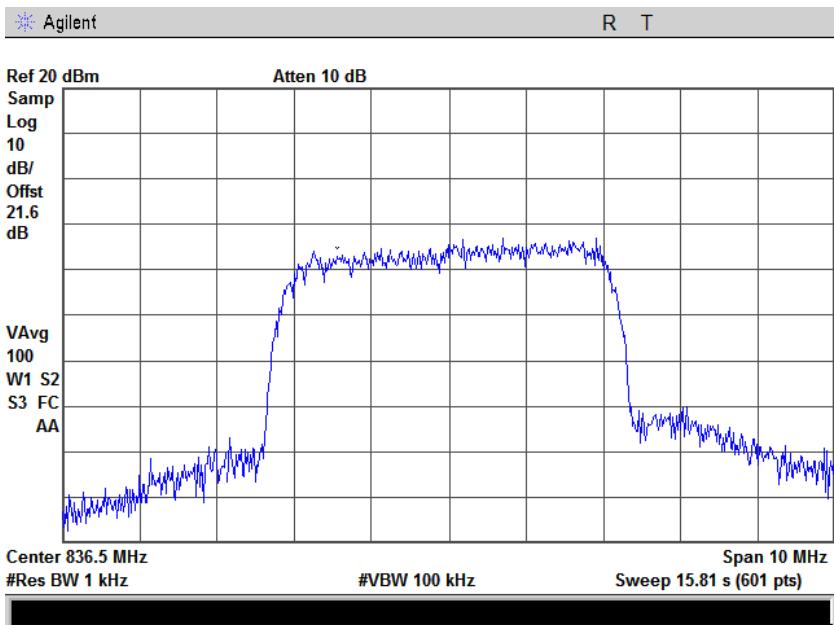
## OUTPUT PLOT UPLINK - WCDMA 824 MHz



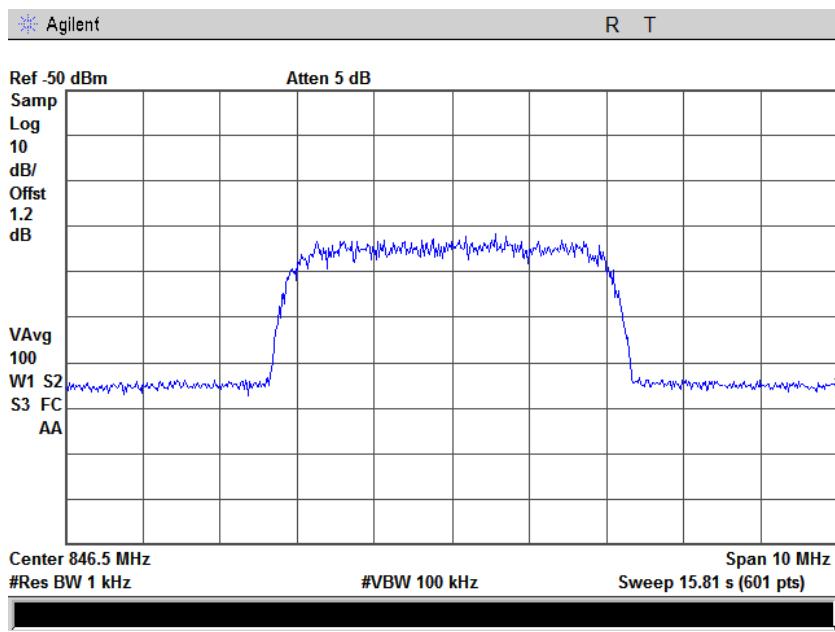
## INPUT PLOT UPLINK - WCDMA 836 MHz



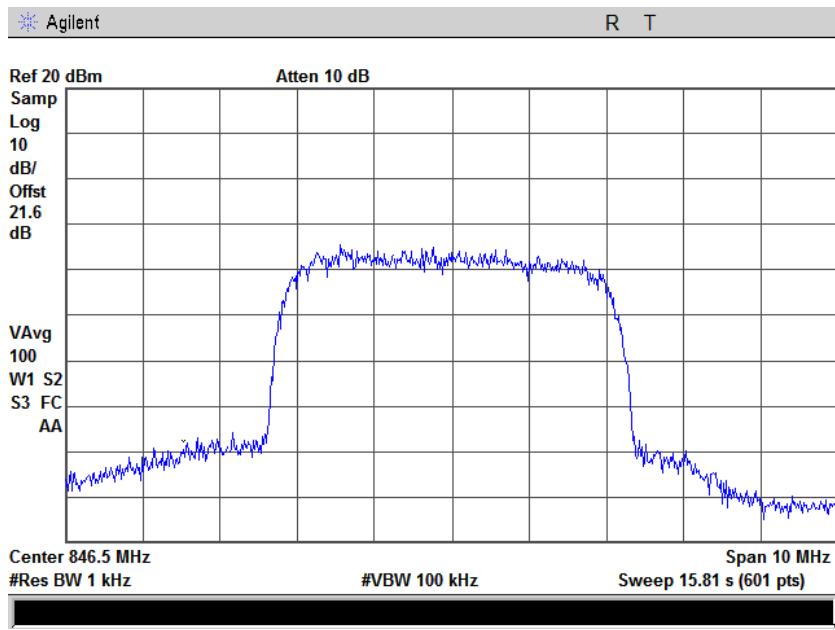
## OUTPUT PLOT UPLINK - WCDMA 836 MHz



## INPUT PLOT UPLINK - WCDMA 849 MHz



## OUTPUT PLOT UPLINK - WCDMA 849 MHz



## **7 FCC 2.1049(i)- BLOCK EDGE**

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### **7.1 Applicable Standard**

According to FCC §22.917, 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  $43+10\log(P)$ .

### **7.2 Test Equipment**

<b>Equipment</b>	<b>Manufacturer</b>	<b>Model #</b>	<b>Serial #</b>	<b>Cal Date</b>	<b>Cal Due</b>
Spectrum Analyzer	Agilent	E4404B	MY44220519	26-Feb-2013	26-Feb-2014
Signal Generator	Agilent	E4437B	US39230102	11-Jan-2012	11-Jan-2014

### **7.3 Test Procedure**

The RF output of the transmitter was connected to the input of the spectrum analyzer through 20dB attenuation.

The center of the spectrum analyzer was set to block edge frequency.

#### **Uplink**

Frequency: 824 - 849MHz

Modulation: EDGE, GSM and WCDMA

Power : 25dBm

#### **Downlink**

Frequency: 869 - 894MHz

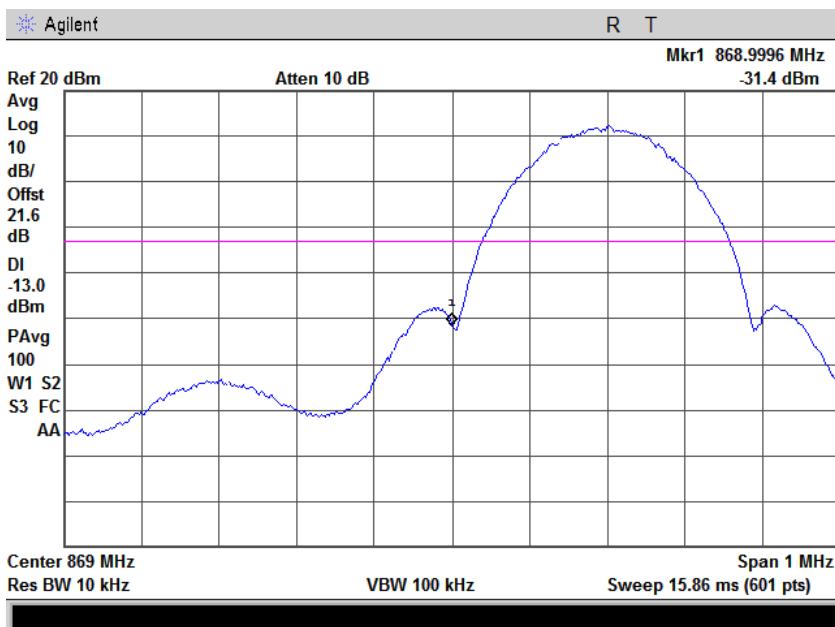
Modulation: EDGE, GSM and WCDMA

Power : 25dBm

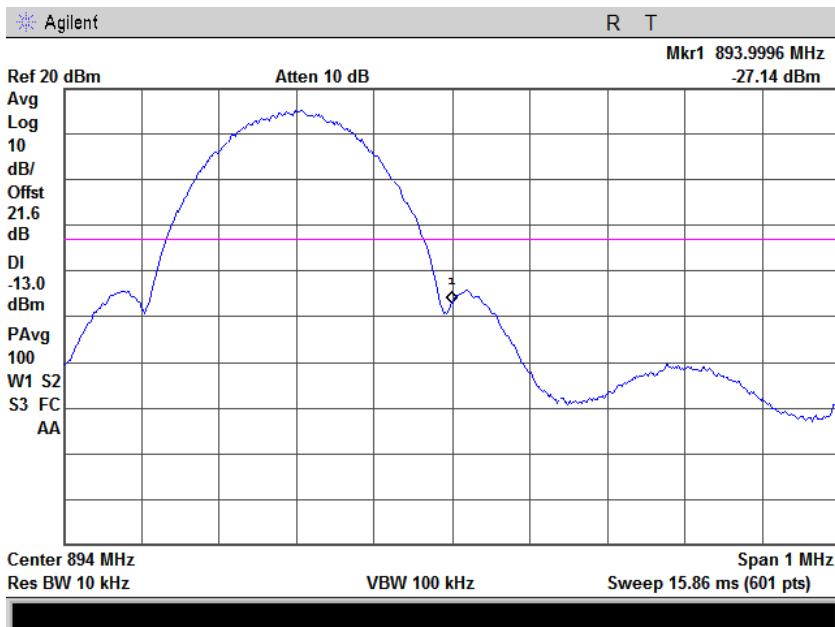
### **7.4 Test Results**

#### 7.4.1 EDGE

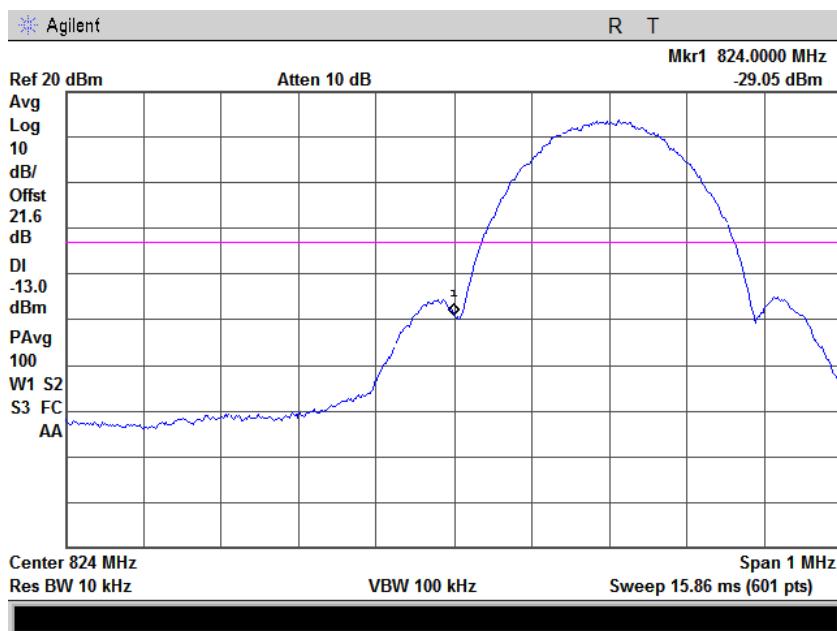
##### Blockedge Downlink - 869MHz



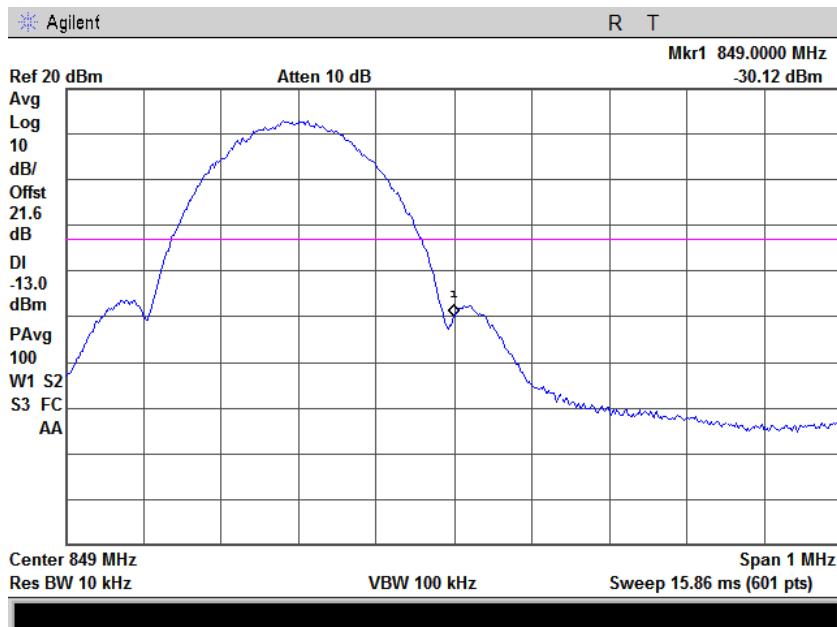
##### Blockedge Downlink - 894MHz



## Blockedge Uplink - 824MHz

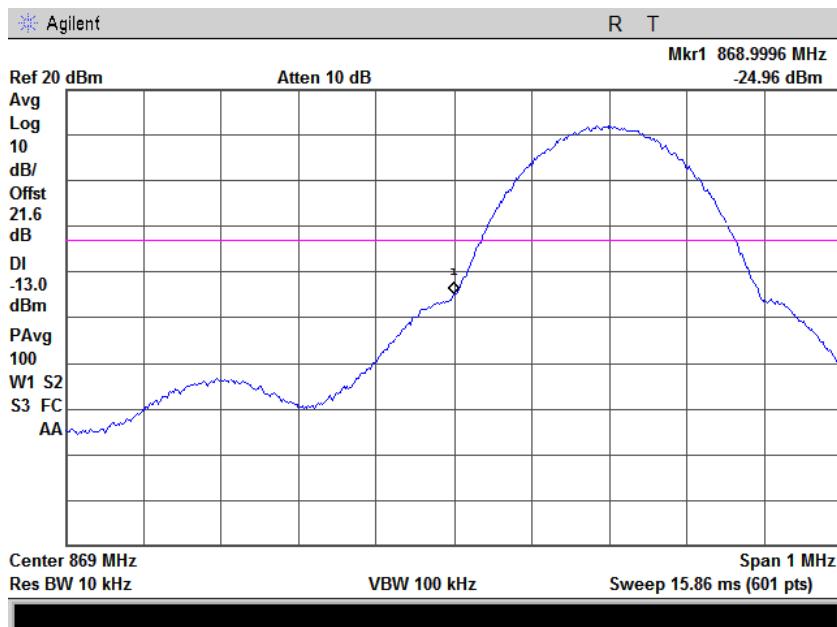


## Blockedge Uplink - 849MHz

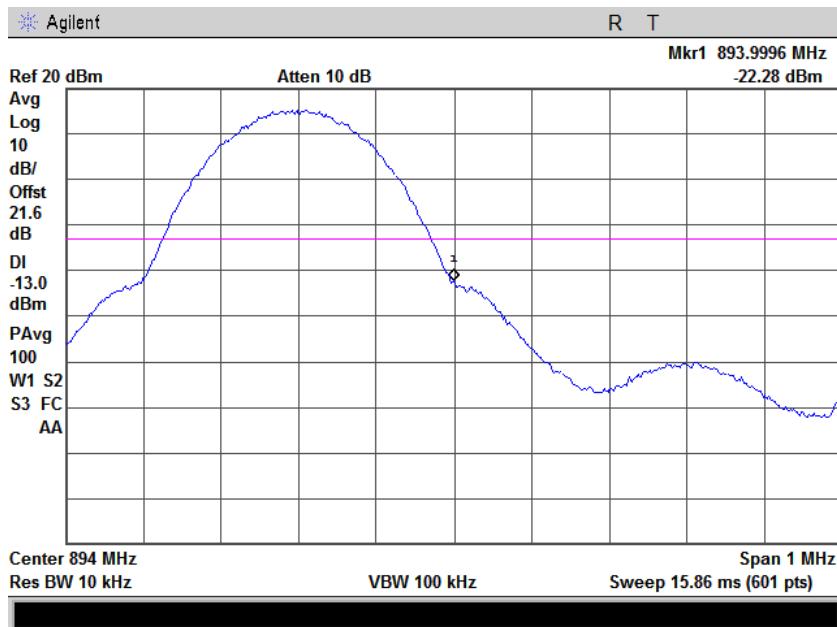


## 7.4.2 GSM

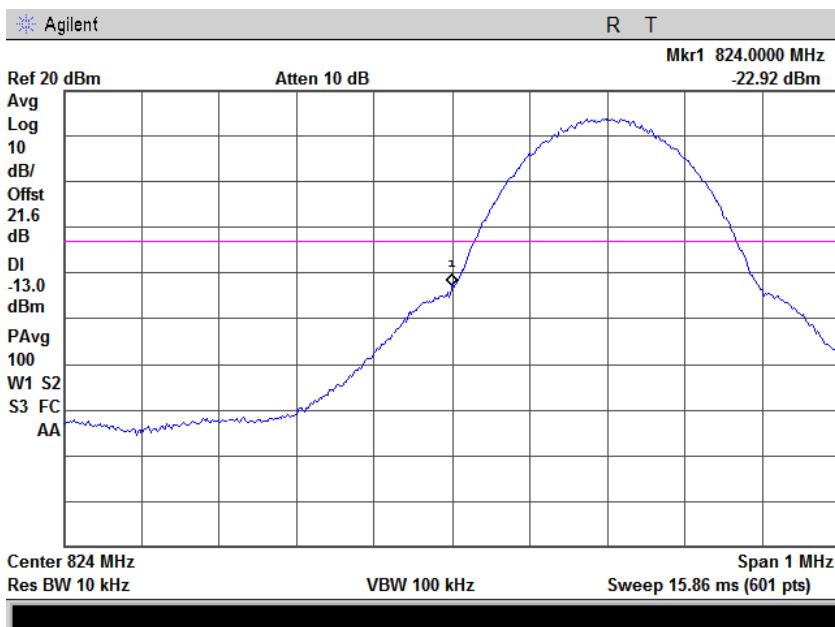
### Blockedge Downlink - 869MHz



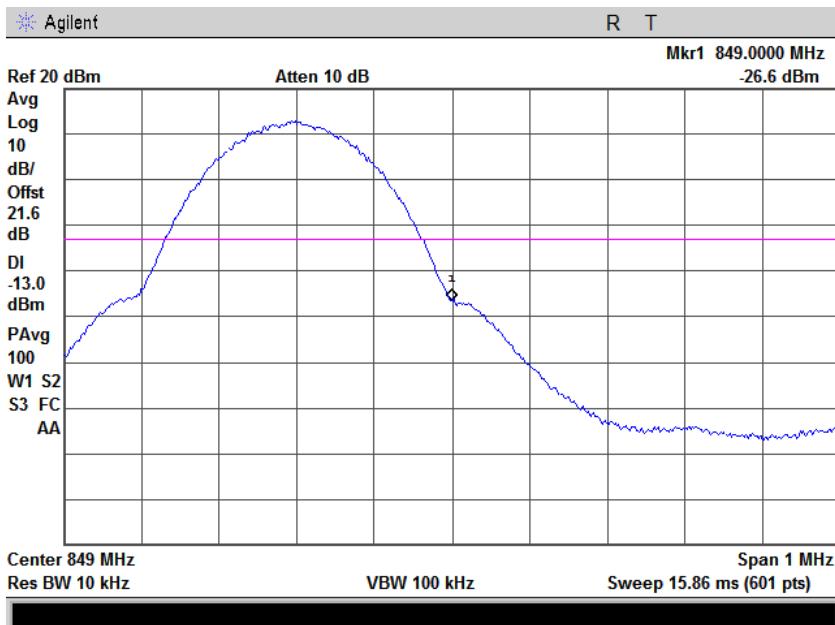
### Blockedge Downlink - 894MHz



## Blockedge Uplink - 824MHz

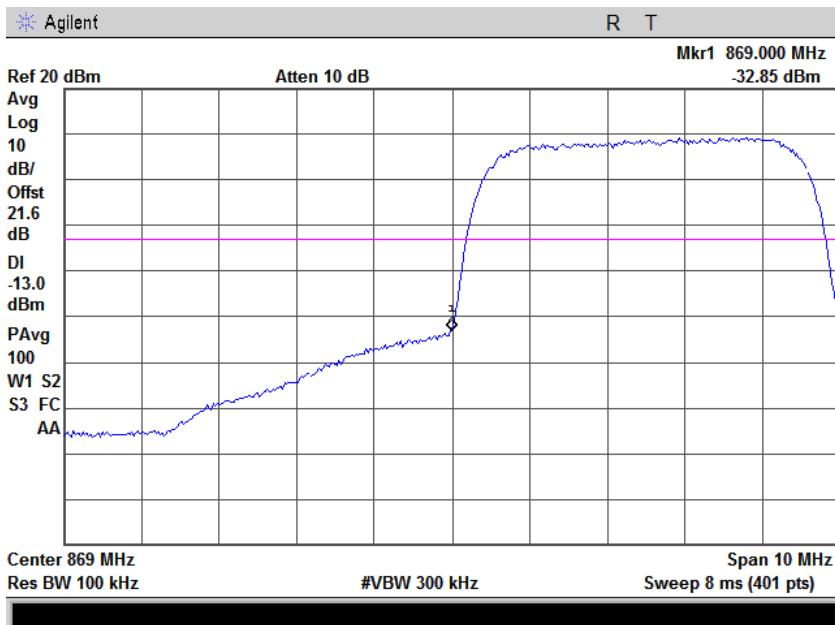


## Blockedge Uplink - 849MHz

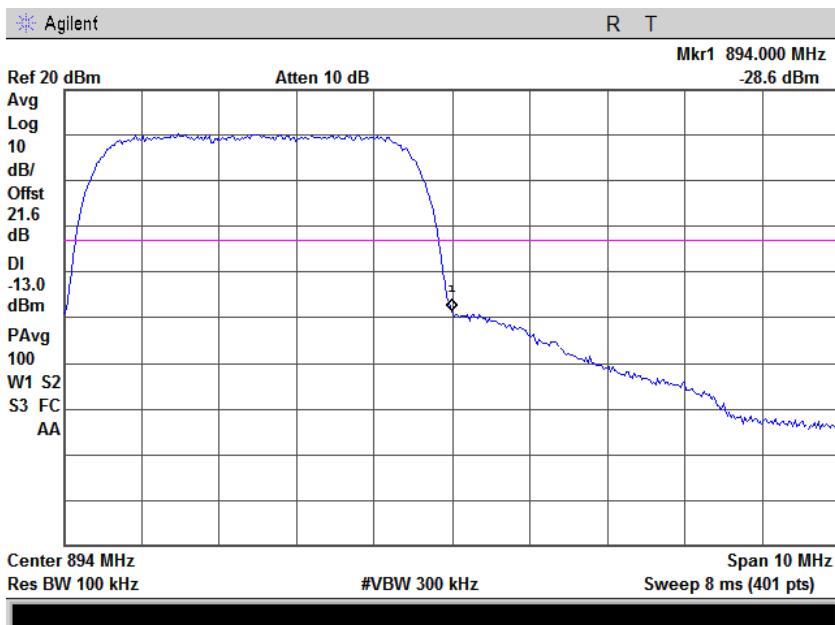


### 7.4.3 WCDMA

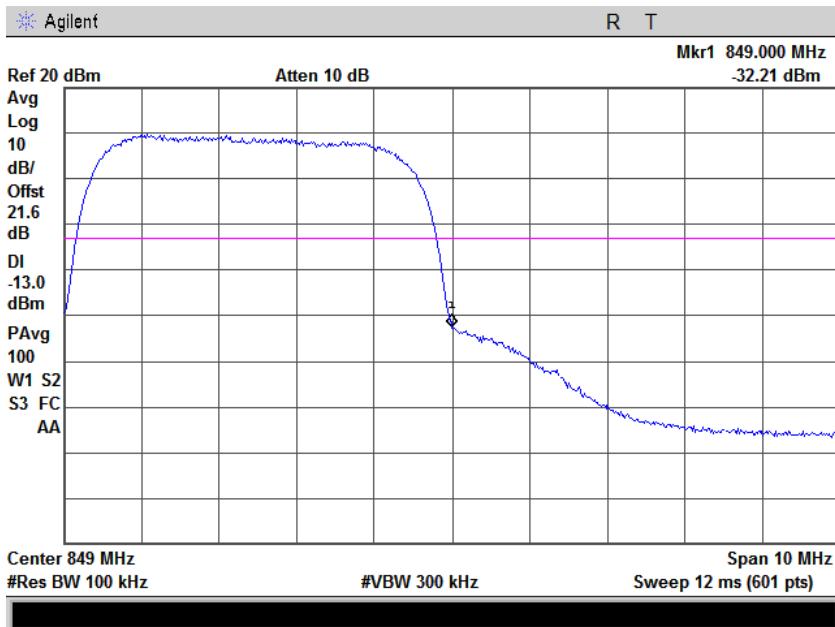
#### Blockedge Downlink - 869MHz



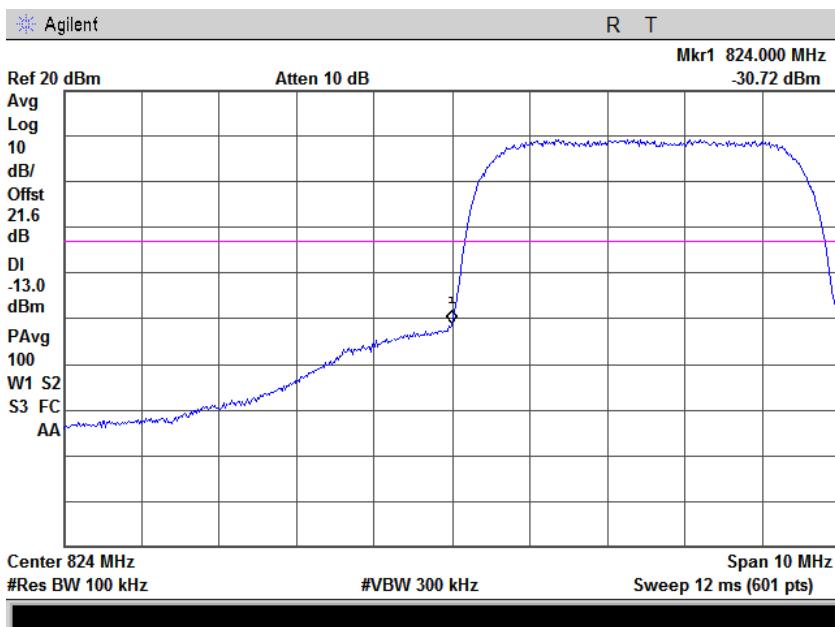
#### Blockedge Downlink - 894MHz



## Blockedge Uplink - 824MHz



## Blockedge Uplink - 849MHz



## **8 FCC §2.1051, §22.917- SPURIOUS EMISSIONS AT ANTENNA TERMINALS**

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### **8.1 Applicable Standard**

As per FCC §22.917 : The power of any emission outside of authorized operating frequency ranges must be attenuated below the transmitting power (P) by a factor of at least  $43+10\log(P)$  dB

### **8.2 Test Equipment**

<b>Equipment</b>	<b>Manufacturer</b>	<b>Model #</b>	<b>Serial #</b>	<b>Cal Date</b>	<b>Cal Due</b>
Spectrum Analyzer	Agilent	E4405B	US41441250	20-Mar-2013	20-Mar-2014
Signal Generator	Agilent	E4437B	US39230102	11-Jan-2012	11-Jan-2014

### **8.3 Test Procedure**

For downlink configuration, Donor antenna port is connected to signal generator and Area Fill antenna port is connected to a spectrum analyzer through 20dB attenuator.

For uplink configuration, Donor antenna port is connected to a spectrum analyzer and Area Fill antenna port is connected to a signal analyzer through 20dB attenuator.

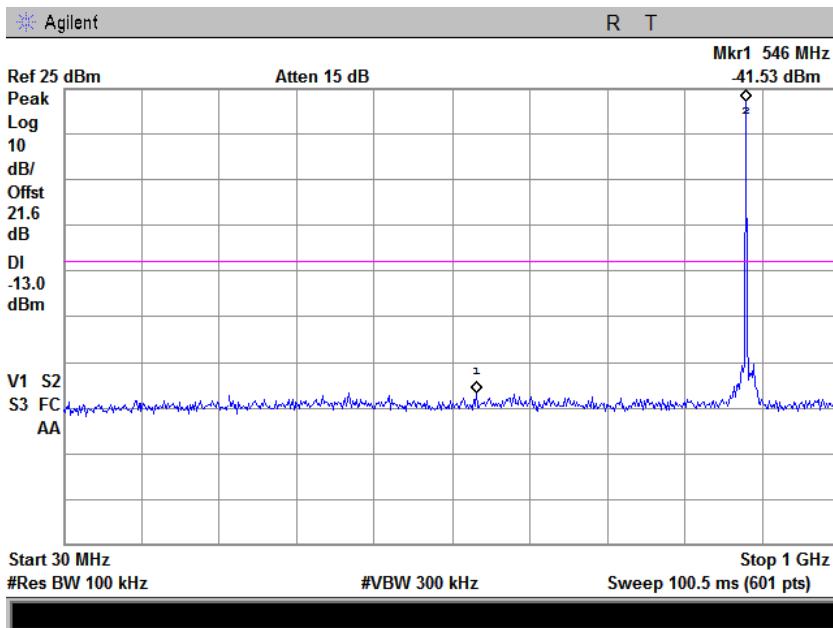
The resolution bandwidth of the spectrum analyzer was set to 100kHz . Sufficient scans were taken to show any out of band emissions up to 10<sup>th</sup> harmonic.

## 8.4 Test Results

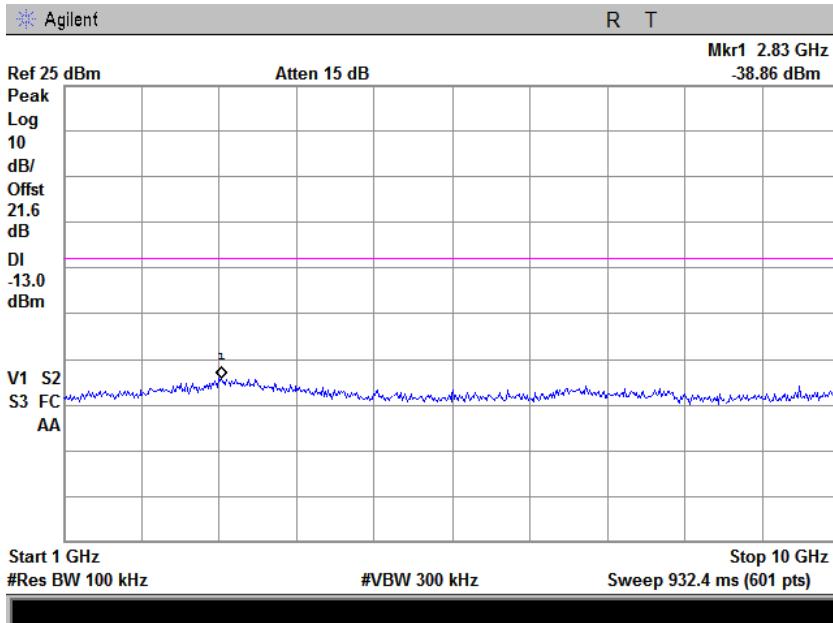
### 8.4.1 EDGE

Downlink : Frequency - 881.5MHz

Plot 1: 30MHz to 1GHz

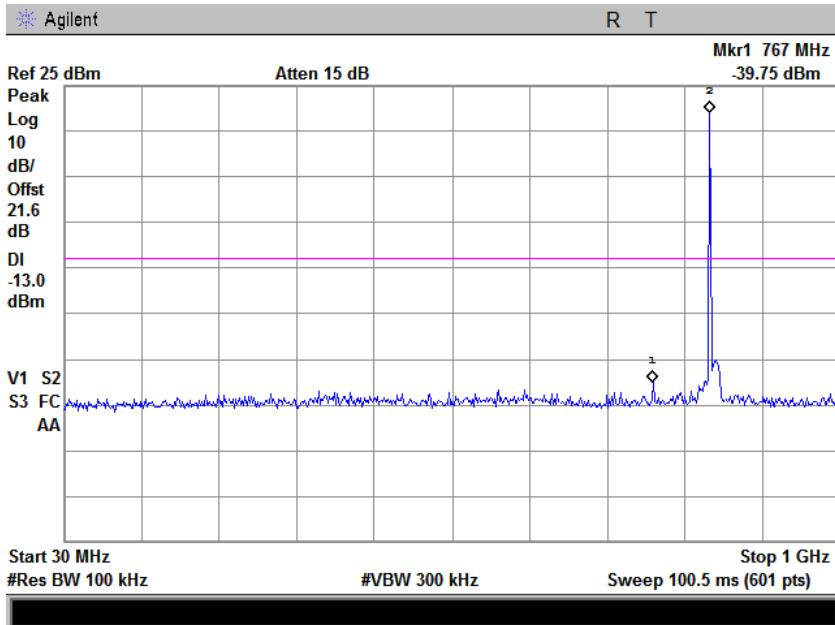


Plot 2: Above 1GHz

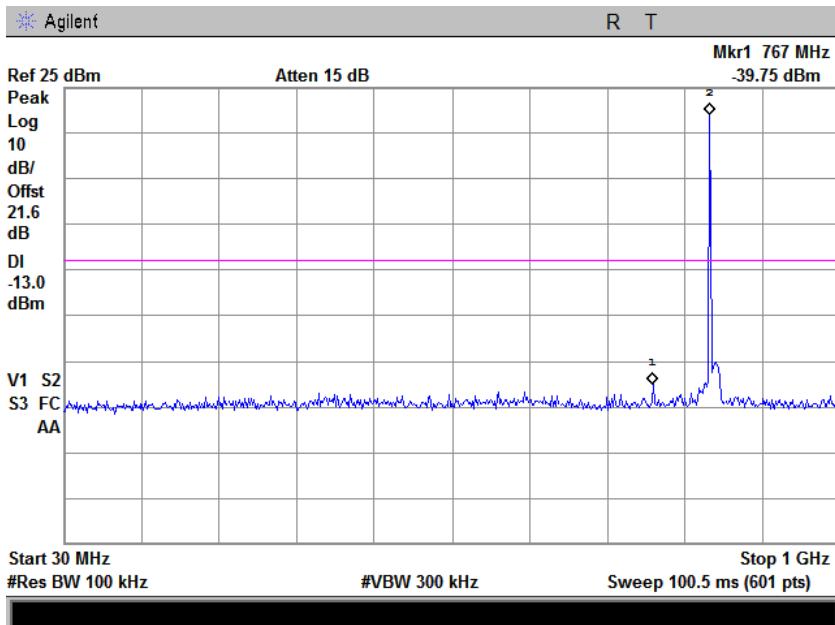


## Uplink, Frequency - 836.5MHz

Plot 1: 30MHz to 1GHz



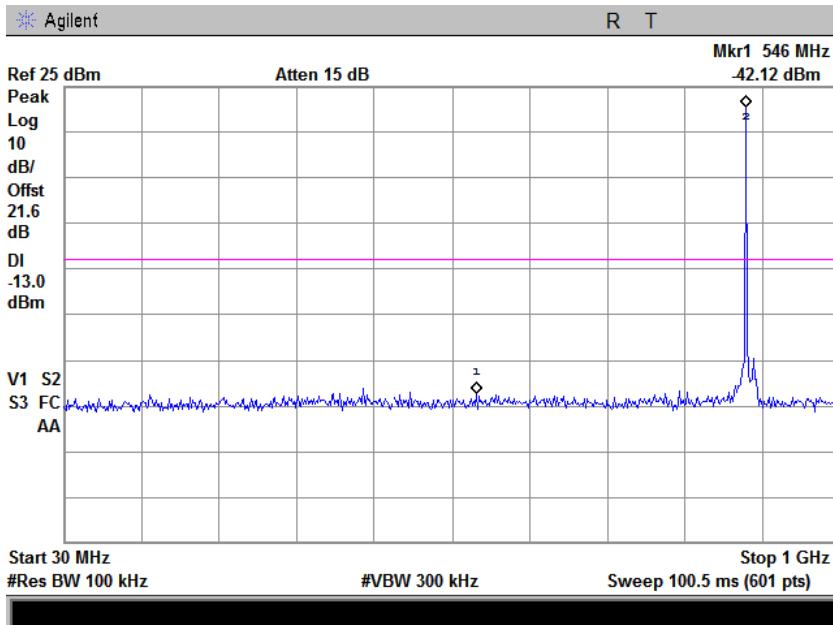
Plot 2: Above 1GHz



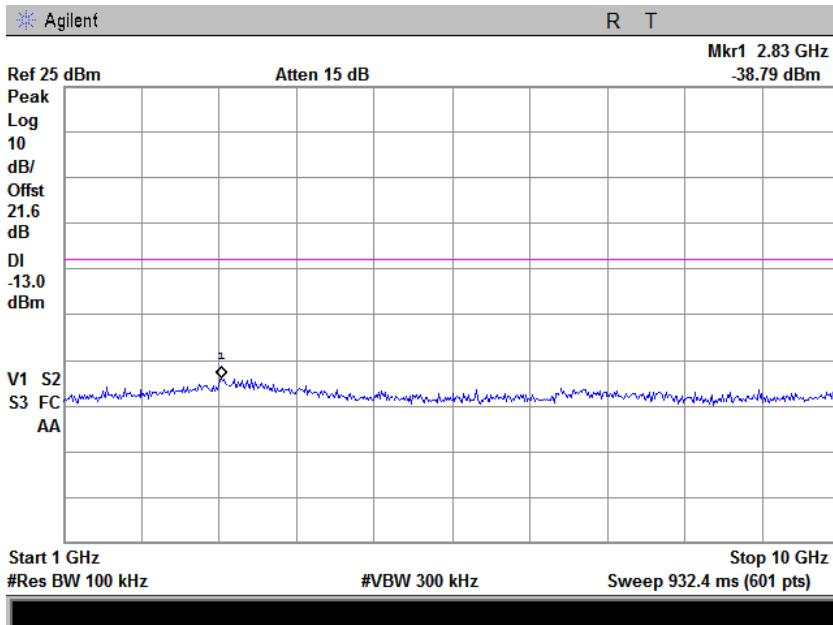
#### 8.4.2 GSM

Downlink, Frequency - 881.5MHz

Plot 1: 30MHz to 1GHz

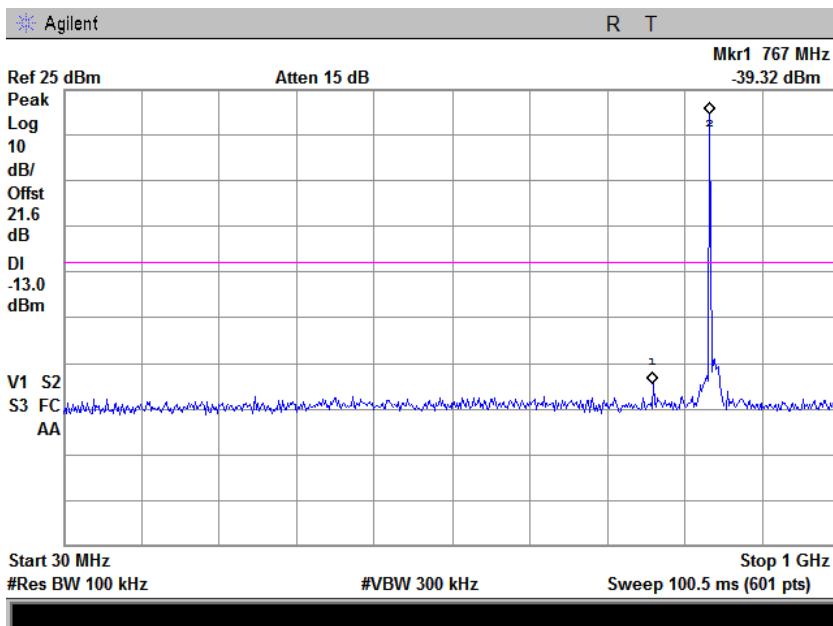


Plot 2: Above 1GHz

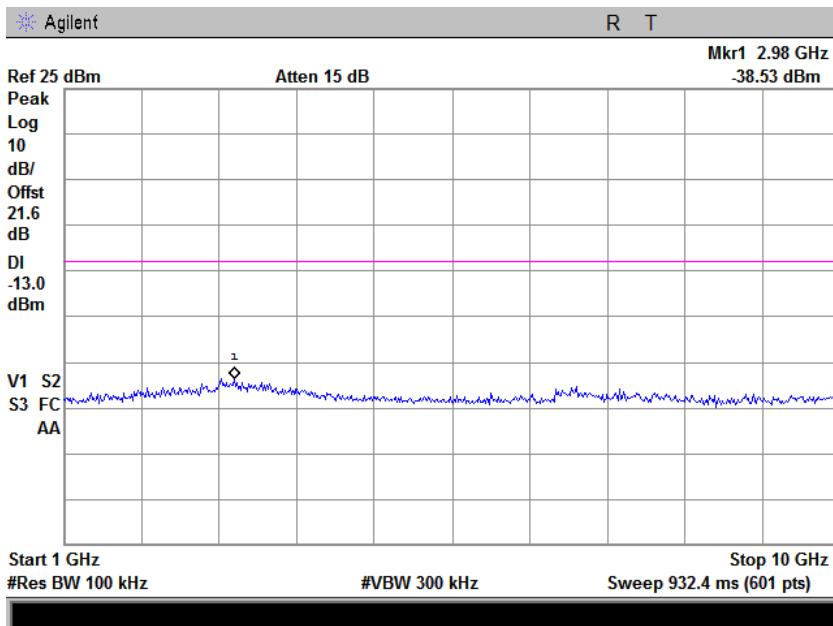


## Uplink, Frequency - 836.5MHz

Plot 1: 30MHz to 1GHz



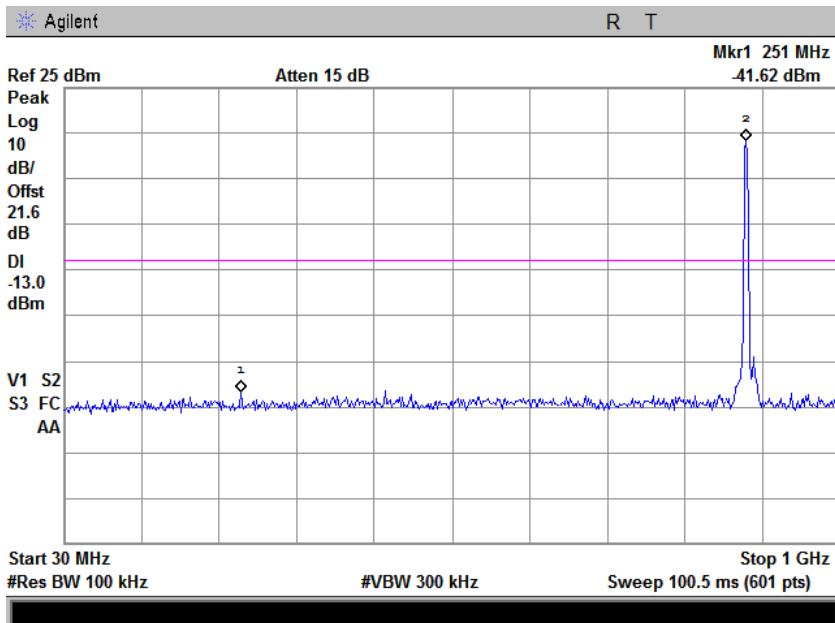
Plot 2: Above 1GHz



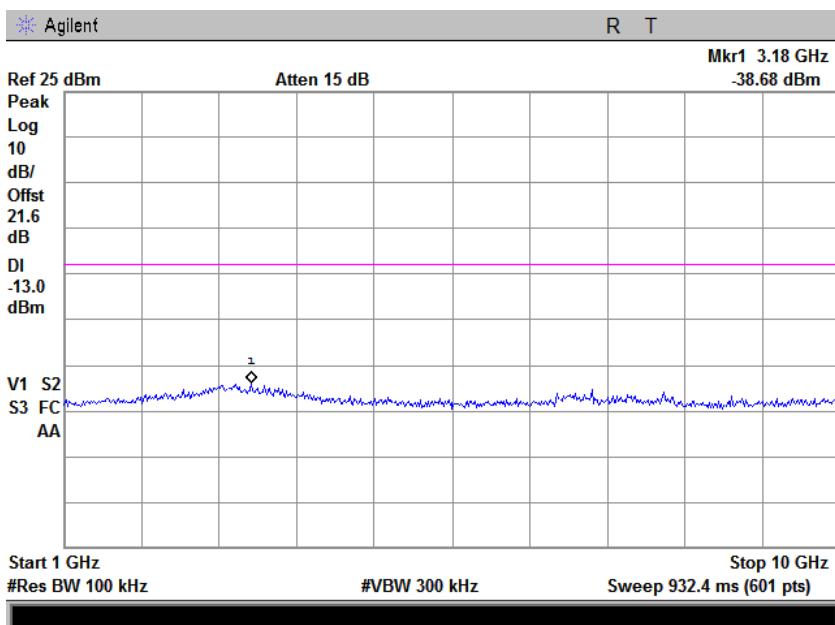
### 8.4.3 WCDMA

Downlink, Frequency - 881.5MHz

Plot 1: 30MHz to 1GHz

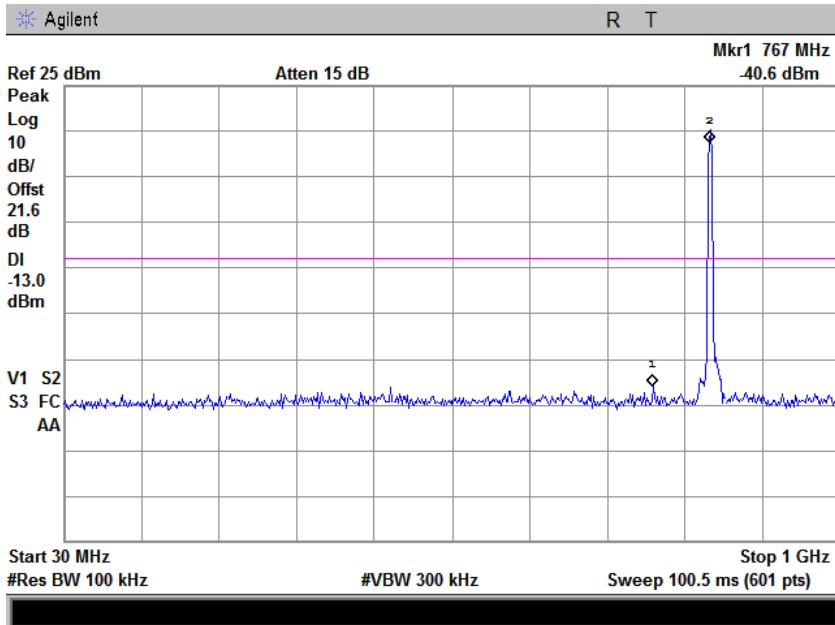


Plot 2: Above 1GHz

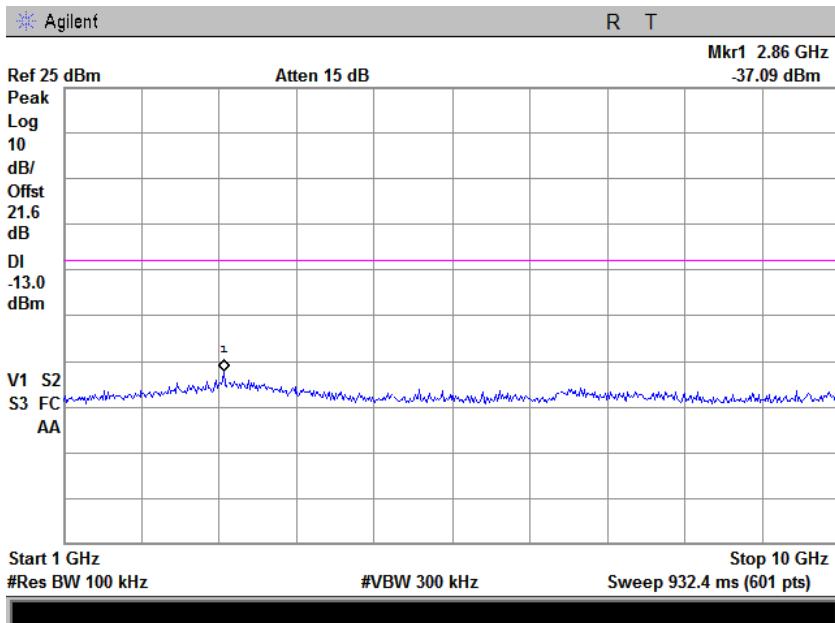


## Uplink, Frequency - 836.5MHz

Plot 1: 30MHz to 1GHz



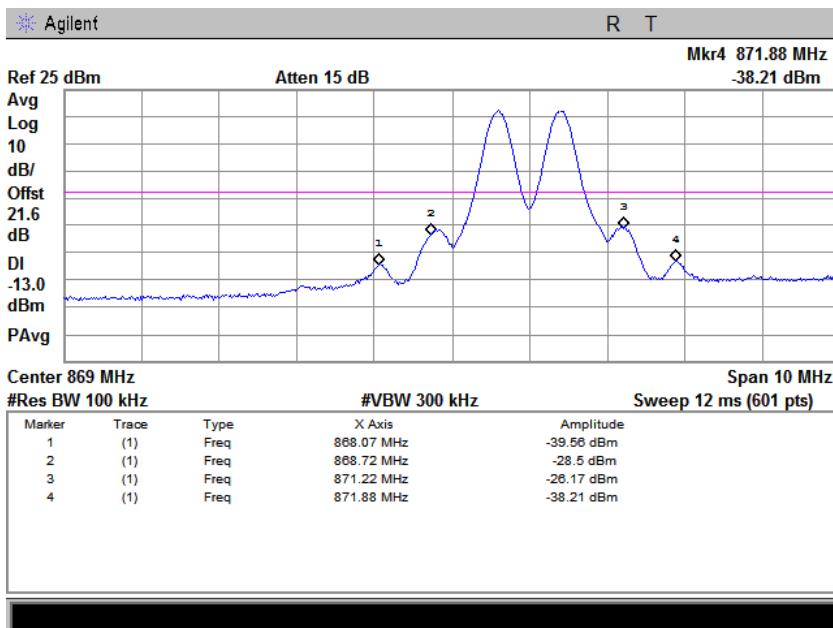
Plot 2: Above 1GHz



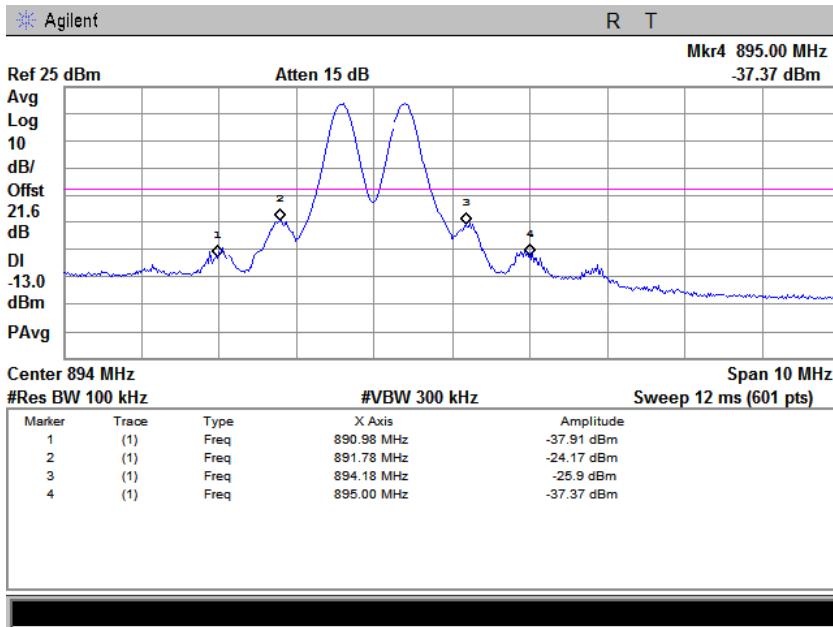
## 8.4.5 Intermodulation Distortion

### 8.4.5.1 EDGE

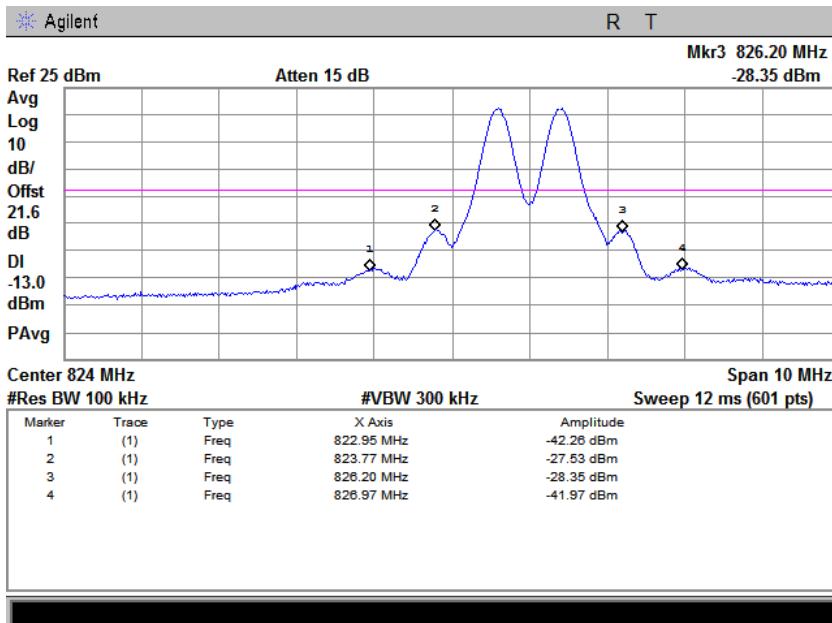
EDGE Downlink , Intermodulation on the lower band edge



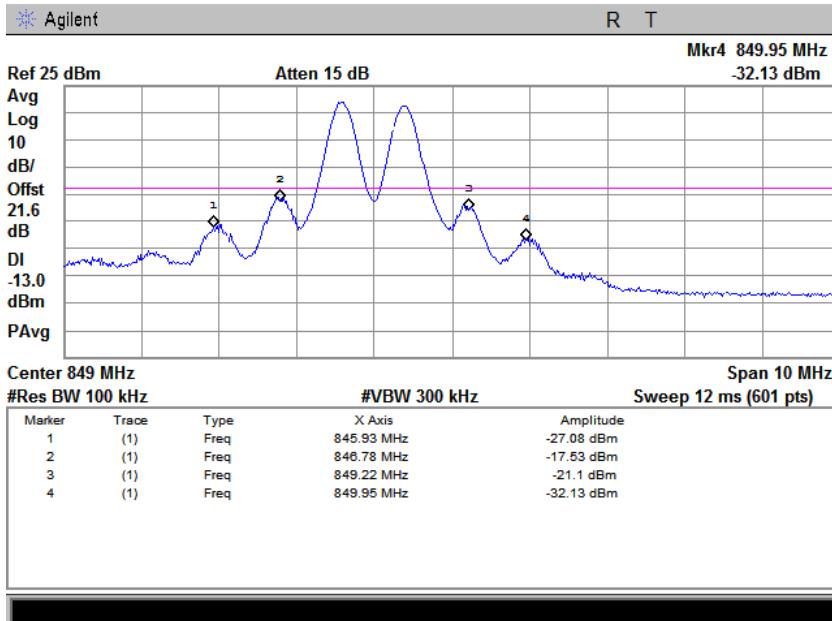
EDGE Downlink , Intermodulation on the upper band edge



## EDGE Uplink , Intermodulation on the lower band edge

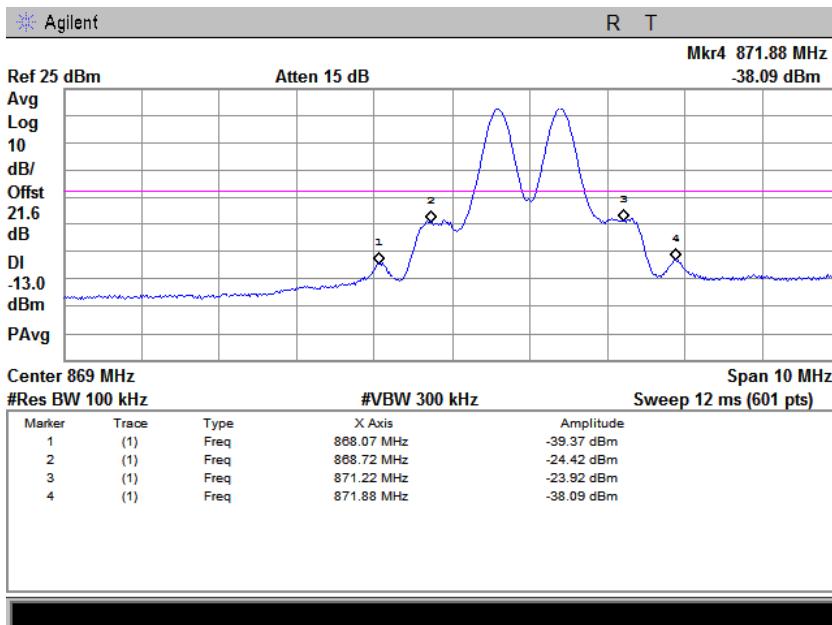


## EDGE Uplink , Intermodulation on the upper band edge

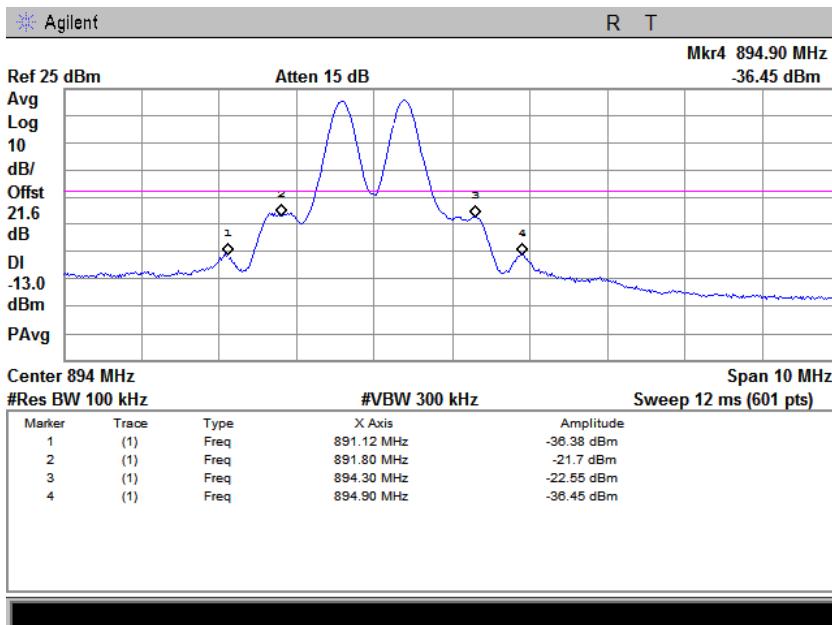


### 8.4.5.2 GSM

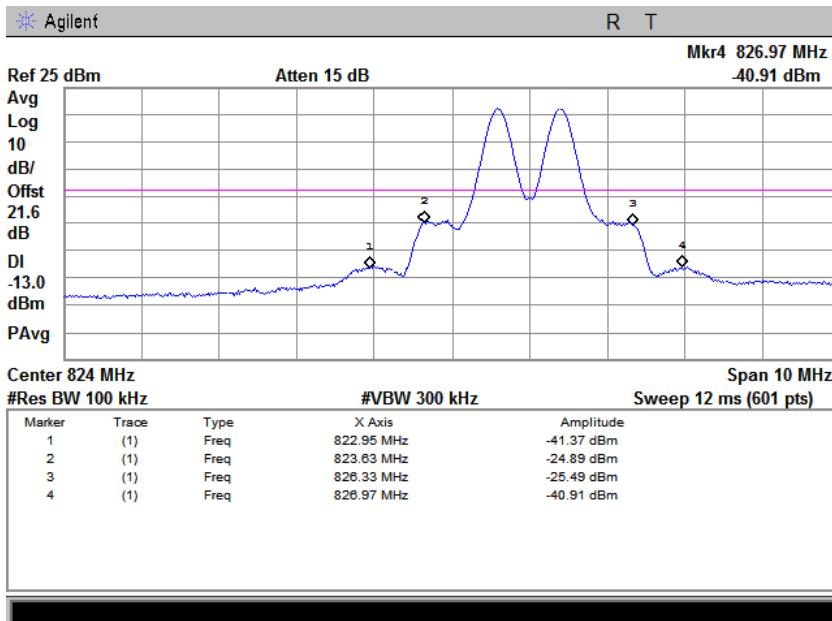
GSM Downlink , Intermodulation on the lower band edge



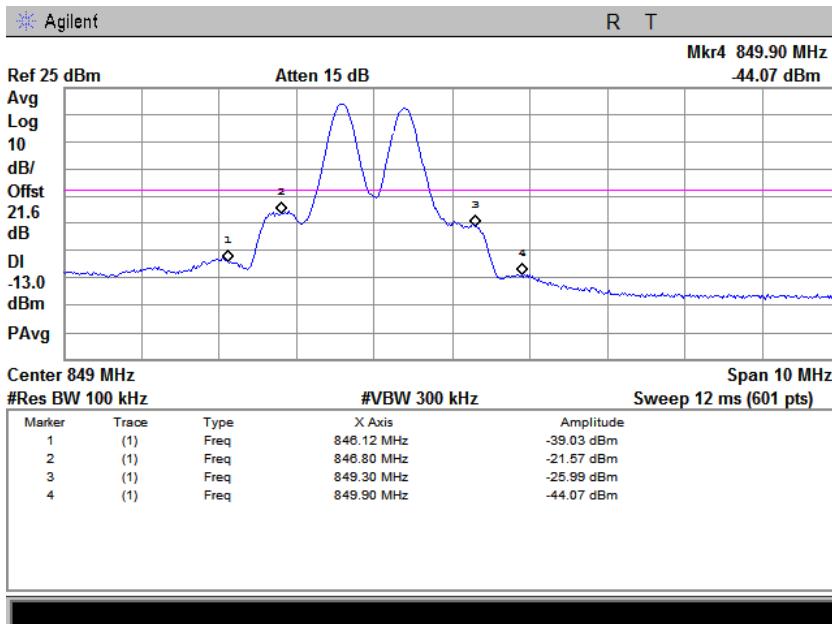
GSM Downlink , Intermodulation on the upper band edge



## GSM Uplink , Intermodulation on the lower band edge

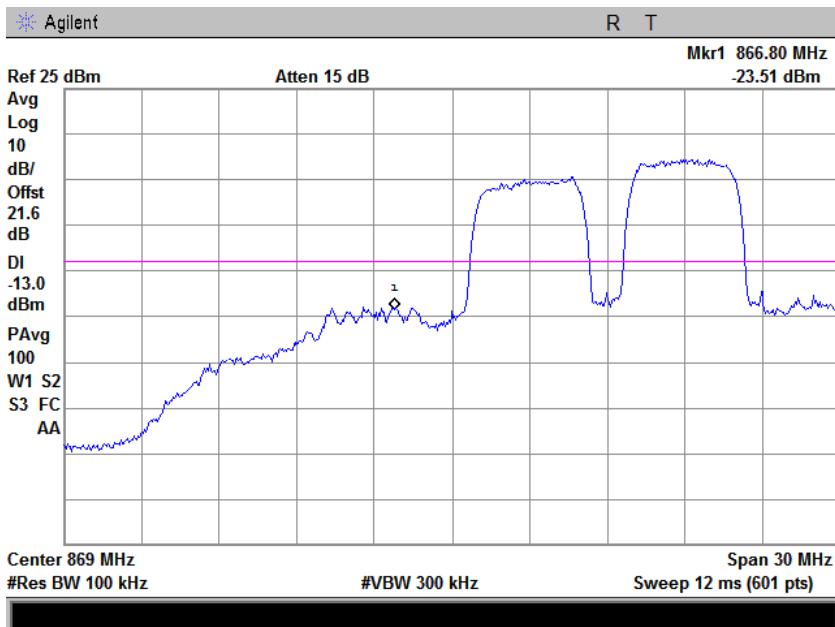


## GSM Uplink , Intermodulation on the upper band edge

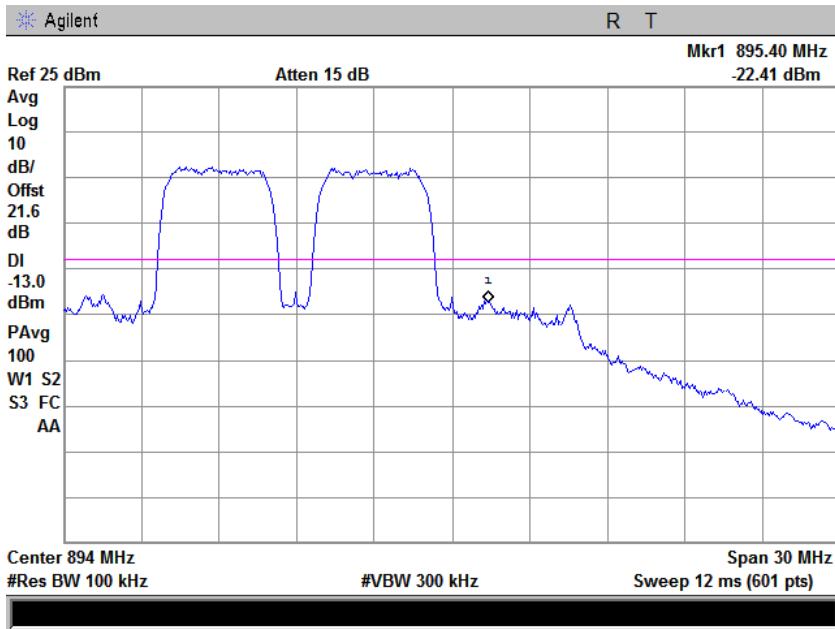


#### 8.4.5.3 WCDMA

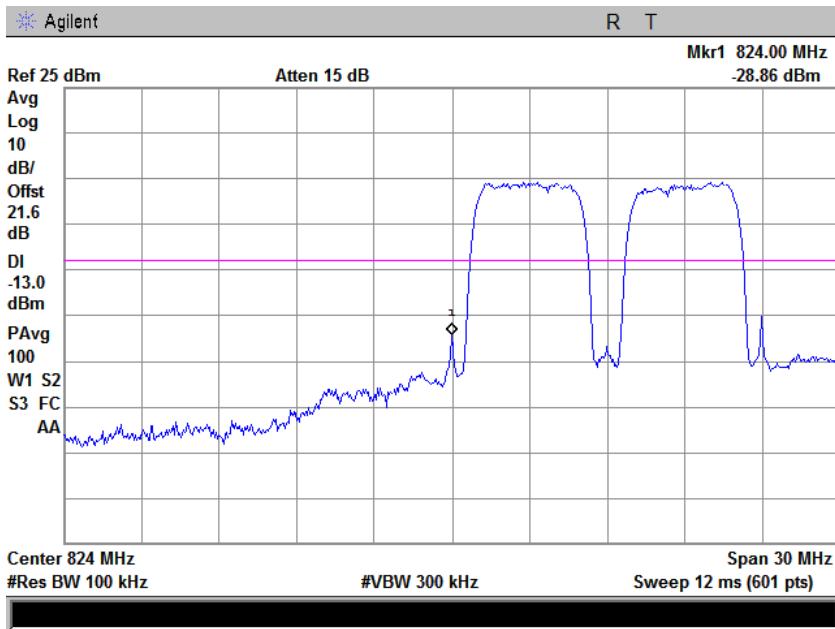
WCDMA Downlink, Intermodulation on the lower band edge



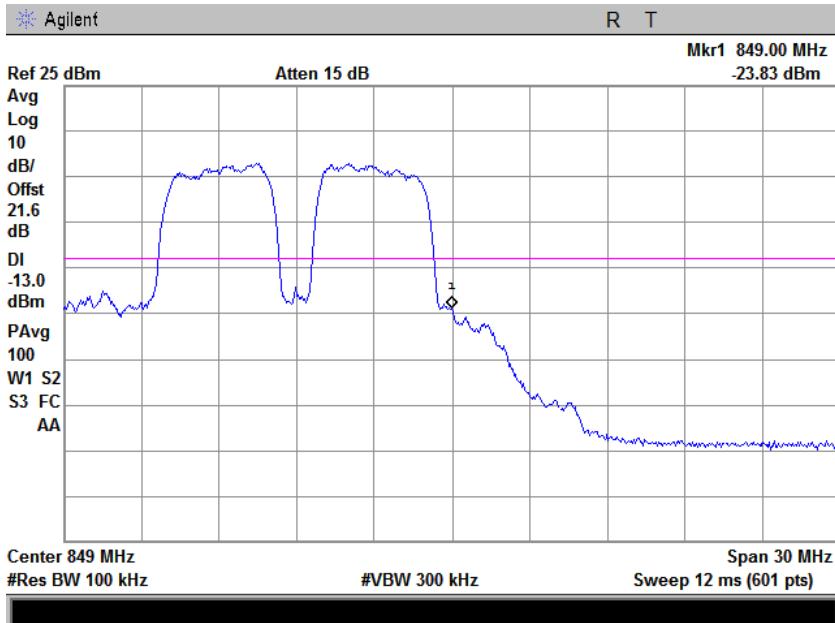
WCDMA Downlink, Intermodulation on the upper band edge



## WCDMA Uplink , Intermodulation on the lower band edge



## WCDMA Uplink , Intermodulation on the upper band edge



## **9 RSS-131 - 99% BANDWIDTH**

### **9.1 Applicable Standard**

Requirements : RSS-131 Issue 2 (2003) Section 6.3.2

### **9.2 Test Equipment**

Equipment	Manufacturer	Model #	Serial #	Cal Date	Cal Due
Spectrum Analyzer	Agilent	E4404B	MY44220519	26-Feb-2013	26-Feb-2014
Signal Generator	Agilent	E4437B	US39230102	11-Jan-2012	11-Jan-2014

### **9.3 Test Procedure**

The RF output of the transmitter was connected to the input of the spectrum analyzer through 20dB attenuator.

The 99% Occupied Bandwidth is measured at the RF antenna port under investigation using the occupied bandwidth measurement function of the spectrum analyzer.

#### **Uplink**

Frequency: 824 - 849MHz

Modulation: EDGE, GSM and WCDMA

Power : 25dBm

#### **Downlink**

Frequency: 869 - 894MHz

Modulation: EDGE, GSM and WCDMA

Power : 25dBm

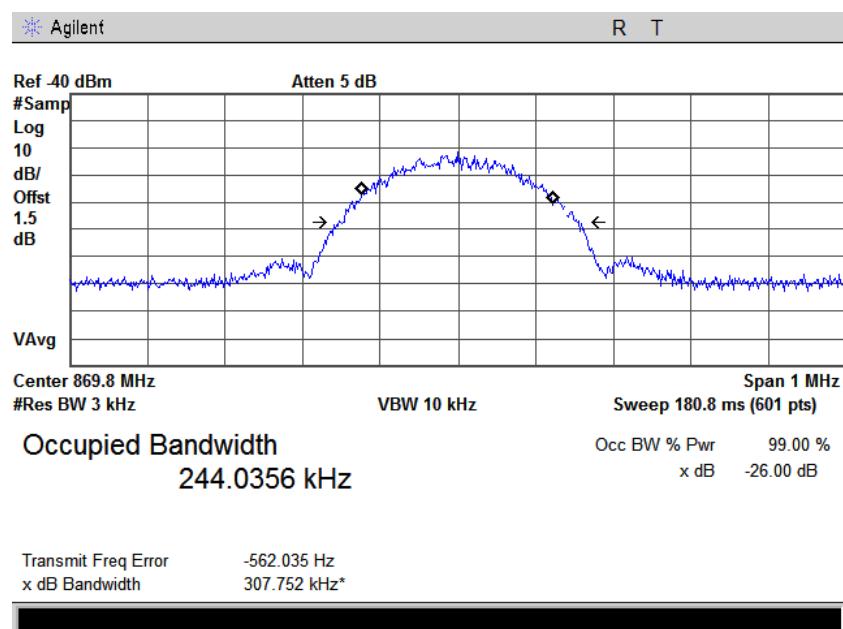
## 9.4 Test Results

### 9.4.1 EDGE:

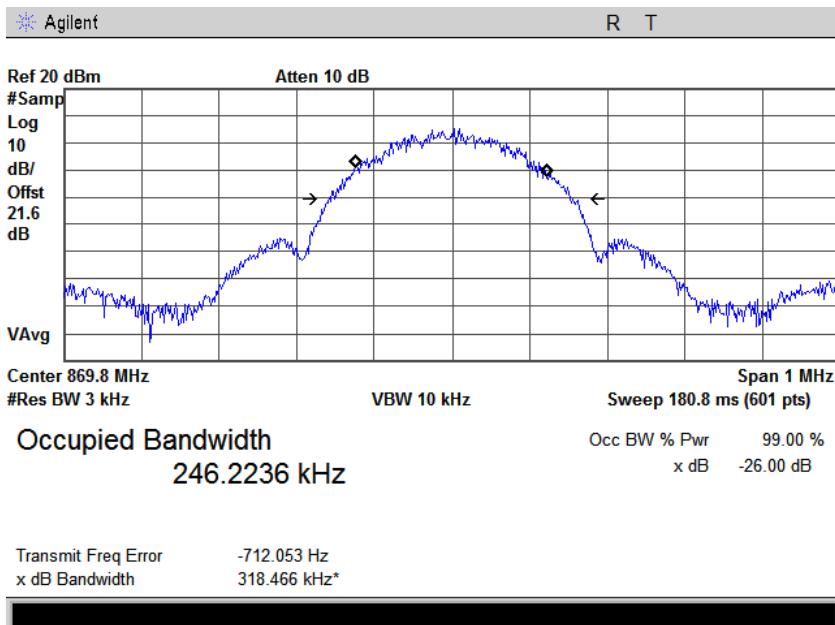
Mode		Channel	Frequency (MHz)	Emission Bandwidth	
EDGE	Downlink	Low	869.8	Input (kHz)	Output (kHz)
		Middle	881.5	249.2	245.3
		High	893.2	246.4	248.0
	Uplink	Low	824.8	246.0	246.3
		Middle	836.5	247.7	246.8
		High	848.2	247.1	246.4

### 99% BANDWIDTH DOWNLINK - EDGE 869MHz

Input

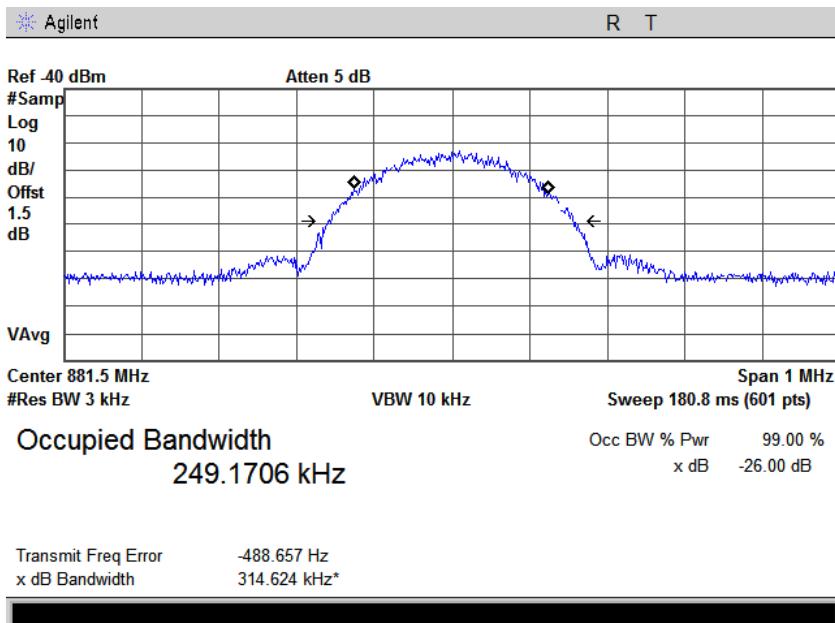


## Output

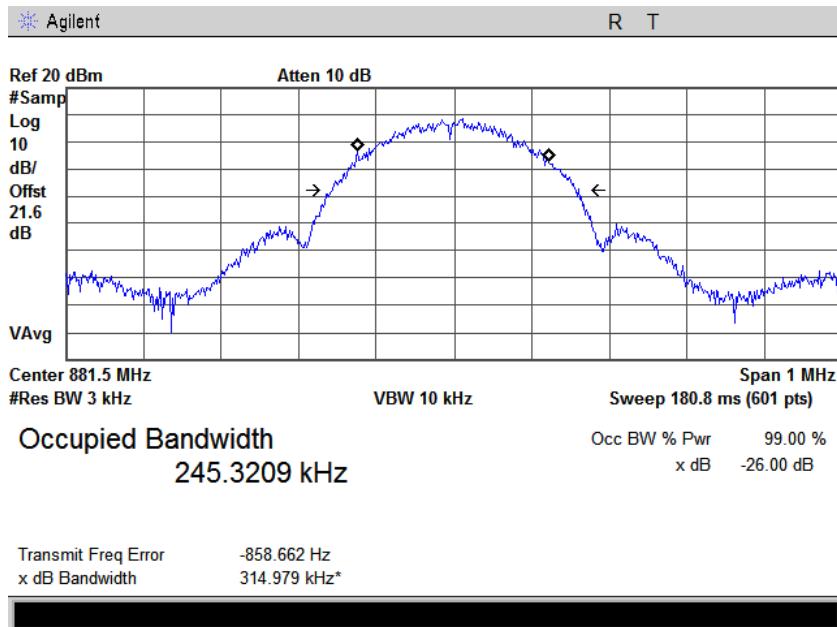


## 99% BANDWIDTH DOWNLINK - EDGE 881MHz

### Input

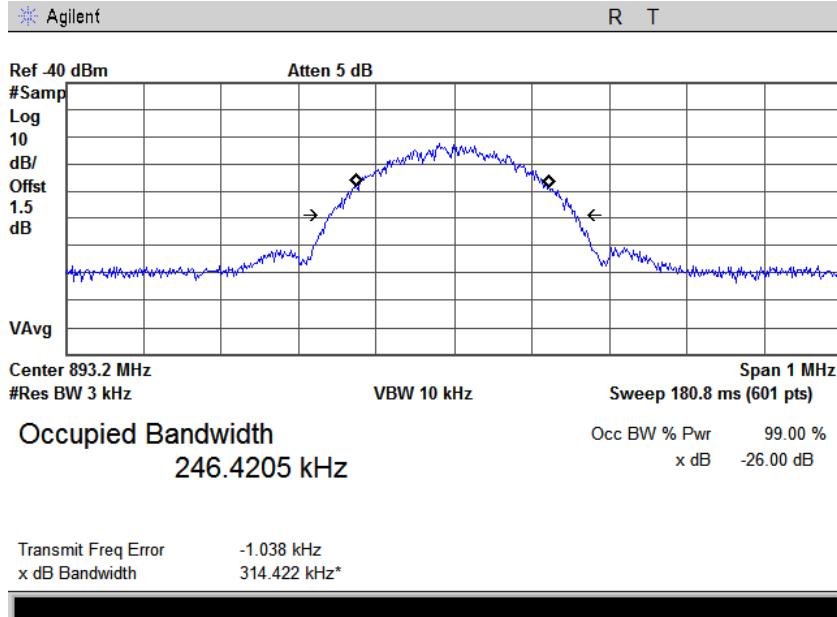


## Output

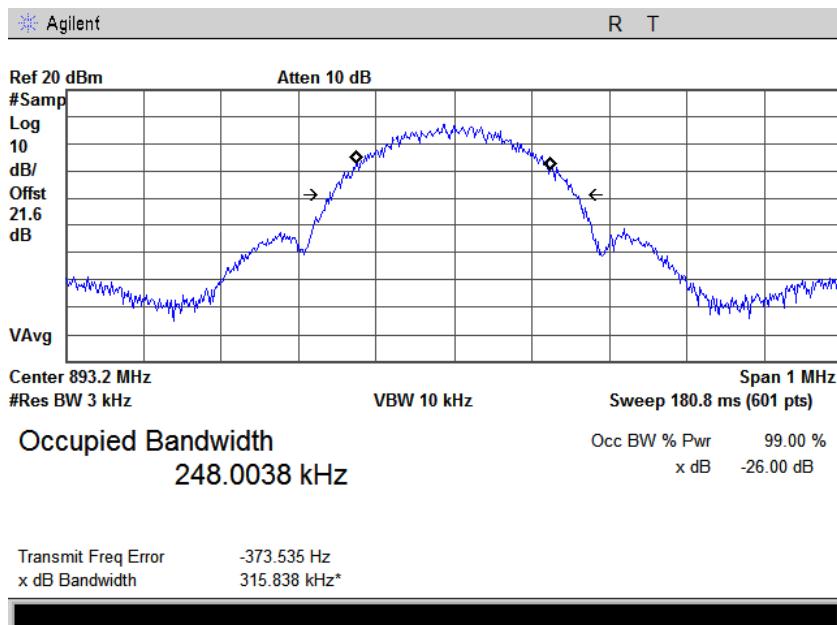


## 99% BANDWIDTH DOWNLINK - EDGE 894MHz

### Input

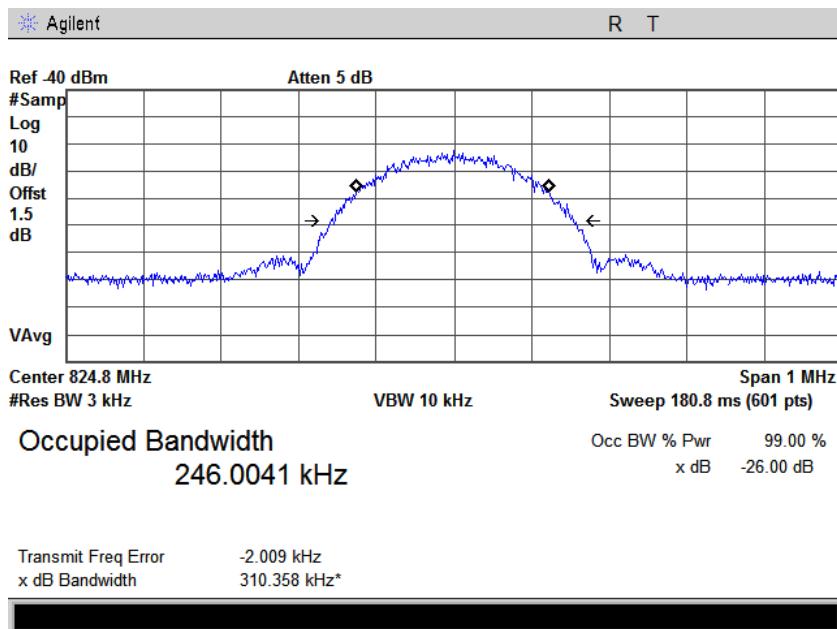


## Output

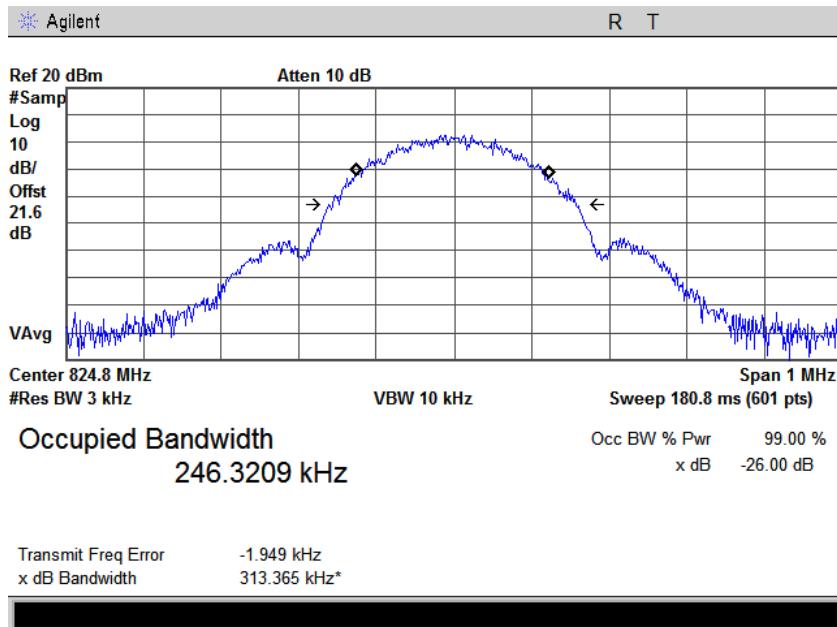


## 99% BANDWIDTH UPLINK - EDGE 824MHz

## Input

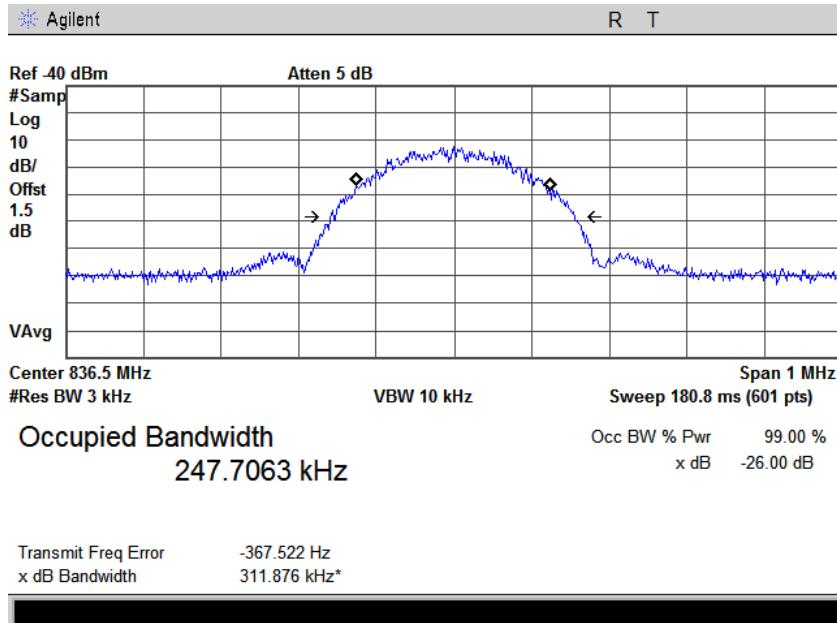


## Output

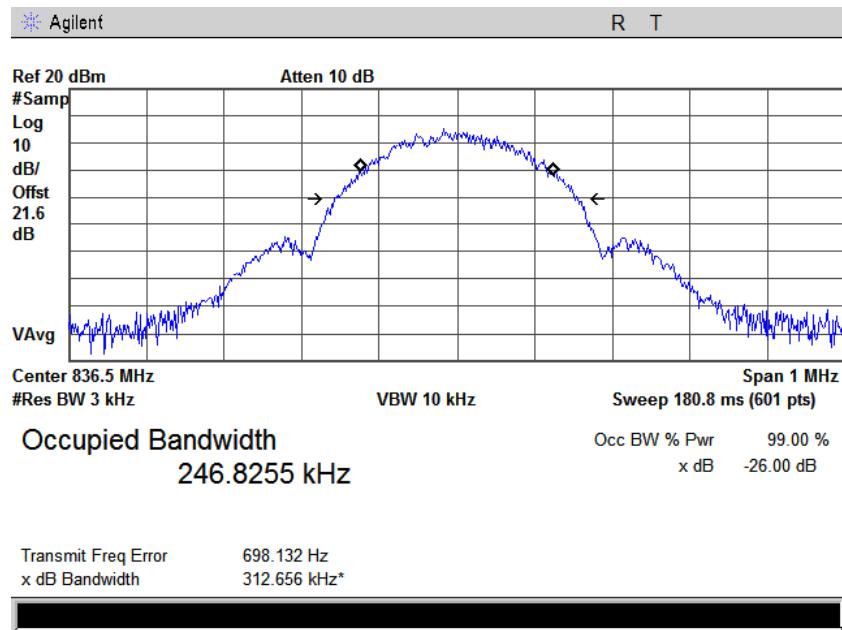


## 99% BANDWIDTH UPLINK - EDGE 836MHz

## Input

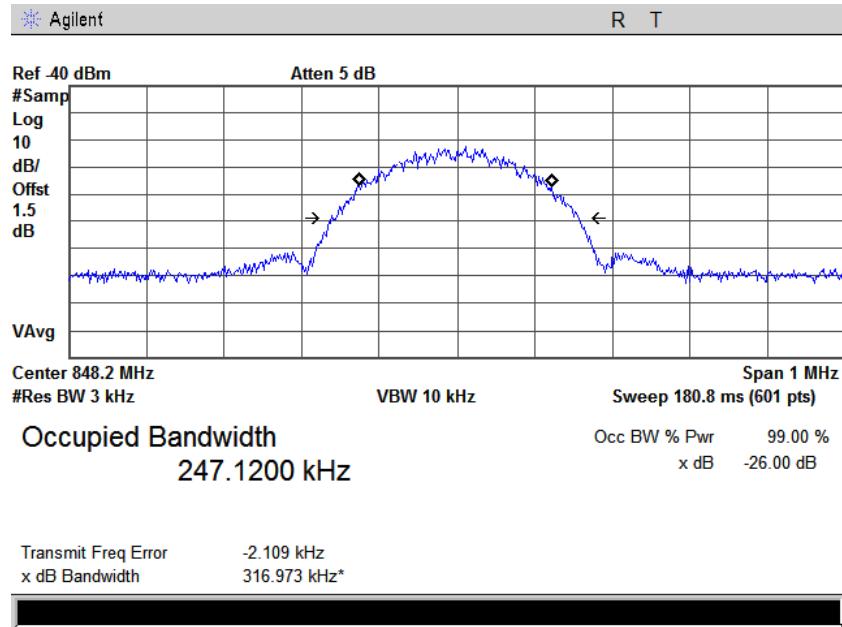


## Output

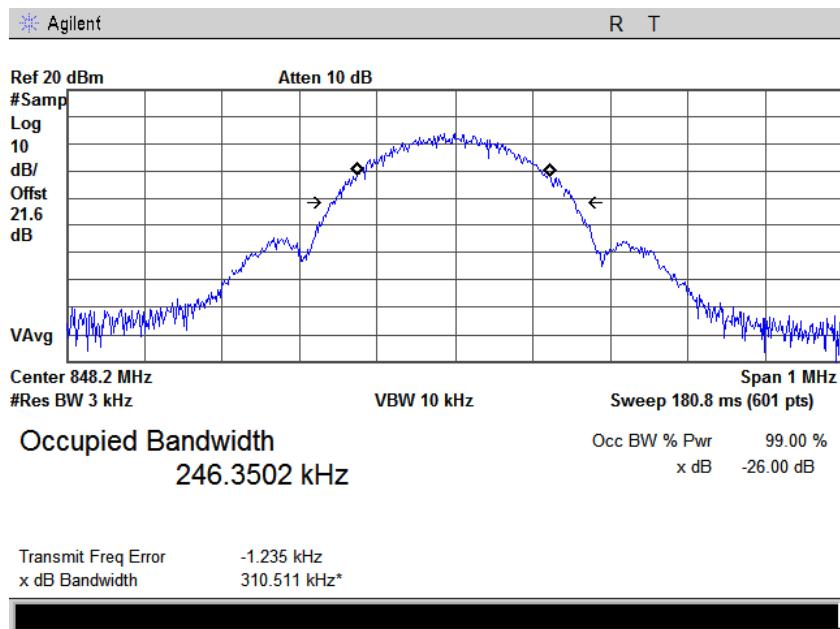


## 99% BANDWIDTH UPLINK - EDGE 849MHz

## Input



## Output

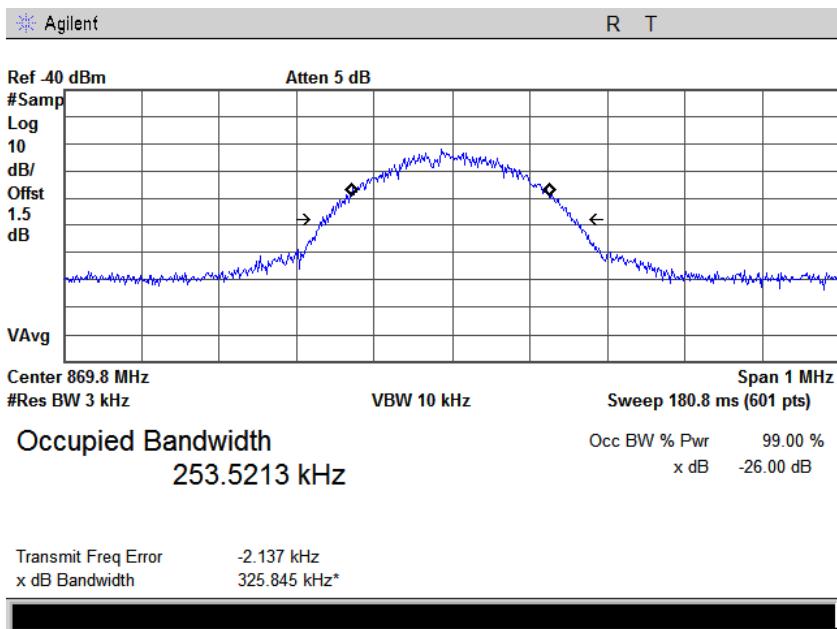


### 9.4.2 GSM:

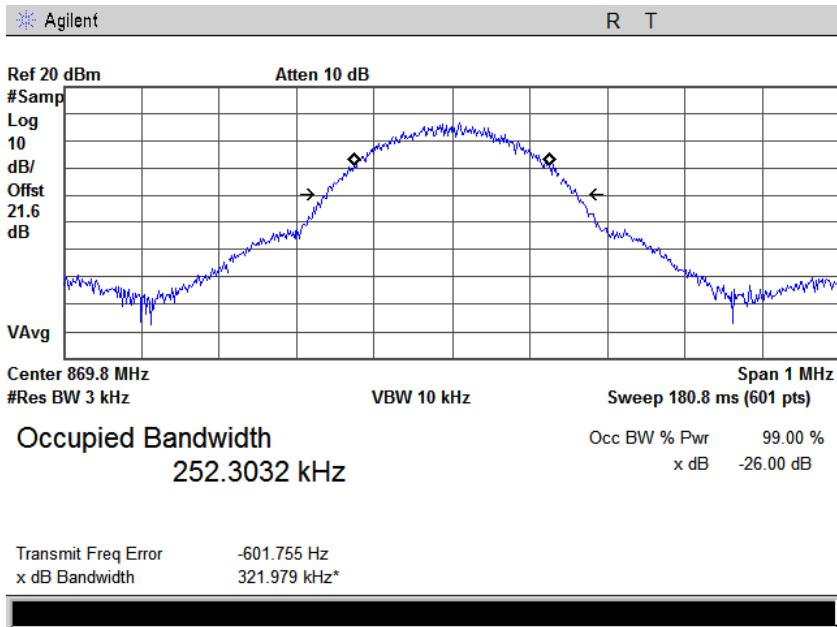
Mode		Channel	Frequency (MHz)	Emission Bandwidth	
GSM	Downlink	Low	869.8	Input (kHz)	Output (kHz)
		Middle	881.5	251.4	254.5
		High	893.8	253.2	254.7
	Uplink	Low	824.8	253.7	254.4
		Middle	836.5	255.4	251.1
		High	848.8	255.8	252.2

## 99% BANDWIDTH DOWNLINK - GSM 869MHz

### Input

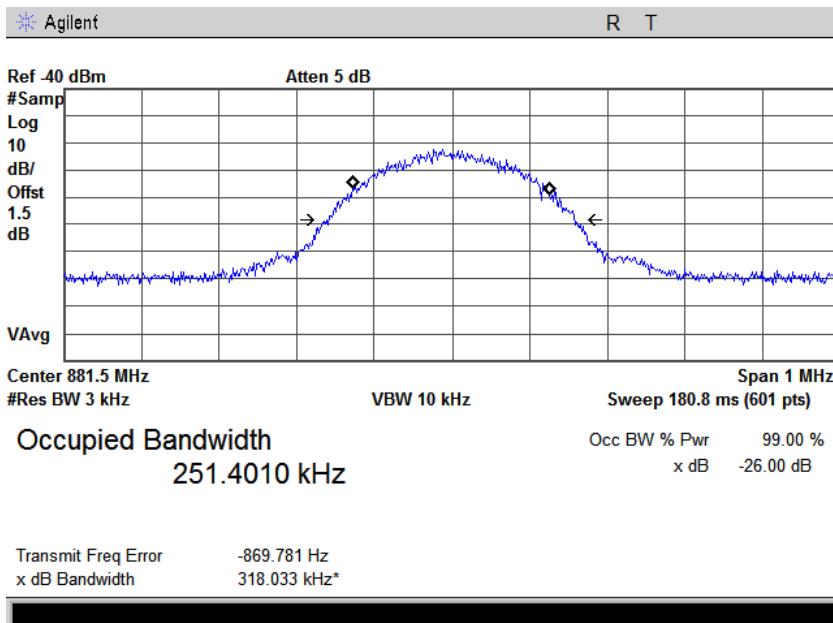


### Output

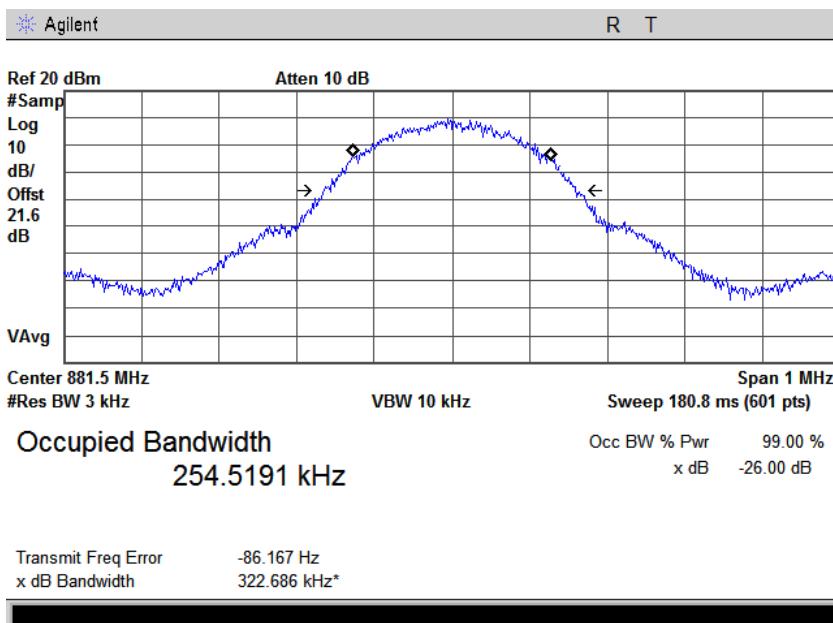


## 99% BANDWIDTH DOWNLINK - GSM 881MHz

### Input

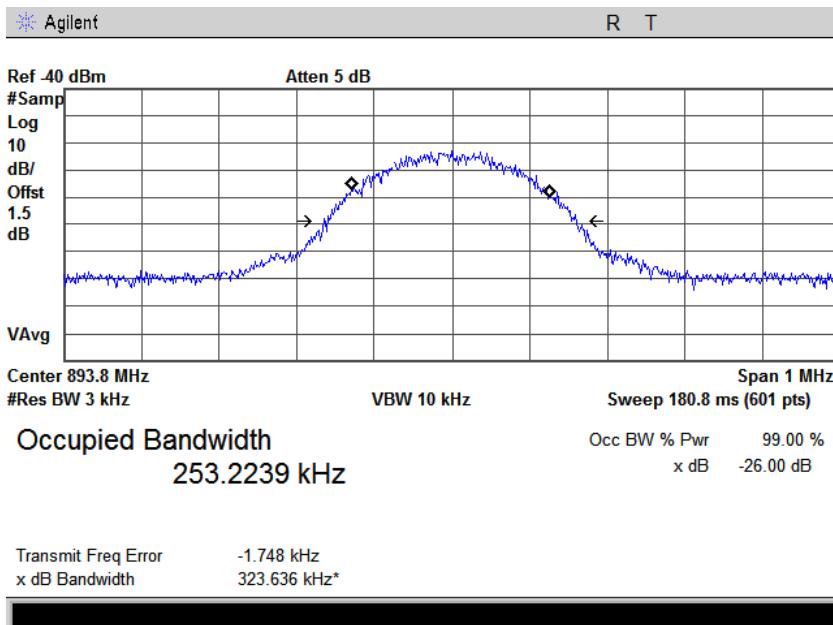


### Output

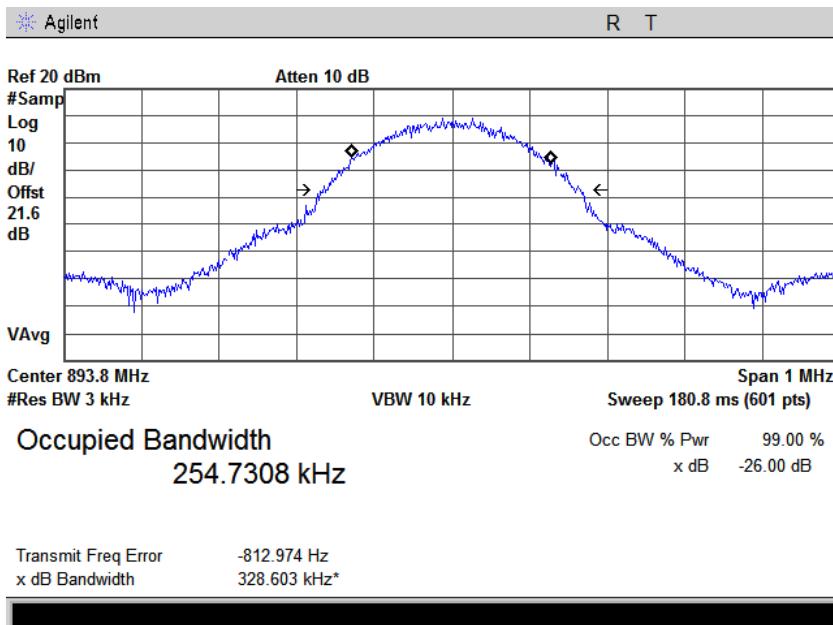


## 99% BANDWIDTH DOWNLINK - GSM 894MHz

### Input

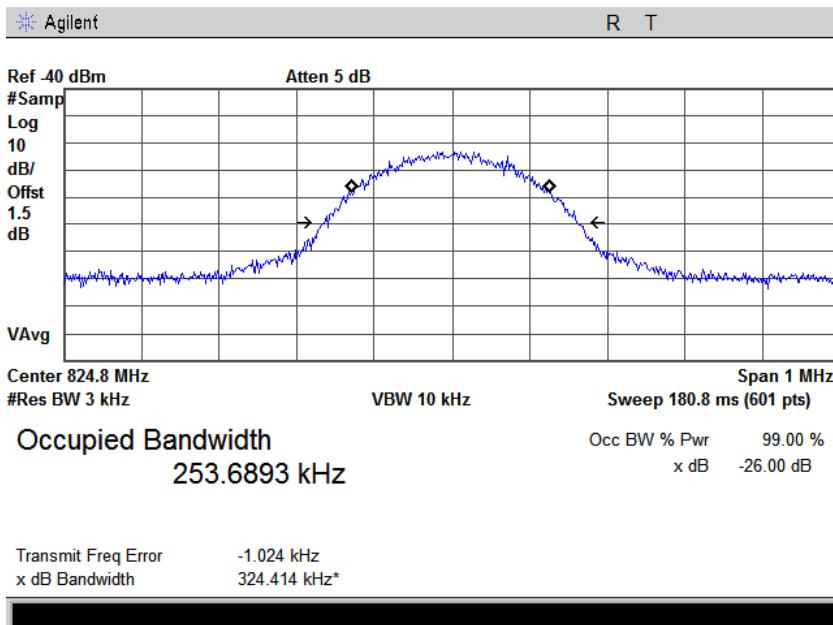


### Output

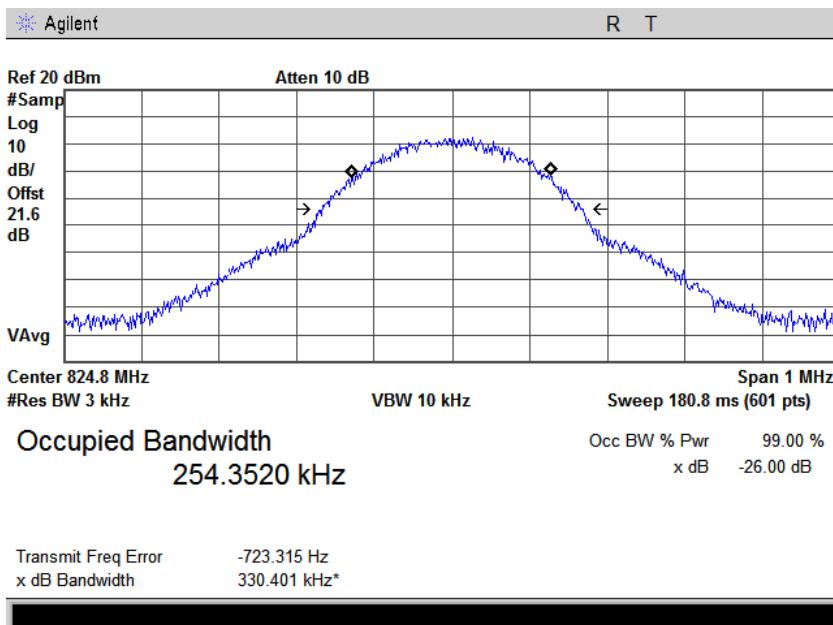


## 99% BANDWIDTH UPLINK - GSM 824MHz

### Input

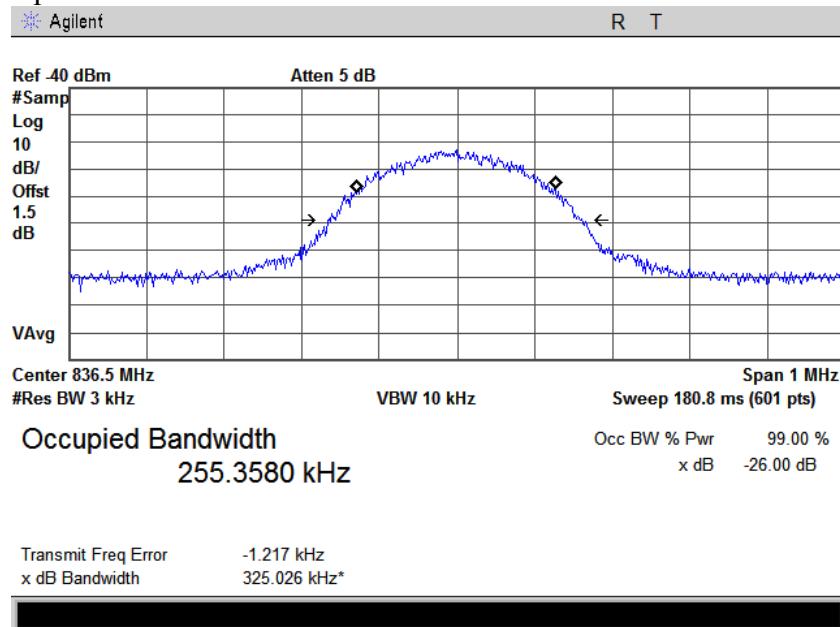


### Output

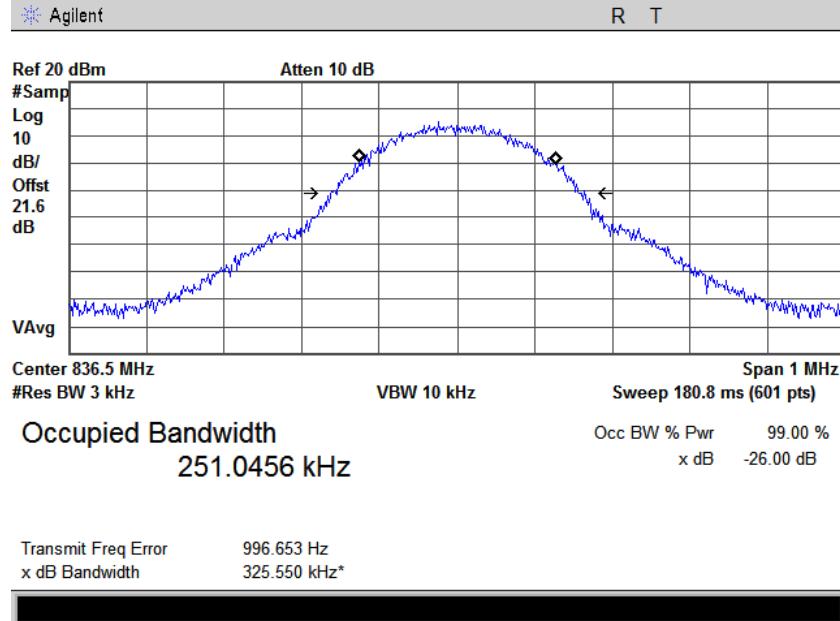


## 99% BANDWIDTH UPLINK - GSM 836MHz

### Input

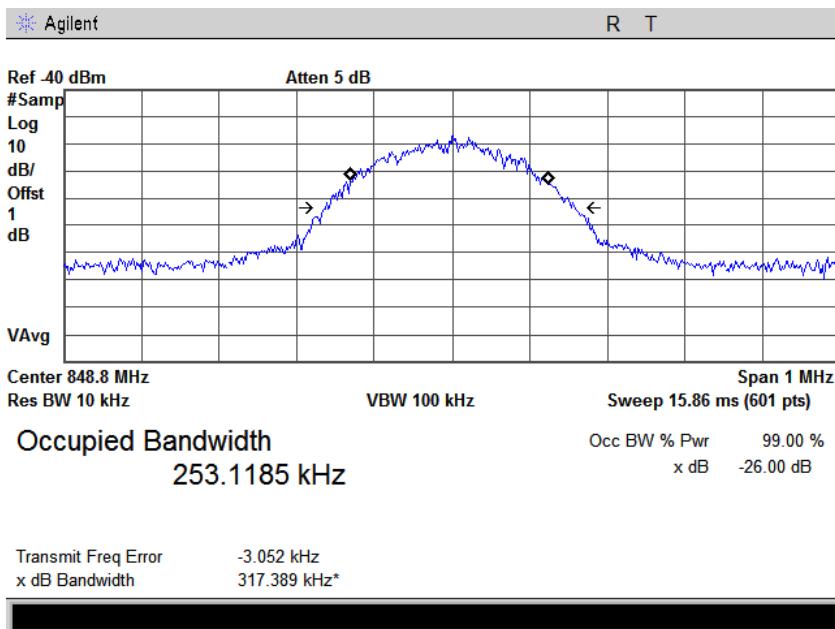


### Output

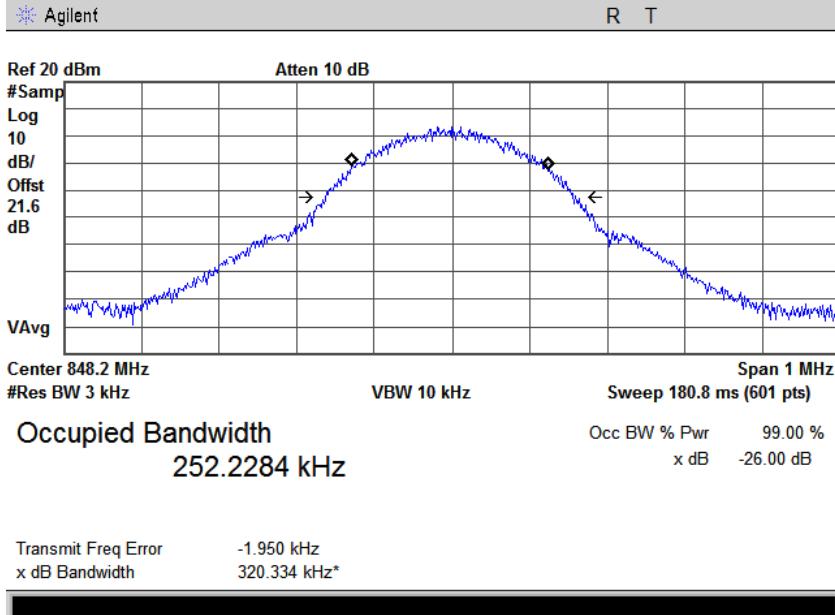


## 99% BANDWIDTH UPLINK - GSM 849MHz

### Input



### Output

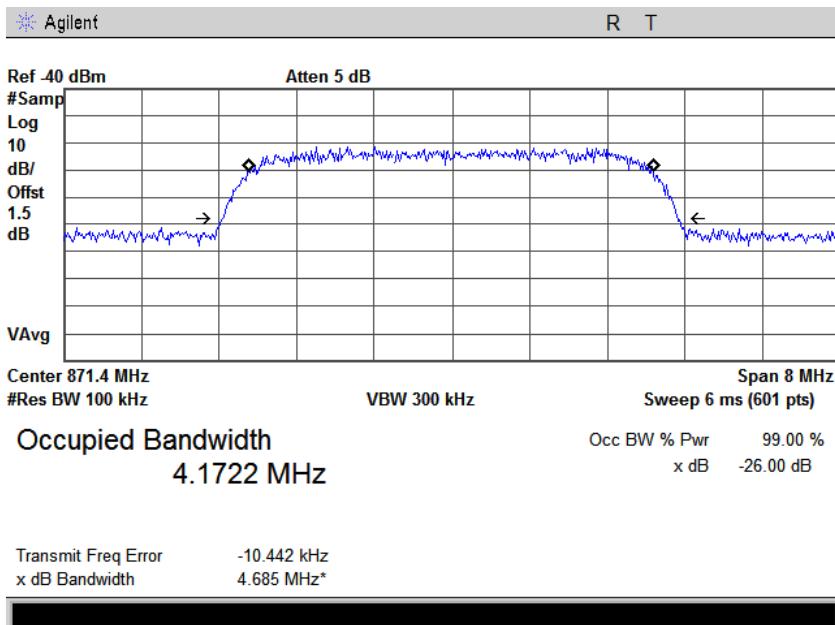


### 9.4.3 WCDMA:

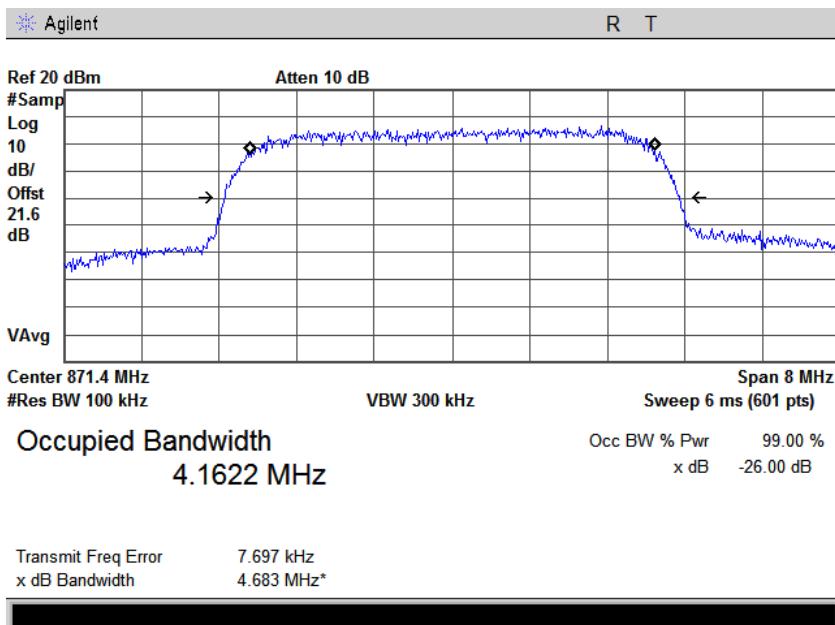
Mode		Channel	Frequency (MHz)	Emission Bandwidth	
WCDMA	Downlink	Low	871.4	Input (kHz)	Output (kHz)
		Middle	881.5	4168.6	4156.8
		High	891.6	4186.1	4164.4
	Uplink	Low	826.4	4174.6	4164.1
		Middle	836.5	4161.6	4167.1
		High	846.6	4175.4	4128.5

## 99% BANDWIDTH DOWNLINK - WCDMA 869MHz

### Input

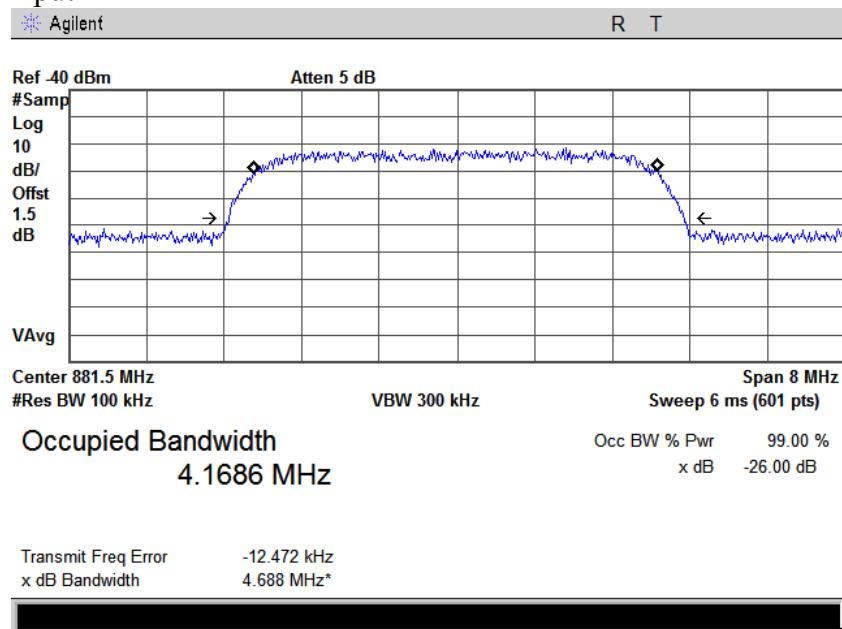


### Output

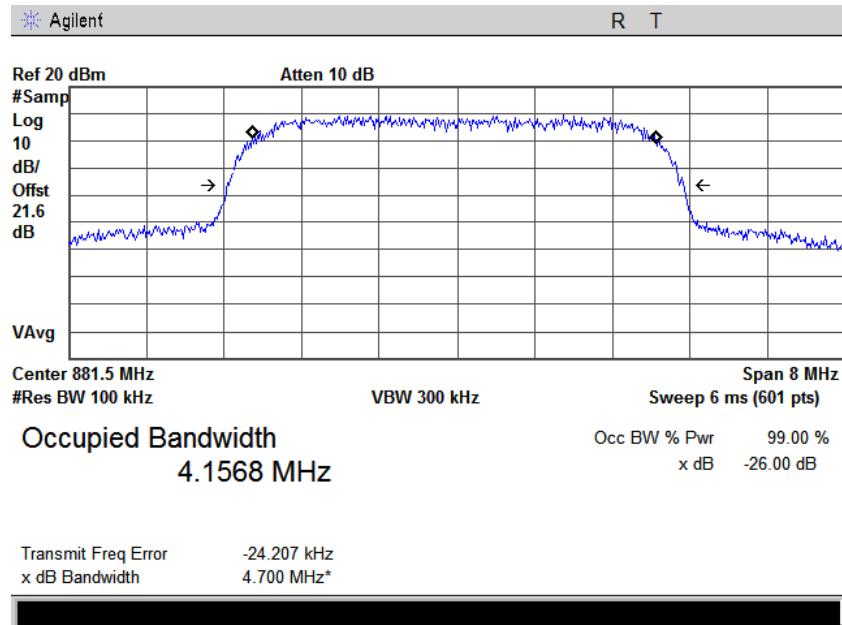


## 99% BANDWIDTH DOWNLINK - WCDMA 881MHz

### Input

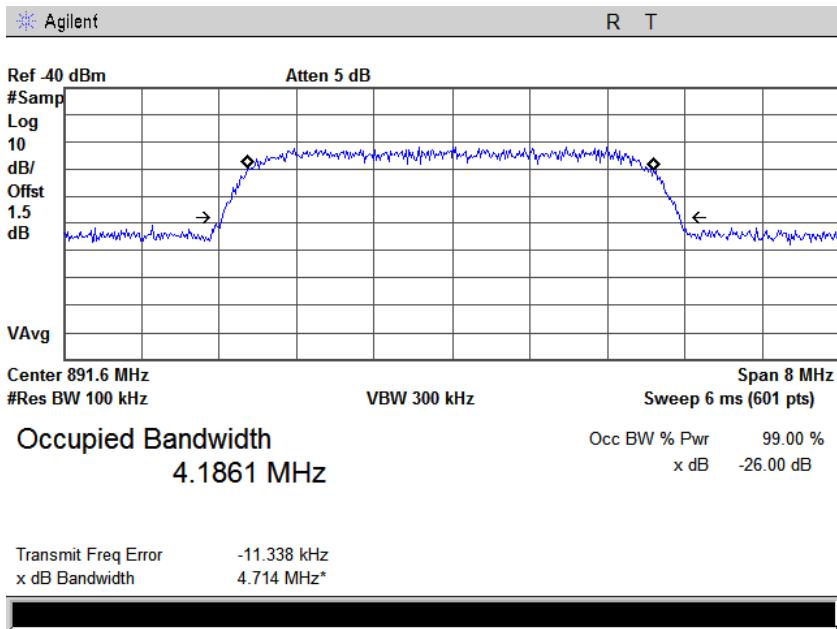


### Output

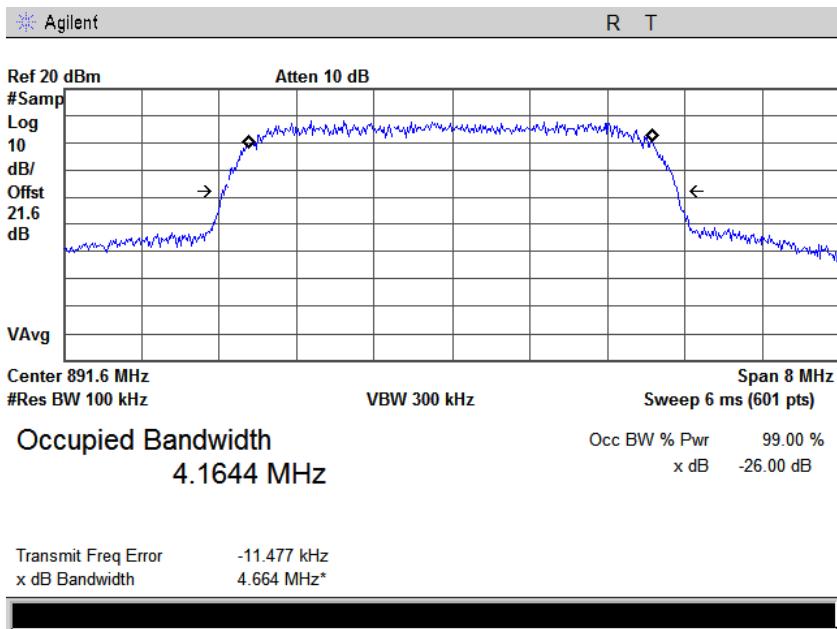


## 99% BANDWIDTH DOWNLINK - WCDMA 894MHz

### Input

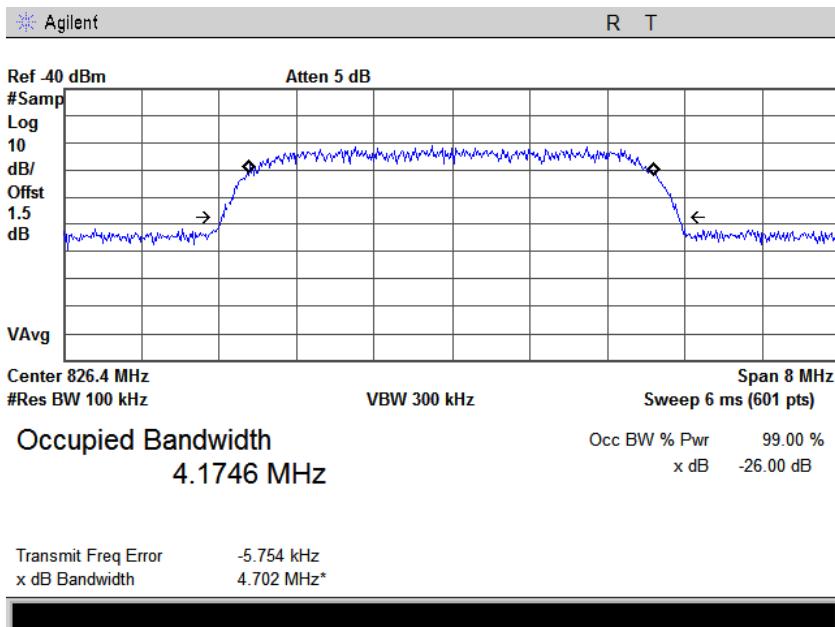


### Output

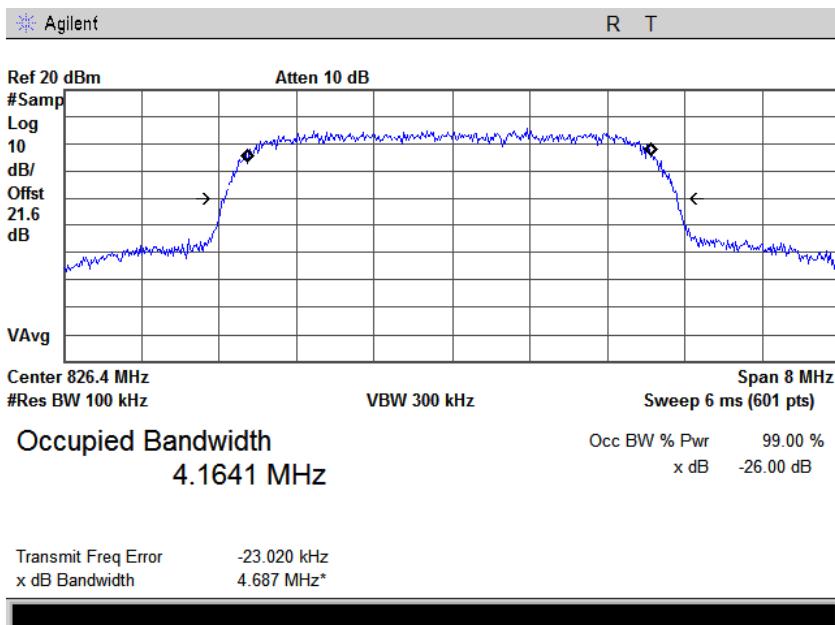


## 99% BANDWIDTH UPLINK - WCDMA 824MHz

### Input

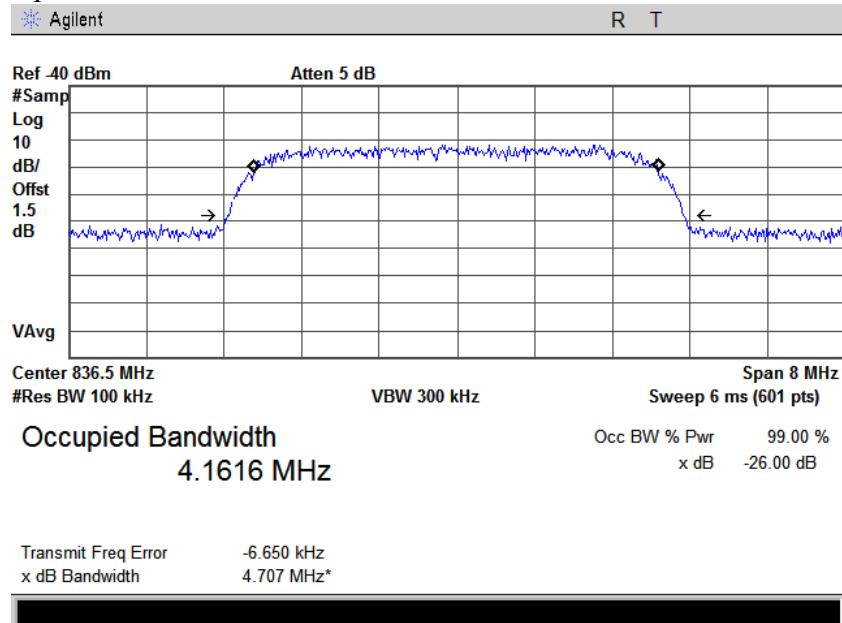


### Output

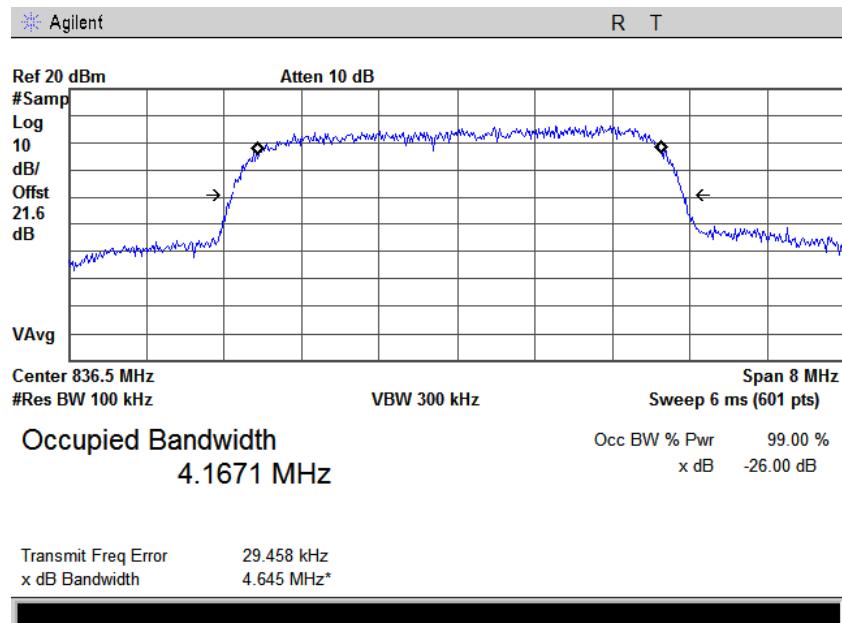


## 99% BANDWIDTH UPLINK - WCDMA 836MHz

### Input

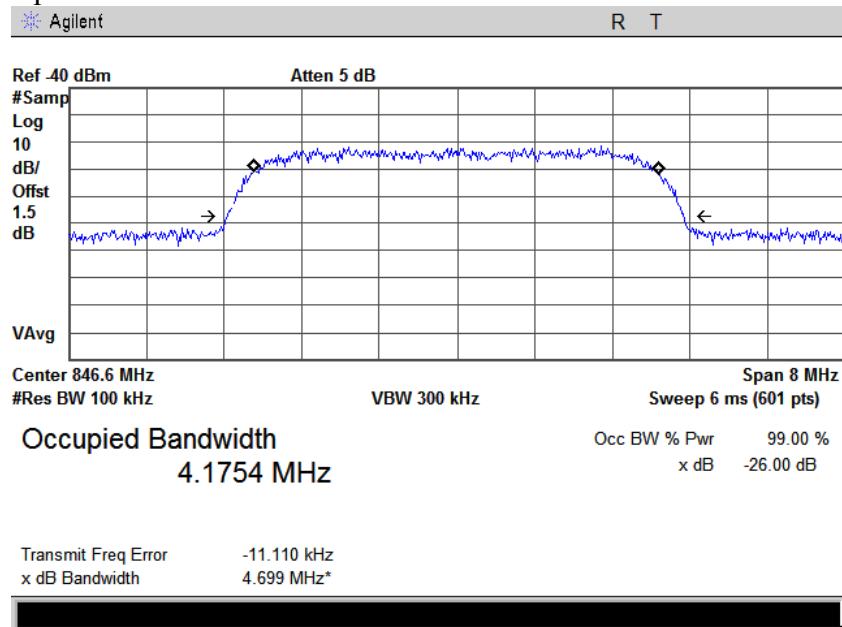


### Output

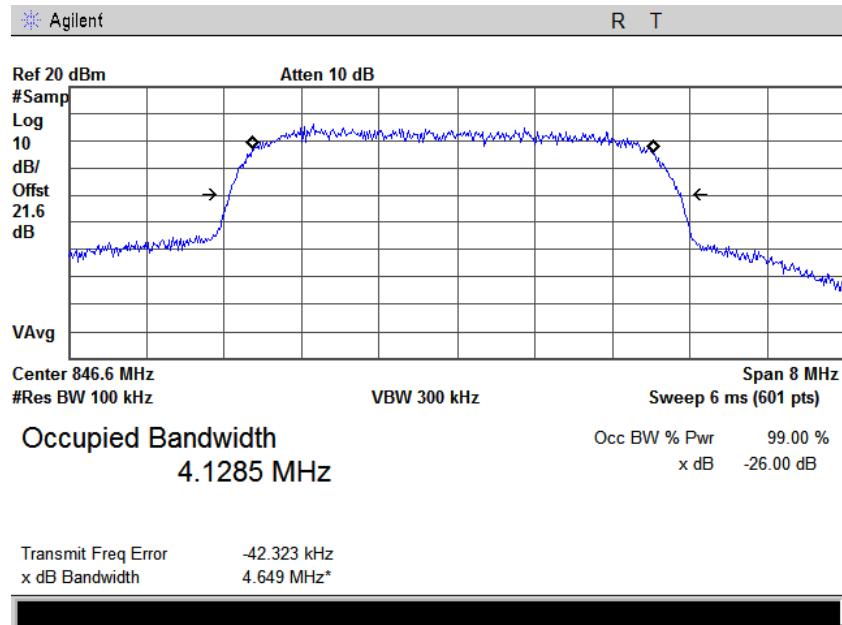


## 99% BANDWIDTH UPLINK - WCDMA 849MHz

### Input



### Output



## **10 RSS-131 PASSBAND GAIN AND BANDWIDTH**

### **10.1 Applicable Standard**

Requirements : RSS-131 Issue 2 (2003) Section 6.1.

The passband gain shall not exceed the nominal gain by more than 1.0 dB. The 20 dB bandwidth shall not exceed the nominal bandwidth that is stated by the manufacturer. Outside of the 20 dB bandwidth, the gain shall not exceed the gain at the 20 dB point.

### **10.2 Test Equipment**

Equipment	Manufacturer	Model #	Serial #	Cal Date	Cal Due
Spectrum Analyzer	Agilent	E4404B	MY44220519	26-Feb-2013	26-Feb-2014
Signal Generator	Agilent	E4437B	US39230102	11-Jan-2012	11-Jan-2014

### **10.3 Test Procedure**

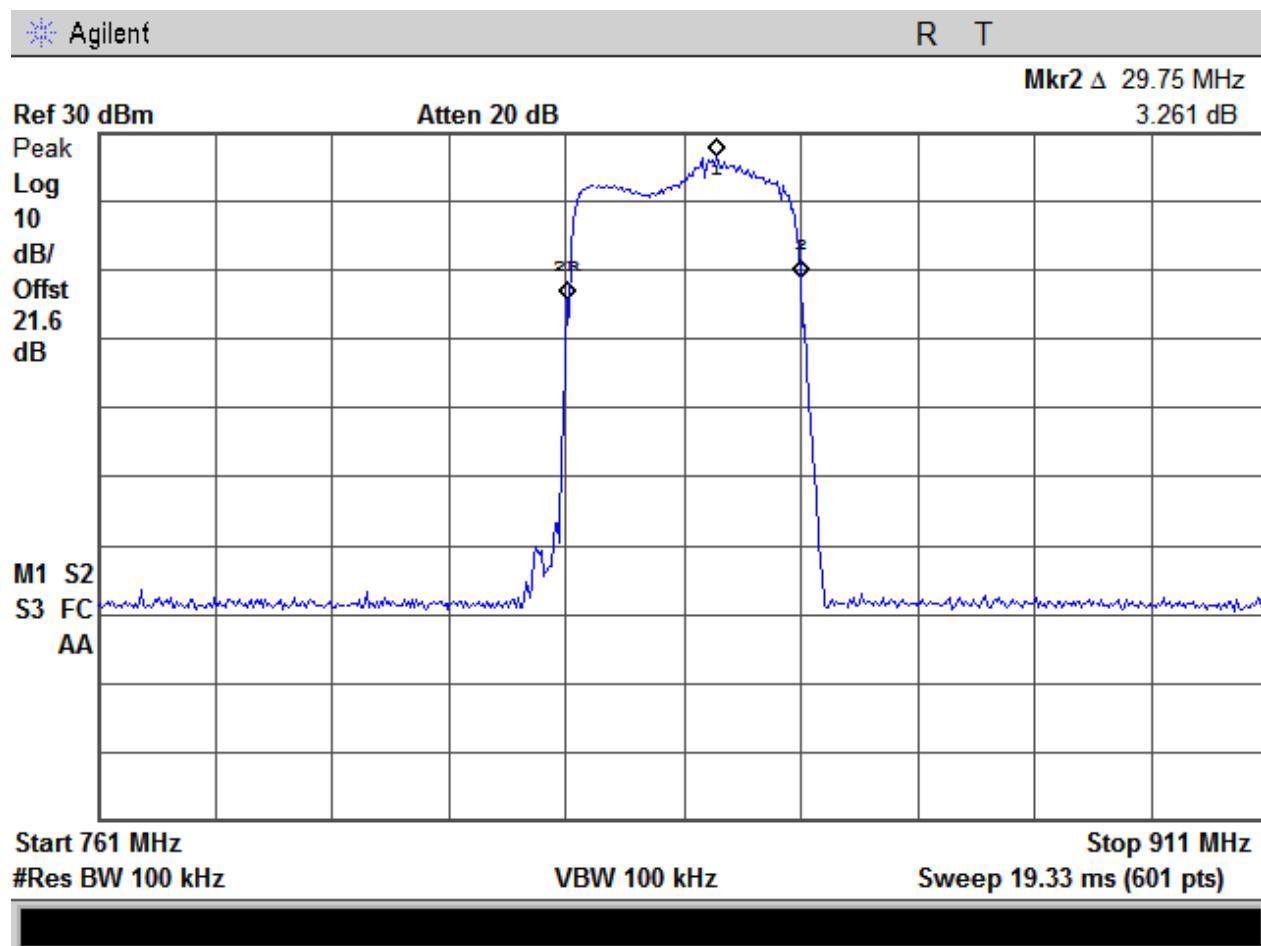
For downlink configuration, Donor antenna port is connected to Signal Generator and Area Fill antenna port is connected to Spectrum Analyzer through 20dB attenuator.

For uplink configuration, Donor antenna port is connected to Spectrum Analyzer through 20dB attenuator and Area Fill antenna port is connected to Signal Generator.

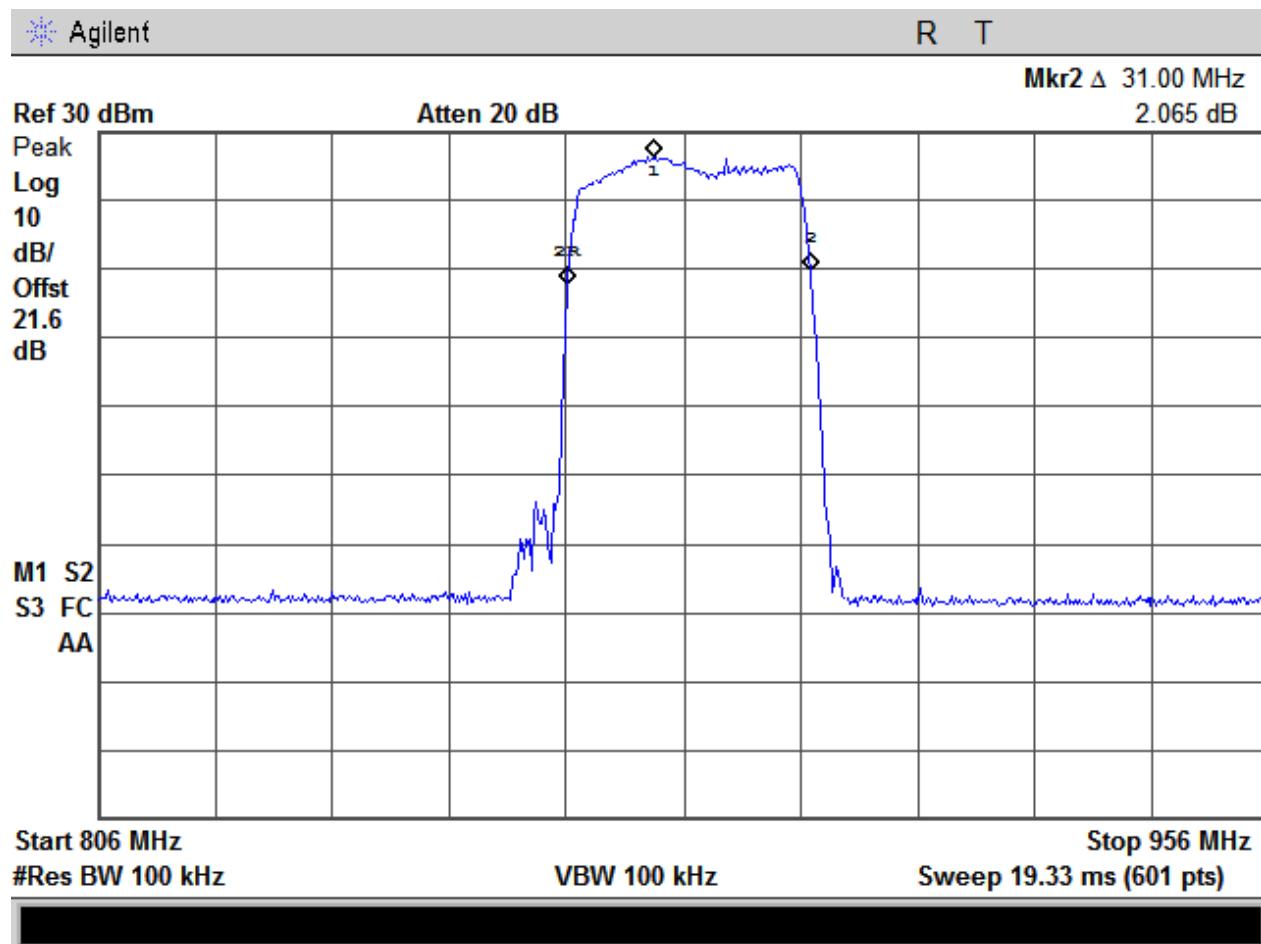
With the aid of a Signal Generator in sweep mode and spectrum analyzer, was measured the gain-versus-frequency response of the EUT from the midband frequency of the passband up to at least  $f_0 + 250\%$  of the 20 dB bandwidth.

## 10.4 Test Results

### 10.4.1 Uplink



## 10.4.2 Downlink



## **11 FCC §2.1055 & §22.355 Frequency Stability**

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### **11.1 Applicable Standard**

§ 22.355 Except as otherwise provided in this part, the carrier frequency of each transmitter in the Public Mobile Services must be maintained within the tolerances given in Table C-1 of this section.

Table C-1—Frequency Tolerance for Transmitters in the Public Mobile Services

Frequency range (MHz)	Base, fixed (ppm)	Mobile >3Watts (ppm)	Mobile $\leq 3$ watts (ppm)
25 to 50	20.0	20.0	50.0
50 to 450	5.0	5.0	50.0
450 to 512	2.5	5.0	5.0
821 to 896	1.5	2.5	2.5
928 to 929	5.0	n/a	n/a
929 to 960	1.5	n/a	n/a
2110 to 2220	10.0	n/a	n/a

### **11.2 Test Equipment**

Equipment	Manufacturer	Model #	Serial #	Cal Date	Cal Due
Frequency Counter	Agilent	53132A	MY40006238	14-Jun-2013	14-Jun-2015
Signal Generator	Agilent	E4437B	US39230102	11-Jan-2012	11-Jan-2014

### **11.3 Test Procedure**

For downlink configuration, Donor antenna port is connected to Signal Generator and Area Fill antenna port is connected to Frequency Counter through 20dB attenuator.

For uplink configuration, Donor antenna port is connected to Frequency Counter through 20dB attenuator and Area Fill antenna port is connected to an ESG.

The frequency drift was measured at the EUT input vs EUT output under the ambient temperature with extreme voltage supply (  $\pm 15\%$  ) and under extreme temperature condition.

## 11.4 Test Results

### Frequency Tolerance Test at Extreme Voltage Under Ambient Temperature (+23°C)

	<b>Nominal Carrier Frequency (MHz)</b>	<b>Measured Frequency at EUT Input</b>	<b>Measured Frequency at EUT Output at 120V AC</b>	<b>Frequency Deviation from EUT Output to EUT Input (ppm)</b>
<b>Uplink</b>	836.5	836 500 000.0	836 500 000.0	0
<b>Downlink</b>	881.5	881 500 000.0	881 500 000.0	0

	<b>Nominal Carrier Frequency (MHz)</b>	<b>Measured Frequency at EUT Input</b>	<b>Measured Frequency at EUT Output at 102V AC (-15%)</b>	<b>Frequency Deviation from EUT Output to EUT Input (ppm)</b>
<b>Uplink</b>	836.5	836 500 000.0	836 500 000.0	0
<b>Downlink</b>	881.5	881 500 000.0	881 500 000.0	0

	<b>Nominal Carrier Frequency (MHz)</b>	<b>Measured Frequency at EUT Input</b>	<b>Measured Frequency at EUT Output at 138V AC(+15%)</b>	<b>Frequency Deviation from EUT Output to EUT Input (ppm)</b>
<b>Uplink</b>	836.5	836 500 000.0	836 500 000.0	0
<b>Downlink</b>	881.5	881 500 000.0	881 500 000.0	0

Frequency Tolerance Test at Extreme Temperature.

**Measured Data at Low Temperature ( -40°C)**

	<b>Nominal Carrier Frequency (MHz)</b>	<b>Measured Frequency at EUT Input</b>	<b>Measured Frequency at EUT Output at 120V AC</b>	<b>Frequency Deviation from EUT Output to EUT Input (ppm)</b>
<b>Uplink</b>	836.5	836 500 000.0	836 500 000.0	0
<b>Downlink</b>	881.5	881 500 000.0	881 500 000.0	0

**Measured Data at Low Temperature ( 0°C)**

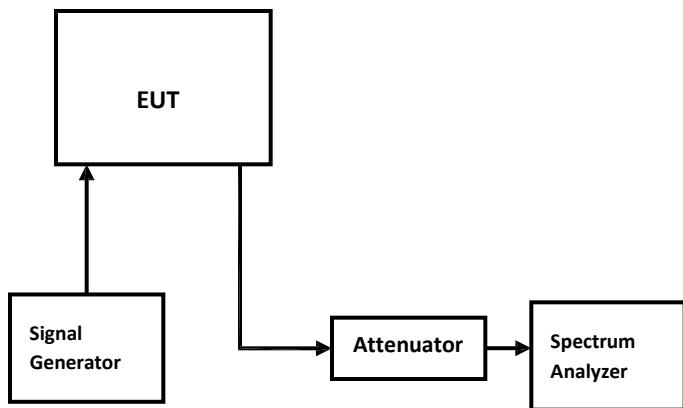
	<b>Nominal Carrier Frequency (MHz)</b>	<b>Measured Frequency at EUT Input</b>	<b>Measured Frequency at EUT Output at 120V AC</b>	<b>Frequency Deviation from EUT Output to EUT Input (ppm)</b>
<b>Uplink</b>	836.5	836 500 000.0	836 500 000.0	0
<b>Downlink</b>	881.5	881 500 000.0	881 500 000.0	0

**Measured Data at High Temperature ( +50°C)**

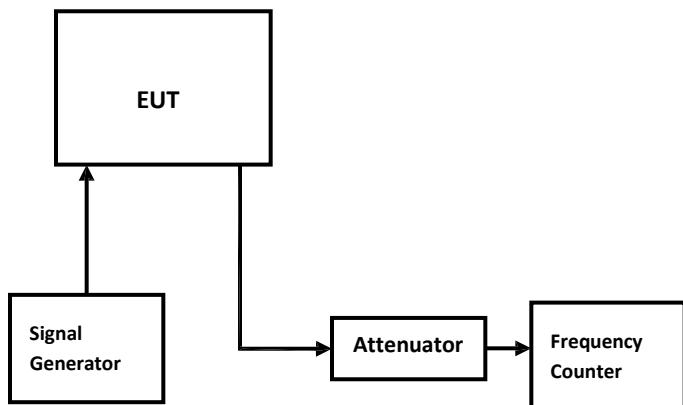
	<b>Nominal Carrier Frequency (MHz)</b>	<b>Measured Frequency at EUT Input</b>	<b>Measured Frequency at EUT Output at 120V AC</b>	<b>Frequency Deviation from EUT Output to EUT Input (ppm)</b>
<b>Uplink</b>	836.5	836 500 000.0	836 500 000.0	0
<b>Downlink</b>	881.5	881 500 000.0	881 500 000.0	0

# Appendix A: Block Diagram of Test Setup

Conducted Emissions, Output Power, Occupied Bandwidth, Passband Gain and Bandwidth



Frequency Stability



## Appendix B: Test Setup Photographs

### Frequency Stability Setup:



### General Test Setup:

