

FCC Part 22H & 24E Measurement and Test Report

For
CHEP

2901 Tasman Drive Suite 107 Santa Clara 95054

FCC ID: 2APRDULTRA

FCC Rules: FCC Part 22H, FCC Part 24E

Product Description: CHEP Pallet Tracker

Tested Model: Ultra

Report No.: STR18028049I

Sample Receipt Date: 2018-02-06

Tested Date: 2018-02-07 to 2018-03-12

Issued Date: 2018-03-12

Tested By: Jason Su / Engineer

Reviewed By: Silin Chen / EMC Manager

Approved & Authorized By: Jandy So / PSQ Manager

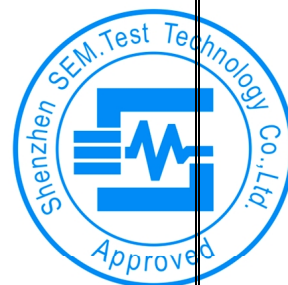
Prepared By:

Shenzhen SEM Test Technology Co., Ltd.

1/F, Building A, Hongwei Industrial Park, Liuxian 2nd Road,
Bao'an District, Shenzhen, P.R.C. (518101)

Tel.: +86-755-33663308 Fax.: +86-755-33663309 Website: www.semtest.com.cn

Jason Su
Silin Chen
Jandy So



Note: This test report is limited to the above client company and the product model only. It may not be duplicated without prior permitted by Shenzhen SEM. Test Technology Co., Ltd.

**TABLE OF CONTENTS**

1. GENERAL INFORMATION.....	3
1.1 PRODUCT DESCRIPTION FOR EQUIPMENT UNDER TEST (EUT).....	3
1.2 TEST STANDARDS.....	5
1.3 TEST METHODOLOGY.....	5
1.4 TEST FACILITY	5
1.5 EUT SETUP AND TEST MODE.....	6
1.6 MEASUREMENT UNCERTAINTY	8
1.7 TEST EQUIPMENT LIST AND DETAILS	8
2. SUMMARY OF TEST RESULTS	9
3. RF EXPOSURE	10
3.1 STANDARD APPLICABLE.....	10
3.2 TEST RESULT.....	10
4. RF OUTPUT POWER	11
4.1 STANDARD APPLICABLE.....	11
4.2 TEST PROCEDURE.....	11
4.3 ENVIRONMENTAL CONDITIONS	11
4.4 SUMMARY OF TEST RESULTS/PLOTS	12
5. PEAK-TO-AVERAGE RATIO (PAR) OF TRANSMITTER.....	19
5.1 STANDARD APPLICABLE.....	19
5.2 TEST PROCEDURE.....	19
5.3 ENVIRONMENTAL CONDITIONS	19
5.4 SUMMARY OF TEST RESULTS	20
6. EMISSION BANDWIDTH.....	21
6.1 STANDARD APPLICABLE.....	21
6.2 TEST PROCEDURE.....	21
6.3 ENVIRONMENTAL CONDITIONS	21
6.4 SUMMARY OF TEST RESULTS/PLOTS	22
7. OUT OF BAND EMISSIONS AT ANTENNA TERMINAL.....	39
7.1 STANDARD APPLICABLE.....	39
7.2 TEST PROCEDURE.....	39
7.3 ENVIRONMENTAL CONDITIONS	39
7.4 SUMMARY OF TEST RESULTS/PLOTS	40
8. SPURIOUS RADIATED EMISSIONS.....	88
8.1 STANDARD APPLICABLE.....	88
8.2 TEST PROCEDURE.....	88
8.3 ENVIRONMENTAL CONDITIONS	88
8.4 SUMMARY OF TEST RESULTS/PLOTS	88
9. FREQUENCY STABILITY	99
9.1 STANDARD APPLICABLE.....	99
9.2 TEST PROCEDURE.....	99
9.3 ENVIRONMENTAL CONDITIONS	99
9.4 SUMMARY OF TEST RESULTS/PLOTS	100



1. GENERAL INFORMATION

1.1 Product Description for Equipment Under Test (EUT)

Client Information

Applicant: CHEP
Address of applicant: 2901 Tasman Drive Suite 107 Santa Clara 95054

Manufacturer: Minewing (Shenzhen) Electronics Integrated Co., Ltd
Address of manufacturer: Floor #2, Building H2, Hongfa-Tech Park, No 32 TonG
Tau Road, ShiYan Town, Bao'An District, Shenzhen, China,
518108

General Description of EUT:	
Product Name:	CHEP Pallet Tracker
Brand Name:	/
Model No.:	Ultra
Adding Model(s):	/
Rated Voltage:	DC 10.5V
Software Version:	/
Hardware Version:	/
Device Category:	Mobile Device
<i>The EUT Main board support GSM850/900/DCS1800/PCS1900, WCDMA Band 2/5 function. It is intended for speech, Multimedia Message Service (MMS) transmission. It is equipped with GPRS/EDGE class 12 for GSM850/900/DCS1800/PCS1900, GPS, FM, Bluetooth and Wi-Fi functions. For more information see the following datasheet</i>	
<i>Note: The test data is gathered from a production sample provided by the manufacturer.</i>	

Technical Characteristics of EUT:	
2G	
Support Networks:	GPRS, EDGE
Support Band:	GSM850/PCS1900
Uplink Frequency:	GPRS/EDGE 850: 824~849MHz GPRS/EDGE 1900: 1850~1910MHz
Downlink Frequency:	GPRS/EDGE 850: 869~894MHz GPRS/EDGE 1900: 1930~1990MHz
Max RF Output Power:	GSM850: 32.45dBm, GSM1900: 29.21dBm EDGE850: 26.90dBm, EDGE1900: 25.24dBm
Type of Emission:	GSM850: 247KGXW, GSM1900: 245KGXW EDGE850: 249KG7W, EDGE1900: 256KG7W
Type of Modulation:	GMSK, 8DPSK
Type of Antenna:	Integral
Antenna Gain:	GSM850: -4.5dBi; PCS 1900: -4.0dBi
GPRS/EDGE Class:	Class 12
3G	
Support Networks:	WCDMA, HSDPA, HSUPA
Support Band:	WCDMA Band 2, WCDMA Band 5
Uplink Frequency:	WCDMA Band 2: 1850~1910MHz WCDMA Band 5: 824~849MHz
Downlink Frequency:	WCDMA Band 2: 1930~1990MHz WCDMA Band 5: 869~894MHz
RF Output Power:	WCDMA Band 2: 24.31dBm, WCDMA Band 5: 25.02dBm
Type of Emission:	WCDMA Band 2: 4M24F9W WCDMA Band 5: 4M22F9W
Type of Modulation:	GMSK, 8DPSK
Antenna Type:	Integral
Antenna Gain:	WCDMA Band 2: -4.0dBi, WCDMA Band 5: -4.5dBi

1.2 Test Standards

The following report is prepared on behalf of the CHEP in accordance with FCC Part 2 subpart J, FCC Part 22 subpart H and FCC Part 24 subpart E of the Federal Communication Commissions rules.

The objective is to determine compliance with FCC Part 2 subpart J, FCC Part 22 subpart H and FCC Part 24 subpart E of the Federal Communication Commissions rules.

Maintenance of compliance is the responsibility of the manufacturer. Any modification of the product, which result in lowering the emission, should be checked to ensure compliance has been maintained.

1.3 Test Methodology

All measurements contained in this report were conducted with ANSI/TIA-603-D: 2010 and ANSI C63.4-2014, American National Standard for Methods of Measurement of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the range of 9 kHz to 40 GHz. The measurement guide KDB 971168 D01 Power Meas License Digital Systems v03 shall be performed also.

1.4 Test Facility

FCC – Registration No.: 125990

Shenzhen SEM Test Technology Co., Ltd. Laboratory has been recognized to perform compliance testing on equipment subject to the Commissions Declaration Of Conformity (DOC). The Designation Number is CN5010, and Test Firm Registration Number is 125990.

Industry Canada (IC) Registration No.: 11464A

The 3m Semi-anechoic chamber of Shenzhen SEM.Test Technology Co., Ltd. has been registered by Certification and Engineering Bureau of Industry Canada for radio equipment testing with Registration No.: 11464A.

1.5 EUT Setup and Test Mode

The EUT was operated in the engineering mode to fix the Tx frequency that was for the purpose of the measurements. All testing shall be performed under maximum output power condition, and to measure its highest possible emissions level, more detailed description as follows:

Test Mode List		
Test Mode	Description	Remark
TM1	GPRS 850	Low, Middle, High Channels
TM2	EDGE 850	Low, Middle, High Channels
TM3	GPRS 1900	Low, Middle, High Channels
TM4	EDGE 1900	Low, Middle, High Channels
TM5	WCDMA Band 5	Low, Middle, High Channels
TM6	HSDPA Band 5	Low, Middle, High Channels
TM7	HSUPA Band 5	Low, Middle, High Channels
TM8	WCDMA Band 2	Low, Middle, High Channels
TM9	HSDPA Band 2	Low, Middle, High Channels
TM10	HSUPA Band 2	Low, Middle, High Channels

Testing Configure			
Support Band	Support Standard	Channel Frequency	Channel Number
GSM 850	GPRS/EDGE	824.2 MHz	128
		836.6 MHz	190
		848.8 MHz	251
PCS 1900	GPRS/EDGE	1850.2 MHz	512
		1880.0 MHz	661
		1909.8 MHz	810
WCDMA Band 5	WCDMA/HSDPA/HSUPA	826.4 MHz	4132
		836.6 MHz	4183
		846.6 MHz	4233
WCDMA Band 2	WCDMA/HSDPA/HSUPA	1852.4 MHz	9262
		1880.0 MHz	9400
		1907.6 MHz	9538
Note: the transmitter has been tested on the communications mode of GPRS, EDGE, WCDMA, HSDPA, HSUPA compliance test and record the worst case.			

EUT Cable List and Details

Cable Description	Length (M)	Shielded/Unshielded	With Core/Without Core
/	/	/	/

Auxiliary Equipment List and Details

Description	Manufacturer	Model	Serial Number
/	/	/	/

Special Cable List and Details

Cable Description	Length (M)	Shielded/Unshielded	With Core/Without Core
/	/	/	/

1.6 Measurement Uncertainty

Measurement uncertainty		
Parameter	Conditions	Uncertainty
RF Output Power	Conducted	$\pm 0.42\text{dB}$
Occupied Bandwidth	Conducted	$\pm 1.5\%$
Frequency Stability	Conducted	2.3%
Transmitter Spurious Emissions	Conducted	$\pm 0.42\text{dB}$
Transmitter Spurious Emissions	Radiated	30-200MHz $\pm 4.52\text{dB}$
		0.2-1GHz $\pm 5.56\text{dB}$
		1-6GHz $\pm 3.84\text{dB}$
		6-18GHz $\pm 3.92\text{dB}$

1.7 Test Equipment List and Details

No.	Description	Manufacturer	Model	Serial No.	Cal Date	Due. Date
SEMT-1075	Communication Tester	Rohde & Schwarz	CMW500	148650	2017-06-12	2018-06-11
SEMT-1063	GSM Tester	Rohde & Schwarz	CMU200	114403	2017-06-12	2018-06-11
SEMT-1072	Spectrum Analyzer	Agilent	E4407B	MY41440400	2017-06-12	2018-06-11
SEMT-1079	Spectrum Analyzer	Agilent	N9020A	US47140102	2017-06-12	2018-06-11
SEMT-1080	Signal Generator	Agilent	83752A	3610A01453	2017-06-12	2018-06-11
SEMT-1081	Vector Signal Generator	Agilent	N5182A	MY47070202	2017-06-12	2018-06-11
SEMT-1028	Power Divider	Weinschel	1506A	PM204	2017-06-12	2018-06-11
SEMT-1082	Power Divider	RF-Lambda	RFLT4W5M18G	14110400027	2017-06-12	2018-06-11
SEMT-1031	Spectrum Analyzer	Rohde & Schwarz	FSP30	836079/035	2017-06-12	2018-06-11
SEMT-1007	EMI Test Receiver	Rohde & Schwarz	ESVB	825471/005	2017-06-12	2018-06-11
SEMT-1008	Amplifier	Agilent	8447F	3113A06717	2017-06-12	2018-06-11
SEMT-1043	Amplifier	C&D	PAP-1G18	2002	2017-06-12	2018-06-11
SEMT-1069	Loop Antenna	Schwarz beck	FMZB 1516	9773	2017-06-08	2018-06-07
SEMT-1068	Broadband Antenna	Schwarz beck	VULB9163	9163-333	2017-06-08	2018-06-07
SEMT-1042	Horn Antenna	ETS	3117	00086197	2017-06-08	2018-06-07
SEMT-1121	Horn Antenna	Schwarzbeck	BBHA 9170	BBHA9170582	2017-06-08	2018-06-07
SEMT-1168	Pre-amplifier	Direction Systems Inc.	PAP-0126	14141-12838	2017-08-15	2018-08-14
SEMT-1169	Pre-amplifier	Direction Systems Inc.	PAP-2640	14145-14153	2017-08-15	2018-08-14
SEMT-1163	Spectrum Analyzer	Rohde & Schwarz	FSP40	100612	2017-06-12	2018-06-11
SEMT-1170	DRG Horn Antenna	A.H. SYSTEMS	SAS-574	571	2017-03-09	2018-03-08

2. SUMMARY OF TEST RESULTS

FCC Rules	Description of Test Item	Result
§ 1.1307, § 2.1093	RF Exposure	Compliant
§ 22.913 (a), § 24.232 (c)	RF Output Power	Compliant
§ 24.51	Peak-to-average Ratio (PAR) of Transmitter	Compliant
§ 22.917 (b), § 24.238 (b)	Emission Bandwidth	Compliant
§ 22.917 (a), § 24.238 (a)	Spurious Emissions at Antenna Terminal	Compliant
§ 22.917 (a), § 24.238 (a)	Spurious Radiation Emissions	Compliant
§ 22.917 (a), § 24.238 (a)	Out of Band Emissions	Compliant
§ 22.355, § 24.235	Frequency Stability	Compliant



3. RF Exposure

3.1 Standard Applicable

According to § 1.1307 and § 2.1093, the portable transmitter must comply the RF exposure requirements.

3.2 Test Result

This product complied with the requirement of the RF exposure, please see the SAR report.

4. RF Output Power

4.1 Standard Applicable

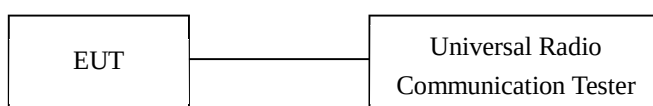
According to §22.913(a)(2), The ERP of mobile and portable stations transmitters and auxiliary test transmitters must not exceed 7 Watts.

According to §24.232 (c), Mobile and portable stations are limited to 2 watts EIRP and the equipment must employ a means for limiting power to the minimum necessary for successful communications.

According to §27.50(d)(4), Fixed, mobile, and portable (hand-held) stations operating in the 1710-1755 MHz band and mobile and portable stations operating in the 1695-1710 MHz and 1755-1780 MHz bands are limited to 1 watt EIRP.

4.2 Test Procedure

Conducted output power test method:



Radiated power test method:

1. The setup of EUT is according with per ANSI/TIA Standard 603D and ANSI C63.4-2014 measurement procedure.
2. 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.
3. The frequency range up to tenth harmonic of the fundamental frequency was investigated.
4. 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.

4.3 Environmental Conditions

Temperature:	24 °C
Relative Humidity:	54%
ATM Pressure:	1011 mbar

4.4 Summary of Test Results/Plots

Max. Radiated Power

ERP For GPRS Mode GSM850

Frequency	Substitute SG	Height	Table	Polar	Cable loss	Antenna Gain	Result	FCC Part 22H Limit
MHz	dBm	Meter	Degree	H / V	dB	dB	dBm	dBm
Low Channel								
824.2	28.1	1.5	0	H	1.5	0	26.6	38.45
824.2	27.48	1.5	0	V	1.5	0	25.98	38.45
Middle Channel								
836.6	28.55	1.5	0	H	1.5	0	27.05	38.45
836.6	28.74	1.5	0	V	1.5	0	27.24	38.45
High Channel								
848.8	28.61	1.5	0	H	1.5	0	27.11	38.45
848.8	28.61	1.5	0	V	1.5	0	27.11	38.45

EIRP For GPRS Mode PCS1900

Frequency	Substitute SG	Height	Table	Polar	Cable loss	Antenna Gain	Result	FCC Part 24E Limit
MHz	dBm	Meter	Degree	H / V	dB	dB	dBm	dBm
Low Channel								
1850.2	20.02	1.5	0	H	1.9	7.7	25.82	33.00
1850.2	18.42	1.5	0	V	1.9	7.7	24.22	33.00
Middle Channel								
1880.0	19.1	1.5	0	H	1.9	7.7	24.9	33.00
1880.0	18.45	1.5	0	V	1.9	7.7	24.25	33.00
High Channel								
1909.8	19.63	1.5	0	H	1.9	7.7	25.43	33.00
1909.8	18.82	1.5	0	V	1.9	7.7	24.62	33.00

ERP For EDGE Mode GSM850

Frequency	Substitute SG	Height	Table	Polar	Cable loss	Antenna Gain	Result	FCC Part 22H Limit
MHz	dBm	Meter	Degree	H / V	dB	dB	dBm	dBm
Low Channel								
824.2	25.26	1.5	0	H	1.5	0	23.76	38.45
824.2	25.77	1.5	0	V	1.5	0	24.27	38.45
Middle Channel								
836.6	24.96	1.5	0	H	1.5	0	23.46	38.45
836.6	26.36	1.5	0	V	1.5	0	24.86	38.45
High Channel								
848.8	24.78	1.5	0	H	1.5	0	23.28	38.45
848.8	24.67	1.5	0	V	1.5	0	23.17	38.45

EIRP For EDGE Mode PCS1900

Frequency	Substitute SG	Height	Table	Polar	Cable loss	Antenna Gain	Result	FCC Part 24E Limit
MHz	dBm	Meter	Degree	H / V	dB	dB	dBm	dBm
Low Channel								
1850.2	17.92	1.5	0	H	1.9	7.7	23.72	33.00
1850.2	17.14	1.5	0	V	1.9	7.7	22.94	33.00
Middle Channel								
1880.0	17.57	1.5	0	H	1.9	7.7	23.37	33.00
1880.0	17.07	1.5	0	V	1.9	7.7	22.87	33.00
High Channel								
1909.8	17.21	1.5	0	H	1.9	7.7	23.01	33.00
1909.8	16.28	1.5	0	V	1.9	7.7	22.08	33.00

ERP For WCDMA Mode Band 5

Frequency	Substitute SG	Height	Table	Polar	Cable loss	Antenna Gain	Result	FCC Part 22H Limit
MHz	dBm	Meter	Degree	H / V	dB	dBd	dBm	dBm
Low Channel								
826.4	24.91	1.5	0	H	1.5	0	23.41	38.45
826.4	25.62	1.5	0	V	1.5	0	24.12	38.45
Middle Channel								
836.6	23.68	1.5	0	H	1.5	0	22.18	38.45
836.6	24.9	1.5	0	V	1.5	0	23.4	38.45
High Channel								
846.6	24.98	1.5	0	H	1.5	0	23.48	38.45
846.6	24.08	1.5	0	V	1.5	0	22.58	38.45

ERP For HSDPA Mode Band 5

Frequency	Substitute SG	Height	Table	Polar	Cable loss	Antenna Gain	Result	FCC Part 22H Limit
MHz	dBm	Meter	Degree	H / V	dB	dBd	dBm	dBm
Low Channel								
826.4	20.85	1.5	0	H	1.5	0	19.35	38.45
826.4	22.77	1.5	0	V	1.5	0	21.27	38.45
Middle Channel								
836.6	20.94	1.5	0	H	1.5	0	19.44	38.45
836.6	20.23	1.5	0	V	1.5	0	18.73	38.45
High Channel								
846.6	20.84	1.5	0	H	1.5	0	19.34	38.45
846.6	21.34	1.5	0	V	1.5	0	19.84	38.45

ERP For HSPA Mode Band 5

Frequency	Substitute SG	Height	Table	Polar	Cable loss	Antenna Gain	Result	FCC Part 22H Limit
MHz	dBm	Meter	Degree	H / V	dB	dBd	dBm	dBm
Low Channel								
826.4	21.81	1.5	0	H	1.5	0	20.31	38.45
826.4	21.62	1.5	0	V	1.5	0	20.12	38.45
Middle Channel								
836.6	21.25	1.5	0	H	1.5	0	19.75	38.45
836.6	22.17	1.5	0	V	1.5	0	20.67	38.45
High Channel								
846.6	20.06	1.5	0	H	1.5	0	18.56	38.45
846.6	22.22	1.5	0	V	1.5	0	20.72	38.45

EIRP For WCDMA Mode Band 2

Frequency	Substitute SG	Height	Table	Polar	Cable loss	Antenna Gain	Result	FCC Part 24E Limit
MHz	dBm	Meter	Degree	H / V	dB	dB	dBm	dBm
Low Channel								
1852.4	24.03	1.5	0	H	1.5	0	22.53	33
1852.4	25.19	1.5	0	V	1.5	0	23.69	33
Middle Channel								
1880.0	25.95	1.5	0	H	1.5	0	24.45	33
1880.0	24.01	1.5	0	V	1.5	0	22.51	33
High Channel								
1907.6	26.03	1.5	0	H	1.5	0	24.53	33
1907.6	24.96	1.5	0	V	1.5	0	23.46	33

EIRP For HSDPA Mode Band 2

Frequency	Substitute SG	Height	Table	Polar	Cable loss	Antenna Gain	Result	FCC Part 24E Limit
MHz	dBm	Meter	Degree	H / V	dB	dB	dBm	dBm
Low Channel								
1852.4	21.84	1.5	0	H	1.5	0	20.34	33
1852.4	21.71	1.5	0	V	1.5	0	20.21	33
Middle Channel								
1880.0	20.89	1.5	0	H	1.5	0	19.39	33
1880.0	21.96	1.5	0	V	1.5	0	20.46	33
High Channel								
1907.6	20.54	1.5	0	H	1.5	0	19.04	33
1907.6	22.82	1.5	0	V	1.5	0	21.32	33

EIRP For HSUPA Mode Band 2

Frequency	Substitute SG	Height	Table	Polar	Cable loss	Antenna Gain	Result	FCC Part 24E Limit
MHz	dBm	Meter	Degree	H / V	dB	dB	dBm	dBm
Low Channel								
1852.4	21.83	1.5	0	H	1.5	0	20.33	33
1852.4	20.01	1.5	0	V	1.5	0	18.51	33
Middle Channel								
1880.0	21.49	1.5	0	H	1.5	0	19.99	33
1880.0	22	1.5	0	V	1.5	0	20.5	33
High Channel								
1907.6	20.36	1.5	0	H	1.5	0	18.86	33
1907.6	20.42	1.5	0	V	1.5	0	18.92	33

Note: Result = Substitute - Cable loss + Antenna Gain

Max. Conducted Output Power

For Cellular Band (GSM850)

Test Mode	Channel	Frequency (MHz)	Average Power (dBm)	FCC Part 22.913 Limit (dBm)
GPRS(1 Slot)	Low Channel	824.2	32.42	38.45
	Middle Channel	836.6	32.45	38.45
	High Channel	848.8	32.41	38.45
EDGE(1 Slot)	Low Channel	824.2	26.90	38.45
	Middle Channel	836.6	26.89	38.45
	High Channel	848.8	26.87	38.45

For PCS Band (GSM1900)

Test Mode	Channel	Frequency (MHz)	Average Power (dBm)	FCC Part 24.232 Limit (dBm)
GPRS(1 Slot)	Low Channel	1850.2	29.21	33.0
	Middle Channel	1880.0	29.11	33.0
	High Channel	1909.8	29.04	33.0
EDGE(1 Slot)	Low Channel	1850.2	25.24	33.0
	Middle Channel	1880.0	25.13	33.0
	High Channel	1909.8	25.10	33.0

For WCDMA Band 5

Test Mode	Channel	Frequency (MHz)	Average Power (dBm)	FCC Part 22.913 Limit (dBm)
WCDMA	Low Channel	826.4	25.02	38.45
	Middle Channel	836.6	24.38	38.45
	High Channel	846.6	24.19	38.45
HSDPA	Low Channel	826.4	23.39	38.45
	Middle Channel	836.6	23.18	38.45
	High Channel	846.6	23.03	38.45
HSUPA	Low Channel	826.4	23.44	38.45
	Middle Channel	836.6	23.21	38.45
	High Channel	846.6	23.05	38.45

For WCDMA Band 2

Test Mode	Channel	Frequency (MHz)	Average Power (dBm)	FCC Part 24.232 Limit (dBm)
WCDMA	Low Channel	1852.4	24.31	33.00
	Middle Channel	1880.0	24.18	33.00
	High Channel	1907.6	24.27	33.00
HSDPA	Low Channel	1852.4	22.70	33.00
	Middle Channel	1880.0	22.69	33.00
	High Channel	1907.6	22.70	33.00
HSUPA	Low Channel	1852.4	22.68	33.00
	Middle Channel	1880.0	22.19	33.00
	High Channel	1907.6	22.27	33.00

5. Peak-to-average Ratio (PAR) of Transmitter

5.1 Standard Applicable

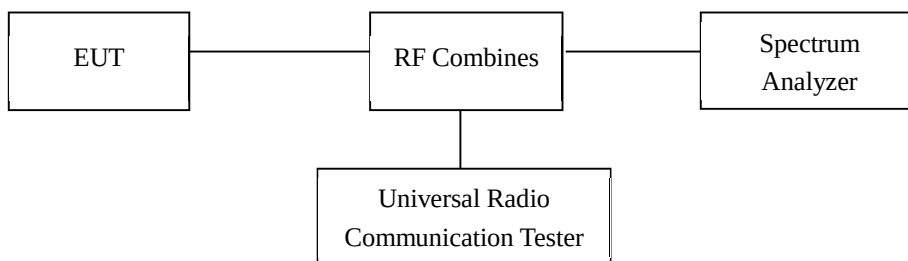
According to §24.232(d), Power measurements for transmissions by stations authorized under this section may be made either in accordance with a Commission-approved average power technique or in compliance with paragraph (e) of this section. In both instances, equipment employed must be authorized in accordance with the provisions of §24.51. In measuring transmissions in this band using an average power technique, the peak-to-average ratio (PAR) of the transmission may not exceed 13 dB.

According to §27.50(B), the peak-to-average power ratio (PAPR) of the transmitter output power must not exceed 13 dB. The PAPR measurements should be made using either an instrument with complementary cumulative distribution function (CCDF) capabilities to determine that PAPR will not exceed 13 dB for more than 0.1 percent of the time or other Commission approved procedure. The measurement must be performed using a signal corresponding to the highest PAPR expected during periods of continuous transmission.

5.2 Test Procedure

The RF output terminal of the transmitter was connected to the input of the spectrum analyzer via a suitable attenuation. The RBW of the spectrum analyzer was set to 30kHz and the peak-to-average ratio (PAR) of the transmission was recorded. Record the maximum PAPR level associated with a probability of 0.1%.

Test Configuration for the emission bandwidth testing:



5.3 Environmental Conditions

Temperature:	25 °C
Relative Humidity:	54%
ATM Pressure:	1011 mbar

5.4 Summary of Test Results

Only the worst case was selected to record

For PCS Band

Test Mode	Channel	Frequency (MHz)	PAR (dB)	Limit (dB)
GPRS(1 Slot)	512	1850.2	3.75	13
EDGE(1 Slot)	512	1850.2	4.30	13

For WCDMA Band 2

Test Mode	Channel	Frequency (MHz)	PAR (dB)	Limit (dB)
WCDMA	9400	1880	4.05	13
HSDPA	9400	1880	3.97	13
HSUPA	9400	1880	4.56	13

6. Emission Bandwidth

6.1 Standard Applicable

According to §22.917(b), The emission bandwidth is defined as the width of the signal between two points, one below the carrier center frequency and one above the carrier center frequency, outside of which all emissions are attenuated at least 26 dB below the transmitter power.

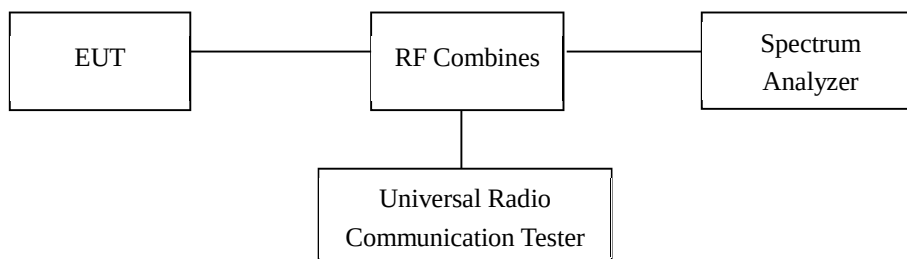
According to §24.238(b), The emission bandwidth is defined as the width of the signal between two points, one below the carrier center frequency and one above the carrier center frequency, outside of which all emissions are attenuated at least 26 dB below the transmitter power.

According to §27.53, The emission bandwidth is defined as the width of the signal between two points, one below the carrier center frequency and one above the carrier center frequency, outside of which all emissions are attenuated at least 26 dB below the transmitter power.

6.2 Test Procedure

The RF output terminal of the transmitter was connected to the input of the spectrum analyzer via a suitable attenuation. The RBW of the spectrum analyzer was set to 10kHz for GSM mode and 100kHz for WCDMA mode, VBW shall be at least 3 times the RBW, and the 26dB bandwidth was recorded.

Test Configuration for the emission bandwidth testing:



6.3 Environmental Conditions

Temperature:	25 °C
Relative Humidity:	54%
ATM Pressure:	1011 mbar

6.4 Summary of Test Results/Plots

For Cellular Band

Test Mode	Channel	Frequency (MHz)	99% Emission Bandwidth (kHz)	26 dB Emission Bandwidth (kHz)
GPRS	128	824.2	247.0993	320.243
	190	836.6	246.6108	321.269
	251	848.8	243.7318	325.241
EDGE	128	824.2	248.6529	316.947
	190	836.6	246.9603	317.367
	251	848.8	244.2611	321.854

For PCS Band

Test Mode	Channel	Frequency (MHz)	99% Emission Bandwidth (kHz)	26 dB Emission Bandwidth (kHz)
GPRS	512	1850.2	240.3304	325.861
	661	1880.0	244.6208	321.529
	810	1909.8	244.9519	304.068
EDGE	512	1850.2	246.3507	327.172
	661	1880.0	256.4462	326.611
	810	1909.8	249.7774	325.821

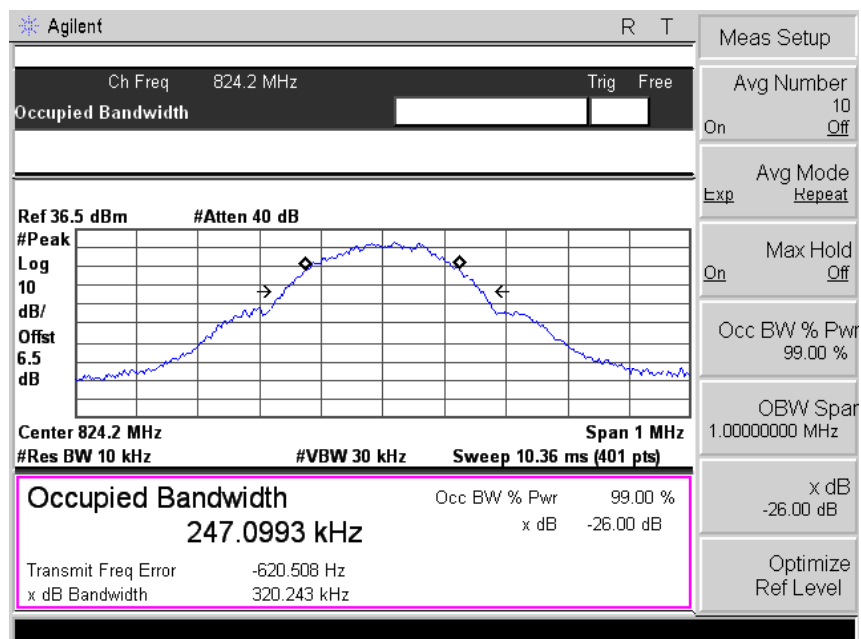
For Band 5

Test Mode	Channel	Frequency (MHz)	99% Emission Bandwidth (MHz)	26 dB Emission Bandwidth (MHz)
WCDMA	4132	826.4	4.2187	4.891
	4183	836.6	4.2135	4.846
	4233	846.6	4.2200	4.841
HSDPA	4132	826.4	4.2056	4.862
	4183	836.6	4.1943	4.880
	4233	846.6	4.2141	4.889
HSUPA	4132	826.4	4.2181	4.903
	4183	836.6	4.2155	4.880
	4233	846.6	4.2159	4.870

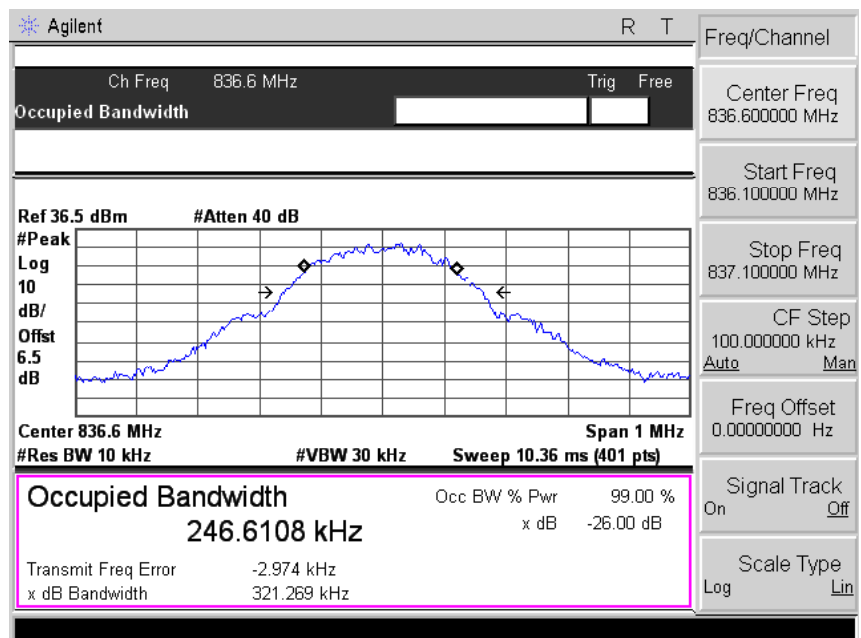
For Band 2

Test Mode	Channel	Frequency (MHz)	99% Emission Bandwidth (MHz)	26 dB Emission Bandwidth (MHz)
WCDMA	9262	1852.4	4.2085	4.850
	9400	1880.0	4.2206	4.880
	9538	1907.6	4.2086	4.899
HSDPA	9262	1852.4	4.1958	4.853
	9400	1880.0	4.2067	4.927
	9538	1907.6	4.2283	4.917
HSUPA	9262	1852.4	4.2163	4.868
	9400	1880.0	4.2162	4.846
	9538	1907.6	4.2421	4.898

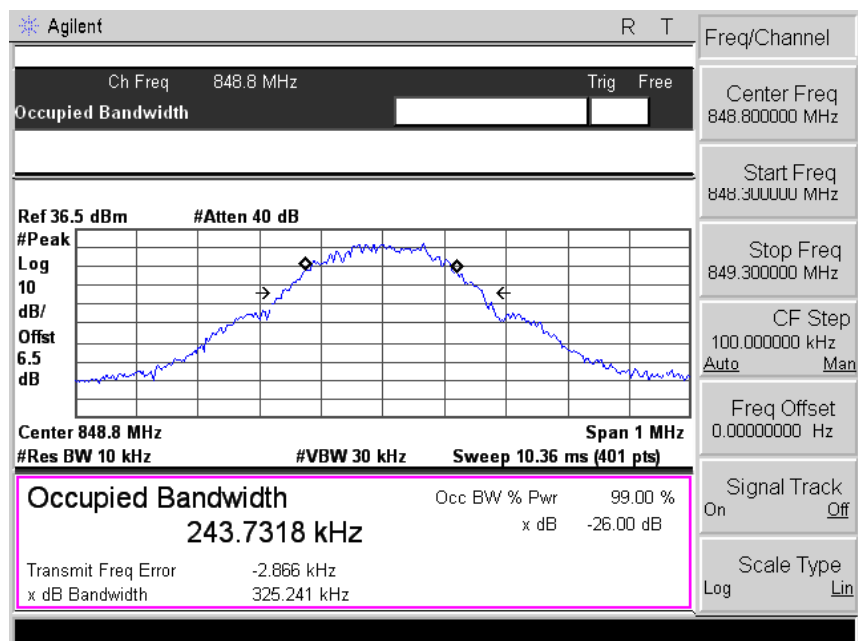
For Cellular Band
GPRS Low Channel



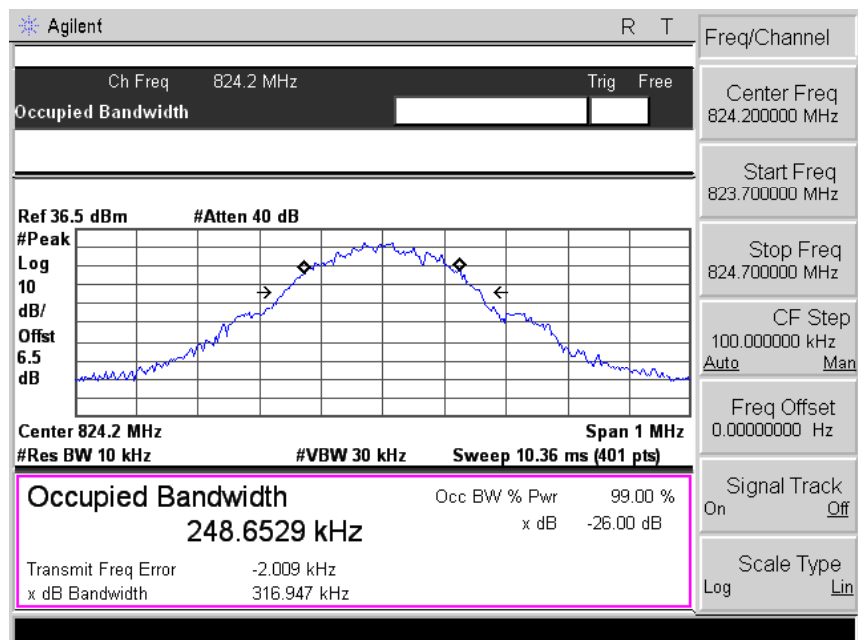
GPRS Middle Channel



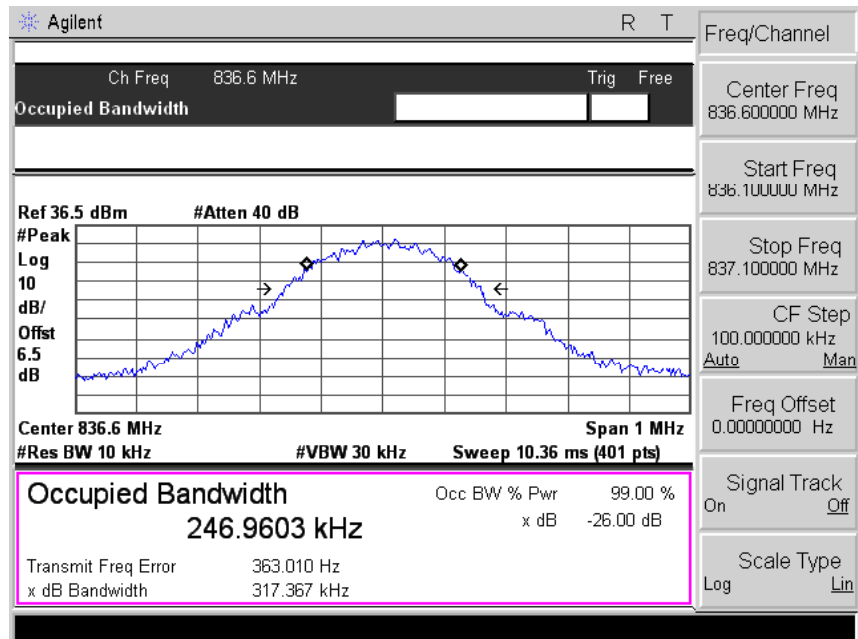
GPRS High Channel



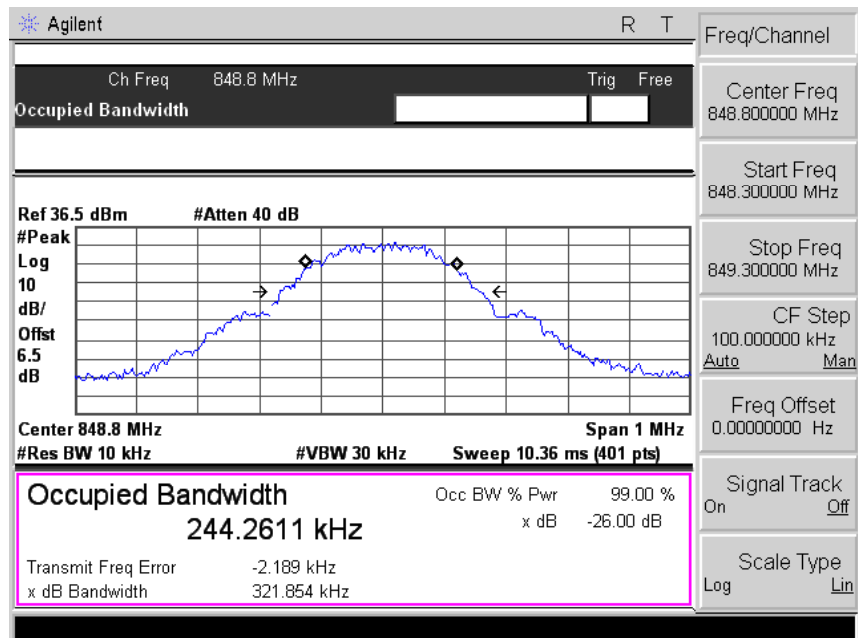
EDGE Low Channel



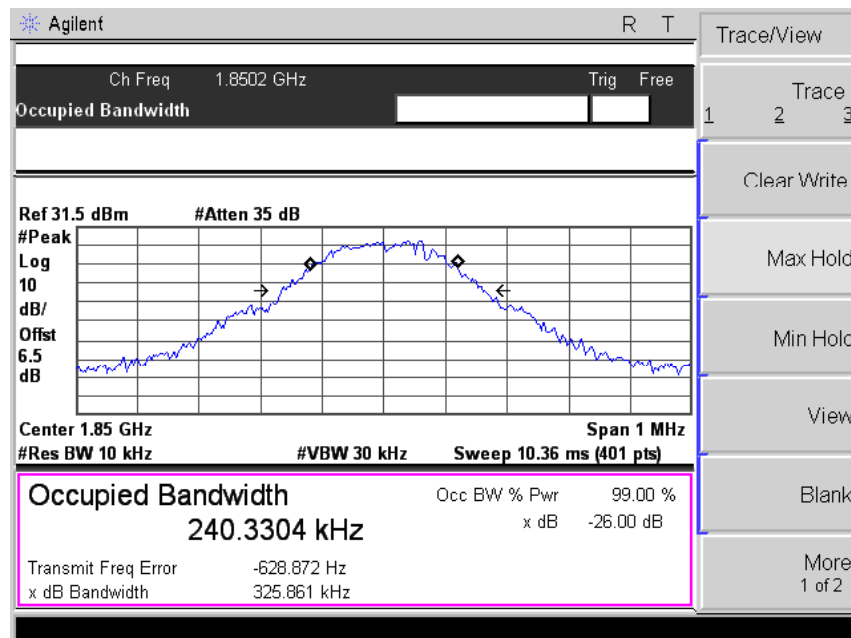
EDGE Middle Channel



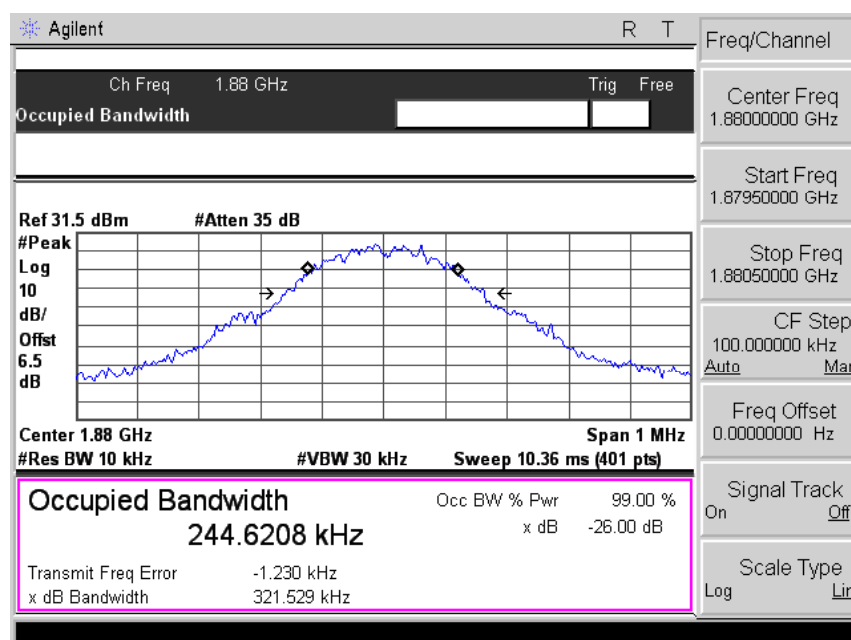
EDGE High Channel



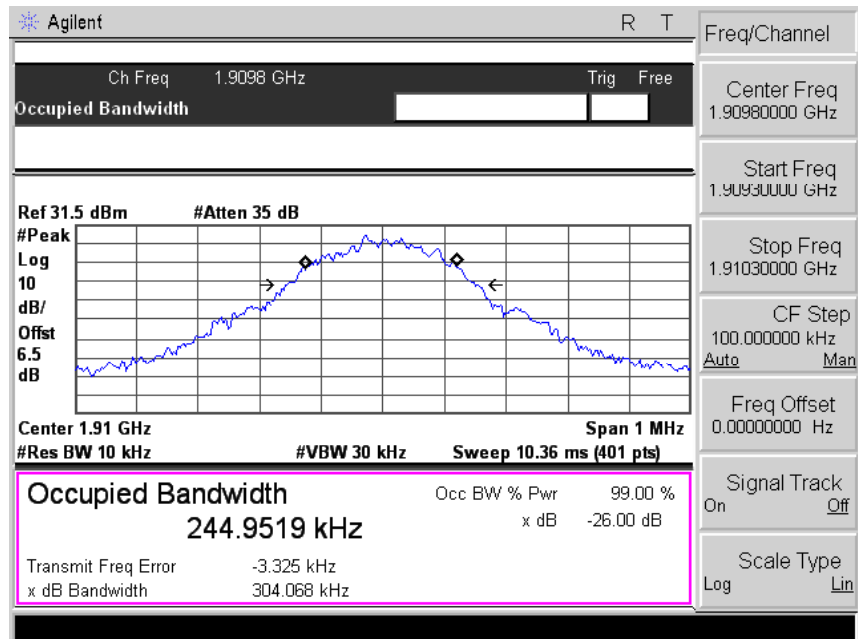
For PCS Band
GPRS Low Channel



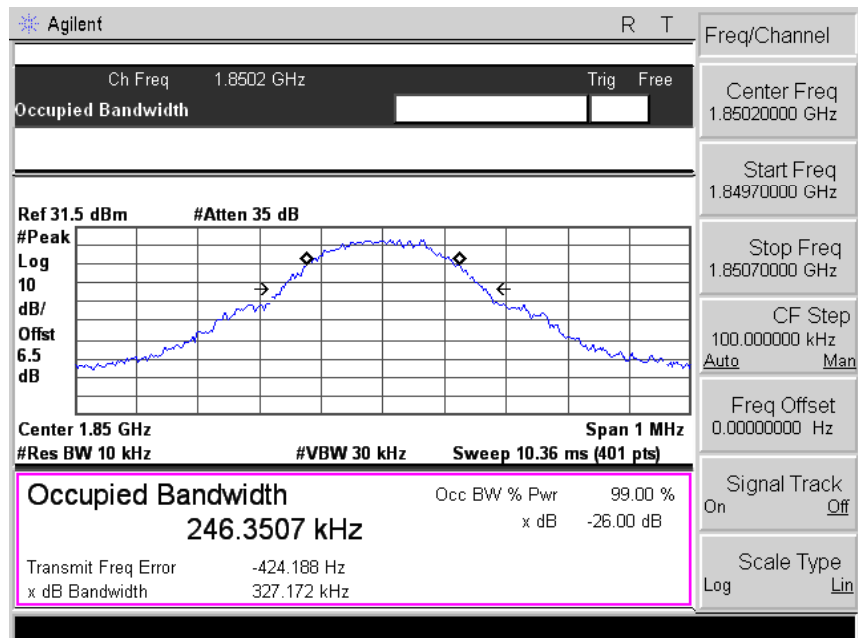
GPRS Middle Channel



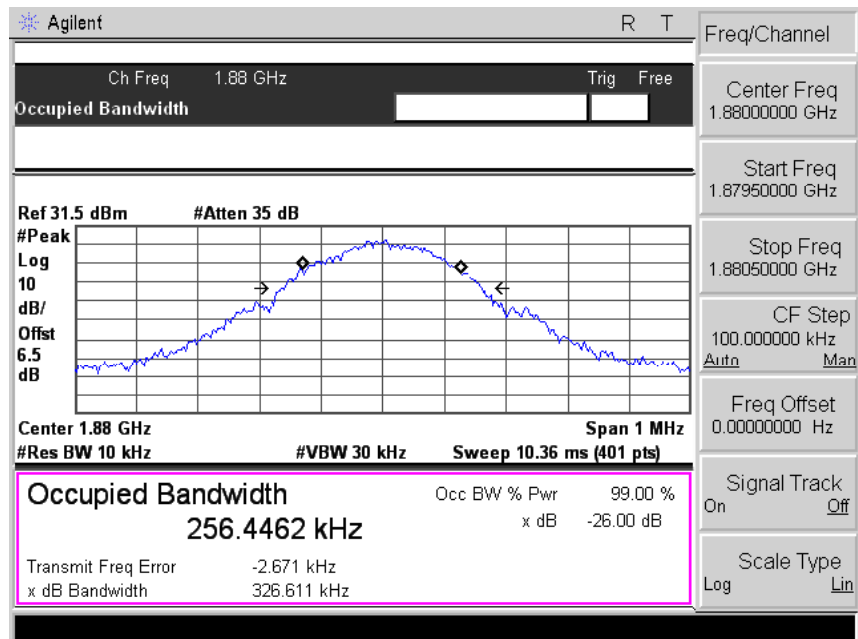
GPRS High Channel



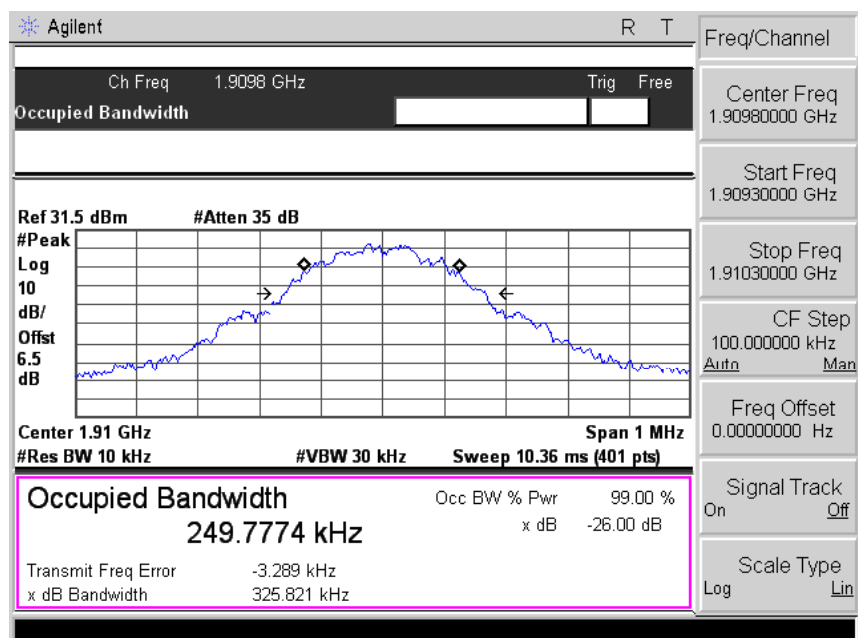
EDGE Low Channel



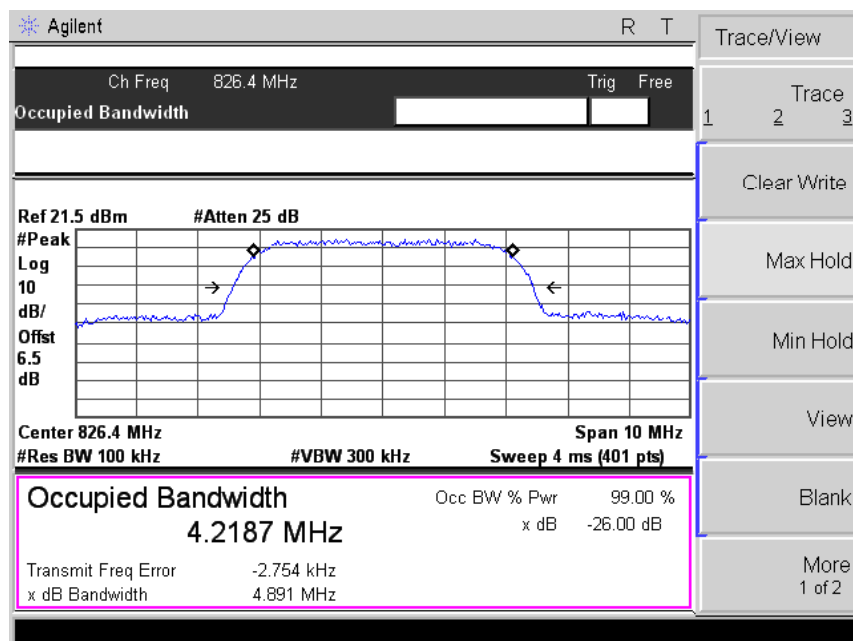
EDGE Middle Channel



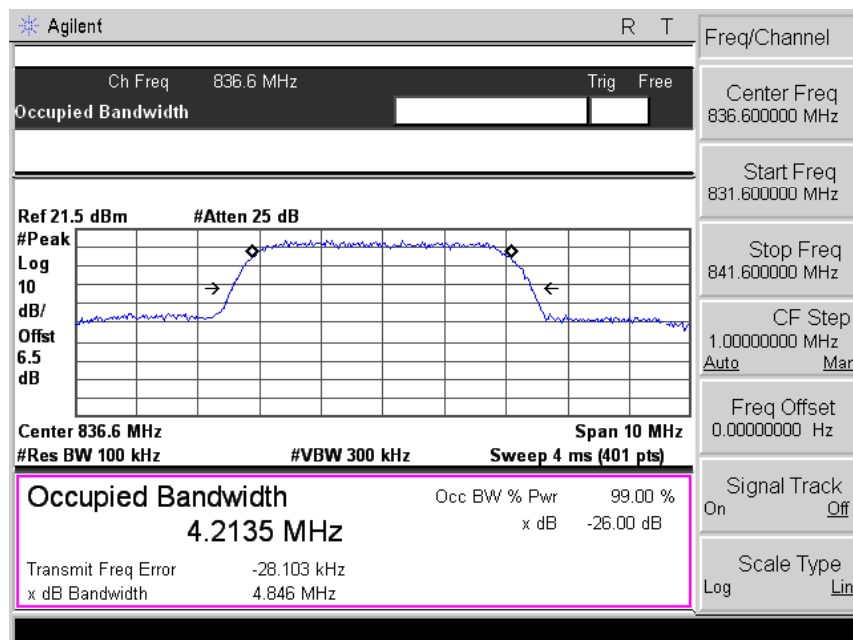
EDGE High Channel



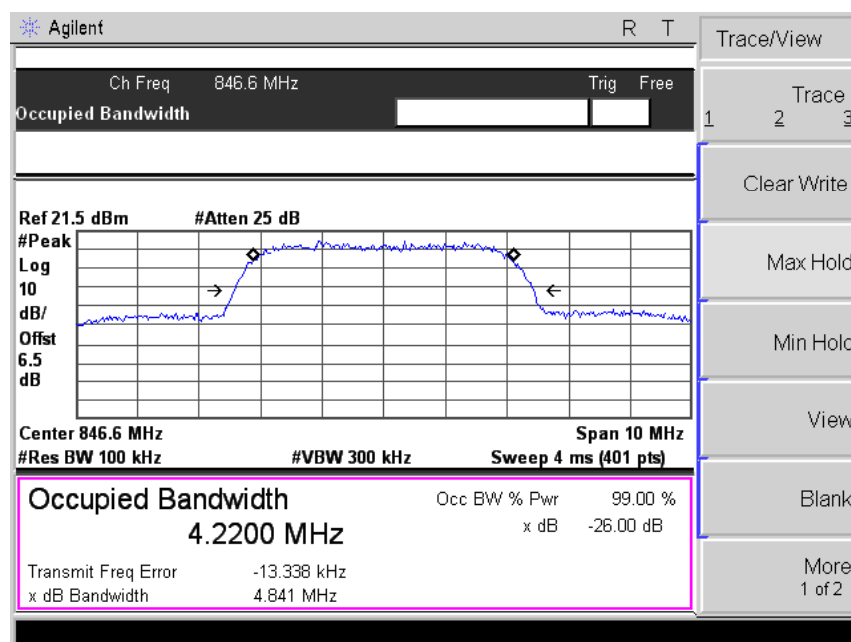
For Band V
WCDMA Low Channel



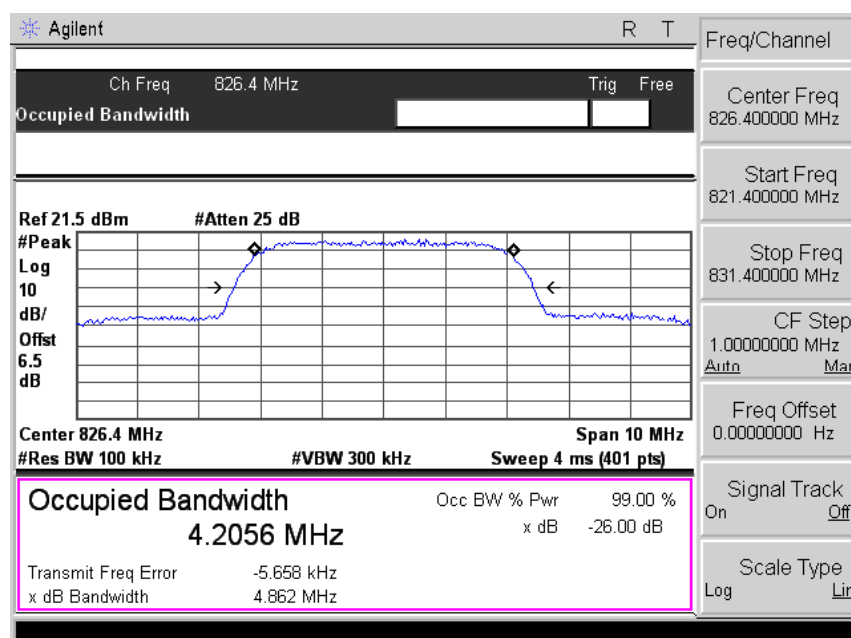
WCDMA Middle Channel



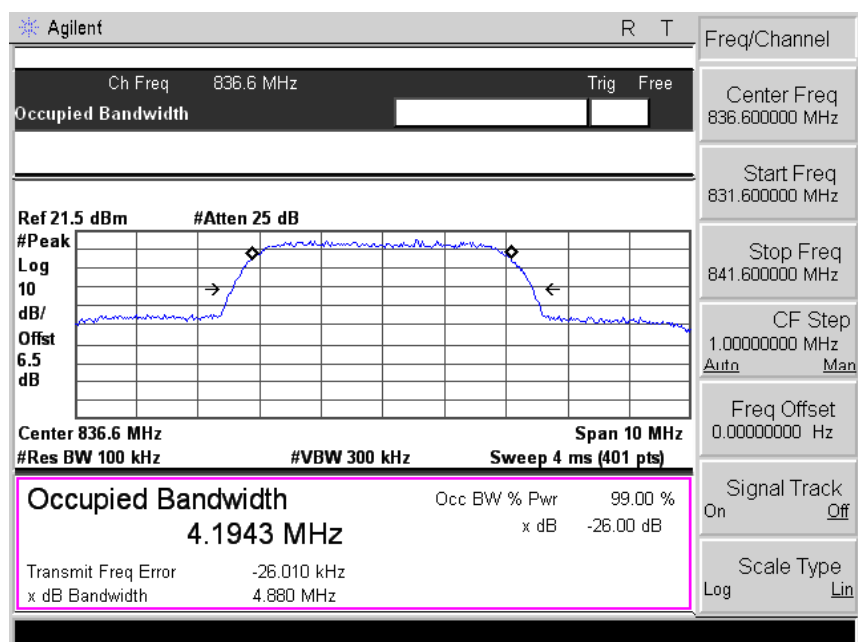
WCDMA High Channel



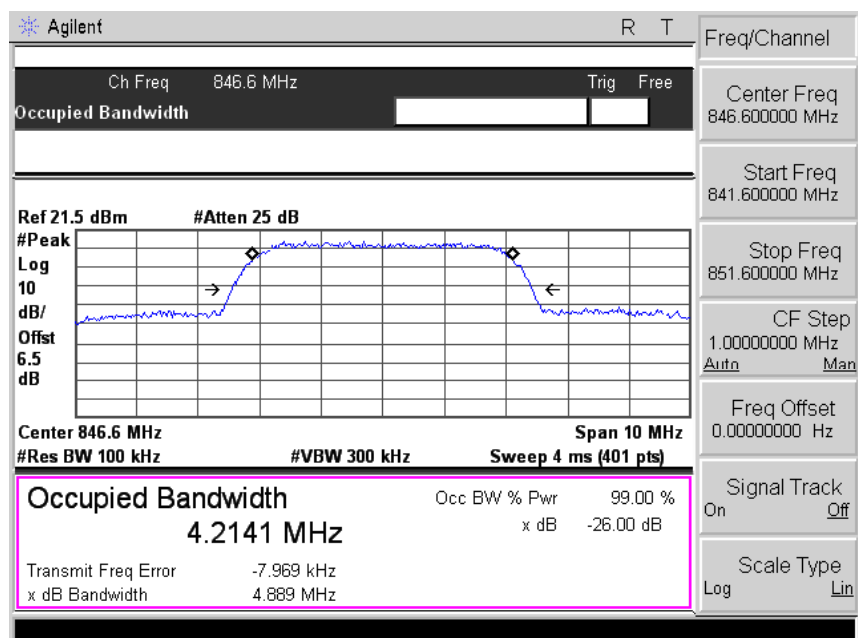
HSDPA Low Channel



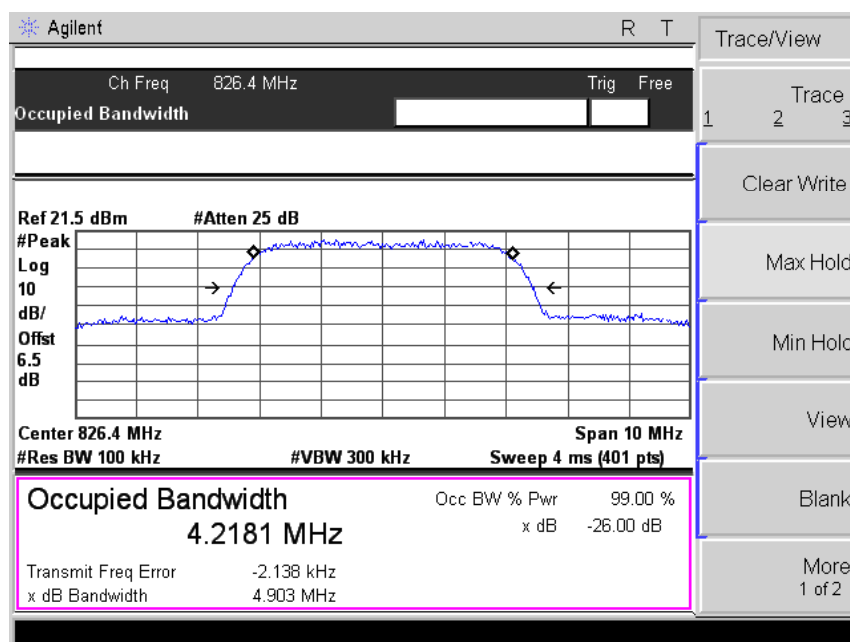
HSDPA Middle Channel



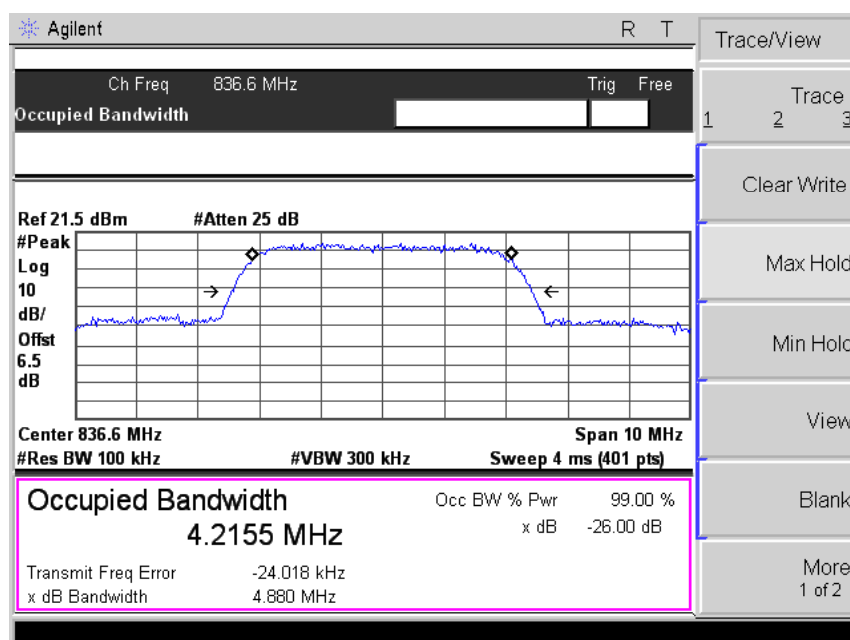
HSDPA High Channel



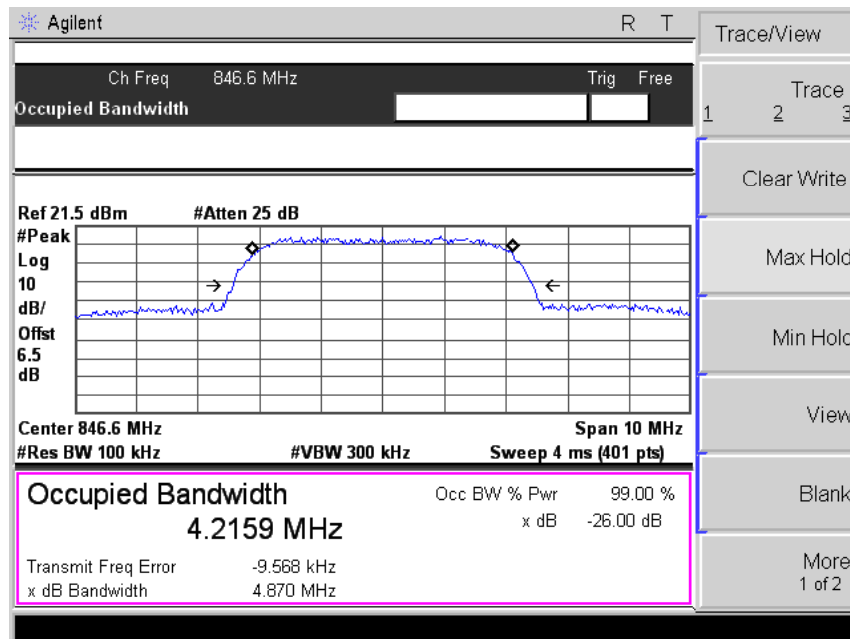
HSUPA Low Channel



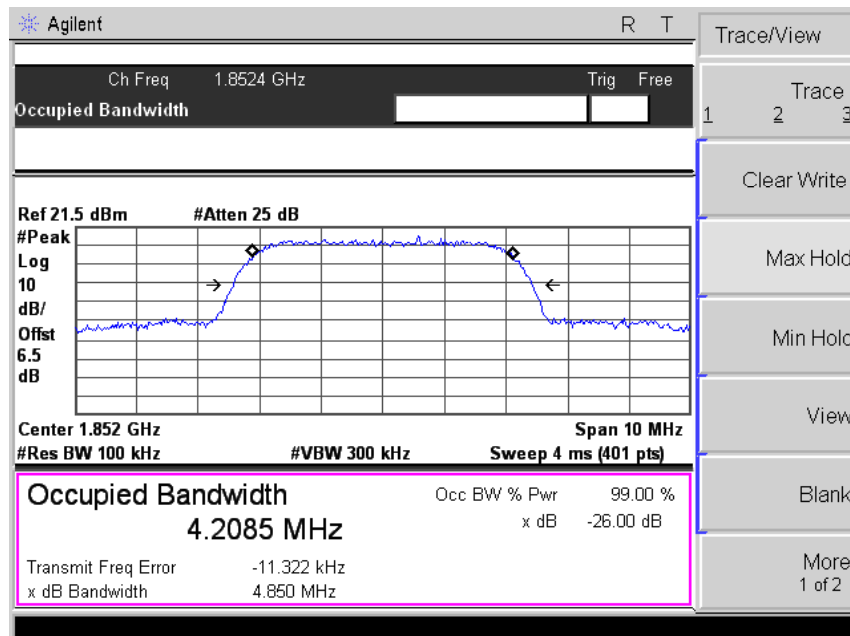
HSUPA Middle Channel



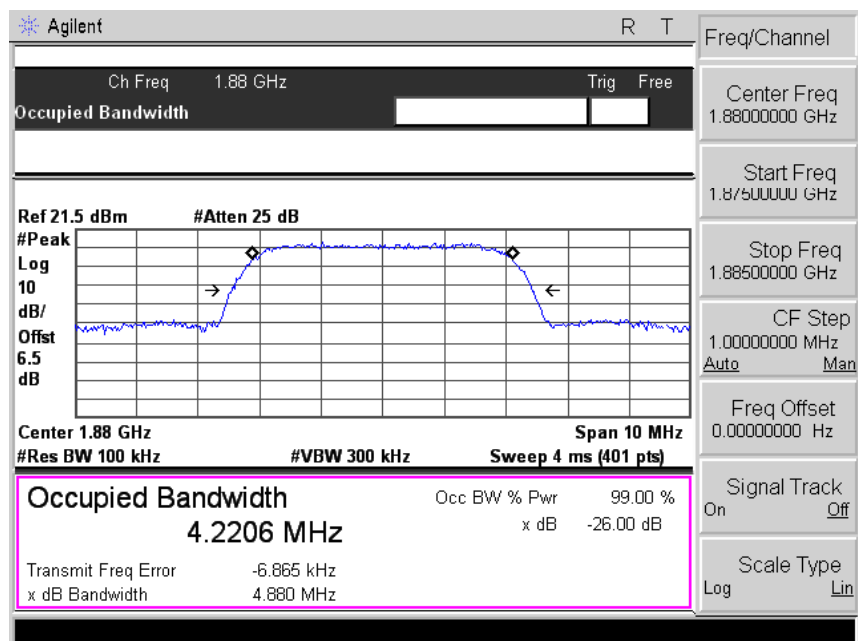
HSUPA High Channel



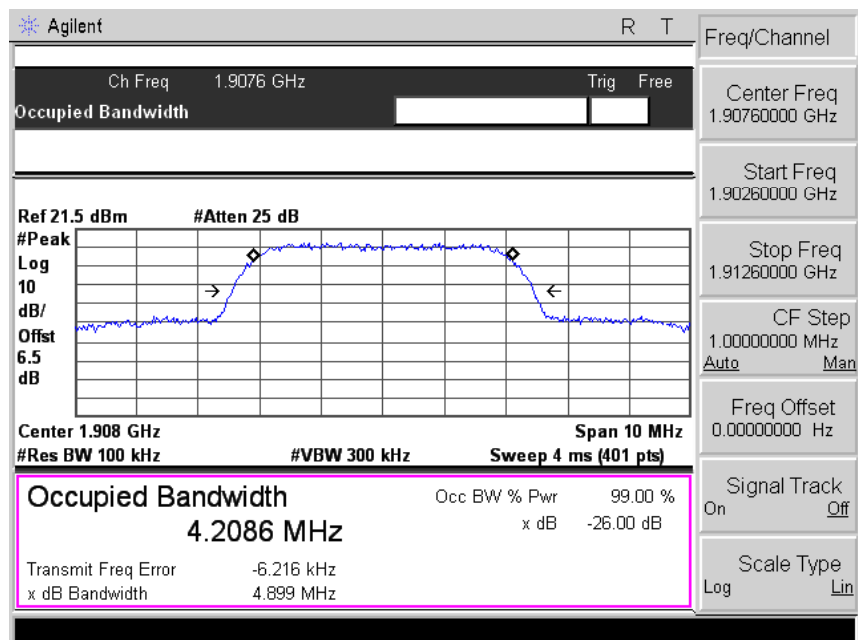
For Band II WCDMA Low Channel



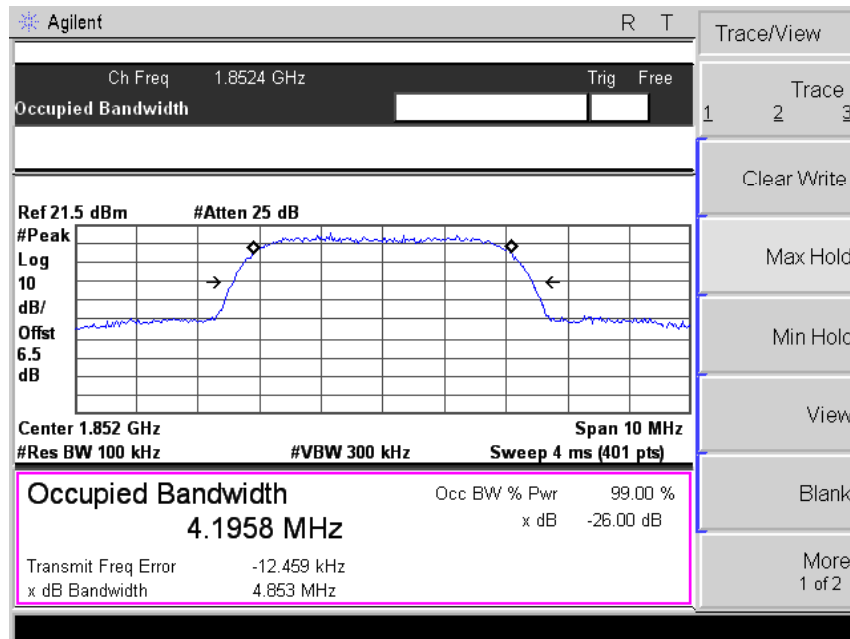
WCDMA Middle Channel



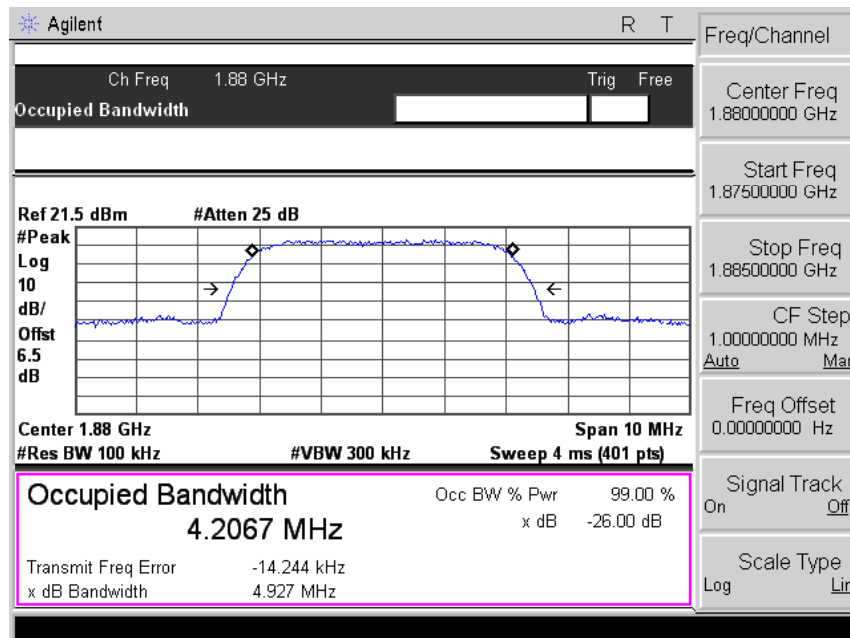
WCDMA High Channel



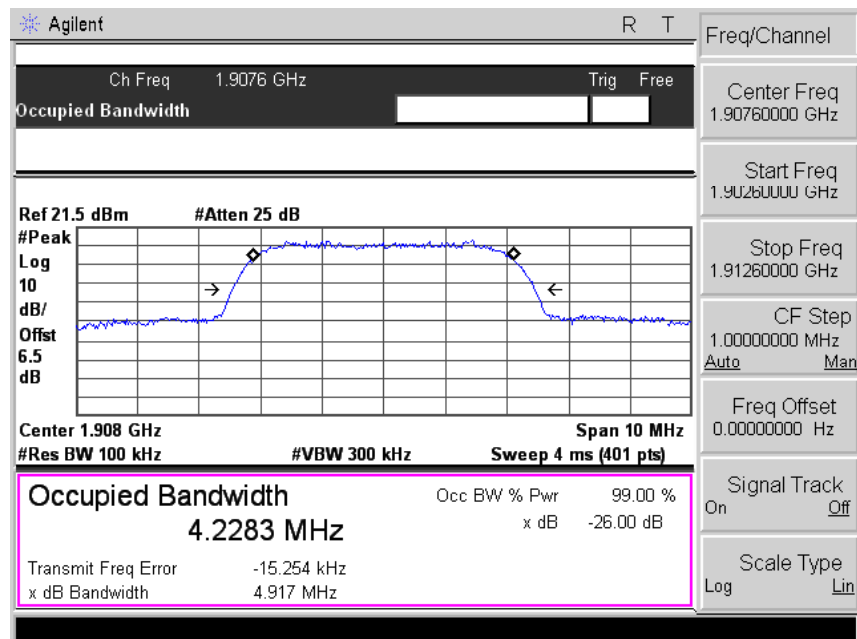
HSDPA Low Channel



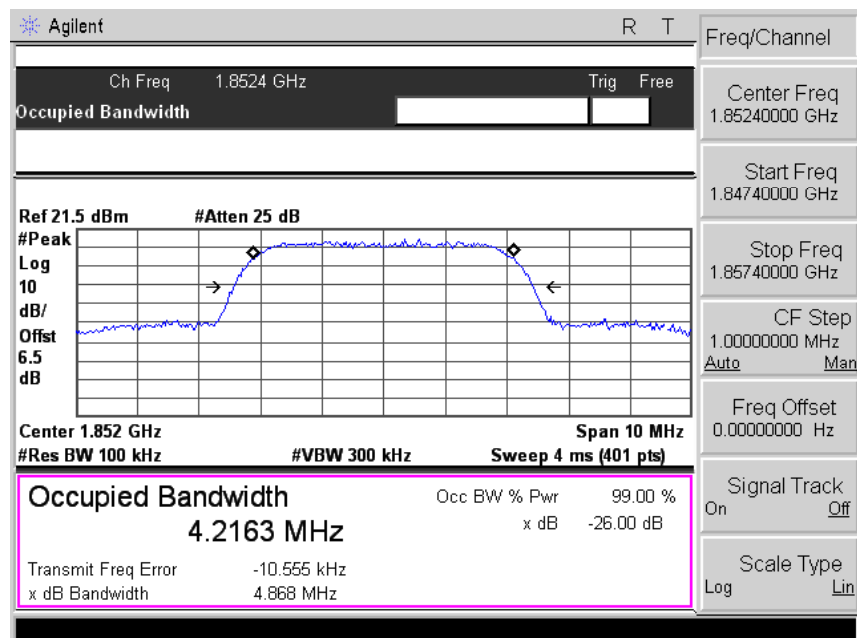
HSDPA Middle Channel



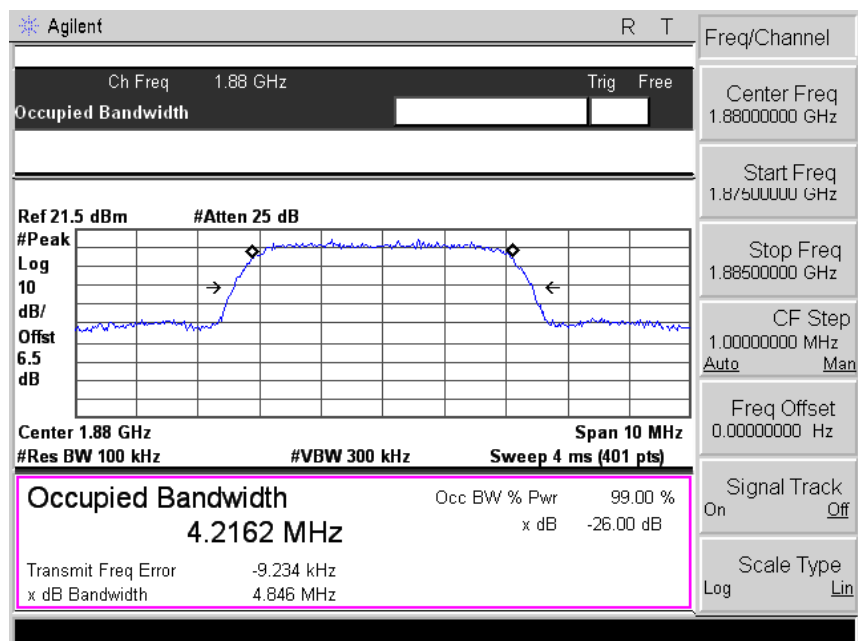
HSDPA High Channel



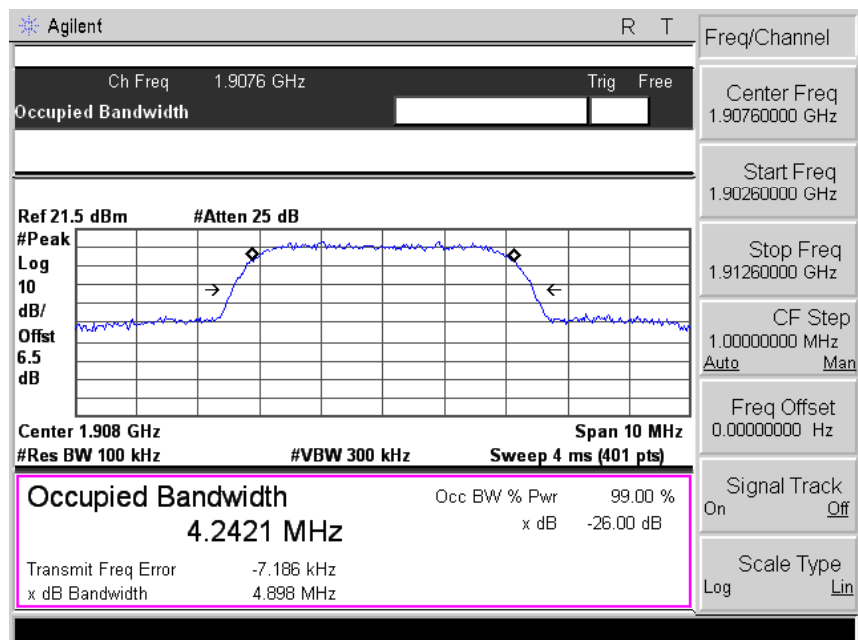
HSUPA Low Channel



HSUPA Middle Channel



HSUPA High Channel



7. Out of Band Emissions at Antenna Terminal

7.1 Standard Applicable

According to §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.

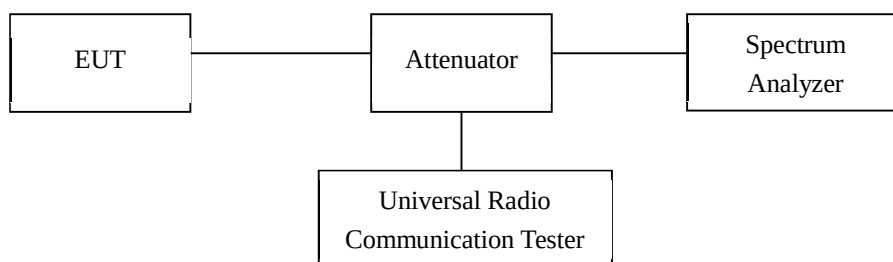
According to §24.238(a), the power of any emissions outside of the authorized operating frequency ranges must be attenuated below the transmitting power (P) by a factor of at least $43 + 10 \log(P)$ dB.

According to §27.53 (h), the power of any emission outside a licensee's frequency block shall be attenuated below the transmitter power (P) in watts by at least $43 + 10 \log_{10}(P)$ dB.

7.2 Test Procedure

The RF output terminal of the transmitter was connected to the input of the spectrum analyzer via a suitable attenuation. The RBW of the spectrum analyzer was set to 100kHz and 1MHz for the scan frequency from 30MHz to 1GHz and the scan frequency from 1GHz to up to 10th harmonic.

Test Configuration for the out of band emissions testing:



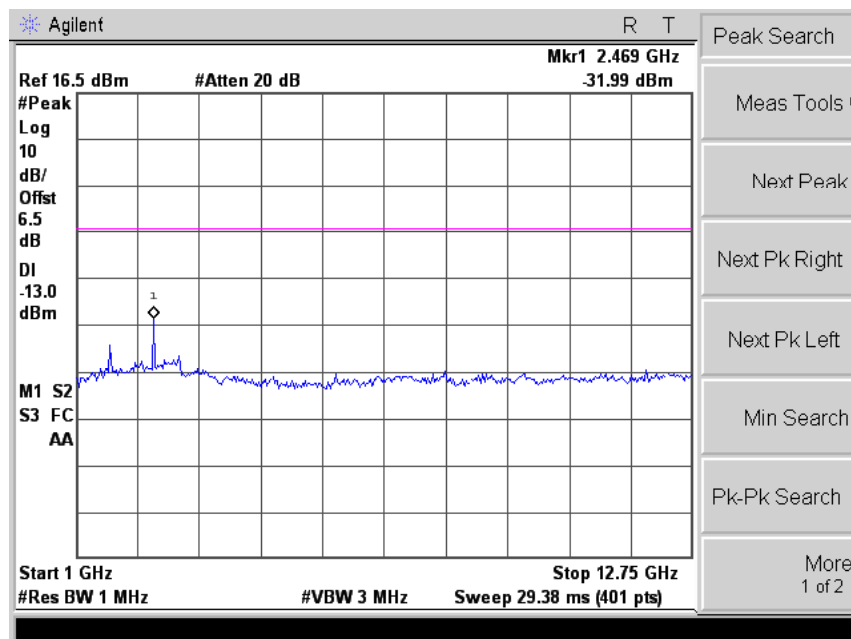
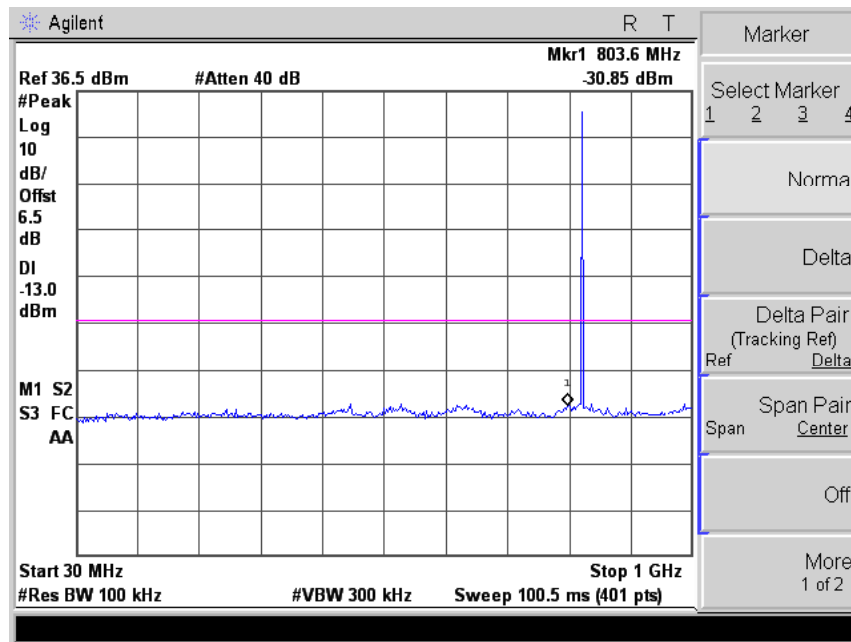
7.3 Environmental Conditions

Temperature:	25 °C
Relative Humidity:	53%
ATM Pressure:	1018 mbar

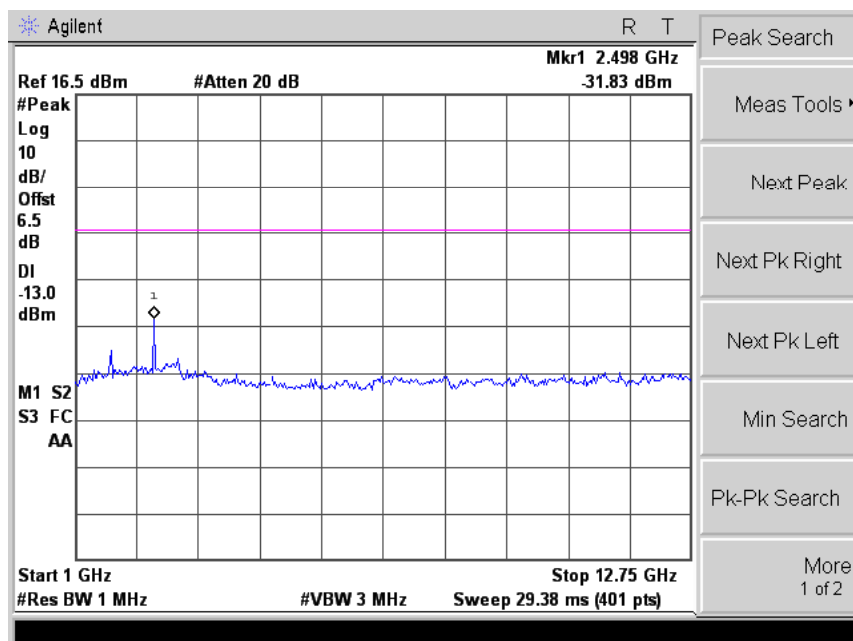
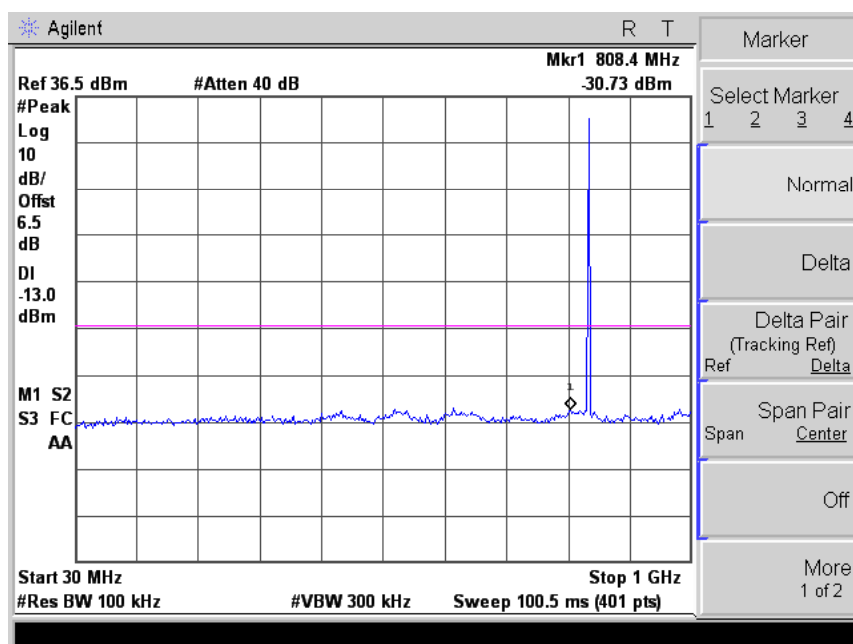
7.4 Summary of Test Results/Plots

Please refer to the following test plots For Cellular Band

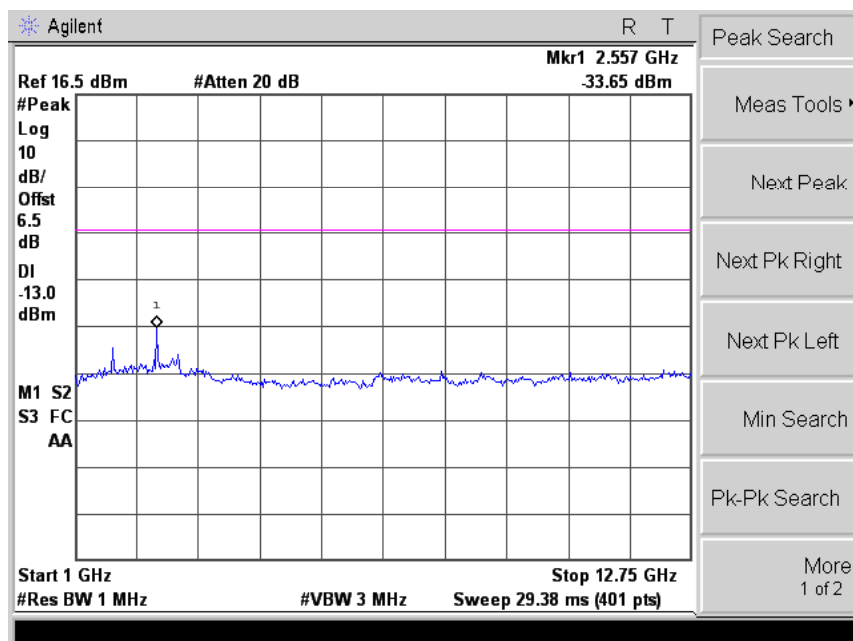
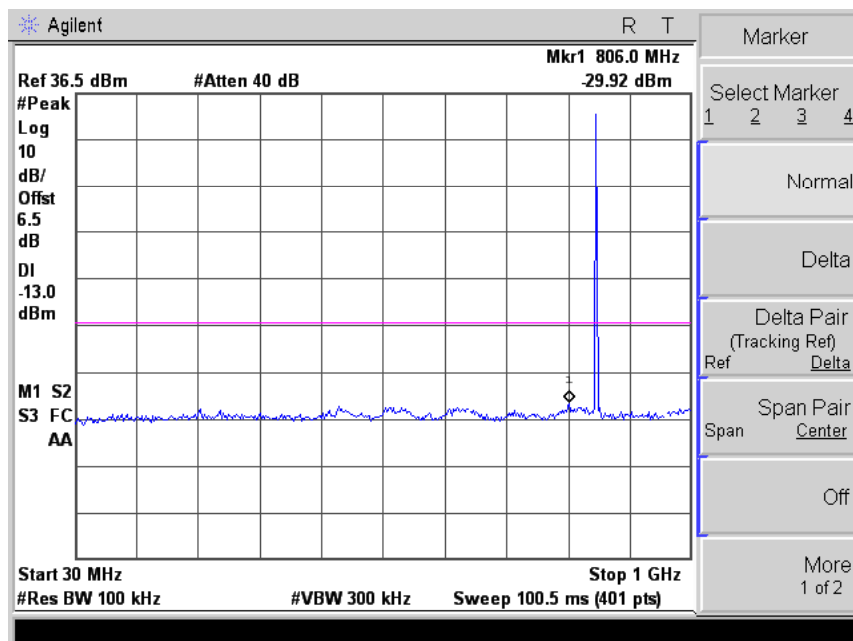
Please refer to the following test plots For Cellular Band
GPRS Low Channel



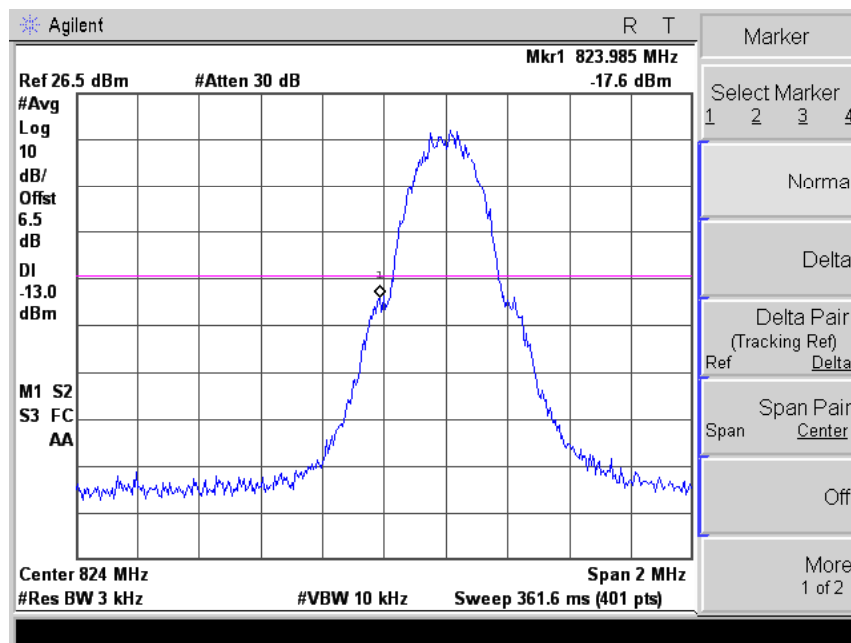
GPRS Middle Channel



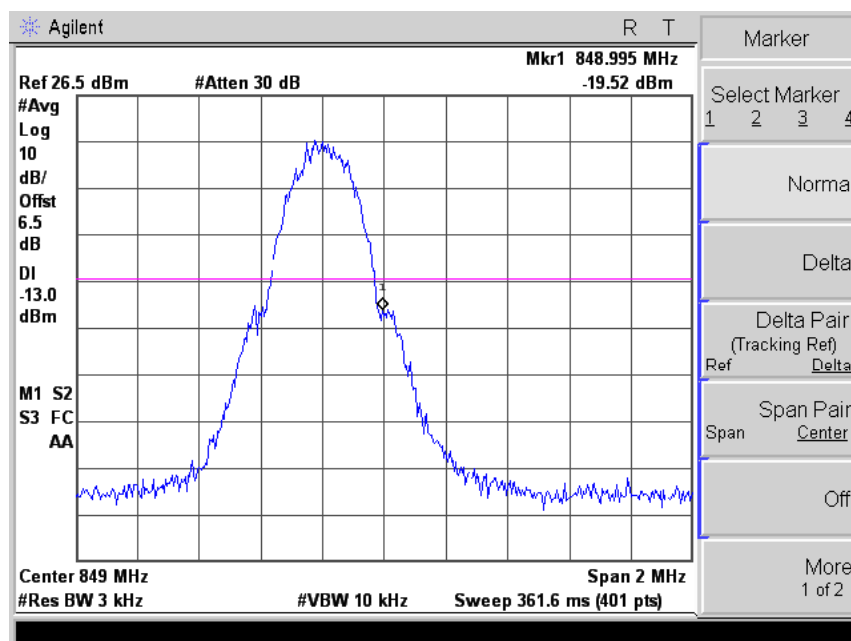
GPRS High Channel



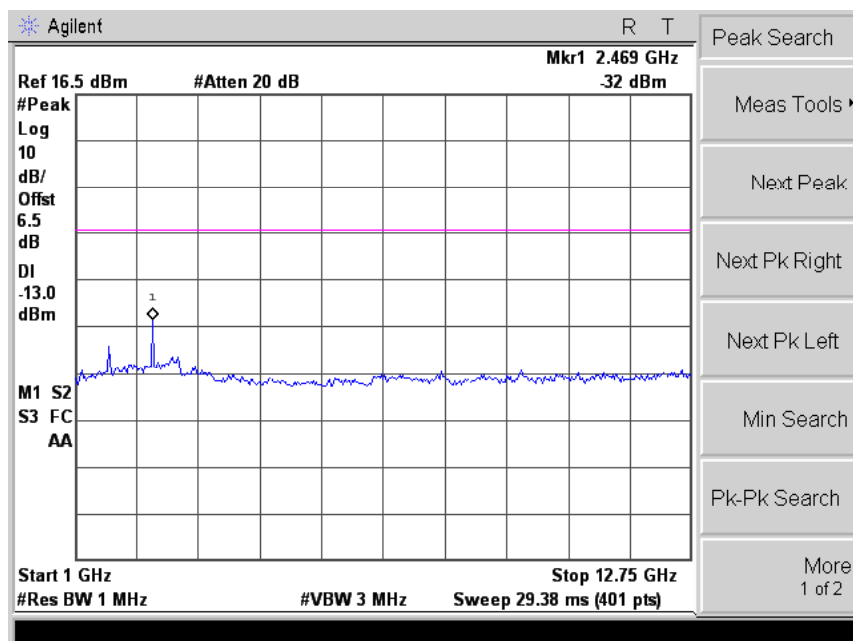
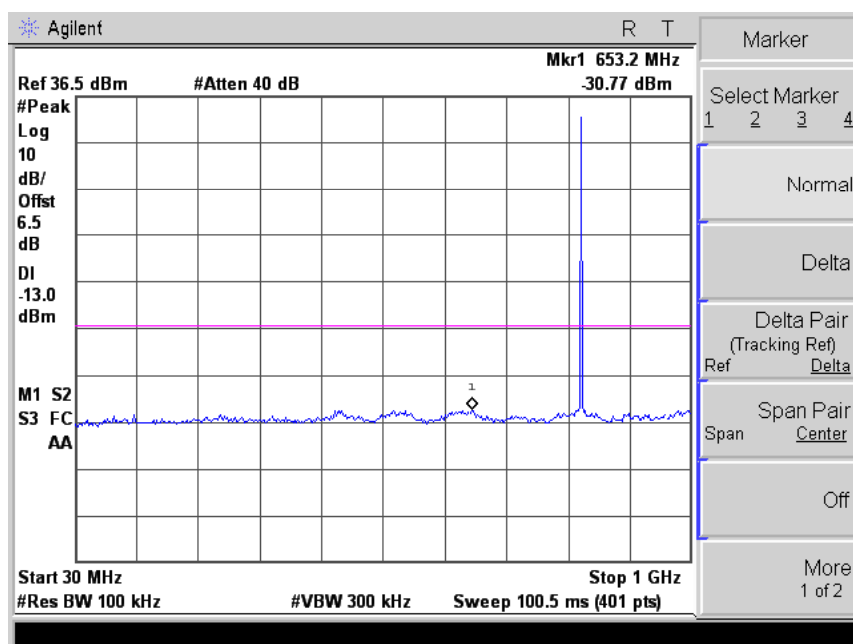
GPRS Low Band Emission



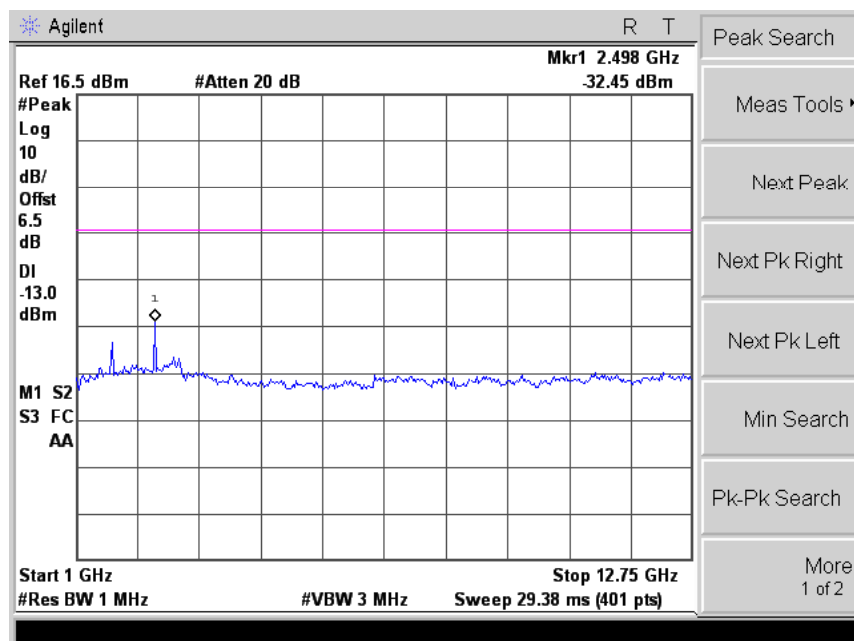
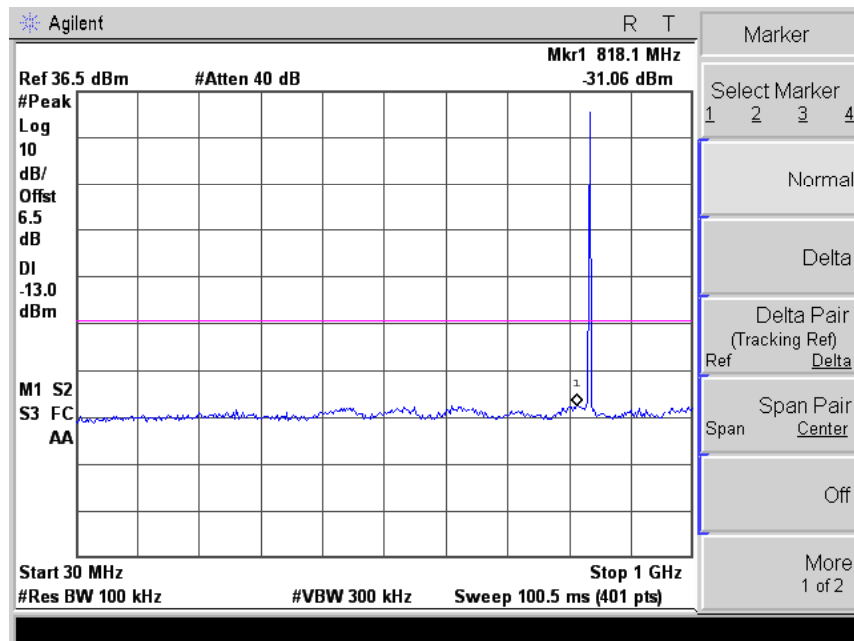
GPRS High Band Emission



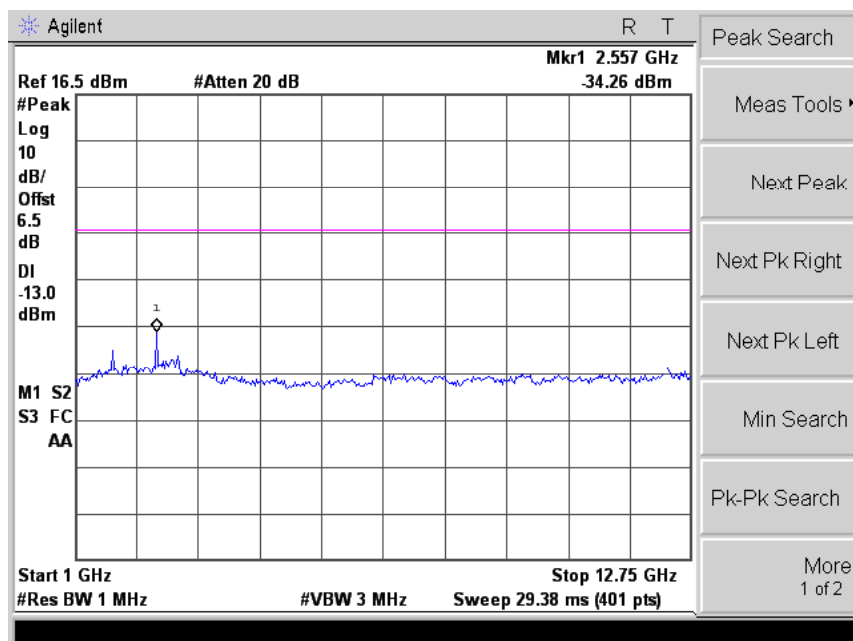
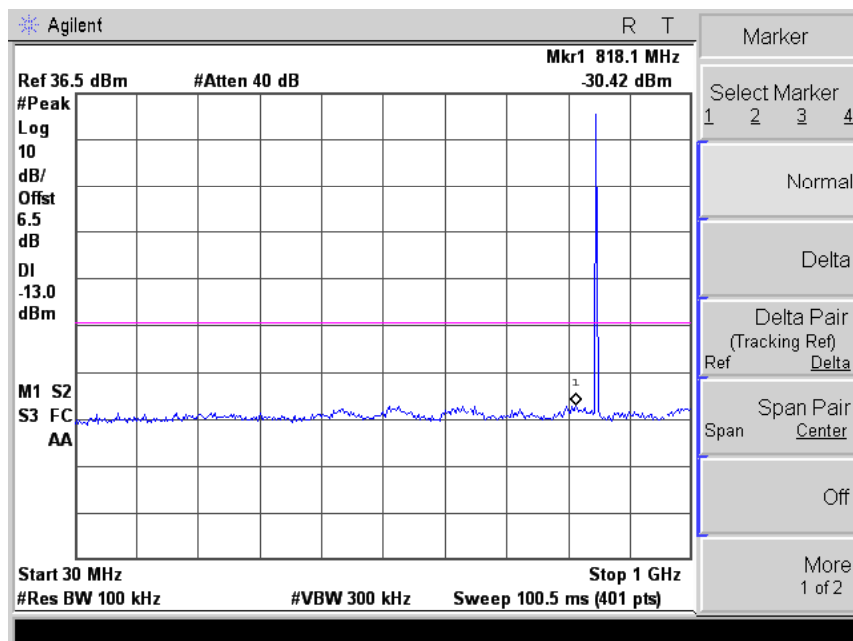
EDGE Low Channel



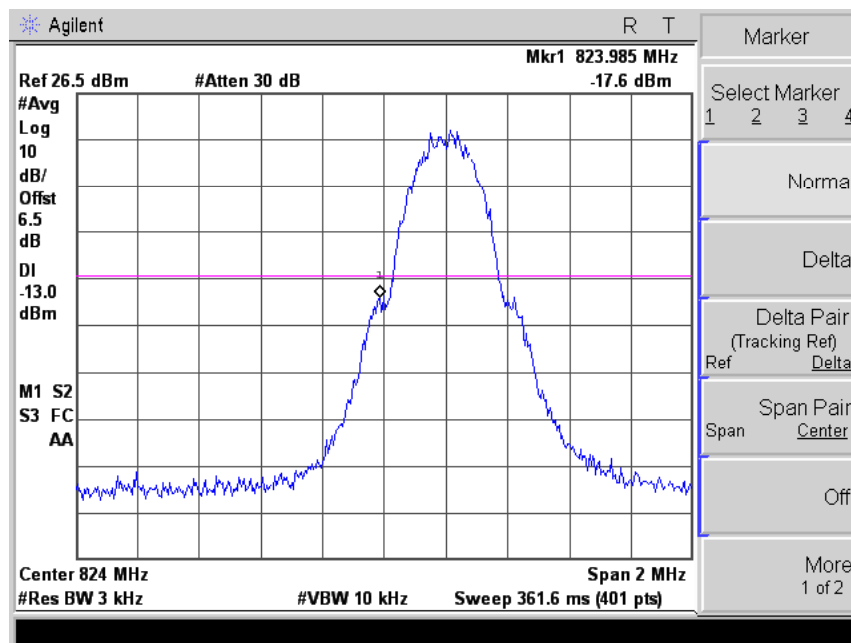
EDGE Middle Channel



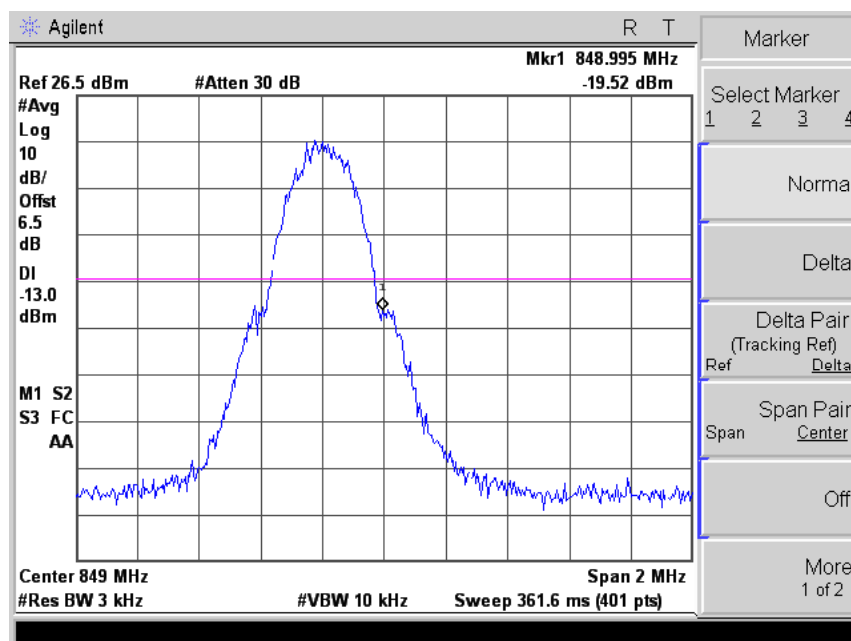
EDGE High Channel



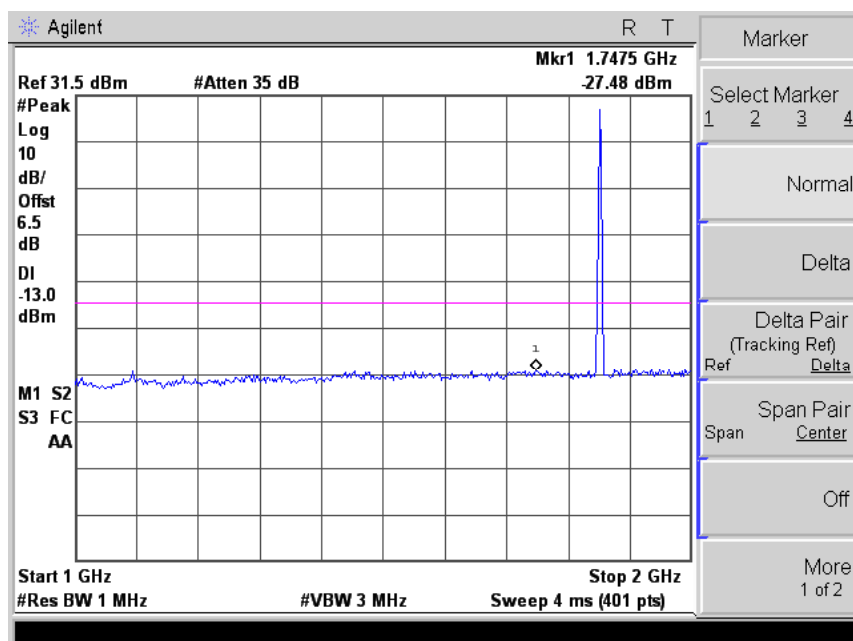
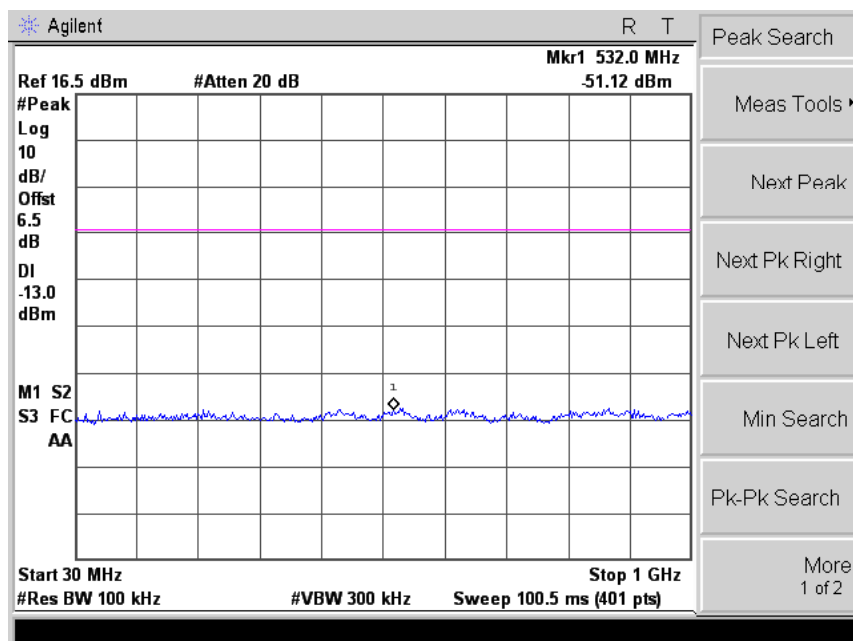
EDGE Low Band Emission

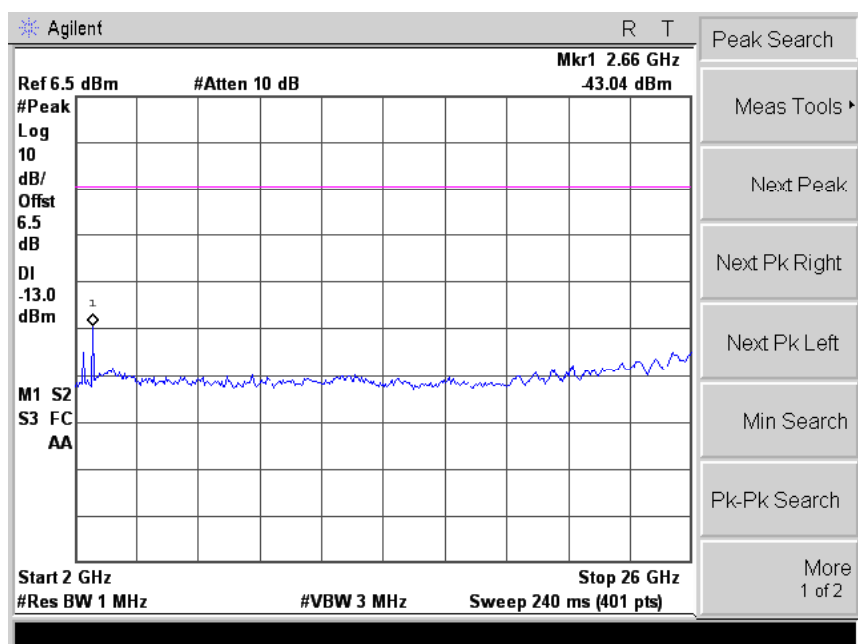


EDGE High Band Emission

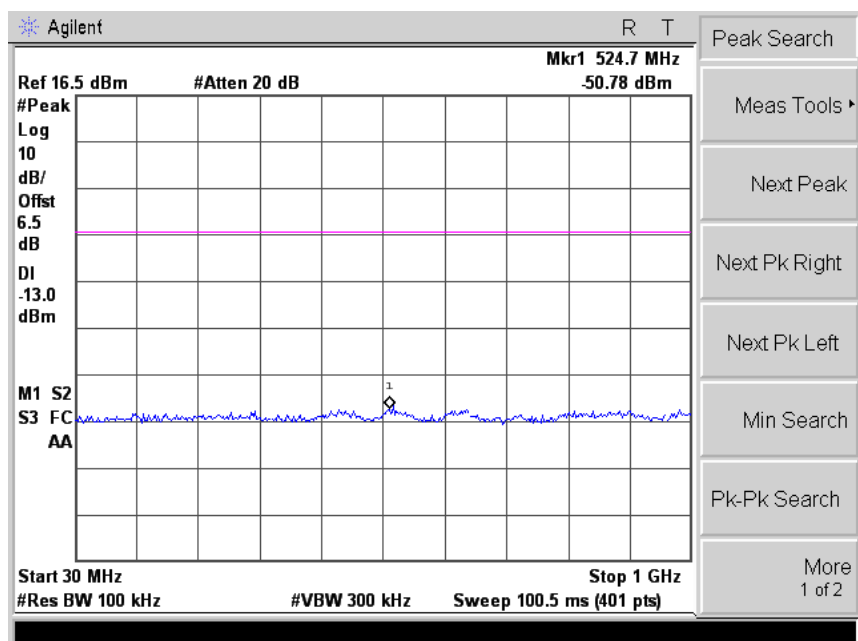


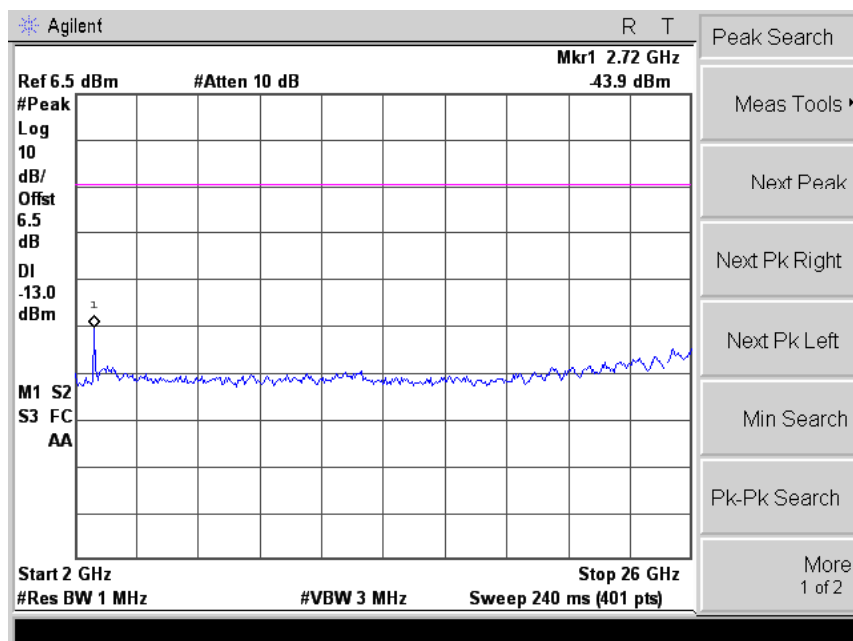
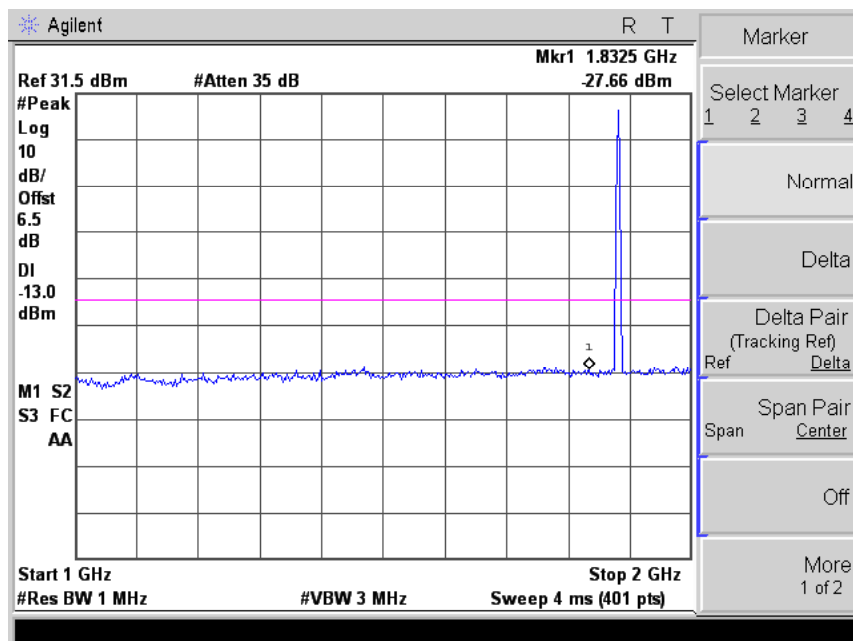
For PCS Band
GPRS Low Channel



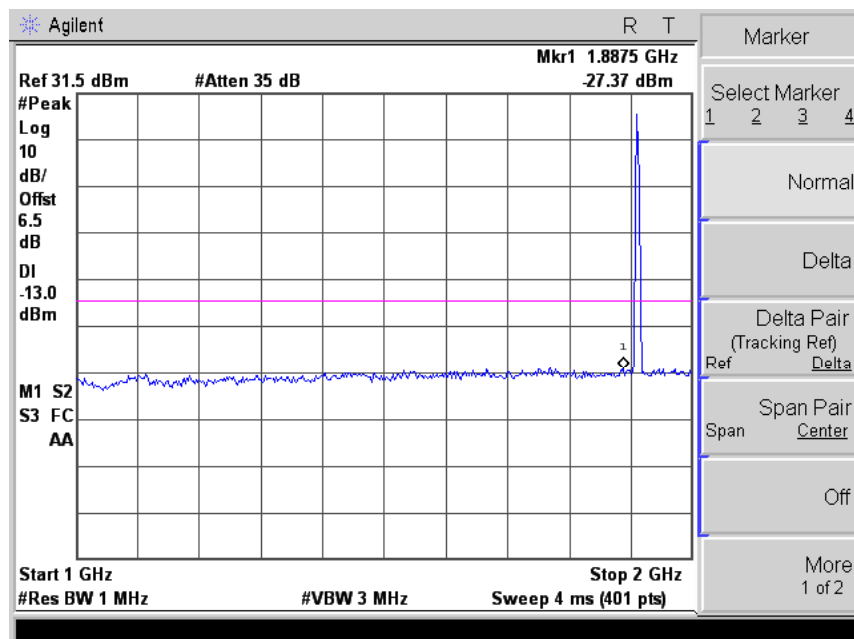
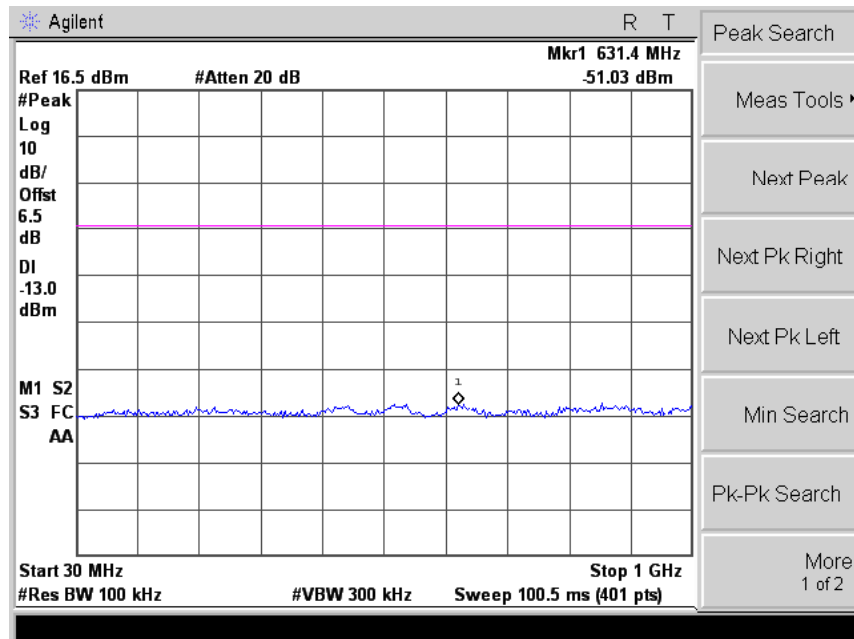


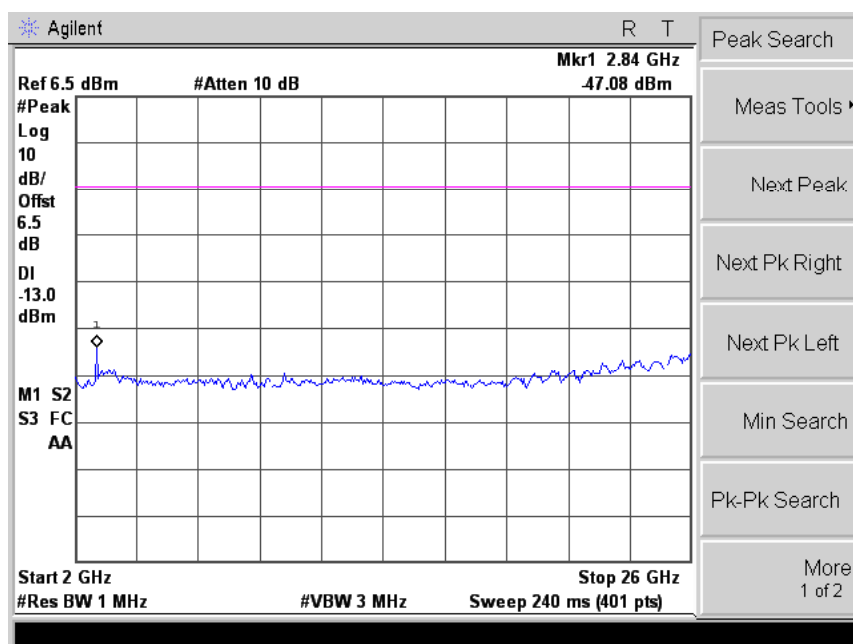
GPRS Middle Channel



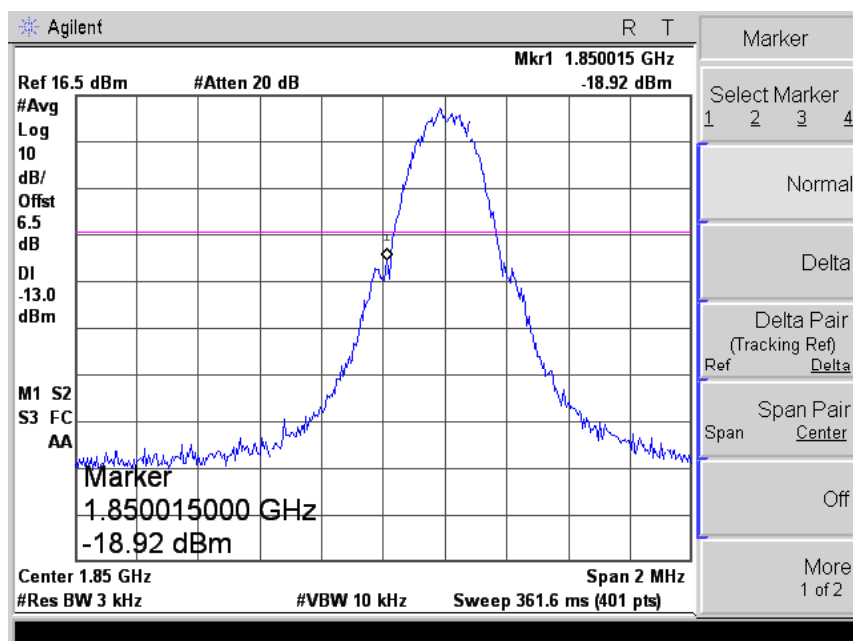


GPRS High Channel

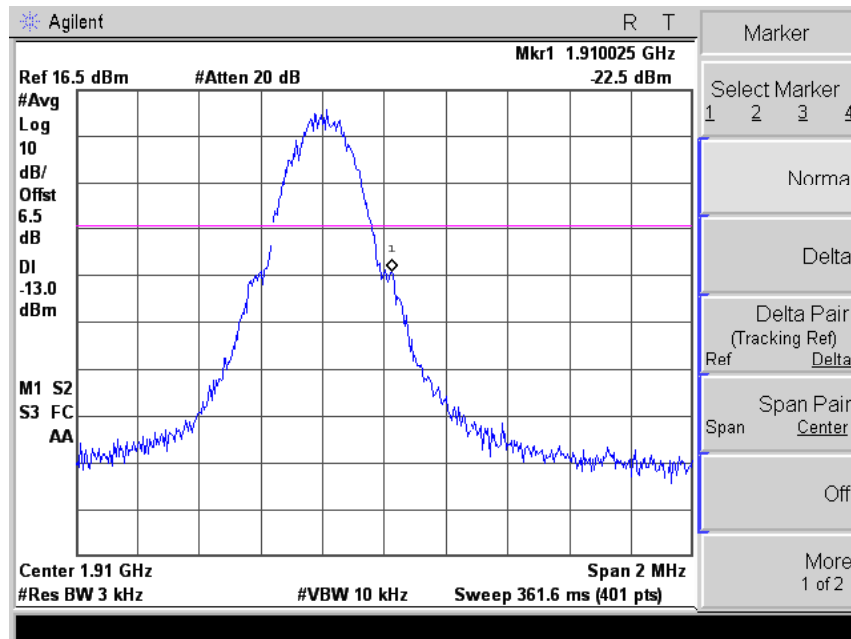




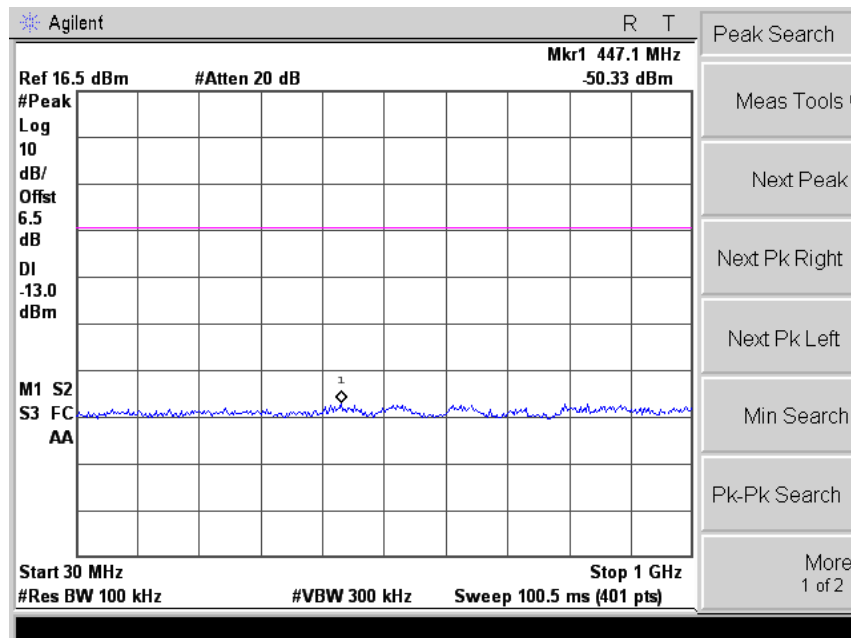
GPRS Low Band Emission

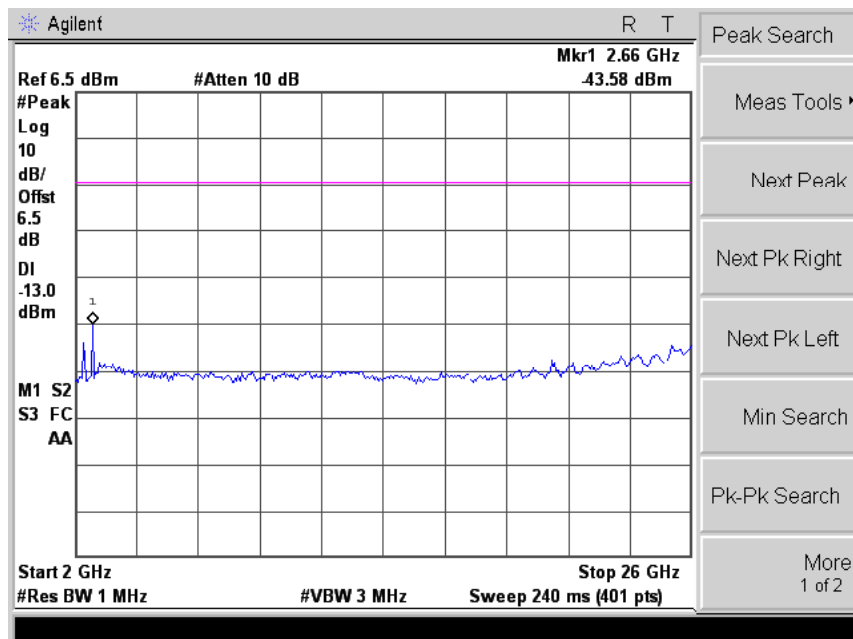
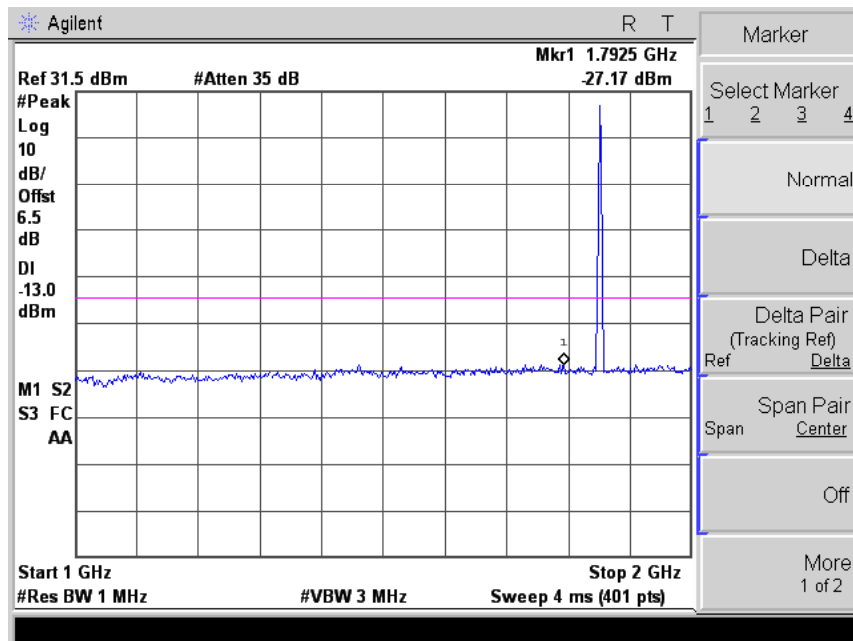


GPRS High Band Emission

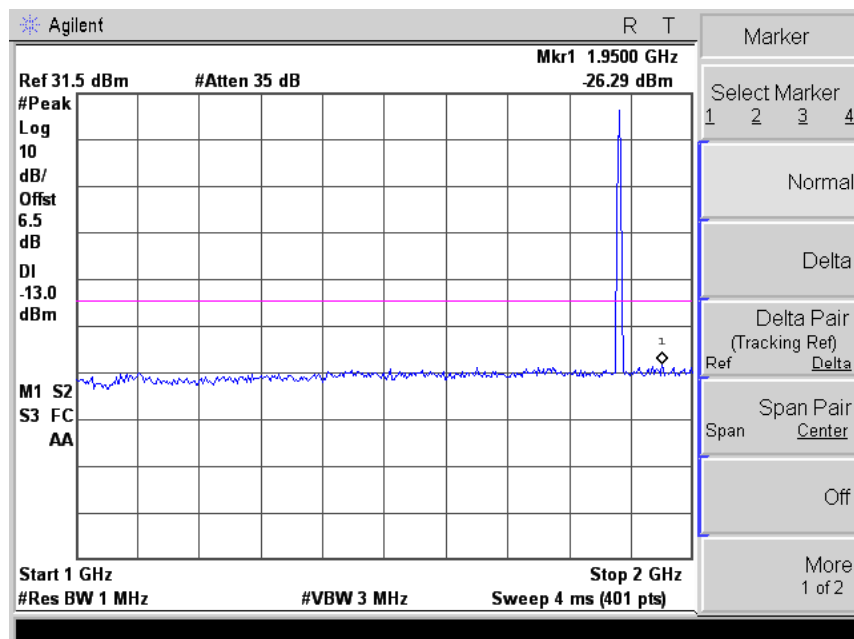
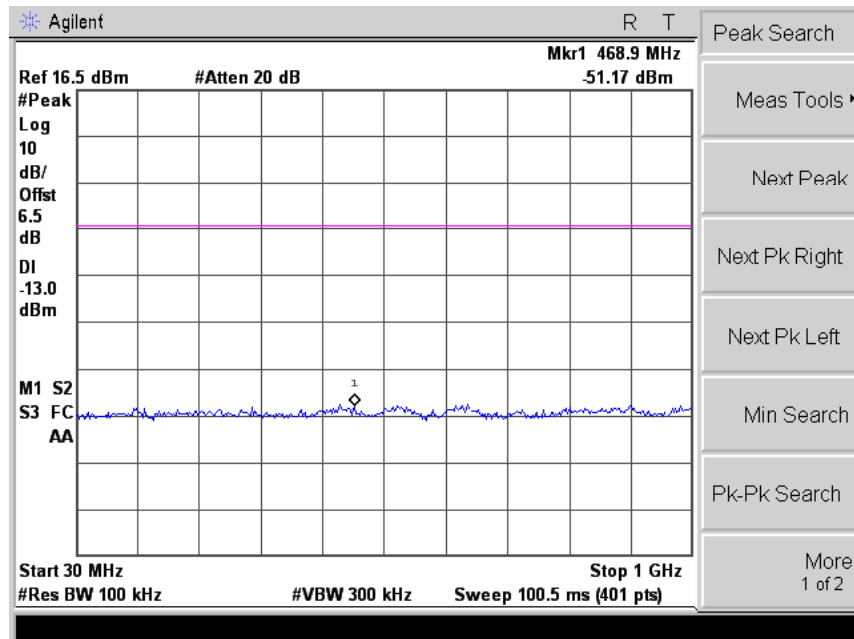


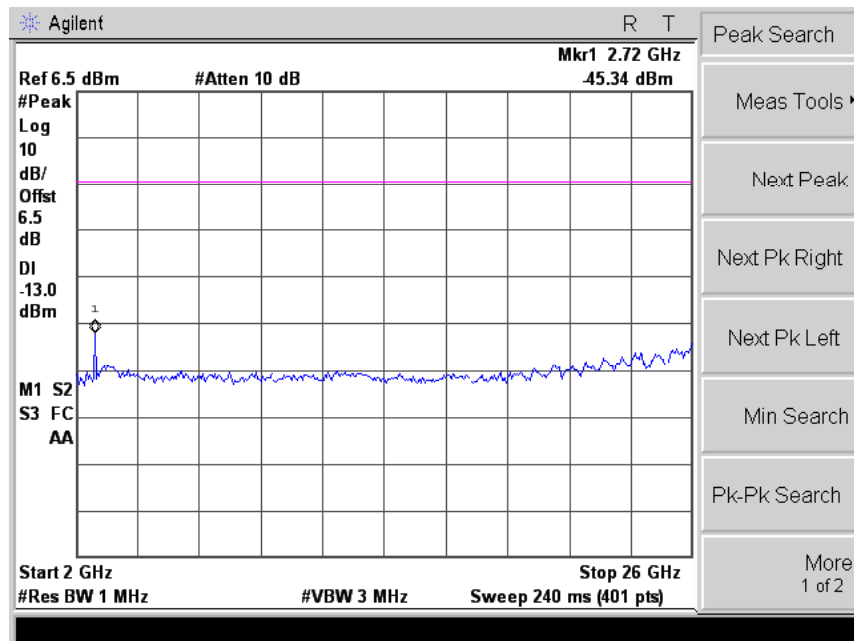
EDGE Low Channel



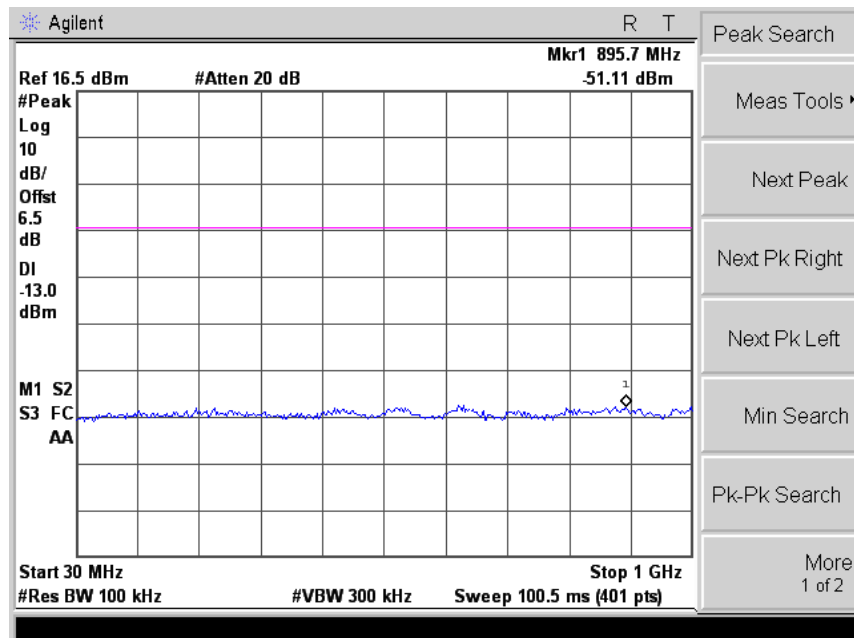


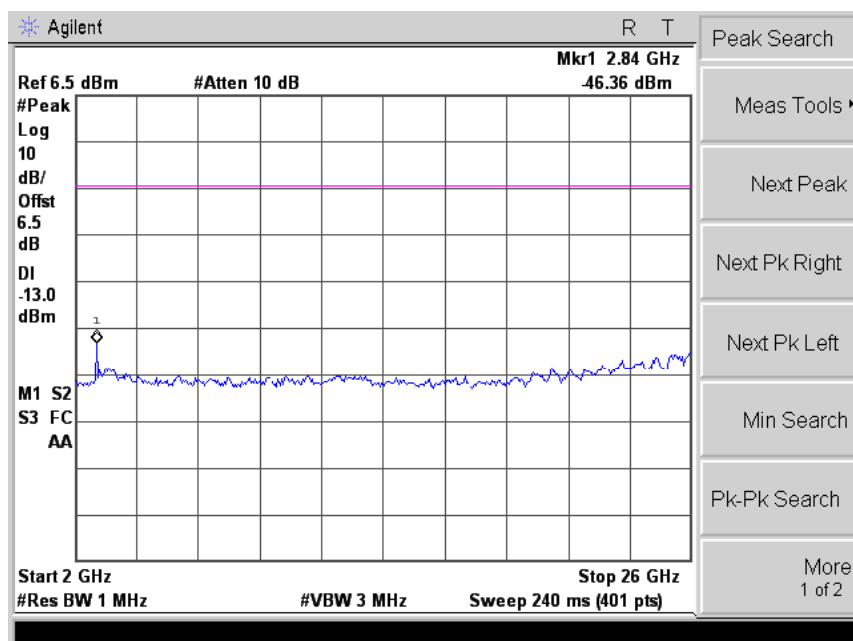
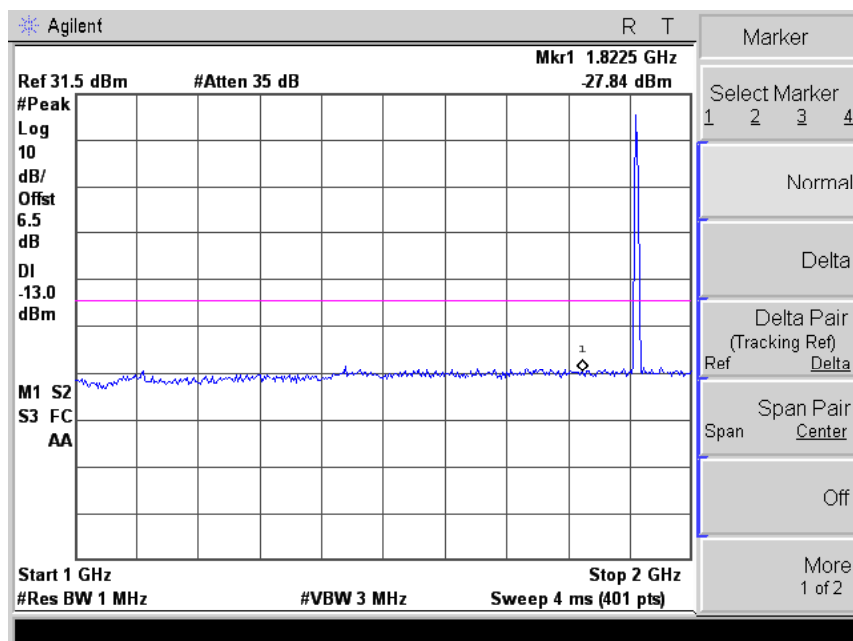
EDGE Middle Channel



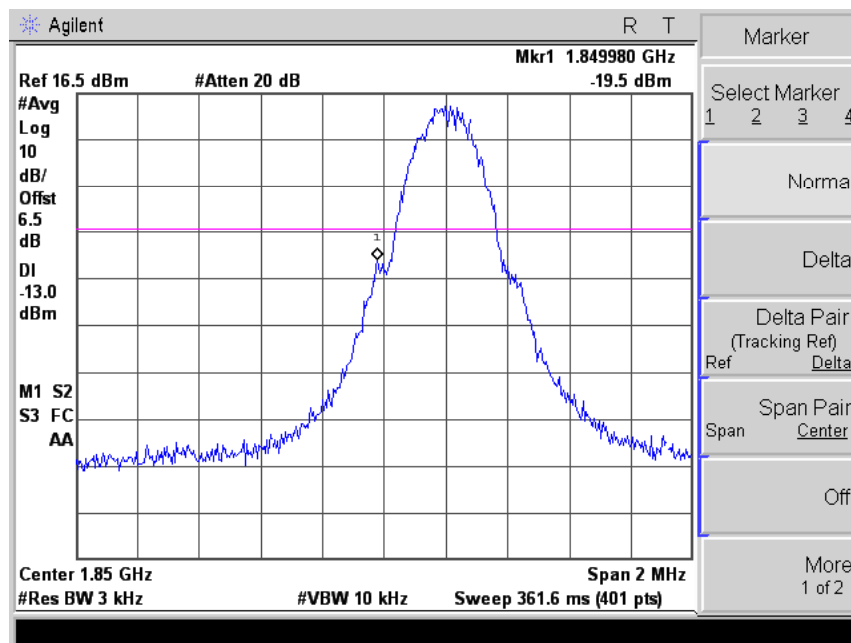


EDGE High Channel

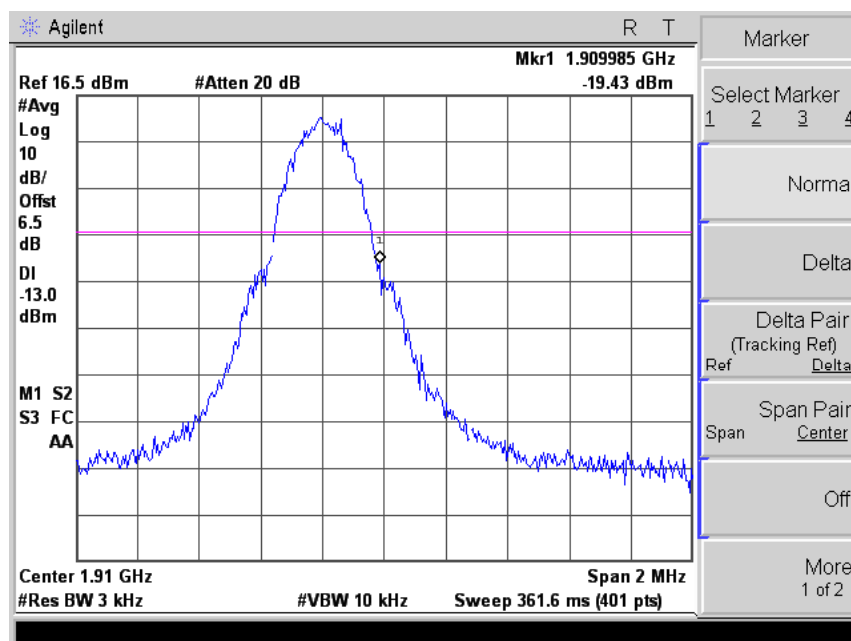




EDGE Low Band Emission

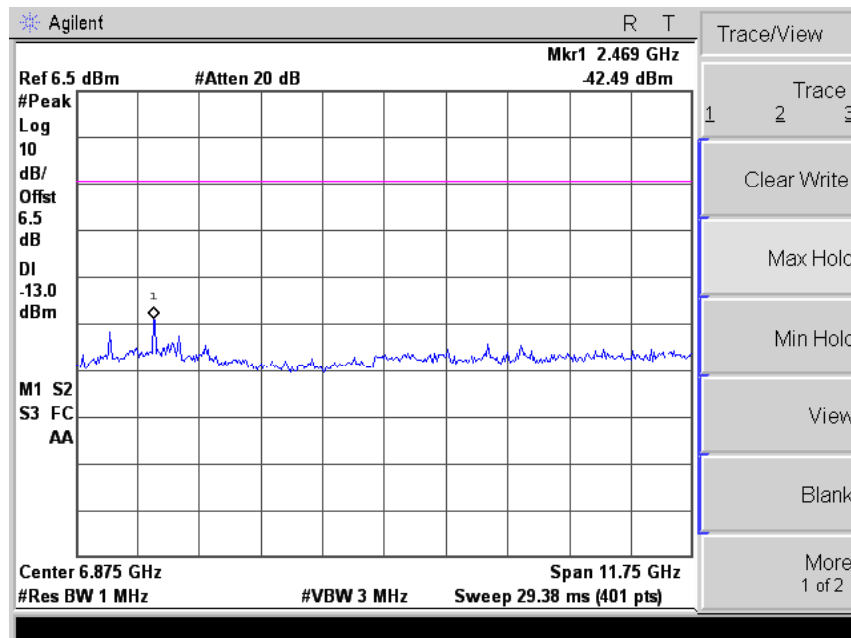
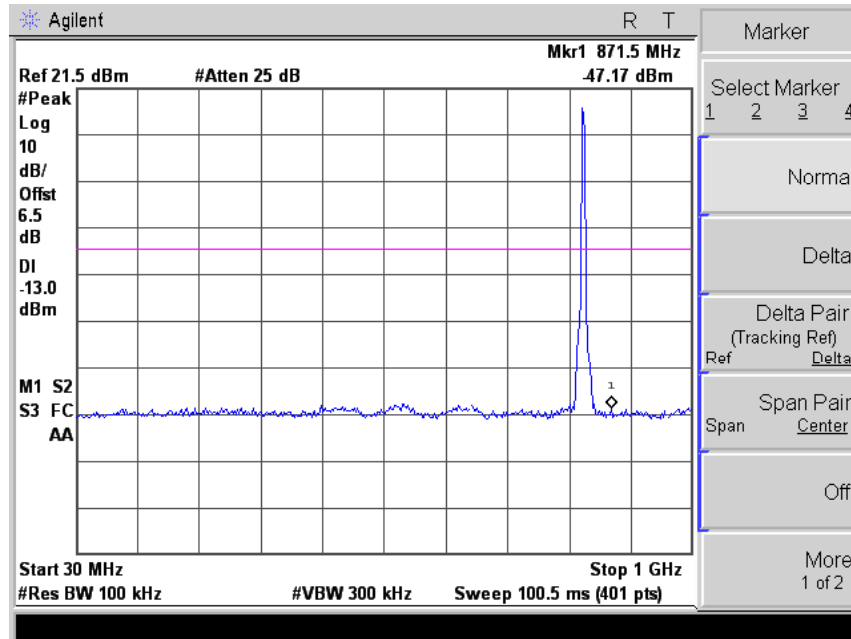


EDGE High Band Emission

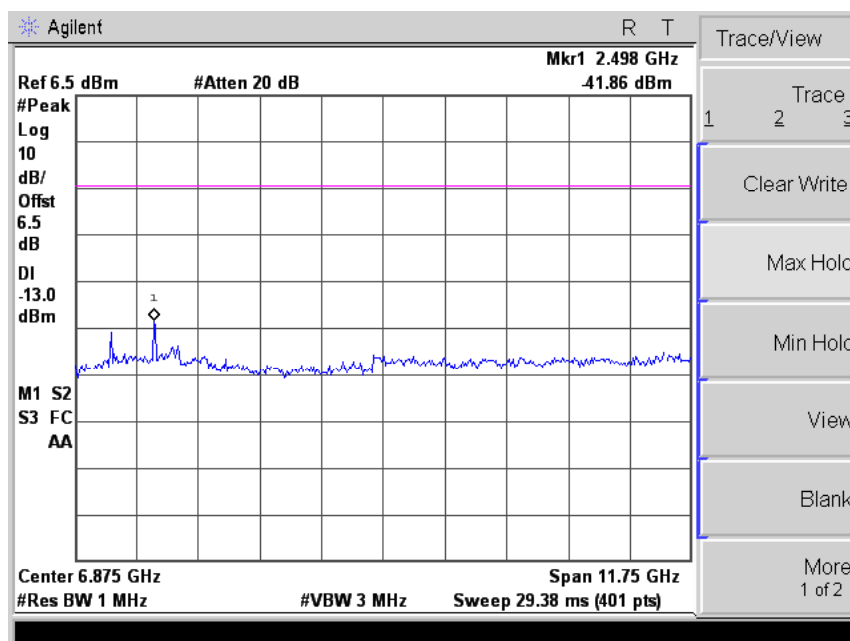
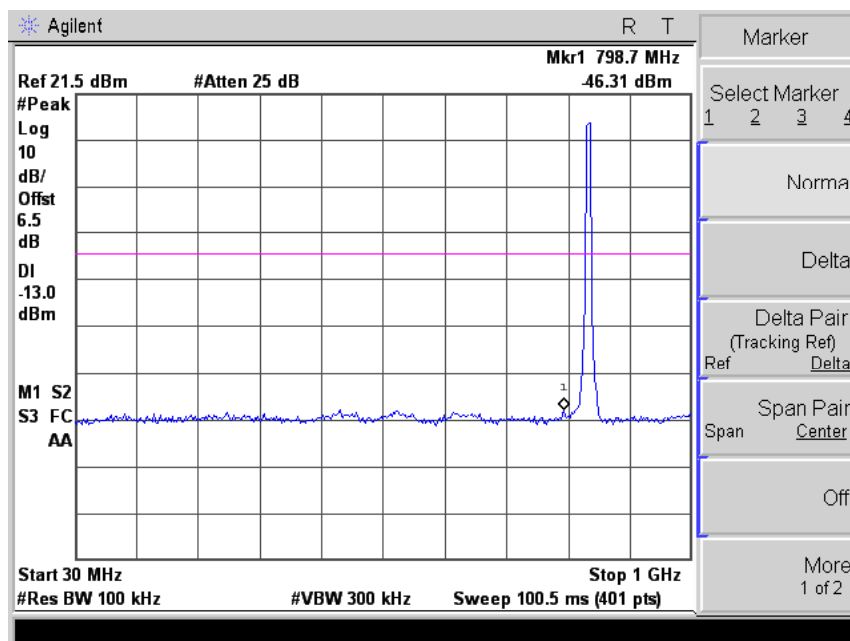


For Band V

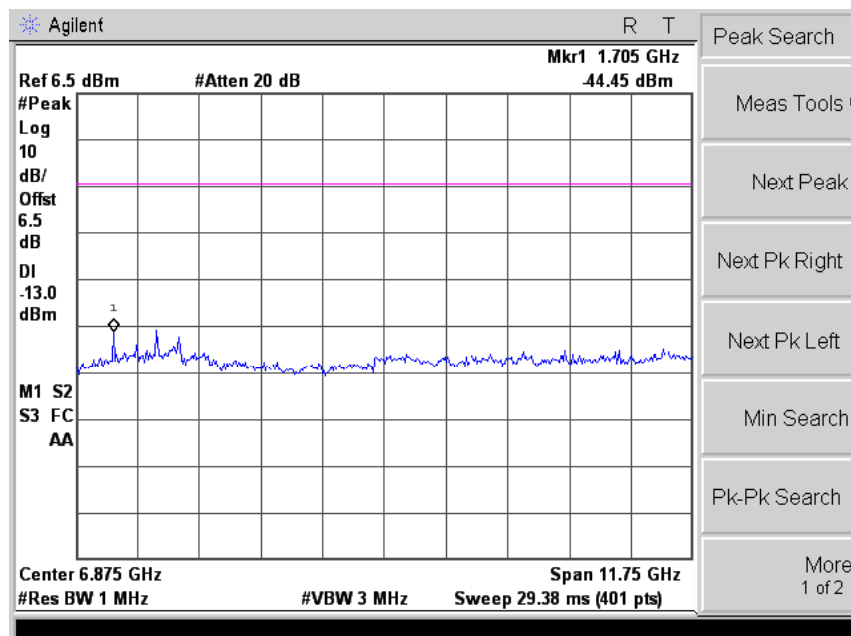
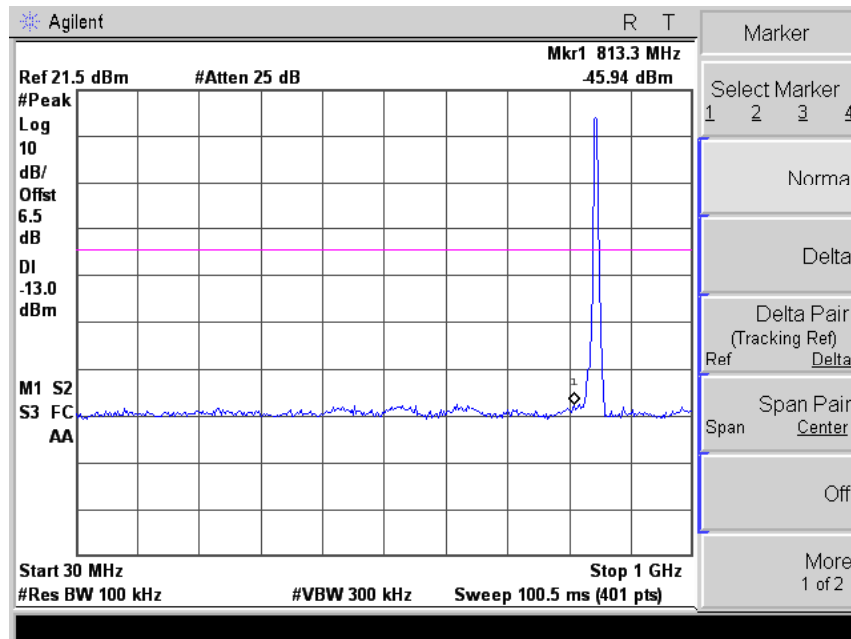
WCDMA Low Channel



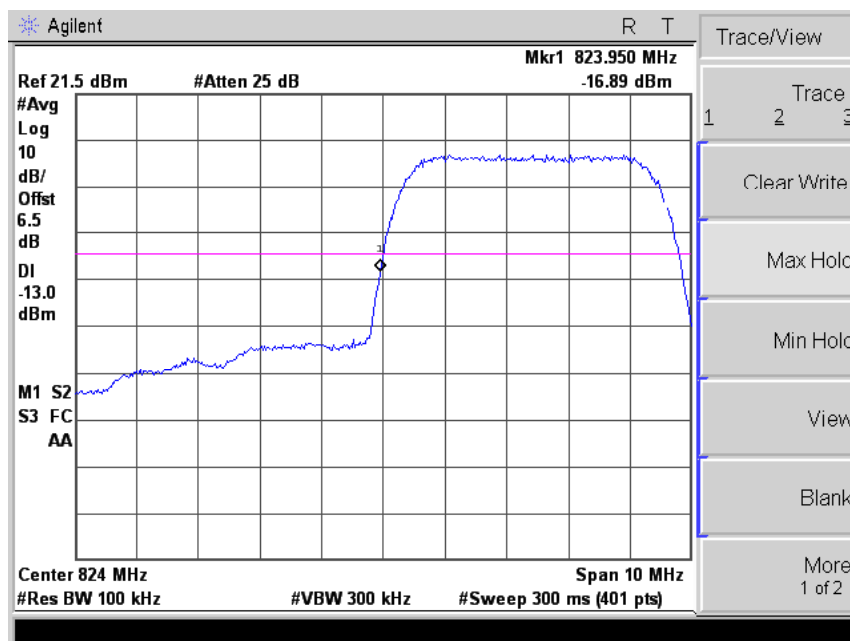
WCDMA Middle Channel



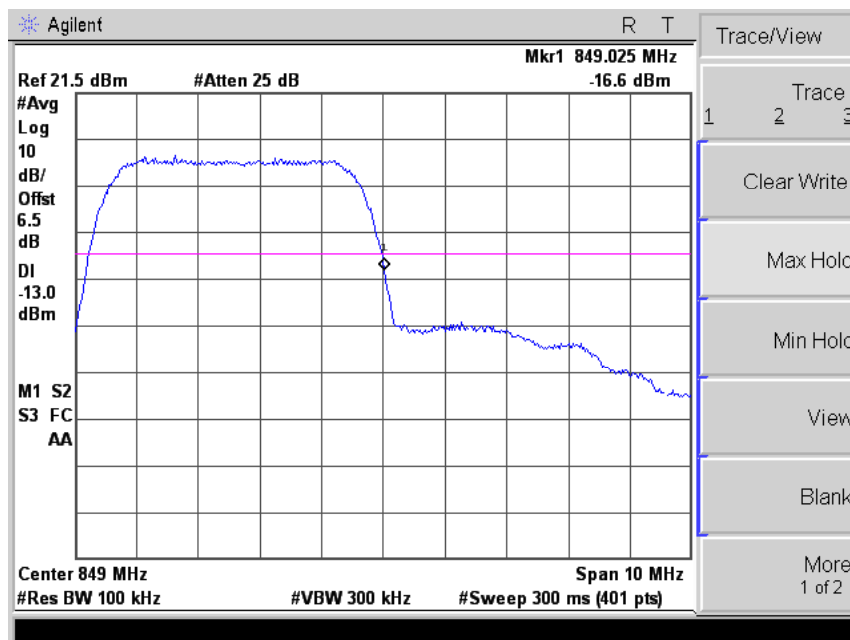
WCDMA High Channel



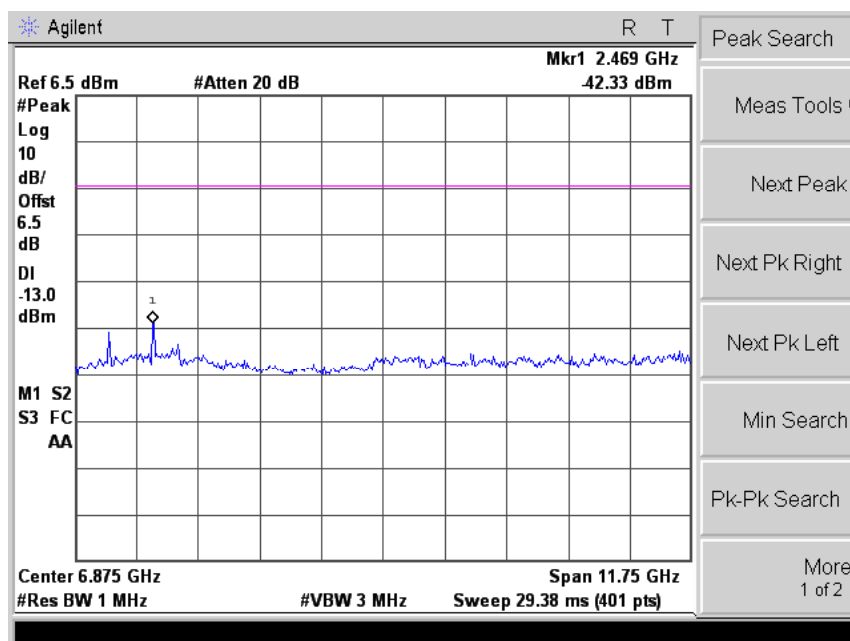
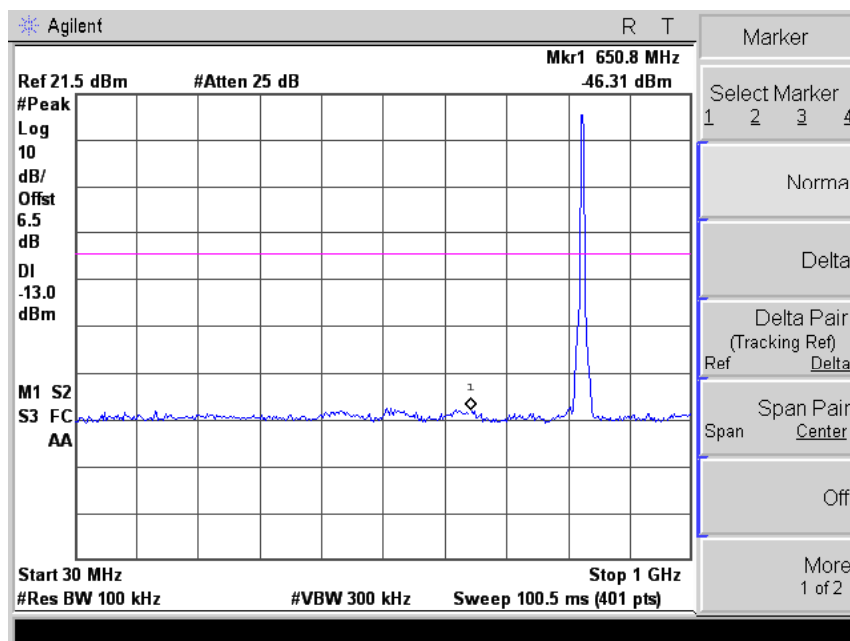
WCDMA Low Band Spurious Emission



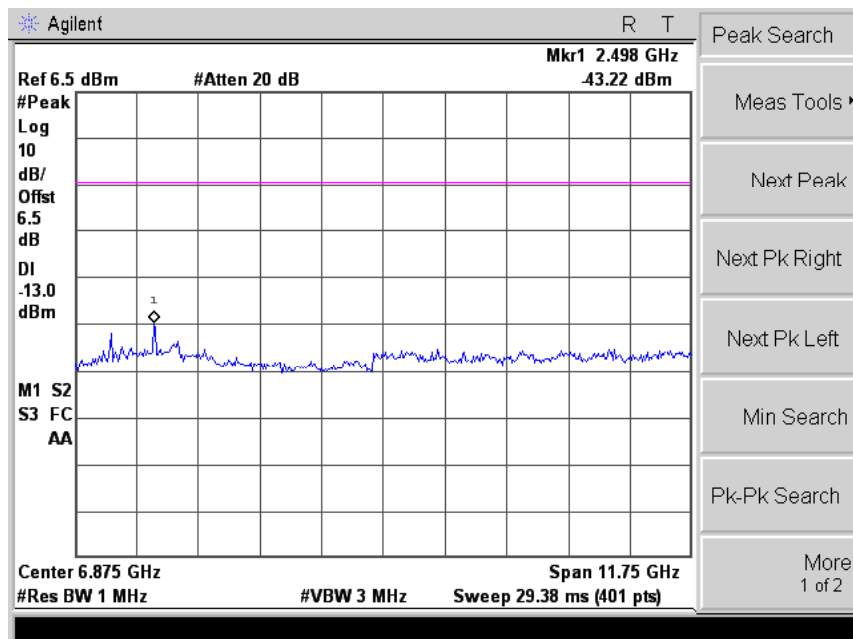
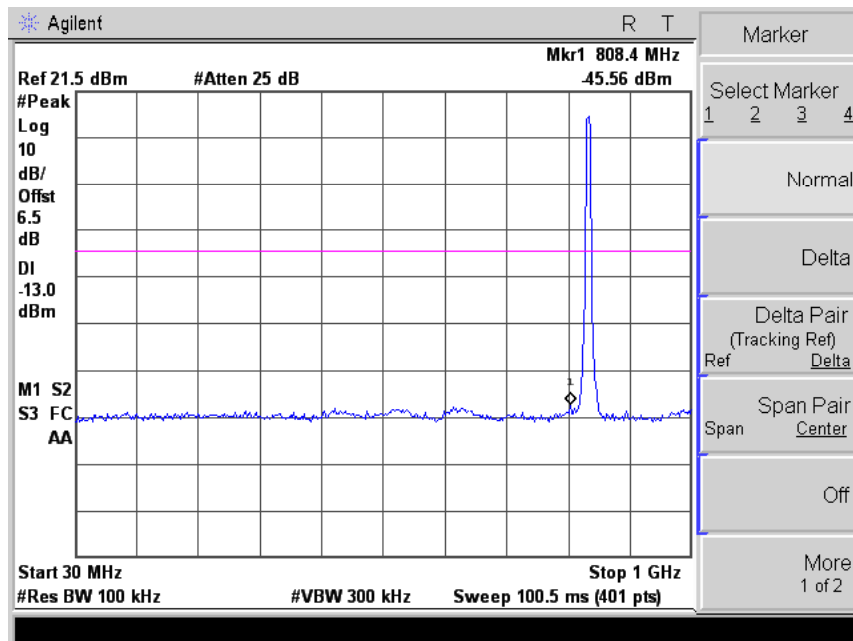
WCDMA High Band Spurious Emission



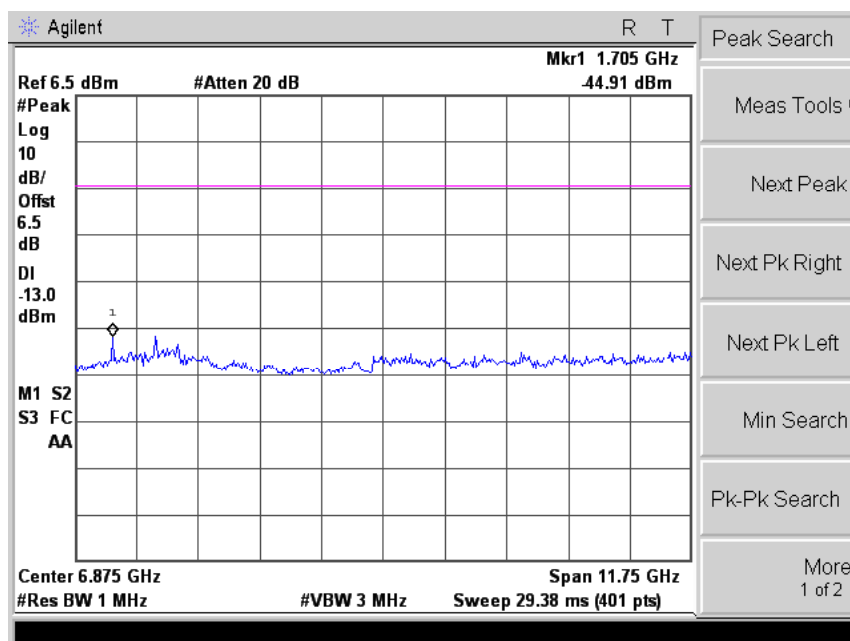
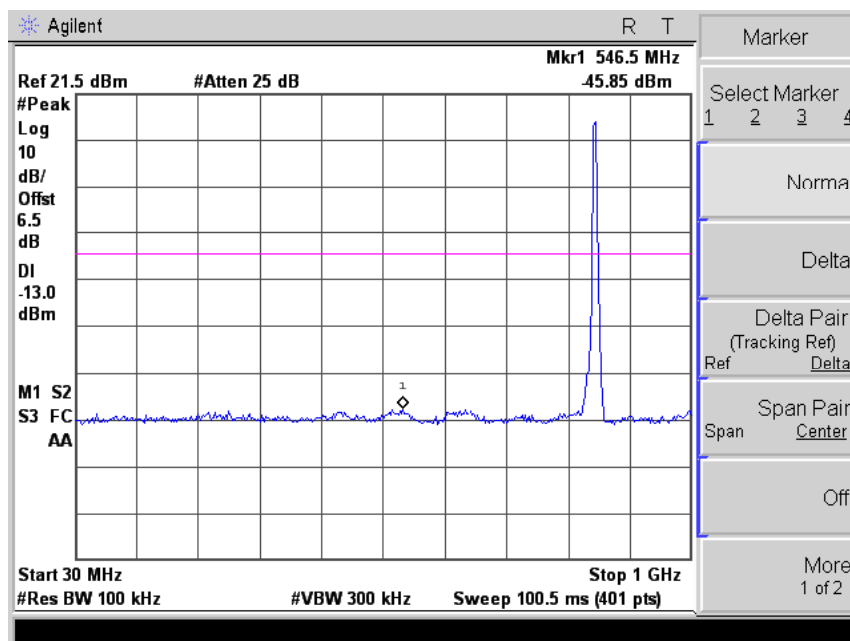
HSDPA Low Channel



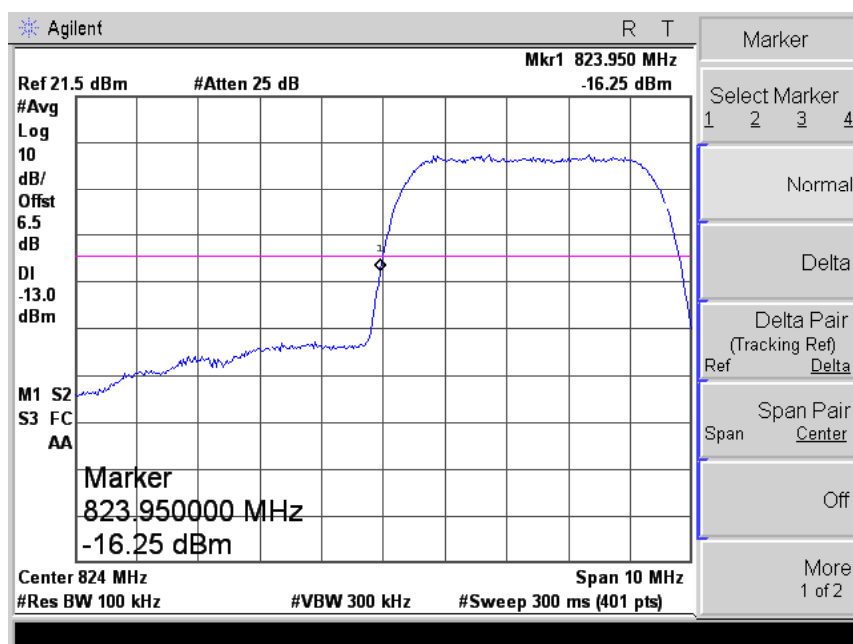
HSDPA Middle Channel



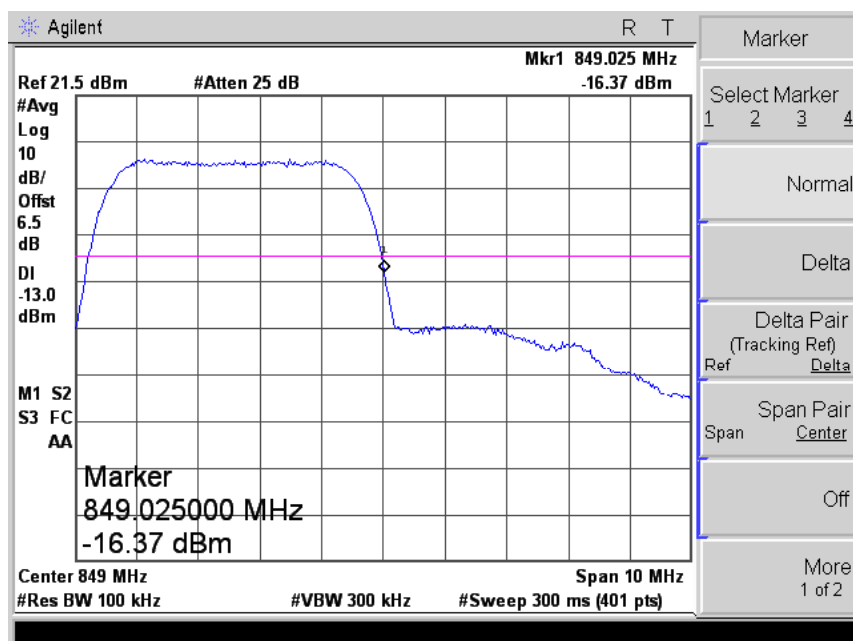
HSDPA High Channel



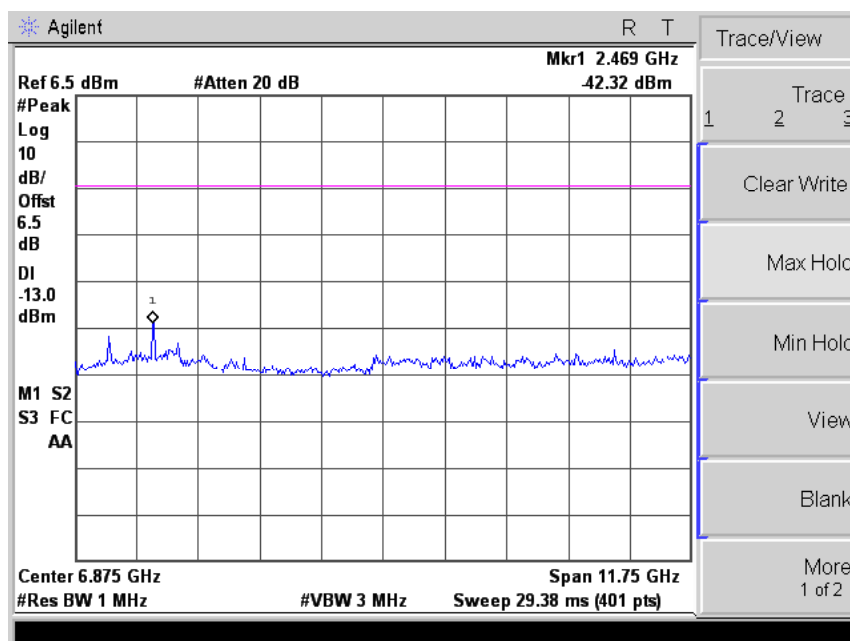
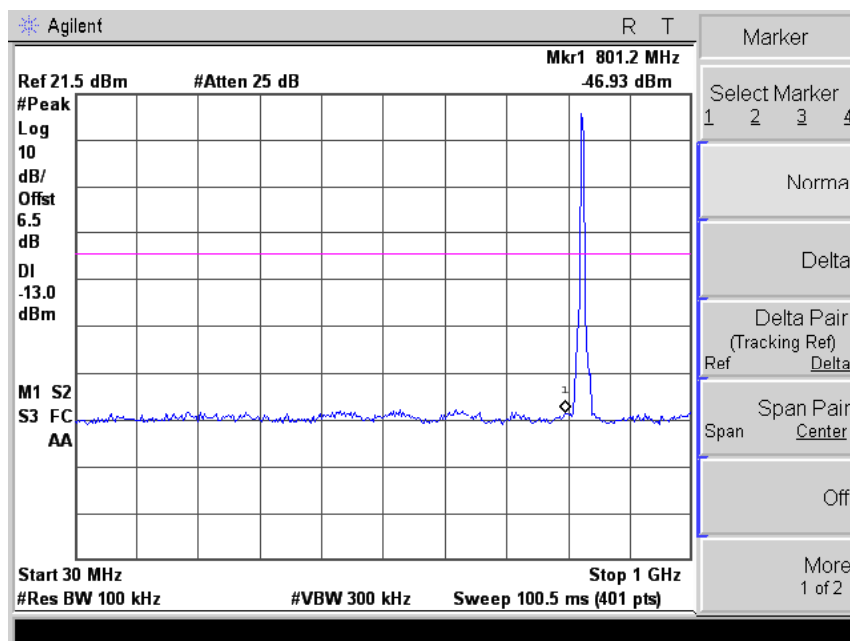
HSDPA Low Band Spurious Emission



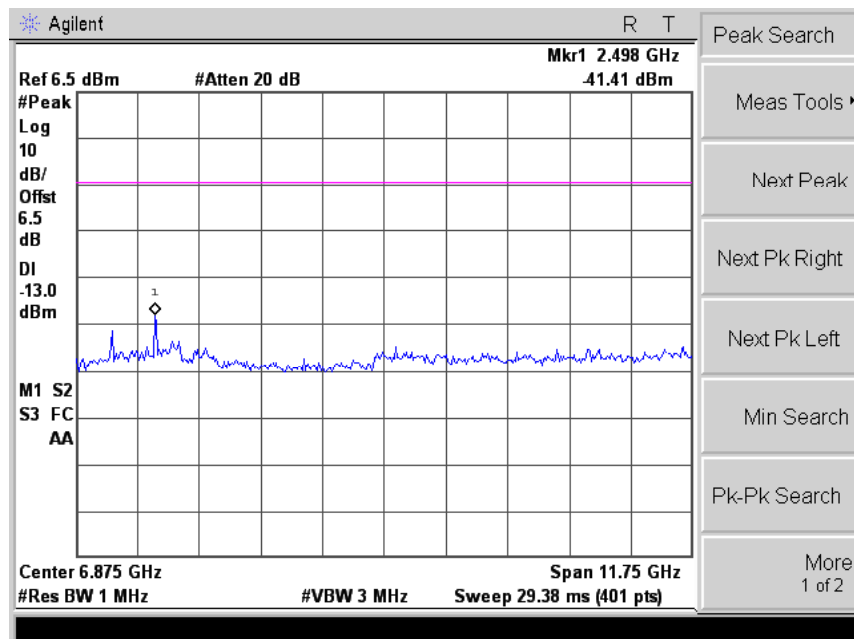
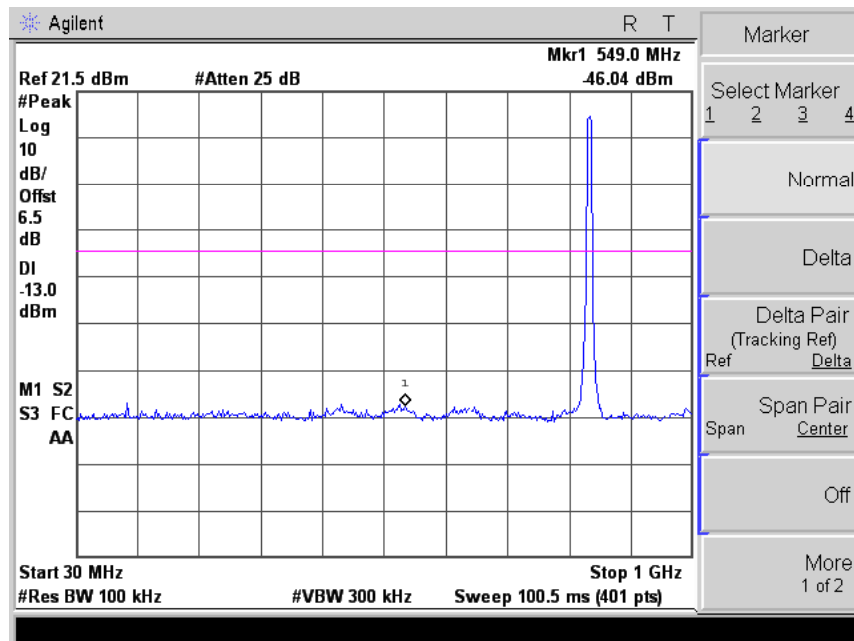
HSDPA High Band Spurious Emission



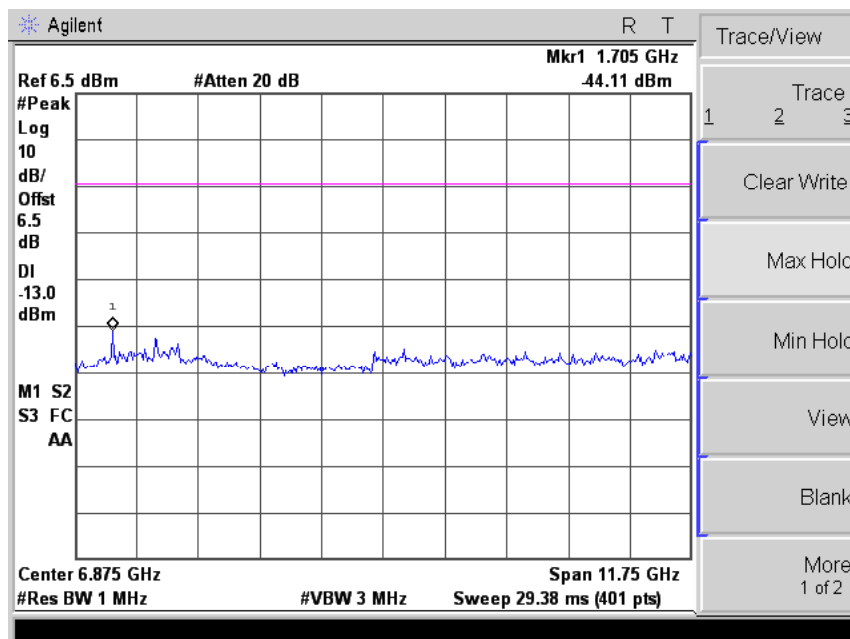
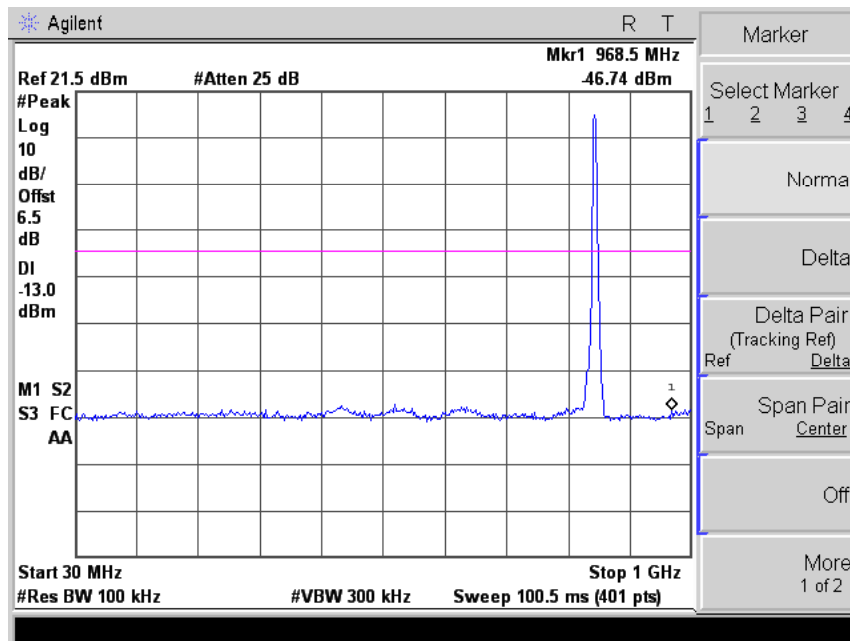
HSPA Low Channel



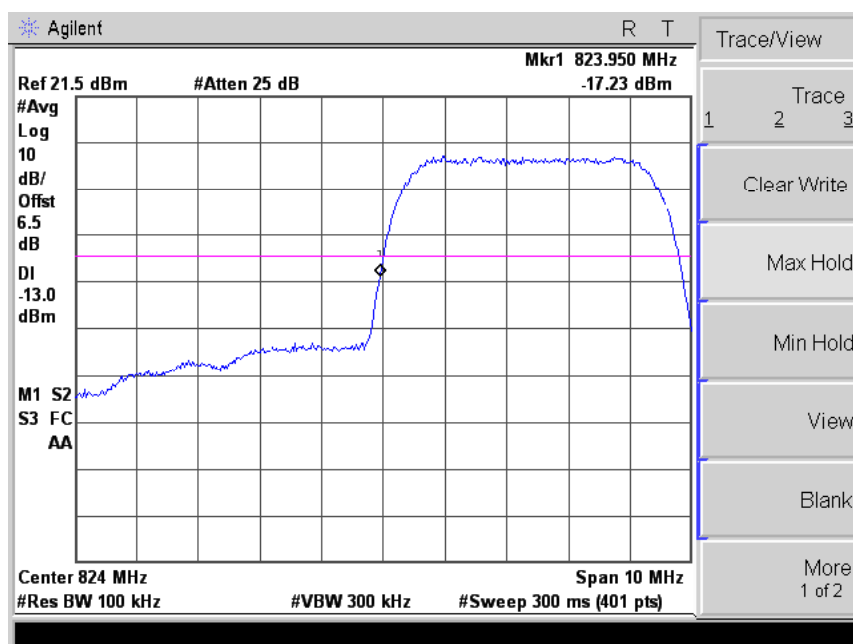
HSUPA Middle Channel



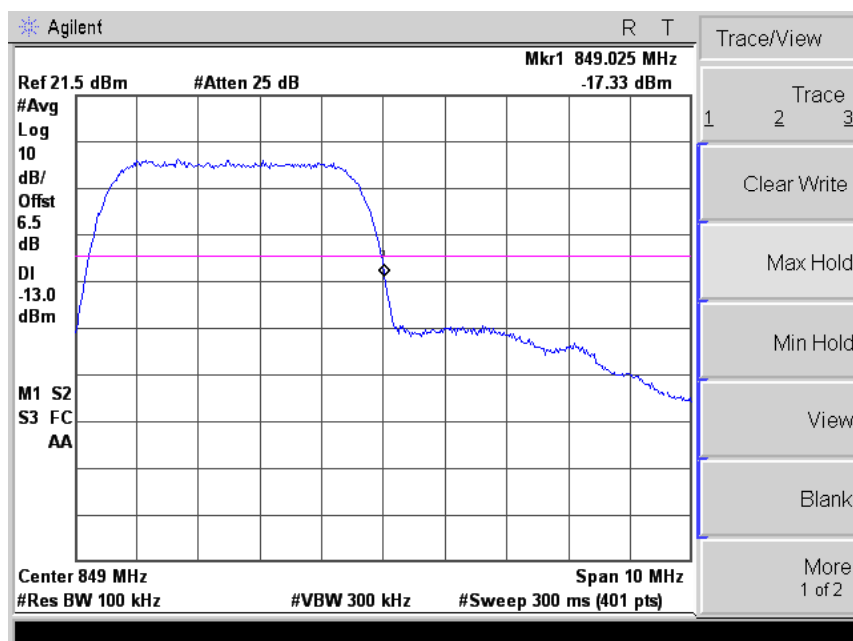
HSUPA High Channel



HSUPA Low Band Spurious Emission

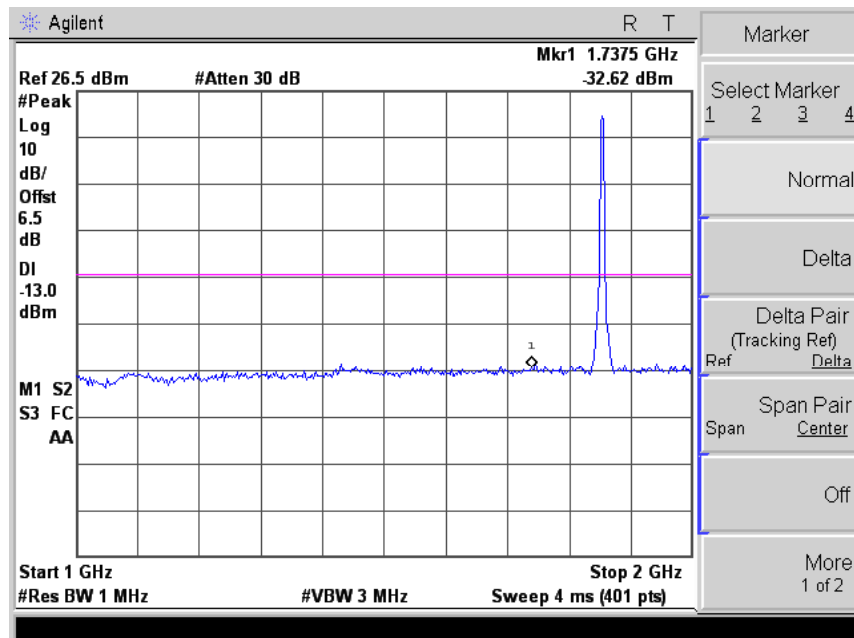
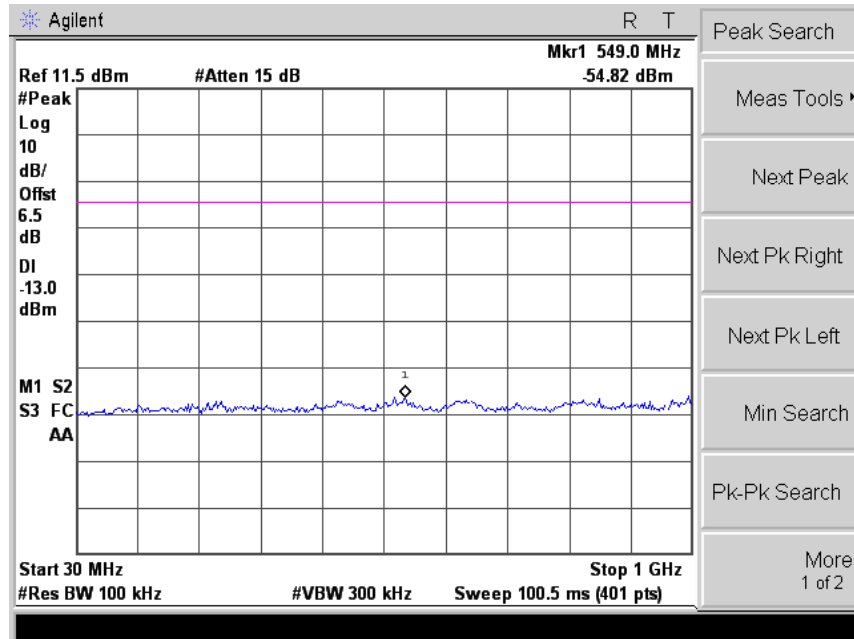


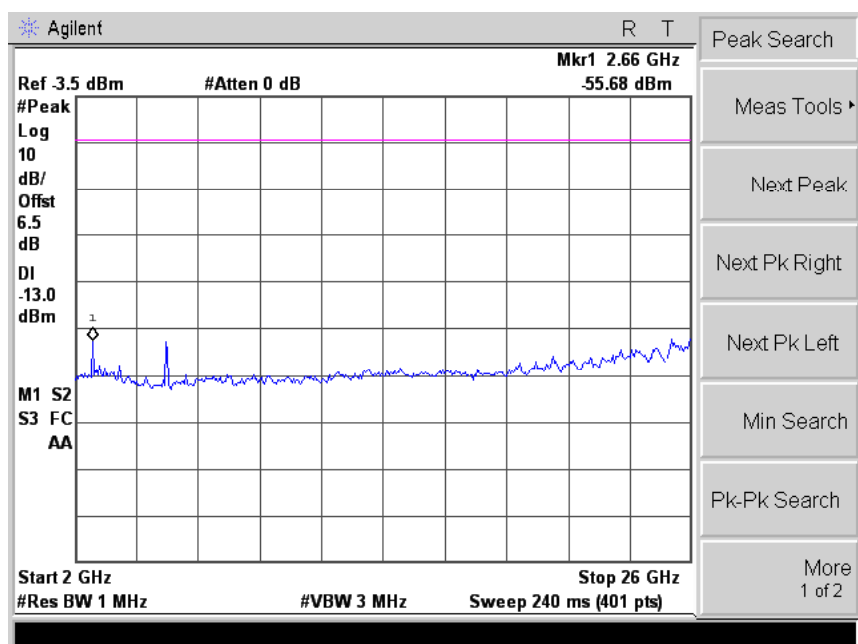
HSUPA High Band Spurious Emission



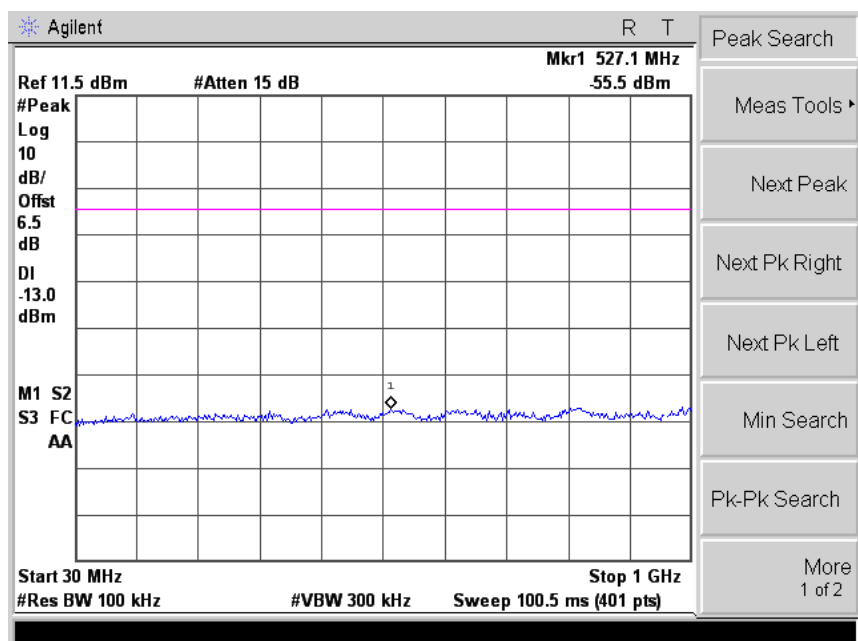
For Band II

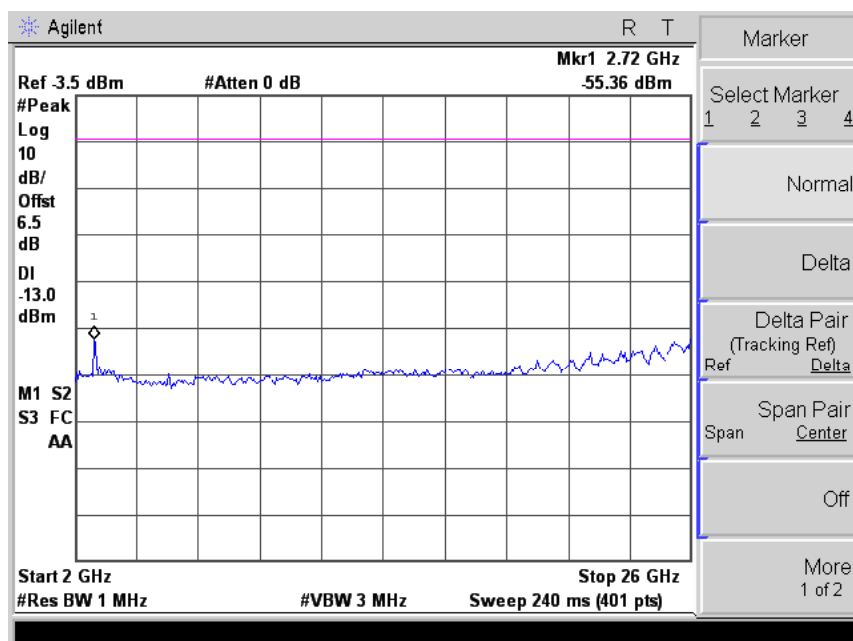
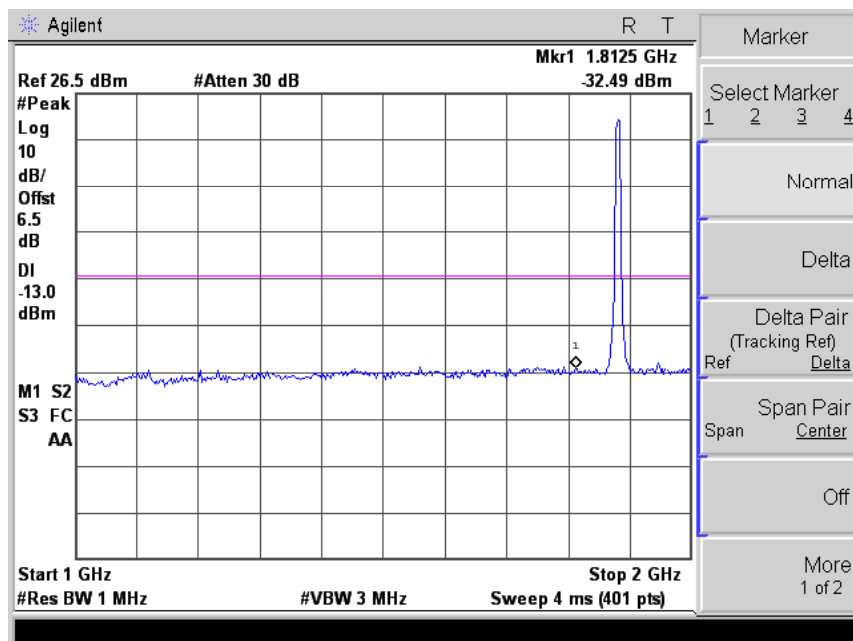
WCDMA Low Channel



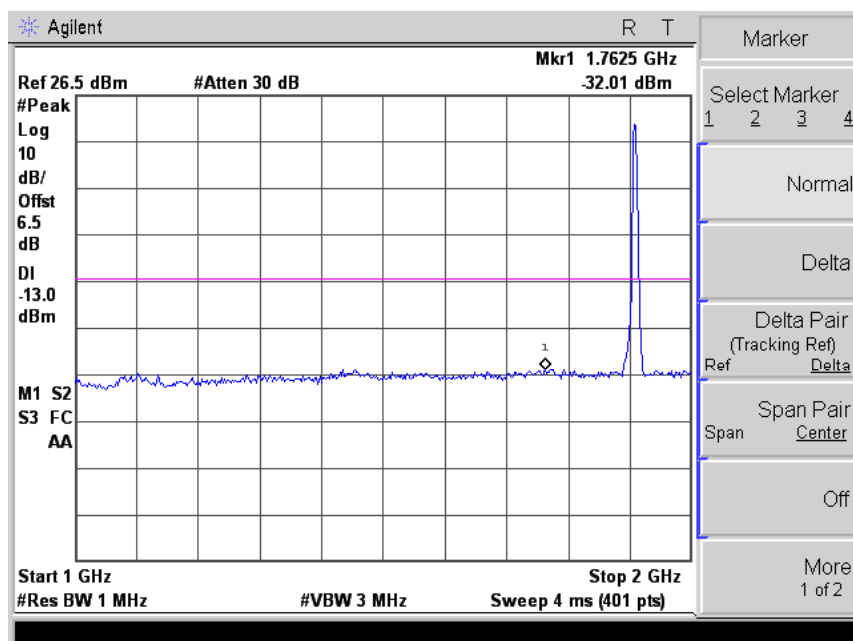
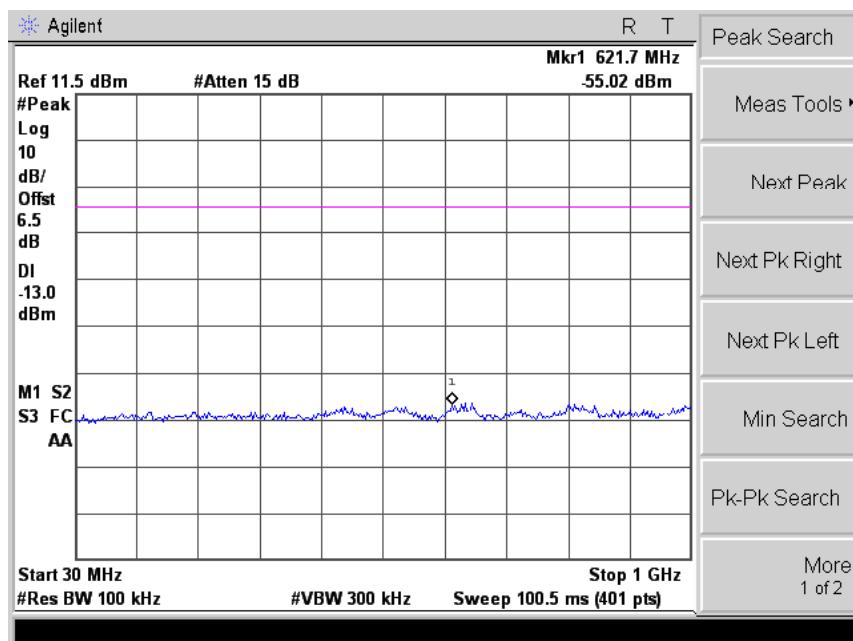


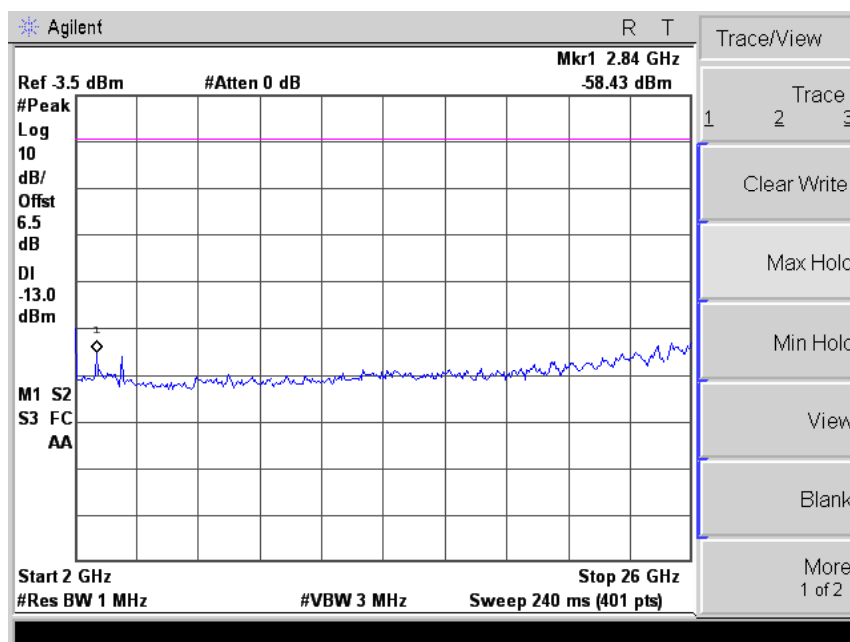
WCDMA Middle Channel



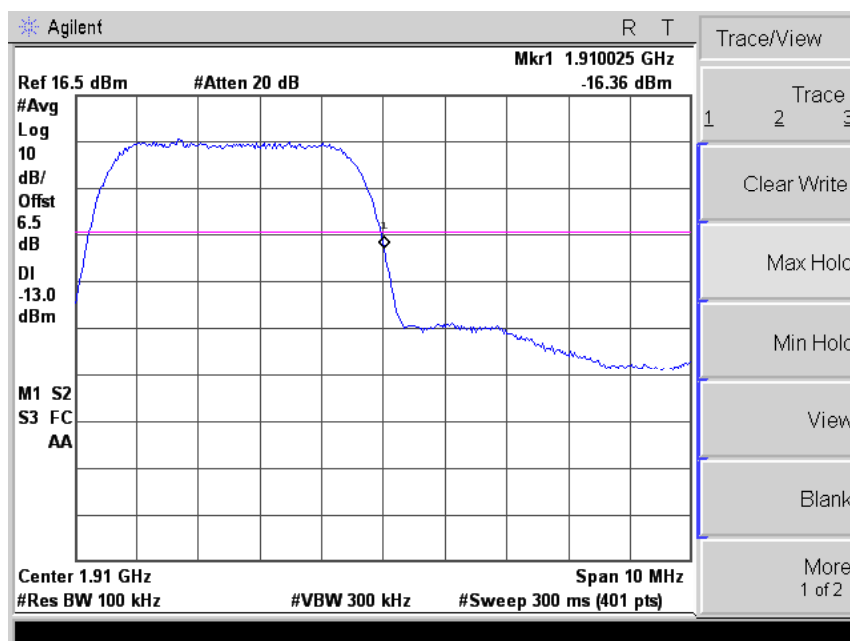


WCDMA High Channel

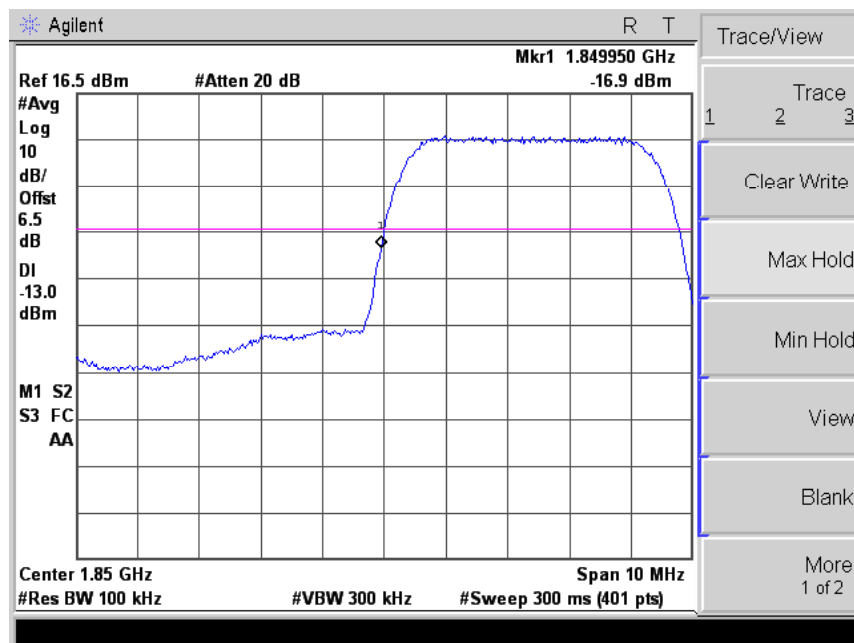




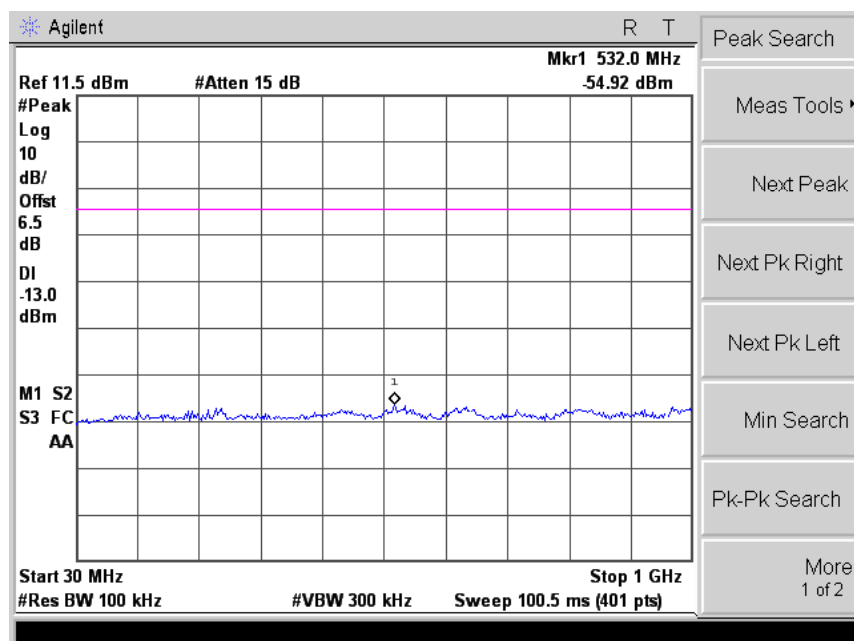
WCDMA Low Band Spurious Emission

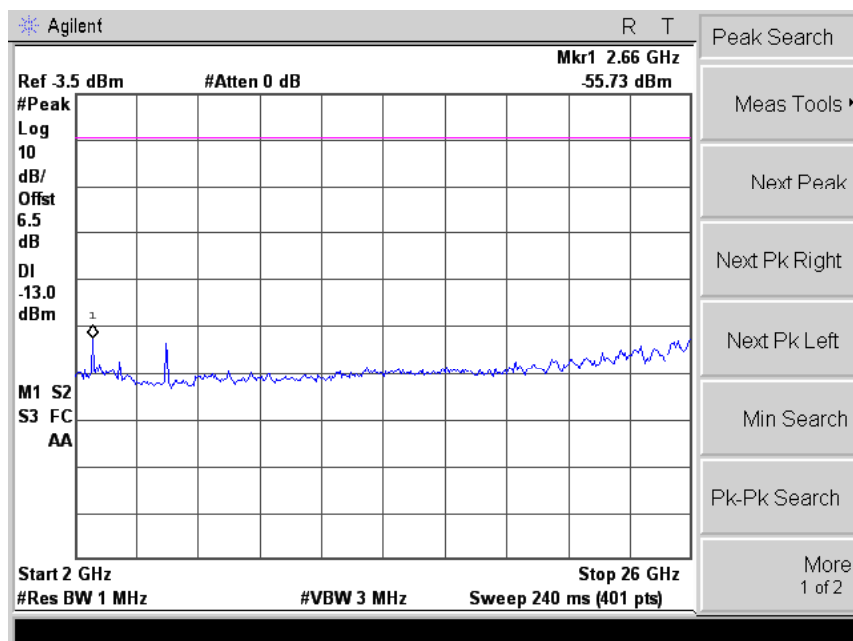
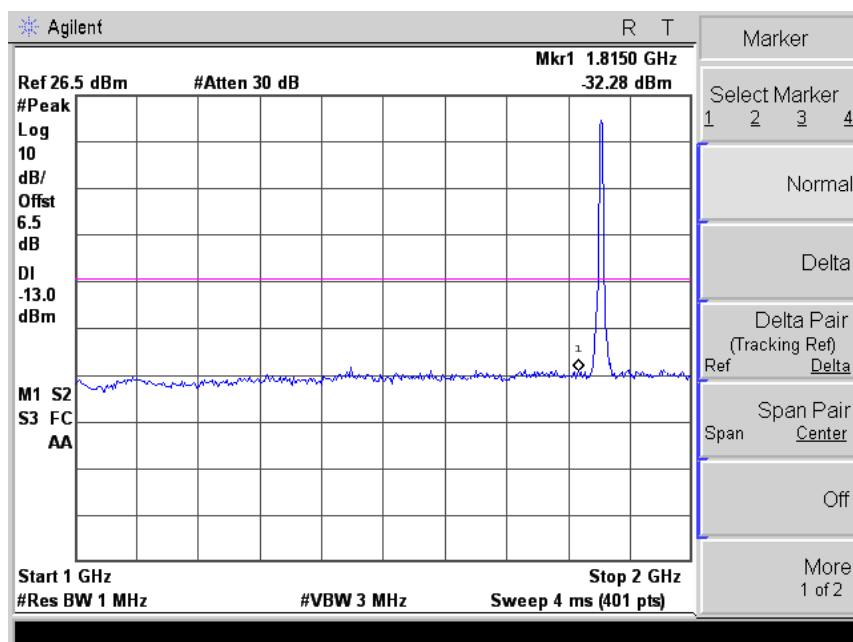


WCDMA High Band Spurious Emission

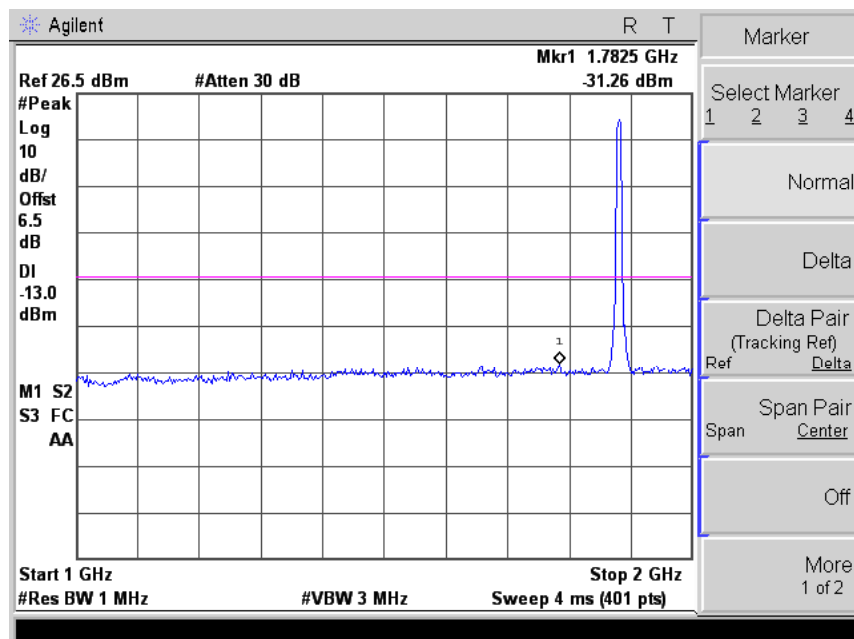
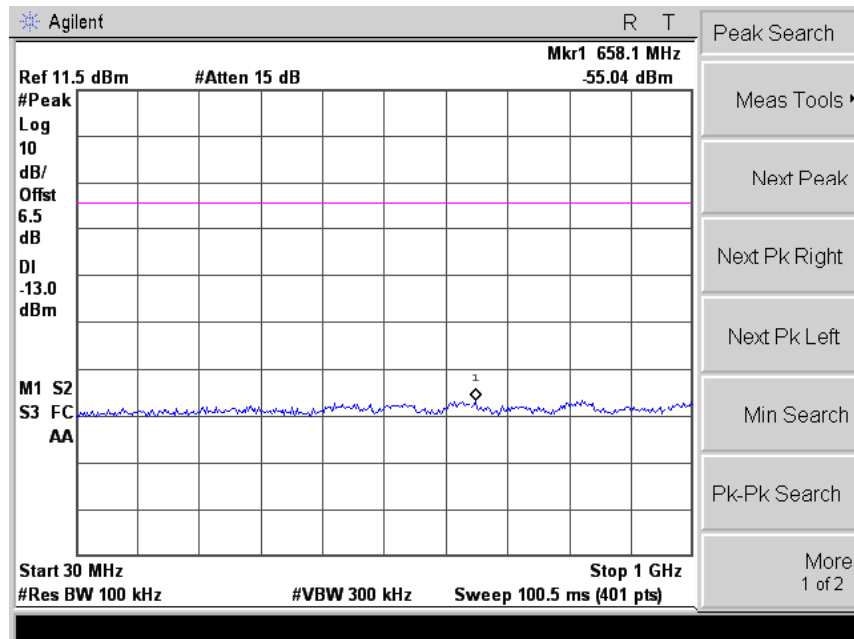


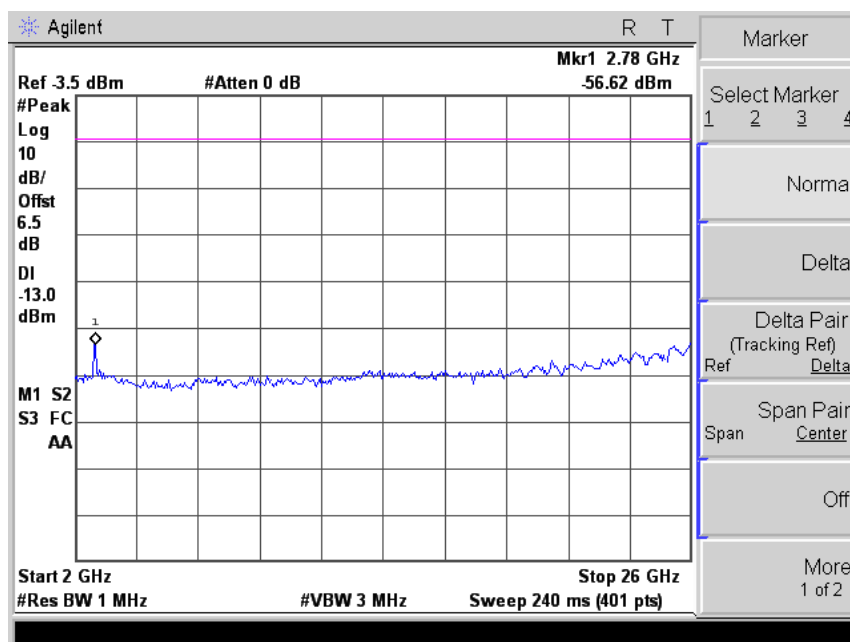
HSDPA Low Channel



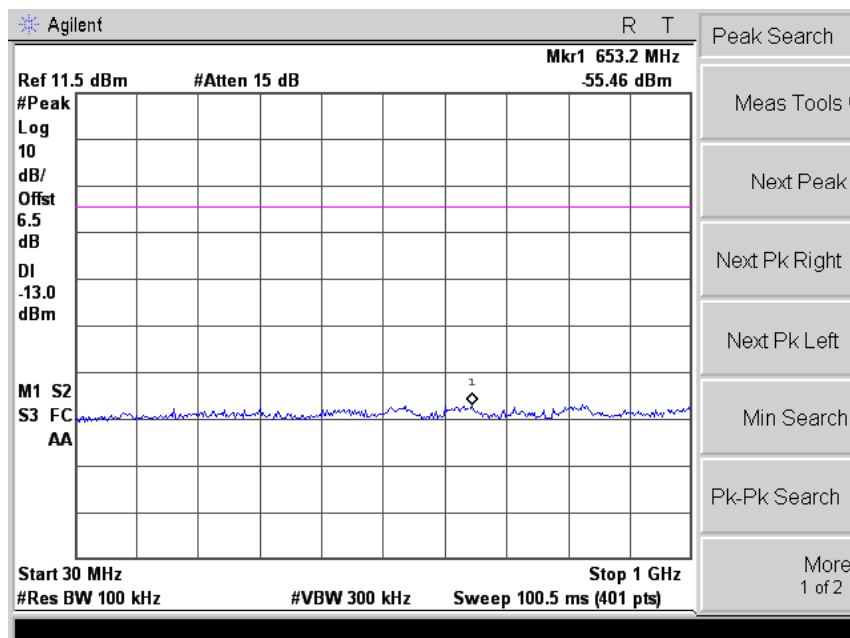


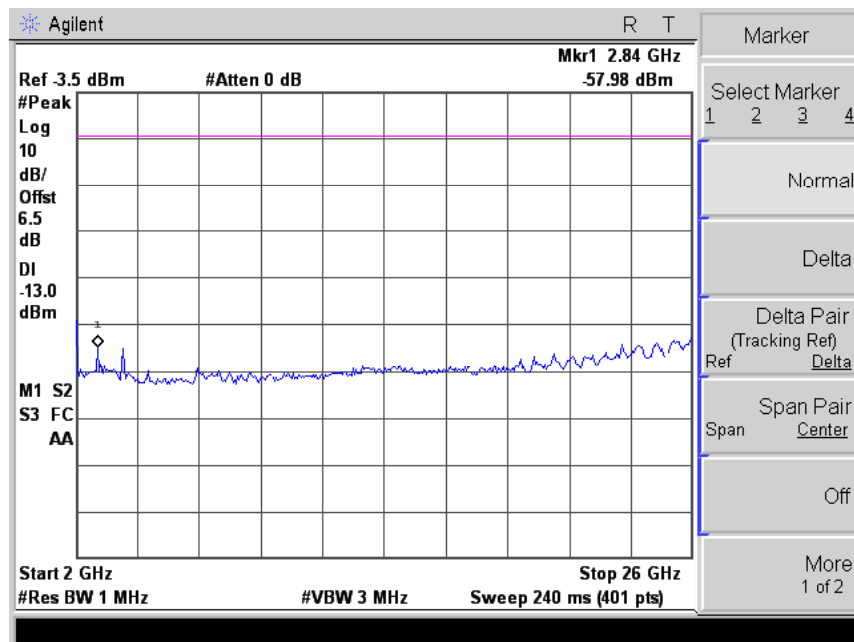
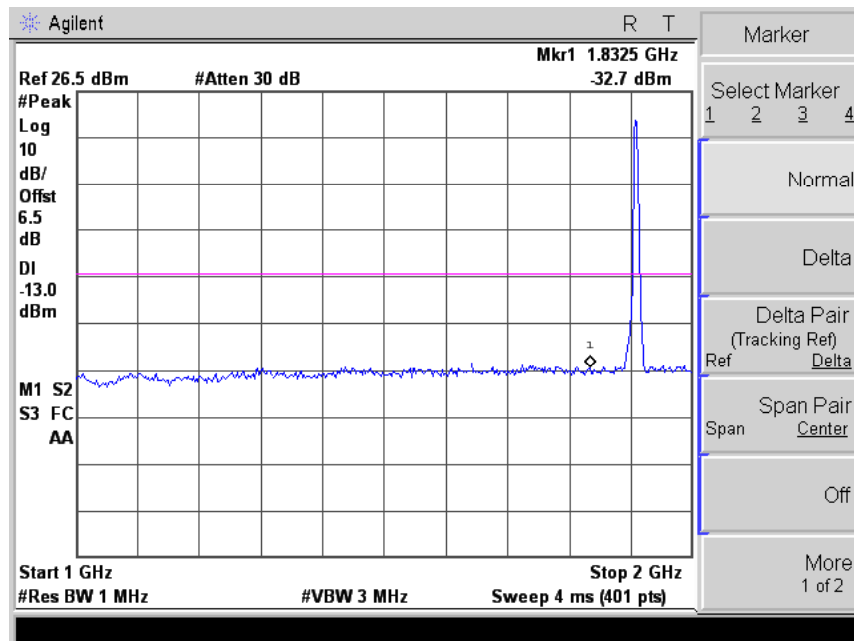
HSDPA Middle Channel



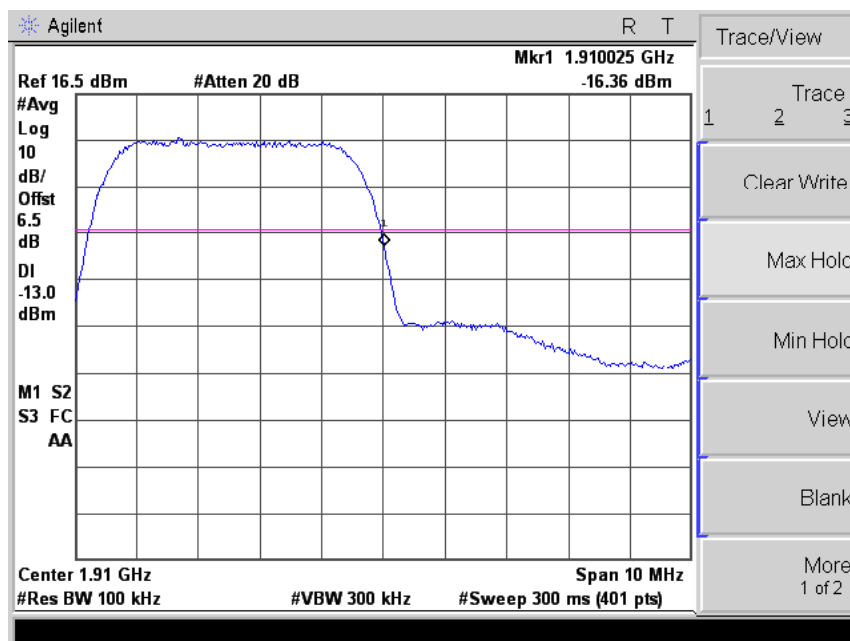


HSDPA High Channel

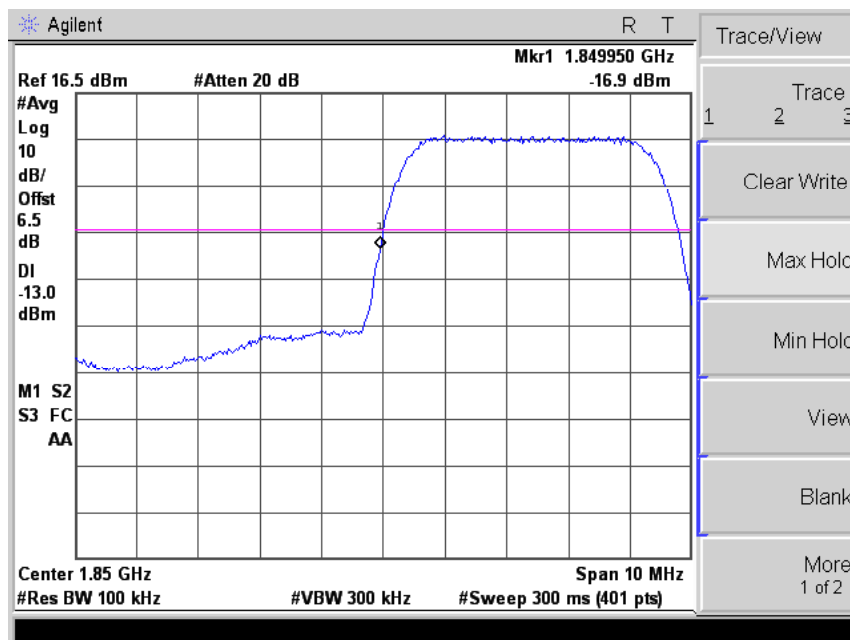




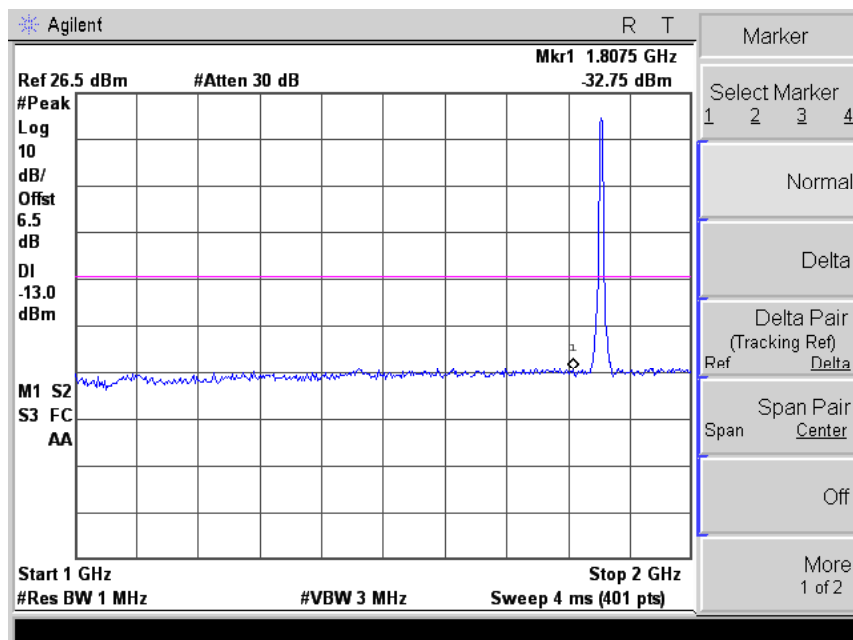
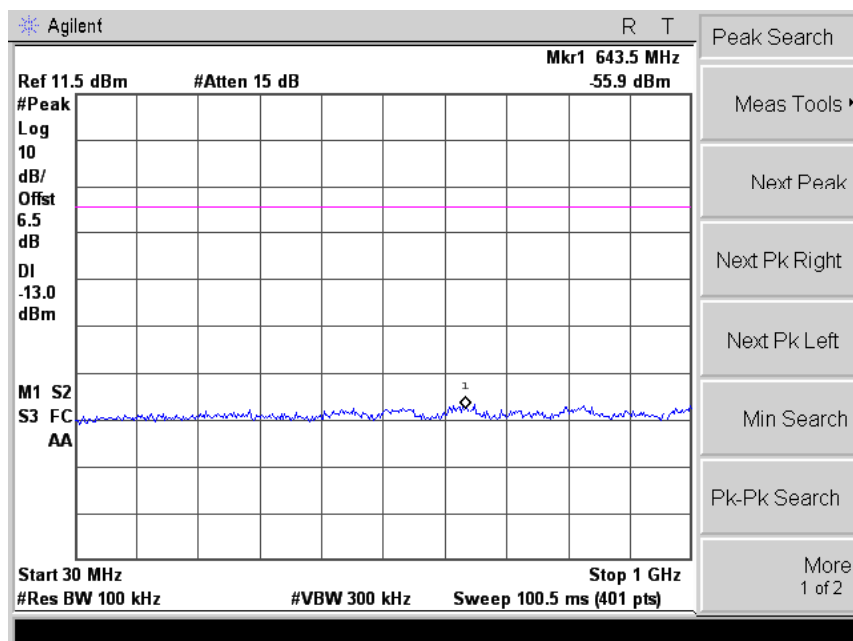
HSDPA Low Band Spurious Emission

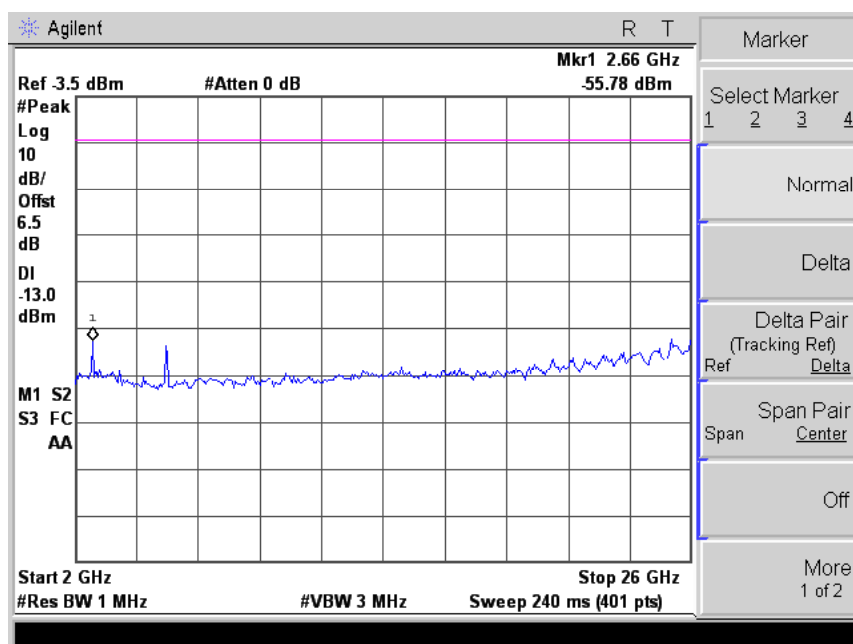


HSDPA High Band Spurious Emission

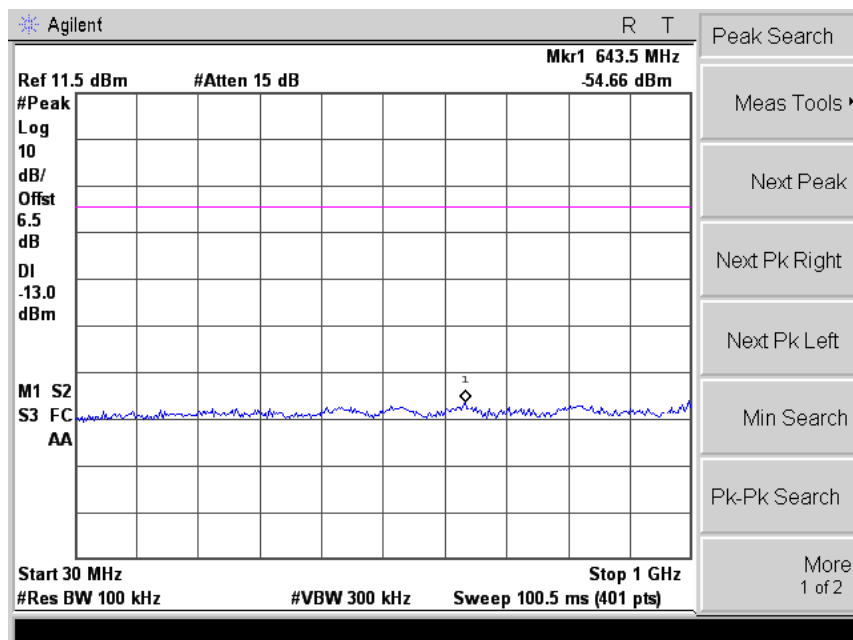


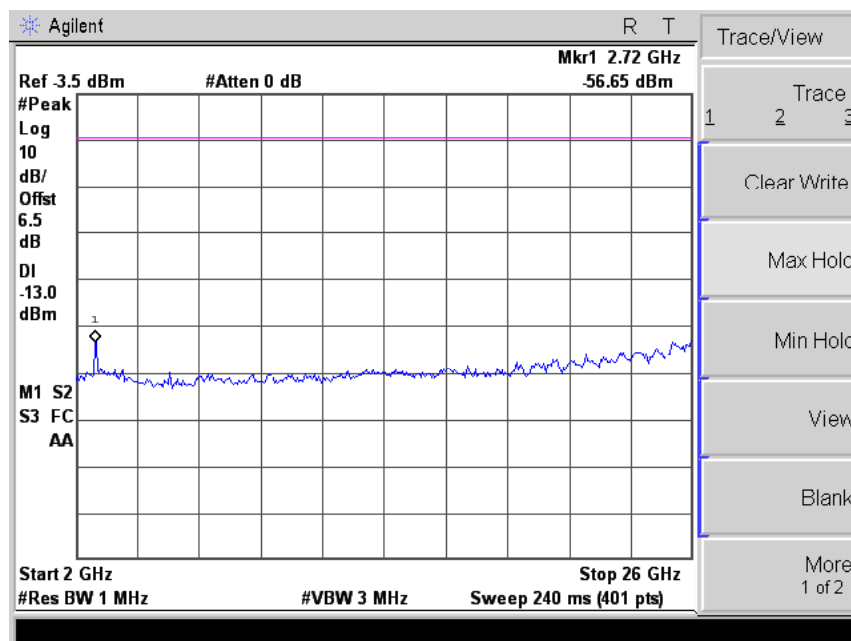
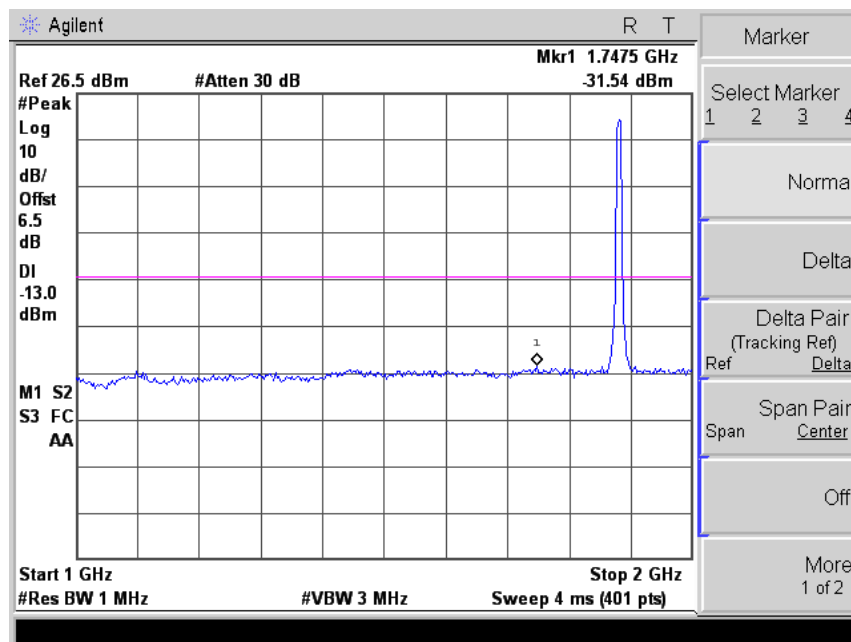
HSUPA Low Channel



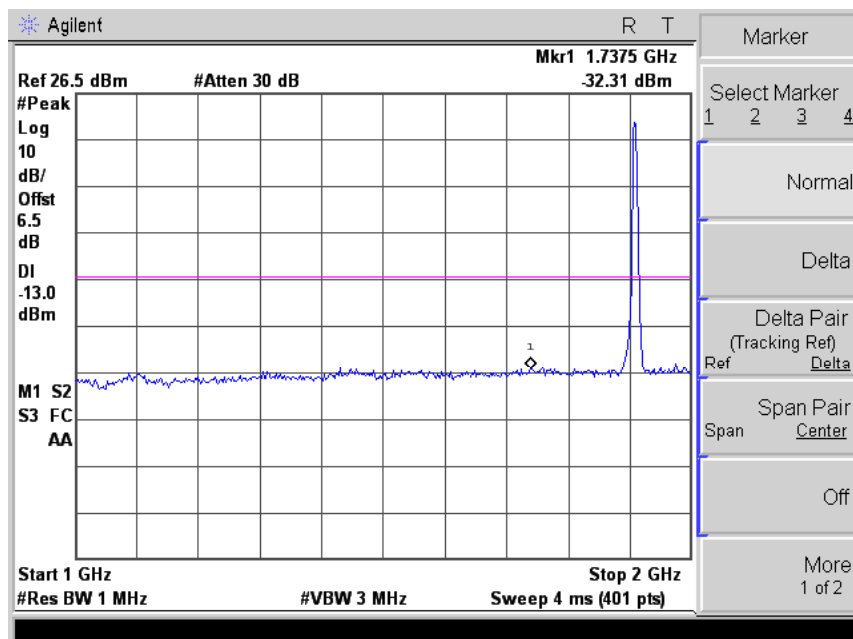
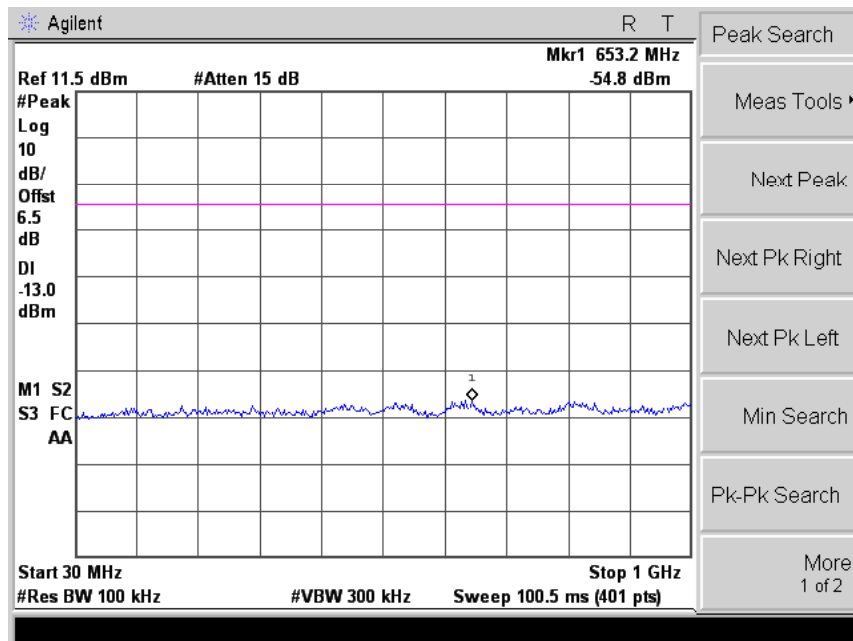


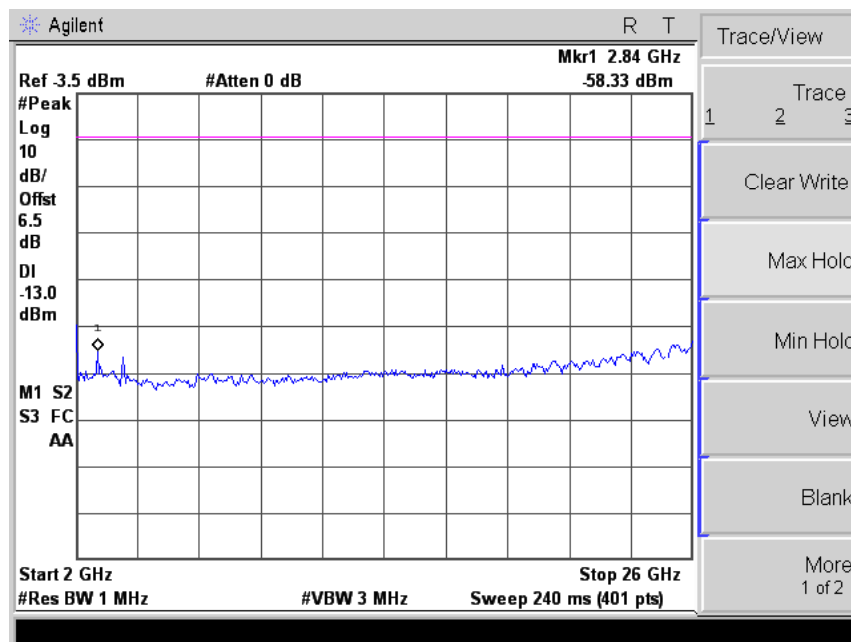
HSUPA Middle Channel



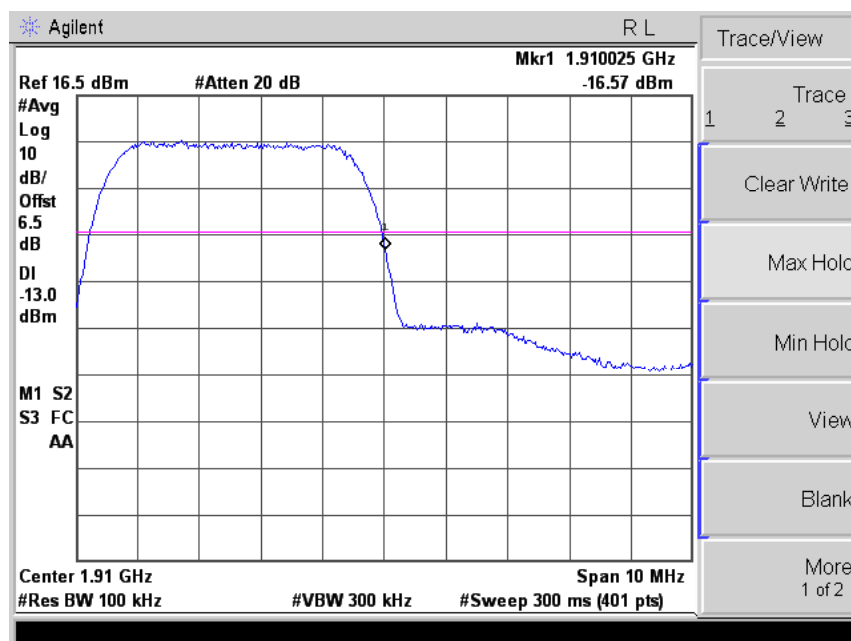


HSUPA High Channel

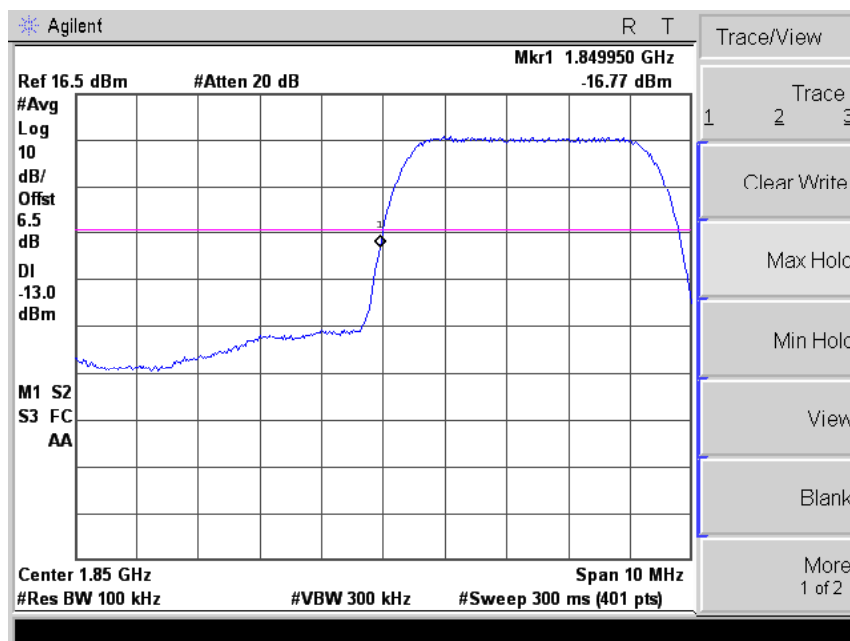




HSUPA Low Band Spurious Emission



HSUPA High Band Spurious Emission



8. Spurious Radiated Emissions

8.1 Standard Applicable

According to §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 §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.

According to §27.53 (h), the power of any emission outside a licensee's frequency block shall be attenuated below the transmitter power (P) in watts by at least $43 + 10 \log_{10}(P)$ dB.

8.2 Test Procedure

1. The setup of EUT is according with per ANSI/TIA Standard 603D and ANSI C63.4-2014 measurement procedure.
2. 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.
3. The frequency range up to tenth harmonic of the fundamental frequency was investigated.
4. 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.

$$\text{Spurious attenuation limit in dB} = 43 + 10 \log_{10}(\text{power out in Watts})$$

8.3 Environmental Conditions

Temperature:	25 °C
Relative Humidity:	52%
ATM Pressure:	1012 mbar

8.4 Summary of Test Results/Plots

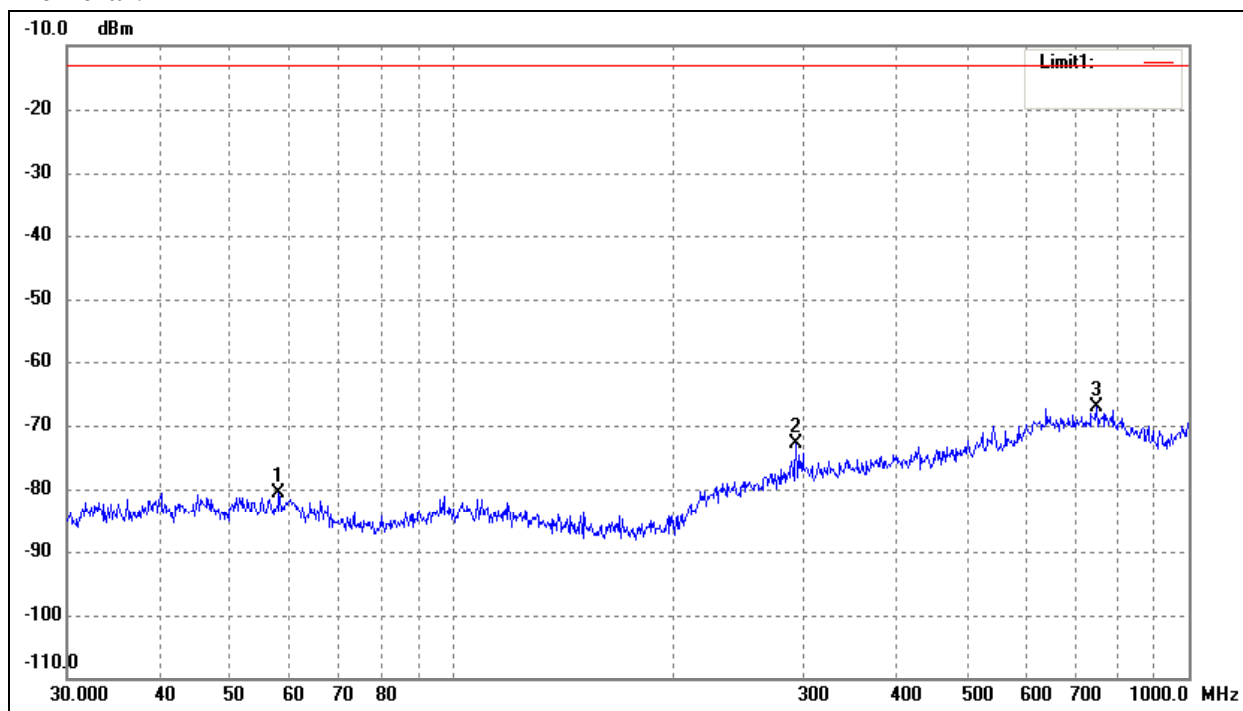
According to the data below, the FCC Part 22.917 and 24.238 standards, and had the worst margin of:

Note: this EUT was tested in 3 orthogonal positions and the worst case position data was reported.

Spurious Emission From 30MHz to 1GHz

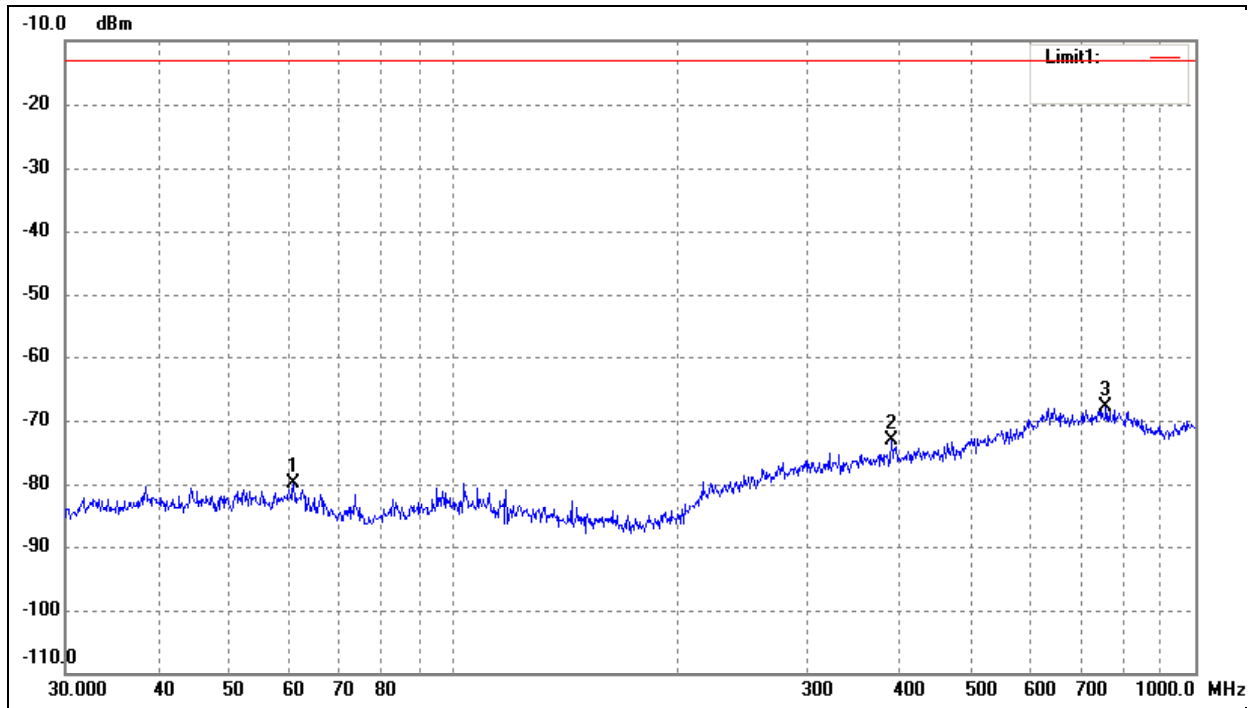
For Cellular Band_ GSM850 Mode

Horizontal:



No.	Frequency (MHz)	Reading (dBm)	Correct dB	Result (dBm)	Limit (dBm)	Margin (dB)	Degree ()	Height (cm)	Remark
1	58.2030	-75.86	-4.75	-80.61	-13.00	-67.61	310	100	peak
2	293.0842	-74.77	1.97	-72.80	-13.00	-59.80	93	100	peak
3	750.1083	-78.74	11.57	-67.17	-13.00	-54.17	192	100	peak

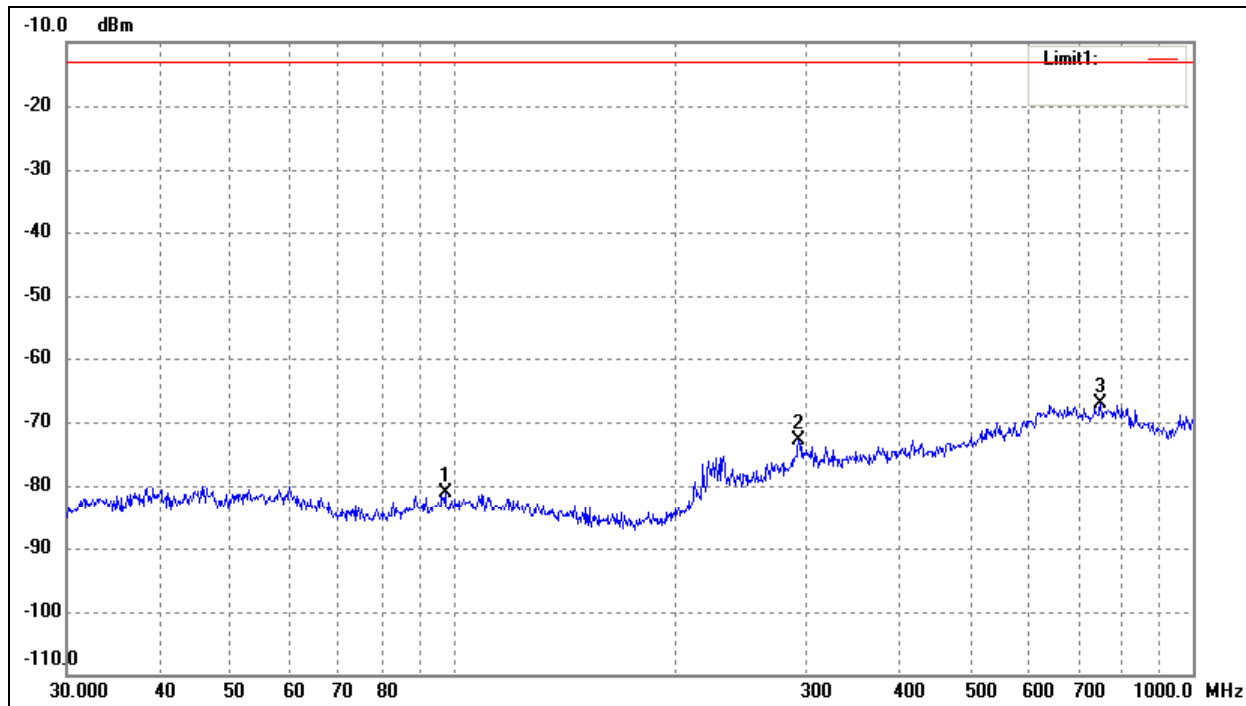
Vertical:



No.	Frequency (MHz)	Reading (dBm)	Correct dB	Result (dBm)	Limit (dBm)	Margin (dB)	Degree ()	Height (cm)	Remark
1	60.9176	-74.92	-4.90	-79.82	-13.00	-66.82	249	100	peak
2	389.3549	-76.59	3.43	-73.16	-13.00	-60.16	93	100	peak
3	758.0408	-79.11	11.27	-67.84	-13.00	-54.84	197	100	peak

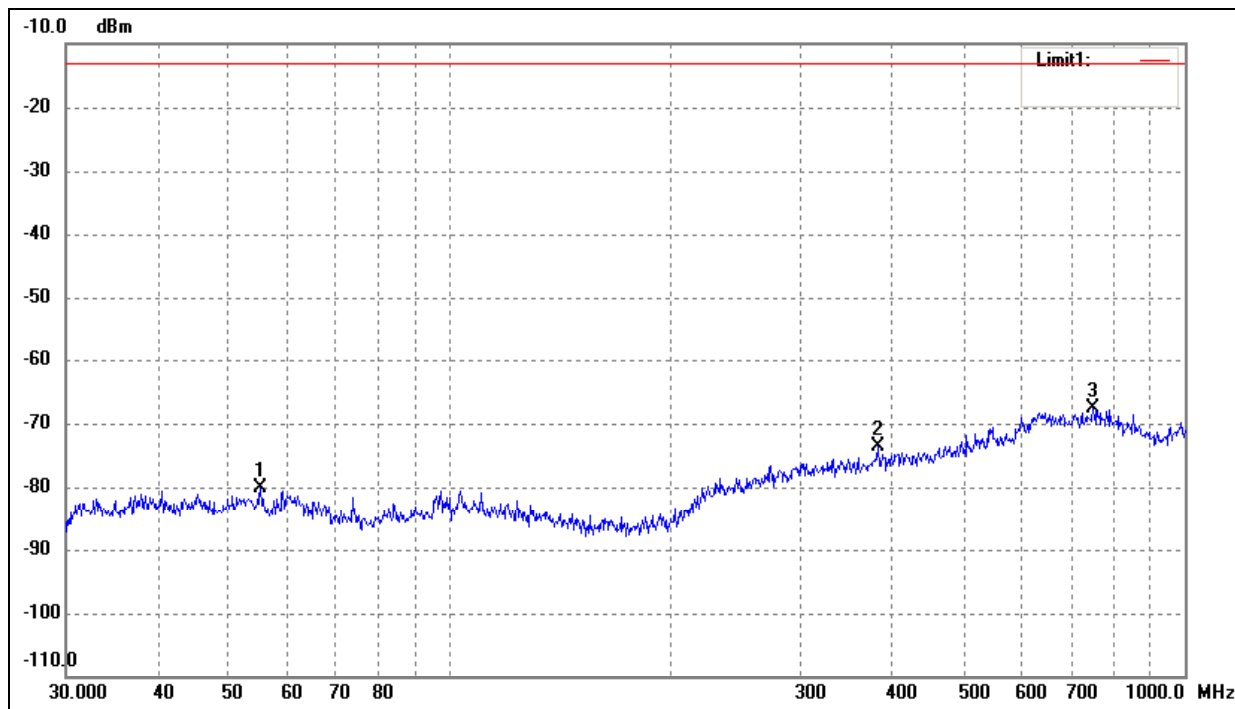
For Cellular Band_ GSM1900 Mode

Horizontal:



No.	Frequency (MHz)	Reading (dBm)	Correct dB	Result (dBm)	Limit (dBm)	Margin (dB)	Degree ()	Height (cm)	Remark
1	97.4560	-76.07	-5.13	-81.20	-13.00	-68.20	58	100	peak
2	293.0842	-74.77	1.97	-72.80	-13.00	-59.80	221	100	peak
3	750.1083	-78.74	11.57	-67.17	-13.00	-54.17	90	100	peak

Vertical:

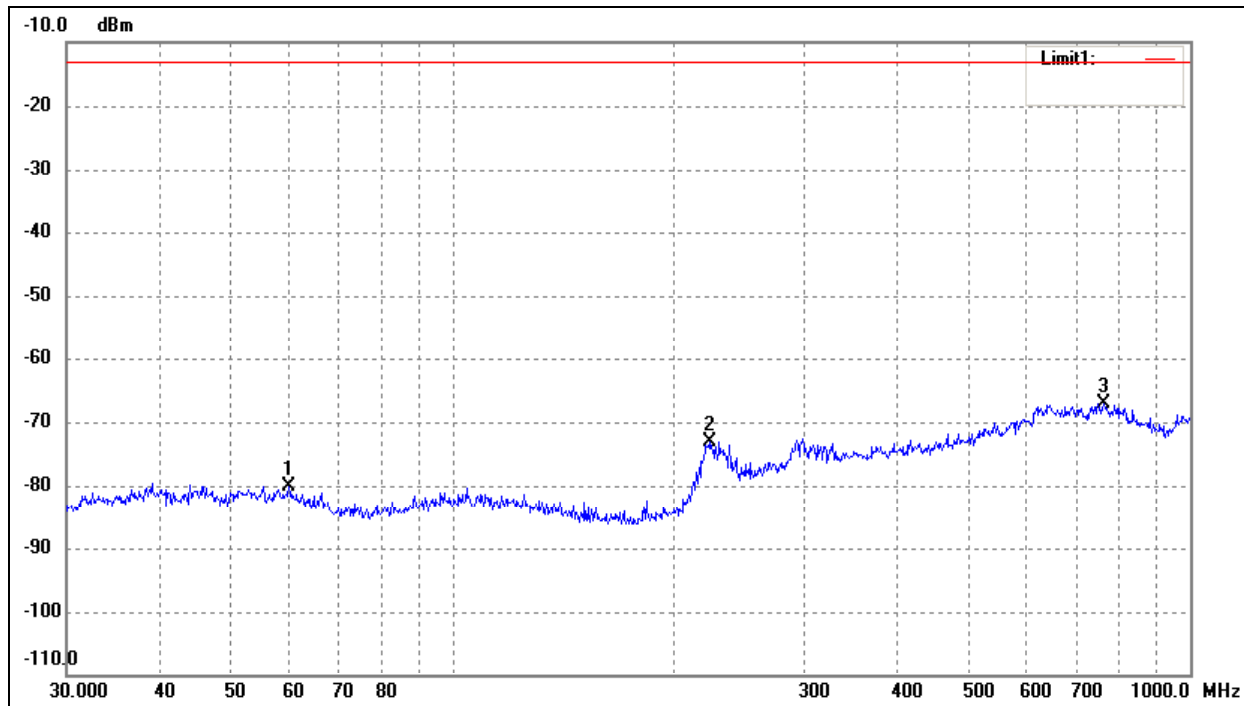


No.	Frequency (MHz)	Reading (dBm)	Correct dB	Result (dBm)	Limit (dBm)	Margin (dB)	Degree ()	Height (cm)	Remark
1	55.2207	-75.30	-4.71	-80.01	-13.00	-67.01	295	100	peak
2	382.5879	-76.74	3.08	-73.66	-13.00	-60.66	185	100	peak
3	750.1083	-79.22	11.57	-67.65	-13.00	-54.65	76	100	peak

Note: Margin= (Reading+ Correct)- Limit

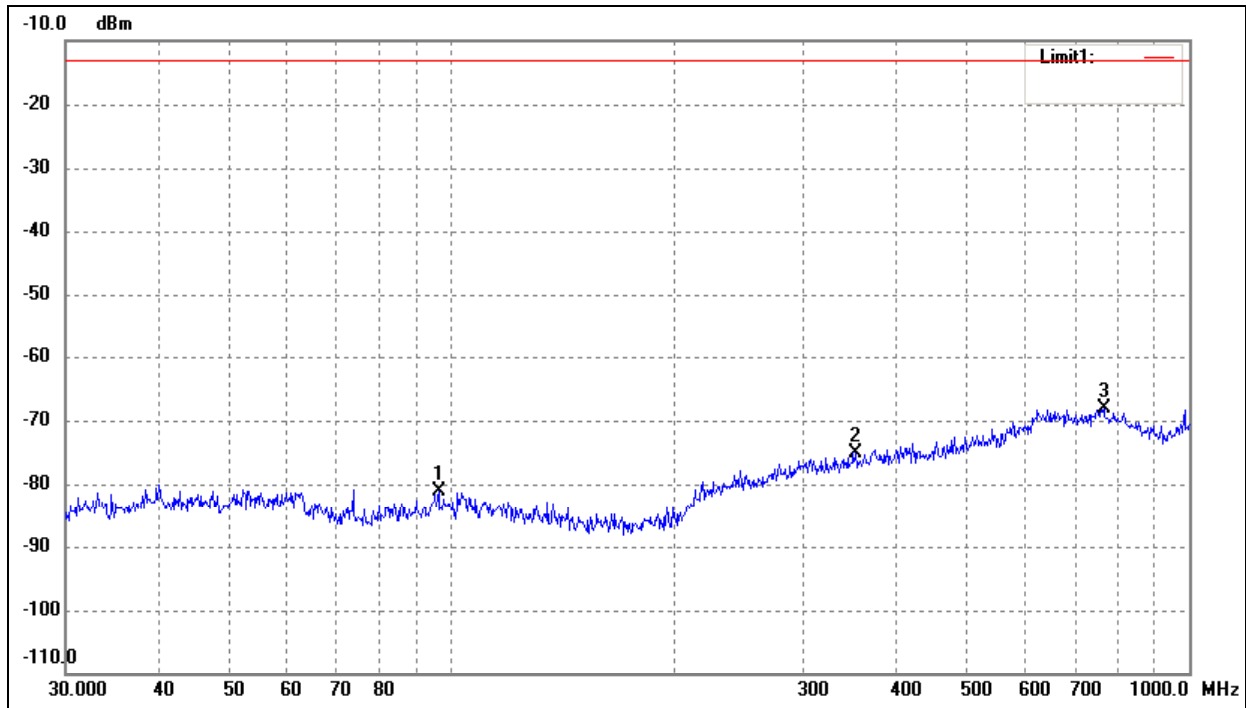
For band 5 Mode

Horizontal:



No.	Frequency (MHz)	Reading (dBm)	Correct dB	Result (dBm)	Limit (dBm)	Margin (dB)	Degree ()	Height (cm)	Remark
1	60.0691	-75.47	-4.72	-80.19	-13.00	-67.19	153	100	peak
2	223.7334	-71.25	-1.81	-73.06	-13.00	-60.06	159	100	peak
3	763.3757	-78.05	11.02	-67.03	-13.00	-54.03	93	100	peak

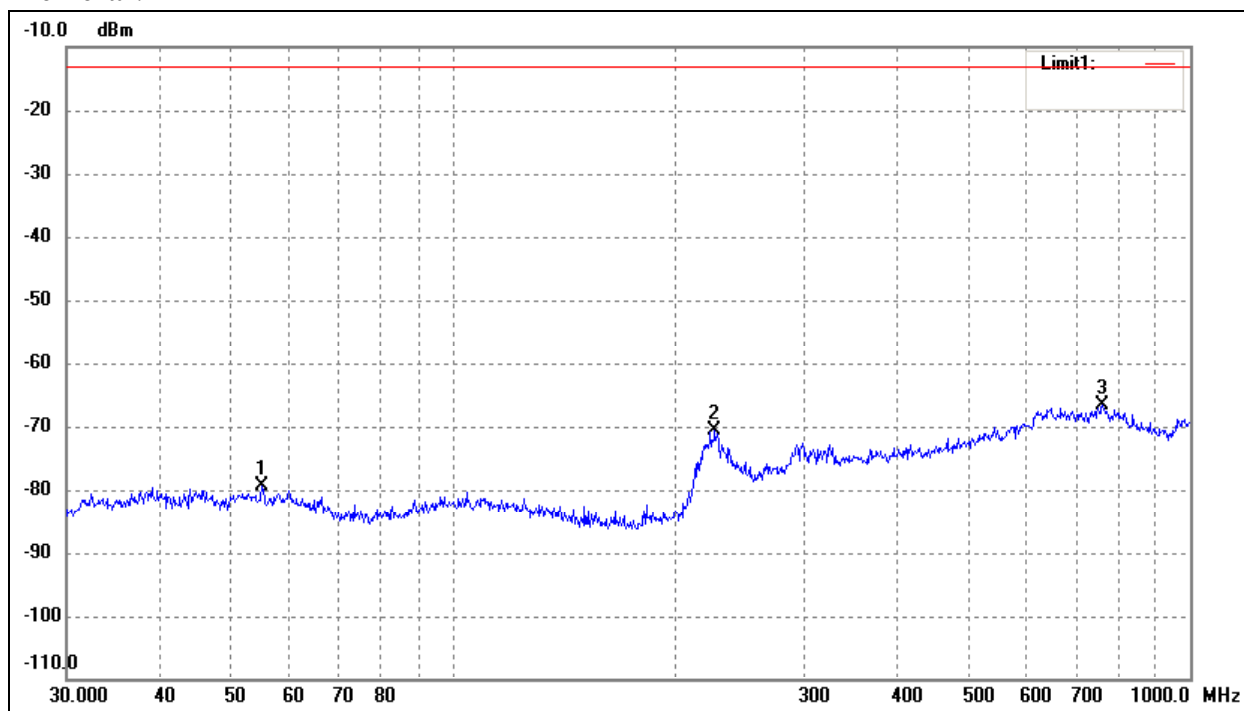
Vertical:



No.	Frequency (MHz)	Reading (dBm)	Correct dB	Result (dBm)	Limit (dBm)	Margin (dB)	Degree ()	Height (cm)	Remark
1	96.0986	-75.83	-5.34	-81.17	-13.00	-68.17	99	100	peak
2	352.9434	-77.77	2.63	-75.14	-13.00	-62.14	167	100	peak
3	766.0572	-79.05	10.87	-68.18	-13.00	-55.18	73	100	peak

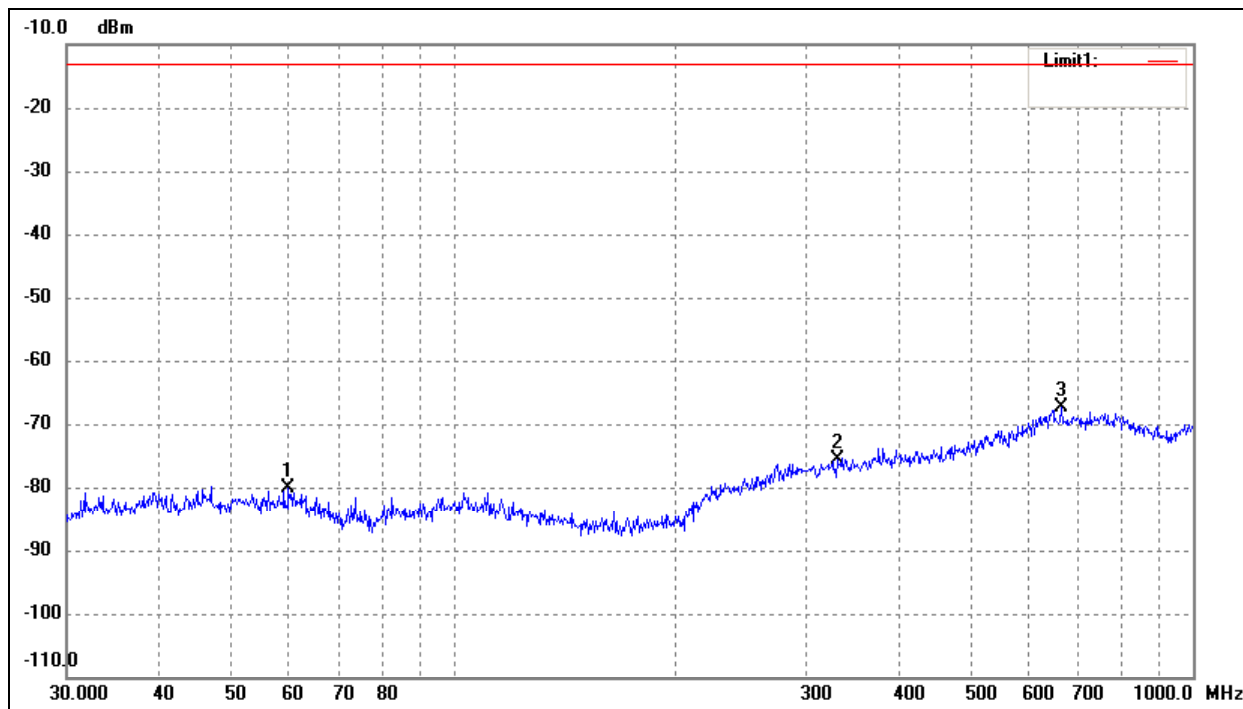
For band 2 Mode

Horizontal:



No.	Frequency (MHz)	Reading (dBm)	Correct dB	Result (dBm)	Limit (dBm)	Margin (dB)	Degree ()	Height (cm)	Remark
1	55.2207	-74.60	-4.71	-79.31	-13.00	-66.31	347	100	peak
2	226.8936	-69.04	-1.60	-70.64	-13.00	-57.64	177	100	peak
3	760.7036	-77.86	11.16	-66.70	-13.00	-53.70	74	100	peak

Vertical:



No.	Frequency (MHz)	Reading (dBm)	Correct dB	Result (dBm)	Limit (dBm)	Margin (dB)	Degree ()	Height (cm)	Remark
1	59.8588	-75.33	-4.71	-80.04	-13.00	-67.04	115	100	peak
2	330.1949	-77.89	2.28	-75.61	-13.00	-62.61	118	100	peak
3	663.4729	-77.79	10.49	-67.30	-13.00	-54.30	79	100	peak

Note: Margin= (Reading+ Correct)- Limit

Spurious Emissions Above 1GHz

For Cellular Band_GSM850 Mode

Frequency (MHz)	Reading (dBm)	Correct dB	Result (dBm)	Limit (dBm)	Margin (dB)	Polar H/V
Low Channel (824.2MHz)						
1648.4	-34.51	4.94	-29.57	-13	-16.57	H
2472.6	-44.31	8.46	-35.85	-13	-22.85	H
1648.4	-34.55	4.94	-29.61	-13	-16.61	V
2472.6	-42.02	8.46	-33.56	-13	-20.56	V
Middle Channel (836.6MHz)						
1673.2	-33.44	5.11	-28.33	-13	-15.33	H
2509.8	-39.77	8.54	-31.23	-13	-18.23	H
1673.2	-34.76	5.11	-29.65	-13	-16.65	V
2509.8	-41.66	8.54	-33.12	-13	-20.12	V
High Channel (848.8MHz)						
1697.6	-32.79	5.25	-27.54	-13	-14.54	H
2546.4	-41.14	5.29	-35.85	-13	-22.85	H
1697.6	-34.45	8.59	-25.86	-13	-12.86	V
2546.4	-41.26	5.29	-35.97	-13	-22.97	V

For PCS Band_GSM1900 Mode

Frequency (MHz)	Reading (dBm)	Correct dB	Result (dBm)	Limit (dBm)	Margin (dB)	Polar H/V
Low Channel (1850.2MHz)						
3700.4	-37.3	10.54	-26.76	-13	-13.76	H
5550.6	-41.45	13.37	-28.08	-13	-15.08	H
3700.4	-34.96	10.54	-24.42	-13	-11.42	V
5550.6	-43.76	13.37	-30.39	-13	-17.39	V
Middle Channel (1880MHz)						
3760.0	-36.79	10.64	-26.15	-13	-13.15	H
5640.0	-42.16	13.54	-28.62	-13	-15.62	H
3760.0	-35.56	10.64	-24.92	-13	-11.92	V
5640.0	-42.01	13.54	-28.47	-13	-15.47	V
High Channel (1909.8MHz)						
3819.6	-36.81	10.74	-26.07	-13	-13.07	H
5729.4	-43.28	13.71	-29.57	-13	-16.57	H
3819.6	-37.52	10.74	-26.78	-13	-13.78	V
5729.4	-41.54	13.71	-27.83	-13	-14.83	V

For Band 5 Mode

Frequency	Reading	Correct	Result	Limit	Margin	Polar
(MHz)	(dBm)	dB	(dBm)	(dBm)	(dB)	H/V
Low Channel (826.4MHz)						
1652.8	-34.51	4.94	-29.57	-13	-16.57	H
2479.2	-44.31	8.46	-35.85	-13	-22.85	H
1652.8	-34.55	4.94	-29.61	-13	-16.61	V
2479.2	-42.02	8.46	-33.56	-13	-20.56	V
Middle Channel (836.6MHz)						
1672.8	-32.97	5.11	-27.86	-13	-14.86	H
2509.2	-42.85	8.54	-34.31	-13	-21.31	H
1672.8	-32.98	5.11	-27.87	-13	-14.87	V
2509.2	-40.11	8.54	-31.57	-13	-18.57	V
High Channel (846.6MHz)						
1693.2	-33.37	5.25	-28.12	-13	-15.12	H
2539.8	-41.69	8.57	-33.12	-13	-20.12	H
1693.2	-35.85	5.25	-30.6	-13	-17.6	V
2539.8	-40.32	8.57	-31.75	-13	-18.75	V

For Band 2 Mode

Frequency	Reading	Correct	Result	Limit	Margin	Polar
(MHz)	(dBm)	dB	(dBm)	(dBm)	(dB)	H/V
Low Channel (1852.4MHz)						
3704.8	-34.73	10.17	-24.56	-13	-11.56	H
5557.2	-42.88	14.69	-28.19	-13	-15.19	H
3704.8	-34.88	10.17	-24.71	-13	-11.71	V
5557.2	-44.66	14.69	-29.97	-13	-16.97	V
Middle Channel (1880MHz)						
3760.8	-37.14	10.26	-26.88	-13	-13.88	H
5640.0	-43.39	14.78	-28.61	-13	-15.61	H
3760.8	-34.3	10.26	-24.04	-13	-11.04	V
5640.0	-41.9	14.78	-27.12	-13	-14.12	V
High Channel (1907.6MHz)						
3815.2	-37.04	10.59	-26.45	-13	-13.45	H
5722.8	-41.64	15.03	-26.61	-13	-13.61	H
3815.2	-36.79	10.59	-26.2	-13	-13.2	V
5722.8	-42.02	15.03	-26.99	-13	-13.99	H

Note: Result=Reading+ Correct, Margin= Result- Limit

Note: Testing is carried out with frequency rang 9kHz to the tenth harmonics, other than listed in the table above are attenuated more than 20dB below the permissible limits or the field strength is too small to be measured.

9. Frequency Stability

9.1 Standard Applicable

According to §22.355, the carrier frequency of each transmitter in the Public Mobile Services must be maintained within the tolerances given in Table below:

Frequency Tolerance for Cellular Band

Frequency range (MHz)	Base, fixed (ppm)	Mobile >3 watts (ppm)	Mobile ≤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

According to §24.235, the frequency stability shall be sufficient to ensure that the fundamental emission stays within the authorized frequency block.

According to §27.54 The frequency stability shall be sufficient to ensure that the fundamental emissions stay within the authorized bands of operation.

9.2 Test Procedure

According to §2.1055, the following test procedure was performed.

The Frequency Stability is measured directly with a Frequency Domain Analyzer. Frequency Deviation in ppm is calculated from the measured peak to peak value.

The Carrier Frequency Stability over Power Supply Voltage and over Temperature is measured with a Frequency Domain Analyzer in histogram mode

Temperature:	Supply Voltage
20°C	DC 3.3-4.2V declared by manufacturer
-30°C to +50°C	Normal

9.3 Environmental Conditions

Temperature:	20°C
Relative Humidity:	54%
ATM Pressure:	1011 mbar

9.4 Summary of Test Results/Plots

For Cellular Band GPRS Mode

Reference Frequency(Middle Channel): 836.6MHz, Limit: 2.5ppm			
Environment Temperature (°C)	Power Supplied (VDC)	Frequency Measure with Time Elapsed	
		MCF (Hz)	Error (ppm)
50	10.5	58	0.0699
40	10.5	49	0.0588
30	10.5	38	0.0451
20	10.5	31	0.0368
10	10.5	27	0.0322
0	10.5	22	0.0257
-10	10.5	28	0.0331
-20	10.5	34	0.0405
-30	10.5	38	0.0451

For PCS Band GPRS Mode

Reference Frequency(Middle Channel): 1880 MHz, Limit: 2.5ppm			
Environment Temperature (°C)	Power Supplied (VDC)	Frequency Measure with Time Elapsed	
		MCF (Hz)	Error (ppm)
50	10.5	63	0.0336
40	10.5	51	0.0270
30	10.5	45	0.0241
20	10.5	41	0.0217
10	10.5	35	0.0188
0	10.5	29	0.0155
-10	10.5	37	0.0196
-20	10.5	42	0.0221
-30	10.5	48	0.0254

For Cellular Band EDGE Mode

Reference Frequency(Middle Channel): 836.6MHz, Limit: 2.5ppm			
Environment Temperature (°C)	Power Supplied (VDC)	Frequency Measure with Time Elapsed	
		MCF (Hz)	Error (ppm)
50	10.5	44	0.0524
40	10.5	38	0.0460
30	10.5	32	0.0386
20	10.5	25	0.0303
10	10.5	21	0.0248
0	10.5	15	0.0184
-10	10.5	22	0.0257
-20	10.5	27	0.0322
-30	10.5	34	0.0405

For PCS Band EDGE Mode

Reference Frequency(Middle Channel): 1880 MHz, Limit: 2.5ppm			
Environment Temperature (°C)	Power Supplied (VDC)	Frequency Measure with Time Elapsed	
		MCF (Hz)	Error (ppm)
50	10.5	77	0.0409
40	10.5	64	0.0340
30	10.5	53	0.0282
20	10.5	48	0.0258
10	10.5	42	0.0221
0	10.5	35	0.0188
-10	10.5	42	0.0225
-20	10.5	50	0.0266
-30	10.5	55	0.0295

For WCDMA Band 5 Mode

Reference Frequency(Middle Channel): 836.6 MHz, Limit: 2.5ppm			
Environment Temperature (°C)	Power Supplied (VDC)	Frequency Measure with Time Elapsed	
		MCF (Hz)	Error (ppm)
50	10.5	55	0.0662
40	10.5	45	0.0542
30	10.5	37	0.0441
20	10.5	33	0.0395
10	10.5	28	0.0331
0	10.5	23	0.0276
-10	10.5	27	0.0322
-20	10.5	32	0.0386
-30	10.5	38	0.0451

For WCDMA Band 2 Mode

Reference Frequency(Middle Channel): 1880 MHz, Limit: 2.5ppm			
Environment Temperature (°C)	Power Supplied (VDC)	Frequency Measure with Time Elapsed	
		MCF (Hz)	Error (ppm)
50	10.5	60	0.0319
40	10.5	50	0.0266
30	10.5	46	0.0245
20	10.5	42	0.0225
10	10.5	38	0.0200
0	10.5	32	0.0172
-10	10.5	39	0.0209
-20	10.5	44	0.0233
-30	10.5	50	0.0266

For HSDPA Band 5 Mode

Reference Frequency(Middle Channel): 836.6 MHz, Limit: 2.5ppm			
Environment Temperature (°C)	Power Supplied (VDC)	Frequency Measure with Time Elapsed	
		MCF (Hz)	Error (ppm)
50	10.5	65	0.0782
40	10.5	57	0.0680
30	10.5	52	0.0625
20	10.5	47	0.0561
10	10.5	40	0.0478
0	10.5	32	0.0386
-10	10.5	40	0.0478
-20	10.5	45	0.0542
-30	10.5	49	0.0588

For HSDPA Band 2 Mode

Reference Frequency(Middle Channel): 1880 MHz, Limit: 2.5ppm			
Environment Temperature (°C)	Power Supplied (VDC)	Frequency Measure with Time Elapsed	
		MCF (Hz)	Error (ppm)
50	10.5	72	0.0385
40	10.5	59	0.0315
30	10.5	55	0.0291
20	10.5	47	0.0250
10	10.5	41	0.0217
0	10.5	35	0.0184
-10	10.5	42	0.0221
-20	10.5	47	0.0250
-30	10.5	53	0.0282

For HSUPA Band 5 Mode

Reference Frequency(Middle Channel): 836.6 MHz, Limit: 2.5ppm			
Environment Temperature (°C)	Power Supplied (VDC)	Frequency Measure with Time Elapsed	
		MCF (Hz)	Error (ppm)
50	10.5	69	0.0828
40	10.5	62	0.0745
30	10.5	55	0.0653
20	10.5	51	0.0607
10	10.5	43	0.0515
0	10.5	38	0.0451
-10	10.5	43	0.0515
-20	10.5	51	0.0607
-30	10.5	58	0.0699

For HSUPA Band 2 Mode

Reference Frequency(Middle Channel): 1880 MHz, Limit: 2.5ppm			
Environment Temperature (°C)	Power Supplied (VDC)	Frequency Measure with Time Elapsed	
		MCF (Hz)	Error (ppm)
50	10.5	58	0.0311
40	10.5	46	0.0245
30	10.5	37	0.0196
20	10.5	32	0.0172
10	10.5	26	0.0139
0	10.5	18	0.0098
-10	10.5	26	0.0139
-20	10.5	31	0.0164
-30	10.5	36	0.0192

So, Frequency Stability Versus Input Voltage is:

Reference Frequency(Middle Channel): GPRS 836.6MHz, Limit: 2.5ppm			
Environment Temperature (°C)	Power Supplied (VDC)	Frequency Measure with Time Elapsed	
		Frequency (Hz)	Error (ppm)
20	8.9	47	0.0561
	10.5	37	0.0441
	12.1	52	0.0616
Reference Frequency(Middle Channel): GPRS 1880 MHz, Limit: 2.5ppm			
Environment Temperature (°C)	Power Supplied (VDC)	Frequency Measure with Time Elapsed	
		Frequency (Hz)	Error (ppm)
20	8.9	32	0.0172
	10.5	18	0.0094
	12.1	26	0.0139

Reference Frequency(Middle Channel): EDGE 836.6MHz, Limit: 2.5ppm			
Environment Temperature (°C)	Power Supplied (VDC)	Frequency Measure with Time Elapsed	
		Frequency (Hz)	Error (ppm)
20	8.9	27	0.0322
	10.5	20	0.0239
	12.1	24	0.0285
Reference Frequency(Middle Channel): EDGE 1880 MHz, Limit: 2.5ppm			
Environment Temperature (°C)	Power Supplied (VDC)	Frequency Measure with Time Elapsed	
		Frequency (Hz)	Error (ppm)
20	8.9	46	0.0245
	10.5	32	0.0168
	12.1	47	0.0250
Reference Frequency(Middle Channel): WCDMA 836.6MHz, Limit: 2.5ppm			
Environment Temperature (°C)	Power Supplied (VDC)	Frequency Measure with Time Elapsed	
		Frequency (Hz)	Error (ppm)
20	8.9	28	0.0340
	10.5	18	0.0221
	12.1	24	0.0285

Reference Frequency(Middle Channel): WCDMA 1880 MHz, Limit: 2.5ppm			
Environment Temperature (°C)	Power Supplied (VDC)	Frequency Measure with Time Elapsed	
		Frequency (Hz)	Error (ppm)
20	8.9	48	0.0254
	10.5	33	0.0176
	12.1	46	0.0245
Reference Frequency(Middle Channel): HSDPA 836.6MHz, Limit: 2.5ppm			
Environment Temperature (°C)	Power Supplied (VDC)	Frequency Measure with Time Elapsed	
		Frequency (Hz)	Error (ppm)
20	8.9	31	0.0368
	10.5	15	0.0184
	12.1	21	0.0248

Reference Frequency(Middle Channel): HSDPA 1880 MHz, Limit: 2.5ppm			
Environment Temperature (°C)	Power Supplied (VDC)	Frequency Measure with Time Elapsed	
		Frequency (Hz)	Error (ppm)
20	8.9	30	0.0160
	10.5	16	0.0086
	12.1	32	0.0168
Reference Frequency(Middle Channel): HSUPA 836.6MHz, Limit: 2.5ppm			
Environment Temperature (°C)	Power Supplied (VDC)	Frequency Measure with Time Elapsed	
		Frequency (Hz)	Error (ppm)
20	8.9	52	0.0616
	10.5	37	0.0441
	12.1	42	0.0497
Reference Frequency(Middle Channel): HSUPA 1880 MHz, Limit: 2.5ppm			
Environment Temperature (°C)	Power Supplied (VDC)	Frequency Measure with Time Elapsed	
		Frequency (Hz)	Error (ppm)
20	8.9	30	0.0160
	10.5	18	0.0094
	12.1	27	0.0143

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