FCC Part 22H & 24E
Measurement and Test Report

For

Shenzhen Reachfar Technology Co.,Ltd.

5F, Building A, No. 86 Industrial road, Longhua, Shenzhen, 518109, China

FCC ID: 2AJ5OV40

FCC Rules:	FCC Part 22H, FCC Part 24E
Product Description:	GPS tracker
Tested Model:	V40
Report No.:	STR16098230I-1
Tested Date:	2016-09-28 to 2016-10-11
Issued Date:	2016-10-12
Tested By:	Iven Guo / Engineer
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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.

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1. GENERAL INFORMATION

1.1 Product Description for Equipment Under Test (EUT)

Client Information

Applicant: Shenzhen Reachfar Technology Co.,Ltd.

Address of applicant: 5F, Building A, No. 86 Industrial road, Longhua, Shenzhen, 518109, China

Manufacturer: Shenzhen Ruifenghuizhi Technology Co., Ltd.

Address of manufacturer: 5F, Building A, No. 86 Industrial road, Longhua, 518109, China

General Description of EUT:	
Product Name:	GPS tracker
Brand Name:	/
Model No.:	V40
Adding Model(s):	V42, V36, V38, V34
Hardware version:	G75-MB-V1.2
Software version:	G75-SW-V1.0
Rated Voltage:	DC 3.7V Li-ion Battery
Battery:	700mAh
Device Category:	Portable Device
Note: The test data is gathered from a production sample provided by the manufacturer. The appearance of others models listed in the report is different from main-test model V40, but the circuit and the electronic construction do not change, declared by the manufacturer.	

Technical Characteristics of EUT:	
2G	
Support Networks:	GSM, GPRS
Support Band:	GSM850/PCS1900
Uplink Frequency:	GSM/GPRS 850: 824~849MHz GSM/GPRS 1900: 1850~1910MHz
Downlink Frequency:	GSM/GPRS 850: 869~894MHz GSM/GPRS 1900: 1930~1990MHz
Max RF Output Power:	GSM850: 31.81dBm, GSM1900: 29.18dBm
Type of Emission:	GSM850: 246KGXW, GSM1900: 247KGXW
Type of Modulation:	GMSK
Type of Antenna:	Integral Antenna
Antenna Gain:	GSM850: -0.10dBi; GSM1900: 0.46dBi
GPRS 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: 22.54dBm, WCDMA Band 5: 22.68dBm
Type of Emission:	WCDMA Band 2: 4M18F9W WCDMA Band 5: 4M17F9W
Type of Modulation:	BPSK
Antenna Type:	Integral Antenna
Antenna Gain:	WCDMA Band 2: 0.46dBi, WCDMA Band 5: -0.10dBi

1.2 Test Standards

The following report is prepared on behalf of the Shenzhen Reachfar Technology Co.,Ltd. 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 v02r02 shall be performed also.

1.4 Test Facility

- **FCC – Registration No.: 934118**
  Shenzhen SEM.Test Technology Co., Ltd. EMC Laboratory has been registered and fully described in a report filed with the (FCC) Federal Communications Commission. The acceptance letter from the FCC is maintained in our files and the Registration is 934118.

- **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.

- **CNAS Registration No.: L4062**
  Shenzhen SEM.Test Technology Co., Ltd. is a testing organization accredited by China National Accreditation Service for Conformity Assessment (CNAS) according to ISO/IEC 17025. The accreditation certificate number is L4062. All measurement facilities used to collect the measurement data are located at 1/F, Building A, Hongwei Industrial Park, Liuxian 2nd Road, Bao'an District, Shenzhen, P.R.C (518101)

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	GSM 850	Low, Middle, High Channels
TM2	GPRS 850	Low, Middle, High Channels
TM3	GSM 1900	Low, Middle, High Channels
TM4	GPRS 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	GSM/GPRS	824.2 MHz	128
		836.6 MHz	190
		848.8 MHz	251
PCS 1900	GSM/GPRS	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 GSM, GPRS, 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
USB Cable	0.5	Unshielded	Without Ferrite

Auxiliary Equipment List and Details

Description	Manufacturer	Model	Serial Number

Notebook	Lenovo	E10	LR-63C8R

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	±0.42dB
Occupied Bandwidth	Conducted	±1.5%
Frequency Stability	Conducted	2.3%
Transmitter Spurious Emissions	Radiated	±5.1dB
Transmitter Spurious Emissions	Conducted	±0.42dB

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	2016-06-04	2017-06-03
SEMT-1034	GSM Tester	Rohde & Schwarz	CMU200	104036	2016-06-04	2017-06-03
SEMT-1072	Spectrum Analyzer	Agilent	E4407B	MY41440400	2016-06-04	2017-06-03
SEMT-1079	Spectrum Analyzer	Agilent	N9020A	US47140102	2016-06-04	2017-06-03
SEMT-1080	Signal Generator	Agilent	83752A	3610A01453	2016-06-04	2017-06-03
SEMT-1081	Vector Signal Generator	Agilent	N5182A	MY47070202	2016-06-04	2017-06-03
SEMT-1028	Power Divider	Weinschel	1506A	PM204	2016-06-04	2017-06-03
SEMT-1082	Power Divider	RF-Lambda	RFLT4W5M18G	14110400027	2016-06-04	2017-06-03
SEMT-1031	Spectrum Analyzer	Rohde & Schwarz	FSP30	836079/035	2016-06-04	2017-06-03
SEMT-1007	EMI Test Receiver	Rohde & Schwarz	ESVB	825471/005	2016-06-04	2017-06-03
SEMT-1008	Amplifier	Agilent	8447F	3113A06717	2016-06-04	2017-06-03
SEMT-1043	Amplifier	C&D	PAP-1G18	2002	2016-06-04	2017-06-03
SEMT-1069	Loop Antenna	Schwarz beck	FMZB 1516	9773	2016-06-04	2017-06-03
SEMT-1068	Broadband Antenna	Schwarz beck	VULB9163	9163-333	2016-06-04	2017-06-03
SEMT-1042	Horn Antenna	ETS	3117	00086197	2016-06-04	2017-06-03
SEMT-1121	Horn Antenna	ETS	3116B	00088203	2016-06-04	2017-06-03
SEMT-1087	Semi-Anechoic Chamber	SAEMC	FSAC318	/	2016-10-08	2018-10-07
SEMT-1089	Shielding Room	SAEMC	MSR743	/	2016-10-08	2018-10-07

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

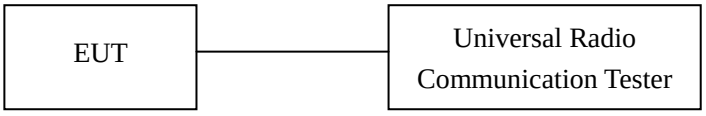
According to §22.913(a)(2), The ERP of mobile and portable stations transmitters and auxiliary test transmitters must not exceed 7 Watts.

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 GSM Mode GSM850

Frequency	Substitude 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	32.21	1.5	0	H	1.5	0	30.71	38.45
824.2	33.31	1.5	0	V	1.5	0	31.81	38.45
Middle Channel								
836.4	32.03	1.5	0	H	1.5	0	30.53	38.45
836.4	31.77	1.5	0	V	1.5	0	30.27	38.45
High Channel								
848.8	32.66	1.5	0	H	1.5	0	31.16	38.45
848.8	32.38	1.5	0	V	1.5	0	30.88	38.45

EIRP For GSM Mode PCS1900

Frequency	Substitude 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	22.93	1.5	0	H	1.9	7.7	28.73	33.00
1850.2	23.01	1.5	0	V	1.9	7.7	28.81	33.00
Middle Channel								
1880.0	22.91	1.5	0	H	1.9	7.7	28.71	33.00
1880.0	21.57	1.5	0	V	1.9	7.7	27.37	33.00
High Channel								
1909.8	22.49	1.5	0	H	1.9	7.7	28.29	33.00
1909.8	22.04	1.5	0	V	1.9	7.7	27.84	33.00

ERP For GPRS Mode GSM850

Frequency	Substitude 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	31.46	1.5	0	H	1.5	0	29.96	38.45
824.2	31.23	1.5	0	V	1.5	0	29.73	38.45
Middle Channel								
836.6	31.49	1.5	0	H	1.5	0	29.99	38.45
836.6	31.76	1.5	0	V	1.5	0	30.26	38.45
High Channel								
848.8	32.36	1.5	0	H	1.5	0	30.86	38.45
848.8	32.55	1.5	0	V	1.5	0	31.05	38.45

EIRP For GPRS Mode PCS1900

Frequency	Substitude 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	22.17	1.5	0	H	1.9	7.7	27.97	33.00
1850.2	22.48	1.5	0	V	1.9	7.7	28.28	33.00
Middle Channel								
1880.0	21.47	1.5	0	H	1.9	7.7	27.27	33.00
1880.0	21.88	1.5	0	V	1.9	7.7	27.68	33.00
High Channel								
1909.8	21.04	1.5	0	H	1.9	7.7	26.84	33.00
1909.8	22.72	1.5	0	V	1.9	7.7	28.52	33.00

ERP For WCDMA Mode Band 5

Frequency	Substitude 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	23.35	1.5	0	H	1.5	0	21.85	38.45
826.4	23.1	1.5	0	V	1.5	0	21.6	38.45
Middle Channel								
836.6	24.73	1.5	0	H	1.5	0	23.23	38.45
836.6	22.73	1.5	0	V	1.5	0	21.23	38.45
High Channel								
846.6	23.33	1.5	0	H	1.5	0	21.83	38.45
846.6	23.02	1.5	0	V	1.5	0	21.52	38.45

ERP For HSDPA Mode Band 5

Frequency	Substitude 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	21.49	1.5	0	H	1.5	0	19.99	38.45
826.4	21.71	1.5	0	V	1.5	0	20.21	38.45
Middle Channel								
836.6	19.58	1.5	0	H	1.5	0	18.08	38.45
836.6	20.31	1.5	0	V	1.5	0	18.81	38.45
High Channel								
846.6	21.77	1.5	0	H	1.5	0	20.27	38.45
846.6	22.49	1.5	0	V	1.5	0	20.99	38.45

ERP For HSUPA Mode Band 5

Frequency	Substitude 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	19.56	1.5	0	H	1.5	0	18.06	38.45
826.4	21.66	1.5	0	V	1.5	0	20.16	38.45
Middle Channel								
836.6	20.19	1.5	0	H	1.5	0	18.69	38.45
836.6	21.69	1.5	0	V	1.5	0	20.19	38.45
High Channel								
846.6	20.77	1.5	0	H	1.5	0	19.27	38.45
846.6	21.72	1.5	0	V	1.5	0	20.22	38.45

EIRP For WCDMA Mode Band 2

Frequency	Substitude 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	16.77	1.5	0	H	1.9	7.7	22.57	33
1852.4	16.1	1.5	0	V	1.9	7.7	21.9	33
Middle Channel								
1880.0	17.24	1.5	0	H	1.9	7.7	23.04	33
1880.0	16.81	1.5	0	V	1.9	7.7	22.61	33
High Channel								
1907.6	17.35	1.5	0	H	1.9	7.7	23.15	33
1907.6	17.05	1.5	0	V	1.9	7.7	22.85	33

EIRP For HSDPA Mode Band 2

Frequency	Substitude 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	14.57	1.5	0	H	1.9	7.7	20.37	33
1852.4	15.19	1.5	0	V	1.9	7.7	20.99	33
Middle Channel								
1880.0	13.4	1.5	0	H	1.9	7.7	19.2	33
1880.0	13.32	1.5	0	V	1.9	7.7	19.12	33
High Channel								
1907.6	13.85	1.5	0	H	1.9	7.7	19.65	33
1907.6	13.72	1.5	0	V	1.9	7.7	19.52	33

EIRP For HSUPA Mode Band 2

Frequency	Substitude 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	14.21	1.5	0	H	1.9	7.7	20.01	33
1852.4	14.35	1.5	0	V	1.9	7.7	20.15	33
Middle Channel								
1880.0	15.94	1.5	0	H	1.9	7.7	21.74	33
1880.0	13.26	1.5	0	V	1.9	7.7	19.06	33
High Channel								
1907.6	14.07	1.5	0	H	1.9	7.7	19.87	33
1907.6	14.17	1.5	0	V	1.9	7.7	19.97	33

Note: Result = Substitude - 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)
GSM	Low Channel	824.2	31.26	38.45
	Middle Channel	836.6	31.15	38.45
	High Channel	848.8	31.03	38.45
GPRS(1 Slot)	Low Channel	824.2	31.81	38.45
	Middle Channel	836.6	31.72	38.45
	High Channel	848.8	31.12	38.45

For PCS Band (GSM1900)

Test Mode	Channel	Frequency (MHz)	Average Power (dBm)	FCC Part 24.232 Limit (dBm)
GSM	Low Channel	1850.2	29.10	33.0
	Middle Channel	1880.0	28.72	33.0
	High Channel	1909.8	29.09	33.0
GPRS(1 Slot)	Low Channel	1850.2	29.18	33.0
	Middle Channel	1880.0	28.84	33.0
	High Channel	1909.8	29.17	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	22.35	38.45
	Middle Channel	836.6	22.68	38.45
	High Channel	846.6	22.32	38.45
HSDPA	Low Channel	826.4	21.35	38.45
	Middle Channel	836.6	21.60	38.45
	High Channel	846.6	21.09	38.45
HSUPA	Low Channel	826.4	21.57	38.45
	Middle Channel	836.6	21.46	38.45
	High Channel	846.6	21.83	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	22.54	33.00
	Middle Channel	1880.0	22.53	33.00
	High Channel	1907.6	22.52	33.00
HSDPA	Low Channel	1852.4	21.27	33.00
	Middle Channel	1880.0	21.11	33.00
	High Channel	1907.6	21.36	33.00
HSUPA	Low Channel	1852.4	21.53	33.00
	Middle Channel	1880.0	21.51	33.00
	High Channel	1907.6	21.31	33.00

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

5.1 Standard Applicable

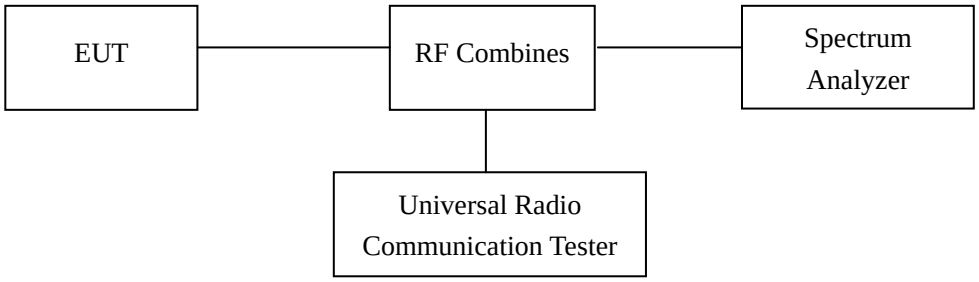
According to §24.232(d), Power measurements for transmissions by stations authorized under this section may be made either in accordance with a Commission-approved average power technique or in compliance with paragraph (e) of this section. In both instances, equipment employed must be authorized in 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)
GSM	661	1880	10.18	13
GPRS(1 Slot)	661	1880	9.91	13

For WCDMA Band 2

Test Mode	Channel	Frequency (MHz)	PAR (dB)	Limit (dB)
WCDMA	9262	1852.4	1.85	13
HSDPA	9262	1852.4	1.85	13
HSUPA	9262	1852.4	1.85	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.

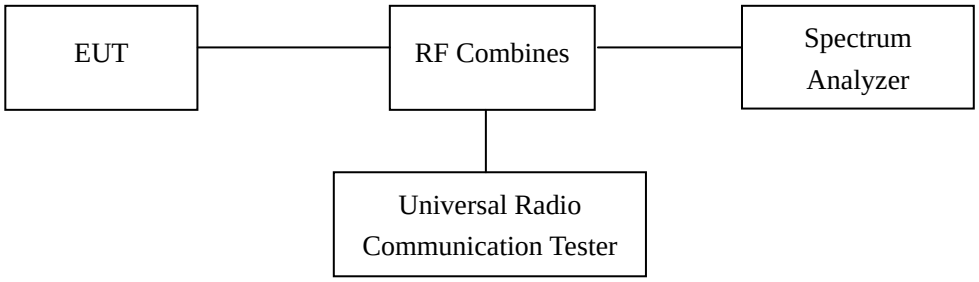
According to §24.238(b), The emission bandwidth is defined as the width of the signal between two points, one below the carrier center frequency and one above the carrier center frequency, outside of which all emissions are attenuated at least 26 dB below the transmitter power.

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)
GSM	128	824.2	244.51	320.5
	190	836.6	242.27	322.1
	251	848.8	243.27	319.1
GPRS	128	824.2	246.20	320.6
	190	836.6	243.51	311.4
	251	848.8	245.96	315.8

For PCS Band

Test Mode	Channel	Frequency (MHz)	99% Emission Bandwidth (kHz)	26 dB Emission Bandwidth (kHz)
GSM	512	1850.2	245.51	316.6
	661	1880.0	247.09	319.9
	810	1909.8	245.81	318.0
GPRS	512	1850.2	245.58	316.4
	661	1880.0	243.68	316.0
	810	1909.8	244.51	313.7

For Band 5

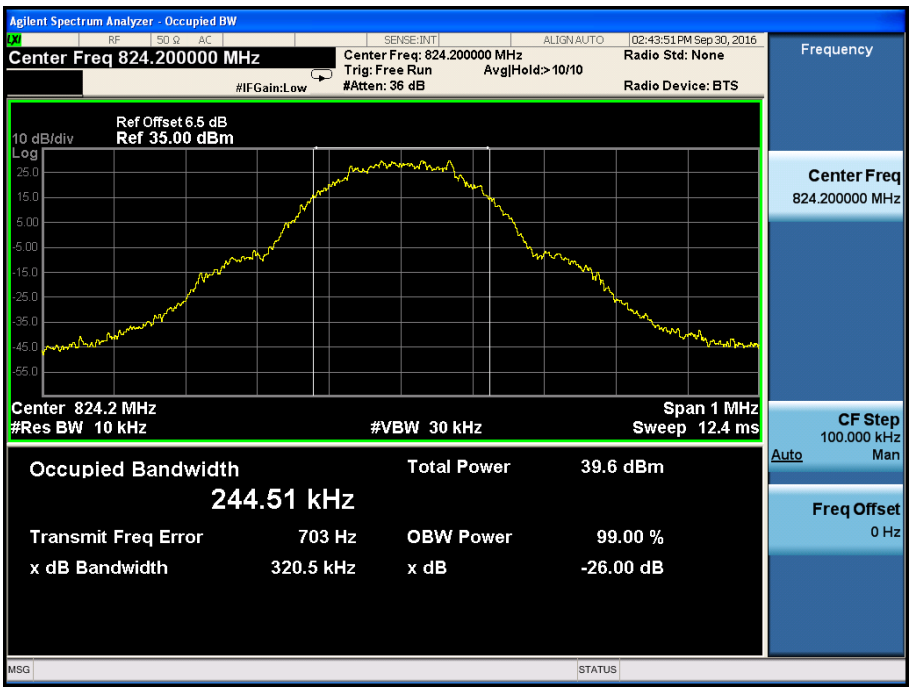
Test Mode	Channel	Frequency (MHz)	99% Emission Bandwidth (MHz)	26 dB Emission Bandwidth (MHz)
WCDMA	4132	826.4	4.1653	4.685
	4183	836.6	4.1401	4.682
	4233	846.6	4.1610	4.666
HSDPA	4132	826.4	4.1618	4.664
	4183	836.6	4.1454	4.657
	4233	846.6	4.1608	4.694
HSUPA	4132	826.4	4.1646	4.710
	4183	836.6	4.1598	4.669
	4233	846.6	4.1504	4.693

For Band 2

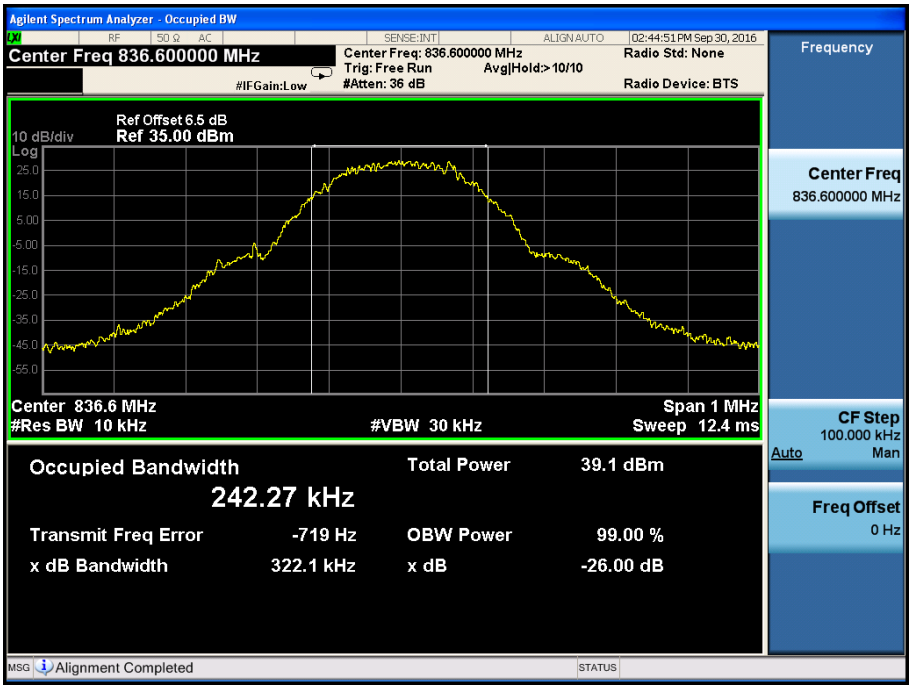
Test Mode	Channel	Frequency (MHz)	99% Emission Bandwidth (MHz)	26 dB Emission Bandwidth (MHz)
WCDMA	9262	1852.4	4.1482	4.680
	9400	1880.0	4.1638	4.713
	9538	1907.6	4.1647	4.692
HSDPA	9262	1852.4	4.1506	4.681
	9400	1880.0	4.1683	4.723
	9538	1907.6	4.1560	4.709
HSUPA	9262	1852.4	4.1579	4.688
	9400	1880.0	4.1767	4.722
	9538	1907.6	4.1774	4.730

For Cellular Band

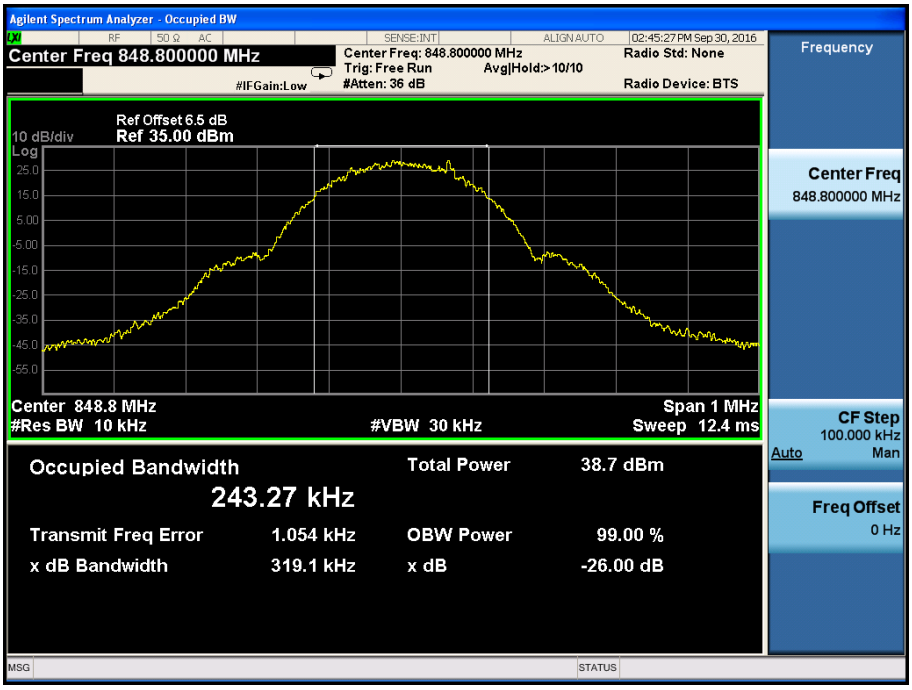
GSM Low Channel



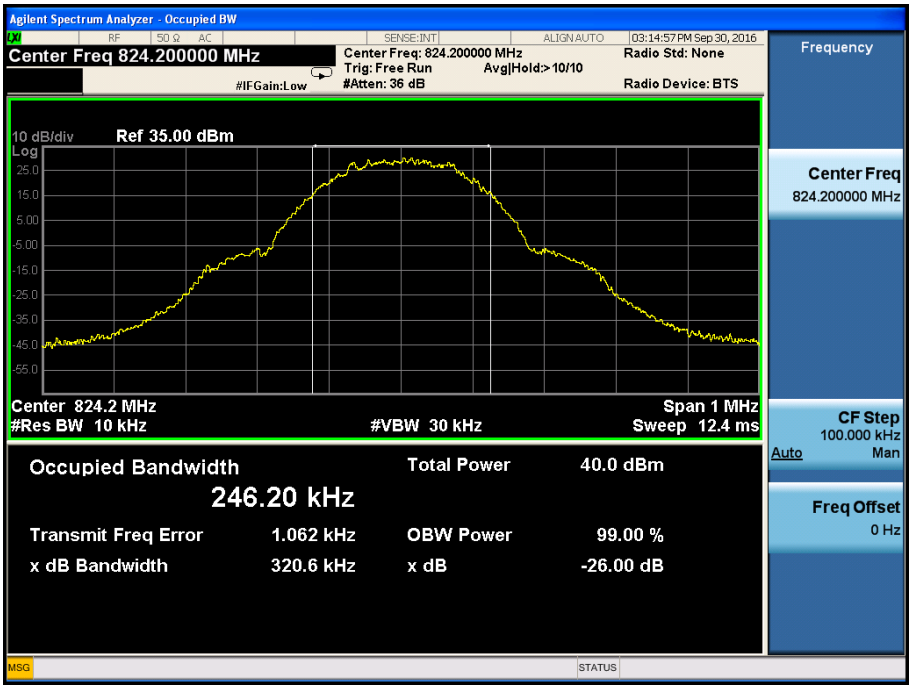
GSM Middle Channel



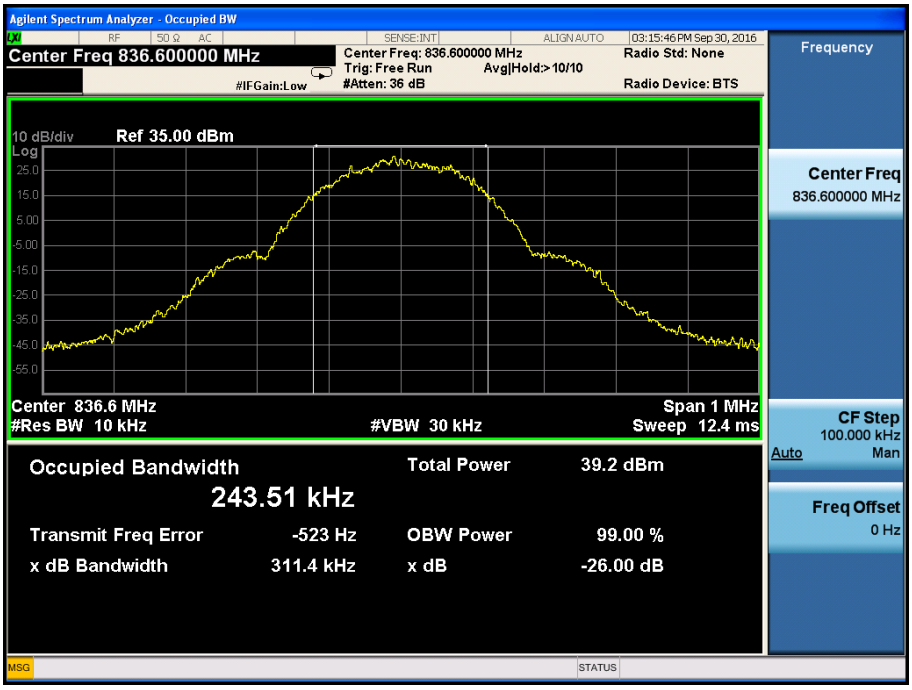
GSM High channel



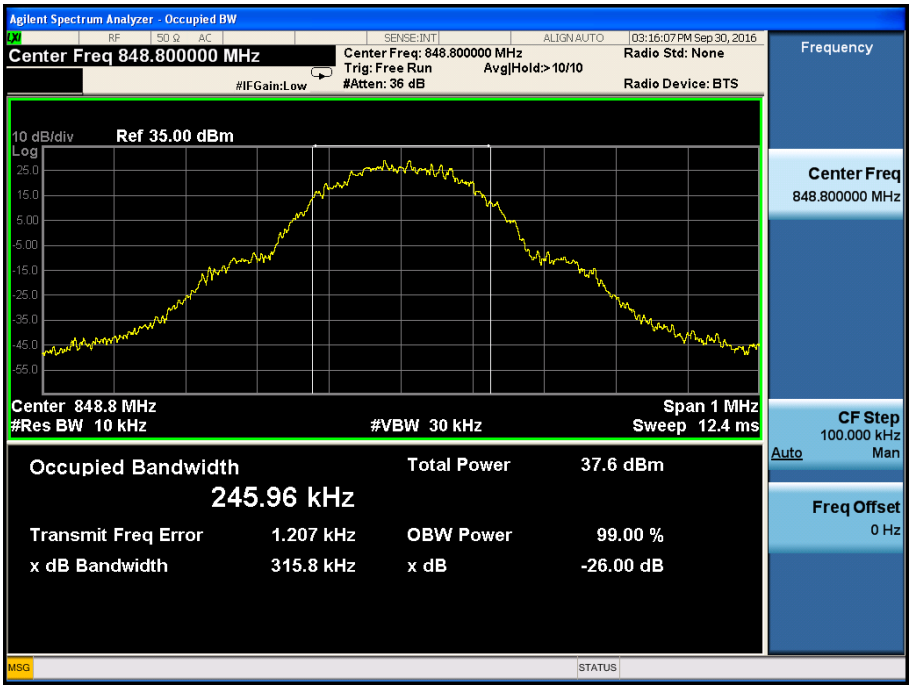
GPRS Low Channel



GPRS Middle Channel

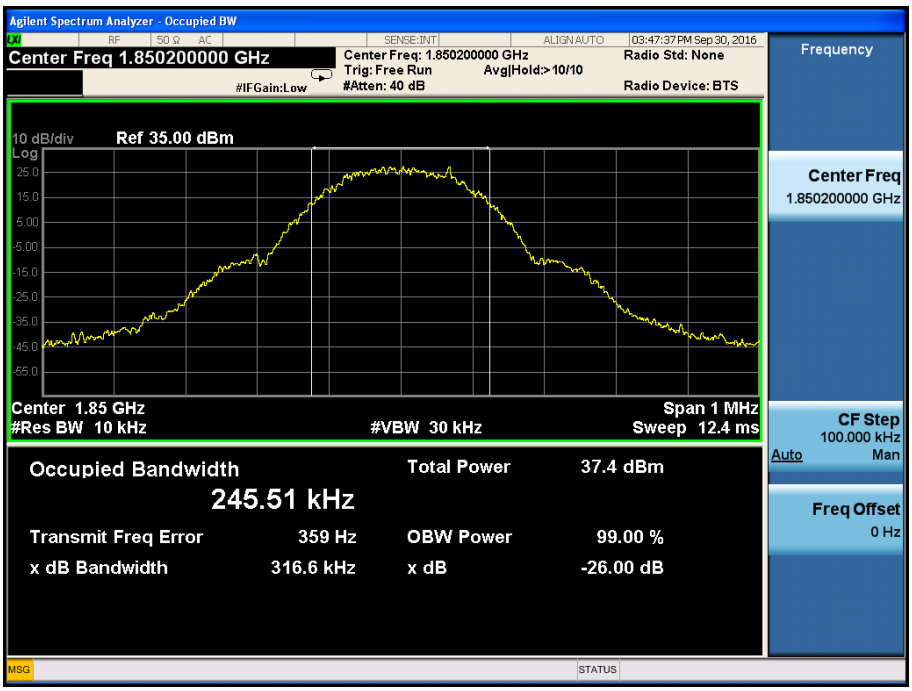


GPRS High Channel

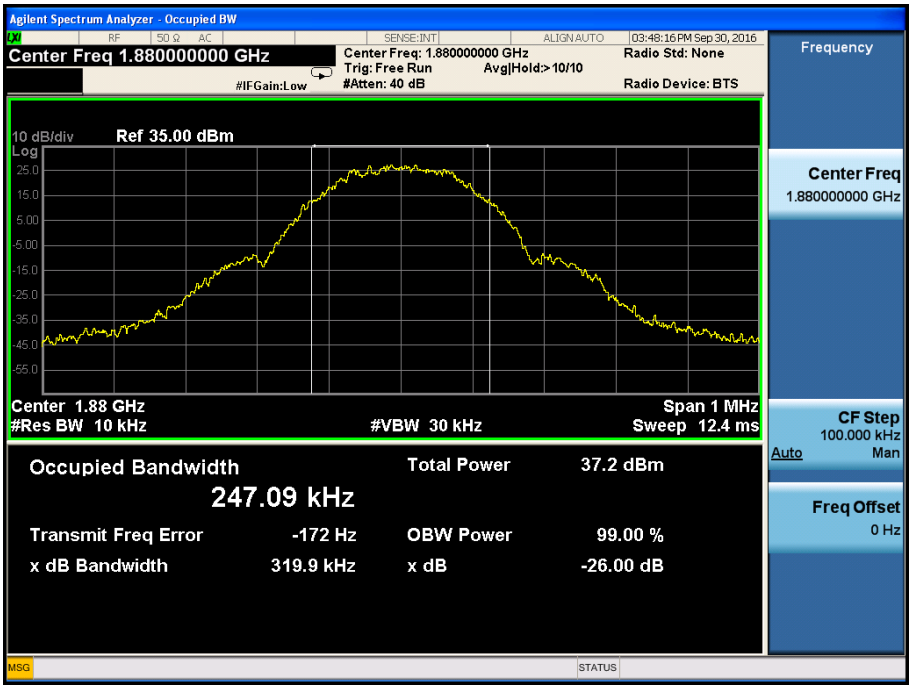


For PCS Band

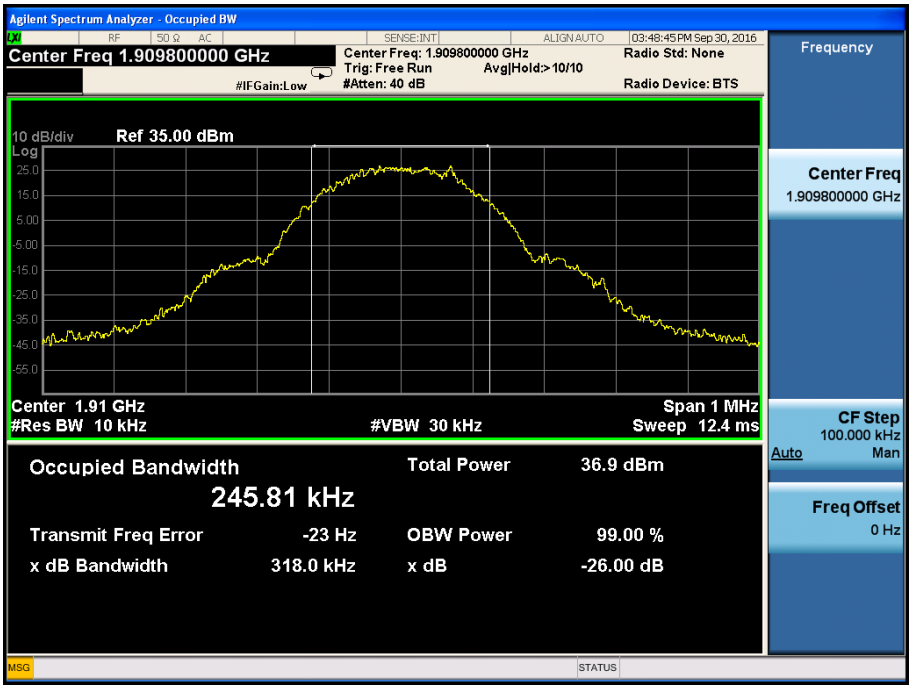
GSM Low Channel



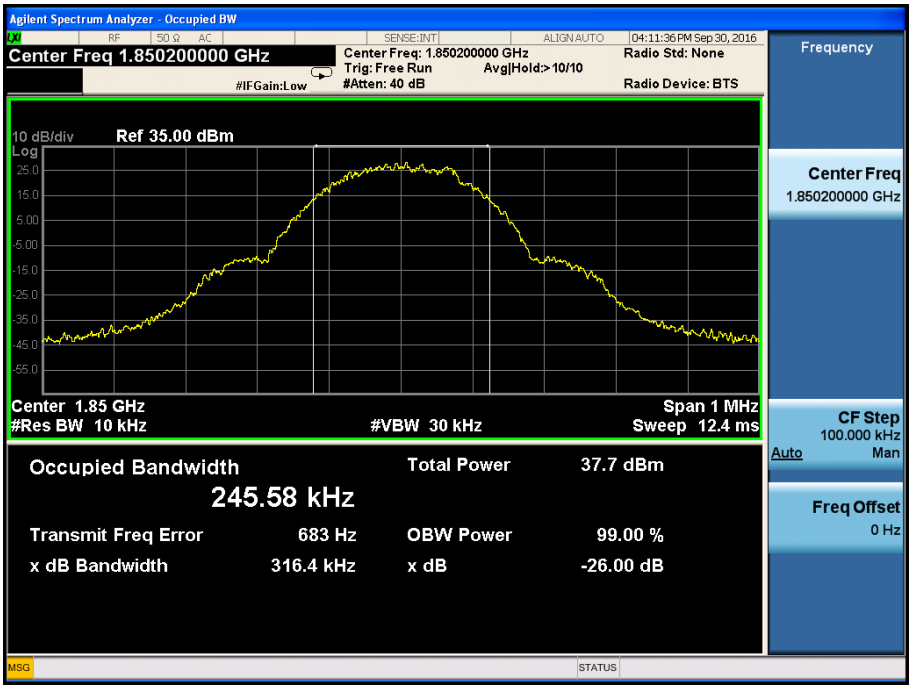
GSM Middle Channel



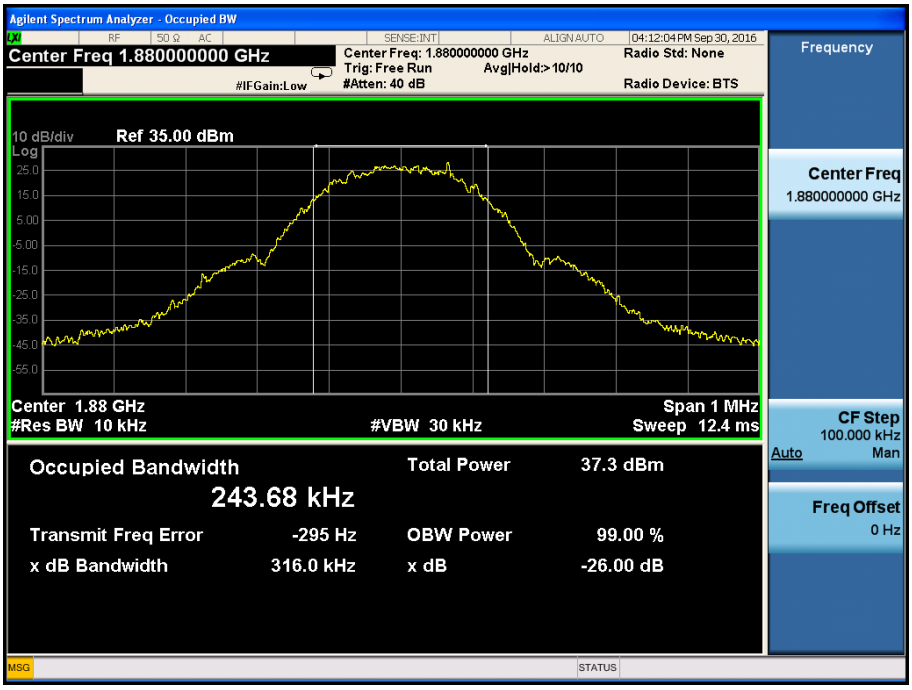
GSM High channel



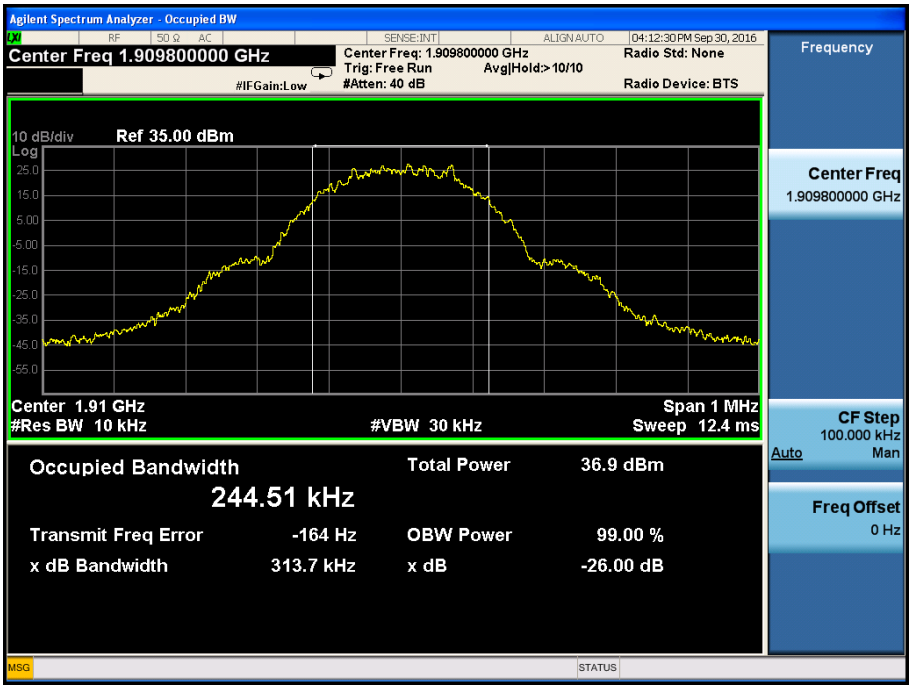
GPRS Low Channel



GPRS Middle Channel

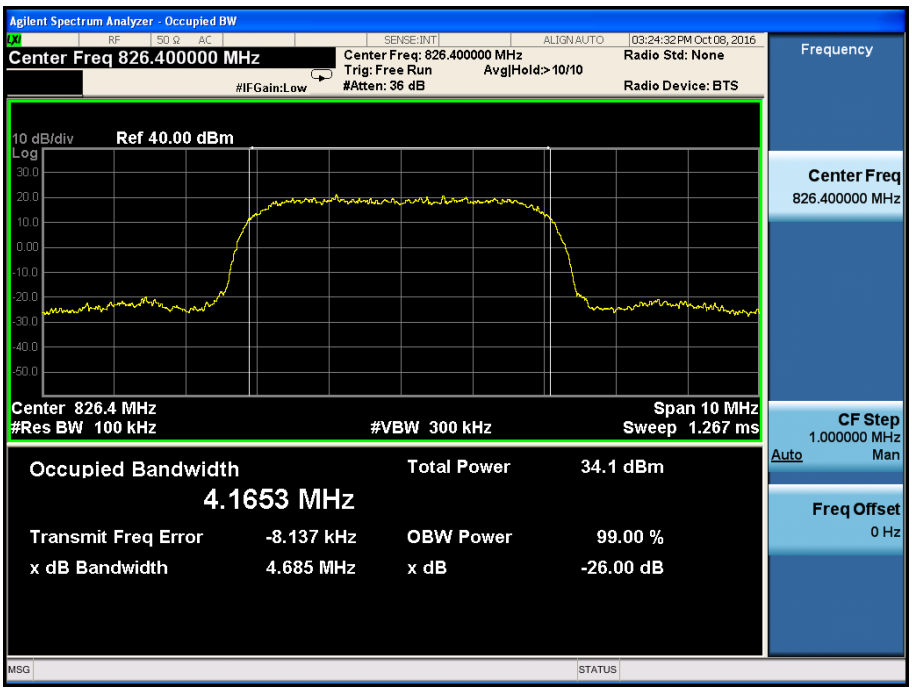


GPRS High Channel

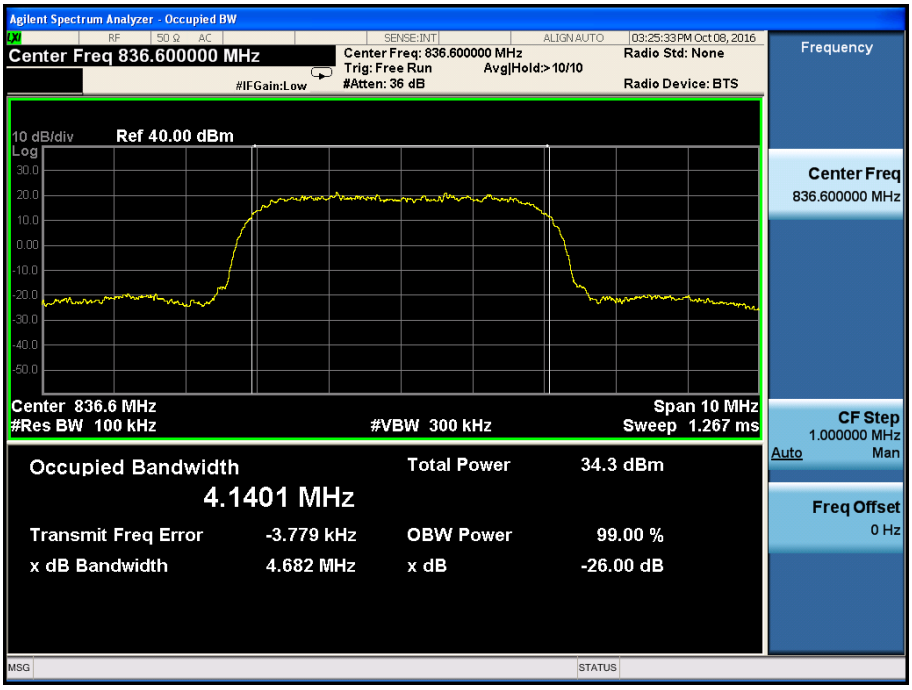


For Band V

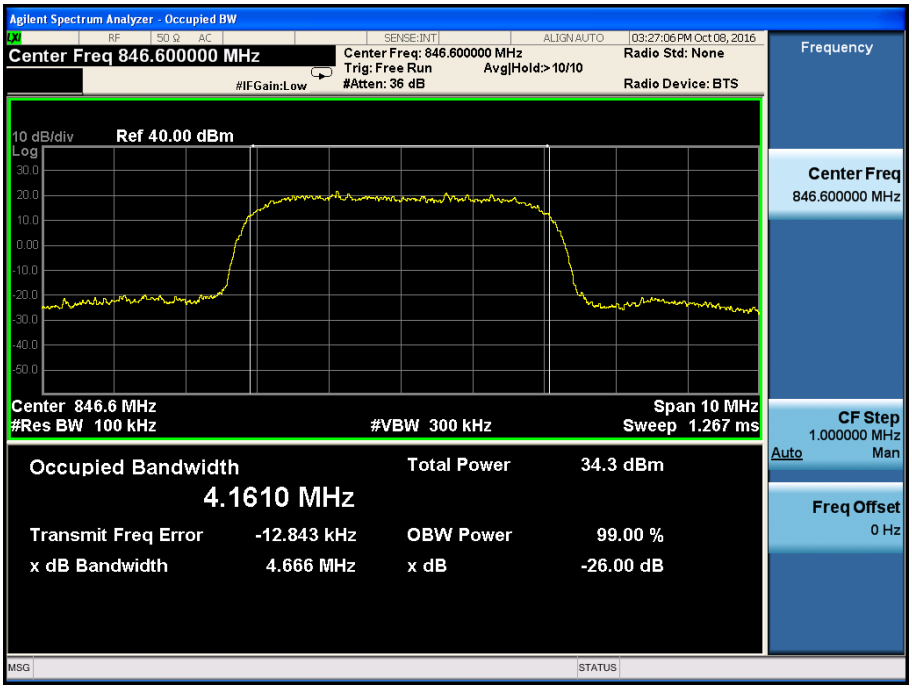
WCDMA Low Channel



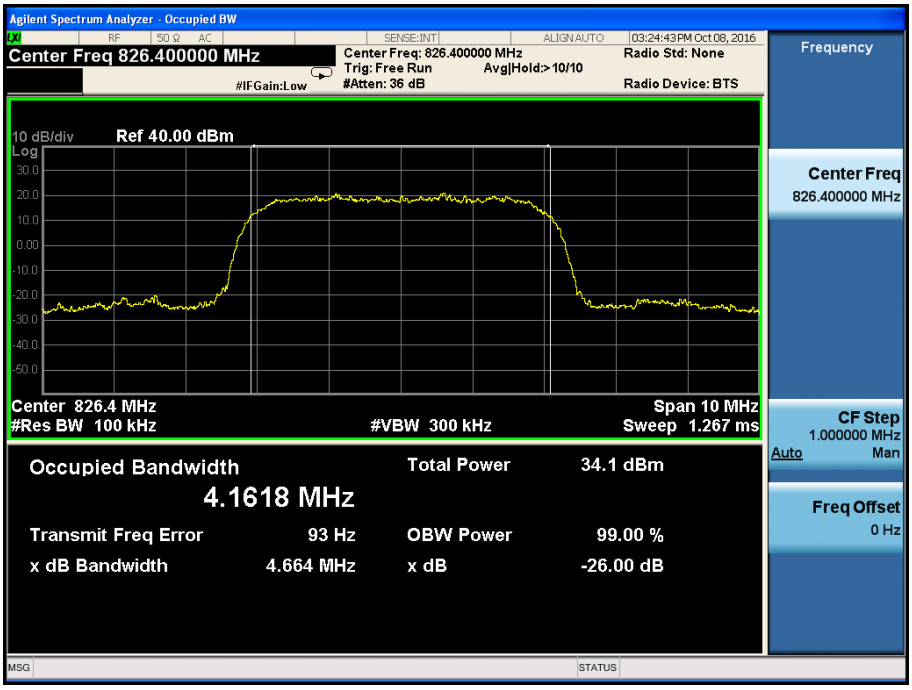
WCDMA Middle Channel



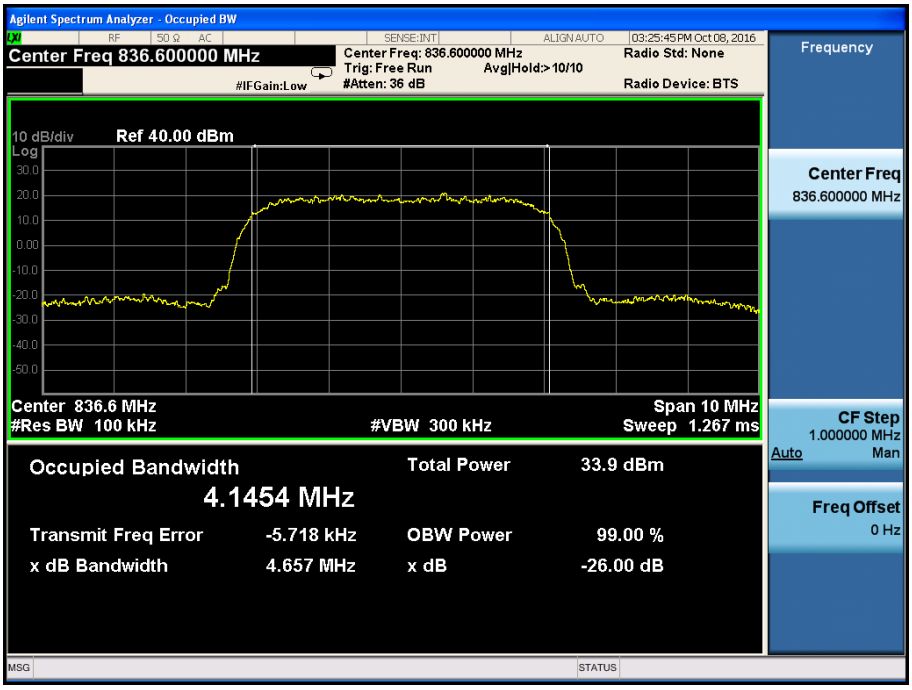
WCDMA High Channel



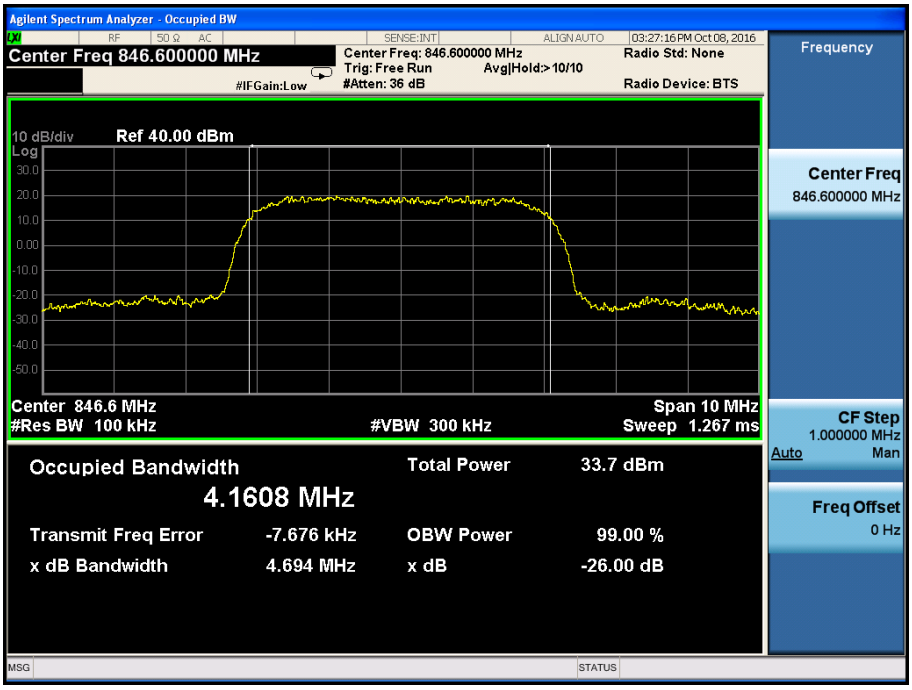
HSDPA Low Channel



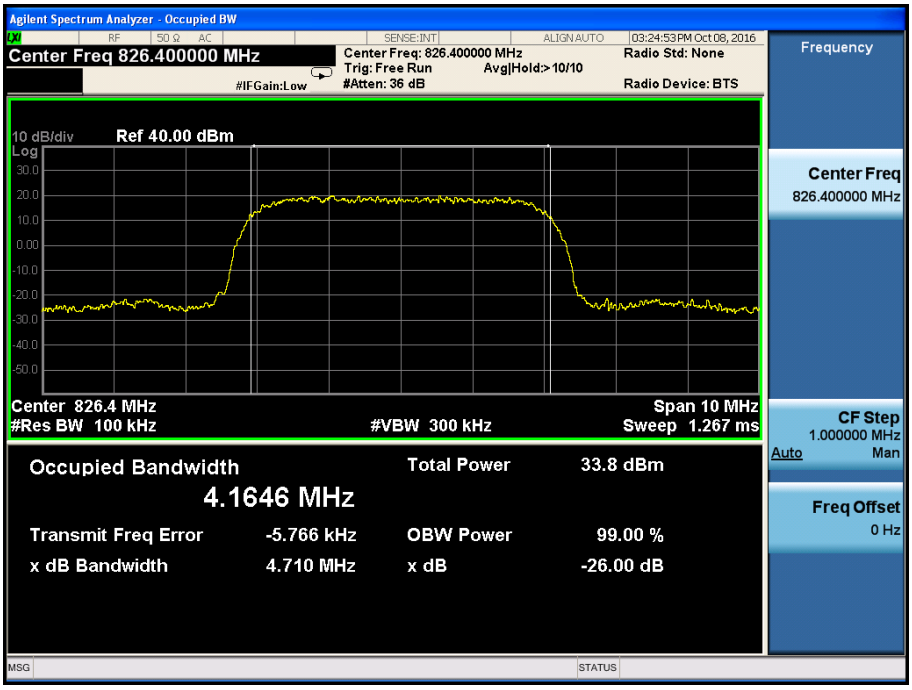
HSDPA Middle Channel



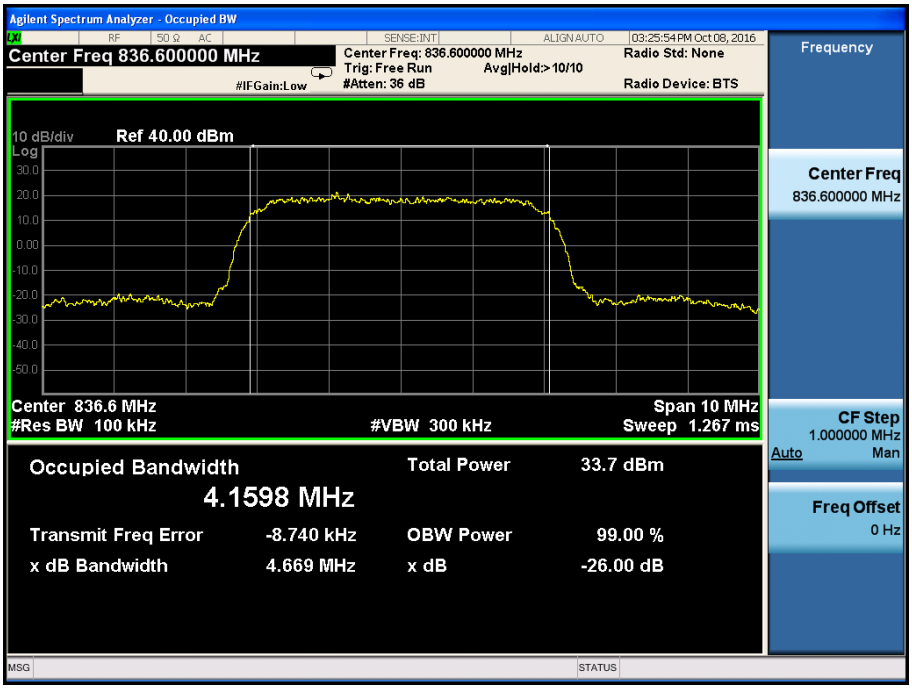
HSDPA High Channel



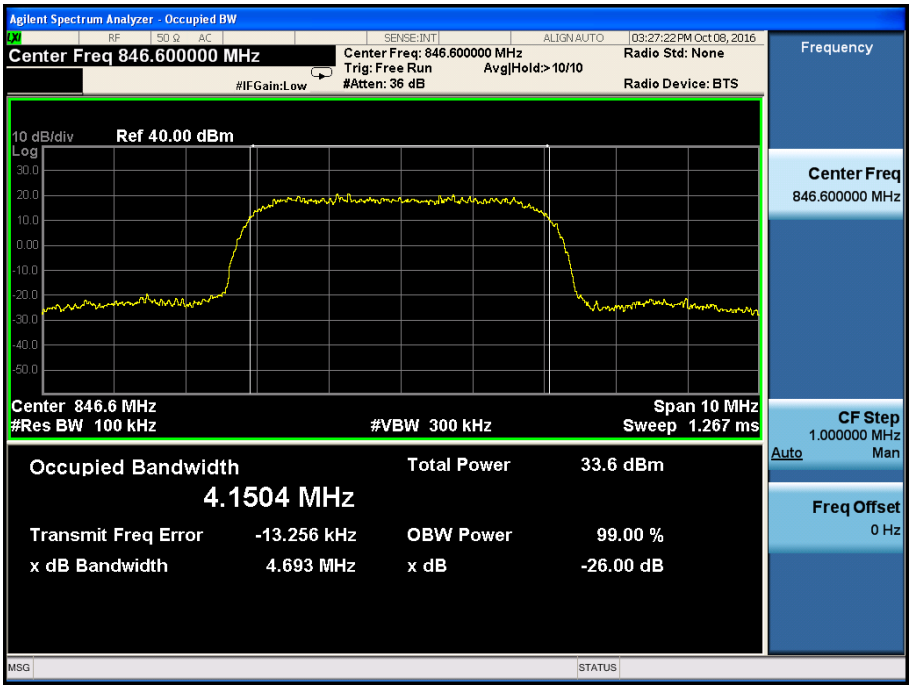
HSUPA Low Channel



HSUPA Middle Channel

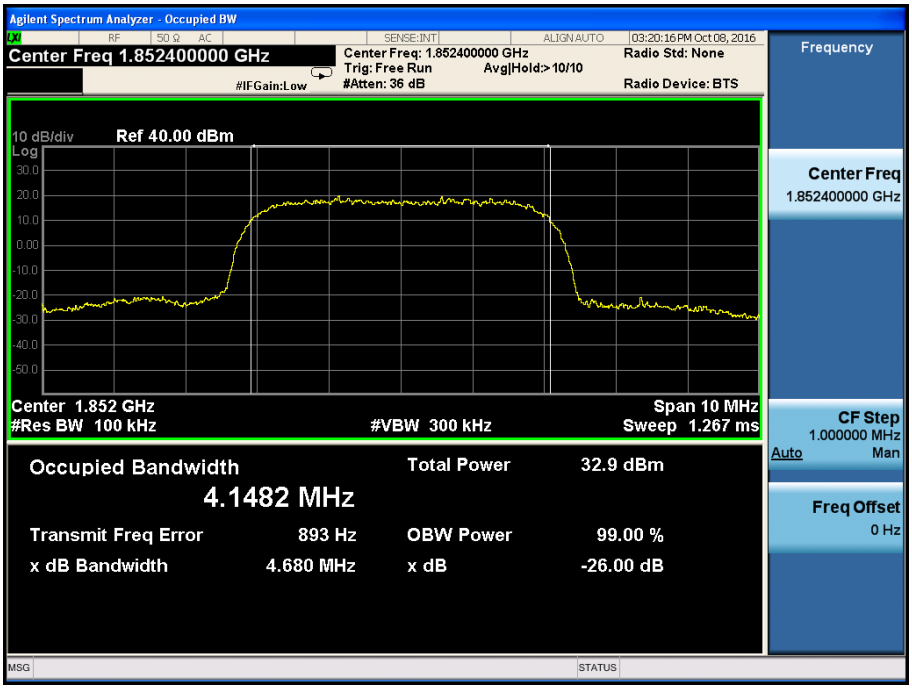


HSUPA High Channel

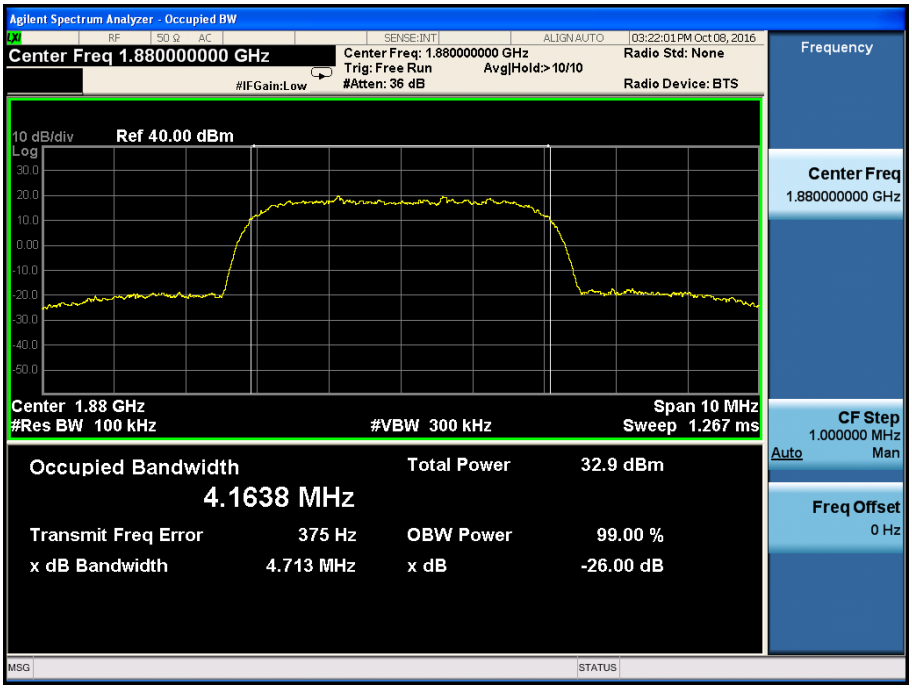


For Band II

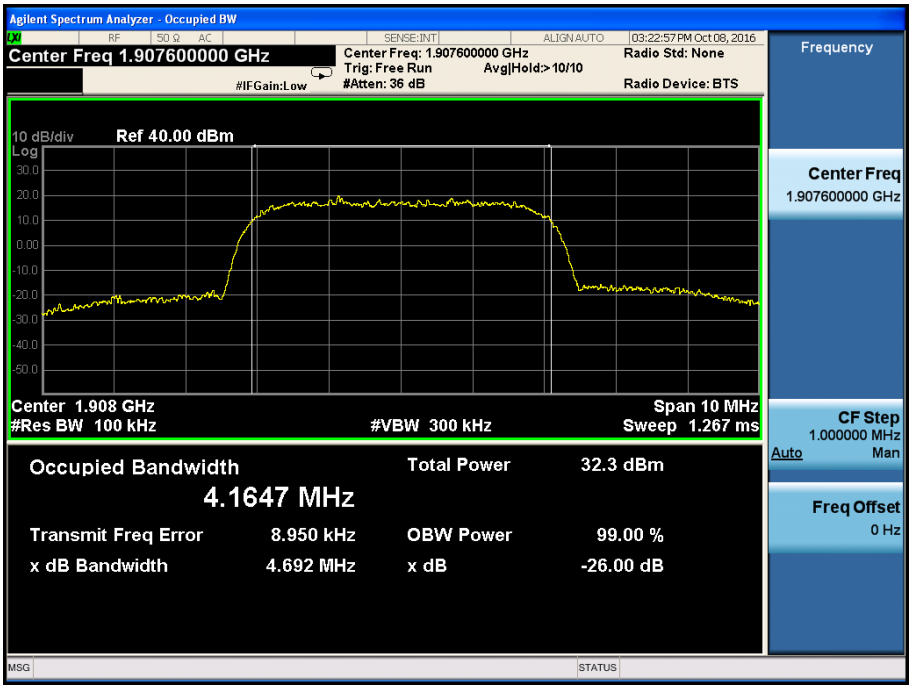
WCDMA Low Channel



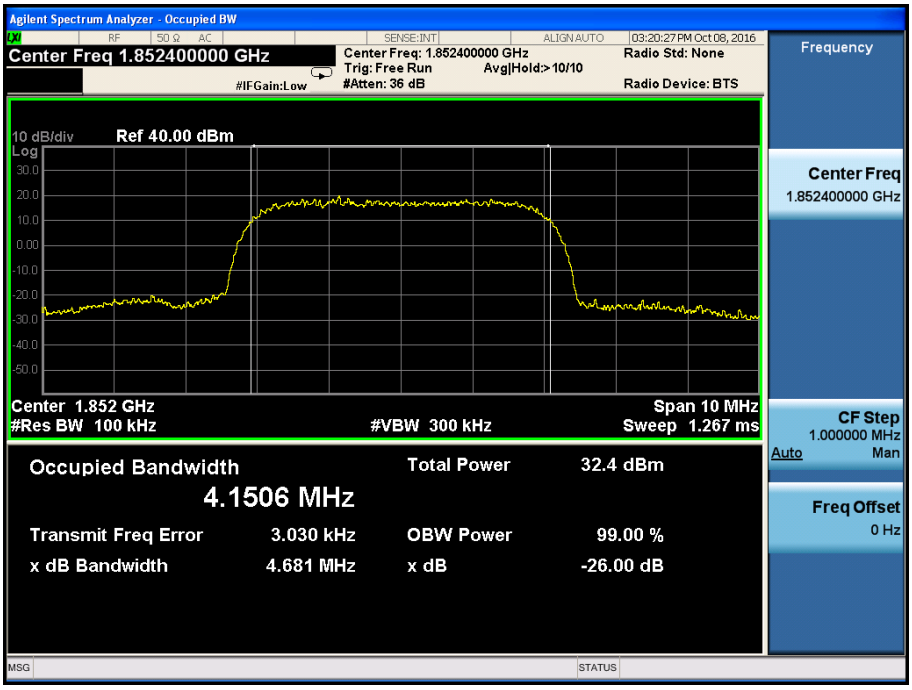
WCDMA Middle Channel



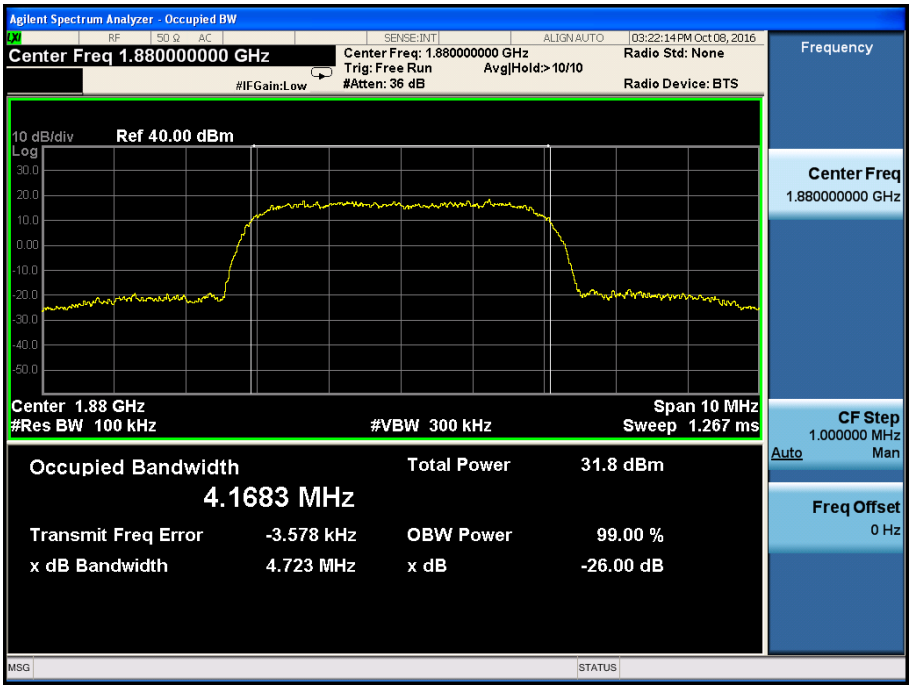
WCDMA High Channel



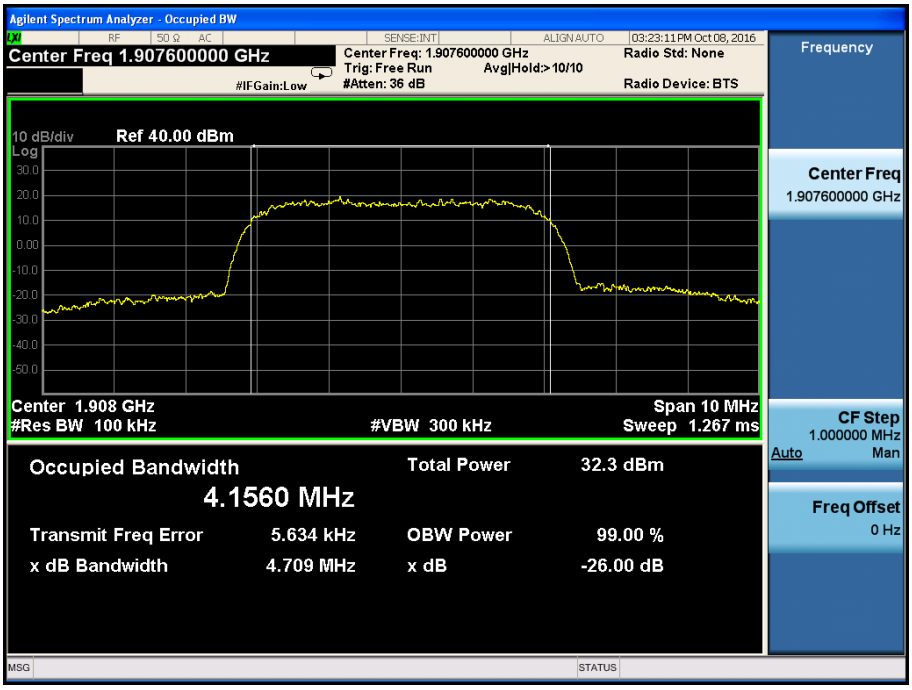
HSDPA Low Channel



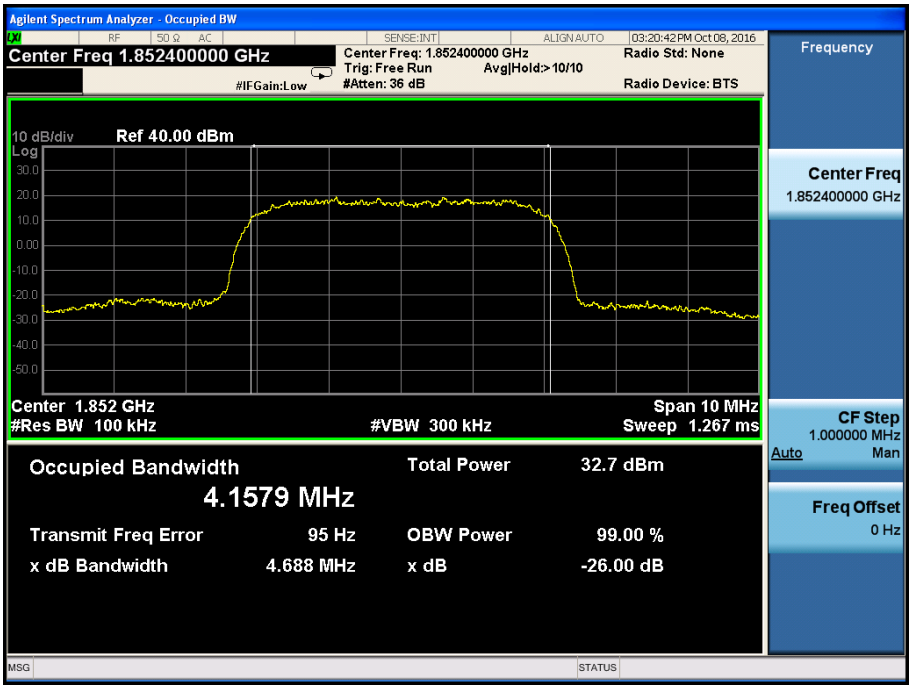
HSDPA Middle Channel



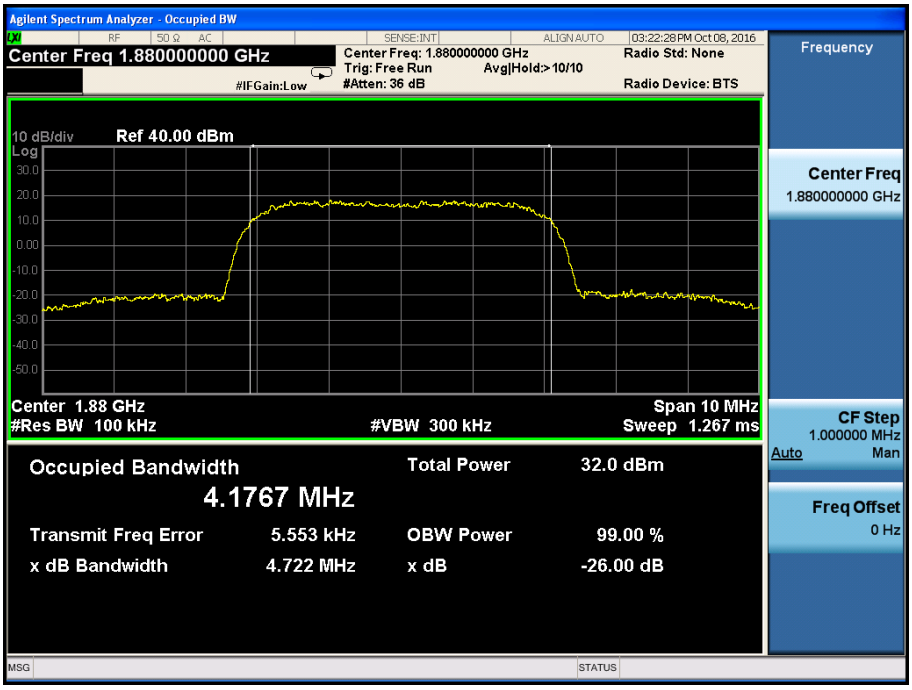
HSDPA High Channel



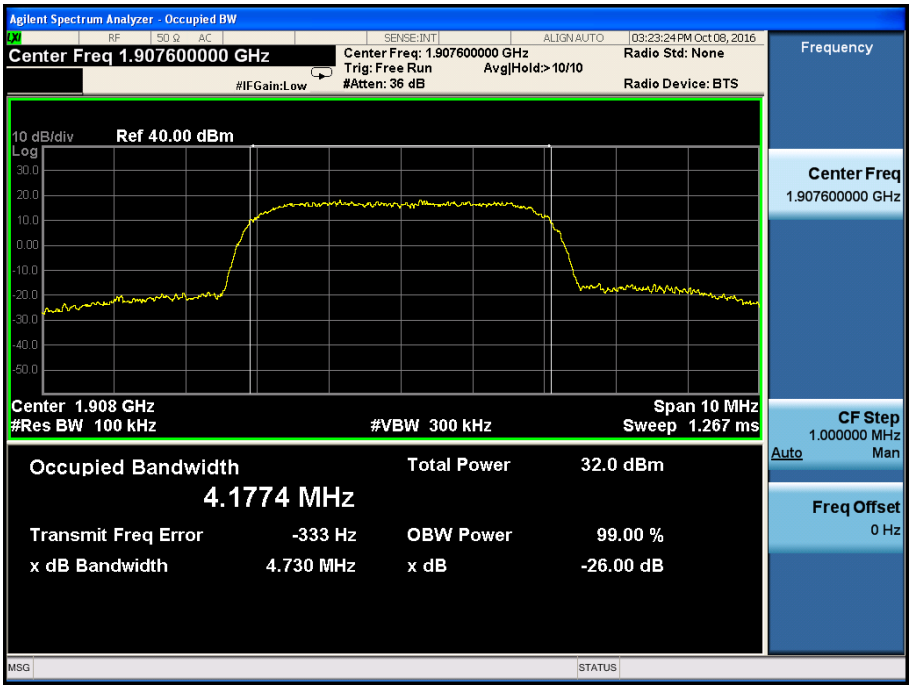
HSUPA Low Channel



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.

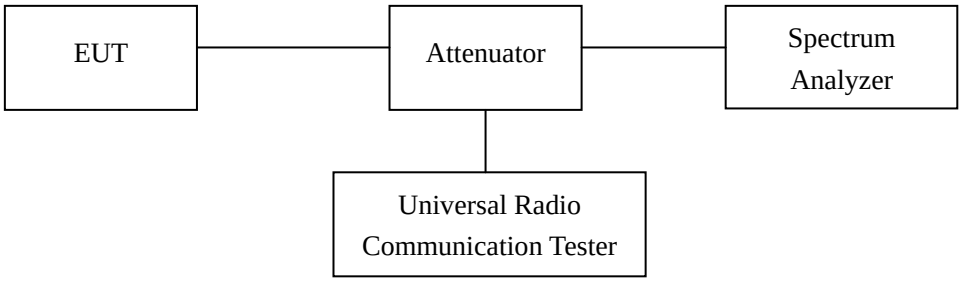
According to §24.238(a), the power of any emissions outside of the authorized operating frequency ranges must be attenuated below the transmitting power (P) by a factor of at least 43 + 10 log(P) dB.

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 log10 (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:



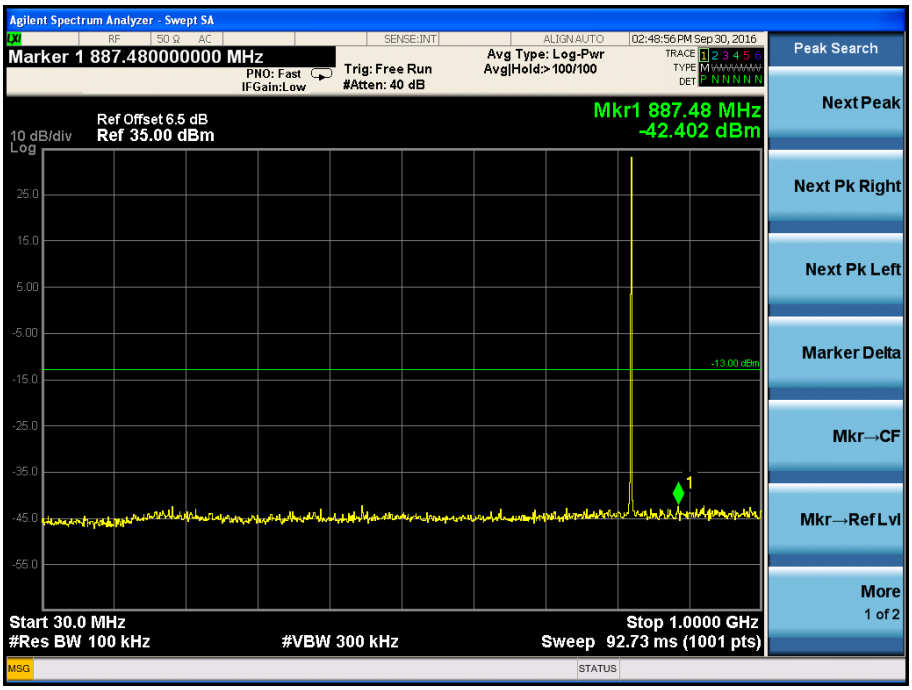
7.3 Environmental Conditions

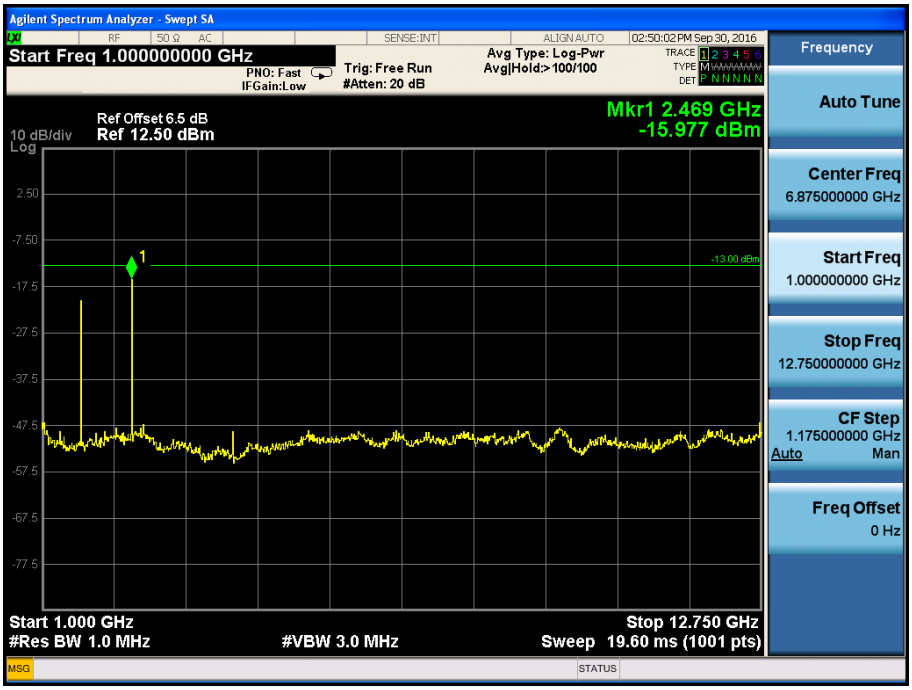
Temperature:	25 °C
Relative Humidity:	53%
ATM Pressure:	1018 mbar

7.4 Summary of Test Results/Plots

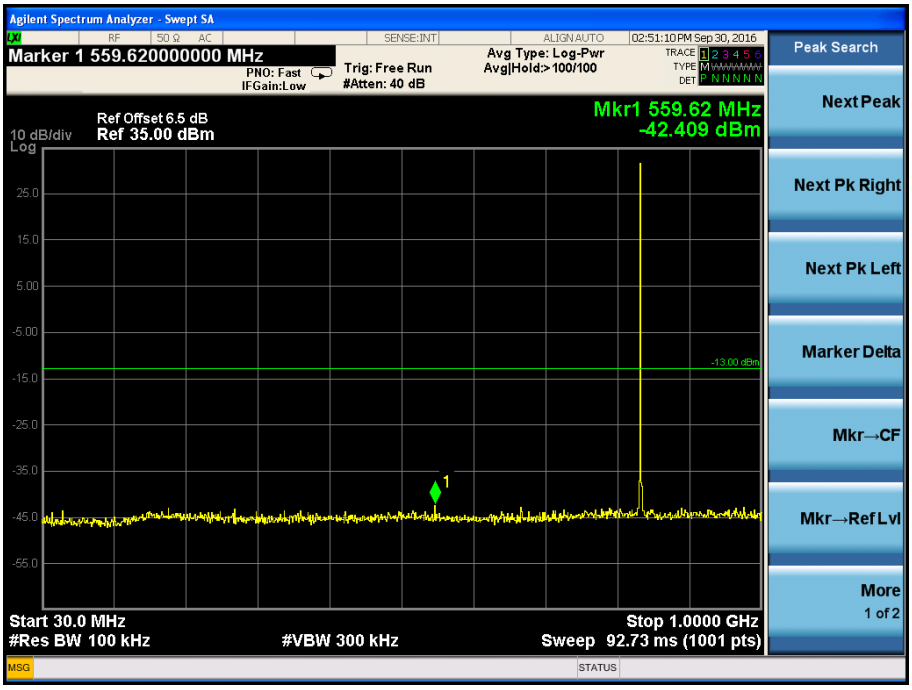
Please refer to the following test plots For Cellular Band

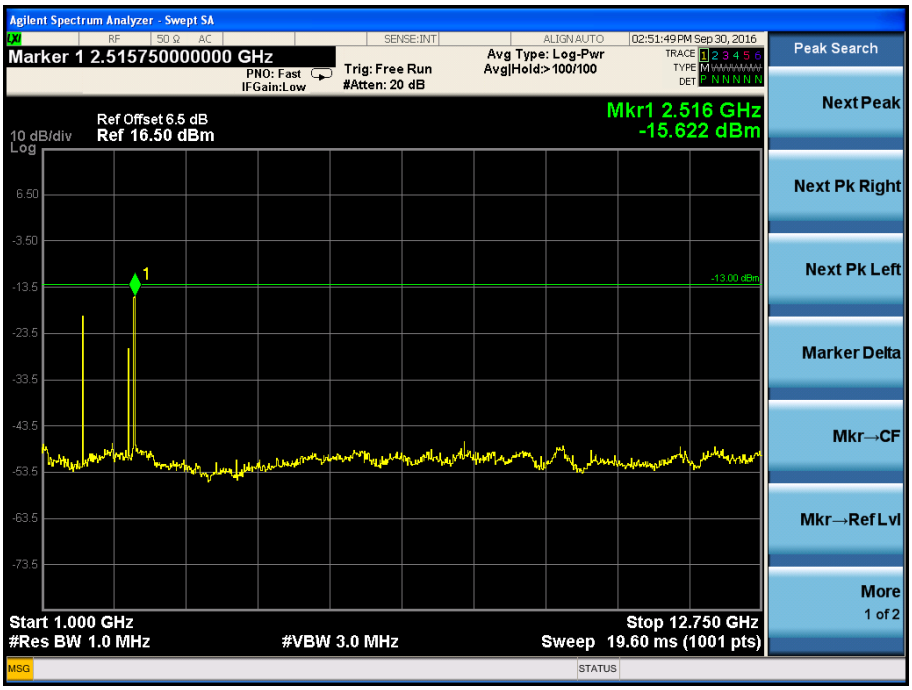
GSM Low Channel



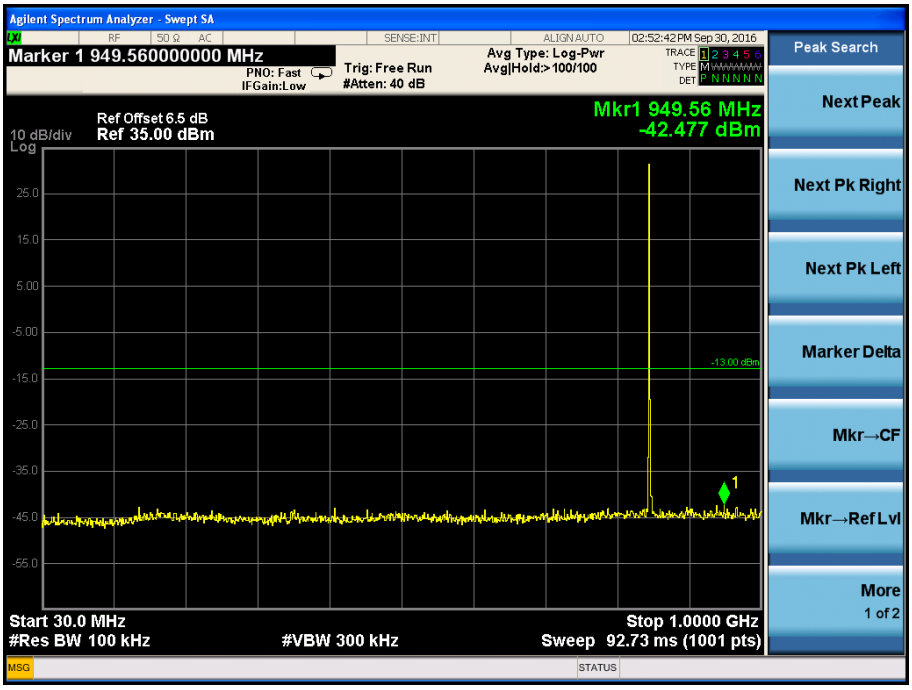


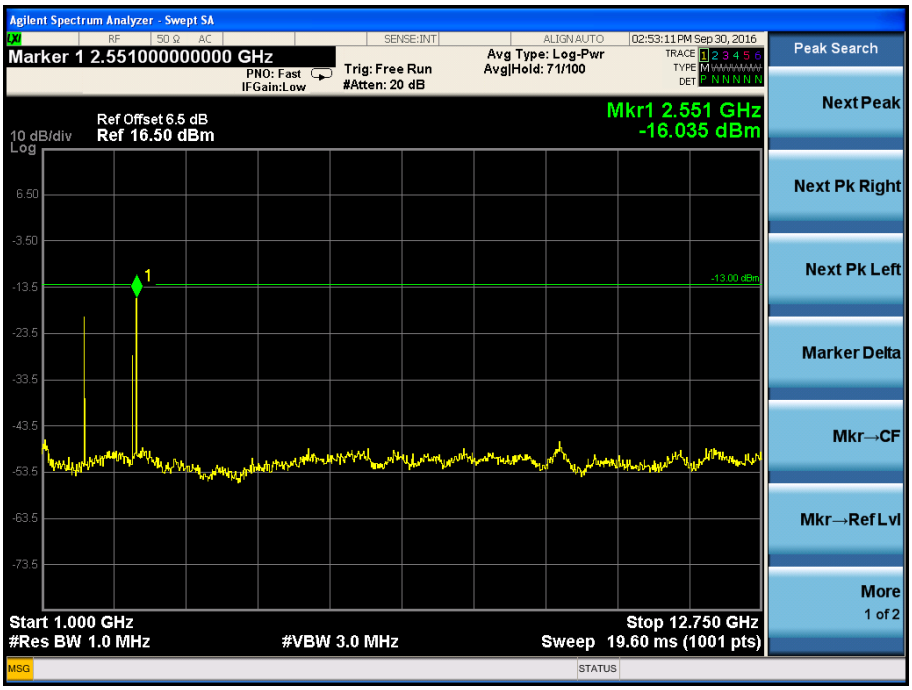
GSM Middle Channel



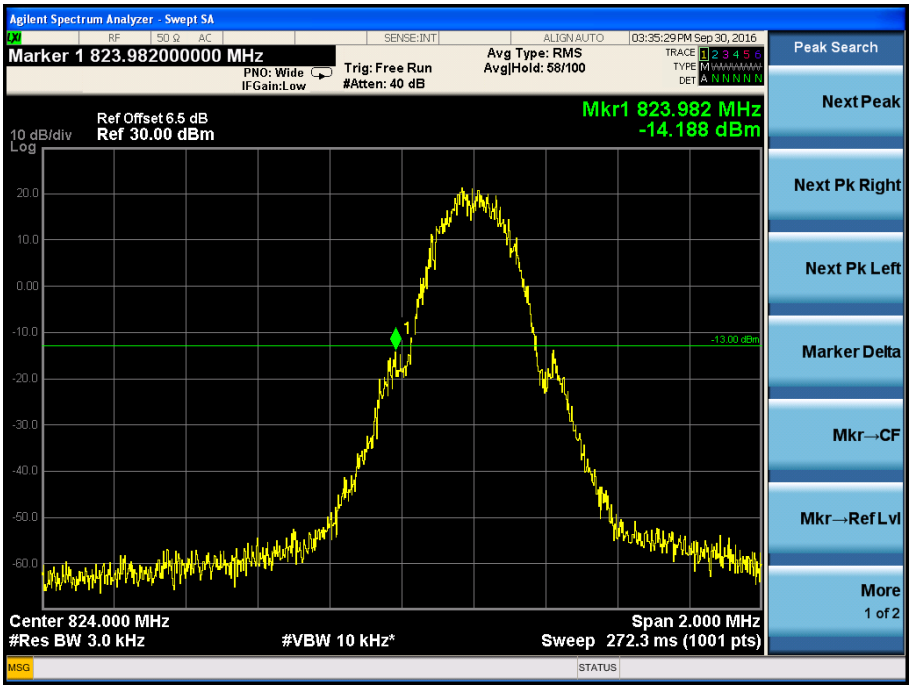


GSM High Channel

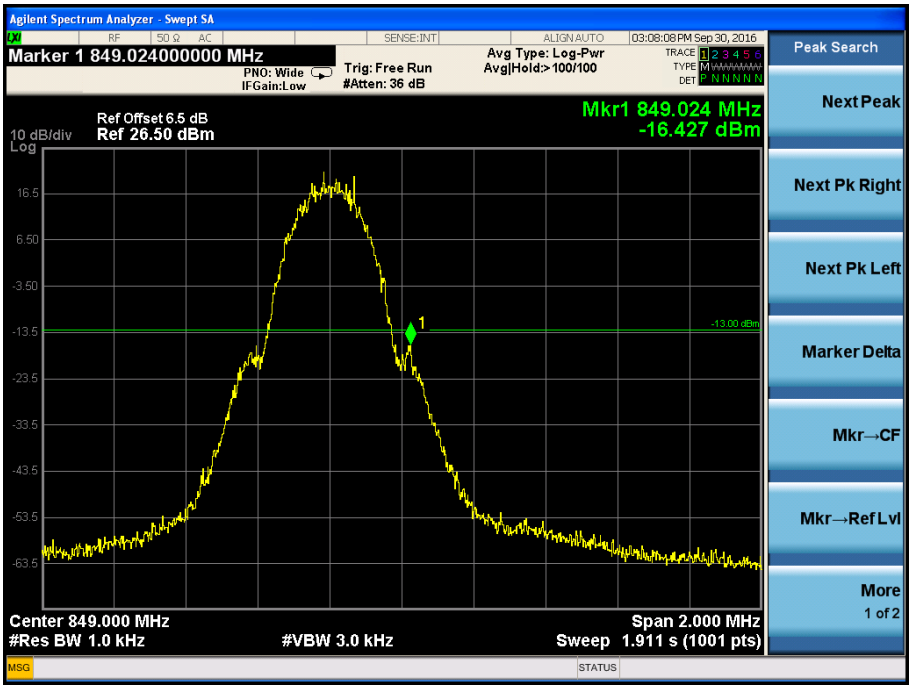




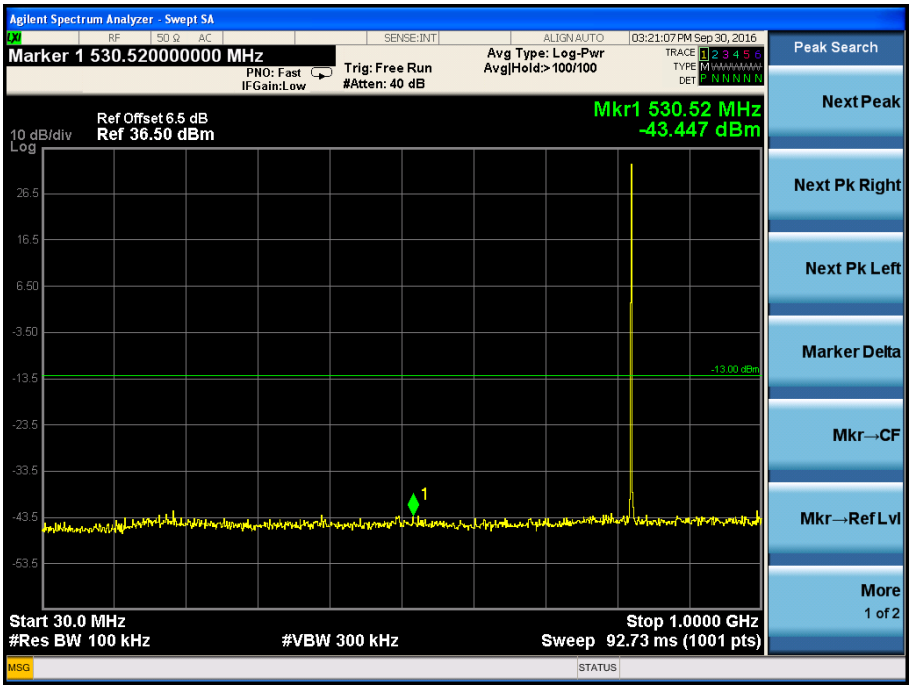
GSM Low Band Emission

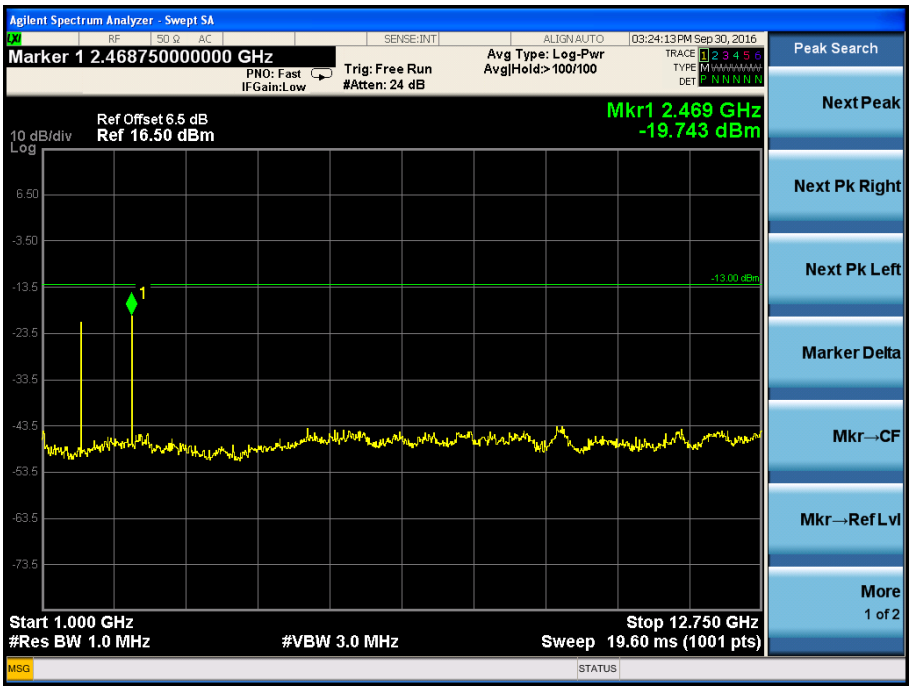


GSM High Band Emission

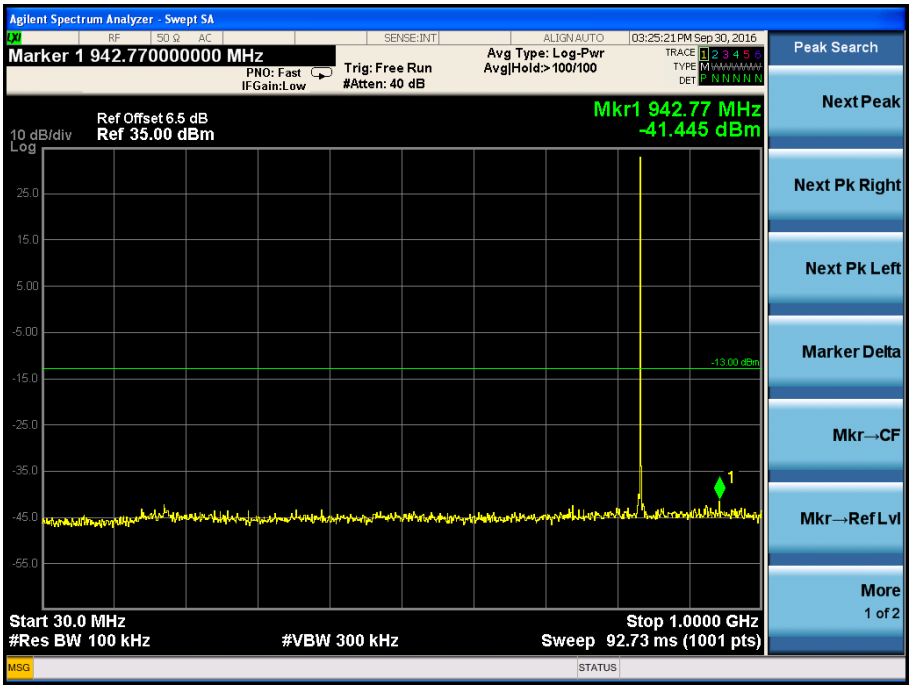


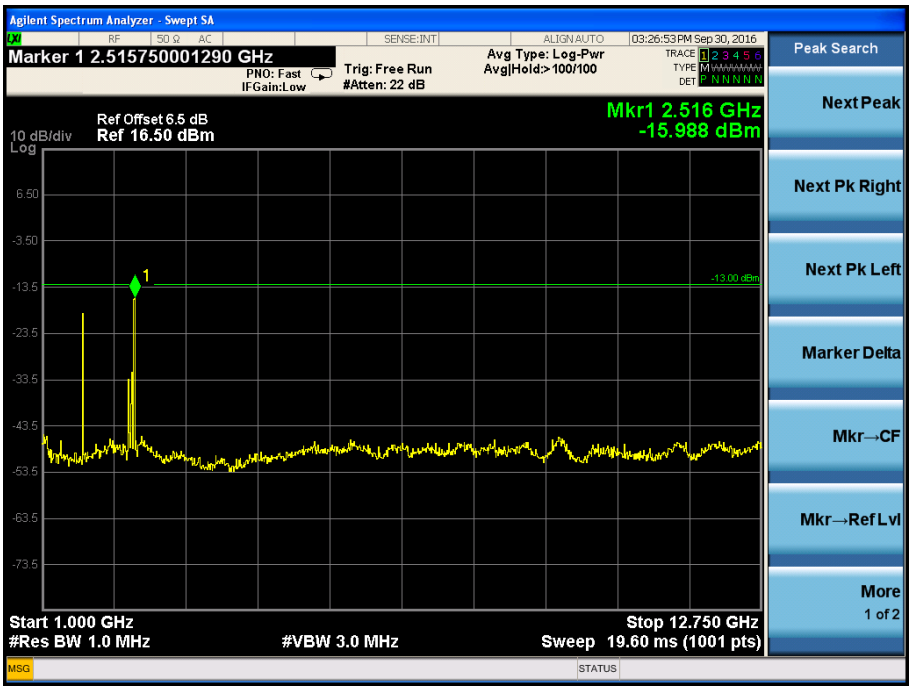
GPRS Low Channel



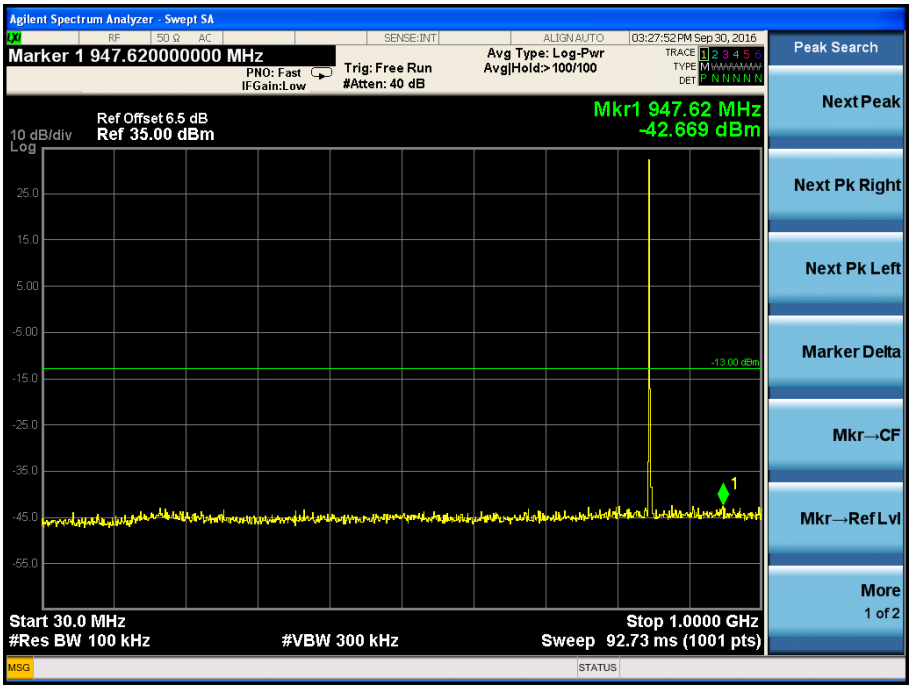


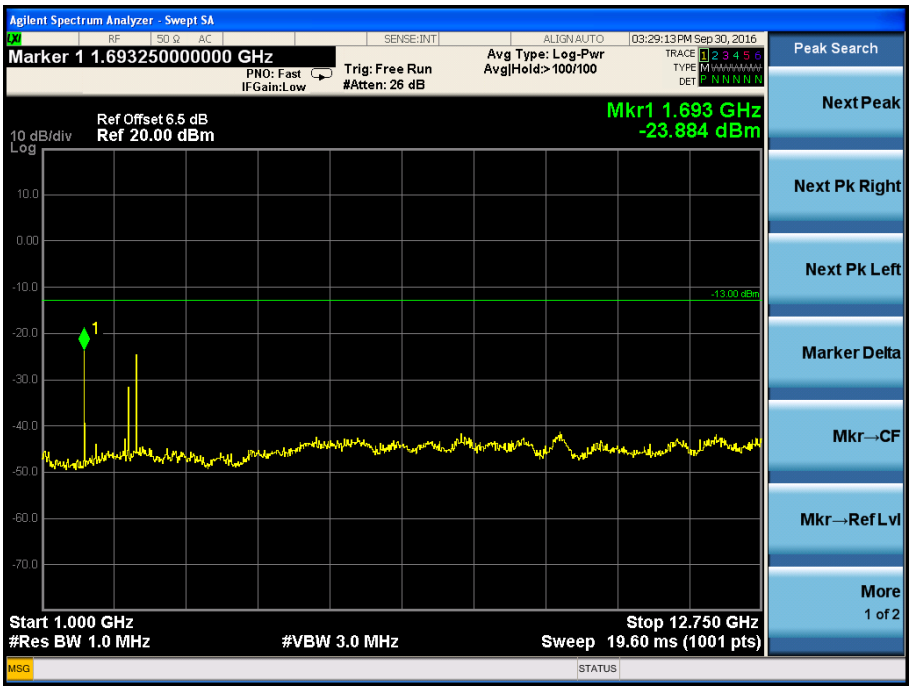
GPRS Middle Channel



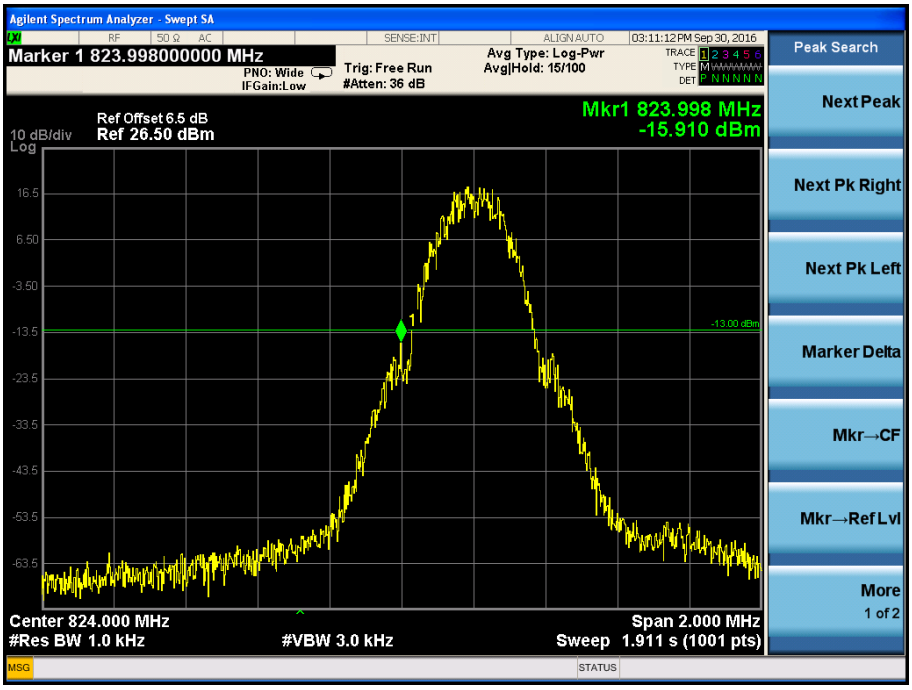


GPRS High Channel

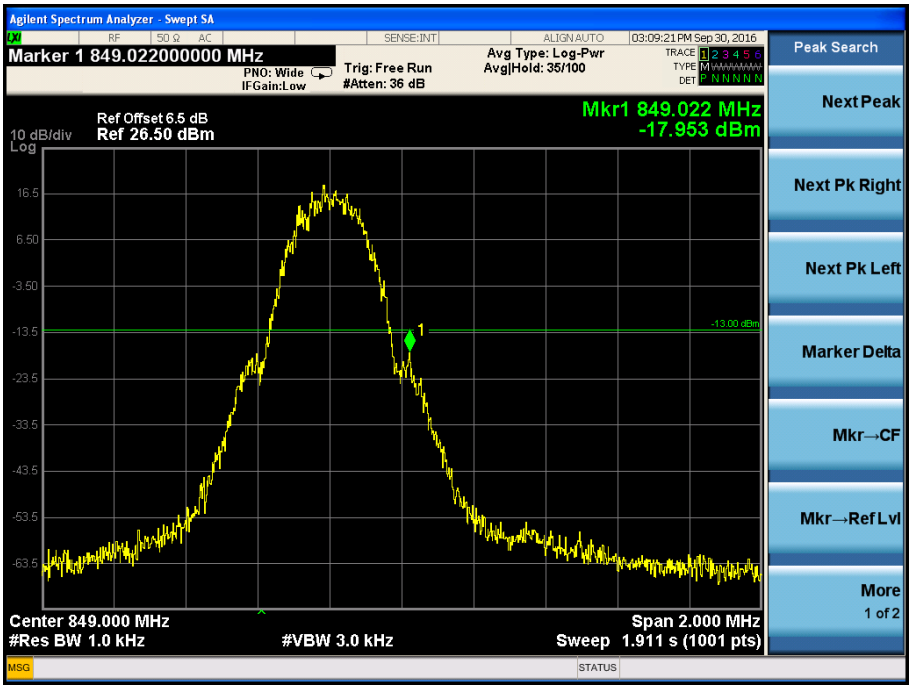




GPRS Low Band Emission

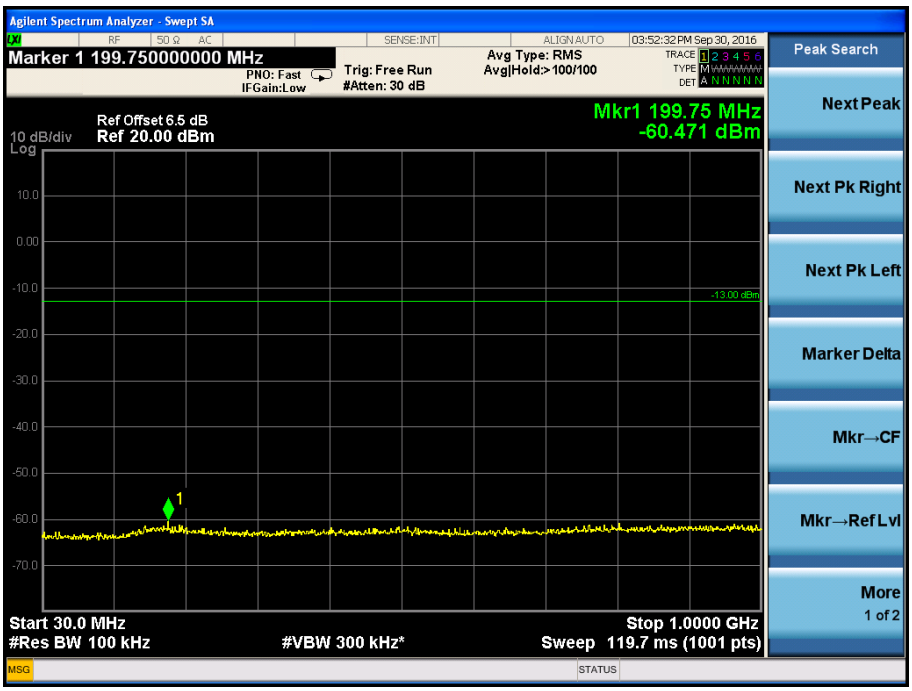


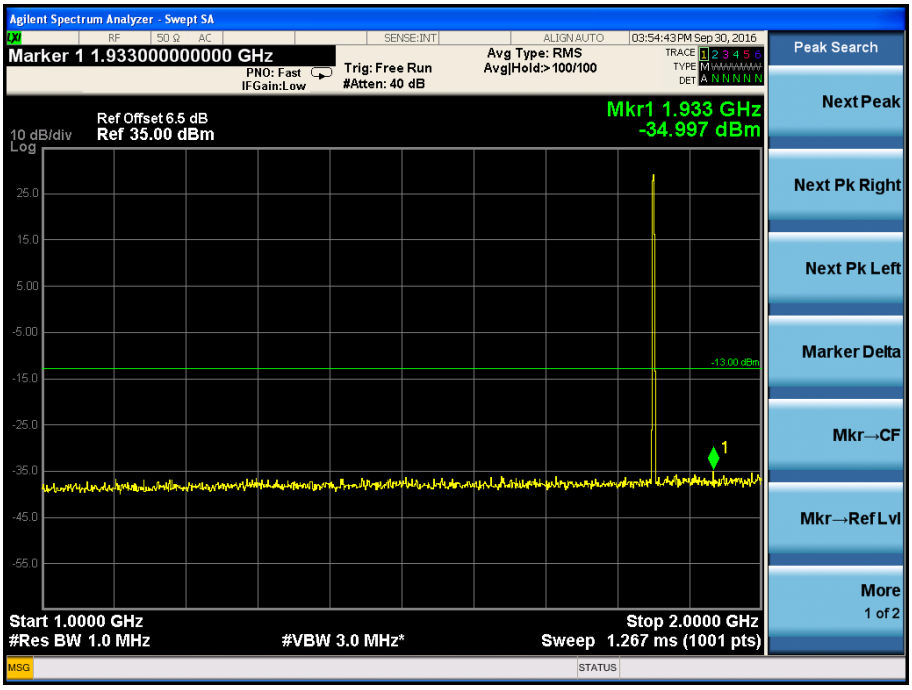
GPRS High Band Emission

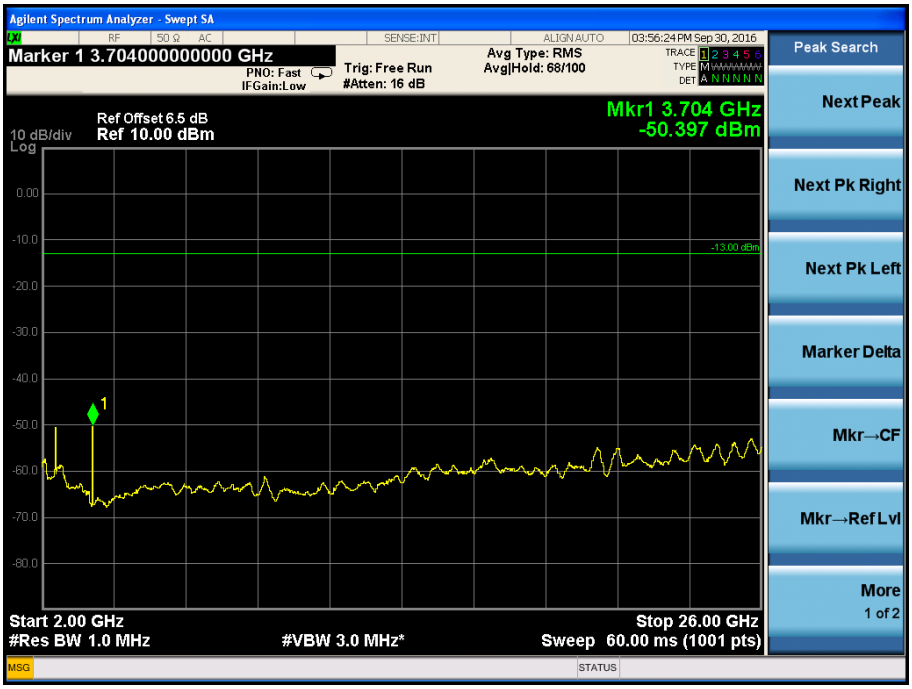


For PCS Band

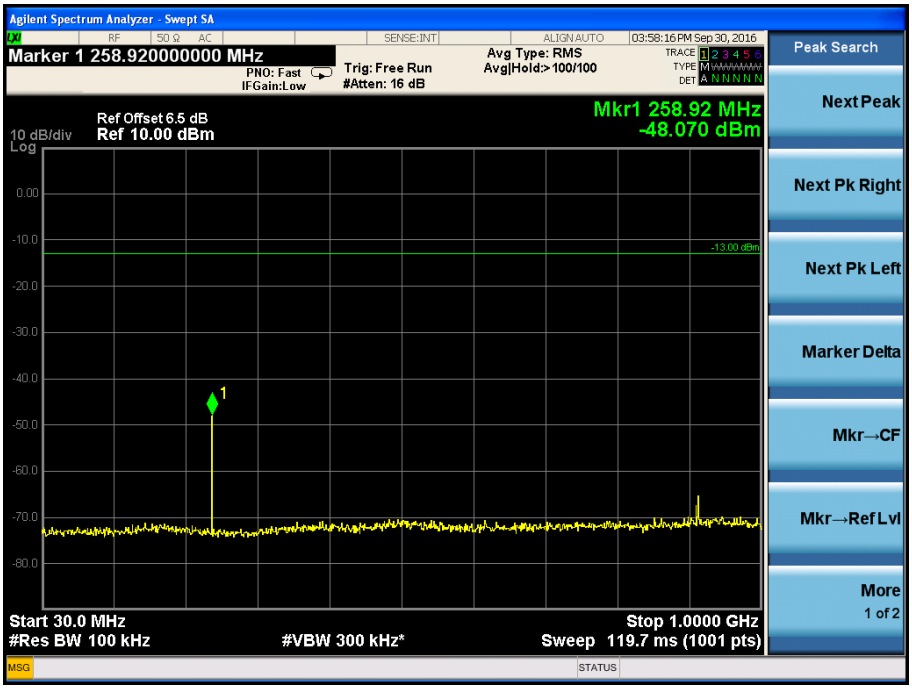
GSM Low Channel

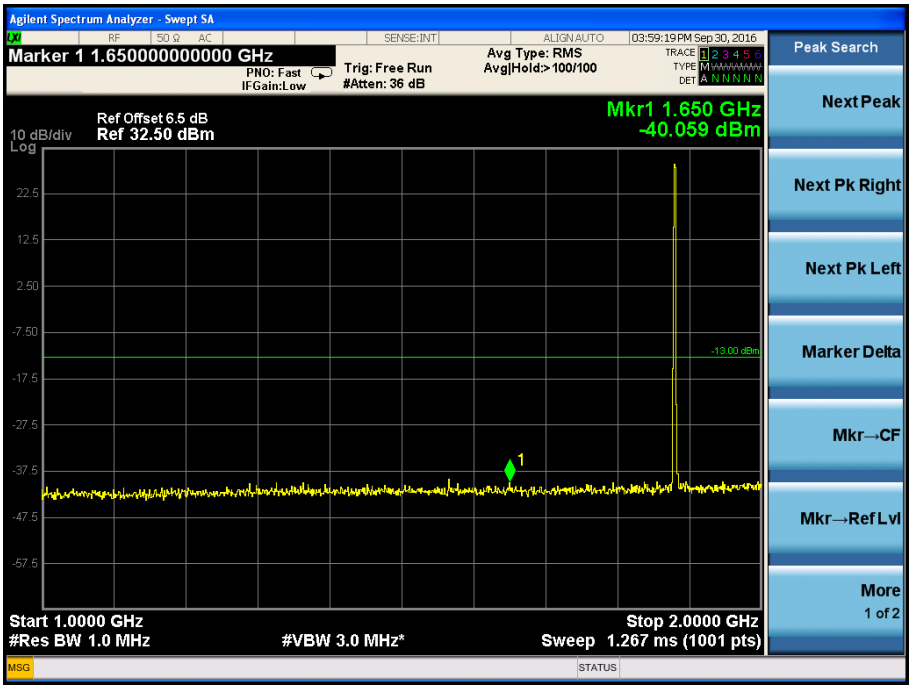


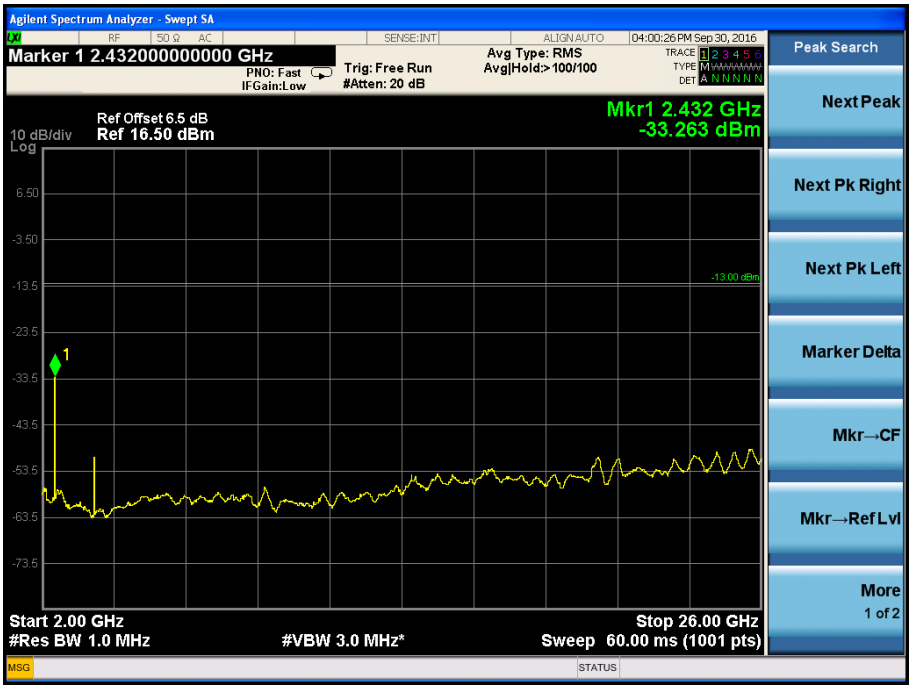




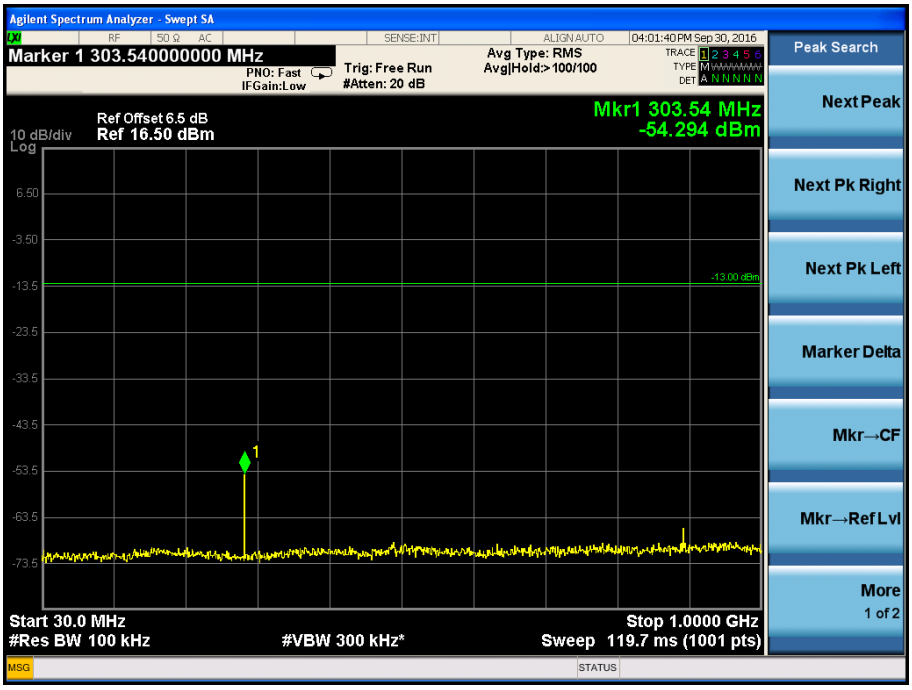
GSM Middle Channel

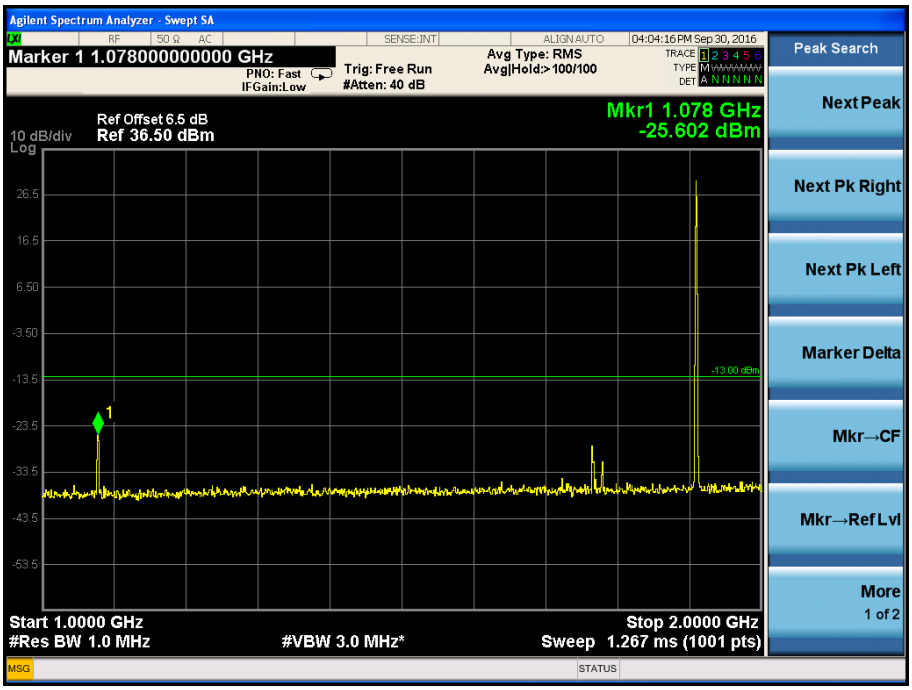


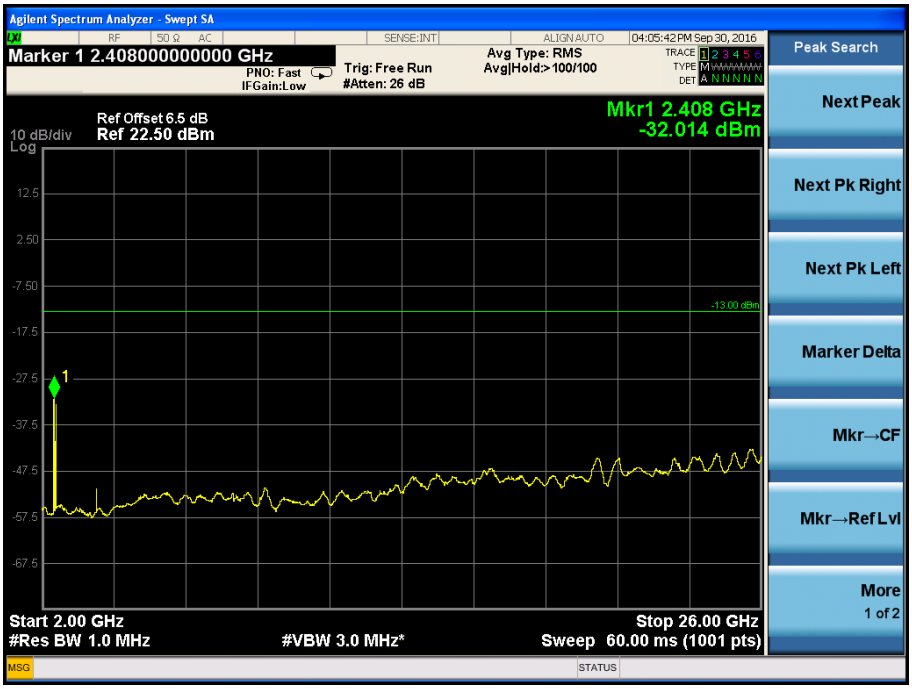

Agilent Spectrum Analyzer - Swept SA
Marker 1 1.650000000000 GHz
PNO: Fast
IFGain:Low
Trig: Free Run
#Atten: 36 dB
Avg Type: RMS
Avg|Hold:>100/100
03:59:19 PM Sep 30, 2016
Ref Offset 6.5 dB
10 dB/div
Ref 32.50 dBm
Mkr1 1.650 GHz
-40.059 dBm
-13.00 dBm
Start 1.0000 GHz
#Res BW 1.0 MHz
#VBW 3.0 MHz*
Stop 2.0000 GHz
Sweep 1.267 ms (1001 pts)
Peak Search
Next Peak
Next Pk Right
Next Pk Left
Marker Delta
Mkr→CF
Mkr→Ref Lvl
More
1 of 2


Agilent Spectrum Analyzer - Swept SA
Marker 1 2.432000000000 GHz
PNO: Fast
IFGain:Low
Trig: Free Run
#Atten: 20 dB
Avg Type: RMS
Avg|Hold:>100/100
04:00:26 PM Sep 30, 2016
Ref Offset 6.5 dB
10 dB/div
Ref 16.50 dBm
Mkr1 2.432 GHz
-33.263 dBm
-13.00 dBm
Start 2.00 GHz
#Res BW 1.0 MHz
#VBW 3.0 MHz*
Stop 26.00 GHz
Sweep 60.00 ms (1001 pts)
Peak Search
Next Peak
Next Pk Right
Next Pk Left
Marker Delta
Mkr→CF
Mkr→Ref Lvl
More
1 of 2

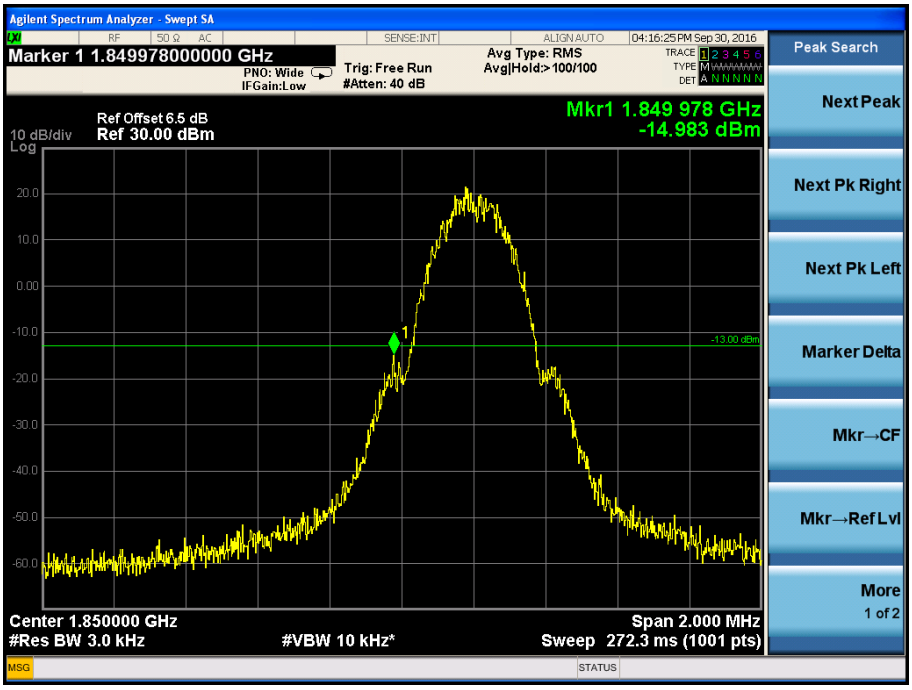
GSM High Channel



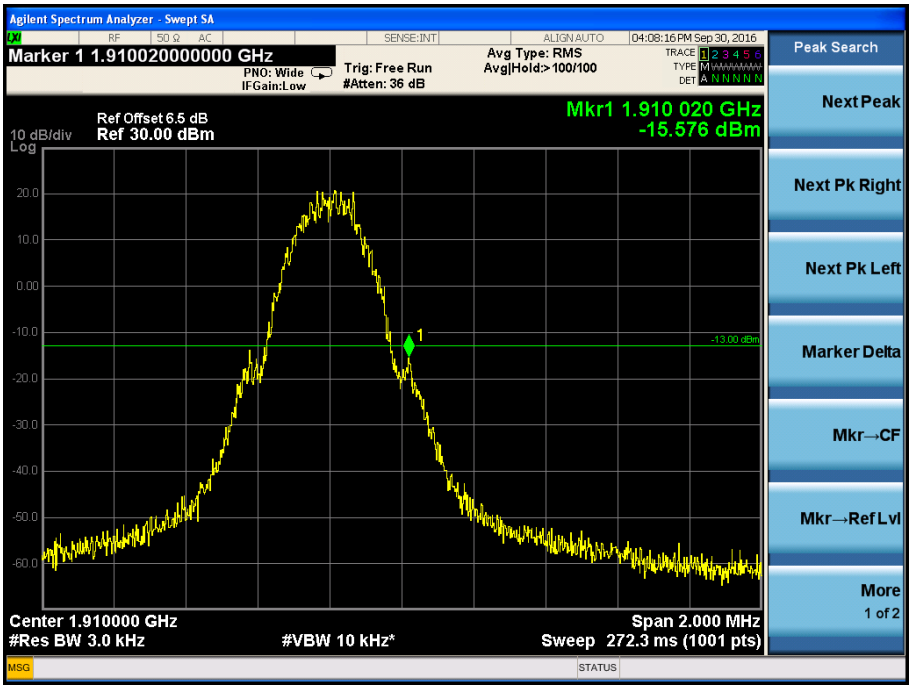




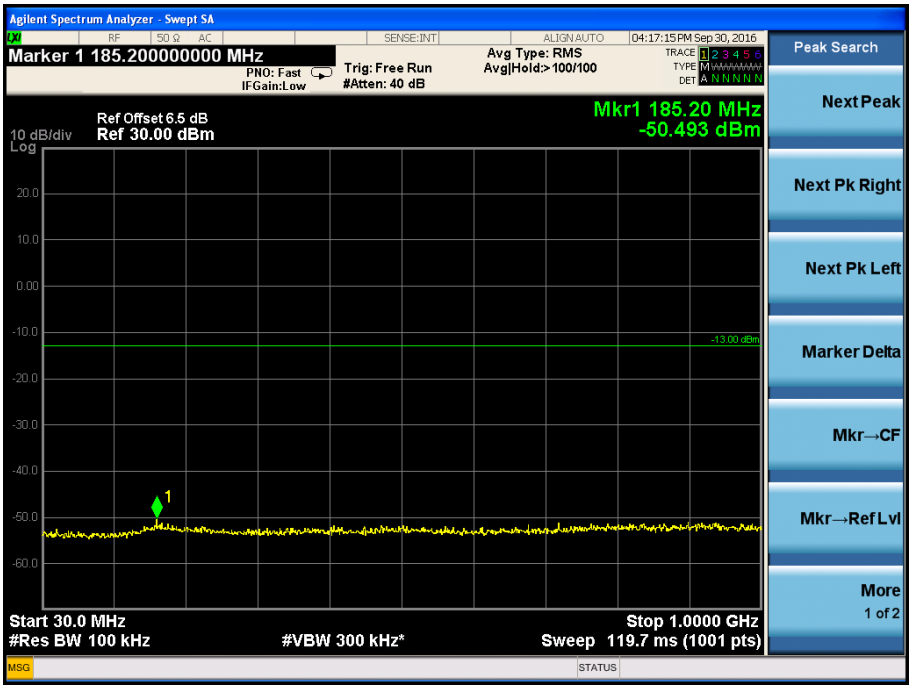
GSM Low Band Emission

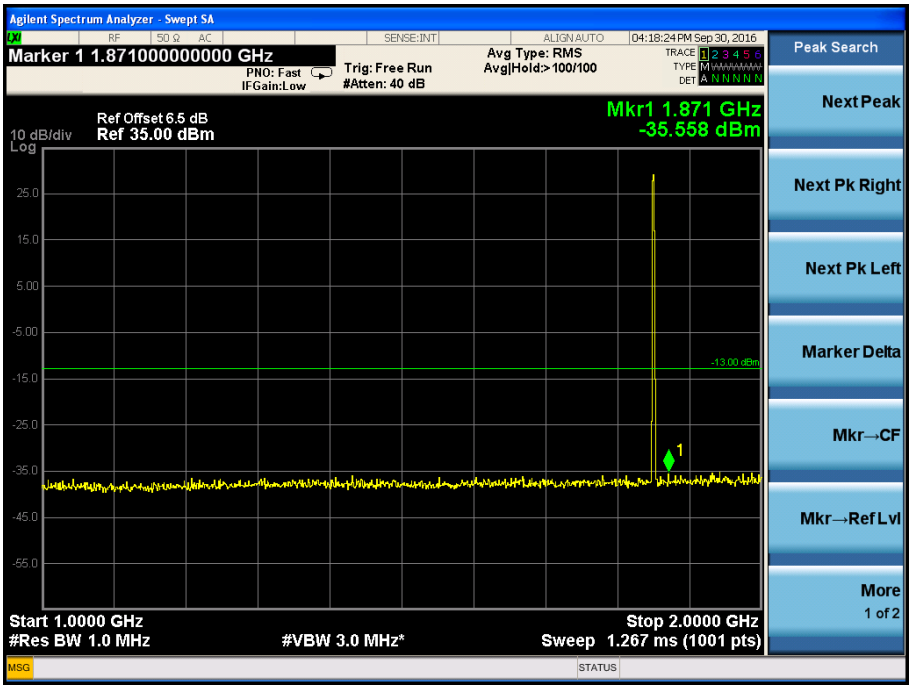


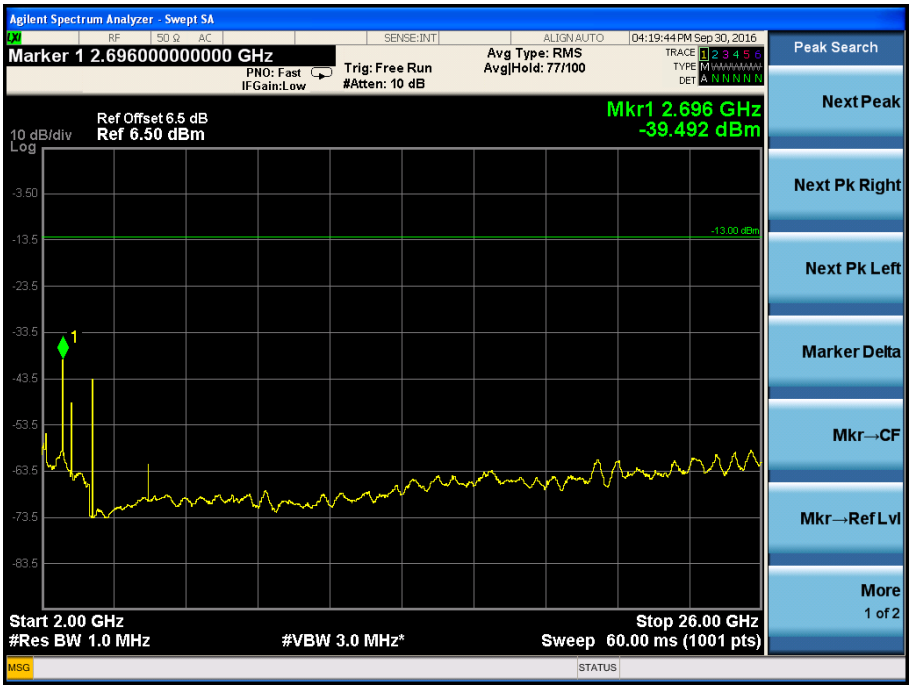
GSM High Band Emission



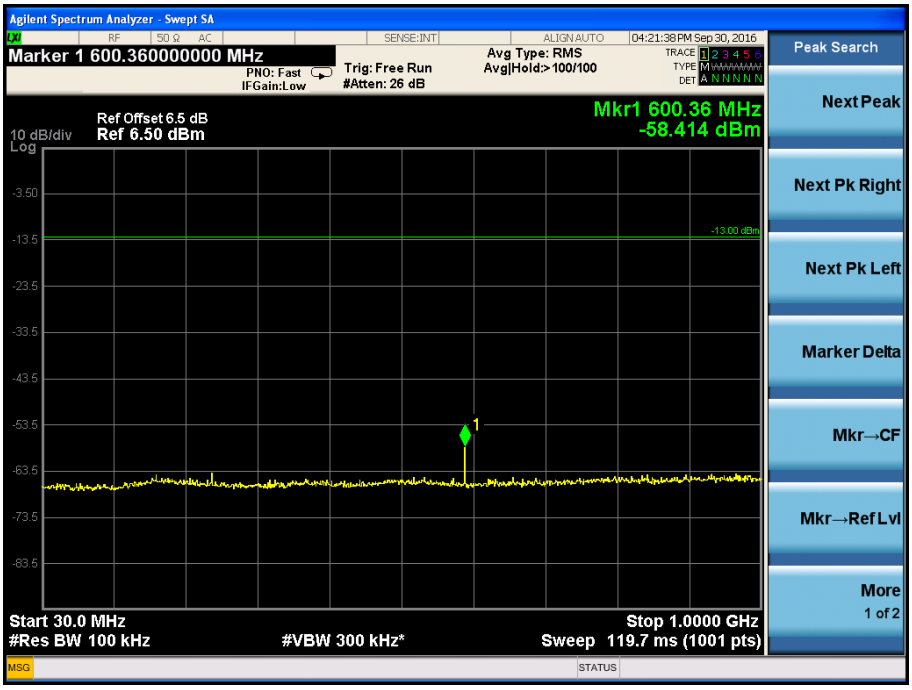
GPRS Low Channel

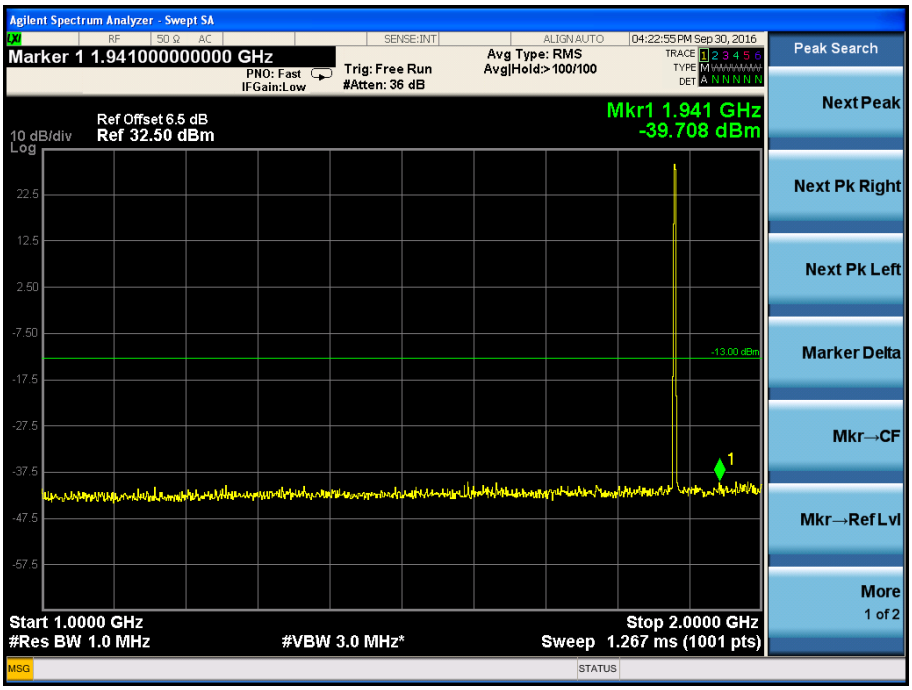


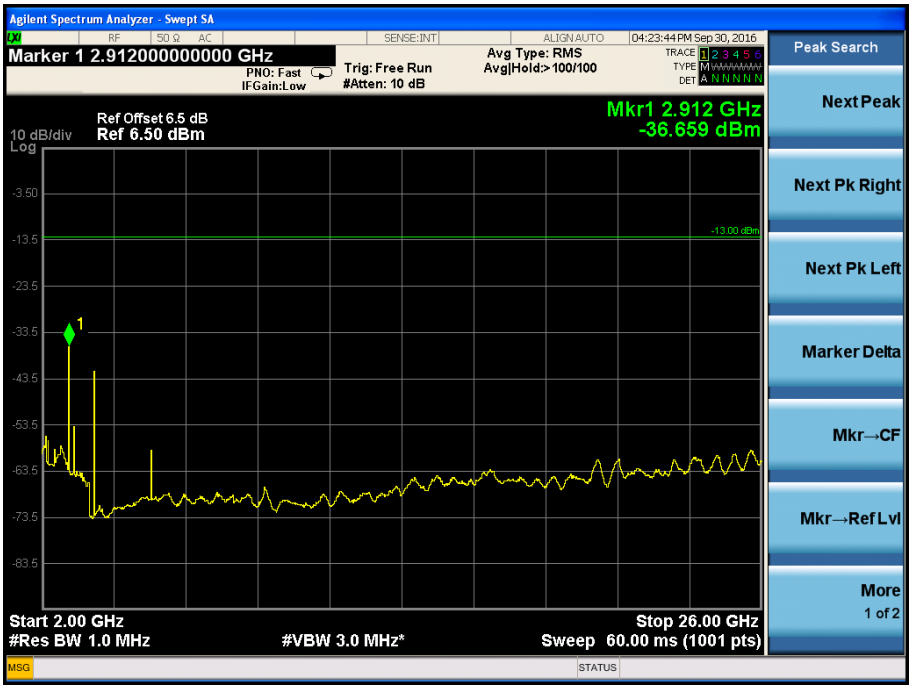

Agilent Spectrum Analyzer - Swept SA
Marker 1 1.871000000000 GHz
PNO: Fast
IFGain:Low
Trig: Free Run
#Atten: 40 dB
Avg Type: RMS
Avg|Hold:>100/100
04:18:24 PM Sep 30, 2016
Ref Offset 6.5 dB
10 dB/div
Ref 35.00 dBm
Mkr1 1.871 GHz
-35.558 dBm
-13.00 dBm
Start 1.0000 GHz
#Res BW 1.0 MHz
#VBW 3.0 MHz*
Stop 2.0000 GHz
Sweep 1.267 ms (1001 pts)
Peak Search
Next Peak
Next Pk Right
Next Pk Left
Marker Delta
Mkr→CF
Mkr→Ref Lvl
More
1 of 2


Agilent Spectrum Analyzer - Swept SA
Marker 1 2.696000000000 GHz
PNO: Fast
IFGain:Low
Trig: Free Run
#Atten: 10 dB
Avg Type: RMS
Avg|Hold: 77/100
04:19:44 PM Sep 30, 2016
Ref Offset 6.5 dB
10 dB/div
Ref 6.50 dBm
Mkr1 2.696 GHz
-39.492 dBm
-13.00 dBm
Start 2.00 GHz
#Res BW 1.0 MHz
#VBW 3.0 MHz*
Stop 26.00 GHz
Sweep 60.00 ms (1001 pts)
Peak Search
Next Peak
Next Pk Right
Next Pk Left
Marker Delta
Mkr→CF
Mkr→Ref Lvl
More
1 of 2

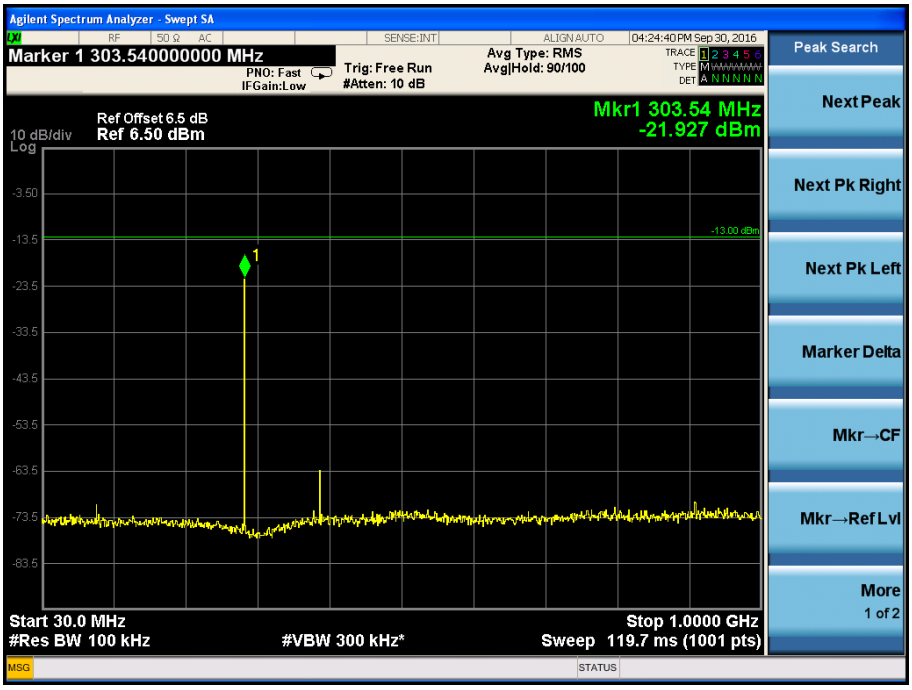
GPRS Middle Channel

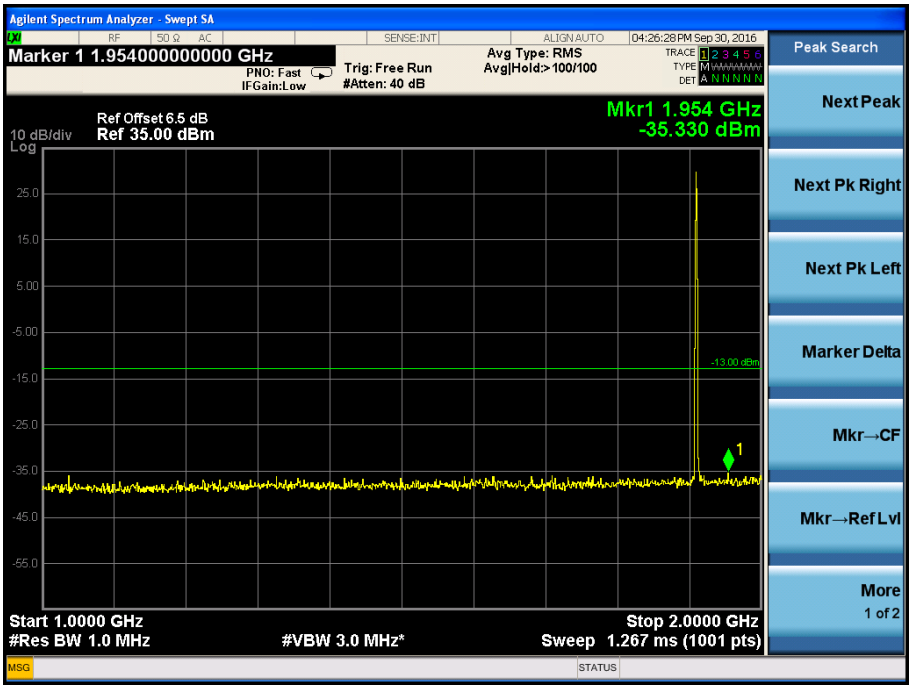


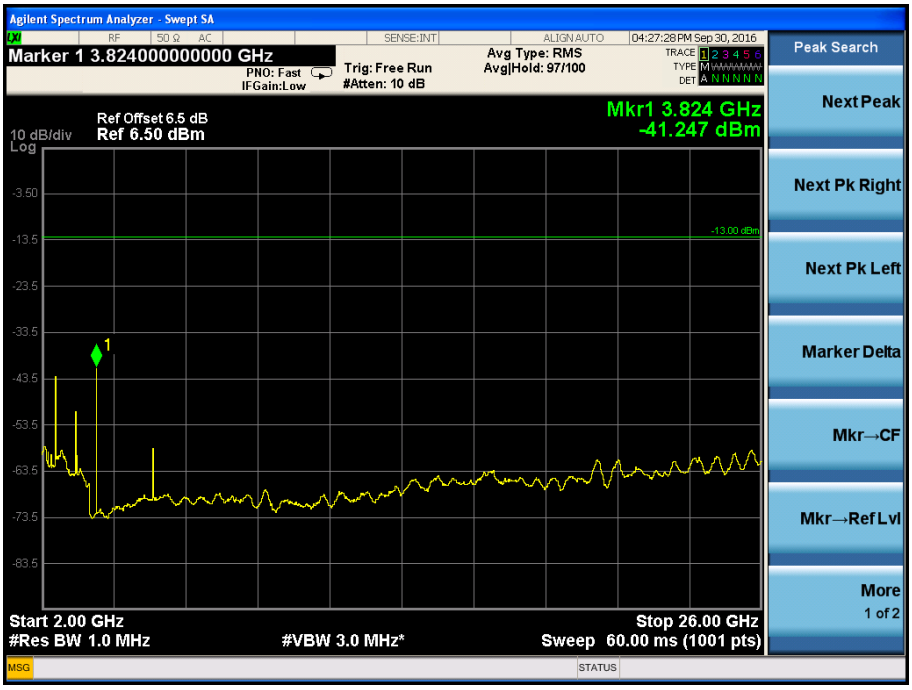




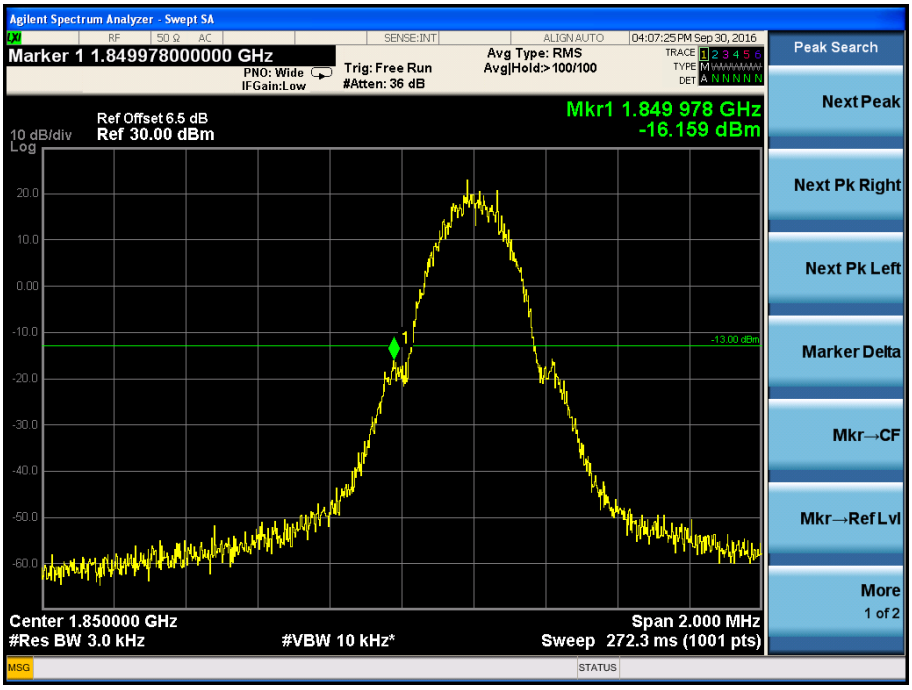
GPRS High Channel



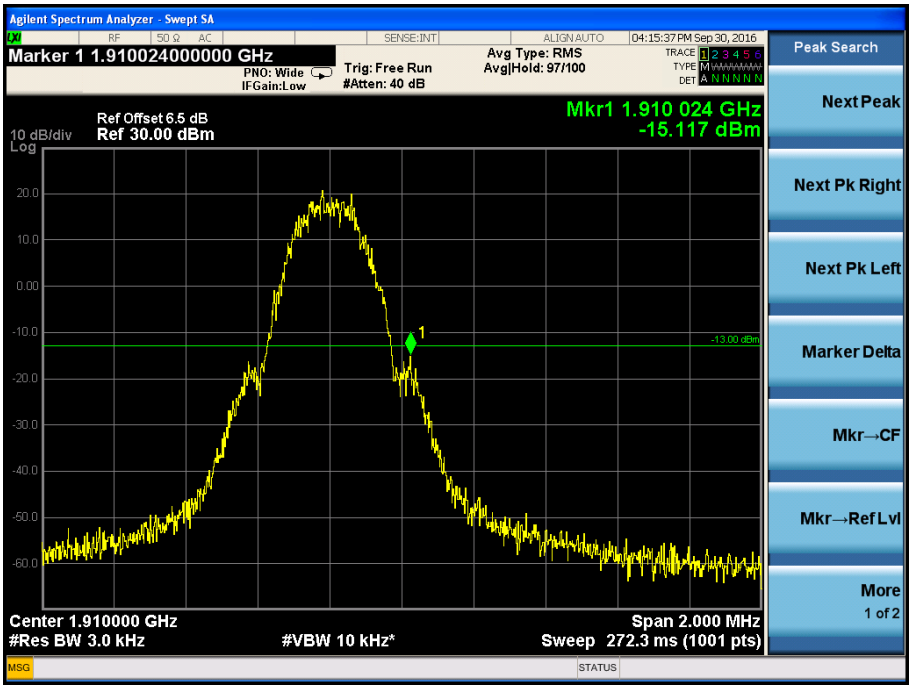

Agilent Spectrum Analyzer - Swept SA
Marker 1 1.954000000000 GHz
PNO: Fast
IFGain:Low
Trig: Free Run
#Atten: 40 dB
Avg Type: RMS
Avg|Hold:>100/100
04:26:28 PM Sep 30, 2016
Ref Offset 6.5 dB
10 dB/div
Ref 35.00 dBm
Mkr1 1.954 GHz
-35.330 dBm
-13.00 dBm
Start 1.0000 GHz
#Res BW 1.0 MHz
#VBW 3.0 MHz*
Stop 2.0000 GHz
Sweep 1.267 ms (1001 pts)
Peak Search
Next Peak
Next Pk Right
Next Pk Left
Marker Delta
Mkr→CF
Mkr→Ref Lvl
More
1 of 2


Agilent Spectrum Analyzer - Swept SA
Marker 1 3.824000000000 GHz
PNO: Fast
IFGain:Low
Trig: Free Run
#Atten: 10 dB
Avg Type: RMS
Avg|Hold: 97/100
04:27:28 PM Sep 30, 2016
Ref Offset 6.5 dB
10 dB/div
Ref 6.50 dBm
Mkr1 3.824 GHz
-41.247 dBm
-13.00 dBm
Start 2.00 GHz
#Res BW 1.0 MHz
#VBW 3.0 MHz*
Stop 26.00 GHz
Sweep 60.00 ms (1001 pts)
Peak Search
Next Peak
Next Pk Right
Next Pk Left
Marker Delta
Mkr→CF
Mkr→Ref Lvl
More
1 of 2

GPRS Low Band Emission

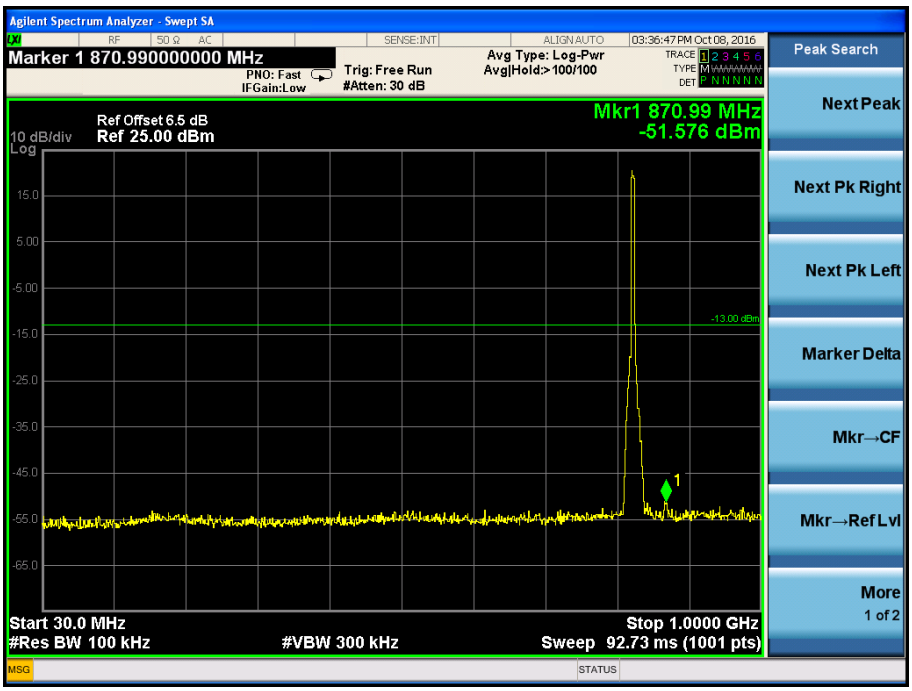


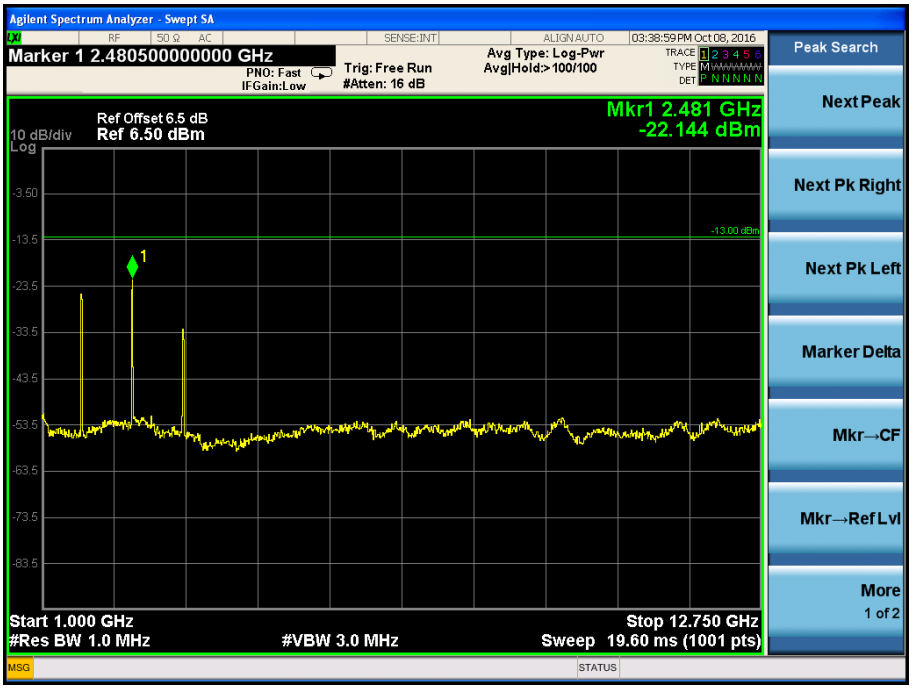
GPRS High Band Emission



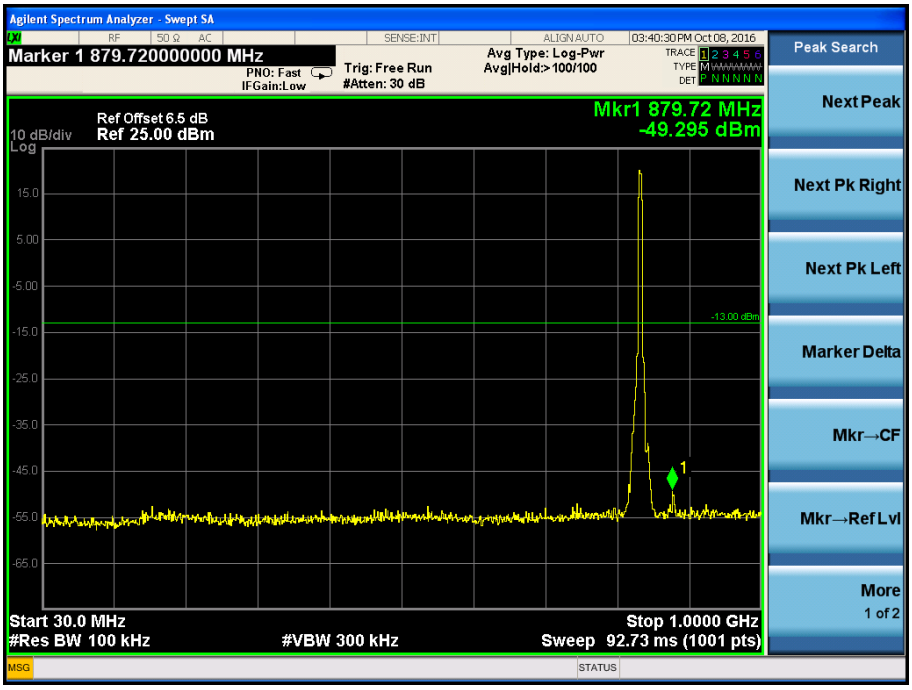
For Band V

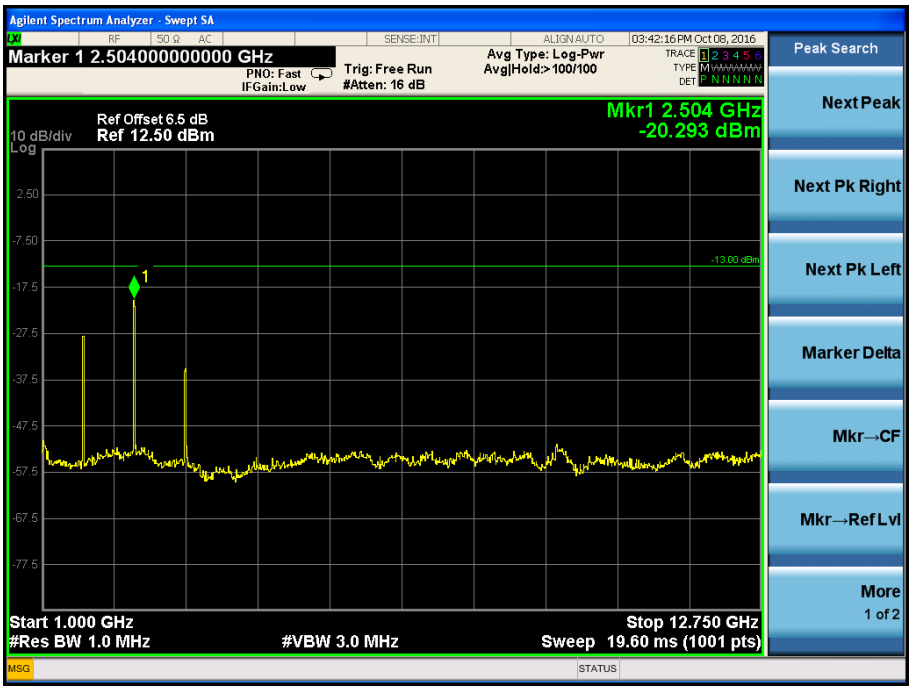
WCDMA Low Channel



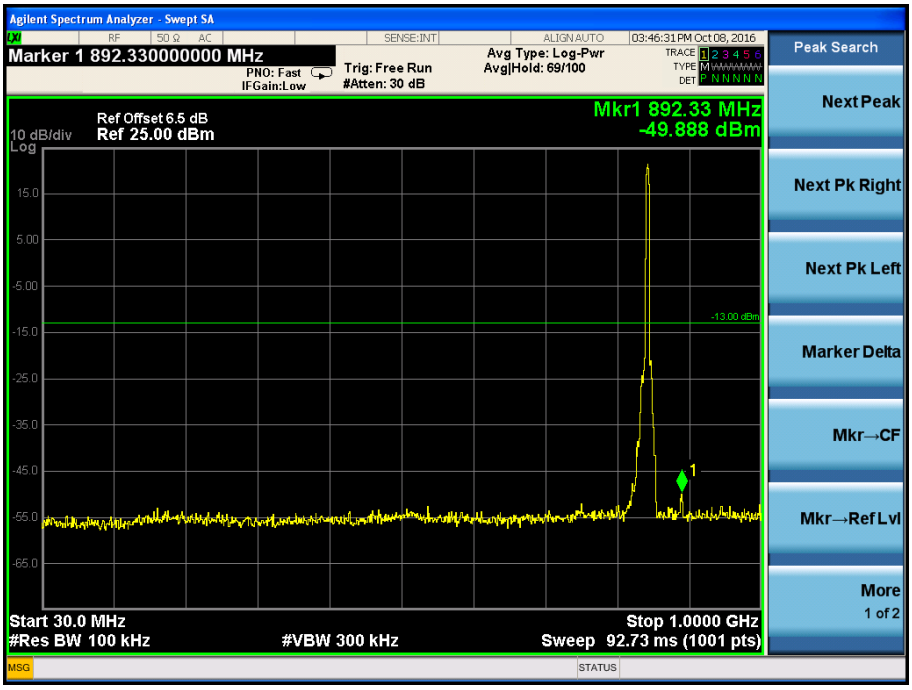


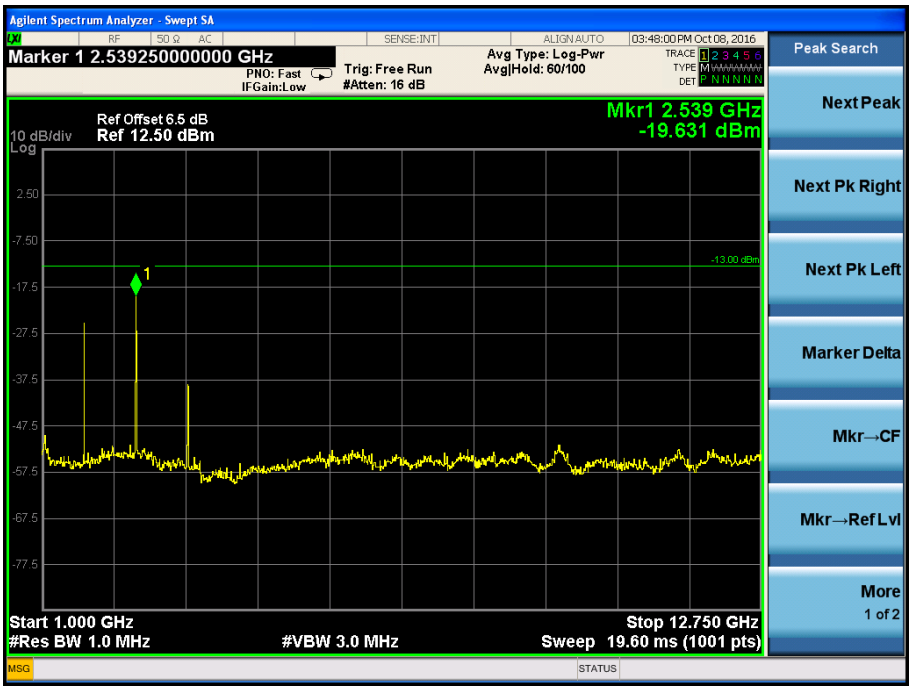
WCDMA Middle Channel





WCDMA High Channel

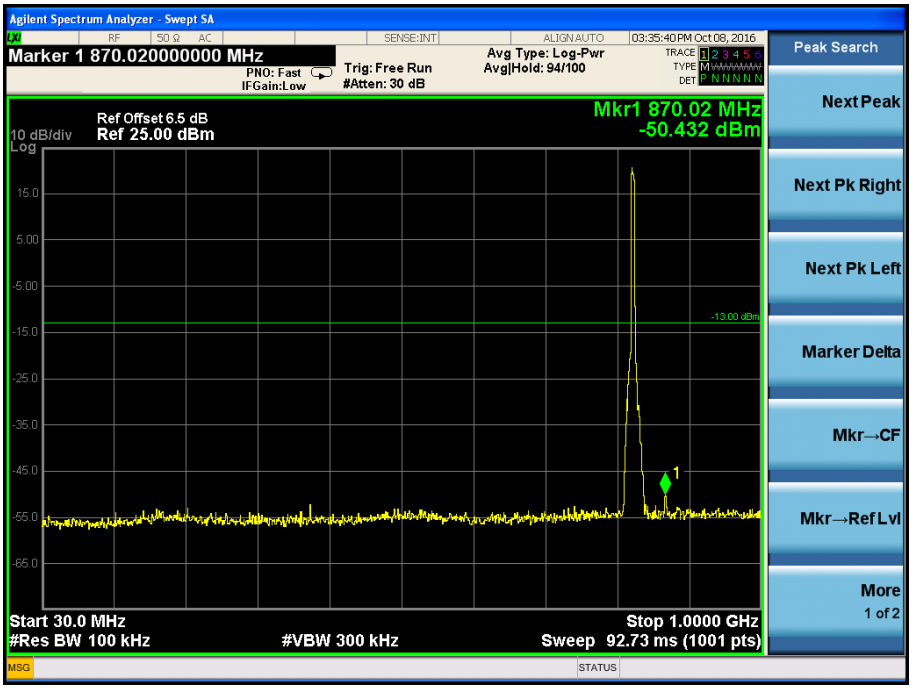


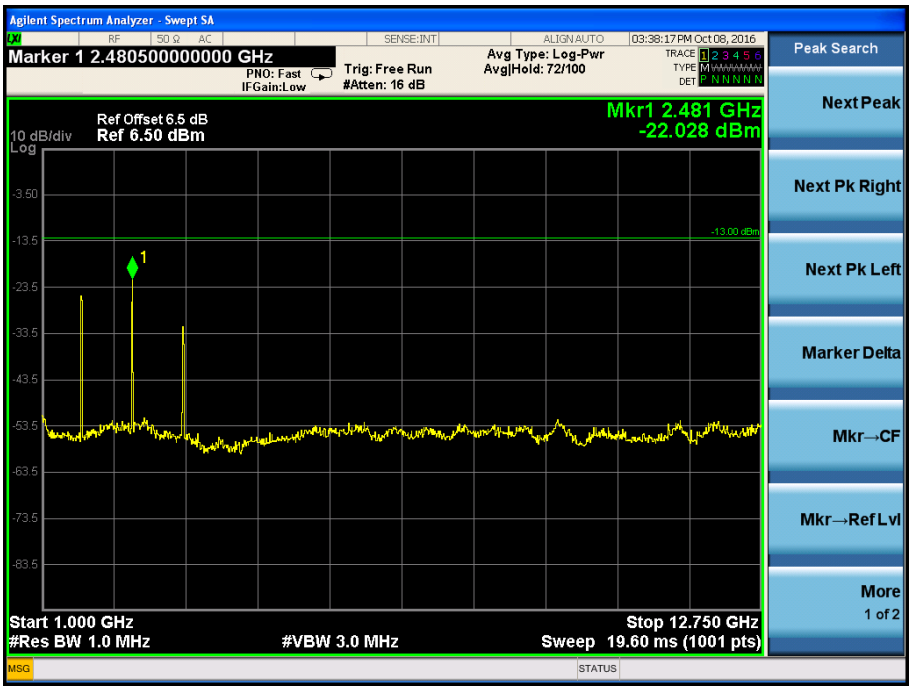


WCDMA Low Band Spurious Emission

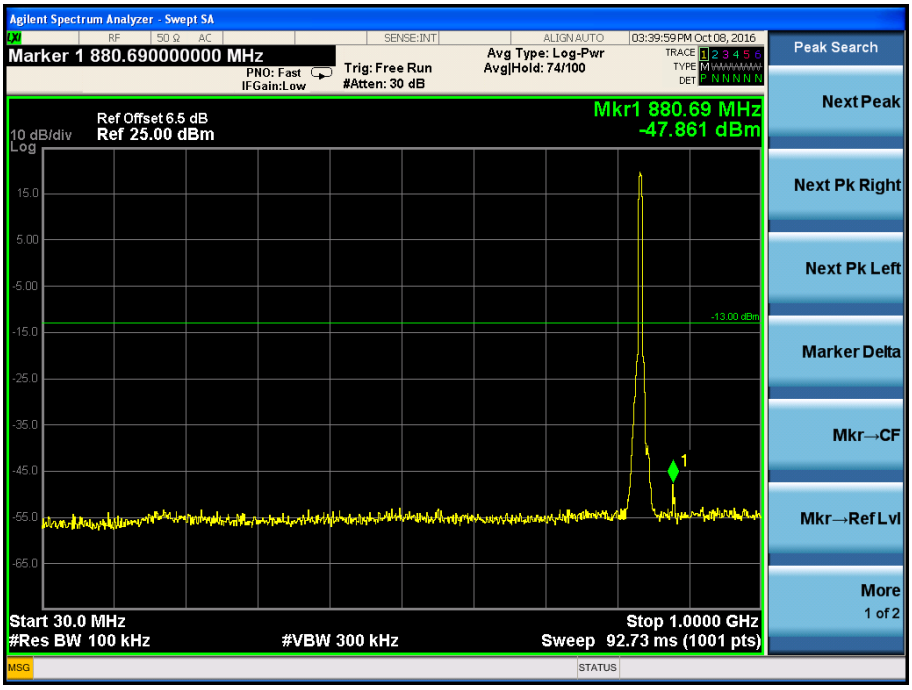
WCDMA High Band Spurious Emission

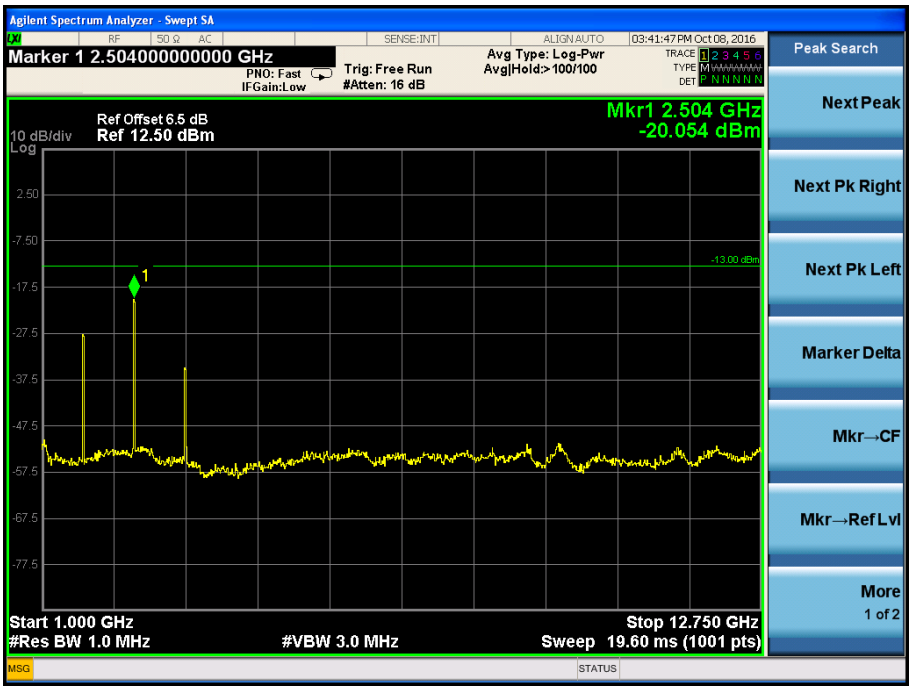
HSDPA Low Channel



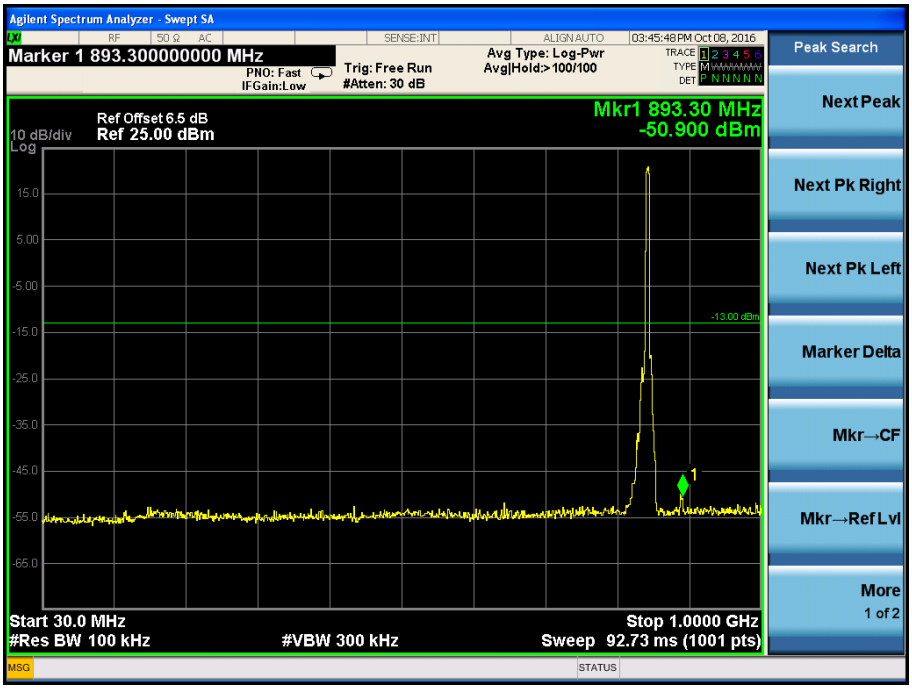


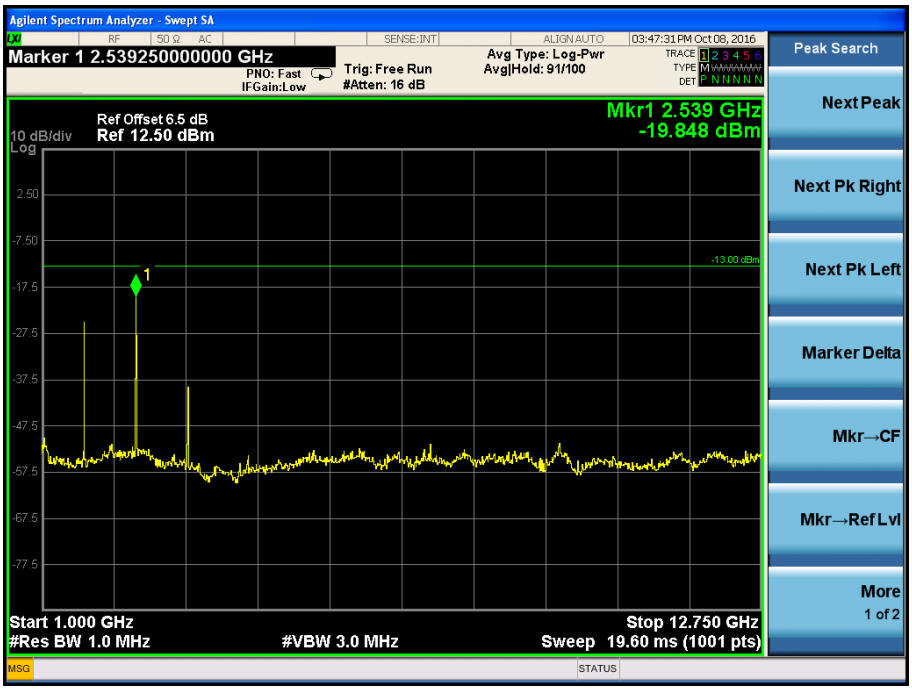
HSDPA Middle Channel



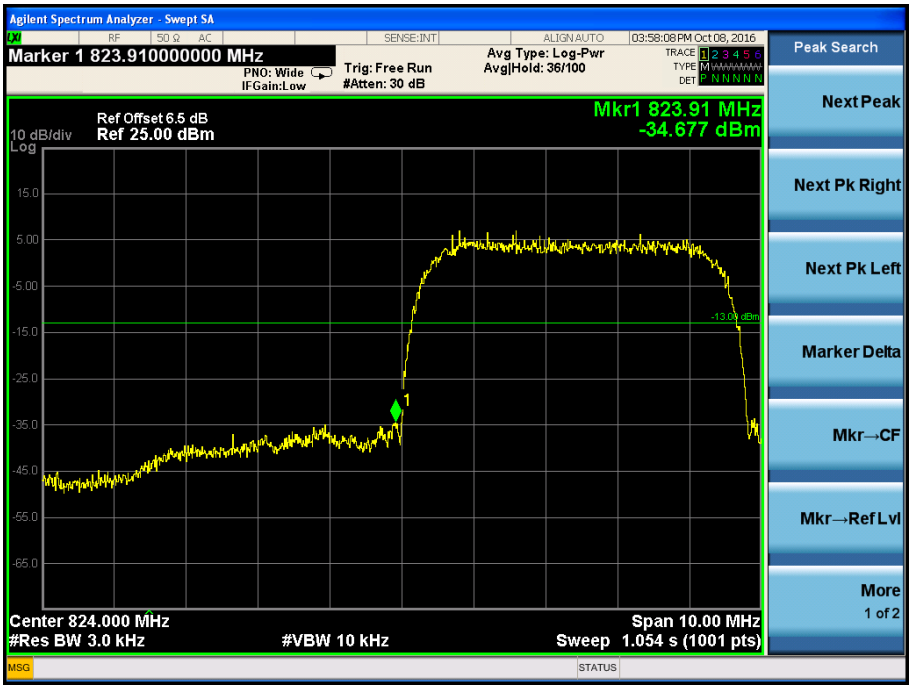


HSDPA High Channel



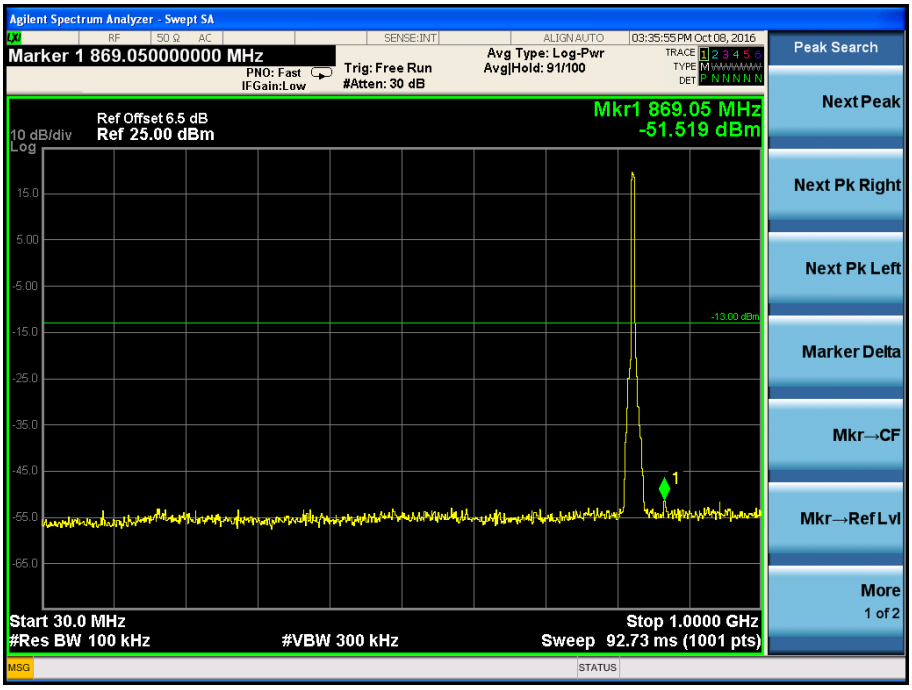


HSDPA Low Band Spurious Emission

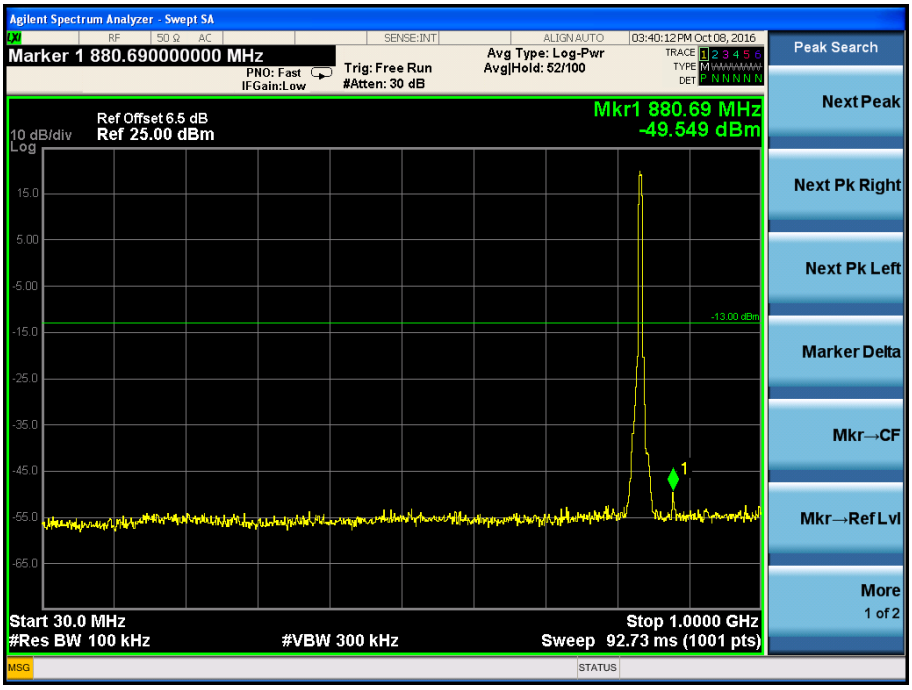


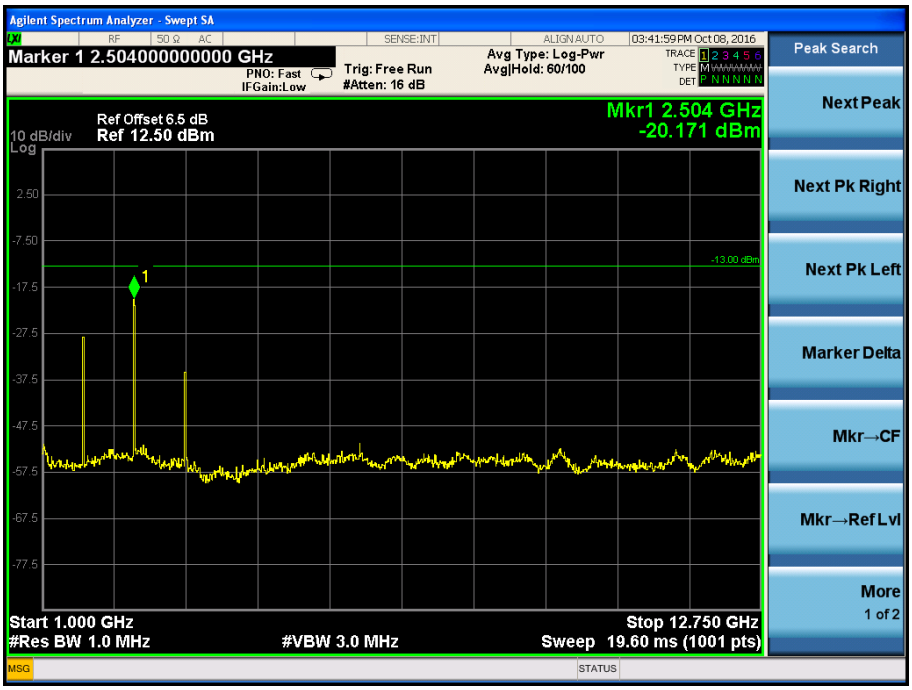
HSDPA High Band Spurious Emission

HSUPA Low Channel

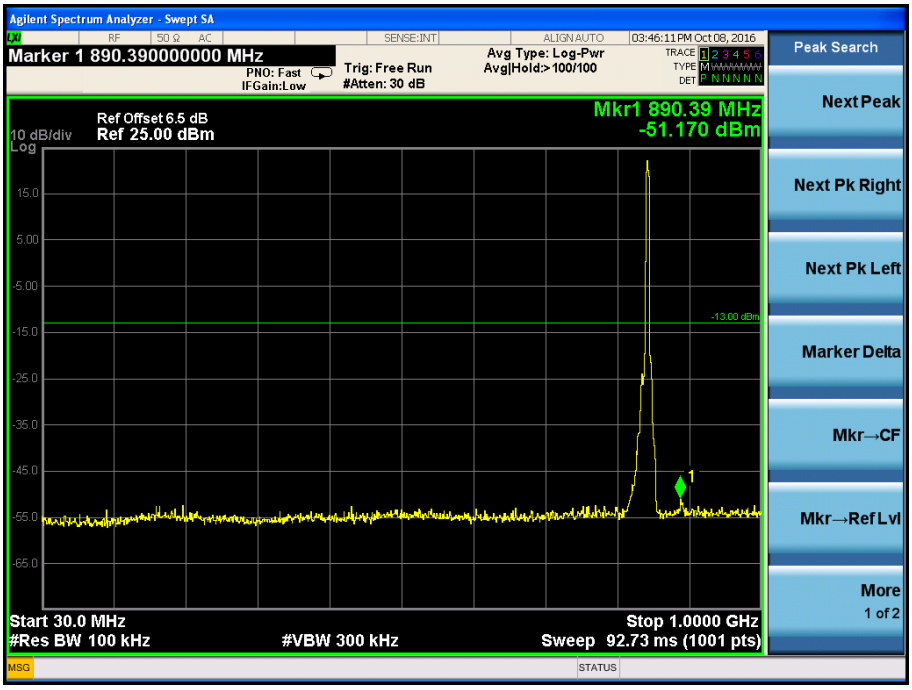


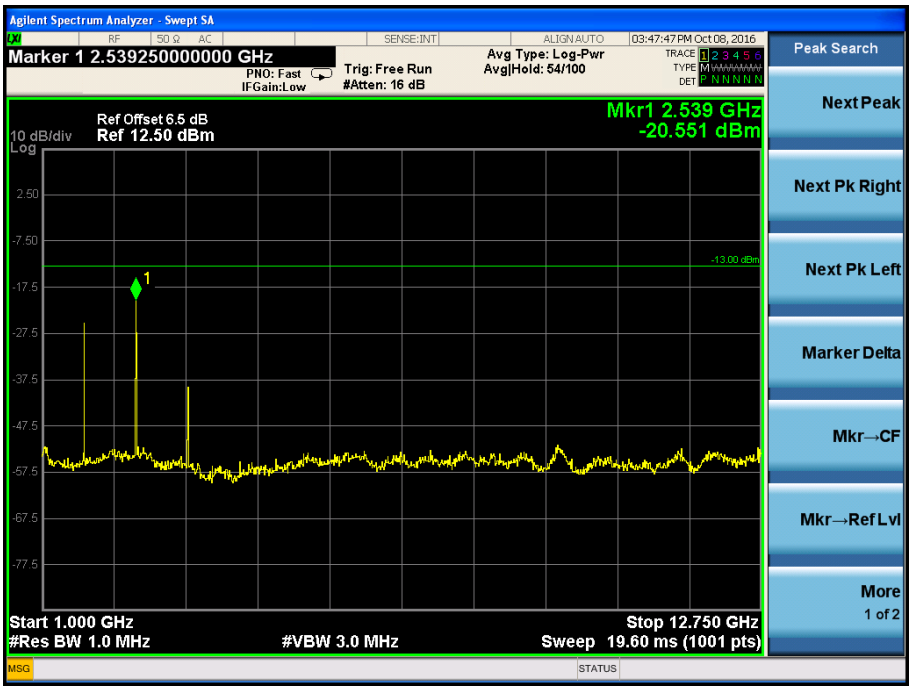
HSUPA Middle Channel





HSUPA High Channel



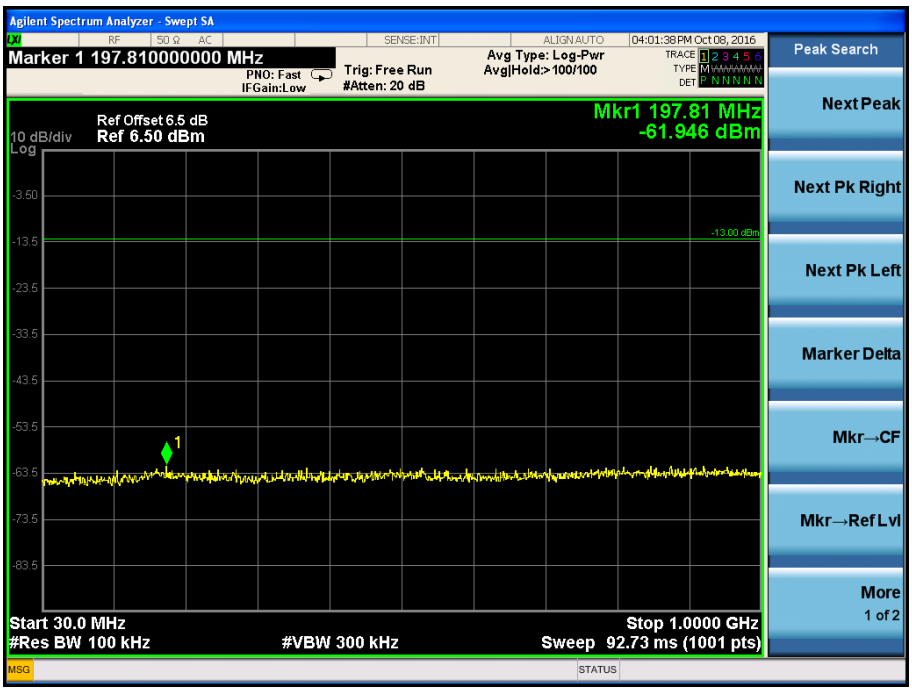


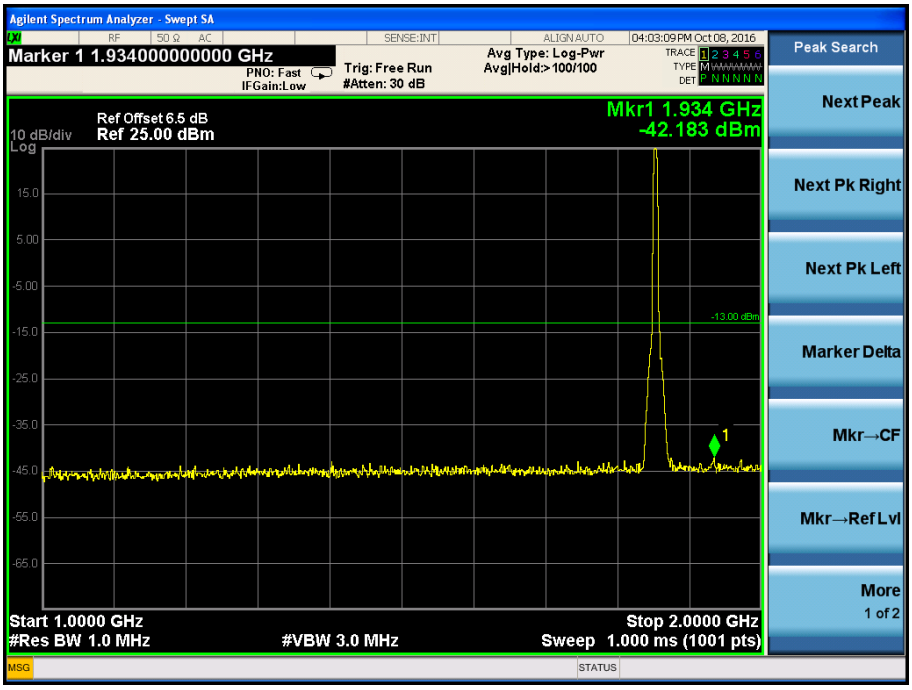
HSUPA Low Band Spurious Emission

HSUPA High Band Spurious Emission

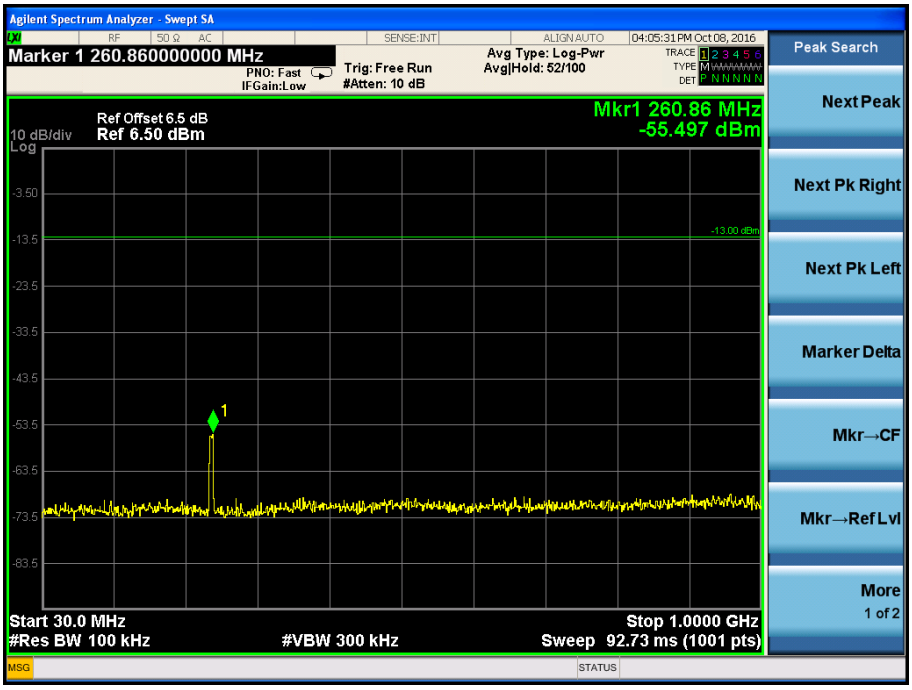
For Band II

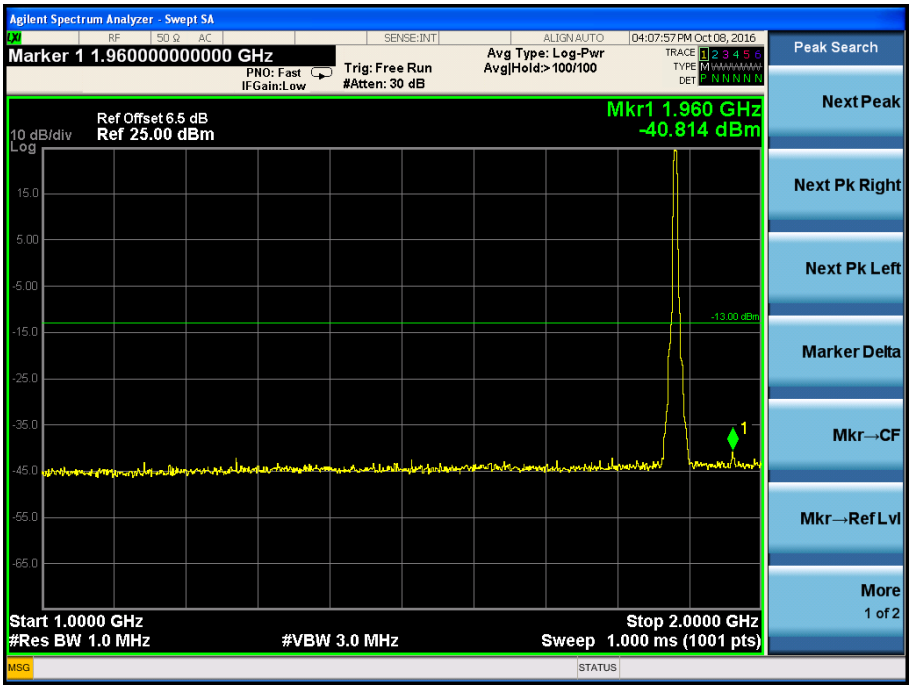
WCDMA Low Channel

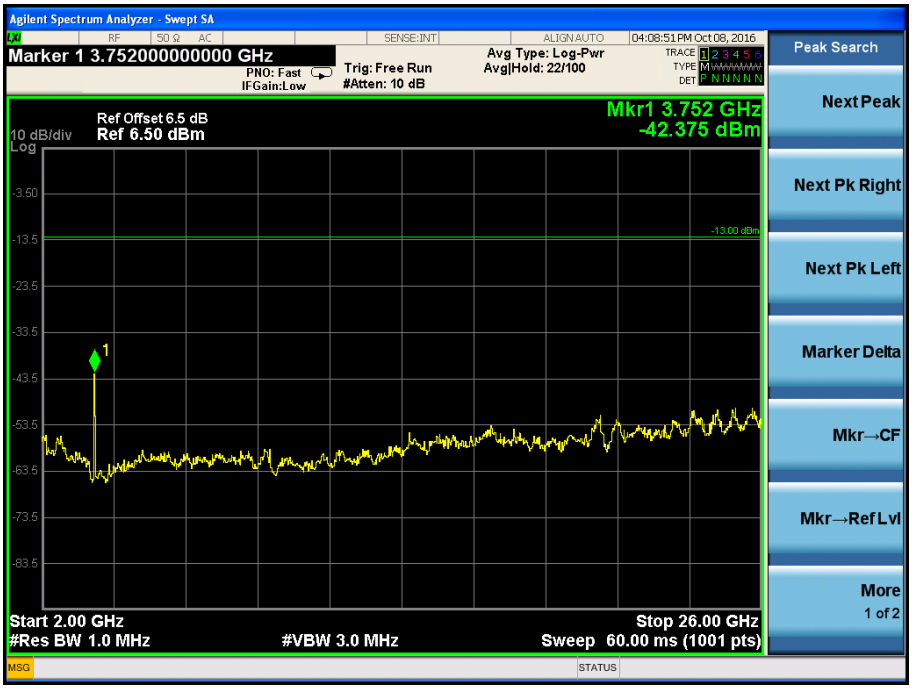




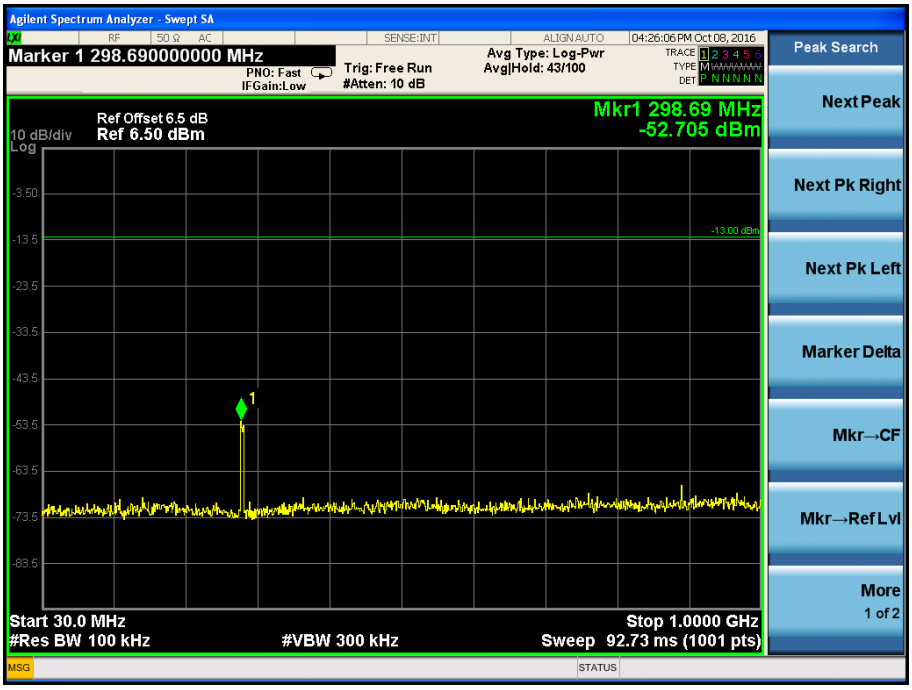
WCDMA Middle Channel

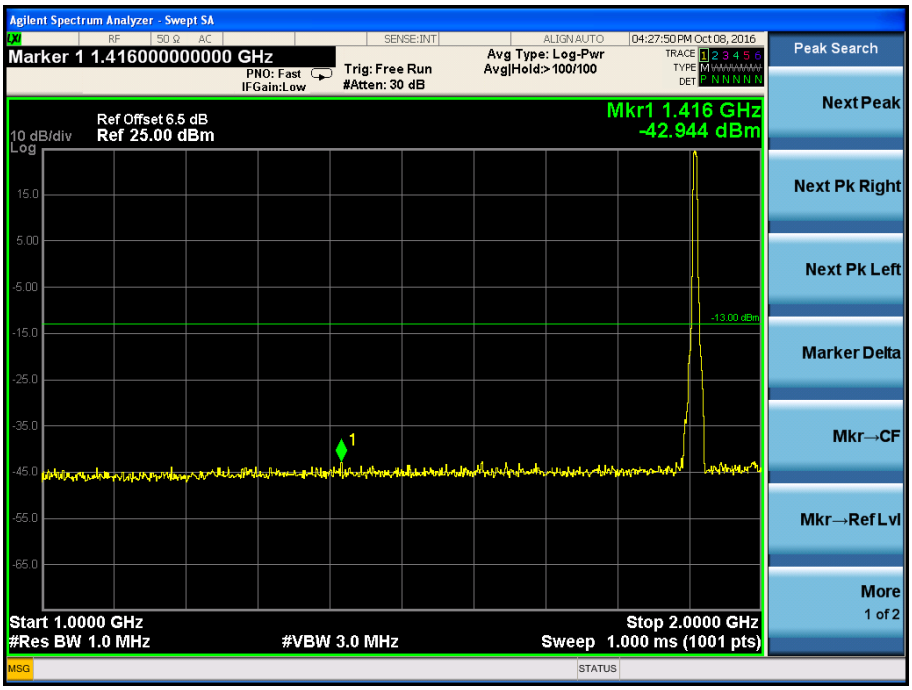


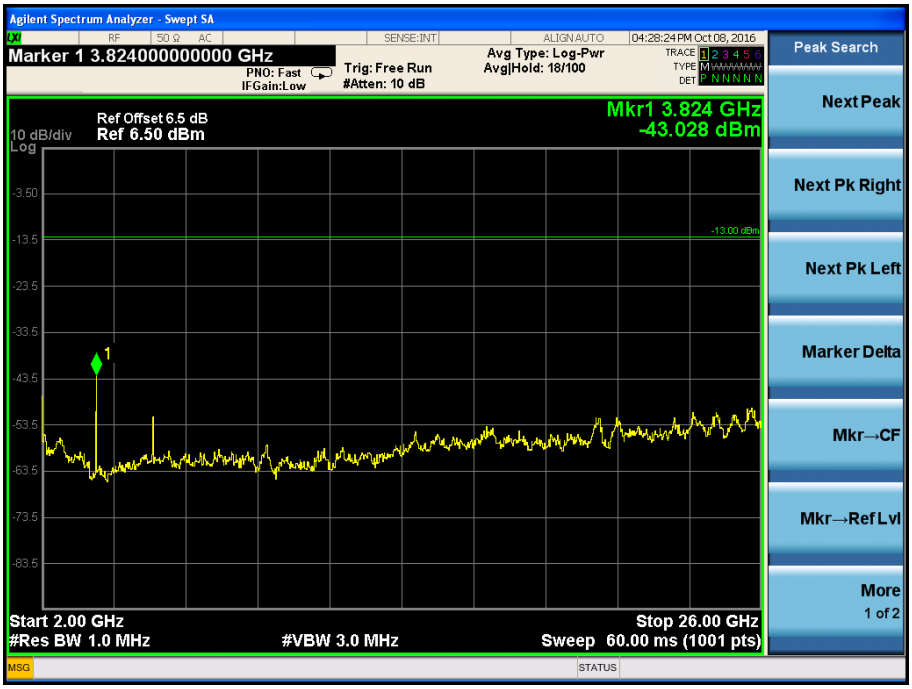

Agilent Spectrum Analyzer - Swept SA
Marker 1 1.960000000000 GHz
PNO: Fast
IFGain:Low
Trig: Free Run
#Atten: 30 dB
Avg Type: Log-Pwr
Avg|Hold:>100/100
04:07:57 PM Oct 08, 2016
Ref Offset 6.5 dB
10 dB/div
Ref 25.00 dBm
Mkr1 1.960 GHz
-40.814 dBm
-13.00 dBm
Start 1.0000 GHz
#Res BW 1.0 MHz
#VBW 3.0 MHz
Stop 2.0000 GHz
Sweep 1.000 ms (1001 pts)
Peak Search
Next Peak
Next Pk Right
Next Pk Left
Marker Delta
Mkr→CF
Mkr→Ref Lvl
More
1 of 2


Agilent Spectrum Analyzer - Swept SA
Marker 1 3.752000000000 GHz
PNO: Fast
IFGain:Low
Trig: Free Run
#Atten: 10 dB
Avg Type: Log-Pwr
Avg|Hold: 22/100
04:08:51 PM Oct 08, 2016
Ref Offset 6.5 dB
10 dB/div
Ref 6.50 dBm
Mkr1 3.752 GHz
-42.375 dBm
-13.00 dBm
Start 2.00 GHz
#Res BW 1.0 MHz
#VBW 3.0 MHz
Stop 26.00 GHz
Sweep 60.00 ms (1001 pts)
Peak Search
Next Peak
Next Pk Right
Next Pk Left
Marker Delta
Mkr→CF
Mkr→Ref Lvl
More
1 of 2

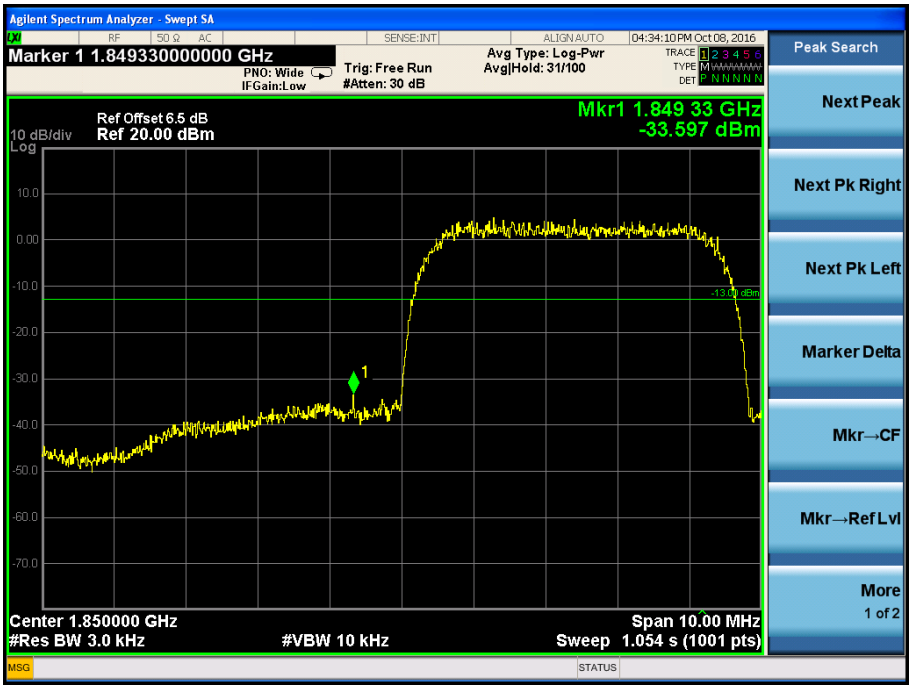
WCDMA High Channel





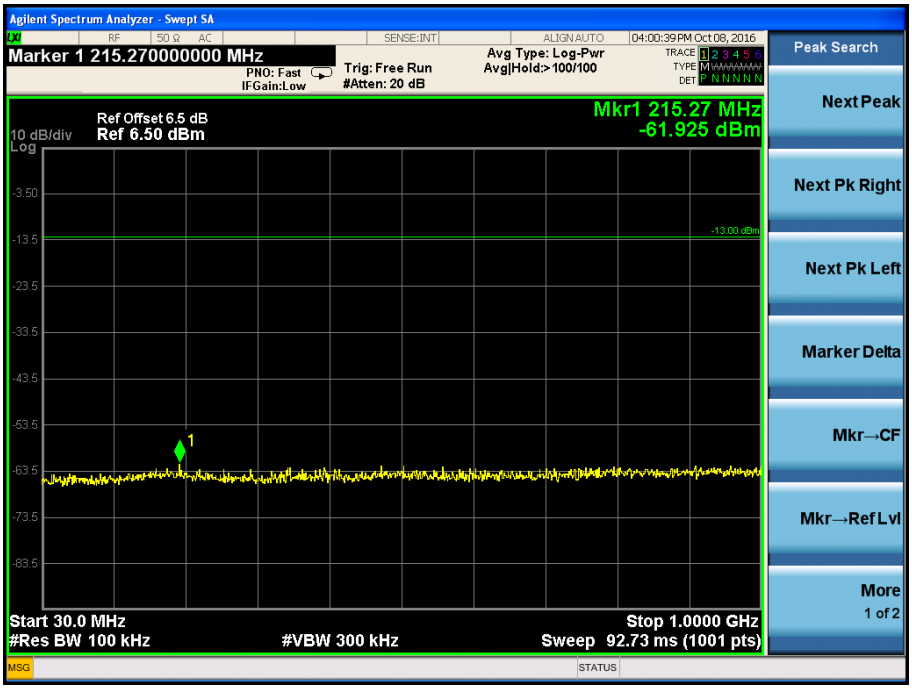


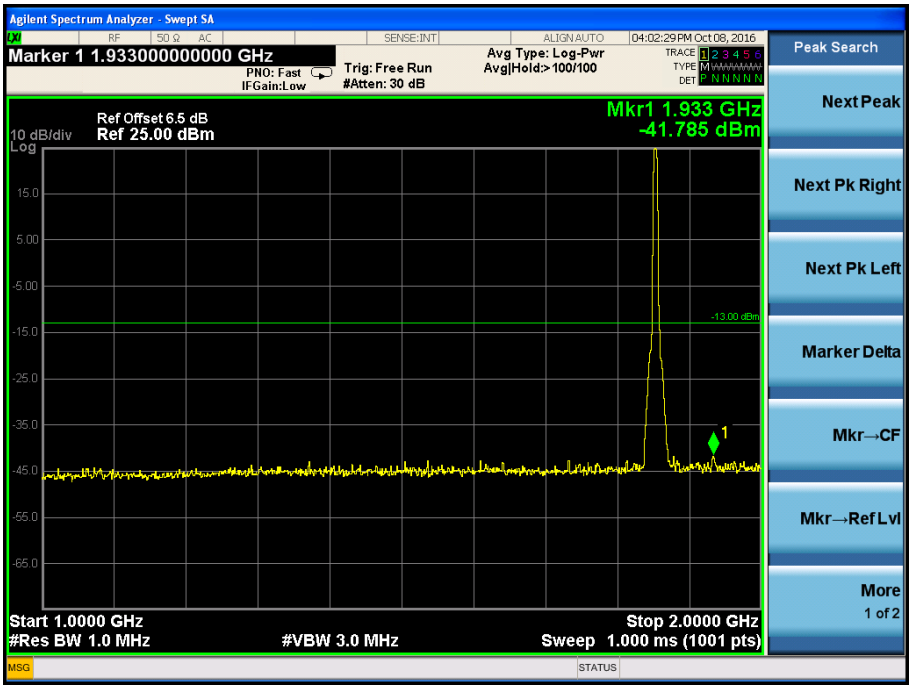
WCDMA Low Band Spurious Emission

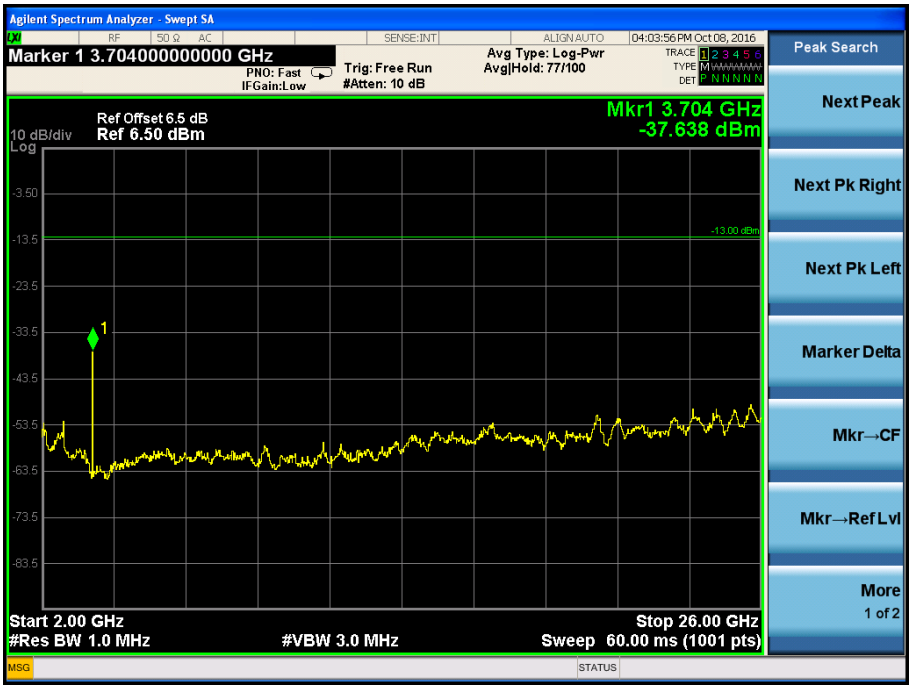


WCDMA High Band Spurious Emission

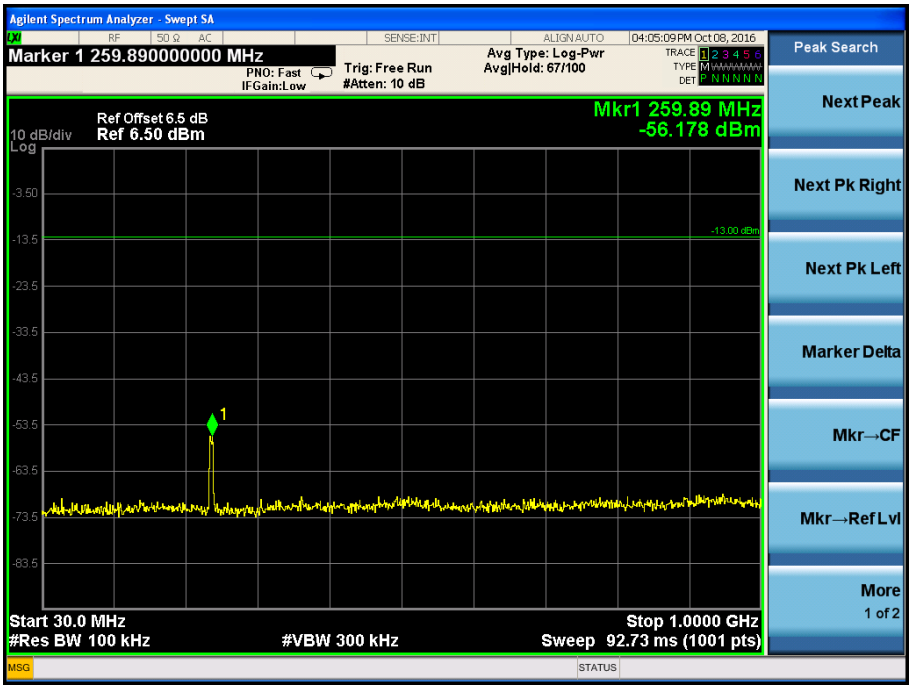
HSDPA Low Channel

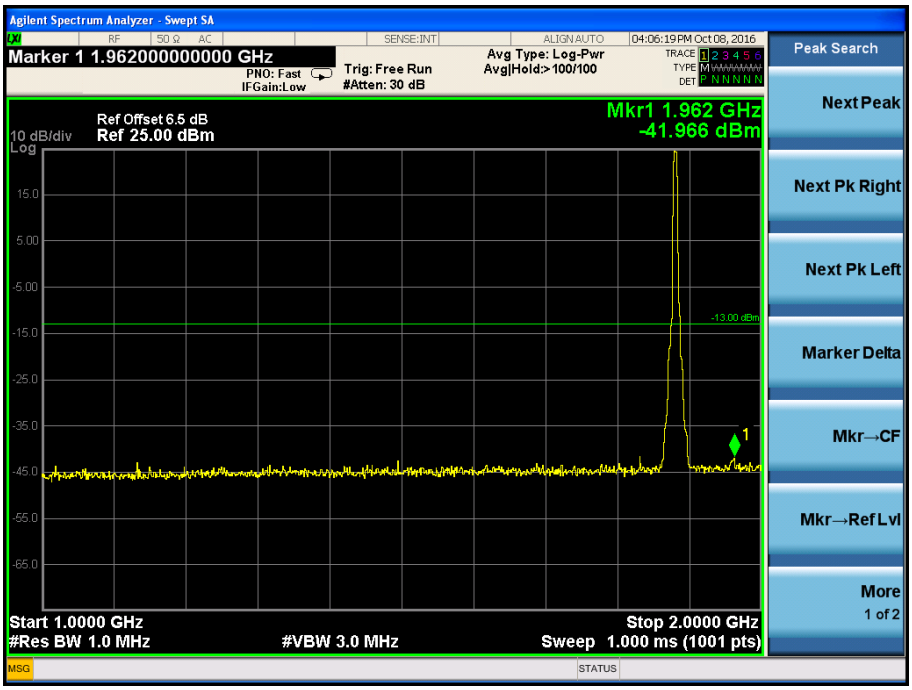


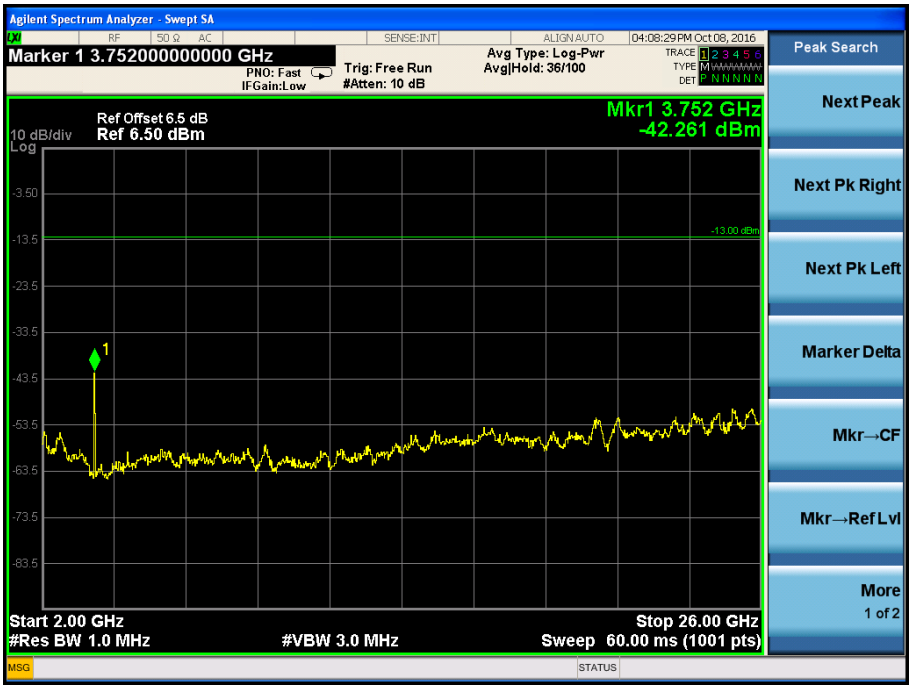

Agilent Spectrum Analyzer - Swept SA
Marker 1 1.933000000000 GHz
PNO: Fast
IFGain:Low
Trig: Free Run
#Atten: 30 dB
Avg Type: Log-Pwr
Avg|Hold:>100/100
04:02:29 PM Oct 08, 2016
Ref Offset 6.5 dB
10 dB/div
Ref 25.00 dBm
Log
Mkr1 1.933 GHz
-41.785 dBm
-13.00 dBm
Start 1.0000 GHz
#Res BW 1.0 MHz
#VBW 3.0 MHz
Stop 2.0000 GHz
Sweep 1.000 ms (1001 pts)
Peak Search
Next Peak
Next Pk Right
Next Pk Left
Marker Delta
Mkr→CF
Mkr→Ref Lvl
More
1 of 2


Agilent Spectrum Analyzer - Swept SA
Marker 1 3.704000000000 GHz
PNO: Fast
IFGain:Low
Trig: Free Run
#Atten: 10 dB
Avg Type: Log-Pwr
Avg|Hold: 77/100
04:03:56 PM Oct 08, 2016
Ref Offset 6.5 dB
10 dB/div
Ref 6.50 dBm
Log
Mkr1 3.704 GHz
-37.638 dBm
-13.00 dBm
Start 2.00 GHz
#Res BW 1.0 MHz
#VBW 3.0 MHz
Stop 26.00 GHz
Sweep 60.00 ms (1001 pts)
Peak Search
Next Peak
Next Pk Right
Next Pk Left
Marker Delta
Mkr→CF
Mkr→Ref Lvl
More
1 of 2

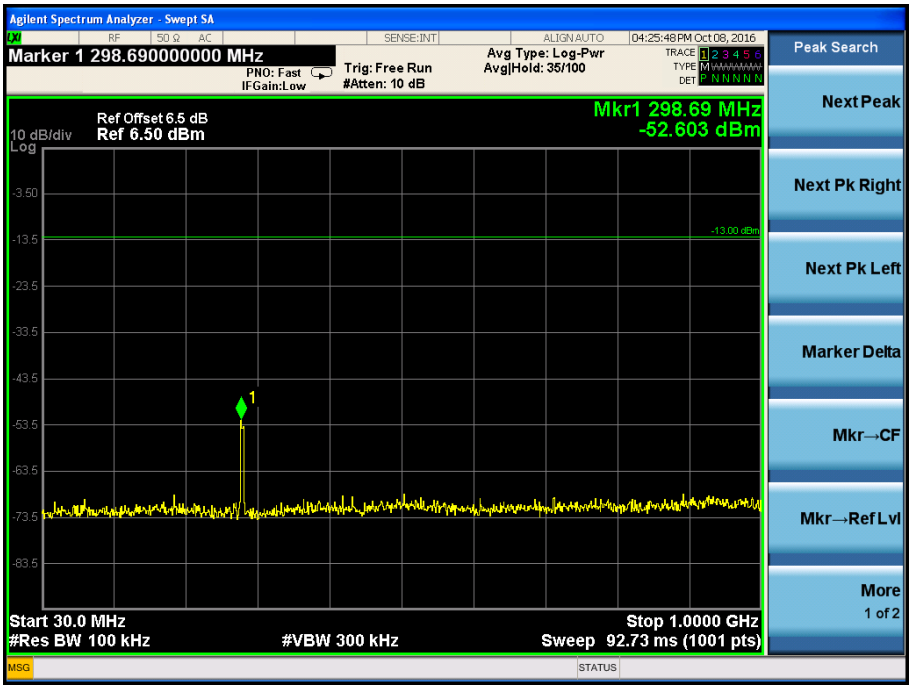
HSDPA Middle Channel

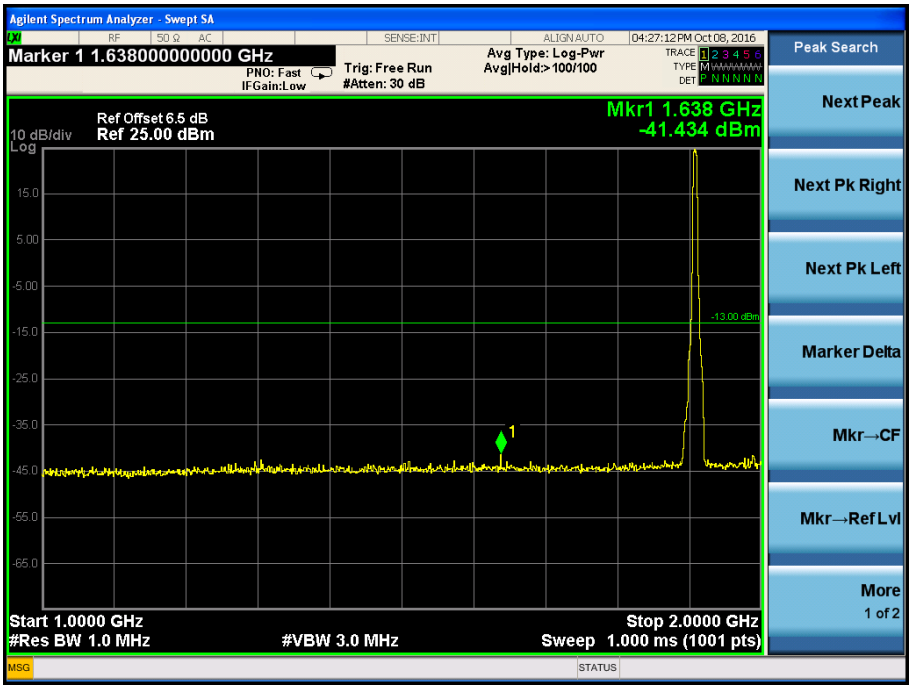


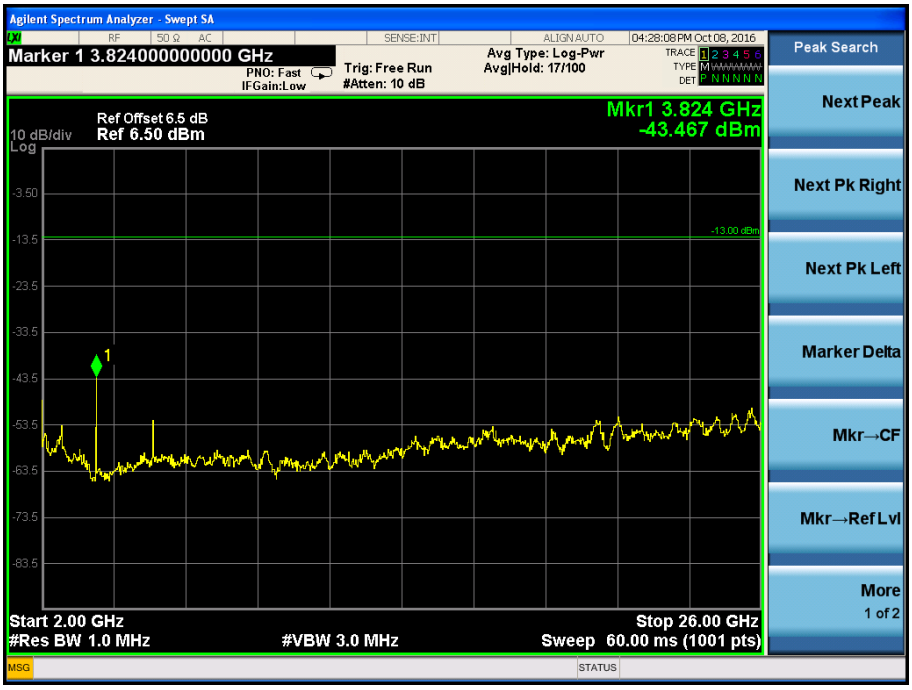




HSDPA High Channel



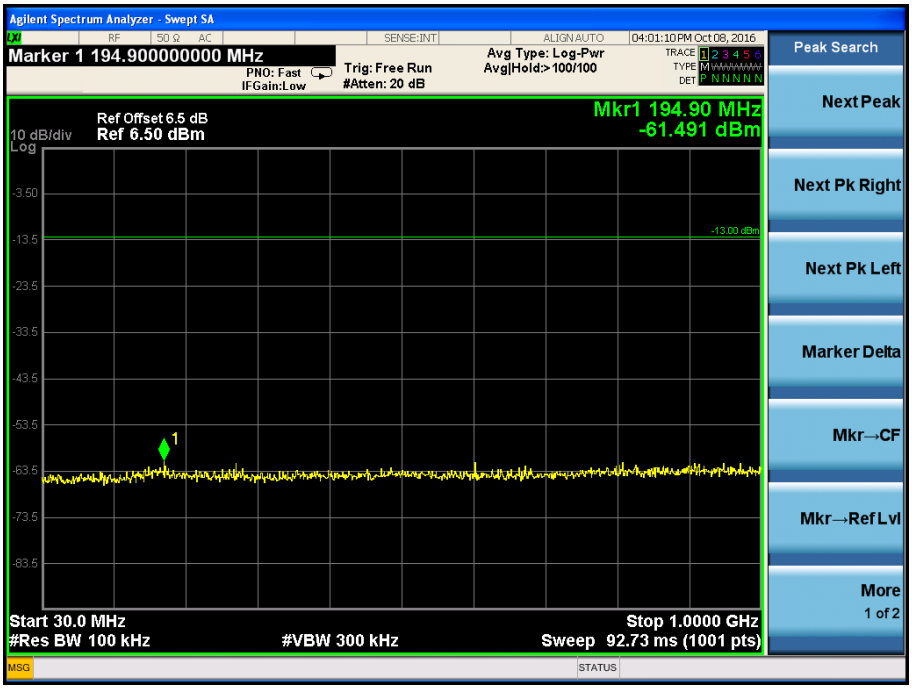

Agilent Spectrum Analyzer - Swept SA
Marker 1 1.638000000000 GHz
PNO: Fast
IFGain:Low
Trig: Free Run
#Atten: 30 dB
Avg Type: Log-Pwr
Avg|Hold:>100/100
04:27:12 PM Oct 08, 2016
Ref Offset 6.5 dB
10 dB/div
Ref 25.00 dBm
Mkr1 1.638 GHz
-41.434 dBm
-13.00 dBm
Start 1.0000 GHz
#Res BW 1.0 MHz
#VBW 3.0 MHz
Stop 2.0000 GHz
Sweep 1.000 ms (1001 pts)
Peak Search
Next Peak
Next Pk Right
Next Pk Left
Marker Delta
Mkr→CF
Mkr→Ref Lvl
More
1 of 2

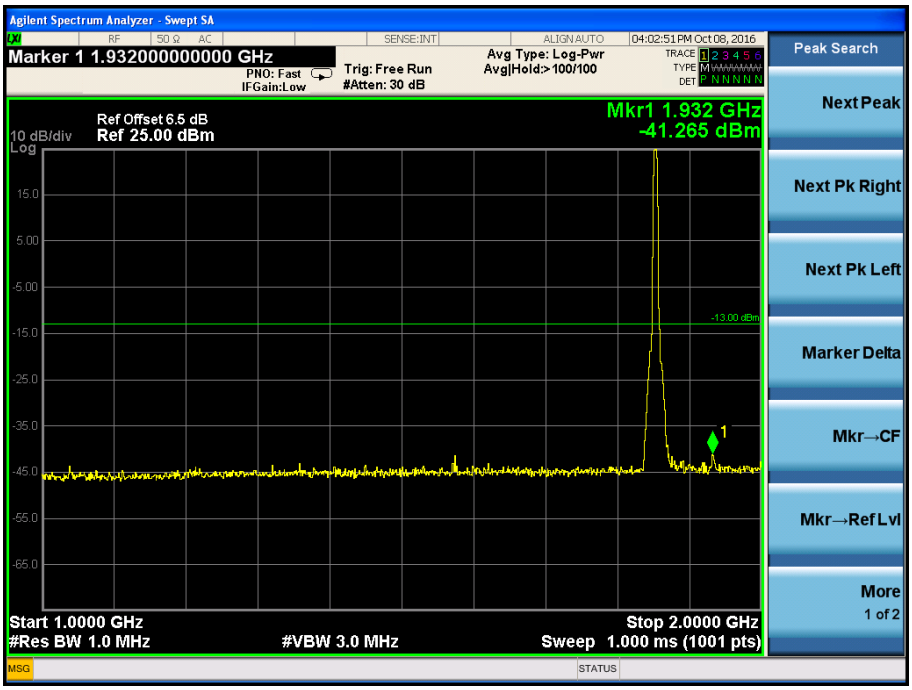

Agilent Spectrum Analyzer - Swept SA
Marker 1 3.824000000000 GHz
PNO: Fast
IFGain:Low
Trig: Free Run
#Atten: 10 dB
Avg Type: Log-Pwr
Avg|Hold: 17/100
04:28:08 PM Oct 08, 2016
Ref Offset 6.5 dB
10 dB/div
Ref 6.50 dBm
Mkr1 3.824 GHz
-43.467 dBm
-13.00 dBm
Start 2.00 GHz
#Res BW 1.0 MHz
#VBW 3.0 MHz
Stop 26.00 GHz
Sweep 60.00 ms (1001 pts)
Peak Search
Next Peak
Next Pk Right
Next Pk Left
Marker Delta
Mkr→CF
Mkr→Ref Lvl
More
1 of 2

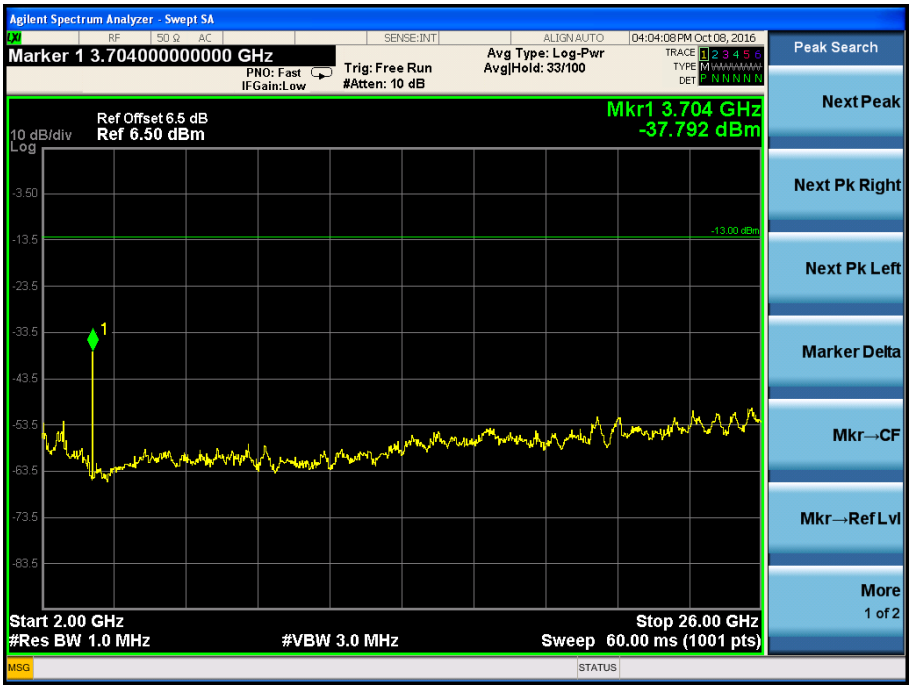
HSDPA Low Band Spurious Emission

HSDPA High Band Spurious Emission

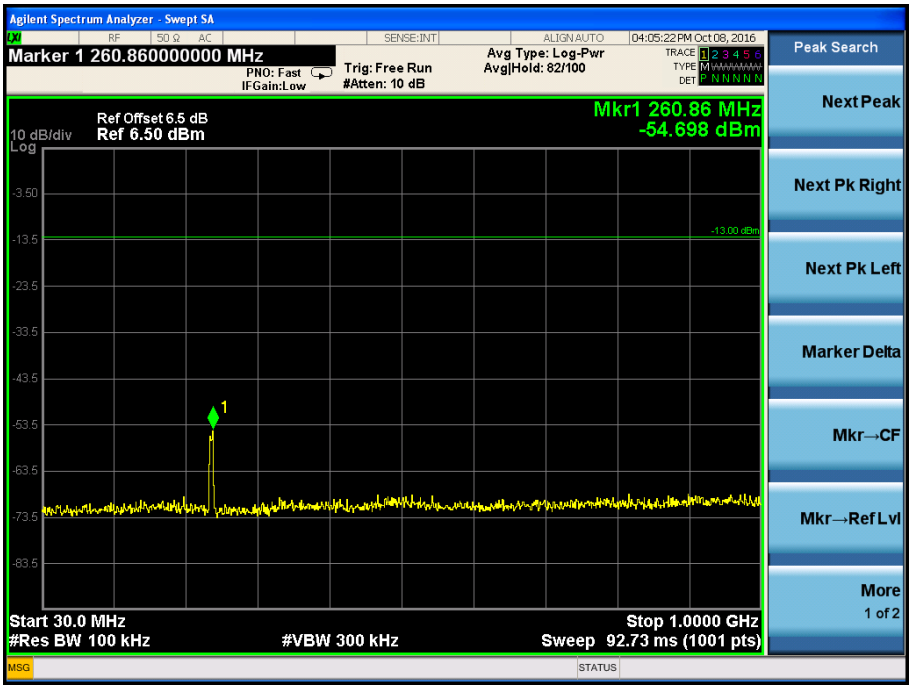
HSUPA Low Channel

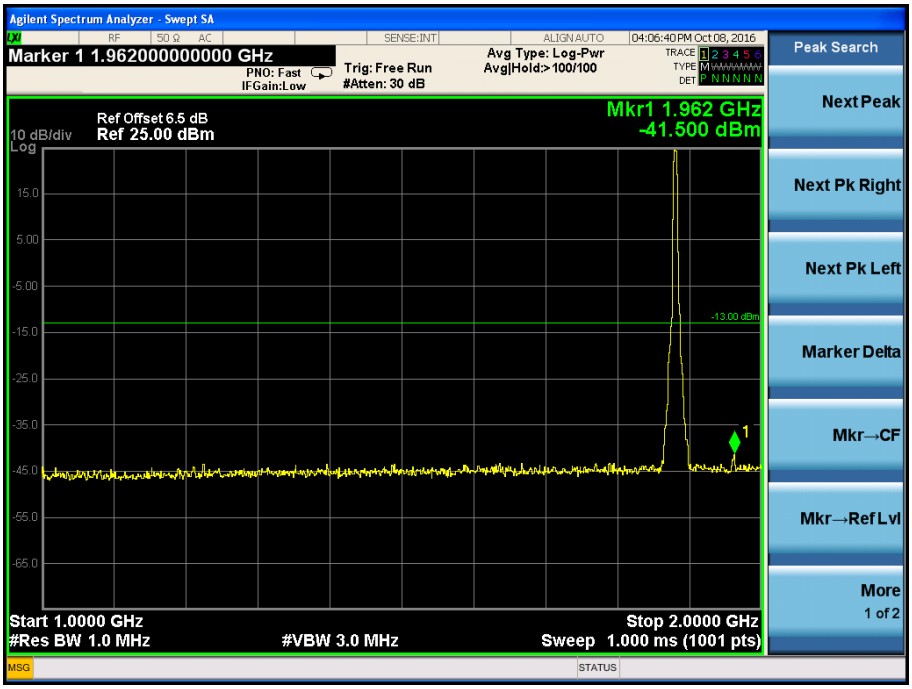


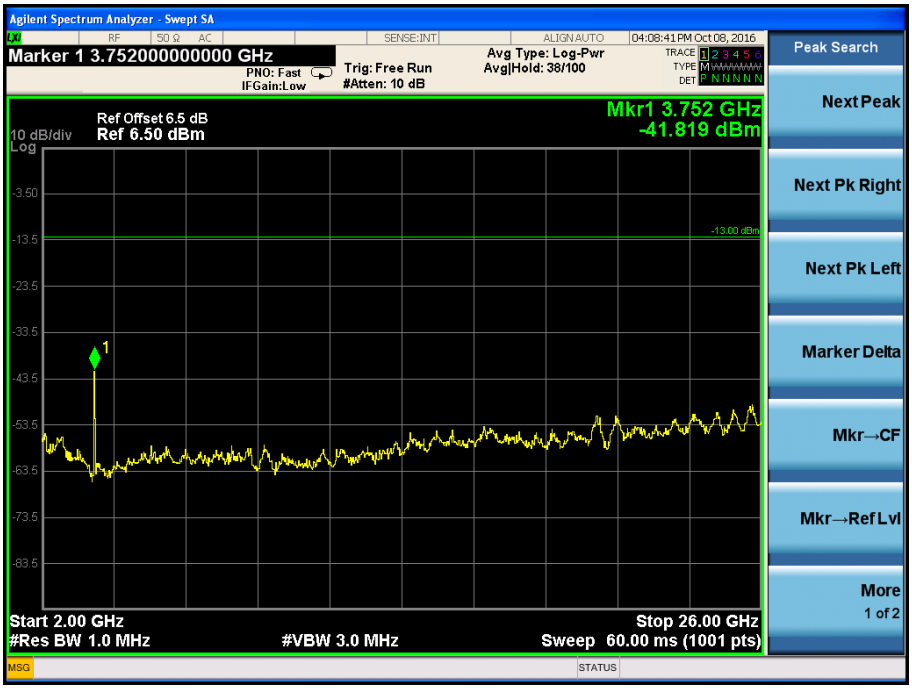




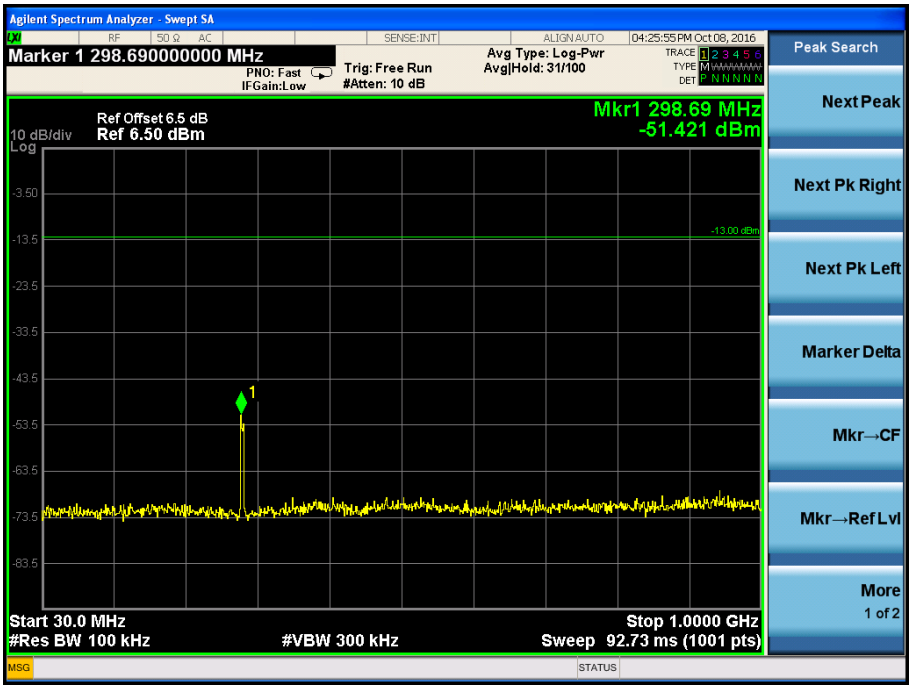
HSUPA Middle Channel

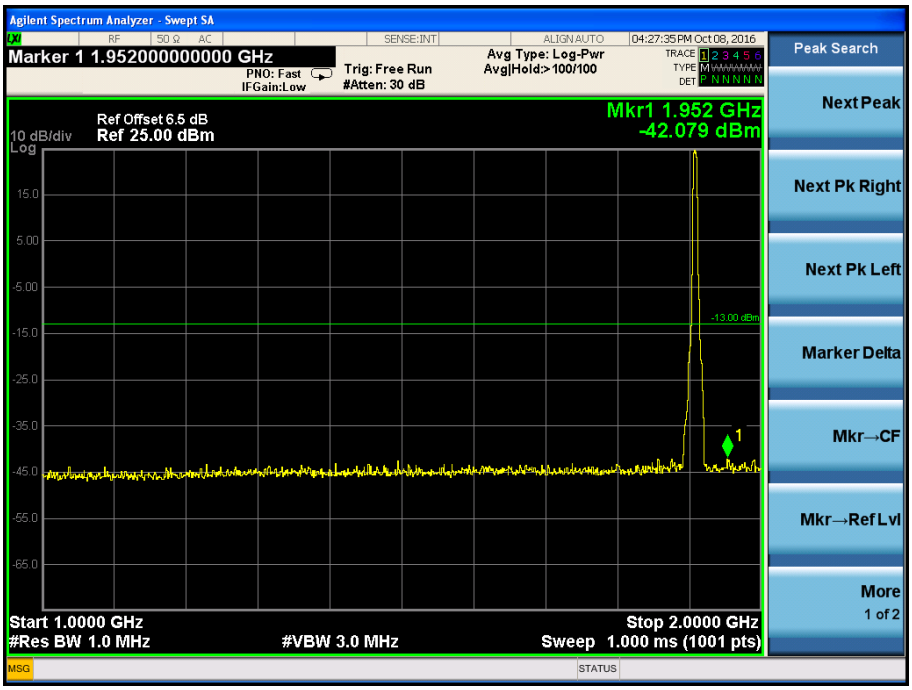



Agilent Spectrum Analyzer - Swept SA
Marker 1 1.962000000000 GHz
PNO: Fast
IFGain:Low
Trig: Free Run
#Atten: 30 dB
Avg Type: Log-Pwr
Avg|Hold:>100/100
04:06:40 PM Oct 08, 2016
Ref Offset 6.5 dB
10 dB/div
Ref 25.00 dBm
Mkr1 1.962 GHz
-41.500 dBm
-13.00 dBm
Start 1.0000 GHz
#Res BW 1.0 MHz
#VBW 3.0 MHz
Stop 2.0000 GHz
Sweep 1.000 ms (1001 pts)
Peak Search
Next Peak
Next Pk Right
Next Pk Left
Marker Delta
Mkr→CF
Mkr→Ref Lvl
More
1 of 2


Agilent Spectrum Analyzer - Swept SA
Marker 1 3.752000000000 GHz
PNO: Fast
IFGain:Low
Trig: Free Run
#Atten: 10 dB
Avg Type: Log-Pwr
Avg|Hold: 38/100
04:08:41 PM Oct 08, 2016
Ref Offset 6.5 dB
10 dB/div
Ref 6.50 dBm
Mkr1 3.752 GHz
-41.819 dBm
-13.00 dBm
Start 2.00 GHz
#Res BW 1.0 MHz
#VBW 3.0 MHz
Stop 26.00 GHz
Sweep 60.00 ms (1001 pts)
Peak Search
Next Peak
Next Pk Right
Next Pk Left
Marker Delta
Mkr→CF
Mkr→Ref Lvl
More
1 of 2

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 log10 (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.

Spurious attenuation limit in dB =43+10 Log_{10} (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:

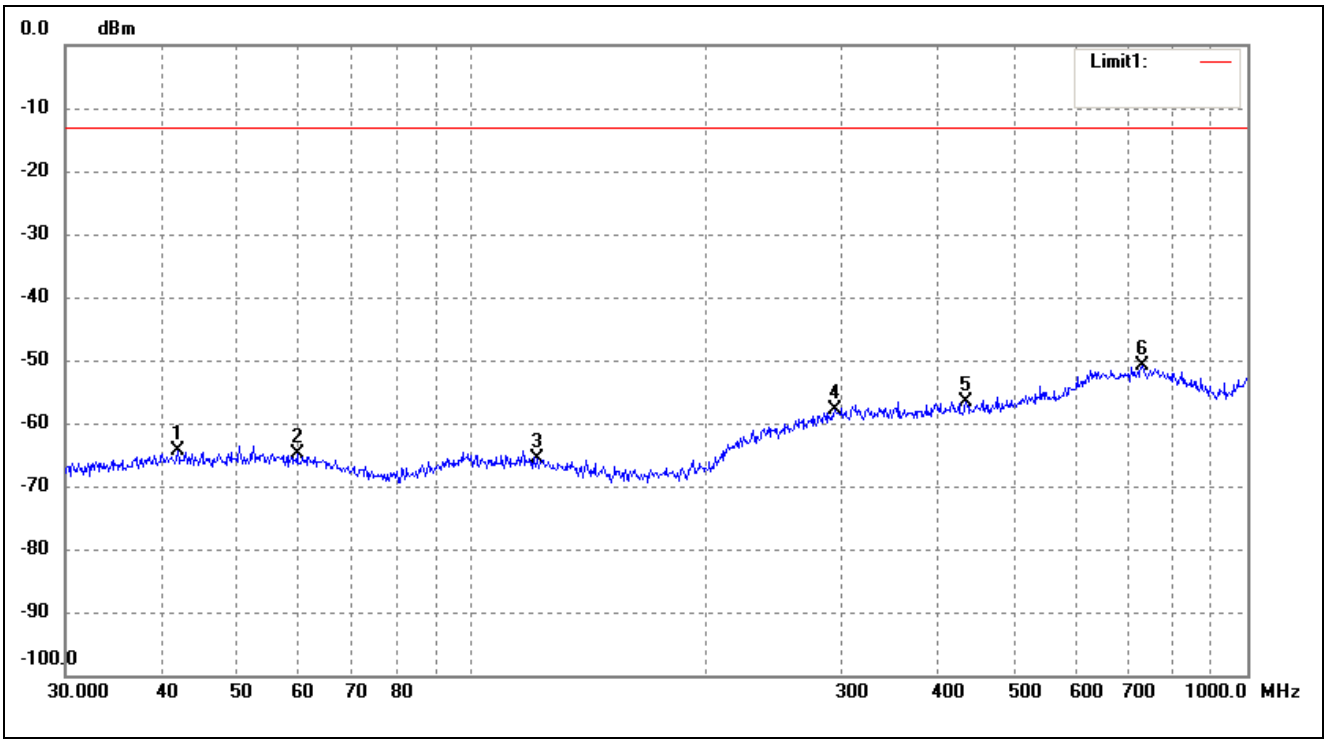
Note: 1.This EUT was tested in 3 orthogonal positions and the worst case position data was reported.

2. All test modes are performed, but only the worst case is recorded in this report.

Spurious Emission From 30MHz to 1GHz

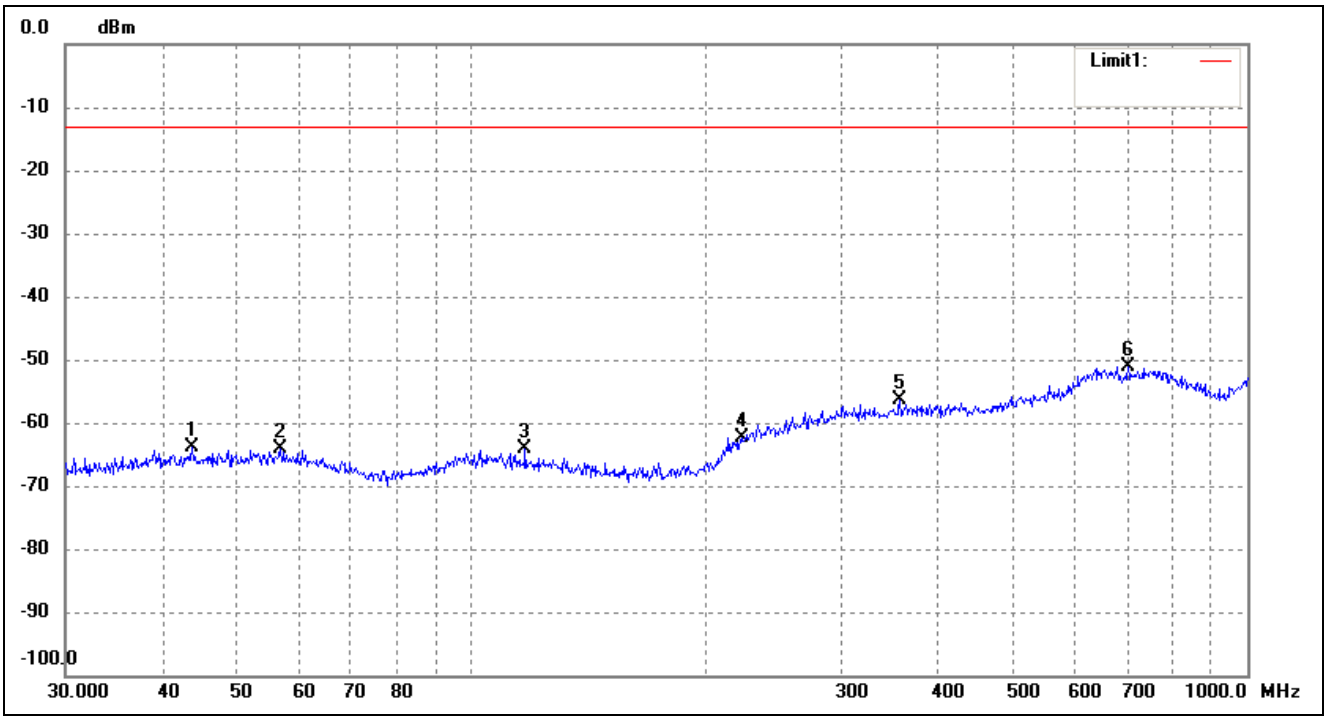
For Cellular Band_ GSM850 Mode (Middle Channel)

Horizontal:



No.	Frequency	Reading	Correct	Result	Limit	Margin	Remark
	(MHz)	(dBm)	Factor(dB)	(dBm)	(dBm)	(dB)	
1	41.8596	-81.04	16.73	-64.31	-13.00	-51.31	ERP
2	59.6493	-81.82	16.83	-64.99	-13.00	-51.99	ERP
3	121.5486	-82.08	16.49	-65.59	-13.00	-52.59	ERP
4	294.1137	-81.30	23.54	-57.76	-13.00	-44.76	ERP
5	434.0651	-80.81	24.11	-56.70	-13.00	-43.70	ERP
6	731.9203	-81.31	30.34	-50.97	-13.00	-37.97	ERP

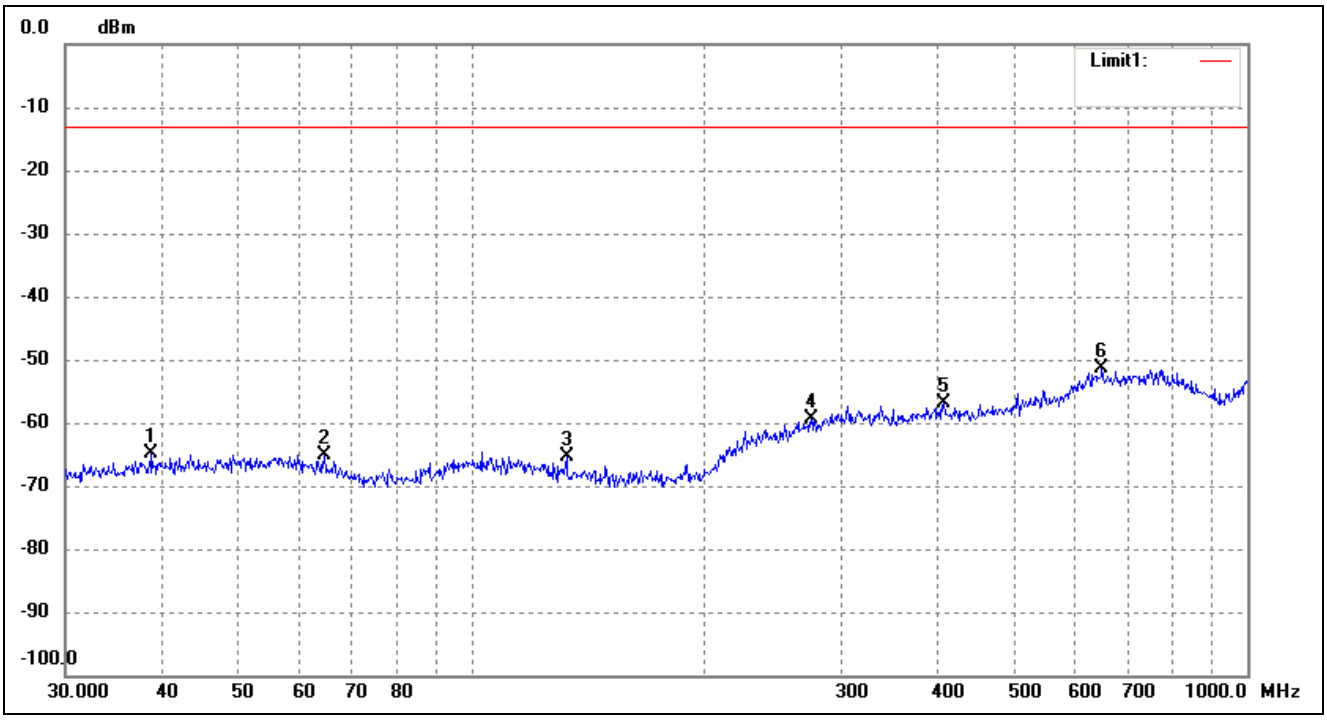
Vertical:



No.	Frequency	Reading	Correct	Result	Limit	Margin	Remark
	(MHz)	(dBm)	Factor(dB)	(dBm)	(dBm)	(dB)	
1	43.6585	-80.70	16.74	-63.96	-13.00	-50.96	ERP
2	56.7917	-80.98	16.80	-64.18	-13.00	-51.18	ERP
3	117.3603	-80.67	16.63	-64.04	-13.00	-51.04	ERP
4	222.9502	-81.90	19.65	-62.25	-13.00	-49.25	ERP
5	356.6758	-79.96	23.62	-56.34	-13.00	-43.34	ERP
6	701.7610	-80.05	29.04	-51.01	-13.00	-38.01	ERP

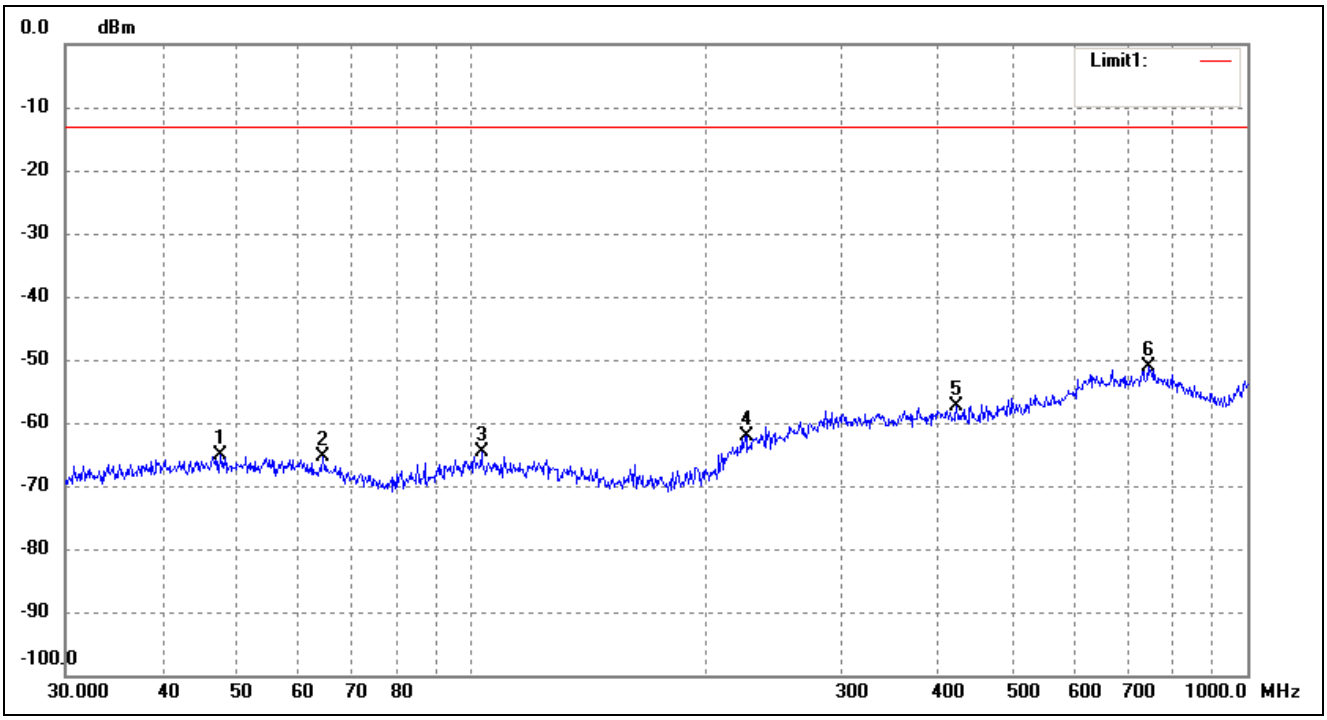
For Cellular Band_ GSM1900 Mode (Low Channel)

Horizontal:



No.	Frequency	Reading	Correct	Result	Limit	Margin	Remark
	(MHz)	(dBm)	Factor(dB)	(dBm)	(dBm)	(dB)	
1	38.7518	-81.41	16.54	-64.87	-13.00	-51.87	ERP
2	64.6594	-80.88	15.86	-65.02	-13.00	-52.02	ERP
3	132.6850	-80.88	15.56	-65.32	-13.00	-52.32	ERP
4	274.1939	-81.77	22.52	-59.25	-13.00	-46.25	ERP
5	406.0880	-81.18	24.25	-56.93	-13.00	-43.93	ERP
6	649.6597	-81.09	29.64	-51.45	-13.00	-38.45	ERP

Vertical:

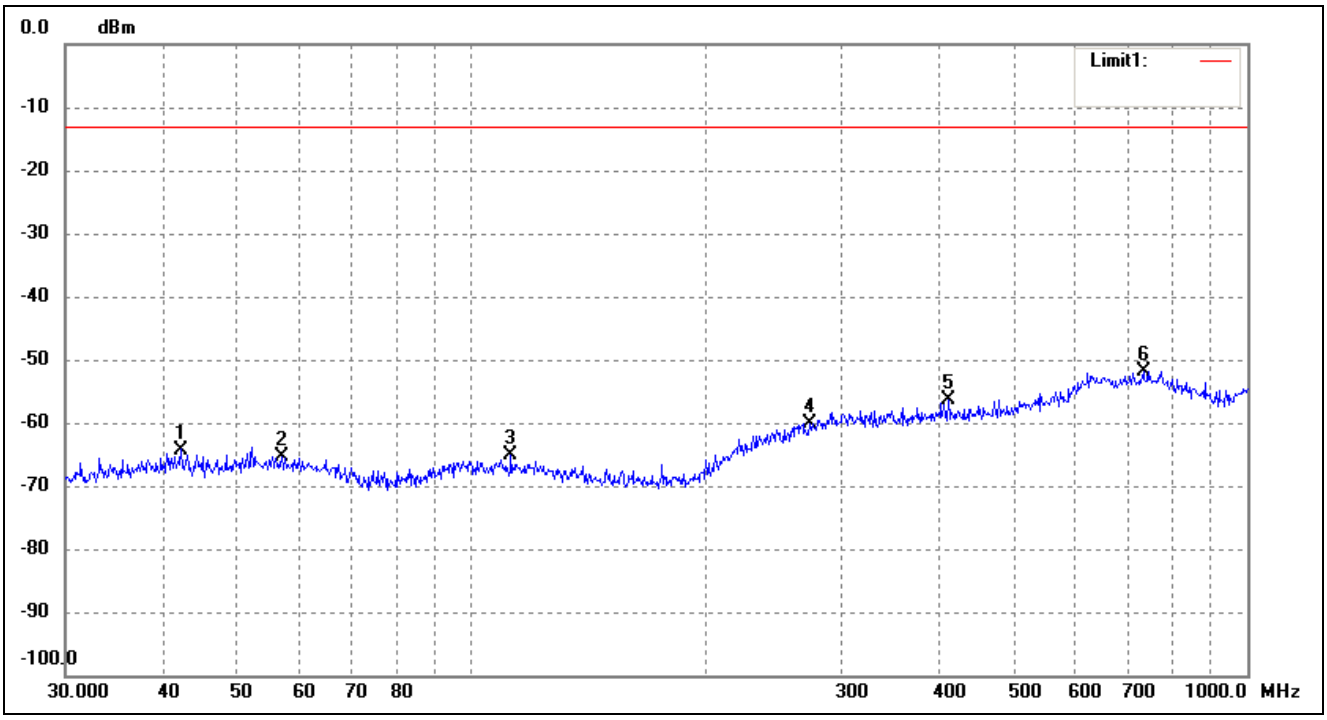


No.	Frequency	Reading	Correct	Result	Limit	Margin	Remark
	(MHz)	(dBm)	Factor(dB)	(dBm)	(dBm)	(dB)	
1	47.4918	-81.81	16.76	-65.05	-13.00	-52.05	ERP
2	64.4331	-81.40	15.91	-65.49	-13.00	-52.49	ERP
3	103.0800	-81.20	16.70	-64.50	-13.00	-51.50	ERP
4	226.0994	-81.90	19.85	-62.05	-13.00	-49.05	ERP
5	422.0577	-81.22	23.75	-57.47	-13.00	-44.47	ERP
6	744.8661	-81.75	30.61	-51.14	-13.00	-38.14	ERP

Note: Margin= (Reading+ Correct)- Limit

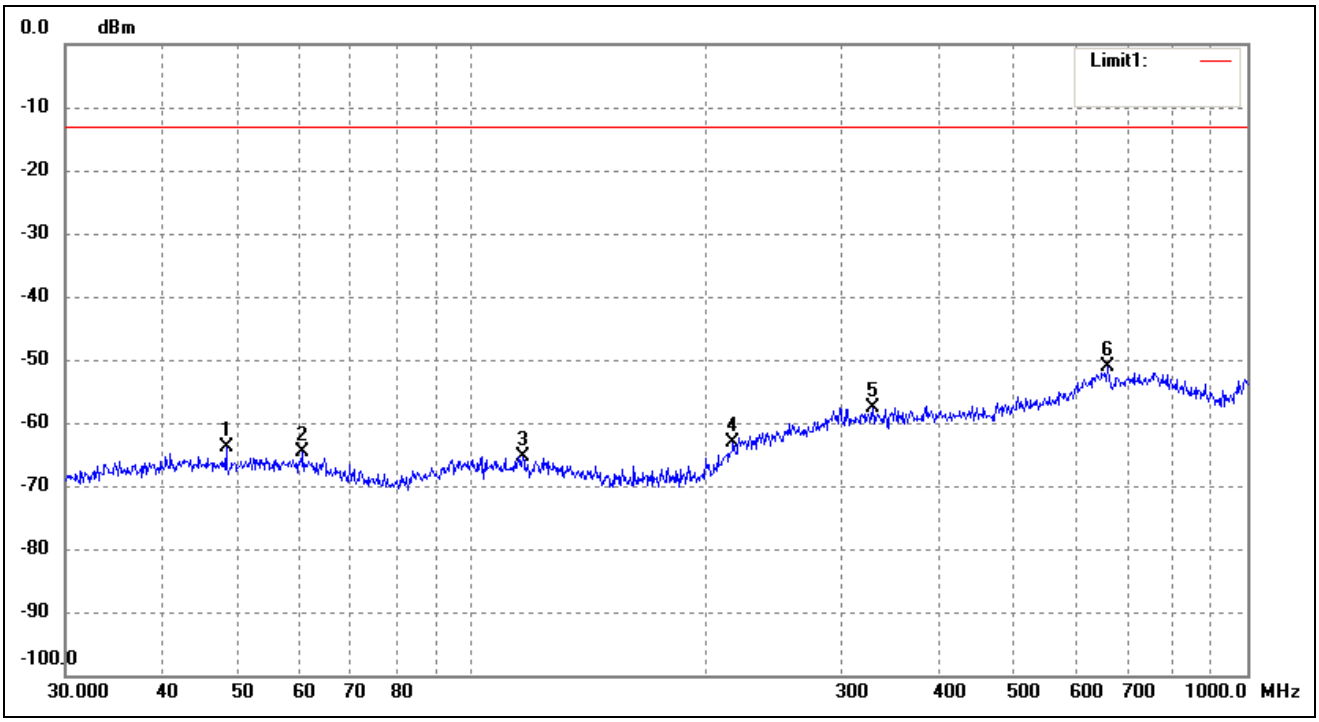
For band 5 Mode (RMC-Middle Channel)

Horizontal:



No.	Frequency	Reading	Correct	Result	Limit	Margin	Remark
	(MHz)	(dBm)	Factor(dB)	(dBm)	(dBm)	(dB)	
1	42.3022	-80.99	16.74	-64.25	-13.00	-51.25	ERP
2	56.9912	-82.11	16.80	-65.31	-13.00	-52.31	ERP
3	112.5244	-81.78	16.65	-65.13	-13.00	-52.13	ERP
4	273.2341	-82.51	22.44	-60.07	-13.00	-47.07	ERP
5	411.8240	-80.40	24.02	-56.38	-13.00	-43.38	ERP
6	734.4913	-82.34	30.49	-51.85	-13.00	-38.85	ERP

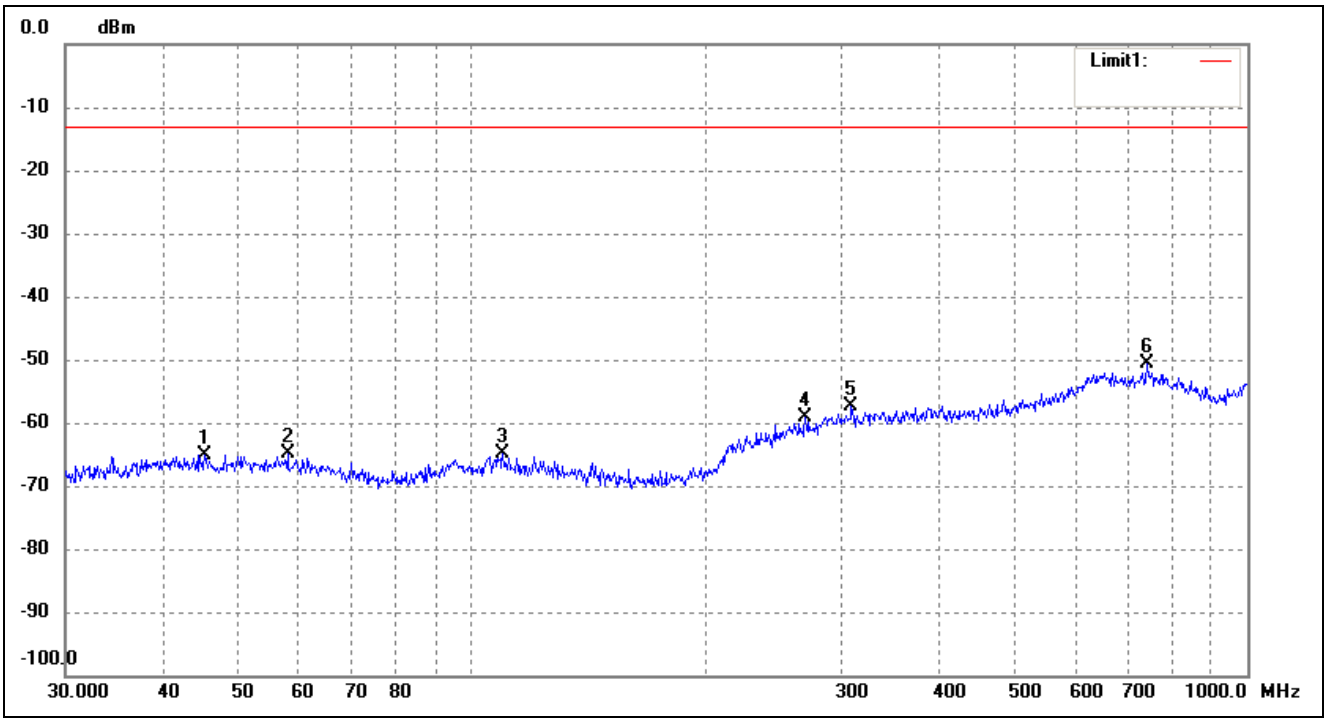
Vertical:



No.	Frequency	Reading	Correct	Result	Limit	Margin	Remark
	(MHz)	(dBm)	dB	(dBm)	(dBm)	(dB)	
1	48.3318	-80.69	16.76	-63.93	-13.00	-50.93	ERP
2	60.7044	-81.28	16.70	-64.58	-13.00	-51.58	ERP
3	116.5401	-81.89	16.63	-65.26	-13.00	-52.26	ERP
4	217.5443	-82.04	18.95	-63.09	-13.00	-50.09	ERP
5	329.0390	-81.03	23.47	-57.56	-13.00	-44.56	ERP
6	661.1505	-80.55	29.44	-51.11	-13.00	-38.11	ERP

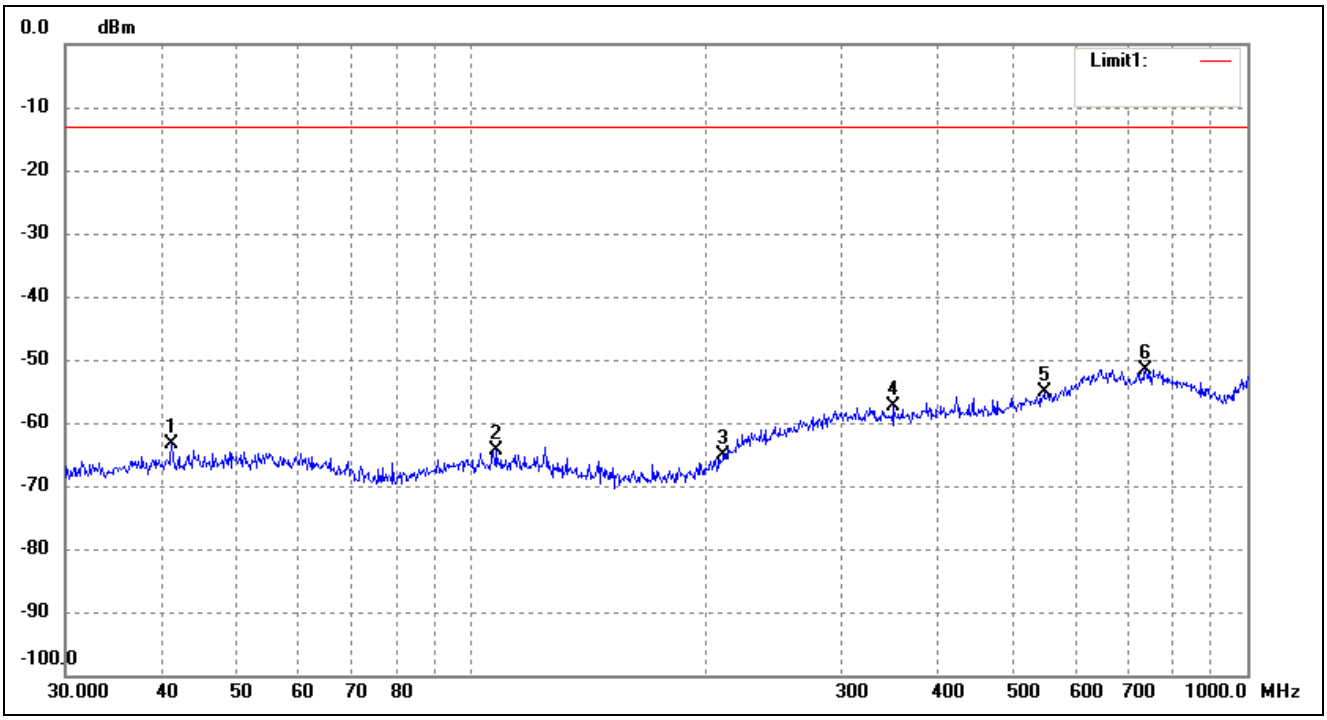
For band 2 Mode (RMC-Middle Channel)

Horizontal:



No.	Frequency	Reading	Correct	Result	Limit	Margin	Remark
	(MHz)	(dBm)	dB	(dBm)	(dBm)	(dB)	
1	45.3755	-81.77	16.75	-65.02	-13.00	-52.02	ERP
2	57.9993	-81.63	16.78	-64.85	-13.00	-51.85	ERP
3	109.7960	-81.51	16.66	-64.85	-13.00	-51.85	ERP
4	269.4284	-81.23	22.17	-59.06	-13.00	-46.06	ERP
5	308.9126	-81.19	23.74	-57.45	-13.00	-44.45	ERP
6	742.2587	-81.42	30.73	-50.69	-13.00	-37.69	ERP

Vertical:



No.	Frequency	Reading	Correct	Result	Limit	Margin	Remark
	(MHz)	(dBm)	Factor(dB)	(dBm)	(dBm)	(dB)	
1	41.1320	-80.21	16.73	-63.48	-13.00	-50.48	ERP
2	107.8877	-81.00	16.68	-64.32	-13.00	-51.32	ERP
3	211.5265	-82.65	17.65	-65.00	-13.00	-52.00	ERP
4	350.4768	-80.76	23.45	-57.31	-13.00	-44.31	ERP
5	547.0977	-80.83	25.68	-55.15	-13.00	-42.15	ERP
6	739.6605	-82.39	30.80	-51.59	-13.00	-38.59	ERP

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	-39.39	4.94	-34.45	-13	-21.45	H
2472.6	-44.12	8.46	-35.66	-13	-22.66	H
1648.4	-36.22	4.94	-31.28	-13	-18.28	V
2472.6	-41.62	8.46	-33.16	-13	-20.16	V
Middle Channel (836.6MHz)						
1673.2	-36.38	5.11	-31.27	-13	-18.27	H
2509.8	-41.17	8.54	-32.63	-13	-19.63	H
1673.2	-36.36	5.11	-31.25	-13	-18.25	V
2509.8	-41.62	8.54	-33.08	-13	-20.08	V
High Channel (848.8MHz)						
1697.6	-38.84	5.29	-33.55	-13	-20.55	H
2546.4	-44.62	8.59	-36.03	-13	-23.03	H
1697.6	-38.47	5.29	-33.18	-13	-20.18	V
2546.4	-42.11	8.59	-33.52	-13	-20.52	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	-39.92	10.54	-29.38	-13	-16.38	H
5550.6	-42.69	13.37	-29.32	-13	-16.32	H
3700.4	-37.81	10.54	-27.27	-13	-14.27	V
5550.6	-42.77	13.37	-29.4	-13	-16.4	V
Middle Channel (1880MHz)						
3760.0	-36.15	10.64	-25.51	-13	-12.51	H
5640.0	-42.93	13.54	-29.39	-13	-16.39	H
3760.0	-36.84	10.64	-26.2	-13	-13.2	V
5640.0	-44.33	13.54	-30.79	-13	-17.79	V
High Channel (1909.8MHz)						
3819.6	-39.28	10.74	-28.54	-13	-15.54	H
5729.4	-44.29	13.71	-30.58	-13	-17.58	H
3819.6	-38.69	10.74	-27.95	-13	-14.95	V
5729.4	-44.67	13.71	-30.96	-13	-17.96	V

For WCDMA Band 5 Mode

Frequency (MHz)	Reading (dBm)	Correct dB	Result (dBm)	Limit (dBm)	Margin (dB)	Polar H/V
Low Channel (826.4MHz)						
1652.8	-38.92	4.94	-33.98	-13	-20.98	H
2479.2	-41.17	8.46	-32.71	-13	-19.71	H
1652.8	-38.48	4.94	-33.54	-13	-20.54	V
2479.2	-43.45	8.46	-34.99	-13	-21.99	V
Middle Channel (836.6MHz)						
1672.8	-38.32	5.11	-33.21	-13	-20.21	H
2509.2	-44.07	8.54	-35.53	-13	-22.53	H
1672.8	-36.06	5.11	-30.95	-13	-17.95	V
2509.2	-42.37	8.54	-33.83	-13	-20.83	V
High Channel (846.6MHz)						
1693.2	-37.97	5.29	-32.68	-13	-19.68	H
2539.8	-44.6	8.59	-36.01	-13	-23.01	H
1693.2	-38.58	5.29	-33.29	-13	-20.29	V
2539.8	-41.84	8.59	-33.25	-13	-20.25	V

For WCDMA Band 2 Mode

Frequency (MHz)	Reading (dBm)	Correct dB	Result (dBm)	Limit (dBm)	Margin (dB)	Polar H/V
Low Channel (1852.4MHz)						
3704.8	-36.87	10.17	-26.7	-13	-13.7	H
5557.2	-42.67	14.69	-27.98	-13	-14.98	H
3704.8	-38.37	10.17	-28.2	-13	-15.2	V
5557.2	-43.06	14.69	-28.37	-13	-15.37	V
Middle Channel (1880MHz)						
3760.8	-36.05	10.26	-25.79	-13	-12.79	H
5640.0	-42.48	14.78	-27.7	-13	-14.7	H
3760.8	-39.43	10.26	-29.17	-13	-16.17	V
5640.0	-41.97	14.78	-27.19	-13	-14.19	V
High Channel (1907.6MHz)						
3815.2	-36.18	10.59	-25.59	-13	-12.59	H
5722.8	-43.93	15.03	-28.9	-13	-15.9	H
3815.2	-36.8	10.59	-26.21	-13	-13.21	V
5722.8	-43.82	15.03	-28.79	-13	-15.79	H

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

Testing is carried out with frequency rang 9kHz to 20GHz, which above 3th Harmonics are attenuated more than 20dB below the permissible limits or the field strength is too small to be measured, so the data is not display.

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 GSM 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	3.7	53	0.0634
40	3.7	47	0.0562
30	3.7	42	0.0502
20	3.7	36	0.0430
10	3.7	31	0.0371
0	3.7	27	0.0323
-10	3.7	34	0.0406
-20	3.7	41	0.0490
-30	3.7	45	0.0538

For PCS Band GSM 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	3.7	56	0.0298
40	3.7	47	0.0250
30	3.7	42	0.0223
20	3.7	38	0.0202
10	3.7	32	0.0170
0	3.7	26	0.0138
-10	3.7	33	0.0176
-20	3.7	37	0.0197
-30	3.7	43	0.0229

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	3.7	66	0.0789
40	3.7	55	0.0657
30	3.7	45	0.0538
20	3.7	39	0.0466
10	3.7	32	0.0383
0	3.7	25	0.0299
-10	3.7	32	0.0383
-20	3.7	37	0.0442
-30	3.7	44	0.0526

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	3.7	52	0.0277
40	3.7	46	0.0245
30	3.7	38	0.0202
20	3.7	34	0.0181
10	3.7	29	0.0154
0	3.7	22	0.0117
-10	3.7	25	0.0133
-20	3.7	31	0.0165
-30	3.7	38	0.0202

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	3.7	52	0.0622
40	3.7	45	0.0538
30	3.7	38	0.0454
20	3.7	34	0.0406
10	3.7	29	0.0347
0	3.7	22	0.0263
-10	3.7	28	0.0335
-20	3.7	36	0.0430
-30	3.7	43	0.0514

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	3.7	65	0.0346
40	3.7	57	0.0303
30	3.7	49	0.0261
20	3.7	42	0.0223
10	3.7	35	0.0186
0	3.7	30	0.0160
-10	3.7	35	0.0186
-20	3.7	40	0.0213
-30	3.7	45	0.0239

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	3.7	52	0.0622
40	3.7	40	0.0478
30	3.7	35	0.0418
20	3.7	31	0.0371
10	3.7	23	0.0275
0	3.7	18	0.0215
-10	3.7	22	0.0263
-20	3.7	29	0.0347
-30	3.7	35	0.0418

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	3.7	64	0.0340
40	3.7	53	0.0282
30	3.7	44	0.0234
20	3.7	38	0.0202
10	3.7	31	0.0165
0	3.7	27	0.0144
-10	3.7	32	0.0170
-20	3.7	37	0.0197
-30	3.7	42	0.0223

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	3.7	69	0.0825
40	3.7	55	0.0657
30	3.7	51	0.0610
20	3.7	46	0.0550
10	3.7	42	0.0502
0	3.7	35	0.0418
-10	3.7	42	0.0502
-20	3.7	49	0.0586
-30	3.7	57	0.0681

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	3.7	52	0.0277
40	3.7	41	0.0218
30	3.7	29	0.0154
20	3.7	24	0.0128
10	3.7	20	0.0106
0	3.7	16	0.0085
-10	3.7	22	0.0117
-20	3.7	30	0.0160
-30	3.7	37	0.0197

So, Frequency Stability Versus Input Voltage is:

Reference Frequency(Middle Channel): GSM 836.6MHz, Limit: 2.5ppm			
Environment Temperature (°C)	Power Supplied (VDC)	Frequency Measure with Time Elapsed	
		Frequency (Hz)	Error (ppm)
20	3.3	45	0.0538
	3.7	36	0.0430
	4.3	39	0.0466
Reference Frequency(Middle Channel): GSM 1880 MHz, Limit: 2.5ppm			
Environment Temperature (°C)	Power Supplied (VDC)	Frequency Measure with Time Elapsed	
		Frequency (Hz)	Error (ppm)
20	3.3	32	0.0170
	3.7	38	0.0202
	4.3	37	0.0197
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	3.3	43	0.0514
	3.7	39	0.0466
	4.3	48	0.0574
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	3.3	40	0.0213
	3.7	34	0.0181
	4.3	50	0.0266

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	3.3	22	0.0263
	3.7	34	0.0406
	4.3	22	0.0263
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	3.3	25	0.0133
	3.7	42	0.0223
	4.3	33	0.0176
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	3.3	24	0.0287
	3.7	31	0.0371
	4.3	20	0.0239

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	3.3	41	0.0218
	3.7	38	0.0202
	4.3	35	0.0186
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	3.3	28	0.0335
	3.7	46	0.0550
	4.3	19	0.0227
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	3.3	28	0.0149
	3.7	24	0.0128
	4.3	25	0.0133

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