



FCC RF Test Report

Product Name: Mobile WiFi

Product Model: HW-02E

Report Number: SYBH(Z-RF)001122012-2001

FCC ID: QISHW-02E

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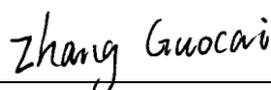


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Date of Receipt Sample: 2012-12-04
Start Date of Test: 2012-12-05
End Date of Test: 2012-12-14

Test Result: Pass

Approved by Senior Engineer:	2012-12-21	Dai Linjun	
	Date	Name	Signature

Prepared by:	2012-12-21	Zhang Guocai	
	Date	Name	Signature



Modification Record

No.	Last Report No.	Modification Description
1		First report.



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2 Test Summary

2.1 Cellular Band (824-849 MHz paired with 869-894 MHz)

Test Item	FCC Rule No.	IC Rule No.	Requirements	Test Result	Verdict (NOTE 2)
RF Power Output	§2.1046, §22.913	RSS-Gen, §4.8; RSS-132, §4.4	FCC: ERP ≤ 7 W. IC: EIRP ≤ 11.5 W.	Appendix A	Pass
Bandwidth	§2.1049, §2.917	RSS-Gen, §4.6	OBW: No limit. EBW: No limit.	Appendix B	Pass
Band Edges Compliance	§2.1051, §2.917	RSS-Gen, §4.9; RSS-132, §4.5	≤ -13 dBm/1%*EBW, in 1 MHz bands immediately outside and adjacent to the frequency block.	Appendix C	Pass
Spurious Emission at Antenna Terminals	§2.1051, §2.917	RSS-Gen, §4.9; RSS-132, §4.5	FCC: ≤ -13 dBm/100 kHz, from 9 kHz to 10 th harmonics but outside authorized operating frequency ranges. IC: ≤ -13 dBm/100 kHz (for EBW ≤ 4 MHz) or ≤ -13 dBm/1 MHz (for EBW > 4 MHz), from 9 kHz to 10 th harmonics but outside authorized operating frequency ranges.	Appendix D	Pass
Field Strength of Spurious Radiation	§2.1053, §22.917	RSS-Gen, §4.9; RSS-132, §4.5	FCC: ≤ -13 dBm/100 kHz. IC: ≤ -13 dBm/100 kHz (for EBW ≤ 4 MHz) or ≤ -13 dBm/1 MHz (for EBW > 4 MHz).	Appendix E	Pass
Frequency Stability	§2.1055, §22.355	RSS-Gen, §4.7; RSS-132, §4.3	≤ ±2.5ppm.	Appendix F	Pass
<p>NOTE 1: For Receiver Spurious Emissions, If the receiver has a detachable antenna of known impedance, antenna conducted spurious emissions measurement is permitted as an alternative to radiated measurement. However, the radiated method is recommended. The antenna conducted test shall be performed with the antenna disconnected and the receiver antenna terminals connected to a measuring instrument having equal impedance to that specified for the antenna.</p> <p>NOTE 2: For the verdict, the "N/A" denotes "not applicable", the "N/T" denotes "not tested".</p>					



2.2 PCS Band (1850-1915 MHz paired with 1930-1995 MHz)

Test Item	FCC Rule No.	IC Rule No.	Requirements	Test Result	Verdict (NOTE 2)
RF Power Output	§2.1046, §24.232	RSS-Gen, §4.8; RSS-133, §6.4	EIRP ≤ 2 W; PAR ≤ 13 dB.	Appendix A	Pass
Bandwidth	§2.1049, §2.917	RSS-Gen, §4.6	OBW: No limit. EBW: No limit.	Appendix B	Pass
Band Edges Compliance	§2.1051, §24.238	RSS-Gen, §4.9; RSS-133, §6.5	≤ -13 dBm/1%*EBW, in 1 MHz bands immediately outside and adjacent to the frequency block.	Appendix C	Pass
Spurious Emission at Antenna Terminals	§2.1051, §24.238	RSS-Gen, §4.9; RSS-133, §6.5	≤ -13 dBm/1 MHz, from 9 kHz to 10 th harmonics but outside authorized operating frequency ranges.	Appendix D	Pass
Field Strength of Spurious Radiation	§2.1053, §24.238	RSS-Gen, §4.9; RSS-133, §6.5	≤ -13 dBm/1 MHz.	Appendix E	Pass
Frequency Stability	§2.1055, §24.235	RSS-Gen, §4.7; RSS-133, §6.3	FCC: within authorized frequency block. IC: ≤ ±2.5 ppm.	Appendix F	Pass
Photos of Test Setups	---	---	---	Appendix G	---
<p>NOTE 1: For Receiver Spurious Emissions, If the receiver has a detachable antenna of known impedance, antenna conducted spurious emissions measurement is permitted as an alternative to radiated measurement. However, the radiated method is recommended. The antenna conducted test shall be performed with the antenna disconnected and the receiver antenna terminals connected to a measuring instrument having equal impedance to that specified for the antenna.</p> <p>NOTE 2: For the verdict, the "N/A" denotes "not applicable", the "N/T" denotes "not tested".</p>					



3 Description of the Equipment under Test (EUT)

3.1 General Description

HW-02E is a LTE/UMTS/ EDGE triple mode and WiFi Wireless mobile Router; it can be used as a WiFi hotspot based on standard of IEEE802.11b/g/n, max to 10 WiFi stations can be associating with HW-02E simultaneously. About 3G WCDMA wireless mode, it supports WCDMA and HSDPA/HSUPA/HSPA+/DC-HSDPA, operating in Band5. About 2G GSM, operating in GSM850MHz and GSM1900MHz. The WiFi frequency is 2.4GHz.

HW-02E supports 1Tx2Rx for 3G WCDMA, WiFi supports 2Tx2Rx.

3.2 EUT Identity

NOTE: Unless otherwise noted in the report, the functional boards installed in the units shall be selected from the below list, but not means all the functional boards listed below shall be installed in one unit.

3.2.1 Board

Board		
Description	Hardware Version	Software version
Main board	CL1E5371SM	21.100.00.09.736

3.2.2 Sub-Assembly

Sub-Assembly			
Sub-Assembly Name	Model	Manufacturer	Description
Adapter	HUAWEI	HW-050100U3W	Adapter,0degC,45degC,100V,240V,5.0v/1.0A,PSE 2pin/DC USB2.0,Japan,NTT LOGO,Super Small,ERP V,PSE,White,Terminal Dedicated LOGO,ERP V
Li-ion Battery	HUAWEI	HB5F2H	Rated capacity: 1780mAh Nominal Voltage:  +3.7V Charging Voltage:  +4.2V

3.3 Technical Specification

Characteristics	Description	
Radio System Type		<input checked="" type="checkbox"/> GSM <input checked="" type="checkbox"/> UMTS <input type="checkbox"/> LTE <input type="checkbox"/> CDMA
Supported Frequency Range	GSM850	Transmission (TX): 824-849 MHz
		Receiving (RX): 869-894 MHz
	GSM1900	Transmission (TX): 1850-1910 MHz
		Receiving (RX): 1930-1990 MHz
	WCDMA850	Transmission (TX): 824-849 MHz
		Receiving (RX): 869-894 MHz
TX and RX Antenna Ports	TX & RX port:	1
	TX-only port:	0
	RX-only port:	1
TX Output Power	GSM850: 32dBm GSM1900: 29dBm UMTS850: 22.5dBm	
Supported Channel Bandwidth	GSM system:	<input checked="" type="checkbox"/> 200 kHz
	UMTS system:	<input checked="" type="checkbox"/> 5 MHz
Designation of Emissions (Note: the necessary bandwidth of which is the worst value from the measured occupied bandwidths for each type of channel bandwidth configuration.)	GSM850:	251KGXW, 252KG7W
	GSM1900	248KGXW, 252KG7W
	UMTS system:	4M16F9W



4 General Test Conditions / Configurations

4.1 Test Modes

NOTE: The test mode(s) are selected according to relevant radio technology specifications.

Test Mode	Test Modes Description
GSM/TM1	GSM system, GSM/GPRS, GMSK modulation
GSM/TM2	GSM system, EDGE, 8PSK modulation
UMTS/TM1	WCDMA system, QPSK modulation
UMTS/TM2	HSDPA system, QPSK modulation
UMTS/TM3	HSUPA system, QPSK modulation

4.2 Test Environment

Environment Parameter	Selected Values During Tests	
Relative Humidity	Ambient	
Temperature	TN	Ambient
Voltage	VL	3.6V
	VN	3.7V
	VH	4.2V

NOTE: VL= lower extreme test voltage
VN= nominal voltage
VH= upper extreme test voltage
TN= normal temperature

4.3 Test Frequency

Test Mode	TX / RX	RF Channel		
		Low (L)	Middle (M)	High (H)
GSM/TM1& GSM/TM2	TX	Channel 128	Channel 192	Channel 251
		824.2MHz	837.0MHz	848.8MHz
	RX	Channel 128	Channel 192	Channel 251
		869.2MHz	882.0MHz	893.8MHz
GSM/TM1& GSM/TM2	TX	Channel 512	Channel 661	Channel 810
		1850.2MHz	1880.0MHz	1909.8MHz
	RX	Channel 512	Channel 661	Channel 810
		1930.2 MHz	1960.0 MHz	1989.8 MHz
UMTS/TM1& UMTS/TM2& UMTS/TM3	TX	Channel 4132	Channel 4182	Channel 4233
		826.4MHz	836.4MHz	846.6MHz
	RX	Channel 4357	Channel 4407	Channel 4458
		871.4MHz	881.4MHz	891.6MHz

4.4 DESCRIPTION OF TESTS

4.4.1 Radiated Power and Radiated Spurious Emissions

Radiated spurious emissions are investigated indoors in a semi-anechoic chamber to determine the frequencies producing the worst case emissions. Final measurements for radiated power and radiated spurious emissions are performed on the 3 meter OATS per the guidelines of ANSI/TIA-603-C-2004. The equipment under test was transmitting while connected to its integral antenna and is placed on a wooden turntable 80cm above the ground plane and 3 meters from the receive antenna. The spectrum is scanned from the lowest frequency generated in the equipment up to a frequency including its 10th harmonic. The receive antenna height is adjusted between 1 and 4 meter height, the turntable is rotated through 360 degrees, and the EUT is manipulated through all orthogonal planes representative of its typical use to achieve the highest reading on the receive spectrum analyzer. Emissions are also investigated with the receive antenna horizontally and vertically polarized.

A portable or small unlicensed wireless device shall be placed on a non-metallic test fixture or other non-metallic support during testing. The supporting fixture shall permit orientation of the EUT in each of three orthogonal (x, y, z) axis positions such that emissions from the EUT are maximized. Measure the EUT maximum RF power and record the result.

A half-wave dipole is then substituted in place of the EUT. For emissions above 1GHz, a horn antenna is substituted in place of the EUT. The substitute antenna is driven by a signal generator with the level of the signal generator being adjusted to obtain the same receive spectrum analyzer level previously recorded from the spurious emission from the EUT. The power of the emission is calculated using the following formula:

$$P_d \text{ [dBm]} = P_g \text{ [dBm]} - \text{cable loss [dB]} + \text{antenna gain [dBd/dBi]}$$

Where, P_d is the dipole equivalent power, P_g is the generator output into the substitution antenna, and the antenna gain is the gain of the substitute antenna used relative to either a half-wave dipole (dBd) or an isotropic source (dBi). The substitute level is equal to $P_g \text{ [dBm]} - \text{cable loss [dB]}$.

The calculated P_d levels are then compared to the absolute spurious emission limit of -13dBm which is equivalent to the required minimum attenuation of $43 + 10\log_{10}(\text{Power}_{\text{[Watts]}})$.

Note: Reference test setup 3

4.4.2 Occupied Bandwidth

The occupied bandwidth, that is the frequency bandwidth such that, below its lower and above its upper frequency limits, the mean powers radiated are each equal to 0.5 percent of the total mean power radiated by a given emission shall be measured. The span of the analyzer shall be set to capture all products of the modulation process, including the emission skirts. The resolution bandwidth shall be set to as close to 1 percent of the selected span as is possible without being below 1 percent. The video bandwidth shall be set to 3 times the resolution bandwidth. Video averaging is not permitted. Where practical, a sampling detector shall be used since a peak or, peak hold, may produce a wider bandwidth than actual. The trace data points are recovered and are directly summed in linear terms. The recovered amplitude data points, beginning at the lowest frequency, are placed in a running sum until 0.5 percent of the total is reached and that frequency recorded. The process is repeated for the highest frequency data points. This frequency is recorded. The span between the two recorded frequencies is the occupied bandwidth.

Note: Reference test setup 1.

4.4.3 Spurious and Harmonic Emissions at Antenna Terminal

The level of the carrier and the various conducted spurious and harmonic frequencies is measured by means of a calibrated spectrum analyzer. The spectrum is scanned from the lowest frequency generated in the equipment up to a frequency including its 10th harmonic. On any frequency outside a licensee's frequency block, the power of any emission shall be attenuated below the transmitter power (P) by at least $43 + 10 \log(P)$ dB. Compliance with these provisions is based on the use of measurement instrumentation employing a resolution bandwidth of 1 MHz or greater. However, in the 1 MHz bands immediately outside and adjacent to the frequency block a resolution bandwidth of at least one percent of the emission bandwidth of the fundamental emission of the transmitter may be employed. The emission bandwidth is defined as the width of the signal between two points, one below the carrier center frequency and one above the carrier center frequency, outside of which all emission are attenuated at least 26 dB below the transmitter power.

Note: Reference test setup 1.

4.4.4 Peak-Average Ratio

A peak to average ratio measurement is performed at the conducted port of the EUT. For WCDMA signals, the spectrum analyzers Complementary Cumulative Distribution Function (CCDF) measurement profile is used to determine the largest deviation between the average and the peak power of the EUT in a given bandwidth. The CCDF curve shows how much time the peak waveform spends at or above a given average power level. The percent of time the signal spends at or above the level defines the probability for that particular power level. For GSM signals, an average and a peak trace are used on a spectrum analyzer to determine the largest deviation between the average and the peak power of the EUT in a bandwidth greater than the emission bandwidth. The traces are generated with the spectrum analyzer set to zero span mode.

Note: Reference test setup 1.

4.4.5 Frequency Stability / Temperature Variation

Frequency stability testing is performed in accordance with the guidelines of ANSI/TIA-603-C-2004. The frequency stability of the transmitter is measured by:

- a.) **Temperature:** The temperature is varied from -30°C to $+50^{\circ}\text{C}$ in 10°C increments using an environmental chamber.
- b.) **Primary Supply Voltage:** The primary supply voltage is varied from 85% to 115% of the nominal value for non hand-carried battery and AC powered equipment. For hand-carried, battery-powered equipment, primary supply voltage is reduced to the battery operating end point which shall be specified by the manufacturer.

Specification – The frequency stability shall be sufficient to ensure that the fundamental emission stays within the authorized frequency block. The frequency stability of the transmitter shall be maintained within $\pm 0.00025\%$ (± 2.5 ppm) of the center frequency.

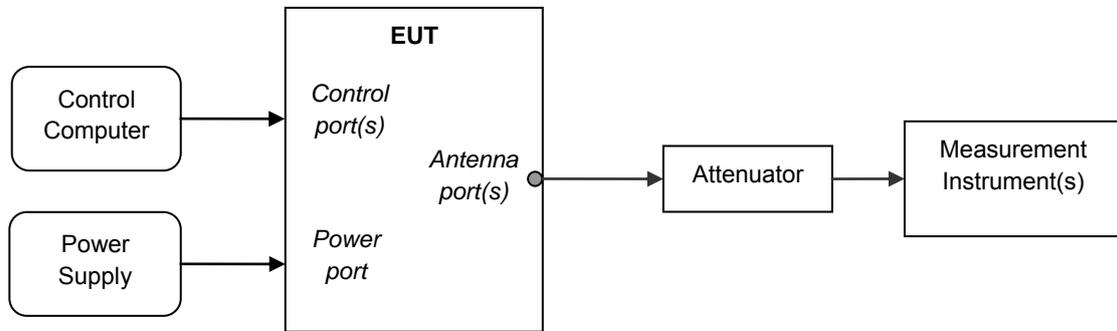
Time Period and Procedure:

1. The carrier frequency of the transmitter is measured at room temperature (20°C to provide a reference).
2. The equipment is turned on in a “standby” condition for fifteen minutes before applying power to the transmitter. Measurement of the carrier frequency of the transmitter is made within one minute after applying power to the transmitter.
3. Frequency measurements are made at 10°C intervals ranging from -30°C to $+50^{\circ}\text{C}$. A period of at least one half-hour is provided to allow stabilization of the equipment at each temperature level.

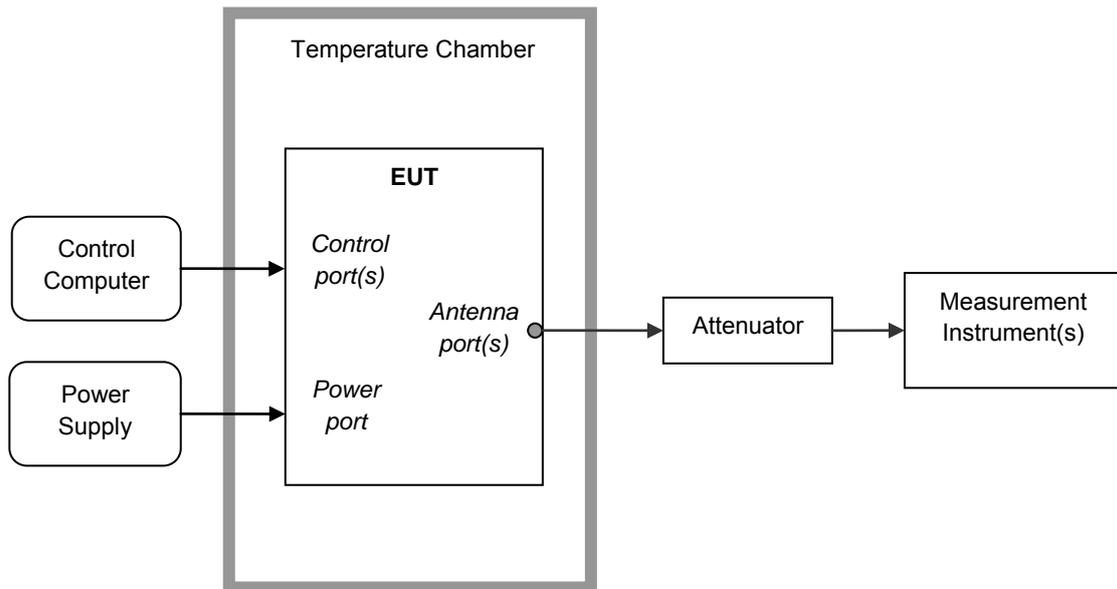
Note: Reference test setup 2.

4.5 Test Setups

4.5.1 Test Setup 1



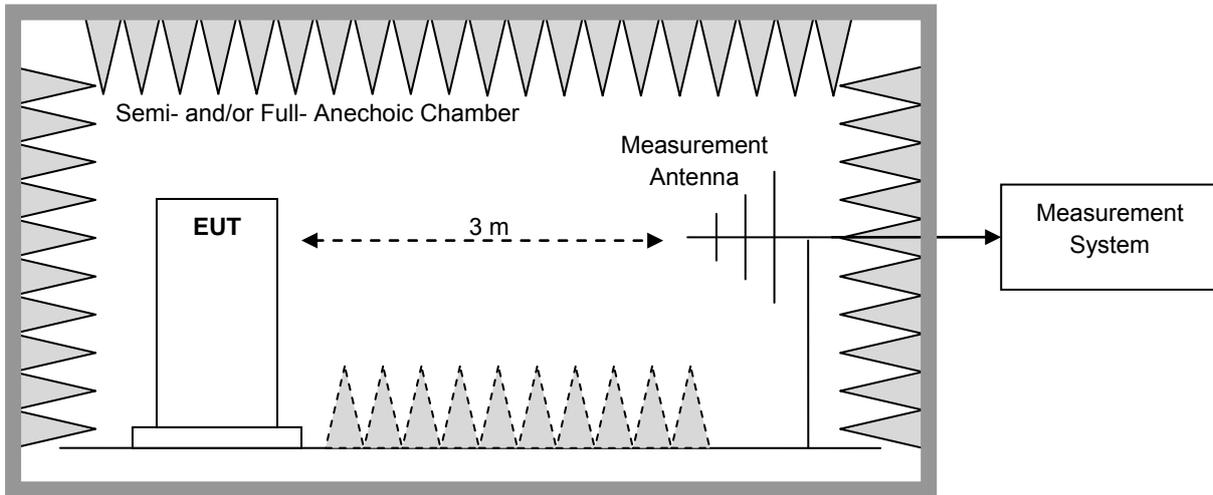
4.5.2 Test Setup 2



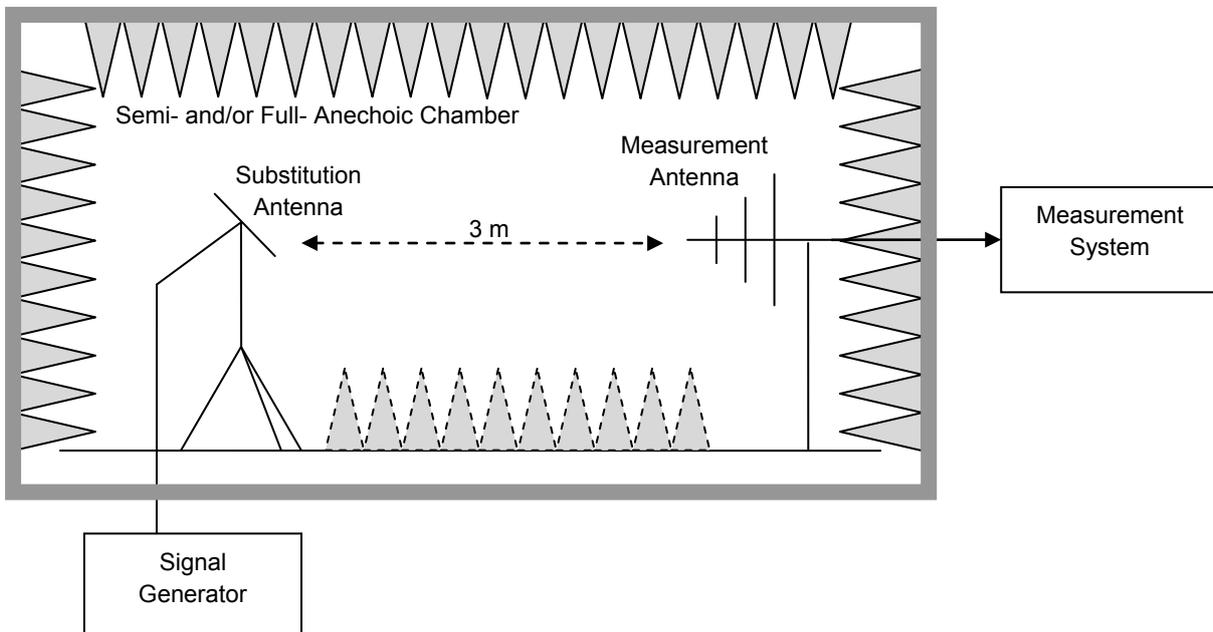
4.5.3 Test Setup 3

NOTE: Effective radiated power (ERP) refers to the radiation power output of the EUT, assuming all emissions are radiated from half-wave dipole antennas.

4.5.3.1 Step 1: Pre-test



4.5.3.2 Step 2: Substitution method to verify the maximum ERP



4.6 Test Conditions

Test Case		Test Conditions	
Transmitter Output Power	Average Power, Total	Test Env.	Ambient Climate & Rated Voltage
		Test Setup	Test Seup 1
		RF Channels (TX)	L, M, H (L= low channel, M= middle channel, H= high channel)
		Test Mode	GSM/TM1& GSM/TM2&UMTS/TM1&UMTS/TM2&UMTS/TM3
	Peak-to-Average Ratio (if required)	Test Env.	Ambient Climate & Rated Voltage
		Test Setup	Test Seup 1
		RF Channels (TX)	L, M, H (L= low channel, M= middle channel, H= high channel)
		Test Mode	GSM/TM1& GSM/TM2
Bandwidth	Occupied Bandwidth	Test Env.	Ambient Climate & Rated Voltage
		Test Setup	Test Seup 1
		RF Channels (TX)	L, M, H (L= low channel, M= middle channel, H= high channel)
		Test Mode	GSM/TM1& GSM/TM2&UMTS/TM1
	Emission Bandwidth (if required)	Test Env.	Ambient Climate & Rated Voltage
		Test Setup	Test Seup 1
		RF Channels (TX)	L, M, H (L= low channel, M= middle channel, H= high channel)
		Test Mode	GSM/TM1& GSM/TM2&UMTS/TM1
Band Edges Compliance	Test Env.	Ambient Climate & Rated Voltage	
	Test Setup	Test Seup 1	
	RF Channels (TX)	L, M, H (L= low channel, M= middle channel, H= high channel)	
	Test Mode	GSM/TM1& GSM/TM2&UMTS/TM1	
Spurious Emission at Antenna Terminals	Test Env.	Ambient Climate & Rated Voltage	
	Test Setup	Test Seup 1	
	RF Channels (TX)	L, M, H (L= low channel, M= middle channel, H= high channel)	
	Test Mode	GSM/TM1& GSM/TM2&UMTS/TM1	
Field Strength of Spurious Radiation	Test Env.	Ambient Climate & Rated Voltage	
	Test Setup	Test Seup 3	
	Test Mode	GSM/TM1& GSM/TM2&UMTS/TM1&UMTS/TM2&UMTS/TM3 NOTE: If applicable, the EUT conf. that has maximum power density (based on the equivalent power level) is selected.	
	RF Channels (TX)	L, M, H (L= low channel, M= middle channel, H= high channel)	



Test Case	Test Conditions	
Frequency Stability	Test Env.	(1) -30 °C to +50 °C with step 10 °C at Rated Voltage; (2) VL, VN and VH of Rated Voltage at Ambient Climate.
	Test Setup	Test Seup 2
	RF Channels (TX)	L, M, H (L= low channel, M= middle channel, H= high channel)
	Test Mode	GSM/TM1& GSM/TM2&UMTS/TM1



5 Main Test Instruments

Equipment Name	Manufacturer	Model	Serial Number	Cal Date	Cal. Due
Power supply	KEITHLEY	2303	1288003	2012-11-09	2013-11-08
Universal Radio Communication Tester	R&S	CMU200	117341	2012-01-13	2013-01-12
Universal Radio Communication Tester	Agilent	E5515C	MY50260239	2012-11-09	2013-11-08
Spectrum Analyzer	Agilent	E4440A	MY49420179	2012-07-18	2013-07-17
Signal Analyzer	R&S	FSQ31	200021	2012-11-09	2013-11-08
Temperature Chamber	WEISS	WKL64	24600294	2012-02-14	2013-02-13
Signal generator	Agilent	E8257D	MY49281095	2012-07-10	2013-07-09
Spectrum analyzer	R&S	FSU3	200474	2012-03-06	2013-03-05
Spectrum analyzer	R&S	FSU43	100144	2012-03-06	2013-03-05
Double-Ridged Waveguide Horn Antenna (1G~18GHz)	R&S	HF907	100304	2012-04-06	2013-04-05
Double-Ridged Waveguide Horn Antenna (1G~18GHz)	R&S	HF907	100391	2012-04-06	2013-04-05
Trilog Broadband Antenna (30M~3GHz)	SCHWARZBEC K	VULB 9163	9163-521	2012-07-18	2013-07-17
Pyramidal Horn Antenna(26GHz-40GHz)	ETS-Lindgren	3160-10	00123940	2012-02-28	2013-02-27
Pyramidal Horn Antenna(18GHz-26.5GHz)	ETS-Lindgren	3160-09	00125912	2012-02-28	2013-02-27



6 Measurement Uncertainty

For a 95% confidence level ($k = 2$), the measurement expanded uncertainties for defined systems, in accordance with the recommendations of ISO 17025 as following:

Test Item		Extended Uncertainty
RF Power Output	Power [dBm]	U = 0.39 dB
Bandwidth	Magnitude [%]	U = 0.2%
Band Edge Compliance	Disturbance Power [dBm]	U = 2.0 dB
Spurious Emissions, Conducted	Disturbance Power [dBm]	U = 2.0 dB
Field Strength of Spurious Radiation	ERP [dBm]	For 3 m Chamber: U = 4.6 dB (30 MHz to 1GHz) U = 3.0 dB (above 1 GHz) For 10 m Chamber: U = 4.6 dB (30 MHz to 1GHz) U = 3.0 dB (above 1 GHz)
Frequency Stability	Frequency Accuracy [ppm]	U = 0.21 ppm

END



Appendix for Test report

Appendix_A: Effective Radiated Power Output Data

Part I - Test Results

Test Band	Test Mode	Test Channel	Tx Slot	Measured[dBm]	Limit [dBm]	Verdict
GSM850	GSM/TM1	LCH	1 Tx Slot	28.85	38.5	PASS
		MCH	1 Tx Slot	28.52	38.5	PASS
		HCH	1 Tx Slot	28.26	38.5	PASS
	GSM/TM2	LCH	1 Tx Slot	21.56	38.5	PASS
		MCH	1 Tx Slot	21.52	38.5	PASS
		HCH	1 Tx Slot	21.51	38.5	PASS
GSM1900	GSM/TM1	LCH	1 Tx Slot	27.26	33	PASS
		MCH	1 Tx Slot	27.28	33	PASS
		HCH	1 Tx Slot	27.37	33	PASS
	GSM/TM2	LCH	1 Tx Slot	22.84	33	PASS
		MCH	1 Tx Slot	22.79	33	PASS
		HCH	1 Tx Slot	22.77	33	PASS
Test Band	Test Mode	Test Channel	Test Case	Measured[dBm]	Limit [dBm]	Verdict
WCDMA850	UMTS/TM1	LCH	12.2kbps	18.83	38.5	PASS
		MCH	12.2kbps	18.87	38.5	PASS
		HCH	12.2kbps	18.89	38.5	PASS
	UMTS/TM2	LCH	Subtest 1	18.65	38.5	PASS
		MCH	Subtest 1	18.56	38.5	PASS
		HCH	Subtest 1	18.56	38.5	PASS
	UMTS/TM3	LCH	Subtest 1	17.52	38.5	PASS
		MCH	Subtest 1	17.87	38.5	PASS
		HCH	Subtest 1	17.34	38.5	PASS



Peak-to-Average Ratio

Part I - Test Results

Test Band	Test Mode	Test Channel	Measured[dB]	Limit [dB]	Verdict
GSM1900	GSM/TM1	LCH	0.5	13	PASS
		MCH	0.47	13	PASS
		HCH	0.5	13	PASS
	GSM/TM2	LCH	3.09	13	PASS
		MCH	3.09	13	PASS
		HCH	3.11	13	PASS



Appendix_B: Bandwidth

Part I - Test Results

Test Band	Test Mode	Test Channel	Occupied Bandwidth [kHz]	Emission Bandwidth [kHz]	Verdict
GSM850	GSM/TM1	LCH	245.00	317.16	Pass
		MCH	250.55	318.36	Pass
		HCH	248.00	321.01	Pass
	GSM/TM2	LCH	248.04	322.53	Pass
		MCH	251.02	320.47	Pass
		HCH	250.46	312.88	Pass
GSM1900	GSM/TM1	LCH	246.68	316.71	Pass
		MCH	247.40	317.82	Pass
		HCH	247.08	317.52	Pass
	GSM/TM2	LCH	247.34	309.24	Pass
		MCH	251.08	317.73	Pass
		HCH	243.42	300.26	Pass
Test Band	Test Mode	Test Channel	Occupied Bandwidth [MHz]	Emission Bandwidth [MHz]	Verdict
WCDMA850	UMTS/TM1	LCH	4.14	4.71	Pass
		MCH	4.14	4.72	Pass
		HCH	4.15	4.72	Pass



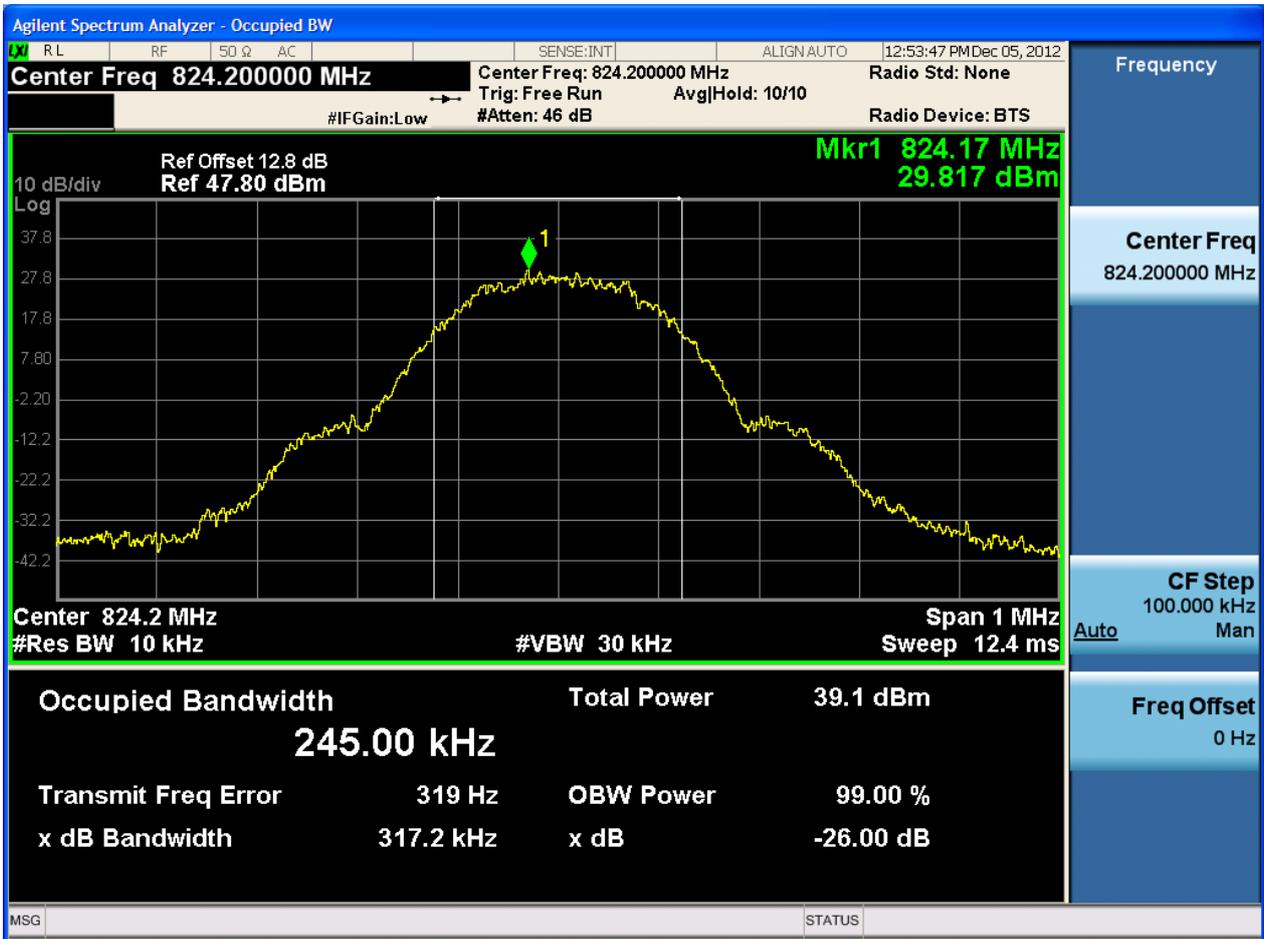
Part II - Test Plots

3.1 For GSM

3.1.1 Test Band = GSM850

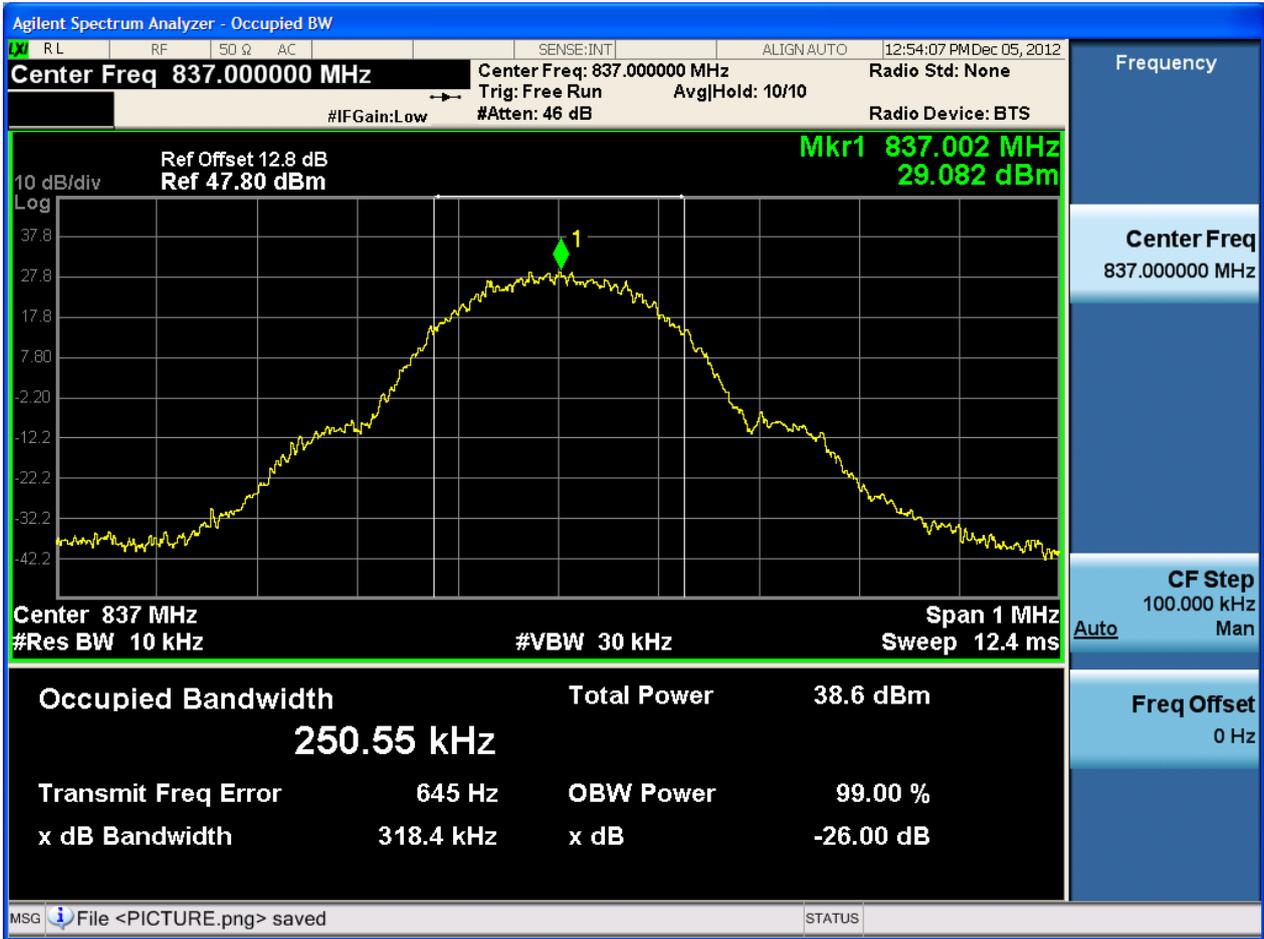
3.1.1.1 Test Mode = GSM/TM1

3.1.1.1.1 Test Channel = LCH



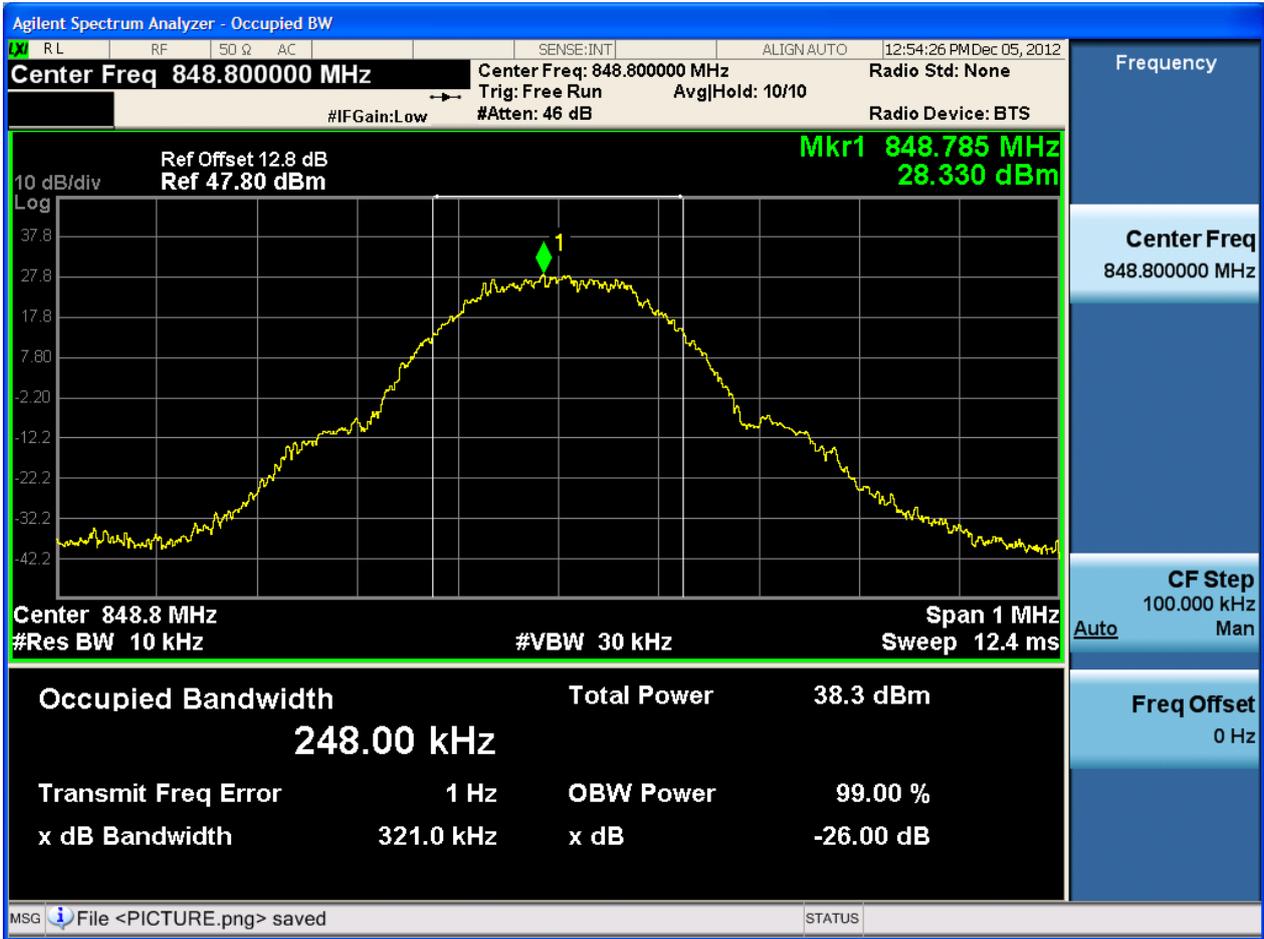


3.1.1.1.2 Test Channel = MCH





3.1.1.1.3 Test Channel = HCH





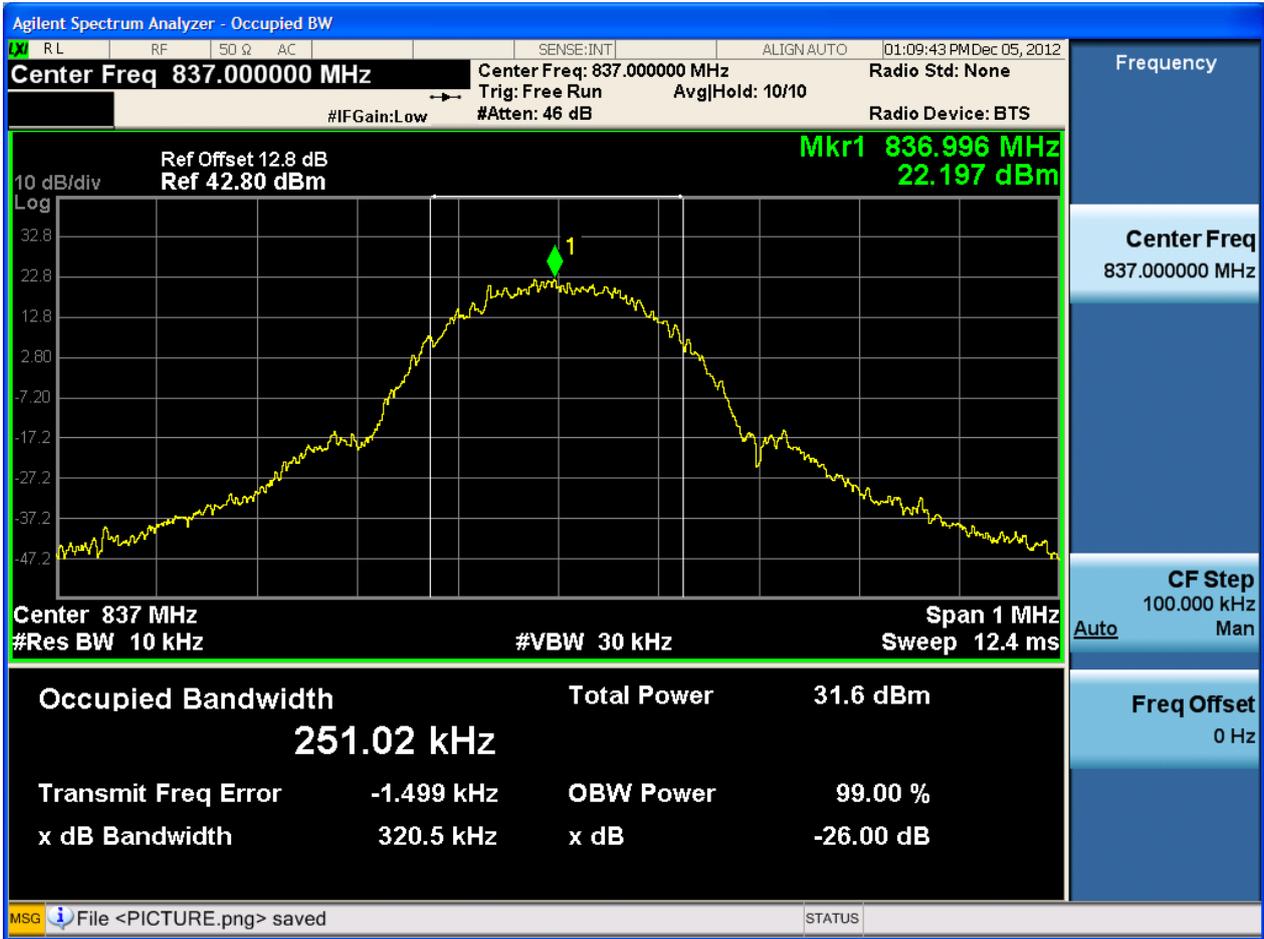
3.1.1.2 Test Mode = GSM/TM2

3.1.1.2.1 Test Channel = LCH



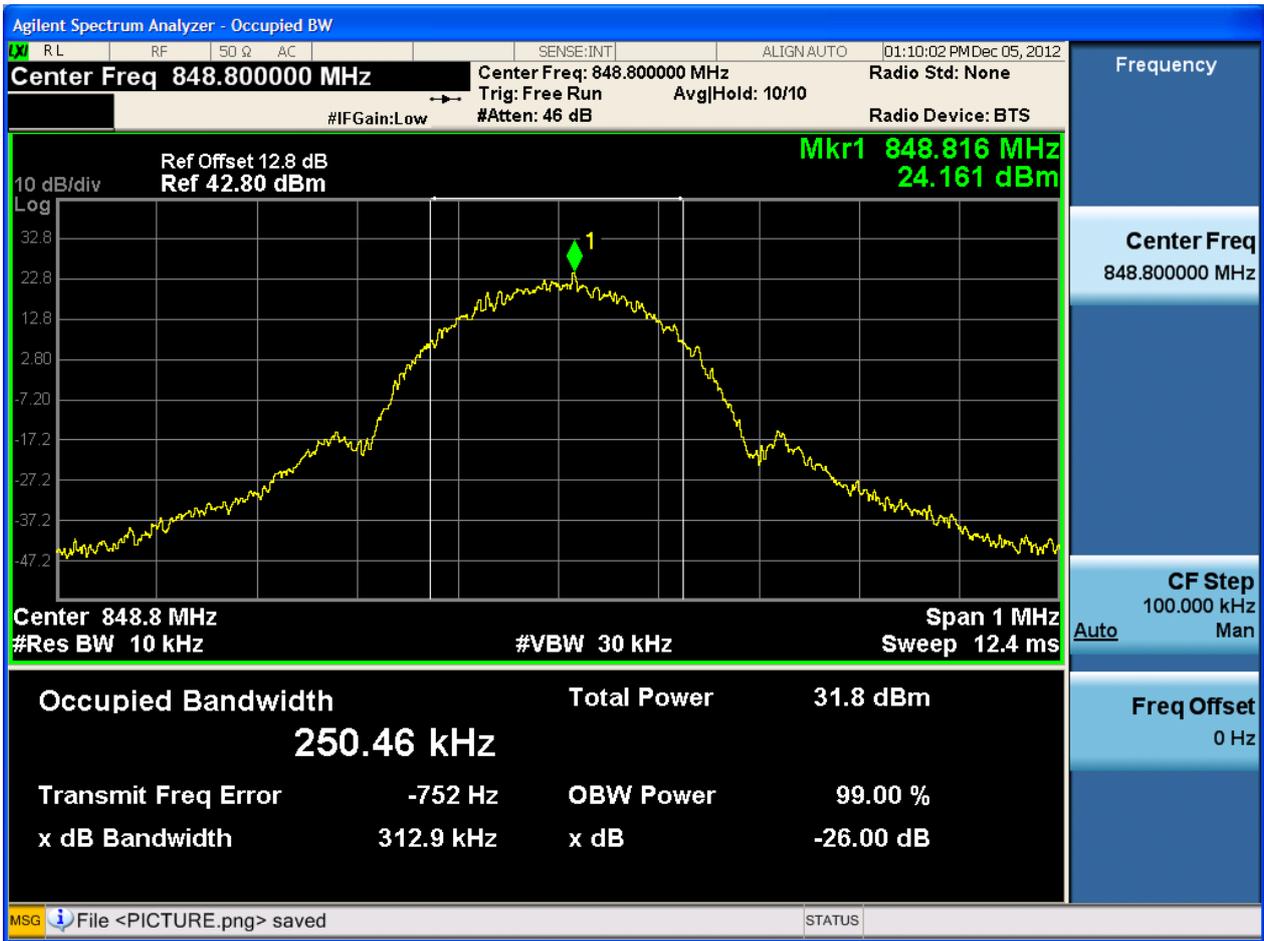


3.1.1.2.2 Test Channel = MCH





3.1.1.2.3 Test Channel = HCH





3.1.2 Test Band = GSM1900

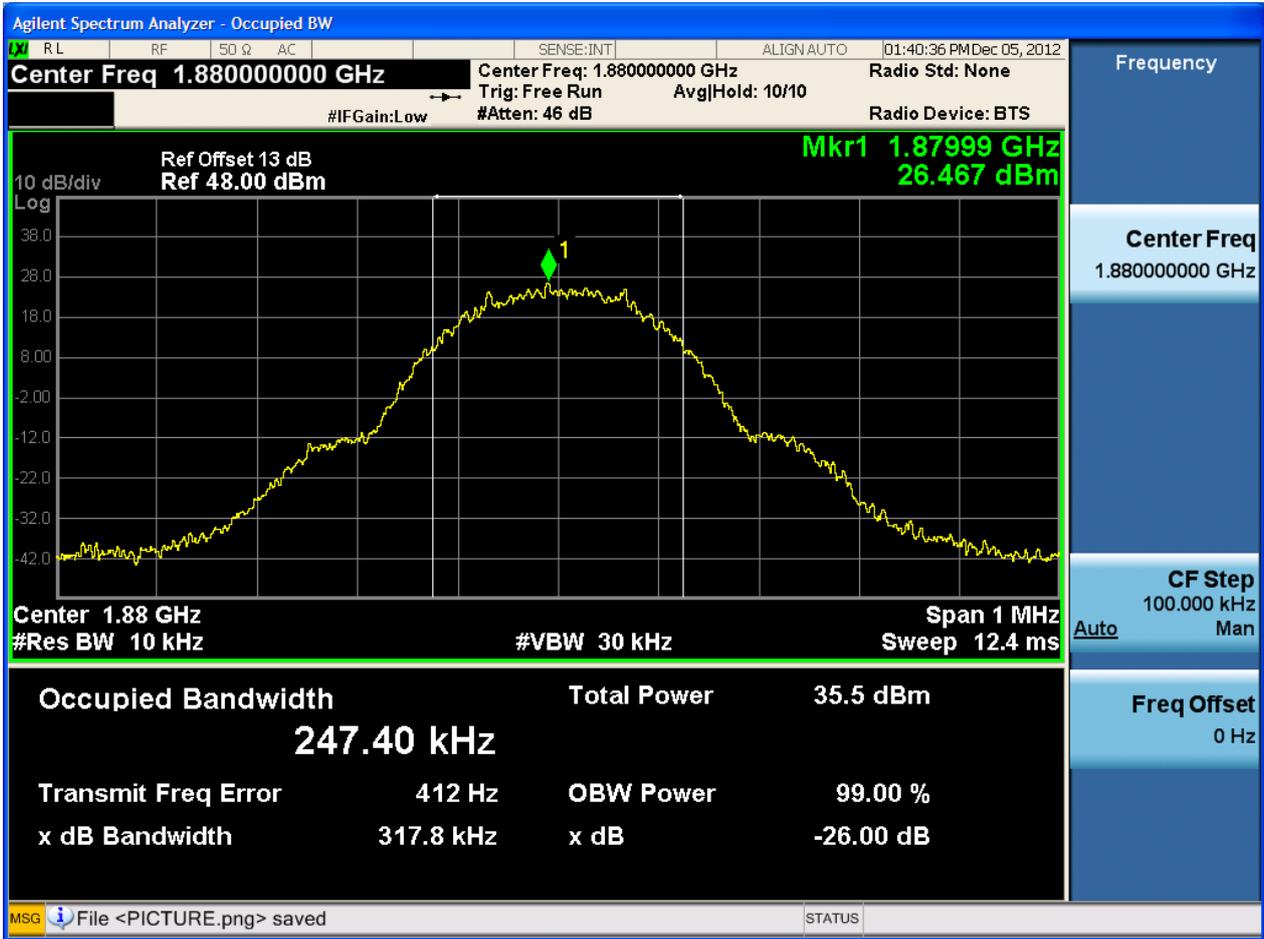
3.1.2.1 Test Mode = GSM/TM1

3.1.2.1.1 Test Channel = LCH



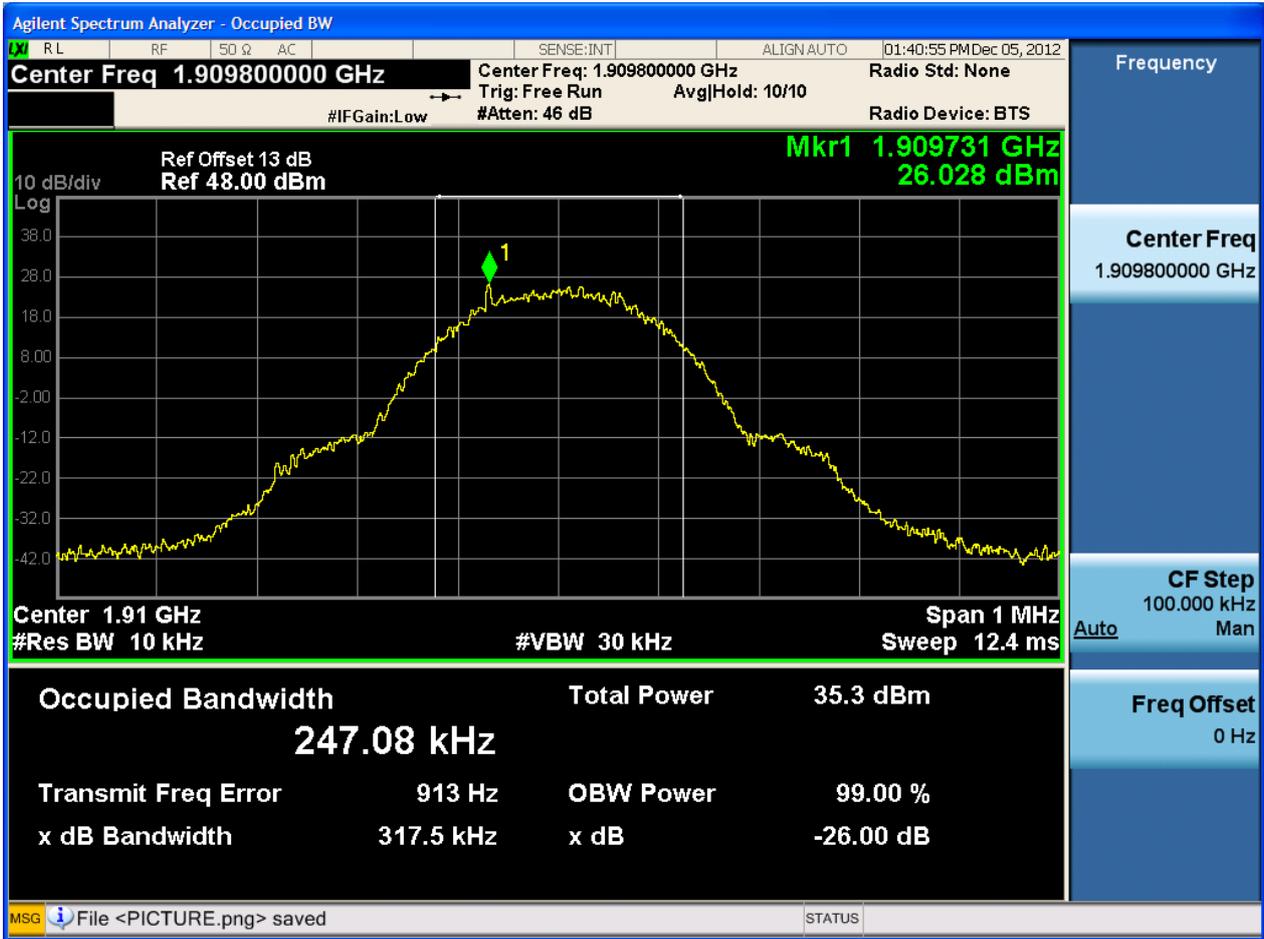


3.1.2.1.2 Test Channel = MCH





3.1.2.1.3 Test Channel = HCH





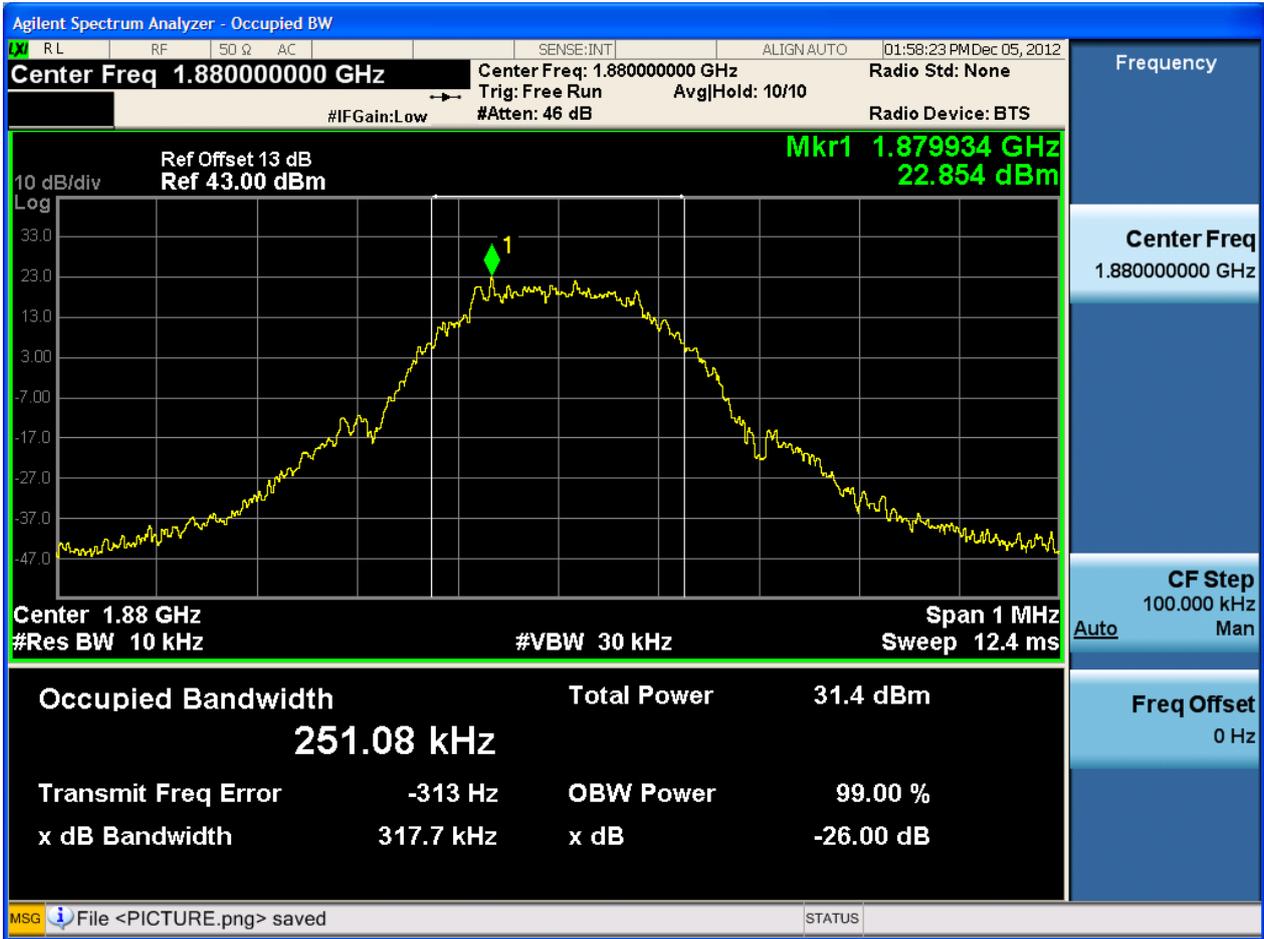
3.1.2.2 Test Mode = GSM/TM2

3.1.2.2.1 Test Channel = LCH



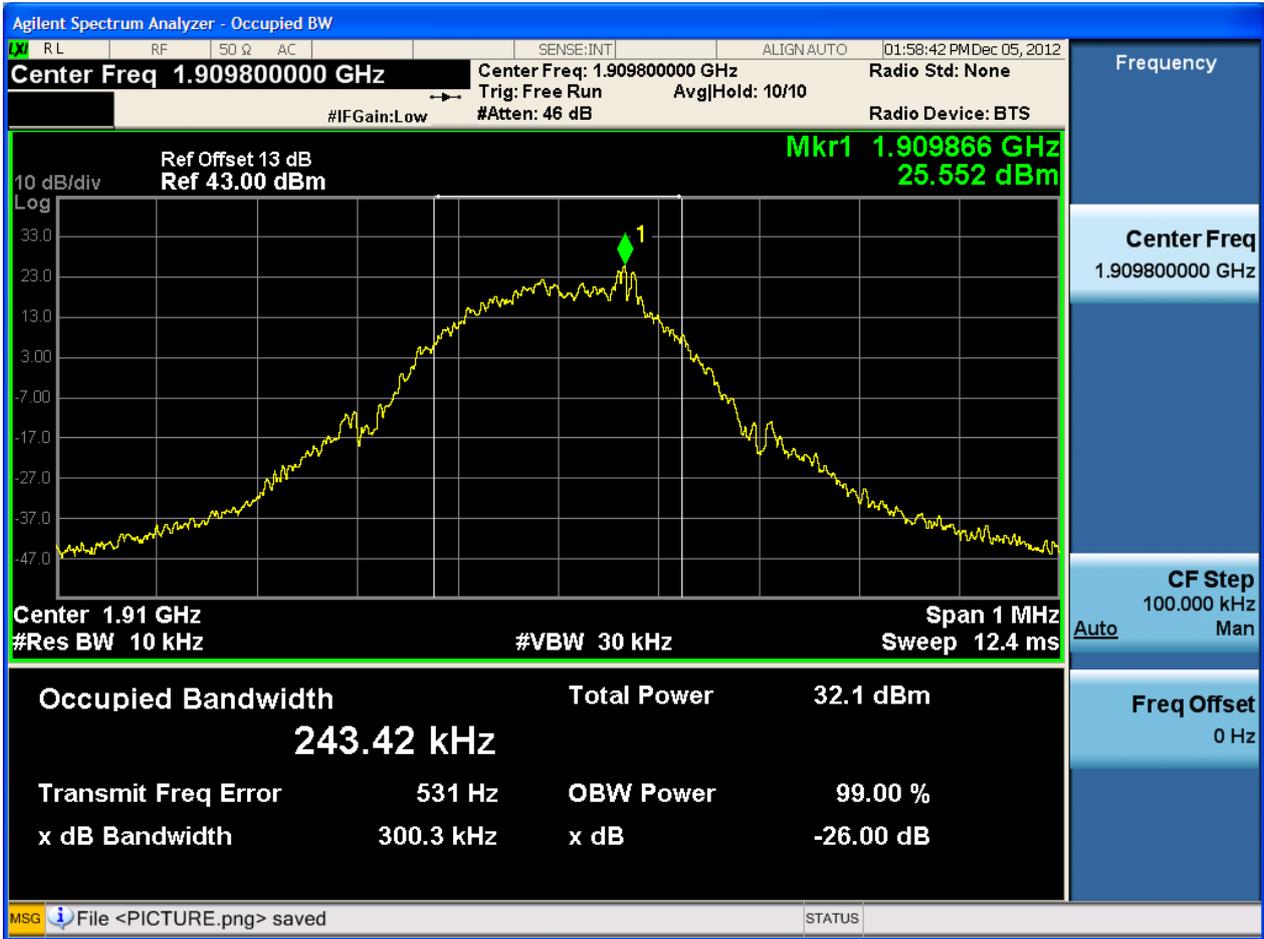


3.1.2.2.2 Test Channel = MCH





3.1.2.2.3 Test Channel = HCH



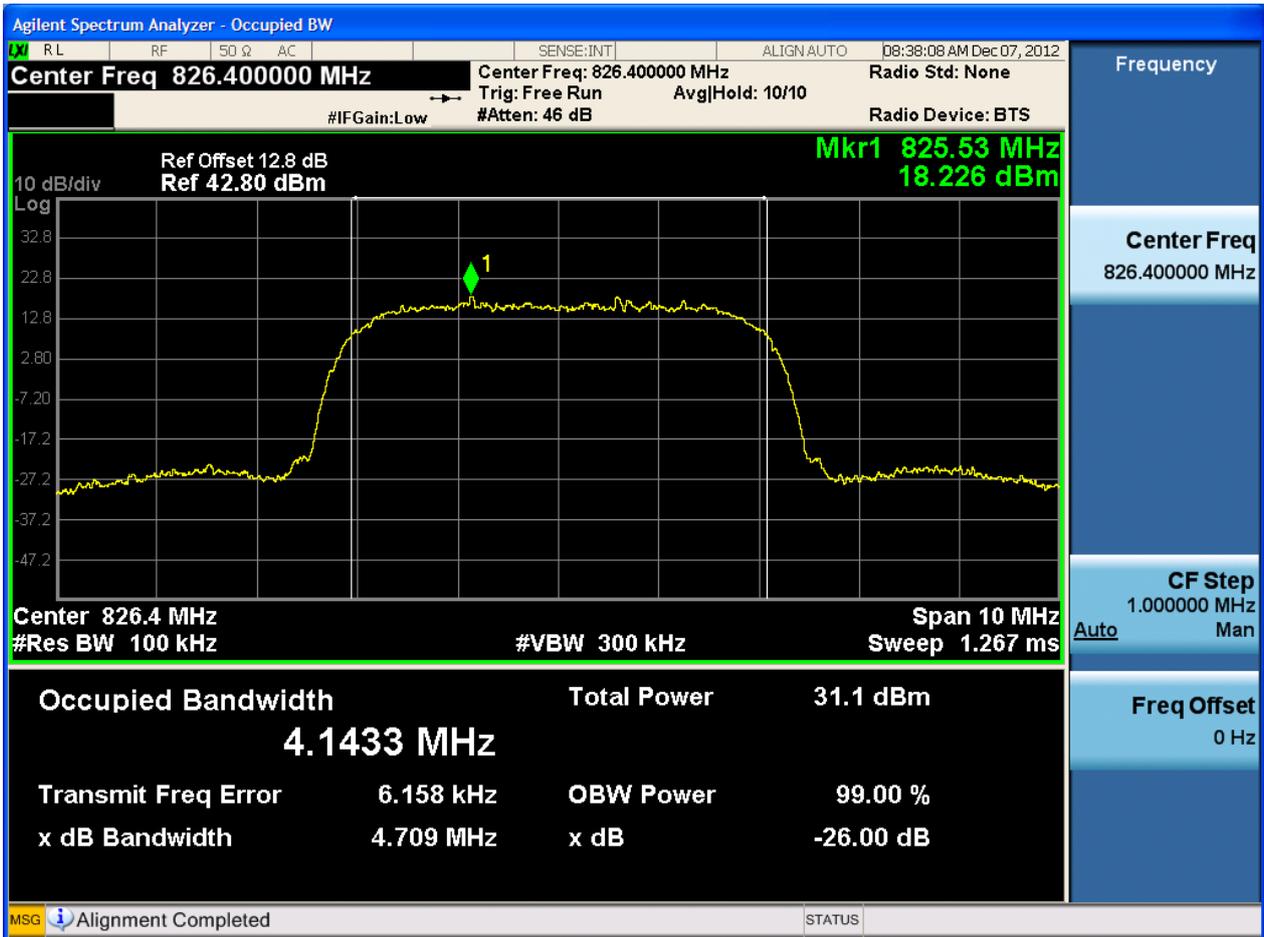


3.2 For UMTS

3.2.1 Test Band = WCDMA850

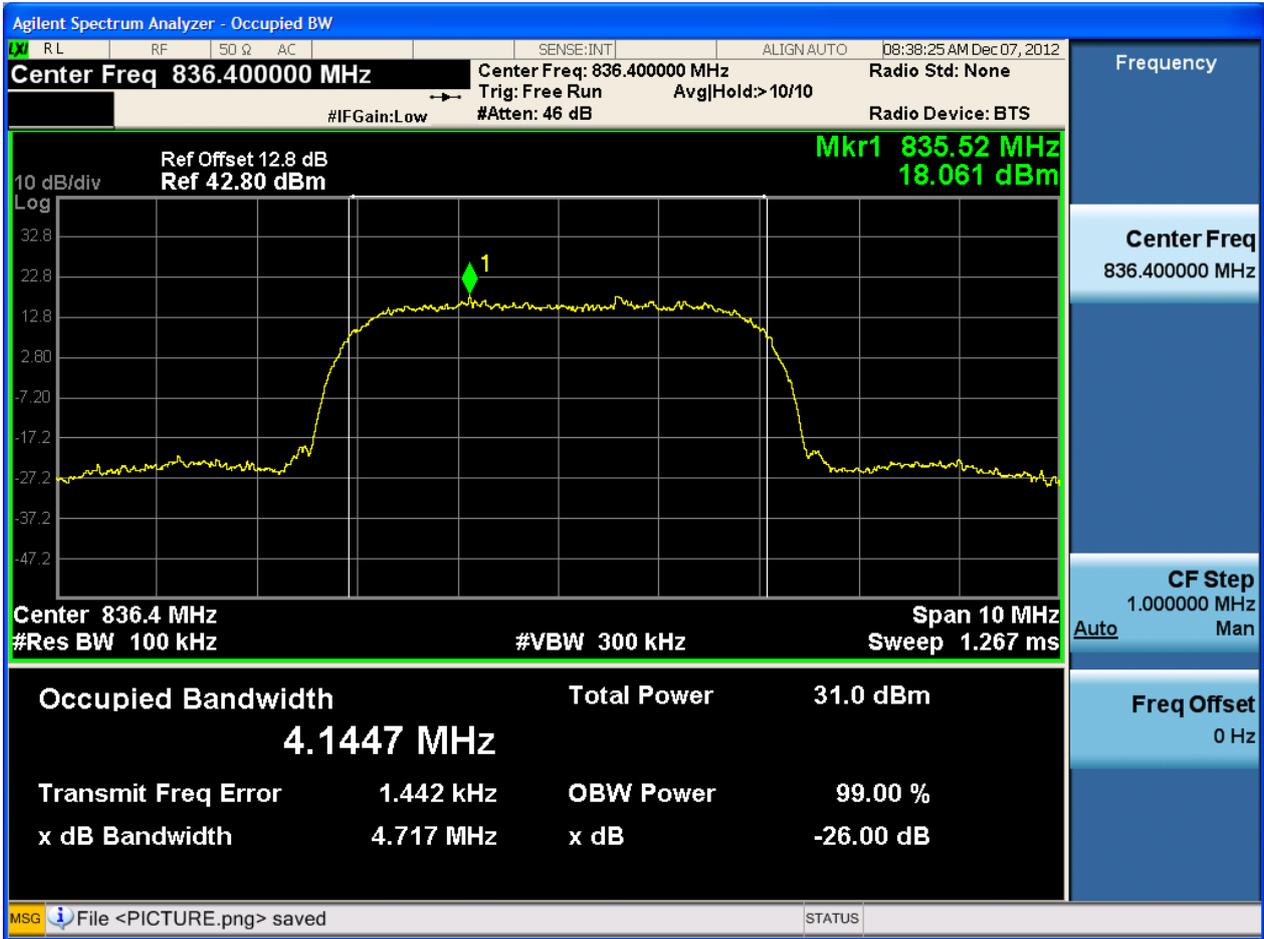
3.2.1.1 Test Mode = UMTS/TM1

3.2.1.1.1 Test Channel = LCH



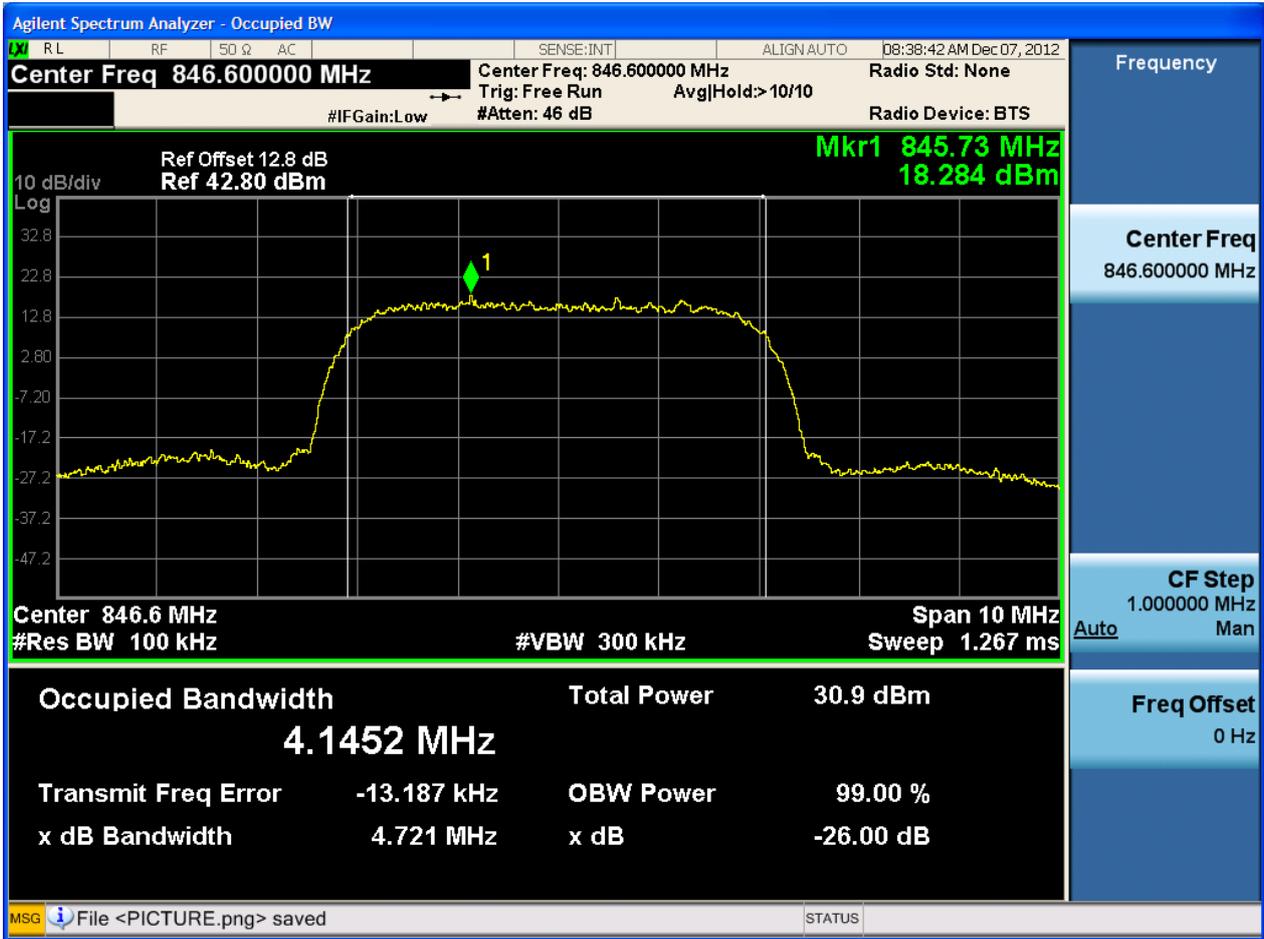


3.2.1.1.2 Test Channel = MCH





3.2.1.1.3 Test Channel = HCH





Appendix_C: Band Edges Compliance

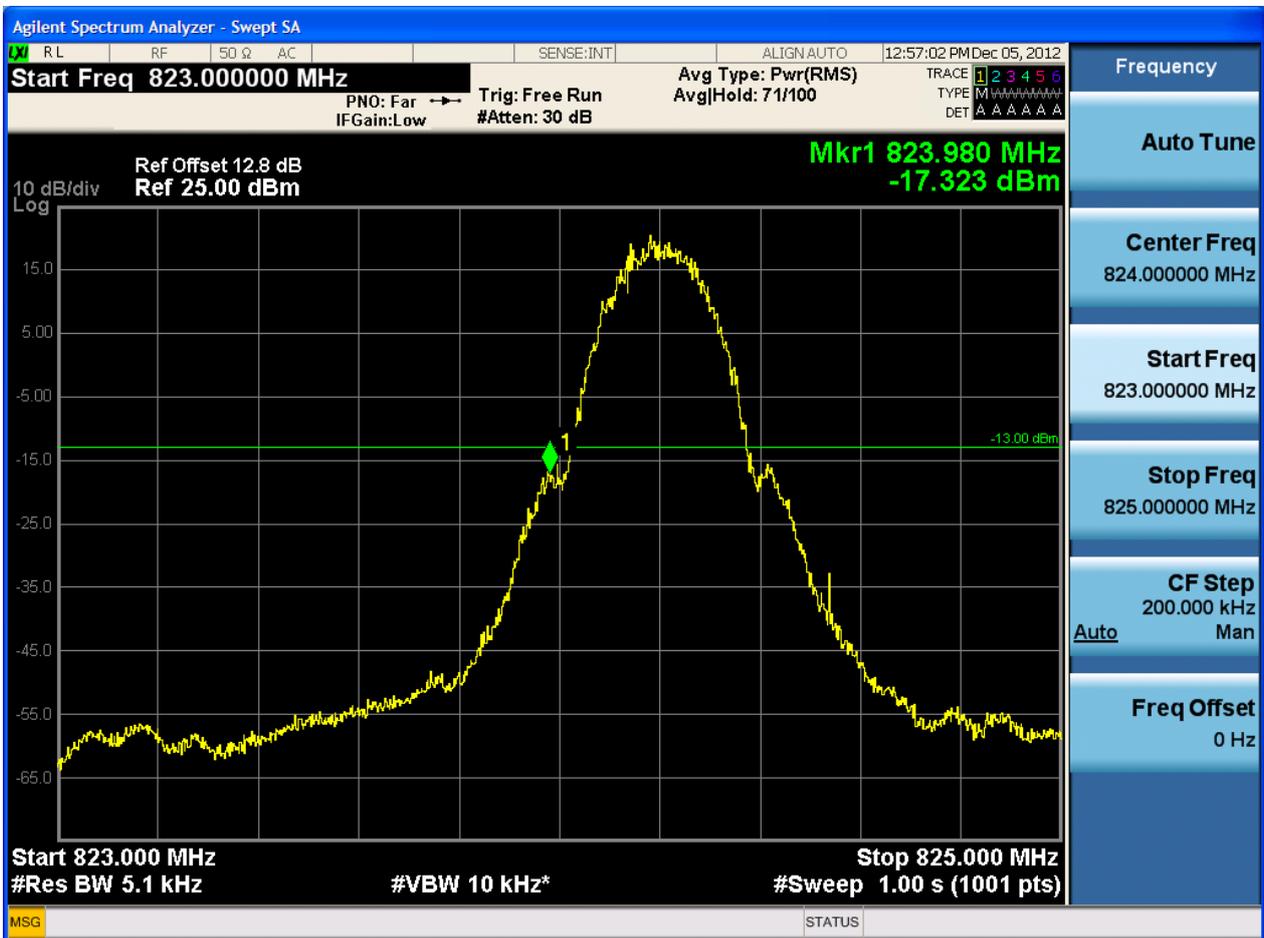
Part I - Test Plots

4.1 For GSM

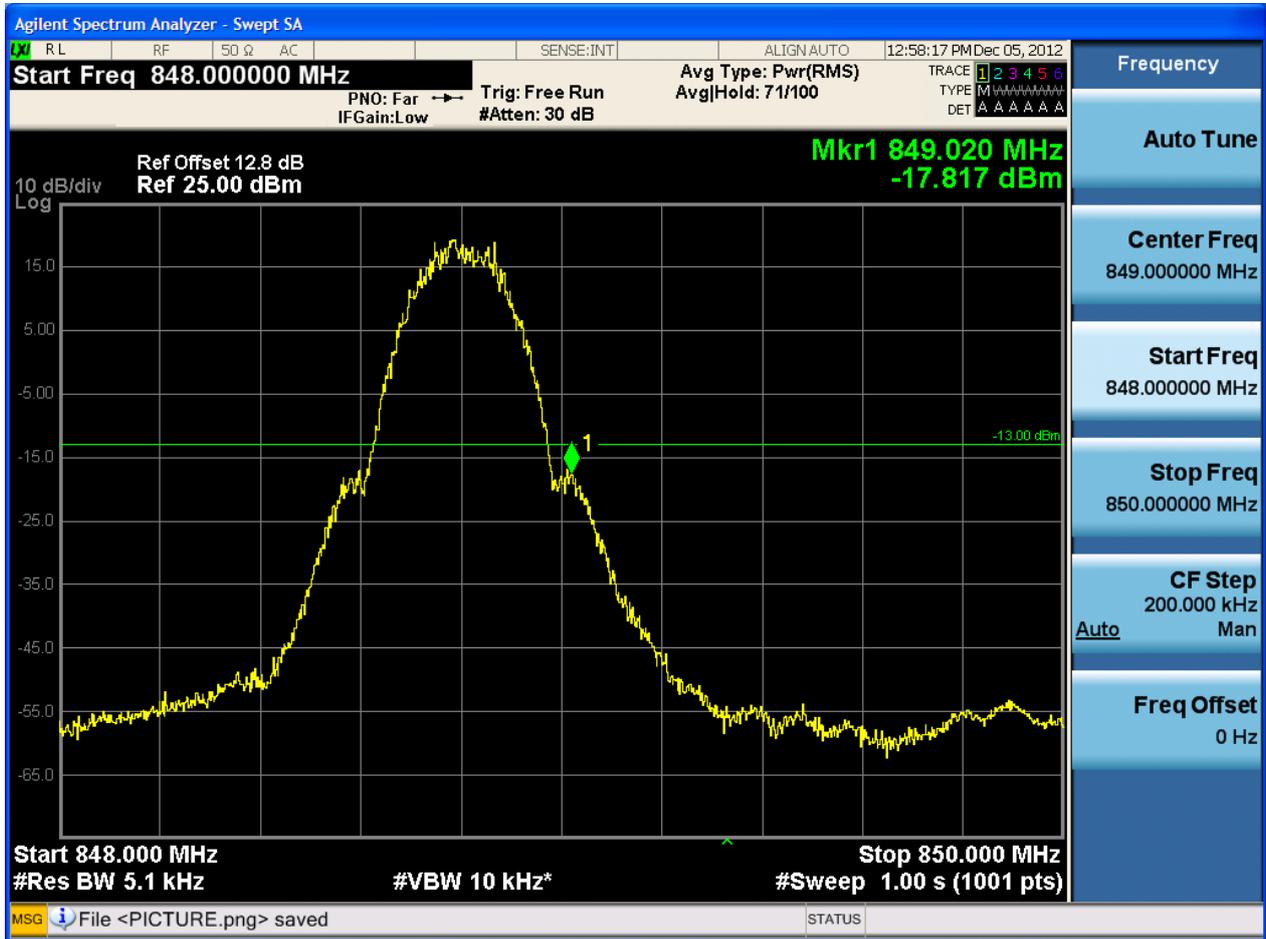
4.1.1 Test Band = GSM850

4.1.1.1 Test Mode = GSM/TM1

4.1.1.1.1 Test Channel = LCH



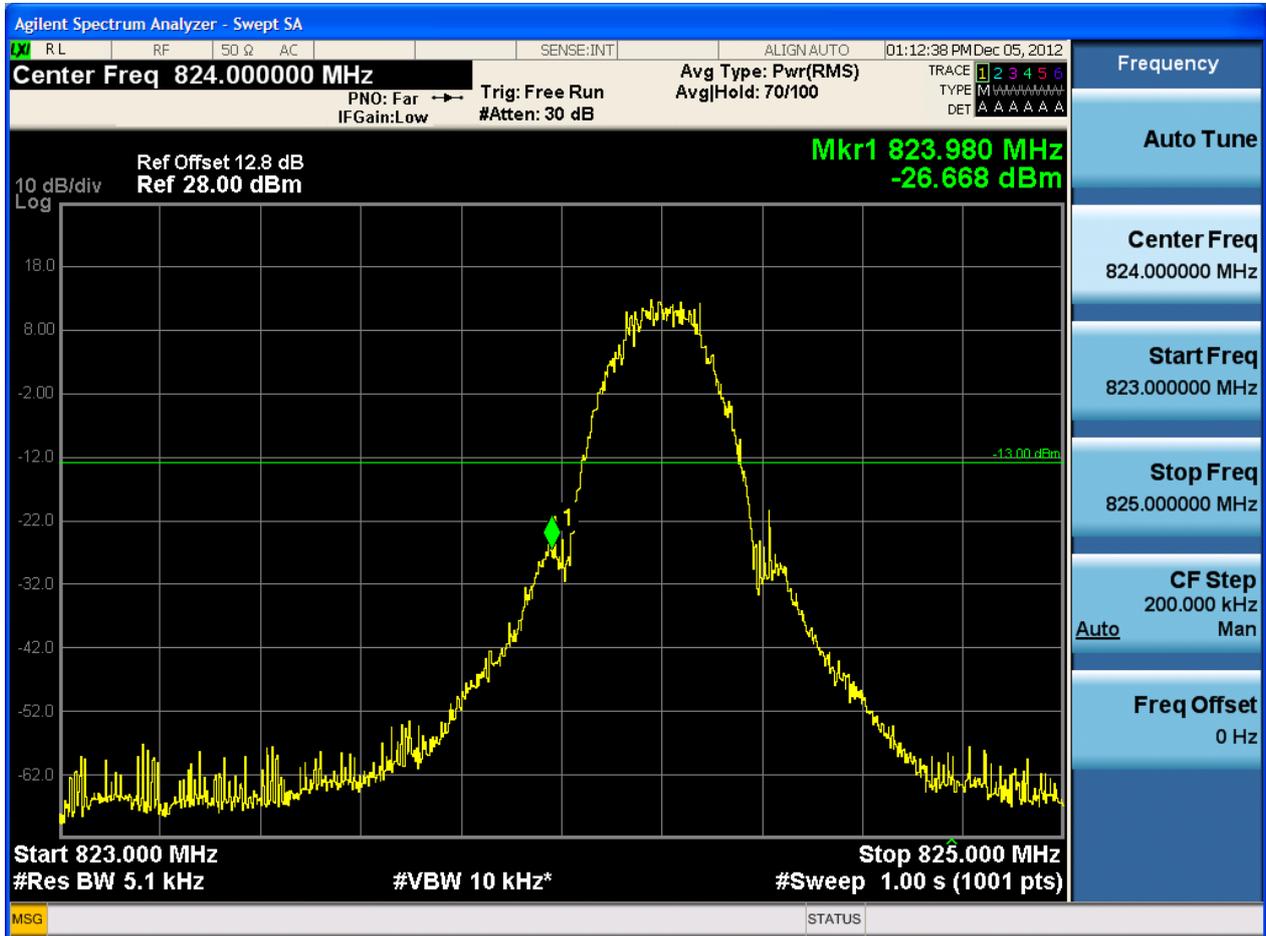
4.1.1.1.2 Test Channel = HCH



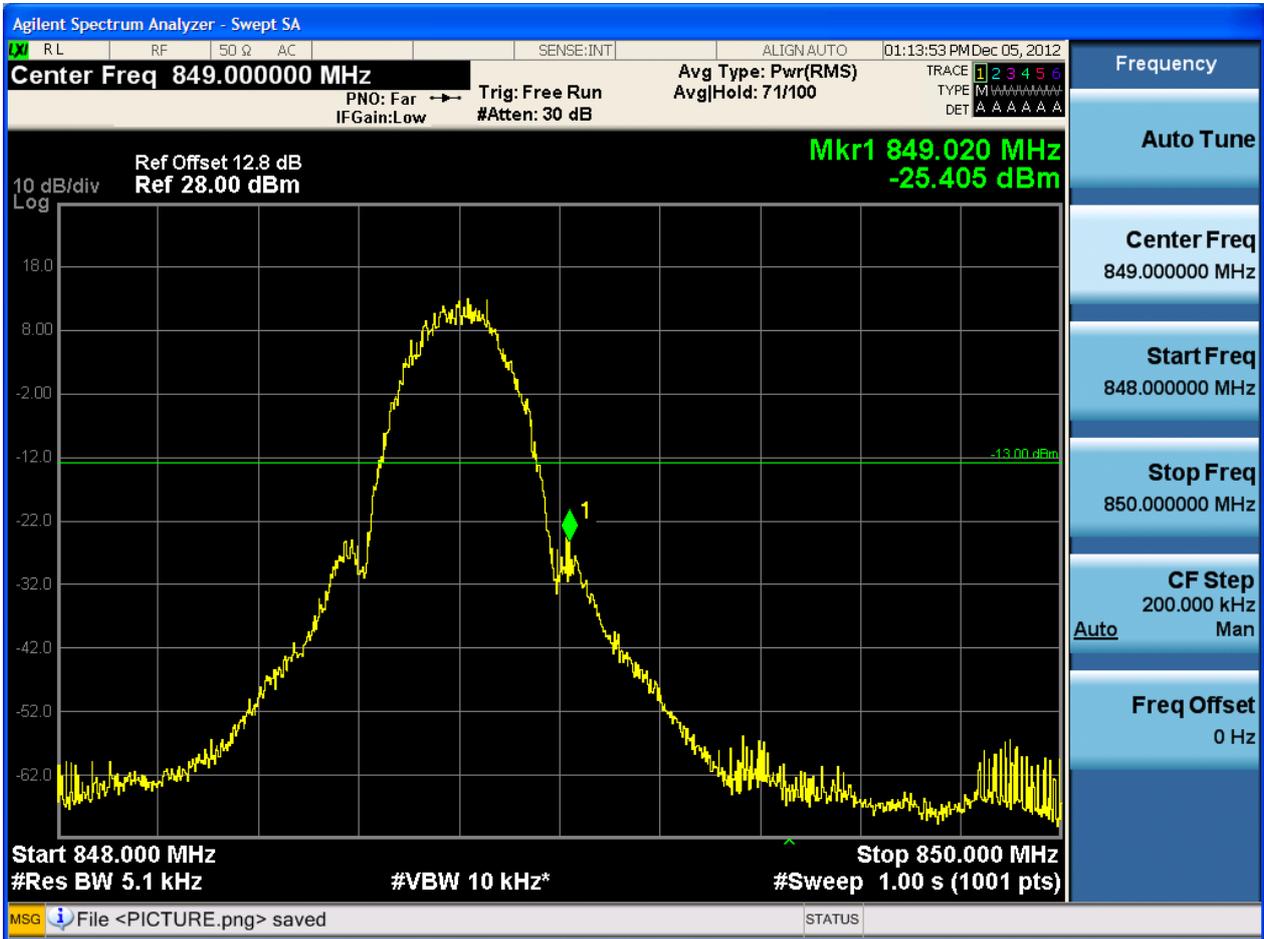


4.1.1.2 Test Mode = GSM/TM2

4.1.1.2.1 Test Channel = LCH



4.1.1.2.2 Test Channel = HCH

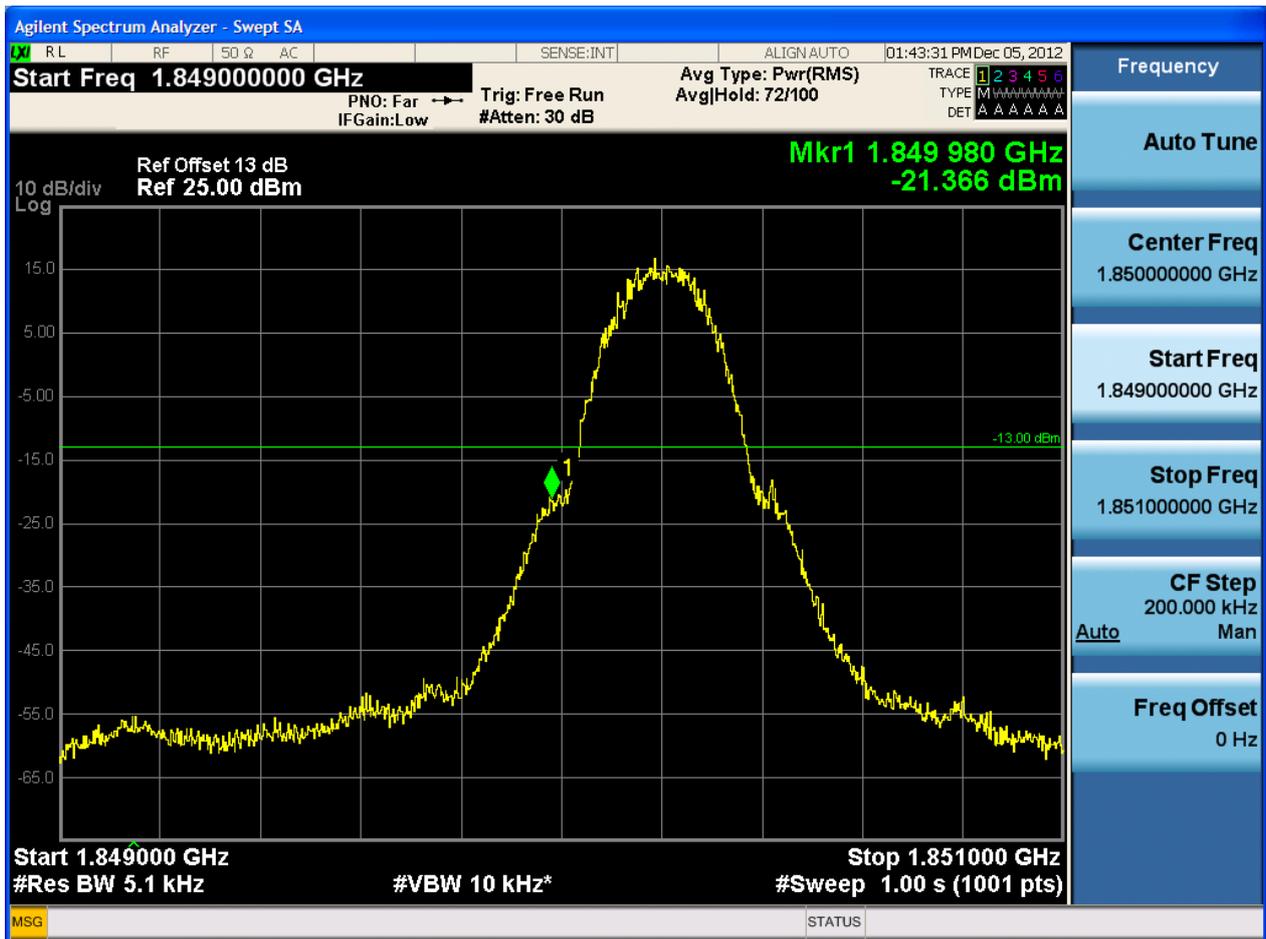




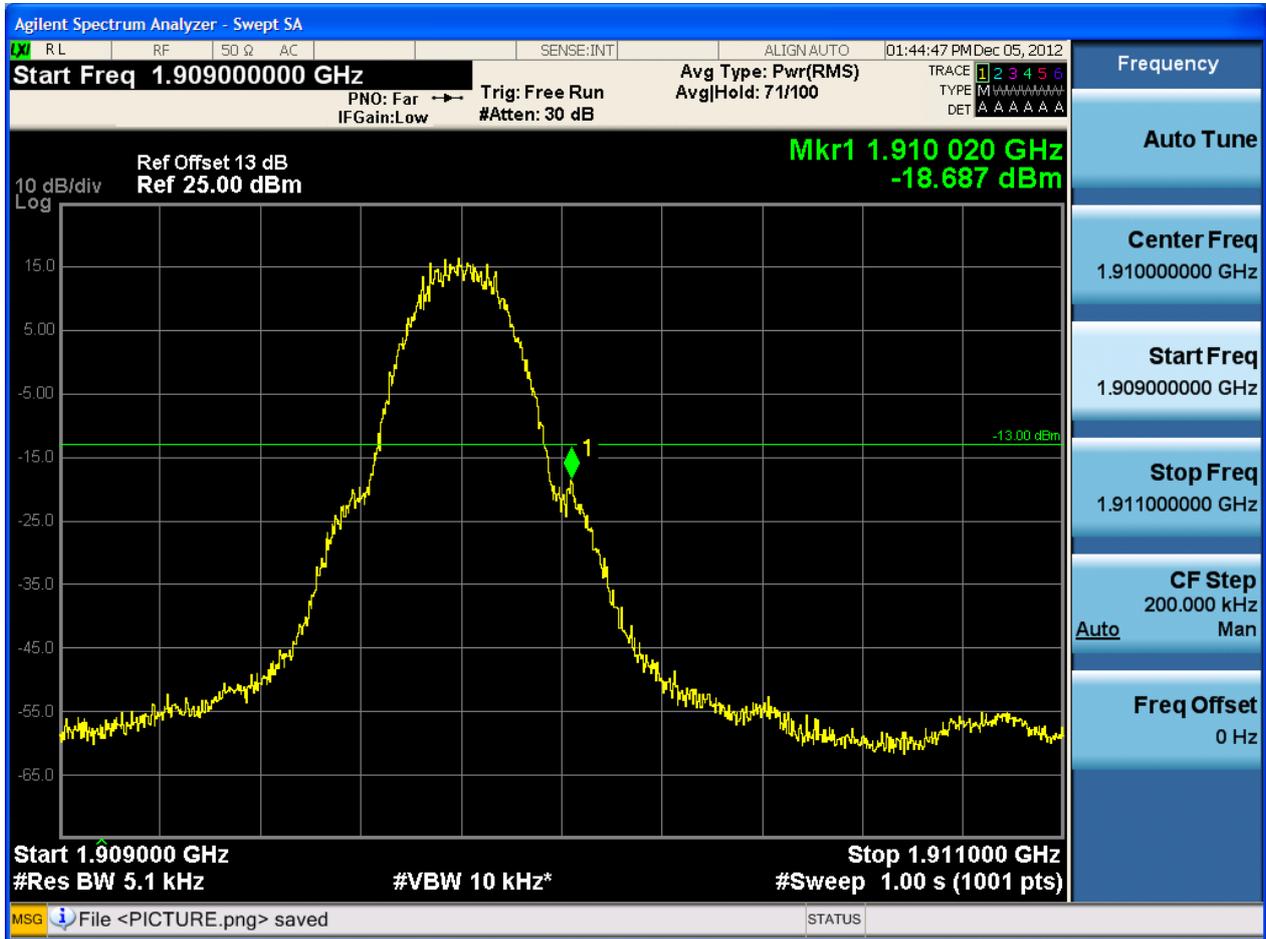
4.1.2 Test Band = GSM1900

4.1.2.1 Test Mode = GSM/TM1

4.1.2.1.1 Test Channel = LCH

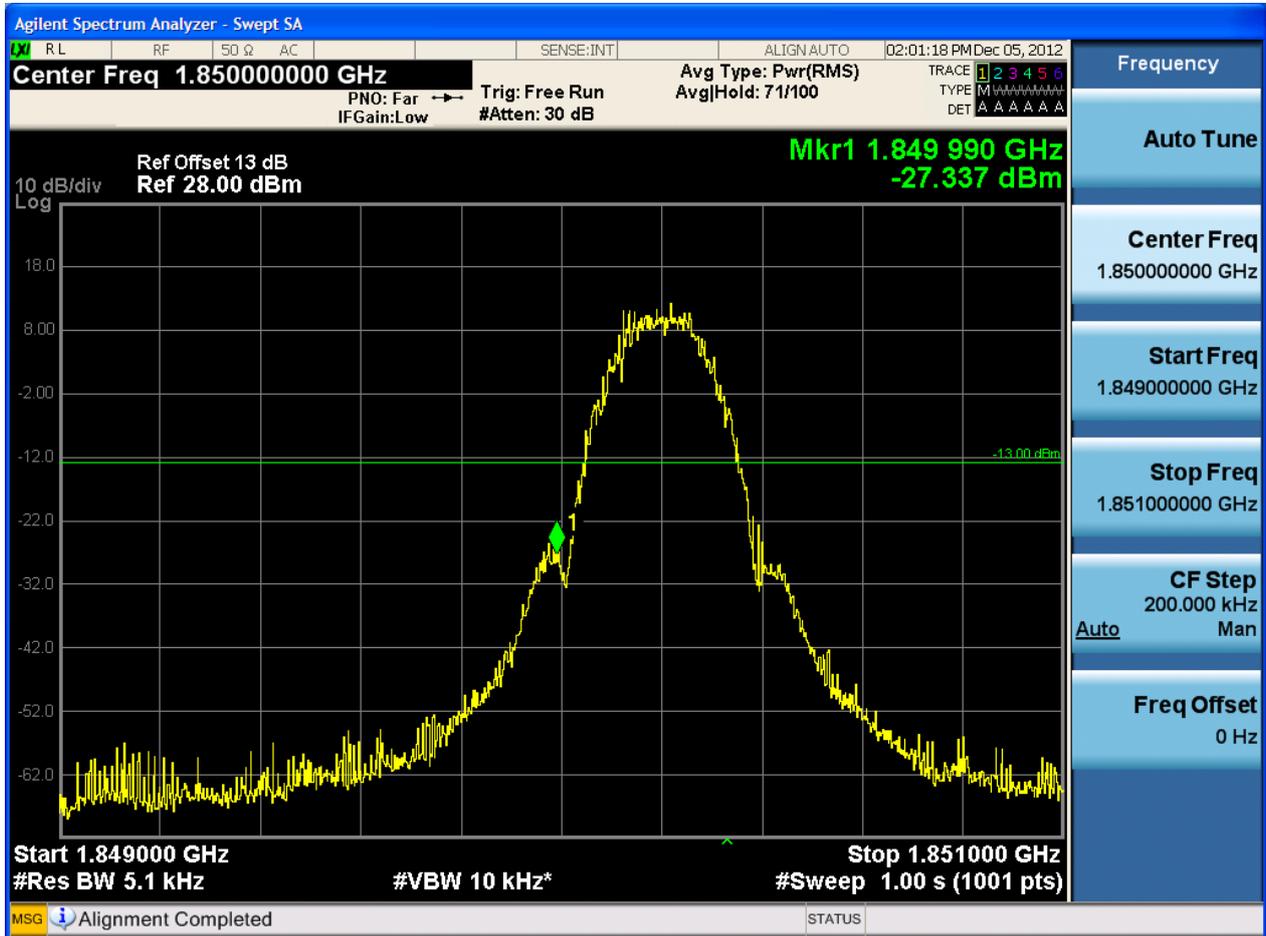


4.1.2.1.2 Test Channel = HCH

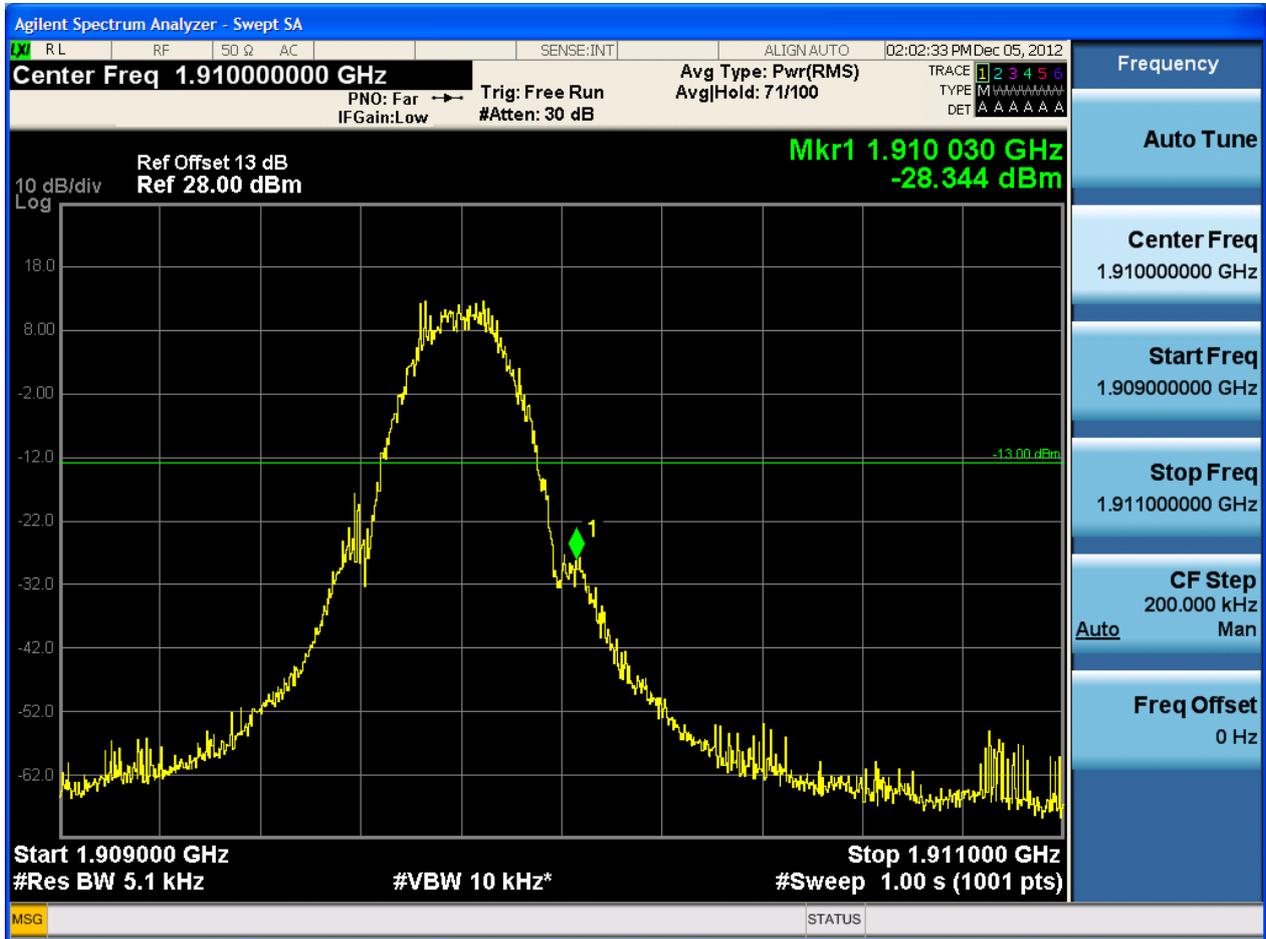


4.1.2.2 Test Mode = GSM/TM2

4.1.2.2.1 Test Channel = LCH



4.1.2.2.2 Test Channel = HCH



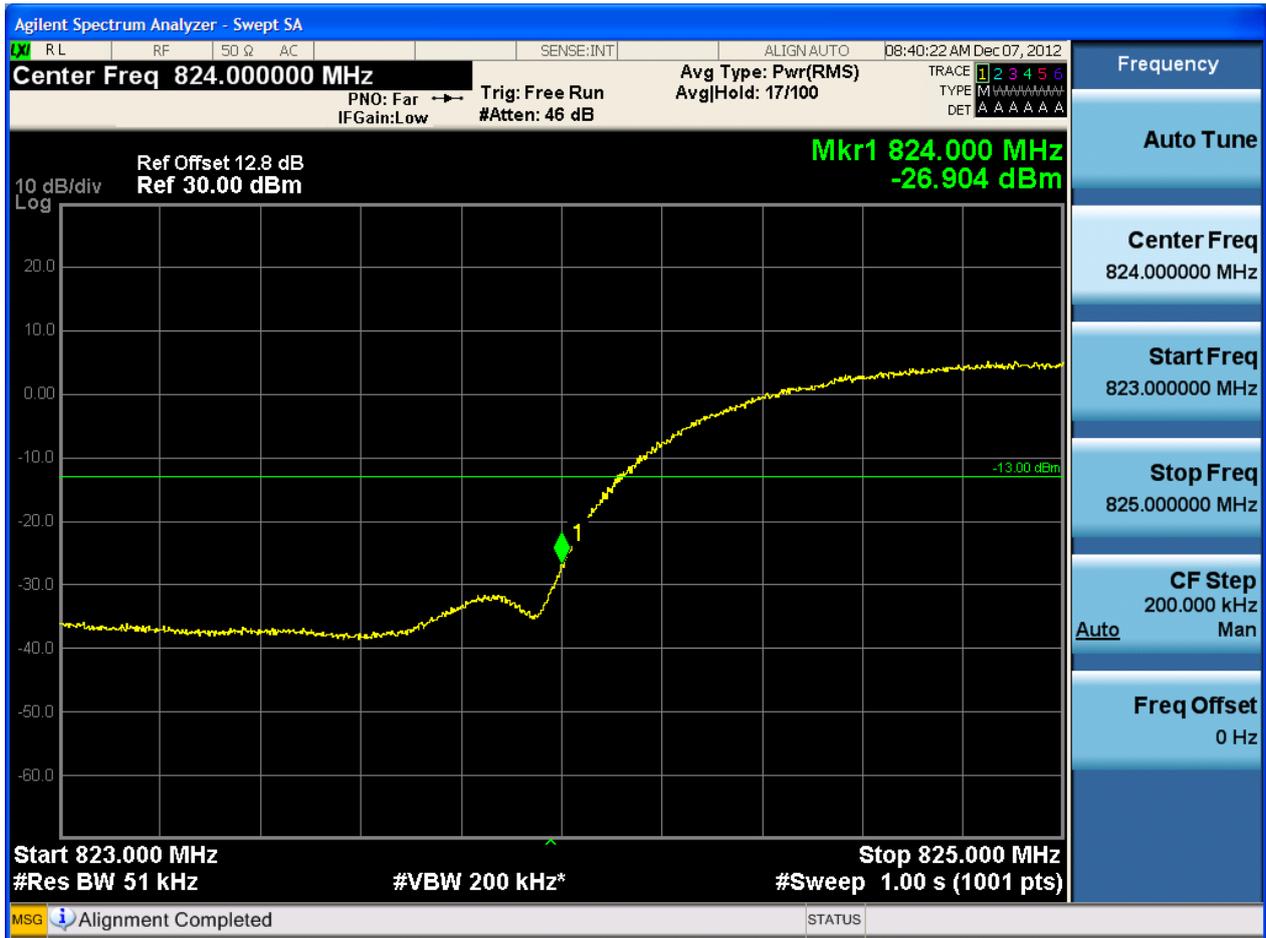


4.2 For UMTS

4.2.1 Test Band = WCDMA850

4.2.1.1 Test Mode = UMTS/TM1

4.2.1.1.1 Test Channel = LCH





4.2.1.1.2 Test Channel = HCH





Appendix_D: Spurious Emission at Antenna Terminal

NOTE: For the averaged unwanted emissions measurements, the measurement points in each sweep is greater than twice the Span/RBW in order to ensure bin-to-bin spacing of $< RBW/2$ so that narrowband signals are not lost between frequency bins. As to the present test item, the "Measurement Points = $k * (Span / RBW)$ " with k between 4 and 5, which results in an acceptable level error of less than 0.5 dB.

Part I - Test Plots

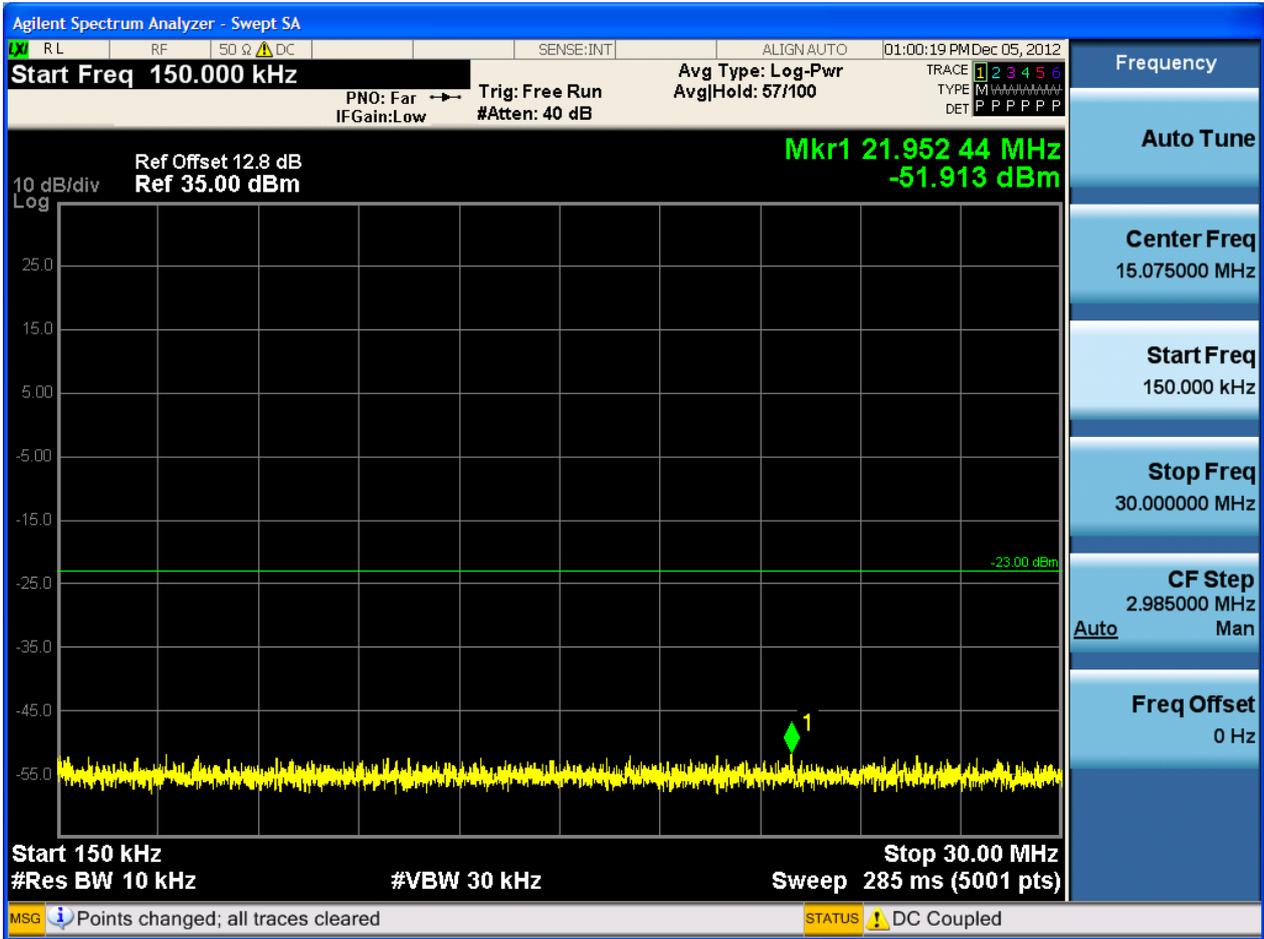
5.1 For GSM

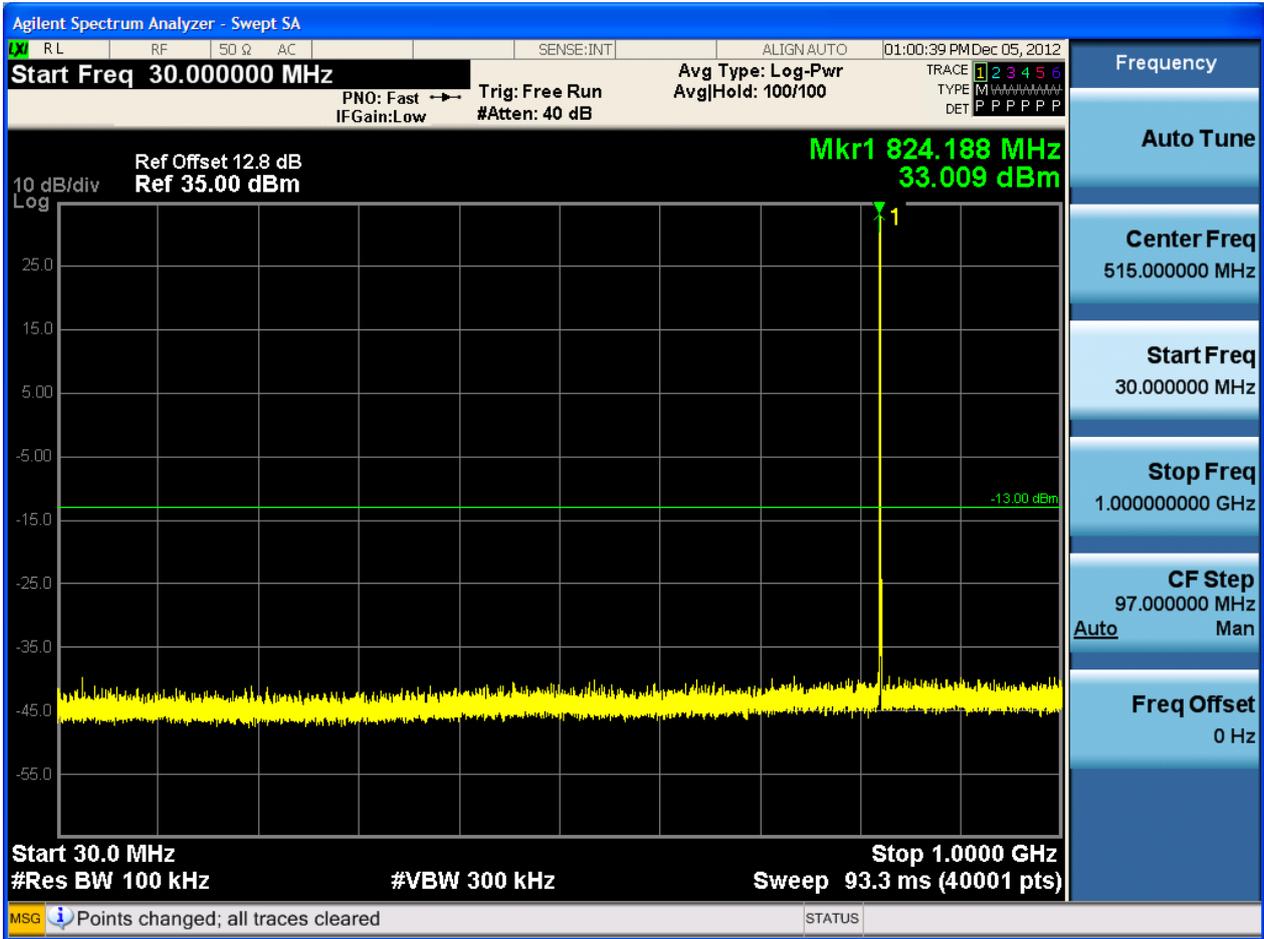
5.1.1 Test Band = GSM850

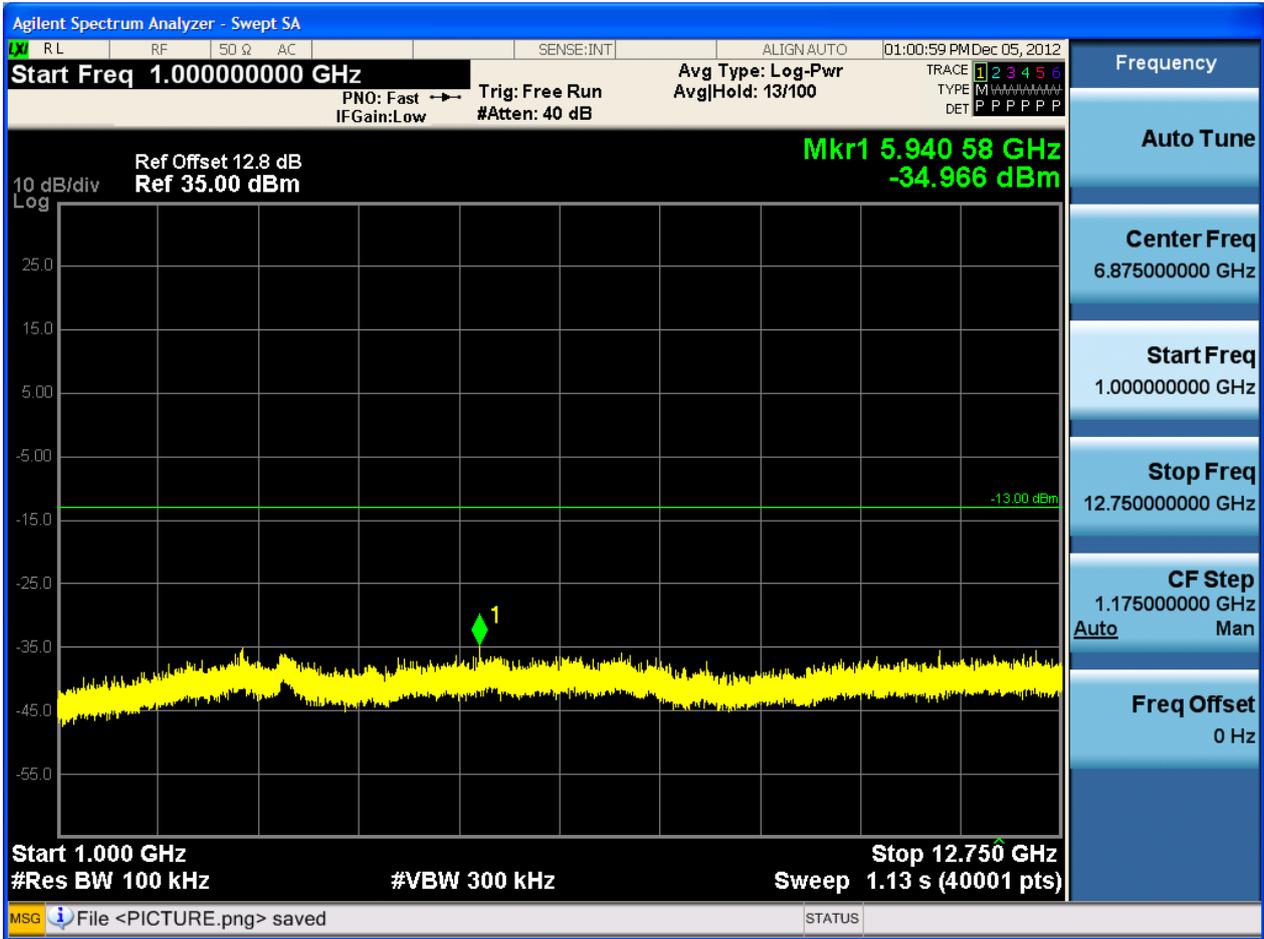
5.1.1.1 Test Mode = GSM/TM1

5.1.1.1.1 Test Channel = LCH



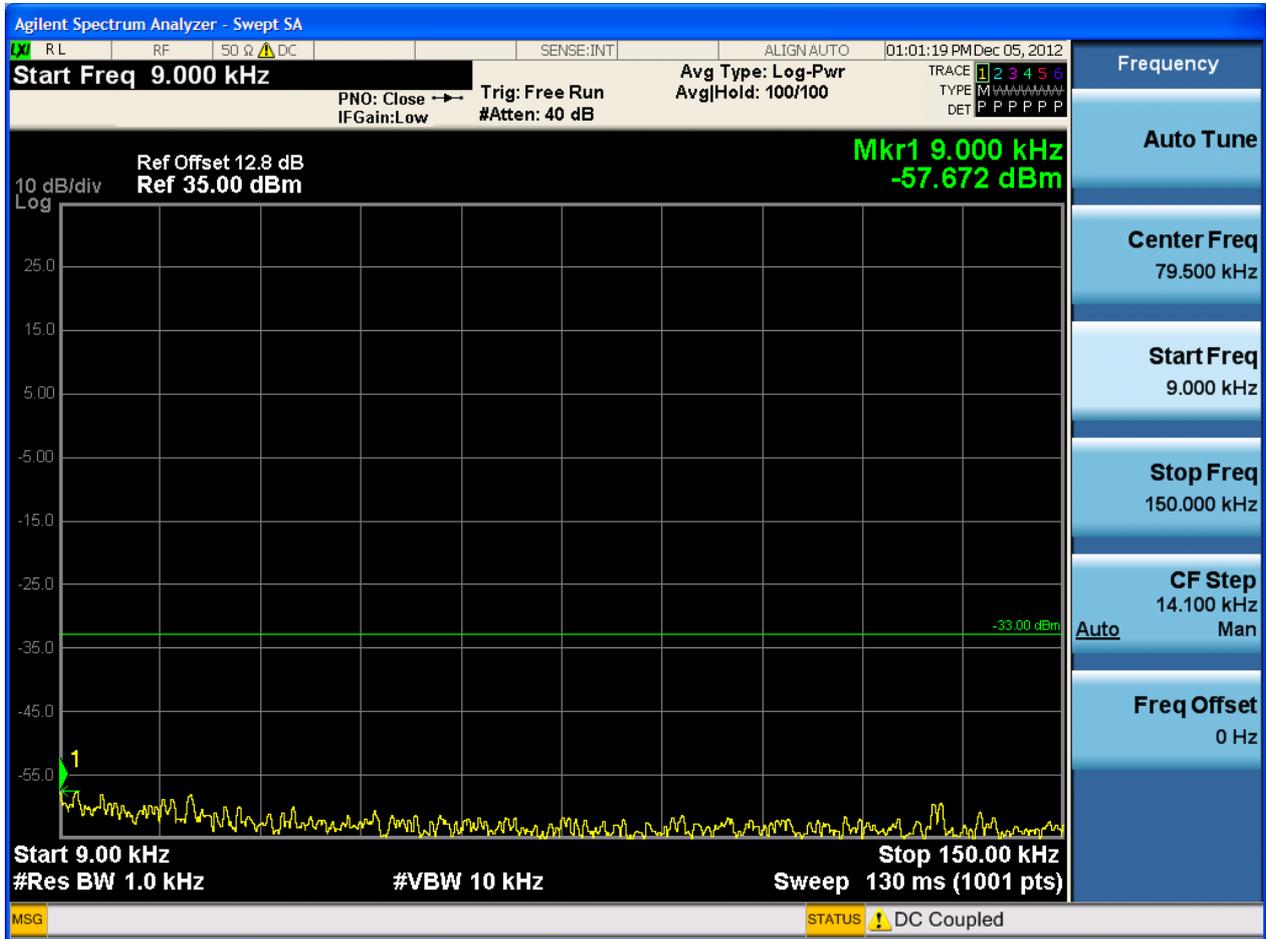


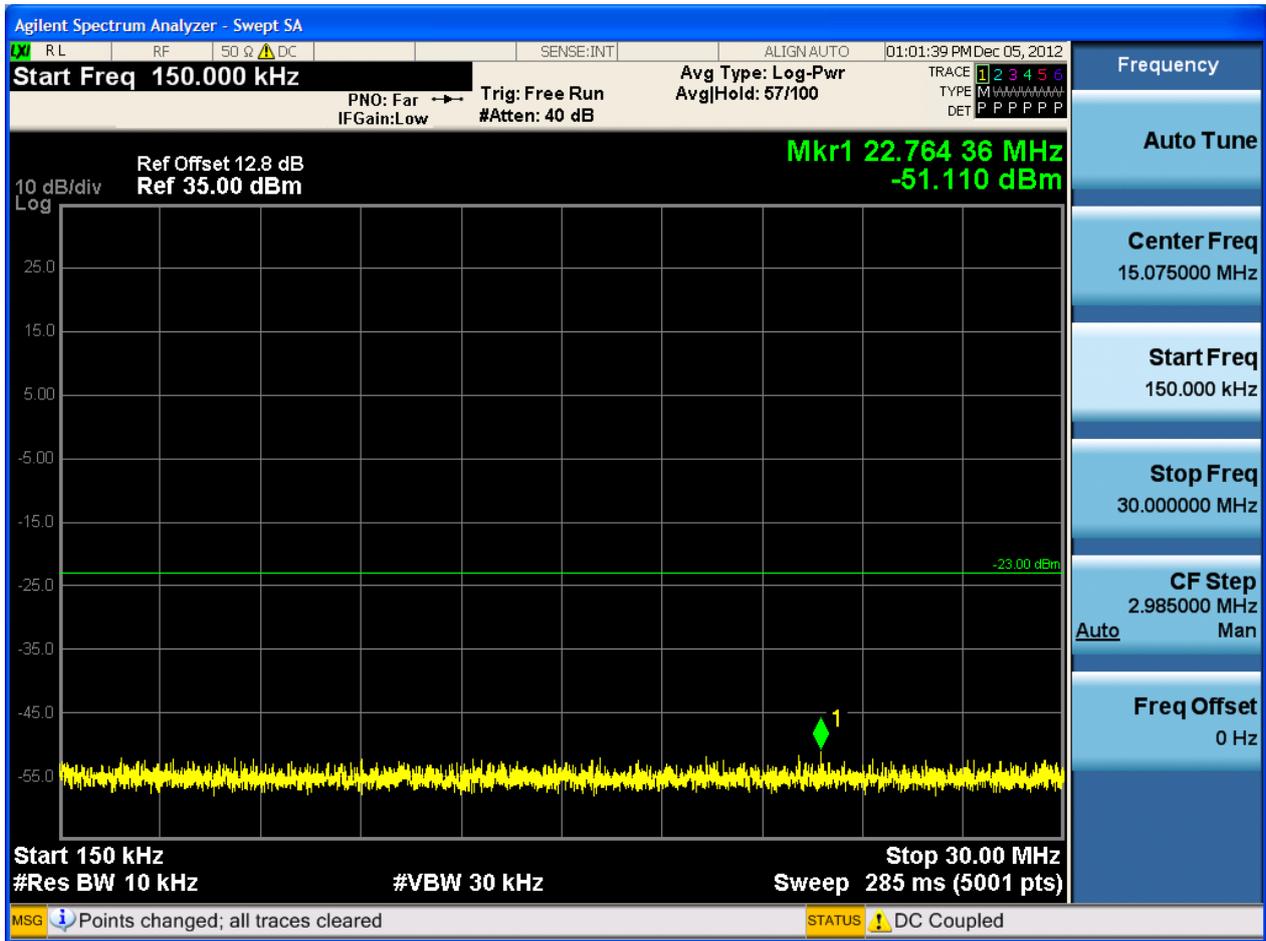


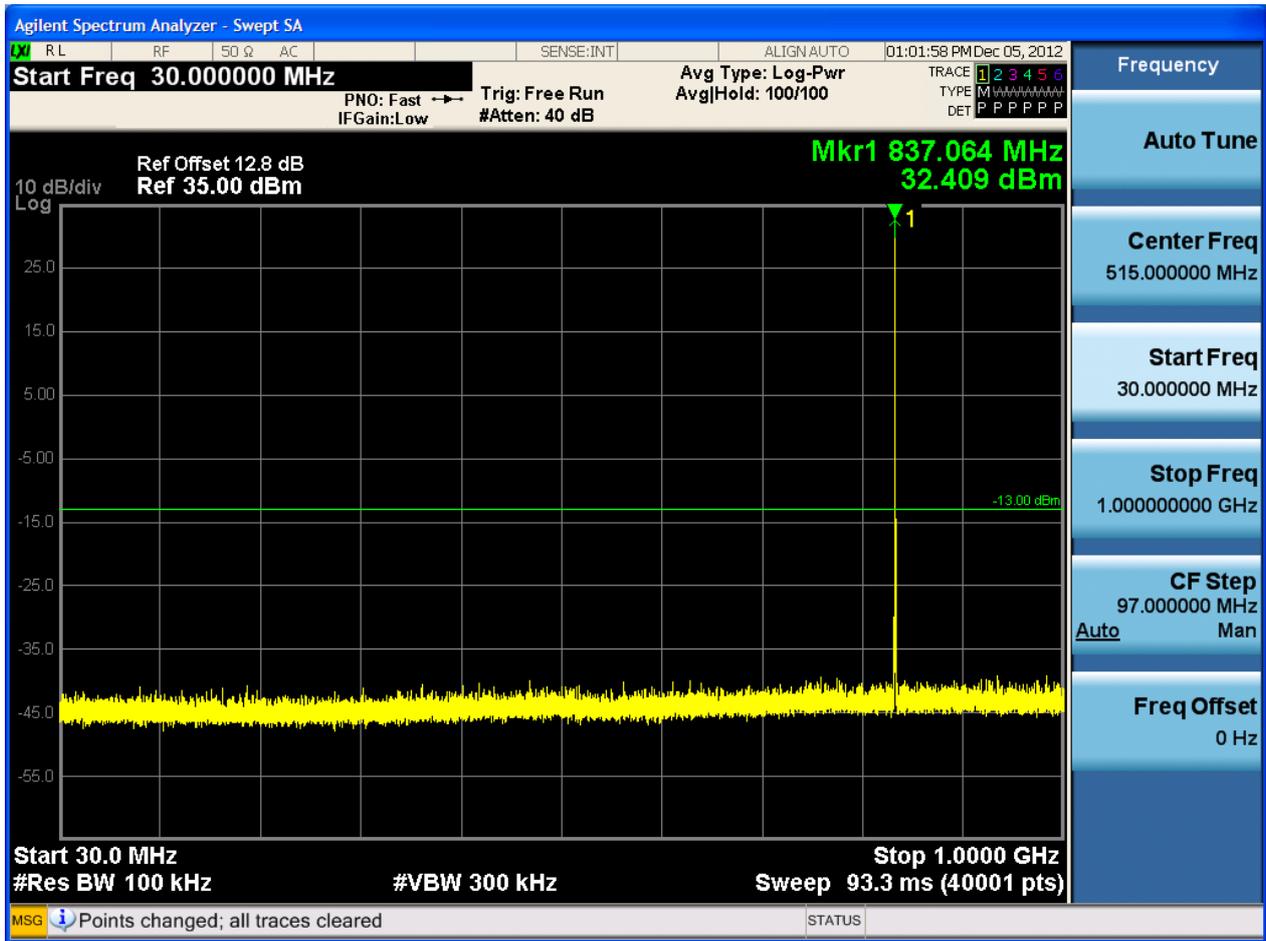


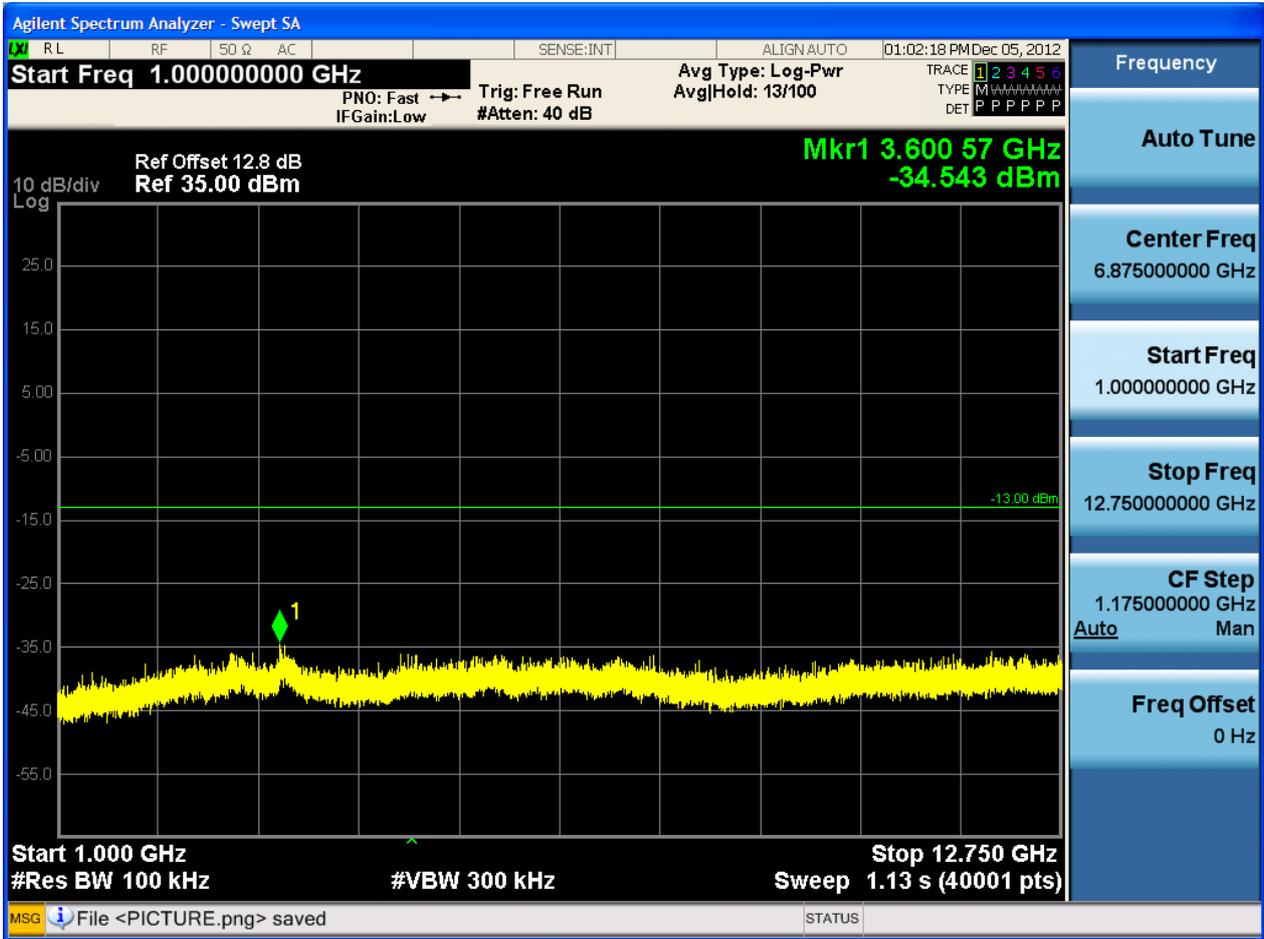


5.1.1.1.2 Test Channel = MCH

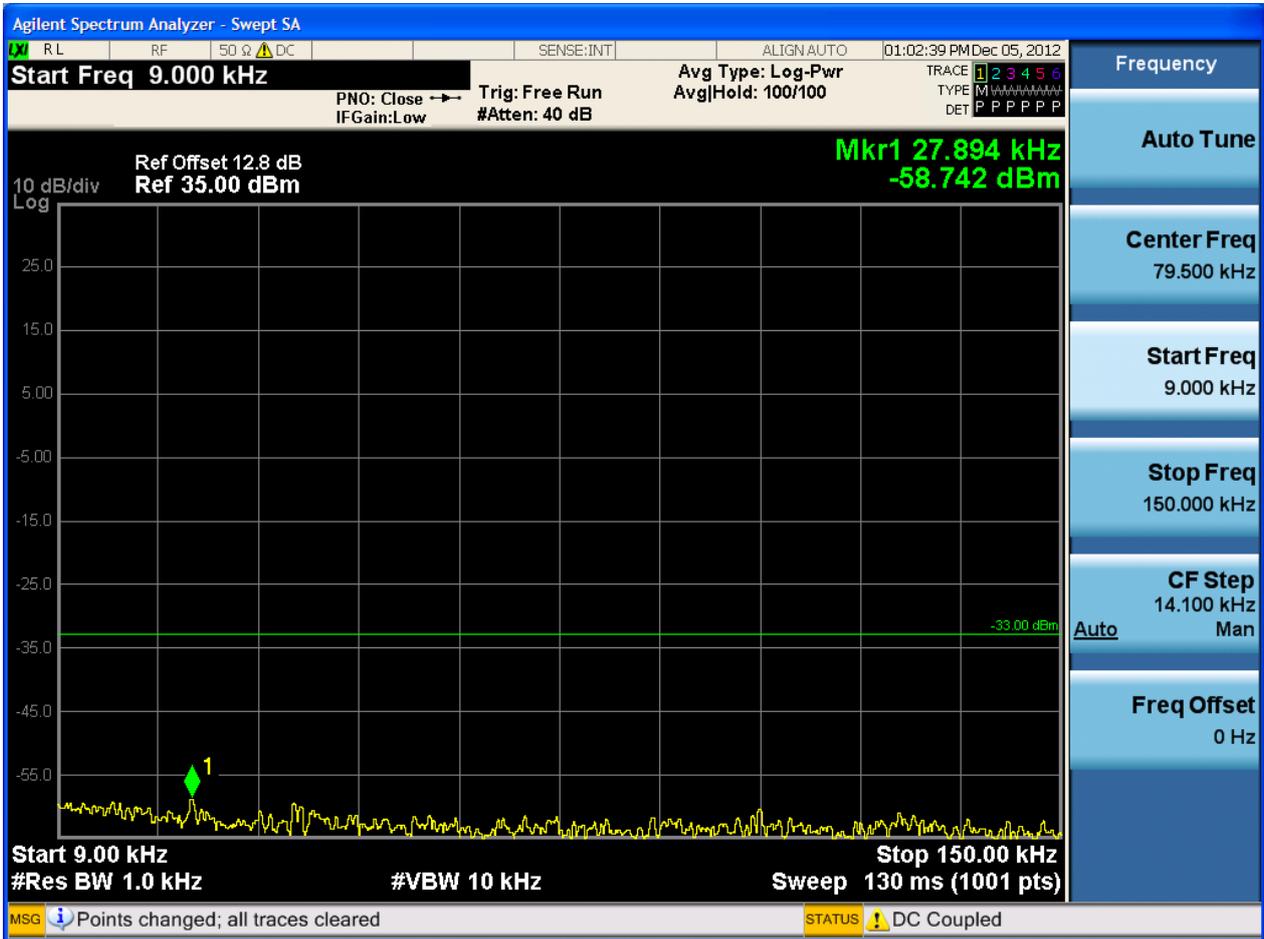


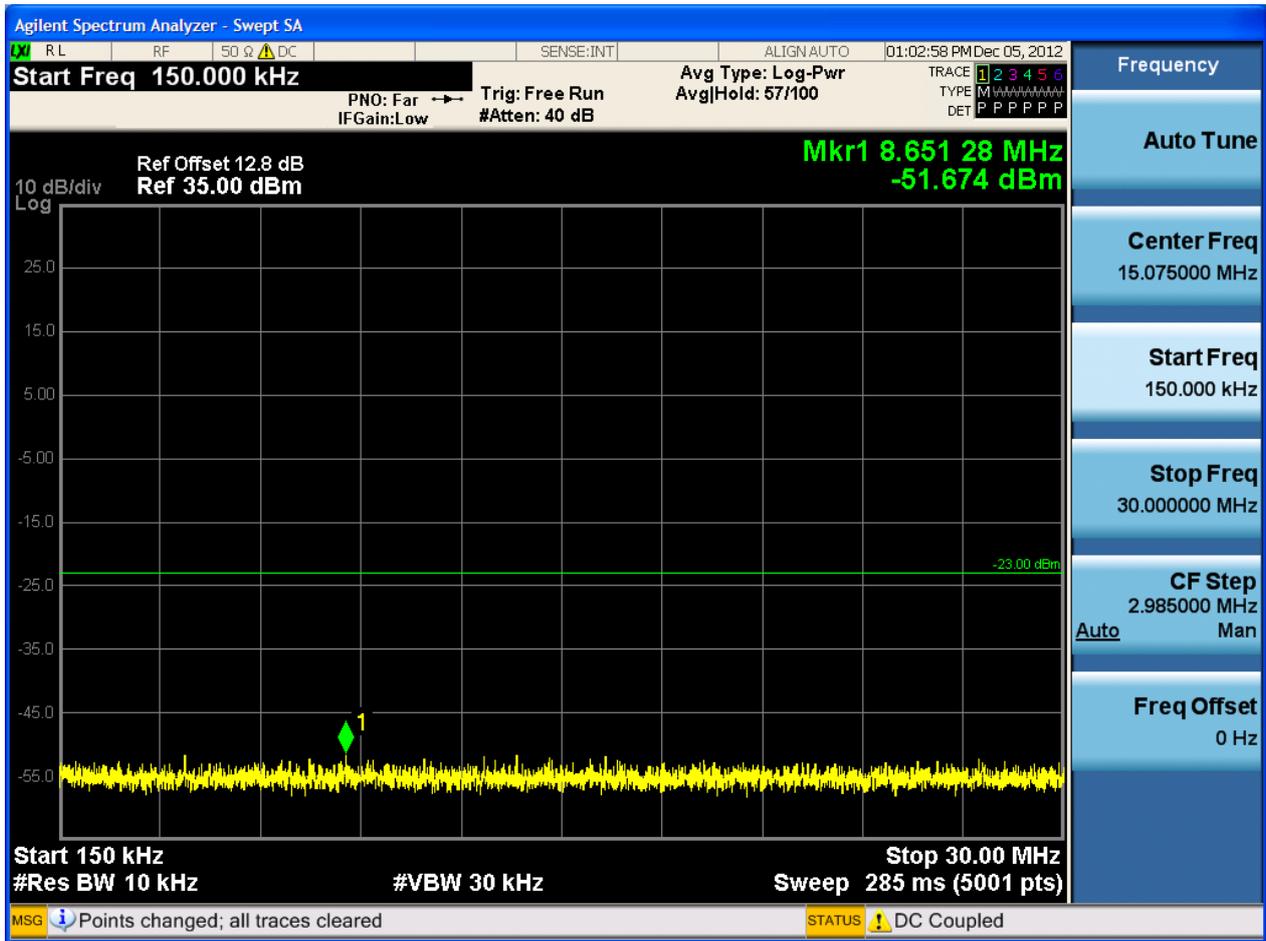


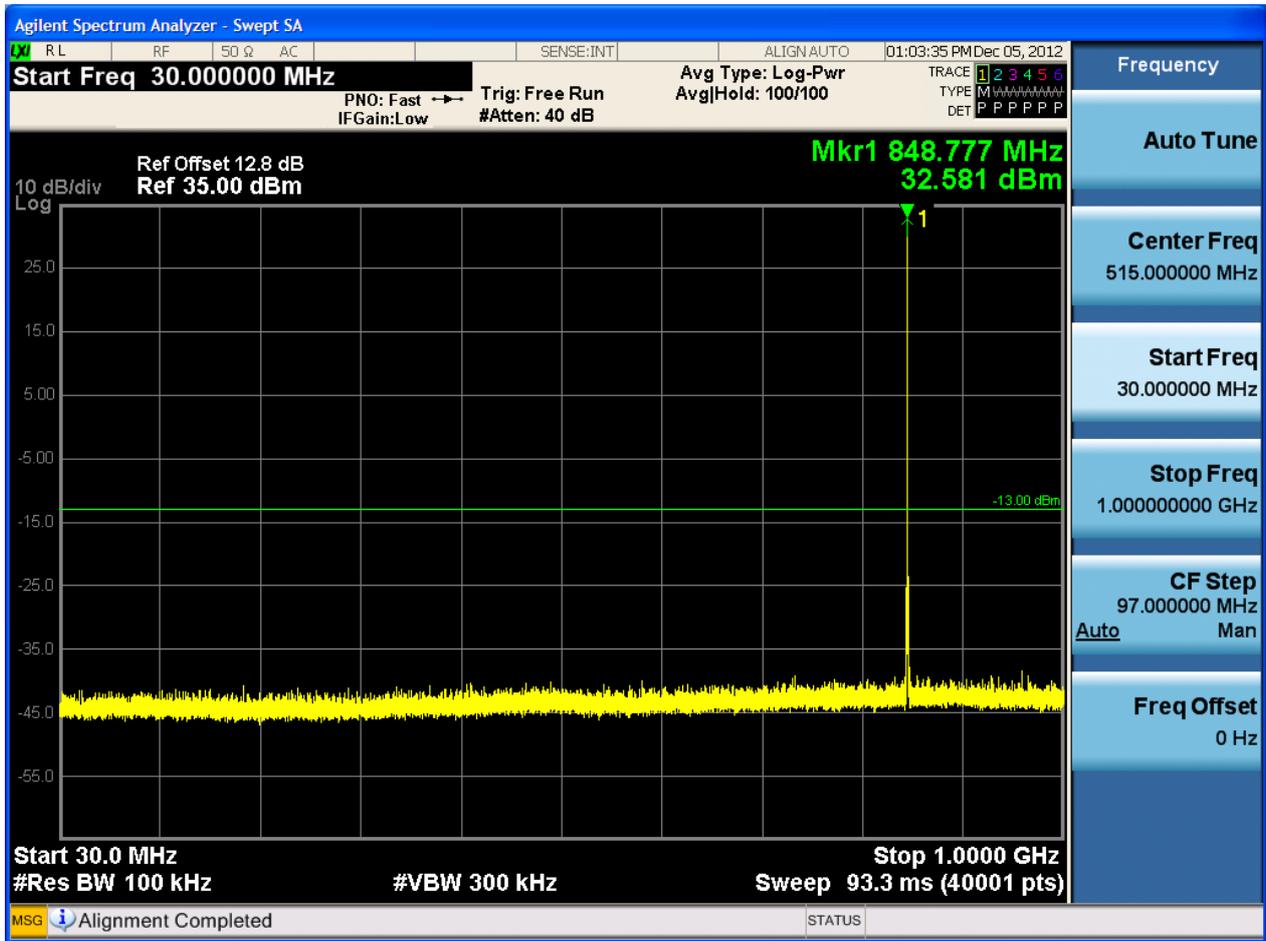


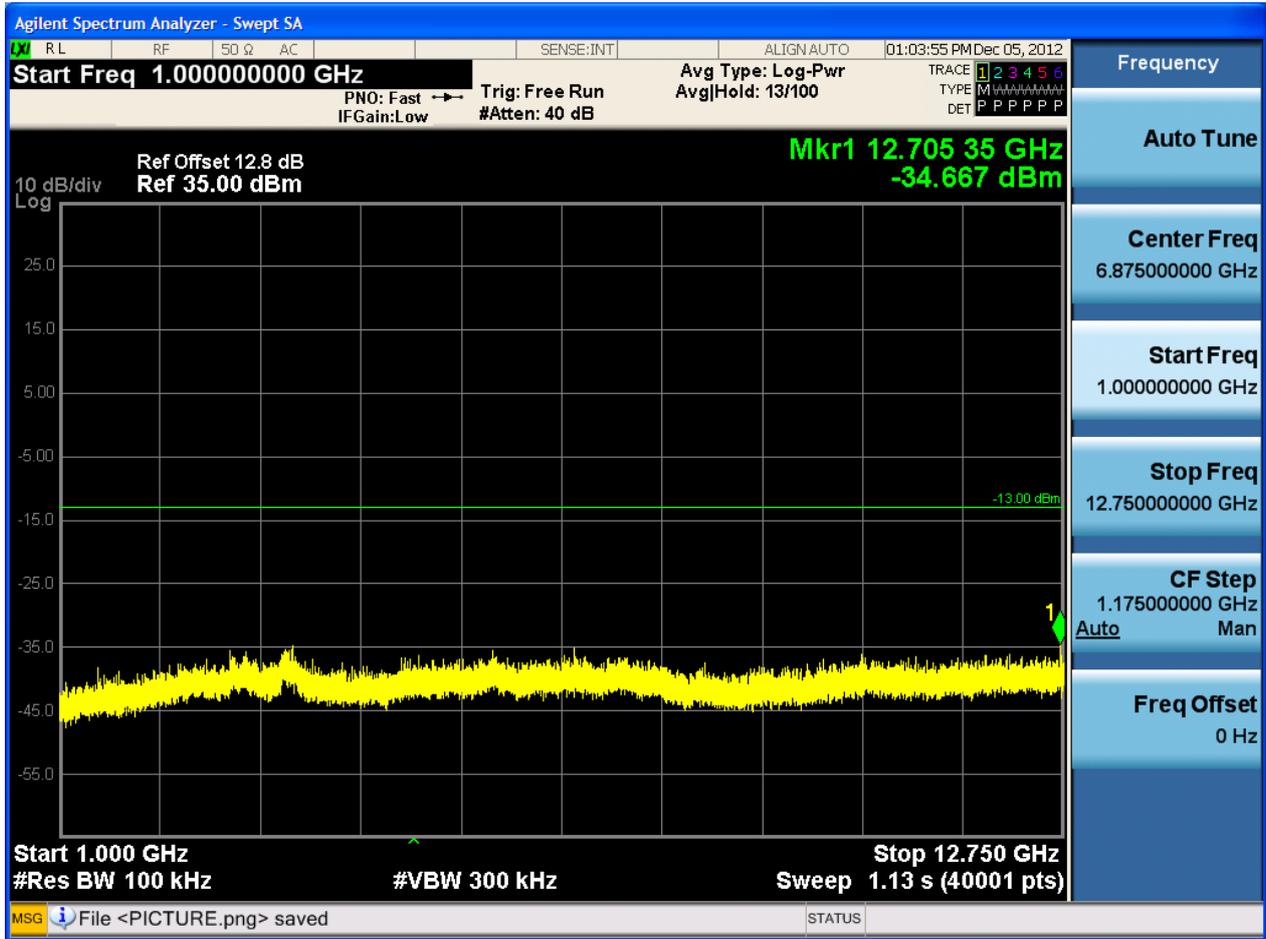


5.1.1.1.3 Test Channel = HCH







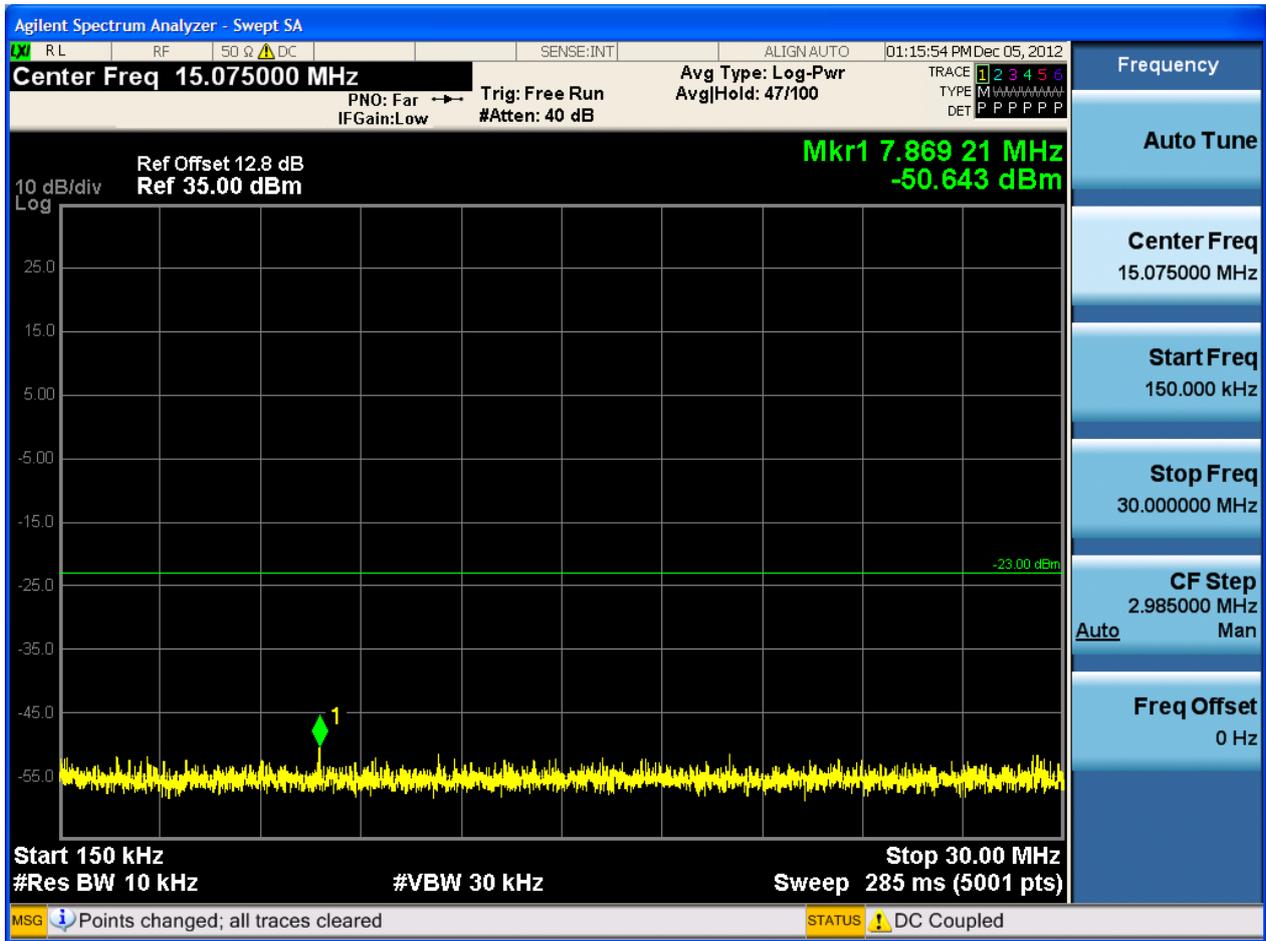


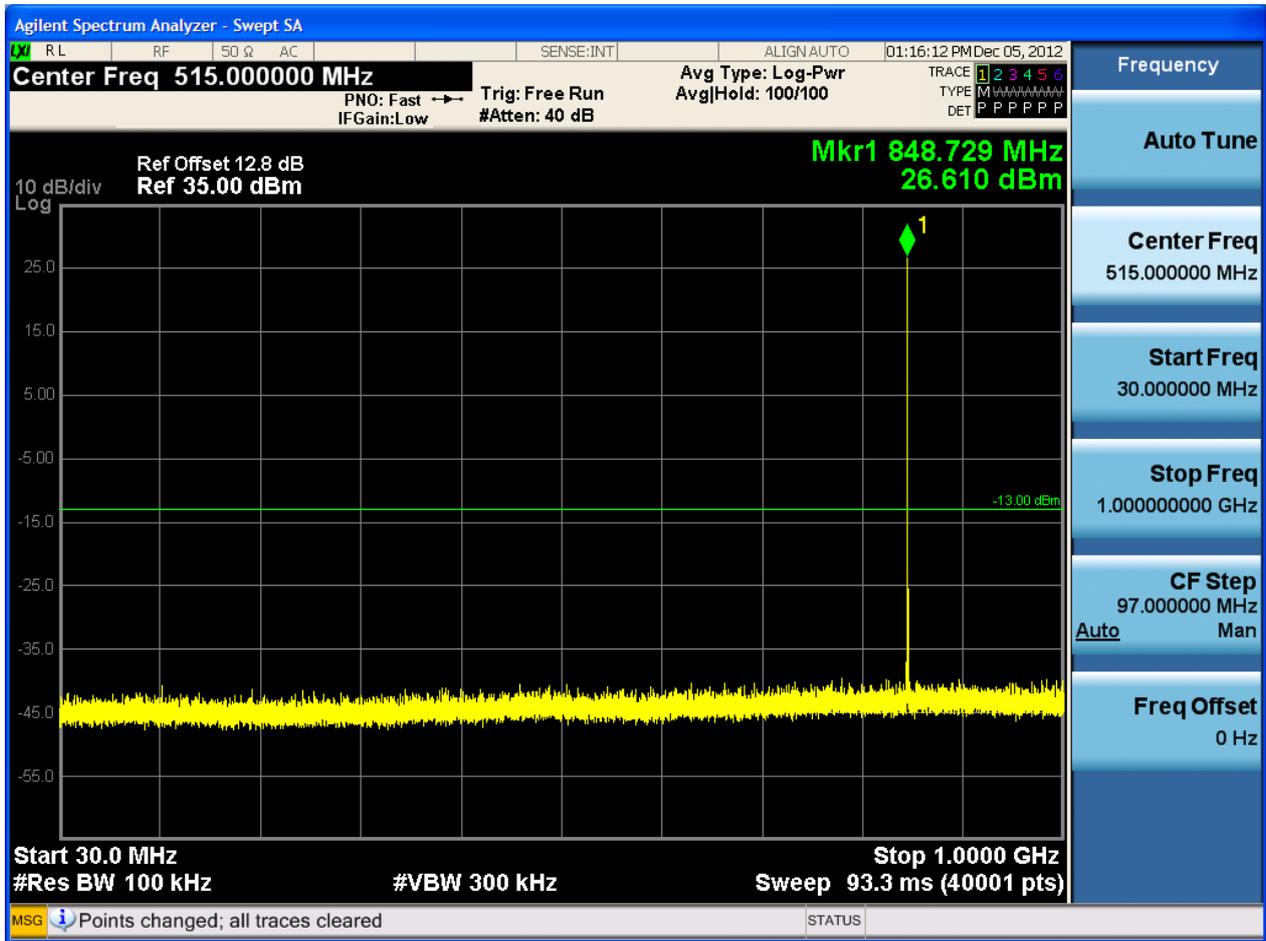


5.1.1.2 Test Mode = GSM/TM2

5.1.1.2.1 Test Channel = LCH

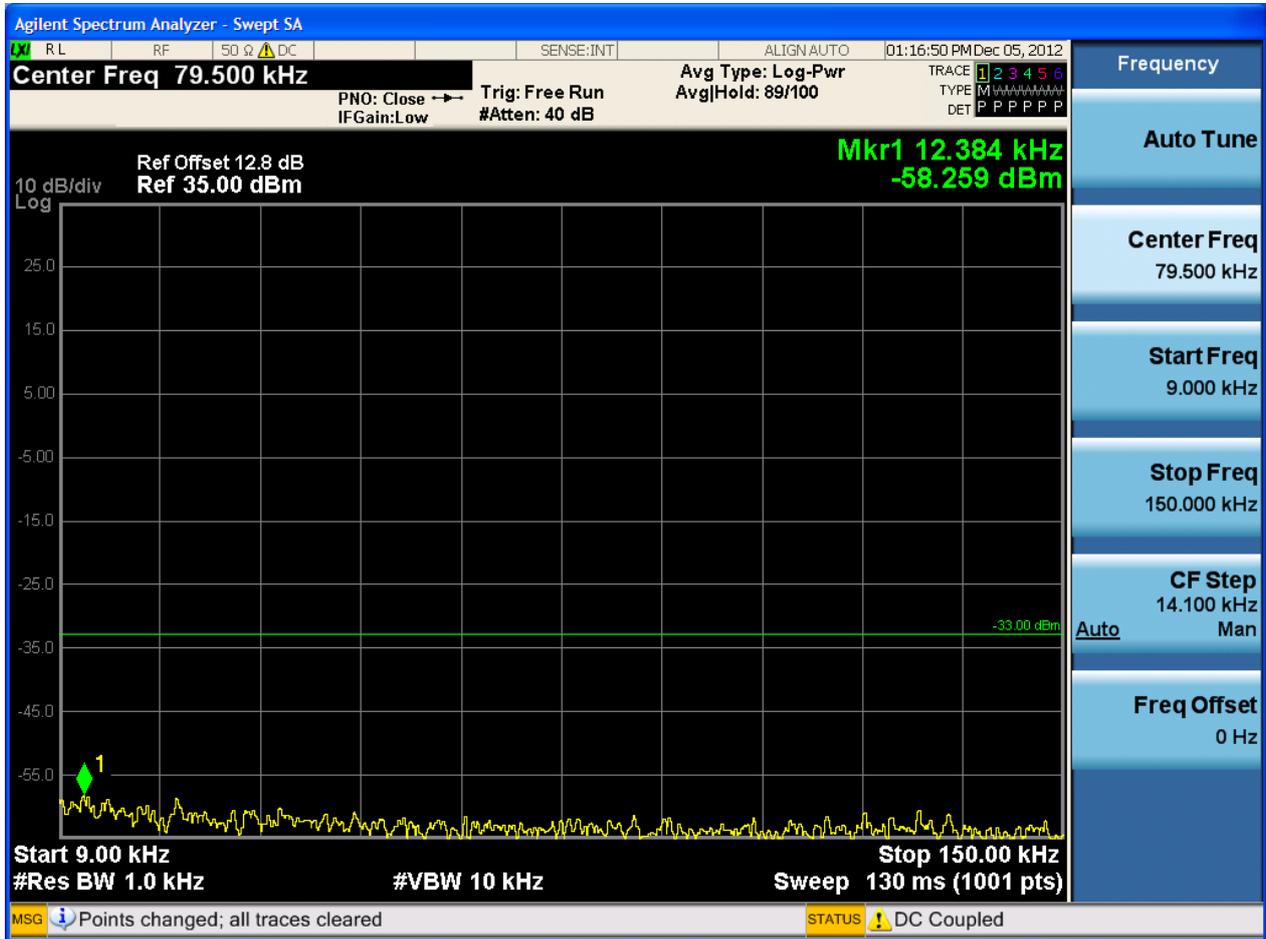


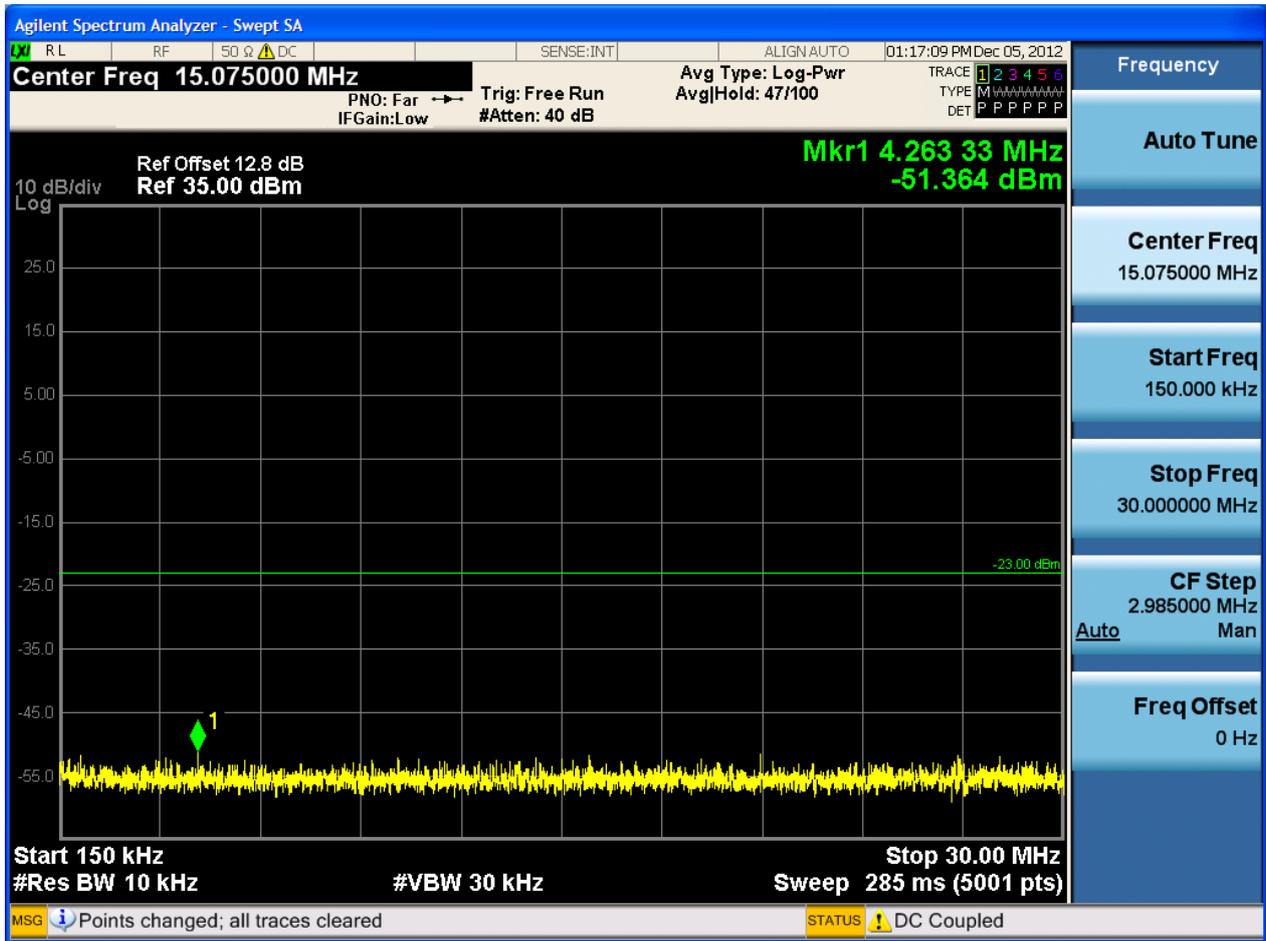


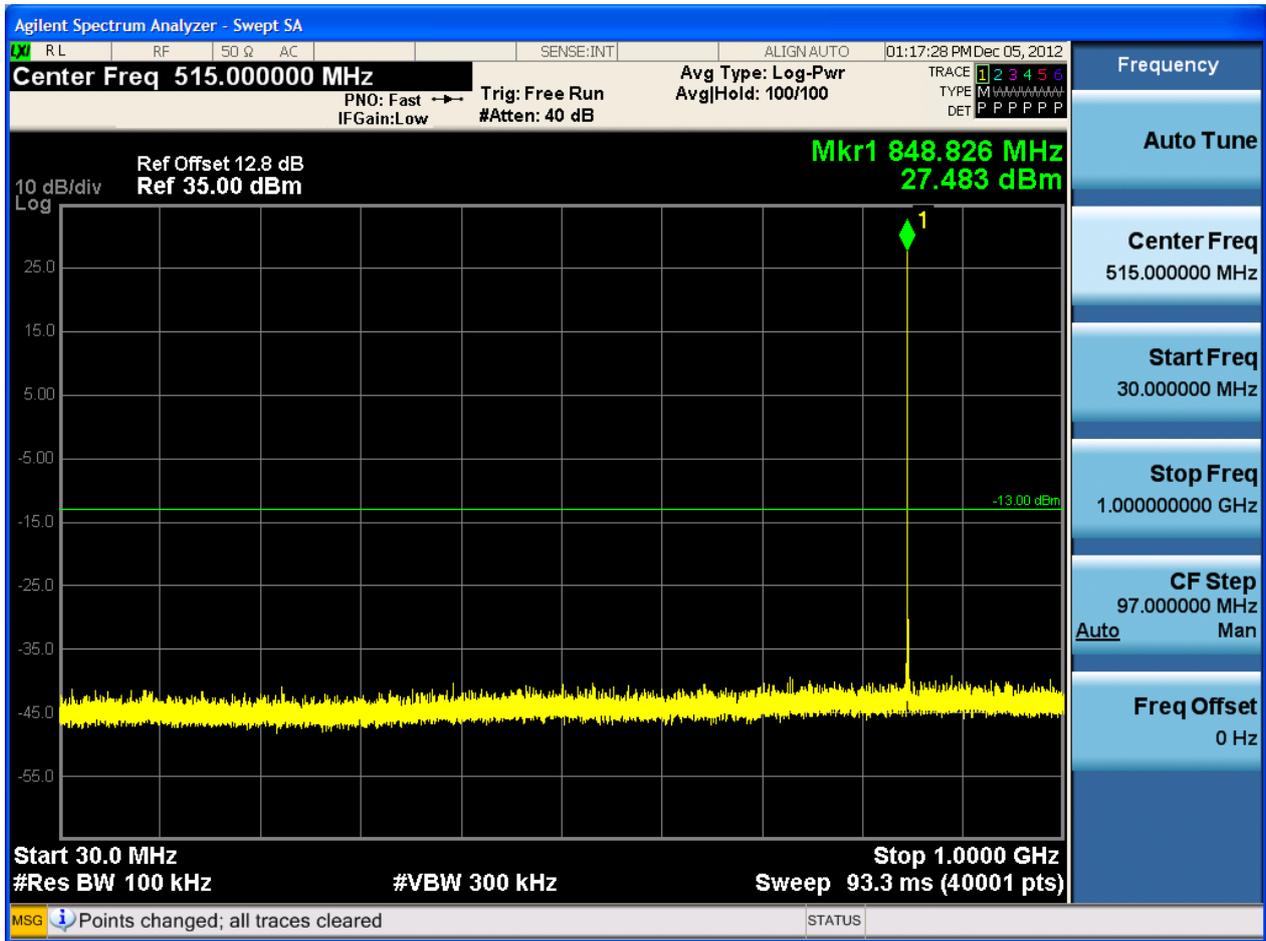


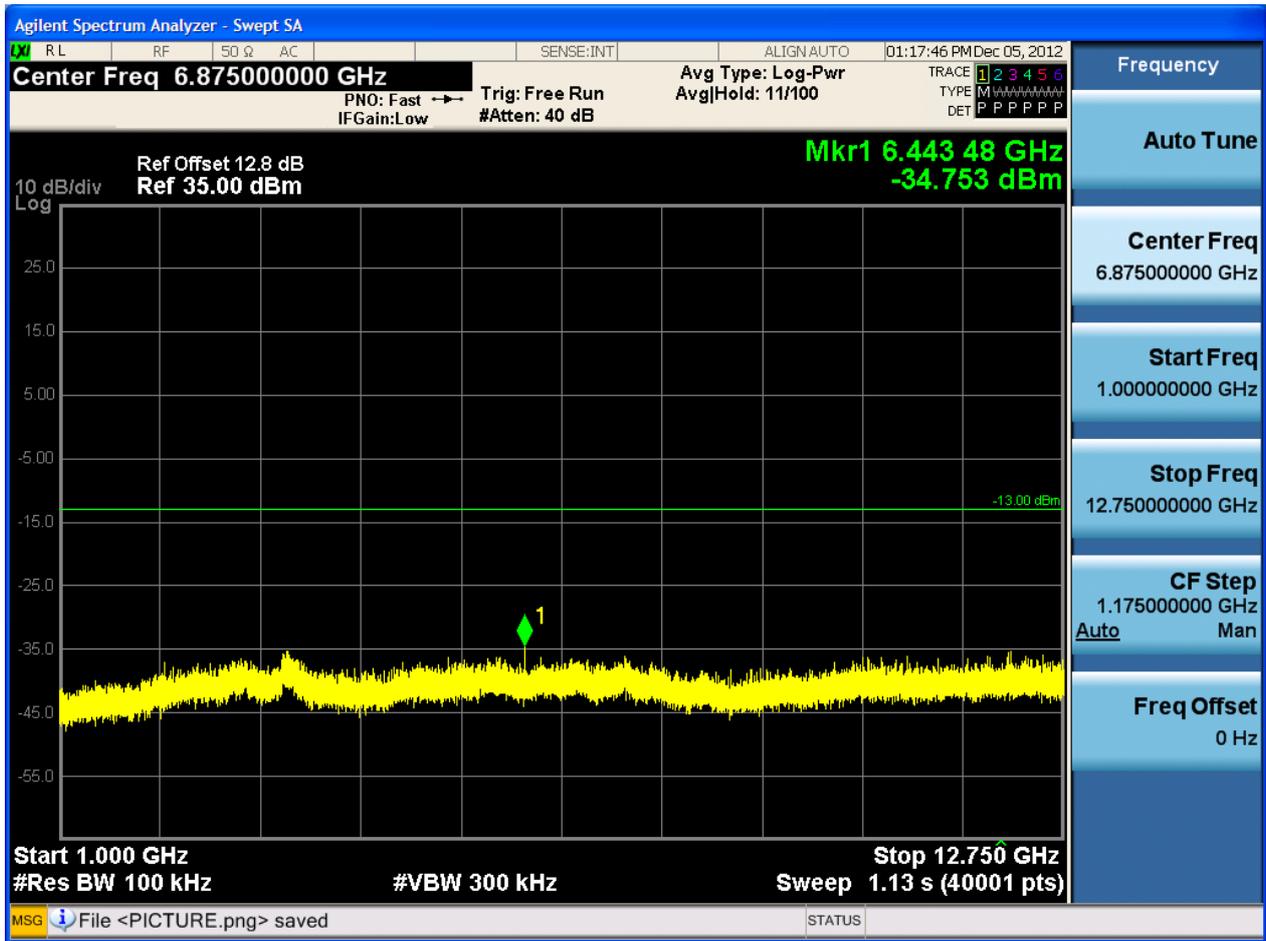


5.1.1.2.2 Test Channel = MCH



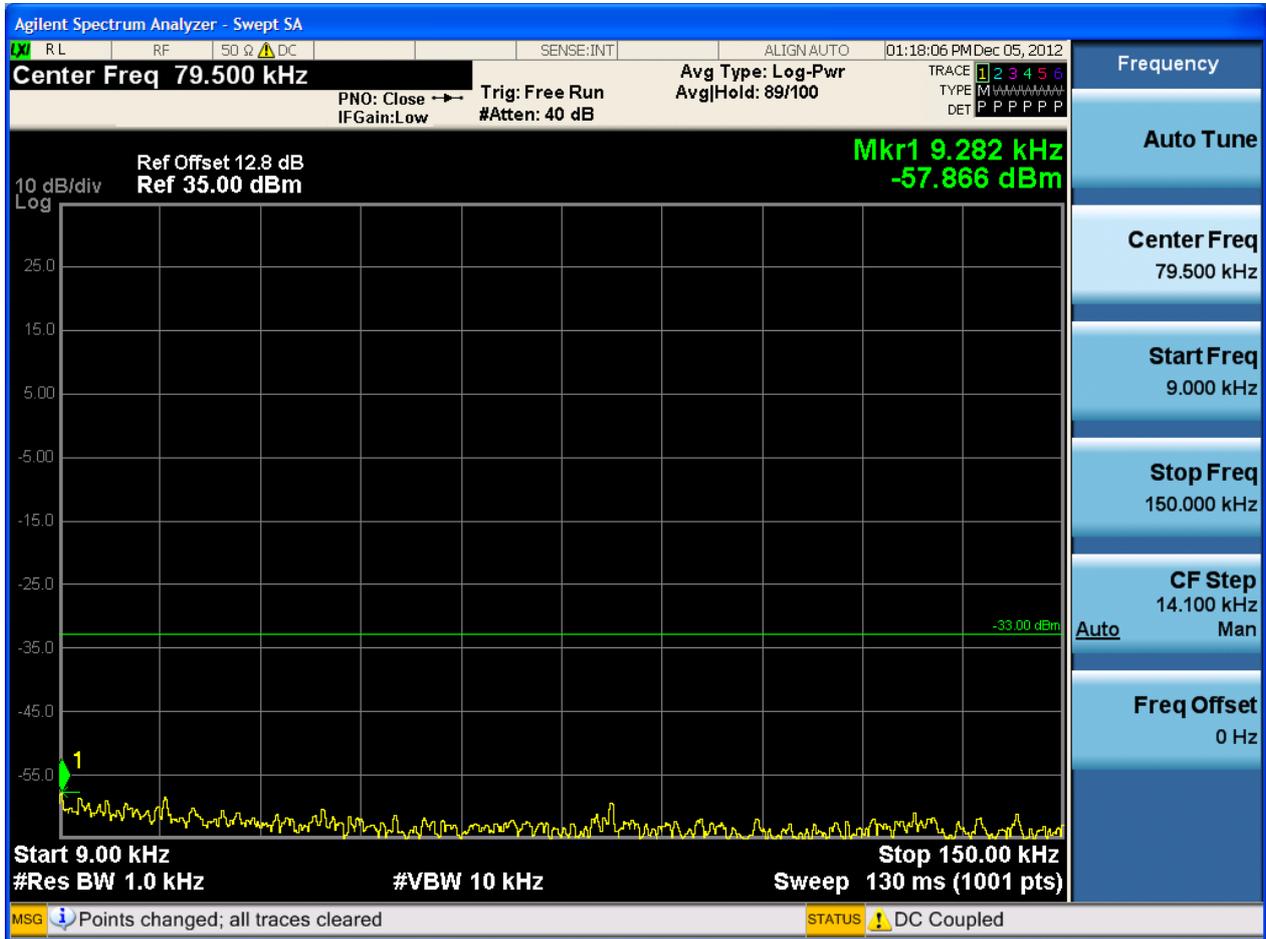


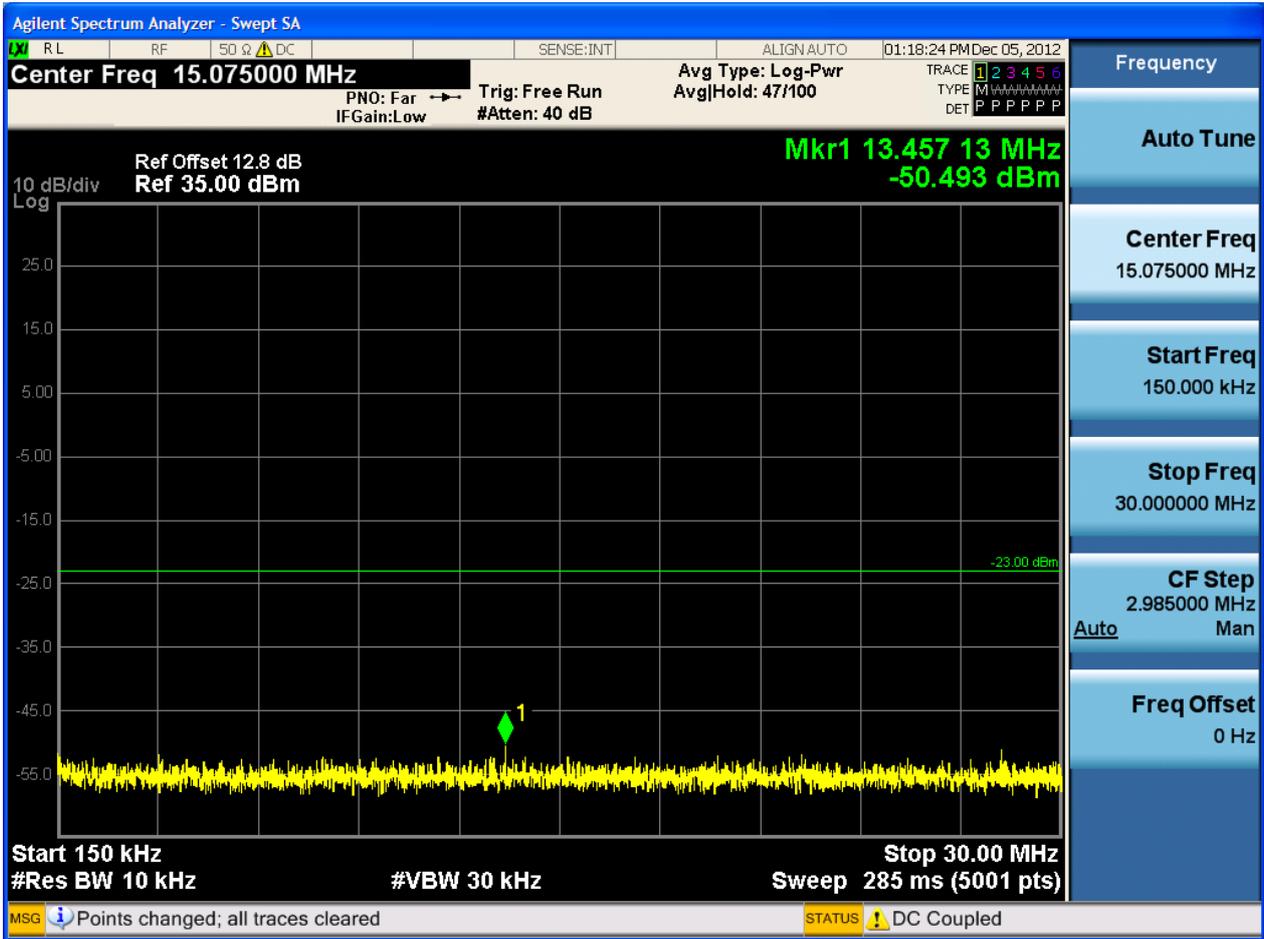


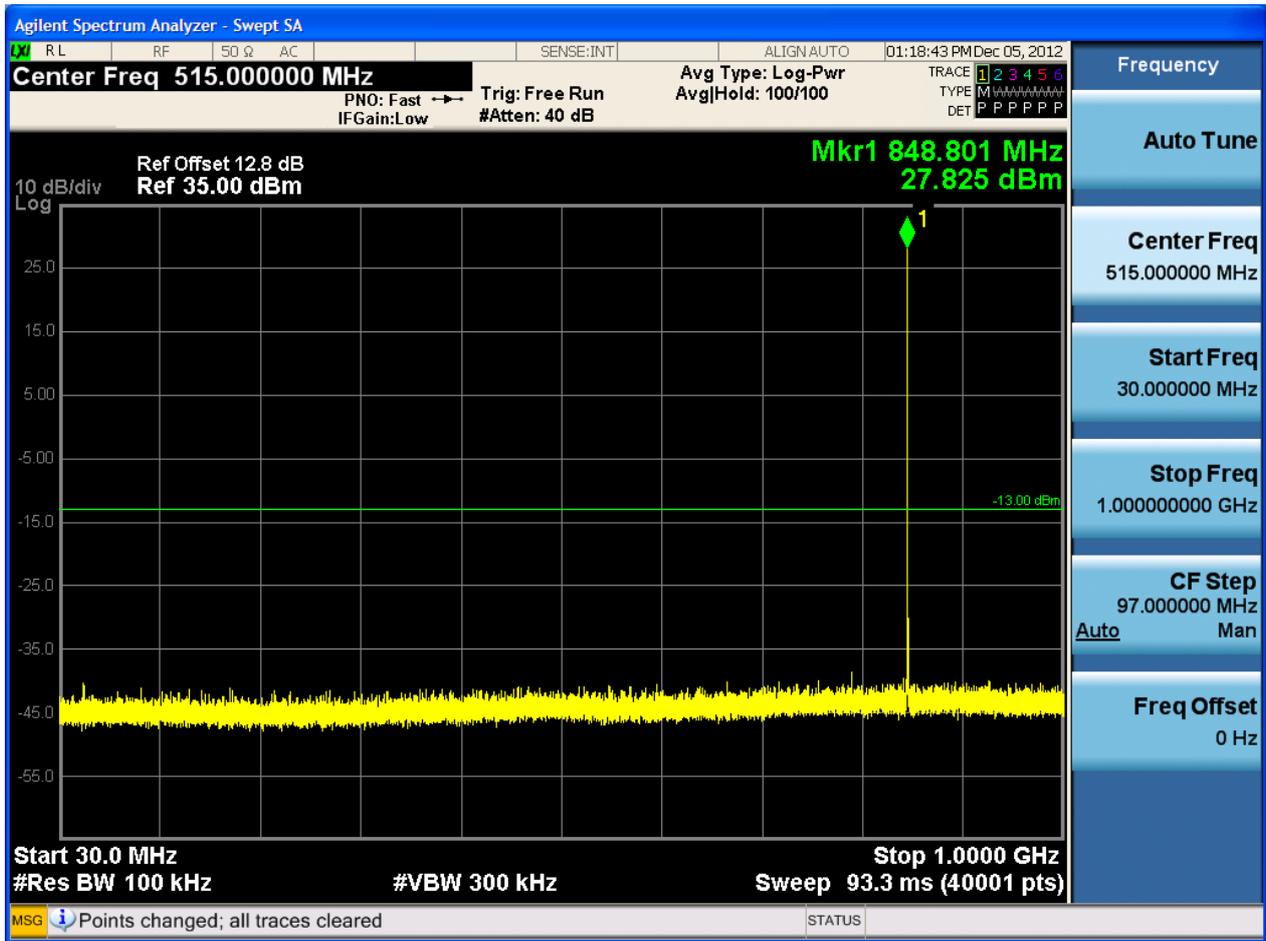


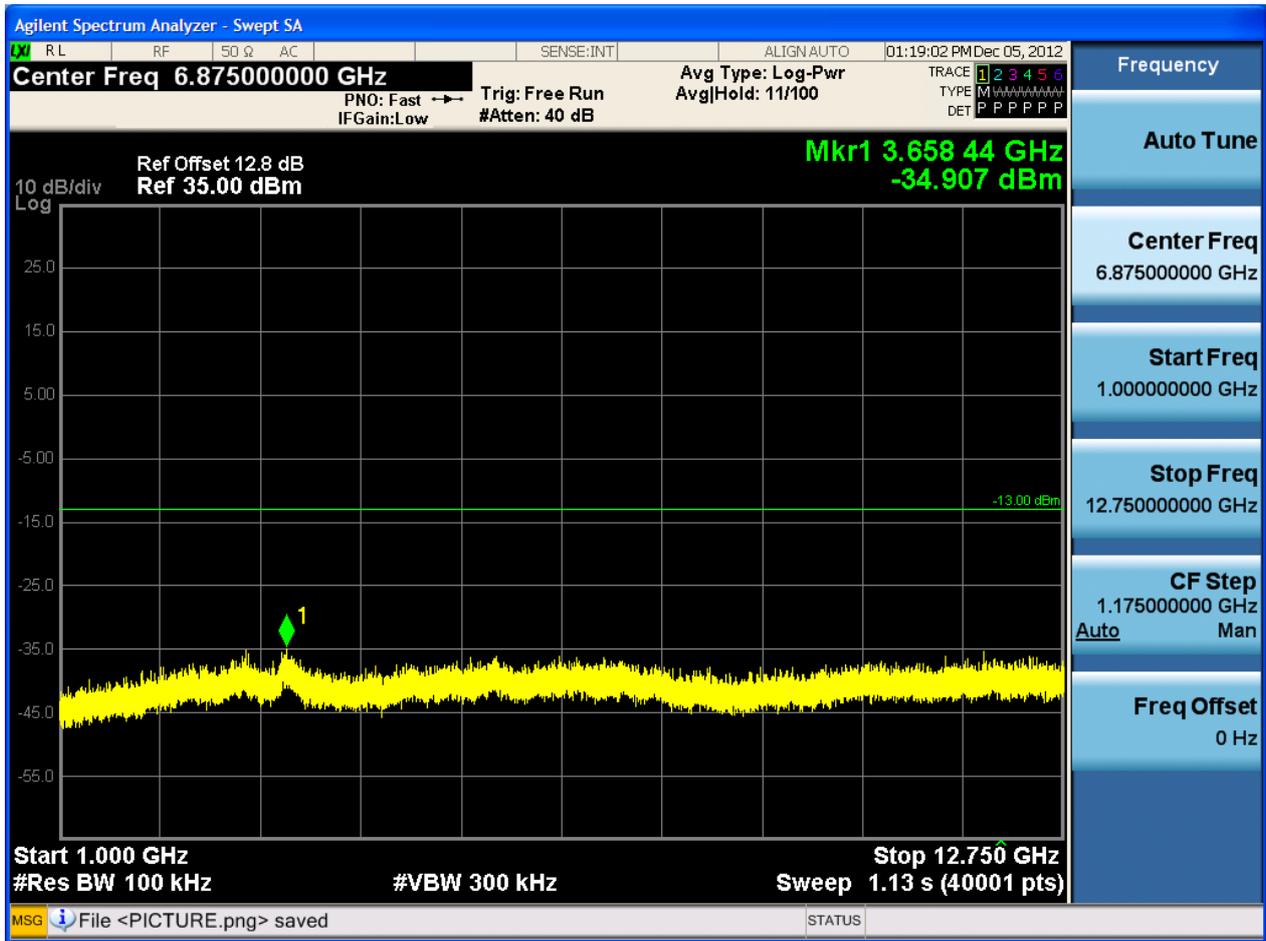


5.1.1.2.3 Test Channel = HCH







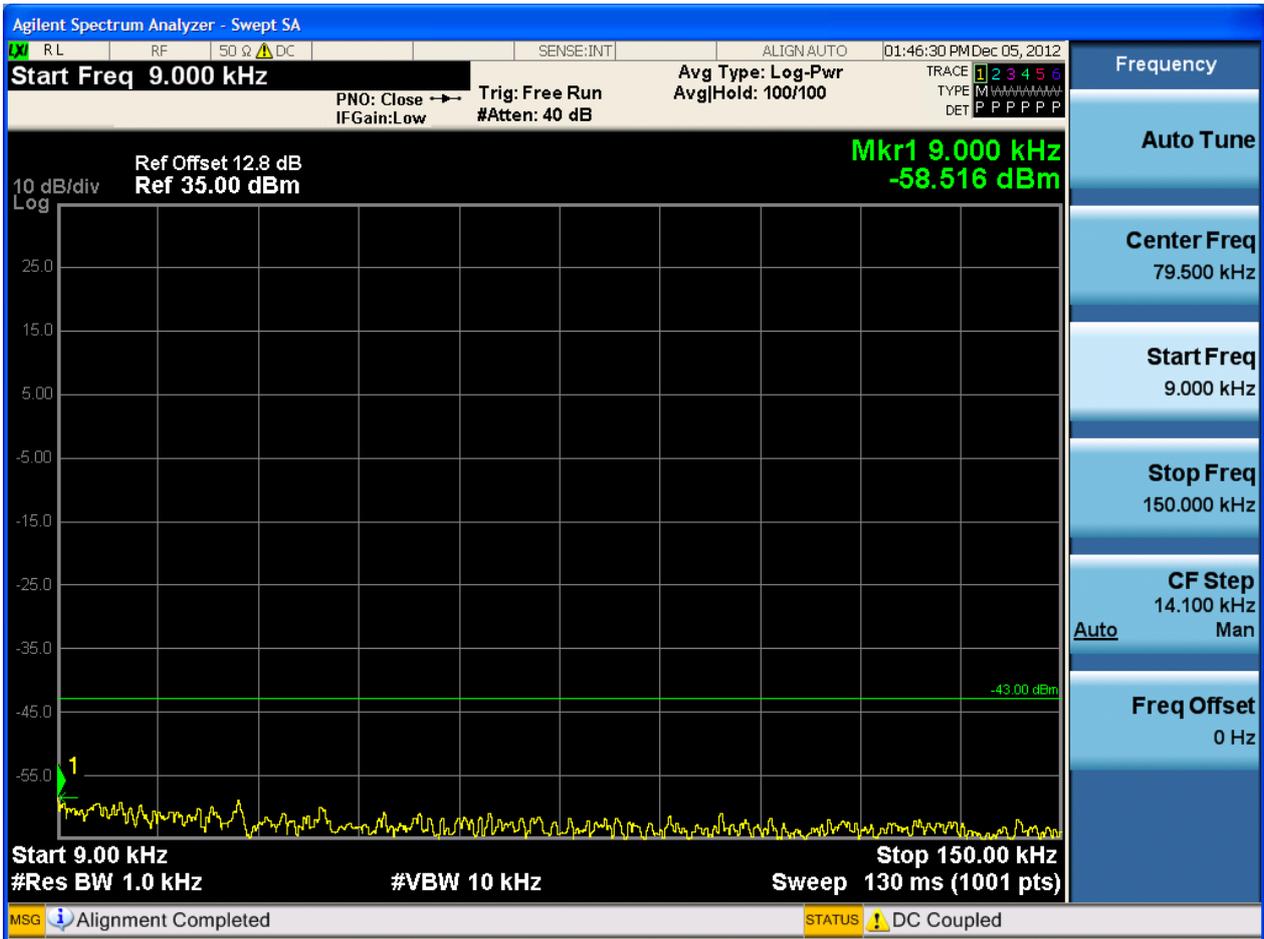


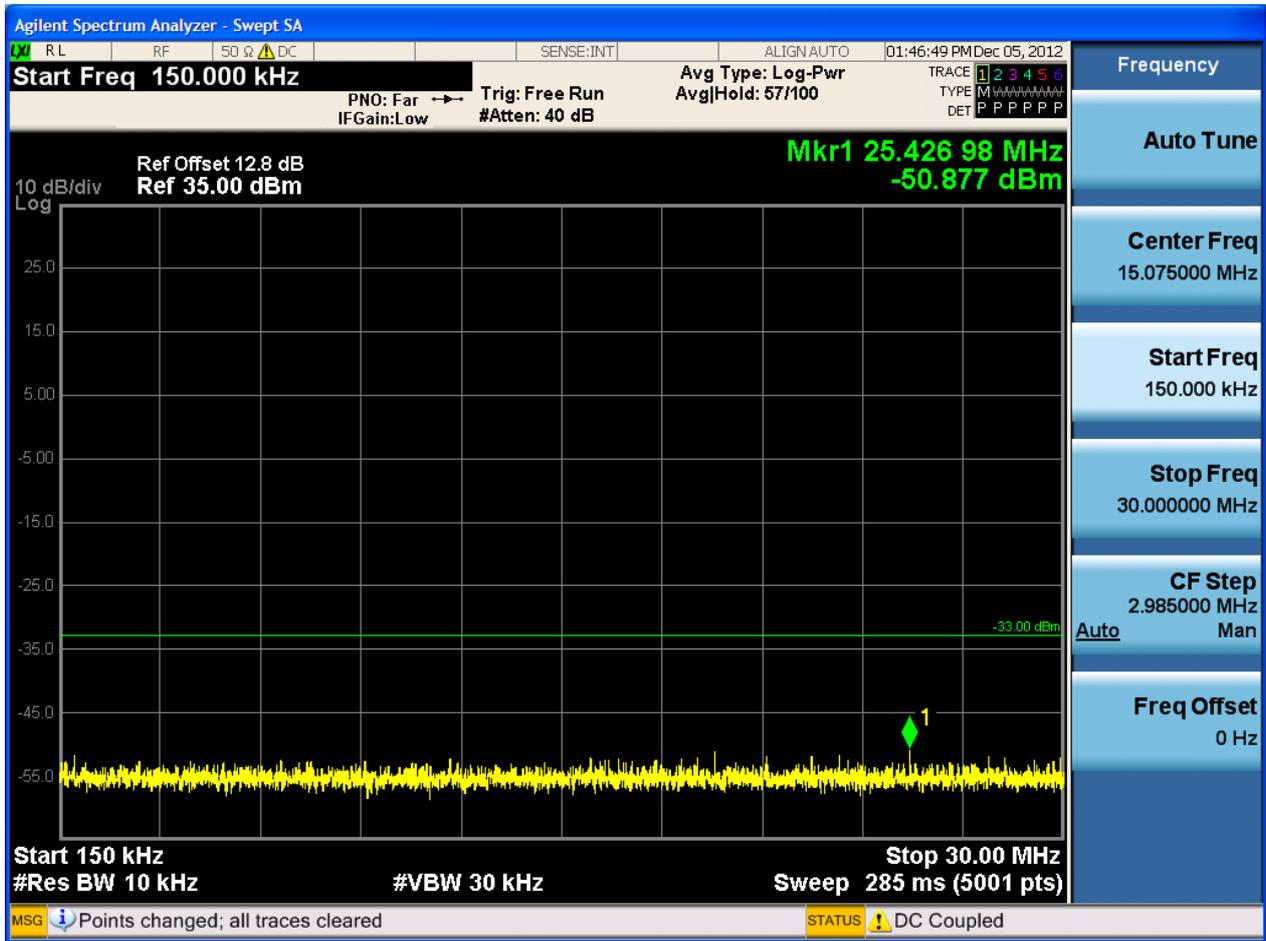


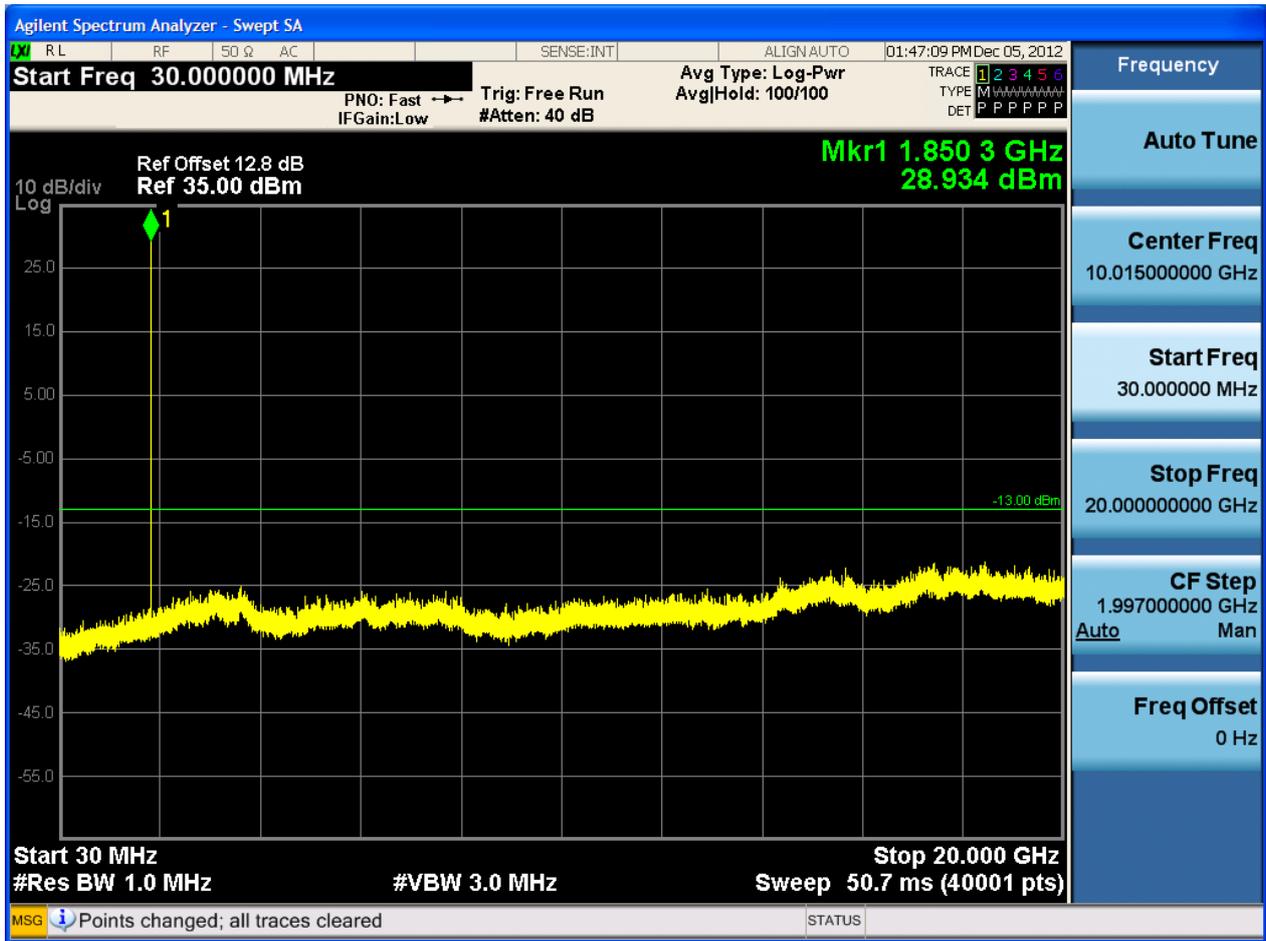
5.1.2 Test Band = GSM1900

5.1.2.1 Test Mode = GSM/TM1

5.1.2.1.1 Test Channel = LCH

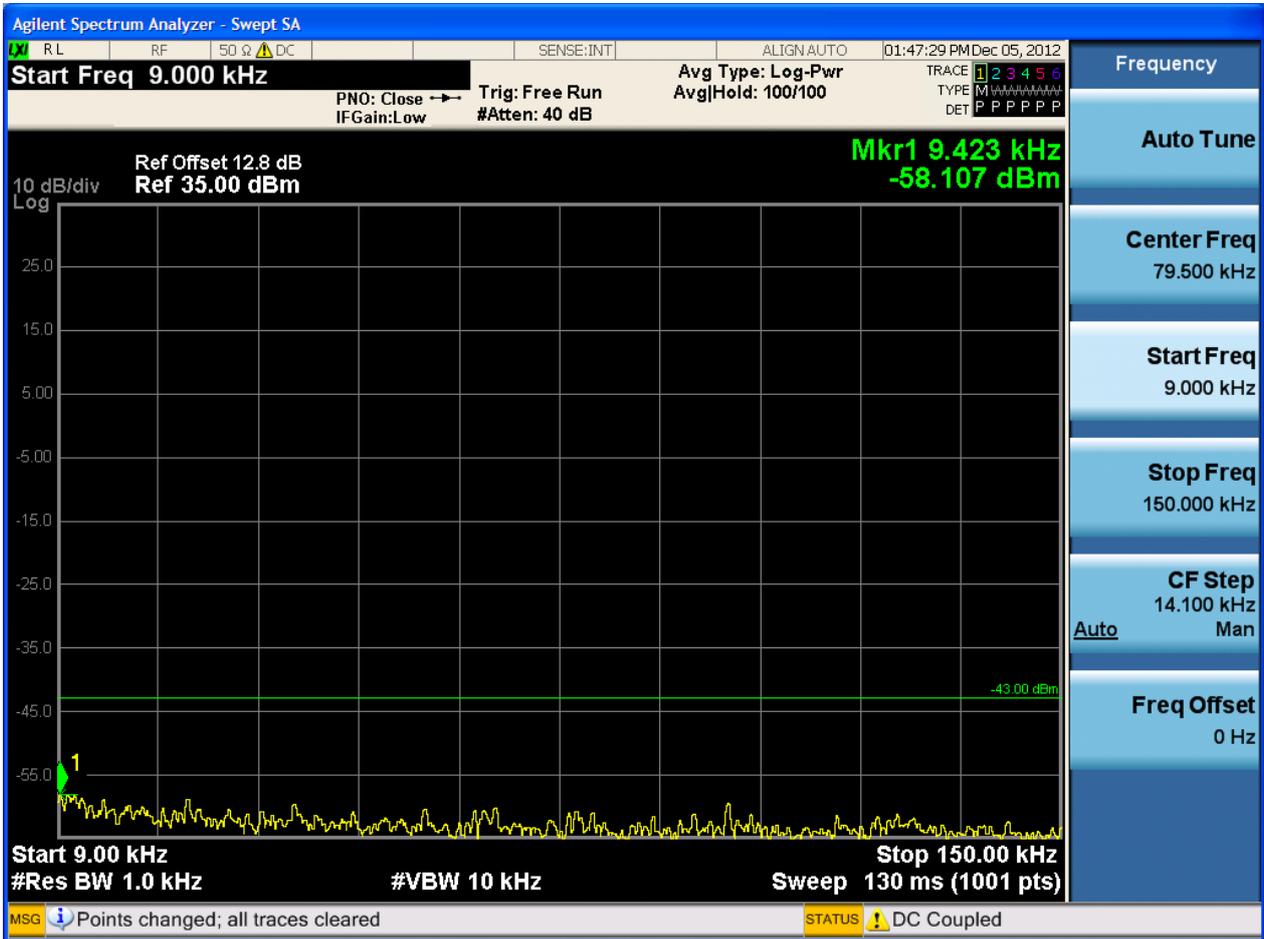


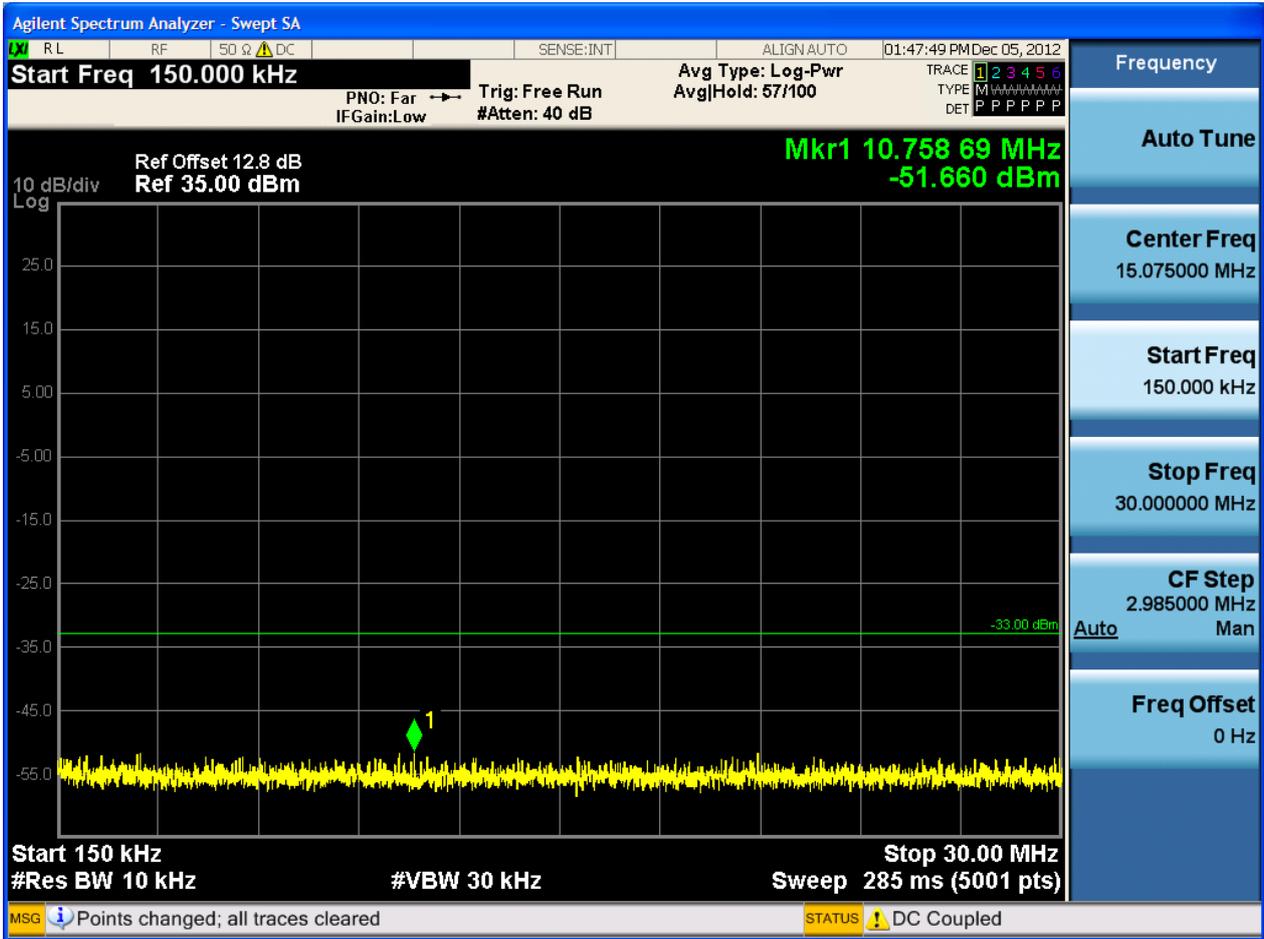


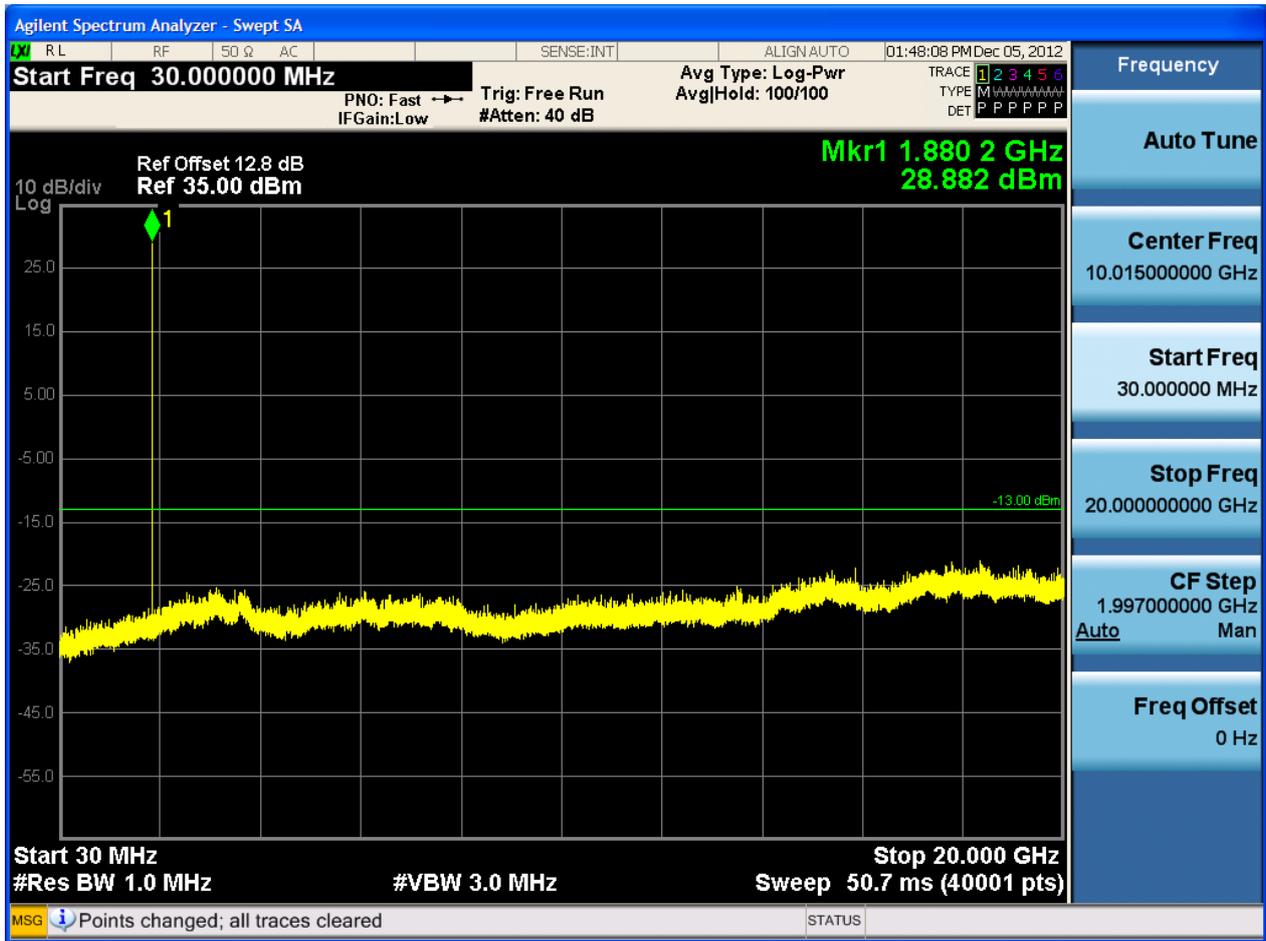




5.1.2.1.2 Test Channel = MCH

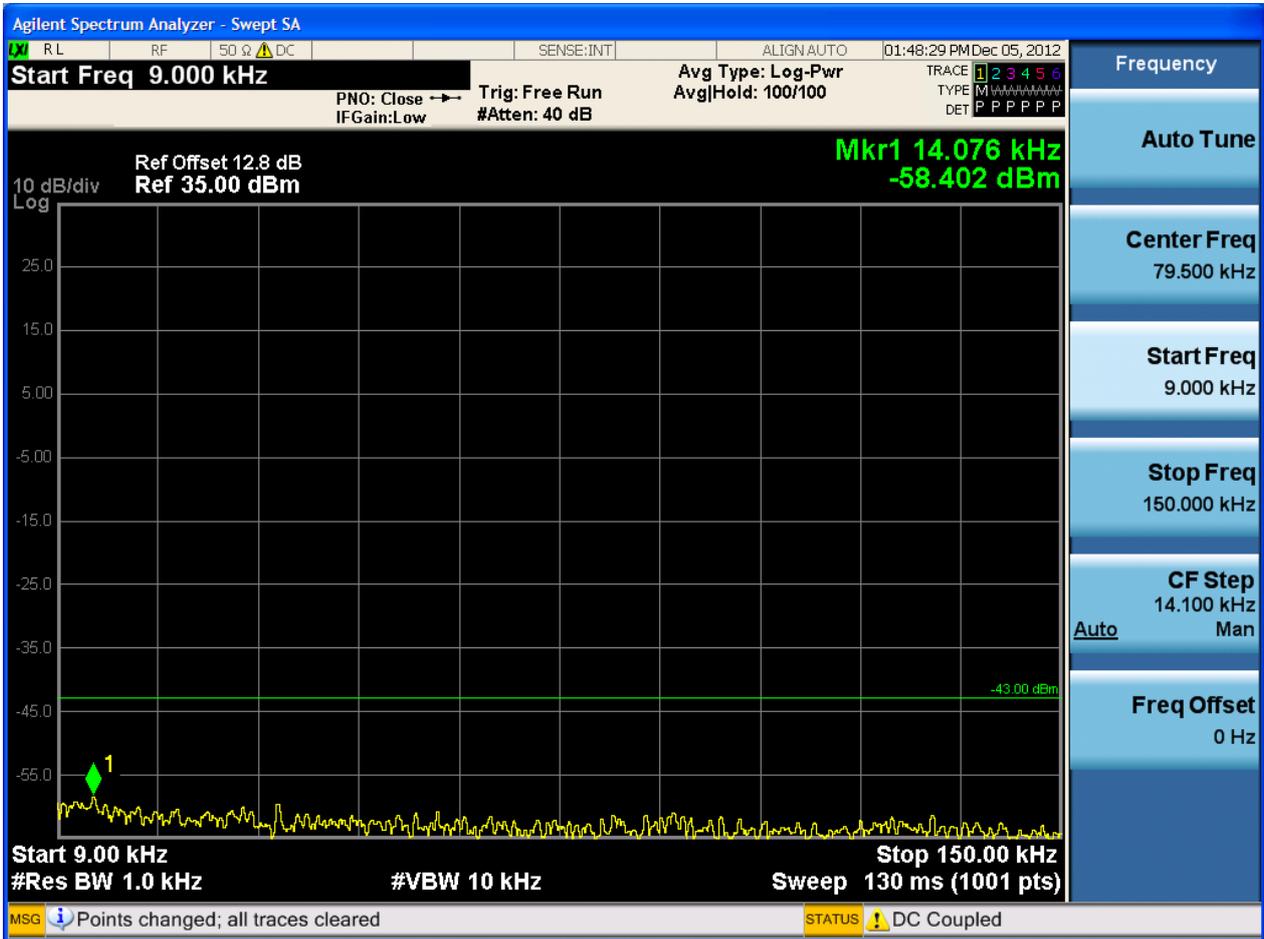


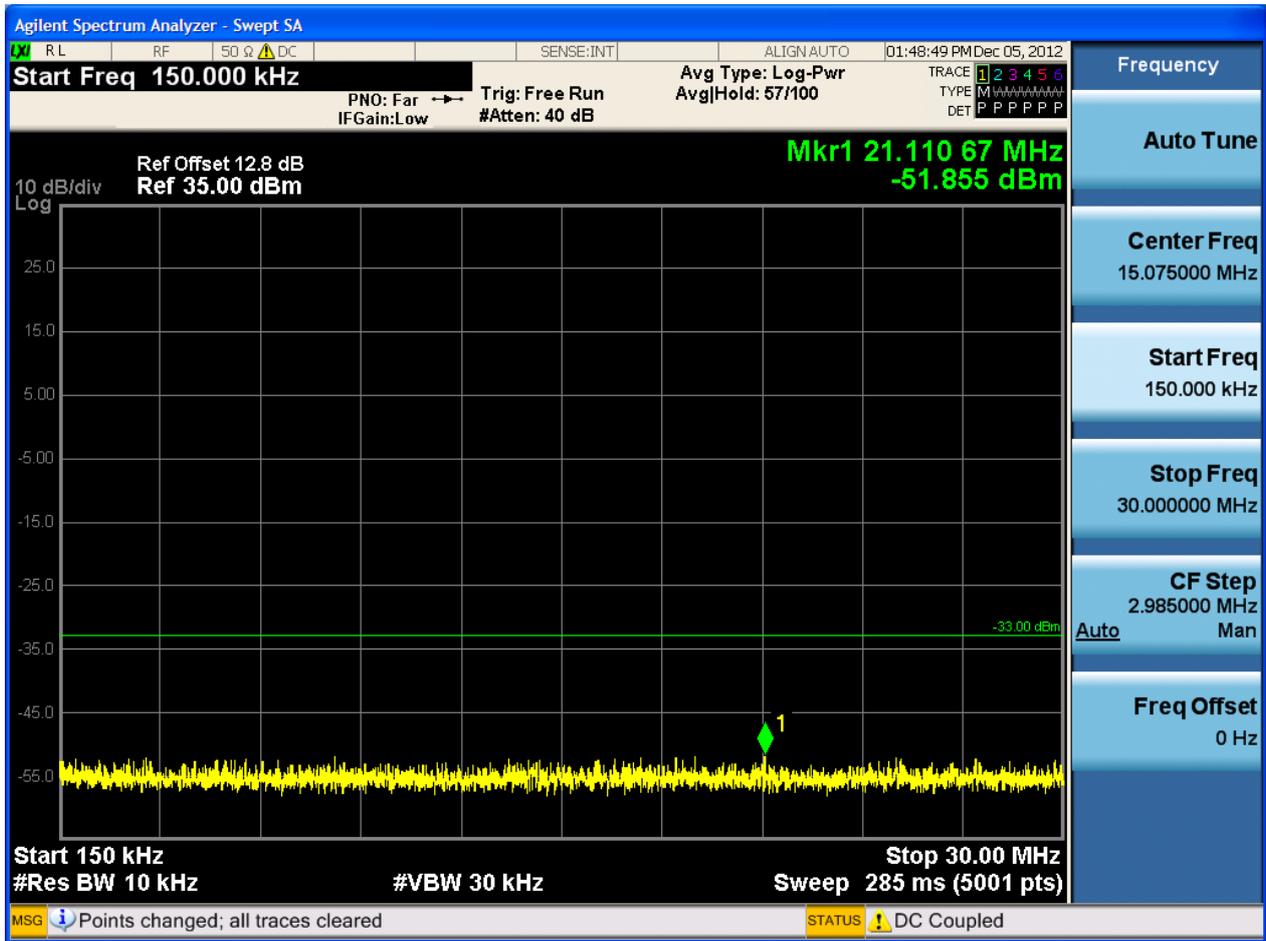


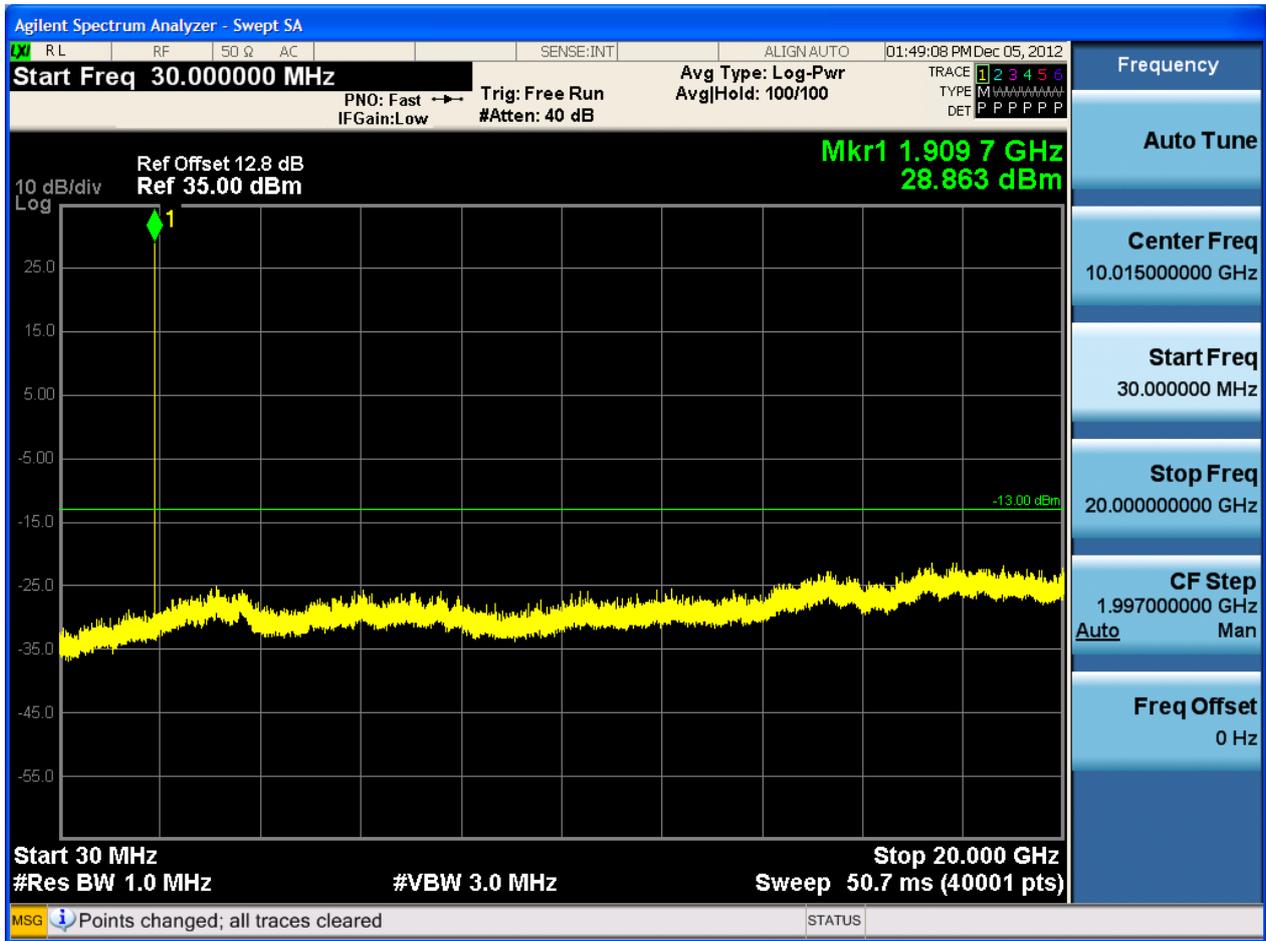




5.1.2.1.3 Test Channel = HCH



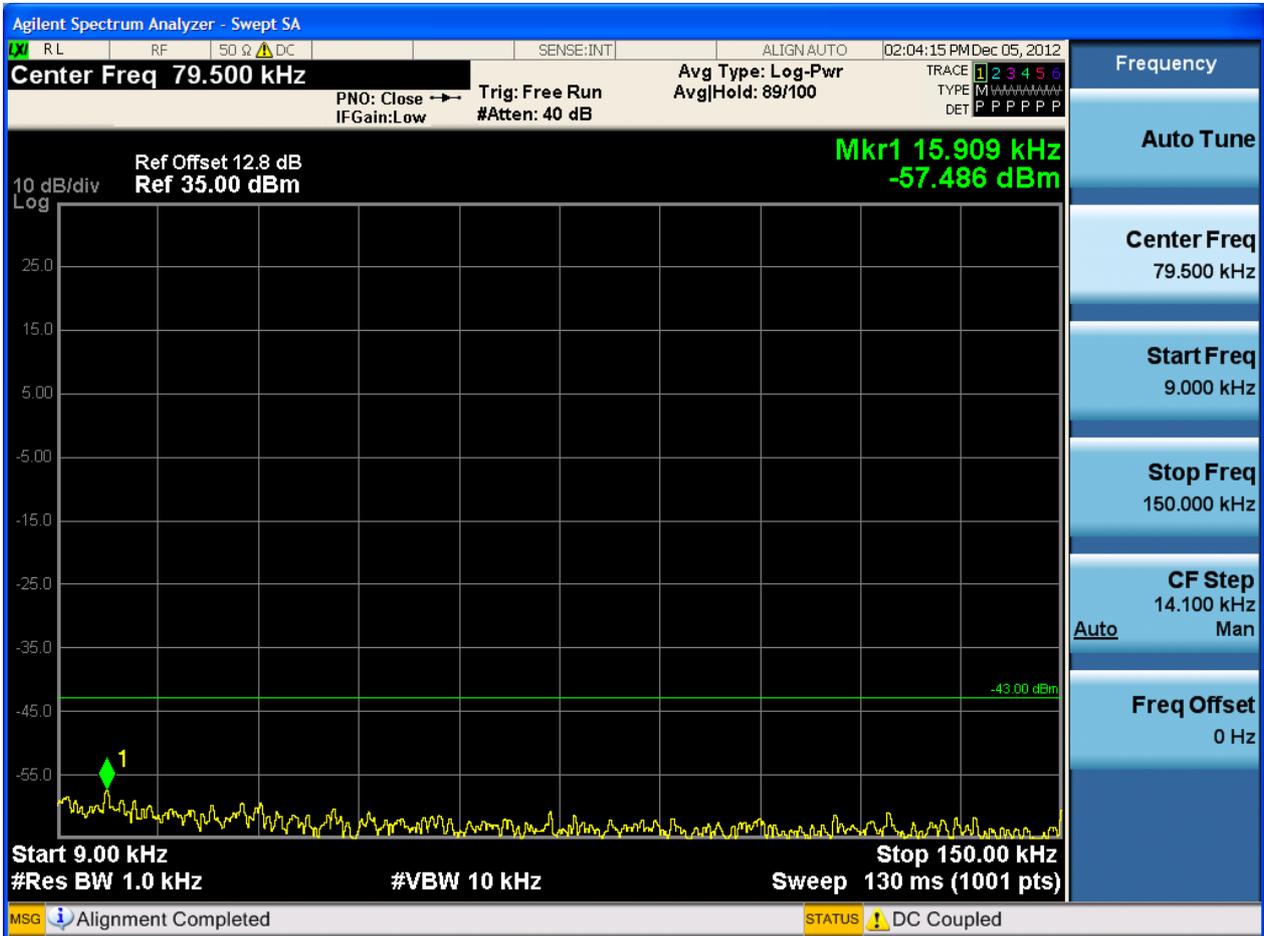


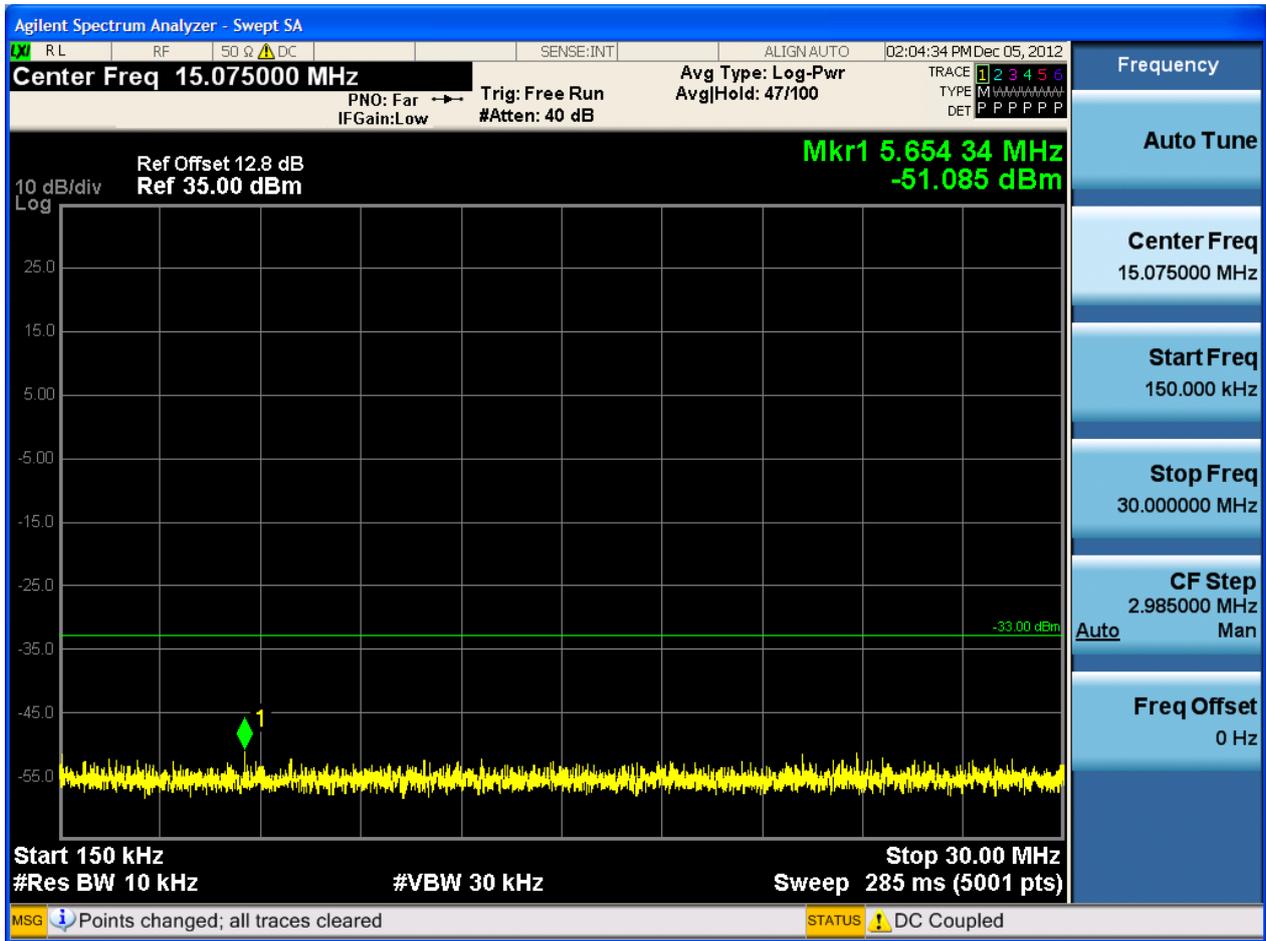




5.1.2.2 Test Mode = GSM/TM2

5.1.2.2.1 Test Channel = LCH

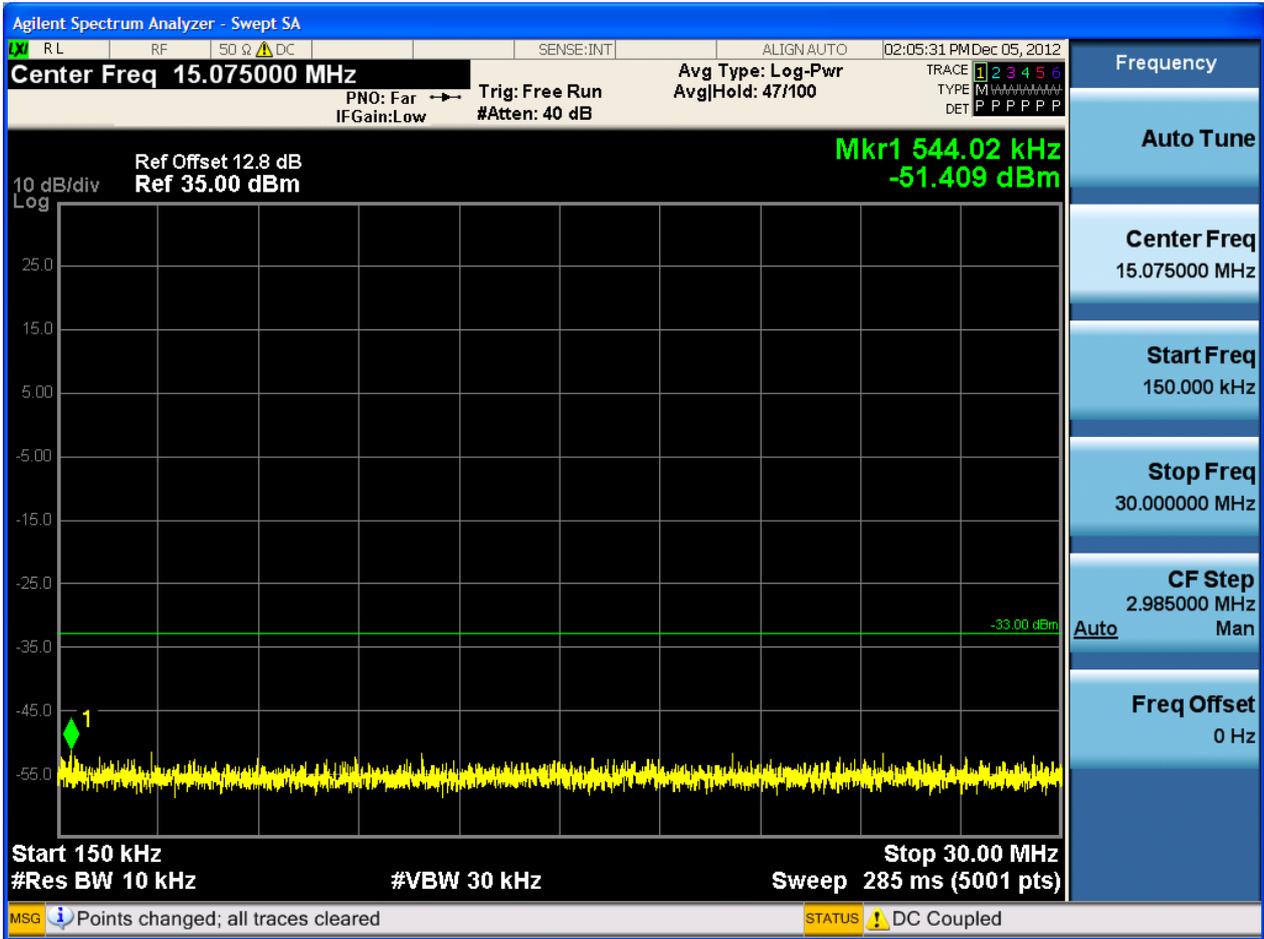


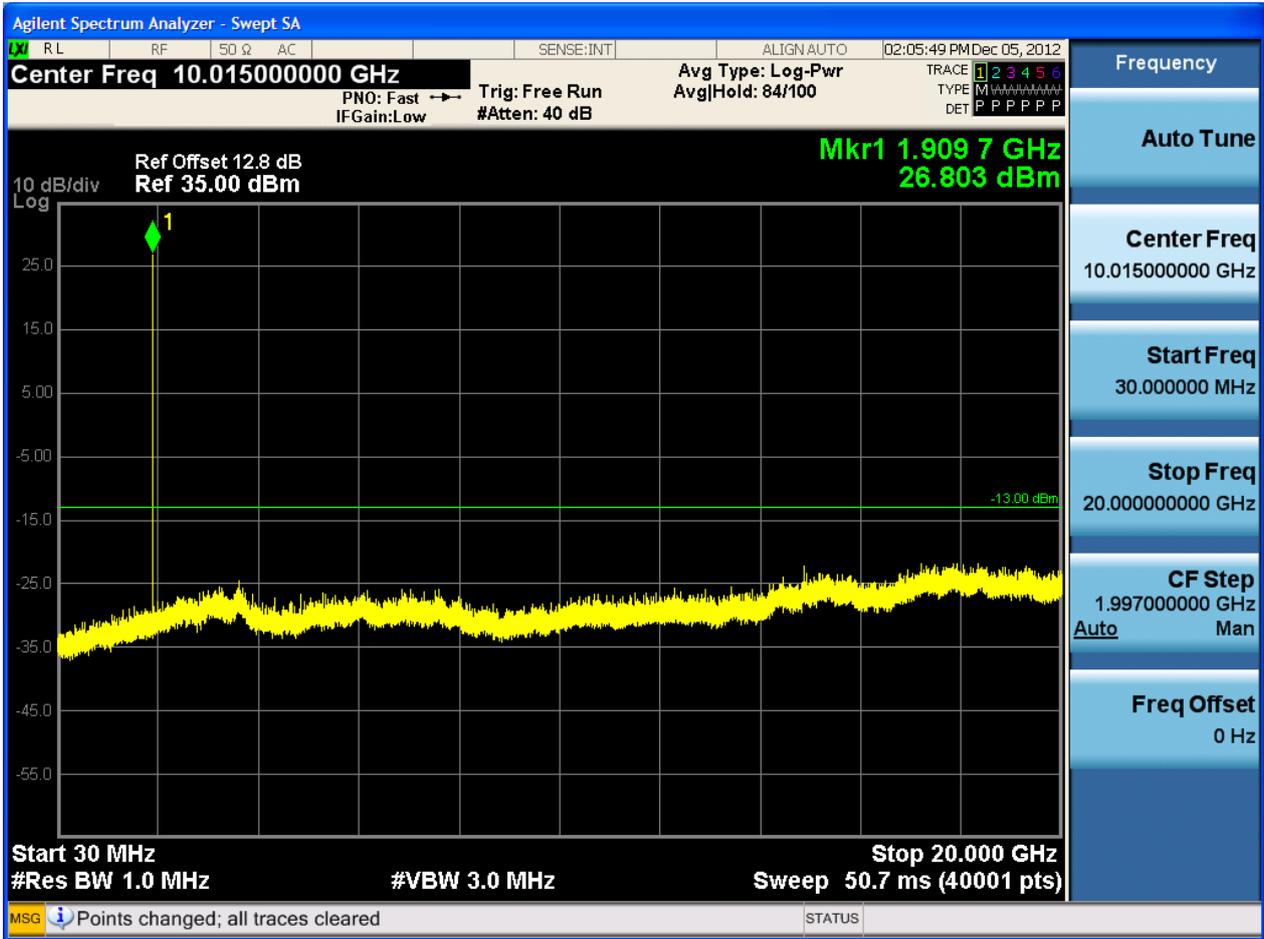




5.1.2.2.2 Test Channel = MCH

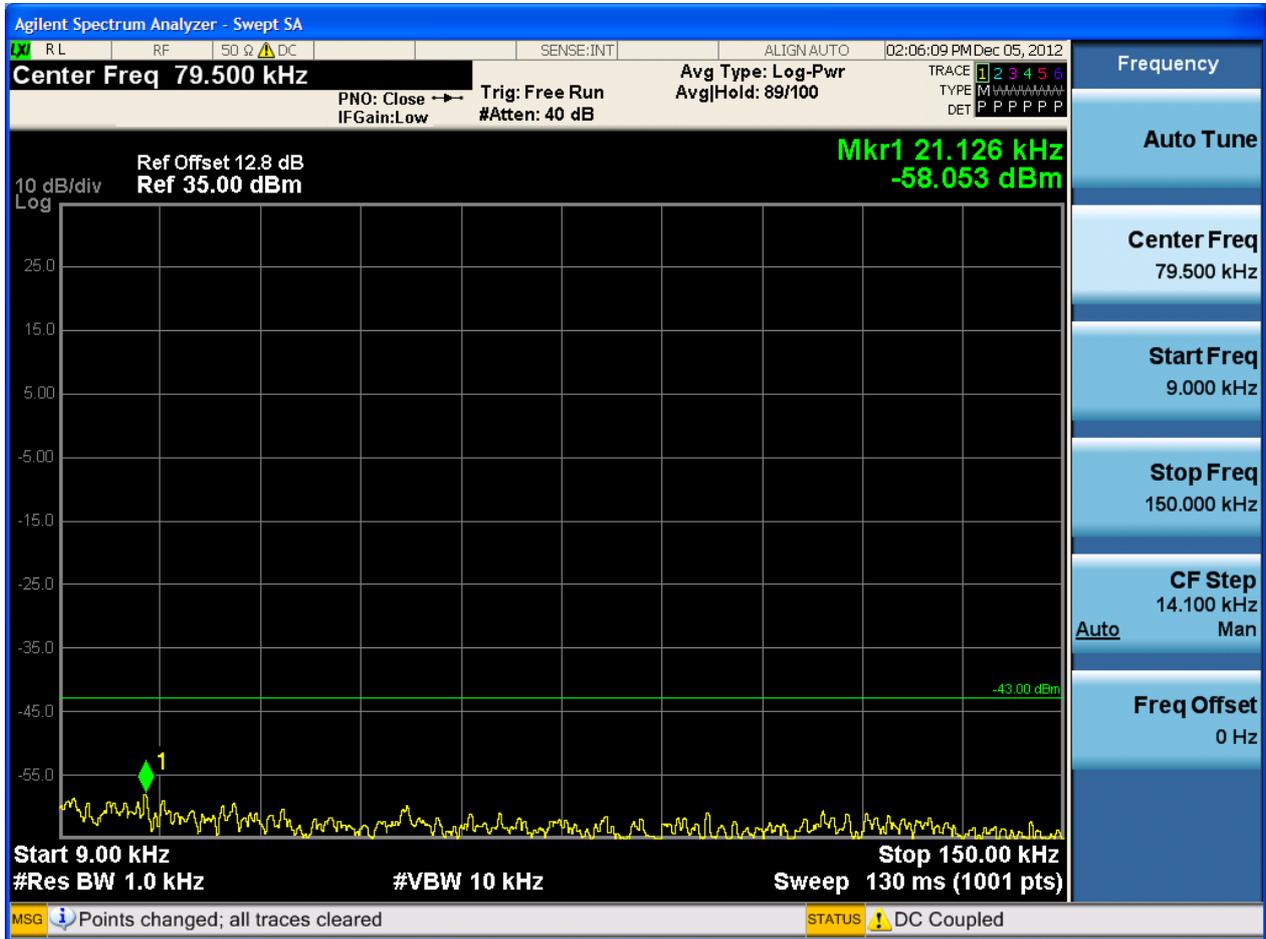


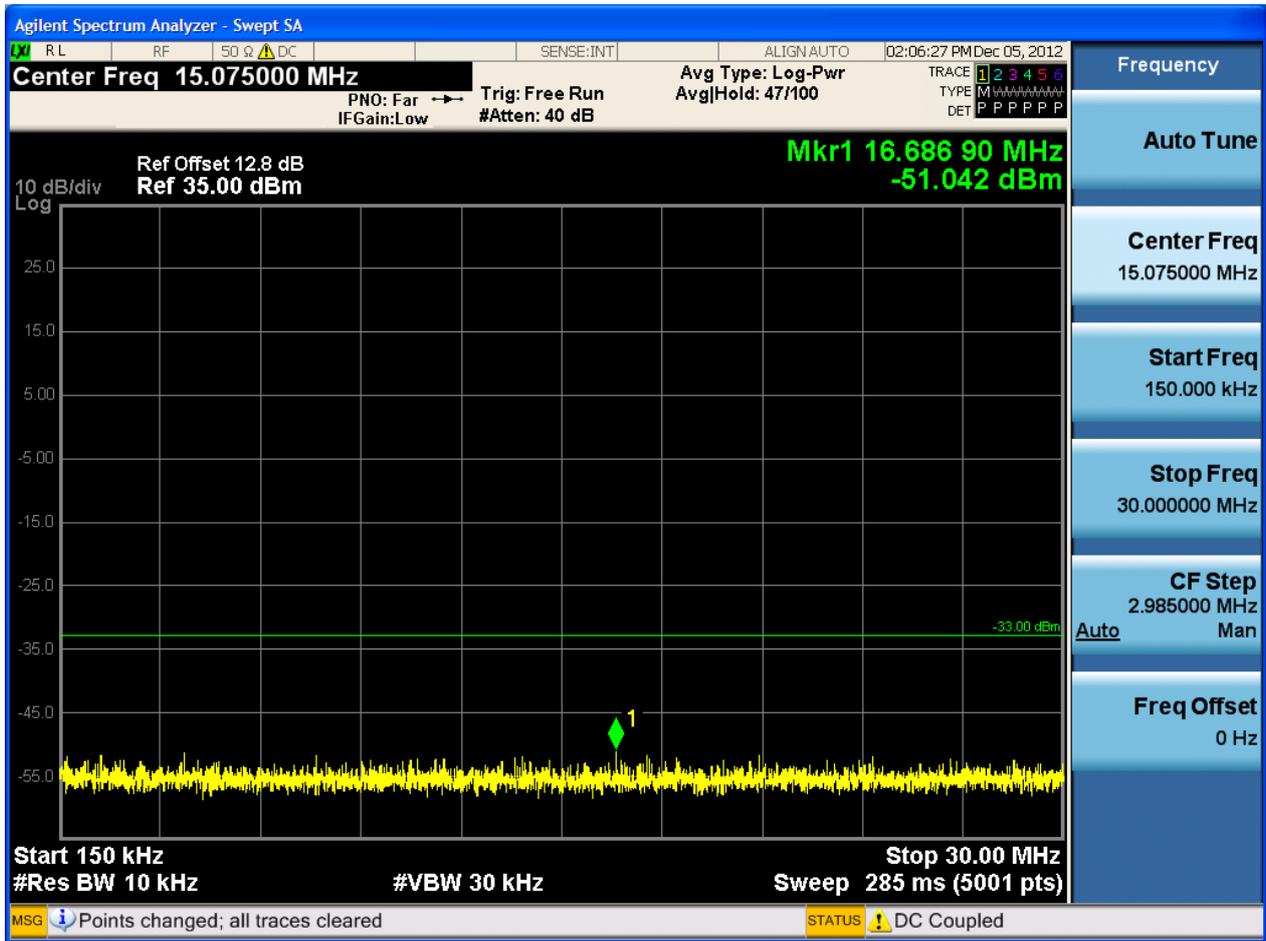






5.1.2.2.3 Test Channel = HCH







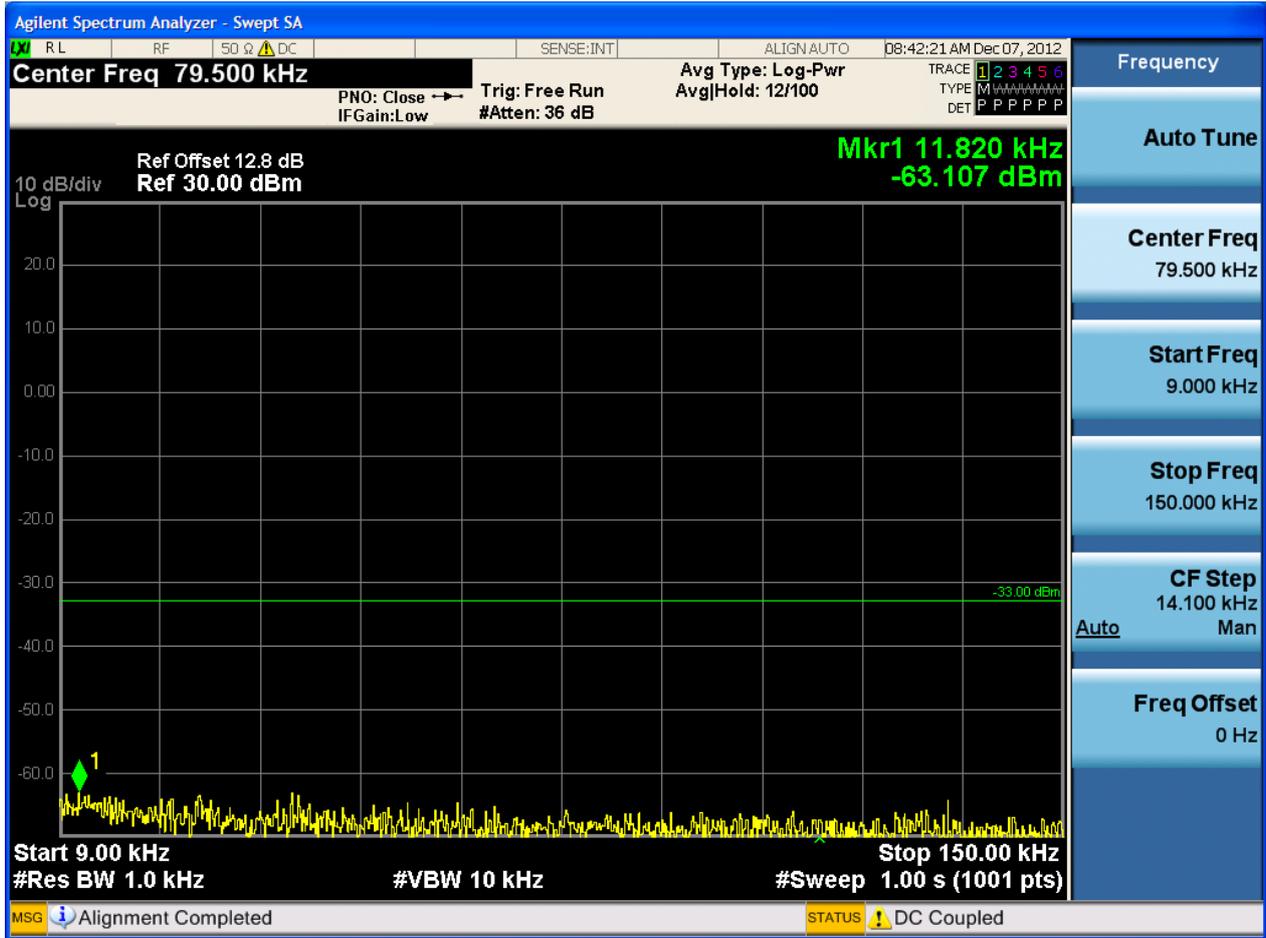


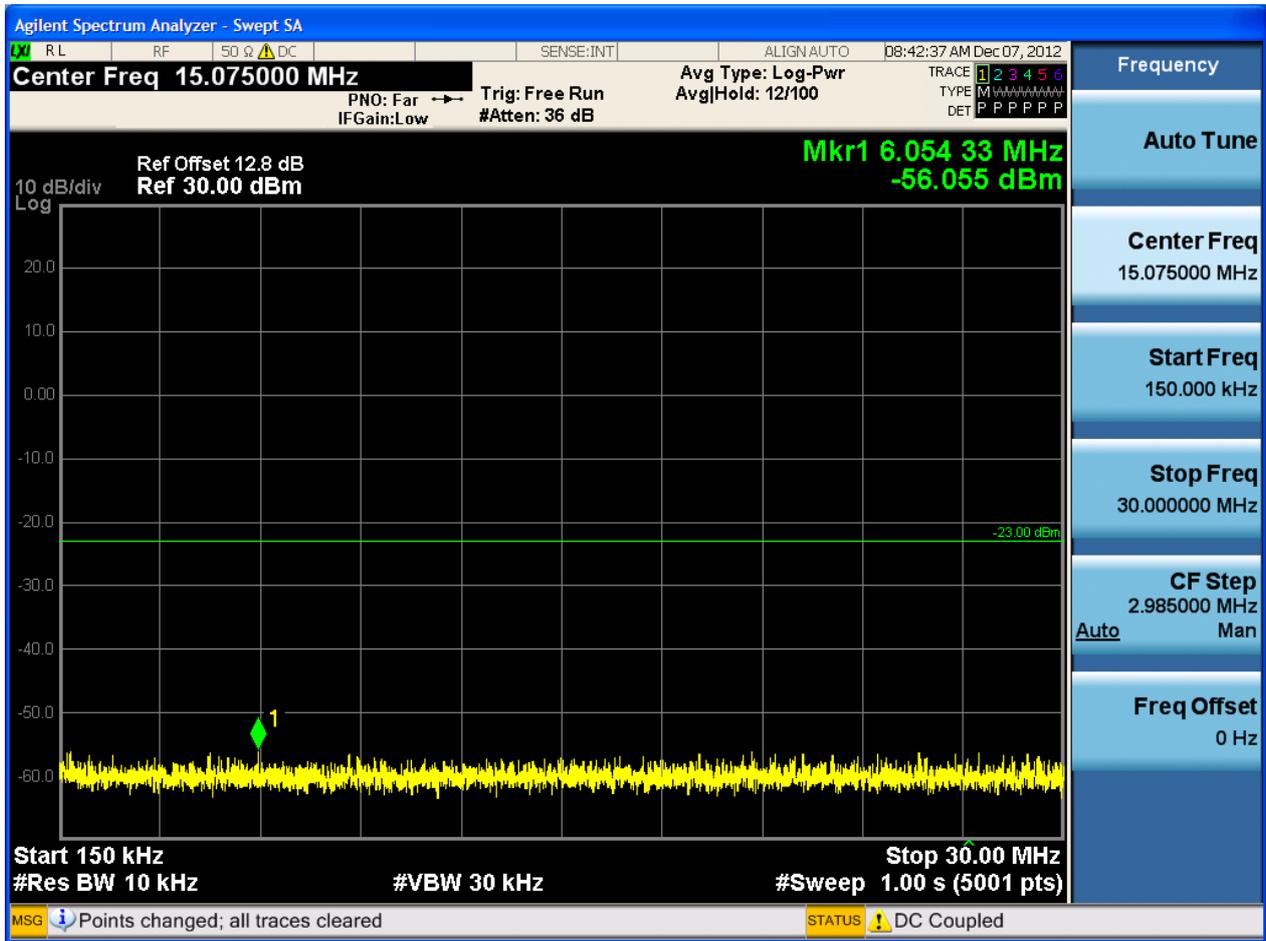
5.2 For UMTS

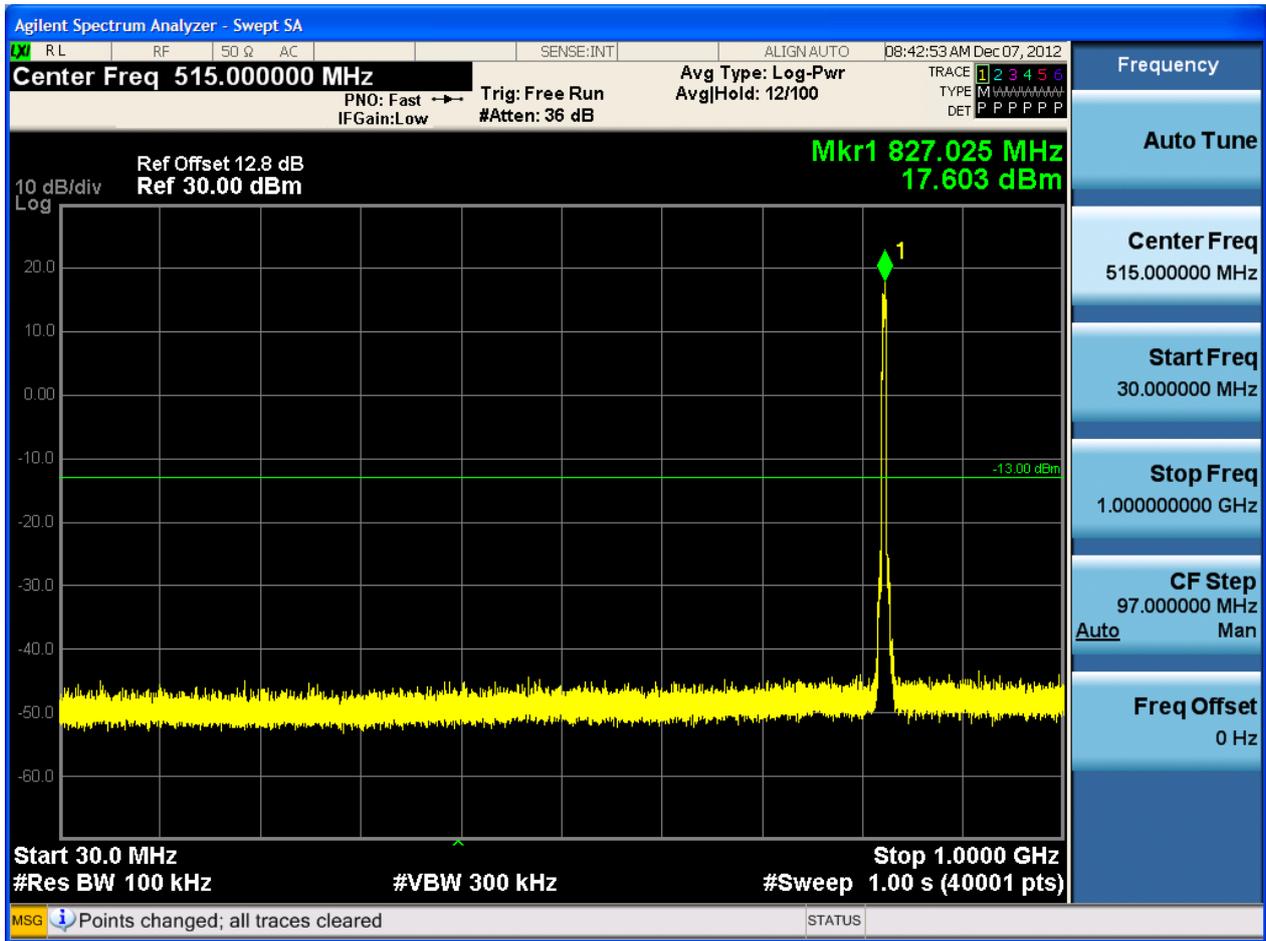
5.2.1 Test Band = WCDMA850

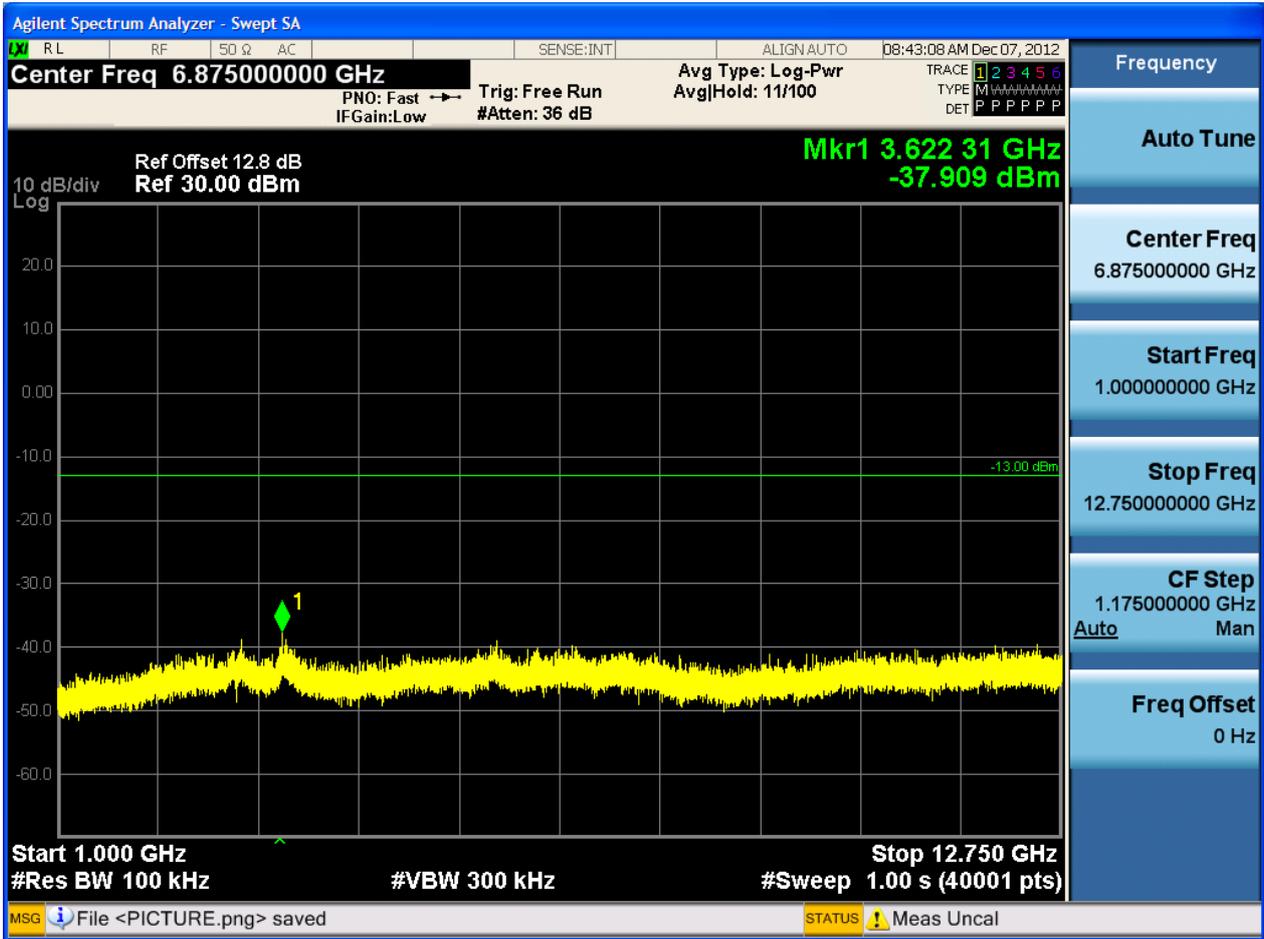
5.2.1.1 Test Mode = UMTS/TM1

5.2.1.1.1 Test Channel = LCH

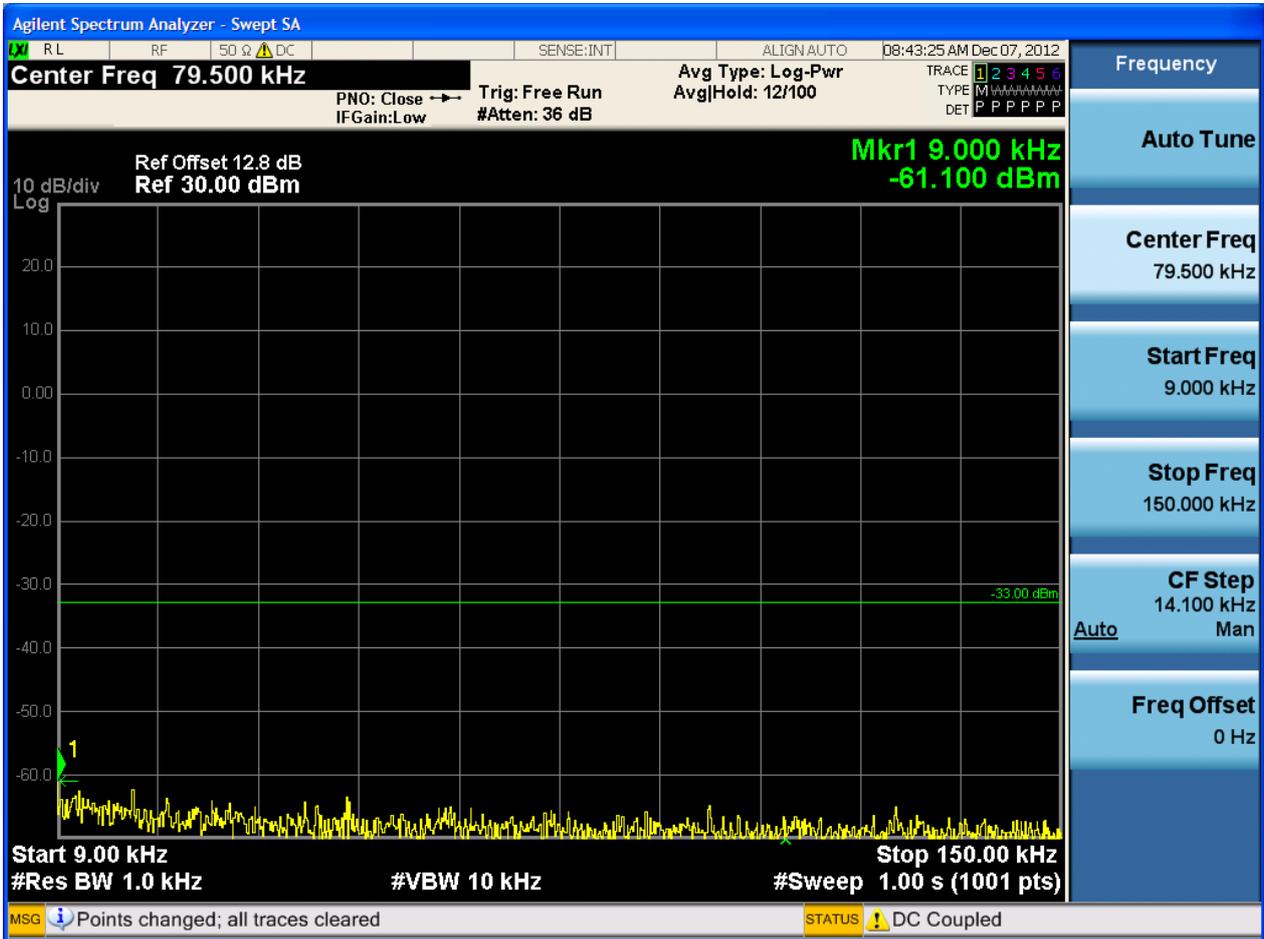


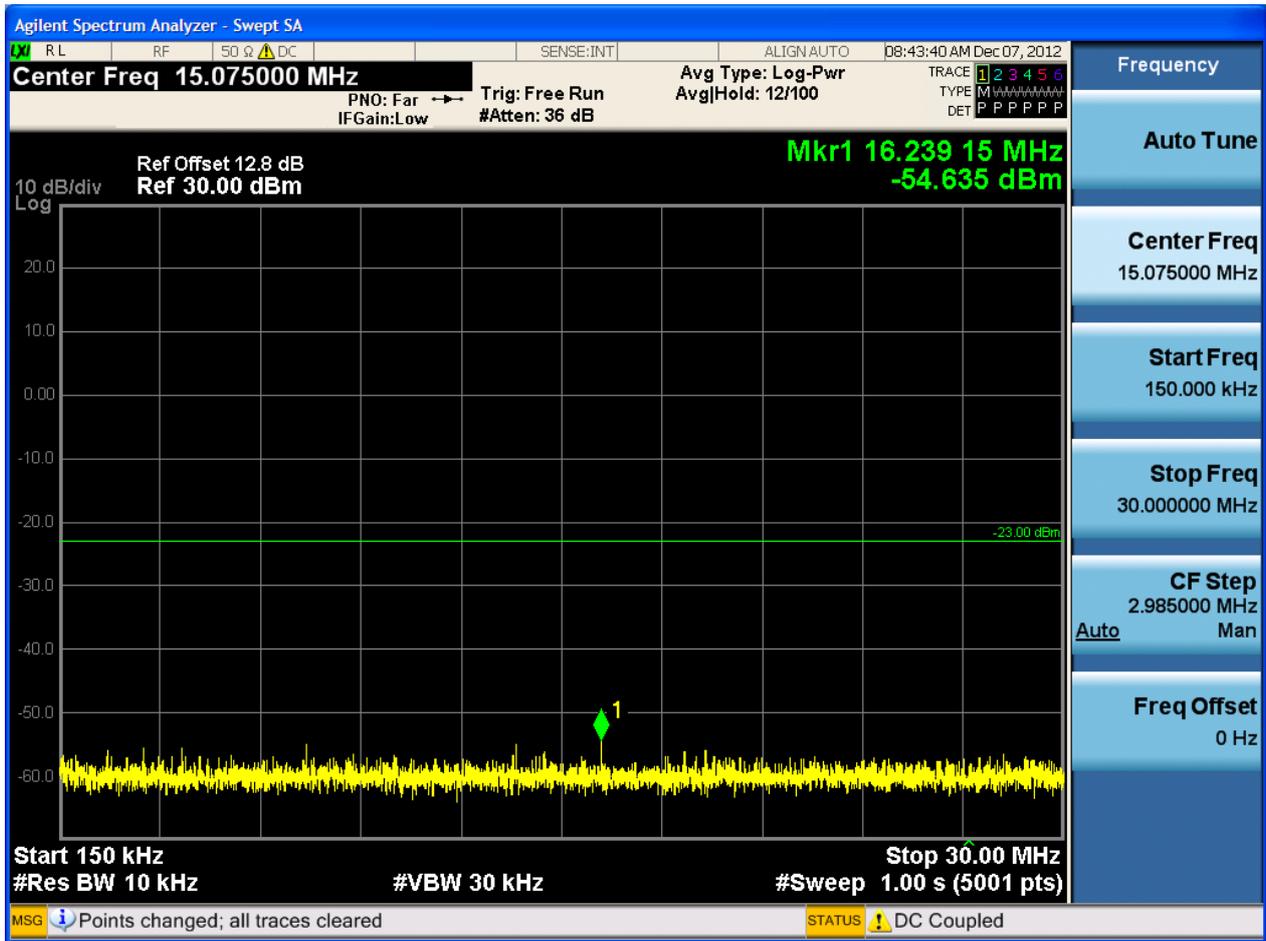


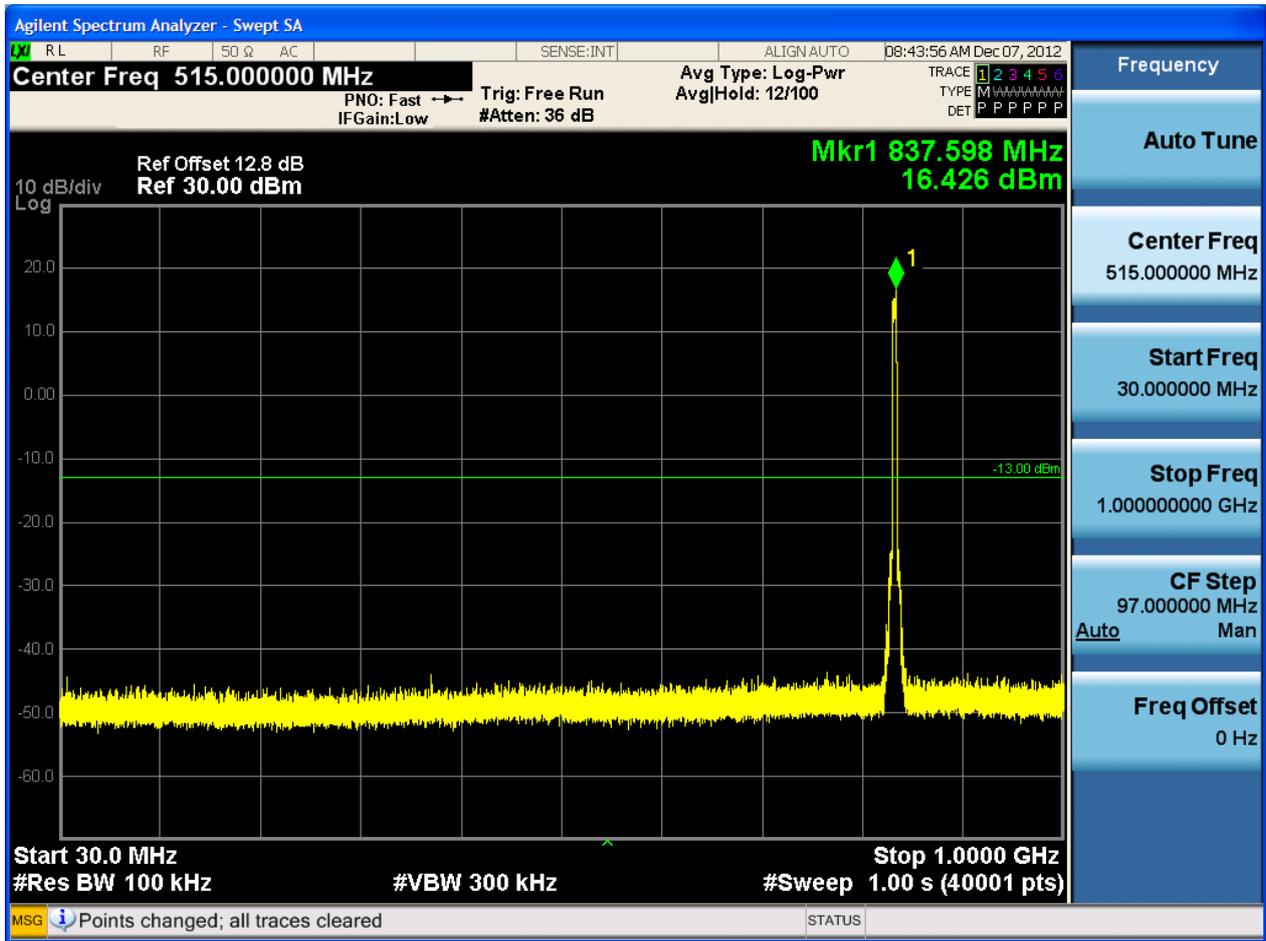




5.2.1.1.2 Test Channel = MCH



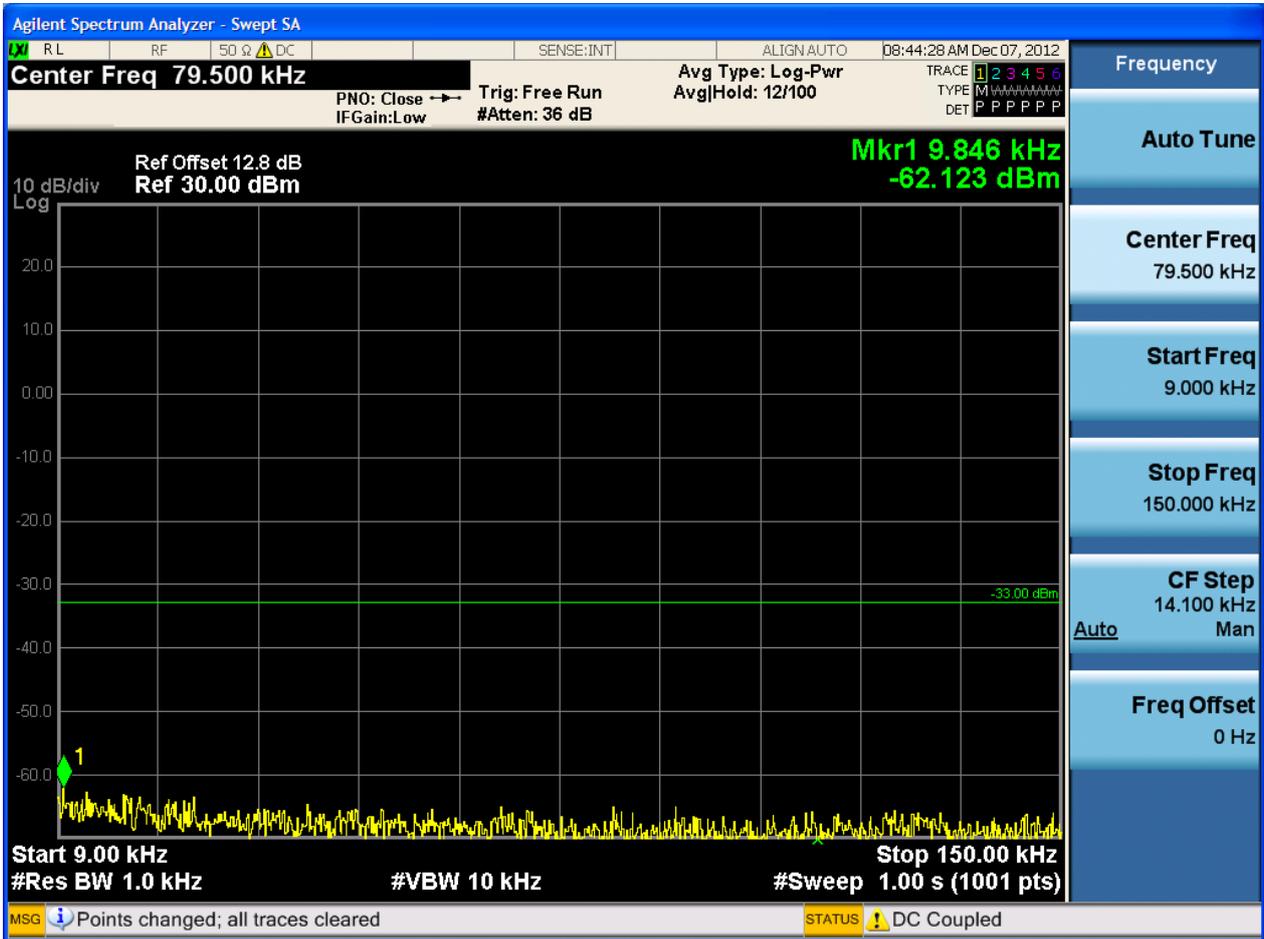


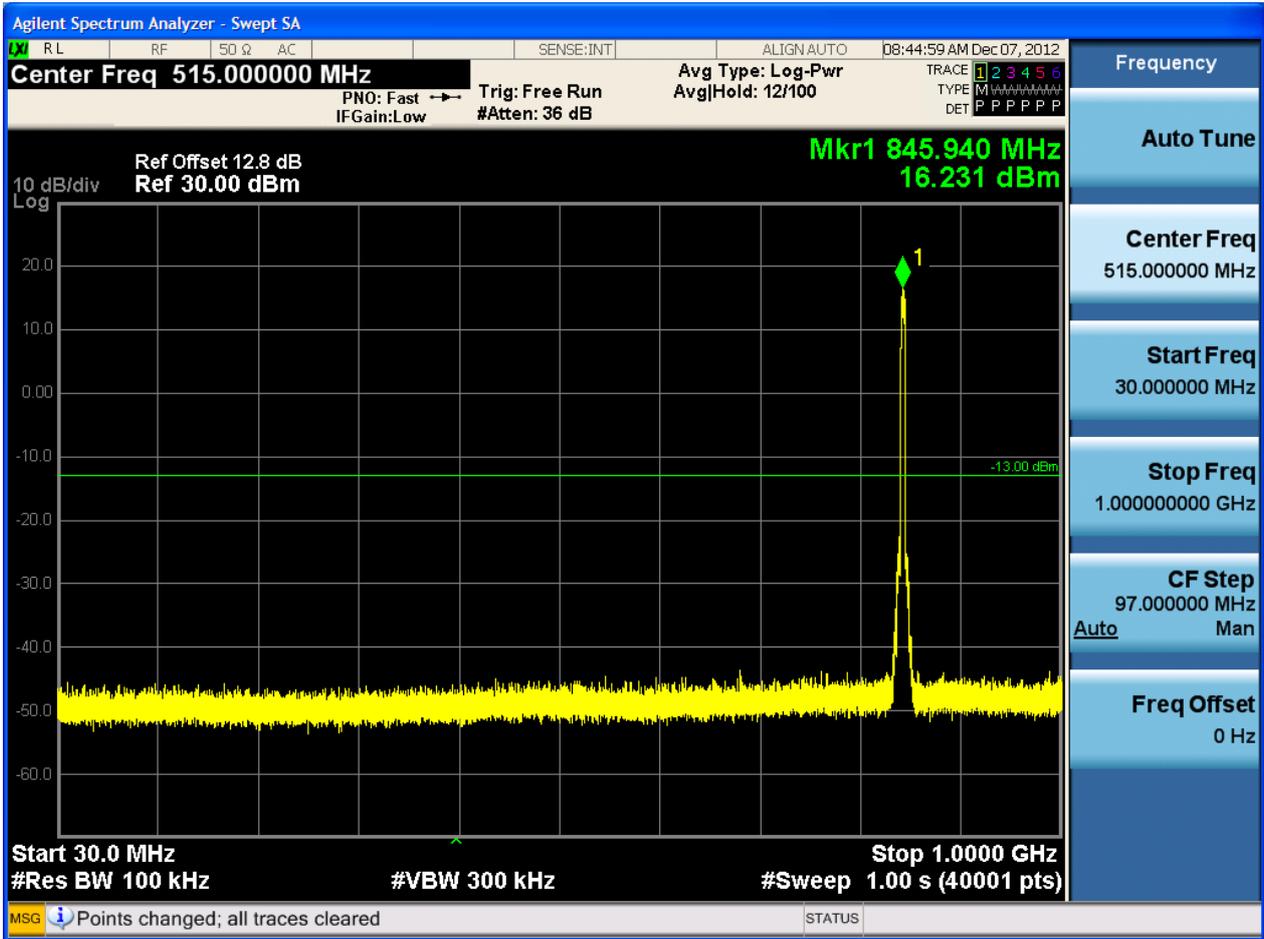






5.2.1.1.3 Test Channel = HCH



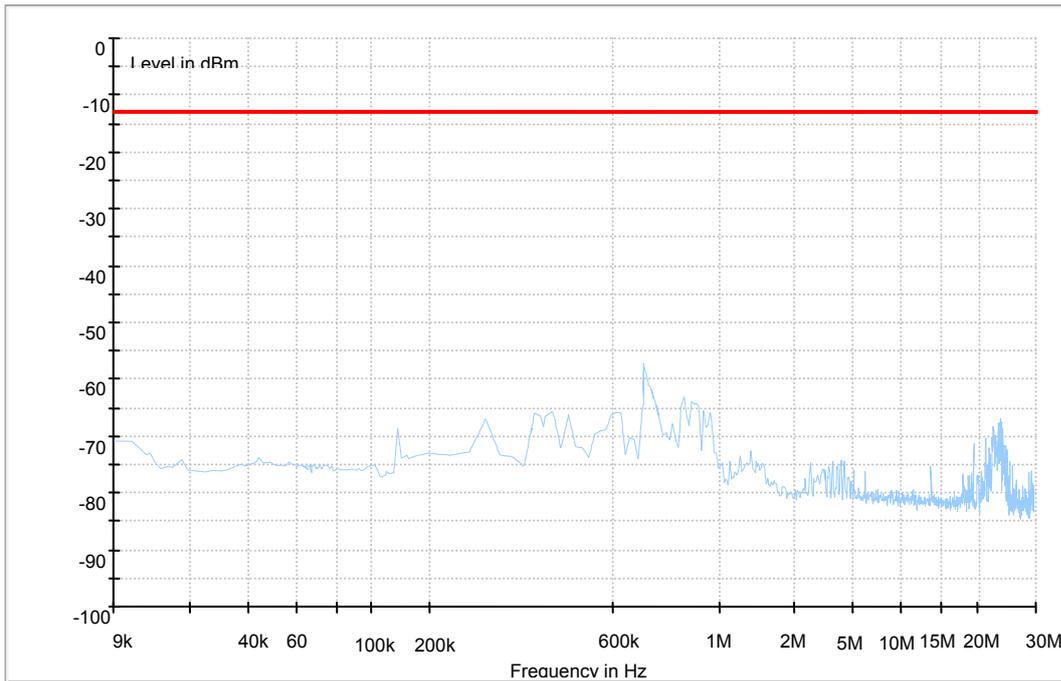




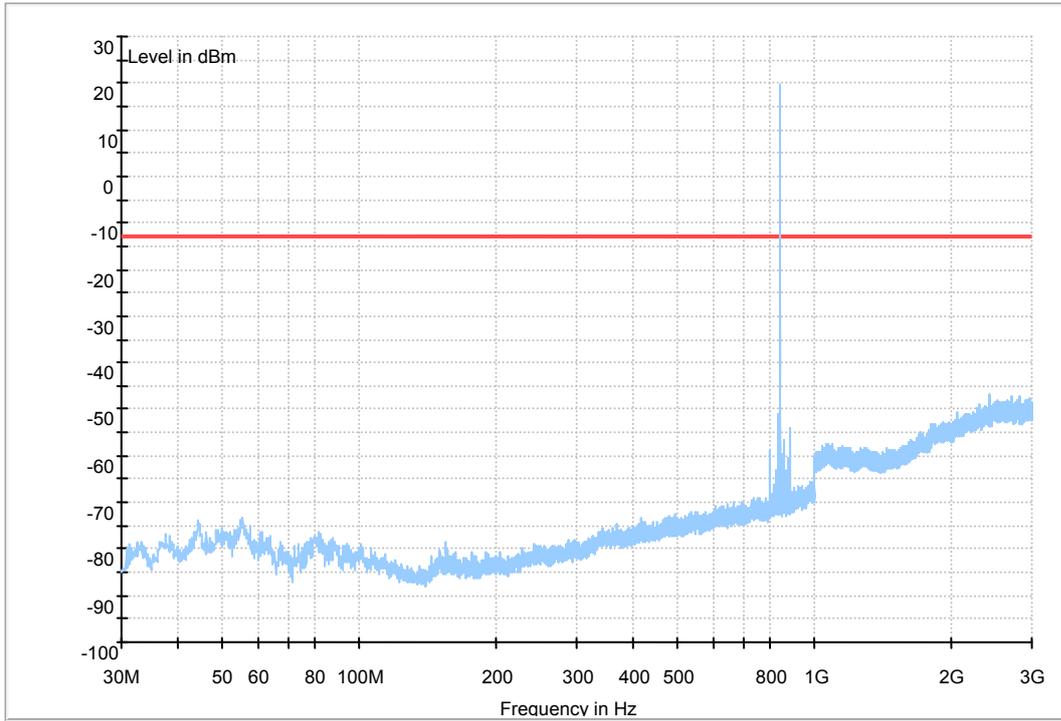
Appendix_E: Radiated Spurious Emission

GPRS 850

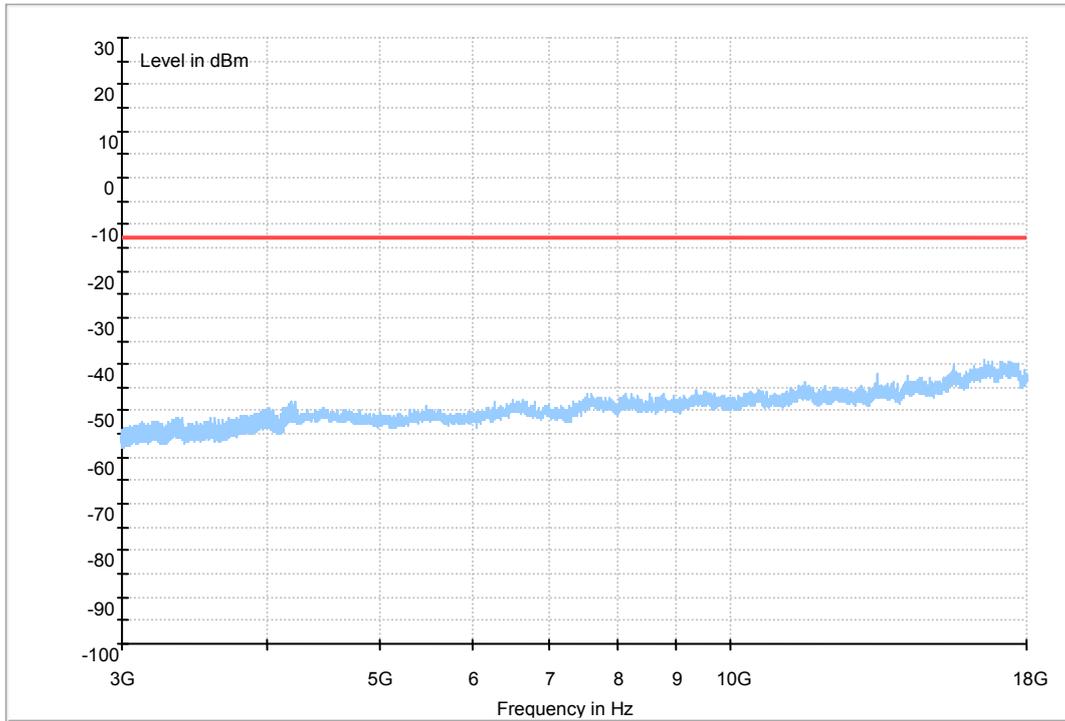
Traffic Mode (9kHz-30MHz)



Traffic Mode (30MHz-3GHz)

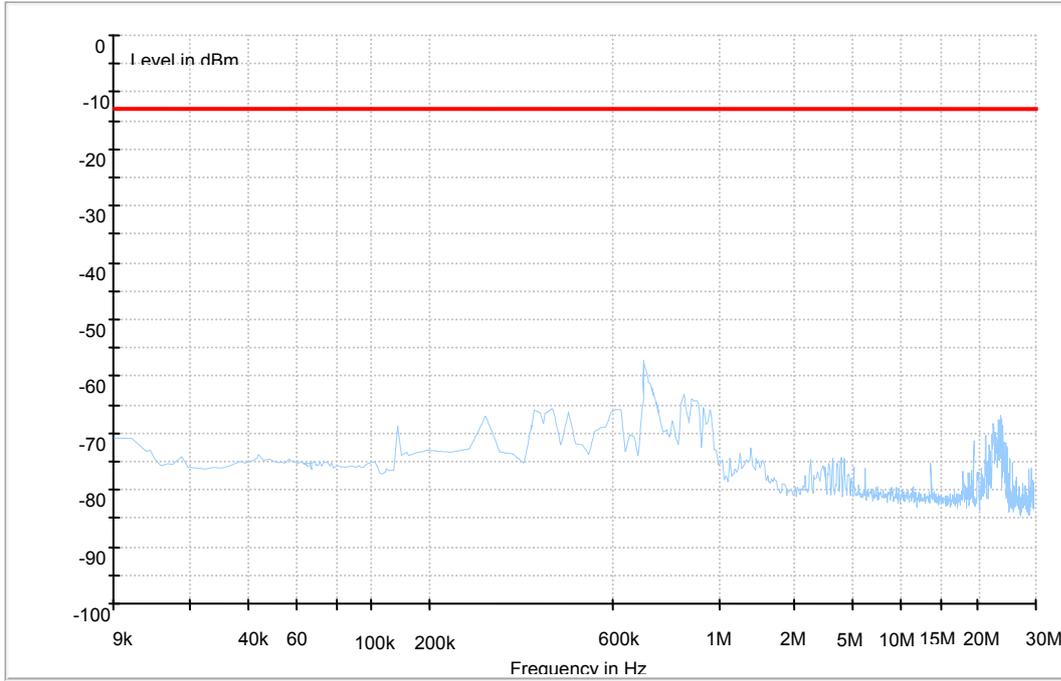


Traffic Mode (3GHz-18GHz)

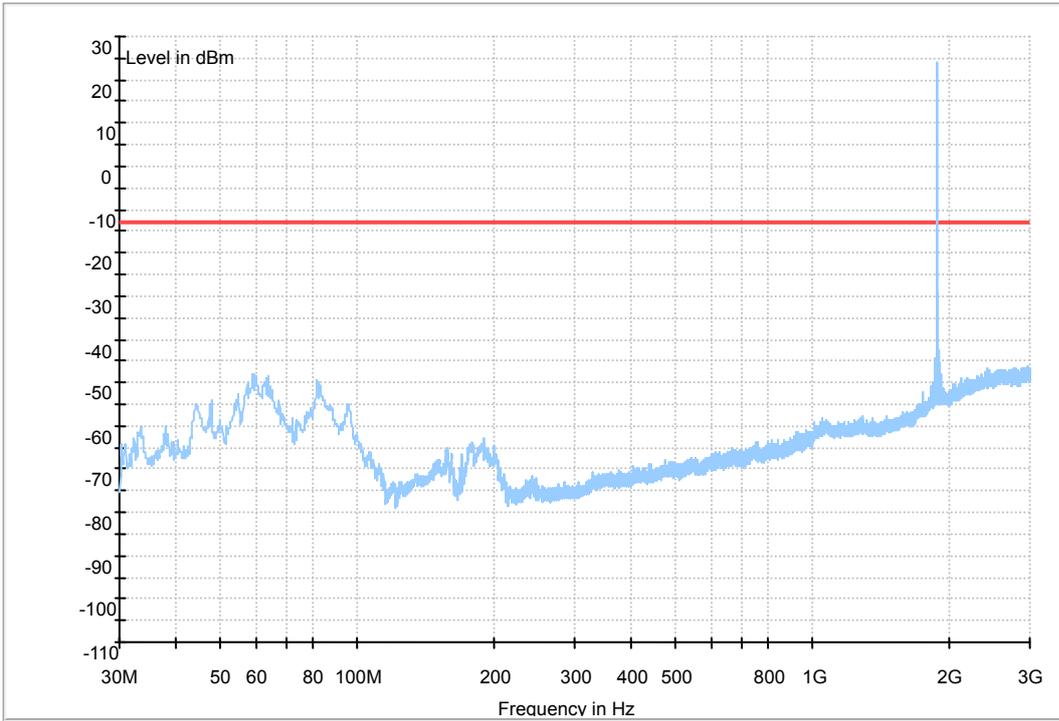


GPRS 1900

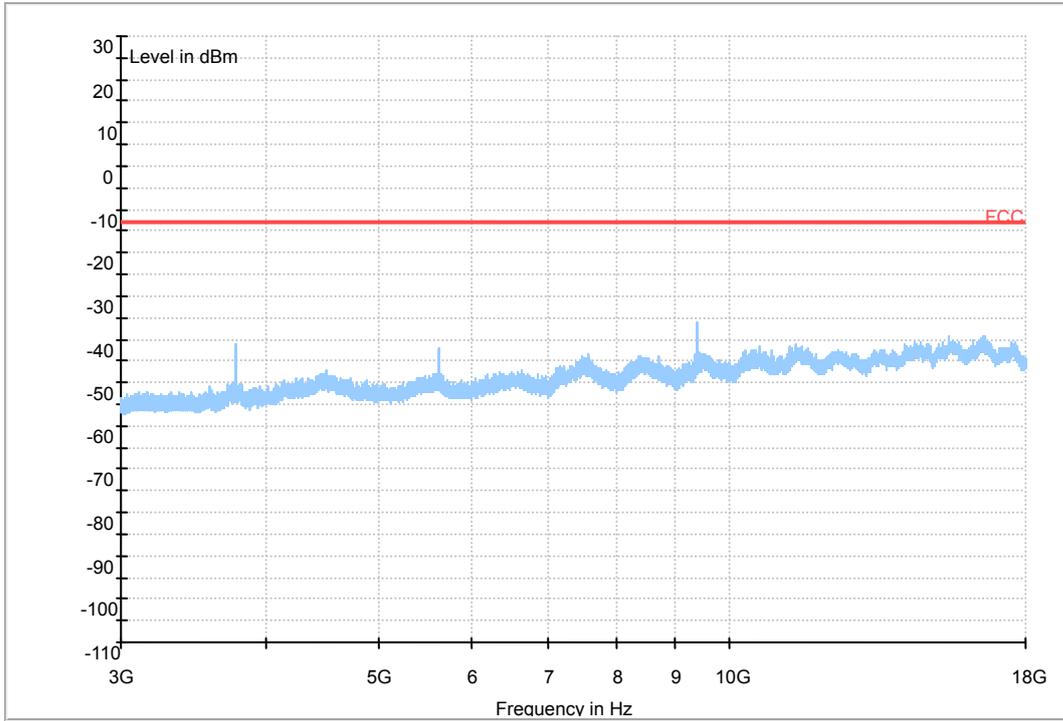
Traffic Mode (9kHz-30MHz)



Traffic Mode (30MHz-3GHz)

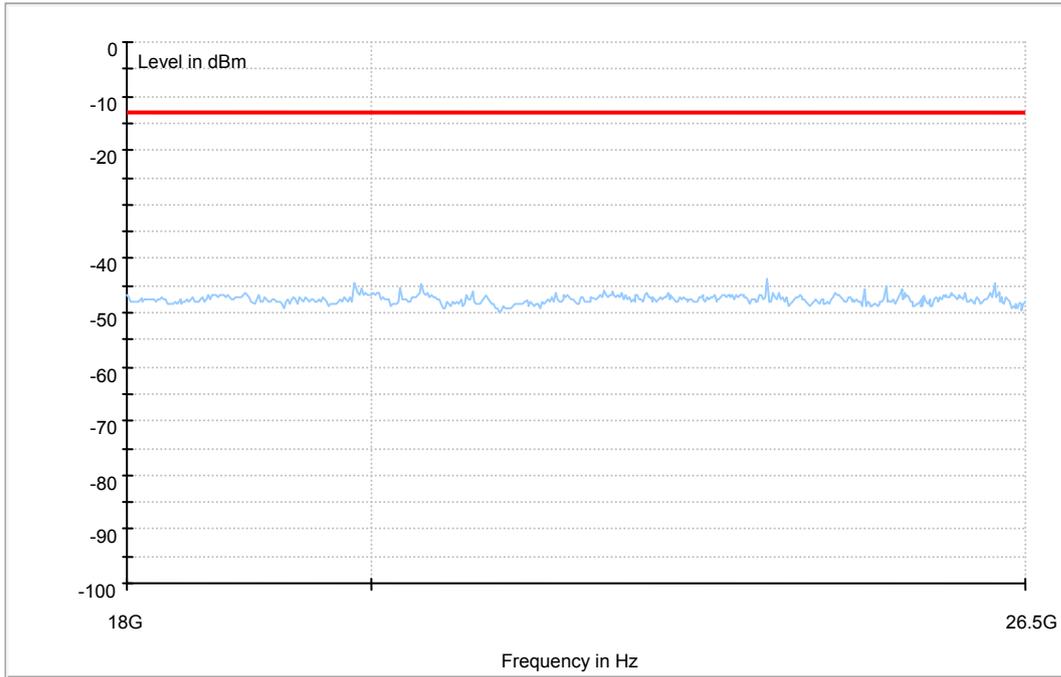


Traffic Mode (3GHz-18GHz)



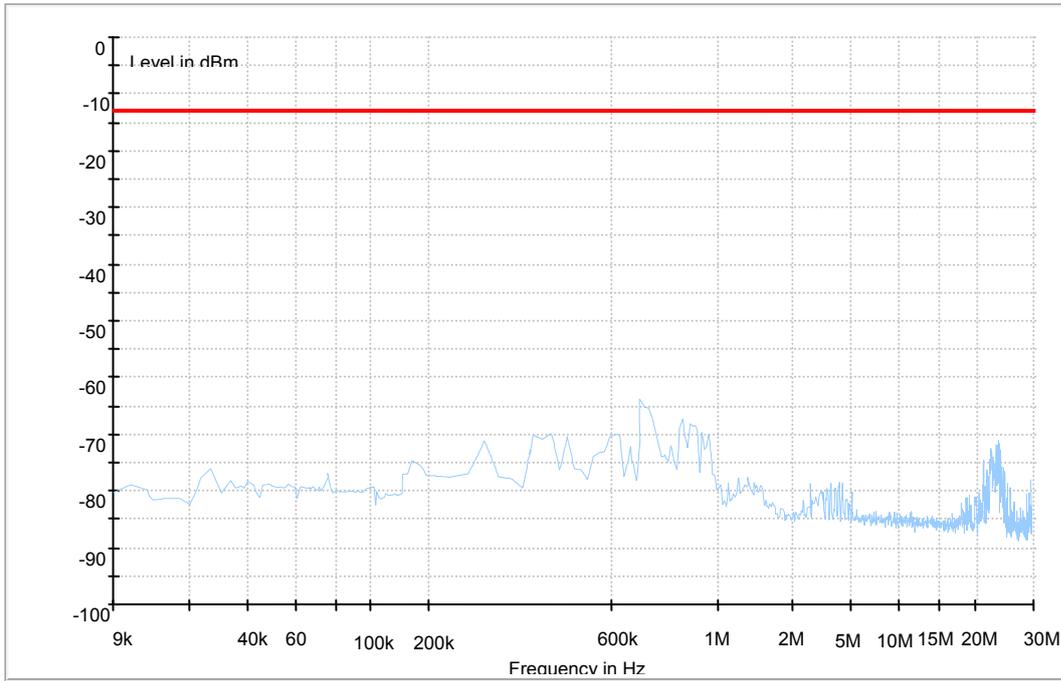
A

Traffic Mode (18GHz-26.5GHz)

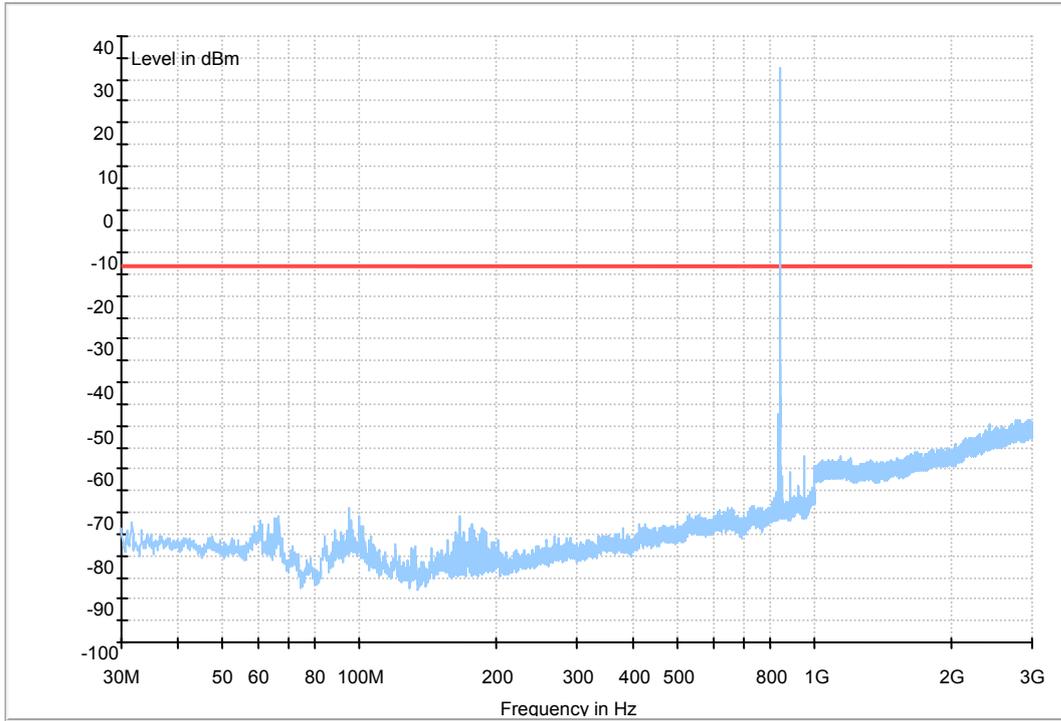


EDGE 850

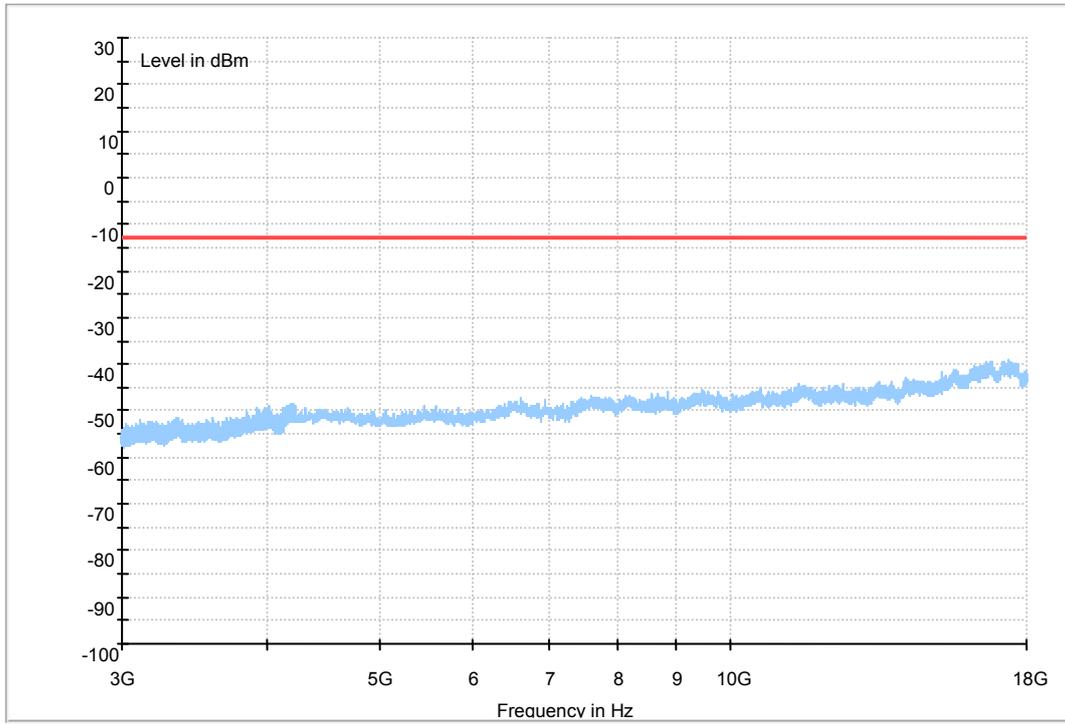
Traffic Mode (9kHz-30MHz)



Traffic Mode (30MHz-3GHz)

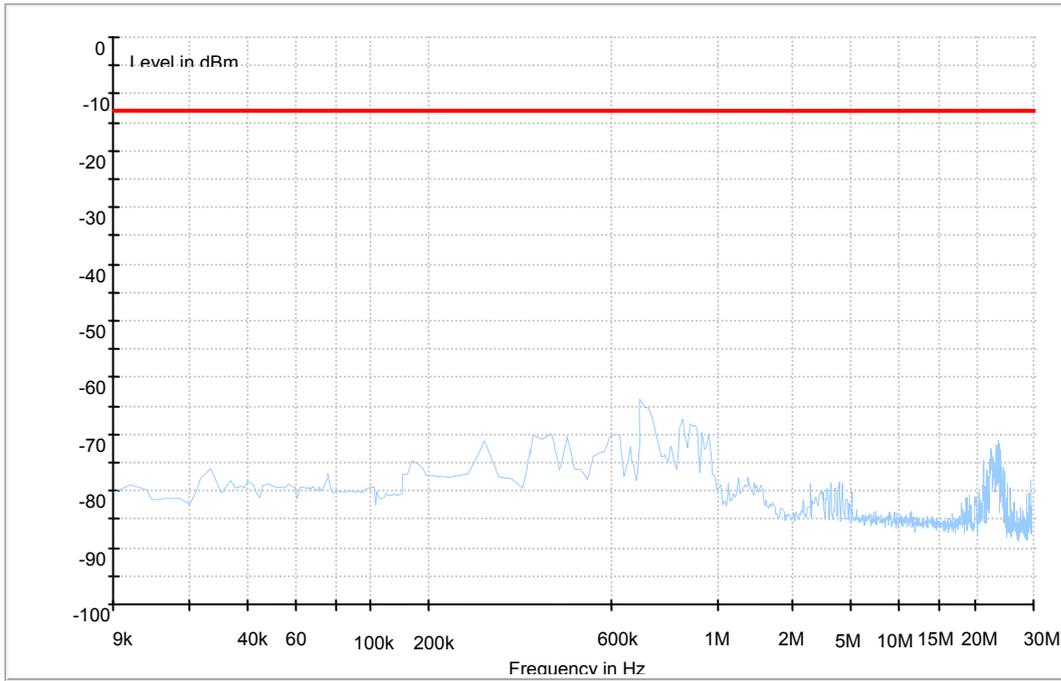


Traffic Mode (3GHz-18GHz)

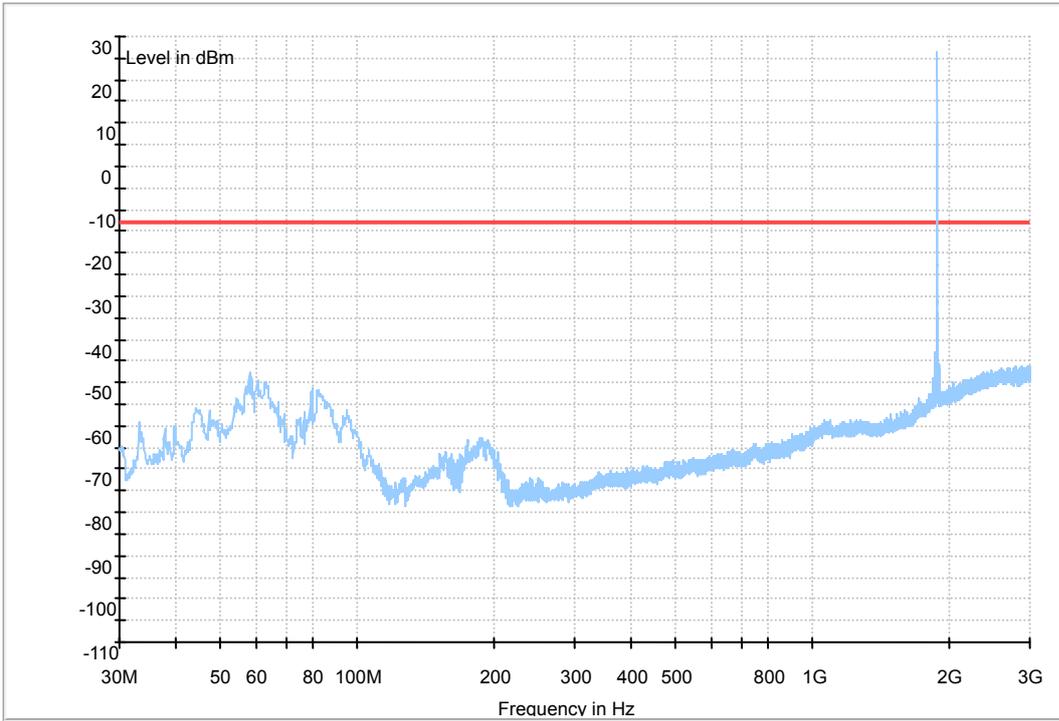


EDGE 1900

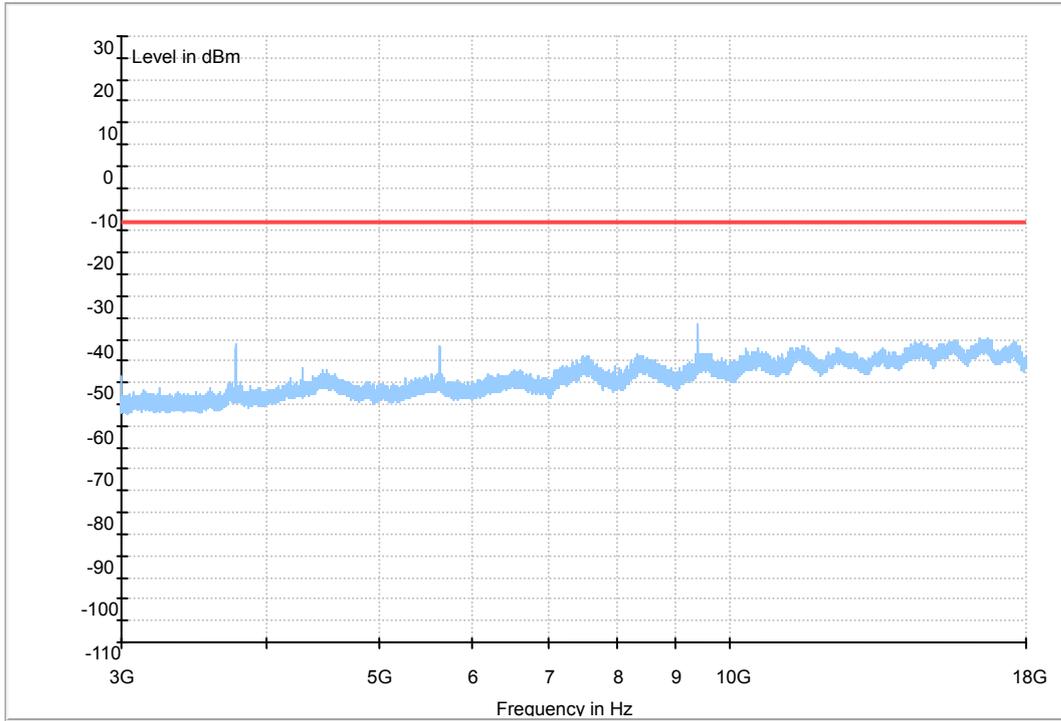
Traffic Mode (9kHz-30MHz)



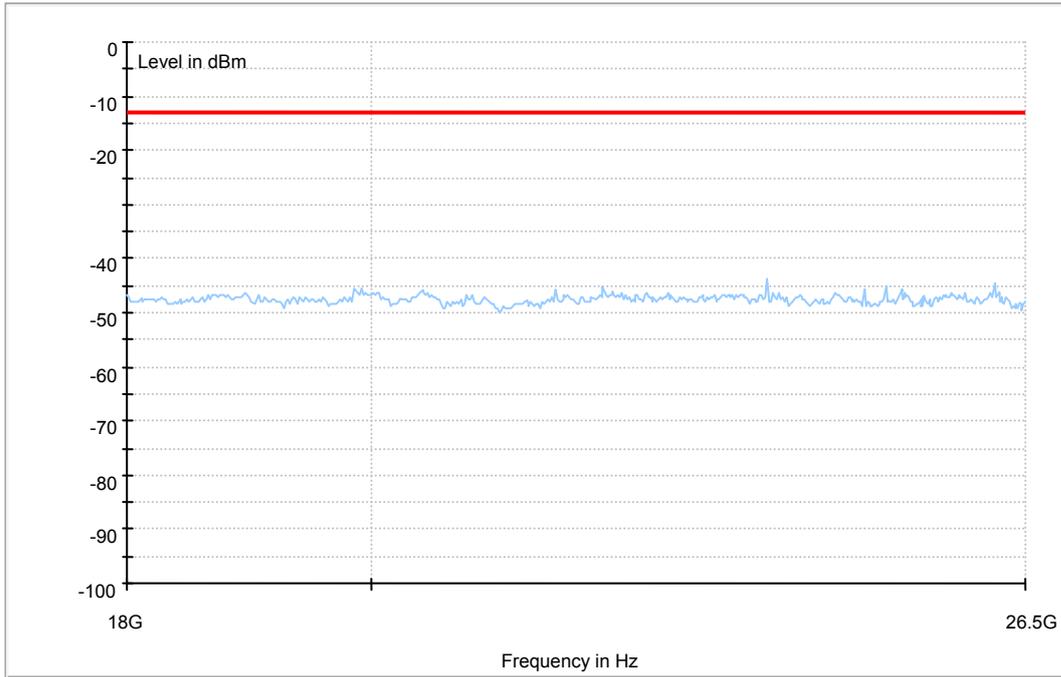
Traffic Mode (30MHz-3GHz)



Traffic Mode (3GHz-18GHz)

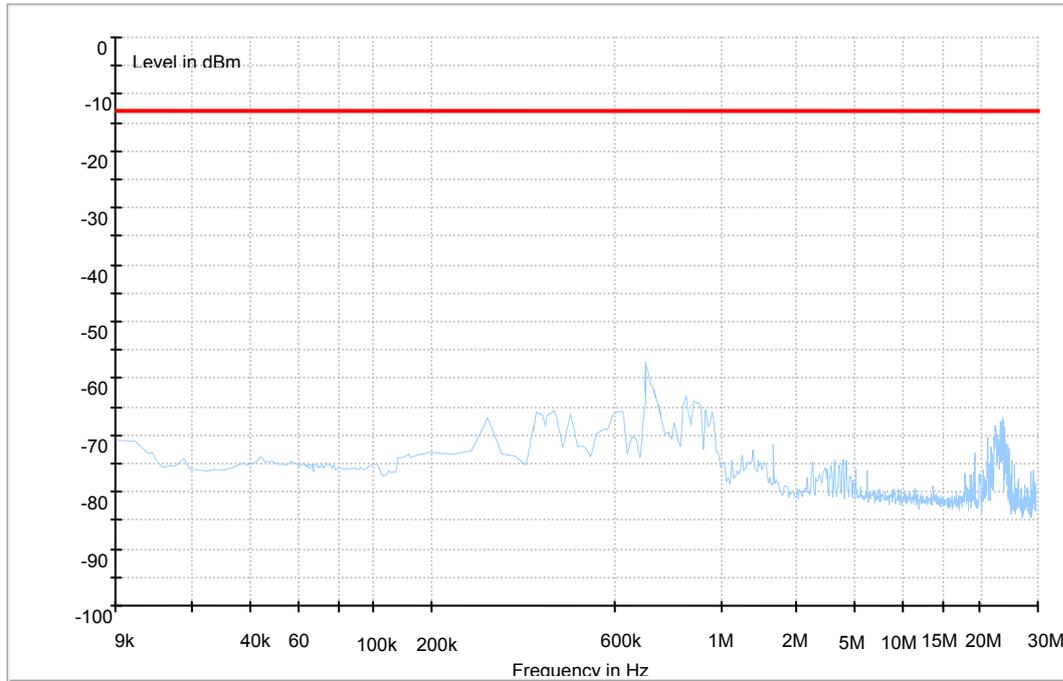


Traffic Mode (18GHz-26.5GHz)

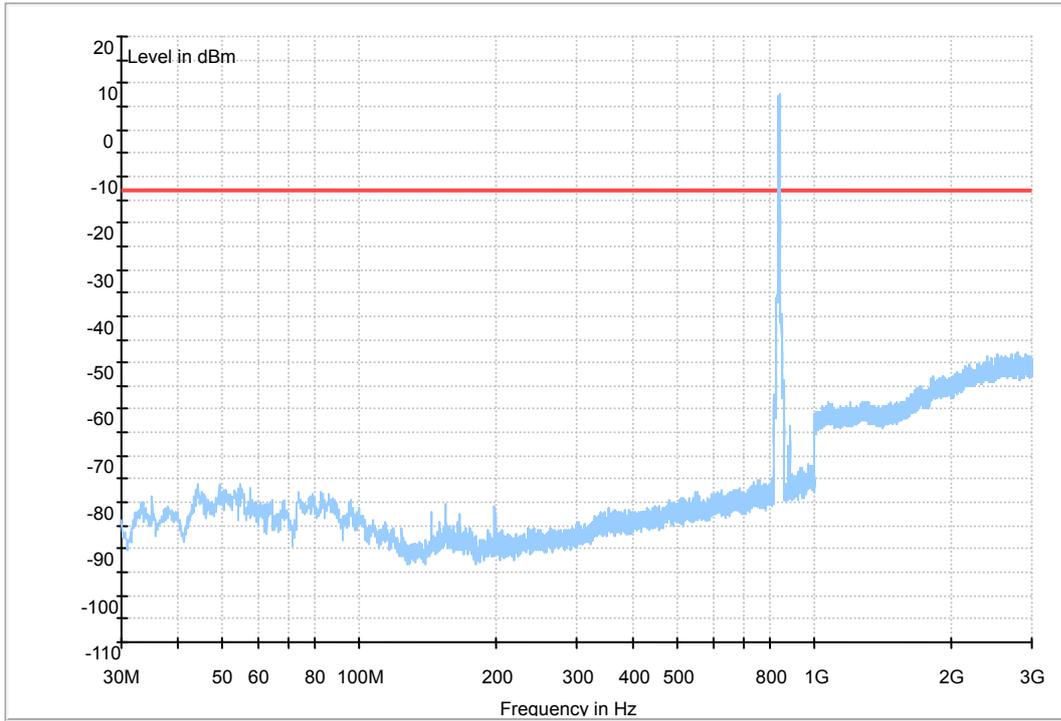


WCDMA Band V

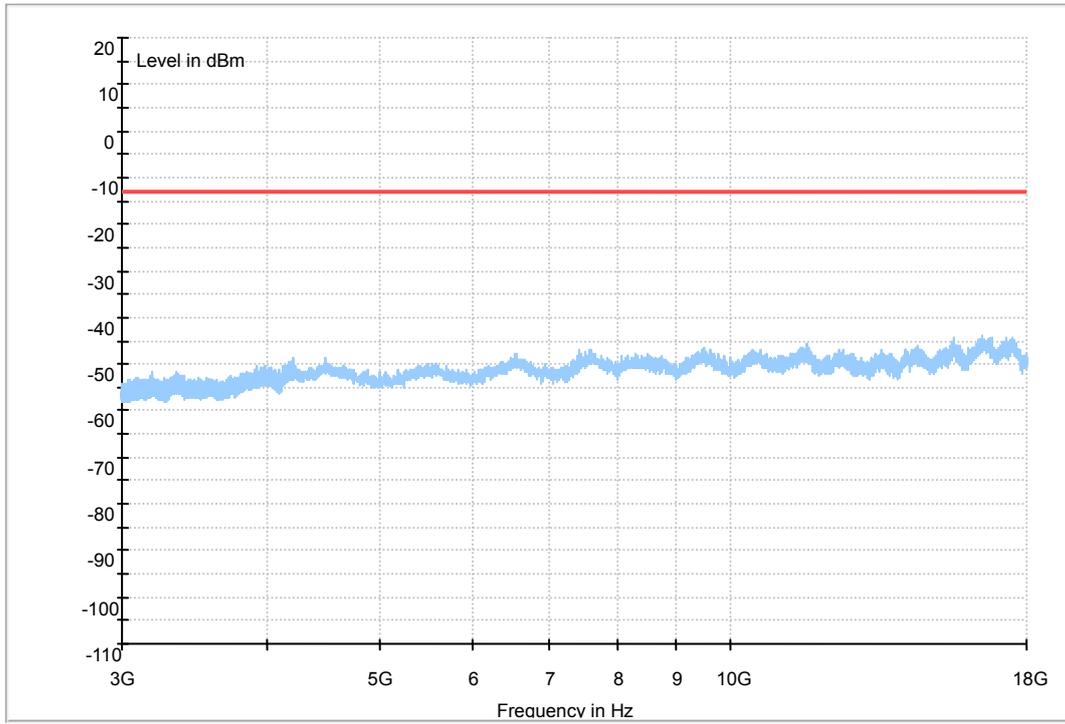
Traffic Mode (9kHz-30MHz)



Traffic Mode (30MHz-3GHz)

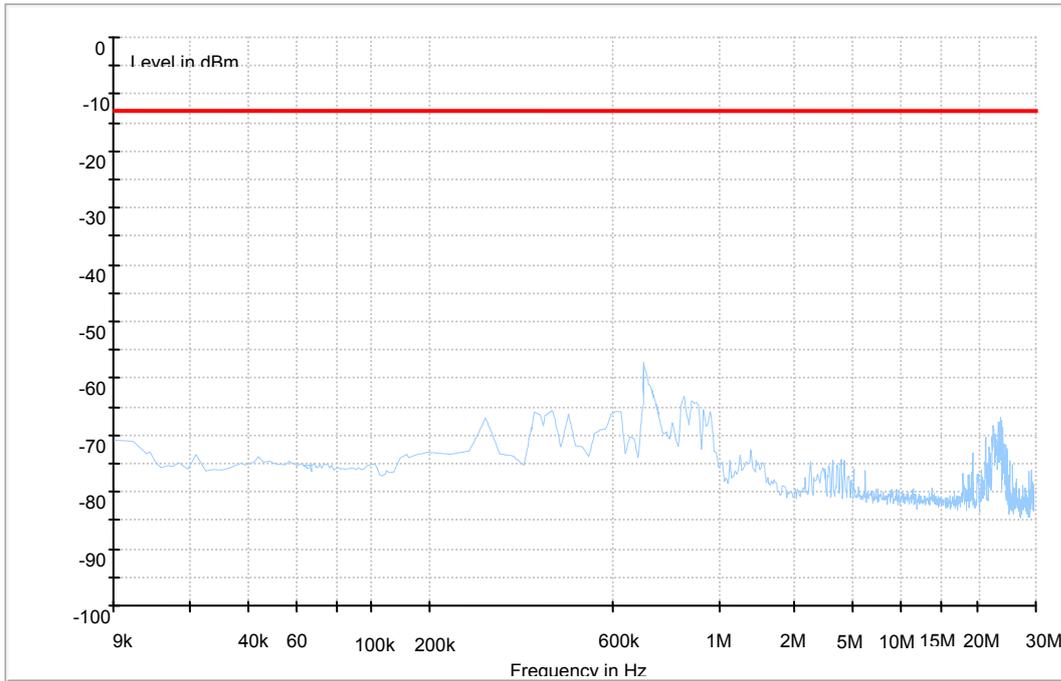


Traffic Mode (3GHz-18GHz)

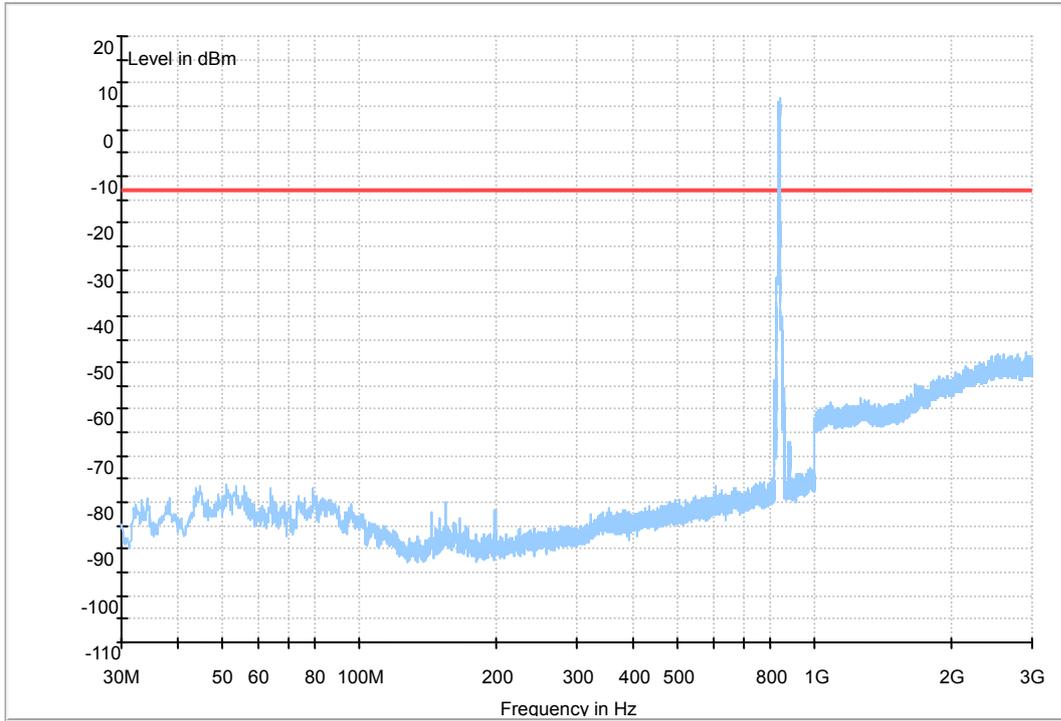


HSDPA Band V

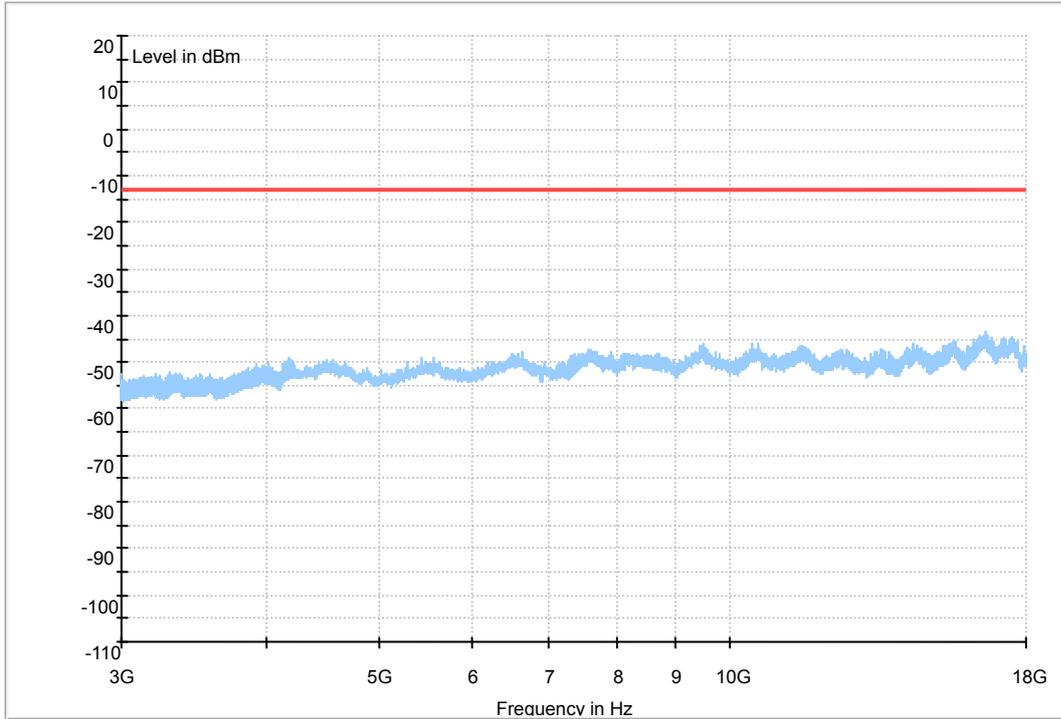
Traffic Mode (9kHz-30MHz)



Traffic Mode (30MHz-3GHz)

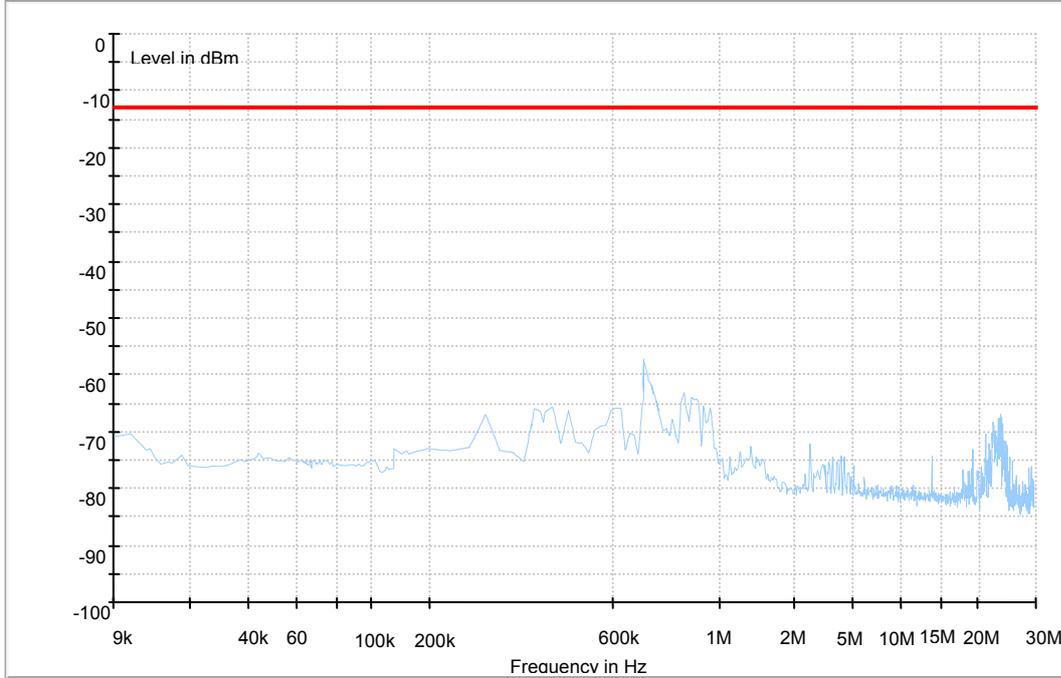


Traffic Mode (3GHz-18GHz)

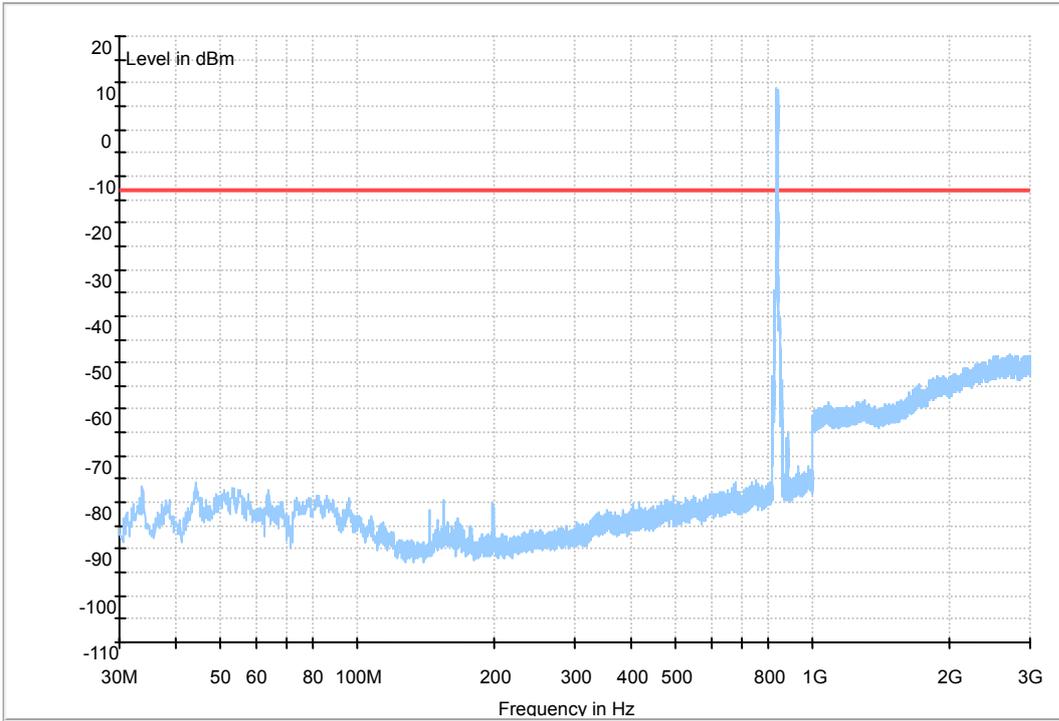


HSUPA Band V

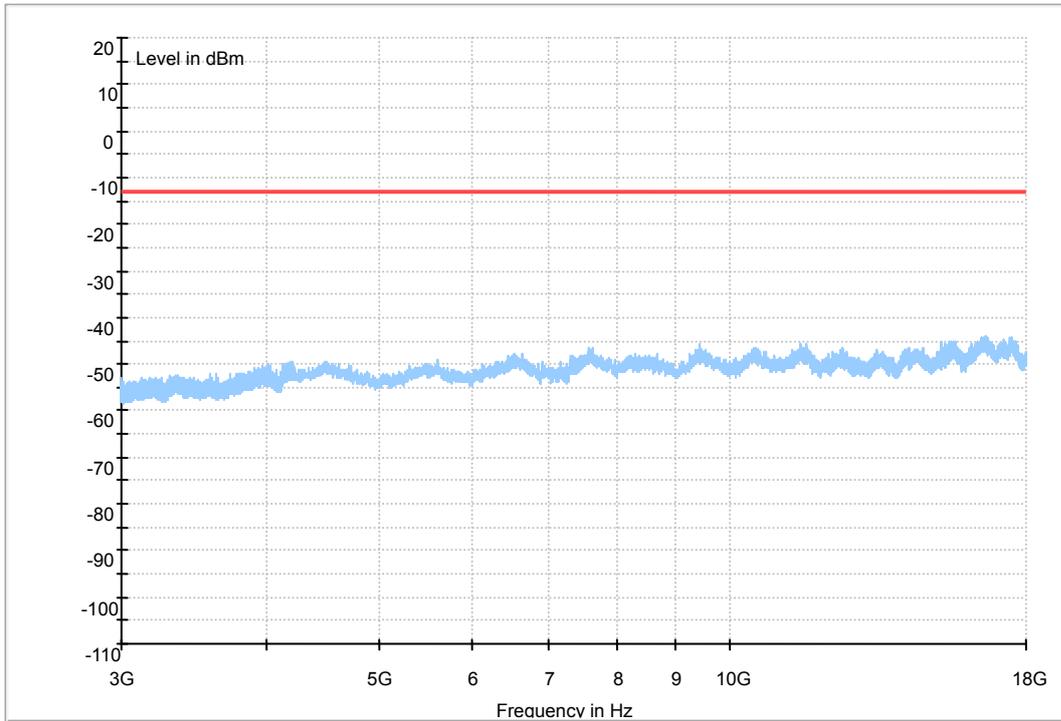
Traffic Mode (9kHz-30MHz)



Traffic Mode (30MHz-3GHz)



Traffic Mode (3GHz-18GHz)



Appendix_F: Frequency Stability

6.1 For GSM

6.1.1 Frequency Error vs. Voltage:

Test Band	Test Mode	Test Channel	Test Temp.	Test Volt.	Freq. Error [Hz]	Freq. vs. rated [ppm]	Limit [ppm]	Verdict
GSM850	GSM/TM1	LCH	TN	VH	-10.85	-0.01316	±2.5	PASS
				VN	-11.95	-0.0145	±2.5	PASS
				VL	-11.30	-0.01371	±2.5	PASS
		MCH	TN	VH	-7.36	-0.00879	±2.5	PASS
				VN	-2.97	-0.00355	±2.5	PASS
				VL	-5.42	-0.00648	±2.5	PASS
	HCH	TN	VH	-12.27	-0.01446	±2.5	PASS	
			VN	-8.52	-0.01004	±2.5	PASS	
			VL	-12.98	-0.01529	±2.5	PASS	
	GSM/TM2	LCH	TN	VH	-15.34	-0.01861	±2.5	PASS
				VN	-20.89	-0.02535	±2.5	PASS
				VL	-23.18	-0.02812	±2.5	PASS
		MCH	TN	VH	-14.63	-0.01748	±2.5	PASS
				VN	-10.82	-0.01293	±2.5	PASS
				VL	-12.40	-0.01481	±2.5	PASS
		HCH	TN	VH	-12.04	-0.01418	±2.5	PASS
				VN	-17.01	-0.02004	±2.5	PASS
				VL	-26.35	-0.03104	±2.5	PASS
GSM1900	GSM/TM1	LCH	TN	VH	-30.74	-0.01661	±2.5	PASS
				VN	-25.25	-0.01365	±2.5	PASS
				VL	-36.48	-0.01972	±2.5	PASS
		MCH	TN	VH	-46.17	-0.02456	±2.5	PASS
				VN	-59.34	-0.03156	±2.5	PASS
				VL	-38.16	-0.0203	±2.5	PASS
	HCH	TN	VH	-41.52	-0.02174	±2.5	PASS	
			VN	-45.14	-0.02364	±2.5	PASS	
			VL	-51.14	-0.02678	±2.5	PASS	
	GSM/TM2	LCH	TN	VH	-33.80	-0.01827	±2.5	PASS
				VN	-33.71	-0.01822	±2.5	PASS
				VL	-29.38	-0.01588	±2.5	PASS

Test Band	Test Mode	Test Channel	Test Temp.	Test Volt.	Freq. Error [Hz]	Freq. vs. rated [ppm]	Limit [ppm]	Verdict
		MCH	TN	VH	-50.37	-0.02679	±2.5	PASS
				VN	-46.17	-0.02456	±2.5	PASS
				VL	-59.37	-0.03158	±2.5	PASS
		HCH	TN	VH	-59.92	-0.03138	±2.5	PASS
				VN	-46.10	-0.02414	±2.5	PASS
				VL	-51.43	-0.02693	±2.5	PASS

6.1.2 Frequency Error vs. Temperature:

Test Band	Test Mode	Test Channel	Test Volt.	Test Temp.	Freq. Error [Hz]	Freq. vs. rated [ppm]	Limit [ppm]	Verdict
GSM850	GSM/TM1	LCH	VN	-30	-11.69	-0.01418	±2.5	PASS
				-20	-13.30	-0.01614	±2.5	PASS
				-10	-9.36	-0.01136	±2.5	PASS
				0	-11.88	-0.01441	±2.5	PASS
				10	-9.75	-0.01183	±2.5	PASS
				20	-13.04	-0.01582	±2.5	PASS
				30	-12.01	-0.01457	±2.5	PASS
				40	-12.91	-0.01566	±2.5	PASS
		MCH	VN	-30	-1.61	-0.00192	±2.5	PASS
				-20	-0.39	-0.00047	±2.5	PASS
				-10	-0.58	-0.00069	±2.5	PASS
				0	0.45	0.00054	±2.5	PASS
				10	-3.03	-0.00362	±2.5	PASS
				20	-0.39	-0.00047	±2.5	PASS
				30	0.19	0.00023	±2.5	PASS
				40	0.32	0.00038	±2.5	PASS
		HCH	VN	-30	-10.85	-0.01278	±2.5	PASS
				-20	-11.88	-0.014	±2.5	PASS
				-10	-17.24	-0.02031	±2.5	PASS
				0	-14.85	-0.0175	±2.5	PASS
				10	-13.43	-0.01582	±2.5	PASS
				20	-15.88	-0.01871	±2.5	PASS
				30	-20.15	-0.02374	±2.5	PASS
				40	-13.11	-0.01545	±2.5	PASS
		LCH	VN	-30	-24.63	-0.02988	±2.5	PASS
				-20	-24.73	-0.03	±2.5	PASS
				30	-15.82	-0.01864	±2.5	PASS
				40	-15.82	-0.01864	±2.5	PASS



Test Band	Test Mode	Test Channel	Test Volt.	Test Temp.	Freq. Error [Hz]	Freq. vs. rated [ppm]	Limit [ppm]	Verdict		
				-10	-20.02	-0.02429	±2.5	PASS		
				0	-21.50	-0.02609	±2.5	PASS		
				10	-16.53	-0.02006	±2.5	PASS		
				20	-18.18	-0.02206	±2.5	PASS		
				30	-21.60	-0.02621	±2.5	PASS		
				40	-23.54	-0.02856	±2.5	PASS		
				50	-27.02	-0.03278	±2.5	PASS		
		MCH	VN	-30	-18.44	-0.02203	±2.5	PASS		
				-20	-14.79	-0.01767	±2.5	PASS		
				-10	-9.52	-0.01137	±2.5	PASS		
				0	-4.55	-0.00544	±2.5	PASS		
				10	-11.85	-0.01416	±2.5	PASS		
				20	-16.53	-0.01975	±2.5	PASS		
				30	-12.75	-0.01523	±2.5	PASS		
				40	-7.14	-0.00853	±2.5	PASS		
		HCH	VN	50	-13.33	-0.01593	±2.5	PASS		
				-30	-20.11	-0.02369	±2.5	PASS		
				-20	-23.47	-0.02765	±2.5	PASS		
				-10	-36.32	-0.04279	±2.5	PASS		
				0	-26.25	-0.03093	±2.5	PASS		
				10	-31.32	-0.0369	±2.5	PASS		
				20	-28.48	-0.03355	±2.5	PASS		
				30	-27.25	-0.0321	±2.5	PASS		
		GSM1900	GSM/TM1	LCH	VN	40	-31.96	-0.03765	±2.5	PASS
						50	-29.77	-0.03507	±2.5	PASS
						-30	-30.09	-0.01626	±2.5	PASS
						-20	-23.70	-0.01281	±2.5	PASS
-10	-22.47					-0.01214	±2.5	PASS		
0	-33.84					-0.01829	±2.5	PASS		
10	-24.67					-0.01333	±2.5	PASS		
MCH	VN			20	-20.47	-0.01106	±2.5	PASS		
				30	-23.70	-0.01281	±2.5	PASS		
				40	-29.77	-0.01609	±2.5	PASS		
				50	-24.02	-0.01298	±2.5	PASS		
				-30	-51.21	-0.02724	±2.5	PASS		
				-20	-44.43	-0.02363	±2.5	PASS		
				-10	-53.01	-0.0282	±2.5	PASS		
0	-52.95	-0.02816	±2.5	PASS						
10	-53.40	-0.0284	±2.5	PASS						
20	-48.69	-0.0259	±2.5	PASS						



Test Band	Test Mode	Test Channel	Test Volt.	Test Temp.	Freq. Error [Hz]	Freq. vs. rated [ppm]	Limit [ppm]	Verdict		
				30	-52.30	-0.02782	±2.5	PASS		
				40	-44.36	-0.0236	±2.5	PASS		
				50	-44.94	-0.0239	±2.5	PASS		
		HCH	VN	-30	-46.88	-0.02455	±2.5	PASS		
				-20	-50.04	-0.0262	±2.5	PASS		
				-10	-42.23	-0.02211	±2.5	PASS		
				0	-44.36	-0.02323	±2.5	PASS		
				10	-54.76	-0.02867	±2.5	PASS		
				20	-41.26	-0.0216	±2.5	PASS		
				30	-50.75	-0.02657	±2.5	PASS		
				40	-41.46	-0.02171	±2.5	PASS		
				50	-46.30	-0.02424	±2.5	PASS		
				LCH	VN	-30	-41.07	-0.0222	±2.5	PASS
						-20	-26.76	-0.01446	±2.5	PASS
						-10	-29.32	-0.01585	±2.5	PASS
	0	-30.19	-0.01632			±2.5	PASS			
	10	-25.09	-0.01356			±2.5	PASS			
	20	-37.87	-0.02047			±2.5	PASS			
	30	-42.23	-0.02282			±2.5	PASS			
	40	-40.42	-0.02185			±2.5	PASS			
	50	-38.23	-0.02066			±2.5	PASS			
	GSM/TM2	MCH	VN	-30	-57.18	-0.03041	±2.5	PASS		
				-20	-60.70	-0.03229	±2.5	PASS		
				-10	-53.98	-0.02871	±2.5	PASS		
				0	-58.63	-0.03119	±2.5	PASS		
				10	-53.08	-0.02823	±2.5	PASS		
				20	-59.86	-0.03184	±2.5	PASS		
				30	-58.53	-0.03113	±2.5	PASS		
				40	-49.24	-0.02619	±2.5	PASS		
				50	-59.28	-0.03153	±2.5	PASS		
		HCH	VN	-30	-58.66	-0.03072	±2.5	PASS		
				-20	-50.85	-0.02663	±2.5	PASS		
				-10	-63.83	-0.03342	±2.5	PASS		
				0	-55.76	-0.0292	±2.5	PASS		
				10	-57.95	-0.03034	±2.5	PASS		
				20	-65.06	-0.03407	±2.5	PASS		
30				-68.06	-0.03564	±2.5	PASS			
40	-52.85	-0.02767	±2.5	PASS						
50	-67.96	-0.03558	±2.5	PASS						

6.2 For UMTS

6.2.1 Frequency Error vs. Voltage:

Test Band	Test Mode	Test Channel	Test Temp.	Test Volt.	Freq. Error [Hz]	Freq. vs. rated [ppm]	Limit [ppm]	Verdict
WCDMA850	UMTS/TM1	LCH	TN	VH	2.23	0.0027	±2.5	PASS
				VN	0.20	0.00024	±2.5	PASS
				VL	-6.38	-0.00772	±2.5	PASS
		MCH	TN	VH	-1.10	-0.00132	±2.5	PASS
				VN	-0.58	-0.00069	±2.5	PASS
				VL	-1.68	-0.00201	±2.5	PASS
		HCH	TN	VH	-0.18	-0.00021	±2.5	PASS
				VN	-1.14	-0.00135	±2.5	PASS
				VL	-1.37	-0.00162	±2.5	PASS

6.2.2 Frequency Error vs. Temperature:

Test Band	Test Mode	Test Channel	Test Volt.	Test Temp.	Freq. Error [Hz]	Freq. vs. rated [ppm]	Limit [ppm]	Verdict
WCDMA850	UMTS/TM1	LCH	VN	-30	0.38	0.00046	±2.5	PASS
				-20	-0.21	-0.00025	±2.5	PASS
				-10	1.27	0.00154	±2.5	PASS
				0	-0.03	-0.00004	±2.5	PASS
				10	1.62	0.00196	±2.5	PASS
				20	-0.47	-0.00057	±2.5	PASS
				30	-2.81	-0.0034	±2.5	PASS
				40	7.02	0.00849	±2.5	PASS
				50	1.17	0.00142	±2.5	PASS
		MCH	VN	-30	-2.81	-0.00336	±2.5	PASS
				-20	-4.35	-0.0052	±2.5	PASS
				-10	-0.60	-0.00072	±2.5	PASS
				0	-9.55	-0.01142	±2.5	PASS
				10	-5.45	-0.00652	±2.5	PASS
				20	-6.30	-0.00753	±2.5	PASS
				30	-6.35	-0.00759	±2.5	PASS
				40	-4.26	-0.00509	±2.5	PASS
				50	-1.88	-0.00225	±2.5	PASS
		HCH	VN	-30	0.49	0.00058	±2.5	PASS
				-20	1.13	0.00133	±2.5	PASS
				-10	2.87	0.00339	±2.5	PASS



Test Band	Test Mode	Test Channel	Test Volt.	Test Temp.	Freq. Error [Hz]	Freq. vs. rated [ppm]	Limit [ppm]	Verdict
				0	-8.62	-0.01018	±2.5	PASS
				10	-4.96	-0.00586	±2.5	PASS
				20	-3.49	-0.00412	±2.5	PASS
				30	3.05	0.0036	±2.5	PASS
				40	0.98	0.00116	±2.5	PASS
				50	3.54	0.00418	±2.5	PASS

END