

FCC RF Test Report

Product Name: Smart Phone

Product Model: HUAWEI MT1-U06, MT1-U06

Report Number: SYBH(Z-RF)007032013-2001

FCC ID: QISMT1-U06

Reliability Laboratory of Huawei Technologies Co., Ltd.

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Applicant: Huawei Technologies Co., Ltd.
Address: Administration Building, Headquarters of Huawei Technologies Co., Ltd.,
Bantian, Longgang District, Shenzhen, 518129, P.R.C
Product Name: Smart Phone
Product Model: HUAWEI MT1-U06, MT1-U06

Date of Receipt Sample: 2013-02-03
Start Date of Test: 2013-02-05
End Date of Test: 2013-02-16

Test Result: Pass

Approved by Senior

Engineer:	2013-02-28	Dai Linjun	
	Date	Name	Signature

Prepared by:	2013-02-28	Zhong Yaning	
	Date	Name	Signature



Modification Record

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



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1 General Information

1.1 Applied Standard

Applied Rules: 47 CFR FCC Part 02:2012
47 CFR FCC Part 22: 2012
47 CFR FCC Part 24: 2012
47 CFR FCC Part 27 :2012

Test Method: FCC KDB 971168 D01 Power Meas License Digital Systems v02
FCC KDB 662911 D01 Multiple Transmitter Output v01r2

1.2 Test Location

Test Location 1: Reliability Laboratory of Huawei Technologies Co., Ltd.
Address: Administration Building, Headquarters of Huawei Technologies Co., Ltd.,
Bantian, Longgang District, Shenzhen, 518129, P.R.C

1.3 Test Environment Condition

Ambient Temperature: 19.5 to 25 °C
Ambient Relative Humidity: 40 to 55 %
Atmospheric Pressure: Not applicable

2 Test Summary

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

Test Item	FCC Rule No.	Requirements	Test Result	Verdict (NOTE 2)
Output Power Data	§2.1046, §22.913	FCC: ERP $\leq$ 7 W.	Appendix A	Pass
Modulation Characteristics	§2.1047	Digital modulation	Appendix C	Pass
Bandwidth	§2.1049, §22.917	OBW: No limit. EBW: No limit.	Appendix D	Pass
Band Edges Compliance	§2.1051, §22.917	$\leq$ -13 dBm/1%*EBW, in 1 MHz bands immediately outside and adjacent to the frequency block.	Appendix E	Pass
Spurious Emission at Antenna Terminals	§2.1051, §22.917	FCC: $\leq$ -13 dBm/100 kHz, from 9 kHz to 10 th harmonics but outside authorized operating frequency ranges.	Appendix F	Pass
Field Strength of Spurious Radiation	§2.1053, §22.917	FCC: $\leq$ -13 dBm/100 kHz.	Appendix G	Pass
Frequency Stability	§2.1055, §22.355	$\leq$ $\pm$ 2.5ppm.	Appendix H	Pass
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. NOTE 2: For the verdict, the "N/A" denotes "not applicable", the "N/T" denotes "not tested".				

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

Test Item	FCC Rule No.	Requirements	Test Result	Verdict (NOTE 2)
Output Power Data	§2.1046, §24.232	EIRP ≤ 2 W	Appendix A	Pass
Peak-Average Ratio	§2.1046, §24.232	Peak-Average Ratio ≤ 13 dB	Appendix B	Pass
Modulation Characteristics	§2.1047	Digital modulation	Appendix C	Pass
Bandwidth	§2.1049, §22.917	OBW: No limit. EBW: No limit.	Appendix D	Pass
Band Edges Compliance	§2.1051, §24.238	≤ -13 dBm/1%*EBW, in 1 MHz bands immediately outside and adjacent to the frequency block.	Appendix E	Pass
Spurious Emission at Antenna Terminals	§2.1051, §24.238	≤ -13 dBm/1 MHz, from 9 kHz to 10 th harmonics but outside authorized operating frequency ranges.	Appendix F	Pass
Field Strength of Spurious Radiation	§2.1053, §24.238	≤ -13 dBm/1 MHz.	Appendix G	Pass
Frequency Stability	§2.1055, §24.235	FCC: within authorized frequency block.	Appendix H	Pass
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. NOTE 2: For the verdict, the "N/A" denotes "not applicable", the "N/T" denotes "not tested".				

2.3 AWS Band (1710-1755 MHz paired with 2110-2155 MHz)

Test Item	FCC Rule No.	Requirements	Test Result	Verdict (NOTE 2)
Output Power Data	§2.1046, §27.50(d)	EIRP $\leq$ 1 W	Appendix A	Pass
Peak-Average Ratio	§2.1046, §27.50(d)	Peak-Average Ratio $\leq$ 13 dB	Appendix B	Pass
Modulation Characteristics	§2.1047	Digital modulation	Appendix C	Pass
Bandwidth	§2.1049, §22.917	OBW: No limit. EBW: No limit.	Appendix D	Pass
Band Edges Compliance	§2.1051, §27.53(h)	$\leq$ -13 dBm/1%*EBW, in 1 MHz bands immediately outside and adjacent to the frequency block.	Appendix E	Pass
Spurious Emission at Antenna Terminals	§2.1051, §27.53(h)	$\leq$ -13 dBm/1 MHz, from 9 kHz to 10 th harmonics but outside authorized operating frequency ranges.	Appendix F	Pass
Field Strength of Spurious Radiation	§2.1053, §27.53(h)	$\leq$ -13 dBm/1 MHz.	Appendix G	Pass
Frequency Stability	§2.1055, §27.54	Within authorized bands of operation/frequency block.	Appendix H	Pass
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. NOTE 2: For the verdict, the "N/A" denotes "not applicable", the "N/T" denotes "not tested".				

3 Description of the Equipment under Test (EUT)

3.1 General Description

HUAWEI MT1-U06, MT1-U06 is subscriber equipment in the UMTS/GSM system. The HSUPA/HSDPA/UMTS frequency band is Band I, Band II, Band IV, Band V and Band VIII. Band II, Band IV and Band V can be used in this report. The GSM/GPRS/EDGE frequency band includes GSM850 and GSM900 and DCS1800 and PCS1900, but only GSM850MHz and PCS1900MHz bands test data included in this report. The Mobile Phone implements such functions as RF signal receiving/transmitting, UMTS/GSM protocol processing, voice, video, MMS service, GPS, AGPS and WIFI etc. Externally it provides earphone port (to provide voice service) and USIM card interface. It also provides Bluetooth module to synchronize data between a PC and the phone, or to use the built-in modem of the phone to access the Internet with a PC, or to exchange data with other Bluetooth devices.

There are two different types of HUAWEI MT1-U06, MT1-U06. One is with NFC function, its FCC ID is QISMT1-U06N, the other is without NFC function, its FCC ID is QISMT1-U06. The others are the same, including circuit design, PCB board, structure. With the consideration of the identities and differences list above, all the RF tests were conducted to the EUT with NFC function.

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		
Hardware Version	Serial Number	Description
HD1U9900M	MT1-U06V100R001C00B104SP03	Main board of Mobile Phone

3.2.2 Sub-Assembly

Sub-Assembly			
Sub-Assembly Name	Model	Manufacturer	Description
AC/DC Adapter	HW-050200 A3W	Huawei Technologies Co., Ltd.	Input voltage: ~100-240V 50/60Hz 0.5A Output voltage: 5V  2A Rated Power: 10W

Sub-Assembly			
Sub-Assembly Name	Model	Manufacturer	Description
AC/DC Adapter	HW-050200 B3W	Huawei Technologies Co., Ltd.	Input voltage: ~100-240V 50/60Hz 0.5A Output voltage: 5V  2A Rated Power: 10W



Sub-Assembly			
Sub-Assembly Name	Model	Manufacturer	Description
AC/DC Adapter	HW-050200 E3W	Huawei Technologies Co., Ltd.	Input voltage: ~100-240V 50/60Hz 0.5A Output voltage: 5V  2A Rated Power: 10W

Sub-Assembly			
Sub-Assembly Name	Model	Manufacturer	Description
AC/DC Adapter	HW-050200 U3W	Huawei Technologies Co., Ltd.	Input voltage: ~100-240V 50/60Hz 0.5A Output voltage: 5V  2A Rated Power: 10W

3.3 Technical Specification

Characteristics	Description	
Radio System Type	☒ GSM ☒ UMTS	
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
	WCDMA1900	Transmission (TX): 1850-1910 MHz
		Receiving (RX): 1930-1990 MHz
TX and RX Antenna Ports	TX & RX port:	1
		0
	RX-only port:	0
TX Output Power(Target)	GSM850:	32.5dBm
	GSM1900:	30dBm
	UMTS1900:	23dBm
	UMTS1700:	22.2dBm
	UMTS850:	23.5dBm
Supported Channel Bandwidth	GSM system:	☒ 200 kHz
	UMTS system:	☒ 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:	244KGXW, 247KG7W
	GSM1900:	247KGXW, 252KG7W
	UMTS 850:	4M07F9W
	UMTS 1900:	4M07F9W
	UMTS 1700:	4M07F9W

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	3.5V
	VN	3.8V
	VH	4.35V

NOTE1: VL= lower extreme test voltage
VN= nominal voltage
VH= upper extreme test voltage
TN= normal temperature

NOTE2: The test voltage range of 3.5V, 3.8V, 4.35V can cover the voltage 3.5V, 3.7V, 4.2V.

4.3 Test Frequency

Test Mode	TX / RX	RF Channel		
		Low (L)	Middle (M)	High (H)
GSM/TM1& GSM/TM2	TX	Channel 128	Channel 190	Channel 251
		824.2MHz	836.6MHz	848.8MHz
	RX	Channel 128	Channel 190	Channel 251
		869.2MHz	881.6MHz	893.8MHz
GSM/TM1&	TX	Channel 512	Channel 661	Channel 810



Test Mode	TX / RX	RF Channel		
		Low (L)	Middle (M)	High (H)
GSM/TM2	RX	1850.2MHz	1880.0MHz	1909.8MHz
		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
UMTS/TM1& UMTS/TM2& UMTS/TM3	TX	Channel 9262	Channel9400	Channel9538
		1852.4MHz	1880.0MHz	1907.6MHz
	RX	Channel 9662	Channel 9800	Channel 9938
		1932.4 MHz	1960.0 MHz	1987.6 MHz
UMTS/TM1& UMTS/TM2& UMTS/TM3	TX	Channel 1312	Channel1413	Channel1513
		1712.4MHz	1732.6MHz	1752.6MHz
	RX	Channel 1537	Channel 9800	Channel 9939
		2112.4 MHz	2132.6 MHz	2152.6 MHz

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 $43 + 10\log_{10}(\text{Power [Watts]})$.

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°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.

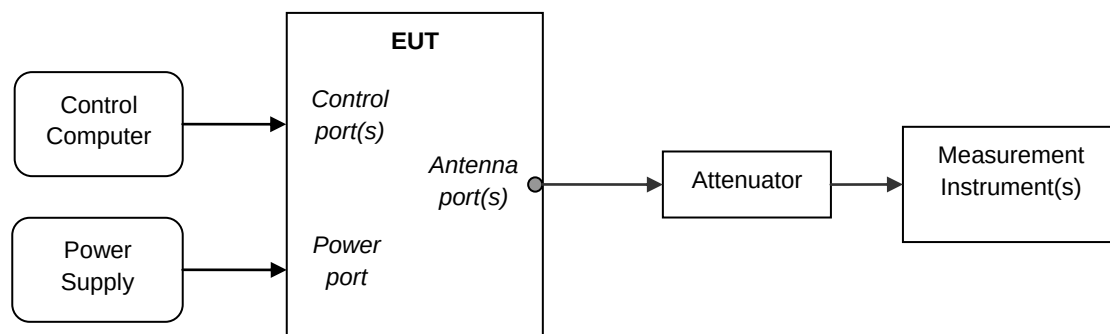
Time Period and Procedure:

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°C. A period of at least one half-hour is provided to allow stabilization of the equipment at each temperature level.

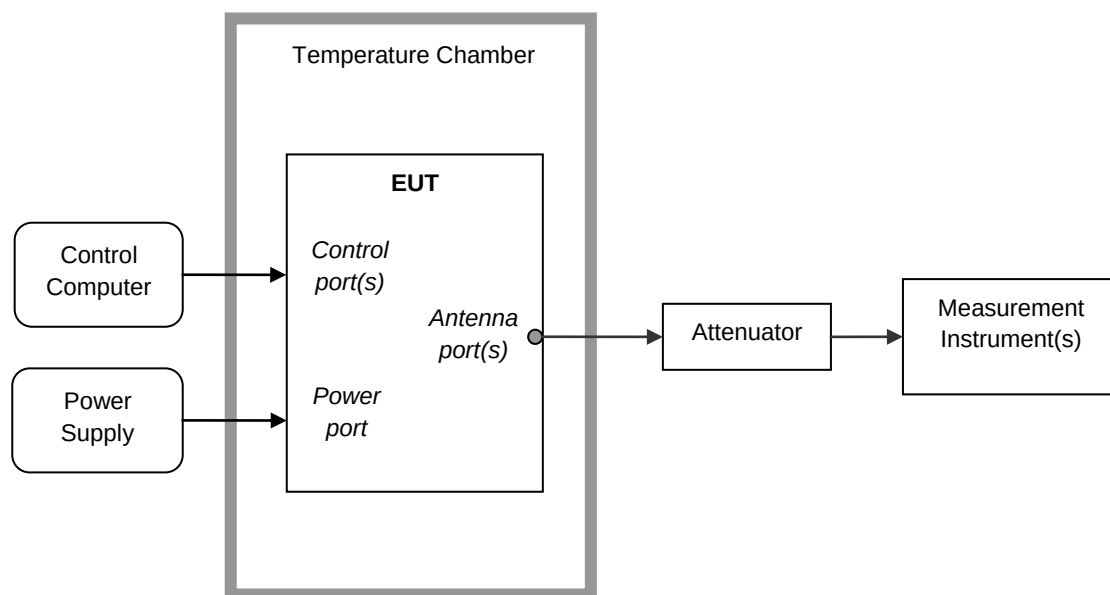
Note: Reference test setup 2.

4.5 Test Setups

4.5.1 Test Setup 1



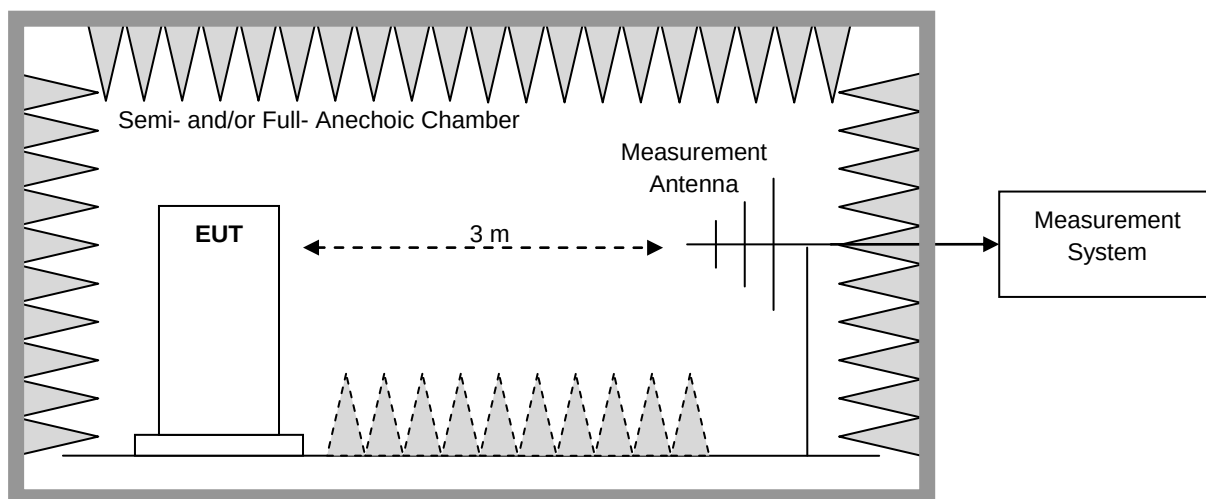
4.5.2 Test Setup 2



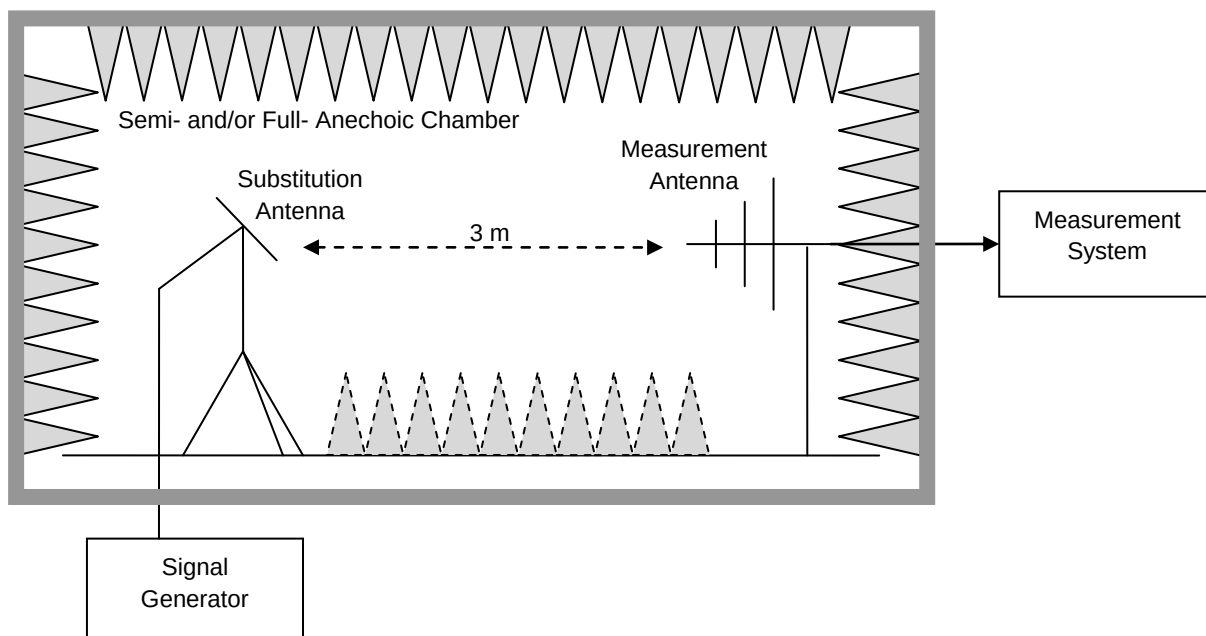
4.5.3 Test Setup 3

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
	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&UMTS/TM1
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) 85%, 100% and 115% 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	123299	2012-09-20	2013-09-19
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	2013-01-29	2014-01-28
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	2012-10-12	2013-10-11
Trilog Broadband Antenna (30M~3GHz)	SCHWARZBEC K	VULB 9163	9163-521	2012-12-09	2013-12-08
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

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1Appendix_A: Output Power Data

Part I - Test Results

Test Band	Test Mode	Test Channel	Measured	ERP [dBm]	Limit [dBm]	Verdict
GSM850	GSM/TM 1	LCH	32.48	32.23	38.5	PASS
		MCH	32.55	32.30	38.5	PASS
		HCH	32.67	32.42	38.5	PASS
	GSM/TM 2	LCH	27.18	26.93	38.5	PASS
		MCH	37.28	27.03	38.5	PASS
		HCH	27.32	27.07	38.5	PASS
WCDMA8 50	UMTS/T M1	LCH	23.59	23.34	33	PASS
		MCH	23.47	23.22	33	PASS
		HCH	23.49	23.24	33	PASS

Note1: a, For getting the ERP (Efficient Radiated Power) or EIRP (Efficient Isotropic Radiated Power) in substitution method, the following formula should be taken to calculate it,

$$\text{ERP [dBm]} = \text{SGP [dBm]} - \text{Cable Loss [dB]} + \text{Gain [dBd]}$$

b, SGP=Signal Generator Level

Note2: RBW > emission bandwidth, VBW > 3 x RBW.

Test Band	Test Mode	Test Channel	Measure d	EIRP [dBm]	Limit [dBm]	Verdict
GSM1900	GSM/TM 1	LCH	30.09	32.09	33	PASS
		MCH	29.97	31.97	33	PASS
		HCH	29.78	31.78	33	PASS
	GSM/TM 2	LCH	25.89	27.89	33	PASS
		MCH	25.81	27.81	33	PASS
		HCH	25.64	27.64	33	PASS
WCDM1900	UMTS/TM1	LCH	22.99	24.99	33	PASS
		MCH	22.87	24.87	33	PASS
		HCH	22.67	24.67	33	PASS
WCDM1700	UMTS/TM1	LCH	22.95	25.19	30	PASS
		MCH	22.87	25.17	30	PASS
		HCH	22.97	25.27	30	PASS

Note1: a, For getting the ERP (Efficient Radiated Power) or EIRP (Efficient Isotropic Radiated Power) in substitution method, the following formula should be taken to calculate it,

$$\text{EIRP [dBm]} = \text{SGP [dBm]} - \text{Cable Loss [dB]} + \text{Gain [dBi]}$$

b, SGP=Signal Generator Level

Note2: RBW > emission bandwidth, VBW > 3 x RBW.

2Appendix_B Peak-to-Average Ratio

Part I - Test Results

Test Band	Test Mode	Test Channel	Measured[dB]	Limit [dB]	Verdict
GSM1900	GSM/TM1	LCH	0.19	13	PASS
		MCH	0.19	13	PASS
		HCH	0.21	13	PASS
	GSM/TM2	LCH	3.08	13	PASS
		MCH	3.18	13	PASS
		HCH	3.22	13	PASS
Test Band	Test Mode	Test Channel	Measured[dB]	Limit [dB]	Verdict
WCDMA1900	UMTS/TM1	LCH	3.43	13	PASS
		MCH	3.39	13	PASS
		HCH	3.33	13	PASS
WCDMA1700	UMTS/TM1	LCH	2.97	13	PASS
		MCH	3.45	13	PASS
		HCH	3.11	13	PASS

3Appendix_C: Modulation Characteristics

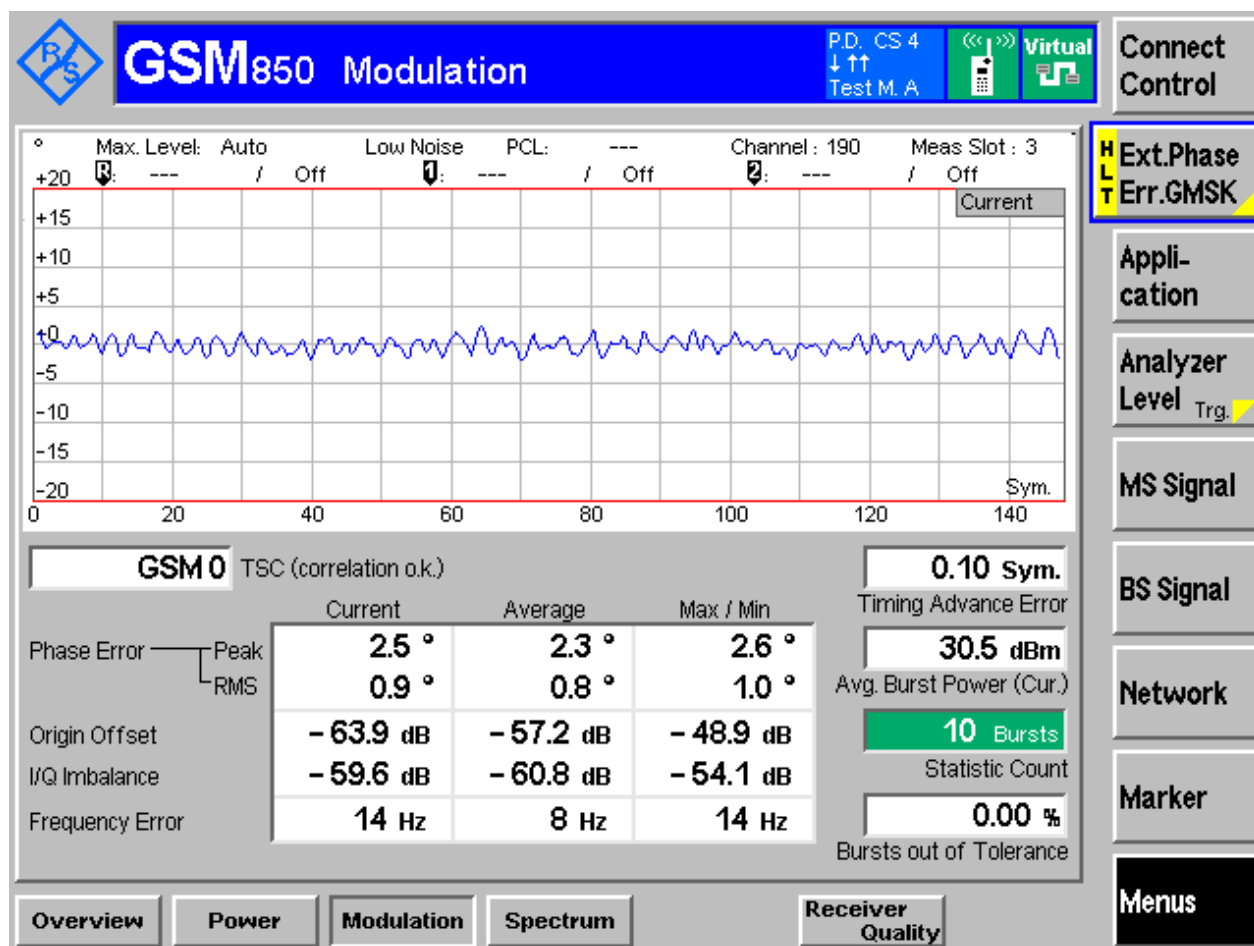
Part I - Test Plots

3.1 For GSM

3.1.1 Test Band = GSM850

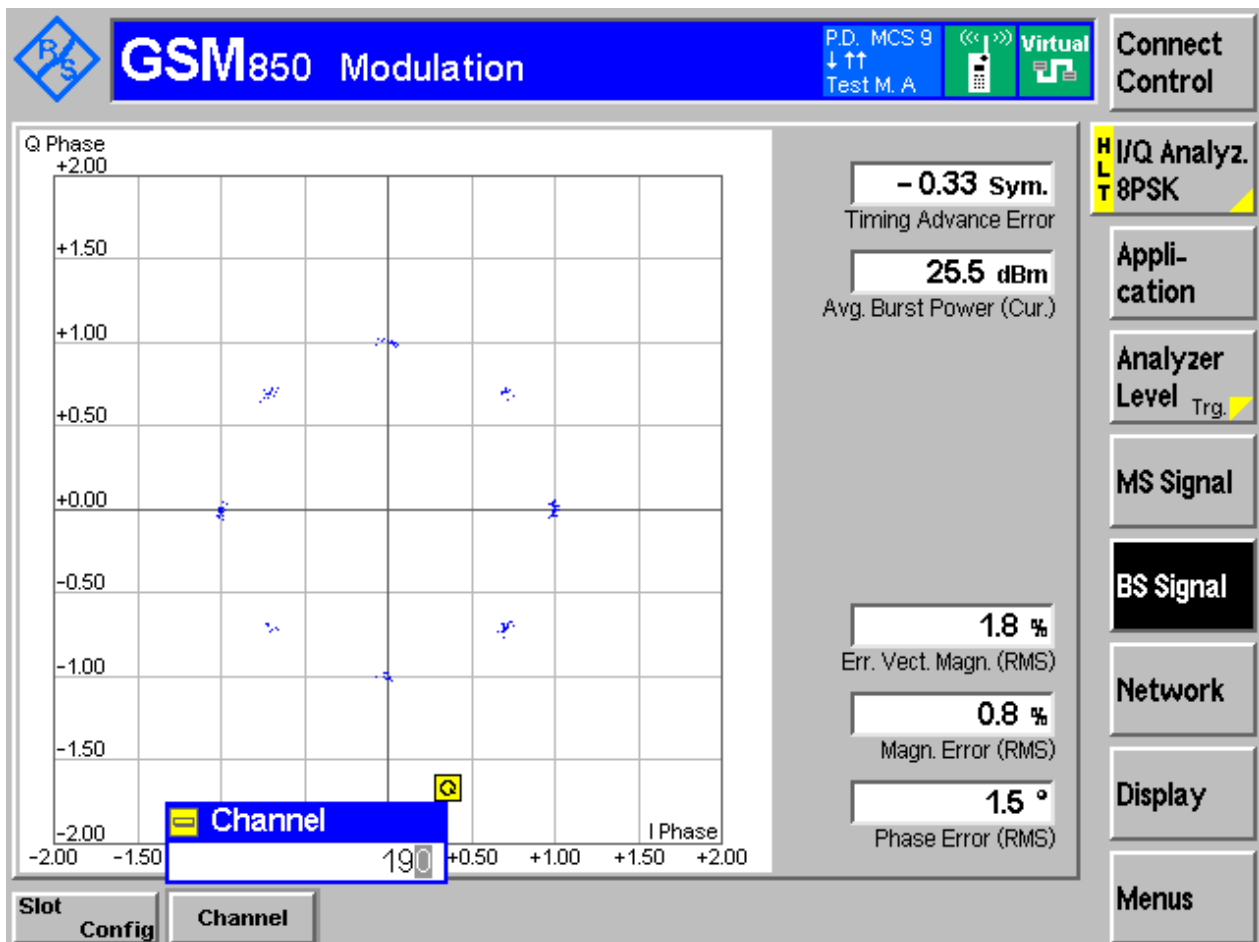
3.1.1.1 Test Mode = GSM/TM1

3.1.1.1.1 Test Channel = MCH



3.1.1.2 Test Mode = GSM/TM2

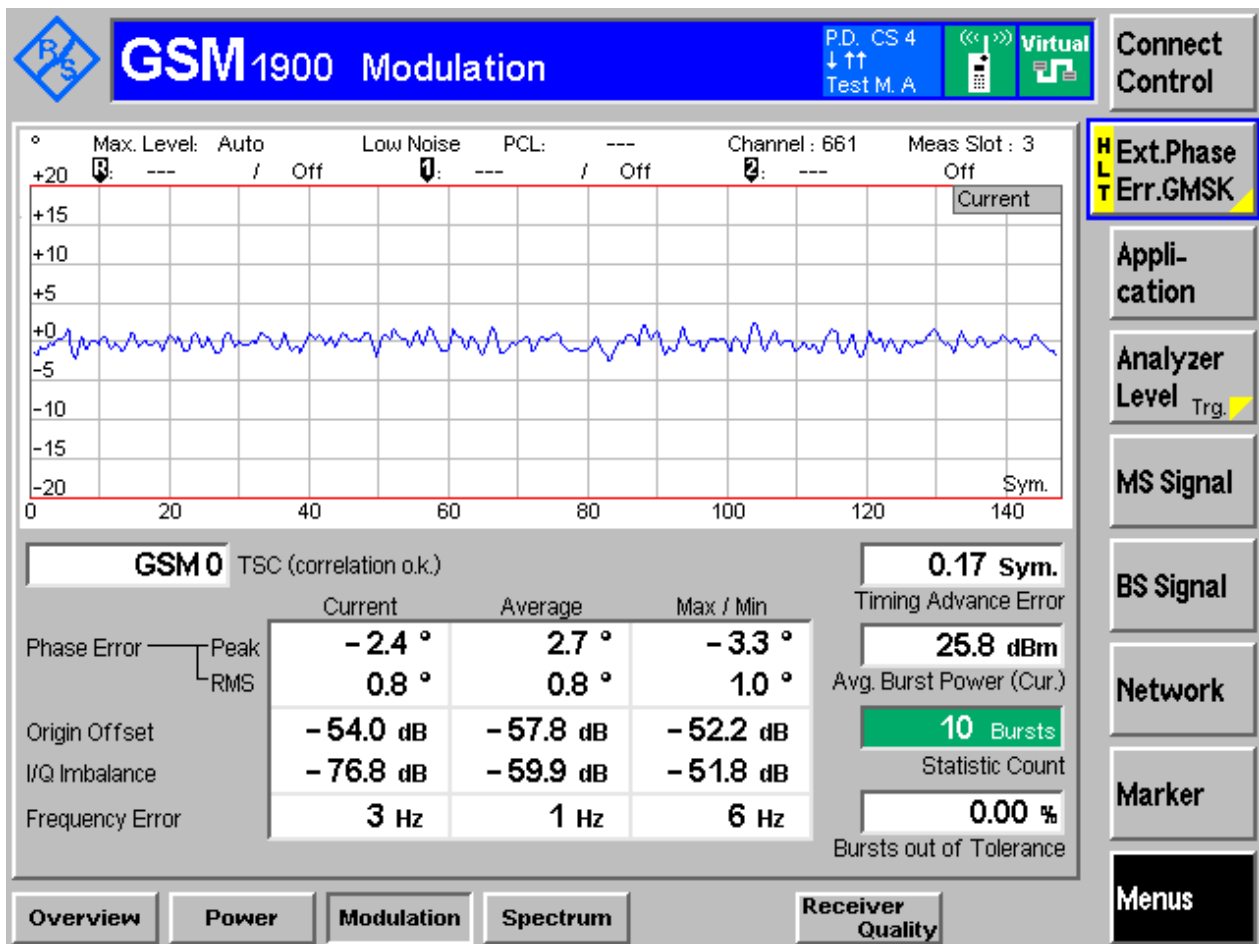
3.1.1.2.1 Test Channel = MCH



3.1.2 Test Band = GSM1900

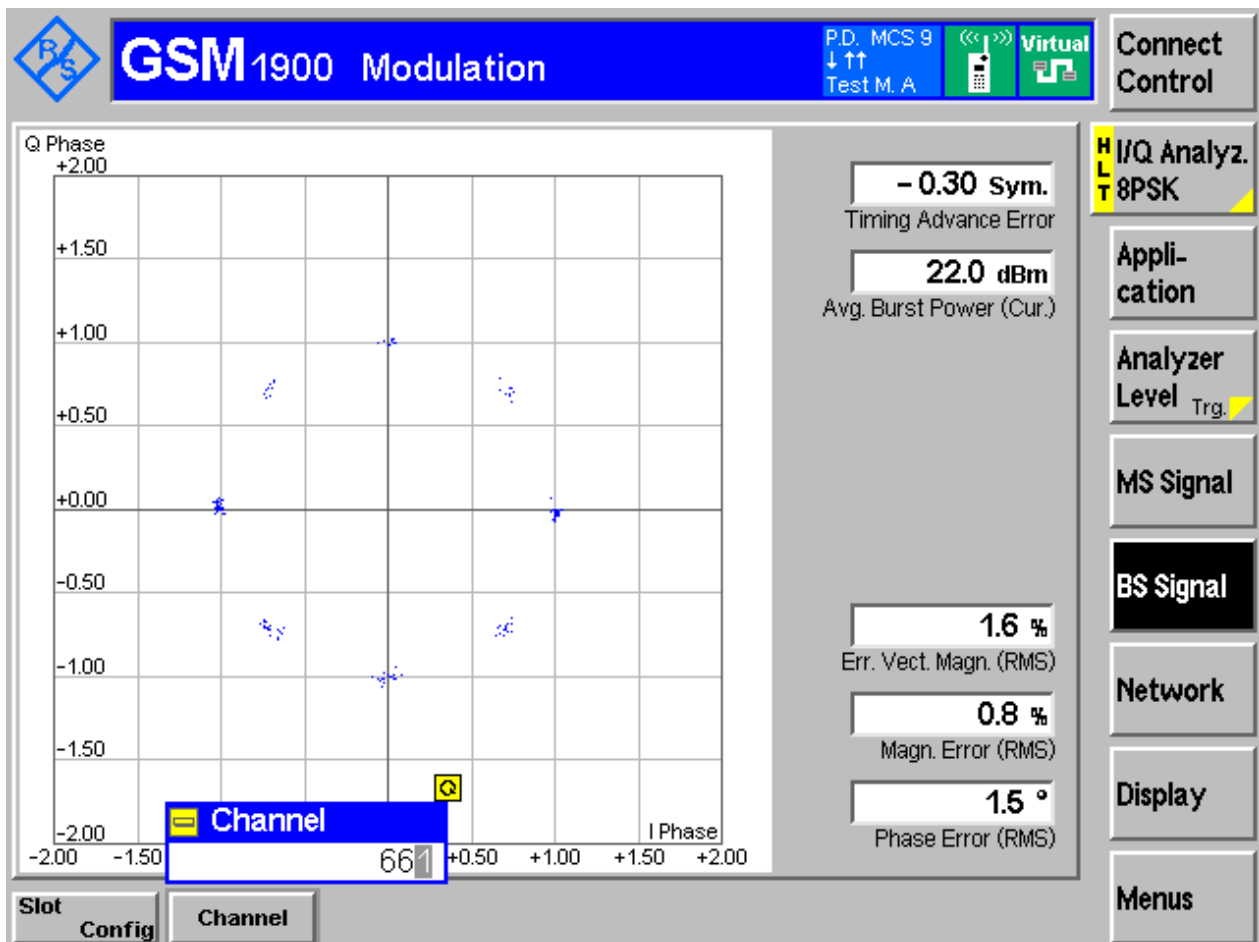
3.1.2.1 Test Mode = GSM/TM1

3.1.2.1.1 Test Channel = MCH



3.1.2.2 Test Mode = GSM/TM2

3.1.2.2.1 Test Channel = MCH

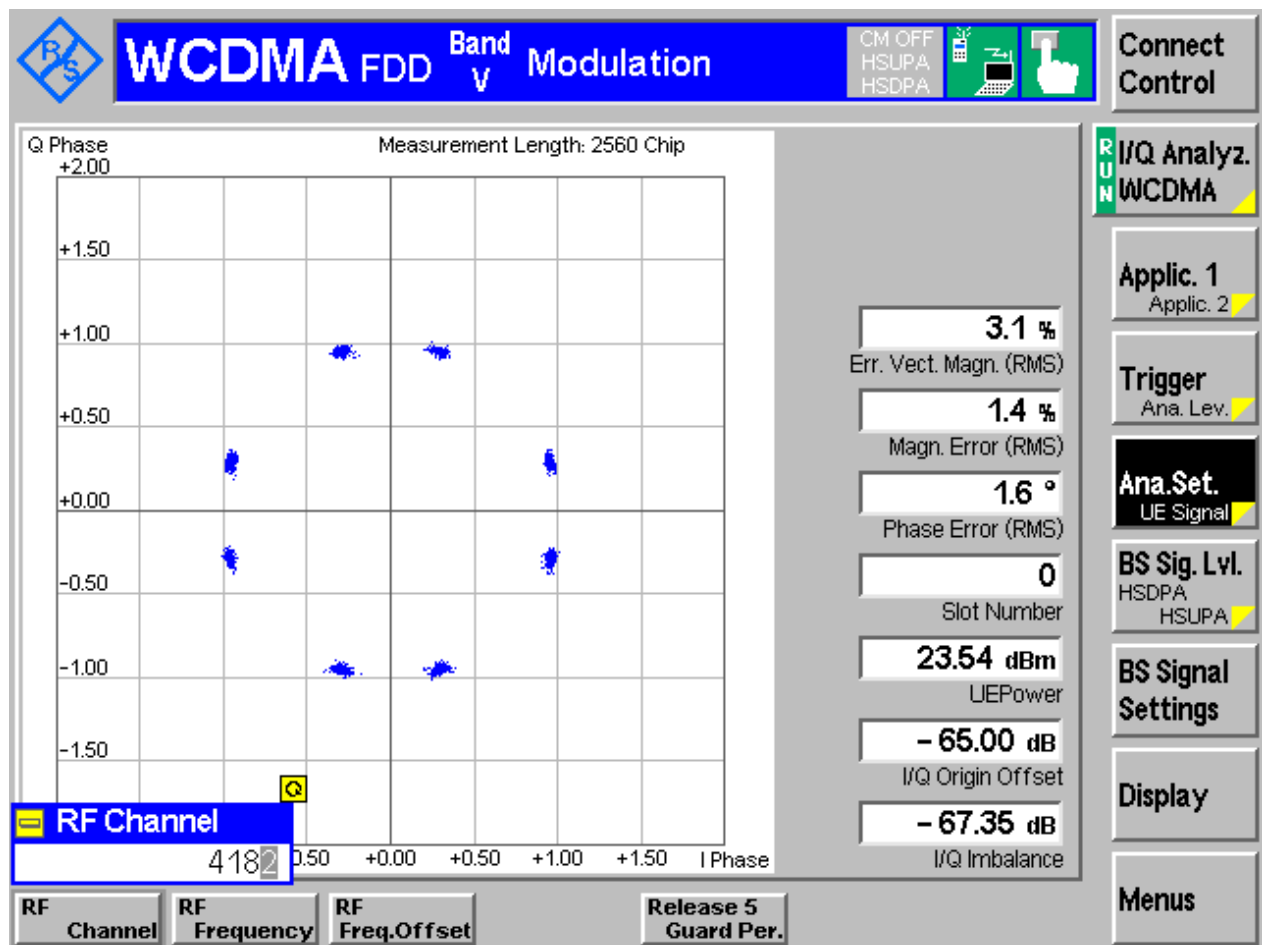


3.2 For UMTS

3.2.1 Test Band = WCDMA850

3.2.1.1 Test Mode = UMTS/TM1

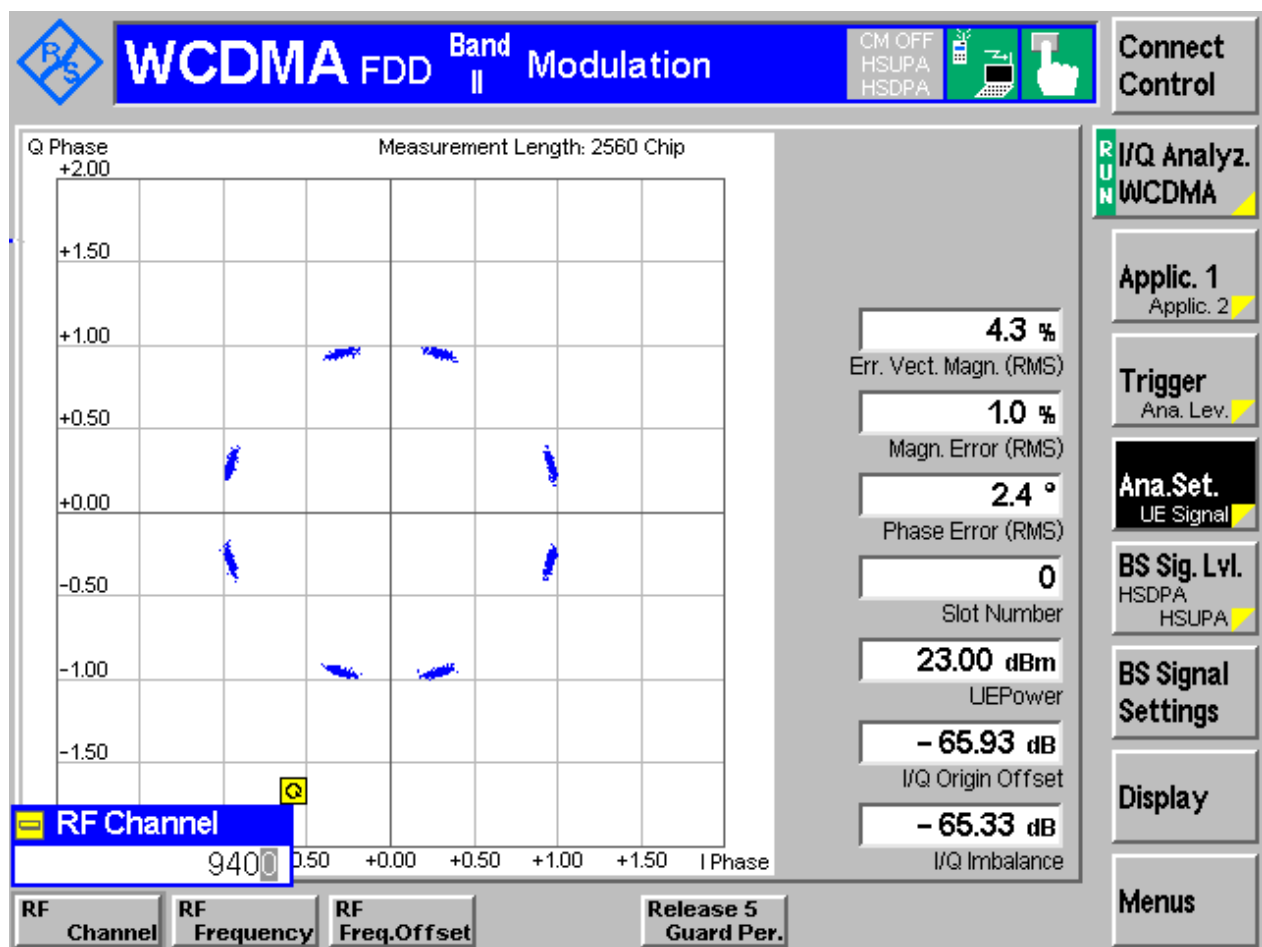
3.2.1.1.1 Test Channel = MCH



3.2.2 Test Band = WCDMA1900

3.2.2.1 Test Mode = UMTS/TM1

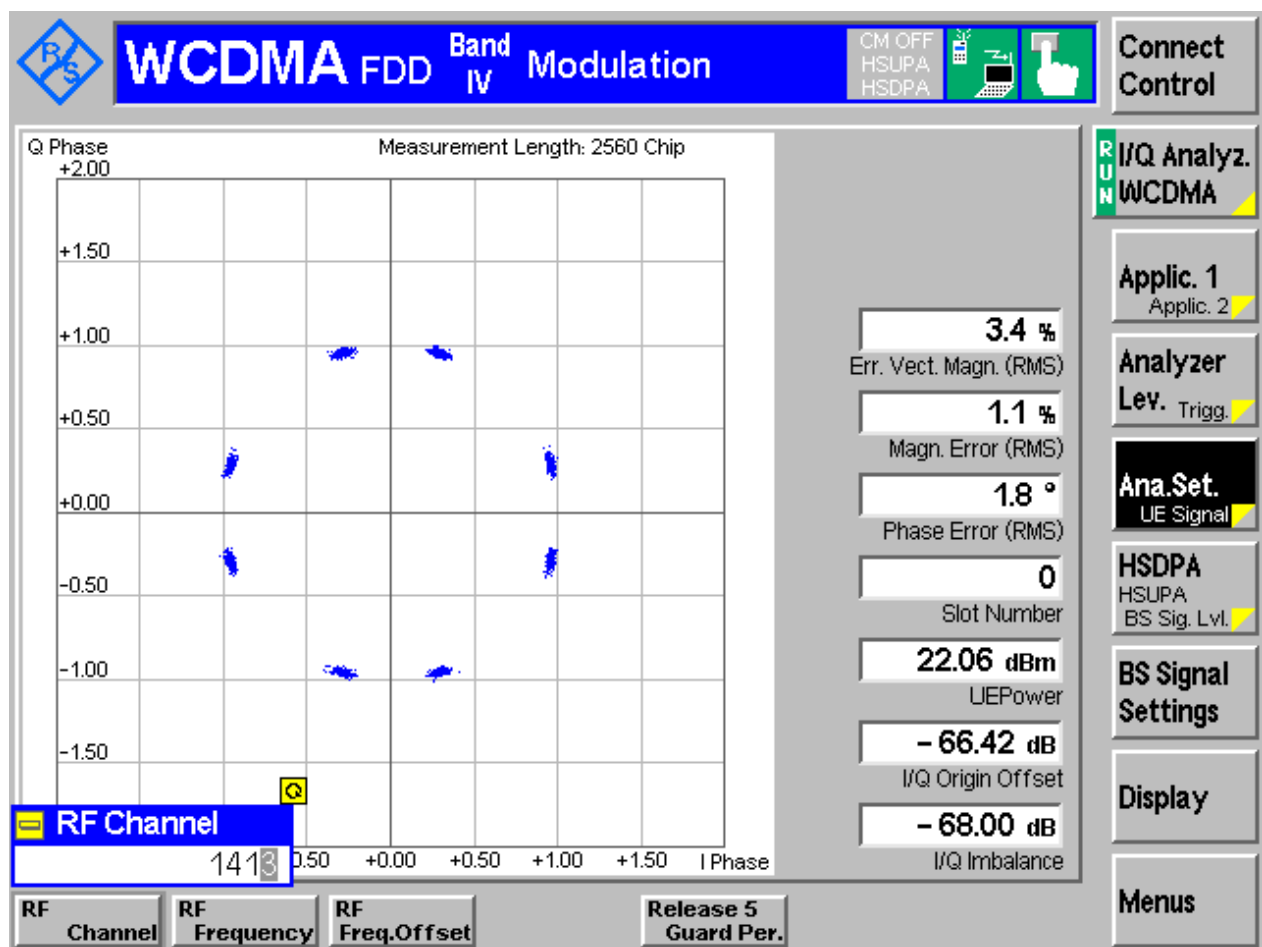
3.2.2.1.1 Test Channel = MCH



3.2.3 Test Band = WCDMA1700

3.2.3.1 Test Mode = UMTS/TM1

3.2.3.1.1 Test Channel = MCH



4Appendix_D: Bandwidth

Part I - Test Results

Test Band	Test Mode	Test Channel	Occupied Bandwidth [kHz]	Emission Bandwidth [kHz]	Verdict
GSM850	GSM/TM1	LCH	243.10	317.86	Pass
		MCH	241.57	320.77	Pass
		HCH	240.28	312.90	Pass
	GSM/TM2	LCH	246.22	306.61	Pass
		MCH	241.53	303.71	Pass
		HCH	243.31	307.50	Pass
GSM1900	GSM/TM1	LCH	244.27	315.89	Pass
		MCH	246.11	317.32	Pass
		HCH	243.19	315.07	Pass
	GSM/TM2	LCH	251.35	312.50	Pass
		MCH	239.99	310.79	Pass
		HCH	245.85	311.28	Pass
Test Band	Test Mode	Test Channel	Occupied Bandwidth [MHz]	Emission Bandwidth [MHz]	Verdict
WCDMA850	UMTS/TM1	LCH	4.07	4.63	Pass
		MCH	4.06	4.62	Pass
		HCH	4.07	4.62	Pass
WCDMA1900	UMTS/TM1	LCH	4.07	4.62	Pass
		MCH	4.06	4.61	Pass
		HCH	4.06	4.60	Pass
WCDMA1700	UMTS/TM1	LCH	4.07	4.61	Pass
		MCH	4.06	4.60	Pass
		HCH	4.06	4.62	Pass



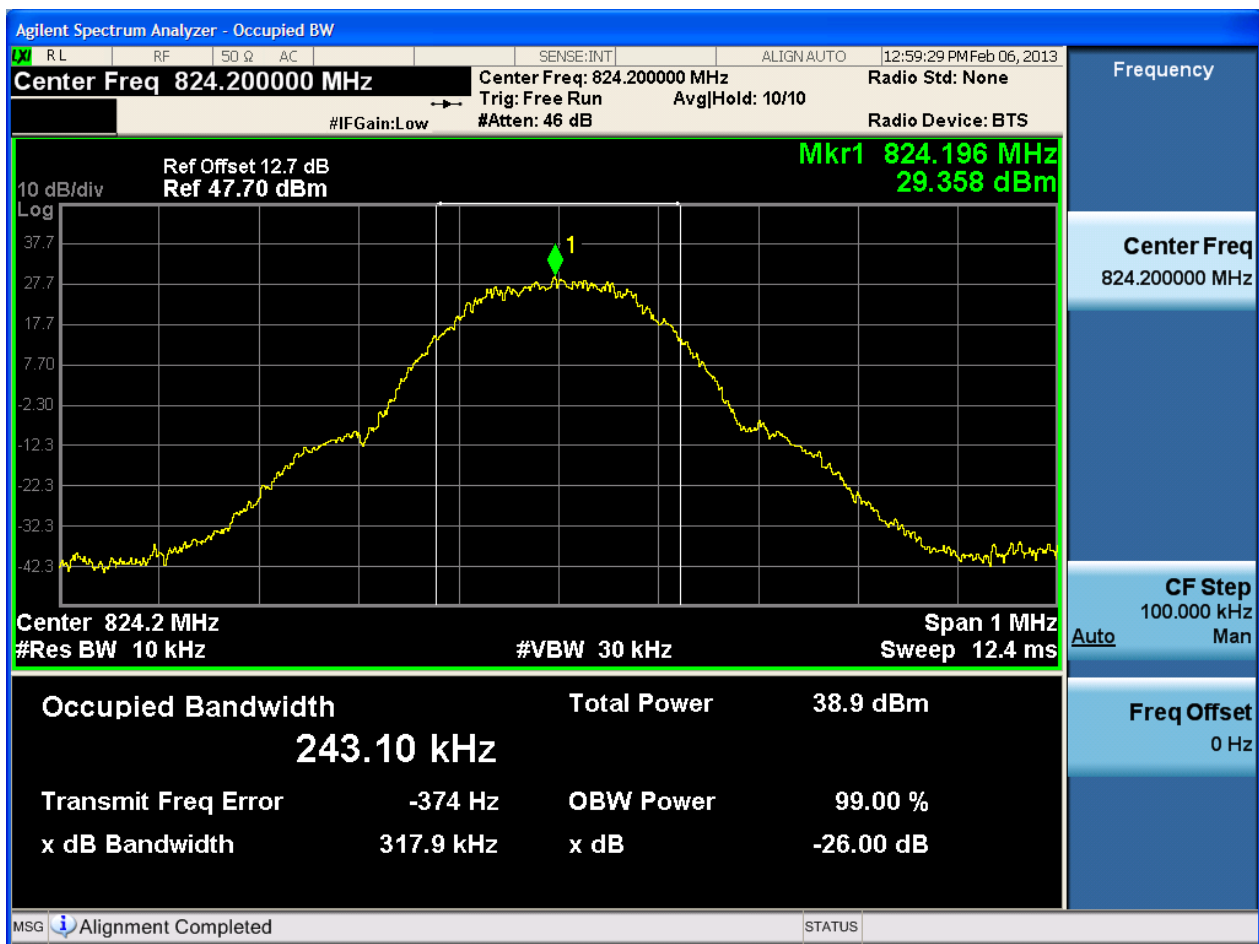
Part II - Test Plots

4.1 For GSM

4.1.1 Test Band = GSM850

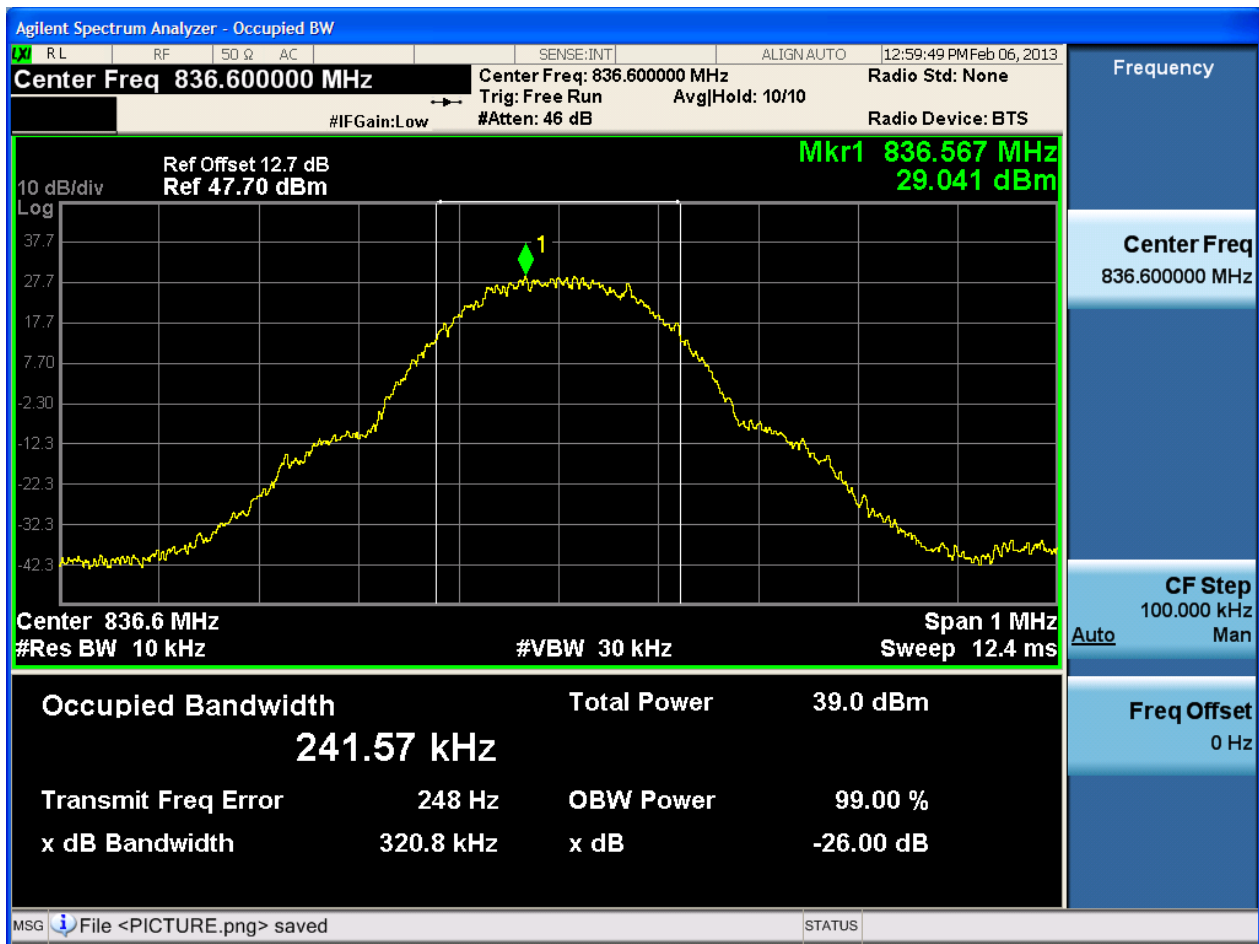
4.1.1.1 Test Mode = GSM/TM1

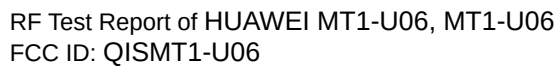
4.1.1.1.1 Test Channel = LCH





4.1.1.1.2 Test Channel = MCH





Agilent Spectrum Analyzer - Occupied BW

Center Freq 848.800000 MHz Center Freq: 848.800000 MHz Radio Std: None
 Trig: Free Run Avg|Hold: 10/10
 #IFGain: Low #Atten: 46 dB Radio Device: BTS

Ref Offset 12.7 dB
 Ref 47.70 dBm

Mkr1 848.765 MHz
 29.561 dBm

10 dB/div
 Log

Center 848.8 MHz Span 1 MHz
 #Res BW 10 kHz #VBW 30 kHz Sweep 12.4 ms

Occupied Bandwidth		Total Power	
240.28 kHz		39.1 dBm	

Transmit Freq Error		OBW Power	
542 Hz		99.00 %	

x dB Bandwidth		x dB	
312.9 kHz		-26.00 dB	

Frequency

Center Freq
 848.800000 MHz

CF Step
 100.000 kHz
 Man

Auto

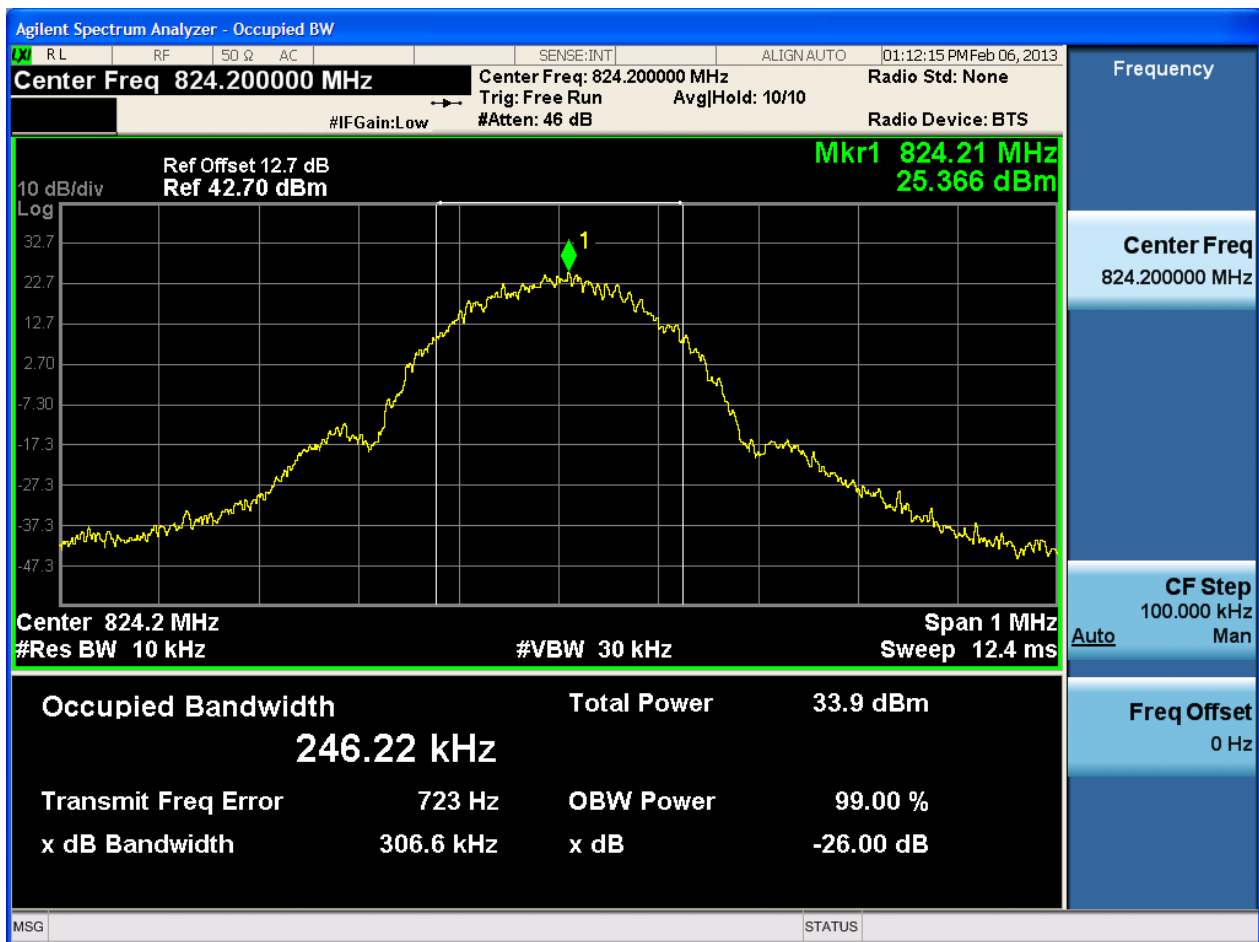
Freq Offset
 0 Hz

MSG File <PICTURE.png> saved STATUS



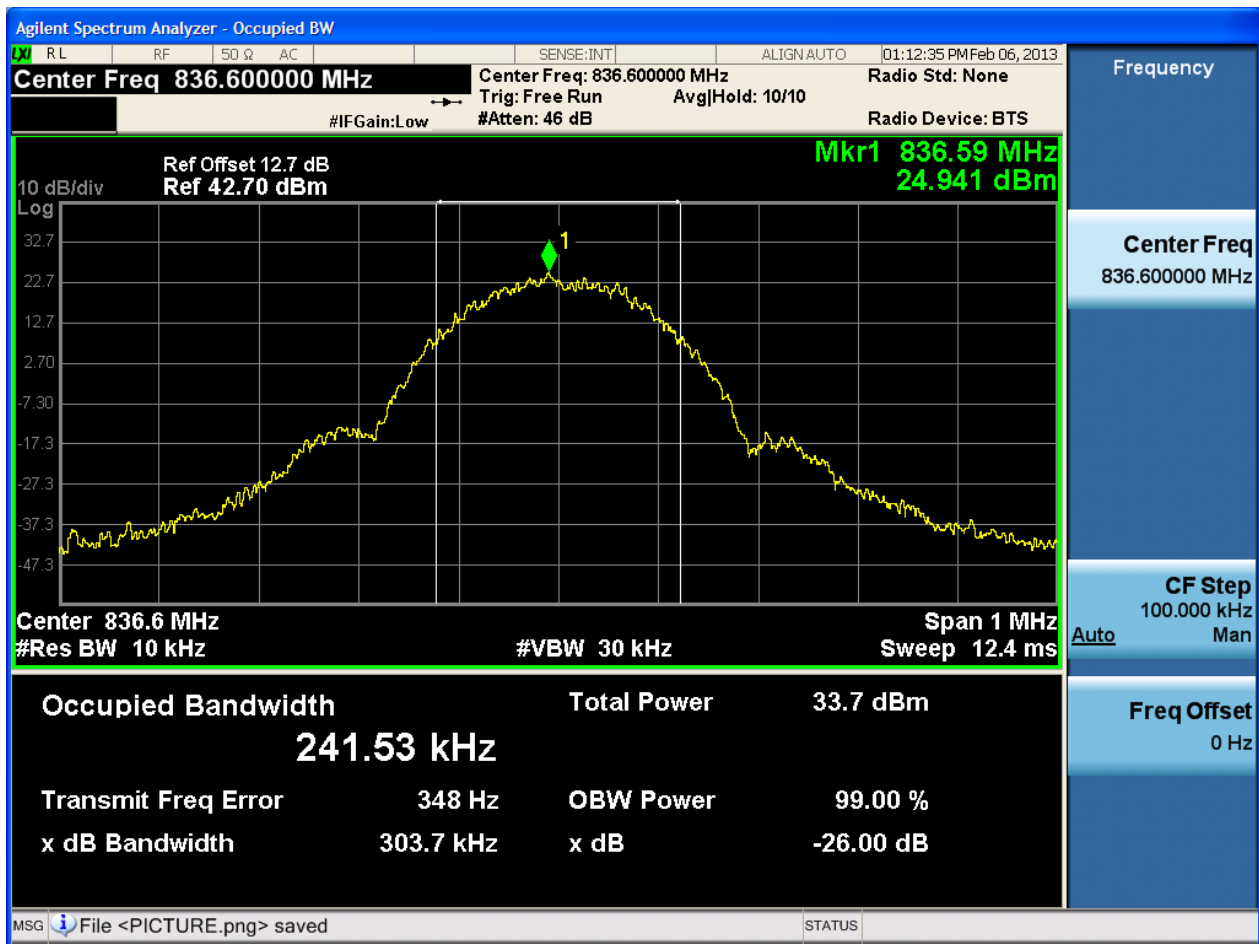
4.1.1.2 Test Mode = GSM/TM2

4.1.1.2.1 Test Channel = LCH



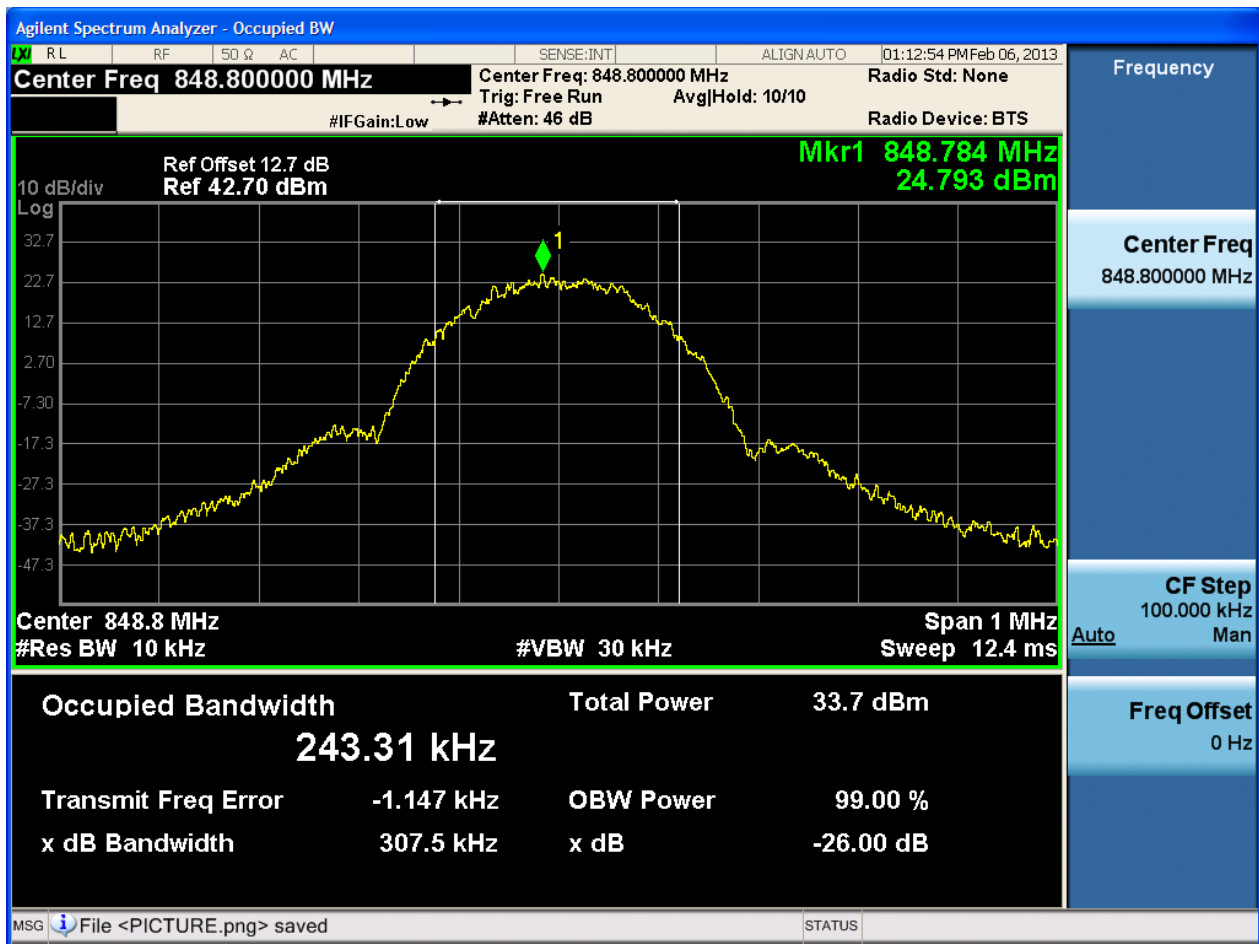


4.1.1.2.2 Test Channel = MCH





4.1.1.2.3 Test Channel = HCH

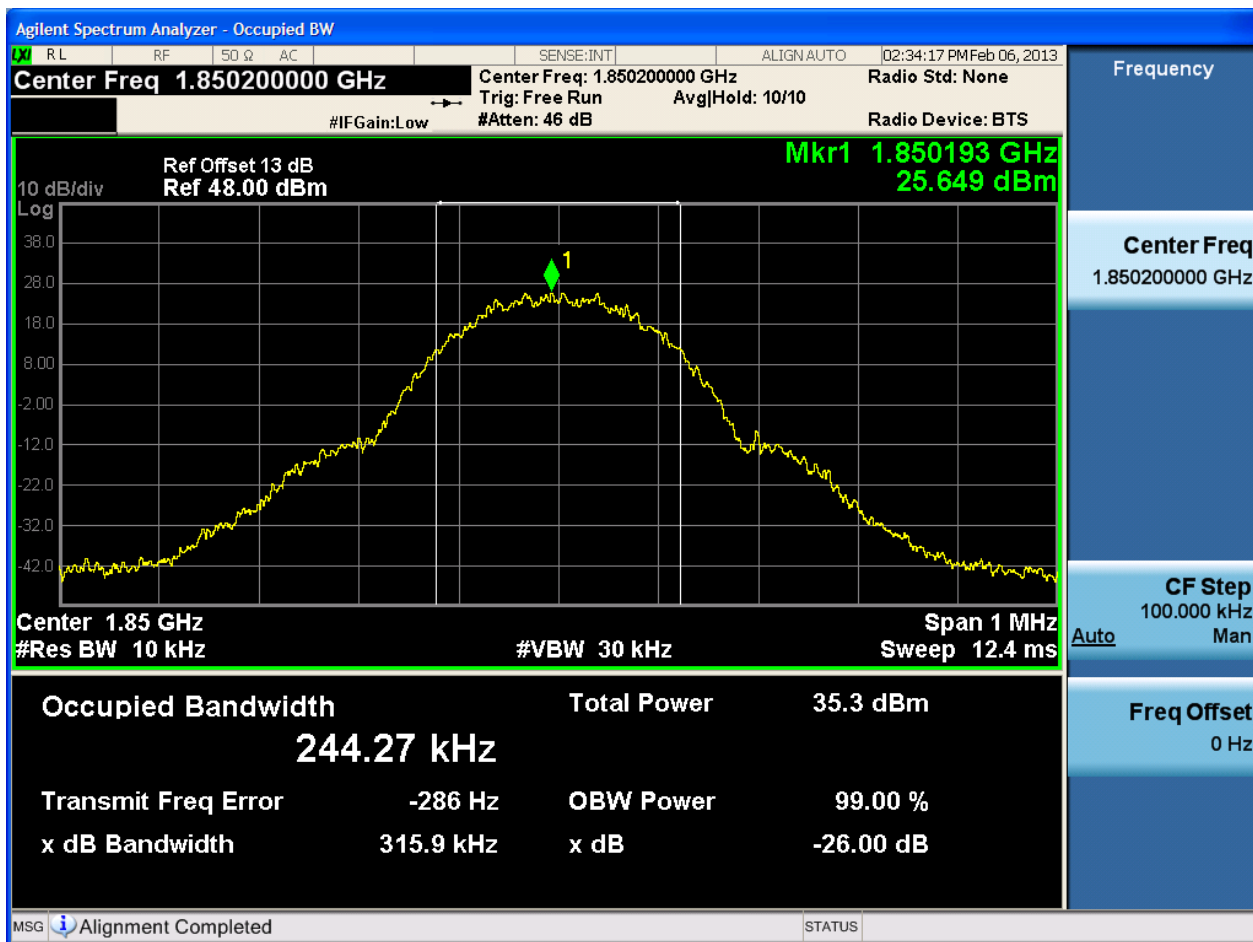




4.1.2 Test Band = GSM1900

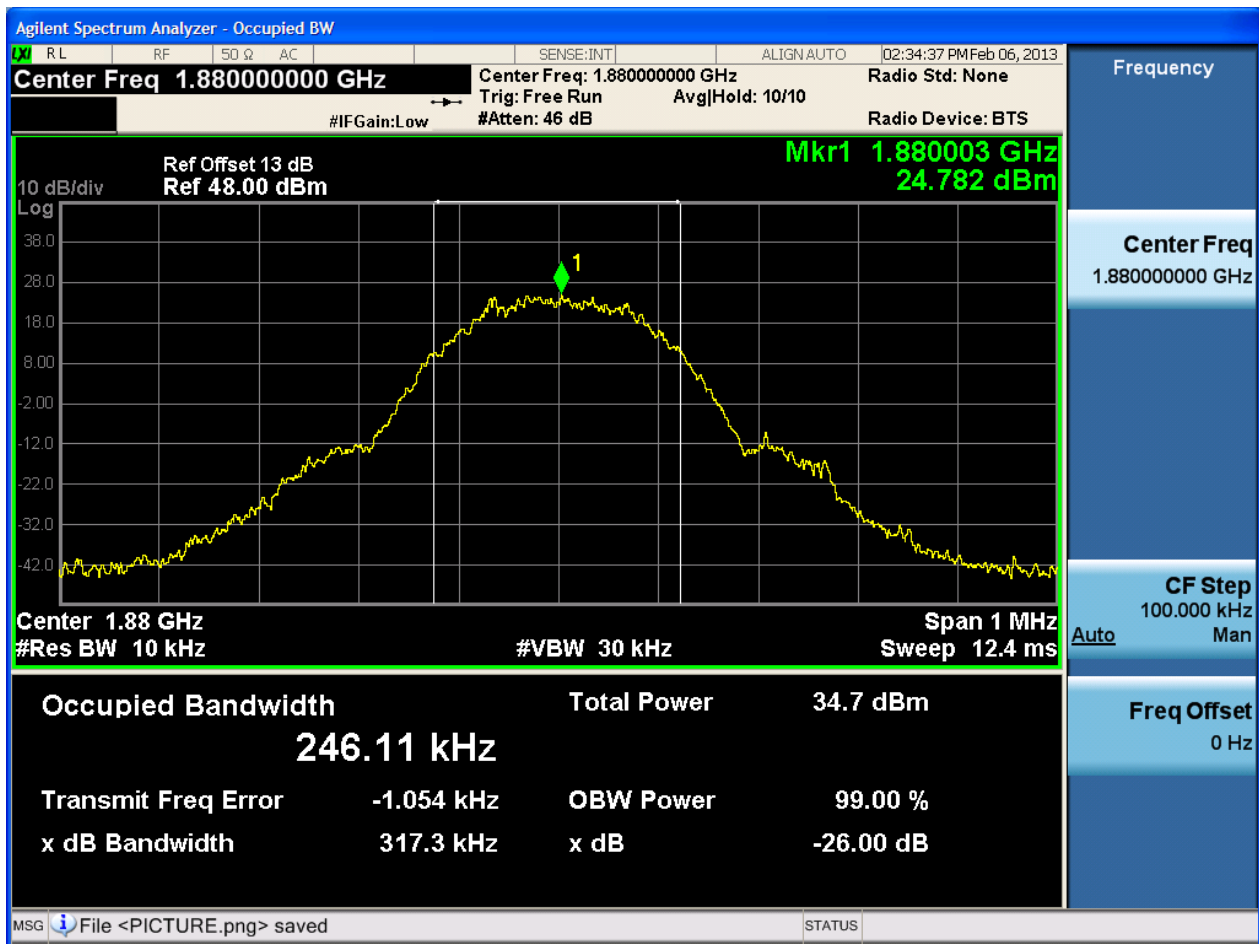
4.1.2.1 Test Mode = GSM/TM1

4.1.2.1.1 Test Channel = LCH



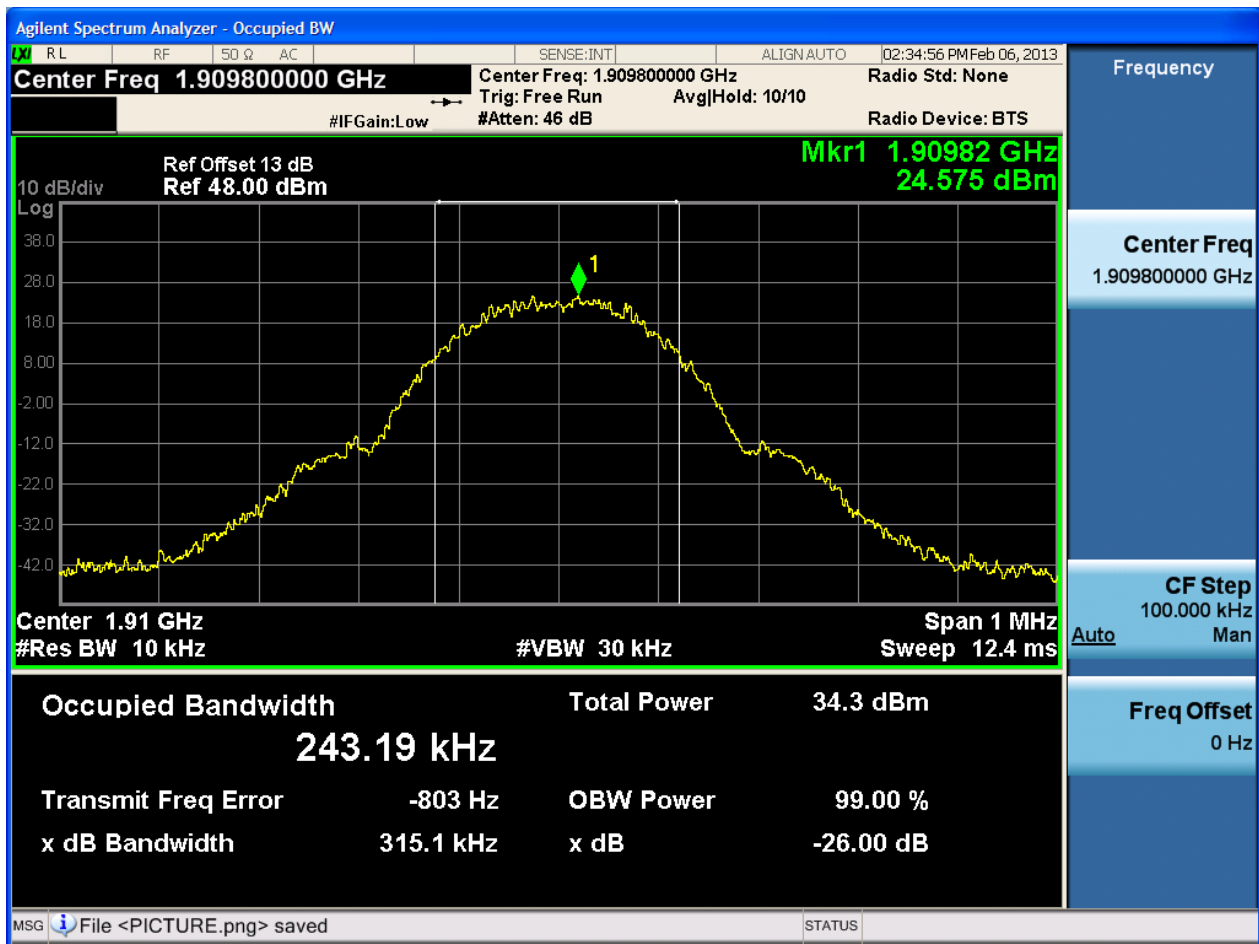


4.1.2.1.2 Test Channel = MCH





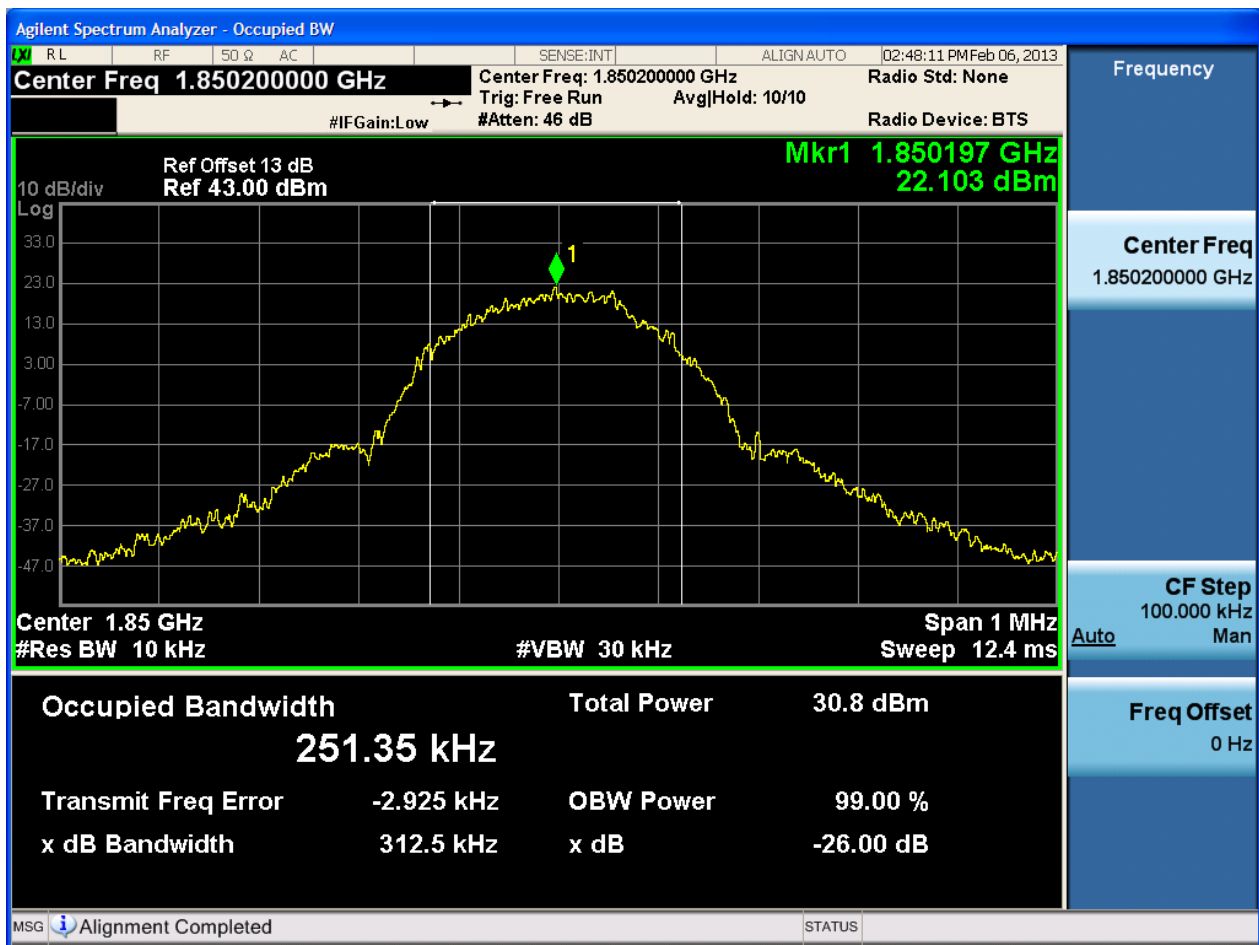
4.1.2.1.3 Test Channel = HCH





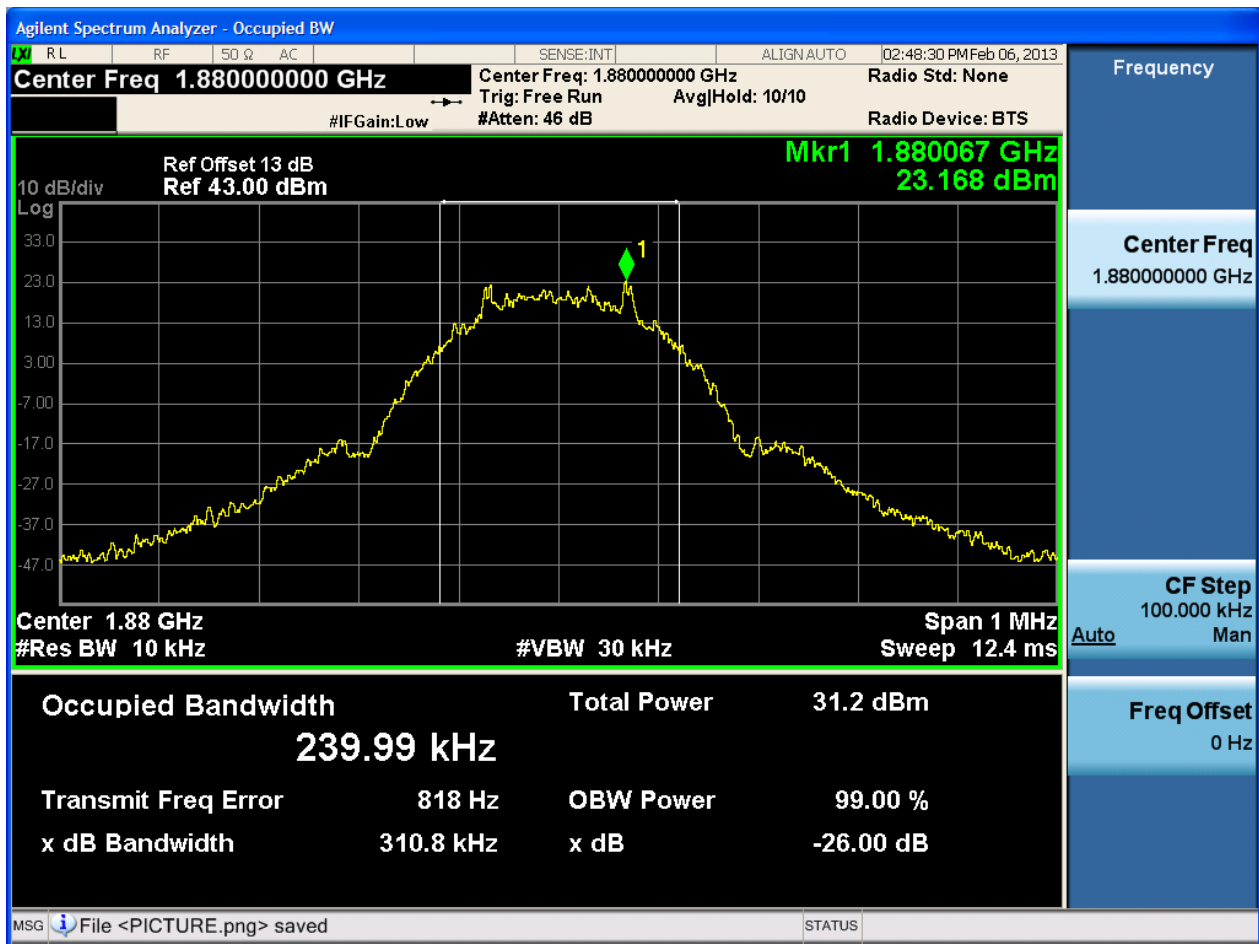
4.1.2.2 Test Mode = GSM/TM2

4.1.2.2.1 Test Channel = LCH



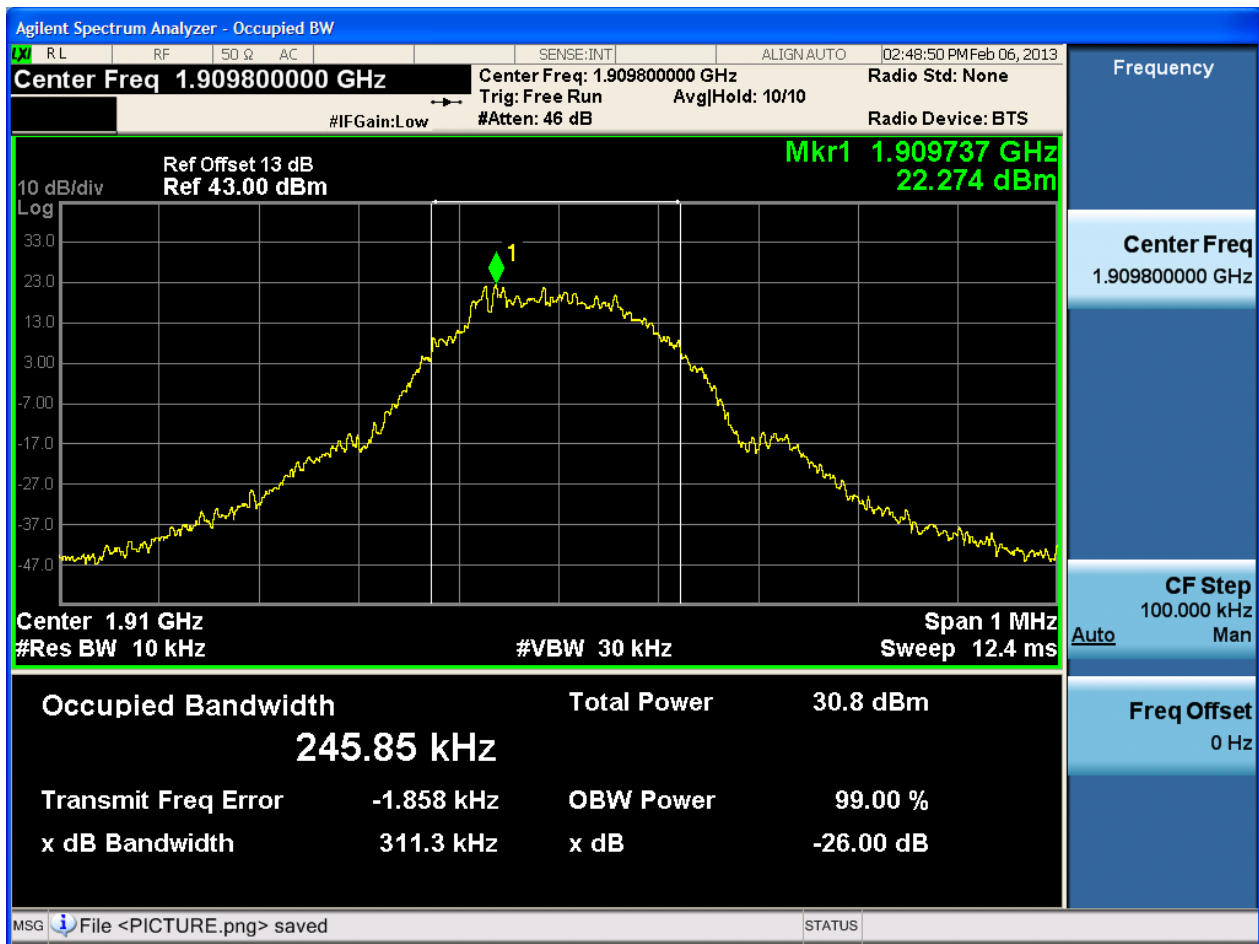


4.1.2.2.2 Test Channel = MCH





4.1.2.2.3 Test Channel = HCH



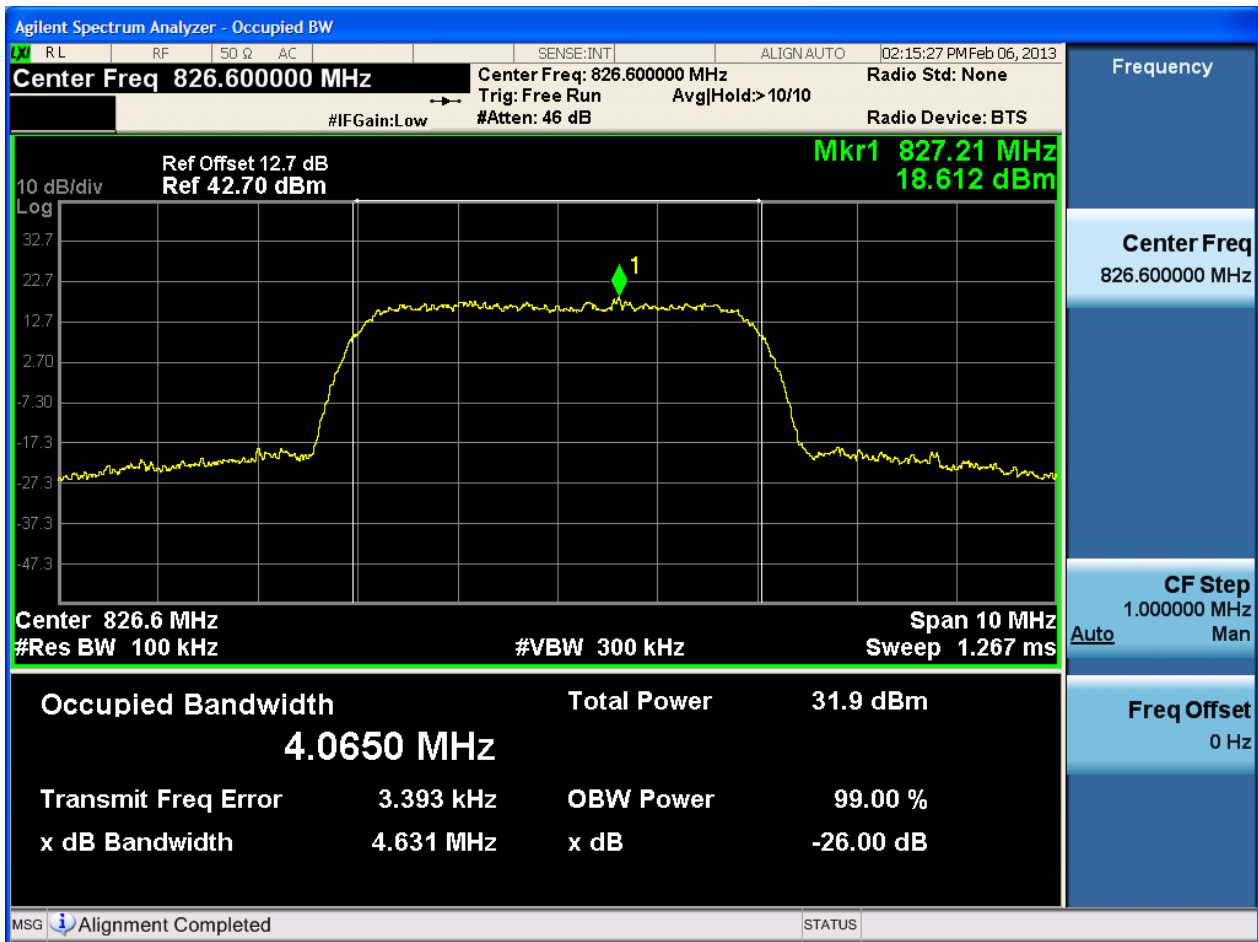


4.2 For UMTS

4.2.1 Test Band = WCDMA850

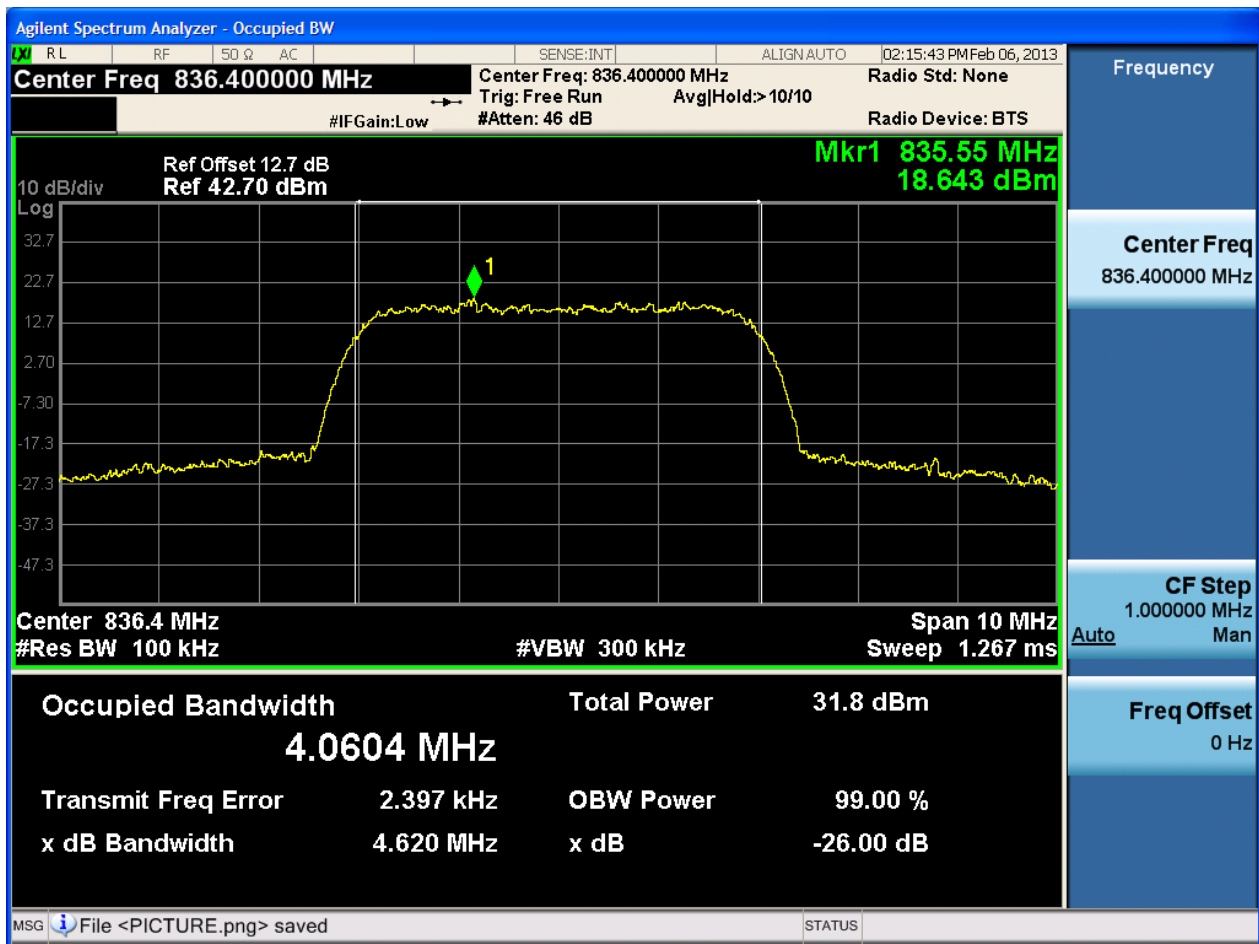
4.2.1.1 Test Mode = UMTS/TM1

4.2.1.1.1 Test Channel = LCH



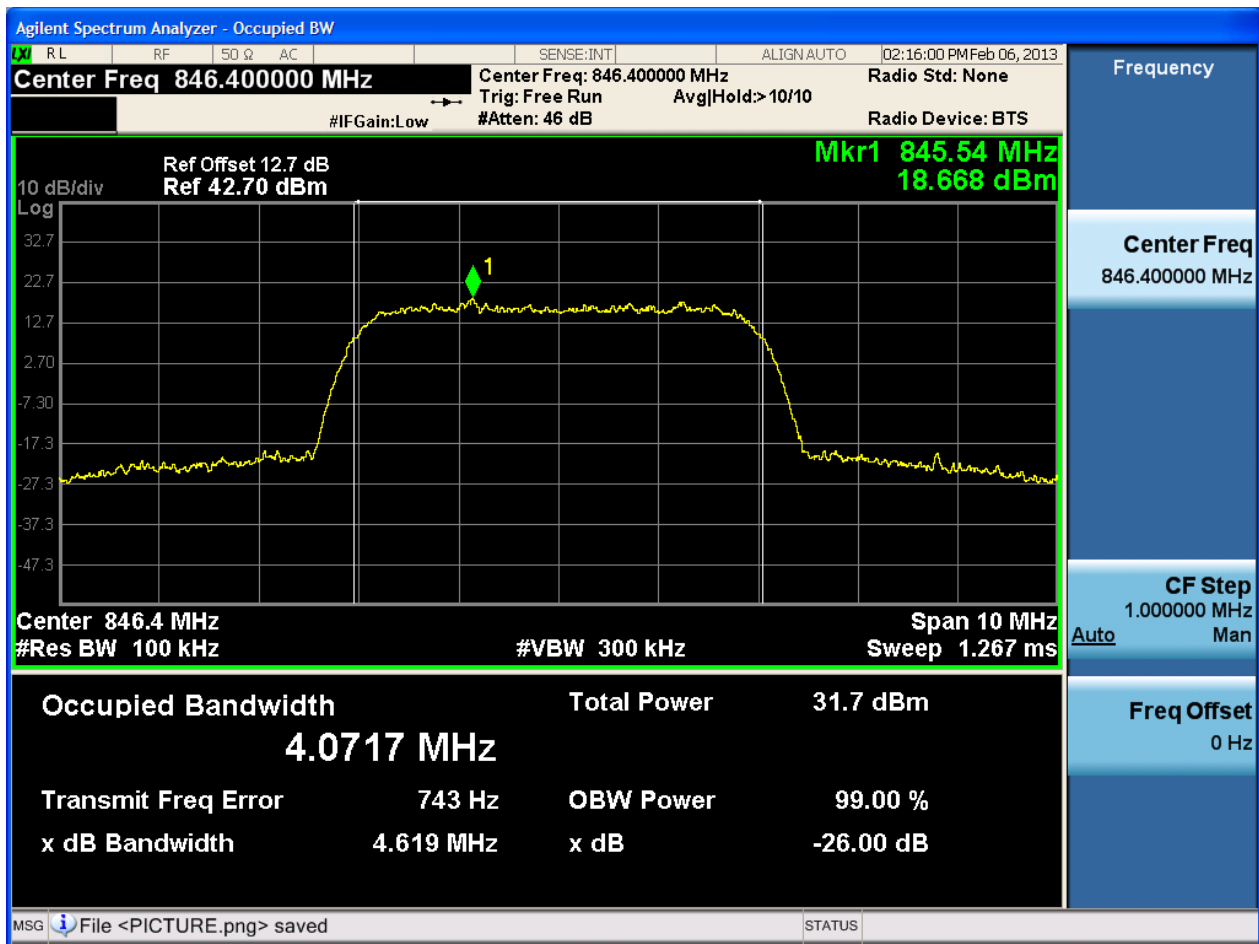


4.2.1.1.2 Test Channel = MCH





4.2.1.1.3 Test Channel = HCH

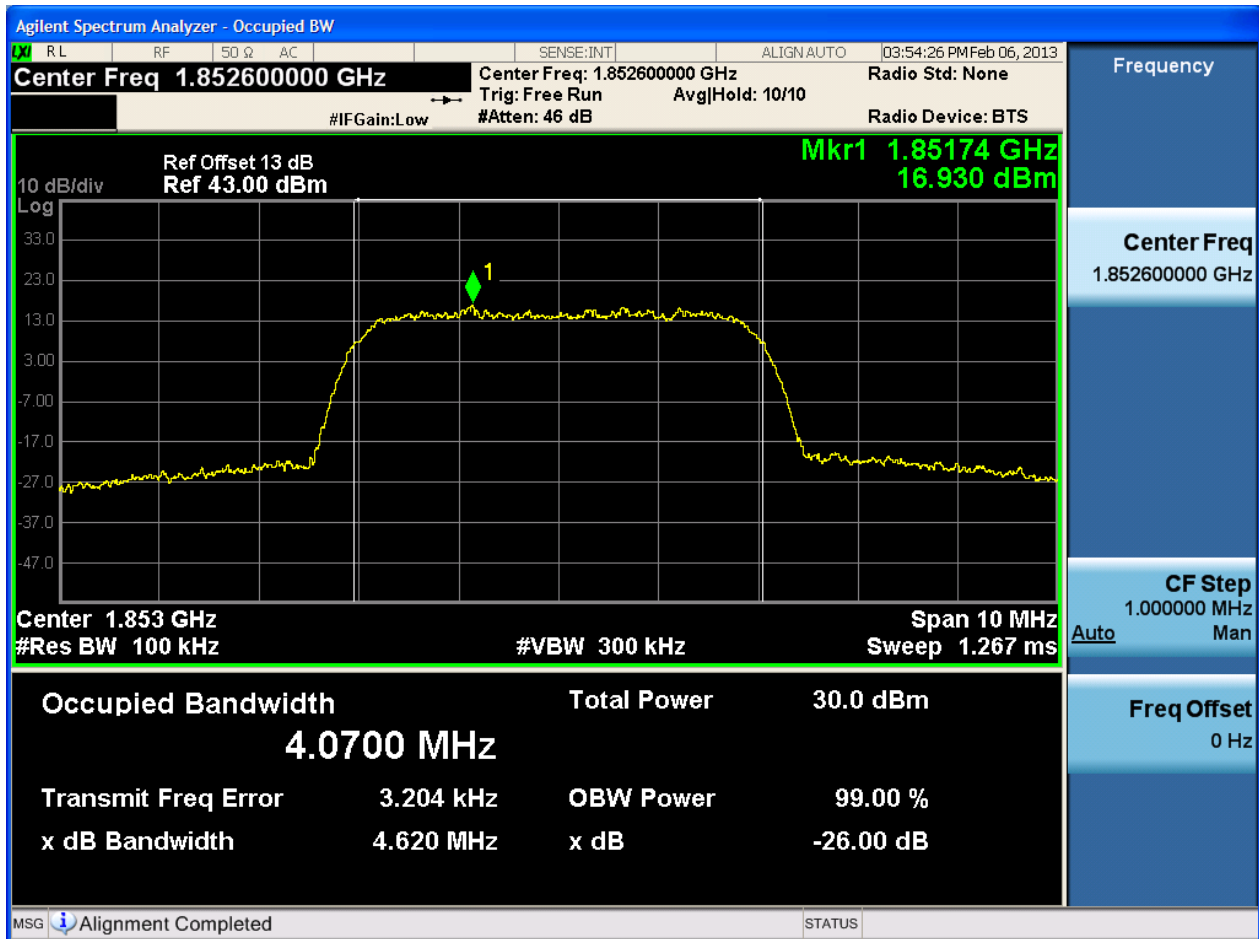




4.2.2 Test Band = WCDMA1900

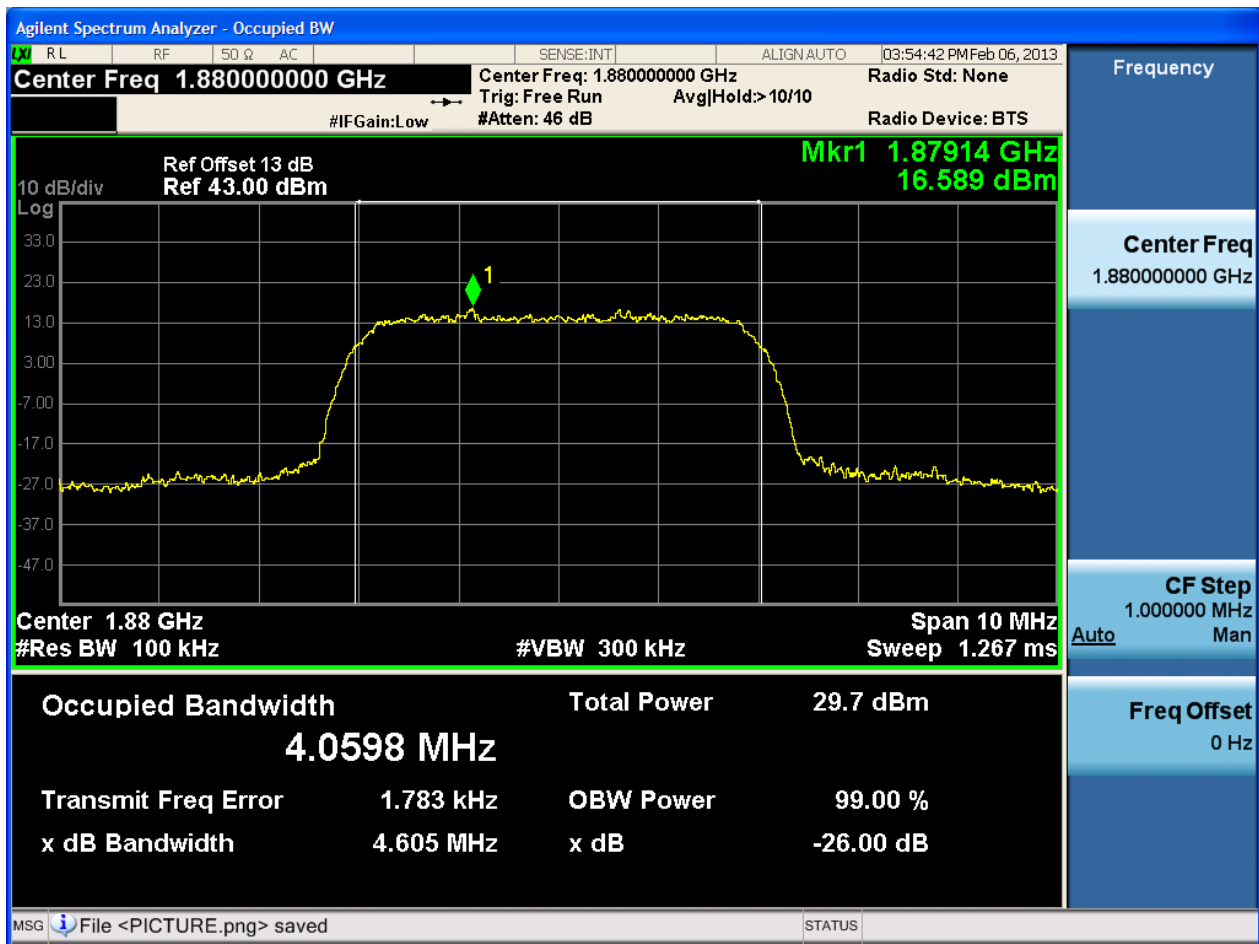
4.2.2.1 Test Mode = UMTS/TM1

4.2.2.1.1 Test Channel = LCH



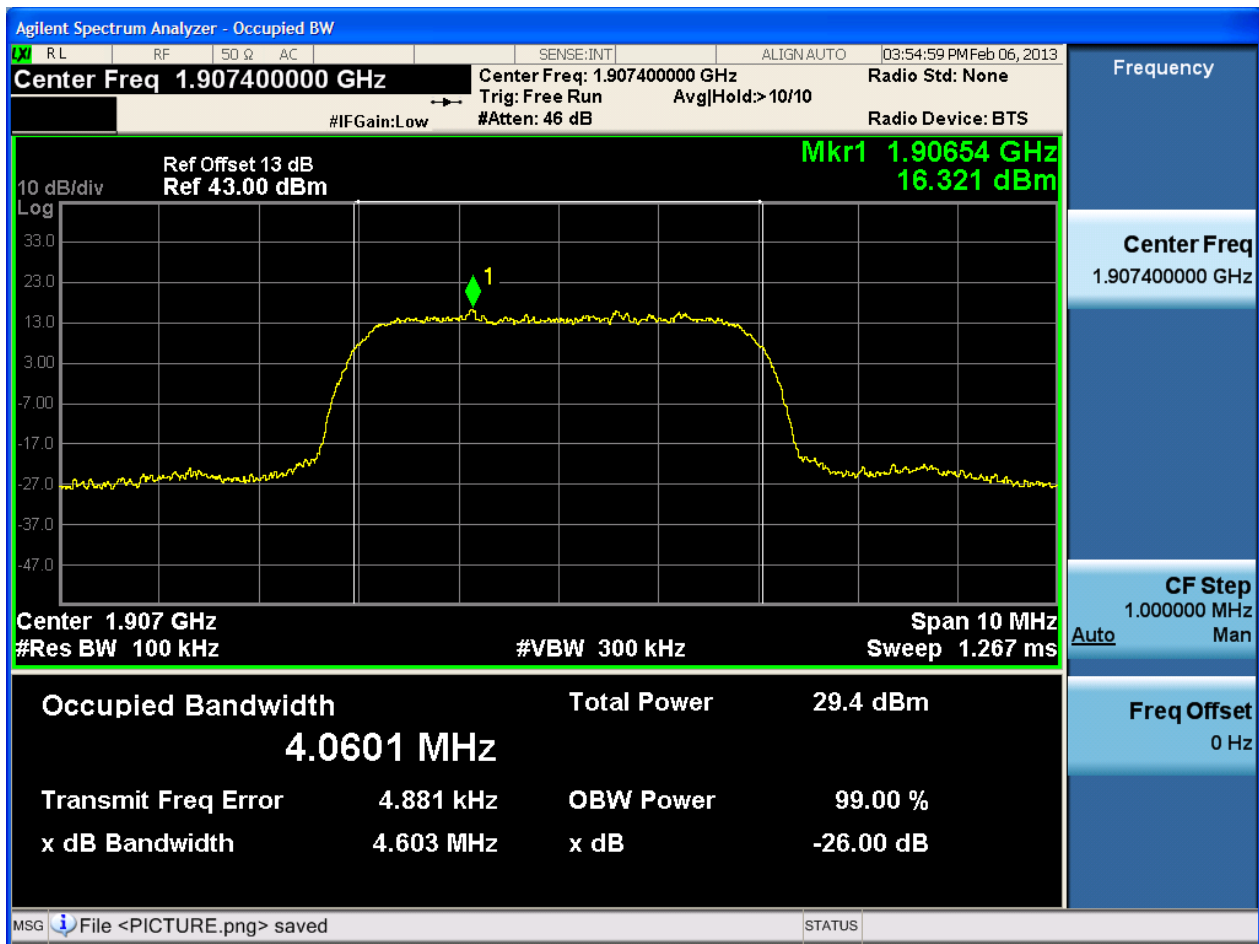


4.2.2.1.2 Test Channel = MCH





4.2.2.1.3 Test Channel = HCH

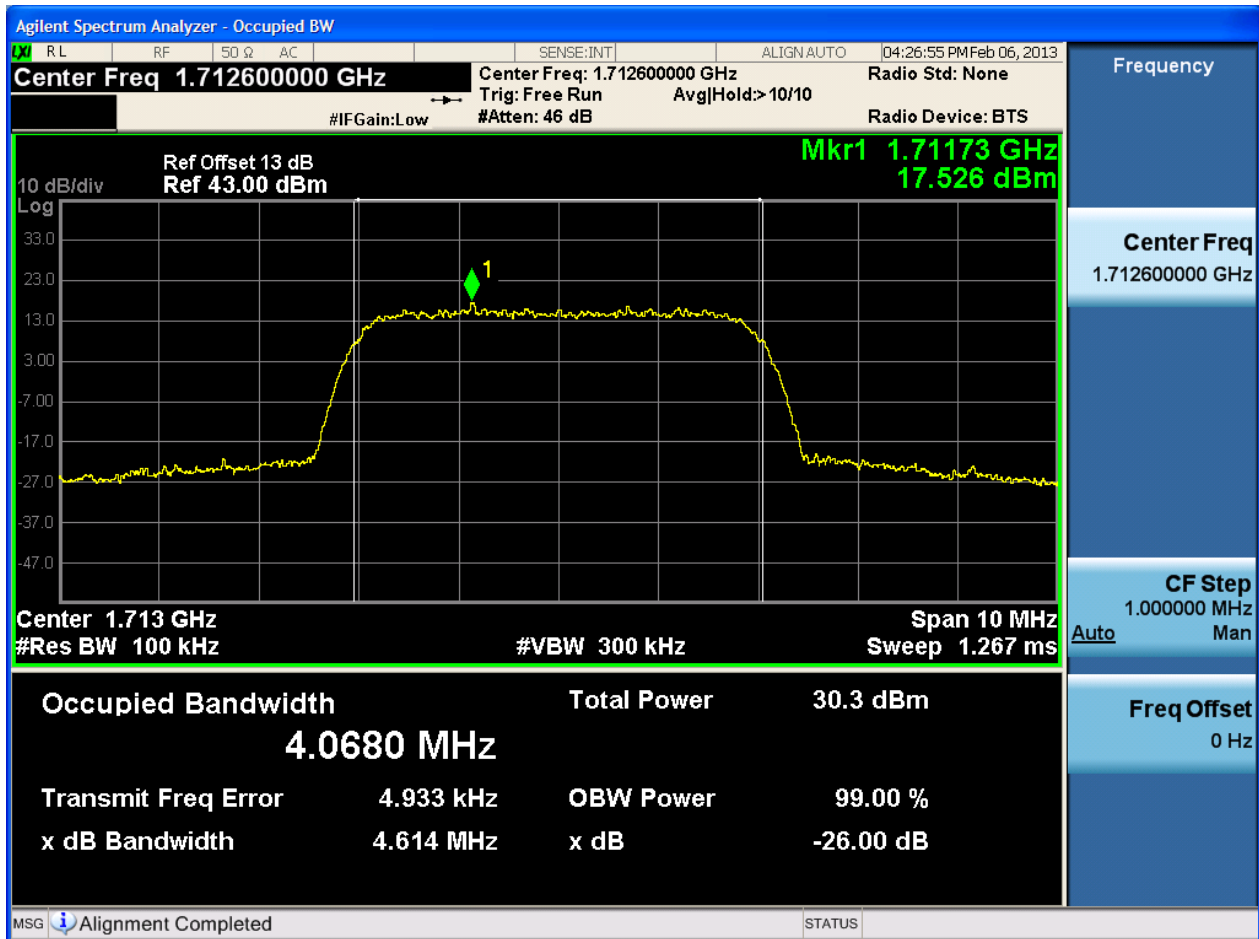


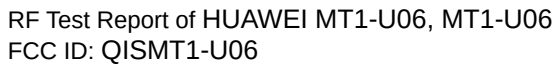


4.2.3 Test Band = WCDMA1700

4.2.3.1 Test Mode = UMTS/TM1

4.2.3.1.1 Test Channel = LCH





Agilent Spectrum Analyzer - Occupied BW

Center Freq 1.732600000 GHz

Center Freq: 1.732600000 GHz
Trig: Free Run
#IFGain: Low
#Atten: 46 dB

Radio Std: None
Avg|Hold: 10/10
Radio Device: BTS

Frequency

Center Freq
1.732600000 GHz

CF Step
1.000000 MHz
Man

Freq Offset
0 Hz

Ref Offset 13 dB
Ref 43.00 dBm

Mkr1 1.73171 GHz
17.099 dBm

10 dB/div
Log

Center 1.733 GHz
#Res BW 100 kHz

Span 10 MHz
Sweep 1.267 ms

#VBW 300 kHz

Occupied Bandwidth
4.0562 MHz

Total Power
30.5 dBm

Transmit Freq Error
3.429 kHz

OBW Power
99.00 %

x dB Bandwidth
4.598 MHz

x dB
-26.00 dB

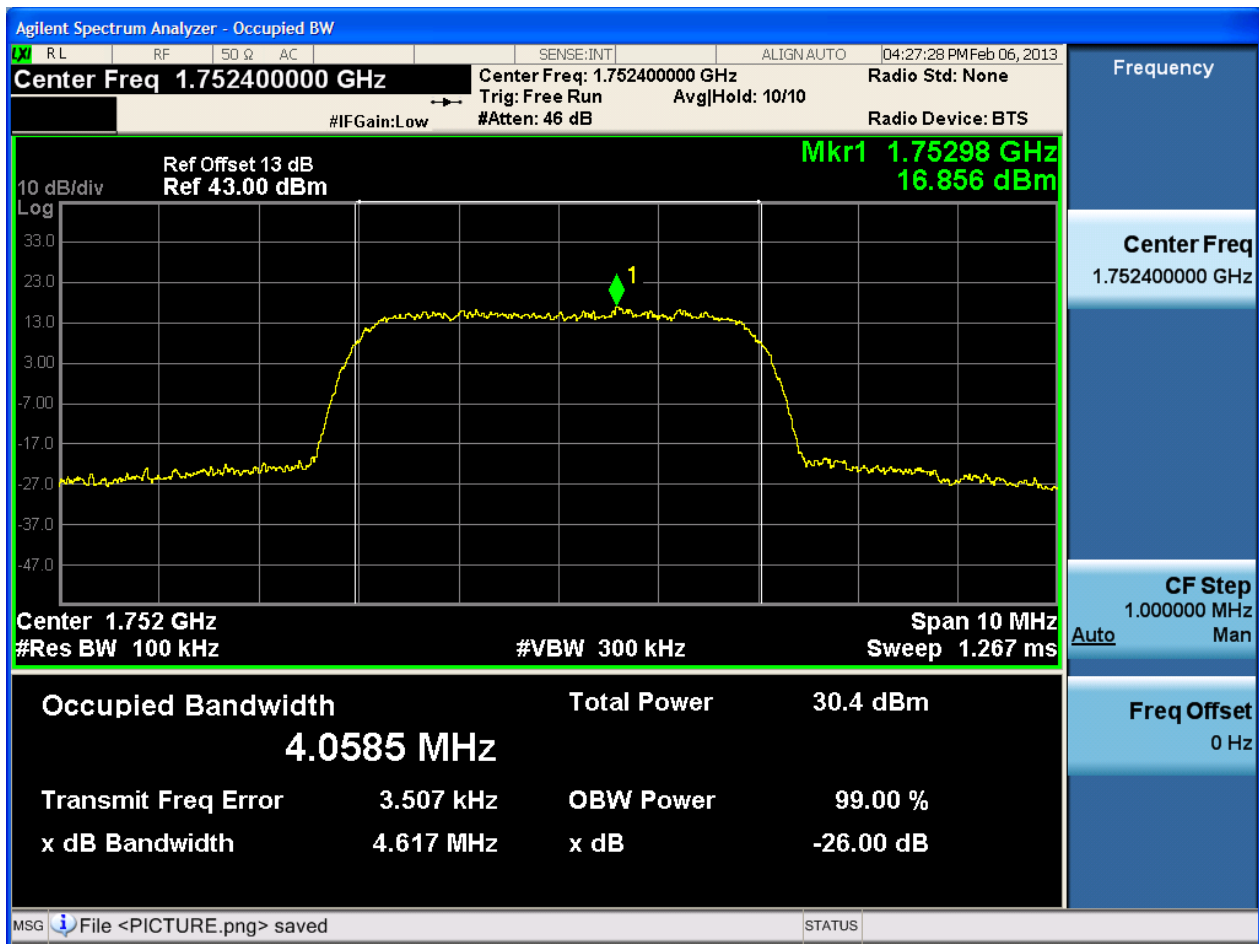
MSG File <PICTURE.png> saved

STATUS

The image shows a screenshot of an Agilent Spectrum Analyzer. The main display area shows a signal spectrum with a peak at 1.733 GHz. The y-axis is labeled 'Log' and ranges from -47.0 to 33.0 dBm. The x-axis is labeled 'Frequency' and ranges from 1.731 GHz to 1.735 GHz. A marker 'Mkr1' is placed at 1.73171 GHz with a value of 17.099 dBm. The signal is a narrowband signal with a bandwidth of 4.0562 MHz. The display also shows various measurement parameters such as Center Freq, Span, Res BW, and Total Power. A message at the bottom indicates that a screenshot of the display has been saved as 'PICTURE.png'.



4.2.3.1.3 Test Channel = HCH





5Appendix_E: Band Edges Compliance

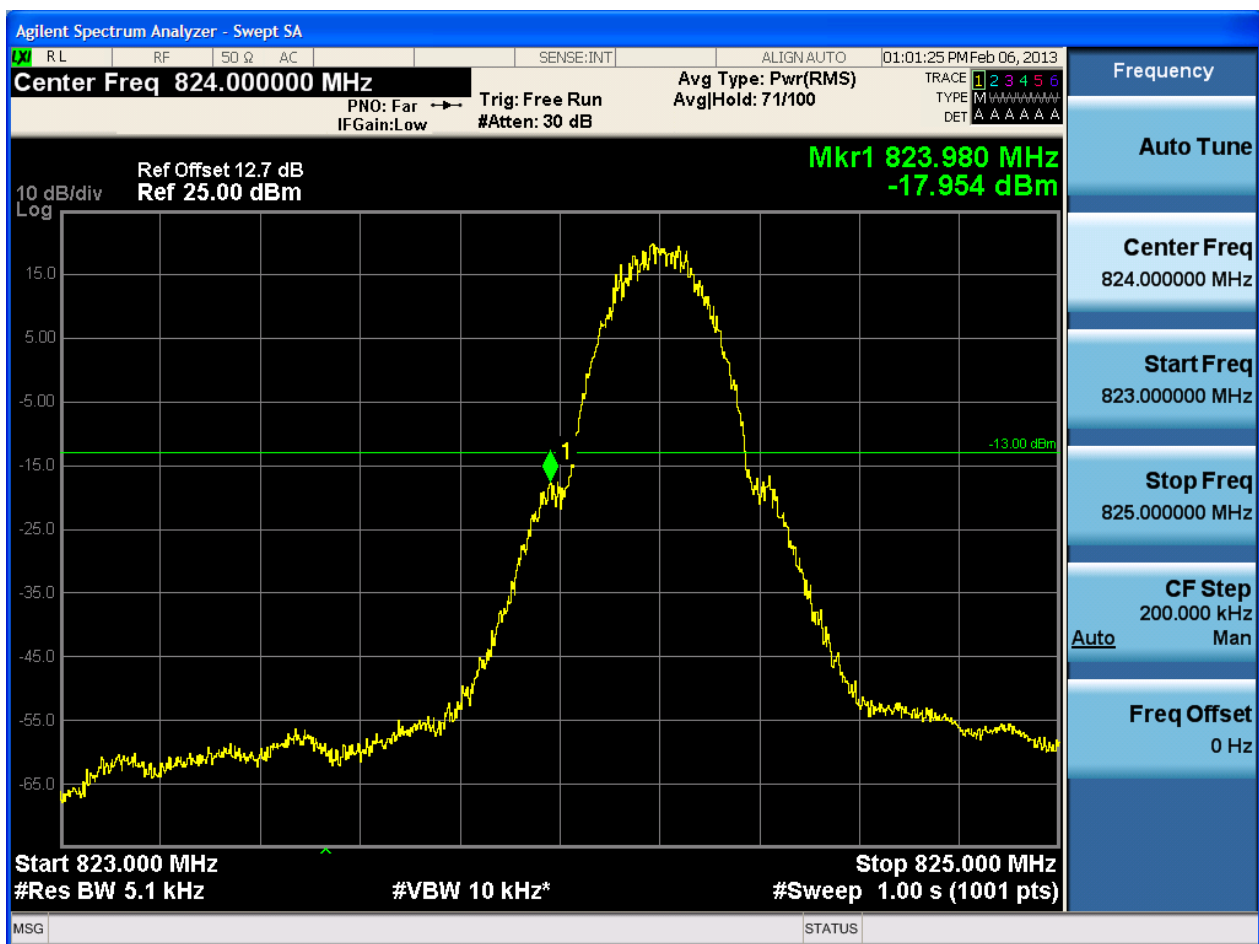
Part I - Test Plots

5.1 For GSM

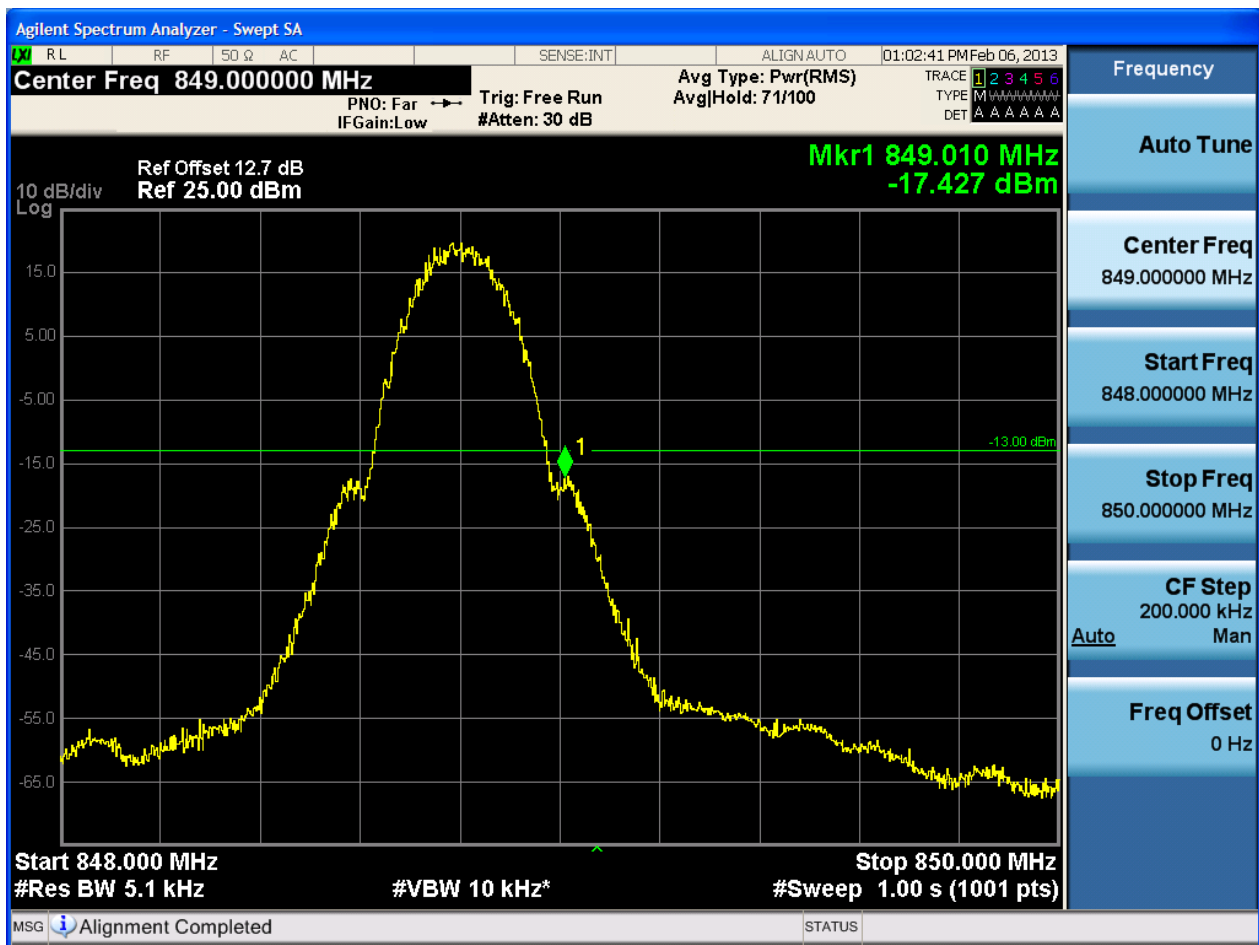
5.1.1 Test Band = GSM850

5.1.1.1 Test Mode = GSM/TM1

5.1.1.1.1 Test Channel = LCH



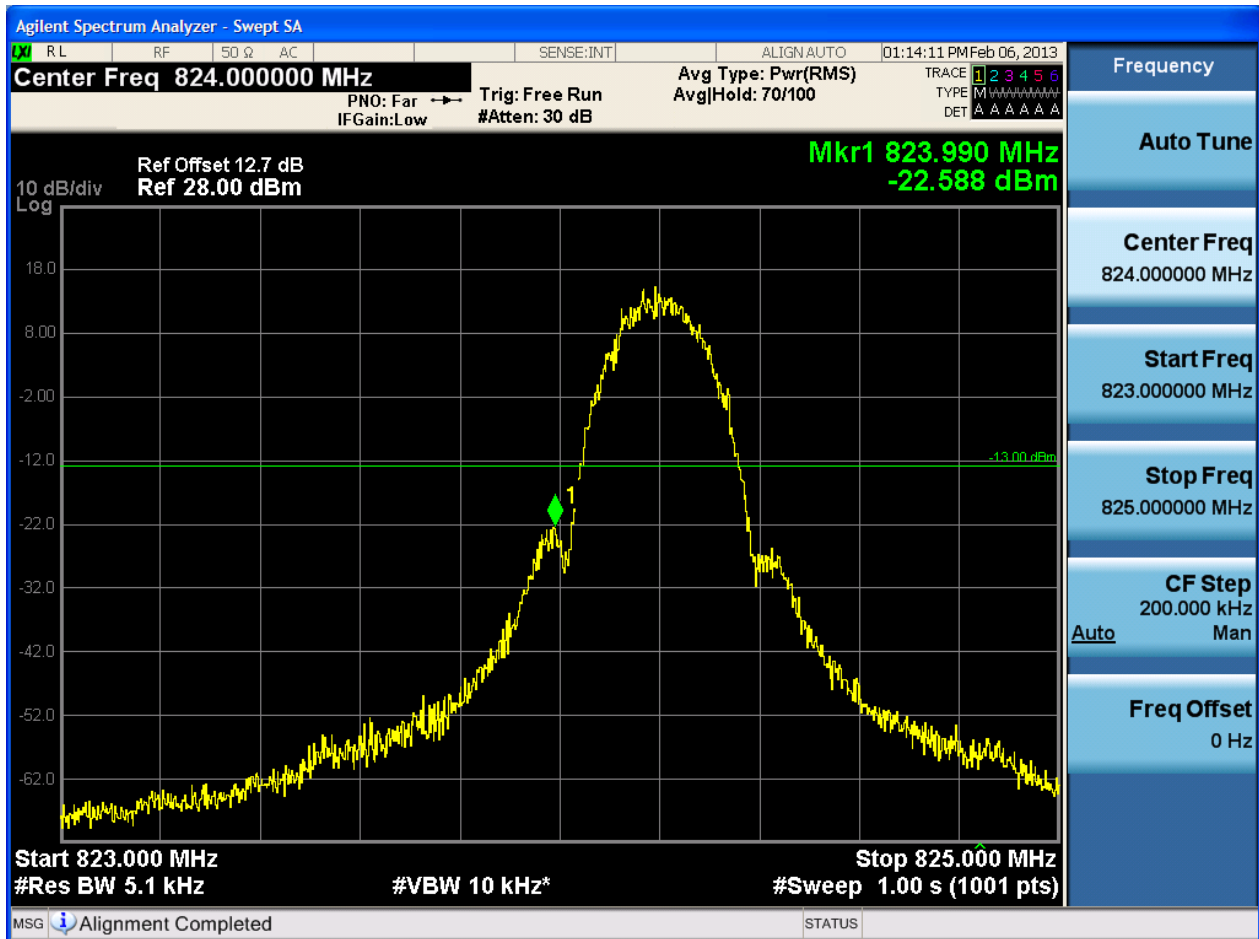
5.1.1.1.2 Test Channel = HCH

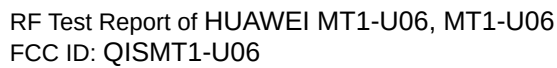




5.1.1.2 Test Mode = GSM/TM2

5.1.1.2.1 Test Channel = LCH





Agilent Spectrum Analyzer - Swept SA

Center Freq 849.000000 MHz

Ref Offset 12.7 dB
Ref 28.00 dBm

10 dB/div
Log

Start 848.000 MHz
#Res BW 5.1 kHz

Stop 850.000 MHz
#Sweep 1.00 s (1001 pts)

#VBW 10 kHz*

Mkr1 849.010 MHz
-24.053 dBm

Auto Tune

Center Freq 849.000000 MHz

Start Freq 848.000000 MHz

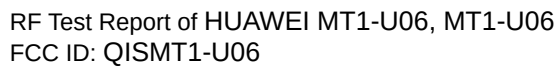
Stop Freq 850.000000 MHz

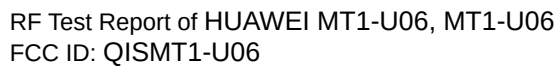
CF Step 200.000 kHz
Auto Man

Freq Offset 0 Hz

MSG File <PICTURE.png> saved

STATUS





Agilent Spectrum Analyzer - Swept SA

Center Freq 1.91000000 GHz

Ref Offset 13 dB
Ref 25.00 dBm

10 dB/div
Log

Mkr1 1.910 020 GHz
-22.776 dBm

Start 1.909000 GHz
#Res BW 5.1 kHz

Stop 1.911000 GHz
#Sweep 1.00 s (1001 pts)

#VBW 10 kHz*

Auto Tune

Center Freq 1.91000000 GHz

Start Freq 1.909000000 GHz

Stop Freq 1.911000000 GHz

CF Step 200.000 kHz
Man

Freq Offset 0 Hz

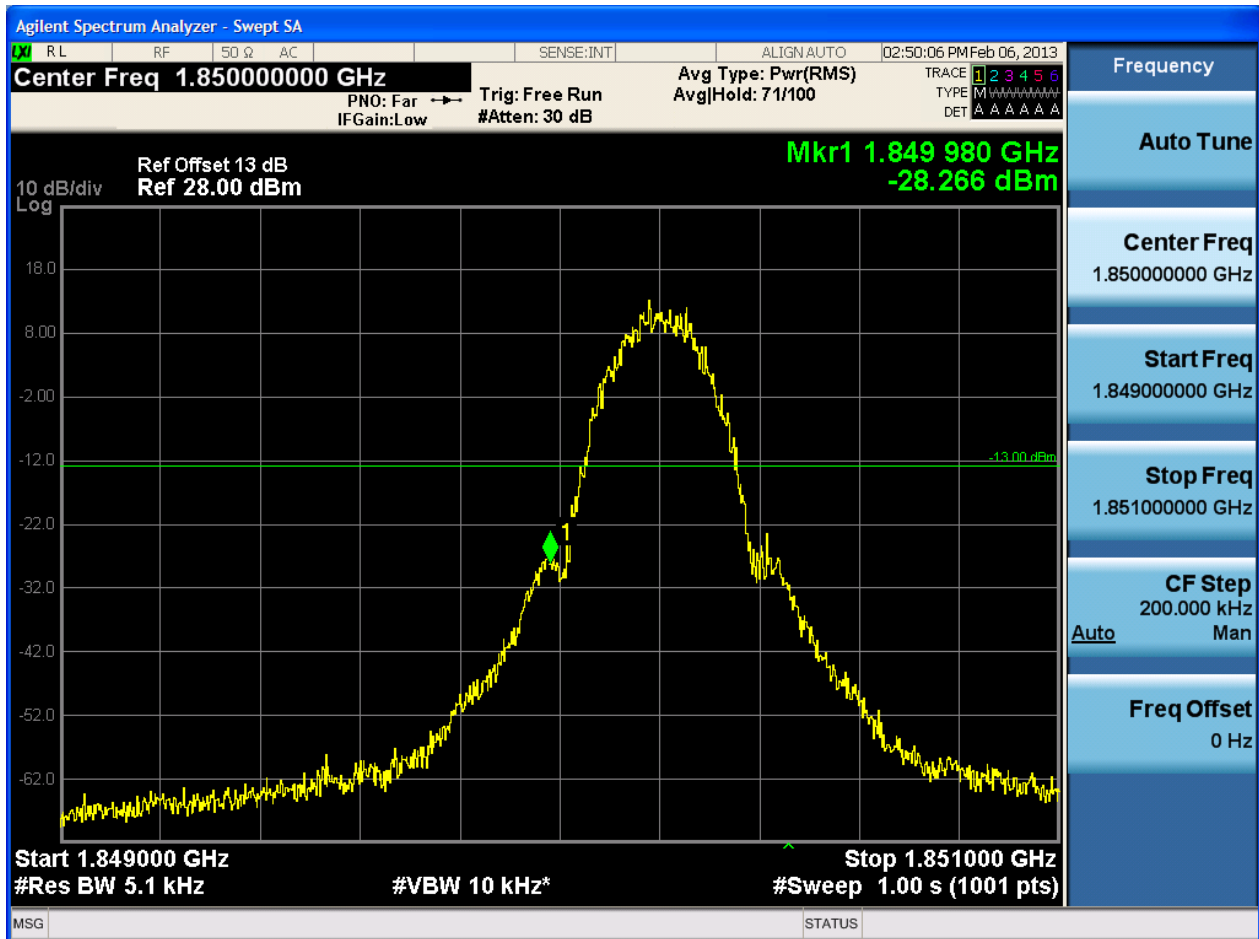
MSG Alignment Completed

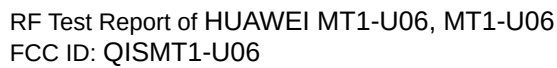
STATUS



5.1.2.2 Test Mode = GSM/TM2

5.1.2.2.1 Test Channel = LCH





Agilent Spectrum Analyzer - Swept SA

Center Freq 1.91000000 GHz

Ref Offset 13 dB
Ref 28.00 dBm

Mkr1 1.910 020 GHz
-26.423 dBm

Start 1.909000 GHz
#Res BW 5.1 kHz

Stop 1.911000 GHz
#Sweep 1.00 s (1001 pts)

#VBW 10 kHz*

10 dB/div
Log

18.0
8.00
-2.00
-12.0
-22.0
-32.0
-42.0
-52.0
-62.0

1.909000000 GHz
1.910000000 GHz
1.911000000 GHz

Auto Tune

Center Freq
1.91000000 GHz

Start Freq
1.909000000 GHz

Stop Freq
1.911000000 GHz

CF Step
200.000 kHz
Man

Freq Offset
0 Hz

MSG File <PICTURE.png> saved

STATUS

The image is a screenshot of an Agilent Spectrum Analyzer in swept mode. The main display is a log-linear plot of power spectral density. The horizontal axis represents frequency, ranging from 1.909000 GHz to 1.911000 GHz. The vertical axis represents power in dBm, ranging from -62.0 to 18.0. A yellow trace shows a broad signal with a prominent peak at 1.910020 GHz, which is marked with a green diamond and labeled '1'. The peak power is -26.423 dBm. A horizontal green line is drawn at -13.00 dBm, labeled 'Ref'. The signal is noisy, and the baseline is around -60 dBm. The top of the screen shows various settings: Center Freq 1.91000000 GHz, Ref Offset 13 dB, Ref 28.00 dBm, Mkr1 1.910 020 GHz, -26.423 dBm, Start 1.909000 GHz, #Res BW 5.1 kHz, Stop 1.911000 GHz, #Sweep 1.00 s (1001 pts), #VBW 10 kHz*. The right side of the screen has a blue sidebar with buttons for 'Auto Tune', 'Center Freq', 'Start Freq', 'Stop Freq', 'CF Step', and 'Freq Offset'. The bottom status bar shows 'MSG File <PICTURE.png> saved' and 'STATUS'.

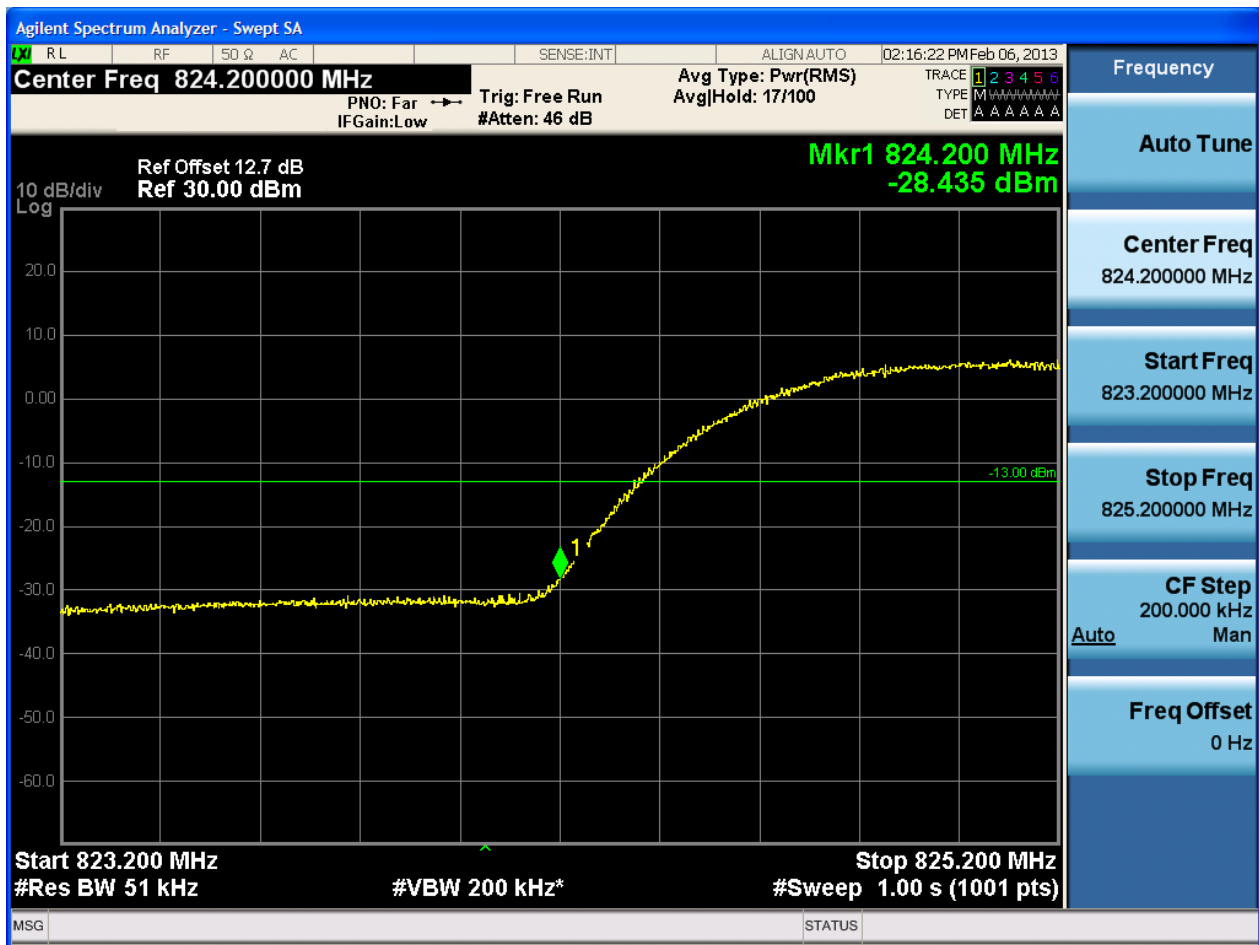


5.2 For UMTS

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 = HCH



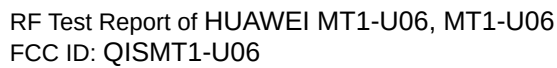


5.2.2 Test Band = WCDMA1900

5.2.2.1 Test Mode = UMTS/TM1

5.2.2.1.1 Test Channel = LCH





Agilent Spectrum Analyzer - Swept SA

Center Freq 1.909800000 GHz

Ref Offset 13 dB
Ref 30.00 dBm

Mkr1 1.909 880 GHz
-31.379 dBm

Start 1.908800 GHz
#Res BW 51 kHz

Stop 1.910800 GHz
#Sweep 1.00 s (1001 pts)

#VBW 200 kHz*

10 dB/div
Log

1

-13.00 dBm

Auto Tune

Center Freq
1.909800000 GHz

Start Freq
1.908800000 GHz

Stop Freq
1.910800000 GHz

CF Step
200.000 kHz
Man

Freq Offset
0 Hz

MSG File <PICTURE.png> saved

STATUS

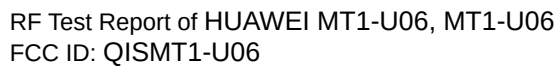


5.2.3 Test Band = WCDMA1700

5.2.3.1 Test Mode = UMTS/TM1

5.2.3.1.1 Test Channel = LCH





Agilent Spectrum Analyzer - Swept SA

Center Freq 1.754800000 GHz

Ref Offset 13 dB
Ref 30.00 dBm

Mkr1 1.754 800 GHz
-31.255 dBm

Start 1.753800 GHz
#Res BW 51 kHz

Stop 1.755800 GHz
#Sweep 1.00 s (1001 pts)

#VBW 200 kHz*

10 dB/div
Log

Auto Tune

Center Freq
1.754800000 GHz

Start Freq
1.753800000 GHz

Stop Freq
1.755800000 GHz

CF Step
200.000 kHz
Man

Freq Offset
0 Hz

MSG File <PICTURE.png> saved

STATUS

Frequency
Auto Tune
Center Freq 1.754800000 GHz
Start Freq 1.753800000 GHz
Stop Freq 1.755800000 GHz
CF Step 200.000 kHz Man
Freq Offset 0 Hz

6Appendix_F: 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.

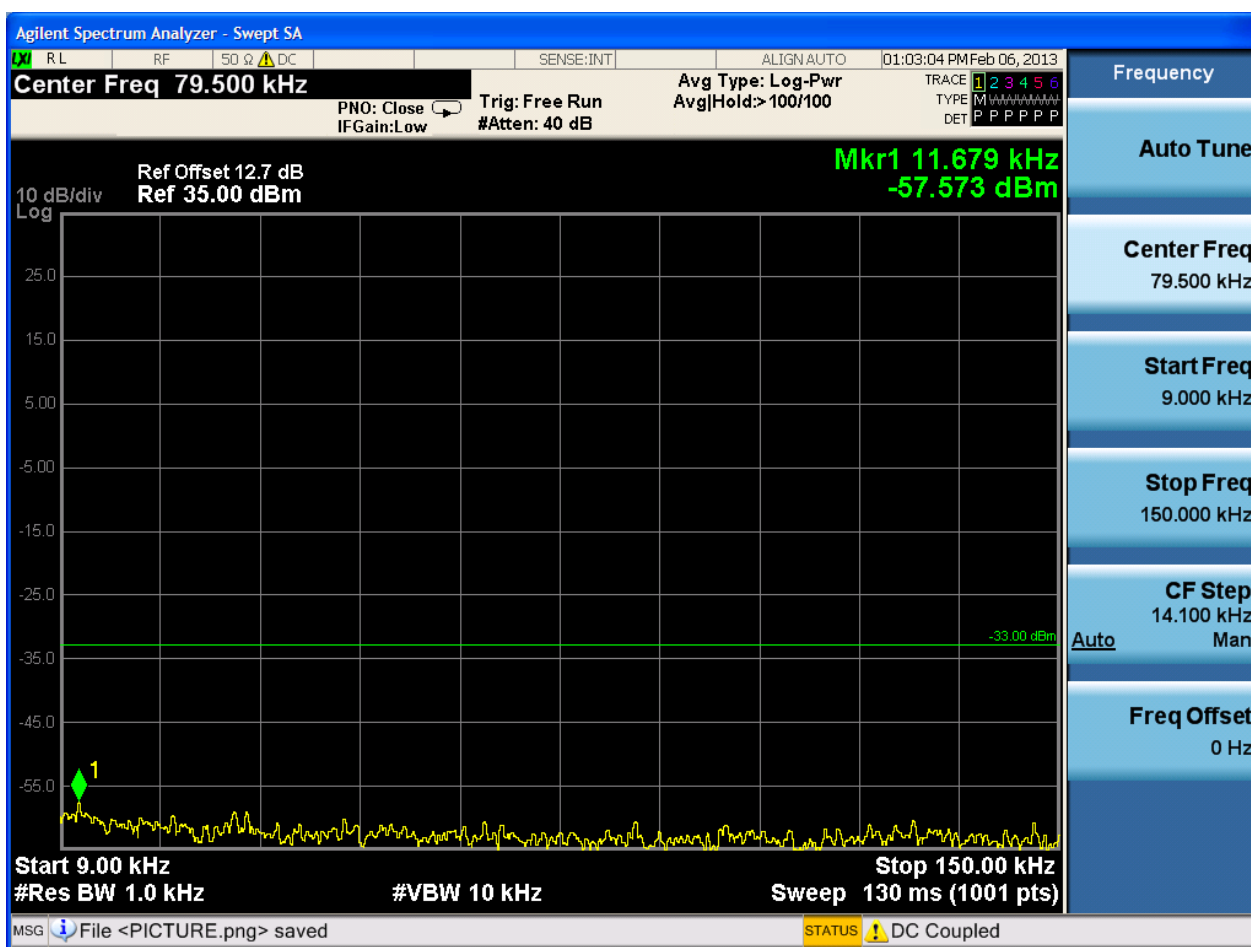
Part I - Test Plots

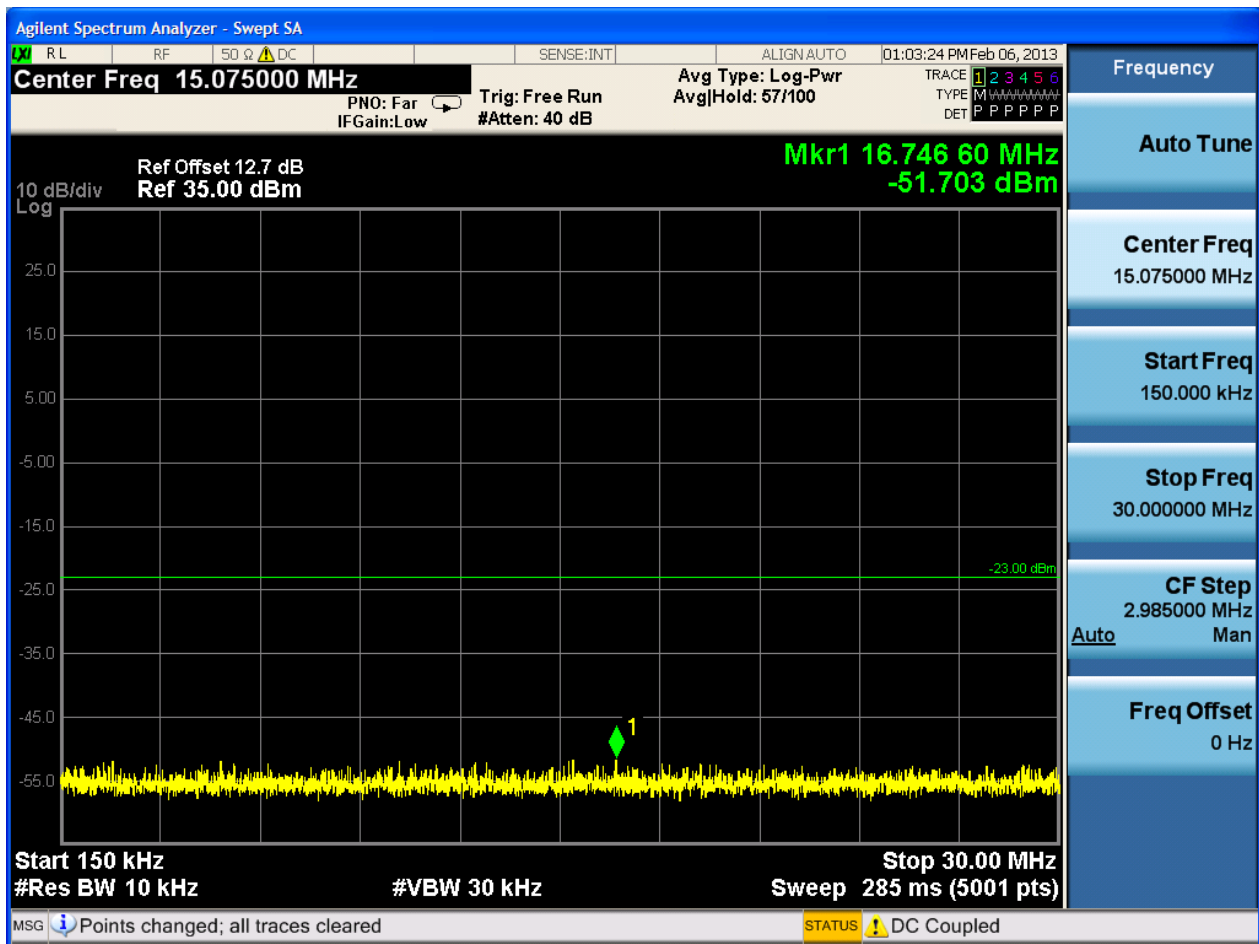
6.1 For GSM

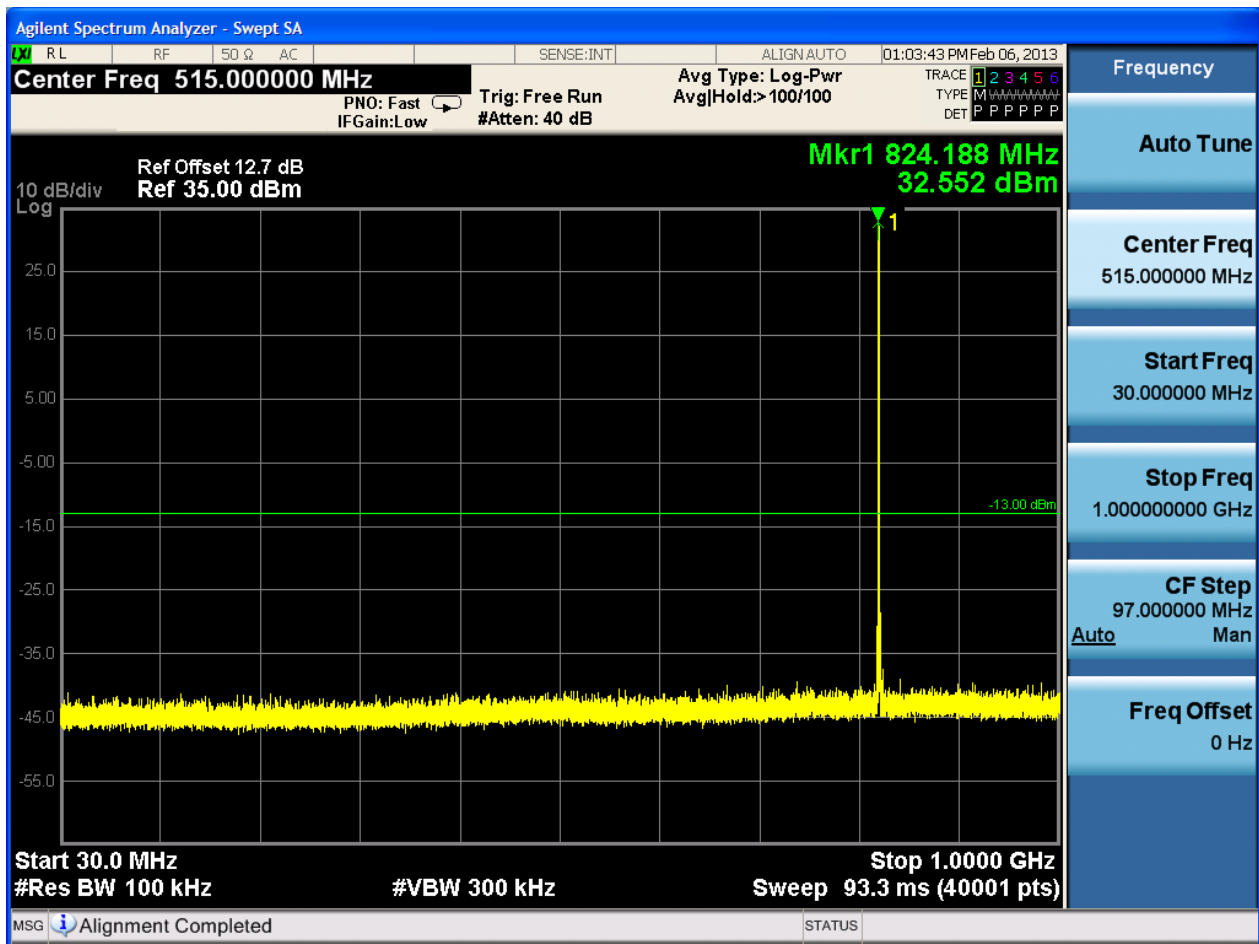
6.1.1 Test Band = GSM850

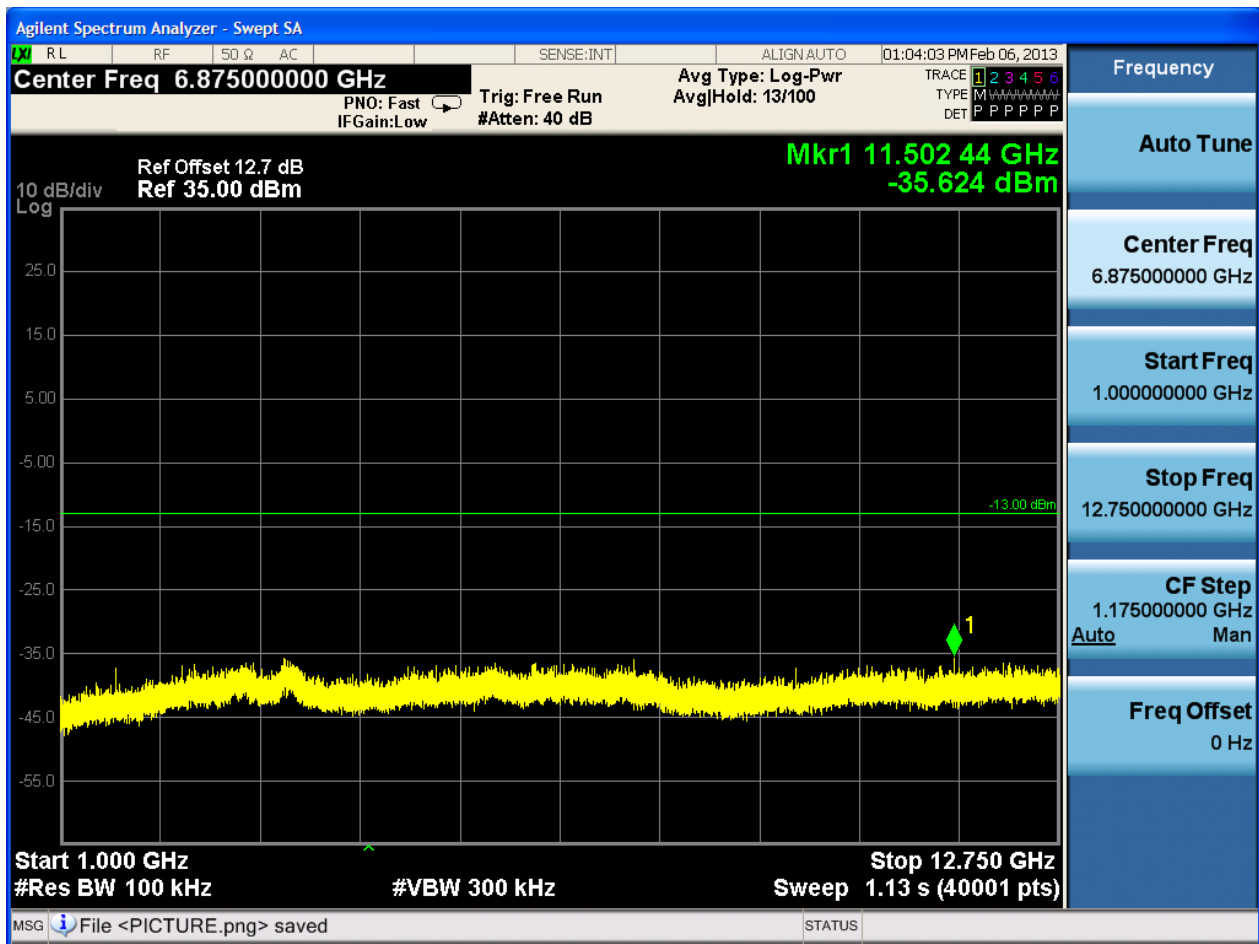
6.1.1.1 Test Mode = GSM/TM1

6.1.1.1.1 Test Channel = LCH



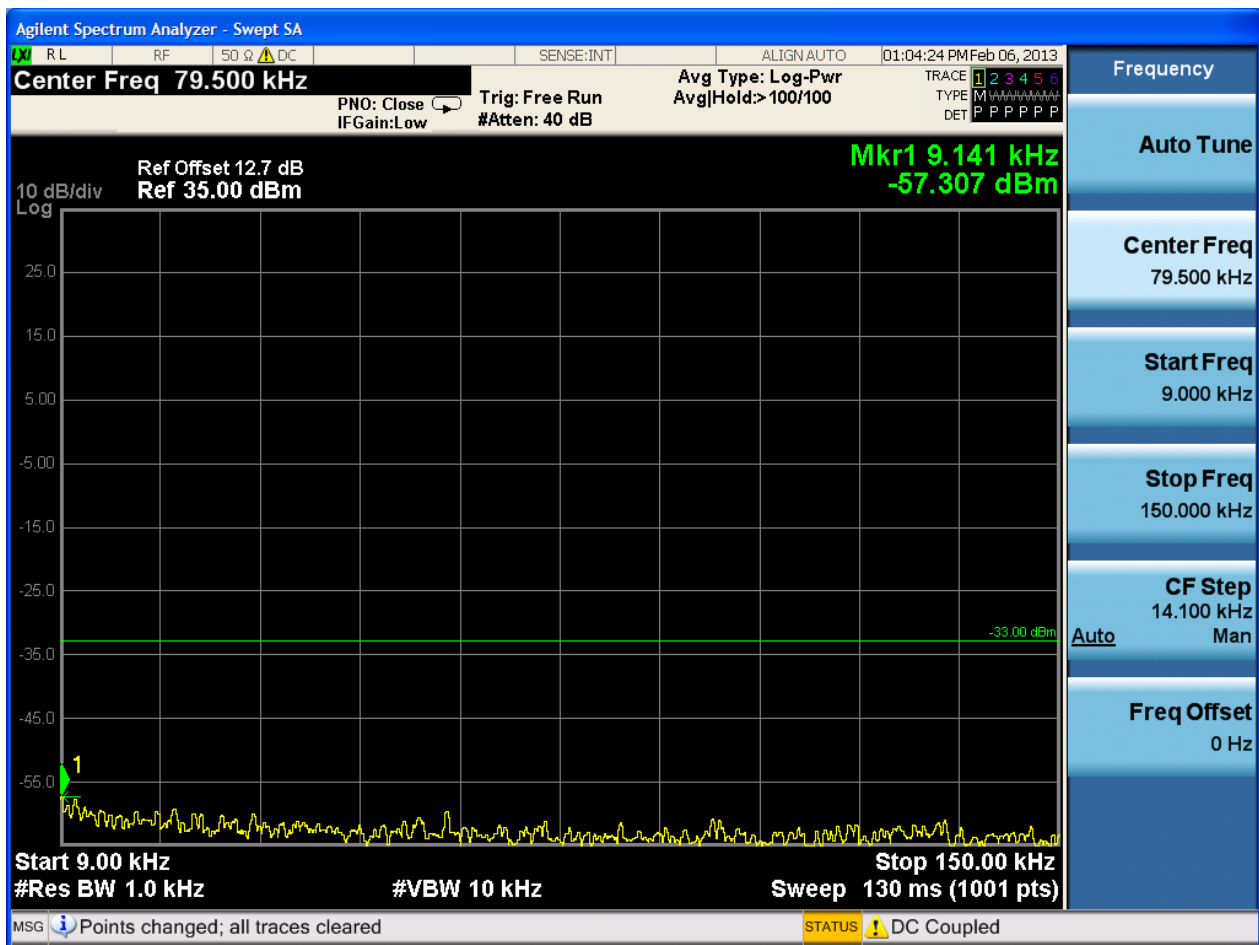


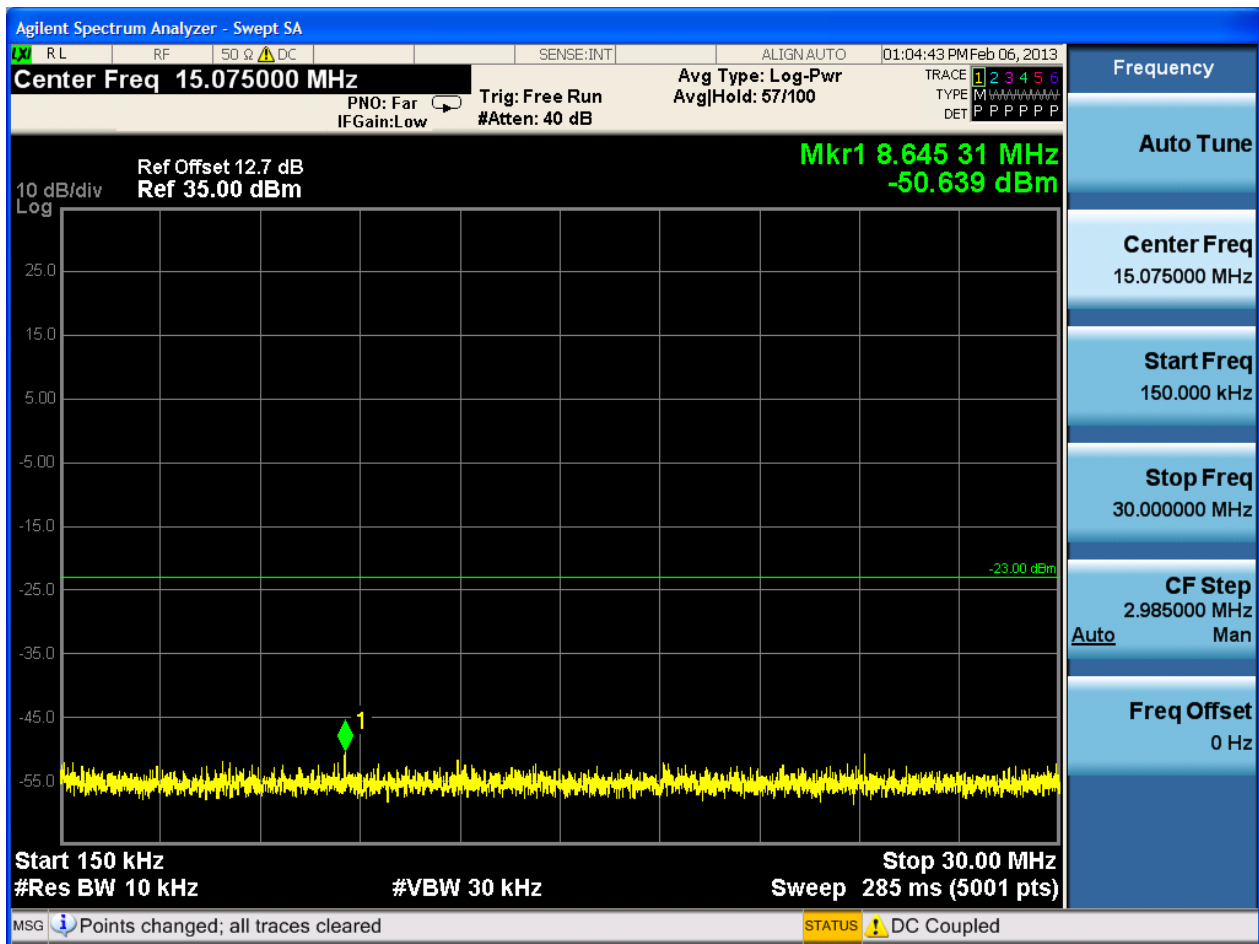


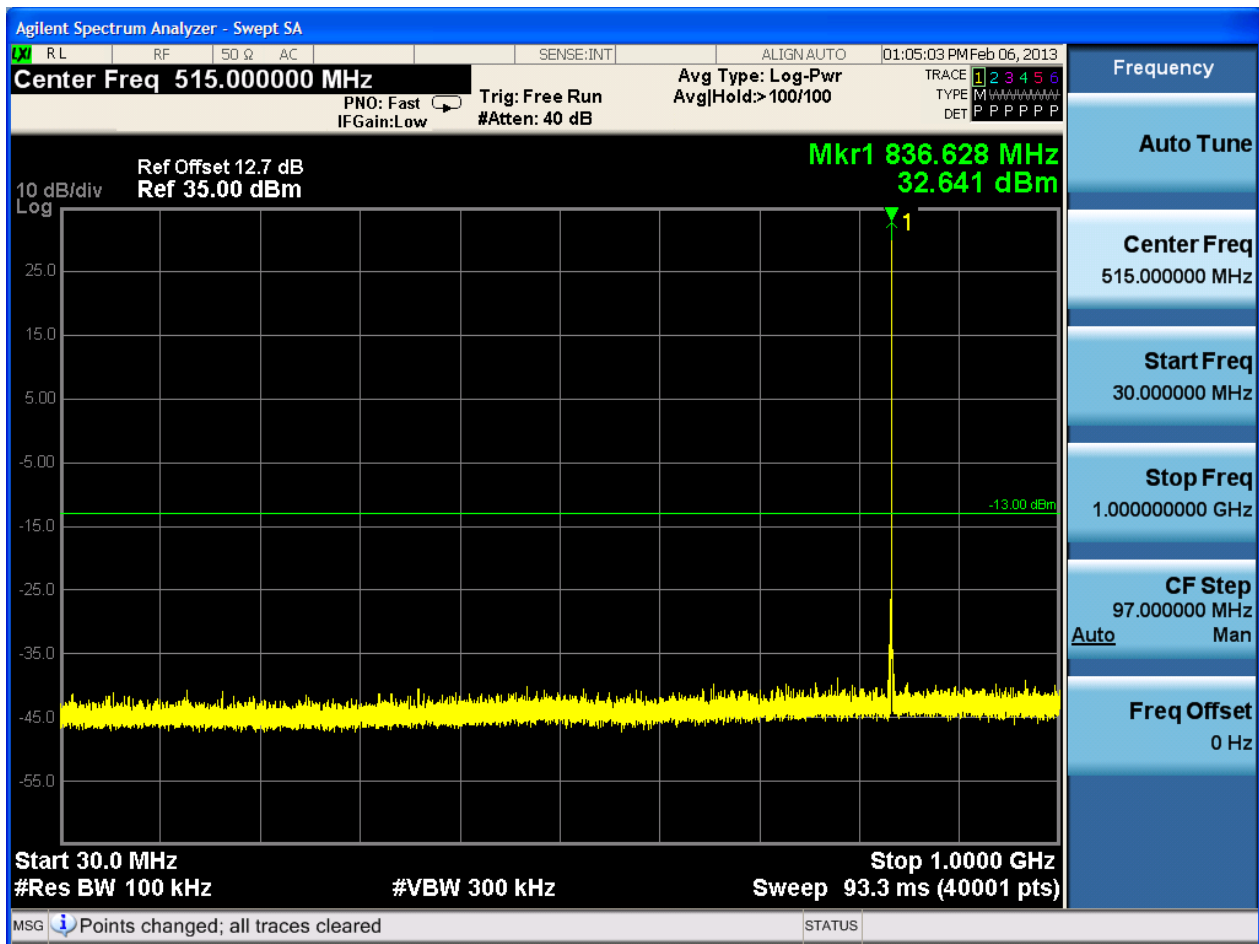


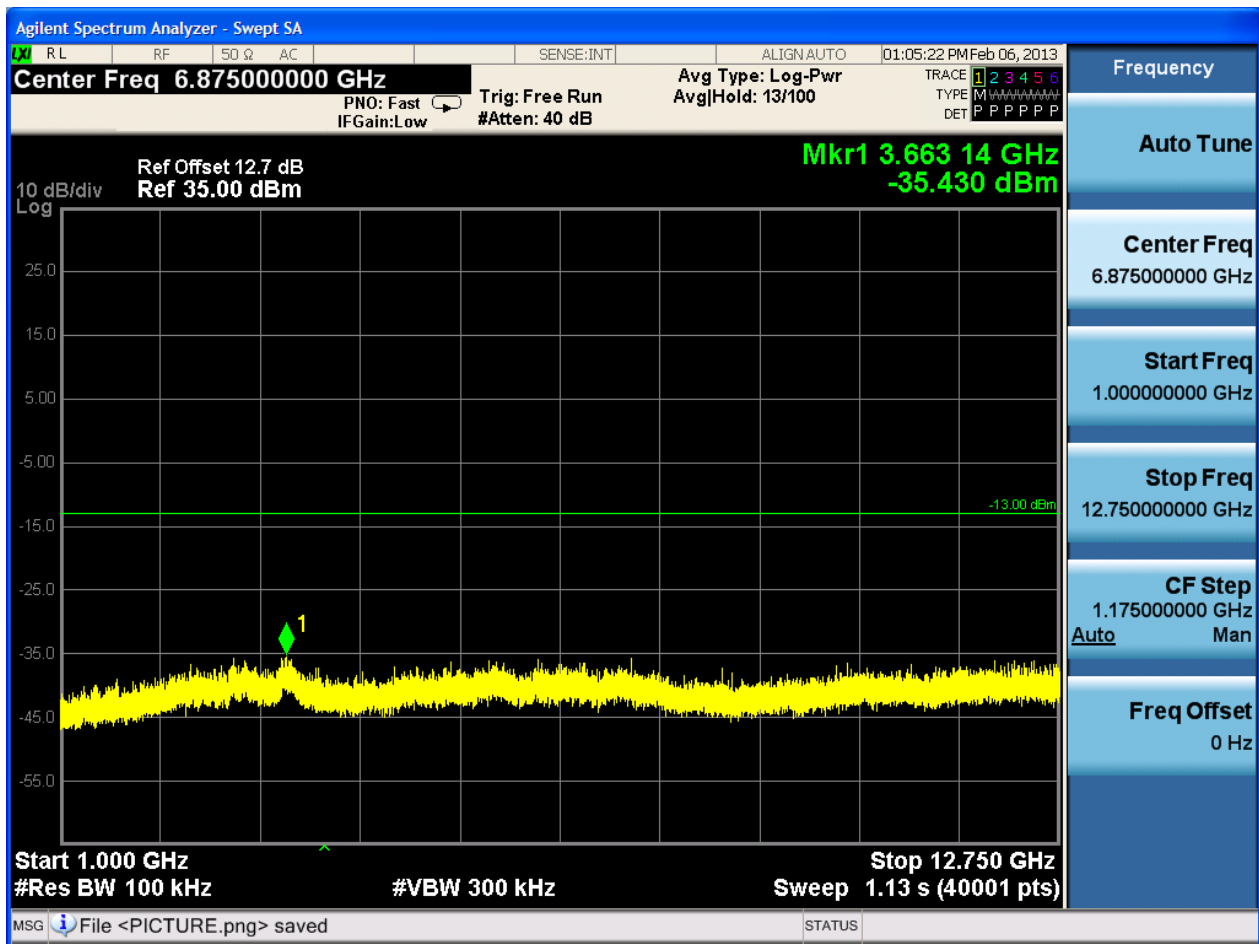


6.1.1.1.2 Test Channel = MCH



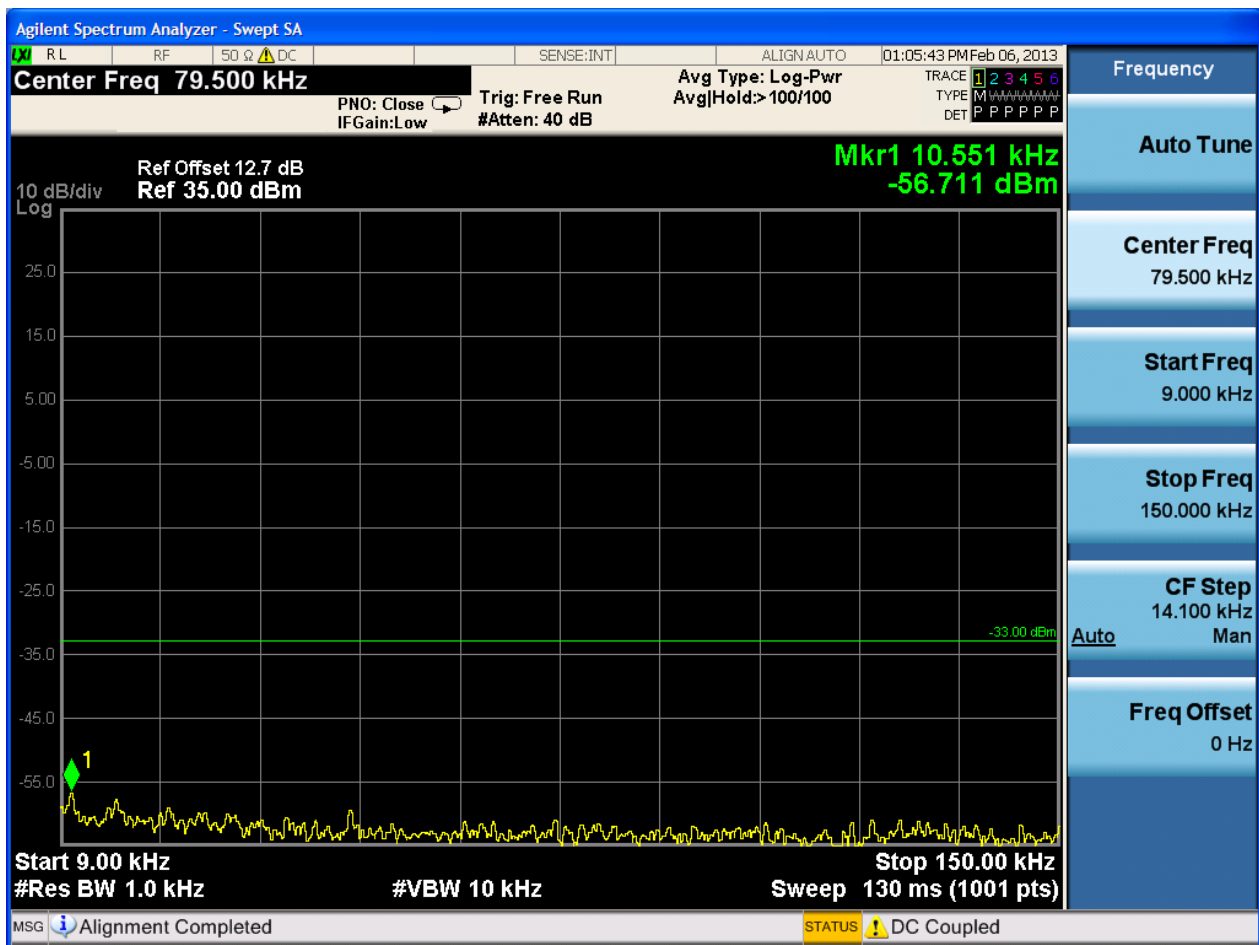


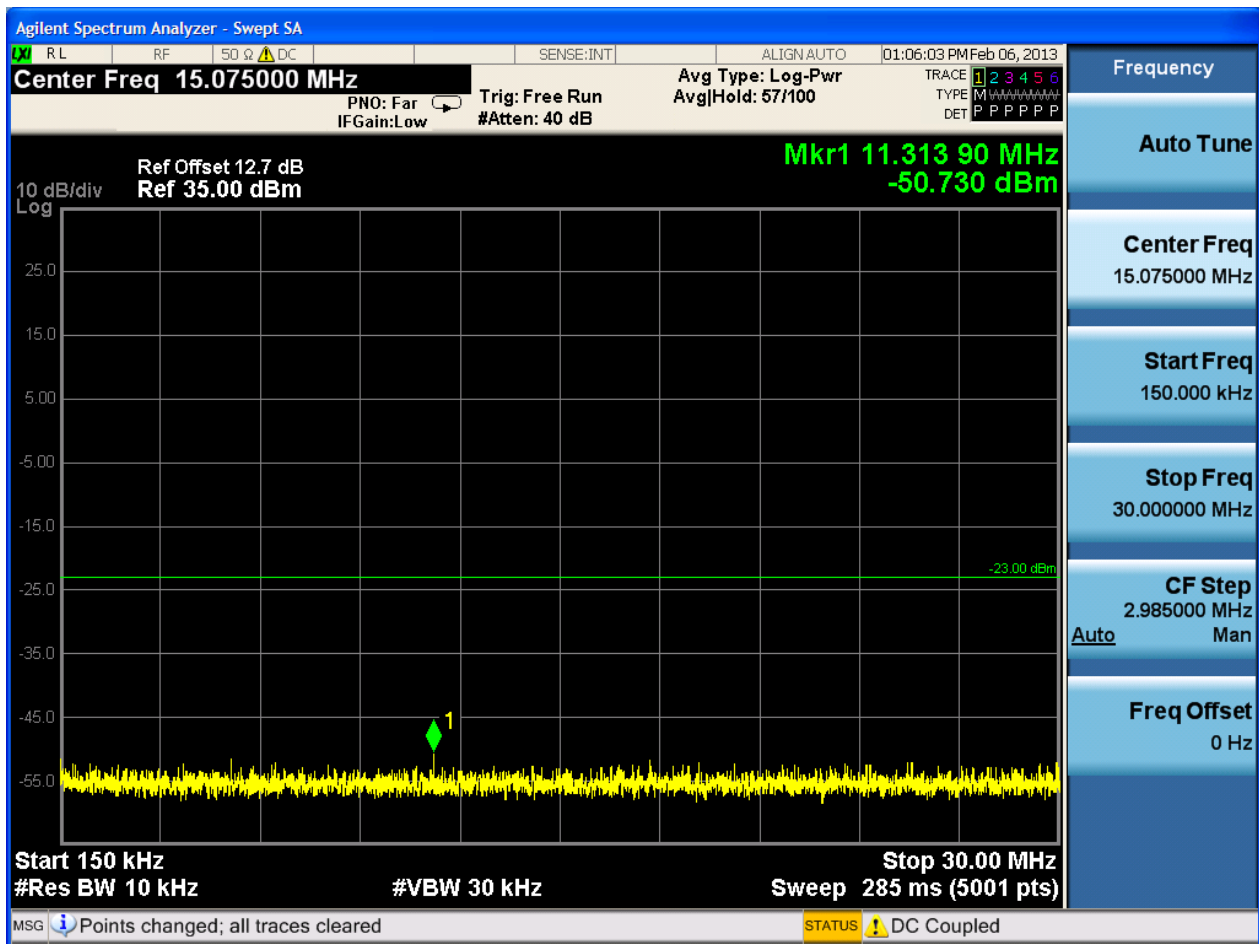


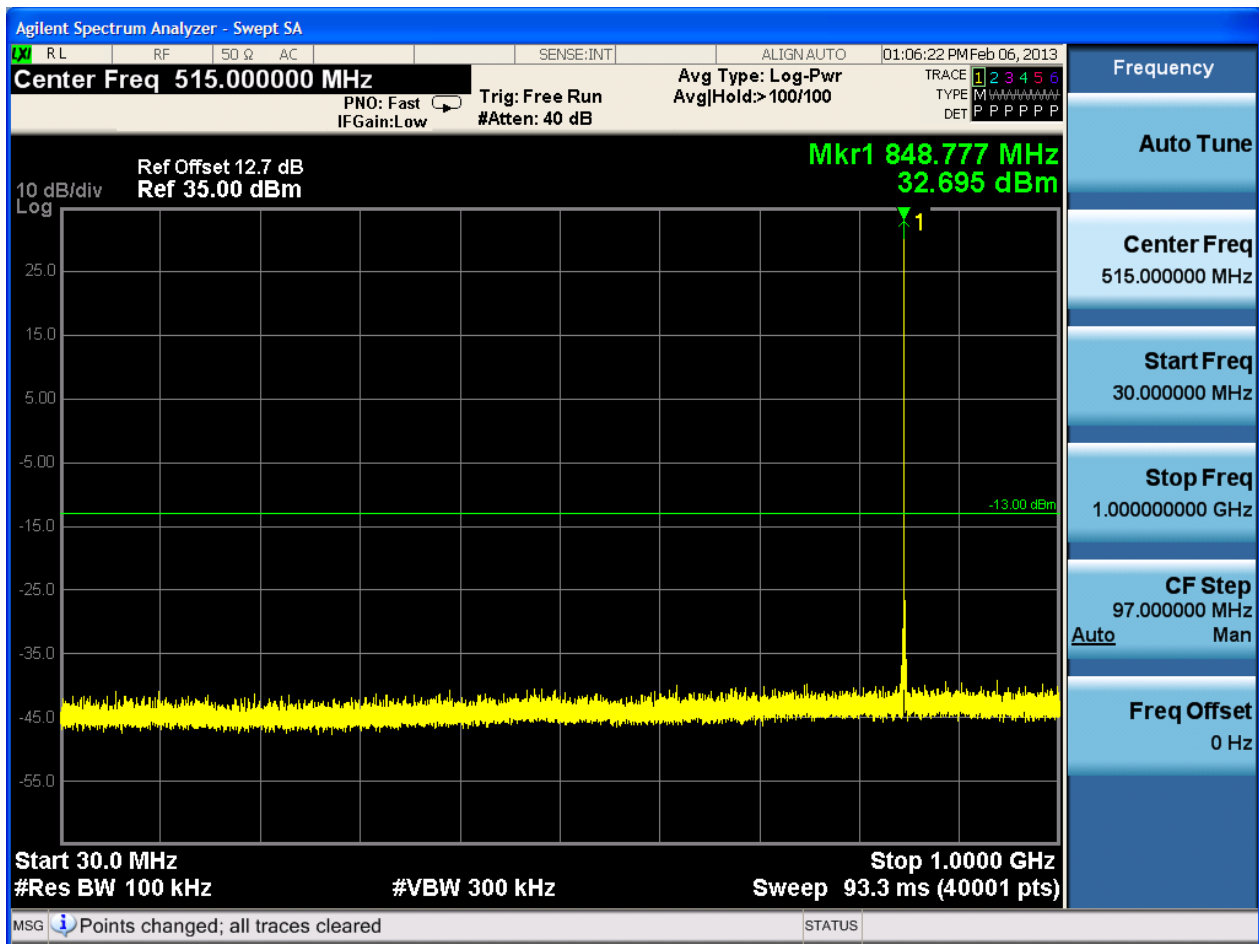


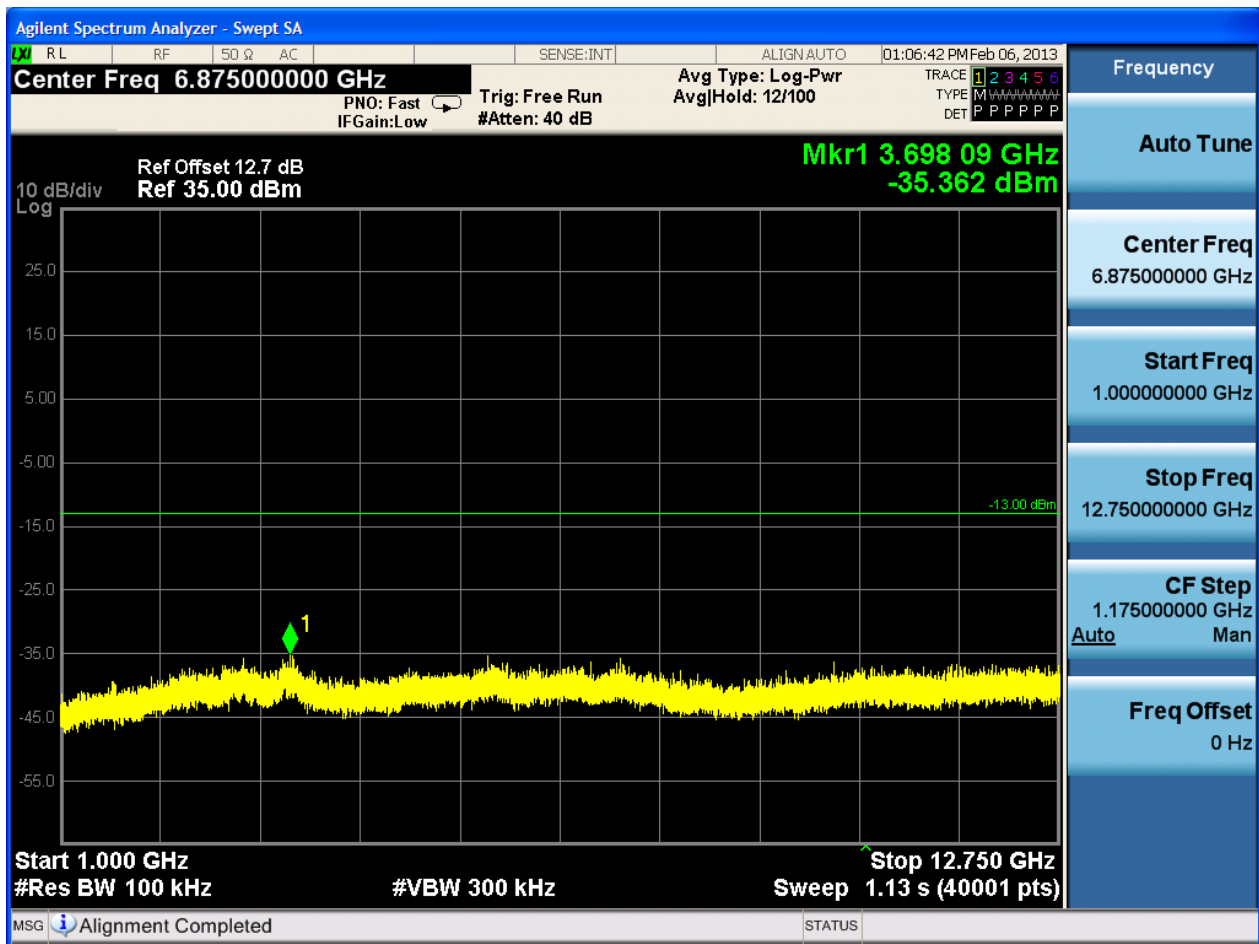


6.1.1.1.3 Test Channel = HCH





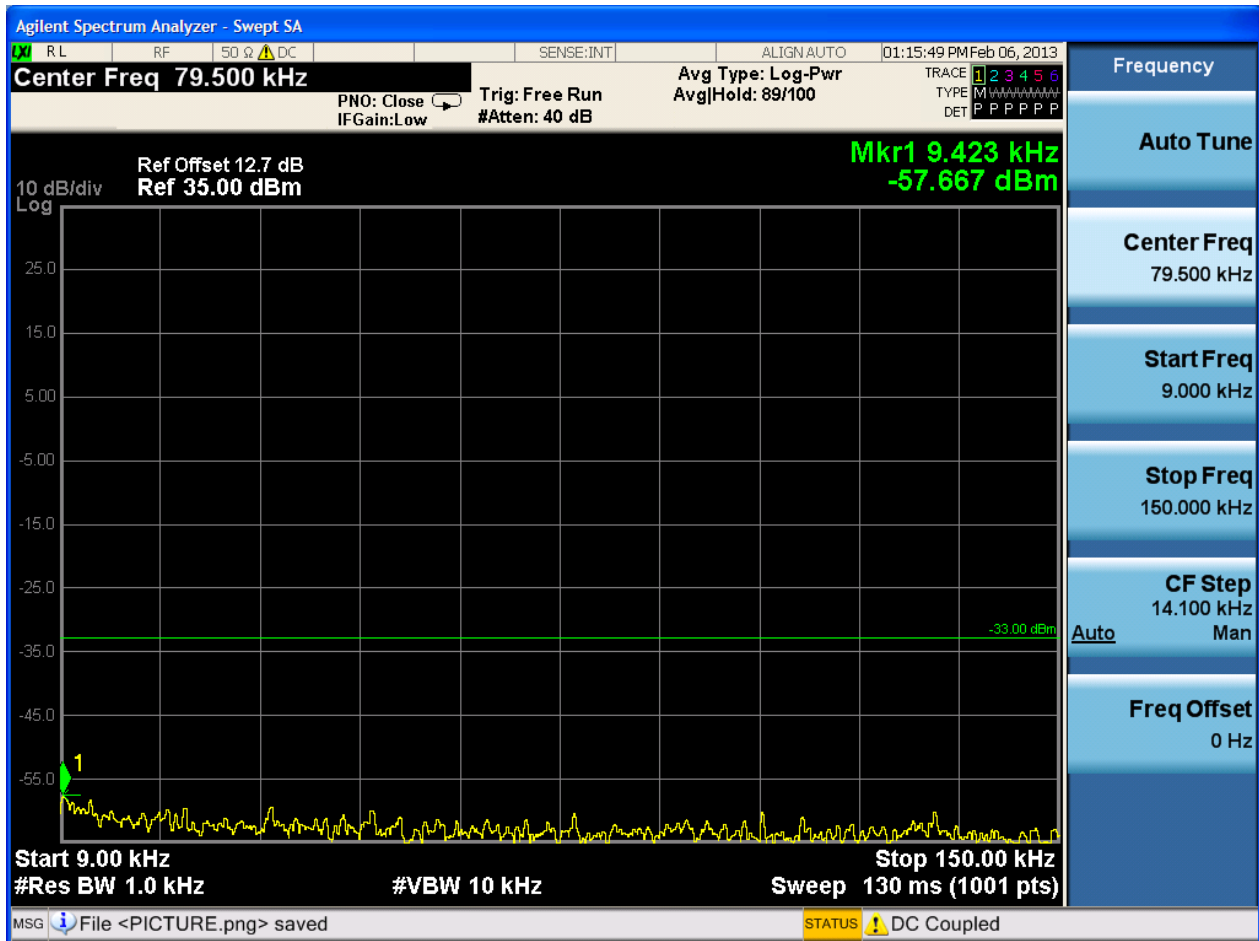


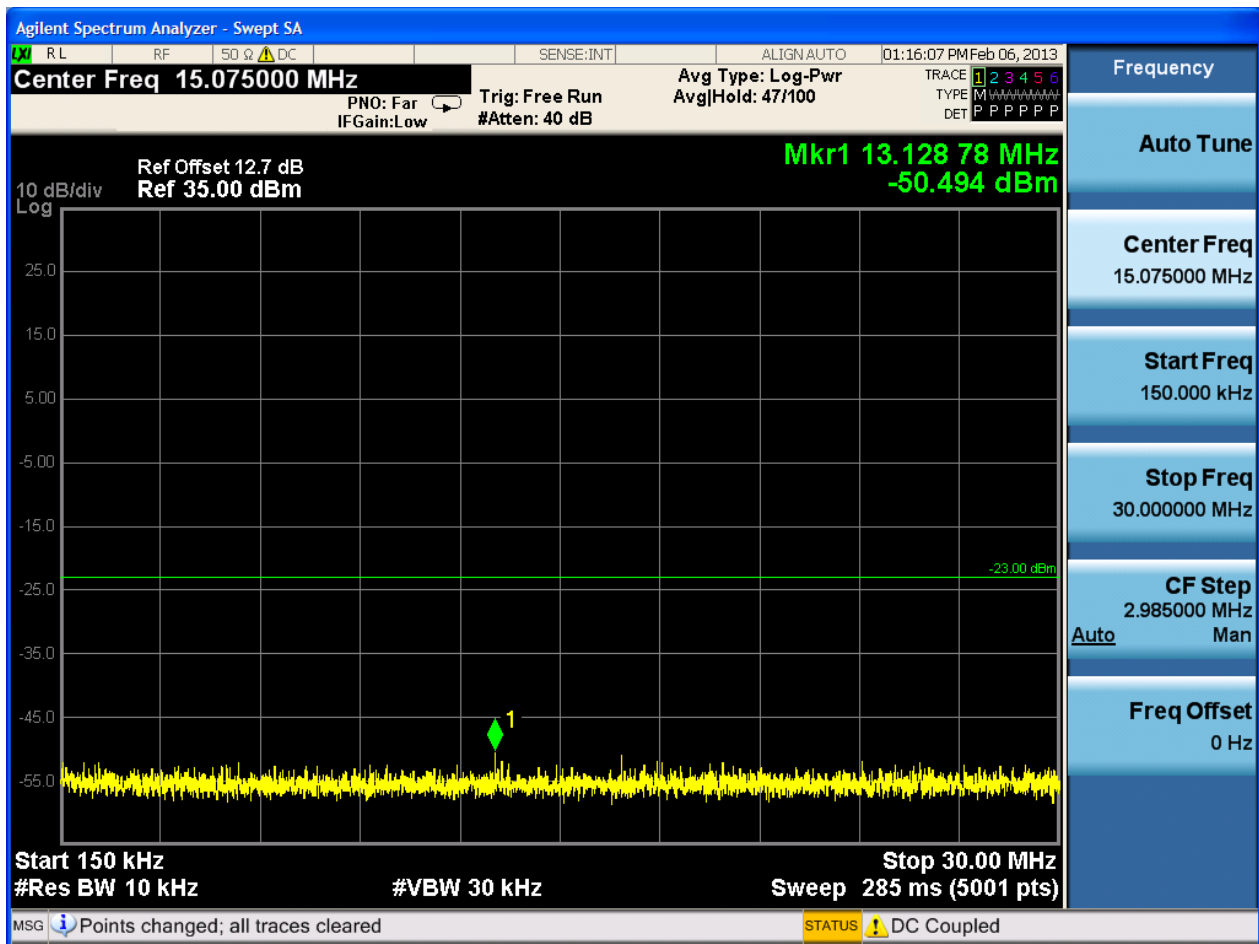


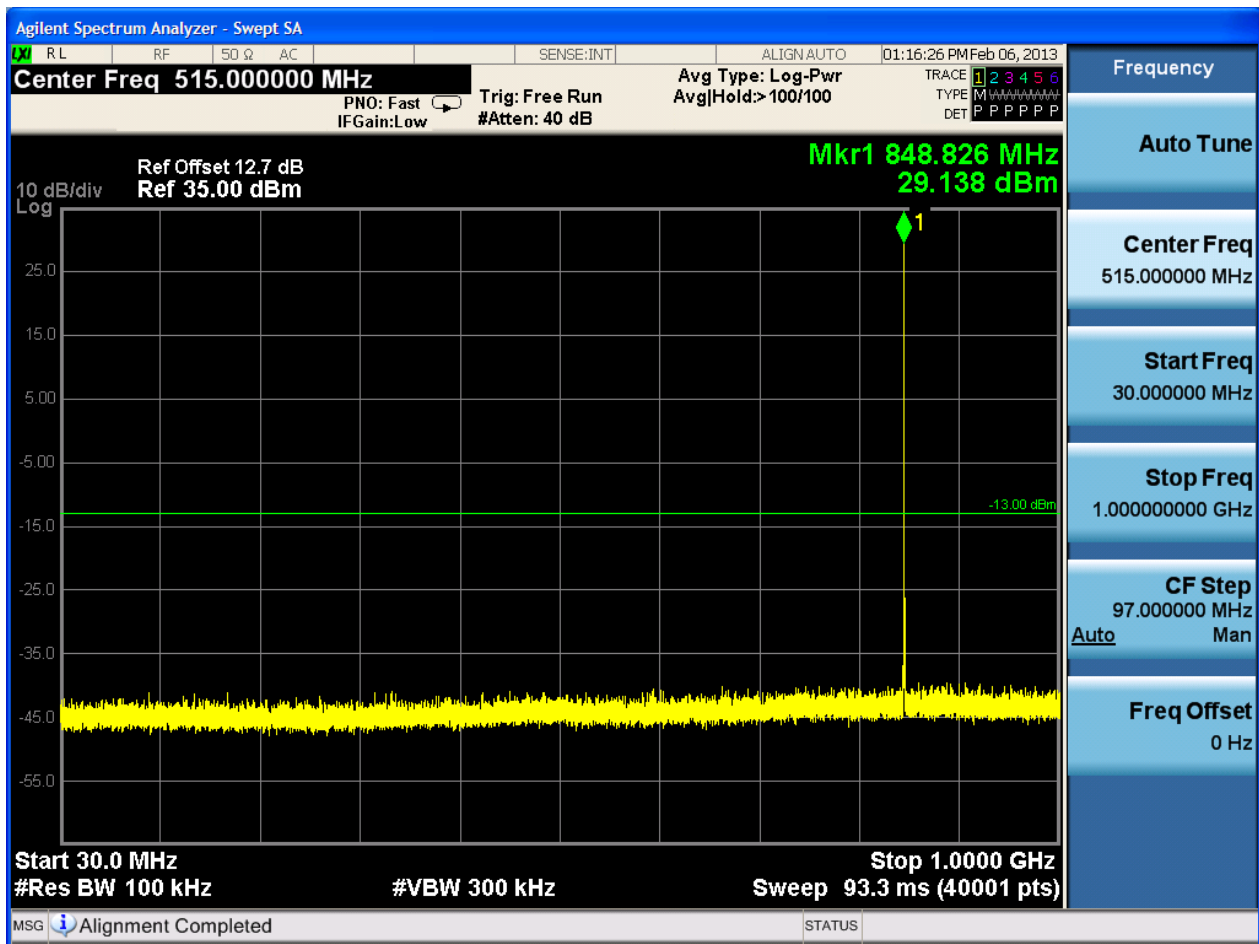


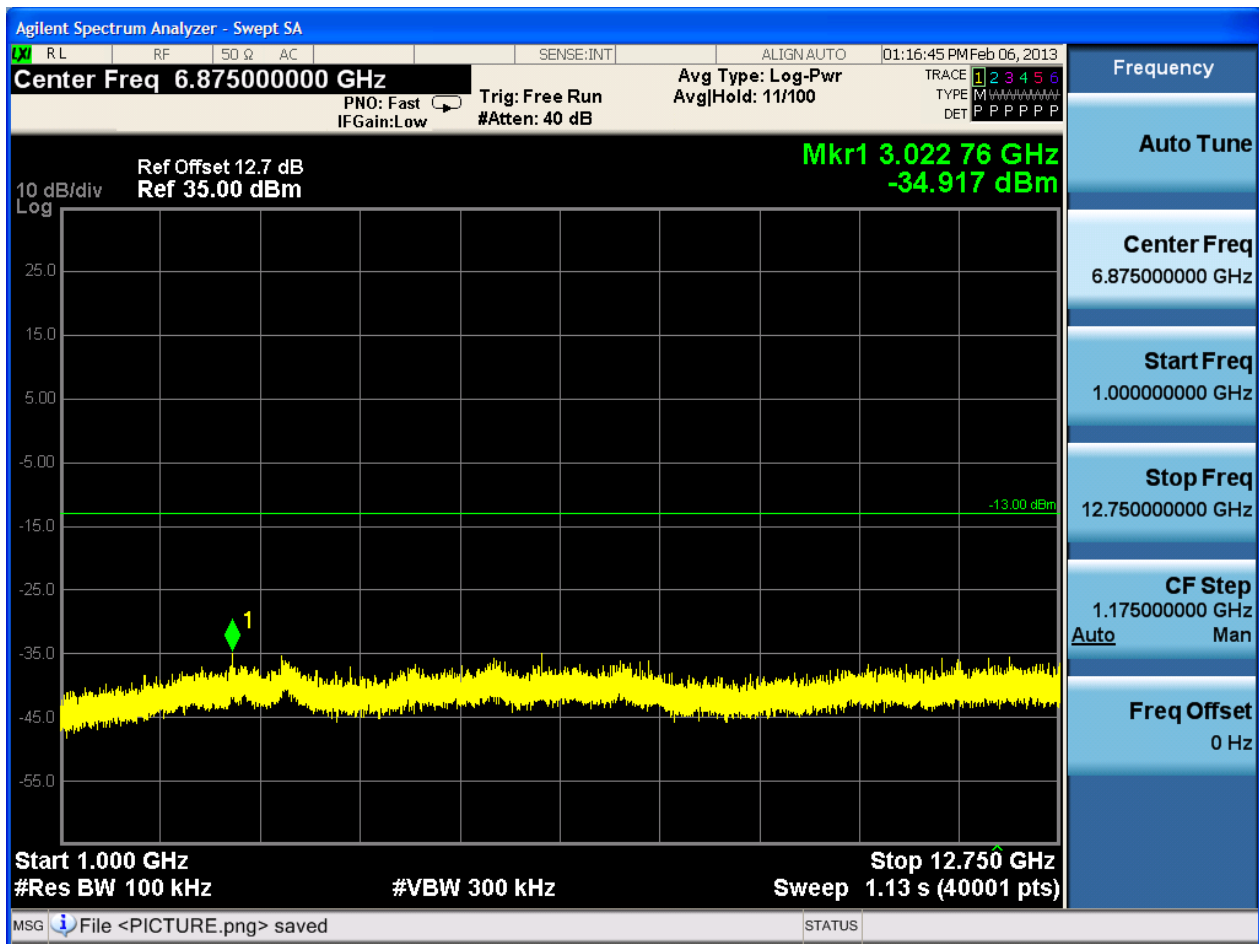
6.1.1.2 Test Mode = GSM/TM2

6.1.1.2.1 Test Channel = LCH



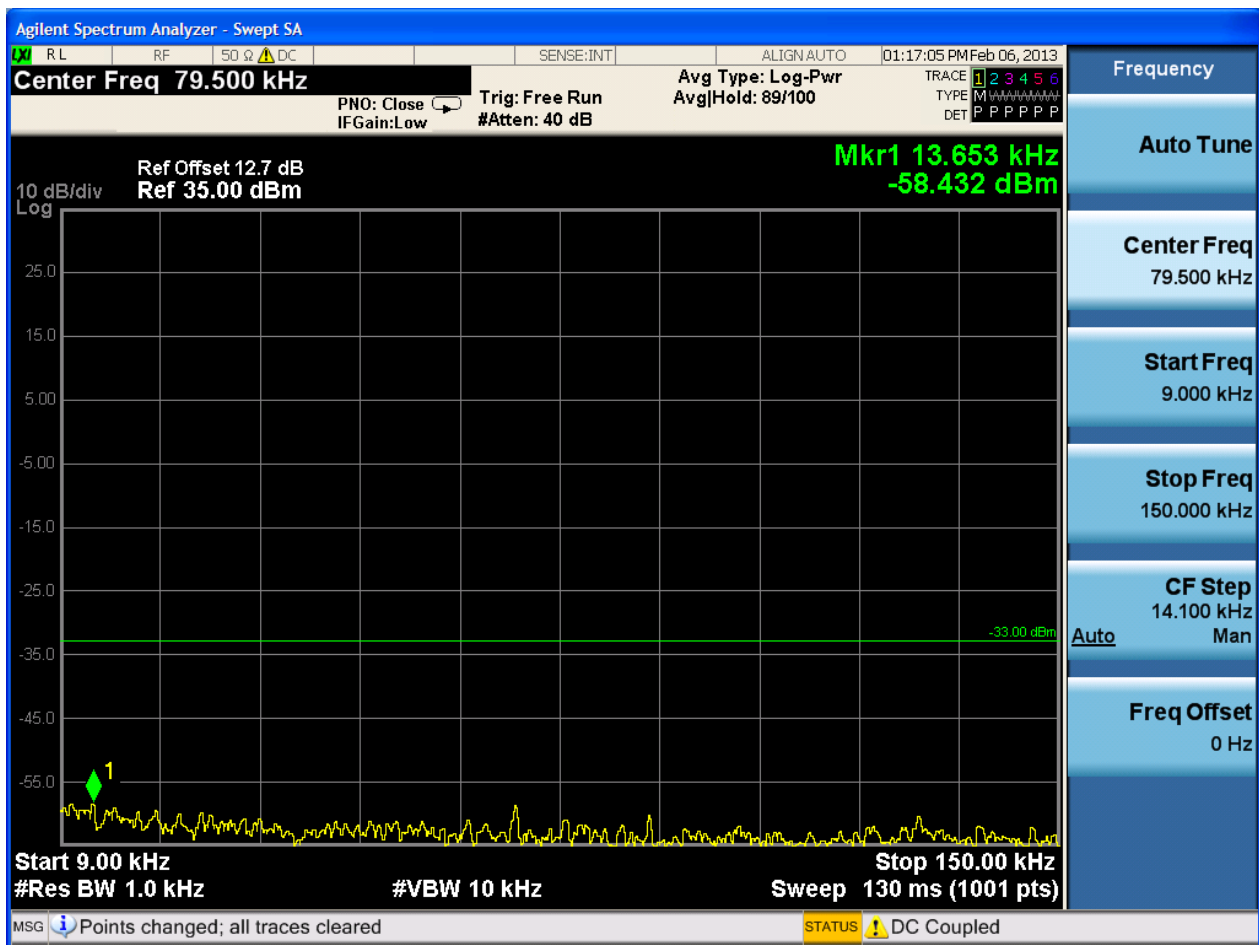


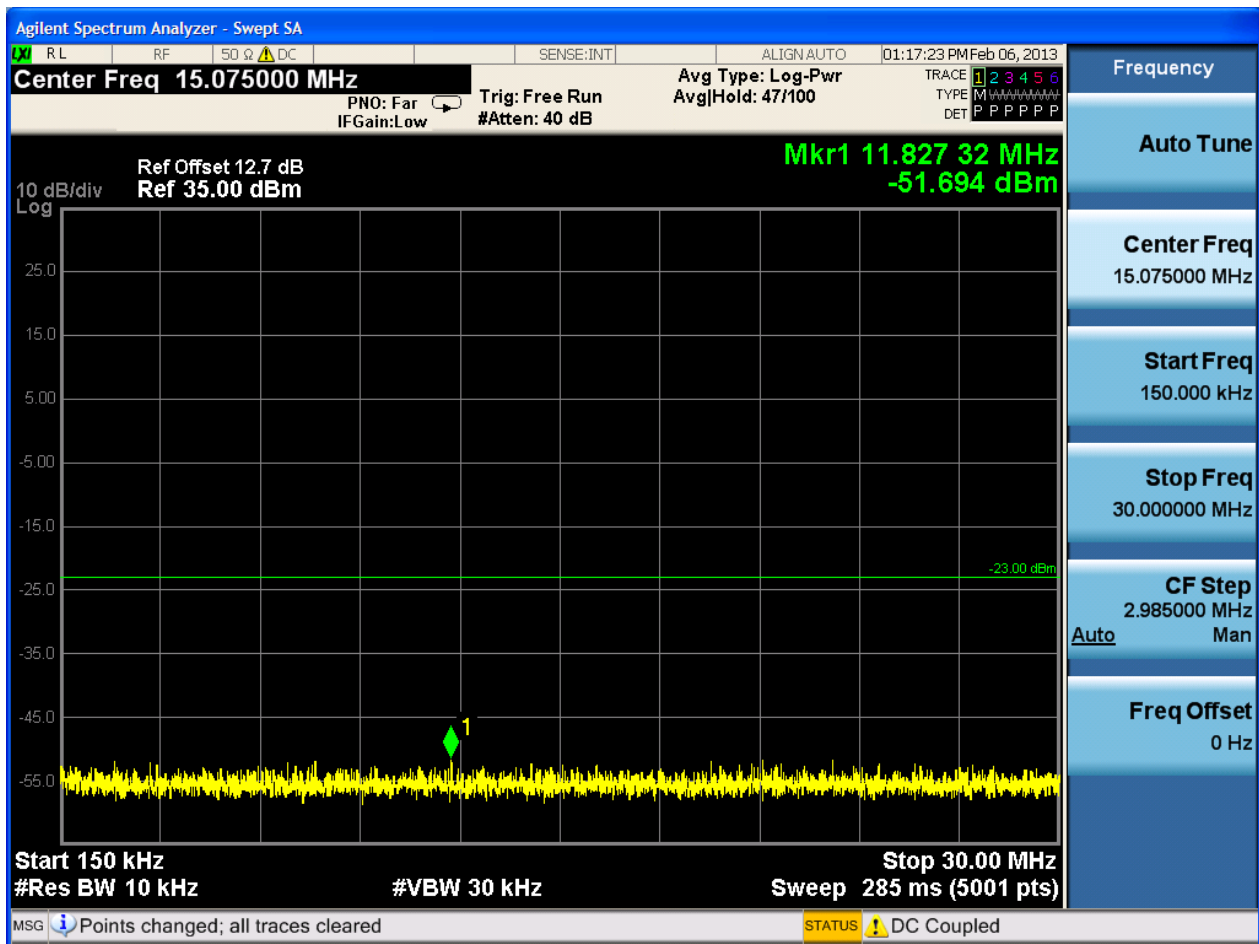


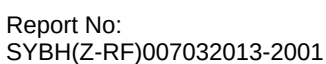
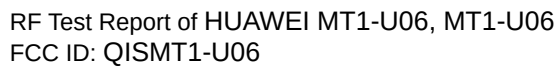


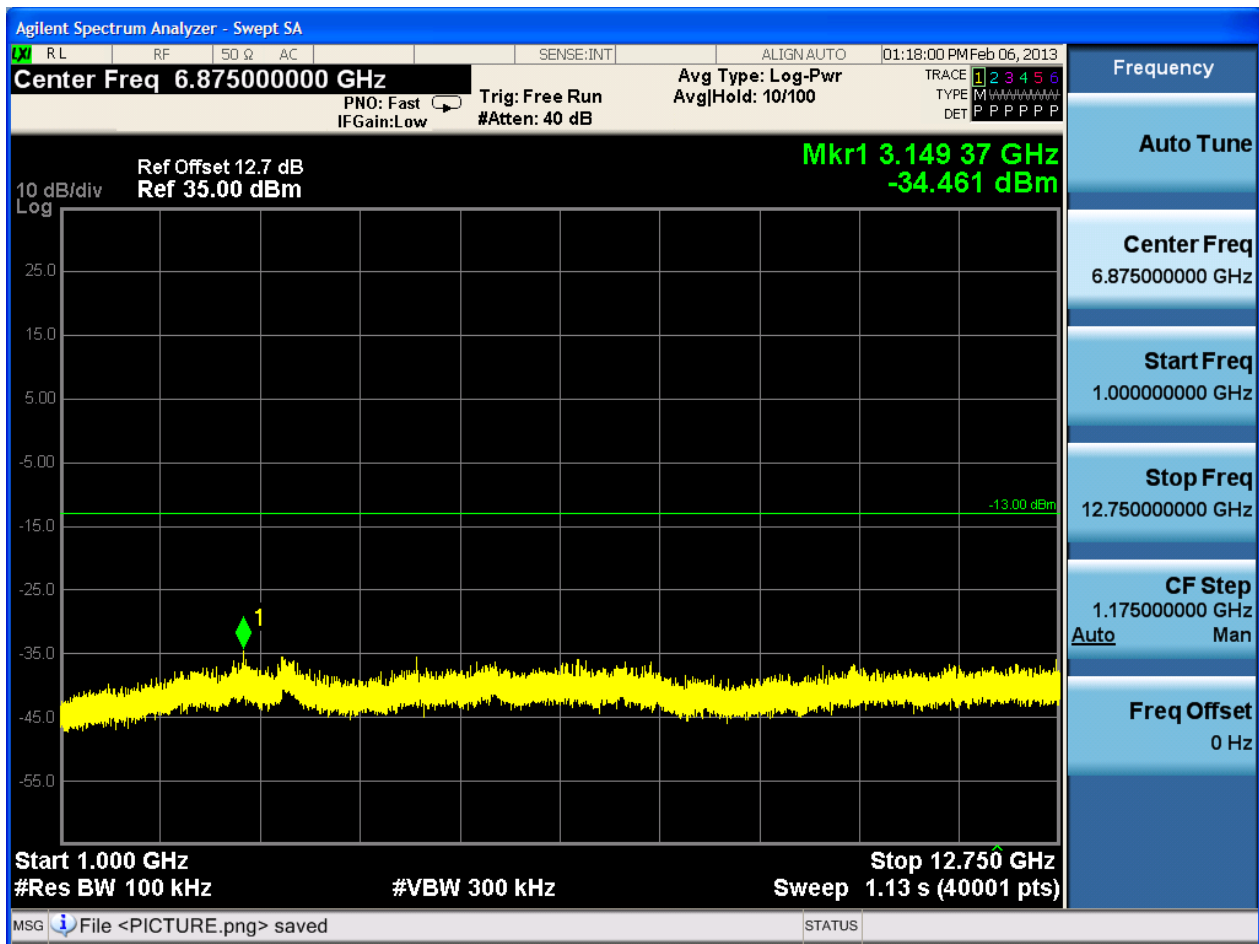


6.1.1.2.2 Test Channel = MCH



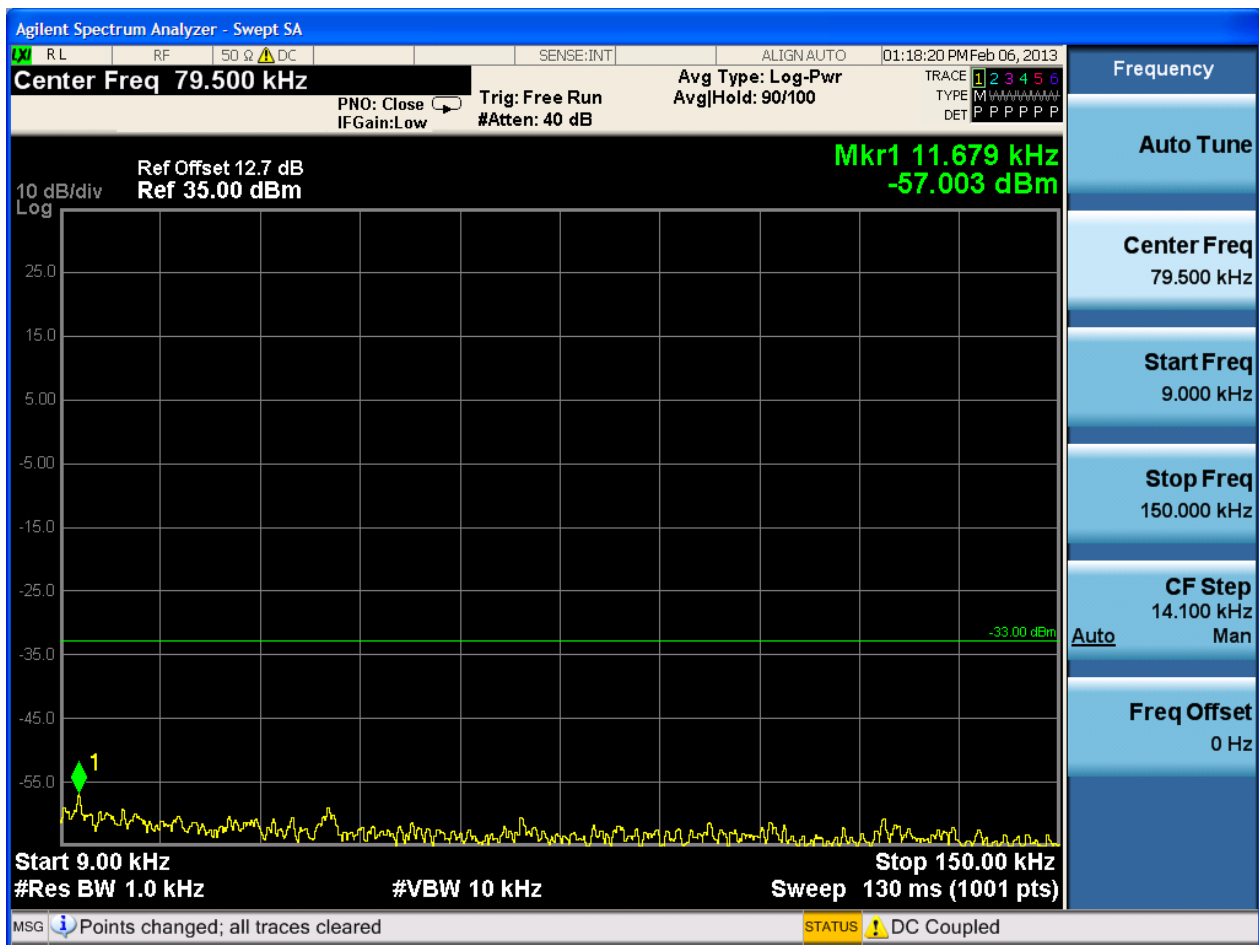


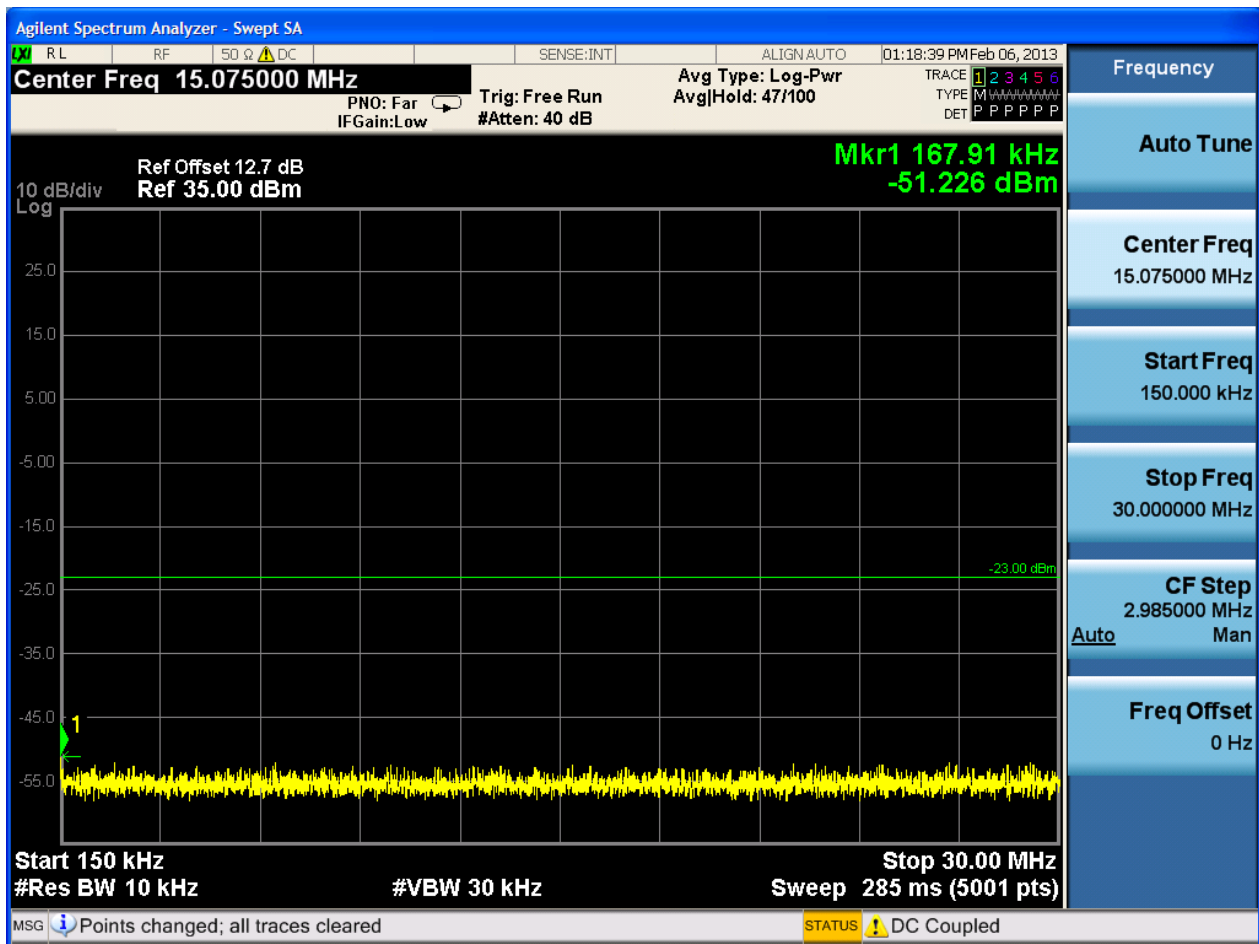


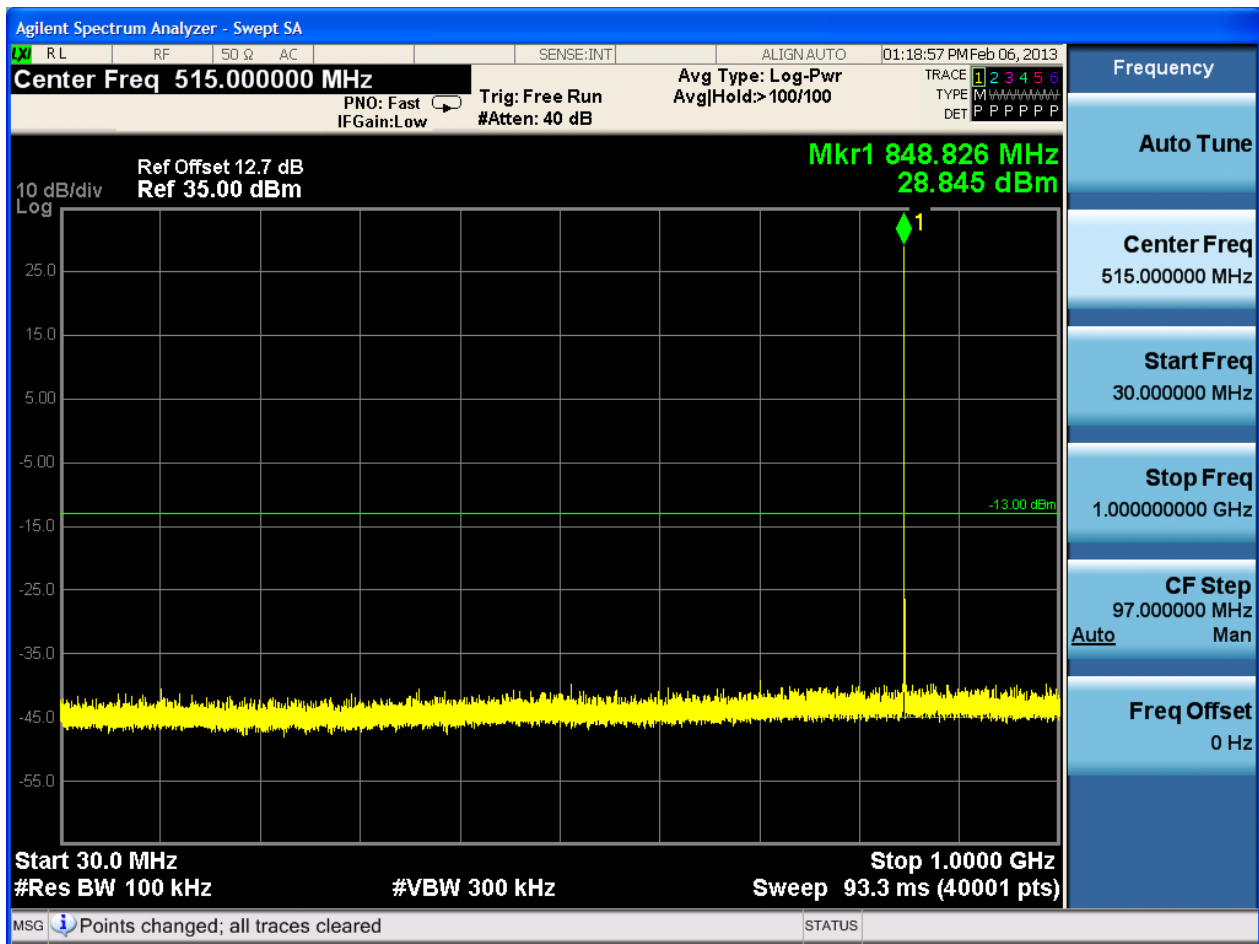


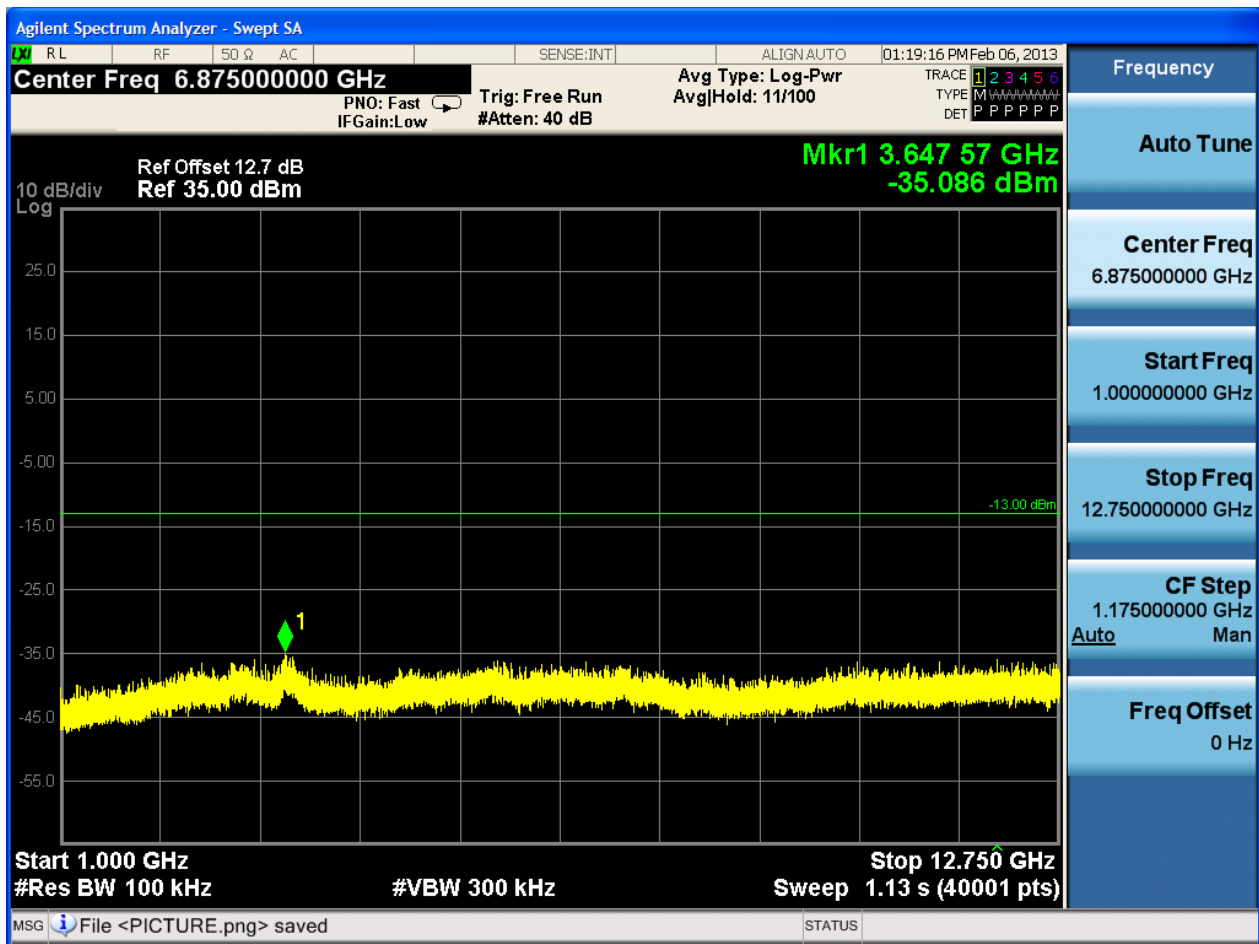


6.1.1.2.3 Test Channel = HCH







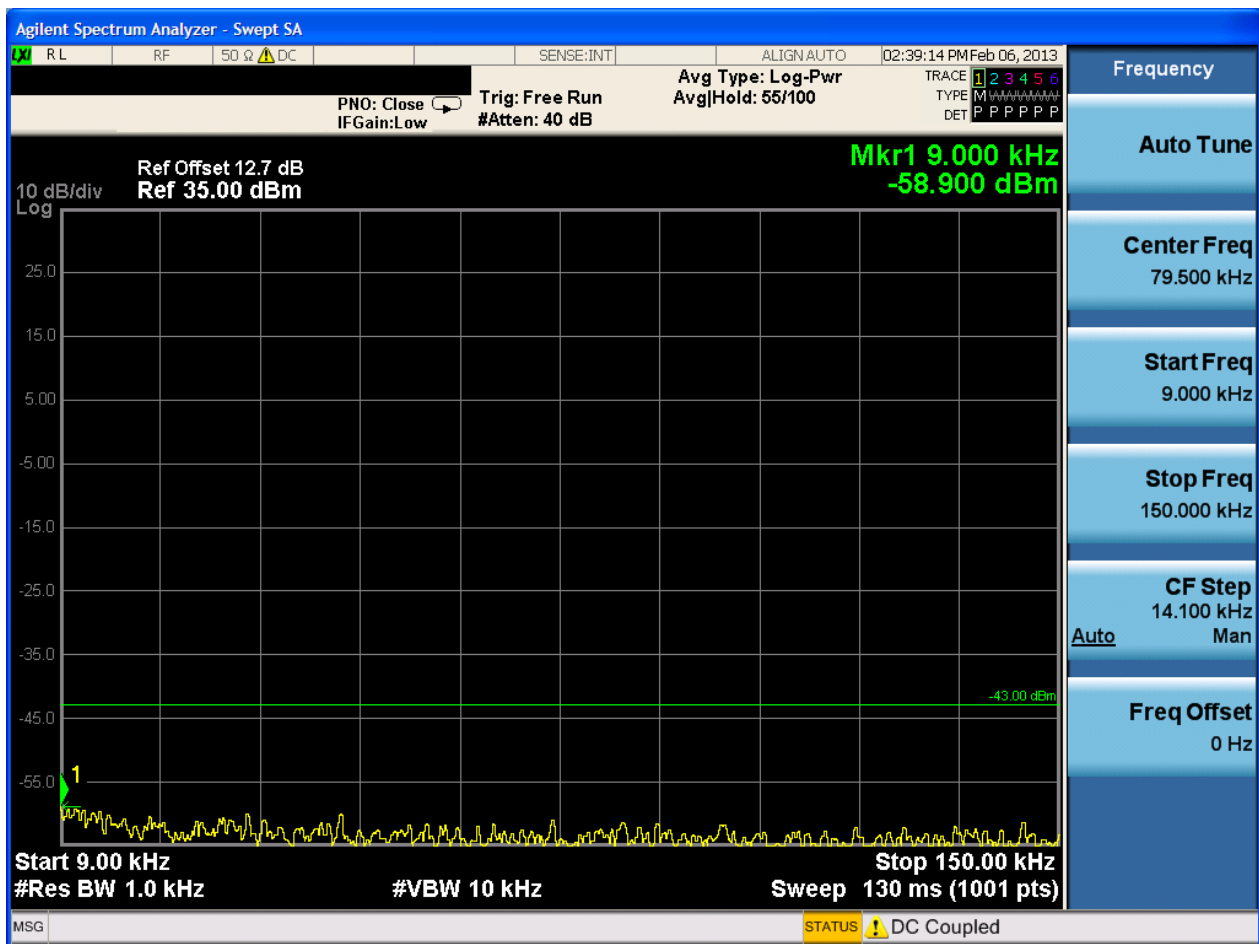


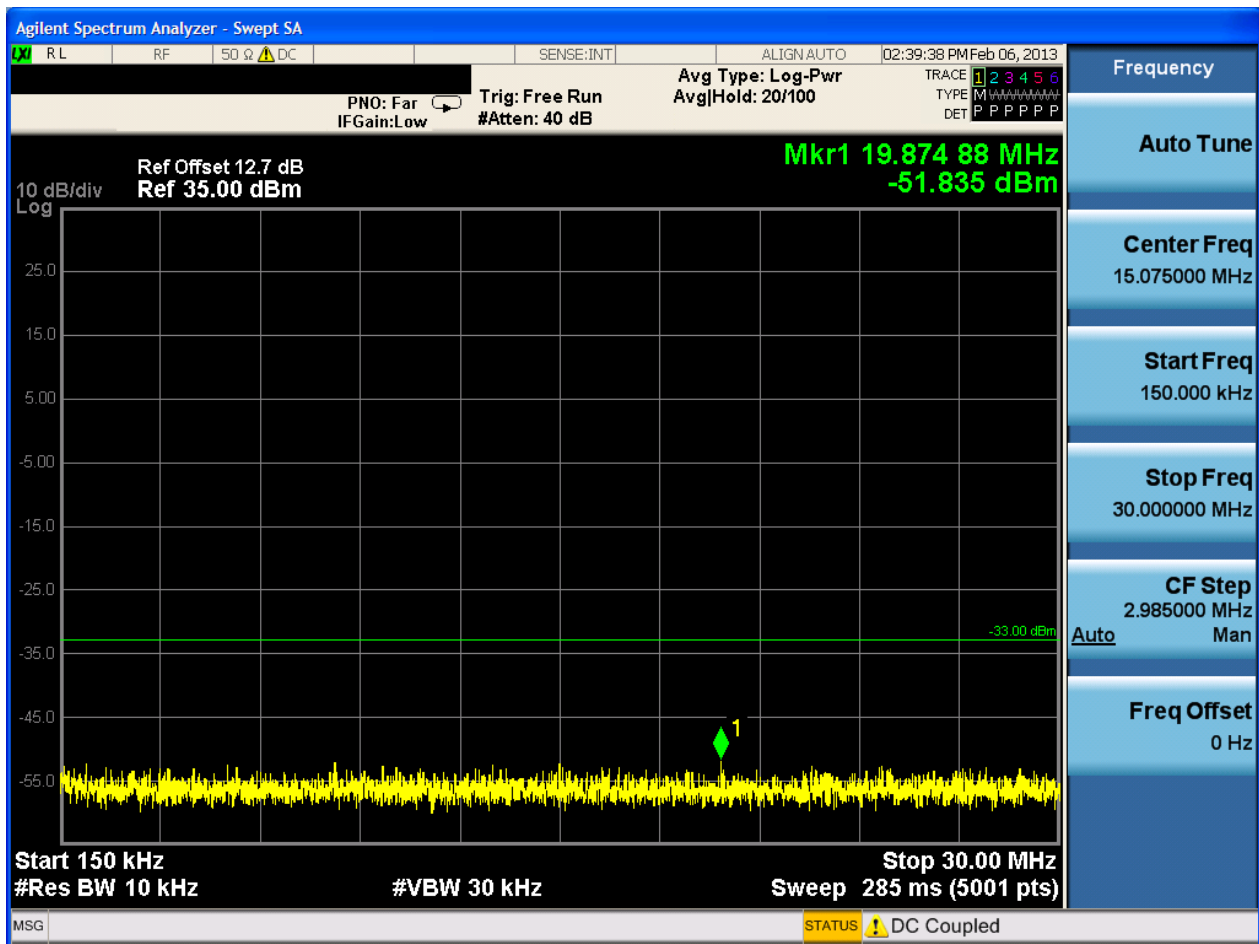


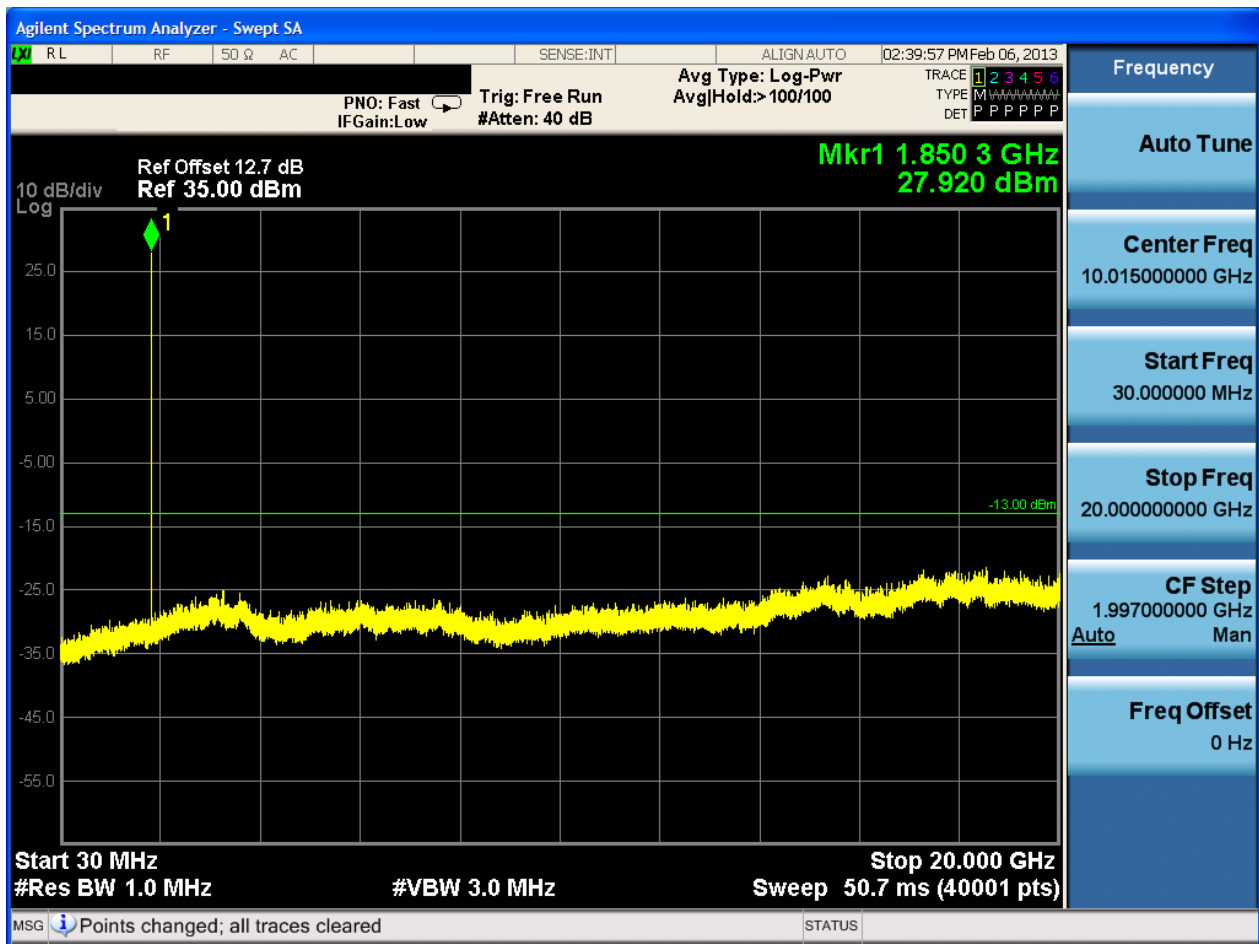
6.1.2 Test Band = GSM1900

6.1.2.1 Test Mode = GSM/TM1

6.1.2.1.1 Test Channel = LCH

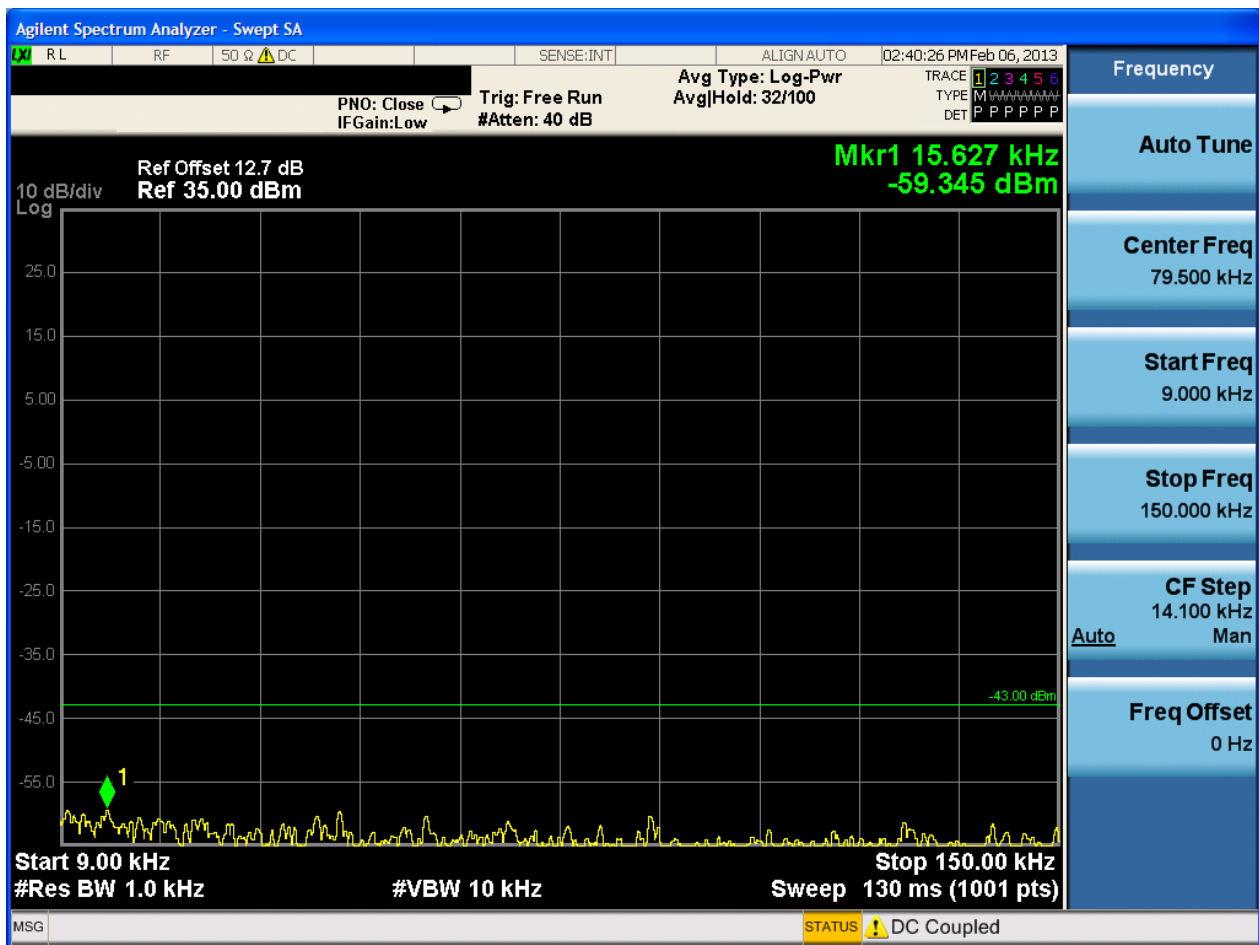


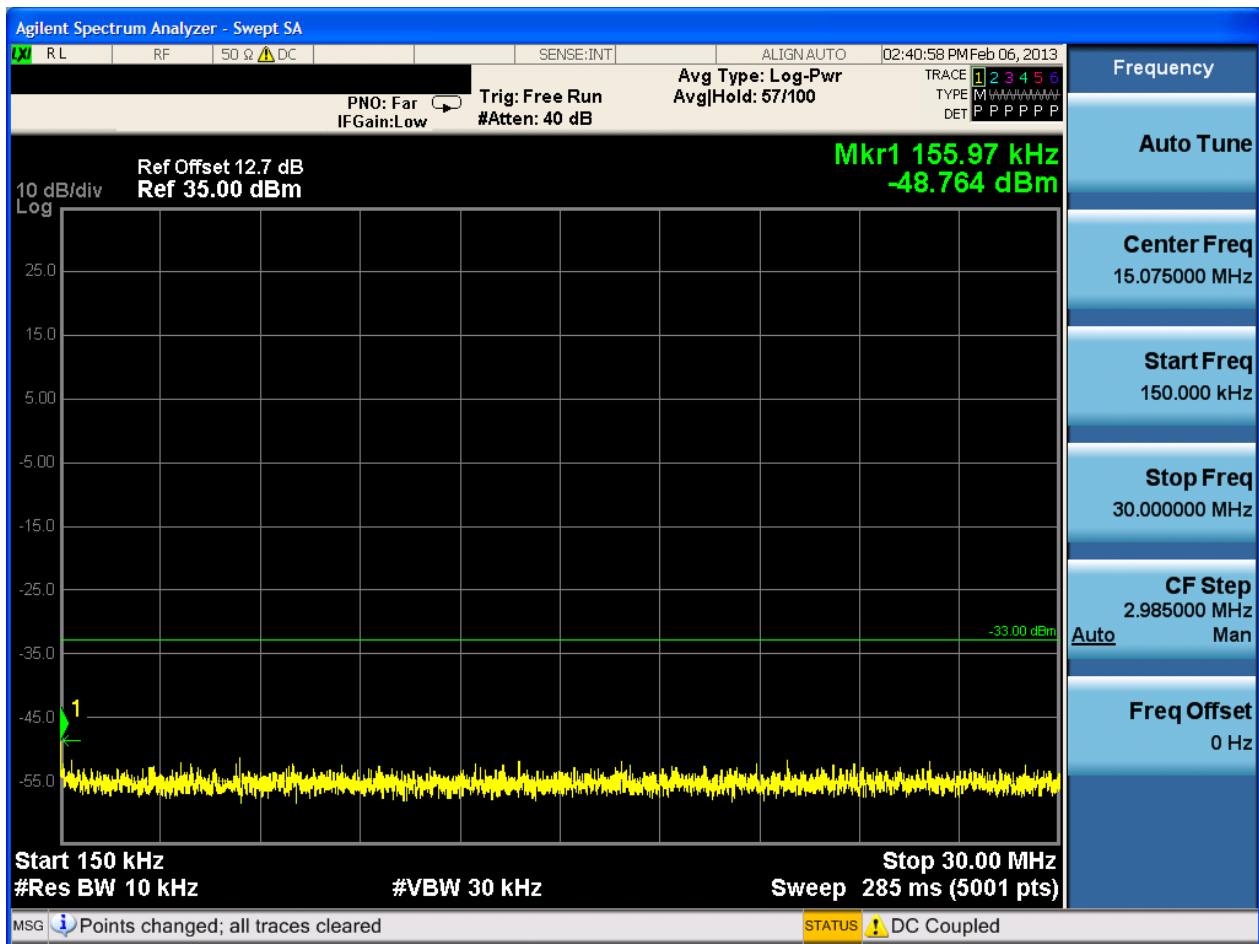


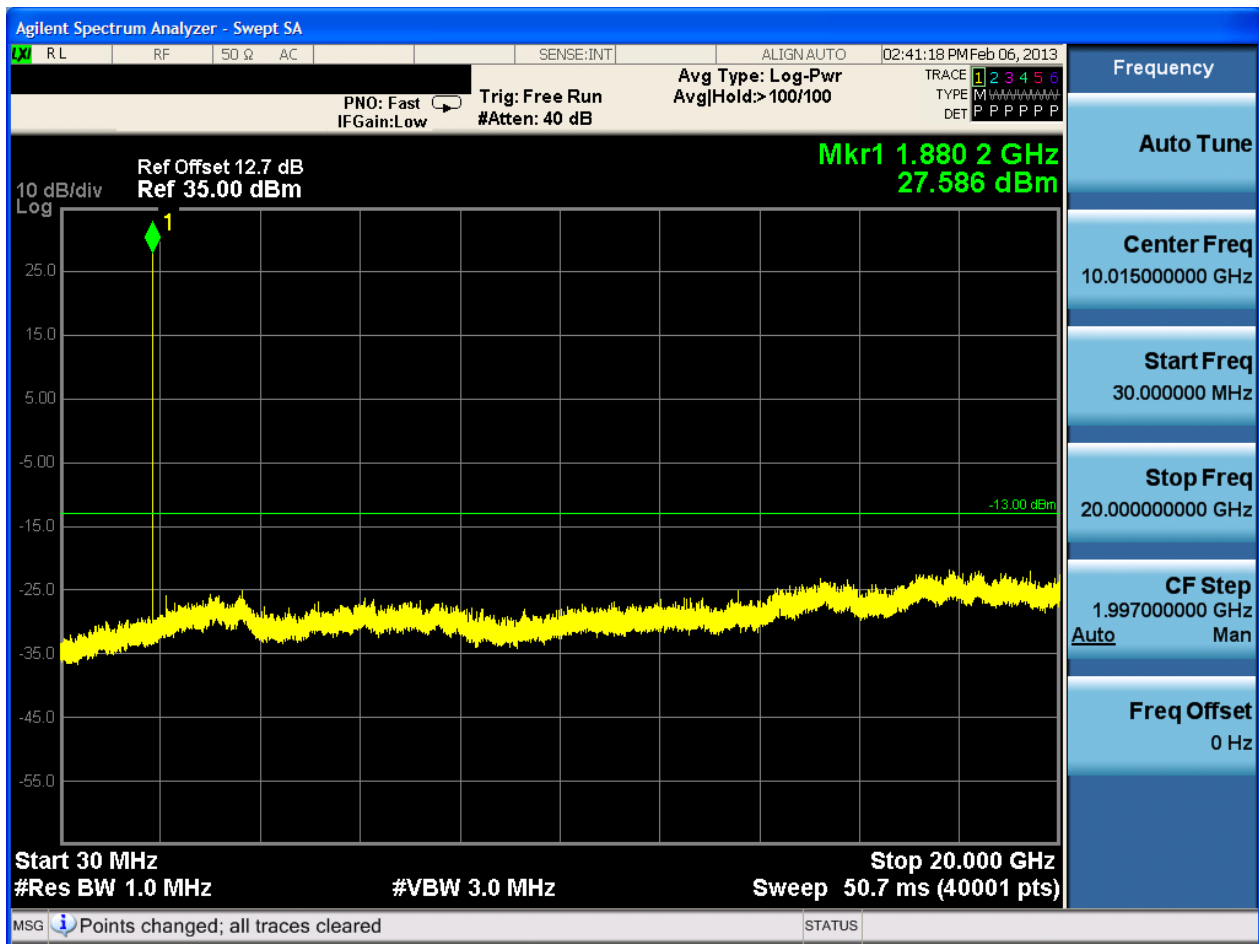




6.1.2.1.2 Test Channel = MCH

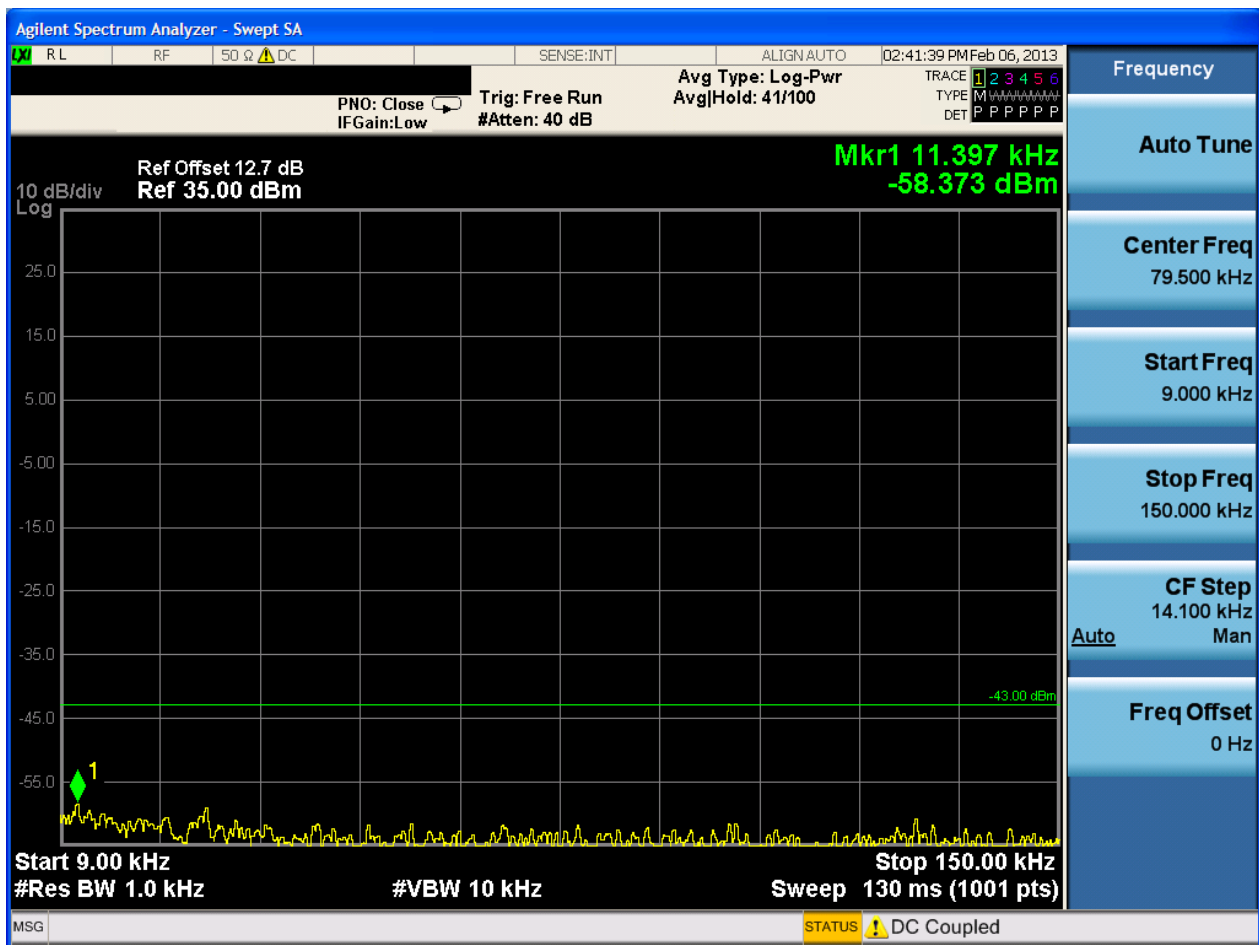


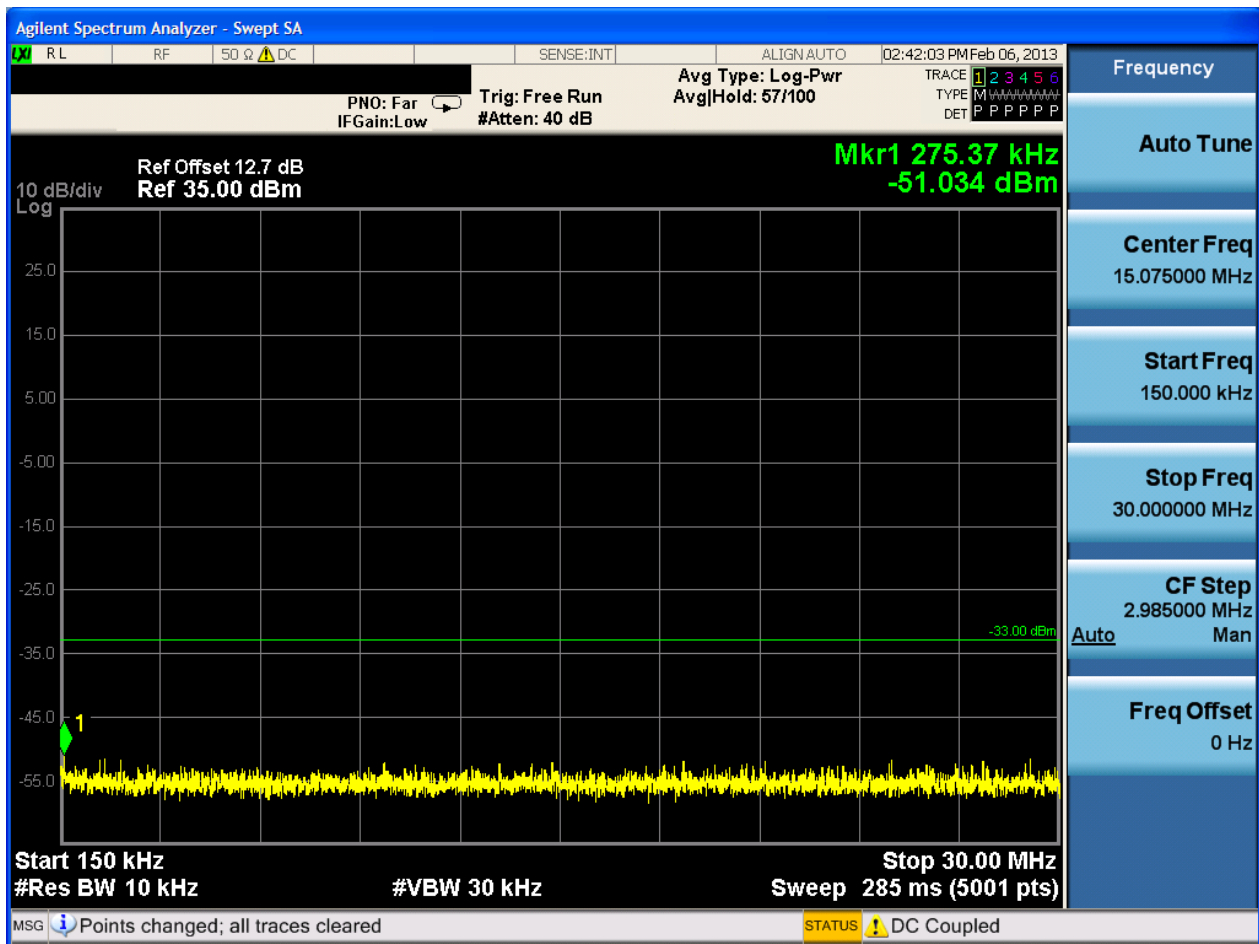


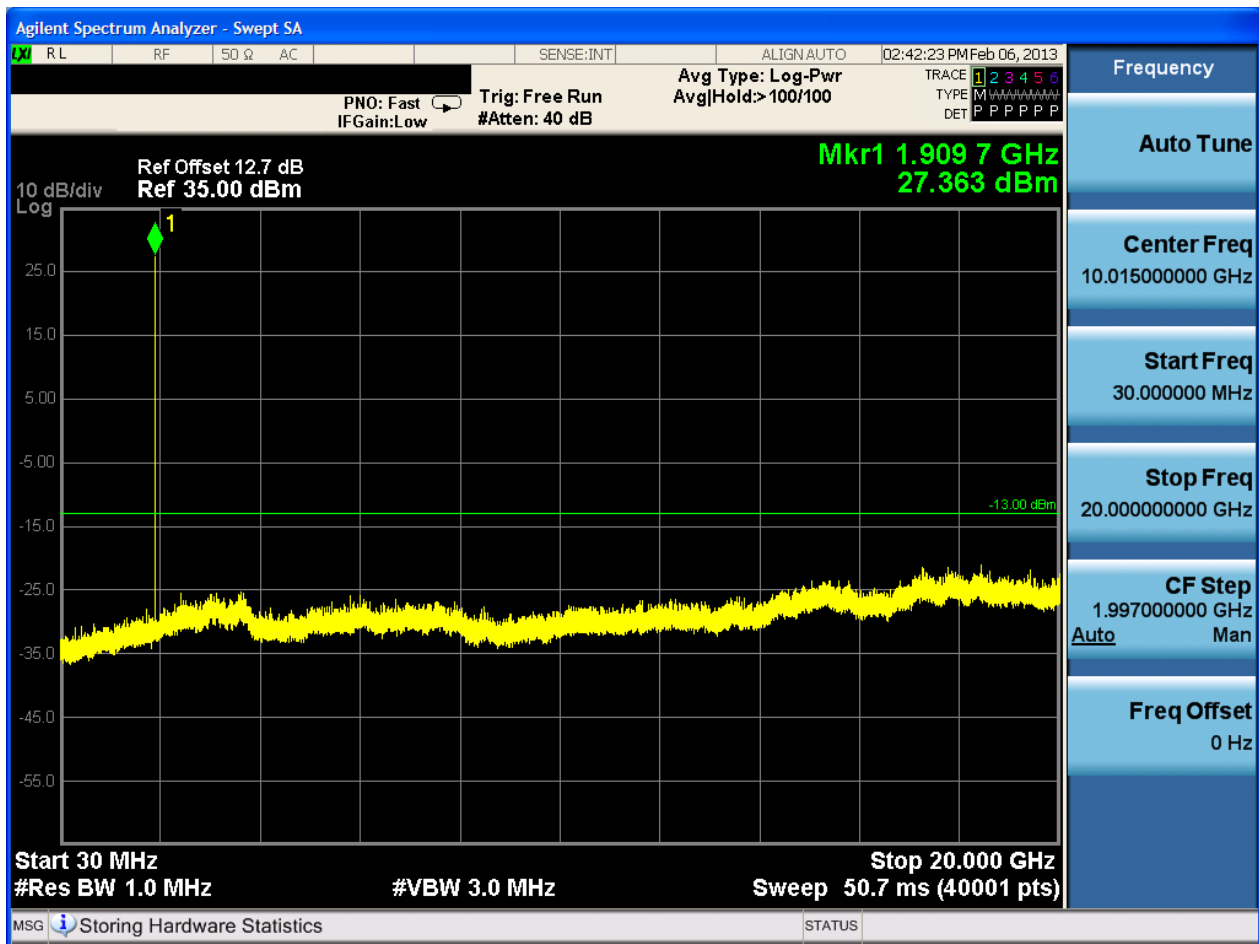


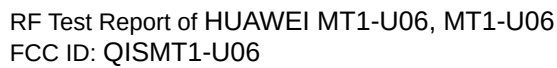


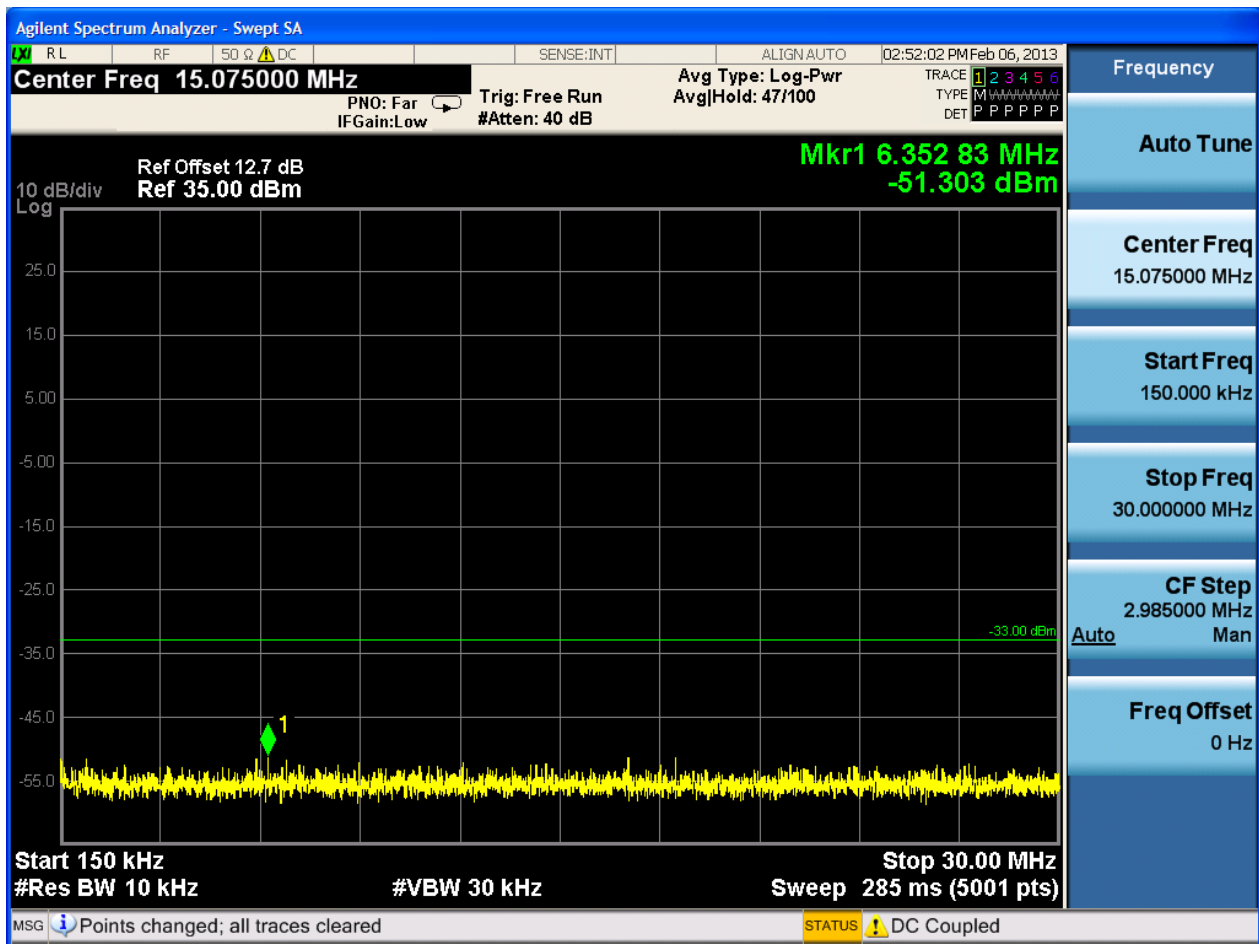
6.1.2.1.3 Test Channel = HCH















6.1.2.2.2 Test Channel = MCH

