



FCC

RF Test Report

Product Name: Smart Phone

Model Number: HUAWEI GRA-UL00,HUAWEI GRA-UL10

Report No: SYBH(Z-RF)011022015-2004

FCC ID: QISGRA-ULX0

Reliability Laboratory of Huawei Technologies Co., Ltd.

Administration Building, Headquarters of Huawei Technologies Co., Ltd., Bantian, Longgang District,
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Notice

1. The laboratory has Passed the accreditation by China National Accreditation Service for Conformity Assessment (CNAS). The accreditation number is L0310.
2. The laboratory has Passed the accreditation by The American Association for Laboratory Accreditation (A2LA). The accreditation number is 2174.01.
3. The laboratory has been listed by the US Federal Communications Commission to perform electromagnetic emission measurements. The site recognition number is 97456.
4. The laboratory has been listed by Industry Canada to perform electromagnetic emission measurements. The recognition numbers of test site are 6369A-1 and 6369A-3.
5. The test report is invalid if not marked with the signatures of the persons responsible for preparing and approving the test report.
6. The test report is invalid if there is any evidence of erasure and/or falsification.
7. The test report is only valid for the test samples.
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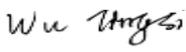


Applicant: Huawei Technologies Co., Ltd.
Address: Administration Building, Headquarters of Huawei Technologies Co., Ltd., Bantian, Longgang District, Shenzhen, 518129, P.R.C

Date of Receipt Sample: 2015-03-16
Start Date of Test: 2015-03-17
End Date of Test: 2015-03-27

Test Result: Pass

Approved by Senior Engineer:	2015-03-31	Liu Chunlin	
	Date	Name	Signature

Prepared by:	2015-03-31	Wu Tingsi	
	Date	Name	Signature



Modification Record

No.	Last Report No.	Modification Description
		First Report



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1 General Information

1.1 Applied Standard

Applied Rules: 47 CFR FCC Part 2, Subpart J 2013
47 CFR FCC Part 15, Subpart C 2013

Test Method: FCC KDB 558074 D01 DTS Meas Guidance v03r02
ANSI C63.10-2009, American National Standard for Testing Unlicensed
Wireless Devices.

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



2 Test Summary

Test Item	FCC Part No.	Requirements	Test Result	Verdict
DTS (6 dB) Bandwidth	15.247(a)(2)	≥ 500 kHz.	Appendix A	Pass
Occupied Bandwidth	---	---	Appendix B	Pass
Duty Cycle	KDB 558074 (6.0)	No limit	Appendix C	Pass
Maximum Conducted Average Output Power	15.247(b)(3)	For directional gain: < 30 dBm – (G[dBi] – 6 [dB]), Average; Otherwise: < 30 dBm, Average.	Appendix D	Pass
Maximum Power Spectral Density Level	15.247(e)	For directional gain: < 8 dBm/3 kHz – (G[dBi] – 6 [dB]), Average. Otherwise: < 8 dBm/3 kHz, Average.	Appendix E	Pass
Band Edges Compliance	15.247(d)	< -30 dBm/100 kHz if total peak power ≤ power limit.	Appendix F	Pass
Unwanted Emissions into Non-Restricted Frequency Bands			Appendix G	Pass
Unwanted Emissions into Restricted Frequency Bands (Radiated)	15.247(d) 15.209 (NOTE 1)	FCC Part 15.209 field strength limit;	Appendix H	Pass
AC Power Line Conducted Emissions	15.207	FCC Part 15.207 conducted limit;	Appendix I	Pass

NOTE 1: According to KDB 558074, antenna-port conducted measurements are acceptable as an alternative to radiated measurements for demonstrating compliance to the limits in the restricted frequency bands. If conducted measurements are performed, then proper impedance matching must be ensured and an additional radiated test for cabinet/case emissions will also be required.



3 Description of the Equipment under Test (EUT)

3.1 General Description

HUAWEI GRA-UL00, HUAWEI GRA-UL10 is subscriber equipment in the LTE/UMTS/GSM system. The LTE frequency band is Band I,Band III,Band IV, Band VII, Band XXXVIII,Band XXXIX,Band XL and Band XLI. The HSUPA/HSDPA/UMTS frequency band is Band I, Band II, Band IV, Band V and Band VIII. The GSM/GPRS/EDGE frequency band includes GSM850 and GSM900 and DCS1800 and PCS1900. The Mobile Phone implements such functions as RF signal receiving/transmitting, LTE/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.

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	HL2TGRACEM	GRA-UL00V100R001C900B022

3.2.2 Sub-Assembly

Name	Manufacture	Description
Adapter	Huawei Technologies Co., Ltd.	Model: HW-050100B2W Input voltage: 100V~240V AC and 50/60 Hz, 0.2A Output voltage: +5V $\overline{\text{---}}$ 1A Rated Power: 5W
Adapter	Huawei Technologies Co., Ltd.	Model: HW-050100U2W Input voltage: 100V~240V AC and 50/60 Hz, 0.2A Output voltage: +5V $\overline{\text{---}}$ 1A Rated Power: 5W
Adapter	Huawei Technologies Co., Ltd.	Model: HW-050100A2W Input voltage: 100V~240V AC and 50/60 Hz,

		0.2A Output voltage: +5V $\overline{\text{---}}$ 1A Rated Power: 5W
Adapter	Huawei Technologies Co., Ltd.	Model: HW-050100E2W Input voltage: 100V~240V AC and 50/60 Hz, 0.2A Output voltage: +5V $\overline{\text{---}}$ 1A Rated Power: 5W
Adapter	Huawei Technologies Co., Ltd.	Model: HW-050100U01 Input voltage: 100V~240V AC and 50/60 Hz, 0.2A Output voltage: +5V $\overline{\text{---}}$ 1A Rated Power: 5W
Adapter	Huawei Technologies Co., Ltd.	Model: HW-050100E01 Input voltage: 100V~240V AC and 50/60 Hz, 0.2A Output voltage: +5V $\overline{\text{---}}$ 1A Rated Power: 5W
Adapter	Huawei Technologies Co., Ltd.	Model: HW-050100U01 Input voltage: 100V~240V AC and 50/60 Hz, 0.2A Output voltage: +5V $\overline{\text{---}}$ 1A Rated Power: 5W
Adapter	Huawei Technologies Co., Ltd.	Model: HW-050100A01 Input voltage: 100V~240V AC and 50/60 Hz, 0.2A Output voltage: +5V $\overline{\text{---}}$ 1A Rated Power: 5W

3.2.3 Battery

Name	Manufacture	Description
Rechargeable Li-ion	Huawei Technologies Co., Ltd.	Battery Model: Rated capacity: 2600mAh Nominal Voltage: $\overline{\text{---}}$ +3.8V Charging Voltage: $\overline{\text{---}}$ +4.35V



3.3 Technical Description

Characteristics	Description			
IEEE 802.11 WLAN Mode Supported	<input checked="" type="checkbox"/> 802.11b (20 MHz channel bandwidth), <input checked="" type="checkbox"/> 802.11g (20 MHz channel bandwidth) <input checked="" type="checkbox"/> 802.11n (20 MHz channel bandwidth), <input checked="" type="checkbox"/> 802.11n (40 MHz channel bandwidth)			
TX/RX Operating Range	2412-2462 MHz band	$f_c = 2407 \text{ MHz} + N * 5 \text{ MHz}$, where: - f_c = "Operating Frequency" in MHz, - N = "Channel Number" with the range from 1 to 11 for the 20 MHz channel bandwidth		
Data Rate	802.11b	1 Mbps, 2 Mbps, 5.5 Mbps, 11 Mbps		
	802.11g	6 Mbps, 9 Mbps, 12 Mbps, 18 Mbps, 24 Mbps, 36 Mbps, 48 Mbps, 54 Mbps		
	802.11n (SISO)	MCS 0 to MCS 7		
Modulation Type	DBPSK/DQPSK/CCK (DSSS), BPSK/QPSK/16QAM/64QAM (OFDM).			
Emission Designator	12M3G7D (for 802.11b mode), 16M6G7D (for 802.11g mod), 17M7G7D (for 802.11n 20m mode) , 36M3G7D (for 802.11n 40m mode)			
TX Power Control	<input type="checkbox"/> Supported, <input checked="" type="checkbox"/> Not Supported			
Standby Mode	<input type="checkbox"/> Supported, <input checked="" type="checkbox"/> Not Supported			
Equipment Type	<input type="checkbox"/> Stand-alone equipment, <input type="checkbox"/> Plug-in radio device, <input checked="" type="checkbox"/> Combined equipment			
Antenna	Description	Isotropic Antenna		
	Type	<input type="checkbox"/> External, <input checked="" type="checkbox"/> Integrated		
	Ports	<input checked="" type="checkbox"/> Ant 1, <input type="checkbox"/> Ant 2, <input type="checkbox"/> Ant 3		
	Smart System	<input checked="" type="checkbox"/> SISO (for 802.11b/g/n), <input type="checkbox"/> MIMO (for 802.11n): 2 Tx & 2 Rx, <input type="checkbox"/> Diversity (for 802.11b/g) : Tx & Rx		
	Gain	-3.5 dBi (per antenna port, max.)		
	Remark	When the EUT is put into service, the practical maximum antenna gain should NOT exceed the value as described above.		
Power Supply	Type	<input checked="" type="checkbox"/> AC/DC Adapter	<input type="checkbox"/> PoE:	<input type="checkbox"/> Other:



4 General Test Conditions / Configurations

4.1 Test Modes

NOTE: Worst cases for each IEEE 802.11 mode are selected to perform tests.

Test Mode	Test Modes Description
11B	IEEE 802.11b with data rate of 1 Mbps using SISO mode.
11G	IEEE 802.11g with data rate of 6 Mbps using SISO mode.
11N20	IEEE 802.11n with data rate of MCS0 and bandwidth of 20 MHz using SISO mode.
11N40	IEEE 802.11n with data rate of MCS0 and bandwidth of 20 MHz using SISO mode.

4.2 EUT Configurations

4.2.1 General Configurations

Configuration	Description
Test Antenna Ports	Until otherwise specified, <ul style="list-style-type: none"> - All TX tests are performed at all TX antenna ports of the EUT, and - All RX tests are performed at all RX antenna ports of the EUT.
Multiple RF Sources	Other than the tested RF source of the EUT, other RF source(s) are disabled or shutdown during measurements.

4.2.2 Customized Configurations

Test Mode	RF Ch.	TX Freq. [MHz]	Ch. BW [MHz]	Power Conf., per Port	Duty cycle [%]
11B	L	Ch No. 1 / 2412 MHz	20	15	99
11B	M	Ch No. 6 / 2437 MHz	20	15	99
11B	H	Ch No. 11 / 2462 MHz	20	15	99
11G	L	Ch No. 1 / 2412 MHz	20	14	94.7
11G	M	Ch No. 6 / 2437 MHz	20	14	94.7
11G	H	Ch No. 11 / 2462 MHz	20	14	94.7
11N20	L	Ch No. 1 / 2412 MHz	20	12	94.3
11N20	M	Ch No. 6 / 2437 MHz	20	12	94.3
11N20	H	Ch No. 11 / 2462 MHz	20	12	94.3
11N40	L	Ch No. 3 / 2422 MHz	40	12	85.3
11N40	M	Ch No. 6 / 2437 MHz	40	12	85.3
11N40	H	Ch No. 9 / 2452 MHz	40	12	85.3



4.3 Test Environments

NOTE: The values used in the test report may be stringent than the declared.

Environment Parameter	Selected Values During Tests		
	Temperature	Voltage	Relative Humidity
NTNV	Ambient	3.8 VDC	Ambient

4.4 Antenna requirements

Excerpt from §15.203 of the FCC Rules/Regulations:

“An intentional radiator antenna shall be designed to ensure that no antenna other than that furnished by the responsible party can be used with the device. The use of a permanently attached antenna or of an antenna that uses a unique coupling to the intentional radiator shall be considered sufficient to comply with the provisions of this section.”

The antennas of the **HUAWEI GRA-UL00,HUAWEI GRA-UL10** are **permanently attached**.
There are no provisions for connection to an external antenna.

Conclusion:

The **EUT FCC ID: QISGRA-ULX0** unit complies with the requirement of §15.203.

Ch. Frequency (MHz)

Ch.	Frequency (MHz)
01	2412
.	.
.	.
06	2437
.	.
.	.
11	2462

Frequency/ Channel Operations



4.5 Description of tests

4.5.1 Bandwidth measurement

- (a) Connect EUT test port to spectrum analyzer.
- (b) Set the EUT to transmit maximum output power at 2.4GHz, then set the measured frequency number and test the bandwidth with spectrum analyzer.

4.5.2 Duty Cycle measurement

- (a) Connect EUT test port to spectrum analyzer.
- (b) Set the EUT to transmit maximum output power at 2.4GHz, then set the measured frequency number and test the Duty Cycle with spectrum analyzer.

4.5.3 Maximum Conducted Average Output Power

- (a) Connect EUT test port to spectrum analyzer.
- (b) Set the EUT to transmit maximum output power at 2.4GHz.
- (c) Then set the EUT to transmit at high, middle and low frequency and measure the conducted output power separately.

4.5.4 Band edge spurious emission

- (a) Connect EUT test port to spectrum analyzer
- (b) Set the EUT to transmit maximum output power at 2.4GHz.
- (c) Then set the EUT to transmit at high, low frequency and measure the conducted band edge spurious separately.

4.5.5 Conducted RF spurious

- (a) Connect EUT test port to spectrum analyzer
- (b) Set the EUT to transmit maximum output power at 2.4GHz.
- (c) Then set the EUT to transmit at high, middle and low frequency and measure the conducted spurious separately.

4.5.6 Power spectral density

- (a) Connect EUT test port to spectrum analyzer
- (b) Set the EUT to transmit maximum output power at 2.4GHz.
- (c) Then set the EUT to transmit at high, middle and low frequency and measure the conducted power spectral density.

4.5.7 Radiated spurious emission & spurious in restricted band

The test site semi-anechoic chamber has met the requirement of NSA tolerance 4dB according to the standards: ANSI C63.10 (2009). The EUT was set-up on insulator 80cm above the Ground Plane. The set-up and test methods were according to ANSI C63.10:2009. The Radiated Disturbance measurements were made using a Rohde and Schwarz Test Receiver and control software.

A preliminary scan and a final scan of the emissions were made by using test script of software; the emissions were measured using a Quasi-Peak Detector below 1GHz, Peak Detector and AV Detector



above 1GHz. The maximal emission value was acquired by adjusting the antenna height, polarisation and turntable azimuth in accordance with the software setup. Normally, the height range of antenna was 1m to 4m, and the azimuth range of turntable was 0° to 360°. The receive antenna has two polarizations V and H.

A portable or small unlicensed wireless device shall be placed on a non-metallic test fixture or other nonmetallic 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.

The EUT communicates with the BTS simulator through Air interface. The EUT operated on the typical channel.

Measurement bandwidth: 30 MHz – 1000 MHz: 120 kHz

Measurement bandwidth: 1000 MHz – 10th Carrier Frequency: 1 MHz

4.5.8 Conducted Emission at Power Port

The Table-top EUT was placed upon a non-metallic table 0.8 m above the horizontal metal reference ground plane. EUT was connected to LISN and LISN was connected to reference Ground Plane. EUT was 80cm from LISN. The set-up and test methods were according to ANSI C63.10: 2009.

Conducted Disturbance at AC Port measurements were undertaken on the L and N Lines. The emissions were measured using a Quasi-Peak Detector and Average Detector.

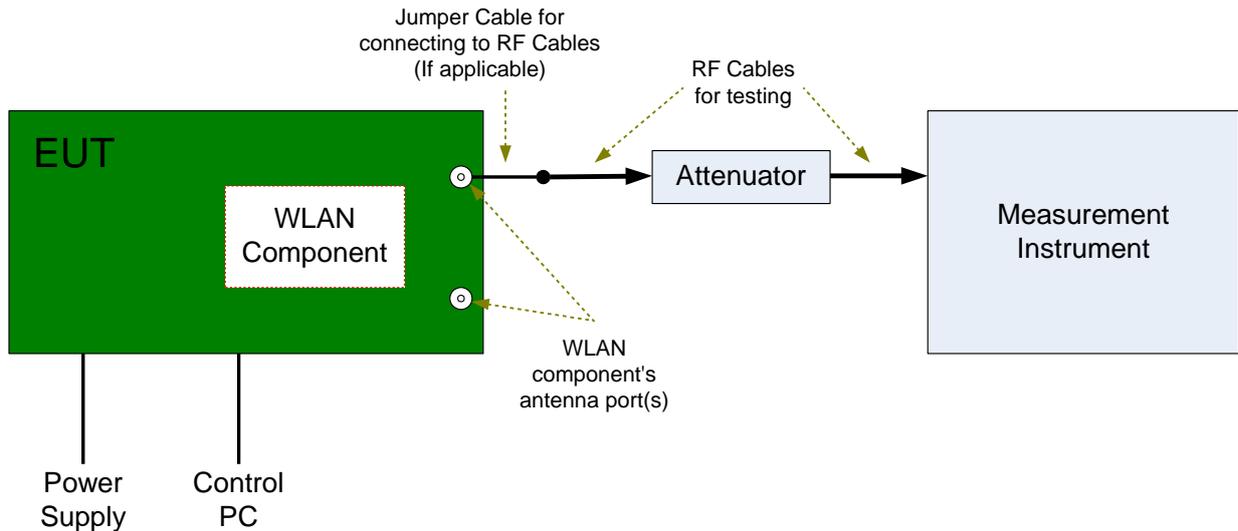
The EUT communicates with the BTS simulator through Air interface, the BTS simulator controls the Wireless Modem to transmit the maximum power which defined in specification of product. The Wireless Modem operated on the typical channel.

Measurement bandwidth (RBW) for 150kHz to 30 MHz: 9 kHz;

4.6 Test Setups

4.6.1 Test Setup 1

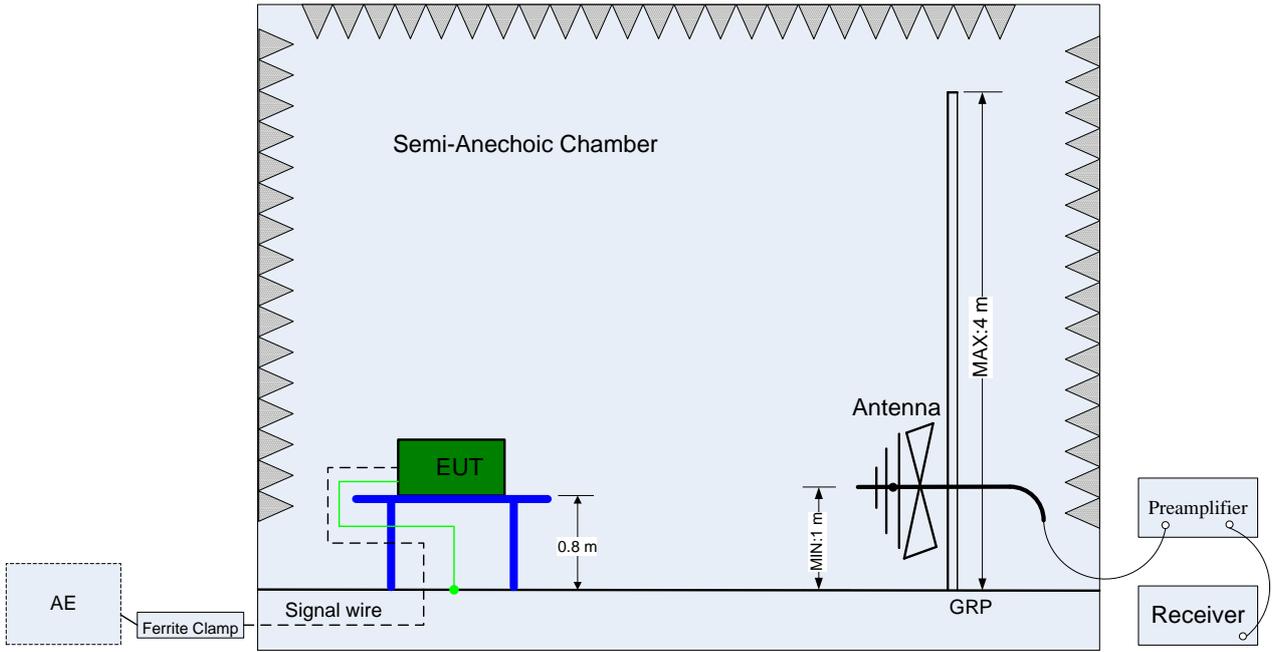
The WLAN component's antenna port(s) of the EUT are connected to the measurement instrument per an appropriate attenuator. The EUT is controlled by PC/software to emit the specified signals for the purpose of measurements.



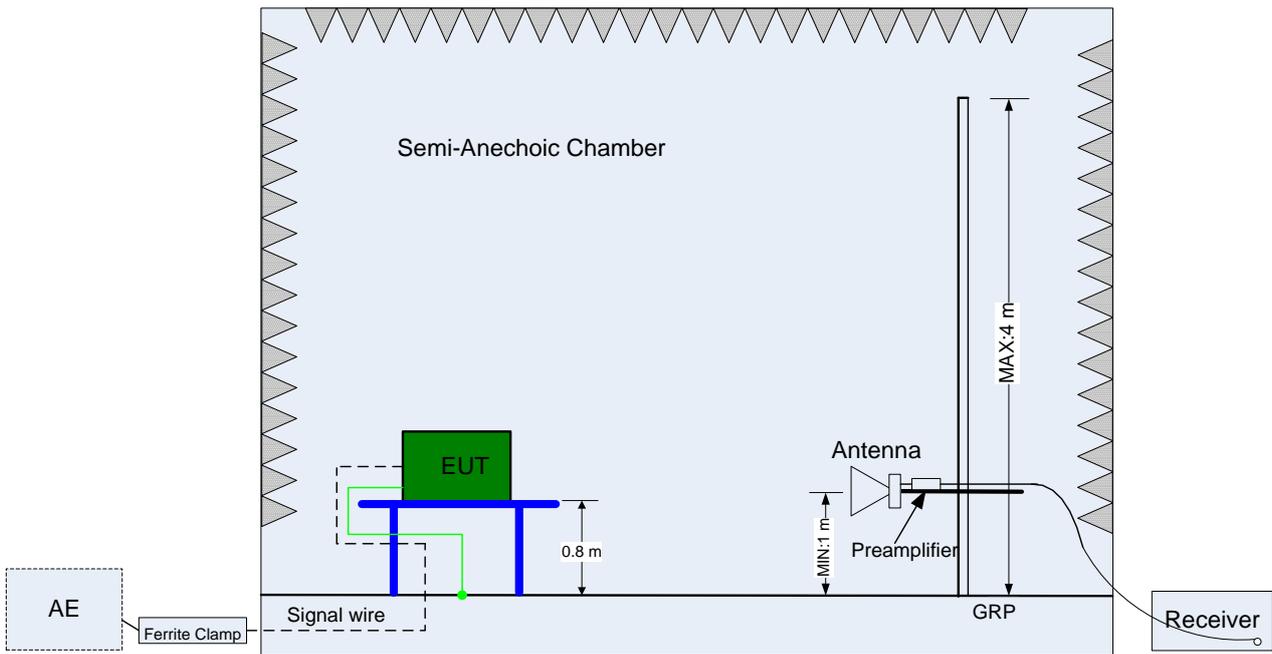
4.6.2 Test Setup 2

The test site semi-anechoic chamber has met the requirement of NSA tolerance 4 dB according to the standards: ANSI C63.4. The test distance is 3m. The setup is according to ANSI C63.4 and CAN/CSA-CEI/IEC CISPR 22.

The maximal emission value is acquired by adjusting the antenna height, polarisation and turntable azimuth. Normally, the height range of antenna is 1 m to 4 m, the azimuth range of turntable is 0° to 360°, and the receive antenna has two polarizations Vertical (V) and Horizontal (H).



(Below 1 GHz)

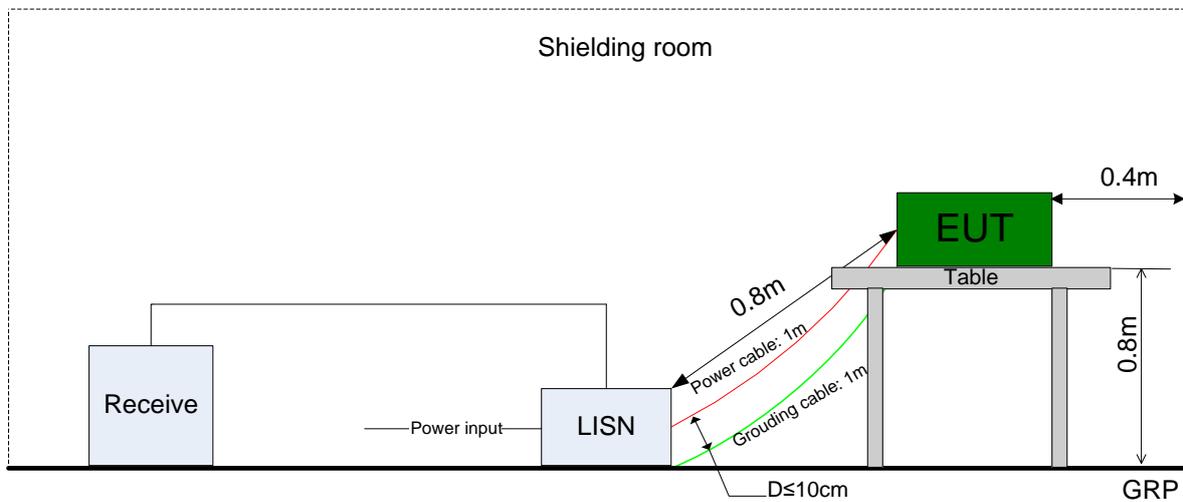


(Above 1 GHz)

4.6.3 Test Setup 3

The mains cable of the EUT (maybe per AC/DC Adapter) must be connected to LISN. The LISN shall be placed 0.8 m from the boundary of EUT and bonded to a ground reference plane for LISN mounted on top of the ground reference plane. This distance is between the closest points of the LISN and the EUT. All other units of the EUT and associated equipment shall be at least 0.8m from the LISN.

Ground connections, where required for safety purposes, shall be connected to the reference ground point of the LISN and, where not otherwise provided or specified by the manufacturer, shall be of same length as the mains cable and run parallel to the mains connection at a separation distance of not more than 0.1 m.



**4.7 Test Conditions**

Test Case	Test Conditions	
	Configuration	Description
DTS (6 dB) Bandwidth	Measurement Method	FCC KDB 558074 §8.2 Option 2.
	Test Environment	NTNV
	Test Setup	Test Setup 1
	EUT Configuration	11B_L, 11B_M, 11B_H 11G_L, 11G_M, 11G_H 11N20_L, 11 N20_M, 11 N20_H 11N40_L, 11 N40_M, 11 N40_H
Maximum Conducted Average Output Power	Measurement Method	FCC KDB 558074 §9.2 .2. 4
	Test Environment	NTNV
	Test Setup	Test Setup 1
	EUT Configuration	11B_L, 11B_M, 11B_H 11G_L, 11G_M, 11G_H 11N20_L, 11 N20_M, 11 N20_H 11N40_L, 11 N40_M, 11 N40_H
Maximum Power Spectral Density Level	Measurement Method	FCC KDB 558074 §10.5
	Test Environment	NTNV
	Test Setup	Test Setup 1
	EUT Configuration	11B_L, 11B_M, 11B_H 11G_L, 11G_M, 11G_H 11N20_L, 11 N20_M, 11 N20_H 11N40_L, 11 N40_M, 11 N40_H
Band Edges Compliance	Measurement Method	FCC KDB 558074 §13.0.
	Test Environment	NTNV
	Test Setup	Test Setup 1
	EUT Configuration	11B_L, 11B_H 11G_L, 11G_H 11N20_L, 11 N20_H 11N40_L, 11 N40_H
Unwanted Emissions into Non-Restricted Frequency Bands	Measurement Method	FCC KDB 558074 §11.0
	Test Environment	NTNV
	Test Setup	Test Setup 1
	EUT Configuration	11B_L, 11B_M, 11B_H 11G_L, 11G_M, 11G_H 11N20_L, 11 N20_M, 11 N20_H 11N40_L, 11 N40_M, 11 N40_H
Unwanted Emissions into Restricted	Measurement Method	ANSI C63.10; FCC KDB 558074 §12.1, Radiated
	Test Environment	NTNV
	Test Setup	Test Setup 2



Test Case	Test Conditions	
	Configuration	Description
Frequency Bands (Radiated)	EUT Placement	<input type="checkbox"/> Flatwise, <input type="checkbox"/> Upright, <input type="checkbox"/> Hung
	EUT Configuration	11B_L, 11B_M, 11B_H 11G_L, 11G_M, 11G_H 11N20_L, 11 N20_M, 11 N20_H 11N40_L, 11 N40_M, 11 N40_H
	EUT Configuration	11x_RX
AC Power Line Conducted Emissions	Measurement Method	AC mains conducted.
	Test Environment	NTNV
	Test Setup	Test Setup 3
	EUT Configuration	(Worst Conf.).

**5 Main Test Instruments**

Equipment Name	Manufacturer	Model	Serial Number	Cal Date	Cal- Due
Power supply	KEITHLEY	2303	A120714713	2014-08-07	2016-08-06
Wireless Communication Test set	Agilent	N4010A	MY49081592	2014-11-04	2015-11-03
Universal Radio Communication Tester	R&S	CMU200	123299	2014-11-04	2015-11-03
Spectrum Analyzer	Agilent	N9020A	MY52090652	2014-07-11	2015-07-10
Universal Radio Communication Tester	R & S	CMW500	126854	2015-02-13	2016-02-12
Spectrum Analyzer	Agilent	E4440A	MY48250119	2014-07-11	2015-07-10
Signal Analyzer	R&S	FSQ31	200021	2014-11-04	2015-11-03
Spectrum Analyzer	Agilent	N9030A	MY49431698	2014-11-04	2015-11-03
Temperature Chamber	WEISS	WKL64	56246002940010	2015-02-13	2016-02-12
Temperature Chamber	ESPEC	MW3030	06114003	2014-05-09	2015-05-08
Signal generator	Agilent	E8257D	MY51500314	2014-05-09	2015-05-08
Vector Signal Generator	R&S	SMU200A	104162	2014-11-04	2015-11-03
Test receiver	R&S	ESU26	100150	2014-05-09	2015-05-08
Spectrum analyzer	R&S	FSU3	200474	2014-11-04	2015-11-03
Spectrum analyzer	R&S	FSU43	100144	2014-11-04	2015-11-03
Double-Ridged Waveguide Horn Antenna (1G~18GHz)	R&S	HF907	100391	2013-12-21	2015-12-20
Trilog Broadband Antenna (30M~3GHz)	SCHWARZ BECK	VULB 9163	9163-521	2013-12-21	2015-12-20
LOOP Antennas(9kHz-30MHz)	R&S	HFH2-Z2	100263	2013-05-11	2015-05-10
Pyramidal Horn Antenna(18GHz-26-5GHz)	ETS-LIND GREN	3160-09	5140299	2015-01-05	2017-01-04
Artificial Mains Network	R&S	ENV4200	100134	2014-11-04	2015-11-03
Artificial Mains Network	R&S	ENV216	100382	2014-11-04	2015-11-03
Power Detecting & Sampling Unit	R&S	OSP-B157	19709DD	2014-09-08	2015-09-07
Signal Generator	Agilent	E4438C	MY47271904	2014-10-28	2015-10-27

END



Appendix for Test report

Appendix A: DTS (6 dB) Bandwidth

In this document, the "DTS6dBBW" refers to the measured "DTS (6 dB) Bandwidth" value. In this Appendix, the "fc(DTS6dBBW)" refers to the centre of the measured "DTS6dBBW". The introduction of the "fc(DTS6dBBW)" is due to that other measurements use it as the spectrum analyzer setting.

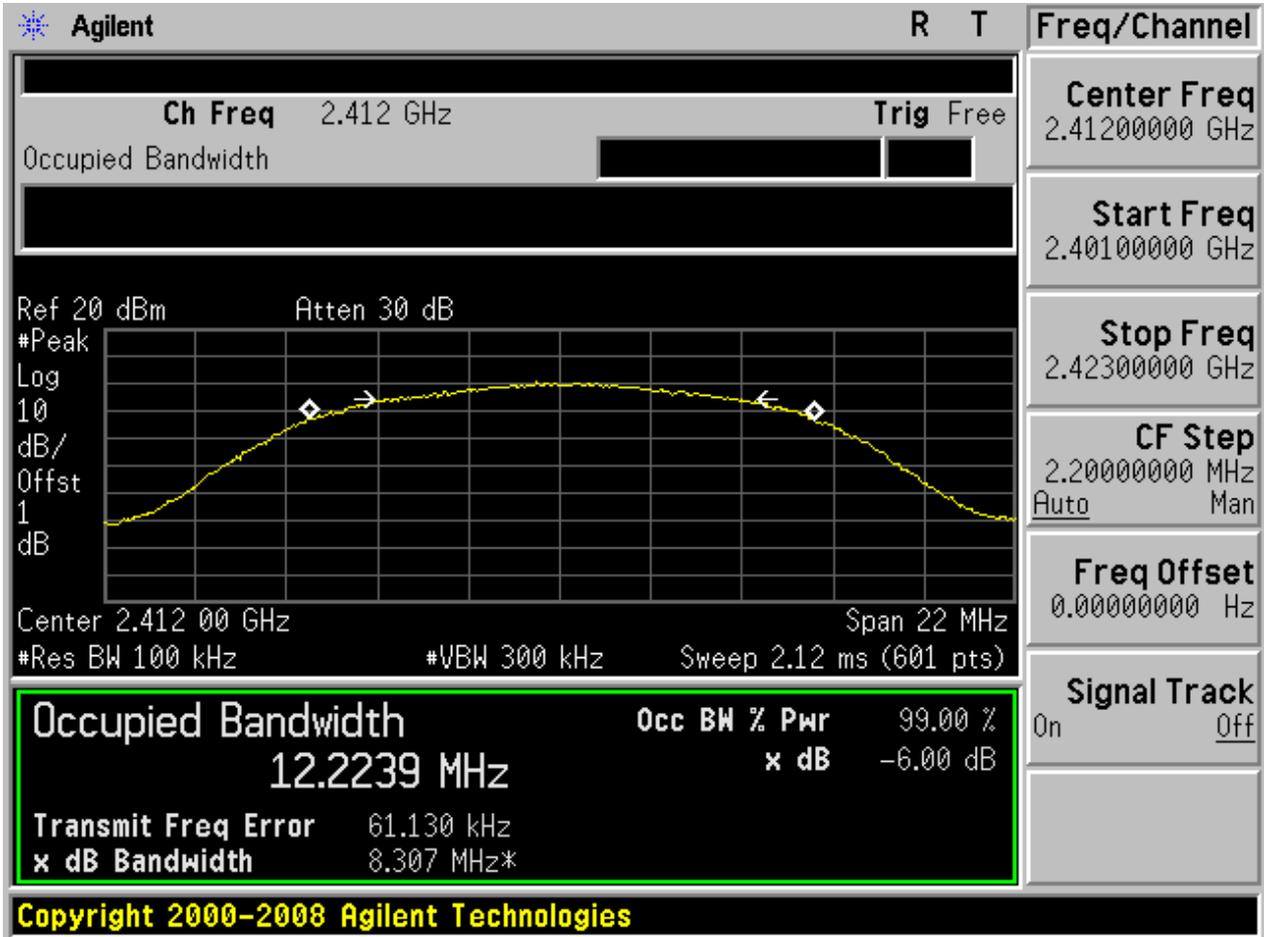
For measurements on smart antenna systems (devices with multiple transmit chains), the test is performed at each chain, and used as respective results for each chain.

Part I - Test Results

Test Mode	Test Channel	Frequency[MHz]	Ant	DTS6dBBW[MHz]	Verdict
11B	L	2412	Ant 1	8.31	pass
11B	M	2437	Ant 1	8.79	pass
11B	H	2462	Ant 1	7.59	pass
11G	L	2412	Ant 1	16.55	pass
11G	M	2437	Ant 1	16.57	pass
11G	H	2462	Ant 1	16.54	pass
11N20	L	2412	Ant 1	17.77	pass
11N20	M	2437	Ant 1	17.72	pass
11N20	H	2462	Ant 1	17.77	pass
11N40	L	2422	Ant 1	35.93	pass
11N40	M	2437	Ant 1	36.47	pass
11N40	H	2452	Ant 1	36.47	pass

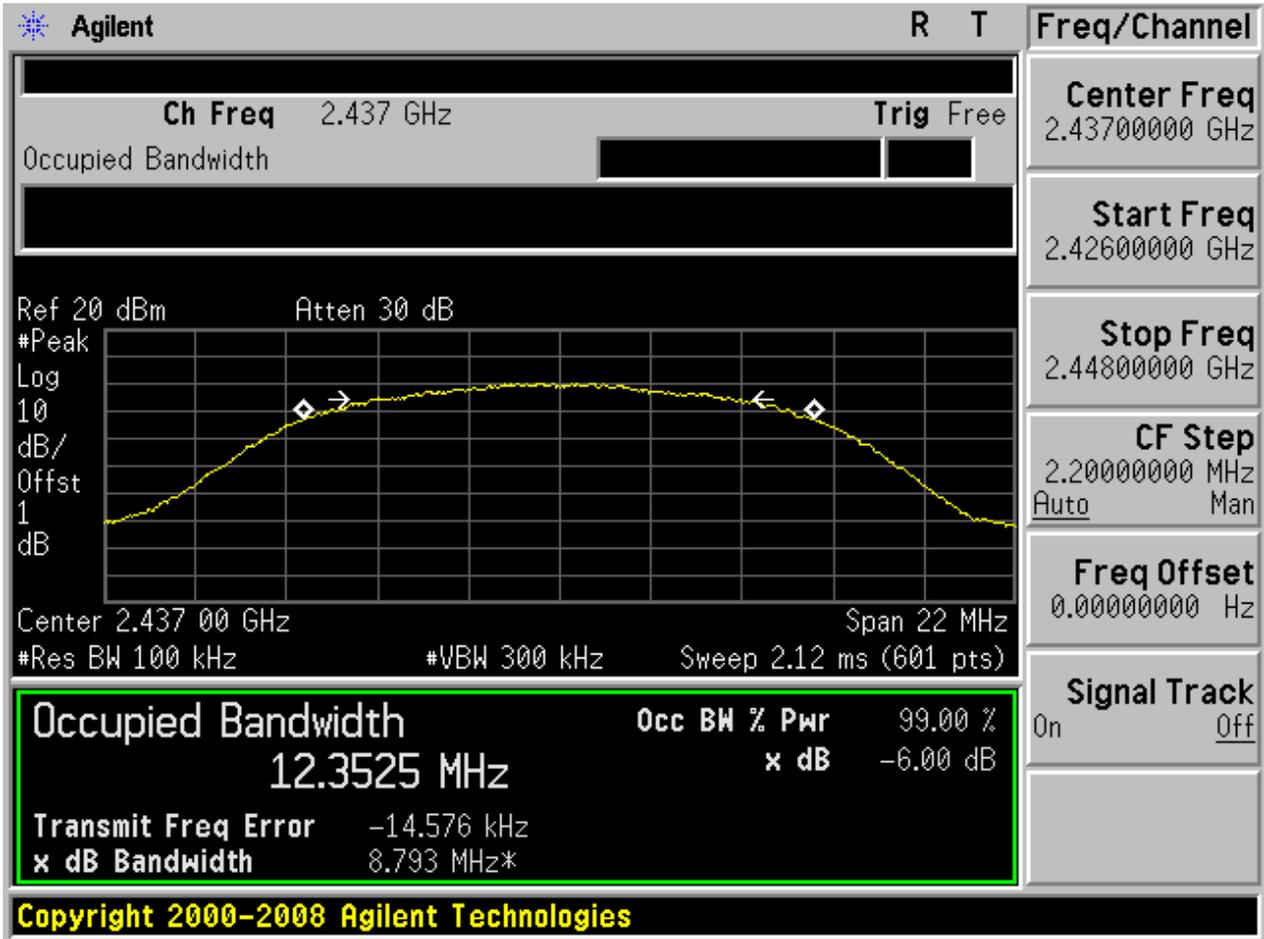
Part II - Test Plots

2.1 11B_L@Ant 1



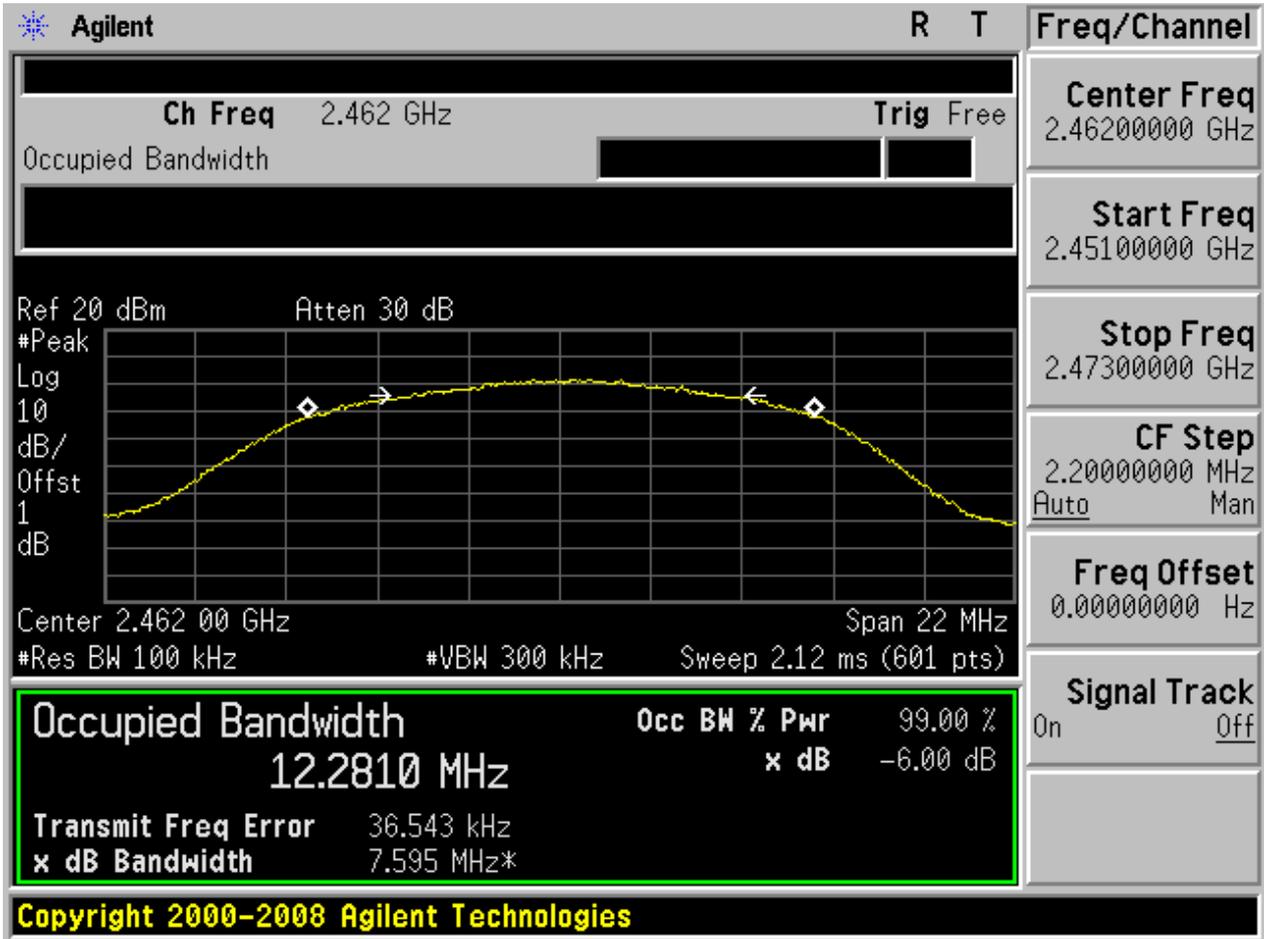


2.2 11B_M@Ant 1

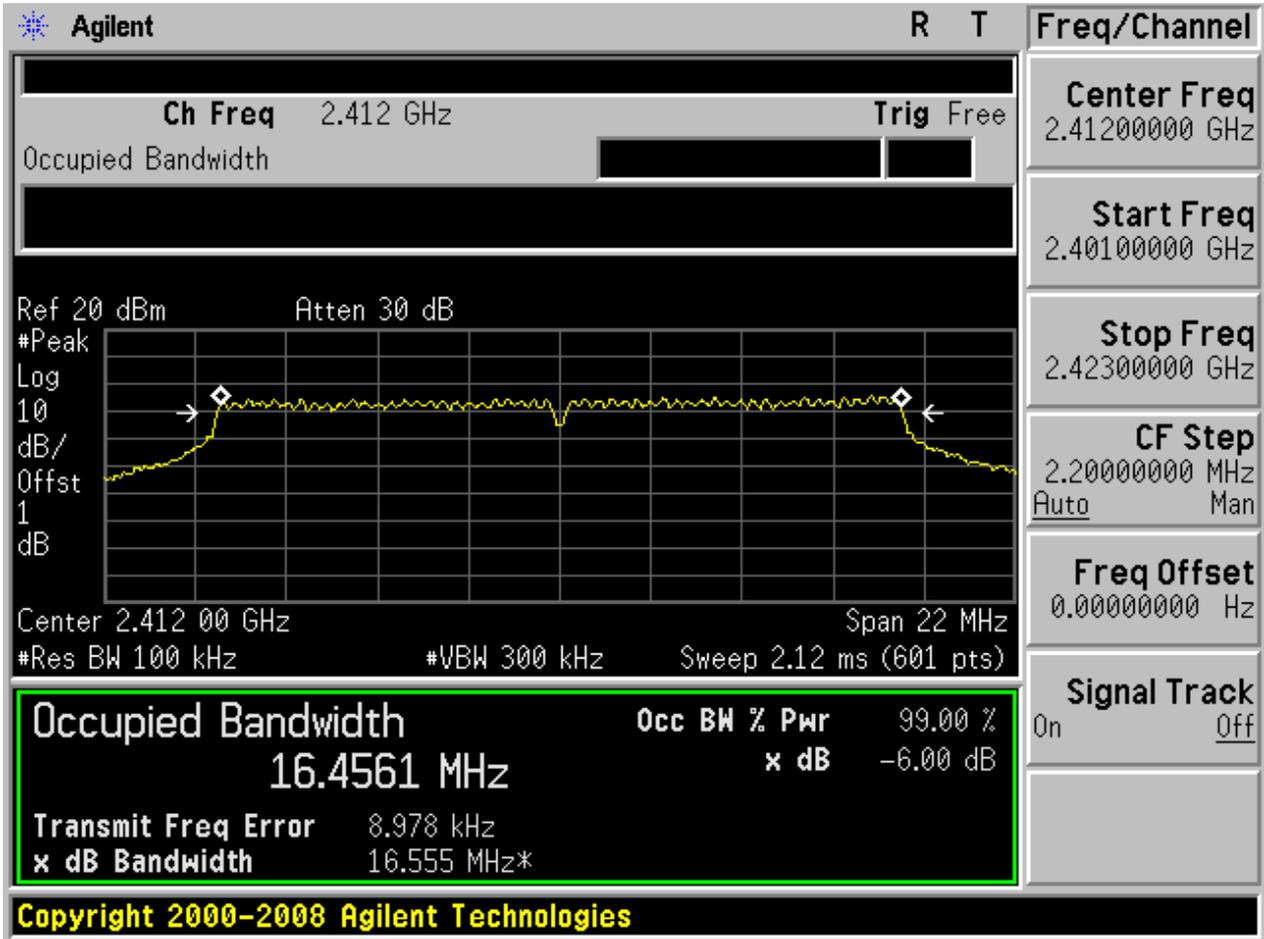




2.3 11B_H@Ant 1

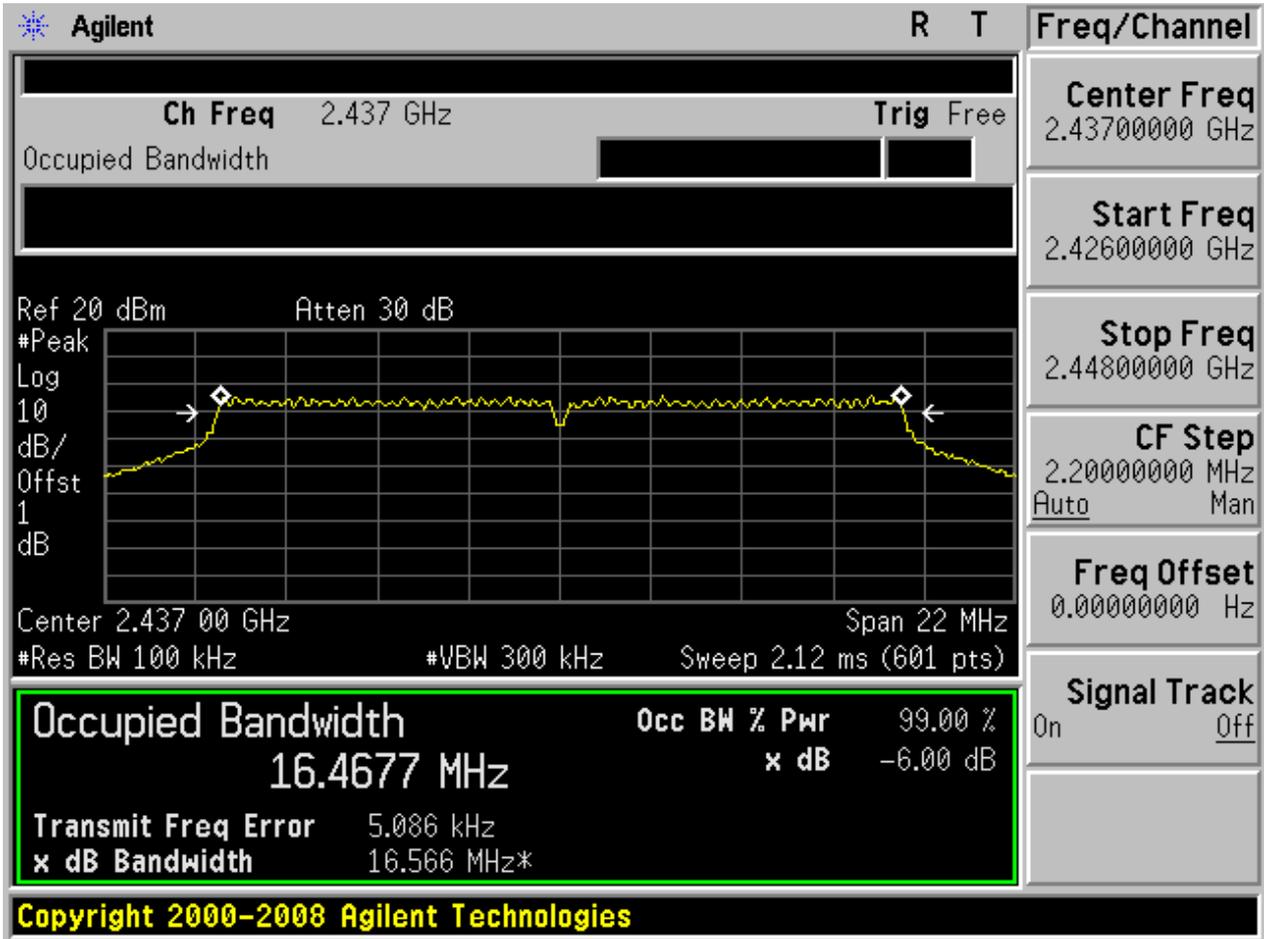


2.4 11G_L@Ant 1



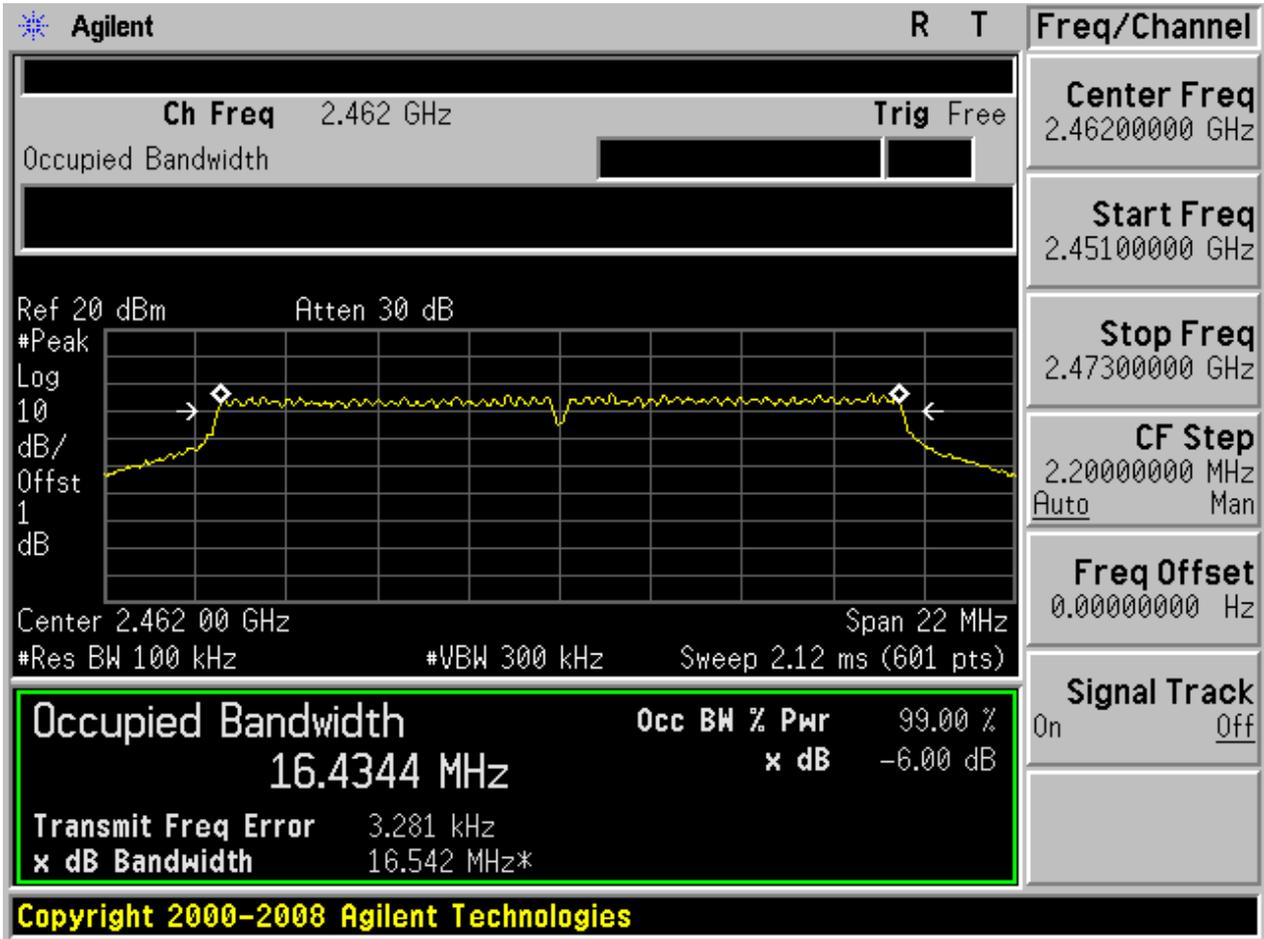


2.5 11G_M@Ant 1



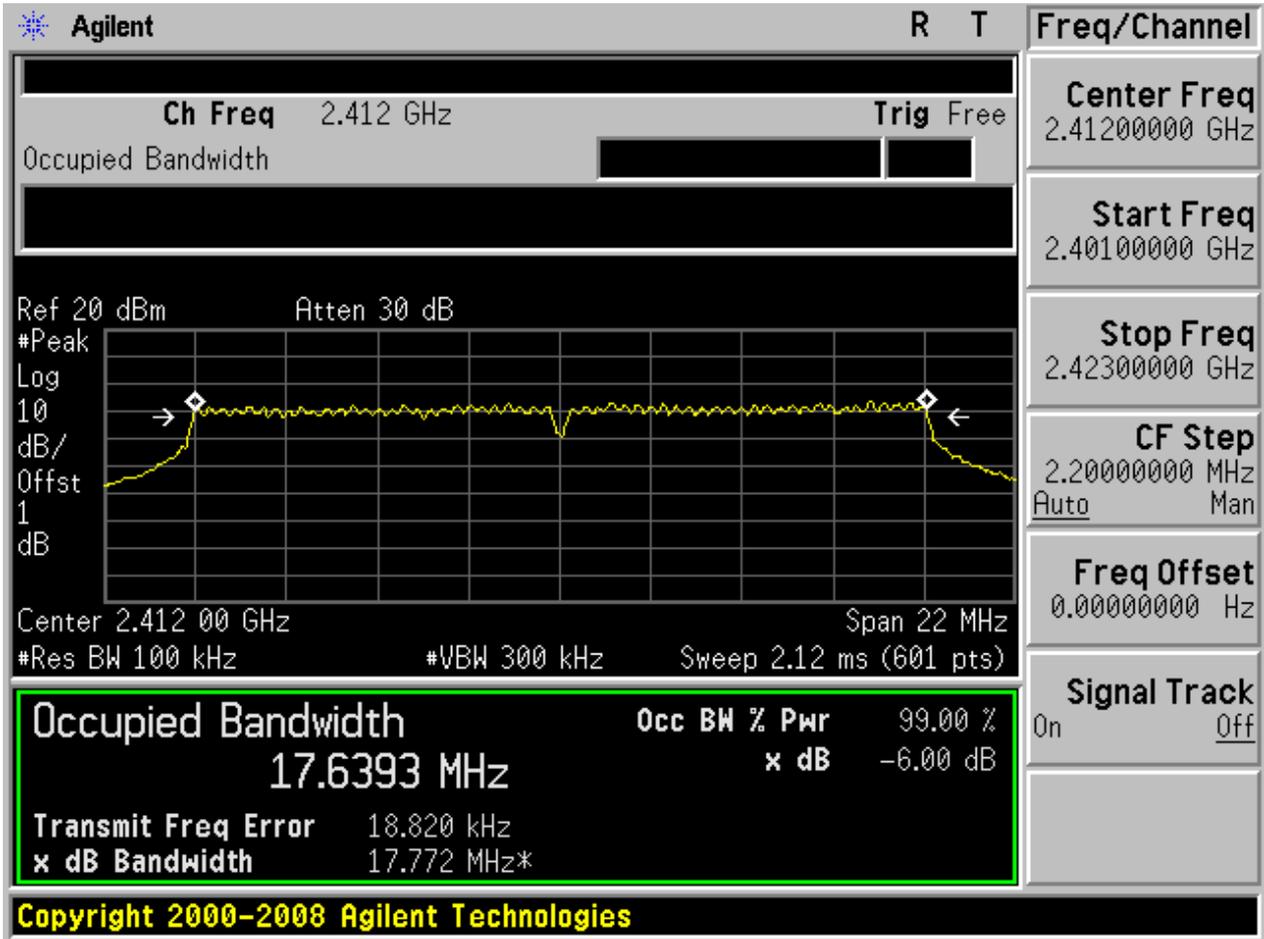


2.6 11G_H@Ant 1



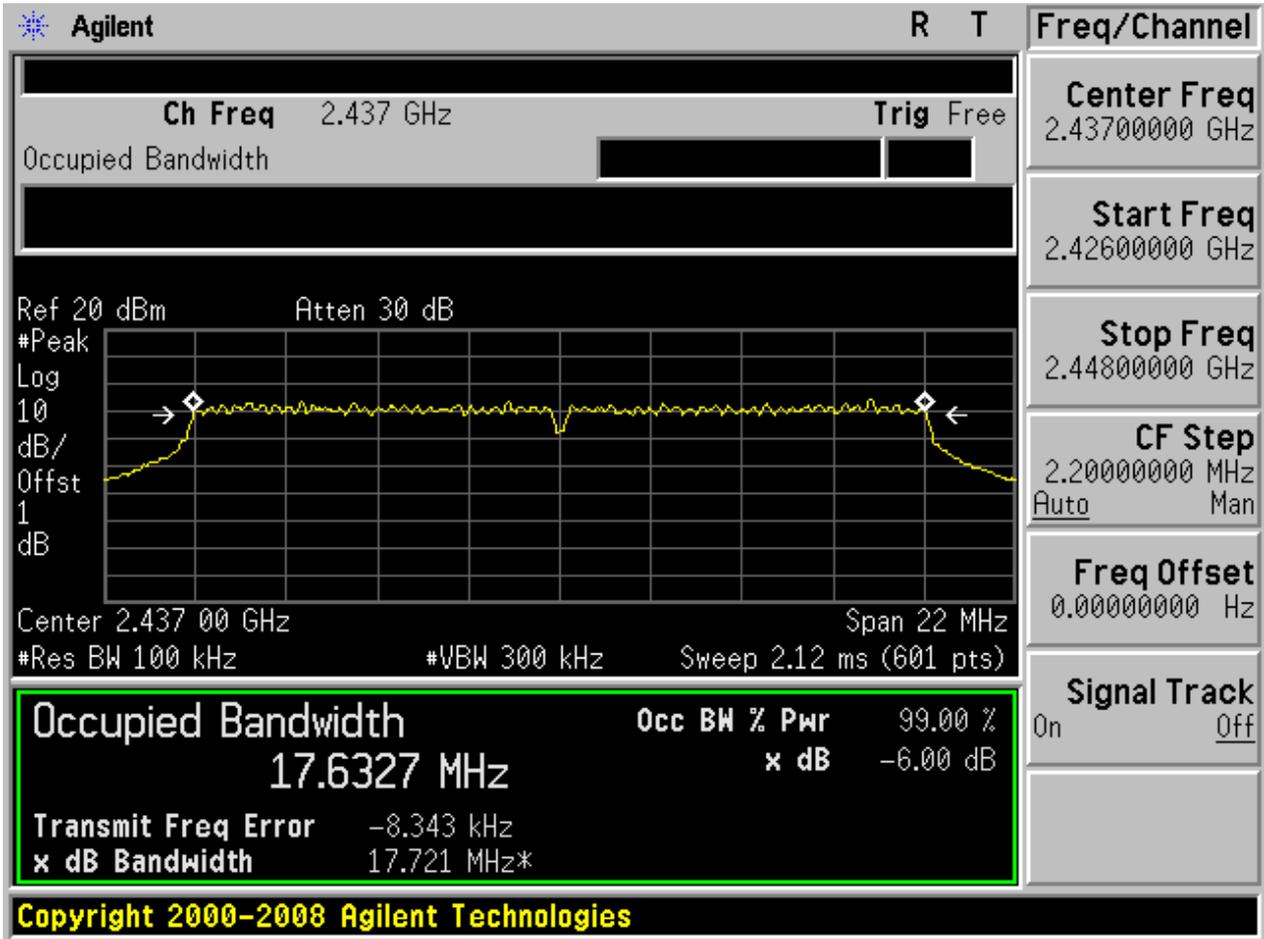


2.7 11N20_L@Ant 1



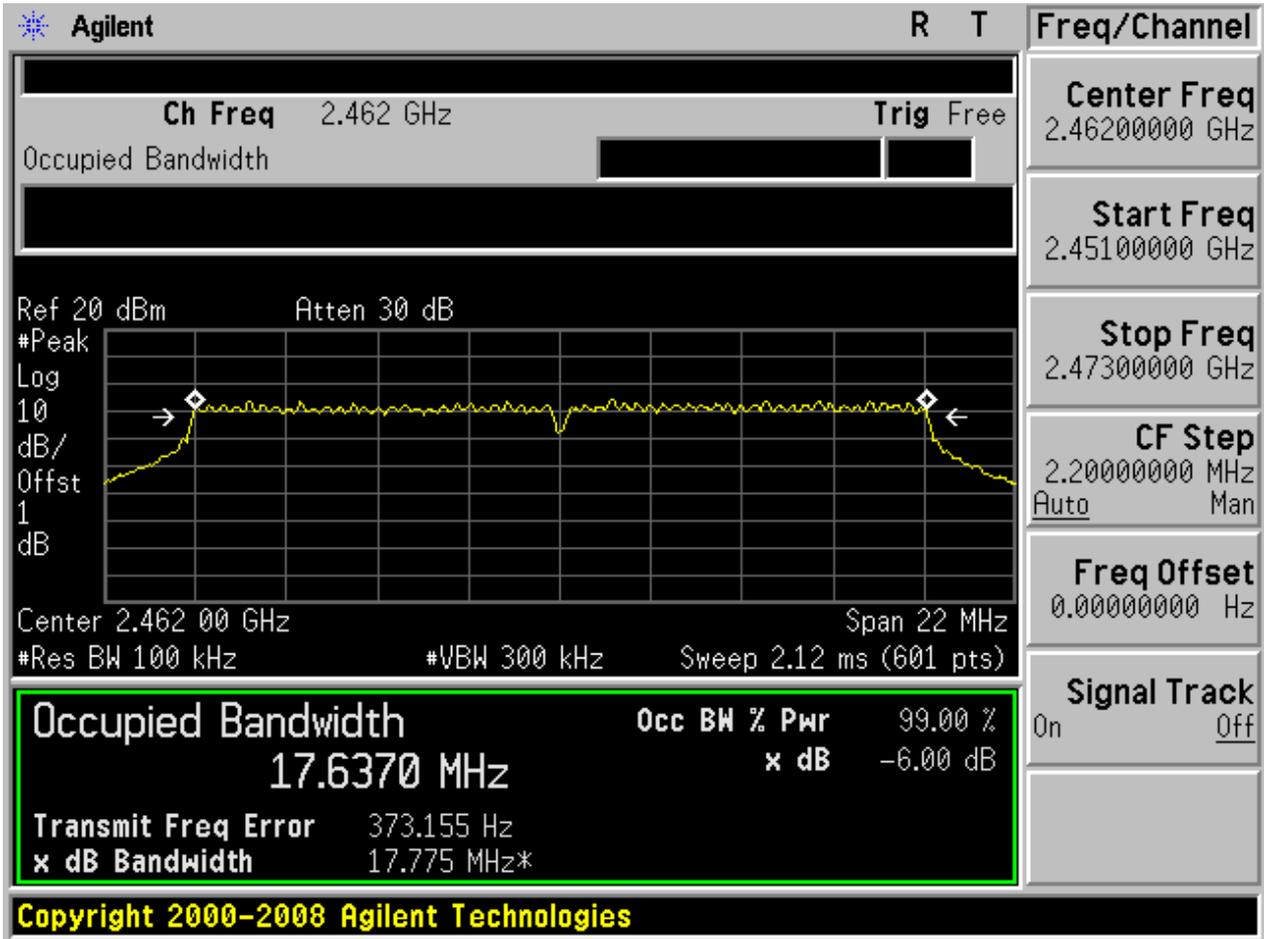


2.8 11N20_M@Ant 1



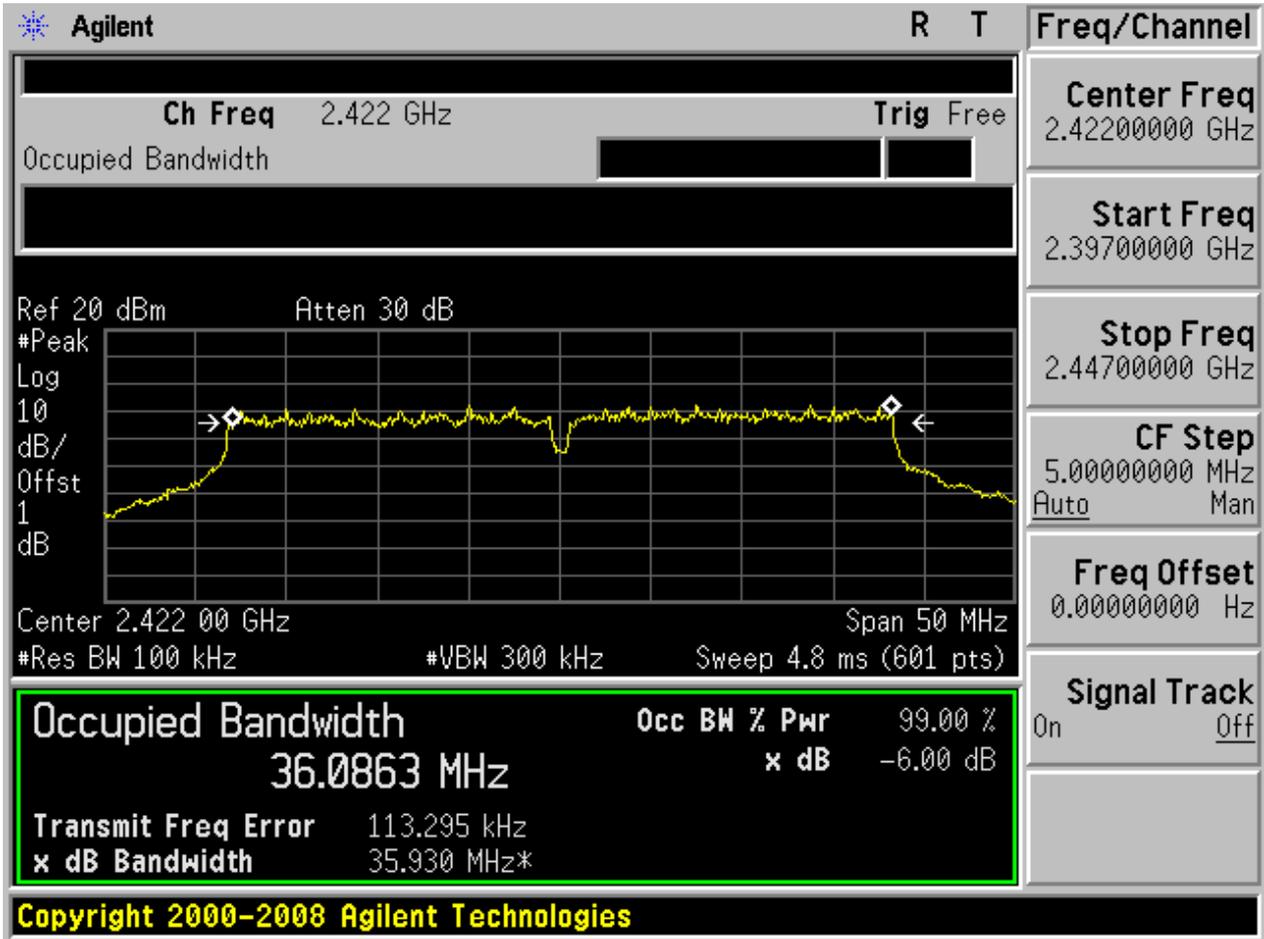


2.9 11N20_H@Ant 1



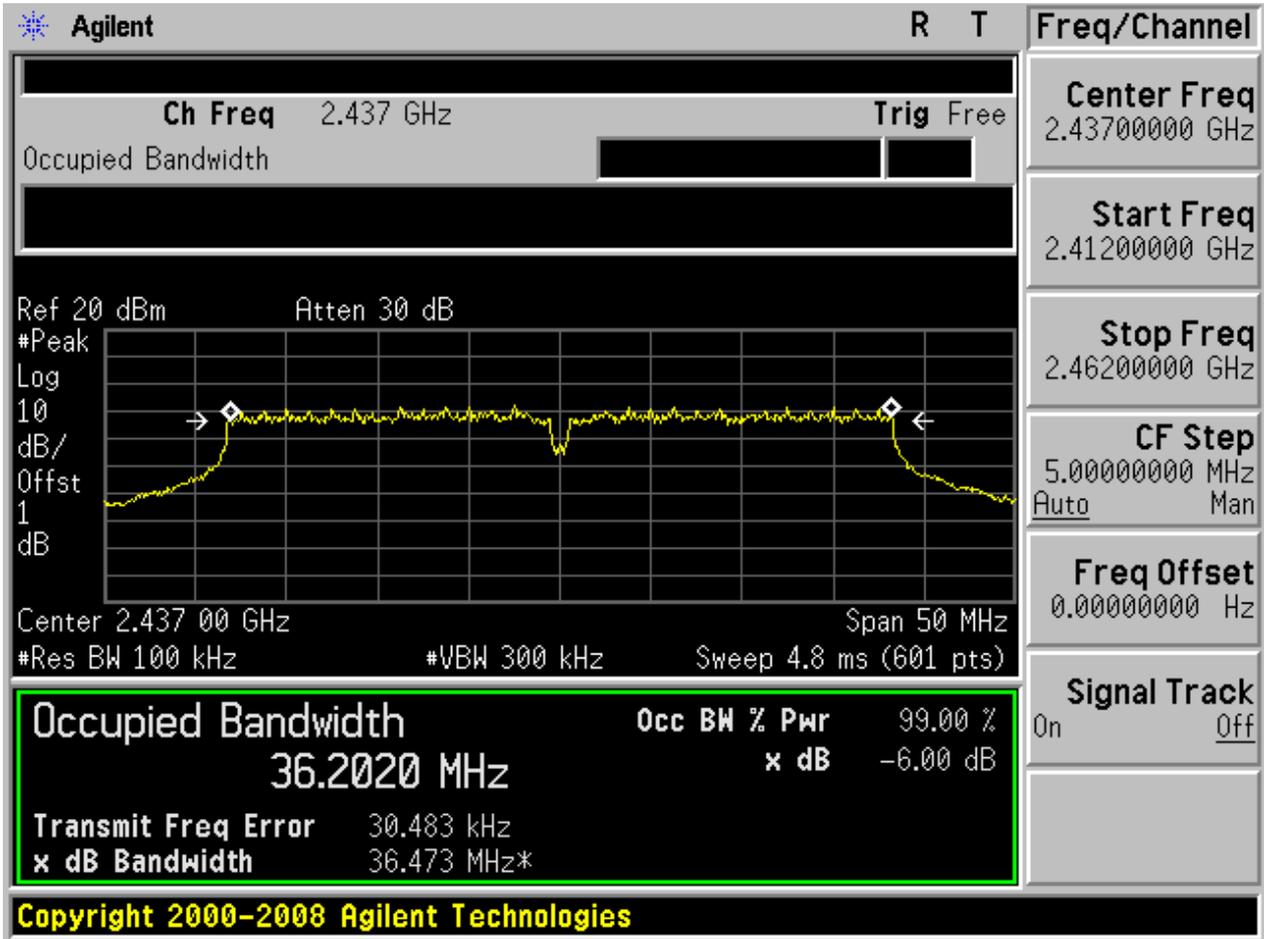


2.10 11N40_L@Ant 1



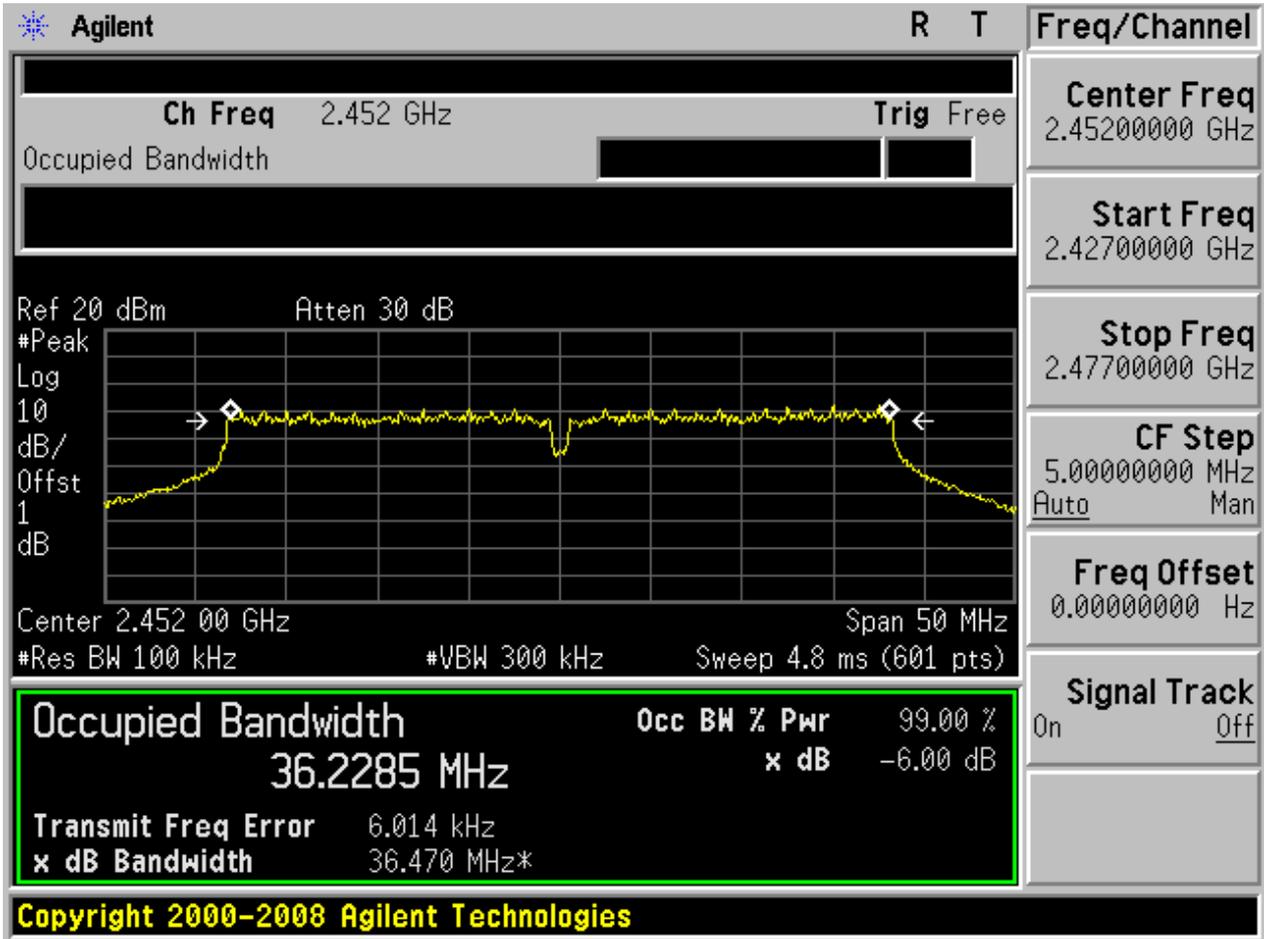


2.11 11N40_M@Ant 1





2.12 11N40_H@Ant 1





Appendix B: Occupied Bandwidth

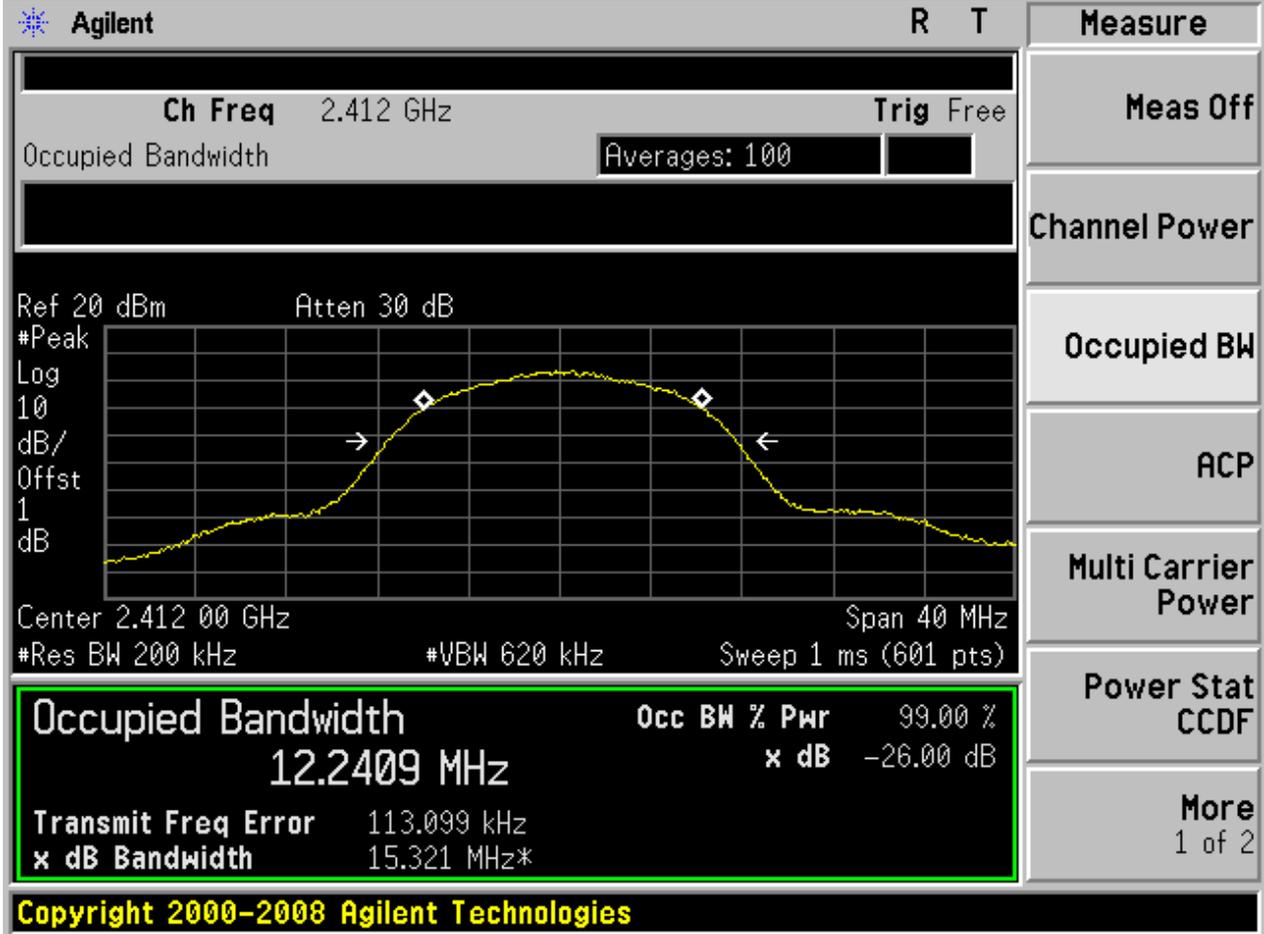
For measurements on smart antenna systems (devices with multiple transmit chains), the test is performed at each chain, and used as respective results for each chain.

Part I - Test Results

Test Mode	Test Channel	Frequency[MHz]	Ant	Occupied Bandwidth [MHz]	Verdict
11B	L	2412	Ant 1	12.24	pass
11B	M	2437	Ant 1	12.33	pass
11B	H	2462	Ant 1	12.28	pass
11G	L	2412	Ant 1	16.57	pass
11G	M	2437	Ant 1	16.56	pass
11G	H	2462	Ant 1	16.56	pass
11N20	L	2412	Ant 1	17.65	pass
11N20	M	2437	Ant 1	17.72	pass
11N20	H	2462	Ant 1	17.65	pass
11N40	L	2422	Ant 1	36.15	pass
11N40	M	2437	Ant 1	36.27	pass
11N40	H	2452	Ant 1	36.28	pass

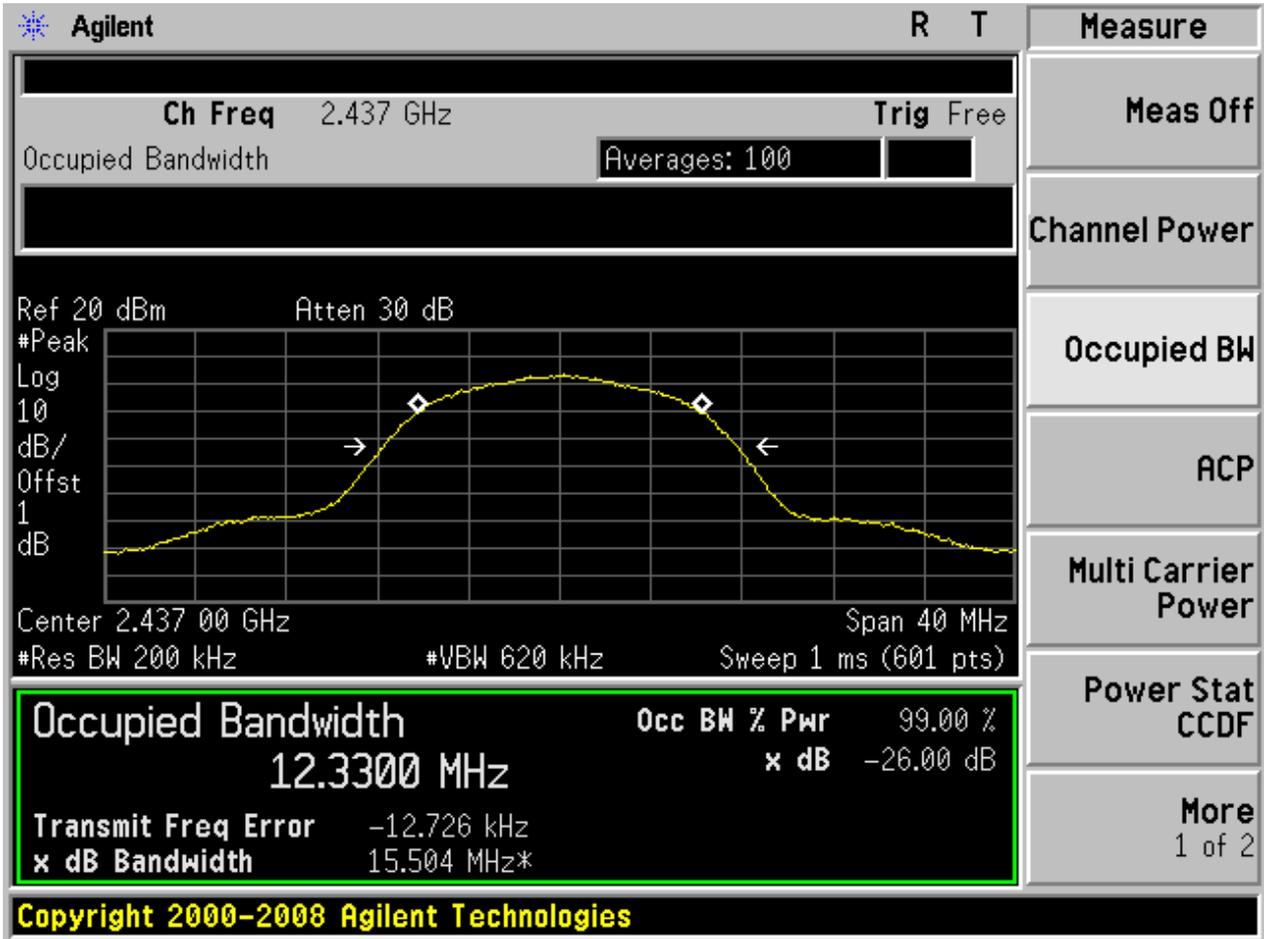
Part II - Test Plots

2.1 11B_L@Ant 1

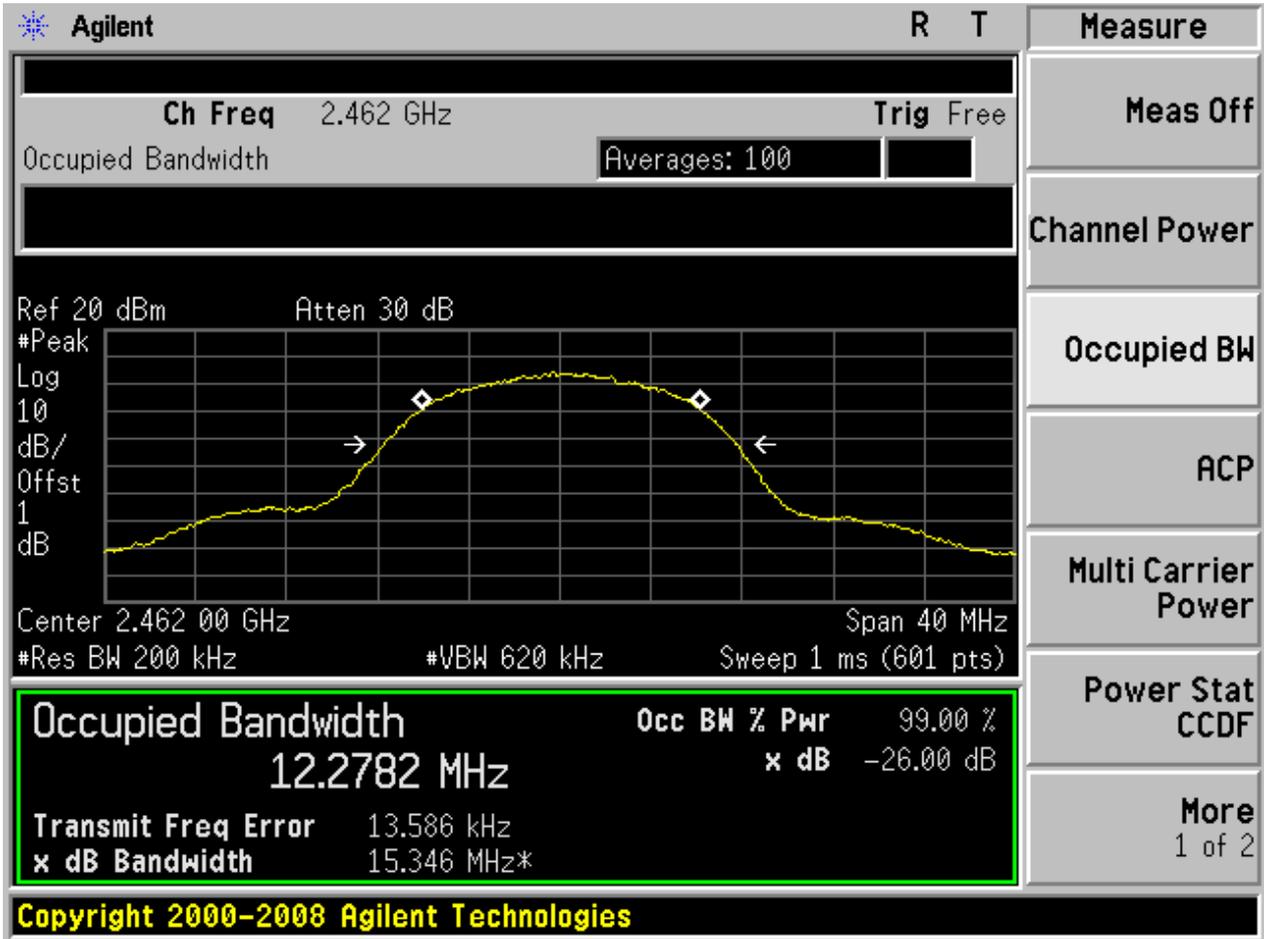




2.2 11B_M@Ant 1

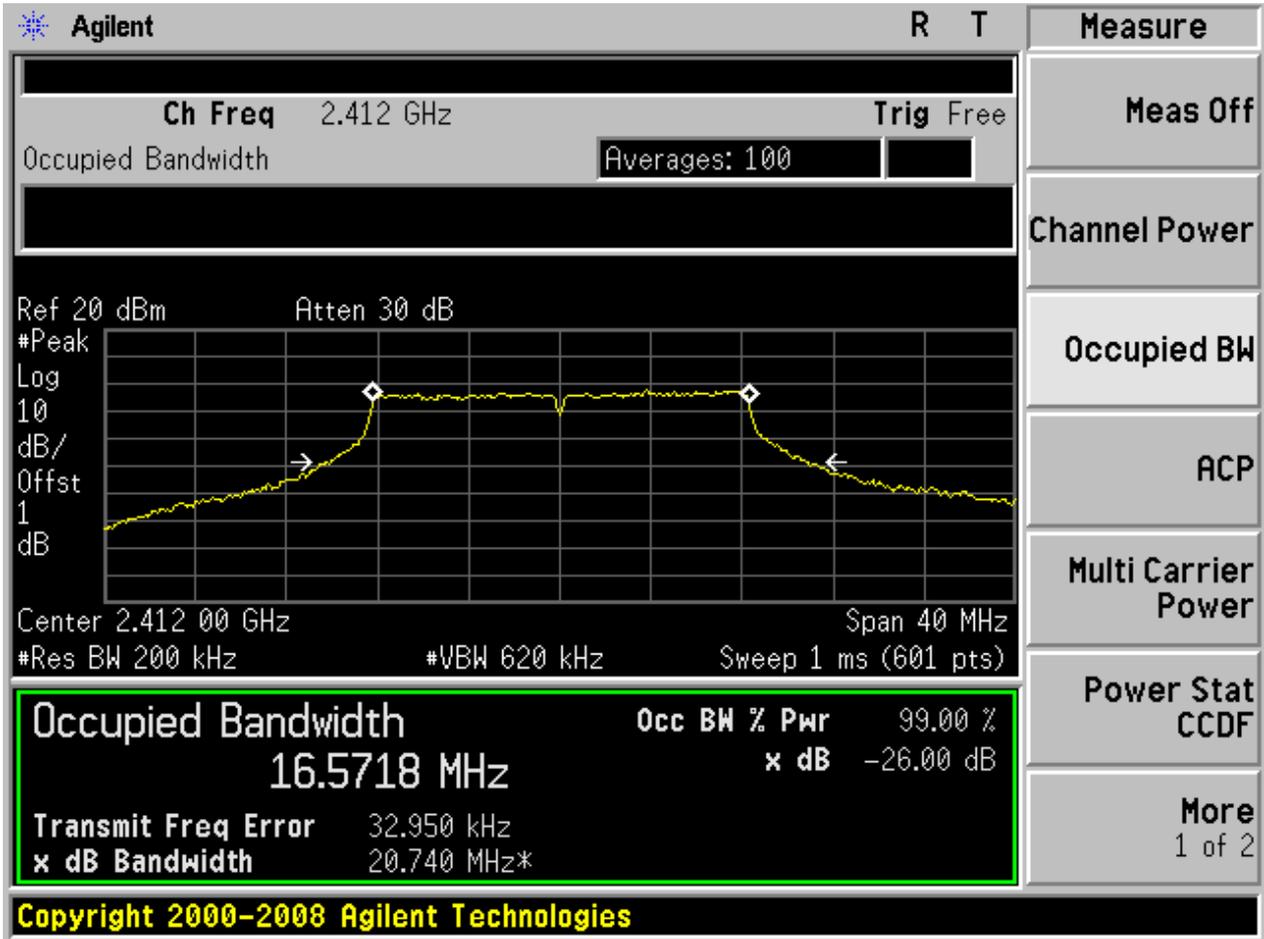


2.3 11B_H@Ant 1



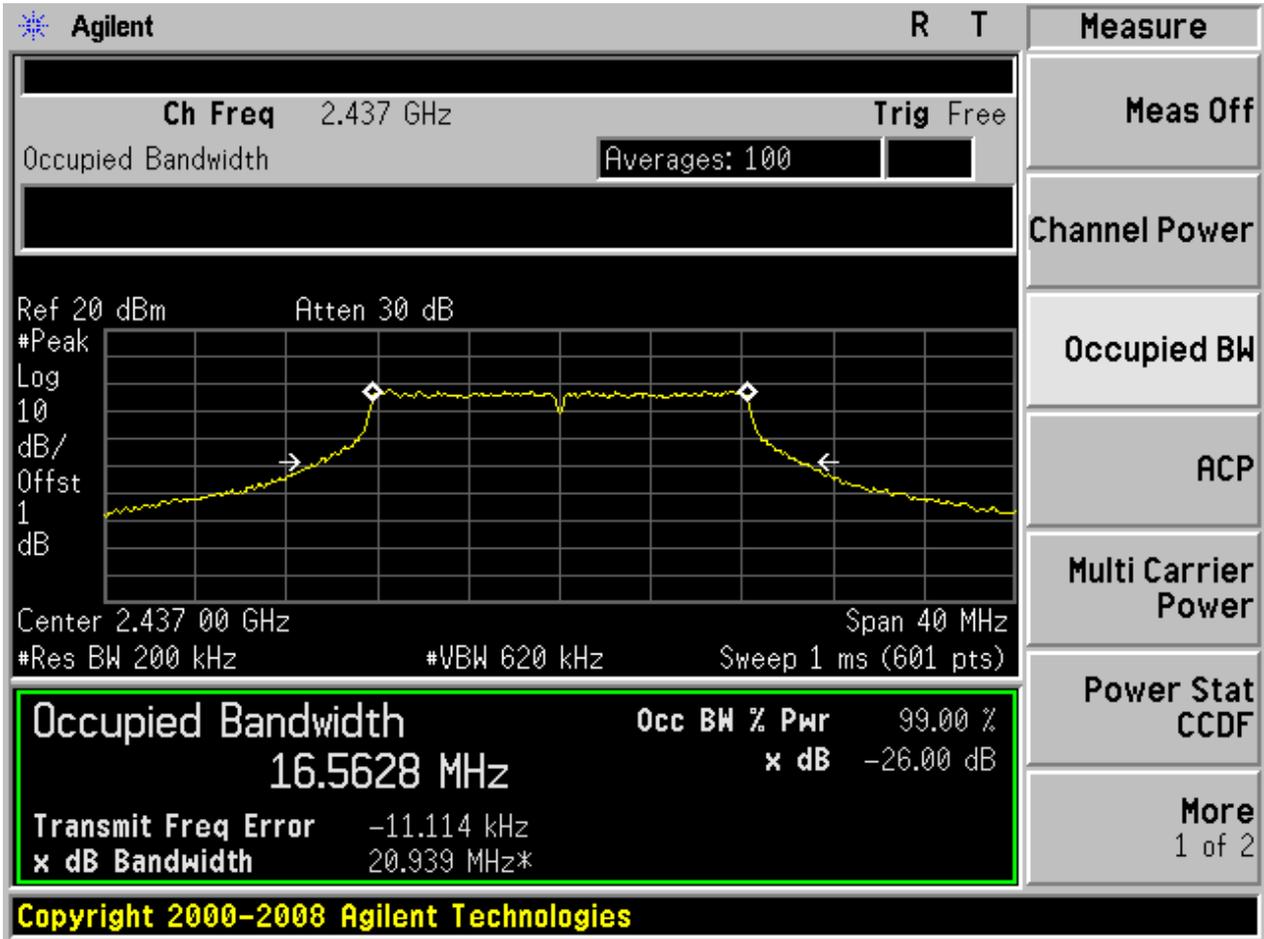


2.4 11G_L@Ant 1



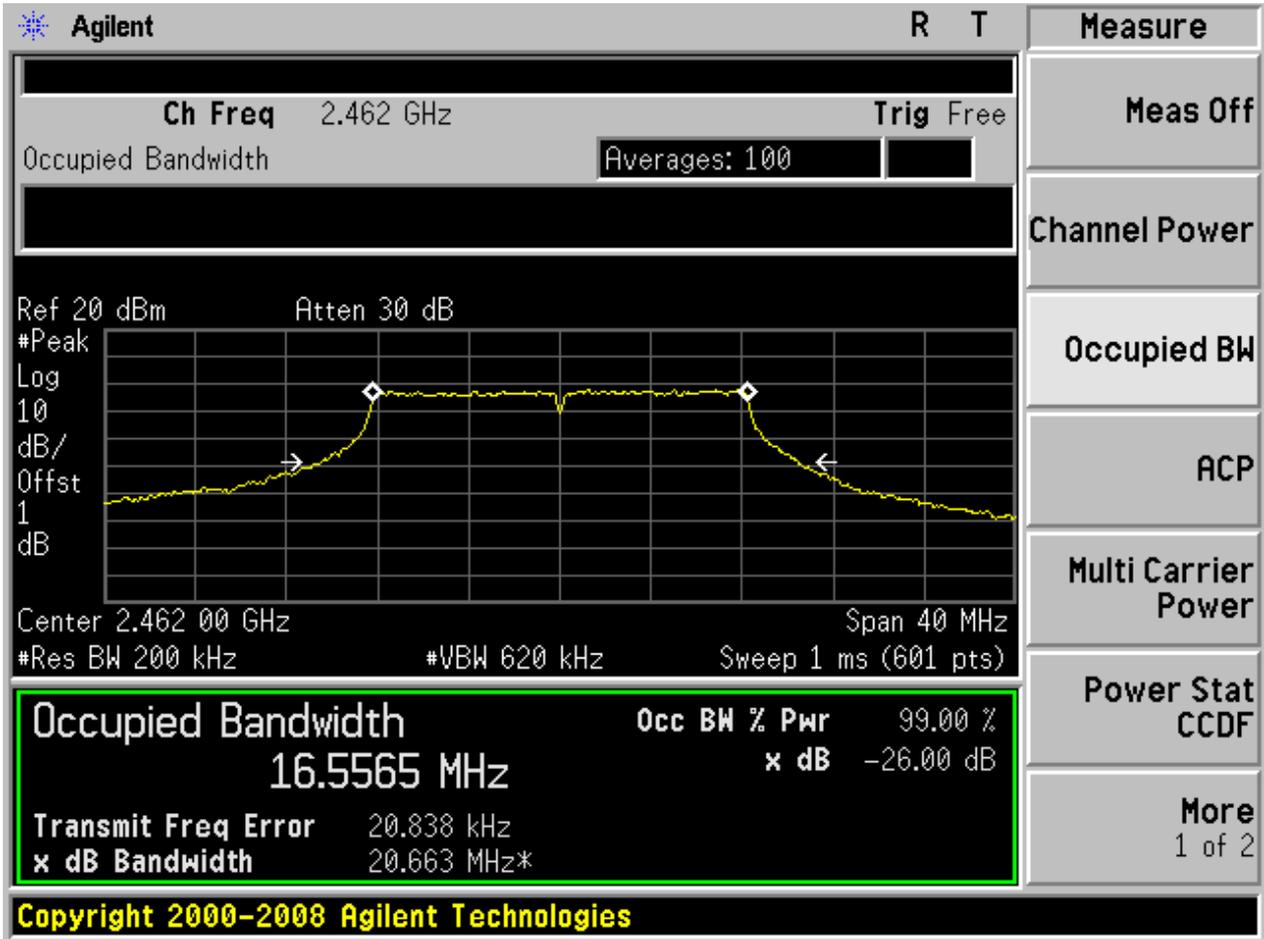


2.5 11G_M@Ant 1



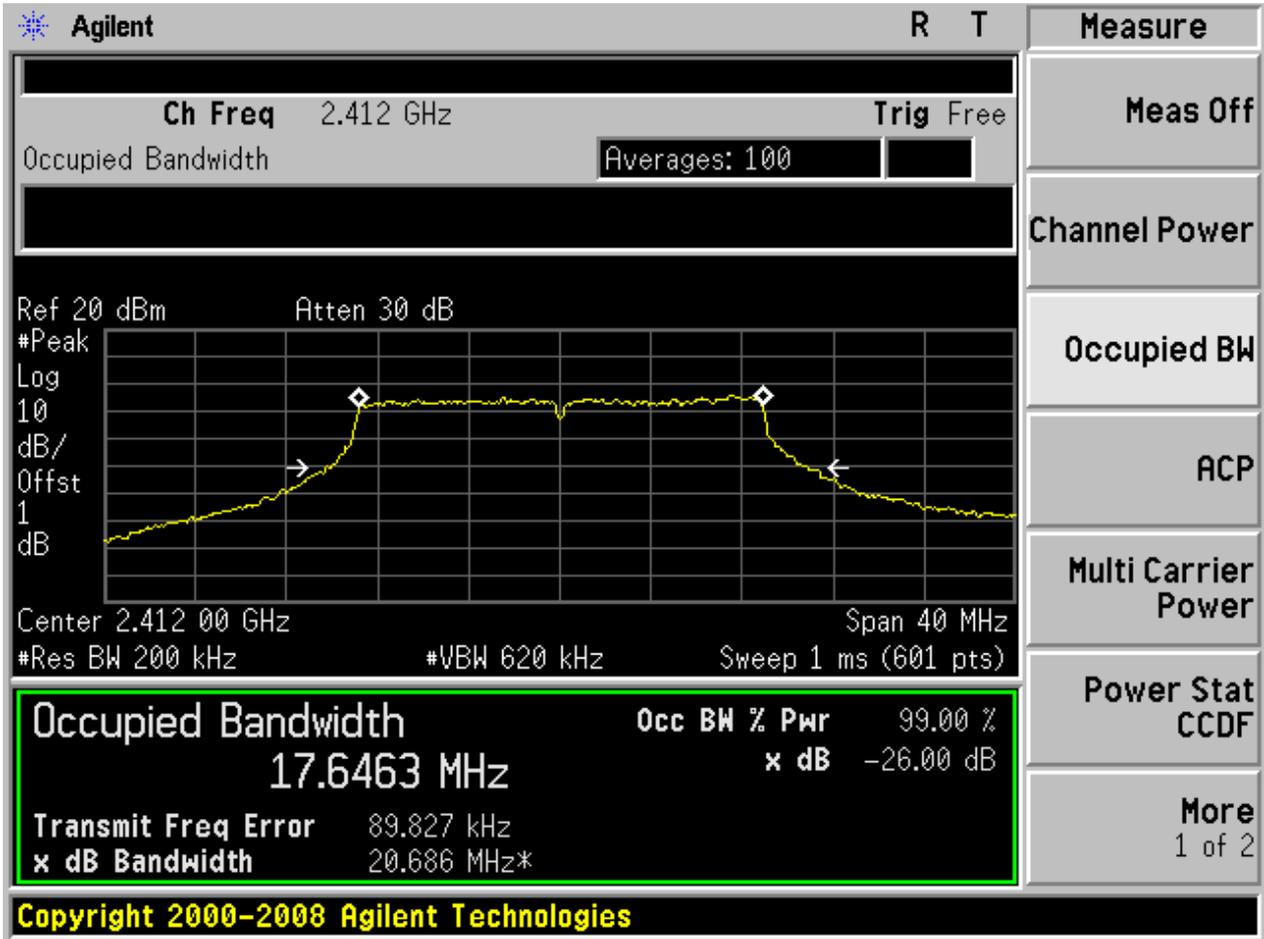


2.6 11G_H@Ant 1



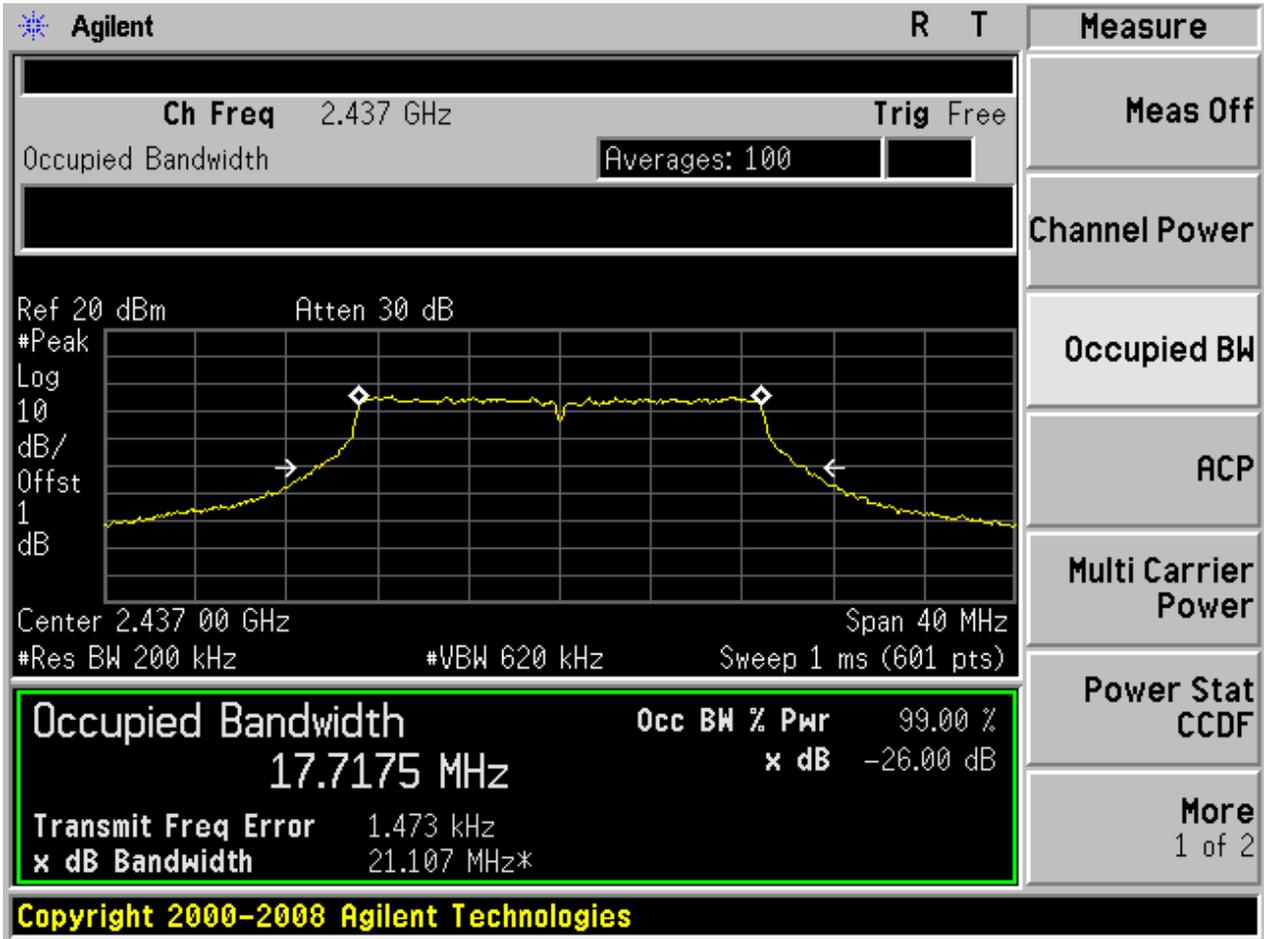


2.7 11N20_L@Ant 1



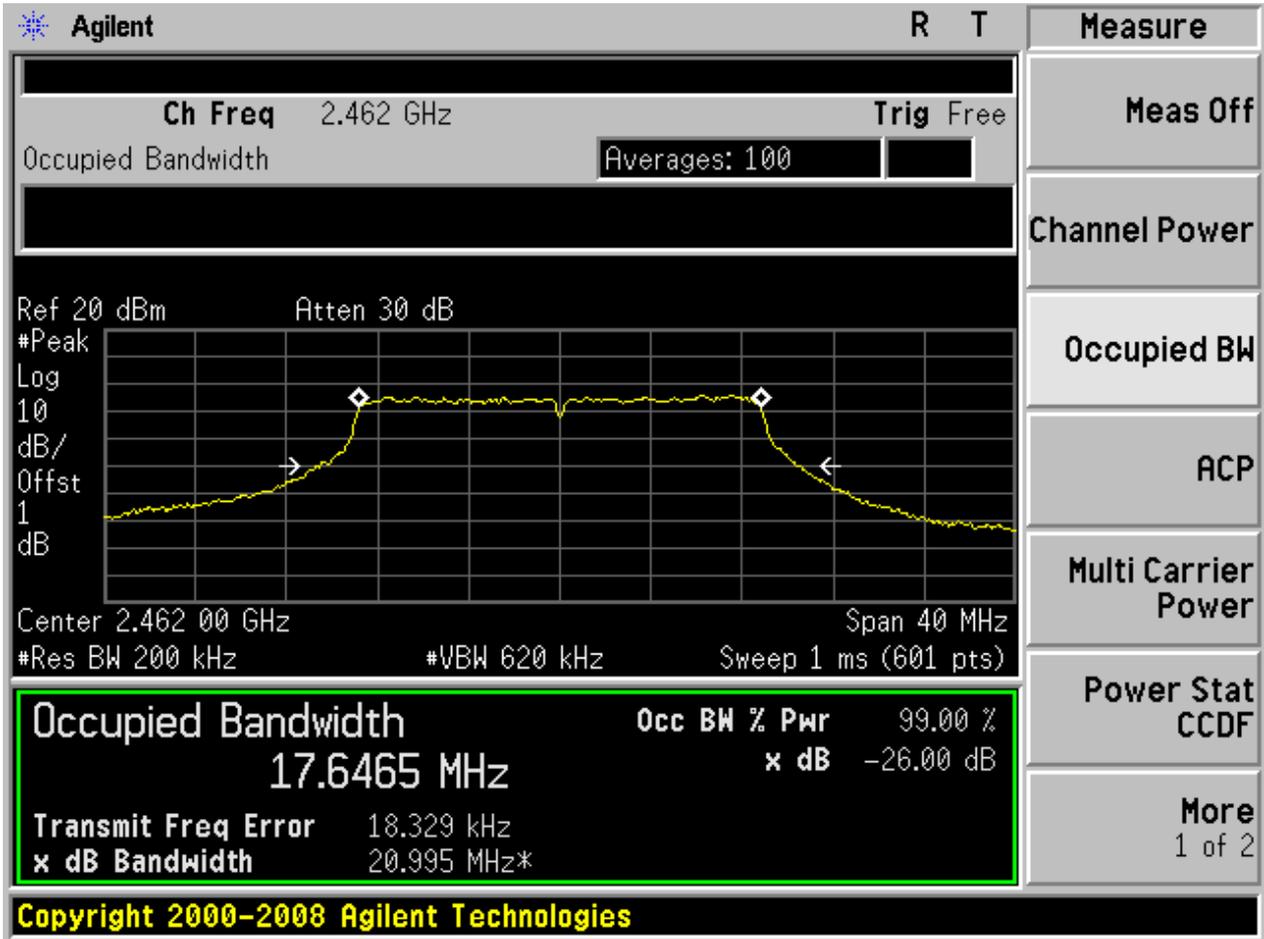


2.8 11N20_M@Ant 1

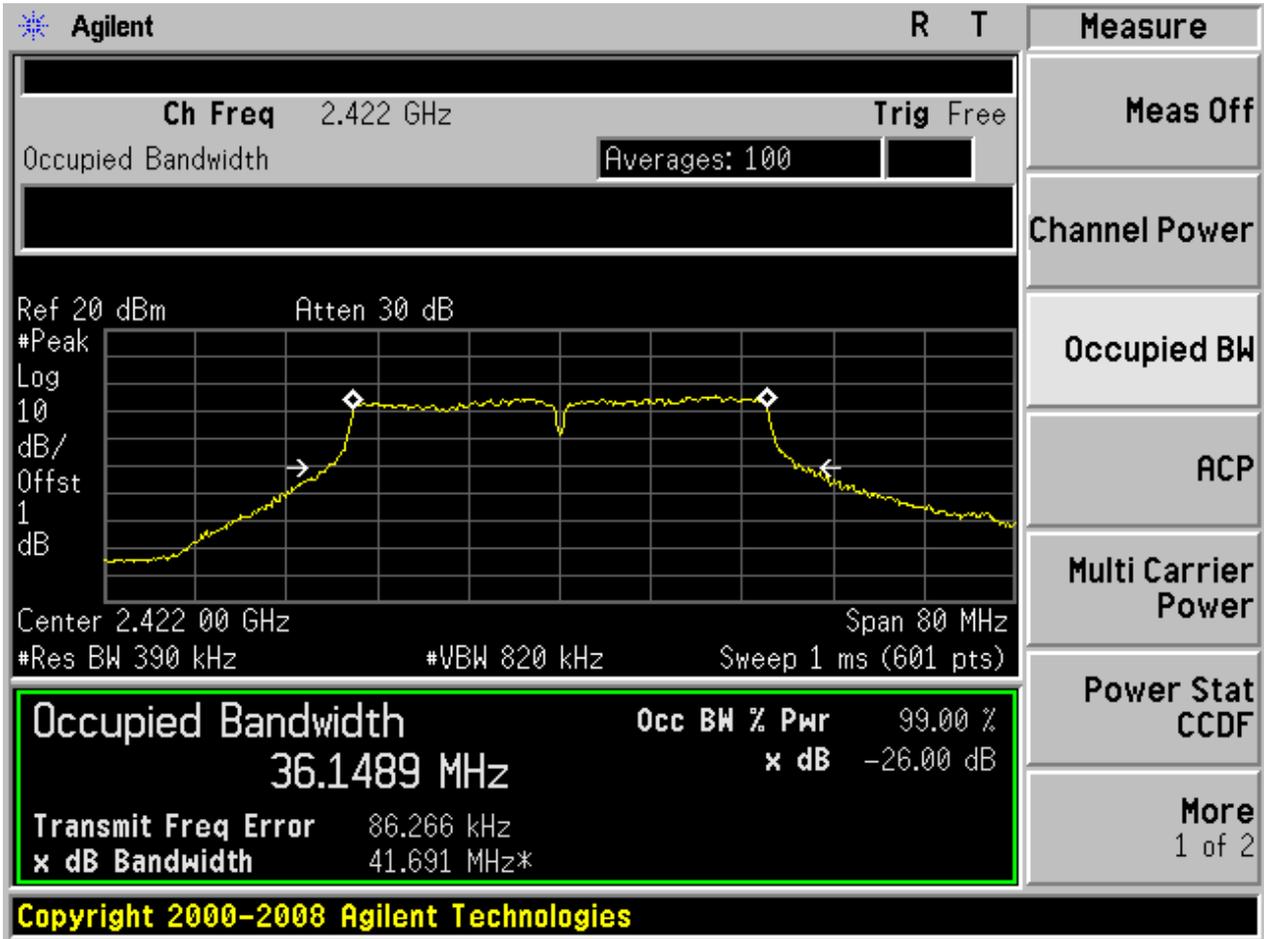




2.9 11N20_H@Ant 1

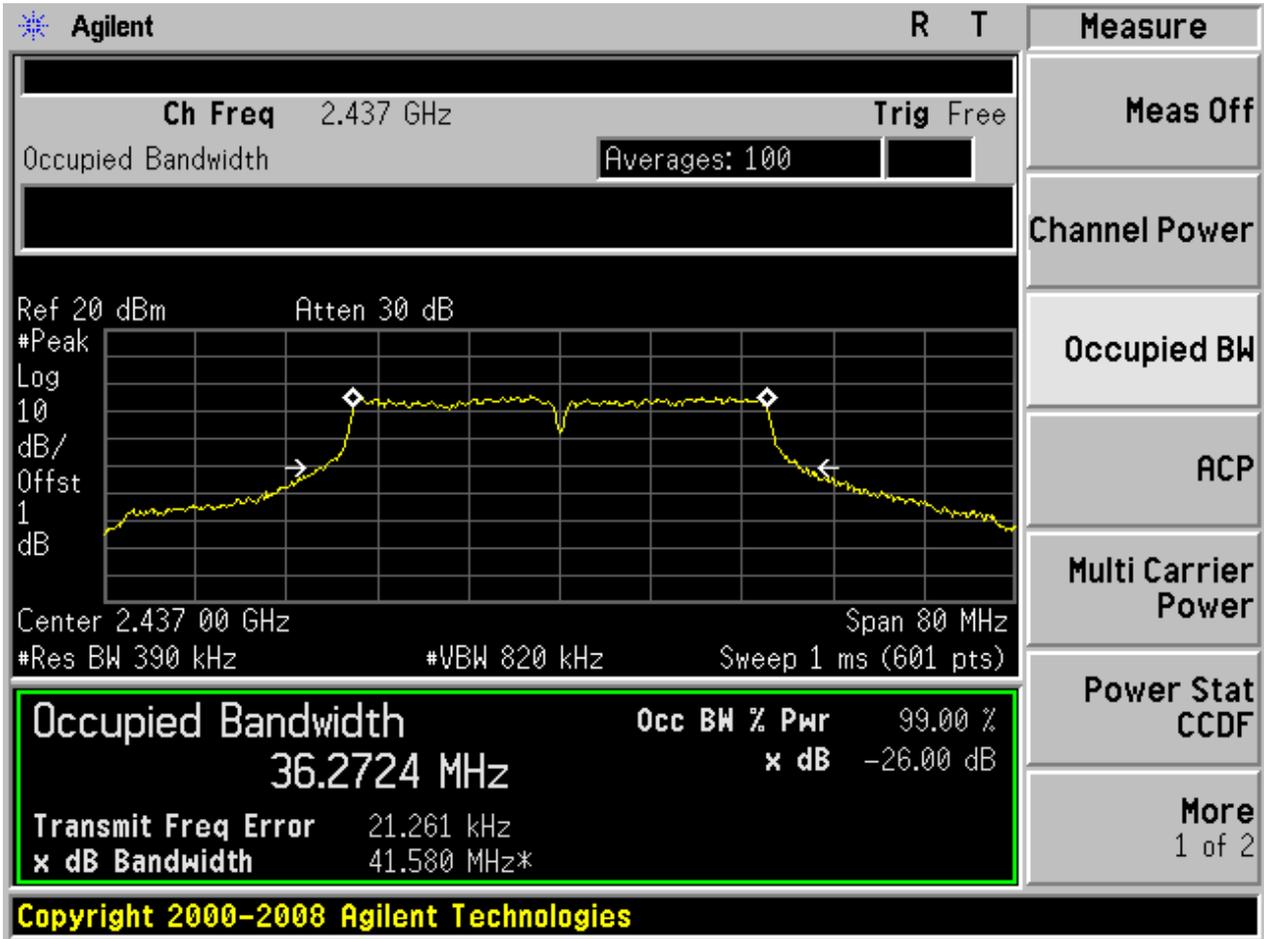


2.10 11N40_L@Ant 1



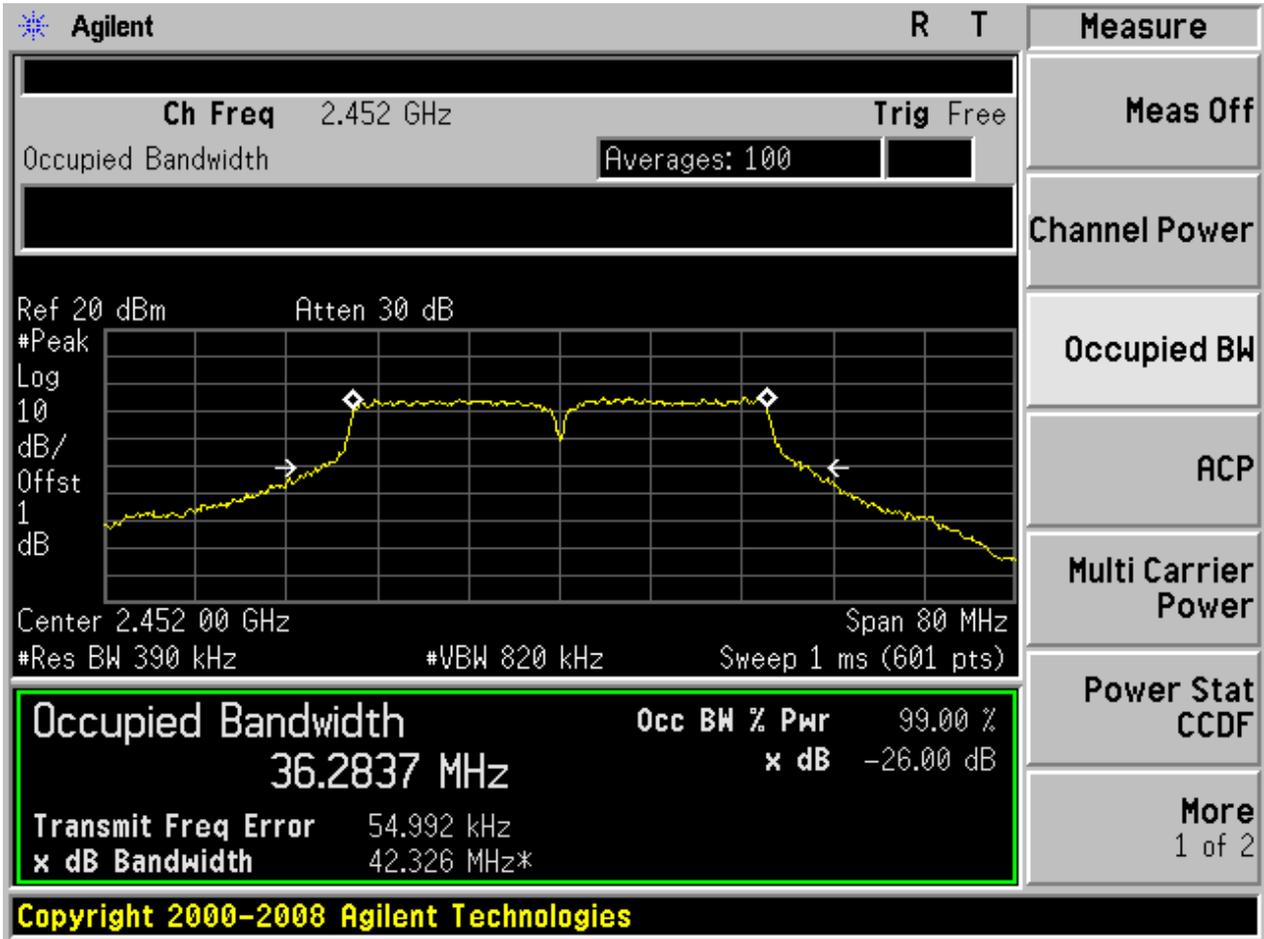


2.11 11N40_M@Ant 1





2.12 11N40_H@Ant 1



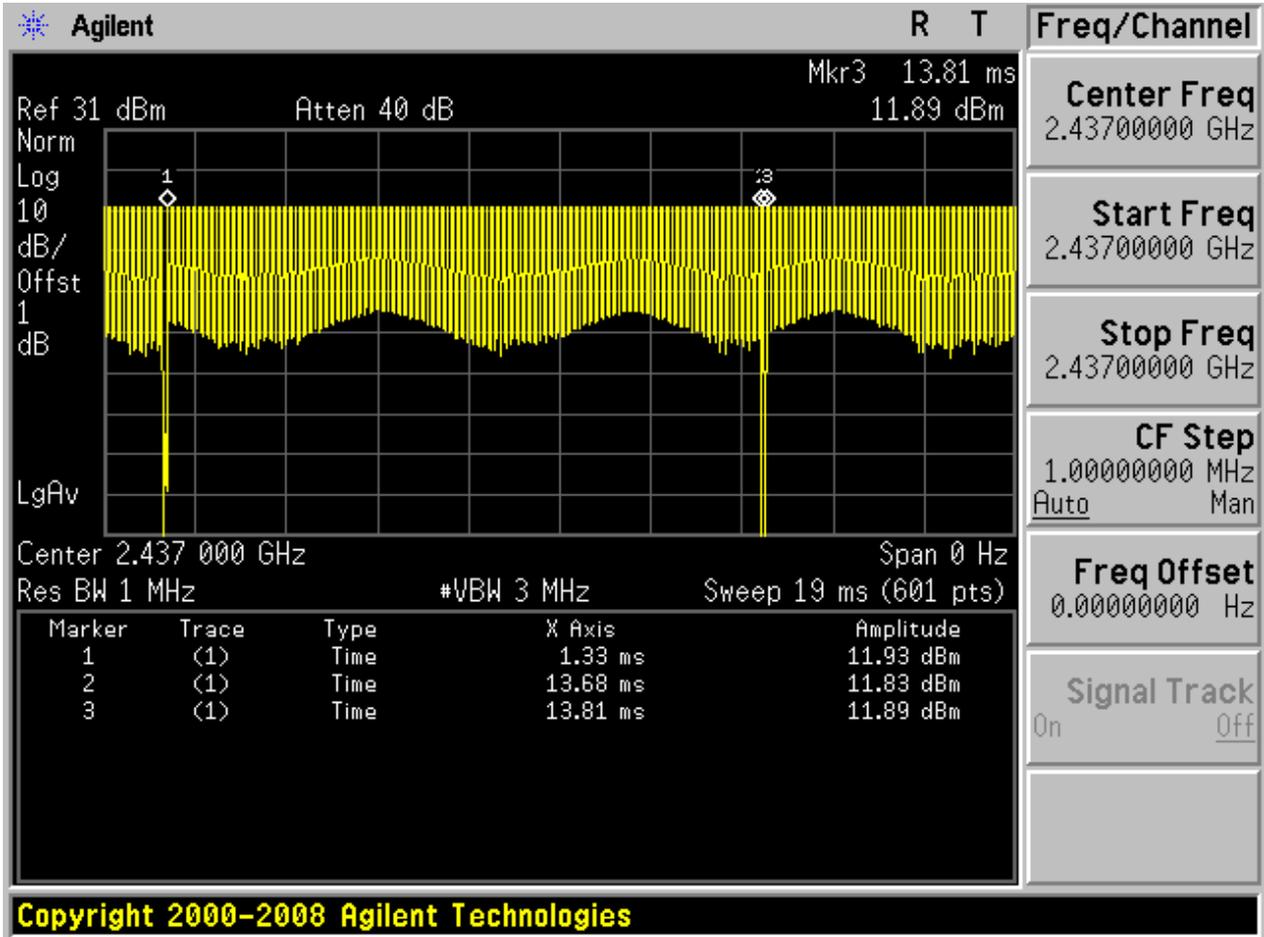
Appendix C: Duty Cycle

Part I - Test Results

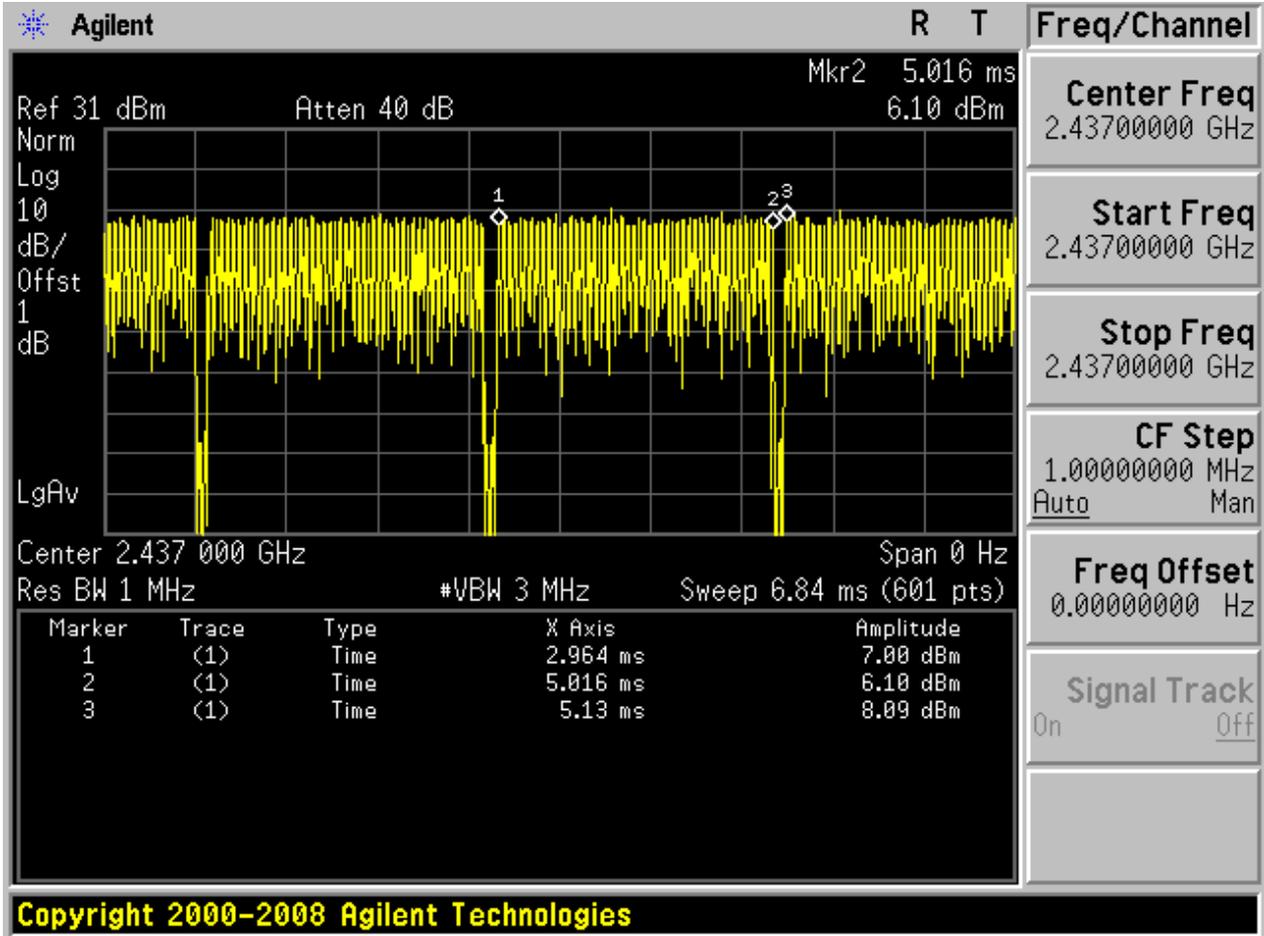
Test Mode	TX Freq. [MHz]	Duty cycle [%]
11B	Ant 1: 2437 MHz	99
11G	Ant 1: 2437 MHz	94.7
11N_20M_SISO	Ant 1: 2437 MHz	94.3
11N_40M_SISO	Ant 1: 2437 MHz	85.3

Part II - Test Plots

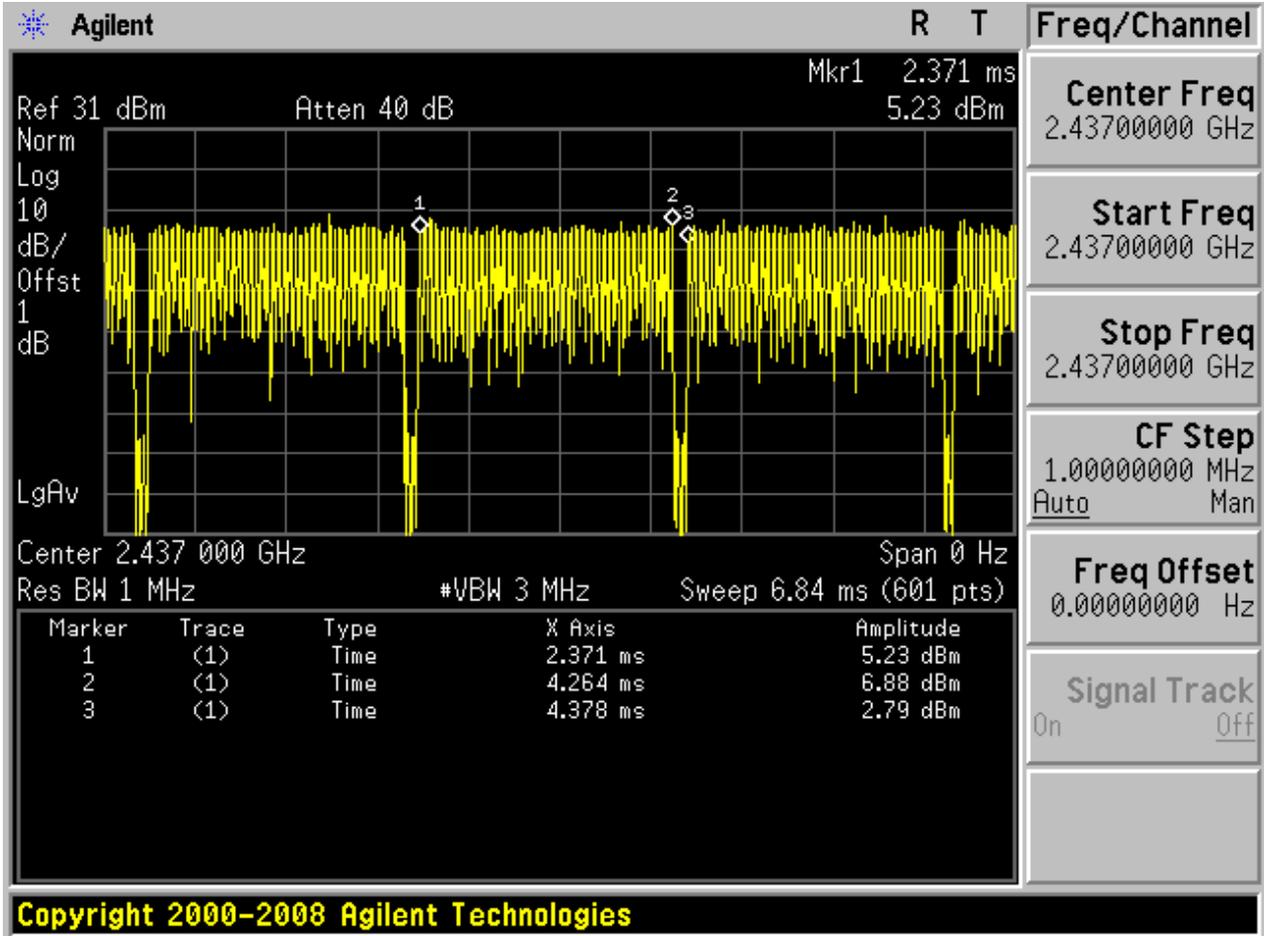
2.1 11B_M@Ant 1



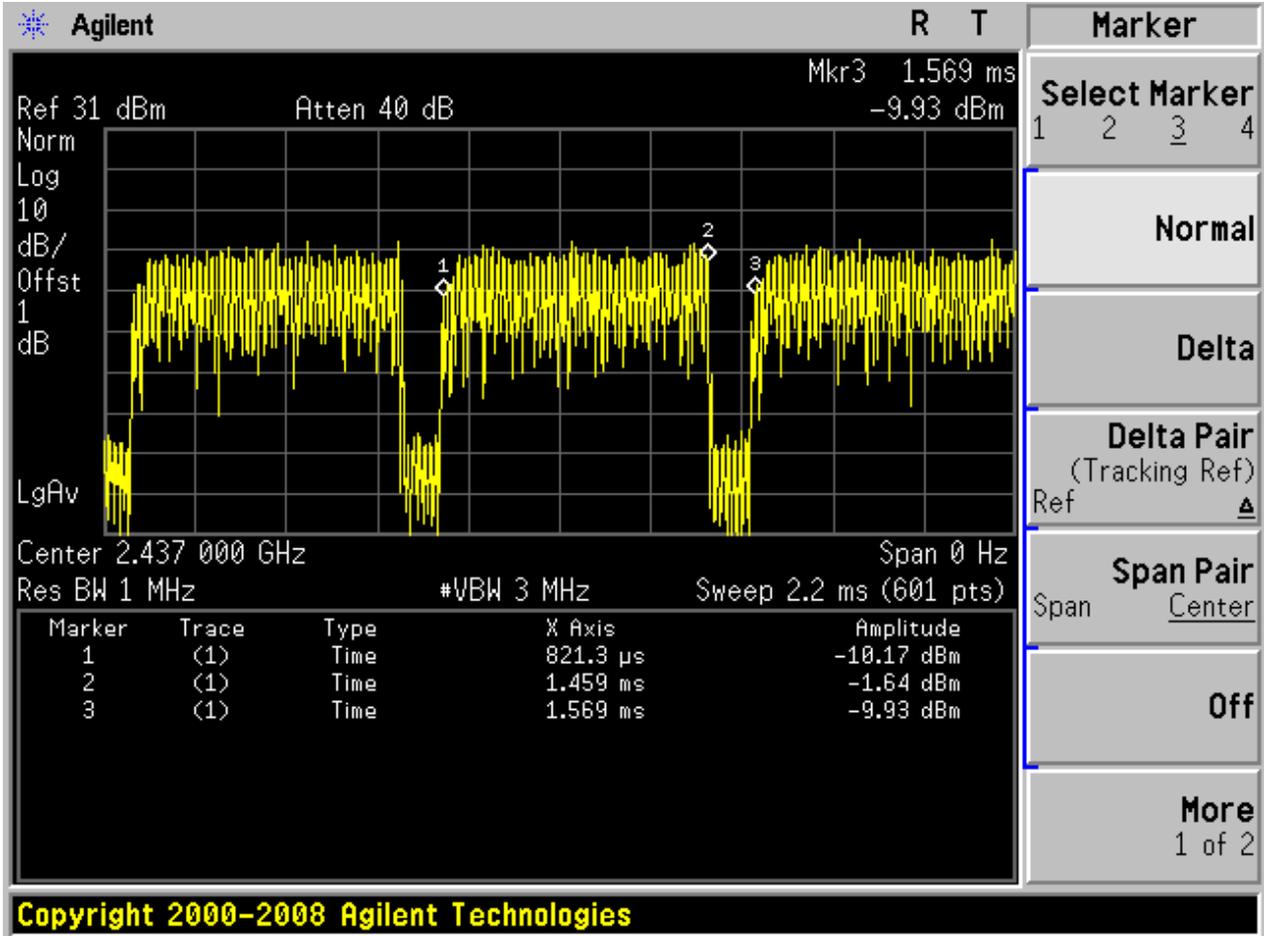
2.2 11G_M@Ant 1



2.3 11N-20M-SISO_M@Ant 1



2.4 11N-40M-SISO_M@Ant 1



Appendix D: Maximum Conducted Average Output Power

Part I - Test Results

Test Mode	Test Channel	Frequency[MHz]	Ant	Power[dBm]	Verdict
11B	L	2412	Ant 1	15.24	pass
11B	M	2437	Ant 1	15.13	pass
11B	H	2462	Ant 1	15.78	pass
11G	L	2412	Ant 1	14.45	pass
11G	M	2437	Ant 1	14.37	pass
11G	H	2462	Ant 1	14.81	pass
11N20	L	2412	Ant 1	12.35	pass
11N20	M	2437	Ant 1	12.62	pass
11N20	H	2462	Ant 1	12.61	pass
11N40	L	2422	Ant 1	12.3	pass
11N40	M	2437	Ant 1	12.75	pass
11N40	H	2452	Ant 1	12.4	pass



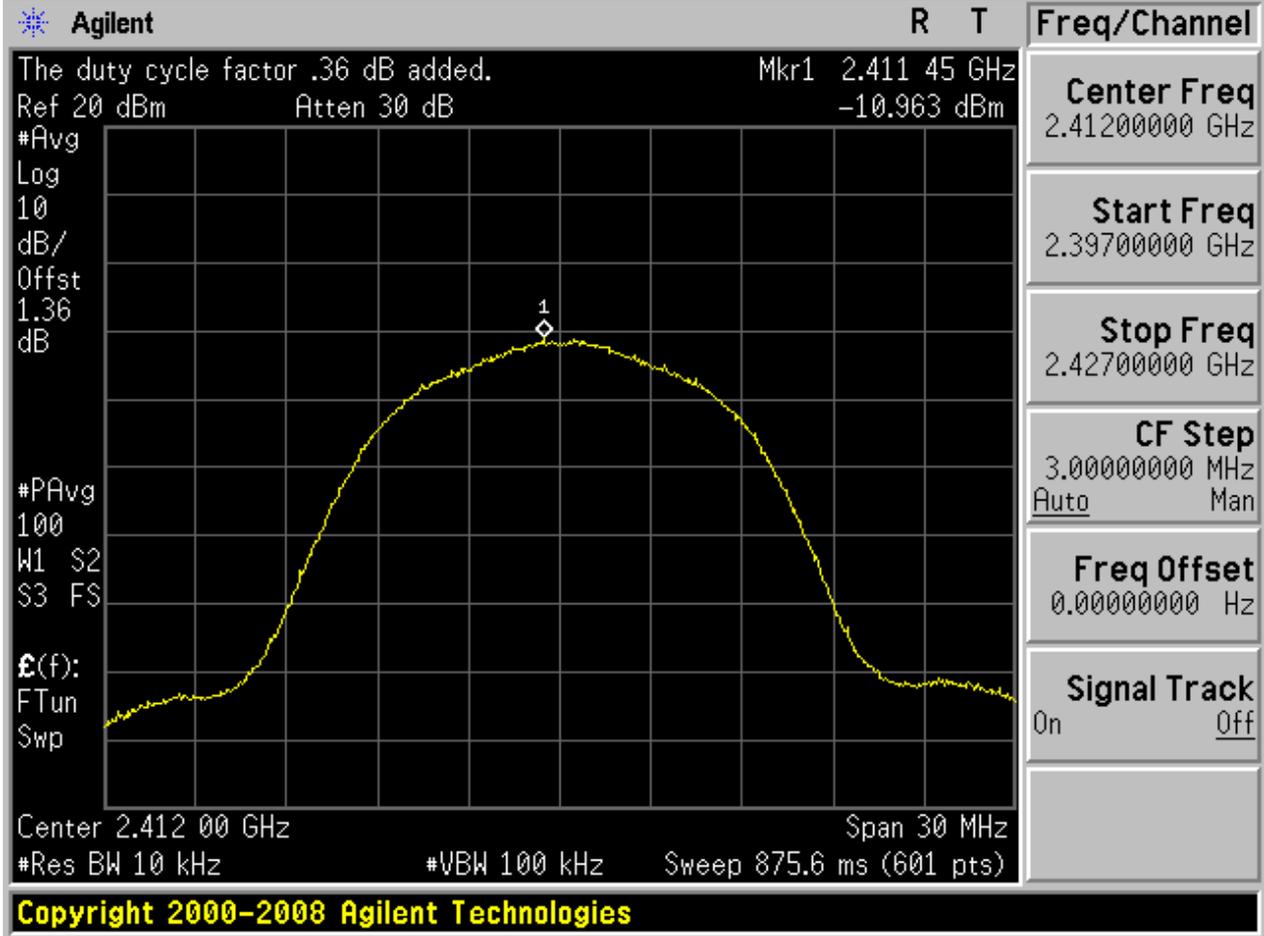
Appendix E: Maximum Power Spectral Density Level

Part I - Test Results

Test Mode	Test Channel	Frequency[MHz]	Ant	PD[MHz]	Verdict
11B	L	2412	Ant 1	-10.96	pass
11B	M	2437	Ant 1	-10.80	pass
11B	H	2462	Ant 1	-9.99	pass
11G	L	2412	Ant 1	-13.65	pass
11G	M	2437	Ant 1	-13.97	pass
11G	H	2462	Ant 1	-13.40	pass
11N20	L	2412	Ant 1	-15.24	pass
11N20	M	2437	Ant 1	-15.35	pass
11N20	H	2462	Ant 1	-14.46	pass
11N40	L	2422	Ant 1	-16.67	pass
11N40	M	2437	Ant 1	-16.81	pass
11N40	H	2452	Ant 1	-16.59	pass

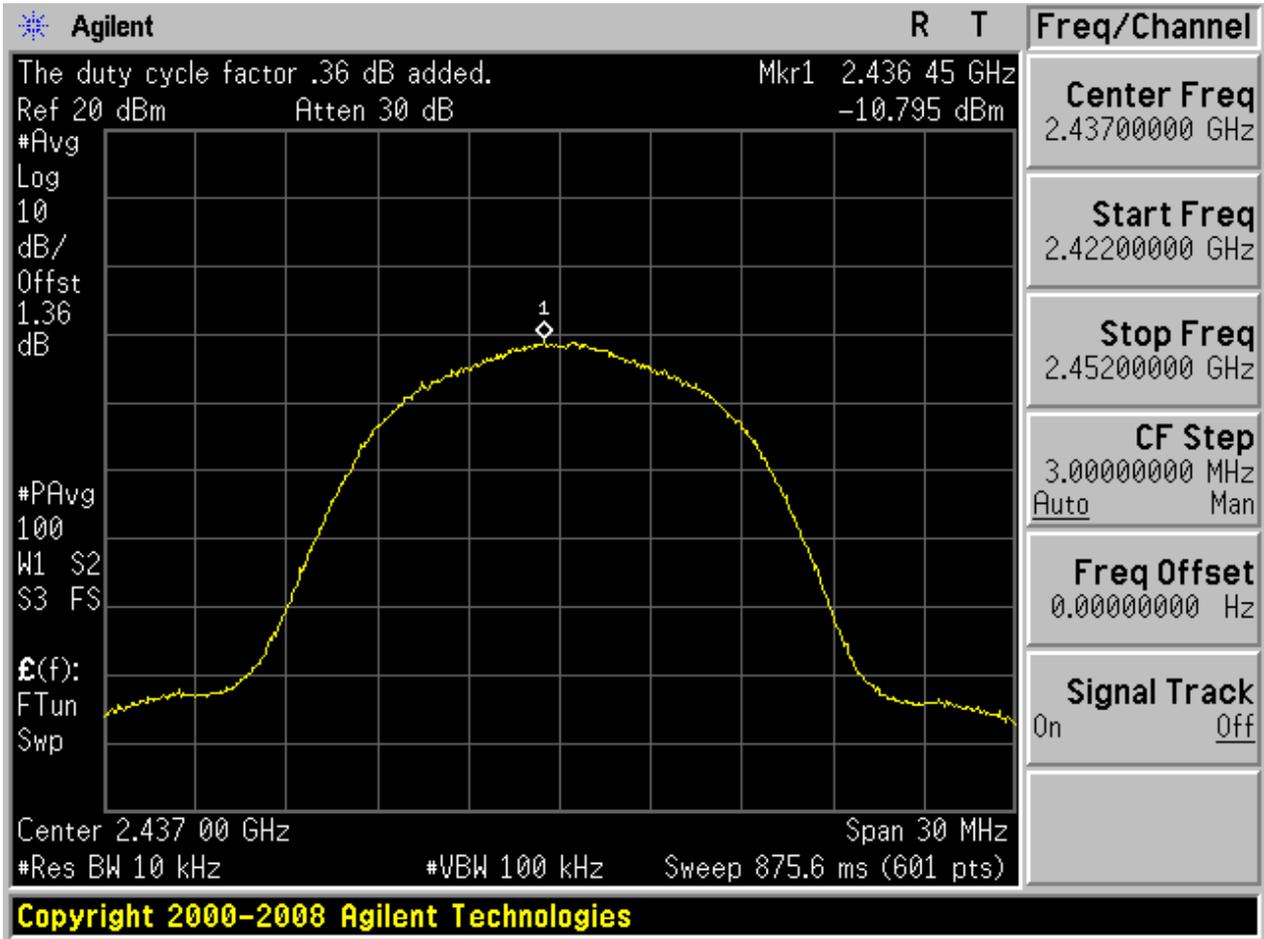
Part II - Test Plots

2.1 11B_L@Ant 1



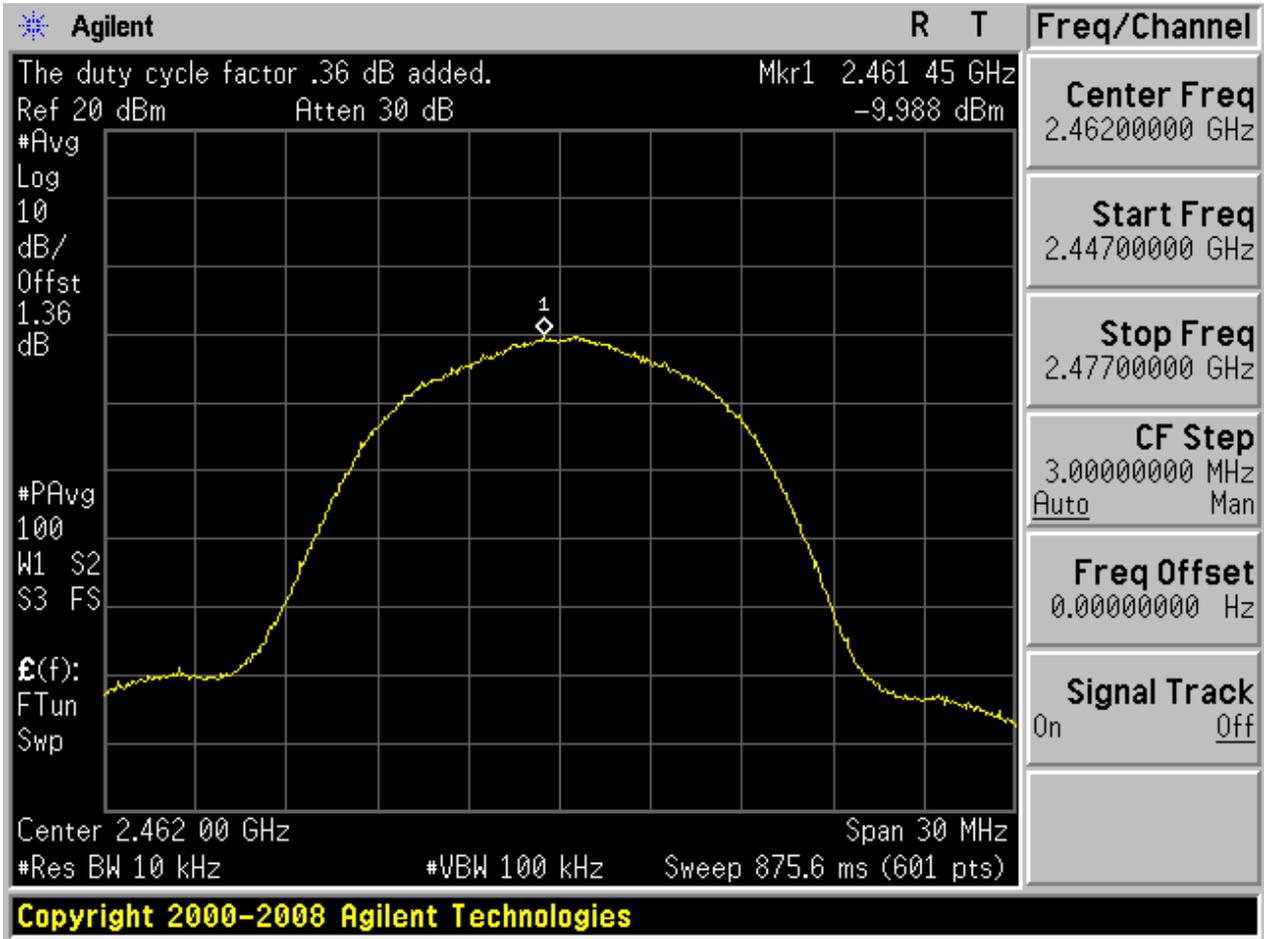


2.2 11B_M@Ant 1

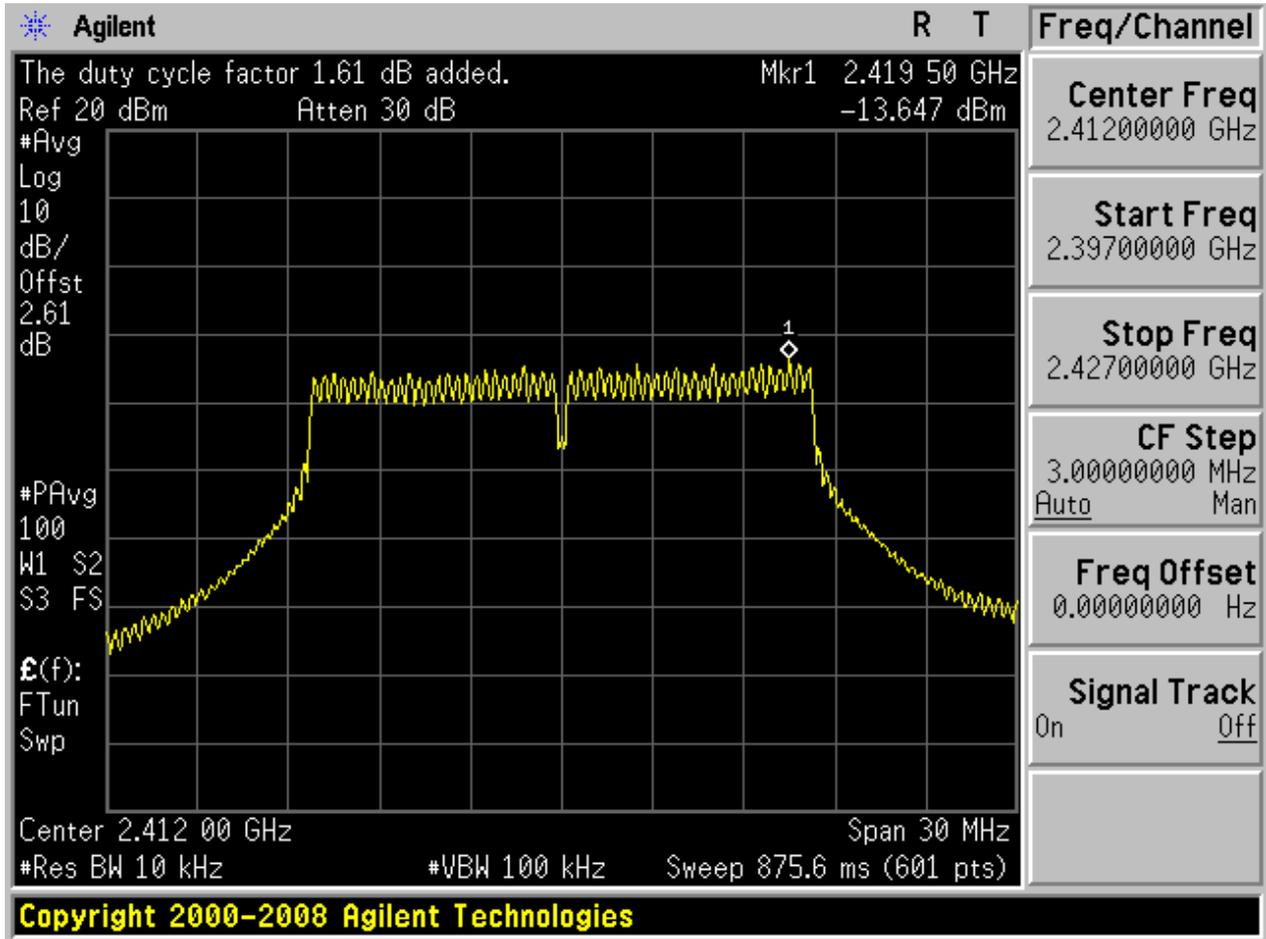




2.3 11B_H@Ant 1

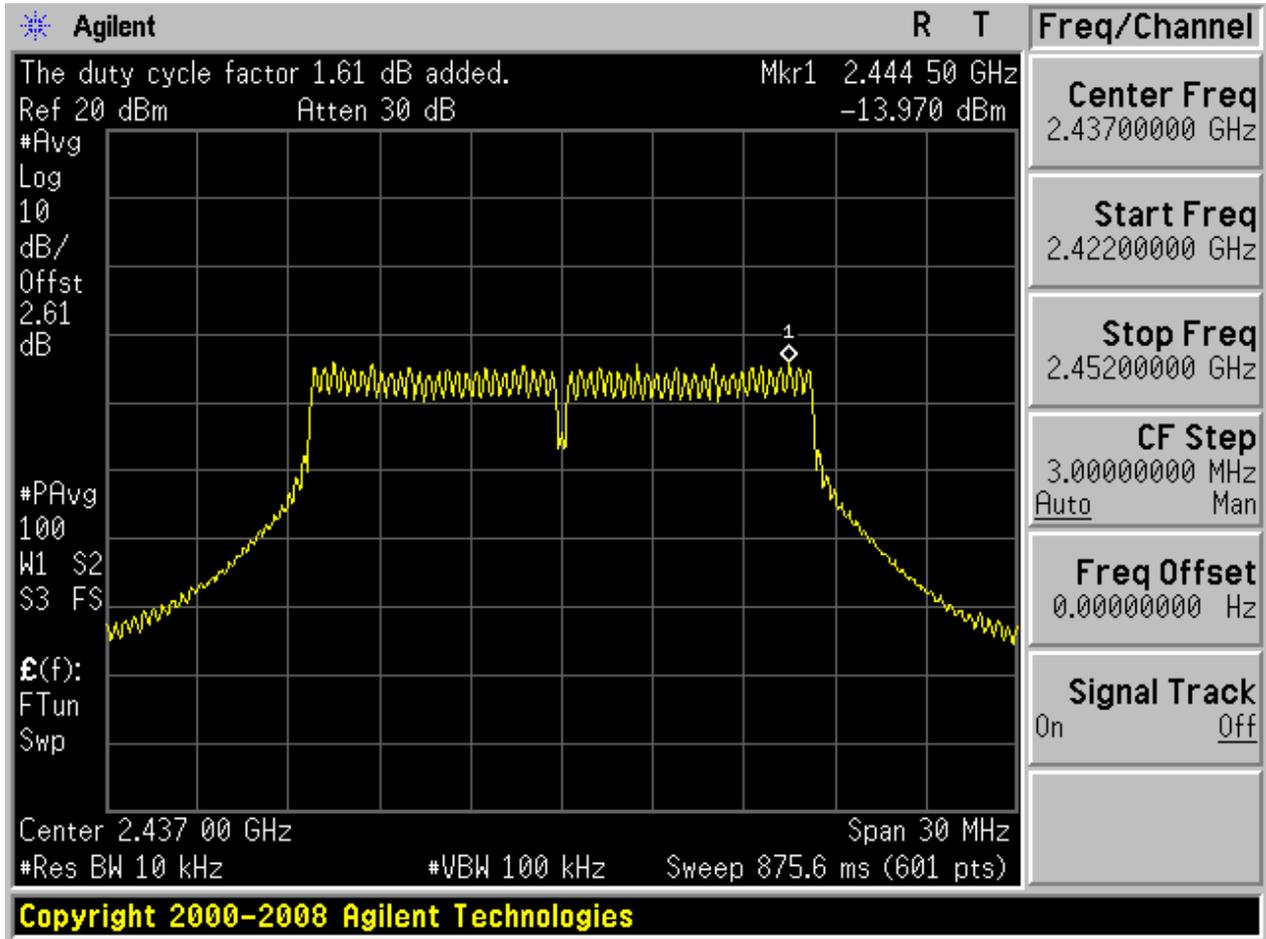


2.4 11G_L@Ant 1

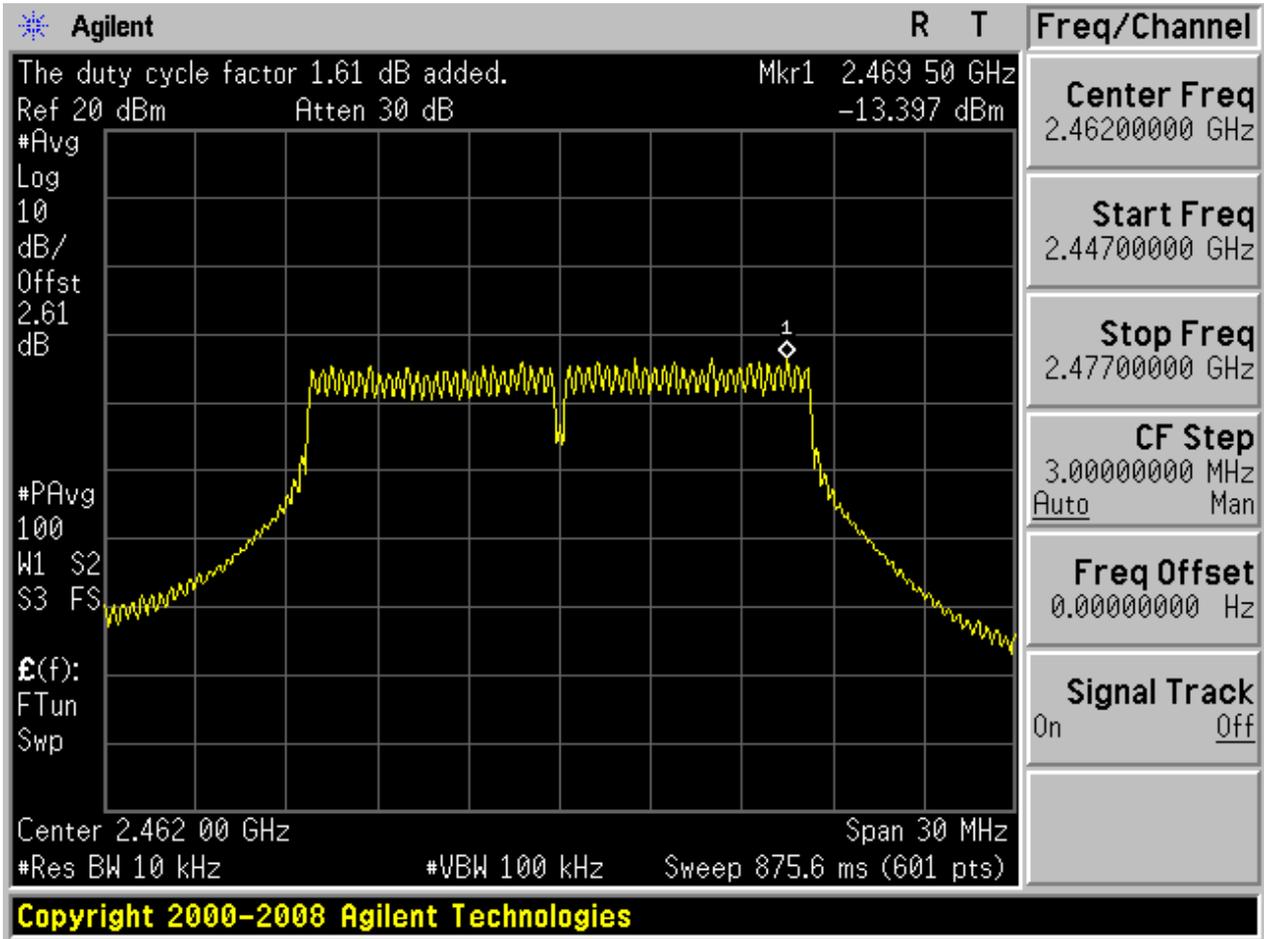




2.5 11G_M@Ant 1

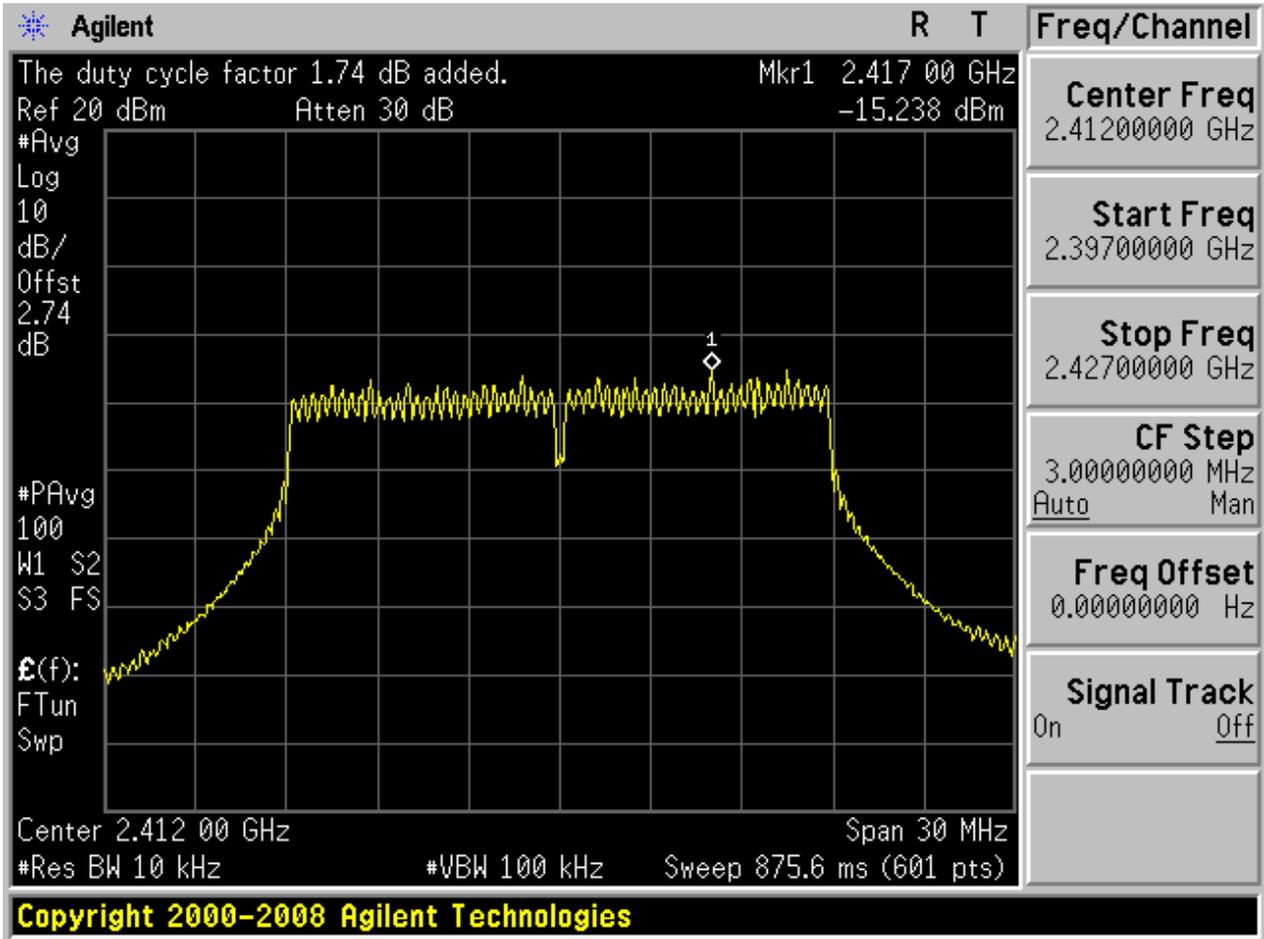


2.6 11G_H@Ant 1



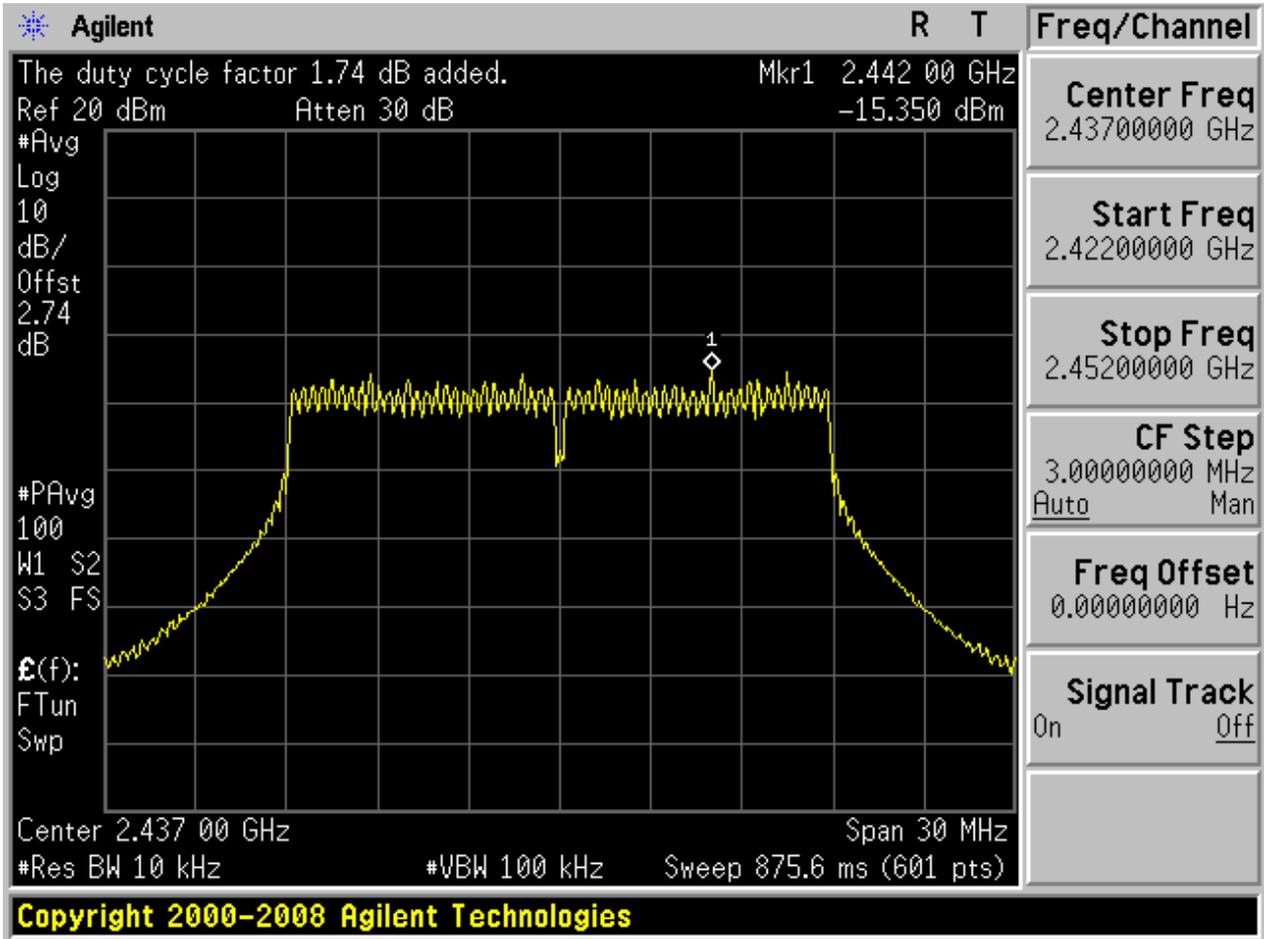


2.7 11N20_L@Ant 1

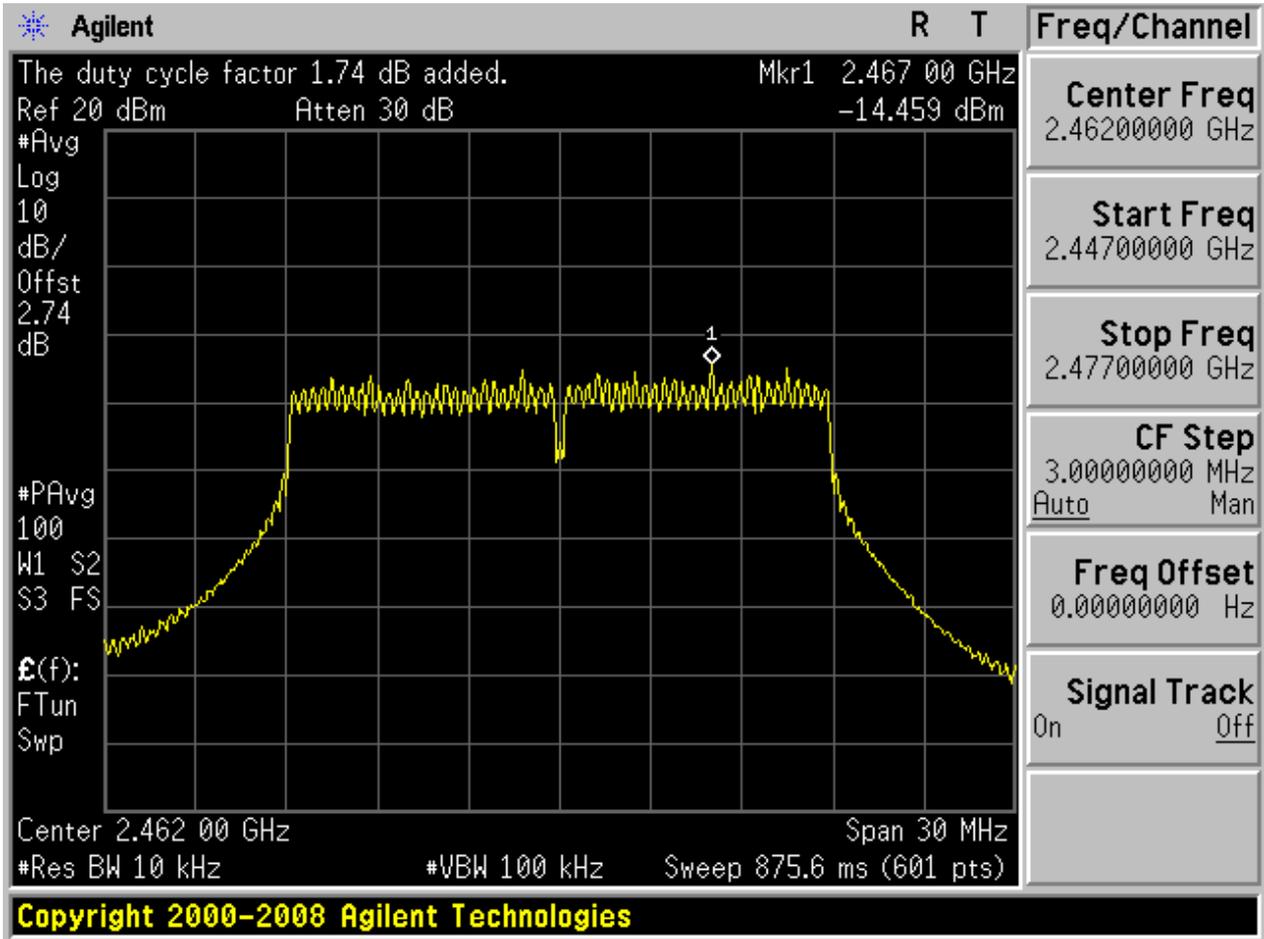




2.8 11N20_M@Ant 1

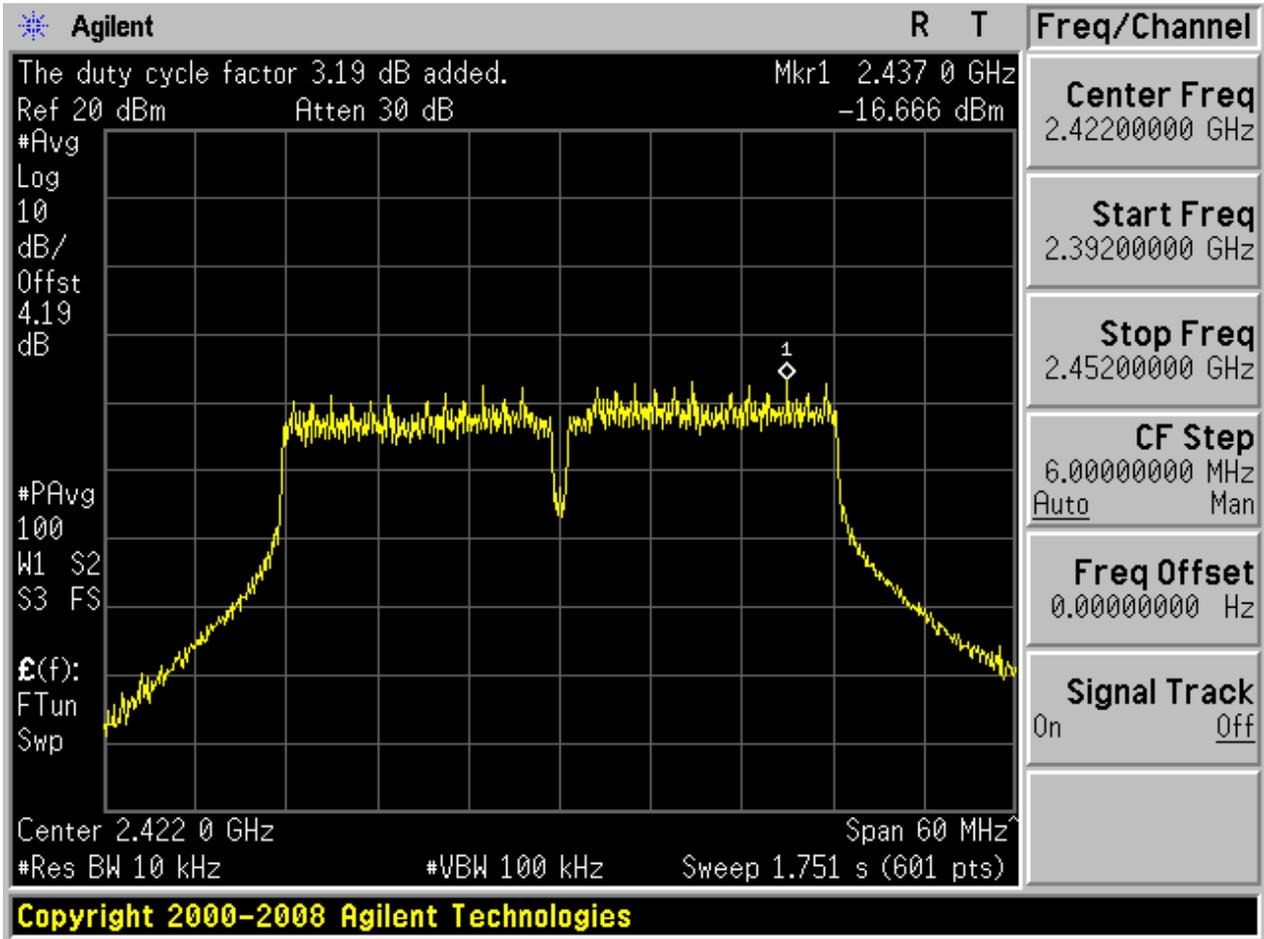


2.9 11N20_H@Ant 1



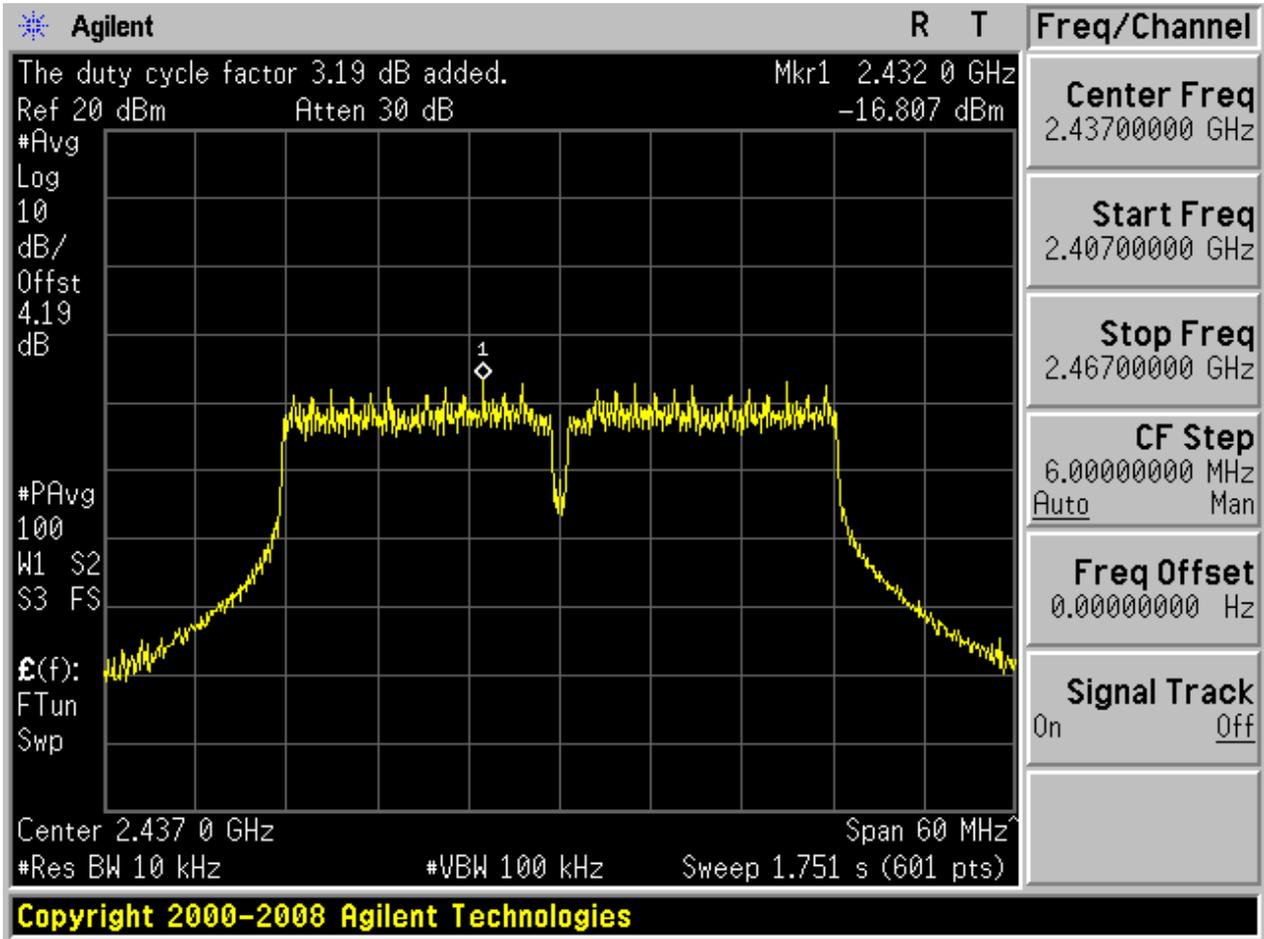


2.10 11N40_L@Ant 1



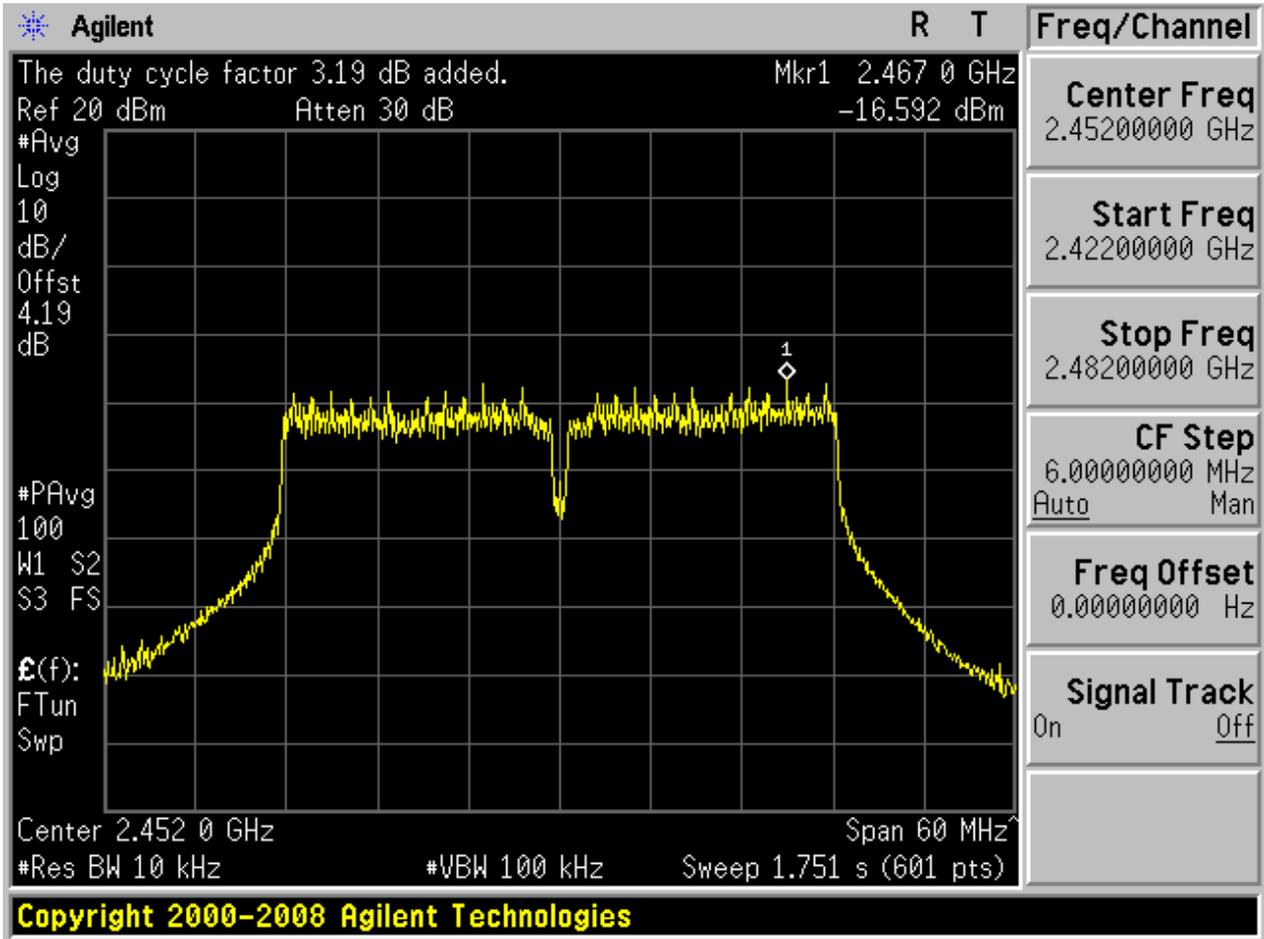


2.11 11N40_M@Ant 1





2.12 11N40_H@Ant 1





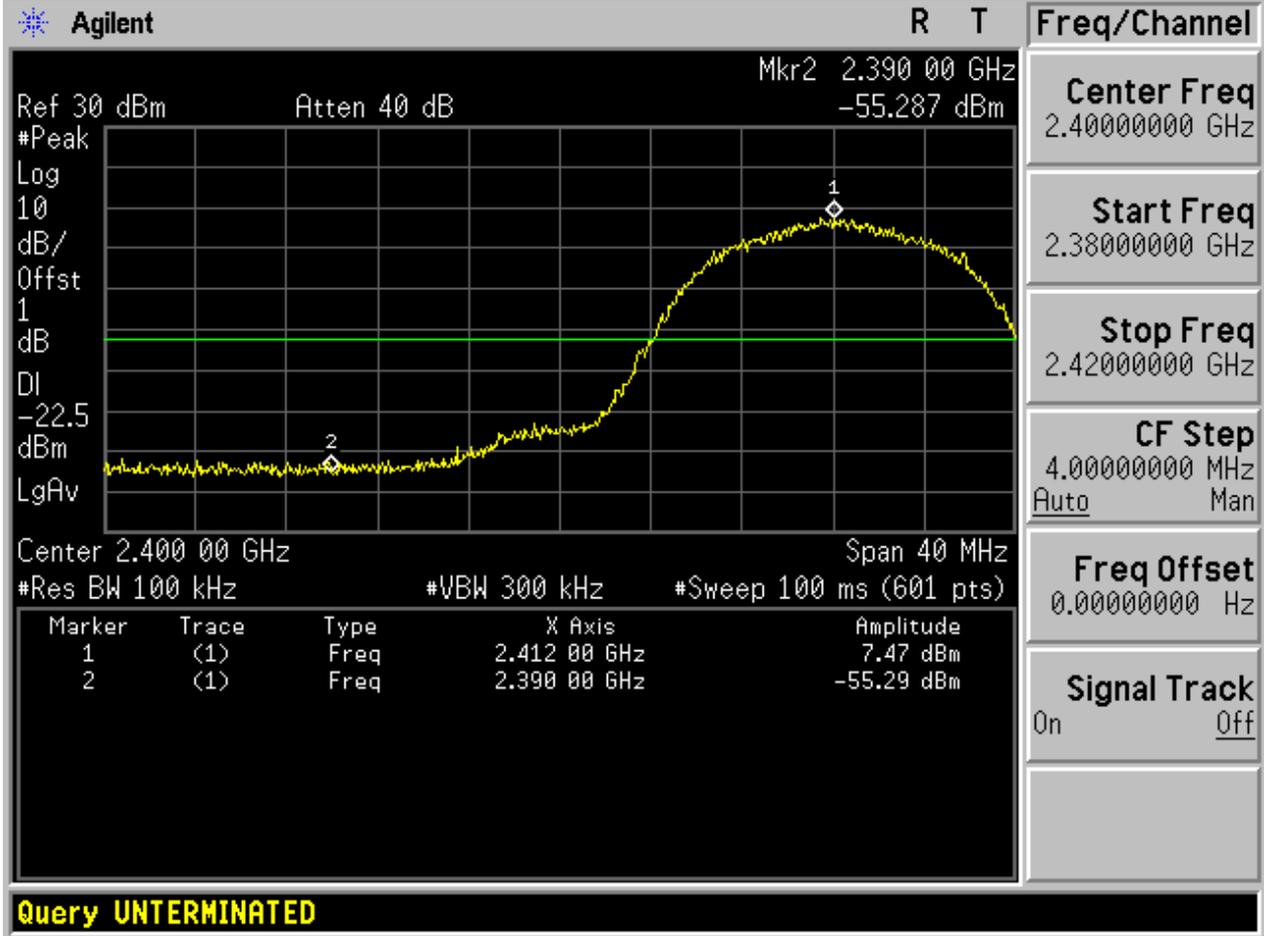
Appendix F: Band Edges Compliance

Part I - Test Results

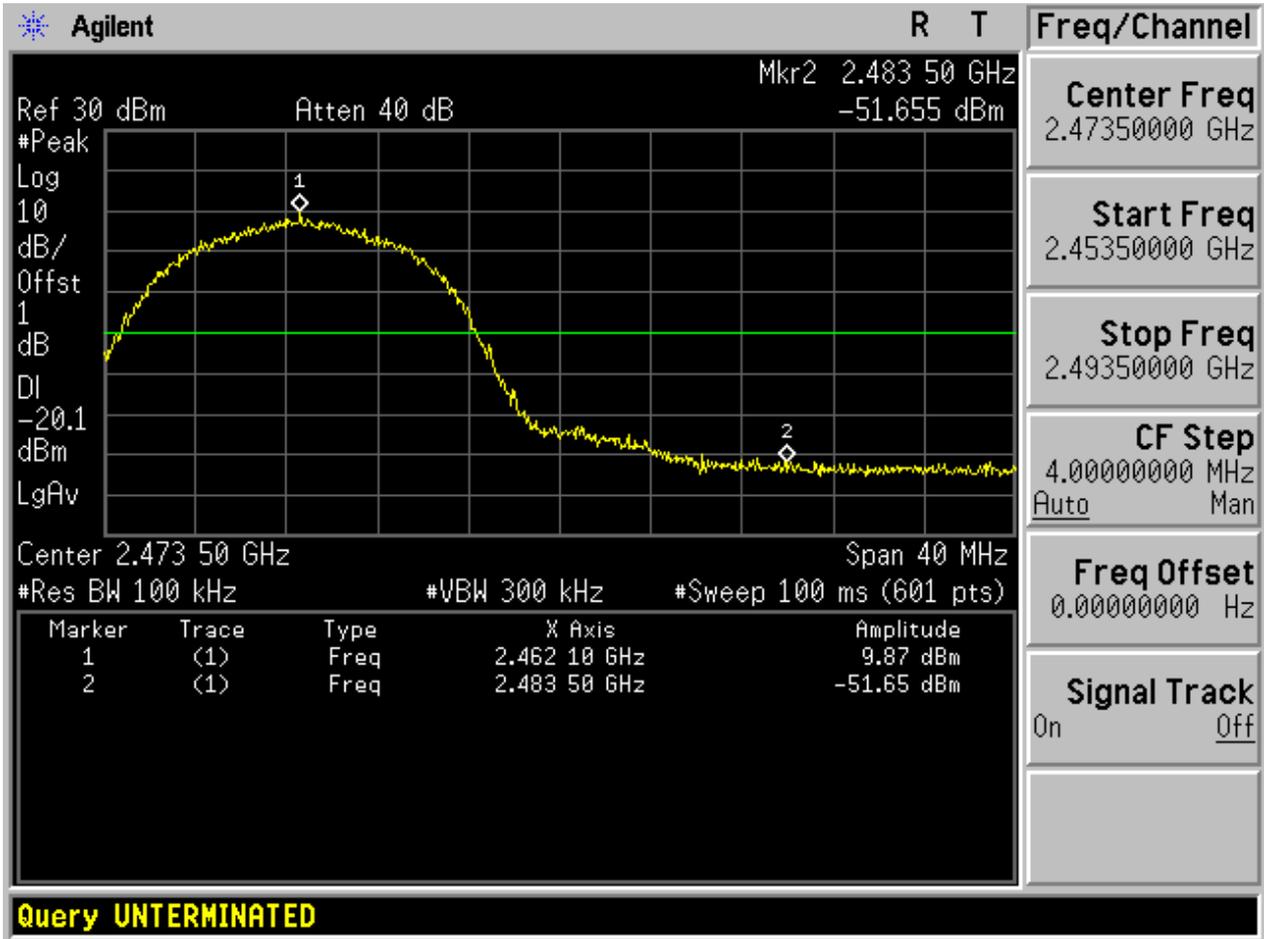
Test Mode	Test Channel	Frequency[MHz]	Ant	Carrier Power[dBm]	Max.Spurious Level[dBm]	Verdict
11B	L	2412	Ant 1	7.46	-55.29	pass
11B	H	2462	Ant 1	9.87	-51.66	pass
11G	L	2412	Ant 1	3.98	-54.48	pass
11G	H	2462	Ant 1	4.04	-46.50	pass
11N20	L	2412	Ant 1	1.97	-53.80	pass
11N20	H	2462	Ant 1	2.10	-49.09	pass
11N40	L	2422	Ant 1	-1.45	-53.03	pass
11N40	H	2452	Ant 1	-0.70	-45.17	pass

Part II - Test Plots

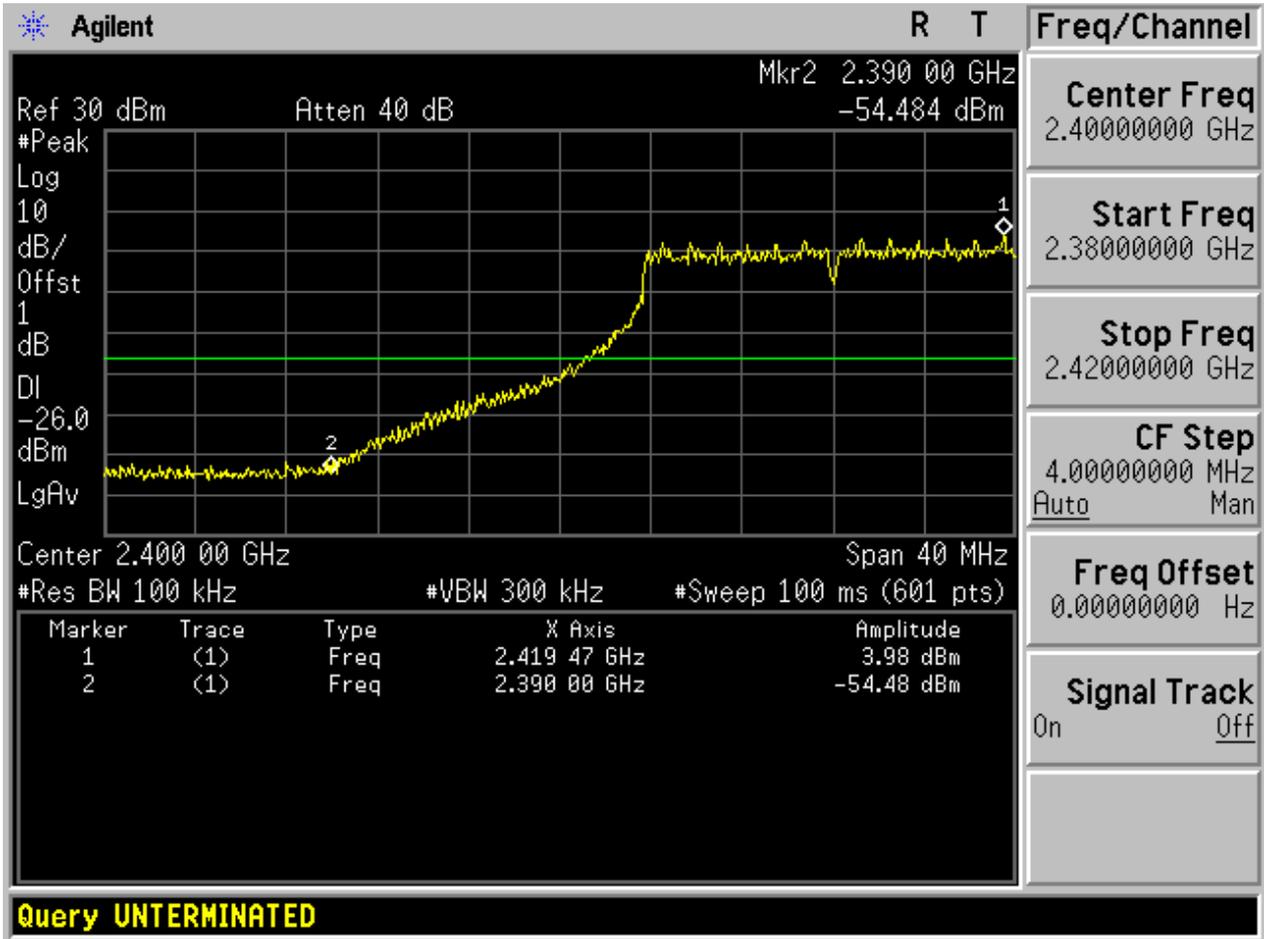
2.1 11B_L@Ant 1



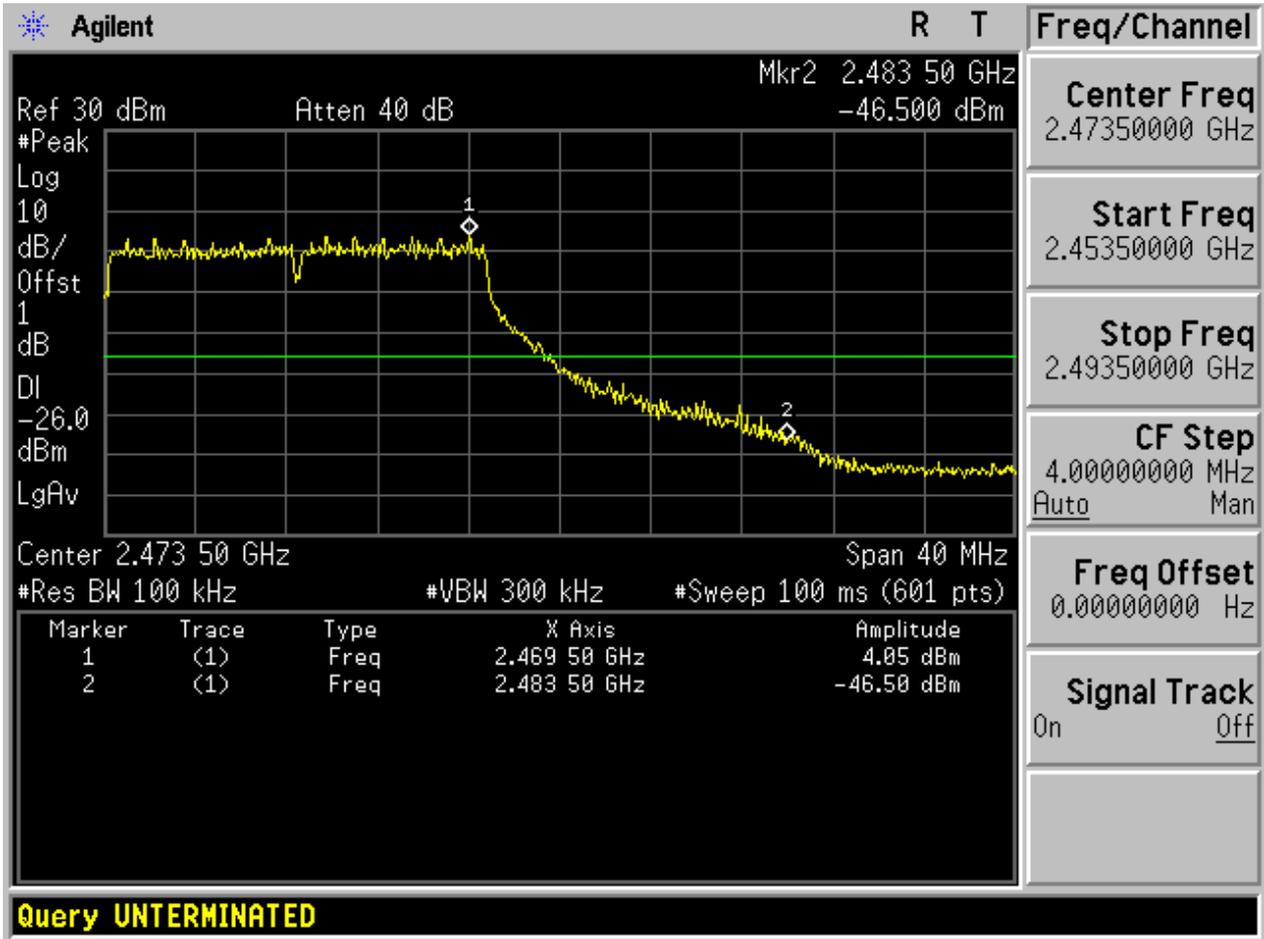
2.2 11B_H@Ant 1



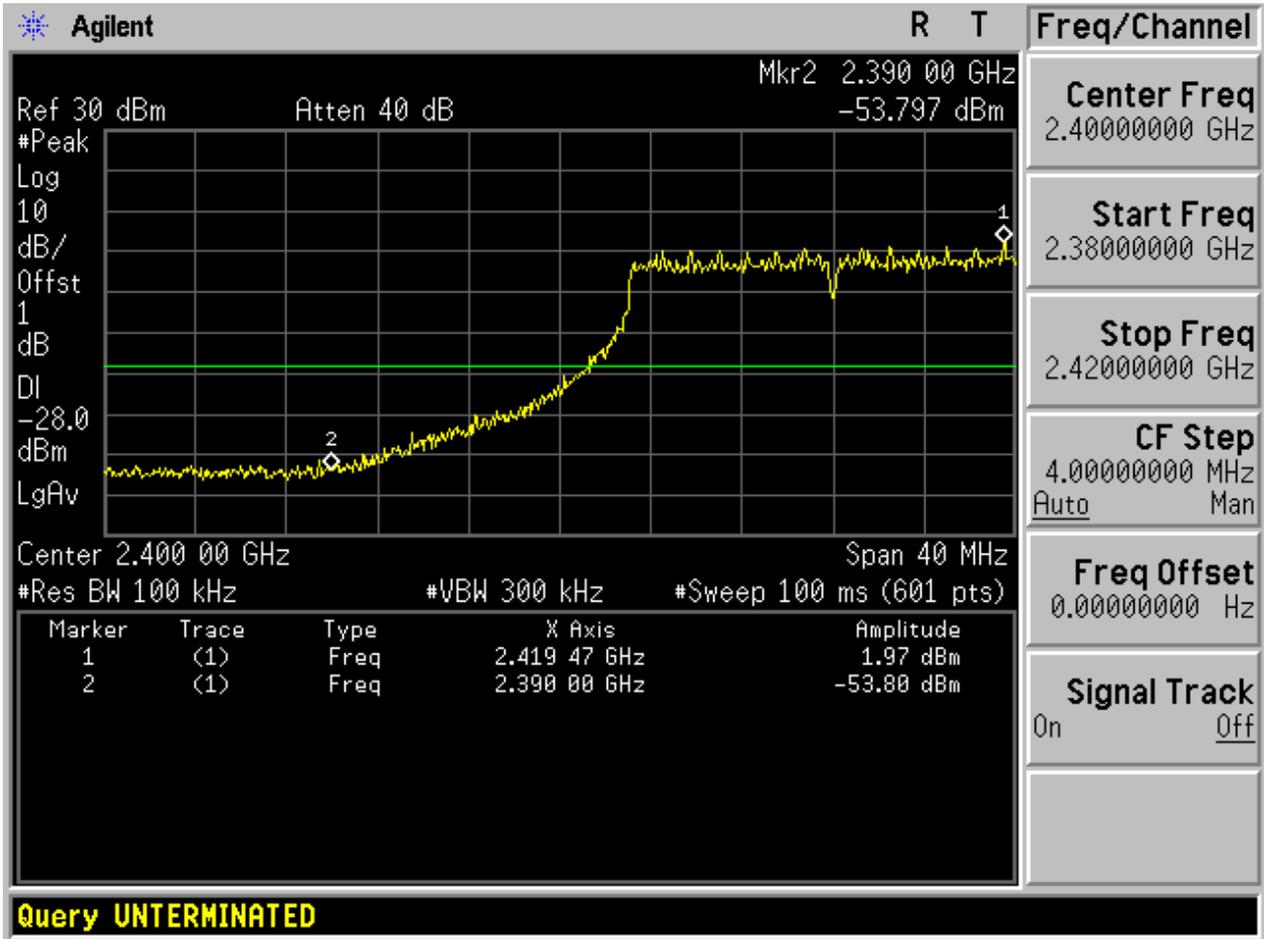
2.4 11G_L@Ant 1



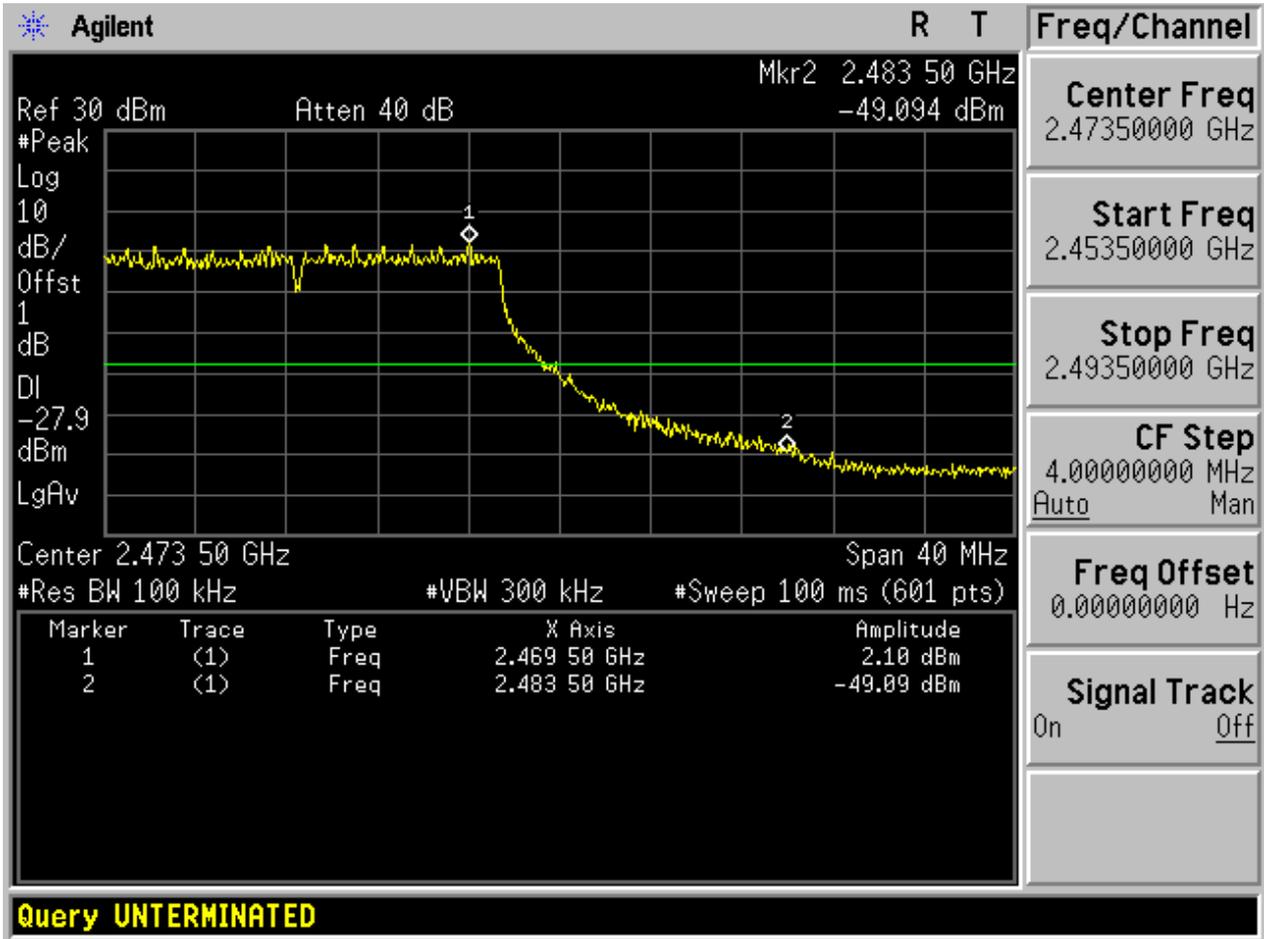
2.5 11G_H@Ant 1



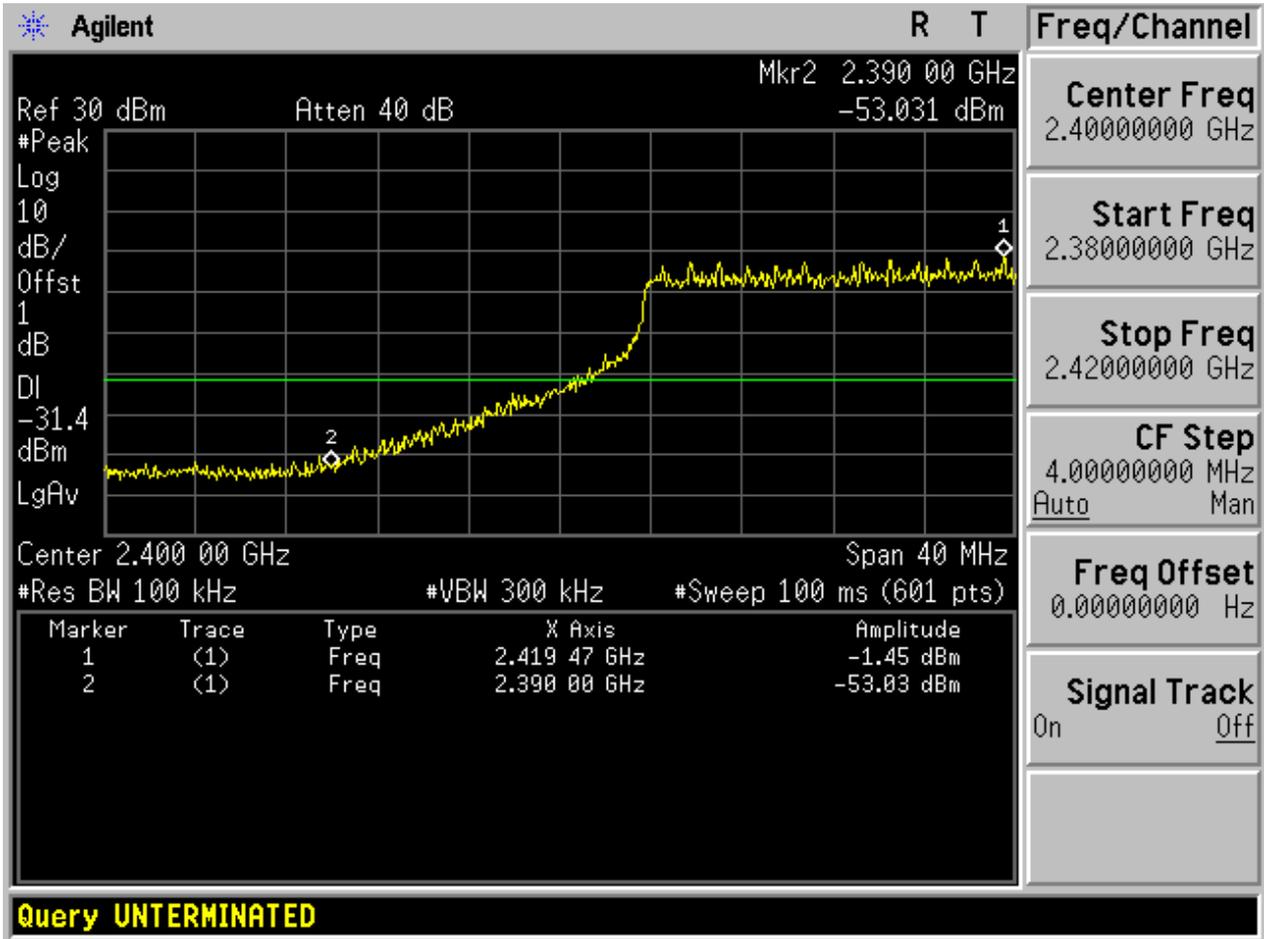
2.6 11N20_L@Ant 1



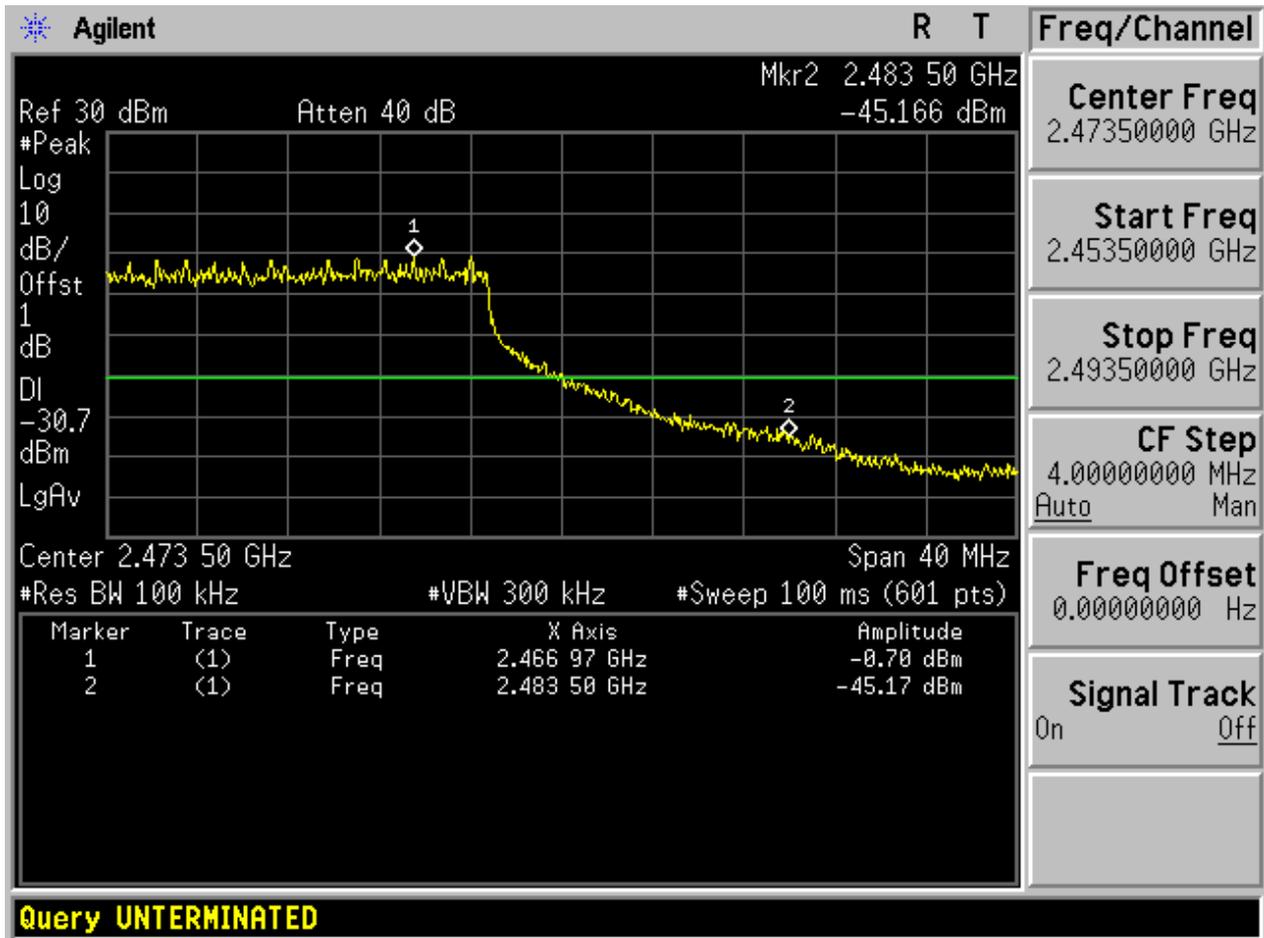
2.7 11N20_H@Ant 1



2.8 11N40_L@Ant 1



2.9 11N40_H@Ant 1



Appendix G: Unwanted Emissions into Non-Restricted Frequency

Bands

In this Appendix, the "Pref", which is used as the reference level, refers to the peak power level in any 100 kHz bandwidth within the fundamental emission, the "Puw" refers to the maximum emission power in 100 kHz band segments outside of the authorized frequency band.

Considering that the higher ratio of RBW to the span for the frequency ranges below 30 MHz makes the results determination be complicated, a narrower RBW other than 100 kHz is used for these ranges. The measured value should add a RBW correction factor (RBWCF) where $RBWCF [dB] = 10 \times \lg(100 [kHz]/\text{narrower RBW [kHz]})$. As to this Appendix, the narrower RBW is 1 kHz and RBWCF is 20 dB for the frequency 9 kHz to 150 kHz, and the narrower RBW is 10 kHz and RBWCF is 10 dB for the frequency 150 kHz to 30 MHz.

For measurements on smart antenna systems (devices with multiple transmit chains), the test is performed at each chain and used as respective results for each chain, due to the relative-limit requirement.

In the result table, the "< Limit" denotes that "The Puw [dBm] is less than Pref[dBm]-30[dBm], see test plots for detailed".

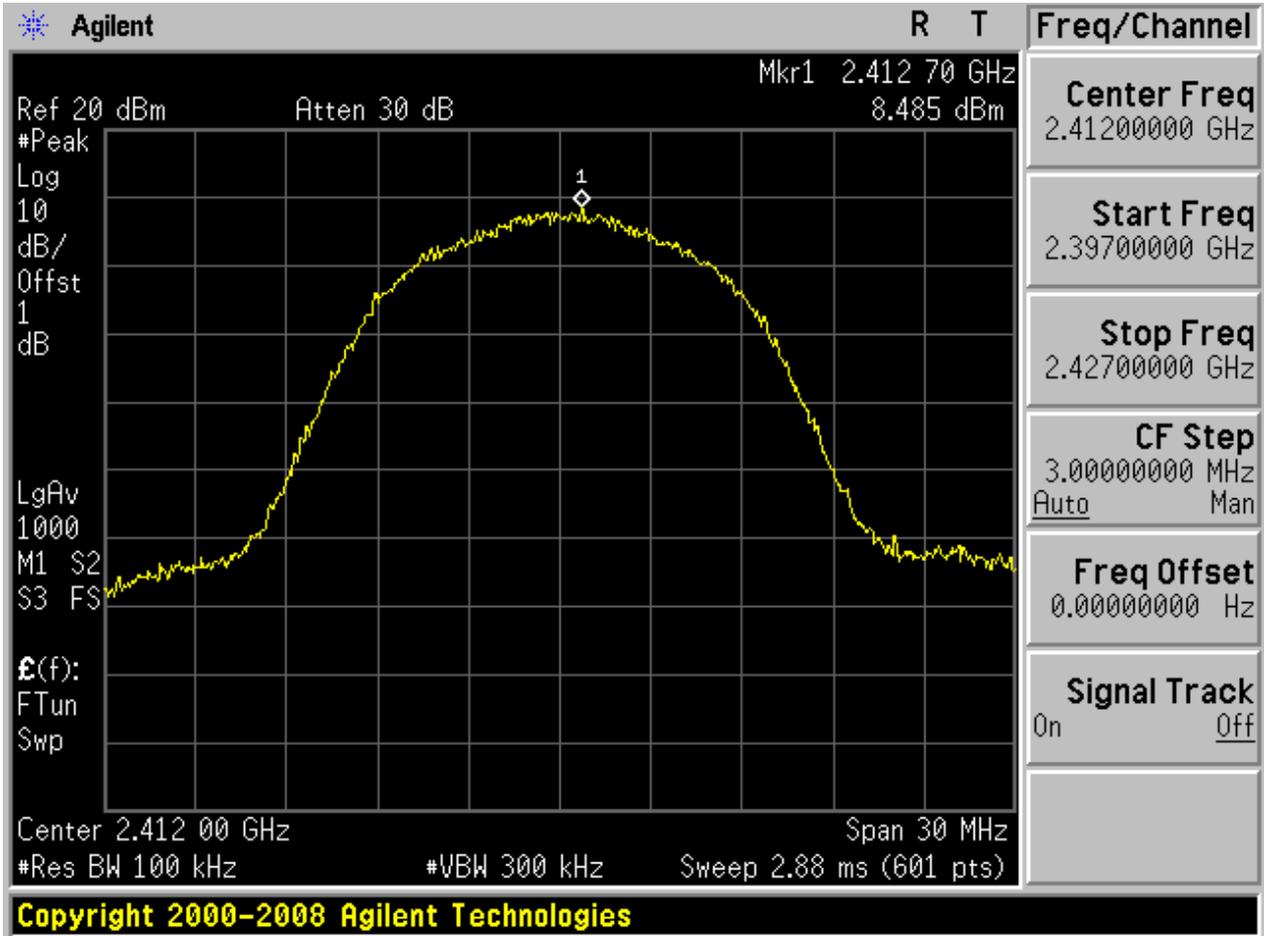
Part I - Test Results

Test Mode	Test Channel	Frequency[MHz]	Ant	Pref[dBm]	Puw[dBm]	Verdict
11B	L	2412	Ant 1	8.48	<limit	pass
11B	M	2437	Ant 1	9.32	<limit	pass
11B	H	2462	Ant 1	9.60	<limit	pass
11G	L	2412	Ant 1	4.11	<limit	pass
11G	M	2437	Ant 1	3.83	<limit	pass
11G	H	2462	Ant 1	4.42	<limit	pass
11N20	L	2412	Ant 1	2.07	<limit	pass
11N20	M	2437	Ant 1	1.77	<limit	pass
11N20	H	2462	Ant 1	2.39	<limit	pass
11N40	L	2422	Ant 1	-0.57	<limit	pass
11N40	M	2437	Ant 1	-0.81	<limit	pass
11N40	H	2452	Ant 1	-0.42	<limit	pass

Part II - Test Plots

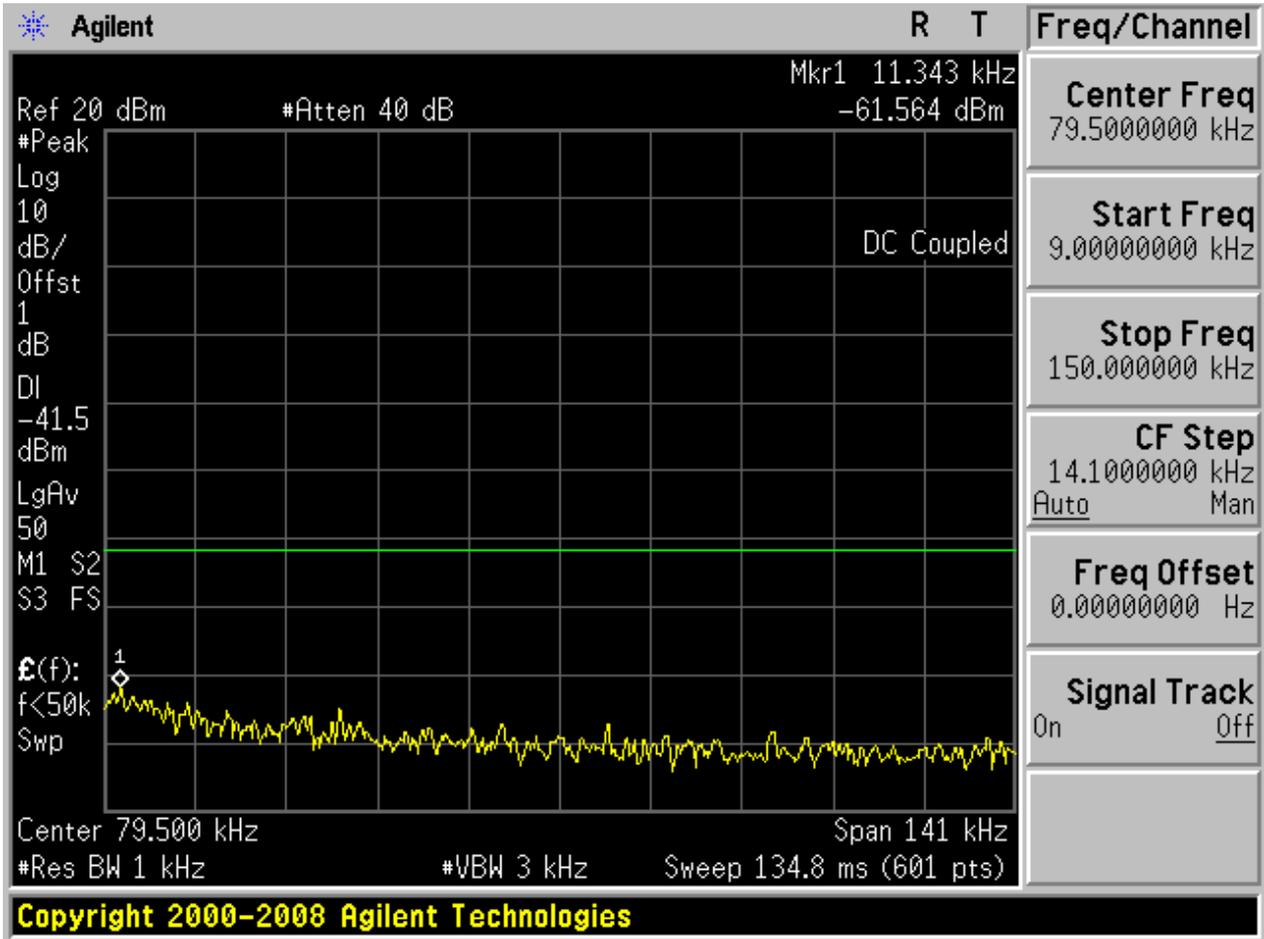
2.1 11B_L@Ant 1

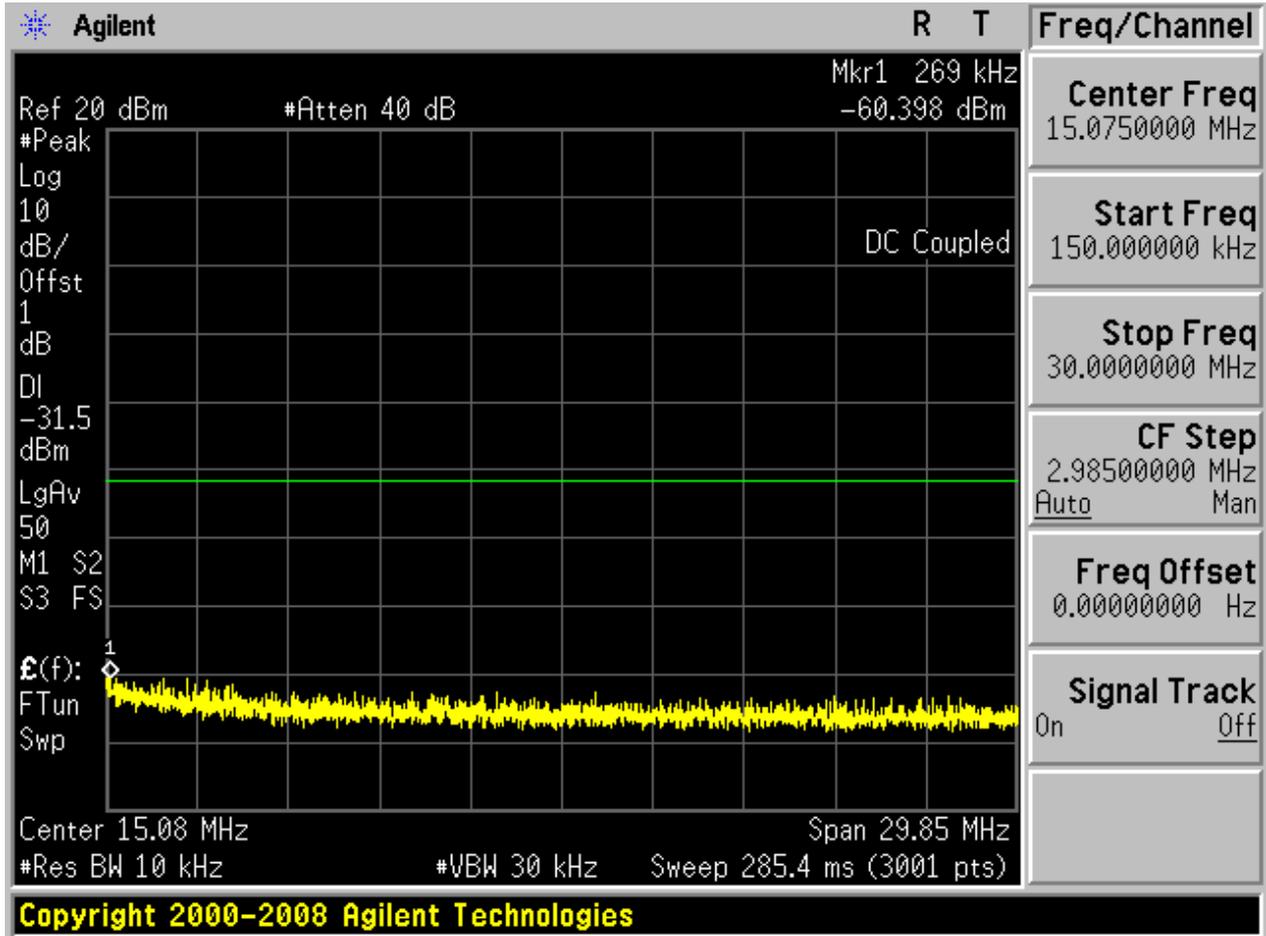
Pref:

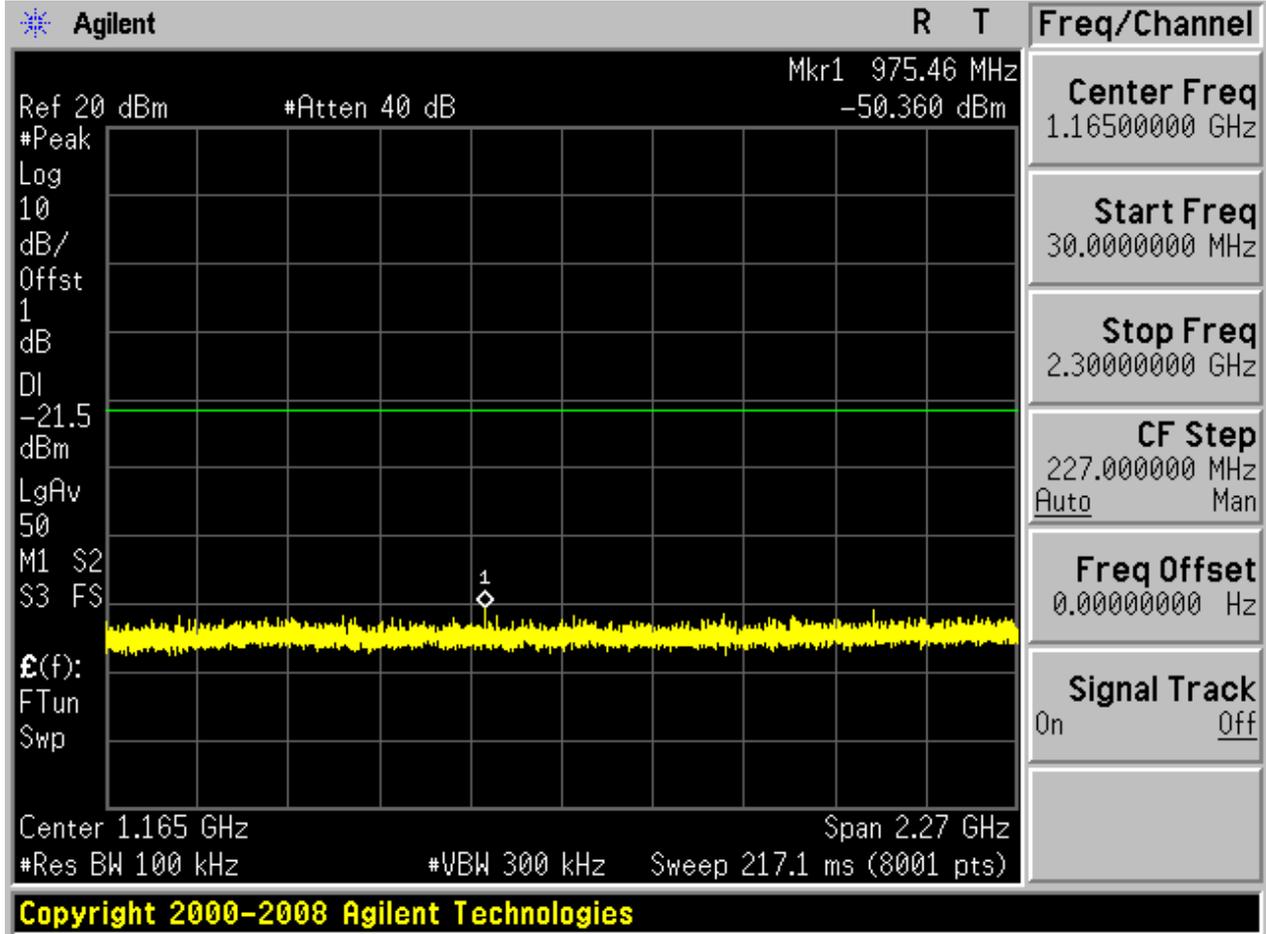


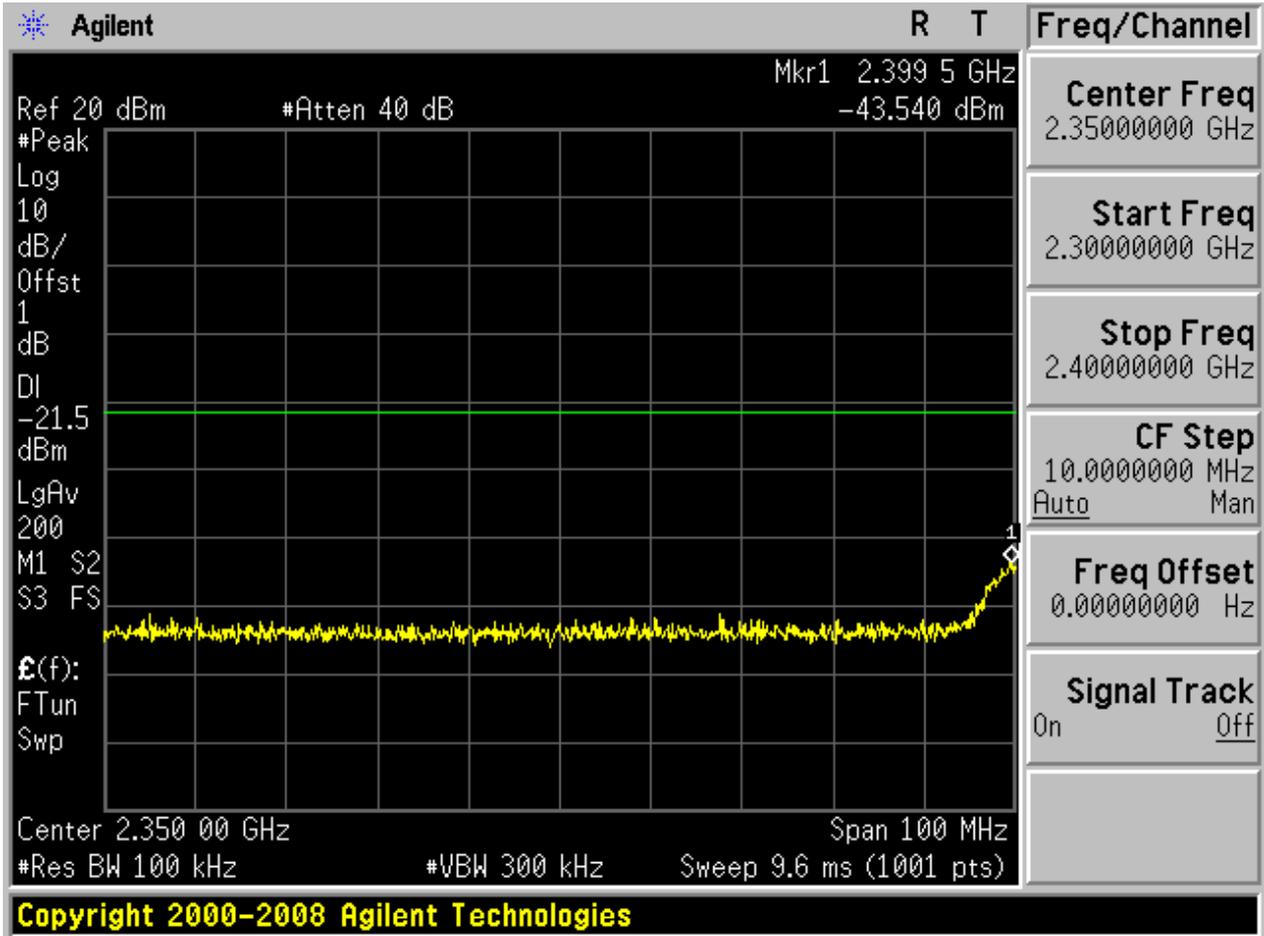


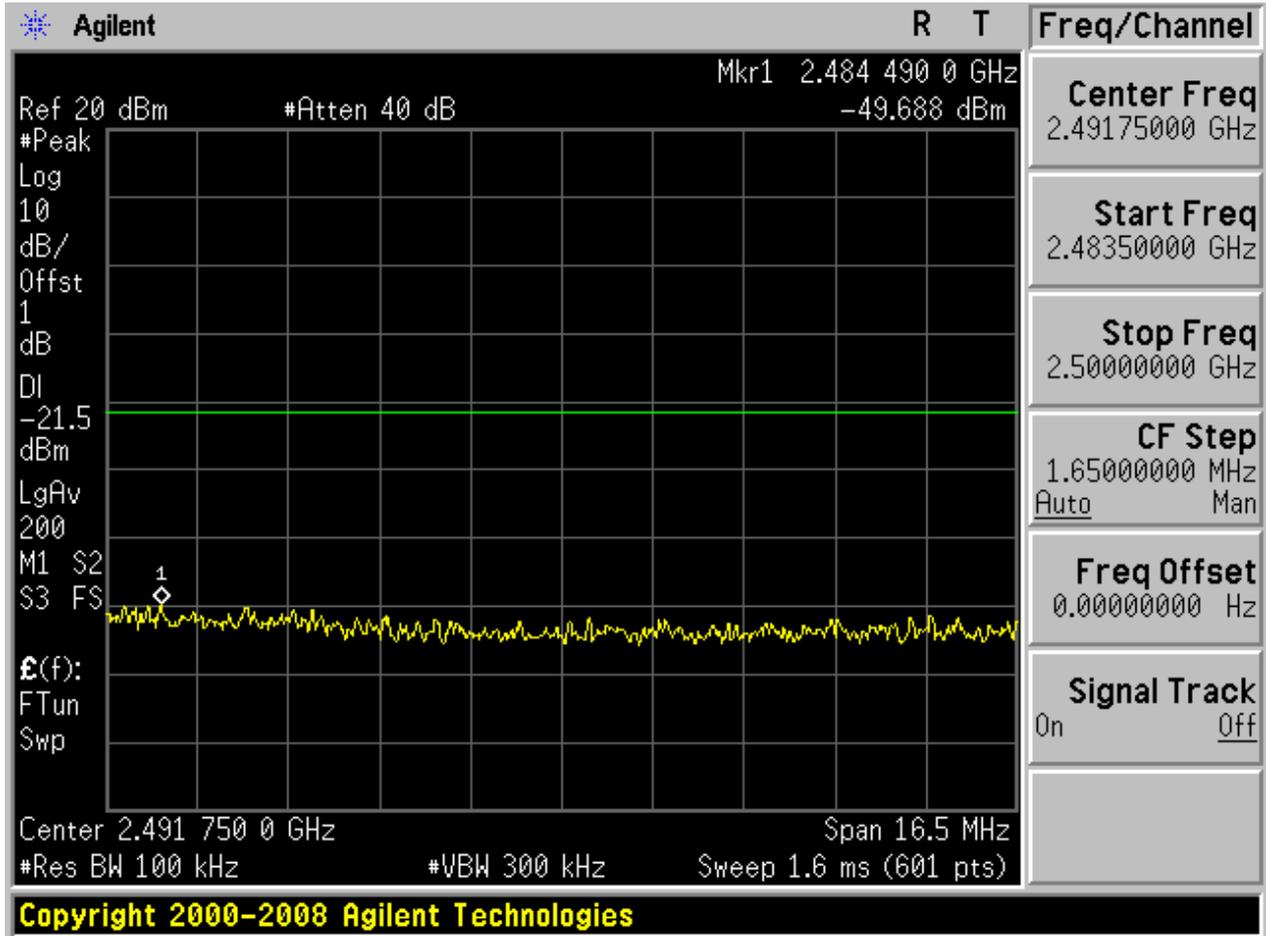
Puw:

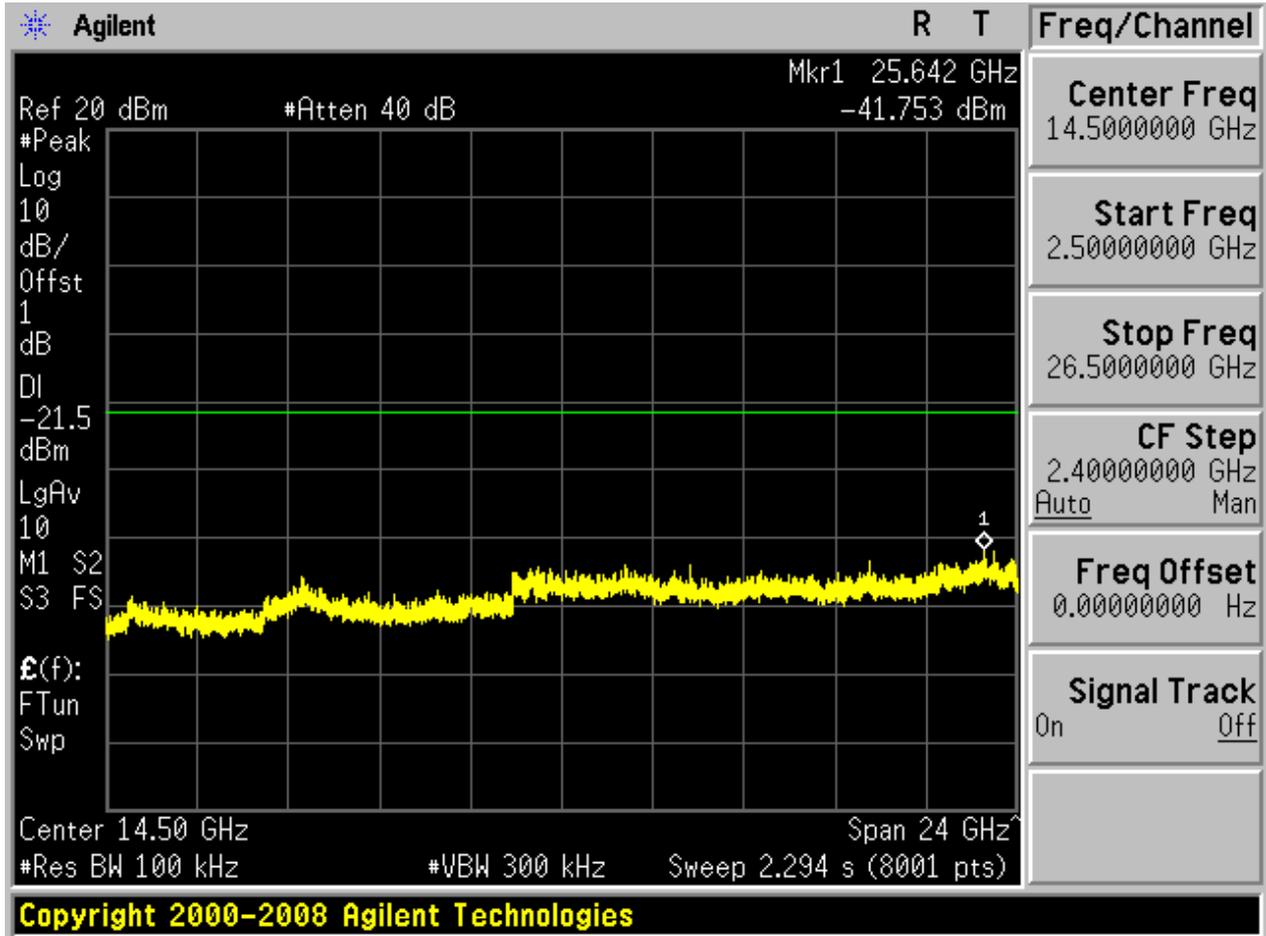






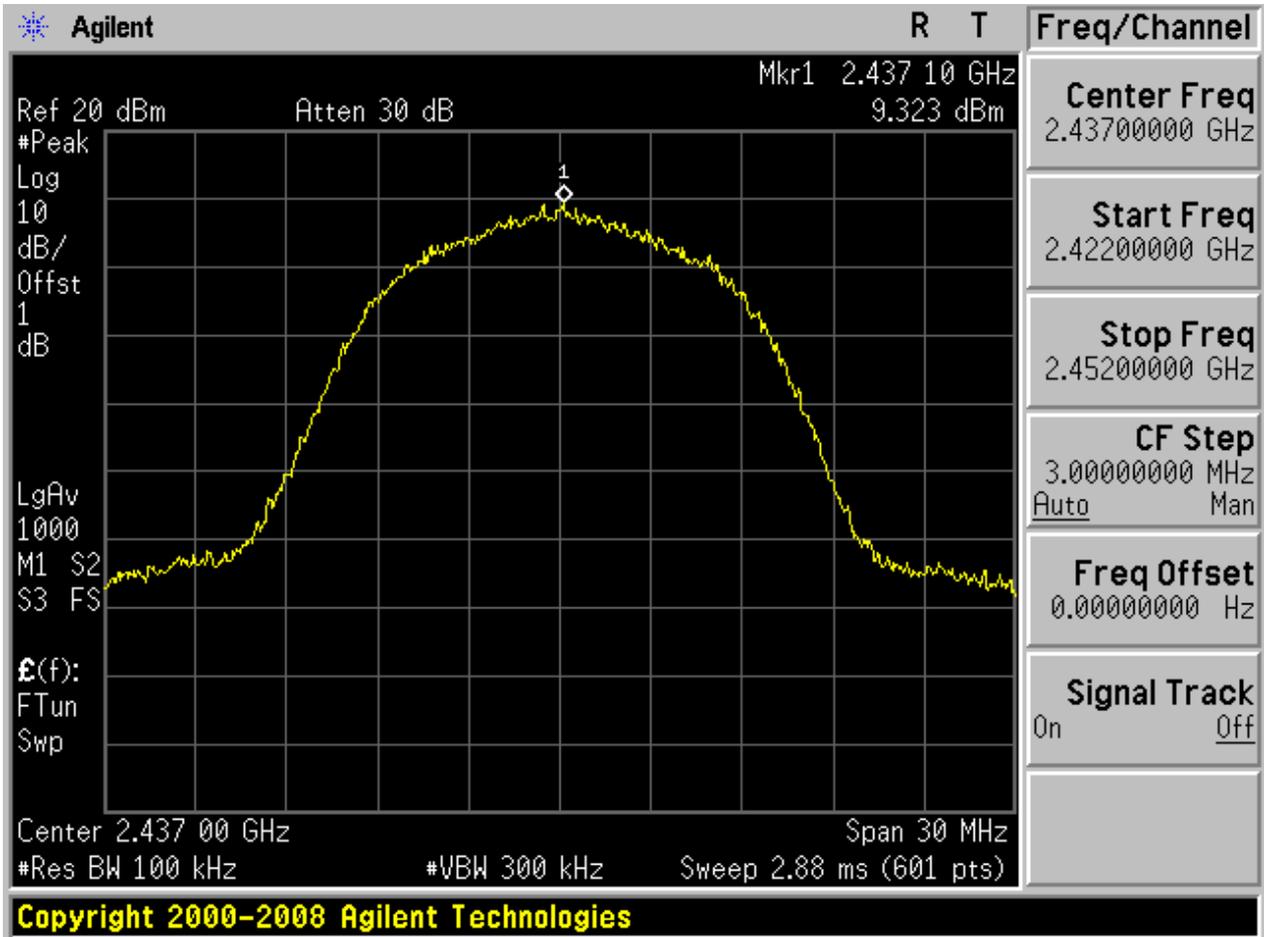






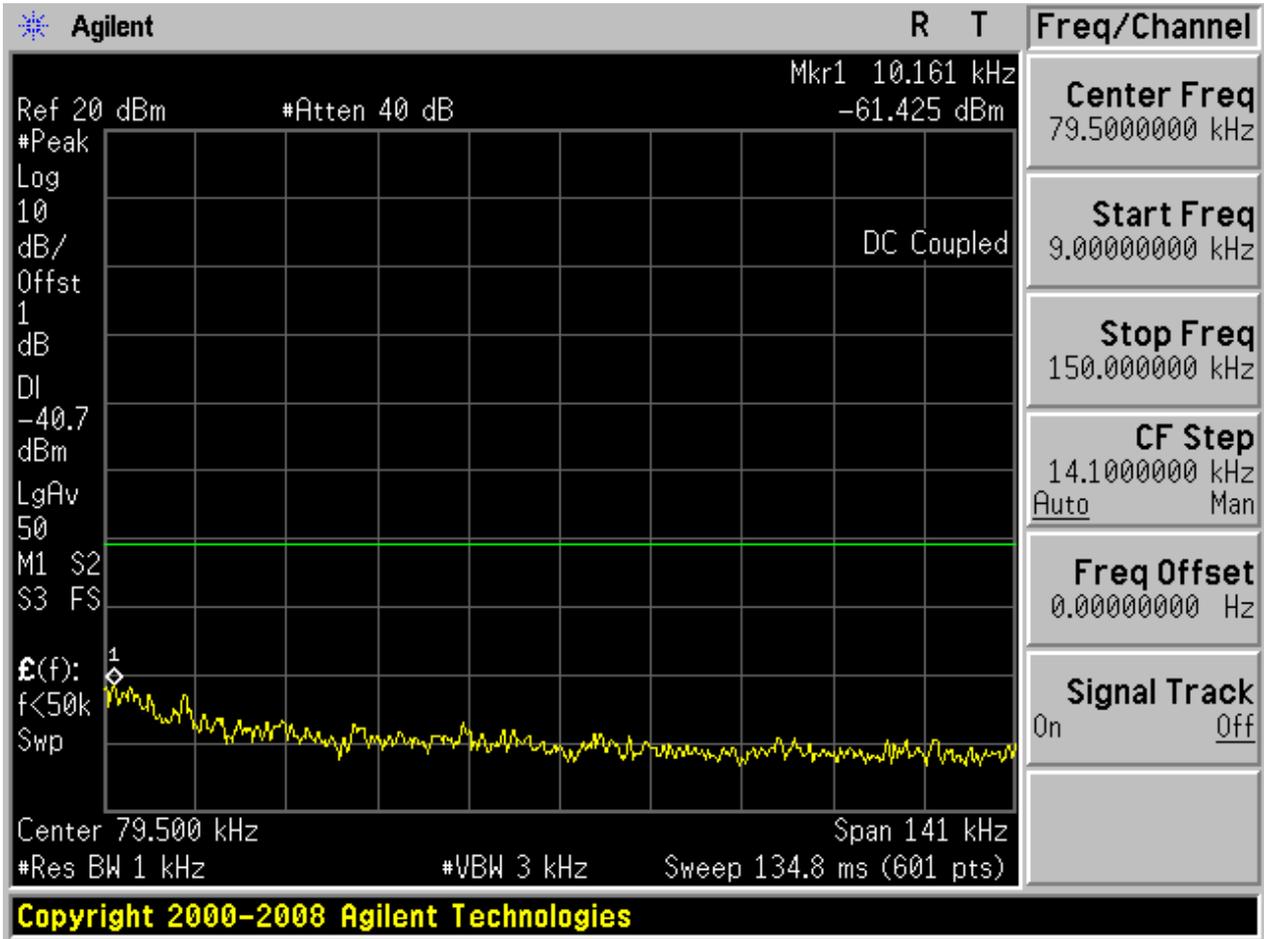
2.2 11B_M@Ant 1

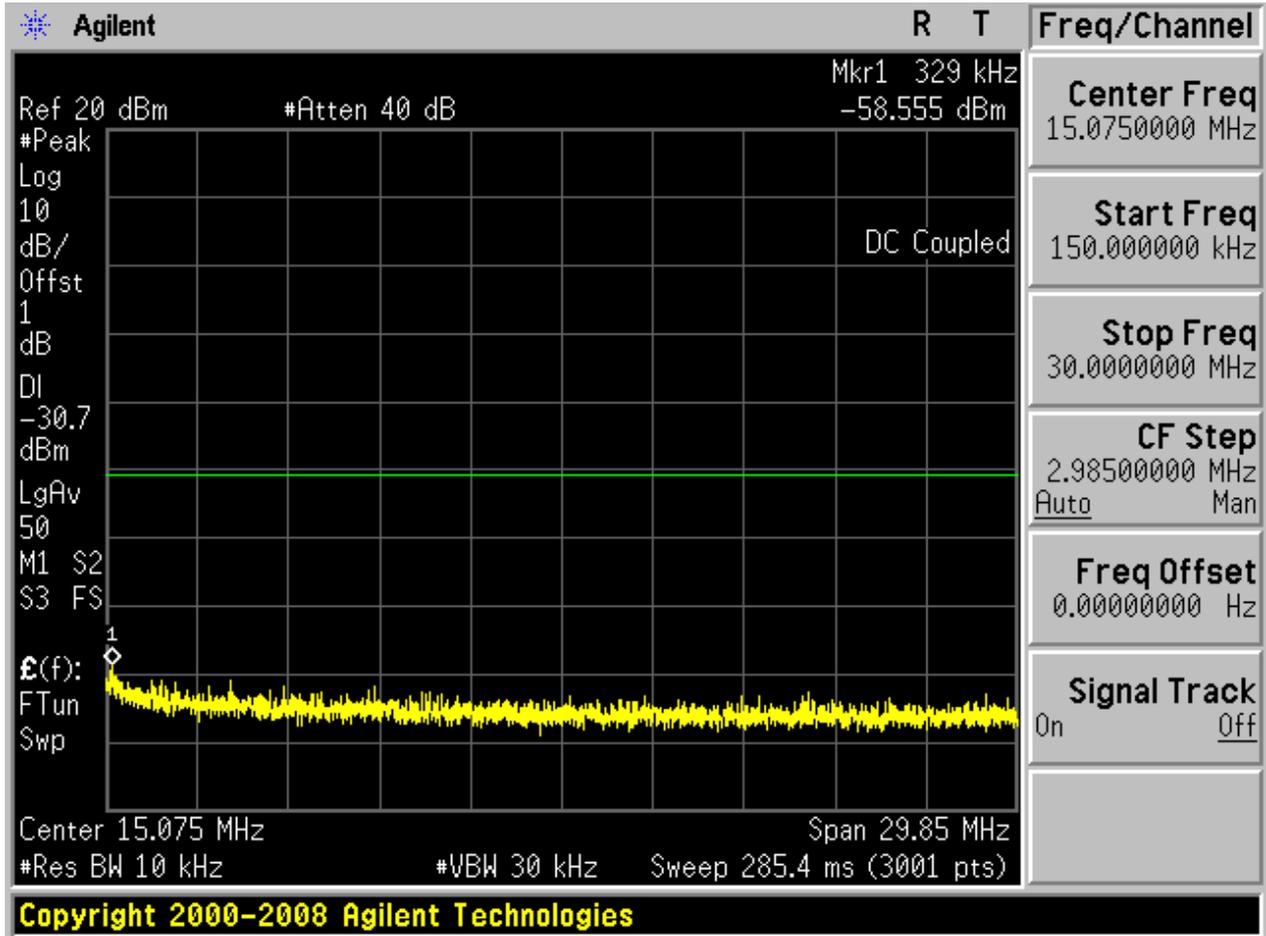
Pref:

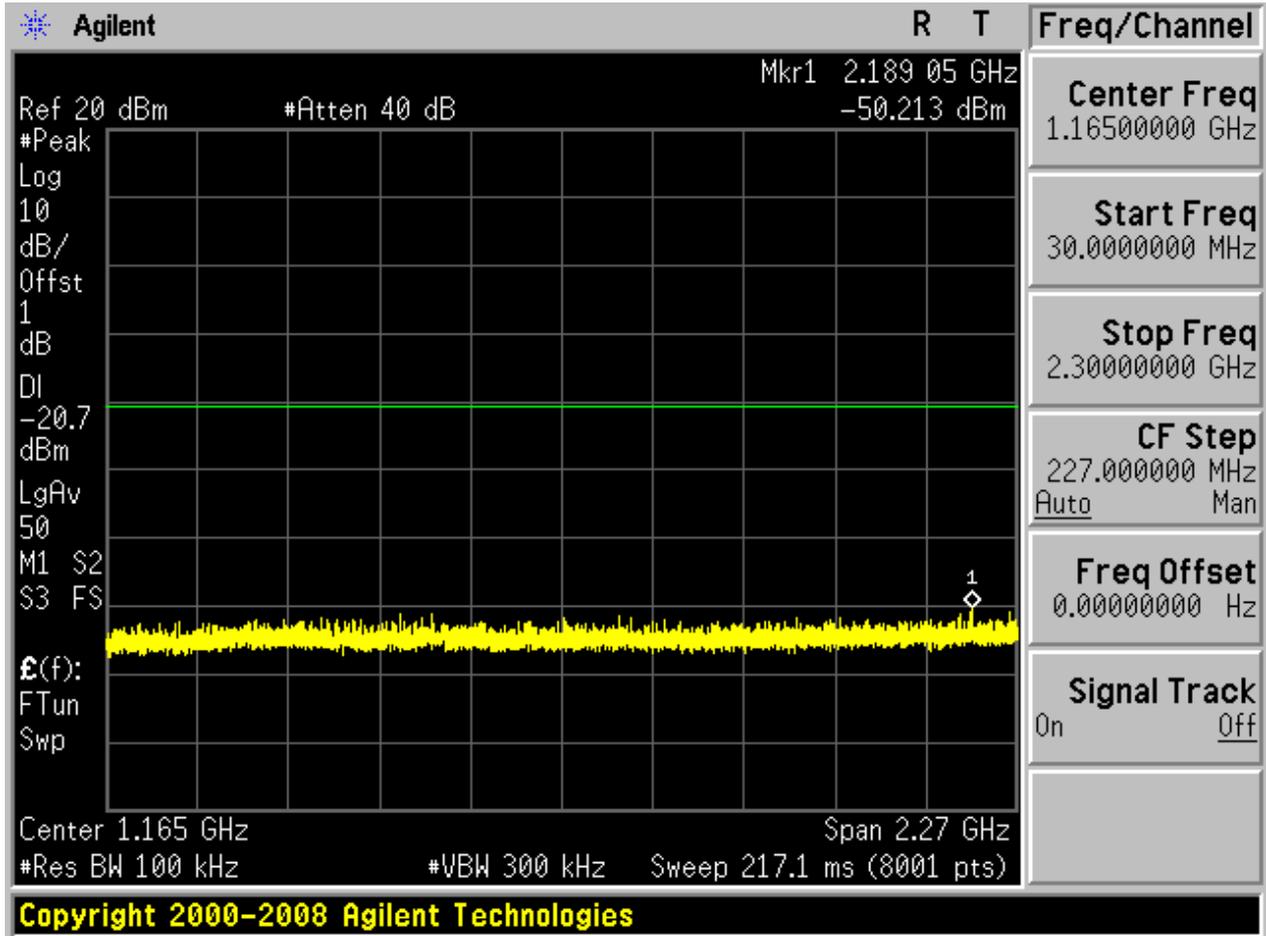


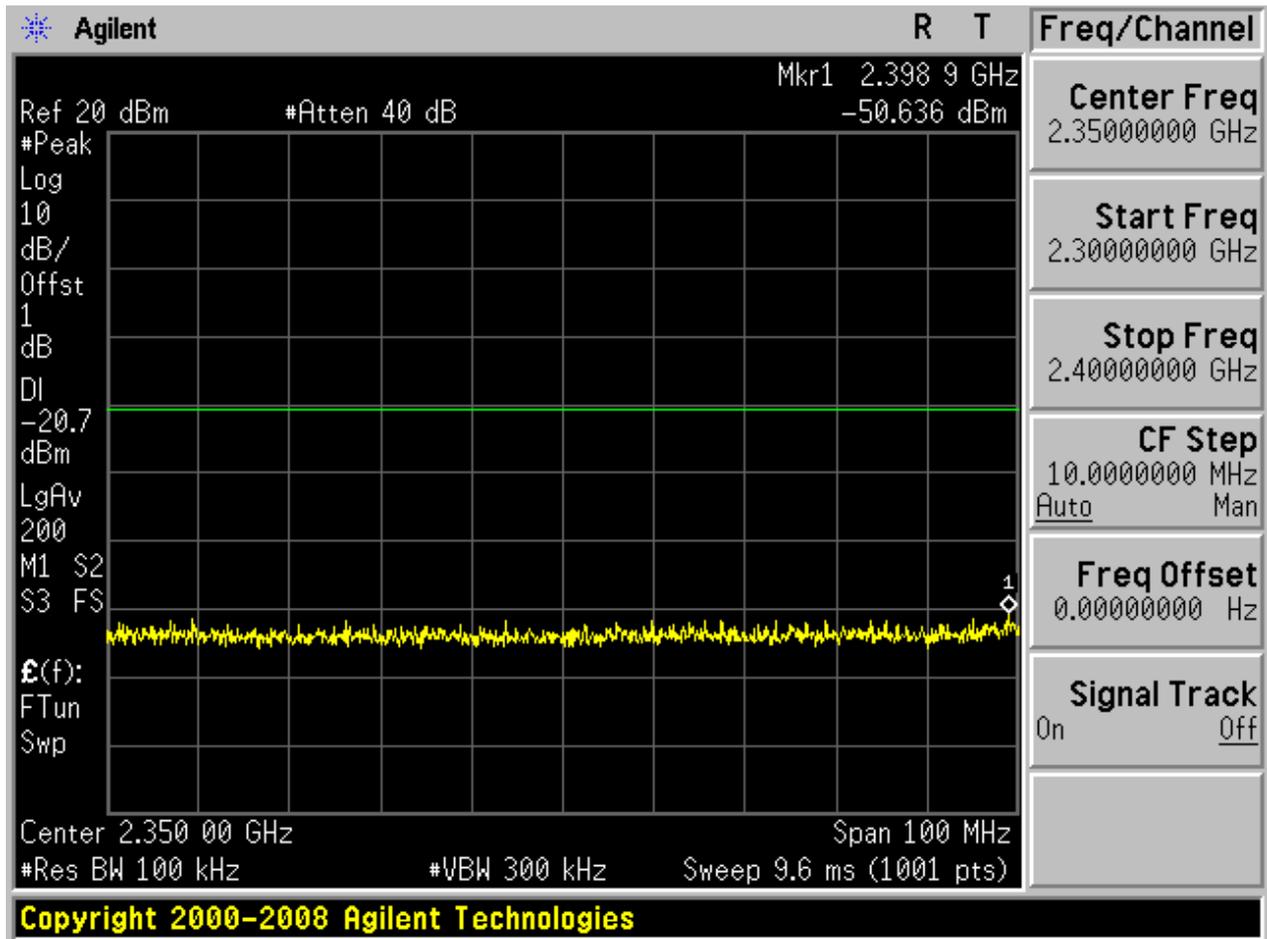


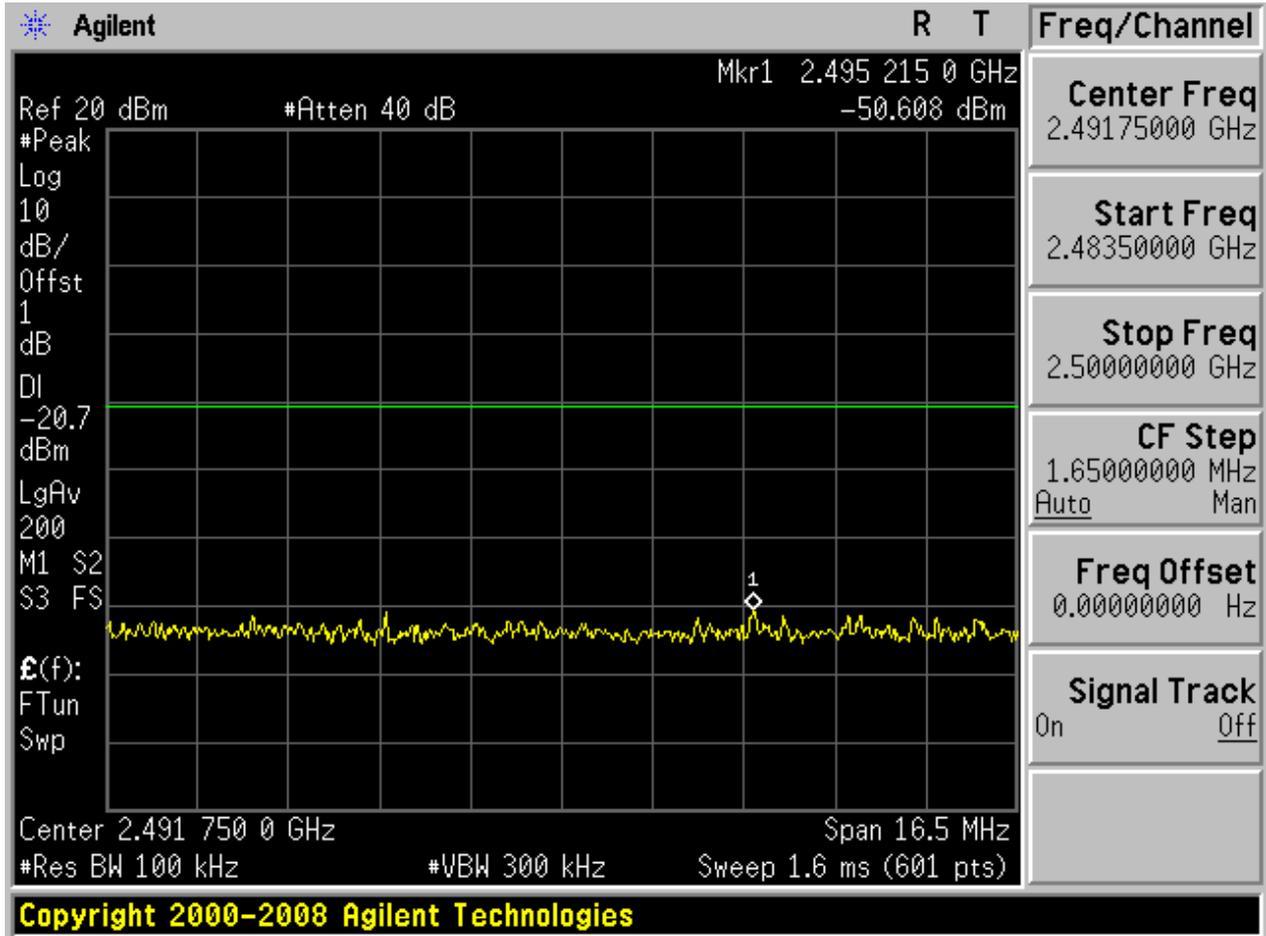
Puw:

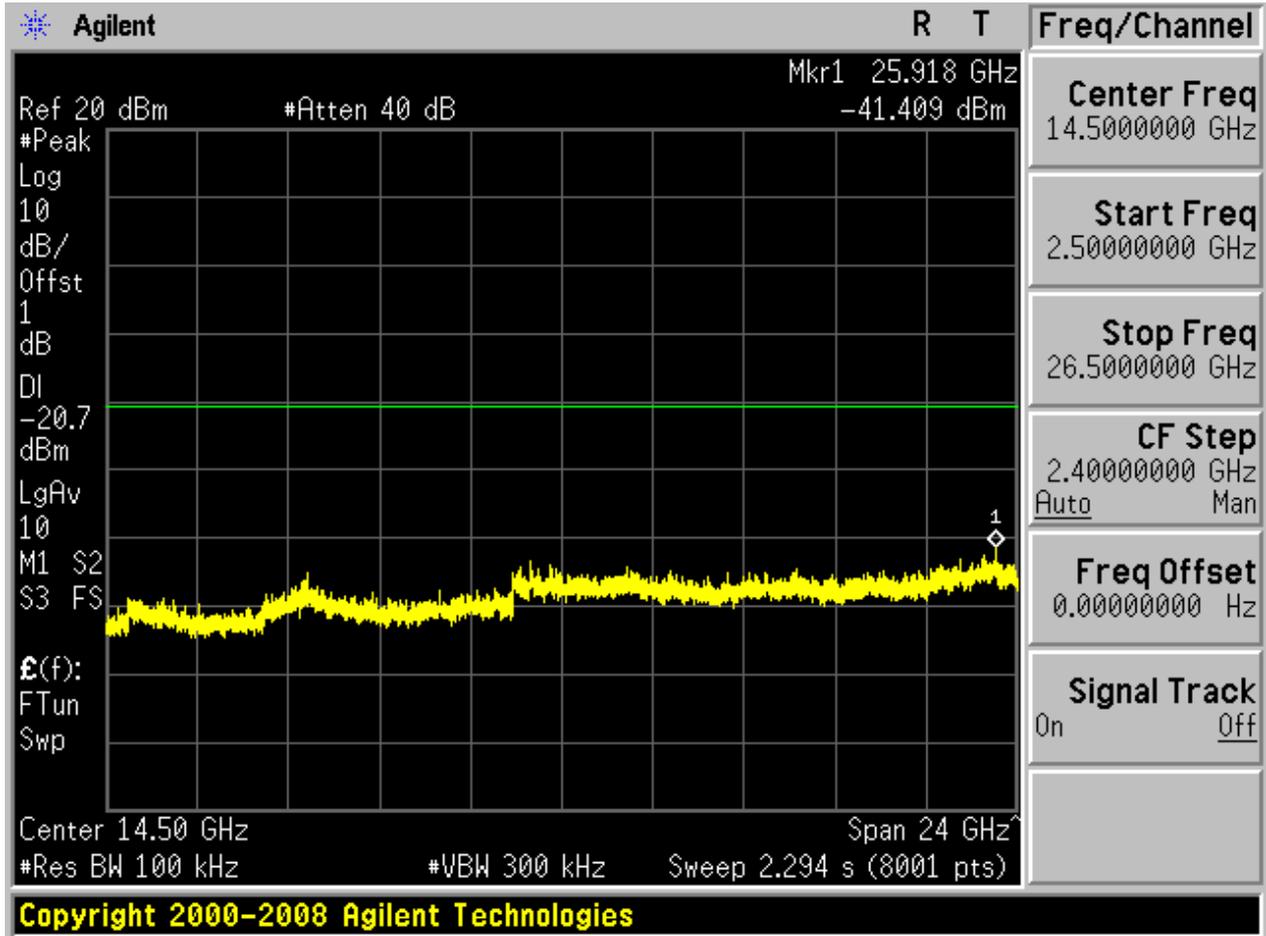






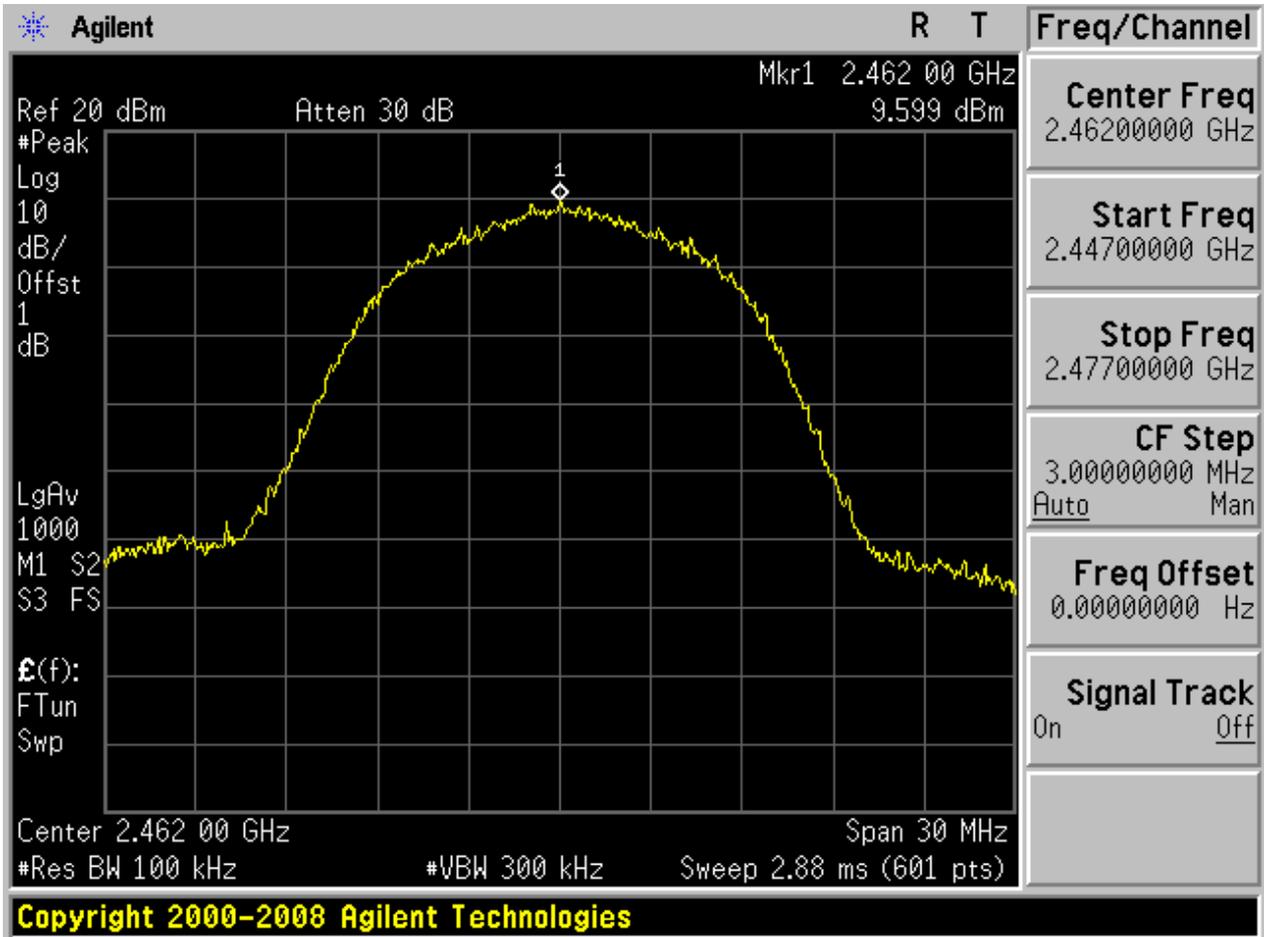






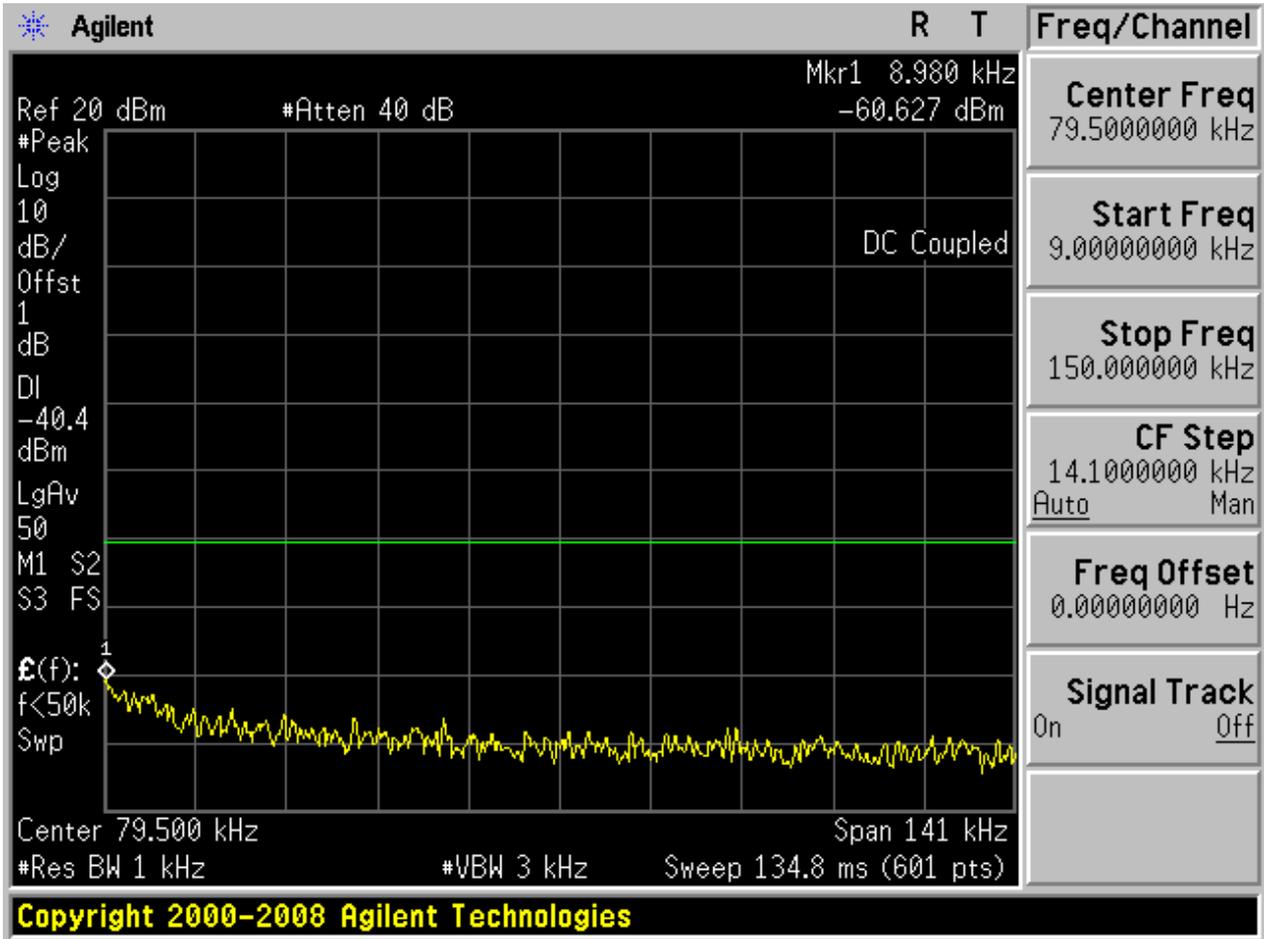
2.3 11B_H@Ant 1

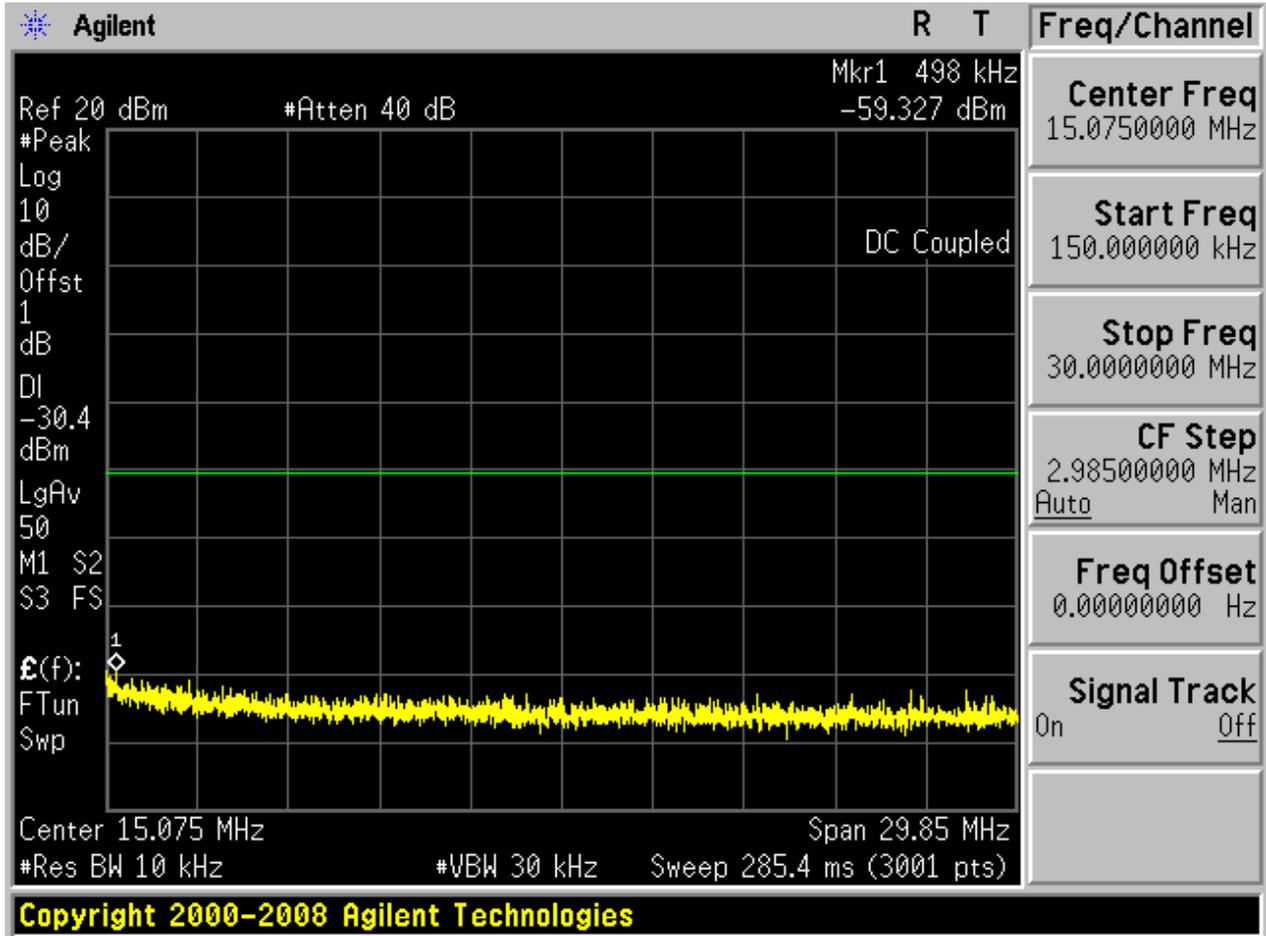
Pref:

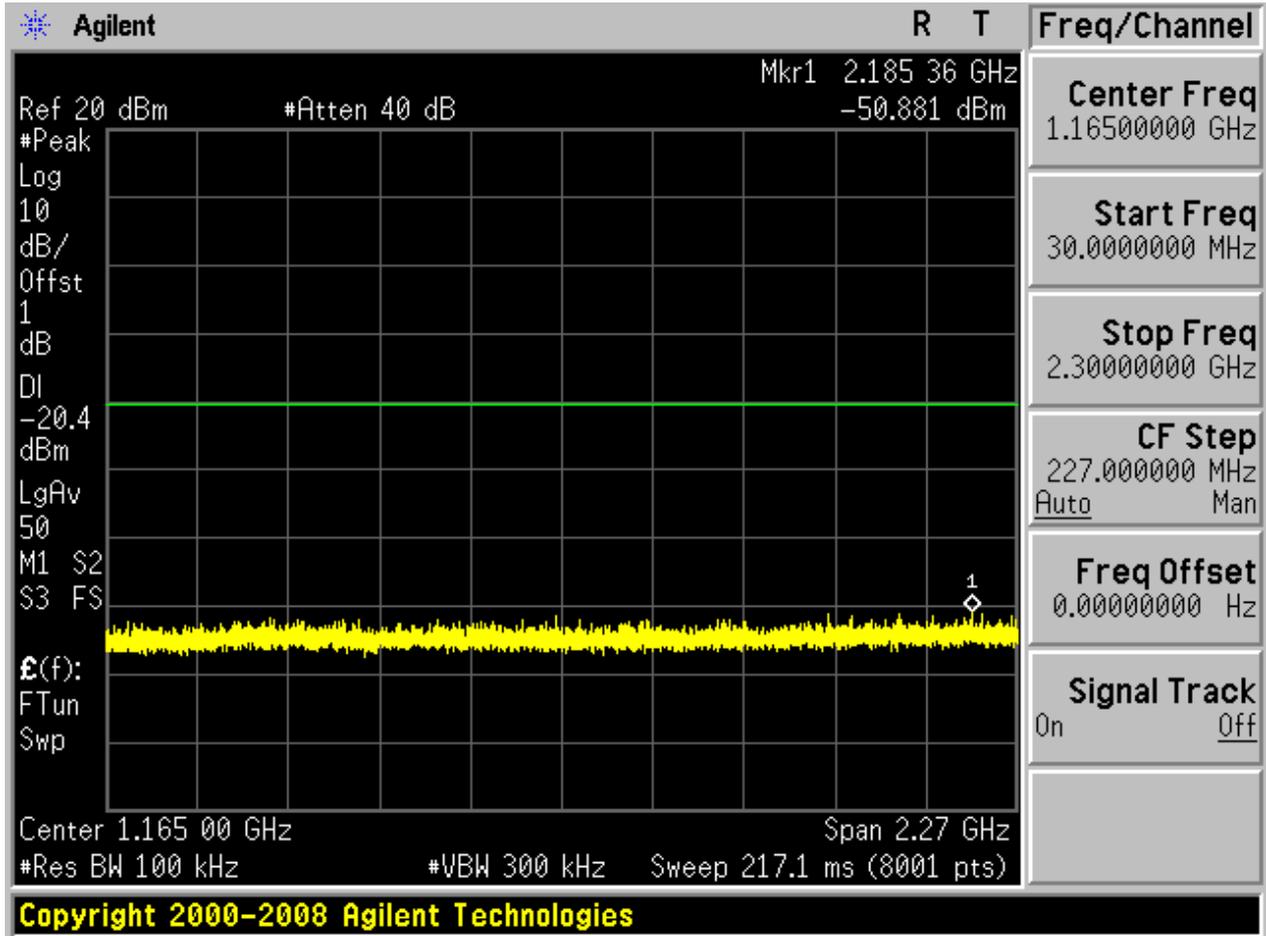


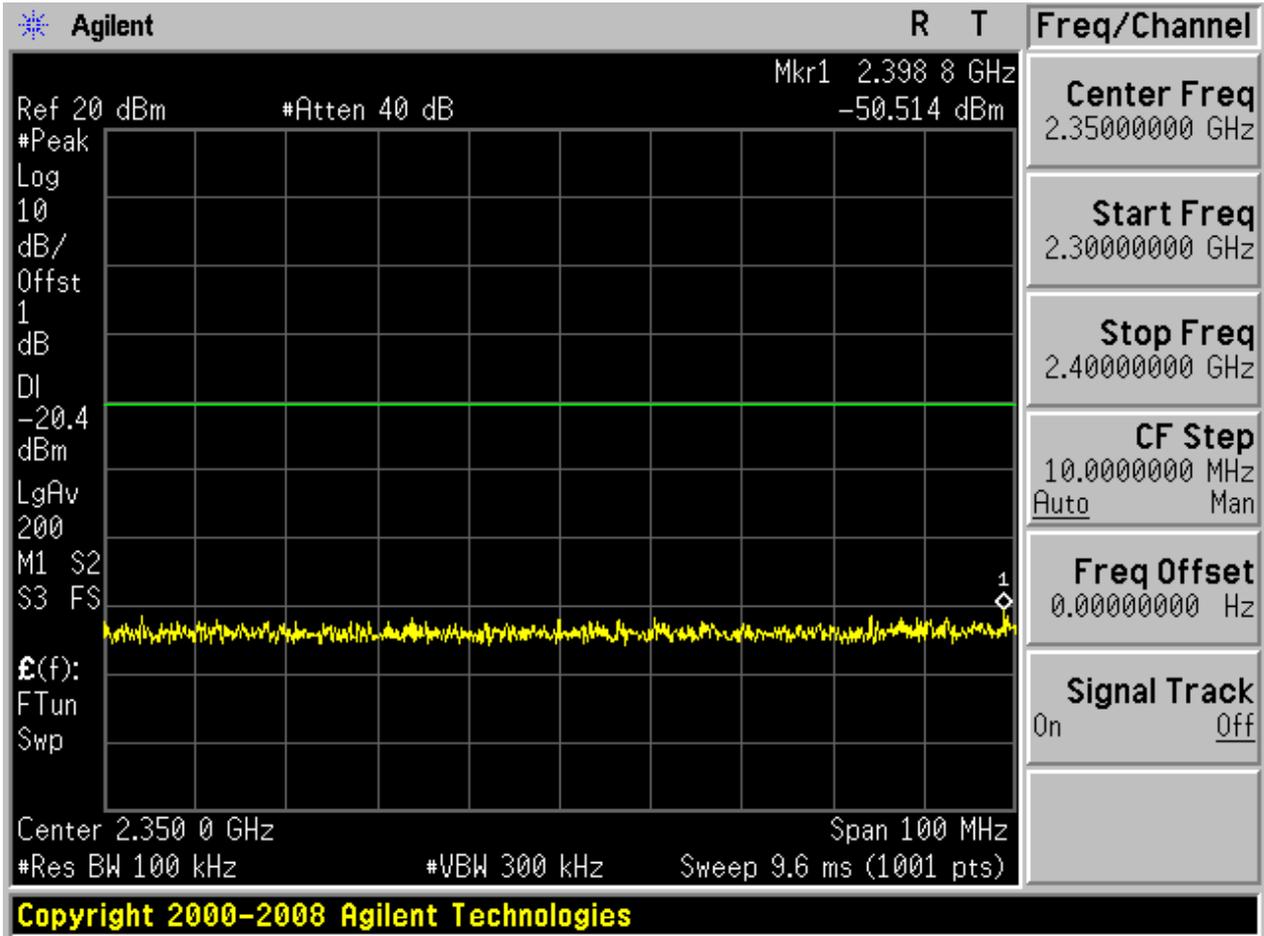


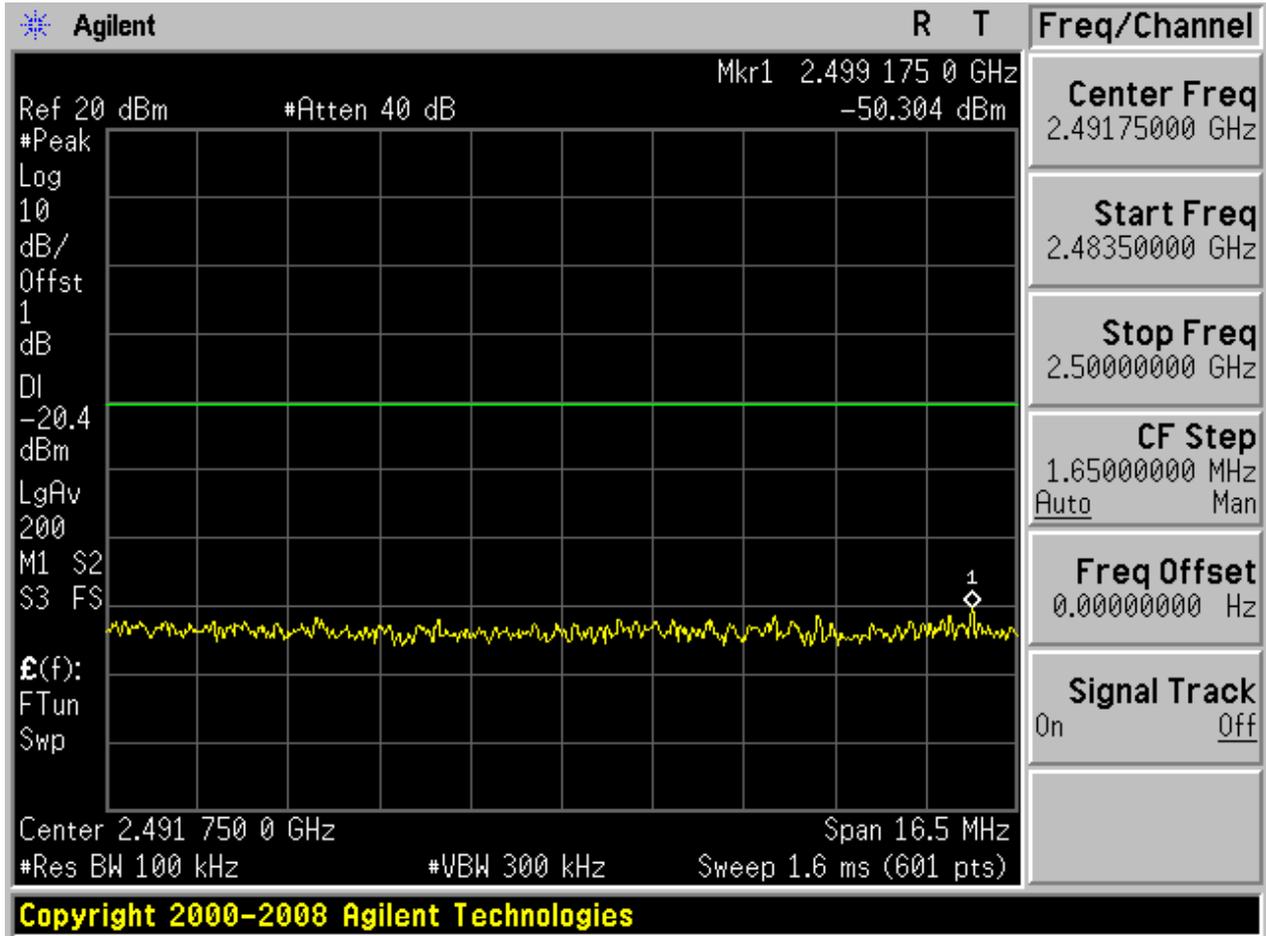
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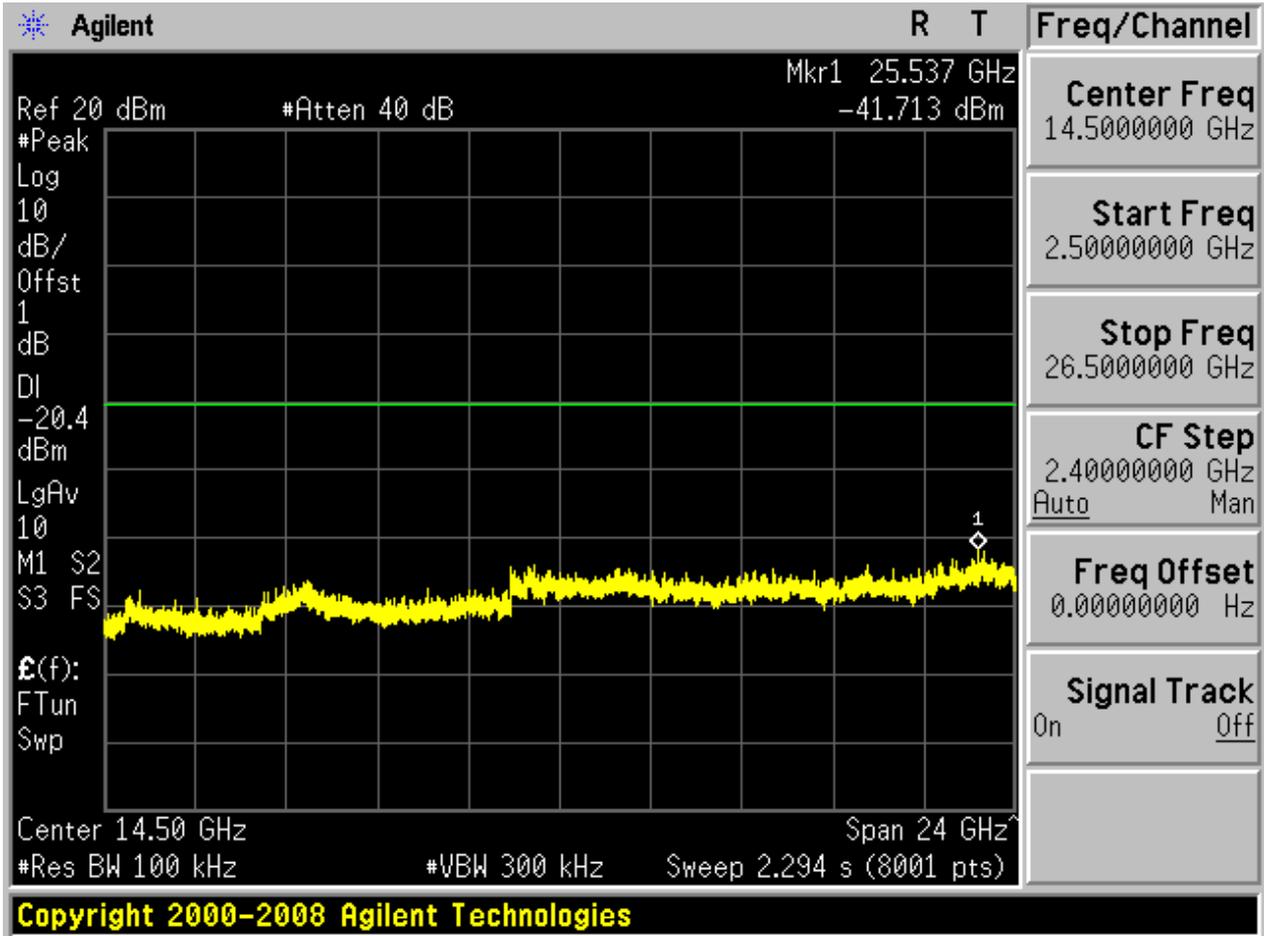






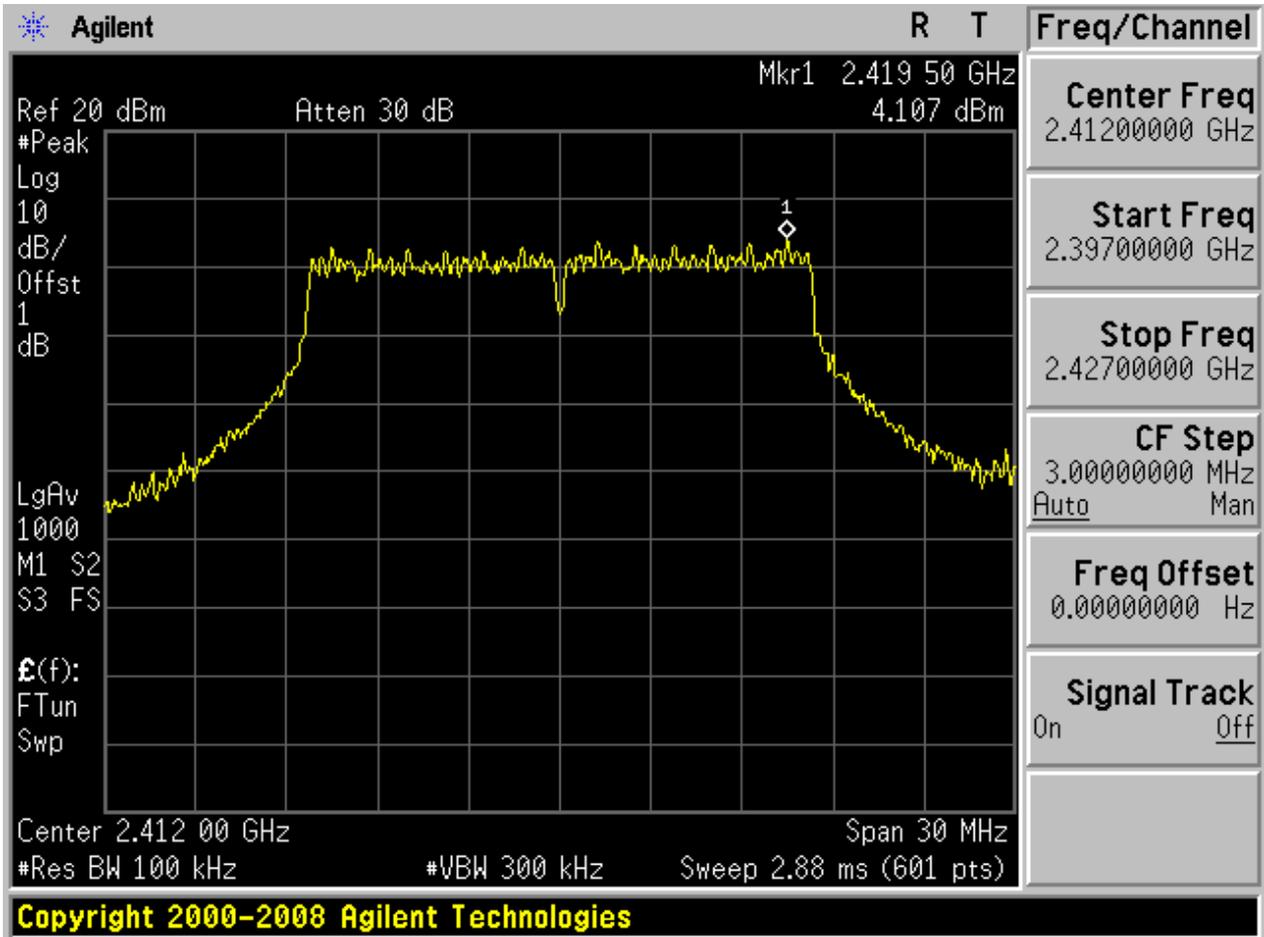




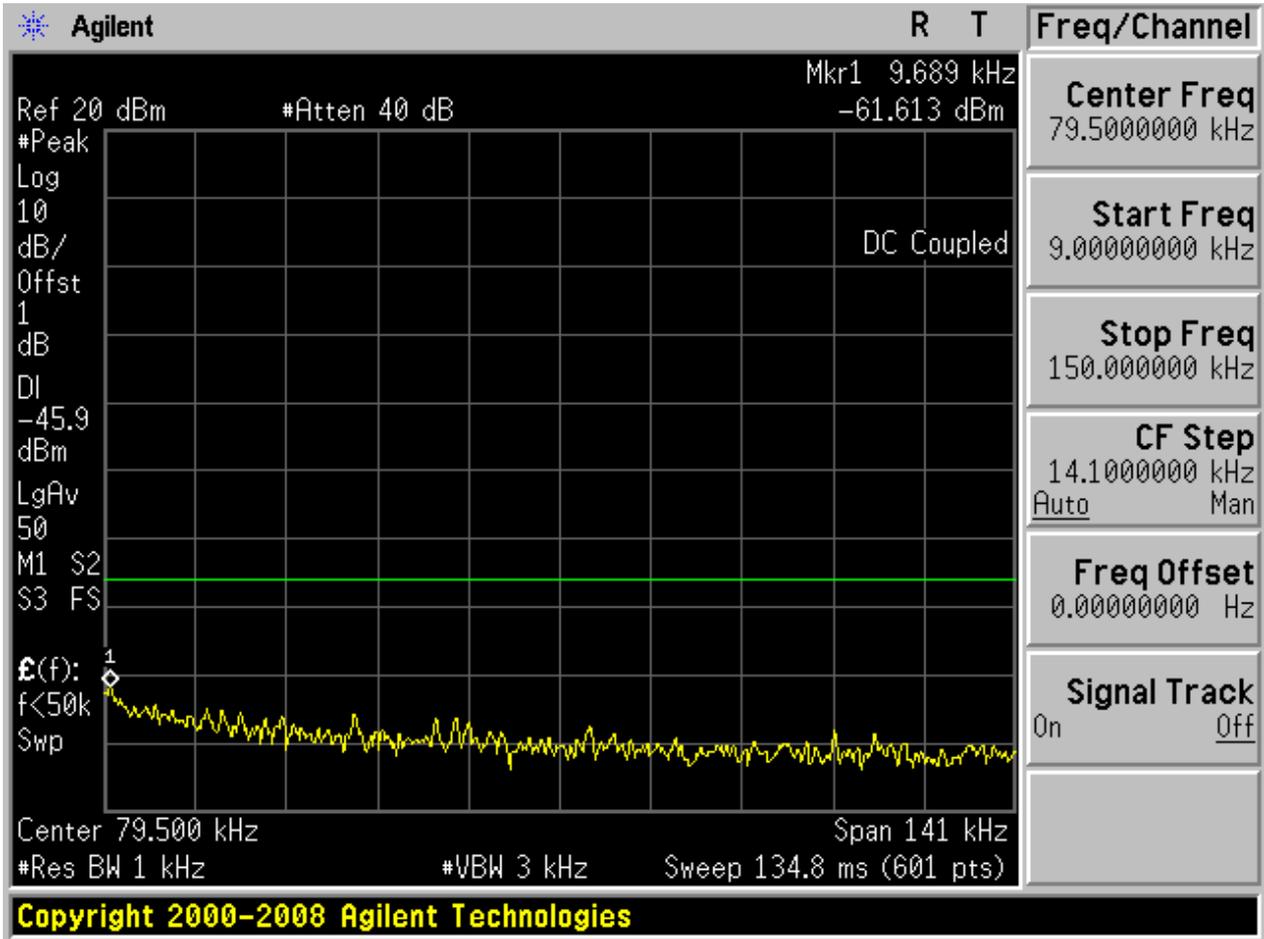


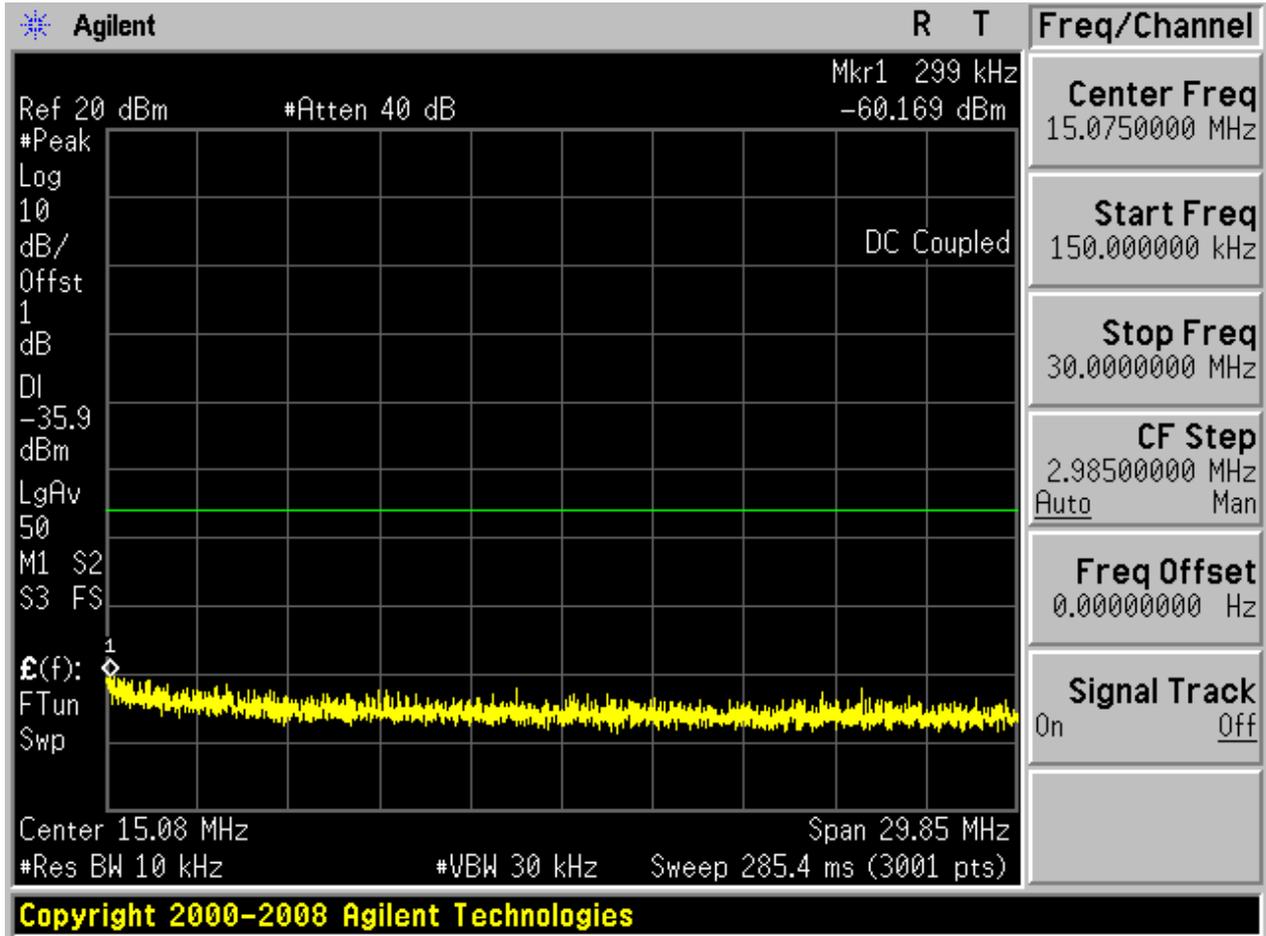
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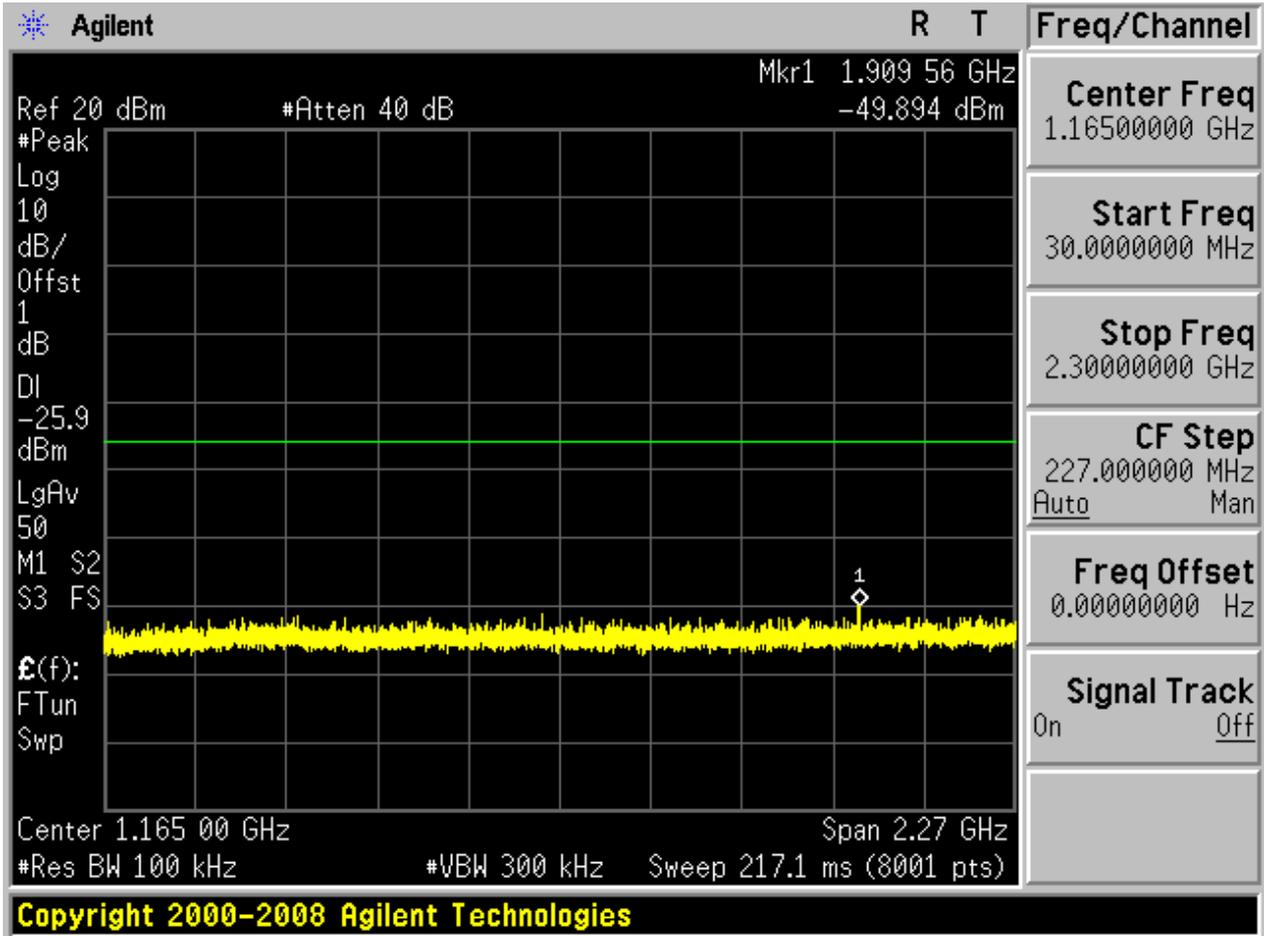
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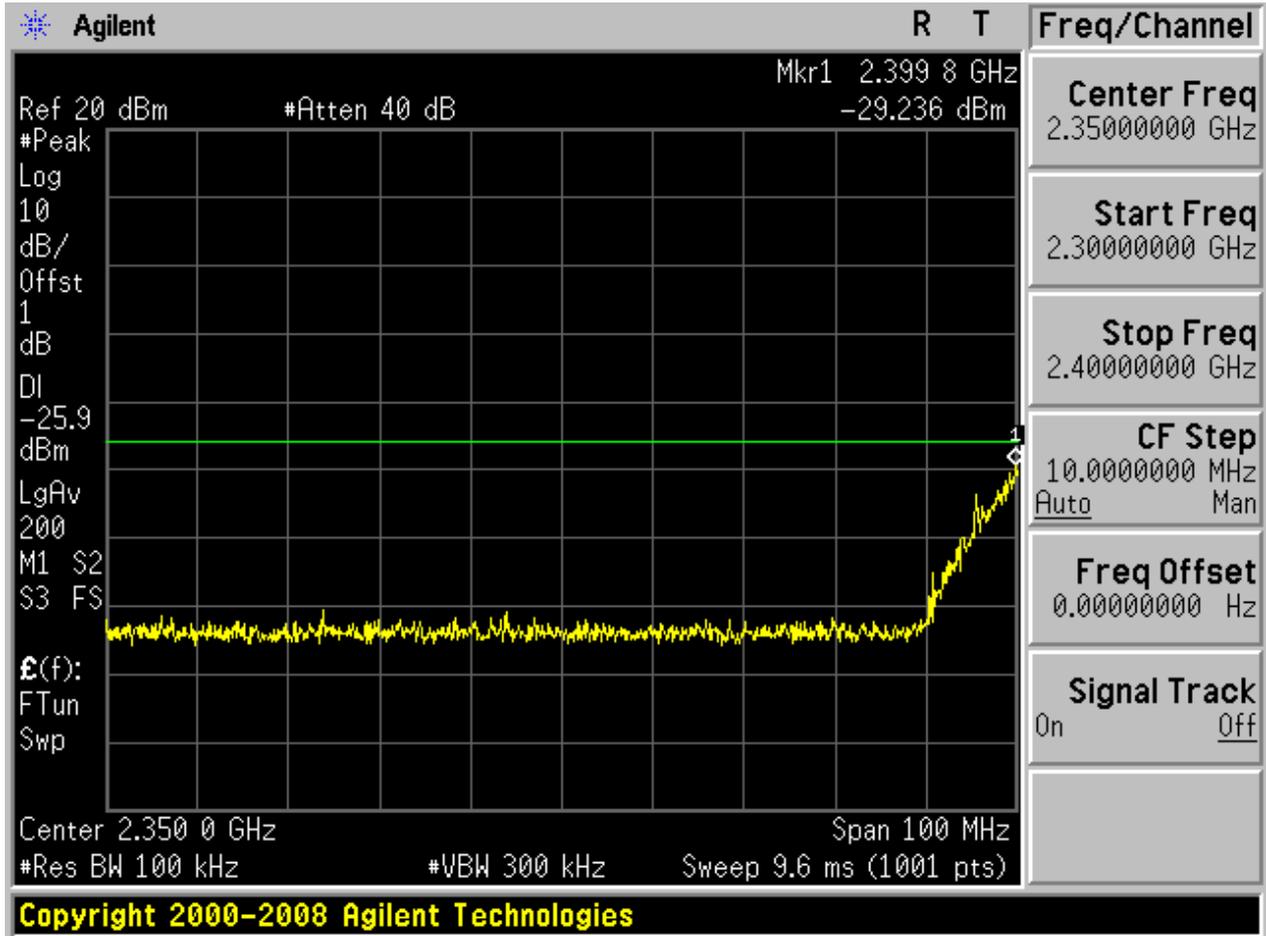


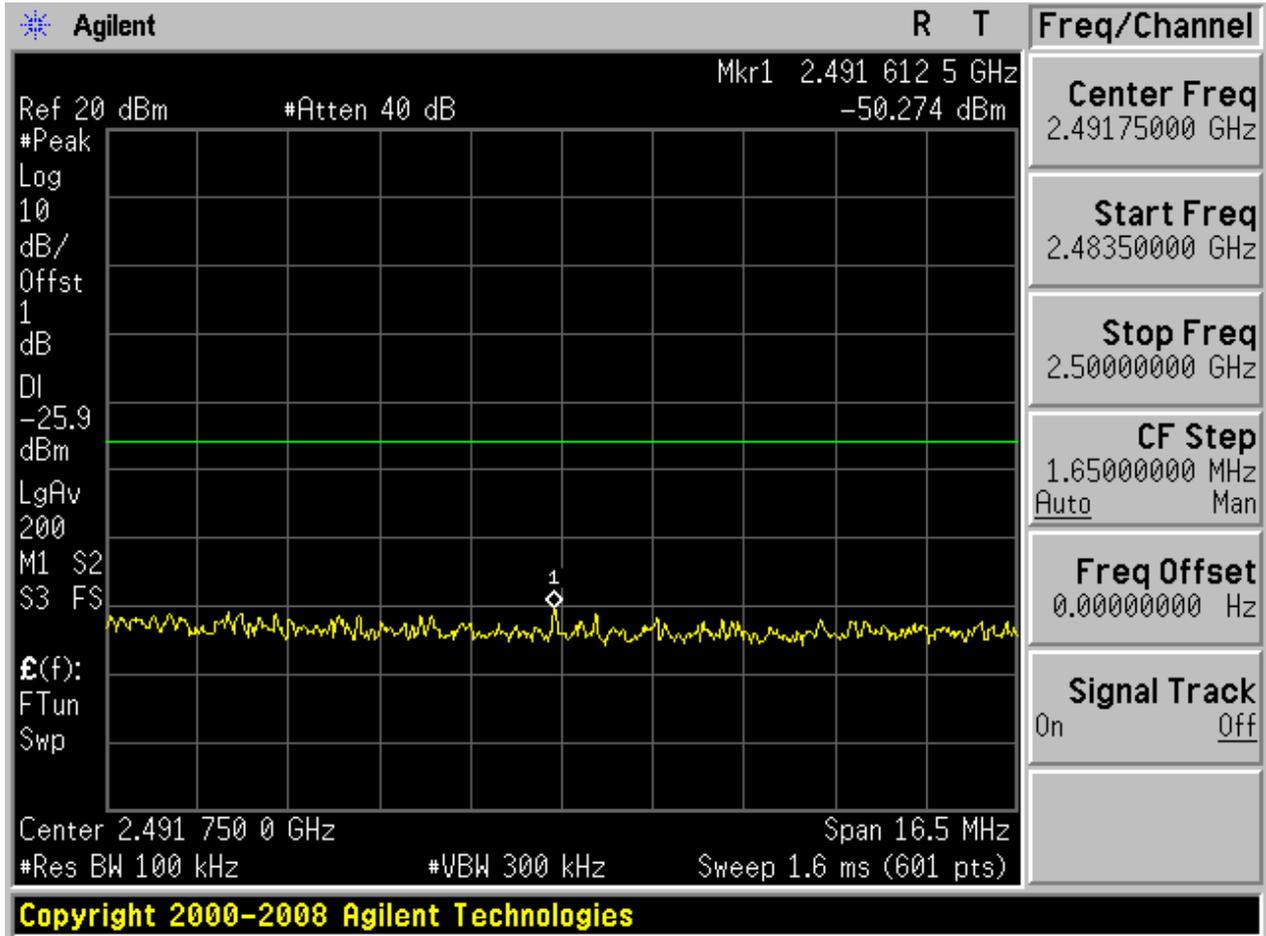
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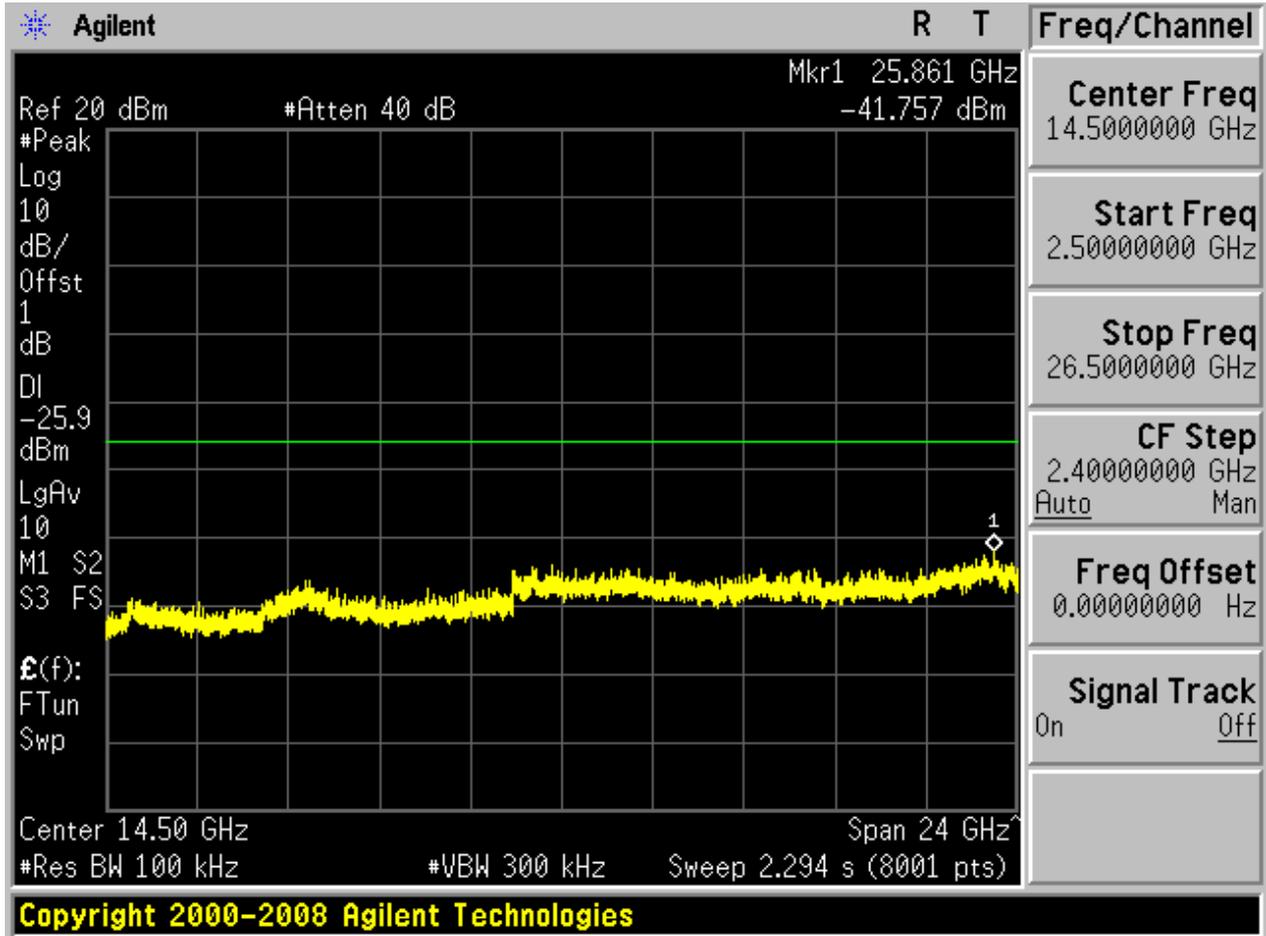








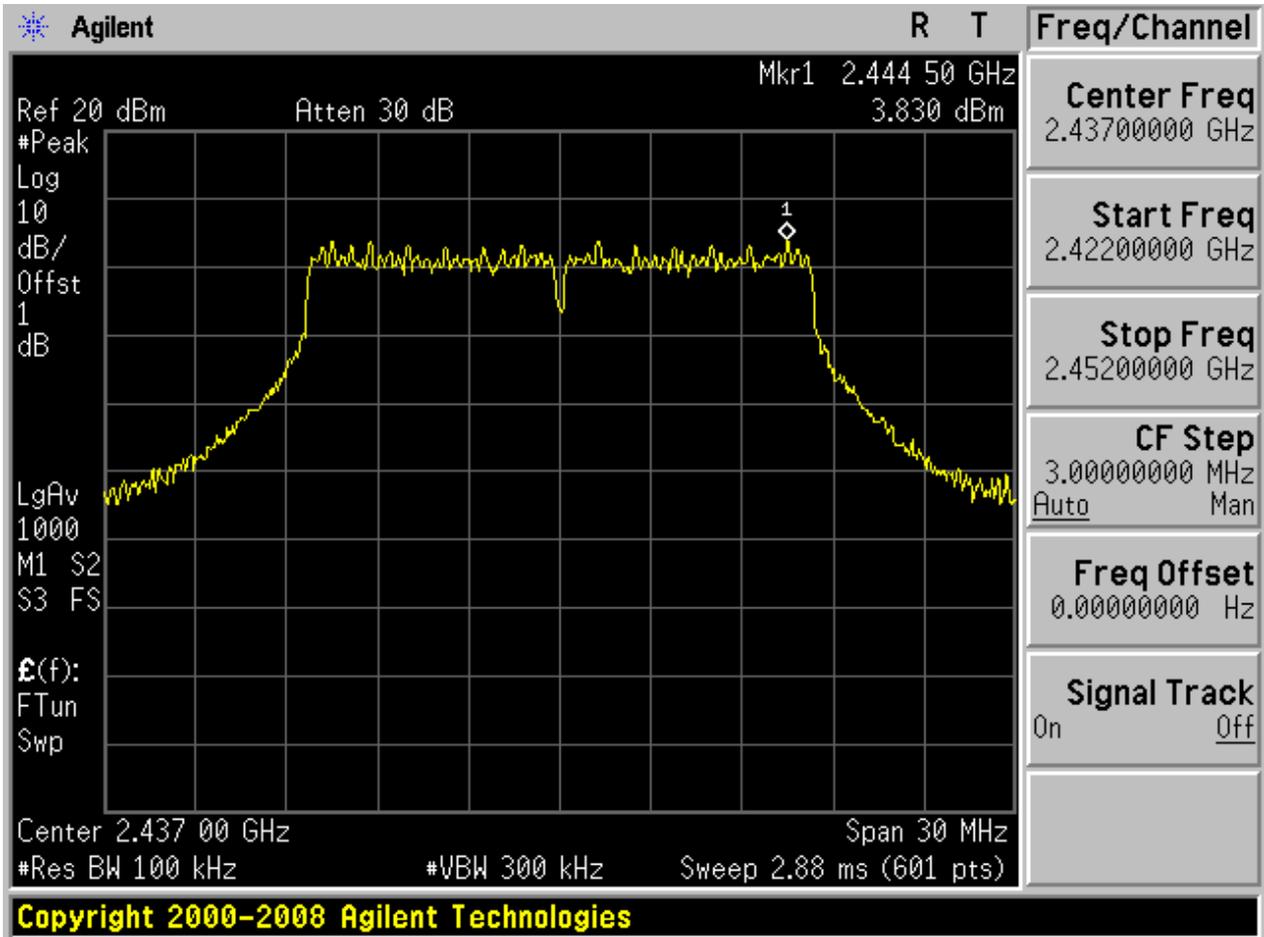






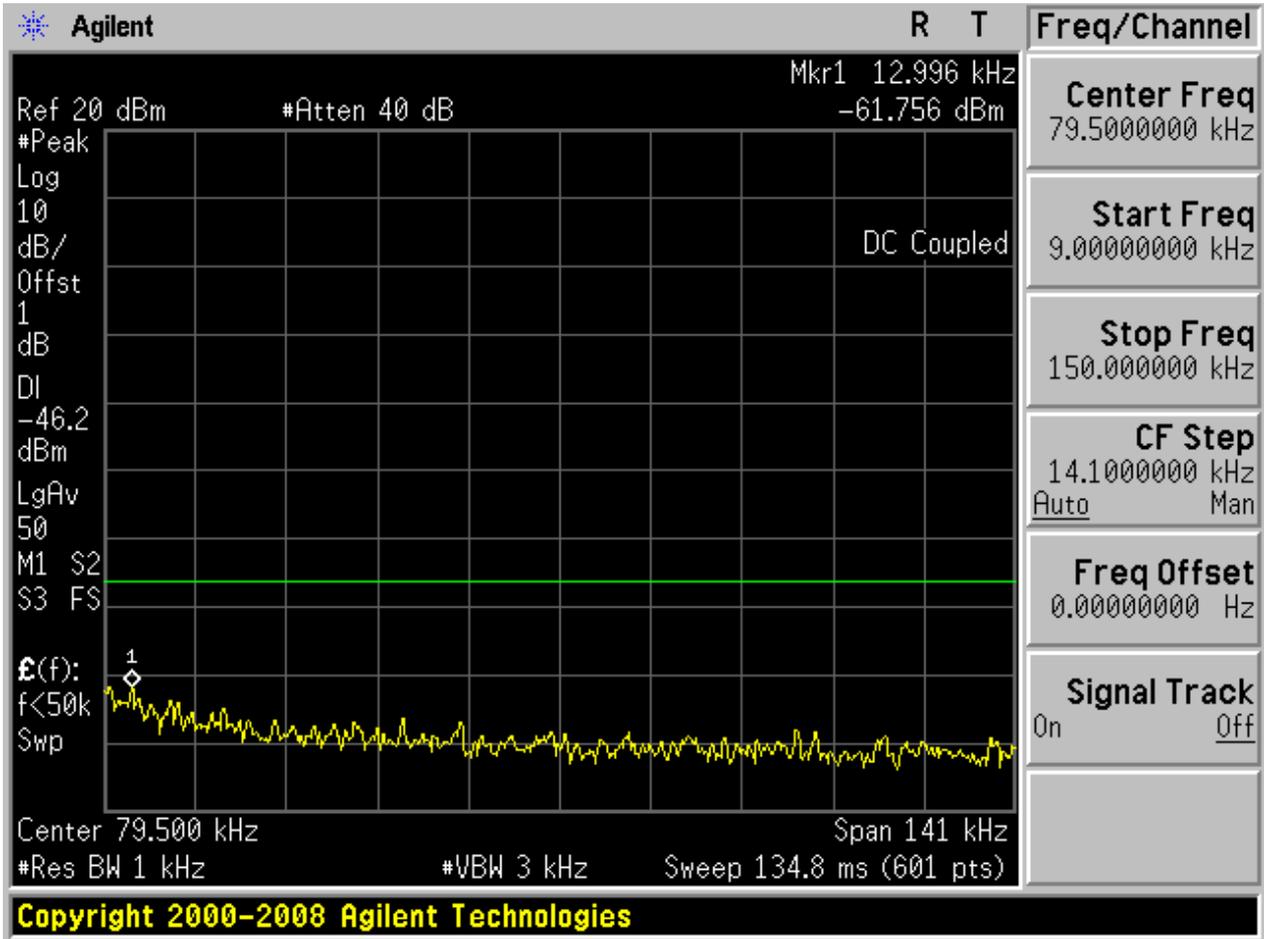
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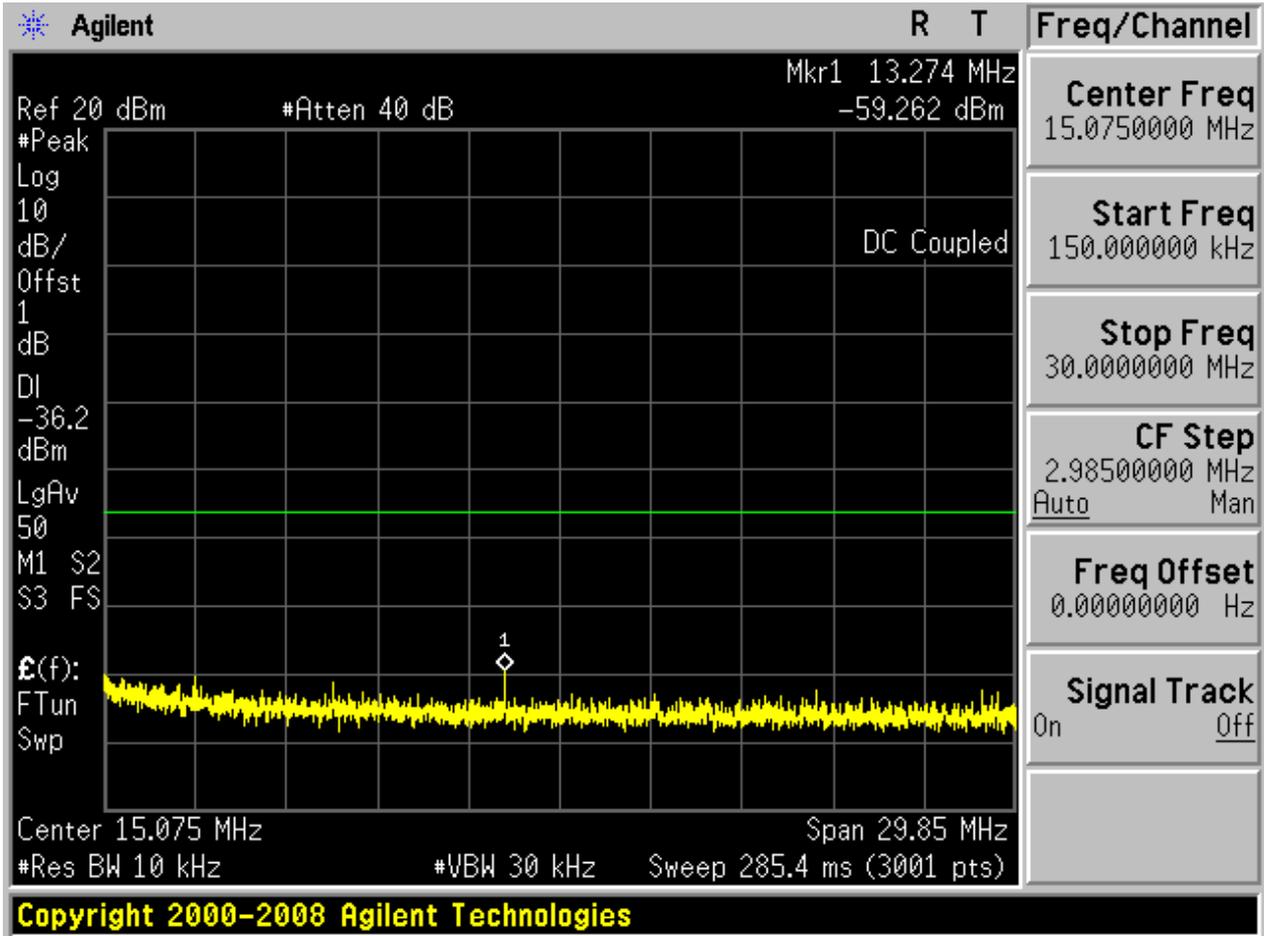
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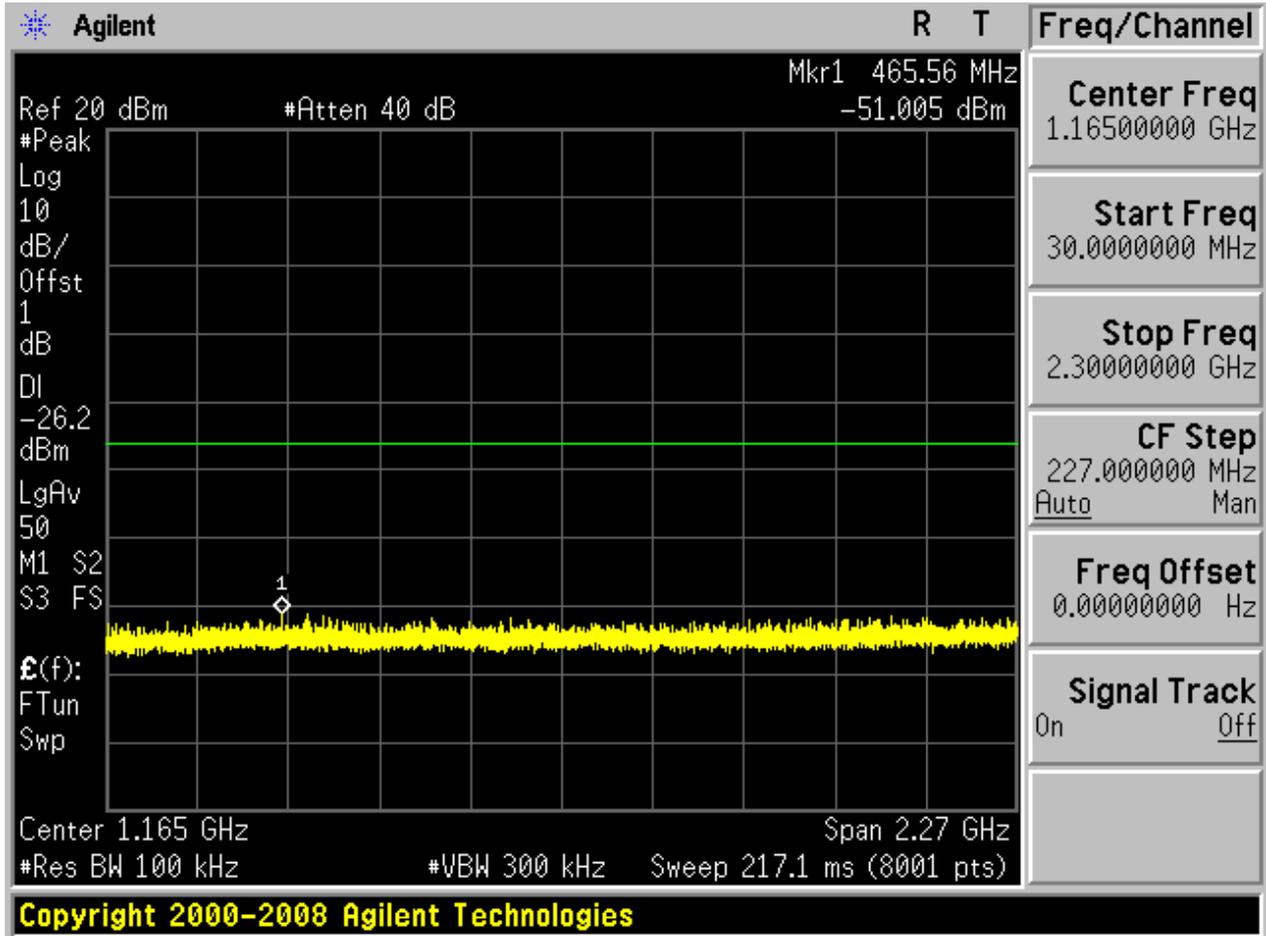


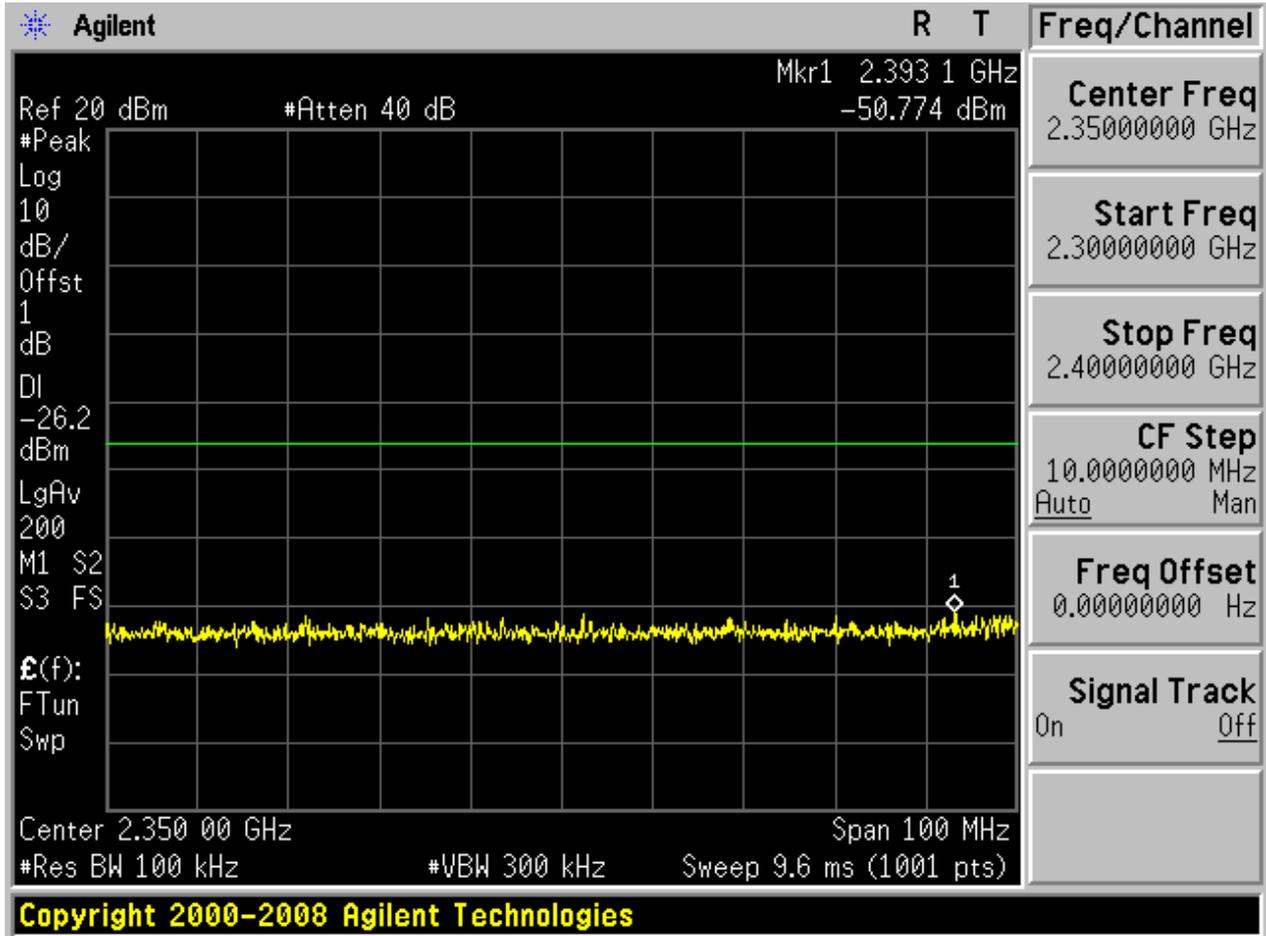


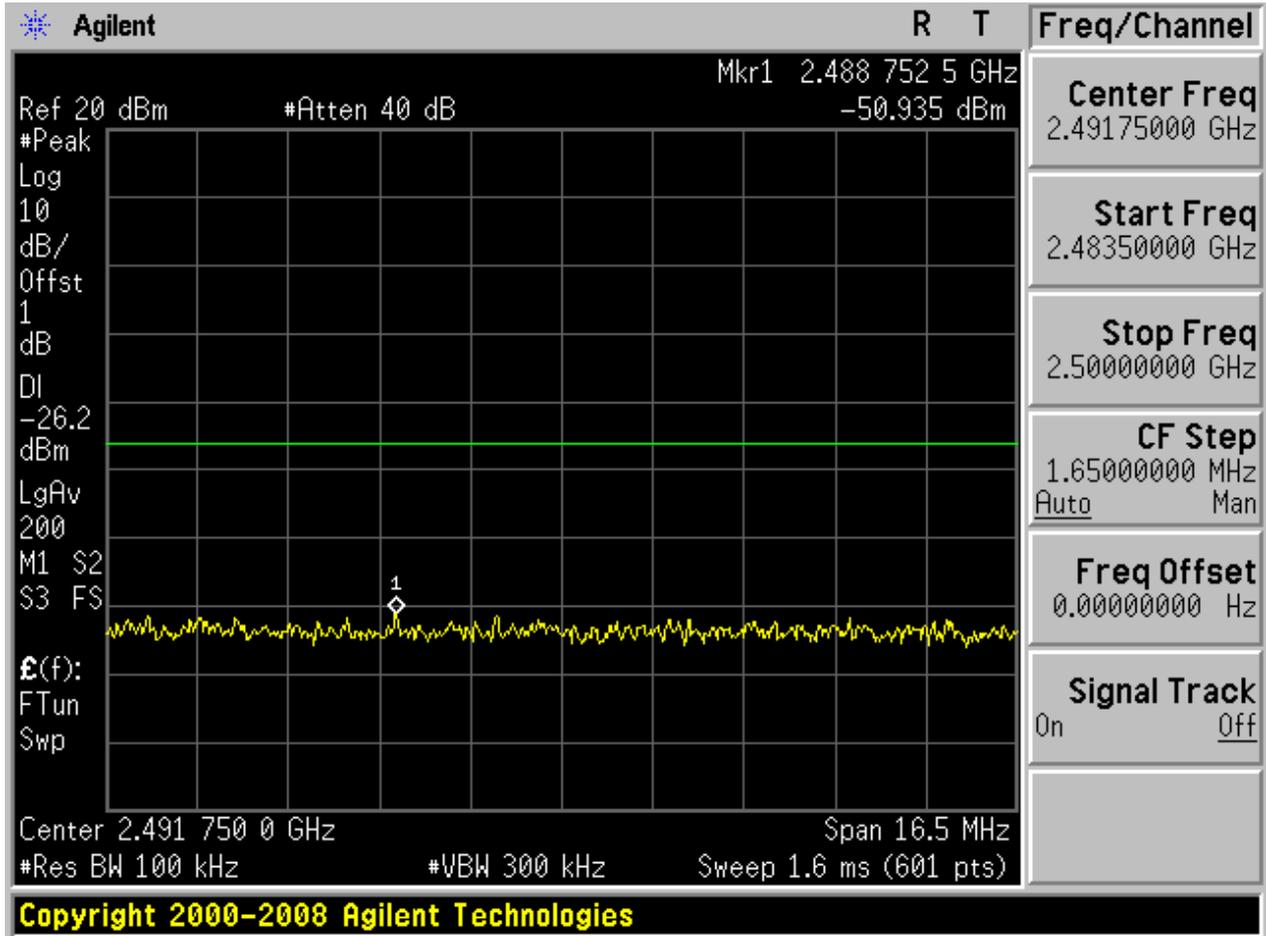
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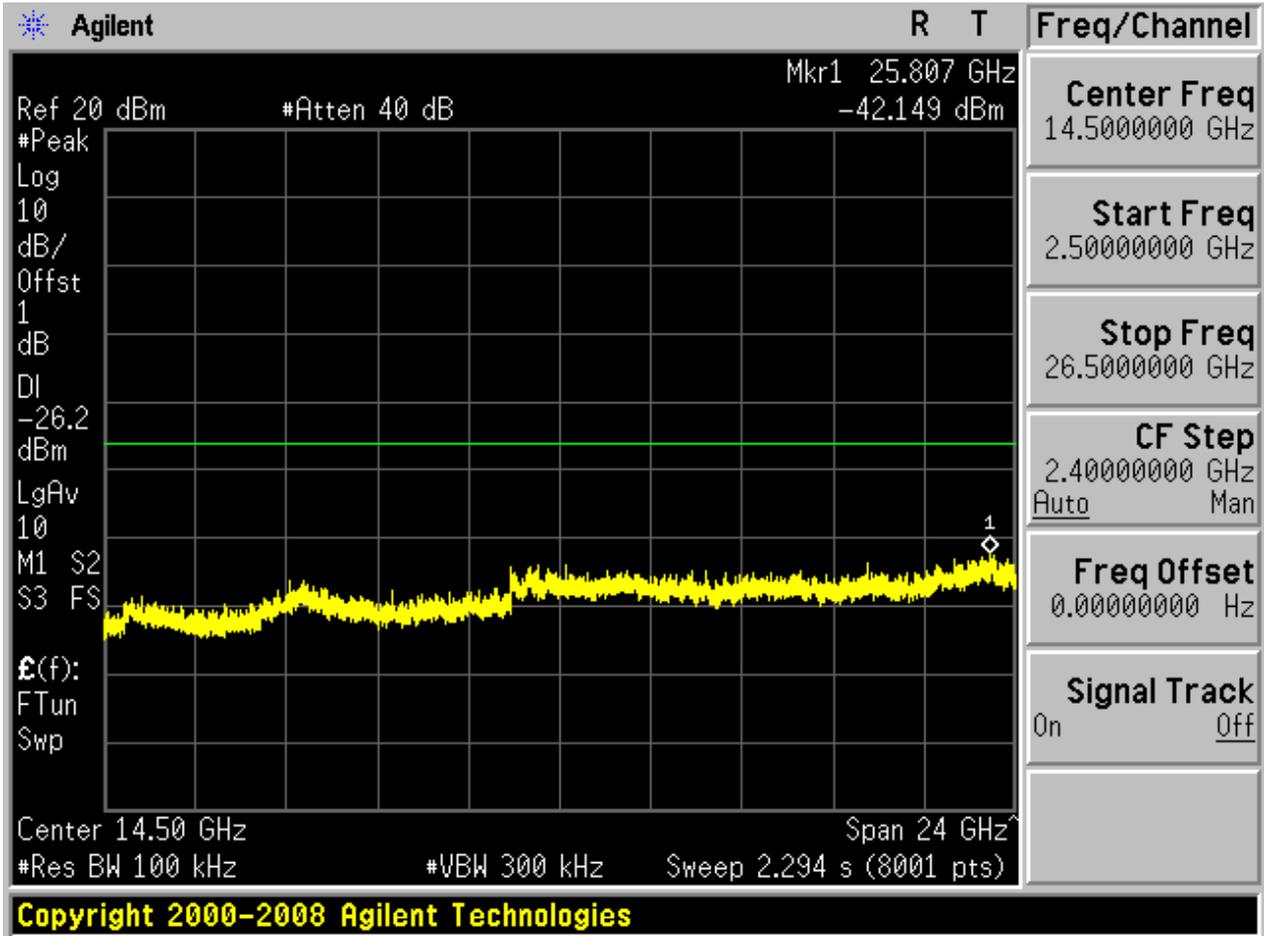








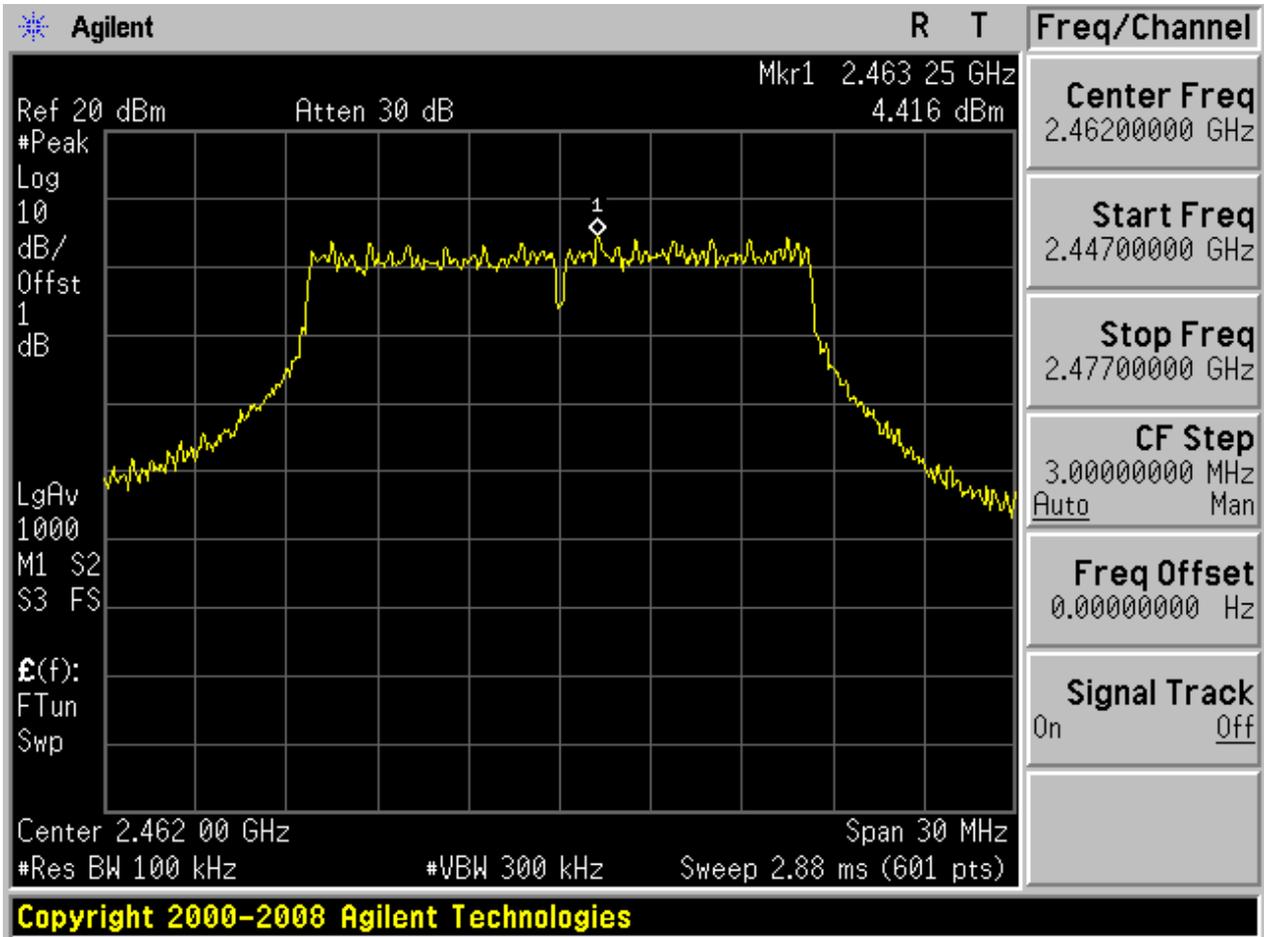






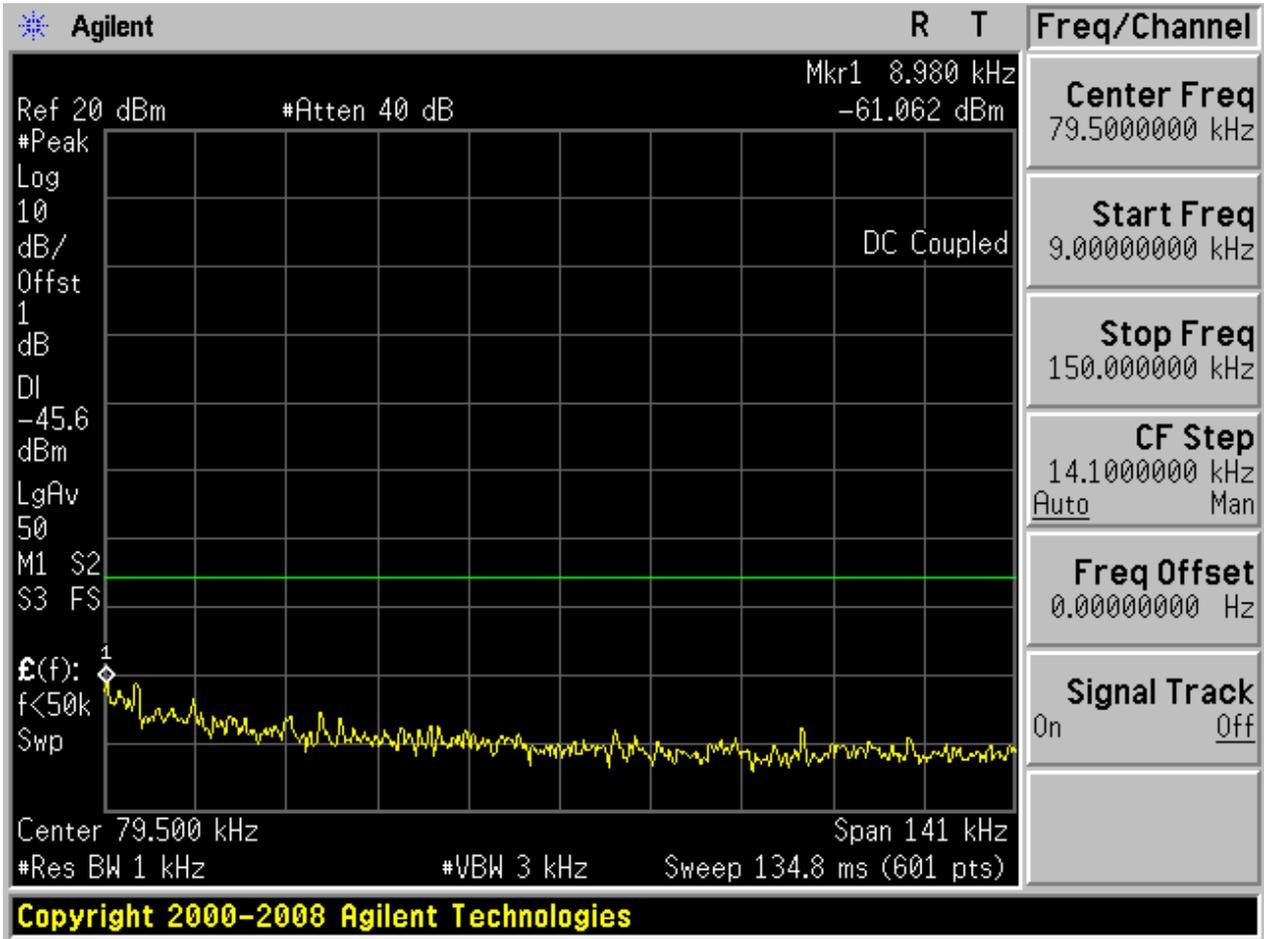
2.6 11G_H@Ant 1

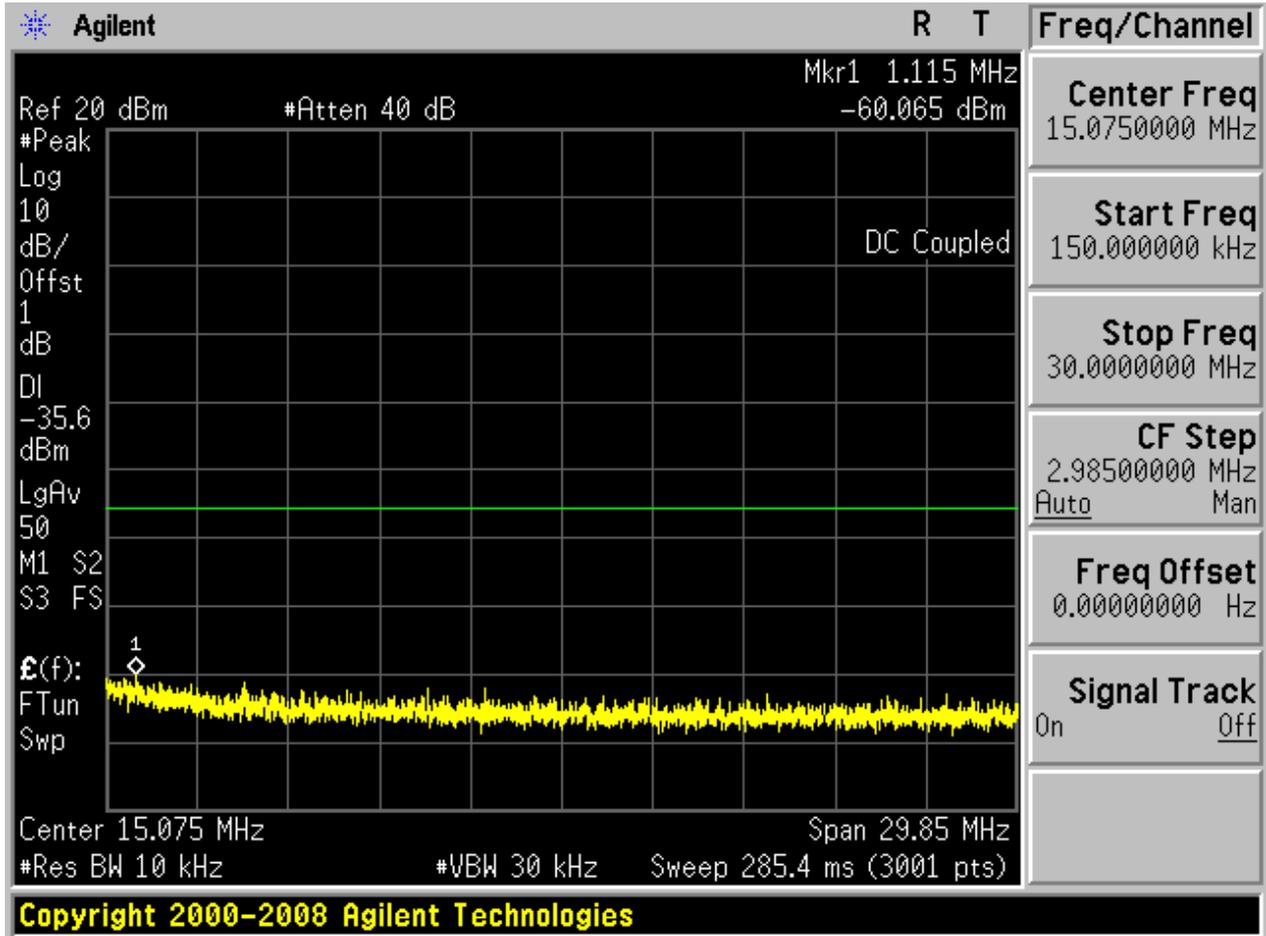
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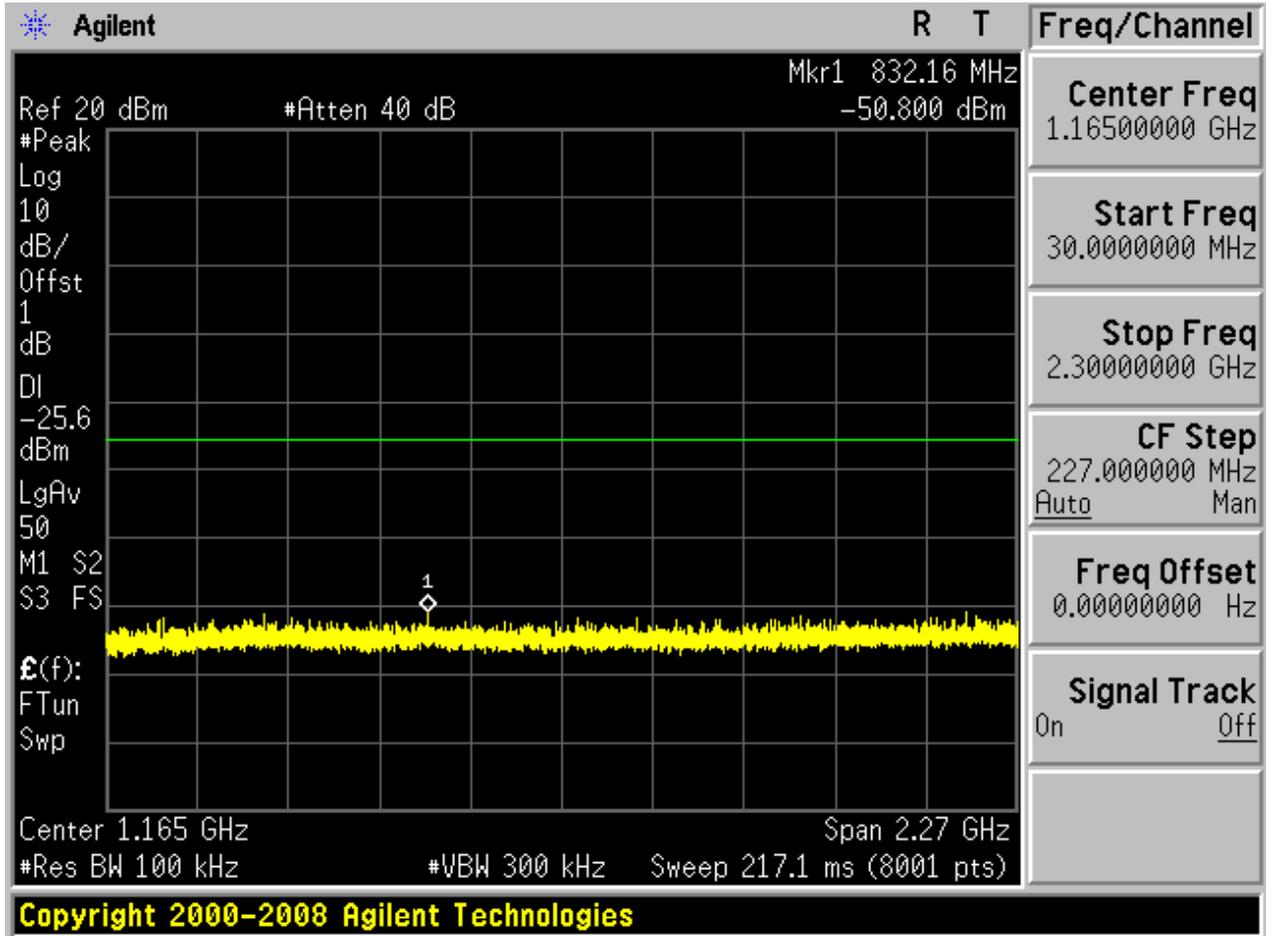


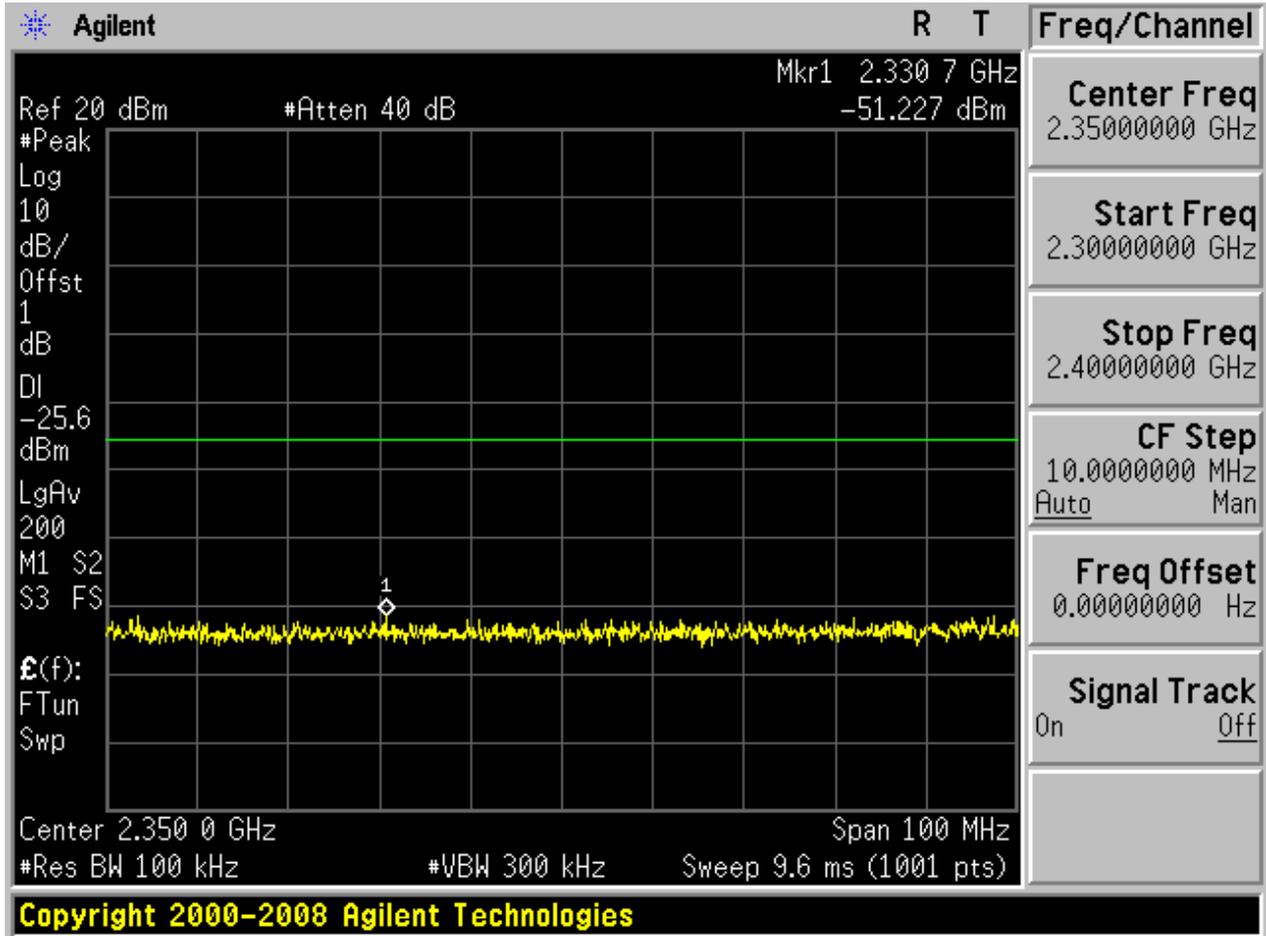


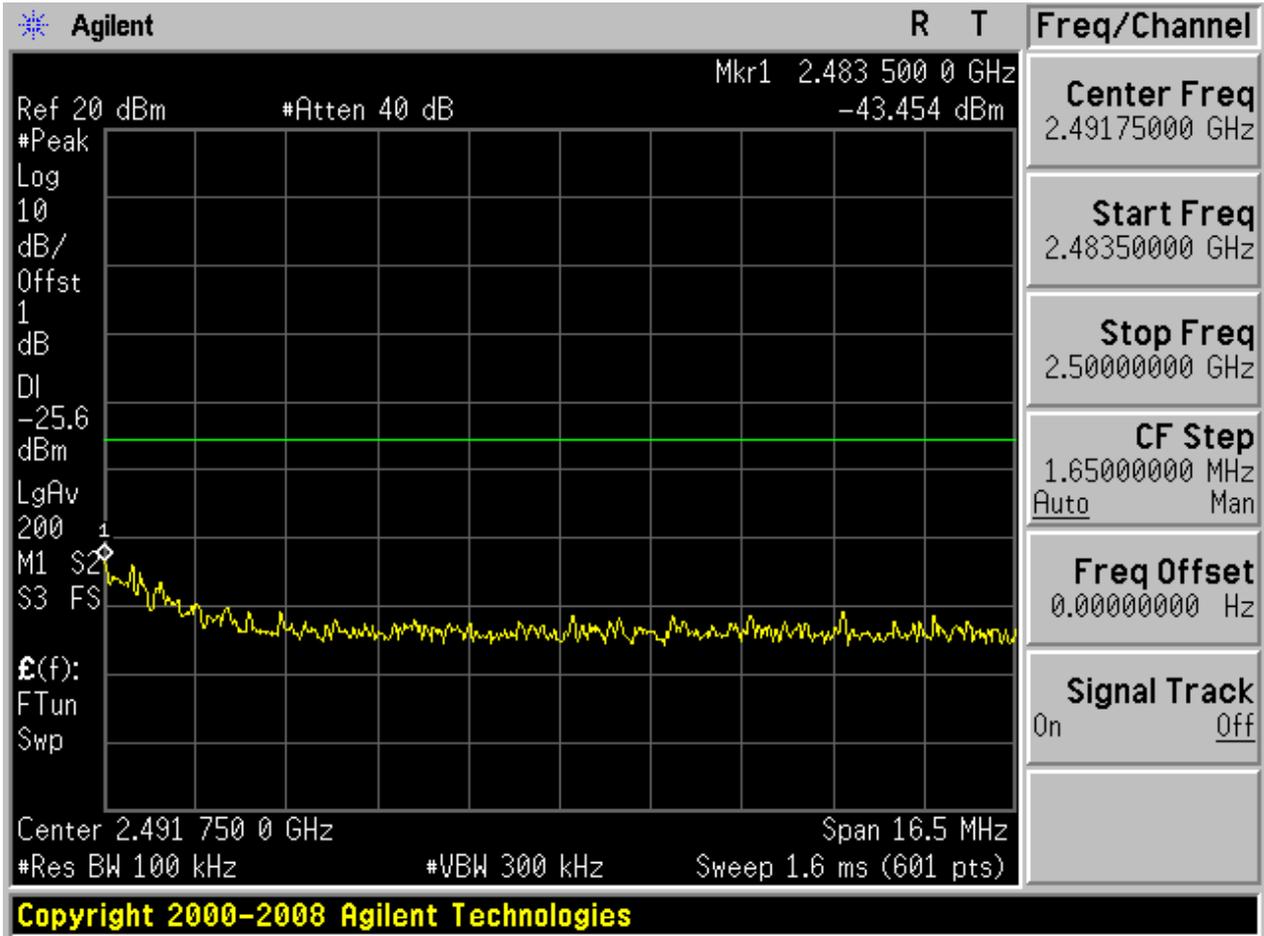
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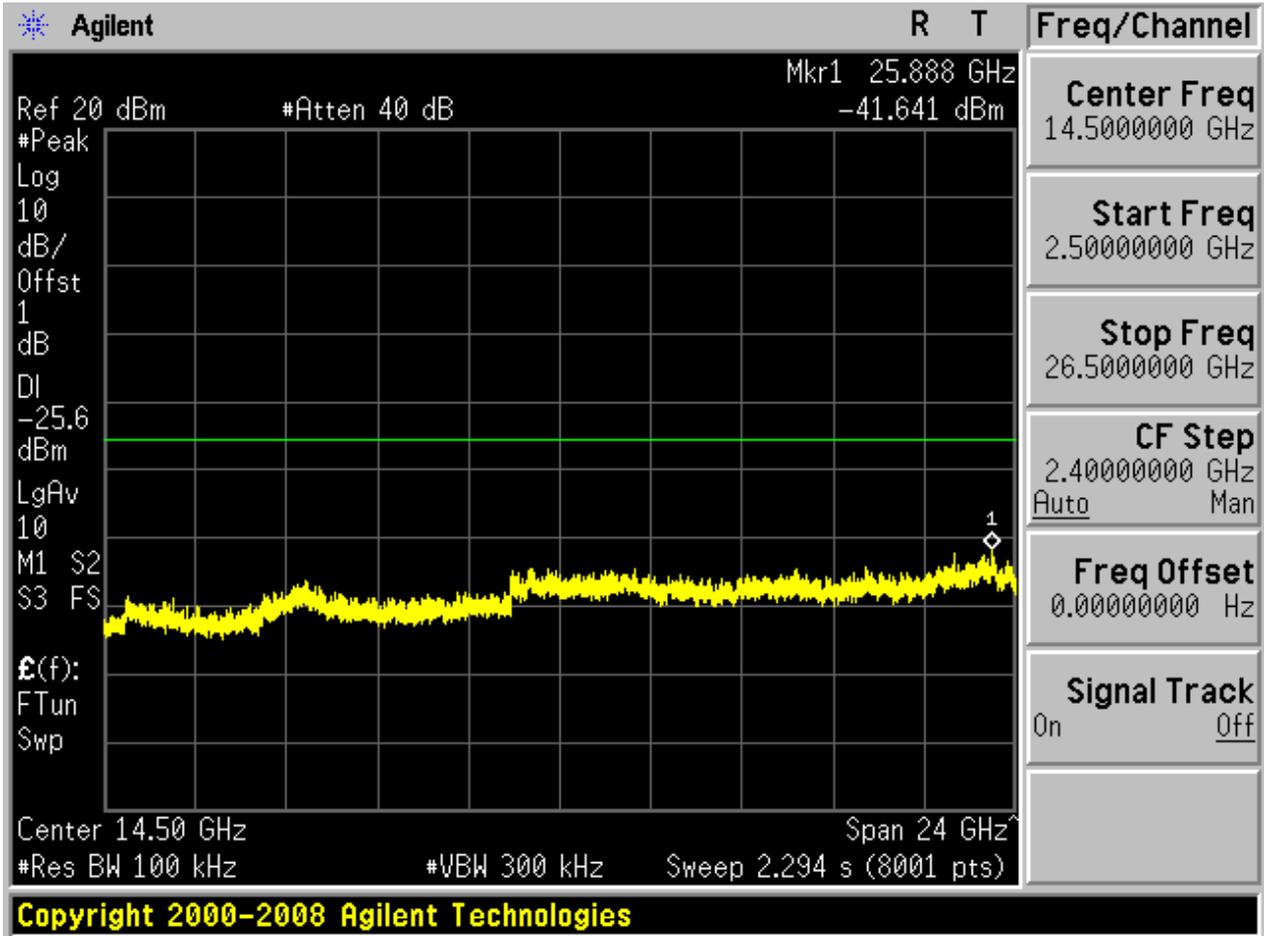






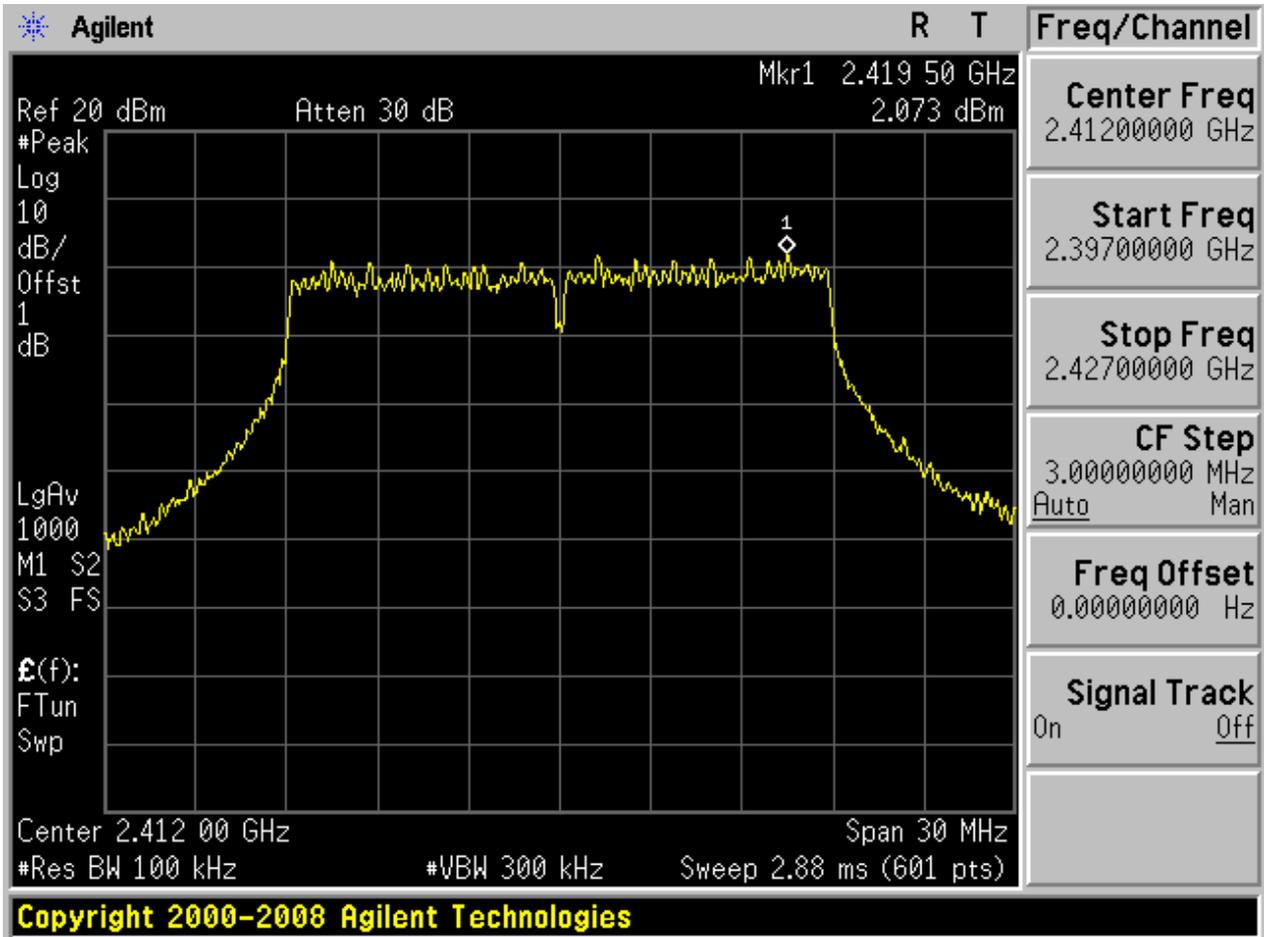






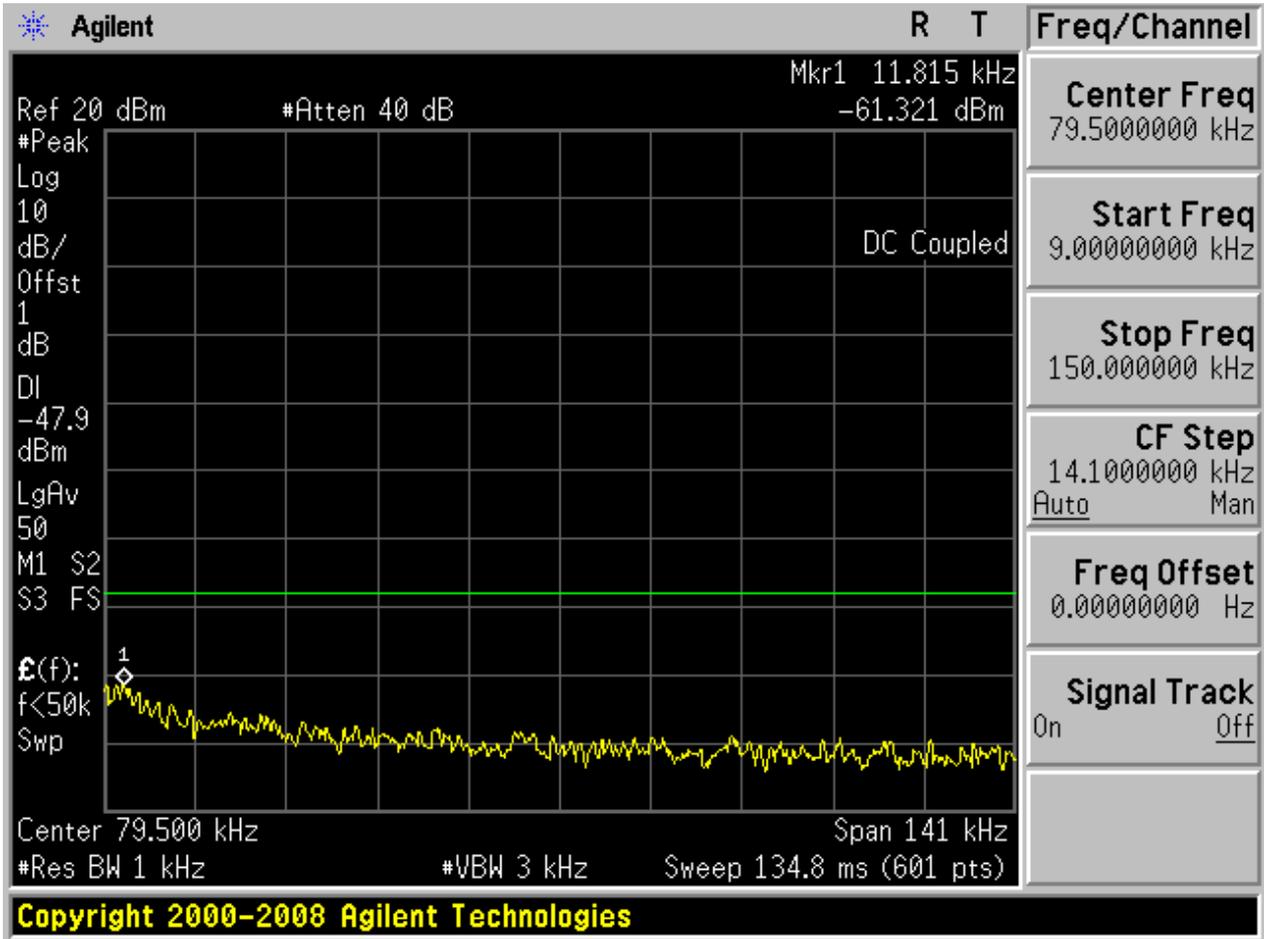
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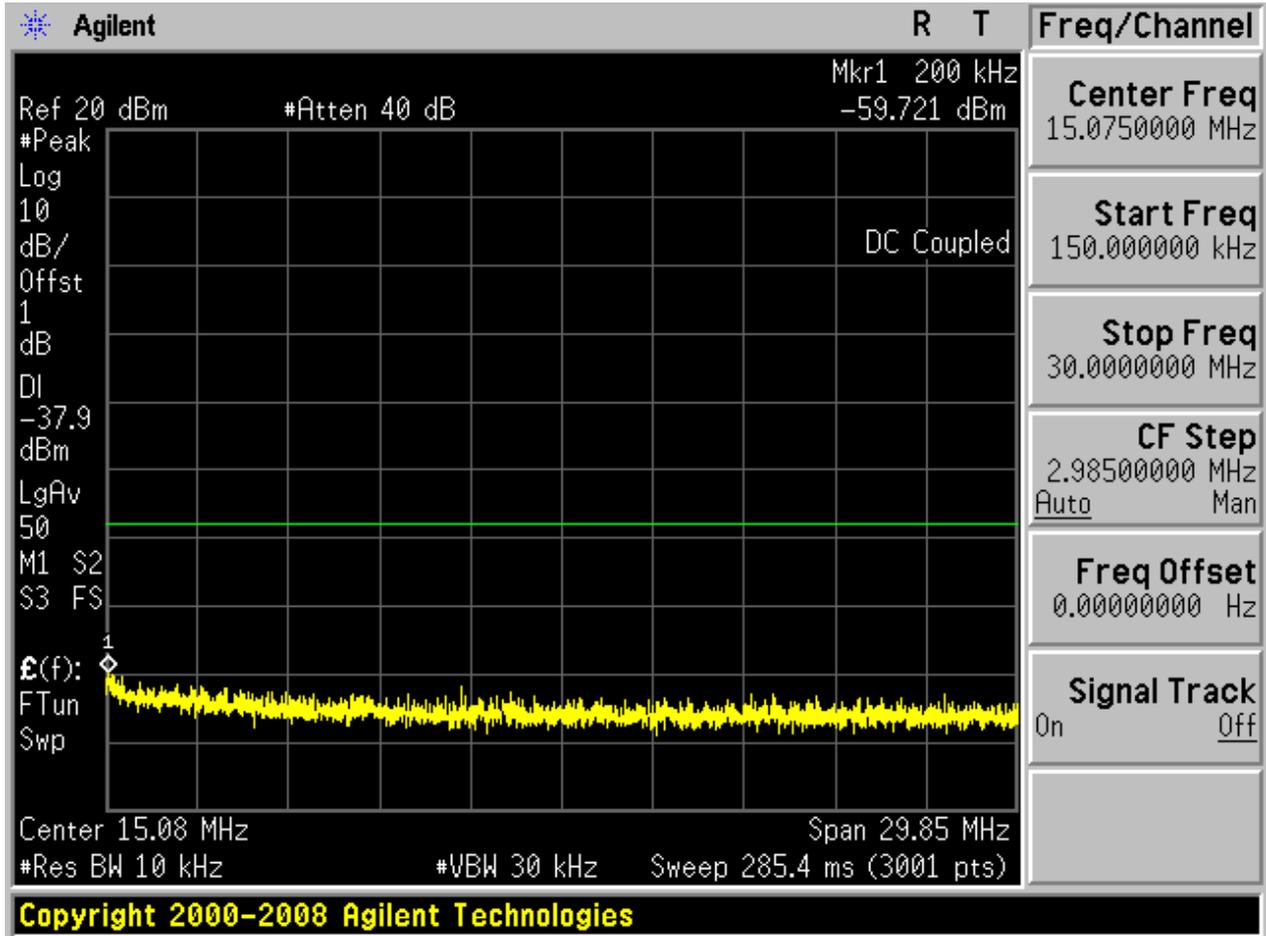
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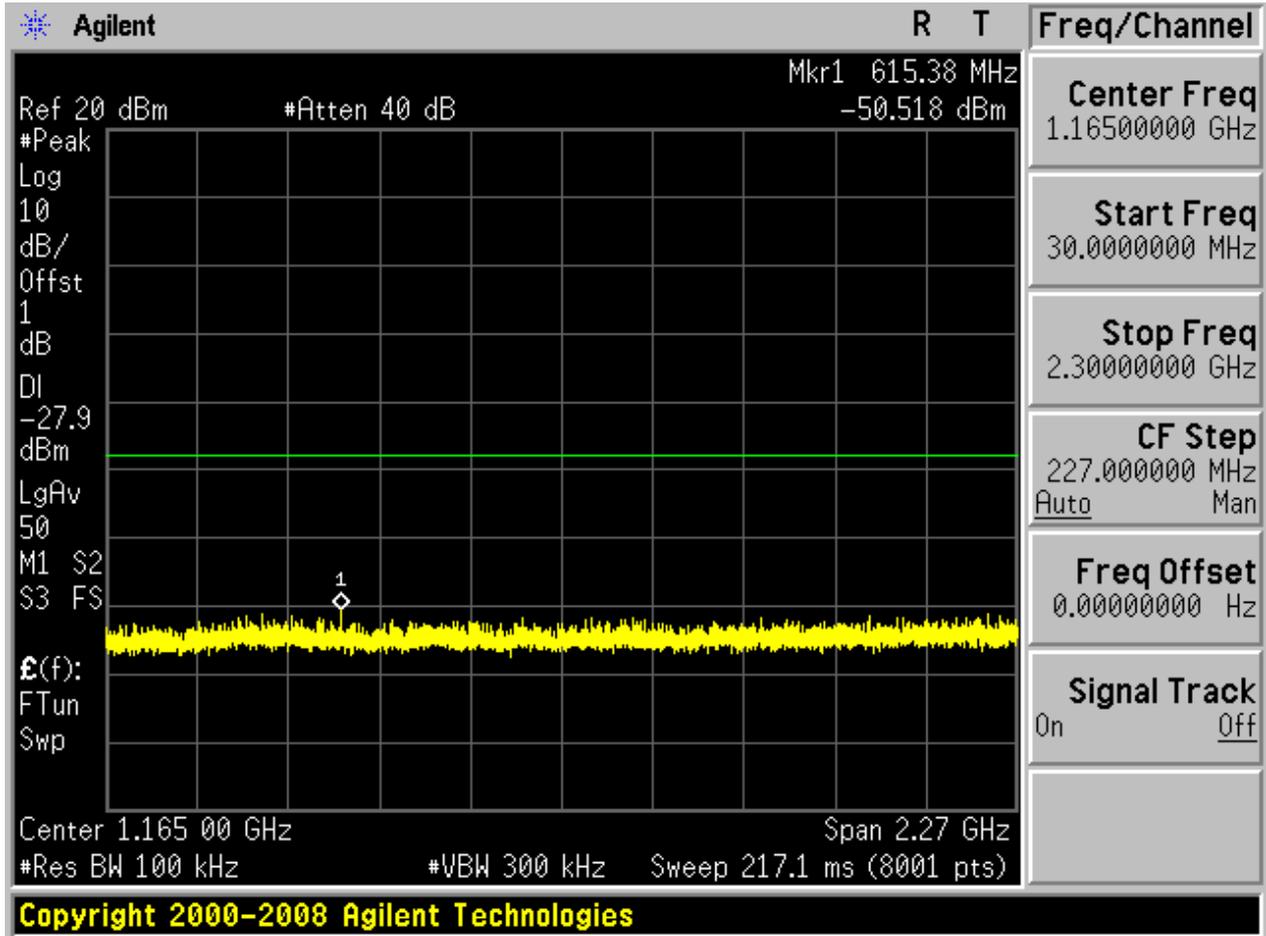


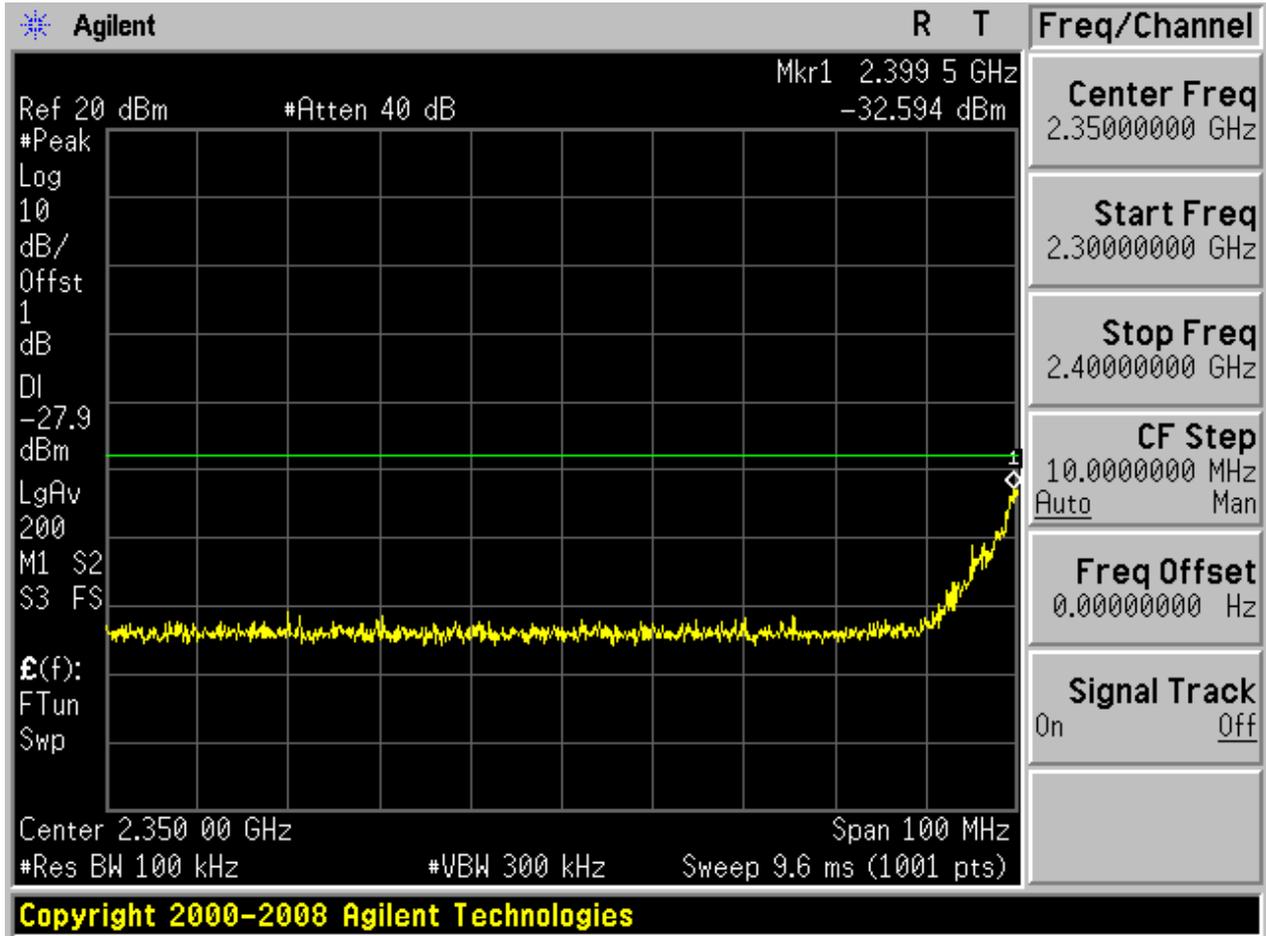


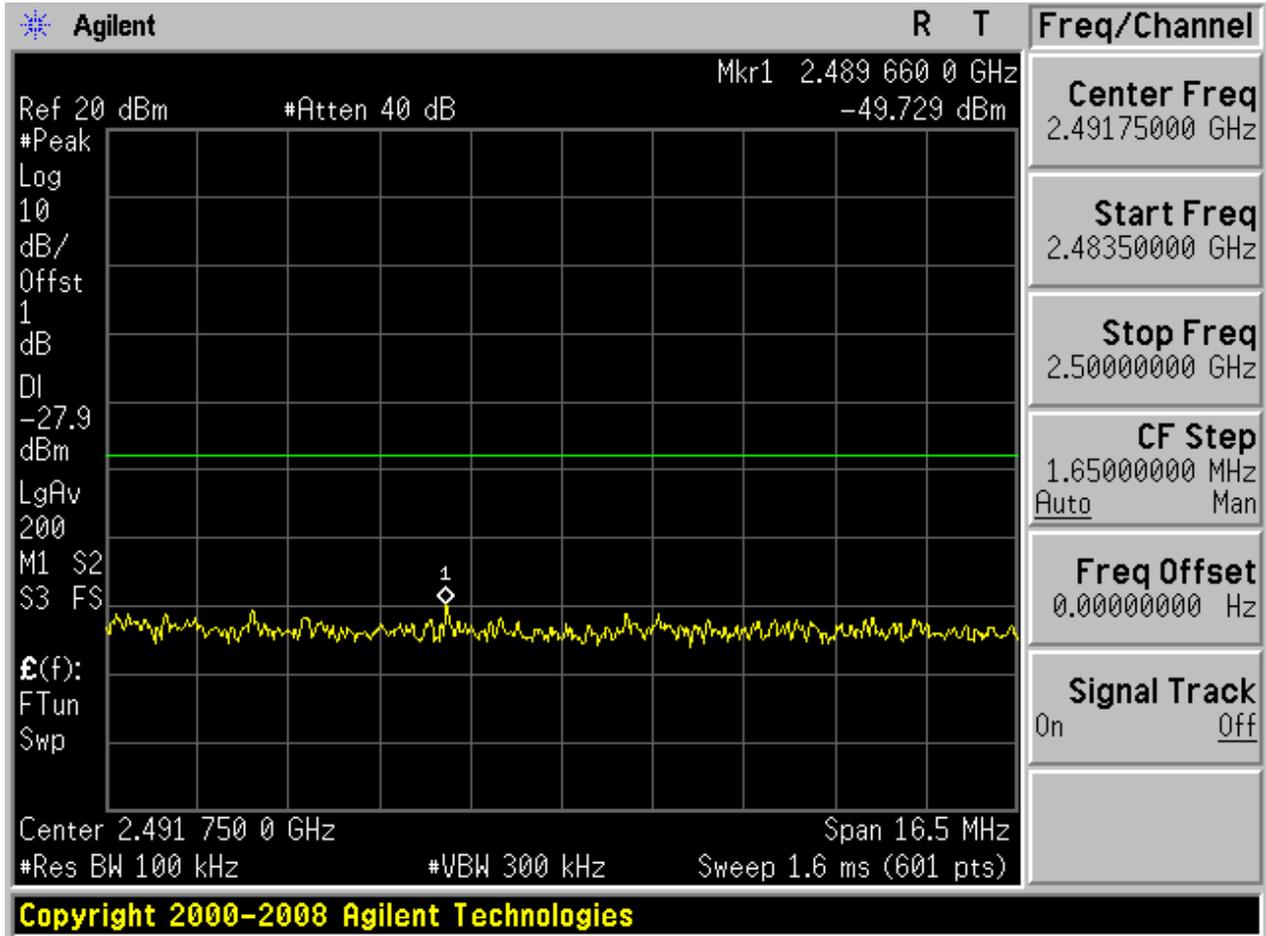
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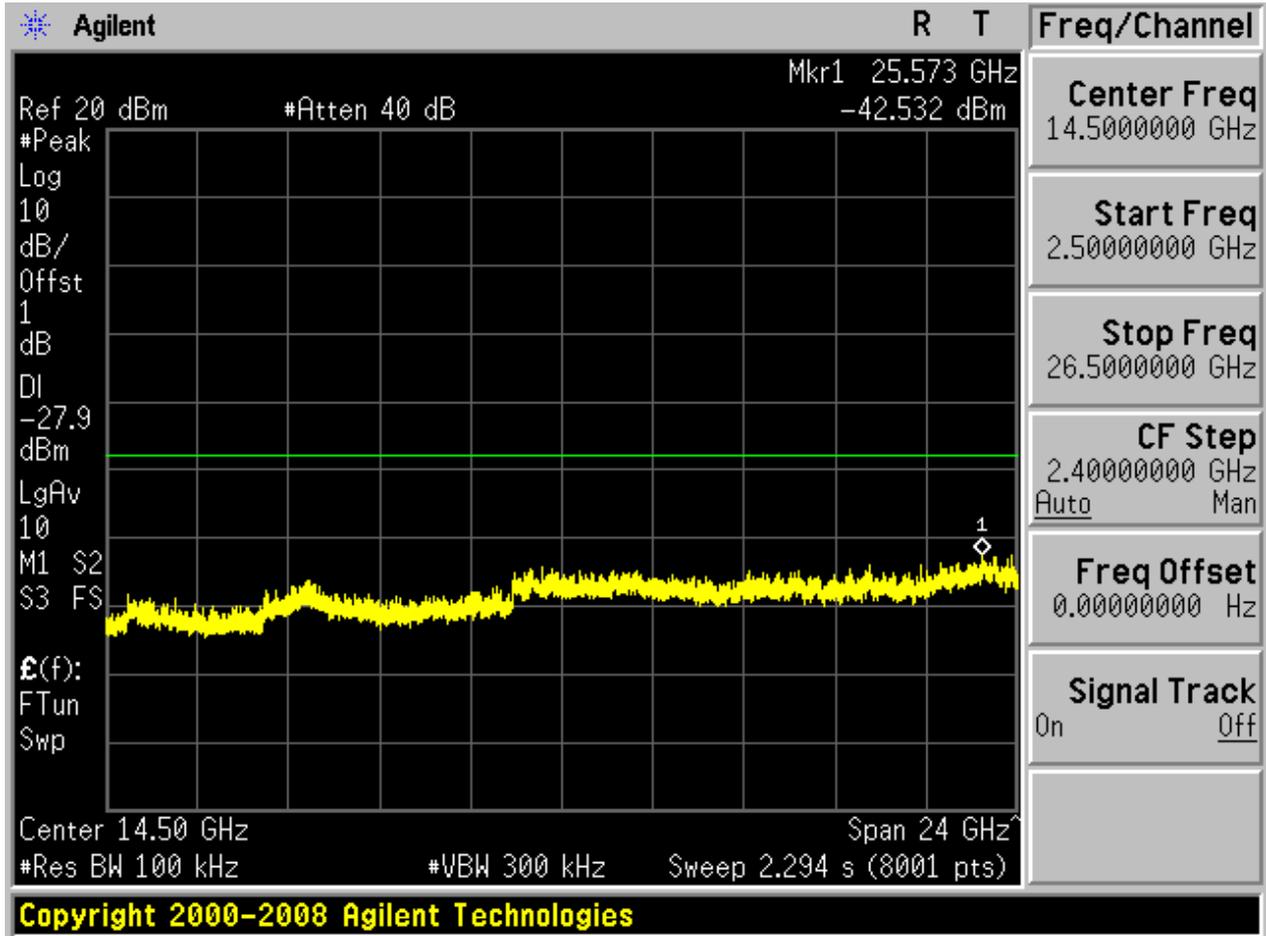






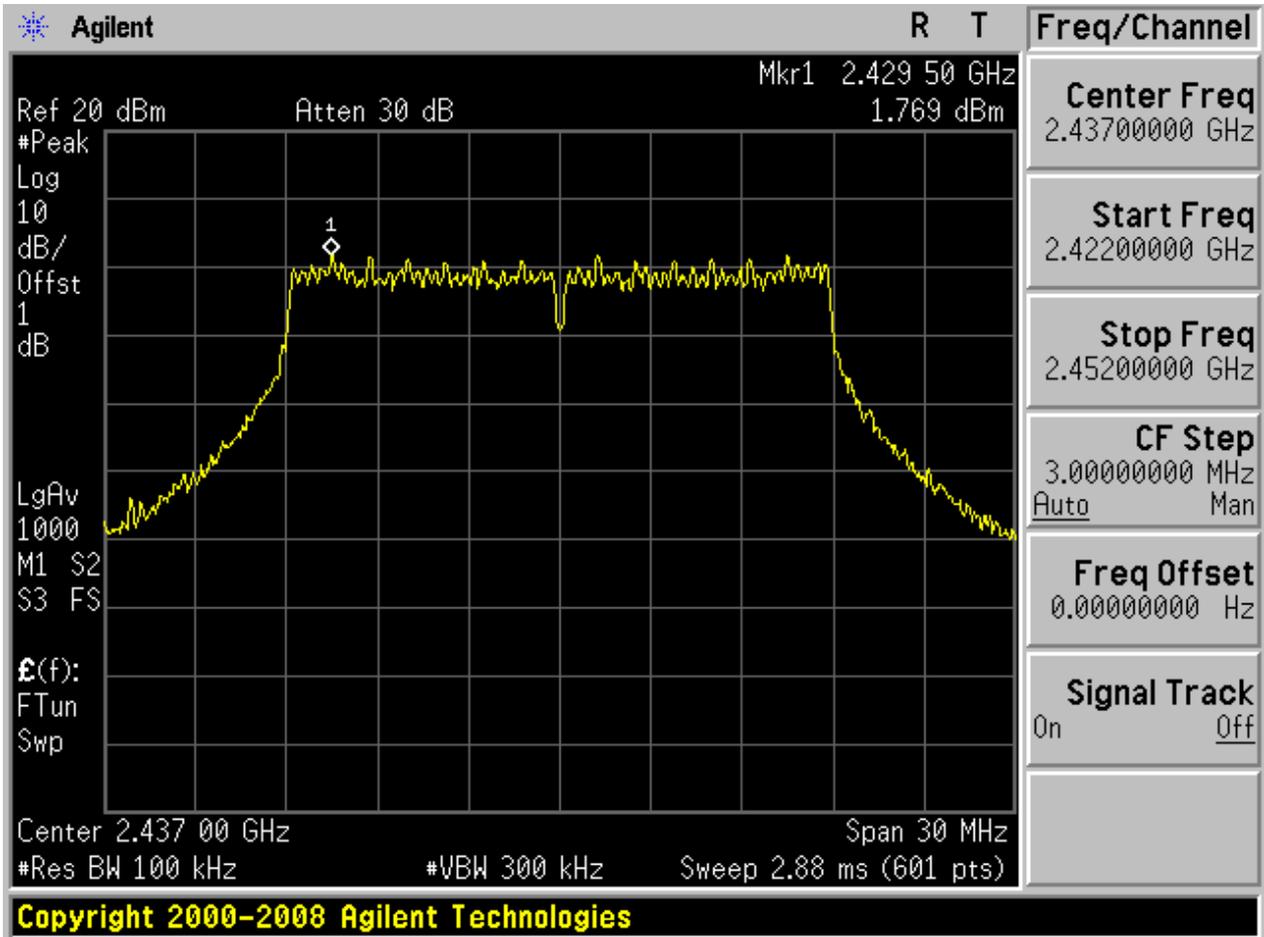






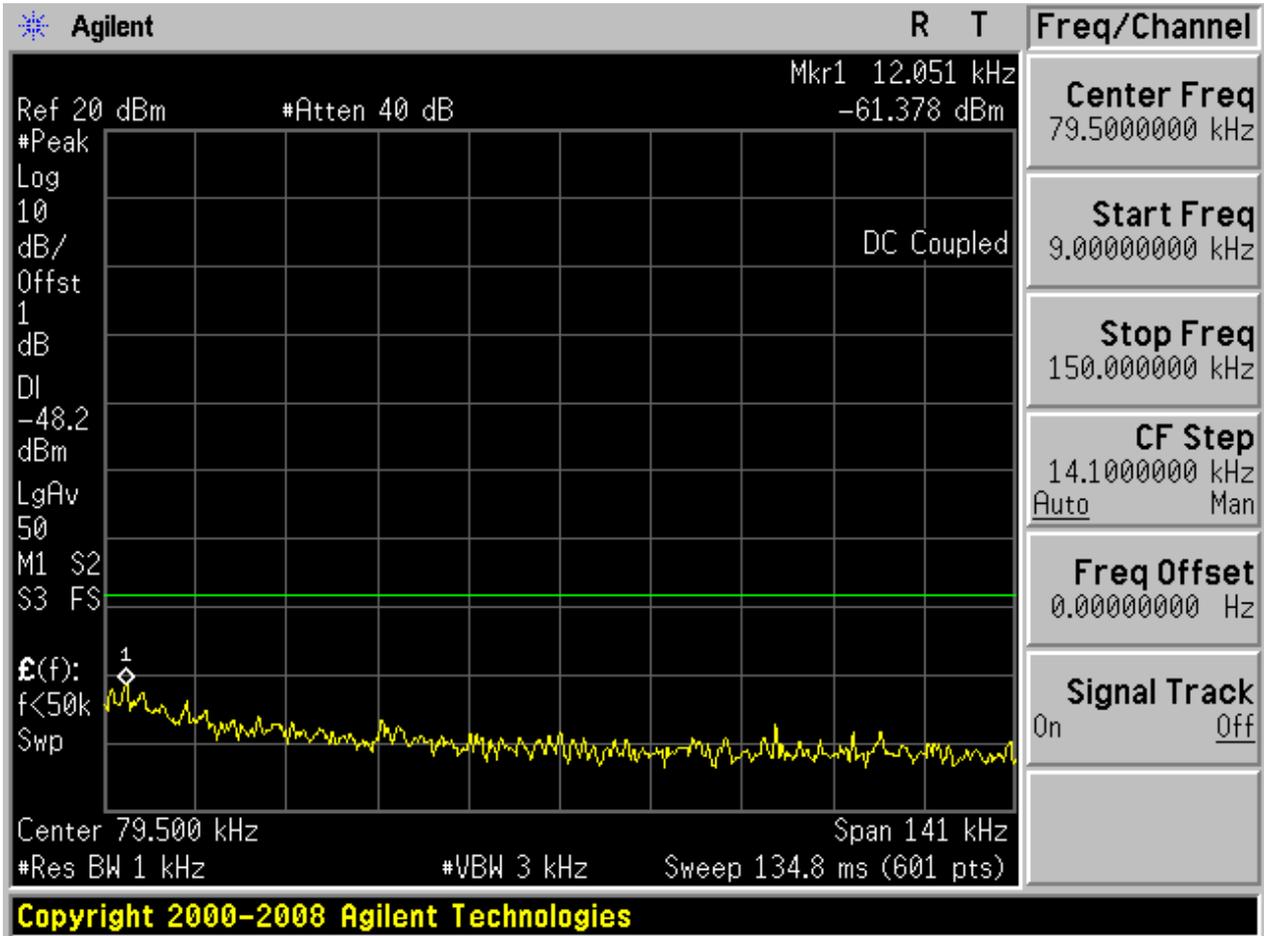
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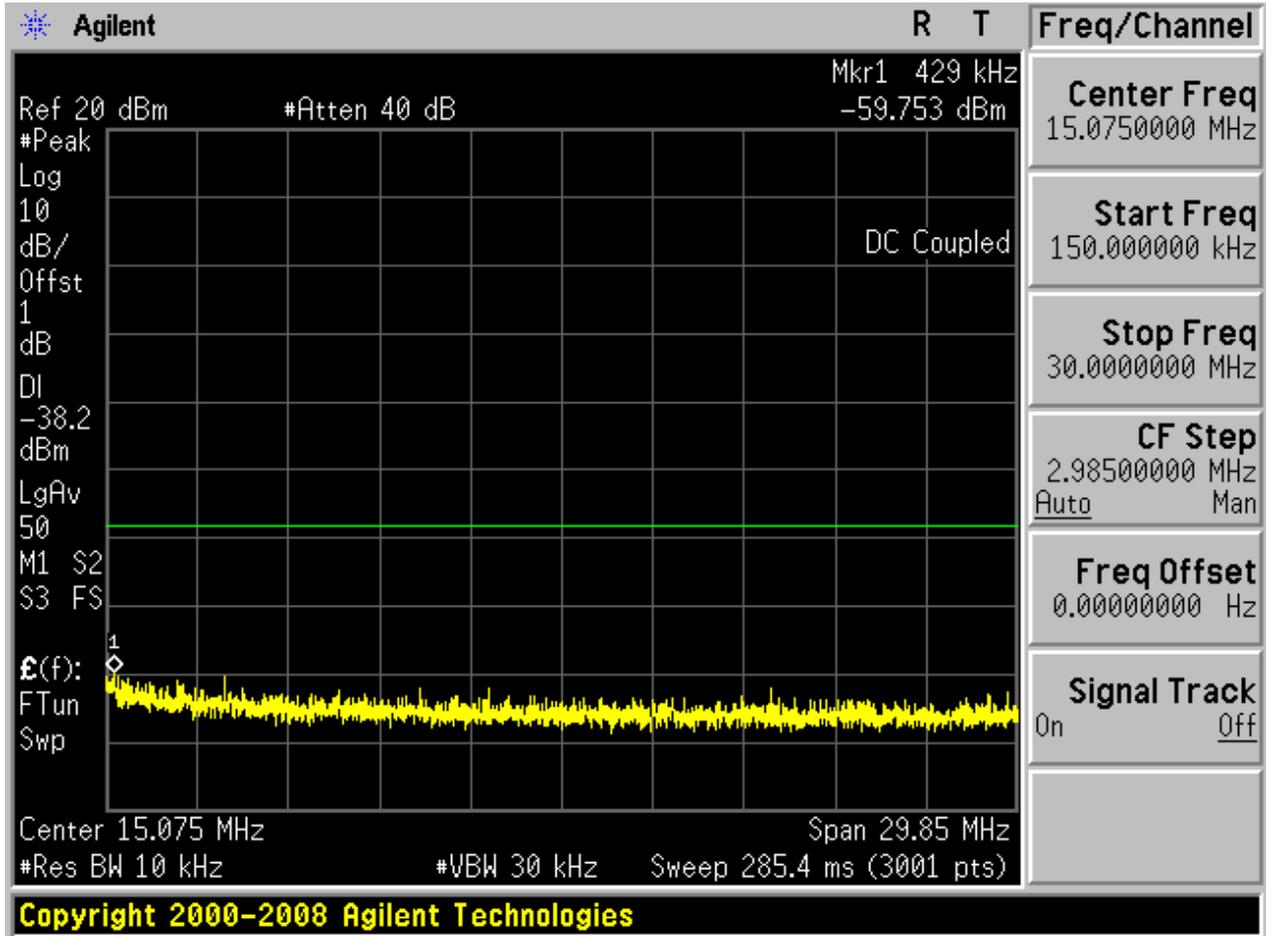
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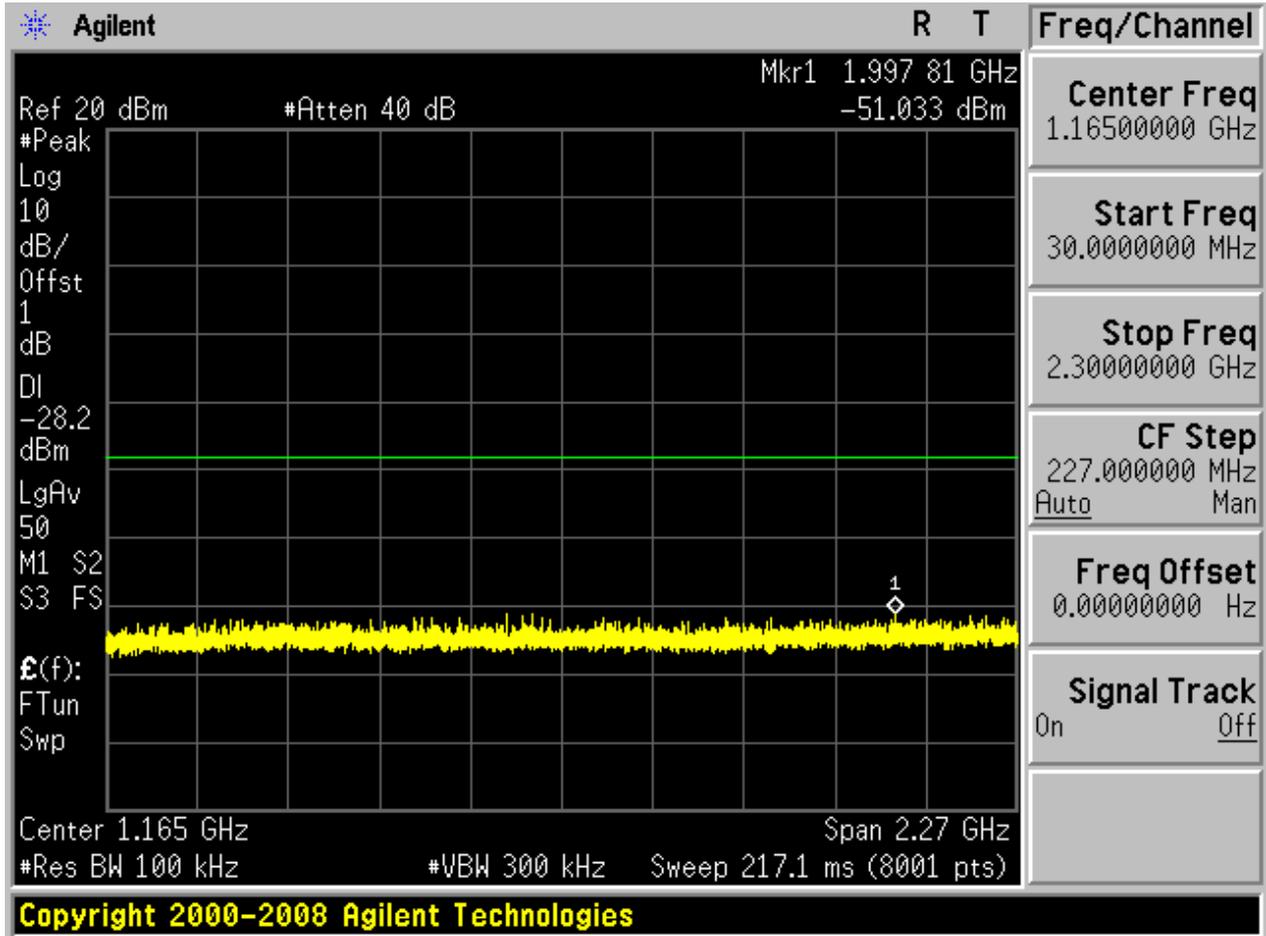


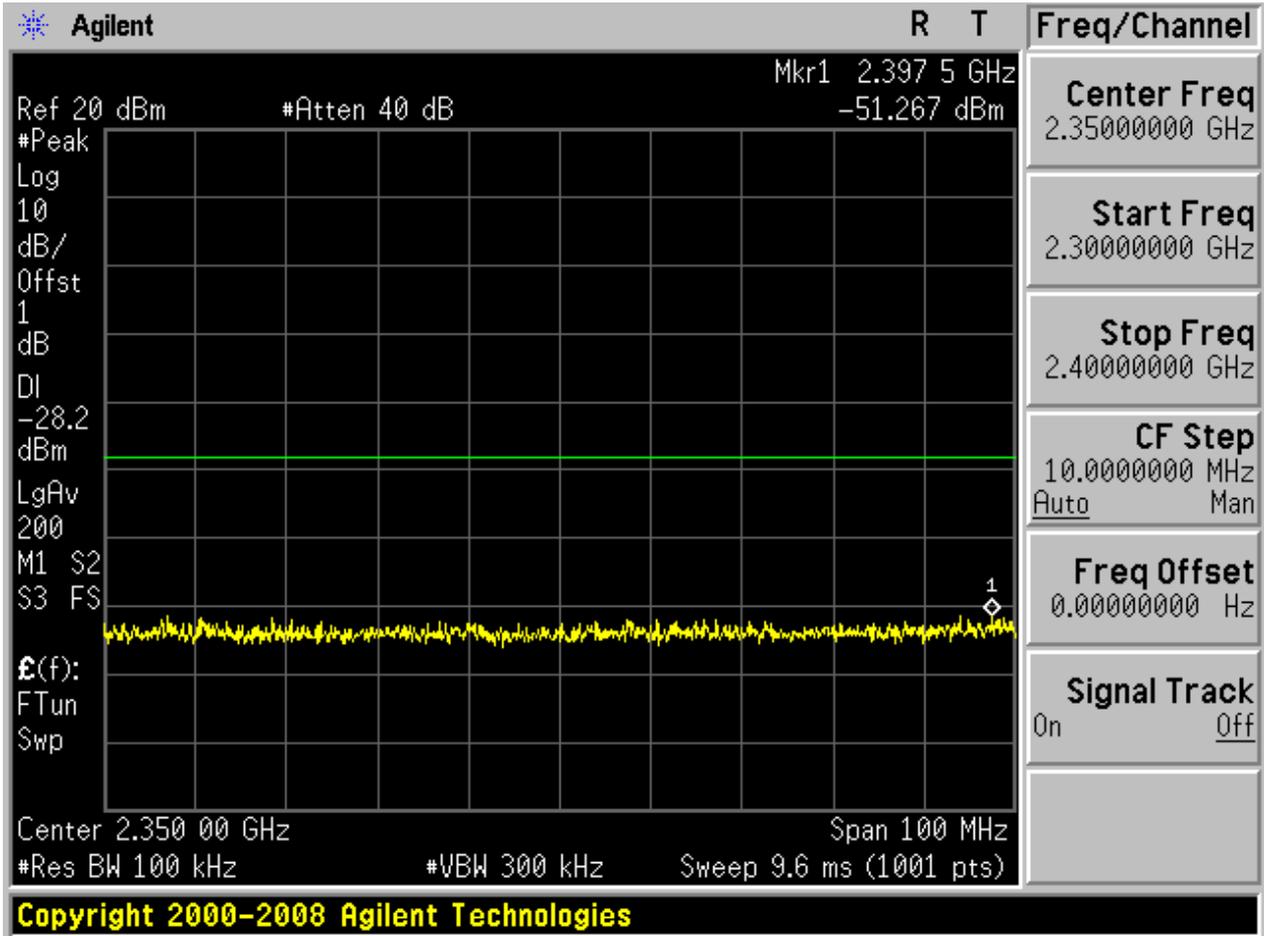


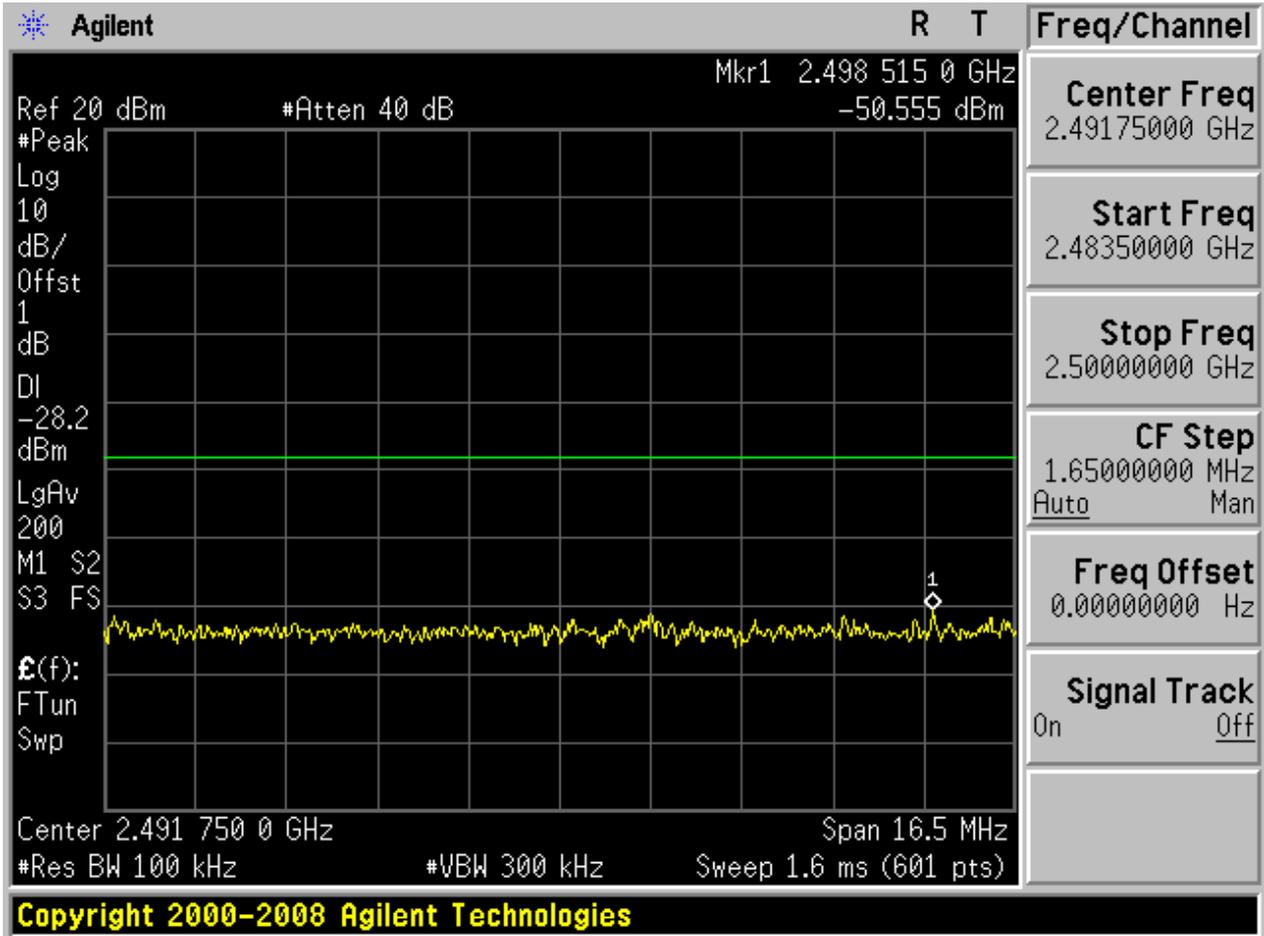
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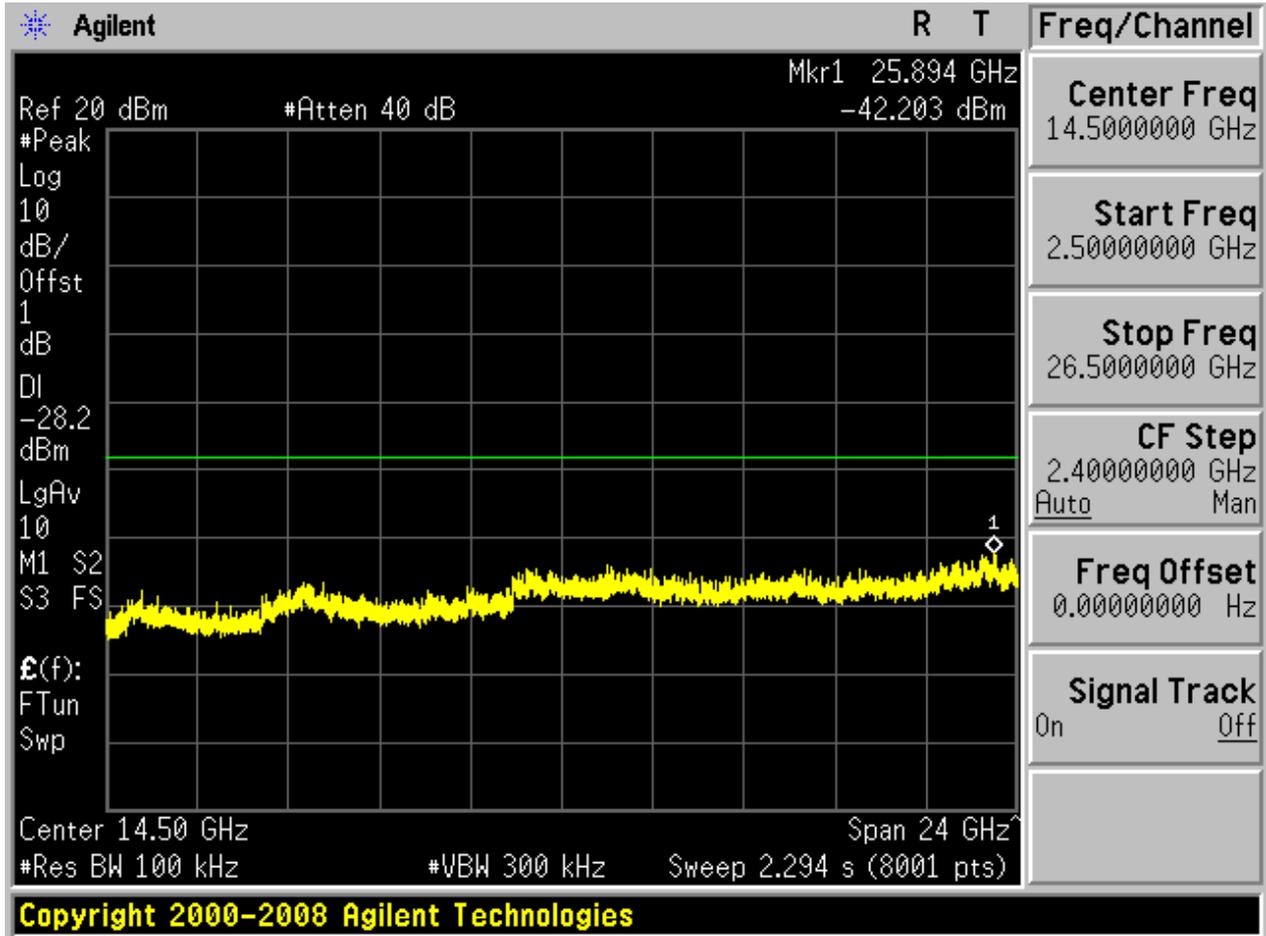






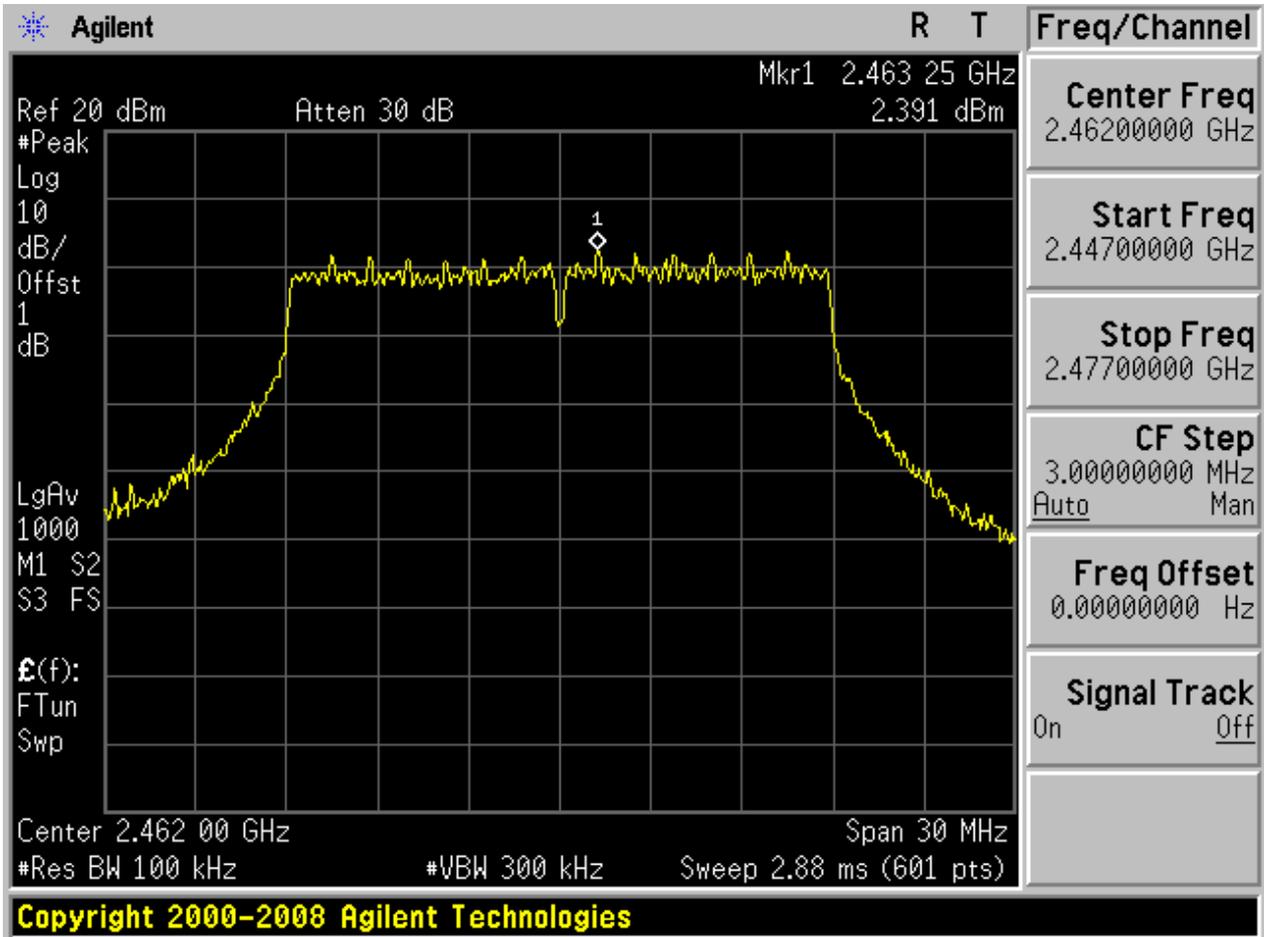






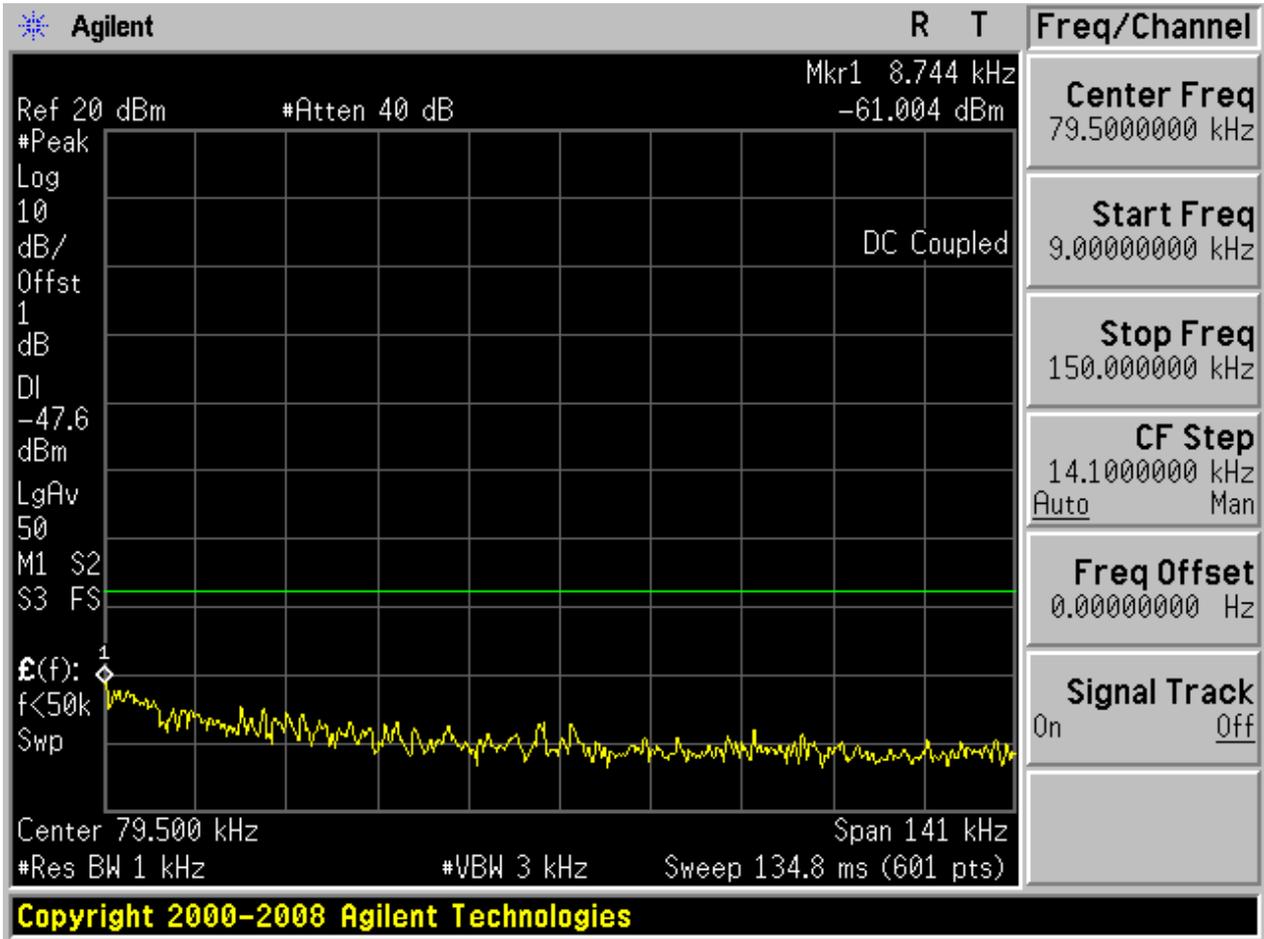
2.9 11N20_H@Ant 1

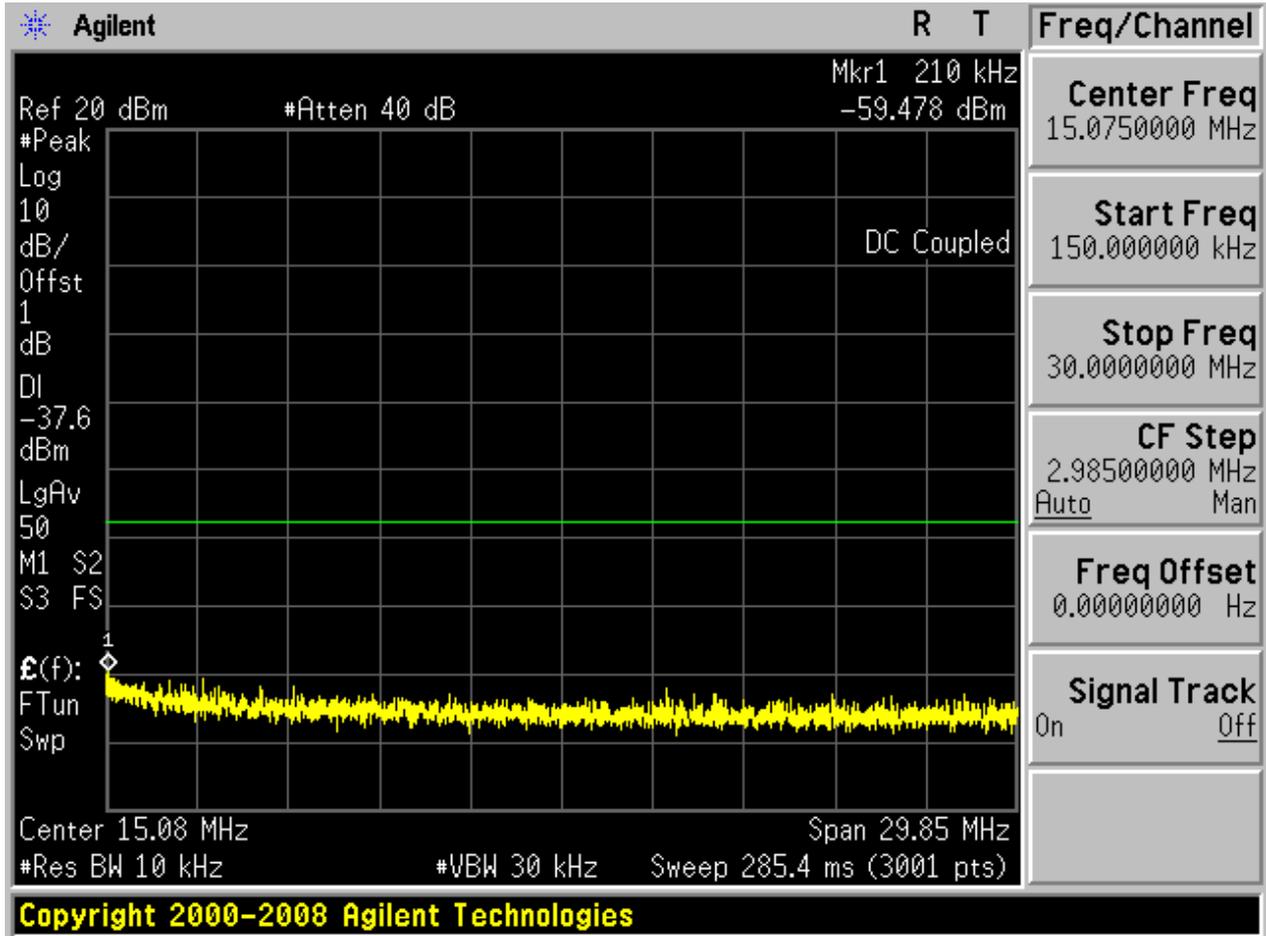
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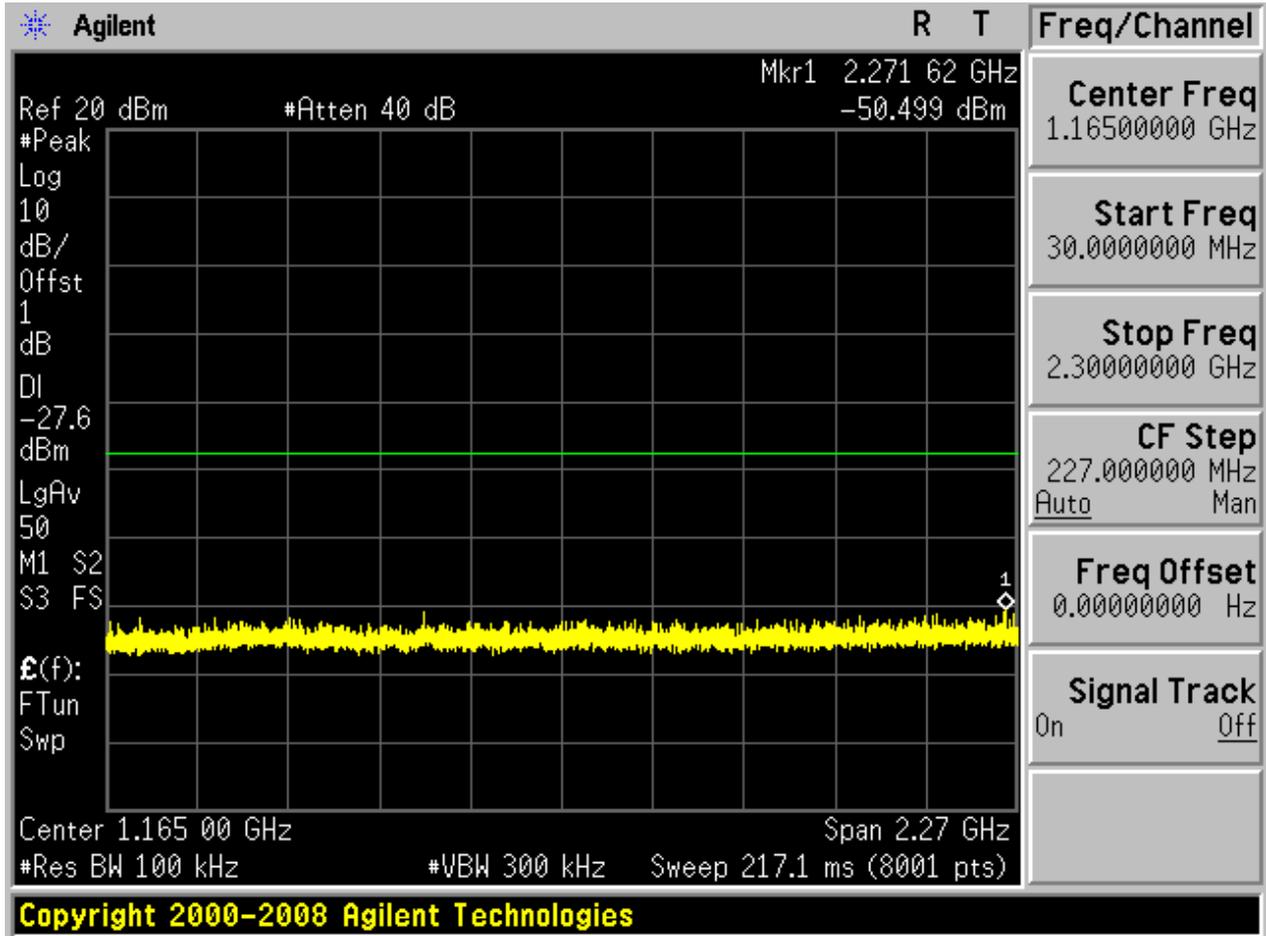


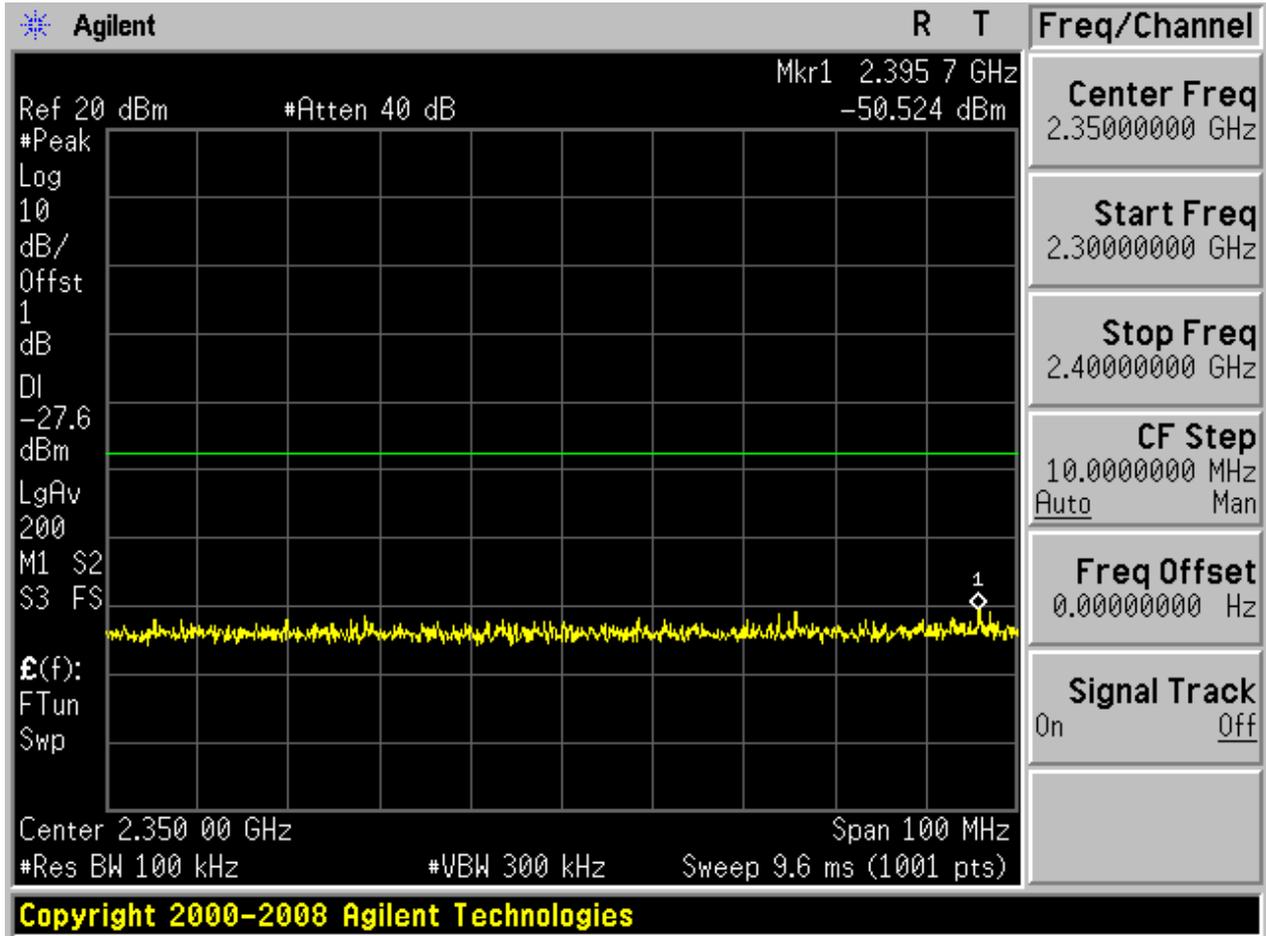


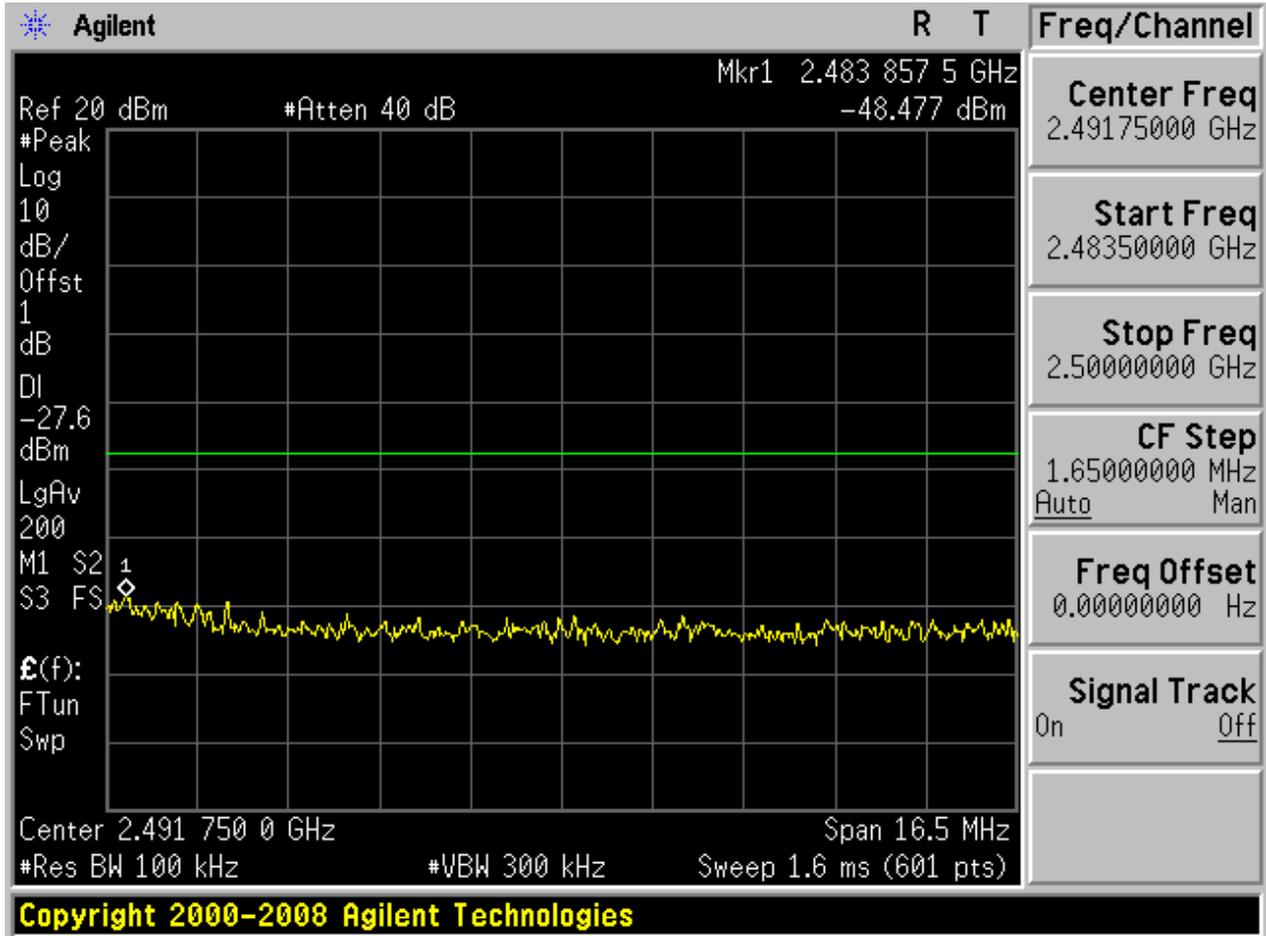
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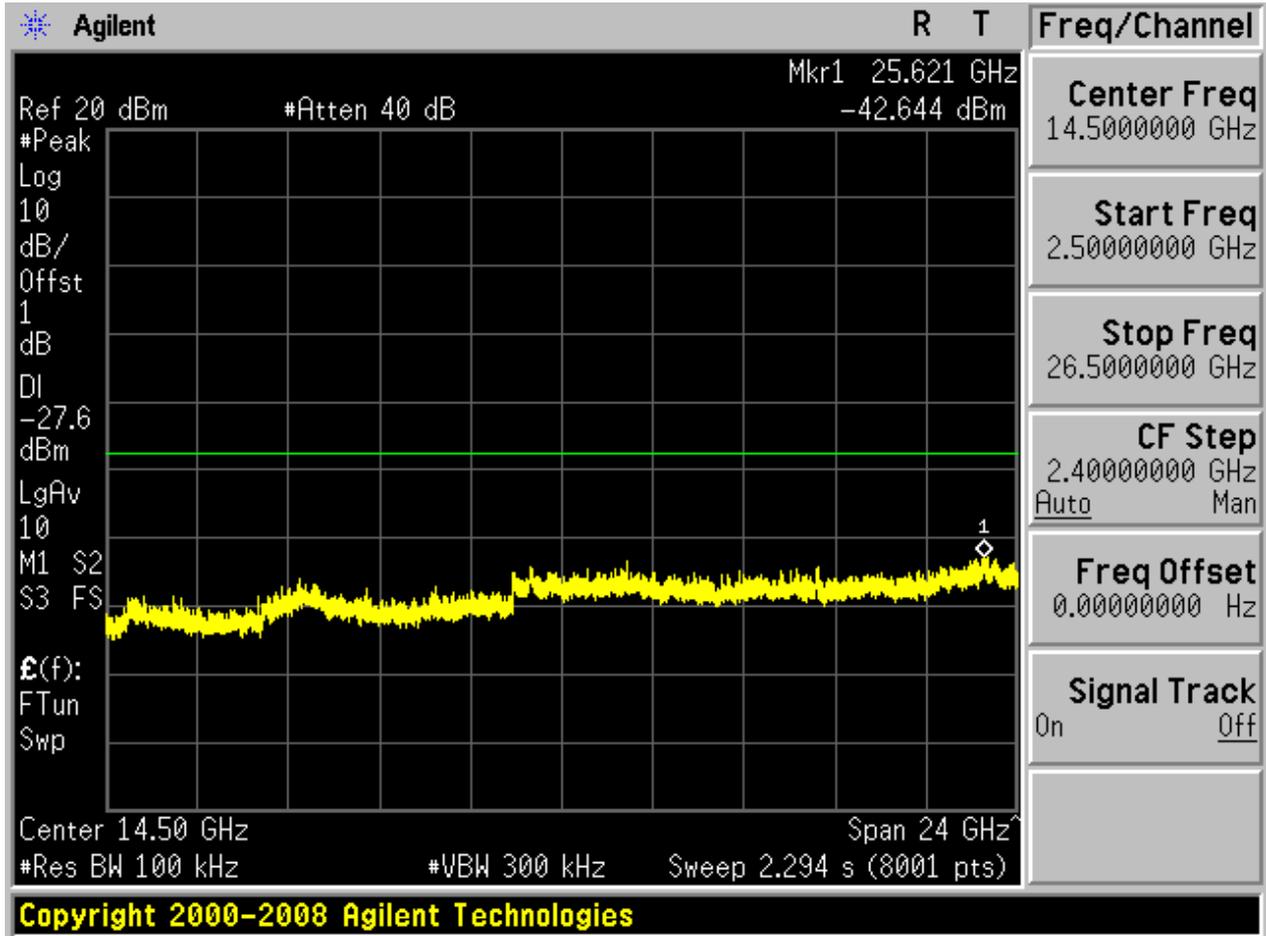






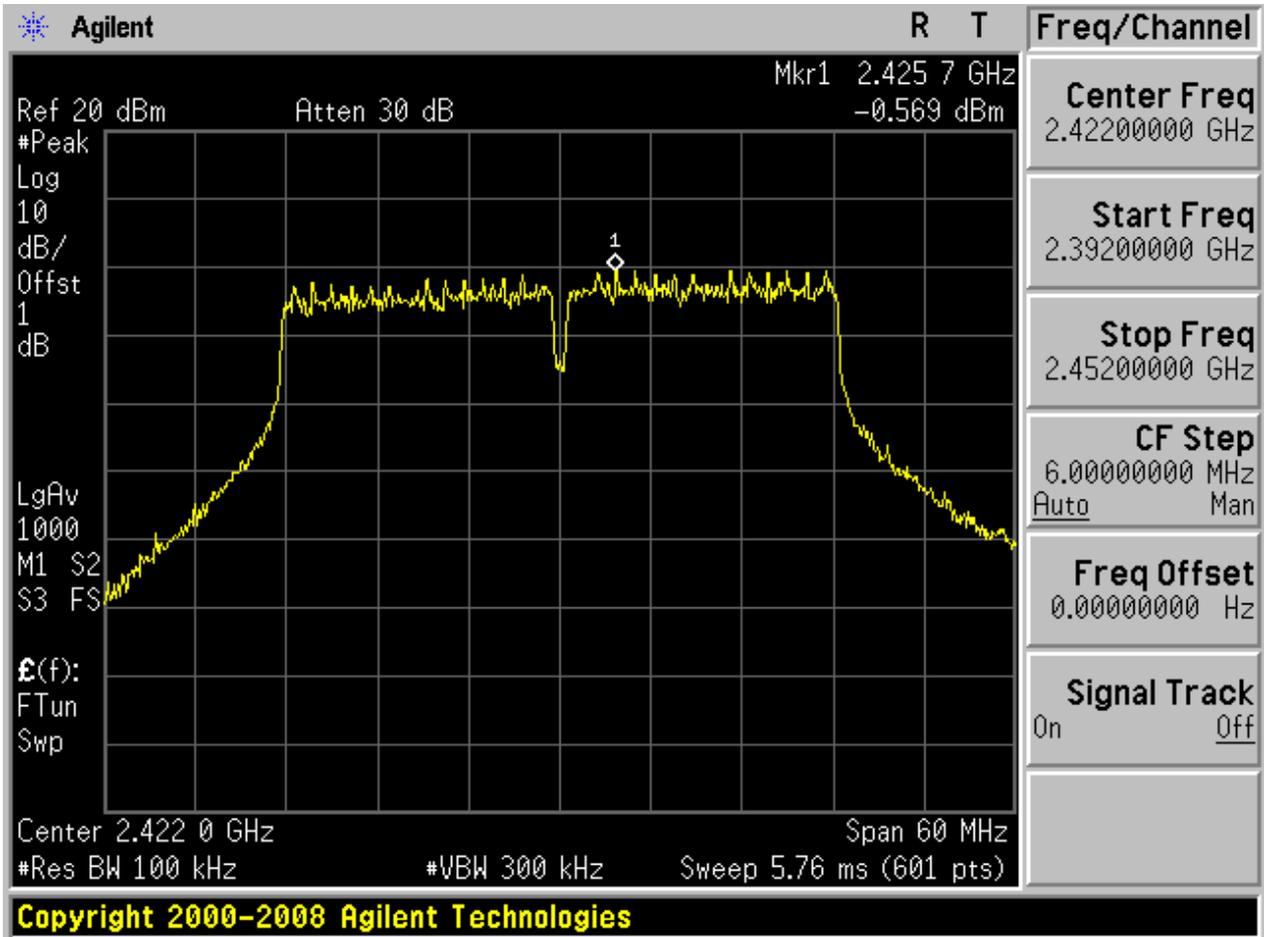






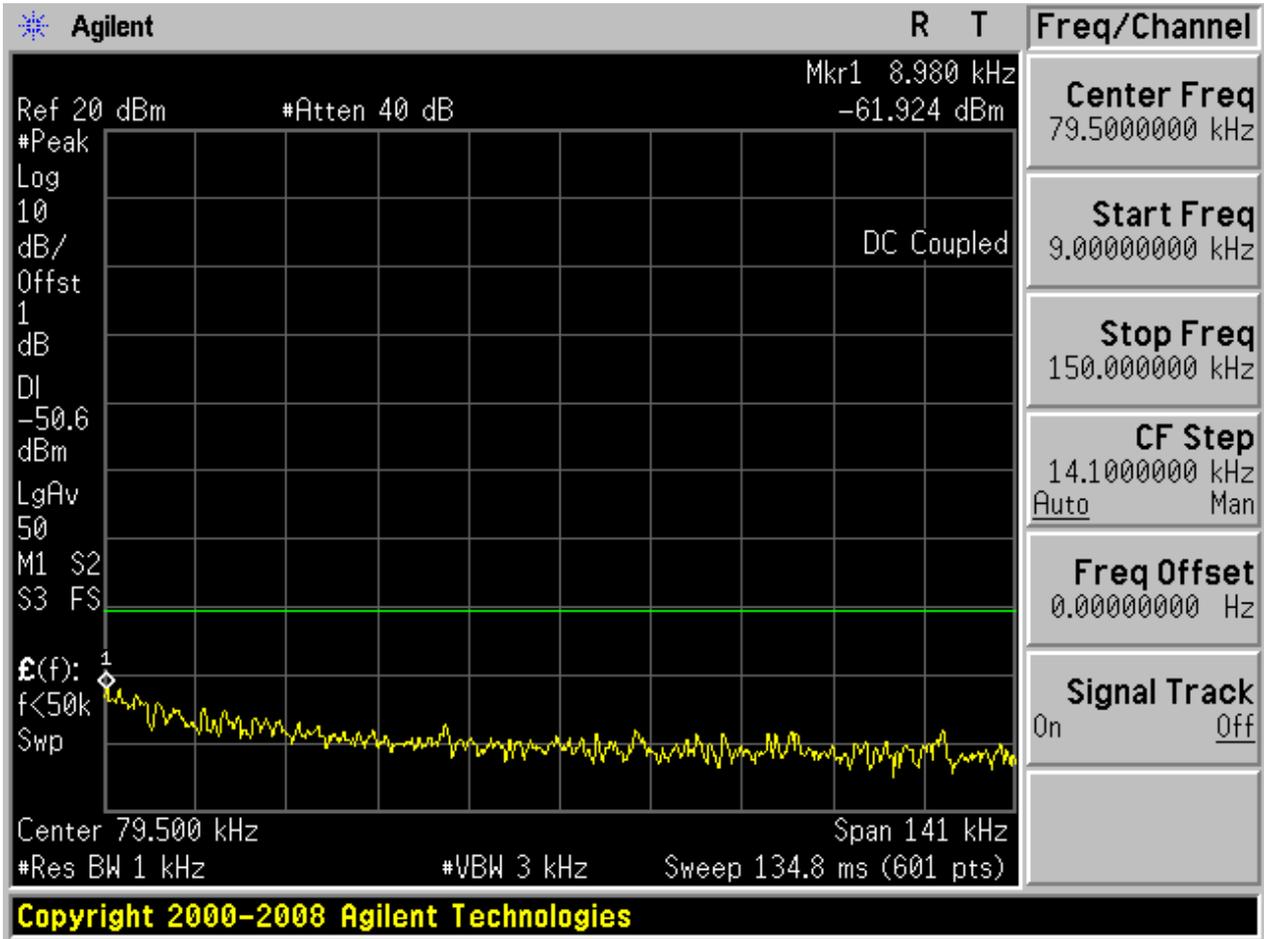
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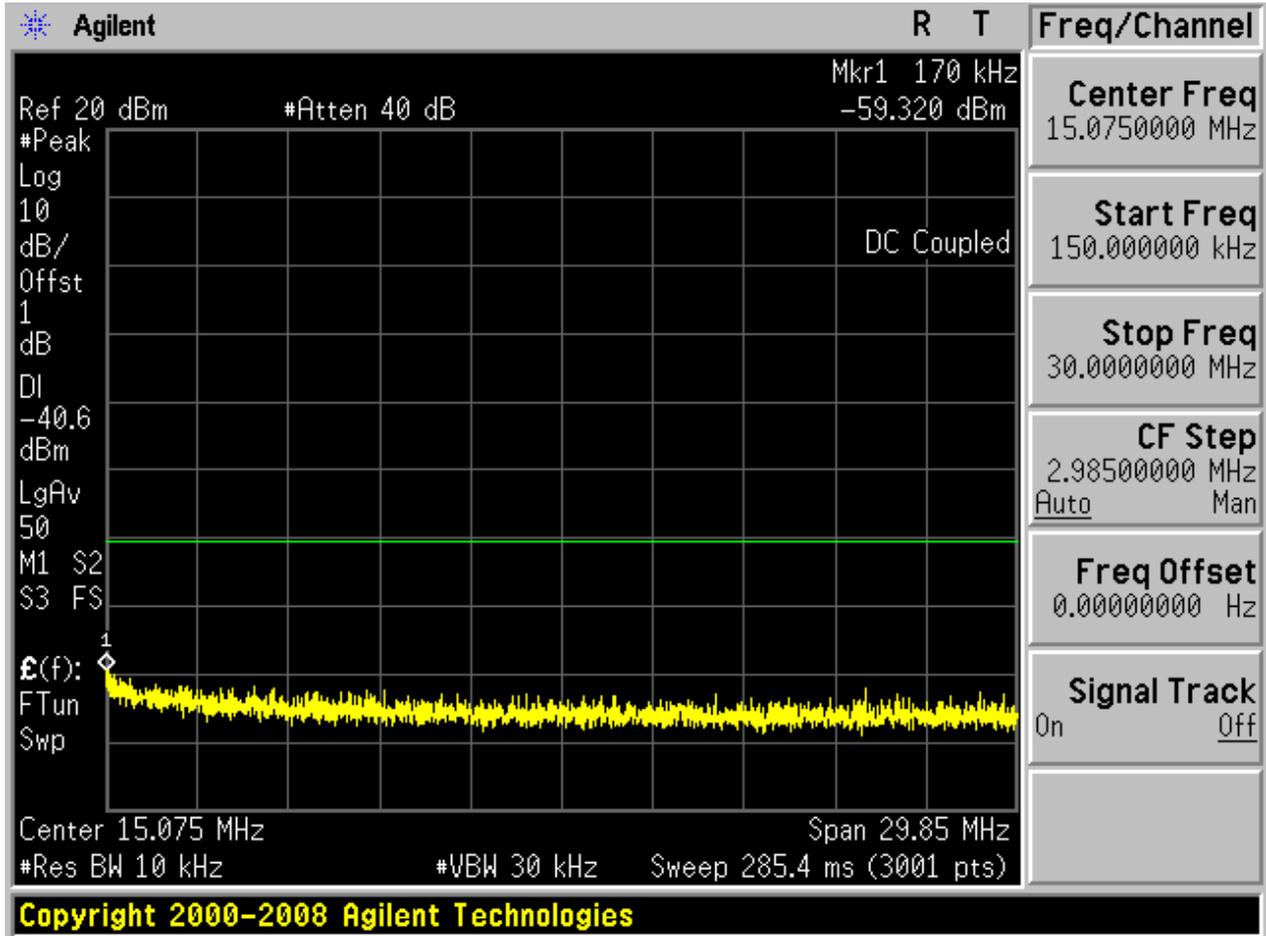
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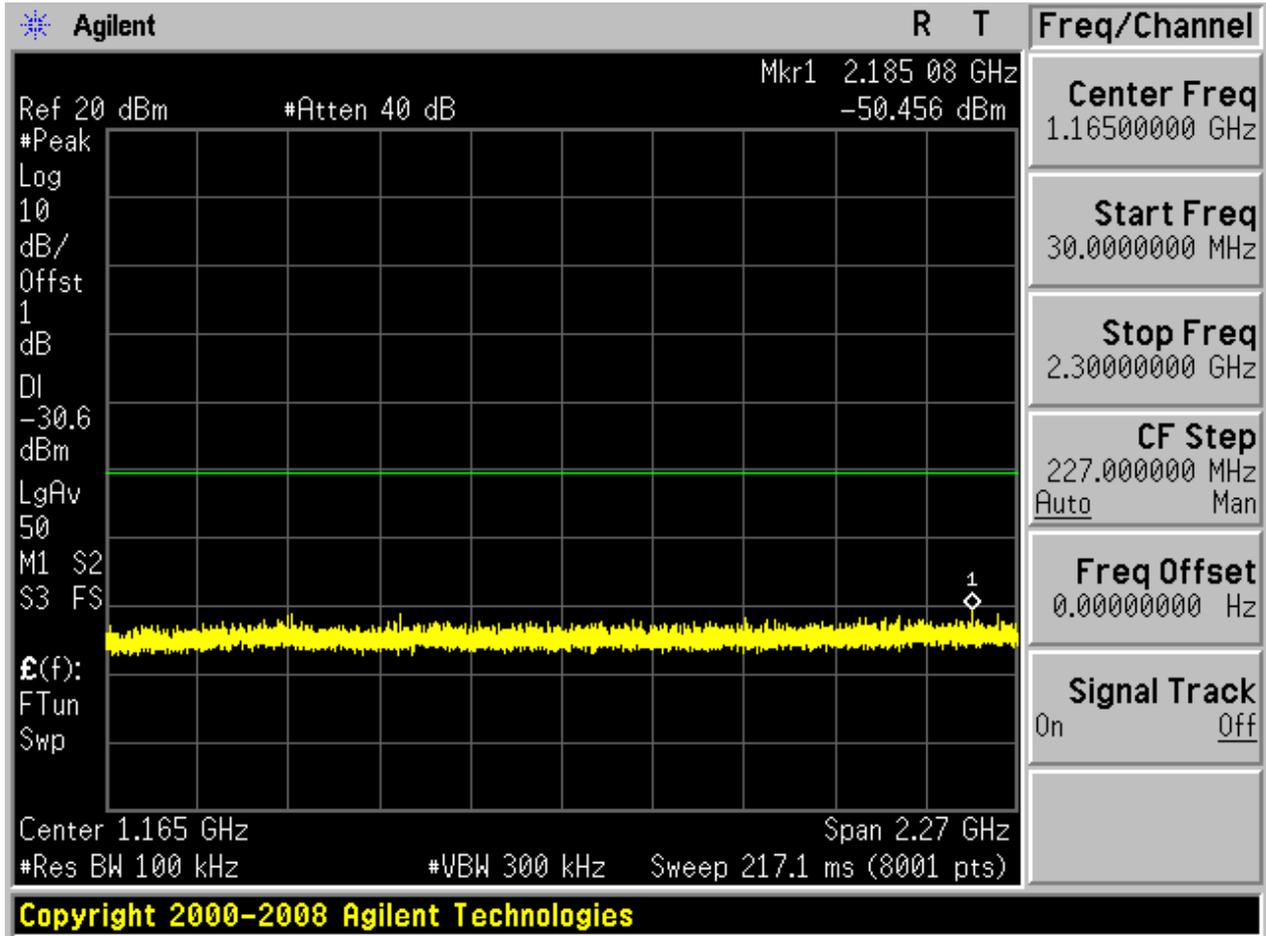


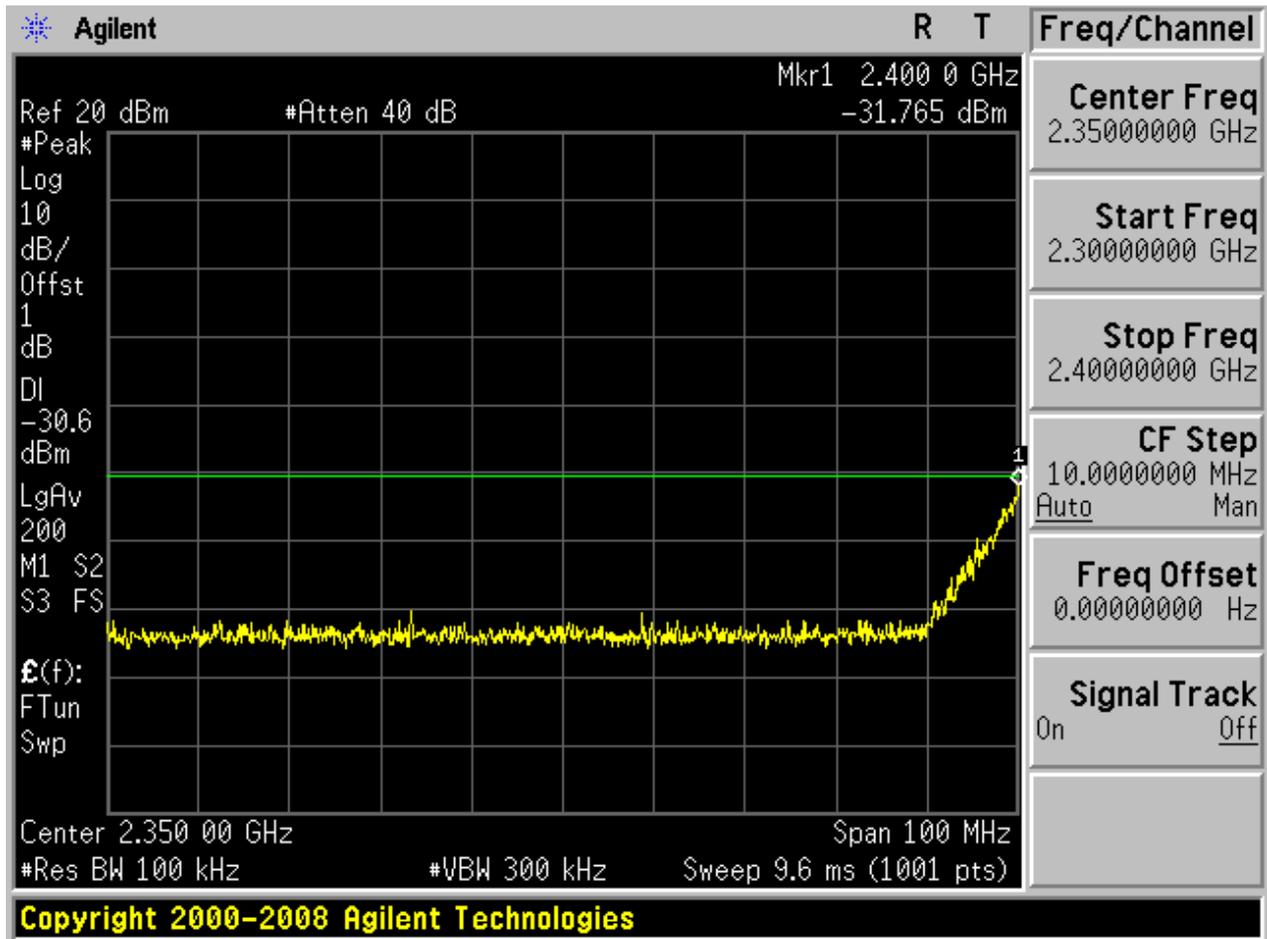


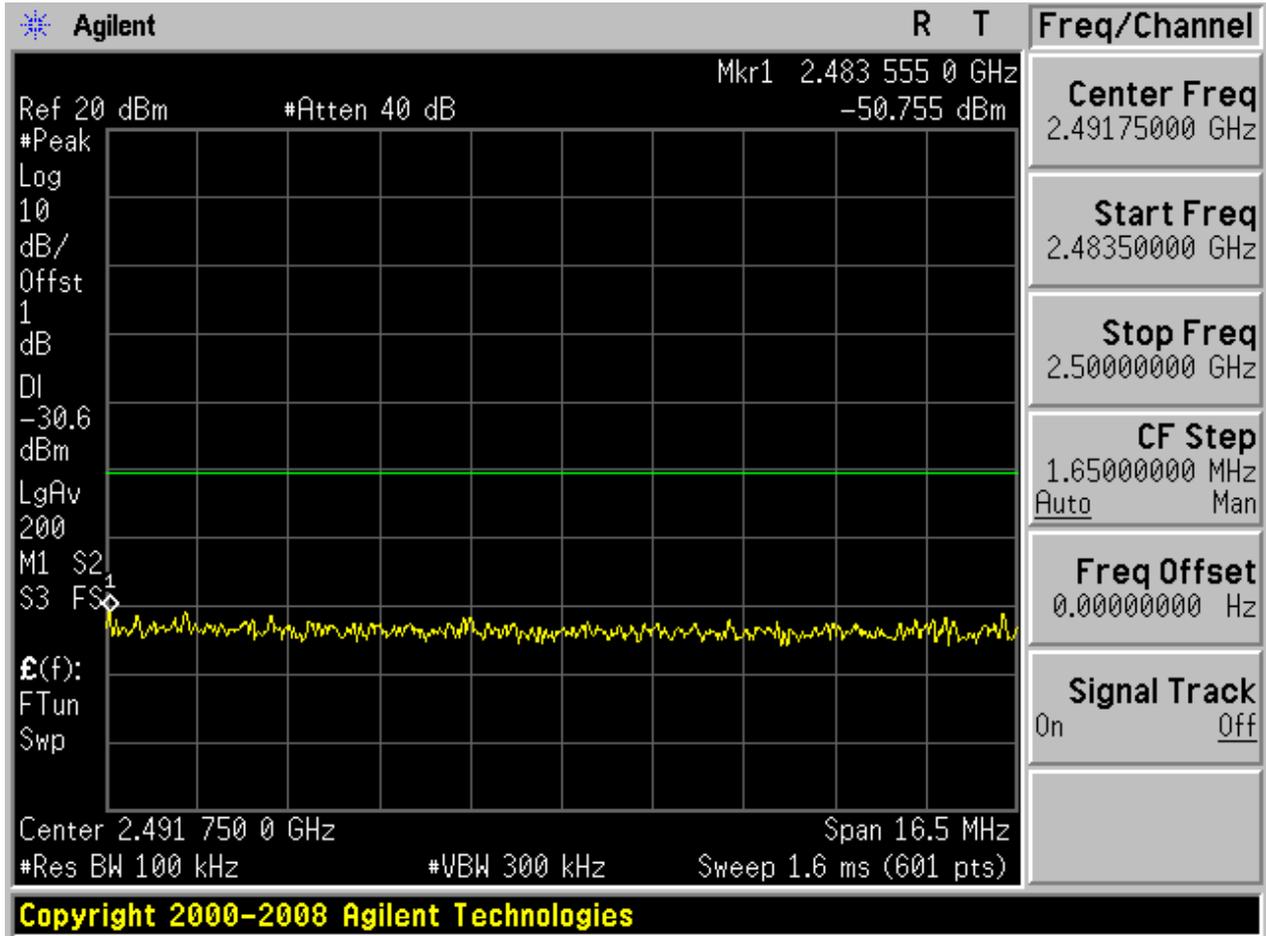
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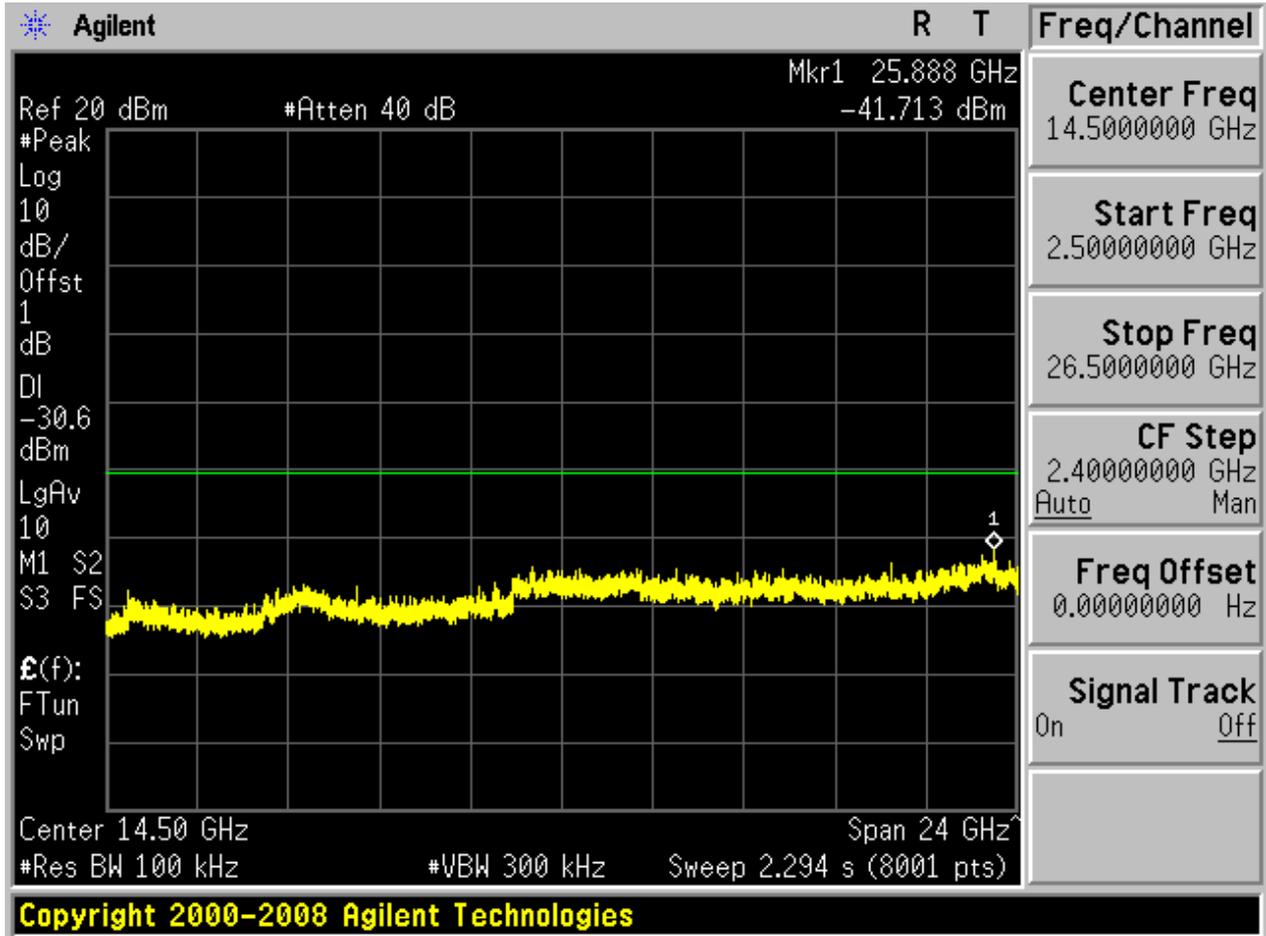






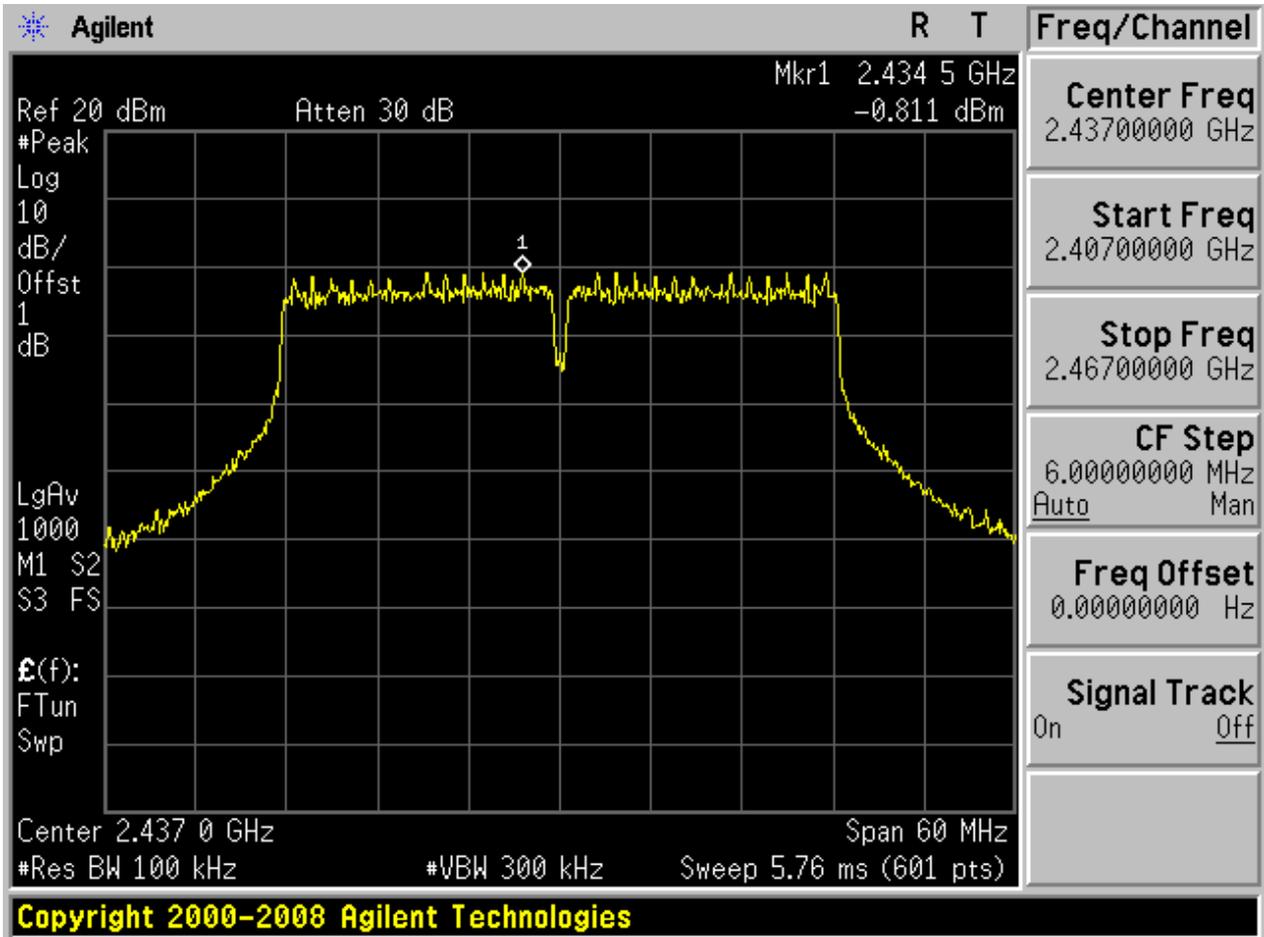






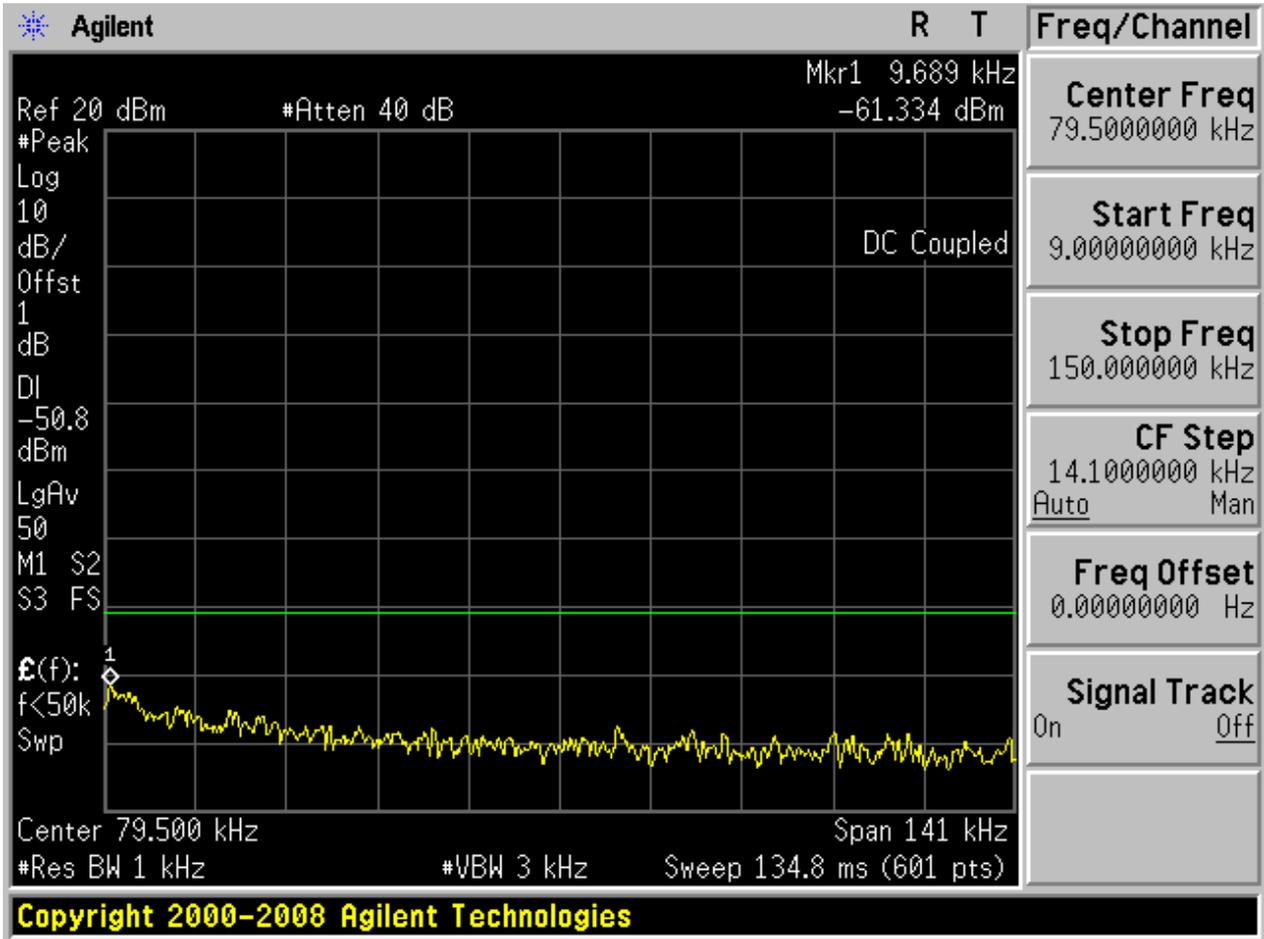
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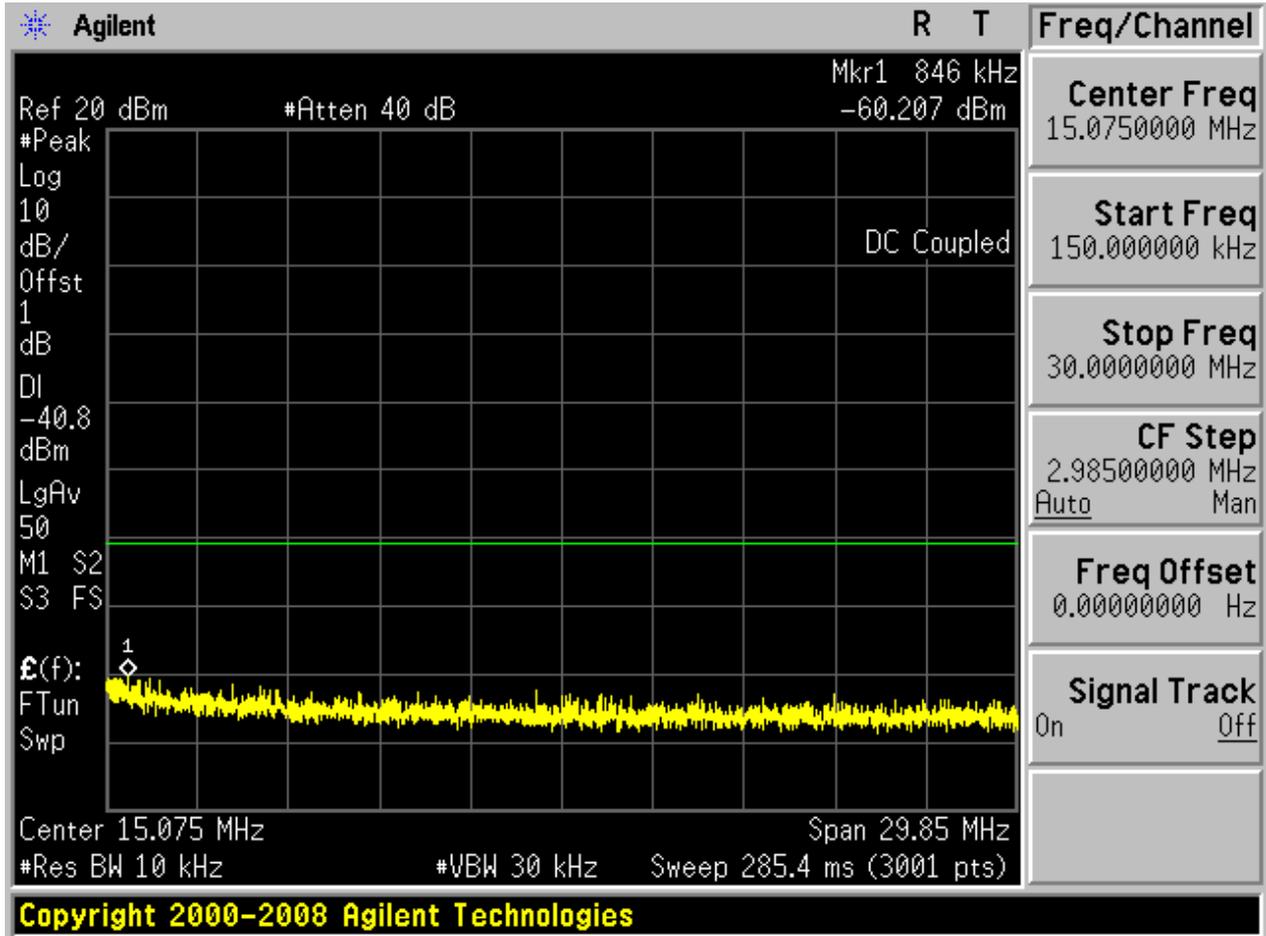
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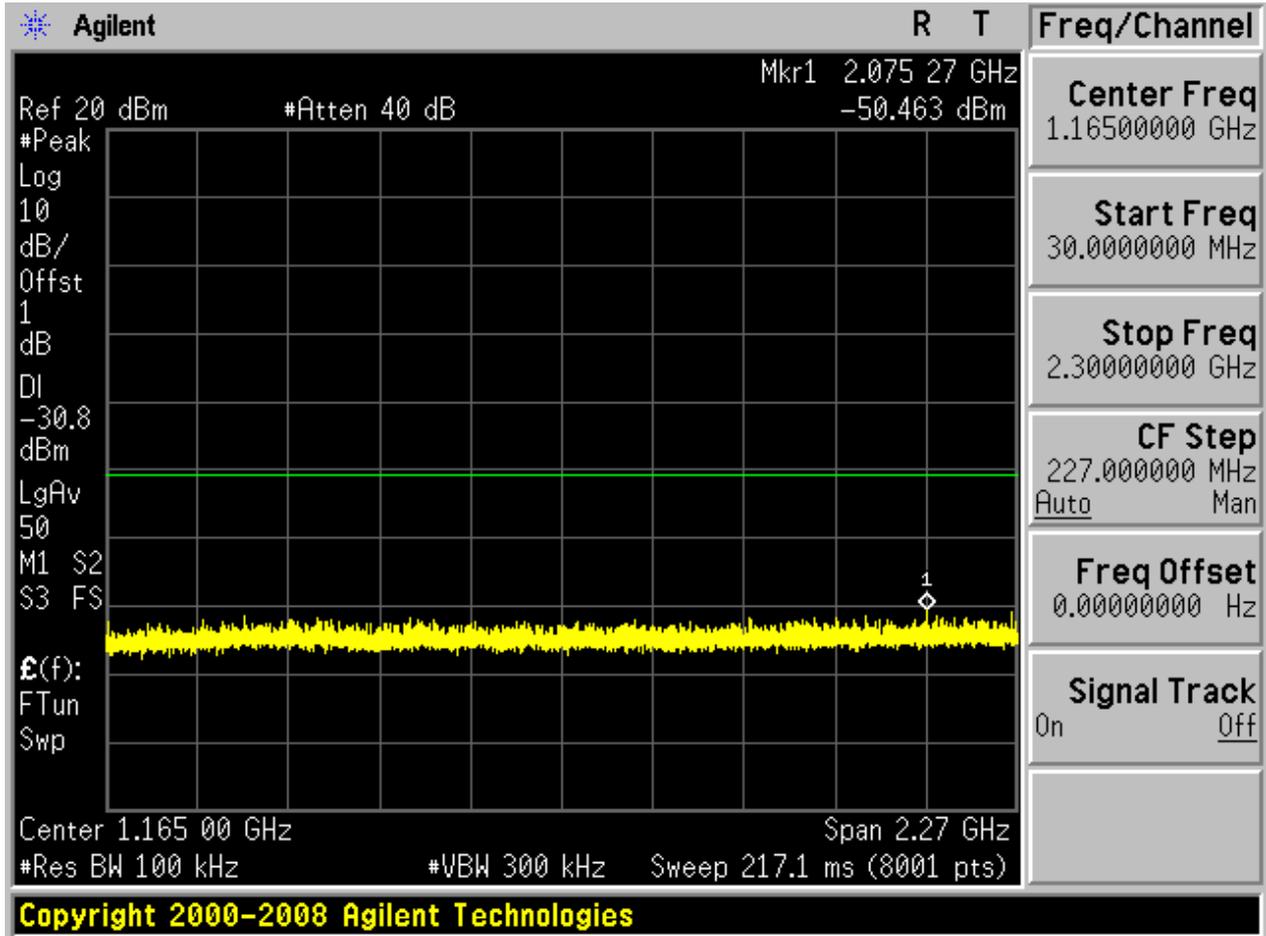


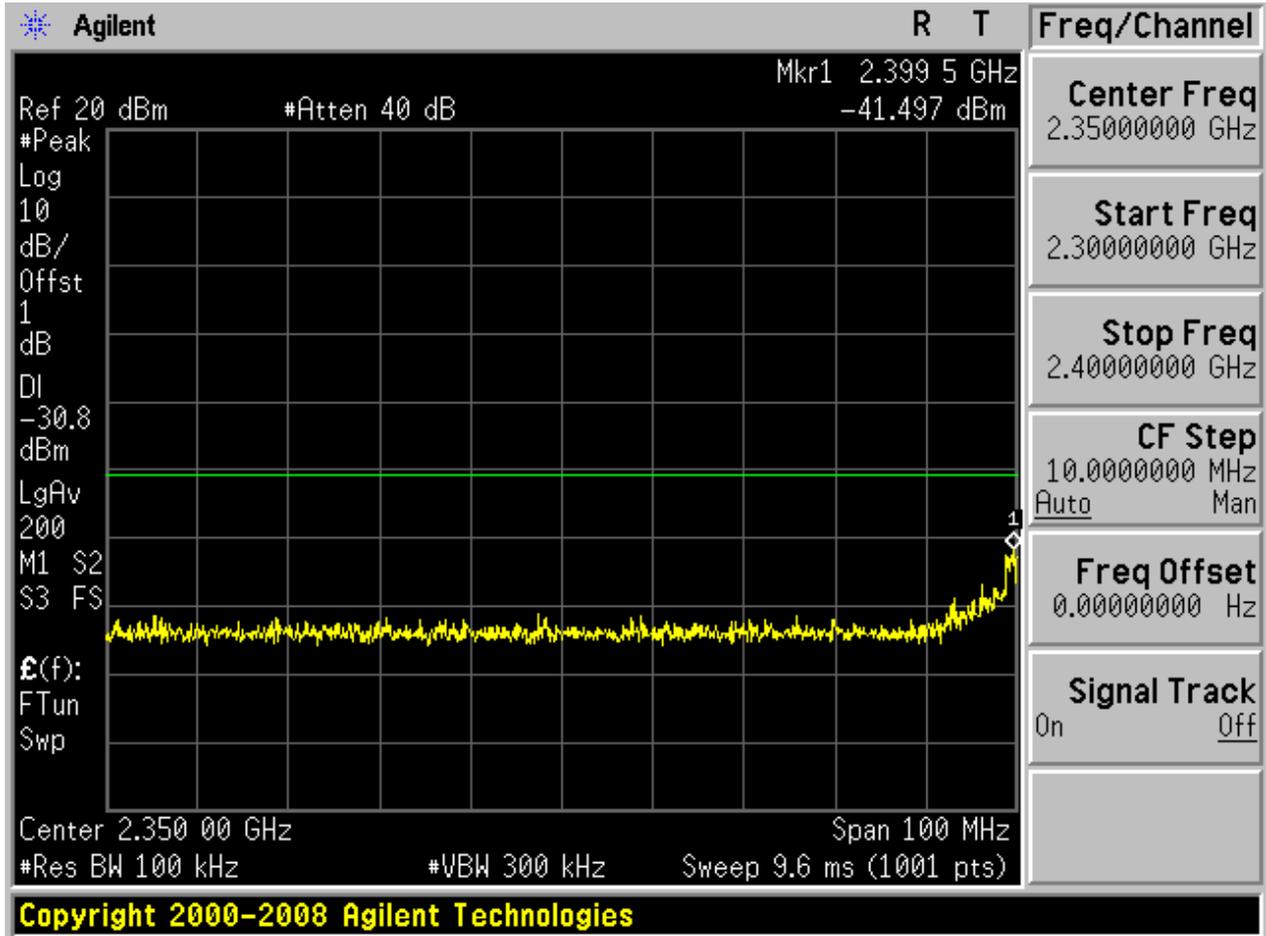


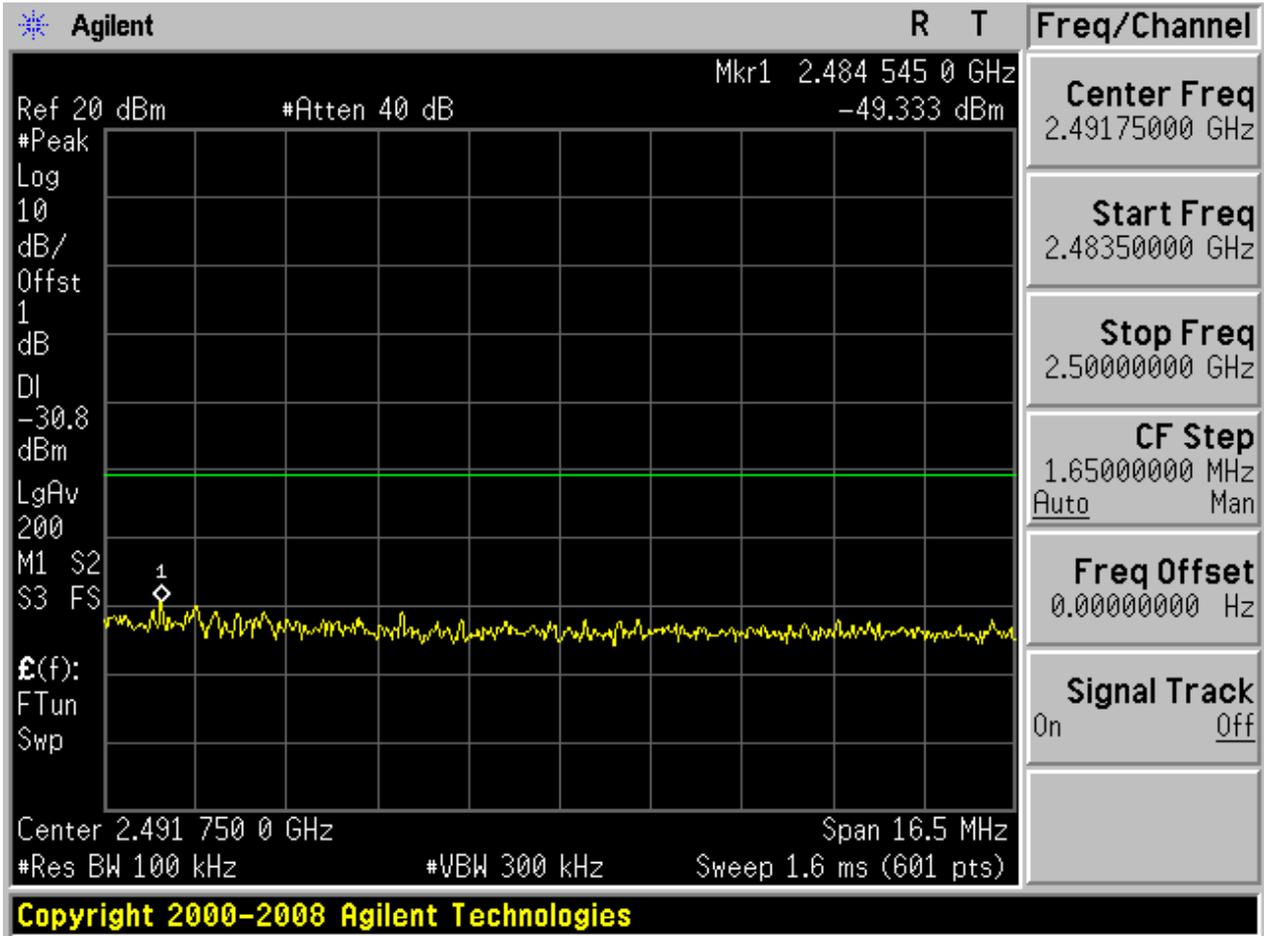
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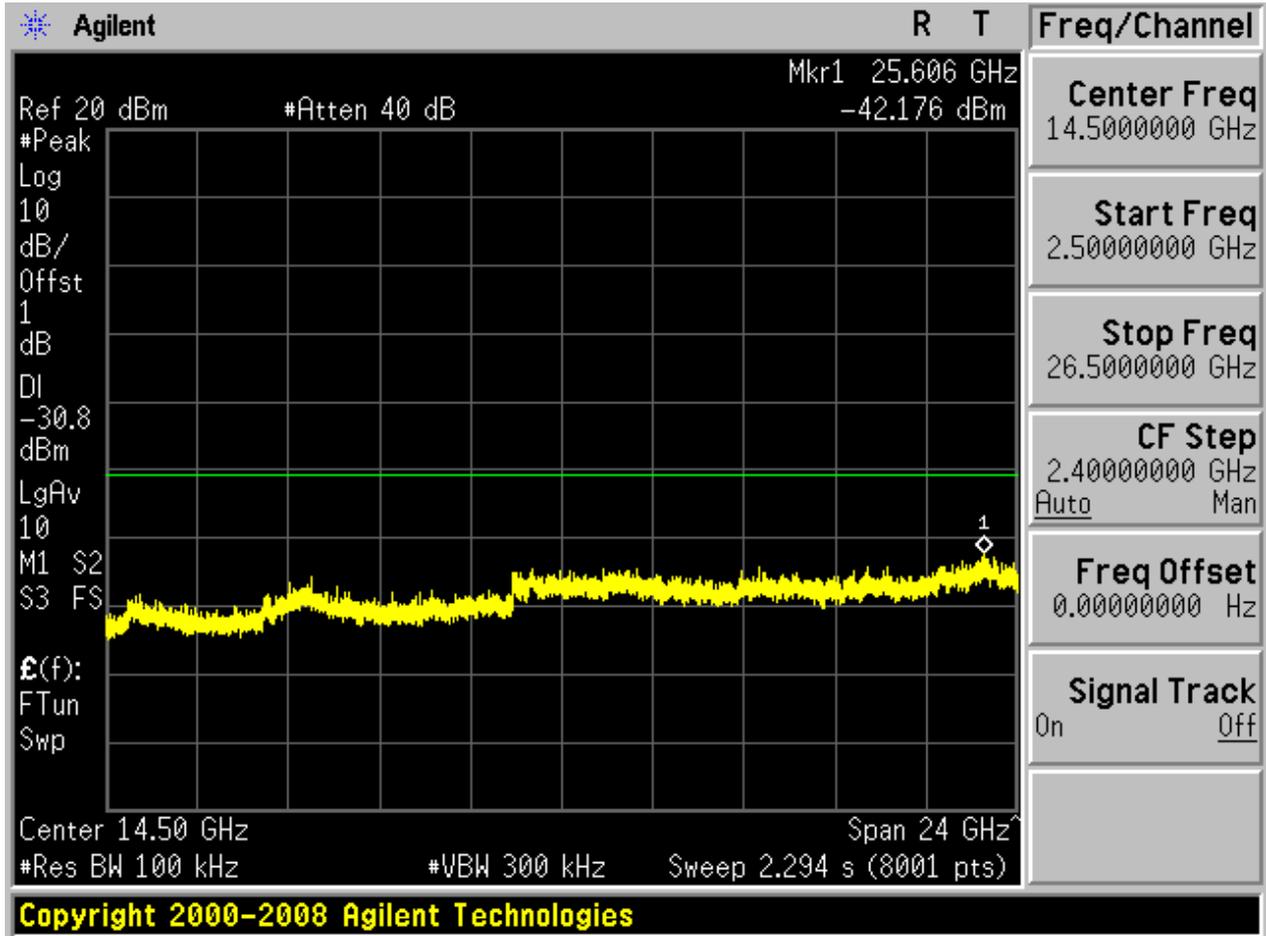






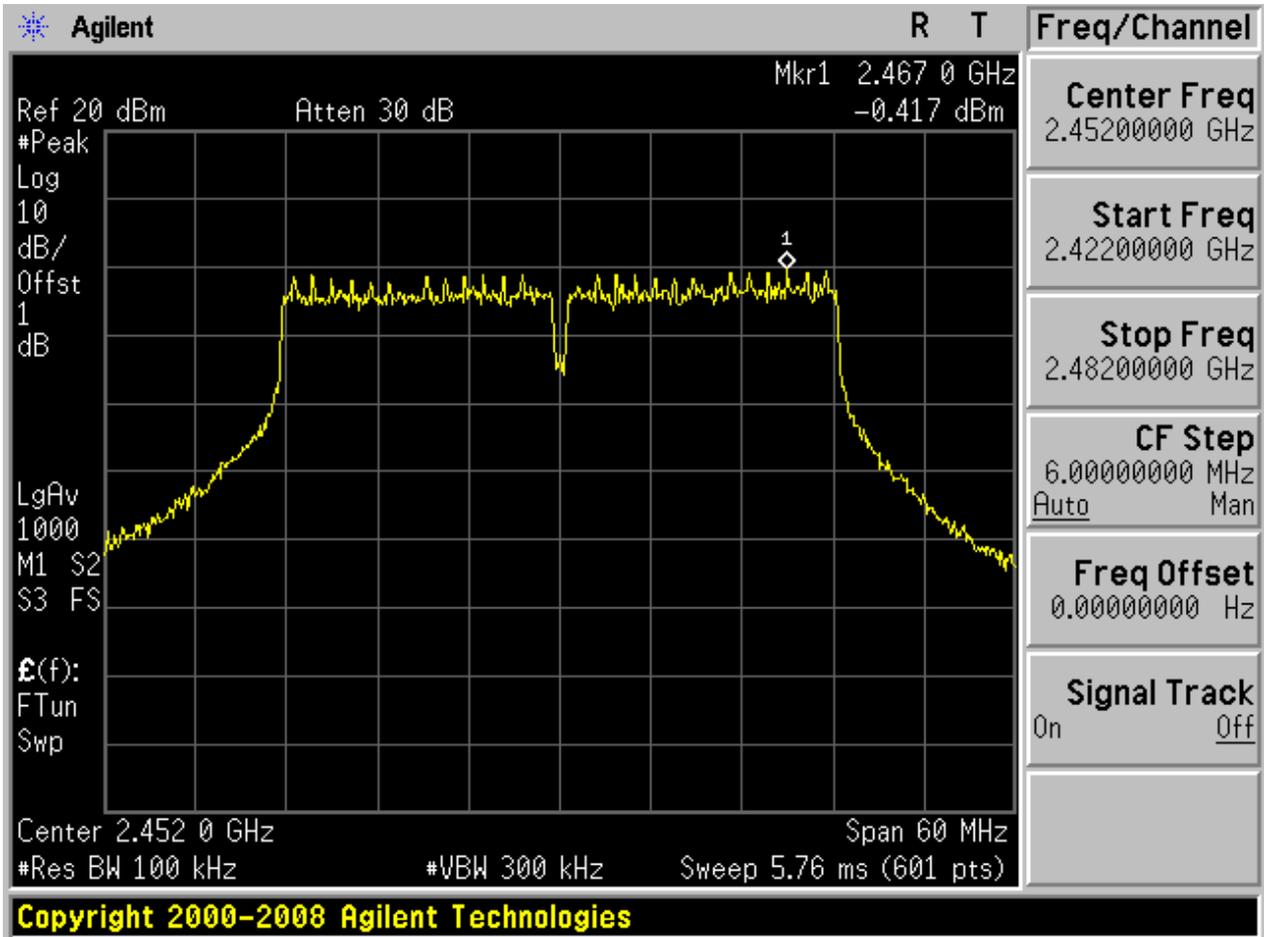






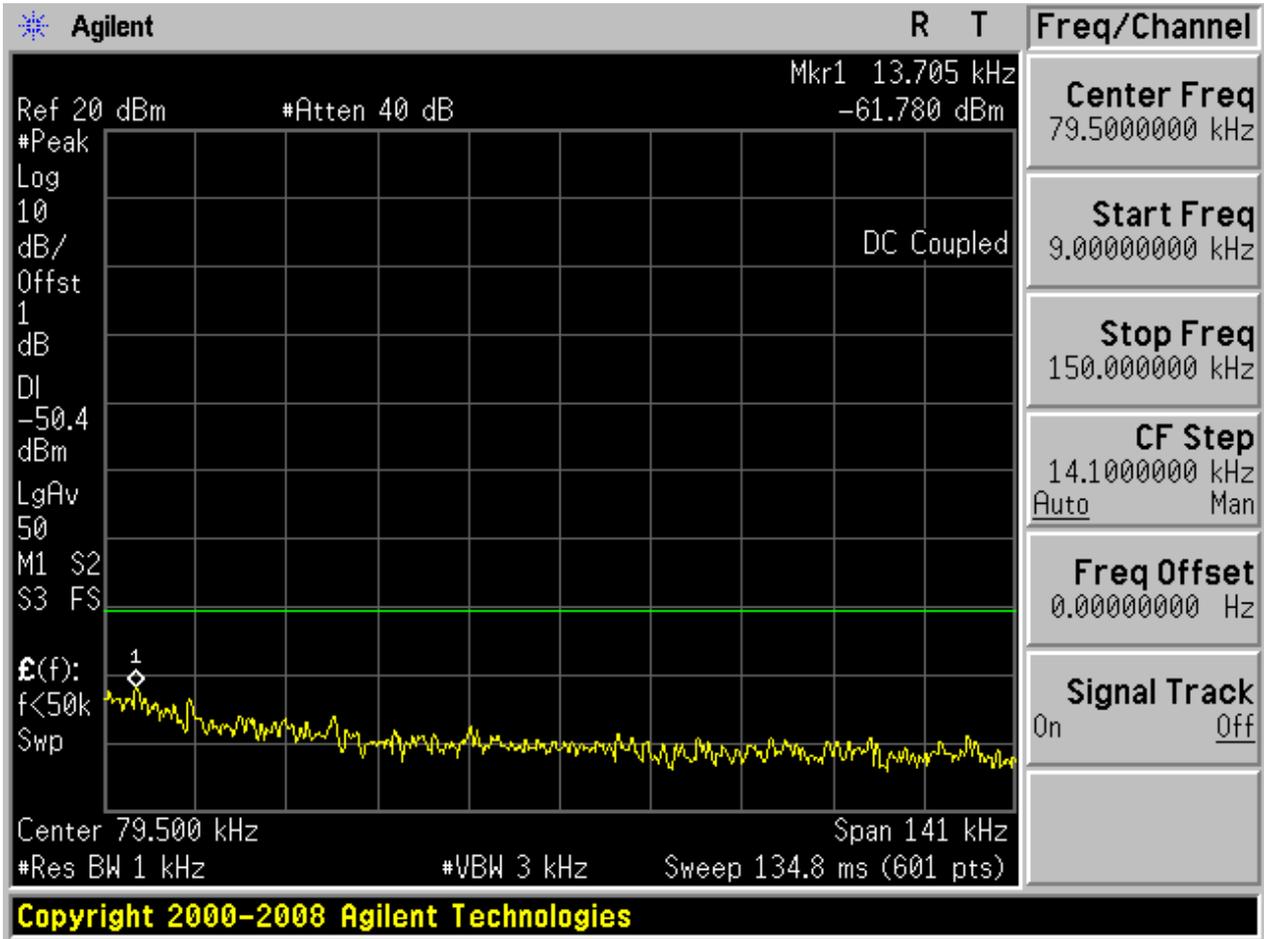
2.12 11N40_H@Ant 1

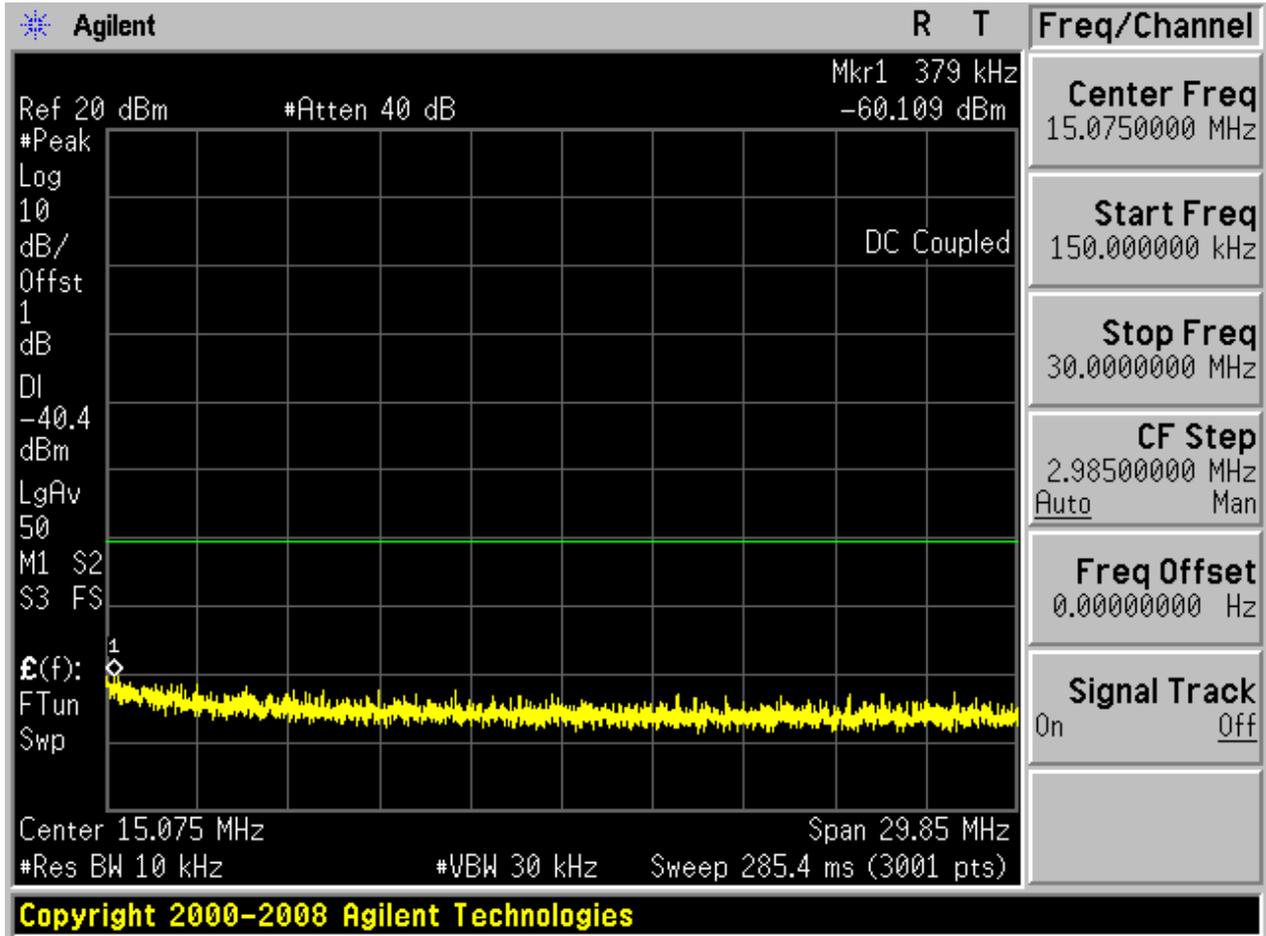
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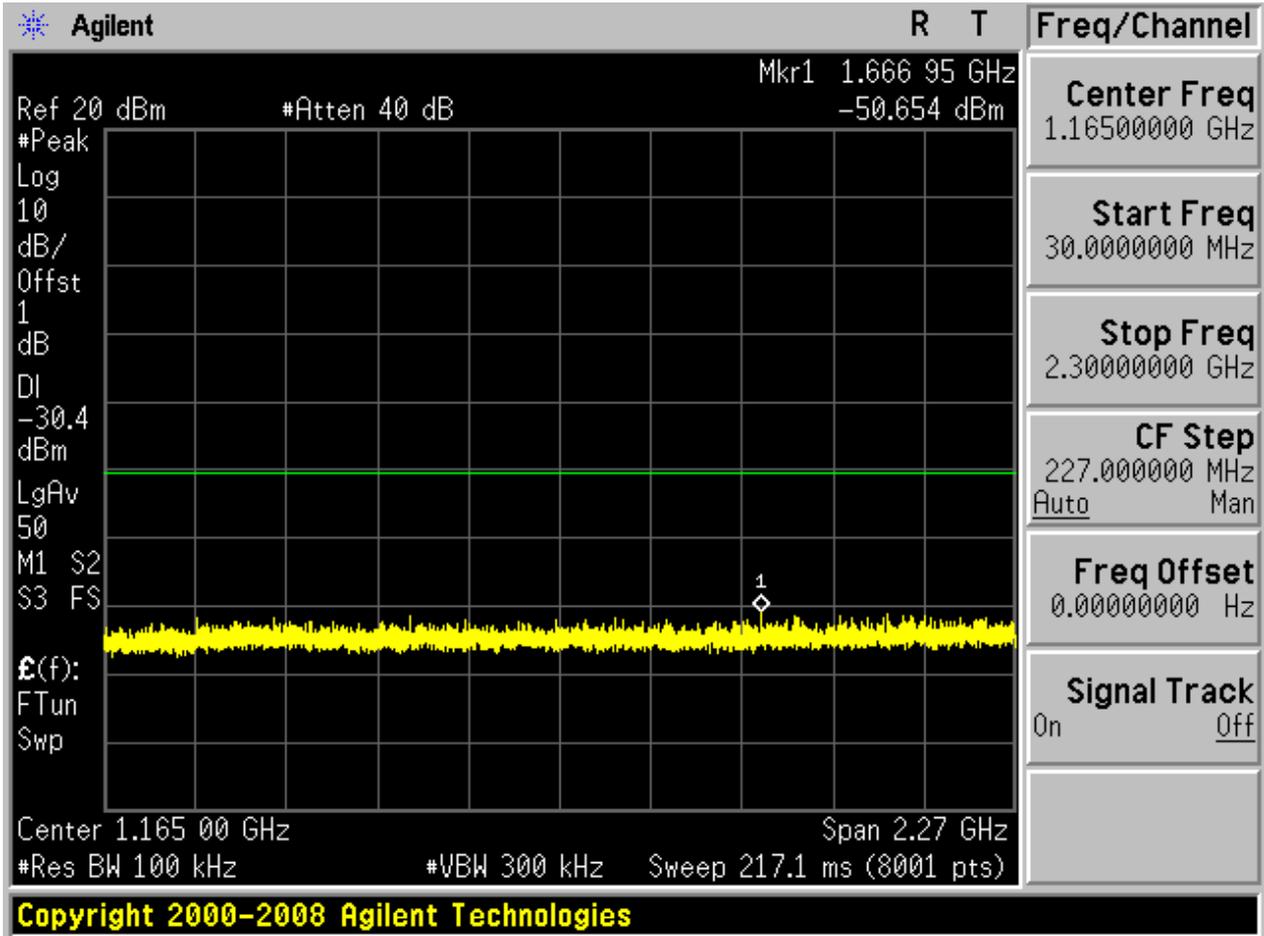


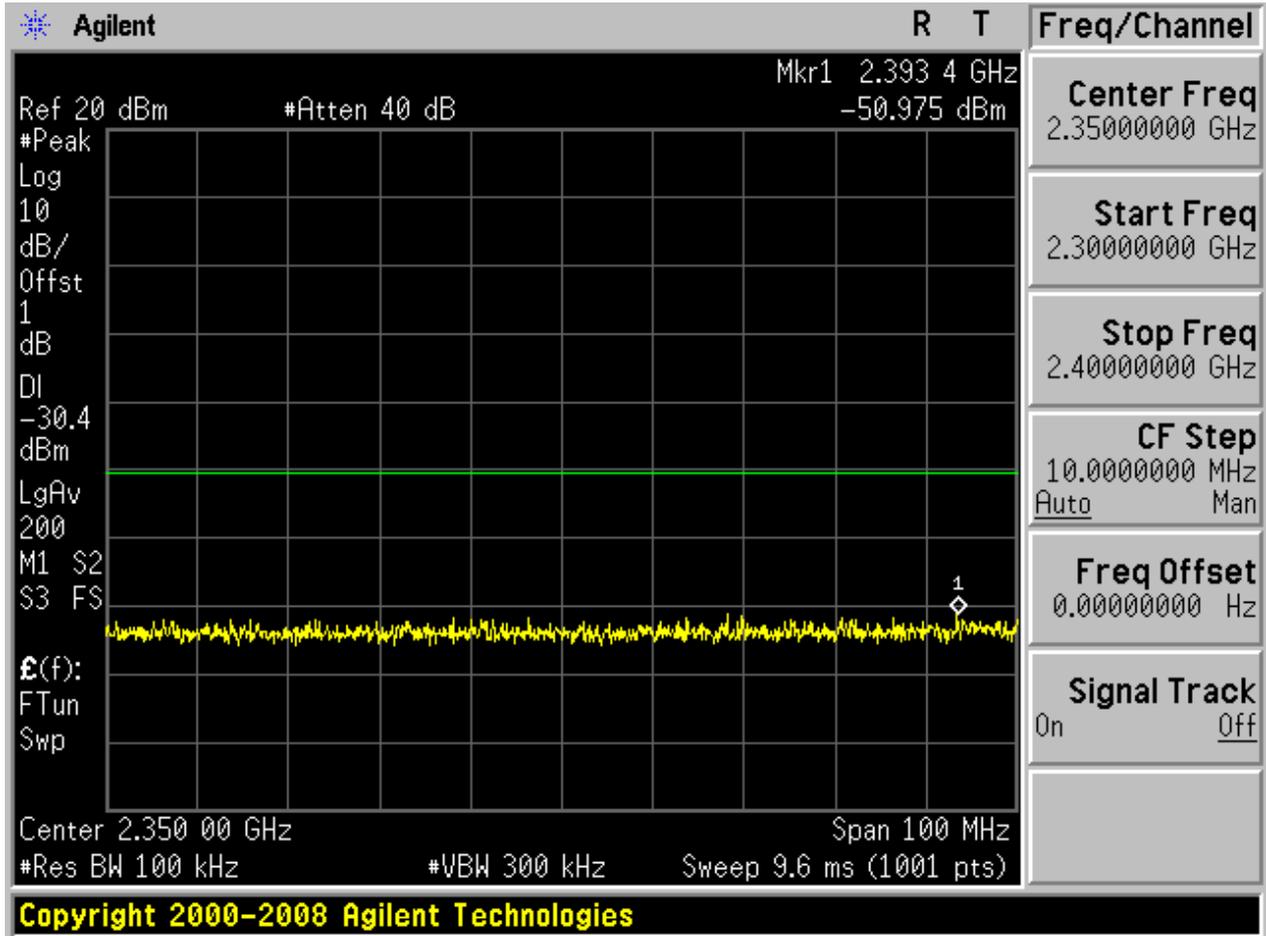


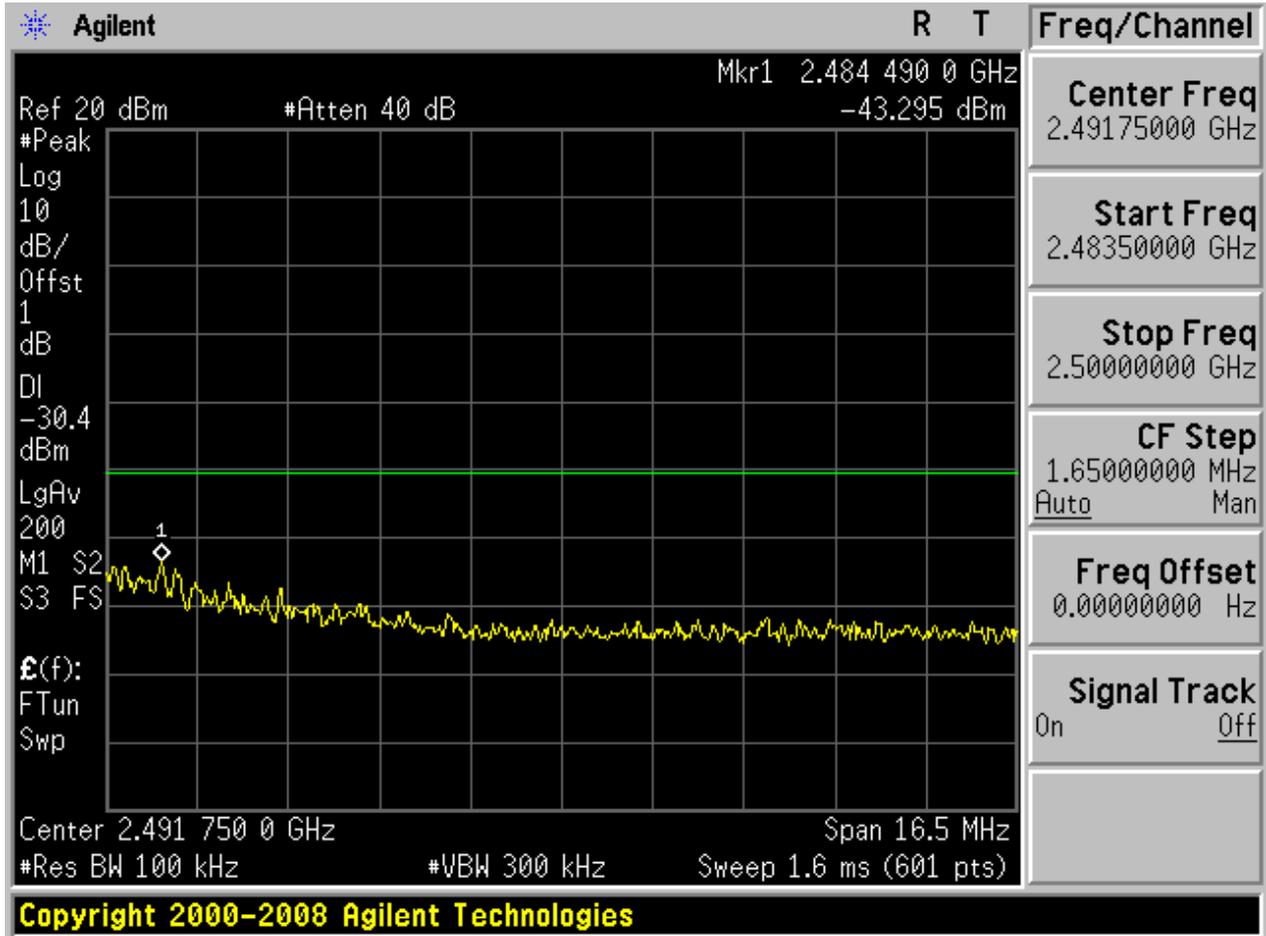
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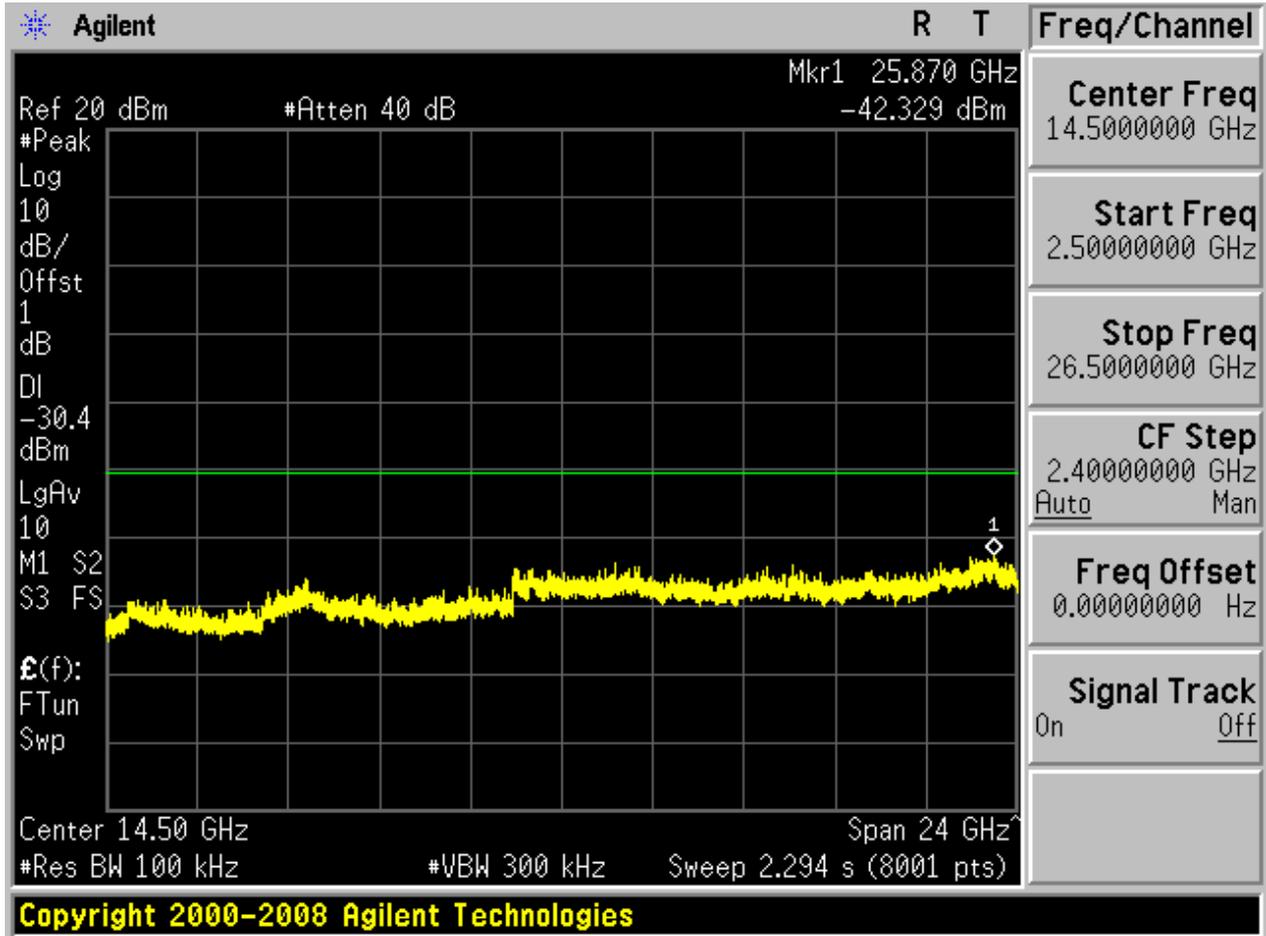














Appendix H: Radiated Spurious Emission & Spurious in Restricted Band

Note: We tested all modes, but the data presented below is the worst case. Below 1GHz, RBW = 100 kHz, VBW = 300 kHz.

Above 1GHz, RBW = 1 MHz, VBW = 3 MHz.

The simultaneous transmission has been considered

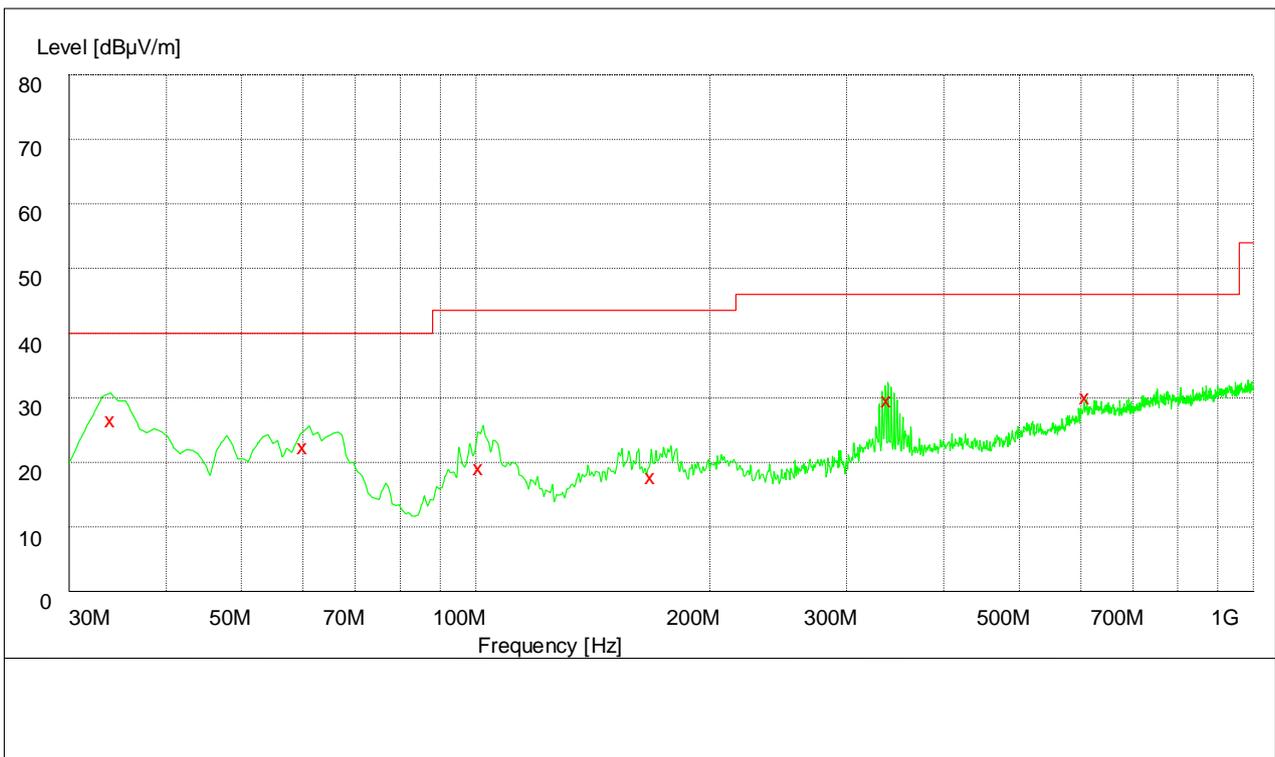
Part 1: Testing Range of “9 kHz to 30MHz”

NOTE1: No peak found in the Test Range of “9 kHz to 30MHz”

Part 2: Testing Range of “30 MHz to 1 GHz”

Note 1: The test results and plot for testing range of “30 MHz to 1 GHz” showed as below is **the WORST case for all Test Modes and Channels**. This range will not be presented for each Test Mode and each Channel.

Note 2: **The emissions in this range are mainly from the Platform Device (Notepad PC and its ancillary components).**



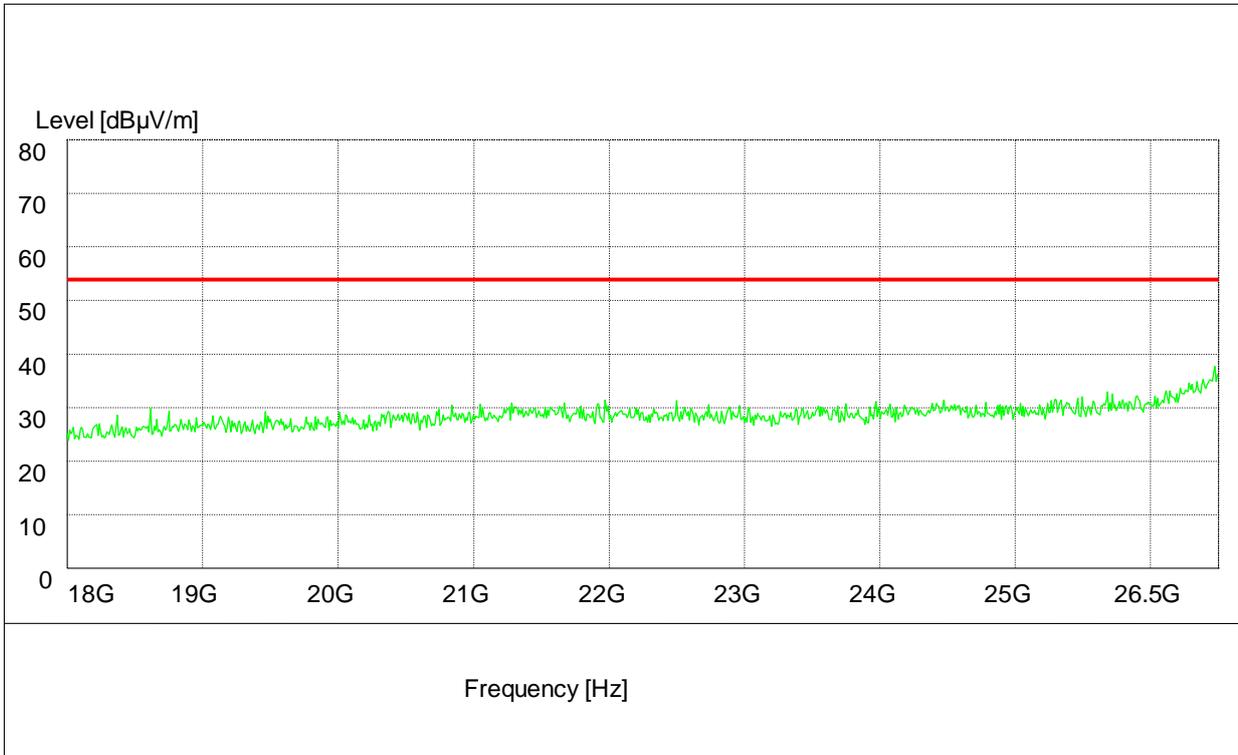
Frequency MHz	Level dBµV/m	Transd dB	Limit dBµV/m	Margin dB	Height cm	Azimuth deg	Plarization
34.120000	28.20	13.2	40.0	11.8	100.0	360.00	VERTICAL
60.200000	23.90	15.1	40.0	16.1	180.0	92.00	VERTICAL
101.268000	20.80	13.8	43.5	22.7	131.0	358.00	VERTICAL



168.488000	19.30	10.7	43.5	24.2	100.0	132.00	VERTICAL
339.144000	31.10	19.1	46.0	14.9	100.0	73.00	HORIZONTAL
610.324000	31.70	24.0	46.0	14.3	132.0	92.00	VERTICAL

Part 3: Testing Range of “18 GHz to 26.5 GHz”

Note: No peak found in pre- test.

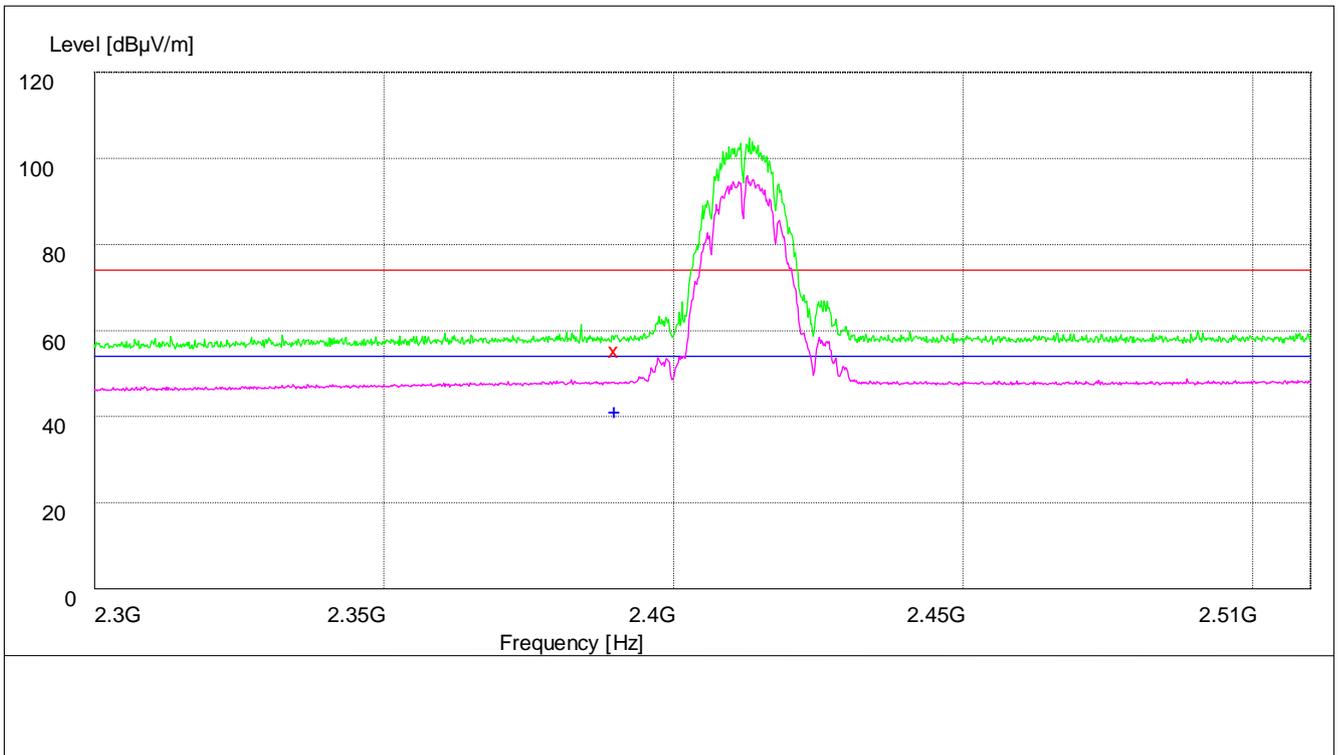


Part 4: Testing Range of “2.3GHz to 2.5GHz”

- Note 1: The testing range of “2.3 GHz to 2.5 GHz” is for checking radiated emissions located in restricted bands near the EUT operating bands.
- Note 2: Two limits are required in the testing range above 1 GHz, that is Peak limit (74 dBμV/m) and Average Limit (54 dBμV/m).
- Note 3: The peak spike exceeds the limit line is EUT’s operating frequency.

Test Mode: 11b

Channel 01



Note: The peak exceeds the limit line is carrier frequency.

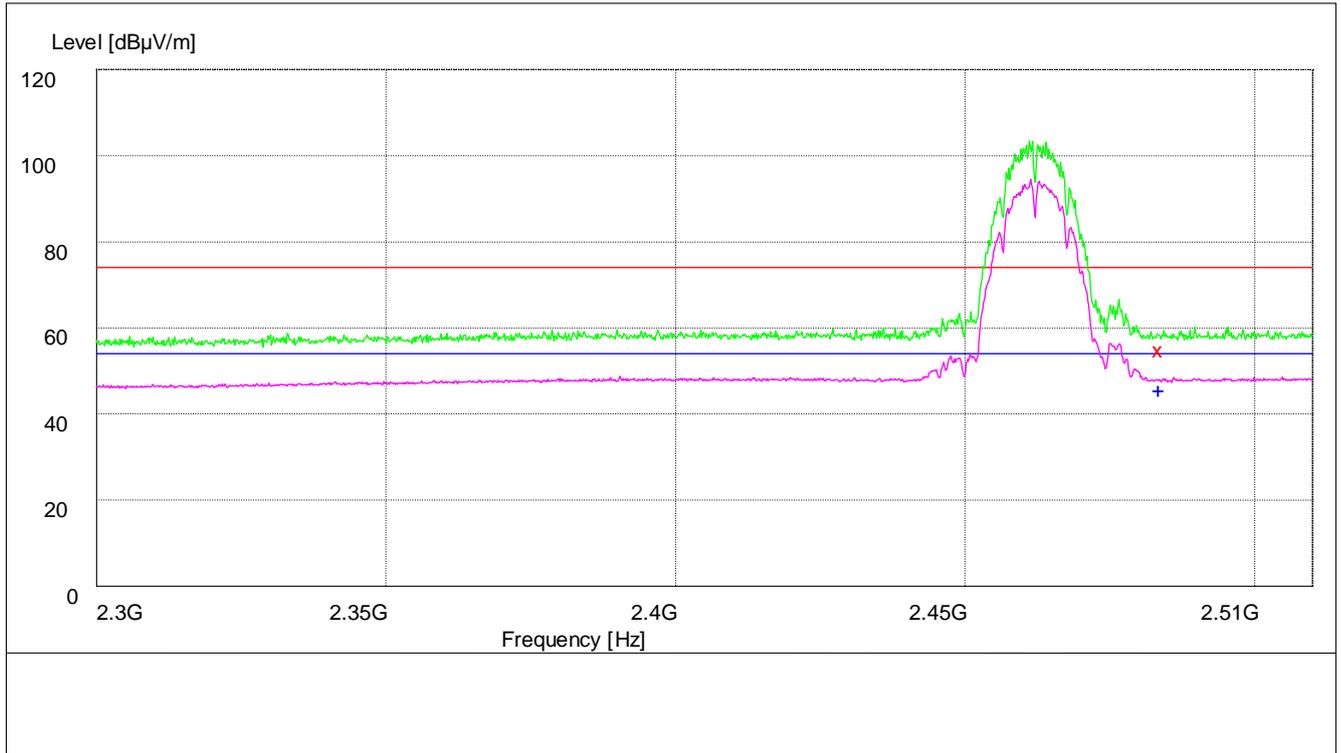
MEASUREMENT RESULT: PK Detector

Frequency MHz	Level dBμV/m	Transd dB	Limit dBμV/m	Margin dB	Height cm	Azimuth deg	Polarization
2390.000000	57.50	34.8	74.0	16.5	197.0	283.00	HORIZONTAL

MEASUREMENT RESULT: AV Detector

Frequency MHz	Level dBμV/m	Transd dB	Limit dBμV/m	Margin dB	Height cm	Azimuth deg	Polarization
2390.000000	43.60	34.8	54.0	10.4	200.0	18.00	VERTICAL

Channel 11



Note: The peak exceeds the limit line is carrier frequency.

MEASUREMENT RESULT: PK Detector

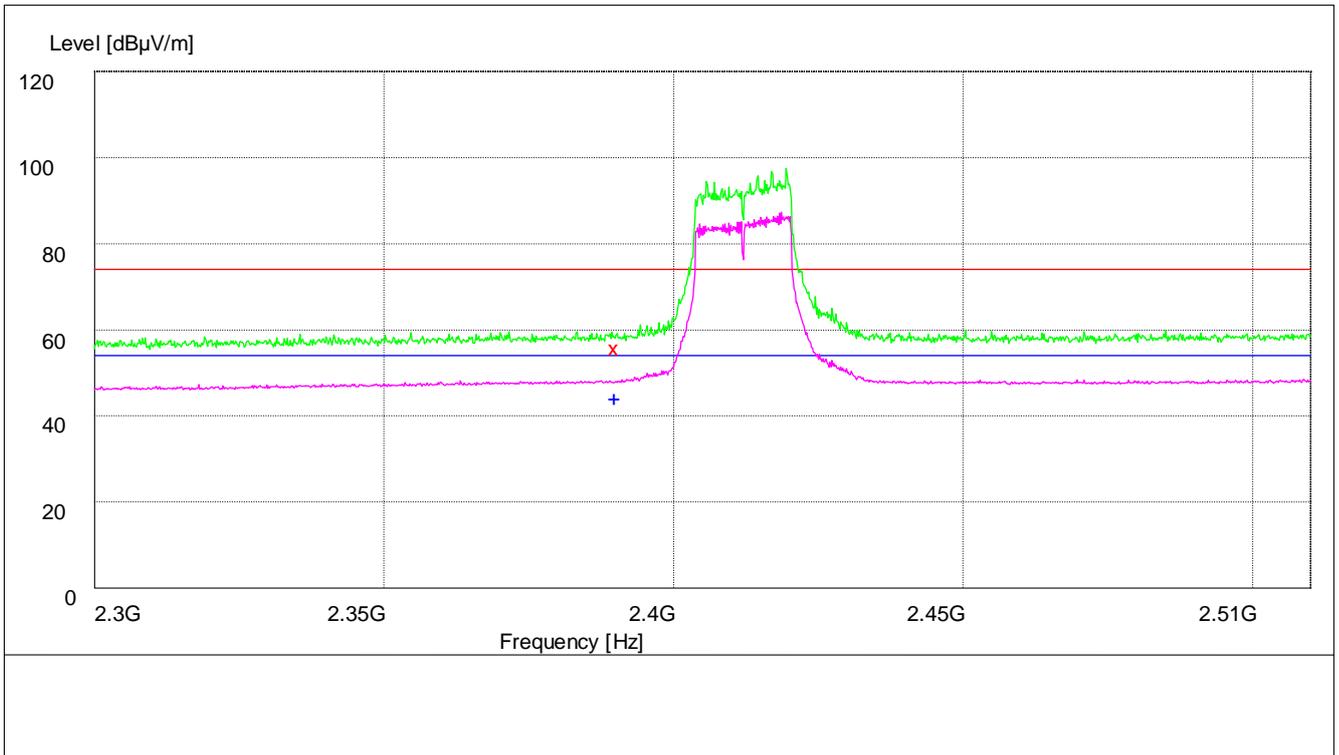
Frequency MHz	Level dBμV/m	Transd dB	Limit dBμV/m	Margin dB	Height cm	Azimuth deg	Polarization
2483.500000	57.00	35.1	74.0	17.0	197.0	127.00	HORIZONTAL

MEASUREMENT RESULT: AV Detector

Frequency MHz	Level dBμV/m	Transd dB	Limit dBμV/m	Margin dB	Height cm	Azimuth deg	Polarization
2483.500000	48.00	35.1	54.0	6.0	100.0	218.00	HORIZONTAL

Test Mode: 11g

Channel 01



Note: The peak exceeds the limit line is carrier frequency.

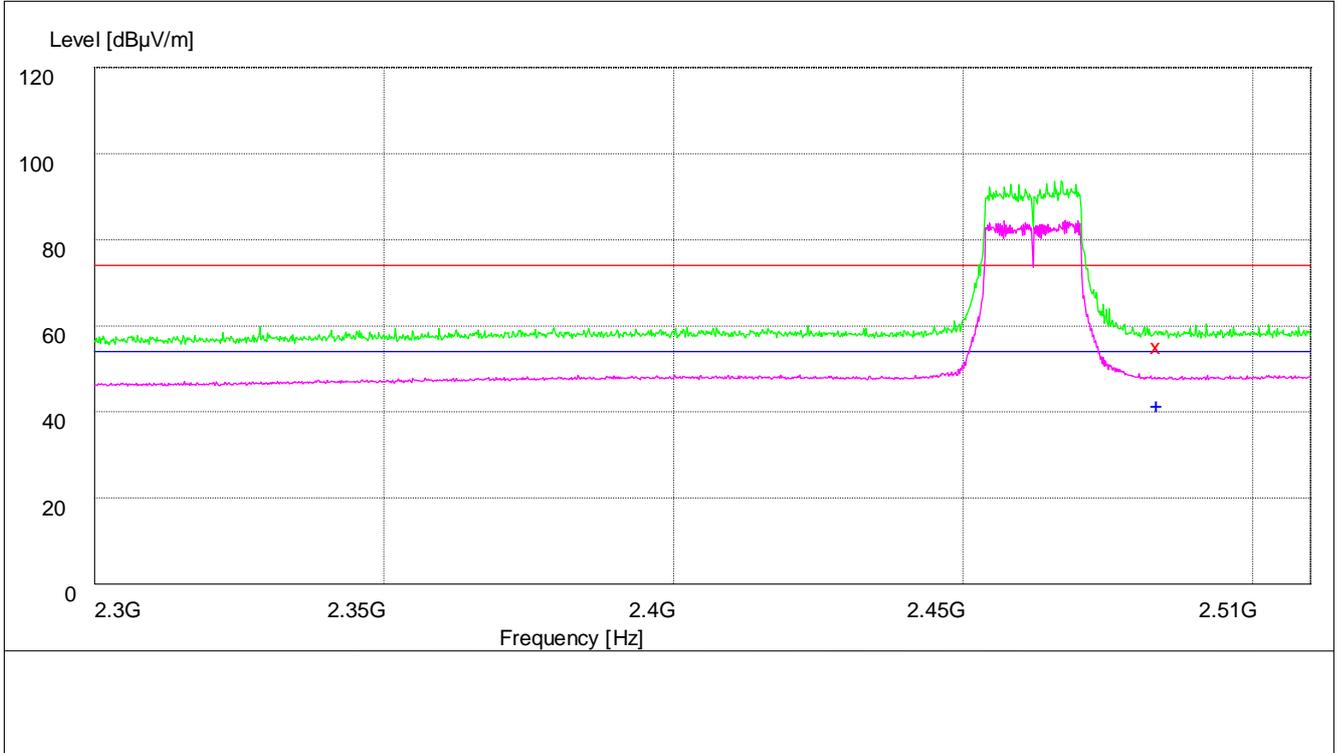
MEASUREMENT RESULT: PK Detector

Frequency MHz	Level dBµV/m	Transd dB	Limit dBµV/m	Margin dB	Height cm	Azimuth deg	Polarization
2390.000000	58.10	34.8	74.0	15.9	135.0	130.00	HORIZONTAL

MEASUREMENT RESULT: AV Detector

Frequency MHz	Level dBµV/m	Transd dB	Limit dBµV/m	Margin dB	Height cm	Azimuth deg	Polarization
2390.000000	46.60	34.8	54.0	7.4	100.0	249.00	VERTICAL

Channel 11



Note: The peak exceeds the limit line is carrier frequency.

MEASUREMENT RESULT: PK Detector

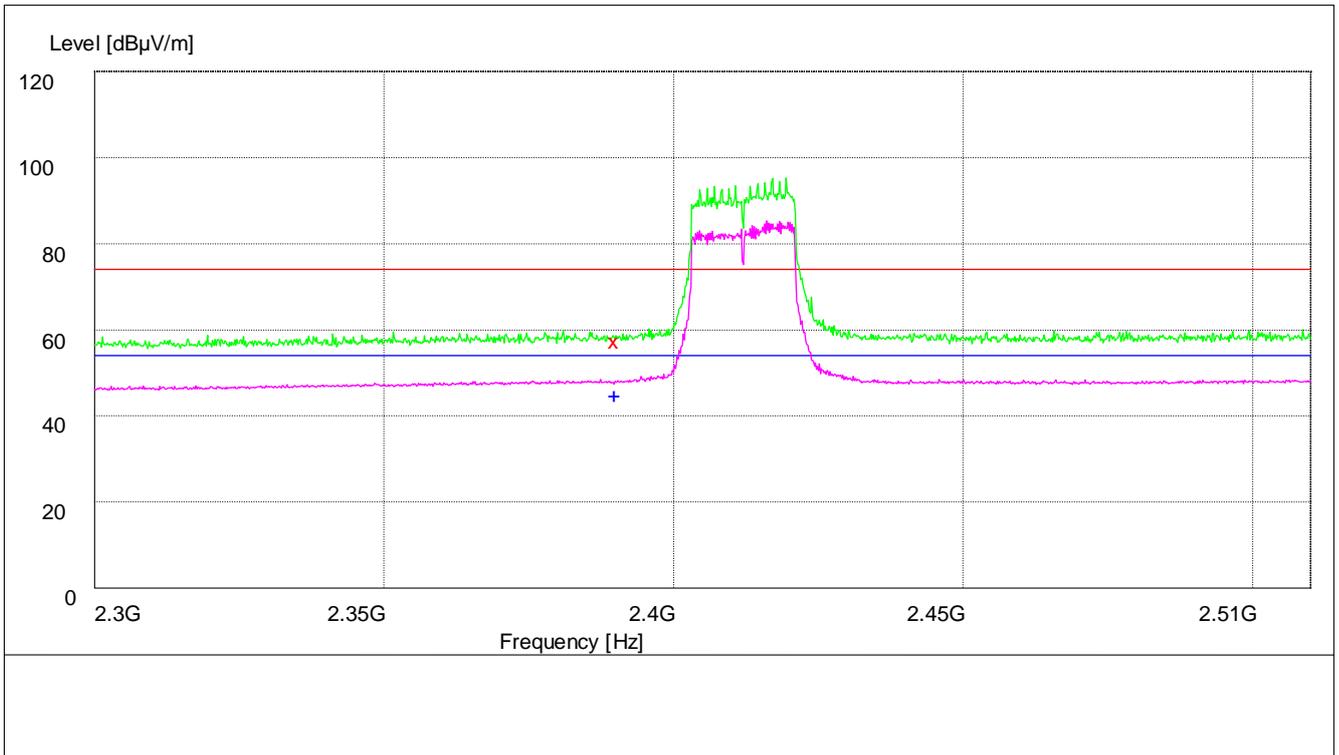
Frequency MHz	Level dBµV/m	Transd dB	Limit dBµV/m	Margin dB	Height cm	Azimuth deg	Polarization
2483.500000	57.30	35.1	74.0	16.7	165.0	171.00	HORIZONTAL

MEASUREMENT RESULT: AV Detector

Frequency MHz	Level dBµV/m	Transd dB	Limit dBµV/m	Margin dB	Height cm	Azimuth deg	Polarization
2483.500000	44.20	35.1	54.0	9.8	100.0	232.00	HORIZONTAL

Test Mode: 11n

Channel 01



Note: The peak exceeds the limit line is carrier frequency.

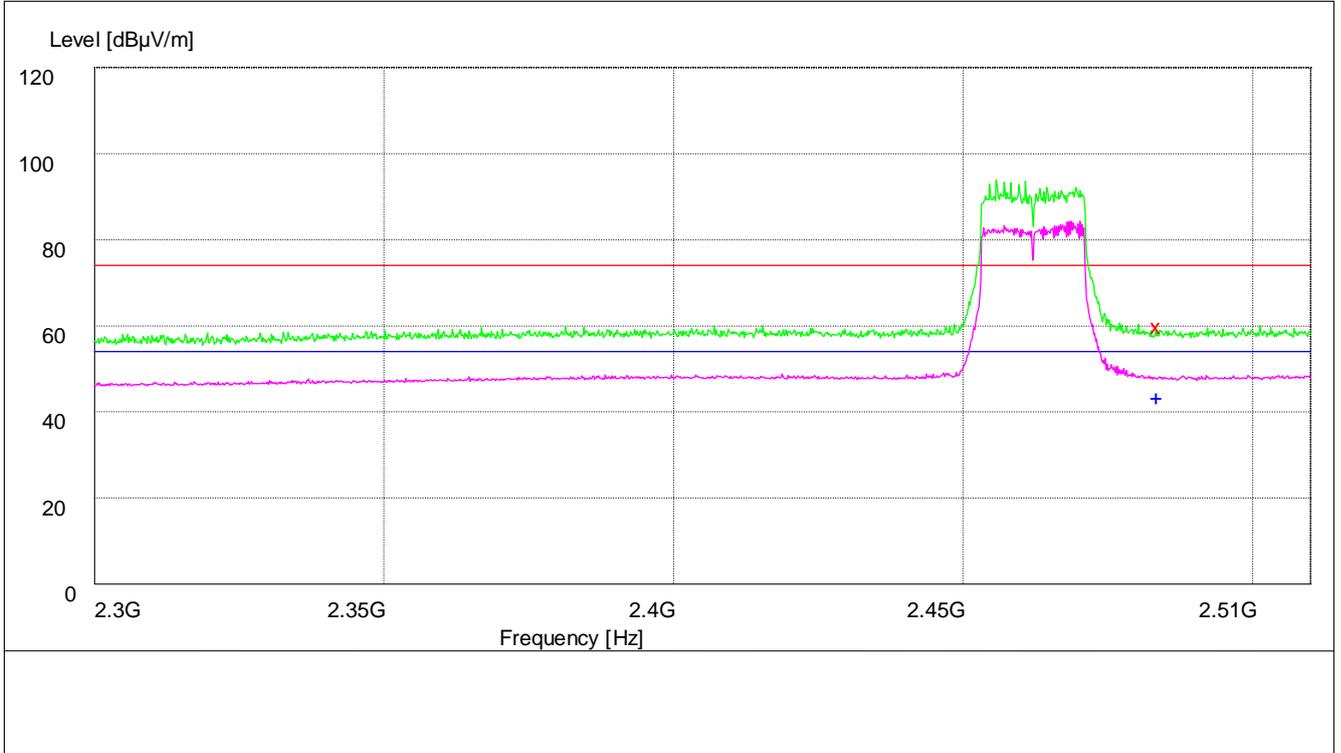
MEASUREMENT RESULT: PK Detector

Frequency MHz	Level dBµV/m	Transd dB	Limit dBµV/m	Margin dB	Height cm	Azimuth deg	Polarization
2390.000000	60.00	34.8	74.0	14.0	100.0	162.00	HORIZONTAL

MEASUREMENT RESULT: AV Detector

Frequency MHz	Level dBµV/m	Transd dB	Limit dBµV/m	Margin dB	Height cm	Azimuth deg	Polarization
2390.000000	47.20	34.8	54.0	6.8	100.0	321.00	VERTICAL

Channel 11



Note: The peak exceeds the limit line is carrier frequency.

MEASUREMENT RESULT: PK Detector

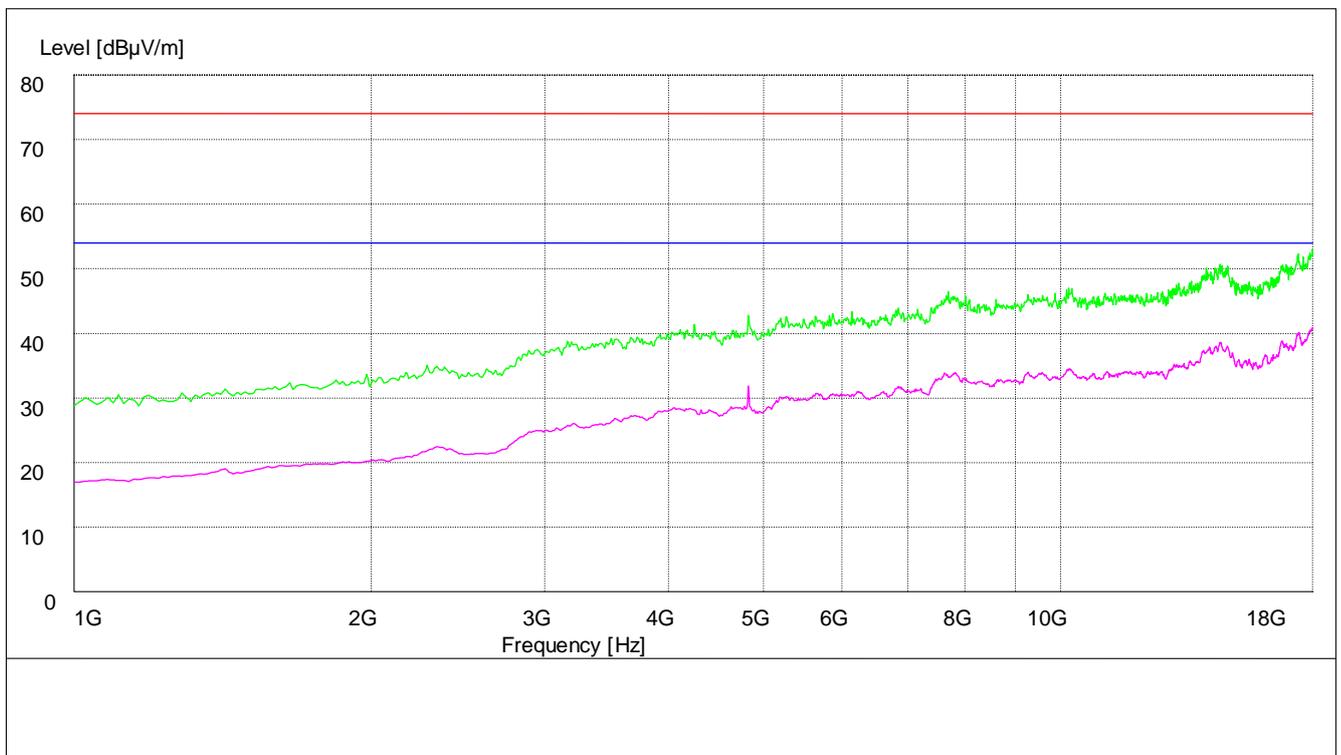
Frequency MHz	Level dBµV/m	Transd dB	Limit dBµV/m	Margin dB	Height cm	Azimuth deg	Polarization
2483.500000	62.10	35.1	74.0	11.9	100.0	226.00	HORIZONTAL

MEASUREMENT RESULT: AV Detector

Frequency MHz	Level dBµV/m	Transd dB	Limit dBµV/m	Margin dB	Height cm	Azimuth deg	Polarization
2483.500000	45.70	35.1	54.0	8.3	100.0	15.00	VERTICAL

Part 5: Testing Range of “1 GHz to 18 GHz”

- Note 1: The test results and plot for testing range of “1 GHz to 18 GHz” showed as below is **the WORST case for all Test Modes and Channels**. This range will not be presented for each Test Mode and each Channel.
- Note 2: The testing range of “1 GHz to 18 GHz” is for checking radiated emissions located in restricted bands faraway from the EUT operating bands.
- Note 3: Two limits are required in the testing range above 1 GHz, that is Peak limit (74 dB μ V/m) and Average Limit (54 dB μ V/m).

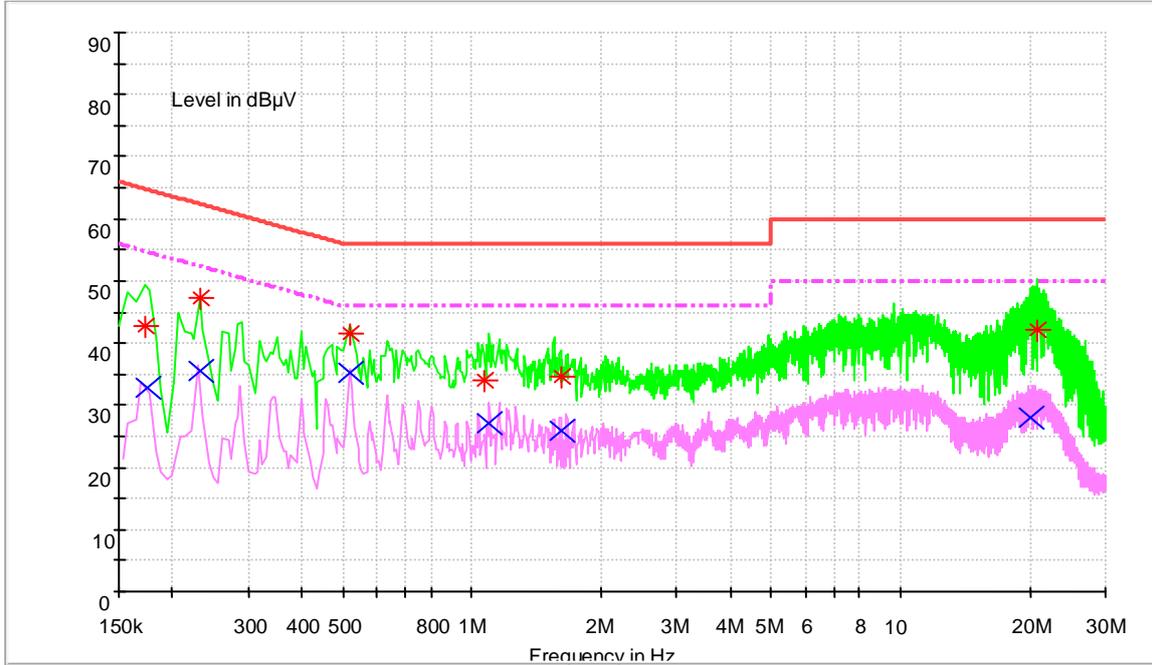




Appendix I: Conducted Emission at Power Port

Note: RBW =9 kHz, VBW = 30 kHz

Channel 6



MEASUREMENT RESULT: QP Detector

Frequency MHz	Level dBµV	Transd dB	Limit dBµV	Margin dB	Line	PE
0.173728	42.8	L1	9.7	22.0	64.8	FLO
0.232088	47.2	L1	9.7	17.5	64.7	FLO
0.517302	41.5	N	9.7	14.5	56.0	FLO
1.071754	33.9	N	9.7	22.1	56.0	FLO
1.613970	34.5	N	9.7	21.5	56.0	FLO
20.775434	42.1	L1	10.1	17.9	60.0	FLO

MEASUREMENT RESULT: AV Detector

Frequency MHz	Level dBµV	Transd dB	Limit dBµV	Margin dB	Line	PE
0.173986	32.9	N	9.7	21.9	54.8	FLO
0.231021	35.4	N	9.7	17.0	52.4	FLO
0.516716	35.3	N	9.7	10.7	46.0	FLO
1.092948	27.0	N	9.7	19.0	46.0	FLO
1.608506	25.7	N	9.7	20.3	46.0	FLO
19.977554	28.0	N	10.1	22.0	50.0	FLO

END