FCC PART 27

TEST AND MEASUREMENT REPORT

For

Whoop Wireless, Inc.

5913 NW 31st Ave., Fort Lauderdale,
Germantown, FL 33309, USA

FCC ID: 2AEQJ-HE4-001

Report Type:	**Product Type:**
Original Report	Industrial Booster

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DOCUMENT REVISION HISTORY

Revision Number	Report Number	Description of Revision	Date of Revision
0	R1509101-27	Initial	2015-11-03

1 General Information

1.1 Product Description for Equipment under Test (EUT)

This test and measurement report was prepared on behalf of *Whoop Wireless, Inc.* and their product model: HE4-001, FCC ID: 2AEQJ-HE4-001 which will henceforth be referred to as the EUT (Equipment under Test). The EUT was a dual-directional industrial amplifier. The EUT operated in the frequency bands of 2100 MHz and 1700 MHz for CDMA, WCDMA and LTE downlink & uplink, 700 MHz for LTE downlink and uplink, respectively.

1.2 Mechanical Description

The EUT measured approximately 25.4 cm (L) x 21 cm (W) x 5.1 cm (H) and weighs 1.25 kg.

The test data gathered are from typical production sample, serial number: R1509101-1, assigned by BACL.

1.3 Objective

This type approval report was prepared on behalf of *Whoop Wireless, Inc.* in accordance with Part 2, Subpart J, Part 20.21, and Part 27 of the Federal Communication Commission's rules.

The objective is to determine compliance with FCC rules for RF output power, occupied bandwidth, spurious emissions at antenna terminal, field strength of spurious radiation and band edge.

1.4 Related Submittal(s)/Grant(s)

No Related Submittals

1.5 Test Methodology

All tests and measurements indicated in this document were performed in accordance with the Code of Federal Regulations Title 47 Part 2, Sub-part J as well as the following parts:

Part 20.21 – Signal Boosters
Part 27 - Miscellineous Wireless Communication Services

Applicable Standards: TIA/EIA603-D, FCC KDB 935210.

All radiated and conducted emissions measurement was performed at Bay Area Compliance Laboratory, Corp. The radiated testing was performed at an antenna-to-EUT distance of 3 meters.

1.6 Measurement Uncertainty

All measurements involve certain levels of uncertainties, especially in the field of EMC. The factors contributing to uncertainties are spectrum analyzer, cable loss, antenna factor calibration, antenna directivity, antenna factor variation with height, antenna phase center variation, antenna factor frequency interpolation, measurement distance variation, site imperfections, mismatch (average), and system repeatability.

Based on CISPR16-4-2:2011, The Treatment of Uncertainty in EMC Measurements, the values ranging from ±2.0 dB for Conducted Emissions tests and ±4.0 dB for Radiated Emissions tests are the most accurate estimates pertaining to uncertainty of EMC measurements at BACL Corp.

1.7 Test Facility

Bay area compliance Laboratories Corp. (BACL) is:
1- An independent Commercial Test Laboratory accredited to **ISO 17025: 2005** by **A2LA**, in the fields of: Electromagnetic Compatibility & Telecommunications covering Emissions, Immunity, Radio, RF Exposure, Safety and Telecom. This includes NEBS (Network Equipment Building System), Wireless RF, Telecommunications Terminal Equipment (TTE); Network Equipment; Information Technology Equipment (ITE); Medical Electrical Equipment; Industrial, Commercial, and Medical Test Equipment; Professional Audio and Video Equipment; Electronic (Digital) Products; Industrial and Scientific Instruments; Cabled Distribution Systems and Energy Efficiency Lighting.

2- An ENERGY STAR Recognized Laboratory, for the LM80 Testing, a wide variety of Luminares and Computers.

3- A NIST Designated Phase-I and Phase-II CAB including: ACMA (Australian Communication and Media Authority), BSMI (Bureau of Standards, Metrology and Inspection of Taiwan), IDA (Infocomm Development Authority of Singapore), IC(Industry Canada), Korea (Ministry of Communications Radio Research Laboratory), NCC (Formerly DGT; Directorate General of Telecommunication of Chinese Taipei) OFTA (Office of the Telecommunications Authority of Hong Kong), Vietnam, VCCI - Voluntary Control Council for Interference of Japan and a designated EU CAB (Conformity Assessment Body) (Notified Body) for the EMC and R&TTE Directives.

4- A Product Certification Body accredited to **ISO Guide 65:1996** by **A2LA** to certify:
1- Unlicensed, Licensed radio frequency devices and Telephone Terminal Equipment for the FCC. Scope A1, A2, A3, A4, B1, B2, B3, B4 & C.
2. Radio Standards Specifications (RSS) in the Category I Equipment Standards List and All Broadcasting Technical Standards (BETS) in Category I Equipment Standards List for Industry Canada.
3. Radio Communication Equipment for Singapore.
4. Radio Equipment Specifications, GMDSS Marine Radio Equipment Specifications, and Fixed Network Equipment Specifications for Hong Kong.
5. Japan MIC Telecommunication Business Law (A1, A2) and Radio Law (B1, B2 and B3).
6. Audio/Video, Battery Charging Systems, Computers, Displays, Enterprise Servers, Imaging Equipment, Set-Top Boxes, Telephony, Televisions, Ceiling Fans, CFLs (Including GU24s),Decorative Light Strings, Integral LED Lamps, Luminaires, Residential Ventilating Fans.

The test site used by BACL Corp. to collect radiated and conducted emissions measurement data is located at its facility in Sunnyvale, California, USA.

The test site at BACL Corp. has been fully described in reports submitted to the Federal Communication Commission (FCC) and Voluntary Control Council for Interference (VCCI). The details of these reports have been found to be in compliance with the requirements of Section 2.948 of the FCC Rules on February 11 and December 10, 1997, and Article 8 of the VCCI regulations on December 25, 1997. The test site also complies with the test methods and procedures set forth in CISPR 22:2008 §10.4 for measurements below 1 GHz and §10.6 for measurements above 1 GHz as well as ANSI C63.4-2009, ANSI C63.4-2009, TIA/EIA-603 & CISPR 24:2010.

The Federal Communications Commission and Voluntary Control Council for Interference have the reports on file and they are listed under FCC registration number: 90464 and VCCI Registration No.: A-0027. The test site has been approved by the FCC and VCCI for public use and is listed in the FCC Public Access Link (PAL) database.

Additionally, BACL Corp. is an American Association for Laboratory Accreditation (A2LA) accredited laboratory (Lab Code 3297-02). The current scope of accreditations can be found at

http://www.a2la.org/scopepdf/3297-02.pdf?CFID=1132286&CFTOKEN=e42a3240dac3f6ba-6DE17DCB-1851-9E57-477422F667031258&jsessionid=8430d44f1f47cf2996124343c704b367816b

2 System Test Configuration

2.1 Justification

The EUT was configured for testing according to TIA/EIA-603-D.
The final qualification test was performed with the EUT operating at normal mode.

2.2 EUT Exercise Software

There was no exercise software with the EUT; signal was sent through EUT using a signal generator.

2.3 Equipment Modifications

No modifications were made to the EUT.

2.4 EUT Internal Configuration

Manufacturer	Description	Model	Serial Number
Zore Access Tech	-	HE4-001 REV A	-

2.5 Local Support Equipment List and Details

Manufacturers	Descriptions	Models	Serial Numbers
Dell	Laptop	Latitude D600	CN-0X2034-48643-3A6-8307

2.6 Power Supply and Line Filters

Manufacturers	Descriptions	Models	Serial Numbers
-	AC/DC Adapter	KWT-0605000	-

2.7 Interface Ports and Cabling

Cable Description	Length (m)	From	To
RF cable	< 1	Signal Generator	Input/EUT
RF cable	< 1	Output/EUT	Spectrum Analyzer

3 Summary of Test Results

FCC Rules	Description of Tests	Results
§2.1091	RF Exposure	Compliant
§2.1046, §27.50(b)(c)(d)	RF Output Power	Compliant
§2.1049	26 dB Occupied Bandwidth	Compliant
§2.1053, §27.53	Spurious Radiated Emissions	Compliant
§2.1053, §27.53	Spurious Emissions at Antenna Terminals	Compliant
§2.1053, §27.53	Band Edge & Intermodulation	Compliant
§2.1055, §27.54	Frequency Stability	N/A[1]
§20.21	Out of Band Rejection	Compliant

[1] The EUT was a signal booster.

4 FCC §1.1307(b) (1) & §2.1091 - RF Exposure

4.1 Applicable Standards

According to §1.1310 and §2.1091 (Mobile Devices) RF exposure is calculated.

Limits for General Population/Uncontrolled Exposure

Frequency Range (MHz)	Electric Field Strength (V/m)	Magnetic Field Strength (A/m)	Power Density (mW/cm^2)	Averaging Time (minute)
Limits for General Population/Uncontrolled Exposure				
0.3-1.34	614	1.63	*(100)	30
1.34-30	824/f	2.19/f	*($180/f^2$)	30
30-300	27.5	0.073	0.2	30
300-1500	/	/	f/1500	30
1500-100,000	/	/	1.0	30

Note: f = frequency in MHz
* = Plane-wave equivalent power density

4.2 MPE Prediction

Predication of MPE limit at a given distance, Equation from OET Bulletin 65, Edition 97-01

$$S = PG/4\pi R^2$$

Where: S = power density
P = power input to antenna
G = power gain of the antenna in the direction of interest relative to an isotropic radiator
R = distance to the center of radiation of the antenna

4.3 Test Results

AWS Band

Downlink

Maximum peak output power at antenna input terminal (dBm):	14.59
Maximum peak output power at antenna input terminal (mW):	28.77
Prediction distance (cm):	30
Prediction frequency (MHz):	2107
Antenna Gain, typical (dBi):	10
Maximum Antenna Gain (numeric):	10
Power density at predication frequency and distance (mW/cm^2):	0.0254
MPE limit for uncontrolled exposure at predication frequency (mW/cm^2):	1.0

Uplink

Maximum peak output power at antenna input terminal (dBm):	19.24
Maximum peak output power at antenna input terminal (mW):	83.95
Prediction distance (cm):	30
Prediction frequency (MHz):	1722.75
Antenna Gain, typical (dBi):	10
Maximum Antenna Gain (numeric):	10
Power density at predication frequency and distance (mW/cm^2):	0.0742
MPE limit for uncontrolled exposure at predication frequency (mW/cm^2):	1.0

LTE Band 13

Downlink

Maximum peak output power at antenna input terminal (dBm):	14.82
Maximum peak output power at antenna input terminal (mW):	30.34
Prediction distance (cm):	30
Prediction frequency (MHz):	747.42
Antenna Gain, typical (dBi):	8.5
Maximum Antenna Gain (numeric):	7.0795
Power density at predication frequency and distance (mW/cm^2):	0.0190
MPE limit for uncontrolled exposure at predication frequency (mW/cm^2):	0.4983

Uplink

Maximum peak output power at antenna input terminal (dBm):	23.01
Maximum peak output power at antenna input terminal (mW):	199.99
Prediction distance (cm):	30
Prediction frequency (MHz):	777.56
Antenna Gain, typical (dBi):	8.5
Maximum Antenna Gain (numeric):	7.0795
Power density at predication frequency and distance (mW/cm^2):	0.1252
MPE limit for uncontrolled exposure at predication frequency (mW/cm^2):	0.5184

LTE Band 17

Downlink

Maximum peak output power at antenna input terminal (dBm):	14.82
Maximum peak output power at antenna input terminal (mW):	30.34
Prediction distance (cm):	30
Prediction frequency (MHz):	745.5
Antenna Gain, typical (dBi):	8.5
Maximum Antenna Gain (numeric):	7.0795
Power density at predication frequency and distance (mW/cm^2):	0.0190
MPE limit for uncontrolled exposure at predication frequency (mW/cm^2):	0.4970

Uplink

Maximum peak output power at antenna input terminal (dBm):	19.72
Maximum peak output power at antenna input terminal (mW):	93.76
Prediction distance (cm):	30
Prediction frequency (MHz):	705.65
Antenna Gain, typical (dBi):	8.5
Maximum Antenna Gain (numeric):	7.0795
Power density at predication frequency and distance (mW/cm^2):	0.0587
MPE limit for uncontrolled exposure at predication frequency (mW/cm^2):	0.4704

Results

For uplink and downlink, the highest power density levels at 30 cm are below the MPE uncontrolled exposure limit.

5 FCC §2.1046 & §27.50(b) (c) (d) - RF Output Power

5.1 Applicable Standards

According to FCC §27.50 (b) (9), control stations and mobile stations transmitting in the 746-757 MHz, 776-788 MHz, and 805-806 MHz bands and fixed stations transmitting in the 787-788 MHz and 805-806 MHz bands are limited to 30 Watts ERP.

According to FCC §27.50 (c) (9), control and mobile stations in the 698-746 MHz band are limited to 30 watts ERP.

According to FCC §27.50 (d) (2), the power of each fixed or base station transmitting in the 1995-2000 MHz, the 2110-2155 MHz 2155-2180 MHz band, or 2180-2200 MHz band and situated in any geographic location other than that described in paragraph (d)(1) of this section is limited to an EIRP of 1640 watts/MHz when transmitting with an emission bandwidth greater than 1 MHz.

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

5.2 Test Procedure

Conducted:

The EUT was connected to the spectrum analyzer and Signal Generator followed by 50Ω-75Ω matching pad.

5.3 Test Equipment List and Details

Manufacturers	Descriptions	Models	Serial Numbers	Calibration Dates	Calibration Interval
Agilent	Analyzer, Spectrum	E4446A	US44300386	2014-10-24	1 year
Keysight Technologies	Vector Signal Generator	N5182B	MY51350070	2014-09-18	2 years
Rohde & Schwarz	Generator, Signal	SMIQ03	849192/0085	2014-07-15	2 years

Statement of Traceability: BACL Corp. *attests that all calibrations have been performed per the A2LA requirements, traceable to the NIST.*

5.4 Test Environmental Conditions

Temperature:	21-23° C
Relative Humidity:	42-48 %
ATM Pressure:	101.4-102 kPa

The testing was performed by Todd Moy 2015-10-12 in the RF Site.

5.5 Test Results

AWS Band

Downlink

Signal Type	AGC	Input Power (dBm)	Output Power (dBm)	Gain (dB)	EIRP (dBm)
Broadband	Off	-49.21	14.59	63.8	24.59
	On	-46.12	14.9	61.02	24.9
Narrowband	Off	-50.95	13.12	64.07	23.12
	On	-47.57	12.65	60.22	22.65

Uplink

Signal Type	AGC	Input Power (dBm)	Output Power (dBm)	Gain (dB)	EIRP (dBm)
Broadband	Off	-51.17	15.86	67.03	25.86
	On	-47.84	15.81	63.65	25.81
Narrowband	Off	-47.36	19.24	66.6	29.24
	On	-45.19	18.13	63.32	28.13

LTE Band 13 & 17

Band	Signal Type	AGC	Input Power (dBm)	Output Power (dBm)	Gain (dB)	ERP (dBm)
Band 13	Downlink					
	Broadband	Off	-48.14	14.82	62.96	44.77
		On	-44.97	14.02	58.99	44.77
	Narrowband	Off	-50.12	12.29	62.41	44.77
		On	-46.78	10.75	57.53	44.77
	Uplink					
	Broadband	Off	-42.76	21.92	64.68	28.27
		On	-39.5	23.47	62.97	29.82
	Narrowband	Off	-42.42	22.37	64.79	28.72
		On	-39.55	23.01	62.56	29.36
Band 17	Downlink					
	Broadband	Off	-48.14	14.82	62.96	21.17
		On	-44.97	14.02	58.99	20.37
	Narrowband	Off	-50.12	12.29	62.41	18.64
		On	-46.78	10.75	57.53	17.10
	Uplink					
	Broadband	Off	-37.78	19.72	57.5	26.07
		On	-34.5	19.24	53.74	25.59
	Narrowband	Off	-39.5	18.85	58.35	25.2
		On	-36.71	17.47	54.18	23.82

Note: ERP=Conducted Output Power (dBm) + Antenna Gain (dBi) -2.15 dB
EIRP=Conducted Output Power (dBm) + Antenna Gain (dBi)

6 FCC §2.1049 – Occupied Bandwidth

6.1 Applicable Standards

Requirements: FCC §2.1049

6.2 Test Procedure

The EUT was connected to the spectrum analyzer and Signal Generator followed by 50Ω-75Ω matching pad.

The resolution bandwidth of the spectrum analyzer was set to at least 1 to 5% of the anticipated OBW and the 26 dB & 99% bandwidth was recorded.

6.3 Test Equipment List and Details

Manufacturers	Descriptions	Models	Serial Numbers	Calibration Dates	Calibration Interval
Agilent	Spectrum Analyzer	E4440A	MY44303352	2014-10-16	1 year
Rohde & Schwarz	Signal Analyzer	FSQ26	200749	2015-03-09	1 year
Agilent	Signal Generator	E4438C	MY45091309	2014-07-15	2 years

Statement of Traceability: BACL Corp. *attests that all calibrations have been performed per the A2LA requirements, traceable to the NIST.*

6.4 Test Environmental Conditions

Temperature:	21-23 °C
Relative Humidity:	42-48 %
ATM Pressure:	101.4-102 kPa

The testing was performed by Todd Moy 2015-10-9 in the RF Site.

6.5 Test Results

Please refer to the following table and plots.

AWS Band

DL/UP	Signal Type	AGC	Input		Output	
			99 % OBW (kHz)	26 dB OBW (kHz)	99 % OBW (kHz)	26 dB OBW (kHz)
Downlink	Broadband	off	4165.2	4628	4185	4668
		on	4165.2	4628	4195.4	4693
	Narrowband	off	240.79	319.16	244.03	317.12
		on	240.79	319.16	241.25	317.36
Uplink	Broadband	off	4170.2	4639	4168.4	4647
		on	4170.2	4640	4164.7	4650
	Narrowband	off	242.42	318.96	244.51	320.22
		on	242.42	318.96	243.12	319.12

LTE Band 13

DL/UP	Signal Type	AGC	Input		Output	
			99 % OBW (kHz)	26 dB OBW (kHz)	99 % OBW (kHz)	26 dB OBW (kHz)
Downlink	Broadband	off	4169.4	4664	4152.9	4604
		on	4169.4	4664	4147.7	4683
	Narrowband	off	241.45	318.86	242.90	318.73
		on	241.45	318.86	241.70	321.89
Uplink	Broadband	off	4182.6	4651	4204.6	4822
		on	4182.6	4651	4481.1	4941
	Narrowband	off	243.10	317.55	241.03	316.23
		on	243.10	317.55	244.19	319.10

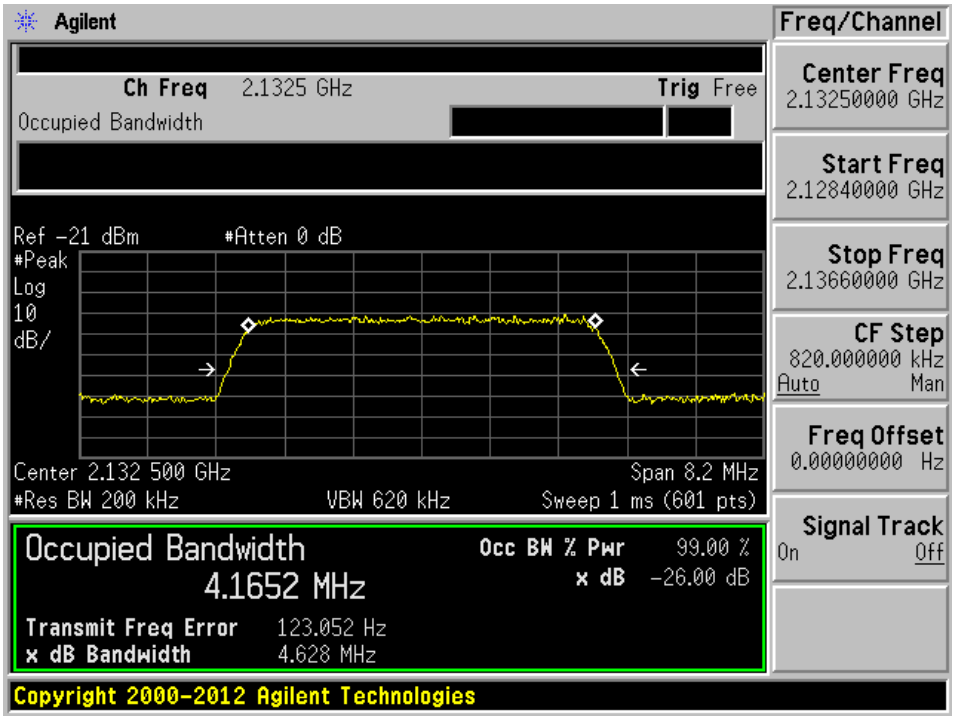
LTE Band 17

DL/UP	Signal Type	AGC	Input		Output	
			99 % OBW (kHz)	26 dB OBW (kHz)	99 % OBW (kHz)	26 dB OBW (kHz)
Downlink	Broadband	off	4187.3	4632	4152.9	4604
		on	4187.3	4632	4147.7	4683
	Narrowband	off	240.84	317.37	245.54	317.95
		on	240.84	317.37	239.12	320.81
Uplink	Broadband	off	4174.1	4654	4113.1	4510
		on	4174.1	4654	4126.3	4941
	Narrowband	off	244.72	323.45	241.03	316.23
		on	244.72	323.45	244.19	319.10

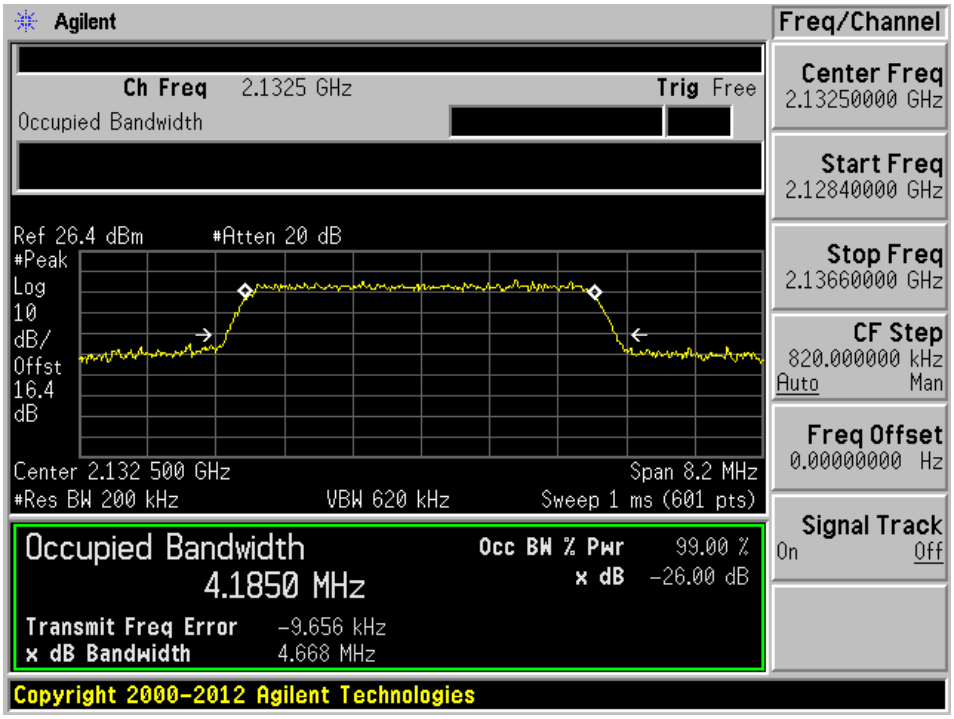
AWS Band, Downlink: Broadband Signal

AGC off

Input

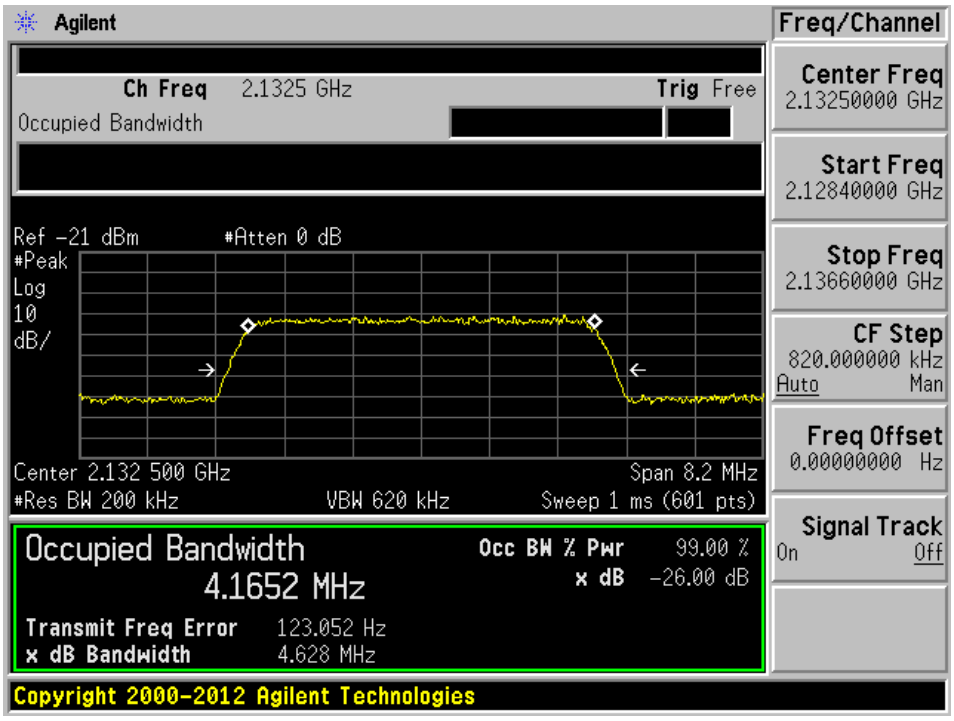


Output

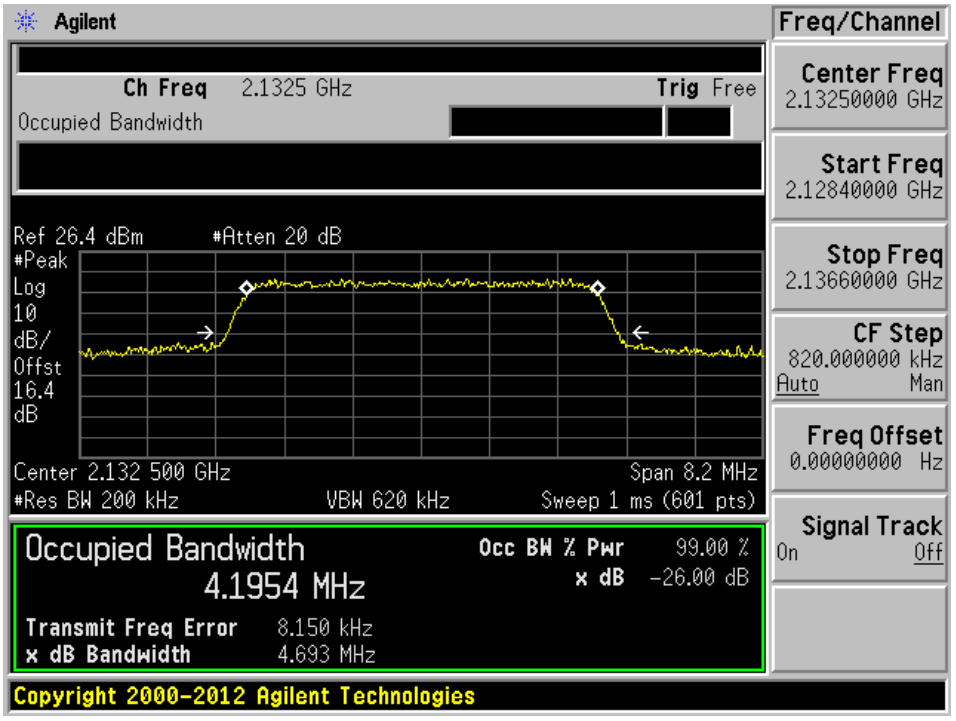


AGC on

Input



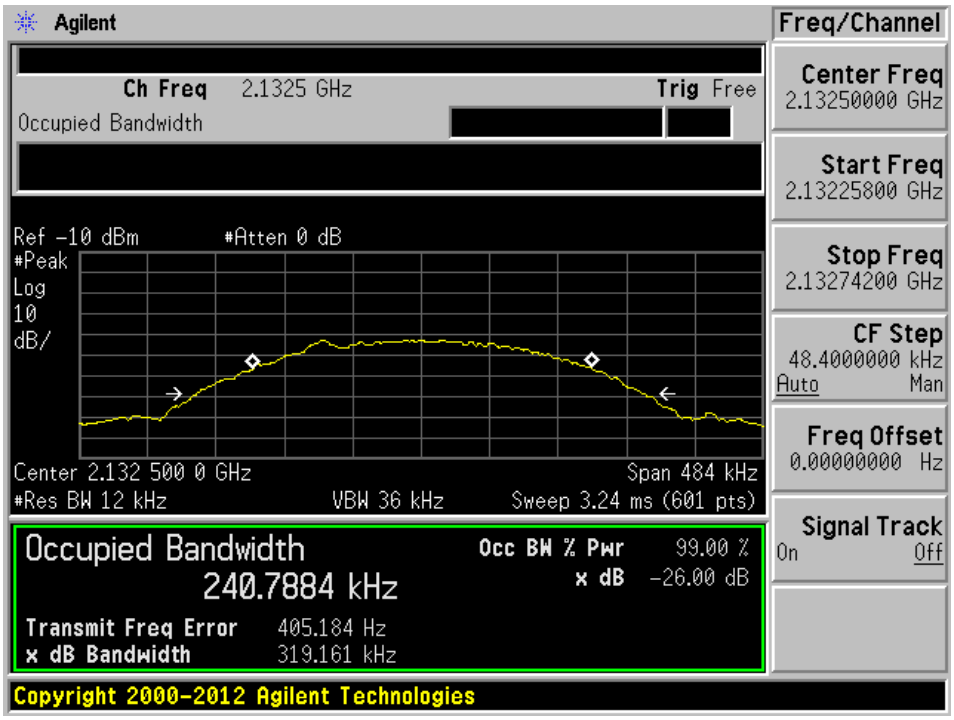
Output



AWS Band, Downlink: Narrowband Signal

AGC off

Input



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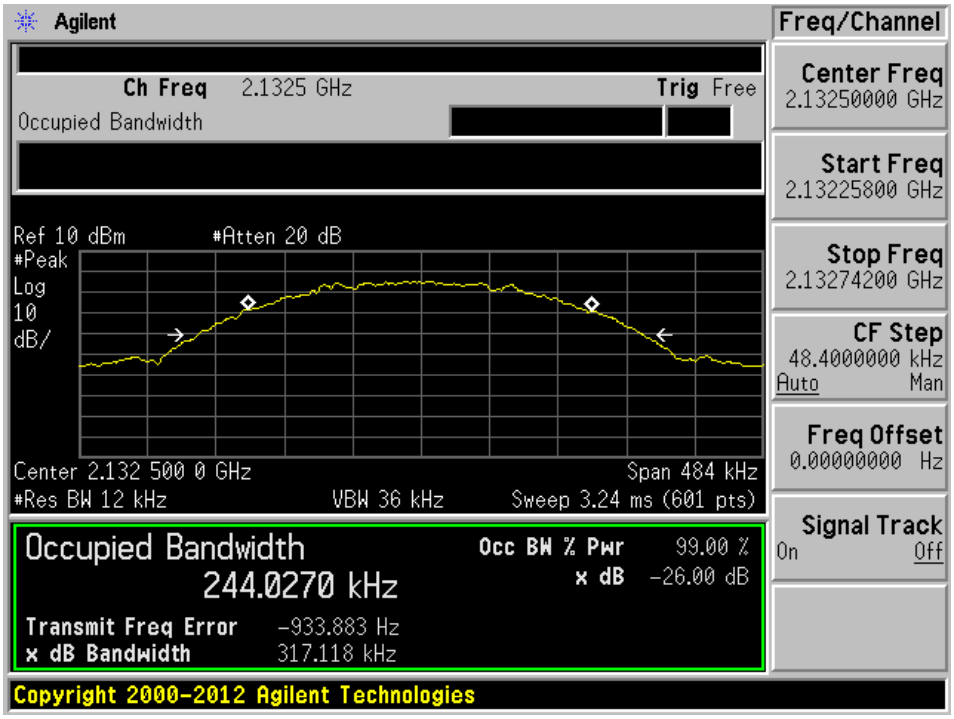
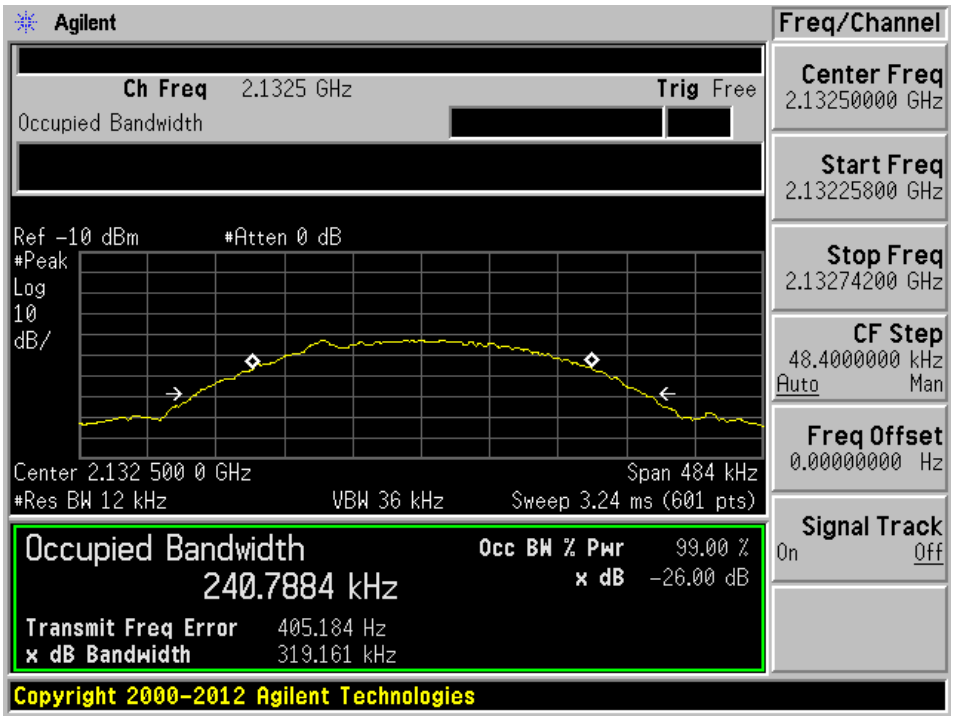
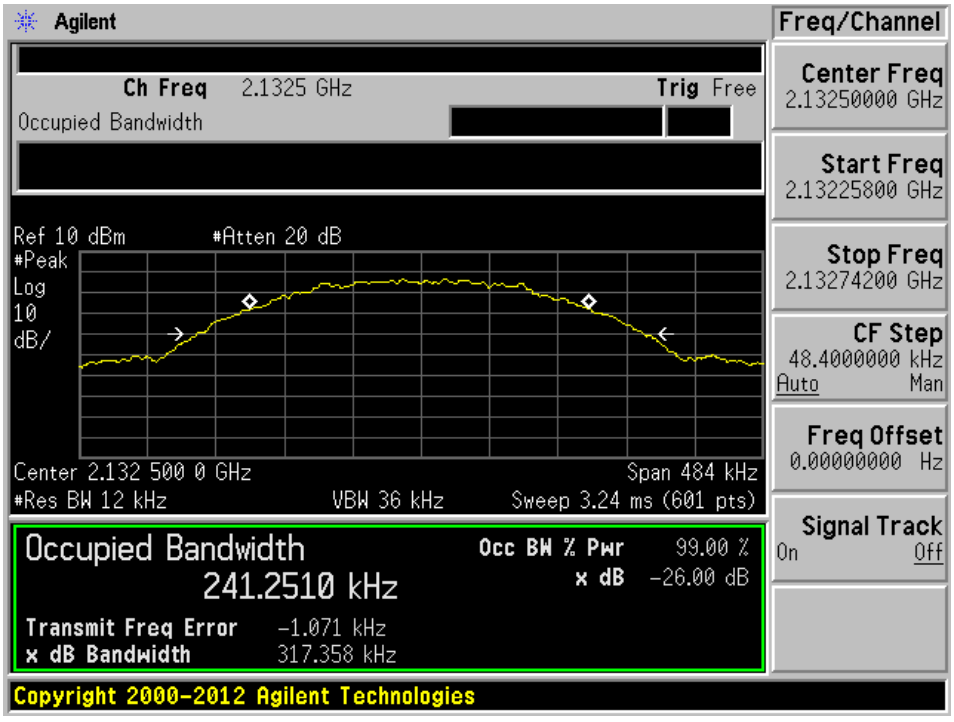


AGC on

Input



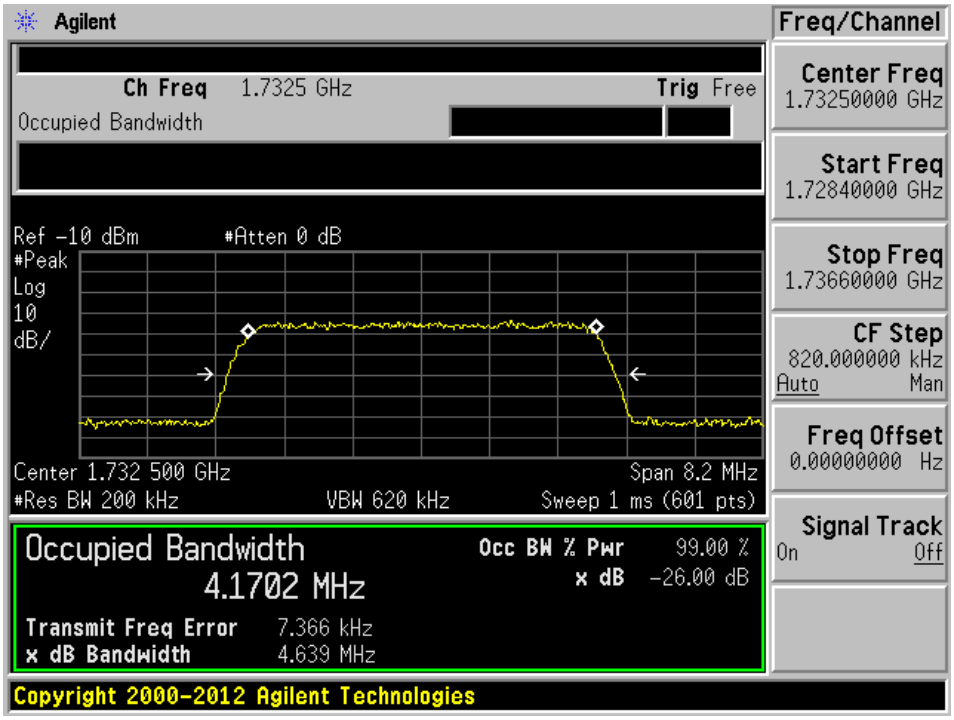
Output



AWS Band, Uplink: Broadband Signal

AGC off

Input



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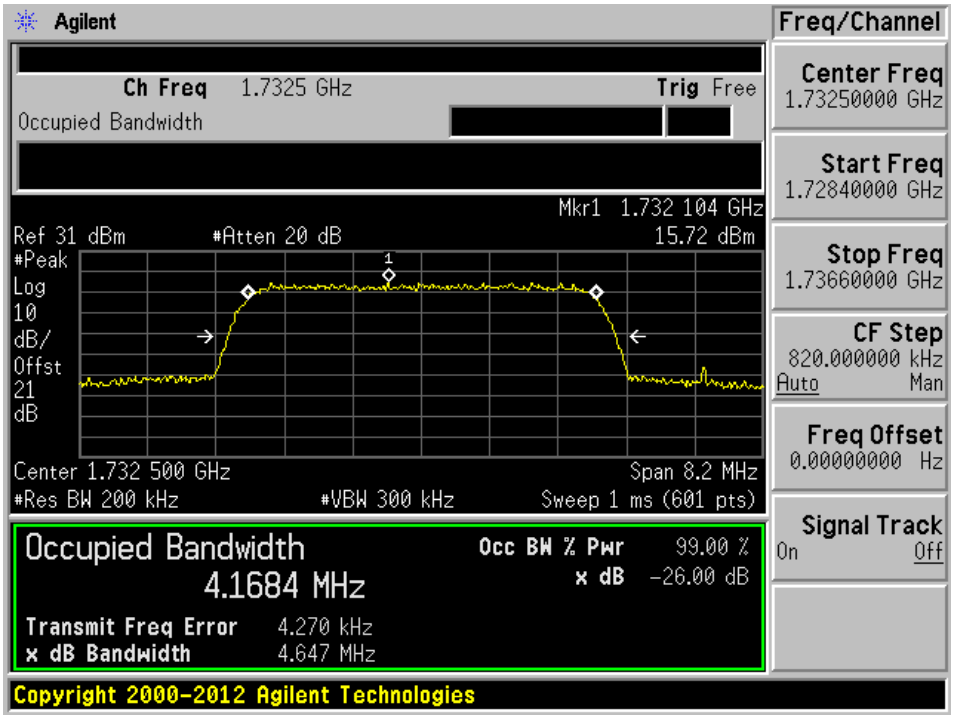
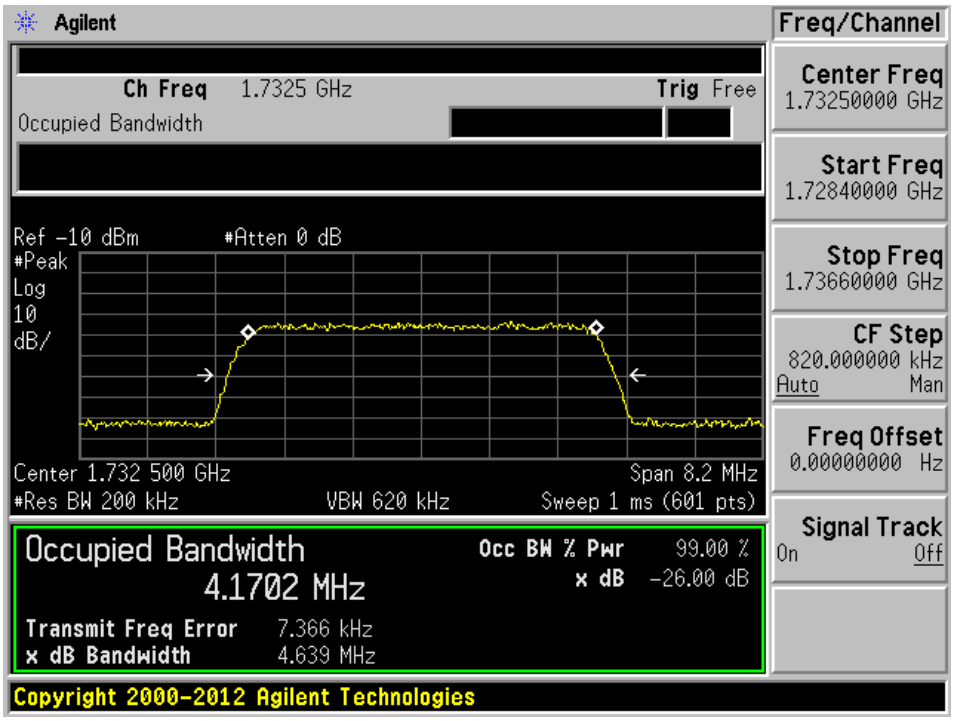
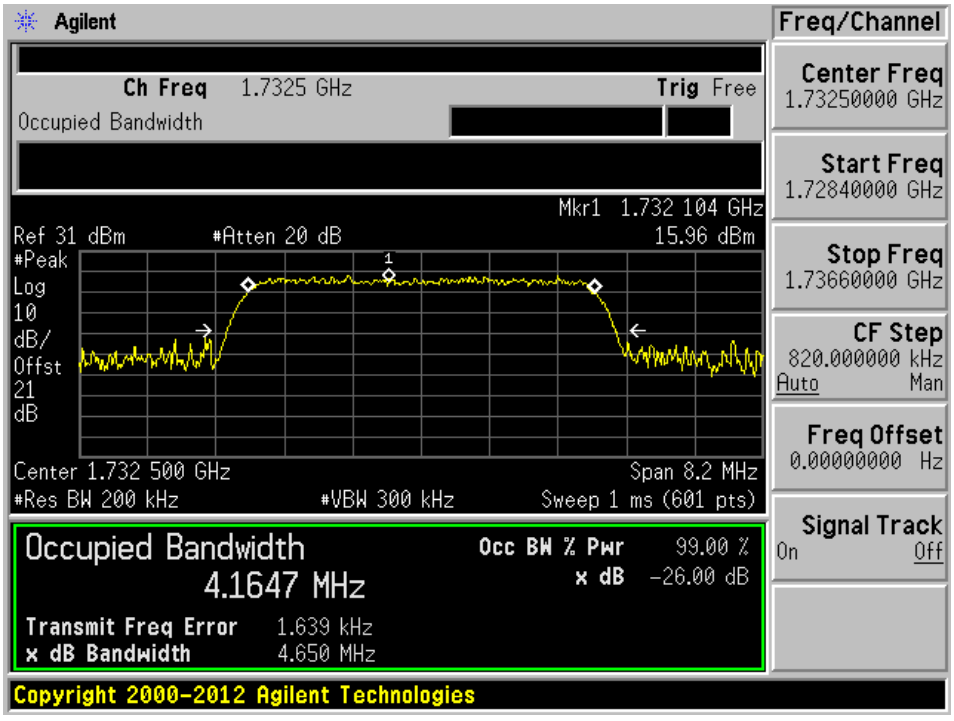


AGC on

Input



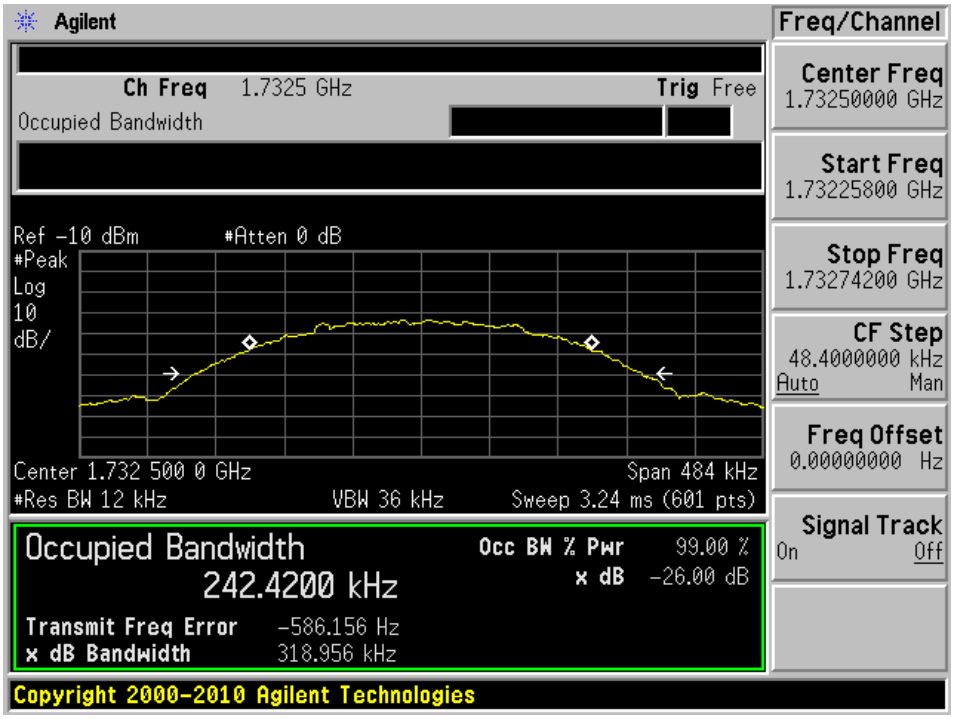
Output



AWS Band, Uplink: Narrowband Signal

AGC off

Input



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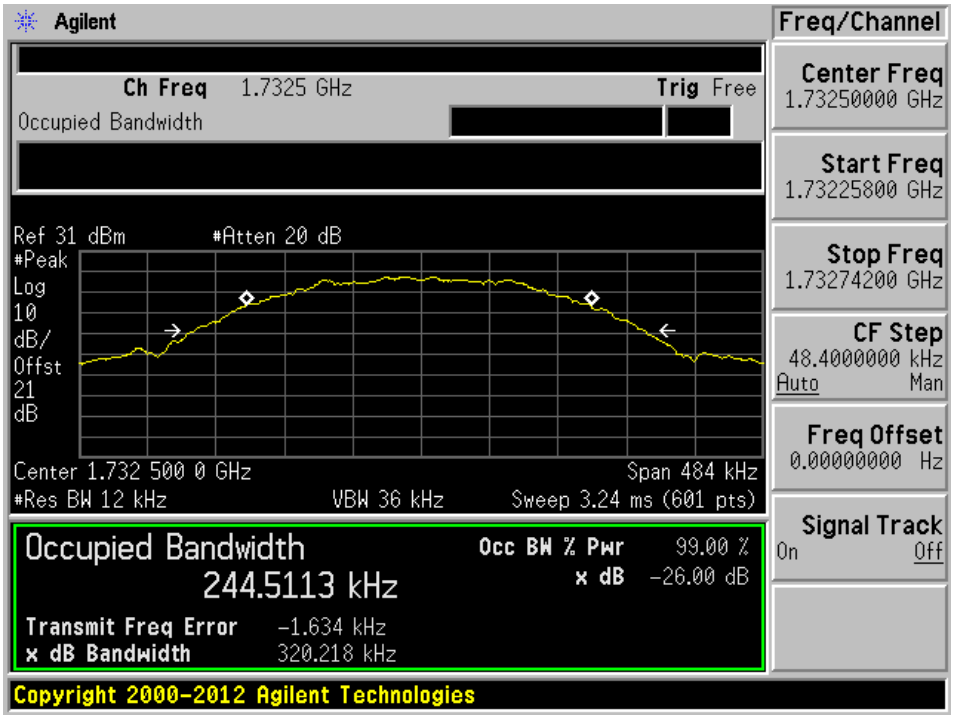
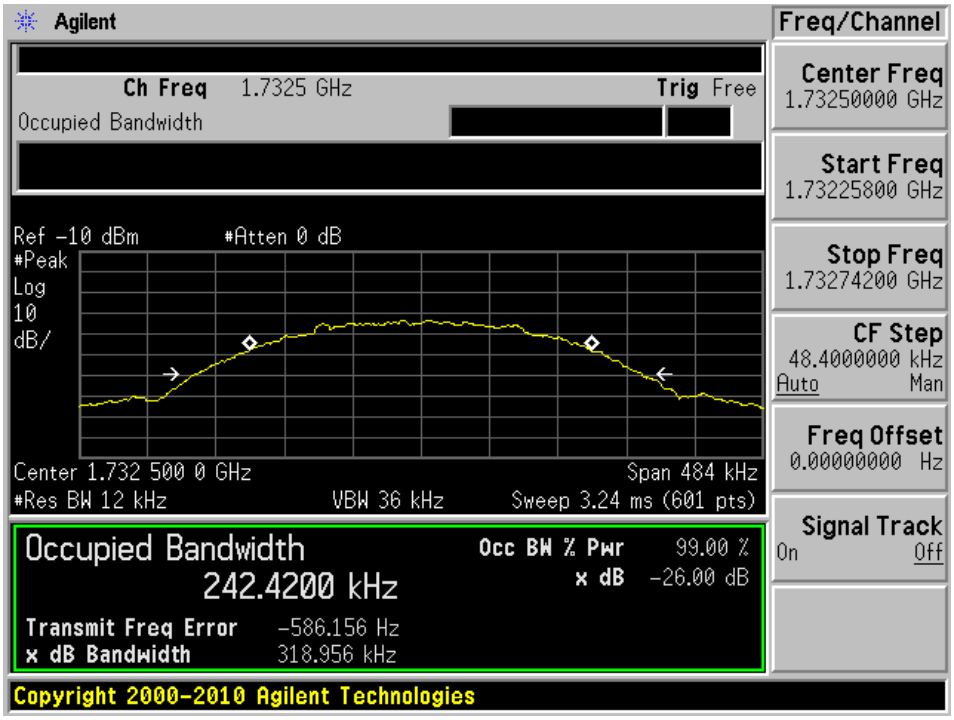
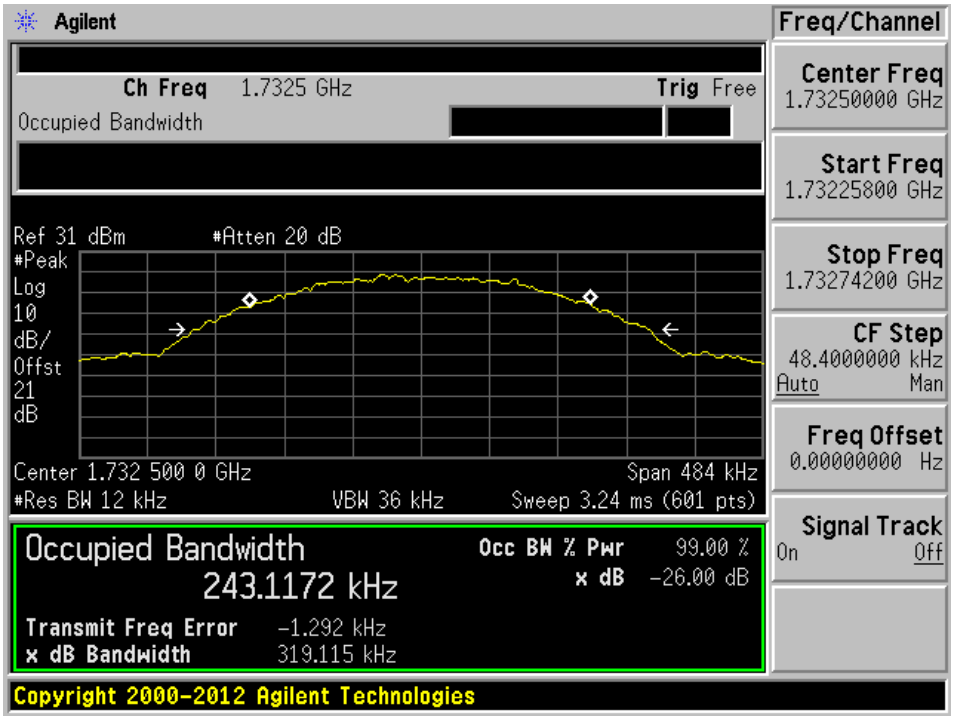


AGC on

Input



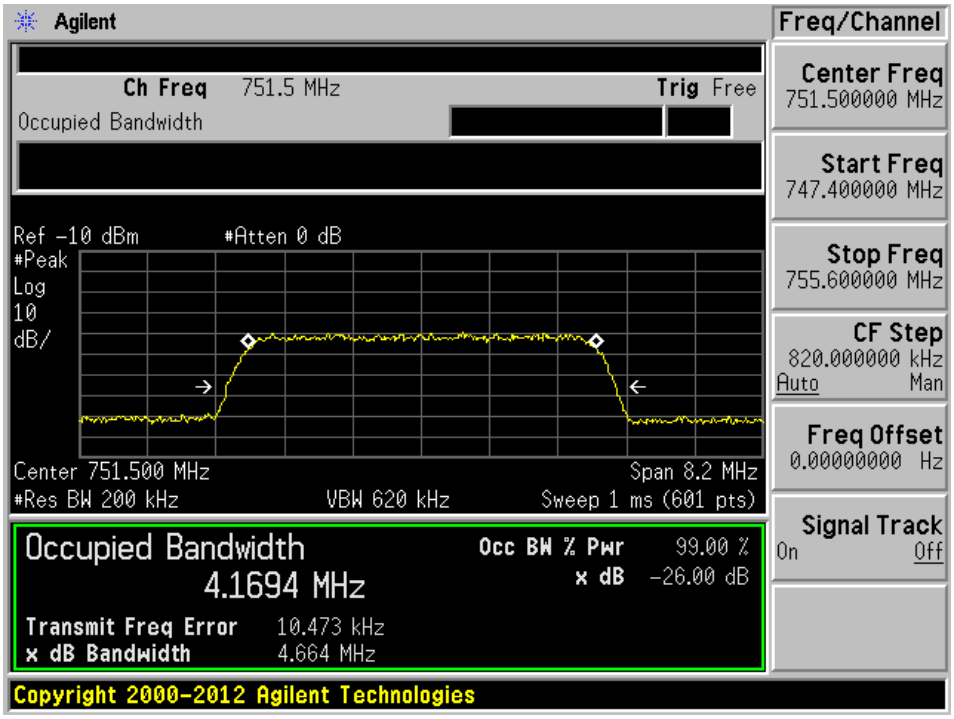
Output



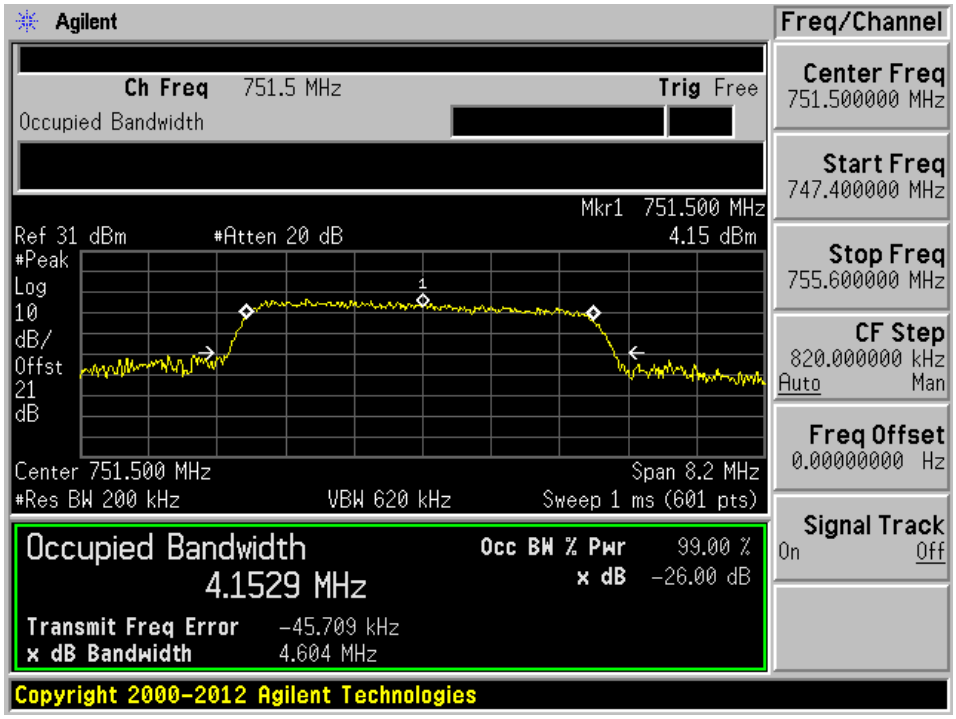
LTE Band 13, Downlink: Broadband Signal

AGC off

Input

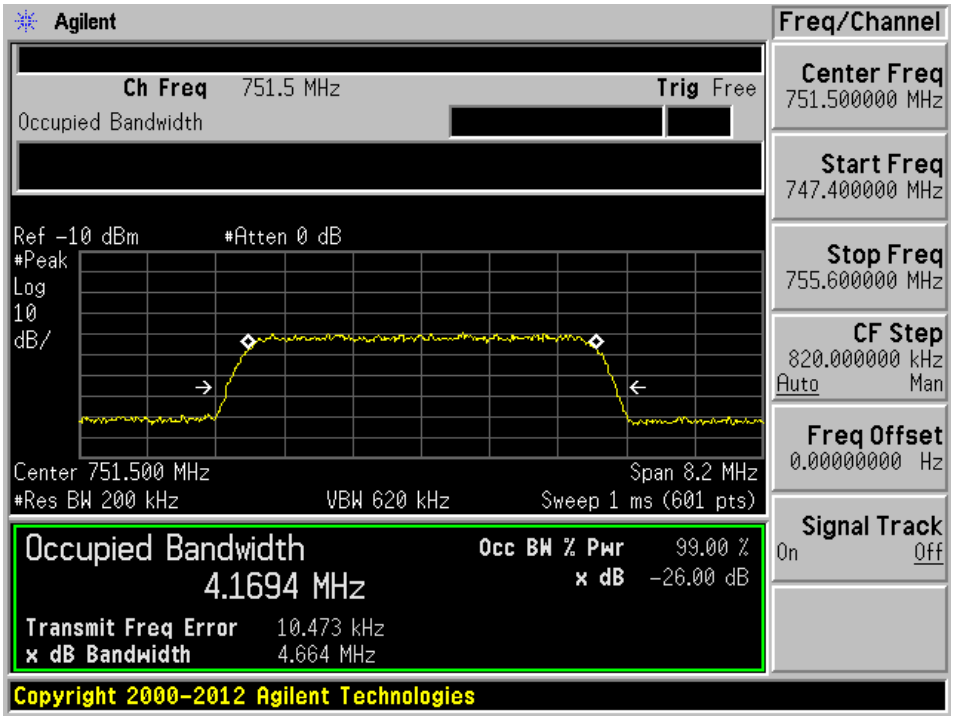


Output



AGC on

Input



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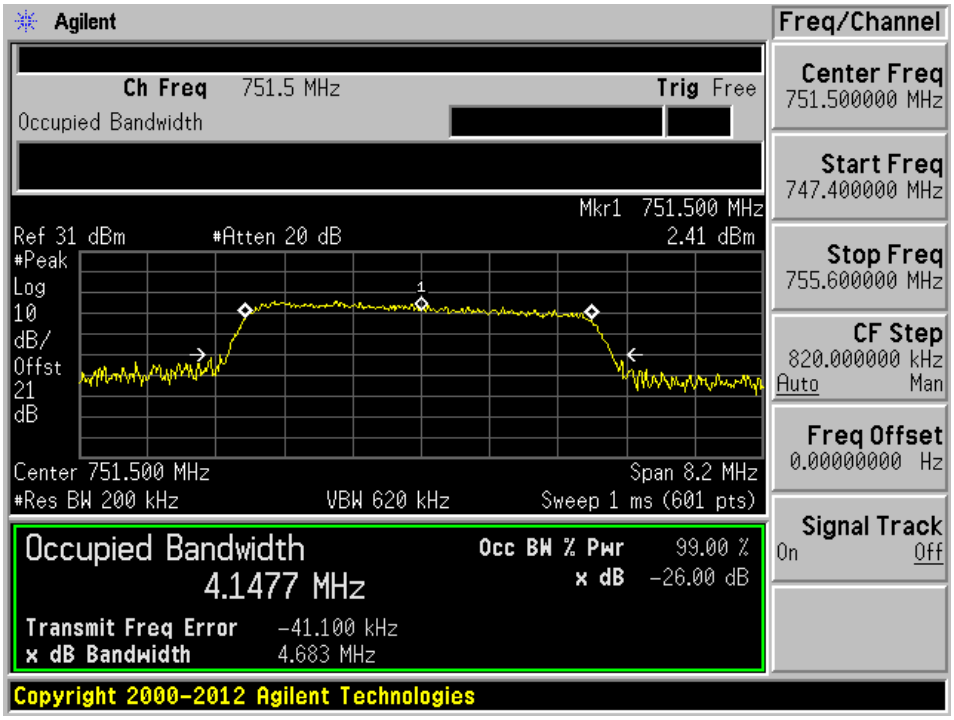
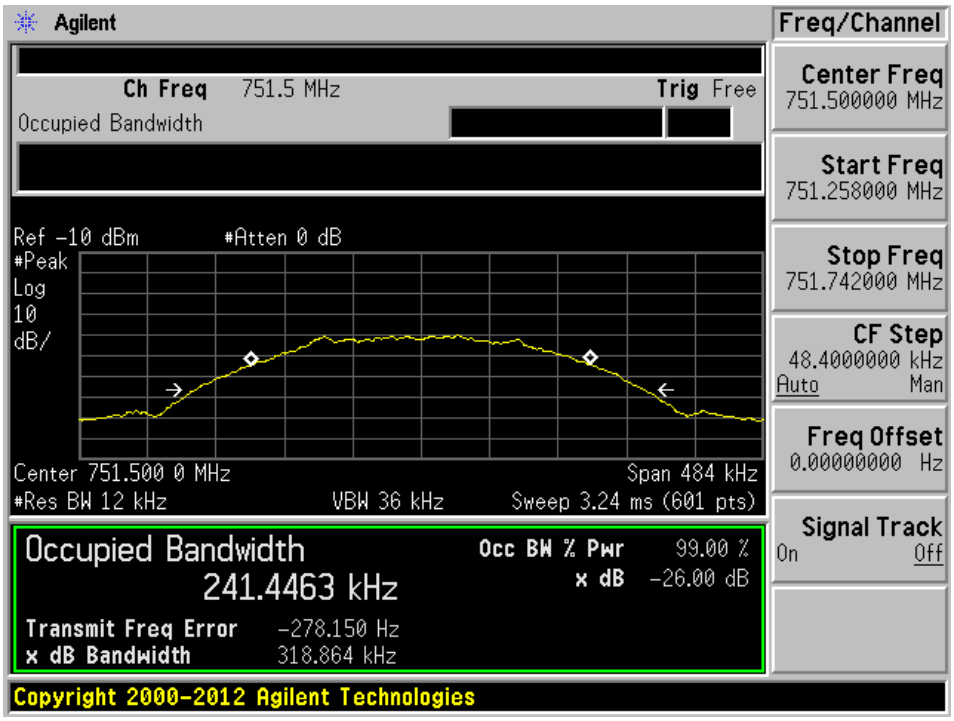


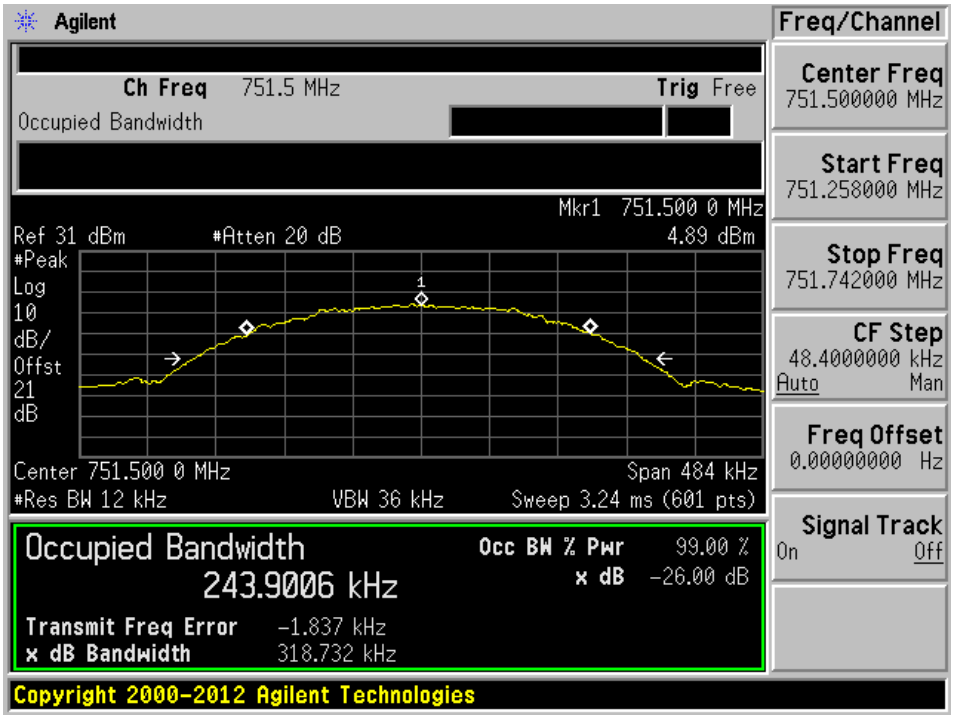
LTE Band 13, Downlink: Narrowband Signal

AGC off

Input

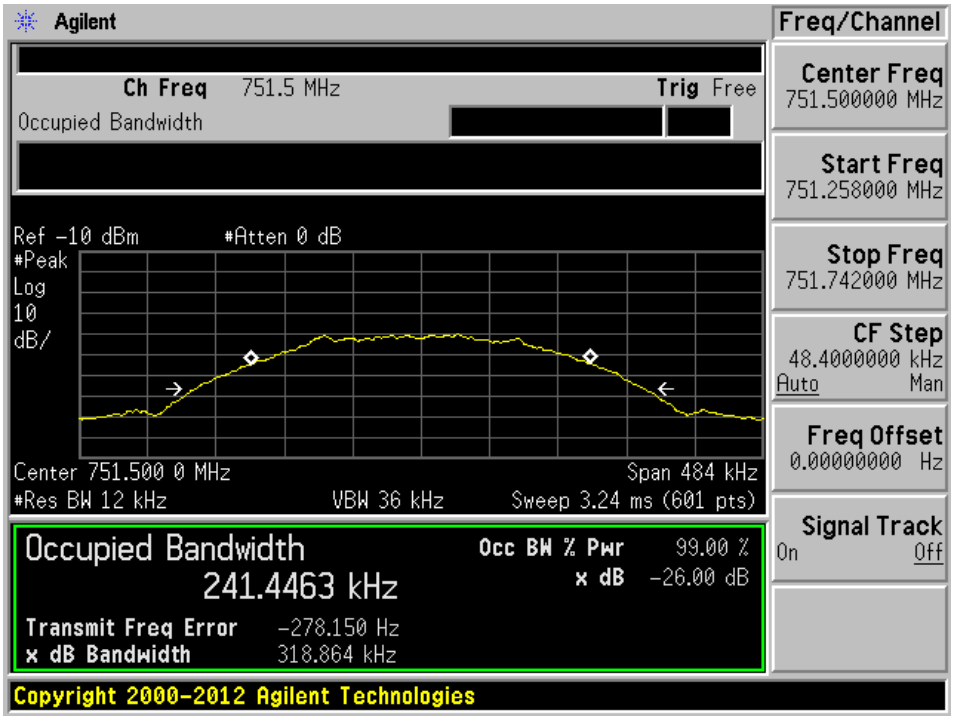


Output

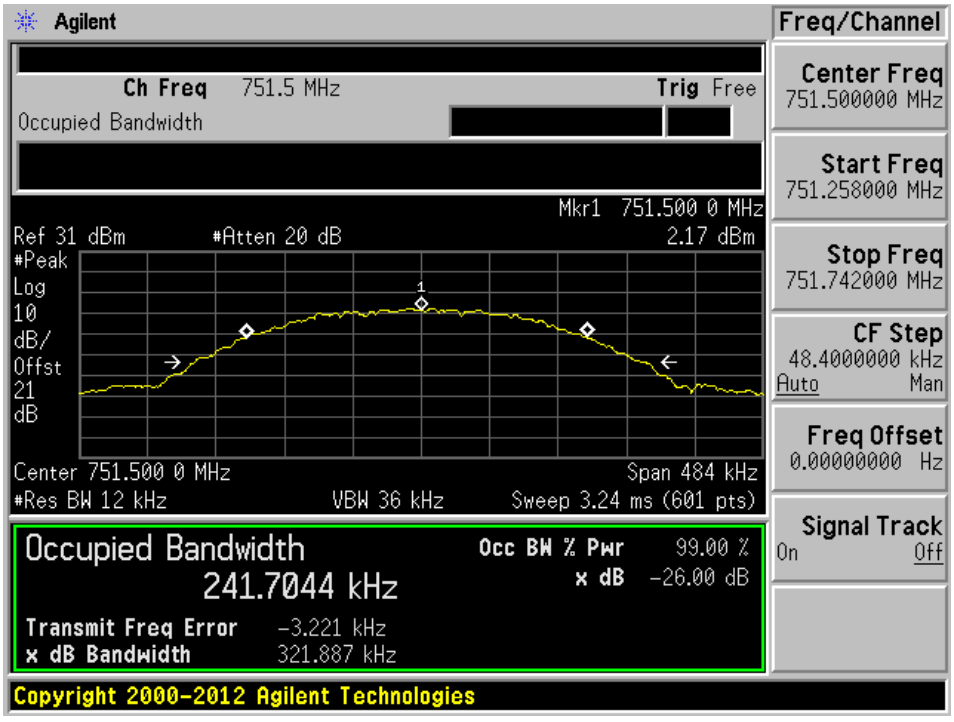


AGC on

Input



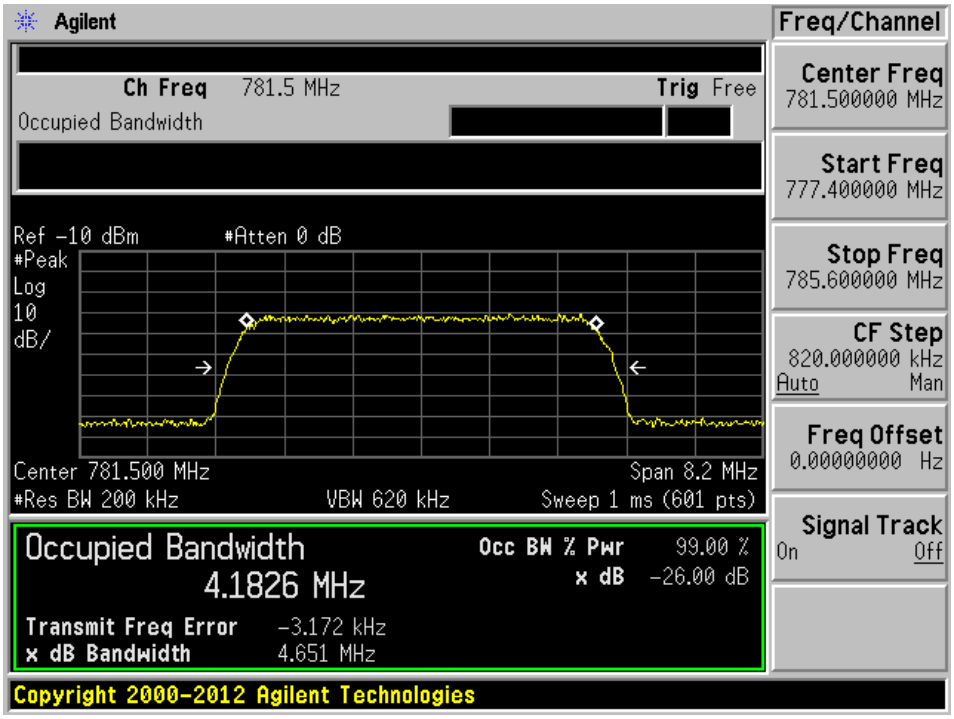
Output



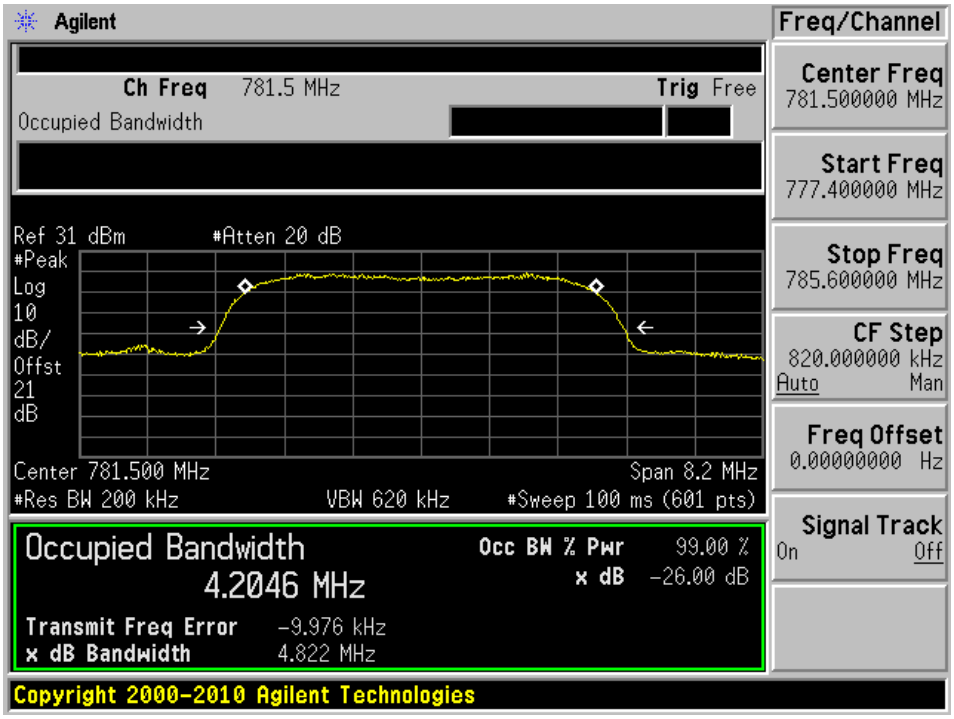
LTE Band 13, Uplink: Broadband Signal

AGC off

Input

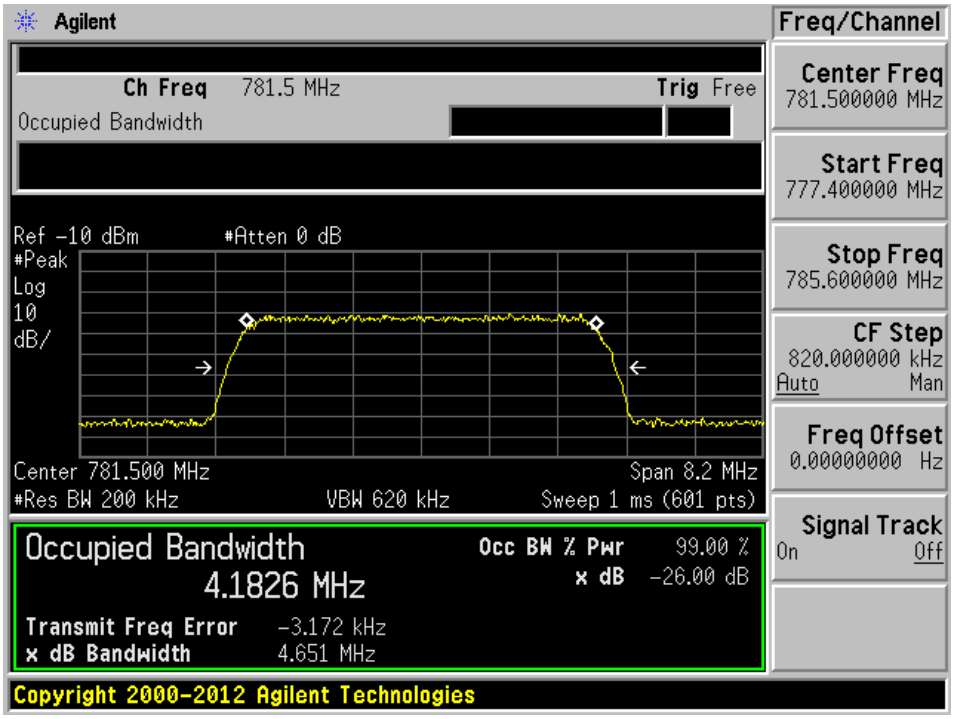


Output

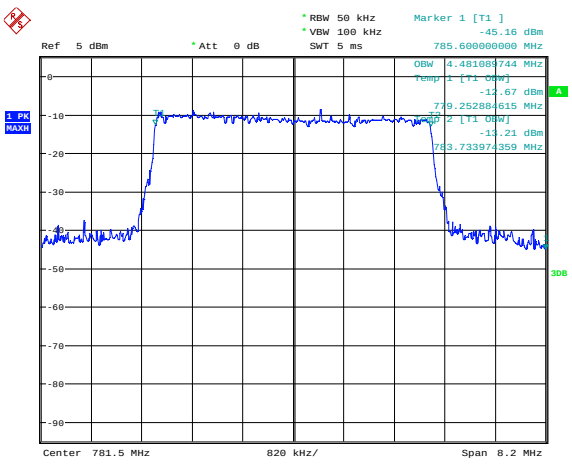


AGC on

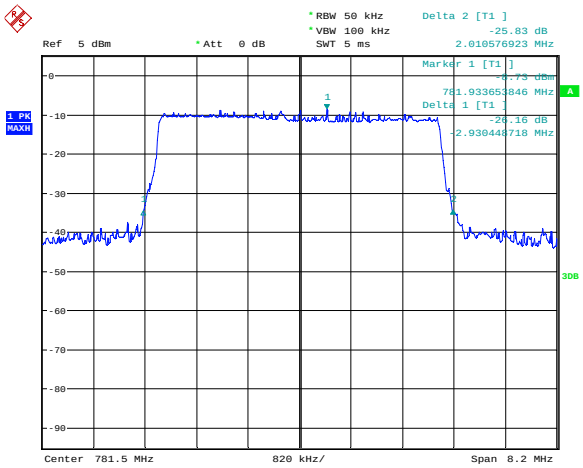
Input



Output



Date: 22.OCT.2015 10:20:30

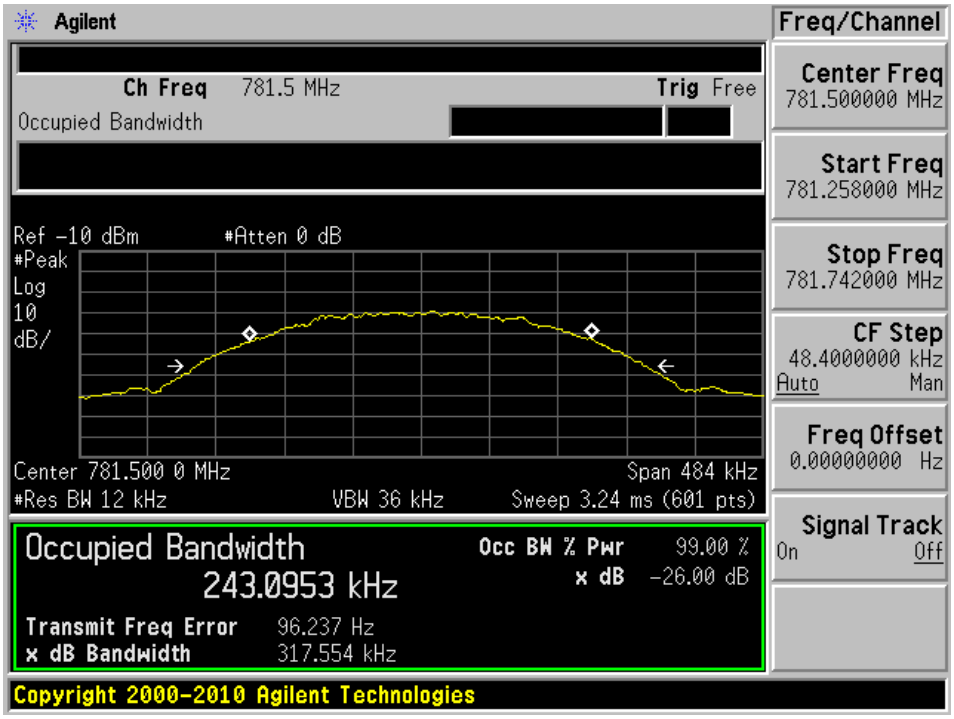


Date: 22.OCT.2015 10:21:19

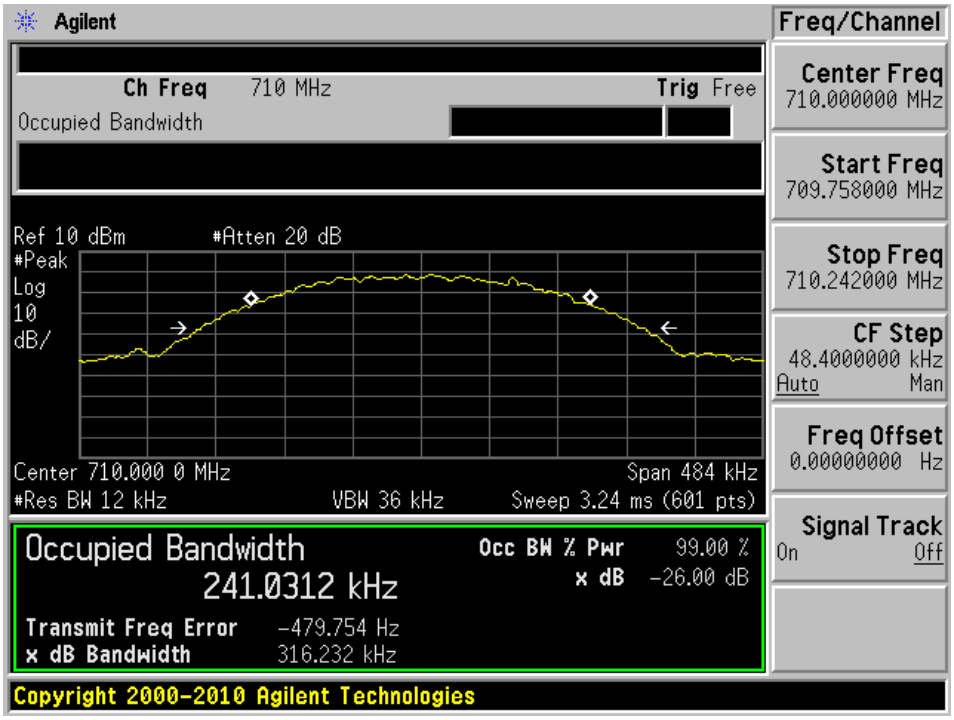
LTE Band 13, Uplink: Narrowband Signal

AGC off

Input

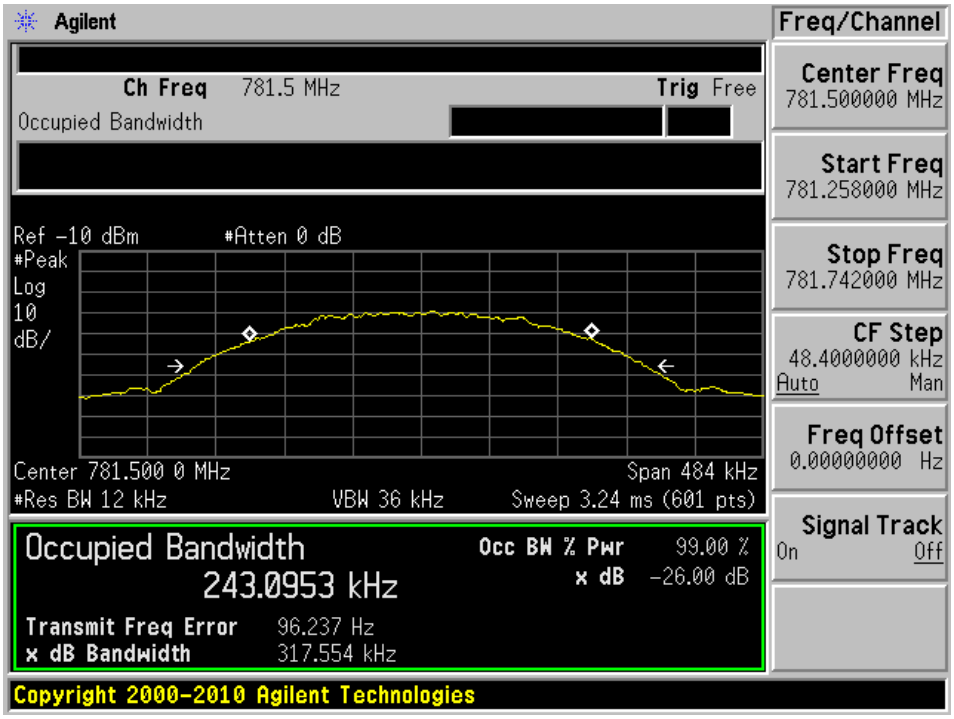


Output

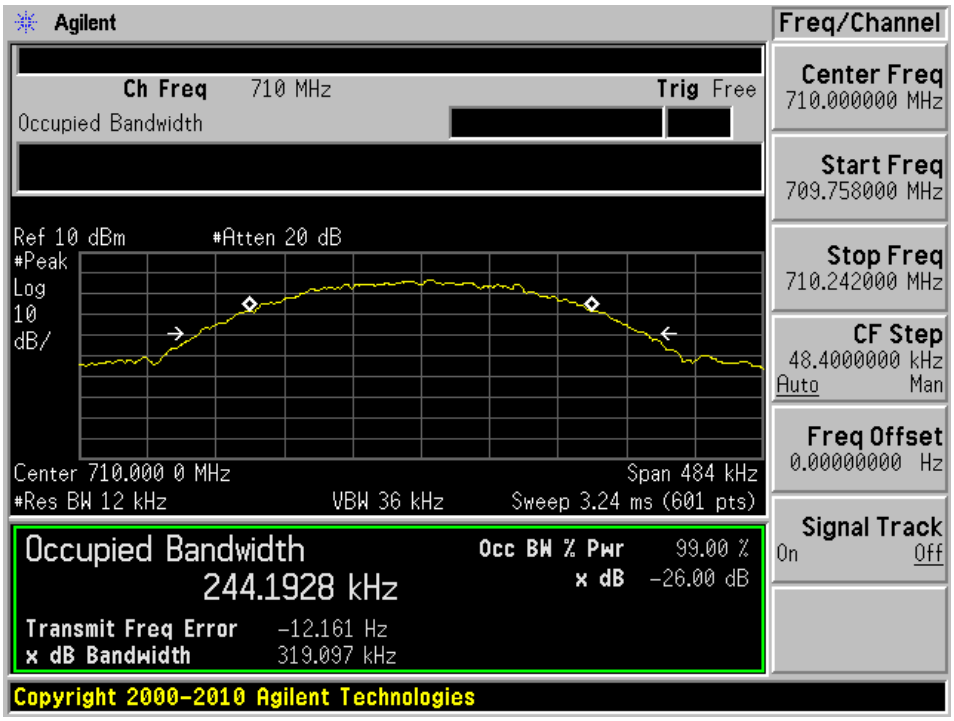


AGC on

Input



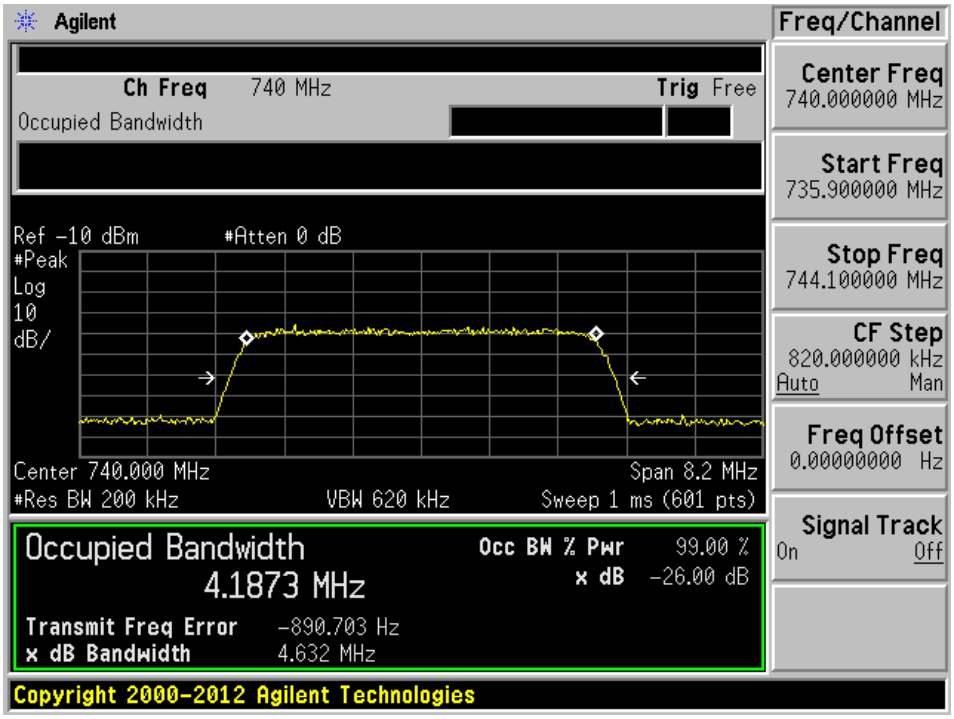
Output



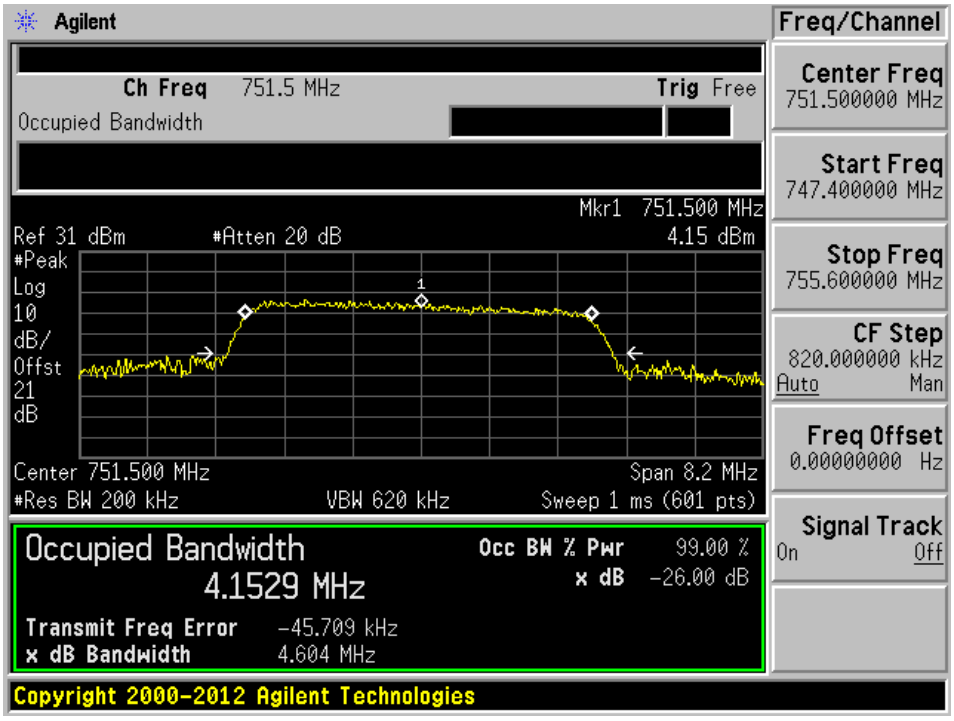
LTE Band 17, Downlink: Broadband Signal

AGC off

Input

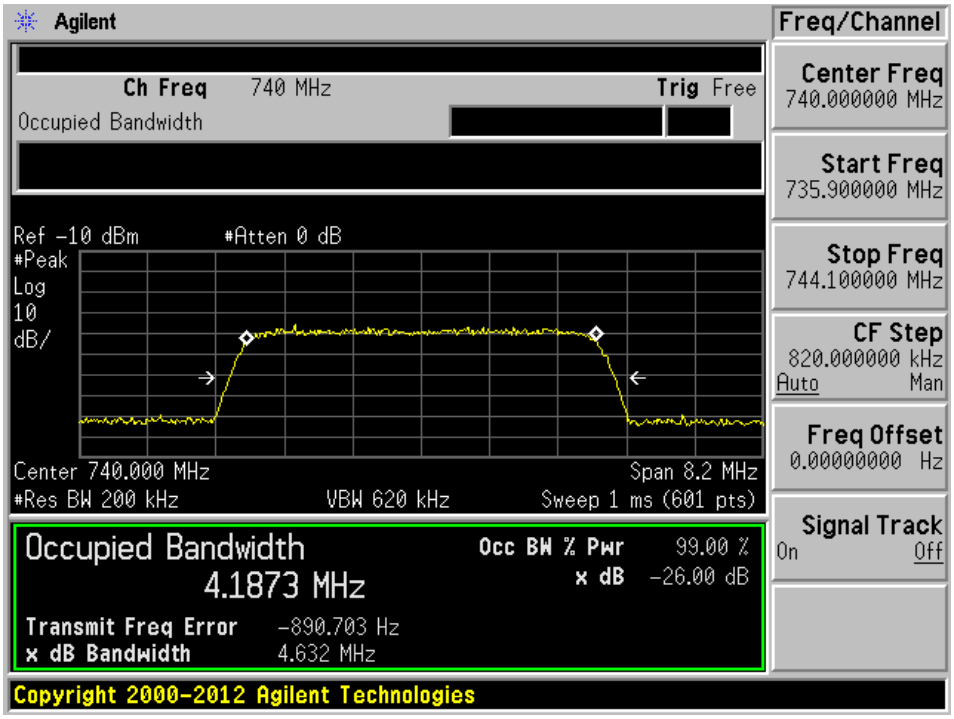


Output

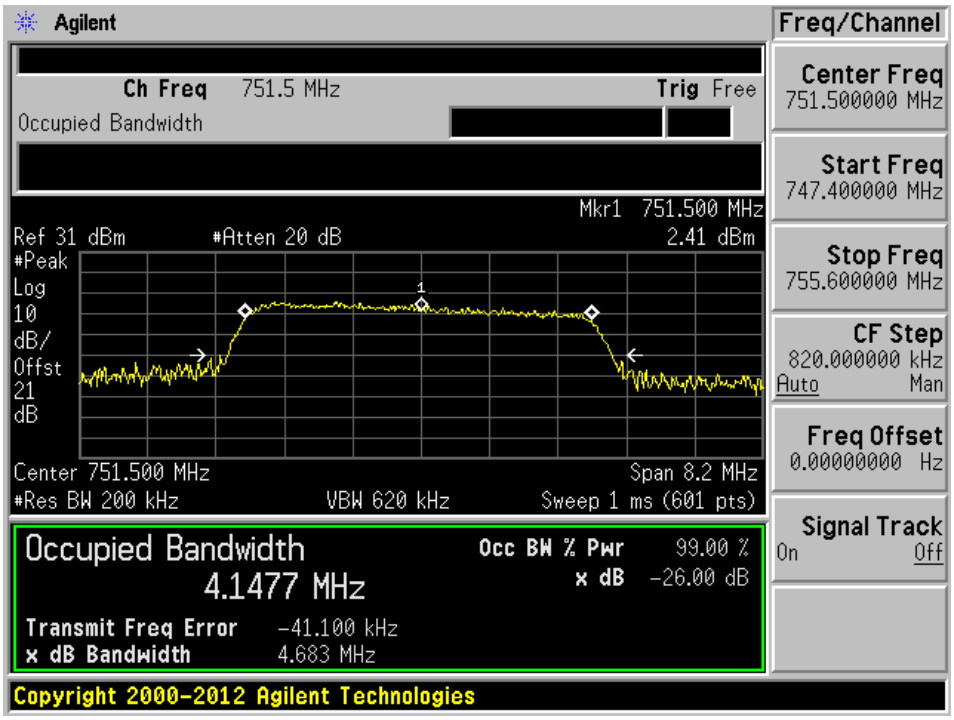


AGC on

Input



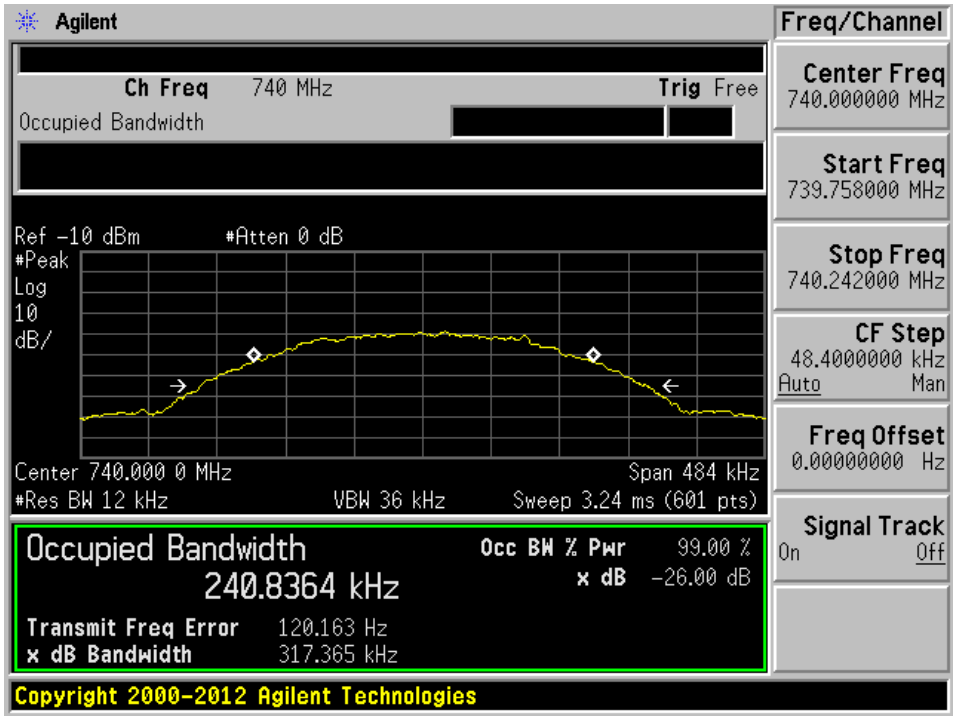
Output



LTE Band 17, Downlink: Narrowband Signal

AGC off

Input



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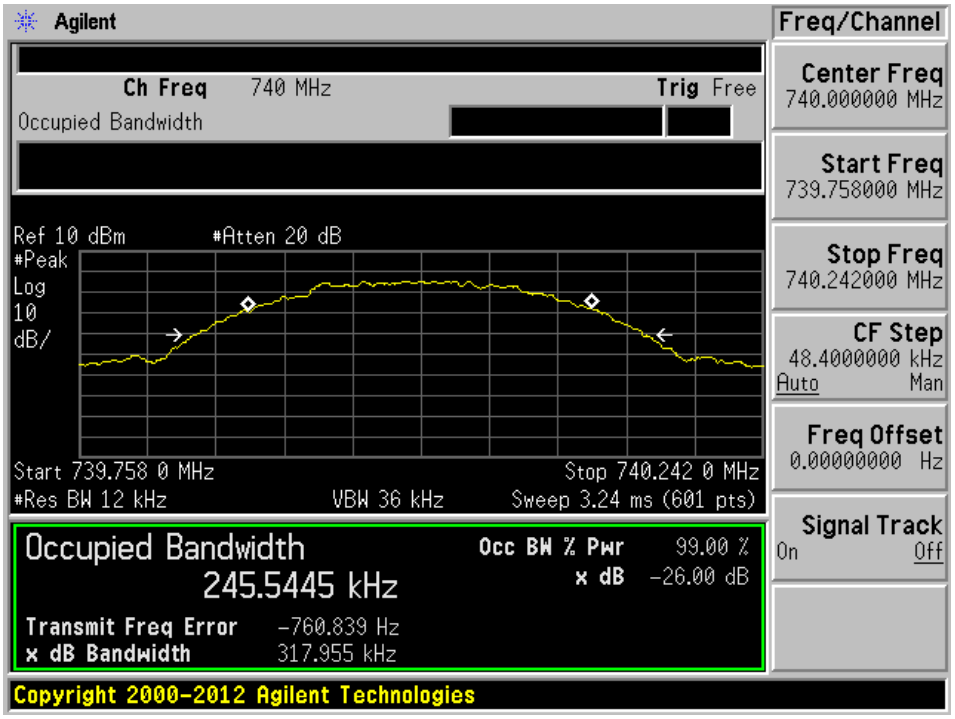
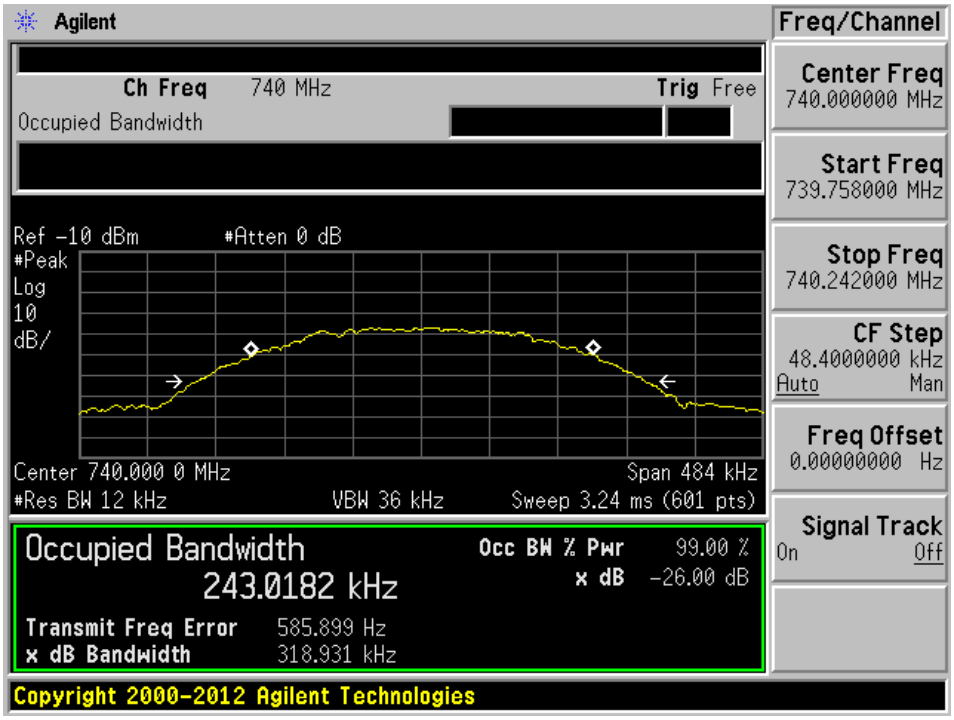


AGC on

Input



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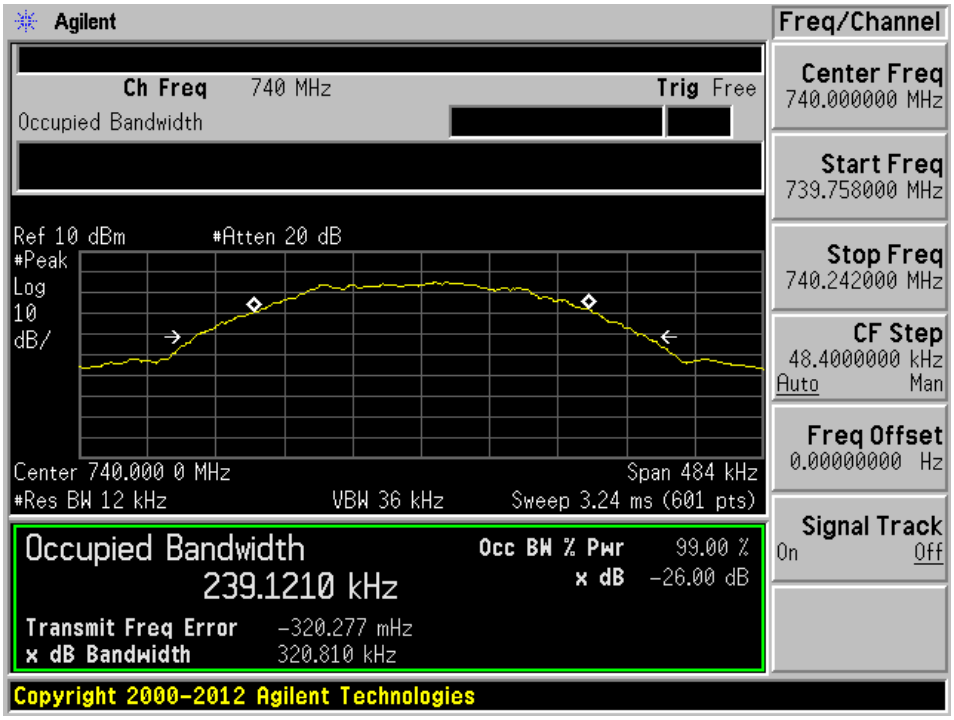
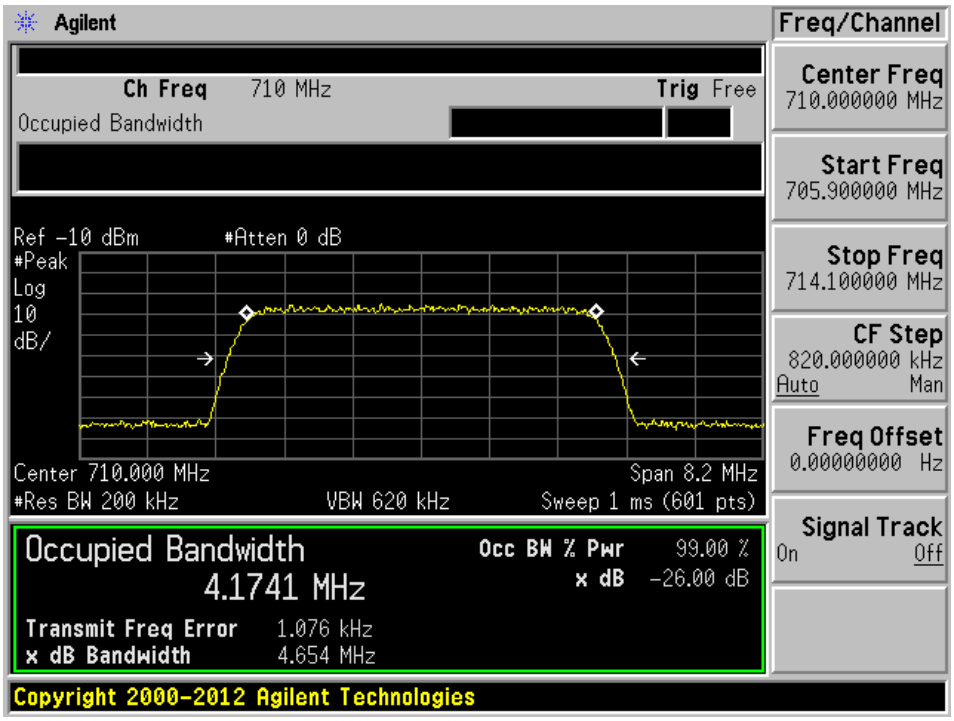


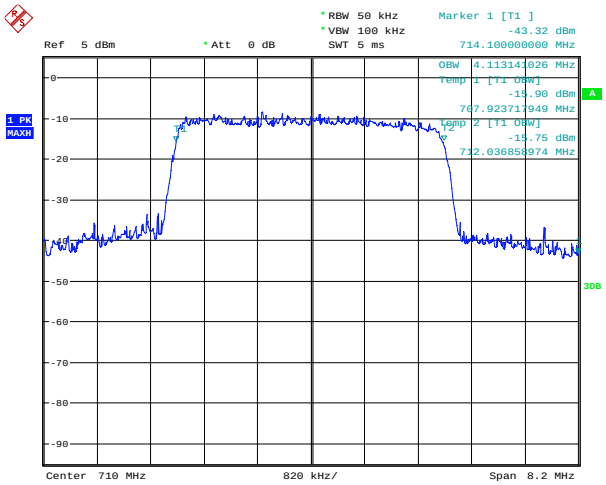
LTE Band 17, Uplink: Broadband Signal

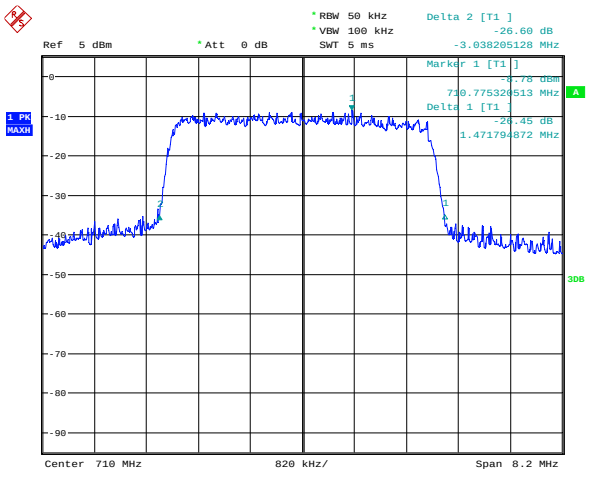
AGC off

Input



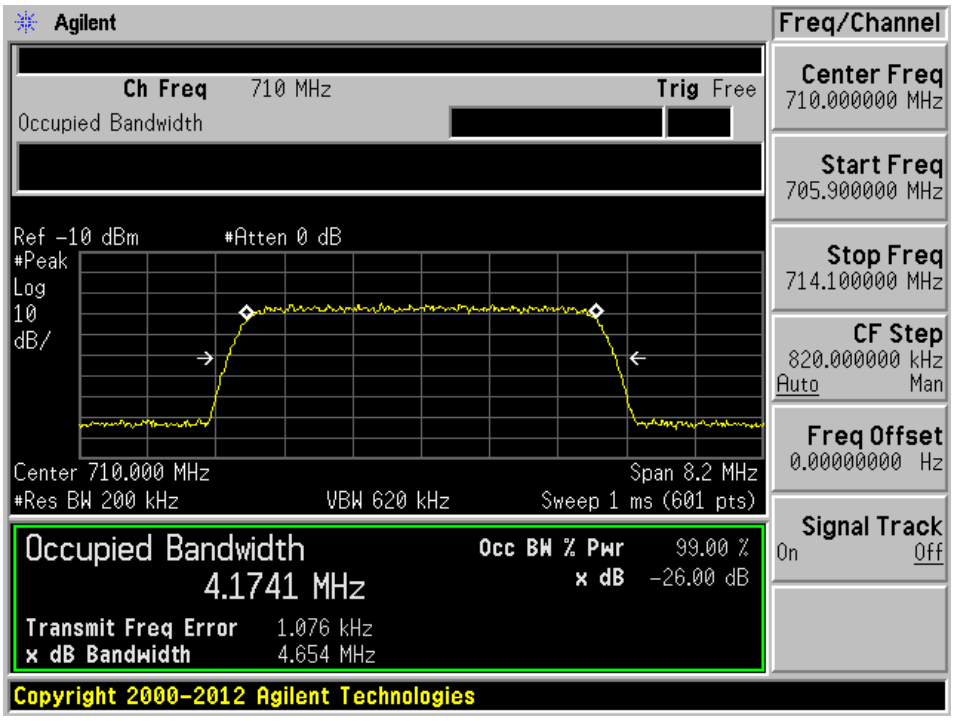
Output



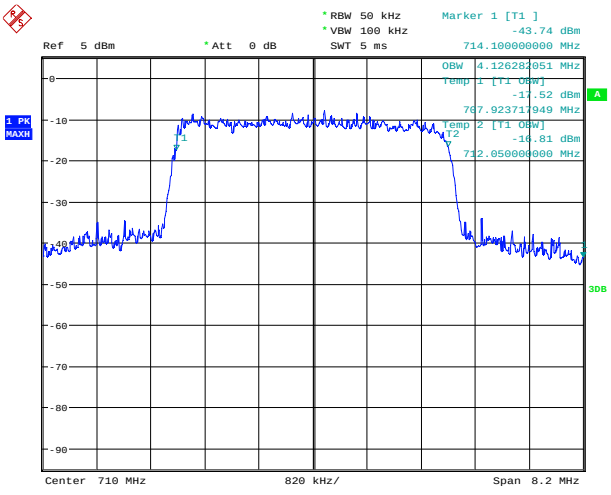


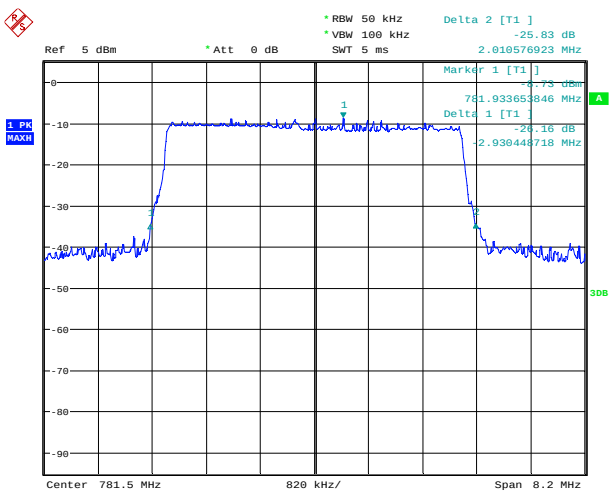
AGC on

Input



Output

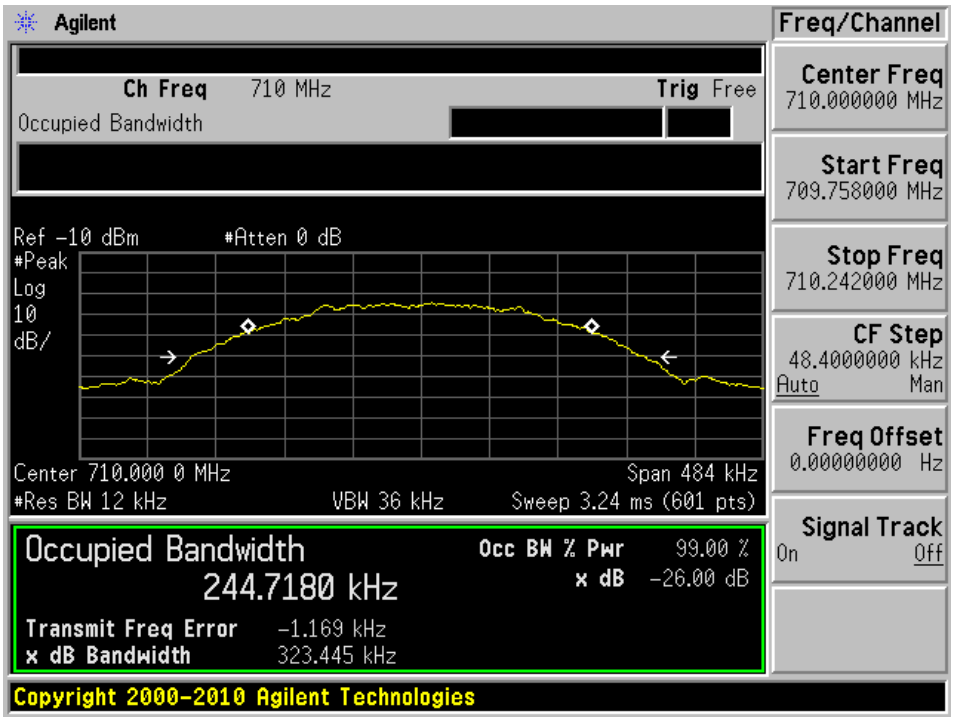




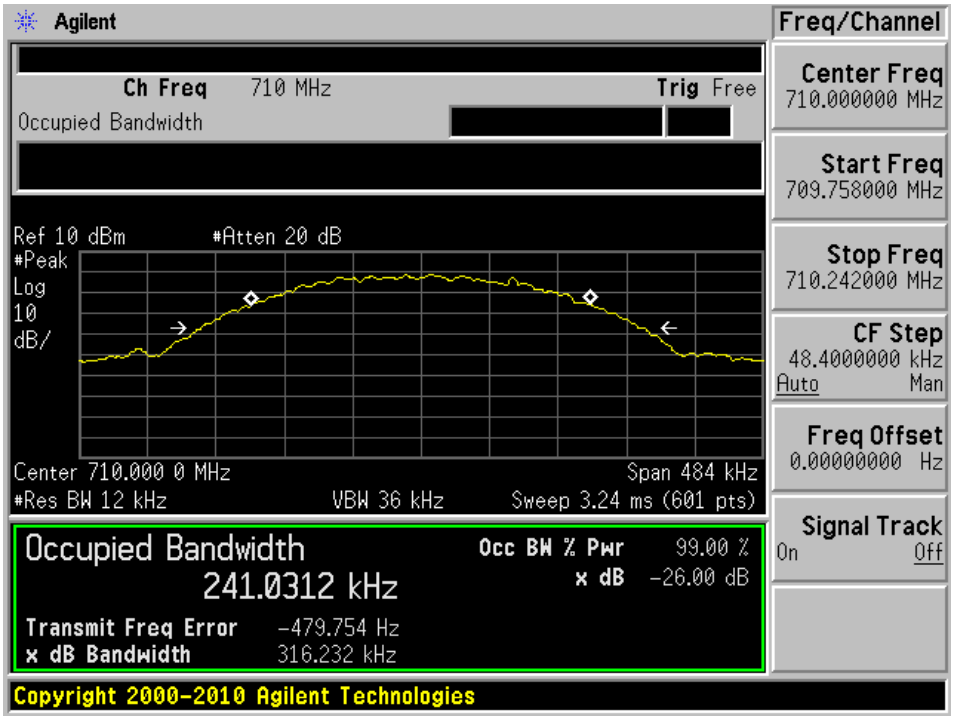
LTE Band 17, Uplink: Narrowband Signal

AGC off

Input

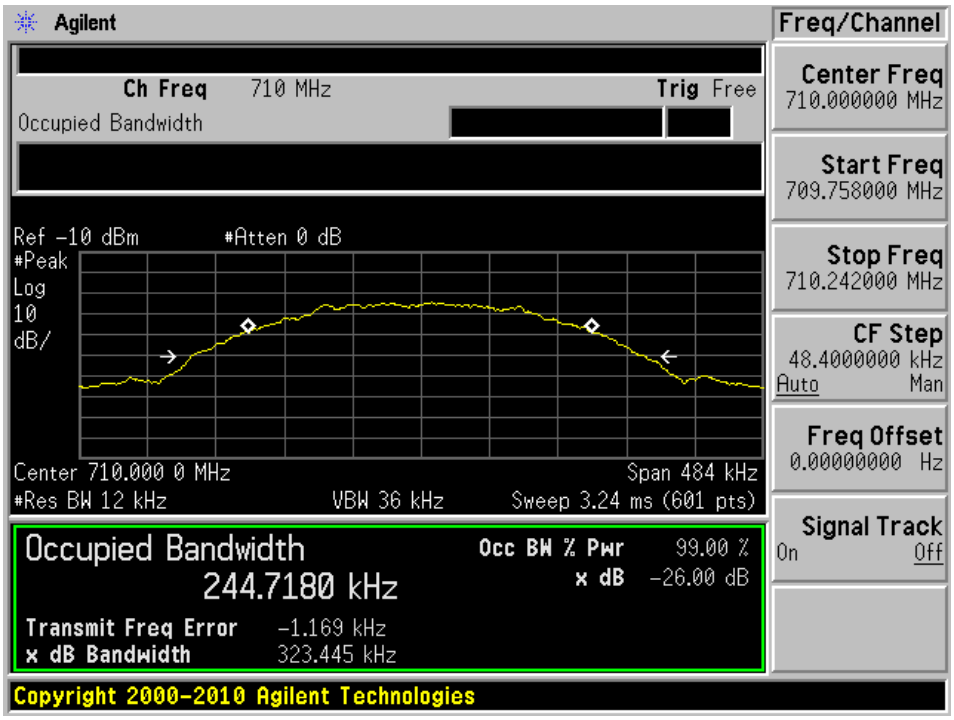


Output

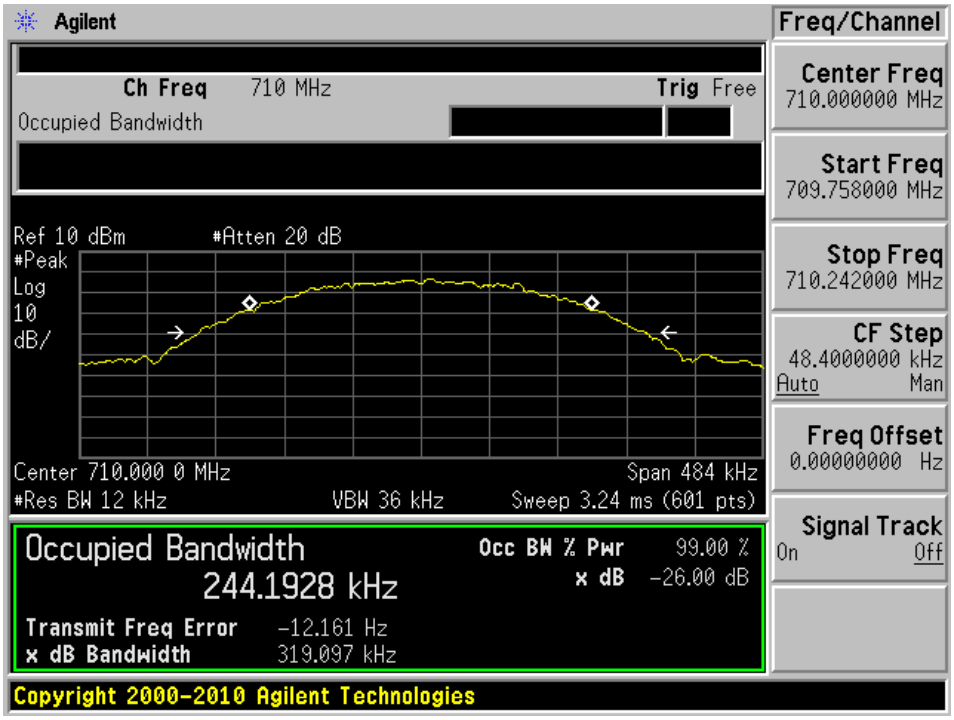


AGC on

Input



Output



7 FCC §2.1053 & §27.53 (c) (g) (h) - Spurious Radiated Emissions

7.1 Applicable Standards

According to FCC §27.53,

(c) For operations in the 746-758 MHz band and the 776-788 MHz band, the power of any emission outside the licensee's frequency band(s) of operation shall be attenuated below the transmitter power (P) within the licensed band(s) of operation, measured in watts, in accordance with the following:

(1) On any frequency outside the 746-758 MHz band, the power of any emission shall be attenuated outside the band below the transmitter power (P) by at least 43 + 10 log (P) dB;

(2) On any frequency outside the 776-788 MHz band, the power of any emission shall be attenuated outside the band below the transmitter power (P) by at least 43 + 10 log (P) dB;

(3) On all frequencies between 763-775 MHz and 793-805 MHz, by a factor not less than 76 + 10 log (P) dB in a 6.25 kHz band segment, for base and fixed stations;

(4) On all frequencies between 763-775 MHz and 793-805 MHz, by a factor not less than 65 + 10 log (P) dB in a 6.25 kHz band segment, for mobile and portable stations;

(5) Compliance with the provisions of paragraphs (c)(1) and (c)(2) of this section is based on the use of measurement instrumentation employing a resolution bandwidth of 100 kHz or greater. However, in the 100 kHz bands immediately outside and adjacent to the frequency block, a resolution bandwidth of at least 30 kHz may be employed;

(6) Compliance with the provisions of paragraphs (c)(3) and (c)(4) of this section is based on the use of measurement instrumentation such that the reading taken with any resolution bandwidth setting should be adjusted to indicate spectral energy in a 6.25 kHz segment.

(g) For operations in the 600 MHz band and the 698-746 MHz band, the power of any emission outside a licensee's frequency band(s) of operation shall be attenuated below the transmitter power (P) within the licensed band(s) of operation, measured in watts, by at least 43 + 10 log (P) dB. Compliance with this provision is based on the use of measurement instrumentation employing a resolution bandwidth of 100 kilohertz or greater. However, in the 100 kilohertz bands immediately outside and adjacent to a licensee's frequency block, a resolution bandwidth of at least 30 kHz may be employed.

(h) AWS emission limits—(1) General protection levels. Except as otherwise specified below, for operations in the 1695-1710 MHz, 1710-1755 MHz, 1755-1780 MHz, 1915-1920 MHz, 1995-2000 MHz, 2000-2020 MHz, 2110-2155 MHz, 2155-2180 MHz, and 2180-2200 bands, the power of any emission outside a licensee's frequency block shall be attenuated below the transmitter power (P) in watts by at least 43 + 10 log10 (P) dB.

7.2 Test Procedure

The transmitter was placed on the turntable, and it was transmitting into a non-radiating load which was also placed on the turntable.

The measurement antenna was placed at a distance of 3 meters from the EUT. During the tests, the antenna height and polarization as well as EUT azimuth were varied in order to identify the maximum level of emissions from the EUT. The test was performed by placing the EUT on 3-orthogonal axis.

The frequency range up to tenth harmonic of the fundamental frequency was investigated.

Remove the EUT and replace it with substitution antenna. A signal generator was connected to the substitution antenna by a non-radiating cable. The absolute levels of the spurious emissions were measured by the substitution.

Spurious emissions in dB = 10 log (TX Power in Watts/0.001) – the absolute level
Spurious attenuation limit in dB = 43 + 10 Log_{10} (power out in Watts)

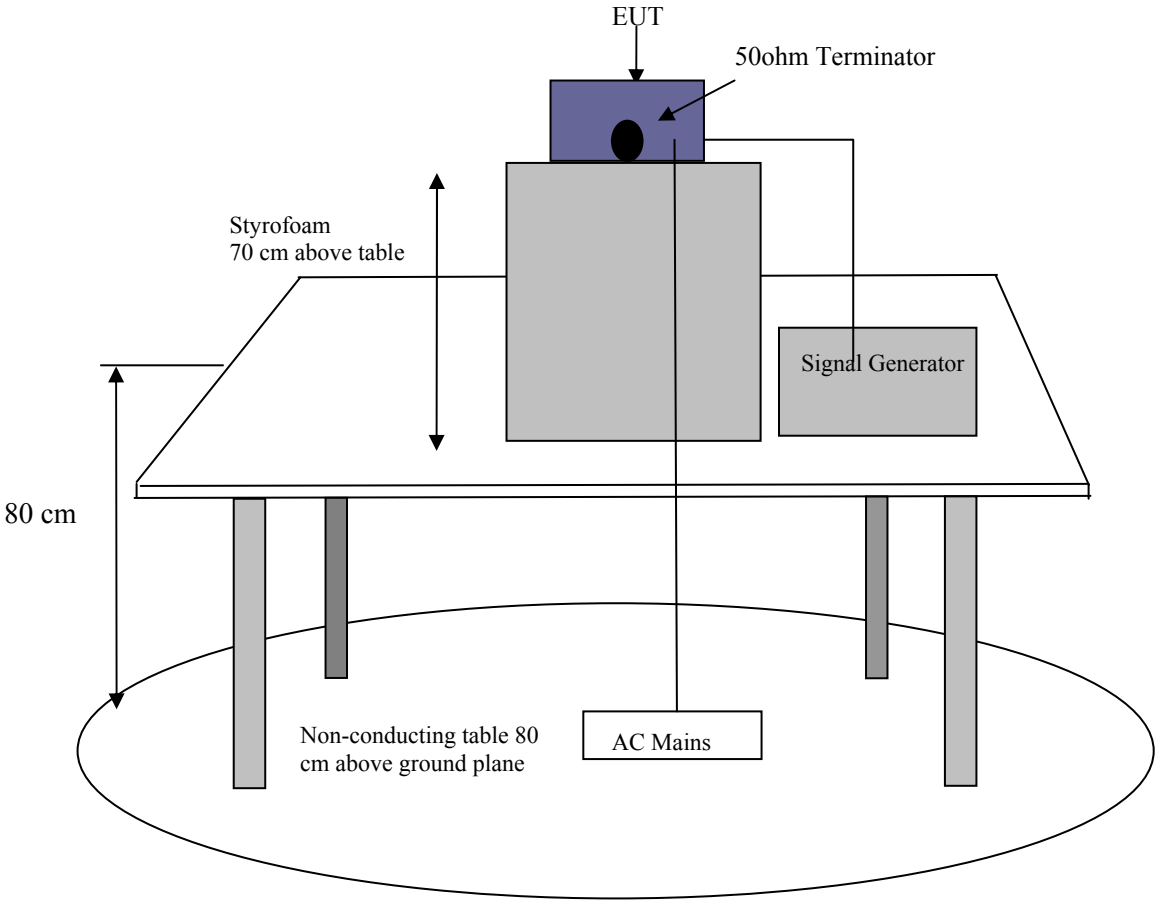
7.3 Test Equipment List and Details

Manufacturer	Description	Model No.	Serial No.	Calibration Date	Calibration Interval
Agilent	Analyzer, Spectrum	E4440A	MY44303352	2015-06-22	1 year
Sunol Science Corp	System Controller	SC99V	122303-1	N/R	N/R
Sunol Sciences	Antenna, Biconi-Log	JB3	A020106-2	2015-07-11	2 years
Hewlett Packard	Pre-amplifier	8447D	2944A10187	3/20/2015	1 year
HP/ Agilant	Pre Amplifier	8449B OPT HO2	3008A0113	3/11/2015	1year
EMCO	Antenna, Horn	3115	9511-4627	2015-01-15	1 year
A.R.A.	Antenna, Horn	DRG-118/A	1132	2015-09-21	2 years
Keysight Technologies	Vector Signal Generator	N5182B	MY51350070	2014-09-18	2 years
COM-POWER	Antenna, Dipole	AD-100	721033DB1, 2, 3, 4	2014-11-03	2 years
Agilent	Analyzer, Communications	E5515C	GB44051221	2015-09-10	1 year

Statement of Traceability: BACL Corp. *attests that all calibrations have been performed per the A2LA requirements, traceable to the NIST.*

7.4 Test Setup Block Diagram

Radiated Emissions Testing



7.5 Test Environmental Conditions

Temperature:	20-21°C
Relative Humidity:	47-49 %
ATM Pressure:	101.4-101.6 kPa

The testing was performed by Todd Moy on 2015- 10-23 in 5 Meter Chamber 3.

7.6 Test Results

Carrier Wave Signal

AWS Band

Downlink

Indicated		Azimuth (degree)	Test Antenna		Substituted					Limit (dBm)	Margin (dB)
Frequency (MHz)	S.A. Amp. (dBuV)		Height (cm)	Polarity (H/V)	Frequency (MHz)	Level (dBm)	Ant. Gain Correction (dB)	Cable Loss (dB)	Absolute Level (dBm)		
47.8	43.59	0	100	V	47.8	-41.97	0	0.05	-42.02	-13	-29.02
300	31.33	175	177	H	300	-70.69	0	0.07	-70.76	-13	-57.76
300	30.28	112	100	V	300	-71.74	0	0.07	-71.81	-13	-58.81
374.4	27.35	254	119	H	374.4	-71.58	0	0.08	-71.66	-13	-58.66
374.4	27.38	119	120	V	374.4	-71.55	0	0.08	-71.63	-13	-58.63
1039	52.73	0	100	H	1039	-57.38	6.122	0.49	-51.748	-13	-38.748
1039	48.9	0	100	V	1039	-62.82	6.279	0.49	-57.031	-13	-44.031
2253	47.97	0	100	H	2253	-59.56	9.205	0.69	-51.045	-13	-38.045
2253	52.88	0	100	V	2253	-55.09	9.506	0.69	-46.274	-13	-33.274

Uplink

Indicated		Azimuth (degree)	Test Antenna		Substituted					Limit (dBm)	Margin (dB)
Frequency (MHz)	S.A. Amp. (dBuV)		Height (cm)	Polarity (H/V)	Frequency (MHz)	Level (dBm)	Ant. Gain Correction (dB)	Cable Loss (dB)	Absolute Level (dBm)		
47.8	42.45	0	100	V	47.8	-43.11	0	0.05	-43.16	-13	-30.16
300	28.36	87	100	H	300	-73.66	0	0.07	-73.73	-13	-60.73
300	29.62	267	100	V	300	-72.4	0	0.07	-72.47	-13	-59.47
374.4	28.26	115	100	H	374.4	-70.67	0	0.08	-70.75	-13	-57.75
374.4	29.76	323	100	V	374.4	-69.17	0	0.08	-69.25	-13	-56.25
1039	48.55	0	100	H	1039	-61.56	6.122	0.49	-55.928	-13	-42.928
1039	47.37	0	100	V	1039	-64.35	6.279	0.49	-58.561	-13	-45.561
2253	47.7	0	100	H	2253	-59.83	9.205	0.69	-51.315	-13	-38.315
2253	50.52	0	100	V	2253	-57.45	9.506	0.69	-48.634	-13	-35.634

LTE Band 13

Downlink

Indicated		Azimuth (degree)	Test Antenna		Substituted					Limit (dBm)	Margin (dB)
Frequency (MHz)	S.A. Amp. (dBuV)		Height (cm)	Polarity (H/V)	Frequency (MHz)	Level (dBm)	Ant. Gain Correction (dB)	Cable Loss (dB)	Absolute Level (dBm)		
47.8	43.51	0	100	V	47.8	-42.05	0	0.05	-42.1	-13	-29.1
300	30.94	178	195	H	300	-71.08	0	0.07	-71.15	-13	-58.15
300	31.24	127	100	V	300	-70.78	0	0.07	-70.85	-13	-57.85
374.4	26.84	273	152	H	374.4	-72.09	0	0.08	-72.17	-13	-59.17
374.4	27.67	102	100	V	374.4	-71.26	0	0.08	-71.34	-13	-58.34
1039	49.42	0	100	H	1039	-60.69	6.122	0.49	-55.058	-13	-42.058
1039	48.57	0	100	V	1039	-63.15	6.279	0.49	-57.361	-13	-44.361
2253	47.12	0	100	H	2253	-60.41	9.205	0.69	-51.895	-13	-38.895
2253	49.36	0	100	V	2253	-58.61	9.506	0.69	-49.794	-13	-36.794

Uplink

Indicated		Azimuth (degree)	Test Antenna		Substituted					Limit (dBm)	Margin (dB)
Frequency (MHz)	S.A. Amp. (dBuV)		Height (cm)	Polarity (H/V)	Frequency (MHz)	Level (dBm)	Ant. Gain Correction (dB)	Cable Loss (dB)	Absolute Level (dBm)		
47.8	42.78	0	100	V	47.8	-42.78	0	0.05	-42.83	-13	-29.83
300	28.92	82	100	H	300	-73.1	0	0.07	-73.17	-13	-60.17
300	28.82	246	100	V	300	-73.2	0	0.07	-73.27	-13	-60.27
374.4	27.73	105	100	H	374.4	-71.2	0	0.08	-71.28	-13	-58.28
374.4	29.53	333	100	V	374.4	-69.4	0	0.08	-69.48	-13	-56.48
1039	46.96	0	100	H	1039	-63.15	6.122	0.49	-57.518	-13	-44.518
1039	48.29	0	100	V	1039	-63.43	6.279	0.49	-57.641	-13	-44.641
2253	45.56	0	100	H	2253	-61.97	9.205	0.69	-53.455	-13	-40.455
2253	46.59	0	100	V	2253	-61.38	9.506	0.69	-52.564	-13	-39.564

LTE Band 17

Downlink

Indicated		Azimuth (degree)	Test Antenna		Substituted					Limit (dBm)	Margin (dB)
Frequency (MHz)	S.A. Amp. (dBuV)		Height (cm)	Polarity (H/V)	Frequency (MHz)	Level (dBm)	Ant. Gain Correction (dB)	Cable Loss (dB)	Absolute Level (dBm)		
47.8	43.72	0	100	V	47.8	-41.84	0	0.05	-41.89	-13	-28.89
300	30.88	178	191	H	300	-71.14	0	0.07	-71.21	-13	-58.21
300	31.39	121	100	V	300	-70.63	0	0.07	-70.7	-13	-57.7
374.4	26.87	290	184	H	374.4	-72.06	0	0.08	-72.14	-13	-59.14
374.4	26.6	108	100	V	374.4	-72.33	0	0.08	-72.41	-13	-59.41
1039	49.63	0	100	H	1039	-60.48	6.122	0.49	-54.848	-13	-41.848
1039	51.87	0	100	V	1039	-59.85	6.279	0.49	-54.061	-13	-41.061
2253	47.57	0	100	H	2253	-59.96	9.205	0.69	-51.445	-13	-38.445
2253	46.87	0	100	V	2253	-61.1	9.506	0.69	-52.284	-13	-39.284

Uplink

Indicated		Azimuth (degree)	Test Antenna		Substituted					Limit (dBm)	Margin (dB)
Frequency (MHz)	S.A. Amp. (dBuV)		Height (cm)	Polarity (H/V)	Frequency (MHz)	Level (dBm)	Ant. Gain Correction (dB)	Cable Loss (dB)	Absolute Level (dBm)		
47.8	42.75	0	100	V	47.8	-42.81	0	0.05	-42.86	-13	-29.86
300	28.64	85	102	H	300	-73.38	0	0.07	-73.45	-13	-60.45
300	29.39	274	100	V	300	-72.63	0	0.07	-72.7	-13	-59.7
374.4	28.99	112	100	H	374.4	-69.94	0	0.08	-70.02	-13	-57.02
374.4	29.42	326	100	V	374.4	-69.51	0	0.08	-69.59	-13	-56.59
1039	47.42	0	100	H	1039	-62.69	6.122	0.49	-57.058	-13	-44.058
1039	47.35	0	100	V	1039	-64.37	6.279	0.49	-58.581	-13	-45.581
2253	46.18	0	100	H	2253	-61.35	9.205	0.69	-52.835	-13	-39.835
2253	47.54	0	100	V	2253	-60.43	9.506	0.69	-51.614	-13	-38.614

8 FCC §2.1051 & §27.53 (c)(g)(h) - Spurious Emissions at Antenna Terminals

8.1 Applicable Standards

According to FCC §27.53,

(c) For operations in the 746-758 MHz band and the 776-788 MHz band, the power of any emission outside the licensee's frequency band(s) of operation shall be attenuated below the transmitter power (P) within the licensed band(s) of operation, measured in watts, in accordance with the following:

(1) On any frequency outside the 746-758 MHz band, the power of any emission shall be attenuated outside the band below the transmitter power (P) by at least 43 + 10 log (P) dB;

(2) On any frequency outside the 776-788 MHz band, the power of any emission shall be attenuated outside the band below the transmitter power (P) by at least 43 + 10 log (P) dB;

(3) On all frequencies between 763-775 MHz and 793-805 MHz, by a factor not less than 76 + 10 log (P) dB in a 6.25 kHz band segment, for base and fixed stations;

(4) On all frequencies between 763-775 MHz and 793-805 MHz, by a factor not less than 65 + 10 log (P) dB in a 6.25 kHz band segment, for mobile and portable stations;

(5) Compliance with the provisions of paragraphs (c)(1) and (c)(2) of this section is based on the use of measurement instrumentation employing a resolution bandwidth of 100 kHz or greater. However, in the 100 kHz bands immediately outside and adjacent to the frequency block, a resolution bandwidth of at least 30 kHz may be employed;

(6) Compliance with the provisions of paragraphs (c)(3) and (c)(4) of this section is based on the use of measurement instrumentation such that the reading taken with any resolution bandwidth setting should be adjusted to indicate spectral energy in a 6.25 kHz segment.

(g) For operations in the 600 MHz band and the 698-746 MHz band, the power of any emission outside a licensee's frequency band(s) of operation shall be attenuated below the transmitter power (P) within the licensed band(s) of operation, measured in watts, by at least 43 + 10 log (P) dB. Compliance with this provision is based on the use of measurement instrumentation employing a resolution bandwidth of 100 kilohertz or greater. However, in the 100 kilohertz bands immediately outside and adjacent to a licensee's frequency block, a resolution bandwidth of at least 30 kHz may be employed.

(h) AWS emission limits—(1) General protection levels. Except as otherwise specified below, for operations in the 1695-1710 MHz, 1710-1755 MHz, 1755-1780 MHz, 1915-1920 MHz, 1995-2000 MHz, 2000-2020 MHz, 2110-2155 MHz, 2155-2180 MHz, and 2180-2200 bands, the power of any emission outside a licensee's frequency block shall be attenuated below the transmitter power (P) in watts by at least 43 + 10 log10 (P) dB.

8.2 Test Procedure

The EUT was connected to the spectrum analyzer and Signal Generator followed by 50Ω-75Ω matching pad

The resolution bandwidth of the spectrum analyzer was set 100 KHz or greater for frequency band 746MHz-788MHz and greater than 1MHz for 2100 and 1700 band. Sufficient scans were taken to show any out of band emissions up to 10th harmonic.

8.3 Test Equipment List and Details

Manufacturers	Descriptions	Models	Serial Numbers	Calibration Dates	Calibration Interval
Agilent	Analyzer, Spectrum	E4446A	US44300386	2014-10-24	1 year
Keysight Technologies	Vector Signal Generator	N5182B	MY51350070	2014-09-18	2 years
Rohde & Schwarz	Generator, Signal	SMIQ03	849192/0085	2014-07-15	2 years

Statement of Traceability: BACL Corp. *attests that all calibrations have been performed per the A2LA requirements, traceable to the NIST.*

8.4 Test Environmental Conditions

Temperature:	21-23° C
Relative Humidity:	42-48 %
ATM Pressure:	101.4-102 kPa

The testing was performed by Todd Moy 2015-10-10 in the RF Site.

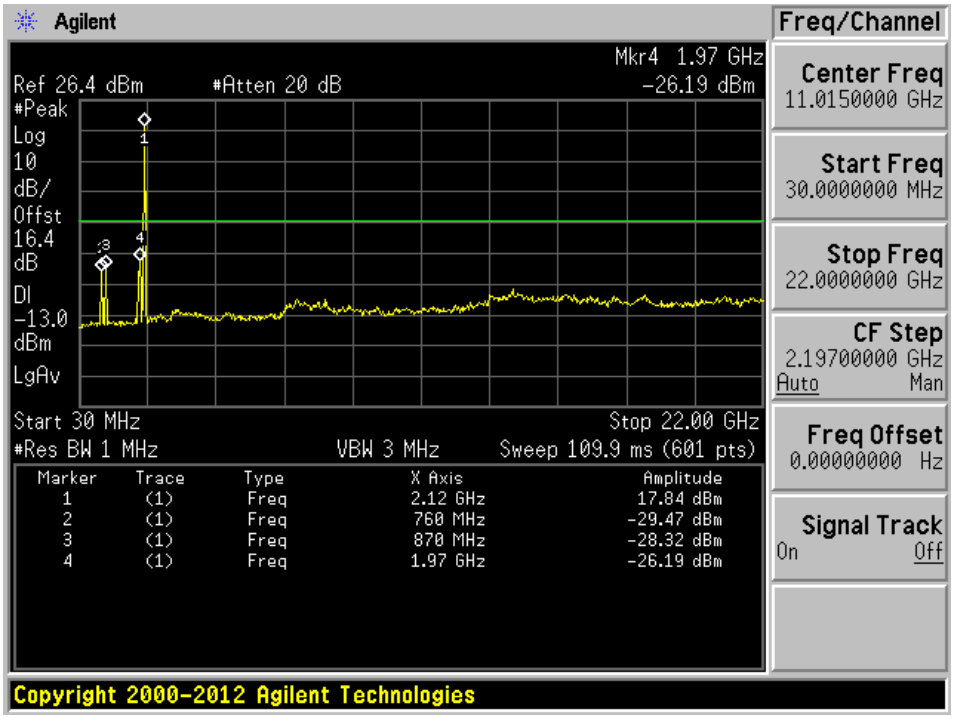
8.5 Test Results

Please refer to the following plots,

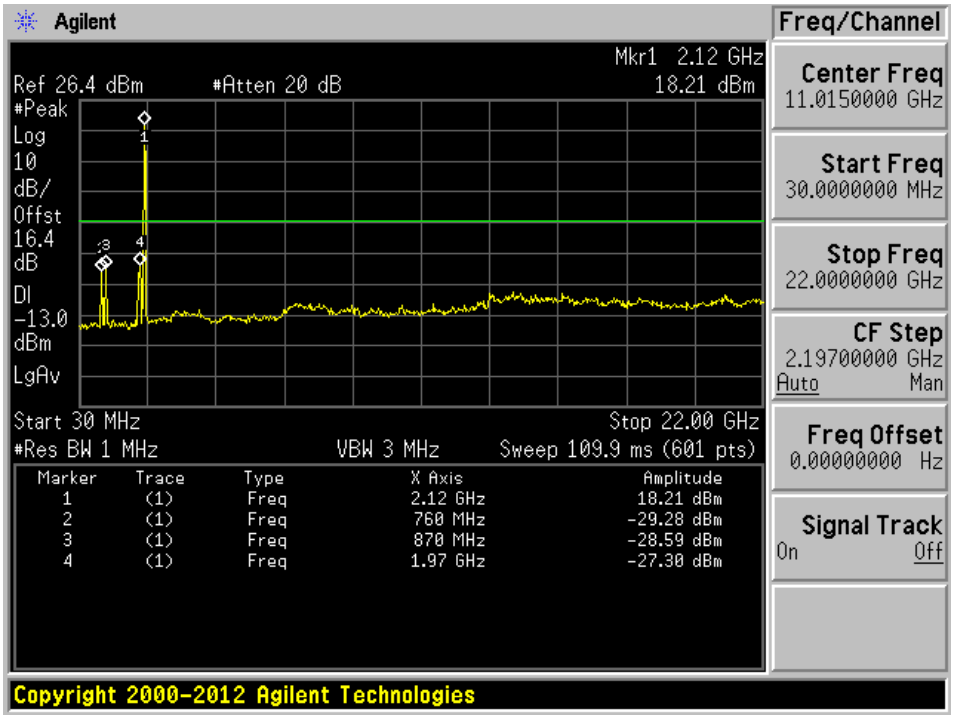
AWS Band, Downlink: Broadband Signal

AGC Off

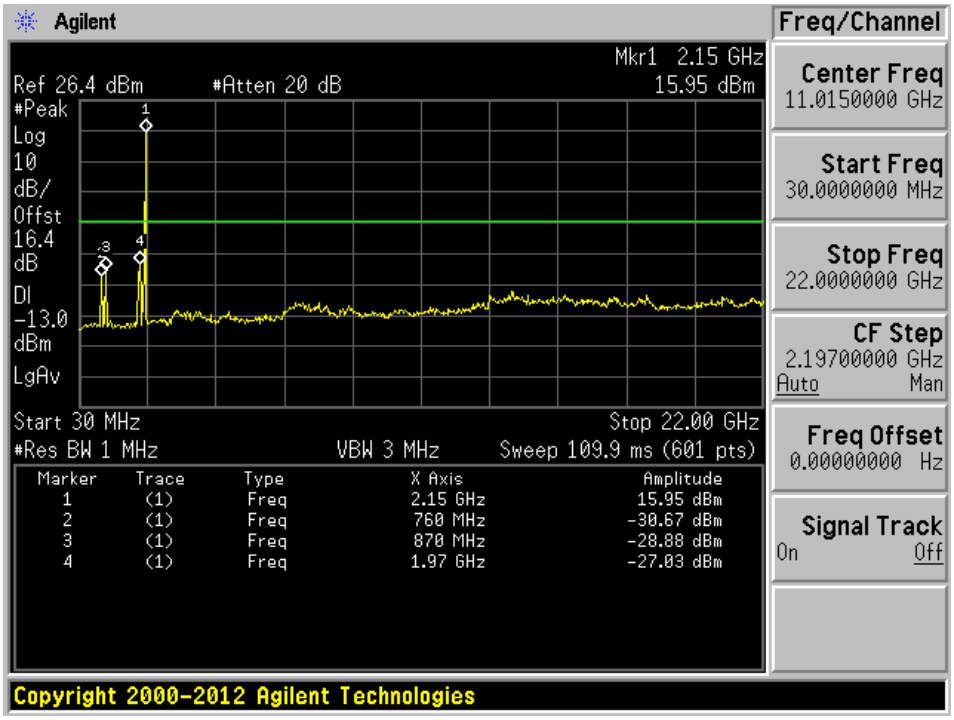
Low Channel: 2112.5 MHz



Middle Channel: 2132.5 MHz

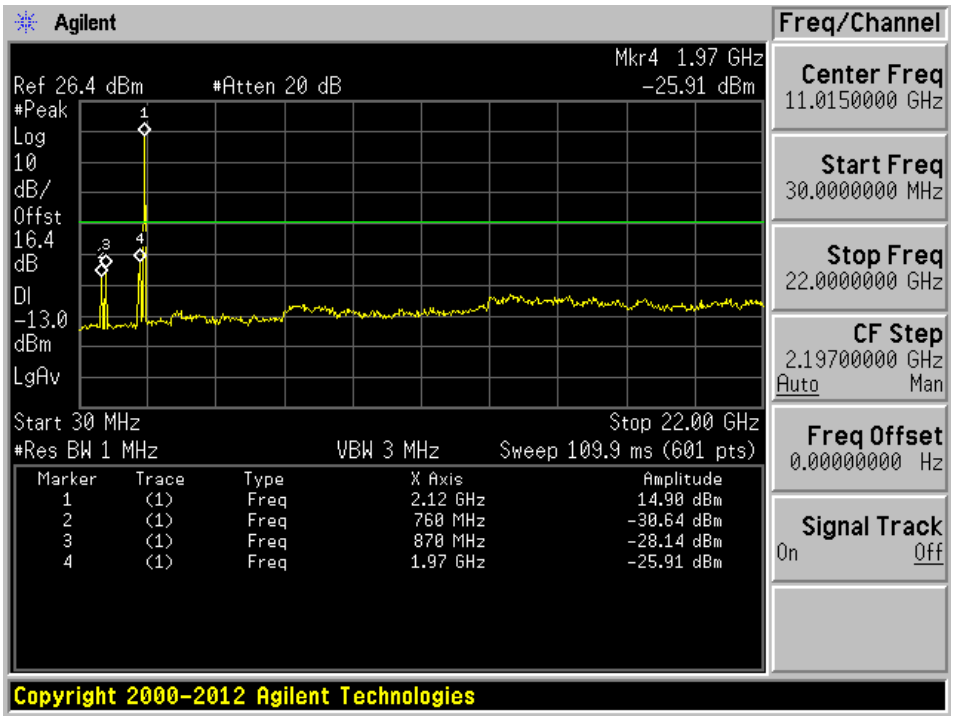


High Channel: 2152.5 MHz

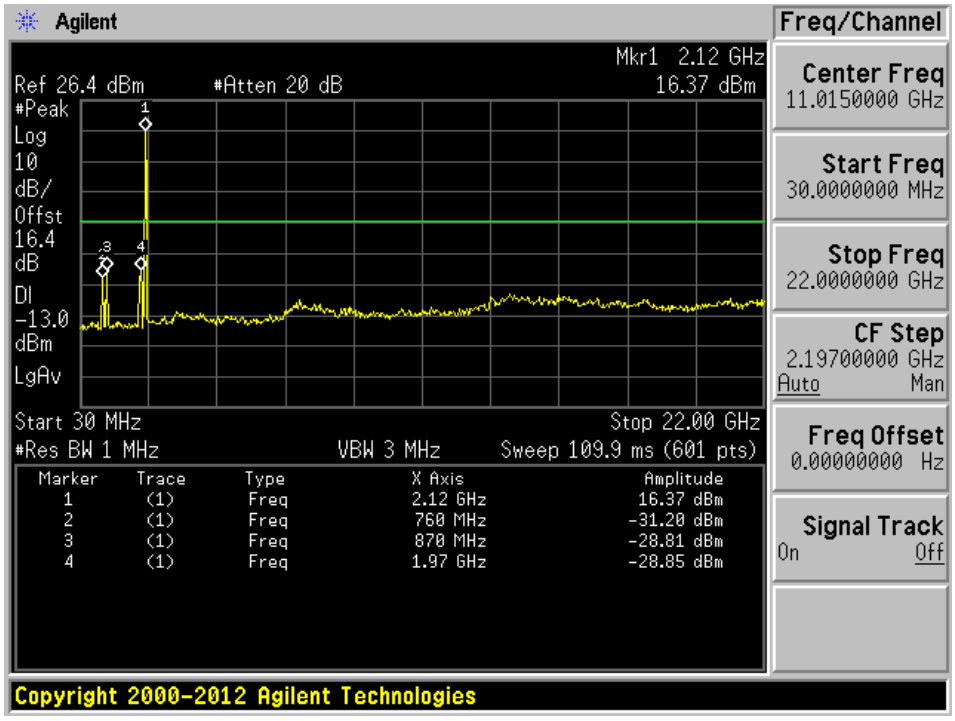


AGC On

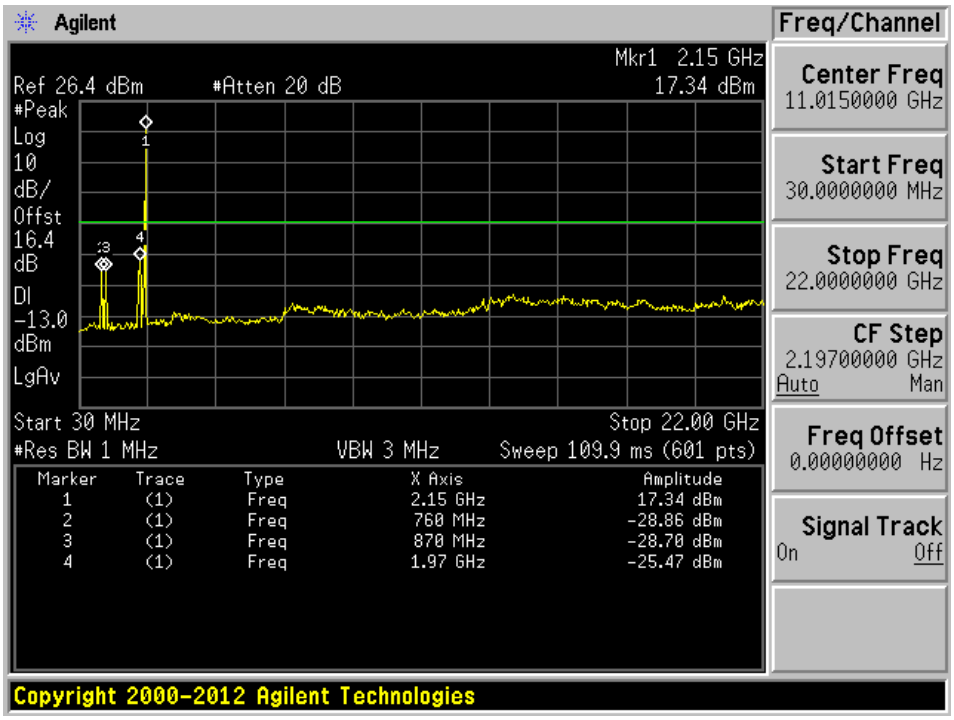
Low Channel: 2112.5 MHz



Middle Channel: 2132.5 MHz



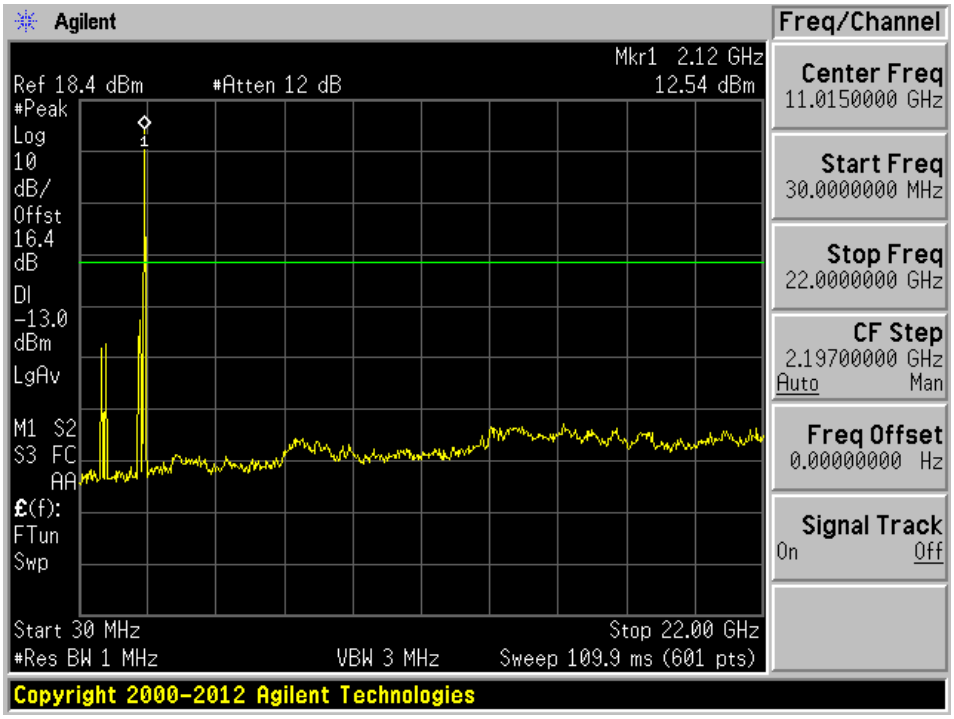
High Channel: 2152.5 MHz



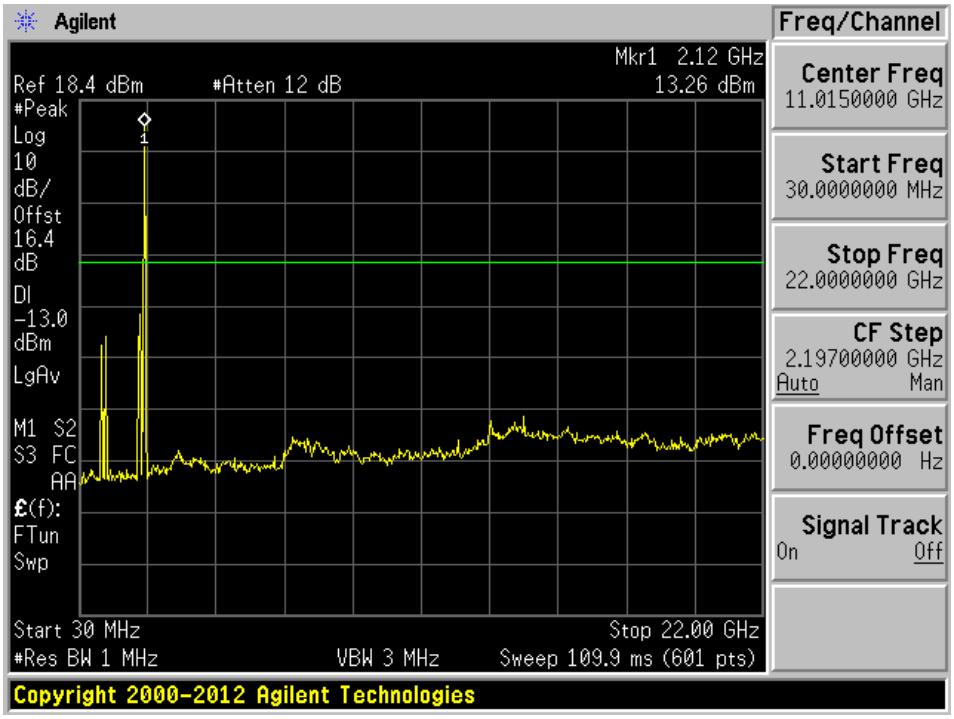
AWS Band, Downlink: Narrowband signal

AGC Off

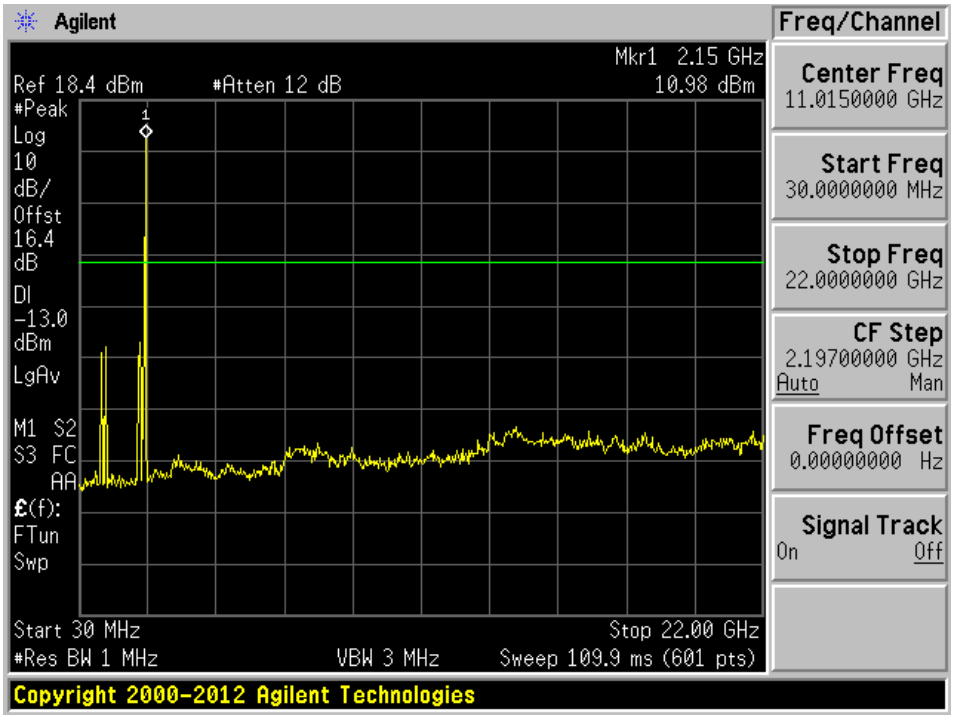
Low Channel: 2110.7 MHz



Middle Channel: 2132.5 MHz

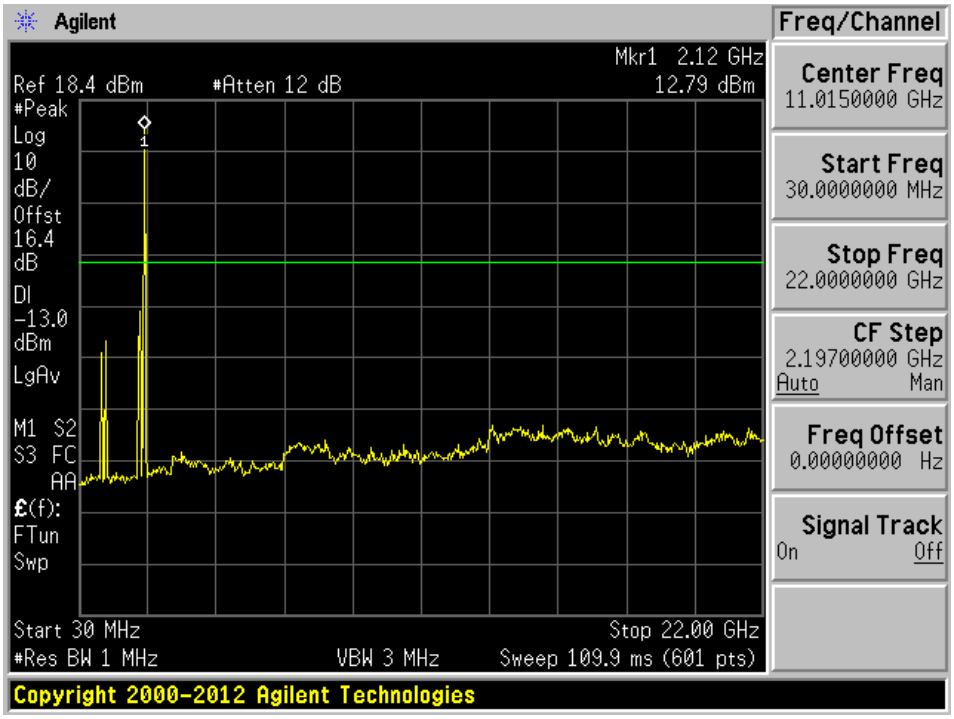


High Channel: 2154.3 MHz

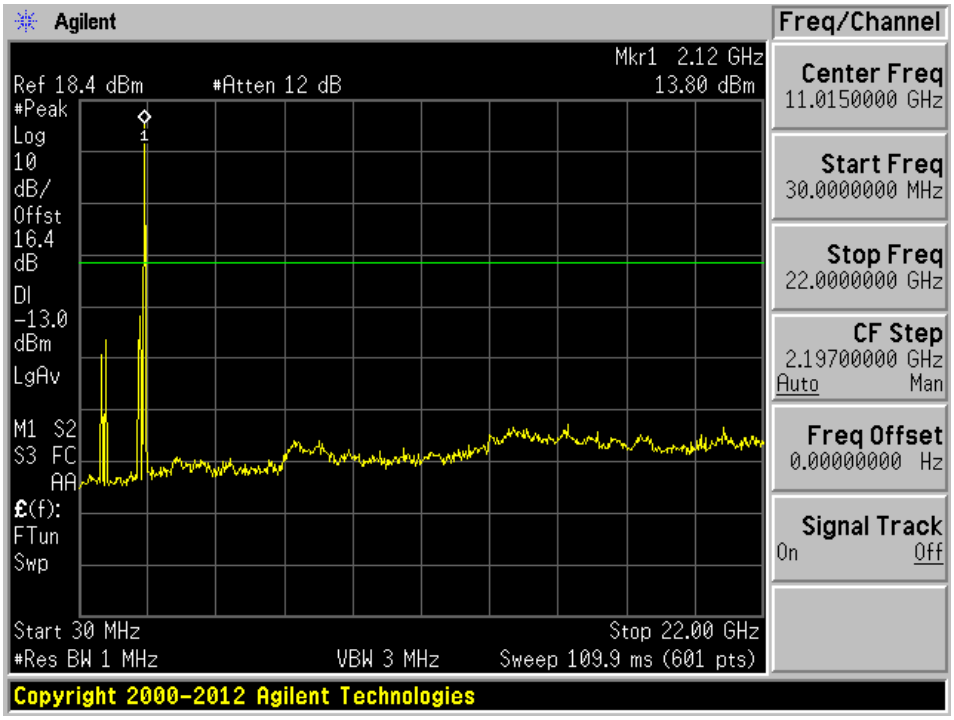


AGC On

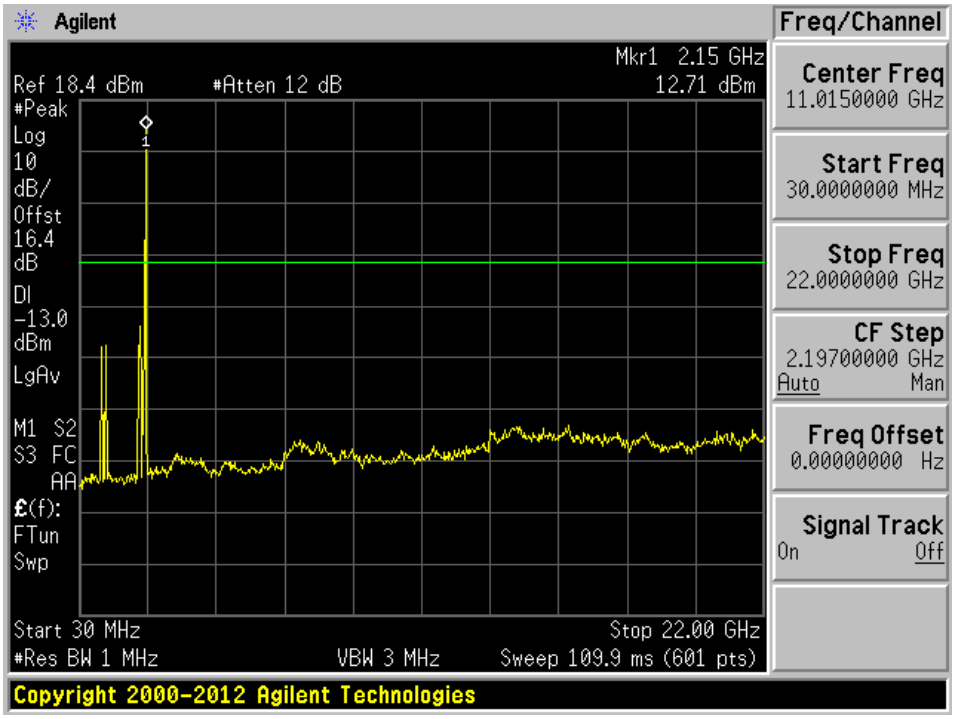
Low Channel: 2110.7 MHz



Middle Channel: 2132.5 MHz



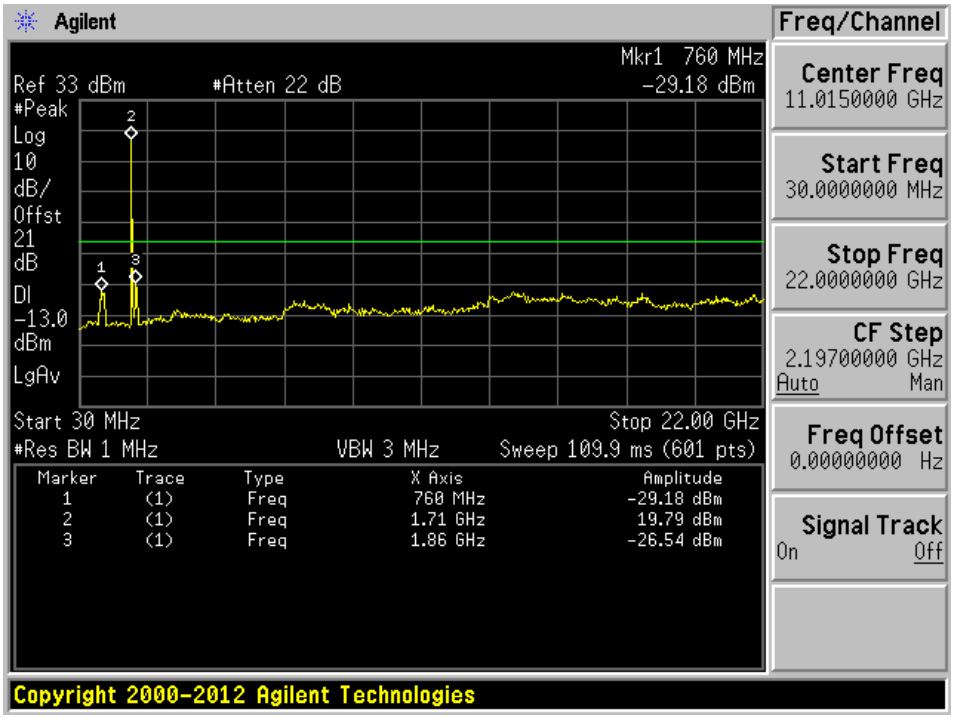
High Channel: 2154.3 MHz



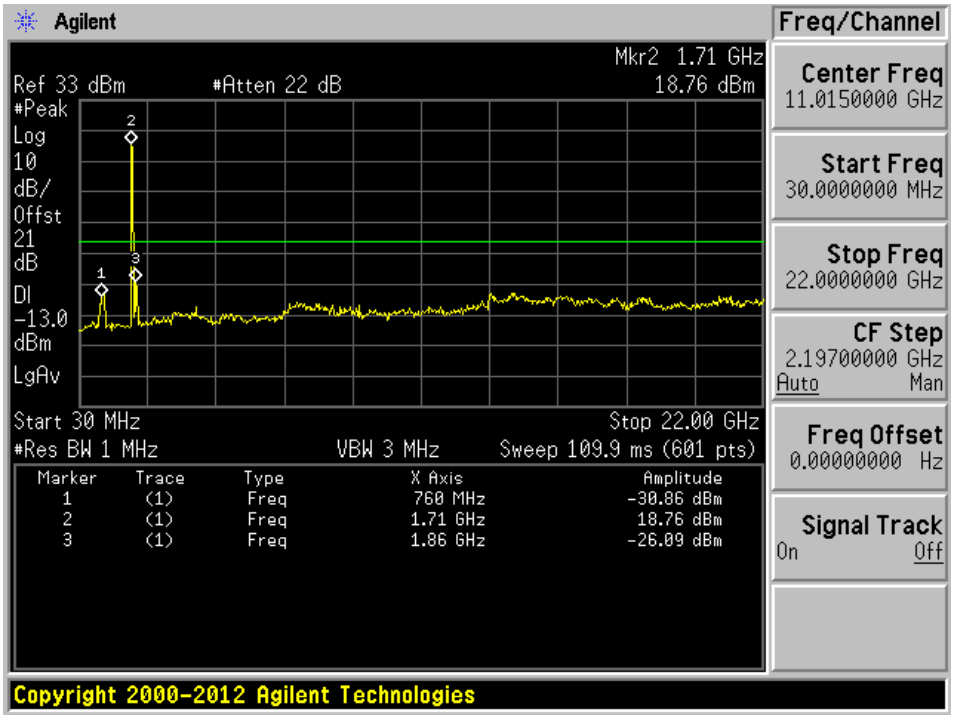
AWS Band, Uplink: Broadband Signal

AGC Off

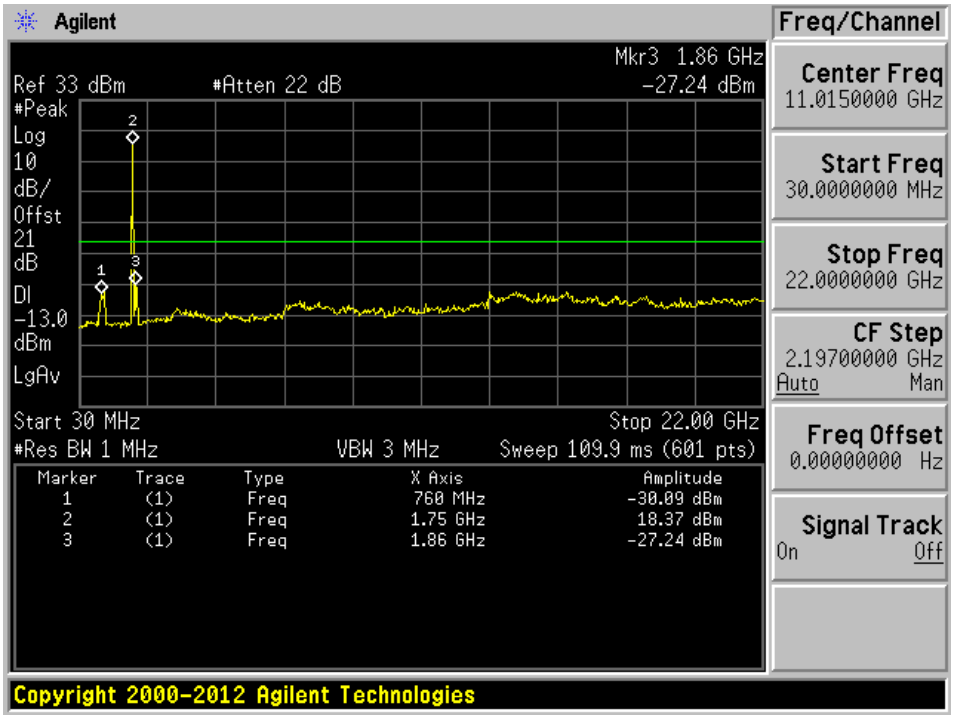
Low Channel: 1712.5 MHz



Middle Channel: 1732.5 MHz

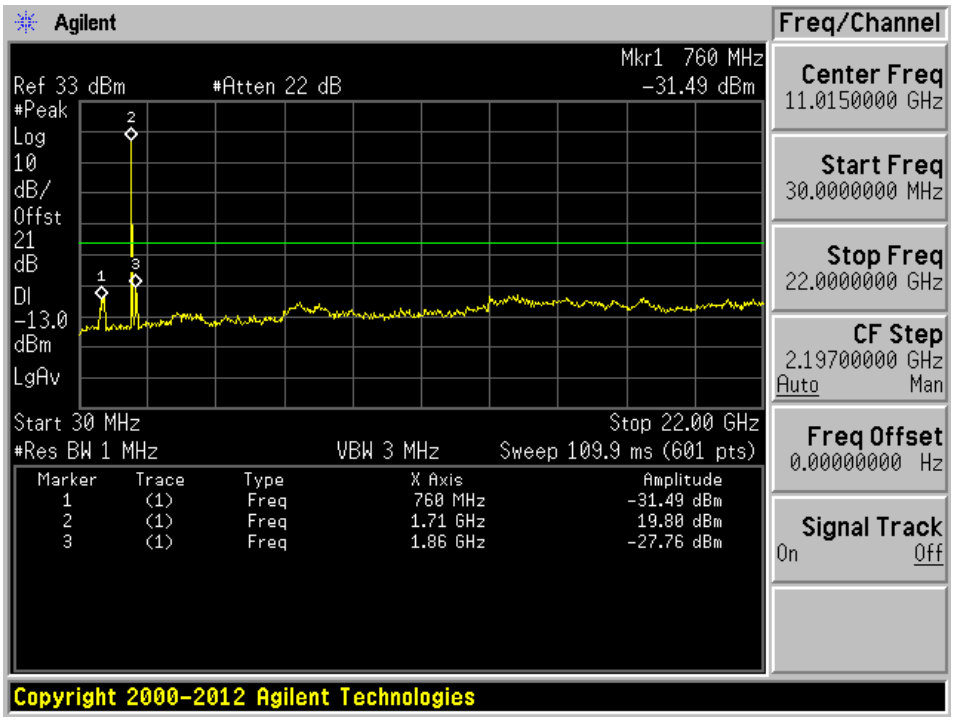


High Channel: 1752.5 MHz

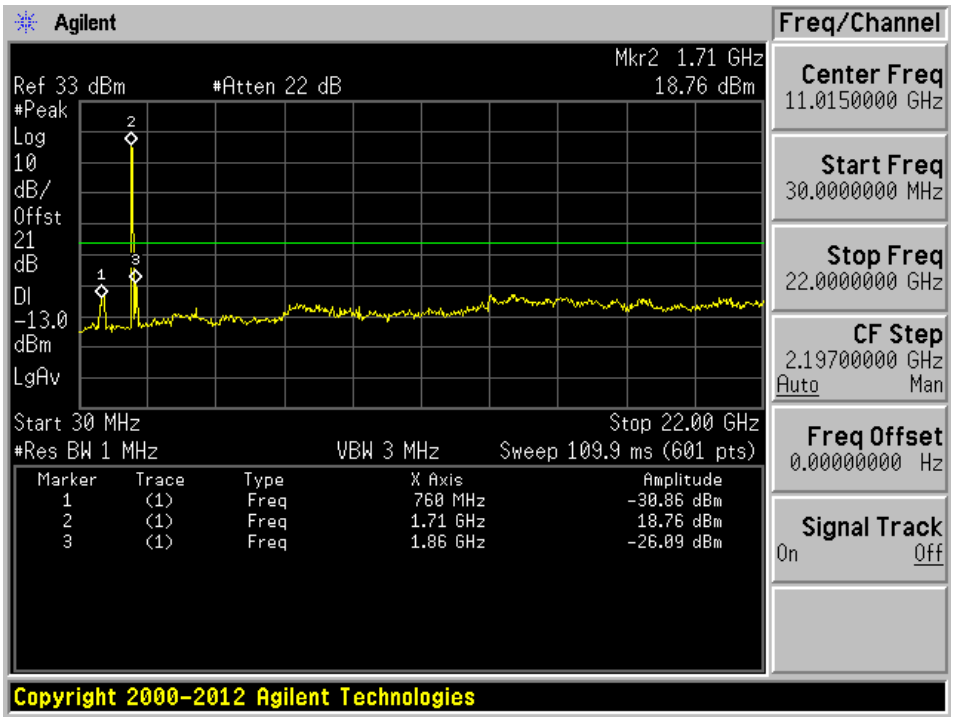


AGC On

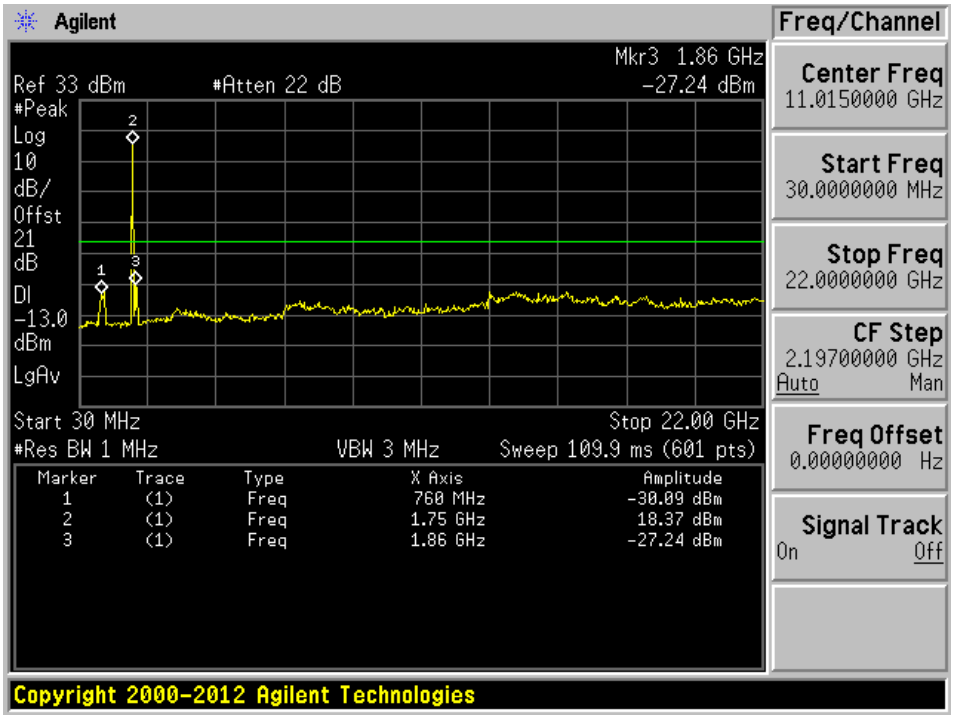
Low Channel: 1712.5 MHz



Middle Channel: 1732.5 MHz



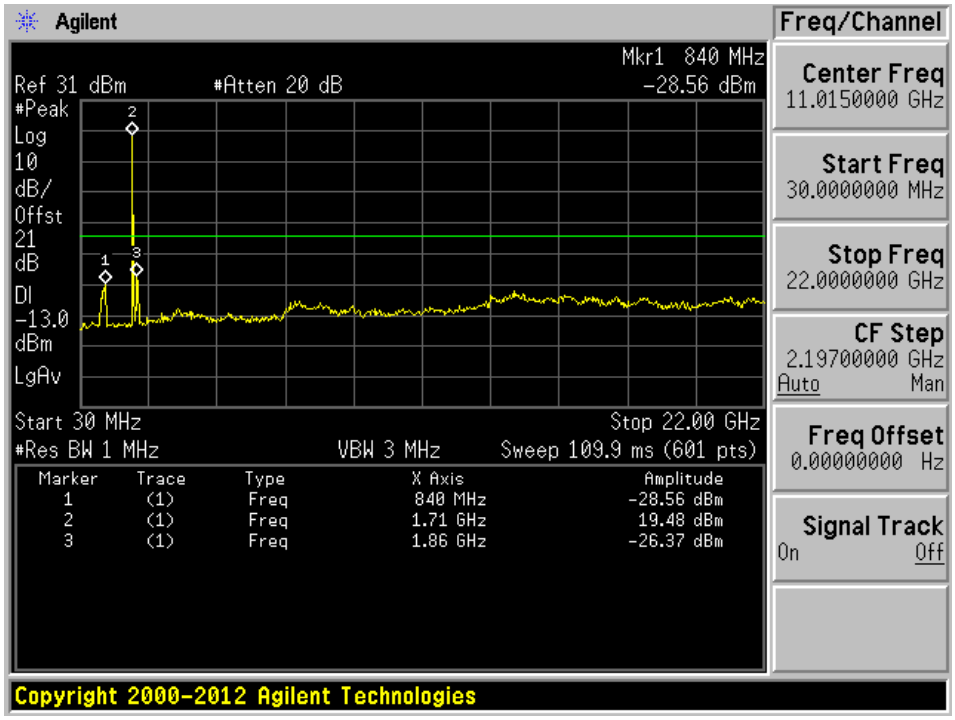
High Channel: 1752.5 MHz



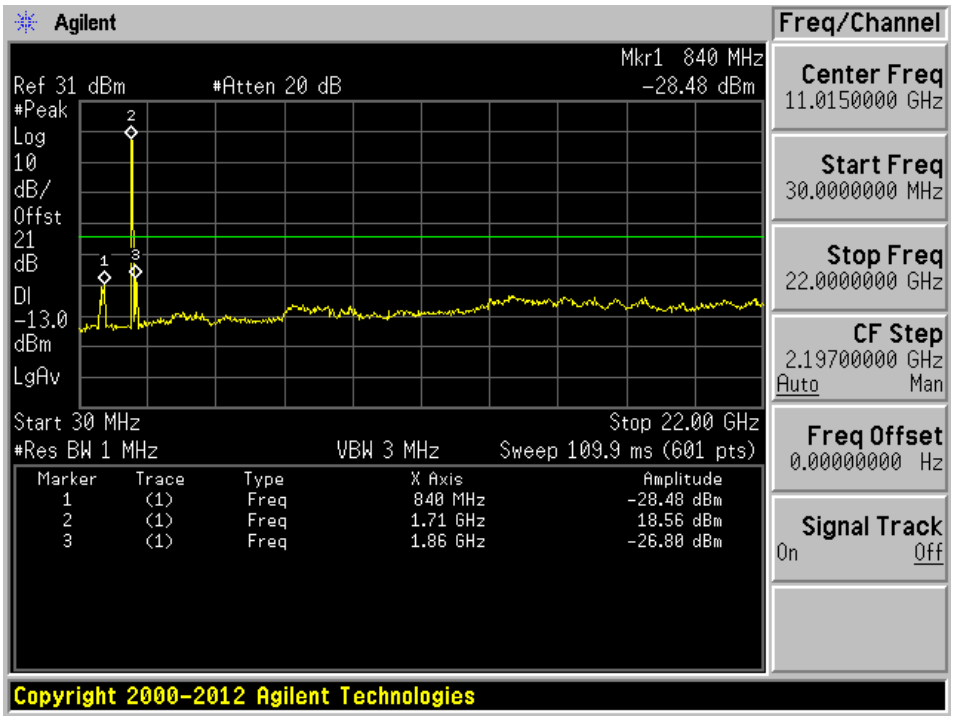
AWS Band, Uplink: Narrowband Signal

AGC Off

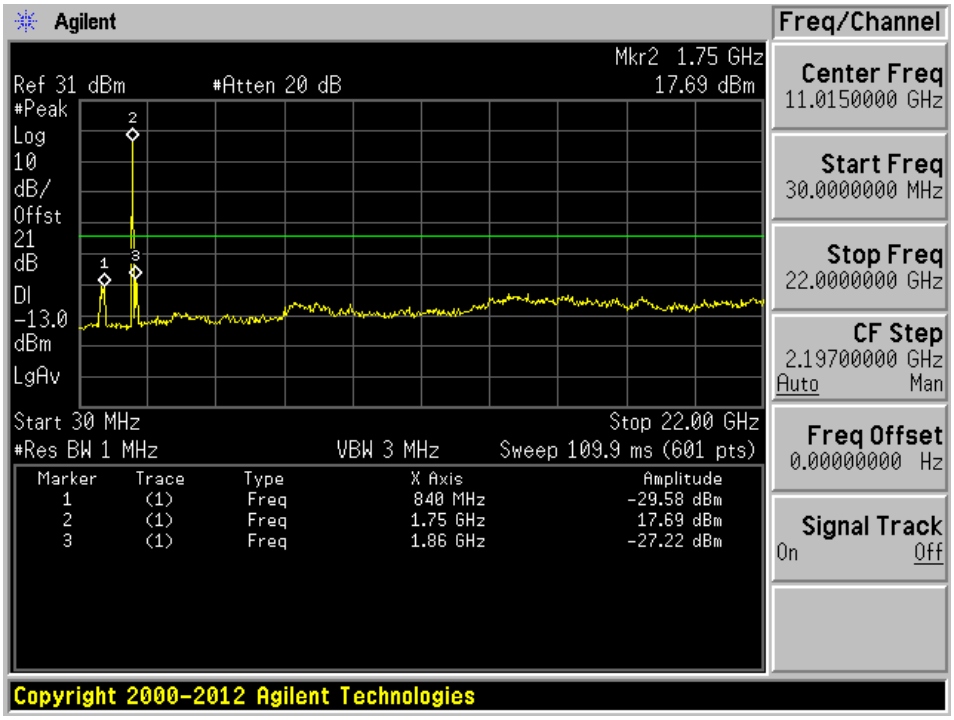
Low Channel: 1710.7 MHz



Middle Channel: 1732.5 MHz

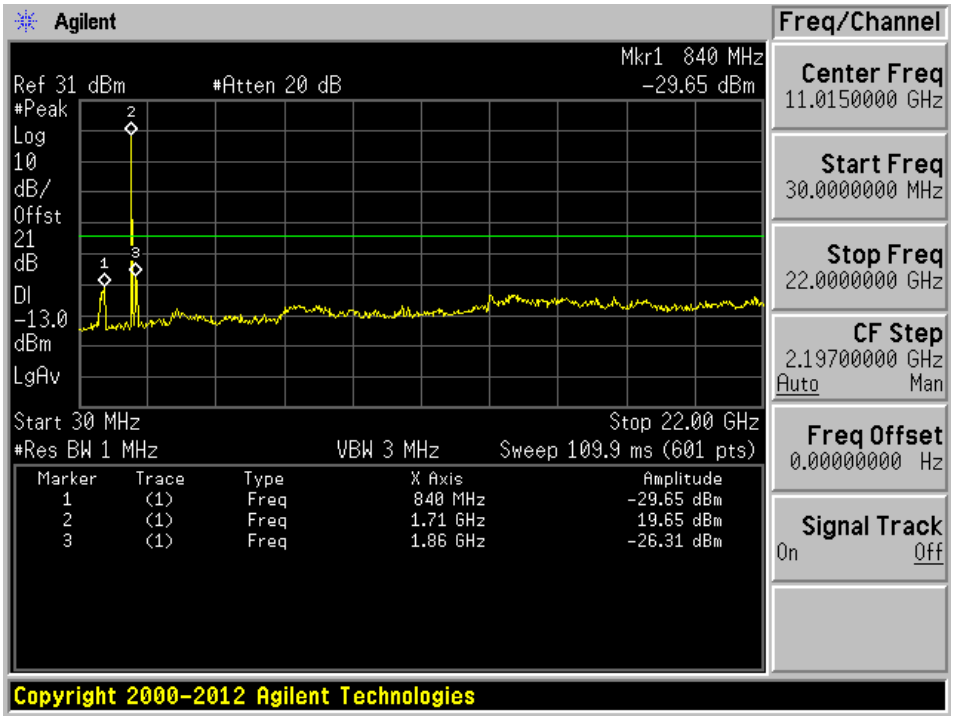


High Channel: 1754.3 MHz

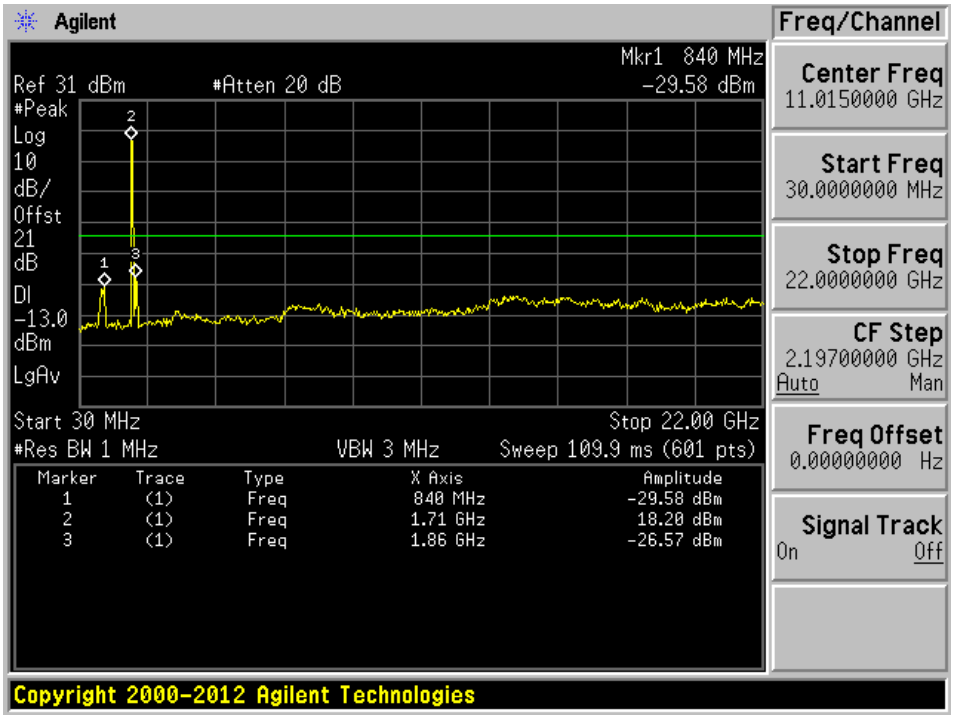


AGC On

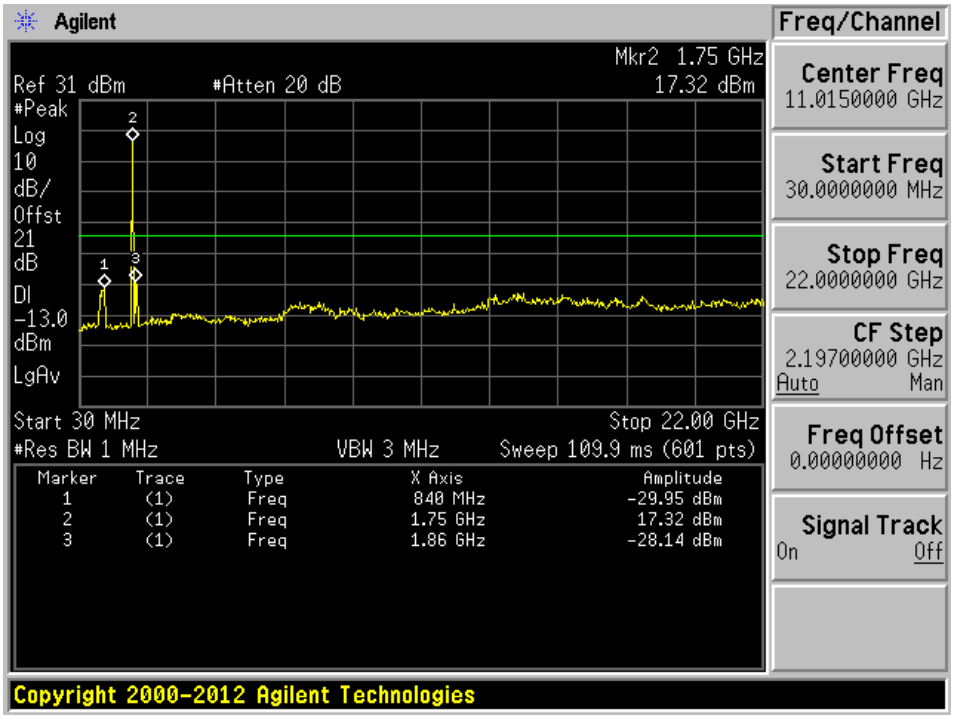
Low Channel: 1710.7 MHz



Middle Channel: 1732.5 MHz



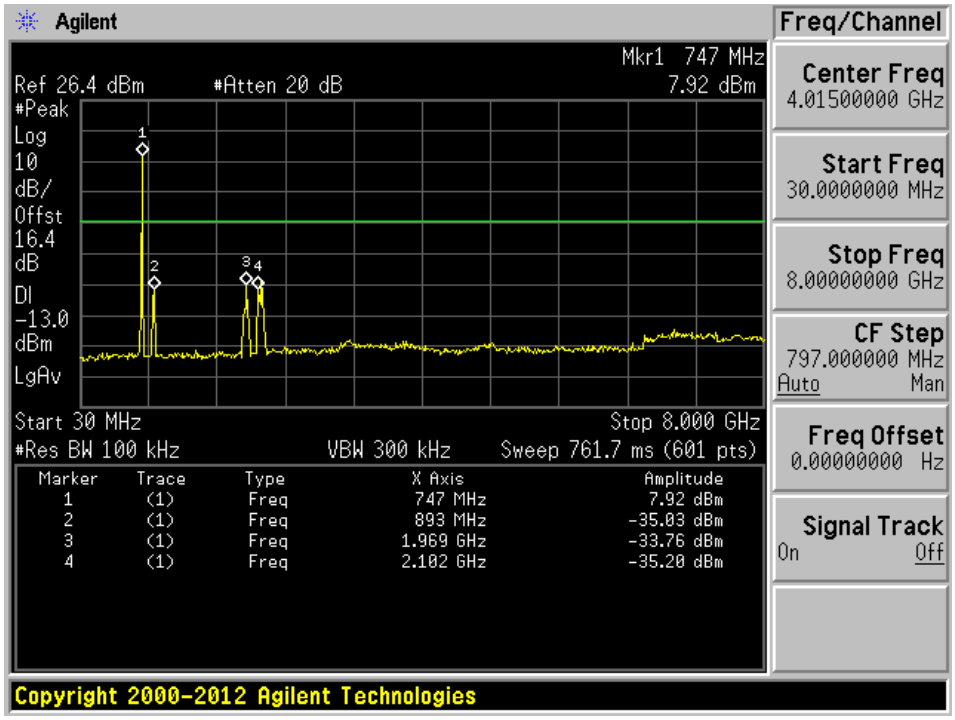
High Channel: 1754.3 MHz



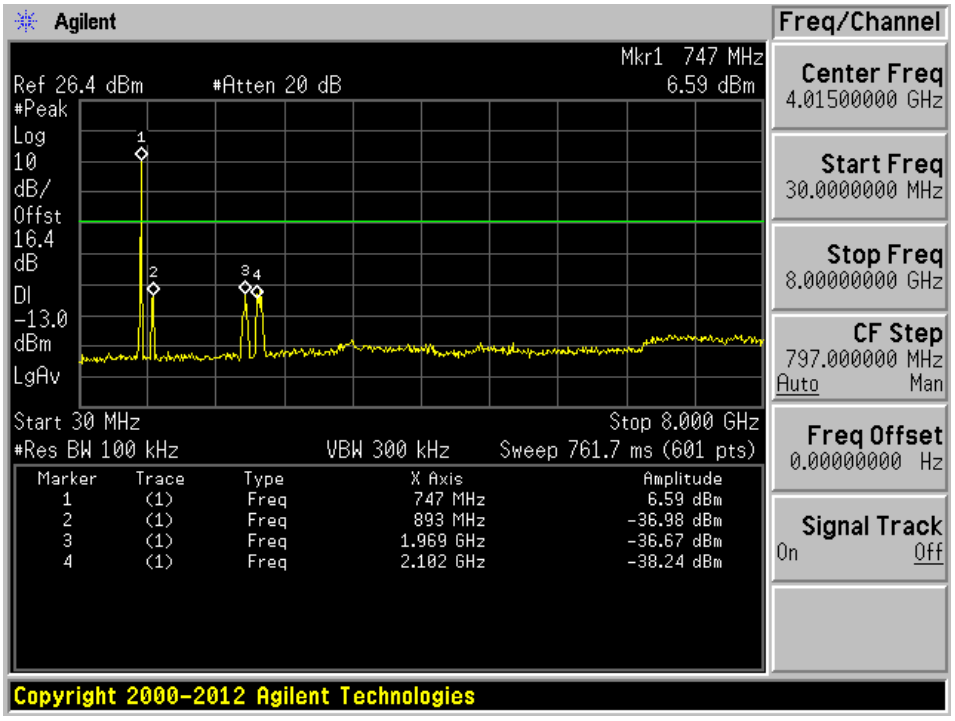
LTE Band 13, Downlink: Broadband signal

AGC Off

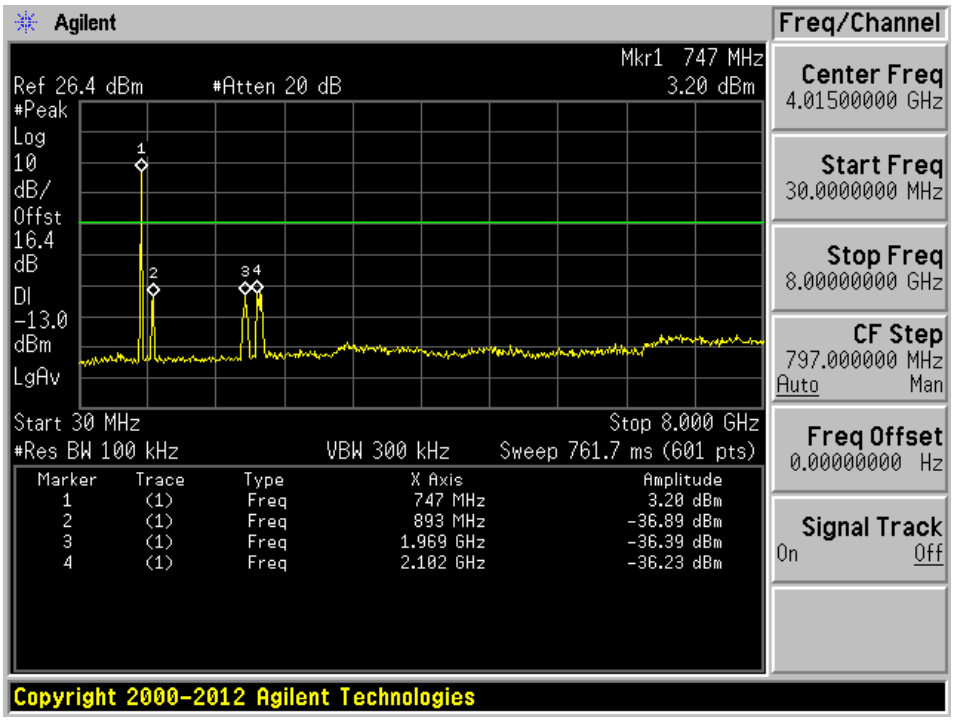
Low Channel: 748.5 MHz



Middle Channel: 751.5 MHz

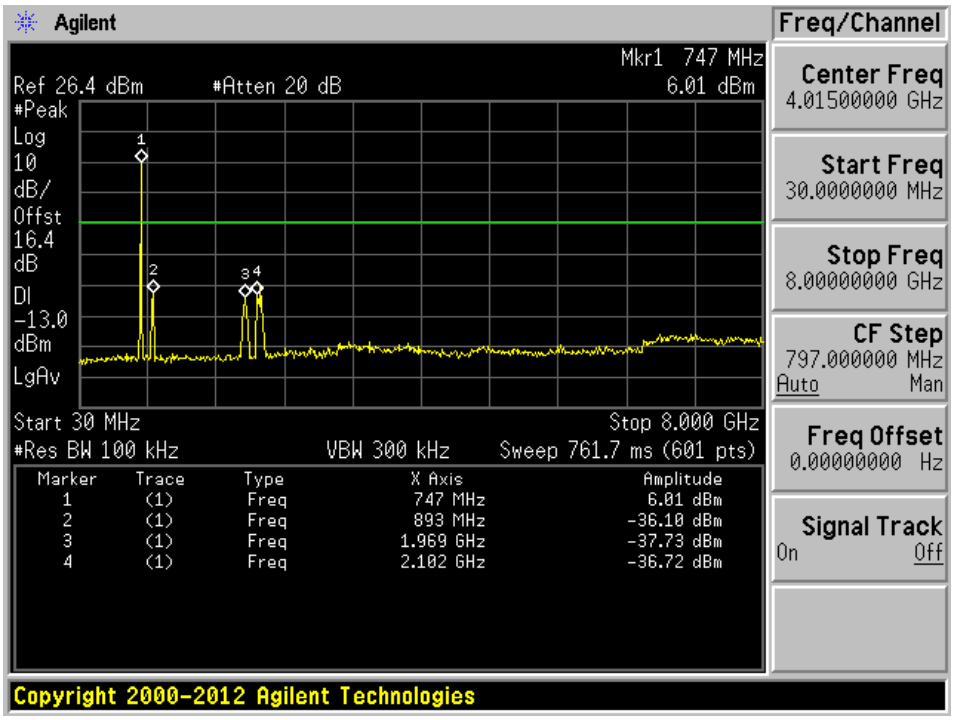


High Channel: 753.5 MHz

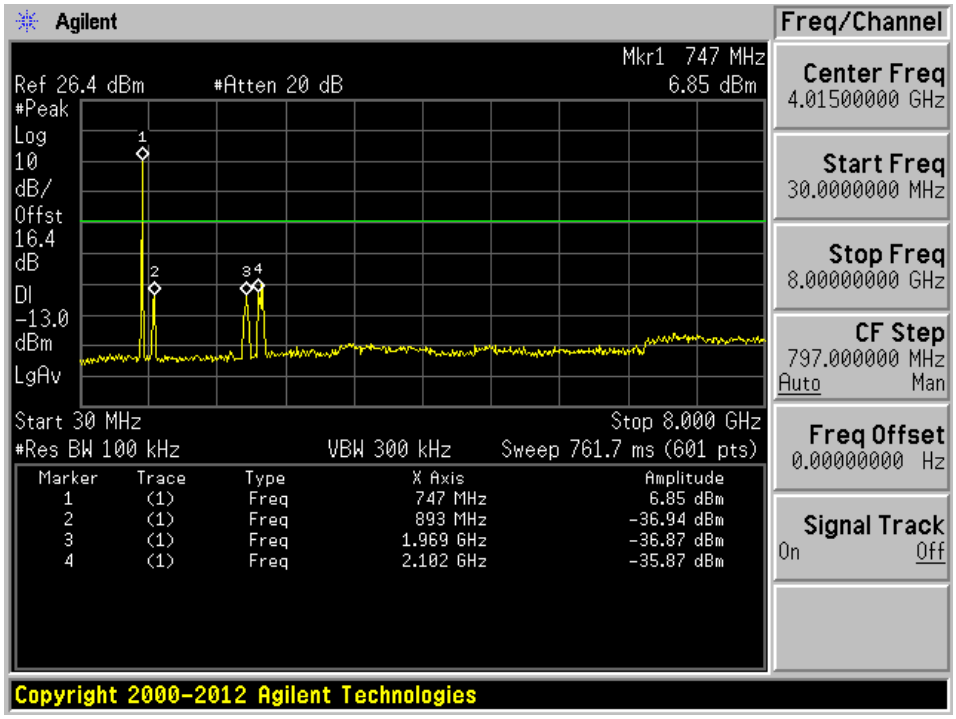


AGC On

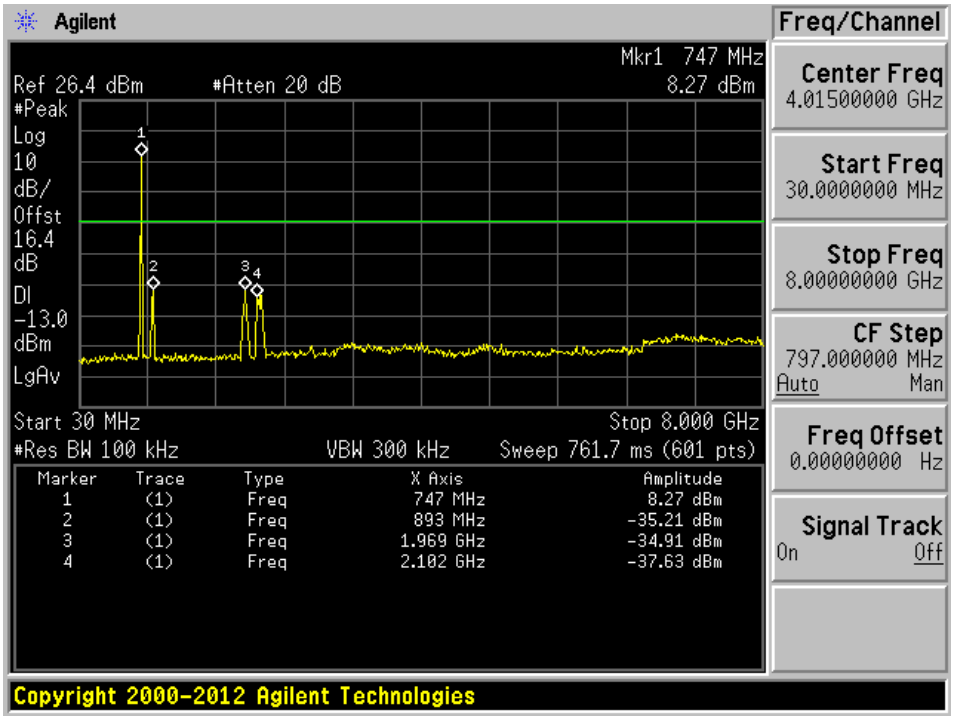
Low Channel: 748.5 MHz



Middle Channel: 751.5 MHz



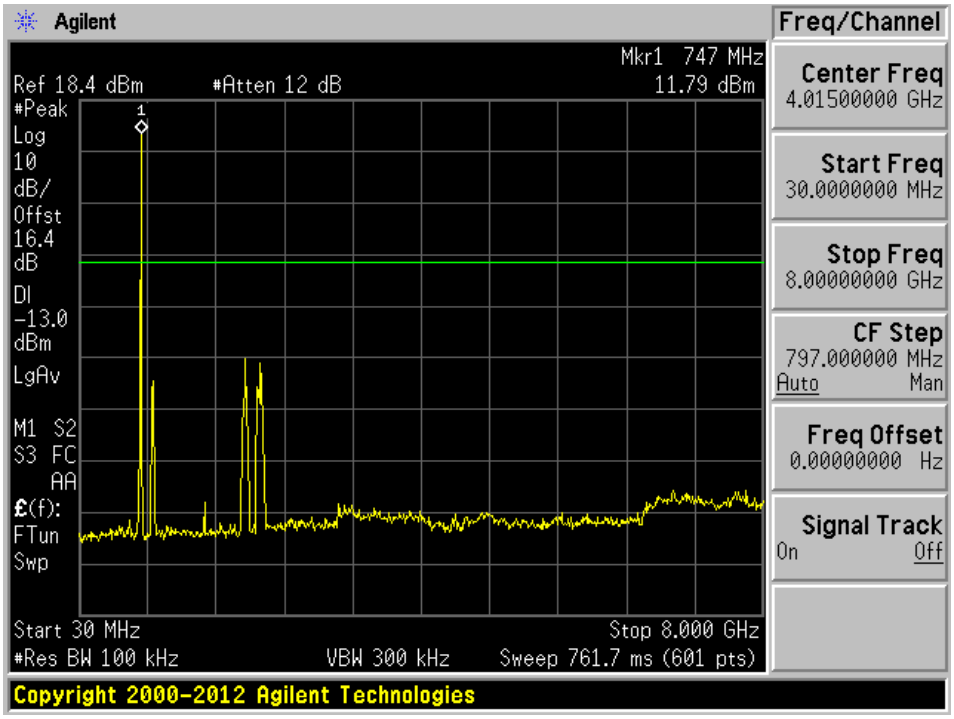
High Channel: 753.5.MHz



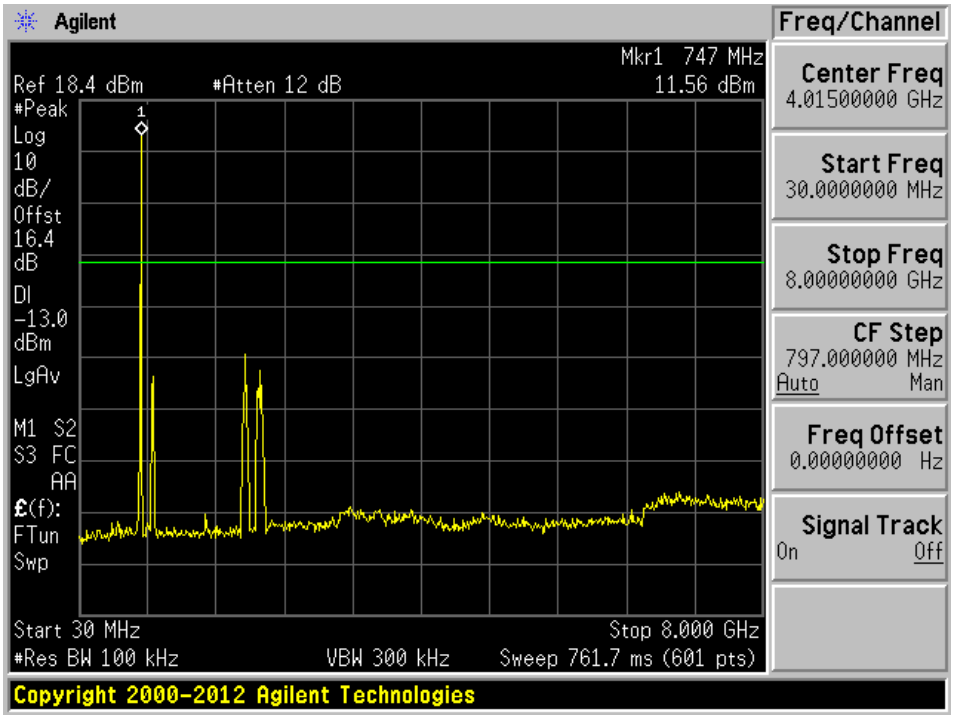
LTE Band 13, Downlink: Narrowband Signal

AGC Off

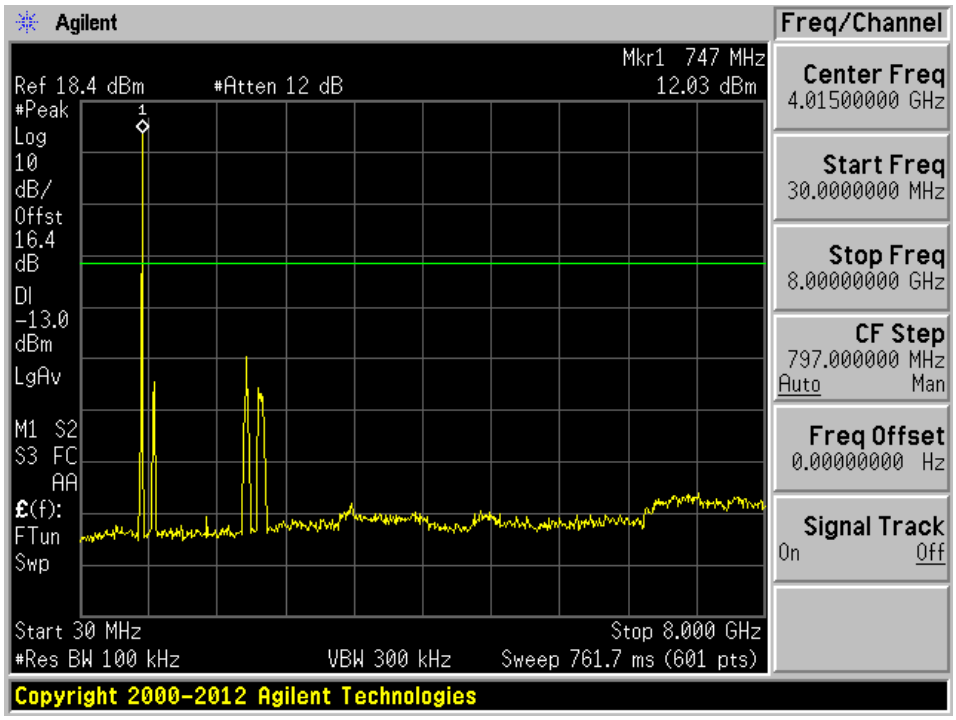
Low Channel: 748.5 MHz



Middle Channel: 751.5 MHz

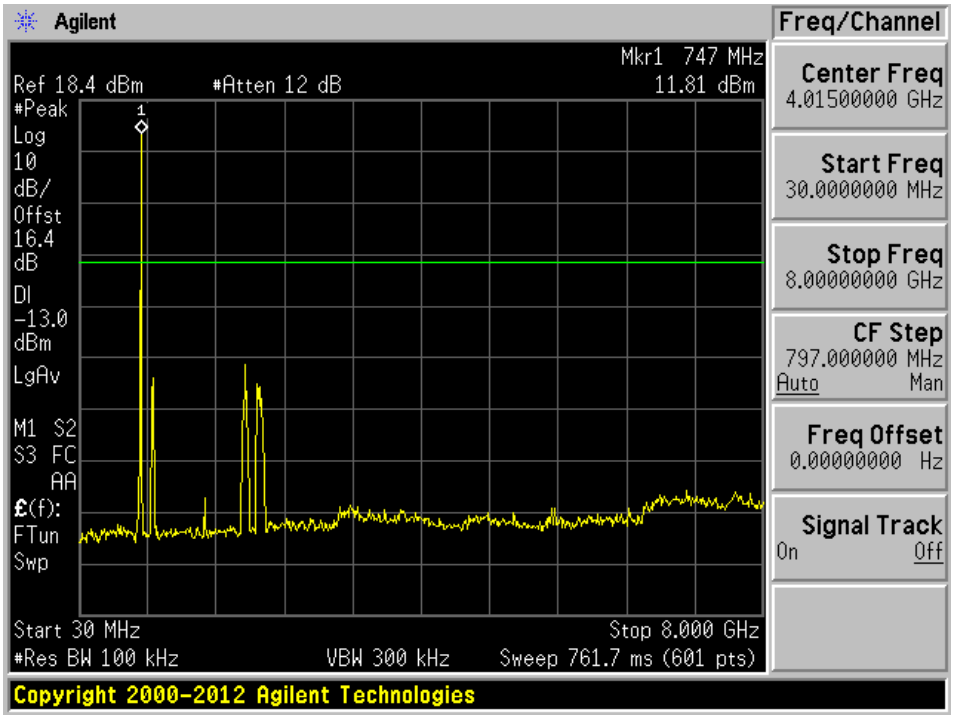


High Channel: 753.5 MHz

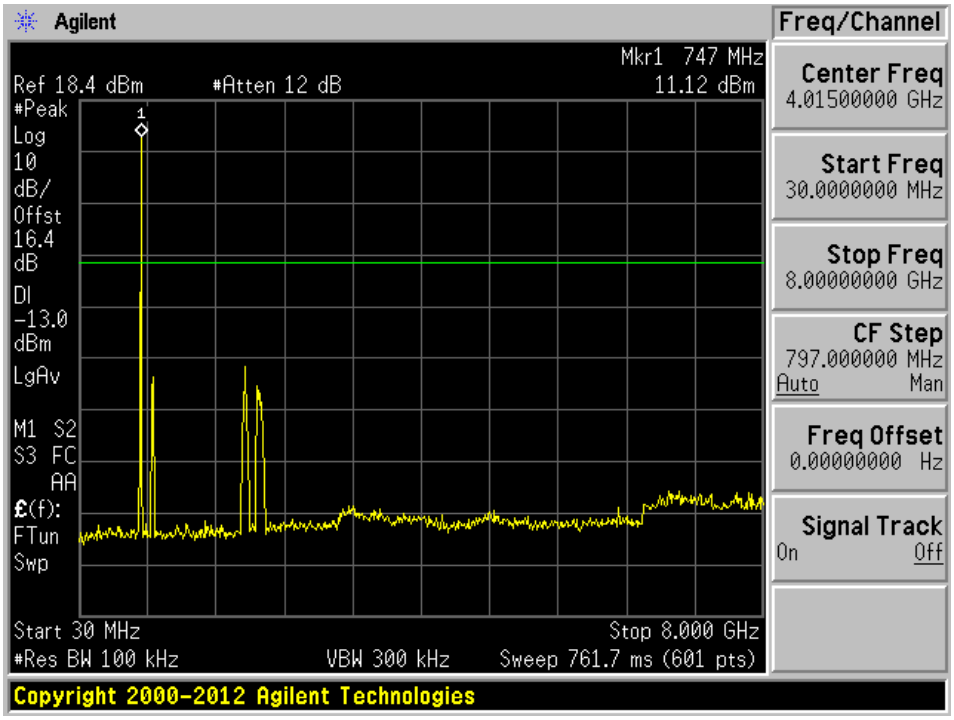


AGC On

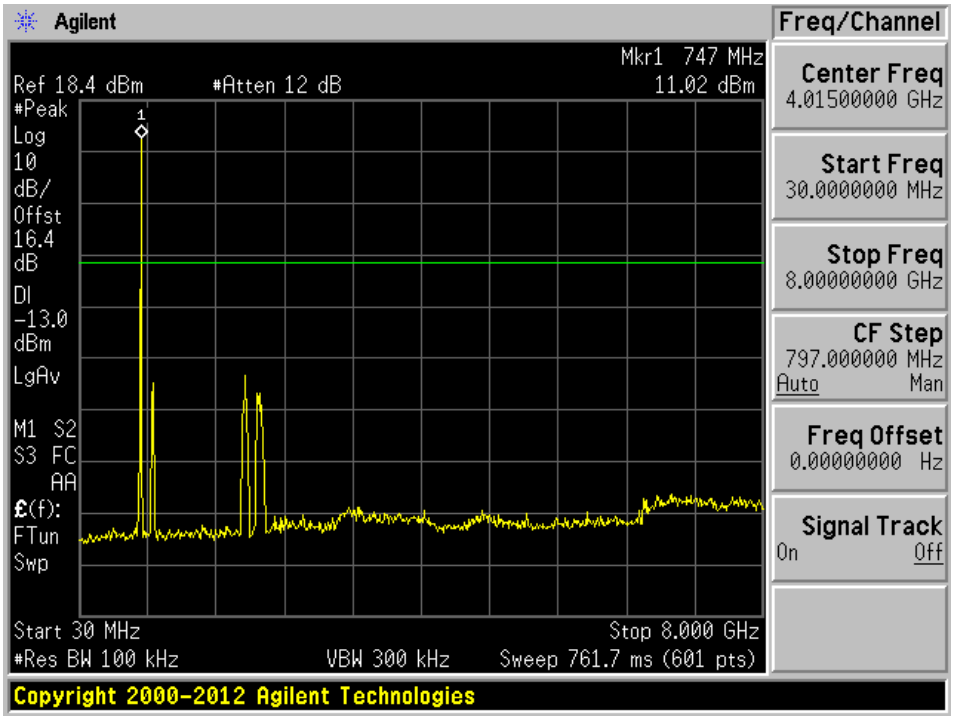
Low Channel: 748.5 MHz



Middle Channel: 751.5 MHz



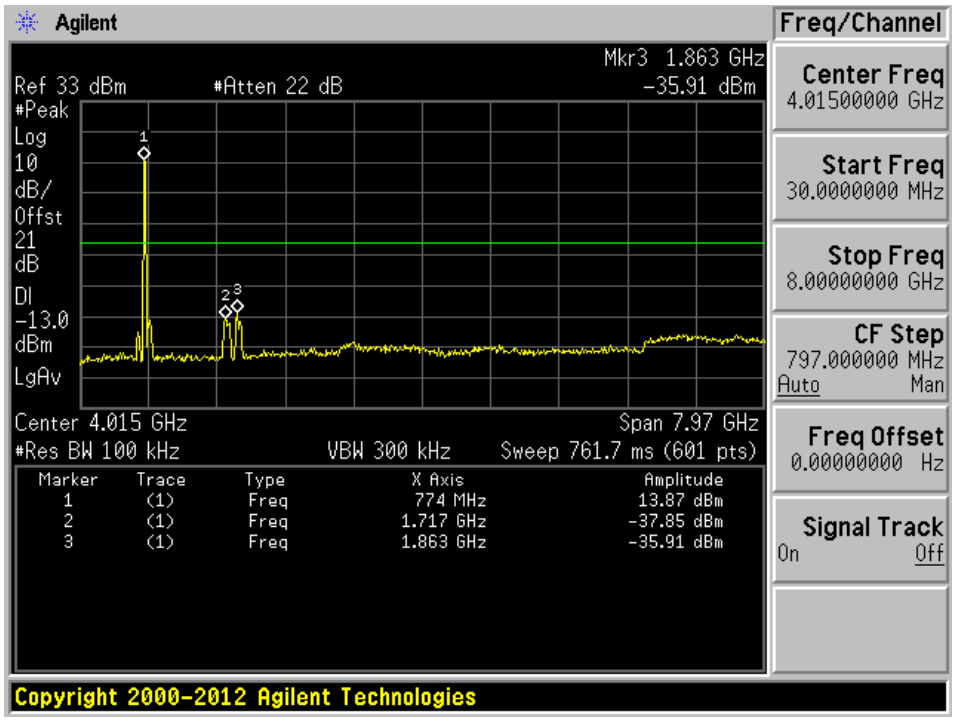
High Channel: 753.5 MHz



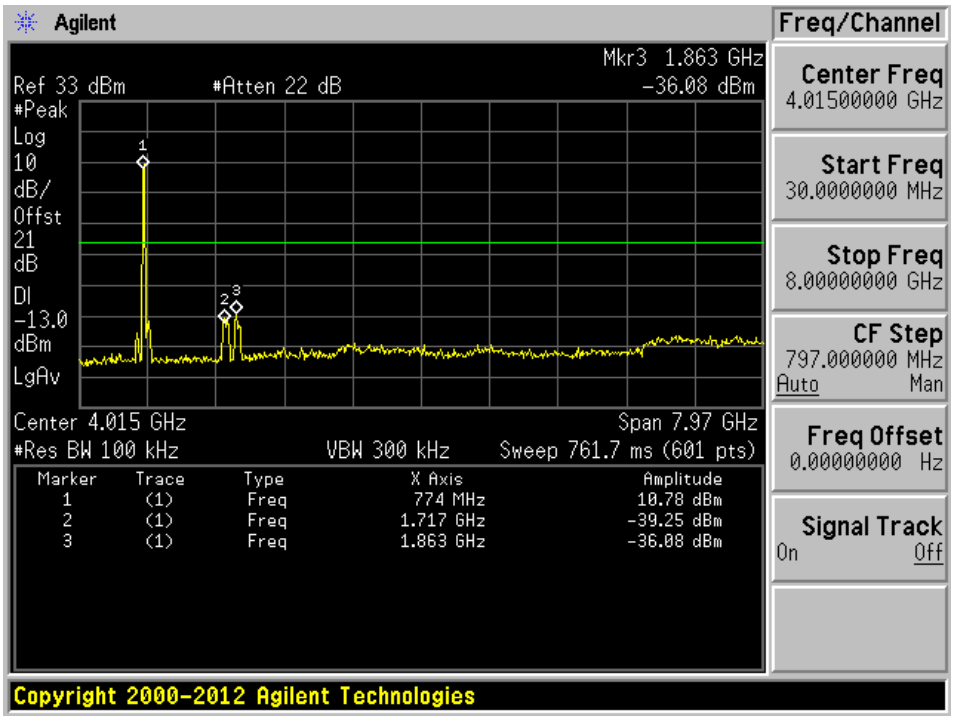
LTE Band 13, Uplink: Broadband Signal

AGC Off

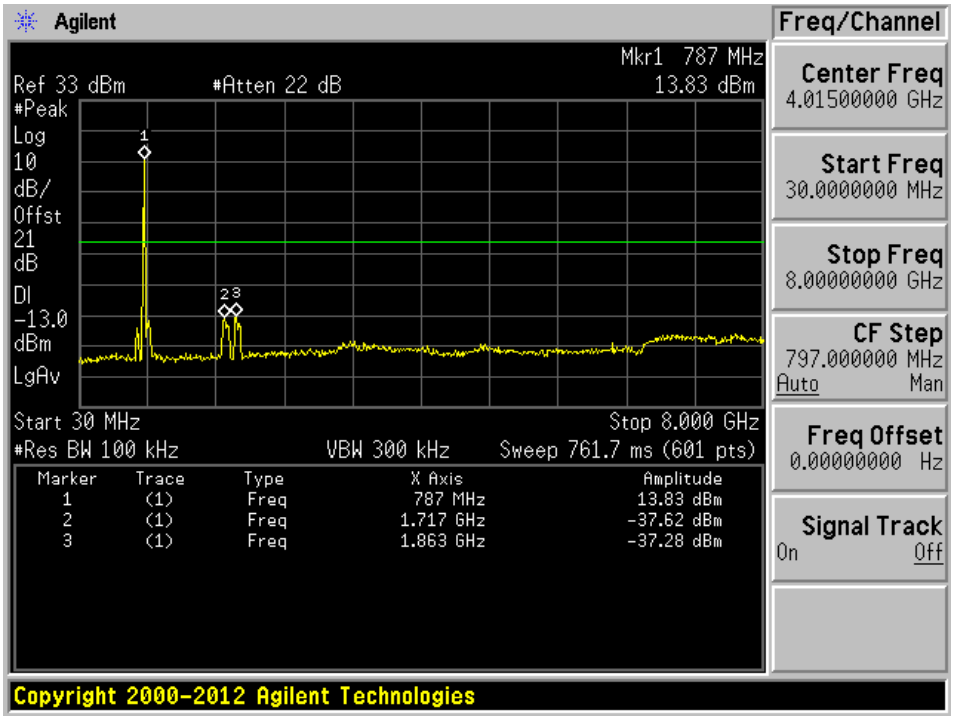
Low Channel: 779.5 MHz



Middle Channel: 781.5 MHz

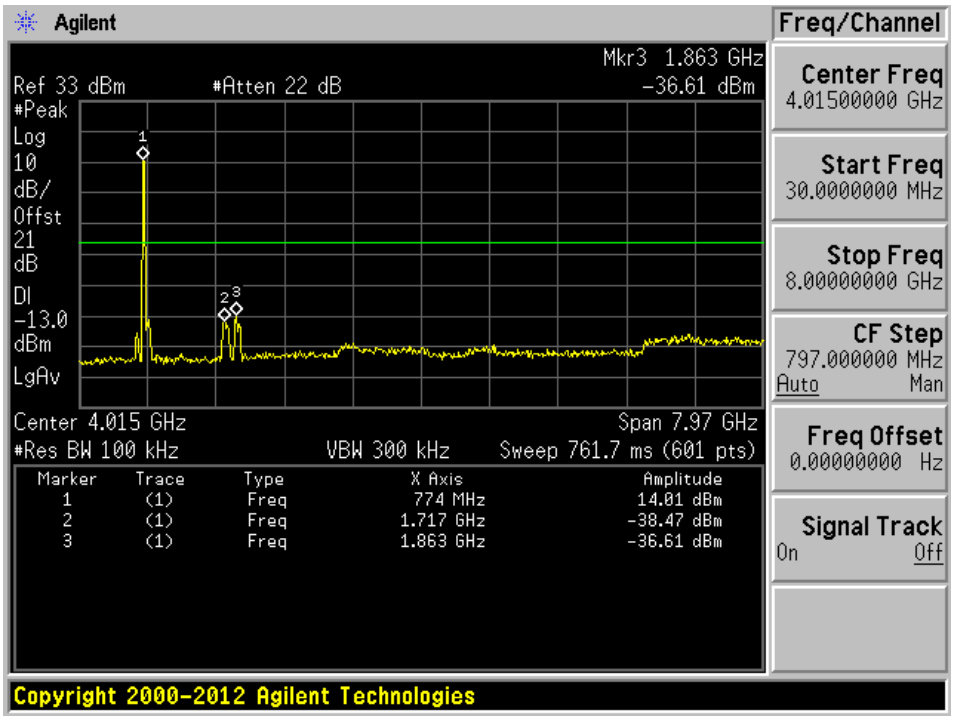


High Channel: 784.5 MHz

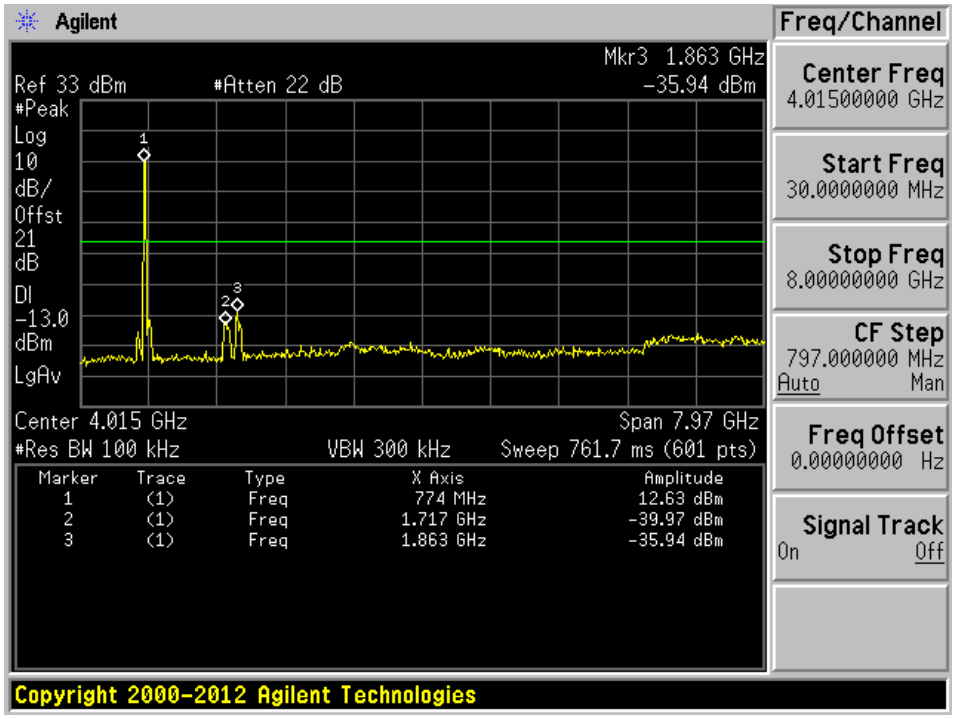


AGC On

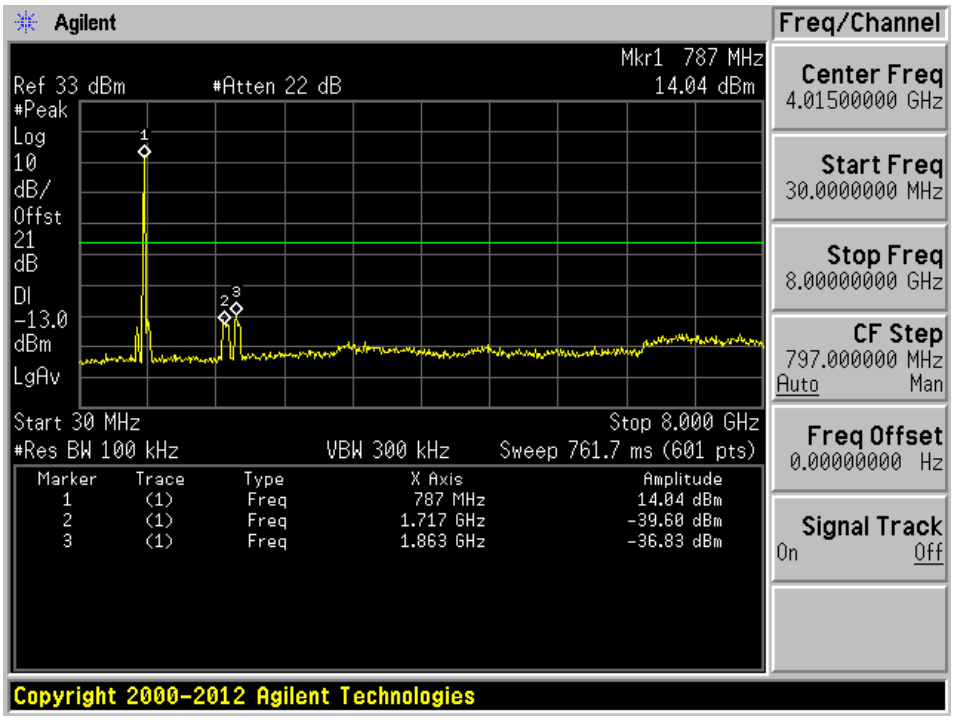
Low Channel: 779.5 MHz



Middle Channel: 781.5 MHz



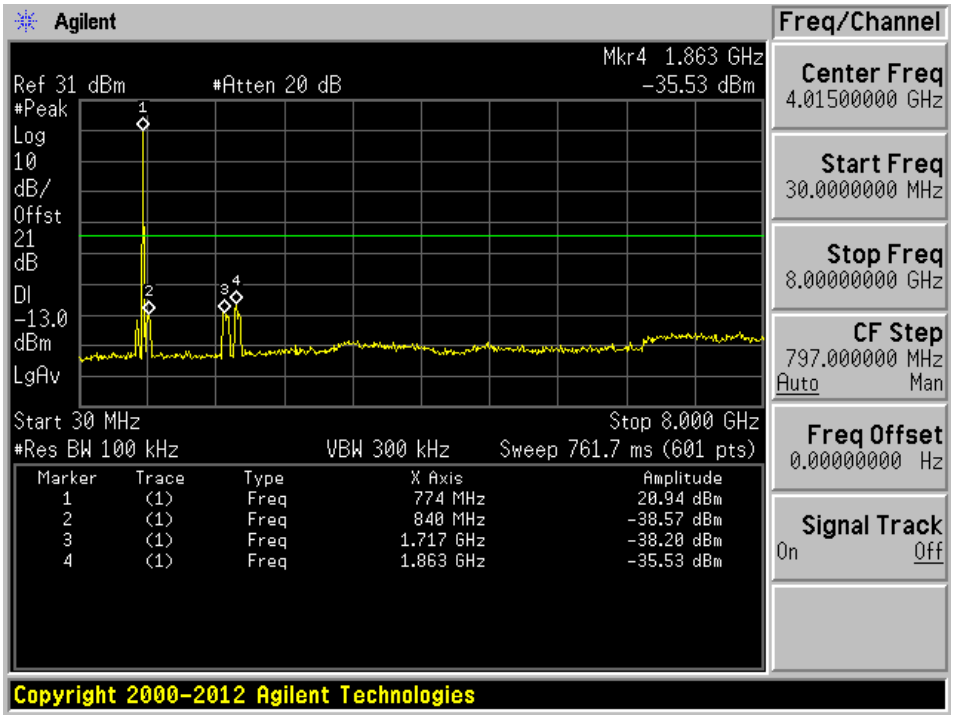
High Channel: 784.5 MHz



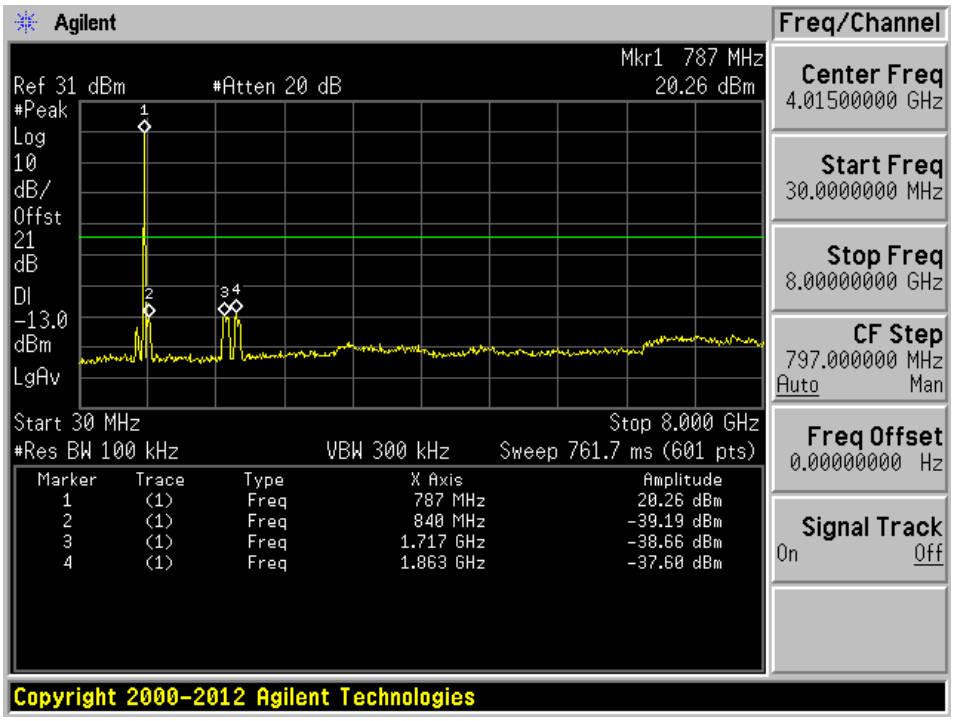
LTE Band 13, Uplink: Narrowband signal

AGC Off

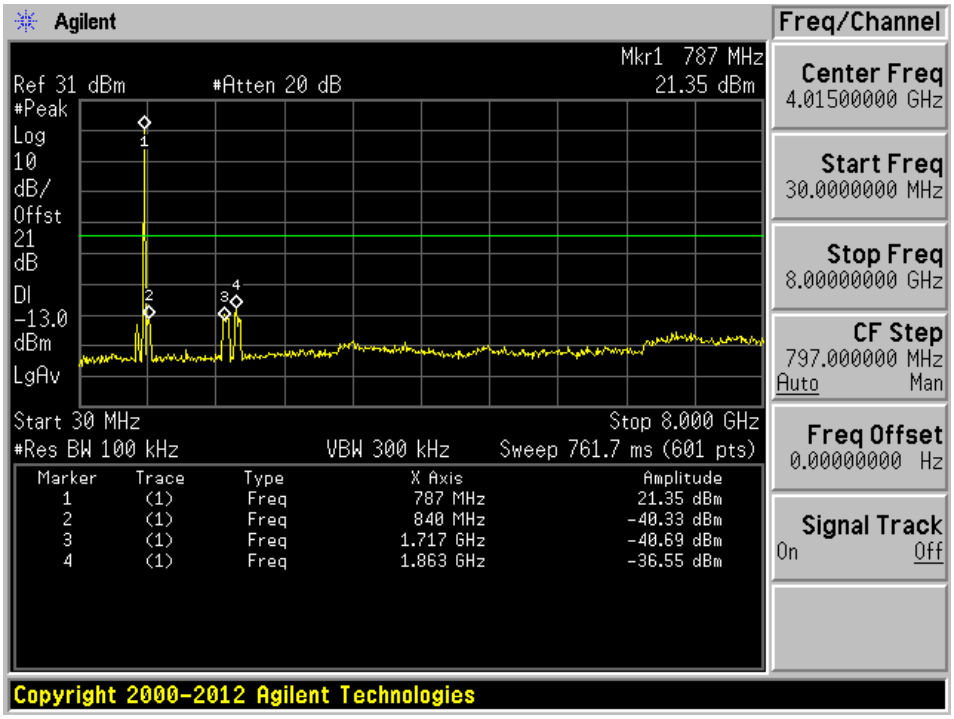
Low Channel: 779.5 MHz



Middle Channel: 781.5 MHz

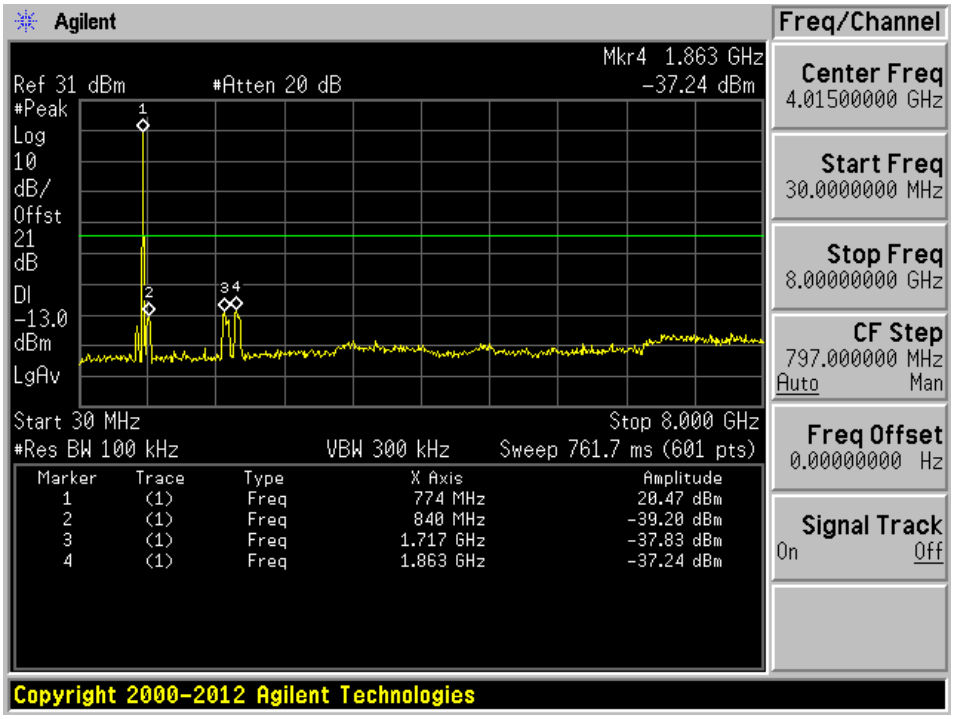


High Channel: 784.5 MHz

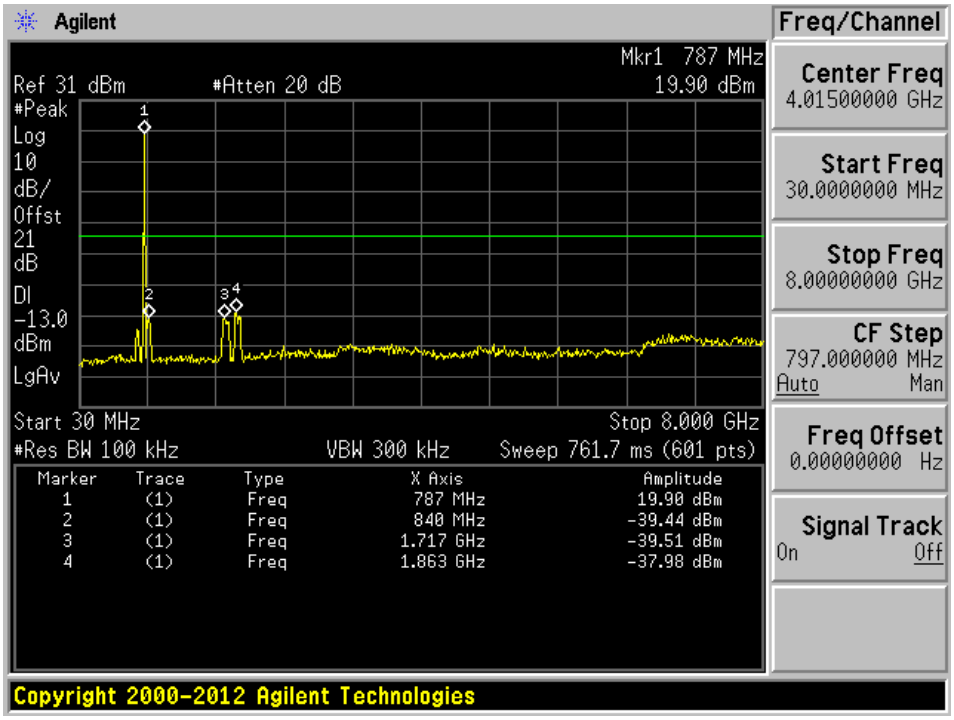


AGC On

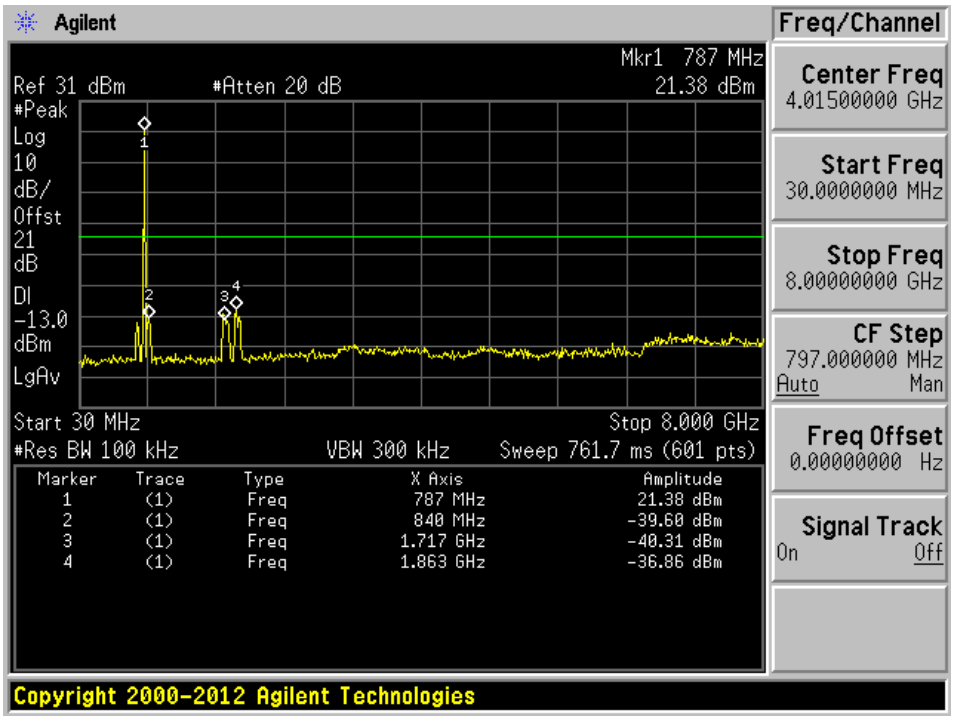
Low Channel: 779.5 MHz



Middle Channel: 781.5 MHz



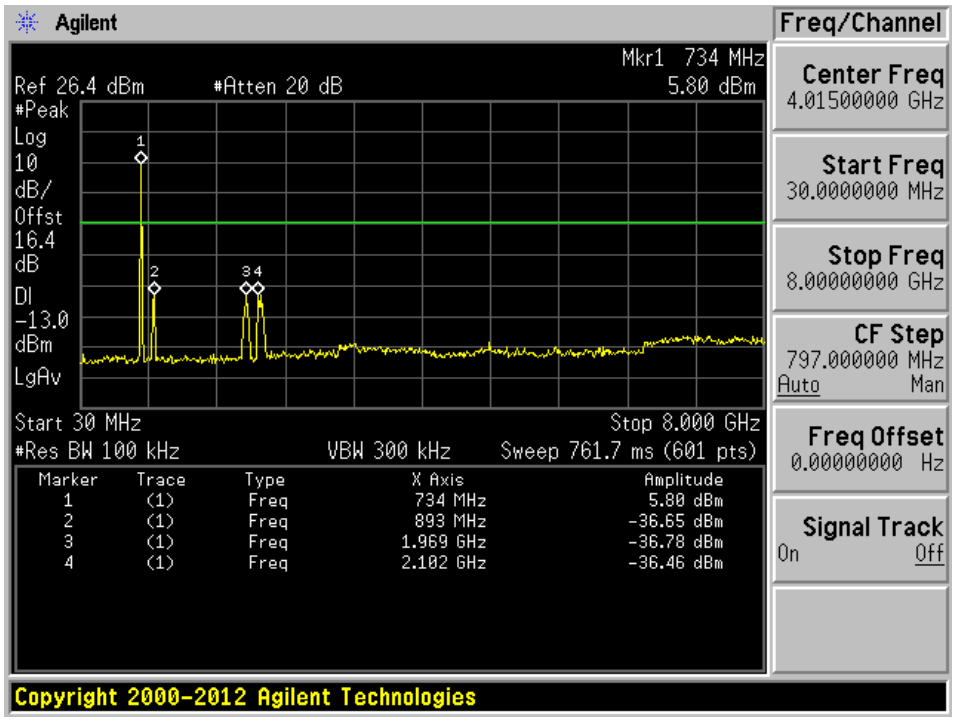
High Channel: 784.5 MHz



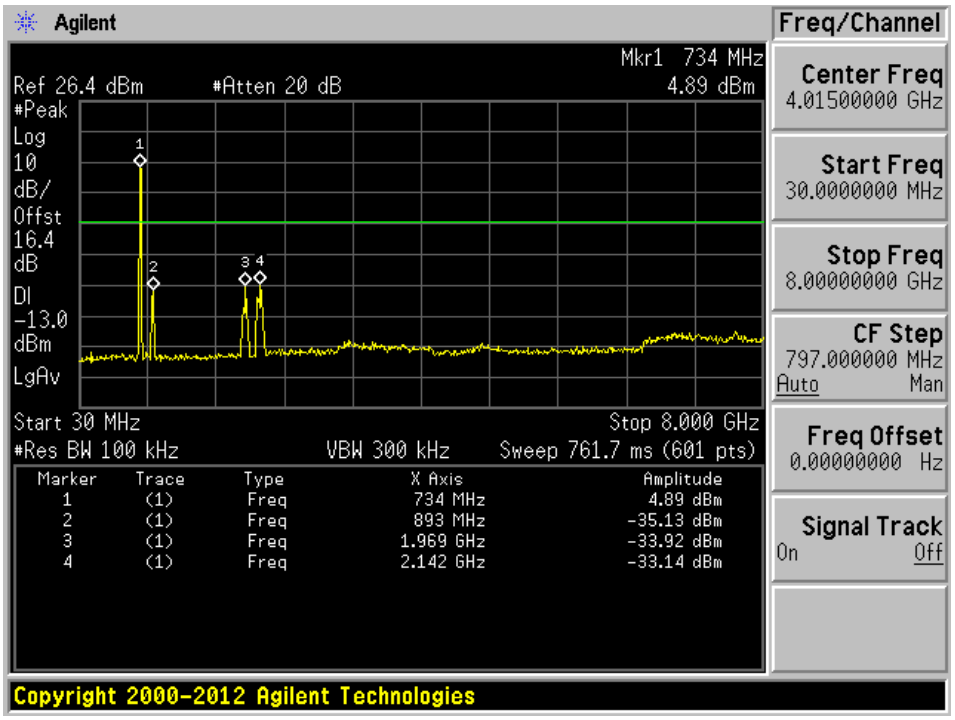
LTE Band 17, Downlink: Broadband Signal

AGC Off

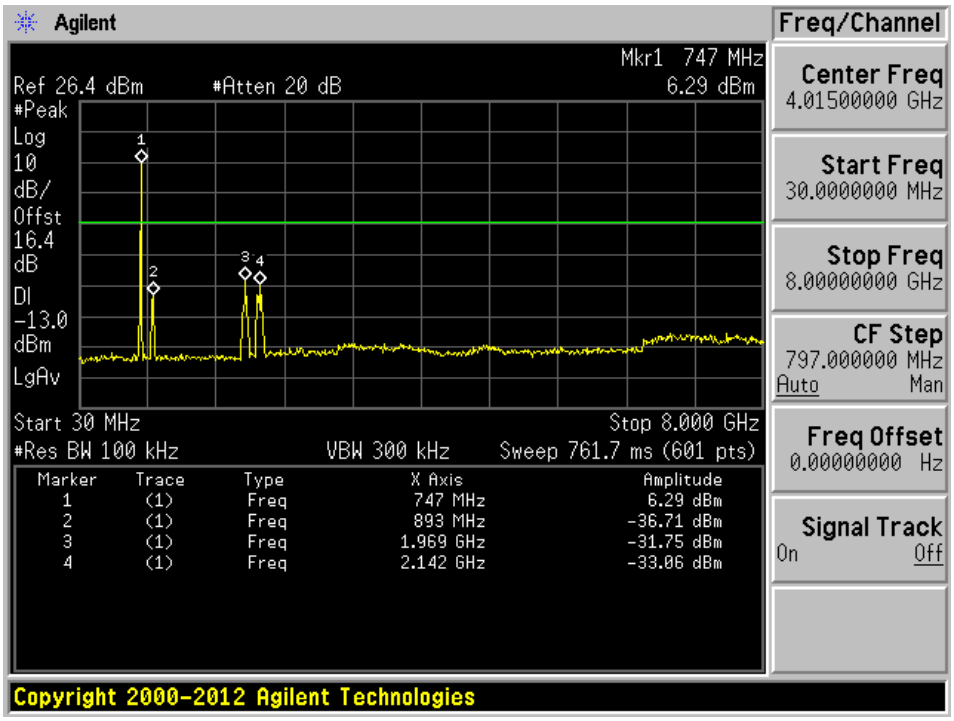
Low Channel: 736.5 MHz



Middle Channel: 740 MHz

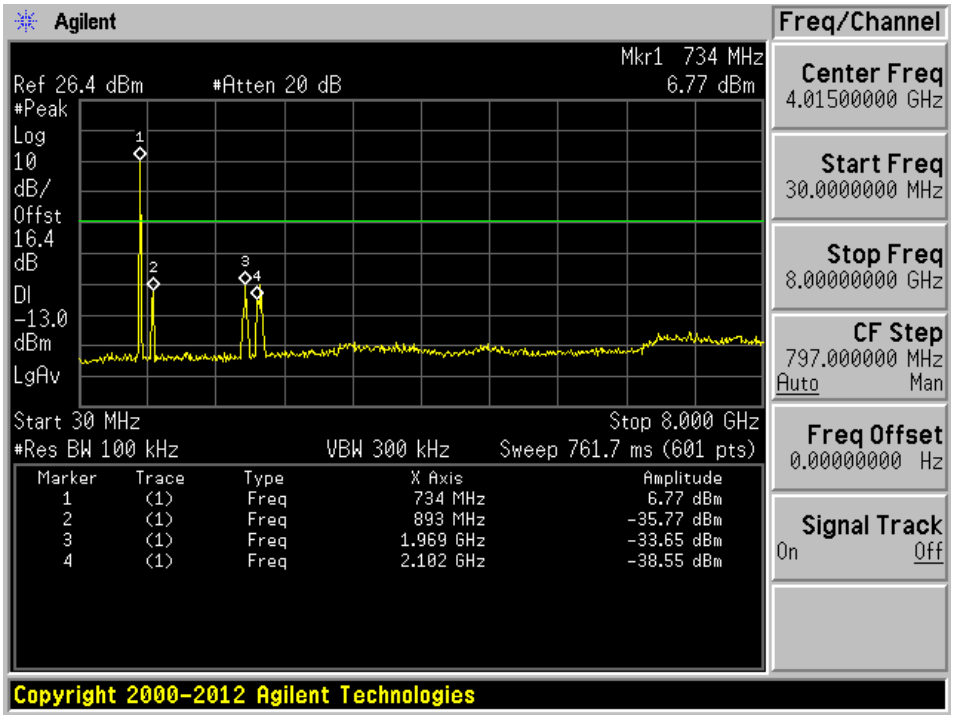


High Channel: 743.5 MHz

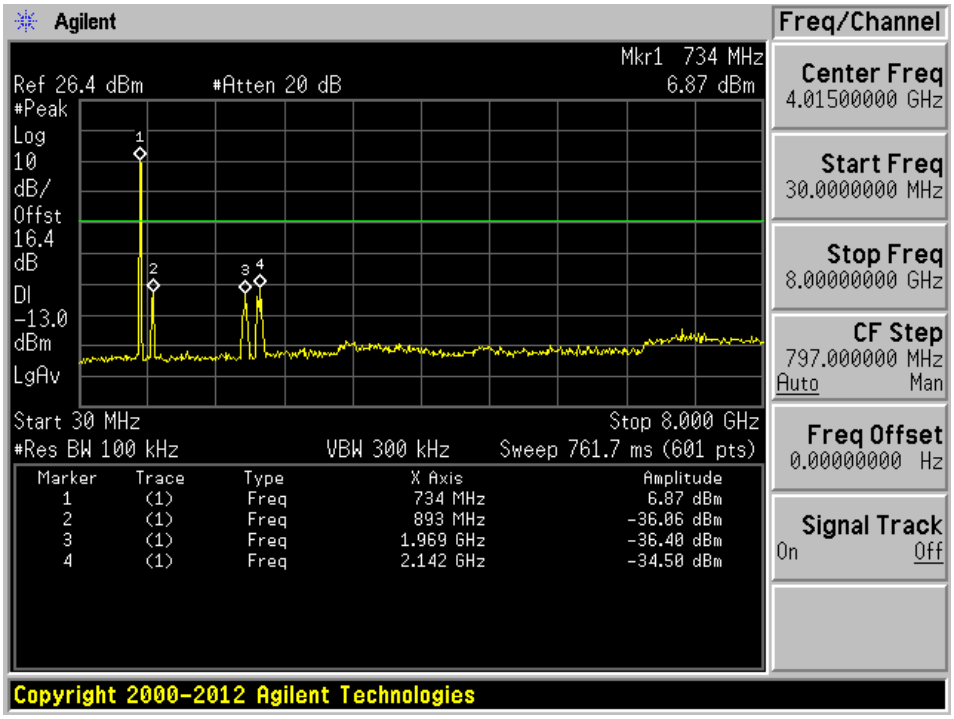


AGC On

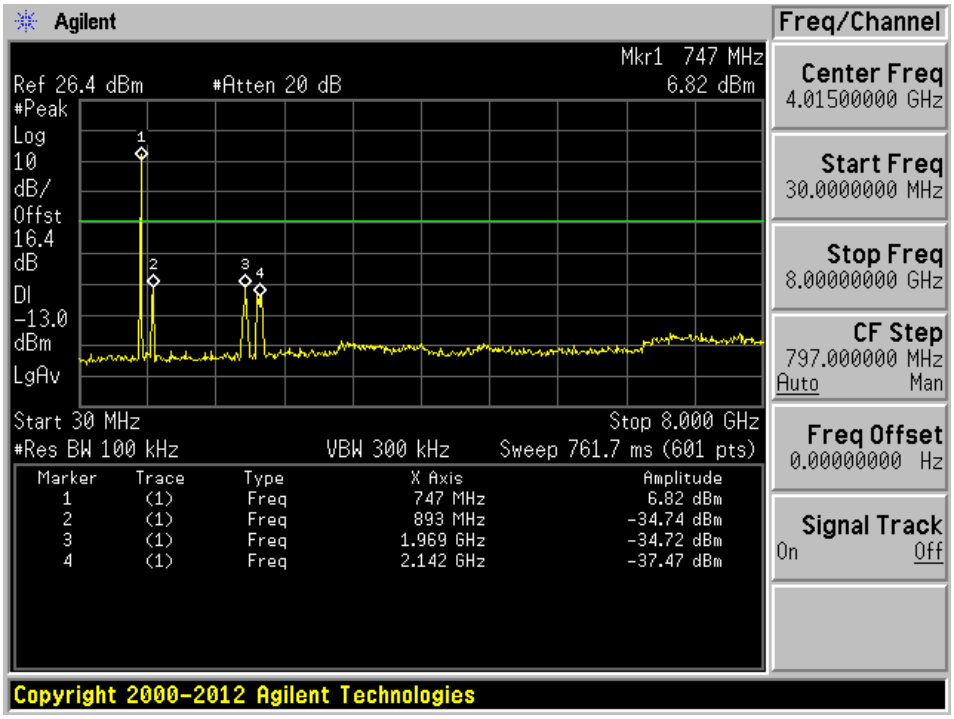
Low Channel: 736.5 MHz



Middle Channel: 740 MHz



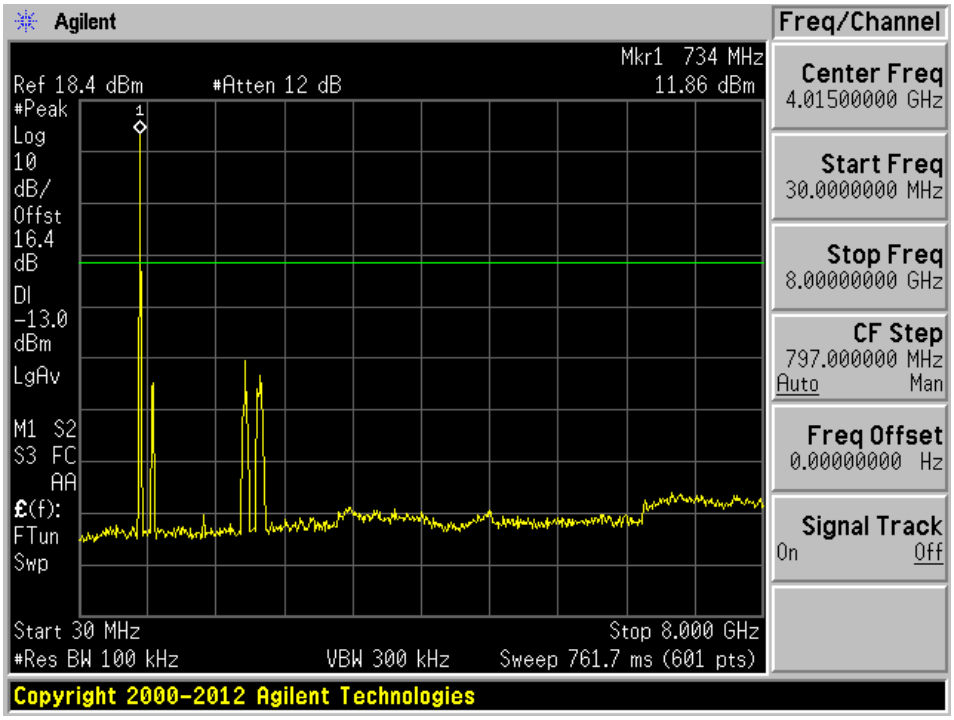
High Channel: 743.5 MHz



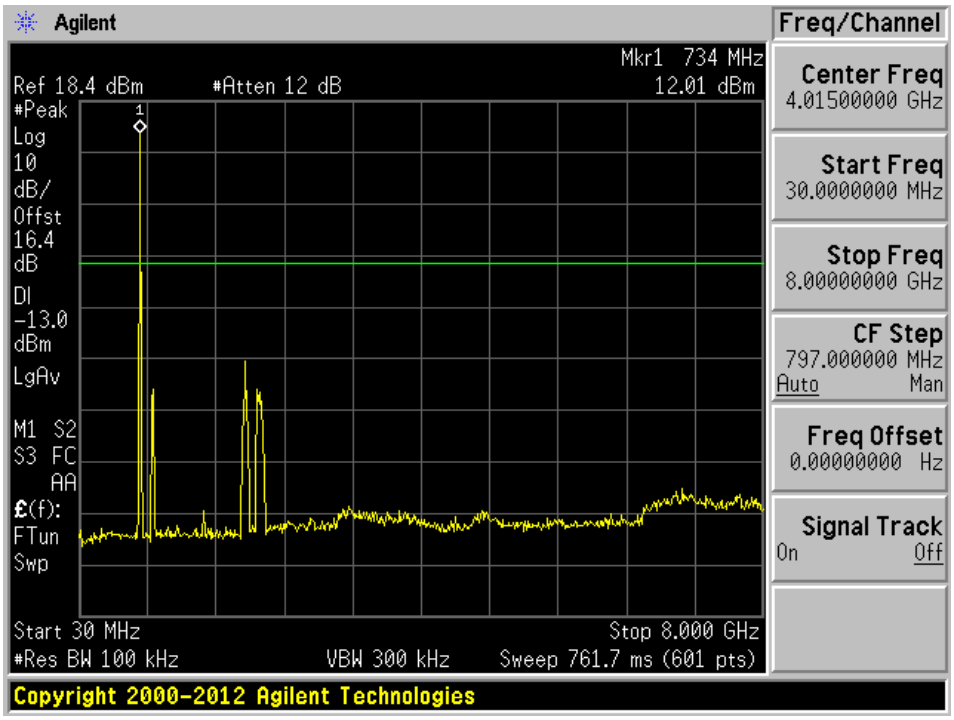
LTE Band 17, Downlink: Narrowband Signal

AGC Off

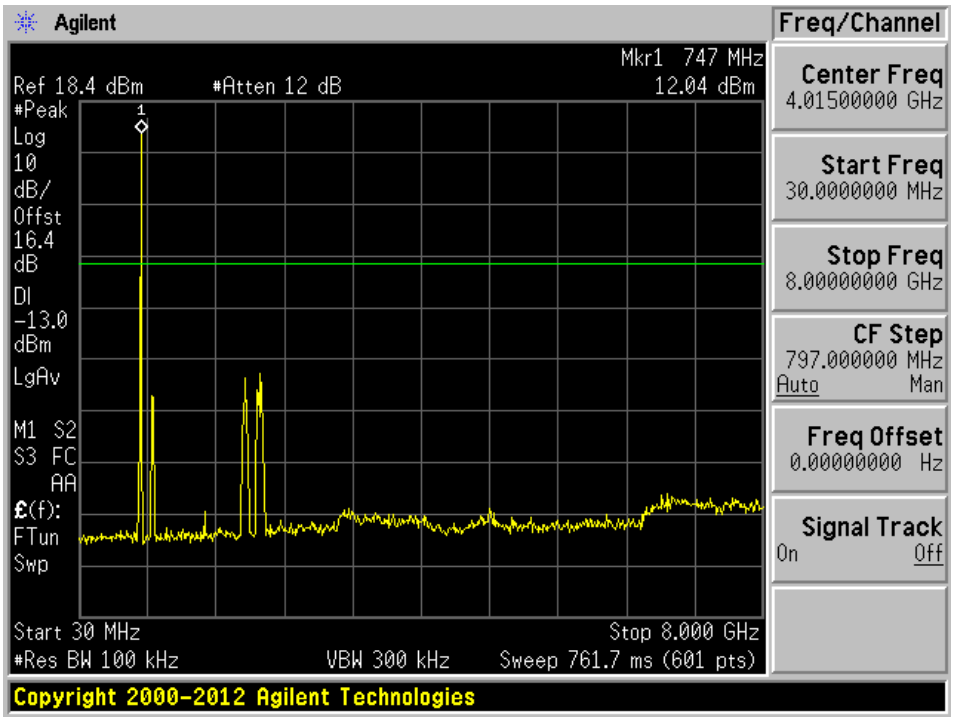
Low Channel: 736.5 MHz



Middle Channel: 740 MHz

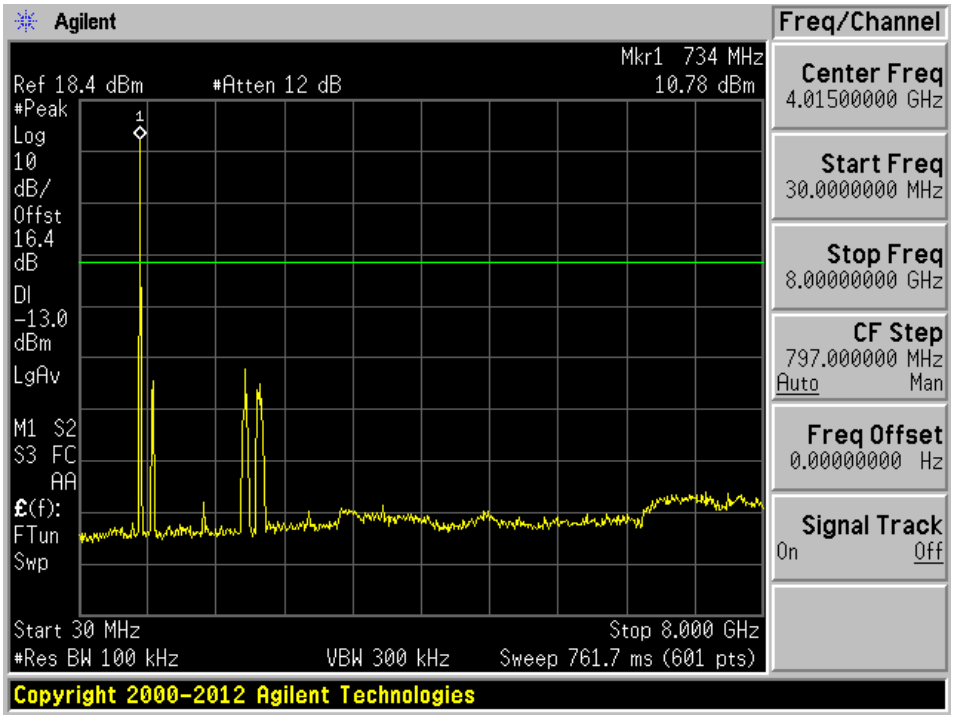


High Channel: 743.5 MHz

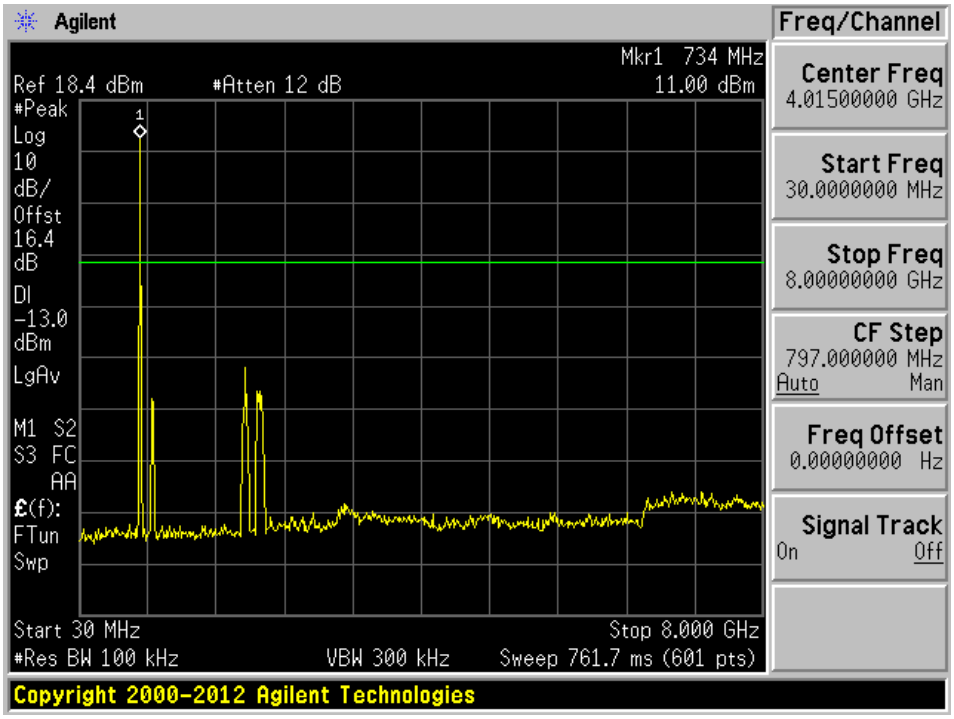


AGC On

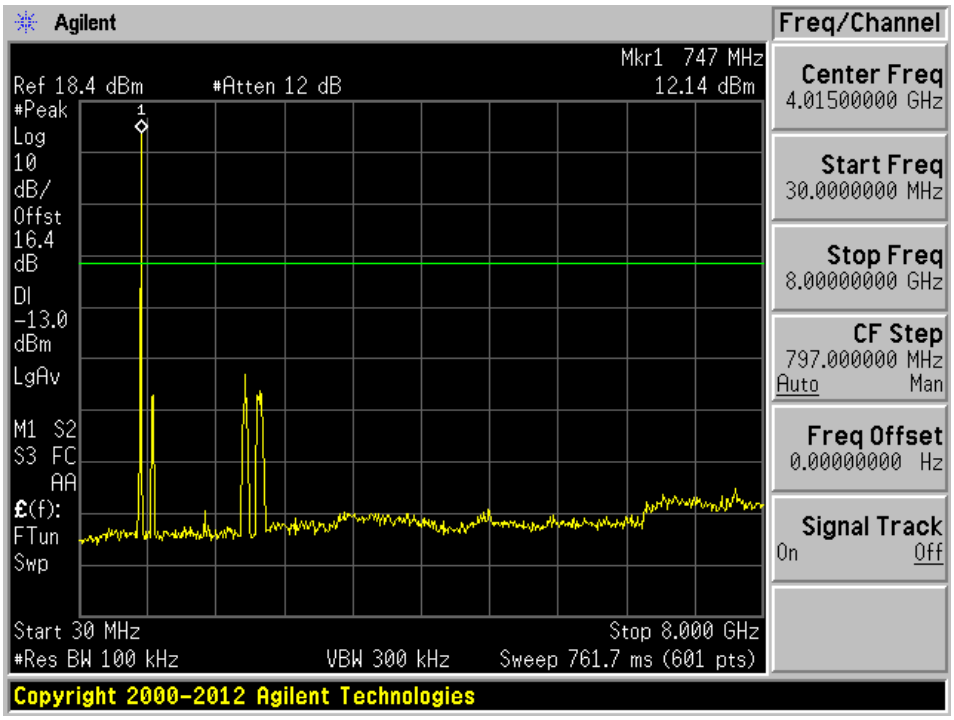
Low Channel: 736.5 MHz



Middle Channel: 740 MHz



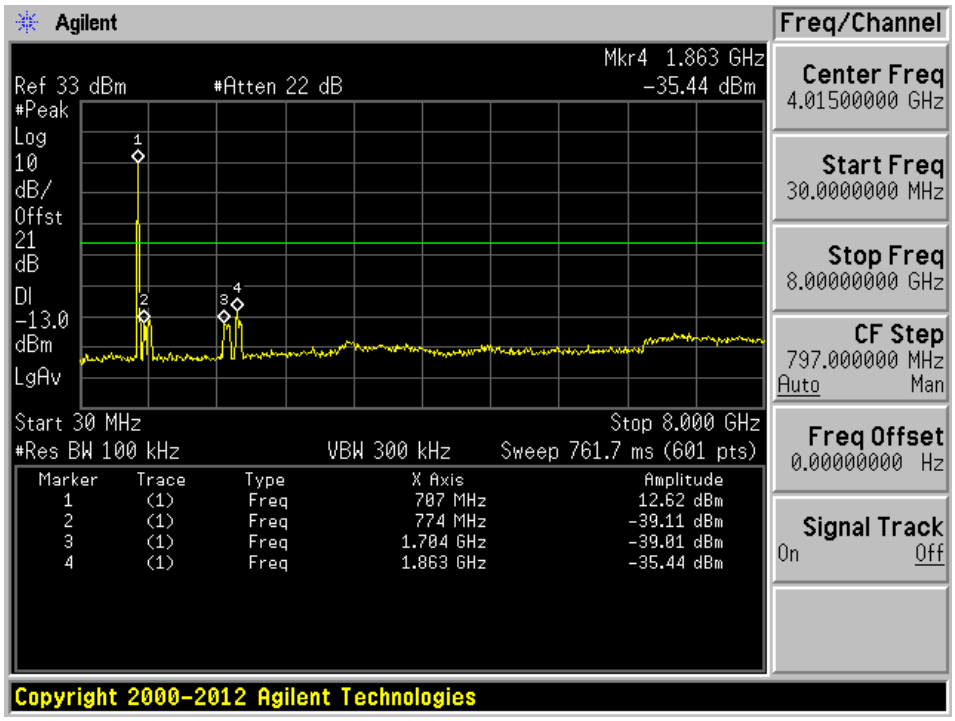
High Channel: 743.5 MHz



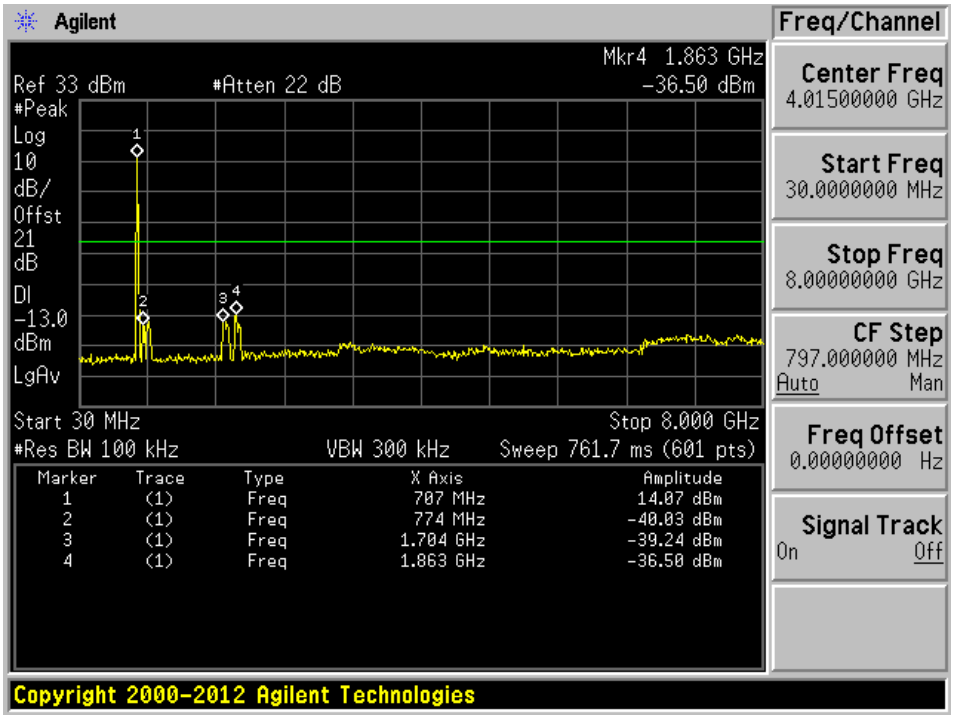
LTE Band 17, Uplink: Broadband Signal

AGC Off

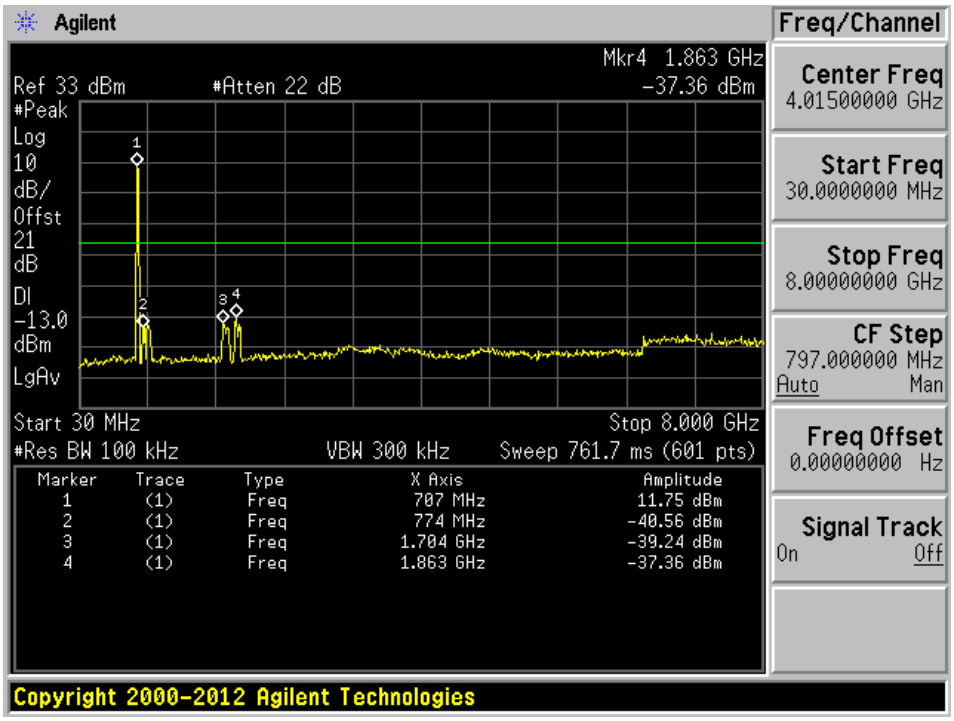
Low Channel: 706.5 MHz



Middle Channel: 710 MHz

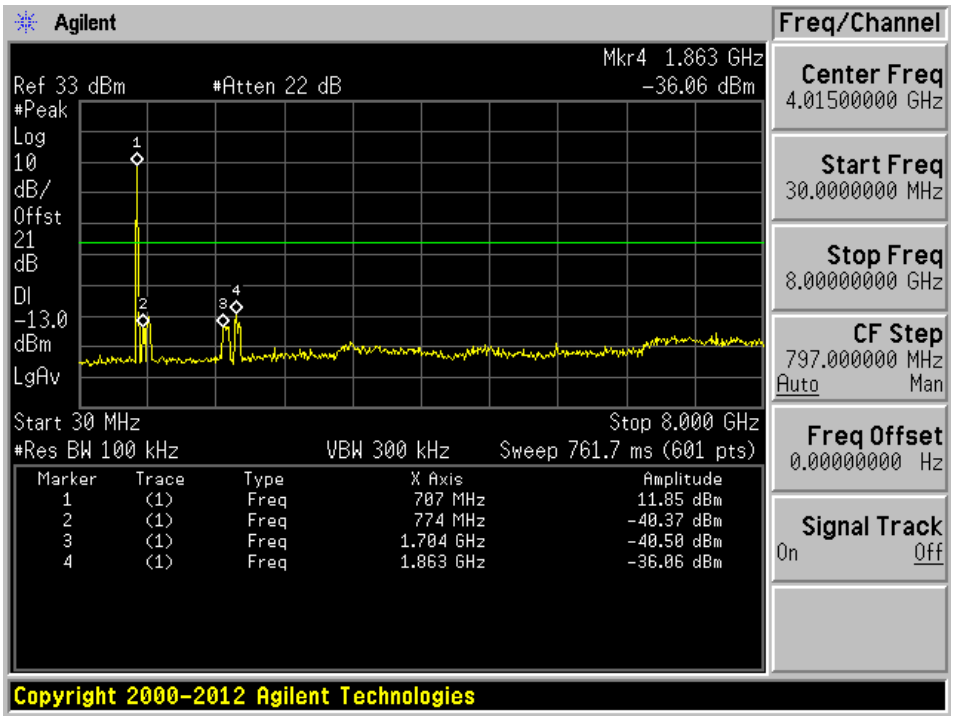


High Channel: 713.5 MHz

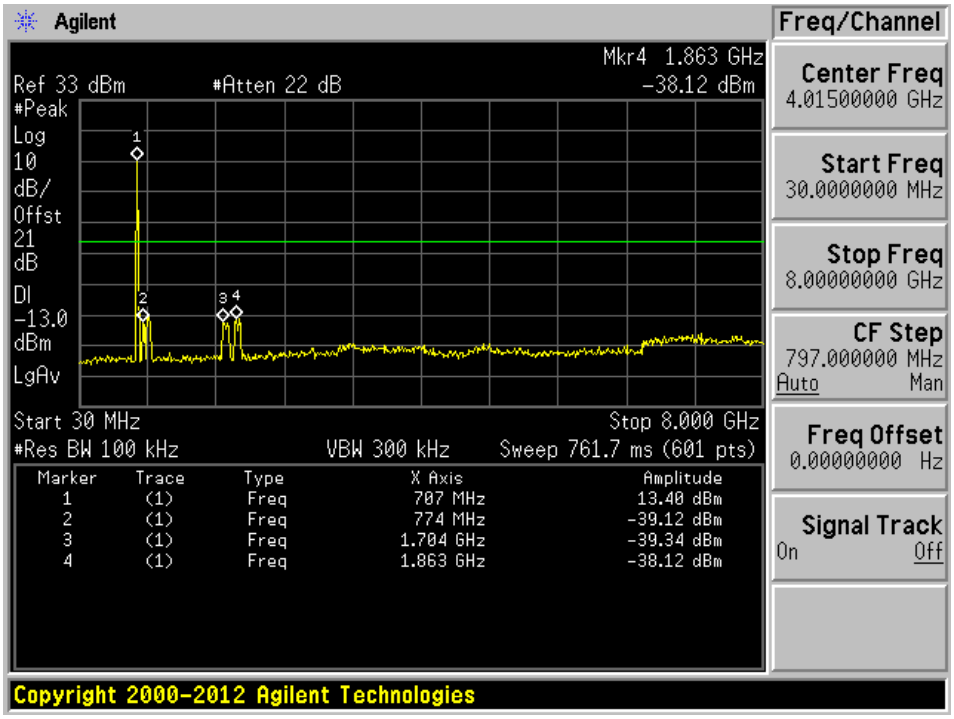


AGC On

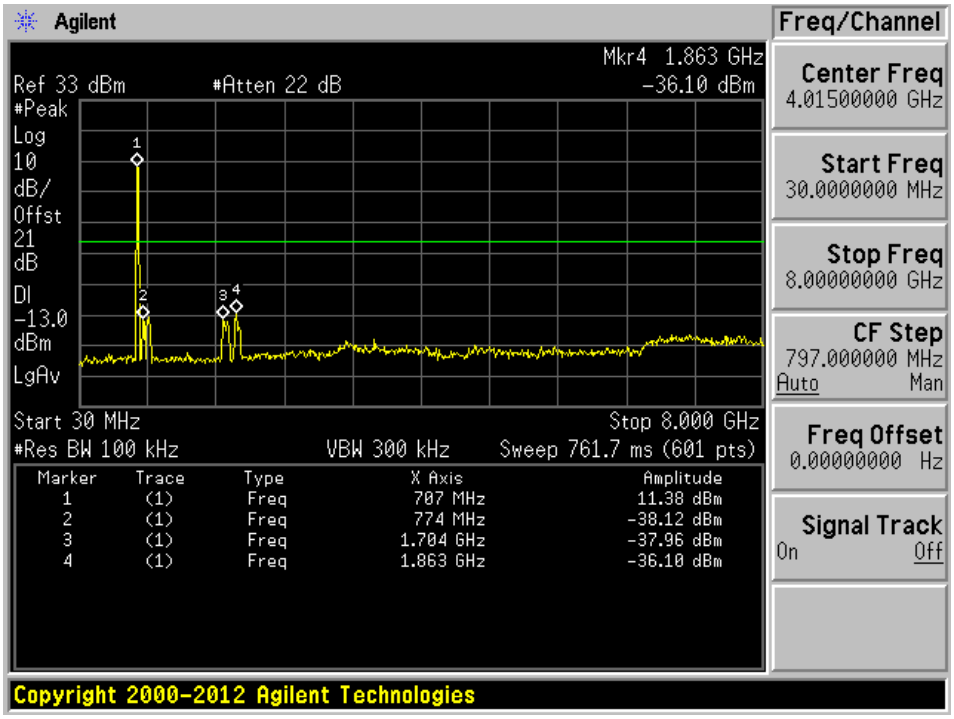
Low Channel: 706.5 MHz



Middle Channel: 710 MHz



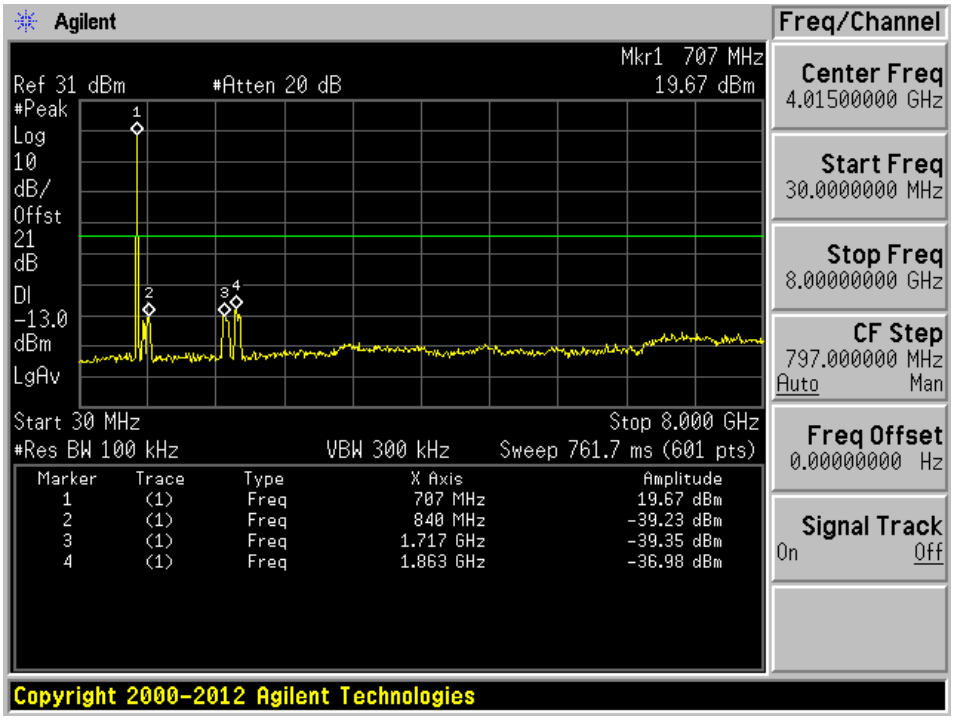
High Channel: 713.5 MHz



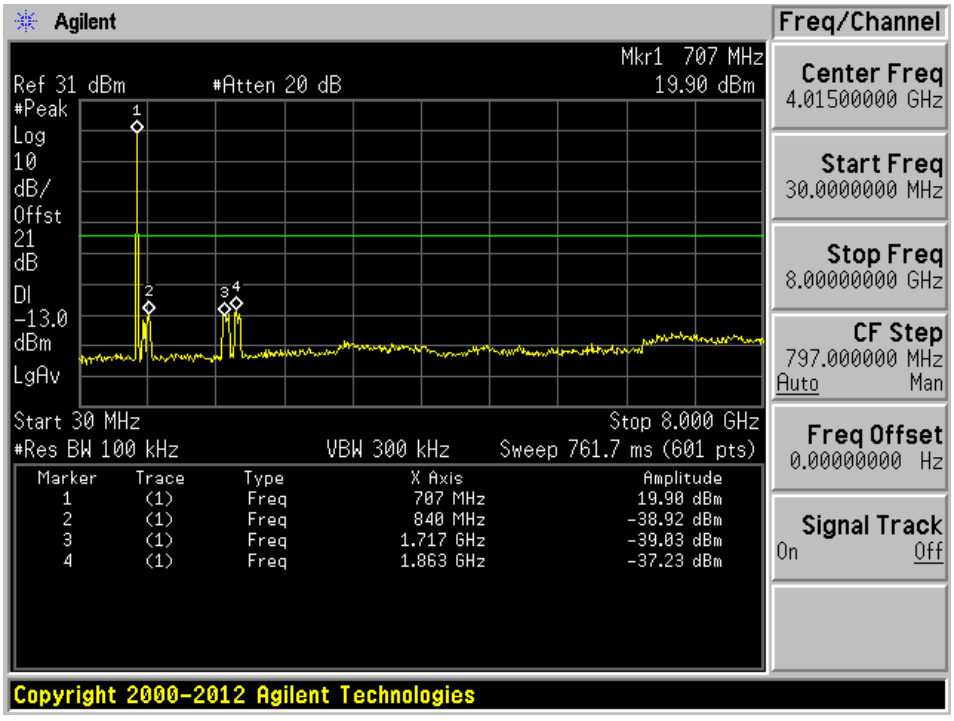
LTE Band 17, Uplink: Narrowband Signal

AGC Off

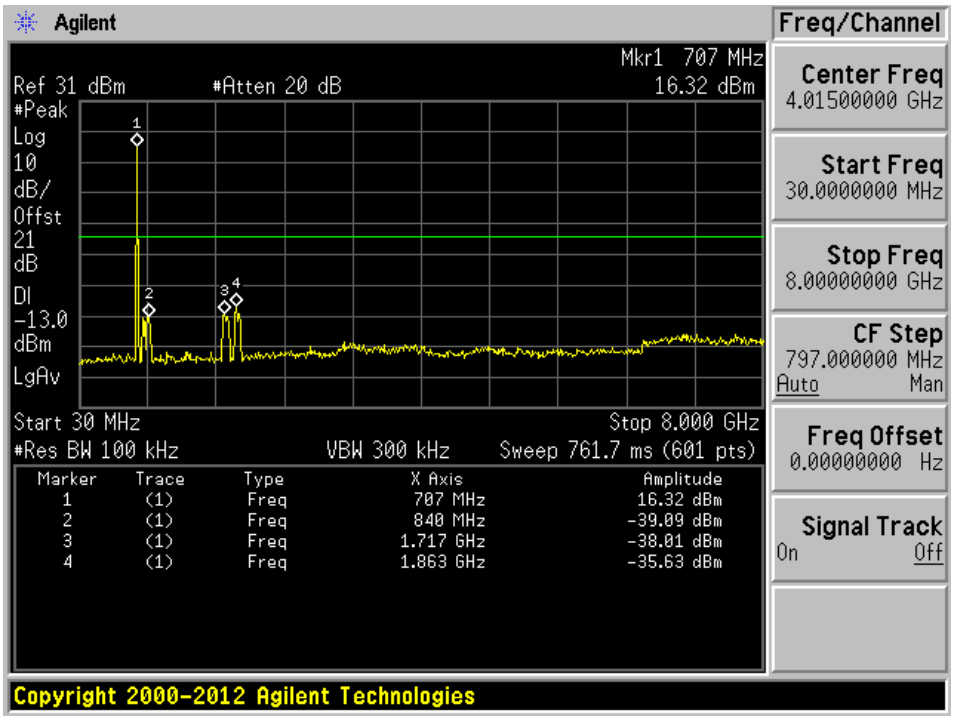
Low Channel: 706.5 MHz



Middle Channel: 710 MHz

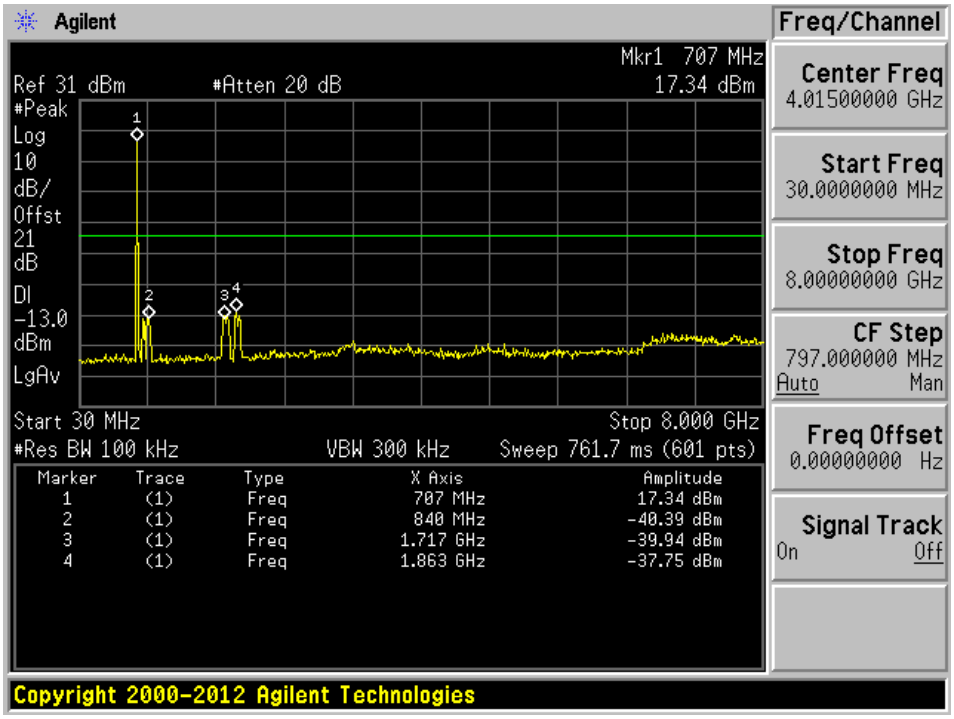


High Channel: 713.5 MHz

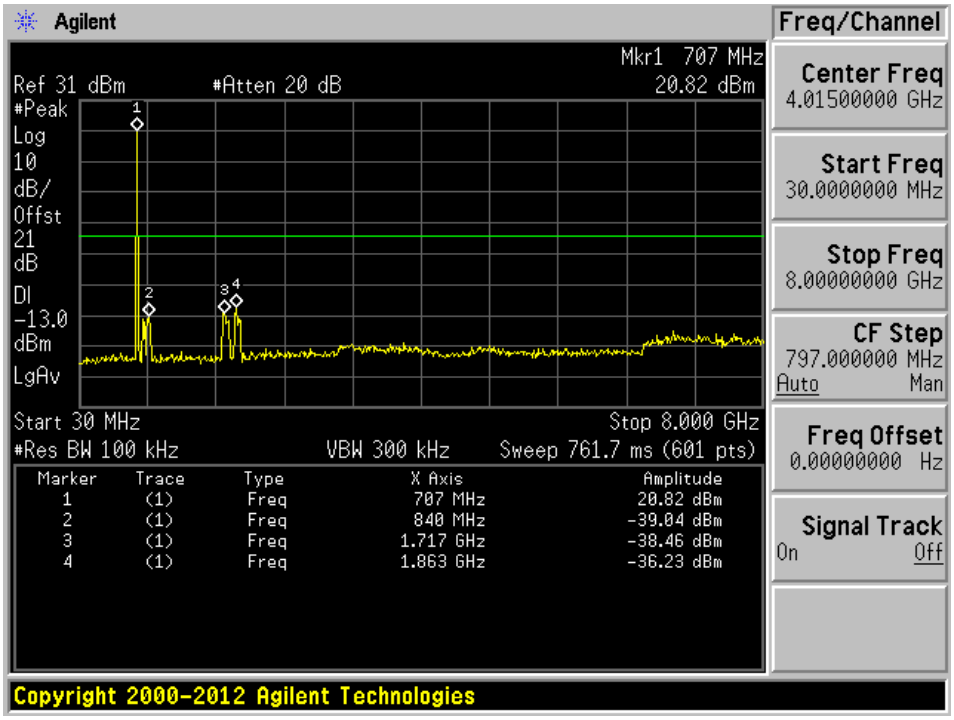


AGC On

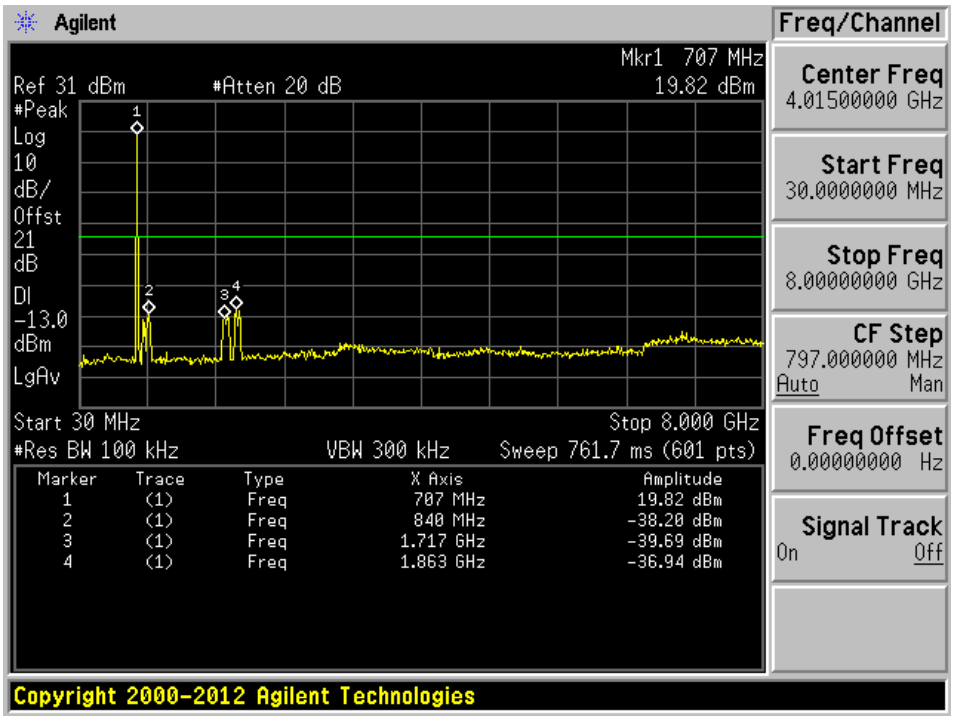
Low Channel: 706.5 MHz



Middle Channel: 710 MHz



High Channel: 713.5 MHz



9 FCC §27.53 (c)(g)(h) - Band Edge & Intermodulation

9.1 Applicable Standards

According to FCC §27.53,

(c) For operations in the 746-758 MHz band and the 776-788 MHz band, the power of any emission outside the licensee's frequency band(s) of operation shall be attenuated below the transmitter power (P) within the licensed band(s) of operation, measured in watts, in accordance with the following:

(1) On any frequency outside the 746-758 MHz band, the power of any emission shall be attenuated outside the band below the transmitter power (P) by at least 43 + 10 log (P) dB;

(2) On any frequency outside the 776-788 MHz band, the power of any emission shall be attenuated outside the band below the transmitter power (P) by at least 43 + 10 log (P) dB;

(3) On all frequencies between 763-775 MHz and 793-805 MHz, by a factor not less than 76 + 10 log (P) dB in a 6.25 kHz band segment, for base and fixed stations;

(4) On all frequencies between 763-775 MHz and 793-805 MHz, by a factor not less than 65 + 10 log (P) dB in a 6.25 kHz band segment, for mobile and portable stations;

(5) Compliance with the provisions of paragraphs (c)(1) and (c)(2) of this section is based on the use of measurement instrumentation employing a resolution bandwidth of 100 kHz or greater. However, in the 100 kHz bands immediately outside and adjacent to the frequency block, a resolution bandwidth of at least 30 kHz may be employed;

(6) Compliance with the provisions of paragraphs (c)(3) and (c)(4) of this section is based on the use of measurement instrumentation such that the reading taken with any resolution bandwidth setting should be adjusted to indicate spectral energy in a 6.25 kHz segment.

(g) For operations in the 600 MHz band and the 698-746 MHz band, the power of any emission outside a licensee's frequency band(s) of operation shall be attenuated below the transmitter power (P) within the licensed band(s) of operation, measured in watts, by at least 43 + 10 log (P) dB. Compliance with this provision is based on the use of measurement instrumentation employing a resolution bandwidth of 100 kilohertz or greater. However, in the 100 kilohertz bands immediately outside and adjacent to a licensee's frequency block, a resolution bandwidth of at least 30 kHz may be employed.

(h) AWS emission limits—(1) General protection levels. Except as otherwise specified below, for operations in the 1695-1710 MHz, 1710-1755 MHz, 1755-1780 MHz, 1915-1920 MHz, 1995-2000 MHz, 2000-2020 MHz, 2110-2155 MHz, 2155-2180 MHz, and 2180-2200 bands, the power of any emission outside a licensee's frequency block shall be attenuated below the transmitter power (P) in watts by at least 43 + 10 log10 (P) dB.

9.2 Test Procedure

The EUT was connected to the spectrum analyzer and Signal Generator followed by 50Ω-75Ω matching pad.

The center frequency of the spectrum analyzer was set according to center frequency of the EUT to be transmitted. The RBW was set to greater than 30 KHz for 700 bands and greater than 1% of emission bandwidth for AWS band LTE.

9.3 Test Equipment List and Details

Manufacturers	Descriptions	Models	Serial Numbers	Calibration Dates	Calibration Interval
Agilent	Analyzer, Spectrum	E4446A	US44300386	2014-10-24	1 year
Agilent	Generator, Signal	E4438C	MY45091309	2015-08-21	1 year
Keysight Technologies	Vector Signal Generator	N5182B	MY51350070	2014-09-18	2 years
Rohde & Schwarz	Generator, Signal	SMIQ03	849192/0085	2014-07-15	2 years

Statement of Traceability: BACL Corp. *attests that all calibrations have been performed per the A2LA requirements, traceable to the NIST.*

9.4 Test Environmental Conditions

Temperature:	21-23° C
Relative Humidity:	42-48 %
ATM Pressure:	101.4-102 kPa

The testing was performed by Todd Moy 2015-10-10 in the RF Site.

9.5 Test Results

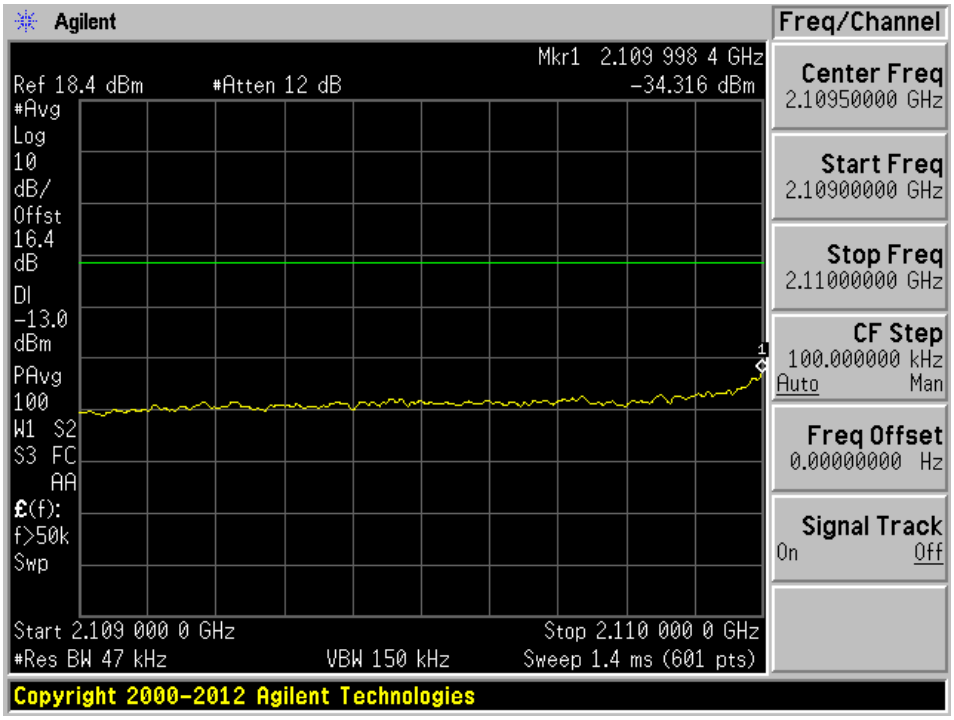
Please refer to the following plots.

Band Edge:

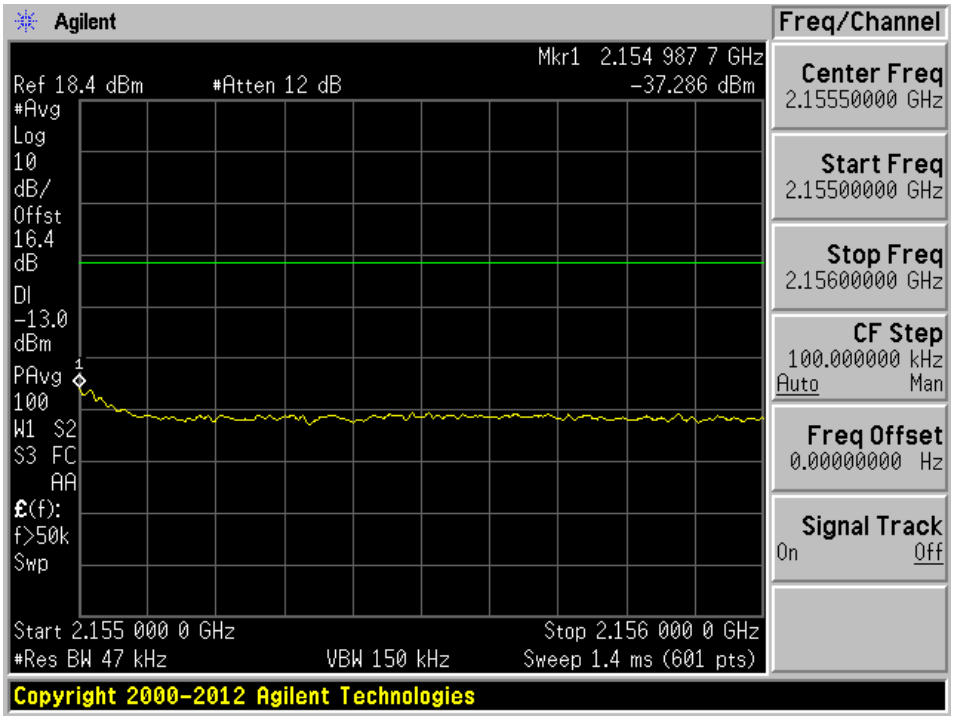
AWS Band, Downlink: Broadband Signal

AGC Off

Lower Band Edge

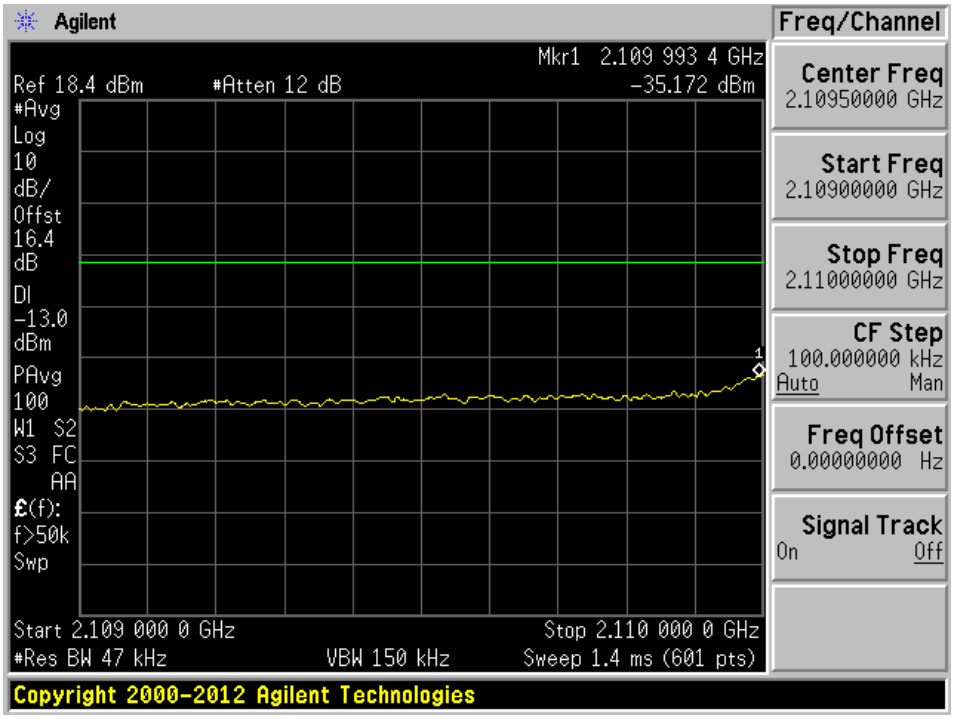


Upper Band Edge

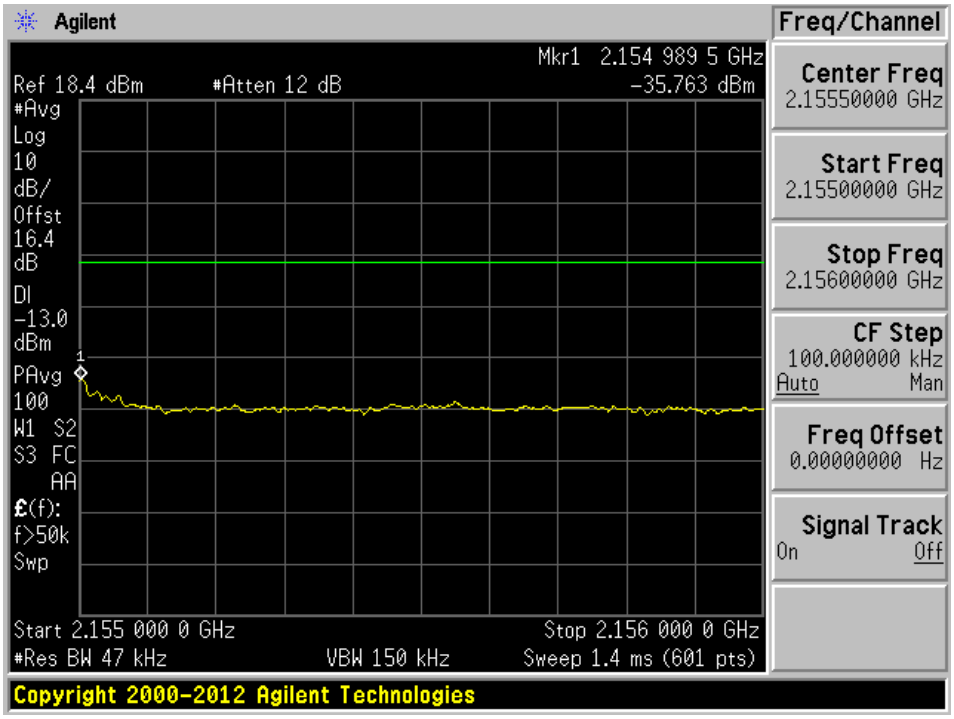


AGC On

Lower Band Edge



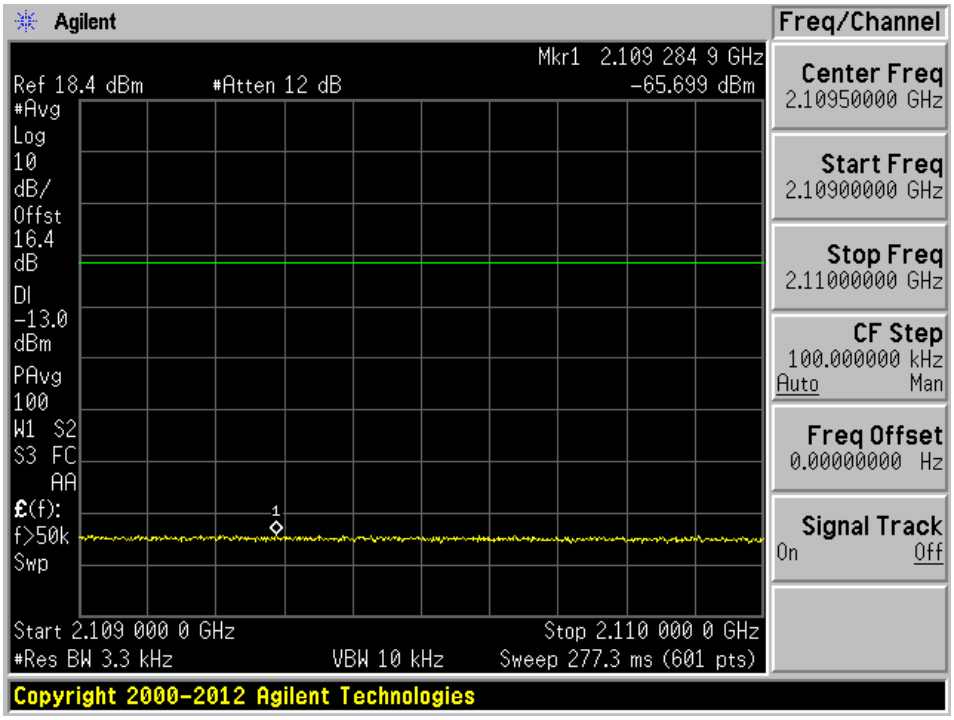
Upper Band Edge



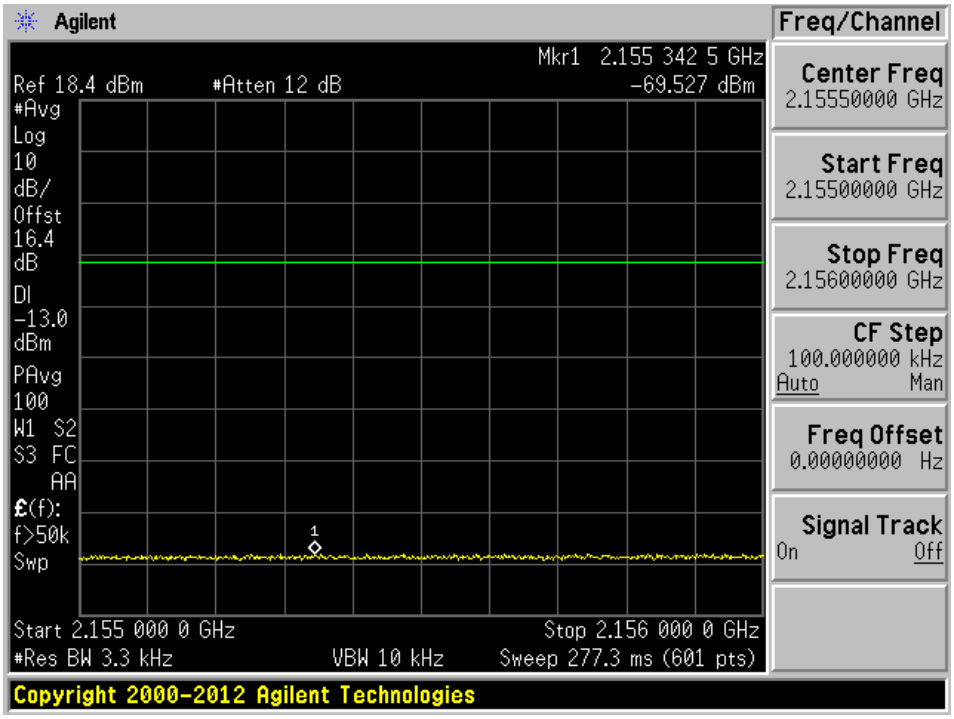
AWS Band, Downlink: Narrowband Signal

AGC Off

Lower Band Edge

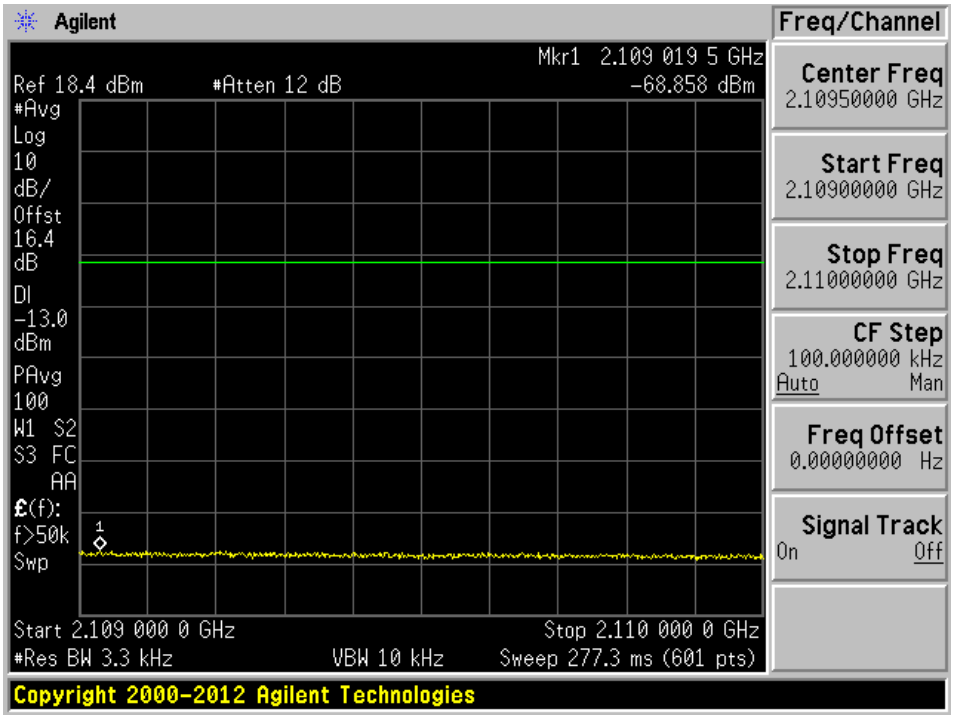


Upper Band Edge

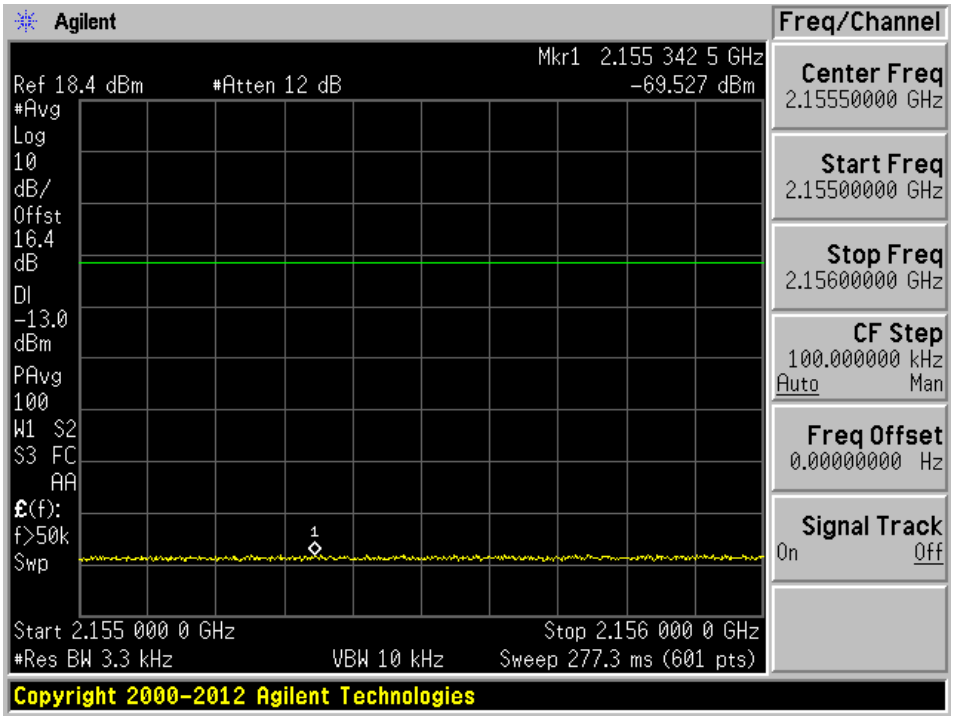


AGC On

Lower Band Edge



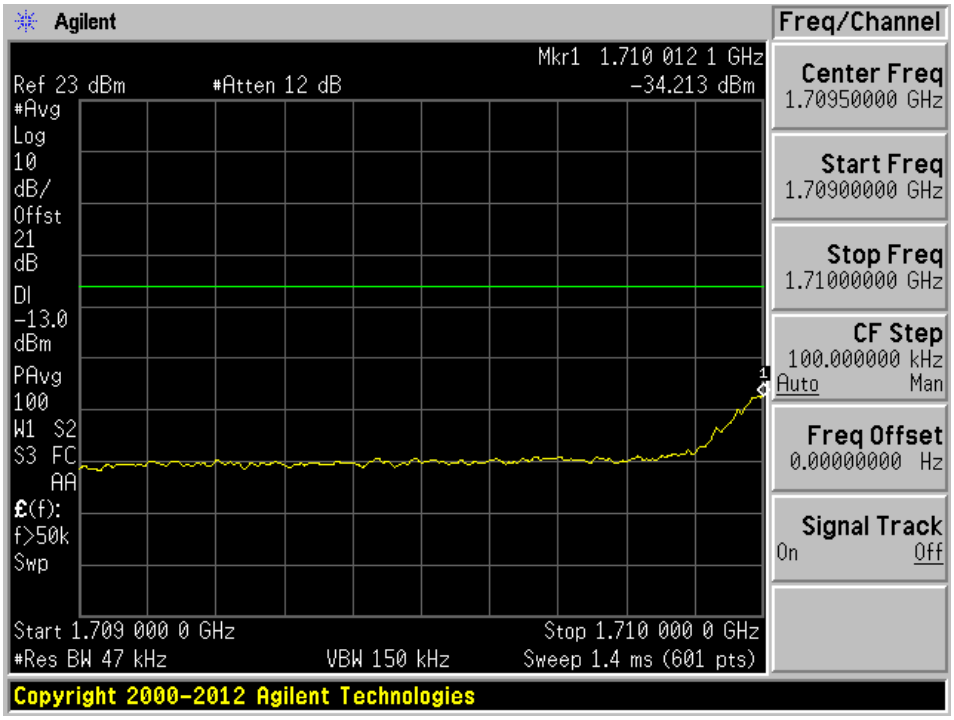
Upper Band Edge



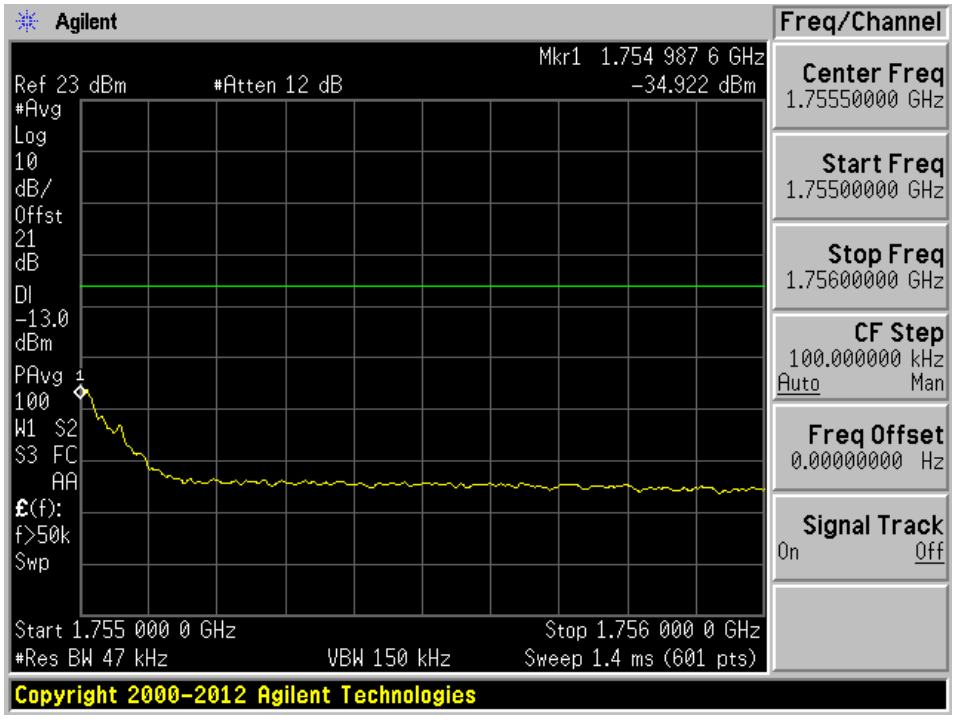
AWS Band, Uplink: Broadband Signal

AGC Off

Lower Band Edge

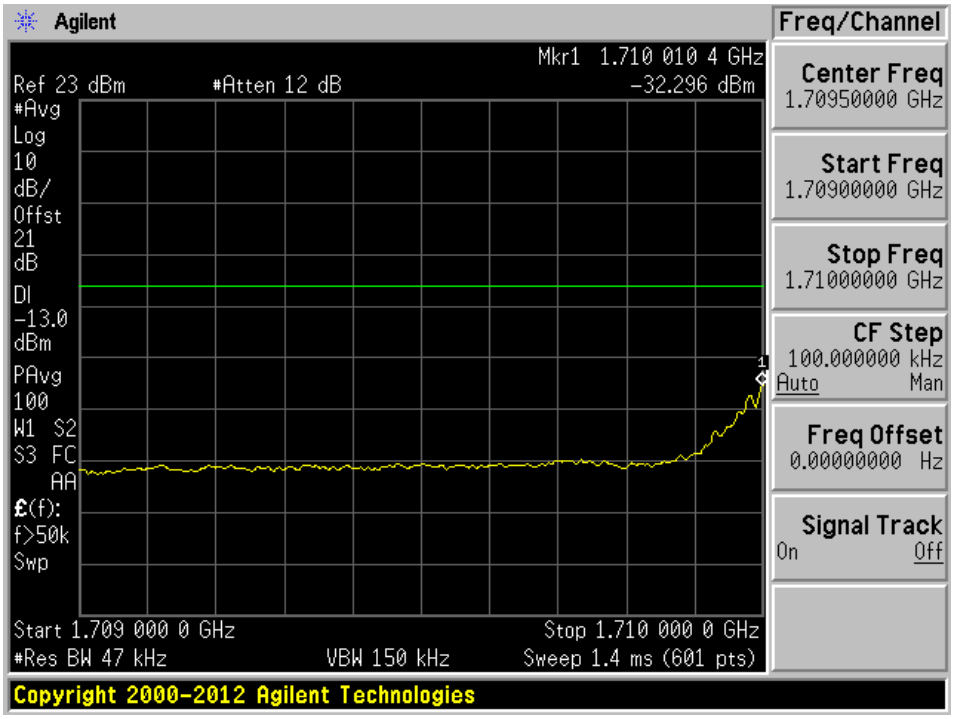


Upper Band Edge

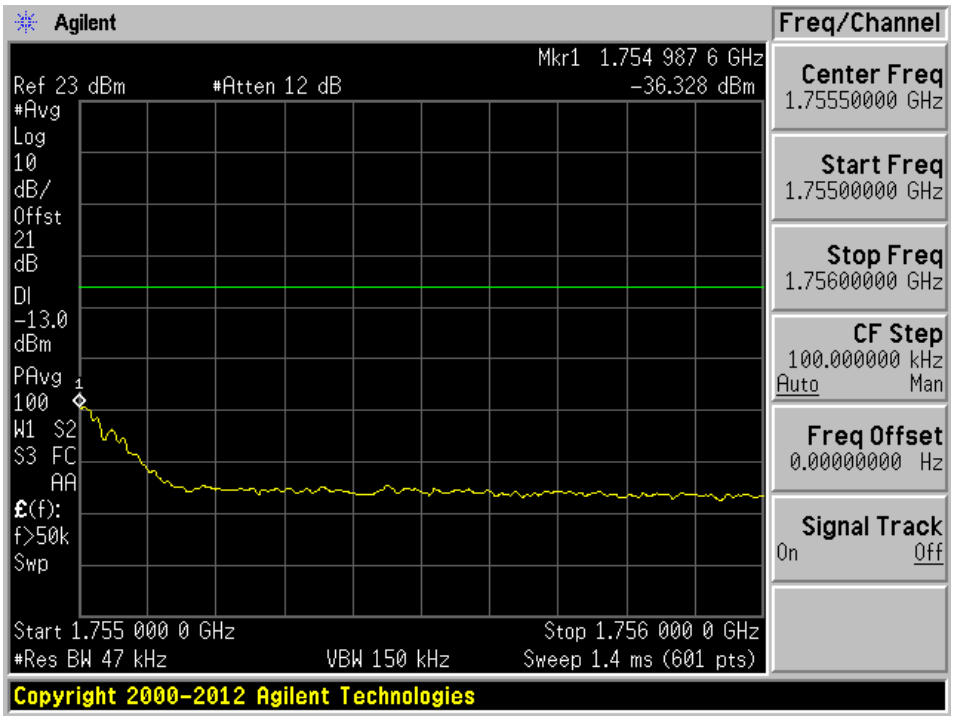


AGC On

Lower Band Edge



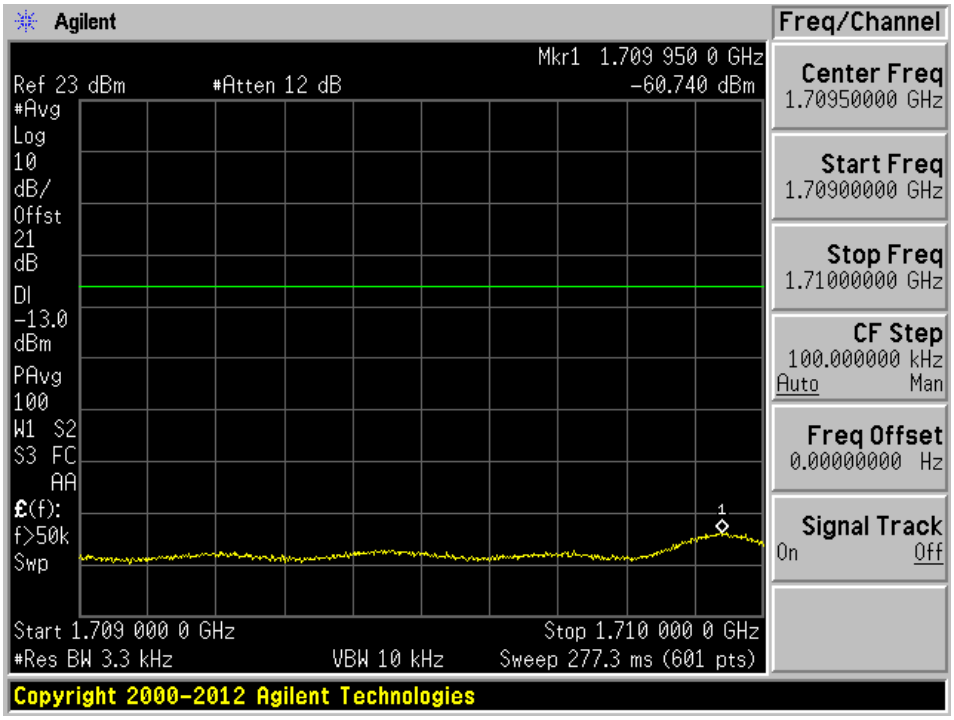
Upper Band Edge



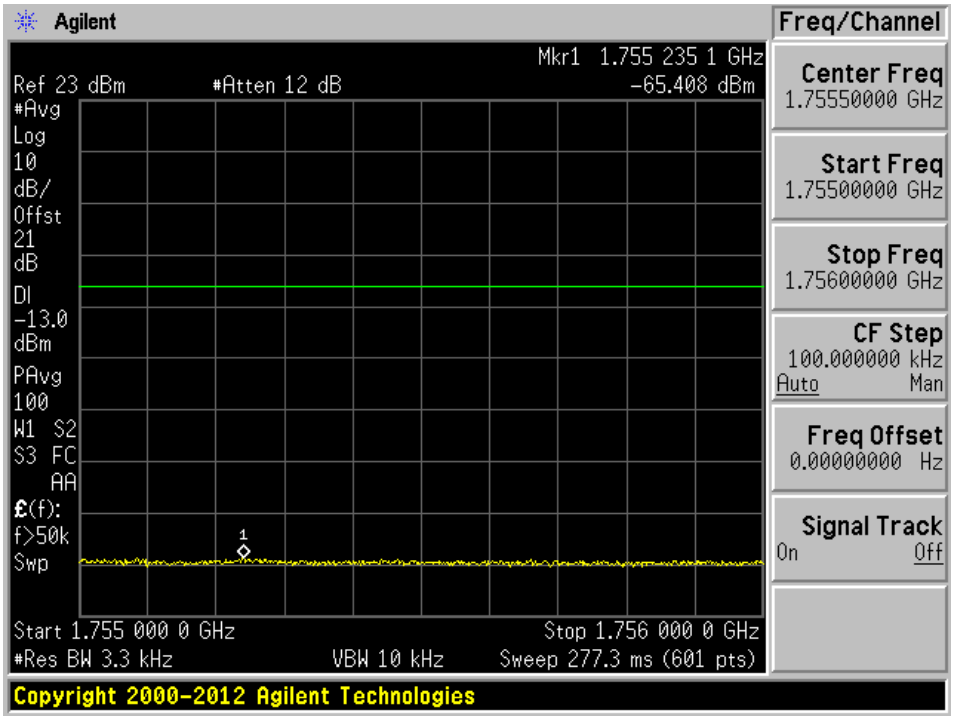
AWS Band, Uplink: Narrowband signal

AGC Off

Lower Band Edge

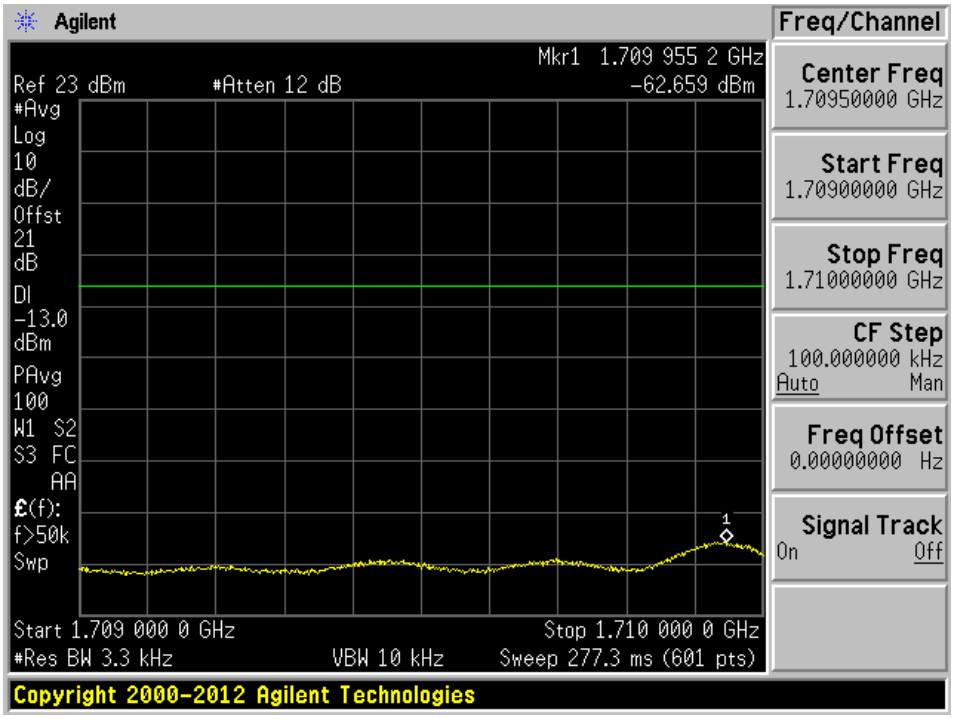


Upper Band Edge

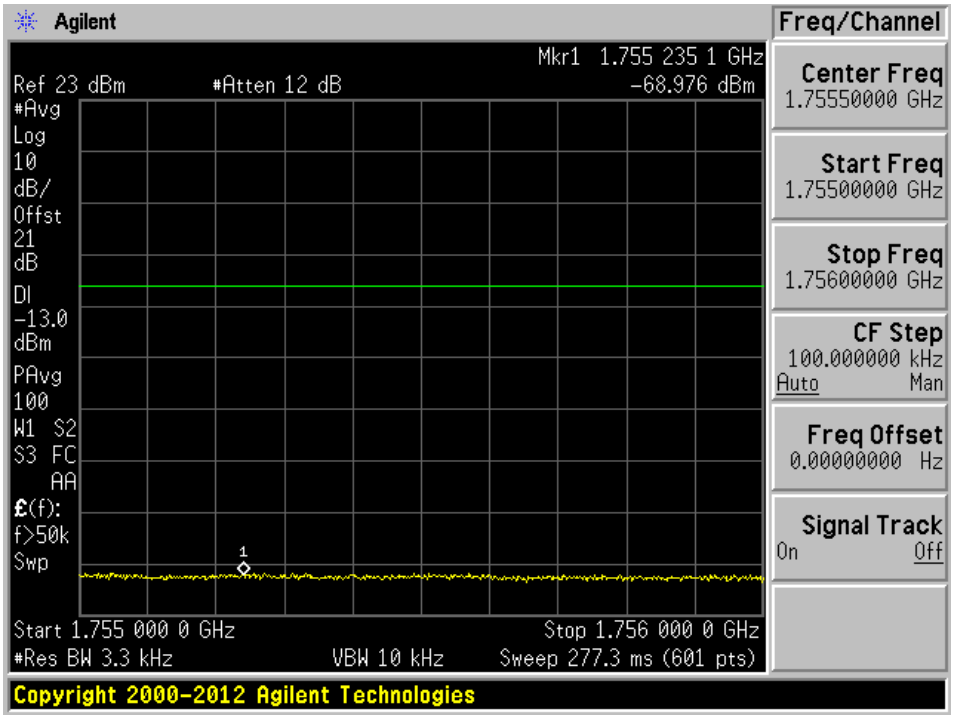


AGC On

Lower Band Edge



Upper Band Edge

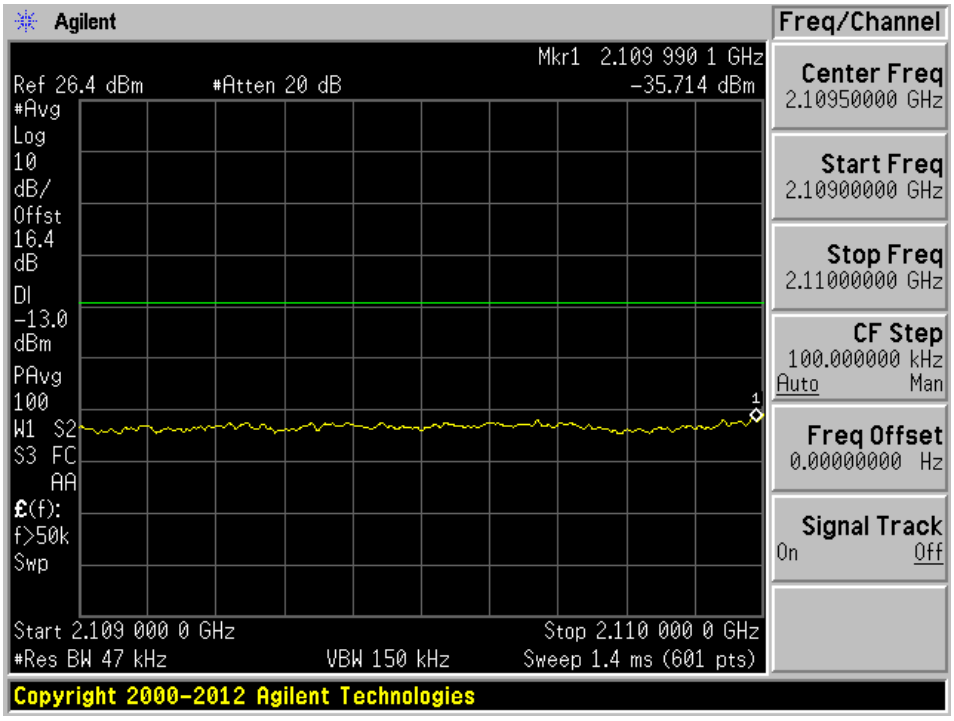


Intermodulation:

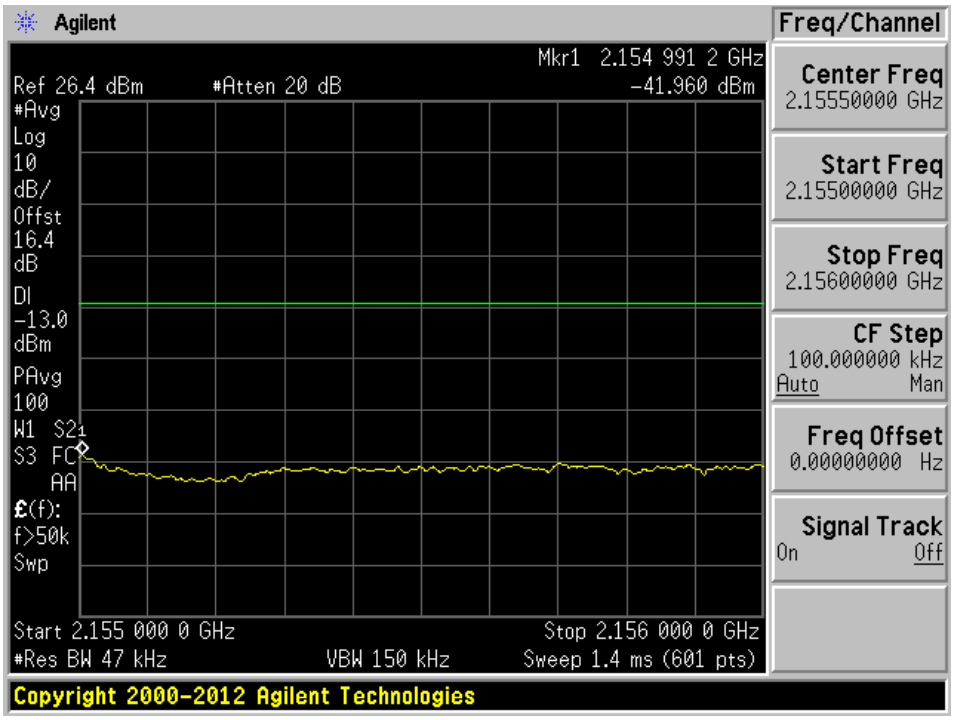
AWS Band, Downlink: Broadband signal

AGC Off

Low Channel

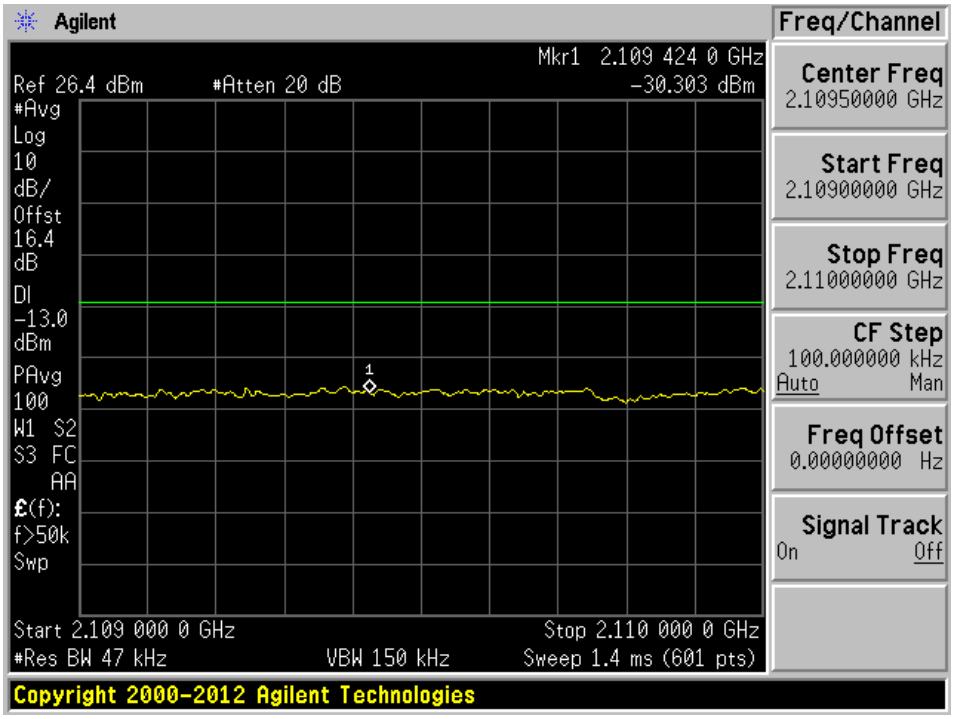


High Channel

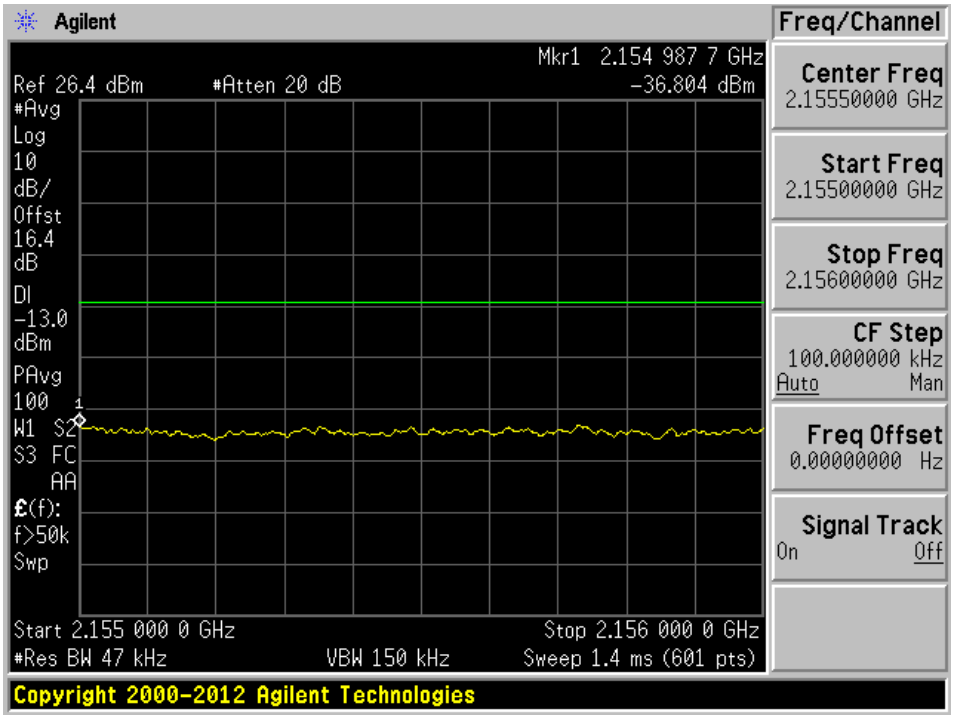


AGC On

Low Channel



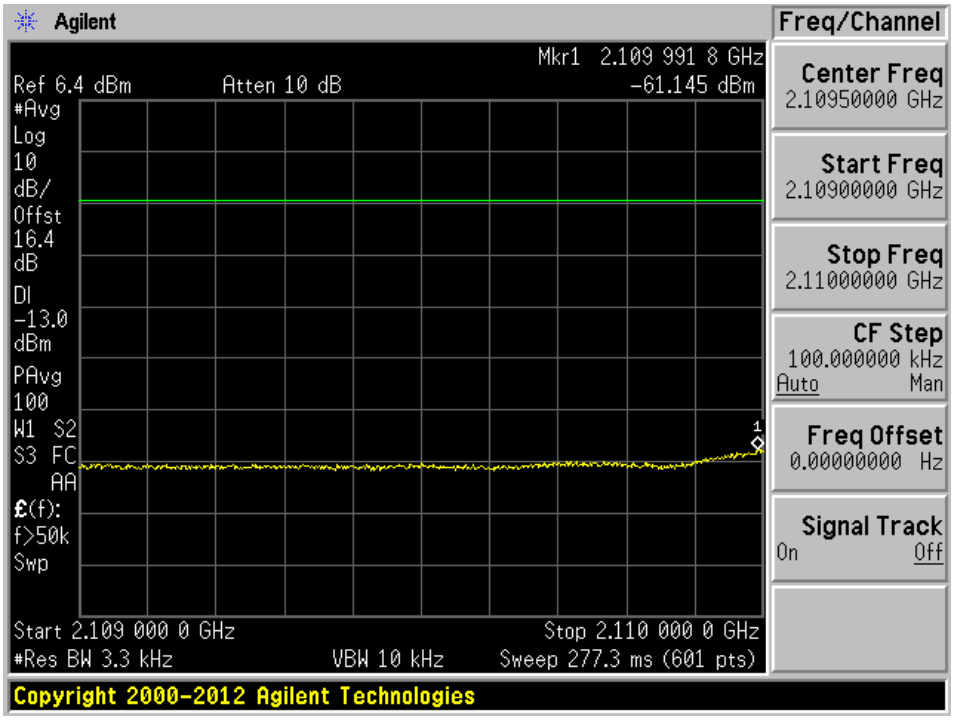
High Channel



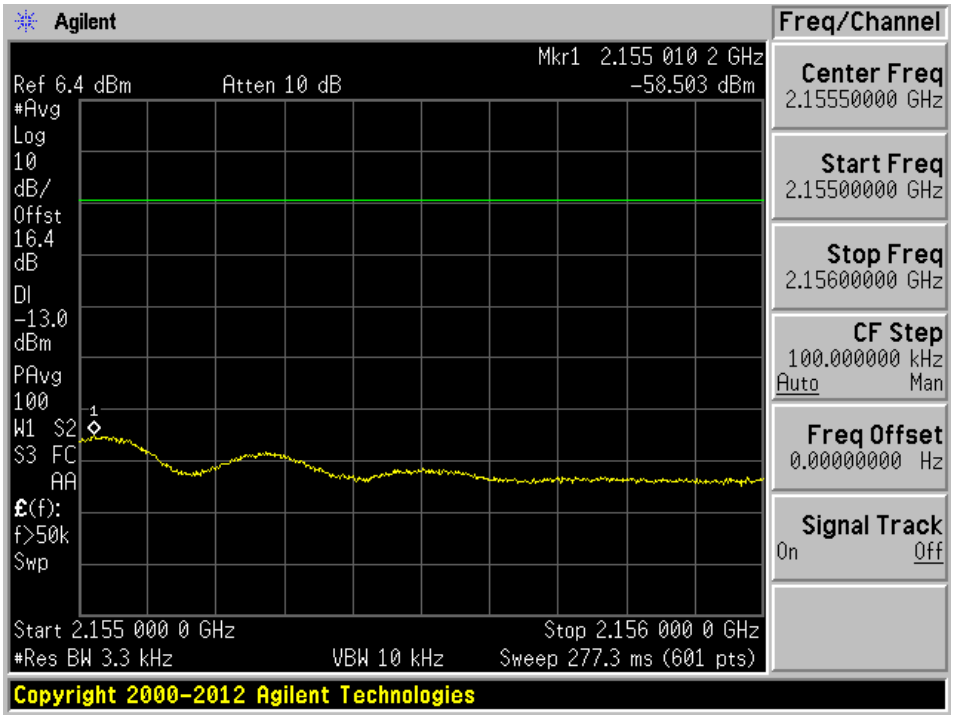
AWS Band, Downlink: Narrowband Signal

AGC Off

Low Channel

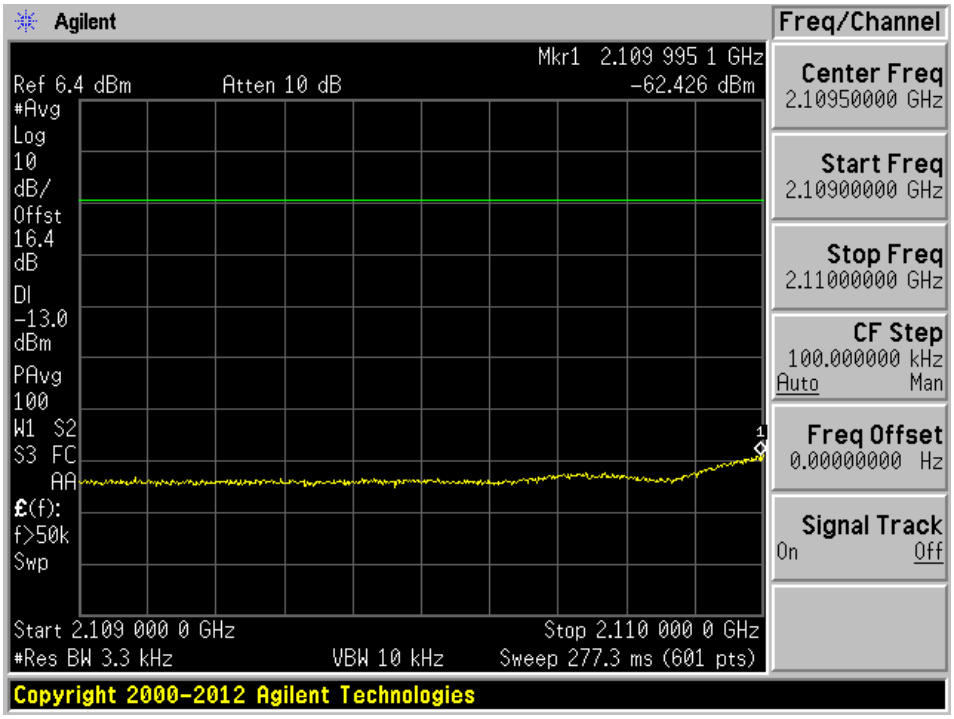


High Channel

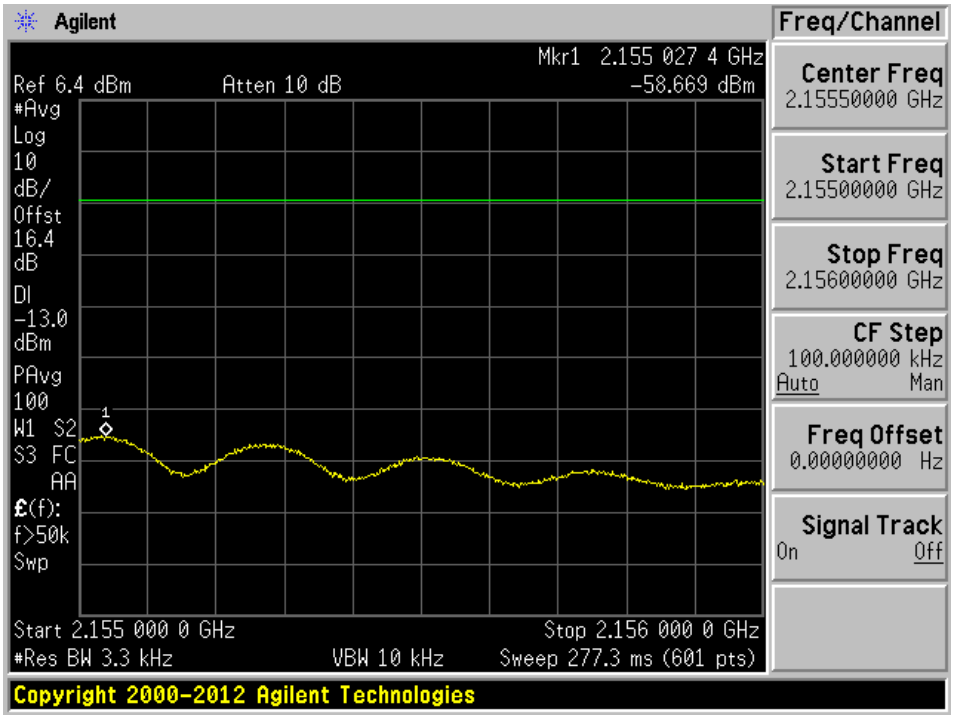


AGC On

Low Channel



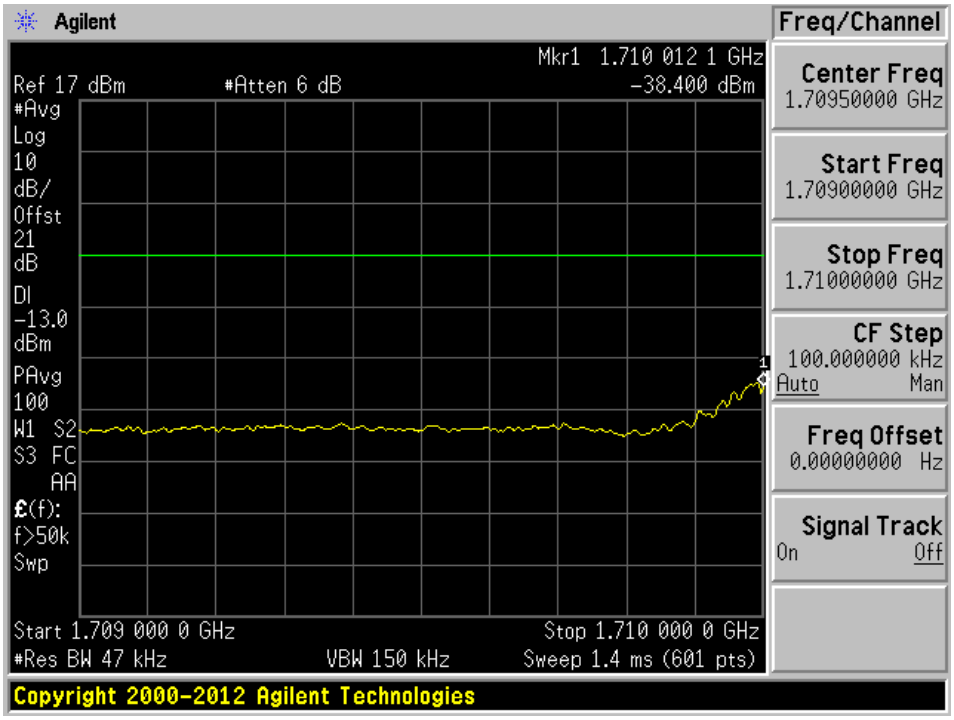
High Channel



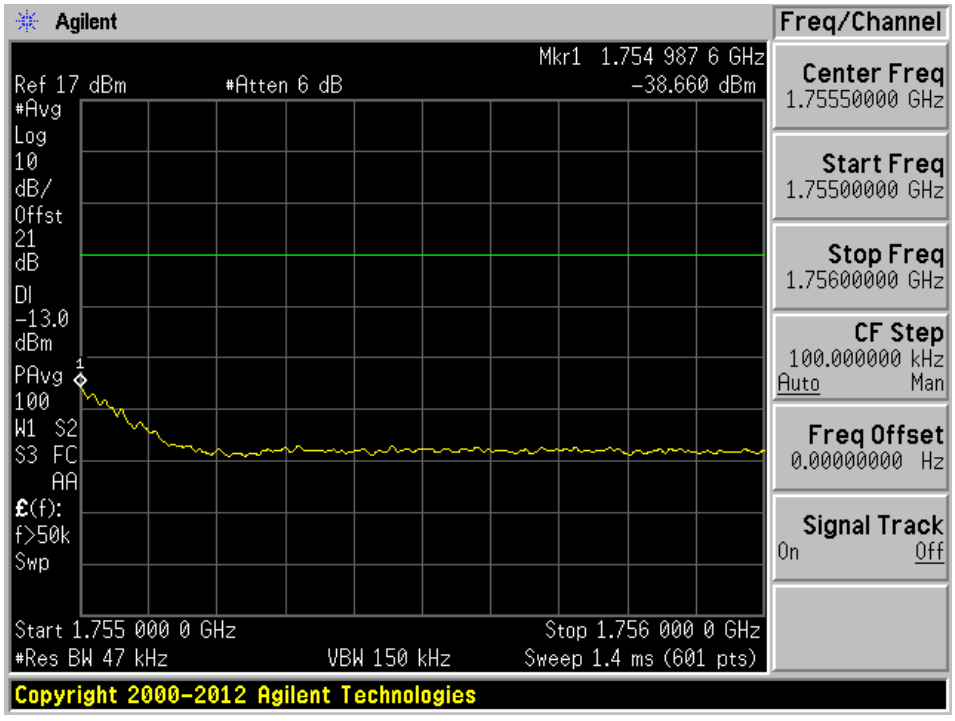
AWS Band, Uplink: Broadband Signal

AGC Off

Low Channel

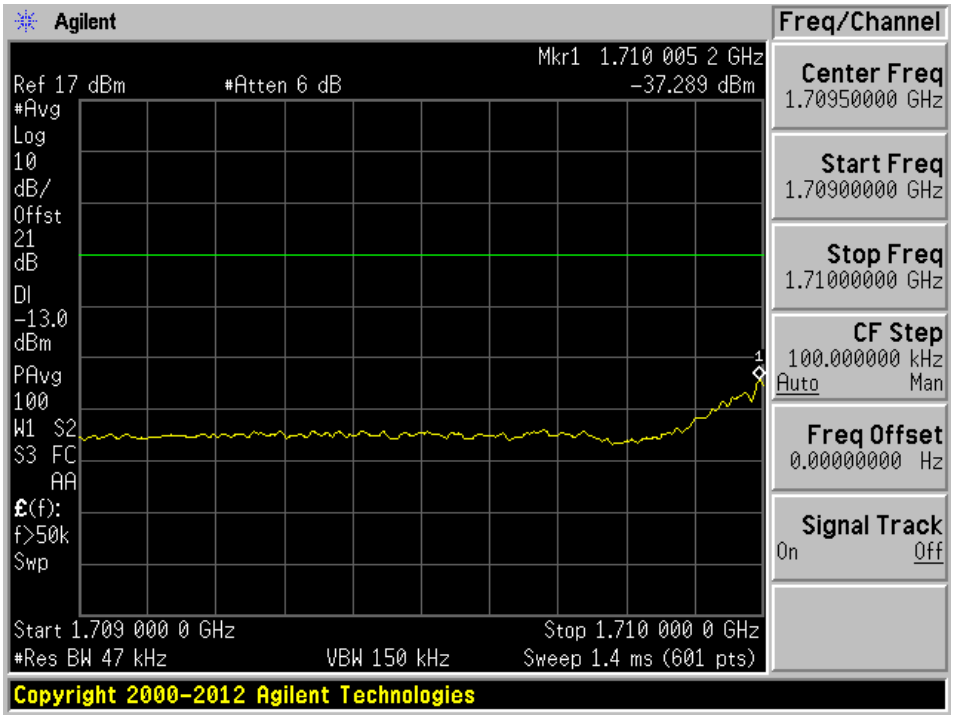


High Channel

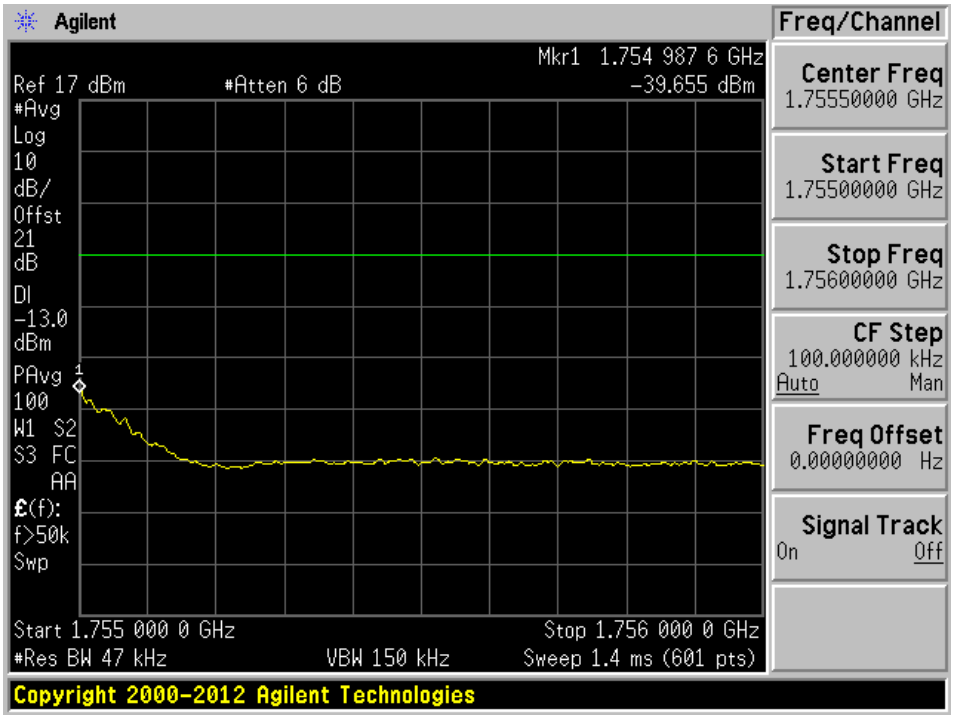


AGC On

Low Channel



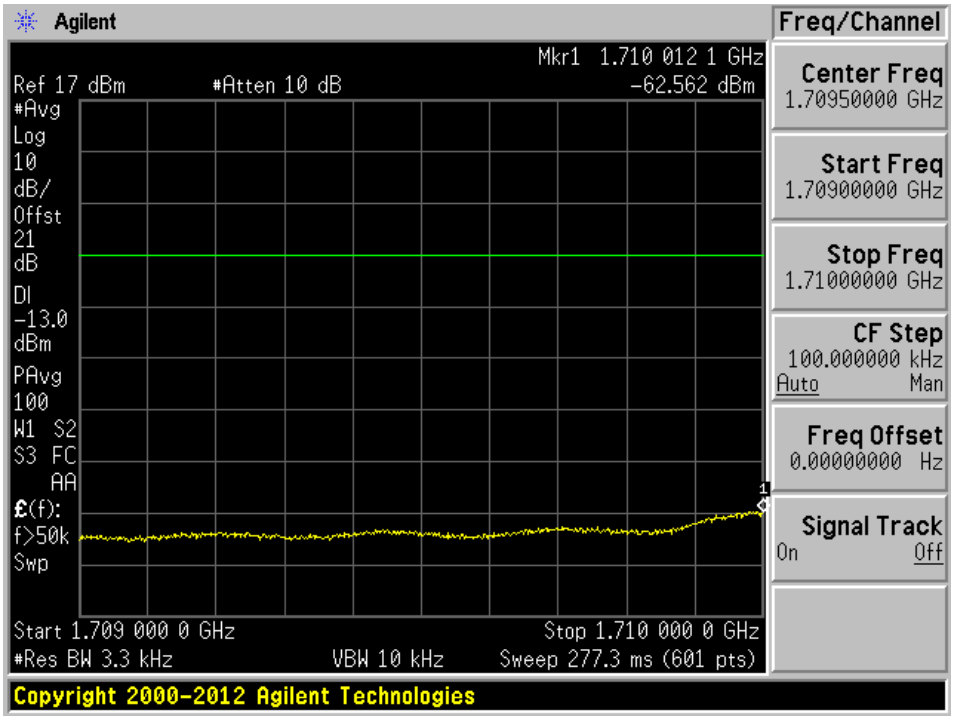
High Channel



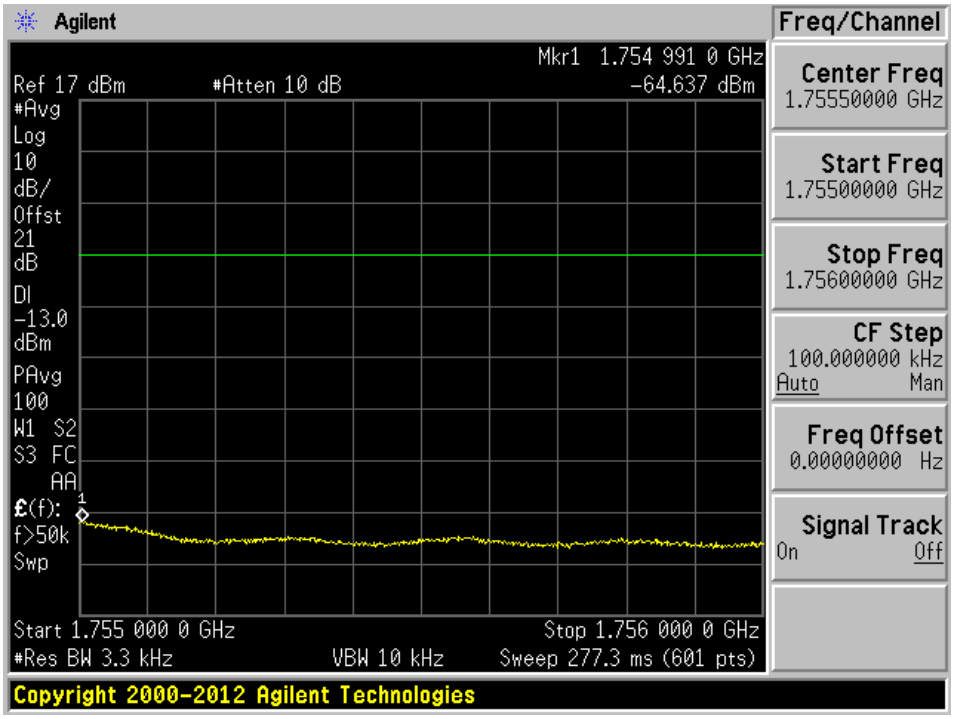
AWS Band, Uplink: Narrowband Signal

AGC Off

Low Channel

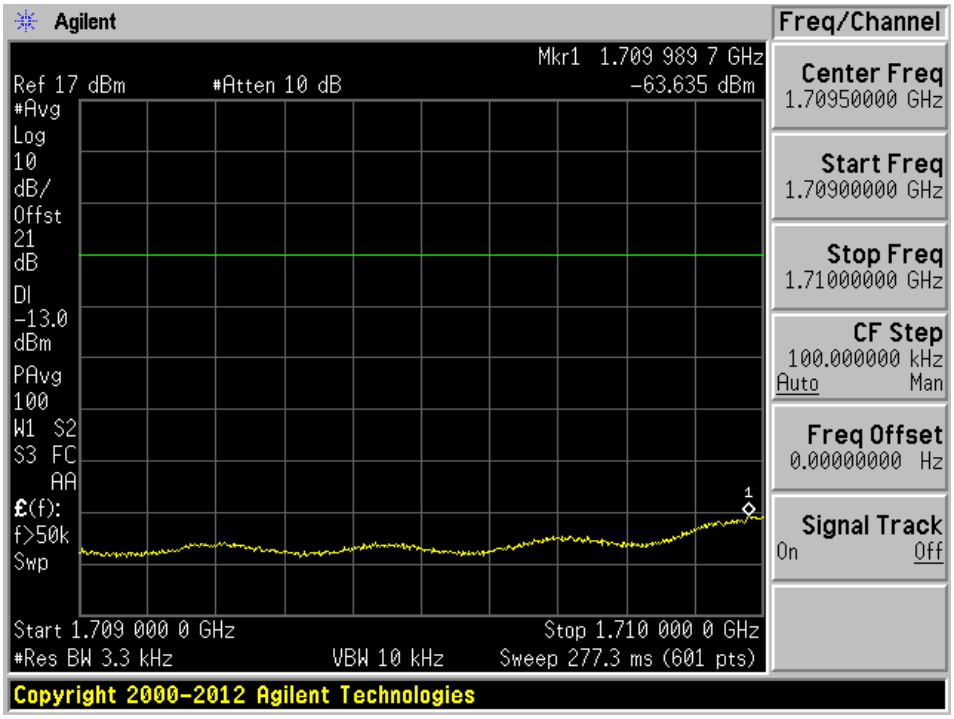


High Channel

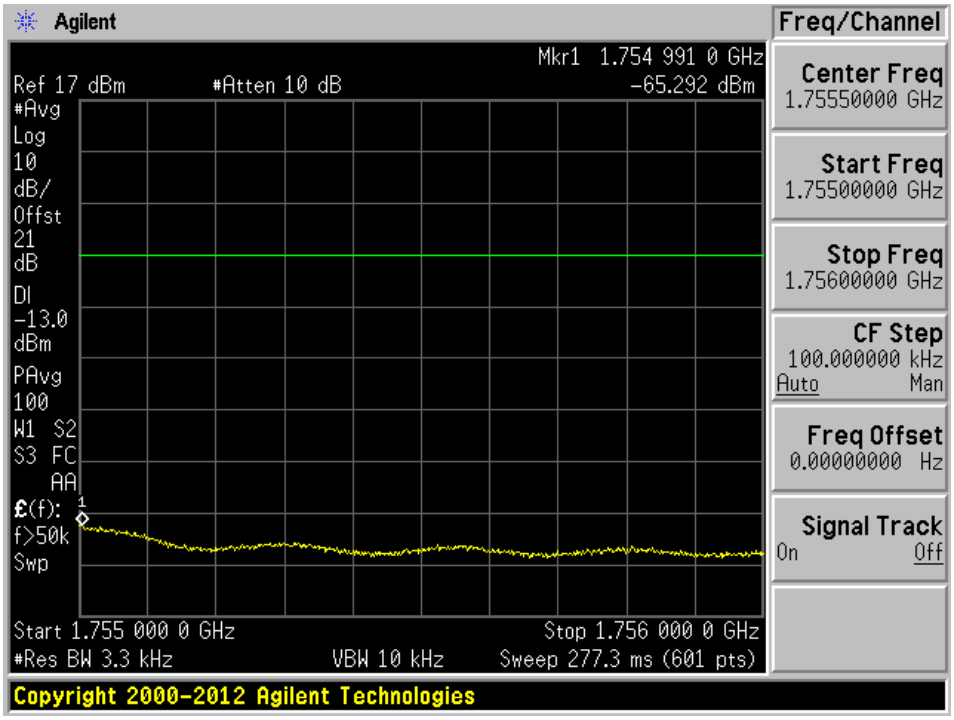


AGC On

Low Channel



High Channel

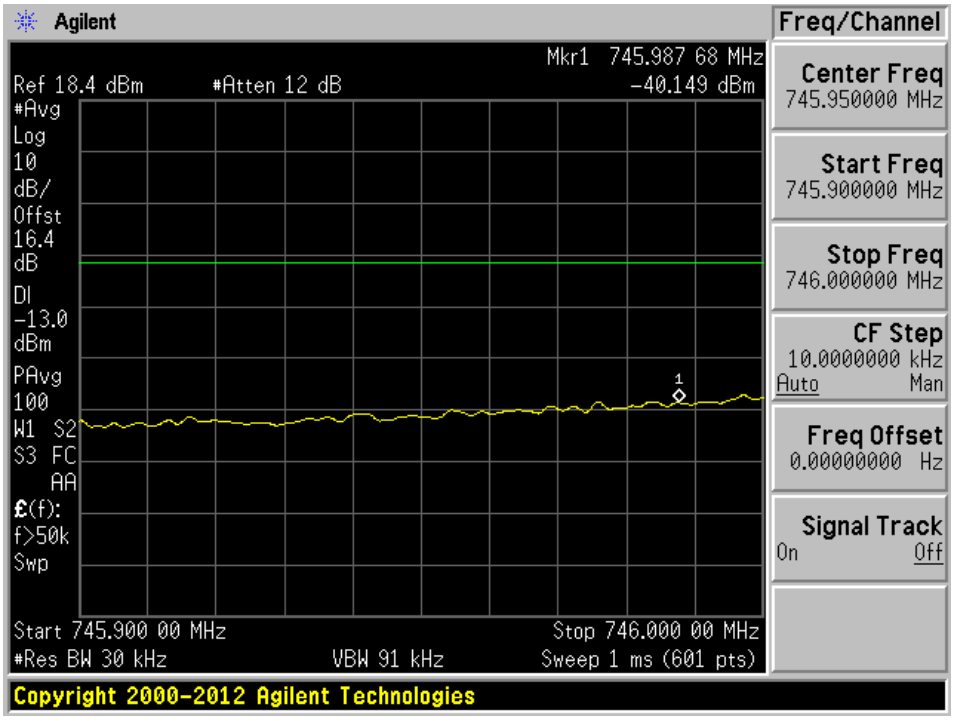


Band Edge:

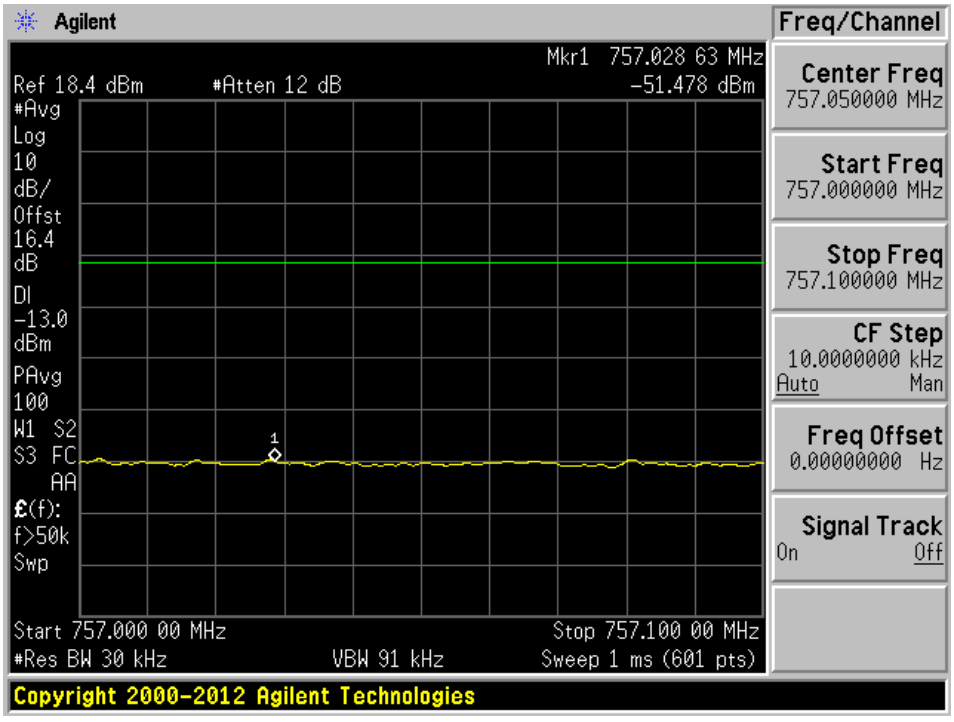
LTE Band 13, Downlink: Broadband signal

AGC Off

Lower Band Edge

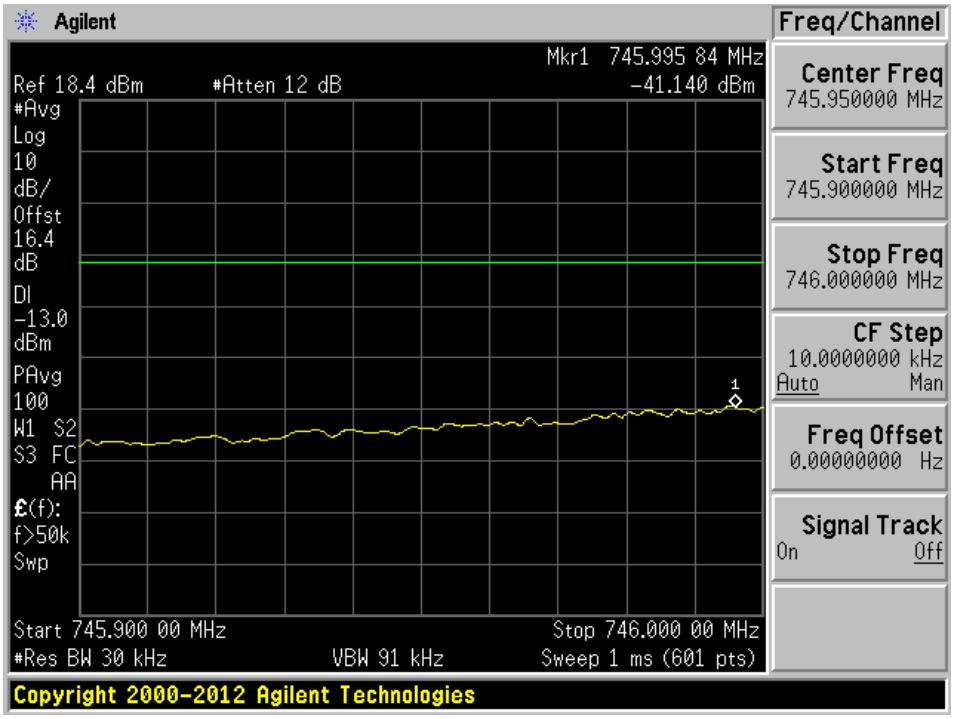


Upper Band Edge

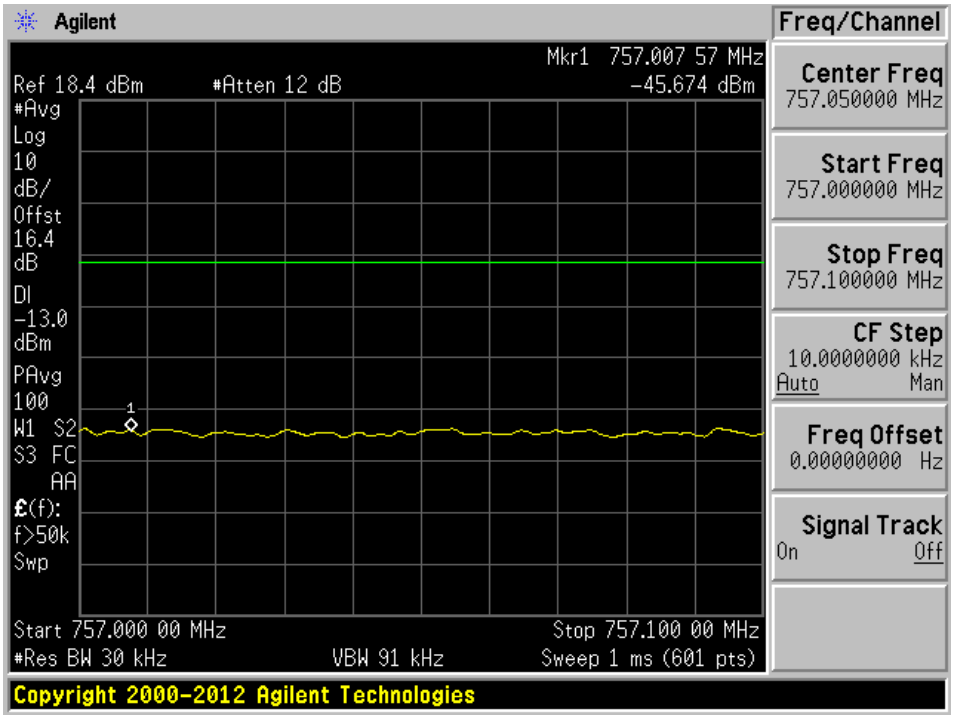


AGC On

Lower Band Edge



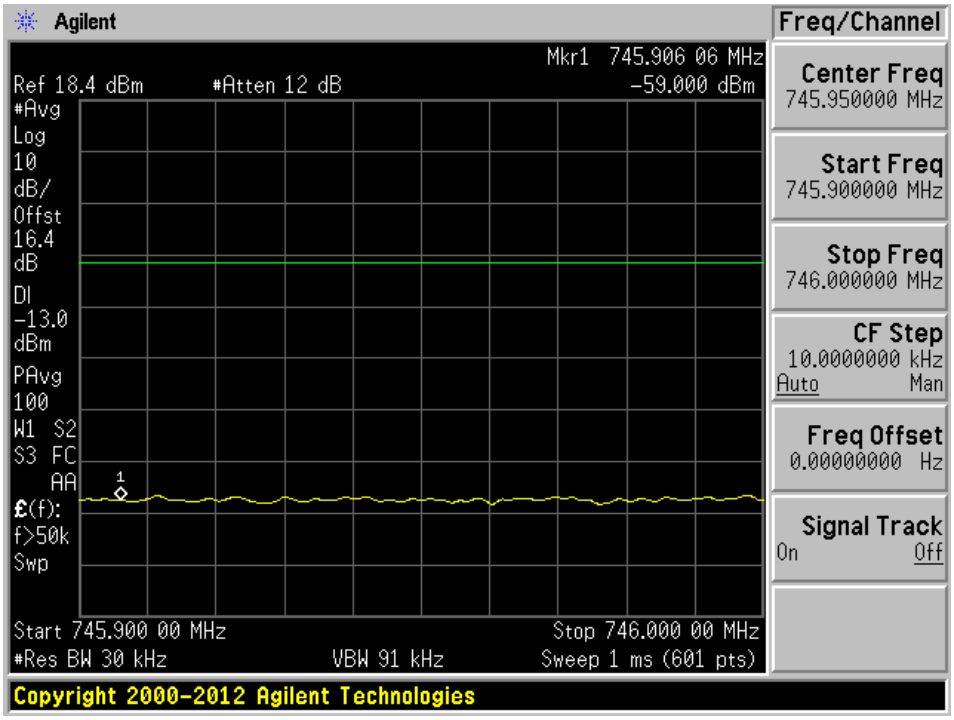
Upper Band Edge



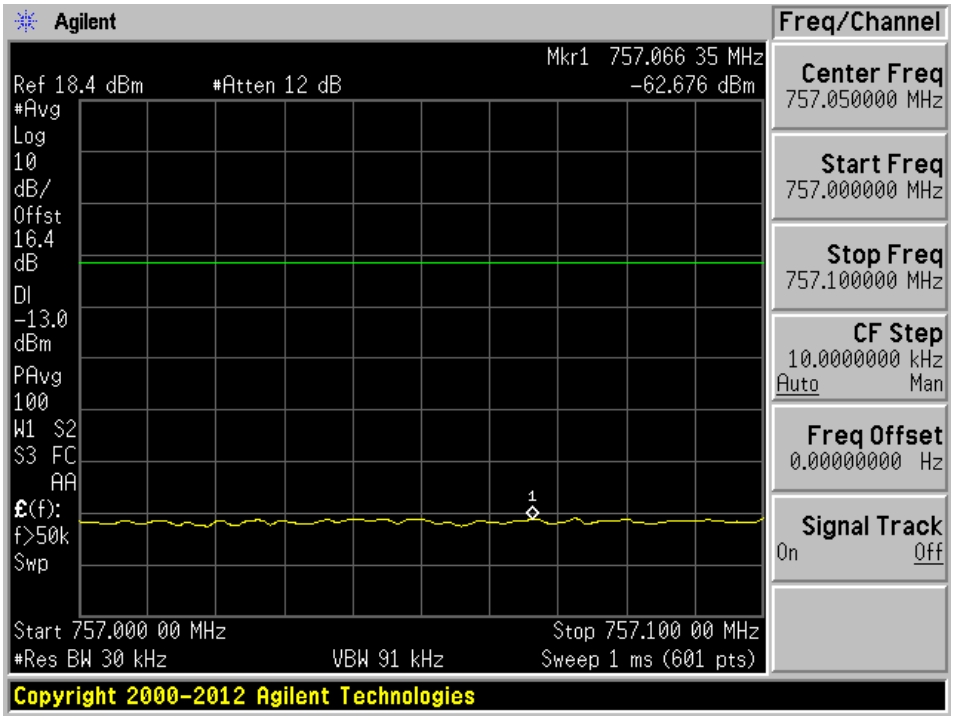
LTE Band 13, Downlink: Narrowband Signal

AGC Off

Lower Band Edge

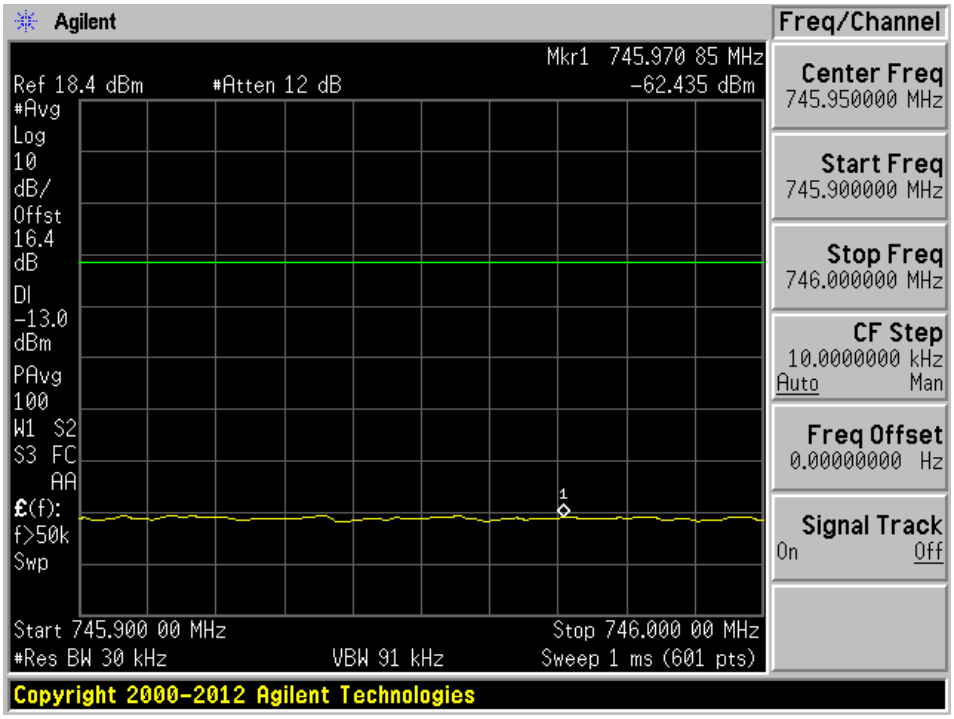


Upper Band Edge

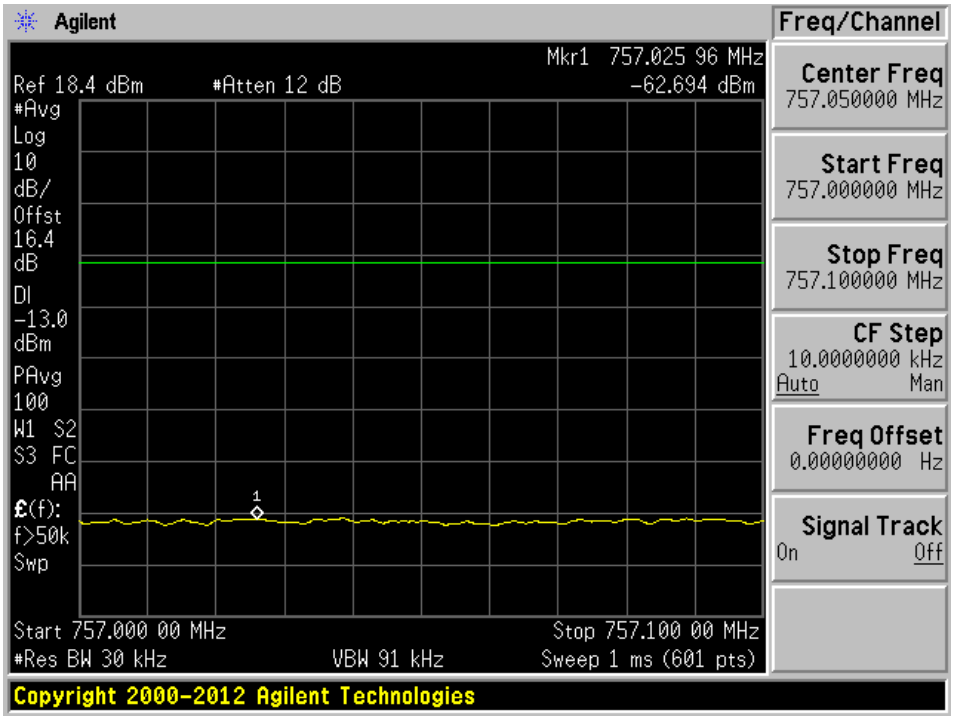


AGC On

Lower Band Edge



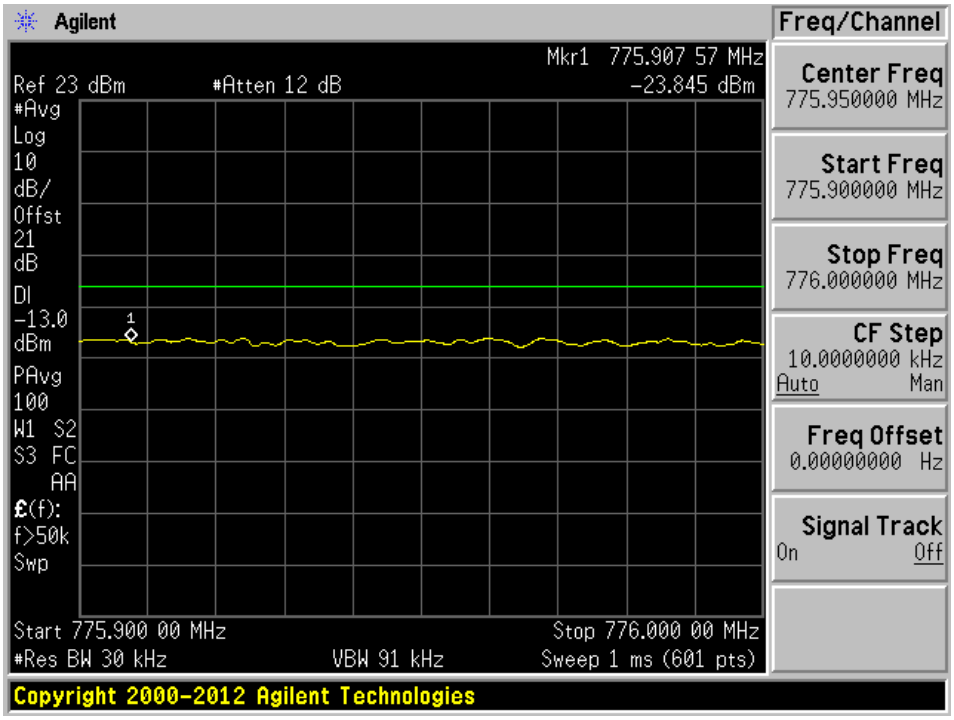
Upper Band Edge



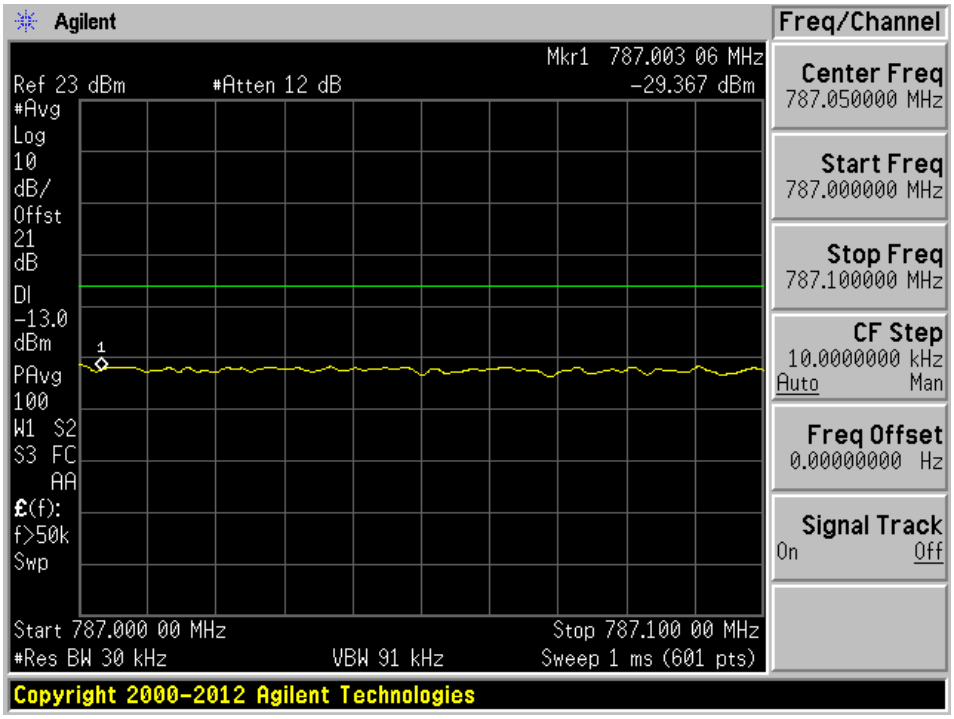
LTE Band 13, Uplink: Broadband Signal

AGC Off

Lower Band Edge

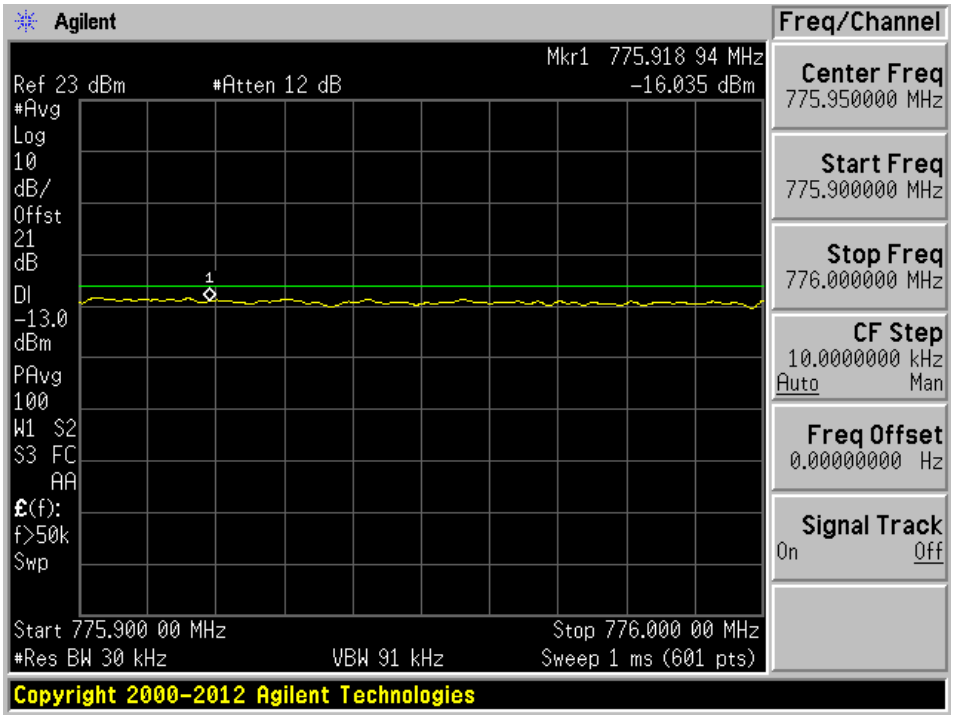


Upper Band Edge

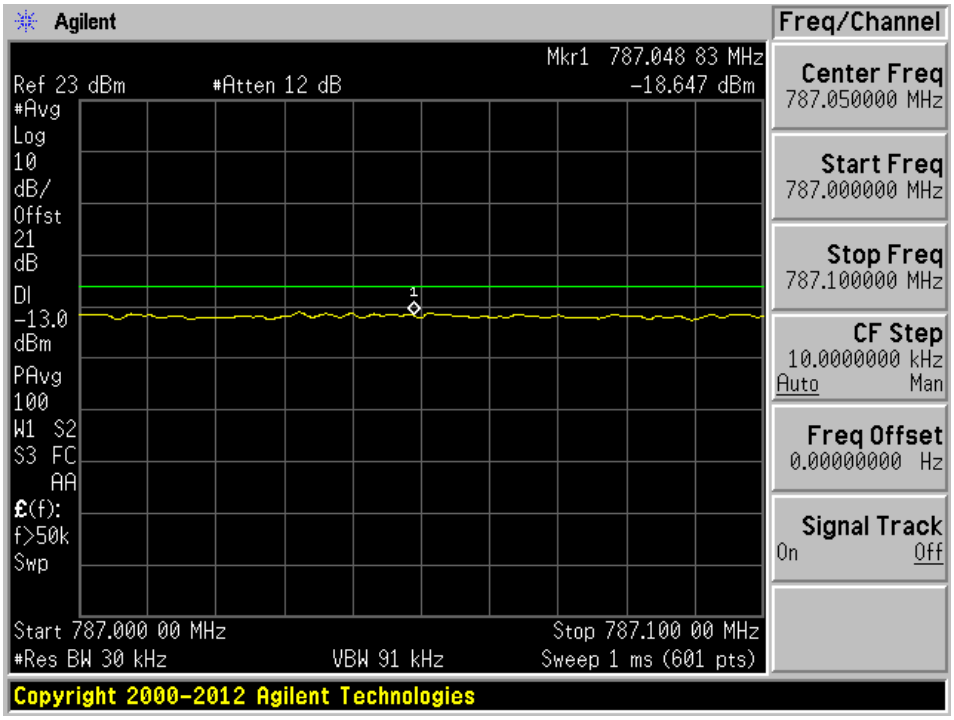


AGC On

Lower Band Edge



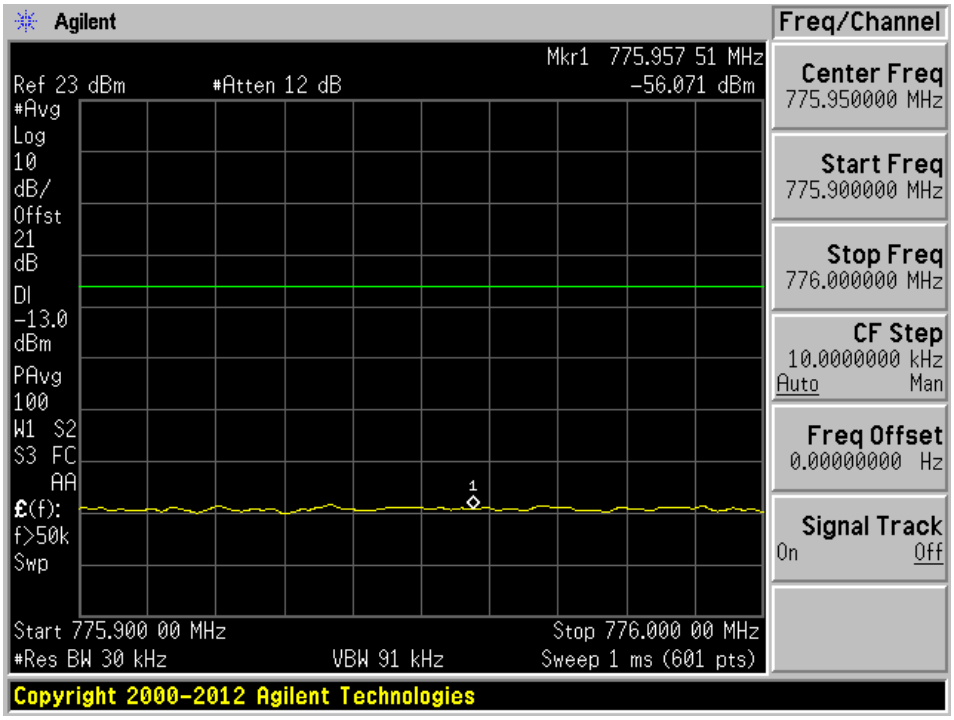
Upper Band Edge



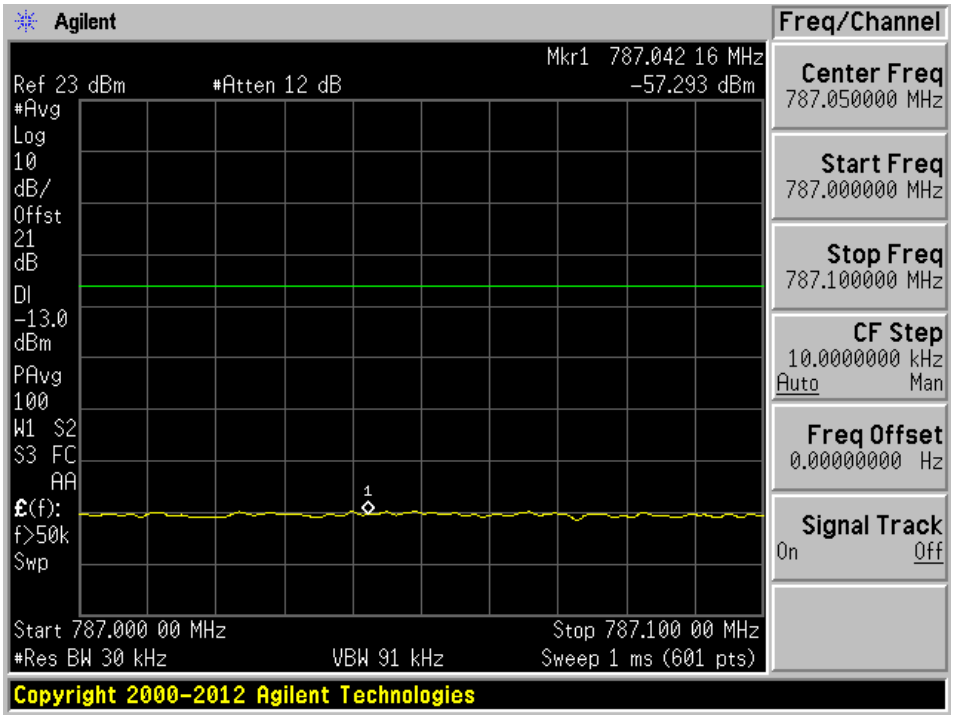
LTE Band 13, Uplink: Narrowband Signal

AGC Off

Lower Band Edge

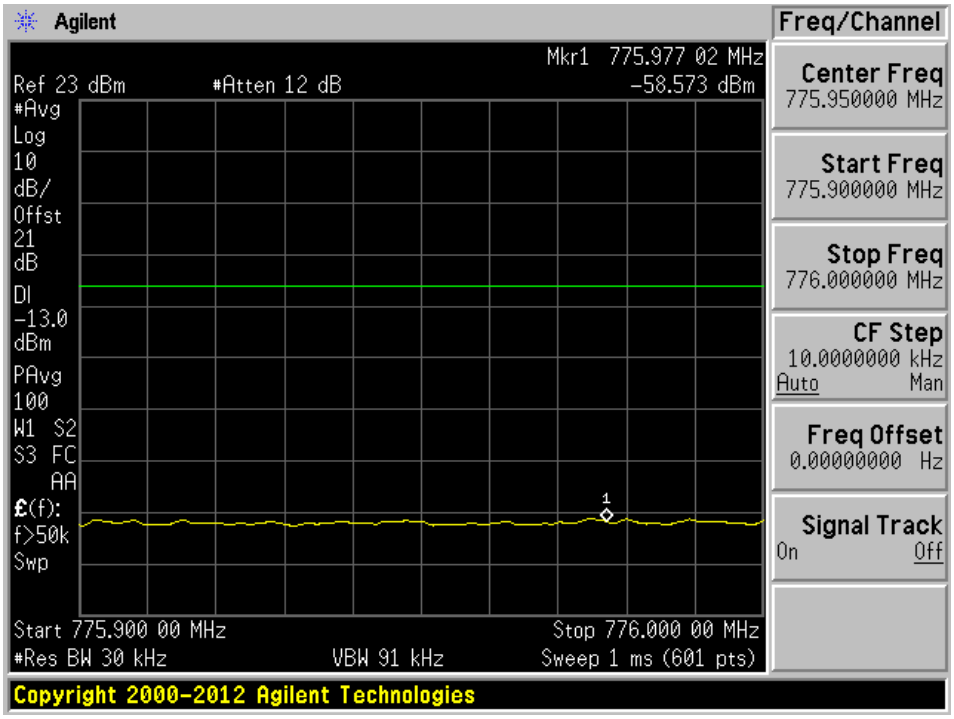


Upper Band Edge

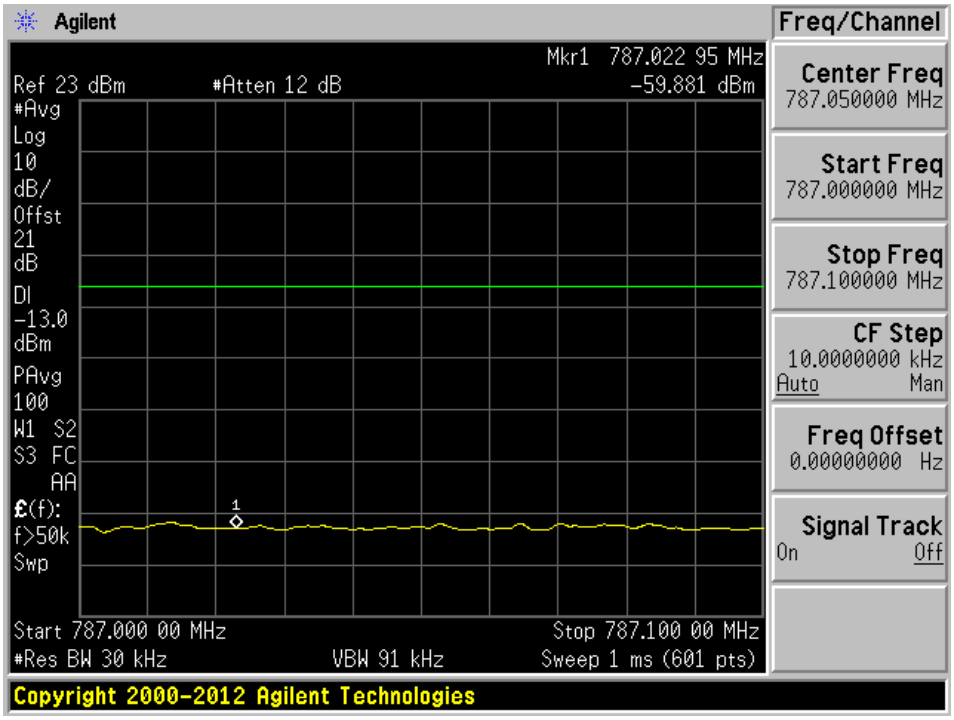


AGC On

Lower Band Edge



Upper Band Edge

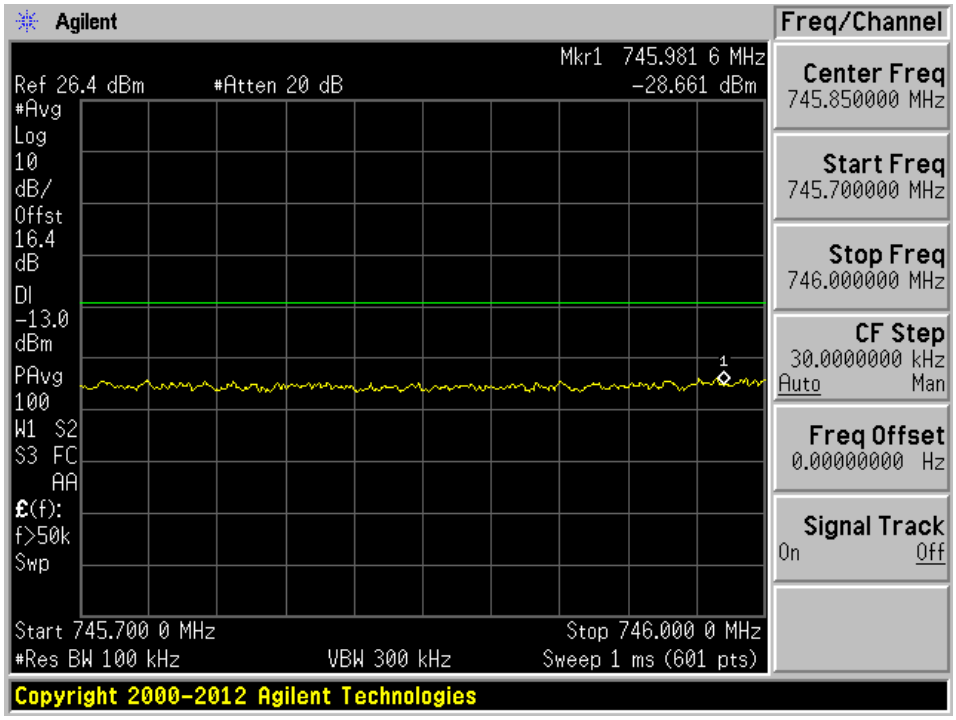


Intermodulation:

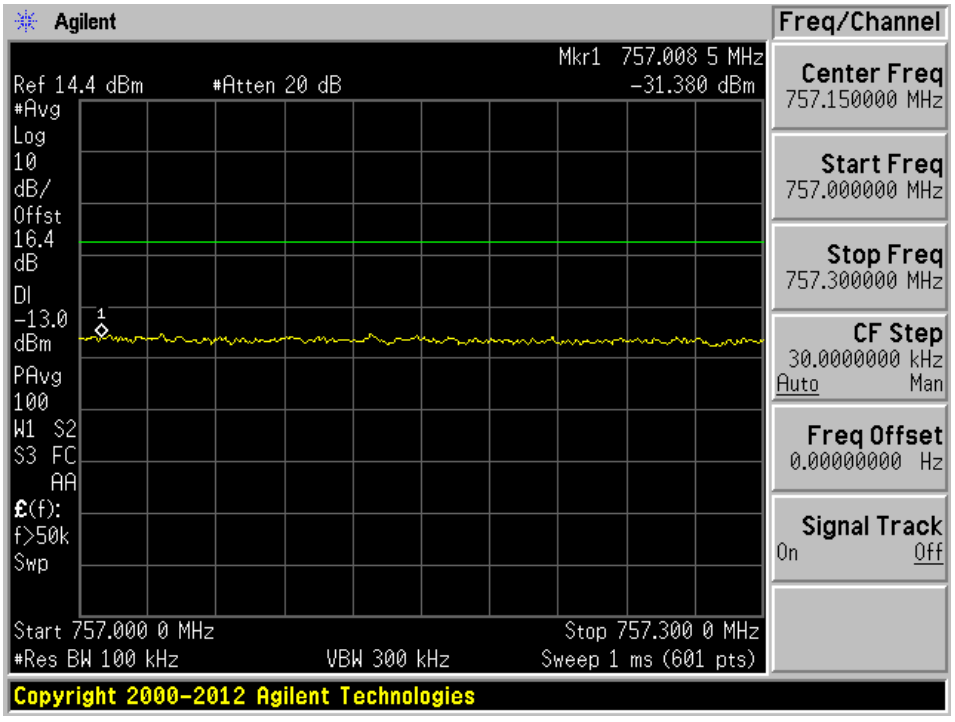
LTE Band 13, Downlink: Broadband Signal

AGC Off

Low Channel

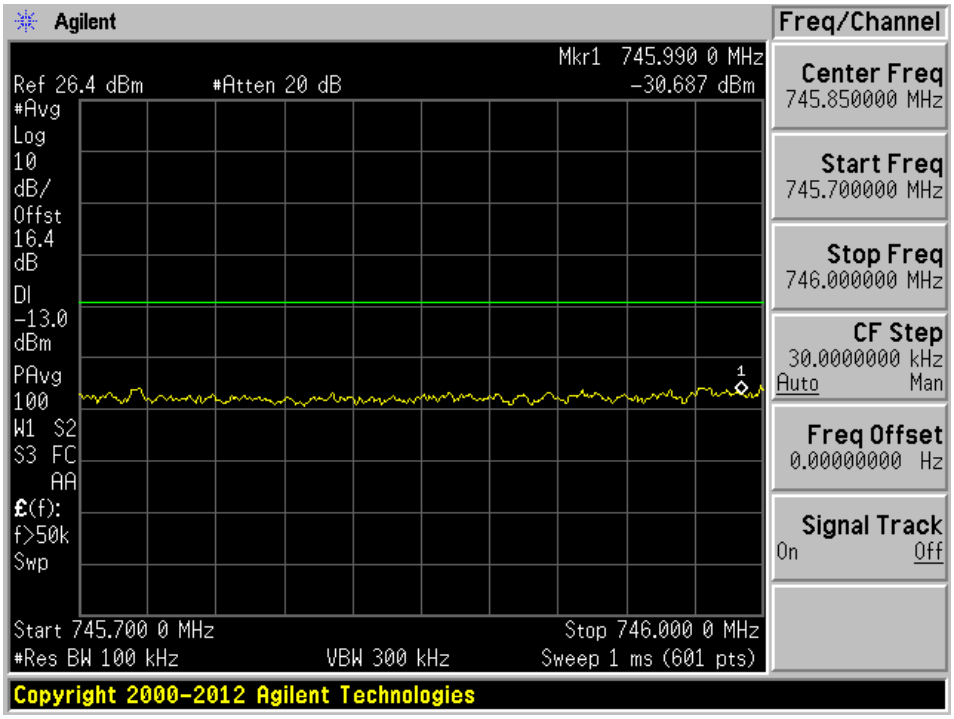


High Channel

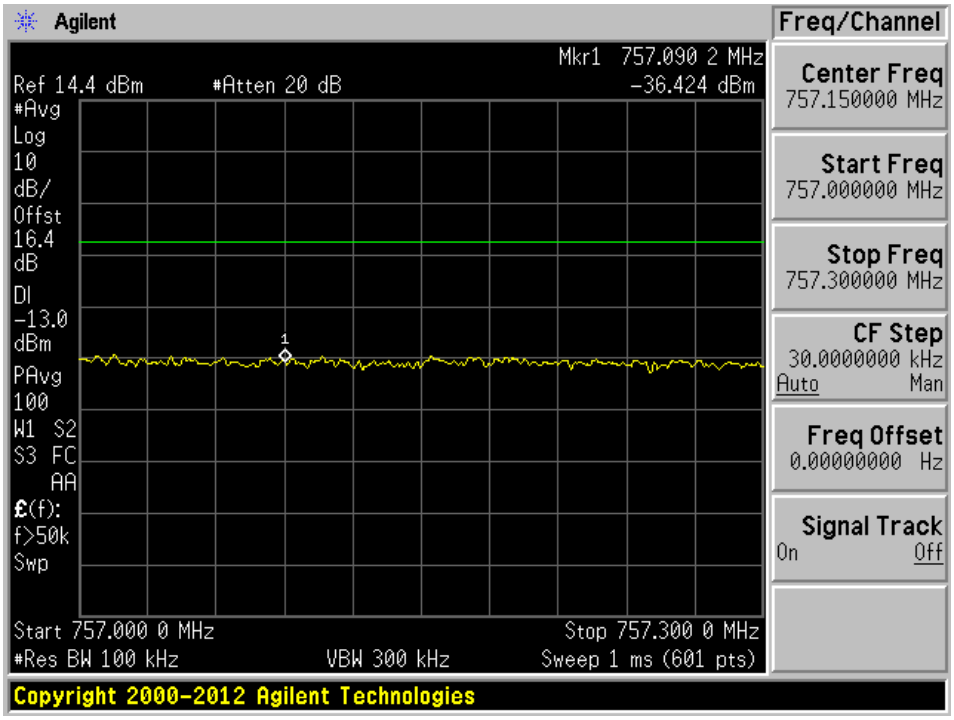


AGC On

Low Channel



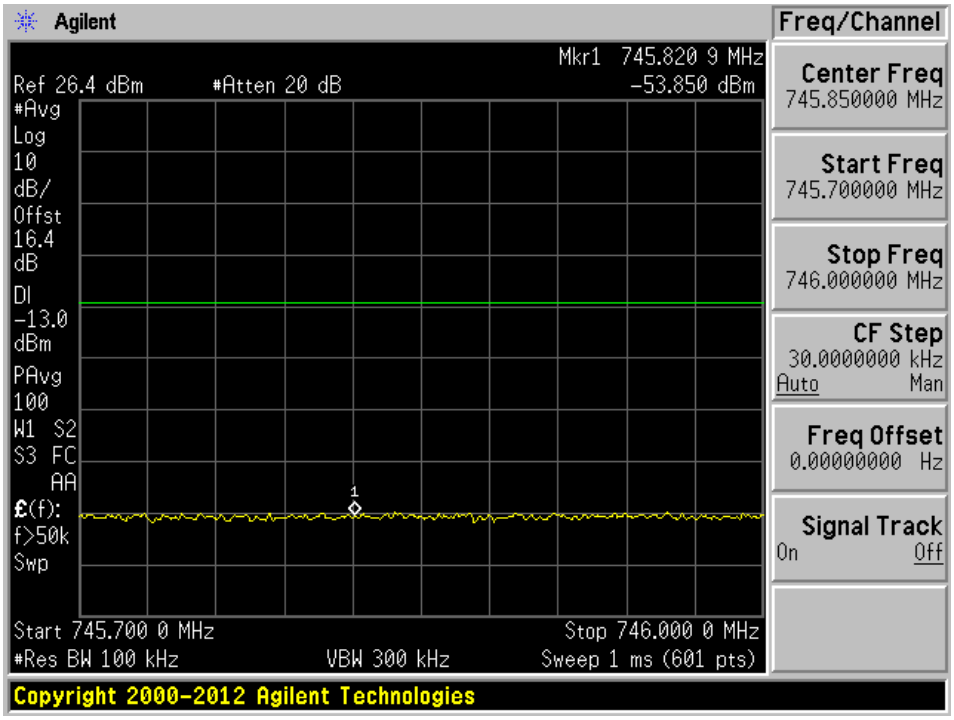
High Channel



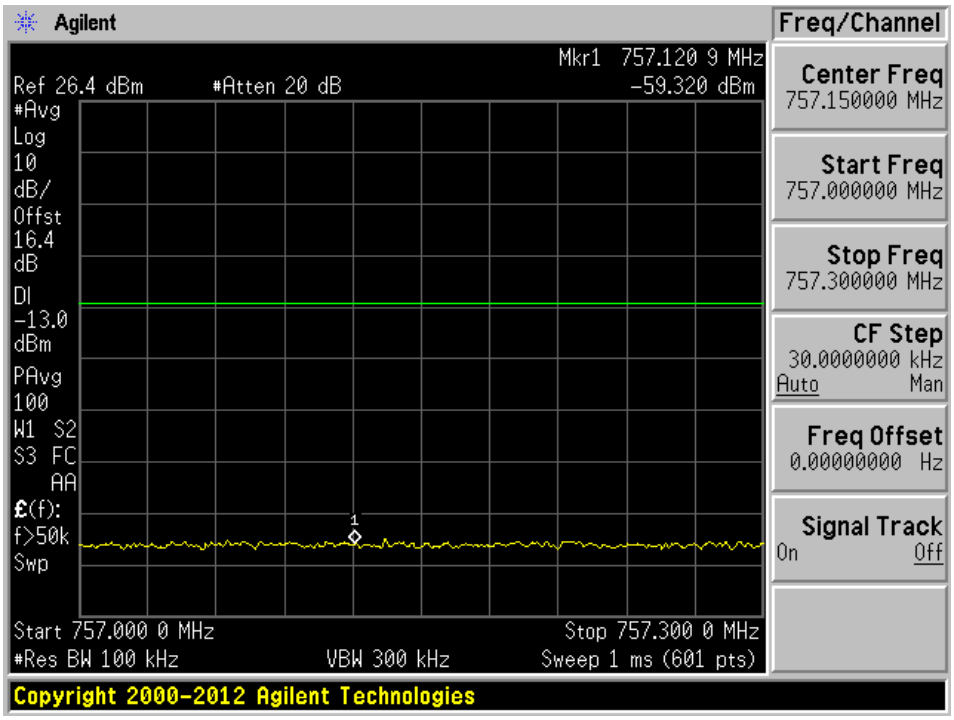
LTE Band 13, Downlink: Narrowband Signal

AGC Off

Low Channel

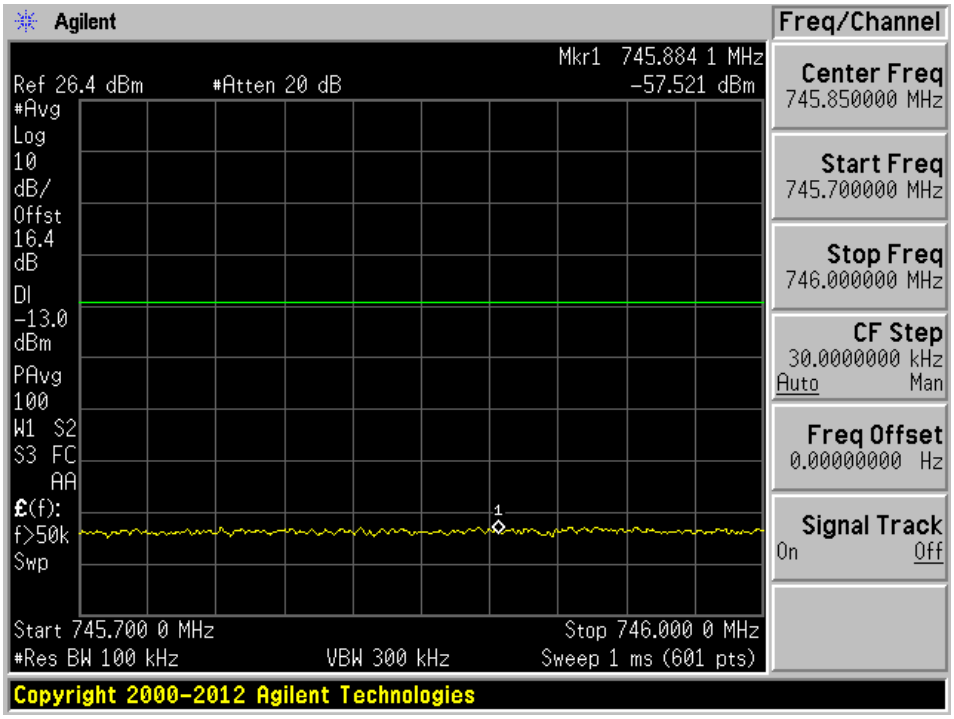


High Channel

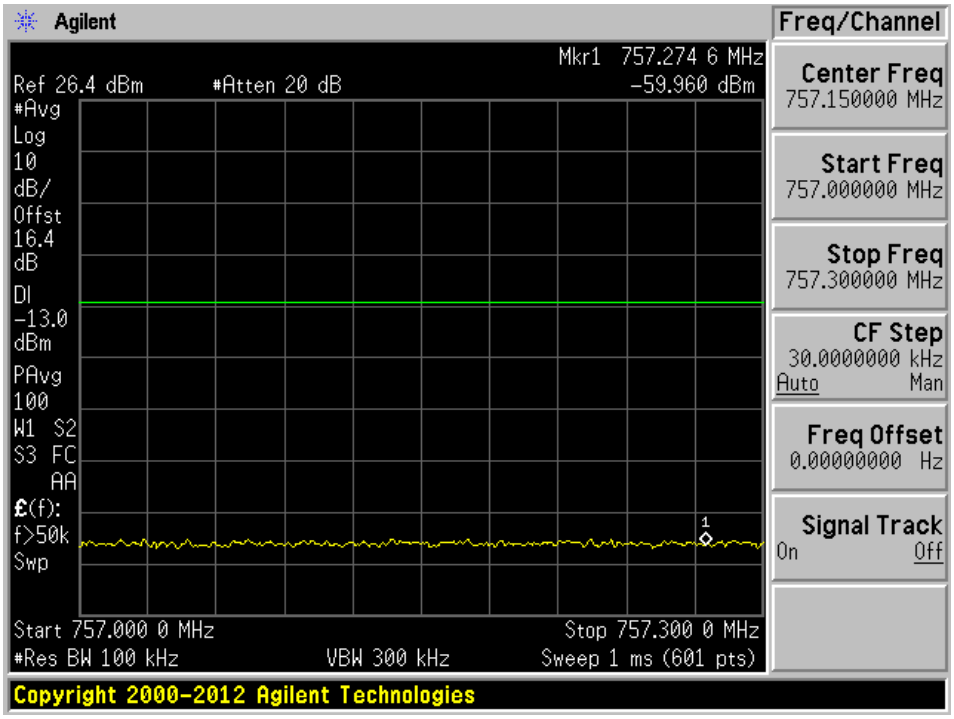


AGC On

Low Channel



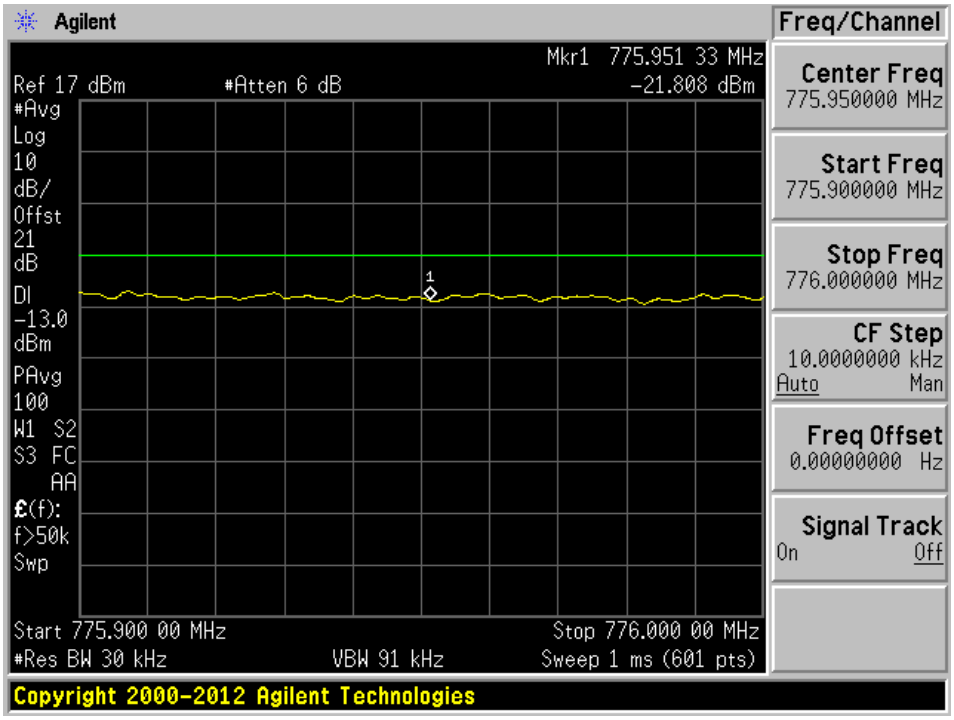
High Channel



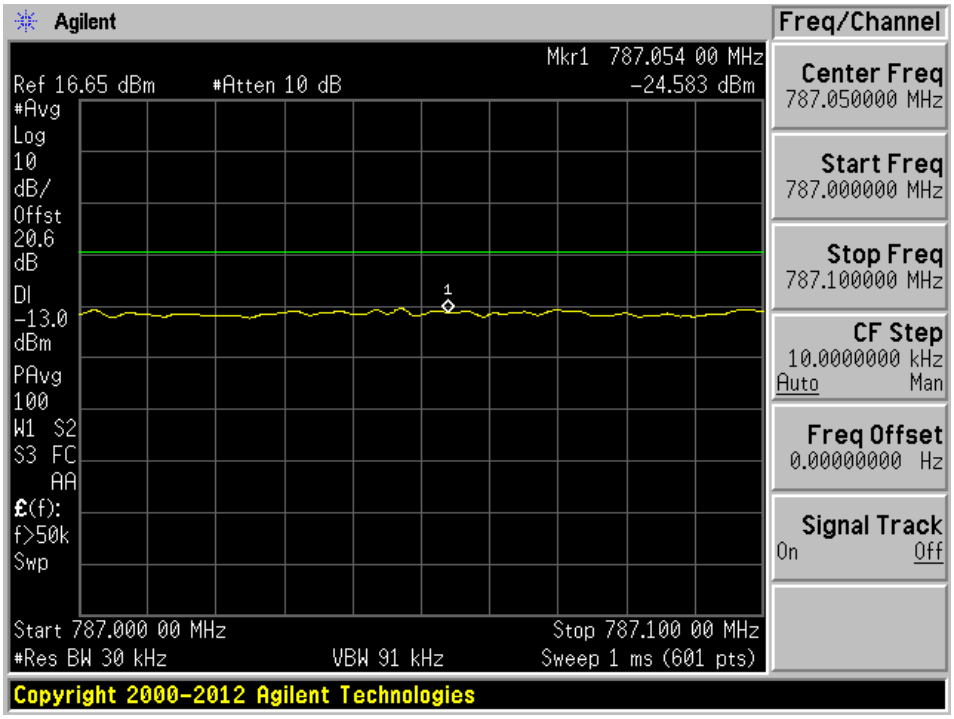
LTE Band 13, Uplink: Broadband Signal

AGC Off

Low Channel

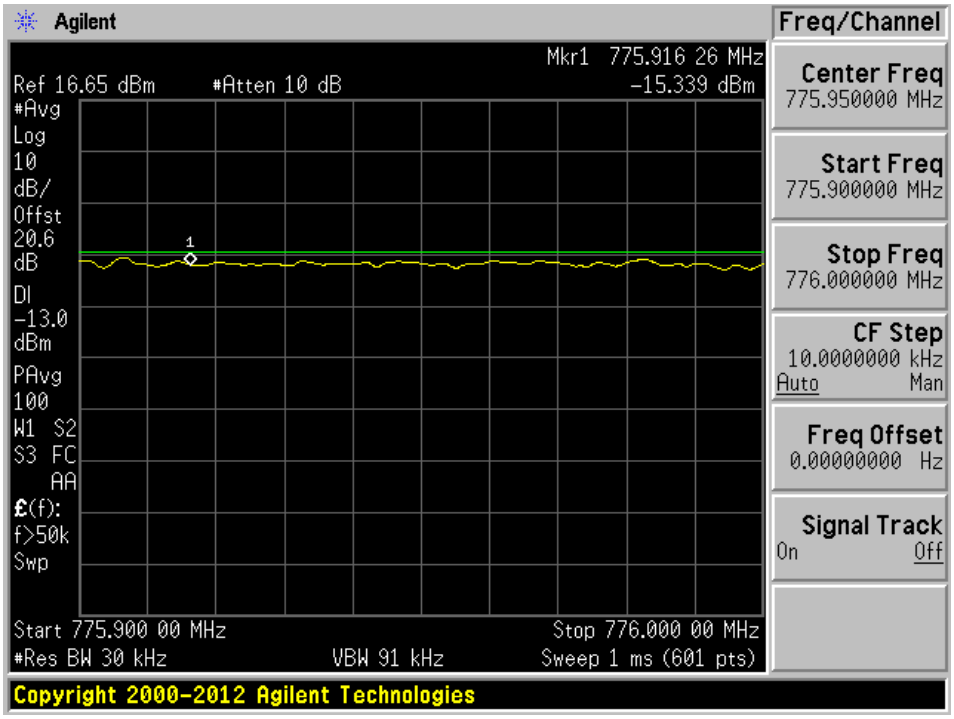


High Channel

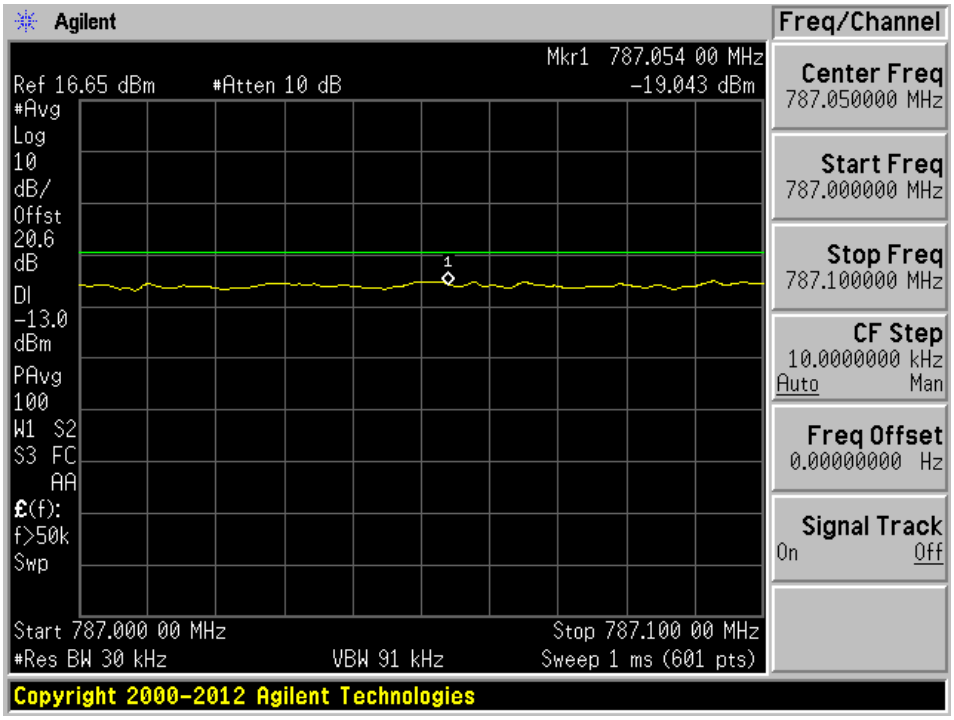


AGC On

Low Channel



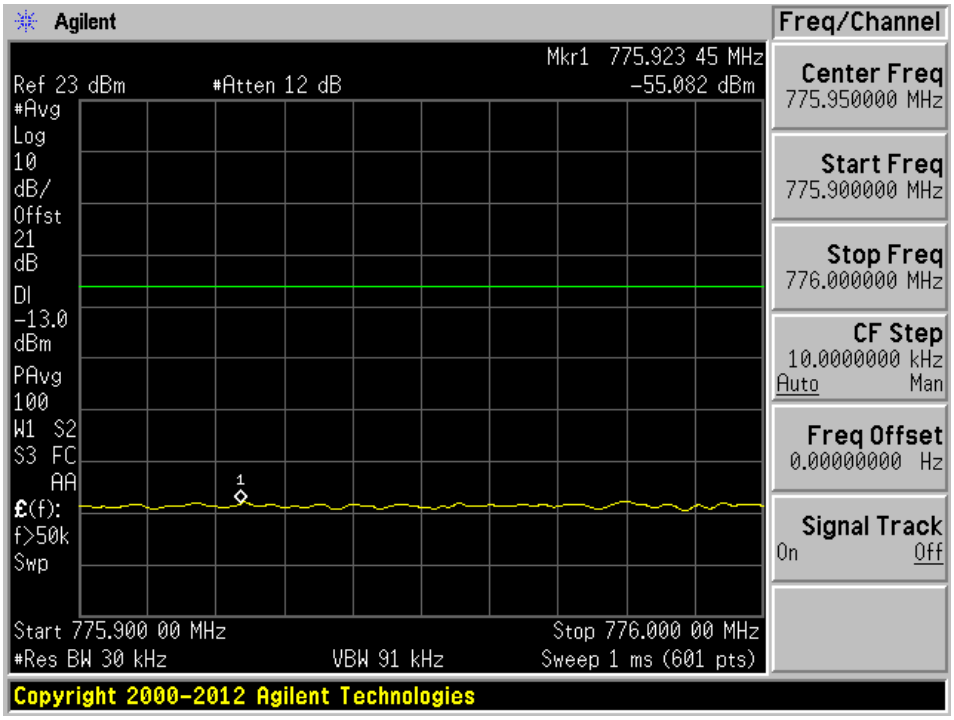
High Channel



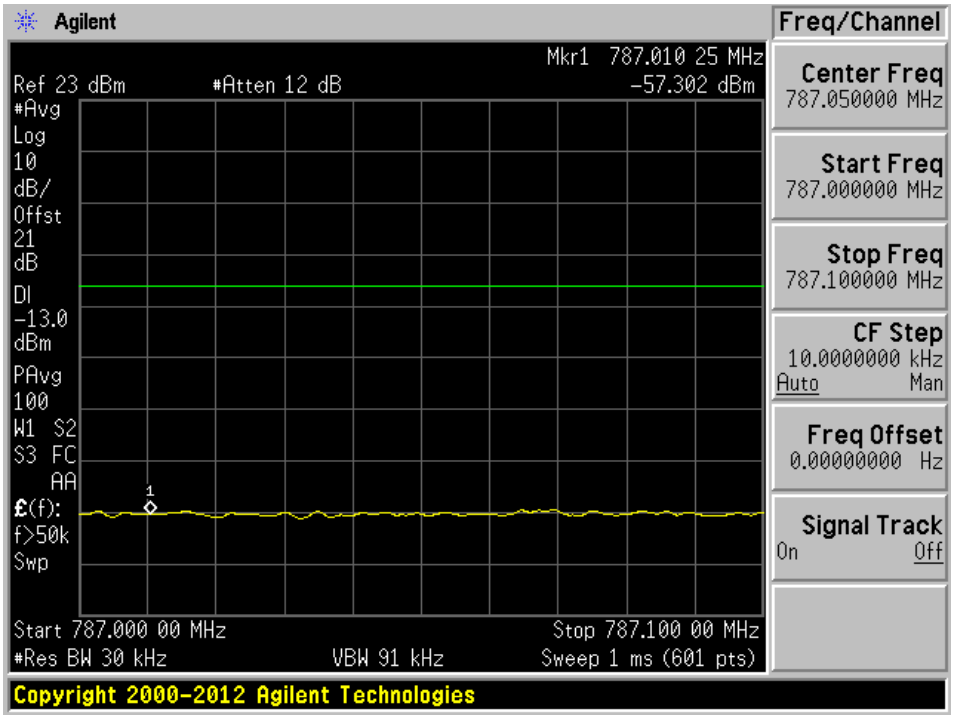
LTE Band 13, Uplink: Narrowband Signal

AGC Off

Low Channel

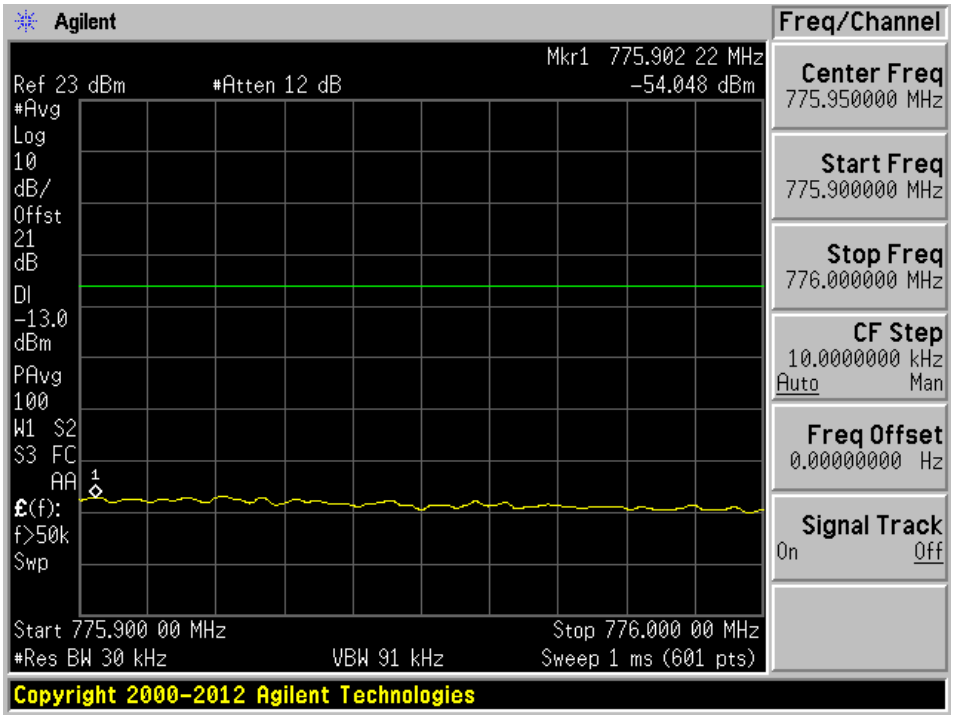


High Channel

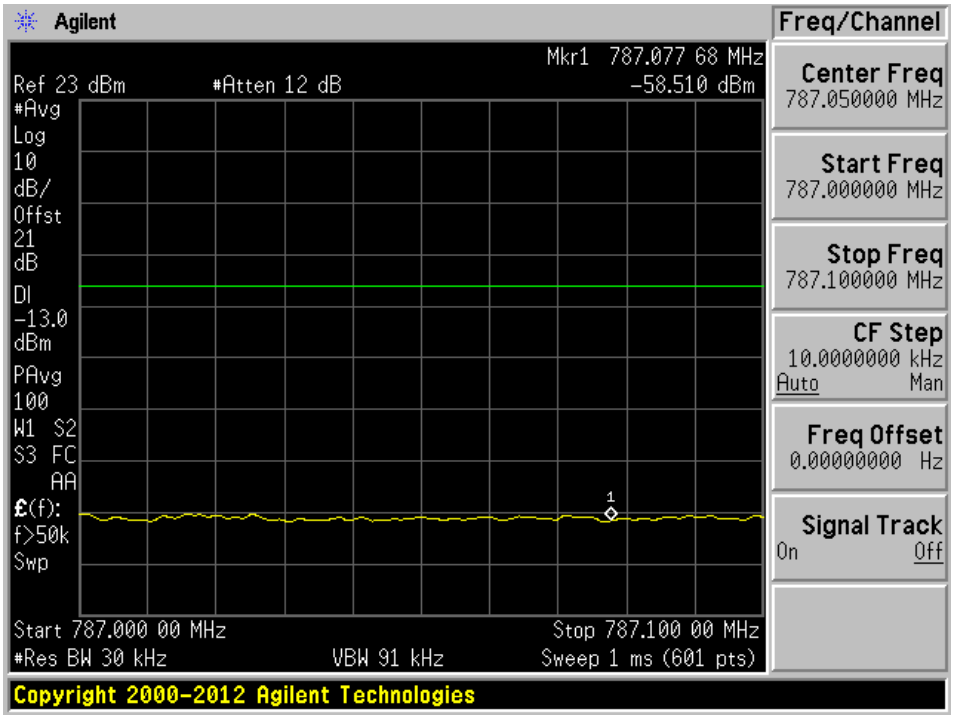


AGC On

Low Channel



High Channel

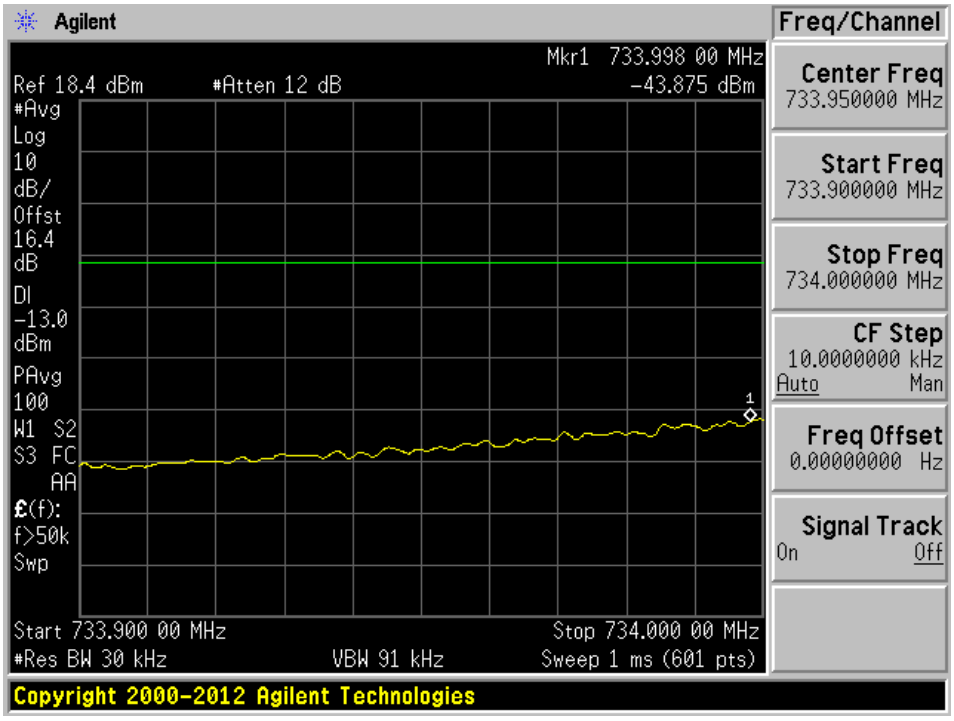


Band Edge:

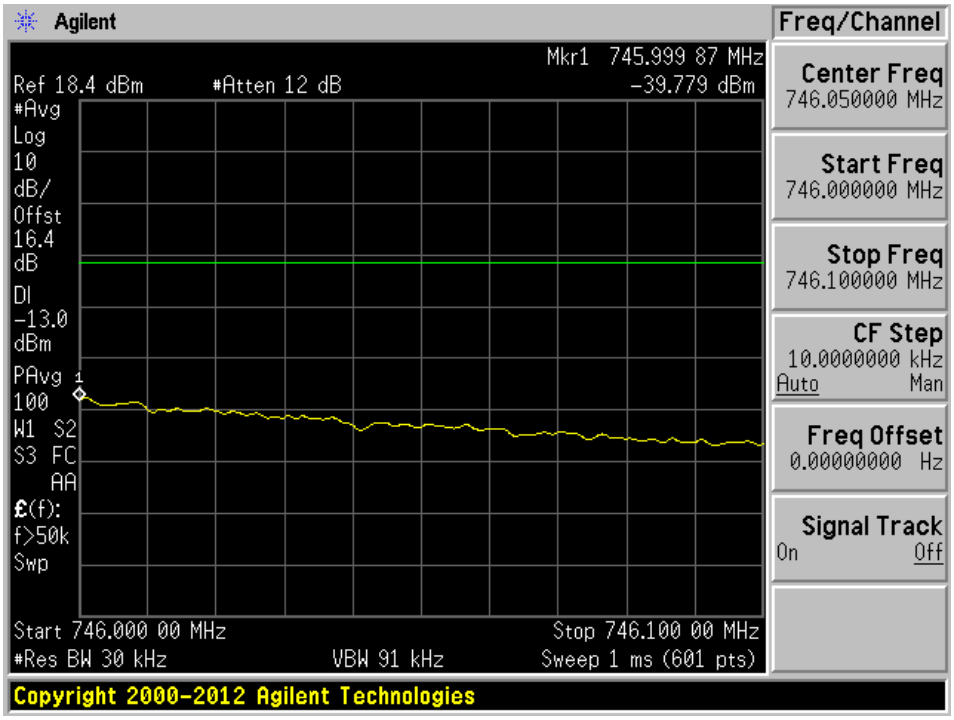
LTE Band 17, Downlink: Broadband signal

AGC Off

Lower Band Edge

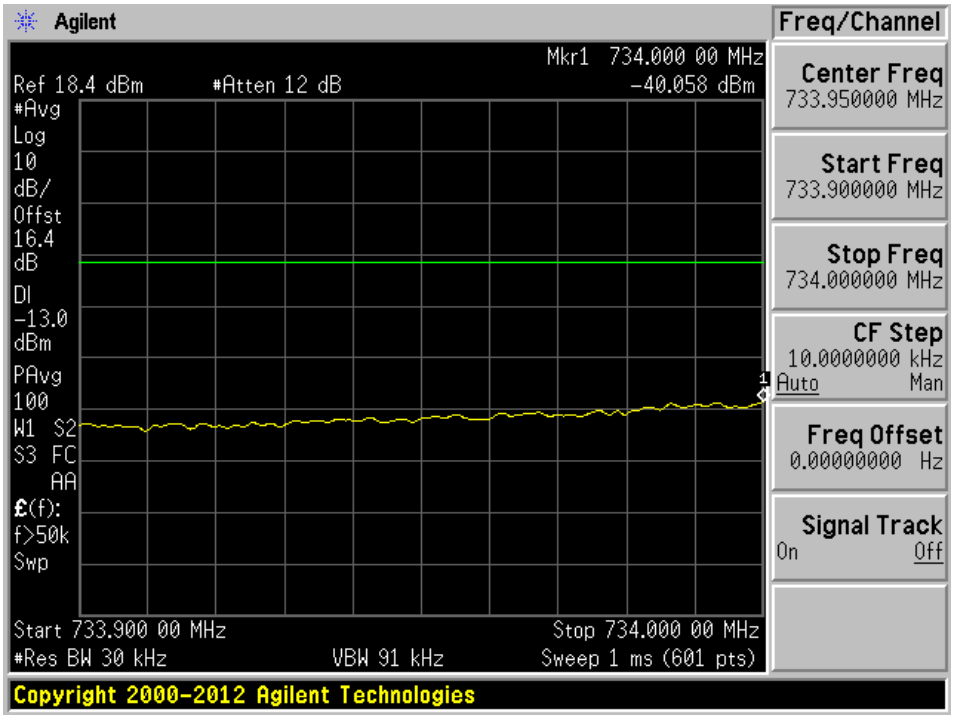


Upper Band Edge

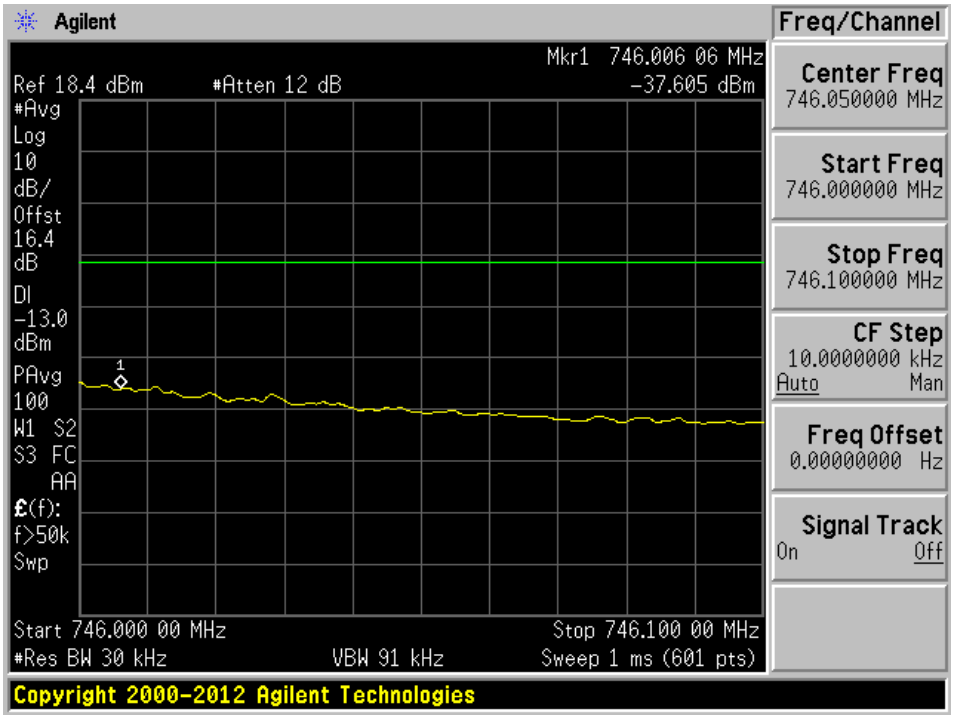


AGC On

Lower Band Edge



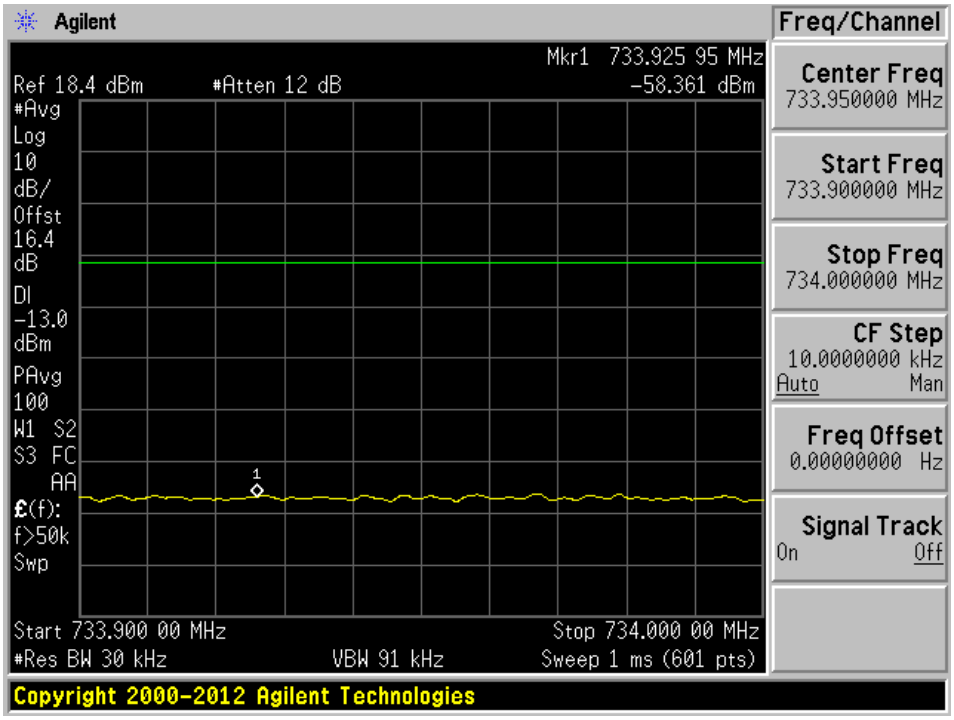
Upper Band Edge



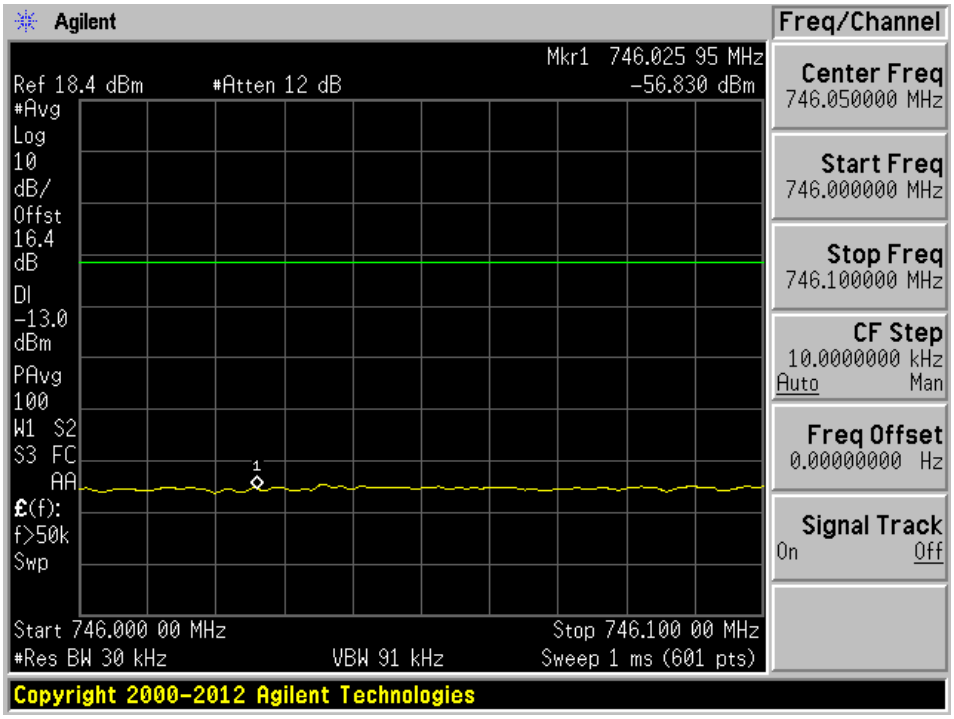
LTE Band 17, Downlink: Narrowband Signal

AGC Off

Lower Band Edge

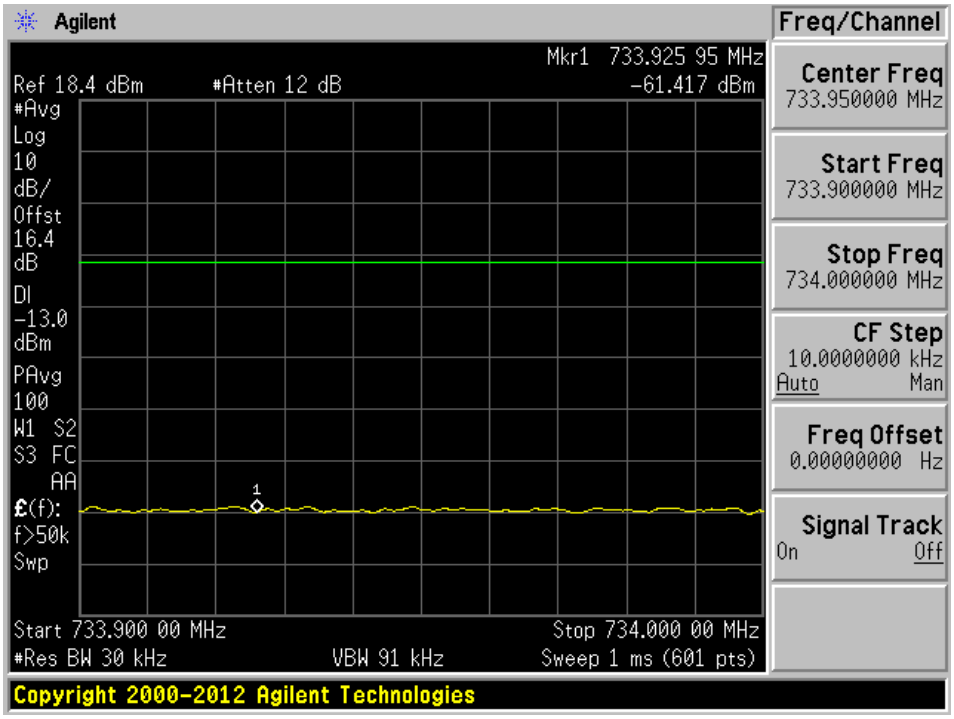


Upper Band Edge

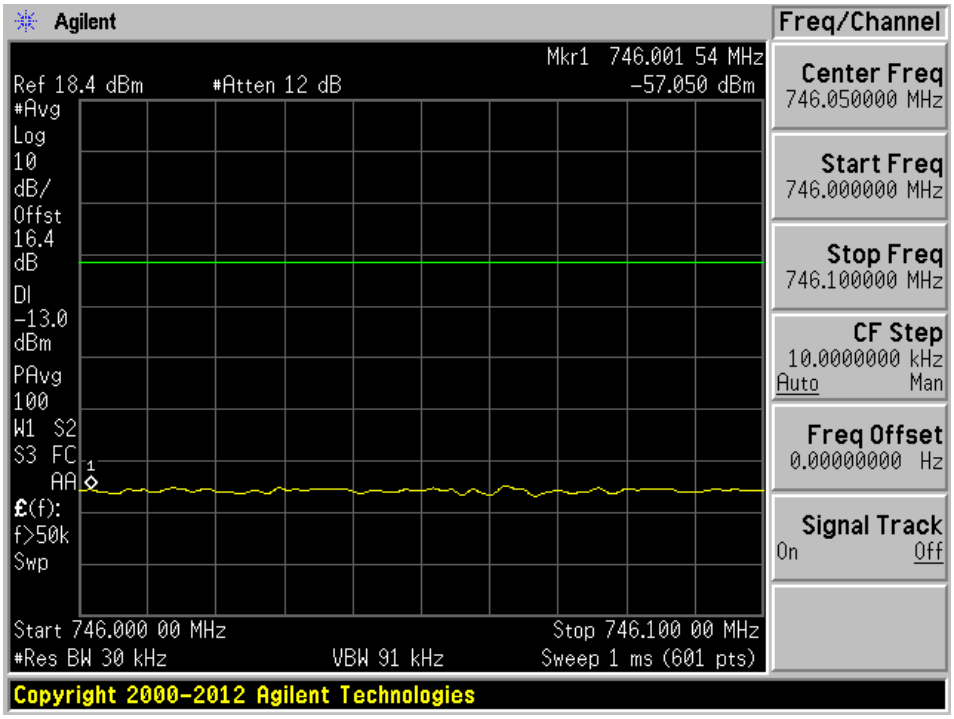


AGC On

Lower Band Edge



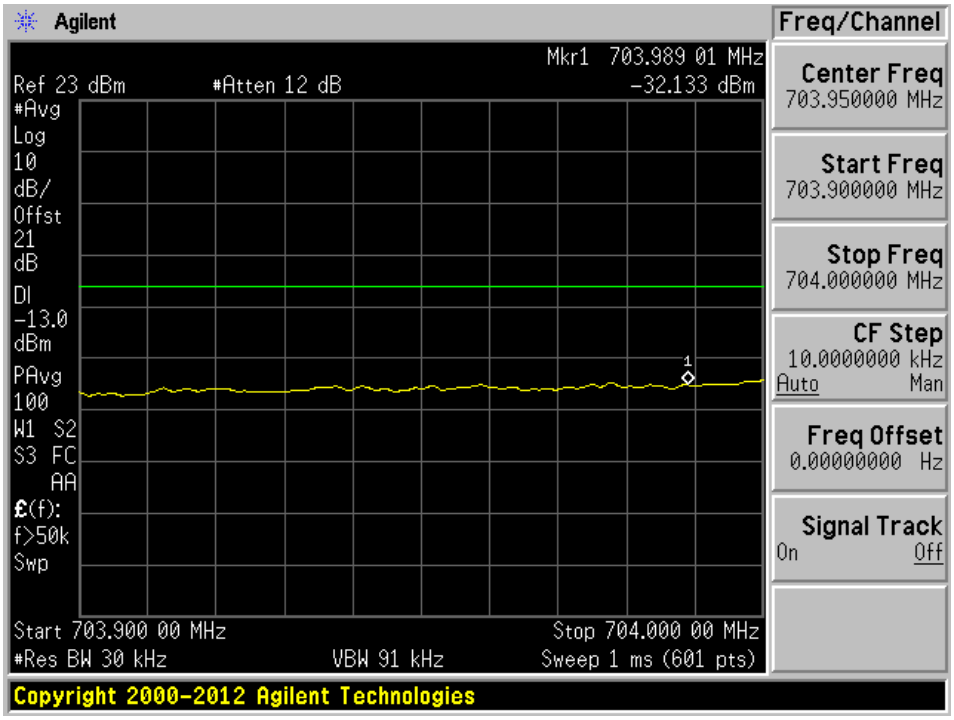
Upper Band Edge



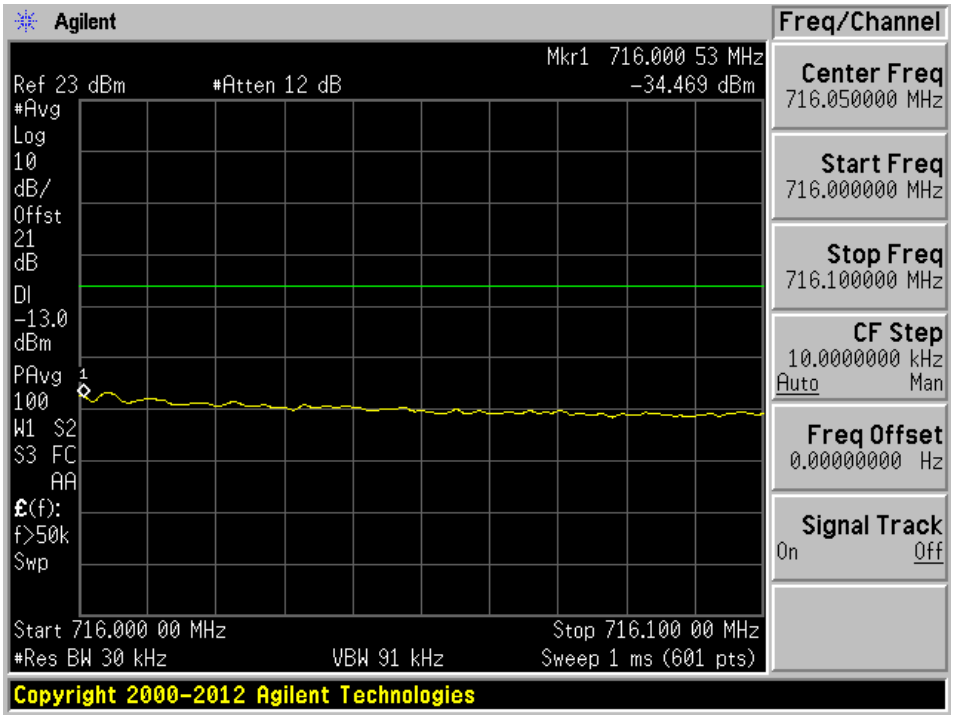
LTE Band 17, Uplink: Broadband Signal

AGC Off

Lower Band Edge

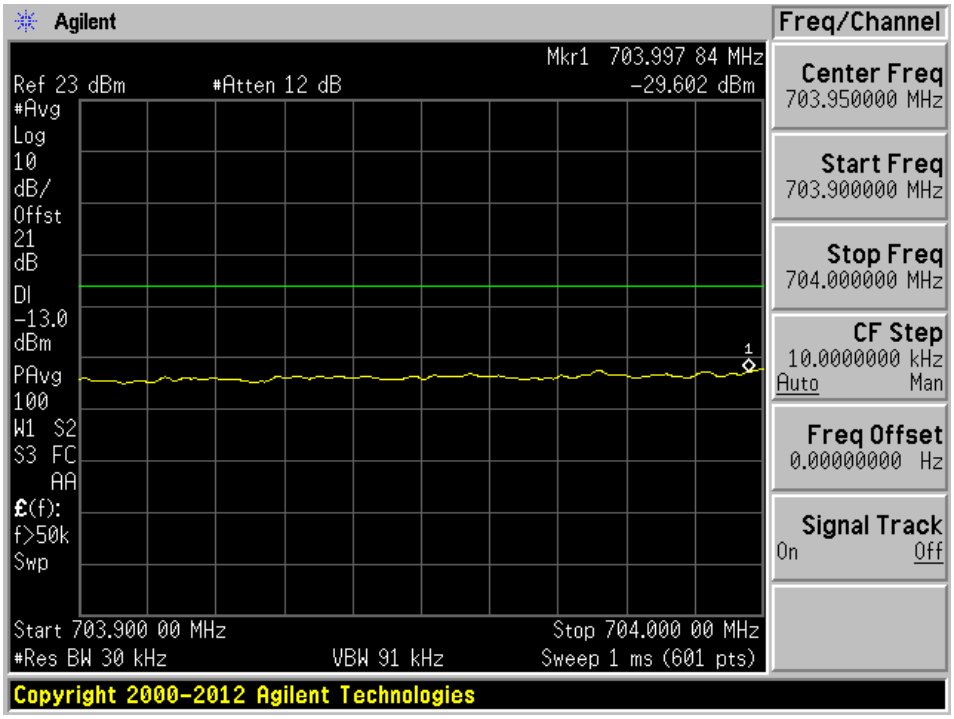


Upper Band Edge

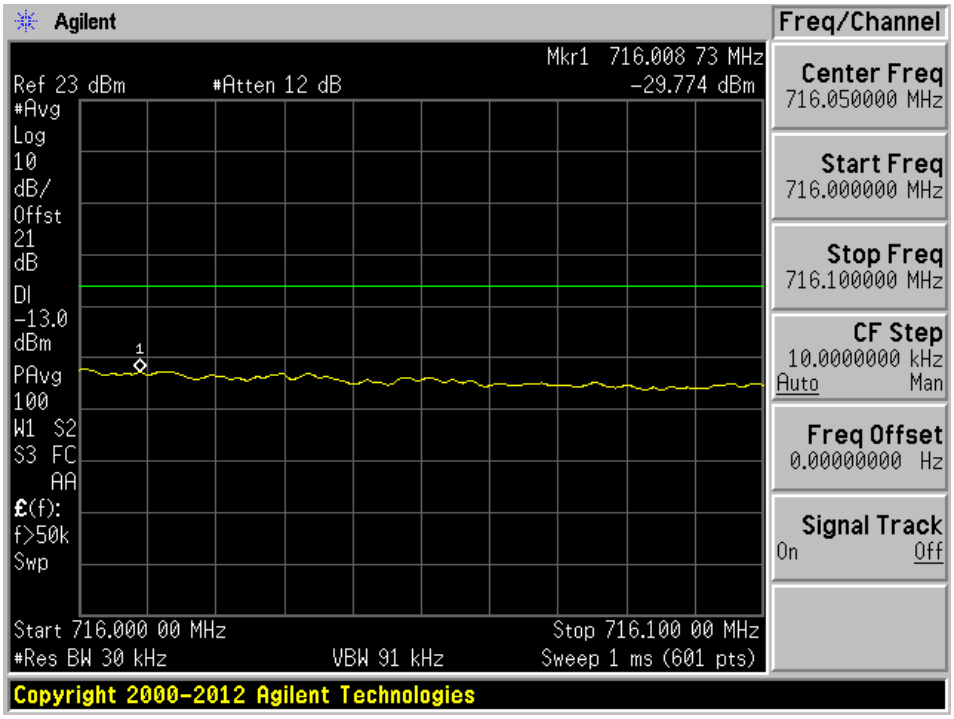


AGC On

Lower Band Edge



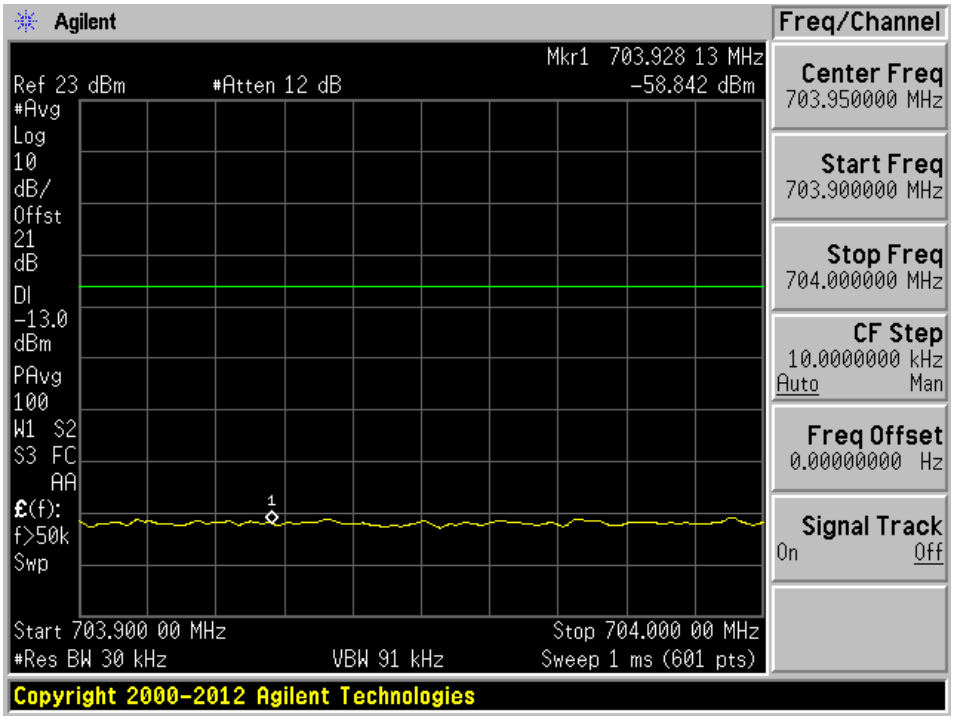
Upper Band Edge



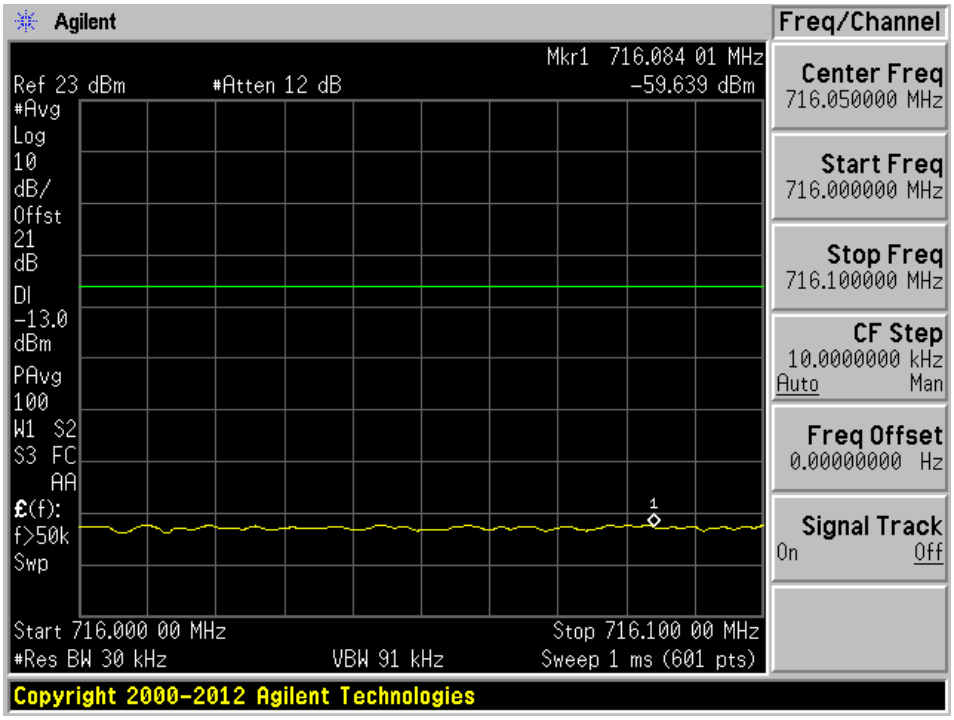
LTE Band 17, Uplink: Narrowband Signal

AGC Off

Lower Band Edge

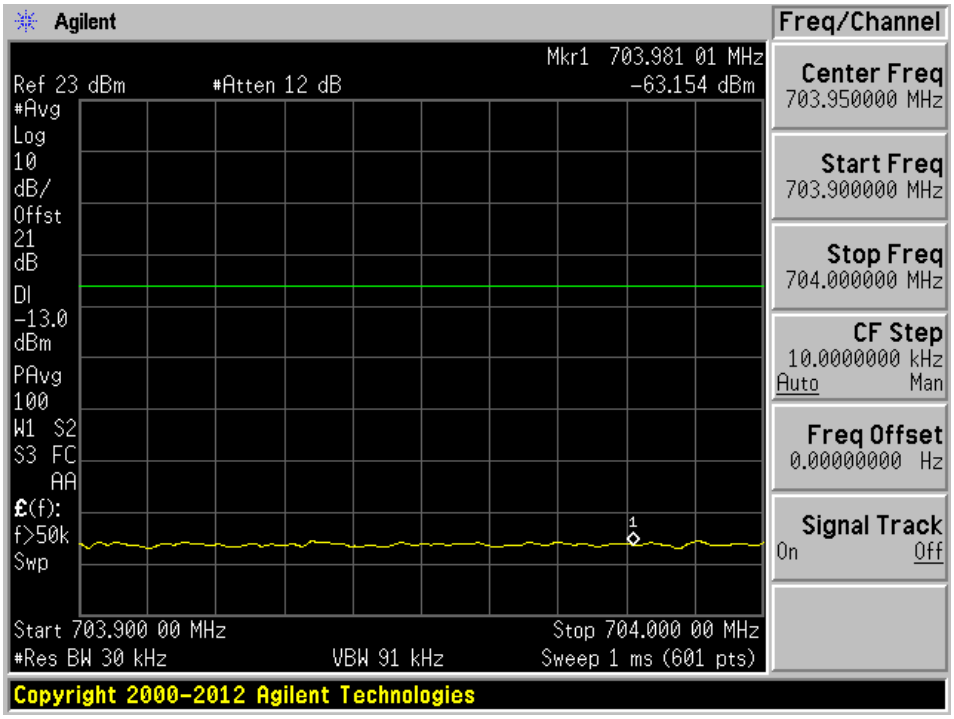


Upper Band Edge

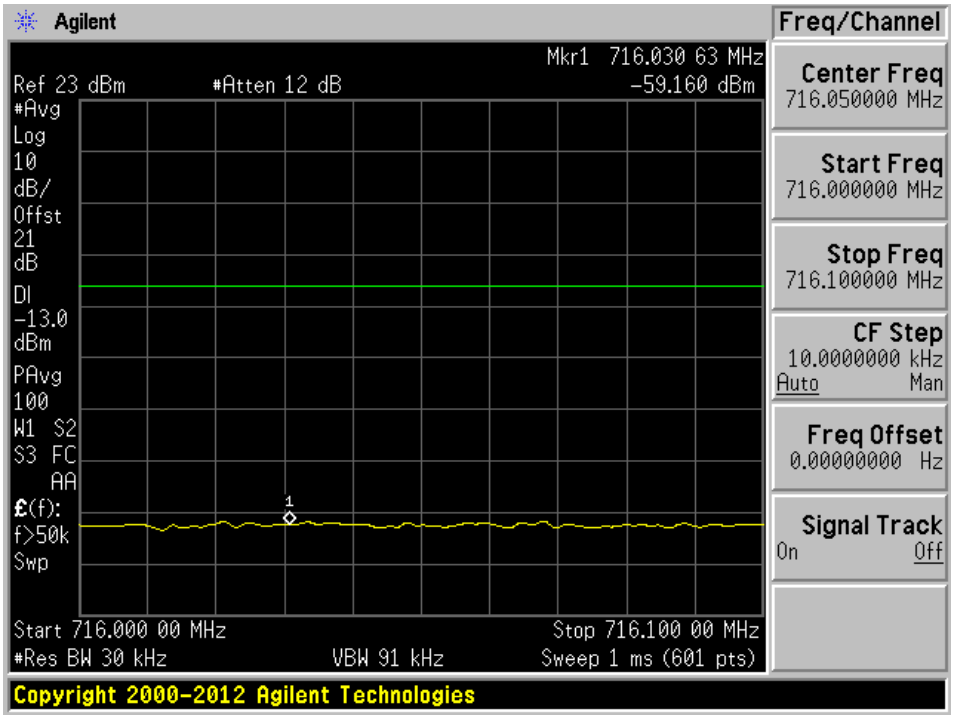


AGC On

Lower Band Edge



Upper Band Edge

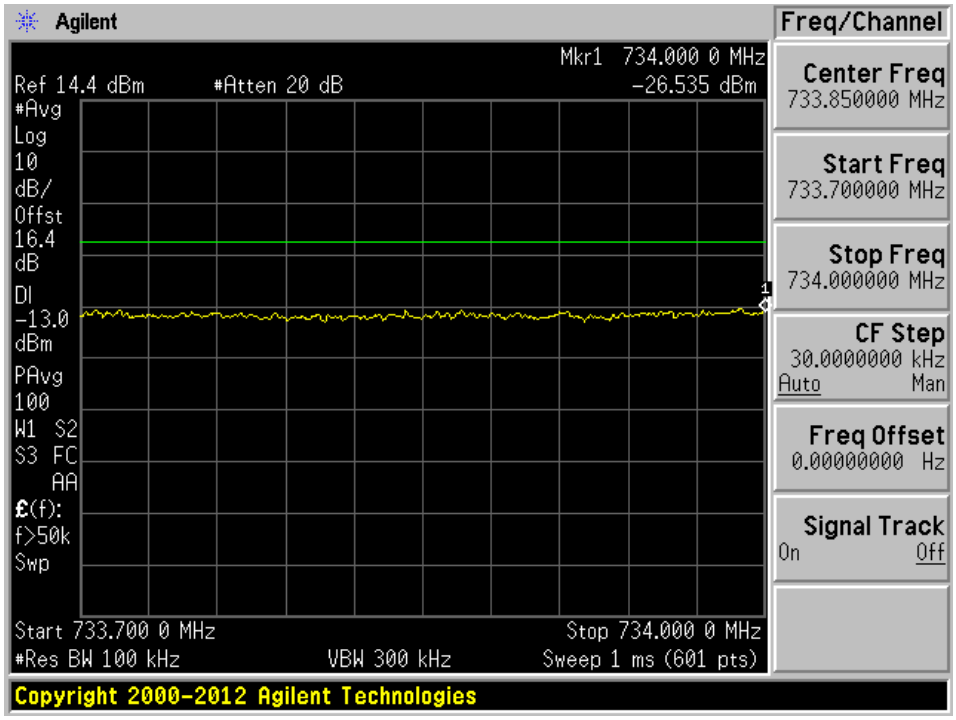


Intermodulation:

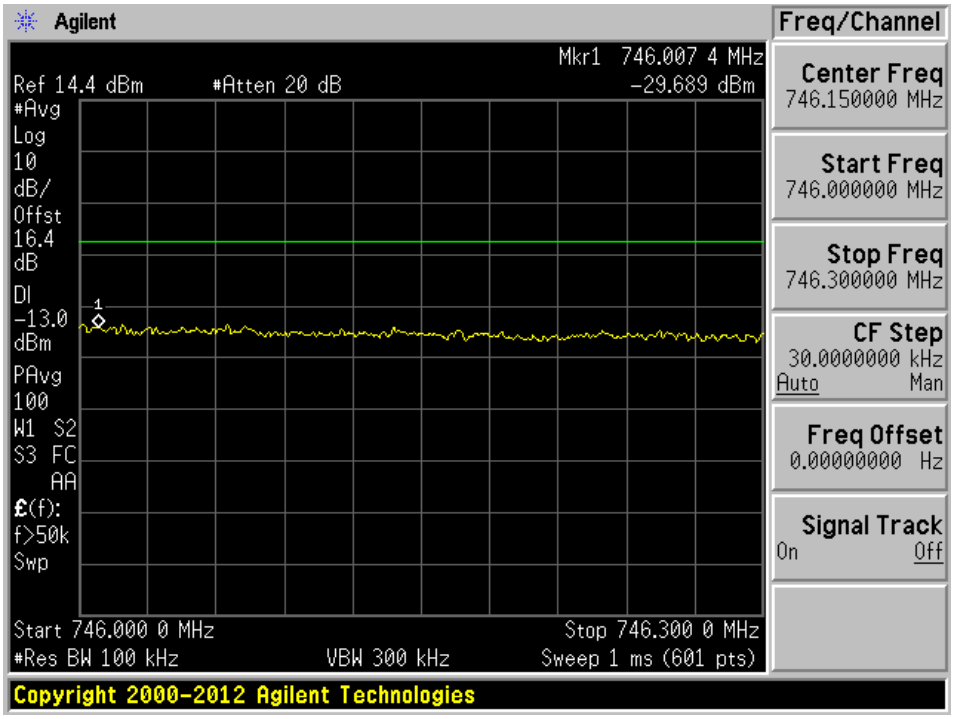
LTE Band 17, Downlink: Broadband Signal

AGC Off

Low Channel

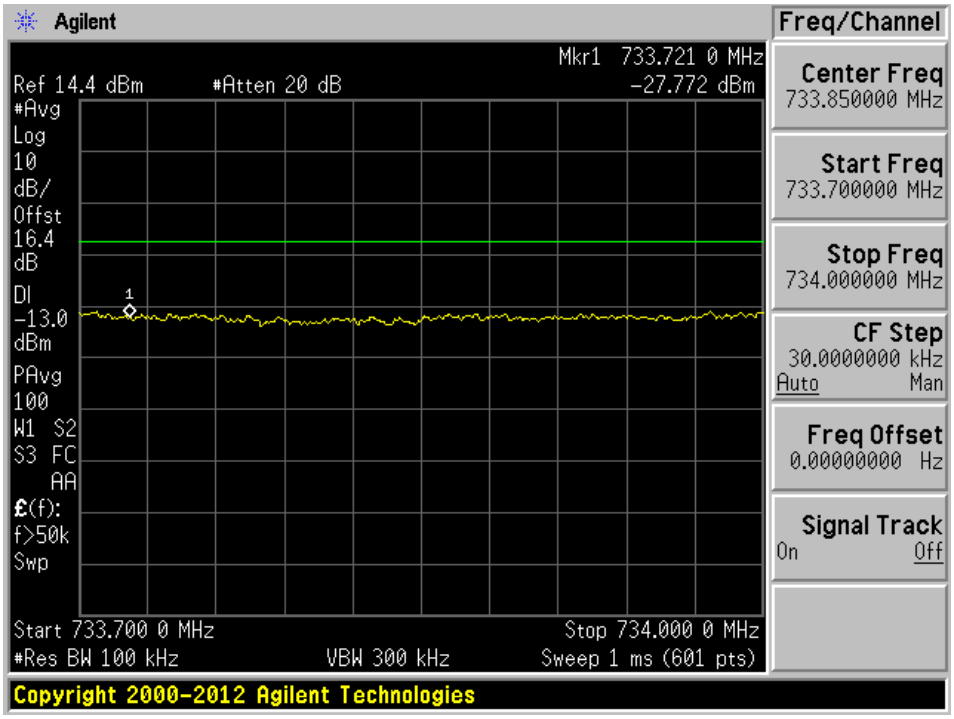


High Channel

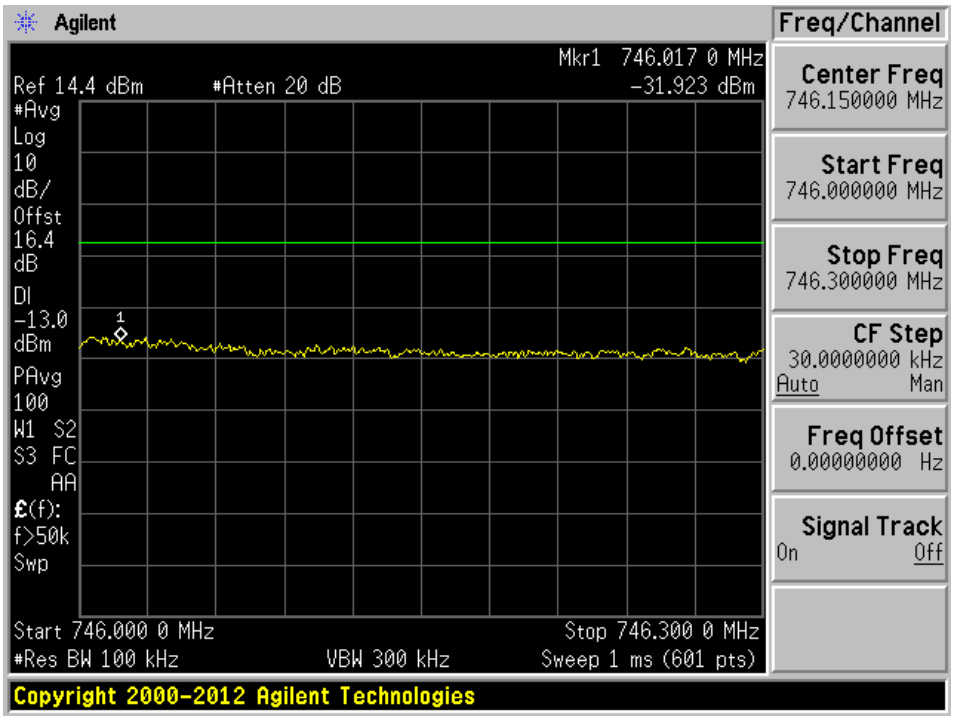


AGC On

Low Channel



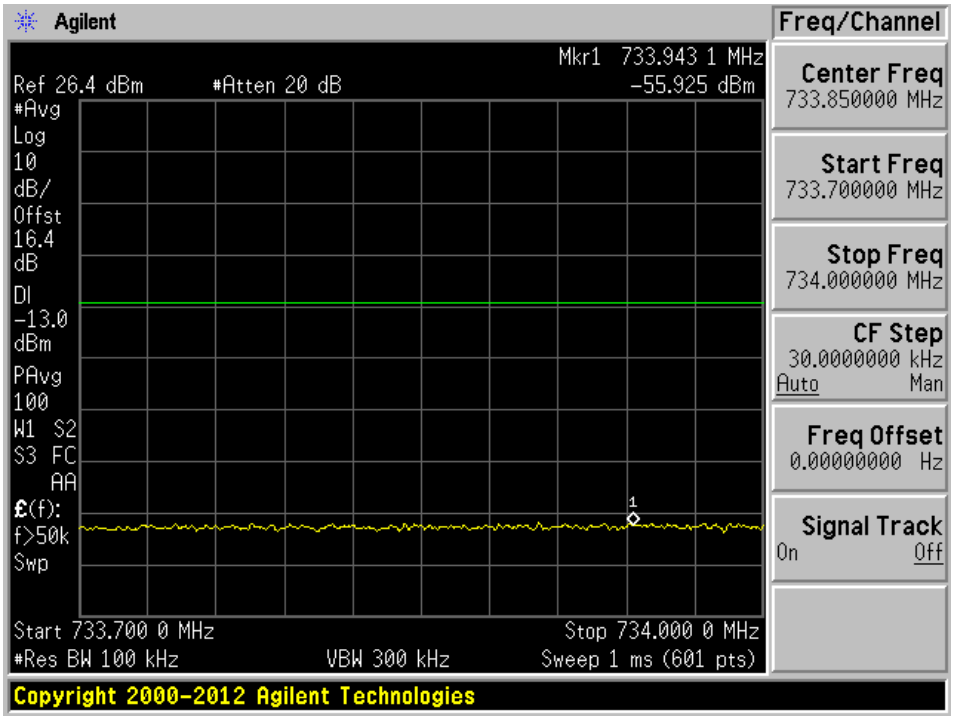
High Channel



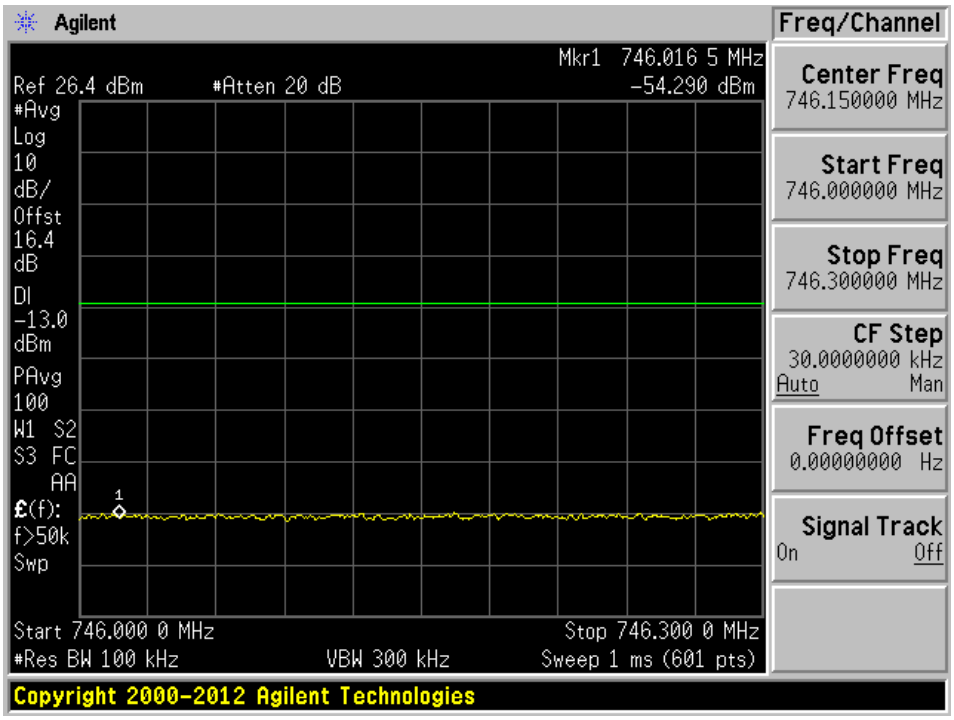
LTE Band 17, Downlink: Narrowband Signal

AGC Off

Low Channel

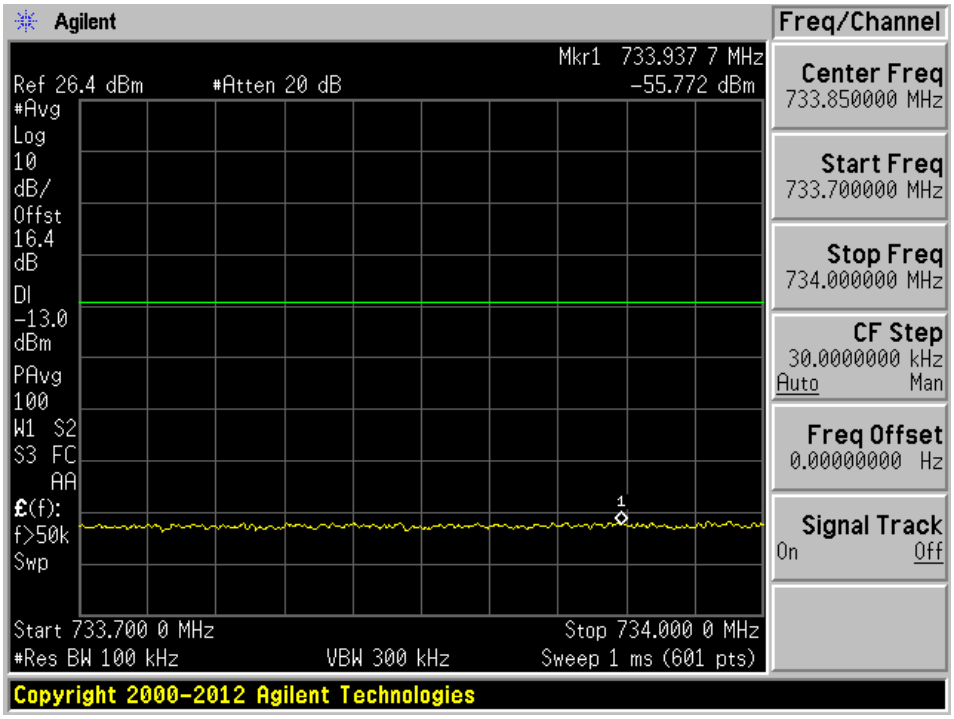


High Channel

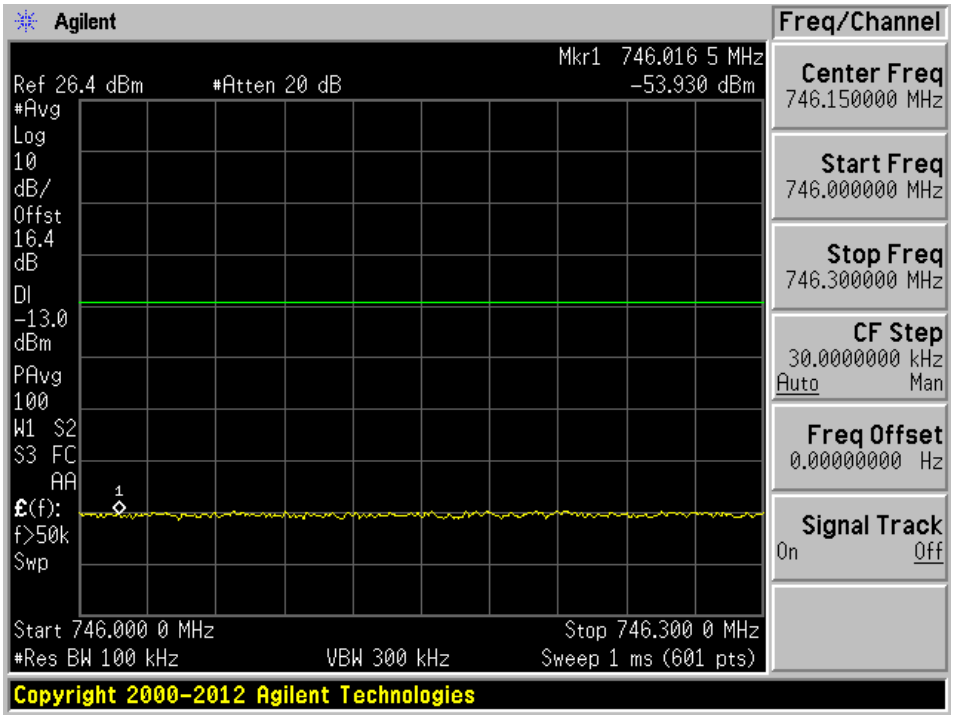


AGC On

Low Channel



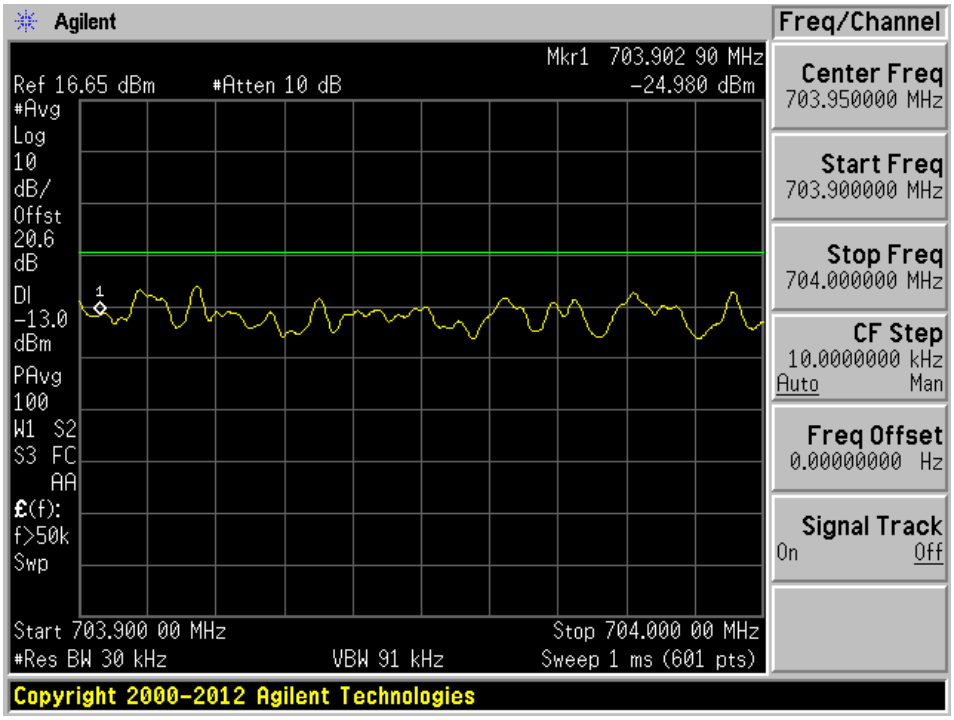
High Channel



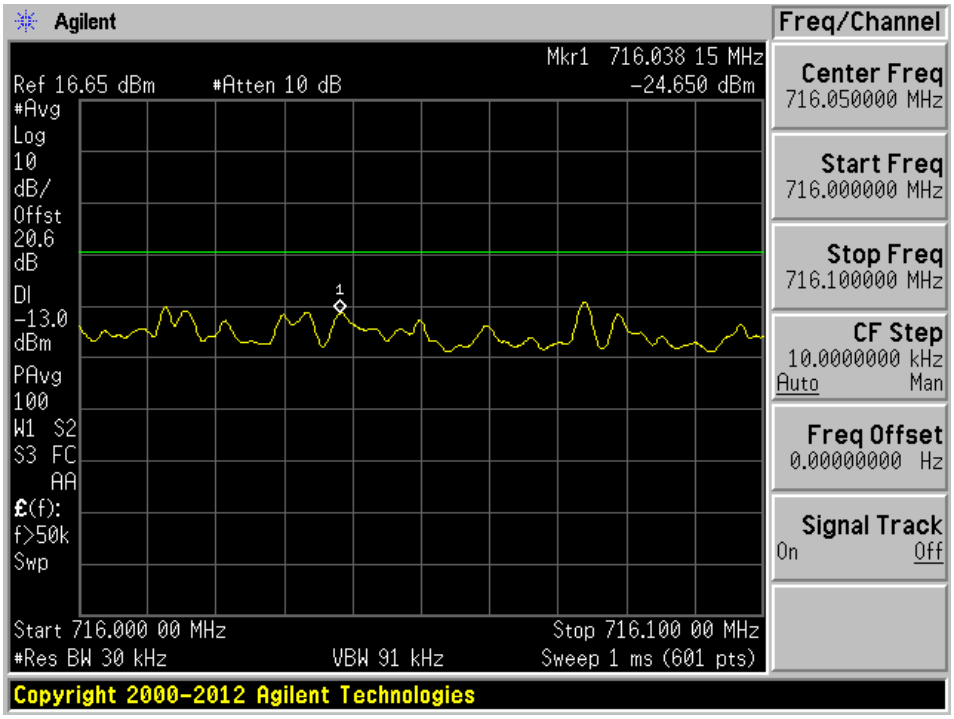
LTE Band 17, Uplink: Broadband Signal

AGC Off

Low Channel

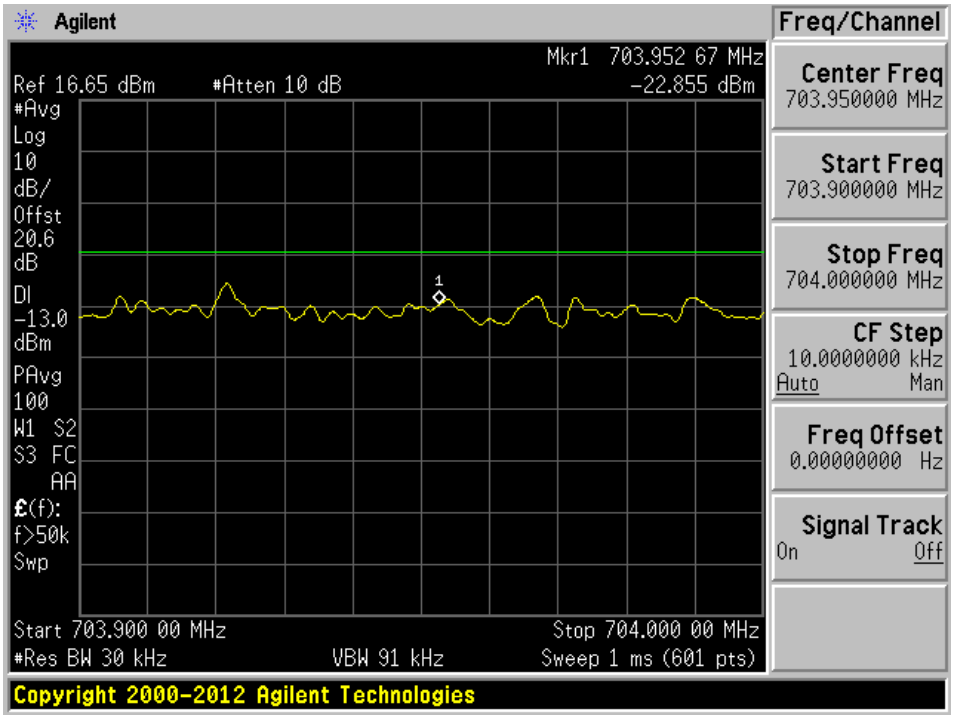


High Channel

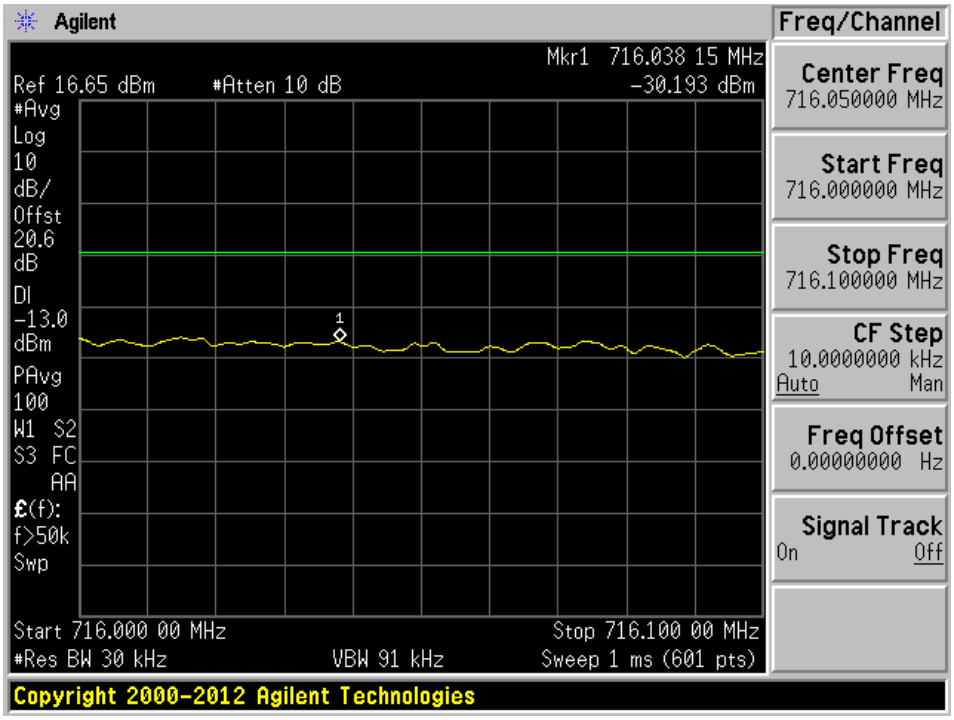


AGC On

Low Channel



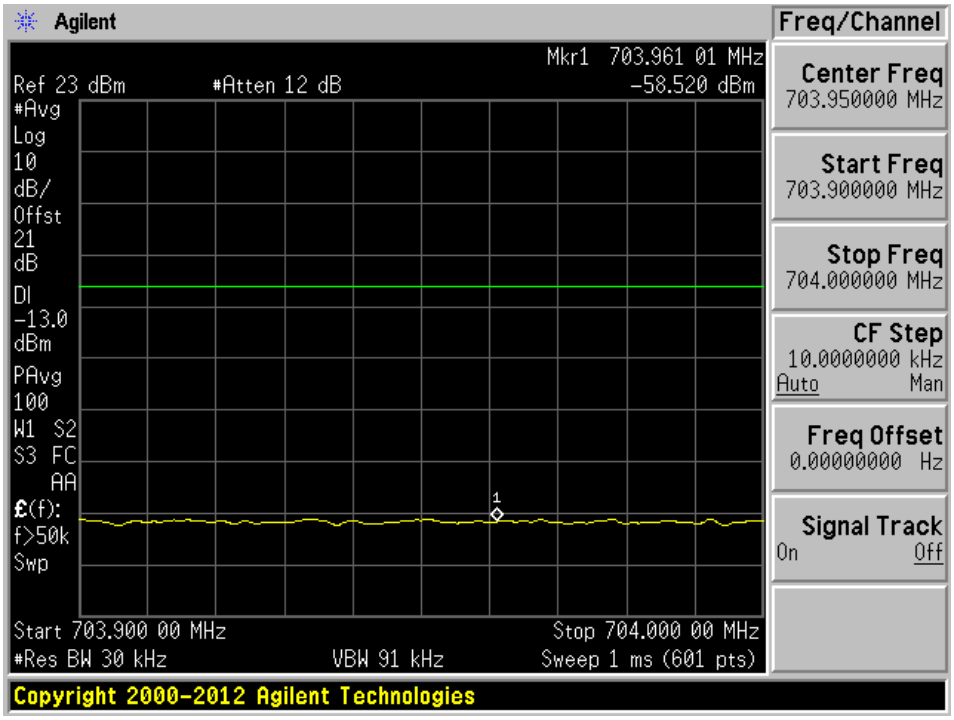
High Channel



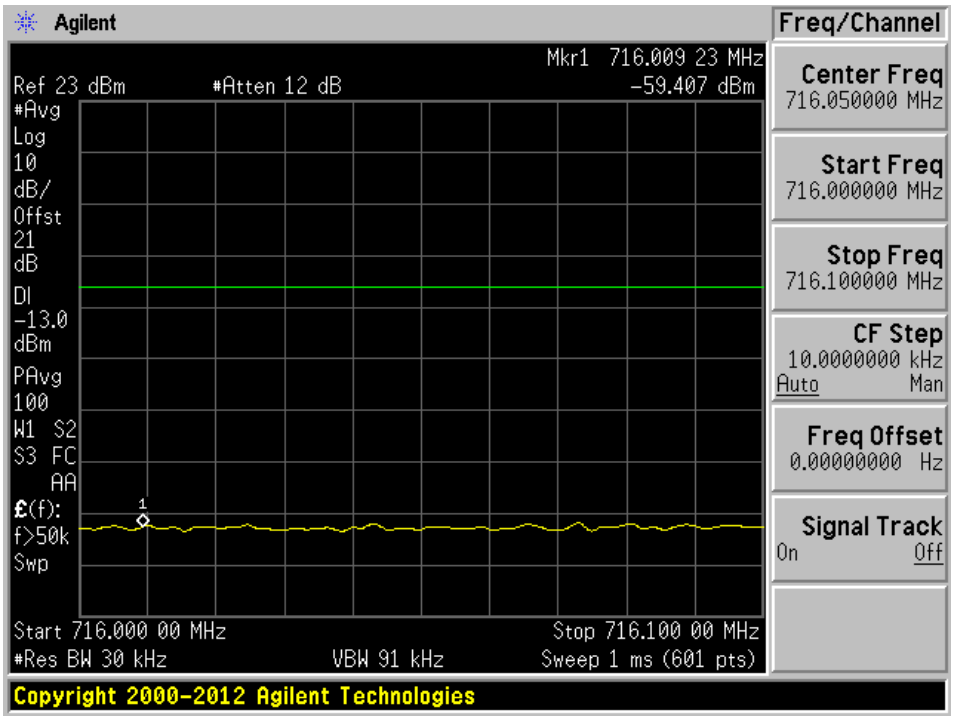
LTE Band 17, Uplink: Narrowband Signal

AGC Off

Low Channel

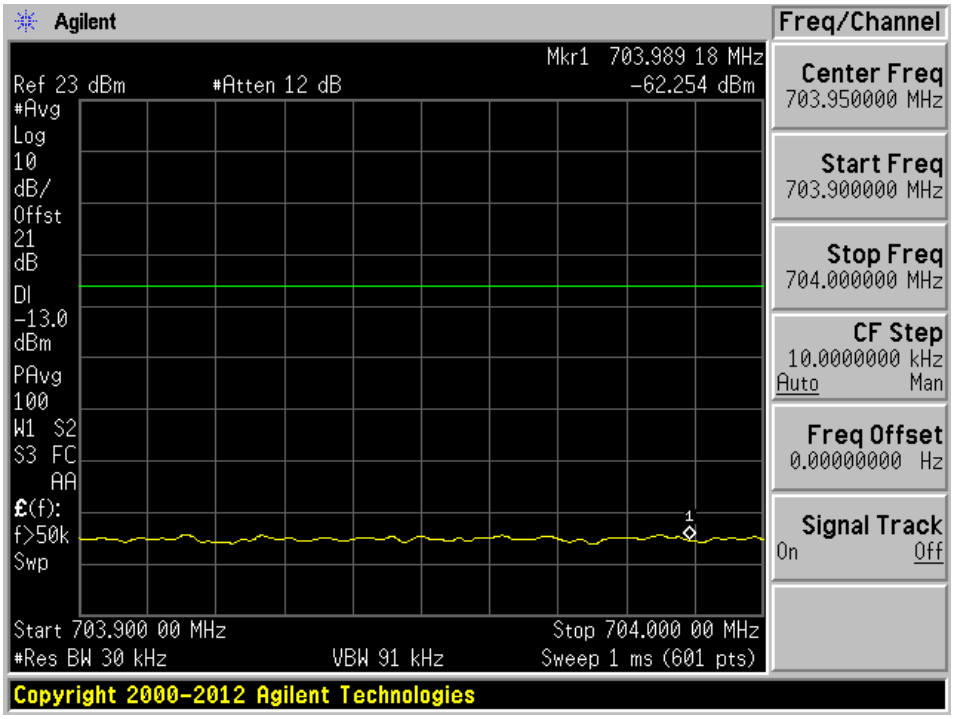


High Channel

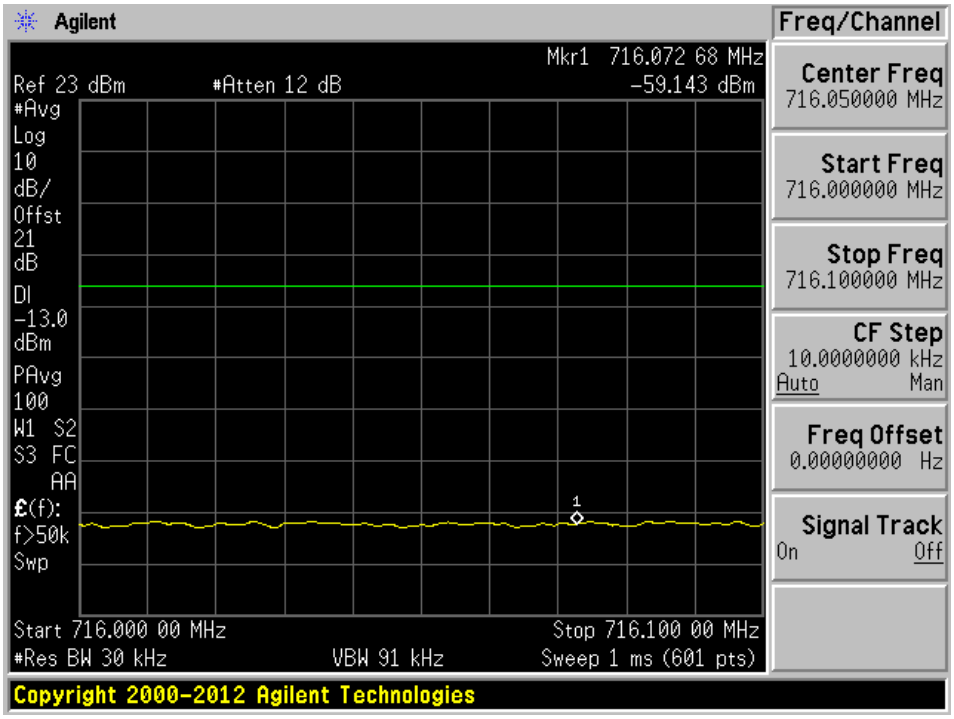


AGC On

Low Channel



High Channel



10 FCC §20.21 - Out of Band Rejection

10.1 Applicable Standard

According to FCC Part 20.21, a frequency selective booster shall have −20 dB at the band edge referenced to the gain in the center of the pass band of the booster, where band edge is the end of the licensee's allocated spectrum.

10.2 Test Procedure

KDB 935210 D05, Section 3.3.

The RF output of the transceiver was connected to a spectrum analyzer through appropriate attenuation. The span of the spectrum analyzer was set to be wide enough in order to capture the spectrum of entire operating band.

10.3 Test Equipment List and Details

Manufacturer	Descriptions	Models	Serial Numbers	Calibration Dates	Calibration Interval
Agilent	Analyzer, Spectrum	E4446A	US44300386	2014-10-24	1 year
Keysight Technologies	Vector Signal Generator	N5182B	MY51350070	2014-09-18	2 years

Statement of Traceability: BACL Corp. *attests that all calibrations have been performed per the A2LA requirements, traceable to the NIST.*

10.4 Test Environmental Conditions

Temperature:	21-23° C
Relative Humidity:	42-48 %
ATM Pressure:	101.4-102 kPa

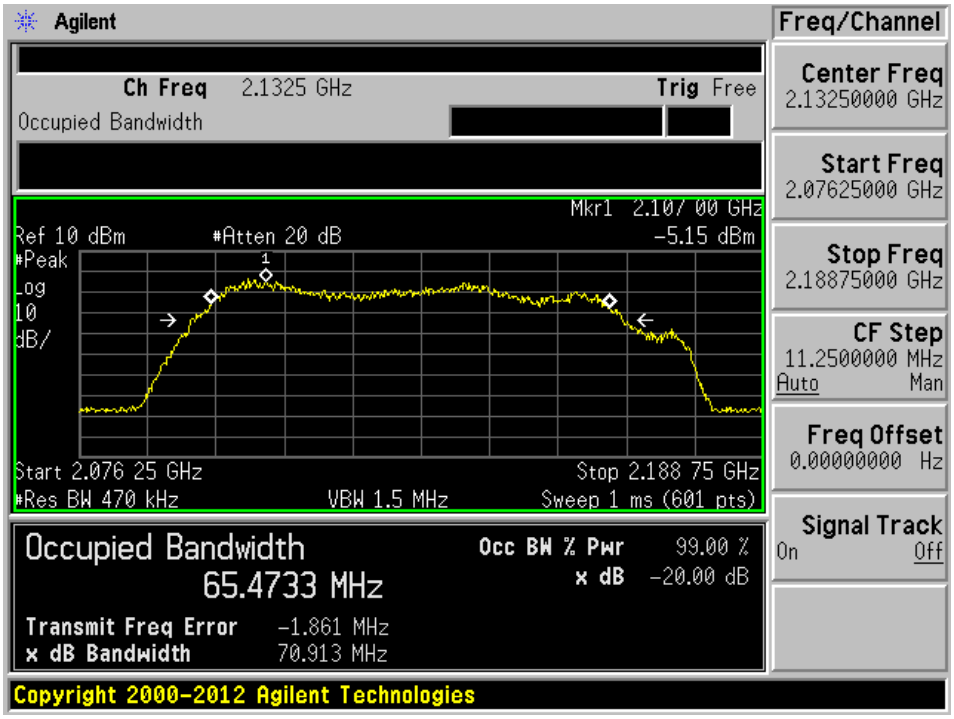
The testing was performed by Ronak Patel on 2015-09-21 in the RF Site.

10.5 Test Results

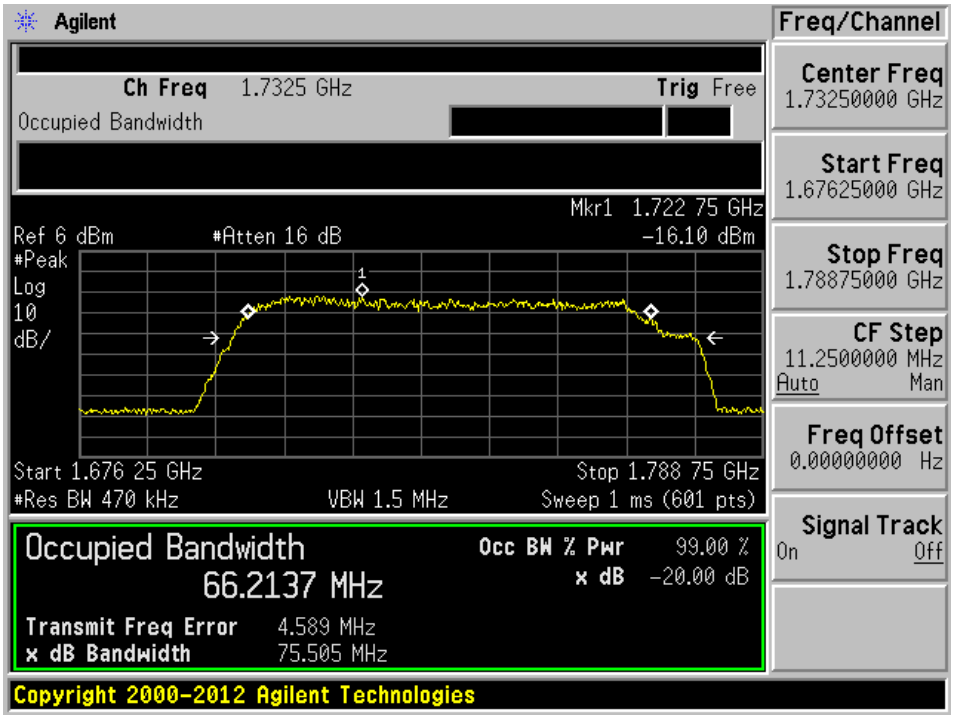
Please refer to the following plot,

AWS Band

Downlink, 2110-2155 MHz

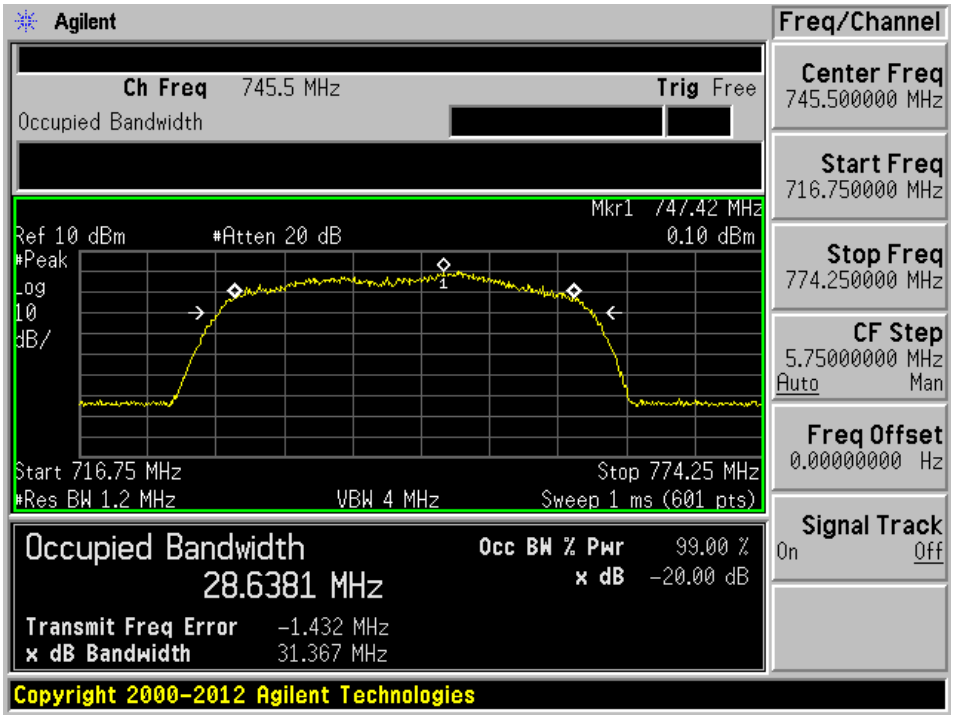


Uplink, 1710-1755 MHz

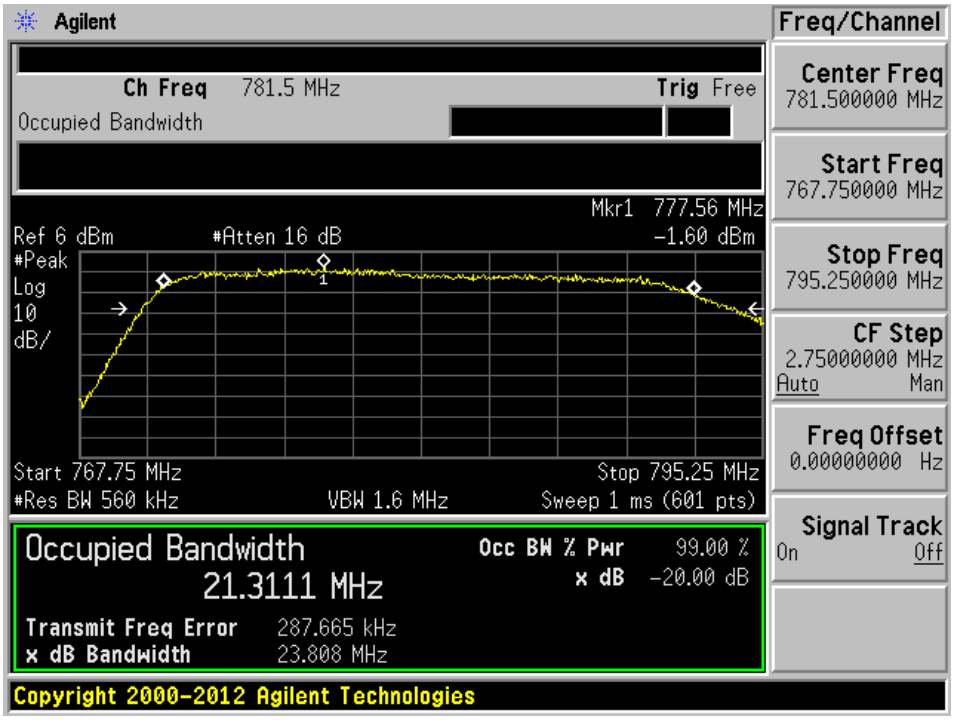


LTE Band

Downlink, 734-757 MHz



Uplink, 776-787 MHz



Uplink, 704-716 MHz