Lab Code: 200167-0

FCC PART 27

TEST AND MEASUREMENT REPORT

For

Beijing Telestone Technology Co., Ltd.

6F, Saiou Scientific Building, No. 5 Haiying Road, Fentai Science Park,

Beijing 100070, China

FCC ID: U5TWFDS-RUC
Model: WFDS-RUC

Report Type:	**Product Type:**
Original Report	Remote Unit for Wireless Fiber Distribution System

Test Engineer: Quinn Jiang

Report Number: R1105246-27

Report Date: 2011-06-09

Victor Zhang

Reviewed By: EMC/RF Lead

Prepared By: **(84)**
Bay Area Compliance Laboratories Corp.
1274 Anvilwood Avenue,
Sunnyvale, CA 94089, USA
Tel: (408) 732-9162
Fax: (408) 732 9164

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DOCUMENT REVISION HISTORY

Revision Number	Report Number	Description of Revision	Date of Revision
0	R1105246-27	Original Report	2011-06-09

1 GENERAL INFORMATION

1.1 Product Description for Equipment under Test (EUT)

The Beijing Telestone Technology Co., Ltd. FCC ID: U5TWFDS-RUC, Model: WFDS-RUC or the "EUT" as referred to in this report is a remote unit of wireless fiber distribution system. The system consists three modular components, the Main Unit (model: WFDS-MU), Expansion Unit (model: WFDS-EU) and Remote Unit (model: WFDS-RUC).

Remote Unit - Specification

Parameters		Specifications
Frequency	850 MHz	UL: 824-849 MHz DL: 869-894 MHz
	1900 MHz	UL: 1850-1910 MHz DL: 1930-1990 MHz
	2100 MHz	UL: 1710-1755 MHz DL: 2110-2155 MHz
Output Power		21 dBm
Power consumption		25 W
Operating Temperature		-10°C to +50°C
.Operating Humidity Range		5% - 90% RH, non-condensing

1.2 Mechanical Description

The EUT measures 326mm **(L)** x 250mm **(W)** x 75mm **(H)**, and weighs approximately 5kg.

The test data gathered are from production sample, serial number: PSF95R, provided by manufacture.

1.3 Objective

This type approval report is prepared on behalf of *Beijing Telestone Technology Co., Ltd.* in accordance with Part 2, Subpart J, and Part 27 of the Federal Communication Commissions rules.

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

1.4 Related Submittal(s)/Grant(s)

N/A

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 27 – Miscellaneous Wireless Communications Services
Applicable Standards: TIA/EIA-603-C, ANSI C63.4-2003.

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 NIS 81, 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.

Detailed instrumentation measurement uncertainties can be found in BACL Corp. report QAP-018.

1.7 Test Facility

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 sites at BACL have been fully described in reports submitted to the Federal Communication Commission (FCC) and Voluntary Control Council for Interference (VCCI). The details of these reports has 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 facility also complies with the radiated and AC line conducted test site criteria set forth in ANSI C63.4-2003.

The Federal Communications Commission, Industry Canada, and Voluntary Control Council for Interference has the reports on file and is listed under FCC registration number: 90464, IC registration number: 3062A, and VCCI Registration Number: C-2463 and R-2698. The test site has been approved by the FCC, IC, and VCCI for public use and is listed in the FCC Public Access Link (PAL) database.

Additionally, BACL is a National Institute of Standards and Technology (NIST) accredited laboratory, under the National Voluntary Laboratory Accredited Program (Lab Code 200167-0). The current scope of accreditations can be found at http://ts.nist.gov/ts/htdocs/210/214/scopes/2001670.htm

2 SYSTEM TEST CONFIGURATION

2.1 Justification

The EUT was configured for testing according to TIA/EIA-603-C.

The final qualification test was performed with the EUT operating at normal mode.

2.2 EUT Exercise Software

N/A, signal was sent through EUT using a signal generator, device was set to normal operating mode.

2.3 Equipment Modifications

No modifications were made to the EUT.

2.4 Local Support Equipment and Software List and Details

Manufacturer	Description	Model	Serial Number
Rohde & Schwarz	Signal Generator	SMIQ03	DE23746
Dell	Laptop	Latitude D600	CN-0X2034-48643-3A6-8307
BK Precision	DC Power Supply	1740	-
Agilent	ESG-D Series Signal Generator	E4438C	MY45091309
Agilent	Signal Studio for 3GPP LTE	N7624B	-
Beijing Telestone Technology Co., Ltd	Main Unit	WFDS-MU	19F2KC
Beijing Telestone Technology Co., Ltd	Expansion Unit	WFDS-EU	52ALSN

2.5 Internal Configurations of EUT

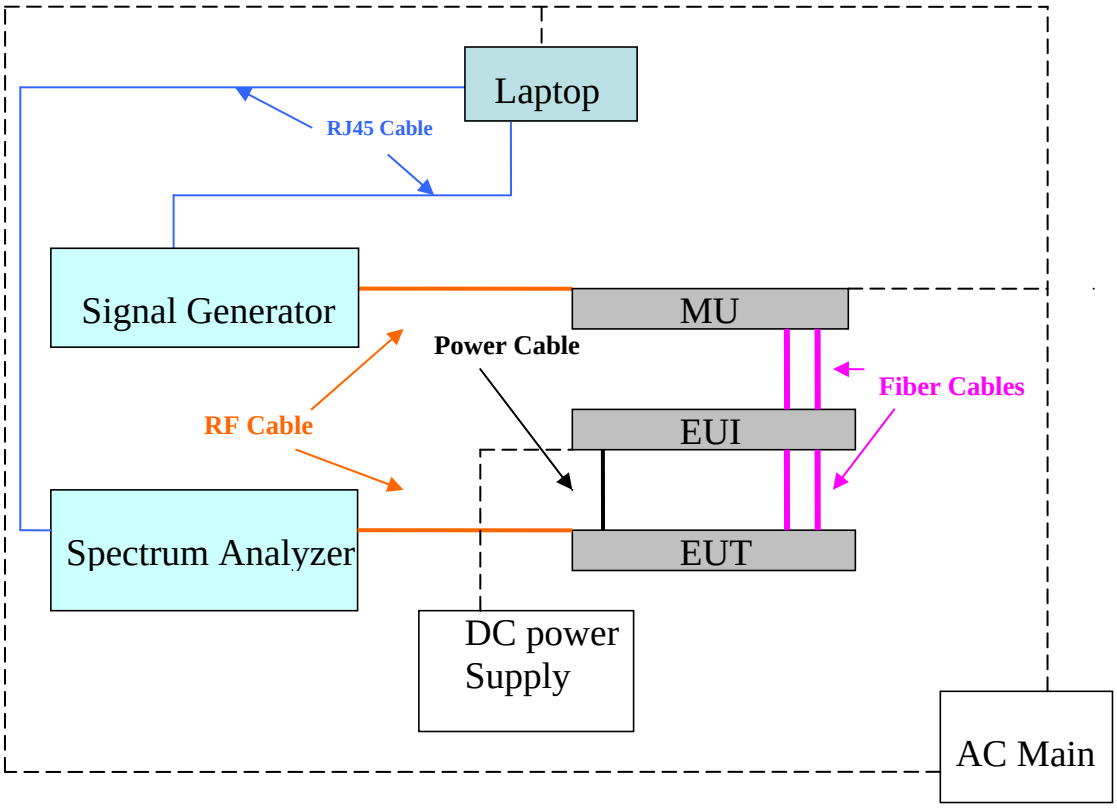
Manufacturer	Description	Model	Serial Number
Beijing Telestone Technology Co., Ltd	Main PCB Board	TS29000113	YF11040044
Beijing Telestone Technology Co., Ltd	BST8270-12 Board	-	-
Beijing Telestone Technology Co., Ltd	PSU Board	-	-
Beijing Telestone Technology Co., Ltd	RAU-AWS Board	RAU-AWS-2132-21	TS7.820.0445a
Beijing Telestone Technology Co., Ltd	RAU-Cellular Board	RAU-Cellular-881-21	TS7.820.0443a
Beijing Telestone Technology Co., Ltd	RAU-PCS Board	RAU-PCS-1960-21	TS7.820.0444a
Beijing Telestone Technology Co., Ltd	Splitter	Splitter-3	TS7.820.0408
Beijing Telestone Technology Co., Ltd	Combiner	-	-

2.6 Interface Ports and Cables

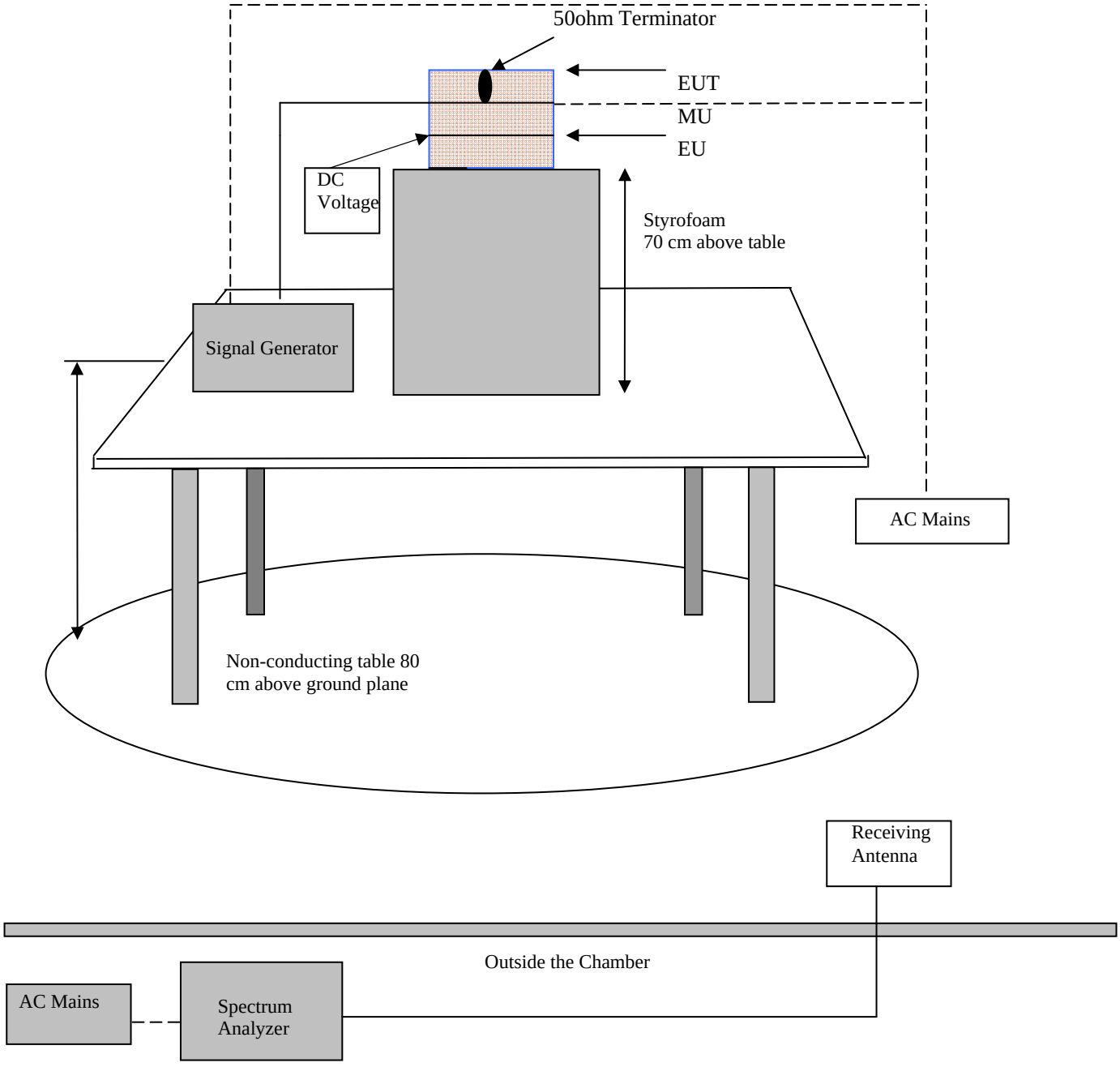
Cable Description	Length (m)	To	From
RF Cable	< 1	Remote Unit (EUT)	Spectrum Analyzer
RF Cable	< 1	Main Unit	Signal Generator
Power Cable	<1	Expansion Unit	Remote Unit (EUT)
2 Fiber Cables	10	Expansion Unit	Remote Unit (EUT)
2 Fiber Cables	10	Expansion Unit	Main Unit

2.7 Test Setup Block Diagram

Conducted RF



Radiated Emission



3 SUMMARY OF TEST RESULTS

FCC Rules	Description of Tests	Results
§2.1046, §27.50(d)(i)	RF Output Power	Compliant
§2.1047	Modulation Characteristics	N/A
§2.1049, §27.53 (c)	Occupied Bandwidth	Compliant
§2.1053, §27.53 (c)(g)	Spurious Radiated Emissions	Compliant
§2.1051, §27.53 (c)(g)	Spurious Emissions at Antenna Terminals	Compliant
§27.53 (c)(g)	Band Edge	Compliant
§2.1055, §27.54	Frequency Stability	Compliant
§2.1091, §27.52	RF Exposure Information	Compliant

4 FCC §2.1046 & §27.50 – RF OUTPUT POWER

4.1 Applicable Standard

According to FCC §27.50, the maximum effective radiated power (ERP) of fixed and base station must not exceed 1000 Watts.

4.2 Test Procedure

Conducted:

The RF output of the transmitter was connected to the signal generator and the spectrum analyzer through sufficient attenuation.

4.3 Test Equipment List and Details

Manufacturers	Descriptions	Models	Serial Numbers	Calibration Dates
Agilent	ESG-D Series Signal Generator	E4438C	MY45091309	2011-04-28
Agilent	Spectrum Analyzer	E4446A	US44300386	2010-08-18

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

4.4 Test Environmental Conditions

Temperature:	20-25°C
Relative Humidity:	38-44 %
ATM Pressure:	101-102 kPa

The testing was performed by Quinn from 2011-06-03 to 2011-06-07 at RF Site.

4.5 Test Results

Maximum Output Power (LTE)

Mode	Modulation	Frequency (MHz)	Output Power (dBm)
Downlink 2110 - 2155 MHz	QPSK (1.4 MHz)	2111	21.01
	QPSK (1.4 MHz)	2132	21.24
	QPSK (1.4 MHz)	2154	21.18
	16QAM (1.4 MHz)	2111	20.99
	16QAM (1.4 MHz)	2132	21.22
	16QAM (1.4 MHz)	2154	21.16
	64QAM (1.4 MHz)	2111	21.15
	64QAM (1.4 MHz)	2132	21.23
	64QAM (1.4 MHz)	2154	21.18
	QPSK (3 MHz)	2112	21.06
	QPSK (3 MHz)	2132	21.34
	QPSK (3 MHz)	2153	21.26
	16QAM (3 MHz)	2112	20.97
	16QAM (3 MHz)	2132	21.36
	16QAM (3 MHz)	2153	21.06
	64QAM (3 MHz)	2112	20.99
	64QAM (3 MHz)	2132	21.36
	64QAM (3 MHz)	2153	21.11
	QPSK (5 MHz)	2113	21.06
	QPSK (5 MHz)	2132	21.40
	QPSK (5 MHz)	2152	20.31
	16QAM (5 MHz)	2113	21.10
	16QAM (5 MHz)	2132	21.69
	16QAM (5 MHz)	2152	20.33
	64QAM (5 MHz)	2113	21.12
	64QAM (5 MHz)	2132	21.41
	64QAM (5 MHz)	2152	20.64
	QPSK (10 MHz)	2115	21.05
	QPSK (10 MHz)	2132	21.53
	QPSK (10 MHz)	2150	20.74
	16QAM (10 MHz)	2115	21.08
	16QAM (10 MHz)	2132	21.55
	16QAM (10 MHz)	2150	20.76
	64QAM (10 MHz)	2115	21.07
	64QAM (10 MHz)	2132	21.54
	64QAM (10 MHz)	2150	20.73

5 FCC §2.1047 - MODULATION CHARACTERISTIC

5.1 Applicable Standard

According to FCC §2.1047(d) and Part 27, there is no specific requirement for digital modulation, therefore modulation characteristic is not presented.

5.2 Test Result

N/A

6 FCC §2.1049 & §27.53 - OCCUPIED BANDWIDTH

6.1 Applicable Standard

Requirements: FCC §2.1049 and §27.53.

6.2 Test Procedure

The RF output of the transmitter was connected to the simulator and the spectrum analyzer through sufficient attenuation.

The resolution bandwidth of the spectrum analyzer was set at 100 kHz and the 26 dB & 99% bandwidth was recorded.

6.3 Test Equipment List and Details

Manufacturers	Descriptions	Models	Serial Numbers	Calibration Dates
Agilent	ESG-D Series Signal Generator	E4438C	MY45091309	2011-04-28
Agilent	Spectrum Analyzer	E4446A	US44300386	2010-08-18

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

6.4 Test Environmental Conditions

Temperature:	20-25°C
Relative Humidity:	38-44 %
ATM Pressure:	101-102 kPa

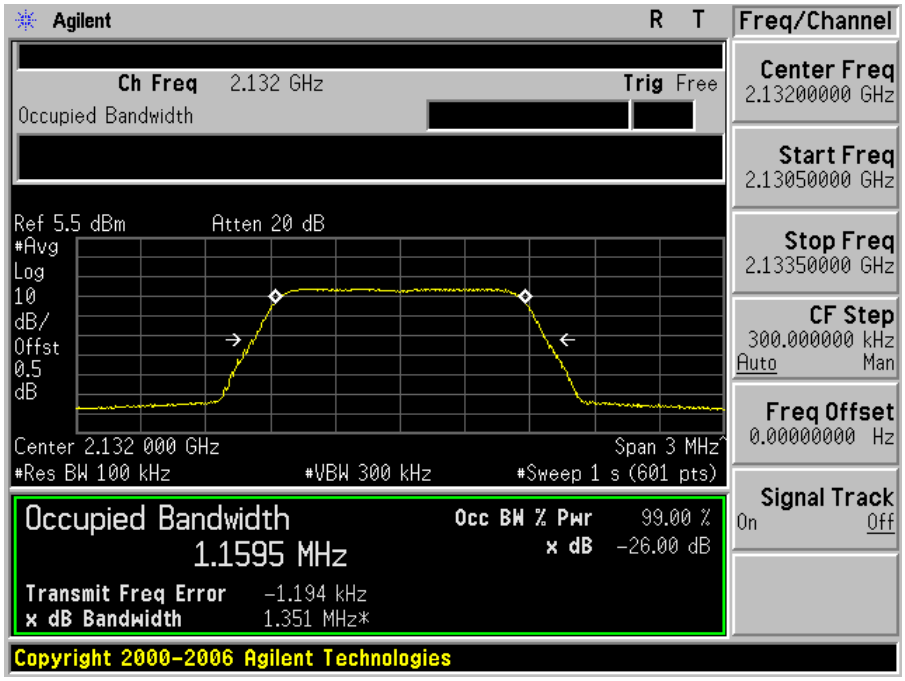
The testing was performed by Quinn from 2011-06-03 to 2011-06-07 at RF Site.

6.5 Test Results

Band	Modulation	Frequency (MHz)	Emission Bandwidth Input (MHz)	Emission Bandwidth Output (MHz)
Downlink 2110-2155 MHz	QPSK (1.4 MHz)	2132	1.1595	1.1602
	16QAM (1.4 MHz)	2132	1.1600	1.1598
	64QAM (1.4 MHz)	2132	1.1595	1.1596
	QPSK (3 MHz)	2132	2.7258	2.7266
	16QAM (3 MHz)	2132	2.7281	2.7281
	64QAM (3 MHz)	2132	2.7263	2.7269
	QPSK (5 MHz)	2132	4.4896	4.4909
	16QAM (5 MHz)	2132	4.4917	4.4916
	64QAM (5 MHz)	2132	4.4907	4.4918
	QPSK (10 MHz)	2132	8.9218	8.9240
	16QAM (10 MHz)	2132	8.9225	8.9260
	64QAM (10 MHz)	2132	8.9206	8.9231

LTE-QPSK (1.4 MHz), Frequency: 2132 MHz

Input



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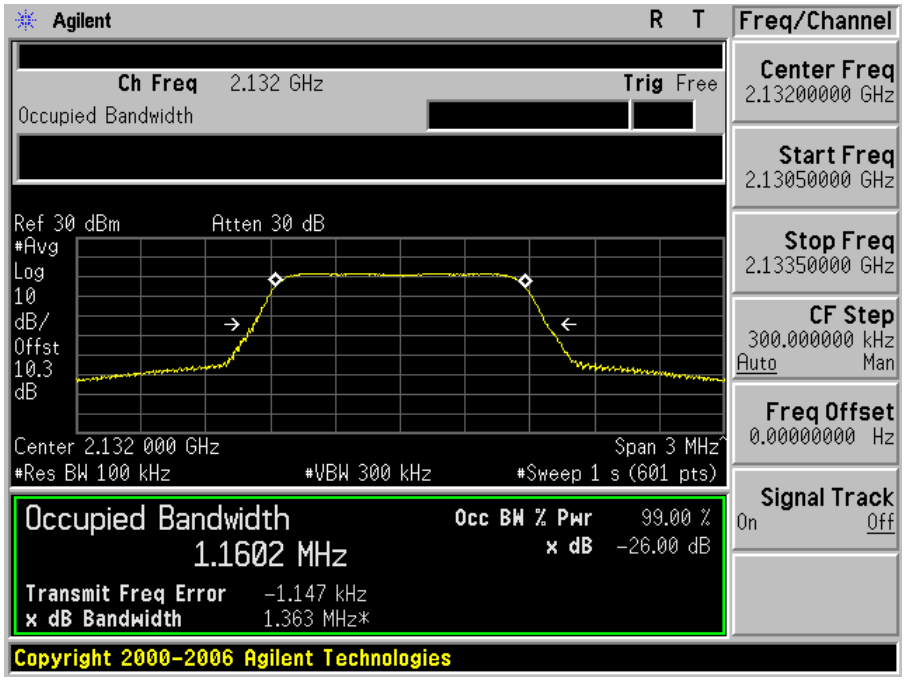
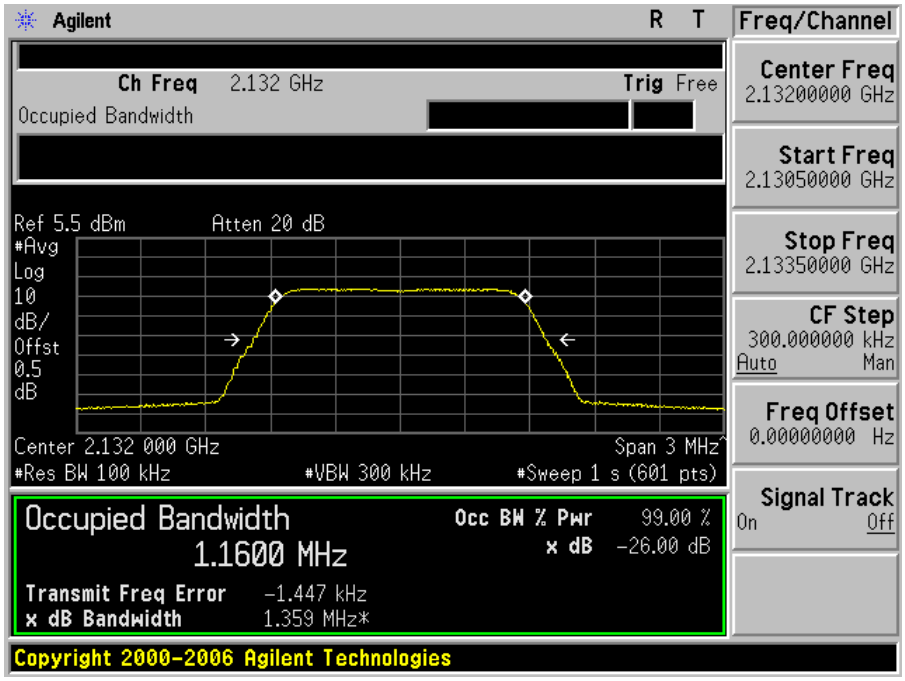


LTE-16QAM (1.4 MHz), Frequency: 2132 MHz

Input



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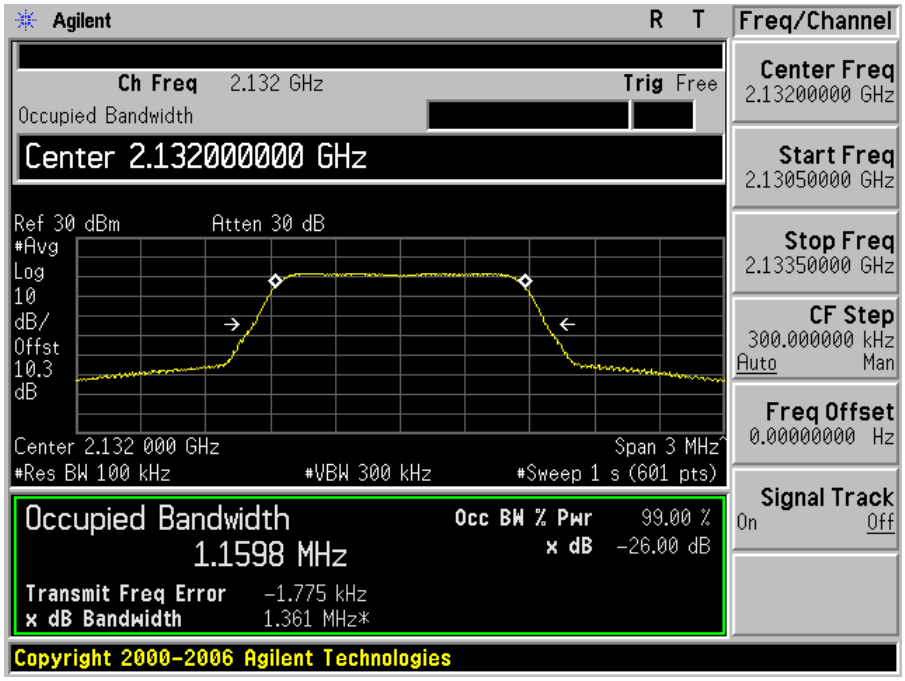
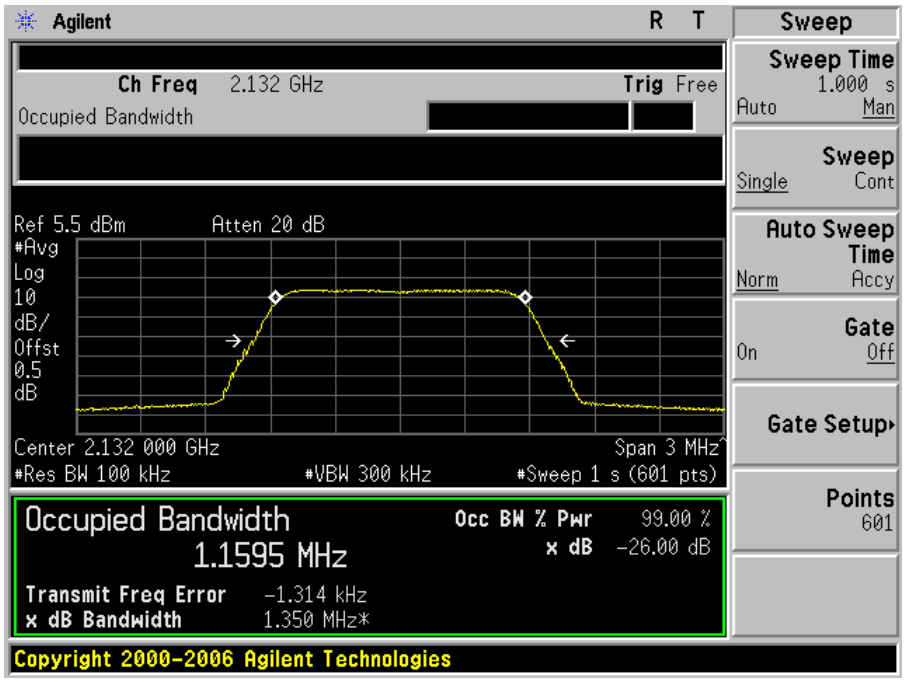
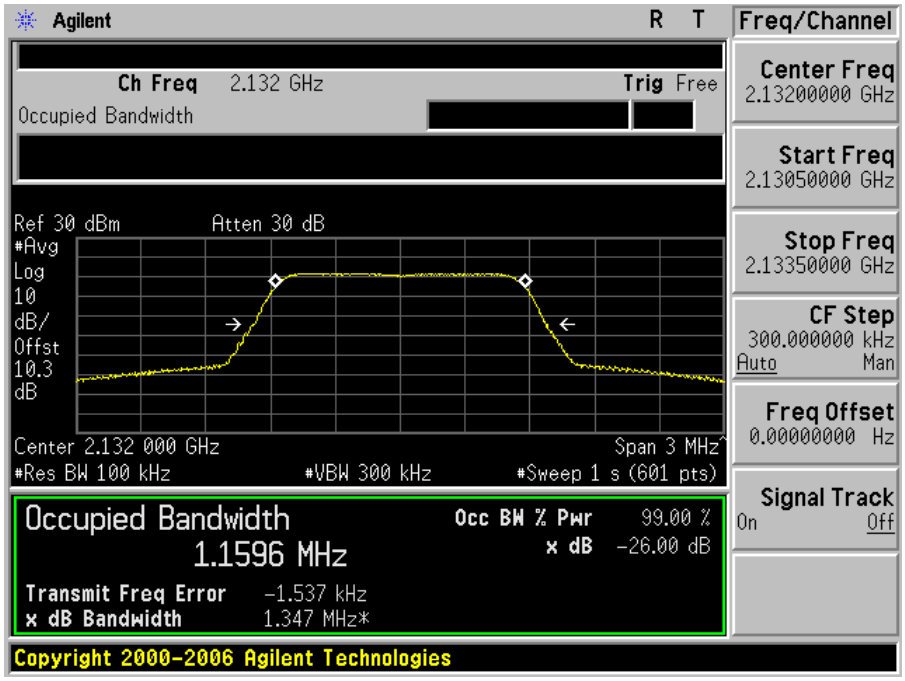


LTE-64QAM (1.4 MHz), Frequency: 2132 MHz

Input

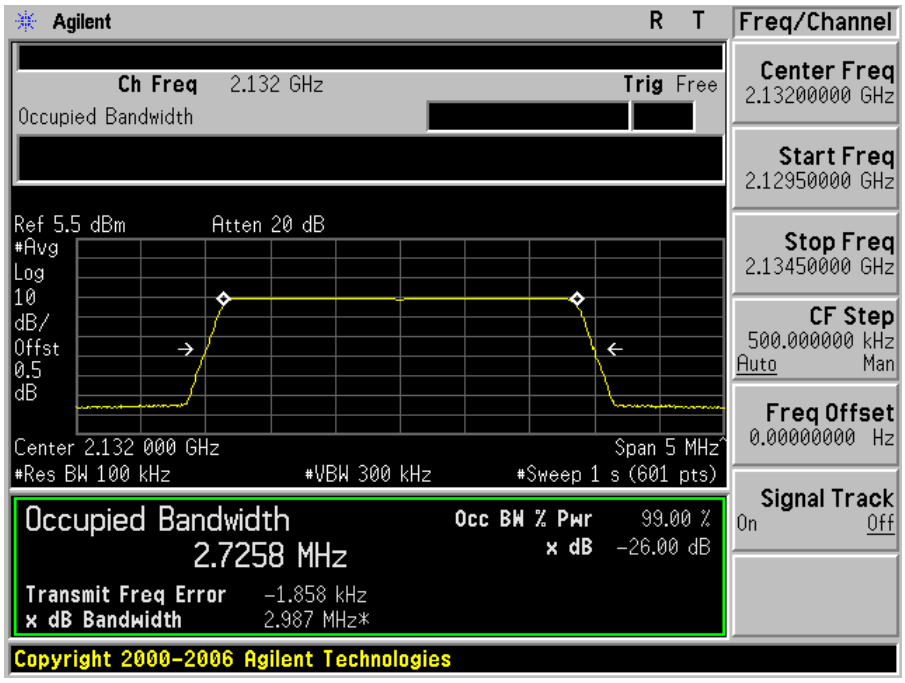


Output

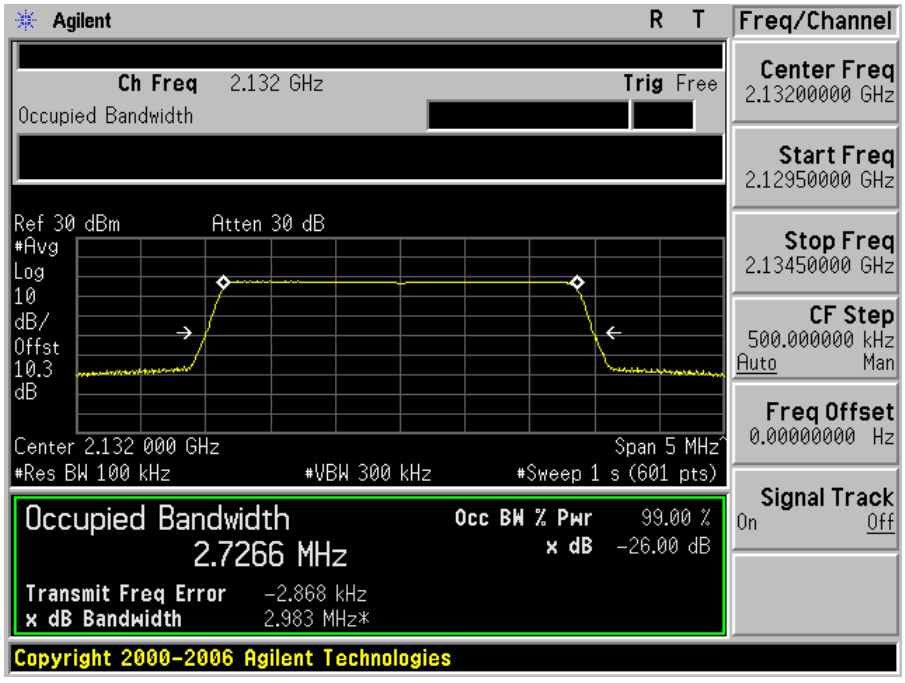


LTE-QPSK (3 MHz), Frequency: 2132 MHz

Input

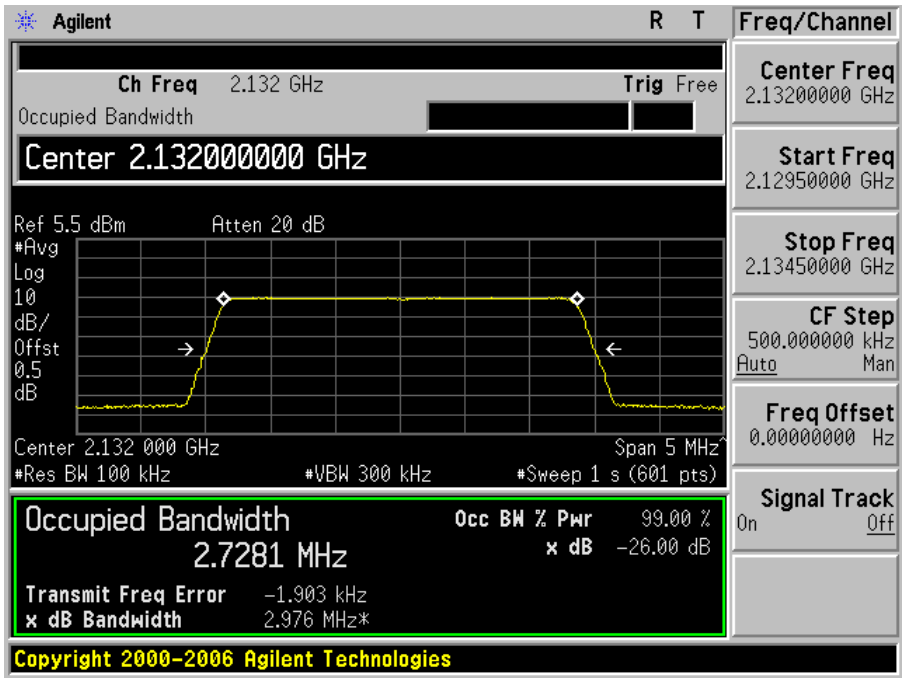


Output



LTE-16QAM (3 MHz), Frequency: 2132 MHz

Input



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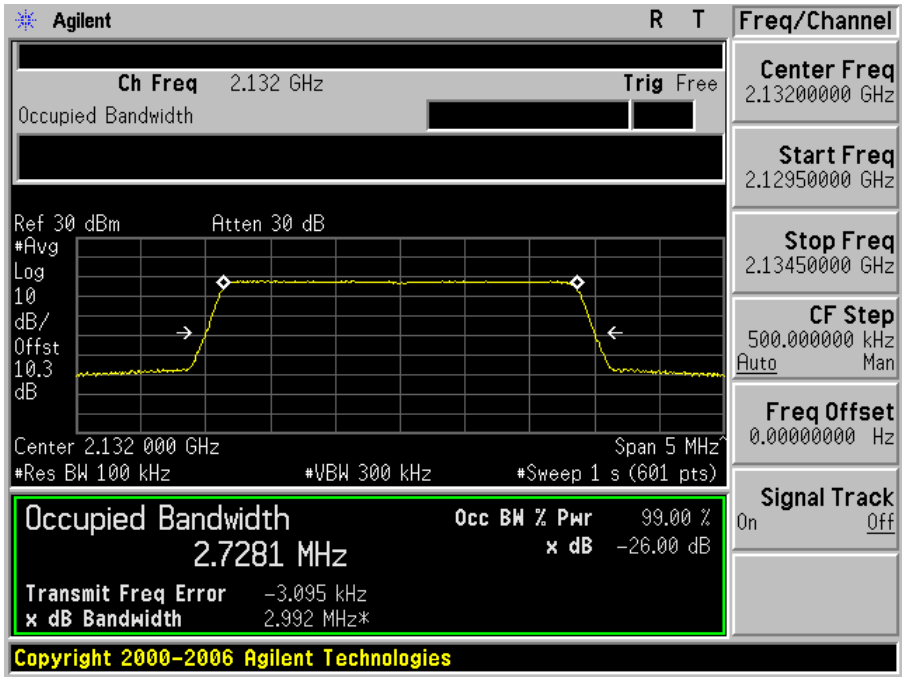
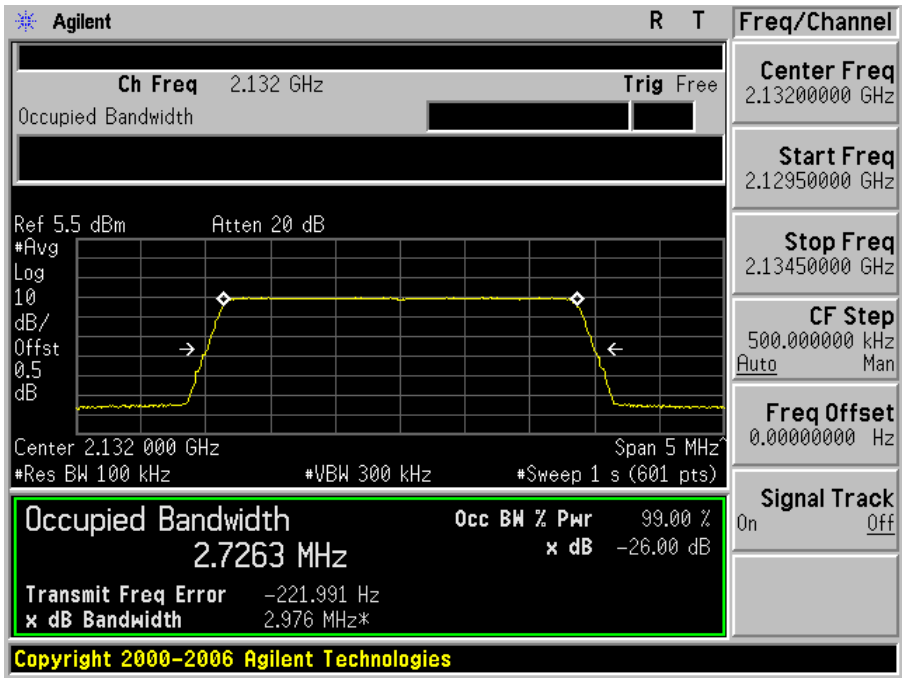


LTE-64QAM (3 MHz), Frequency: 2132 MHz

Input



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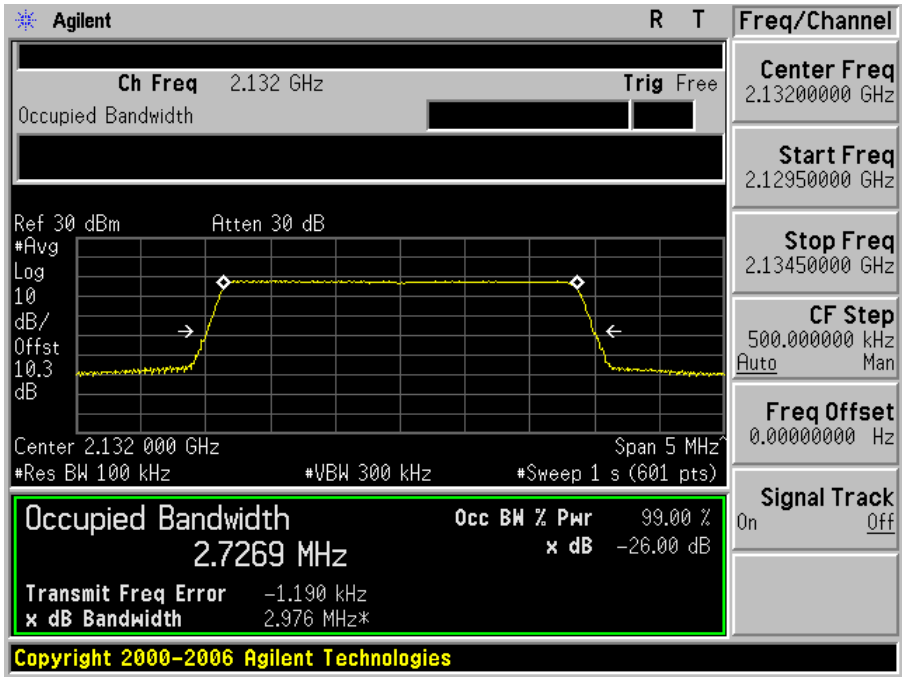
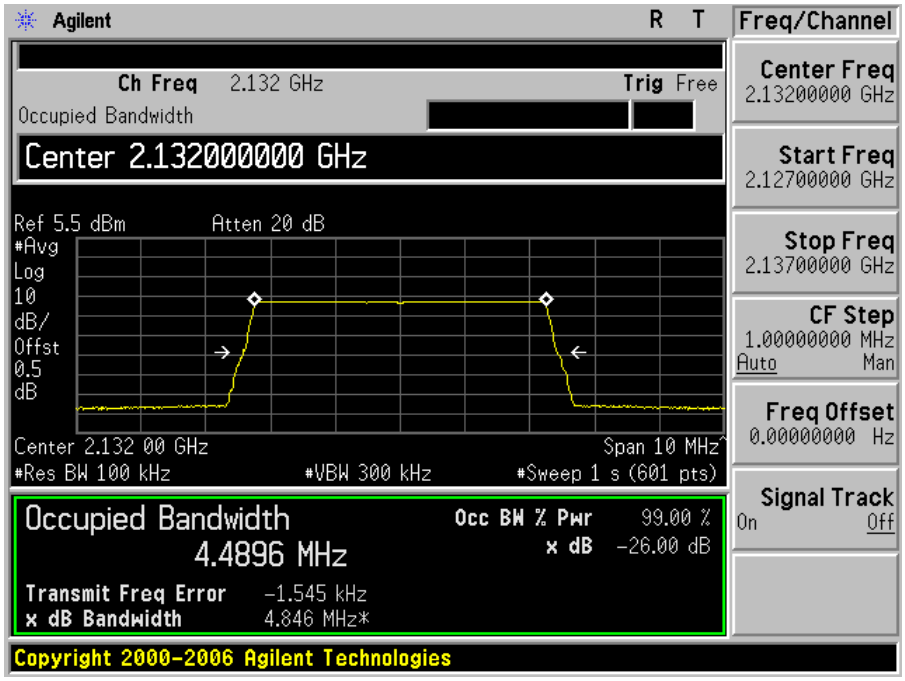
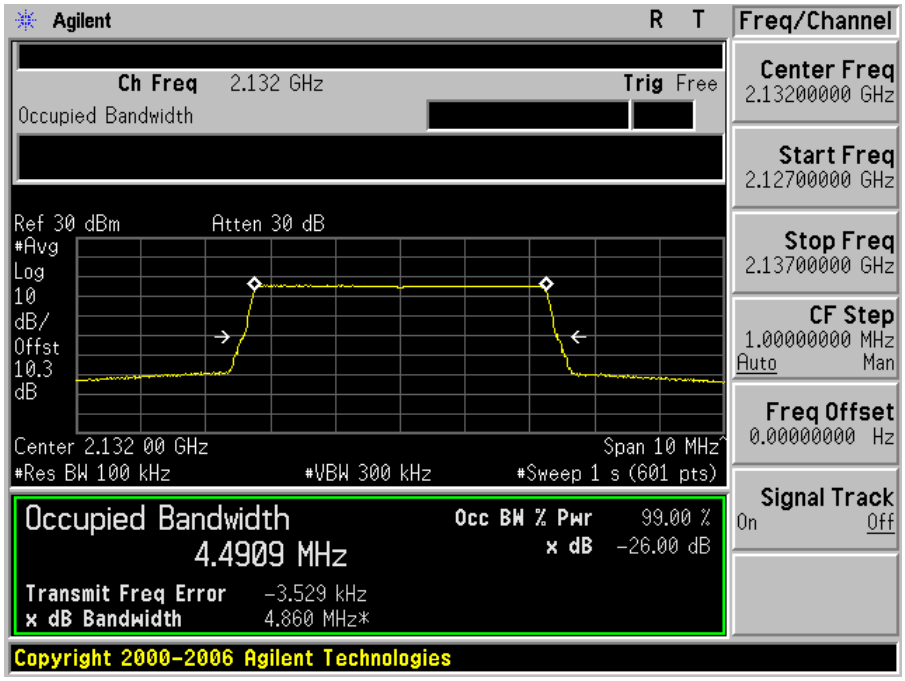


LTE-QPSK (5 MHz), Frequency: 2132 MHz

Input

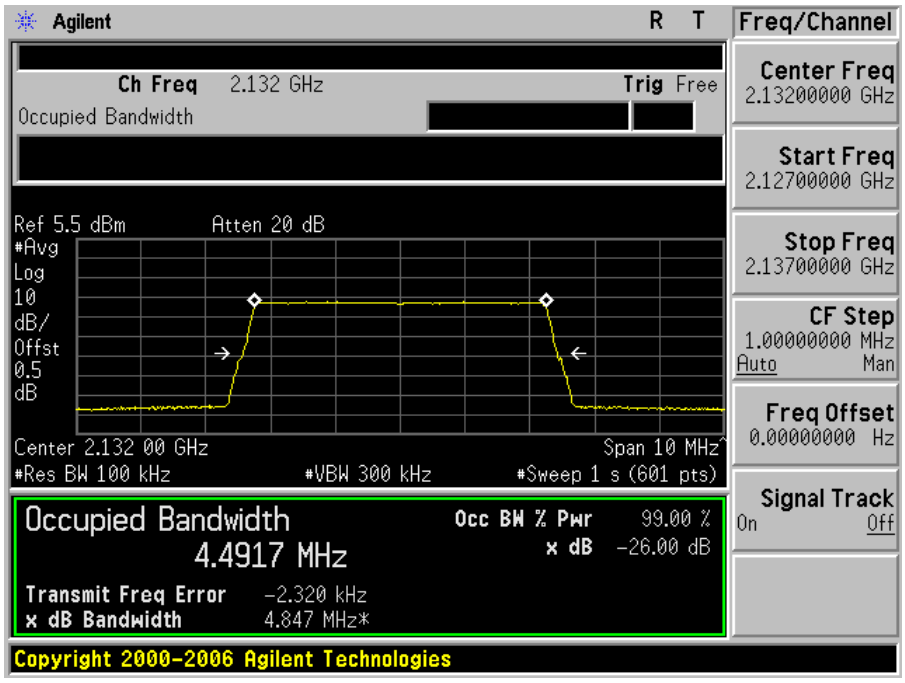


Output



LTE-16QAM (5 MHz), Frequency: 2132 MHz

Input



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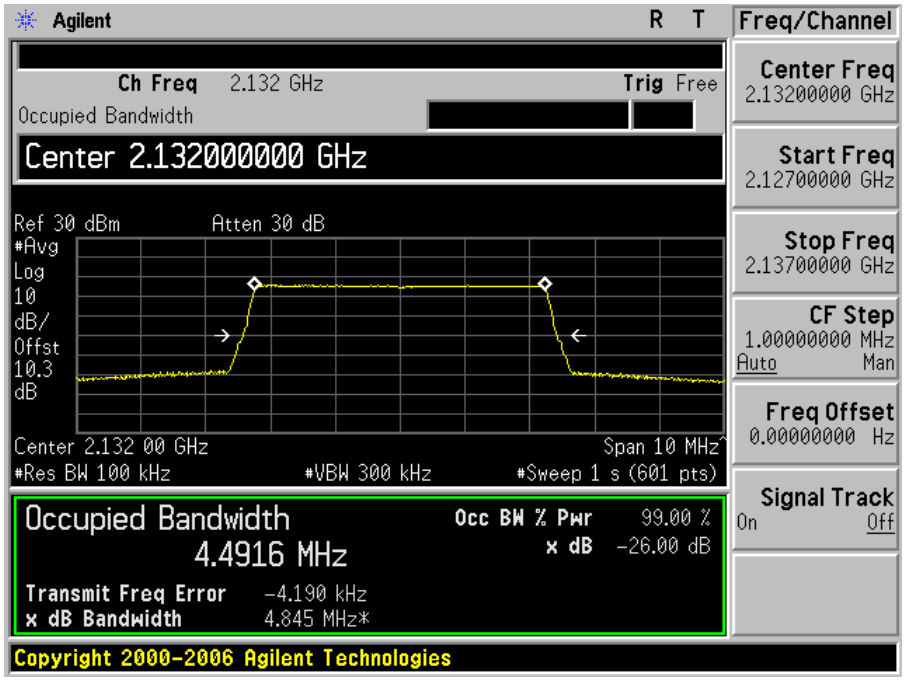
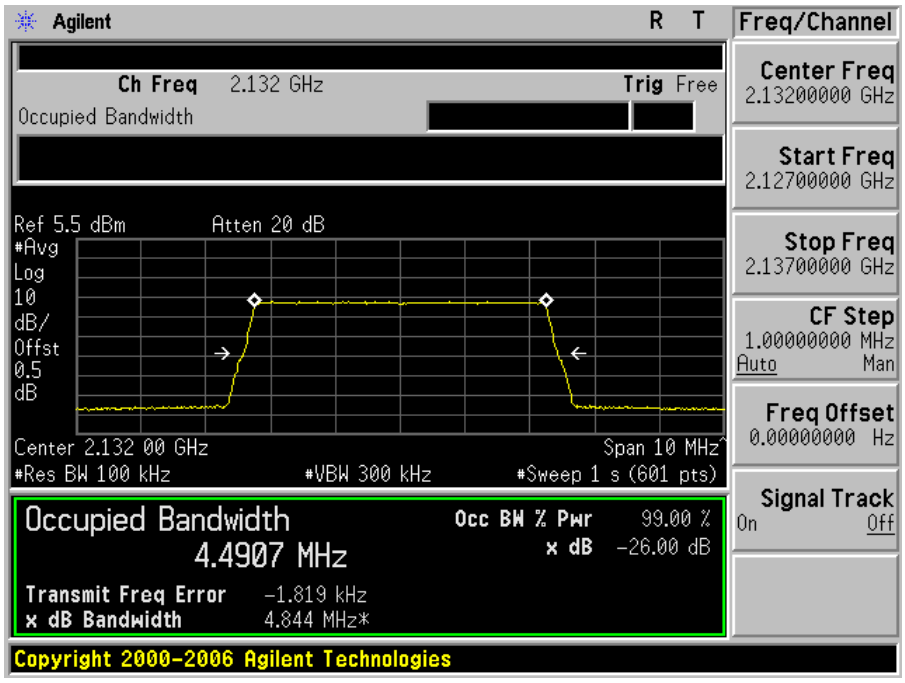


LTE-64QAM (5 MHz), Frequency: 2132 MHz

Input



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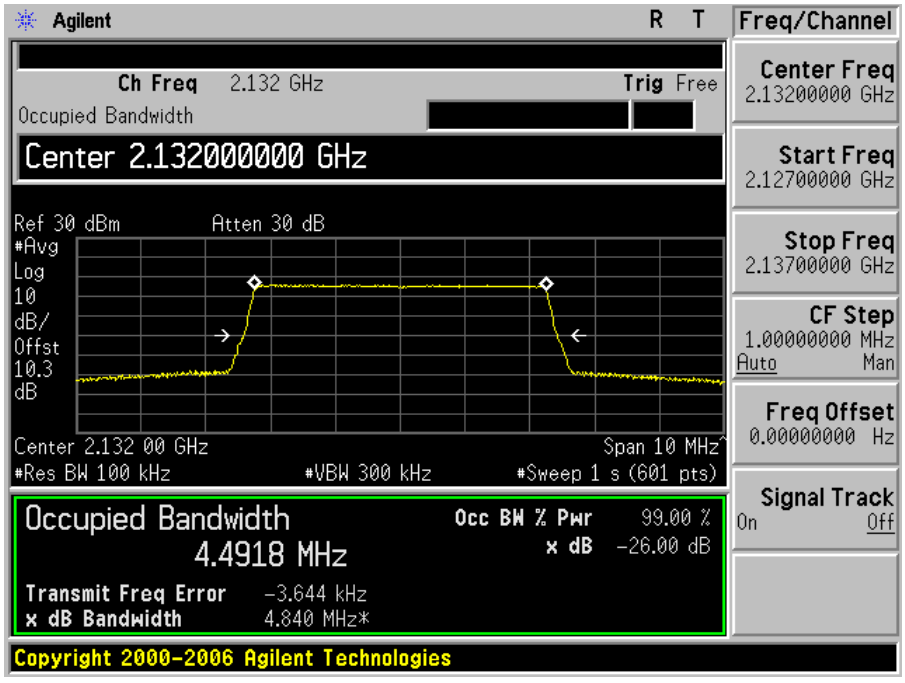
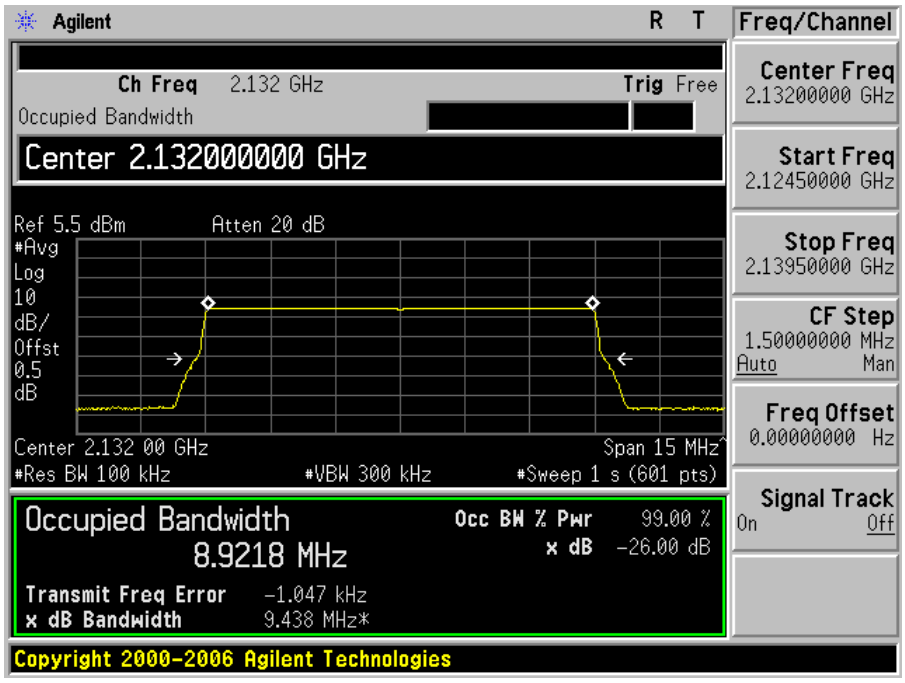


LTE-QPSK (10 MHz), Frequency: 2132 MHz

Input



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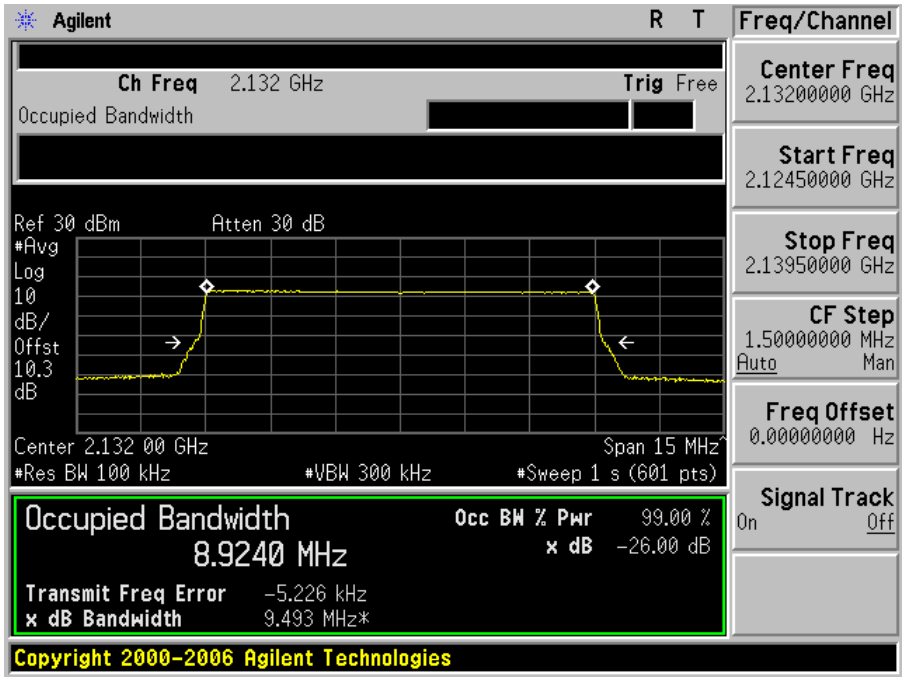
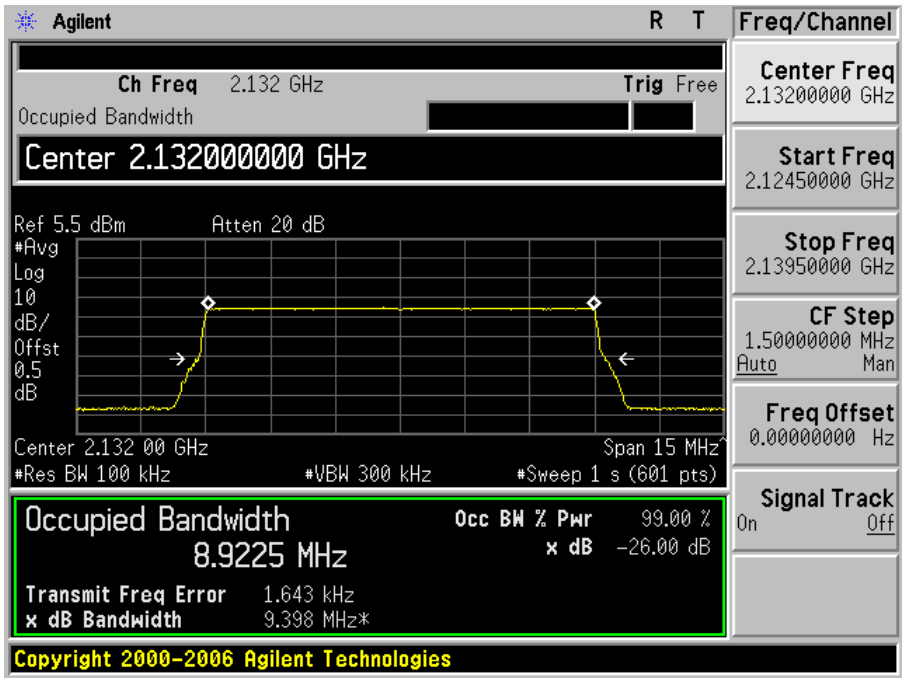


LTE-16QAM (10 MHz), Frequency: 2132 MHz

Input



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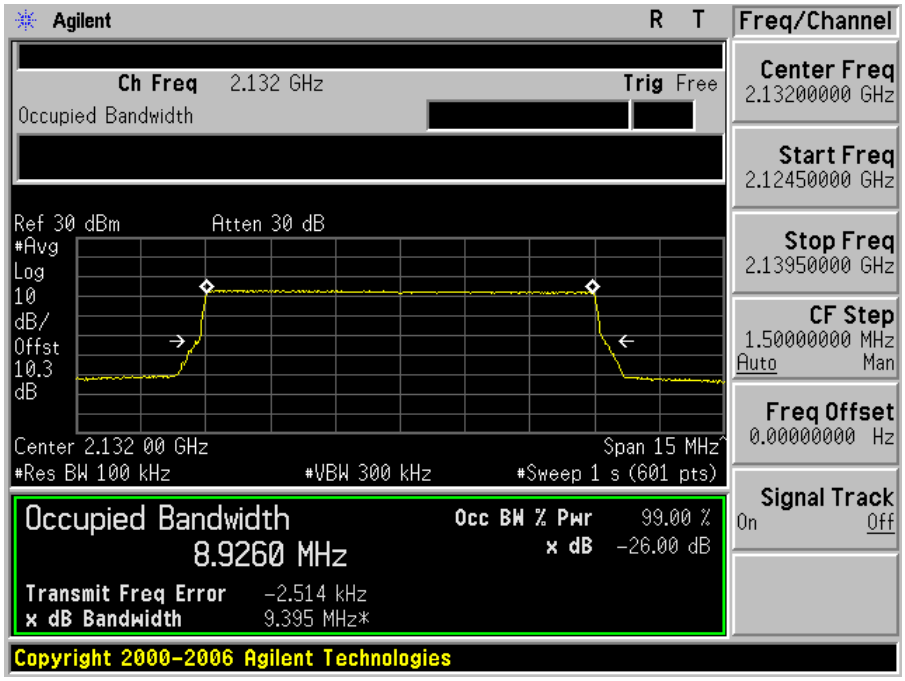
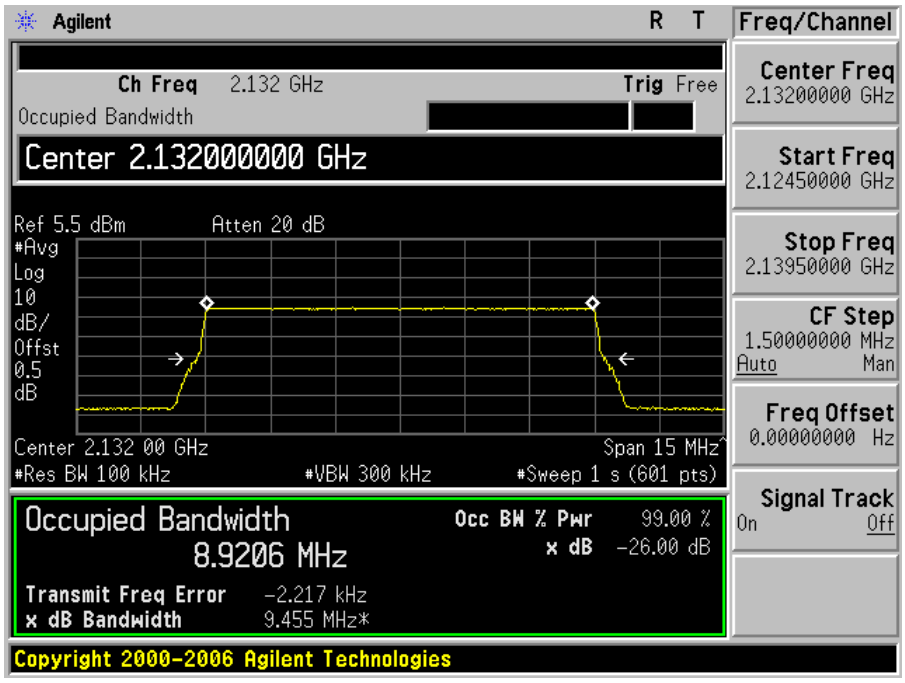


LTE-64QAM (10 MHz), Frequency: 2132 MHz

Input



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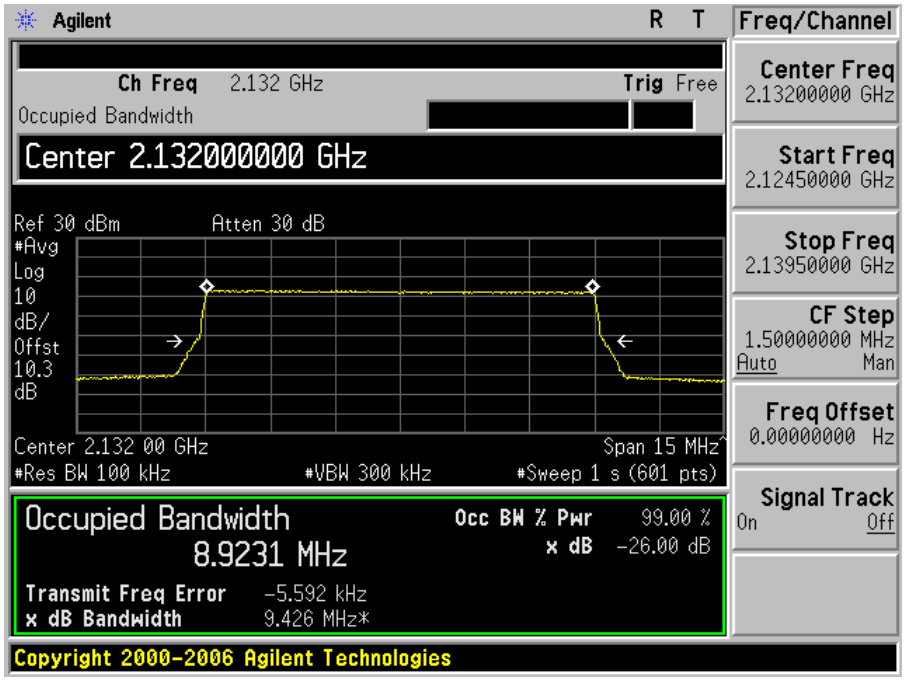


7 FCC §2.1053 & §27.53 - SPURIOUS RADIATED EMISSIONS

7.1 Applicable Standard

Requirements: FCC §2.1053, §27.53.

7.2 Test Procedure

The transmitter was placed on a wooden 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	Serial Number	Calibration Date
Agilent	Spectrum Analyzer	E4440A	US45303156	2010-08-09
Agilent	ESG-D Series Signal Generator	E4438C	MY45091309	2011-04-28
Rohde & Schwarz	EMI Test Receiver	ESCI 1166.5950K03	100337	2011-03-21
Sunol Science Corp	System Controller	SC99V	122303-1	N/R
Sunol Science Corp	Combination Antenna	JB3	A0020106-3	2010-06-16
Hewlett Packard	Pre amplifier	8447D	2944A06639	2010-06-18
A.R.A Inc	Horn antenna	DRG-1181A	1132	2010-11-29
Mini-Circuits	Pre Amplifier	ZVA-183-S	570400946	2011-05-09

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

7.4 Test Environmental Conditions

Temperature:	20-25°C
Relative Humidity:	38-44 %
ATM Pressure:	101-102 kPa

The testing was performed by Quinn from 2011-06-03 to 2011-06-07at Chamber3.

7.5 Test Results

Modulation: CW Signal – 2132 MHz (Scan from 30 MHz to 26 GHz @ 3 Meter Distance)

Indicated		Turntable Azimuth (degree)	Test Antenna		Substituted					Limit (dBm)	Margin (dB)
Frequency (MHz)	S.A. Amp. (dBuV)		Height (cm)	Polarity (H/V)	Frequency (MHz)	S.G. Level (dBm)	Ant. Gain (dB)	Cable Loss (dB)	Absolute Level (dBm)		
106.73	58.53	263	170	H	106.73	-29.78	0	0.4	-30.18	-13	-17.18
106.73	47.52	201	200	V	106.73	-40.79	0	0.4	-41.19	-13	-28.19
2445	49.87	274	169	H	2445	-52.1	9	1.5	-44.6	-13	-31.6
2445	45.89	349	170	V	2445	-56.08	9	1.5	-48.58	-13	-35.58

8 FCC §2.1051 & §27.53 - SPURIOUS EMISSIONS AT ANTENNA TERMINALS

8.1 Applicable Standard

Requirements: FCC §2.1051 & §27.53.

The spectrum shall be investigated to the tenth harmonics of the highest fundamental frequency as specified in § 2.1057.

The power of any emission outside of the authorized operating frequency ranges must be attenuated below the transmitting power (P) by a factor of at least 43 + 10 log (P) dB

8.2 Test Procedure

The RF output of the transceiver was connected to a spectrum analyzer and simulator through appropriate attenuation. The resolution bandwidth of the spectrum analyzer was set at 100 kHz. Sufficient scans were taken to show any out of band emissions up to 10^{th} harmonic.

8.3 Test Equipment List and Details

Manufacturers	Descriptions	Models	Serial Numbers	Calibration Dates
Agilent	ESG-D Series Signal Generator	E4438C	MY45091309	2011-04-28
Agilent	Spectrum Analyzer	E4446A	US44300386	2010-08-18

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

8.4 Test Environmental Conditions

Temperature:	20-25°C
Relative Humidity:	38-44 %
ATM Pressure:	101-102 kPa

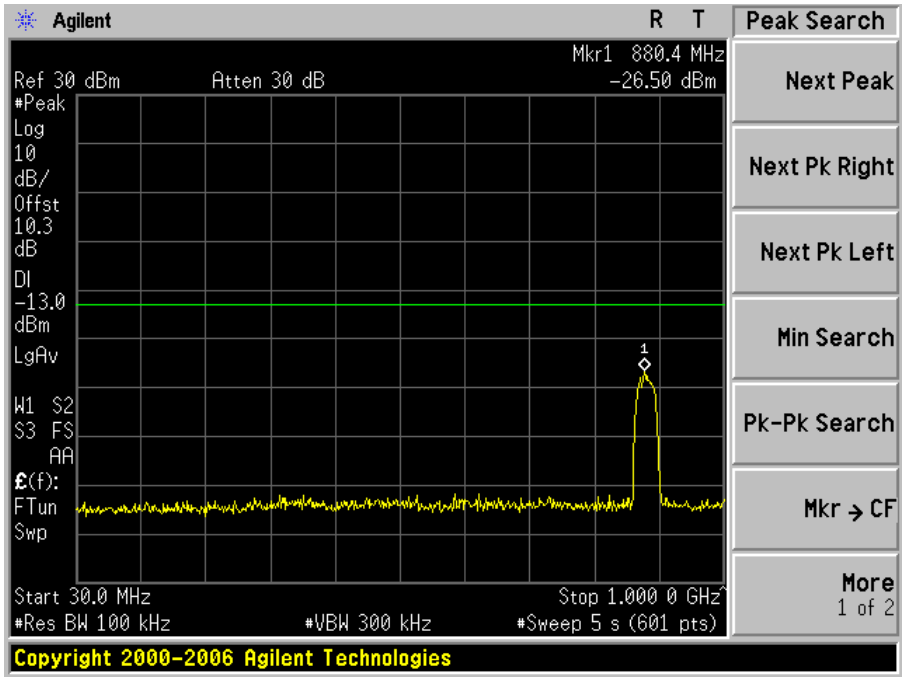
The testing was performed by Quinn from 2011-06-03 to 2011-06-07 at RF Site.

8.5 Test Results

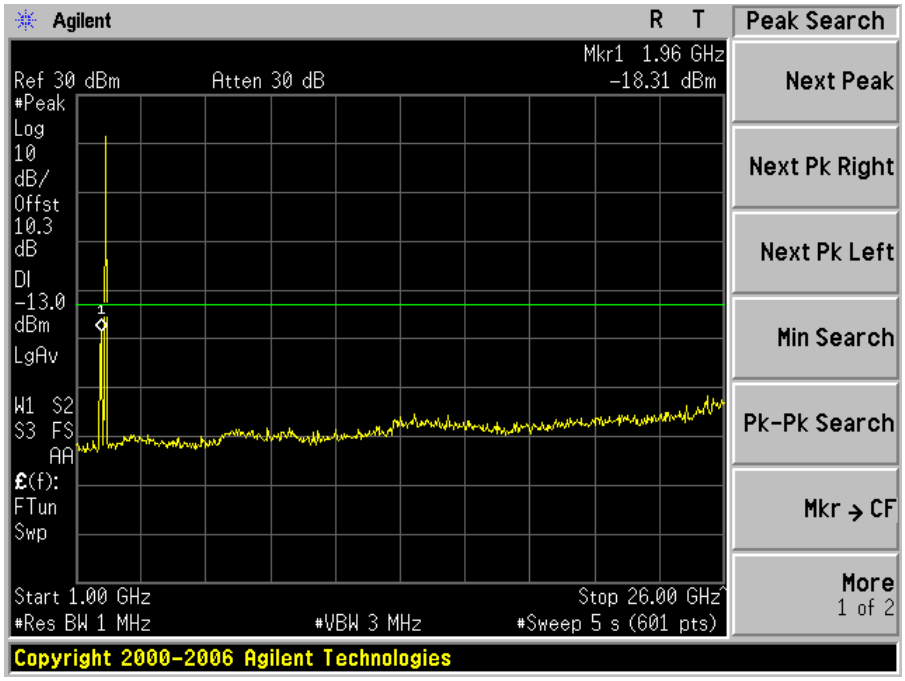
Please refer to the following plots.

Modulation: CW Signal, Frequency: 2132 MHz

Plot 1: 30 MHz to 1 GHz



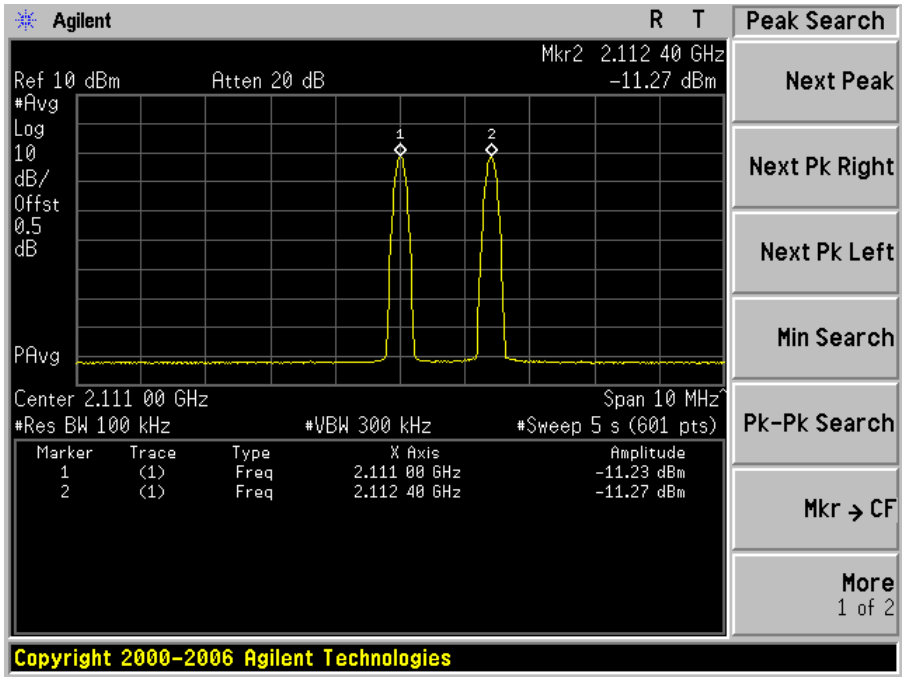
Plot 2: Above 1 GHz



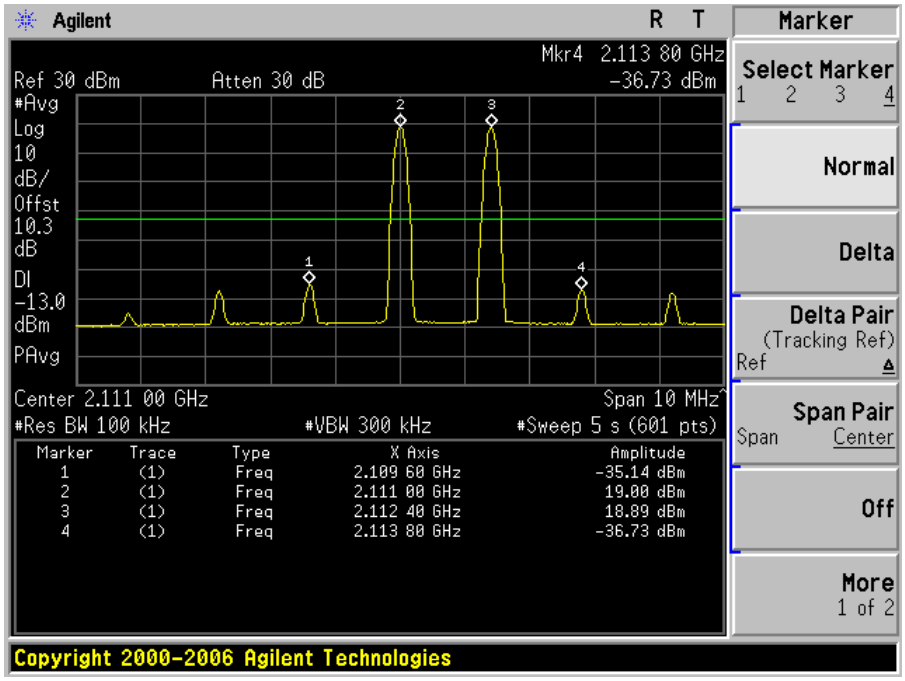
Inter-Modulation:

Lowest Frequency

Input

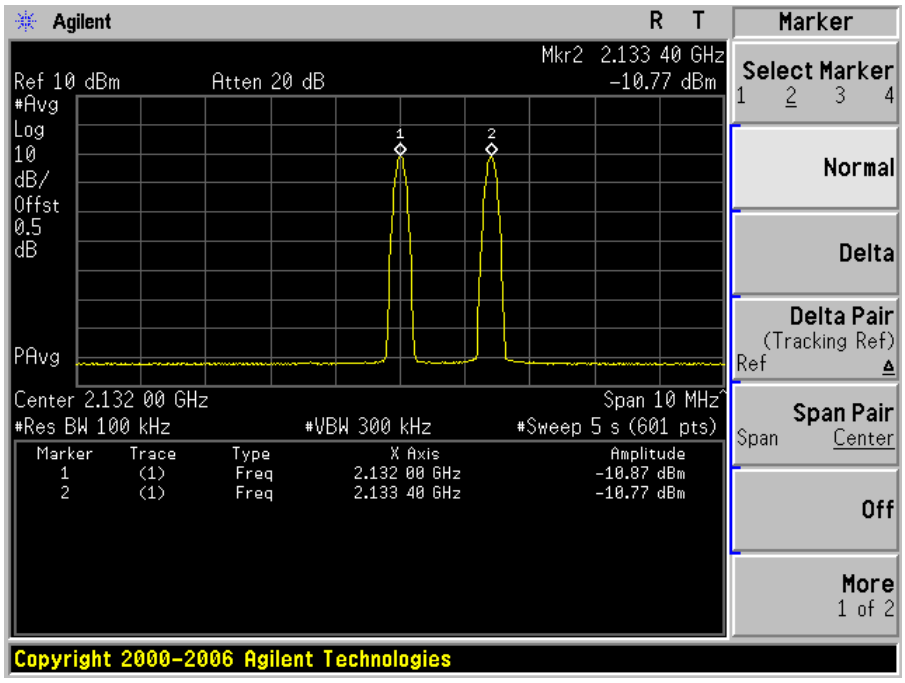


Output

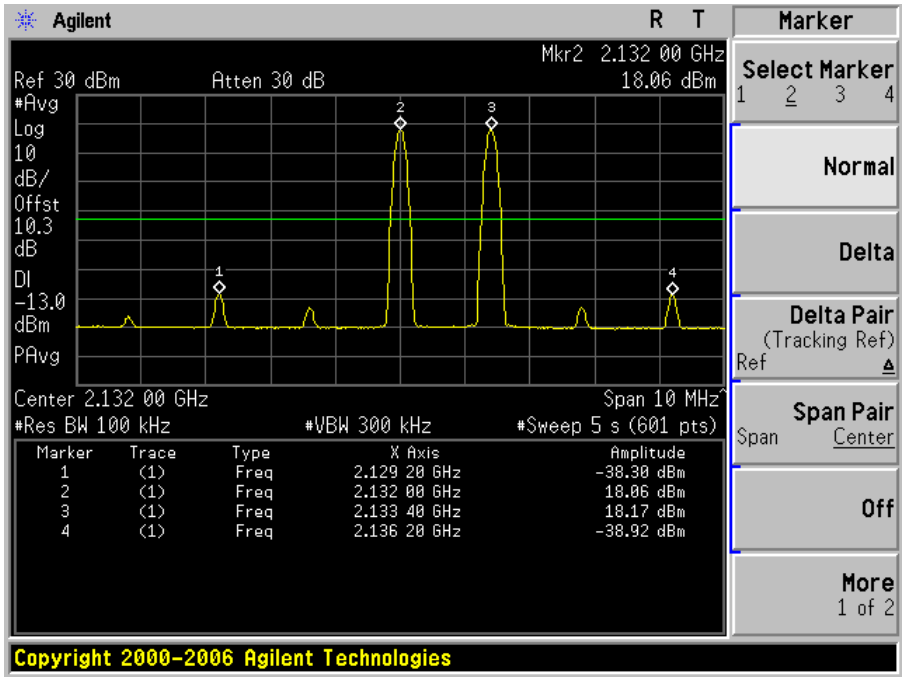


Middle Frequency

Input

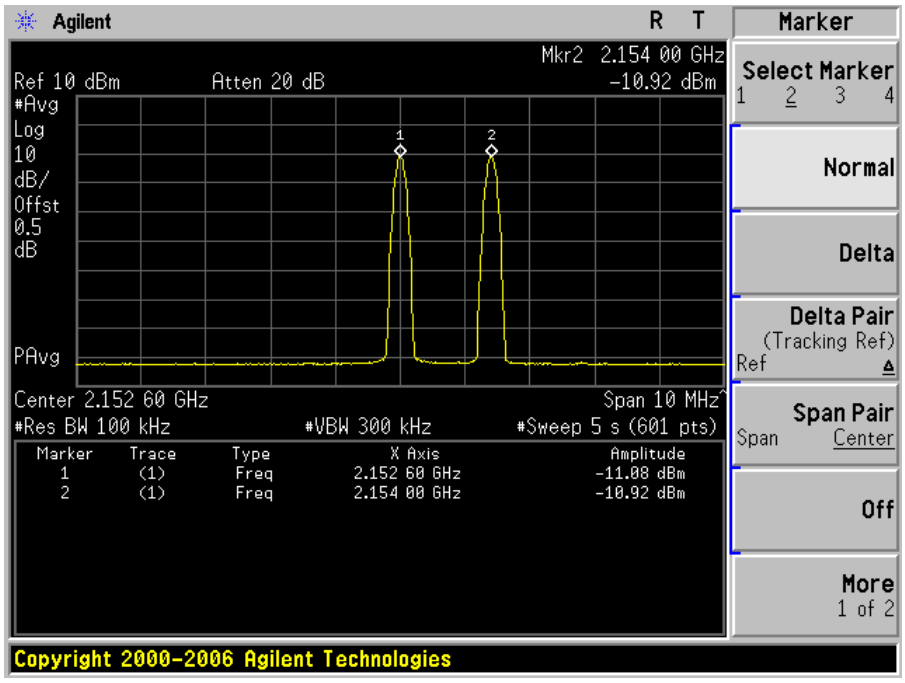


Output



Highest Frequency

Input



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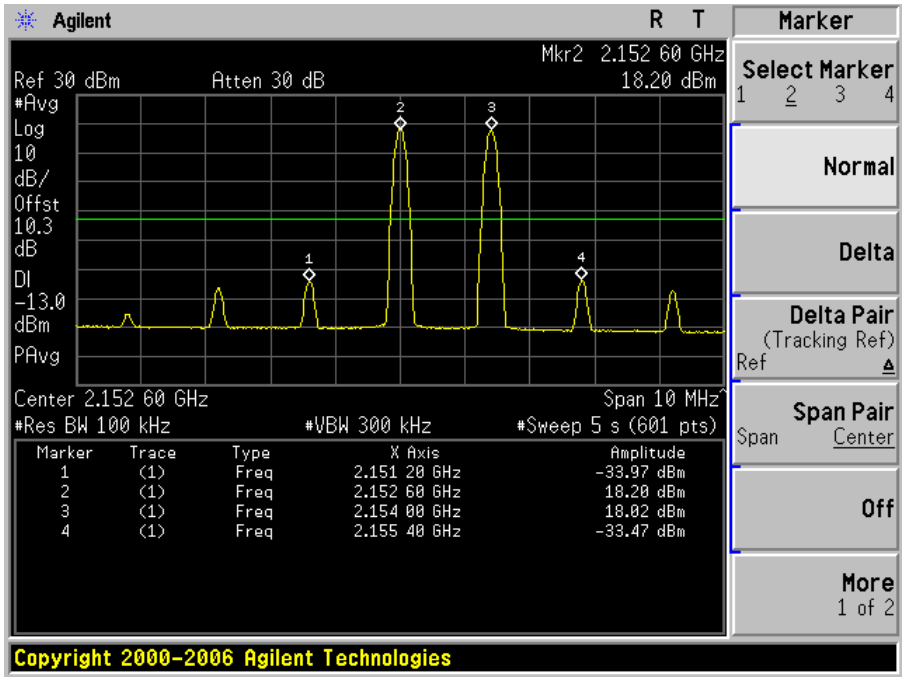
Output



9 FCC §27.53 – BAND EDGE

9.1 Applicable Standard

According to FCC §27.53, the power of any emissions outside of the authorized operating frequency ranges must be attenuated below the transmitting power (P) by a factor of at least 43 + 10 log(P) dB.

9.2 Test Procedure

The RF output of the transmitter was connected to the input of the spectrum analyzer through sufficient attenuation.

The center of the spectrum analyzer was set to block edge frequency.

9.3 Test Equipment List and Details

Manufacturers	Descriptions	Models	Serial Numbers	Calibration Dates
Agilent	ESG-D Series Signal Generator	E4438C	MY45091309	2011-04-28
Agilent	Spectrum Analyzer	E4446A	US44300386	2010-08-18

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

9.4 Test Environmental Conditions

Temperature:	20-25°C
Relative Humidity:	38-44 %
ATM Pressure:	101-102 kPa

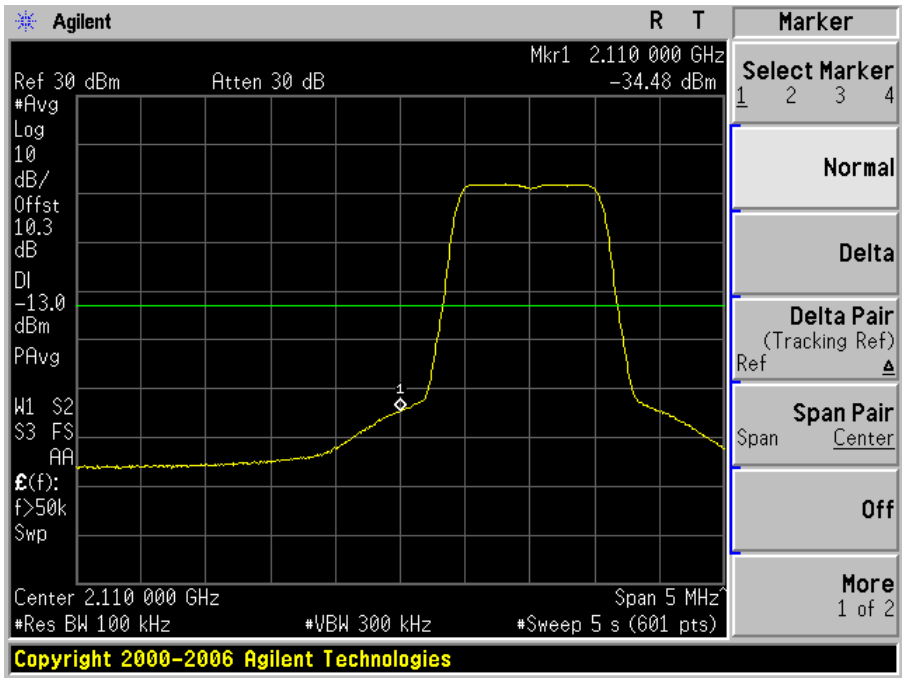
The testing was performed by Quinn from 2011-06-03 to 2011-06-07 at RF Site.

9.5 Test Results

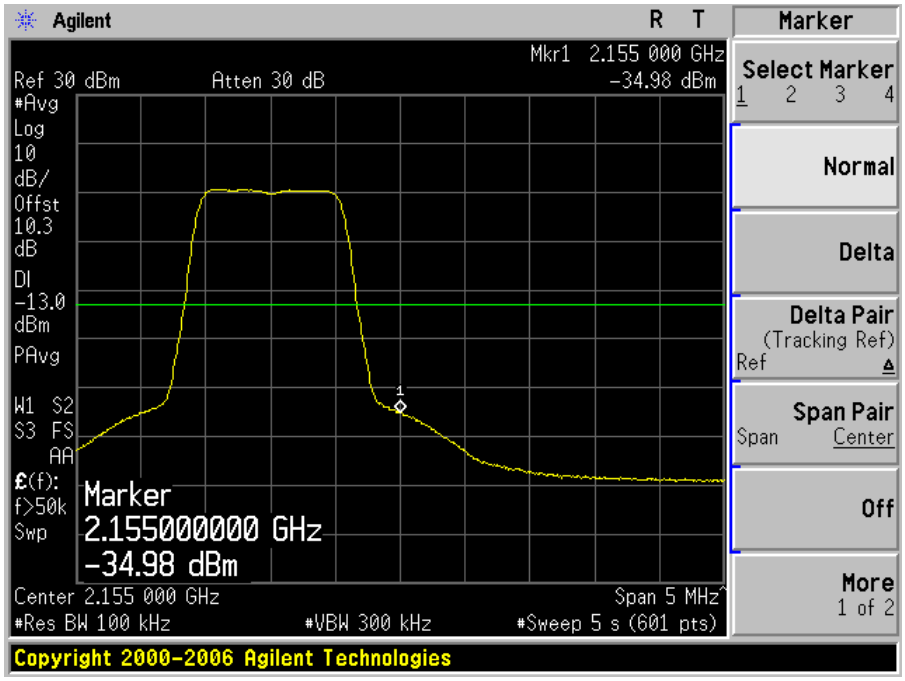
Please refer to the following plots.

Modulation: LTE-QPSK (1.4 MHz):

Lowest Edge

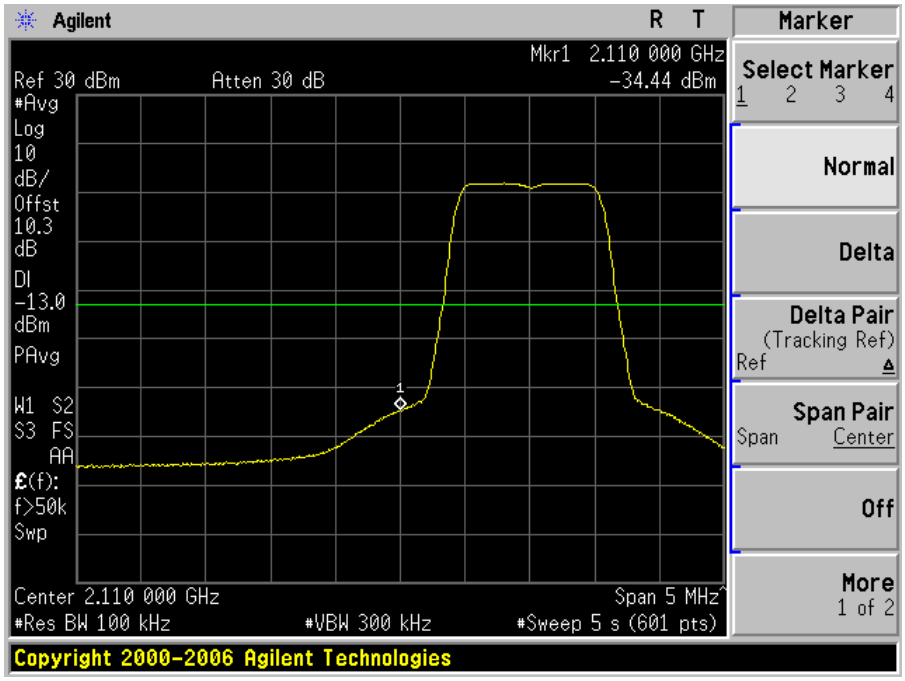


Highest Edge

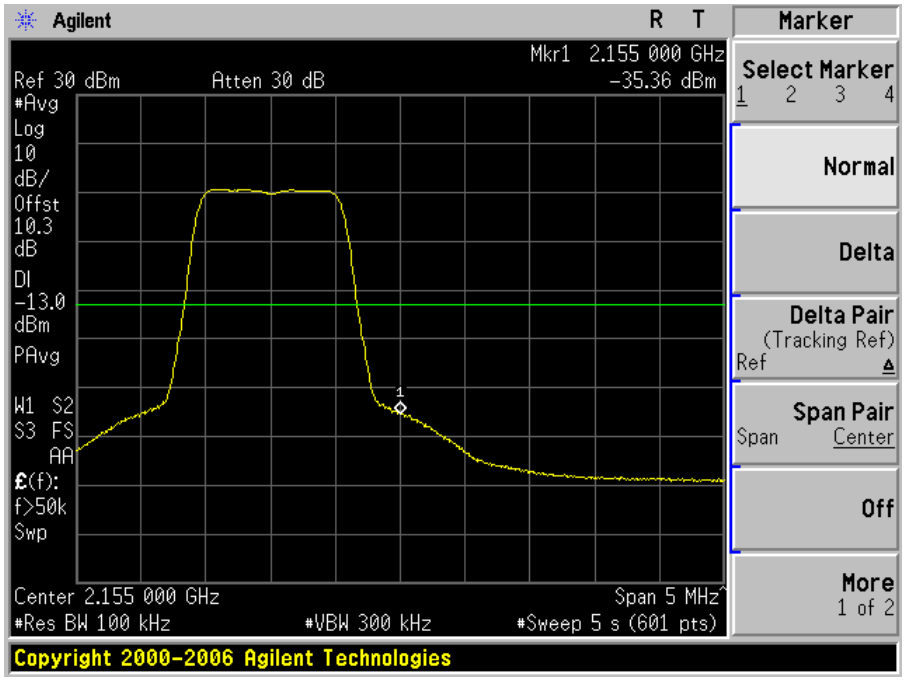


Modulation: LTE-16QAM (1.4 MHz):

Lowest Edge

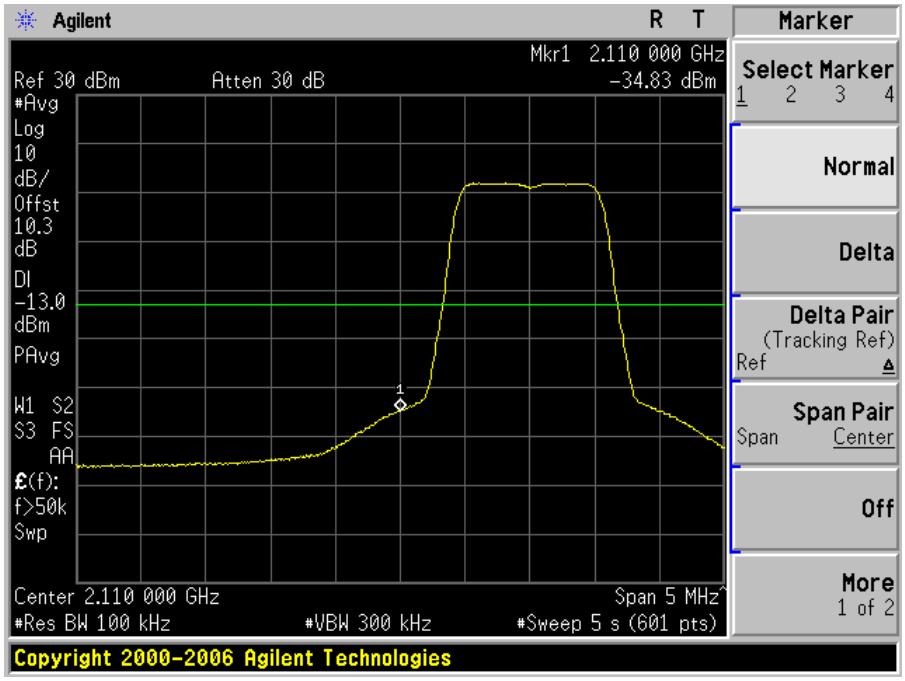


Highest Edge

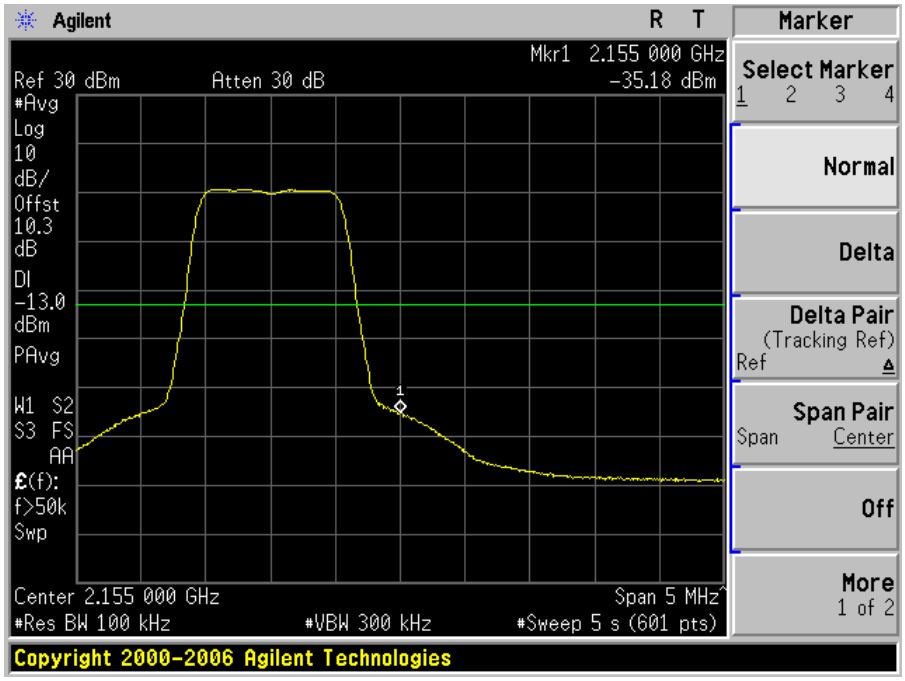


Modulation: LTE-64QAM (1.4 MHz):

Lowest Edge

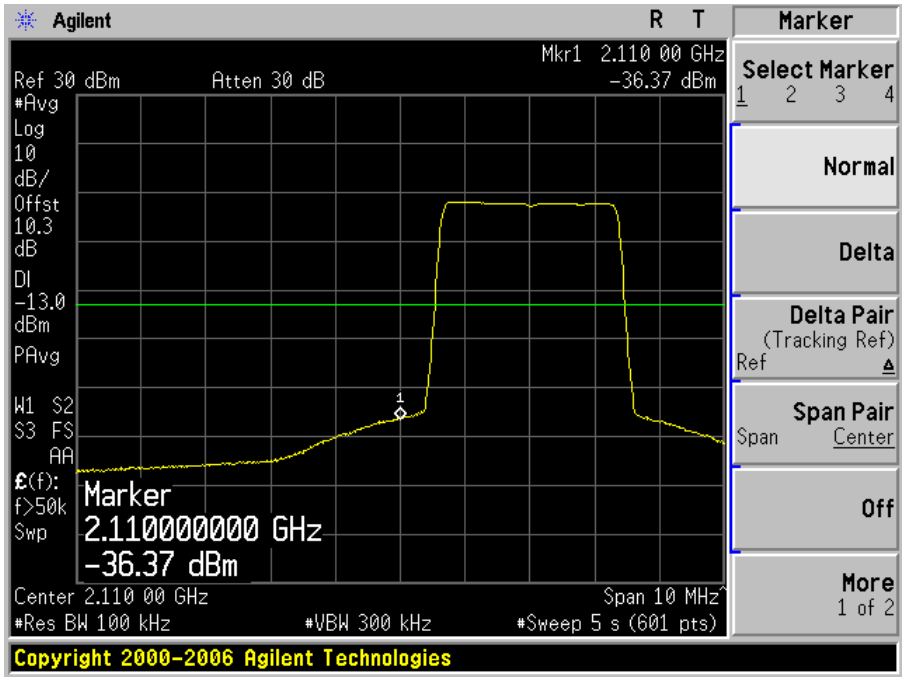


Highest Edge

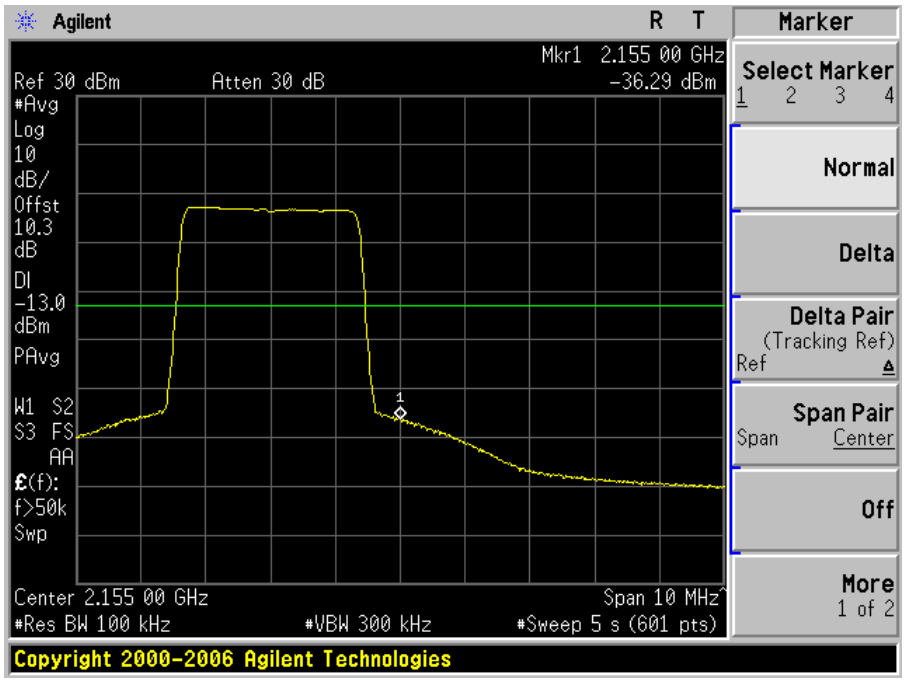


Modulation: LTE-QPSK (3 MHz):

Lowest Edge

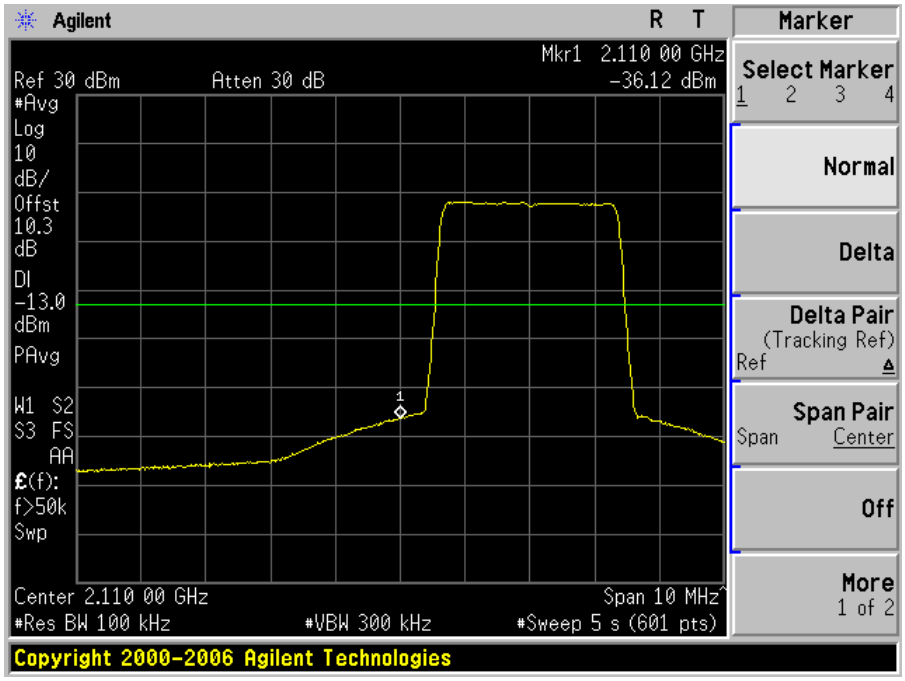


Highest Edge

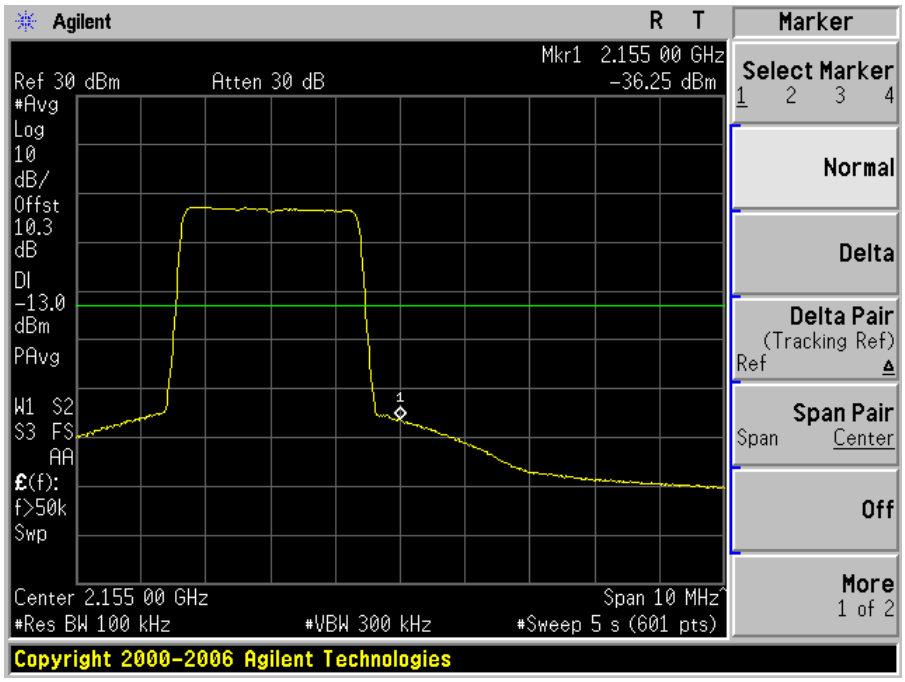


Modulation: LTE-16QAM (3 MHz):

Lowest Edge

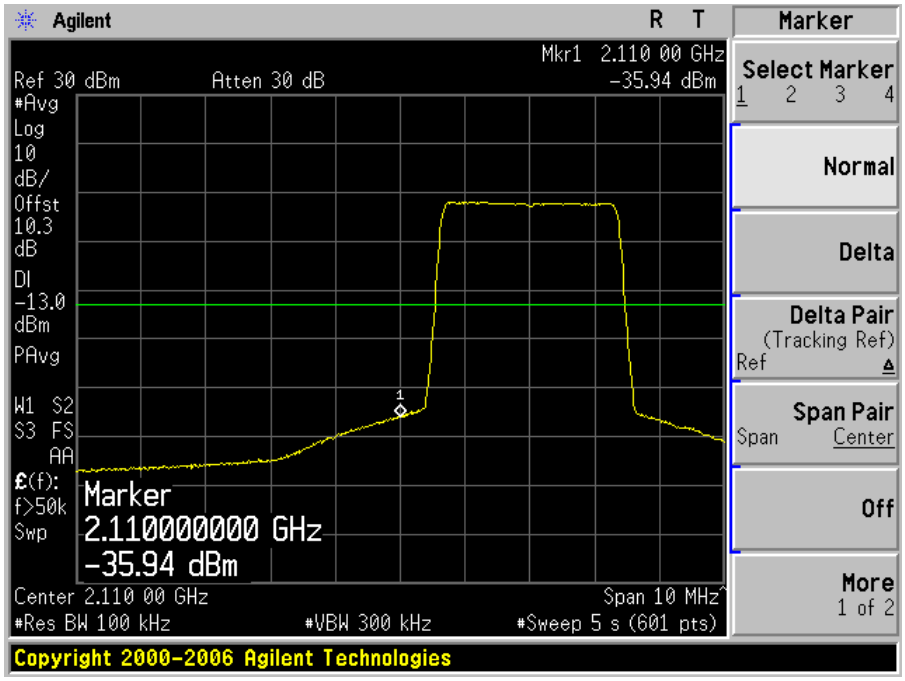


Highest Edge

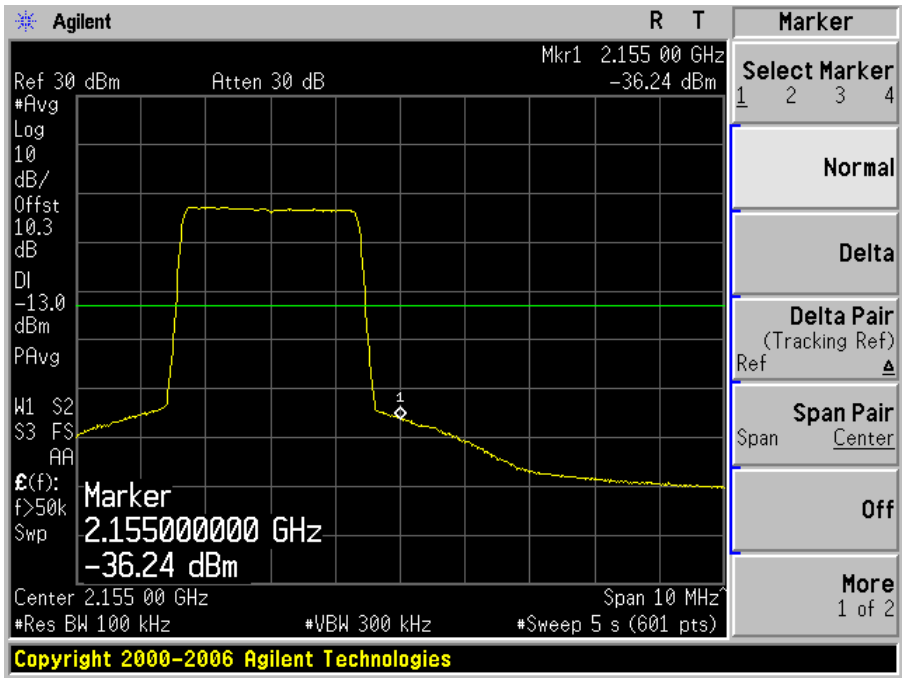


Modulation: LTE-64QAM (3 MHz):

Lowest Edge

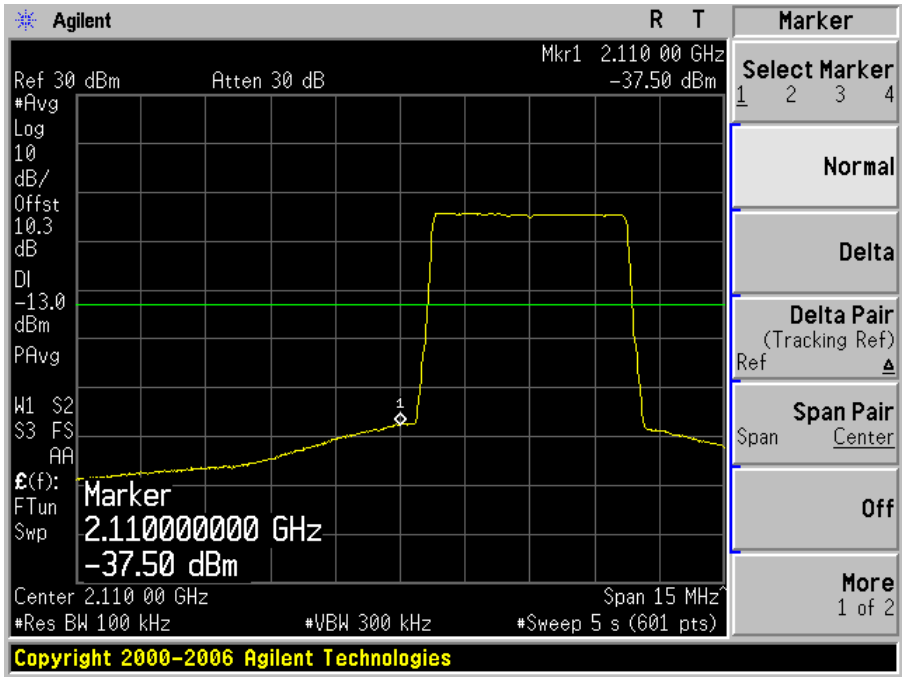


Highest Edge

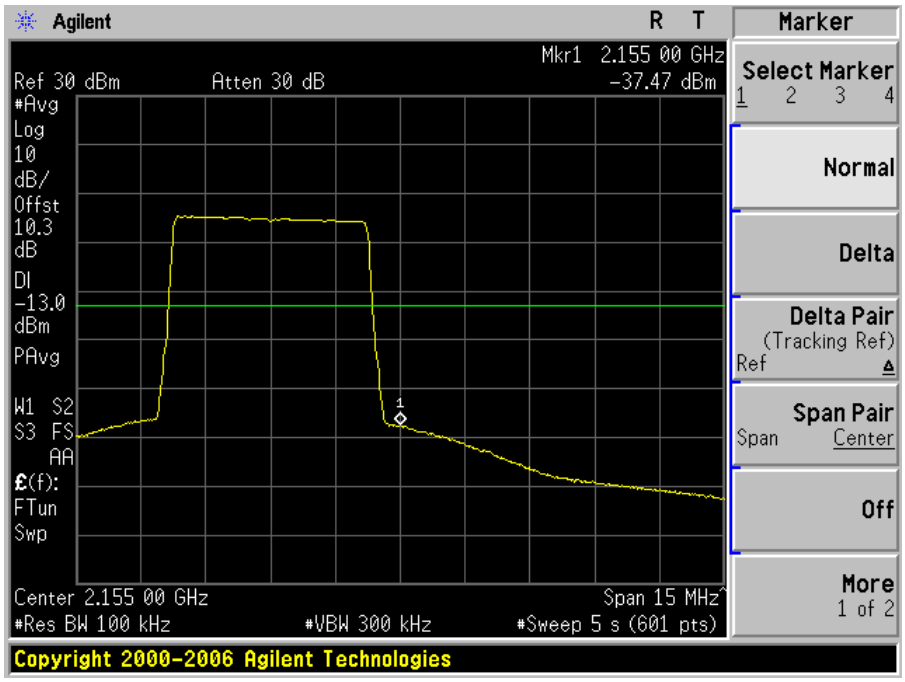


Modulation: LTE-QPSK (5 MHz):

Lowest Edge

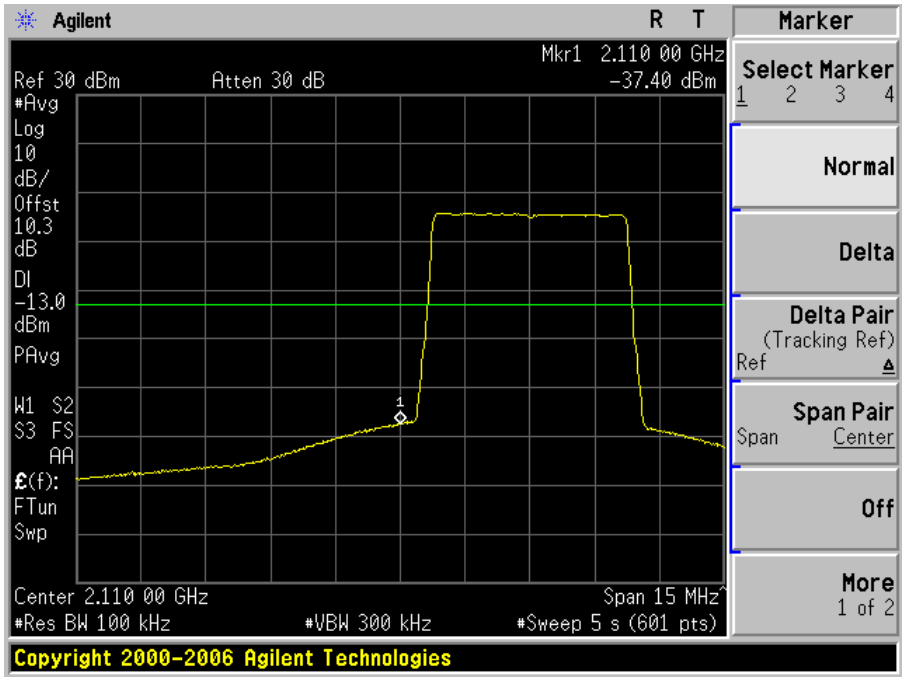


Highest Edge

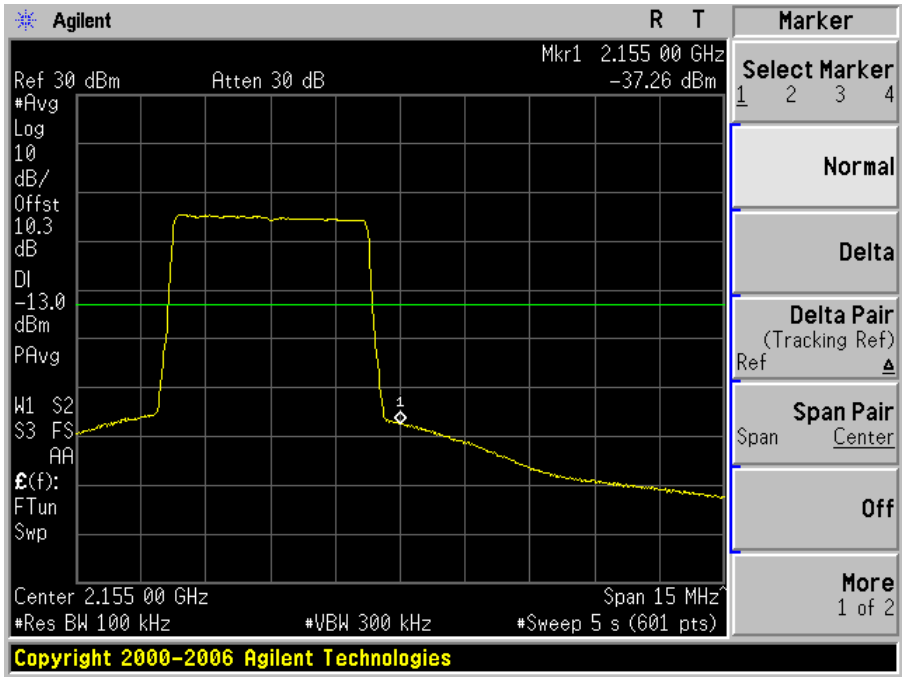


Modulation: LTE-16QAM (5 MHz):

Lowest Edge

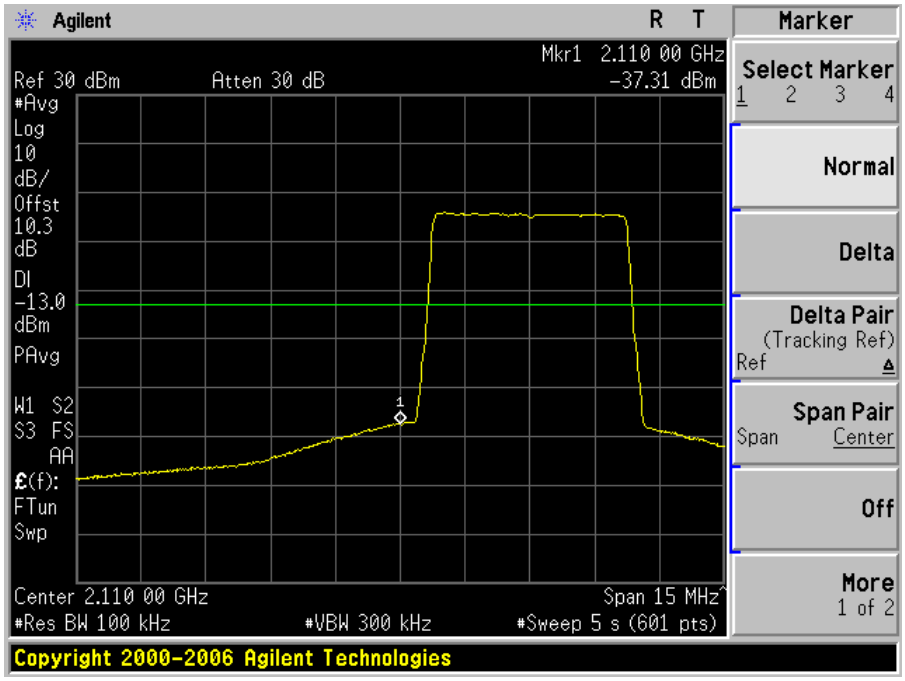


Highest Edge

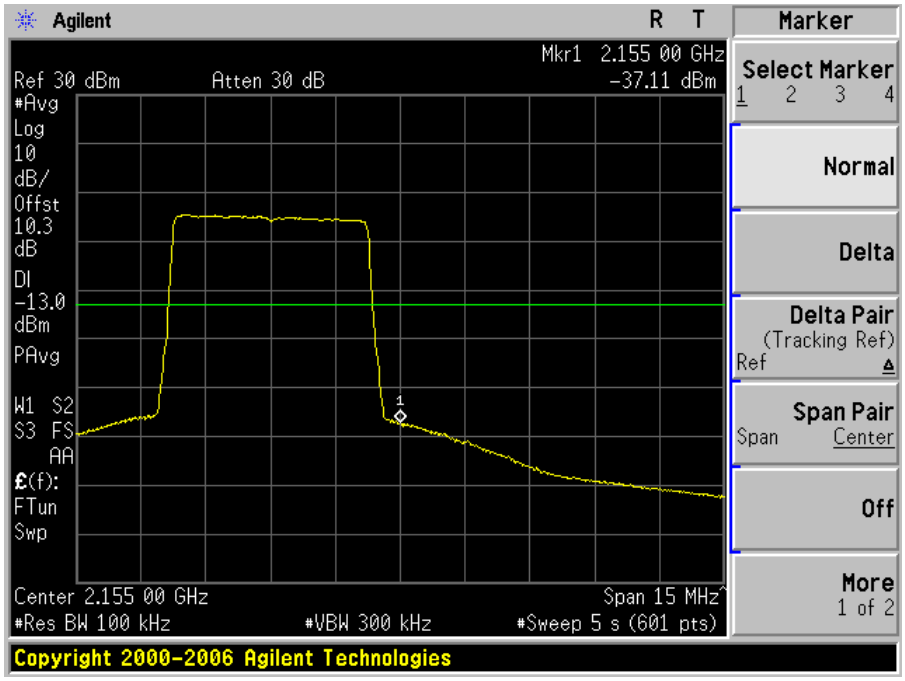


Modulation: LTE-64QAM (5 MHz):

Lowest Edge

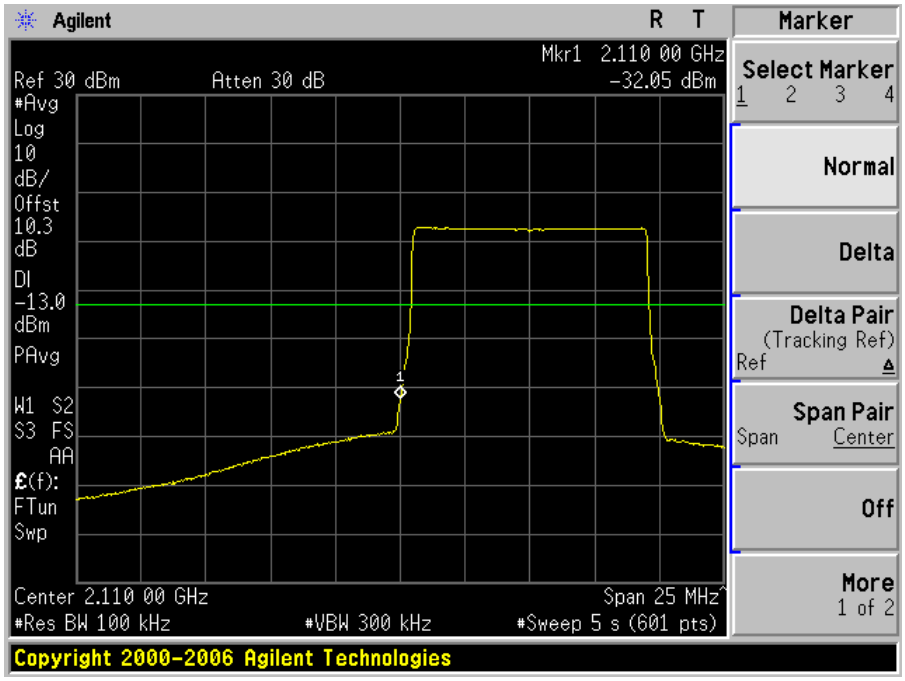


Highest Edge

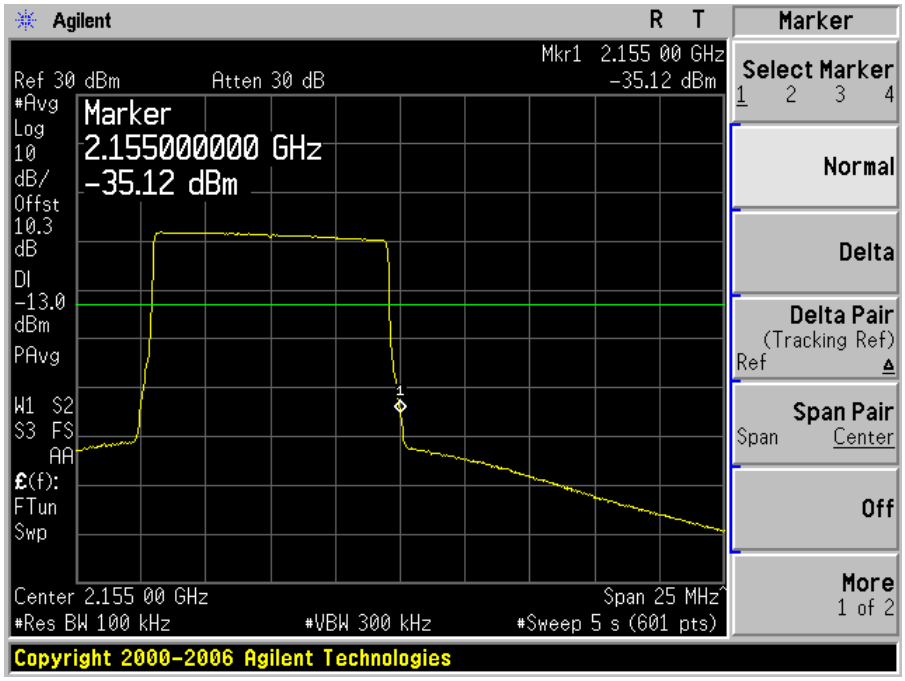


Modulation: LTE-QPSK (10 MHz):

Lowest Edge

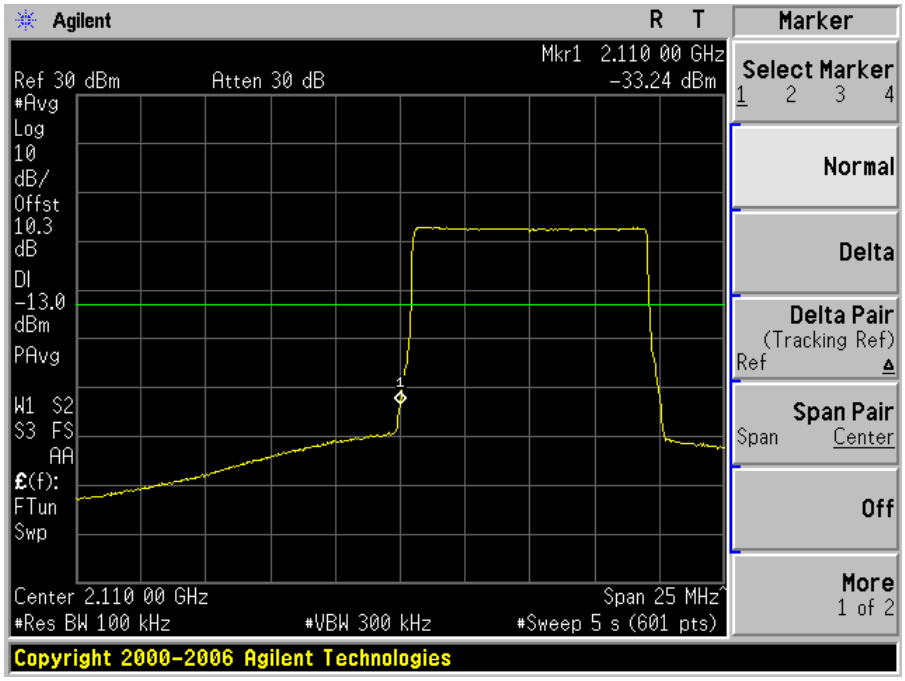


Highest Edge

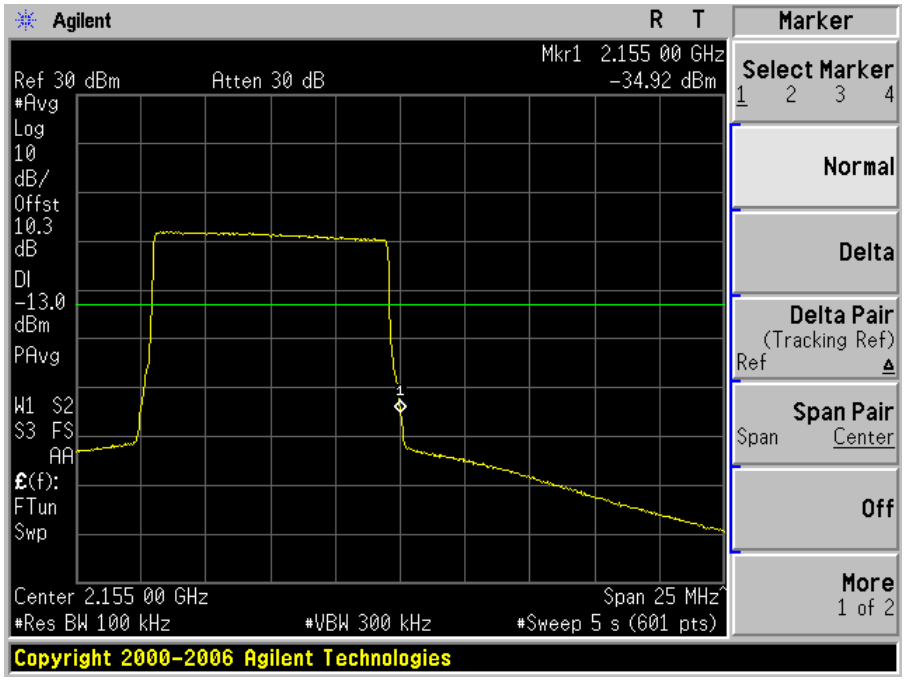


Modulation: LTE-16QAM (10 MHz):

Lowest Edge

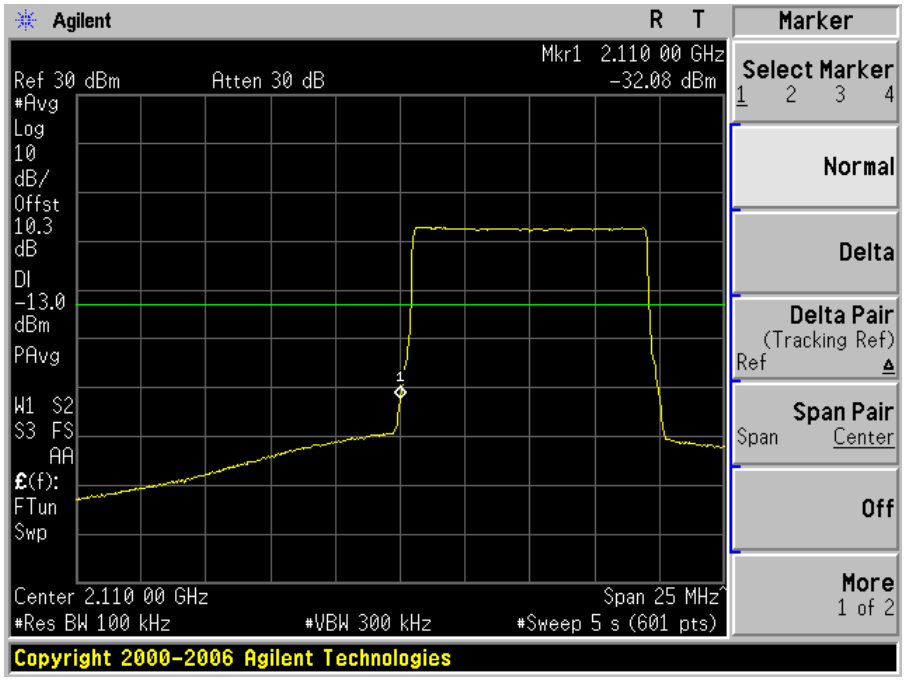


Highest Edge

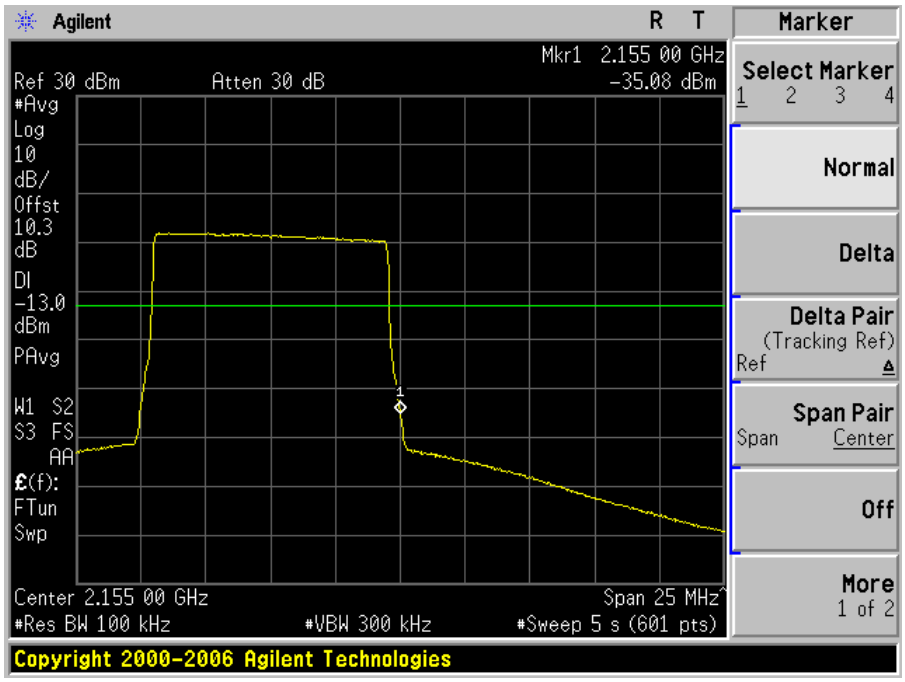


Modulation: LTE-64QAM (10 MHz):

Lowest Edge



Highest Edge



10 FCC §2.1055 & §27.54 – FREQUENCY STABILITY

10.1 Applicable Standard

According to FCC §27.54, the frequency stability shall be sufficient to ensure that the fundamental emissions stay within the authorized bands of operation.

10.2 Test Procedure

The frequency stability of the transmitter is measured by:

a.) **Temperature:** The temperature is varied from - 30 °C to + 50 °C using an environmental chamber.
b.) **Primary Supply Voltage:** The primary supply voltage is varied from battery end point to 115 % of the voltage normally at the input to the device or at the power supply terminals if cables are not normally supplied.

Specification — the frequency stability shall be sufficient to ensure that the fundamental emission stays within the authorized frequency block. The frequency stability of the transmitter shall be maintained within ± 0.000 25 %(± 2.5 ppm) of the center frequency.

10.3 Test Results

Test Condition		Reference Frequency (MHz)	Measured Frequency (MHz)	Frequency Error (PPM)	Results
Voltage (Vdc)	Temperature (^{O}C)				
48	50	2132	2131.998570	-0.67073	Compliance
48	40	2132	2131.998570	-0.67073	Compliance
48	30	2132	2131.998550	-0.68011	Compliance
48	20	2132	2131.998520	-0.69418	Compliance
48	10	2132	2131.998330	-0.7833	Compliance
48	0	2132	2131.998370	-0.76454	Compliance
48	-10	2132	2131.998420	-0.74109	Compliance
48	-20	2132	2131.998450	-0.72702	Compliance
48	-30	2132	2131.998480	-0.71295	Compliance
55.2	20	2132	2131.998540	-0.68512	Compliance
40.8	20	2132	2131.998530	-0.68982	Compliance

11 FCC §1.1307(b) & §27.52 & §2.1091 - RF EXPOSURE INFORMATION

11.1 Applicable Standard

According to FCC §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	[1] (100)	30
1.34-30	824/f	2.19/f	[1] ($180/f^2$)	30
30-300	27.5	0.073	0.2	30
300-1500	/	/	f/1500	30
1500-100,000	/	/	1.0	30

f = frequency in MHz
[1] = Plane-wave equivalent power density

11.2 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 = Antenna Gain
R = distance to the center of radiation of the antenna

Maximum average output power at antenna input terminal (dBm):	21.69
Maximum average output power at antenna input terminal (mW):	147.57
Prediction distance (cm):	20
Prediction frequency (MHz):	2132
Antenna Gain, typical (dBi):	5.0
Maximum Antenna Gain (numeric):	3.16
Power density at predication frequency and distance (mW/cm^2):	0.0928
MPE limit for uncontrolled exposure at predication frequency (mW/cm^2):	1.0

Result:

The outdoor antenna with 5 dBi gain should have at least 20 cm prediction distance to meet the MPE limit, the highest power density level at 20 cm is 0.0928 mW/cm^2, which is below the uncontrolled exposure limit of 1.0 mW/cm^2.