Lab Code: 200167-0

FCC PART 27

TEST AND MEASUREMENT REPORT

For

Vecima Networks Inc.

150 Cardinal Place,

Saskatoon, SK, Canada S7L 6H7

FCC ID: OPPTRX2526Y
Model: TR2526+, TRI2526+

Report Type:	**Product Type:**
Original Report	2.5 GHz Subscriber Transceiver

Test Engineer: Lionel Lara

Report Number: R1110181-27

Report Date: 2011-12-16

Victor Zhang

Reviewed By: EMC/RF Lead

Prepared By: **(SP)**
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	R1110181-27	Original Report	2011-12-12

1 GENERAL INFORMATION

1.1 Product Description for Equipment under Test (EUT)

This report has been compiled on behalf of *Vecima Networks Inc*, FCC ID: OPPTRX2526Y, Model: TR2526+ and TRI2526 or the "EUT" as referred to in this report is a 2.5 GHz Subscriber Transceiver operating at 2496-2524 MHz. The EUT supports two modulations: QPSK and 16QAM. The TR2526+ and TRI2526+ versions are electronically identical except that model: TRI2526+ has an integrated antenna and model: TR2526+ has a non-integrated version.

1.2 Mechanical Description

The EUT TRI2526+ measures 20cm **(L)** x 2.5cm **(W)** x 15cm **(H)**, and weighs approximately 680.4 g.

The test data gathered are from production sample, sample number: MRNN1A provided by the manufacturer.

The EUT TR2526+ measures 31cm **(L)** x 5cm **(W)** x 31cm **(H)**, and weighs approximately 1360.8 g.

The test data gathered are from production sample, sample number: XC6J78 provided by the manufacturer

1.3 Objective

This type approval report is prepared on behalf of *Vecima Networks Inc* 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
Dell	Laptop	PP05L	37140867901
Agilent	ESG-D Series Signal Generator	E4438C	MY45091309
Agilent	Signal Studio for 3GPP LTE	N7624B	-

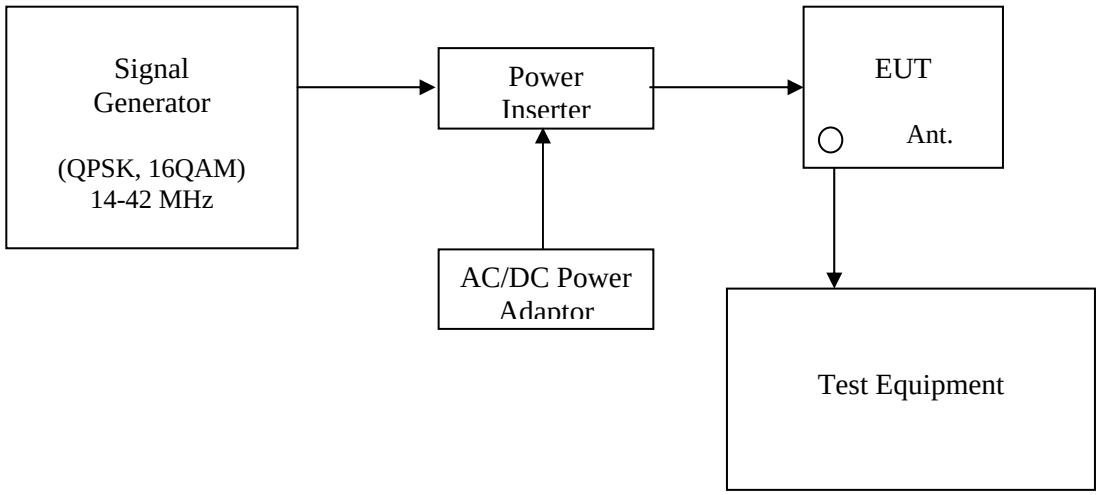
2.5 EUT Internal Configurations of EUT

Manufacturers	Descriptions	Models	Serial Numbers
Vecima Networks	Main board	PC4L0102	2954399
Vecima Networks	Main board	PC4L0102	2954403

2.6 Interface Ports and Cables

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

2.7 Test Setup Block Diagram



3 SUMMARY OF TEST RESULTS

FCC Rules	Description of Tests	Results
§2.1046, §27.50(h)	RF Output Power	Compliant
§2.1047	Modulation Characteristics	N/A
§2.1049, §27.53 (l)	Occupied Bandwidth	Compliant
§2.1053, §27.53 (l)	Spurious Radiated Emissions	Compliant
§2.1051, §27.53 (l)	Spurious Emissions at Antenna Terminals	Compliant
§27.53	Band Edge	Compliant
§2.1055, §27.54 (d)	Frequency Stability	Compliant
§1.1307, §2.1091, §27.52	RF Exposure	Compliant

N/A: Not applicable.

4 FCC §2.1046 & §27.50 – RF OUTPUT POWER

4.1 Applicable Standard

According to FCC §27.50 (h)

(1) Main, booster and base stations. (i) The maximum EIRP of a main, booster or base station shall not exceed 33 dBW + 10log(X/Y) dBW, where X is the actual channel width in MHz and Y is either 6 MHz if prior to transition or the station is in the MBS following transition or 5.5 MHz if the station is in the LBS and UBS following transition, except as provided in paragraph (h)(1)(ii) of this section.

4.2 Test Procedure

Conducted:

The RF output of the transmitter was connected to the signal generator and the spectrum analyzer through sufficient attenuation. See the test setup block diagram in section 2.7.

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	2011-08-11

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:	42-46 %
ATM Pressure:	101-102 kPa

The testing was performed by Lionel Lara from 2011-10-30 to 2011-11-02 at RF Site.

4.5 Test Results

QPSK:

Symbol Rates (sym/sec)	Channel	Frequency (MHz)	Input Power (dBm)	Output Power (dBm)
640k	Low	2496.5	6	22.45
	Middle	2510	6	22.30
	High	2523.5	6	22.02
1280k	Low	2496.9	6	22.73
	Middle	2510	6	22.86
	High	2523.1	6	22.32
2560k	Low	2497.7	6	22.73
	Middle	2510	6	22.92
	High	2522.3	6	22.47

16QAM:

Symbol Rates (sym/sec)	Channel	Frequency (MHz)	Input Power (dBm)	Output Power (dBm)
640k	Low	2496.5	6	22.55
	Middle	2510	6	22.38
	High	2523.5	6	22.06
1280k	Low	2496.9	6	22.72
	Middle	2510	6	22.85
	High	2523.1	6	22.30
2560k	Low	2497.7	6	22.71
	Middle	2510	6	22.91
	High	2522.3	6	22.46

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. See the test setup block diagram in section 2.7.

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	2011-08-11

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:	42-46 %
ATM Pressure:	101-102 kPa

The testing was performed by Lionel Lara from 2011-10-30 to 2011-11-02 at RF Site.

6.5 Test Results

QPSK:

Symbol Rates (sym/sec)	Channel	Frequency (MHz)	Emission Bandwidth Input (kHz)	Emission Bandwidth Output (kHz)
640k	Low	2496.5	750.5110	750.9539
	Middle	2510	750.8174	752.2908
	High	2523.5	751.1152	748.1170
1280k	Low	2496.9	1518.7	1518.0
	Middle	2510	1518.3	1522.2
	High	2523.1	1517.9	1519.3
2560k	Low	2497.7	2995.4	2999.3
	Middle	2510	2995.6	3003.3
	High	2522.3	2995.0	2991.3

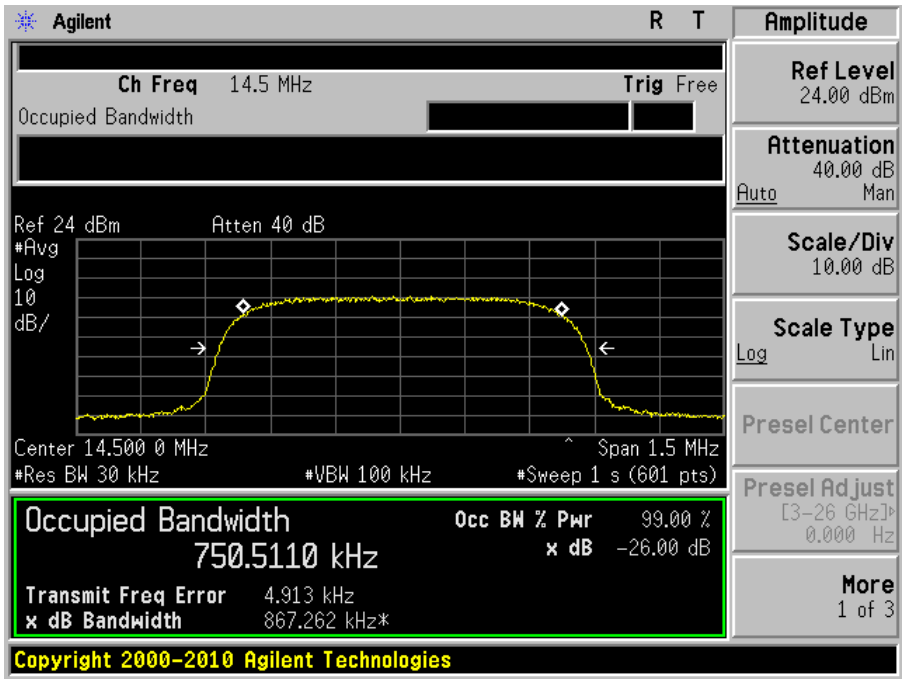
16QAM:

Symbol Rates (sym/sec)	Channel	Frequency (MHz)	Emission Bandwidth Input (kHz)	Emission Bandwidth Output (kHz)
640k	Low	2496.5	750.0657	749.8727
	Middle	2510	750.7438	752.3044
	High	2523.5	751.6744	748.5670
1280k	Low	2496.9	1518.2	1517.4
	Middle	2510	1518.0	1521.8
	High	2523.1	1517.7	1518.4
2560k	Low	2497.7	2995.1	2998.1
	Middle	2510	2994.7	3003.3
	High	2522.3	2995.5	2990.8

Please refer to the following plots.

QPSK (640 kbps), Frequency: 2496.5 MHz

Input



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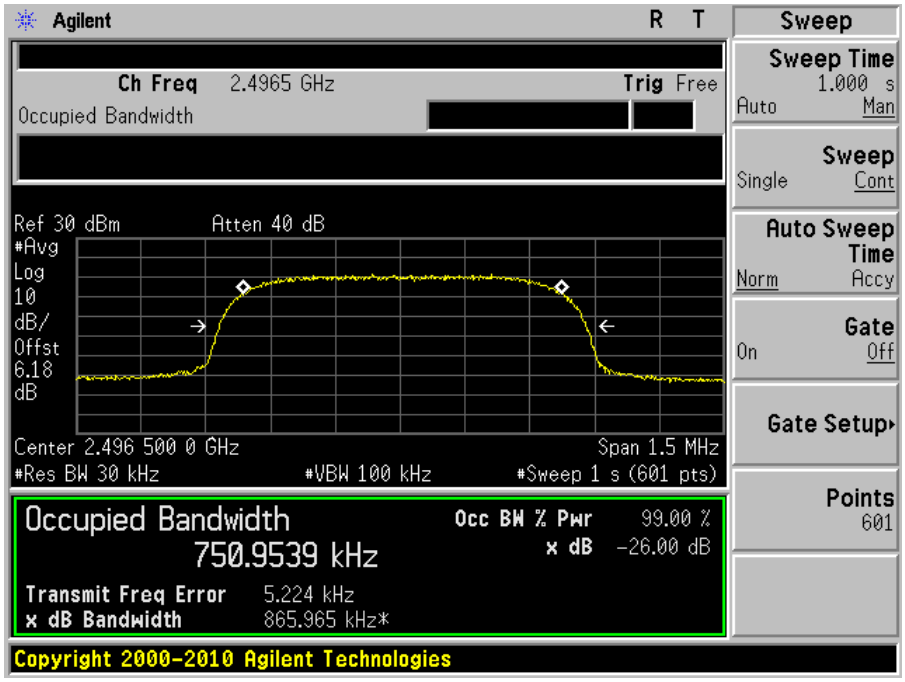
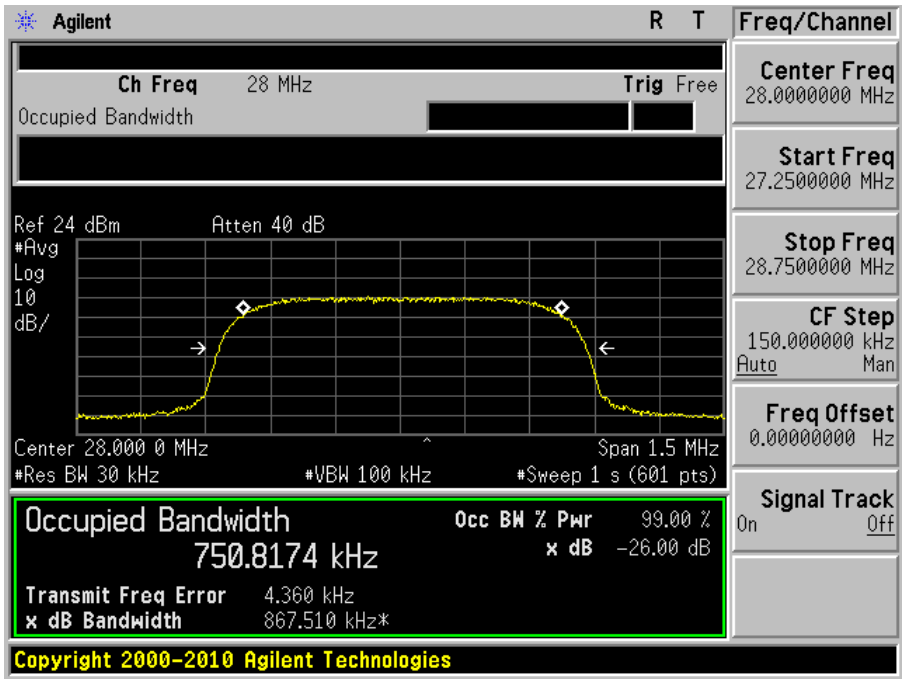


QPSK (640 kbps), Frequency: 2510 MHz

Input



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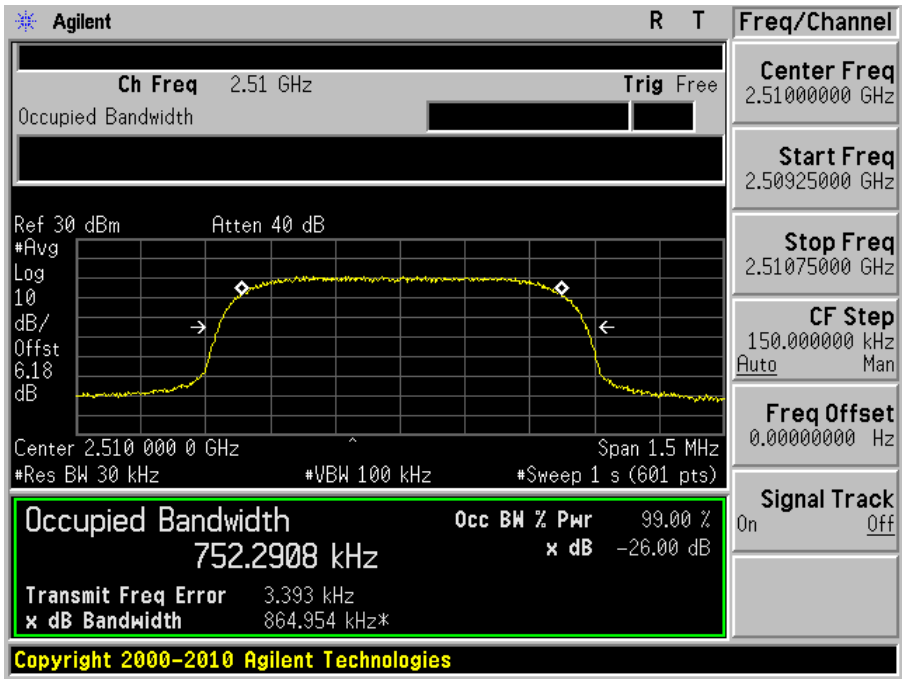
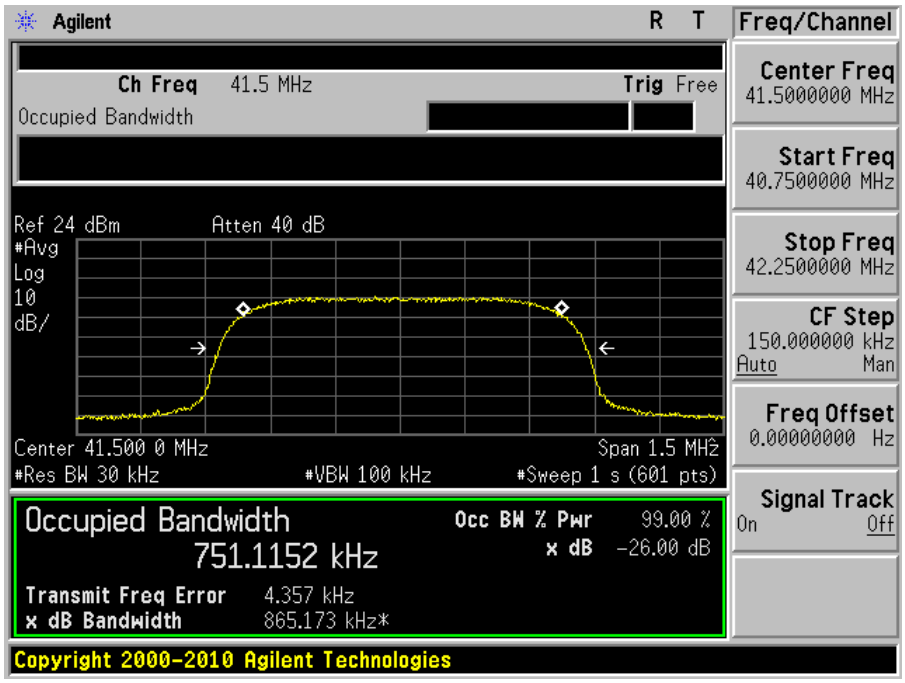
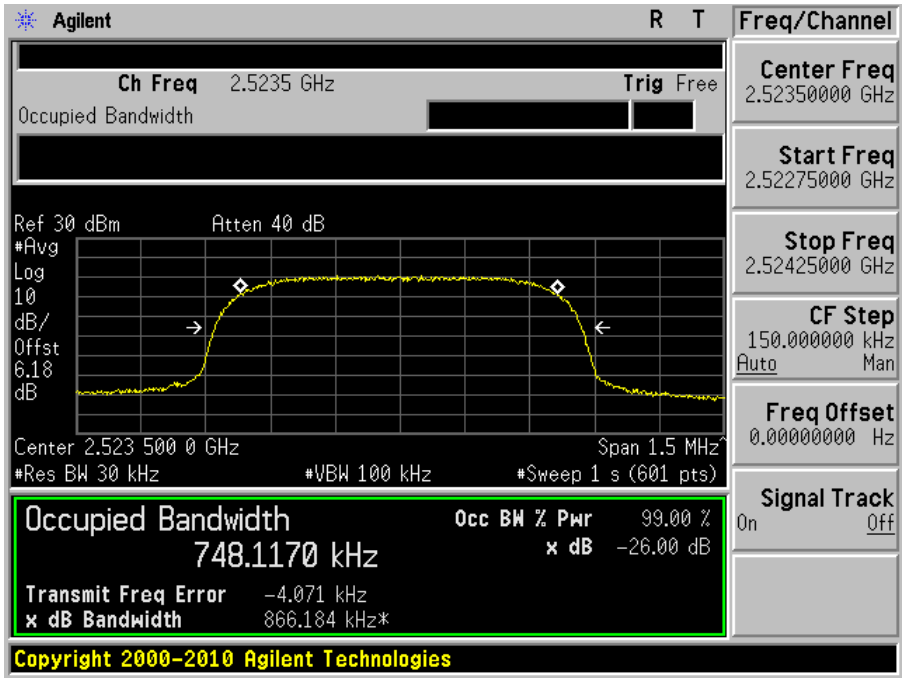


QPSK (640 kbps), Frequency: 2523.5 MHz

Input

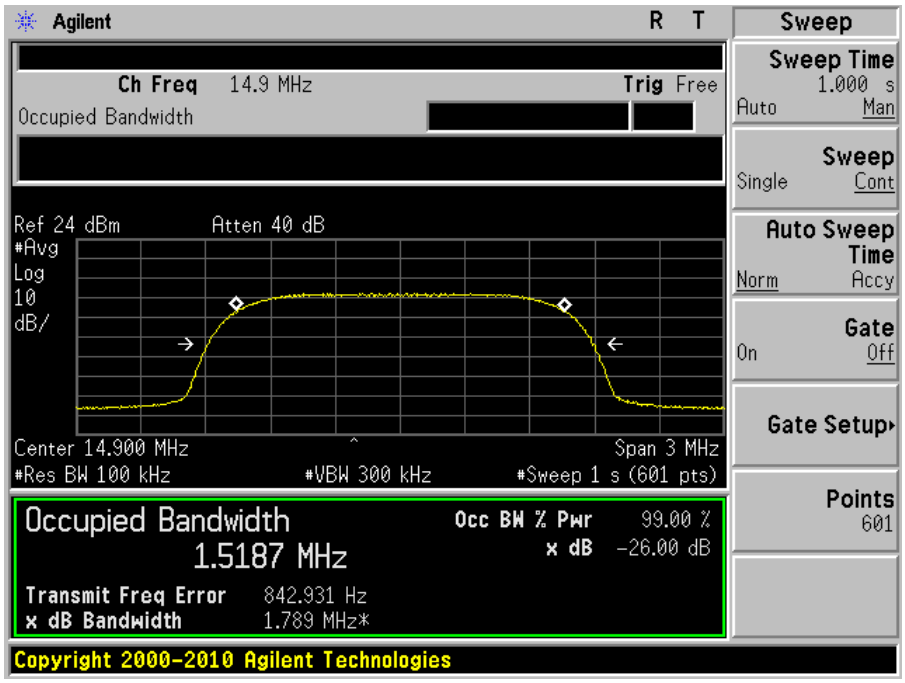


Output



QPSK (1280 kbps), Frequency: 2496.9 MHz

Input



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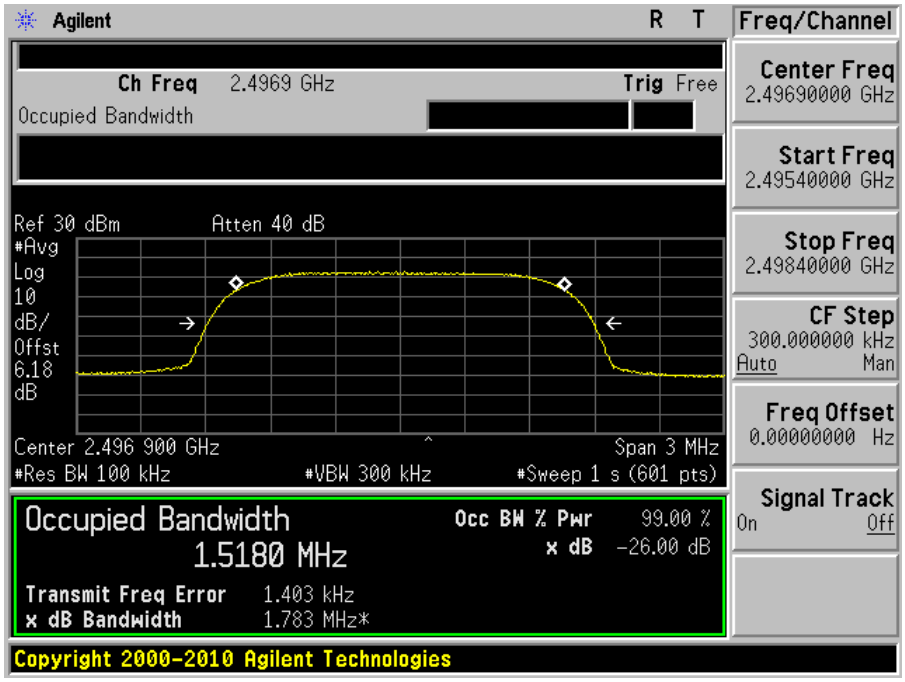
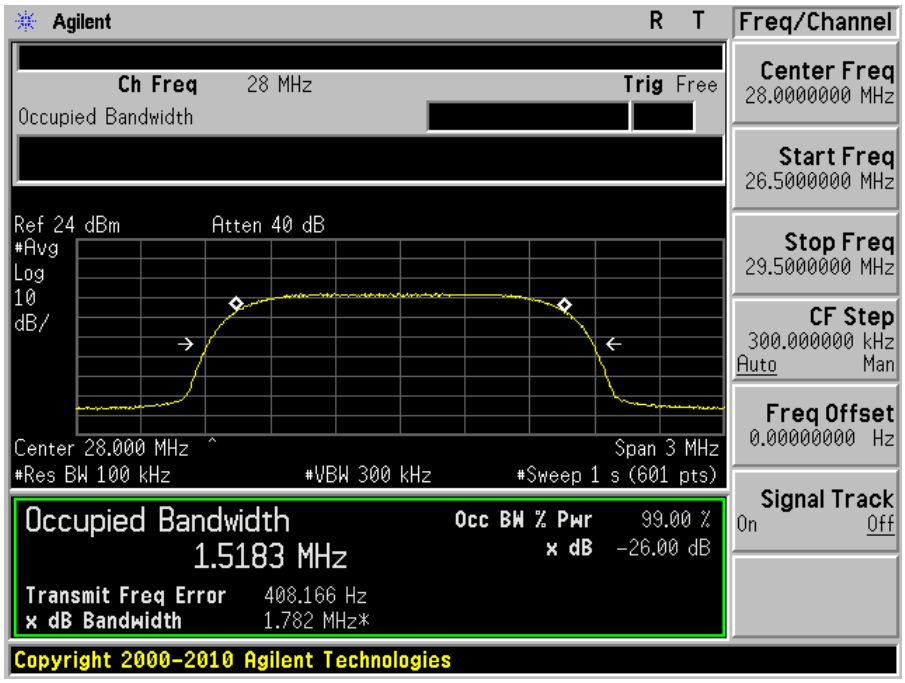
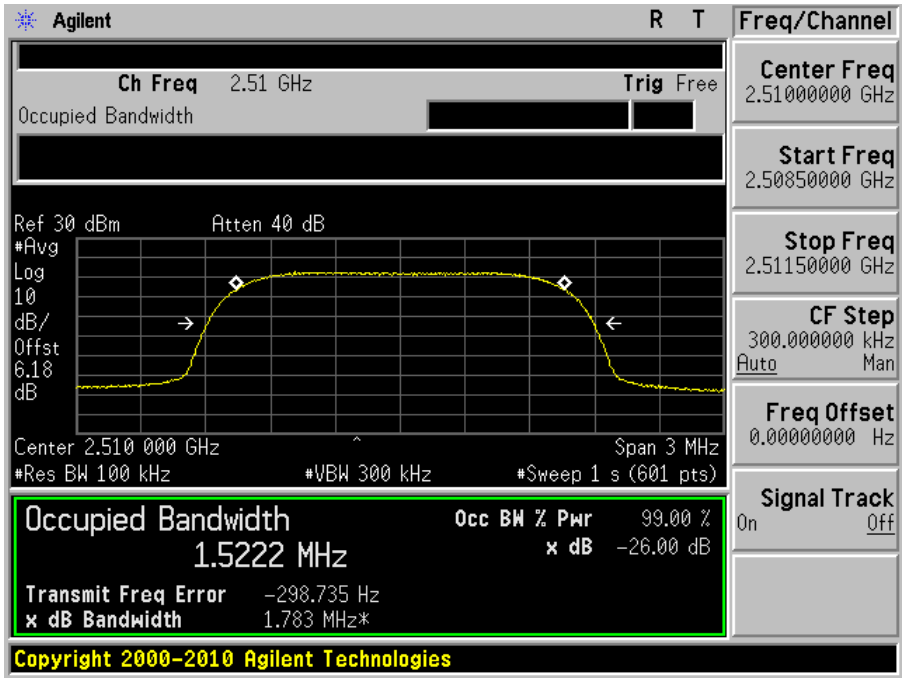


QPSK (1280 kbps), Frequency: 2510 MHz

Input

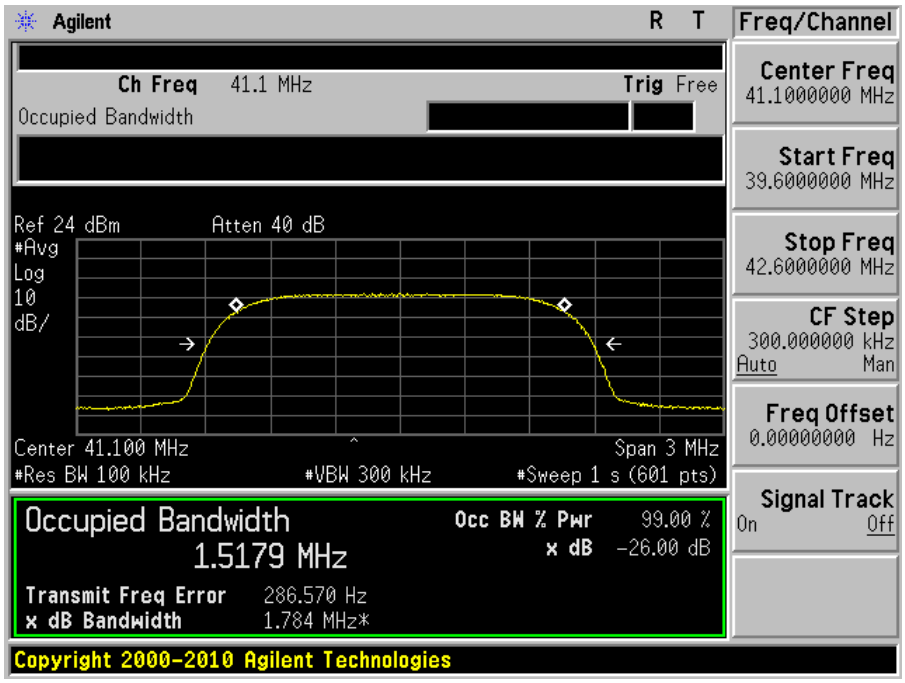


Output

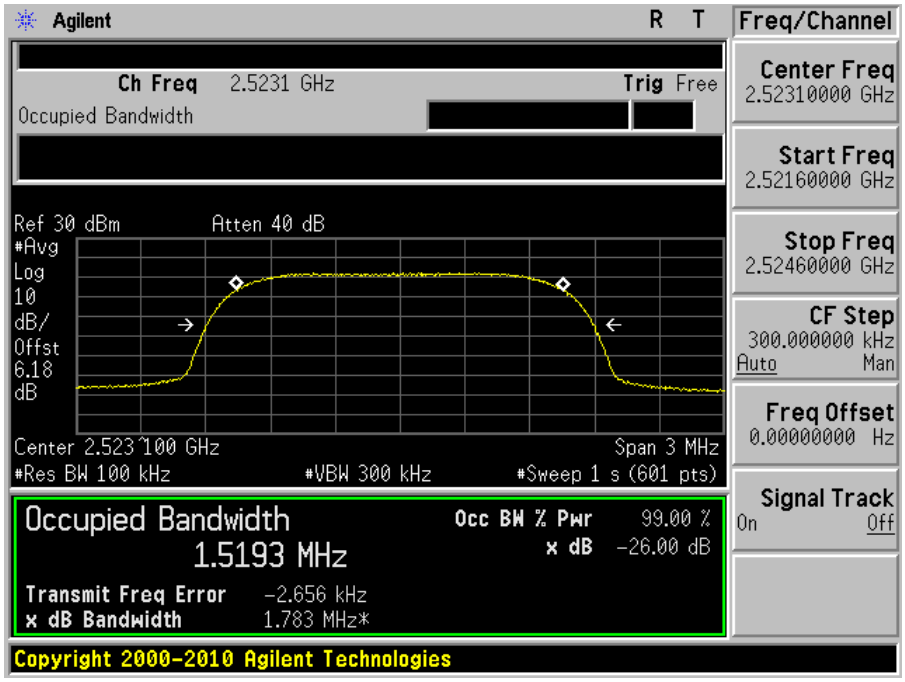


QPSK (1280 kbps), Frequency: 2523.1 MHz

Input

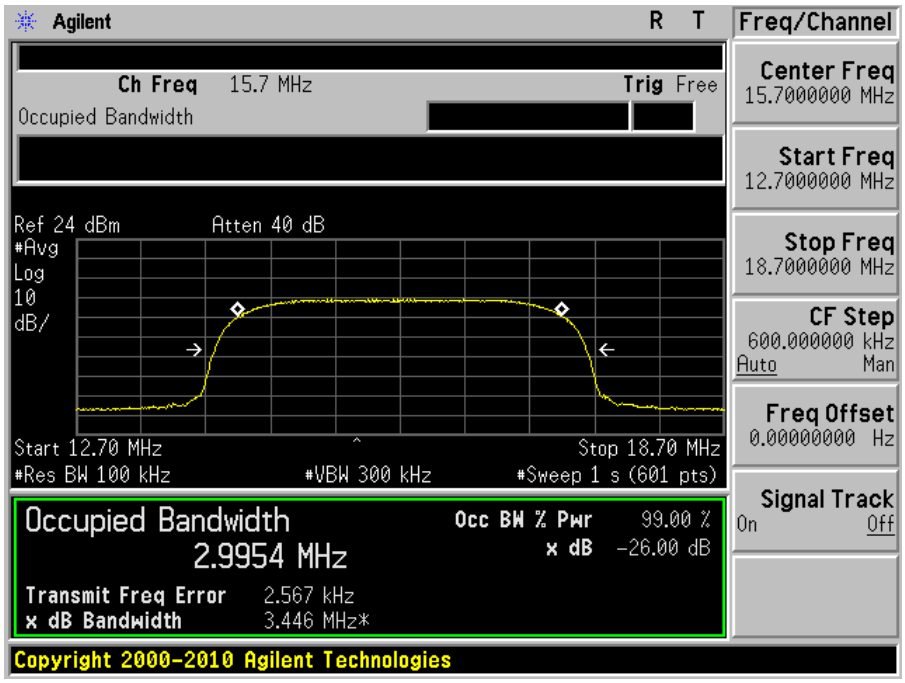


Output

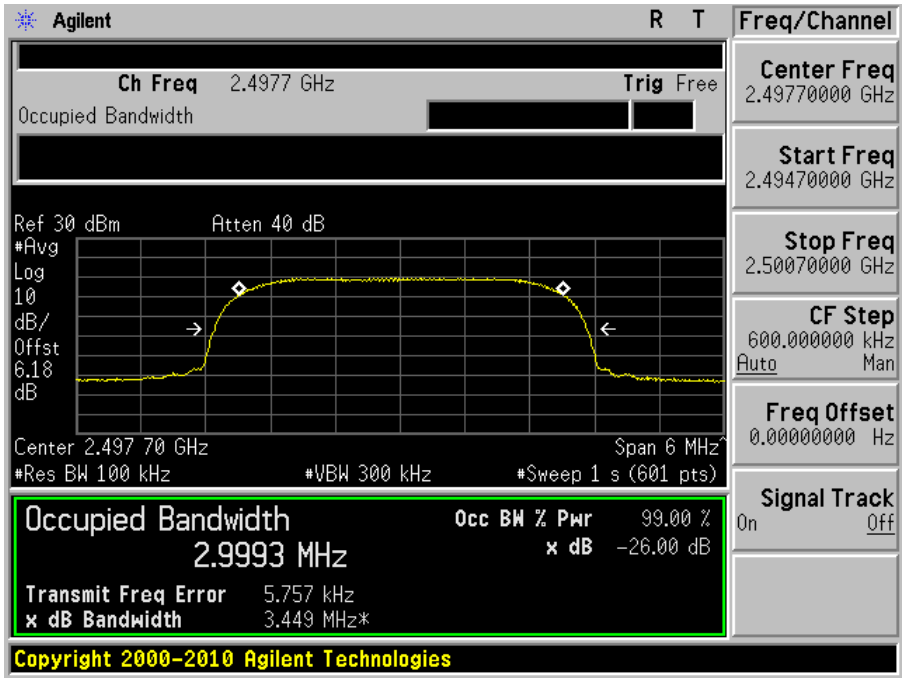


QPSK (2560 kbps), Frequency: 2497.7 MHz

Input

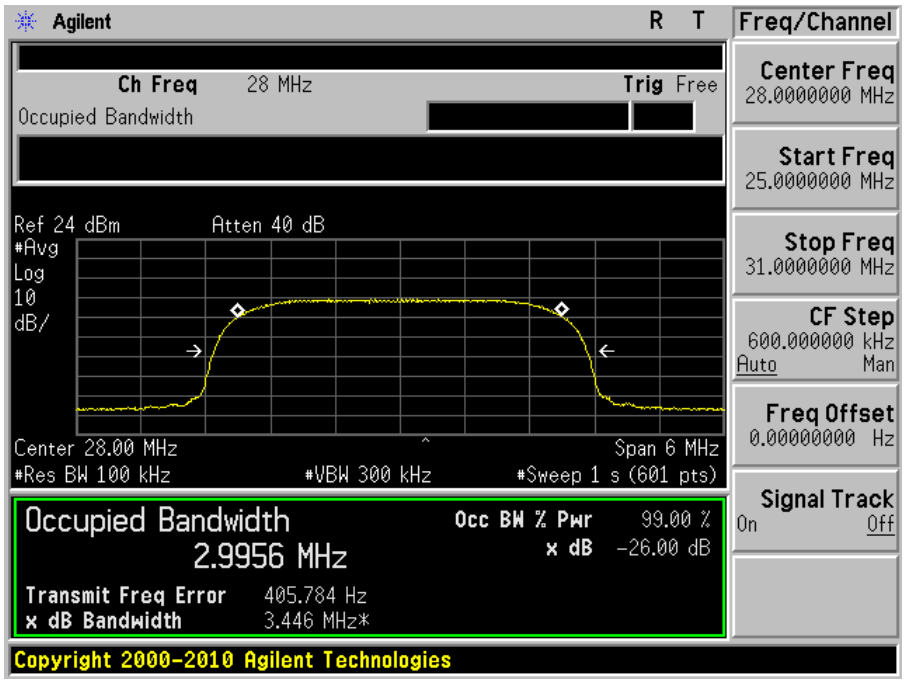


Output



QPSK (2560 kbps), Frequency: 2510 MHz

Input



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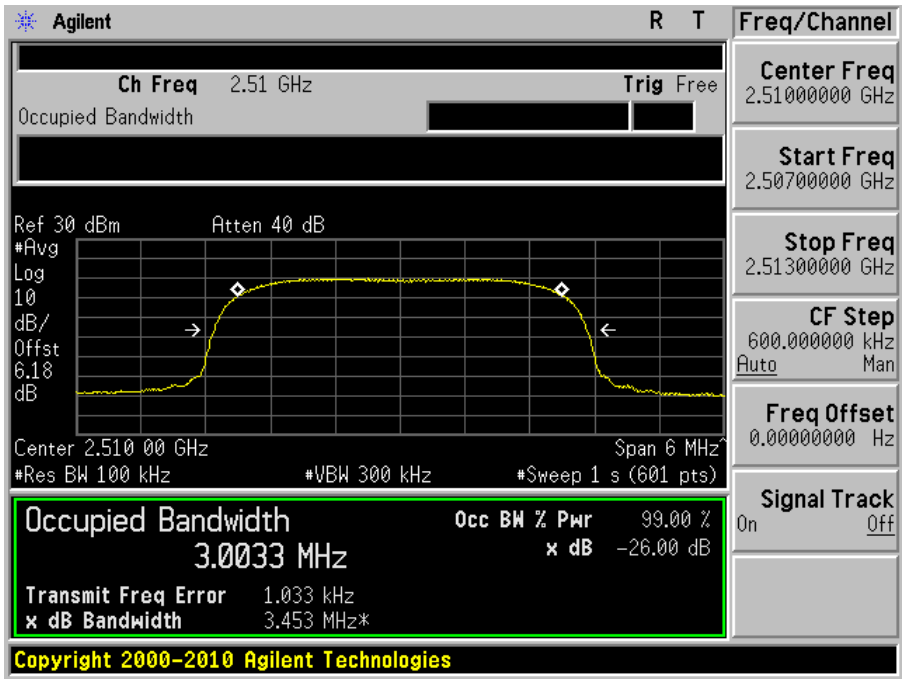
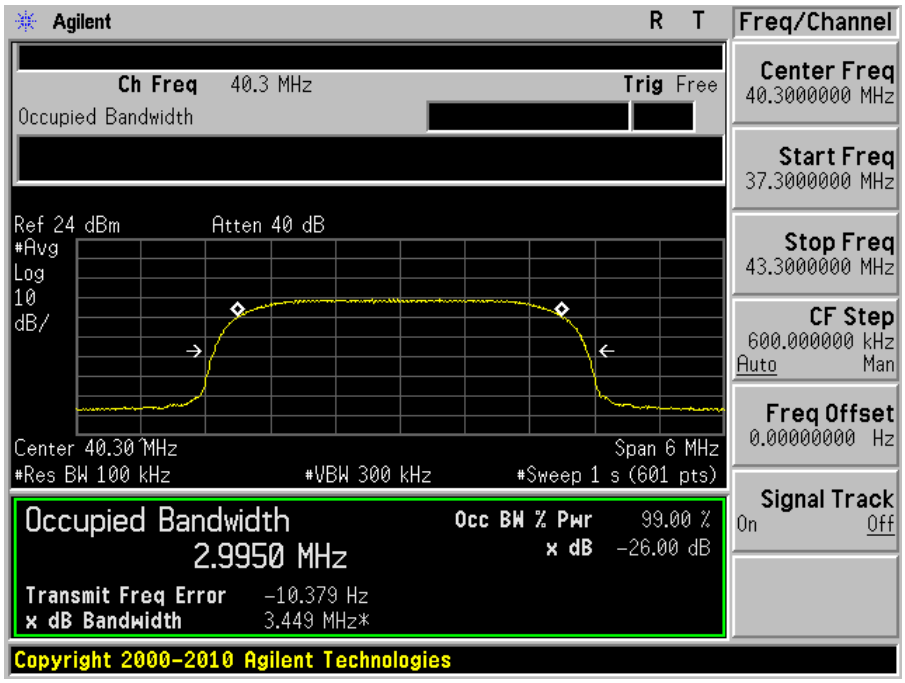


QPSK (2560 kbps), Frequency: 2522.3 MHz

Input



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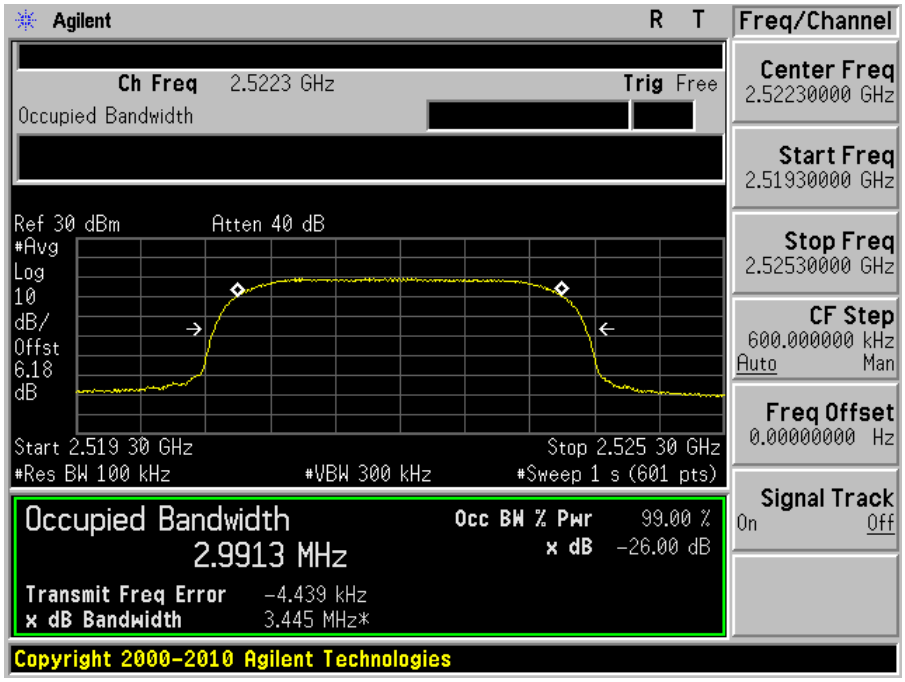
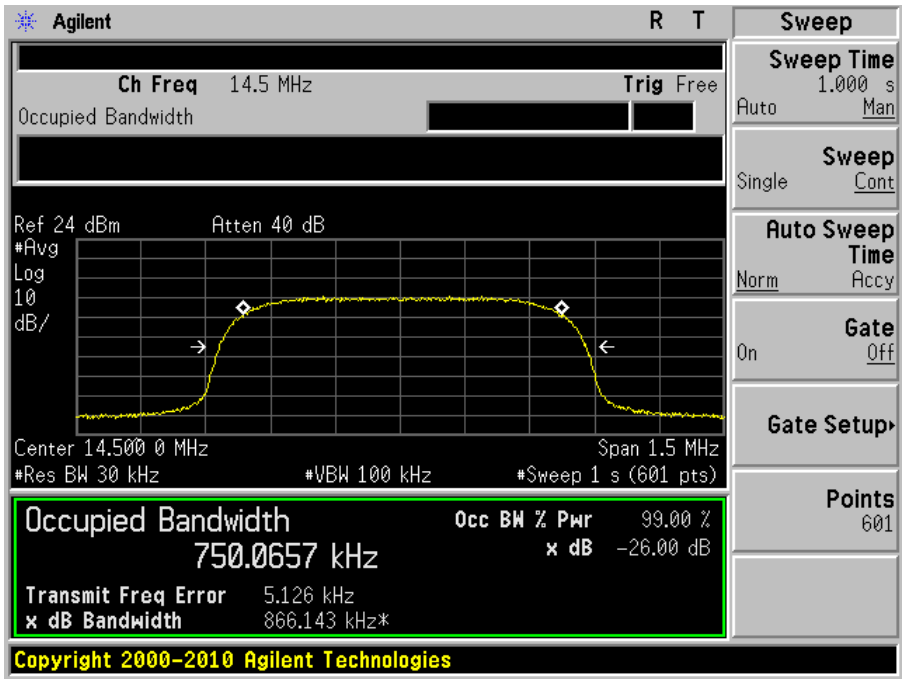


16QAM (640 kbps), Frequency: 2496.5 MHz

Input



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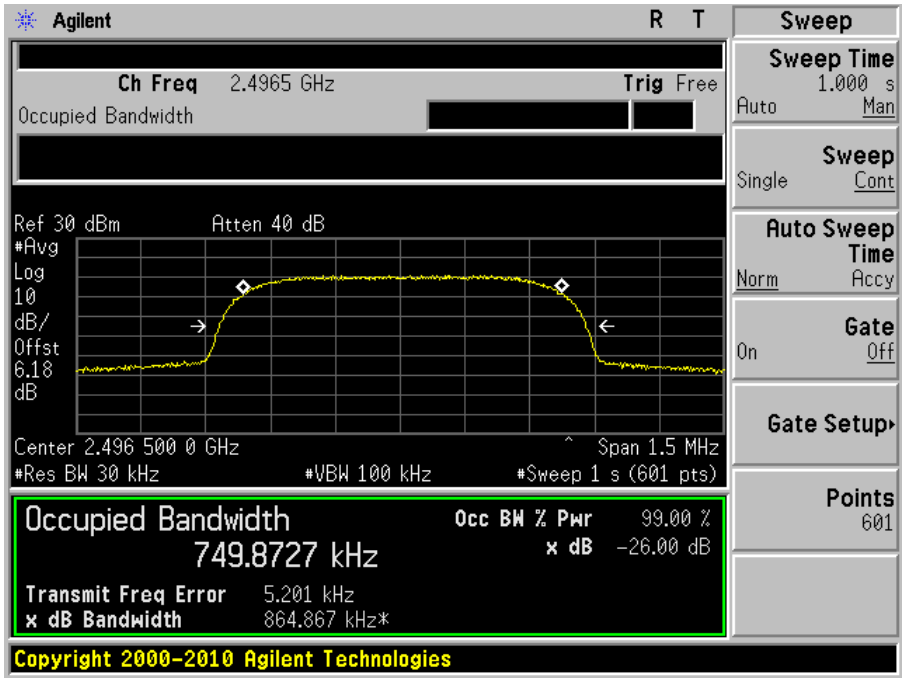
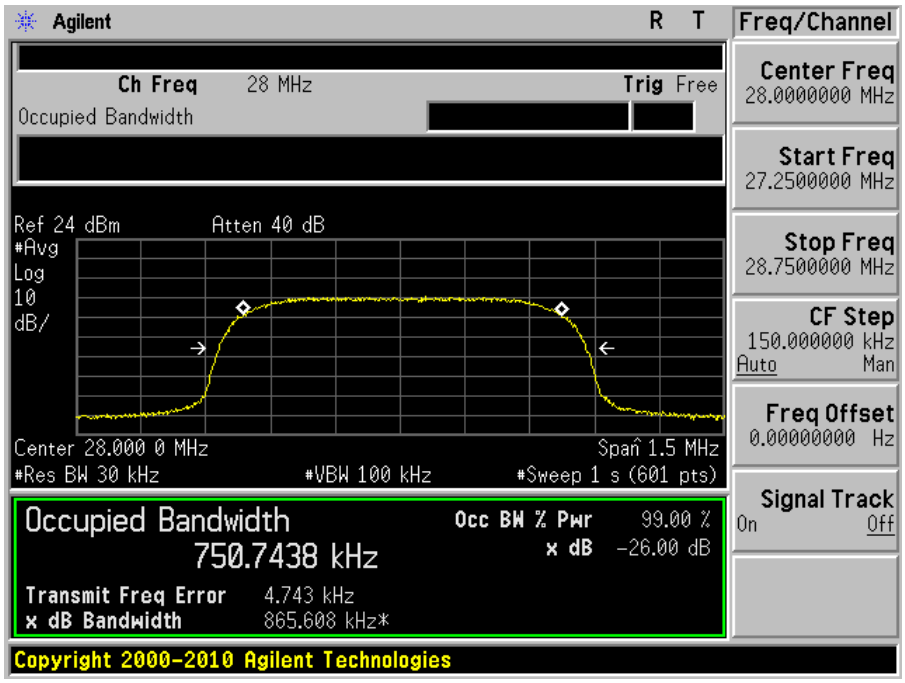


16QAM (640 kbps), Frequency: 2510 MHz

Input



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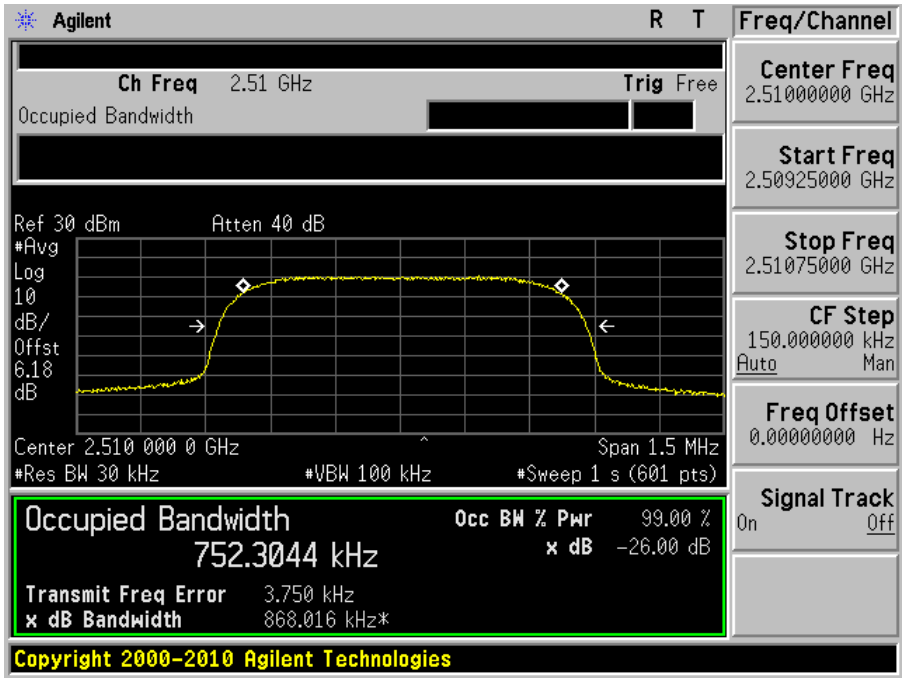
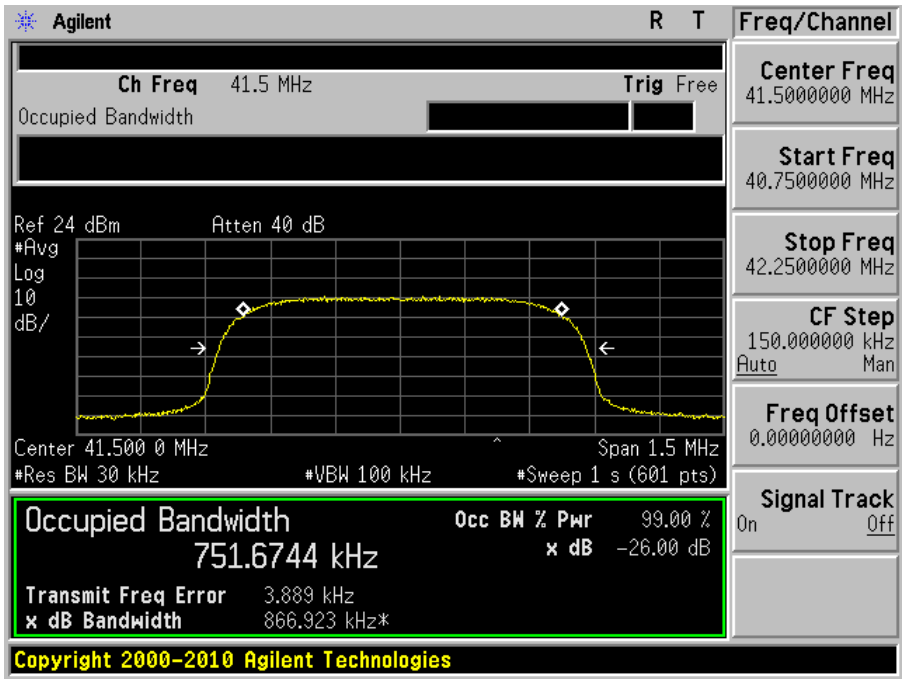


16QAM (640 kbps), Frequency: 2523.5 MHz

Input



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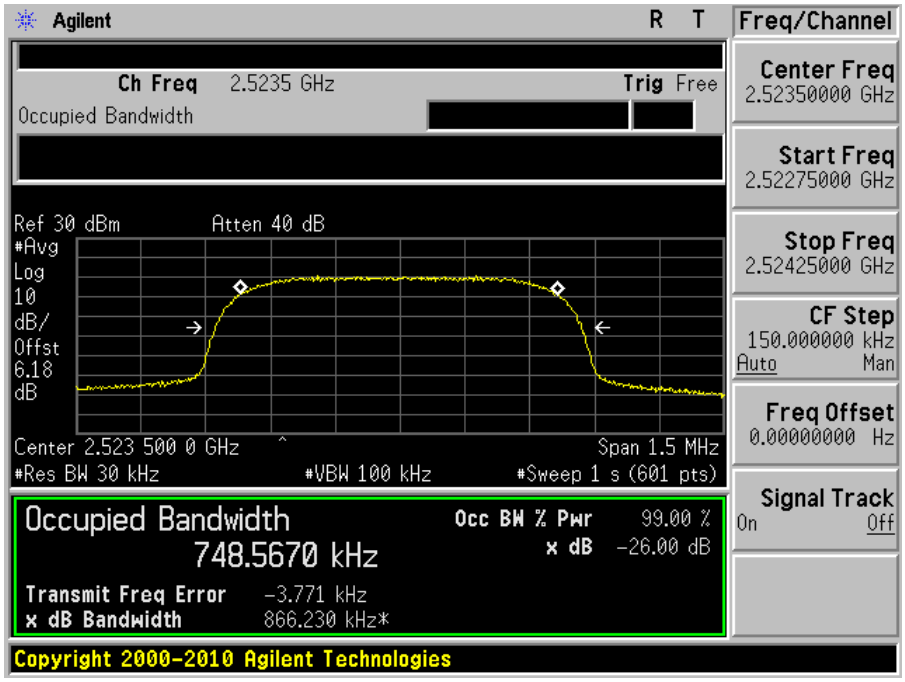
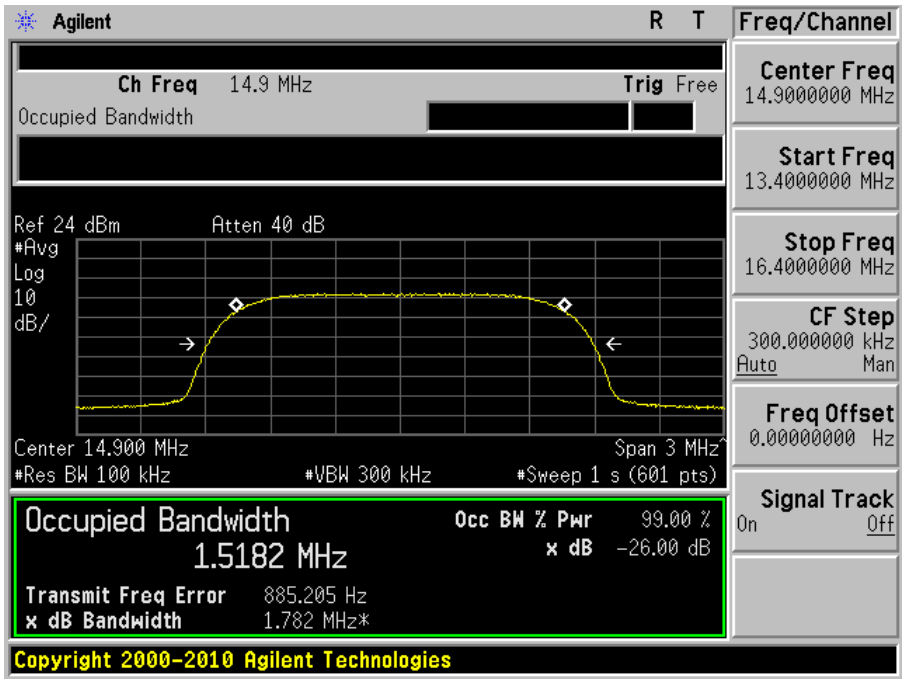


16QAM (1280 kbps), Frequency: 2496.9 MHz

Input



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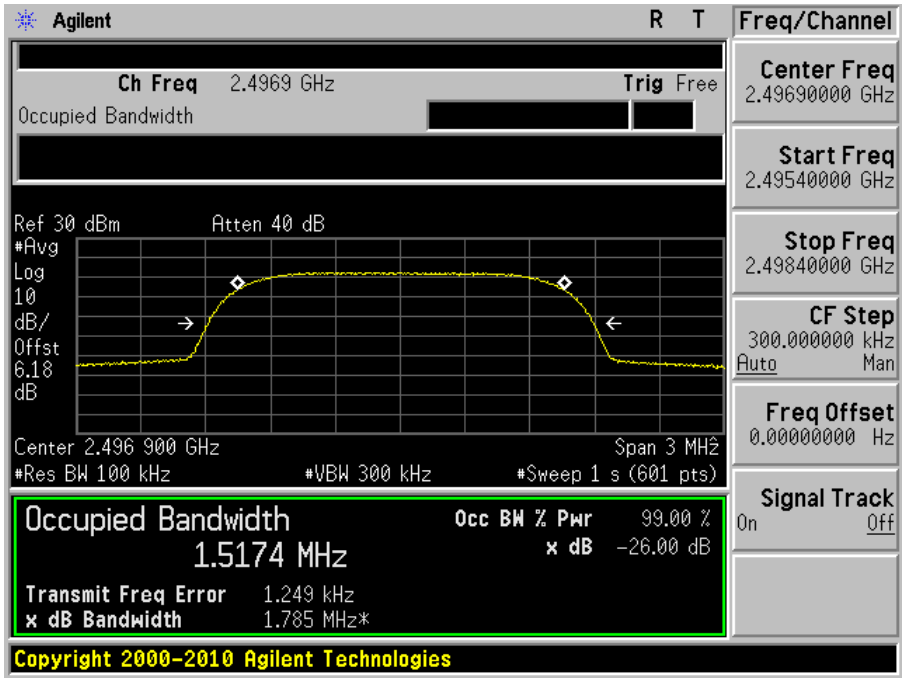
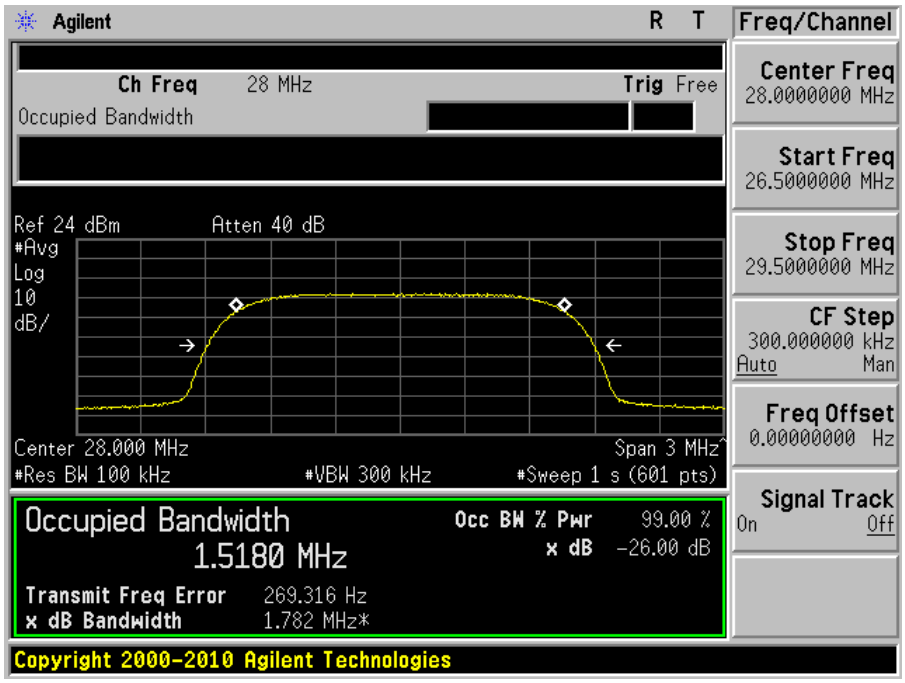
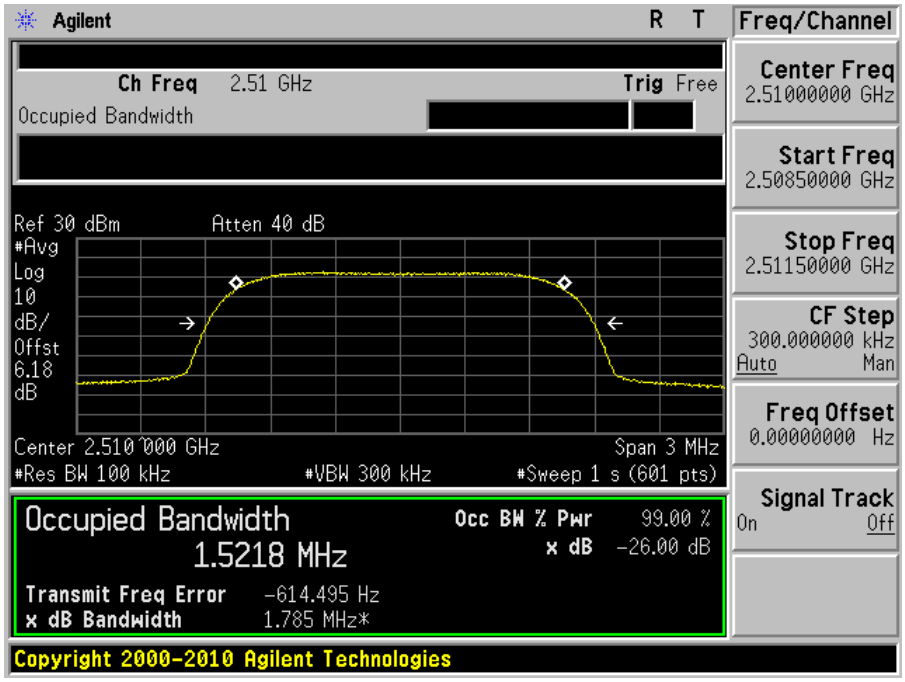


16QAM (1280 kbps), Frequency: 2510 MHz

Input

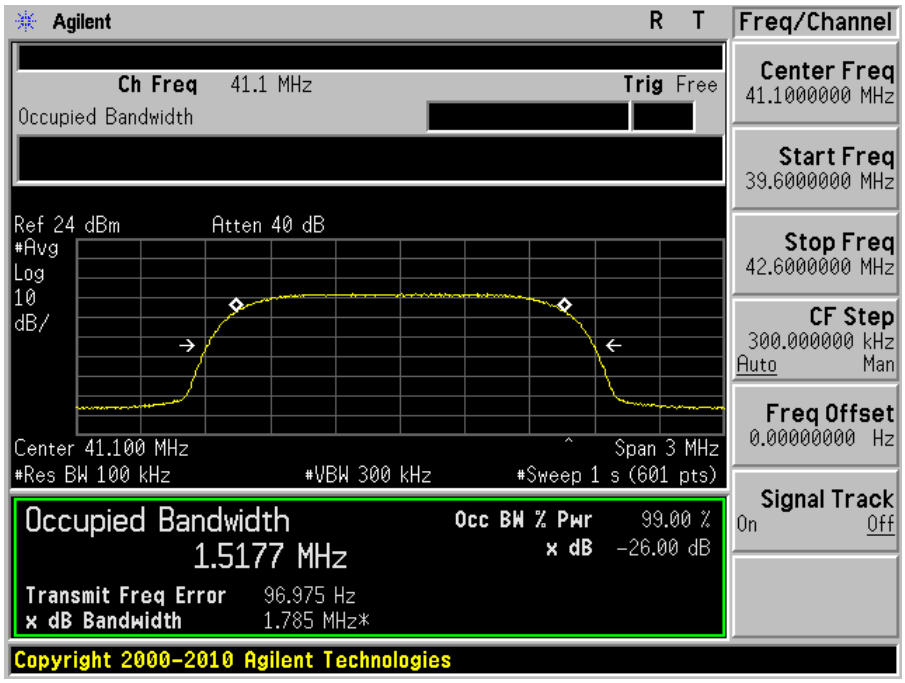


Output



16QAM (1280 kbps), Frequency: 2523.1 MHz

Input



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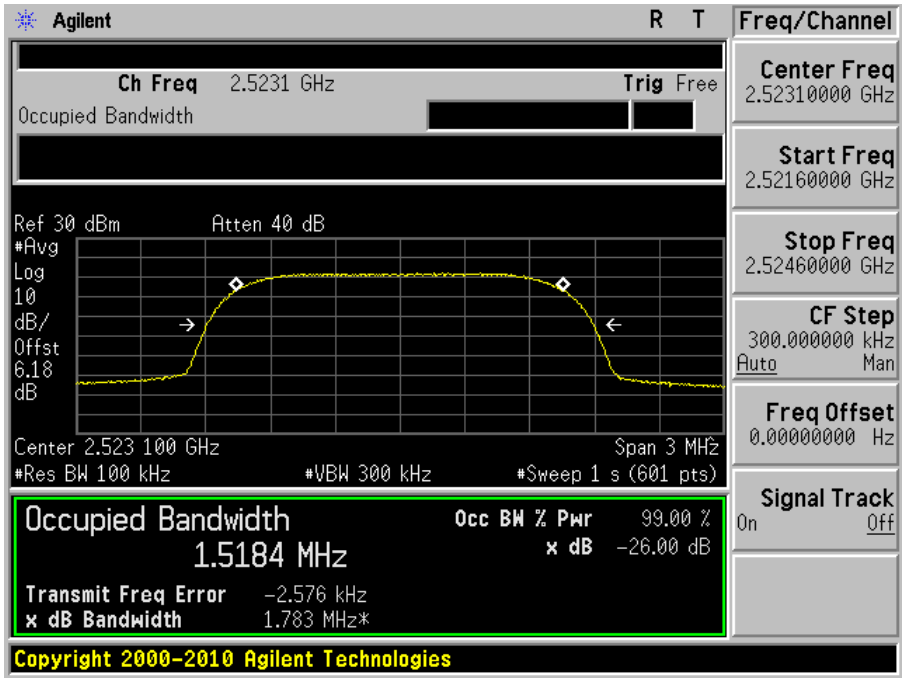
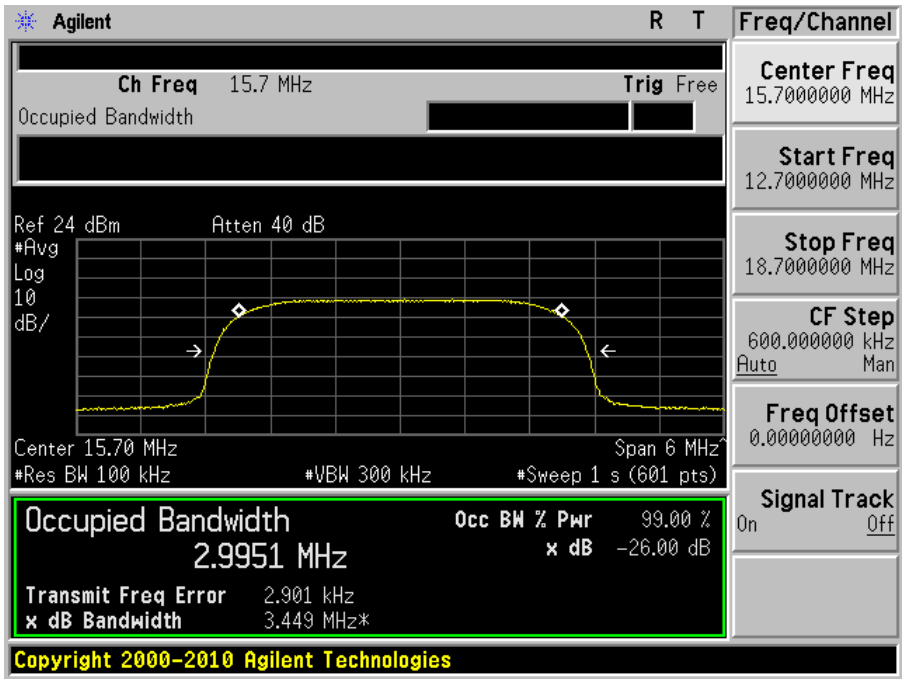


16QAM (2560 kbps), Frequency: 2497.7 MHz

Input



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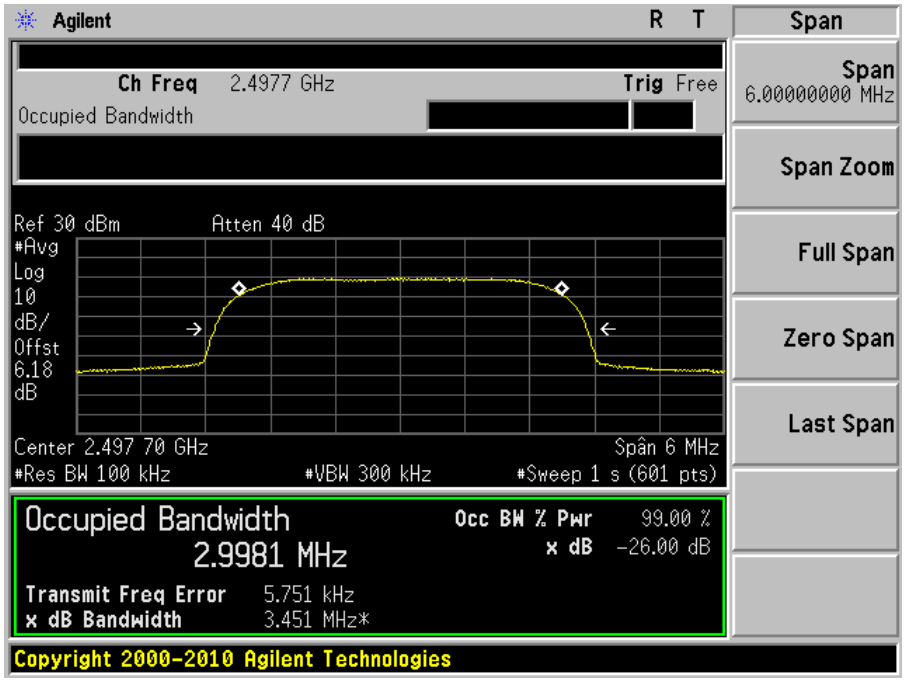
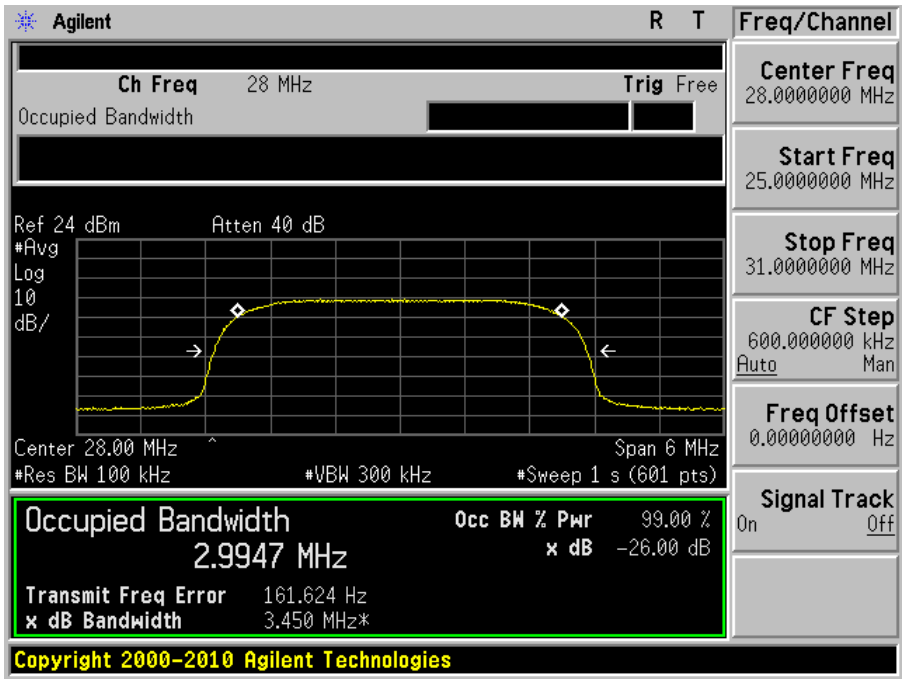
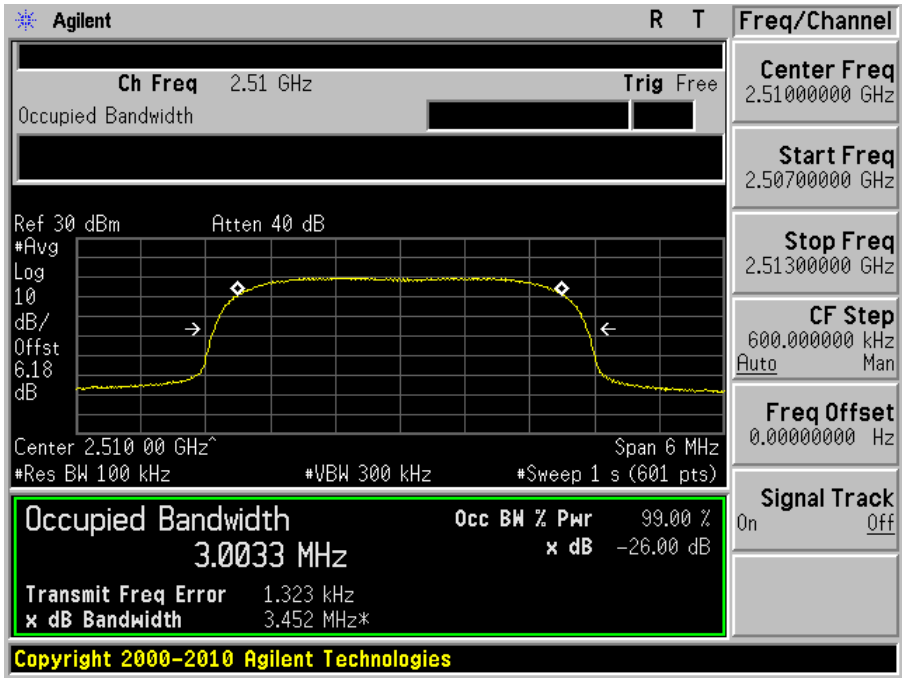


16QAM (2560 kbps), Frequency: 2510 MHz

Input

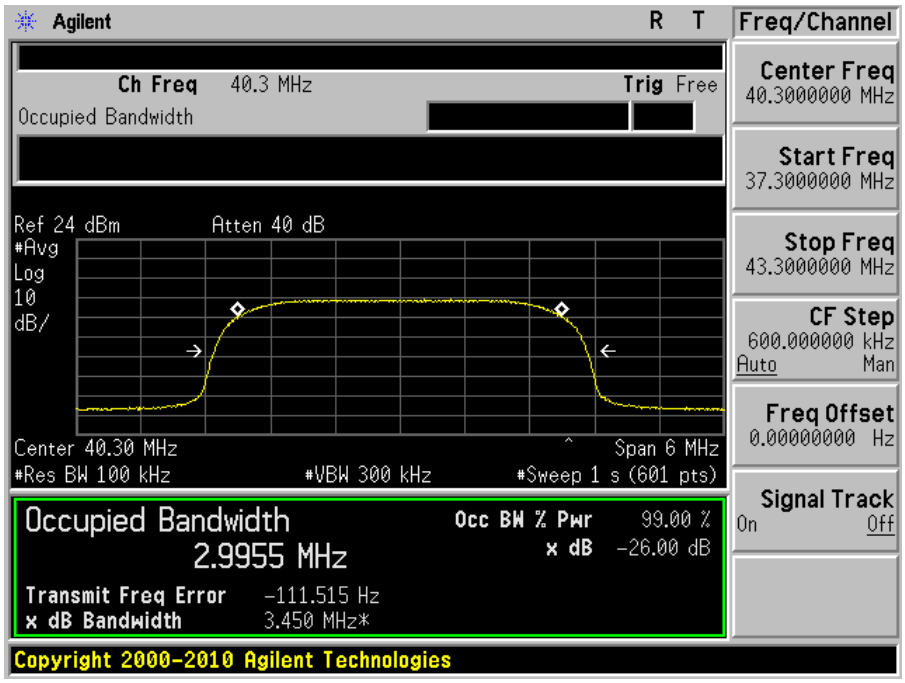


Output

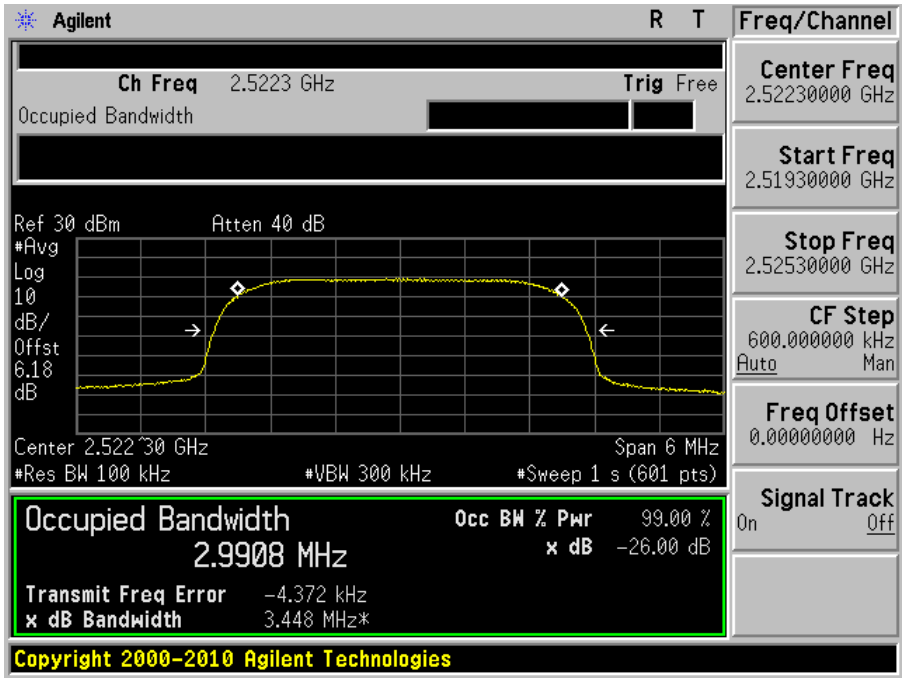


16QAM (2560 kbps), Frequency: 2522.3 MHz

Input



Output



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	E4446A	US44300386	2011-08-11
Agilent	Signal Generator	E4438C	MY45091309	2011-04-28
Sunol Science Corp	System Controller	SC99V	122303-1	N/R
Sunol Science Corp	Combination Antenna	JB3	A020106-2	2011-08-10
Hewlett Packard	Pre amplifier	8447D	2944A06639	2011-06-09
EMCO	Horn antenna	3115	9511-4627	2011-10-03
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:	42-46 %
ATM Pressure:	101-102 kPa

The testing was performed by Lionel Lara from 2011-10-30 to 2011-11-03 at Chamber3.

7.5 Summary of Test Results

The worst case reading as follows:

Modulation	Margin (dB)	Frequency (MHz)	Polarization (Horizontal/Vertical)	Frequency Range
QPSK	-36.91	163.85	Horizontal	30 MHz – 25 GHz

7.6 Test Results

Model: TRI2526+

Worst Modulation: QPSK – Middle Channel (Below 1 GHz)

Symbol rate: 640 kbps

Indicated		Turntable 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)		
64.2	55.03	321	100	V	64.2	-56.46	0	0.39	-56.85	-13	-43.85
64.2	48.33	189	298	H	64.2	-63.16	0	0.39	-63.55	-13	-50.55
163.85	32.71	89	100	V	163.85	-54.75	0	0.47	-55.22	-13	-42.22
163.85	38.02	71	143	H	163.85	-49.44	0	0.47	-49.91	-13	-36.91

Symbol rate: 1280 kbps

Indicated		Turntable 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)		
64.38	54.06	344	101	V	64.38	-57.43	0	0.39	-57.82	-13	-44.82
64.38	47.78	171	289	H	64.38	-63.71	0	0.39	-64.1	-13	-51.1
163.84	33.6	83	100	V	163.84	-53.86	0	0.47	-54.33	-13	-41.33
163.84	37.81	69	146	H	163.84	-49.65	0	0.47	-50.12	-13	-37.12

Symbol rate: 2560 kbps

Indicated		Turntable 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)		
64.53	54.16	324	100	V	64.53	-57.33	0	0.39	-57.72	-13	-44.72
64.53	47.06	178	288	H	64.53	-64.43	0	0.39	-64.82	-13	-51.82
163.67	32.44	87	100	V	163.67	-55.02	0	0.47	-55.49	-13	-42.49
163.67	37.12	75	150	H	163.67	-50.34	0	0.47	-50.81	-13	-37.81

Worst Modulation: QPSK – Middle Channel (Above 1 GHz)

Symbol rate: 640 kbps

Indicated		Turntable 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)		
-*	-	-	-	-	-	-	-	-	-	-	-
-*	-	-	-	-	-	-	-	-	-	-	-

*Spurious emissions at or below noise floor level

Symbol rate: 1280 kbps

Indicated		Turntable 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)		
-*	-	-	-	-	-	-	-	-	-	-	-
-*	-	-	-	-	-	-	-	-	-	-	-

*Spurious emissions at or below noise floor level

Symbol rate: 2560 kbps

Indicated		Turntable 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)		
-*	-	-	-	-	-	-	-	-	-	-	-
-*	-	-	-	-	-	-	-	-	-	-	-

*Spurious emissions at or below noise floor level

Model: TR2526+

Worst Modulation: QPSK – Middle Channel (Below 1 GHz)

Symbol rate: 640 kbps

Indicated		Turntable 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)		
55.37	52.52	340	100	V	55.37	-58.97	0	0.39	-59.36	-13	-46.36
55.37	39.69	200	338	H	55.37	-71.8	0	0.39	-72.19	-13	-59.19
163.84	33.19	83	150	V	163.84	-54.27	0	0.47	-54.74	-13	-41.74
163.84	36.86	72	150	H	163.84	-50.6	0	0.47	-51.07	-13	-38.07

Symbol rate: 1280 kbps

Indicated		Turntable 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)		
61.01	52.21	311	100	V	61.01	-59.28	0	0.39	-59.67	-13	-46.67
61.01	46.04	44	361	H	61.01	-65.45	0	0.39	-65.84	-13	-52.84
163.85	32.92	86	148	V	163.85	-54.54	0	0.47	-55.01	-13	-42.01
163.85	37.05	69	150	H	163.85	-50.41	0	0.47	-50.88	-13	-37.88

Symbol rate: 2560 kbps

Indicated		Turntable 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)		
59.36	51.47	315	100	V	59.36	-60.02	0	0.39	-60.41	-13	-47.41
59.36	41.33	39	342	H	59.36	-70.16	0	0.39	-70.55	-13	-57.55
163.79	32.81	80	150	V	163.79	-54.65	0	0.47	-55.12	-13	-42.12
163.79	36.99	68	150	H	163.79	-50.47	0	0.47	-50.94	-13	-37.94

Worst Modulation: QPSK – Middle Channel (Above 1 GHz)

Symbol rate: 640 kbps

Indicated		Turntable 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)		
2031.99	55.42	360	214	V	2031.99	-44.83	9.1	1.68	-37.41	-13	-24.41
2031.99	52.52	22	100	H	2031.99	-47.73	9.1	1.68	-40.31	-13	-27.31

Symbol rate: 1280 kbps

Indicated		Turntable 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)		
2032	56.35	4	211	V	2032	-43.9	9.1	1.68	-36.48	-13	-23.48
2032	52.26	22	100	H	2032	-47.99	9.1	1.68	-40.57	-13	-27.57

Symbol rate: 2560 kbps

Indicated		Turntable 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)		
2032.08	55.12	4	211	V	2032.08	-45.13	9.1	1.68	-37.71	-13	-24.71
2032.08	52.17	341	100	H	2032.08	-48.08	9.1	1.68	-40.66	-13	-27.66

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	2011-08-11

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:	42-46 %
ATM Pressure:	101-102 kPa

The testing was performed by Lionel Lara from 2011-10-30 to 2011-11-03 at RF Site.

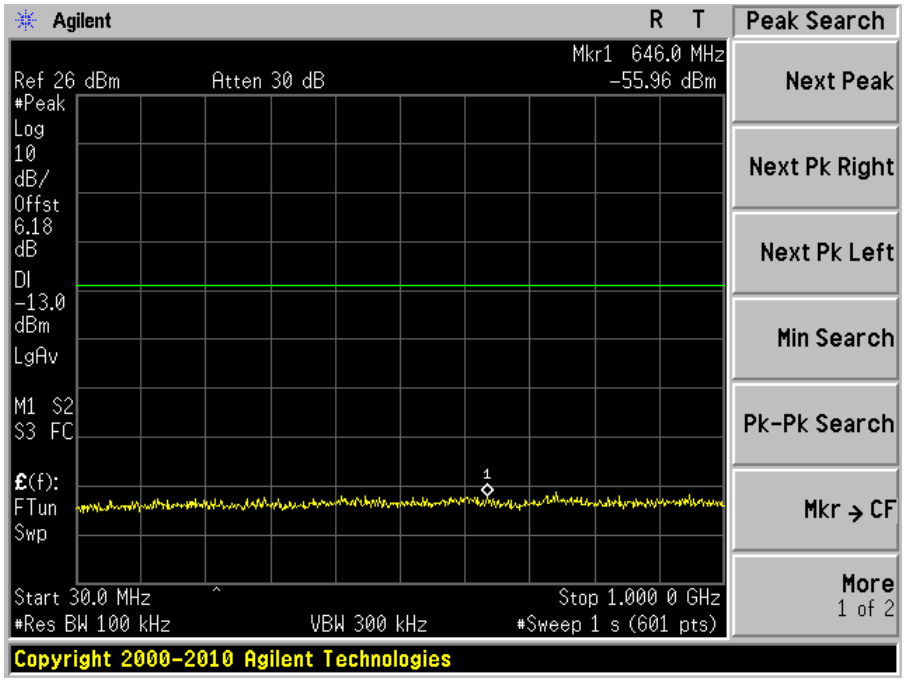
8.5 Test Results

Please refer to the following plots.

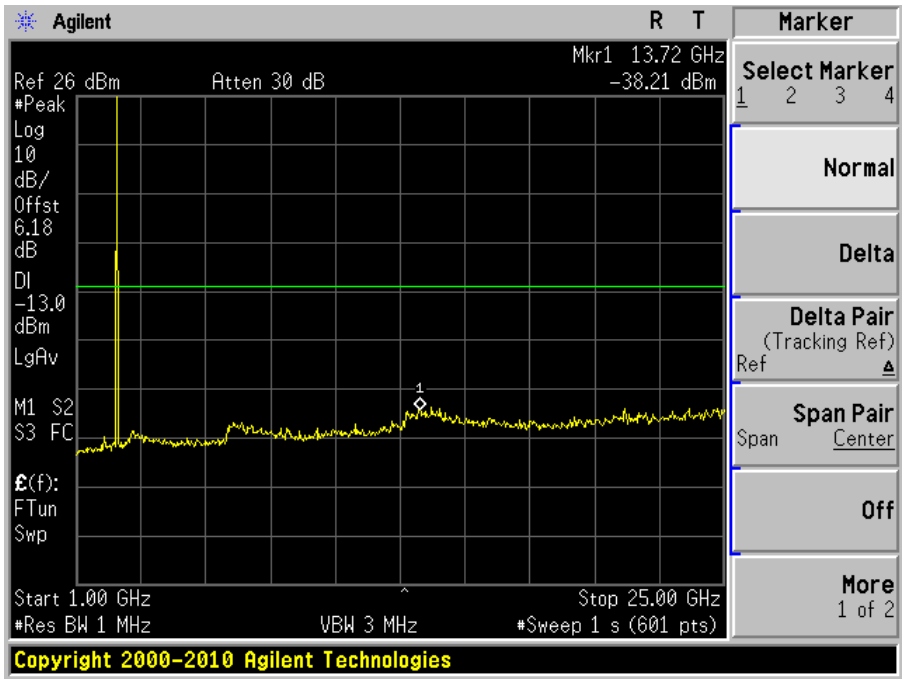
Modulation: QPSK

Frequency: 2510 MHz, Symbol rate: 640 kbps

Plot 1: 30 MHz to 1 GHz

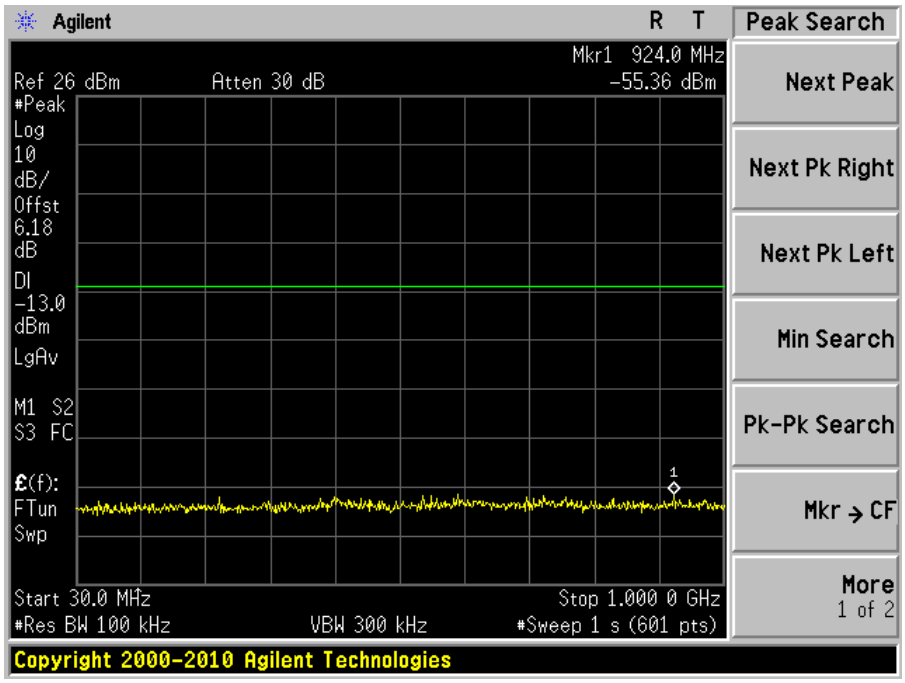


Plot 2: Above 1 GHz

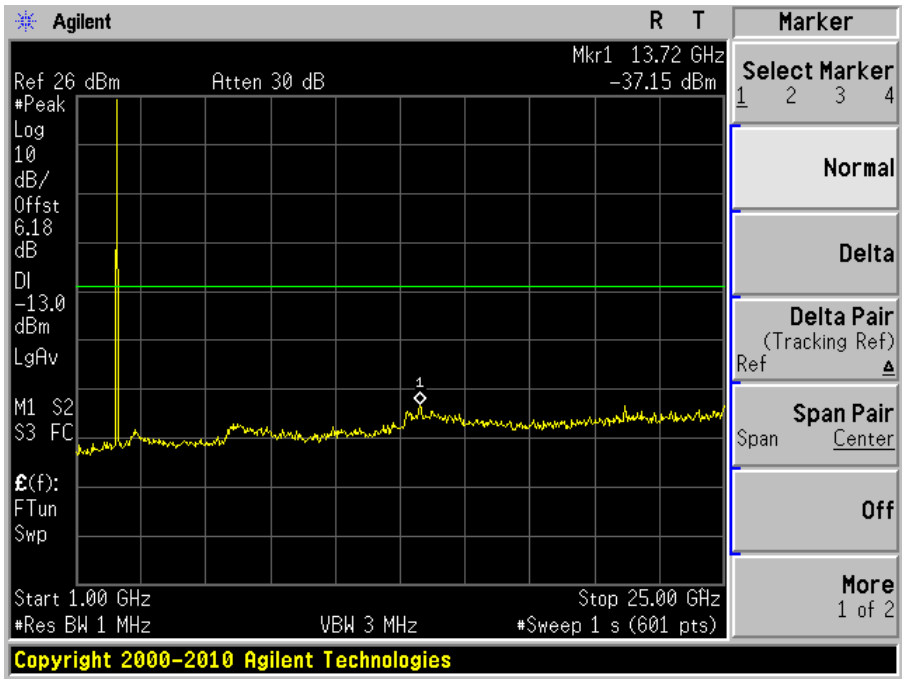


Frequency: 2510 MHz, Symbol rate: 1280 kbps

Plot 1: 30 MHz to 1 GHz

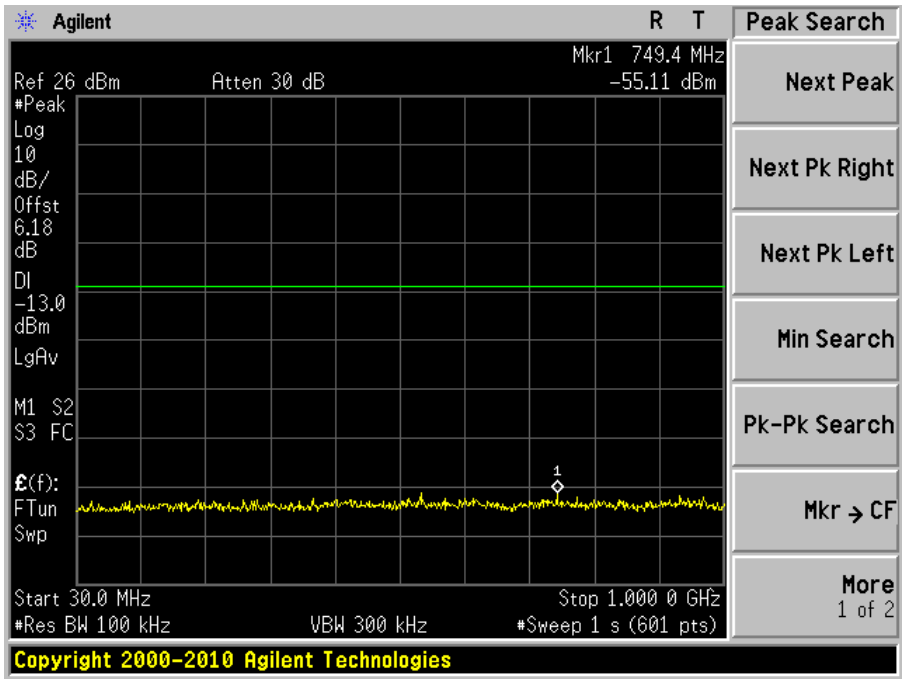


Plot 2: Above 1 GHz

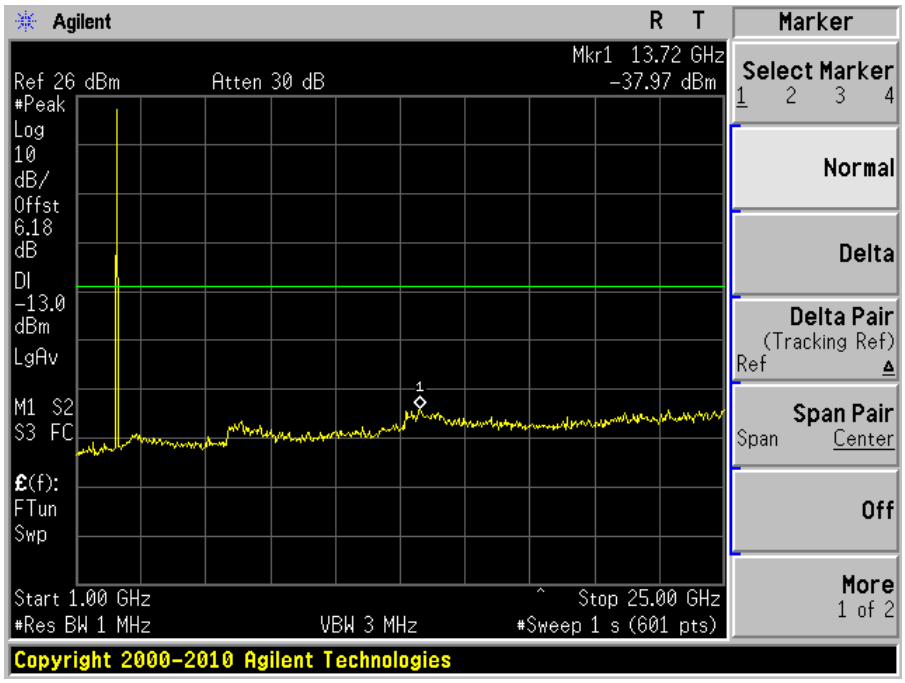


Frequency: 2510 MHz, Symbol rate: 2560 kbps

Plot 1: 30 MHz to 1 GHz



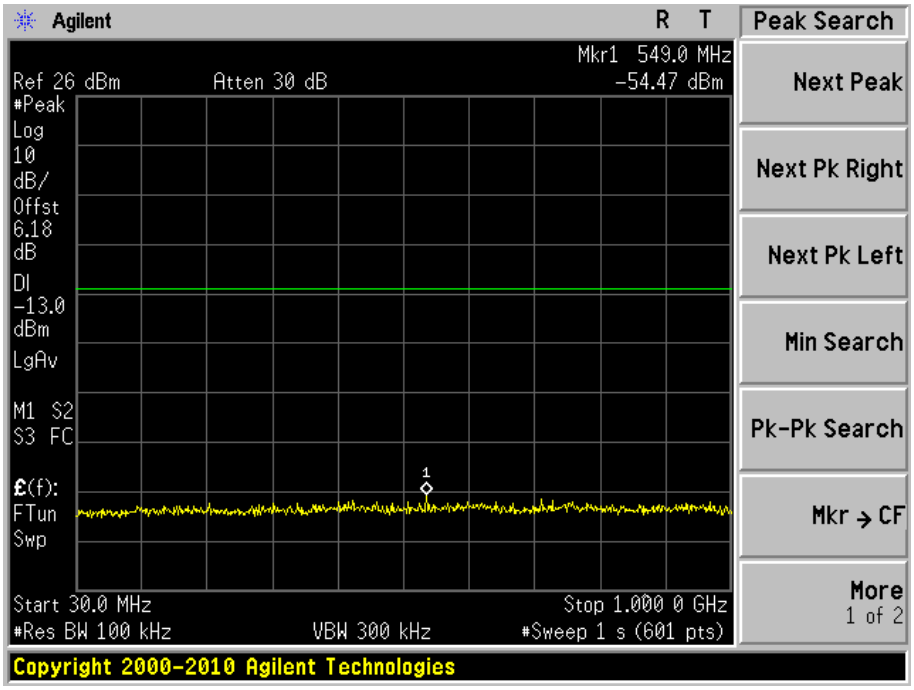
Plot 2: Above 1 GHz



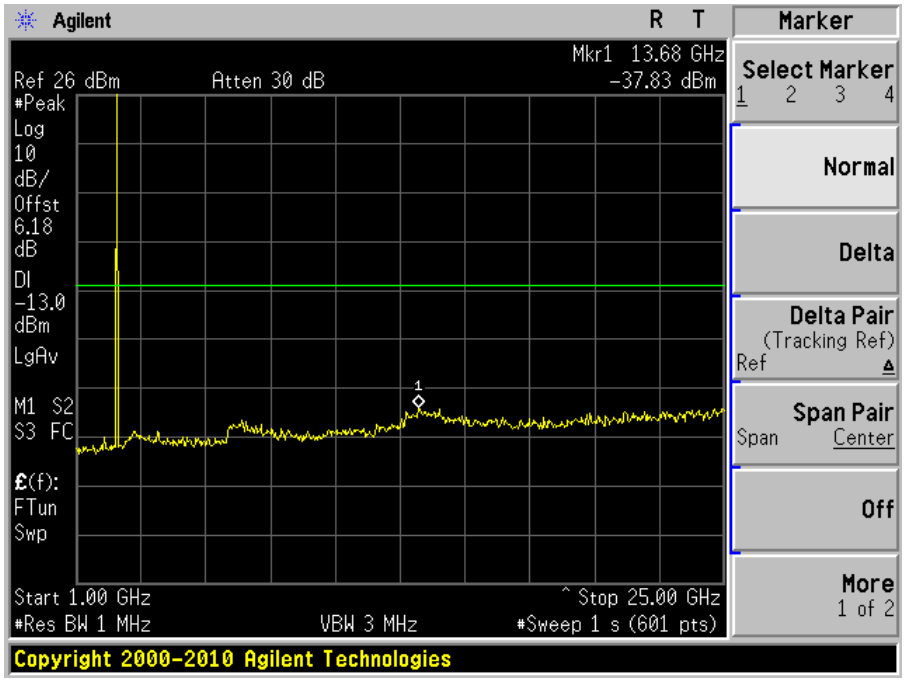
Modulation: 16QAM

Frequency: 2510 MHz, Symbol rate: 640 kbps

Plot 1: 30 MHz to 1 GHz

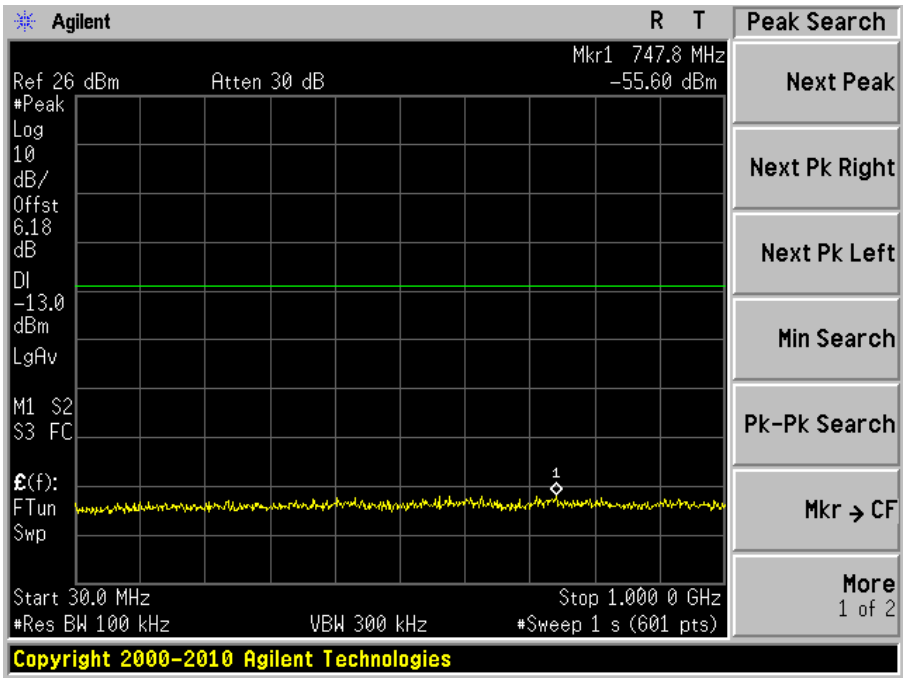


Plot 2: Above 1 GHz

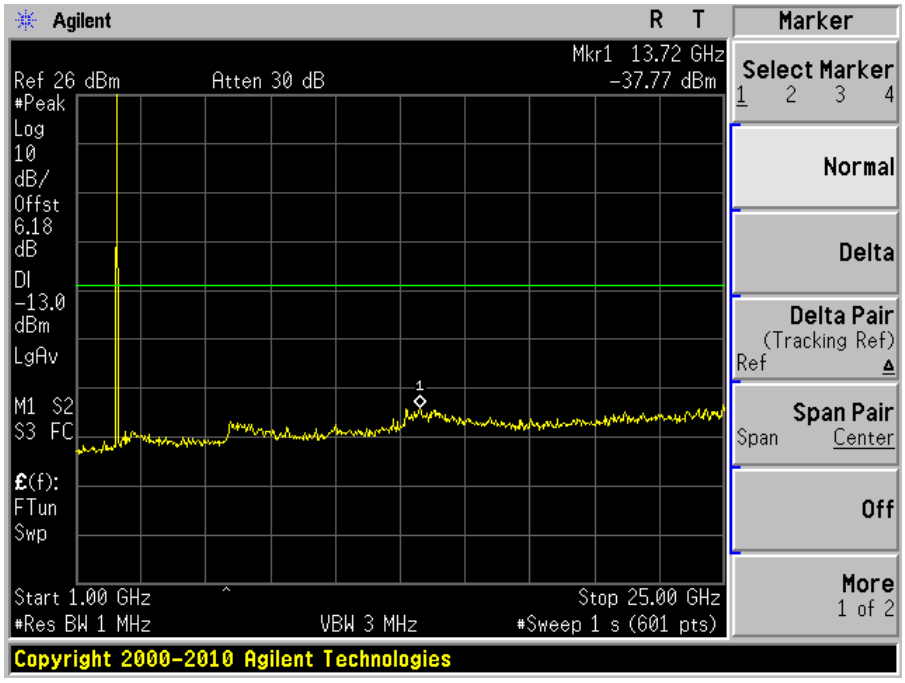


Frequency: 2510 MHz, Symbol rate: 1280 kbps

Plot 1: 30 MHz to 1 GHz

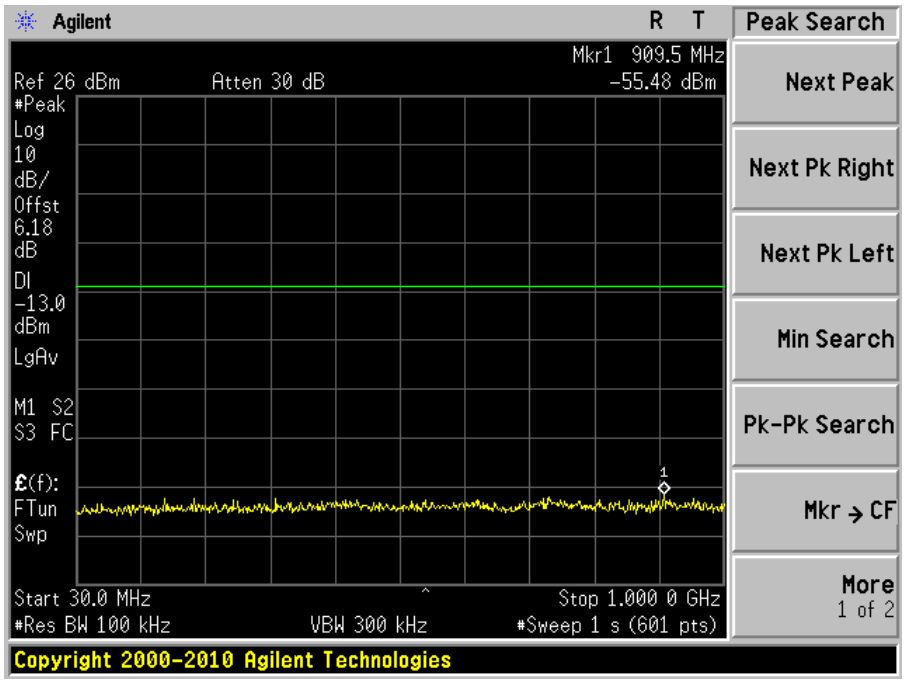


Plot 2: Above 1 GHz

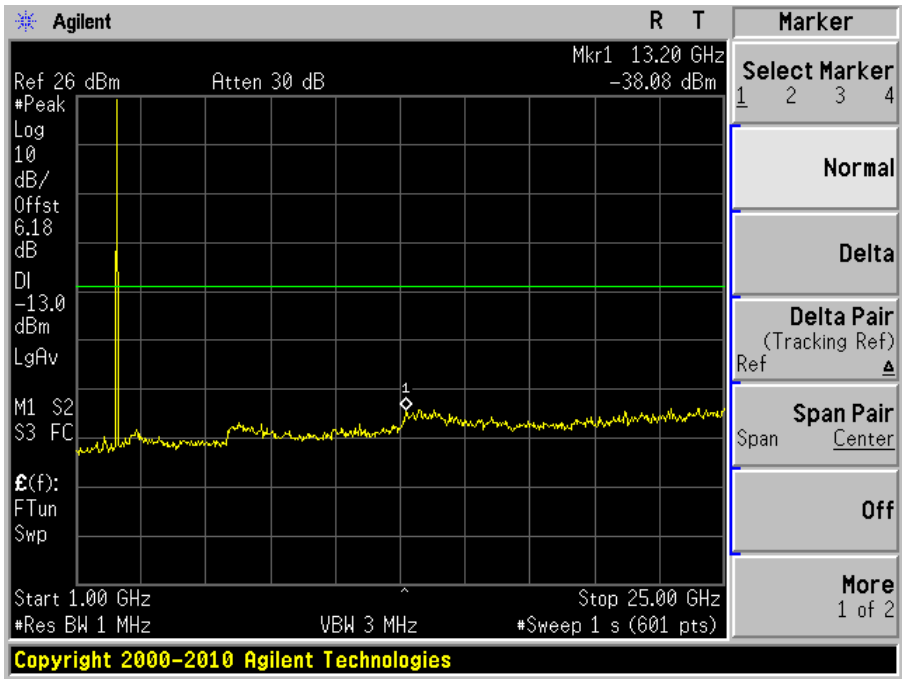


Frequency: 2510 MHz, Symbol rate: 2560 kbps

Plot 1: 30 MHz to 1 GHz



Plot 2: Above 1 GHz



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	2011-08-11

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:	42-46 %
ATM Pressure:	101-102 kPa

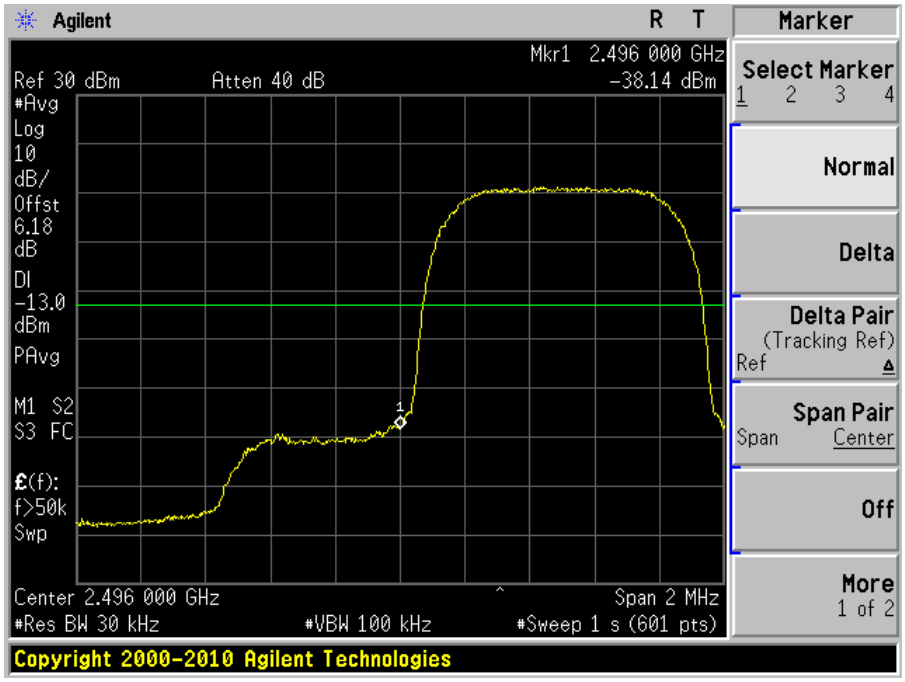
The testing was performed by Lionel Lara from 2011-10-30 to 2011-1-02 at RF Site.

9.5 Test Results

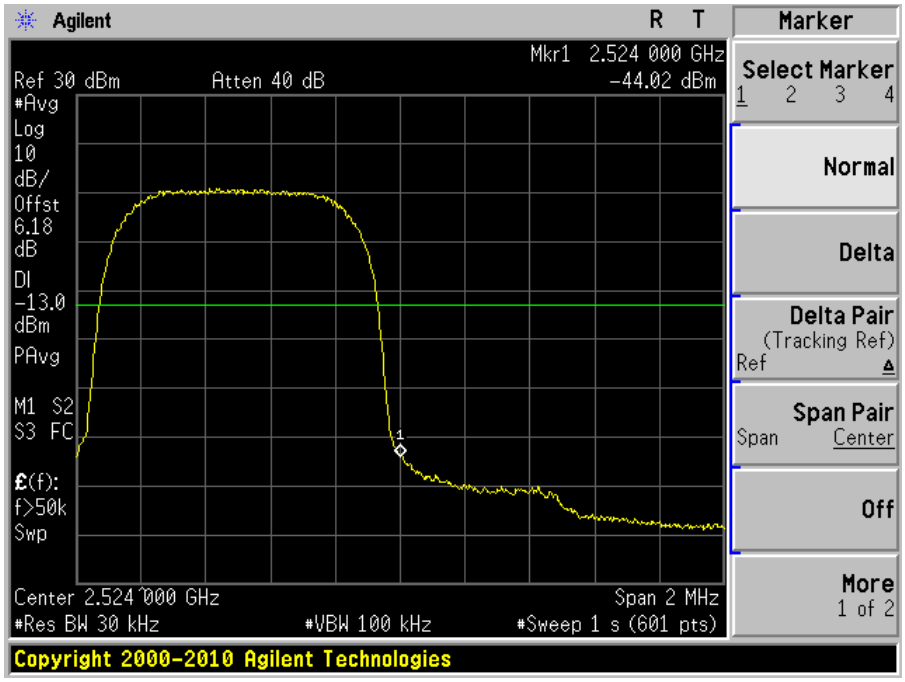
Please refer to the following plots.

Modulation: QPSK, Symbol rate: 640 kbps

Plot 1: Lowest Edge

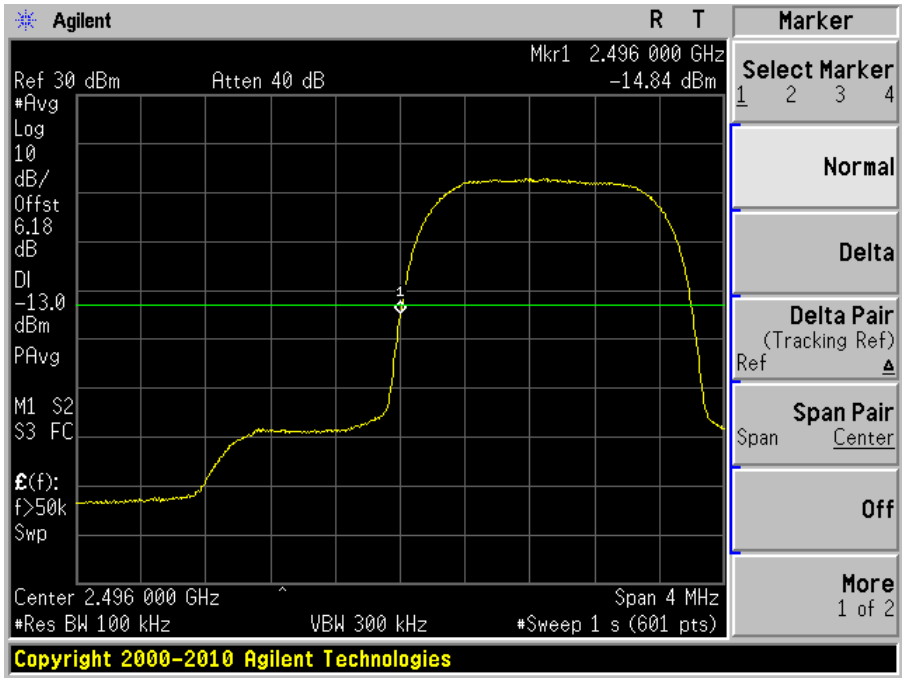


Plot 2: Highest Edge

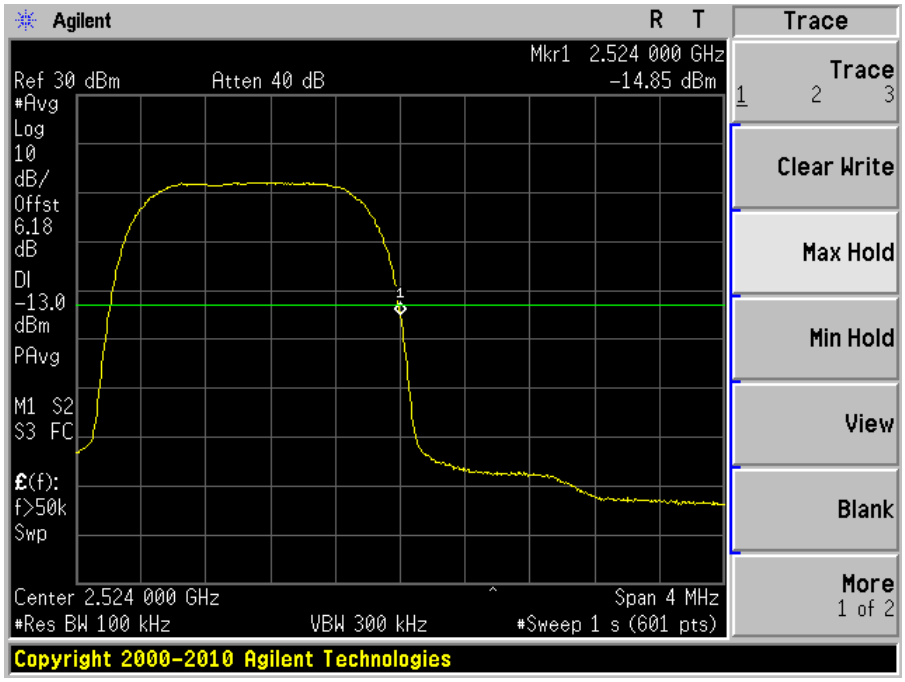


Modulation: QPSK, Symbol rate: 1280 kbps

Plot 1: Lowest Edge

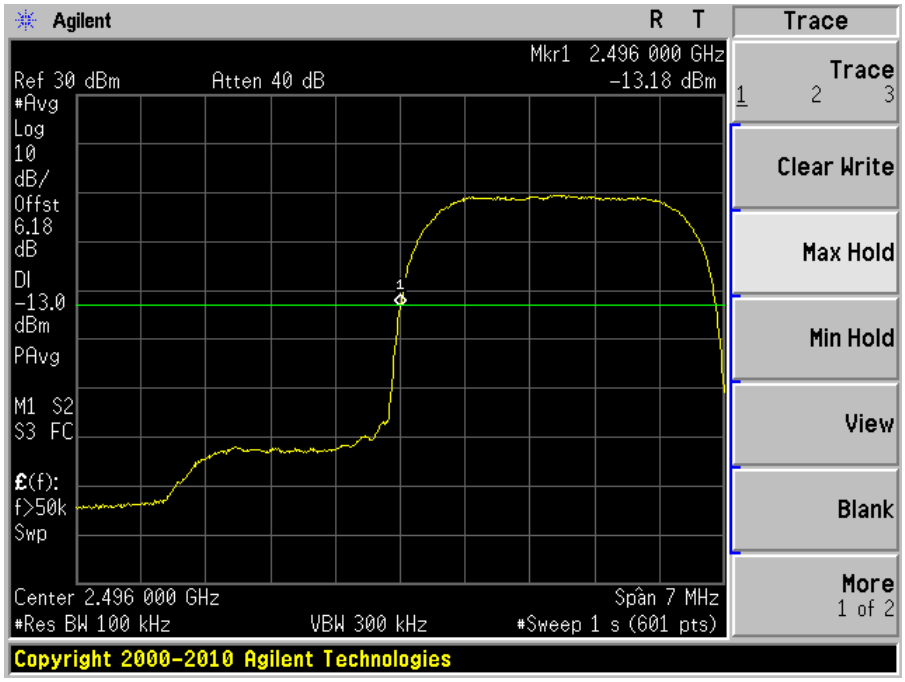


Plot 2: Highest Edge

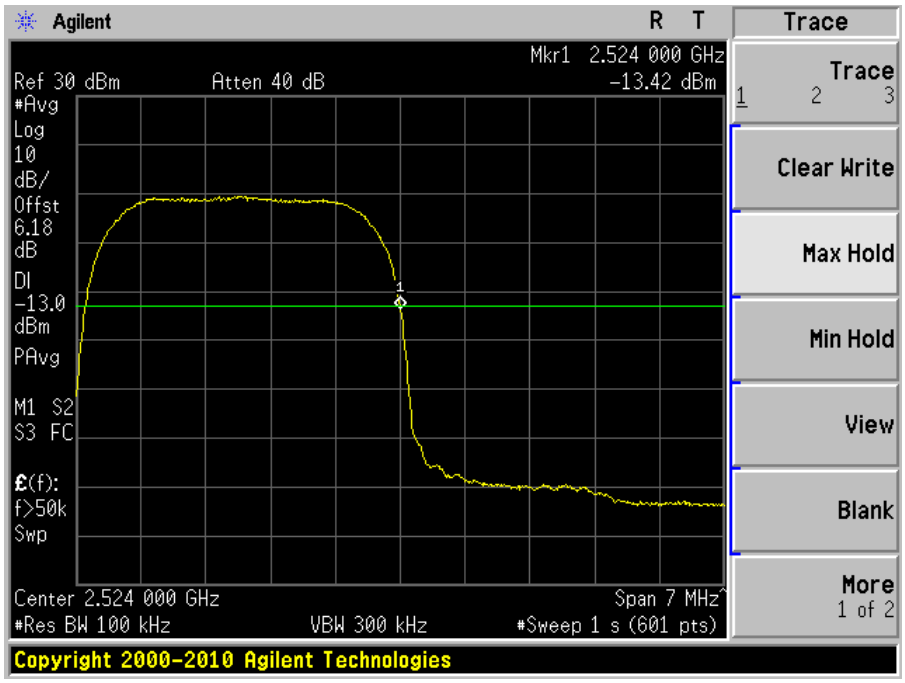


Modulation: QPSK, Symbol rate: 2560 kbps

Plot 1: Lowest Edge

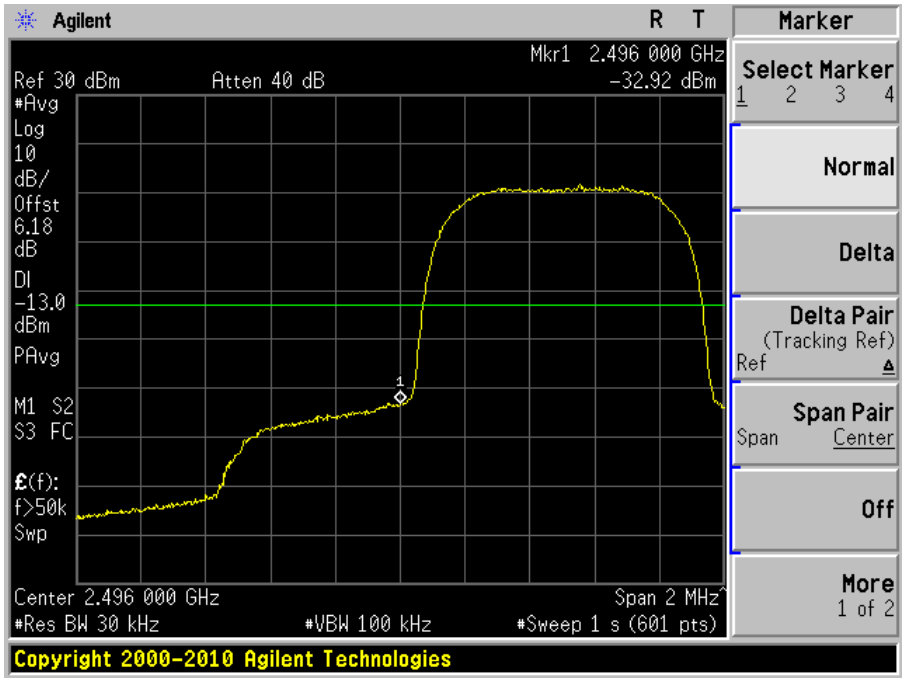


Plot 2: Highest Edge

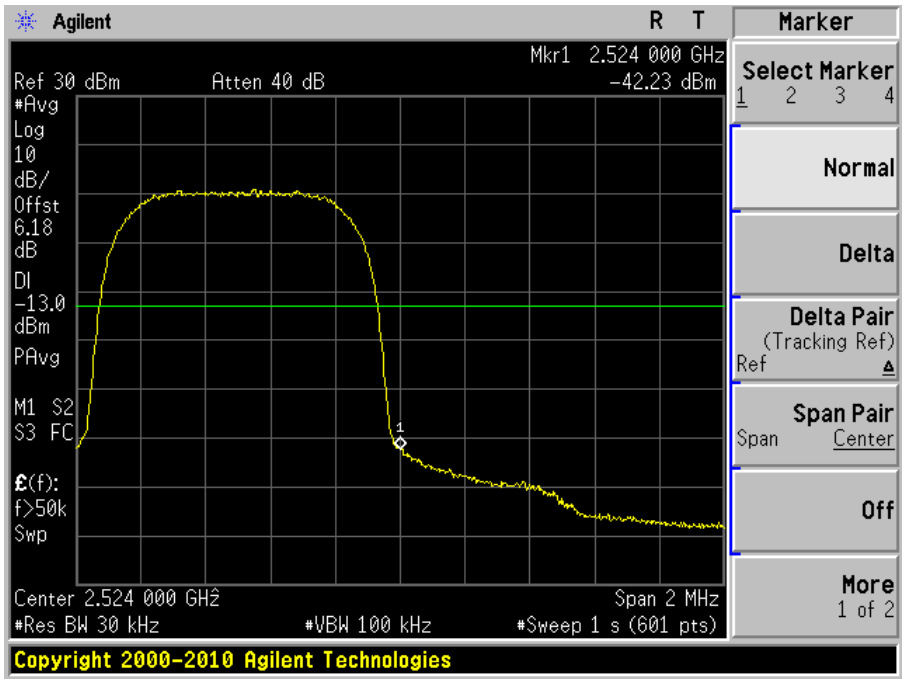


Modulation: 16QAM, Symbol rate: 640 kbps

Plot 1: Lowest Edge

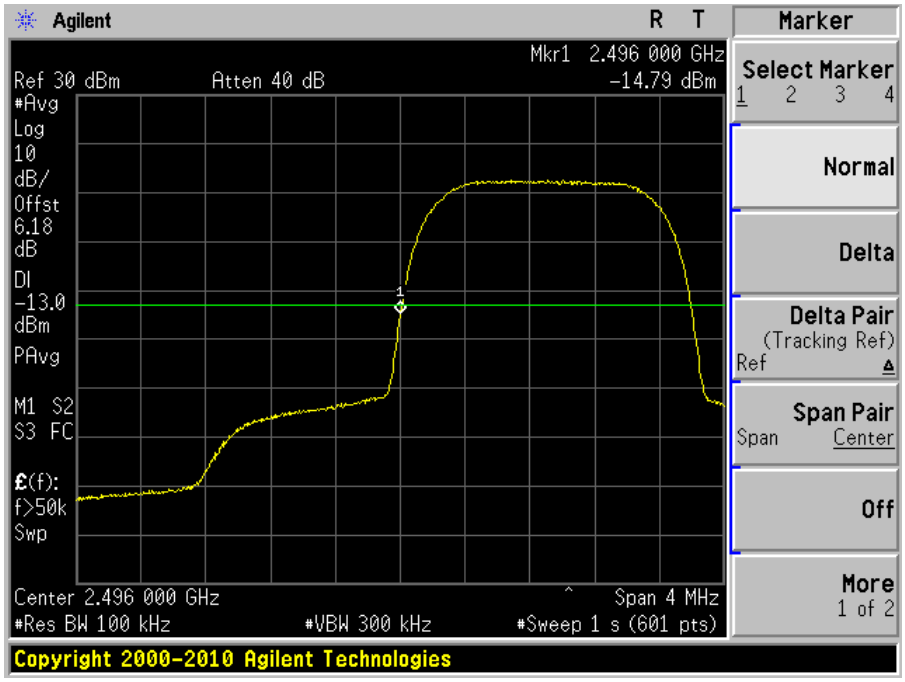


Plot 2: Highest Edge

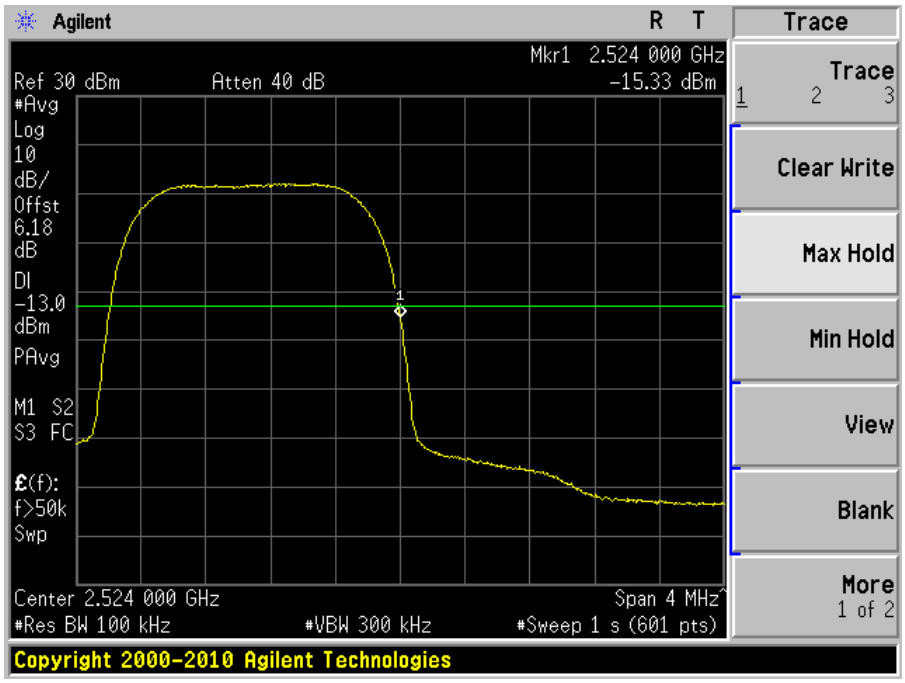


Modulation: 16QAM, Symbol rate: 1280 kbps

Plot 1: Lowest Edge

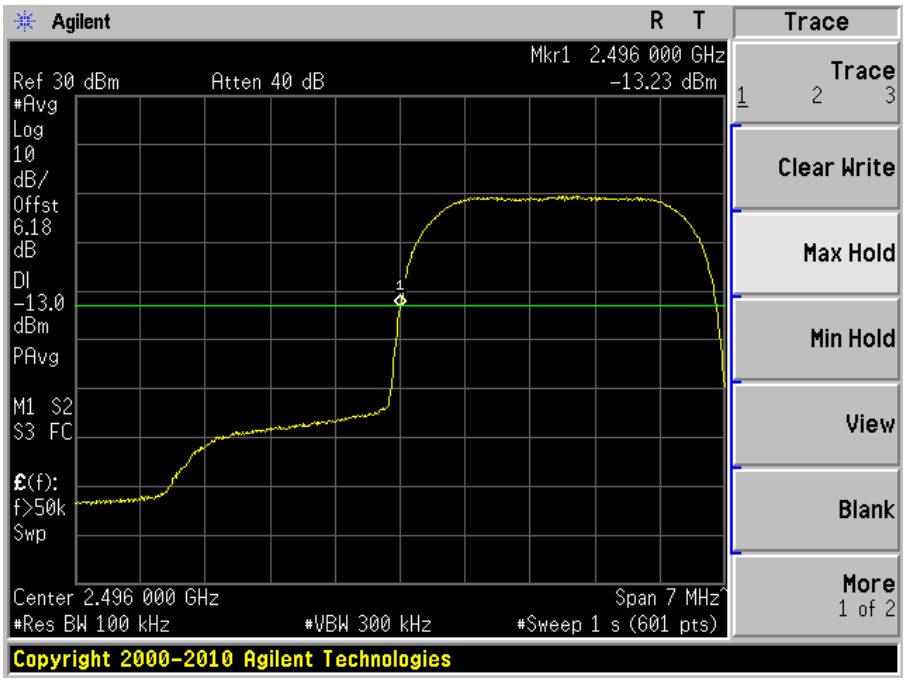


Plot 2: Highest Edge

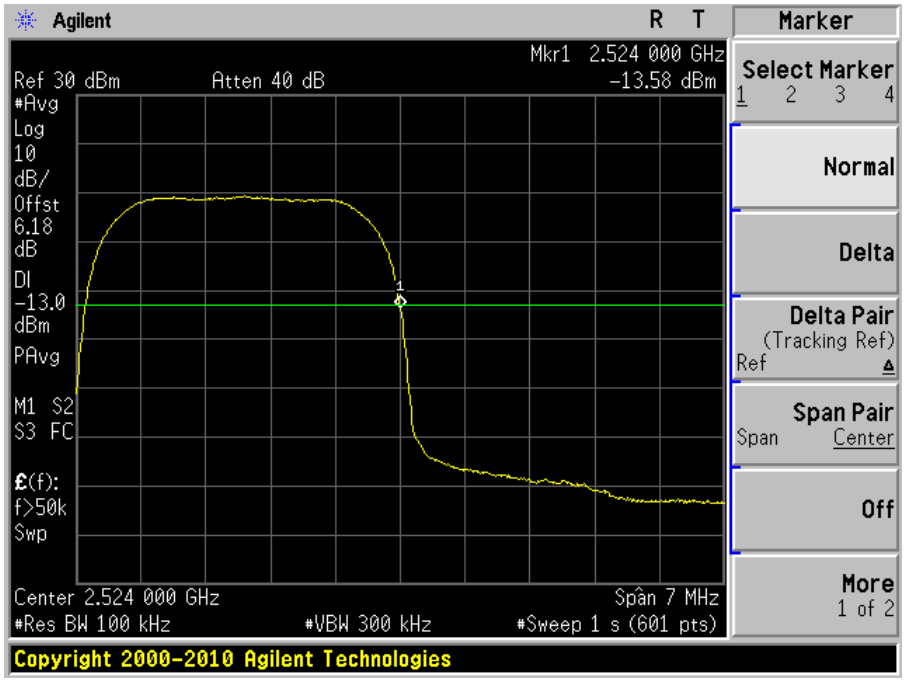


Modulation: 16QAM, Symbol rate: 2560 kbps

Plot 1: Lowest Edge



Plot 2: 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 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	2011-08-11
Espec	Humidity Chamber	ESL-4CA	18010	2011-01-28

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

10.4 Test Environmental Conditions

Temperature:	20-25°C
Relative Humidity:	42-46 %
ATM Pressure:	101-102 kPa

The testing was performed by Lionel Lara from 2011-10-30 to 2011-1-02 at RF Site.

10.5 Test Results

Modulation QPSK

Middle Channel, Symbol Rates: 640 (kbps)

Test Environment		Channel Frequency (MHz)	Measured Frequency (MHz)	Frequency Error (MHz)	Frequency Error (ppm)
Supply Voltage (Vac)	Temperature (°C)				
Frequency Stability with Temperature					
120	-30	2510	2509.9941	0.0059	2.3505
	-20	2510	2509.9963	0.0037	1.4741
	-10	2510	2510.0024	-0.0024	-0.9561
	0	2510	2510.0060	-0.0060	-2.3904
	10	2510	2510.0049	-0.0049	-1.9521
	20	2510	2510.0049	-0.0049	-1.9521
	30	2510	2510.0015	-0.0015	-0.5976
	40	2510	2509.9968	0.0032	1.2749
	50	2510	2509.9942	0.0058	2.3107
Frequency Stability with Supply Voltage					
20	102	2510	2510.0048	-0.0048	-1.9123
	138	2510	2510.0049	-0.0049	-1.9521

Middle Channel, Symbol Rates: 1280 (kbps)

Test Environment		Channel Frequency (MHz)	Measured Frequency (MHz)	Frequency Error (MHz)	Frequency Error (ppm)
Supply Voltage (Vac)	Temperature (°C)				
Frequency Stability with Temperature					
120	-30	2510	2509.9983	0.0017	0.6772
	-20	2510	2509.9962	0.0038	1.5139
	-10	2510	2509.9952	0.0048	1.9123
	0	2510	2510.0046	-0.0046	-1.8326
	10	2510	2509.9996	0.0004	0.1593
	20	2510	2509.9996	0.0004	0.1593
	30	2510	2509.9994	0.0006	0.2390
	40	2510	2509.9981	0.0019	0.7569
	50	2510	2509.9986	0.0014	0.5577
Frequency Stability with Supply Voltage					
20	102	2510	2510.0054	-0.0054	-2.1513
	138	2510	2510.0046	-0.0046	-1.8326

Middle Channel, Symbol Rates: 2560 (kbps)

Test Environment		Channel Frequency (MHz)	Measured Frequency (MHz)	Frequency Error (MHz)	Frequency Error (ppm)
Supply Voltage (Vac)	Temperature (°C)				
Frequency Stability with Temperature					
120	-30	2510	2510.0000	0.0000	0
	-20	2510	2510.0000	0.0000	0
	-10	2510	2510.0018	-0.0018	-0.7171
	0	2510	2509.9993	0.0007	0.2788
	10	2510	2509.9970	0.0030	1.1952
	20	2510	2509.9992	0.0008	0.3187
	30	2510	2509.9970	0.0030	1.1952
	40	2510	2510.0012	-0.0012	-0.4780
	50	2510	2509.9992	0.0008	0.3187
Frequency Stability with Supply Voltage					
20	102	2510	2509.9974	0.0026	1.0358
	138	2510	2510.0056	-0.0056	-2.2310

Modulation 16QAM

Middle Channel, Symbol Rates: 640 (kbps)

Test Environment		Channel Frequency (MHz)	Measured Frequency (MHz)	Frequency Error (MHz)	Frequency Error (ppm)
Supply Voltage (Vac)	Temperature (°C)				
Frequency Stability with Temperature					
120	-30	2510	2510.0056	-0.0056	-2.2310
	-20	2510	2510.0024	-0.0024	-0.9561
	-10	2510	2510.0006	-0.0006	-0.2390
	0	2510	2510.0019	-0.0019	-0.7569
	10	2510	2509.9963	0.0037	1.4741
	20	2510	2510.0059	-0.0059	-2.3505
	30	2510	2509.9968	0.0032	1.2749
	40	2510	2510.0046	-0.0046	-1.8326
	50	2510	2510.0034	-0.0034	-1.3545
Frequency Stability with Supply Voltage					
20	102	2510	2509.9968	0.0032	1.2749
	138	2510	2509.9997	0.0003	0.1195

Middle Channel, Symbol Rates: 1280 (kbps)

Test Environment		Channel Frequency (MHz)	Measured Frequency (MHz)	Frequency Error (MHz)	Frequency Error (ppm)
Supply Voltage (Vac)	Temperature (°C)				
Frequency Stability with Temperature					
120	-30	2510	2509.9952	0.0048	1.9123
	-20	2510	2509.9981	0.0019	0.7569
	-10	2510	2510.0046	-0.0046	-1.8326
	0	2510	2509.9943	0.0057	2.2709
	10	2510	2509.9943	0.0057	2.2709
	20	2510	2509.9964	0.0036	1.4342
	30	2510	2510.0054	-0.0054	-2.1513
	40	2510	2509.9985	0.0015	0.5976
	50	2510	2510.0027	-0.0027	-1.0756
Frequency Stability with Supply Voltage					
20	102	2510	2510.0041	-0.0041	-1.6334
	138	2510	2510.0046	-0.0046	-1.8326

Middle Channel, Symbol Rates: 2560 (kbps)

Test Environment		Channel Frequency (MHz)	Measured Frequency (MHz)	Frequency Error (MHz)	Frequency Error (ppm)
Supply Voltage (Vac)	Temperature (°C)				
Frequency Stability with Temperature					
120	-30	2510	2509.9982	0.0018	0.7171
	-20	2510	2509.9943	0.0057	2.2709
	-10	2510	2509.9952	0.0048	1.9123
	0	2510	2509.9999	0.0001	0.0398
	10	2510	2509.9986	0.0014	0.5577
	20	2510	2509.9974	0.0026	1.0358
	30	2510	2509.9974	0.0026	1.0358
	40	2510	2509.9993	0.0007	0.2788
	50	2510	2509.9976	0.0024	0.9561
Frequency Stability with Supply Voltage					
20	102	2510	2510.0046	-0.0046	-1.8326
	138	2510	2510.0056	-0.0056	-2.2310

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 = 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

Model: TRI2526+

Maximum peak output power at antenna input terminal (dBm):	22.92
Maximum peak output power at antenna input terminal (mW):	195.884
Prediction distance (cm):	150
Prediction frequency (MHz):	2510
Antenna Gain, typical (dBi):	18
Maximum Antenna Gain (numeric):	63.10
Power density at predication frequency and distance (mW/cm^2):	0.0437
MPE limit for uncontrolled exposure at predication frequency (mW/cm^2):	1.0

Model: TR2526+

Maximum peak output power at antenna input terminal (dBm):	22.92
Maximum peak output power at antenna input terminal (mW):	195.884
Prediction distance (cm):	150
Prediction frequency (MHz):	2510
Antenna Gain, typical (dBi):	24
Maximum Antenna Gain (numeric):	251.19
Power density at predication frequency and distance (mW/cm^2):	0.1741
MPE limit for uncontrolled exposure at predication frequency (mW/cm^2):	1.0

Test Result

To Compliant with the FCC RF Exposure requirements in section 1.1037, a minimum separation distance of 150 cm is required between the antenna and all persons.