

FCC PART 27

MEASUREMENT AND TEST REPORT

For

Vecima Networks, Inc.

150 Cardinal Place, Saskatoon,
SK, Canada S7L 6H7

FCC ID: OPPTRX2525Y
Model: TR2525B/TRI2525B

Report Type: Class II Permissive Change	Product Type: 2.5GHz Subscriber Transceiver
Test Engineer: Victor Zhang 	
Report Number: R0809114-27	
Report Date: 2008-09-29	
Reviewed By: Boni Baniqued  Sr. RF Engineer	
Prepared By: Bay Area Compliance Laboratories Corp. (66) 1274 Anvilwood Ave Sunnyvale, CA 94089, USA Tel: (408) 732-9162 Fax: (408) 732 9164	

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* This report may contain data that are not covered by the NVLAP accreditation and are marked with an asterisk "*" (Rev 2)

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DOCUMENT REVISION HISTORY

Revision #	Report Number	Description of Revision	Date of Revision
0	R0809114-27	Original	2008-09-29

GENERAL INFORMATION

1.1 Product Description for Equipment under Test (EUT)

The Vecima Networks, Inc. product, FCC ID: OPPTRX2525Y, model numbers: TR2525B and TRI2525B or the “EUT” as referred to in this report is a point to point transceiver device designed for outdoor use. The EUT operates on 2.5 GHz band (2512 MHz) and consists of two models that are sold and marketed together. Model: TR2525B is a routing device designed to be connected to a modem and to an external antenna. Model: TRI2525B is a point to point wireless transceiver with built in panel antenna with max gain 18 dBi designed to be connected to a digital device (i.e. surveillance camera, remote measurement equipment). TRI2525B transmits information to TR2525B that can then be sent via modem/router to a network; information/commands from the clients connected to the network can conversely also be transmitted back to the digital device.

1.2 Mechanical Description

The Vecima Networks Inc. product, FCC ID: OPPTRX2525Y consists of two models (TR2525B and TRI2525B) both of metallic construction which measure approximately 305 mmL x305 mmW x 70 mmH (weight: 2 kg) and 200 mmL x150 mmW x 40 mmH (weight: 1 kg) respectively.

* The test data gathered are from production sample provided by the manufacturer.

1.3 EUT Photo



Model: TR2525B



Model: TRI2525B

Please see Exhibit C for additional EUT photos

1.4 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 of the manufacturer is to demonstrate compliance with FCC rules for RF Output Power, Spurious Emission, and RF Exposure.

1.5 Related Submittal(s)/Grant(s)

This is a Class II permissive change regarding FCC ID: OPPTRX2525Y that was certified on 2007-04-27. The original test report was filing under R0703133 on 2007-04-04

1.6 Test Methodology

All measurements contained in this report were conducted in accordance with TIA 603-C and ANSI C63.4-2003, American National Standard for Methods of Measurement of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the range of 9 kHz to 40 GHz.

1.7 Measurement Uncertainty

All measurements involve certain levels of uncertainties, especially in 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 range from ± 2.0 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.

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

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.

1.8 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 603-C and ANSI C63.4-2003.

The EUT was tested in the testing mode to represent *worst-case* results during the final qualification test.

2.2 EUT Exercise Software

The EUT was operating in max power mode during radiated and conducted testing.

2.3 Equipment Modifications

No modifications were made to the EUT.

2.4 Special Accessories

N/A

2.5 Local Support Equipment

Manufacturer	Description	Model	Serial Number	Calibration Date
Rohde & Schwarz	Signal Generator	SMIQ	849192/0085	2007-12-03
Midwest Microwave	40 dB Attenuator	392	NA	NA
Narda	50 ohm Terminator	370 BNW	9310	NA

2.6 Remote Support Equipment

Manufacturer	Description	Model	Serial Number	FCC ID
/	/	/	/	/

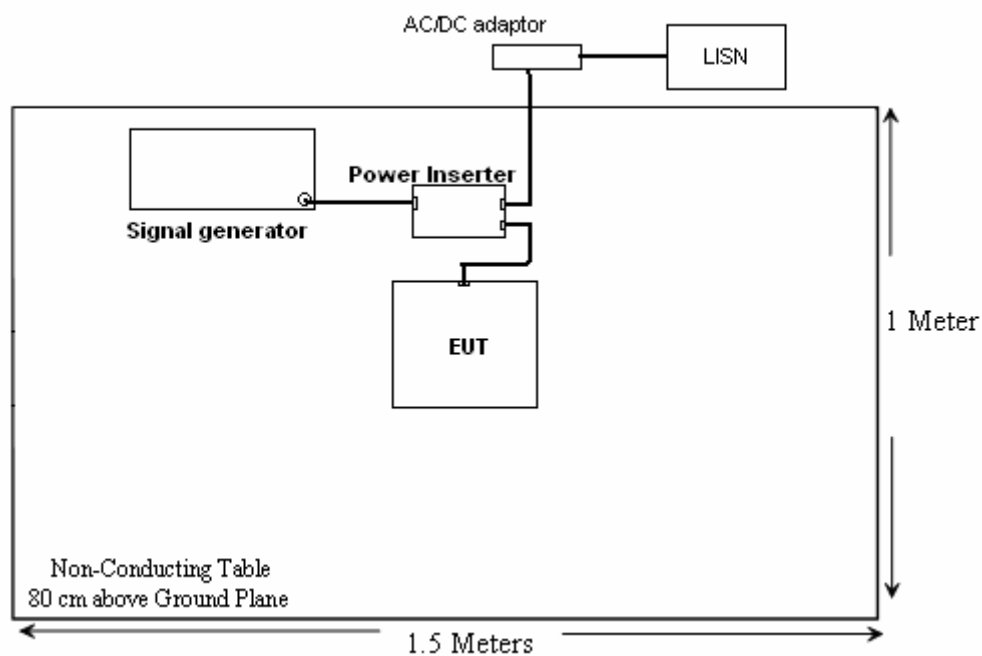
2.7 Power Supply Information

Manufacturer	Description	Model	Serial Number	FCC ID
/	/	/	/	/

2.8 External I/O Cabling List and Details

Cable Description	Length (m)	Port/From	To
RG6 cable	1.5	Power Inserter (Transceiver port)	EUT (modem port)
SMA low-loss RF cable	1.2	Signal Generator	Power Inserter (Modem port)

2.9 Test Setup Block Diagrams



3 SUMMARY OF TEST RESULTS

Results reported relate only to the product tested.

FCC Rules	Description of Test	Results
§2.1046 & §27.50(h)	RF Output Power	Compliant
§2.1047	Modulation Characteristics	NA
§2.1049, §27.53 (l)	Occupied Bandwidth	Refer to original report (FCC ID: OPPTRX2525Y)
§1.1307(b)(1) & §2.1091 & §27.52	RF Exposure	Compliant
§2.1051 & §27.53(l)	Spurious Emission at Antenna Terminals	Compliant
§2.1053 & §27.53(l)	Field Strength of Spurious Radiation	Compliant
§2.1055 & §27.54 (d)	Frequency Stability	Refer to original report (FCC ID: OPPTRX2525Y)

4 §2.1046 & §27.50(h) – RF OUTPUT POWER

4.1 Standard Applicable

(1) Main, booster and base stations. (i) The maximum EIRP of a main, booster or base station shall not exceed $33 \text{ dBW} + 10\log(X/Y) \text{ dBW}$, 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 Measurement Procedure

1. Place the EUT on a bench and set it in transmitting mode.
2. Remove the antenna from the EUT and then connect a low loss RF cable from the antenna port to a spectrum analyzer.



4.3 Equipment Lists

Manufacturer	Description	Model Number	Serial Number	Cal. Date
Agilent	Spectrum analyzer	E4446A	US45303156	2008-05-31
R & S	Signal Generator	SMIQ	849192/0085	2007-12-03

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

4.4 Environmental Conditions

Temperature:	25 °C
Relative Humidity:	58 %
ATM Pressure:	101.5 kPa

* The testing was performed Victor Zhang on 2008-09-15.

4.5 Measurement Result

Modulation type: QPSK, Symbol rate: 2560 ksym/sec

Channel	Frequency (MHz)	Conducted Output Power (dBm)	Limit (dBm)
Mid	2512	22.90	59.75

Modulation type: QPSK, Symbol rate: 640 ksym/ sec

Channel	Frequency (MHz)	Conducted Output Power (dBm)	Limit (dBm)
Mid	2512	23.12	53.66

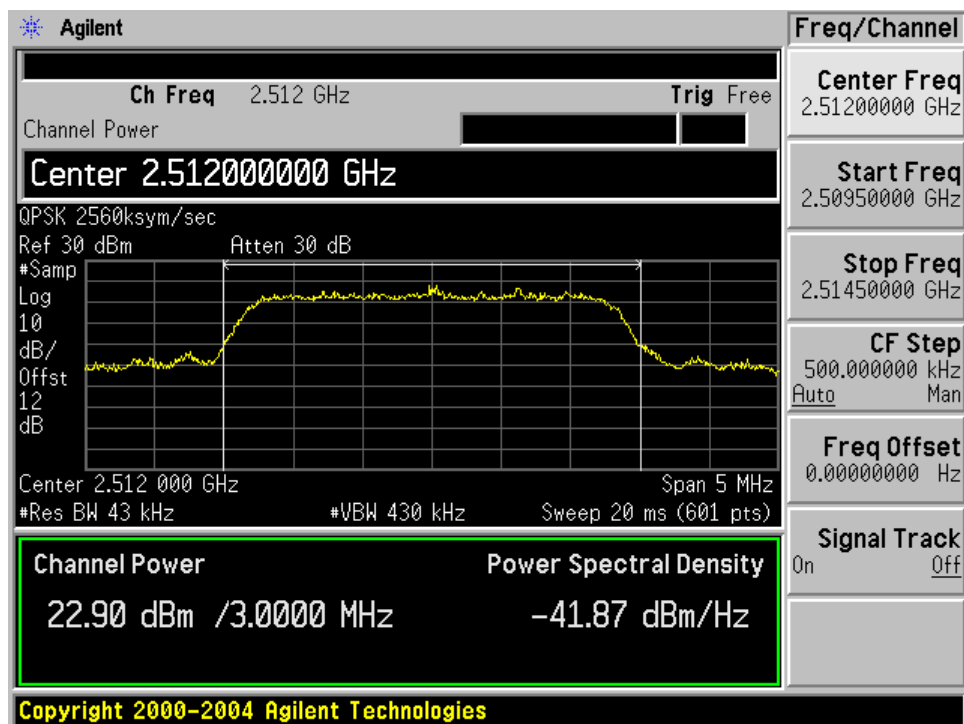
Modulation type: 16QAM, Symbol rate: 2560 ksym/sec

Channel	Frequency (MHz)	Conducted Output Power (dBm)	Limit (dBm)
Mid	2512	21.80	59.75

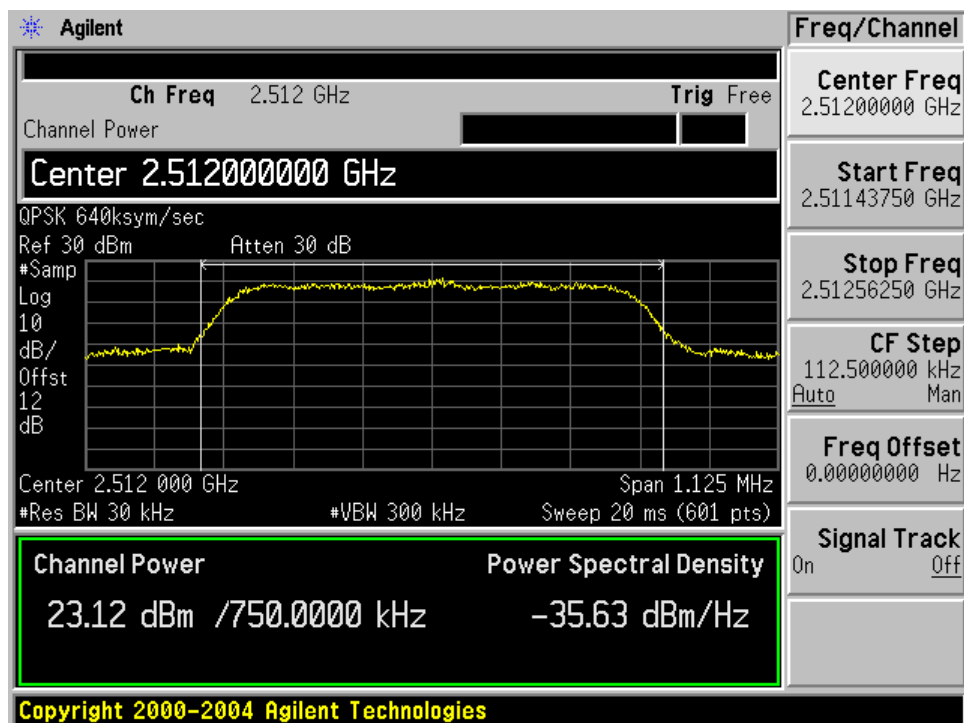
Modulation type: 16QAM, Symbol rate: 640 ksym/ sec

Channel	Frequency (MHz)	Conducted Output Power (dBm)	Limit (dBm)
Mid	2512	21.59	53.66

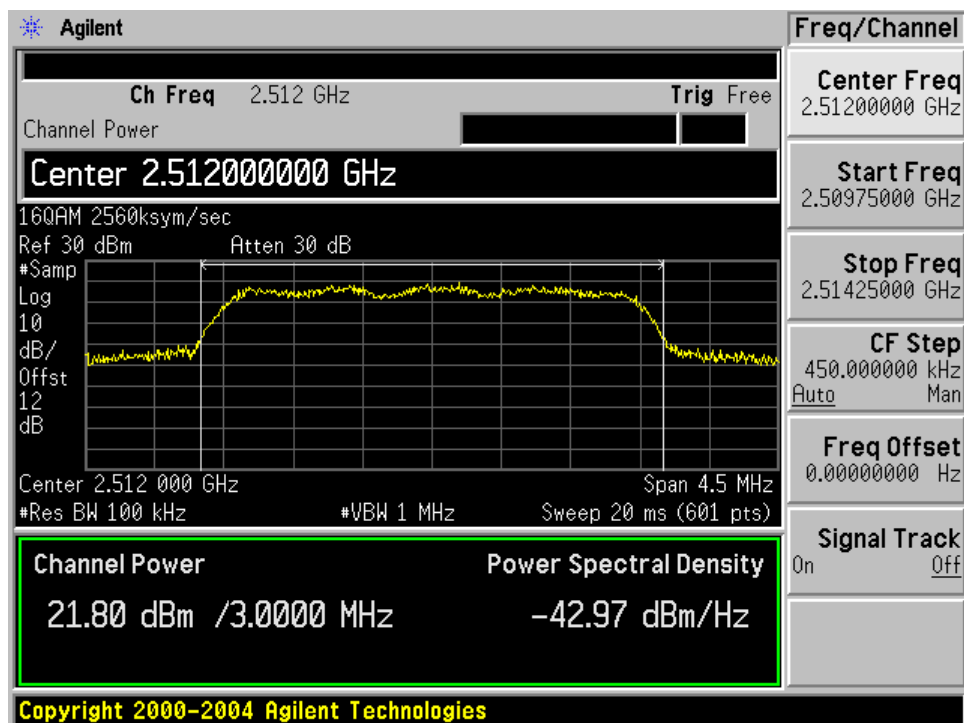
Modulation type: QPSK, Symbol rate: 2560 ksym/sec



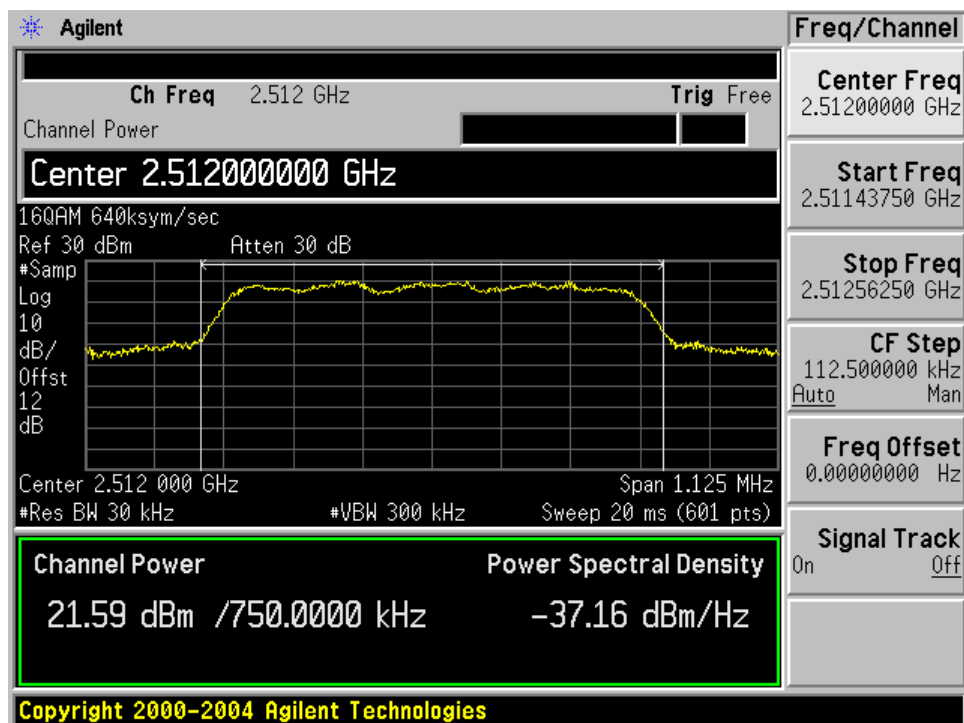
Modulation type: QPSK, Symbol rate: 640 ksym/sec



Modulation type: 16QAM, Symbol rate: 2560 ksym/sec



Modulation type: 16QAM, Symbol rate: 640 ksym/ sec



5 §2.1047 – MODULATION CHARACTERISTICS

The EUT uses digital modulation techniques only which were employed during the tests for occupied bandwidth. Part 27 does not have a modulation characteristics requirement for digital modulation thus this section is not applicable.

6 §2.1049, §27.53 – OCCUPIED BANDWIDTH

Refer to the original report.

7 §27.52, §1.1307(b) (1) & §2.1091 - RF EXPOSURE

7.1 Standard Applicable

According to §1.1307(b)(1), systems operating under the provisions of this section shall be operated in a manner that ensures that the public is not exposed to radio frequency energy level in excess of the Commission's guidelines.

According to §1.1310 and §2.1091 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

f = frequency in MHz

* = Plane-wave equivalent power density

7.2 MPE Prediction

Prediction of MPE limit at a given distance

Equation from page 18 of 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

18 dBi Antenna

Maximum peak output power at antenna input terminal (dBm): 23.12(dBm)

Maximum peak output power at antenna input terminal (mW): 205.12 (mW)

Predication distance (cm): 73.70 cm

Predication frequency (MHz): 2512 (MHz)

Maximum Antenna Gain, typical (dBi): 18.0 (dBi)

Maximum Antenna Gain (numeric): 63.1 (numeric)

Power density of predication frequency at 73.7 cm (mW/cm²): 0.191 (mW/cm²)

MPE limit for uncontrolled exposure at predication frequency (mW/cm²): 1.00 (mW/cm²)

7.3 Test Result

The power density of predication frequency at 73.7 cm is 0.191 mW/ cm² for the 18 dBi antenna, which is according to calculation, under the MPE limit for uncontrolled exposure of 1.00 mW/ cm².

8 §2.1051 & §27.53(l) – SPURIOUS EMISSIONS AT ANTENNA TERMINALS

8.1 Standard Applicable

§2.1051: The radio frequency voltage or powers generated within the equipment and appearing on a spurious frequency shall be checked at the equipment output terminals when properly loaded with a suitable artificial antenna. Curves or equivalent data shall show the magnitude of each harmonic and other spurious emission that can be detected when the equipment is operated under the conditions specified in §2.1049 as appropriate. The magnitude of spurious emissions which are attenuated more than 20 dB below the permissible value need not be specified.

§27.53(l): For BRS and EBS stations, the power of any emissions outside the licensee's frequency bands of operation shall be attenuated below the transmitter power (P) measured in watts.

§27.53(l): (2) For fixed and temporary fixed digital stations, the attenuation shall be not less than $43 + 10 \log (P)$ dB, unless a documented interference complaint is received from an adjacent channel licensee. Provided that the complaint cannot be mutually resolved between the parties, both licensees of existing and new systems shall reduce their out-of-band emissions by at least $67 + 10 \log (P)$ dB measured at 3 MHz from their channel's edges for distances between stations exceeding 1.5 km. For stations separated by less than 1.5 km, the new licensee shall reduce attenuation at least $67 + 10 \log (P) - 20 \log (D\text{km}/1.5)$, or when collocated, limit the undesired signal level at the affected licensee's base station receiver(s) at the collocation site to no more than -107 dBm. Mobile Service Satellite licensees operating on frequencies below 2495 MHz may also submit a documented interference complaint against BRS licensees operating on channel BRS1 on the same terms and conditions as adjacent channel BRS or EBS licensees.

8.2 Measurement Procedure

Spurious emissions appearing at the antenna terminals were measured with a spectrum analyzer by connecting the spectrum analyzer directly via a short cable to the antenna output terminals or across the antenna leads on the PCB as specified by the manufacturer.

8.3 Equipment Lists

Manufacturer	Description	Model Number	Serial Number	Cal. Date
Agilent	Spectrum analyzer	E4446A	US45303156	2008-05-31
R & S	Signal Generator	SMIQ	849192/0085	2007-12-03

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

8.4 Environmental Conditions

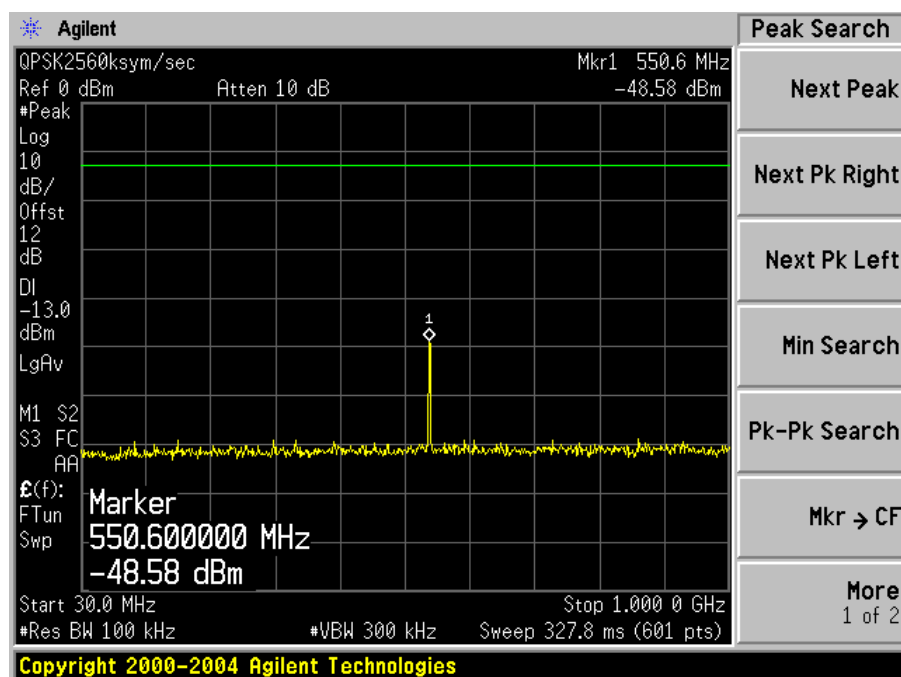
Temperature:	25 °C
Relative Humidity:	58 %
ATM Pressure:	101.5 kPa

* The testing was performed Victor Zhang on 2008-09-15.

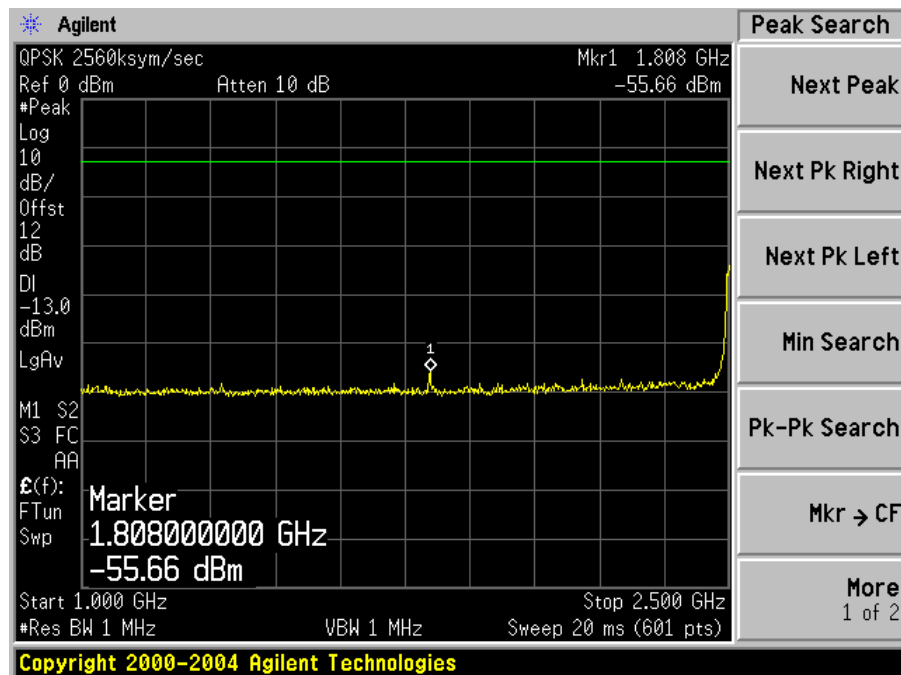
8.5 Test Results Summary

Please refer to the following plots:

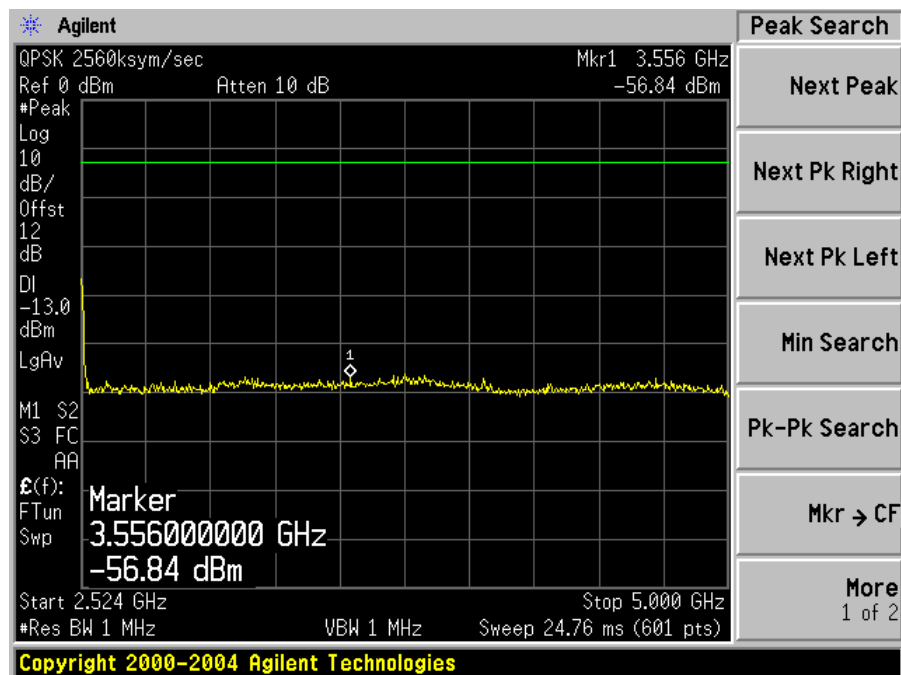
Modulation type: QPSK, Symbol Rate: 2560 ksym/sec, Middle Channel



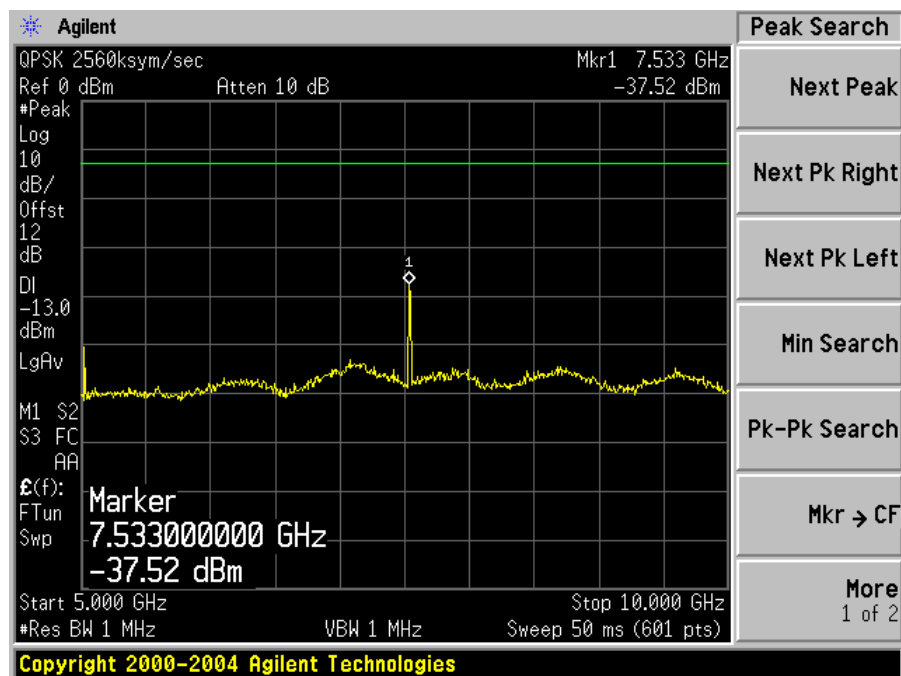
Plot 1: 30 MHz to 1GHz



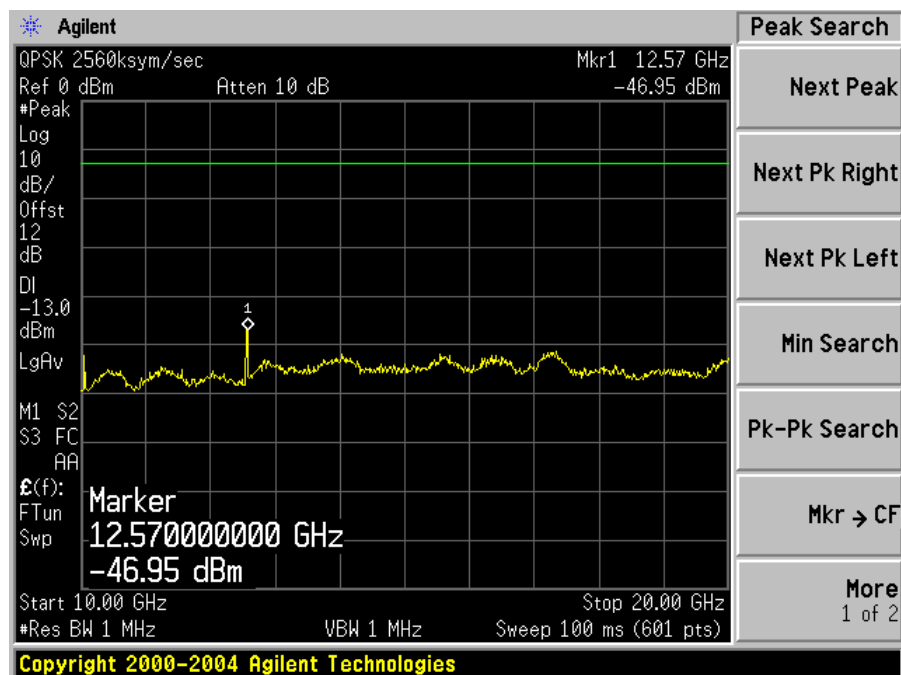
Plot 2: 1 GHz to 2.5 GHz



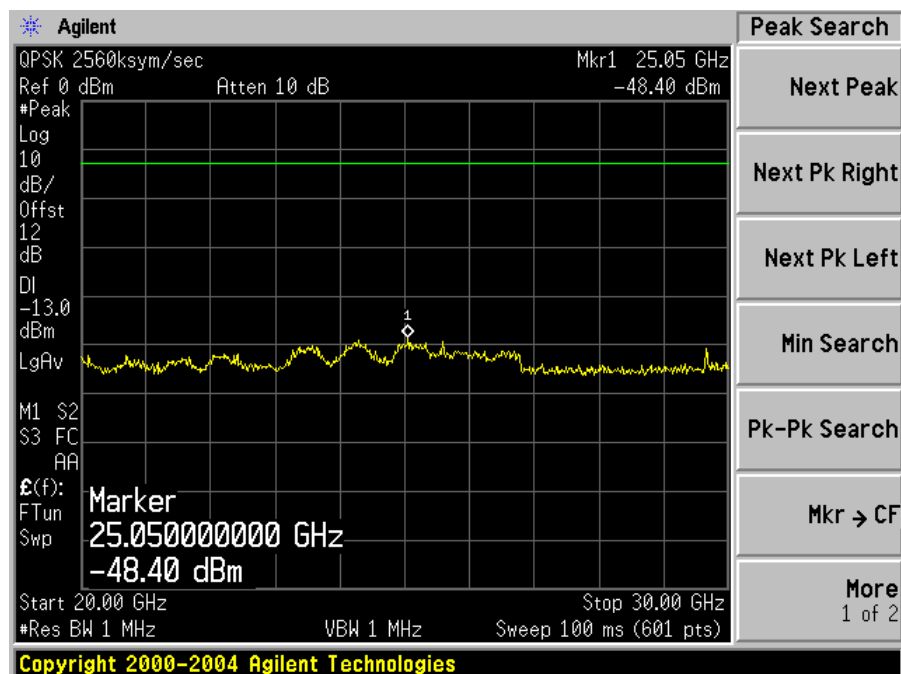
Plot 3: 2.524 GHz to 5 GHz



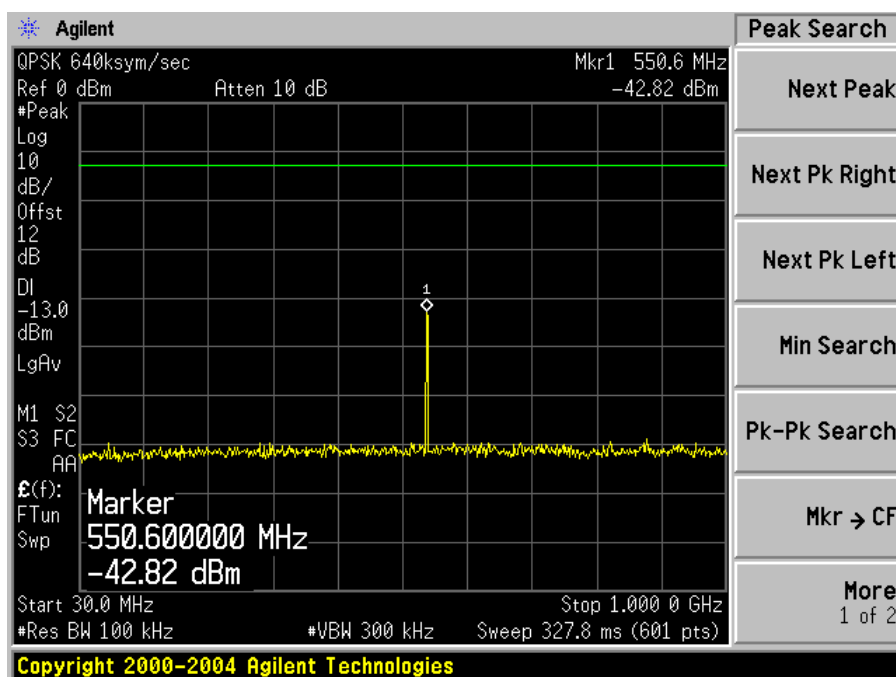
Plot 4: 5 GHz to 10 GHz



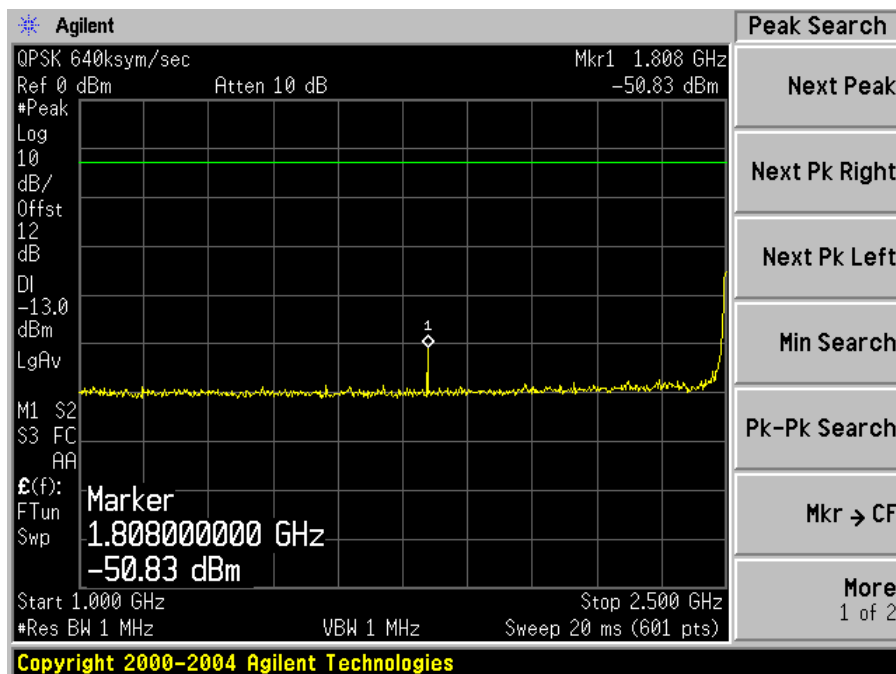
Plot 5: 10 GHz to 20 GHz



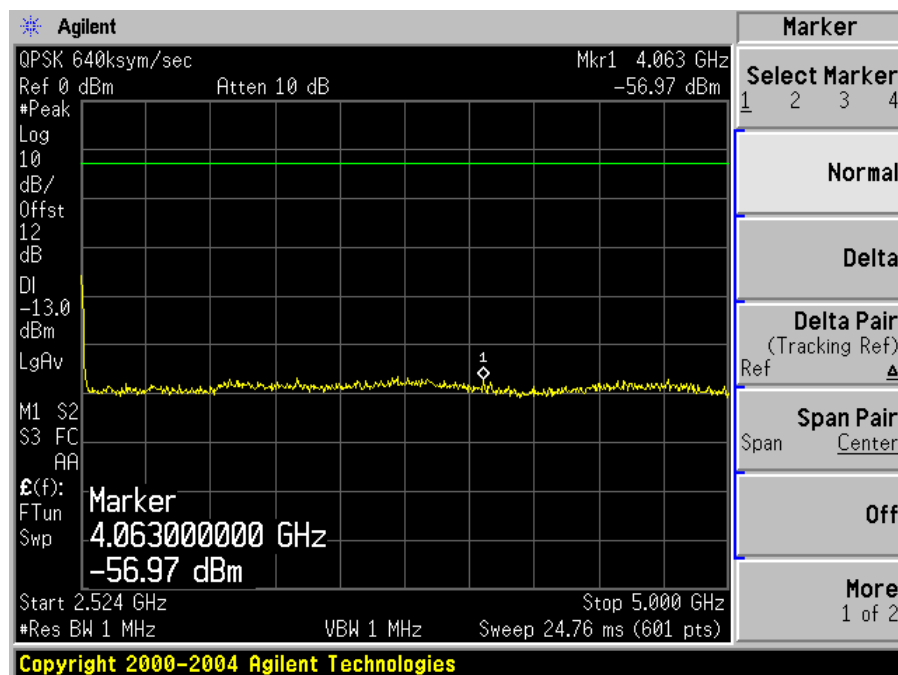
Plot 6: 20 GHz to 30 GHz

Modulation type: QPSK, Symbol rate: 640 ksym/sec, Middle Channel

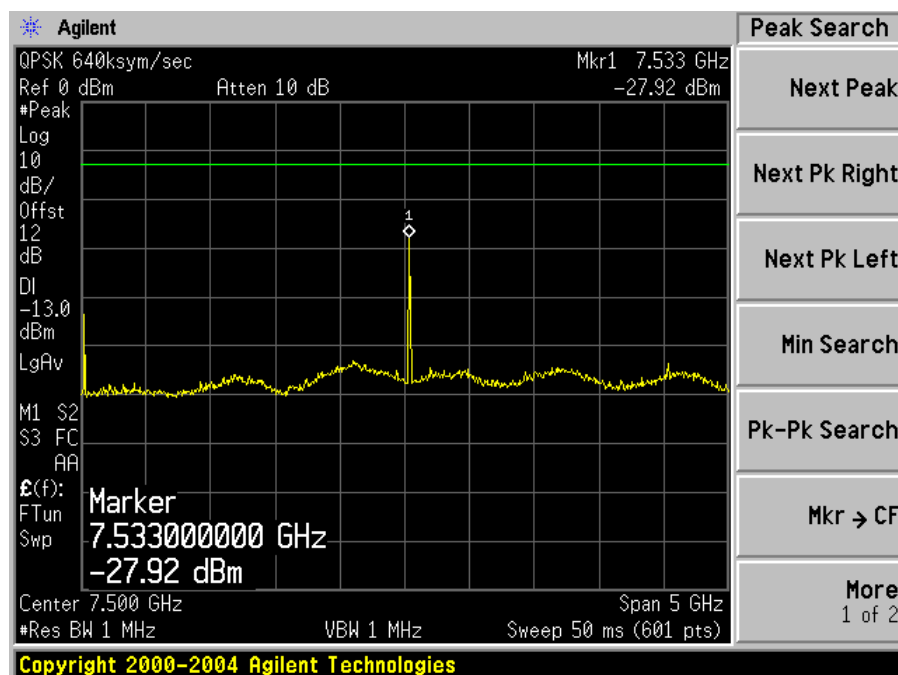
Plot 1: 30 MHz to 1GHz



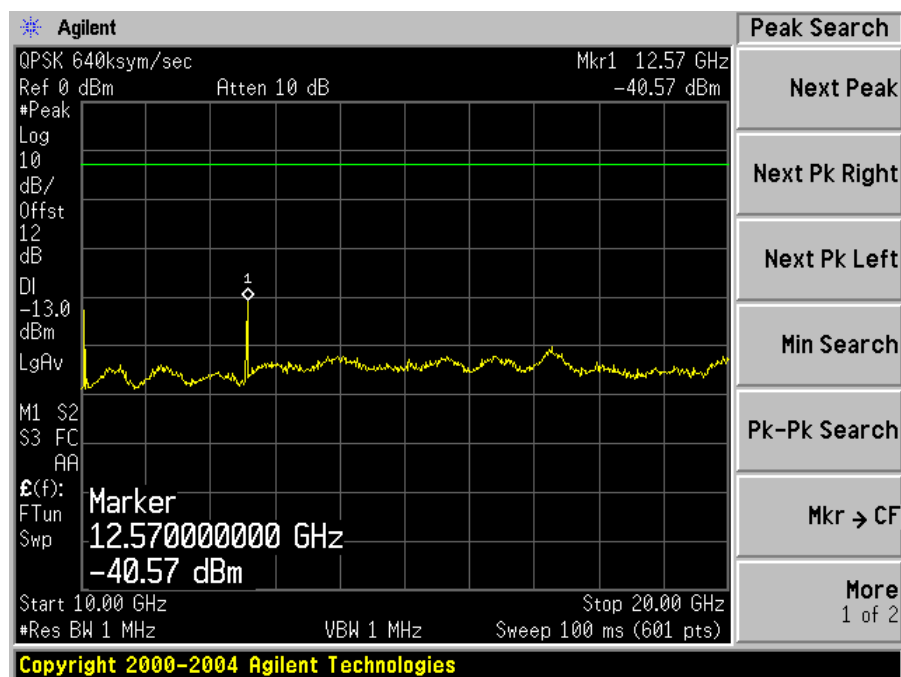
Plot 2: 1 GHz to 2.5 GHz



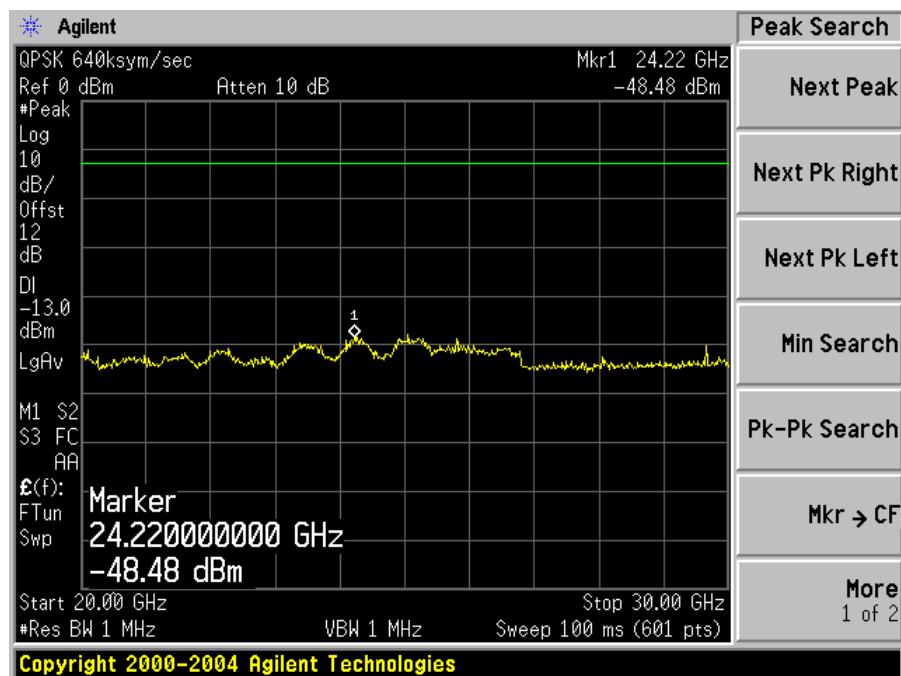
Plot 3: 2.524 GHz to 5 GHz



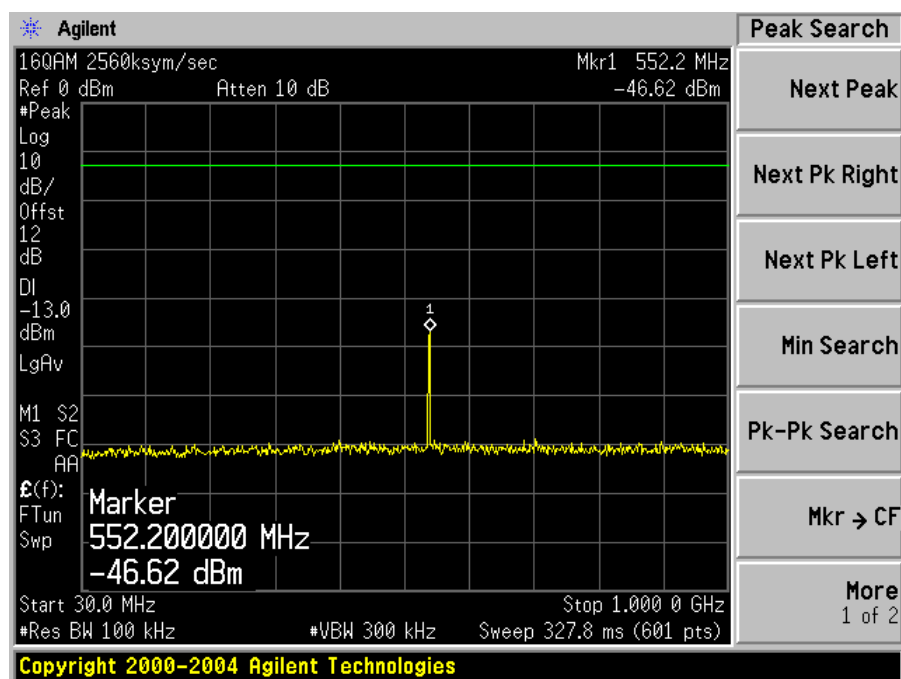
Plot 4: 5 GHz to 10 GHz



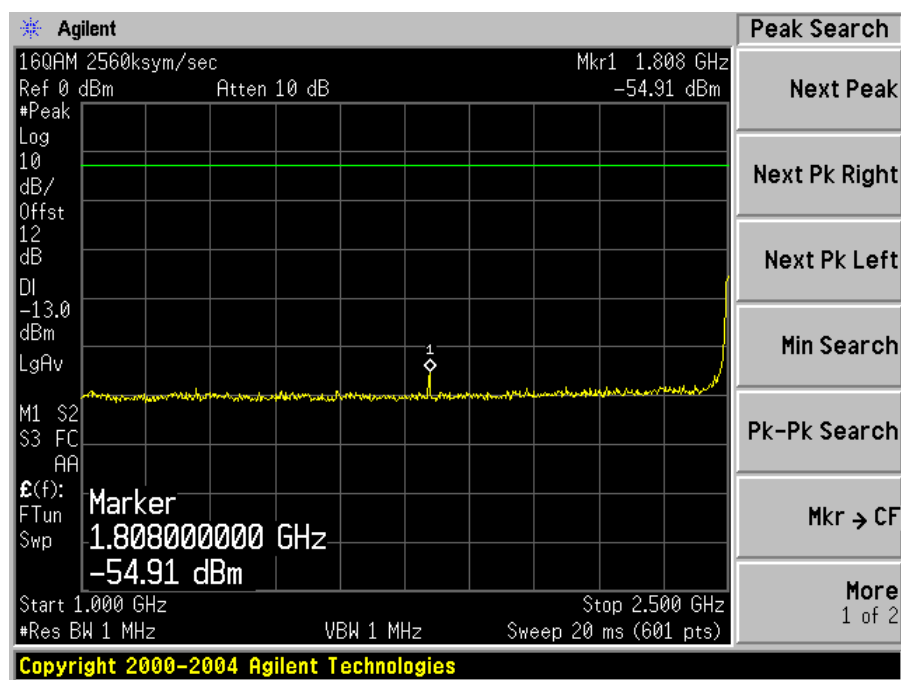
Plot 5: 10 GHz to 20 GHz



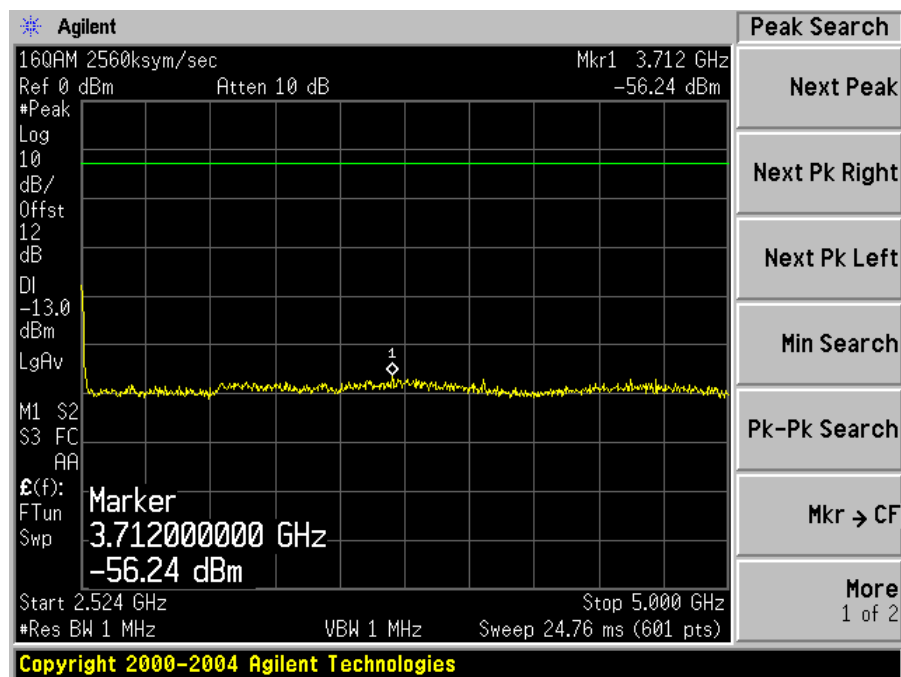
Plot 6: 20 GHz to 30 GHz

Modulation type: 16QAM, Symbol rate: 2560 ksym/sec, Middle Channel

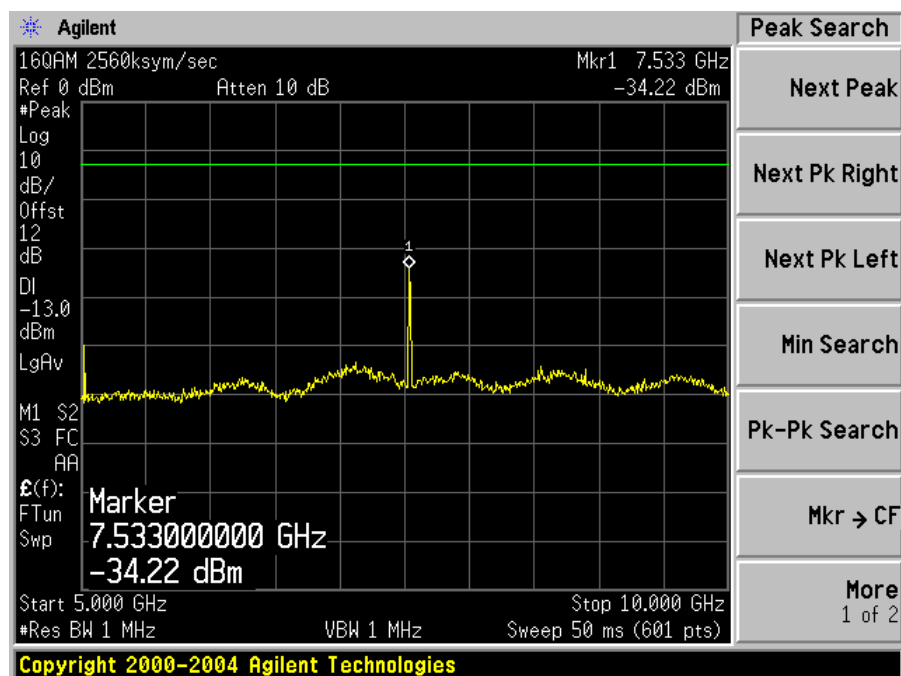
Plot 1: 30 MHz to 1GHz



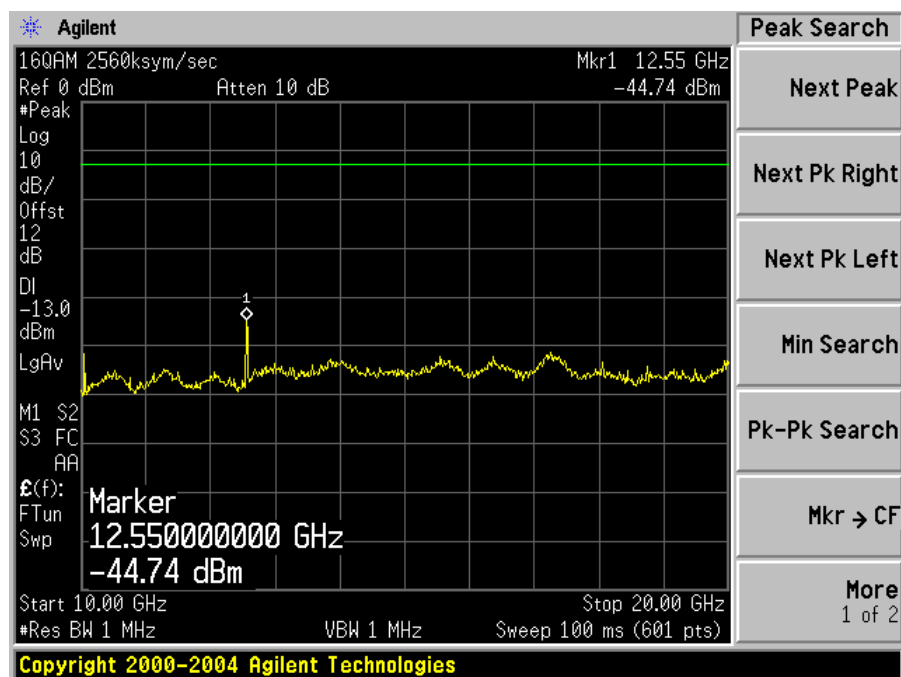
Plot 2: 1 GHz to 2.5 GHz



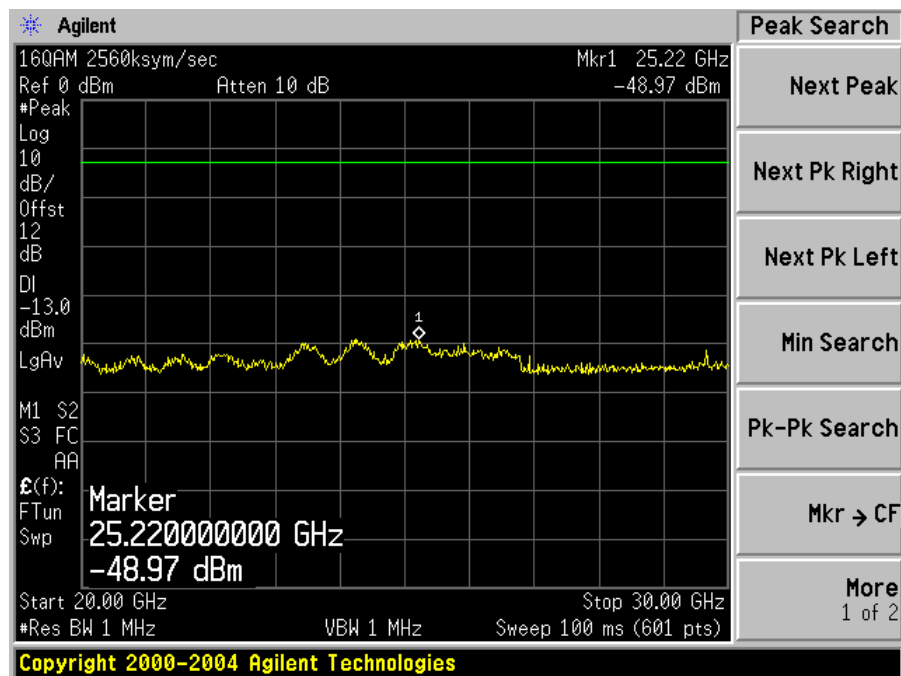
Plot 3: 2.524 GHz to 5 GHz



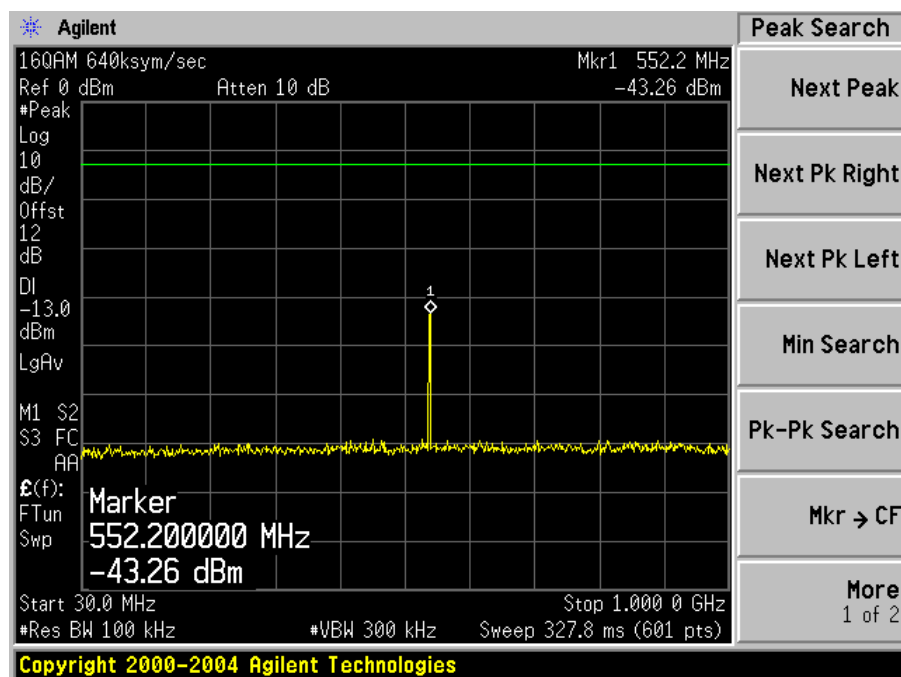
Plot 4: 5 GHz to 10 GHz



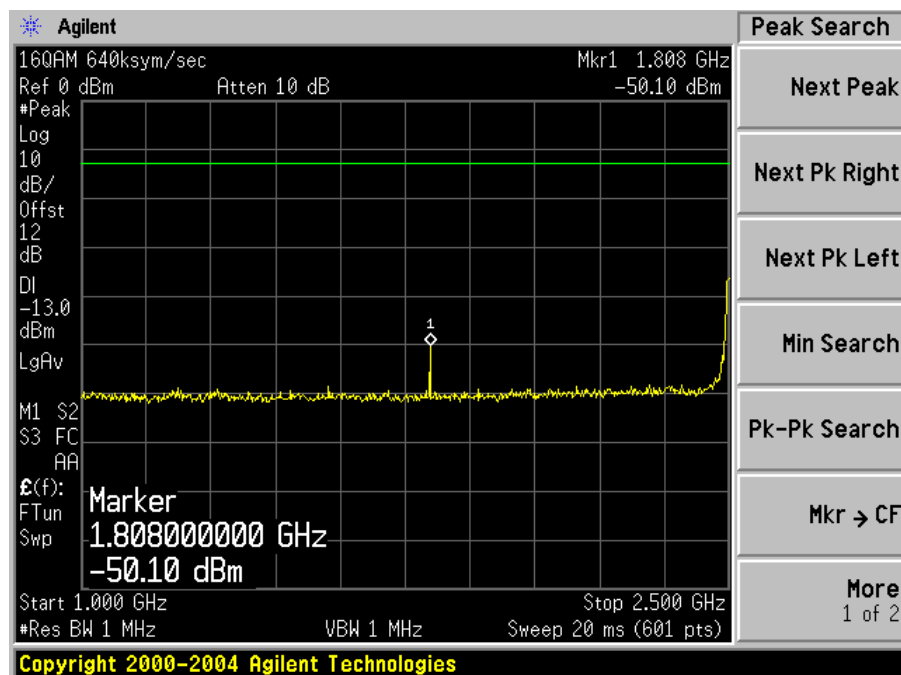
Plot 5: 10 GHz to 20 GHz



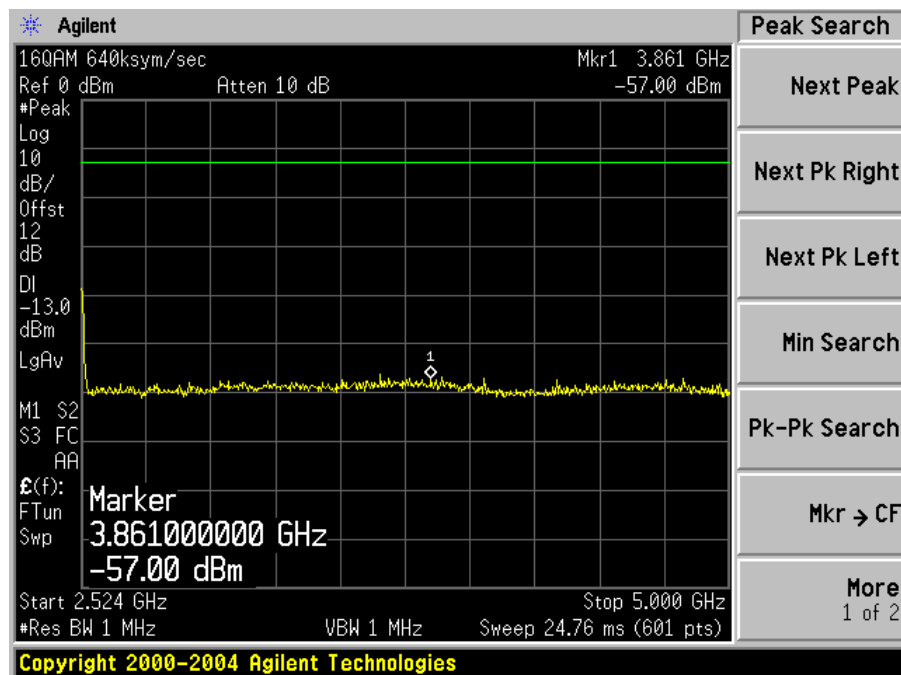
Plot 6: 20 GHz to 30 GHz

Modulation type: 16QAM, Symbol rate: 640 ksym/ sec, Middle Channel

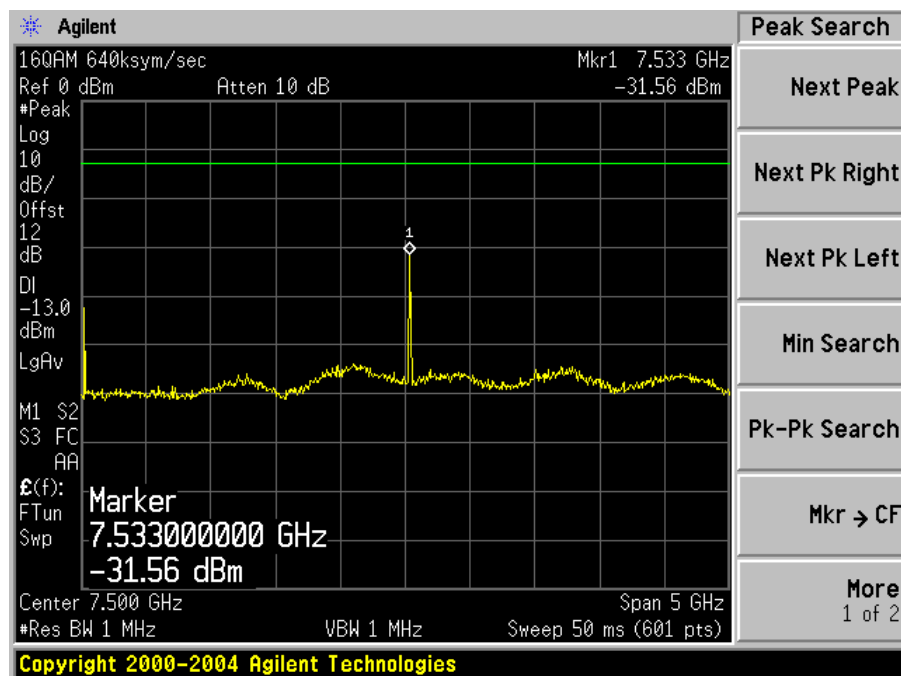
Plot 1: 30 MHz to 1GHz



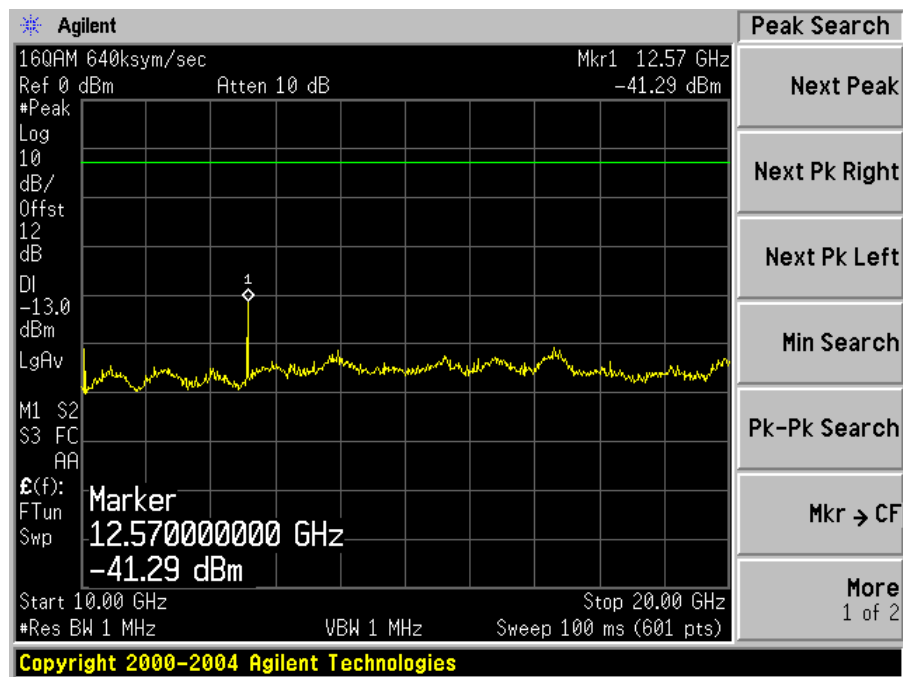
Plot 2: 1 GHz to 2.5 GHz



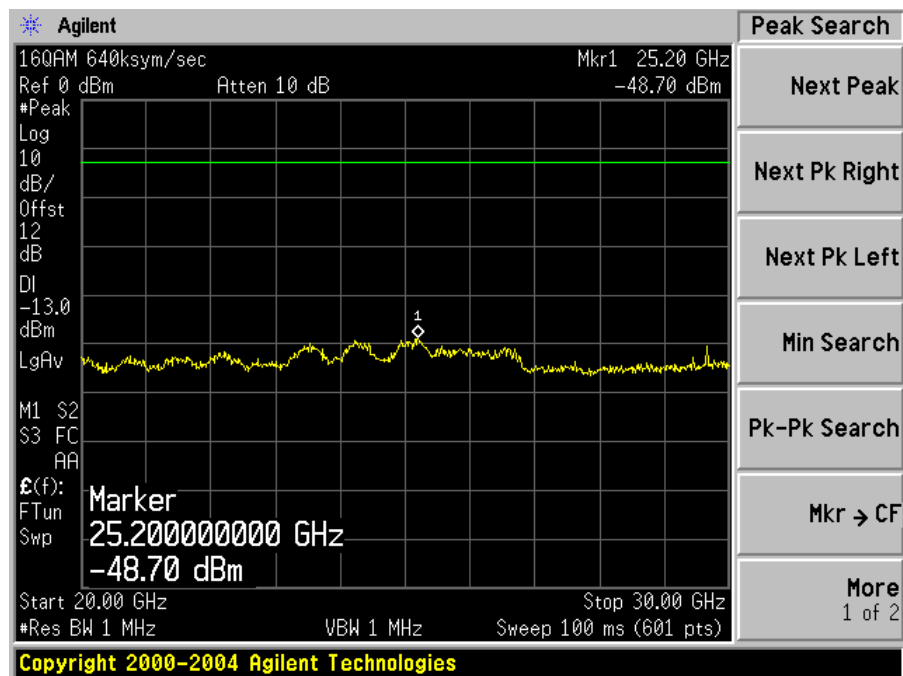
Plot 3: 2.524 GHz to 2.5 GHz



Plot 4: 5 GHz to 10 GHz



Plot 5: 10 GHz to 20 GHz



Plot 6: 20 GHz to 30 GHz

9 § 2.1053 & §27.53 (l) – FIELD STRENGTH OF SPURIOUS RADIATION

9.1 Standard Applicable

Requirement: §27.53(l): For BRS and EBS stations, the power of any emissions outside the licensee's frequency bands of operation shall be attenuated below the transmitter power (P) measured in watts.

9.2 Measurement Procedure

The testing procedure was set according to TIA 603-C.

9.3 Equipment Lists

Manufacturer	Description	Model Number	Serial Number	Cal. Dates
Mini-Circuits	Pre amplifier	ZKL-2	7786100643	2008-01-02
HP	Pre amplifier	8449B	3147A00400	2007-11-02
Sunol Science Corp	Combination Antenna	JB1 Antenna	A103105-3	2008-03-25
A. H. Systems	Antenna, Horn, DRG	SAS-200/571	261	2008-07-01
Agilent	Spectrum Analyzer	E4440A	MY44303352	2008-04-28
A.R.A.	Antenna, Horn	DRG-118/A	1132	2006-08-17
R & S	Signal Generator	SMIQ	849192/0085	2007-12-03

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

9.4 Environmental Conditions

Temperature:	25 °C
Relative Humidity:	58 %
ATM Pressure:	101.5 kPa

* The testing was performed by Victor Zhang on 2008-09-15

9.5 Measurement Result

According to the data in the following table, the EUT was found compliant with the FCC Standard part 27.53, and had the worst margin reading(s) of:

Model: TRI2525B

Modulation type: QPSK, Symbol rate: 2560 ksym/sec

Modulation type: QPSK, Symbol rate: 2560 ksym/sec			
Margin (dB)	Frequency (MHz)	Polarization (Horizontal/Vertical)	Frequency Range
-10.79	5024	Vertical	30 MHz- 26 GHz

Modulation type: QPSK, Symbol rate: 640 ksym/ sec

Modulation type: QPSK, Symbol rate: 640 ksym/sec			
Margin (dB)	Frequency (MHz)	Polarization (Horizontal/Vertical)	Frequency Range
-7.10	5024	Vertical	30 MHz- 26 GHz

Modulation type: 16QAM, Symbol rate: 2560 ksym/sec

Modulation type: 16QAM, Symbol rate: 2560 ksym/sec			
Margin (dB)	Frequency (MHz)	Polarization (Horizontal/Vertical)	Frequency Range
-9.70	5024	Vertical	30 MHz- 26 GHz

Modulation type: 16QAM, Symbol rate: 640 ksym/ sec

Modulation type: 16QAM, Symbol rate: 640 ksym/sec			
Margin (dB)	Frequency (MHz)	Polarization (Horizontal/Vertical)	Frequency Range
-4.20	5024	Vertical	30 MHz- 26 GHz

Model: TR2525B

Emissions at noise floor level

Model: TRI2525B (Antenna Gain = 18 dBi)

Modulation type: QPSK, Symbol rate: 2560 ksym/sec

Indicated		Table Angle (degree)	Test Antenna		Substituted					Limit (dBm)	Margin (dB)
Freq. (MHz)	Amp. (dBuV)		Height (m)	Polarity (H/V)	Freq. (MHz)	Level (dBm)	Ant. Gain (dBi)	Cable Loss (dB)	Absolute Level (dBm)		
5024.00	63.38	360	1.41	V	5024.00	-33.50	10.40	0.69	-23.79	-13.00	-10.79
6096.00	55.74	200	1.42	V	6096.00	-38.03	11.00	0.77	-27.80	-13.00	-14.80
6096.00	54.20	193	1.54	H	6096.00	-40.29	11.00	0.77	-30.06	-13.00	-17.06
5024.00	53.75	183	1.55	H	5024.00	-42.50	10.40	0.69	-32.79	-13.00	-19.79

Modulation type: QPSK, Symbol rate: 640 ksym/sec

Indicated		Table Angle (degree)	Test Antenna		Substituted					Limit (dBm)	Margin (dB)
Freq. (MHz)	Amp. (dBuV)		Height (m)	Polarity (H/V)	Freq. (MHz)	Level (dBm)	Ant. Gain (dBi)	Cable Loss (dB)	Absolute Level (dBm)		
5024.00	67.07	360	1.55	V	5024.00	-29.81	10.40	0.69	-20.10	-13.00	-7.10
6096.00	56.04	200	1.39	V	6096.00	-37.73	11.00	0.77	-27.50	-13.00	-14.50
5024.00	56.74	121	1.50	H	5024.00	-39.51	10.40	0.69	-29.80	-13.00	-16.80
6096.00	53.75	192	1.54	H	6096.00	-40.74	11.00	0.77	-30.51	-13.00	-17.51

Modulation type: 16QAM, Symbol rate: 2560 ksym/sec

Indicated		Table Angle (degree)	Test Antenna		Substituted					Limit (dBm)	Margin (dB)
Freq. (MHz)	Amp. (dBuV)		Height (m)	Polarity (H/V)	Freq. (MHz)	Level (dBm)	Ant. Gain (dBi)	Cable Loss (dB)	Absolute Level (dBm)		
5024.00	64.47	360	1.54	V	5024.00	-32.41	10.40	0.69	-22.70	-13.00	-9.70
6096.00	55.50	198	1.43	V	6096.00	-38.27	11.00	0.77	-28.04	-13.00	-15.04
5024.00	57.39	122	1.55	H	5024.00	-38.86	10.40	0.69	-29.15	-13.00	-16.15
6096.00	54.10	193	1.59	H	6096.00	-40.39	11.00	0.77	-30.16	-13.00	-17.16

Modulation type: 16QAM, Symbol rate: 640 ksym/sec

Indicated		Table Angle (degree)	Test Antenna		Substituted					Limit (dBm)	Margin (dB)
Freq. (MHz)	Amp. (dBuV)		Height (m)	Polarity (H/V)	Freq. (MHz)	Level (dBm)	Ant. Gain (dBi)	Cable Loss (dB)	Absolute Level (dBm)		
5024.00	69.97	360	1.37	V	5024.00	-26.91	10.40	0.69	-17.20	-13.00	-4.20
5024.00	63.24	258	1.35	H	5024.00	-33.01	10.40	0.69	-23.30	-13.00	-10.30
6096.00	56.17	200	1.40	V	6096.00	-37.60	11.00	0.77	-27.37	-13.00	-14.37
6096.00	54.00	192	1.57	H	6096.00	-40.49	11.00	0.77	-30.26	-13.00	-17.26

Model: TR2525B (Antenna port: terminated)

Modulation type: QPSK, Symbol rate: 2560 ksym/sec

Emissions are at noise floor level

Modulation type: QPSK, Symbol rate: 640 ksym/ sec

Emissions are at noise floor level

Modulation type: 16QAM, Symbol rate: 2560 ksym/sec

Emissions are at noise floor level

Modulation type: 16QAM, Symbol rate: 640 ksym/ sec

Emissions are at noise floor level

10 § 2.1053 & §27.53 (l) – FIELD STRENGTH OF SPURIOUS RADIATION

Refer to the original report.