

FCC PART 24 TYPE APPROVAL EMI MEASUREMENT AND TEST REPORT

For

VCom Inc.

150 Cardinal Place
Saskatoon, SK Canada S7L 6H7

FCC ID: OPPTRI1819

This Report Concerns: ☒ Original Report	Equipment Type: 1.9GHz Broadband Wireless Transceiver
Test Engineer: Daniel Deng / 	
Report No.: R0501106	
Report Date: 2005-02-01	
Reviewed By: Ming Jing / 	
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Note: The test report is specially limited to the above company and the product model only. It may not be duplicated without prior written consent of Bay Area Compliance Laboratory Corporation. This report **must not** be used by the client to claim product certification, approval, or endorsement by NVLAP, NIST or any agency of the US Government.

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GENERAL INFORMATION

Product Description for Equipment Under Test (EUT)

The VCom Inc. product, FCC ID: *OPPTRI1819*, Model: *TRI1819* or the "EUT" as referred to in this report is a 1.9GHz Broadband Wireless Transceiver. The EUT measures approximately 305mm(L) x 305mm(W) x 75mm(H). The EUT operates at the frequency of 1870 – 1885 MHz, maximum output power (ERIP) 30.5dBm (1.122W), and emission designator 800KG1D & 3M20G1D.

** The test data gathered are from typical production sample, serial number: 315882, provided by the manufacturer.*

Objective

This type approval report is prepared on behalf of VCom Inc. in accordance with Part 2, Subpart J, and Part 24 Subpart E of the Federal Communication Commissions rules.

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

Related Submittal(s)/Grant(s)

No Related Submittals

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 24 Subpart E - PCS

Applicable Standards: TIA EIA 137-A, TIA EIA 98-C, ANSI 63.4-2003, and TIA/EIA-603A.

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.

Test Facility

The Open Area Test site used by Bay Area Compliance Laboratory Corporation to collect radiated and conducted emission measurement data is located in the back parking lot of the building at 230 Commercial Street, Sunnyvale, California, USA.

Test site at Bay Area Compliance Laboratory Corporation has been fully described in reports submitted to the Federal Communication Commission (FCC) and Voluntary Control Council for Interference (VCCI). The details of these reports have been found to be in compliance with the requirements of Section 2.948 of the FCC Rules and Article 8 of the VCCI regulations. The facility also complies with the test methods and procedures set forth in ANSI C63.4-2003.

The Federal Communications Commission and Voluntary Control Council for Interference has the reports on file and is listed under FCC file 31040/SIT 1300F2 and VCCI Registration No.: C-1298 and R-1234. The test site has been approved by the FCC and VCCI for public use and is listed in the FCC Public Access Link (PAL) database.

Additionally, BACL 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>

SYSTEM TEST CONFIGURATION

Justification

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

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

Block Diagram

Please refer to Exhibit D.

Equipment Modifications

No modifications were made to the EUT.

Local Support Equipment List and Details

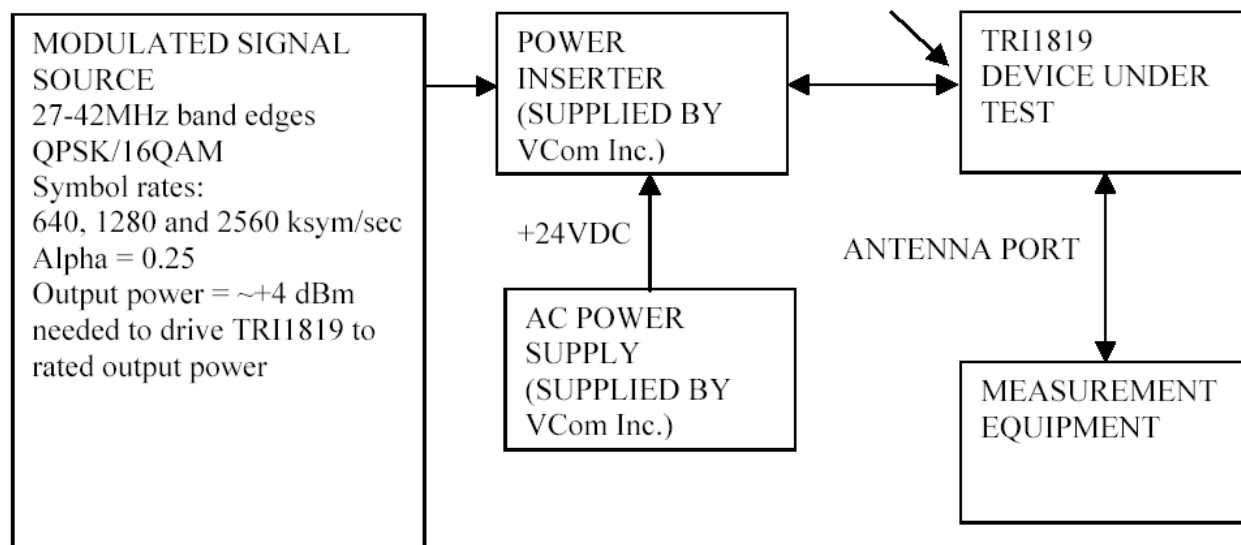
Manufacturer	Description	Model	Serial Number	FCC ID
Agilent	Signal Generator	E4432B	US40053380	N/A

External Cables List and Details

Cable Description	Length (M)	From	To
Cable	1	EUT input port	Power inserter
Cable	1	AC power adaptor	Power inserter
RF Cable	1.5	Signal generator	Power inserter

Power Supply and Line Filters

Manufacturer	Description	Model	Serial Number	FCC ID
Vcom	AC/DC adaptor	DDU240075	N/A	N/A

Test Setup Block Diagram

SUMMARY OF TEST RESULTS

Results reported relate only to the product tested

FCC RULE	DESCRIPTION OF TEST	RESULT
§ 2.1047	Modulation Characteristics	Compliant
§ 2.1053	Field Strength of Spurious Radiation	Compliant
§ 15.107	Conducted Emissions	Compliant
§ 2.1093	RF Exposure	Compliant
§ 2.1046, § 24.232	RF Output Power	Compliant
§ 2.1046, § 24.232	Conducted Output Power	Compliant
§ 2.1049 § 24.238	Out of Band Emission, Occupied Bandwidth	Compliant
§ 2.1051, § 24.238(a)	Spurious Emissions at Antenna Terminals	Compliant
§ 2.1055 (a) § 2.1055 (d) § 24.235	Frequency stability vs. temperature Frequency stability vs. voltage	Compliant
§ 24.238	Band Edge	Compliant

§2.1093 – RF EXPOSURE

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 §2.1093 RF exposure is calculated.

Limits for Maximum Permissible Exposure (MPE)

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
1500-15000	/	/	1.0	30

f = frequency in MHz

* = Plane-wave equivalent power density

MPE Prediction

Predication 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

Maximum peak output power at antenna input terminal: 18.17 (dBm)

Maximum peak output power at antenna input terminal: 65.6 (mW)

Prediction distance: 150 (cm)

Predication frequency: 1880 (MHz)

Antenna Gain (typical): 15 (dBi)

antenna gain: 31.6 (numeric)

Power density at predication frequency at 150 cm: 0.00733 (mW/cm²)

MPE limit for uncontrolled exposure at prediction frequency: 1.0 (mW/cm²)

Test Result

The EUT is defined as a mobile device since the predicted power density level at 150 cm is 0.00733 mW/cm². This is below the uncontrolled exposure limit of 1.0mW/cm² at 1880 MHz.

§2.1047 - MODULATION CHARACTERISTIC

Applicable Standard

Requirement: FCC § 2.1047.

Test Procedure

UMTS digital mode is used by EUT.

Test Equipment List and Details

Manufacturer	Description	Model	Serial Number	Cal. Date
HP	Spectrum Analyzer	HP8564E	3943A01781	2004-08-01
HP	Plotter	HP7470A	2541A49659	Not Required

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

Environmental Conditions

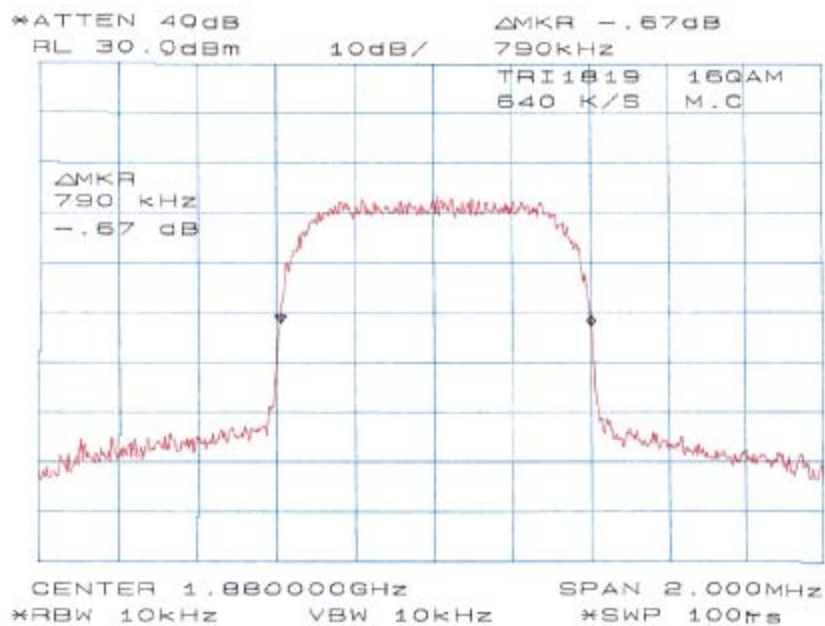
Temperature:	17° C
Relative Humidity:	45%
ATM Pressure:	1015 mbar

The testing was performed by Daniel Deng on 2005-01-22.

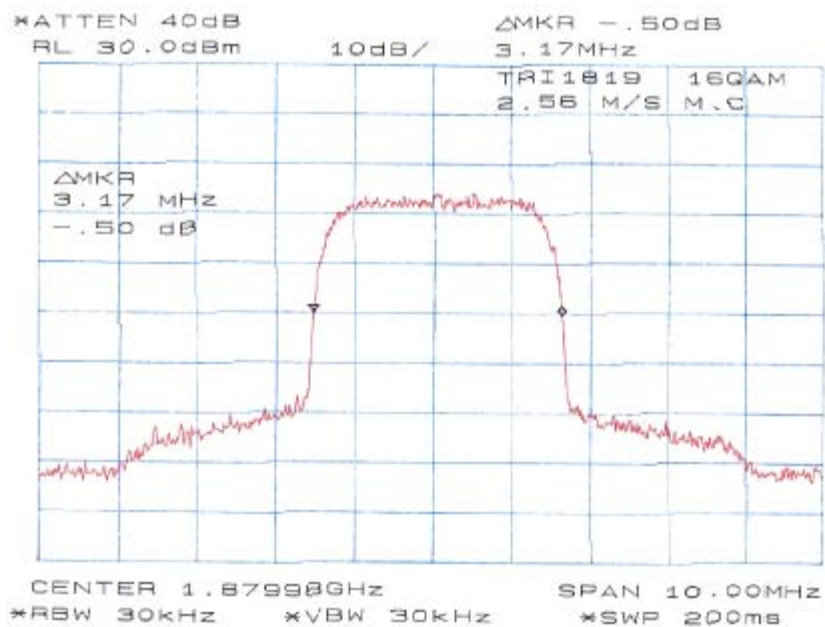
Test Results

Please refer to the hereinafter plots.

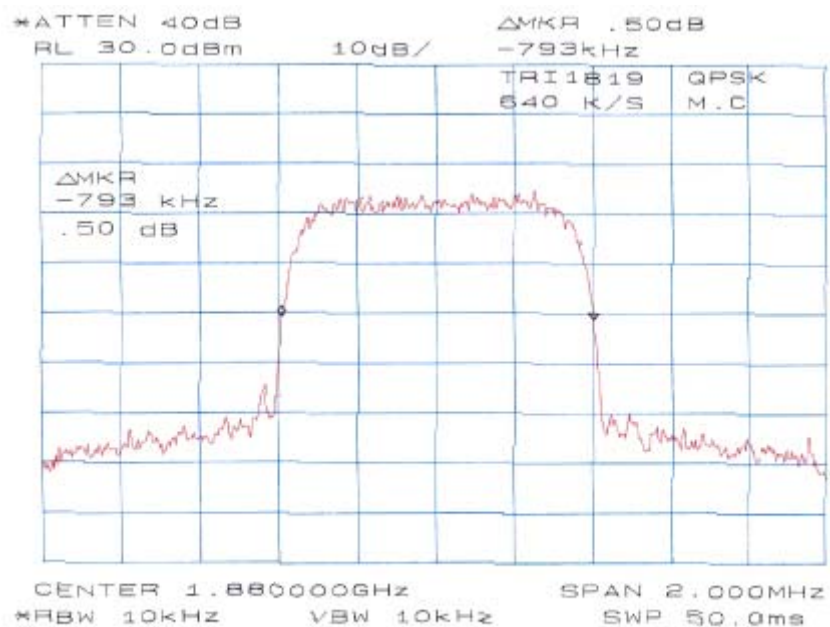
16QAM 640Ksym/sec



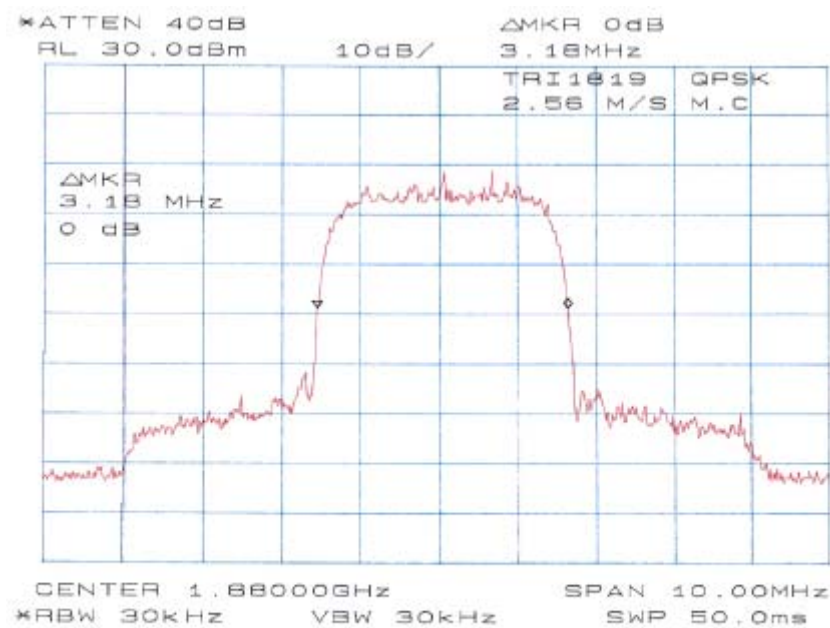
16QAM 2.5Msym/sec



QPSK 640Ksym/sec



QPSK 2.56Msym/sec



§2.1053 – SPURIOUS RADIATED EMISSIONS

Applicable Standard

Requirements: CFR 47, § 2.1053.

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 = $10 \lg (\text{TXpwr in Watts}/0.001)$ – the absolute level

Spurious attenuation limit in dB = $43 + 10 \log_{10} (\text{power out in Watts})$

Test Equipment List and Details

Manufacturer	Description	Model	Serial Number	Cal. Date
HP	Spectrum Analyzer	8568B	2601A02165	2004-07-03
HP	Amplifier	8447E	2944A10187	2004-09-23
HP	Quasi-Peak Adapter	85650A	3019A05393	2004-06-13
EMCO	Biconical Antenna	3110B	9309-1165	2004-10-11
EMCO	Log Periodic Antenna	3146	2101	2004-10-11
AH System	Horn Antenna	SAS-200/511	261	2004-08-02
HP	Spectrum Analyzer	HP8564E	3943A01781	2004-08-01
Rohde & Schwarz	Generator, Signal	SMIQ03	DE23746	2004-01-10

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

Environmental Conditions

Temperature:	17° C
Relative Humidity:	45%
ATM Pressure:	1015 mbar

The testing was performed by Daniel Deng on 2005-01-22.

Test Result**Transmitter:**

QPSK 640 Ksym/sec: -30.4 dB at 5640.09 MHz

QPSK 2.56 Msym/sec: -32.0 dB at 5637.80 MHz

16QAM 640 Ksym/sec: -29.2 dB at 5639.91 MHz

16QAM 2.56 Msym/sec: -32.1 dB at 5641.80 MHz

Receiver:

-8.2 dB at 598.40 MHz

Transmitter, QPSK 640 Ksym/sec

EUT							Generator			Standard	
Indicated		Table	Test Antenna		Substitution		Antenna	Cable	Absolute	FCC 24	FCC 24
Frequency MHz	Ampl. dBuV/m	Angle Degree	Height Meter	Polar H/V	Frequency MHz	Level dBm	Gain Corrected	Loss dB	Level dBm	Limit dBm	Margin dB
5640.09	58.84	180	1.5	v	5640.09	-49.8	10.6	4.2	-43.4	-13	-30.4
5640.09	58.3	30	1.6	h	5640.09	-50.1	10.6	4.2	-43.7	-13	-30.7
3760.06	47.65	300	1.4	h	3760.06	-58.1	10.1	3.8	-51.8	-13	-38.8
3760.06	45.69	30	1.5	v	3760.06	-60.5	10.1	3.8	-54.2	-13	-41.2
1565.77	57.62	90	1.6	h	1565.77	-60.8	7.4	1.7	-55.1	-13	-42.1
1565.77	57.82	0	1.7	v	1565.77	-61.5	7.4	1.7	-55.8	-13	-42.8
2186.63	48.72	270	1.5	v	2186.63	-65.9	6.5	2.5	-61.9	-13	-48.9
2186.63	48.09	330	1.6	h	2186.63	-66.3	6.5	2.5	-62.3	-13	-49.3

Transmitter, QPSK 2.56 Msym/sec

EUT							Generator			Standard	
Indicated		Table	Test Antenna		Substitution		Antenna	Cable	Absolute	FCC 24	FCC 24
Frequency MHz	Ampl. dBuV/m	Angle Degree	Height Meter	Polar H/V	Frequency MHz	Level dBm	Gain Corrected	Loss dB	Level dBm	Limit dBm	Margin dB
5637.81	56.95	60	1.6	h	5637.81	-51.4	10.6	4.2	-45	-13	-32.0
5637.81	55.41	180	1.6	v	5637.81	-53.2	10.6	4.2	-46.8	-13	-33.8
3758.54	47.28	0	1.6	h	3758.54	-58.5	10.1	3.8	-52.2	-13	-39.2
3758.54	45.81	180	1.7	v	3758.54	-60.4	10.1	3.8	-54.1	-13	-41.1
1565.74	58.25	90	1.8	h	1565.74	-60.2	7.4	1.7	-54.5	-13	-41.5
1565.74	58.8	30	1.6	v	1565.74	-60.5	7.4	1.7	-54.8	-13	-41.8
2186.75	49.29	0	1.5	h	2186.75	-65.1	6.5	2.5	-61.1	-13	-48.1
2186.75	48	60	1.4	v	2186.75	-66.6	6.5	2.5	-62.6	-13	-49.6

Transmitter, 16QAM 640 Ksym/sec

EUT					Substitution		Generator			Standard	
Indicated		Table	Test Antenna				Antenna	Cable	Absolute	FCC 24	FCC 24
Frequency MHz	Ampl. dBuV/m	Angle Degree	Height Meter	Polar H/V	Frequency MHz	Level dBm	Gain Corrected	Loss dB	Level dBm	Limit dBm	Margin dB
5639.91	59.52	45	1.6	h	5639.91	-48.6	10.6	4.2	-42.2	-13	-29.2
5639.91	59.26	180	1.6	v	5639.91	-49.4	10.6	4.2	-43	-13	-30.0
3759.94	47.41	300	1.6	h	3759.94	-58.3	10.1	3.8	-52	-13	-39.0
1565.84	59.07	270	1.8	h	1565.84	-59.4	7.4	1.7	-53.7	-13	-40.7
1565.84	59.68	0	1.5	v	1565.84	-59.6	7.4	1.7	-53.9	-13	-40.9
3759.94	45.56	180	1.8	v	3759.94	-60.6	10.1	3.8	-54.3	-13	-41.3
2186.38	48.14	90	1.8	h	2186.38	-66.3	6.5	2.5	-62.3	-13	-49.3
2186.38	47.55	270	1.4	v	2186.38	-67.1	6.5	2.5	-63.1	-13	-50.1

Transmitter, 16QAM 2.56 Msym/sec

EUT							Generator			Standard	
Indicated		Table	Test Antenna		Substitution		Antenna	Cable	Absolute	FCC 24	FCC 24
Frequency MHz	Ampl. dBuV/m	Angle Degree	Height Meter	Polar H/V	Frequency MHz	Level dBm	Gain Corrected	Loss dB	Level dBm	Limit dBm	Margin dB
5641.8	57.13	180	1.6	v	5641.8	-51.5	10.6	4.2	-45.1	-13	-32.1
5641.8	55.78	270	1.6	h	5641.8	-52.6	10.6	4.2	-46.2	-13	-33.2
3761.2	47.5	0	1.5	h	3761.2	-58.2	10.1	3.8	-51.9	-13	-38.9
3761.2	45.68	180	1.7	v	3761.2	-60.5	10.1	3.8	-54.2	-13	-41.2
1565.14	59.23	180	1.5	v	1565.14	-60.1	7.4	1.7	-54.4	-13	-41.4
1565.14	56.07	90	2	h	1565.14	-62.3	7.4	1.7	-56.6	-13	-43.6
2186.35	49.34	330	1.6	h	2186.35	-65.1	6.5	2.5	-61.1	-13	-48.1
2186.35	48.34	180	1.4	v	2186.35	-66.3	6.5	2.5	-62.3	-13	-49.3

Receiver

INDICATED		TABLE	ANTENNA		CORRECTION FACTOR			CORRECTED AMPLITUDE	FCC 15 CLASS B	
Frequency MHz	Ampl. dBμV/m	Angle Degree	Height Meter	Polar H/ V	Antenna dB	Cable dB	Amp. dB	Corr. Ampl. dBμV/m	Limit dBμV/m	Margin dB
598.40	42.1	90	1.5	H3	18.9	5.4	28.6	37.8	46.0	-8.2
891.40	35.2	180	1.5	H3	23.1	7	27.6	37.7	46.0	-8.3
891.40	33.4	0	1.5	V3	23.1	7	27.6	35.9	46.0	-10.1
598.40	40.1	180	1.6	V3	18.9	5.4	28.6	35.8	46.0	-10.2
171.60	44.8	180	1.8	H3	13.3	2.8	27.8	33.1	43.5	-10.4
163.80	45.3	60	1.6	V3	13.2	2.5	28	33.0	43.5	-10.5
205.60	45.6	180	1.4	H3	10.5	3	27.7	31.4	43.5	-12.1
52.32	40.1	0	1.5	V3	10.5	1.6	28.5	23.7	40.0	-16.3

§15.107 - CONDUCTED EMISSIONS

Measurement Uncertainty

All measurements involve certain levels of uncertainties, especially in field of EMC. The factors contributing to uncertainties are spectrum analyzer, cable loss, and LISN.

Based on NIS 81, The Treatment of Uncertainty in EMC Measurements, the best estimate of the uncertainty of any conducted emissions measurement at BACL is ± 2.4 dB.

EUT Setup

The measurement was performed in the shielded room, using the same setup per ANSI C63.4-2003 measurement procedure. The specification used was FCC 15 Class B limits.

The spacing between the peripherals was 10 cm.

The external I/O cables were draped along the test table and bundled as required.

The EUT was connected to 120VAC/60Hz power source.

Spectrum Analyzer Setup

The spectrum analyzer was set to investigate the spectrum from 150 kHz to 30MHz.

Test Equipment List and Details

Manufacturer	Description	Model	Serial Number	Cal. Date
Rohde & Schwarz	Artificial LISN	ESH2-Z5	871884/039	2004-03-28
Rohde & Schwarz	EMI Test Receiver	ESCS30	100176	2004-05-06
Fluke	Calibrated Voltmeter	189	18485-38	2004-07-18

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

Test Procedure

During the conducted emission test, the power cord of the EUT was connected to the mains outlet of the LISN.

Maximizing procedure was performed on the six (6) highest emissions of the EUT.

All data was recorded in the peak detection mode, quasi-peak and average. Average readings are distinguished with an "Ave".

Test Results Summary

According to the recorded data, the EUT complies with the FCC Conducted limits for a Class B device, with the worst margin reading of:

-7.87 dB at 0.385 MHz in the **Neutral** conductor mode.

Conducted Emissions Test Data

Environmental Conditions

Temperature:	17° C
Relative Humidity:	45%
ATM Pressure:	1015 mbar

The testing was performed by Daniel Deng on 2005-01-22.

Frequency MHz	LINE CONDUCTED EMISSIONS			FCC15 CLASS B	
	Amplitude dBμV	Detector Qp/Ave/Peak	Phase Line/Neutral	Limit dBμV	Margin dB
0.385	50.3	QP	Neutral	58.17	-7.87
0.290	51.1	QP	Neutral	60.52	-9.42
0.150	53.6	QP	Neutral	66.00	-12.40
0.260	48.9	QP	Line	61.43	-12.53
0.385	45.2	QP	Line	58.17	-12.97
0.150	52.5	QP	Line	66.00	-13.50
0.385	20.1	Ave	Neutral	48.17	-28.07
0.290	20.5	Ave	Neutral	50.52	-30.02
0.150	23.4	Ave	Neutral	56.00	-32.60
0.385	15.4	Ave	Line	48.17	-32.77
0.260	18.6	Ave	Line	51.43	-32.83
0.150	22.9	Ave	Line	56.00	-33.10

Plots of Conducted Emission

The plots of conducted emission are presented hereinafter as reference.

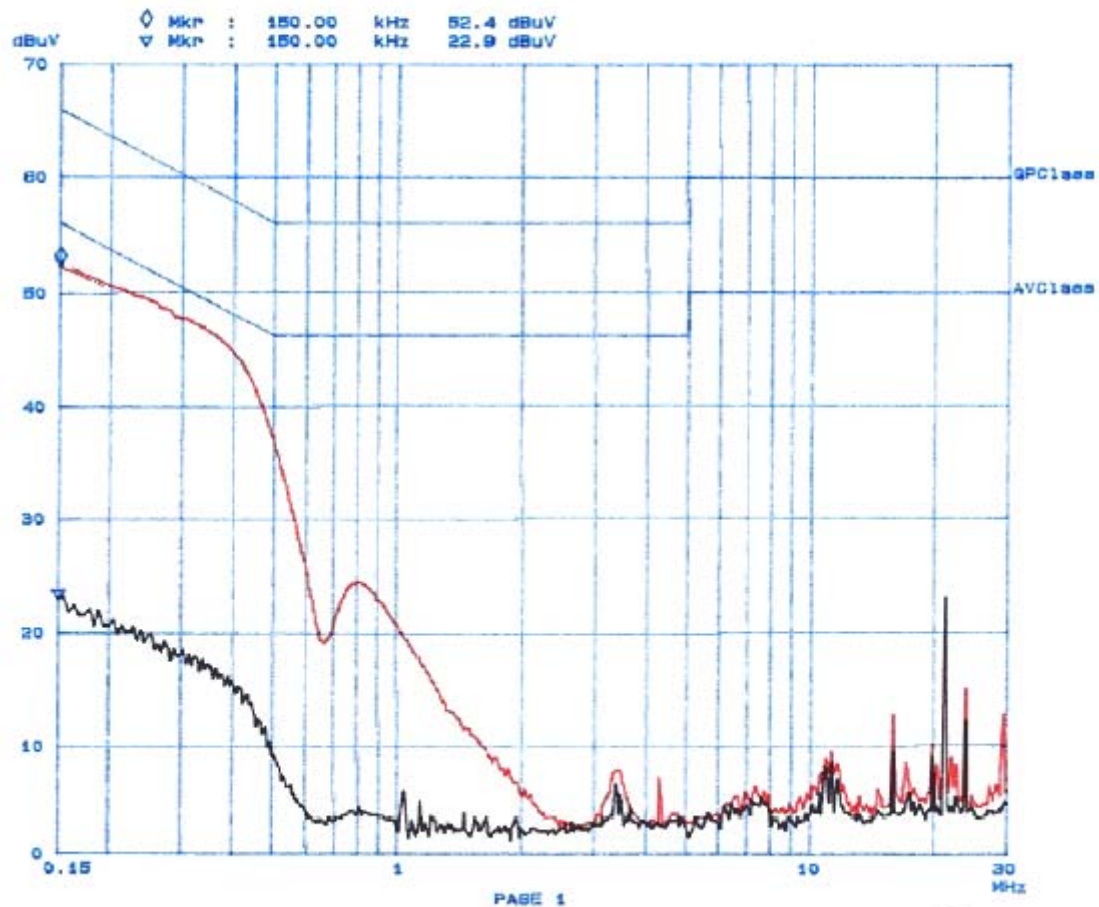
Bay Area Compliance Laboratory Corp
Class B

28. Jan 05 11:28

EUT: TRI1819
Manuf: Vcom
Op Cond: Normal
Operator: Daniel
Comment: L
120V AC

Scan Settings (3 Ranges)

Frequencies			Receiver Settings				
Start	Stop	Step	IF BW	Detector	M-Time	Atten	Preamp
150k	1M	5k	9k	GP+AV	20ms	15dB LN	OFF
1M	5M	10k	9k	GP+AV	1ms	15dB LN	OFF
5M	30M	100k	9k	GP+AV	1ms	15dB LN	OFF



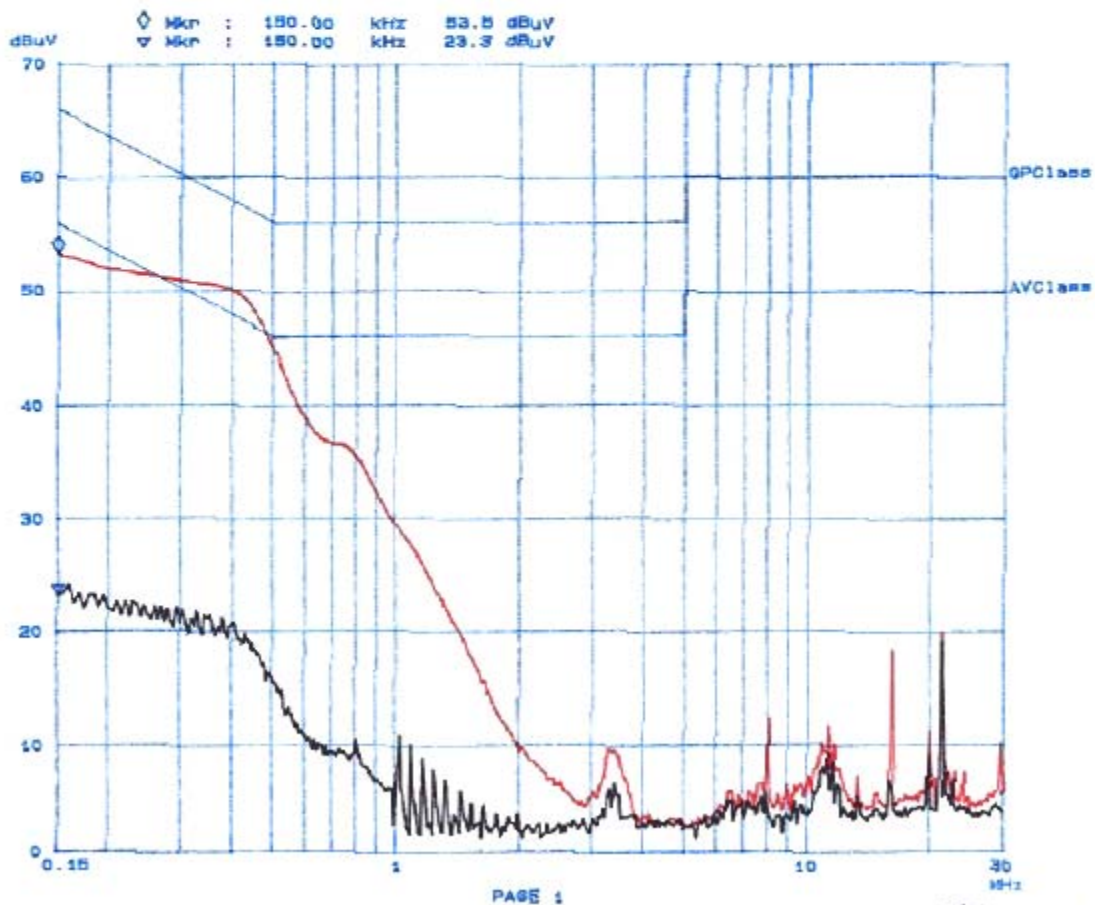
Bay Area Compliance Laboratory Corp
Class B

26. Jan 05 11:05

EUT: TRI1819
Manuf: Vcom
Op Cond: Normal
Operator: Daniel
Comment: N
120V AC

Scan Settings (3 Ranges)

Frequencies			Receiver Settings			
Start	Stop	Step	IF BW	Detector	M-Time	Atten Preamp
150k	1M	5k	9k	GP+AV	20ms	15dB LN OFF
1M	5M	10k	9k	GP+AV	1ms	15dB LN OFF
5M	30M	100k	9k	GP+AV	1ms	15dB LN OFF



§2.1046, & §24.232 - RF POWER OUTPUT

Applicable Standard

According to FCC §2.1046 and §24.232 (1), mobile/portable stations are limited to 2 watts EIRP.

Test Procedure

1. On a test site, the EUT shall be placed at 1.5m height on a turn table, and in the position closest to normal use as declared by the applicant.
2. The test antenna shall be oriented initially for vertical polarization located 3m from EUT to correspond to the frequency of the transmitter.
3. The output of the test antenna shall be connected to the measuring receiver and the quasi-peak detector is used for the measurement.
4. The transmitter shall be switched on, if possible, without modulation and the measuring receiver shall be tuned to the frequency of the transmitter under test.
5. The test antenna shall be raised and lowered through the specified range of height until a maximum signal level is detected by the measuring receiver.
6. The transmitter shall then be rotated through 360° in the horizontal plane, until the maximum signal level is detected by the measuring receiver.
7. The test antenna shall be raised and lowered again through the specified range of height until a maximum signal level is detected by the measuring receiver.
8. The maximum signal level detected by the measuring receiver shall be noted.
9. The transmitter shall be replaced by a horn (substitution antenna).
10. The substitution antenna shall be orientated for vertical polarization and the length of the substitution antenna shall be adjusted to correspond to the frequency of the transmitter.
11. The substitution antenna shall be connected to a calibrated signal generator.
12. In necessary, the input attenuator setting of the measuring receiver shall be adjusted in order to increase the sensitivity of the measuring receiver.
13. The test antenna shall be raised and lowered through the specified range of height to ensure that the maximum signal is received.
14. The input signal to the substitution antenna shall be adjusted to the level that produces a level detected by the measuring receiver, which is equal to the level noted while the transmitter radiated power was measured, corrected for the change of input attenuator setting of the measuring receiver.
15. The input level to the substitution antenna shall be recorded as power level in dBm, corrected for any change of input attenuator setting of the measuring receiver.
16. The measurement shall be repeated with the test antenna and the substitution antenna orientated for horizontal polarization.
17. The measure of the effective radiated power is the large of the two levels recorded, at the input to the substitution antenna, corrected for gain of the substitution antenna if necessary.

Test Equipment List and Details

Manufacturer	Description	Model	Serial Number	Cal. Date
HP	Spectrum Analyzer	8568B	2601A02165	2004-07-03
HP	Amplifier	8447E	2944A10187	2003-09-23
HP	Quasi-Peak Adapter	85650A	3019A05393	2004-06-13
EMCO	Biconical Antenna	3110B	9309-1165	2004-10-11
EMCO	Log Periodic Antenna	3146	2101	2004-10-11
AH System	Horn Antenna	SAS-200/511	261	2004-08-02
Rohde & Schwarz	Generator, Signal	SMIQ03	DE23746	2004-01-10

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

Environmental Conditions

Temperature:	17° C
Relative Humidity:	45%
ATM Pressure:	1015 mbar

The testing was performed by Daniel Deng on 2005-01-22.

Test Results

MODE	FREQUENCY (MHZ)	SUBSTITUTION READING (dBm)	SUBSTITUTION ANTENNA GAIN	SUBSTITUTION CALBE LOSS (dB)	EIRP (dBm)
QPSK 640 Ksym/sec	1880.03	28.4	6.5	2.2	32.7
QPSK 2.56 Msym/sec	1879.27	28.3	6.5	2.2	32.6
16QAM 640 Ksym/sec	1879.97	28.3	6.5	2.2	32.6
16QAM 2.56 Msym/sec	1880.60	28.3	6.5	2.2	32.6

Sample calculation:

Absolute level = substitution reading + antenna gain - cable loss

For example:

$$28.4 + 6.5 - 2.2 = 32.7$$

§2.1046, & §24.232 – CONDUCTED OUTPUT POWER

Applicable Standard

According to FCC §2.1046 and §24.232 (b), Mobile/Portable Station are limited to 2 Watts e.i.r.p. Peak Power.

Test Procedure

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

Test Equipment List and Details

Manufacturer	Description	Model	Serial Number	Cal. Date
HP	Spectrum Analyzer	HP8564E	3943A01781	2004-08-01
HP	Plotter	HP7470A	2541A49659	Not Required
A.H. Systems	Horn Antenna	SAS200	261	2004-05-31
ETS	Logperiodic Antenna	3148	0004-1155	2003-10-11
EMCO	Biconical Antenna	3110B	9603-2315	2003-10-11

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

Environmental Conditions

Temperature:	17° C
Relative Humidity:	45%
ATM Pressure:	1015 mbar

The testing was performed by Daniel Deng on 2005-01-22.

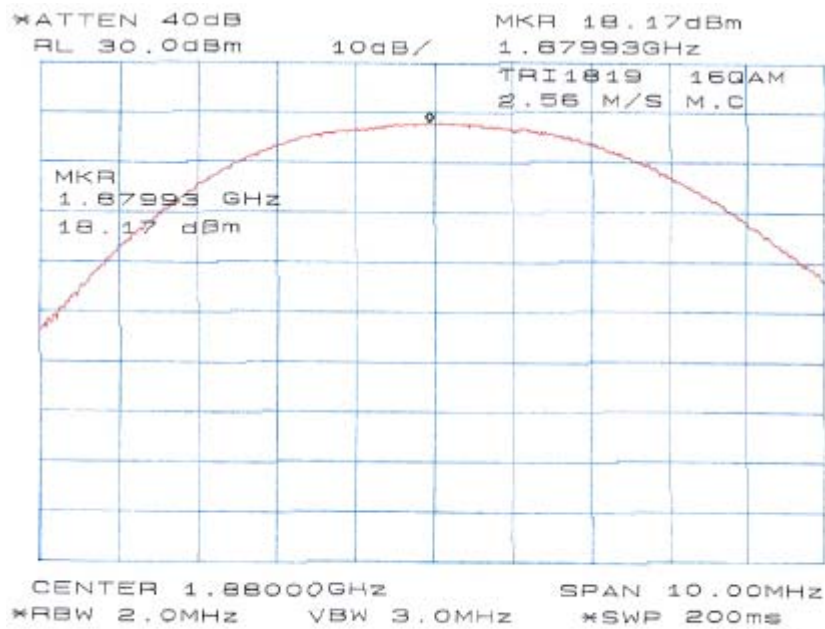
Test Results

Mode	Frequency (MHz)	Output Power in dBm	Output Power in W	Limit in W
16QAM 640 Ksym/sec	1880.00	18.00	0.063	2
16QAM 2.56 Msym/sec	1880.00	18.17	0.066	2
QPSK 640 Ksym/sec	1880.00	18.00	0.063	2
QPSK 2.56 Msym/sec	1880.00	18.00	0.063	2

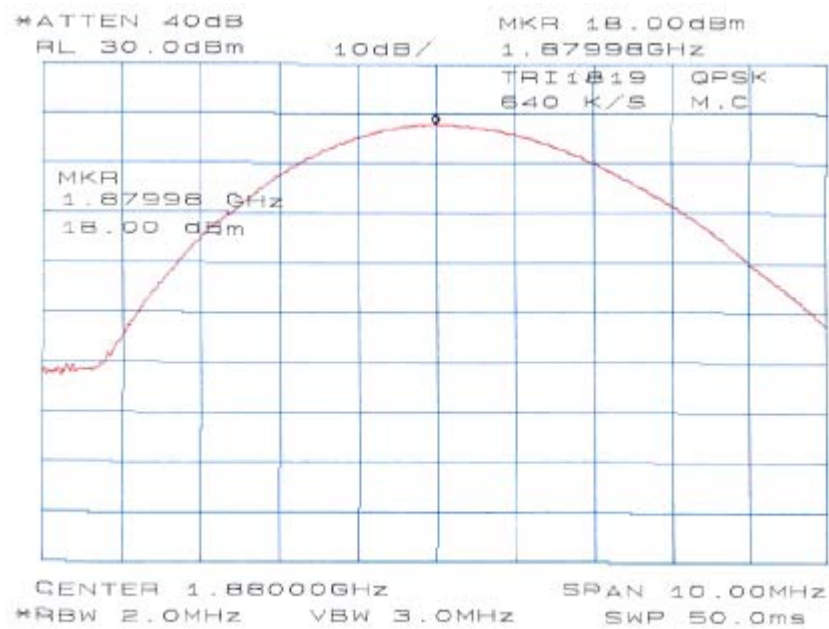
16QAM 640Ksym/sec



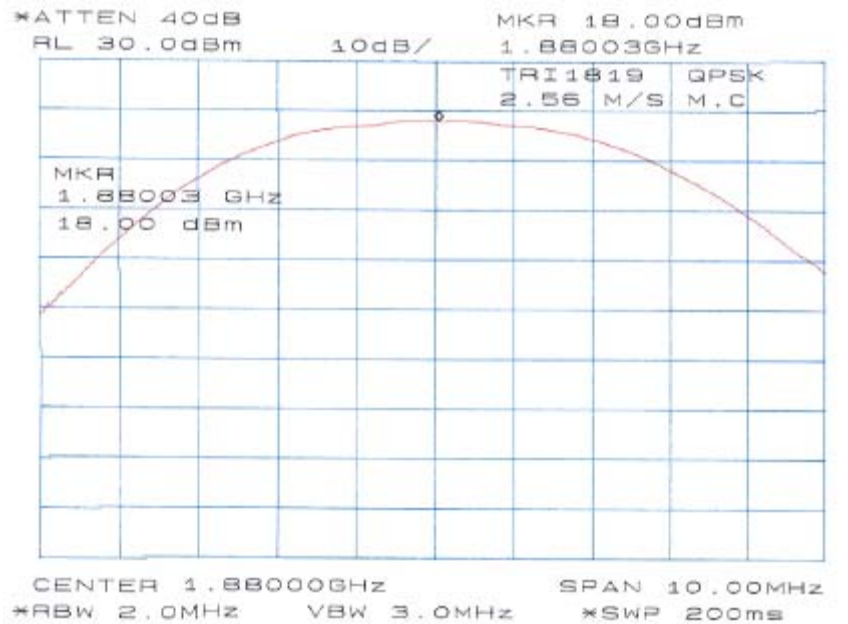
16QAM 2.56Msym/sec



QPSK 640Ksym/sec



16QAM 2.56Msym/sec



§2.1049, & §24.238 - OCCUPIED BANDWIDTH

Applicable Standard

Requirements: CFR 47, Section 2.1049, and Section 24.238.

Test Procedure

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

The resolution bandwidth of the spectrum analyzer was set at 30 KHz and the 26 dB bandwidth was recorded.

Test Equipment List and Details

Manufacturer	Description	Model	Serial Number	Cal. Date
HP	Spectrum Analyzer	HP8564E	3943A01781	2004-08-01
HP	Plotter	HP7470A	2541A49659	Not Required

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

Environmental Conditions

Temperature:	17° C
Relative Humidity:	45%
ATM Pressure:	1015 mbar

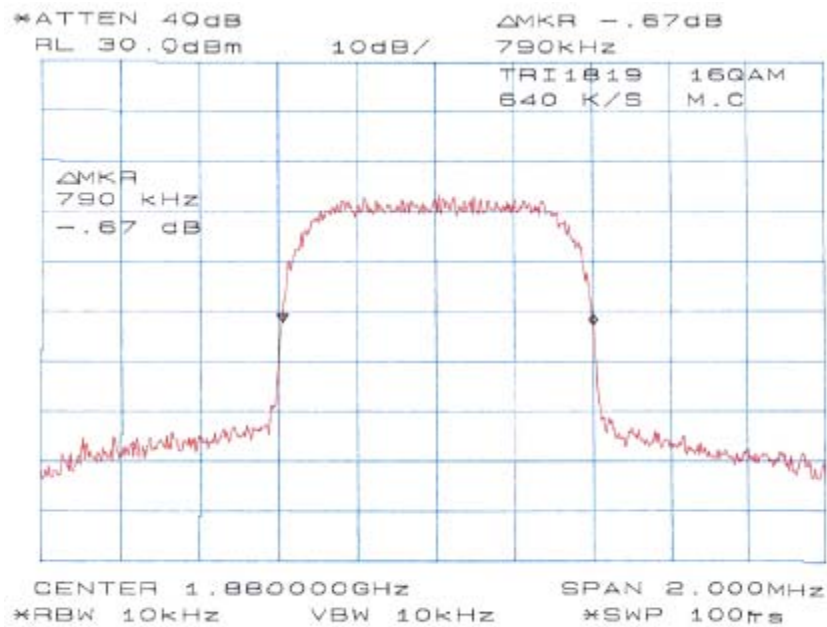
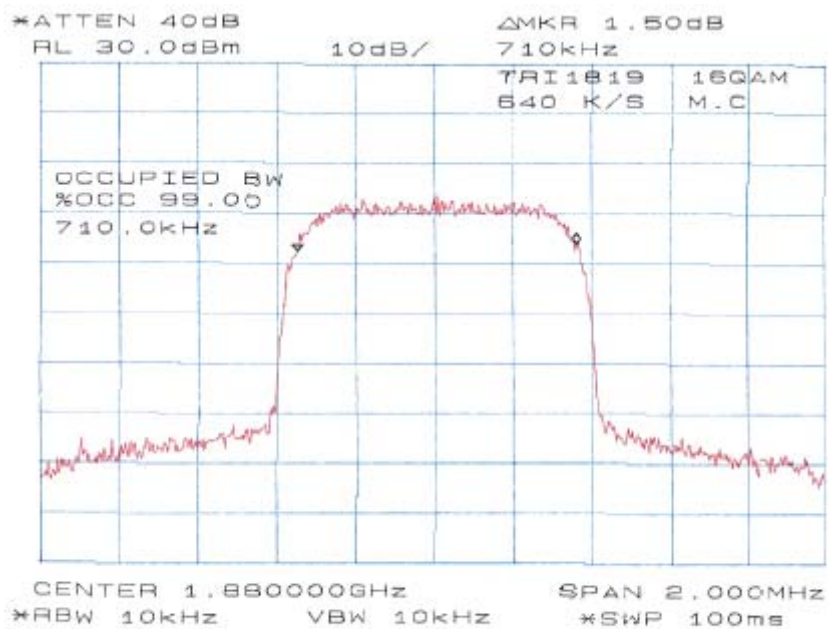
The testing was performed by Daniel Deng on 2005-01-22.

Test Results

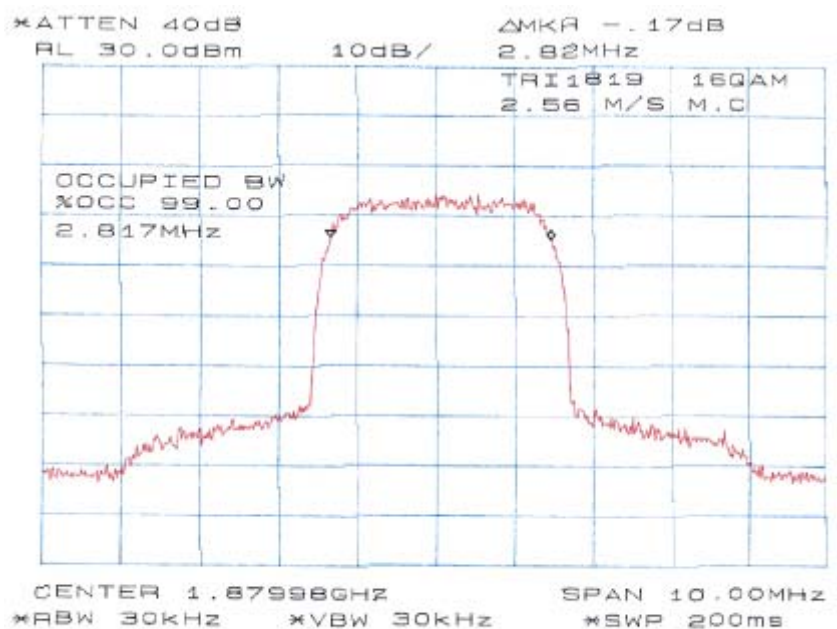
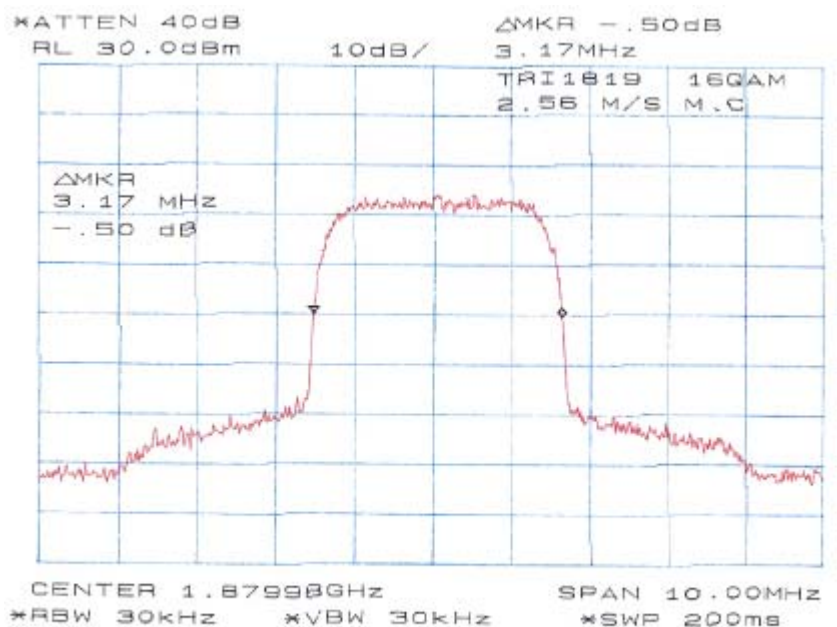
Mode	Channel	Frequency (Mhz)	Type	Measurement (KHz)	Result
16QAM 640 Ksym/sec	Middle	1880.00	Occupied Bandwidth	710	Compliant
			26dB Bandwidth	790	Compliant
16QAM 2.56 Msym/sec	Middle	1880.00	Occupied Bandwidth	2817	Compliant
			26dB Bandwidth	3170	Compliant
QPSK 640 Ksym/sec	Middle	1880.00	Occupied Bandwidth	703	Compliant
			26dB Bandwidth	793	Compliant
QPSK 2.56 Msym/sec	Middle	1880.00	Occupied Bandwidth	2833	Compliant
			26dB Bandwidth	3180	Compliant

Please refer to the hereinafter plots.

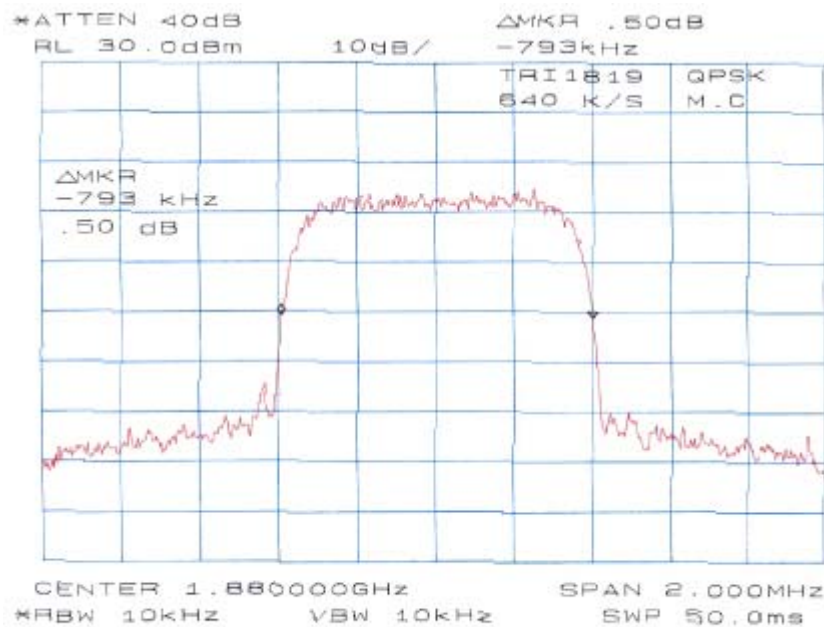
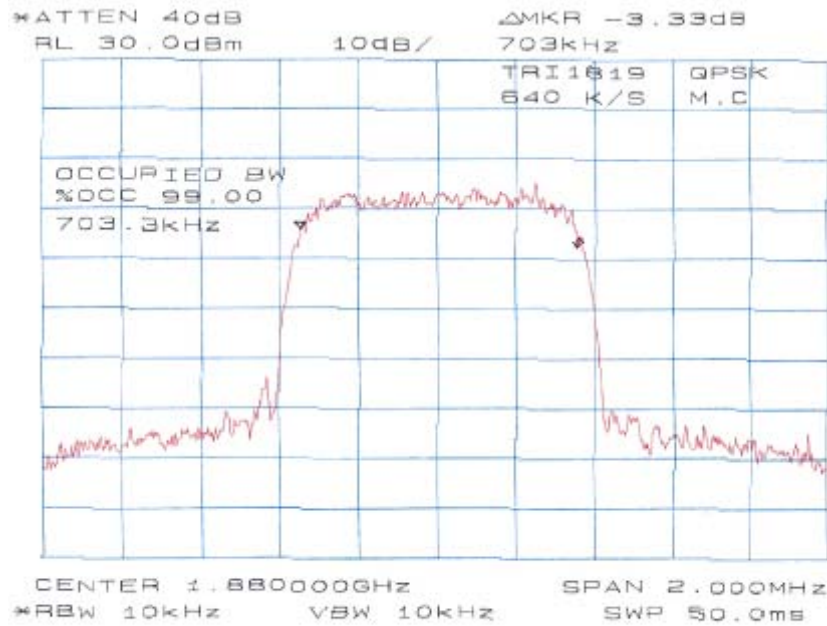
16QAM 640Ksym/sec



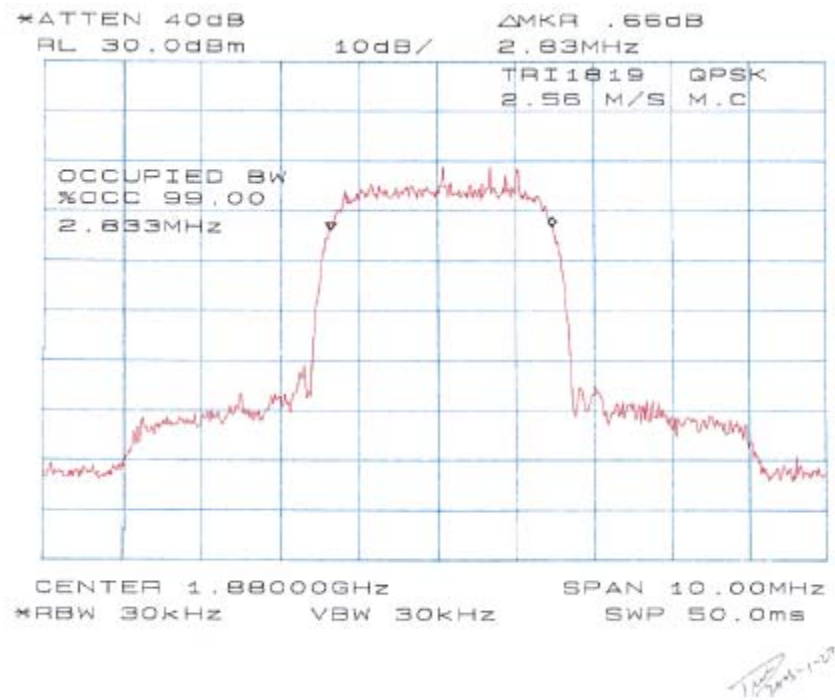
16QAM 2.56Msym/sec

*2004-12**2004-12*

QPSK 640Ksym/sec



QPSK 2.56Msym/sec



§2.1051, & §24.238(a) - SPURIOUS EMISSIONS AT ANTENNA TERMINALS

Applicable Standard

Requirements: CFR 47, § 2.1051 & §24.238(a).

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

Test Procedure

The RF output of the transceiver was connected to a spectrum analyzer 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 10th harmonic.

Test Equipment List and Details

Manufacturer	Description	Model	Serial Number	Cal. Date
HP	Spectrum Analyzer	HP8564E	3943A01781	2004-08-01
HP	Plotter	HP7470A	2541A49659	Not Required

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

Environmental Conditions

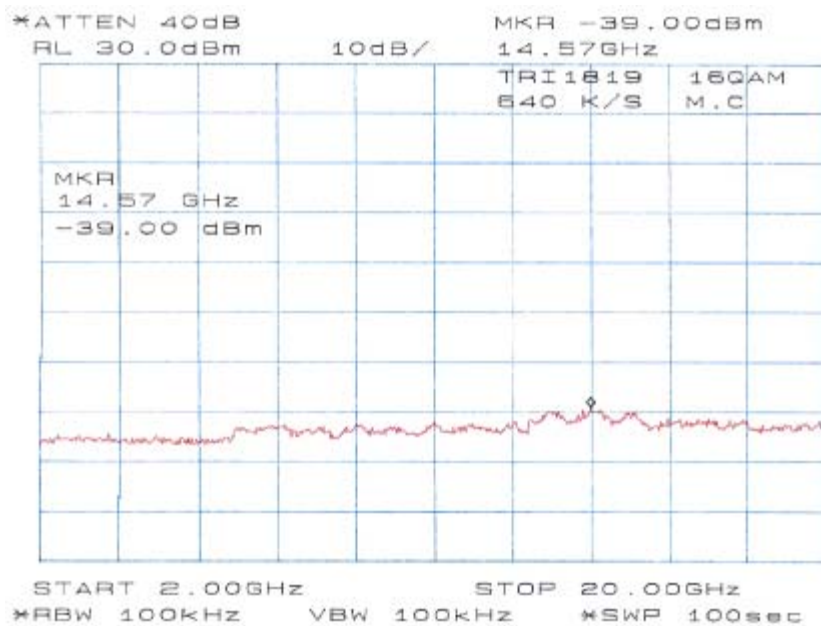
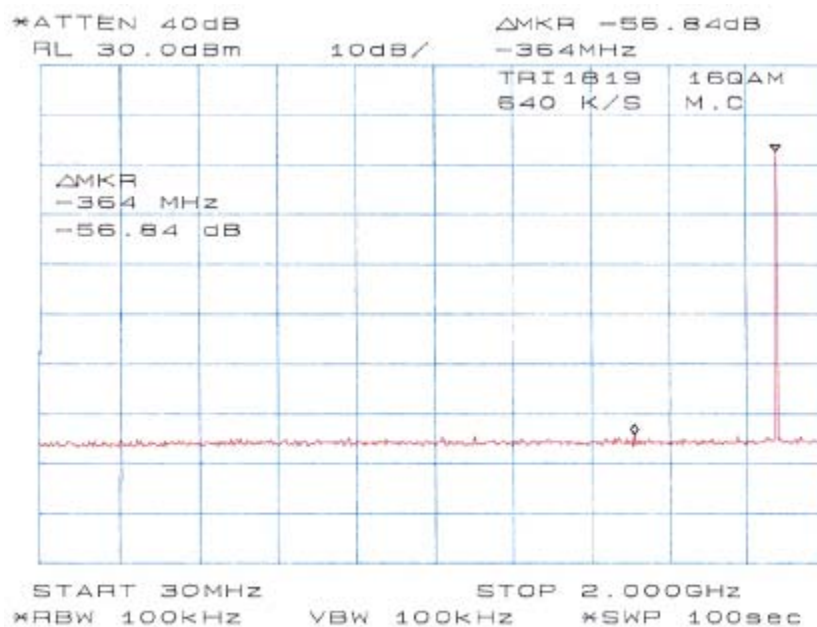
Temperature:	17° C
Relative Humidity:	45%
ATM Pressure:	1015 mbar

The testing was performed by Daniel Deng on 2005-01-22.

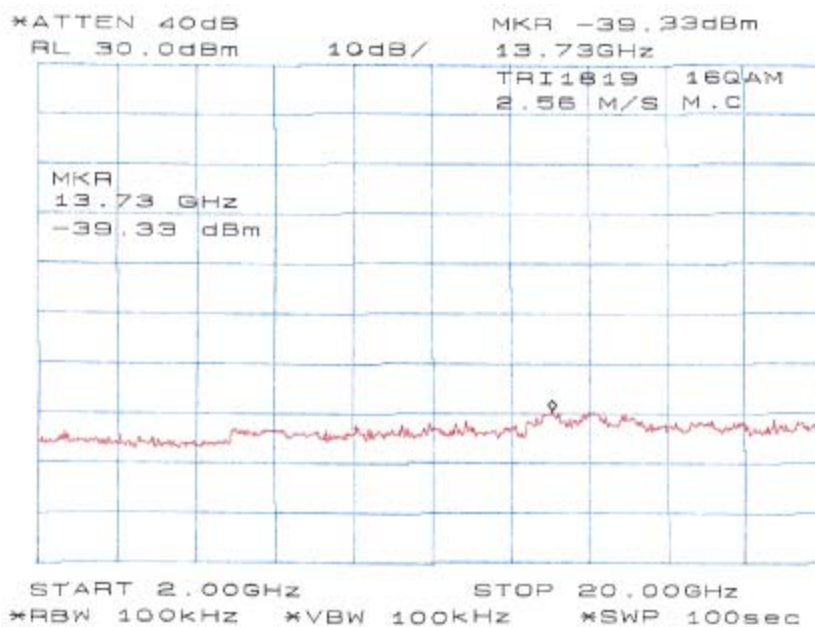
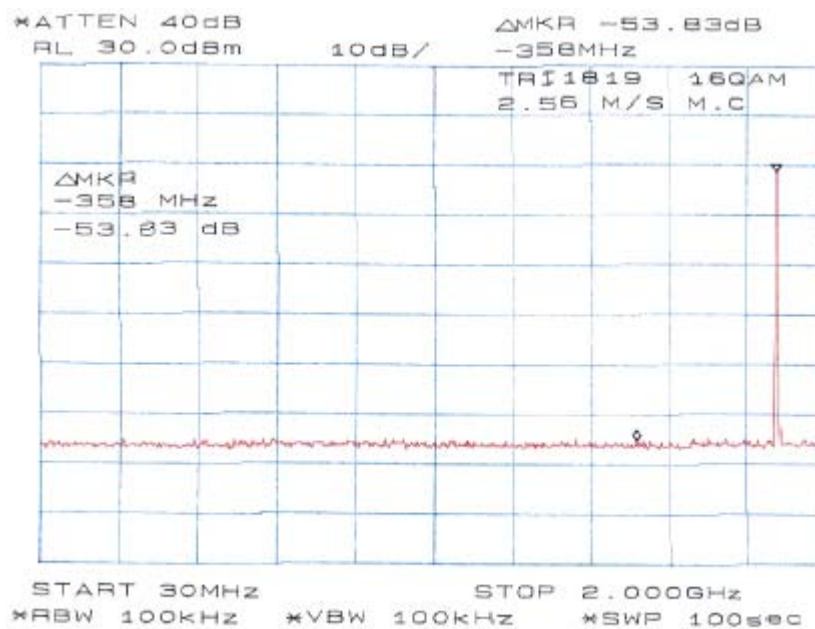
Test Results

Please refer to the hereinafter plots.

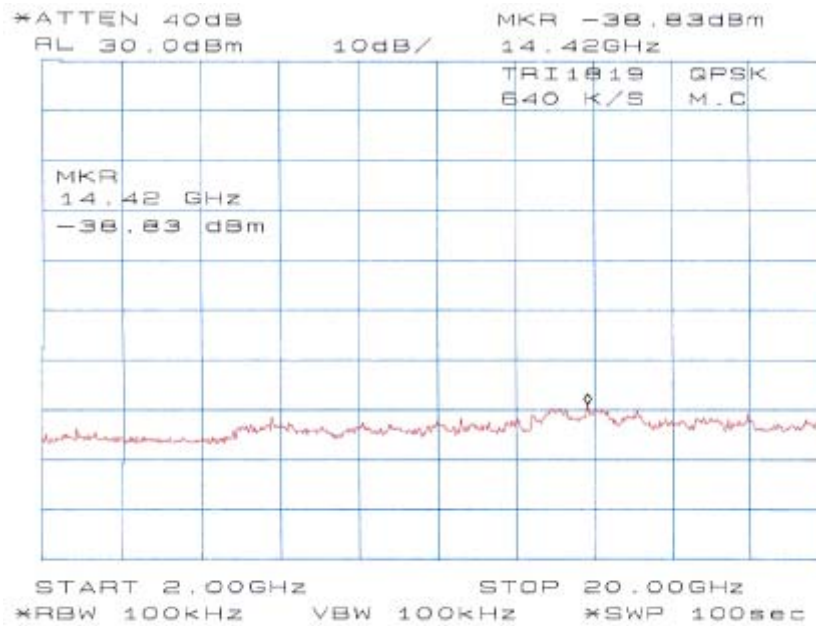
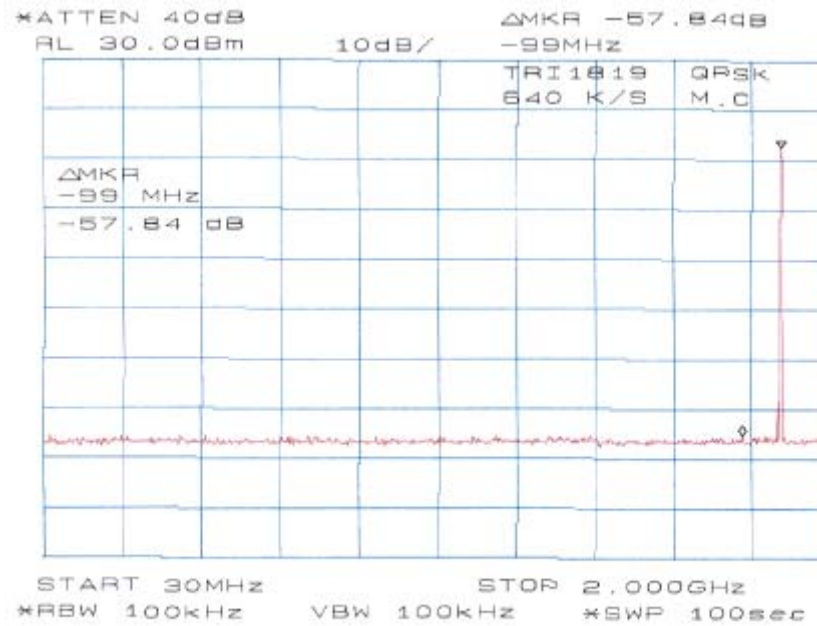
16QAM 640Ksym/sec



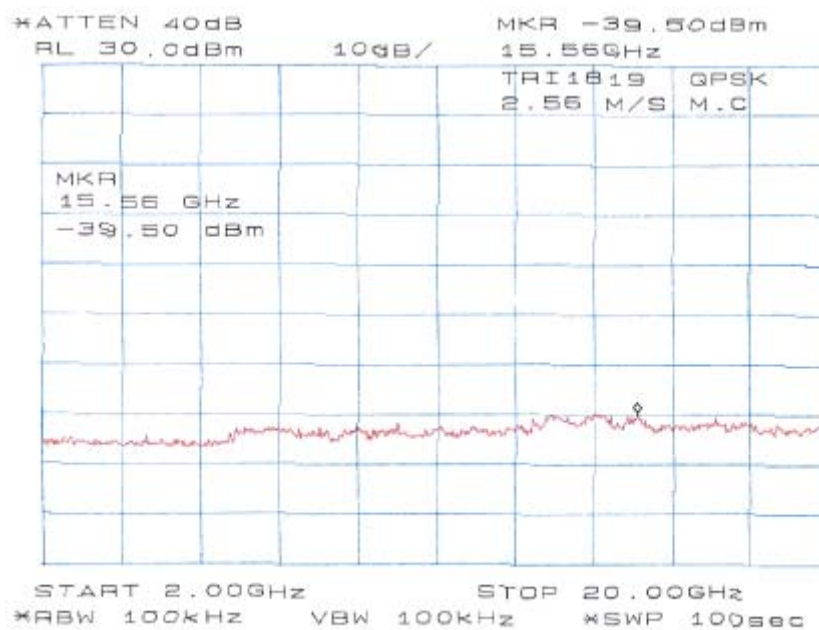
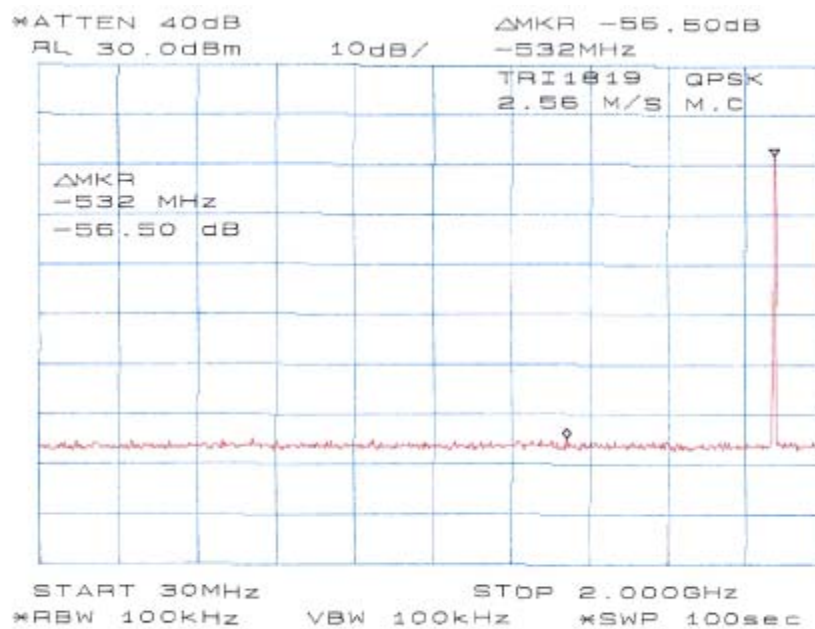
16QAM 2.56Msym/sec



QPSK 640Ksym/sec



QPSK 2.56Msym/sec



§2.1055 (a), §2.1055 (d), & §24.235 - FREQUENCY STABILITY

Applicable Standard

Requirements: FCC § 2.1055 (a), § 2.1055 (d) & following:

According to §24.235, The frequency stability shall be sufficient to ensure that the fundamental emission stays within the authorized frequency block.

Test Procedure

Frequency Stability vs. Temperature: The equipment under test was connected to an external DC power supply and the RF output was connected to a frequency counter via feed-through attenuators. The EUT was placed inside the temperature chamber. The DC leads and RF output cable exited the chamber through an opening made for the purpose.

After the temperature stabilized for approximately 20 minutes, the frequency output was recorded from the counter.

Frequency Stability vs. Voltage: An external variable DC power supply was connected to the battery terminals of the equipment under test. The voltage was set to 115% of the nominal value and was then decreased until the transmitter light no longer illuminated; i.e., the battery end point. The output frequency was recorded for each battery voltage.

Test Equipment List and Details

Manufacturer	Description	Model	Serial Number	Cal. Date
HP	Spectrum Analyzer	HP8564E	3943A01781	2004-08-01
HP	Plotter	HP7470A	2541A49659	Not Required
HP	Temperature Oven	7475A	2541A49659	Not Required

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

Environmental Conditions

Temperature:	17° C
Relative Humidity:	45%
ATM Pressure:	1015 mbar

The testing was performed by Daniel Deng on 2005-01-22.

Test Results*Frequency Stability Versus Temperature*

Reference Frequency : 1880.0000 MHz			
Temperature C	Power supplied Vac	Frequency Measure with Time Elapsed	
		MCF (MHz)	Error ppm
50	120	1879.999159	-0.45
40	120	1879.999326	-0.36
30	120	1879.999298	-0.37
20	120	1879.999531	-0.25
10	120	1880.000126	0.07
0	120	1880.000368	0.20
-10	120	1880.000291	0.15
-20	120	1880.000359	0.19
-30	120	1880.000485	0.26

Frequency Stability Versus Voltage

Reference Frequency : 1880.0000 MHz			
Power supplied Vac	Environment Temperature (° C)	Frequency Measure with Time Elapsed	
		(MHz)	Error ppm
102	20	1879.999515	-0.26
138	20	1879.999625	-0.20

§24.238 – BAND EDGE

Applicable Standard

According to §24.238, 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.

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, RBW set to 30KHz.

Test Equipment List and Details

Manufacturer	Description	Model	Serial Number	Cal. Date
HP	Spectrum Analyzer	HP8564E	3943A01781	2004-08-01
HP	Plotter	HP7470A	2541A49659	Not Required

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

Environmental Conditions

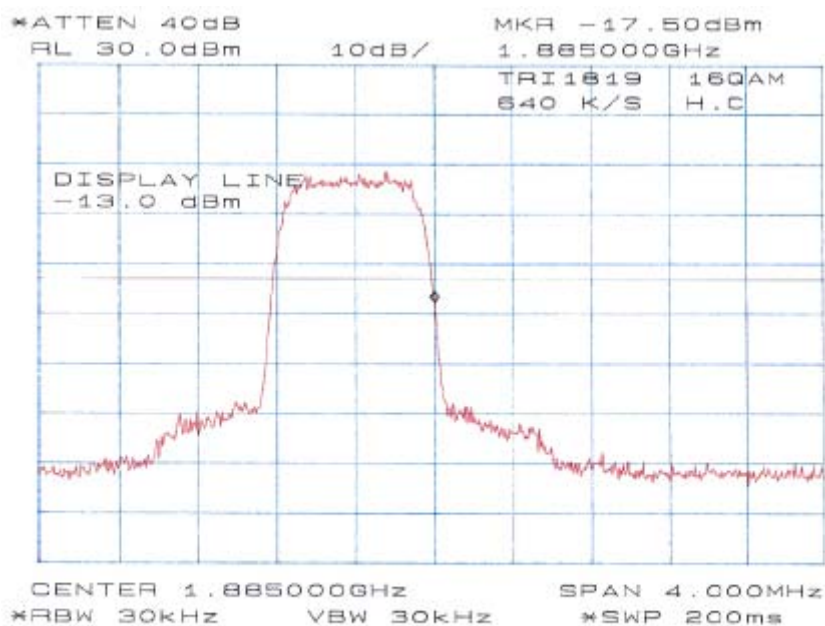
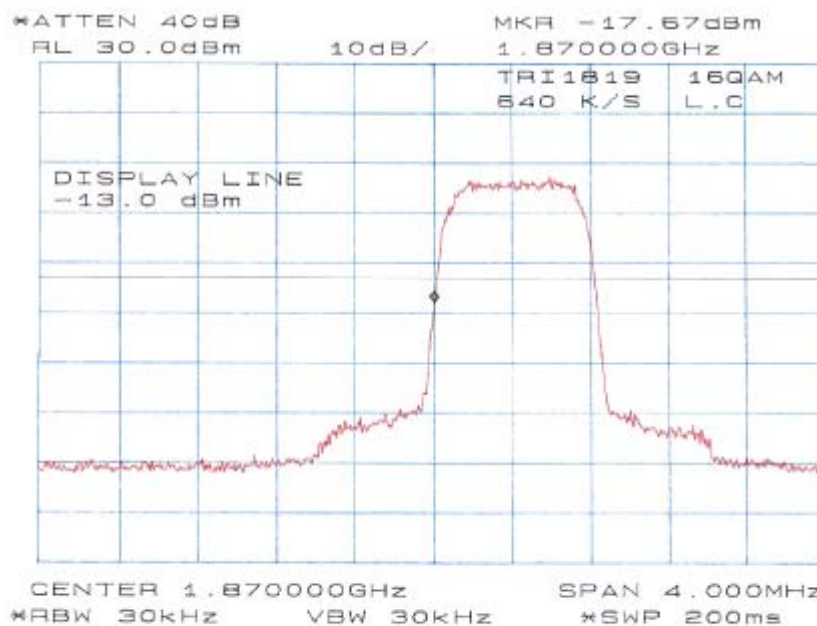
Temperature:	17° C
Relative Humidity:	45%
ATM Pressure:	1015 mbar

The testing was performed by Daniel Deng on 2005-01-22.

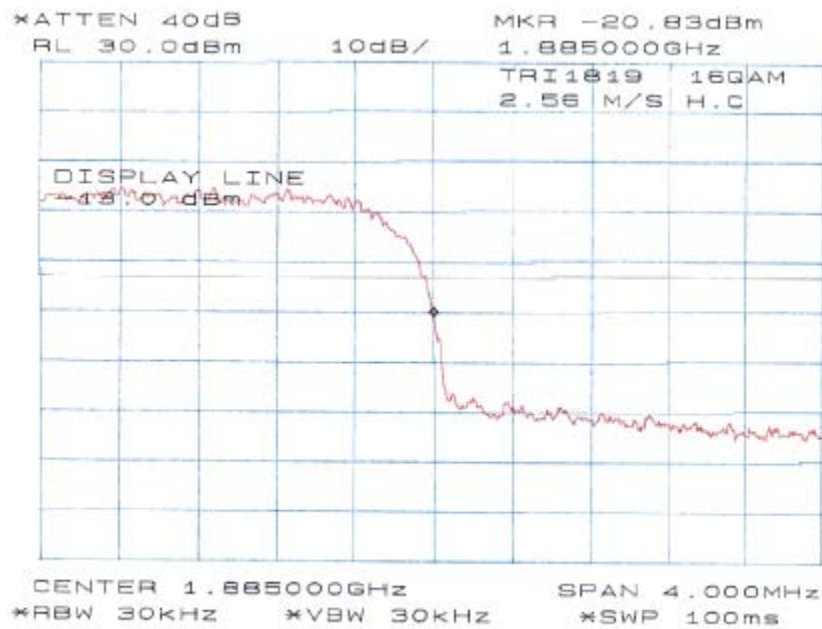
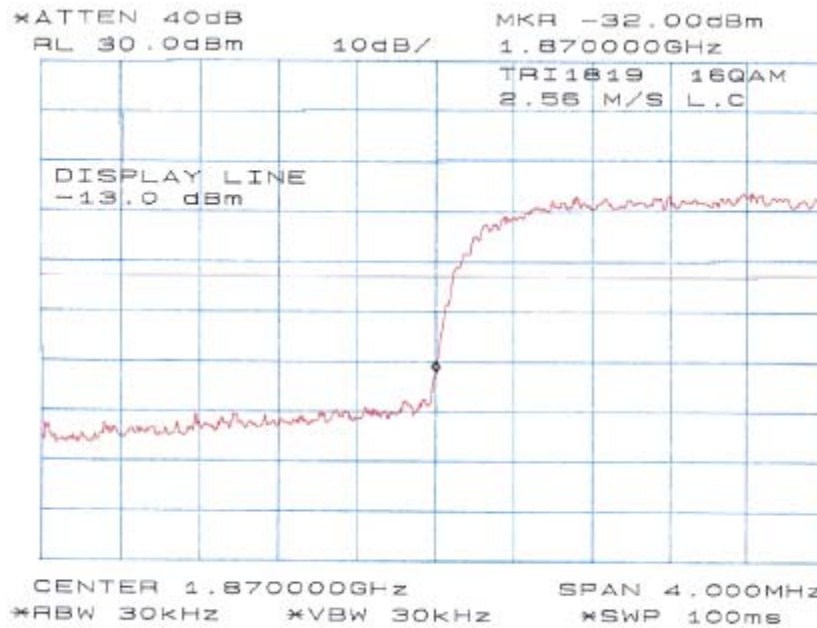
Test Results

Please refer to the following plots.

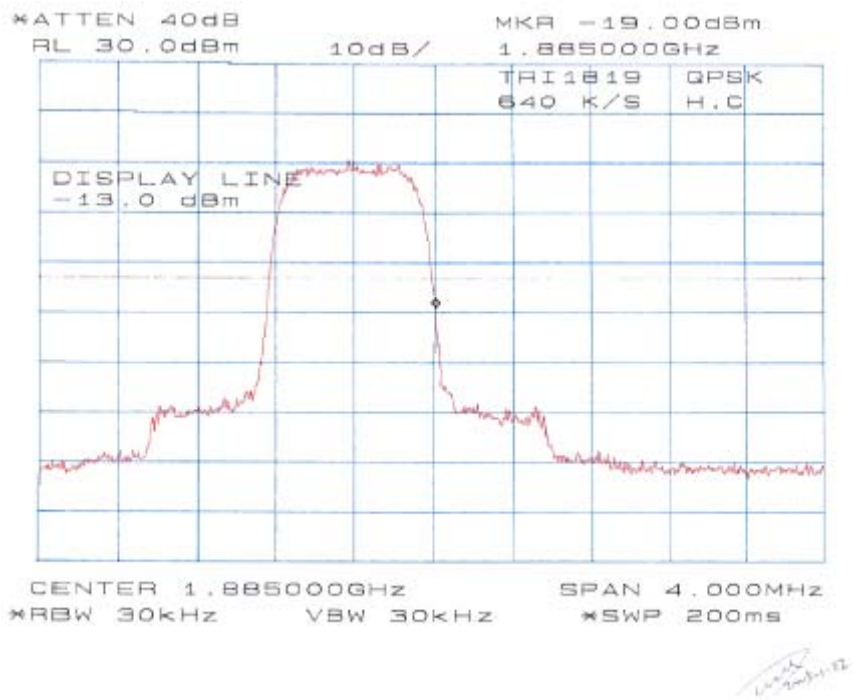
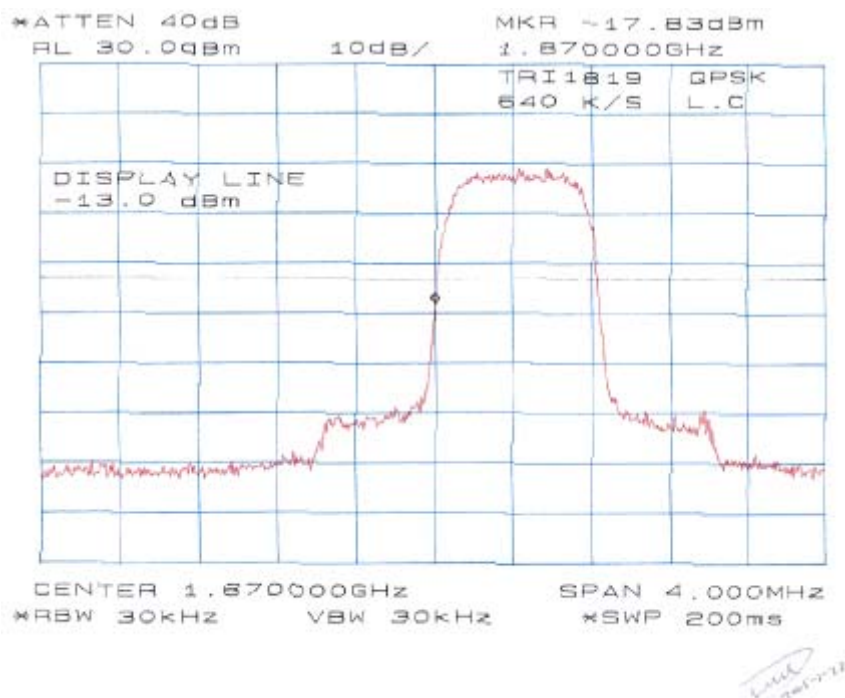
16QAM 640Ksym/sec



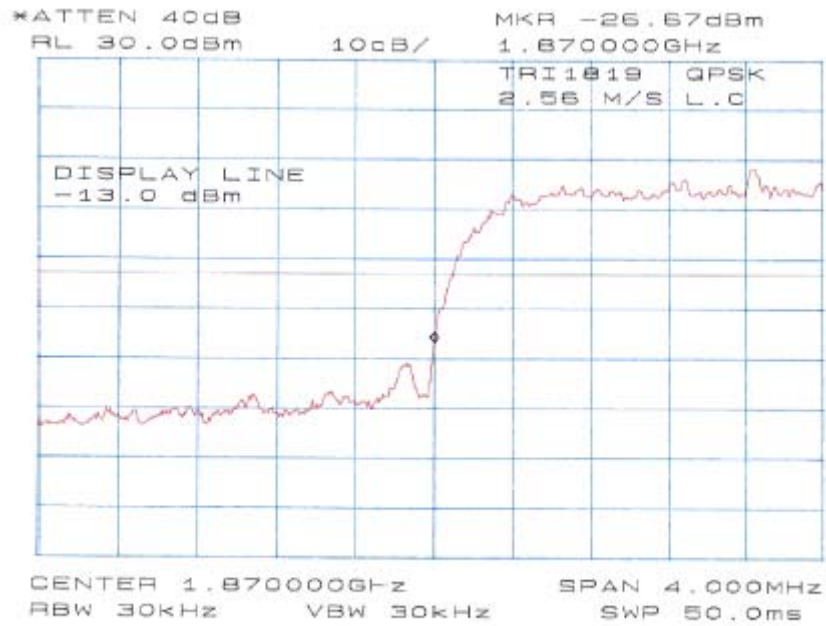
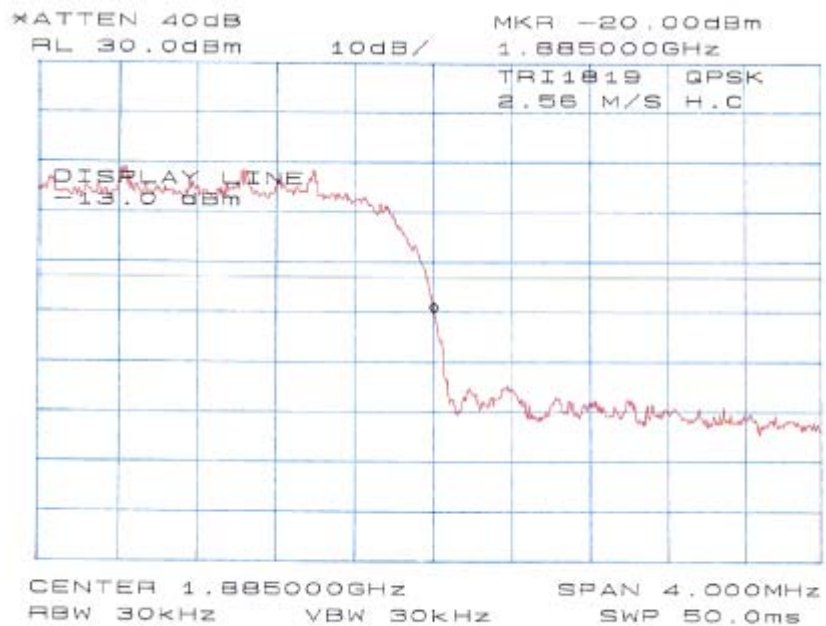
16QAM 2.56Msym/sec



QPSK 640Ksym/sec



QPSK 2.56sym/sec

*Line
6-8-12**Line
6-8-12*