Lab Code: 200167-0

FCC PART 27

TEST AND MEASUREMENT REPORT

For

ADC Telecommunications Inc.

P.O. Box 1101, Minneapolis,

Minnesota, United States 55440-1101

FCC ID: NOO-U0559-011

Report Type:	**Product Type:**
Original Report	Wireless Network System

Test Engineer:	Victor Zhang
Report Number:	R0907293-27A
Report Date:	2009-09-03
Reviewed By:	Boni Baniqued Senior RF Engineer
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TABLE OF CONTENTS

DOCUMENT REVISION HISTORY

Revision Number	Report Number	Description of Revision	Date of Revision
0	R0907293-27	Original Report	2009-09-01
1	R0907293-27A	Updated Product Description	2009-09-03

1 GENERAL INFORMATION

1.1 Product Description for Equipment under Test (EUT)

The ADC Telecommunications, Inc. FCC ID: NOO-U0559-011, Model: Main Hub (UNS-CS75-MH-2), EHUB (UNS-EH-2), RAU (UNS-CS75-1) or the "EUT" as referred to in this report is wireless network systems operate for LTE technology for Band 13 (700 MHz). It is designed to operate as a seamless extension of the public wireless network infrastructure, expanding the reach of wireless communications by delivering crystal clear signals and ample capacity throughout any public or private facility. The EUT is designed for mid-sized to large edifices containing dense, high traffic data environment such as convention center, sporting arenas and airports. The EUT is a system comprised of three unit types: A main hub, a base station or repeater, and up to 4-expansion hubs that connect to the main hub via Single-mode or Multi-mode fiber optics and can support up to 32 Remote Access Units (RAU) that connect to the expansion hub via Cat-5/5E/6 ScTP cable. Each RAU sends and receives RF signals wirelessly in its coverage area. For testing purpose, the EUT comprised of one base station, one main hub and one expansion hub to be tested as a system. Operating frequency range is 746-757MHz for Downlink and 776-787MHz for Uplink.

1.2 Mechanical Description

Model: UNS-CS75-MH-2 (Main Hub) measures approximately 305 mm **(L)** x 438 mm **(W)** x 44.5 mm **(H)**, and weighs approximately 3 kg.

Model: UNS-EH-2 (EHUB) measures approximately 305 mm **(L)** x 438 mm **(W)** x 89 mm **(H)**, and weighs approximately 5 kg.

Model: UNS-CS75-1 (RAU) measures approximately 158 mm **(L)** x 305 mm **(W)** x 44 mm **(H)**, and weighs approximately 1 kg.

**The test data gathered are from production sample, serial number: MR220196 (Main Hub), F01001R6 (Expansion Hub), and MR220YD7 (RAU) provided by the manufacturer.*

1.3 EUT Photo

UNS-CS75-MH-2 (Main Hub)

UNS-EH-2 (Expansion HUB)

UNS-CS75-1 (Remote Access Unit)

Please refer to Exhibit C for more EUT photographs.

1.4 Objective

This type approval report is prepared on behalf of ADC Telecommunications, Inc. in accordance with Part 2, Subpart J, Part 27, Subpart E, 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, frequency stability, band edge, and conducted and radiated margin.

1.5 Related Submittal(s)/Grant(s)

No Related Submittals

1.6 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 Subpart E - MISCELLANEOUS WIRELESS COMMUNICATIONS SERVICES

Applicable Standards: TIA EIA 98-C, TIA/EIA603-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.

1.7 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.

1.8 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/EIA-603-C.

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

2.2 EUT Exercise Software

NA, 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
Agilent	Vector Signal Generator	E4438C	MY47271125
Agilent	Signal Studio for 3GPP LTE	N7624B	-

2.5 Internal Configurations of EUT

Manufacturer	Description	Model	Serial Number
LGC Wireless Inc.	Main Hub PCB Assembly	710511-3 / Rev A	R0828M0516NC
LGC Wireless Inc.	Expansion Hub PCB Assembly	710531-4 / Rev A	053470665NC
LGC Wireless Inc.	Remote Access Unit (RAU) PCB Assembly	710559-0 / Rev 1	R0923M0006NC
The Power Solution	AC/DC Power Supply (Main Hub)	17100033708	0815R06C LPS44
The Power Solution	AC/DC Power Supply (Expansion Hub)	AP-780P-7021-117	-

2.6 Interface Ports and Cables

Cable Description	Length (m)	To	From
Shielded Cable (Fiber Optic)	1.5	Main Hub	RAU
Shield Cable (CAT5)	< 100	Main Hub	Expansion Hub
RF Cable	< 1	Main Hub/RAU	Spectrum Analyzer
RF Cable	< 1	Main Hub/RAU	Signal Generator

3 SUMMARY OF TEST RESULTS

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

4 FCC §2.1046 & §27.50 – RF OUTPUT POWER

4.1 Applicable Standard

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

4.2 Test Procedure

Conducted:

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

4.3 Environmental Conditions

Temperature:	22-24°C
Relative Humidity:	41-43 %
ATM Pressure:	101-102 kPa

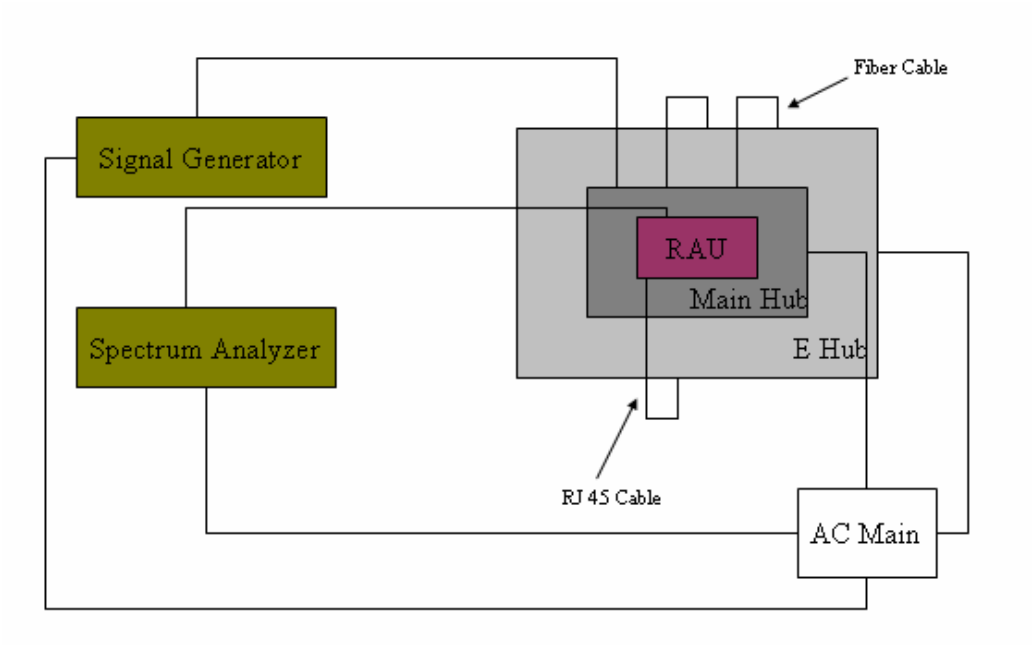
** The testing was performed by Victor Zhang on from 2009-08-24 to 2009-08-26 in RF Site.*

4.4 Test Equipment List and Details

Manufacturers	Descriptions	Models	Serial Numbers	Calibration Dates
Agilent	Spectrum Analyzer	E4440A	MY44303352	2009-04-27
Agilent	Signal Generator	E4438C	MY47271125	2009-04-13

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

4.5 Test Setup Block Diagram (Bench Testing)



4.6 Summary of Test Results

Maximum Output Power – Downlink

Modulation	Frequency (MHz)	Input Power (dBm)	Output Power (dBm)	CCDF (dB)
QPSK	752	0.72	15.49	11.17
16QAM	752	0.73	15.47	10.88
64QAM	752	0.78	15.61	11.31

Maximum Output Power – Uplink

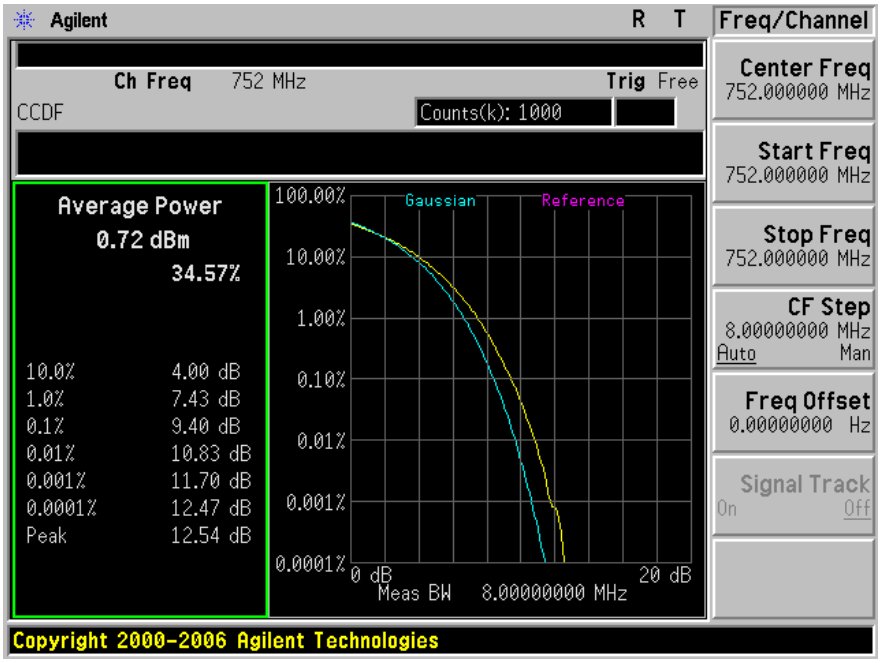
Modulation	Frequency (MHz)	Input Power (dBm)	Output Power (dBm)	CCDF (dB)
QPSK	782	-33.67	-18.13	6.75
16QAM	782	-33.63	-18.66	8.63
64QAM	782	-33.71	-19.02	8.97

Please refer to the following plots for details.

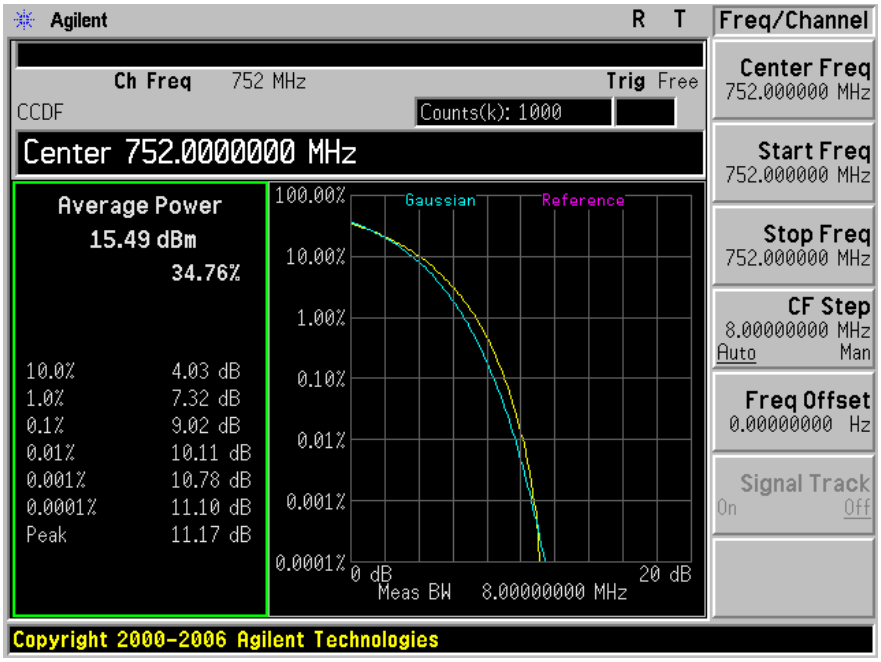
Downlink:

Modulation: QPSK, Frequency: 752 MHz

Input

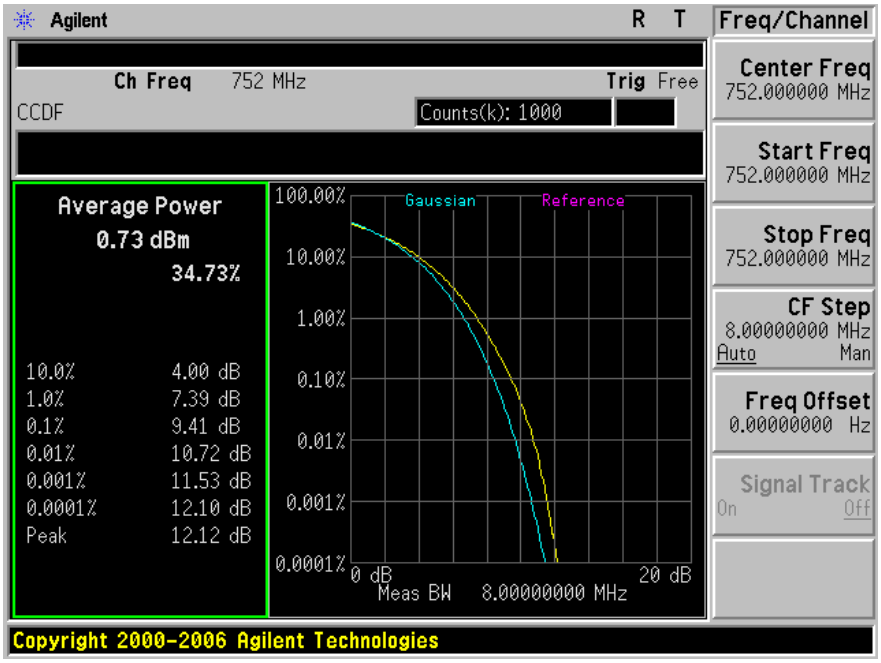


Output

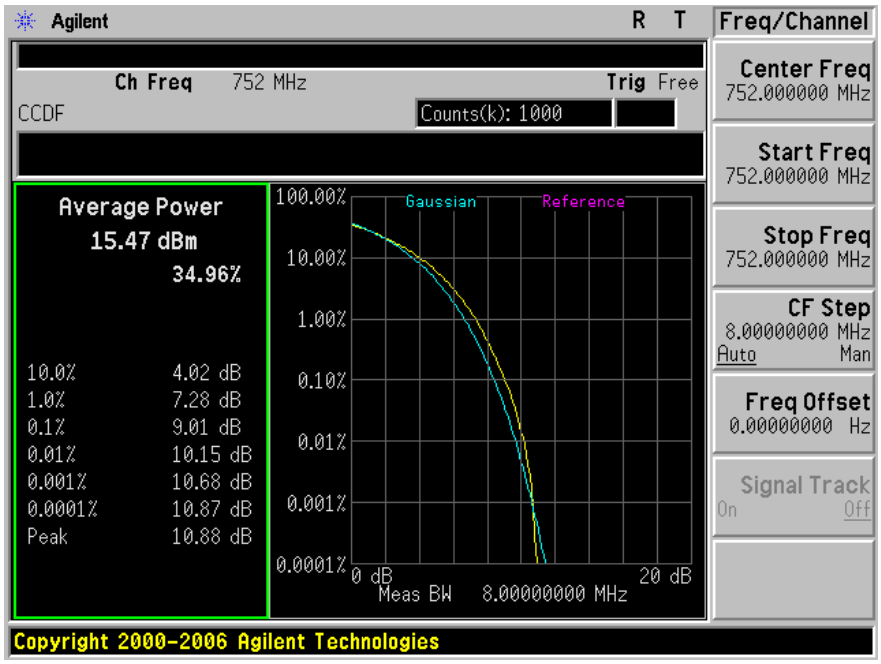


Modulation: 16QAM, Frequency: 752 MHz

Input

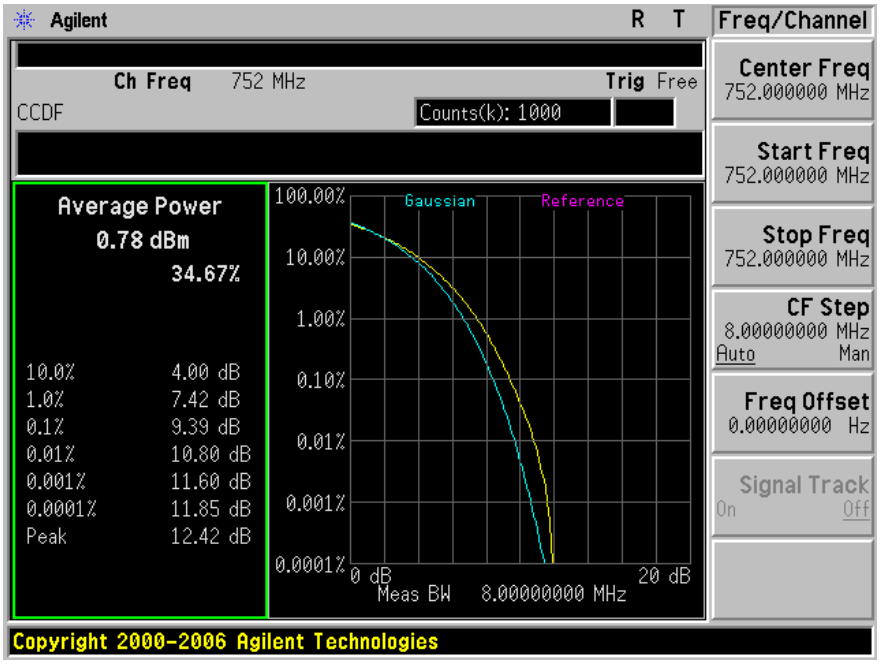


Output

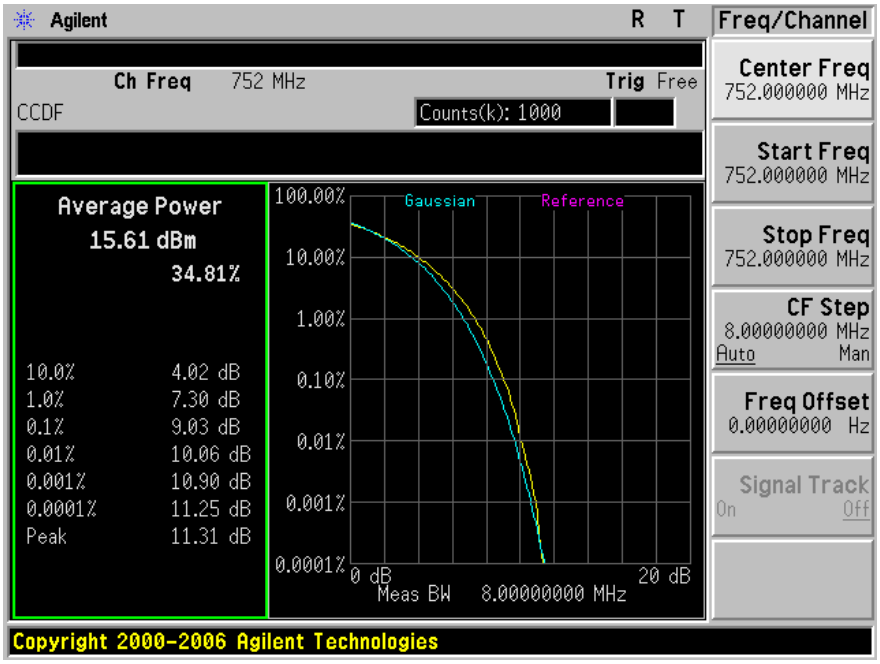


Modulation: 64QAM, Frequency: 752 MHz

Input



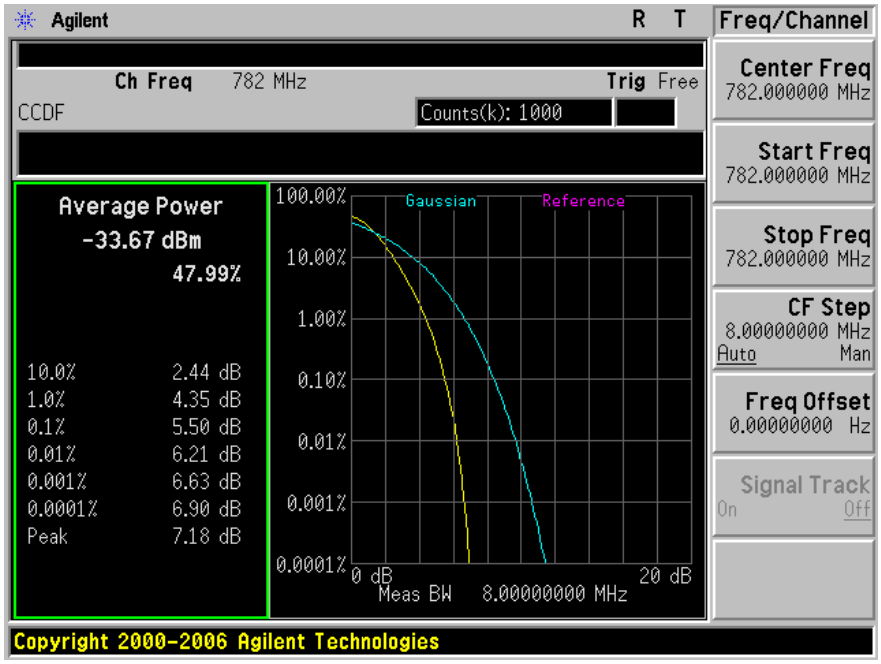
Output



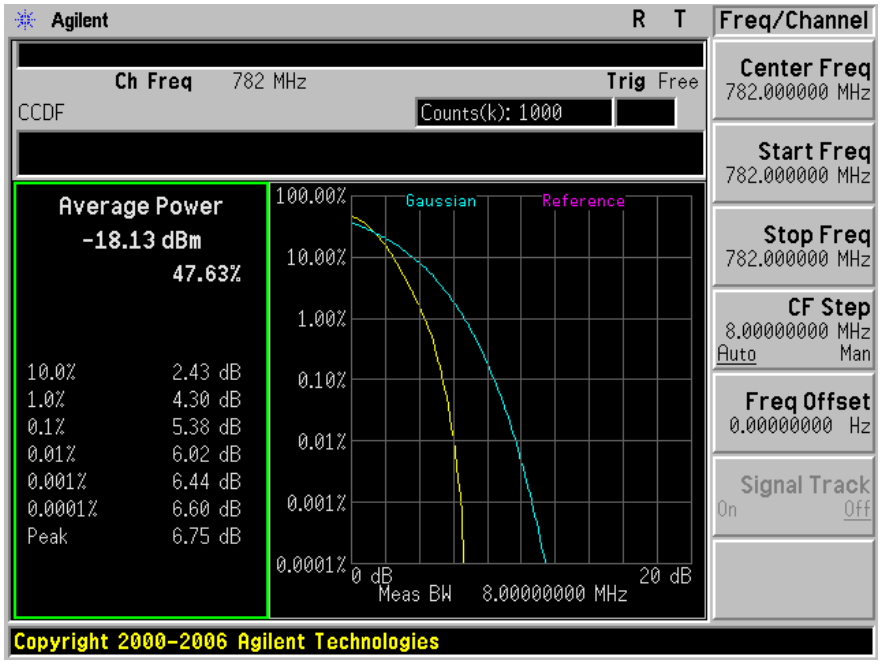
Uplink:

Modulation: QPSK, Frequency: 782 MHz

Input

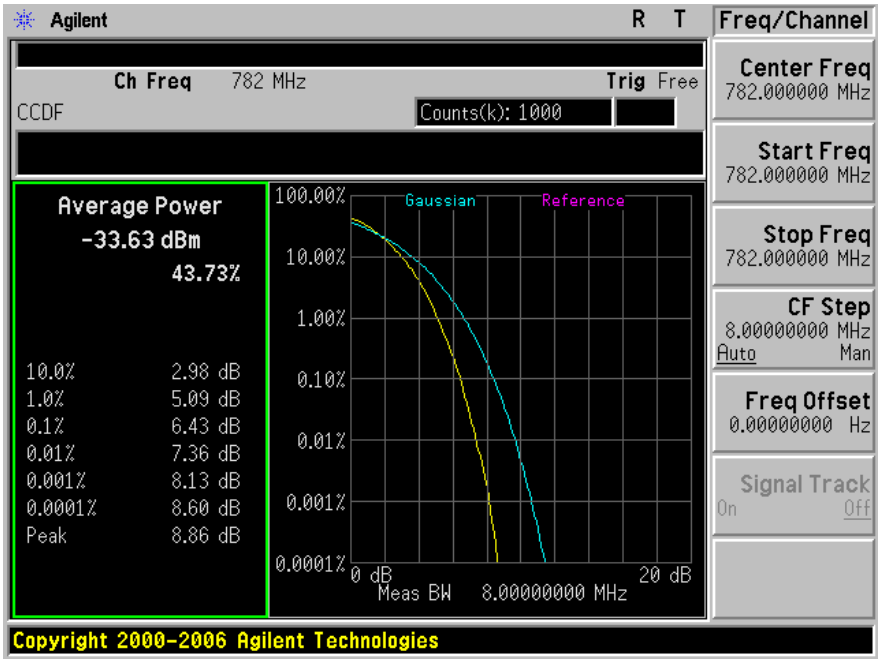


Output

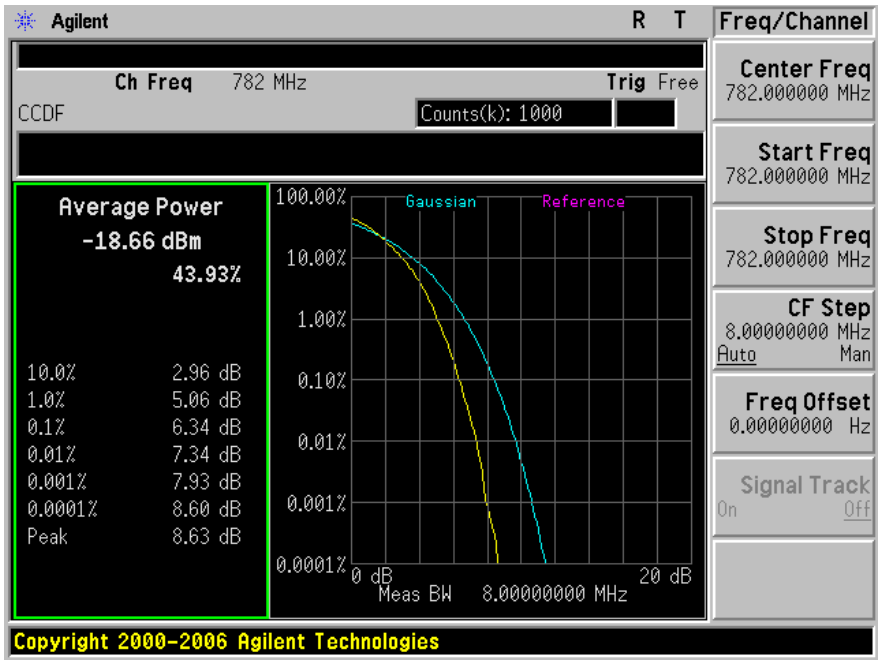


Modulation: 16QAM, Frequency: 782 MHz

Input

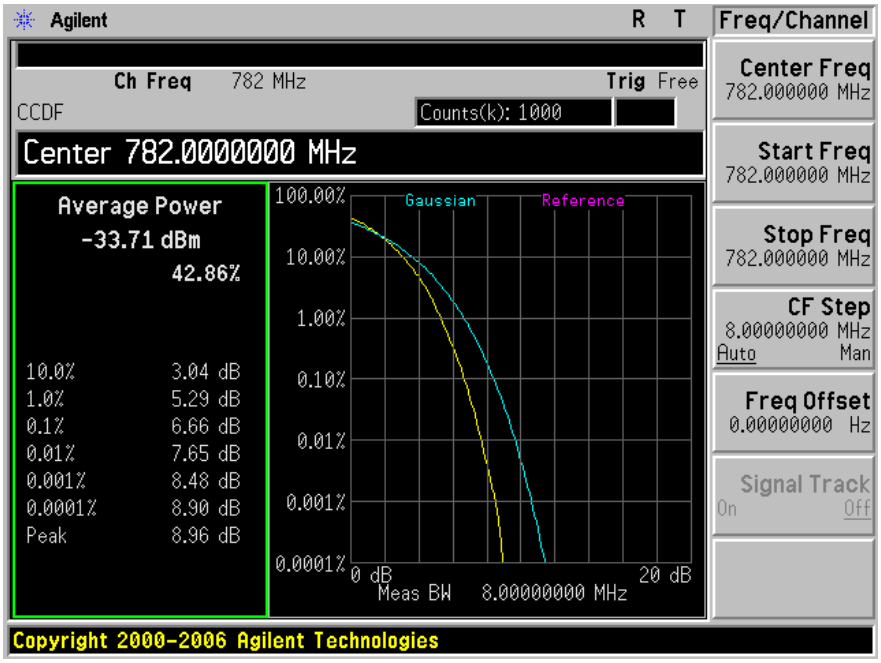


Output

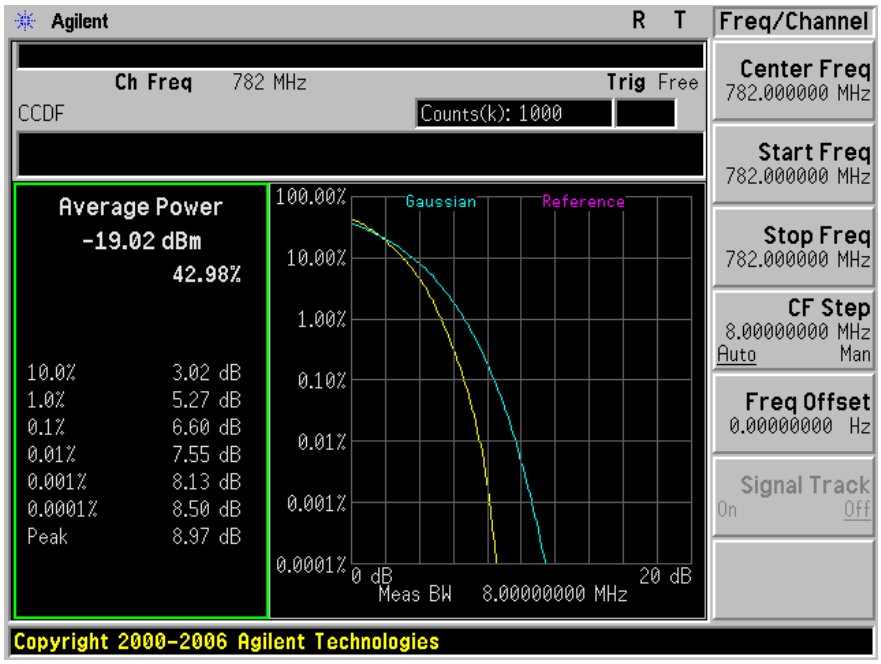


Modulation: 64QAM, Frequency: 782 MHz

Input



Output



5 FCC §2.1047 - MODULATION CHARACTERISTIC

5.1 Applicable Standard

According to FCC § 2.1047(d) and part 25, 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: CFR 47, Section 2.1049 and Section 27.53.

6.2 Test Procedure

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

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

6.3 Environmental Conditions

Temperature:	22-24°C
Relative Humidity:	41-43 %
ATM Pressure:	101-102 kPa

** The testing was performed by Victor Zhang on from 2009-08-24 to 2009-08-26 in RF Site.*

6.4 Test Equipment List and Details

Manufacturers	Descriptions	Models	Serial Numbers	Calibration Dates
Agilent	Spectrum Analyzer	E4440A	MY44303352	2009-04-27
Agilent	Signal Generator	E4438C	MY47271125	2009-04-13

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

6.5 Summary of Test Results

Occupied Bandwidth – Downlink

Modulation	Frequency (MHz)	Emission Bandwidth Input (MHz)	Emission Bandwidth Output (MHz)
QPSK	752	8.9368	8.9186
16QAM	752	8.9402	8.9393
64QAM	752	8.9458	8.9355

Occupied Bandwidth – Uplink

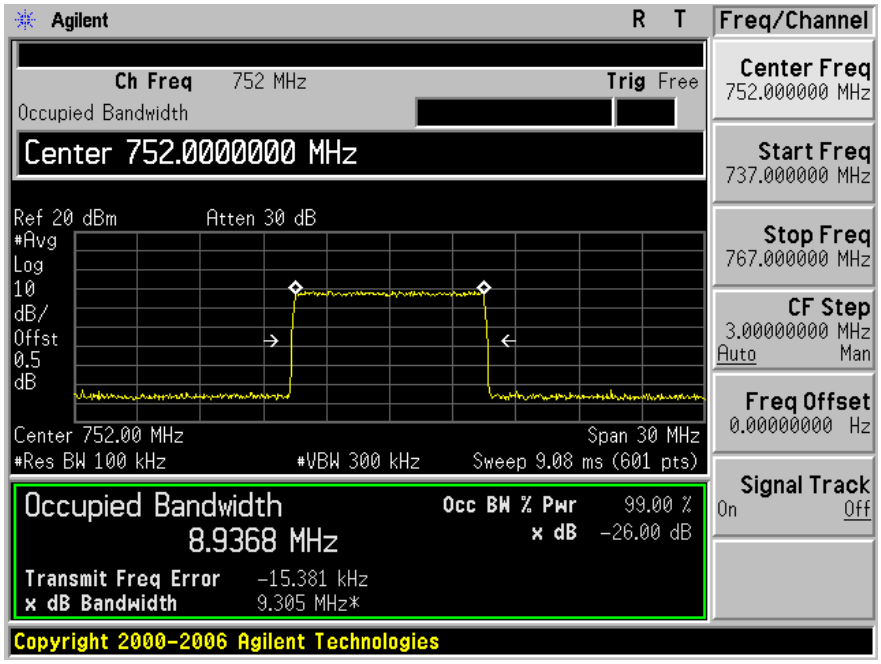
Modulation	Frequency (MHz)	Emission Bandwidth Input (MHz)	Emission Bandwidth Output (MHz)
QPSK	782	8.9221	8.9089
16QAM	782	8.9303	8.9101
64QAM	782	8.9198	8.9092

Please refer to the following plots for details.

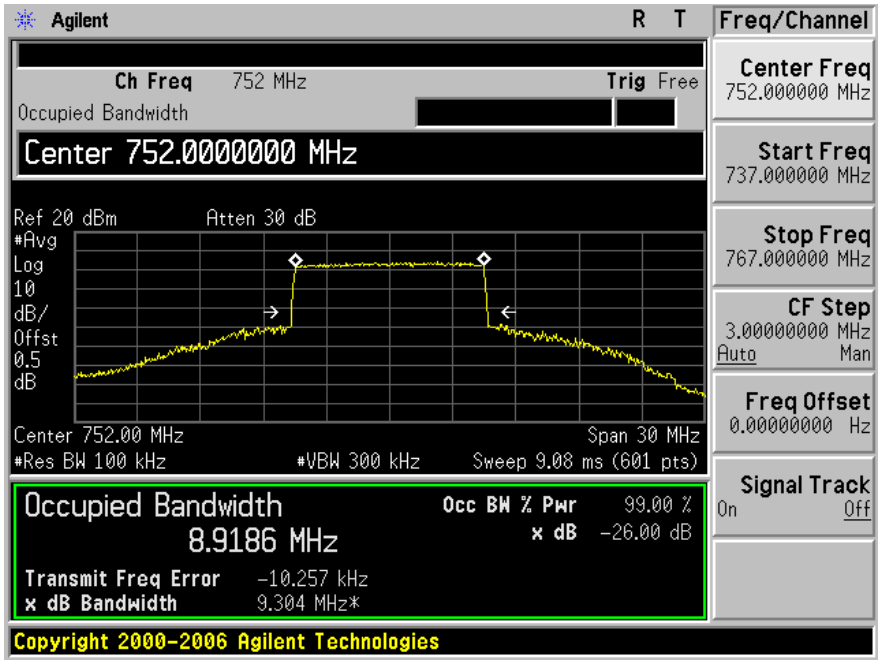
Downlink:

Modulation: QPSK, Frequency: 752 MHz

Input

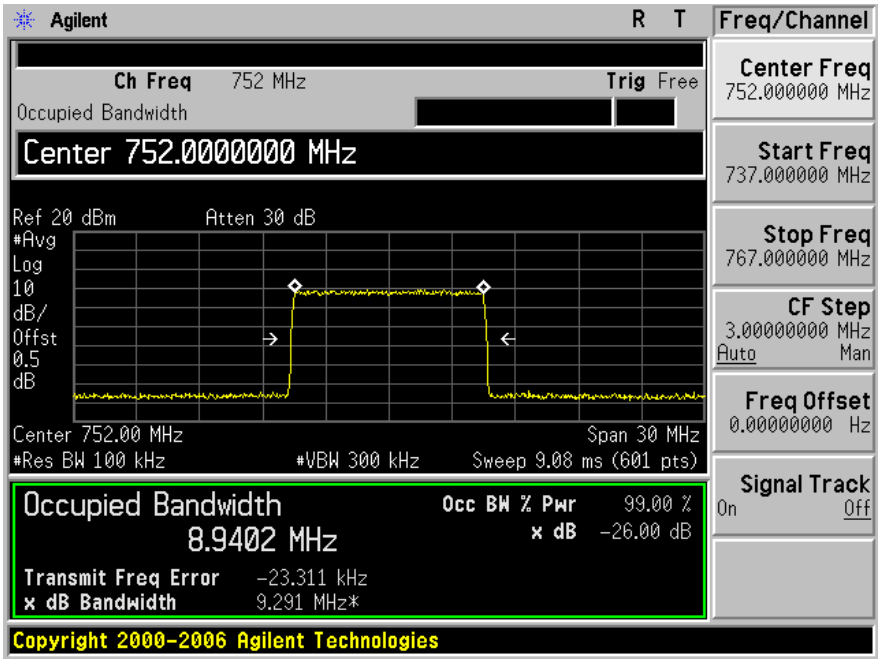


Output

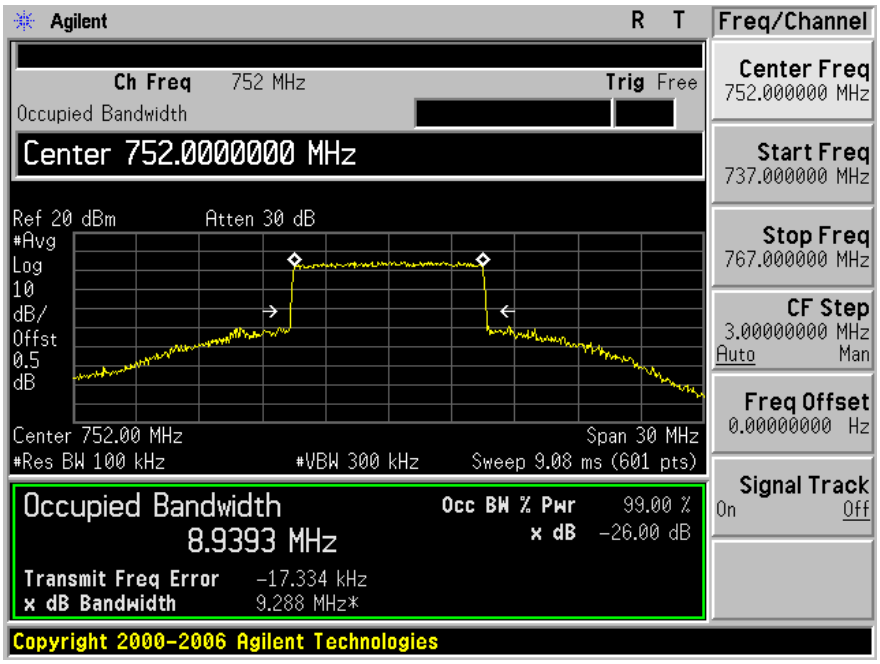


Modulation: 16QAM, Frequency: 752 MHz

Input

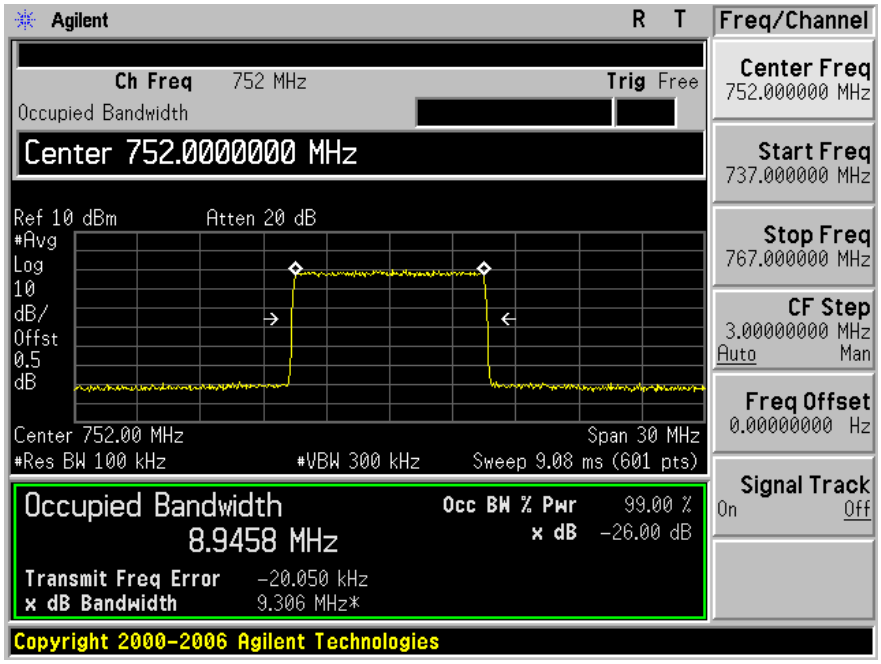


Output

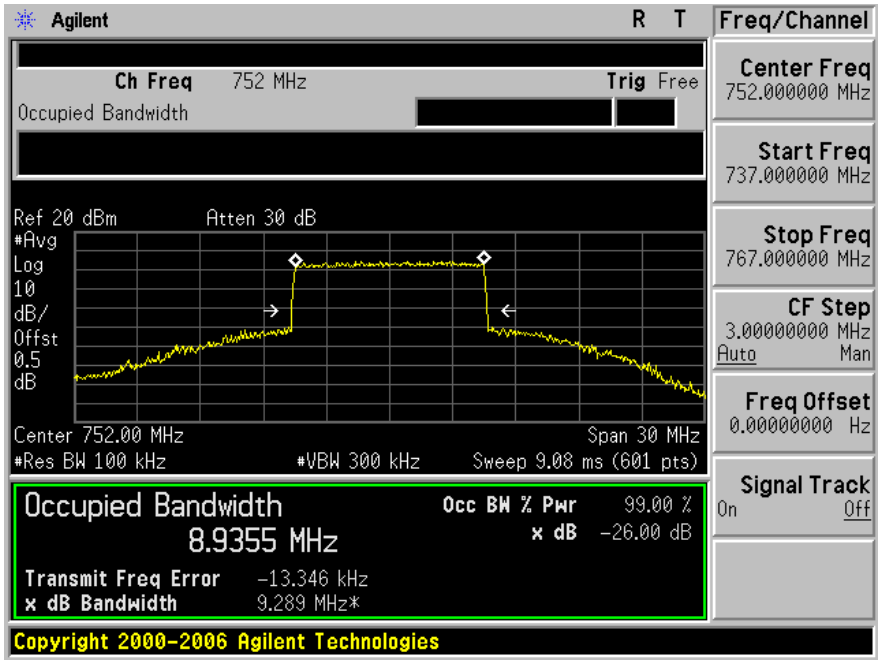


Modulation: 64QAM, Frequency: 752 MHz

Input



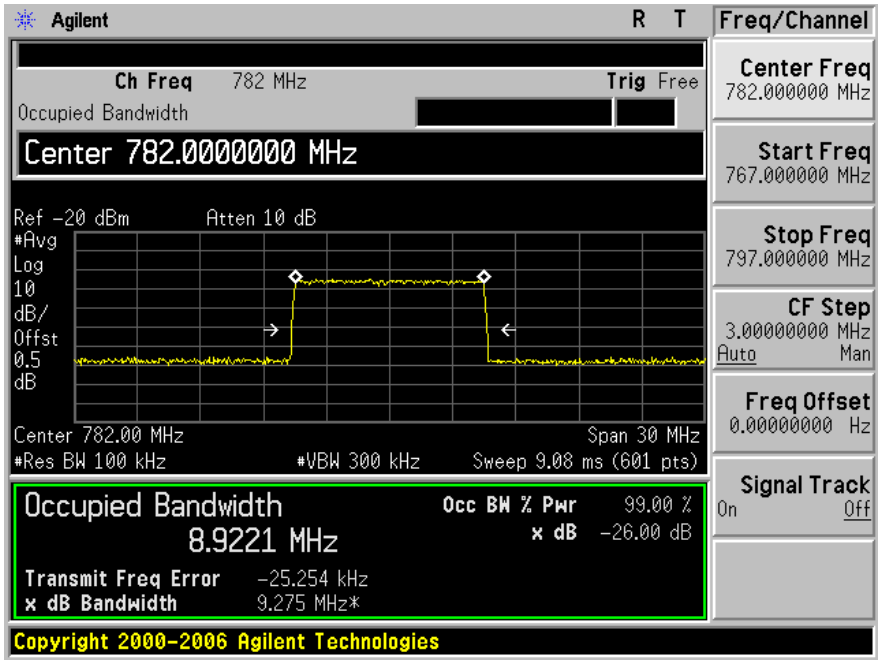
Output



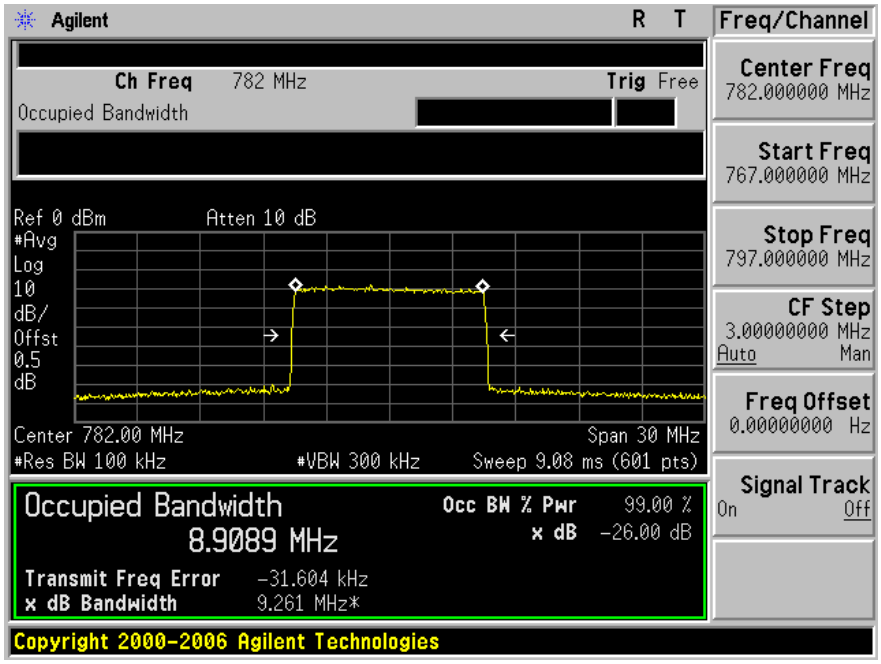
Uplink:

Modulation: QPSK, Frequency: 782 MHz

Input

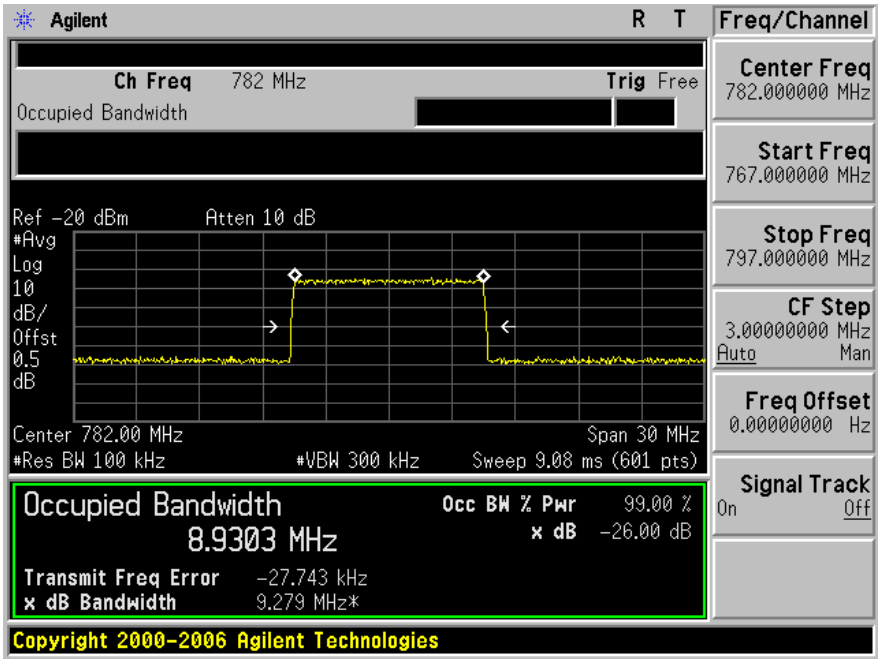


Output

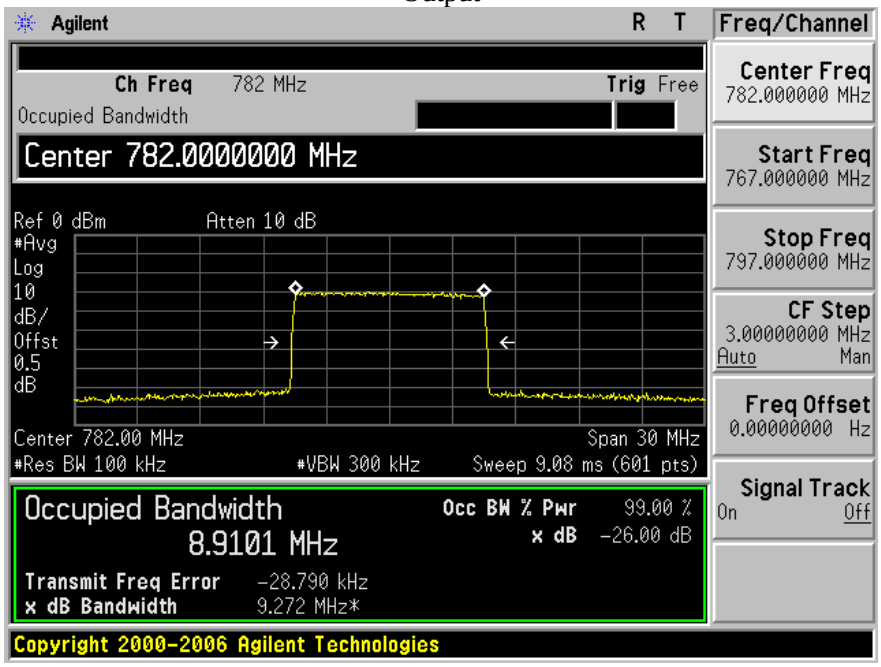


Modulation: 16QAM, Frequency: 782 MHz

Input

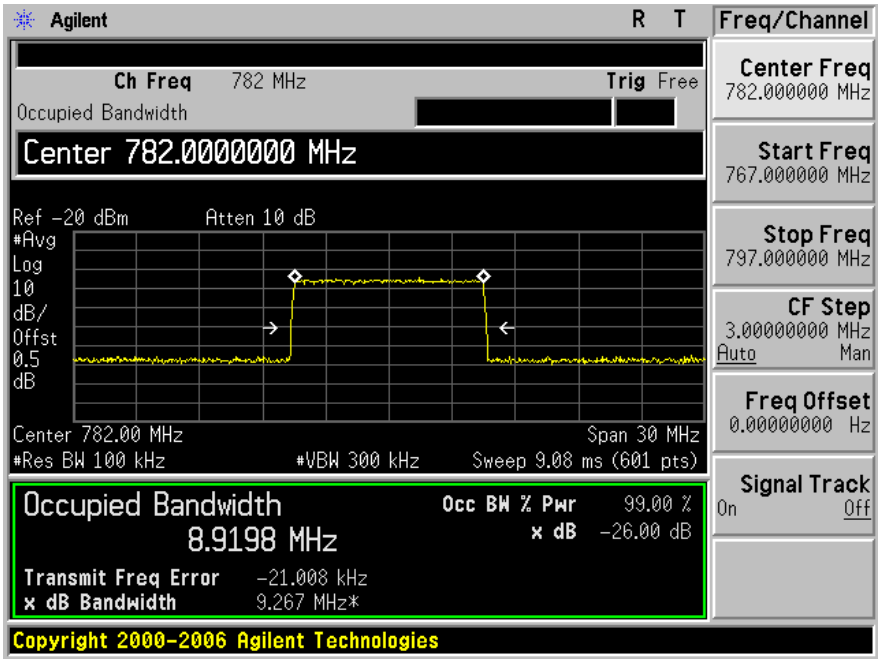


Output

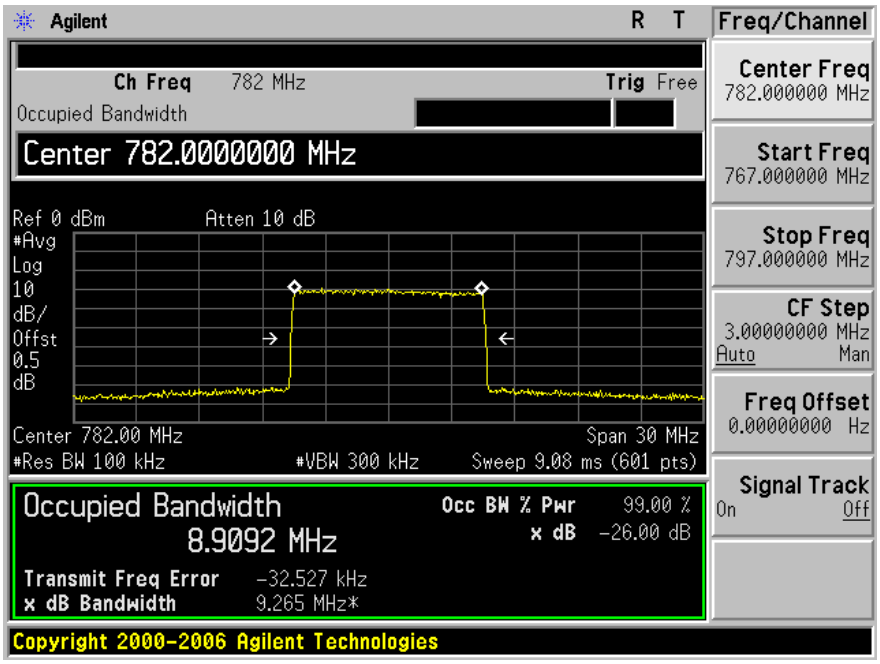


Modulation: 64QAM, Frequency: 782 MHz

Input



Output



7 FCC §2.1053 & §27.53 - SPURIOUS RADIATED EMISSIONS

7.1 Applicable Standard

Requirements: CFR 47, § 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 Environmental Conditions

Temperature:	22.7 °C
Relative Humidity:	44 %
ATM Pressure:	101.7 kPa

** The testing was performed by Dennis Huang on 2009-08-25 in 5 Meter Chamber 3.*

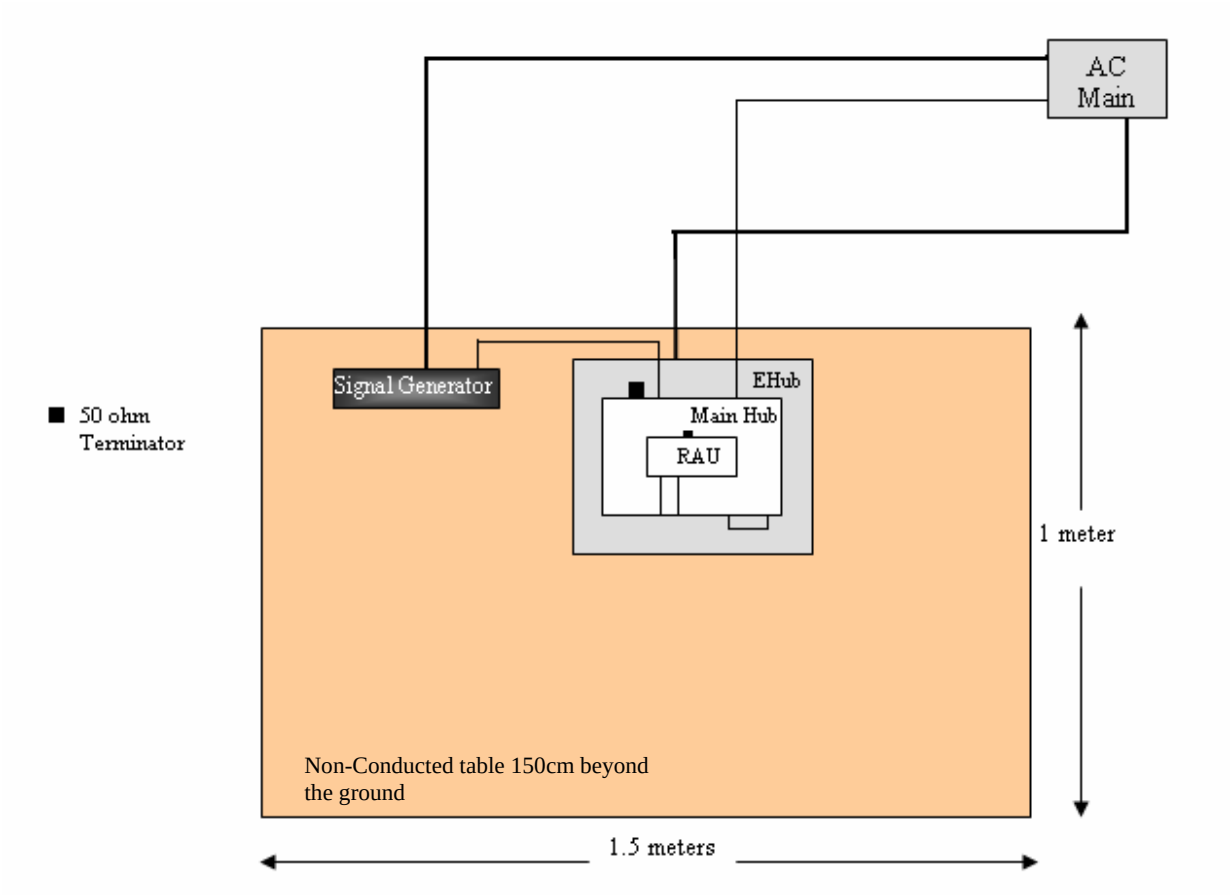
7.4 Test Equipment List and Details

Manufacturer	Description	Model	Serial Number	Calibration Date
Agilent	Spectrum Analyzer	E4440A	US45303156	2009-07-23
Sunol Sciences	Antenna	JB1	A020106-1	2009-04-17
A.R.A	Horn Antenna	DRG-118/A	1132	2009-07-28
Agilent	Signal Generator	E4438C	MY47271125	2009-04-13
Ducommun	Amplifier	ALN-09173030-01	988251-03R	2009-03-04
HP	Pre-Amplifier	8447D	2944A06639	2009-06-05

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

7.5 Test Setup Block Diagram

Radiated Emissions



7.6 Summary of Test Results

The worst case reading as follows:

Modulation: QPSK

Mode: Downlink			
Margin (dB)	**Frequency (MHz)**	**Polarization (Horizontal/Vertical)**	**Input Frequency**
-25.46	4434.85	Vertical	752 MHz

Mode: Uplink			
Margin (dB)	**Frequency (MHz)**	**Polarization (Horizontal/Vertical)**	**Input Frequency**
-25.48	4437	Vertical	782 MHz

Modulation: 16QAM

Mode: Downlink			
Margin (dB)	**Frequency (MHz)**	**Polarization (Horizontal/Vertical)**	**Input Frequency**
-25.57	4436.2	Vertical	752 MHz

Mode: Uplink			
Margin (dB)	**Frequency (MHz)**	**Polarization (Horizontal/Vertical)**	**Input Frequency**
-25.01	3444	Vertical	782 MHz

Modulation: 64QAM

Mode: Downlink			
Margin (dB)	**Frequency (MHz)**	**Polarization (Horizontal/Vertical)**	**Input Frequency**
-25.16	4436.2	Vertical	752 MHz

Mode: Uplink			
Margin (dB)	**Frequency (MHz)**	**Polarization (Horizontal/Vertical)**	**Input Frequency**
-25.93	3444	Vertical	782 MHz

7.7 Test Results

Modulation: QPSK

Downlink (Input frequency = 752 MHz)

Indicated		Azimuth (degree)	Test Antenna		Substituted					Limit (dBm)	Margin (dB)
Frequency (MHz)	S.A. Amp. (dBuV)		Height (m)	Polarity (H/V)	Frequency (MHz)	Level (dBm)	Antenna Gain Correction (dB)	Cable Loss (dB)	Absolute Level (dBm)		
4434.85	62.67	165	1.32	V	4434.85	-48.93	11.1	0.63	-38.46	-13	-25.46
1722.00	61.83	161	1.48	H	1722.00	-49.41	9.3	0.36	-40.47	-13	-27.47
2583.00	57.13	169	1.65	V	2583.00	-50.13	9.2	0.45	-41.38	-13	-28.38
4434.85	58.39	206	1.60	H	4434.85	-53.21	11.1	0.63	-42.74	-13	-29.74
1722.00	60.75	170	1.34	V	1722.00	-52.33	9.3	0.36	-43.39	-13	-30.39
861.033	54.34	235	1.00	H	861.033	-53.91	4.8	0.21	-49.32	-13	-36.32
2583.00	52.05	157	1.60	H	2583.00	-58.40	9.2	0.45	-49.65	-13	-36.65
861.033	53.53	218	1.50	V	861.033	-55.89	4.8	0.21	-51.30	-13	-38.30
1504.00	48.33	211	1.50	H	1504.00	-63.61	8.8	0.34	-55.15	-13	-42.15
1504.00	49.45	174	1.29	V	1504.00	-64.12	8.8	0.34	-55.66	-13	-42.66

Uplink (Input frequency = 782 MHz)

Indicated		Azimuth (degree)	Test Antenna		Substituted					Limit (dBm)	Margin (dB)
Frequency (MHz)	S.A. Amp. (dBuV)		Height (m)	Polarity (H/V)	Frequency (MHz)	Level (dBm)	Antenna Gain Correction (dB)	Cable Loss (dB)	Absolute Level (dBm)		
4437.00	62.65	192	1.50	V	4437.00	-48.95	11.1	0.63	-38.48	-13	-25.48
3444.00	57.28	235	1.50	V	3444.00	-48.31	9.9	0.53	-38.94	-13	-25.94
861.033	62.24	289	1.51	H	861.033	-46.01	4.8	0.21	-41.42	-13	-28.42
4437.00	58.97	246	1.78	H	4437.00	-52.63	11.1	0.63	-42.16	-13	-29.16
2583.00	55.62	187	1.50	V	2583.00	-51.64	9.2	0.45	-42.89	-13	-29.89
861.033	59.69	215	1.50	V	861.033	-49.73	4.8	0.21	-45.14	-13	-32.14
3444.00	53.50	54	2.00	H	3444.00	-55.35	9.9	0.53	-45.98	-13	-32.98
1722.00	54.38	197	1.50	H	1722.00	-56.86	9.3	0.36	-47.92	-13	-34.92
1722.00	56.18	181	1.50	V	1722.00	-56.90	9.3	0.36	-47.96	-13	-34.96
2583.00	53.65	313	195	H	2583.00	-56.80	9.2	0.45	-48.05	-13	-35.05

Modulation: 16QAM

Downlink (Input frequency = 752 MHz)

Indicated		Azimuth (degree)	Test Antenna		Substituted					Limit (dBm)	Margin (dB)
Frequency (MHz)	S.A. Amp. (dBuV)		Height (m)	Polarity (H/V)	Frequency (MHz)	Level (dBm)	Antenna Gain Correction (dB)	Cable Loss (dB)	Absolute Level (dBm)		
4436.20	62.56	166	1.50	V	4436.20	-49.04	11.1	0.63	-38.57	-13	-25.57
3444.00	56.36	228	1.50	V	3444.00	-49.23	9.9	0.53	-39.86	-13	-26.86
4436.20	59.54	173	1.99	H	4436.20	-52.06	11.1	0.63	-41.59	-13	-28.59
2583.00	56.88	172	1.50	V	2583.00	-50.38	9.2	0.45	-41.63	-13	-28.63
3444.00	54.69	61	1.97	H	3444.00	-54.16	9.9	0.53	-44.79	-13	-31.79
861.033	56.47	279	1.50	H	861.033	-51.78	4.8	0.21	-47.19	-13	-34.19
2583.00	54.44	314	1.82	H	2583.00	-56.01	9.2	0.45	-47.26	-13	-34.26
1722.00	54.76	199	1.47	H	1722.00	-56.48	9.3	0.36	-47.54	-13	-34.54
1722.00	55.44	179	2.00	V	1722.00	-57.64	9.3	0.36	-48.70	-13	-35.70
861.033	54.46	215	1.50	V	861.033	-54.96	4.8	0.21	-50.37	-13	-37.37

Uplink (Input frequency = 782 MHz)

Indicated		Azimuth (degree)	Test Antenna		Substituted					Limit (dBm)	Margin (dB)
Frequency (MHz)	S.A. Amp. (dBuV)		Height (m)	Polarity (H/V)	Frequency (MHz)	Level (dBm)	Antenna Gain Correction (dB)	Cable Loss (dB)	Absolute Level (dBm)		
3444.0	58.21	237	1.50	V	3444.00	-47.38	9.9	0.53	-38.01	-13	-25.01
4436.2	62.53	196	1.50	V	4436.20	-49.07	11.1	0.63	-38.60	-13	-25.60
861.00	62.56	284	1.52	H	861.033	-45.69	4.8	0.21	-41.10	-13	-28.10
4436.2	59.60	241	1.50	H	4436.20	-52.00	11.1	0.63	-41.53	-13	-28.53
2583.0	54.21	256	2.15	V	2583.00	-53.05	9.2	0.45	-44.30	-13	-31.30
3444.0	55.00	55	1.93	H	3444.00	-53.85	9.9	0.53	-44.48	-13	-31.48
861.00	59.71	218	1.50	V	861.033	-49.71	4.8	0.21	-45.12	-13	-32.12
2583.0	54.54	310	2.20	H	2583.00	-55.91	9.2	0.45	-47.16	-13	-34.16
1722.0	55.68	180	1.50	V	1722.00	-57.40	9.3	0.36	-48.46	-13	-35.46
1722.0	53.44	120	1.50	H	1722.00	-57.80	9.3	0.36	-48.86	-13	-35.86

Modulation: 64QAM

Downlink (Input frequency = 752 MHz)

Indicated		Azimuth (degree)	Test Antenna		Substituted					Limit (dBm)	Margin (dB)
Frequency (MHz)	S.A. Amp. (dBuV)		Height (m)	Polarity (H/V)	Frequency (MHz)	Level (dBm)	Antenna Gain Correction (dB)	Cable Loss (dB)	Absolute Level (dBm)		
4436.20	62.97	167	1.5	V	4436.20	-48.63	11.1	0.63	-38.16	-13	-25.16
3444.00	56.77	230	1.5	V	3444.00	-48.82	9.9	0.53	-39.45	-13	-26.45
2583.00	57.91	125	1.5	V	2583.00	-49.35	9.2	0.45	-40.60	-13	-27.60
4436.20	59.64	180	1.8	H	4436.20	-51.96	11.1	0.63	-41.49	-13	-28.49
3444.00	54.89	180	2.0	H	3444.00	-53.96	9.9	0.53	-44.59	-13	-31.59
861.033	56.32	280	1.5	H	861.033	-51.93	4.8	0.21	-47.34	-13	-34.34
2583.00	54.12	319	2.0	H	2583.00	-56.33	9.2	0.45	-47.58	-13	-34.58
1722.00	54.67	200	1.5	H	1722.00	-56.57	9.3	0.36	-47.63	-13	-34.63
1722.00	55.32	180	1.8	V	1722.00	-57.76	9.3	0.36	-48.82	-13	-35.82
861.033	54.97	214	1.5	V	861.033	-54.45	4.8	0.21	-49.86	-13	-36.86

Uplink (Input frequency = 782 MHz)

Indicated		Azimuth (degree)	Test Antenna		Substituted					Limit (dBm)	Margin (dB)
Frequency (MHz)	S.A. Amp. (dBuV)		Height (m)	Polarity (H/V)	Frequency (MHz)	Level (dBm)	Antenna Gain Correction (dB)	Cable Loss (dB)	Absolute Level (dBm)		
3444.0	57.29	238	1.50	V	3444.0	-48.30	9.9	0.53	-38.93	-13	-25.93
4436.2	62.13	180	1.50	V	4436.2	-49.47	11.1	0.63	-39.00	-13	-26.00
861.00	62.12	283	1.60	H	861.0	-46.13	4.8	0.21	-41.54	-13	-28.54
4436.2	58.91	240	1.50	H	4436.2	-52.69	11.1	0.63	-42.22	-13	-29.22
2583.0	54.01	255	1.79	V	2583.0	-53.25	9.2	0.45	-44.50	-13	-31.50
3444.0	54.87	102	1.80	H	3444.0	-53.98	9.9	0.53	-44.61	-13	-31.61
861.00	58.70	211	1.60	V	861.0	-50.72	4.8	0.21	-46.13	-13	-33.13
2583.0	54.31	310	1.80	H	2583.0	-56.14	9.2	0.45	-47.39	-13	-34.39
1722.0	55.47	175	1.50	V	1722.0	-57.61	9.3	0.36	-48.67	-13	-35.67
1722.0	53.28	119	1.50	H	1722.0	-57.96	9.3	0.36	-49.02	-13	-36.02

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

8.1 Applicable Standard

Requirements: CFR 47, § 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 10th harmonic.

8.3 Environmental Conditions

Temperature:	22-24°C
Relative Humidity:	41-43 %
ATM Pressure:	101-102 kPa

** The testing was performed by Victor Zhang on from 2009-08-24 to 2009-08-26 in RF Site.*

8.4 Test Equipment List and Details

Manufacturers	Descriptions	Models	Serial Numbers	Calibration Dates
Agilent	Spectrum Analyzer	E4440A	MY44303352	2009-04-27
Agilent	Signal Generator	E4438C	MY47271125	2009-04-13

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

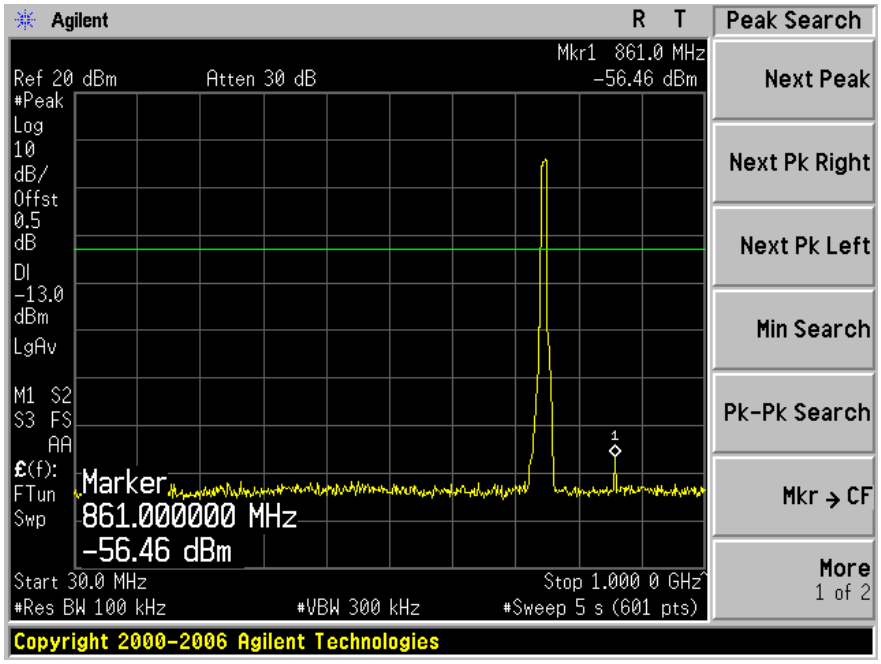
8.5 Test Results

Please refer to the following plots.

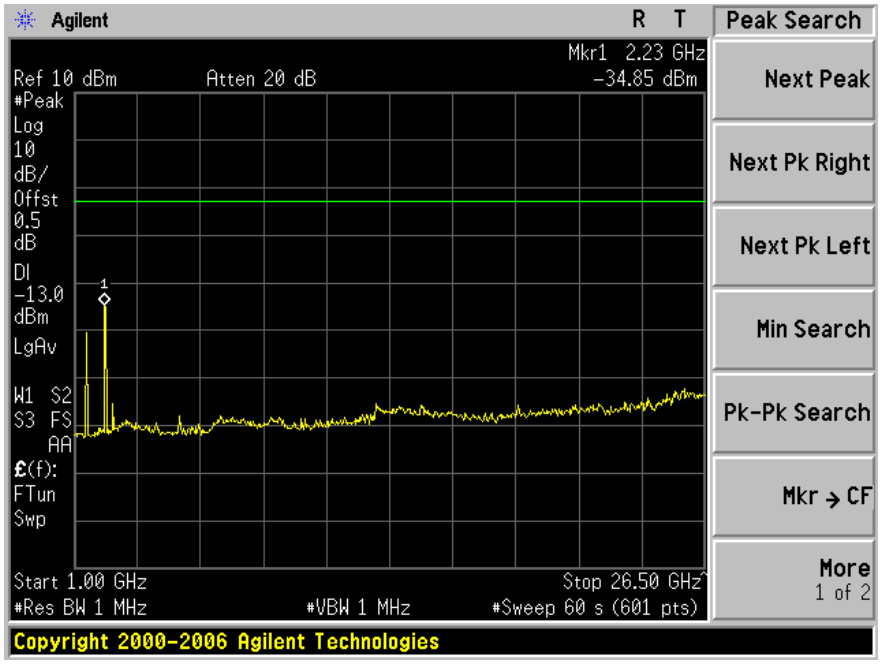
Downlink:

Modulation: QPSK, Frequency: 752 MHz

Plot 1: 30MHz to 1GHz

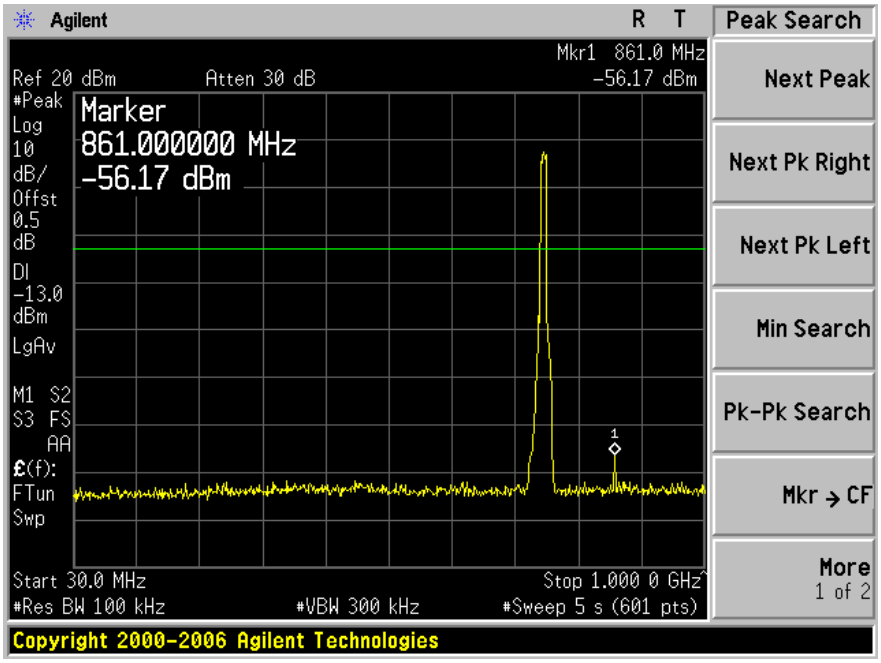


Plot 2: Above 1GHz

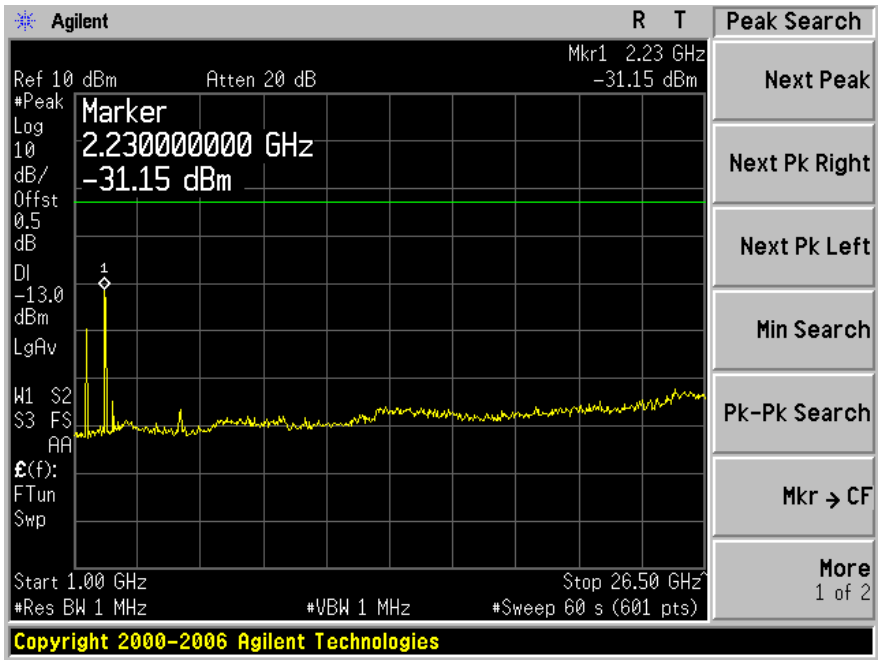


Modulation: 16QAM, Frequency: 752 MHz

Plot 1: 30MHz to 1GHz

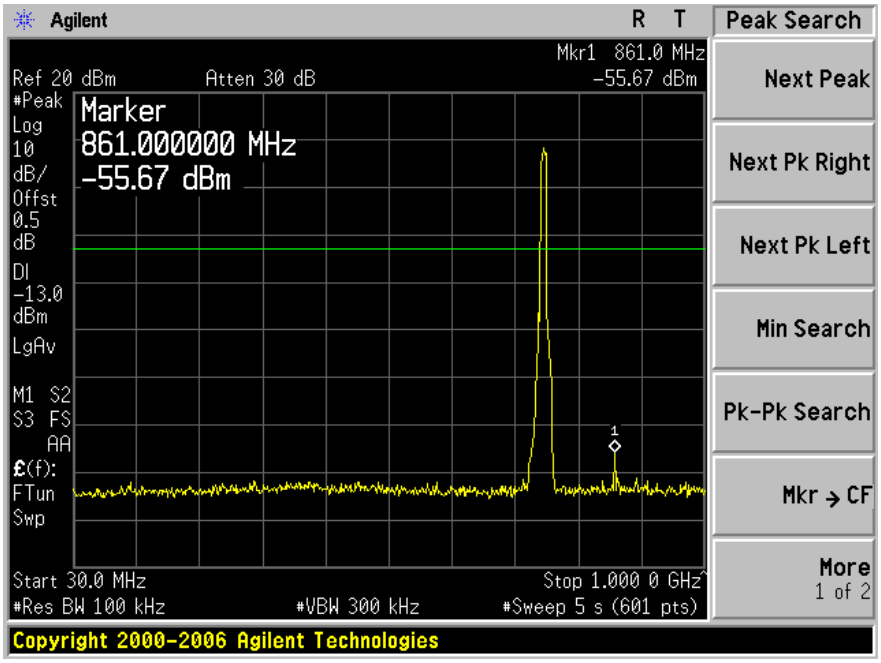


Plot 2: Above 1GHz

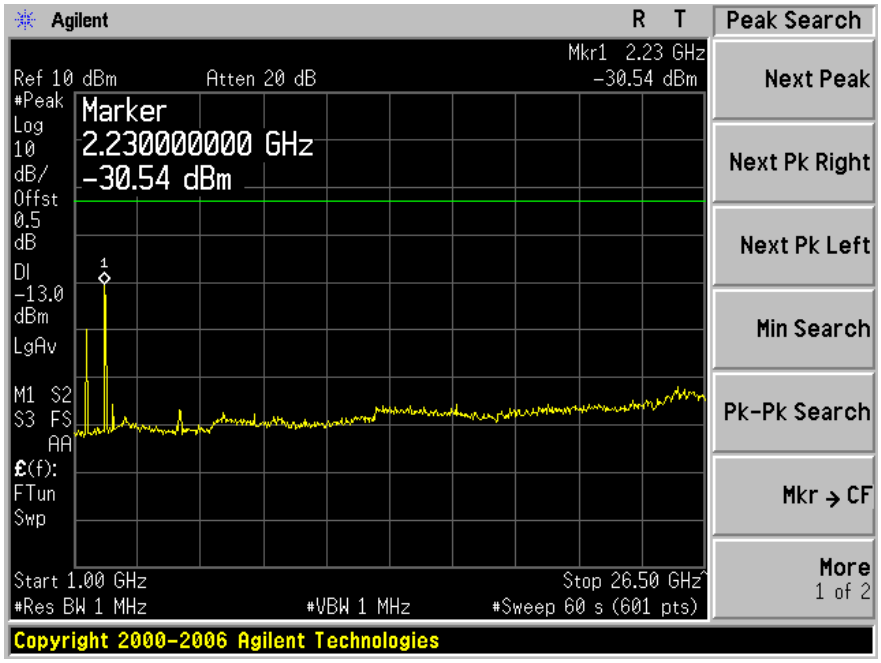


Modulation: 64QAM, Frequency: 752 MHz

Plot 1: 30MHz to 1GHz



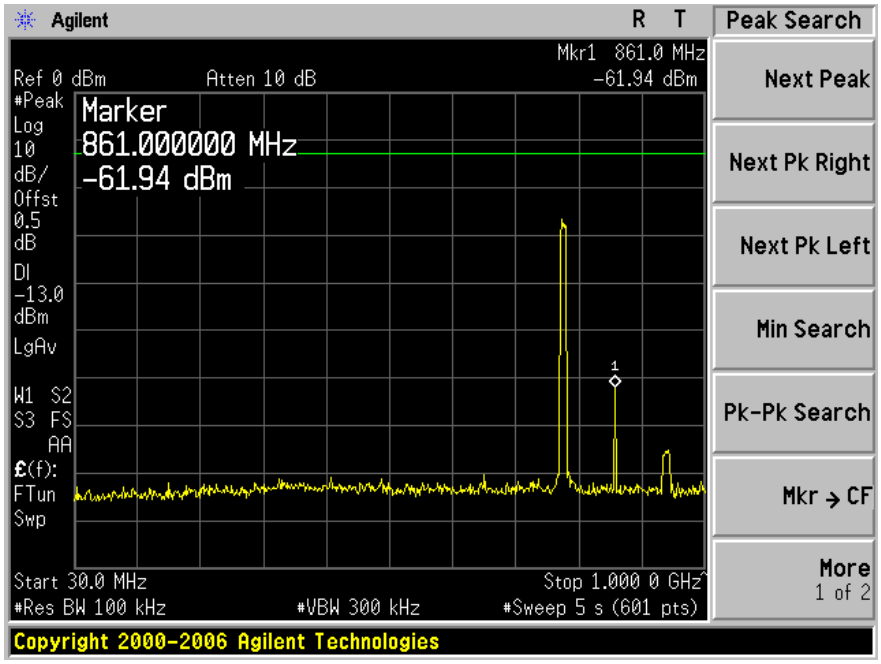
Plot 2: Above 1GHz



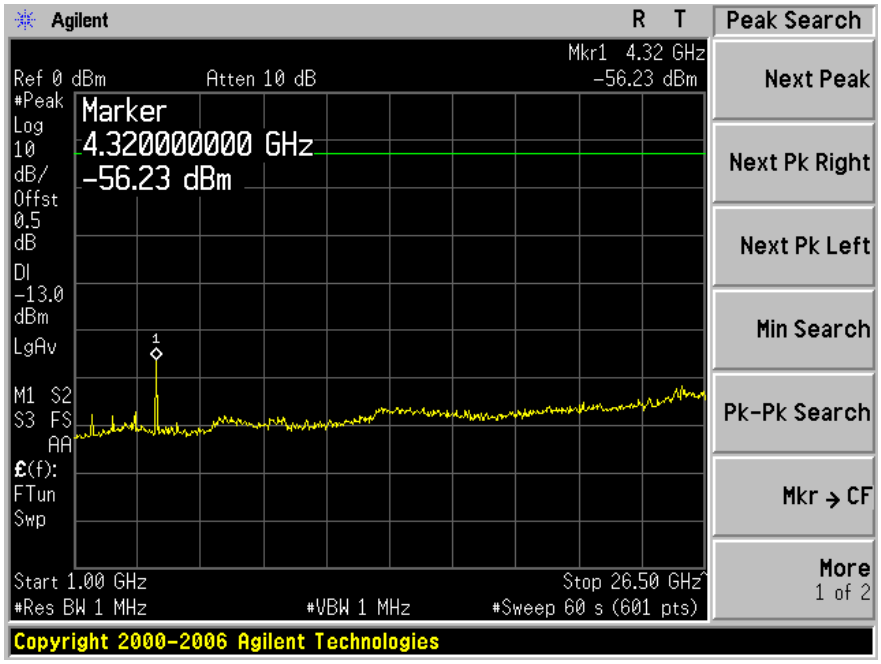
Uplink:

Modulation: QPSK, Frequency: 782 MHz

Plot 1: 30MHz to 1GHz

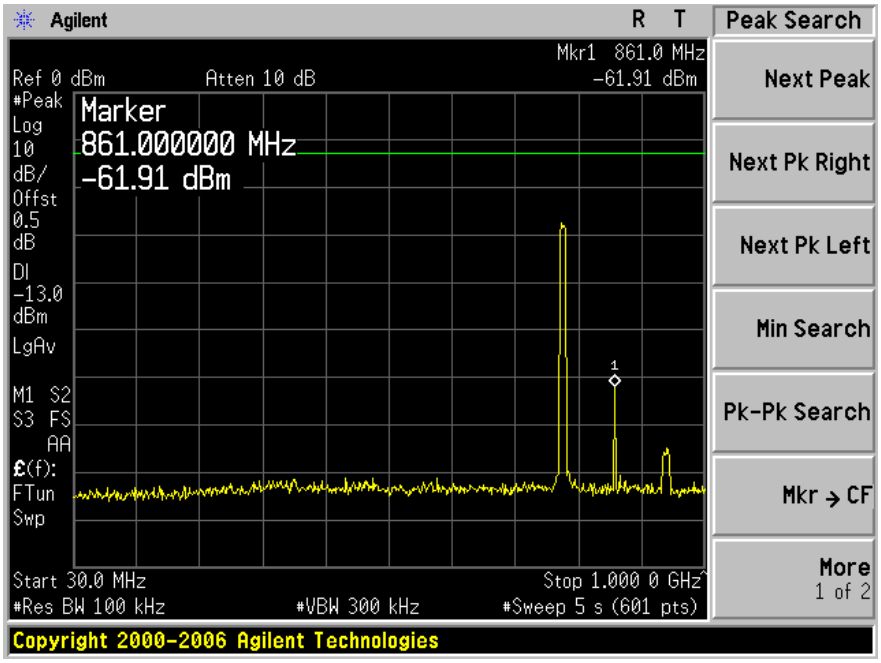


Plot 2: Above 1GHz

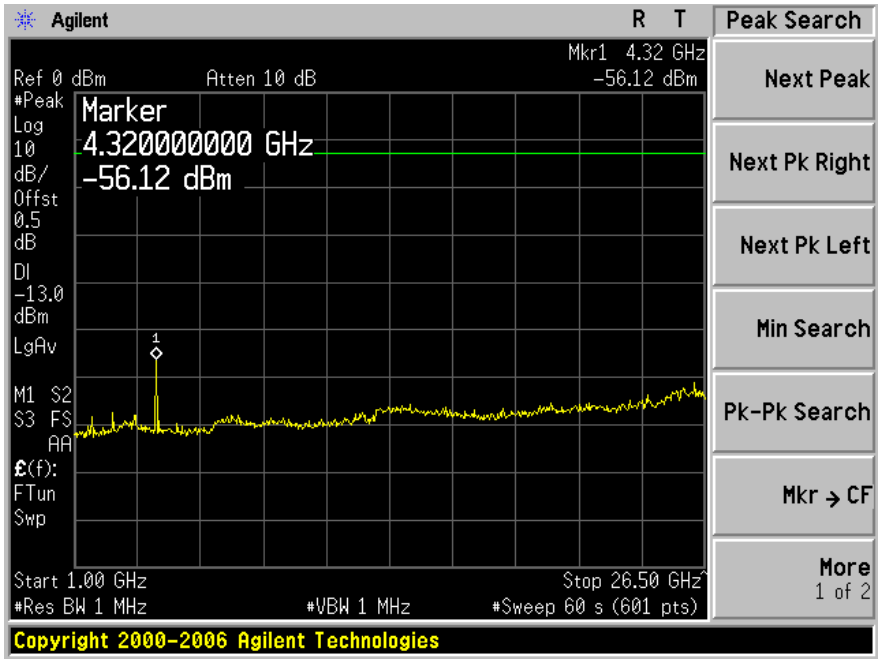


Modulation: 16QAM, Frequency: 782 MHz

Plot 1: 30MHz to 1GHz

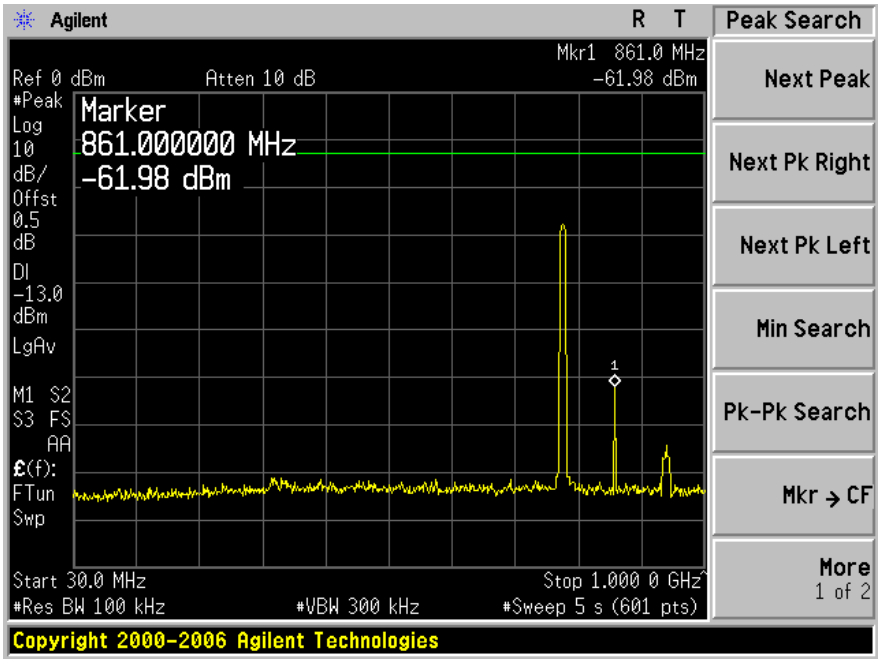


Plot 2: Above 1GHz

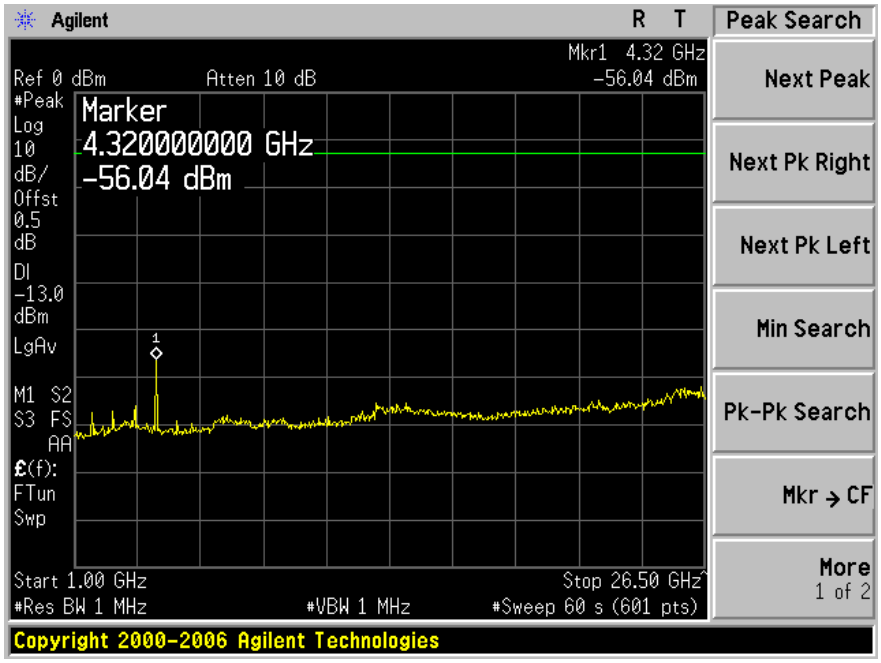


Modulation: 64QAM, Frequency: 782 MHz

Plot 1: 30MHz to 1GHz



Plot 2: Above 1GHz



9 FCC §27.53 – BAND EDGE

9.1 Applicable Standard

According to § 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 Environmental Conditions

Temperature:	22-24°C
Relative Humidity:	41-43 %
ATM Pressure:	101-102 kPa

** The testing was performed by Victor Zhang on from 2009-08-24 to 2009-08-26 in RF Site.*

9.4 Test Equipment List and Details

Manufacturers	Descriptions	Models	Serial Numbers	Calibration Dates
Agilent	Spectrum Analyzer	E4440A	MY44303352	2009-04-27
Agilent	Signal Generator	E4438C	MY47271125	2009-04-13

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

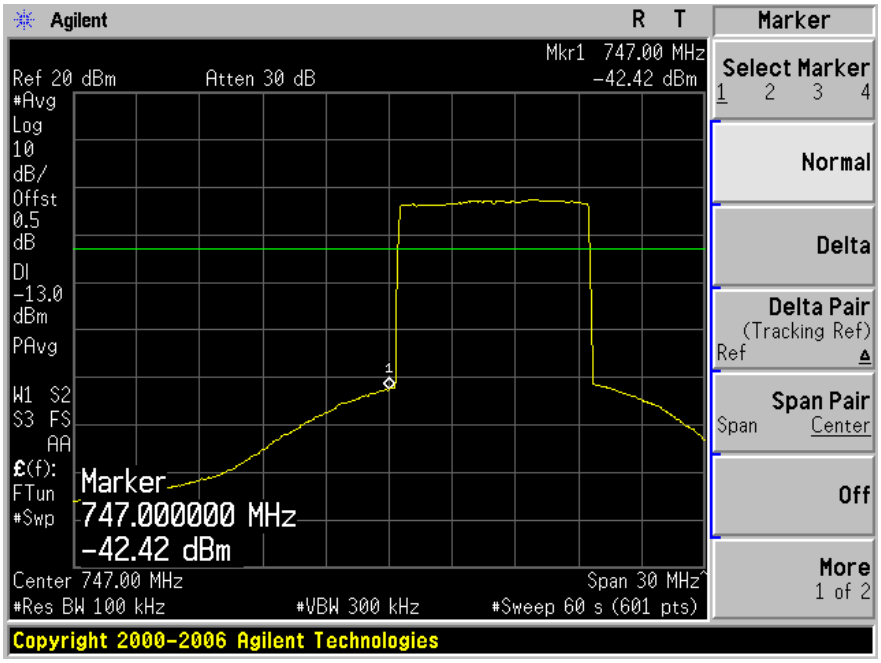
9.5 Test Results

Please refer to the following plots.

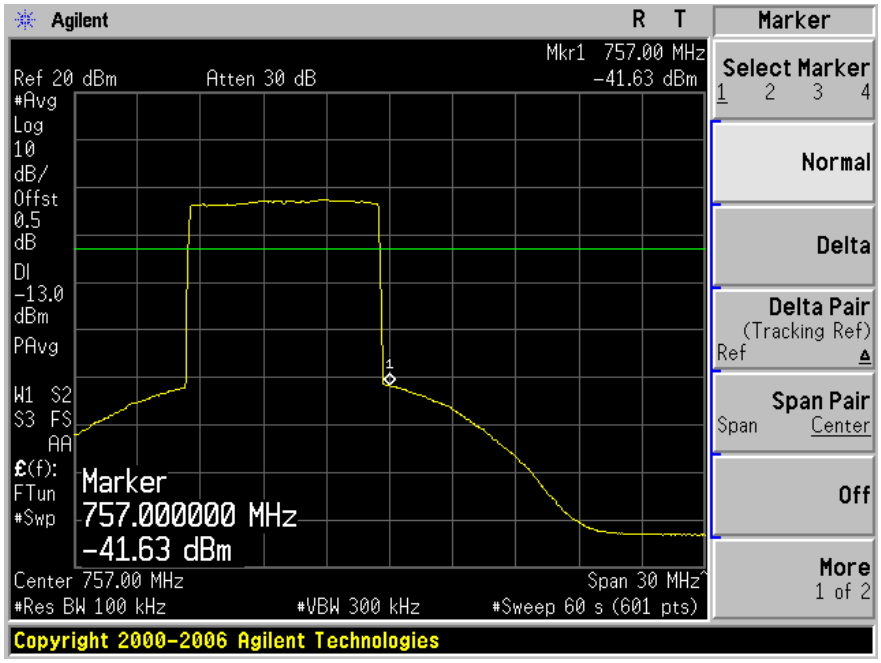
Downlink:

Modulation: QPSK

Plot 1: Lowest Edge

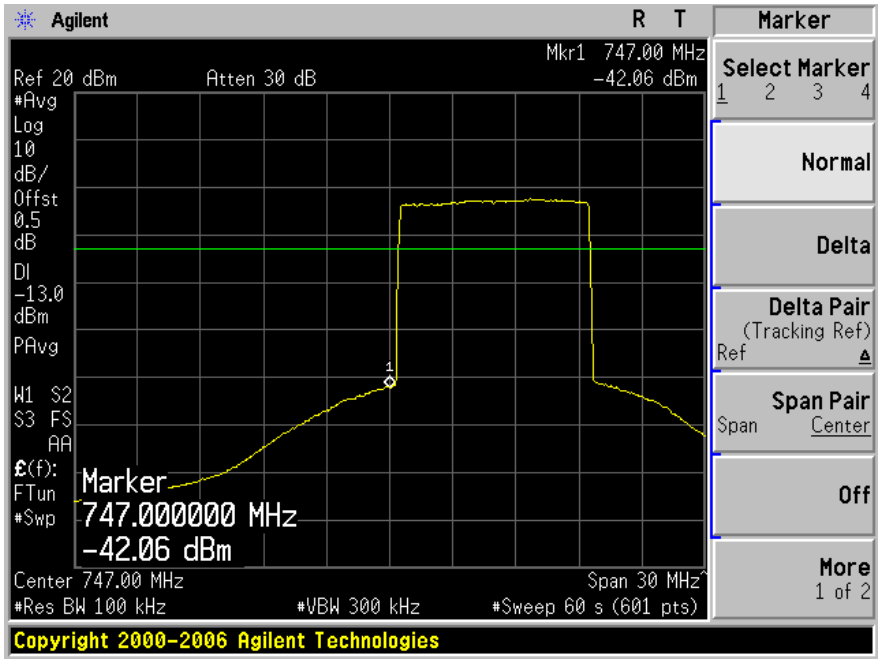


Plot 2: Highest Edge

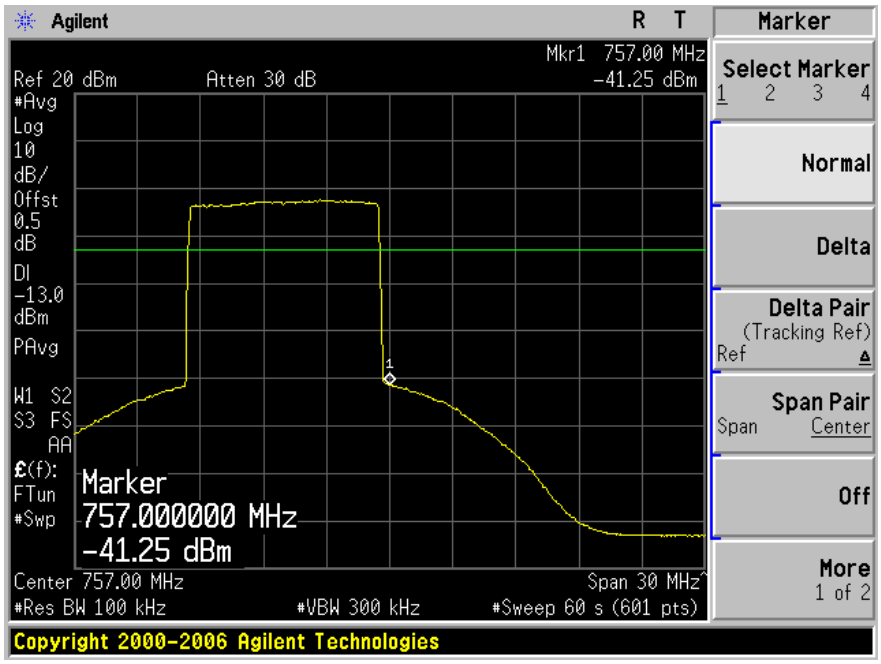


Modulation: 16QAM

Plot 1: Lowest Edge

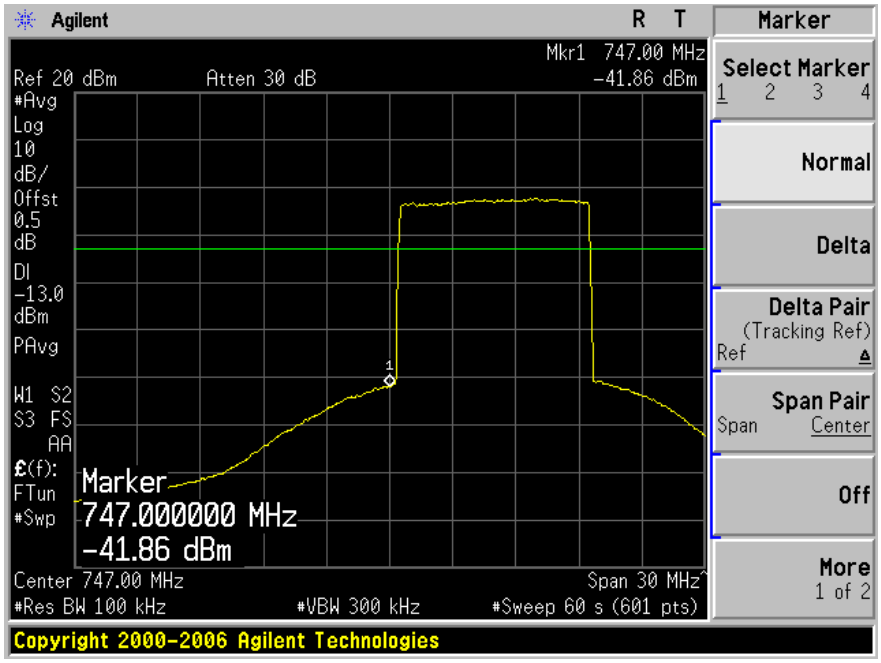


Plot 2: Highest Edge

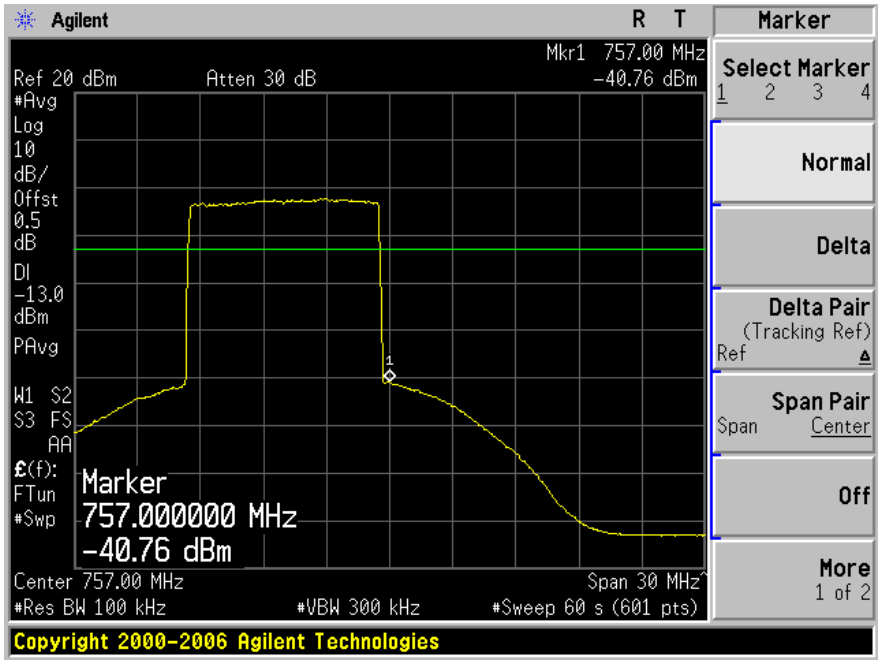


Modulation: 64QAM

Plot 1: Lowest Edge



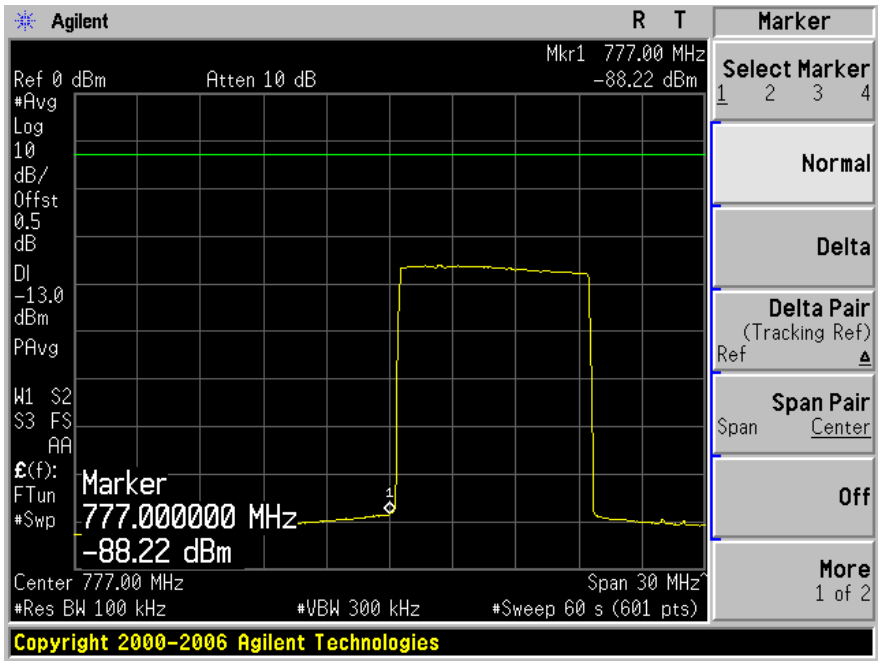
Plot 2: Highest Edge



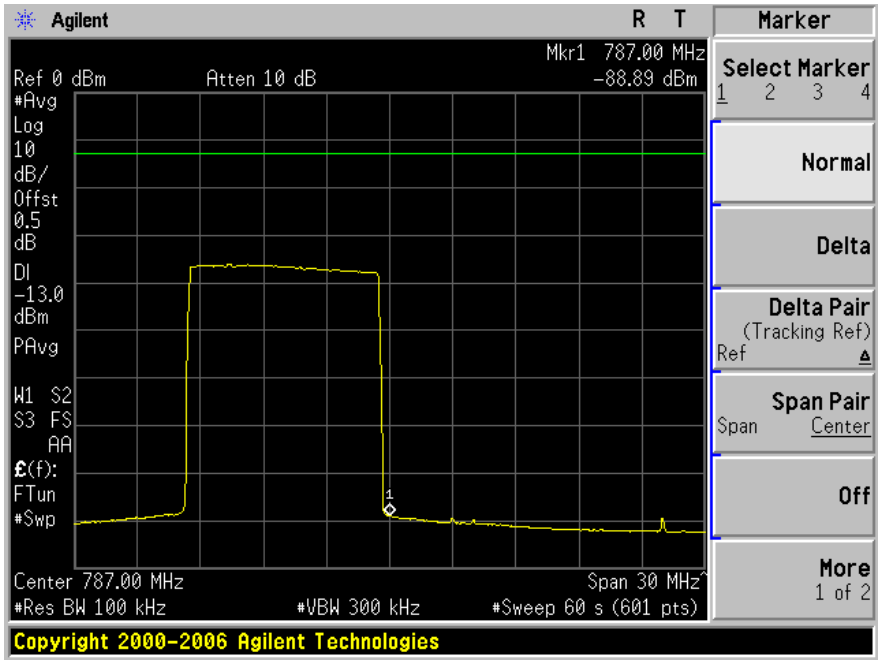
Uplink:

Modulation: QPSK

Plot 1: Lowest Edge

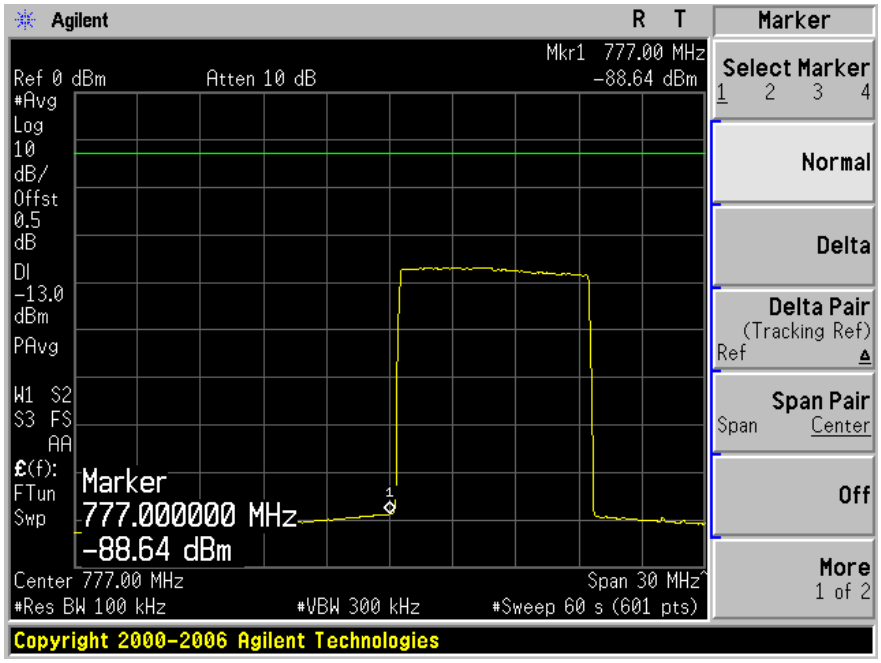


Plot 2: Highest Edge

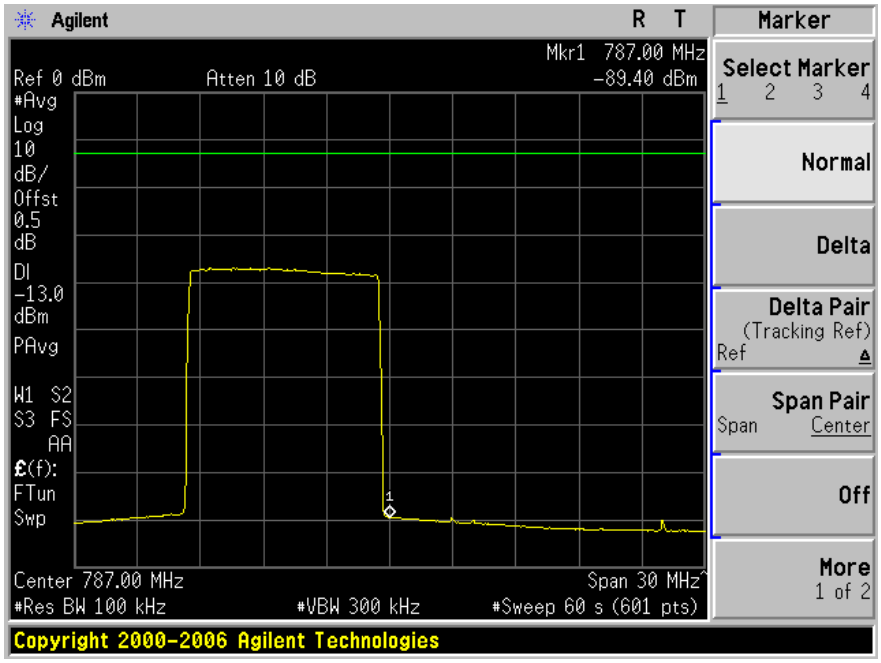


Modulation: 16QAM

Plot 1: Lowest Edge

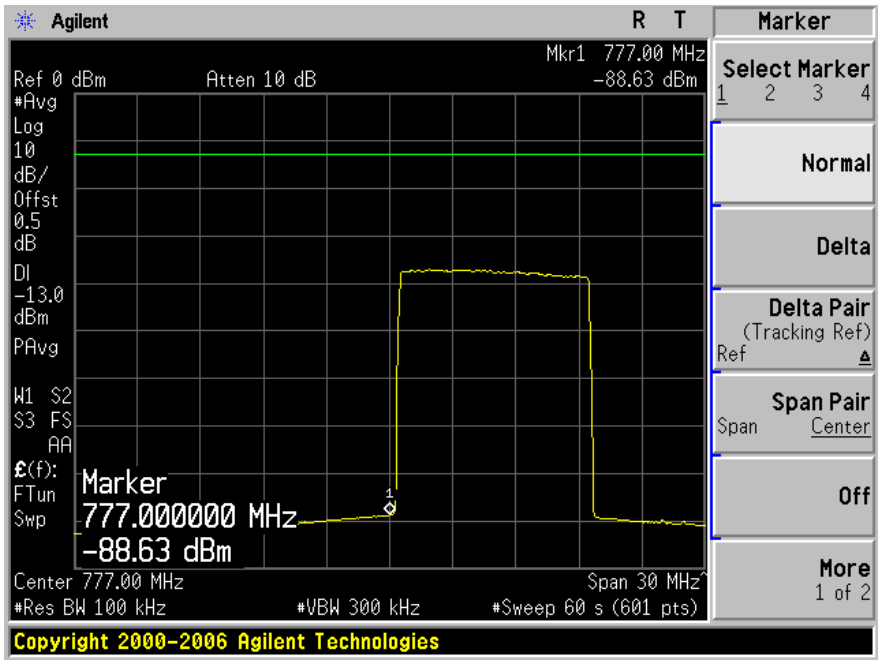


Plot 2: Highest Edge

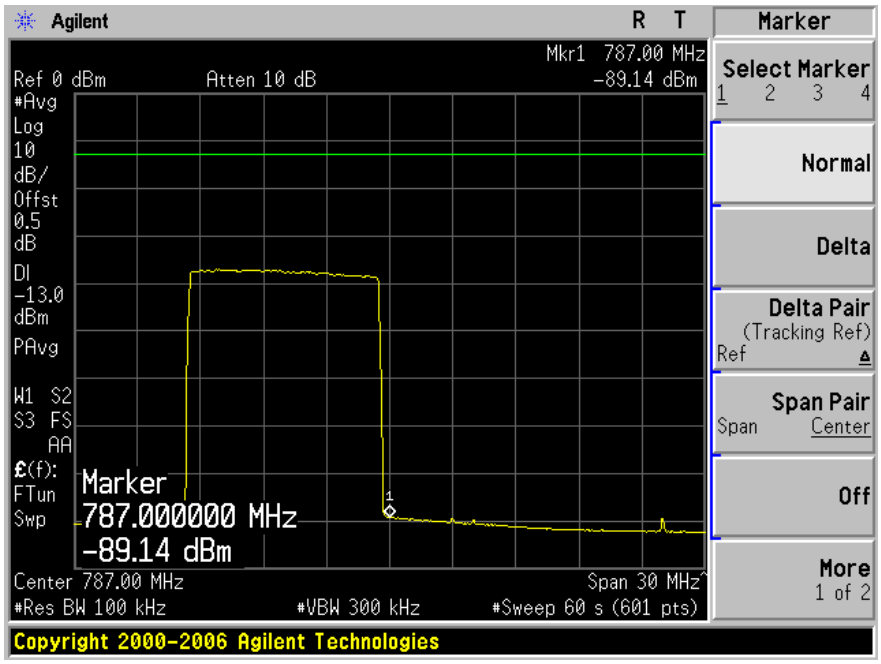


Modulation: 64QAM

Plot 1: Lowest Edge



Plot 2: Highest Edge



10 FCC §2.1055 & §27.54 – Frequency Stability

10.1 Applicable Standard

According to § 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 Environmental Conditions

Temperature:	22-24°C
Relative Humidity:	41-43 %
ATM Pressure:	101-102 kPa

** The testing was performed by Victor Zhang on from 2009-08-24 to 2009-08-26 in RF Site.*

10.4 Test Equipment List and Details

Manufacturers	Descriptions	Models	Serial Numbers	Calibration Dates
Agilent	Spectrum Analyzer	E4440A	MY44303352	2009-04-27
Agilent	Signal Generator	E4438C	MY47271125	2009-04-13
Tenney	Temperature Oven	Versa Tenn	12.431-8	2008-12-20

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

10.5 Test Results

Please refer to the following tables.

Downlink

The EUT is tested at 752 MHz with QPSK modulation

(Frequency Drift with Supply Voltage Variation)

Voltage (Vac)	Frequency Error (Hz)	Difference (Hz)	Frequency Error (ppm)
102	35	-19	0.046543
120	54	0	0.071809
138	71	17	0.094415

(Frequency Drift with Supply Temperature Variation)

Temperature (ºC)	Frequency Error (Hz)	Difference (Hz)	Frequency Error (ppm)
50	-6	-60	-0.007980
40	59	5	0.078457
30	36	-18	0.047872
20	54	0	0.071809
10	46	-8	0.061170
0	101	47	0.134309
-10	139	85	0.184840
-20	79	25	0.105053

Uplink:

The EUT is tested at 782 MHz with QPSK modulation

(Frequency Drift with Supply Voltage Variation)

Voltage (Vac)	Frequency Error (Hz)	Difference (Hz)	Frequency Error (ppm)
102	15	-79	0.019947
120	94	0	0.125000
138	18	-76	0.023936

(Frequency Drift with Supply Temperature Variation)

Temperature (ºC)	Frequency Error (Hz)	Difference (Hz)	Frequency Error (ppm)
50	31	-63	0.041223
40	139	45	0.184840
30	6	-88	0.007979
20	94	0	0.125000
10	14	-80	0.018617
0	6	-88	0.007979
-10	74	-20	0.098404
-20	86	-8	0.114362

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

11.1 Applicable Standard

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

Limits for General Population/Uncontrolled Exposure

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

f = frequency in MHz
* = 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

Downlink:

QPSK:

Maximum peak output power at antenna input terminal (dBm):	15.49
Maximum peak output power at antenna input terminal (mW):	35.40
Prediction distance (cm):	20
Prediction frequency (MHz):	752
Antenna Gain, typical (dBi):	8.39
Maximum Antenna Gain (numeric):	6.902
Power density at predication frequency and distance (mW/cm^2):	0.0486
MPE limit for uncontrolled exposure at predication frequency (mW/cm^2):	0.5013

16QAM:

Maximum peak output power at antenna input terminal (dBm):	15.47
Maximum peak output power at antenna input terminal (mW):	35.24
Prediction distance (cm):	20
Prediction frequency (MHz):	752
Antenna Gain, typical (dBi):	8.39
Maximum Antenna Gain (numeric):	6.902
Power density at predication frequency and distance (mW/cm^2):	0.04839
MPE limit for uncontrolled exposure at predication frequency (mW/cm^2):	0.5013

64QAM:

Maximum peak output power at antenna input terminal (dBm):	15.61
Maximum peak output power at antenna input terminal (mW):	36.39
Prediction distance (cm):	20
Prediction frequency (MHz):	752
Antenna Gain, typical (dBi):	8.39
Maximum Antenna Gain (numeric):	6.902
Power density at predication frequency and distance (mW/cm^2):	0.04997
MPE limit for uncontrolled exposure at predication frequency (mW/cm^2):	0.5013

Uplink:

QPSK:

Maximum peak output power at antenna input terminal (dBm):	-18.13
Maximum peak output power at antenna input terminal (mW):	0.0154
Prediction distance (cm):	20
Prediction frequency (MHz):	782
Antenna Gain, typical (dBi):	8.39
Maximum Antenna Gain (numeric):	6.902
Power density at predication frequency and distance (mW/cm^2):	0.0000211
MPE limit for uncontrolled exposure at predication frequency (mW/cm^2):	0.5213

16QAM:

Maximum peak output power at antenna input terminal (dBm):	-18.66
Maximum peak output power at antenna input terminal (mW):	0.0136
Prediction distance (cm):	20
Prediction frequency (MHz):	782
Antenna Gain, typical (dBi):	8.39
Maximum Antenna Gain (numeric):	6.902
Power density at predication frequency and distance (mW/cm^2):	0.0000187
MPE limit for uncontrolled exposure at predication frequency (mW/cm^2):	0.5213

64QAM:

Maximum peak output power at antenna input terminal (dBm):	-19.02
Maximum peak output power at antenna input terminal (mW):	0.0125
Prediction distance (cm):	20
Prediction frequency (MHz):	782
Antenna Gain, typical (dBi):	8.39
Maximum Antenna Gain (numeric):	6.902
Power density at predication frequency and distance (mW/cm^2):	0.0000172
MPE limit for uncontrolled exposure at predication frequency (mW/cm^2):	0.5213

Test Result

For Downlink, the highest power density level at 20 cm is 0.04997mW/cm², which is below the uncontrolled exposure limit of 0.5013 mW/cm² at 752 MHz.
For Uplink, the highest power density level at 40 cm is 0.0000211mW/cm², which is below the uncontrolled exposure limit of 0.5213 mW/cm² at 782 MHz.

Note:
Antenna gain is restricted to 1.5 Watt ERP (2.49 Watt EIRP) in order to satisfy RF expo- sure compliance requirements. If higher than 1.5 Watt ERP, routine MPE evaluation is needed. The antennas should be installed to provide at least 20 cm from all persons to satisfy MPE requirements of FCC Part 2, 2.1091.