Lab Code: 200167-0

FCC PART 90 SUBPART Z

TEST AND MEASUREMENT REPORT

For

Vecima Networks Inc.

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

FCC ID: OPPOBR3650HP
Model: VistaMax OBR3650/HP+

Report Type:	**Product Type:**
Original Report	3.65 GHz WiMax Base Station Transceiver

Test Engineer:	Jack Liu
Report Number:	R0902203-90
Report Date:	2009-03-24
Reviewed By:	Daniel Deng Senior RF Engineer
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GENERAL INFORMATION

Product Description for Equipment under Test (EUT)

This BACL measurement and test report has been prepared on behalf of *Vecima Networks Inc.* product, FCC ID: OPPOBR3650HP, Model: VistaMAX OBR3650/HP+ or the "EUT" as referred to in this report is a WiMAX/IEEE 802.16-2004 outdoor base station transceiver operating in the 3650~3675 MHz band.

Technical Specification:

Item	Specification
RF Frequency	3650 to 3675 MHz
RF Frequency Step Size	250 kHz
Duplexing Mode	TDD
Channel Bandwidth	3.5 MHz or 7 MHz (software selectable)
Modulation Types	IEEE 802.16-2004, OFDM256, burst by burst adaptive BPSK-1/2 QPSK-1/2, QPSK-3/4 16QAM-1/2, 16QAM-3/4 64QAM-2/3, 64QAM-3/4
Output Power	+17 dBm to +27 dBm

Two external antennas are available for the EUT.

Items	Omni Antenna	120° Vertical Antenna
Antenna Gain	11dBi	12dBi
Polarization	Vertical	Vertical
Azimuth Beam Width	360°	120°
Tuned Frequency	3.4 - 3.7 GHz	3.4 - 3.7 GHz

Mechanical Description

The EUT is of metallic construction and measures approximately 50.8 cm (L) x 20 cm (W) x 12.7 mm (H) with an approximate weight of 9 kg.

** The test data gathered are from typical production sample, sample ID: 72268, serial number: 11122 provided by the BACL.*

Objective

This report is prepared on behalf of *Vecima Networks, Inc.* in accordance with Part 2, Subpart J and Part 90 Subpart Z of the Federal Communication Commissions rules.

The objective is to determine compliance with FCC rules for

RF Output Power
Occupied Bandwidth
Spurious Emissions at Antenna Terminal
Field Strength of Spurious Radiation
Frequency Stability

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 90 Subparts Z - Wireless Broadband Services in the 3650-3700 MHz Band

Applicable Standards: 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.

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 $\pm$2.0 dB for Conducted Emissions tests and $\pm$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.

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/Standards/scopes/2001670.htm

SYSTEM TEST CONFIGURATION

Justification

The EUT was configured for testing with instructions provided by the manufacturer which set the rated power at antenna port.

The final qualification test was performed with the EUT operating with testing software provided by the manufacturer.

Equipment Modifications

No modifications were necessary for the EUT to comply with the applicable limits and requirements.

Local Support Equipment List and Details

N/A

Power Supply Information

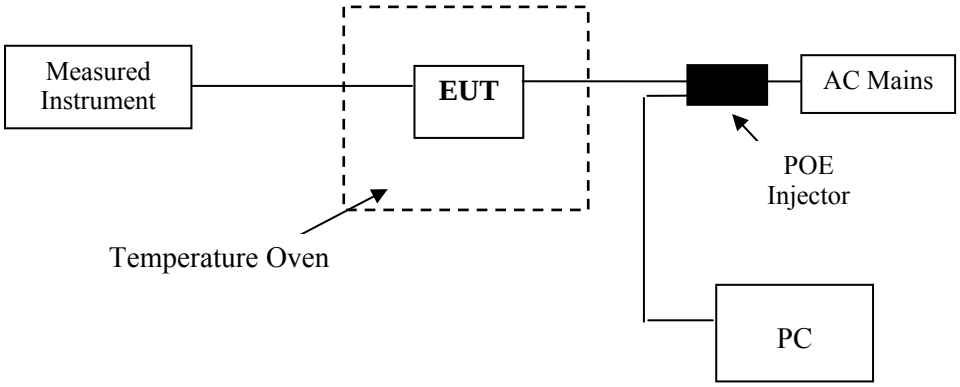
Manufacturer	Description	Model	Serial Number
Vecima Networks	Single Port POE Injector	PW183RB4800F02	VPN100002+

Interface Ports and Cabling

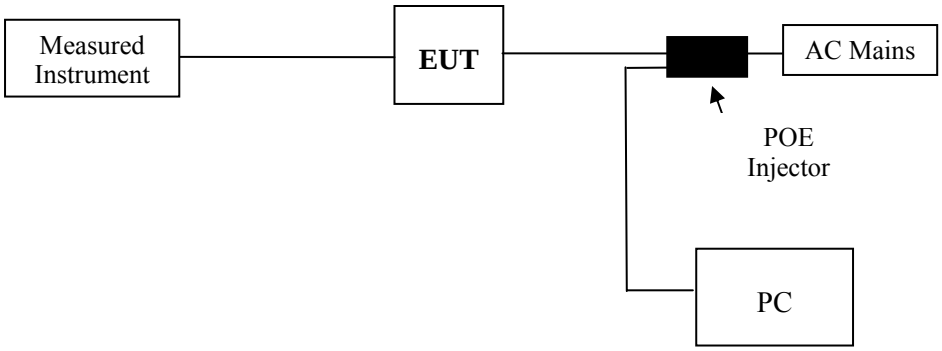
Cable Description	Length (m)	From	To
Ethernet Cable (RJ-45)	1.5	PC	POE Injector
Ethernet Cable (RJ-45)	1.5	POE Injector	EUT

Test Setup Block Diagram

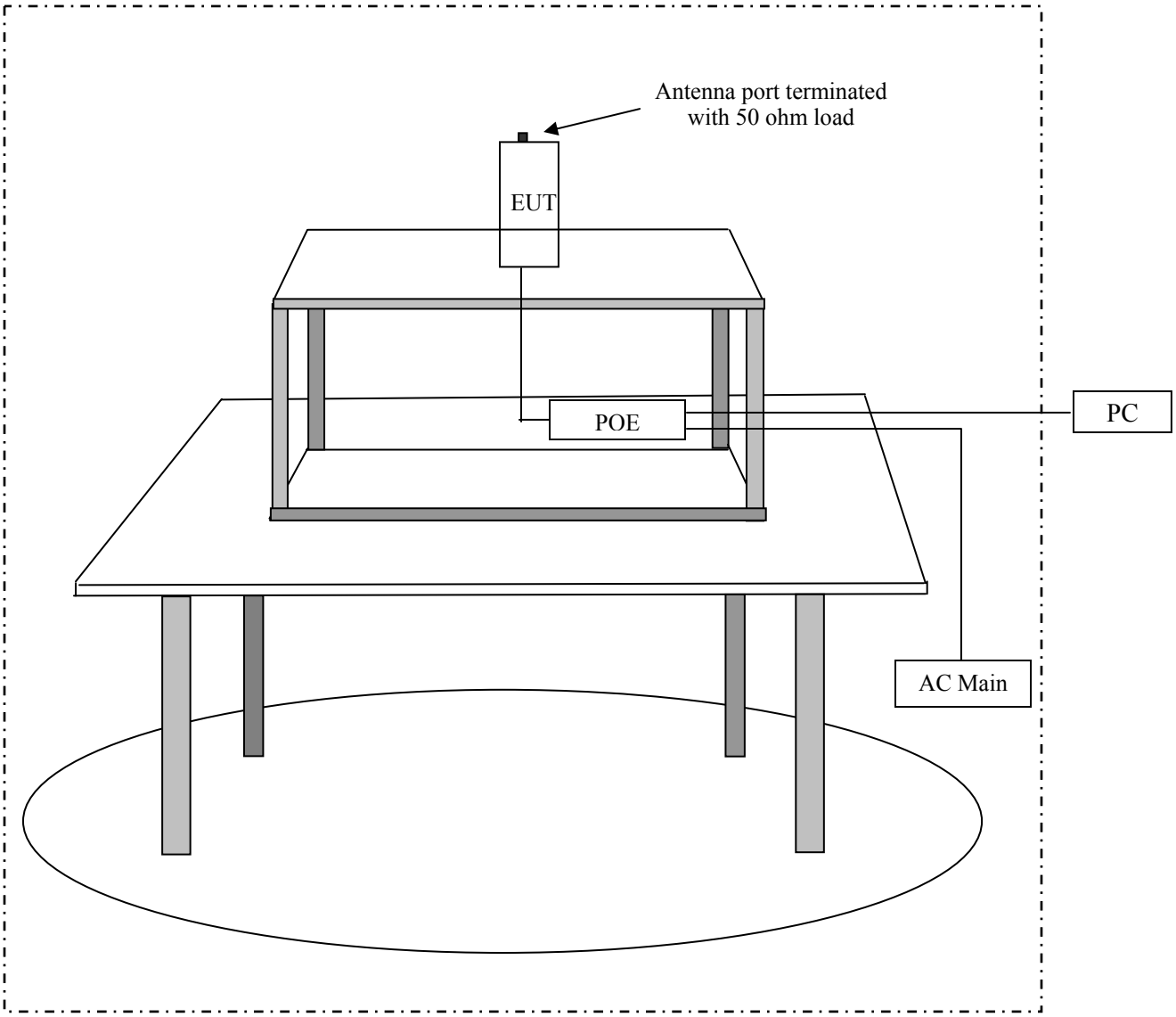
Frequency Stability



Antenna Port Conducted Test



Radiated Emission Test



SUMMARY OF TEST RESULTS

FCC Rules	Description of Test	Result
§1.1310; §2.1091, §90.1335	RF Exposure	Compliant
§ 2.1046; § 90.1321	RF Output Power	Compliant
§ 90.1321	Peak EIRP Power Density	Compliant
§ 2.1047	Modulation Characteristics	N/R *
§ 2.1049	99 % Occupied Bandwidth & 26 dB Bandwidth	Compliant
§ 2.1051; § 90.1323	Spurious Emissions at Antenna Terminals	Compliant
§ 2.1053; § 90.1323	Field Strength of Spurious Radiation	Compliant
§ 2.1055; §90.213	Frequency Stability	Compliant

Note: * Digital modulation.

§1.1310, §2.1091 & §90.1335 – RF EXPOSURE

Applicable Standards

According to §1.1307(b), 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.

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 (minutes)**
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

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

Channel BW = 3.5 MHz

Omni Directional Antenna 11 dBi

Maximum peak output power at antenna input terminal (dBm):	24.31
Maximum peak output power at antenna input terminal (mW):	269.77
Prediction distance (cm):	25
Prediction frequency (MHz):	3651.75
Maximum Antenna Gain, typical (dBi):	11.0
Maximum Antenna Gain (numeric):	12.59
Power density of prediction frequency at 25 cm (mW/cm^2):	0.43
MPE limit for uncontrolled exposure at prediction frequency (mW/cm^2):	1.00

120 Degree Vertical Antenna 12 dBi

Maximum peak output power at antenna input terminal (dBm):	24.31
Maximum peak output power at antenna input terminal (mW):	269.77
Prediction distance (cm):	25
Prediction frequency (MHz):	3651.75
Maximum Antenna Gain, typical (dBi):	12.0
Maximum Antenna Gain (numeric):	15.85
Power density of prediction frequency at 25 cm (mW/cm^2):	0.54
MPE limit for uncontrolled exposure at prediction frequency (mW/cm^2):	1.00

Channel BW = 7 MHz

Omni Directional Antenna 11 dBi

Maximum peak output power at antenna input terminal (dBm):	26.57
Maximum peak output power at antenna input terminal (mW):	453.94
Prediction distance (cm):	25
Prediction frequency (MHz):	3653.50
Maximum Antenna Gain, typical (dBi):	11.0
Maximum Antenna Gain (numeric):	12.59
Power density of prediction frequency at 25 cm (mW/cm^2):	0.73
MPE limit for uncontrolled exposure at prediction frequency (mW/cm^2):	1.00

120 Degree Vertical Antenna 12dBi

Maximum peak output power at antenna input terminal (dBm):	26.57
Maximum peak output power at antenna input terminal (mW):	453.94
Prediction distance (cm):	25
Prediction frequency (MHz):	3653.50
Maximum Antenna Gain, typical (dBi):	12.0
Maximum Antenna Gain (numeric):	15.85
Power density of prediction frequency at 23 cm (mW/cm^2):	0.92
MPE limit for uncontrolled exposure at prediction frequency (mW/cm^2):	1.00

Conclusion

The MPE meets 1.0 mW/cm^2 at 25 cm minimum distance, The RF Exposure information has been addressed in the user manual.

§2.1046 & §90.1321– POWER AND ANTENNA LIMITS

Applicable Standard

According to FCC §2.1046, §90.1321

Base and fixed stations are limited to 25 watts/25 MHz equivalent isotropically radiated power (EIRP). In any event, the peak EIRP power density shall not exceed 1 Watt in any one-megahertz slice of spectrum.

Test Procedure

Antenna Port Conducted Method:

The RF output of the transmitter was connected to the power meter through sufficient attenuation.

EIRP= Output Power at Antenna Port + Antenna Gain – Cable Lose

Test Equipment List and Details

Manufacturer	Description	Model	Serial Number	Calibration Due Date
Agilent	Power Meter	E4419B	MY41291511	2009-10-09
Agilent	Power Sensor	E9301A	MZ42059409	2009-10-09
Agilent	Power Sensor	E4412A	MZ42059181	2009-10-09

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

Environmental Conditions

Temperature:	17 ~20 ºC
Relative Humidity:	30~40 %
ATM Pressure:	101.5-102.1 kPa

** The testing was performed by Jack Liu on 2009-3-12 to 2009-3-17, 2009-06-12*

Test Results

Channel BW = 3.5 MHz

1) Omni Directional Antenna, Gain =11 dBi (3.4 GHz to 3.7 GHz)

Antenna Port Output Power (dBm)			Antenna Gain (dBi)	Cable Lose (dB)	EIRP (dBm)			EIRP Limit (dBm)
3651.75 (MHz)	3662.50 (MHz)	3673.25 (MHz)			3651.75 (MHz)	3662.50 (MHz)	3673.25 (MHz)	
24.31	24.25	23.97	11	1	34.31	34.25	33.97	35.44

2) 120 Degree Vertical Antenna, Gain = 12 dBi (3.4 GHz to 3.7 GHz)

Antenna Port Output Power (dBm)			Antenna Gain (dBi)	Cable Lose (dB)	EIRP (dBm)			EIRP Limit (dBm)
3651.75 (MHz)	3662.50 (MHz)	3673.25 (MHz)			3651.75 (MHz)	3662.50 (MHz)	3673.25 (MHz)	
24.31	24.25	23.97	12	1	35.31	35.25	34.97	35.44

Note: Measured under CW Mode

Channel BW = 7.0 MHz

1) Omni Directional Antenna Gain =11 dBi (3.4 GHz to 3.7 GHz)

Antenna Port Output Power (dBm)			Antenna Gain (dBi)	Cable Lose (dB)	EIRP (dBm)			EIRP Limit (dBm)
3653.50 (MHz)	3662.50 (MHz)	3671.50 (MHz)			3653.50 (MHz)	3662.50 (MHz)	3671.50 (MHz)	
26.57	26.15	26.51	11	1	36.57	36.15	36.51	38.45

2) 120 Degree Vertical Antenna Gain = 12 dBi (3.4 GHz to 3.7 GHz)

Antenna Port Output Power (dBm)			Antenna Gain (dBi)	Cable Lose (dB)	EIRP (dBm)			EIRP Limit (dBm)
3653.50 (MHz)	3662.50 (MHz)	3671.50 (MHz)			3653.50 (MHz)	3662.50 (MHz)	3671.50 (MHz)	
26.57	26.15	26.51	12	1	37.57	37.15	37.51	38.45

Note: Measured under CW Mode

§90.1321–PEAK EIRP POWER DENSITY

Applicable Standard

According to FCC§90.1321

Base and fixed stations are limited to 25 watts/25 MHz equivalent isotropically radiated power (EIRP). In any event, the peak EIRP power density shall not exceed 1 Watt in any one-megahertz slice of spectrum.

Test Procedure

Conducted:

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

Test Equipment List and Details

Manufacturer	Description	Model	Serial Number	Calibration Due Date
Agilent	Spectrum Analyzer	E4440A	US45303156	2009-05-31

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

Environmental Conditions

Temperature:	17 ~20 ºC
Relative Humidity:	30~40 %
ATM Pressure:	101.5-102.1 kPa

** The testing was performed by Jack Liu on 2009-3-12 to 2009-3-17.*

Test Results

Channel BW = 3.5 MHz

1) Omni Directional Antenna Gain =11 dBi (3.4 GHz to 3.7 GHz)

Power Density (dBm/MHz)			Antenna Gain (dBi)	Cable Lose (dB)	EIRP Power Density (dBm/MHz)			EIRP Limit (dBm)
3651.75 (MHz)	3662.50 (MHz)	3673.25 (MHz)			3651.75 (MHz)	3662.50 (MHz)	3673.25 (MHz)	
15.11	13.28	13.16	11	1	25.11	23.28	23.16	30

2) 120 Degree Vertical Antenna Gain = 12 dBi (3.4 GHz to 3.7 GHz)

Power Density (dBm/MHz)			Antenna Gain (dBi)	Cable Lose (dB)	EIRP Power Density (dBm/MHz)			EIRP Limit (dBm)
3651.75 (MHz)	3662.50 (MHz)	3673.25 (MHz)			3651.75 (MHz)	3662.50 (MHz)	3673.25 (MHz)	
15.11	13.28	13.16	12	1	26.11	24.28	24.16	30

Channel BW = 7.0 MHz

1) Omni Directional Antenna Gain =11 dBi (3.4 GHz to 3.7 GHz)

Power Density (dBm/MHz)			Antenna Gain (dBi)	Cable Lose (dB)	EIRP Power Density (dBm/MHz)			EIRP Limit (dBm)
3653.50 (MHz)	3662.50 (MHz)	3671.50 (MHz)			3653.50 (MHz)	3662.50 (MHz)	3671.50 (MHz)	
9.41	8.81	8.97	11	1	19.41	18.81	18.97	30

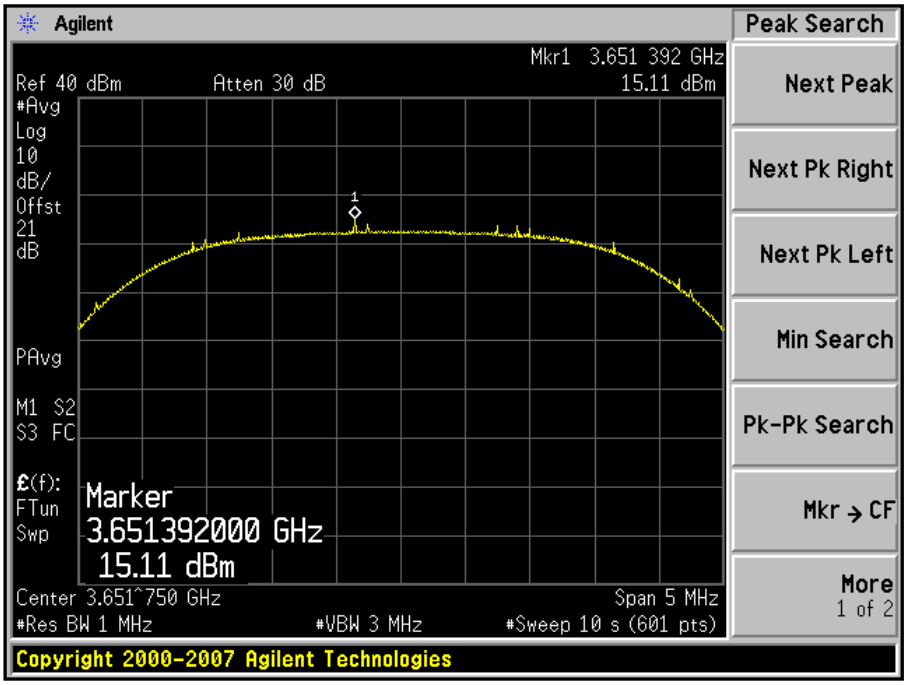
2) 120 Degree Vertical Antenna Gain = 12 dBi (3.4 GHz to 3.7 GHz)

Power Density (dBm/MHz)			Antenna Gain (dBi)	Cable Lose (dB)	EIRP Power Density (dBm/MHz)			EIRP Limit (dBm)
3653.50 (MHz)	3662.50 (MHz)	3671.50 (MHz)			3653.50 (MHz)	3662.50 (MHz)	3671.50 (MHz)	
9.41	8.81	8.97	12	1	20.41	19.81	19.97	30

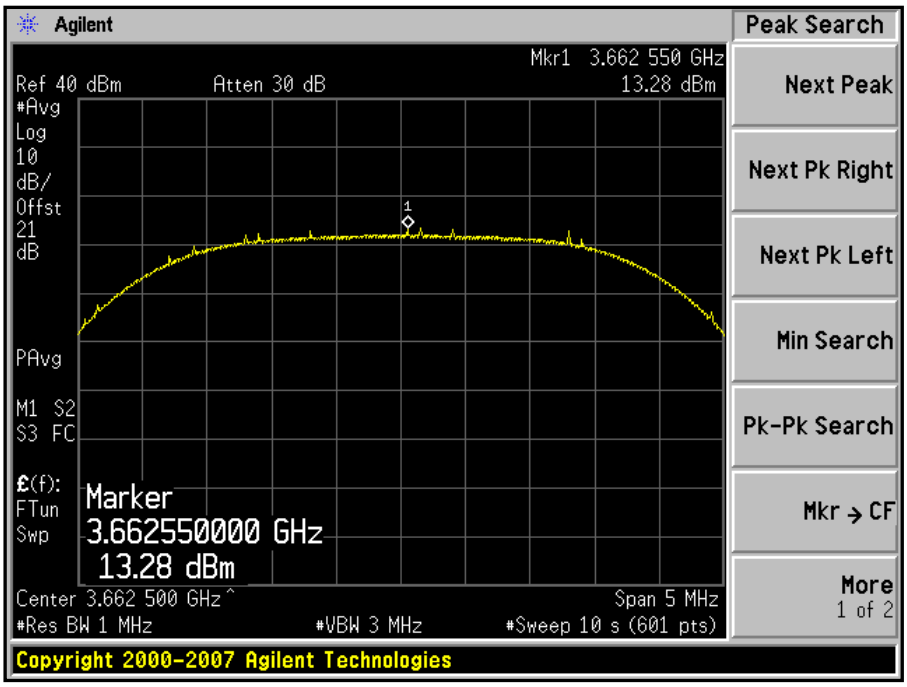
Please refer to the hereinafter plots.

Channel BW = 3.5 MHz

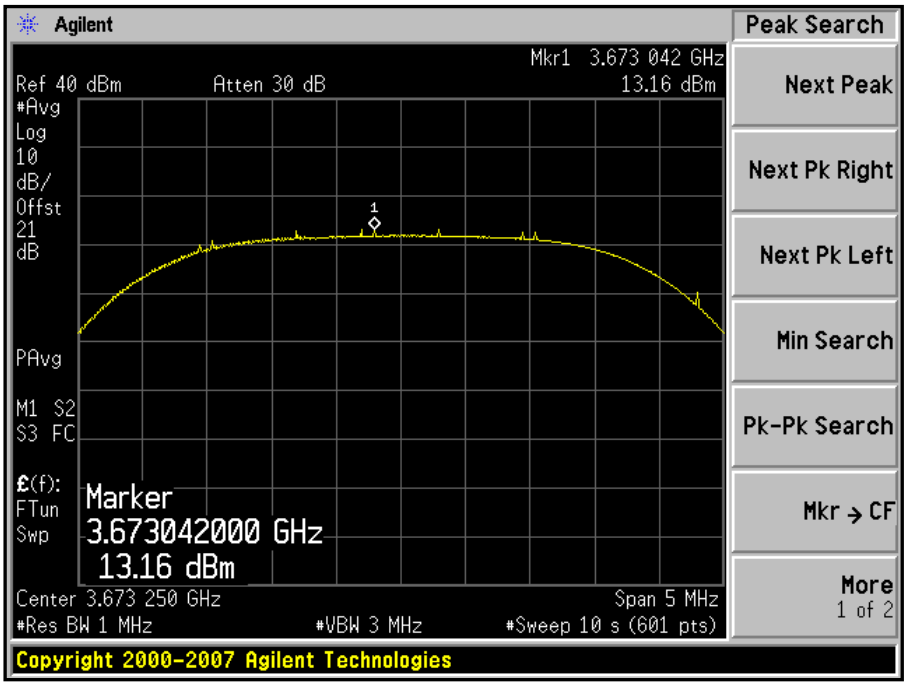
Low Channel (Fc = 3651.75 MHz)



Middle Channel (Fc = 3662.50 MHz)

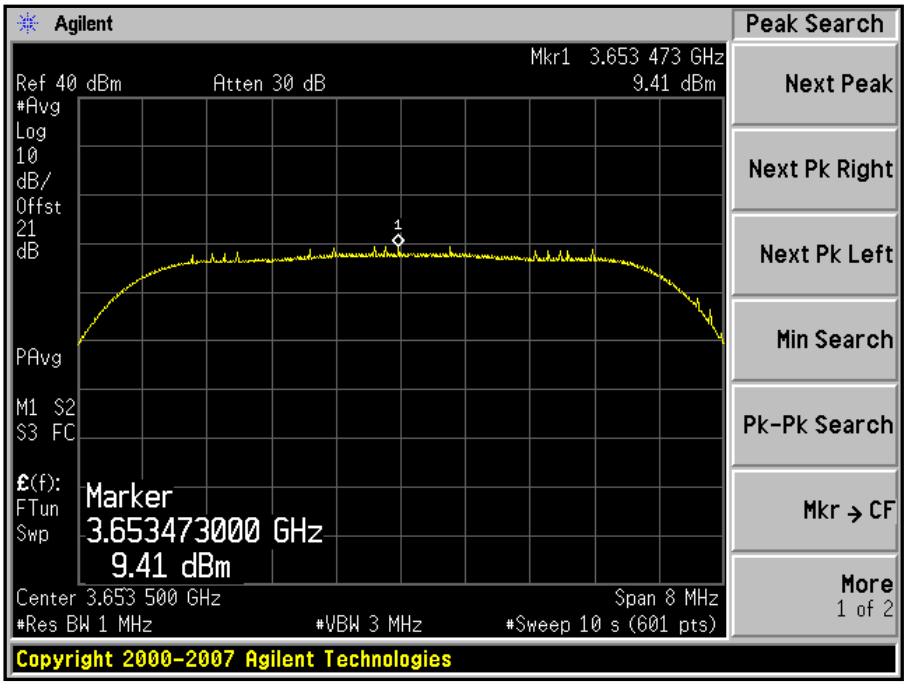


High Channel (Fc = 3673.25 MHz)

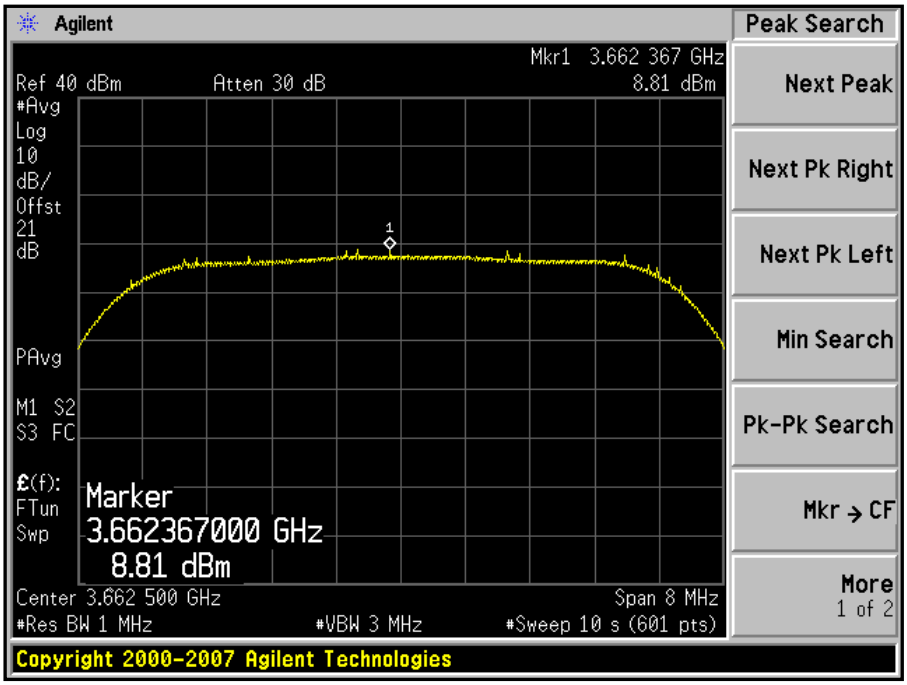


Channel BW = 7.0 MHz

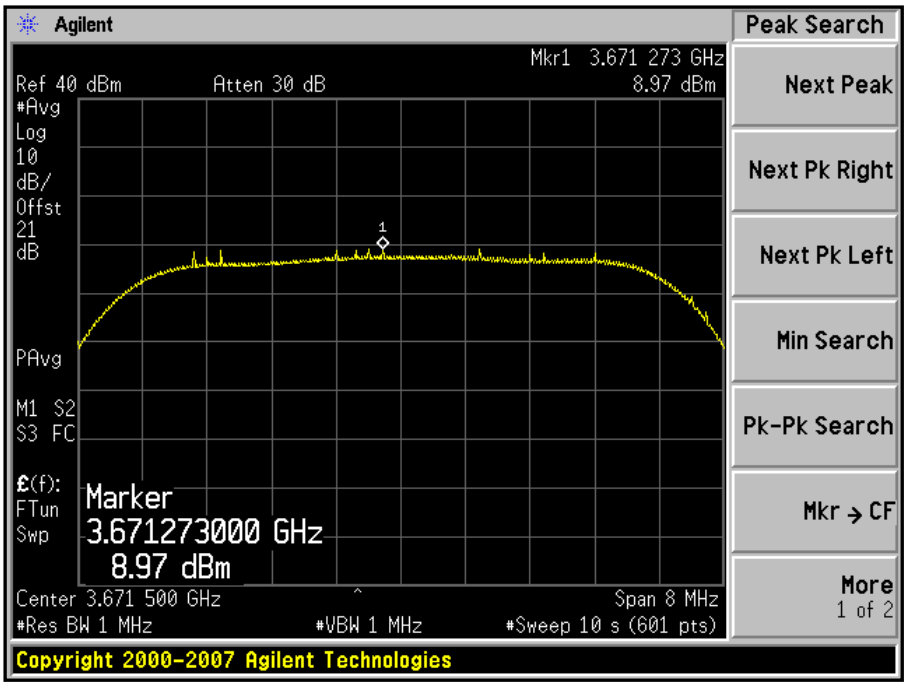
Low Channel (Fc = 3653.50 MHz)



Middle Channel (Fc = 3662.50 MHz)



High Channel (Fc = 3671.50 MHz)



§2.1049 – 99% OCCUPIED BANDWIDTH & 26 BANDWIDTH

Applicable Standard

§2.1049

The occupied bandwidth, that is the frequency bandwidth such that, below its lower and above its upper frequency limits, the mean powers radiated are each equal to 0.5 percent of the total mean power radiated by a given emission shall be measured under the following conditions as applicable:

a) Radiotelegraph transmitters for manual operation when keyed at 16 dots per second.

(b) Other keyed transmitters—when keyed at the maximum machine speed.

(c) Radiotelephone transmitters equipped with a device to limit modulation or peak envelope power shall be modulated as follows. For single sideband and independent sideband transmitters, the input level of the modulating signal shall be 10 dB greater than that necessary to produce rated peak envelope power.

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 ≥ 1% of Occupied Bandwidth and the VBW ≥ RBW on the spectrum.

Test Equipment List and Details

Manufacturer	Description	Model	Serial Number	Calibration Due Date
Agilent	Spectrum Analyzer	E4440A	US45303156	2009-05-31

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

Environmental Conditions

Temperature:	17 ~20 ºC
Relative Humidity:	30~40 %
ATM Pressure:	101.5-102.1 kPa

** The testing was performed by Jack Liu on 2009-3-12 to 2009-3-17.*

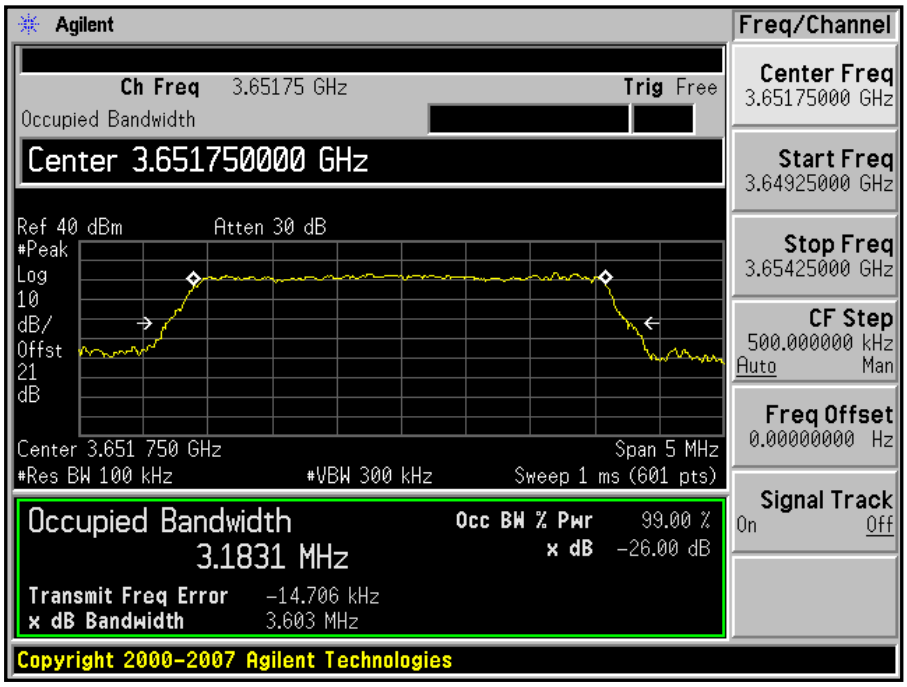
Test Result

Channel Band Width (MHz)	Frequency (MHz)	99 % Bandwidth (MHz)	26 dB Bandwidth (MHz)
3.5	3651.75	3.1831	3.603
	3662.50	3.1776	3.528
	3673.25	3.1759	3.566
7.0	3653.50	6.2819	7.071
	3662.50	6.2830	6.960
	3671.50	6.2732	7.009

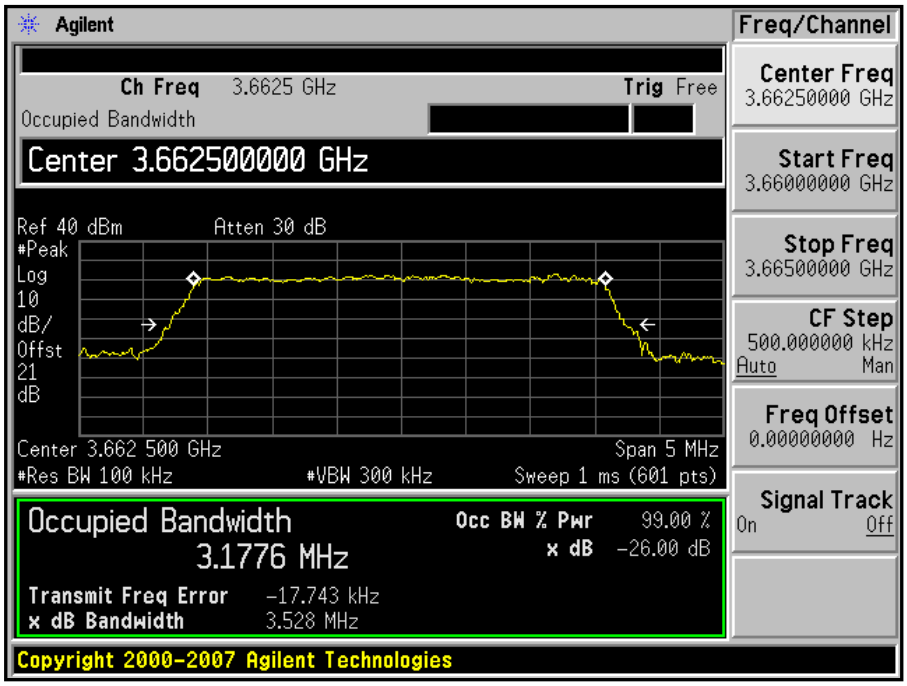
Please refer to the hereinafter plots.

Channel Bandwidth = 3.5 MHz

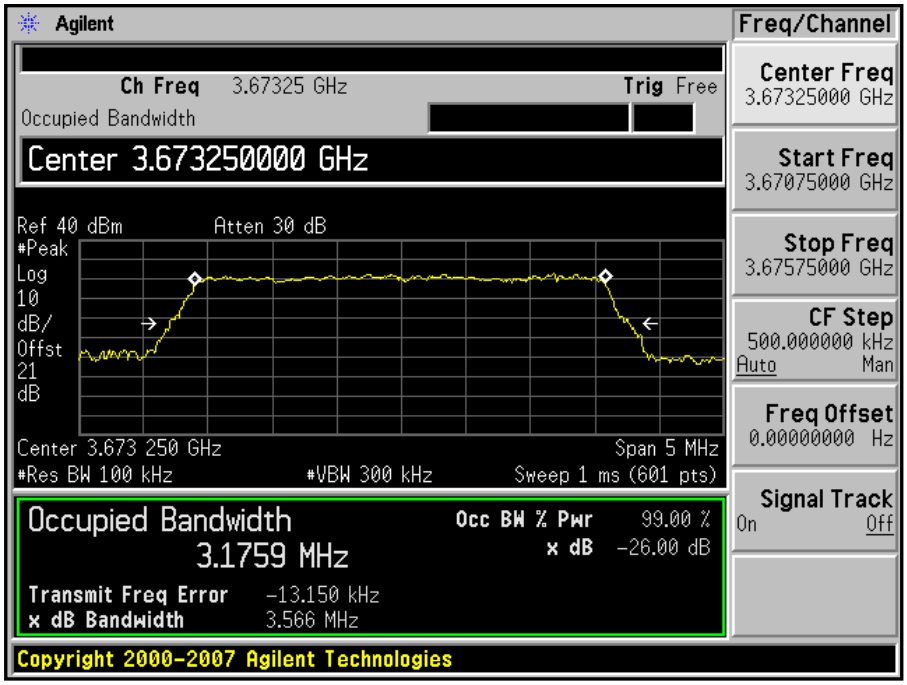
Low Channel (Fc = 3651.75 MHz)



Middle Channel (Fc = 3662.50 MHz)

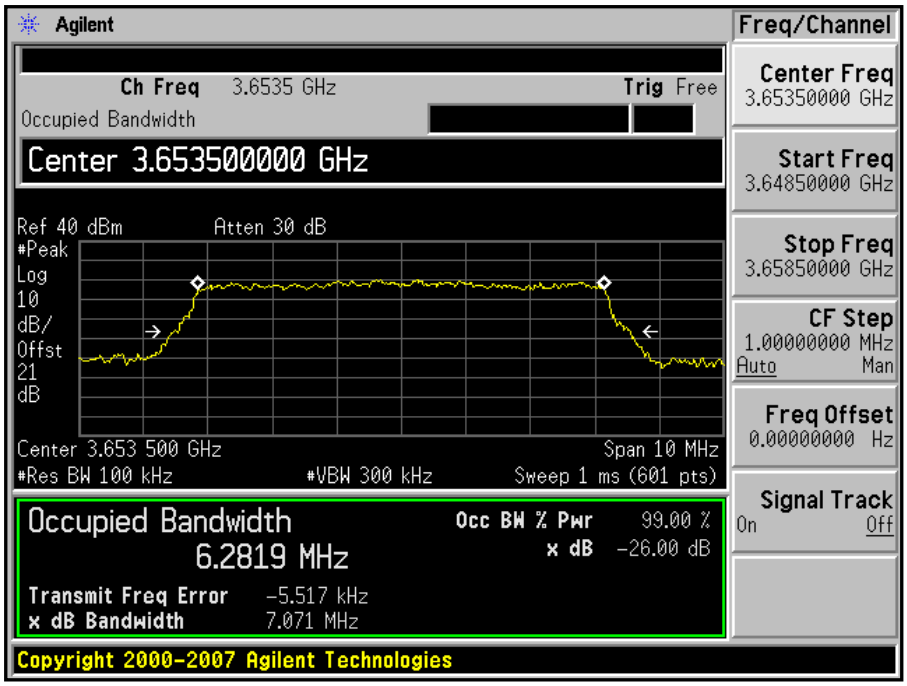


High Channel (Fc = 3673.25 MHz)

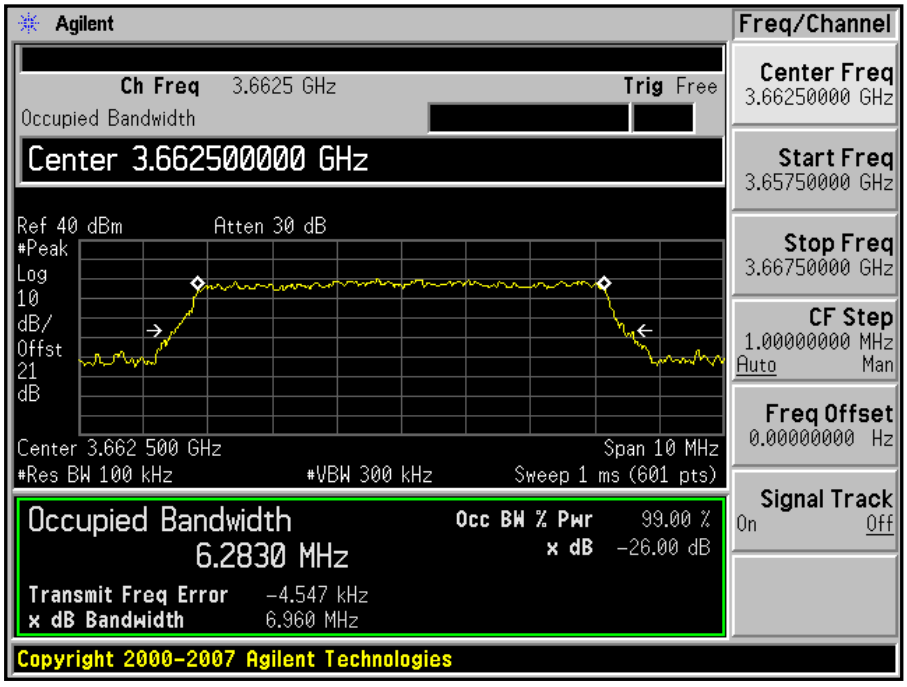


Channel Bandwidth = 7.0 MHz

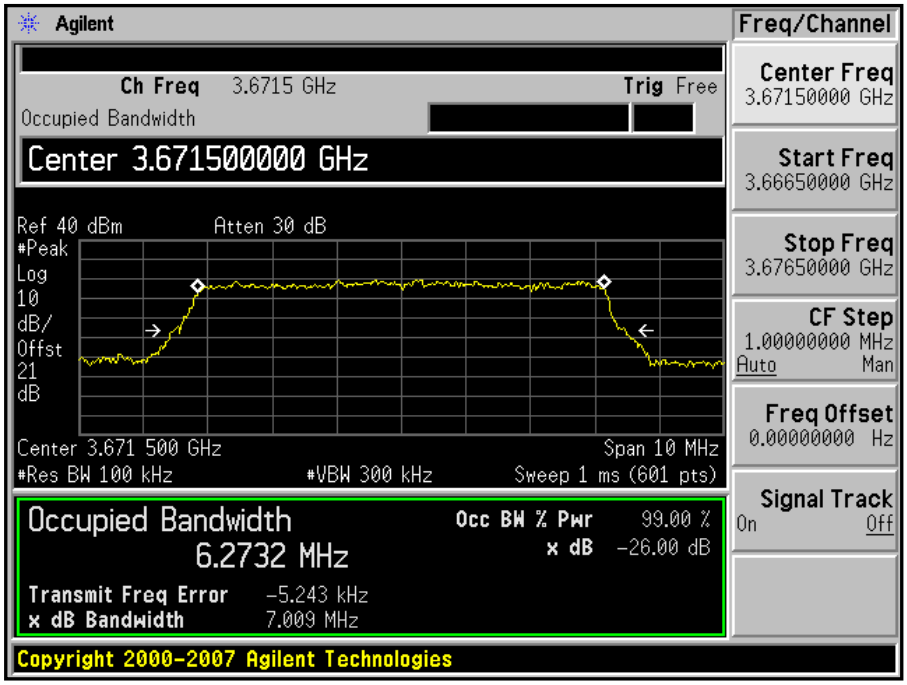
Low Channel (Fc = 3653.50 MHz)



Middle Channel (Fc = 3662.50 MHz)



High Channel (Fc = 3671.50 MHz)



§2.1051 & §90.1323 - SPURIOUS EMISSIONS AT ANTENNA TERMINALS

Applicable Standard

Requirements: CFR 47 § 2.1051, § 90.1323.

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

The power of any emission outside a licensee's frequency band(s) of operation shall be attenuated below the transmitter power (P) within the licensed band(s) of operation, measured in watts, by at least 43 + 10 log (P) dB.

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 10 kHz for below 1GHz testing and 1MHz for above 1GHZ testing. 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	Calibration Due Date
Agilent	Spectrum Analyzer	E4446A	US44300386	2009-05-19

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

Environmental Conditions

Temperature:	17 ~20 ºC
Relative Humidity:	30~40 %
ATM Pressure:	101.5-102.1 kPa

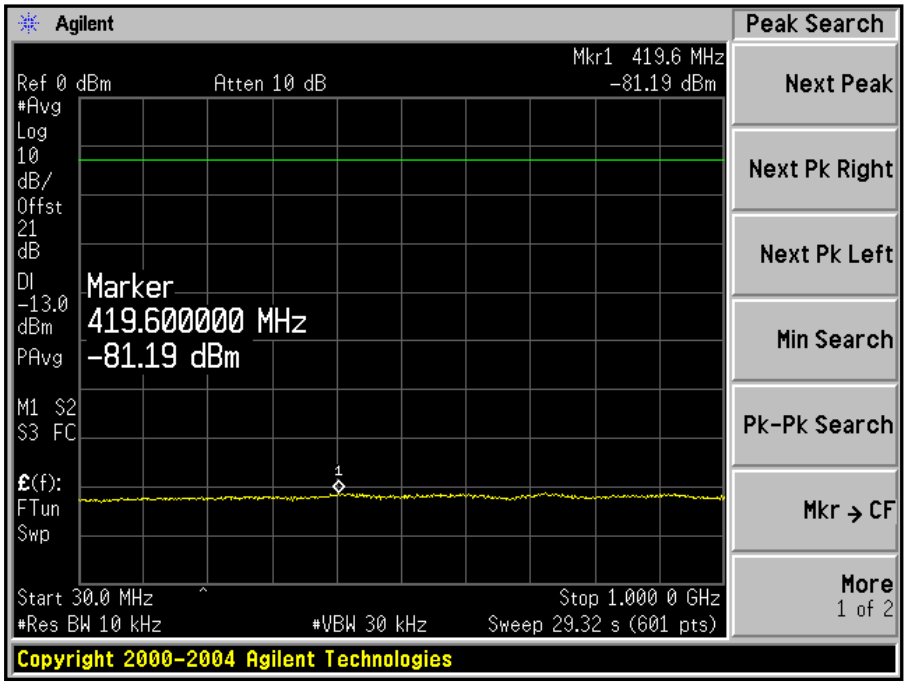
** The testing was performed by Jack Liu on 2009-3-12 to 2009-3-17*

Test Results

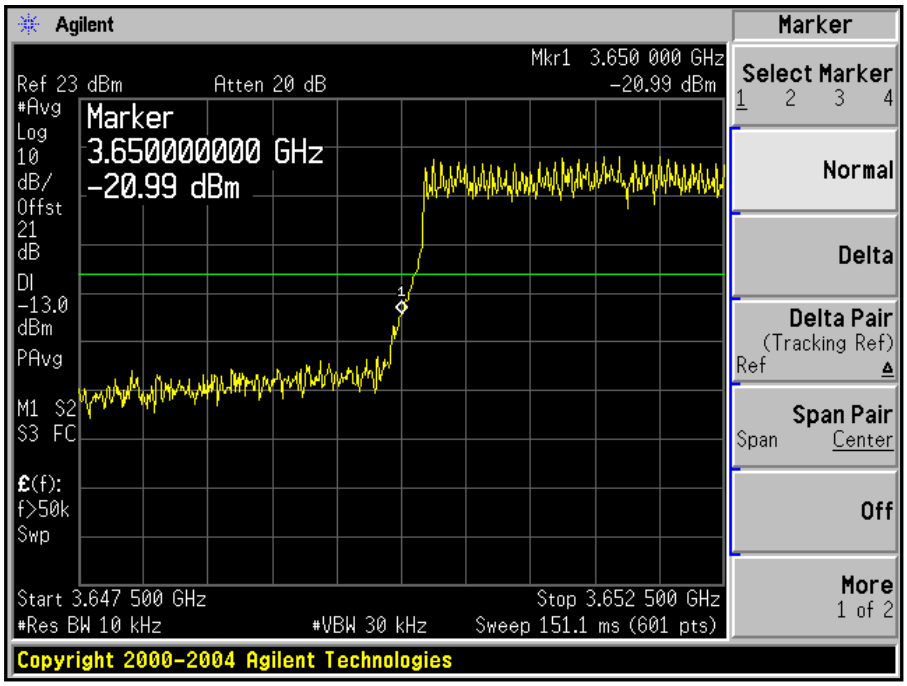
Please refer to the hereinafter plots.

Channel Bandwidth = 3.5 MHz, Low Channel

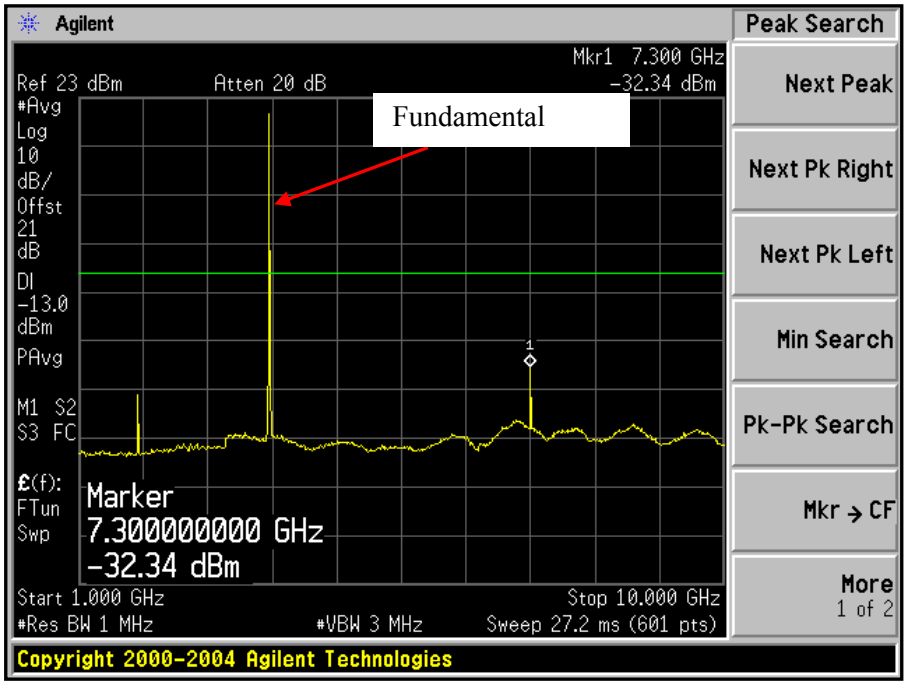
30 MHz - 1 GHz



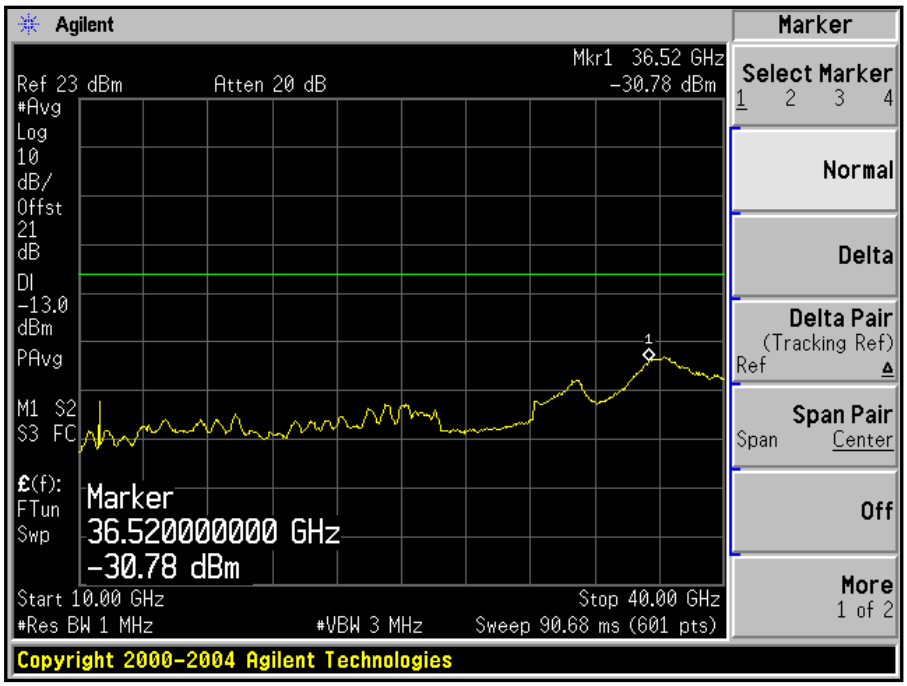
Band Edge: Low Channel



1 – 10 GHz

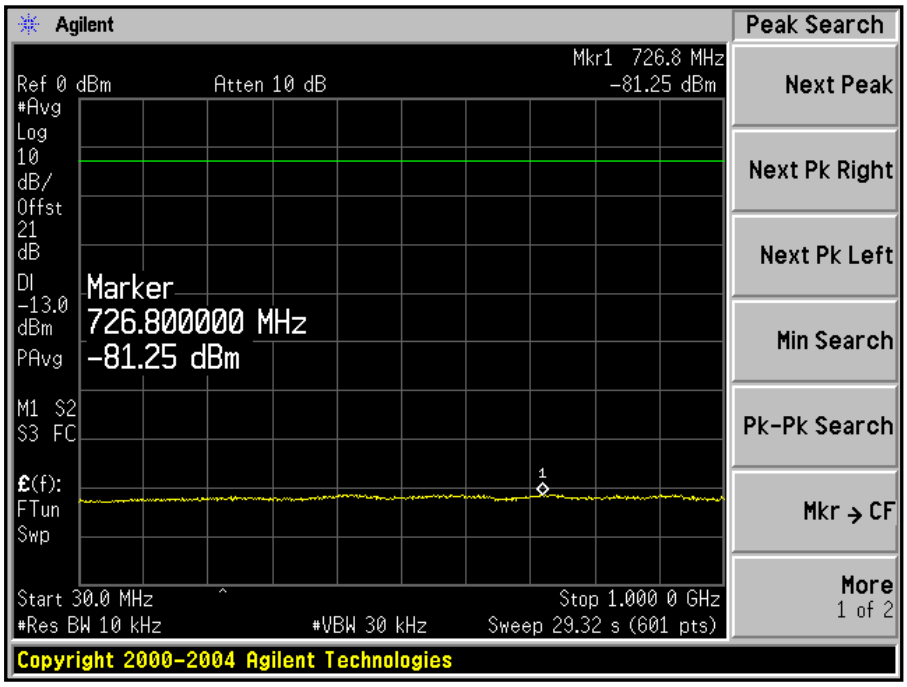


10 - 40 GHz

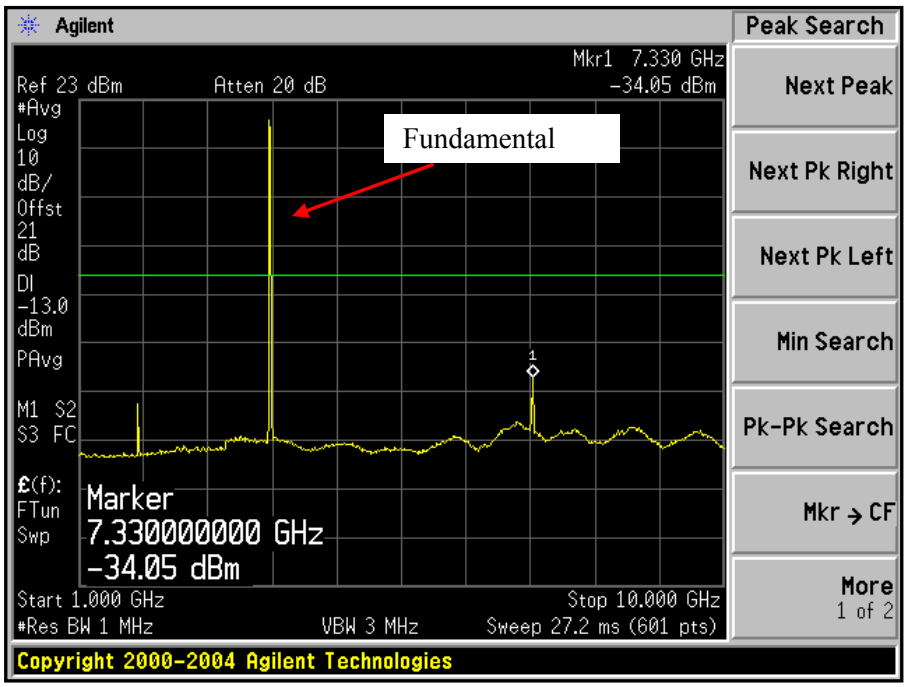


Channel Bandwidth = 3.5 MHz, Middle Channel

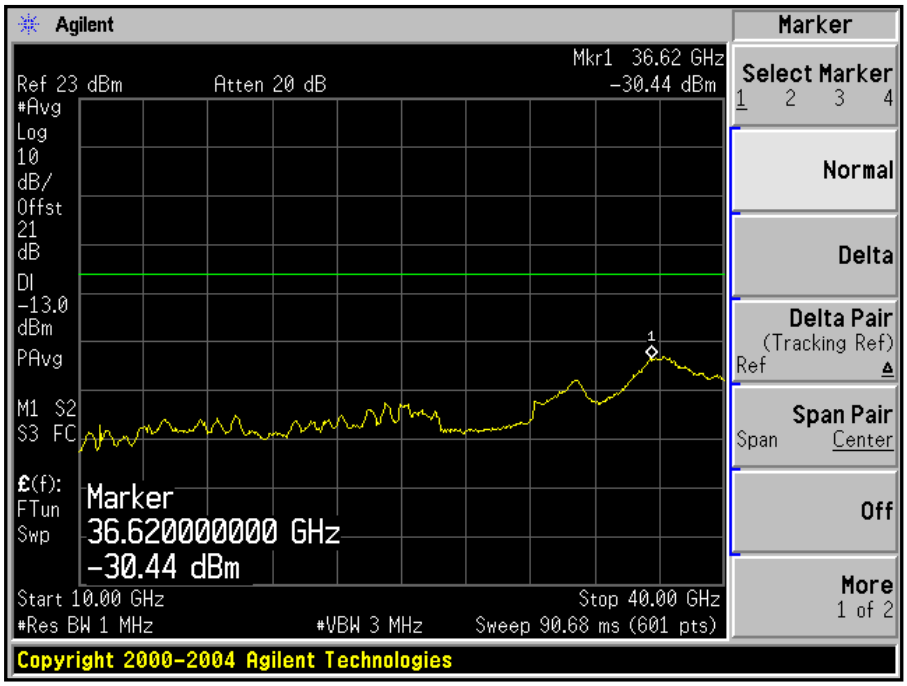
30 MHz – 1 GHz



1 – 10 GHz

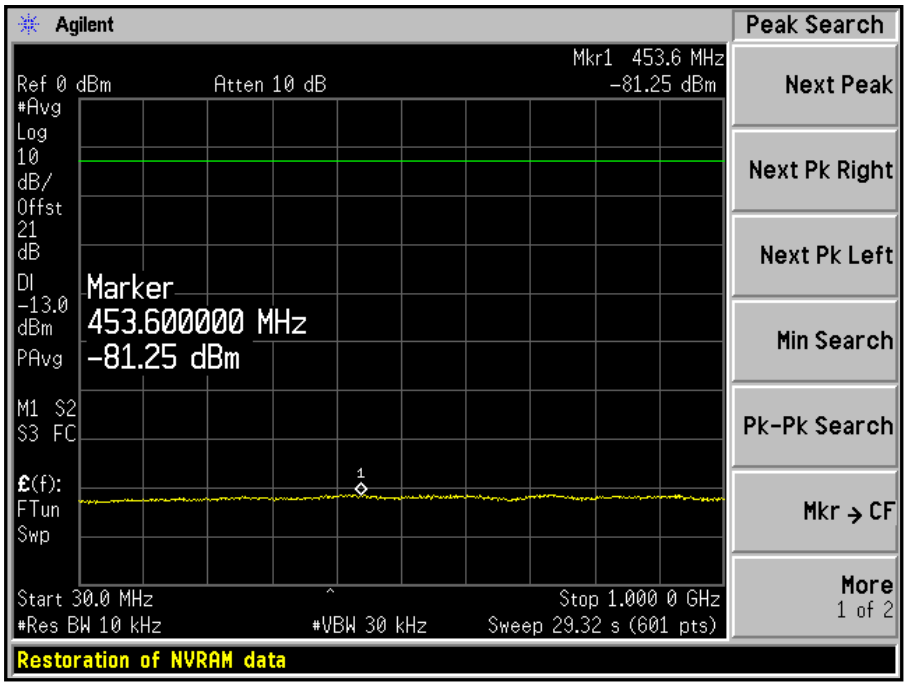


10 – 40 GHz

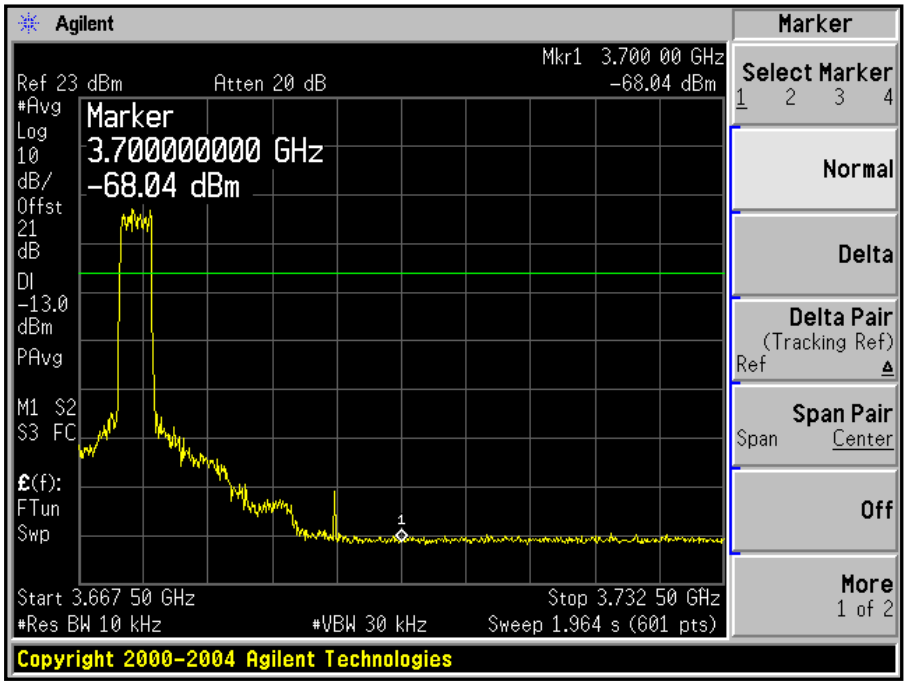


Channel Bandwidth = 3.5 MHz, High Channel

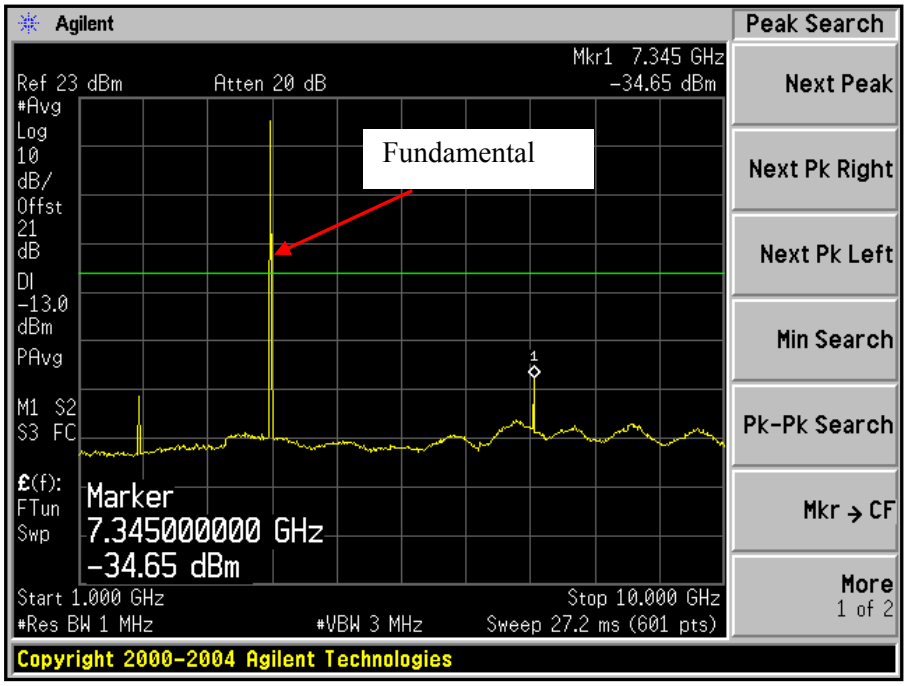
30 MHz – 1 GHz



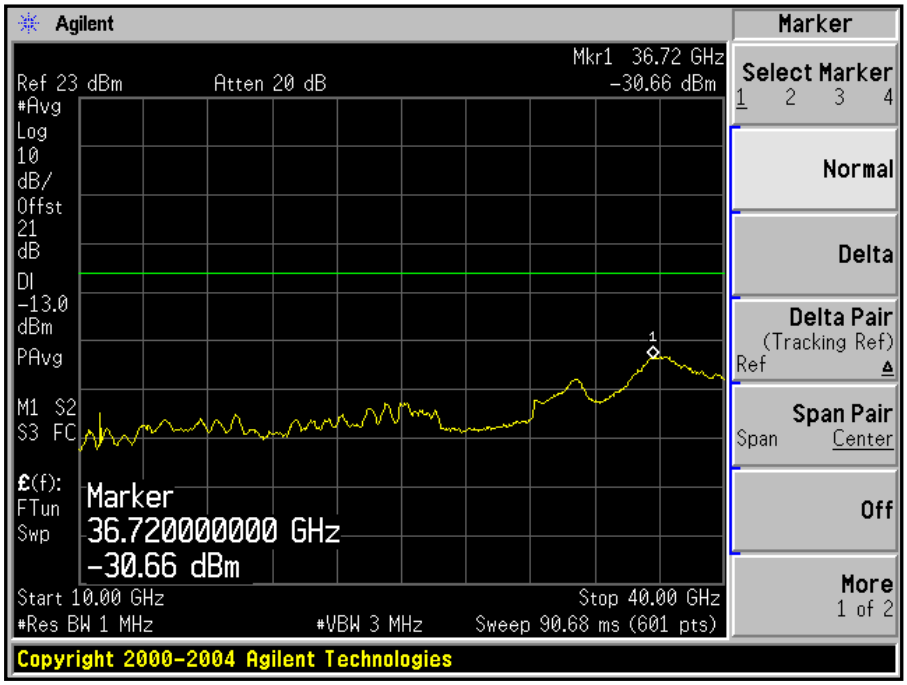
Band Edge: High Channel



1 – 10 GHz

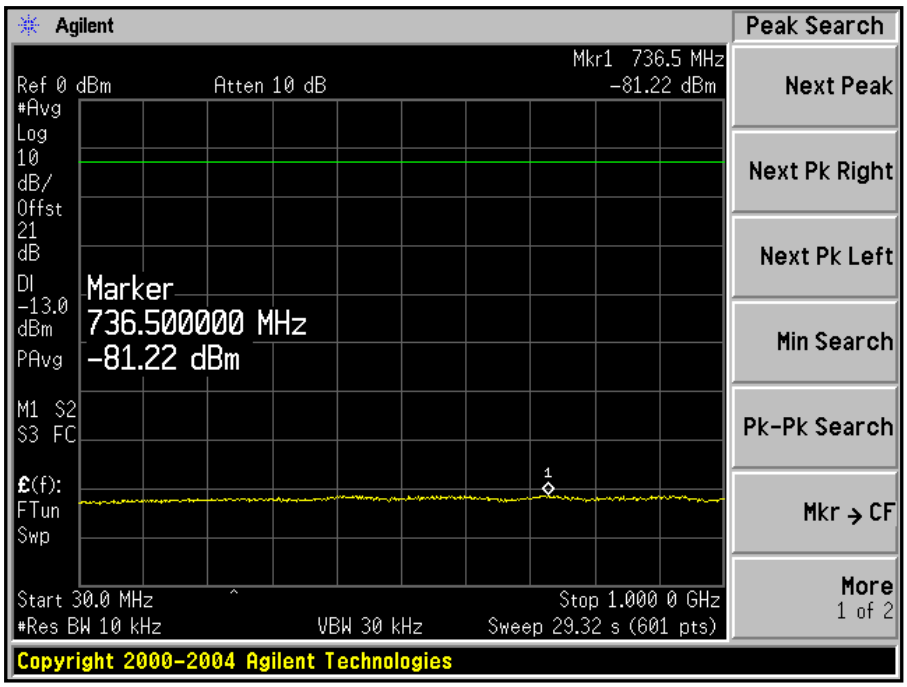


10 – 40 GHz

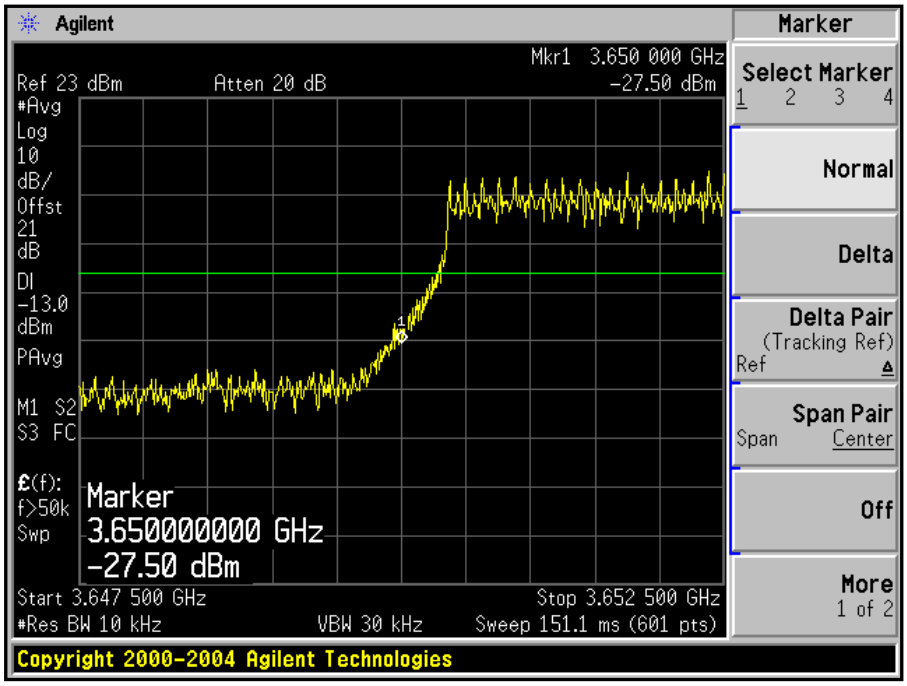

Agilent
Marker
Mkr1 36.72 GHz
Ref 23 dBm
Atten 20 dB
-30.66 dBm
#Avg
Log
10
dB/
Offst
21
dB
Dl
-13.0
dBm
PAvg
M1 S2
S3 FC
£(f):
FTun
Swp
Marker
36.720000000 GHz
-30.66 dBm
Start 10.00 GHz
Stop 40.00 GHz
#Res BW 1 MHz
#VBW 3 MHz
Sweep 90.68 ms (601 pts)
Select Marker
1 2 3 4
Normal
Delta
Delta Pair
(Tracking Ref)
Ref
Span Pair
Span Center
Off
More
1 of 2
Copyright 2000-2004 Agilent Technologies

Channel Bandwidth = 7.0 MHz, Low Channel

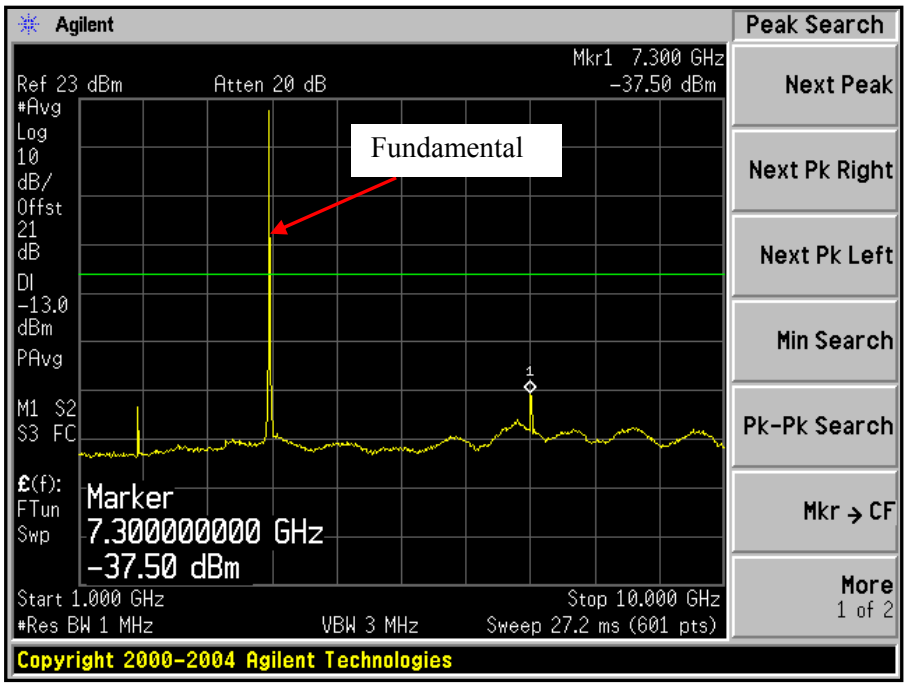
30 MHz – 1 GHz



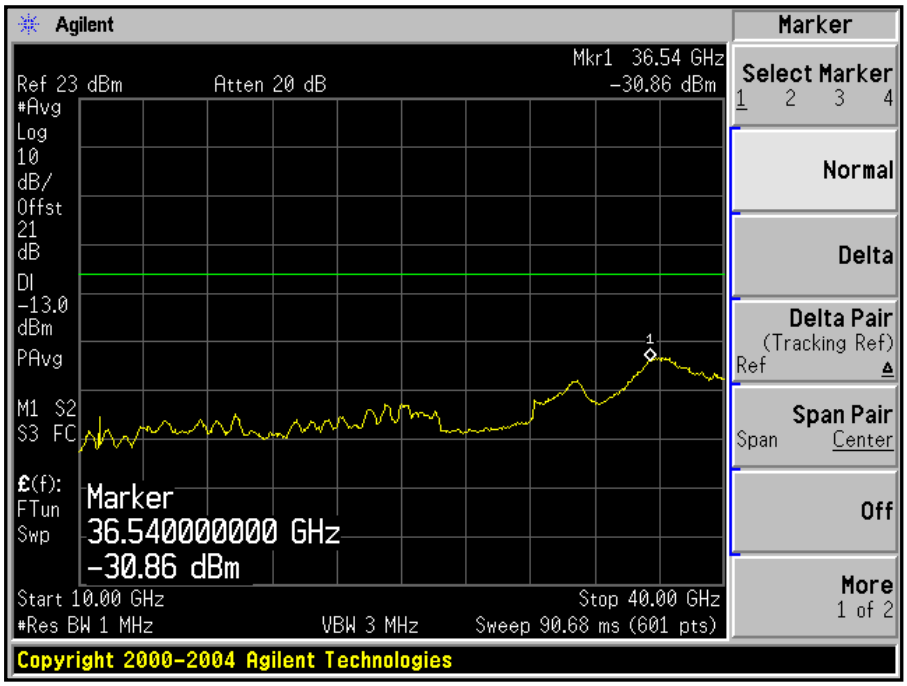
Band Edge: Low Channel



1 – 10 GHz

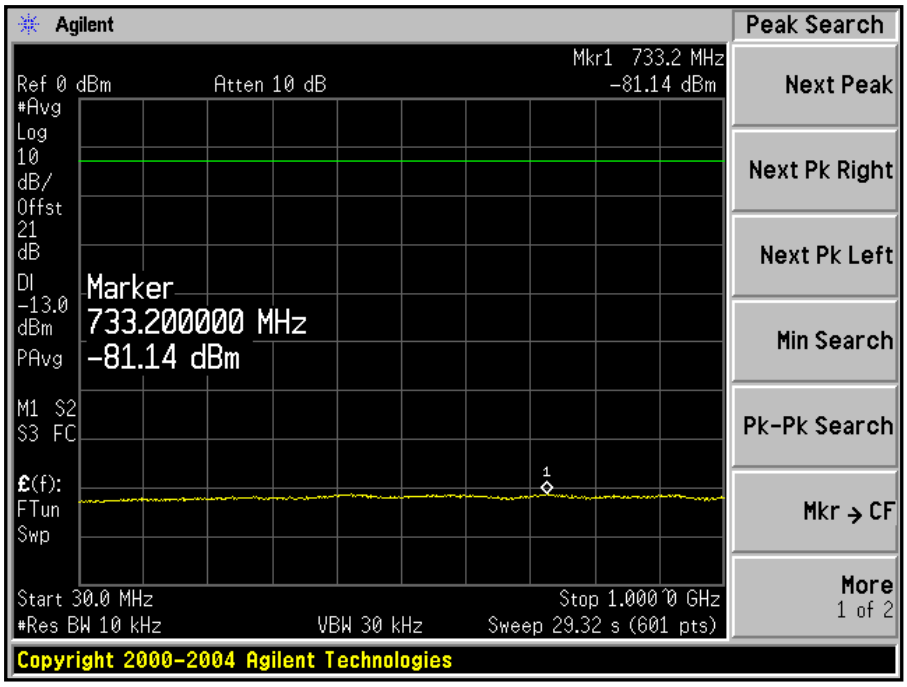


10 - 40 GHz

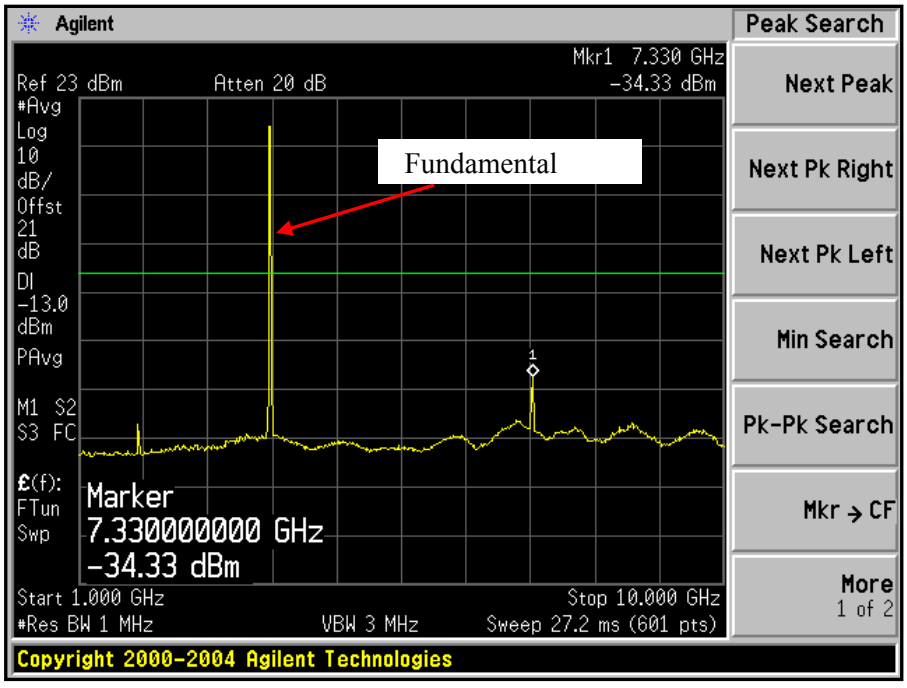


Channel Bandwidth = 7.0 MHz, Middle Channel

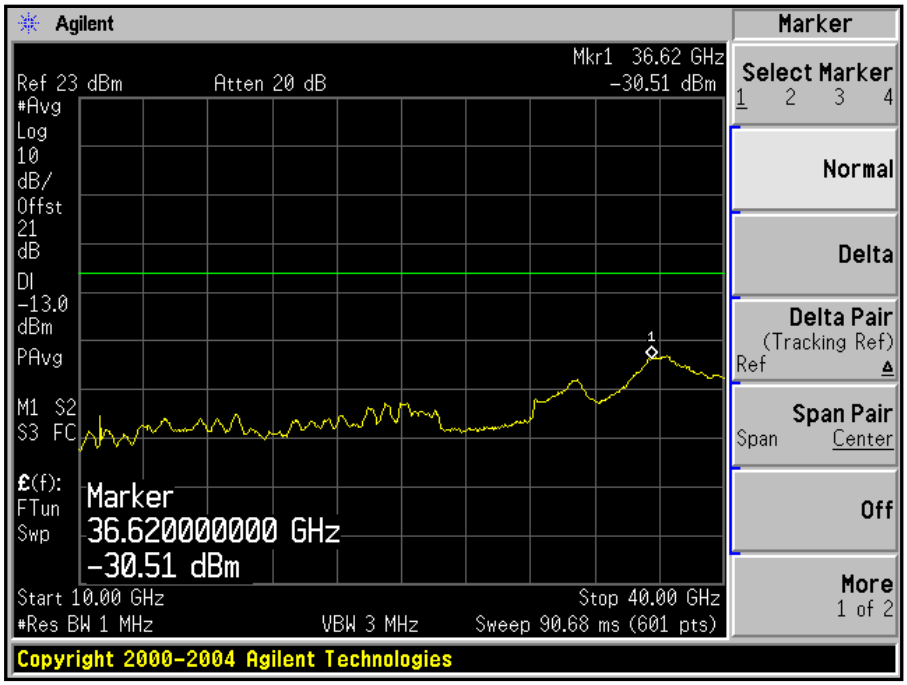
30 MHz – 1 GHz



1 – 10 GHz

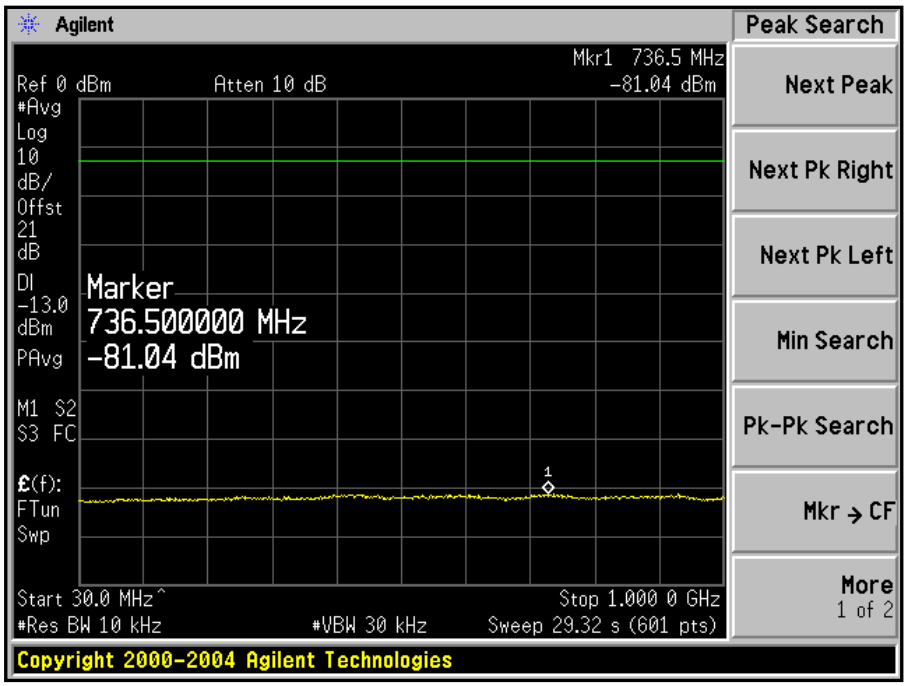


10 - 40 GHz

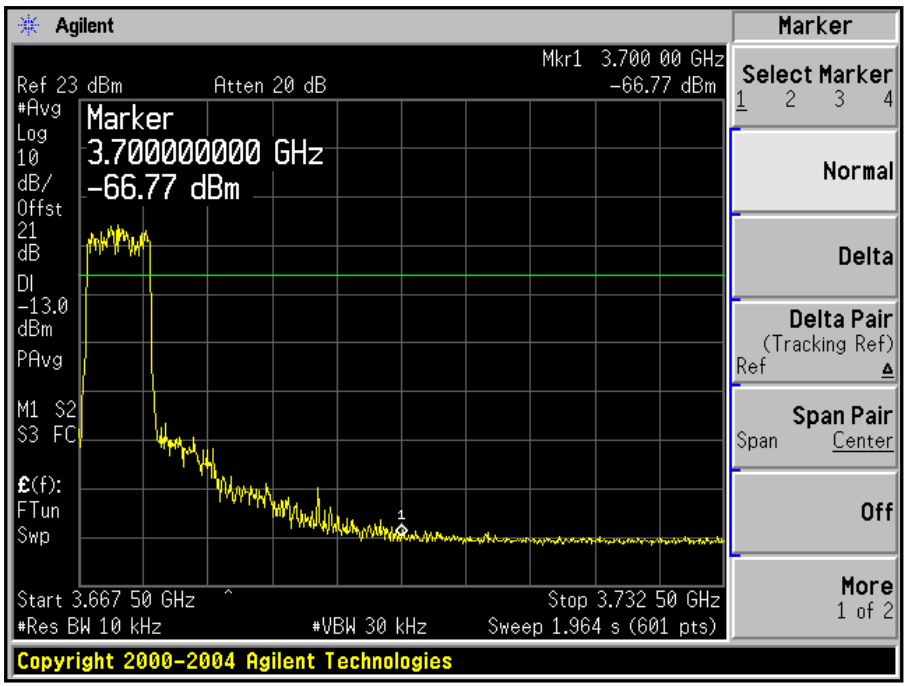


Channel Bandwidth = 7.0 MHz, High Channel

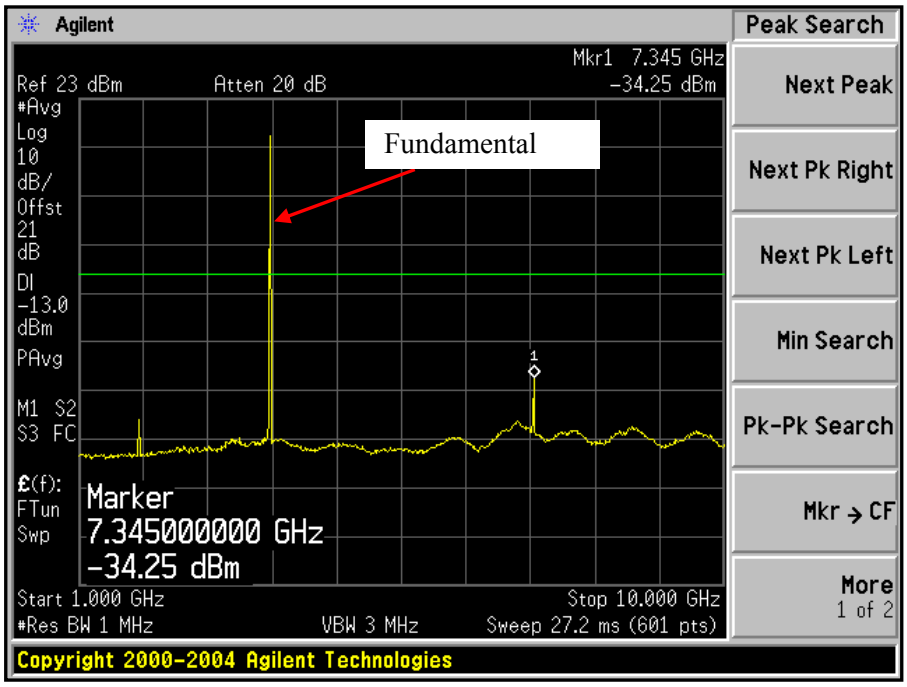
30 MHz – 1 GHz



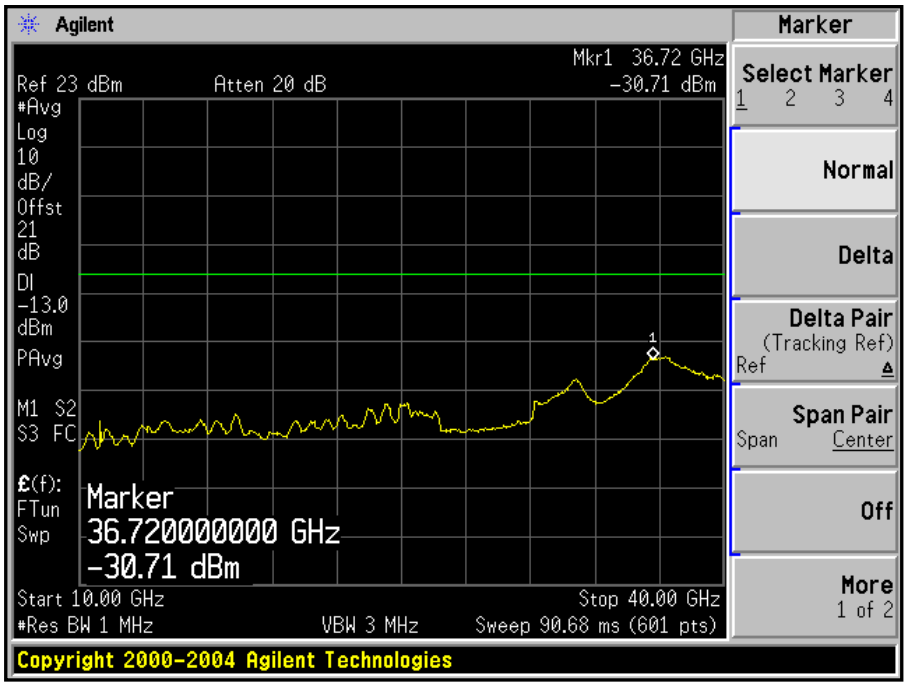
Band Edge: High Channel



1 – 10 GHz



10 – 40 GHz


Agilent
Marker
Mkr1 36.72 GHz
Ref 23 dBm
Atten 20 dB
-30.71 dBm
#Avg
Log
10
dB/
Offst
21
dB
Dl
-13.0
dBm
PAvg
M1 S2
S3 FC
£(f):
FTun
Swp
Marker
36.720000000 GHz
-30.71 dBm
Start 10.00 GHz
Stop 40.00 GHz
#Res BW 1 MHz
VBW 3 MHz
Sweep 90.68 ms (601 pts)
Select Marker
1 2 3 4
Normal
Delta
Delta Pair
(Tracking Ref)
Ref
Span Pair
Span Center
Off
More
1 of 2
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§2.1053 & §90.1323 - SPURIOUS RADIATED EMISSIONS

Applicable Standard

Requirements: CFR 47, 2.1053, 90.1323

The power of any emission outside a licensee's frequency band(s) of operation shall be attenuated below the transmitter power (P) within the licensed band(s) of operation, measured in watts, by at least 43 + 10 log (P) dB.

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 attenuation limit in dB = 43 + 10 Log_{10} (power out in Watts)
Limit (dBm) = Power (dBm) - Spurious attenuation limit (dB)

Test Equipment List and Details

Manufacturer	Description	Model	Serial Number	Calibration Due Date
Agilent	Spectrum Analyzer	E4446A	US44300386	2009-05-19
Sunol Sciences	Antenna	JB1	A103105-3	2009-03-25
A.R.A	Horn Antenna	DRG-118/A	1132	2009-07-28
A. H. Systems	Antenna, Horn, DRG	SAS-200/571	261	2009-07-01
HP	Pre-Amplifier	8449B	3008A01978	2009-10-21
HP	Pre-Amplifier	8447D	2944A06639	2009-12-19

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

Environmental Conditions

Temperature:	17 ~20 ºC
Relative Humidity:	30~40 %
ATM Pressure:	101.5-102.1 kPa

** The testing was performed by Jack Liu on 2009-3-12 to 2009-3-17.*

Test Results

Low Channel: 3651.75 MHz

Indicated			Test Antenna		Substituted				Absolute Level (dBm)	FCC Limit (dBm)	Margin (dB)
Frequency (MHz)	Amplitude (dBuV)	Angle (degree)	Height (m)	Polar (H/V)	Frequency (MHz)	Level (dBm)	Ant. Gain Correction (dBi)	Cable Loss (dB)			
-	-	-	-	-	-	-	-	-	-	- 13	-

Note: Emissions levels are at the noise floor and/or more then 20dB below the limit.

Middle Channel: 3662.5 MHz

Indicated			Test Antenna		Substituted				Absolute Level (dBm)	FCC Limit (dBm)	Margin (dB)
Frequency (MHz)	Amplitude (dBuV)	Angle (degree)	Height (m)	Polar (H/V)	Frequency (MHz)	Level (dBm)	Ant. Gain Correction (dBi)	Cable Loss (dB)			
-	-	-	-	-	-	-	-	-	-	- 13	-

Note: Emissions levels are at the noise floor and/or more then 20dB below the limit.

High Channel: 3673.25 MHz

Indicated			Test Antenna		Substituted				Absolute Level (dBm)	FCC Limit (dBm)	Margin (dB)
Frequency (MHz)	Amplitude (dBuV)	Angle (degree)	Height (m)	Polar (H/V)	Frequency (MHz)	Level (dBm)	Ant. Gain Correction (dBi)	Cable Loss (dB)			
-	-	-	-	-	-	-	-	-	-	- 13	-

Note: Emissions levels are at the noise floor and/or more then 20dB below the limit.

§2.1055 & §90.213 – FREQUENCY STABILITY

Applicable Standard

Requirements: FCC § 2.1055 and §90.213

Test Procedure

Frequency Stability vs. Temperature: The equipment under test was connected to an external AC power supply and the RF output was connected to communication test set via feed-through attenuators. The EUT was placed inside the temperature chamber. The AC 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 communication test set.

Frequency Stability vs. Voltage: An external variable AC 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	Calibration Due Date
Espec	Chamber, Humidity	ESL-4CA	18010	2009-12-10
Agilent	Spectrum Analyzer	E4440A	US45303156	2009-05-31

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

Environmental Conditions

Temperature:	17 ~20 ºC
Relative Humidity:	30~40 %
ATM Pressure:	101.5-102.1 kPa

** The testing was performed by Jack Liu on 2009-3-12 to 2009-3-17.*

Test Results

Channel BW = 3.5 MHz (Middle Channel: 3662.5 MHz)

Frequency Stability versus Temperature

Test Condition		Reference Frequency (MHz)	Measured Frequency (MHz)	Frequency Error (ppm)
Voltage (Vac)	Temperature (^{O}C)			
120	-30	3662.5	3662.4903	-2.6484641638
120	-20	3662.5	3662.5077	2.1023890785
120	-10	3662.5	3662.5103	2.8122866894
120	0	3662.5	3662.4883	-3.1945392492
120	10	3662.5	3662.5111	3.0307167236
120	20	3662.5	3662.4901	-2.7030716724
120	30	3662.5	3662.4843	-4.2866894198
120	40	3662.5	3662.4880	-3.2764505120
120	50	3662.5	3662.4770	-6.2798634813

Frequency Stability versus Voltage

Test Condition		Reference Frequency (MHz)	Measured Frequency (MHz)	Frequency Error (ppm)
Voltage (Vac)	Temperature (^{O}C)			
102	25	3662.5	3662.4678	-8.7918088737
120	25	3662.5	3662.4894	-2.8941979522
138	25	3662.5	3662.4893	-2.9215017064

Channel BW = 7 MHz (Middle Channel: 3662.5 MHz)

Frequency Stability versus Temperature

Test Condition		Reference Frequency (MHz)	Measured Frequency (MHz)	Frequency Error (PPM)
Voltage (Vac)	Temperature (^{O}C)			
120	-30	3662.5	3662.4933	-1.8293515358
120	-20	3662.5	3662.5083	2.2662116041
120	-10	3662.5	3662.5100	2.7303754267
120	0	3662.5	3662.5150	4.0955631399
120	10	3662.5	3662.5245	6.6894197952
120	20	3662.5	3662.5270	7.3720136519
120	30	3662.5	3662.5321	8.7645051194
120	40	3662.5	3662.5343	9.3651877133
120	50	3662.5	3662.5344	9.3924914676

Frequency Stability versus Voltage

Test Condition		Reference Frequency (MHz)	Measured Frequency (MHz)	Frequency Error (ppm)
Voltage (Vac)	Temperature (^{O}C)			
102	25	3662.5	3662.5230	6.2798634813
120	25	3662.5	3662.5240	6.5529010239
138	25	3662.5	3662.5110	3.0034129693