

FCC PART 15 SUBPART C

EMI MEASUREMENT AND TEST REPORT

For

M/A-COM Inc.

221 Jefferson Ridge Parkway
Lynchburg, VA 24501

FCC ID: BV8MTT-A025

2003-06-18

This Report Concerns: ☒ Original Report	Equipment Type: ISM Radio
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Report No.: R0305011	
Test Date: 2003-05-20	
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1 - GENERAL INFORMATION

1.1 Product Description for Equipment Under Test (EUT)

The *M/A-COM Inc.* 's, FCC ID: BV8MTT-A025, or the "EUT" as referred to in this report is an ISM Radio which measures approximately 16"L x 12"W x 8"H. The ISM radio operates within the OpenSky network to provide a point to multi-point communication link between tower sites and cell sites. The ISM radio is a lost cost link used to extend the coverage area associated with a tower site. The coverage area serviced using a cell site may be necessary due to geographic constraints such as range (remote locations) or blocking.

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

1.2 Objective

This type approval report is prepared on behalf of *M/A-COM Inc.* in accordance with Part 2, Subpart J, Part 15, Subparts A and C of the Federal Communication Commissions rules.

The objective of the manufacturer is to demonstrate compliance with FCC rules for Output Power, Antenna Requirements, 6 dB Bandwidth, power density, 100 kHz Bandwidth of Band Edges Measurement, Conducted and Spurious Radiated Emission.

1.3 Related Submittal(s)/Grant(s)

No related submittals.

1.4 Test Methodology

All measurements contained in this report were conducted with ANSI C63.4-2001, American National Standard for Methods of Measurement of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the range of 9 kHz to 40 GHz and FCC97114 for Direct Sequence SS.

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.

1.5 Test Facility

The Open Area Test site used by BACL 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 BACL 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 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 C63.4-2001.

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 scope of the accreditation covers the FCC Method – 47 CFR Part – Digital Devices, CISPER 22: 1997: Electromagnetic Interference – Limits and Methods of Measurement of Information Technology Equipment test methods.

1.6 Test Equipment List

Manufacturer	Description	Model	Serial Number	Cal. Due Date
HP	Spectrum Analyzer	8568B	Panel 2408A00105 Display 2403A06544	2004-05-01
HP	Spectrum Analyzer	8564E	29190A00242	2003-12-06
HP	Amplifier	8447E	1937A01054	2004-05-01
HP	Quasi-Peak Adapter	85650A	2521A00718	2004-05-01
Com-Power	Biconical Antenna	AB-100	14012	2004-05-01
Com-Power	LISN	LI-200	12005	2004-03-28
Com-Power	LISN	LI-200	12008	2004-03-28
Com-Power	Log Periodic Antenna	AL-100	16091	2004-05-01
Com-Power	Log Periodic Antenna	AB-900	15049	2004-05-01
Rohde & Schwarz	EMI Test Receiver	ESPI	1147 8007 07	2003-12-03

* **Statement of Traceability:** Bay Area Compliance Laboratory Corp. certifies that all calibration has been performed using suitable standards traceable to the NIST.

1.7 Support Equipment List and Details

Manufacturer	Description	Model	Serial Number	FCC ID
Sony	Notebook	PCG-F150	289864303404240	DOC

1.8 External I/O Cabling List and Details

Cable Description	Length (M)	Port/From	To
Shielded Serial Cable	1.5	Serial Port/Notebook PC	EUT

2 - SYSTEM TEST CONFIGURATION

2.1 Justification

The host system was configured for testing according to ANSI C63.4-2001.

The EUT was tested in the normal (native) operating mode to represent *worst-case* results during the final qualification test.

2.2 EUT Exercise Software

The EUT exercise program used during radiated and conducted testing was designed to exercise the system components. The test software, provided by the customer, is started the Windows terminal program under the Windows 98/2000/ME/XP operating system.

Once loaded, set the Tx channel to low, mid and high for testing.

2.3 Special Accessories

As shown in section 2.7, all interface cables used for compliance testing are shielded. The notebook and the peripherals featured shielded metal connectors.

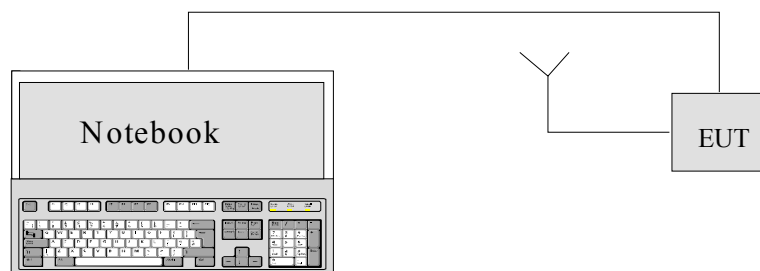
2.4 Schematics / Block Diagram

Please refer to Appendix A.

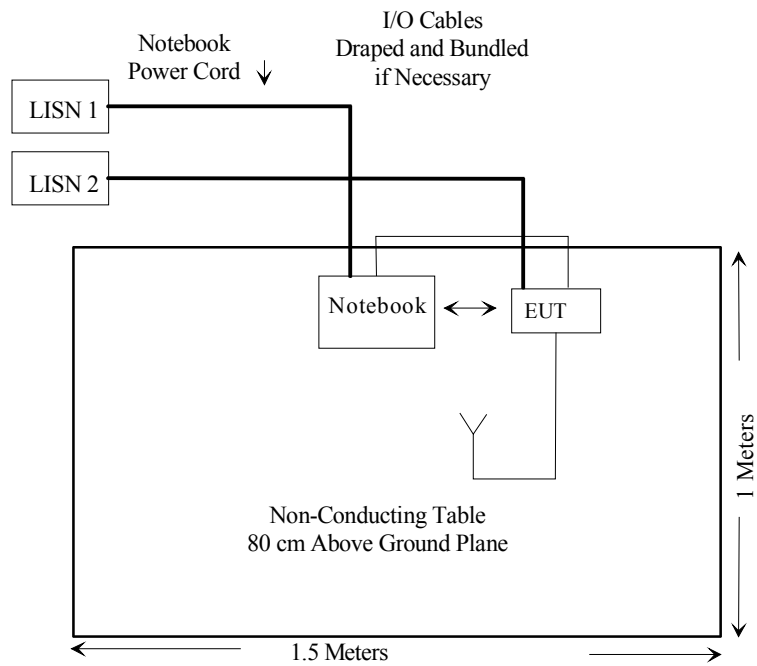
2.5 Equipment Modifications

No modifications were made to the EUT.

2.6 Configuration of Test System



2.7 Test Setup Block Diagram



3 - SUMMARY OF TEST RESULTS

FCC RULES	DESCRIPTION OF TEST	RESULT	REFERENCE
§ 15.203	Antenna Requirement	Compliant	Section 9
§ 15.205	Spurious Emissions in Restricted Bands	Compliant	Section 10
§ 15.207 (a)	Conducted Emission	Compliant	Section 11
§ 15.209 (a)	Radiated Emission	Compliant	Section 10
§ 15.209 (a)	Spurious Emission	Compliant	Section 6
§ 15.247 (a) (2)	6 dB Bandwidth	Compliant	Section 5
§ 15.247 (b)(3)	Maximum Peak Output Power	Compliant	Section 4
§ 15.247 (c)	100 kHz Bandwidth of Frequency Band Edge	Compliant	Section 8
§ 15.247 (d)	Peak Power Spectral Density	Compliant	Section 7

4 - CONDUCTED OUTPUT POWER MEASUREMENT

4.1 Standard Applicable

According to §15.247(b) (3), for systems using digital modulation in 2400-2483.5 MHz: 1 Watt

4.2 Measurement Procedure

1. Place the EUT on the turntable and set it in transmitting mode.
2. Remove the antenna from the EUT and then connect a low loss RF cable from the antenna port to the Spectrum Analyzer.
3. The peak power will be obtained by adding the bandwidth correction factor, $10\log(\text{BW 6dB} / \text{RBW})$ to the peak power reading at $\text{RBW} = 2.0 \text{ MHz}$ of the spectrum analyzer.

4.3 Test Equipment

Manufacturer	Model No.	Serial No.	Calibration Due Date
HP	8564E	Spectrum Analyzer	2003-12-06

4.4 Measurement Result

Output Power for All Other Antennas

	Frequency (MHz)	Peak Output Power (dBm)	Correction Factor (dBm)	Corrected Factor (dBm)	Output Power (W)	Standard (W)	Result
Port A	2412	16.00	8.2	24.20	0.26	$\leq 1.2 \text{ W}$	Compliant
	2442	15.83	8.2	24.03	0.25	$\leq 1.2 \text{ W}$	Compliant
	2465	15.17	8.2	23.37	0.22	$\leq 1.2 \text{ W}$	Compliant
Port B	2412	16.00	8.2	24.20	0.26	$\leq 1.2 \text{ W}$	Compliant
	2442	15.83	8.2	24.03	0.25	$\leq 1.2 \text{ W}$	Compliant
	2465	15.33	8.2	23.53	0.23	$\leq 1.2 \text{ W}$	Compliant

Note: Correction Factor = $10 \log (\text{BW6dB}/\text{RBW}) = 10 \log (13.08/2.0) = 8.2 \text{ dBm}$

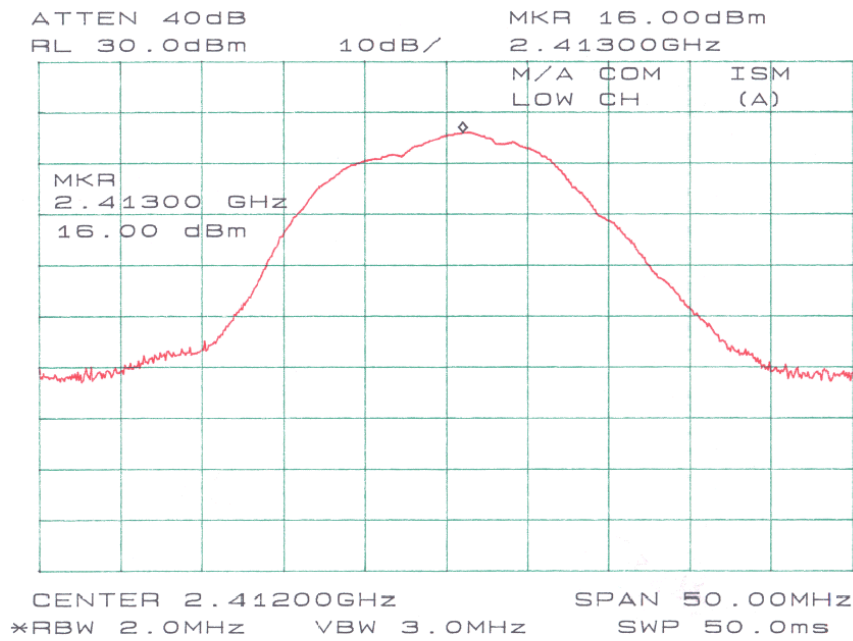
Output Power for 24dBi Directional Antenna

	Frequency (MHz)	Peak Output Power (dBm)	Correction Factor (dBm)	Corrected Factor (dBm)	Output Power (W)	Standard (W)	Result
Port A	2412	8.00	8.2	16.2	0.042	$\leq 1.2 \text{ W}$	Compliant
	2442	8.00	8.2	16.2	0.042	$\leq 1.2 \text{ W}$	Compliant
	2462	7.33	8.2	15.53	0.036	$\leq 1.2 \text{ W}$	Compliant
Port B	2412	8.00	8.2	16.2	0.042	$\leq 1.2 \text{ W}$	Compliant
	2442	8.00	8.2	16.2	0.042	$\leq 1.2 \text{ W}$	Compliant
	2462	7.67	8.2	15.87	0.039	$\leq 1.2 \text{ W}$	Compliant

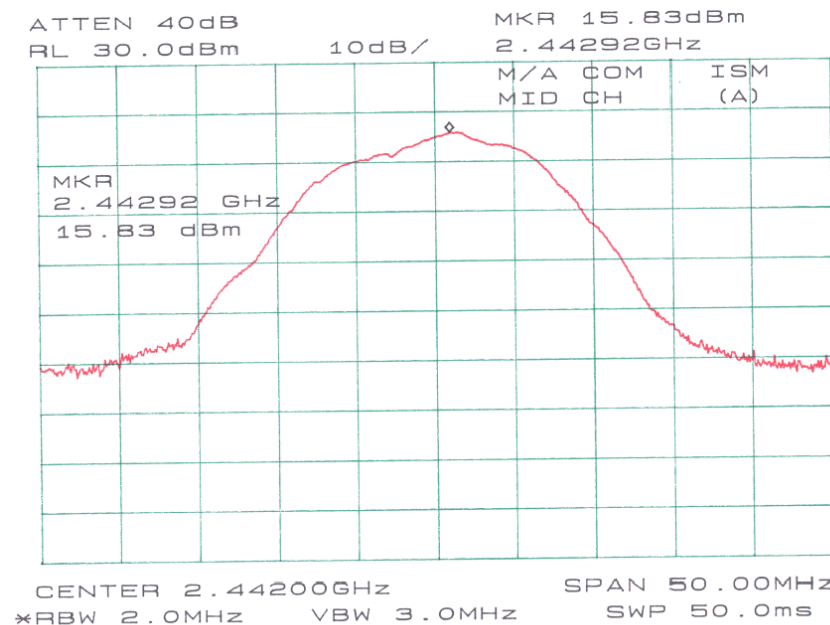
Note: Correction Factor = $10 \log (\text{BW6dB}/\text{RBW}) = 10 \log (13.17/2.0) = 8.2 \text{ dBm}$

Please refer to following plots:

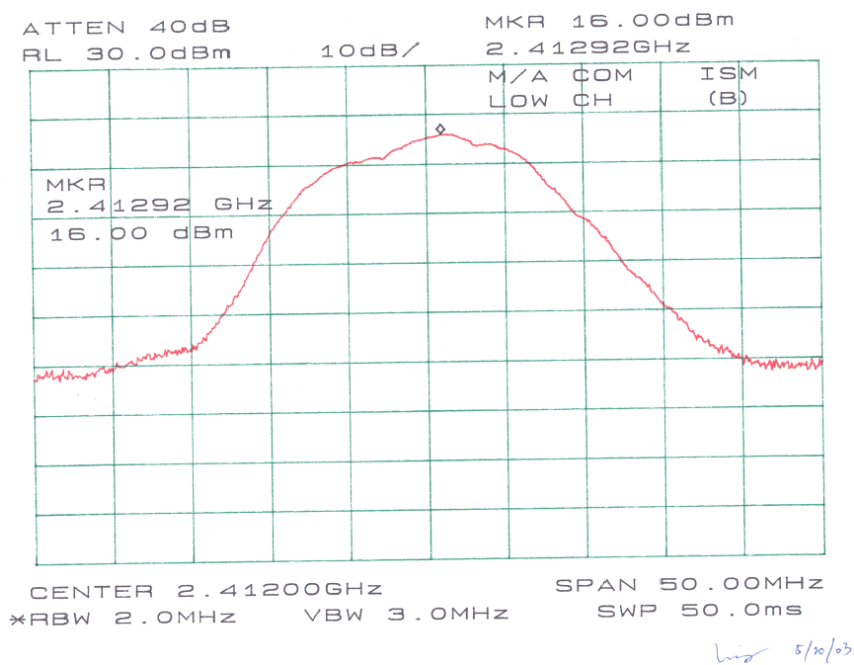
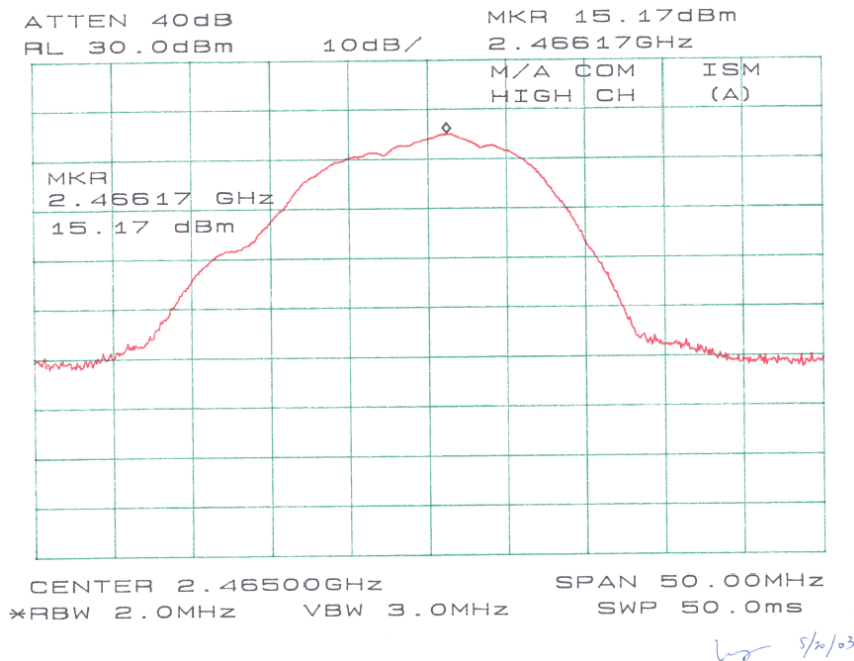
Output Power Plots for All Other Antennas Antenna

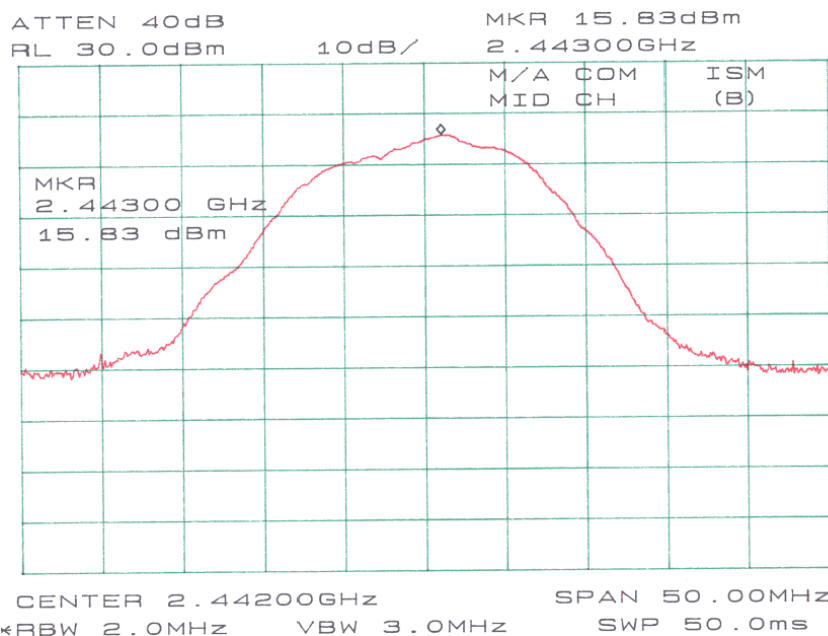
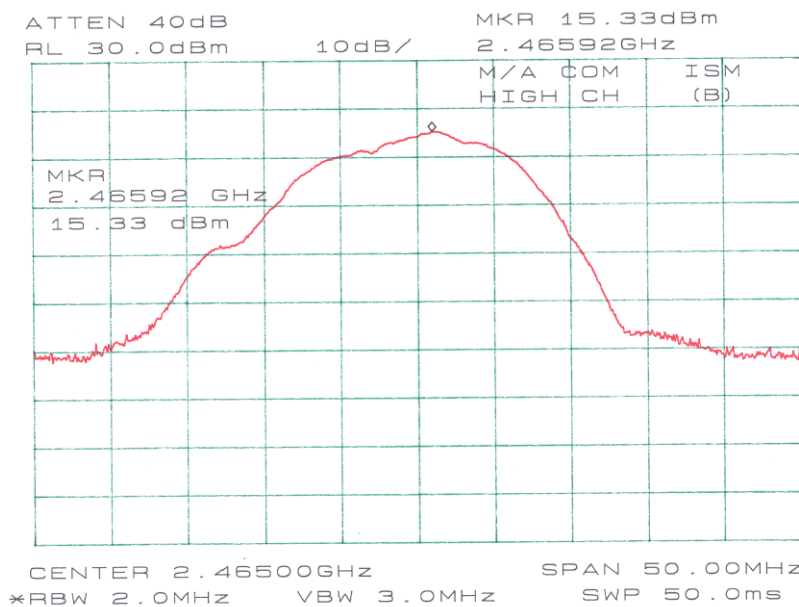


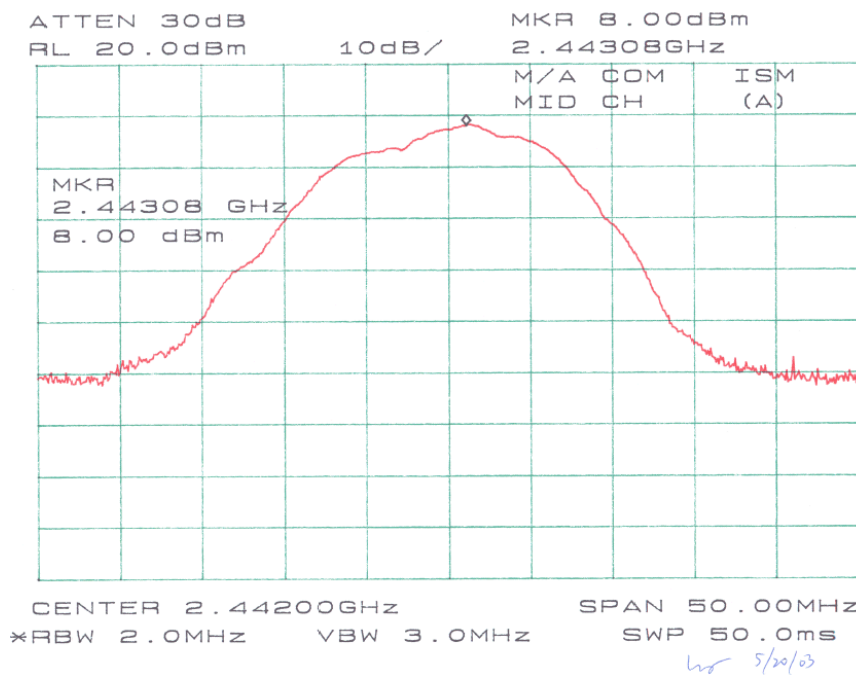
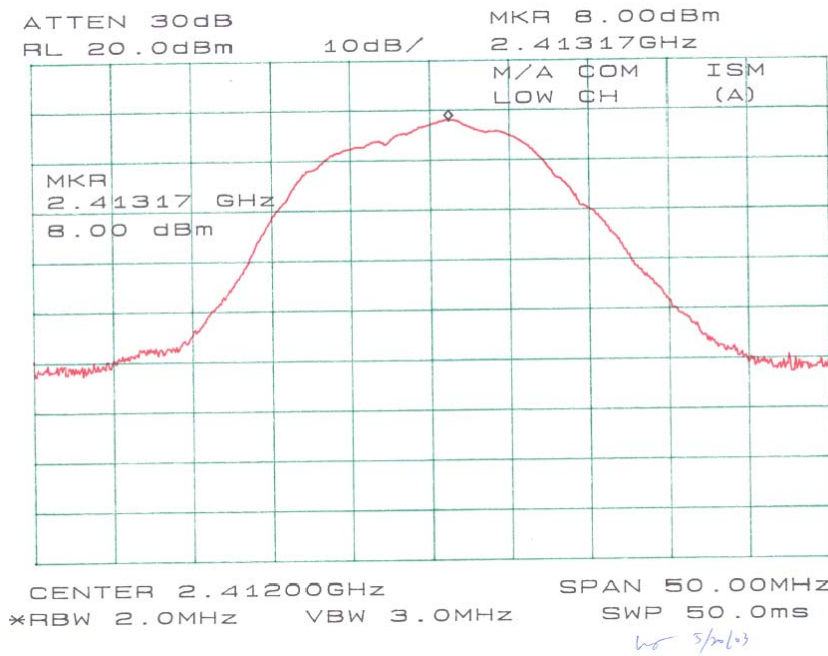
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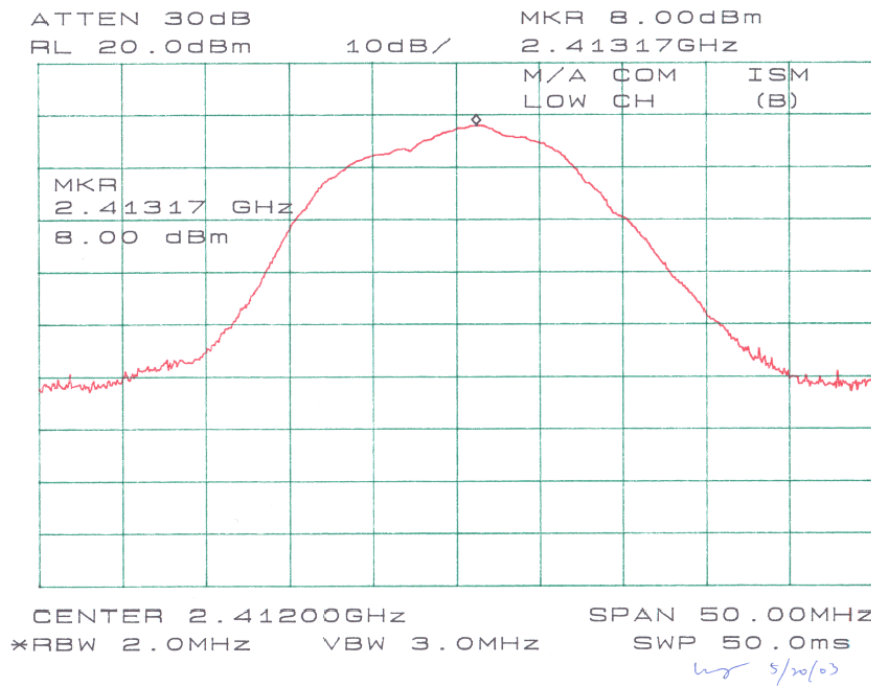
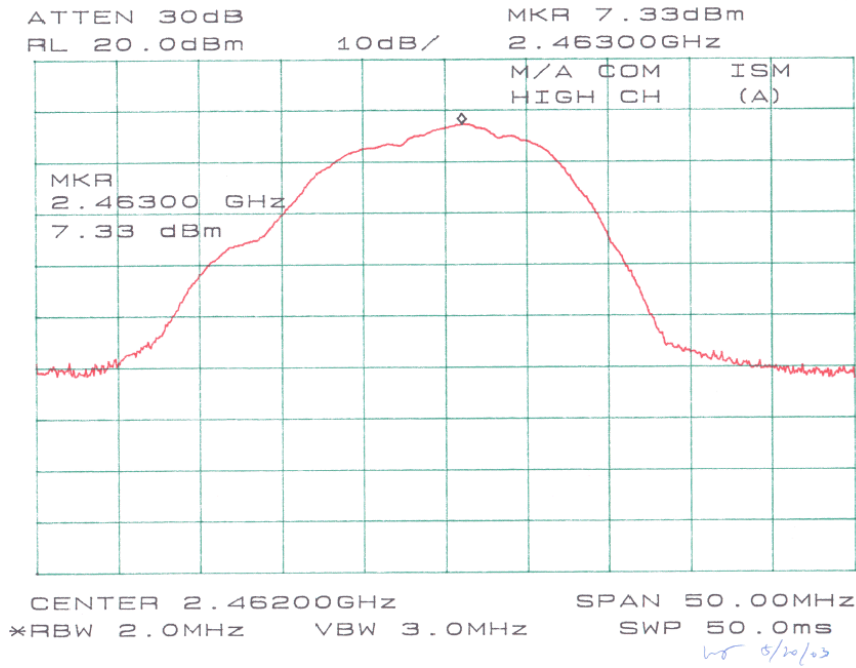


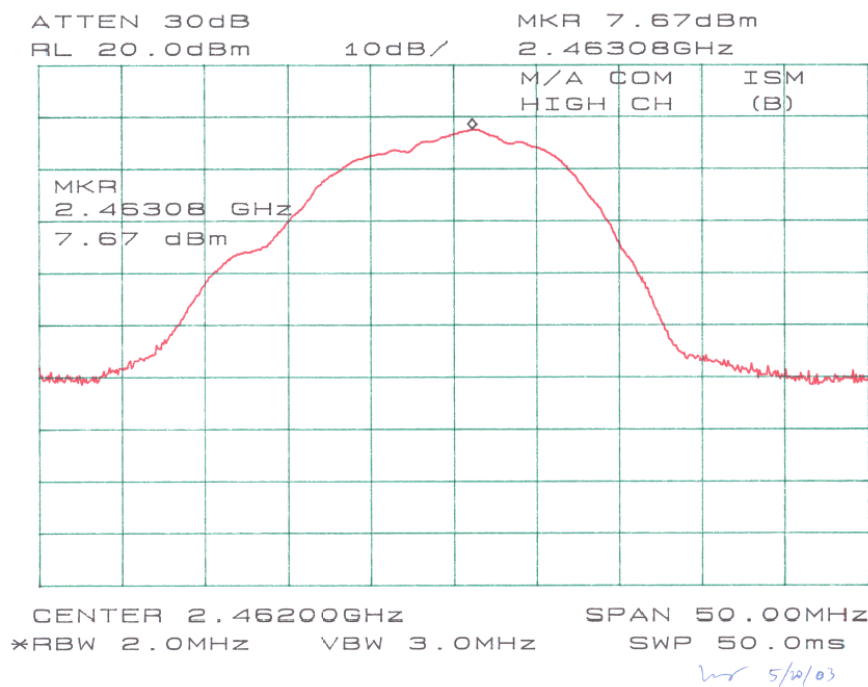
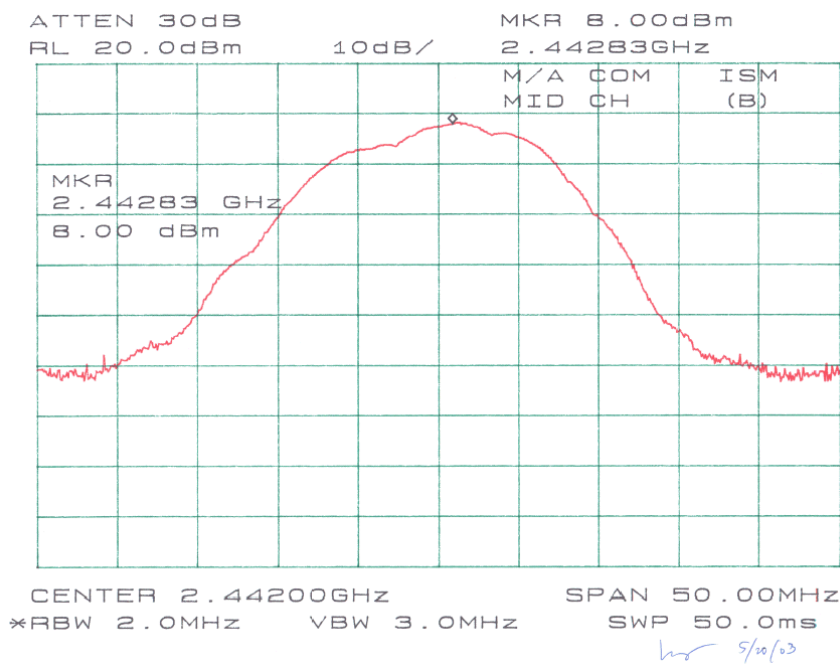
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Output Power Plots for 24dBi Directional Antenna





5 – 6 DB BANDWIDTH

5.1 Standard Applicable

According to §15.247(a)(2), for systems using digital modulation techniques operate in 2400 – 2483.5MHz, the minimum 6dB bandwidth shall be at least 500 kHz.

5.2 Measurement Procedure

1. Check the calibration of the measuring instrument using either an internal calibrator or a known signal from an external generator.
2. Position the EUT without connection to measurement instrument. Turn on the EUT and connect it to measurement instrument. Then set it to any one convenient frequency within its operating range. Set a reference level on the measuring instrument equal to the highest peak value.
3. Measure the frequency difference of two frequencies that were attenuated 6 dB from the reference level. Record the frequency difference as the emission bandwidth.
4. Repeat above procedures until all frequencies measured were complete.

5.3 Test Equipment

Manufacturer	Model No.	Serial No.	Calibration Due Date
HP	8564E	Spectrum Analyzer	2003-12-06

5.4 Measurement Result

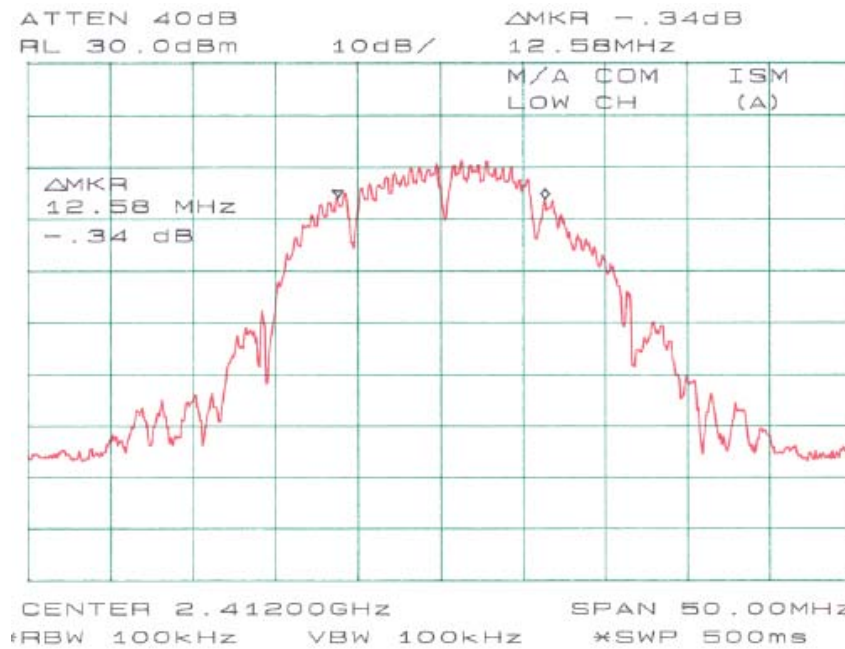
6dB Bandwidth for All Other Antennas

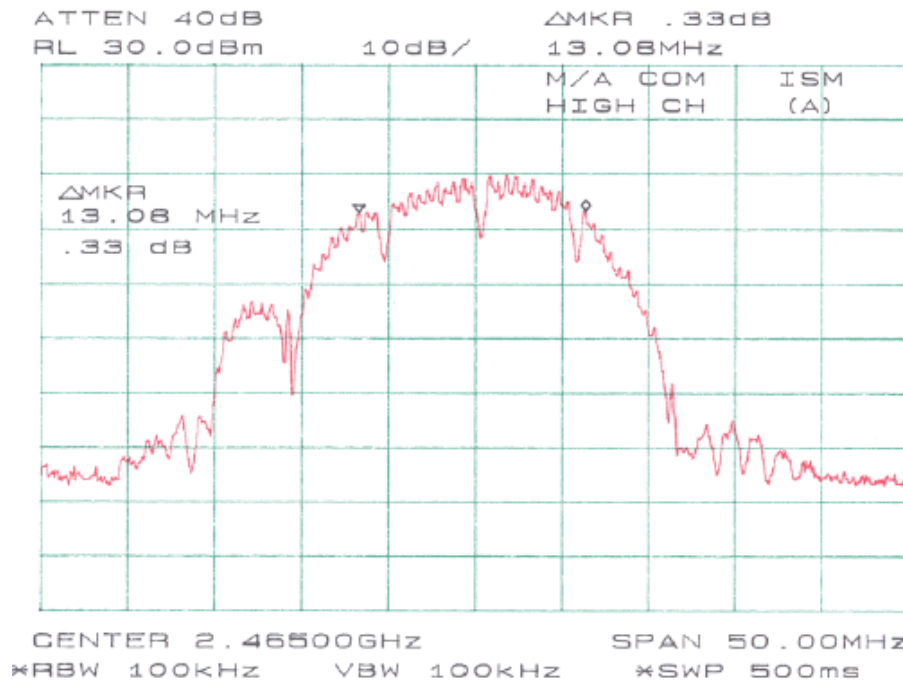
	Frequency (MHz)	Measured (MHz)	Standard (kHz)	Result
Port A	2412	12.58	≥ 500	Compliant
	2442	12.08	≥ 500	Compliant
	2465	13.08	≥ 500	Compliant
Port B	2412	12.67	≥ 500	Compliant
	2442	12.08	≥ 500	Compliant
	2465	13.00	≥ 500	Compliant

6dB Bandwidth for 24dBi Directional Antenna

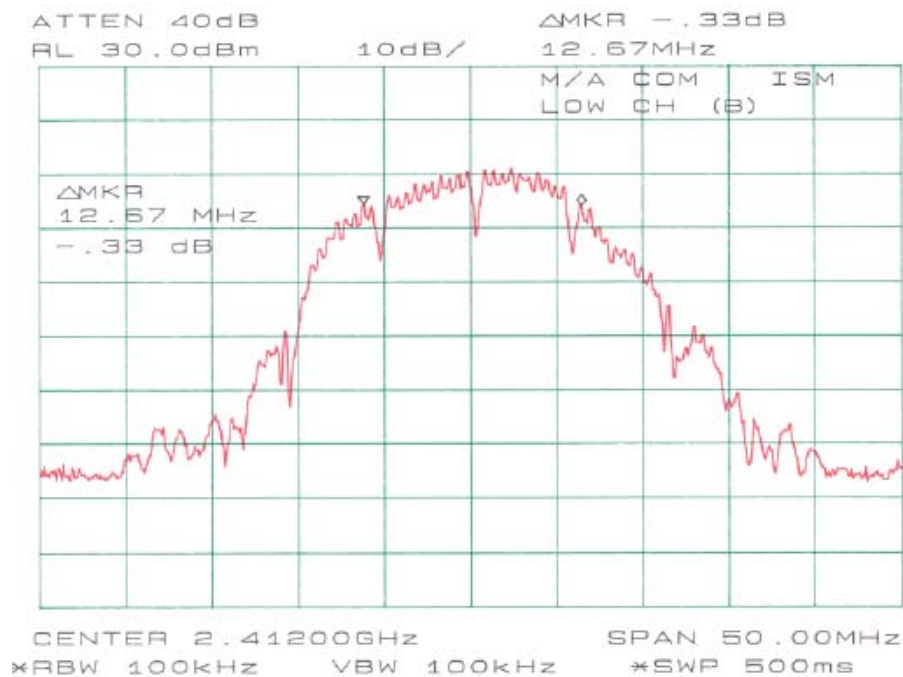
	Frequency (MHz)	Measured (MHz)	Standard (kHz)	Result
Port A	2412	12.08	≥ 500	Compliant
	2442	13.17	≥ 500	Compliant
	2462	12.67	≥ 500	Compliant
Port B	2412	12.50	≥ 500	Compliant
	2442	12.33	≥ 500	Compliant
	2462	13.08	≥ 500	Compliant

Please refer to following pages for plots of 6 dB Bandwidth.

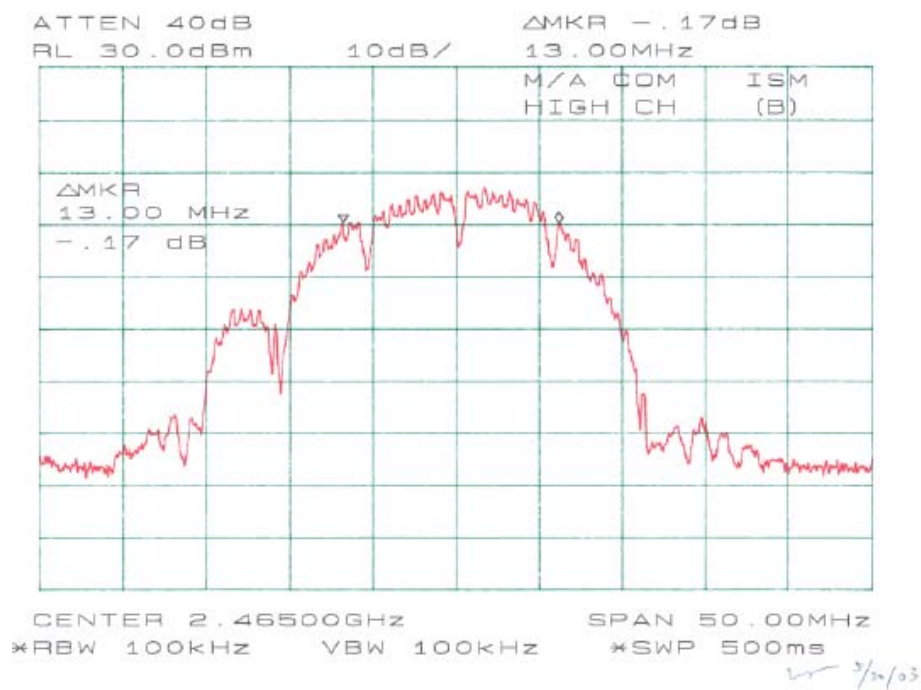
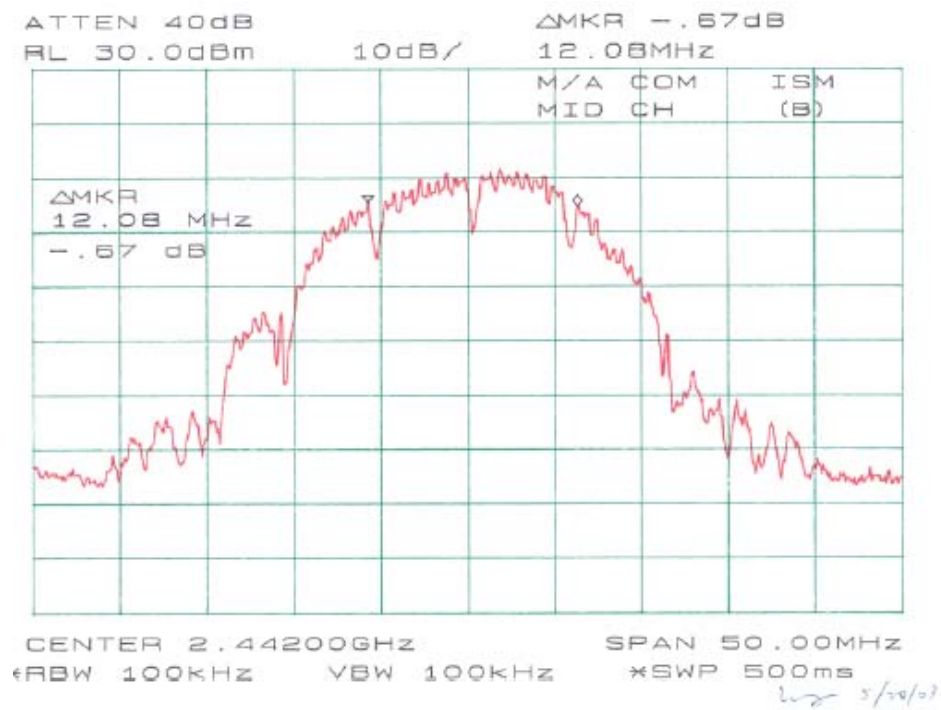
6dB Bandwidth Plots for All Other Antennas*low 5/20/03**low 5/20/03*



2-8 5/2/03



2-8 5/2/03



6dB Bandwidth Plots for 24dBi Directional Antenna