

# FCC CFR47 PART 15 CERTIFICATION CLASS II PERMISSIVE CHANGE TEST REPORT

## **FOR**

WLAN PC CARD

**MODEL NUMBER: LA-4121** 

**FCC ID: H9PLA4121** 

**REPORT NUMBER: 03U1983-1** 

**ISSUE DATE: JUNE 5, 2003** 

Prepared for

SYMBOL TECHNOLOGIES, INC. 6480 VIA DEL ORO DRIVE SAN JOSE, CA 95119 USA

*Prepared by* 

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### TABLE OF CONTENTS

1. TI	EST RESULT CERTIFICATION	3
2. DI	ESCRIPTION OF CLASS II PERMISSIVE CHANGE	4
3. TI	EST METHODOLOGY	5
4. FA	ACILITIES AND ACCREDITATION	5
4.1.	FACILITIES AND EQUIPMENT	5
4.2.		6
<b>5.</b> C	ALIBRATION AND UNCERTAINTY	7
5.1.	MEASURING INSTRUMENT CALIBRATION	7
5.2.	MEASUREMENT UNCERTAINTY	
5.3.	TEST AND MEASUREMENT EQUIPMENT	7
6. SU	UPPORT EQUIPMENT / EUT SETUP	8
7. Al	PPLICABLE RULES AND RESULT	10
7.1.	RADIATED EMISSIONS	10
7.2.	DISH ANTENNA RESULTS	
7.3.	YAGI ANTENNA RESULTS	
7.4.	PANEL ANTENNA RESULTS	
7.5.	PATCH ANTENNA RESULTS	
7.6.	DIPOLE ANTENNA RESULTS	
7.7.	WORST-CASE EMISSIONS 30 TO 1000 MHz	69

# 1. TEST RESULT CERTIFICATION

**COMPANY NAME:** SYMBOL TECHNOLOGIES, INC.

6480 VIA DEL ORO DRIVE SAN JOSE, CA 95119 USA

**EUT DESCRIPTION:** WLAN PC CARD

MODEL NUMBER: LA-4121

**DATE TESTED:** MARCH 24 TO MARCH 28, 2003

#### APPLICABLE STANDARDS

STANDARD TEST RESULTS

FCC PART 15 SUBPART C NO NON-COMPLIANCE NOTED

Compliance Certification Services, Inc. tested the above equipment in accordance with the requirements set forth in the above standards. The test results show that the equipment tested is capable of demonstrating compliance with the requirements as documented in this report.

**Note**: This document reports conditions under which testing was conducted and results of tests performed. This document may not be altered or revised in any way unless done so by Compliance Certification Services and all revisions are duly noted in the revisions section. Any alteration of this document not carried out by Compliance Certification Services will constitute fraud and shall nullify the document.

Approved & Released For CCS By:

Tested By:

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# 2. DESCRIPTION OF CLASS II PERMISSIVE CHANGE

The EUT is a WLAN operating over the 2400 to 2483.5 MHz band with an output power of 21.3 dBm (135mW). Additional antennas and antenna types are added, as follows:

4	yna,	Kr.	Exp	osure A	Ariter	ırıa .	Sum			
	FCC ID: H9PLA41	21 WLAN	PC Card	, 11 Mbps, T	Γ2				ork Systems Orga Source Based DC Factor: 0.72	
	Output Power: 135	mW Class II	Permis	sive Change					DC Factor: 0.71	
			M	obile Ant	ennas					
Ant No	Description	Symbol P/N	Туре	Min Cable (In.)	Gain (dBi)	EIRP (mW)	MPE (cm)	TR Status	Device Type	Prof Install
01.	Panel 8.5, 120° Sector	ML-2499-11PNA2-01	Panel	577	8.5	961	7.4	See # 11	Fixed Pt - MutiPt	
02.	Panel 9.5, 65°	ML-2499-12PNA2-01	Panel		9.5	1209	8.3	Sec #11	Fixed Pt - MuliPt	
03.	Panel 6.3, 80°, Diverse	ML-2499-7PNA2-01	Panel		6.3	571	5.7	See # 11	Fixed Pt - MutiPt	
04.	Rubber Duck, Cushcraft	ML-2499-APA2-01	Dipole		2.0	214	3.5	Sec # 9	Fixed Pt - MutiPt	
05.	Pipe Bomb 11* x 48*	ML-2499-HPA3-01	Dipole		4.9	413	4.9	Sec # 9	Fixed Pt - MutiPt	
06.	Panel HD 6.3, 65°	ML-2499-PNAHD-01	Panel		6.3	571	5.7	Sec # 11	Fixed Pt - MutiPt	
07.	Patch, 2.3, 48*	ML-2499-SD3-01	Patch		2.3	227	3.6	Tested	Fixed Pt - MutiPt	
08.	Patch, Diversity	ML-2499-SDD1-01	Patch		2.3	227	3.6	Sec # 7	Fixed Pt - MuliPt	
09.	Dipole 25" x 7"	ML-2499-BMMA1-01	Dipole	120	3.9	333	4.4	Tested	Fixed Pt - Pt	Ø
10.	Dish, 18, 10°	ML-2499-BPDA1-01	Dish	120	20.9	16709	30.9	Tested	Fixed Pt - Pt	Ø
11.	Panel 14.5, 31°	ML-2499-BPNA3-01	Panel	120	11.4	1875	10.4	Tested	Fixed Pt - Pt	Ø
12.	Yagi, 13.6, 34*	ML-2499-BYGA2-01	Yagi	120	13.1	2773	12.6	Tested	Fixed Pt - Pt	<b>V</b>

Point-to-point operations may employ transmitting antennas with directional gain greater than 6dBi provided the maximum peak output power of the intentional radiator is reduced by 1dB for every 3dB that the directional gain of the antenna exceeds 6dBi. The highest fixed point-to-point antenna gain, including coaxial feed cable, is 20.9dBi.

(20.9 dBi - 6 dBi) / 3 = 5 dB, therefore the output power limit is 30 - 5 = 25 dBm, and the EUT output power is 21.8 dBm.

Except for point-to-point operations the output power must be reduced by the amount in dB that the directional gain of the antenna exceeds 6dBi. The highest such antenna gain, including coaxial feed cable, is 9.5 dBi.

(9.5 dBi - 6 dBi) = 3.5 dB, therefore the output power limit is 30 - 3.5 = 26.5 dBm, and the EUT output power is 21.8 dBm.

# 3. TEST METHODOLOGY

The tests documented in this report were performed in accordance with ANSI C63.4/1992, FCC CFR 47 Part 2 and FCC CFR 47 Part 15.

# 4. FACILITIES AND ACCREDITATION

### 4.1. FACILITIES AND EQUIPMENT

The open area test sites and conducted measurement facilities used to collect the radiated data are located at 561F Monterey Road, Morgan Hill, California, USA. The sites are constructed in conformance with the requirements of ANSI C63.7, ANSI C63.4 and CISPR Publication 22.

All receiving equipment conforms to CISPR Publication 16-1, "Radio Interference Measuring Apparatus and Measurement Methods."

# 4.2. TABLE OF ACCREDITATIONS AND LISTINGS

Country	Agency	Scope of Accreditation	Logo
USA	FCC	3/10 meter Open Area Test Sites to perform FCC Part 15/18 measurements	FC 1300
Japan	VCCI	CISPR 22 Two OATS and one conducted Site	<b>VCCI</b> R-1014, R-619, C-640
Norway	NEMKO	EN50081-1, EN50081-2, EN50082-1, EN50082-2, IEC61000-6-1, IEC61000-6-2, EN50083-2, EN50091-2, EN50130-4, EN55011, EN55013, EN55014-1, EN55104, EN55015, EN61547, EN55022, EN55024, EN61000-3-2, EN61000-3-3, EN60945, EN61326-1	N <sub>ELA 117</sub>
Norway	NEMKO	EN60601-1-2 and IEC 60601-1-2, the Collateral Standards for Electro-Medical Products. MDD, 93/42/EEC, AIMD 90/385/EEC	N <sub>ELA-171</sub>
Taiwan	BSMI	CNS 13438	版 SL2-IN-E-1012
Canada	Industry Canada	RSS210 Low Power Transmitter and Receiver	Canada IC2324 A,B,C, and F

# 5. CALIBRATION AND UNCERTAINTY

### 5.1. MEASURING INSTRUMENT CALIBRATION

The measurement instruments utilized to perform the tests documented in this report have been calibrated in accordance with the manufacturer's recommendations, and are traceable to national standards.

#### 5.2. MEASUREMENT UNCERTAINTY

Where relevant, the following measurement uncertainty levels have been estimated for tests performed on the apparatus:

Radiated Emission					
30MHz – 200 MHz	+/- 3.3dB				
200MHz – 1000MHz	+4.5/-2.9dB				
1000MHz – 2000MHz	+4.6/-2.2dB				
Power Line Conducted Emission					
150kHz – 30MHz	+/-2.9				

# 5.3. TEST AND MEASUREMENT EQUIPMENT

The following test and measurement equipment was utilized for the tests documented in this report:

TEST AND MEASUREMENT EQUIPMENT LIST						
Name of Equipment	Manufacturer	Model	Serial Number	Calibration Due Date		
Quasi-Peak Adapter	HP	85650A	2521A01038	7/16/04		
SA Display Section	HP	85662A	2314A04793	7/16/04		
SA RF Section	HP	85680A	2314A02604	7/16/04		
Horn Antenna (1 - 18GHz)	EMCO	3115	6739	2/4/04		
Antenna, Biconical	Eaton	94455-1	1214	3/06/04		
Antenna, Log Periodic 200- 1000MHz	EMCO	3146	9107-3163	3/06/04		
Preamplifier	Miteq	NSP10023988	646456	4/26/04		
Spectrum Analyzer	HP	8593EM	3710A00205	6/11/03		
High Pass Filter (4.57GHz)	FSY Microwave	FM-4570-9SS	003	N.C.R.		

# 6. SUPPORT EQUIPMENT / EUT SETUP

## **SUPPORT EQUIPMENT**

PERIPHERAL SUPPORT EQUIPMENT LIST						
Device Type Manufacturer Model Serial Number FCC ID						
Laptop	Dell	PPL	NA	DoC		
PCMCIA Extension Board	NA	NA	NA	NA		
AC Adapter	Dell	DA-2	85391	NA		

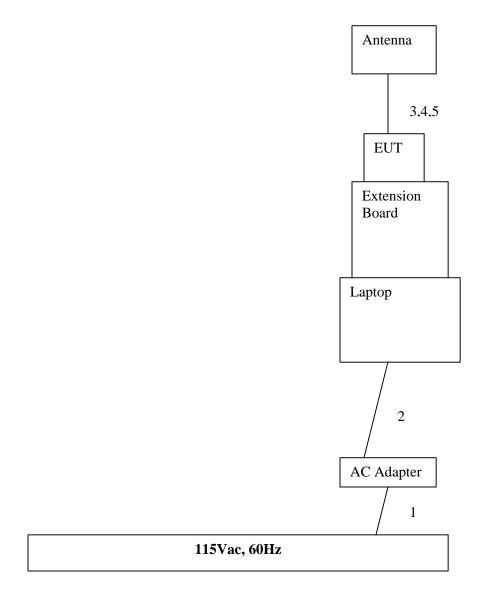
# **I/O CABLES**

Cable	Port	# of	Connector	Cable	Cable	Remarks
No.		Identical	Type	Type	Length	
		Ports				
1	AC	2	US115V	Un-Shielded	2m	NA
2	DC	1	DC	Un-Shielded	2m	NA
3	RF	2	BNC M	Shielded	10cm	NA
4	RF	2	Coax	Shielded	100m	NA
5	RF	2	BNC M - N M	Shielded	30cm	NA

### **TEST SETUP**

The EUT was operated as a standalone device, using an Ethernet connection to make setup adjustments. Each antenna is external.

### **SETUP DIAGRAM**



Page 9 of 69

# 7. APPLICABLE RULES AND RESULT

#### 7.1. RADIATED EMISSIONS

#### **LIMITS**

§15.205 (a) Except as shown in paragraph (d) of this section, only spurious emissions are permitted in any of the frequency bands listed below:

MHz	MHz	MHz	GHz
0.090 - 0.110	16.42 - 16.423	399.9 - 410	4.5 - 5.15
<sup>1</sup> 0.495 - 0.505	16.69475 - 16.69525	608 - 614	5.35 - 5.46
2.1735 - 2.1905	16.80425 - 16.80475	960 - 1240	7.25 - 7.75
4.125 - 4.128	25.5 - 25.67	1300 - 1427	8.025 - 8.5
4.17725 - 4.17775	37.5 - 38.25	1435 - 1626.5	9.0 - 9.2
4.20725 - 4.20775	73 - 74.6	1645.5 - 1646.5	9.3 - 9.5
6.215 - 6.218	74.8 - 75.2	1660 - 1710	10.6 - 12.7
6.26775 - 6.26825	108 - 121.94	1718.8 - 1722.2	13.25 - 13.4
6.31175 - 6.31225	123 - 138	2200 - 2300	14.47 - 14.5
8.291 - 8.294	149.9 - 150.05	2310 - 2390	15.35 - 16.2
8.362 - 8.366	156.52475 - 156.52525	2483.5 - 2500	17.7 - 21.4
8.37625 - 8.38675	156.7 - 156.9	2655 - 2900	22.01 - 23.12
8.41425 - 8.41475	162.0125 - 167.17	3260 - 3267	23.6 - 24.0
12.29 - 12.293	167.72 - 173.2	3332 - 3339	31.2 - 31.8
12.51975 - 12.52025	240 - 285	3345.8 - 3358	36.43 - 36.5
12.57675 - 12.57725	322 - 335.4	3600 - 4400	$\binom{2}{}$
13.36 - 13.41			

<sup>&</sup>lt;sup>1</sup> Until February 1, 1999, this restricted band shall be 0.490-0.510 MHz.

§15.205 (b) Except as provided in paragraphs (d) and (e), the field strength of emissions appearing within these frequency bands shall not exceed the limits shown in Section 15.209. At frequencies equal to or less than 1000 MHz, compliance with the limits in Section 15.209 shall be demonstrated using measurement instrumentation employing a CISPR quasi-peak detector. Above 1000 MHz, compliance with the emission limits in Section 15.209 shall be demonstrated based on the average value of the measured emissions. The provisions in Section 15.35 apply to these measurements.

<sup>&</sup>lt;sup>2</sup> Above 38.6

§15.209 (a) Except as provided elsewhere in this Subpart, the emissions from an intentional radiator shall not exceed the field strength levels specified in the following table:

Frequency (MHz)	Field Strength (microvolts/meter)	Measurement Distance (meters)
30 - 88 88 - 216	100 ** 150 **	3
216 - 960 Above 960	200 ** 500	3 3

<sup>\*\*</sup> Except as provided in paragraph (g), fundamental emissions from intentional radiators operating under this Section shall not be located in the frequency bands 54-72 MHz, 76-88 MHz, 174-216 MHz or 470-806 MHz. However, operation within these frequency bands is permitted under other sections of this Part, e.g., Sections 15.231 and 15.241.

§15.209 (b) In the emission table above, the tighter limit applies at the band edges.

#### **TEST PROCEDURE**

The EUT is placed on a non-conducting table 80 cm above the ground plane. The antenna to EUT distance is 3 meters. The EUT is configured in accordance with ANSI C63.4. The EUT is set to transmit in a continuous mode.

For measurements below 1 GHz the resolution bandwidth is set to 100 kHz for peak detection measurements or 120 kHz for quasi-peak detection measurements. Peak detection is used unless otherwise noted as quasi-peak.

For measurements above 1 GHz the resolution bandwidth is set to 1 MHz, then the video bandwidth is set to 1 MHz for peak measurements and 10 Hz for average measurements.

The spectrum from 30 MHz to 26 GHz is investigated with the transmitter set to the lowest, middle, and highest channels.

The frequency range of interest is monitored at a fixed antenna height and EUT azimuth. The EUT is rotated through 360 degrees to maximize emissions received. The antenna is scanned from 1 to 4 meters above the ground plane to further maximize the emission. Measurements are made with the antenna polarized in both the vertical and the horizontal positions.

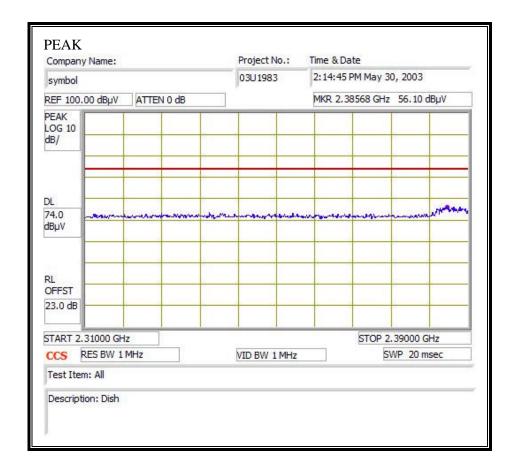
# 7.2. DISH ANTENNA RESULTS

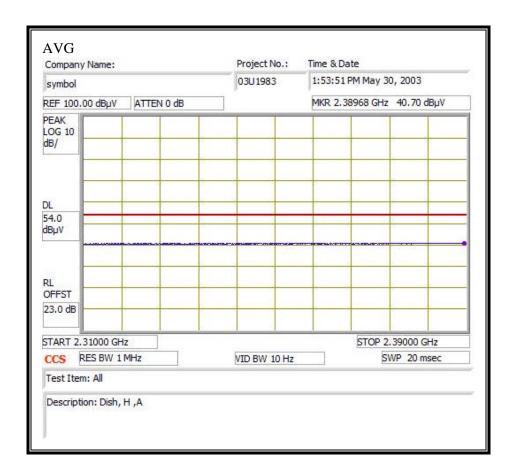
# **SETUP PHOTOS**



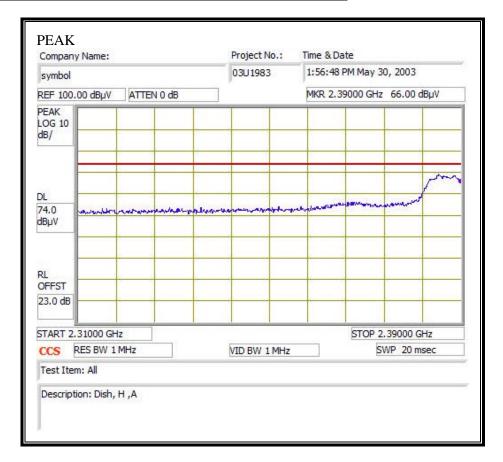


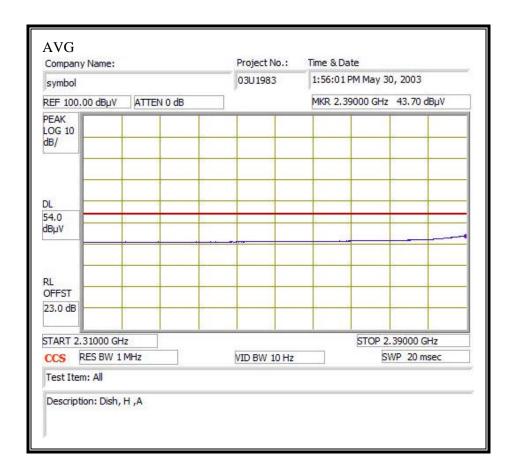
### ADJACENT RESTRICTED BAND (LOW CHANNEL, HORIZONTAL)



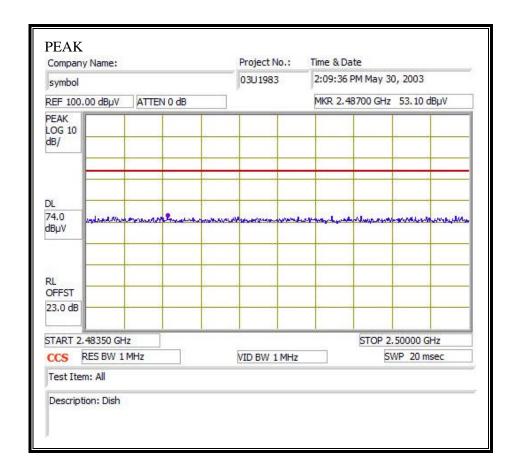


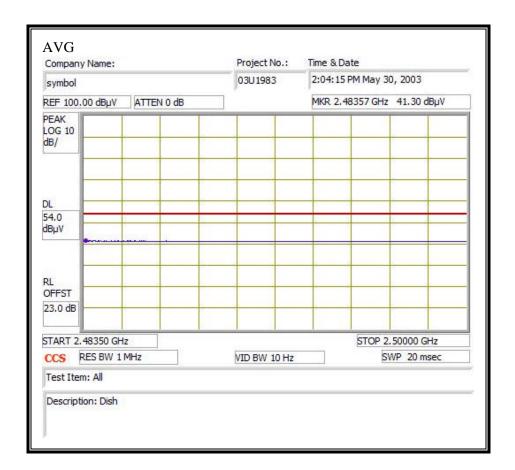
### ADJACENT RESTRICTED BAND (LOW CHANNEL, VERTICAL)



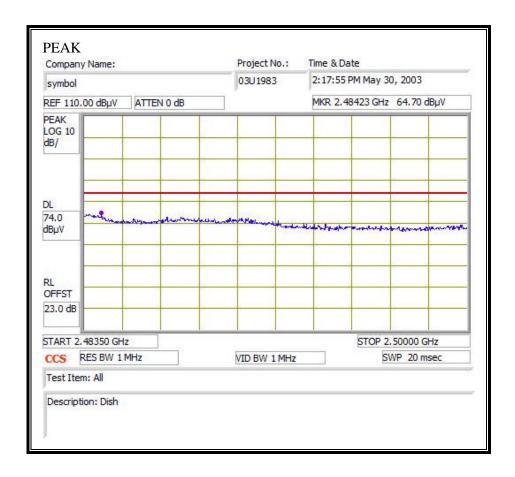


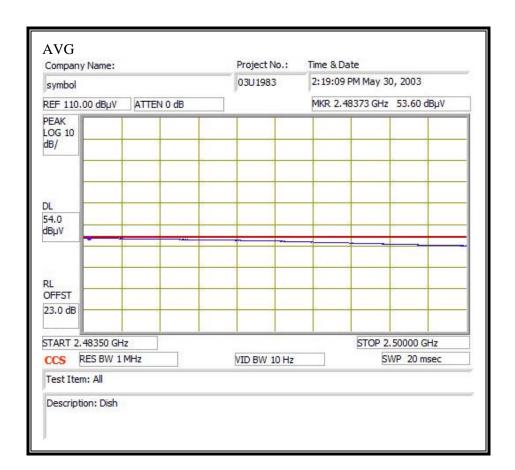
#### ADJACENT RESTRICTED BAND (HIGH CHANNEL, HORIZONTAL)



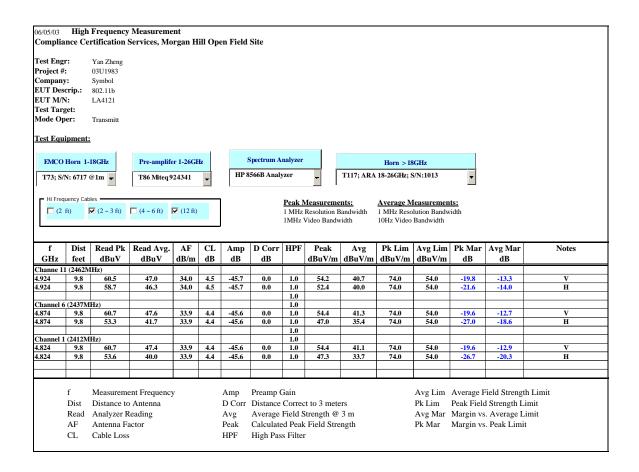


### **ADJACENT RESTRICTED BAND (HIGH CHANNEL, VERTICAL)**





### **HARMONICS AND SPURIOUS EMISSIONS**



Note: no other harmonics or spurious detected above 1 GHz.

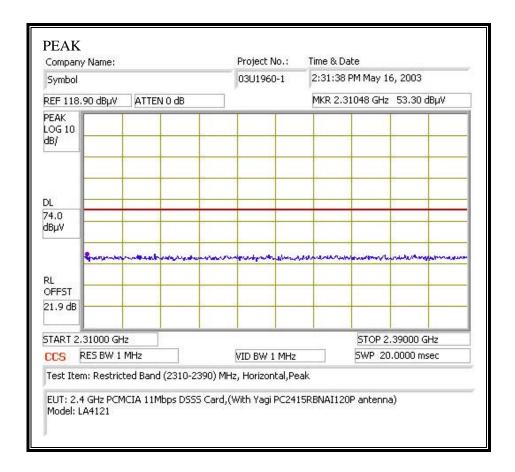
# 7.3. YAGI ANTENNA RESULTS

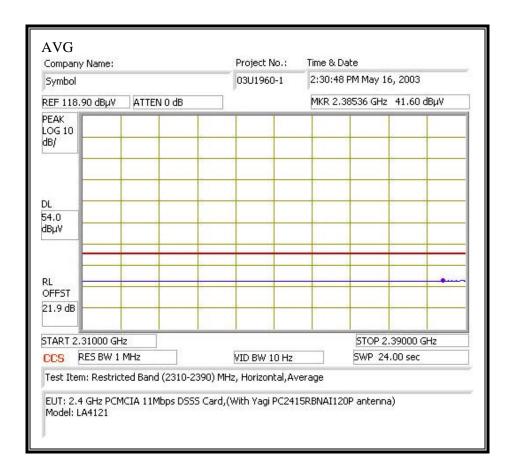
# **SETUP PHOTOS**



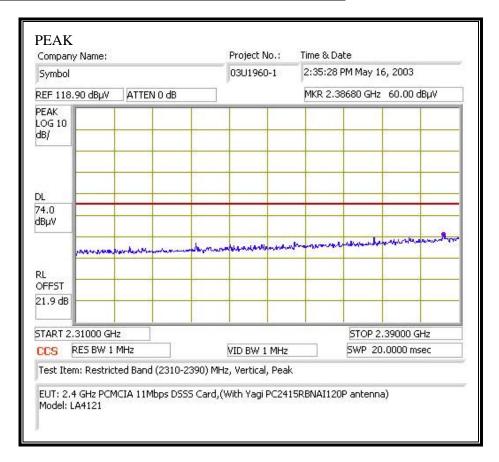


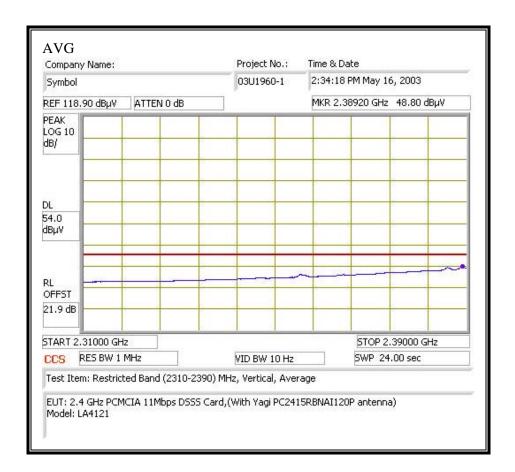
### ADJACENT RESTRICTED BAND (LOW CHANNEL, HORIZONTAL)



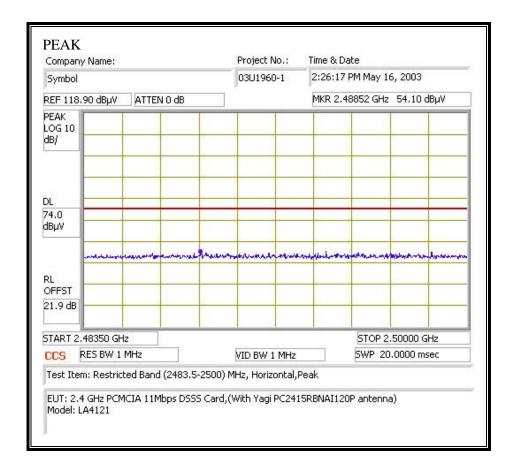


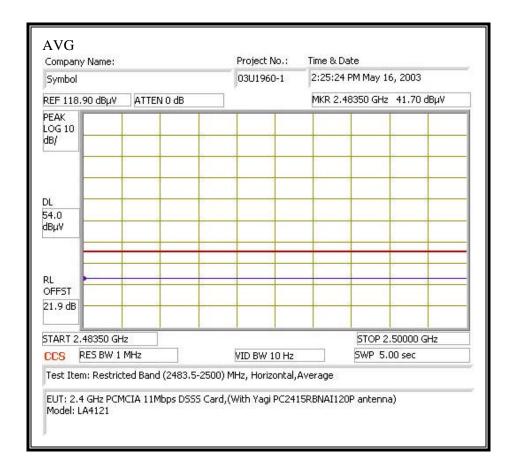
### ADJACENT RESTRICTED BAND (LOW CHANNEL, VERTICAL)



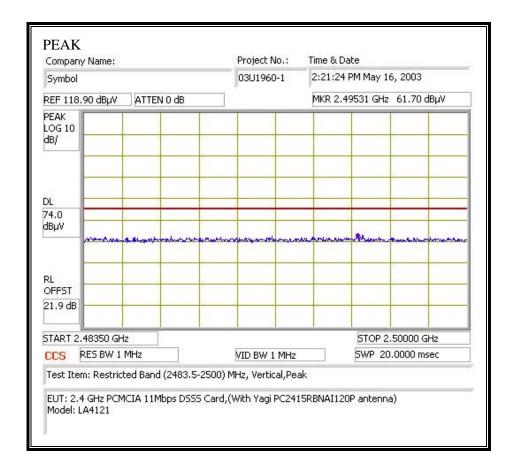


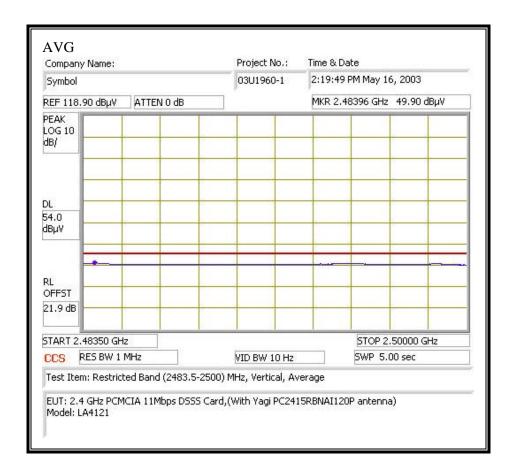
### ADJACENT RESTRICTED BAND (HIGH CHANNEL, HORIZONTAL)



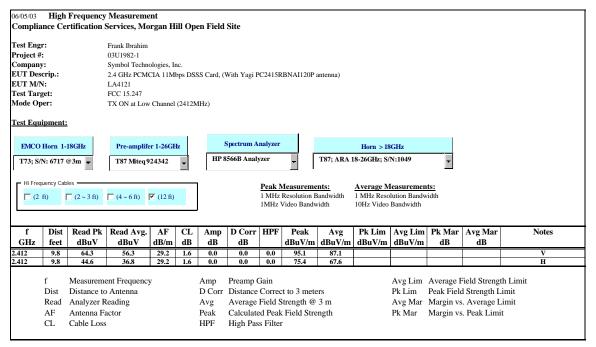


### ADJACENT RESTRICTED BAND (HIGH CHANNEL, VERTICAL)

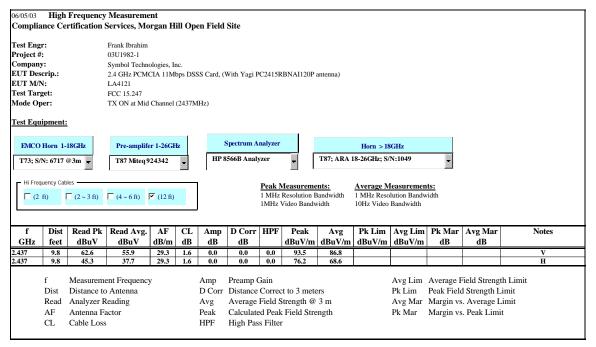




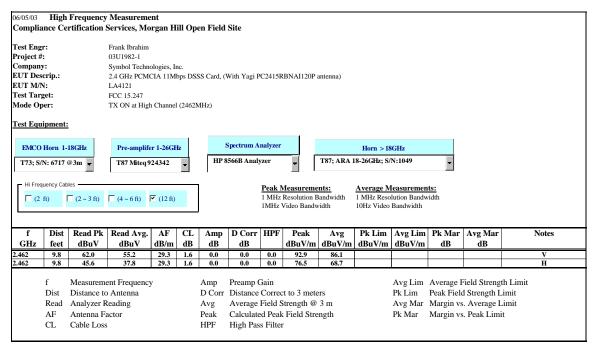
### **HARMONICS AND SPURIOUS EMISSIONS**



Note: no harmonics or spurious detected in the freq range of 1-25 GHz.



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