

**Permissive Change Test Report  
(Radiated Emissions in Restricted Bands)  
FCC Part 15.247 (c)  
for  
Symbol Technologies  
on the  
Spread Spectrum Frequency Hopping Radio  
Model: LA4121  
FCC ID: H9PLA4121**

Test Report #: 200319221  
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Date of Test: November 21, 2000

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Lab Code: 200201-01

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**Table of Contents**

**1.0 Summary of Tests.....2**

**2.0 General Description.....3**

2.1 Product Description ..... 3

2.3 Test Methodology ..... 4

2.4 Test Facility ..... 4

**3.0 System Test Configuration .....5**

3.1 Support Equipment.....5

Dell Latitude Cpi D266XT, Model PPL, S/N 2HWTD.....5

3.3 Justification ..... 6

3.4 Software Exercise Program ..... 6

3.5 Mode of Operation During Test ..... 6

3.6 Modifications Required for Compliance ..... 6

**4.0 Measurement Results .....7**

4.1 Transmitter Radiated Emissions in Restricted Bands, FCC Ref: 15.247(c)..... 7

4.2 Radiated Emission Test Results..... 8

4.3 Radiated Emission Configuration Photograph..... 15


4.4 List of Test Equipment .....19

**5.0 Document History.....20**


1.0 Summary of Tests

Symbol Technologies Inc. - Model No. H9PLA4121

TEST	REFERENCE	RESULTS
Radiated Emission in Restricted Bands	15.247(c)	Passed

Test Engineer:   
Suresh Kondapalli

Date: 11/30/00

EMC Site Mgr.:   
David Chernomordik

Date: 11/30/00

**2.0 General Description****2.1 Product Description**

The Symbol Technologies model H9PLA4121 is 2.4 GHz Spread Spectrum radio in the form of a PCMCIA card that is used for wireless communication from a computer to a LAN.

**Overview of the EUT**

<b>Trade Name &amp; Model No.</b>	Symbol Technologies, Model No. H9PLA4121
<b>Frequency Range (MHz)</b>	2402 – 2480
<b>Antenna(s)</b>	Internal Antenna Model 3146BD, Gain 0 dBi, P/N 10-41359-01, Manufactured by Symbol Yagi Antenna Model LA 2415N, Gain 13 dBi, P/N PC2415RBN120, Manufactured by Cushcraft
<b>Manufacturer name &amp; address</b>	Symbol Technologies 6480 Via Del Oro San Jose, California 95119

### 2.3 Test Methodology

This report is designed to show that the 2 new antennas added to the previously certified device complies with FCC regulations. Only radiated emissions in restricted bands were tested because the transmitter itself has not been modified.

Radiated emissions measurements were performed according to the procedures in ANSI C63.4 (1992). Radiated tests were performed at an antenna to EUT distance of 3 meters, unless stated otherwise in the "**Data Sheet**" of this Application.

### 2.4 Test Facility

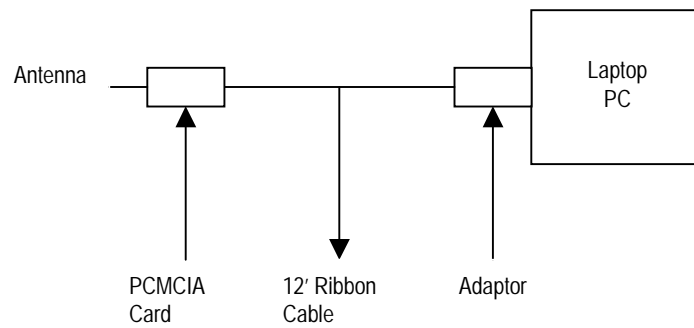
The open area test site 2 facility used to collect the radiated data is located at 1365 Adams Court, Menlo Park, CA 94025. This test facility and site measurement data have been fully placed on file with the FCC.

**3.0 System Test Configuration**

3.1 Support Equipment

Dell Latitude Cpi D266XT, Model PPL, S/N 2HWTD

3.2 Test Setup Diagram:



### 3.3 Justification

For emission testing, the equipment under test (EUT) was configured for testing in a typical fashion (as a customer would normally use it). During testing, all cables were manipulated to produce worst case emissions.

For radiated emission measurements, the EUT is attached to a cardboard box (if necessary) and placed on the wooden turntable. If the EUT attaches to peripherals, they are connected and operational (as typical as possible). The EUT is wired to transmit full power.

The signal is maximized through rotation and placement in the three orthogonal axes. The antenna height and polarization are varied during the search for maximum signal level. The antenna height is varied from 1 to 4 meters. Radiated emissions are taken at three meters unless the signal level is too low for measurement at that distance. If necessary, a pre-amplifier is used and/or the test is conducted at a closer distance.

All readings are extrapolated back to the equivalent three meter reading using inverse scaling with distance.

### 3.4 Software Exercise Program

The EUT exercise program used during radiated and conducted testing was designed to exercise the various system components in a manner similar to a typical use.

### 3.5 Mode of Operation During Test

For emissions testing, the unit was setup to transmit continuously to simplify the measurement methodology. Care was taken to ensure proper power supply voltages during testing.

### 3.6 Modifications Required for Compliance

The following modifications were installed during compliance testing in order to bring the product into compliance (Please note that this list does not include changes made specifically by Symbol Technologies Inc. prior to compliance testing):

No modifications were made to the EUT by Intertek Testing Services.

#### **4.0 Measurement Results**

##### **4.1 Transmitter Radiated Emissions in Restricted Bands, *FCC Ref: 15.247(c)***

Radiated emission measurements were performed from 30 MHz to 25000 MHz. Analyzer resolution is 100 kHz or greater for frequencies from 30 MHz to 1000 MHz and 1 MHz for frequencies above 1000 MHz.

Data is included of the worst case configuration (the configuration which resulted in the highest emission levels). A sample calculation, configuration photographs and data tables of the emissions are included. All measurements were performed with peak detection and average detection (above 1 GHz) unless otherwise specified.

On the following pages, the emissions on the harmonics frequencies, the limits, and the margin of compliance are presented. These tests were made when the transmitter is in full radiated power. Duty cycle correction was not used.

For the test results, refer to the following radiated emission data sheets.

#### **Note:**

It was verified that radiated emission data from digital portion of the EUT is not worse than the data previously measured and presented in the original report.



4.2 Radiated Emission Test Results

The EUT passed the test, refer to the attached data sheets.

**Radiated Emissions Test Data**

Company:	Symbol Technologies	Model #:	LA4121	Standard	FCC § 15.247 (R.B.)
EUT:	PCMCI CARD	S/N #:		Limits	11
Project #:	J200031992	Test Date:	Nov 21, 2000	Test Distance_	3 meters
Test Mode:	Internal Antenna Model 3146BD Tx@ 2412MHz	Engineer:	Suresh K	Duty Relaxation	0 dB

	Antenna Used			Pre-Amp Used			Cable Used			Transducer Used
Number:	14	8	21	8	10	13	21	0	0	0
Model:	EMCO 3115	EMCO 3115	3160-9	CDI P1000	AFT18855	ACO/400	Grn_M+L	None	None	None

Frequency	Reading	Detector	Ant	Amp.	Ant. Pol.	Ant. Factor	Pre-Amp	Insert. Loss	D. C. F.	Net	Limit @3m	Margin
MHz	dB(μV)	P/A/Q	#	#	H/V	dB(1/m)	dB	dB	dB	dB(μV/m)	dB(μV/m)	dB
2412.00E+0	89.9	Peak	14	0	V	30.1	0.0	2.3	0.0	122.3	-	-
4824.00E+0	29.0	Peak	14	8	V	33.9	28.1	3.2	0.0	38.0	74.0	-36.0
4824.00E+0	16.8	Ave.	14	8	V	33.9	28.1	3.2	0.0	25.8	54.0	-28.2
7235.90E+0	39.0	Peak	14	8	V	38.0	28.0	4.3	0.0	53.3	74.0	-20.7
7235.90E+0	28.5	Peak	14	8	V	38.0	28.0	4.3	0.0	42.8	54.0	-11.2
1.21E+4	40.7	Peak	14	10	V	42.3	39.1	5.9	0.0	49.8	74.0	-24.2
1.21E+4	28.6	Ave.	14	10	V	42.3	39.1	5.9	0.0	37.7	54.0	-16.3
1.45E+4	40.9*	Peak	14	10	V	40.7	37.8	6.5	0.0	50.3	74.0	-23.7
1.45E+4	29.3*	Ave.	14	10	V	40.7	37.8	6.5	0.0	38.7	54.0	-15.3
1.93E+4	34.8*	Peak	21	13	V	40.2	23.3	7.7	0.0	59.4	74.0	-14.6
1.93E+4	25.0*	Ave.	21	13	V	40.2	23.3	7.7	0.0	49.6	54.0	-4.4
2.17E+4	26.0*	Peak	21	13	V	40.3	23.3	7.9	0.0	50.9	74.0	-23.1
2.17E+4	21.4*	Ave.	21	13	V	40.3	23.3	7.9	0.0	46.3	54.0	-7.7

<b>Notes:</b>	a) D.C.F.:Distance Correction Factor
	b) Inset. Loss (dB) = Cable A + Cable B + Cable C .
	c) Net (dB) = Reading + Antenna Factor - Pre-amp + Insert. Loss. - Transducer Loss - Duty Relaxation (transmitter only).
	d) Negative signs (-) in Margin column signify levels below the limits.
	e) All measurements above 10GHz are made at 1 meter distance from EUT
	f) *Noise floor

**Radiated Emissions Test Data**

Company:	Symbol Technologies	Model #:	Antenna LA2415N	Standard_	FCC § 15.247 (R.B.)
EUT:	PCMCI CARD	S/N #:	4	Limits_	11
Project #:	J200031992	Test Date:	Nov 21, 2000	Test Distance_	3 meters
Test Mode:	Cushcraft Yagi Antenna, Tx @2412MHz	Engineer:	Suresh K.	Duty Relaxation	0 dB

	Antenna Used			Pre-Amp Used			Cable Used			Transducer Used
Number:	14	8	21	8	10	13	21	0	0	0
Model:	EMCO 3115	EMCO 3115	3160-9	CDI_P1000	AFT18855	ACO/400	Gm_M+L	None	None	None

Frequency	Reading	Detector	Ant.	Amp.	Ant. Pol.	Ant. Factor	Pre-Amp	Insert. Loss	D. C. F.	Net	Limit @3m	Margin
MHz	dB(μV)	P/A/Q	#	#	H/V	dB(1/m)	dB	dB	dB	dB(μV/m)	dB(μV/m)	dB
2412.00	94.5	Peak	14	0	V	30.1	0.0	2.3	0.0	126.9	-	-
4824.00	27.9	Peak	14	8	V	33.9	28.1	3.2	0.0	36.9	74.0	-37.1
4824.00	16.5	Ave.	14	8	V	33.9	28.1	3.2	0.0	25.5	54.0	-28.5
7236.00	35.4	Peak	14	8	V	38.0	28.0	4.3	0.0	49.7	74.0	-24.3
7236.00	24.0	Ave.	14	8	V	38.0	28.0	4.3	0.0	38.3	54.0	-15.7
12100.00	40.3	Peak	14	10	V	42.3	39.1	5.9	0.0	49.4	74.0	-24.6
12100.00	28.8	Ave.	14	10	V	42.3	39.1	5.9	0.0	37.9	54.0	-16.1
1.45E+4	40.2*	Peak	14	10	V	40.7	37.8	6.5	0.0	49.6	74.0	-24.4
1.45E+4	29.3*	Ave.	14	10	V	40.7	37.8	6.5	0.0	38.7	54.0	-15.3
1.93E+4	36.5*	Peak	21	13	V	40.2	23.3	7.7	0.0	61.1	74.0	-12.9
1.93E+4	25.6*	Ave.	21	13	V	40.2	23.3	7.7	0.0	50.2	54.0	-3.8
2.17E+4	25.9*	Peak	21	13	V	40.3	23.3	7.9	0.0	50.8	74.0	-23.2
2.17E+4	19.9*	Ave.	21	13	V	40.3	23.3	7.9	0.0	44.8	54.0	-9.2

<b>Notes:</b>	a) D.C.F.:Distance Correction Factor
	b) Insert. Loss (dB) = Cable A + Cable B + Cable C .
	c) Net (dB) = Reading + Antenna Factor - Pre-amp + Insert. Loss. - Transducer Loss - Duty Relaxation (transmitter only).
	d) Negative signs (-) in Margin column signify levels below the limits.
	e) All measurements above 10GHz were made at 1meter distance
	f) * Noise Floor

**Radiated Emissions Test Data**

Company:	Symbol Technologies	Model #:	LA4121	Standard_	FCC § 15.247 (R.B.)
EUT:	PCMCI CARD	S/N #:	Not Labeled	Limits_	11
Project #:	J200031992	Test Date:	Nov 21, 2000	Test Distance_	3 meters
Test Mode:	Internal Antenna Model3146BD, TX@2437MHz	Engineer:	Suresh K	Duty Relaxation	0 dB

	Antenna Used			Pre-Amp Used			Cable Used			Transducer Used
Number:	14	8	21	8	10	13	21	0	0	0
Model:	EMCO 3115	EMCO 3115	3160-9	CDI_P1000	AFT18855	ACO/400	Grn_M+L	None	None	None

Frequency	Reading	Detector	Ant. #	Amp. #	Ant. Pol.	Ant. Factor	Pre-Amp	Insert. Loss	D. C. F.	Net	Limit @3m	Margin
MHz	dB(µV)	P/A/Q	#	#	H/V	dB(1/m)	dB	dB	dB	dB(µV/m)	dB(µV/m)	dB
2437.00	113.6	Peak	14	0	V	30.1	0	2.3	0.0	117.9	-	-
4874.00	27.6	Peak	14	8	V	33.9	28.1	3.2	0.0	36.6	74.0	-37.4
4874.00	16.8	Ave.	14	8	V	33.9	28.1	3.2	0.0	25.8	54.0	-28.2
7311.00	38.2	Peak	14	8	V	38.0	28.0	4.3	0.0	52.5	74.0	-21.5
7311.00	26.9	Ave.	14	8	V	38.0	28.0	4.3	0.0	41.2	54.0	-12.8
1.22E+4	39.0	Peak	14	10	V	42.3	39.1	5.9	0.0	48.1	74.0	-25.9
1.22E+4	27.5	Ave.	14	10	V	42.3	39.1	5.9	0.0	36.6	54.0	-17.4
1.46E+4	40.5*	Peak	14	10	V	41.1	37.4	6.8	0.0	51.0	74.0	-23.0
1.46E+4	29.6*	Ave.	14	10	V	41.1	37.4	6.8	0.0	40.1	54.0	-13.9
1.95E+4	33.9*	Peak	21	13	V	40.2	23.3	7.7	0.0	58.5	74.0	-15.5
1.95E+4	26.1*	Ave.	21	13	V	40.2	23.3	7.7	0.0	50.7	54.0	-3.3
2.19E+4	27.9*	Peak	21	13	V	40.3	23.3	7.9	0.0	52.8	74.0	-21.2
2.19E+4	20.1*	Ave.	21	13	V	40.3	23.3	7.9	0.0	45.0	54.0	-9.0

<b>Notes:</b>	a) D.C.F.:Distance Correction Factor
	b) Inset. Loss (dB) = Cable A + Cable B + Cable C .
	c) Net (dB) = Reading + Antenna Factor - Pre-amp + Inset. Loss. - Transducer Loss - Duty Relaxation (transmitter only).
	d) Negative signs (-) in Margin column signify levels below the limits.
	e) All measurements above 10GHz were performed at 1 meter distance
	f) * Noise Floor

**Radiated Emissions Test Data**

Company:	Symbol Technologies	Model #:	Antenna LA2415N	Standard_	FCC § 15.247 (R.B.)	
EUT:	PCMCI CARD	S/N #:	4	Limits_	11	
Project #:	J200031992	Test Date:	Nov 21, 2000	Test Distance_	3	meters
Test Mode:	Cushcraft Yagi Antenna, Tx @2437 MHz	Engineer:	Suresh K	Duty Relaxation	0	dB

	Antenna Used			Pre-Amp Used			Cable Used			Transducer Used	
Number:	14	8	21	8	10	13	21	0	0	0	
Model:	EMCO 3115	EMCO 3115	3160-9	CDI_P1000	AFT18855	ACO/400	Grn_M+L	None	None	None	

Frequency MHz	Reading dB(µV)	Detector P/A/Q	Ant. #	Amp. #	Ant. Pol. H/V	Ant. Factor dB(1/m)	Pre-Amp dB	Insert. Loss dB	D. C. F. dB	Net dB(µV/m)	Limit @3m dB(µV/m)	Margin dB
2437.00E+0	93.8	Peak	14	0	V	30.1	0.0	2.3	0.0	126.2	-	-
4874.00E+0	27.3	Peak	14	8	V	33.9	28.1	3.2	0.0	36.3	74.0	-37.7
4874.00E+0	16.7	Ave.	14	8	V	33.9	28.1	3.2	0.0	25.7	54.0	-28.3
7311.00E+0	36.9	Peak	14	8	V	38.0	28.0	4.3	0.0	51.2	74.0	-22.8
7311.00E+0	24.6	Ave.	14	8	V	38.0	28.0	4.3	0.0	38.9	54.0	-15.1
1.22E+4	41.4	Peak	14	10	V	42.3	39.1	5.9	0.0	50.5	74.0	-23.5
1.22E+4	29.2	Ave.	14	10	V	42.3	39.1	5.9	0.0	38.3	54.0	-15.7
1.46E+4	41.9*	Peak	14	10	V	41.1	37.4	6.8	0.0	52.4	74.0	-21.6
1.46E+4	29.7*	Ave.	14	10	V	41.1	37.4	6.8	0.0	40.2	54.0	-13.8
1.95E+4	37.3*	Peak	21	13	V	40.2	23.3	7.7	0.0	61.9	74.0	-12.1
1.95E+4	26.0*	Ave.	21	13	V	40.2	23.3	7.7	0.0	50.6	54.0	-3.4
2.20E+4	27.9*	Peak	21	13	V	40.3	23.3	7.9	0.0	52.8	74.0	-21.2
2.20E+4	20.1*	Ave.	21	13	V	40.3	23.3	7.9	0.0	45.0	54.0	-9.0

<b>Notes:</b>	a) D.C.F.:Distance Correction Factor
	b) Insert. Loss (dB) = Cable A + Cable B + Cable C .
	c) Net (dB) = Reading + Antenna Factor - Pre-amp + Insert. Loss. - Transducer Loss - Duty Relaxation (transmitter only).
	d) Negative signs (-) in Margin column signify levels below the limits.
	e) All measurements above 10GHz were Performed at 1meter distance
	f) * Noise Floor

**Radiated Emissions Test Data**

Company:	Symbol Technologies	Model #:	LA4121	Standard_	FCC § 15.247 (R.B.)
EUT:	PCMCI CARD	S/N #:	-	Limits_	11
Project #:	J200031992	Test Date:	Nov 21, 2000	Test Distance_	3 meters
Test Mode:	Internal Antenna Model3146BD, TX@2462MHz	Engineer:	Suresh K	Duty Relaxation	0 dB

	Antenna Used			Pre-Amp Used			Cable Used			Transducer Used
Number:	14	8	21	8	10	13	21	0	0	0
Model:	EMCO 3115	EMCO 3115	3160-9	CDI_P1000	AFT18855	ACO/400	Grn_M+L	None	None	None

Frequency	Reading	Detector	Ant. #	Amp. #	Ant. Pol.	Ant. Factor	Pre-Amp	Insert. Loss	D. C. F.	Net	Limit @3m	Margin
MHz	dB(µV)	P/A/Q	#	#	H/V	dB(1/m)	dB	dB	dB	dB(µV/m)	dB(µV/m)	dB
2462.00E+0	84.2	Peak	14	0	V	30.1	0.0	2.3	0.0	116.6	-	-
4924.00E+0	28.3	Peak	14	8	V	33.9	28.1	3.2	0.0	37.3	74.0	-36.7
4924.00E+0	16.8	Ave.	14	8	V	33.9	28.1	3.2	0.0	25.8	54.0	-28.2
7386.00E+0	36.0	Peak	14	8	V	38.0	28.0	4.3	0.0	50.3	74.0	-23.7
7386.00E+0	24.2	Ave.	14	8	V	38.0	28.0	4.3	0.0	38.5	54.0	-15.5
1.23E+4	39.2	Peak	14	10	V	42.3	39.1	5.9	0.0	48.3	74.0	-25.7
1.23E+4	28.8	Ave.	14	10	V	42.3	39.1	5.9	0.0	37.9	54.0	-16.1
1.48E+4	40.6*	Peak	14	10	V	41.1	37.4	6.8	0.0	51.1	74.0	-22.9
1.48E+4	29.7*	Ave.	14	10	V	41.1	37.4	6.8	0.0	40.2	54.0	-13.8
1.97E+4	37.3*	Peak	21	13	V	40.3	23.3	7.7	0.0	62.0	74.0	-12.0
1.97E+4	26.0*	Ave.	21	13	V	40.3	23.3	7.7	0.0	50.7	54.0	-3.3
2.22E+4	27.9*	Peak	21	13	V	40.3	23.3	7.9	0.0	52.8	74.0	-21.2
2.22E+4	20.1*	Ave.	21	13	V	40.3	23.3	7.9	0.0	45.0	54.0	-9.0

<b>Notes:</b>	a) D.C.F.:Distance Correction Factor
	b) Insert. Loss (dB) = Cable A + Cable B + Cable C .
	c) Net (dB) = Reading + Antenna Factor - Pre-amp + Insert. Loss. - Transducer Loss - Duty Relaxation (transmitter only).
	d) Negative signs (-) in Margin column signify levels below the limits.
	e) All measurements above 10GHz were performed at 1 meter from EUT
	f) * Noise Floor

**Radiated Emissions Test Data**

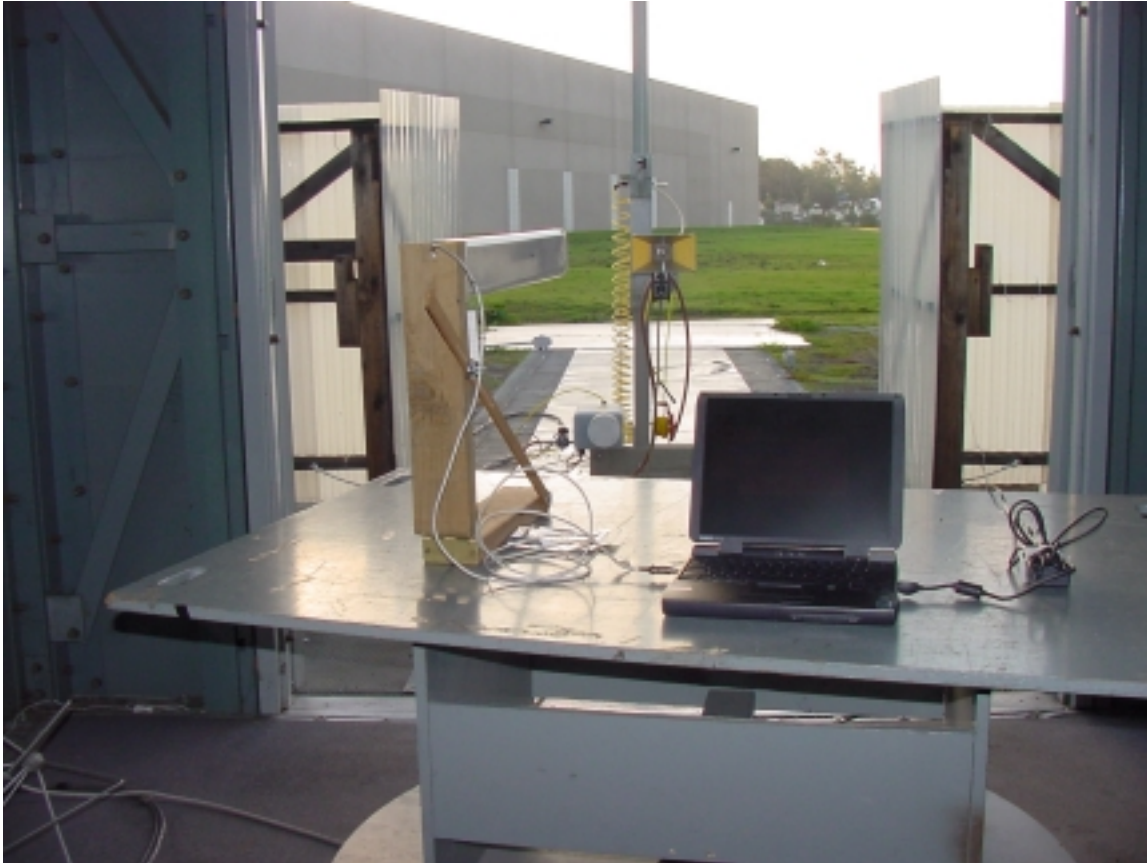
Company:	Symbol Technologies	Model #:	Antenna LA2415N	Standard_	FCC § 15.247 (R.B.)
EUT:	PCMCI CARD	S/N #:	4	Limits_	11
Project #:	J200031992	Test Date:	Nov 21, 2000	Test Distance_	3 meters
Test Mode:	Cushcraft Yagi Antenna, Tx @2462MHz	Engineer:	Suresh K	Duty Relaxation	0 dB

	Antenna Used			Pre-Amp Used			Cable Used			Transducer Used
Number:	14	8	21	8	10	13	21	0	0	0
Model:	EMCO 3115	EMCO 3115	3160-9	CDI_P1000	AFT18855	ACO/400	Gm_M+L	None	None	None

Frequency	Reading	Detector	Ant.	Amp.	Ant. Pol.	Ant. Factor	Pre-Amp	Insert. Loss	D. C. F.	Net	Limit @3m	Margin
MHz	dB(μV)	P/A/Q	#	#	H/V	dB(1/m)	dB	dB	dB	dB(μV/m)	dB(μV/m)	dB
2462.00E+0	94.5	Peak	14	0	V	30.1	0.0	2.3	0.0	126.9	-	-
4924.00E+0	28.1	Peak	14	8	V	33.9	28.1	3.2	0.0	37.1	74.0	-36.9
4924.00E+0	16.8	Ave.	14	8	V	33.9	28.1	3.2	0.0	25.8	54.0	-28.2
7386.00E+0	36.5	Peak	14	8	V	38.0	28.0	4.3	0.0	50.8	74.0	-23.2
7386.00E+0	24.3	Ave.	14	8	V	38.0	28.0	4.3	0.0	38.6	54.0	-15.4
1.23E+4	39.3	Peak	14	10	V	42.3	39.1	5.9	0.0	48.4	74.0	-25.6
1.23E+4	28.7	Ave.	14	10	V	42.3	39.1	5.9	0.0	37.8	54.0	-16.2
1.48E+4	40.1*	Peak	14	10	V	41.1	37.4	6.8	0.0	50.6	74.0	-23.4
1.48E+4	29.8*	Ave.	14	10	V	41.1	37.4	6.8	0.0	40.3	54.0	-13.7
1.97E+4	37.3*	Peak	21	13	V	40.3	23.3	7.7	0.0	62.0	74.0	-12.0
1.97E+4	26.0*	Ave.	21	13	V	40.3	23.3	7.7	0.0	50.7	54.0	-3.3
2.22E+4	27.9*	Peak	21	13	V	40.3	23.3	7.9	0.0	52.8	74.0	-21.2
2.22E+4	20.1*	Ave.	21	13	V	40.3	23.3	7.9	0.0	45.0	54.0	-9.0

<b>Notes:</b>	a) D.C.F.:Distance Correction Factor
	b) Insert. Loss (dB) = Cable A + Cable B + Cable C .
	c) Net (dB) = Reading + Antenna Factor - Pre-amp + Insert. Loss. - Transducer Loss - Duty Relaxation (transmitter only).
	d) Negative signs (-) in Margin column signify levels below the limits.
	e) All measurements above 10GHz were performed at 1 meter from EUT
	f) * Noise Floor

4.3 Radiated Emission Configuration Photograph

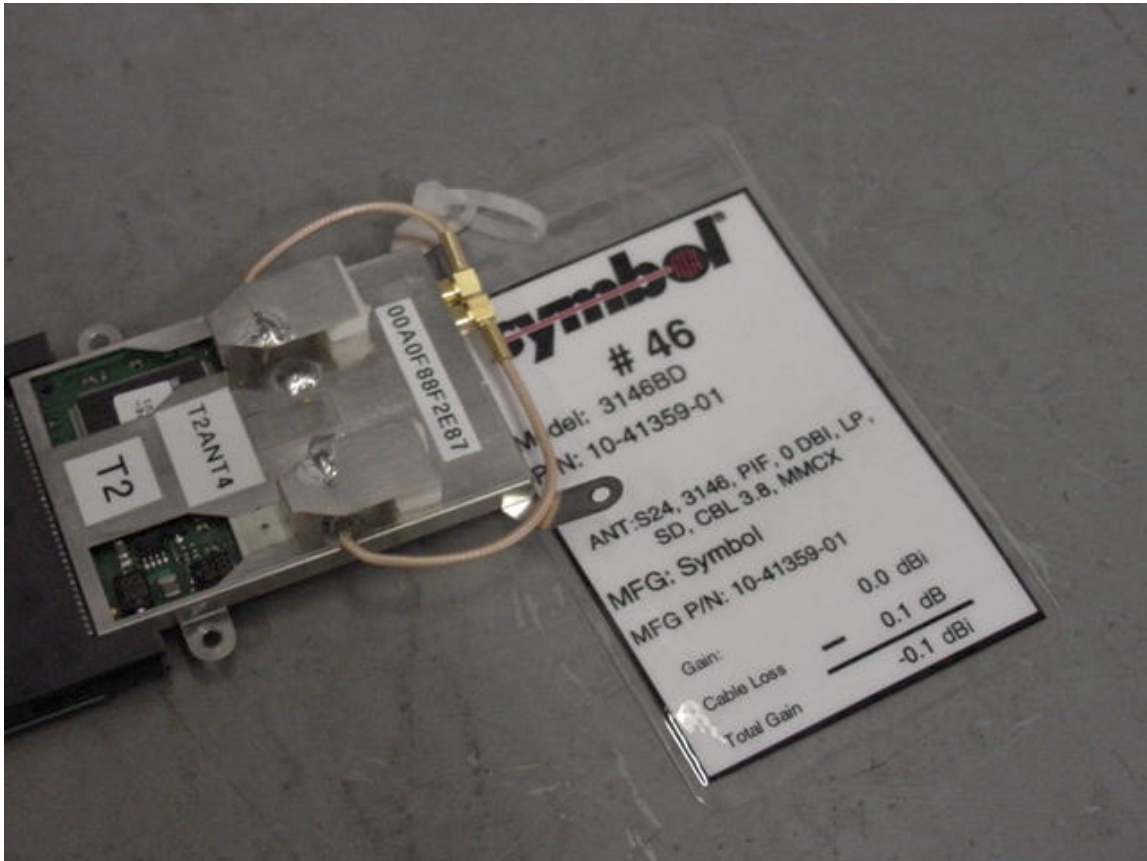




4.3 Radiated Emission Configuration Photograph – Continued



4.3 Radiated Emission Configuration Photograph - Continued



4.3 Radiated Emission Configuration Photograph - Continued



## 4.4 List of Test Equipment

Equipment	Manufacturer	Model/Type	Serial #	Cal Int	Cal Due	USED
Horn Antenna #14	EMCO	3115	8812-3049	12	2/5/01	X
Horn Antenna #14	EMCO	3160-9	-	#	#	X
Pre-Amplifier	CDI	P1000	N/A	12	10/4/01	X
Pre-Amplifier	Avantek	AFT1885	N/A	12	10/4/01	X
Pre-Amplifier	CTT	ACO/400	N/A	12	10/4/01	X
Spectrum Analyzer w/85650 QP Adaptor	Hewlett Packard	8566B	2416A00317 2043A00251	6	2/03/01	X

# No Calibration Required

**5.0 Document History**

<b>Revision/Job Number</b>	<b>Date</b>	<b>Change</b>
1.0 / J20031922	November 30, 2000	Original document