ITS Intertek Testing Services
ETL SEMKO

FCC Part 15.247 (c) Radiated Emissions
in Restricted BandsTest Report
for
Symbol Technologies
on the
Spread Spectrum Transmitter
Model: LA2400

Test Report #: J20000670c
Date of Report: January 12, 2000

Job #: J20000670-A
Date of Test: January 10-11, 2000

Total No. of Pages Contained in this Report: 13 + data pages

NVLAP®

Barry E. Smith	Barry E. Smith, Test Engineer
David Chernomordik	David Chernomordik, Ph.D., EMC Site Manager

Intertek Testing Services NA Inc.
1365 Adams Court, Menlo Park, CA 94025
Telephone 650-463-2900 Fax 650-463-2910 Home Page www.etlsemko.com

Warnock Hersey

Table of Contents

1.0 Summary of Tests

Symbol Technologies Inc. - Model No.: LA2400

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

Test Engineer: Barry E. Smith Date: 1/12/2000
Barry E. Smith

EMC Site Mgr.: David Chernomordik Date: 1/20/2000
David Chernomordik

2.0 General Description

2.1 Product Description

The Symbol Technologies model LA2400 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

Trade Name & Model No.	Symbol Technologies, Model No. LA3021-100
Frequency Range (MHz)	2402 - 2480
Antenna(s)	5 antennas
Manufacturer name & address	Symbol Technologies 2145 Hamilton Avenue San Jose, CA 95125

2.3 Test Methodology

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. All other measurements were made in accordance with the procedures in part 2 of CFR 47.

2.4 Test Facility

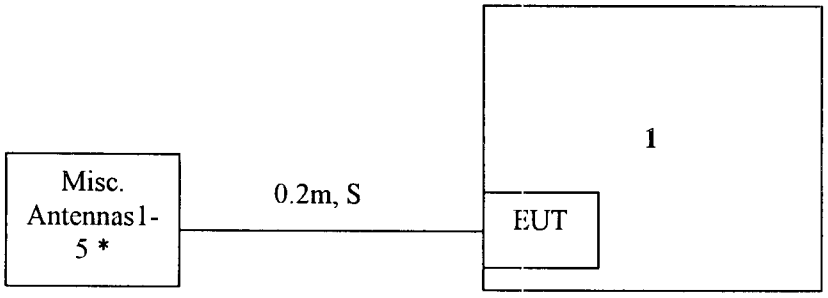
The open area test site facility used to collect the radiated data is located at 1365 Adams Court, Menlo Park, CA 94025. This test facility and site measurement data have been fully placed on file with the FCC.

3.0 System Test Configuration

3.1 Support Equipment

Item #	Description	Model No.	Serial No.	FCC ID
1	Compaq Notebook Computer	2860A	7448HJJ53R518	CNT75MB2CA

3.2 Block Diagram of Test Setup



*: Antenna #1 = Model 7500
Antenna #2 = Model 2740
Antenna #3 = Model Vocollect
Antenna #4 = Model 7240
Antenna #5 = Model Toko

m: Length in meters
S: Shielded

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 units were 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.

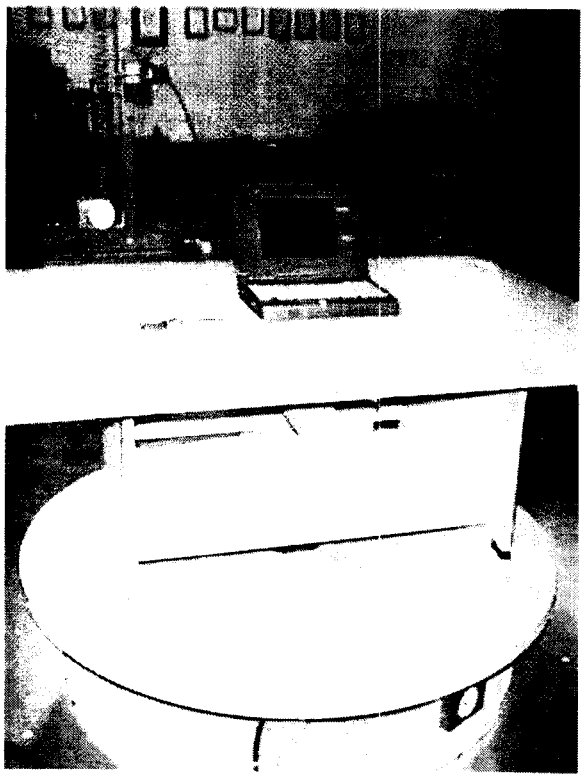
Data is included of the worst case configuration (the configuration which resulted in the highest emission levels). A sample calculation, configuration photographs and data tables of the emissions are included. All measurements were performed with peak detection and average detection (above 1 GHz) unless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

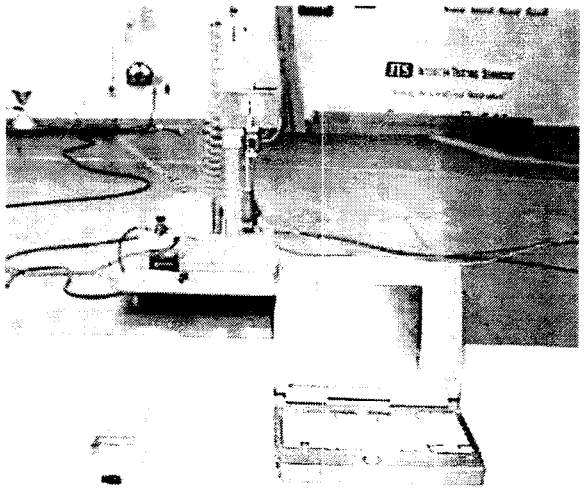
For the test results, refer to the attached radiated emission data sheets.

For transmitters with hopping channel ON times < 100 msec, DUTY CYCLE CORRECTION is permitted for emissions above 1000 MHz: Duty Cycle of 0 dB was used.

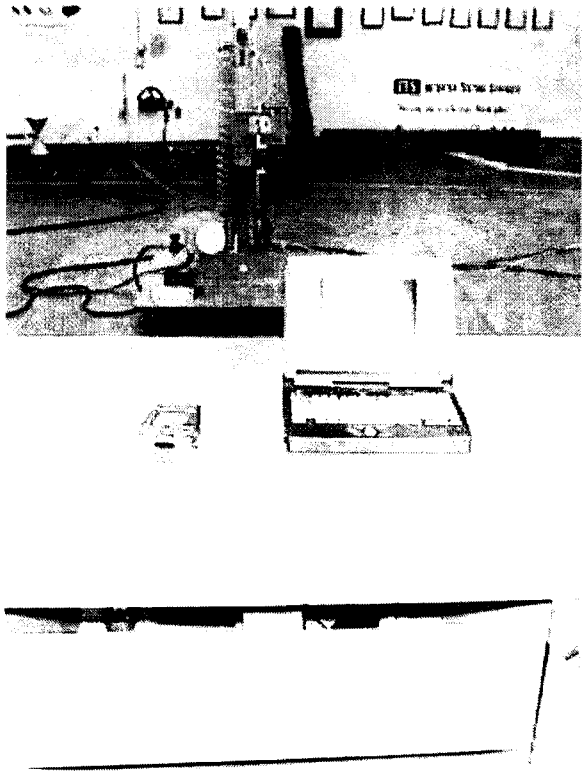
4.2 Radiated Emission Configuration Photograph

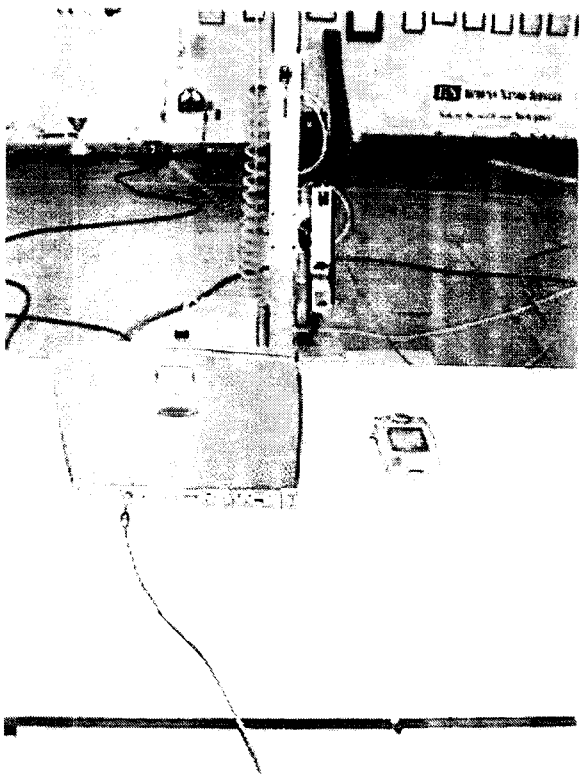


4.2 Radiated Emission Configuration Photograph

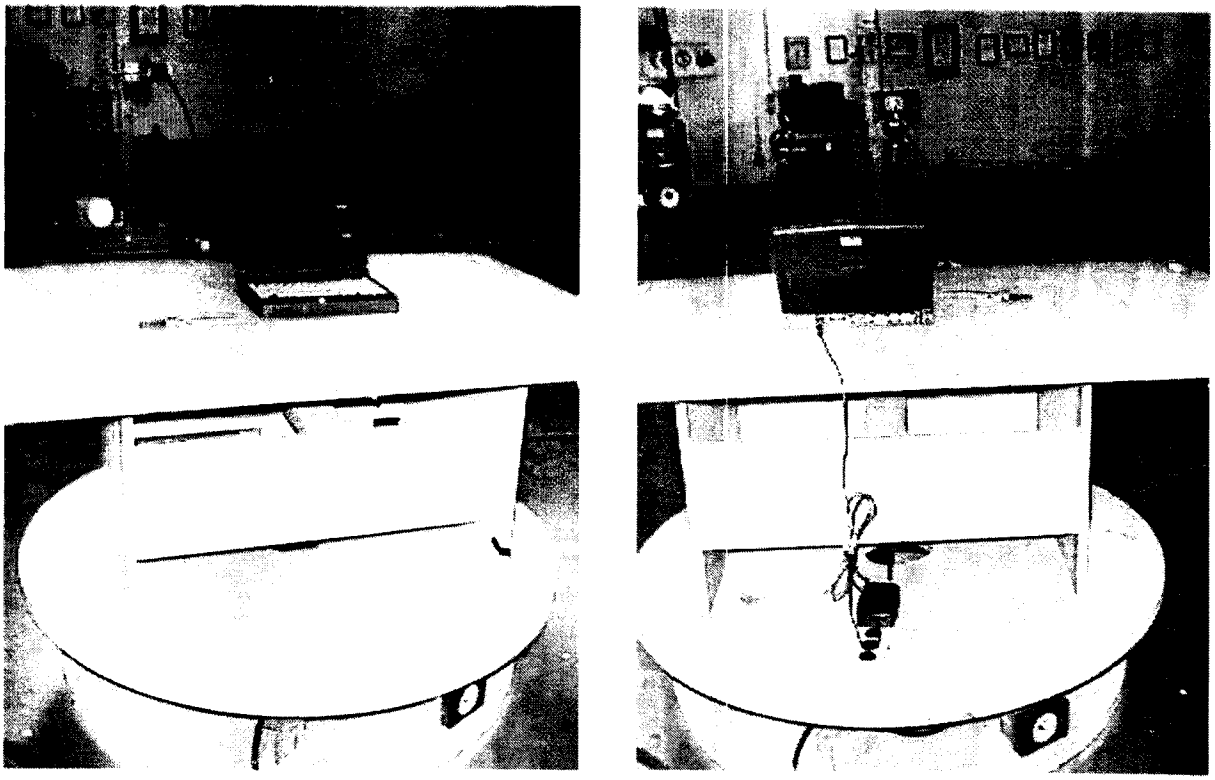


4.2 Radiated Emission Configuration Photograph

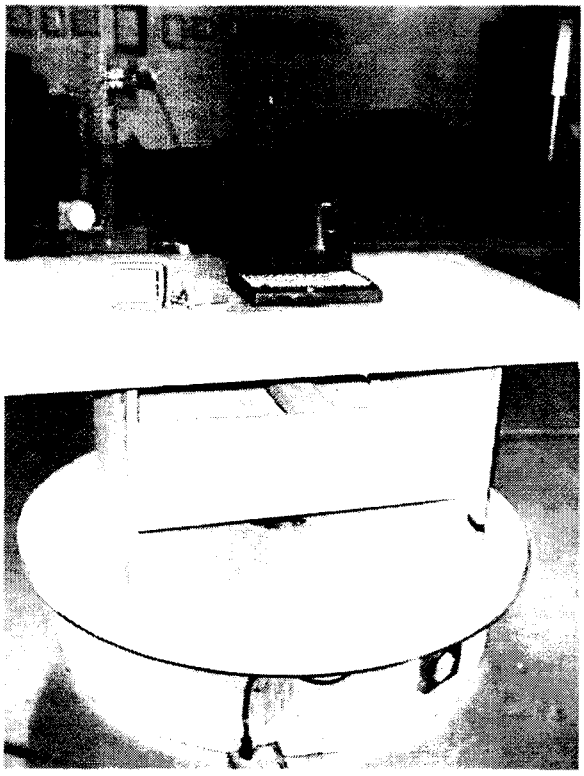




4.2 Radiated Emission Configuration Photograph



4.2 Radiated Emission Configuration Photograph



ITS Intertek Testing Services

Radiated Emissions Test Data

Company:	Symbol				**Model #:**	LA2400		**Standard**		**FCC § 15.247 (R.B.)**		
EUT:	Spread Sprectrum Radio				**S/N #:**			**Limits**		11		
Project #:	J20000670				**Test Date:**	Jan 10, 2000		**Test Distance**		3	meters	
Test Mode:	CW Xmit antenna Toko				**Engineer:**	Barry Smith		**Duty Relaxation**		0	dB	
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
2402												
4804	49.1	Peak	14	8	V	33.9	28.1	3.2	0.0	58.1	74.0	-15.9
4804	46.0	Ave.	14	8	V	33.9	28.1	3.2	0.0	55.0	54.0	1.0
7206	37.9	Peak	14	8	V	38.0	28.0	4.3	0.0	52.2	74.0	-21.8
7206	26.8	Ave.	14	8	V	38.0	28.0	4.3	0.0	41.1	54.0	-12.9
12010	41.1	Peak	14	10	V	42.3	39.1	5.9	0.0	50.2	74.0	-23.9
12010	29.1	Ave.	14	10	V	42.3	39.1	5.9	0.0	38.2	54.0	-15.9
19216 *	29.0	Peak	21	13	V	40.2	23.3	7.7	0.0	53.6	74.0	-20.4
19216 *	20.8	Ave.	21	13	V	40.2	23.3	7.7	0.0	45.4	54.0	-8.6
2440												
4880	46.4	Peak	14	8	V	33.9	28.1	3.2	0.0	55.4	74.0	-18.6
4880	42.6	Ave.	14	8	V	33.9	28.1	3.2	0.0	51.6	54.0	-2.4
7320	39.7	Peak	14	8	V	38.0	28.0	4.3	0.0	54.0	74.0	-20.0
7320	30.1	Ave.	14	8	V	38.0	28.0	4.3	0.0	44.4	54.0	-9.6
12200	41.4	Peak	14	10	V	42.3	39.1	5.9	0.0	50.5	74.0	-23.6
12200	29.3	Ave.	14	10	V	42.3	39.1	5.9	0.0	38.4	54.0	-15.7
19520 *	28.9	Peak	21	13	V	40.3	23.3	7.7	0.0	53.6	74.0	-20.4
19520 *	20.7	Ave.	21	13	V	40.3	23.3	7.7	0.0	45.4	54.0	-8.6
2480												
4960	45.5	Peak	14	8	V	33.9	28.1	4.9	-9.5	46.7	74.0	-27.3
4960	41.9	Ave.	14	8	V	33.9	28.1	4.9	-9.5	43.1	54.0	-10.9
7440	40.2	Peak	14	8	V	38.0	28.0	6.3	-9.5	47.0	74.0	-27.0
7440	31.4	Ave.	14	8	V	38.0	28.0	6.3	-9.5	38.2	54.0	-15.8
12400	42.0	Peak	14	10	V	42.3	39.1	8.8	-9.5	44.5	74.0	-29.5
12400	29.6	Ave.	14	10	V	42.3	39.1	8.8	-9.5	32.1	54.0	-21.9
22320 *	36.9	Peak	21	13	V	40.3	23.3	0.0	-9.5	44.4	74.0	-29.6
22320 *	34.4	Ave.	21	13	V	40.3	23.3	0.0	-9.5	41.9	54.0	-12.1

* Noise floor with RBW 300kHz

** Subtract 6dB for duty cycle factor declared by Symbol Technologies

ITS Intertek Testing Services

Radiated Emissions Test Data

Company:	Symbol	Model #:	LA2400	Standard	FCC § 15.247 (R.B.)
EUT:	Spread Sprectrum Radio	S/N #:		Limits	11
Project #:	J20000670	Test Date:	Jan 10, 2000	Test Distance	3 meters
Test Mode:	CW Xmit antenna 2740	Engineer:	Barry Smith	Duty Relaxation	0 dB

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
2402												
4804	46.9	Peak	14	8	V	33.9	28.1	3.2	0.0	55.9	74.0	-18.1
4804	43.5	Ave.	14	8	V	33.9	28.1	3.2	0.0	52.5	54.0	-1.5
7206	39.2	Peak	14	8	V	38.0	28.0	4.3	0.0	53.5	74.0	-20.5
7206	29.8	Ave.	14	8	V	38.0	28.0	4.3	0.0	44.1	54.0	-9.9
12010	40.7	Peak	14	10	V	42.3	39.1	5.9	0.0	49.8	74.0	-24.3
12010	28.7	Ave.	14	10	V	42.3	39.1	5.9	0.0	37.8	54.0	-16.3
19216 *	33.5	Peak	21	13	V	40.2	23.3	7.7	0.0	58.1	74.0	-15.9
19216 *	22.8	Ave.	21	13	V	40.2	23.3	7.7	0.0	47.4	54.0	-6.6
2440												
4880	45.5	Peak	14	8	V	33.9	28.1	3.2	0.0	54.5	74.0	-19.5
4880	41.5	Ave.	14	8	V	33.9	28.1	3.2	0.0	50.5	54.0	-3.5
7320	40.0	Peak	14	8	V	38.0	28.0	4.3	0.0	54.3	74.0	-19.7
7320	29.5	Ave.	14	8	V	38.0	28.0	4.3	0.0	43.8	54.0	-10.2
12200	41.6	Peak	14	10	V	42.3	39.1	5.9	0.0	50.7	74.0	-23.4
12200	29.8	Ave.	14	10	V	42.3	39.1	5.9	0.0	38.9	54.0	-15.2
19520 *	33.0	Peak	21	13	V	40.3	23.3	7.7	0.0	57.7	74.0	-16.3
19520 *	21.1	Ave.	21	13	V	40.3	23.3	7.7	0.0	45.8	54.0	-8.2
2480												
4960	46.0	Peak	14	8	V	33.9	28.1	4.9	-9.5	47.2	74.0	-26.8
4960	42.5	Ave.	14	8	V	33.9	28.1	4.9	-9.5	43.7	54.0	-10.3
7440	40.7	Peak	14	8	V	38.0	28.0	6.3	-9.5	47.5	74.0	-26.5
7440	30.7	Ave.	14	8	V	38.0	28.0	6.3	-9.5	37.5	54.0	-16.5
12400	41.4	Peak	14	10	V	42.3	39.1	8.8	-9.5	43.9	74.0	-30.1
12400	29.3	Ave.	14	10	V	42.3	39.1	8.8	-9.5	31.8	54.0	-22.2
22320 *	37.1	Peak	21	13	V	40.3	23.3	0.0	-9.5	44.6	74.0	-29.4
22320 *	31.2	Ave.	21	13	V	40.3	23.3	0.0	-9.5	38.7	54.0	-15.3

* Noise floor with RBW 300kHz

** Subtract 6dB for duty cycle factor declared by Symbol Technologies

ITS Intertek Testing Services

Radiated Emissions Test Data

Company:	Symbol				**Model #:**	LA2400		**Standard**		**FCC § 15.247 (R.B.)**		
EUT:	Spread Sprectrum Radio				**S/N #:**			**Limits**		11		
Project #:	J20000670				**Test Date:**	Jan 10, 2000		**Test Distance**		3	meters	
Test Mode:	CW Xmit antenna Vocollect				**Engineer:**	Barry Smith		**Duty Relaxation**		0	dB	
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
2402												
4804	46.5	Peak	14	8	V	33.9	28.1	3.2	0.0	55.5	74.0	-18.5
4804	43.6	Ave.	14	8	V	33.9	28.1	3.2	0.0	52.6	54.0	-1.4
7206	37.7	Peak	14	8	V	38.0	28.0	4.3	0.0	52.0	74.0	-22.0
7206	27.9	Ave.	14	8	V	38.0	28.0	4.3	0.0	42.2	54.0	-11.8
12010	40.3	Peak	14	10	V	42.3	39.1	5.9	0.0	49.4	74.0	-24.7
12010	29.1	Ave.	14	10	V	42.3	39.1	5.9	0.0	38.2	54.0	-15.9
19216 *	33.3	Peak	21	13	V	40.2	23.3	7.7	0.0	57.9	74.0	-16.1
19216 *	21.6	Ave.	21	13	V	40.2	23.3	7.7	0.0	46.2	54.0	-7.8
2440												
4880	46.2	Peak	14	8	V	33.9	28.1	3.2	0.0	55.2	74.0	-18.8
4880	42.7	Ave.	14	8	V	33.9	28.1	3.2	0.0	51.7	54.0	-2.3
7320	38.8	Peak	14	8	V	38.0	28.0	4.3	0.0	53.1	74.0	-20.9
7320	27.7	Ave.	14	8	V	38.0	28.0	4.3	0.0	42.0	54.0	-12.0
12200	41.2	Peak	14	10	V	42.3	39.1	5.9	0.0	50.3	74.0	-23.8
12200	28.5	Ave.	14	10	V	42.3	39.1	5.9	0.0	37.6	54.0	-16.5
19520 *	33.2	Peak	21	13	V	40.3	23.3	7.7	0.0	57.9	74.0	-16.1
19520 *	21.8	Ave.	21	13	V	40.3	23.3	7.7	0.0	46.5	54.0	-7.5
2480					V							
4960	47.4	Peak	14	8	V	33.9	28.1	4.9	-9.5	48.6	74.0	-25.4
4960	44.4	Ave.	14	8	V	33.9	28.1	4.9	-9.5	45.6	54.0	-8.4
7440	39.5	Peak	14	8	V	38.0	28.0	6.3	-9.5	46.3	74.0	-27.7
7440	29.6	Ave.	14	8	V	38.0	28.0	6.3	-9.5	36.4	54.0	-17.6
12400	41.2	Peak	14	10	V	42.3	39.1	8.8	-9.5	43.7	74.0	-30.3
12400	28.3	Ave.	14	10	V	42.3	39.1	8.8	-9.5	30.8	54.0	-23.2
22320 *	36.6	Peak	21	13	V	40.3	23.3	0.0	-9.5	44.1	74.0	-29.9
22320 *	32.1	Ave.	21	13	V	40.3	23.3	0.0	-9.5	39.6	54.0	-14.4

* Noise floor with RBW 300kHz

** Subtract 6dB for duty cycle factor declared by Symbol Technologies

ITS Intertek Testing Services

Radiated Emissions Test Data

Company:	Symbol	**Model #:**	LA2400	**Standard**	FCC § 15.247 (R.B.)
EUT:	Spread Sprectrum Radio	**S/N #:**		**Limits**	11
Project #:	J20000670	**Test Date:**	Jan 10, 2000	**Test Distance**	3 meters
Test Mode:	CW Xmit antenna 7420	**Engineer:**	Barry Smith	**Duty Relaxation**	0 dB

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
2402												
4804	49.5	Peak	14	8	V	33.9	28.1	3.2	0.0	58.5	74.0	-15.5
4804	46.9	Ave.	14	8	V	33.9	28.1	3.2	0.0	55.9	54.0	1.9
7206	38.7	Peak	14	8	V	38.0	28.0	4.3	0.0	53.0	74.0	-21.0
7206	28.4	Ave.	14	8	V	38.0	28.0	4.3	0.0	42.7	54.0	-11.3
12010	41.7	Peak	14	10	V	42.3	39.1	5.9	0.0	50.8	74.0	-23.3
12010	29.2	Ave.	14	10	V	42.3	39.1	5.9	0.0	38.3	54.0	-15.8
19216 *	31.5	Peak	21	13	V	40.2	23.3	7.7	0.0	56.1	74.0	-17.9
19216 *	22.5	Ave.	21	13	V	40.2	23.3	7.7	0.0	47.1	54.0	-6.9
2440												
4880	48.6	Peak	14	8	V	33.9	28.1	3.2	0.0	57.6	74.0	-16.4
4880	45.6	Ave.	14	8	V	33.9	28.1	3.2	0.0	54.6	54.0	0.6
7320	40.0	Peak	14	8	V	38.0	28.0	4.3	0.0	54.3	74.0	-19.7
7320	30.9	Ave.	14	8	V	38.0	28.0	4.3	0.0	45.2	54.0	-8.8
12200	38.9	Peak	14	10	V	42.3	39.1	5.9	0.0	48.0	74.0	-26.1
12200	29.9	Ave.	14	10	V	42.3	39.1	5.9	0.0	39.0	54.0	-15.1
19520 *	36.0	Peak	21	13	V	40.3	23.3	7.7	0.0	60.7	74.0	-13.3
19520 *	20.1	Ave.	21	13	V	40.3	23.3	7.7	0.0	44.8	54.0	-9.2
2480					V							
4960	45.6	Peak	14	8	V	33.9	28.1	4.9	-9.5	46.8	74.0	-27.2
4960	41.9	Ave.	14	8	V	33.9	28.1	4.9	-9.5	43.1	54.0	-10.9
7440	40.7	Peak	14	8	V	38.0	28.0	6.3	-9.5	47.5	74.0	-26.5
7440	32.5	Ave.	14	8	V	38.0	28.0	6.3	-9.5	39.3	54.0	-14.7
12400	36.2	Peak	14	10	V	42.3	39.1	8.8	-9.5	38.6	74.0	-35.4
12400	27.9	Ave.	14	10	V	42.3	39.1	8.8	-9.5	30.4	54.0	-23.6
22320 *	37.1	Peak	21	13	V	40.3	23.3	0.0	-9.5	44.6	74.0	-29.4
22320 *	35.3	Ave.	21	13	V	40.3	23.3	0.0	-9.5	42.8	54.0	-11.2

* Noise floor with RBW 300kHz

** Subtract 6dB for duty cycle factor declared by Symbol Technologies

ITS Intertek Testing Services

Radiated Emissions Test Data

Company:	Symbol				**Model #:**	LA2400		**Standard_**		**FCC § 15.247 (R.B.)**		
EUT:	Spread Sprectum Radio				**S/N #:**			**Limits**		11		
Project #:	J20000670				**Test Date:**	Jan 10, 2000		**Test Distance_**		3	meters	
Test Mode:	CW Xmit antenna 7500				**Engineer:**	Barry Smith		**Duty Relaxation**		0	dB	
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
2402												
4804	46.6	Peak	14	8	V	33.9	28.1	3.2	0.0	55.6	74.0	-18.4
4804	41.3	Ave.	14	8	V	33.9	28.1	3.2	0.0	50.3	54.0	-3.7
7206	38.5	Peak	14	8	V	38.0	28.0	4.3	0.0	52.8	74.0	-21.2
7206	27.2	Ave.	14	8	V	38.0	28.0	4.3	0.0	41.5	54.0	-12.5
12010	40.7	Peak	14	10	V	42.3	39.1	5.9	0.0	49.8	74.0	-24.3
12010	29.6	Ave.	14	10	V	42.3	39.1	5.9	0.0	38.7	54.0	-15.4
19216 *	35.4	Peak	21	13	V	40.2	23.3	7.7	0.0	60.0	74.0	-14.0
19216 *	23.0	Ave.	21	13	V	40.2	23.3	7.7	0.0	47.6	54.0	-6.4
2440												
4880	49.9	Peak	14	8	V	33.9	28.1	3.2	0.0	58.9	74.0	-15.1
4880	43.7	Ave.	14	8	V	33.9	28.1	3.2	0.0	52.7	54.0	-1.3
7320	39.6	Peak	14	8	V	38.0	28.0	4.3	0.0	53.9	74.0	-20.1
7320	29.4	Ave.	14	8	V	38.0	28.0	4.3	0.0	43.7	54.0	-10.3
12200	41.6	Peak	14	10	V	42.3	39.1	5.9	0.0	50.7	74.0	-23.4
12200	29.6	Ave.	14	10	V	42.3	39.1	5.9	0.0	38.7	54.0	-15.4
19520 *	33.2	Peak	21	13	V	40.3	23.3	7.7	0.0	57.9	74.0	-16.1
19520 *	21.5	Ave.	21	13	V	40.3	23.3	7.7	0.0	46.2	54.0	-7.8
2480												
4960	44.5	Peak	14	8	V	33.9	28.1	4.9	-9.5	45.7	74.0	-28.3
4960	40.7	Ave.	14	8	V	33.9	28.1	4.9	-9.5	41.9	54.0	-12.1
7440	40.8	Peak	14	8	V	38.0	28.0	6.3	-9.5	47.6	74.0	-26.4
7440	30.4	Ave.	14	8	V	38.0	28.0	6.3	-9.5	37.2	54.0	-16.8
12400	40.7	Peak	14	10	V	42.3	39.1	8.8	-9.5	43.2	74.0	-30.8
12400	29.1	Ave.	14	10	V	42.3	39.1	8.8	-9.5	31.6	54.0	-22.4
22320 *	37.7	Peak	21	13	V	40.3	23.3	0.0	-9.5	45.2	74.0	-28.8
22320 *	31.1	Ave.	21	13	V	40.3	23.3	0.0	-9.5	38.6	54.0	-15.4

* Noise floor with RBW 300kHz

** Subtract 6dB for duty cycle factor declared by Symbol Technologies

5.0 Document History

Revision/Job Number	Date	Change
1.0 / J20000670	January 12, 2000	Original document