

# **MEASUREMENT/TECHNICAL REPORT**

**Company - Model: Zoom Telephonics, Inc.  
0231 Board  
FCC ID: BDNWLANPCCRD11  
11 May, 2000**

Description: This is a report to support a request for a new equipment authorization.

Equipment Type: Spread Spectrum Transmitter (DSS)

Report prepared for: Zoom Telephonics, Inc.  
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Letter of Agency

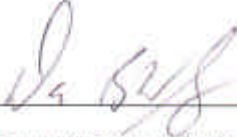


**Letter of Agency**

I appoint **Curtis-Straus LLC** to act as agent in the preparation of this application for registration of the equipment listed below, under Part 15 C of the Rules and Regulations of the Federal Communications Commission. I further certify that no party (as defined in 1.2002 of CFR 47, 1995) to this application including myself, is subject to denial of Federal benefits, pursuant to Section 5301 of the Anti-Drug abuse Act of 1998, 21 U.S.C., 853A.

**Model: 0231 WIRELESS LAN WITH ANTENNAS**

Dated: Second day of February, 2000

	Signature
<u>Dana Whitney, VP, Engineering Dept.</u>	Name/Title
<u>ZOOM Telephonics, Inc.</u>	Company
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## Introduction

This report is an application for a new equipment authorization for the Zoom Telephonics Wireless LAN PC Card FCC ID: BDNWLANPCCRD11. Zoom Telephonics has contracted with Curtis-Straus to test this model of the Wireless LAN PC. Zoom will be marketing this transmitter with five antennas (one internal and four external). The model numbers covered by this report include:

0231 Board to be sold under the following additional model numbers  
4100 Zoom/Wireless LAN PC Card  
4102 Zoom/Wireless LAN PC Card with External Antenna

The 4102 is available with an integrated antenna or with one of four different external antennas (dipole, patch, patch array, and ceramic disk) which carry the following zoom model numbers:

ZoomAir 1.76dBi Dipole Antenna Model 98110-02  
ZoomAir 4.0dBi Omni-Directional Patch Antenna Model 98110-04  
ZoomAir 13.0dBi Directional Patch Array Antenna Model 98110-13  
ZoomAir 2.15dBi Miniature Dielectric Antenna Model 98110-21

This report is designed to demonstrate the compliance of this device with the requirements outlined in Part 15 of CFR 47. The current revision date, 8 October, 1998, of each Part has been used for technical requirements.

## EXHIBIT 1:

### 1.0 Statement of Conformity

The Zoom Telephonics 0231 Board has been found to conform with the following parts of the 47 CFR:

Part 2	Part 15	Comments
2.925	15.19	The necessary labeling is prominently displayed on the device and in the manuals.
	15.21	Information to the user is shown in the instruction manual exhibit.
	15.203	The supplied antennas have proprietary reverse polarity SMA connectors.
	15.205 15.209	The fundamental is not in a Restricted band and the spurious and harmonic emissions in the Restricted bands comply with the general emission limits of 15.209.
	15.247(a)(2)	The unit has a 6dB bandwidth greater than 500kHz as shown in Exhibit 3.
	15.247(b)	The maximum peak output power of the unit does not exceed the limits given in 15.247 as shown in Exhibit 3.
	15.247(b)(4)	This unit does not expose the public to radio frequency levels in excess of the Commission's guidelines when installed properly.
	15.247(c)	All harmonics outside of the band in which the intentional radiator operates are at least 20dB below the highest level of in band desired power. Emissions falling in restricted bands also comply with the radiated emissions limits specified in 15.209(a).
	15.247(d)	The peak power spectral density is less than 8dBm in any 3kHz band.
	15.247(e)	The processing gain is greater than 10dB as measured using the CW jamming method.

**EXHIBIT 2**

**2.0 General Description**

2.1 Product Description

<b>EUT Configuration</b>					
<b>Work Order:</b> A0281					
<b>Company:</b> Zoom Telephonics					
<b>Contact:</b> Fred Grund					
<b>Person(s) Present:</b> Fred Grund					
MN		SN		FCC ID	
<b>EUT:</b> 4100, 4102		Not labeled		BDNWLANPCCRD11	
13 dBi Antenna 98110-02		Not labeled		None	
4 dBi Antenna 98110-04		Not labeled		None	
1.76dBi Antenna 98110-13		Not labeled		None	
2.15dBi Antenna 98110-21		Not labeled		None	
<b>EUT Description:</b> Wireless LAN PCMCIA card with various cables/antennas					
<b>EUT Max Clock Frequency:</b> 2488 MHz					
<b>Support Equipment:</b>		MN		SN	FCC ID
HP Vectra 90 PC		Vectra VL 5/90		US54359823	K4UVECTRAVL5
Dell Monitor		D825TM		8060711	None
Panasonic Printer		KX-PI080i		not labeled	ACJ5Z6KX-P1080I
<b>EUT Cables:</b>		Qty	Shielded?	Length	Ferrites
Antenna cable		1	Yes	3 m	None
<i>Support cabling</i>					
AC power cable		3	No	2 m	None
VGA cable		1	Yes	2 m	One at PC end
Printer cable		1	Yes	2 m	None
Serial cable		1	Yes	2 m	None
Keyboard cable		1	Yes	2 m	None
Mouse cable		1	No	2 m	None
<b>Unpopulated EUT Ports:</b>		Qty	Reason		
		None			
<b>Software / Operating Mode Description:</b>					
The EUT was operating under developmental software which enabled data transmission and/or reception using the attached antenna PCMCIA card (both types: internal antenna and external antenna).					

### 2.3 Test Methodology

Radiated emission testing was performed according to the procedures in ANSI C63.4 (1992). Radiated testing was performed at an antenna to EUT distance of 3 meters below 1 GHz, and at a distance of 3 or 1 meter(s) above 1 GHz. The actual test distance used is noted in the test data sheets. The device's performance was investigated to 10 times the fundamental frequency.

All other performance tests were made in accordance with the procedures outlined in Part 15 of CFR 47. The applicable sections provided under Part 15 are provided in the measurement section of this report, Exhibit 3.

### 2.4 Test Facility

The open area test site used to collect the radiated data is located at 527 Great Road, Littleton, MA 01460. Sites "T" and "F" were used. Please reference your file # 31040/SIT 1300F2 should you have any questions regarding the test site construction.

## 2.5 Test Equipment Used

<b>SPECTRUM ANALYZERS</b>					
<b>x</b>	<b>Analyzer</b>	<b>Model No.</b>	<b>Company</b>	<b>Serial No.</b>	<b>Calibration Due</b>
	<b>RED</b> 9kHz-1.8GHz	8591E	HP	3441A03559	06-MAY-2000
	<b>WHITE</b> 9kHz-22GHz	8593E	HP	3547U01252	10-JAN-2001
	<b>BLUE</b> 9kHz-1.8GHz	8591E	HP	3223A00227	02-SEP-2000
<b>X</b>	<b>YELLOW</b> 9kHz-2.9GHz	8594E	HP	3523A01958	20-OCT-2000
<b>X</b>	<b>GREEN</b> 9kHz-26.5GHz	8593E	HP	3829A03618	04-OCT-2000
	<b>BLACK</b> 9kHz-12.8GHz	8596E	HP	3710A00944	27-MAY-2000
	<b>YELLOW-BLACK</b> 20Hz-40.0MHz	3585A	HP	A183438	11-NOV-2000

<b>LISNS</b>					
<b>x</b>	<b>LISN</b>	<b>Model No.</b>	<b>Company</b>	<b>Serial No.</b>	<b>Calibration Due</b>
	<b>RED</b> 9kHz-30MHz	8012-50-R-24-BNC	Solar	956348	13-MAR-2000
<b>X</b>	<b>BLUE</b> 9kHz-30MHz	8012-50-R-24-BNC	Solar	956349	13-MAR-2000
<b>X</b>	<b>YELLOW-BLACK</b> 9kHz-30MHz	8012-50-R-24-BNC	Solar	984735	26-OCT-2000
	<b>GOLD</b> 9kHz-30MHz	8012-50-R-24-BNC	Solar	984734	26-OCT-2000
	<b>WHITE-BLACK</b> 9kHz-30MHz	8610-50-TS-100-N	Solar	972019	14-APR-2000
	<b>BLACK</b> 9kHz-30MHz	8610-50-TS-100-N	Solar	972017	14-APR-2000
	<b>RED-BLACK</b> 9kHz-30MHz	8610-50-TS-100-N	Solar	972016	14-APR-2000
	<b>BLUE-BLACK</b> 9kHz-30MHz	8610-50-TS-100-N	Solar	972018	14-APR-2000



<b>OPEN AREA TEST SITES (OATS)</b>					
<b>x</b>	<b>Site</b>	<b>FCC Code</b>	<b>IC Code</b>	<b>VCCI Code</b>	<b>Calibration Due</b>
<b>X</b>	<b>"F"</b> Florida	1300F2	IC 2762-F	R-468/ C-480	04-JUN-2000
<b>X</b>	<b>"T"</b> Texas	1300F2	IC 2762-T	R-905/ C-480	08-JAN-2001
	<b>"A"</b> Alaska	1300F2	IC 2762-A	R-903/ C-480	08-MAY-2000
	<b>"M"</b> Maine	93448	IC 2762-M	R-904/ C-480	03-APR-2000
	<b>"J"</b> Jamaica	n/a	n/a	n/a	21-MAY-2000

<b>ANTENNAS</b>					
<b>x</b>	<b>Antenna</b>	<b>Model No.</b>	<b>Company</b>	<b>Serial No.</b>	<b>Calibration Due</b>
	<b>GREEN</b> Bilog: 30MHz-2GHz	CBL6112B	Chase	2435	14-JUL-2000
	<b>GREEN-BLACK</b> Bilog: 30MHz-2GHz	CBL6112B	Chase	2412	27-MAY-2000
	<b>GREEN-WHITE</b> Bilog: 30MHz-2GHz	CBL6112B	Chase	2574	13-MAY-2000
<b>X</b>	<b>RED</b> Bilog: 30MHz-1GHz	3143	EMCO	1270	27-MAY-2000
	<b>BLUE</b> Bilog: 30MHz-1GHz	3143	EMCO	1271	27-MAY-2000
	<b>GREY</b> Bilog: 26MHz-2GHz	3141	EMCO	9703-1038	27-MAY-2000
	<b>YELLOW-BLACK</b> X-Wing Bilog: 20-2000MHz	CBL6140A	Chase	1112	27-MAY-2000
<b>X</b>	<b>YELLOW</b> Horn: 1-18GHz	3115	EMCO	9608-4898	10-MAR-2000
	<b>BLUE HORN</b> Horn: 1-18GHz	3115	EMCO	2230	10-SEPT-2001
<b>X</b>	<b>WHITE</b> Std Gain Horn: 18-26.5GHz	3160-09	EMCO	9610-1068	05-MAY-2000
	<b>SMALL LOOP</b> Passive Loop: 9kHz-30MHz	PLA-130/A	ARA	1024	19-NOV-2000
	<b>LARGE LOOP</b> Passive Loop: 20Hz-5MHz	6511	EMCO	9704-1154	01-OCT-2000
	<b>MONOPOLE</b> Act Monopole: 30Hz-30MHz	3301B	EMCO	3824	30-MAR-2000
	<b>DIPOLE</b> Adj Dipole: 30-1000MHz	3121C	EMCO	1370	26-MAR-2000
	<b>DIPOLE</b> Adj Dipole: 30-1000MHz	3121C	EMCO	1371	26-MAR-2000

<b>PREAMPLIFIERS</b>					
<b>x</b>	<b>Preamplifier</b>	<b>Model No.</b>	<b>Company</b>	<b>Serial No.</b>	<b>Calibration Due</b>
	<b>RED</b> 0.10-2000MHz	ZFL-1000-LN	MiniCircuits/ C-S	n/a	06-FEB-2000
	<b>BLUE</b> 0.01-2000MHz	ZFL-1000-LN	MiniCircuits/ C-S	n/a	09-SEP-2000
	<b>BLUE-BLACK</b> 0.01-2000MHz	ZFL-1000-LN	MiniCircuits/ C-S	n/a	19-OCT-2000
	<b>GREEN</b> 0.01-2000MHz	ZFL-1000-LN	MiniCircuits/ C-S	n/a	04-FEB-2000
	<b>GOLD</b> 0.01-2000MHz	ZFL-1000-LN	MiniCircuits/ C-S	n/a	19-OCT-2000
	<b>BLACK</b> 0.01-2000MHz	ZFL-1000-LN	MiniCircuits/ C-S	n/a	01-MAR-2000
<b>X</b>	<b>ORANGE</b> 0.01-2000MHz	ZFL-1000-LN	MiniCircuits/ C-S	n/a	24-JUN-2000
	<b>WHITE</b> 2-18GHz	SMC-12A	MITEQ	426643	19-OCT-2000
<b>X</b>	<b>YELLOW-BLACK</b> 1-20GHz	SMC-12A	MITEQ	535055	17-OCT-2000
<b>X</b>	<b>YELLOW</b> 18-26.5GHz	AFS4-18002650- 60-8P-4	MITEQ	467559	16-JUN-2000

<b>POWER AND NOISE METERS</b>					
<b>x</b>	<b>Meter</b>	<b>Model No.</b>	<b>Company</b>	<b>Serial No.</b>	<b>Calibration Due</b>
<b>X</b>	<b>POWER METER</b>	435B	HP	2445A11012	11-MAR-2000
<b>X</b>	<b>POWER SENSOR</b>	8481A	HP	2702A61351	11-MAR-2000
	<b>NOISE MEASURING SET (3A AND 3B)</b>	J94003A	Western Electronic	9877	30-MAR-2000

Unless otherwise noted the calibration interval is one year. All equipment is calibrated using standards traceable to NIST or other nationally recognized calibration standard.

## EXHIBIT 3

### 3.0 *Measurement Results*

#### 3.1 Maximum Peak Output Power Measurement

The maximum gain provided by the four attachable antennas is given by the Patch Array antenna with a gain of 13dBi. This translates to a power limit of

$$30\text{dBm} - (13\text{dBm} - 6\text{dBm}) = 23\text{dBm}$$

The maximum peak output power as measured with a broadband power meter at the antenna port is:

Channel 1: 13.1 dBm  
Channel 6: 12.0 dBm    =>    worst case: -9.9 dB margin  
Channel 11: 11.9 dBm

3.2 Electric Field Strength Radiation Measurements

<b>Radiated Emissions Table</b>											<i>Curtis-Straus LLC</i>			
<b>Date:</b> 20-Jan-00			<b>Company:</b> Zoom Telephonics						<b>Table 1</b>					
<b>Engineer:</b> David Heald			<b>EUT Desc:</b> Wireless LAN PCMCIA cards						<b>Work Order:</b> A0281					
<b>Frequency Range:</b> 30-1000 MHz						<b>Measurement Distance:</b> 3 m								
<b>Notes:</b>											<b>EUT Max Freq:</b> 2488 MHz			
Antenna Polarization (H / V)	Frequency (MHz)	Reading (dBµV)	Preamp Factor (dB)	Antenna Factor (dB/m)	Cable Factor (dB)	Adjusted Reading (dBµV/m)	---			FCC Class B				
							Limit (dBµV/m)	Margin (dB)	Result (Pass/Fail)	Limit (dBµV/m)	Margin (dB)	Result (Pass/Fail)		
V	40.0	28.4	22.3	10.1	0.5	16.7	---	---	---	40.0	-23.3	Pass		
V	56.0	41.1	22.4	6.2	0.6	25.5	---	---	---	40.0	-14.5	Pass		
H	88.0	47.1	22.4	7.6	0.8	33.1	---	---	---	40.0	-6.9	Pass		
H	132.0	40.1	22.3	8.5	1.1	27.4	---	---	---	43.5	-16.1	Pass		
H	176.0	42.7	22.3	9.7	1.4	31.5	---	---	---	43.5	-12.0	Pass		
H	200.3	35.8	22.4	10.4	1.5	25.3	---	---	---	43.5	-18.2	Pass		
V	210.5	33.4	22.3	10.9	1.6	23.6	---	---	---	43.5	-19.9	Pass		
H	216.3	33.7	22.3	11.2	1.6	24.2	---	---	---	46.0	-21.8	Pass		
H	220.0	41.5	22.3	11.3	1.6	32.1	---	---	---	46.0	-13.9	Pass		
H	230.5	35.8	22.3	11.8	1.7	27.0	---	---	---	46.0	-19.0	Pass		
H	232.3	40.9	22.3	11.9	1.7	32.2	---	---	---	46.0	-13.8	Pass		
H	264.0	48.5	22.3	13.1	1.9	41.2	---	---	---	46.0	-4.8	Pass		
H	308.0	41.4	22.2	14.3	2.0	35.5	---	---	---	46.0	-10.5	Pass		
H	352.0	43.2	22.1	15.3	2.2	38.6	---	---	---	46.0	-7.4	Pass		
H	396.0	33.4	21.9	16.4	2.3	30.2	---	---	---	46.0	-15.8	Pass		
H	440.0	27.0	21.9	17.5	2.5	25.1	---	---	---	46.0	-20.9	Pass		
H	497.7	33.8	21.9	19.1	2.7	33.7	---	---	---	46.0	-12.3	Pass		
V	660.0	36.5	21.6	20.6	3.4	38.9	---	---	---	46.0	-7.1	Pass		
<b>Table Result:</b> Pass by -4.8 dB											<b>Worst Freq:</b> 264.0 MHz			
<b>Test Site:</b> "F"			<b>Pre-Amp:</b> Orange			<b>Cable:</b> 65 ft RG8A/U			<b>Analyzer:</b> Yellow			<b>Antenna:</b> Red		

<b>Conducted Emissions Chart</b>											<i>Curtis-Straus LLC</i>		
<b>Date:</b> 20-Jan-00			<b>Company:</b> Zoom Telephonics						<b>Table No: 2</b>				
<b>Engineer:</b> David Heald			<b>EUT Desc:</b> Model 2102						<b>Work Order:</b> A0281				
<b>Notes:</b>													
<b>Range:</b> 0.45 - 30.0 MHz				<b>LISN(s):</b> Blue Yellow-Black				<b>Spectrum Analyzer:</b> Blue					
Frequency (MHz)	Quasi-Peak			FCC Class A		Average			FCC Class A				
	L1 (dBµV)	L2 (dBµV)	Reading (dBµV)	Limit (dBµV)	Result (Pass/Fail)	L1 (dBµV)	L2 (dBµV)	Reading (dBµV)	Limit (dBµV)	Result (Pass/Fail)	Margin (dBµV)		
0.47	26.8	28.5	28.5	60.0	Pass			---	60.0	Pass	-31.5		
0.54	25.8	27.8	27.8	60.0	Pass			---	60.0	Pass	-32.2		
1.41	26.4	26.4	26.4	60.0	Pass			---	60.0	Pass	-33.6		
5.00	18.4	18.3	18.4	70.0	Pass			---	70.0	Pass	-51.6		
10.00	18.6	18.5	18.6	70.0	Pass			---	70.0	Pass	-51.4		
18.89	28.6	26.3	28.6	70.0	Pass			---	70.0	Pass	-41.4		

FCC Application for a new equipment authorization for Zoom Telephonics

FCC ID: BDNWLANPCCRD11 • Report No. A0281-1

11-May-00

Spurious Emissions Table											Curtis-Straus LLC		
Date: 21-Jan-00			Company: Zoom					Table 3					
Engineer: David Heald			EUT Desc: Zoom 0231 transmitter					Work Order: A0281					
Frequency Range: 1-2 GHz						Measurement Distance: 3 m							
Notes:													
Antenna Polarization (H/V)	Frequency (MHz)	Reading (dBµV)	Preamp Factor (dB)	Antenna Factor (dB/m)	Cable Factor (dB)	Adjusted Reading (dBµV/m)	---			FCC Class B			
							Limit (dBµV/m)	Margin (dB)	Result (Pass/Fail)	Limit (dBµV/m)	Margin (dB)	Result (Pass/Fail)	
V	1480.0	24.7	20.6	26.9	1.5	32.5	---	---	---	54.0	-21.5	Pass	
V	1665.0	33.8	19.4	27.7	1.7	43.8	---	---	---	54.0	-10.2	Pass	
<b>Table Result:</b> Pass by -10.2 dB							<b>Worst Freq:</b> 1665.0 MHz						
Test Site: "F"			Pre-Amp: Orange		Cable: 12 ft RG214		Analyzer: Green			Antenna: Yellow Horn			

Spurious Emissions Table											Curtis-Straus LLC		
Date: 25-Jan-00			Company: Zoom					Table 4					
Engineer: David Heald			EUT Desc: Zoom 0231 transmitter					Work Order: A0281					
Frequency Range: 2-12.5 GHz						Measurement Distance: 3 m							
Notes: Spurious emissions EUT Max Freq:													
Antenna Polarization (H/V)	Frequency (MHz)	Reading (dBµV)	Preamp Factor (dB)	Antenna Factor (dB/m)	Cable Factor (dB)	Filter Factor (dB)	Distance Correction (dB)	Adjusted Reading (dBµV)	FCC Class B				
									Limit (dBµV/m)	Margin (dB)	Result (Pass/Fail)		
V	4076.0	21.3	20.9	33.6	3.2	1.0	0.0	38.2	54.0	-15.8	Pass		
scan from 10-12.5 GHz		---	---	---	---	---	---	---	---	---	---		
No emissions found		---	---	---	---	---	---	---	---	---	---		
<b>Table Result:</b> Pass by 15.8 dB							<b>Worst Freq:</b> 4076.0 MHz						
Test Site: "F"			Pre-Amp: Yel-Blk		Cable: 12 ft RG214		Analyzer:			Antenna: Yellow Horn			

Bandedge Emissions Table											Curtis-Straus LLC		
Date: 25-Jan-00			Company: Zoom					Table 5					
Engineer: David Heald			EUT Desc: 13 dBi omnidirectional patch antenna					Work Order: A0281					
Frequency Range: Select frequencies						Measurement Distance: 3 m							
Notes: Bandedge emissions for lower gain antennas on individual antenna data sheets.													
Antenna Polarization (H/V)	Frequency (MHz)	Reading (dBµV)	Preamp Factor (dB)	Antenna Factor (dB/m)	Cable Factor (dB)	Filter Factor (dB)	Distance Correction (dB)	Adjusted Reading (dBµV/m)	FCC Class B				
									Limit (dBµV/m)	Margin (dB)	Result (Pass/Fail)		
Channel 11	2483.5	30.2	---	---	---	---	---	---	---	---	---		
H			20.5	30.6	2.2	0.0	0.0	42.5	54.0	-11.5	Pass		
Channel 1	2390.0	35.5	---	---	---	---	---	---	---	---	---		
H			20.5	30.3	2.2	0.0	0.0	47.5	54.0	-6.5	Pass		
<b>Table Result:</b> Pass by -6.5 dB							<b>Worst Freq:</b> 2390.0 MHz						
Test Site: "F"			Pre-Amp: Yel-Blk		Cable: 12 ft RG214		Analyzer: Green			Antenna: Yellow Horn			

FCC Application for a new equipment authorization for Zoom Telephonics

FCC ID: BDNWLANPCCRD11 • Report No. A0281-1

11-May-00

Radiated Emissions Table										Curtis-Straus LLC		
Date: 25-Jan-00			Company: Zoom				Table 6					
Engineer: David Heald			EUT Desc: 13 dBi directional patch antenna				Work Order: A0281					
Frequency Range: Restricted band						Measurement Distance: 3 m						
Notes: Antenna investigated in detail. Other antennas investigated on channel 1 only See Bandedge chart for Fundamental intrusion on adjacent restricted bands												
Antenna Polarization (H / V)	Frequency (MHz)	Reading (dBµV)	Preamp Factor (dB)	Antenna Factor (dB/m)	Cable Factor (dB)	Filter Factor (dB)	Distance Correction (dB)	Adjusted Reading (dBµV/m)	FCC Class B			
									Limit (dBµV/m)	Margin (dB)	Result (Pass/Fail)	
Channel 1			---	---	---	---	---	---	---	---	---	
V	4824.0	21.4	20.6	35.8	3.8	0.0	0.0	40.4	54.0	-13.6	Pass	
V	7236.0	19.5	19.4	38.5	6.2	1.0	9.5	36.3	54.0	-17.7	Pass	
V	12060.0	26.1	17.9	40.7	2.5	1.0	9.5	42.9	63.5	-20.6	Pass	
V	14472.0	28.4	19.7	42.3	2.8	0.0	9.5	44.3	63.5	-19.2	Pass	
H	19296.0	29.7	21.4	40.3	0.0	0.0	9.5	39.1	63.5	-24.4	Pass	
Channel 6			---	---	---	---	---	---	---	---	---	
V	4874.0	20.3	20.5	35.9	3.8	0.0	0.0	39.5	54.0	-14.5	Pass	
V	7311.0	13.9	19.3	38.6	6.1	1.0	9.5	30.8	54.0	-23.2	Pass	
V	12185.0	26.1	18.0	40.8	2.5	1.0	9.5	42.9	63.5	-20.6	Pass	
H	19496.0	32.5	21.4	40.3	0.0	0.0	9.5	41.9	63.5	-21.6	Pass	
Channel 11			---	---	---	---	---	---	---	---	---	
V	4924.0	21.1	20.5	36.1	3.9	0.0	0.0	40.6	54.0	-13.4	Pass	
V	7386.0	14.1	19.3	38.8	6.1	1.0	9.5	31.2	54.0	-22.8	Pass	
V	12310.0	25.5	18.2	41.0	2.5	1.0	9.5	42.3	63.5	-21.2	Pass	
H	19696.0	32.8	21.4	40.3	0.0	0.0	9.5	42.2	63.5	-21.3	Pass	
H	22158.0	35.2	21.9	40.3	0.0	0.0	9.5	44.1	63.5	-19.4	Pass	
<b>Table Result:</b> Pass by -13.4 dB <b>Worst Freq:</b> 4924.0 MHz												
Test Site: "F" Pre-Amp: Yel-Blk, HF Cable: 12 ft RG214 Analyzer: Green Antenna: Yellow Horn												

Radiated Emissions Table										Curtis-Straus LLC		
Date: 13 April, 2000			Company: Zoom Telephonics				Table 7					
Engineer: David Heald			EUT Desc: Ceramic disc antenna				Work Order: A0281					
Frequency Range: to 24800 MHz						Measurement Distance: 3 m, 1 m						
Notes: Highest power channel investigated Other channels investigated for forbidden band intrusion or if they are exclusively in restricted band												
Channel	Frequency (MHz)	Reading (dBµV)	Preamp Factor (dB)	Antenna Factor (dB/m)	Cable Factor (dB)	Filter Factor (dB)	Distance Correction (dB)	Adjusted Reading (dBµV)	FCC Class B			
									Limit (dBµV/m)	Margin (dB)	Result (Pass/Fail)	
1	2390.0	31.1	20.5	30.9	1.1	0.0	0.0	42.6	54.0	-11.4	Pass	
11	2483.5	24.2	20.5	30.9	1.2	0.0	0.0	35.8	54.0	-18.2	Pass	
1	4824.0	18.1	20.6	36.1	1.5	1.0	0.0	36.1	54.0	-17.9	Pass	
1	7236.0	24.4	19.4	37.2	1.9	1.0	9.5	35.6	54.0	-18.4	Pass	
1	12060.0	28.8	17.9	39.2	2.5	1.0	9.5	44.1	54.0	-9.9	Pass	
1	14472.0	29.1	19.7	41.5	2.8	0.0	9.5	44.2	54.0	-9.8	Pass	
1	19296.0	29.6	21.4	40.3	3.2	0.0	9.5	42.2	54.0	-11.8	Pass	
1	21400.0	33.4	21.8	40.3	3.4	0.0	9.5	45.8	54.0	-8.2	Pass	
11	22352.0	36.3	21.9	40.4	3.5	0.0	9.5	48.8	54.0	-5.2	Pass	
1	24000.0	34.1	21.8	40.4	3.7	0.0	9.5	46.9	54.0	-7.1	Pass	
<b>Table Result:</b> Pass by 5.2 dB <b>Worst Freq:</b> 22352.0 MHz												
Test Site: "T" Pre-Amp: Yel-Blk, HF Cable: Sucoflex Analyzer: Green Antenna: Blue Horn, HF												

Radiated Emissions Table										Curtis-Straus LLC		
Date: 13 April, 2000			Company: Zoom Telephonics					Table 8				
Engineer: David Heald			EUT Desc: 1.76 dBi Dipole antenna					Work Order: A0281				
Frequency Range: to 24800 MHz						Measurement Distance: 3 m, 1 m						
Notes: Highest power channel investigated						EUT Max Freq: 2480 MHz						
Other channels investigated for forbidden band intrusion or if they are exclusively in restricted band												
Channel	Frequency (MHz)	Reading (dBµV)	Preamp Factor (dB)	Antenna Factor (dB/m)	Cable Factor (dB)	Filter Factor (dB)	Distance Correction (dB)	Adjusted Reading (dBµV)	FCC Class B			
									Limit (dBµV/m)	Margin (dB)	Result (Pass/Fail)	
1	2390.0	15.8	20.5	30.9	1.1	0.0	0.0	27.3	54.0	-26.7	Pass	
11	2483.5	32.0	20.5	30.9	1.2	0.0	0.0	43.6	54.0	-10.4	Pass	
1	4824.0	18.5	20.6	36.1	1.5	1.0	0.0	36.5	54.0	-17.5	Pass	
1	7236.0	24.0	19.4	37.2	1.9	1.0	9.5	35.2	54.0	-18.8	Pass	
1	12060.0	26.7	17.9	39.2	2.5	1.0	9.5	42.0	54.0	-12.0	Pass	
1	14472.0	29.4	19.7	41.5	2.8	0.0	9.5	44.5	54.0	-9.5	Pass	
1	19296.0	30.8	21.4	40.3	3.2	0.0	9.5	43.4	54.0	-10.6	Pass	
1	21400.0	34.0	21.8	40.3	3.4	0.0	9.5	46.4	54.0	-7.6	Pass	
11	22352.0	35.4	21.9	40.4	3.5	0.0	9.5	47.9	54.0	-6.1	Pass	
1	24000.0	34.9	21.8	40.4	3.7	0.0	9.5	47.7	54.0	-6.3	Pass	
<b>Table Result:</b> Pass by 6.1 dB <b>Worst Freq:</b> 22352.0 MHz												
Test Site: "T" Pre-Amp: Yel-Blk, HF Cable: Sucoflex Analyzer: Green Antenna: Blue Horn, HF												

Radiated Emissions Table										Curtis-Straus LLC		
Date: 13 April, 2000			Company: Zoom Telephonics					Table 9				
Engineer: David Heald			EUT Desc: Integrated antenna					Work Order: A0281				
Frequency Range: to 24800 MHz						Measurement Distance: 3 m, 1 m						
Notes: Highest power channel investigated						EUT Max Freq: 2480 MHz						
Other channels investigated for forbidden band intrusion or if they are exclusively in restricted band												
Channel	Frequency (MHz)	Reading (dBµV)	Preamp Factor (dB)	Antenna Factor (dB/m)	Cable Factor (dB)	Filter Factor (dB)	Distance Correction (dB)	Adjusted Reading (dBµV)	FCC Class B			
									Limit (dBµV/m)	Margin (dB)	Result (Pass/Fail)	
1	2390.0	34.8	20.5	30.9	1.1	0.0	0.0	46.3	54.0	-7.7	Pass	
11	2483.5	32.3	20.5	30.9	1.2	0.0	0.0	43.9	54.0	-10.1	Pass	
1	4824.0	28.4	20.6	36.1	1.5	1.0	0.0	46.4	54.0	-7.6	Pass	
1	7236.0	41.4	19.4	37.2	1.9	1.0	9.5	52.6	54.0	-1.4	Pass	
1	12060.0	31.3	17.9	39.2	2.5	1.0	9.5	46.6	54.0	-7.4	Pass	
1	14472.0	28.9	19.7	41.5	2.8	0.0	9.5	44.0	54.0	-10.0	Pass	
1	19296.0	30.0	21.4	40.3	3.2	0.0	9.5	42.6	54.0	-11.4	Pass	
1	21400.0	33.8	21.8	40.3	3.4	0.0	9.5	46.2	54.0	-7.8	Pass	
11	22352.0	35.6	21.9	40.4	3.5	0.0	9.5	48.1	54.0	-5.9	Pass	
1	24000.0	34.0	21.8	40.4	3.7	0.0	9.5	46.8	54.0	-7.2	Pass	
<b>Table Result:</b> Pass by 1.4 dB <b>Worst Freq:</b> 7236.0 MHz												
Test Site: "T" Pre-Amp: Yel-Blk, HF Cable: Sucoflex Analyzer: Green Antenna: Blue Horn, HF												

Radiated Emissions Table										Curtis-Straus LLC		
Date: 13 April, 2000			Company: Zoom Telephonics				Table 10					
Engineer: David Heald			EUT Desc: 4.0 dBi Omnidirectional patch				Work Order: A0281					
Frequency Range: to 24800 MHz					Measurement Distance: 3 m, 1 m							
Notes: Highest power channel investigated					EUT Max Freq: 2480 MHz							
Other channels investigated for forbidden band intrusion or if they are exclusively in restricted band												
Channel	Frequency (MHz)	Reading (dBµV)	Preamp Factor (dB)	Antenna Factor (dB/m)	Cable Factor (dB)	Filter Factor (dB)	Distance Correction (dB)	Adjusted Reading (dBµV)	FCC Class B			
									Limit (dBµV/m)	Margin (dB)	Result (Pass/Fail)	
1	2390.0	32.6	20.5	30.9	1.1	0.0	0.0	44.1	54.0	-9.9	Pass	
11	2483.5	21.3	20.5	30.9	1.2	0.0	0.0	32.9	54.0	-21.1	Pass	
1	4824.0	18.0	20.6	36.1	1.5	1.0	0.0	36.0	54.0	-18.0	Pass	
1	7236.0	24.3	19.4	37.2	1.9	1.0	9.5	35.5	54.0	-18.5	Pass	
1	12060.0	26.3	17.9	39.2	2.5	1.0	9.5	41.6	54.0	-12.4	Pass	
1	14472.0	29.5	19.7	41.5	2.8	0.0	9.5	44.6	54.0	-9.4	Pass	
1	19296.0	32.6	21.4	40.3	3.2	0.0	9.5	45.2	54.0	-8.8	Pass	
1	21400.0	34.2	21.8	40.3	3.4	0.0	9.5	46.6	54.0	-7.4	Pass	
11	22352.0	36.1	21.9	40.4	3.5	0.0	9.5	48.6	54.0	-5.4	Pass	
1	24000.0	34.6	21.8	40.4	3.7	0.0	9.5	47.4	54.0	-6.6	Pass	
<b>Table Result:</b> Pass by 5.4 dB <span style="float: right;"><b>Worst Freq:</b> 22352.0 MHz</span>												
<b>Test Site:</b> "T" <b>Pre-Amp:</b> Yel-Blk, HF <b>Cable:</b> Sucoflex <b>Analyzer:</b> Green <b>Antenna:</b> Blue Horn, HF												



### 3.3 Power Spectral Density Measurement

The peak power spectral density as measured through a 20dB attenuator is:

Channel 1 (2.4128GHz):  $-30.3 \text{ dBm} + 20\text{dB (attenuator)} = -10.3 \text{ dBm}$

Channel 6 (2.4378GHz):  $-31.5 \text{ dBm} + 20\text{dB (attenuator)} = -11.5 \text{ dBm}$

Channel 11 (2.4601GHz):  $-32.8 \text{ dBm} + 20\text{dB (attenuator)} = -12.8 \text{ dBm}$

### 3.4 Occupied Bandwidth

Occupied Bandwidth		
<b>Work Order:</b> A0281		
<b>Date:</b> 21 Jan, 2000		
<b>Engineer:</b> David Heald		
<b>EUT:</b> 11 MB Wireless LAN card -reduced power		
<b>Company:</b> Zoom Telephonics		
	Frequency (MHz)	Bandwidth (MHz)
Channel 1	2412	10.63
Channel 6	2437	10.63
Channel 11	2462	10.88

### 3.4 Radiofrequency Radiation Exposure Evaluation

During the power output measurement, a maximum power output of **13.1 dBm** was obtained on channel 1 at the antenna port. Adding the worst case manufacturer supplied antenna gain (**13dBi** for the Patch Array antenna) to the maximum power output gives an EIRP of **26.1dBm**.

Since the device operates with an EIRP that may exceed the FCC RF exposure limits, the user/installation manual will contain a warning similar to the following.

**CAUTION:**

*For the purpose of satisfying FCC RF exposure compliance requirements, antennas should be positioned in such a way that a separation distance of at least 20 cm is maintained between the transmitter's radiating structures and the body of the user or nearby persons.*

3.5 Test Setup Photographs



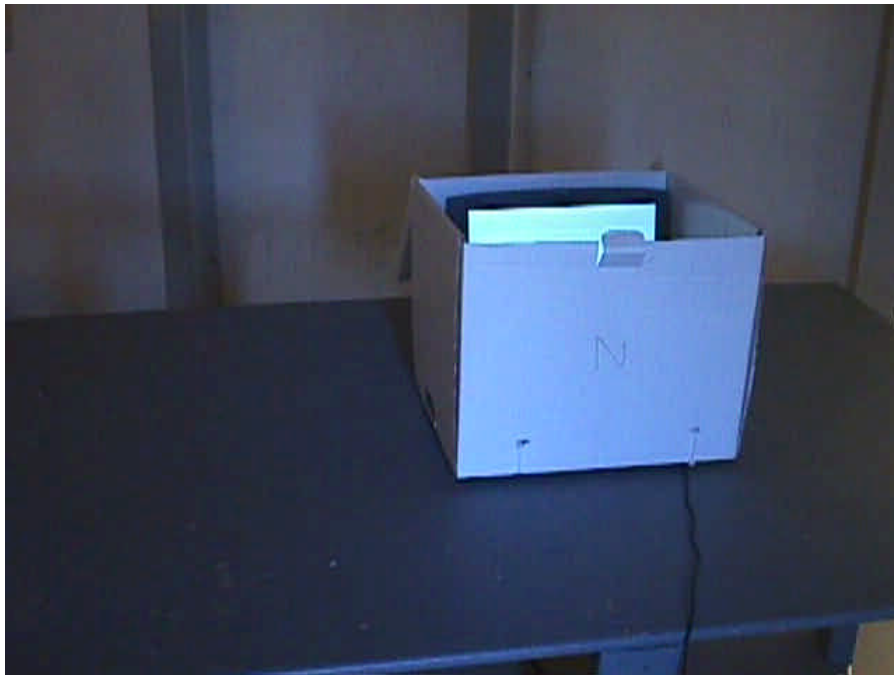
Radiated Emissions Test Setup



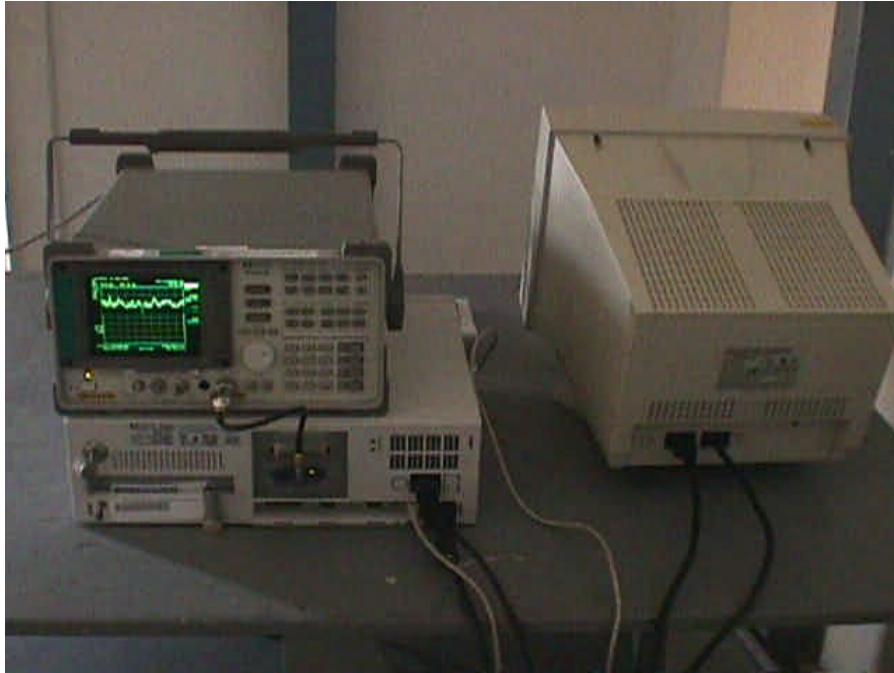
Radiated Emissions Test Setup (13 dBi antenna)



Radiated Emissions Test Setup (other antennas)



Radiated Emissions Test Setup (other antennas)



Antenna Port Conducted Setup

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