

NEMKO Test Report: 1L0303RUS1

Applicant: Intel Corporation
15250 Ave. of Science
SN1-02
San Diego, CA 92128

Equipment Under Test: 802.11b 2.4GHz Wireless LAN module
Model: Agency Series PE3010

FCC ID: PD92011BWLAN

In Accordance With: FCC Part 15, Subpart C, 15.247
Direct Sequence Spread Spectrum Transmitters

Tested By: Nemko Dallas Inc.
802 N. Kealy
Lewisville, Texas 75057-3136

Authorized By:



Tom Tidwell, RF Group Manager

Date: 6/18/01

Total Number of Pages: 46

DIRECT SEQUENCE SPREAD SPECTRUM TRANSMITTER

FCC ID.: [PD92011BWLAN](#)
EQUIPMENT: [Agency Series PE3010](#)

PROJECT NO.: [1L0303RUS1](#)

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FCC PART 15, SUBPART C

DIRECT SEQUENCE SPREAD SPECTRUM TRANSMITTER

FCC ID.: [PD92011BWLAN](#)
EQUIPMENT: [Agency Series PE3010](#)

PROJECT NO.: [1L0303RUS1](#)

DIRECT SEQUENCE SPREAD SPECTRUM TRANSMITTER

FCC ID.: PD92011BWLAN
EQUIPMENT: Agency Series PE3010

PROJECT NO.: 1L0303RUS1

Section 1. Summary of Test Results

Manufacturer: Intel Corporation

Model No.: Agency Series PE3010

Serial No.: None

General: **All measurements are traceable to national standards.**

These tests were conducted on a sample of the equipment for the purpose of demonstrating compliance with Part 15, Subpart C, Paragraph 15.247 for Direct Sequence Spread Spectrum devices. Radiated tests were conducted in accordance with ANSI C63.4-1992. Radiated emissions are made on an open area test site. A description of the test facility is on file with the FCC.

- | | | | |
|-------------------------------------|----------------------------|-------------------------------------|---------------------|
| <input checked="" type="checkbox"/> | New Submission | <input checked="" type="checkbox"/> | Production Unit |
| <input type="checkbox"/> | Class II Permissive Change | <input type="checkbox"/> | Pre-Production Unit |
| <input checked="" type="checkbox"/> | Modular Approval | | |

THIS TEST REPORT RELATES ONLY TO THE ITEM(S) TESTED.

THE FOLLOWING DEVIATIONS FROM, ADDITIONS TO, OR EXCLUSIONS FROM THE TEST SPECIFICATIONS HAVE BEEN MADE.

See " Summary of Test Data".



NVLAP LAB CODE: 100426-0

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FCC ID.: [PD92011BWLAN](#)
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Summary Of Test Data

NAME OF TEST	PARA. NO.	SPEC.	RESULT
Power Line Conducted Emissions	15.207(a)	48 dB μ V	Complies
Minimum 6 dB Bandwidth	15.247(a)(2)	500 kHz	Complies
Maximum Peak Power Output	15.247(b)(1)	1 Watt	Complies
Spurious Emissions (Antenna Conducted)	15.247(c)	-20 dBc/100kHz	Complies
Spurious Emissions (Restricted Bands)	15.247(c)	Table 15.209(a)	Complies
Peak Power Spectral Density	15.247(d)	+8 dBm/3kHz	Complies
Processing Gain	15.247(e)	12.9 dB	Complies

Footnotes:

DIRECT SEQUENCE SPREAD SPECTRUM TRANSMITTER

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Section 2. Equipment Under Test (E.U.T.)

General Equipment Information

Frequency Band: 902 – 928 MHz
 2400 – 2483.5 MHz
 5725 – 5850 MHz

Tuning Range: 2412 - 2462 MHz Channels 1 - 11

User Frequency Adjustment: Software controlled. Not adjustable by user.

DIRECT SEQUENCE SPREAD SPECTRUM TRANSMITTER

FCC ID.: [PD92011BWLAN](#)
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Description of configurations

Two revisions of the EUT were tested. The two versions are identical except that version 5 has slightly different biasing of the PA. The result of this bias change is to slightly lower the rf power output (by less than 1 dB). Both versions were tested and it was found that version 4 represents worst-case emissions. Even so, very little difference was seen between the two versions.

Modular approval rationale

The EUT meets with the FCC requirements for a modular approval on the following merits:

- 1) The EUT is a complete rf transmitter. The only connections to the EUT are data modulation inputs and dc power.
- 2) The rf power density levels are low enough to ensure compliance with FCC exposure regulations at a distance of 5 cm.(2 inches). Any applications for this module would ensure that a minimum separation distance of 20 cm. would be maintained during use.
- 3) It is understood that the various platforms in which this transmitter may operate will require separate testing and/or approval for unintentional emissions.
- 4) The transmitter module has its own rf shielding.
- 5) The modulation inputs are buffered in multiple stages within the transmitter module.
- 6) The transmitter module includes its own power supply regulation.
- 7) The antenna is an integral part of the transmitter module and cannot be removed or altered by the user.
- 8) The transmitter module will have its own FCC ID. number and label.
- 9) All specific requirements for Spread Spectrum transmitters operating under 15.247 are controlled by the transmitter module itself.
- 10) RF exposure requirements are satisfied by the module with a minimum separation distance of 5 cm.

DIRECT SEQUENCE SPREAD SPECTRUM TRANSMITTER

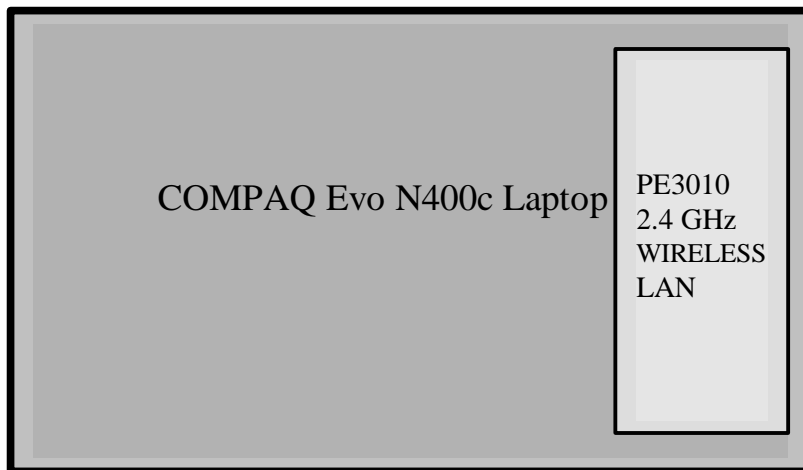
FCC ID.: [PD92011BWLAN](#)
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PROJECT NO.: [1L0303RUS1](#)

Description of Operation

The EUT is a wireless LAN transmitter module that is designed in compliance with 802.11b standards. The module operates as a direct sequence spread spectrum transmitter in the frequency range 2412 - 2462 MHz. The hardware is capable of tuning between 2412 - 2484 MHz but in North America, the frequency range is limited through firmware to channels 1 -11 (2412 - 2462 MHz).

System Diagram



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FCC PART 15, SUBPART C

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Section 3. Powerline Conducted Emissions

NAME OF TEST: Powerline Conducted Emissions	PARA. NO.: 15.207(a)
TESTED BY: Chinda Poy	DATE: 6/12/01

Test Results: Complies.

Measurement Data: See attached plots.

Measurement Uncertainty: +/- 1.3 dB

Temperature: 24 °C

Relative Humidity: 48 %

DIRECT SEQUENCE SPREAD SPECTRUM TRANSMITTER

FCC ID.: **PD92011BWLAN**
 EQUIPMENT: **Agency Series PE3010**

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Test Data—Powerline Conducted Emissions

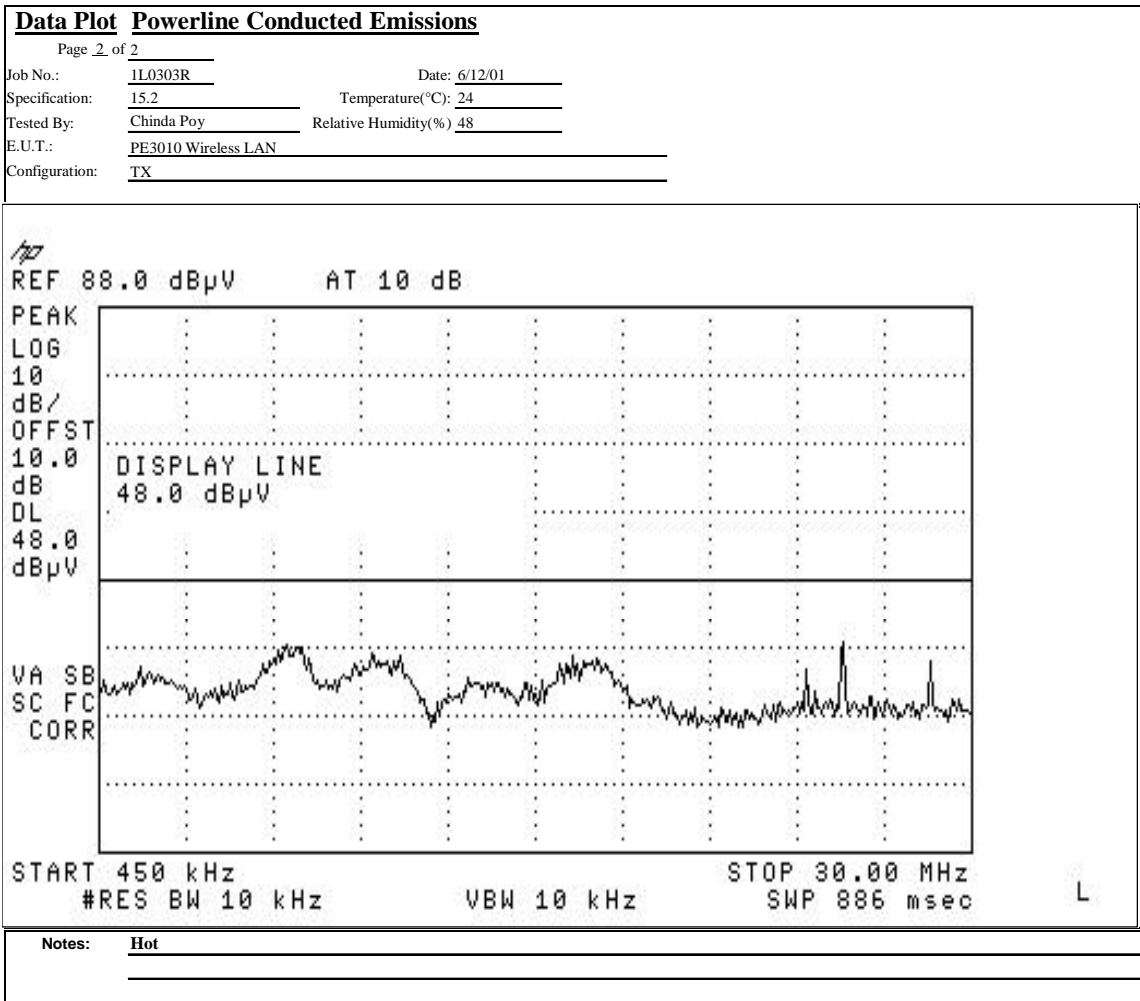
Data Plot Powerline Conducted Emissions		Complete <u> X </u>
Page <u> 1 </u> of 2		Preliminary <u> </u>
Job No.: 1L0303R	Date: 6/12/01	
Specification: 15.247	Temperature(°C): <u> 24 </u>	
Tested By: <u> Chinda Poy </u>	Relative Humidity(%): <u> 48 </u>	
E.U.T.: <u> PE3010 Wireless LAN </u>		
Configuration: <u> TX </u>		
Sample Number: <u> S01 </u>		
Location: <u> Lab 4 </u>	RBW: <u> Refer to plots </u>	
Detector Type: <u> Peak </u>	VBW: <u> Refer to plots </u>	
Test Equipment Used		
Antenna: <u> </u>	Directional Coupler: <u> </u>	
Pre-Amp: <u> </u>	Cable #1: <u> 1976 </u>	
Filter: <u> 704 </u>	Cable #2: <u> 970 </u>	
Receiver: <u> 785 </u>	Cable #3: <u> </u>	
Attenuator #1: <u> </u>	Cable #4: <u> </u>	
Attenuator #2: <u> </u>	L.S.I.N # <u> 969 </u>	
Additional equipment used: <u> </u>		
Measurement Uncertainty: <u> +/-1.3 dB </u>		
Notes: <u> Neutral </u>		

DIRECT SEQUENCE SPREAD SPECTRUM TRANSMITTER

FCC ID.: **PD92011BWLAN**
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PROJECT NO.: **1L0303RUS1**

Test Data—Powerline Conducted Emissions



DIRECT SEQUENCE SPREAD SPECTRUM TRANSMITTER

FCC ID.: [PD92011BWLAN](#)
EQUIPMENT: [Agency Series PE3010](#)

PROJECT NO.: [1L0303RUS1](#)

Section 4. Minimum 6 dB Bandwidth

NAME OF TEST: Minimum 6 dB Bandwidth	PARA. NO.: 15.247(a)(2)
TESTED BY: Chinda Poy	DATE: 6/11/01

Test Results: Complies.

Measurement Data: See 6 dB BW plot
Measured 6 dB bandwidth: 9.93 MHz Minimum
Channel Separation: 5 MHz

Equipment Used: 1464-1465-1045

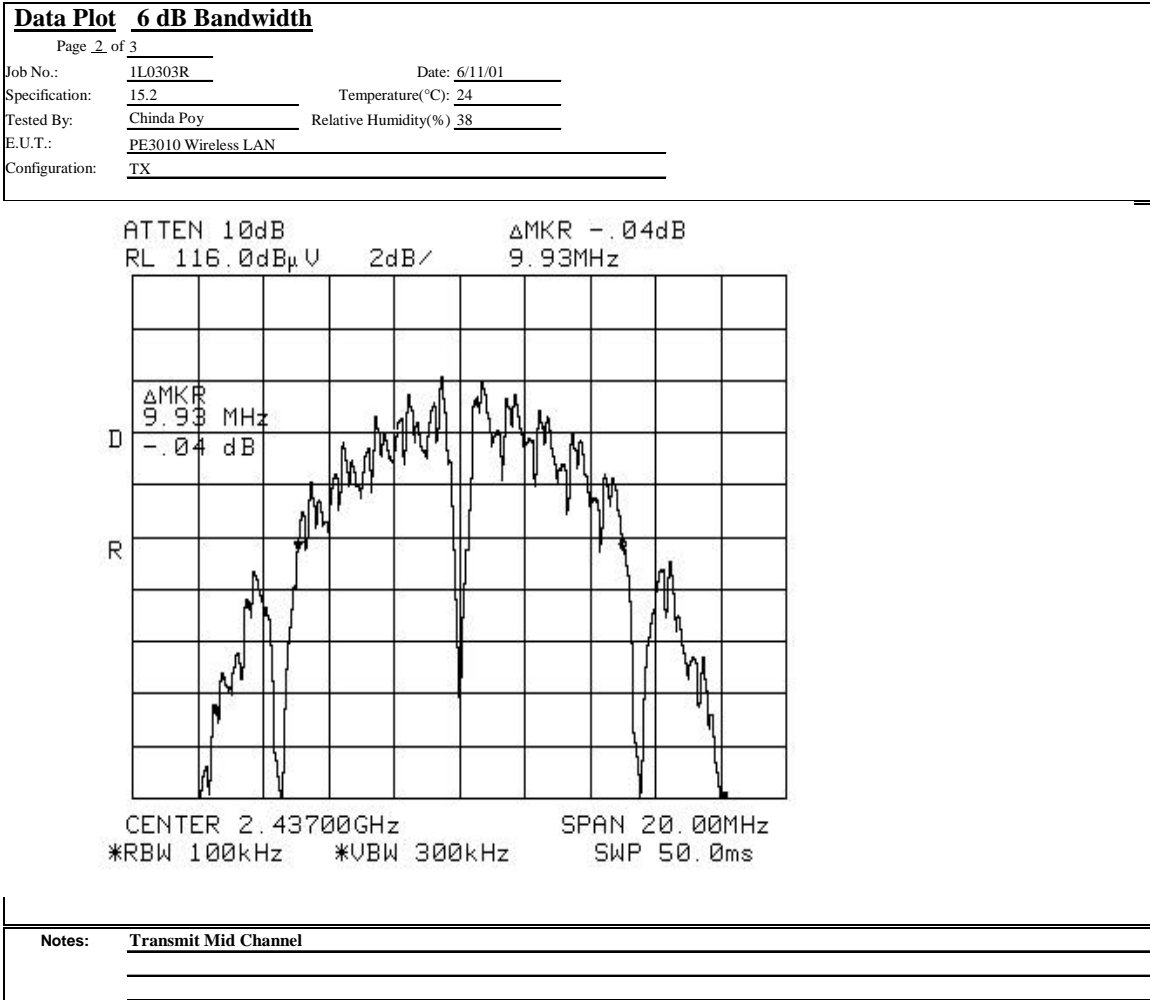
Measurement Uncertainty: +/- 1.6 dB
+/- 1x10⁻⁷ ppm

DIRECT SEQUENCE SPREAD SPECTRUM TRANSMITTER

FCC ID.: **PD92011BWLAN**
 EQUIPMENT: **Agency Series PE3010**

PROJECT NO.: **1L0303RUS1**

Test Data – 6 dB Bandwidth

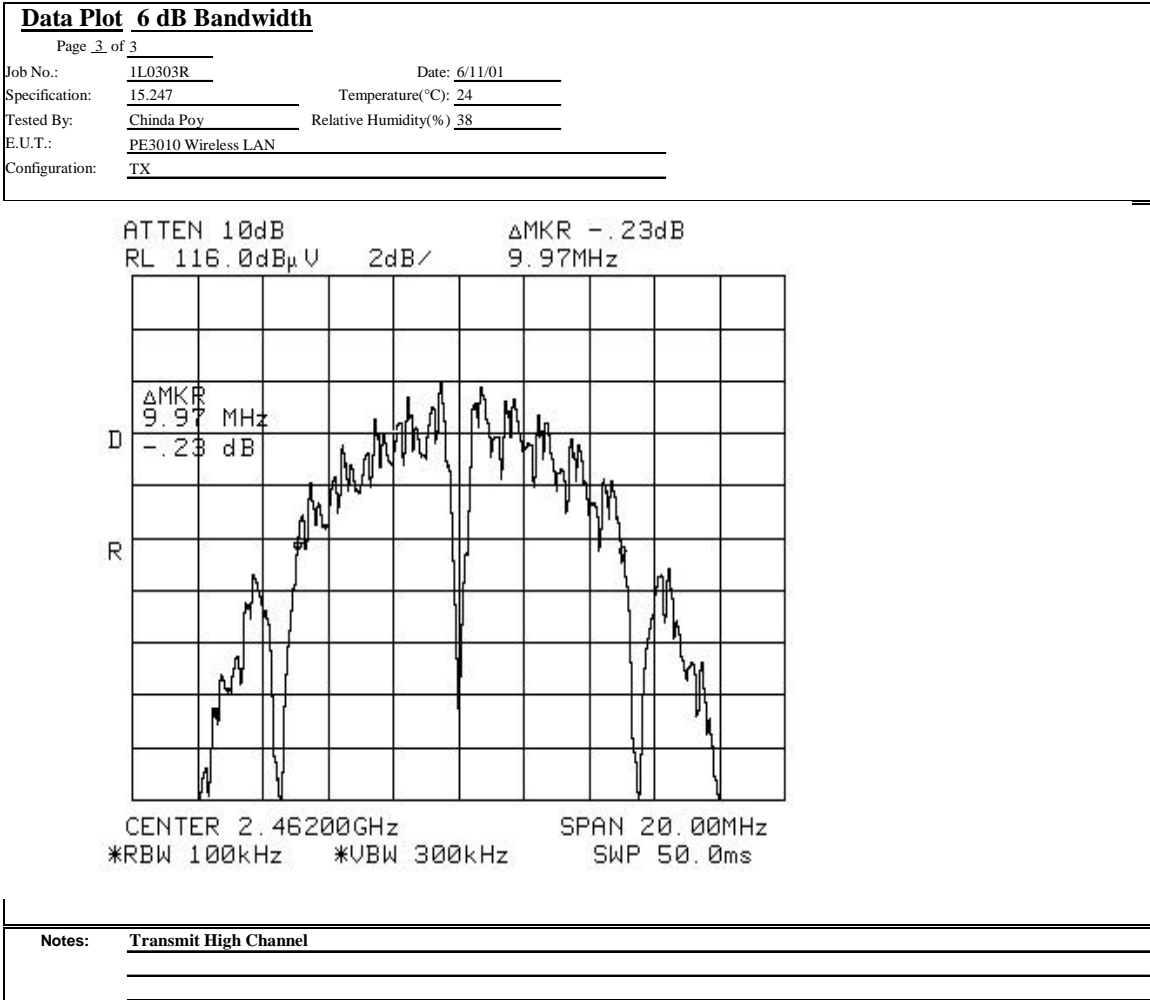


DIRECT SEQUENCE SPREAD SPECTRUM TRANSMITTER

FCC ID.: **PD92011BWLAN**
EQUIPMENT: **Agency Series PE3010**

PROJECT NO.: **1L0303RUS1**

Test Data – 6 dB Bandwidth



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FCC ID.: [PD92011BWLAN](#)
EQUIPMENT: [Agency Series PE3010](#)

PROJECT NO.: [1L0303RUS1](#)

Section 5. Maximum Peak Output Power

NAME OF TEST: Maximum Peak Output power	PARA. NO.: 15.247(b)(1)
TESTED BY: Chinda Poy	DATE: 6/11/01

Test Results: Complies.

Measurement Data:

Antennas: Integral

Frequency (GHz)	RF Power Output (dBm)	Antenna Gain (dBi)	E.I.R.P. (dBm)
2.412	17.0	5	22.0
2.437	16.5	5	21.5
2.462	16.2	5	21.2

Equipment Used: 1029-1030-1469

Measurement Uncertainty: +/- 0.7 dB

Temperature: 24 °C

Relative Humidity: 38 %

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FCC ID.: PD92011BWLAN
EQUIPMENT: Agency Series PE3010

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Section 6. RF Exposure

NAME OF TEST: RF Exposure	PARA. NO.: 15.247(b)(4)
---------------------------	-------------------------

Measurement Data:

The rf power density levels are below the FCC limits at a distance of 5 cm. This device, however, is to be operated at a minimum separation distance of 20 cm. and is to be classified as a mobile device.

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MPE Prediction



Prediction of MPE limit at a given distance

Equation from page 18 of OET Bulletin 65, Edition 97-01

$$S = \frac{PG}{4\pi R^2}$$

where: S = power density
P = power input to the antenna
G = power gain of the antenna in the direction of interest relative to an isotropic radiator
R = distance to the center of radiation of the antenna

Maximum peak output power at antenna input terminal: 17.00 (dBm)
Maximum peak output power at antenna input terminal: 50.11872 (mW)
Antenna gain(typical): 5 (dBi)
Maximum antenna gain: 3.162278 (numeric)
Prediction distance: 20 (cm)
Prediction frequency: 2400 (MHz)
MPE limit for uncontrolled exposure at prediction frequency: 1 (mW/cm²)

Power density at prediction frequency: **0.03153** (mW/cm²)

Maximum allowable antenna gain: **20.0127** (dBi)

DIRECT SEQUENCE SPREAD SPECTRUM TRANSMITTER

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Section 7. Spurious Emissions (conducted)

NAME OF TEST: Spurious Emissions (conducted)	PARA. NO.: 15.247(c)
TESTED BY: Chinda Poy	DATE: 6/11/01

Test Results: Complies.

Measurement Data: See attached plots.

NOTE: The upper band edge emission is subject to the radiated emission requirements of 15.209, therefore the measurement data is included in that section of the test report.

Equipment Used: 1464-1465-1045

Measurement Uncertainty: +/- 1.6 dB

DIRECT SEQUENCE SPREAD SPECTRUM TRANSMITTER

FCC ID.: **PD92011BWLAN**
 EQUIPMENT: **Agency Series PE3010**

PROJECT NO.: **1L0303RUS1**

Test Data – Spurious Emissions Conducted



Nemko Dallas, Inc.

Dallas Headquarters:
 802 N. Kealy
 Lewisville, TX 75057
 Tel: (972) 436-9600
 Fax: (972) 436-2667

Data Plot		BANDEDGE		Complete <u> X </u>																					
Page <u>1</u> of <u>1</u>				Preliminary <u> </u>																					
Job No.:	1L0303R	Date:	6/18/01																						
Specification:	15.247	Temperature(°C):	<u>22</u>																						
Tested By:	<u>David Light</u>	Relative Humidity(%)	<u>50</u>																						
E.U.T.:	<u>BIRDROCK 80211 MULTI-PORT ADAPTER</u>																								
Configuration:	<u>TRANSMIT CHANNEL 1</u>																								
Sample Number:	<u>1</u>																								
Location:	<u>Lab 1</u>	RBW:	<u>100 kHz</u>	Measurement																					
Detector Type:	<u>Peak</u>	VBW:	<u>100 kHz</u>	Distance:	<u>N/A</u> m																				
Test Equipment Used																									
Antenna:	<u> </u>	Directional Coupler:	<u> </u>																						
Pre-Amp:	<u> </u>	Cable #1:	<u>#N/A</u>																						
Filter:	<u> </u>	Cable #2:	<u> </u>																						
Receiver:	<u>1036</u>	Cable #3:	<u> </u>																						
Attenuator #1:	<u>1469</u>	Cable #4:	<u> </u>																						
Attenuator #2:	<u> </u>	Mixer:	<u> </u>																						
Additional equipment used:	<u> </u>																								
Measurement Uncertainty:	<u>+/-1.6 dB</u>																								
<table border="1"> <thead> <tr> <th>Ref Lvl</th> <th>Marker 1 [11]</th> <th>RBW</th> <th>VBW</th> <th>RF Att</th> </tr> </thead> <tbody> <tr> <td>30 dBm</td> <td>6.29 dBm</td> <td>100 kHz</td> <td>100 kHz</td> <td>40 dB</td> </tr> <tr> <td></td> <td>2.41286573 GHz</td> <td>SWT</td> <td>10 ms</td> <td>Unit</td> </tr> <tr> <td></td> <td></td> <td></td> <td></td> <td>dBm</td> </tr> </tbody> </table>						Ref Lvl	Marker 1 [11]	RBW	VBW	RF Att	30 dBm	6.29 dBm	100 kHz	100 kHz	40 dB		2.41286573 GHz	SWT	10 ms	Unit					dBm
Ref Lvl	Marker 1 [11]	RBW	VBW	RF Att																					
30 dBm	6.29 dBm	100 kHz	100 kHz	40 dB																					
	2.41286573 GHz	SWT	10 ms	Unit																					
				dBm																					
Center 2.4 GHz 4 MHz/ Span 40 MHz																									
Date: 18.JUN.2001 16:40:50																									
Notes: <u>lower bandedge</u>																									

DIRECT SEQUENCE SPREAD SPECTRUM TRANSMITTER

FCC ID.: PD92011BWLAN
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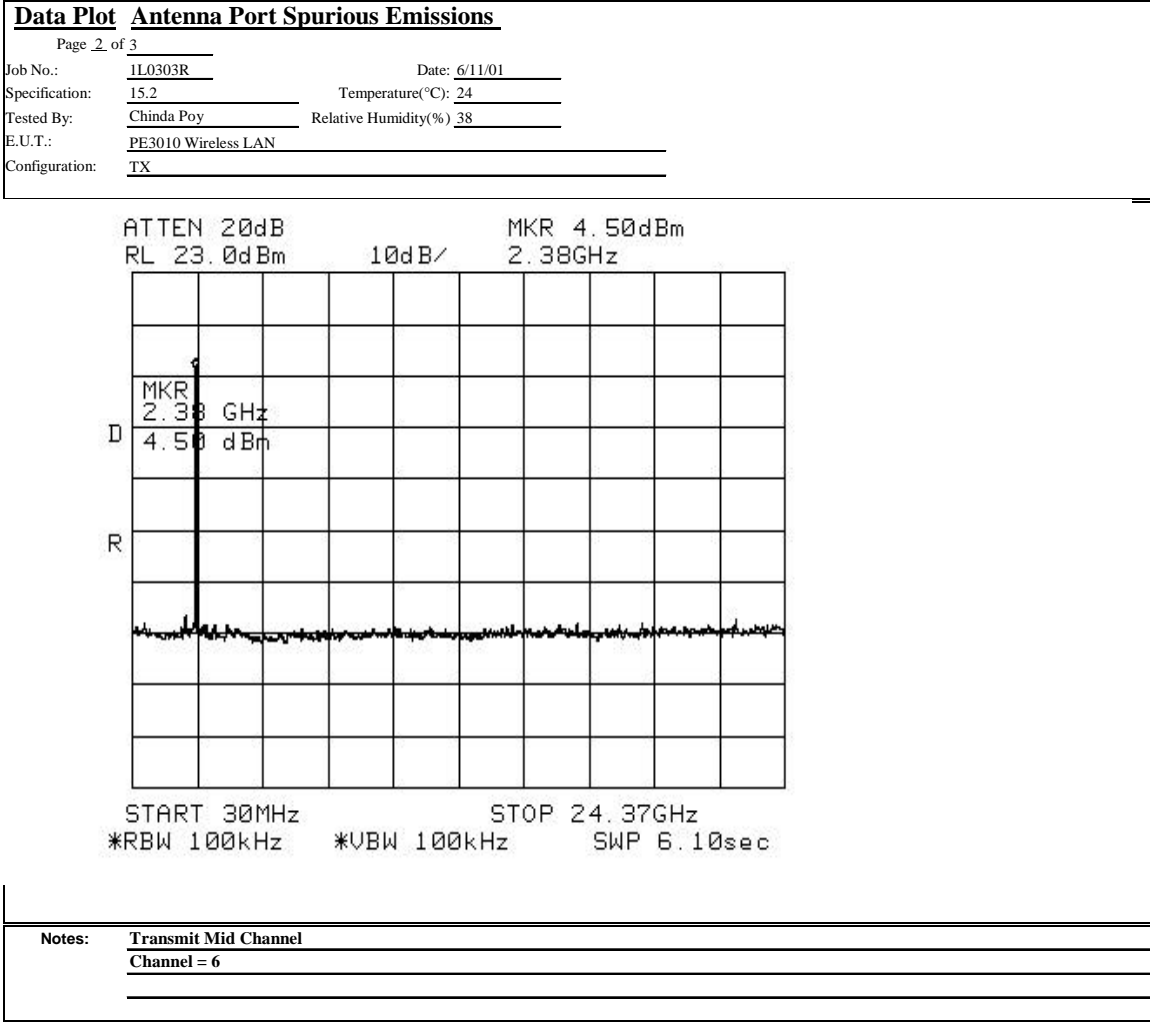
PROJECT NO.: 1L0303RUS1

Data Plot Antenna Port Spurious Emissions	
Page 1 of 3	Complete <u> X </u> Preliminary _____
Job No.: 1L0303R	Date: 6/11/01
Specification: 15.247	Temperature(°C): <u> 24 </u>
Tested By: <u> Chinda Poy </u>	Relative Humidity(%): <u> 38 </u>
E.U.T.: <u> PE3010 Wireless LAN </u>	
Configuration: <u> TX </u>	
Sample Number: <u> S01 </u>	
Location: <u> Lab 2 </u>	RBW: <u> Refer to plots </u>
Detector Type: <u> Peak </u>	VBW: <u> Refer to plots </u>
Test Equipment Used	
Antenna: _____	Directional Coupler: _____
Pre-Amp: _____	Cable #1: <u> 1045 </u>
Filter: _____	Cable #2: _____
Receiver: <u> 1464 </u>	Cable #3: _____
Attenuator #1: <u> 1465 </u>	Cable #4: _____
Attenuator #2: _____	Mixer: _____
Additional equipment used: _____	
Measurement Uncertainty: <u> +/-1.6 dB </u>	
<p>ATTEN 20dB MKR 3.00dBm RL 23.0dBm 10dB/ 2.36GHz</p> <p>START 30MHz STOP 24.12GHz *RBW 100kHz *VBW 100kHz SWP 6.10sec</p>	
Notes: <u> Transmit Low Channel </u> <u> Channel = 1 </u>	

DIRECT SEQUENCE SPREAD SPECTRUM TRANSMITTER

FCC ID.: **PD92011BWLAN**
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DIRECT SEQUENCE SPREAD SPECTRUM TRANSMITTER

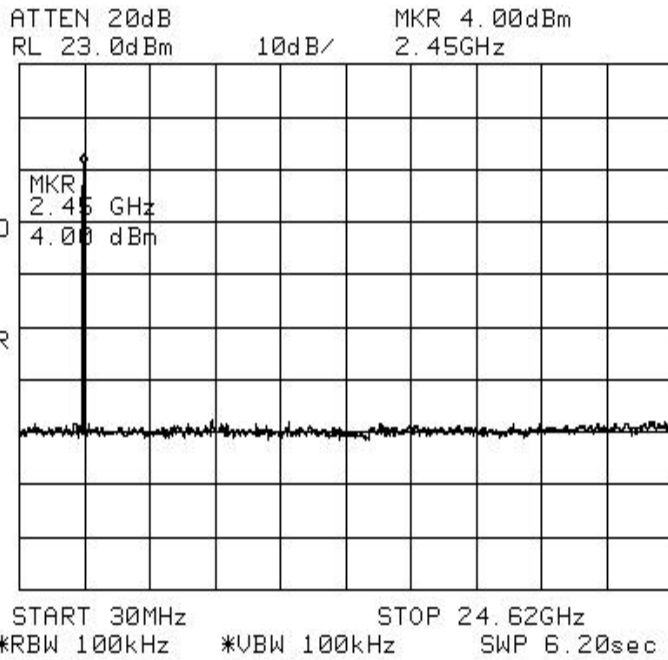
FCC ID.: **PD92011BWLAN**
EQUIPMENT: **Agency Series PE3010**

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Data Plot Antenna Port Spurious Emissions

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Job No.: 1L0303R Date: 6/11/01
Specification: 15.247 Temperature(°C): 24
Tested By: Chinda Poy Relative Humidity(%) 38
E.U.T.: PE3010 Wireless LAN
Configuration: TX



Notes: Transmit High Channel
Channel = 11

DIRECT SEQUENCE SPREAD SPECTRUM TRANSMITTER

FCC ID.: [PD92011BWLAN](#)
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Section 8. Spurious Emissions (radiated)

NAME OF TEST: Peak Power Output	PARA. NO.: 15.247 (c)
TESTED BY: Chinda Poy	DATE: 6/11/01

Test Results: Complies.

Measurement Data: See attached table.

Note: The supply voltage was varied +/- 15 % from nominal for this testing. No change in the emission levels was noted.

Equipment Used: 1464-1016-1482

Measurement Uncertainty: +/- 1.8 dB

DIRECT SEQUENCE SPREAD SPECTRUM TRANSMITTER

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<u>Radiated Emissions</u>	
Page 1 of 1	
Job No.: 1L0303R	Date: 6/11/01
Specification: 15.247	Temperature(°C): 24
Tested By: Chinda Poy	Relative Humidity(%) 35
E.U.T.: PE3010 Wireless LAN	
Configuration: TX	
Sample Number: S01	
Location: AC 3	RBW: 1 MHz
Detector Type: Peak	VBW: 30 kHz
<u>Test Equipment Used</u>	
Antenna: 993	Directional Coupler: #N/A
Pre-Amp: 1016	Cable #1: 1484
Filter: 1482	Cable #2: 1485
Receiver: 1464	Cable #3: #N/A
Attenuator #1: #N/A	Cable #4: #N/A
Attenuator #2: #N/A	Mixer: #N/A
Additional equipment used:	
Measurement Uncertainty: +/-1.8 dB	

Frequency (GHz)	Meter Reading (dBuV)	Antenna Factor (dB)	Cable Loss (dB)	Pre-Amp Gain (dB)	Corrected Reading (dBuV/m)	Limit (dBuV/m)	Delta (dB)	Comment
4.825	37.67	32	5	33.7	41.0	54	-13.0	Channel 1 / Vertical
12.06125	36.67	39.6	8.3	35.7	48.9	54	-5.1	Channel 1 / Noise Floor / Vertical
14.4735	36.17	42.1	7.5	32.7	53.1	54	-0.9	Channel 1 / Noise Floor / Vertical
4.8245	35.5	32	5	33.7	38.8	54	-15.2	Channel 1 / Noise Floor / Horizontal
12.06125	36.17	39.6	8.3	35.7	48.4	54	-5.6	Channel 1 / Noise Floor / Horizontal
14.4735	36	42.1	7.5	32.7	52.9	54	-1.1	Channel 1 / Noise Floor / Horizontal
4.874	36.83	32	5	33.7	40.1	54	-13.9	Channel 6 / Vertical
7.311	35.67	35.7	5.9	33	44.3	54	-9.7	Channel 6 / Noise Floor / Vertical
12.185	36.17	39.6	8.3	35.5	48.6	54	-5.4	Channel 6 / Noise Floor / Vertical
4.874	35.5	32	5	33.7	38.8	54	-15.2	Channel 6 / Noise Floor / Horizontal
7.311	35.67	35.7	5.9	33	44.3	54	-9.7	Channel 6 / Noise Floor / Horizontal
12.185	36.33	39.6	8.3	35.5	48.7	54	-5.3	Channel 6 / Noise Floor / Horizontal
4.924	36.67	32	5	33.7	40.0	54	-14.0	Channel 11 / Vertical
7.386	35.5	35.7	5.9	33	44.1	54	-9.9	Channel 11 / Noise Floor / Vertical
12.31	36	39.6	7.7	35.5	47.8	54	-6.2	Channel 11 / Noise Floor / Vertical
4.924	36.17	32	5	33.7	39.5	54	-14.5	Channel 11 / Horizontal
7.386	36	35.7	5.9	33	44.6	54	-9.4	Channel 11 / Noise Floor / Horizontal
12.31	36	39.6	7.7	35.5	47.8	54	-6.2	Channel 11 / Noise Floor / Horizontal
2.4835	17.4	29	3.5	0	49.9	54	-4.1	Average detector - Horizontal
2.4835	22.5	29	3.5	0	55.0	74	-19.0	Peak detector - Horizontal
2.4835	19.7	29	3.5	0	52.2	54	-1.8	Average detector - Vertical
2.4835	22.5	29	3.5	0	55.0	74	-19.0	Peak detector - Vertical

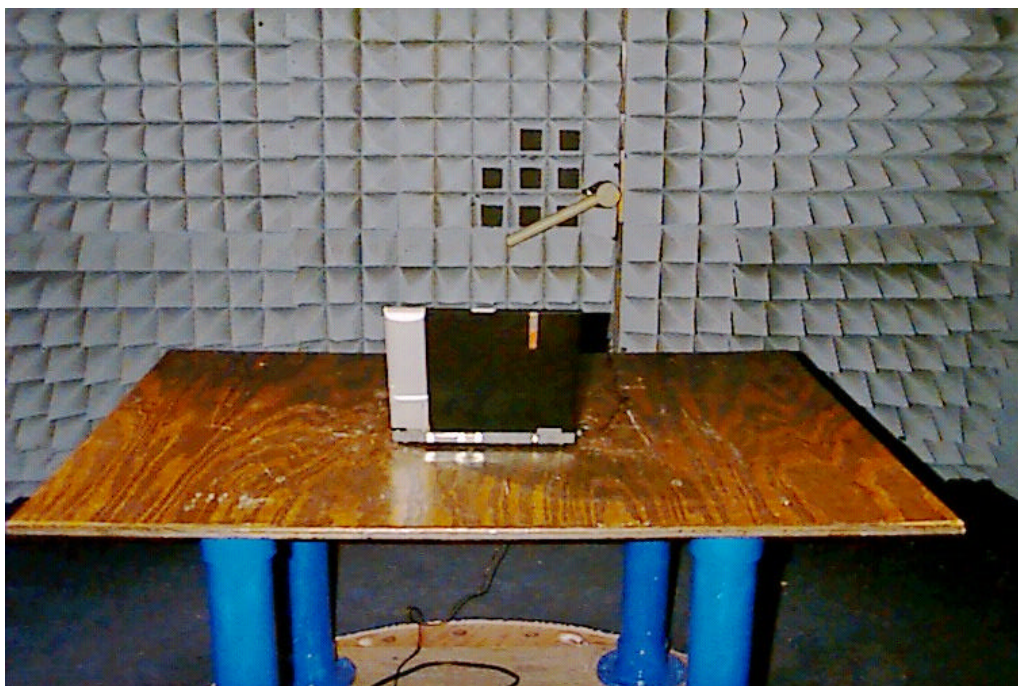
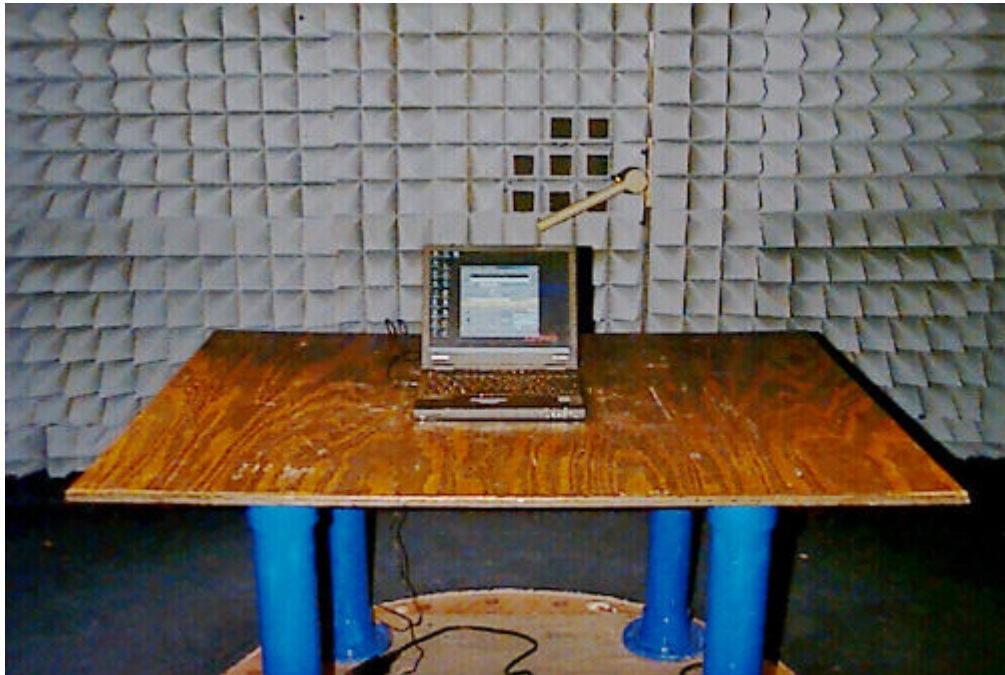
Notes: All readings were taken using PEAK detector unless stated otherwise

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FCC ID.: [PD92011BWLAN](#)
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Radiated Photographs—Radiated Emissions



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Section 9. Peak Power Spectral Density

NAME OF TEST: Peak Power Spectral Density	PARA. NO.: 15.247(d)
TESTED BY: Chinda Poy	DATE: 6/12/01

Test Results: Complies.

Measurement Data: See attached plots.

Equipment Used: 1464-1465-1045

Measurement Uncertainty: +/- 1.6 dB

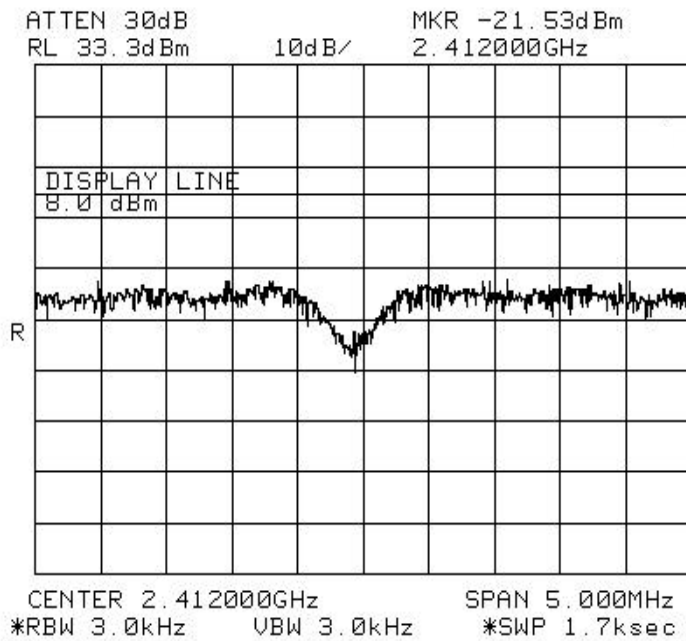
DIRECT SEQUENCE SPREAD SPECTRUM TRANSMITTER

FCC ID.: **PD92011BWLAN**
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Test Data – Peak Power Density Spectral

Data Plot Power Spectral Density	
Page <u>1</u> of <u>3</u>	Complete <u>X</u>
Job No.: <u>1L0303R</u>	Date: <u>6/12/01</u>
Specification: <u>15.247</u>	Temperature(°C): <u>24</u>
Tested By: <u>Chinda Poy</u>	Relative Humidity(%) <u>50</u>
E.U.T.: <u>PE3010 Wireless LAN</u>	
Configuration: <u>TX</u>	
Sample Number: <u>S01</u>	
Location: <u>Lab 2</u>	RBW: <u>Refer to plots</u>
Detector Type: <u>Peak</u>	VBW: <u>Refer to plots</u>
Test Equipment Used	
Antenna: _____	Directional Coupler: _____
Pre-Amp: _____	Cable #1: <u>1045</u>
Filter: _____	Cable #2: _____
Receiver: <u>1464</u>	Cable #3: _____
Attenuator #1: <u>1465</u>	Cable #4: _____
Attenuator #2: _____	Mixer: _____
Additional equipment used: _____	
Measurement Uncertainty: <u>+/-1.6 dB</u>	



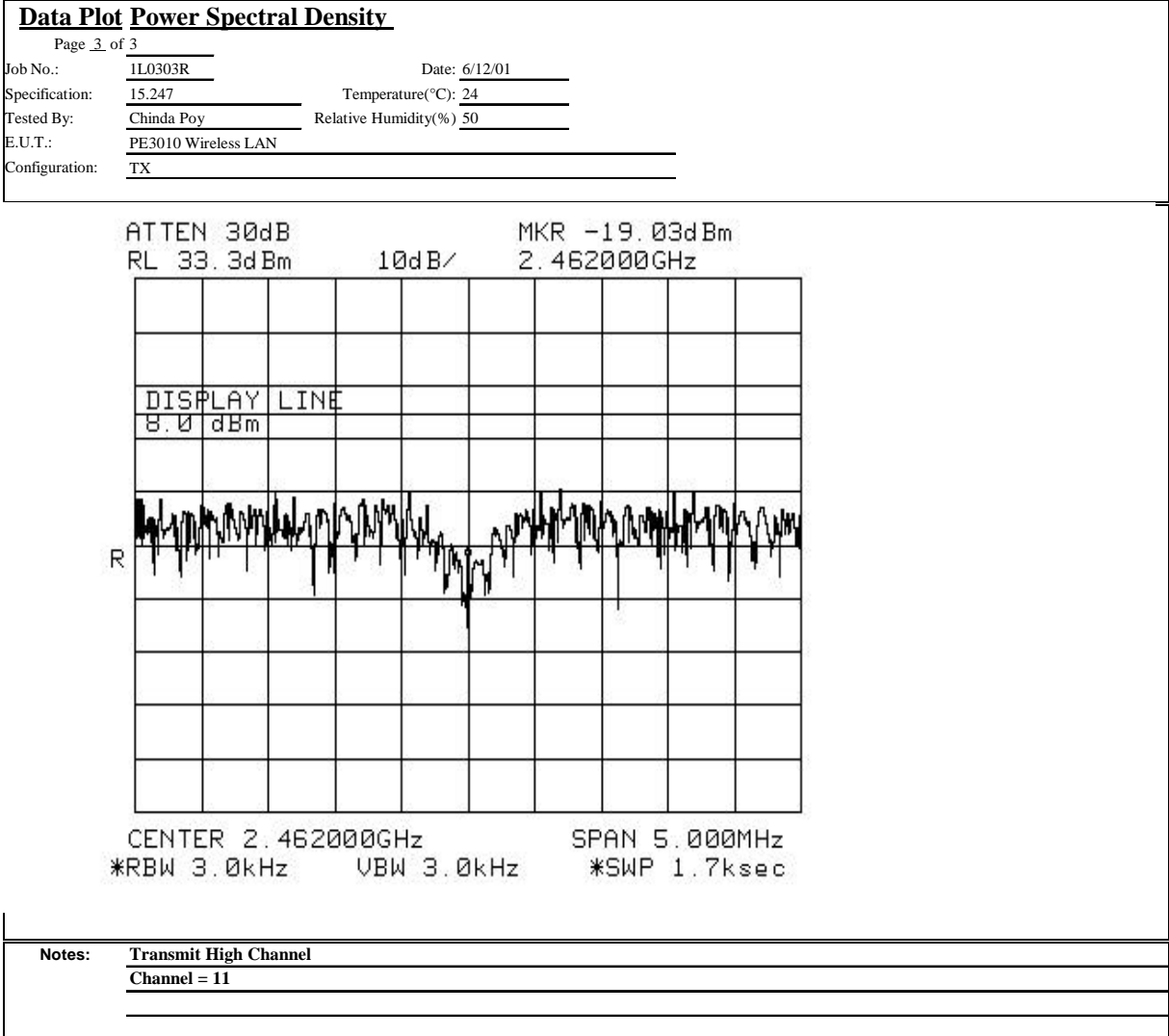
Notes:	<u>Transmit Low Channel</u>
	<u>Channel = 1</u>

DIRECT SEQUENCE SPREAD SPECTRUM TRANSMITTER

FCC ID.: [PD92011BWLAN](#)
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PROJECT NO.: [1L0303RUS1](#)

Test Data – Peak Power Density Spectral



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FCC PART 15, SUBPART C

DIRECT SEQUENCE SPREAD SPECTRUM TRANSMITTER

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PROJECT NO.: [1L0303RUS1](#)

Section 10. Minimum Processing Gain

NAME OF TEST: Minimum Processing Gain	PARA. NO.: 15.247(e)
---------------------------------------	----------------------

Test Results: Complies. The processing gain of the system is 12.9 dB.

Measurement Data: See data in separate Processing Gain report.

:

DIRECT SEQUENCE SPREAD SPECTRUM TRANSMITTER

FCC ID.: [PD92011BWLAN](#)
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PROJECT NO.: [1L0303RUS1](#)

Section 11. Test Equipment List

ASSET	Description	Manufacturer Model Number	Serial Number	Cal. Date	Cal. Due
704	FILTER, HIGH PASS, 5 KHz	SOLAR 7930-5.0	933126	11/04/00	11/04/01
785	ANALYZER, SPECTRUM	HP 8591E	3412A02996	03/08/01	03/08/02
1976	CABLE .5m	KTL RG223	N/A	12/16/00	12/16/01
970	CABLE, 14.8m	KTL RG223	N/A	05/29/01	05/29/02
969	lisn	Schwarzbeck 8120	8120281	07/01/00	07/01/01
1464	Spectrum analyzer	Hewlett Packard 8563E	3551A04428	01/02/01	01/02/02
1465	10 db Attenuator DC 8.0 Ghz	Midwest Microwave 292/10db	NONE	CBU	N/A
1045	CABLE 2m	Astrolab Inc. 32027-2-29094-72TC	N/A	06/01/01	06/01/02
1029	PEAK POWER METER	HP 8900D	3303U0012	03/12/01	03/12/02
1030	PEAK POWER SENSOR	HP 84811A	2539A03573	03/12/01	03/12/02
1469	10 db Attenuator DC 18 Ghz	MCL Inc. BW-S10W2 10db-2WDC	NONE	CBU	N/A
1016	Pre-Amp	HEWLETT PACKARD 8449A	2749A00159	05/30/01	05/30/02
1482	Band Pass Filter	K & L 11SH10-4000/T12000-0/0	2	Cal B4 Use	N/A

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DIRECT SEQUENCE SPREAD SPECTRUM TRANSMITTER

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ANNEX A - TEST DETAILS

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DIRECT SEQUENCE SPREAD SPECTRUM TRANSMITTER

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EQUIPMENT: [Agency Series PE3010](#)

PROJECT NO.: [1L0303RUS1](#)

NAME OF TEST: Powerline Conducted Emissions	PARA. NO.: 15.207(a)
---	----------------------

Minimum Standard: The R.F. that is conducted back onto the AC power line on any frequency within the band 0.45 to 30 MHz shall not exceed 250 μ V (48 dB μ V) across 50 ohms.

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DIRECT SEQUENCE SPREAD SPECTRUM TRANSMITTER

FCC ID.: [PD92011BWLAN](#)
EQUIPMENT: [Agency Series PE3010](#)

PROJECT NO.: [1L0303RUS1](#)

NAME OF TEST: Minimum 6 dB bandwidth	PARA. NO.: 15.247(a)(2)
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Minimum Standard: The minimum 6 dB bandwidth shall be at least 500 kHz

DIRECT SEQUENCE SPREAD SPECTRUM TRANSMITTER

FCC ID.: PD92011BWLAN
EQUIPMENT: Agency Series PE3010

PROJECT NO.: 1L0303RUS1

NAME OF TEST: Maximum Peak Output Power

PARA. NO.: 15.247(b)(1)

Minimum Standard:

The maximum peak output power shall not exceed 1 watt.

If transmitting antennas of directional gain greater than 6 dBi are used, the power shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

Systems operating in the 2400-2483.5 MHz band that are used exclusively for fixed, point to point operation may employ transmitting antennas with directional gain greater than 6 dBi provided the maximum peak output power is reduced by 1 dB for every 3 dB that the directional gain of the antenna exceed 6 dBi.

Systems operating in the 5725 – 5850 MHz band that are used exclusively for fixed, point-to-point operation may employ transmitting antennas with directional gain greater than 6 dBi without any corresponding reduction in transmitter peak output power.

Direct Measurement Method For Detachable Antennas:

If the antenna is detachable, a peak power meter is used to measure the power output with the transmitter operating into a 50 ohm load. The dBi gain of the antenna(s) employed shall be reported.

Calculation Of EIRP For Integral Antenna:

If the antenna is not detachable from the circuit then the Peak Power Output is derived from the peak radiated field strength of the fundamental emission by using the plane wave relation $GP/4\pi R^2 = E^2/120\pi$ and proceeding as follows:

$$P = \frac{E^2 R^2}{30G} = \frac{E^2 3^2}{30G}$$

where,

P = the equivalent isotropic radiated power in watts

E = the maximum measured field strength in V/m

R = the measurement range (3 meters)

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G = the numeric gain of the transmit antenna in relation to an isotropic radiator

The RBW of the spectrum analyzer shall be set to a value greater than the measured 6 dB occupied bandwidth of the E.U.T.

Number of channels tested:

Tuning range	Number of channels tested	Channel location in band
1 MHz or less	1	middle
1 to 10 MHz	2	top and bottom
more than 10 MHz	3	top, middle, bottom

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FCC ID.: [PD92011BWLAN](#)
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PROJECT NO.: [1L0303RUS1](#)

NAME OF TEST: RF Exposure	PARA. NO.: 15.247(b)(4)
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Minimum Standard:

Systems operating under the provisions of this section shall be operated in a manner that ensures the public is not exposed to radio frequency energy levels in excess of the Commission's guidelines stipulated in 1.1307(b)(1) of CFR 47.

DIRECT SEQUENCE SPREAD SPECTRUM TRANSMITTER

FCC ID.: PD92011BWLAN
 EQUIPMENT: Agency Series PE3010

PROJECT NO.: 1L0303RUS1

NAME OF TEST: Spurious Emissions(conducted)	PARA. NO.: 15.247(c)
---	----------------------

Minimum Standard: In any 100kHz bandwidth outside the frequency band in which the transmitter is operating, emissions shall be at least 20 dB below the fundamental emission or shall not exceed the following field strength limits. Emissions falling in the restricted bands of 15.205 shall not exceed the following field strength limits:

Frequency (MHz)	Field Strength (mV/m @ 3m)	Field Strength (dB @ 3m)
30 - 88	100	40.0
88 - 216	150	43.5
216 - 960	200	46.0
Above 960	500	54.0

THE SPECTRUM IS SEARCHED TO THE 10th HARMONIC OF THE HIGHEST FREQUENCY GENERATED IN THE EUT.

Method Of Measurement:

30 MHz - 10th harmonic plot

RBW: 100 kHz
 VBW: 300 kHz
 Sweep: Auto
 Display line: -20 dBc

Lower Band Edge

RBW: At least 1% of span/div.
 VBW: >RBW
 Span: As necessary to display any spurious at band edge.
 Sweep: Auto
 Center Frequency: 902 MHz, 2400 MHz, or 5725 MHz
 Marker: Peak of fundamental emission
 Marker Δ: Peak of highest spurious level below center frequency.

Upper Band Edge

RBW: At least 1% of span/div.
 VBW: >RBW
 Span: As necessary to display any spurious at band edge.
 Sweep: Auto
 Center Frequency: 928 MHz, 2483.5 MHz, or 5850 MHz
 Marker: Peak of fundamental emission
 Marker Δ: Peak of highest spurious level above center frequency.

Number of channels tested:

Tuning range	Number of channels tested	Channel location in band
1 MHz or less	1	middle
1 to 10 MHz	2	top and bottom
more than 10 MHz	3	top, middle, bottom

DIRECT SEQUENCE SPREAD SPECTRUM TRANSMITTER

FCC ID.: [PD92011BWLAN](#)
EQUIPMENT: [Agency Series PE3010](#)

PROJECT NO.: [1L0303RUS1](#)

NAME OF TEST: Radiated Spurious Emissions	PARA. NO.: 15.247(c)
---	----------------------

Minimum Standard: In any 100kHz bandwidth outside the frequency band in which the transmitter is operating, emissions shall be at least 20 dB below the fundamental emission or shall not exceed the following field strength limits:

Emissions falling in the restricted bands of 15.205 shall not exceed the following field strength limits:

Frequency (MHz)	Field Strength (mV/m @ 3m)	Field Strength (dB @ 3m)
30 - 88	100	40.0
88 - 216	150	43.5
216 - 960	200	46.0
Above 960	500	54.0

THE SPECTRUM WAS SEARCHED TO THE 10th HARMONIC

15.205 Restricted Bands

MHz	MHz	MHz	GHz
0.09-0.11	16.42-16.423	399.9-410	4.5-5.25
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
6.125-6.218	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	Above 38.6
13.36-13.41	1718		

Number of channels tested:

Tuning range	Number of channels tested	Channel location in band
1 MHz or less	1	middle
1 to 10 MHz	2	top and bottom
more than 10 MHz	3	top, middle, bottom

DIRECT SEQUENCE SPREAD SPECTRUM TRANSMITTER

FCC ID.: PD92011BWLAN
EQUIPMENT: Agency Series PE3010

PROJECT NO.: 1L0303RUS1

NAME OF TEST: Transmitter Power Density	PARA. NO.: 15.247(d)
---	----------------------

Minimum Standard: The transmitted power density averaged over any 1 second interval shall not be greater than +8 dBm in any 3 kHz bandwidth.

Method Of Measurement: The spectrum analyzer is set as follows:

RBW: 3 kHz
VBW: >3 kHz
Span: => measured 6 dB bandwidth
Sweep: Span(kHz)/3 (i.e. for a span of 1.5 MHz the sweep rate is 1500/3 = 500 sec.
LOG dB/div.: 2 dB

Note: For devices with spectrum line spacing =< 3 kHz, the RBW of the analyzer is reduced until the spectral lines are resolved. The measurement data is normalized to 3 kHz by summing the power of all the individual spectral lines within a 3 kHz band in linear power units.

For Devices With Integral Antenna:

For devices with non-detachable antennas, the received field strength is peaked and the spectrum analyzer is set as above. The peak emission level is then measured and converted to a field strength by adding the appropriate antenna factor and cable loss. This field strength is then converted to an equivalent isotropic radiated power using the same method as described for Peak Power output.

Number of channels tested:

Tuning Range	Number Of Channels Tested	Channel Location In Band
1 MHz or Less	1	Middle
1 to 10 MHz	2	Top And Bottom
More Than 10 MHz	3	Top, Middle, Bottom

DIRECT SEQUENCE SPREAD SPECTRUM TRANSMITTER

FCC ID.: PD92011BWLAN
EQUIPMENT: Agency Series PE3010

PROJECT NO.: 1L0303RUS1

NAME OF TEST: Processing Gain

PARA. NO.: 15.247(e)

Minimum Standard: The processing gain shall be at least 10 dB.

Method Of Measurement: The CW jamming margin method was used to determine the processing gain. A CW signal generator is stepped across the passband of the receiver in 50 kHz increments. At each point the signal generator level required to obtain the recommended bit error rate is recorded. The jammer to signal ratio (J/S) is then calculated. The worst 20% of the J/S points is discarded. The lowest remaining J/S ratio is used to calculate the processing gain.

Calculation Of Processing Gain:

The processing gain was determined by measuring the jamming margin of the E.U.T. and using the following formula:

$$\text{Jamming Margin} = G_p - (S/N)_{\text{out}} - L_{\text{sys}}$$

For a receiver using non-coherent detection the value $(S/N)_{\text{out}}$ is calculated using the formula:

$P_e = (1/2)\text{EXP}\{-E/2N_o\}$ where P_e is the probability of error (minimum Bit Error Rate required for proper operation).

E/N_o is $(S/N)_{\text{out}}$

for example, for a bit error rate of 10^{-4} a S/N ratio of 12.3 dB is required.

L_{sys} (system losses) is assumed to be 2 dB.

Therefore $G_p = M_j + (S/N)_{\text{out}} + L_{\text{sys}}$

Measurement performed at a channel in the center of the operating band of the EUT.

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FCC PART 15, SUBPART C

DIRECT SEQUENCE SPREAD SPECTRUM TRANSMITTER

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PROJECT NO.: [1L0303RUS1](#)

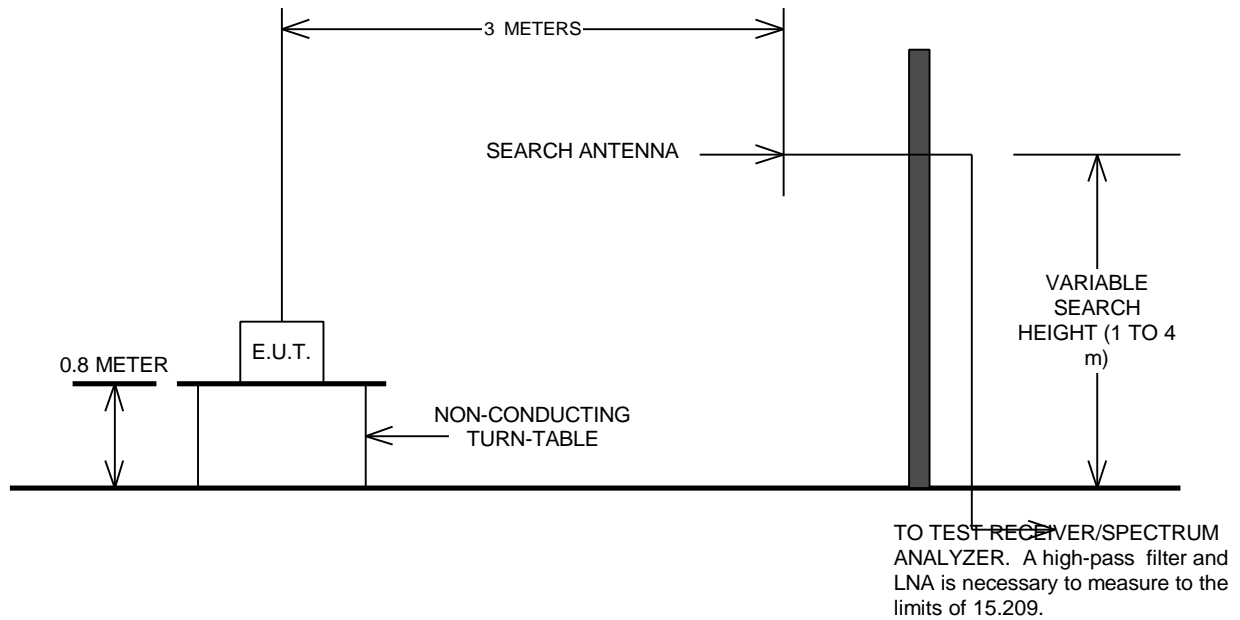
ANNEX B - TEST DIAGRAMS

DIRECT SEQUENCE SPREAD SPECTRUM TRANSMITTER

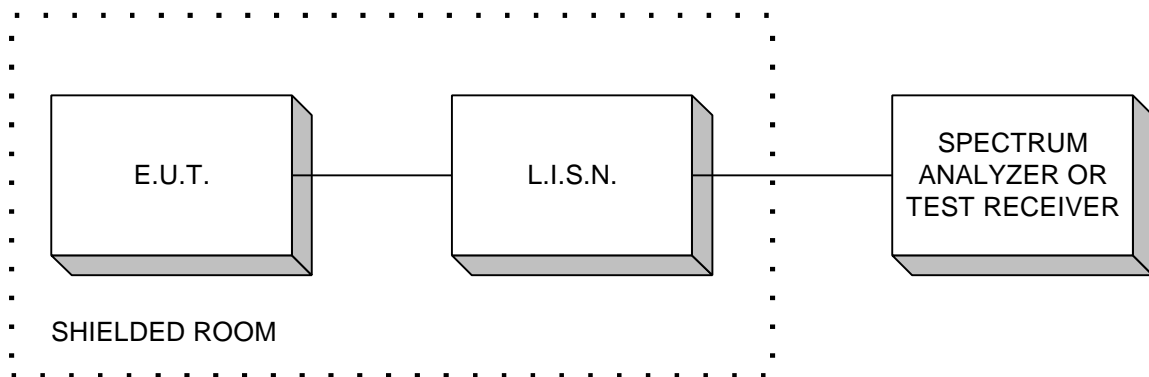
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Test Site For Radiated Emissions



Conducted Emissions

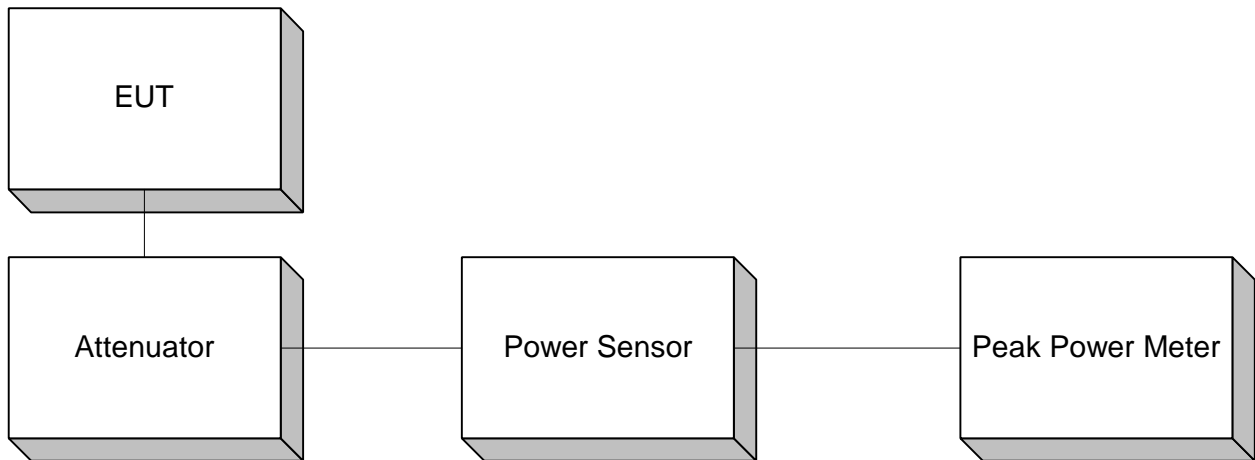


DIRECT SEQUENCE SPREAD SPECTRUM TRANSMITTER

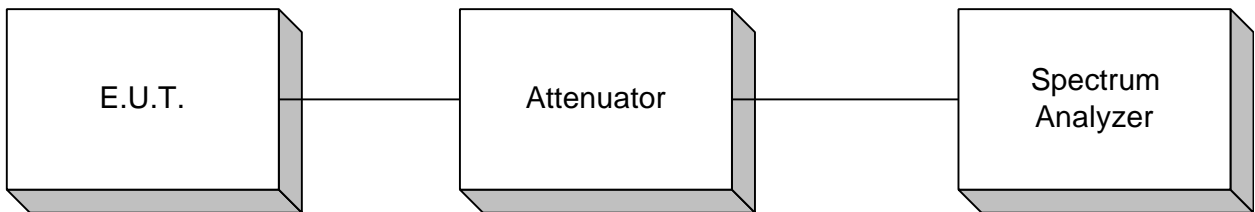
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Peak Power At Antenna Terminals



**Minimum 6 dB Bandwidth
Peak Power Spectral Density
Spurious Emissions (conducted)**



DIRECT SEQUENCE SPREAD SPECTRUM TRANSMITTER

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Processing Gain

