



**Test Report:** 4W08175.3

**Applicant:** BelAir Networks  
603 March Road,  
Ottawa Ont.  
K2K 2M5

**Equipment Under Test:** Wireless LAN Access Radio Module (ARM)  
**(EUT)** 2.4GHz Band

**FCC ID:** RAR20000001

**In Accordance With:** **FCC Part 15, Subpart C, Class II Permissive Change**  
Digitally Modulated Transmitters, 2400-2483.5MHz

**Tested By:** Nemko Canada Inc.  
303 River Road, R.R. 5  
Ottawa, Ontario K1V 1H2

**Authorized By:** Kevin Carr, Wireless/EMC Specialist

**Date:** 26 August 2004

**Total Number of Pages:** 24

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**Section 1. Summary Of Test Results****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 FCC Part 15, Subpart C, Paragraph 15.247 for Digitally Modulated Transmitters.

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".



TESTED BY: \_\_\_\_\_  
Glen Westwell, Wireless Specialist.

DATE: 20 August 2004

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This report applies only to the items tested.

*EQUIPMENT: Wireless LAN ARM***Summary Of Test Data**

Name Of Test	Para. No.	Result
Powerline Conducted Emissions	15.207 (a)	N/A 1
Occupied Bandwidth	15.247 (a)(2)	N/A 2
Peak Power Output	15.247 (b)(3)	Complies
Spurious Emissions (Antenna Conducted)	15.247 (c)	Complies
Spurious Emissions (Radiated)	15.247 (c)	Complies
Transmitter Power Density	15.247 (d)	Complies

**Notes:**

This submission for Class II Permissive Change is to add 2 new antennas to the originally certified 2.4GHz 802.11b radio module. The module has not been changed in anyway from the original submission, and as such only relevant test data has been provided to support compliance (N/A 1&2).

The maximum rated conducted power remains the same as the original certification as well as the maximum EIRP. The conducted power has been decreased to allow for the new 11.5dBi antenna configurations. The RF safety exhibit as originally submitted remains the same due to no change in the maximum conducted power and EIRP.

The radio module was previously approved under FCC ID.# RAR20000001 & Industry Canada Certification .# 4674A-0000001.

**Test Conditions:**

<b>Indoor</b>	Temperature: 23°C Humidity: 41%
<b>Outdoor</b>	Temperature: 22°C Humidity: 44%

**Section 2. General Equipment Specification**

**Manufacturer:** BelAir Networks

**Model No.:** Wireless LAN 2.4GHz ARM

**Serial No.:** K000686441

**Date Received In Laboratory:** 19 July 2004

**Nemko Identification No.:** #19

**Modulation:** **802.11b**  
1-11Mb/s, BPSK-CCK

**Transmitter Output Power (max.rated):** 27dBm @ 8.5dBi antenna  
24dBm @ 11.5dBi antenna

**Transmit Frequency:** 2400-2483.5MHz (Band)  
2412-2462MHz (DUT)

**Antenna Gain:** 8.5dBi integral – original certification

**New Antenna(s):** 8.5dBi OMNI  
11.5dBi integral

**Section 3. Peak Power Output****Para. No.: 15.247(b)(3)**

<b>Test Performed By: Glen Westwell</b>	<b>Date of Test: 26 July 2004</b>
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**Test Results:**

The maximum peak power output of the transmitter is 0.468W.

**Limit:** 1W, (30dBm)**Measurement Data:** The conducted power was verified over all data rates. The worst case found was at 1Mb/s and presented.**Conducted Output Power**

<b>Antenna</b>	<b>Ch.1 (dBm)</b>	<b>Ch.6 (dBm)</b>	<b>Ch.11 (dBm)</b>
<b>8.5dBi</b>	26.7	26.5	26.0
<b>11.5dBi</b>	23.9	24.0	23.9

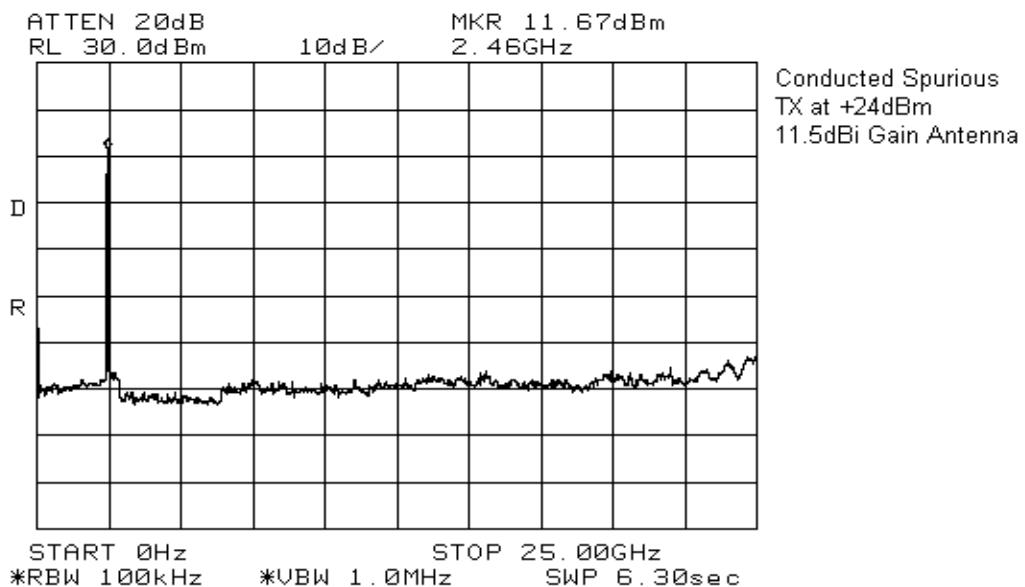
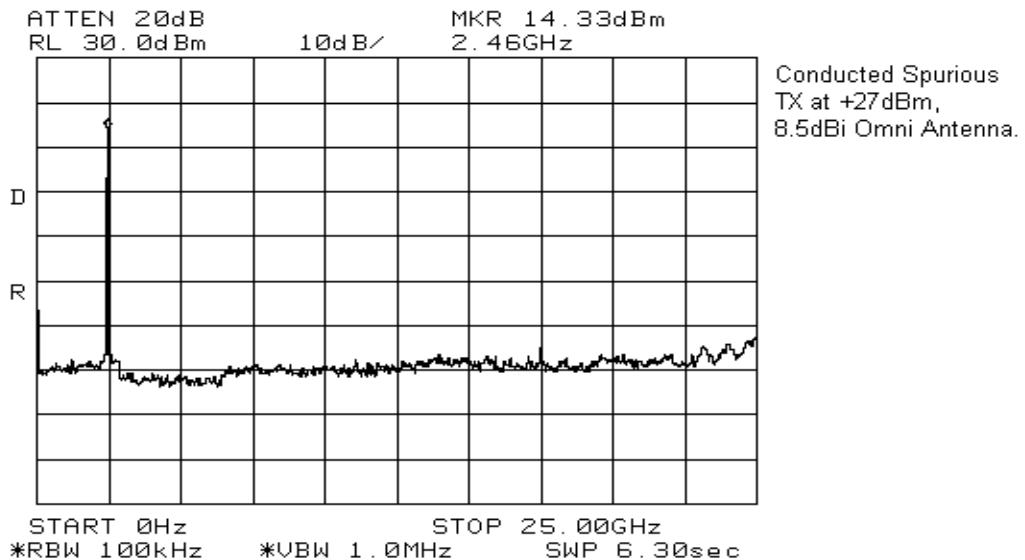
**Section 4. Spurious Emissions (Antenna Conducted)**

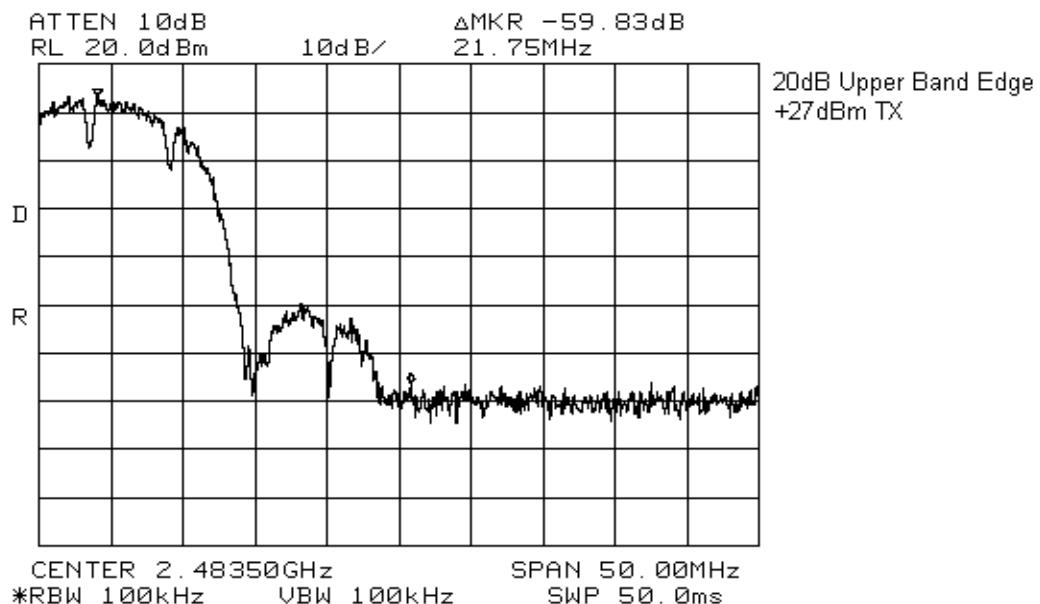
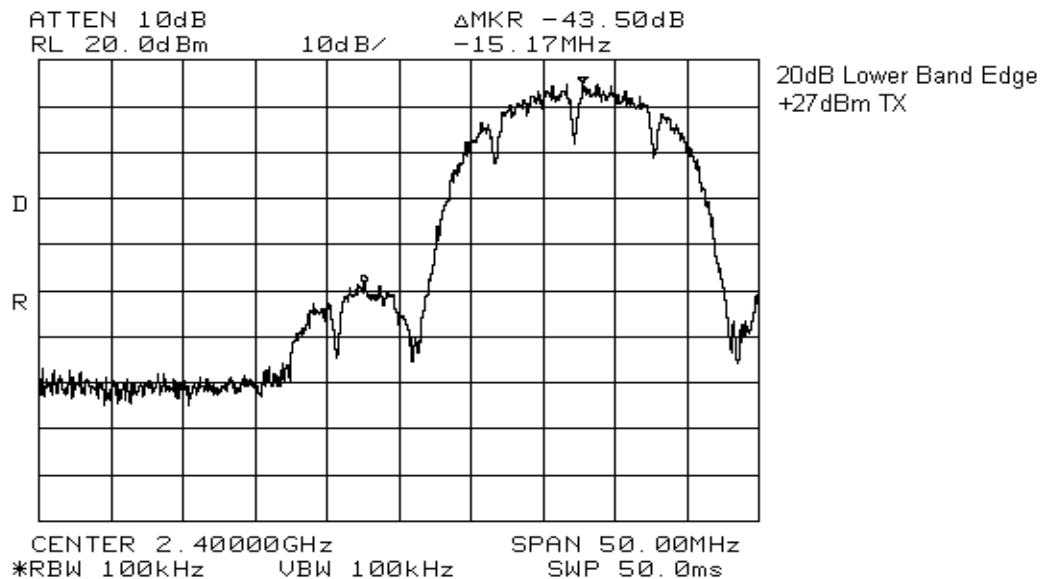
Para. No.: 15.247 (c)

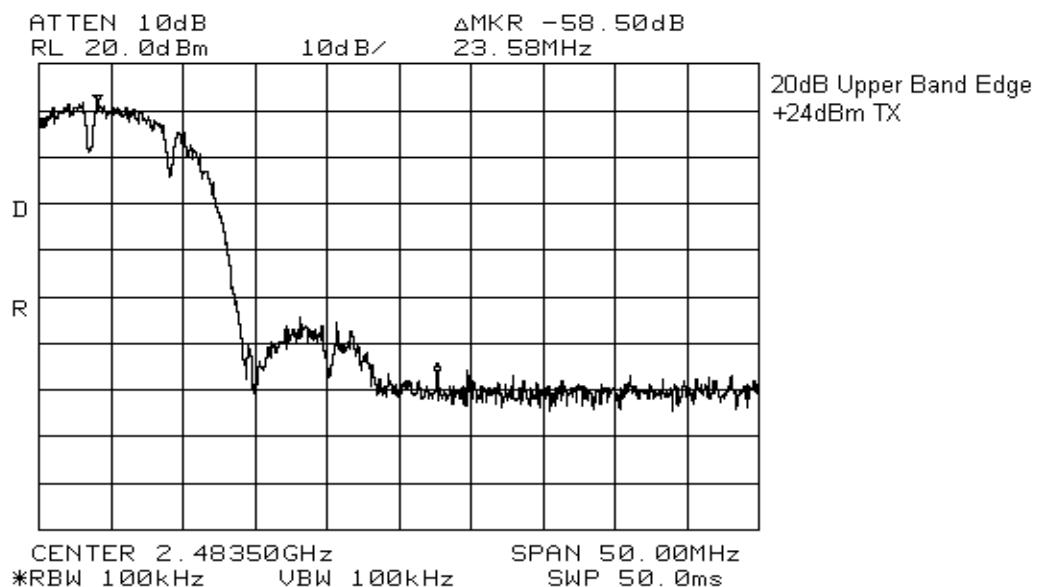
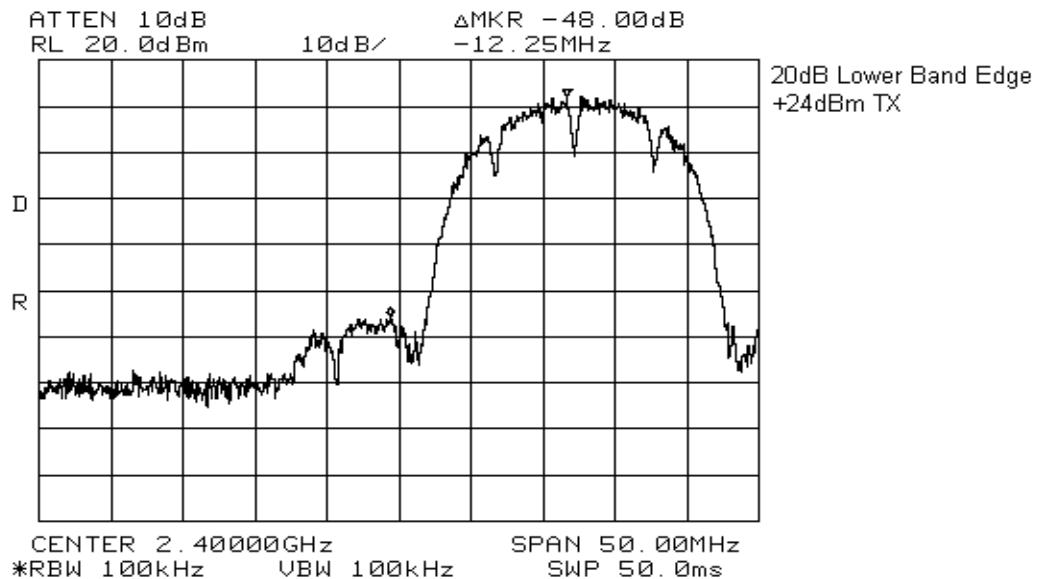
<b>Test Performed By:</b> Glen Westwell	<b>Date of Test:</b> 27 July 2004
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**Test Results:** Complies.**Limit:** 20dBc**Measurement Data:** See attached plots.

Worst case = 43.5dBc

*EQUIPMENT: Wireless LAN ARM*

*EQUIPMENT: Wireless LAN ARM***20dB Bandedge**

*EQUIPMENT: Wireless LAN ARM*

**Section 5. Spurious Emissions (Radiated)****Para. No.: 15.247(c)**

<b>Test Performed By:</b> Glen Westwell	<b>Date of Test:</b> 27 July 2004
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**Test Results:** Complies.**Measurement Data:** See attached plots and table.

The DUT was searched to the 10<sup>th</sup> harmonic. No Harmonic emissions were detected.

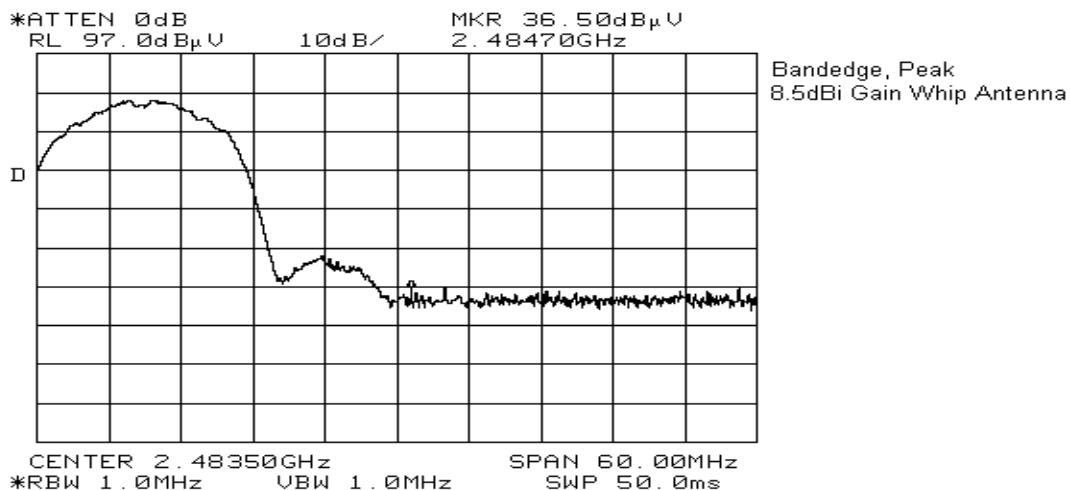
The power supply source was varied +/-15% to verify worst case emissions.

Worst case emissions were verified on 3 orthogonal axis where applicable.

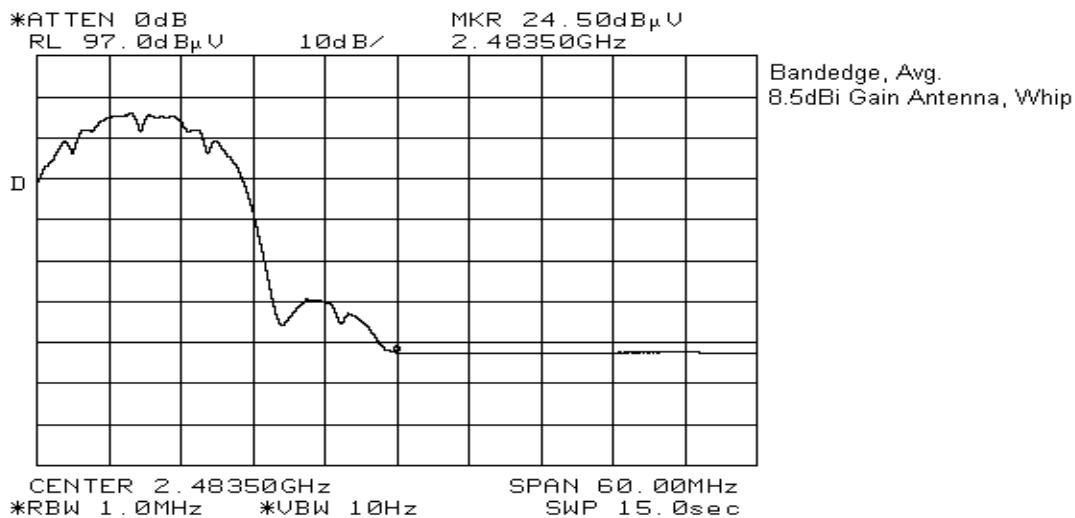
*EQUIPMENT: Wireless LAN ARM*

**8.5dBi Whip Antenna**

Band Edge Level (PK)	Af	Level	Limit
36.5dBuV	33.8	70.3dBuV	74dBuV



Band Edge Level (Avg)	Af	Marker-Delta Correction	Level	Limit
82.0dBuV	33.8dB	-62.5dB	53.3dBuV	54dBuV

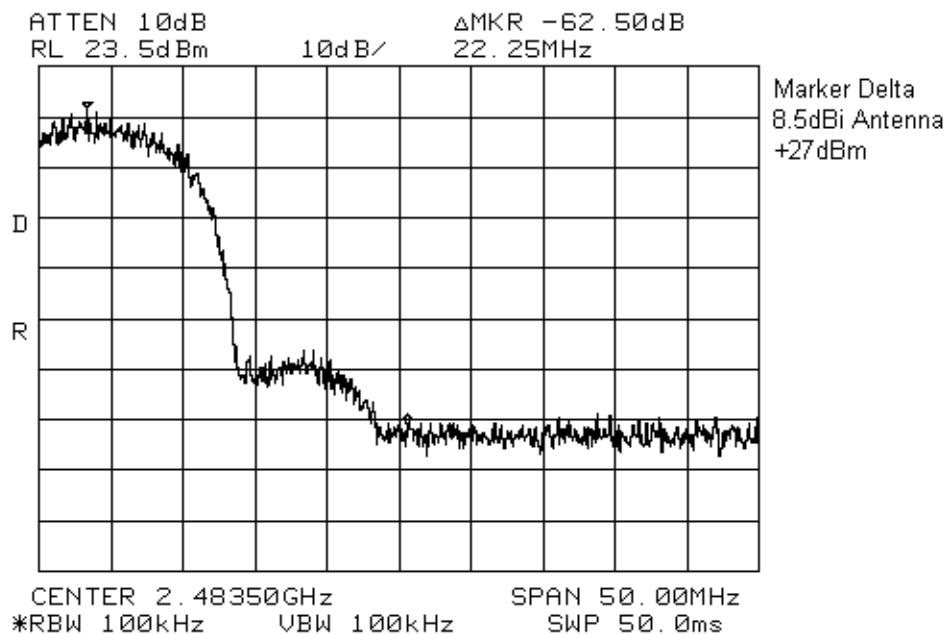


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PROJECT NO.:4W08175.3

*EQUIPMENT: Wireless LAN ARM*

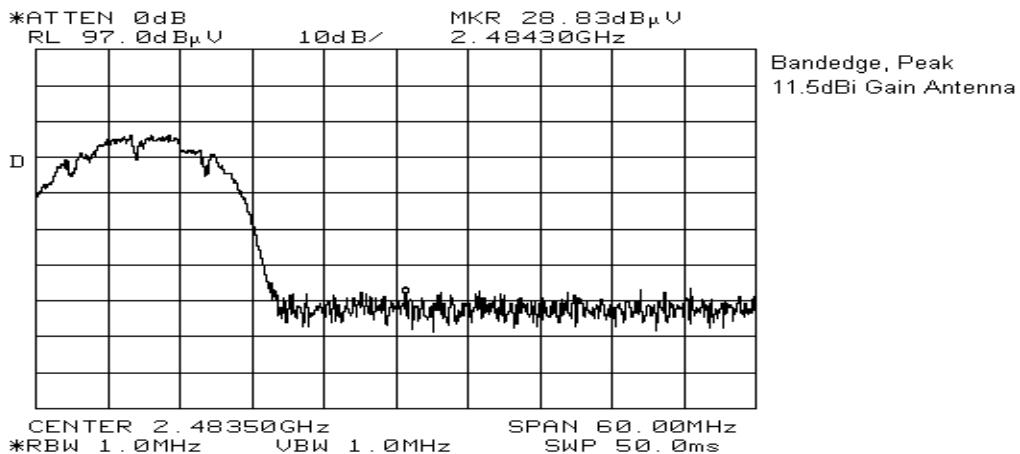
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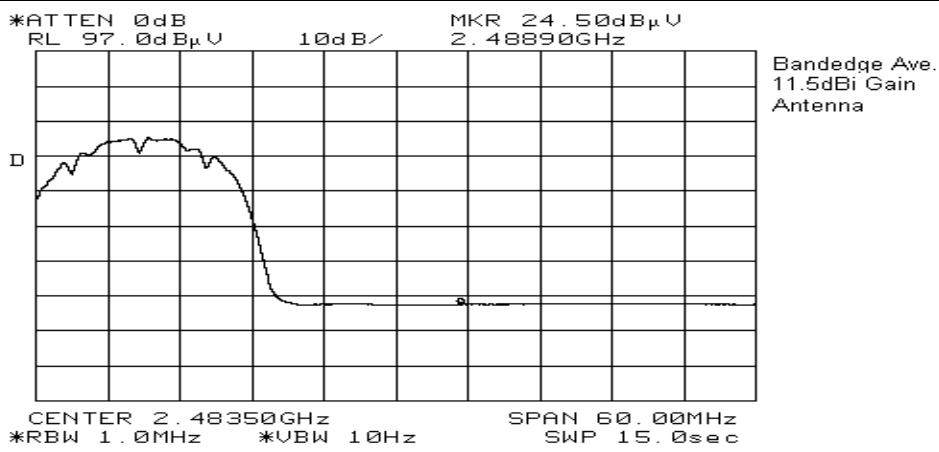
*EQUIPMENT: Wireless LAN ARM*

**11.5dBi Antenna**

Band Edge Level (PK)	Af	Level	Limit
28.8dB $\mu$ V	33.8	62.6dB $\mu$ V	74dB $\mu$ V



Band Edge Level (Avg)	Af	Marker-Delta Correction	Level	Limit
73.0dB $\mu$ V	33.8dB	-59.5dB	47.3dB $\mu$ V	54dB $\mu$ V

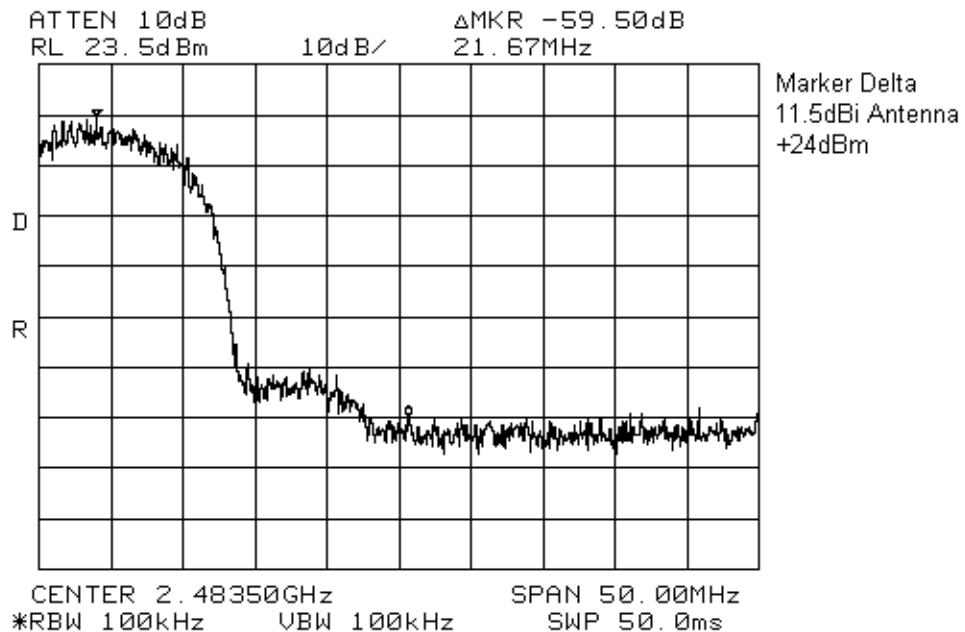


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*EQUIPMENT: Wireless LAN ARM*

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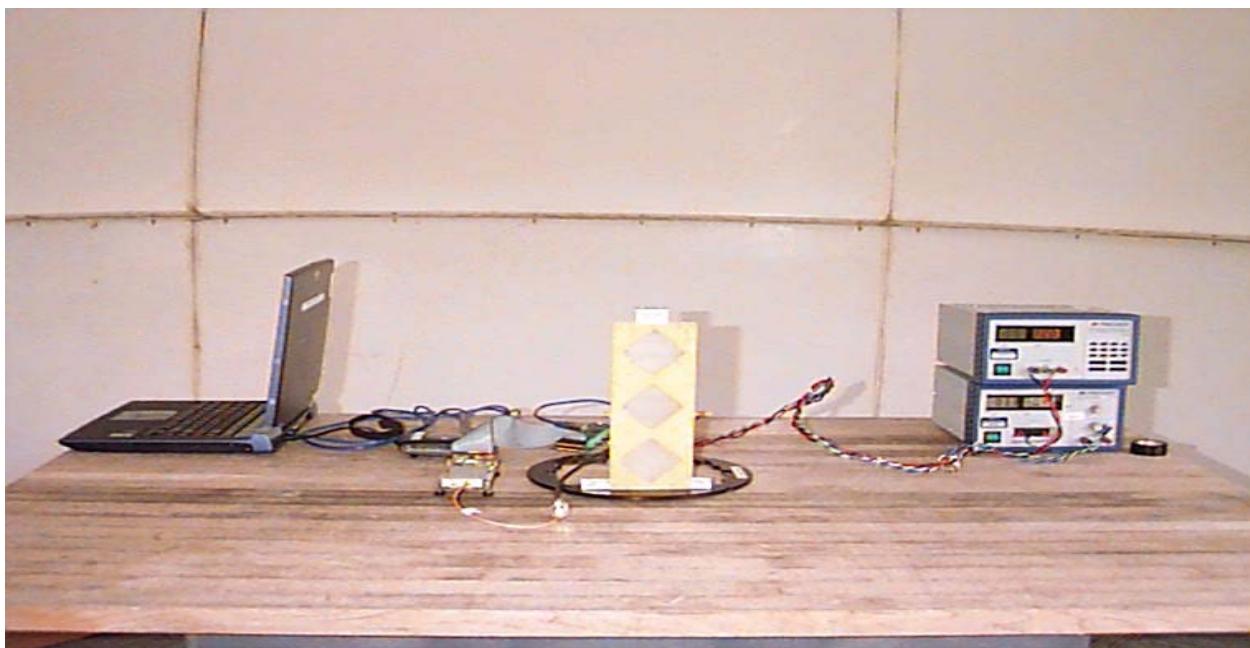


*EQUIPMENT: Wireless LAN ARM*

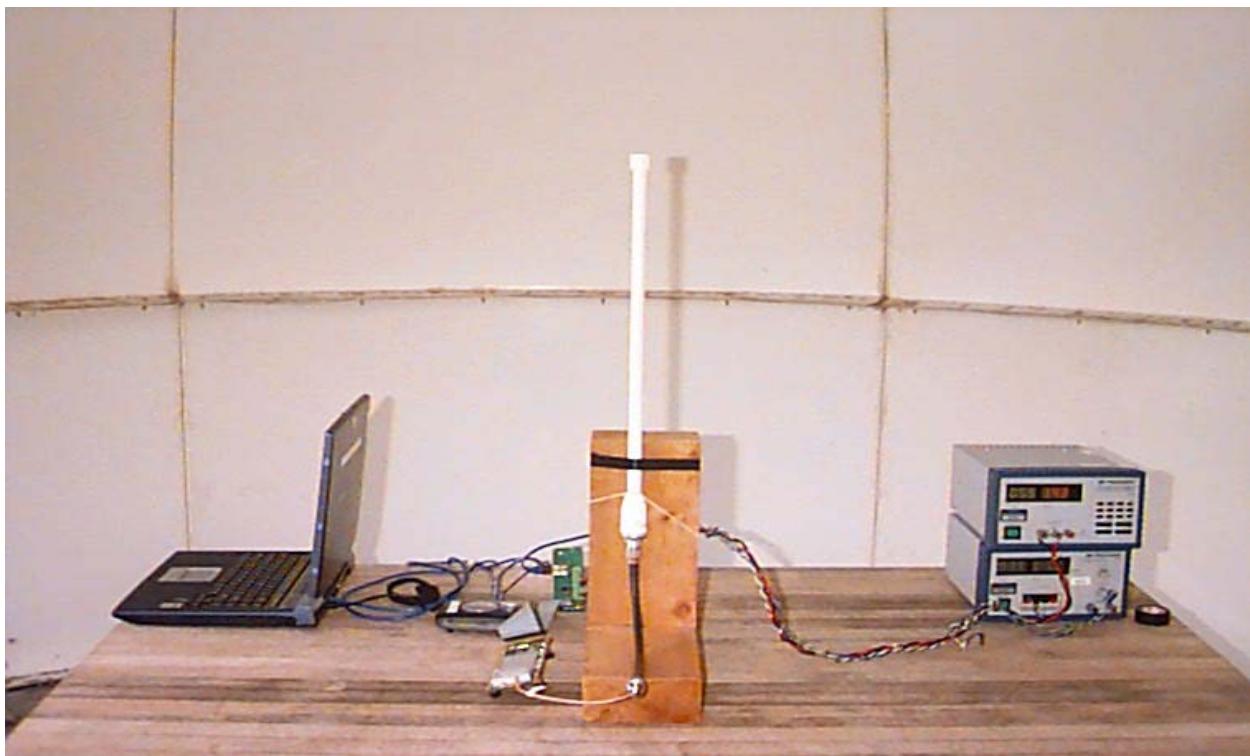
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**Radiated Set Up Photos**

**11.5dBi Gain Antenna**



**8.5dBi Gain Whip Antenna**

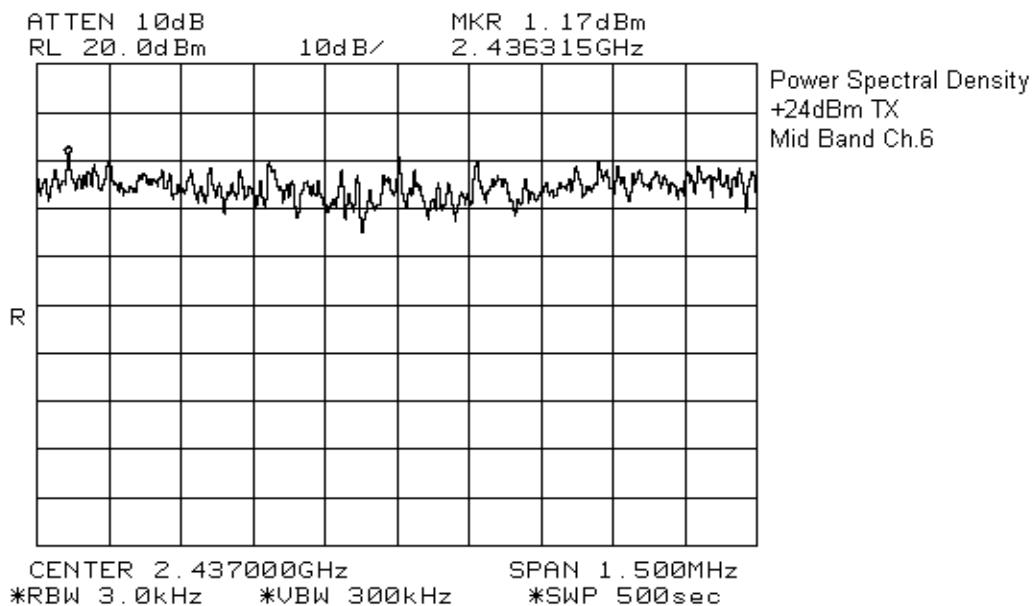
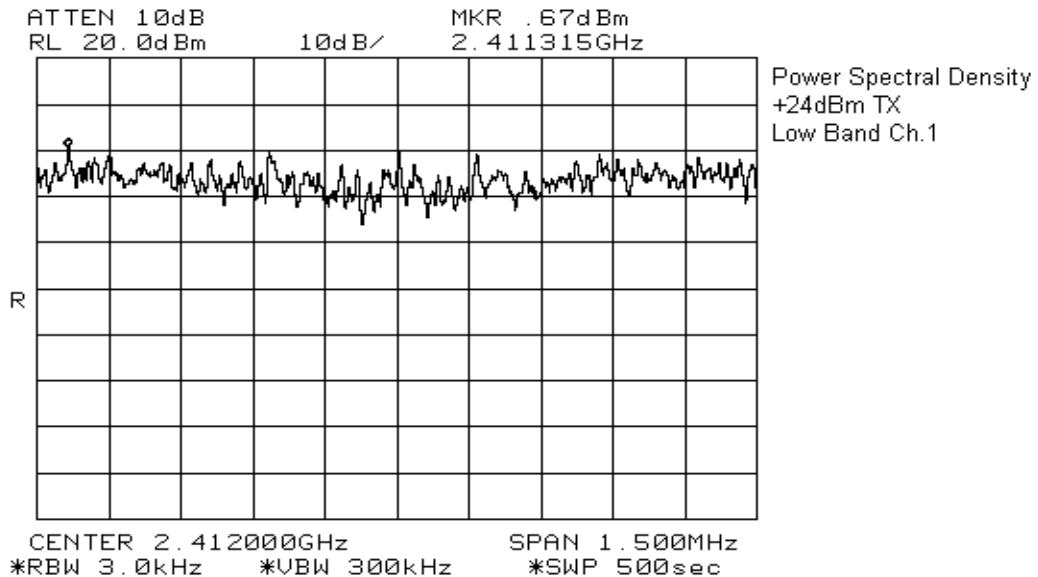


**Section 6. Transmitter Power Density****Para. No.: 15.247(d)**

<b>Test Performed By:</b> Glen Westwell	<b>Date of Test:</b> 27 July 2004
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**Test Results:** Complies**Limit:** +8dBm**Measurement Data:** See attached graphs.

<b>Channel</b>	<b>Conducted Power &amp; Antenna Gain</b>	<b>Power Spectral Density (dBm)</b>
Ch.1	+24dBm, 11.5dBi	0.7
Ch.6		1.2
Ch.11		0.5
Ch.1	+27dBm, 8.5dBi	3.3
Ch.6		3.2
Ch.11		2.0

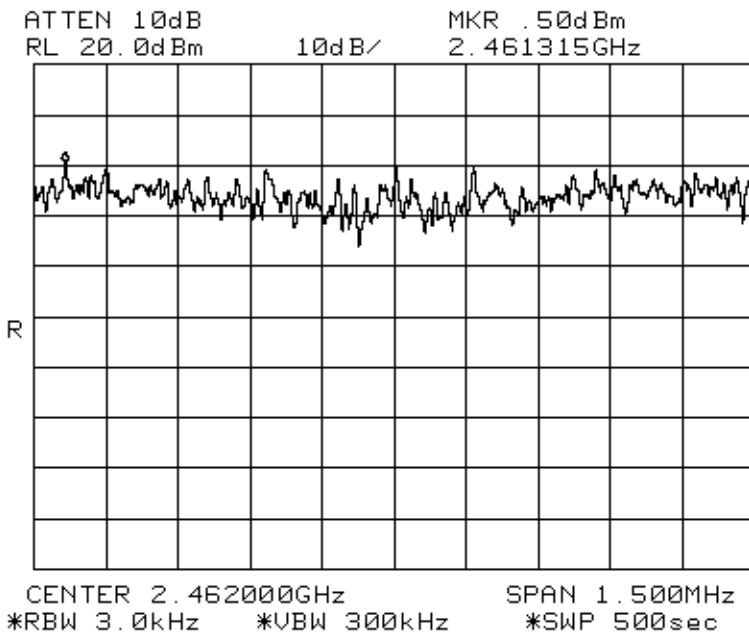
*EQUIPMENT: Wireless LAN ARM***11.5dBi Gain Antenna, Conducted Power Density**

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*EQUIPMENT: Wireless LAN ARM*

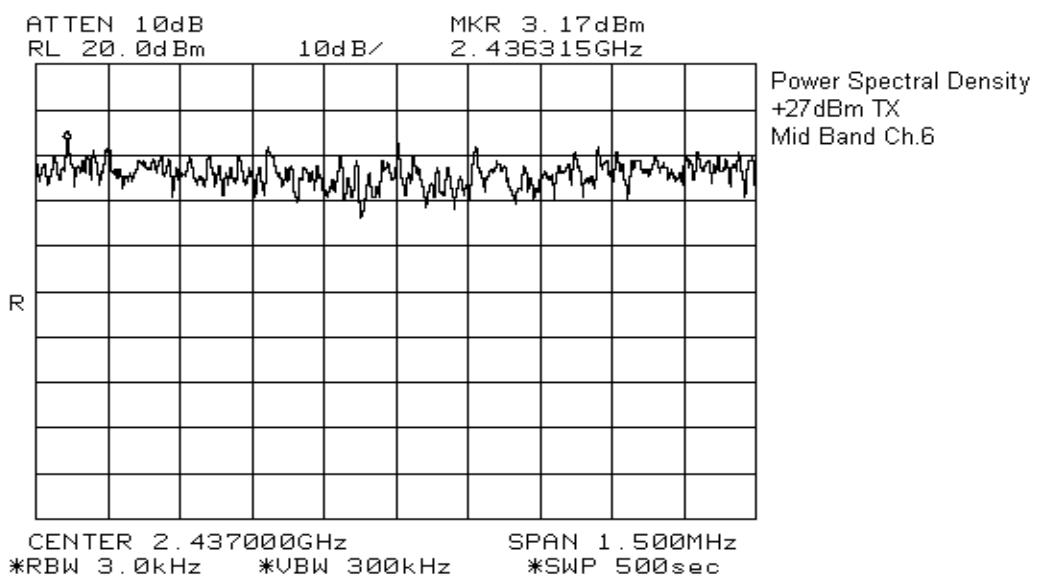
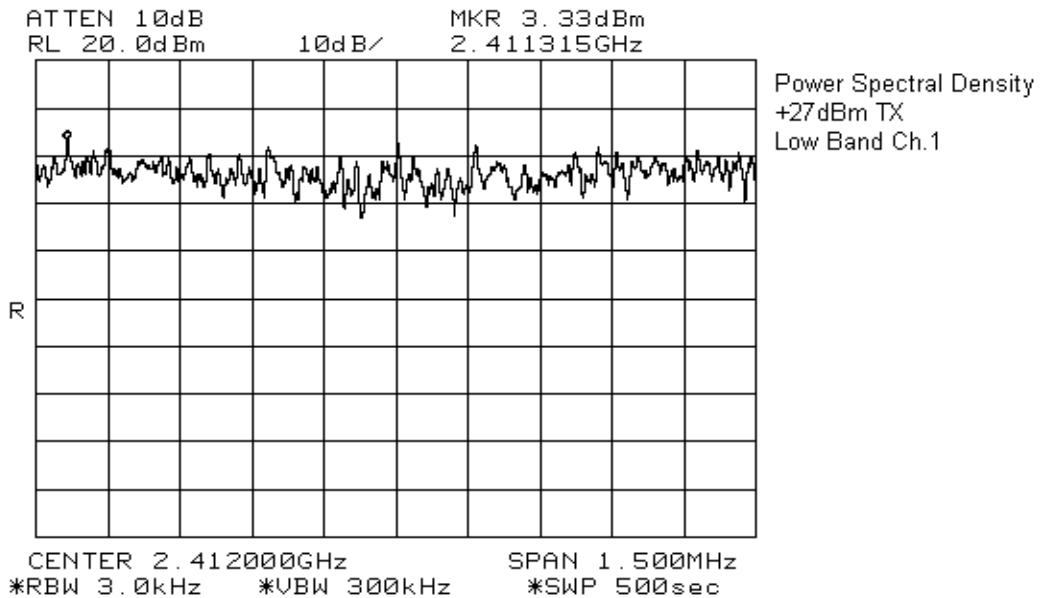
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Power Spectral Density  
+24dBm TX  
High Band Ch.11

### *EQUIPMENT: Wireless LAN ARM*

## 8.5dBi Gain Whip Antenna, Conducted Power Density

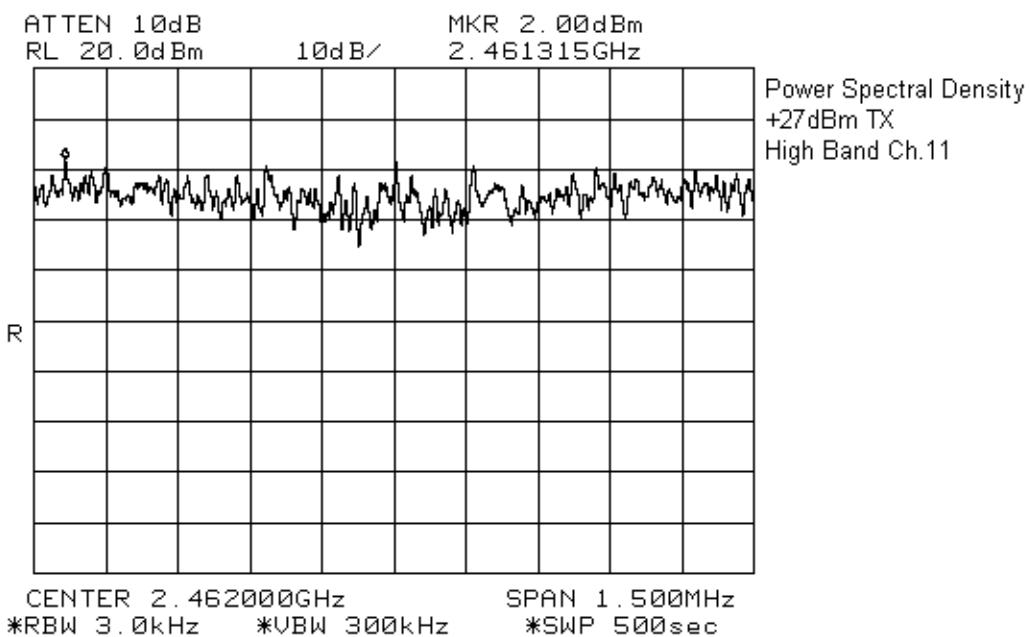


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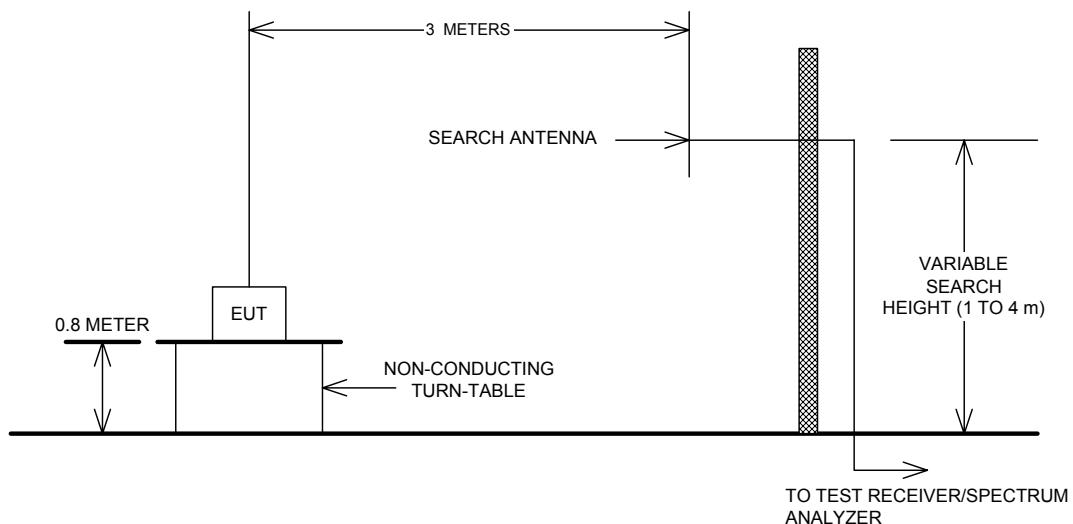
*EQUIPMENT: Wireless LAN ARM*

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## Section 7. Block Diagrams

### Test Site For Radiated Emissions



#### Below 1 GHz

Peak detector.  
RBW = 100 kHz

#### Above 1 GHz For Peak Emission Levels

Peak detector  
RBW = 1 MHz  
VBW = >RBW

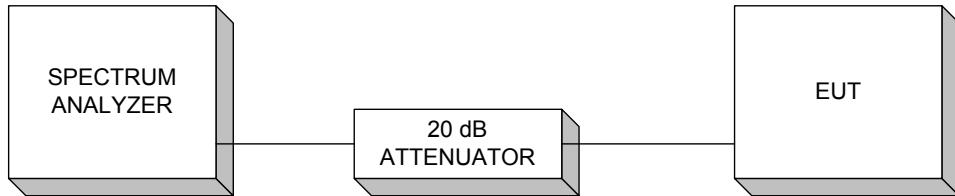
#### Above 1 GHz For Average Emission Levels

Peak detector  
RBW = 1 MHz  
VBW = 10 Hz

*EQUIPMENT: Wireless LAN ARM*

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**Transmitter Power Density & Peak Power At Antenna Terminals**



*EQUIPMENT: Wireless LAN ARM***Section8. Test Equipment List****Equipment List**

CAL Cycle	Equipment	Manufacturer	Model No.	Asset/Serial No.	Last Cal.	Next Cal.
1 Year	Spectrum Analyzer	Hewlett Packard	8565E	FA000981	31 May 04	31 May 05
1 Year	Signal Generator	Rohde & Schwarz	SM1Q06B	FA001878	18 May 04	18 May 05
1 Year	Power Sensor	Hewlett Packard	8487A	FA001741	09 Jun 04	09 Jun 05
1 Year	Power Meter	Hewlett Packard	E4418B	FA001413	26 May 04	26 May 05
1 Year	RF AMP	JCA	4-8 GHz	FA001497	18 June 04	18 June 05
1 Year	Horn Antenna	EMCO #1	3115	FA000649	18 Dec 03	18 Dec 04
1 Year	High Pass Filter (3.9GHz)	K&L	11SH10-4000	FA001340	COU	COU

Note: N/A = Not Applicable, NCR = No Cal Required, COU = CAL On Use.