



Nemko

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Laboratoire accrédité
Portée d'accréditation 75

TM

Test Report:

4W08087

Applicant:

Nortel Networks
3500 Carling Ave.
Nepean, Ontario
K2H 8E9

**Equipment Under Test:
(EUT)**

NTE301AA, AP7220
Wireless Network Router

FCC ID:

AB6NTE301AA

In Accordance With:

**FCC Part 15.247, Subpart C
Class II Permissive Change**

Tested By:

Nemko Canada Inc.
303 River Road, R.R. 5
Ottawa, Ontario K1V 1H2

Authorized By:

Kevin Carr, EMC/EMI/Wireless Specialist

Date:

18 May 2004

Total Number of Pages:

27

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EQUIPMENT: NTE301AA

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 Part 15, Subpart C. 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.

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 Technologist

DATE: 11 May 2004

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This report applies only to the items tested.

Summary Of Test Data

Name Of Test	Para. No.	Result
Powerline Conducted Emissions	15.207(a)	Complies
6dB Bandwidth	15.247(a)(2)	Complies
Peak Output Power	15.247(b)(3)	Complies
Spurious Emissions (Antenna Conducted)	15.247(c)	Complies
Spurious Emissions (Radiated)	15.247(c)	Complies
Peak Power Spectral Density	15.247(d)	Complies

Note:

1. This application is for a class II permissive change for FCC I.D. AB6NTE301AA. This report contains the revised test data relevant to areas impacted by these changes. The RF filter change is part of the 802.11a radio (5GHz) only, and therefore the 802.11a test data has been submitted in this report.

Test Conditions:

Indoor Temperature: 22°C
 Humidity: 42%

EQUIPMENT:NTE301AA

Section 2. General Equipment Specification

Manufacturer:	Nortel Networks
Model No.:	NTE301AA
Serial No.:	NNTM536G1L1F
Date Received In Laboratory:	10 May. 2004
Nemko Identification No.:	#9
Operating Frequency(s):	2412-2462MHz 5740-5840MHz
Rated Power (maximum):	2.4GHz Band = 20dBm 5GHz Band = 20dBm
Modulation/Access Method:	802.11b/g & 802.11a
Antenna Data:	2.4GHz, 802.11b/g (1) Nearson Whip, Model 151 = 5dBi (2) PIFA Integral = 0dBi 5GHz, 802.11a (1) Integral = 10dBi (2) H&S SPA 5600140/14/0/V = 13dBi (3) Andrews #FPA5250D06-N = 18dBi (4) Andrews #FPA5250D12-N = 23.6dBi

Section 3. Powerline Conducted Emissions

Para. No.: 15.207 (a)

Test Performed By: David Duchesne	Date of Test: 5 May. 2004
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Test Results: Complies.

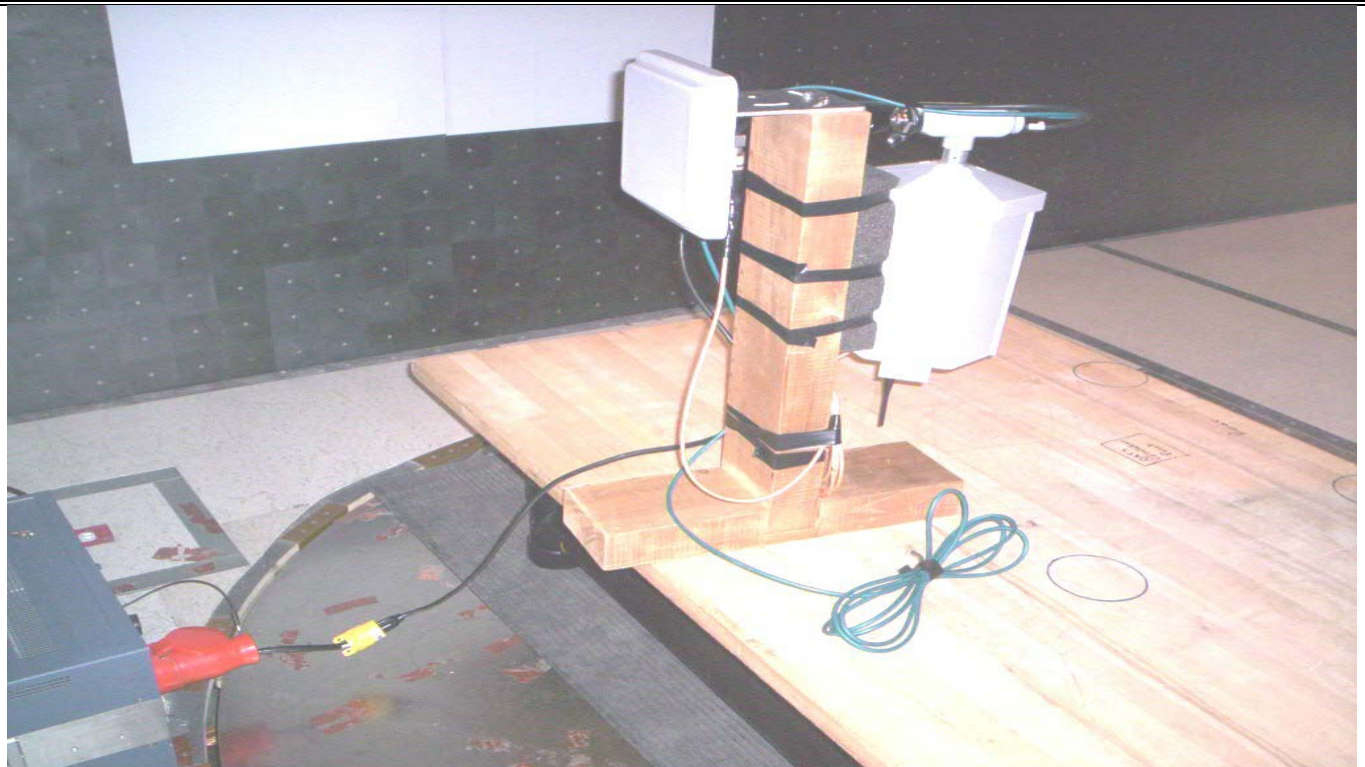
Measurement Data: See attached graph(s).

Limits For Conducted Disturbance At The Mains Ports Of Class B

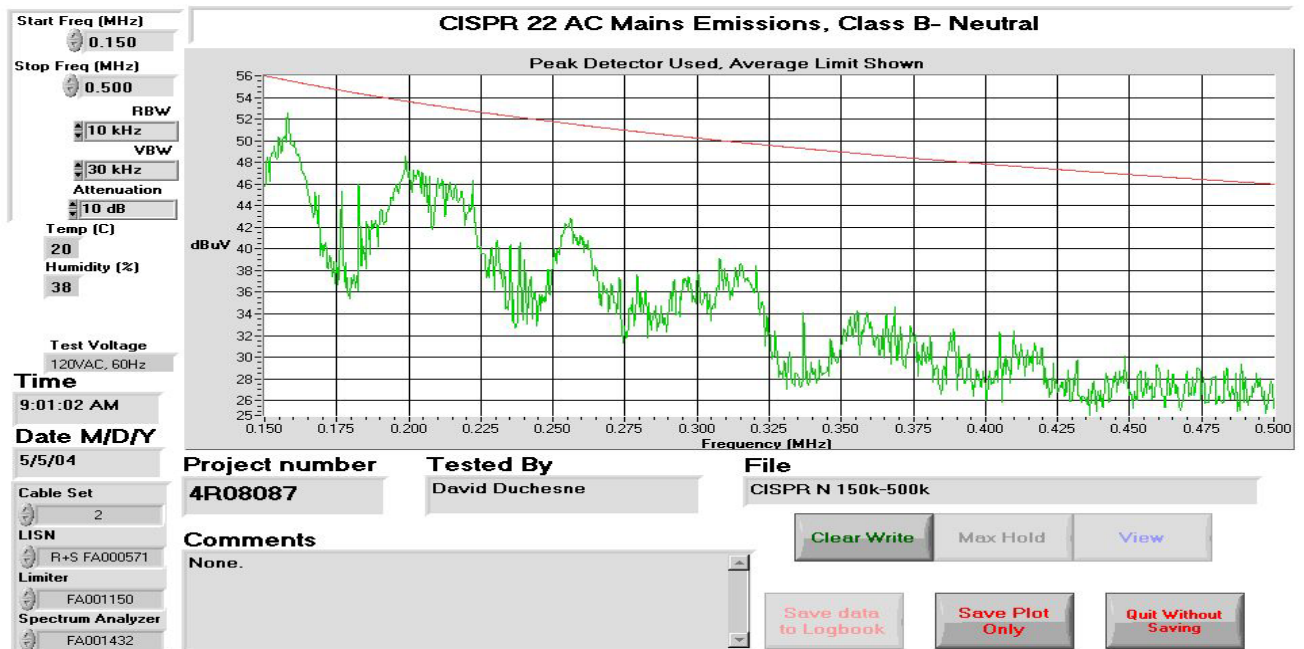
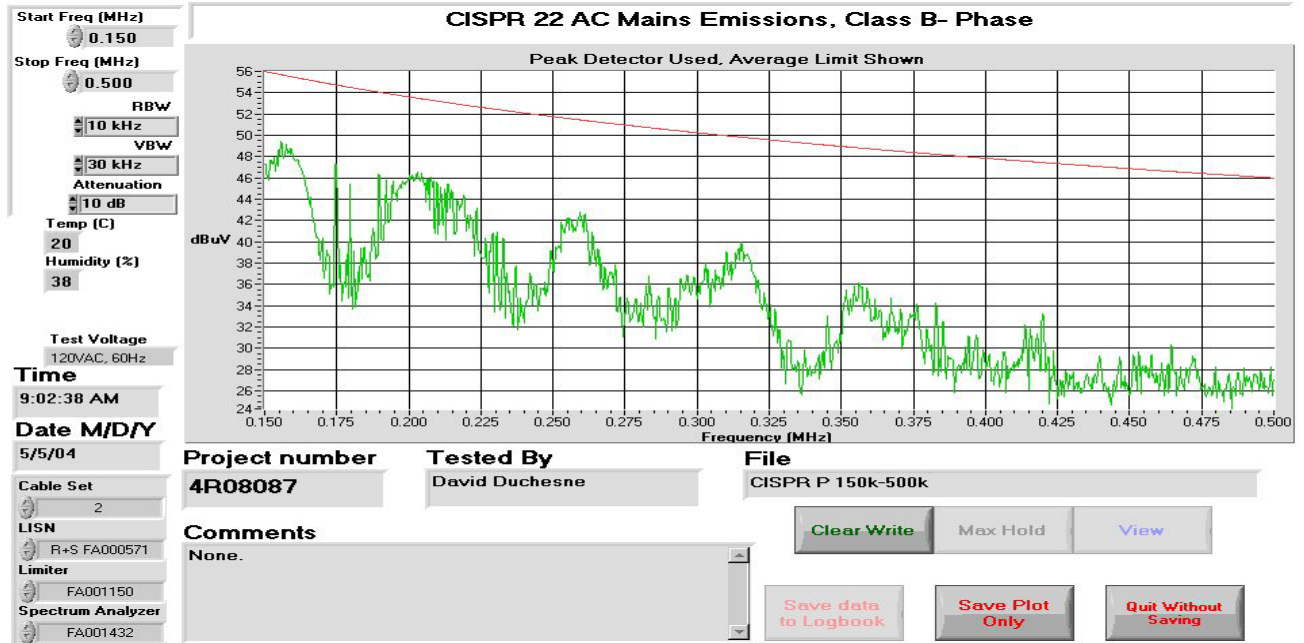
Frequency Range MHz	Limits dB(μV)		Result
	Quasi-Peak	Average	
0.15 to 0.50	66 to 56	56 to 46	Complies.
0.5 to 5	56	46	
5 to 30	60	50	

Note:

1. The lower limit shall apply at the transition frequency.
2. The limit decreases linearly with the logarithm of the frequency in the range 0.15 to 0.50MHz.

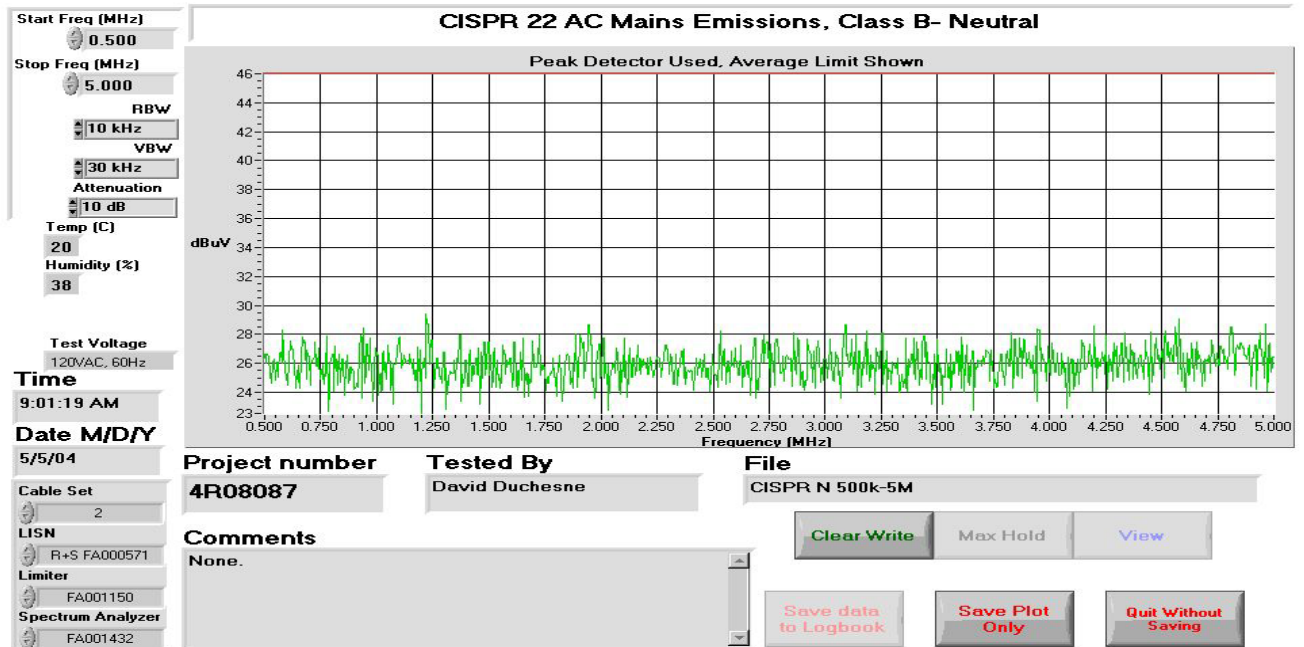
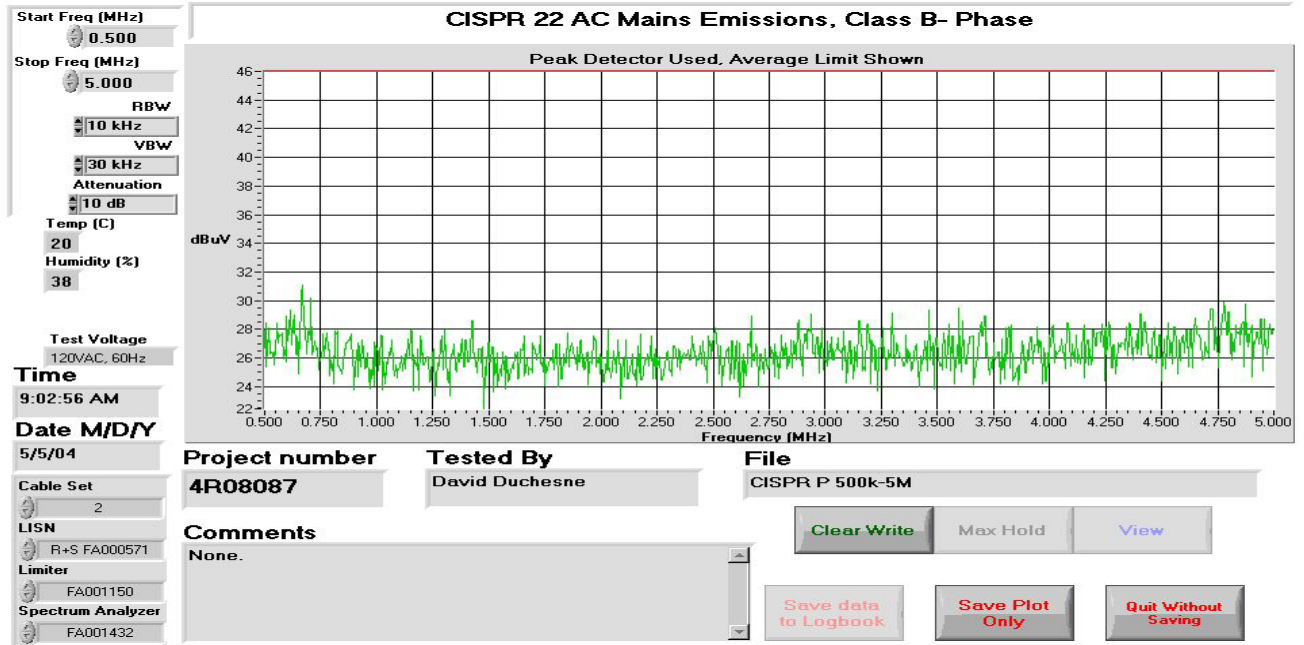


Conducted Disturbance at Mains Plots



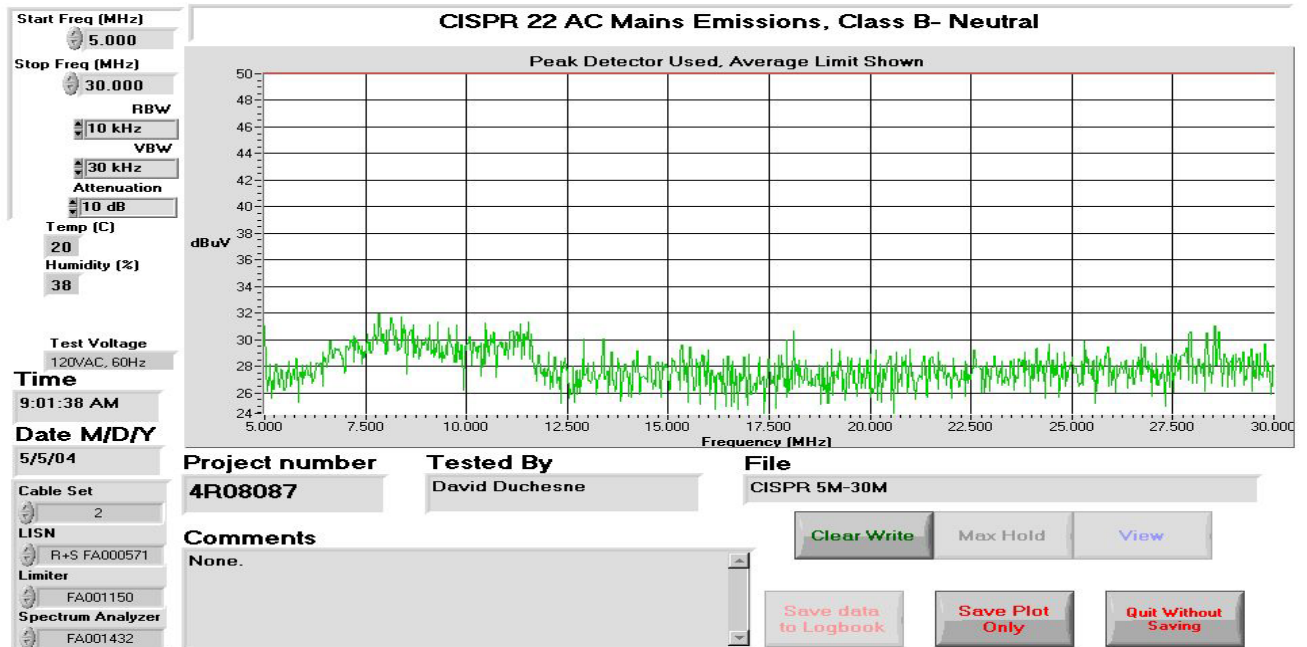
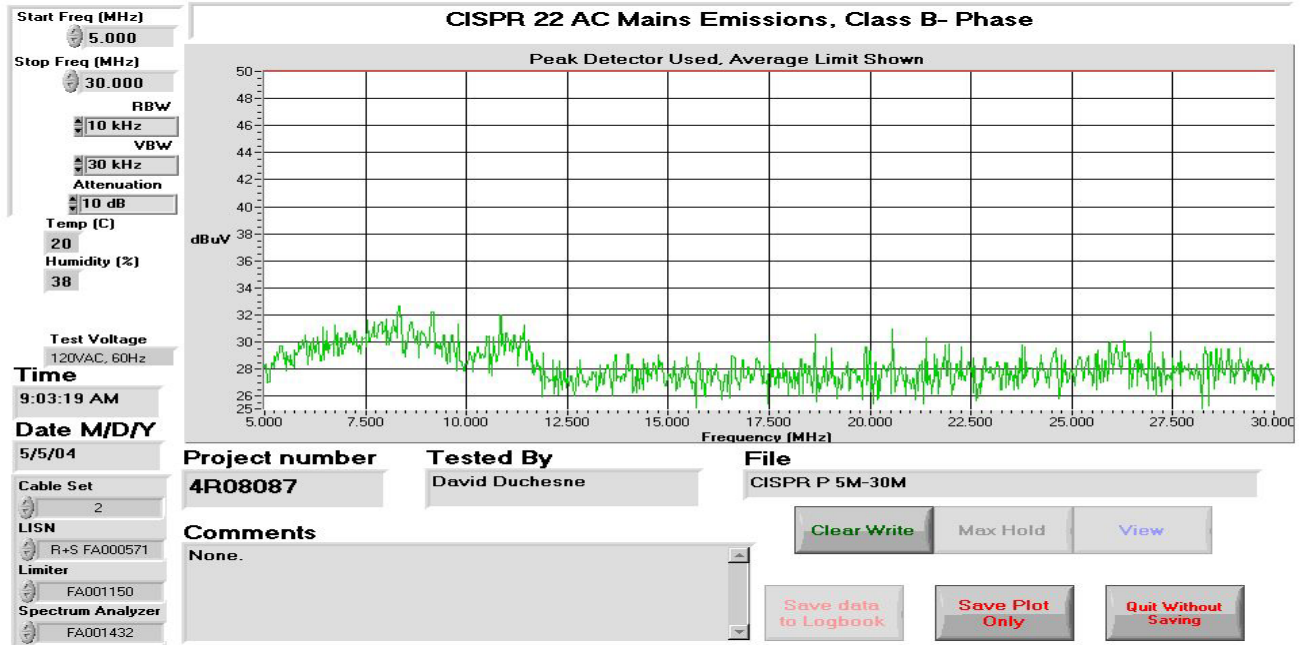
EQUIPMENT:NTE301AA

Conducted Disturbance at Mains Plots, continued



EQUIPMENT:NTE301AA

Conducted Disturbance at Mains Plots, continued



EQUIPMENT:NTE301AA

Section 4. 6dB Bandwidth

Para. No.: 15.247 (a)(2)

Test Performed By: Glen Westwell	Date of Test: 10 May. 2004
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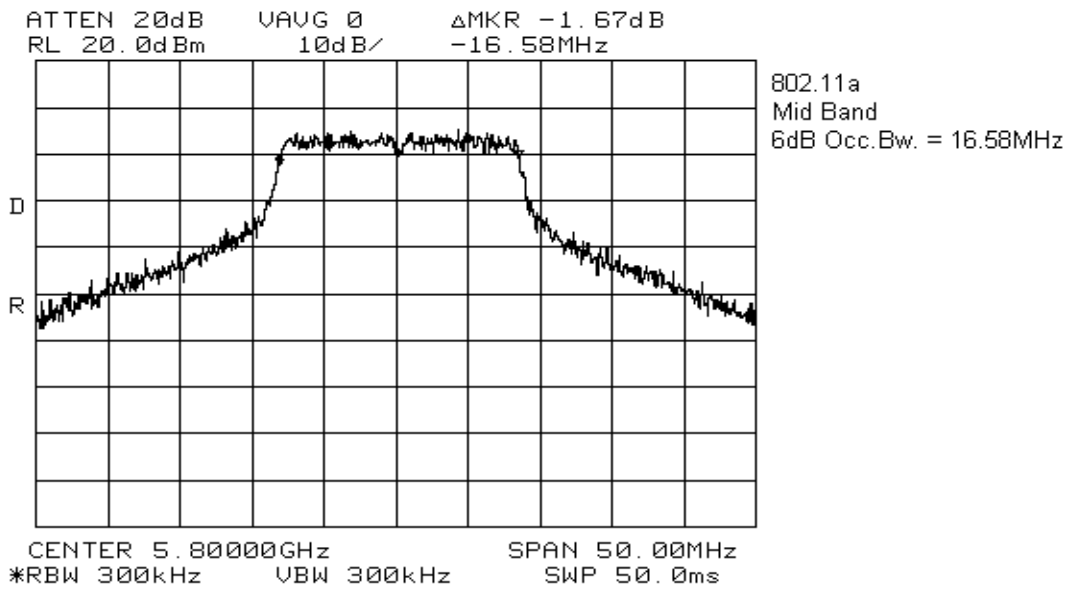
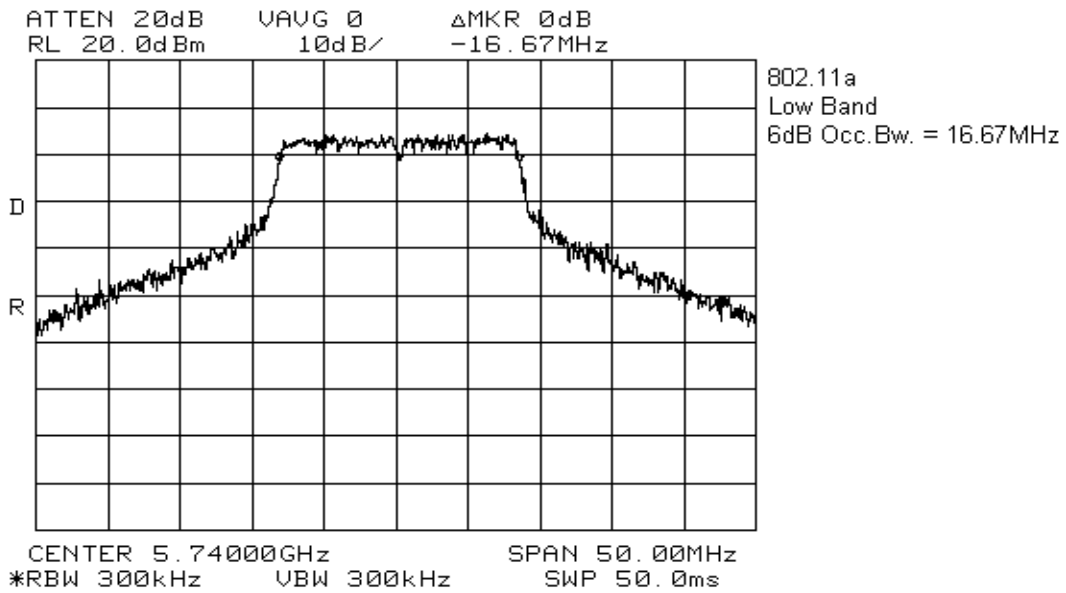
Limit: $\geq 500\text{kHz}$

Test Results: Complies

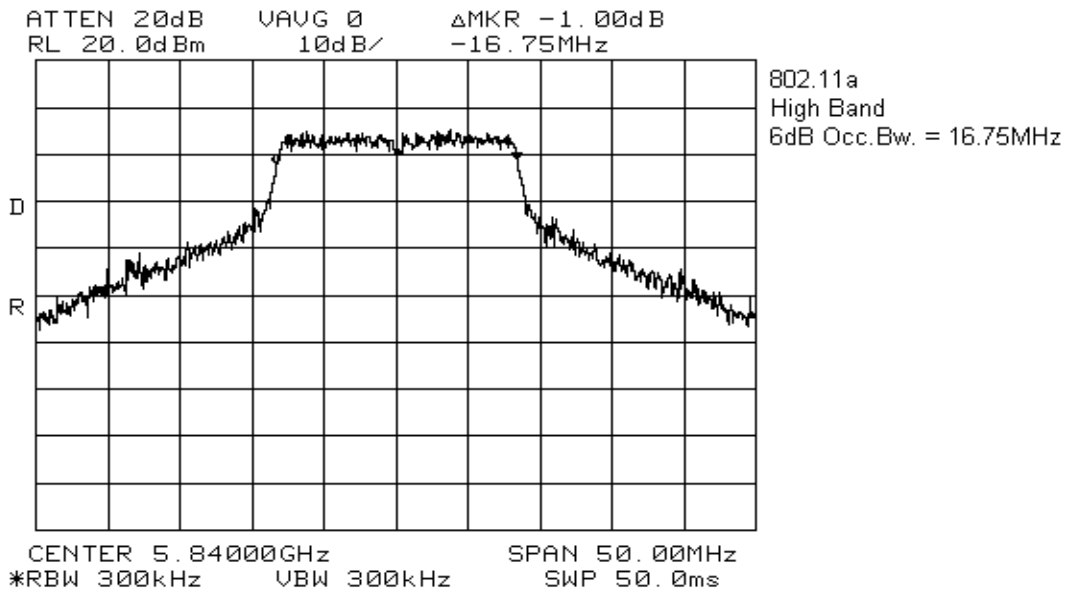
Measurement Data: See attached Plots

6dB Occupied Bandwidth			
802.11a	5740MHz	5800MHz	5840MHz
	16.7MHz	16.6MHz	16.8MHz

EQUIPMENT:NTE301AA



EQUIPMENT:NTE301AA



Section 5. Peak Output Power

Para. No.: 15.247 (b)(3)

Test Performed By: Glen Westwell	Date of Test: 10 May. 2004
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Limit: 1W, (30dBm)

Test Results: Complies

Measurement Data: See attached tables.

EQUIPMENT:NTE301AA

802.11a Radio Antenna Port A (Aux.1), Conducted Power (dBm)								
Data Rate (Mbps)	6-24		36		48		54	
	Measured	Rated	Measure d	Rated	Measure d	Rated	Measure d	Rated
5740MHz	20.0	20.0	18.6	19.0	16.7	17.0	15.4	16.0
5800MHz	19.8	20.0	18.9	19.0	16.6	17.0	15.2	16.0
5840MHz	19.6	20.0	19.1	19.0	16.2	17.0	15.3	16.0

802.11a Radio Antenna Port B (Aux.2), Conducted Power (dBm)								
Data Rate (Mbps)	6-24		36		48		54	
	Measured	Rated	Measure d	Rated	Measure d	Rated	Measure d	Rated
5740MHz	20.0	20.0	18.5	19.0	16.3	17.0	15.3	16.0
5800MHz	20.0	20.0	18.8	19.0	16.3	17.0	15.5	16.0
5840MHz	19.9	20.0	19.1	19.0	16.6	17.0	15.6	16.0

Note:

(1) Power Levels in the above chart will be reduced by +4.5dBm for external antenna operation due to the loss between the radio module and the RF switch matrix and filter.

Antenna Gain & EIRP:

- 802.11a (1) Integral antenna = 10dBi
- (2) H&S SPA 5600140/14/0/V = 13dBi
- (3) Andrews #FPA5250D06-N = 18dBi
- (4) Andrews #FPA5250D12-N = 23.6dBi

- (1) 802.11a Maximum E.I.R.P for Fixed P-P outdoor operation
= 20.0 – (4.5db) +23.6dBi = 39.1dBm
- (2) 802.11a Maximum E.I.R.P for all applications
= 20.0 – (4.5db) +18dBi = 33.5dBm
- (3) 802.11a Maximum E.I.R.P for integral antenna operation
= 20.0+10dBi = 30.0dBm

Limit

- (1) P-P operation = 30dBm conducted power + antenna gain.
- (2) All other applications = 30dBm conducted power + 6dBi antenna gain = 36dBi EIRP.

Section 6. Spurious Emissions

Para. No.: 15.247 (c)

Test Performed By: Glen Westwell	Date of Test 11 May. 2004
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Limit: 20dBc (conducted)
Radiated emissions that fall in the restricted bands must comply with 15.209

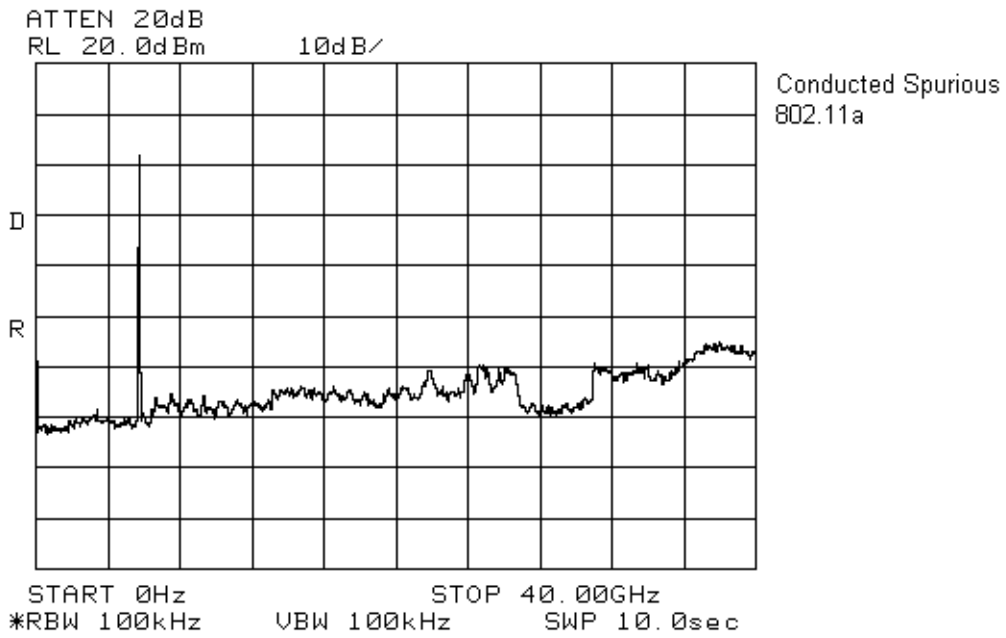
Test Results: Complies

Measurement Data: See attached Plots and table.

- Emissions were searched for all possible configurations. Worst case data has been presented.
- The DUT was searched to the 10th harmonic for the 802.11a radio. Only those emissions within 20dB of the limit were reported.
- No radiated emissions falling in the restricted bands were detected.

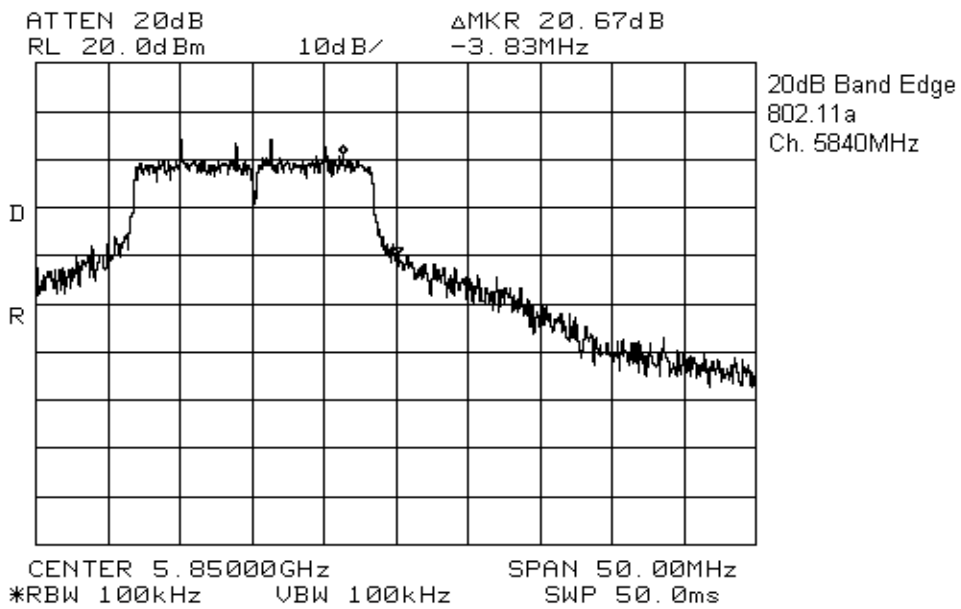
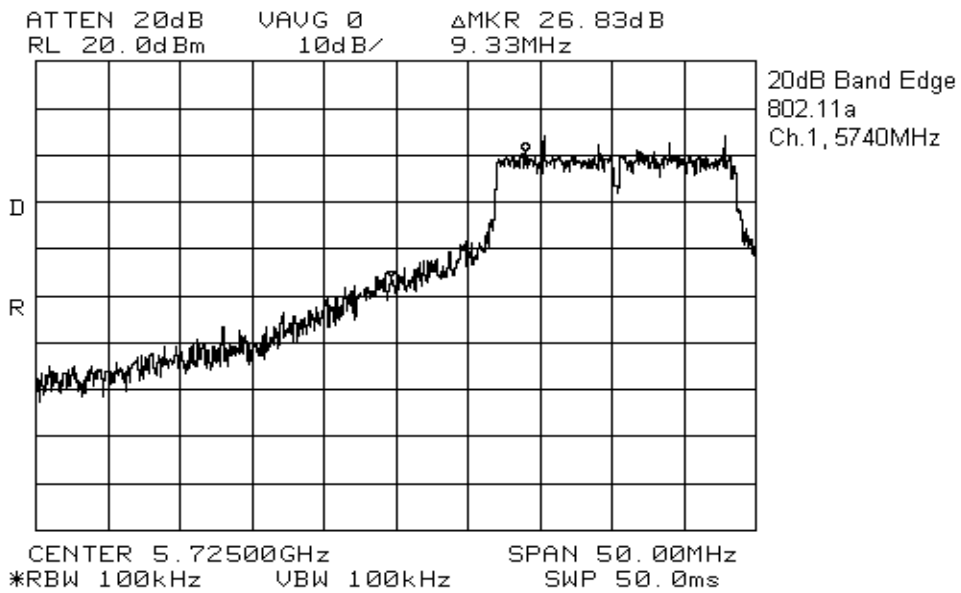
EQUIPMENT:NTE301AA

20dBc



EQUIPMENT:NTE301AA

20dBc

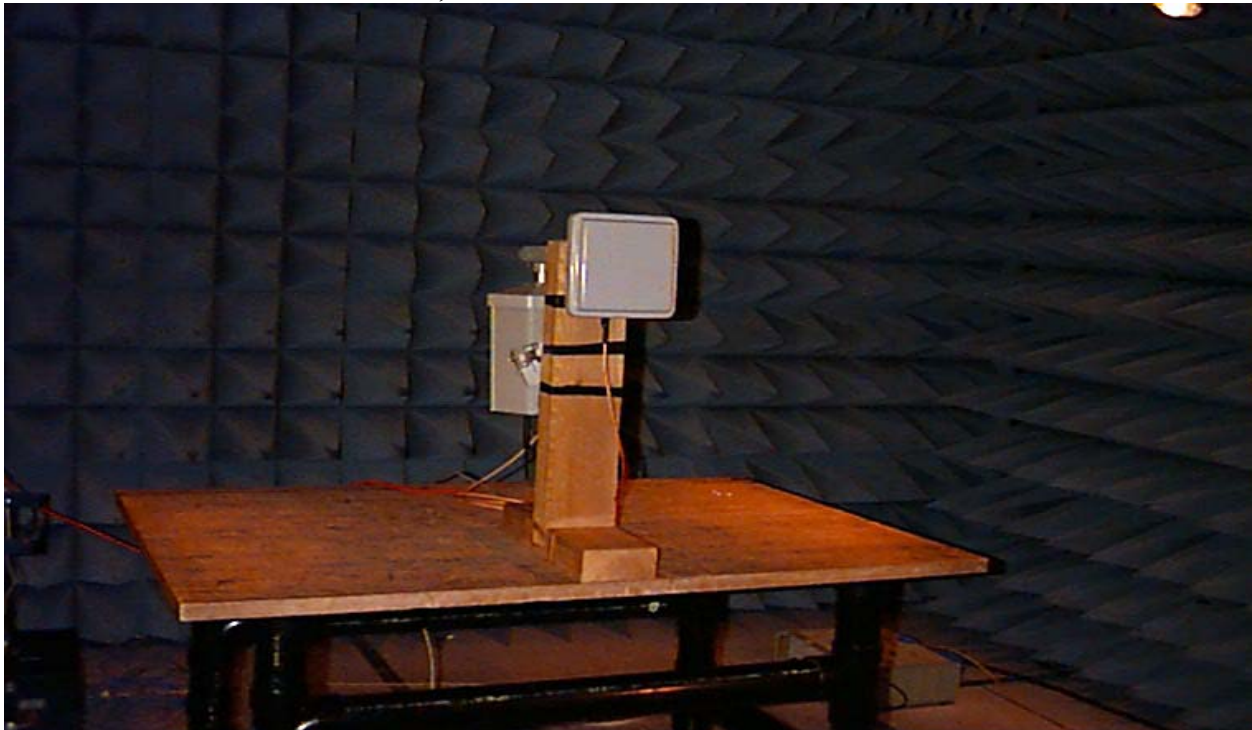


EQUIPMENT:NTE301AA

Radiated Emissions
5GHz Large External Antenna, 23.6dBi



5GHz Mid Size External Antenna, 18dBi



EQUIPMENT:NTE301AA

5GHz Small External Antenna, 13dBi



5GHz Integral Antenna.



EQUIPMENT:NTE301AA

Section 7. Peak Power Spectral Density

Para. No.: 15.247 (d)

Test Performed By: Glen Westwell	Date of Test: 11 May. 2004
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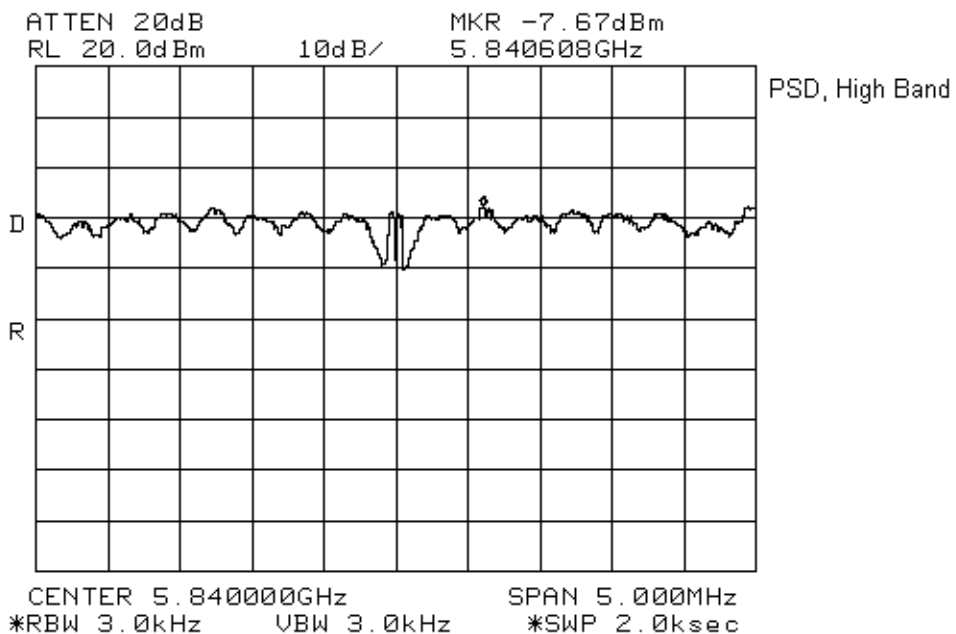
Limit: +8dBm/3kHz

Test Results: Complies

Measurement Data: See Attached Plots

PPSD (dBm/3kHz)			
802.11a	5740MHz	5800MHz	5840MHz
	-7.83dBm	-7.83dBm	-7.67dBm

EQUIPMENT:NTE301AA



Section 8. RF Exposure Evaluation

- (1) Co-location compliance for multiple frequency exposure criteria to the power density exposure limit is detailed in the table(s) below.
- (2) This device will be professionally installed (Fixed) to provide a minimum separation distance of 20cm from all persons for indoor operation as detailed in the co-location compliance table below. This device will not be co-located or operated in conjunction with any other antenna or transmitter not described in this application.
- (3) This device contains one 2.4GHz access radio and one 5GHz backhaul radio. This device will only be operated according to the exposure conditions described in this application. End users and installers will be provided with antenna installation and transmitter operating conditions for satisfying RF exposure compliance.

EQUIPMENT:NTE301AA

Co-location Compliance Table for Integrated 802.11b/g & 802.11a Radios Indoor/Outdoor Operation at 20cm							
802.11b/g Radio Power Density (mW/cm ²)		802.11a Radio Power Density (mW/cm ²)			Total Density for co-located radios (mW/cm ²)	General Exposure Limit (mW/cm ²)	
0dBi (integral)	5dBi	10dBi (integral)	13dBi	18dBi			
0.023918	-----	0.198944	-----	-----	0.222862	1.0	Complies
0.023918	-----	-----	0.158027	-----	0.181945	1.0	Complies
0.023918	-----	-----	-----	0.499724	0.523642	1.0	Complies
	0.075636	0.198944	-----	-----	0.274580	1.0	Complies
	0.075636	-----	0.158027	-----	0.233663	1.0	Complies
	0.075636	-----	-----	0.499724	0.575360	1.0	Complies

Note: The RF energy feed to the 5GHz 802.11a antenna for external antenna operation is +4dB lower than that feed to the integral antenna due to loss in the RF switch matrix.

2.4GHz, 802.11b/g

- (1) Nearson Whip, Model 151 = 5dBi
- (2) PIFA Integral = 0dBi

5GHz, 802.11a

- (3) Integral = 10dBi
- (4) H&S SPA 5600140/14/0/V = 13dBi
- (5) Andrews #FPA5250D06-N = 18dBi

Co-location Compliance Table for Integrated 802.11b/g & 802.11a Radios Outdoor Operation at 30cm (Worst Case)						
802.11b/g Radio Power Density (mW/cm ²)		802.11a Radio Power Density (mW/cm ²)		Total Density for co-located radios (mW/cm ²)	General Exposure Limit (mW/cm ²)	
5dBi		23.6dBi				
0.033616		0.806395		0.840011	1.0	Complies

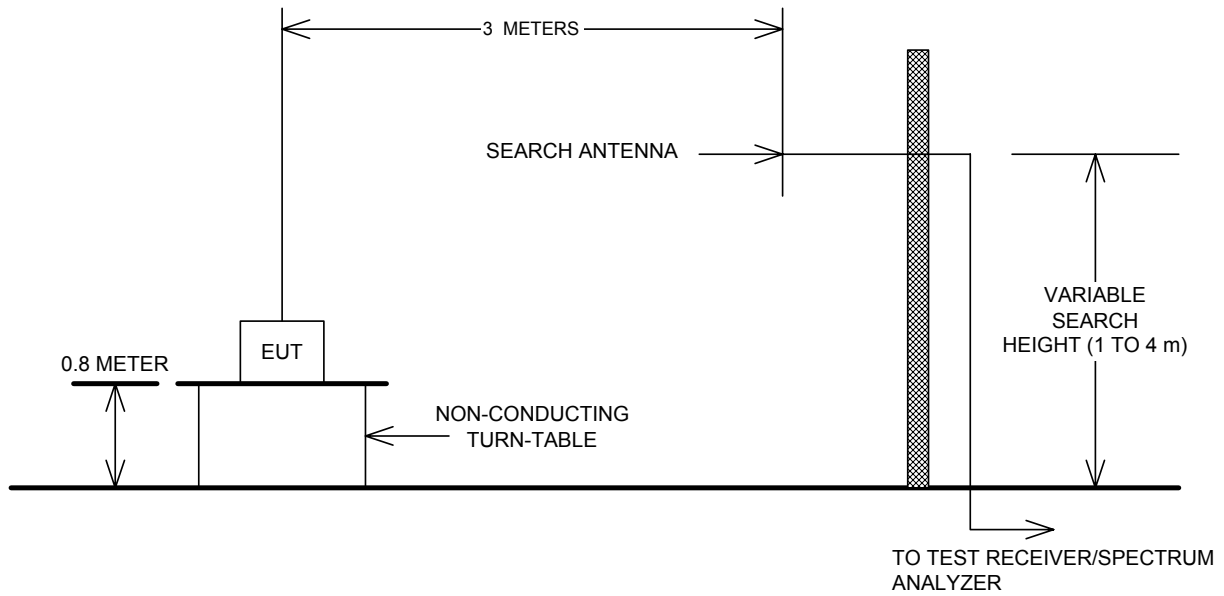
Note: The RF energy feed to the 5GHz 802.11a antenna for external antenna operation is +4dB lower than that feed to the integral antenna due to loss in the RF switch matrix.

5GHz, 802.11a

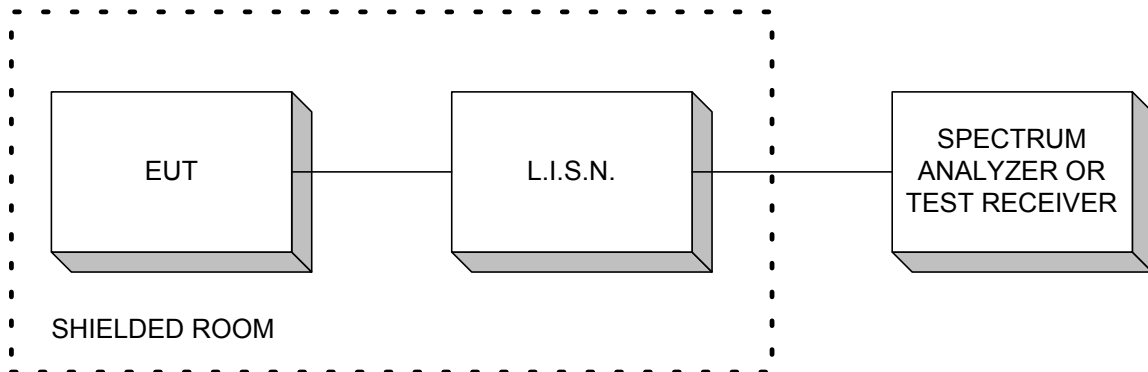
- (1) Andrews #FPA5250D12-N = 23.6dBi

Section 9. Block Diagrams

Test Site For Radiated Emissions

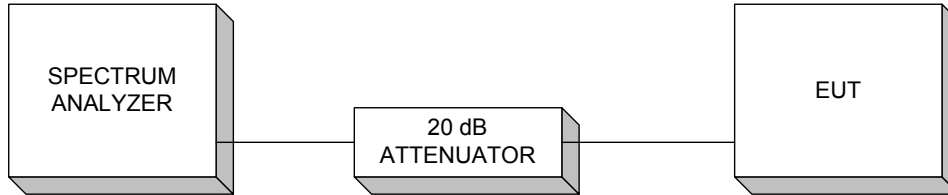


Conducted Emissions



EQUIPMENT:NTE301AA

Conducted Measurements



EQUIPMENT:NTE301AA

Section 10. Test Equipment List

CAL Cycle	Equipment	Manufacturer	Model No.	Asset/Serial No.	Last Cal.	Next Cal.
1 Year	Spectrum Analyzer	Hewlett Packard	8564E	FA001367	13 May 03	13 May 04
1 Year	Power Meter	Hewlett Packard	E4418B	FA001678	27 Feb 04	27 Feb 05
1 Year	Power Sensor	Hewlett Packard	8487A	FA001741	28 Mar 03	14 Jul 04
1 Year	RF AMP	JCA	4-8 GHz	FA001497	18 June 03	18 June 04
1 Year	RF AMP	Narda	5 - 18GHz	FA001409	COU	COU
1 Year	Horn Antenna	EMCO #2	3115	FA000825	10 Dec 03	10 Dec 04
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
1 Year	High Pass Filter (9.6GHz)	Dorado	WR62	21-404	COU	COU
1 Year	LISN	Rohde & Schwarz	ESH2-Z5	FA000571	June 02/03	June 02/04

NA: Not Applicable
 NCR: No Cal Required
 COU: CAL On Use