



Test Report: 4W07790

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

Equipment Under Test: BA200 Wireless LAN Radio Module
(EUT) BEL20005, 5GHz Band

FCC ID: RAR20005001

In Accordance With: **FCC Part 15.401, Subpart E**

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

Authorized By: Kevin Carr, EMC Specialist

Date: 4 March 2004

Total Number of Pages: 42

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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 Part 15, Subpart E. 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: 4 March 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
Emission Bandwidth	15.403(c)	Complies
Peak Conducted Transmit Power	15.407(a)(3)	Complies
Peak Power Spectral Density	15.407(a)(3)	Complies
Peak Excursion Measurement	15.407(a)(6)	Complies
Undesirable Emissions	15.407(b)(3)(5)	Complies

Test Conditions:

Indoor Temperature: 24°C
 Humidity: 2%

Outdoor Temperature: 7°C
 Humidity: 49%

Section 2. General Equipment Specification**Manufacturer:** BelAir Networks Inc.**Model No.:** BEL20005**Serial No.:** K000497310**Date Received In Laboratory:** 22 Jan. 2004**Nemko Identification No.:** #1**Frequency Band:**
5250-5350MHz
5725-5825MHz**Operating Frequency(ies) of DUT:**
TX: 5265-5335MHz
TX: 5740-5810MHz**Transmit Power (Rated):** +14dBm**Data Rates:** 802.11a - 6,9,12,18,24,36,48&54 Mbps**Antenna Gain (integral):** 15dBi

Section 3. RF Exposure Evaluation

- (1) This U-NII Band radio module will be integrated into an enclosure with FCC approved access radio module FCC ID# RAR20000001. Co-location compliance for multiple frequency exposure criteria to the power density exposure limit is detailed in the table below.
- (2) The antenna(s) used with this device are integral and will be installed to provide a minimum separation distance of 20cm from all persons and will not be co-located or operated in conjunction with any other antenna or transmitter not described in this application.
- (3) This integrated modular transmitter 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.

Power Ratio Summation for Integrated Co-located Radios at 20cm.						
802.11b FCC I.D.# RAR20000001 (mW/cm ²)	802.11a FCC I.D.# RAR20005001 (mW/cm ²)	802.11a FCC I.D.# RAR20005001 (mW/cm ²)	802.11a FCC I.D.# RAR20005001 (mW/cm ²)	Sum of Worst Case Power Density at 20cm (mW/cm ²)	General Exposure Limit (mW/cm ²)	
Radio 1	Radio 2	Radio 3	Radio 4			
0.5966	0.1336	-----	-----	0.7302	1.0	PASS
0.5966	0.1336	0.1336	-----	0.8638	1.0	PASS
0.5966	0.1336	0.1336	0.1336	0.9974	1.0	PASS

The typical worst case transmitter duty cycle is 95%. Therefore the conducted power has been corrected from 100% to 95% to address RF exposure.

802.11b Radio

Maximum conducted power = 423.3mW @ a transmitter duty cycle of 95% & cable loss of 0.5dB. Antenna gain = 8.5dBi, therefore the power density at 20cm = 0.5966mW/cm².

802.11a Radio

Maximum conducted power = 21.2mW @ a transmitter duty cycle of 95% & cable loss of 0.5dB. Antenna gain = 15dBi, therefore the power density at 20cm = 0.1336mW/cm².

Note: This calculation includes the 0.5dB in cable loss from the RF port to the antenna.

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EQUIPMENT: BEL20005

FCC PART 15, SUBPART E
PROJECT NO.:4W07790

Section 4. Powerline Conducted Emissions

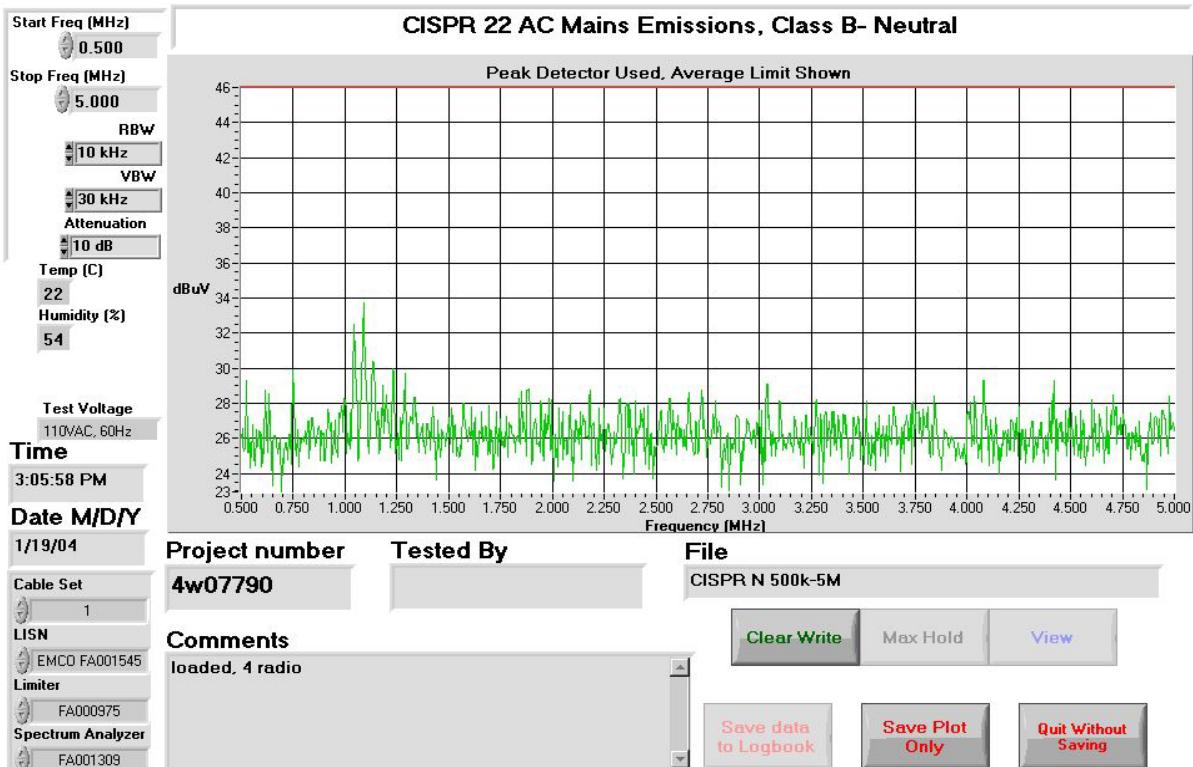
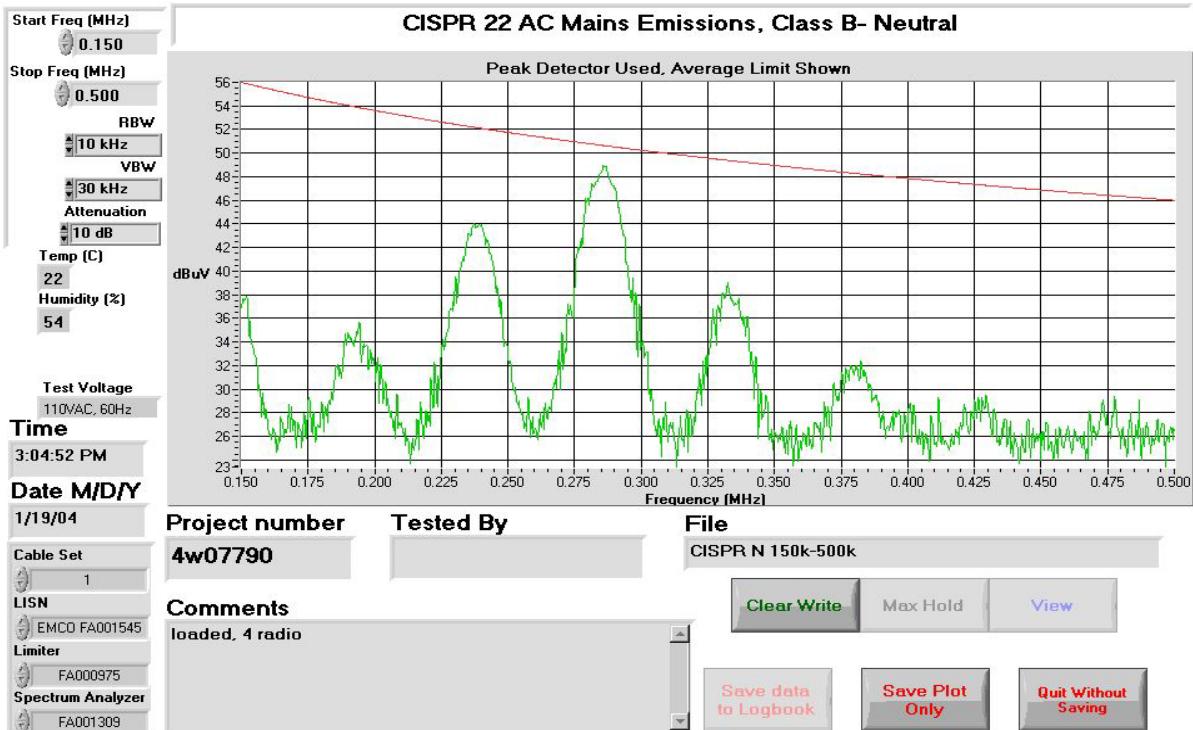
Para. No.: 15.207(a)

Test Performed By: Glen Westwell	Date of Test: 19 Jan. 2004
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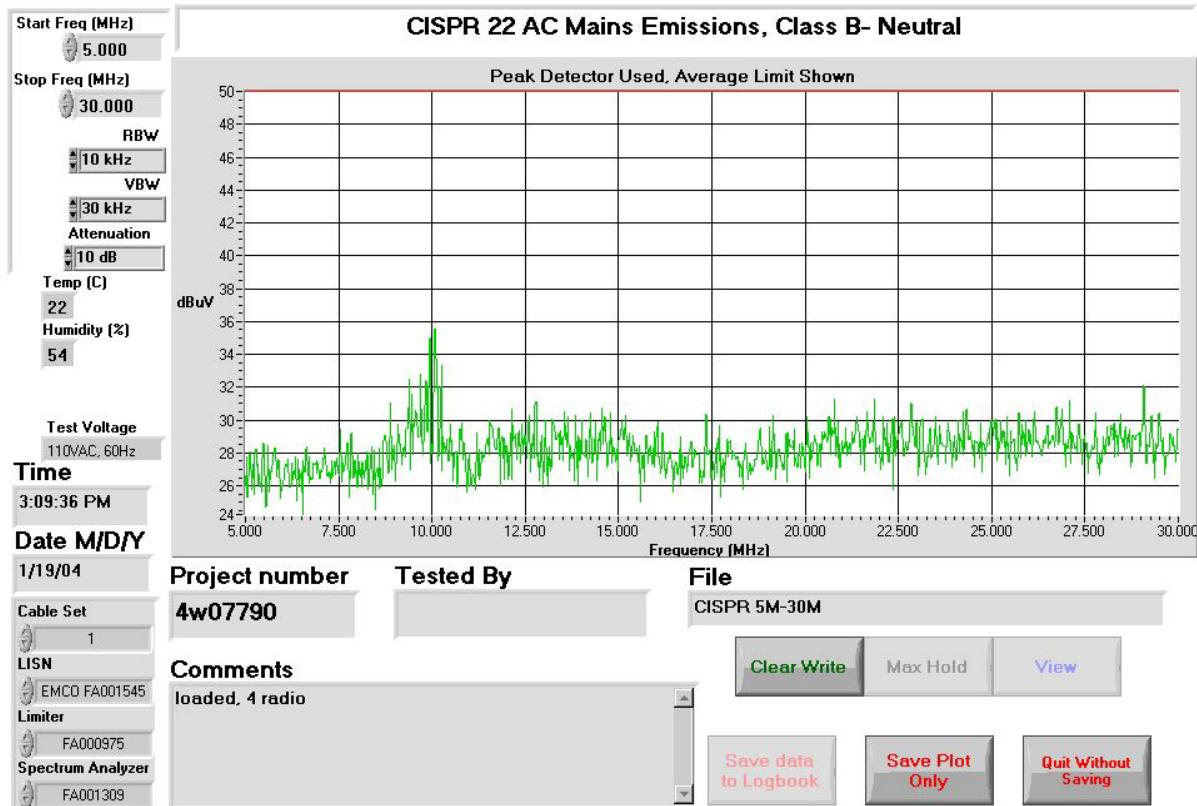
Test Results: Comply.

Measurement Data: See Attached Graphs.

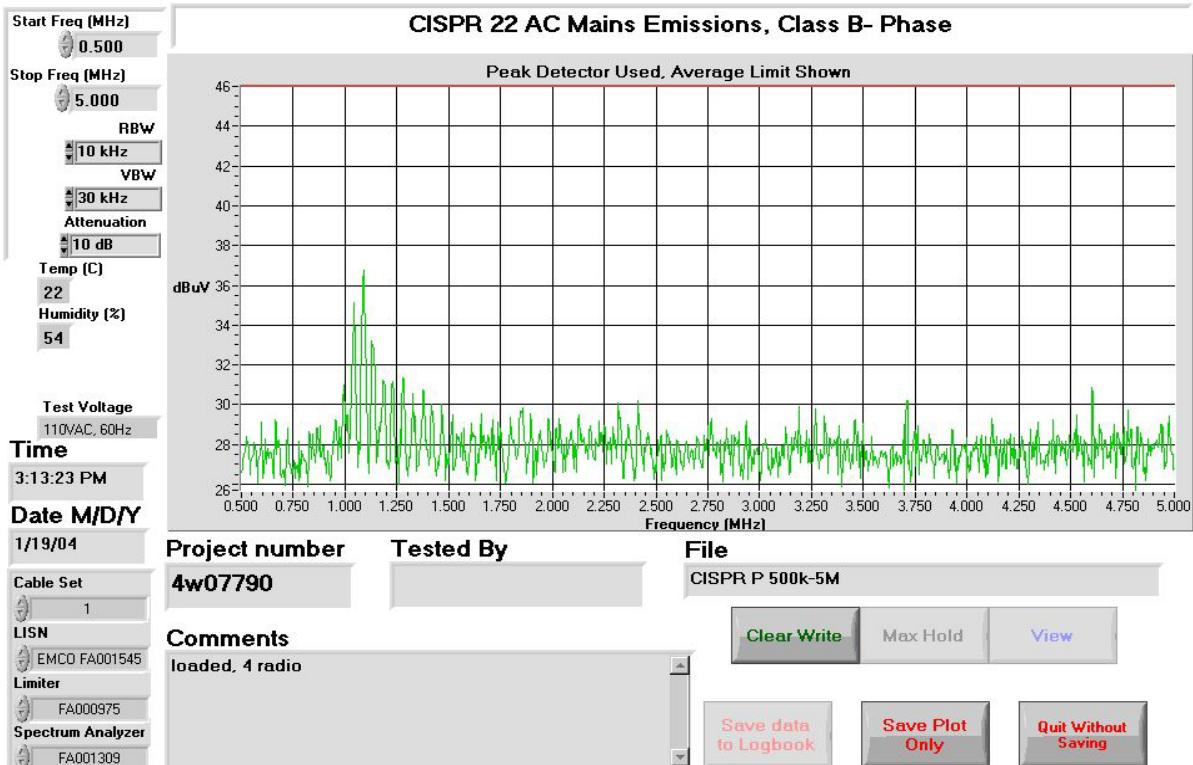
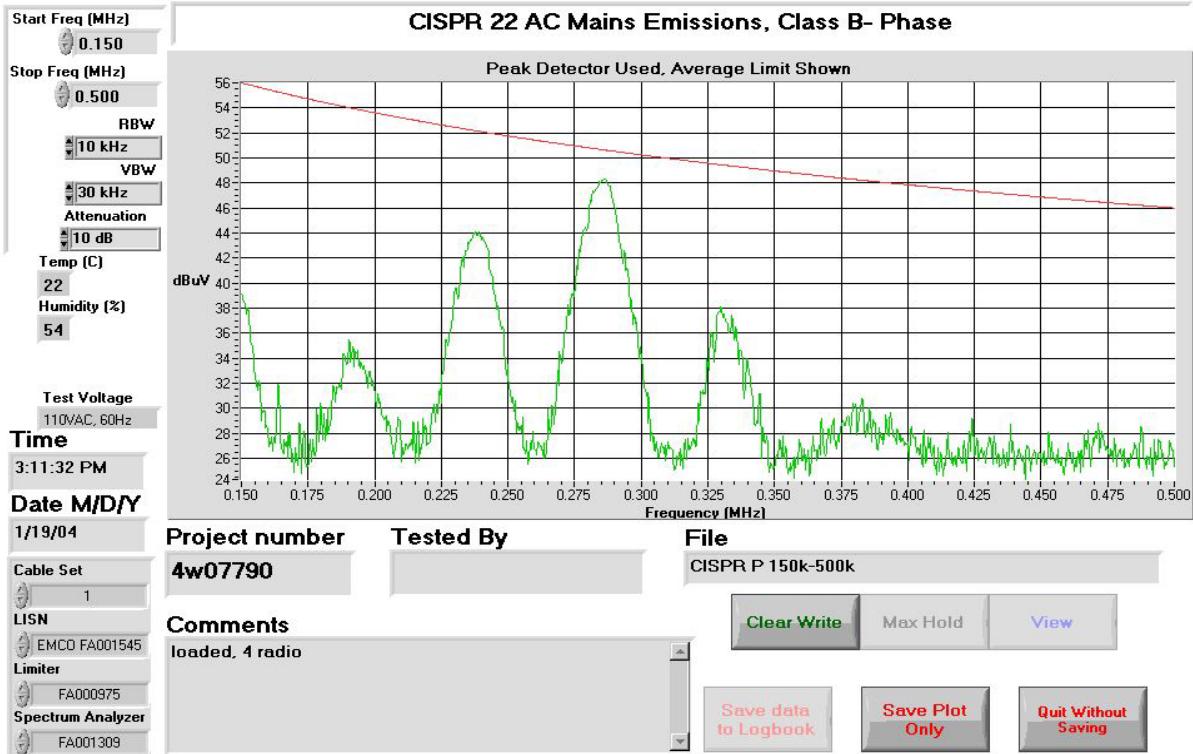
EQUIPMENT: BEL20005



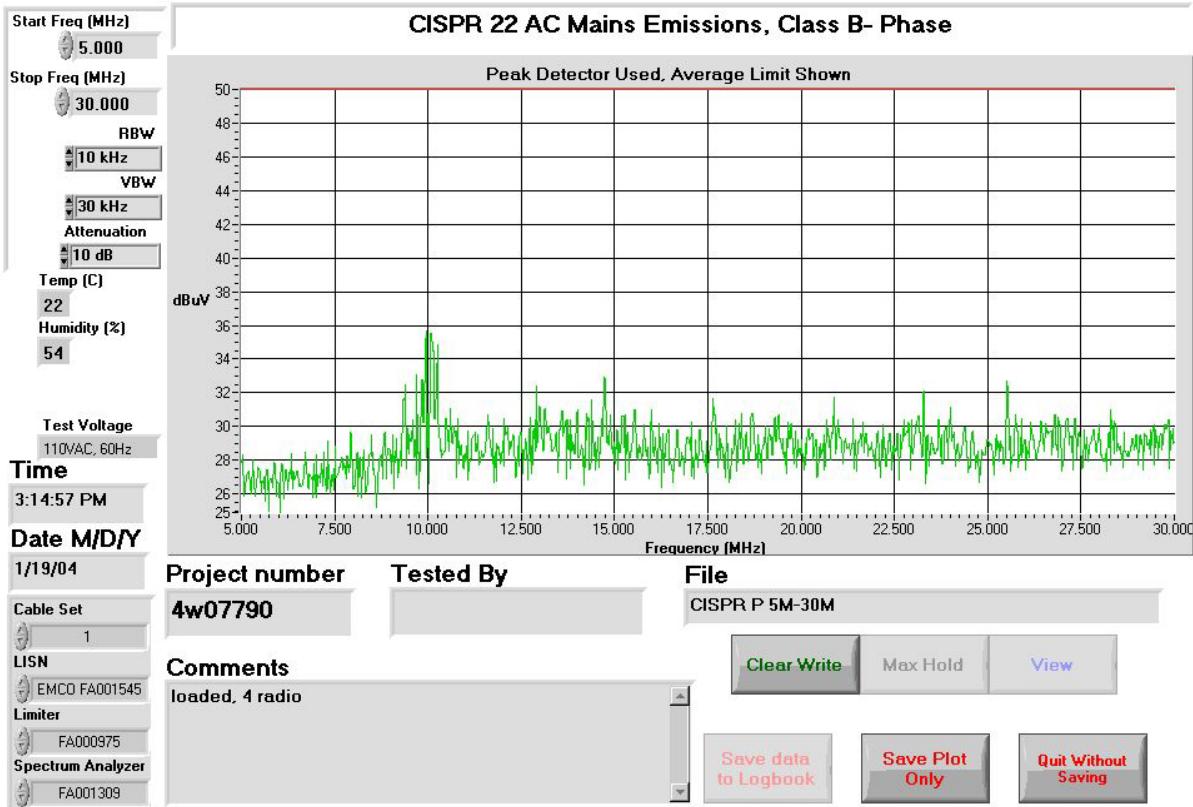
EQUIPMENT: BEL20005



EQUIPMENT: BEL20005



EQUIPMENT: BEL20005



Set Up Photo.



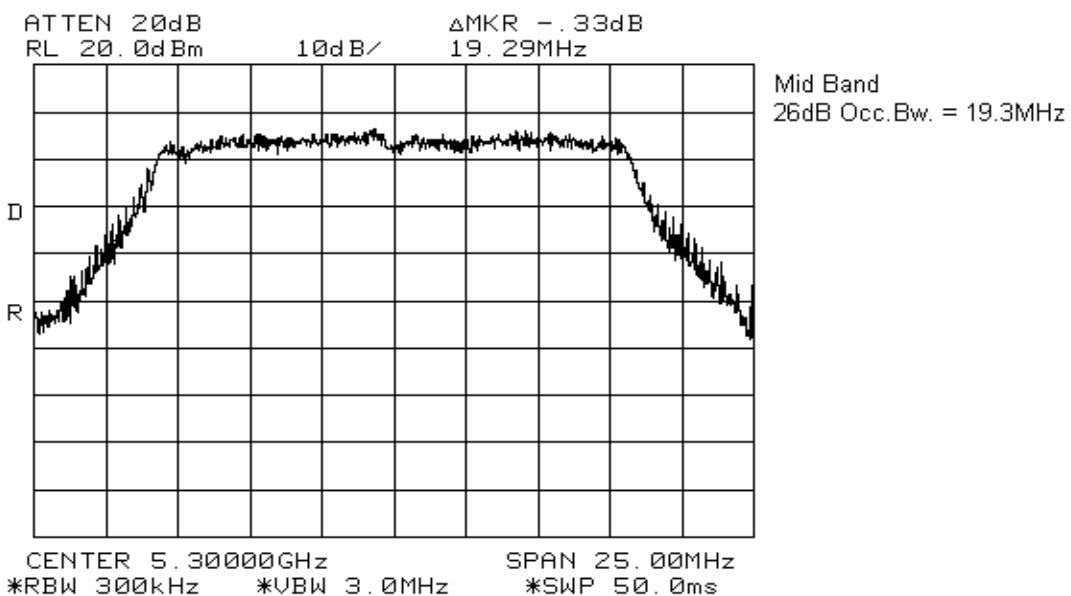
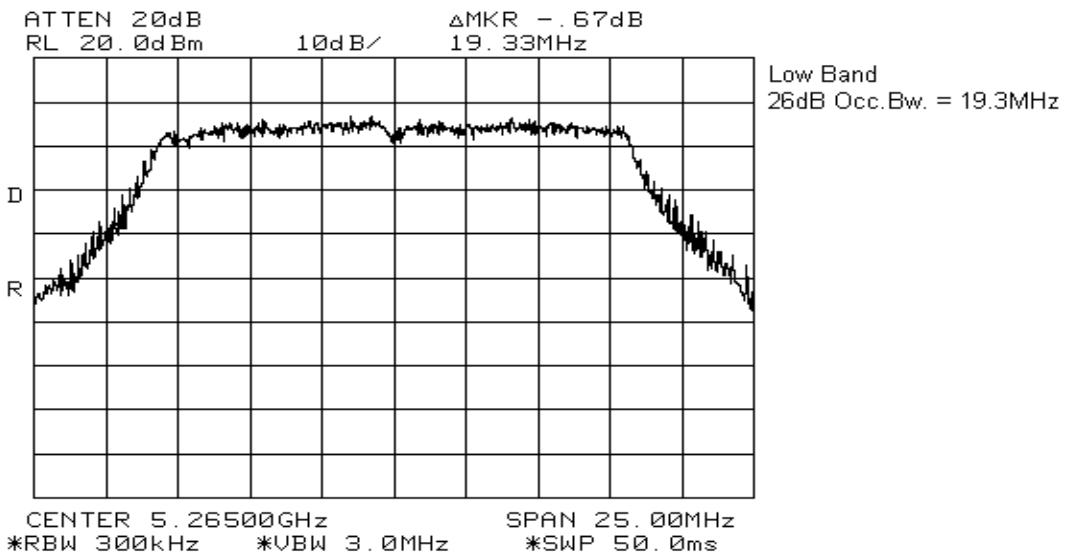
Section 5. Emission Bandwidth**Para. No.: 15.403(c)**

Test Performed By: Glen Westwell	Date of Test: 19 Jan. 2004
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Test Results: Complies**Measurement Data:** See Attached Plots.

Emission Bandwidth (EBW)			
Frequency (U-NII 2)	5265MHz	5300MHz	5335MHz
	19.3MHz	19.3MHz	19.3MHz
Frequency (U-NII 3)	5740MHz	5775MHz	5810MHz
	19.8MHz	19.7MHz	19.6MHz

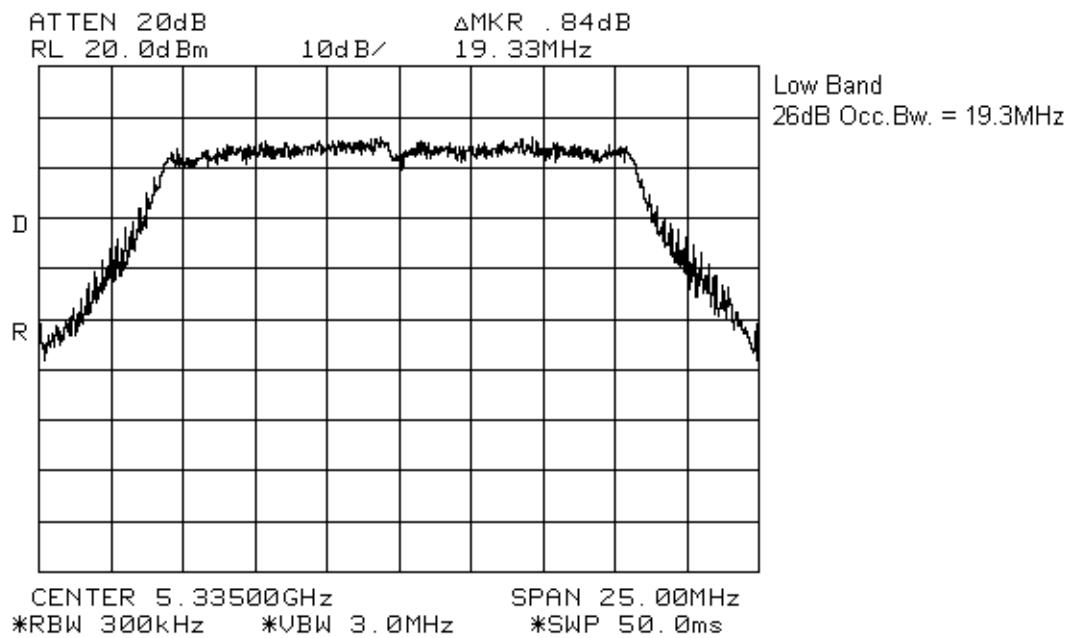
EQUIPMENT: BEL20005

U-NII Band 5.25-5.35GHz

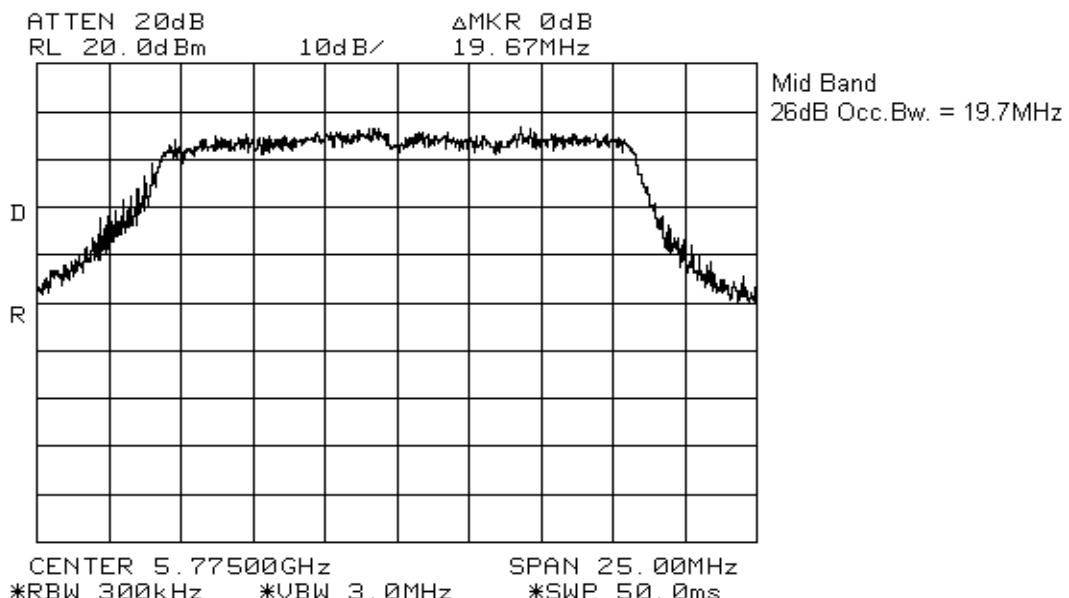
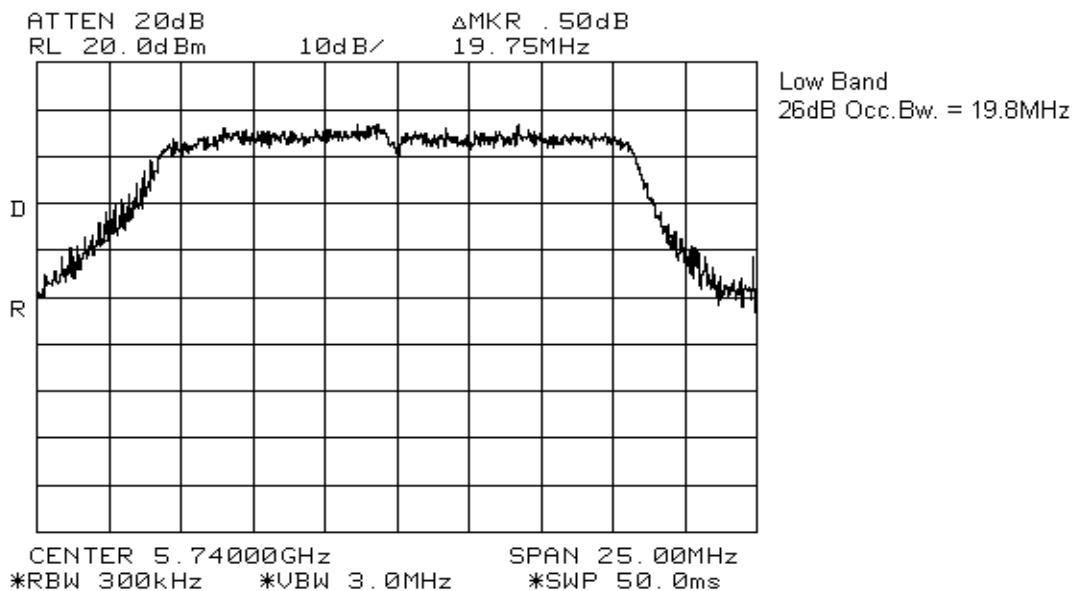
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PROJECT NO.:4W07790

EQUIPMENT: BEL20005



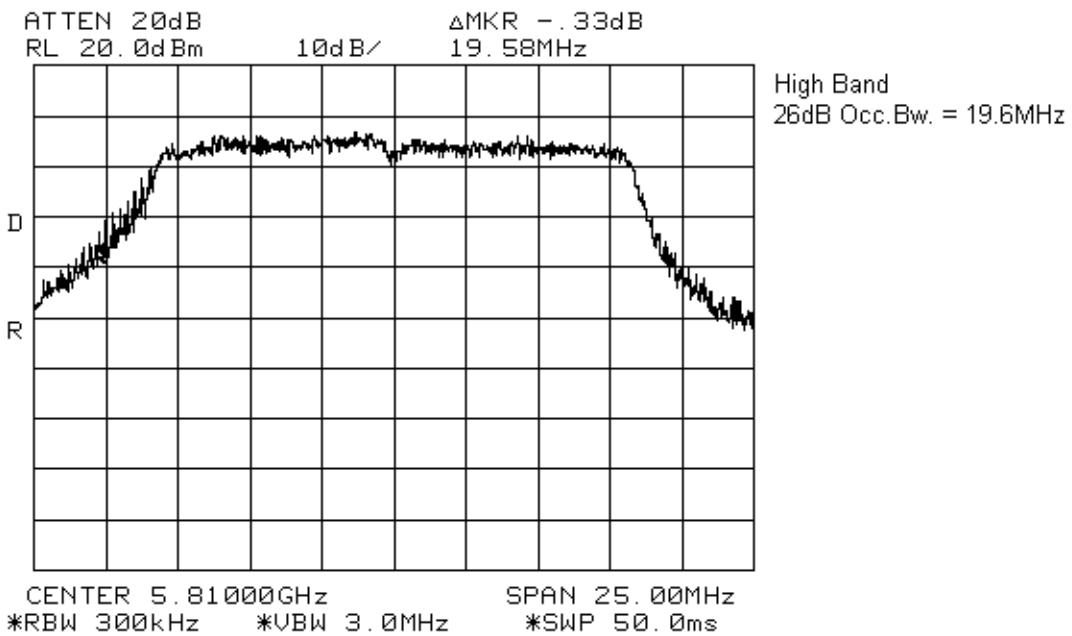
EQUIPMENT: BEL20005

U-NII Band 5.725-5.825GHz

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PROJECT NO.:4W07790

EQUIPMENT: BEL20005



Section 6. Peak Conducted Transmit Power

Para. No.: 15.407(a)(2)(3),

Test Performed By: Glen Westwell	Date of Test: 20 Jan. 2004
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Test Results: Complies.**Measurement Data:** See Attached Data
Worst case data has been presented for maximum power vs data rate.

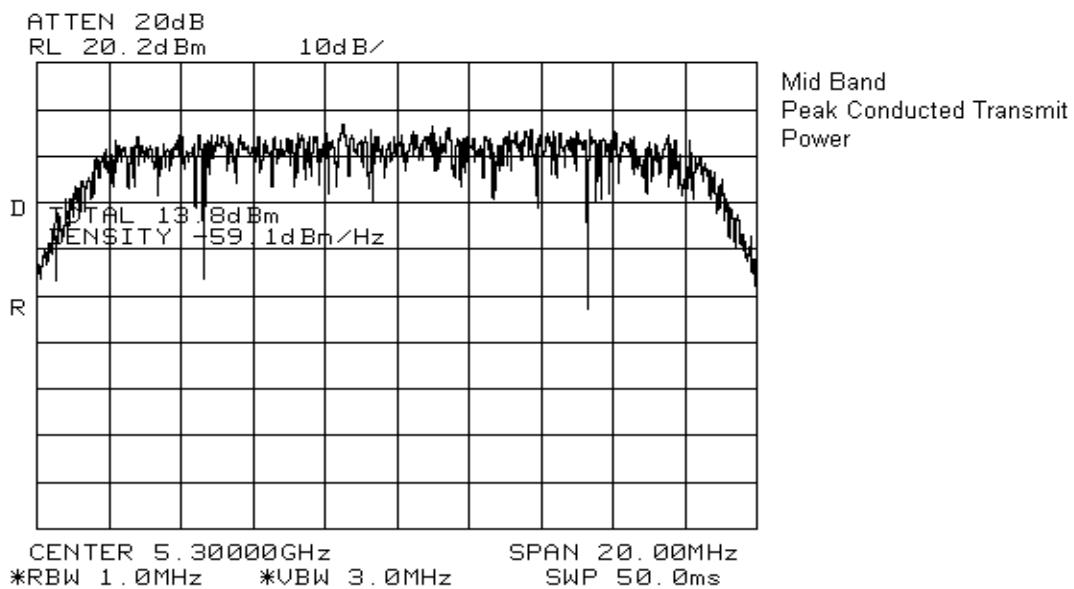
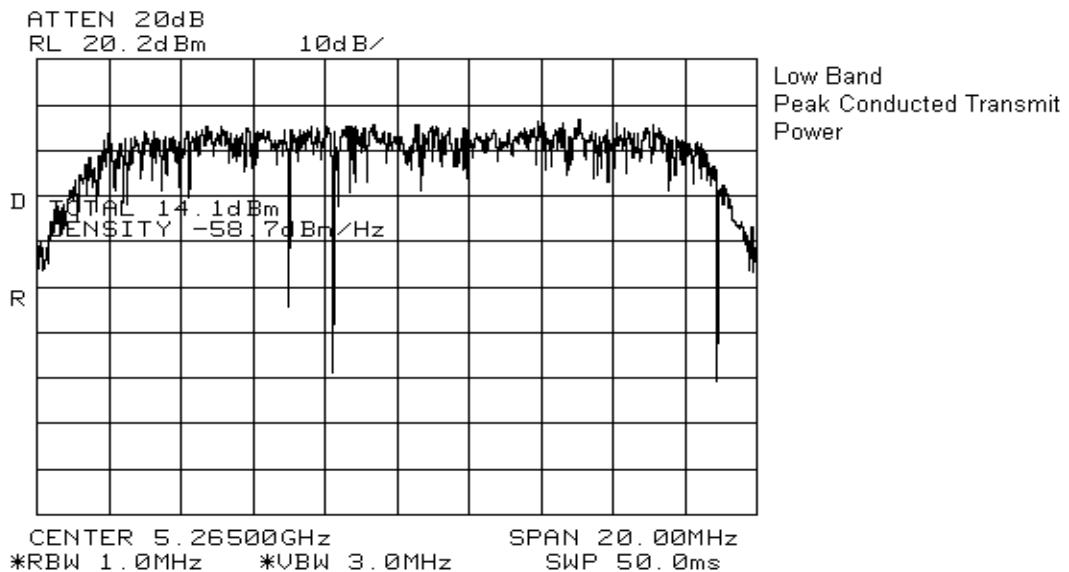
Ref: DA 02-2138 Method 1.

15.407 General Technical Requirements – Peak Transmit Power		
U-NII Band 2 (MHz)	Measured Across EBW (dBm)	Limit (dBm)
5265	14.1	24
5300	13.8	24
5335	13.8	24

U-NII Band 3 (MHz)	Measured Across EBW (dBm)	Limit (dBm)
5740	13.9	30
5775	14.0	30
5810	13.9	30

EQUIPMENT: BEL20005

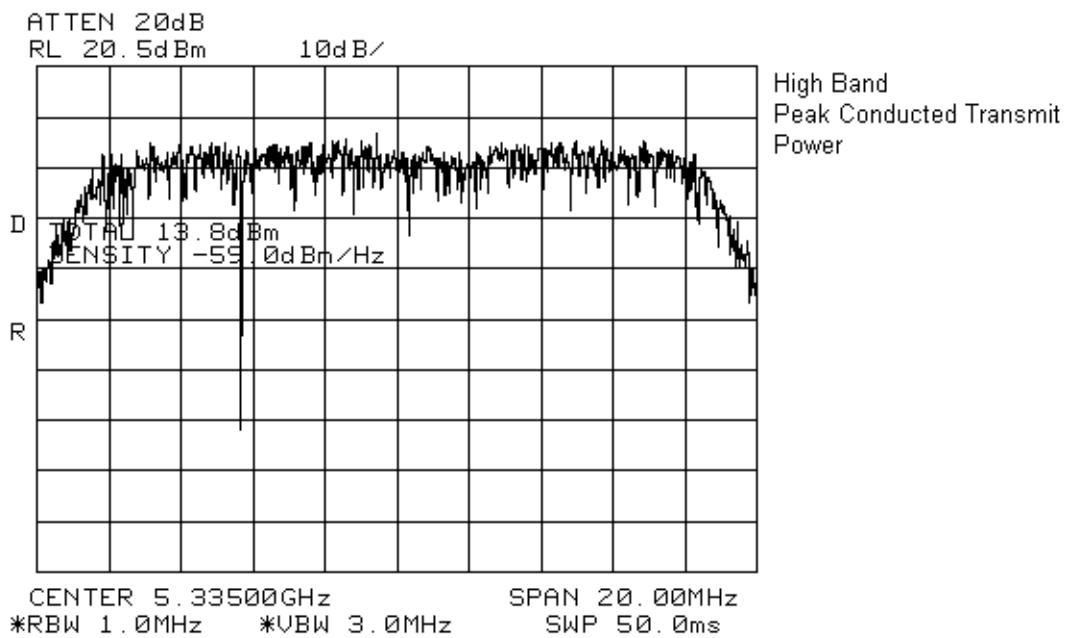
U-NII 2



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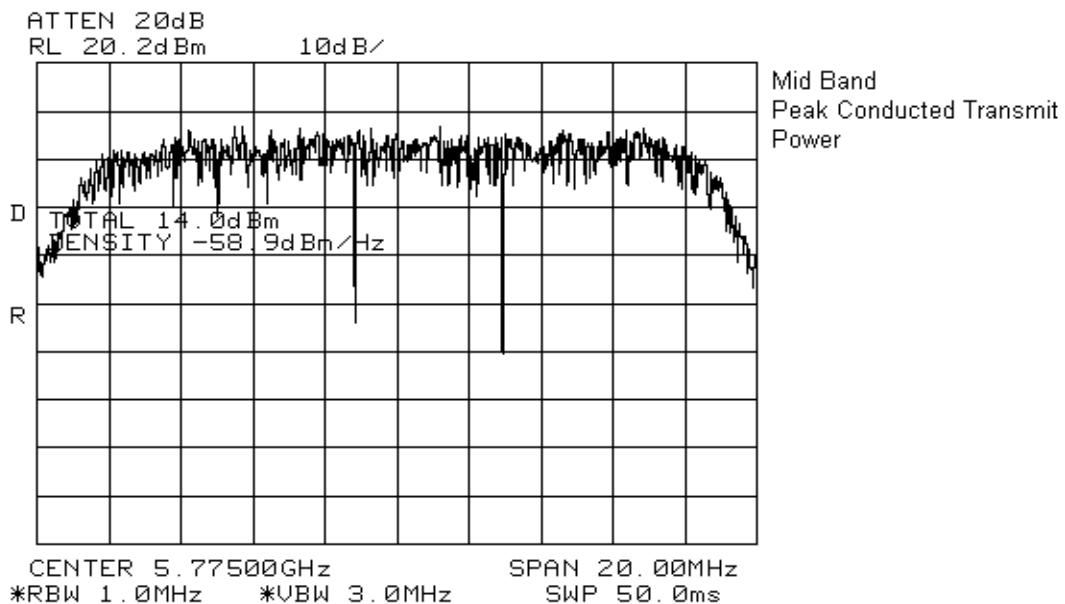
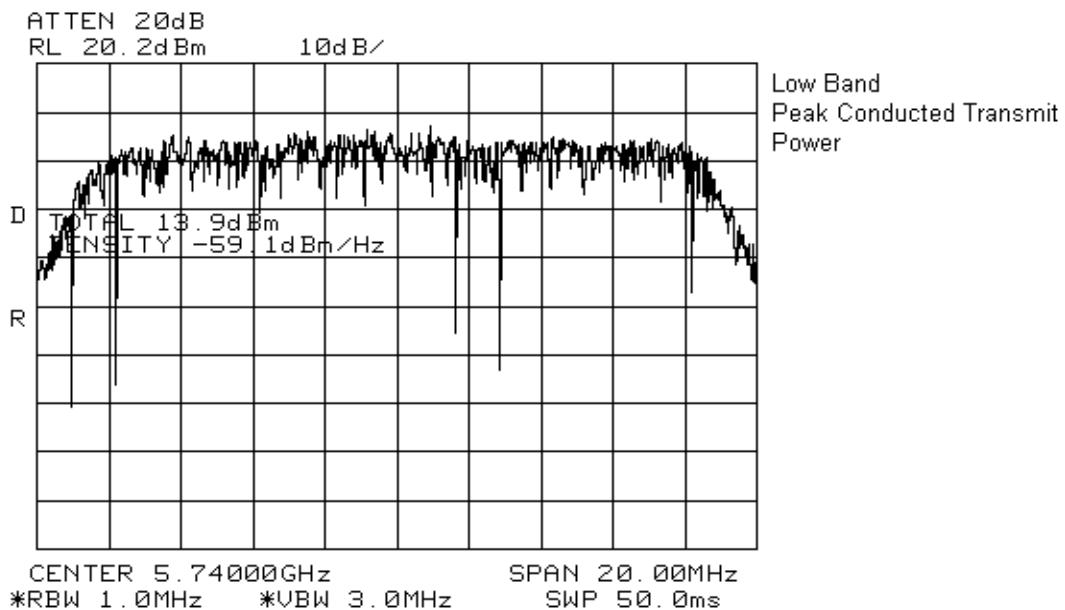
FCC PART 15, SUBPART E
PROJECT NO.:4W07790

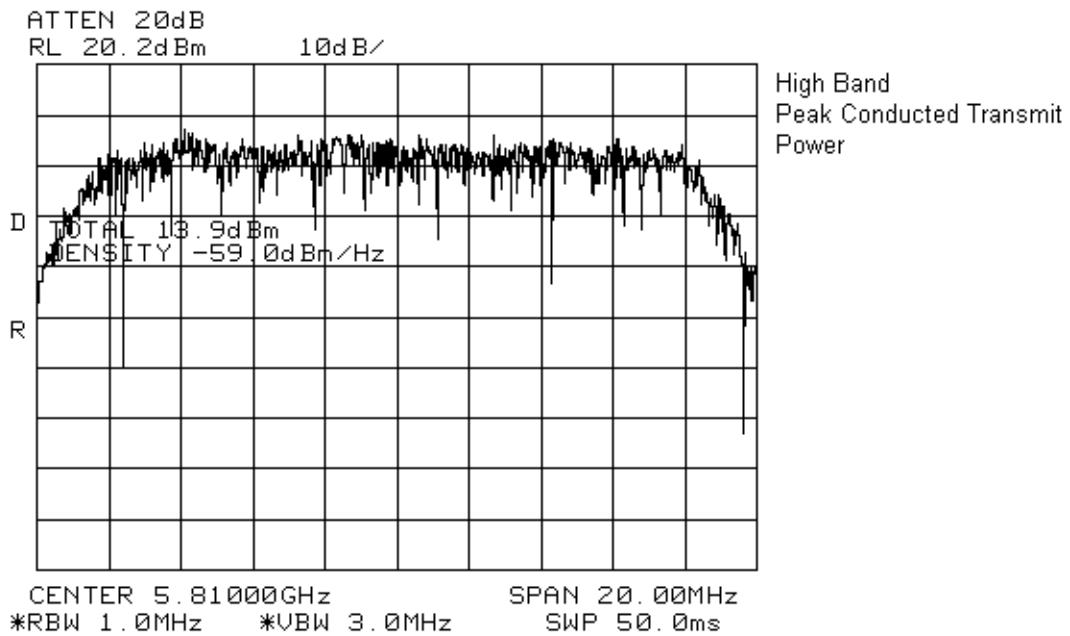
EQUIPMENT: BEL20005



EQUIPMENT: BEL20005

U-NII 3



EQUIPMENT: BEL20005

Section 7. Peak Power spectral density**Para. No.: 15.407(a)(2)(3)**

Test Performed By: Glen Westwell	Date of Test: 21 Jan 2004
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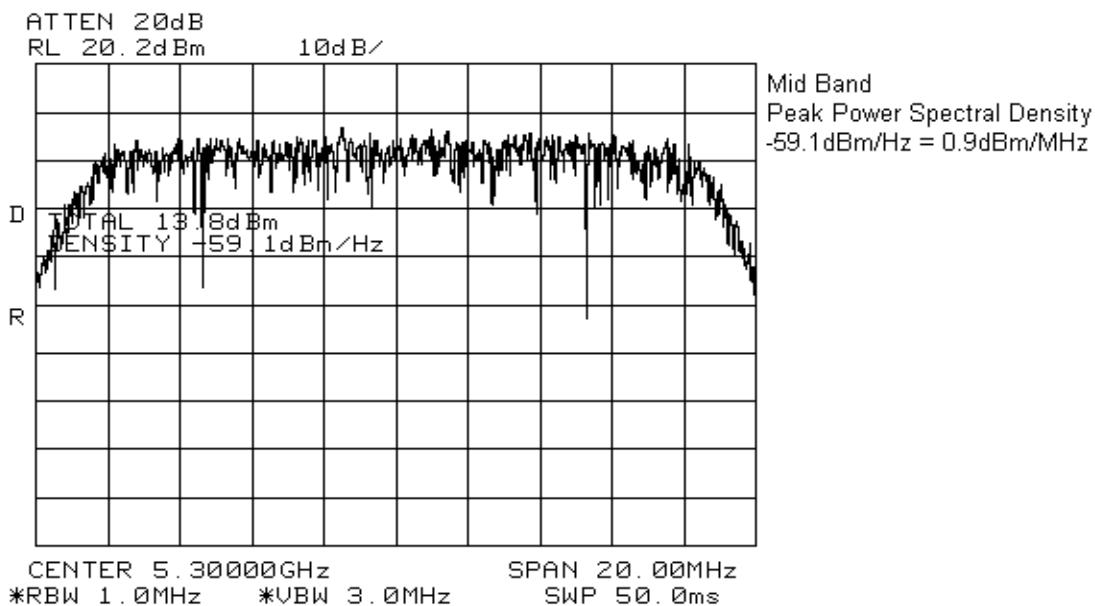
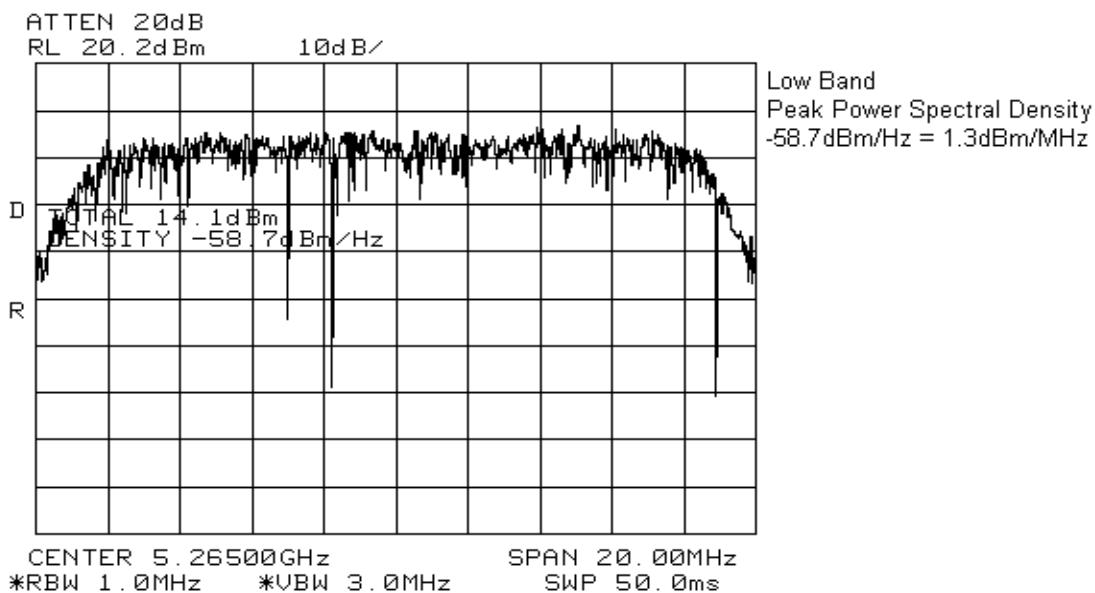
Limit: 5.25-5.35GHz, U-NII 2 = +11dBm/MHz
5.725-5.825GHz, U-NII 3 = +17dBm/MHz**Test Results:** Complies.**Measurement Data:** See attached plots.

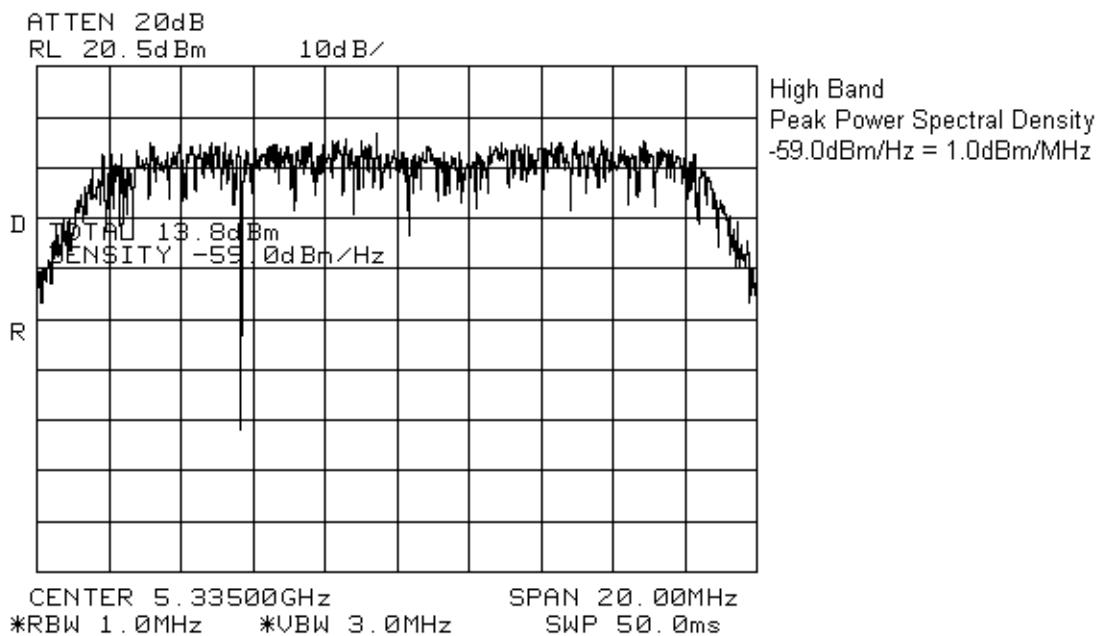
Ref: DA 02-2138 Method 2.

PPSD Measurements	
Frequency (MHz)	Density (dBm/MHz)
5265	1.3
5300	0.9
5335	1.0
5740	0.9
5775	1.1
5810	1.0

EQUIPMENT: BEL20005

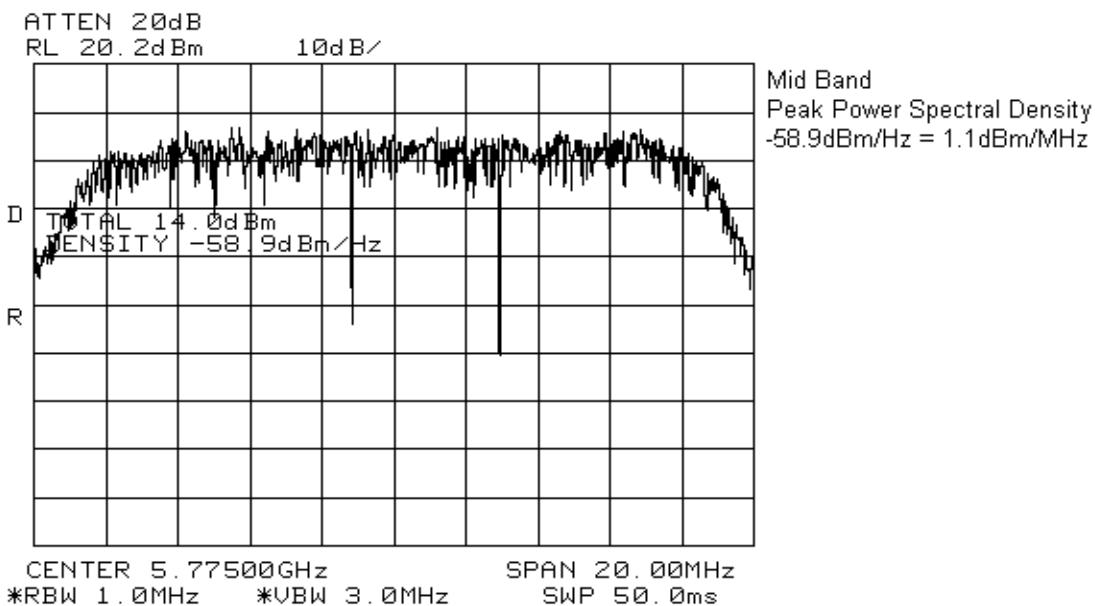
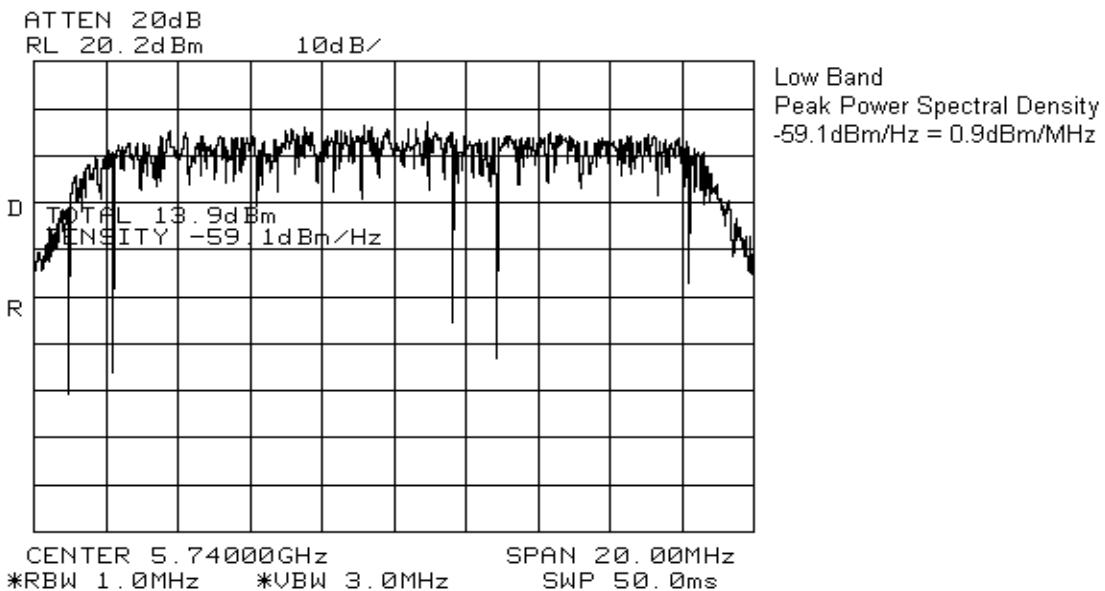
U-NII 2

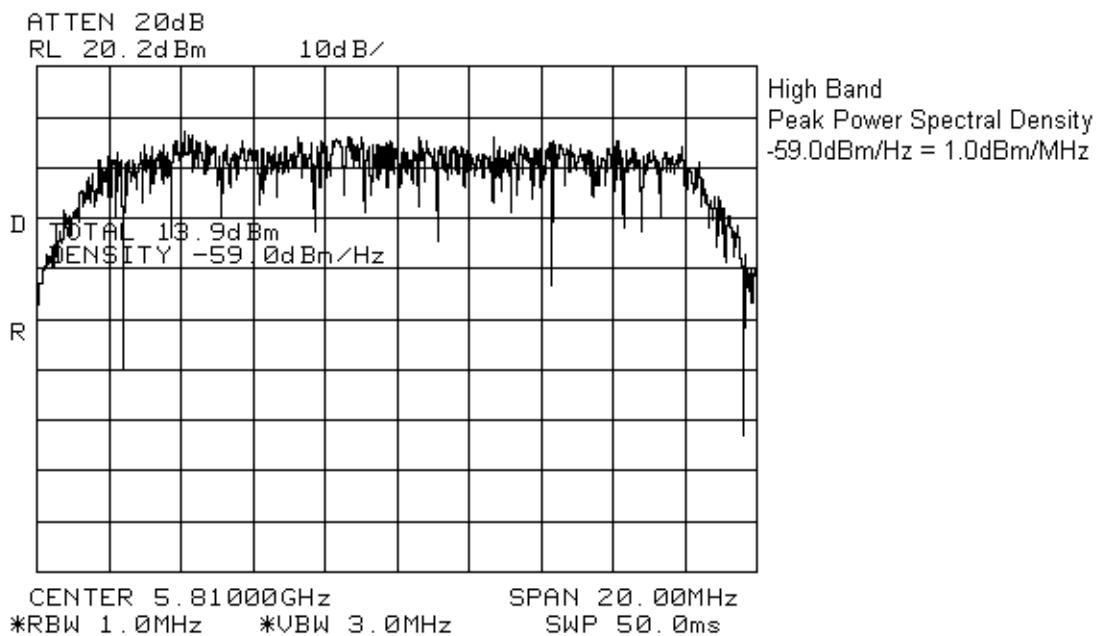


EQUIPMENT: BEL20005

EQUIPMENT: BEL20005

U-NII 3



EQUIPMENT: BEL20005

Section 8. Peak Excursion Measurement**Para. No.: 15.407(a)(6)**

Test Performed By: Glen Westwell	Date of Test: 22 Jan.2004
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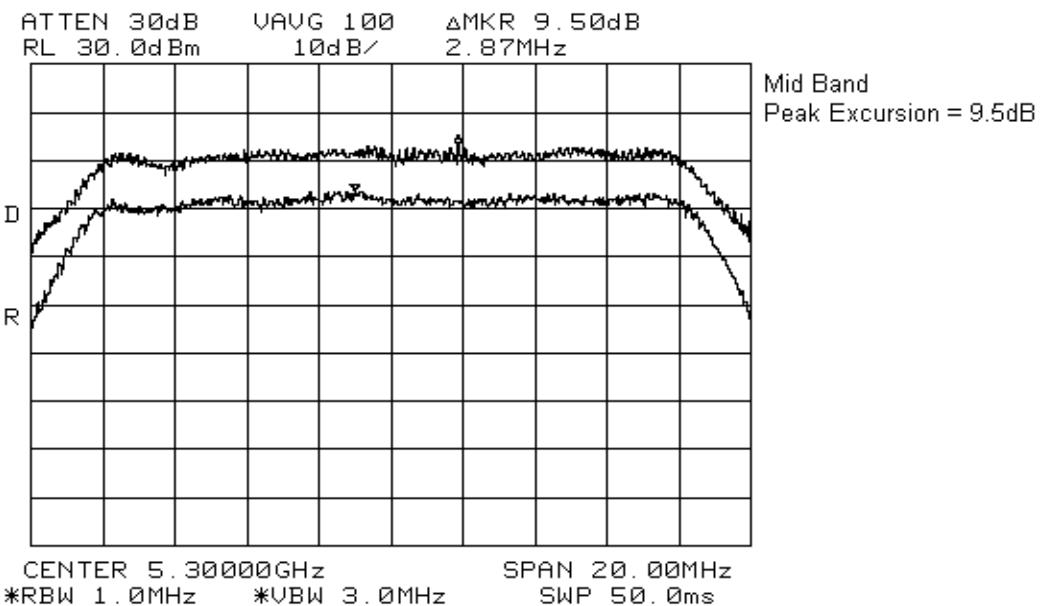
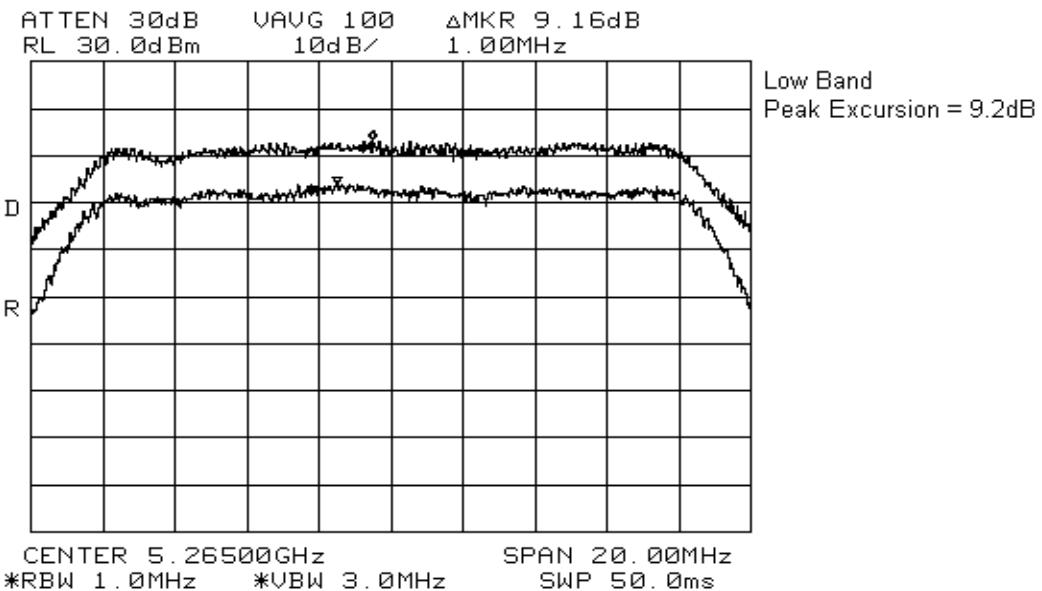
Limit: $\leq +13\text{dB}$ **Test Results:** Complies**Measurement Data:** See attached plots.

Ref: DA 02-2138.

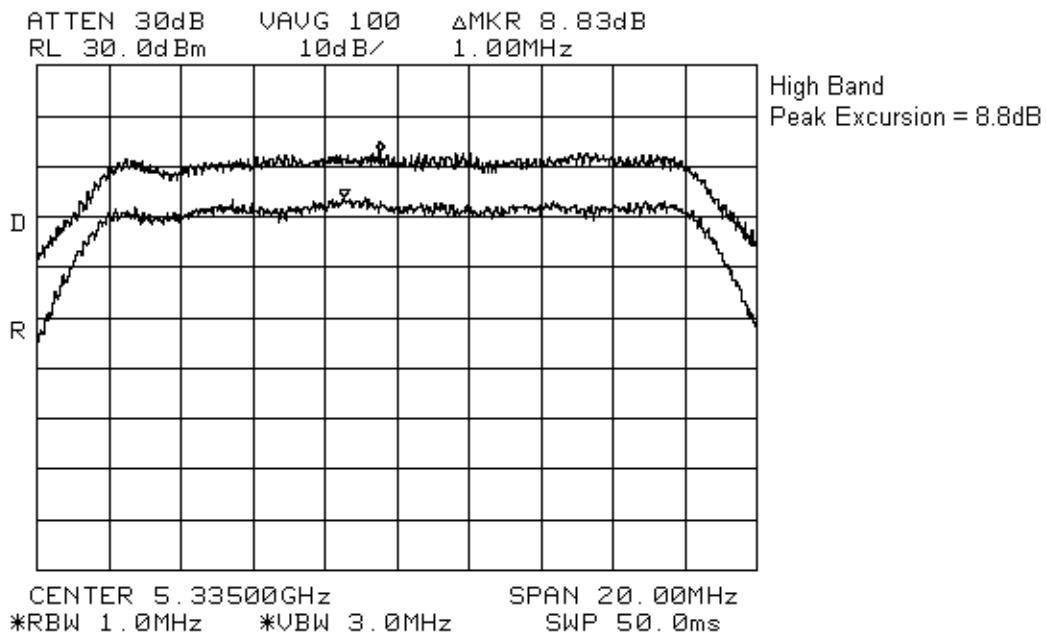
Frequency (MHz)	Modulation Envelope Peak Excursion Ratio (dB)	Limit (dB)
5265	9.2	13
5300	9.5	13
5335	8.8	13
5740	9.0	13
5775	8.7	13
5810	9.7	13

EQUIPMENT: BEL20005

U-NII 2

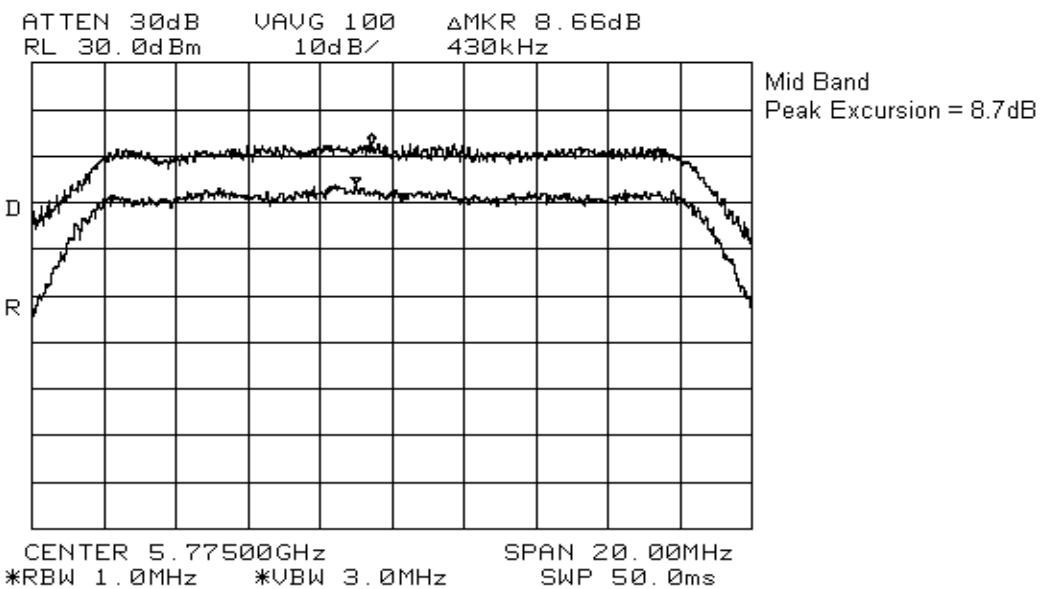
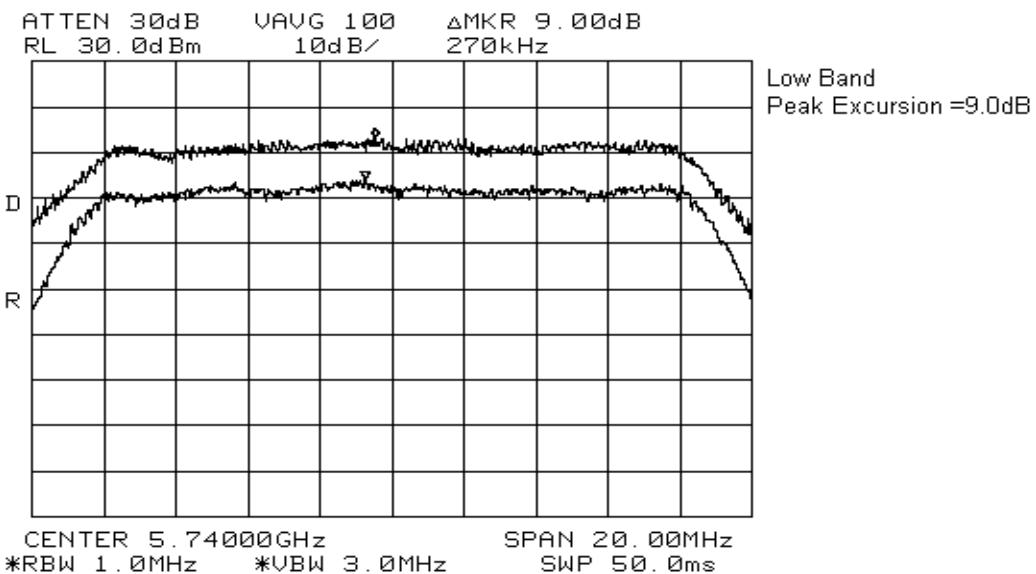


EQUIPMENT: BEL20005



EQUIPMENT: BEL20005

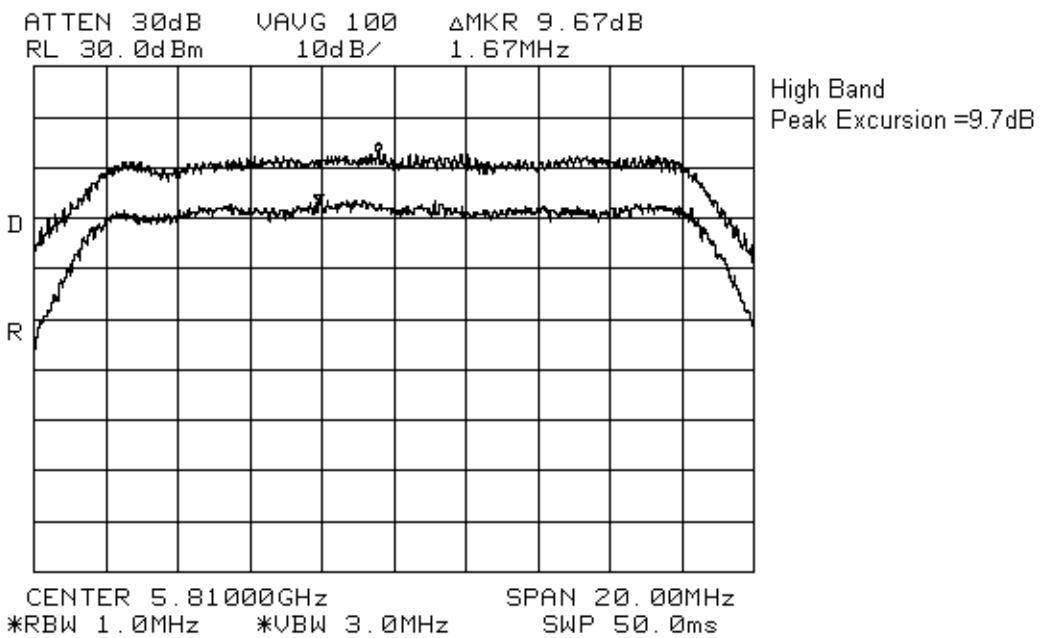
U-NII 3



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Section 9. Undesirable Emissions**Para. No.: 15.407(b)(2)**

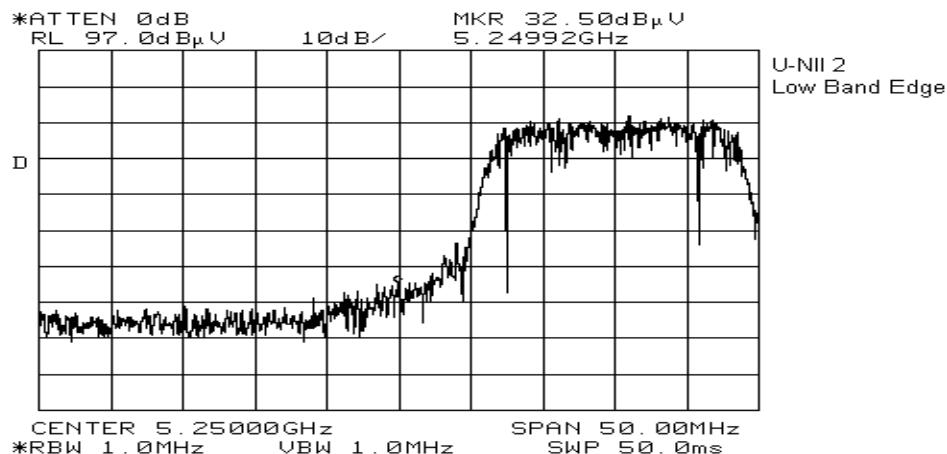
Test Performed By: Glen Westwell	Date of Test: 19 Jan. 2004
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Test Results: Complies**Measurement Data:** See attached plots and table.

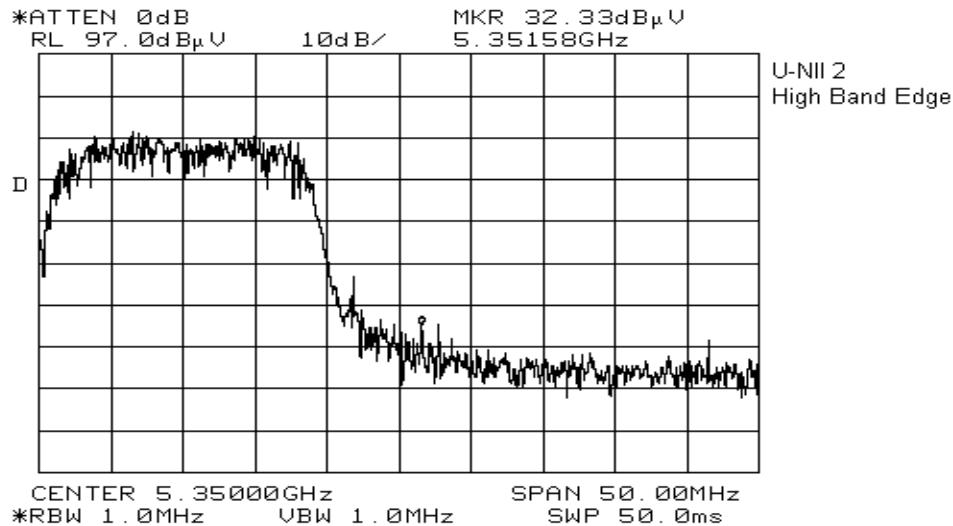
- Emissions were searched for all possible configurations. Worst case data has been presented.
- The DUT was searched from 30MHz to the 10th harmonic. Only those emissions within 20dB of the limit were reported.
- Bandedge emissions were measured at the lowest and highest operating frequencies.
- The power supply source was varied +/-15% to verify worst case emissions.
- Where necessary radiated emissions search were performed at 1 meter to achieve receiver sensitivity.

EQUIPMENT: BEL20005

Band Edge Level (dBuV)	Signal Substitution Level (dBm)	Antenna Gain (dBi)	Emission Power Level (dBm)	Limit (dBm)
32.5dBuV	-40.1	10.8	-29.3	-27.0

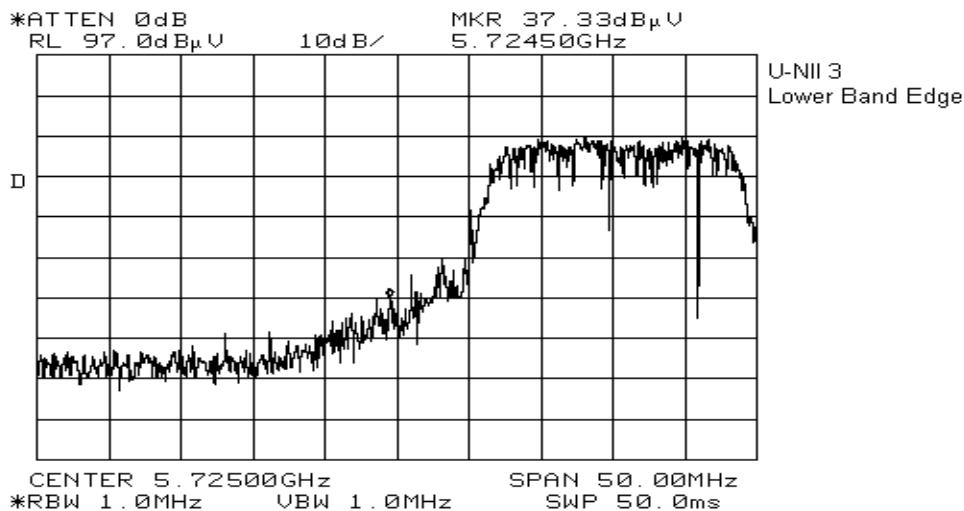


Band Edge Level (dBuV)	Signal Substitution Level (dBm)	Antenna Gain (dBi)	Emission Power Level (dBm)	Limit (dBm)
32.3dBuV	-41.3	10.8	-30.5	-27.0

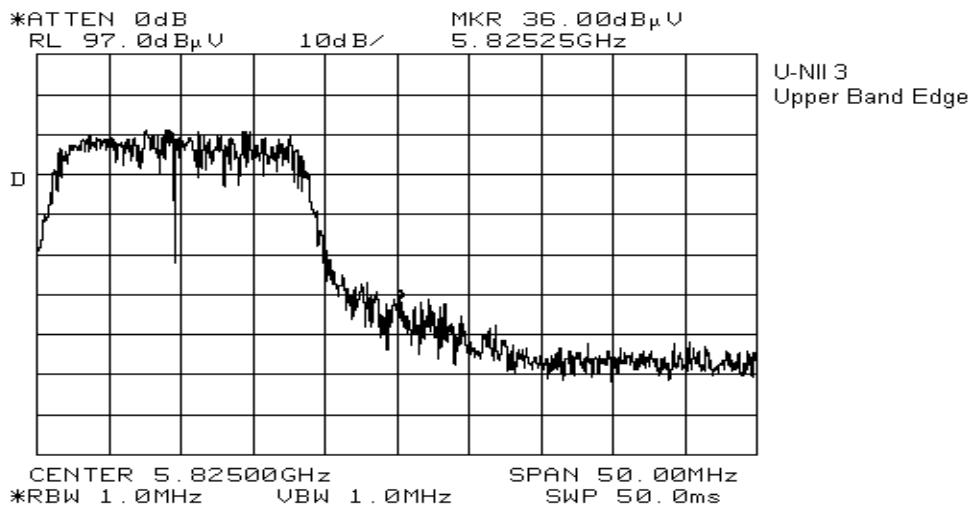


EQUIPMENT: BEL20005

Band Edge Level (dBuV)	Signal Substitution Level (dBm)	Antenna Gain (dBi)	Emission Power Level (dBm)	Limit (dBm)
37.3dBuV	-35.7	10.8	-24.9	-17.0



Band Edge Level (dBuV)	Signal Substitution Level (dBm)	Antenna Gain (dBi)	Emission Power Level (dBm)	Limit (dBm)
36.0dBuV	-35.8	10.8	-25.0	-17.0



EQUIPMENT: BEL20005

Radiated Disturbance Test Data:

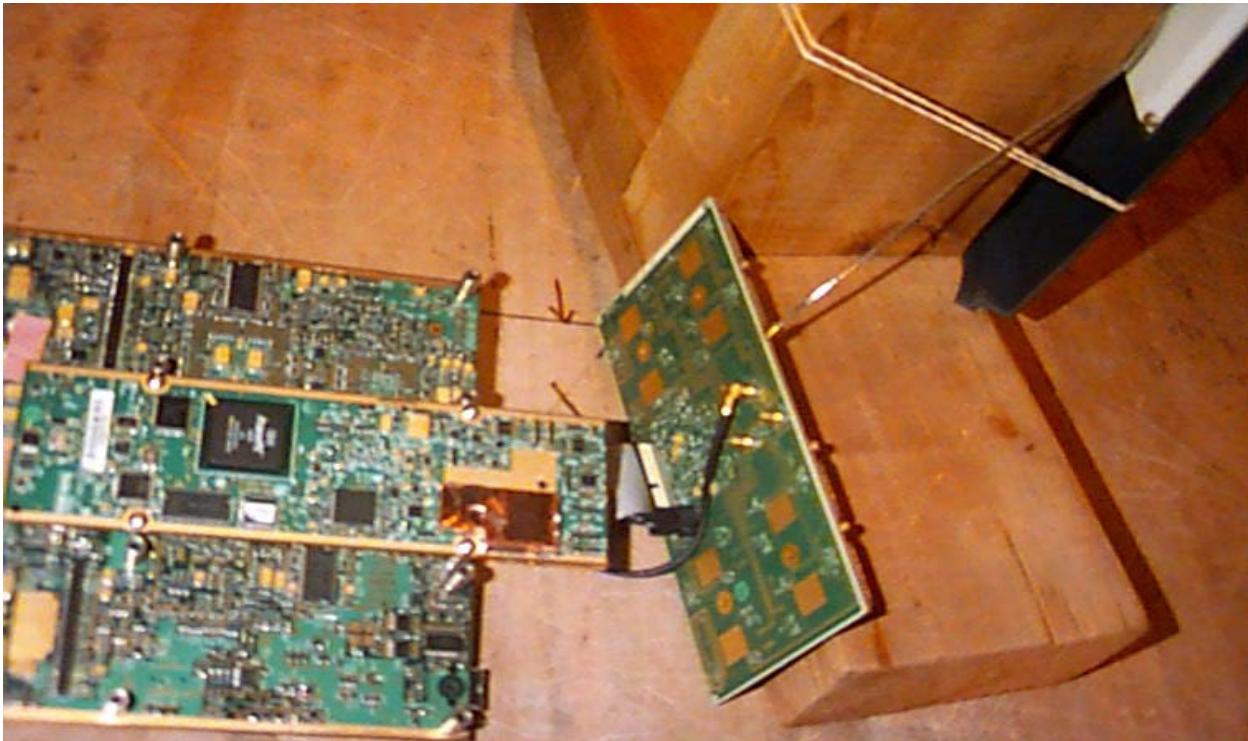
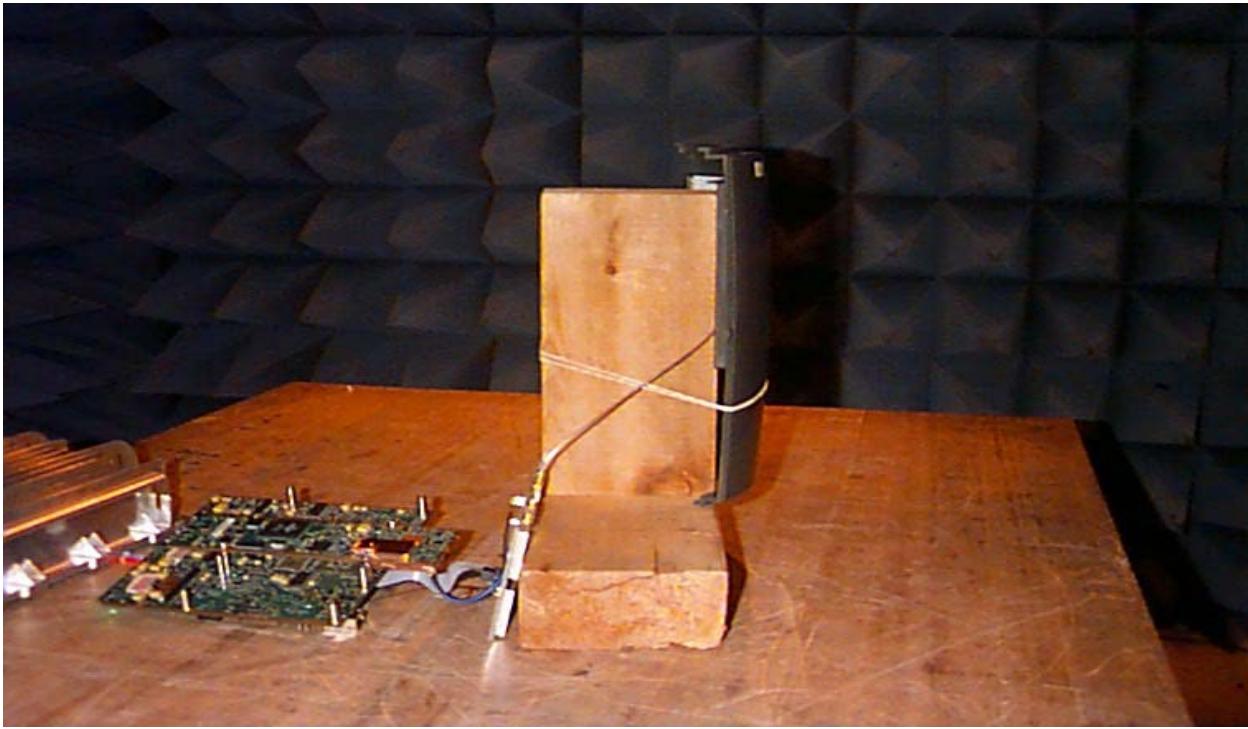
Test Date: 28 Jan. 2004											
Engineer's Name: Glen Westwell											
Temperature (C°): +7						Humidity %: 49					
Test Distance (meters): 3						Dome: 1					
Freq. (MHz)	Ant.	Pol. V/H	RCVD Signal (dB μ V)	Ant. Factor (dB)	Amp. Gain (dB)	Cable Loss (dB)	Field Strength (dB μ V/m)	Limit (dB μ V/m)	Margin (dB)	Detector	Amp.
40.0000	BC1	V	14.8	10.4	N/A	0.8	26.0	40.0	14.0	Q-Peak	N/A
40.0000	BC1	H	17.3	11.5	N/A	0.8	29.6	40.0	10.4	Q-Peak	N/A

Note 1: Antenna Legend: BC = Biconical, BL = Bilog, LP = Log-Periodic, Horn = Horn, ED = EMCO Dipole
Note 2: Detector Legend: Q-Peak = 120 kHz RBW, Average = 1.0 MHz RBW

Radiated Disturbance Detailed Setup Photos:



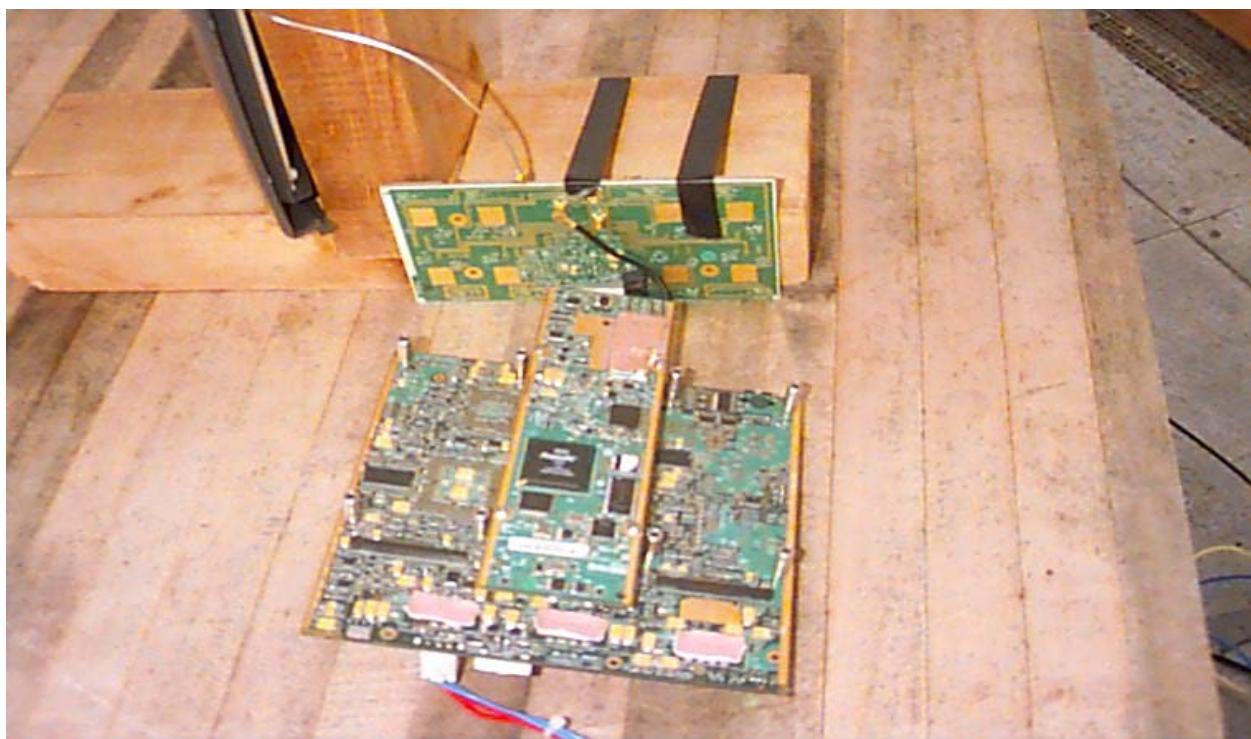
Radiated Disturbance Detailed Setup Photos:

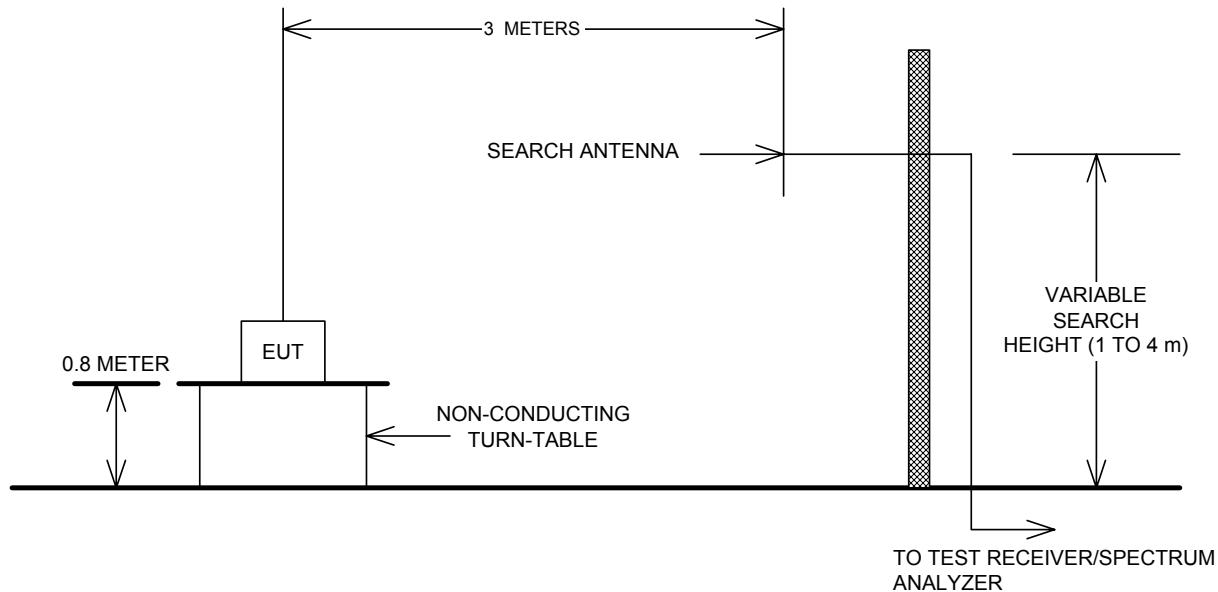
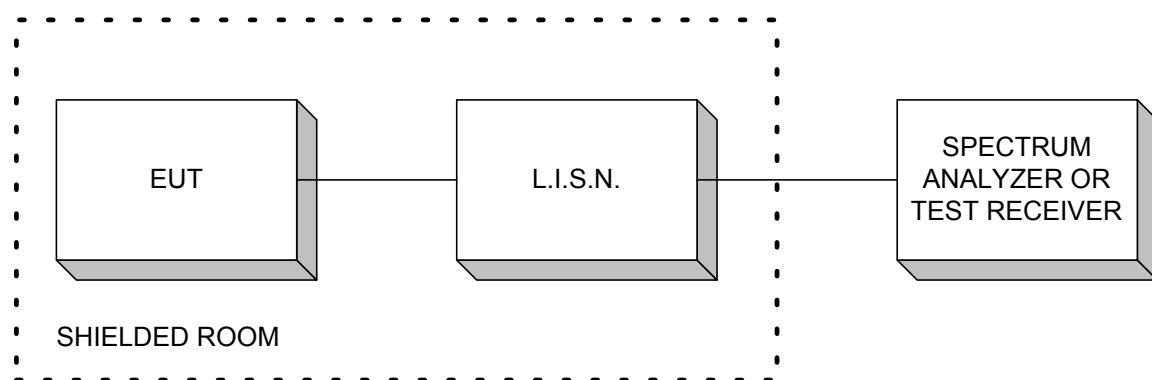


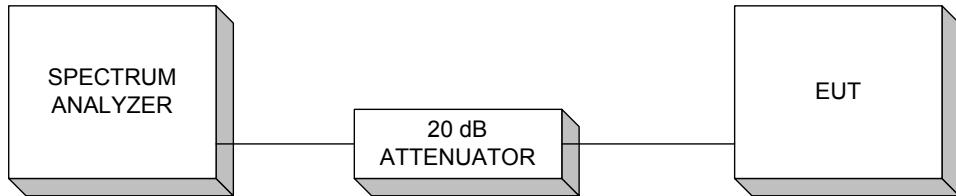
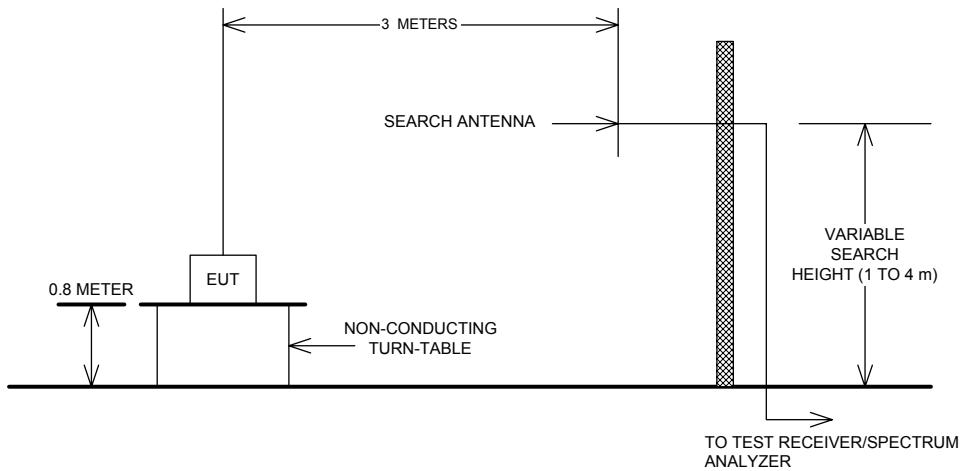
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EQUIPMENT: BEL20005



Section 10. Block Diagrams**Test Site For Radiated Emissions****Conducted Emissions**

**Transmitter Power Density & Peak Power At Antenna Terminals
Conducted Measurements****TIA/EIA 603, Signal Substitution Method**

Section 11. 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	Spectrum Analyzer	Hewlett Packard	8565E	FA000981	03 Jul 03	03 Jul 04
3 Year	Signal Generator	Rhode & Schwarz	SM1Q03E	FA001269	06 Dec 02	06 Dec 05
1 Year	Power Meter	Hewlett Packard	E4418B	FA001413	08 May 03	08 May 04
1 Year	Power Sensor	Hewlett Packard	8487A	FA001419	15 May 03	15 May 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	High Pass Filter (6.7GHz)	Dorado	WR90	20.806	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	Horn Antenna	EMCO #5	3116	FA001847	13 Feb 03	13 Feb 04
1 Year	Signal Generator	Hewlett Packard	8673B	FA001134	COU	COU
1 Year	Receiver	Rohde & Schwarz	ESVS-30	FA001437	July. 24/03	July. 24/04
1 Year	Biconical (1) Antenna	EMCO	3109	FA000805	April. 15/03	April. 15/04
1 Year	Log Periodic Antenna #1	EMCO	LPA-25	FA000477	Sept. 02/03	Sept. 02/04
1 Year	Diplexer	Olsen - OML	DPL.26 (H.P.)		COU	COU
1 Year	Mixer/Antenna 40-60Ghz	Olsen - OML	M19HWA (H.P.)		COU	COU
1 Year	LISN	EMCO	4825/2	FA001545	Oct. 30/03	Oct. 30/04
1 Year	Spectrum Analyzer	Hewlett-Packard	8566B	FA001309	June. 05/03	June. 05/04
1 Year	Spectrum Analyzer Display	Hewlett-Packard	85662A	FA001309	June. 05/03	June. 05/04
NCR	Bilog	Schaffner	CBL6112B	FA001504	NCR	NCR

NA: Not Applicable

NCR: No Cal Required

COU: CAL On Use