



Test Report: 5W53075 Issue 2


Applicant: CommScope, Inc of North Carolina
1100 CommScope Place SE
Hickory, North Carolina
28603-1729

Apparatus: CommScope AirBridge Access Point
(M/N: AP5800)

FCC ID: TOU-AIRBRIDGE-AP

In Accordance With: FCC Part 15 Subpart E, 15.407
Unlicensed National Information Infrastructure
Devices

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

Authorized By: 
Sim Jagpal, Resource Manager

Date: 31 October 2005

Total Number of Pages: 32

Report Summary

These tests were conducted on a sample of the equipment for the purpose of demonstrating compliance with Part 15, Subpart E, 15.407. Radiated tests were conducted in accordance with ANSI C63.4-2003. Radiated emissions are made on an open area test site. A description of the test facility is on file with the FCC.

The assessment summary is as follows:

Apparatus Assessed:	CommScope AirBridge Access Point (M/N: AP5800)
Specification:	FCC Part 15 Subpart E, 15.407
Compliance Status:	Complies
Exclusions:	None
Non-compliances:	None
Report Release History:	Issue 2: Updated product descriptions

Author: Jason Nixon, Telecom Specialist
Jin Xu, Wireless Specialist

Note that the results contained in this report relate only to the items tested and were obtained in the period between the date of initial receipt of samples and the date of issue of the report.

This test report has been completed in accordance with the requirements of ISO/IEC 17025.

Nemko Canada Inc. authorizes the applicant to reproduce this report provided it is reproduced in its entirety and for use by the company's employees only.

Any use which a third party makes of this report, or any reliance on or decisions to be made based on it, are the responsibility of such third parties. Nemko Canada Inc. accepts no responsibility for damages, if any, suffered by any third party as a result of decisions made or actions based on this report.

TABLE OF CONTENTS

Report Summary	2
Section 1 : Equipment Under Test	4
1.1 Product Identification	4
1.2 Samples Submitted for Assessment.....	4
1.3 Theory of Operation	4
1.4 Technical Specifications of the EUT	5
1.5 Block Diagram of the EUT.....	5
Section 2 : Test Conditions	6
2.1 Specifications	6
2.2 Deviations From Laboratory Test Procedures	6
2.3 Test Environment	6
2.4 Test Equipment.....	6
Section 3 : Observations	7
3.1 Modifications Performed During Assessment	7
3.2 Record Of Technical Judgements	7
3.3 EUT Parameters Affecting Compliance	7
3.4 Test Deleted.....	7
3.5 Additional Observations	7
Section 4 : Results Summary	8
4.1 FCC Part 15 Subpart E : Test Results.....	9
Appendix A : Test Results	10
Clause 15.209(a) Radiated Emissions within Restricted Bands	10
Clause 15.403(i) Emission Bandwidth	11
Clause 15.407(a)(3) Power Limits in the 5.725 to 5.825GHz band.....	14
Clause 15.407(b) Spurious Emissions	21
Clause 15.407(a)(6) Peak Excursion Measurement.....	25
Clause 15.31 Power Supply Variation.....	29
Appendix B : Setup Photographs	30
Appendix C : Block Diagram of Test Setups	31

Section 1 : Equipment Under Test

1.1 Product Identification

The Equipment Under Test was identified as follows:

CommScope AirBridge Access Point (M/N: AP5800)

1.2 Samples Submitted for Assessment

The following samples of the apparatus have been submitted for type assessment:

Sample No.	Description	Serial No.
2	5.8 GHZ Strand Mount Transceiver	381353
4	CATV Diplexer	EDPF-42/54
5	Power Inserter	N.A.
9	VCom VMTS1200 DOCSIS Cable Modem Termination System	N.A.

The first samples were received on: October 11, 2005

1.3 Theory of Operation

The AirBridge AP5800 Strand Radio is a wireless access solution to extend DOCSIS service via strand and pole mount access points. The complete radio system consists of an Access Point (AP) and a Subscriber Unit (SU). The AP mounts to the strand (CATV cable) and provides a point-to-multipoint radio link in the 5.8 GHz unlicensed UNII band to subscriber units located up to 2 miles away.

The Strand Radio provides a wireless entry point to the HFC (hybrid fiber/coax) network, extending access to locations that may otherwise be unable to connect to the system.

The AirBridge Access Point is a rugged and weather-proof unit containing an integrated antenna, receiver, downstream demodulator/modulator, transmitter, up-converter, down-converter and cable modem. The AP has two strand clamps designed to mount it securely on the existing wire plant's strand. It is linked into and powered by the cable system using a power-passing tap through a standard 75 Ohm cable connection. The AP's frequency and output power are readily adjustable either locally through an RS-232 connection on the rear of the device, or from remote locations such as the Headend via its internal modem. If strand mounting of the AP is not practical, pole mounting hardware is also available.

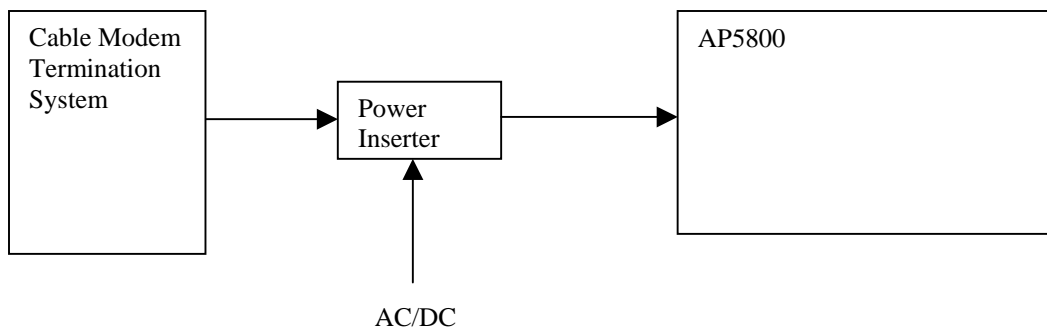
An AP operating in the 5.8 GHz unlicensed band can provide multi-point links supporting several SUs. It's downstream transmitted RF frequency may be set in the 5799 to 5823 MHz band (5802 to 5820 MHz center frequencies), allowing it to operate in one of four different 6 MHz wide channels. The AP supports both 64 and 256 QAM modulation on the downstream with an output power that is variable from +15 to +28 dBm EIRP. The AP fully demodulates the selected downstream channel from the HFC network, and then remodulates it using the same format. This ensures a top quality downstream signal independent of HFC signal quality, and permits the system to prevent transmission unless a valid signal is present. In the upstream direction the AP supports both QPSK and 16 QAM modulation, and can provide a variable gain. The AP's integrated antenna produces a polarized beamwidth of 60° horizontal and 30° vertical, giving it a wide coverage area.

1.4 Technical Specifications of the EUT

Manufacturer:	VCom Inc.
Operating Frequency:	5802 to 5820MHz
No. of Channels	4
Channel Spacing	6MHz
Emission Designator	5M9D1W
Rated Power:	16dBm *
Modulation:	64QAM at 27Mb/s, 256QAM at 38Mb/s
Antenna Data:	14dBi, Mobile Mark SCR14-5725
Antenna Connector:	Internal
Power Source:	30 to 90 VAC supplied by the Cable network.

* Manufacture’s rated power is average power measured using a wide band power meter with a thermocouple detector.

1.5 Block Diagram of the EUT



Section 2 : Test Conditions

2.1 Specifications

The apparatus was assessed against the following specifications:

FCC Part 15 Subpart E, 15.407

Unlicensed National Information Infrastructure Devices

2.2 Deviations From Laboratory Test Procedures

No deviations were made from laboratory test procedures.

2.3 Test Environment

All tests were performed under the following environmental conditions:

Temperature range	:	15 – 30 °C
Humidity range	:	20 - 75 %
Pressure range	:	86 - 106 kPa
Power supply range	:	+/- 5% of rated voltages

2.4 Test Equipment

Equipment	Manufacturer	Model No.	Asset/Serial No.	Last Cal.	Next Cal.
Spectrum Analyzer	Rohde & Schwarz	FSP	FA001920	March 22/05	March 22/06
Spectrum Analyzer	Rohde & Schwarz	FSU	FA001877	May 17/05	May 17/06
Horn Antenna #2	EMCO	3115	FA000825	Dec. 14/04	Dec. 14/05
Horn Antenna #1	EMCO	3115	FA000649	Dec. 22/04	Dec. 22/05
18.0 – 40.0GHz Horn Antenna	EMCO	3116	FA001847	April 25/05	April 25/06
5.0 – 18.0 GHz Amplifier	NARDA	DWT-186N23U40	FA001409	COU	COU
18.0 – 26.0 GHz Amplifier	NARDA	BBS-1826N612	FA001550	COU	COU
26 – 40.0 GHz Amplifier	NARDA	DBL-2640N610	FA001556	COU	COU
Signal Generator	Rhode & Schwarz	SMR 40	FA001879	July 13/05	July 13/06
Power Meter	HP	4418B	FA001678	Mar 8/05	Mar 8/06
Power Probe	HP	8487A	FA001741	May 26/05	May 26/06

* COU (Calibrate on Use)

** NCR (No Calibration Required)

Section 3 : Observations

3.1 Modifications Performed During Assessment

No modifications were performed during assessment.

3.2 Record Of Technical Judgements

The following technical judgement was made during this assessment:

3.2.1 Type of Modulation

The apparatus can be configured to use 64 QAM or 256 QAM modulation. It was judged that the results for 256 QAM would be worst case and only testing on 256 QAM was performed.

3.3 EUT Parameters Affecting Compliance

The user of the apparatus could not alter parameters that would affect compliance.

3.4 Test Deleted

No Tests were deleted from this assessment.

3.5 Additional Observations

There were no additional observations made during this assessment.

Section 4 : Results Summary

This section contains the following:

FCC Part 15 Subpart E : Test Results

The column headed 'Required' indicates whether the associated clauses were invoked for the apparatus under test. The following abbreviations are used:

- N No : not applicable / not relevant.
- Y Yes : Mandatory i.e. the apparatus shall conform to these tests.
- N/T Not Tested, mandatory but not assessed. (See section 3.4 Test deleted)

The results contained in this section are representative of the operation of the apparatus as originally submitted.

4.1 FCC Part 15 Subpart E : Test Results

Part 15	Test Description	Required	Result
15.207(a)	Powerline Conducted Emissions	N (1)	
15.209(a)	Radiated Emissions within Restricted Bands	Y	PASS
15.403(i)	Emission Bandwidth	Y	PASS
15.407(a)(3)	Power Limits	Y	PASS
15.407(b)	Spurious Emissions	Y	PASS
15.407(a)(6)	Peak Excursion Measurement	Y	PASS
15.407(g)	Frequency stability	Y	PASS

Notes:

- (1) The EUT does not connect to AC Mains. The AC voltage used to power the EUT is a 30 to 90VAC clipped sinusoidal waveform, which is provided by the cable network.

Appendix A : Test Results

Clause 15.209(a) Radiated Emissions within Restricted Bands

Except as provided elsewhere in this subpart, the emissions from an intentional radiator shall not exceed the field strength levels specified in the following table:

Frequency (MHz)	Field Strength (microvoltsmeter)	Measurement Distance (meters)
0.009-0.490	2400F (kHz)	300
0.490-1.705	24000F (kHz)	30
1.705-30.0	30	30
30-88	1001	3
88-216	1502	3
216-960	2003	3
Above 960	500	3

Test Conditions:

Sample Number:	2	Temperature (°C):	26
Date:	October 18, 2005	Humidity (%):	33
Modification State:	0	Tester:	Jason Nixon
		Laboratory:	Shielded Room

Test Results: Complies

There were no emissions detected within 20dB below the limit within the restricted bands.

Clause 15.403(i) Emission Bandwidth

The emission bandwidth shall be determined by measuring the width of the signal between two points, one below the carrier center frequency and one above the carrier center frequency, that are 26 dB down relative to the maximum level of the modulated carrier. Determination of the emissions bandwidth is based on the use of measurement instrumentation employing a peak detector function with an instrument resolution bandwidth approximately equal to 1.0 percent of the emission bandwidth of the device under measurement

Test Conditions:

Sample Number:	2,4,5,9	Temperature (°C):	21
Date:	Oct 12, 2005	Humidity (%):	50
Modification State:	0	Tester:	Xu Jin
		Laboratory:	Wireless

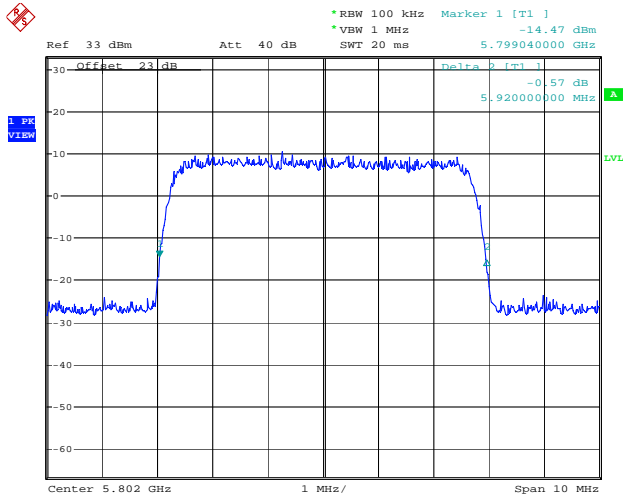
Test Results: Complies

Test Data: See attached table and graphics

26dB Bandwidth Measuring Data(MHz)

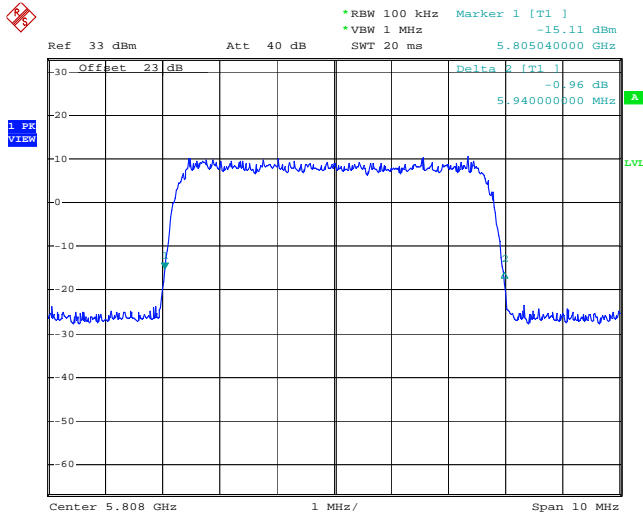
Frequency (MHz)	26dB Bandwidth (MHz)
5802	5.92
5808	5.94
5820	5.92

5802MHz



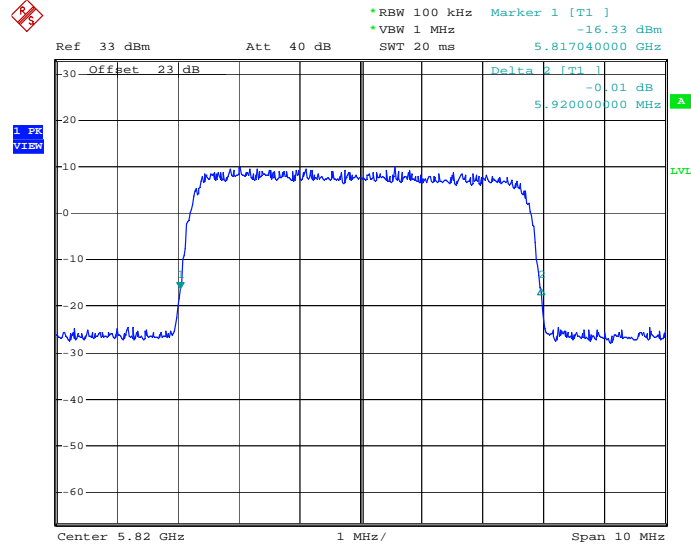
Date: 12.OCT.2005 17:04:12

5808MHz



Date: 12.OCT.2005 17:15:40

5820MHz



Date: 12.OCT.2005 17:18:32

Clause 15.407(a)(3) Power Limits in the 5.725 to 5.825GHz band

(3) For the band 5.725-5.825 GHz, the maximum conducted output power over the frequency band of operation shall not exceed the lesser of 1 W or 17 dBm + 10 log B, where B is the 26-dB emission bandwidth in MHz. In addition, the peak power spectral density shall not exceed 17 dBm in any 1-MHz band. If transmitting antennas of directional gain greater than 6 dBi are used, both the maximum conducted output power and the peak power spectral density shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi. However, fixed point-to-point U-NII devices operating in this band may employ transmitting antennas with directional gain up to 23 dBi without any corresponding reduction in the transmitter peak output power or peak power spectral density. For fixed, point-to-point U-NII transmitters that employ a directional antenna gain greater than 23 dBi, a 1 dB reduction in peak transmitter power and peak power spectral density for each 1 dB of antenna gain in excess of 23 dBi would be required. Fixed, point-to-point operations exclude the use of point-to-multipoint systems, omnidirectional applications, and multiple collocated transmitters transmitting the same information. The operator of the U-NII device, or if the equipment is professionally installed, the installer, is responsible for ensuring that systems employing high gain directional antennas are used exclusively for fixed, point-to-point operations.

Test Conditions:

Sample Number:	2,4,5,9	Temperature (°C):	21
Date:	Oct 12, 2005	Humidity (%):	50
Modification State:	0	Tester:	Jin Xu
		Laboratory:	Wireless

Test Method: FCC Public Notice Ref: DA: 02-2138
Measurement Procedure for Peak Transmit Power in UNII Band

Test Results: Complies

Test Data: See attached tables and plots

Conducted Output Power Test Data (dBm)

Frequency (MHz)	Measured Across EBW (dBm)
5802	14.15
5808	14.17
5820	13.64

Peak Power Spectrum Density Test Data (dBm/MHz)

Frequency (MHz)	PPSD (dBm/MHz)
5802	9.17
5808	8.92
5820	8.51

Manufacturer declare the EUT provides a point-to-multipoint radio link in the 5.8 GHz unlicensed UNII band, and there is 2dB cable loss between the antenna port and the RF module output.

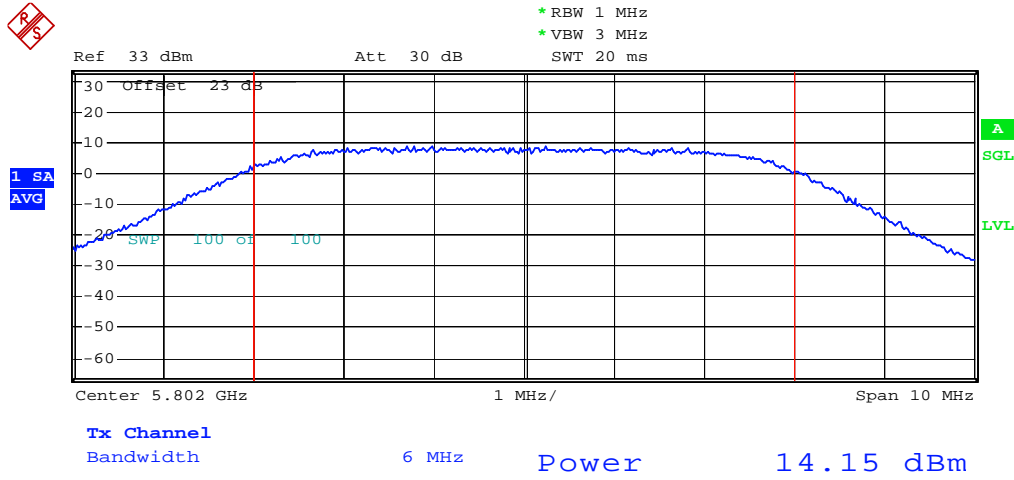
Maximum conducted output power at antenna terminal
 =14.17dBm-2dB=12.17dBm

Limit: Conducted output power limit for 14dBi integral antenna
 Point to Multipoint Operation
 24.7dBm-(14dBi-6dBi)=16.7dBm

Maximum Peak Power Spectrum Density at antenna terminal:
 =9.17dBm/MHz-2dB=7.17dBm/MHz

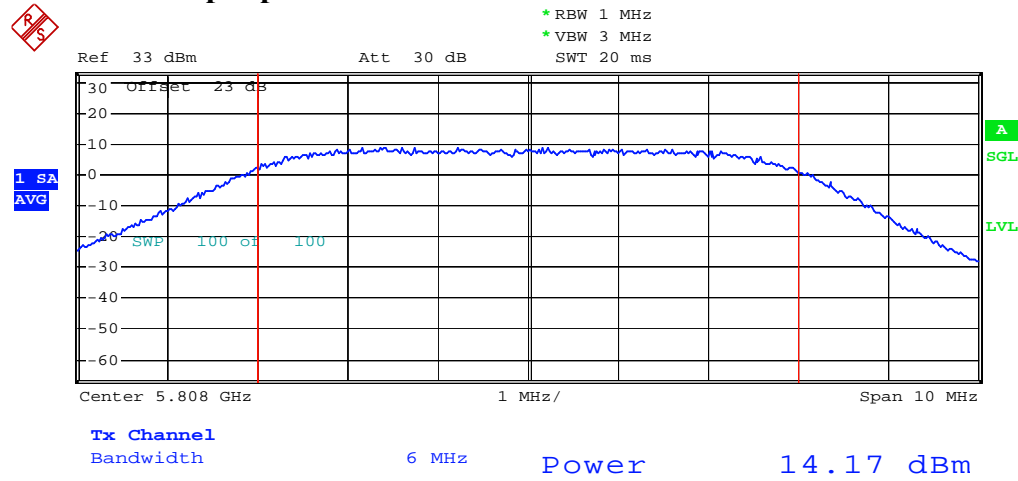
Limit: Conducted Power Limit for antenna 14dBi
 17dBm/MHz-(14dBi-6dBi)=9dBm/MHz

5802MHz Output Power



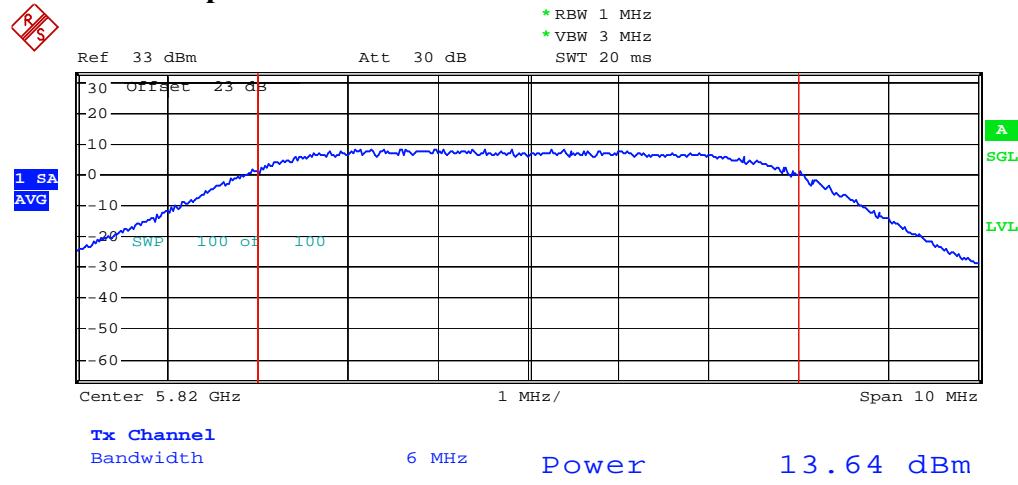
Date: 12.OCT.2005 19:36:25

5808MHz Output power



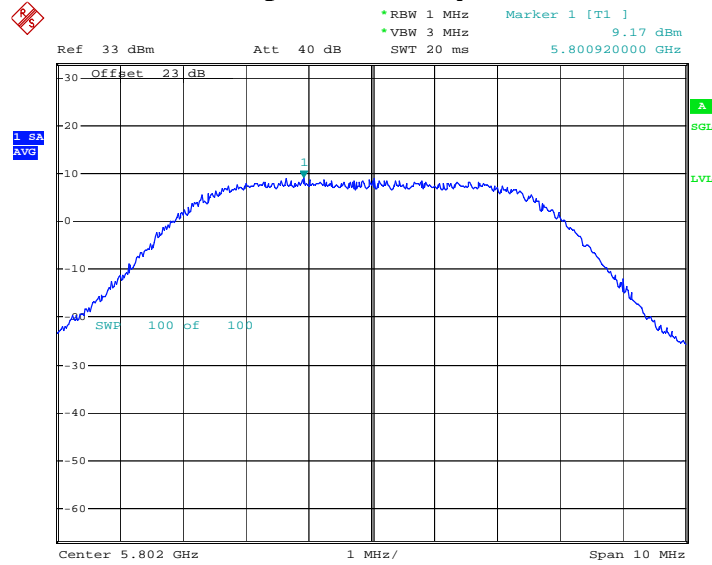
Date: 12.OCT.2005 19:37:28

5820MHz Output Power



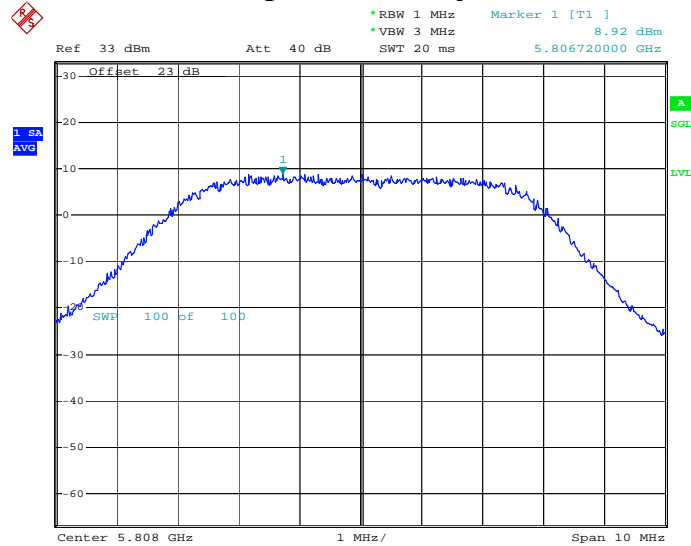
Date: 12.OCT.2005 19:38:22

5802MHz Power Spectral Density



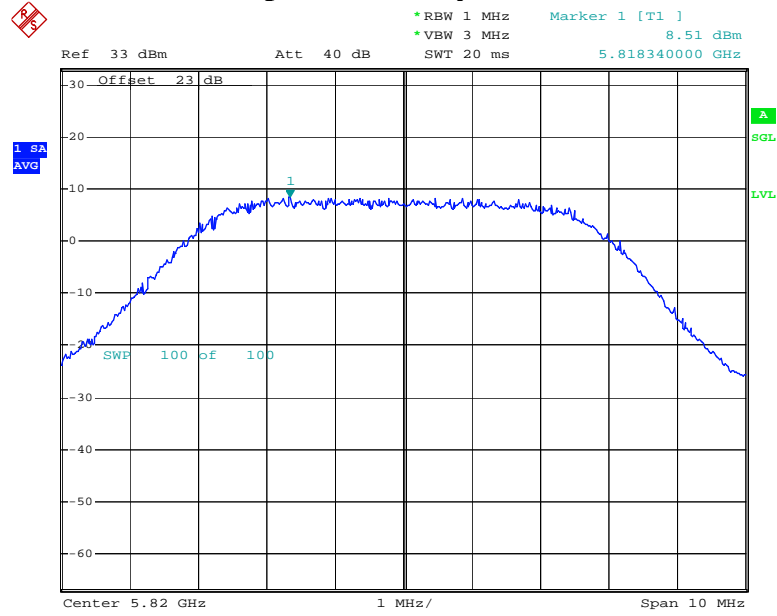
Date: 12.OCT.2005 20:10:08

5808MHz Power Spectral Density



Date: 12.OCT.2005 20:10:58

5820MHz Power Spectral Density



Date: 12.OCT.2005 20:08:40

Clause 15.407(b) Spurious Emissions

Undesirable emission limits: Except as shown in paragraph (b)(6) of this section, the peak emissions outside of the frequency bands of operation shall be attenuated in accordance with the following limits:

- (1) For transmitters operating in the 5.15-5.25 GHz band: all emissions outside of the 5.15-5.35 GHz band shall not exceed an EIRP of -27 dBm/MHz.
- (2) For transmitters operating in the 5.25-5.35 GHz band: all emissions outside of the 5.15-5.35 GHz band shall not exceed an EIRP of -27 dBm/MHz. Devices operating in the 5.25-5.35 GHz band that generate emissions in the 5.15-5.25 GHz band must meet all applicable technical requirements for operation in the 5.15-5.25 GHz band (including indoor use) or alternatively meet an out-of-band emission EIRP limit of -27 dBm/MHz in the 5.15-5.25 GHz band.
- (3) For transmitters operating in the 5.47-5.725 GHz band: all emissions outside of the 5.47-5.725 GHz band shall not exceed an EIRP of -27 dBm/MHz.
- (4) For transmitters operating in the 5.725-5.825 GHz band: all emissions within the frequency range from the band edge to 10 MHz above or below the band edge shall not exceed an EIRP of -17 dBm/MHz; for frequencies 10 MHz or greater above or below the band edge, emissions shall not exceed an EIRP of -27 dBm/MHz.
- (5) The emission measurements shall be performed using a minimum resolution bandwidth of 1 MHz. A lower resolution bandwidth may be employed near the band edge, when necessary, provided the measured energy is integrated to show the total power over 1 MHz.
- (6) Unwanted emissions below 1 GHz must comply with the general field strength limits set forth in 15.209. Further, any U-NII devices using an AC power line are required to comply also with the conducted limits set forth in 15.207.
- (7) The provisions of 15.205 apply to intentional radiators operating under this section.
- (8) When measuring the emission limits, the nominal carrier frequency shall be adjusted as close to the upper and lower frequency block edges as the design of the equipment permits.

Test Conditions:

Sample Number:	2	Temperature (°C):	26
Date:	October 17, 2005	Humidity (%):	33
Modification State:	0	Tester:	Jason Nixon
		Laboratory:	Shield Room

Test Results: Complies

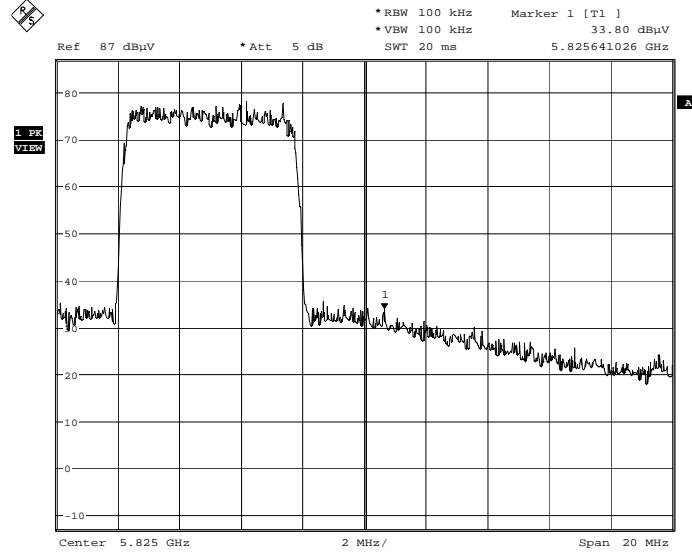
Test Data: See attached tables and plots.

Test data for the Upper Bandedge was tested using a 100kHz RBW. Since the required RBW is 1MHz an integration factor was added to correct for the difference in RBW.

$$\text{Integration Factor} = 10 \text{Log} \left(\frac{1000000}{100000} \right) = 10$$

Upper Bandedge – Horizontal polarization

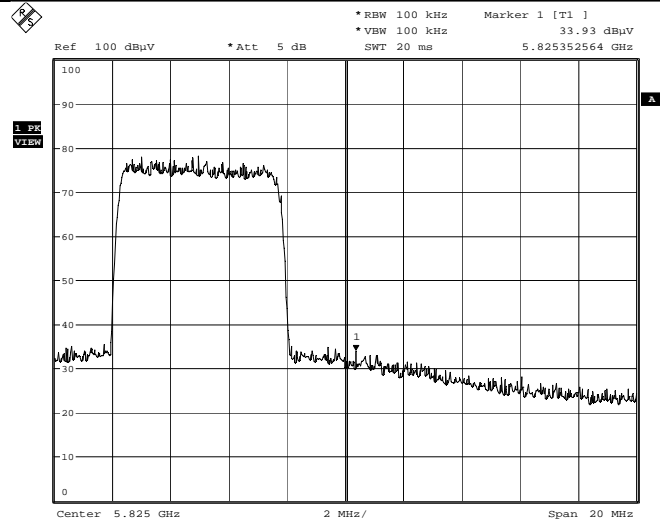
Band Edge Level (dBuV)	Signal Substitution Level (dBm)	Antenna Gain (dBi)	Integration Factor (dB)	Emission Power Level (dBm)	Limit (dBm)
33.8dBuV	-38.07	10.8	10	-17.27	-17.0



Date: 17.OCT.2005 15:10:28

Upper Bandedge –Vertical polarization

Band Edge Level (dBuV)	Signal Substitution Level (dBm)	Antenna Gain (dBi)	Integration Factor (dB)	Emission Power Level (dBm)	Limit (dBm)
33.93dBuV	-38.21	10.8	10	-17.41	-17.0

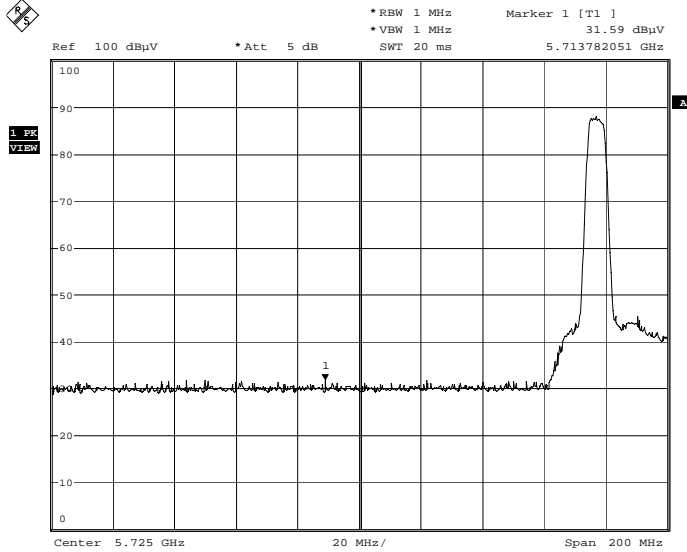


Transcore

Date: 17.OCT.2005 13:18:35

Lower Bandedge – Horizontal polarization

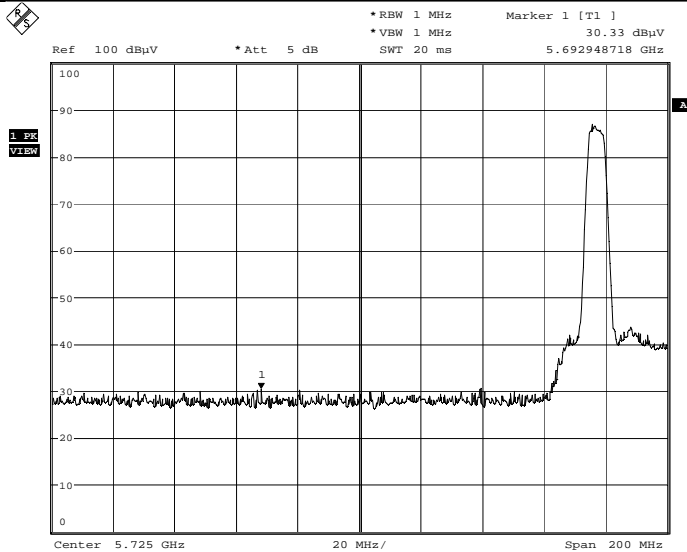
Band Edge Level (dBuV)	Signal Substitution Level (dBm)	Antenna Gain (dBi)	Emission Power Level (dBm)	Limit (dBm)
31.59dBuV	-46.29	10.8	-35.49	-27.0



Date: 17.OCT.2005 14:25:51

Lower Bandedge – Horizontal polarization

Band Edge Level (dBuV)	Signal Substitution Level (dBm)	Antenna Gain (dBi)	Emission Power Level (dBm)	Limit (dBm)
30.33dBuV	-47.51	10.8	-36.71	-27.0



Date: 17.OCT.2005 14:21:22

Radiated Emissions Below 1GHz

All measurements were performed using a Quasi-Peak Detector with 120kHz RBW below 1GHz at a distance of 3 meters.

Freq. (MHz)	Ant	Pol. V/H	RCVD Signal (dBμV)	Ant. Factor (dB)	Amp. Gain (dB)	Duty Cycle Corr. (dB)	Cable Loss (dB)	Level (dBuV)	Limit (dBuV)	Margin (dB)
56.3000	BC1	H	5.5	9.6	N/A	N/A	1.4	16.5	40.0	23.5
31.6400	BC1	H	6.2	13.5	N/A	N/A	1.3	21.0	40.0	19.0
120.0000	BC1	H	5.4	11.6	N/A	N/A	1.8	18.8	43.5	24.7
31.6780	BC1	V	17.0	12.3	N/A	N/A	1.3	30.6	40.0	9.4
120.0000	BC1	V	8.0	12.0	N/A	N/A	1.8	21.8	43.5	21.7
799.0000	LP1	V	8.1	21.4	N/A	N/A	4.3	33.8	46.0	12.2
453.0000	LP1	V	7.4	16.8	N/A	N/A	3.1	27.3	46.0	18.7
451.8000	LP1	H	7.7	16.9	N/A	N/A	3.1	27.7	46.0	18.3

Note 1: Antenna Legend: BC = Biconical, BL = Bilog, LP = Log-Periodic, Horn = Horn, ED = EMCO Dipole

Clause 15.407(a)(6) Peak Excursion Measurement

The ratio of the peak excursion of the modulation envelope (measured using a peak hold function) to the maximum conducted output power (measured as specified above) shall not exceed 13 dB across any 1 MHz bandwidth or the emission bandwidth whichever is less.

Test Conditions:

Sample Number:	2,4,5,9	Temperature (°C):	21
Date:	Oct 13, 2005	Humidity (%):	50
Modification State:	0	Tester:	Xu Jin
		Laboratory:	Wireless

Test Method: FCC Public Notice Ref: DA: 02-2138
Measurement Procedure for Peak Transmit Power in UNII Band

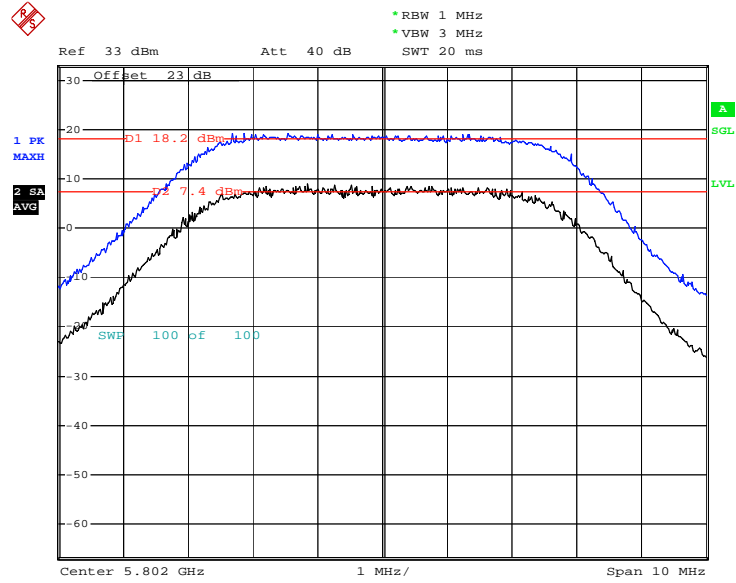
Test Results: Complies

Test Data: See attached table and plots.

Peak Excursion Measurement Test Data (dB)

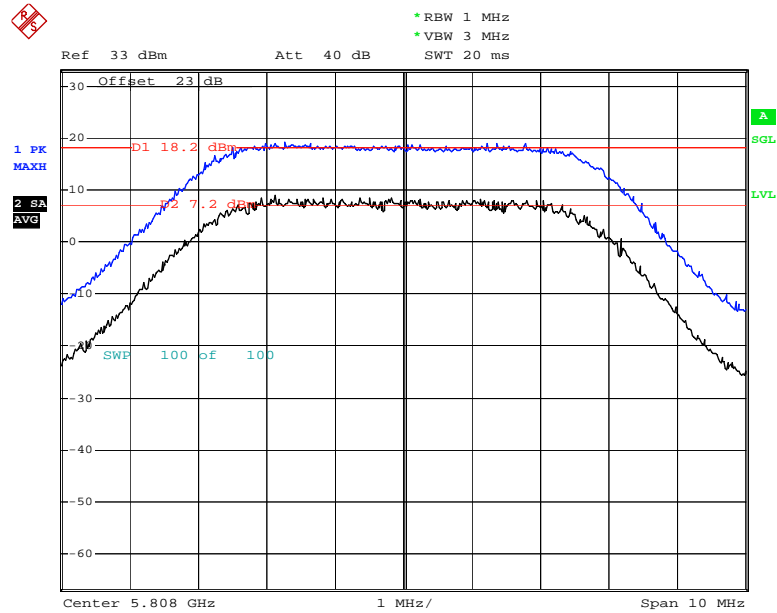
Frequency (MHz)	Peak Excursion Measurement (dB)
5802	10.8
5808	11
5820	10.7

5802MHz Peak Excursion



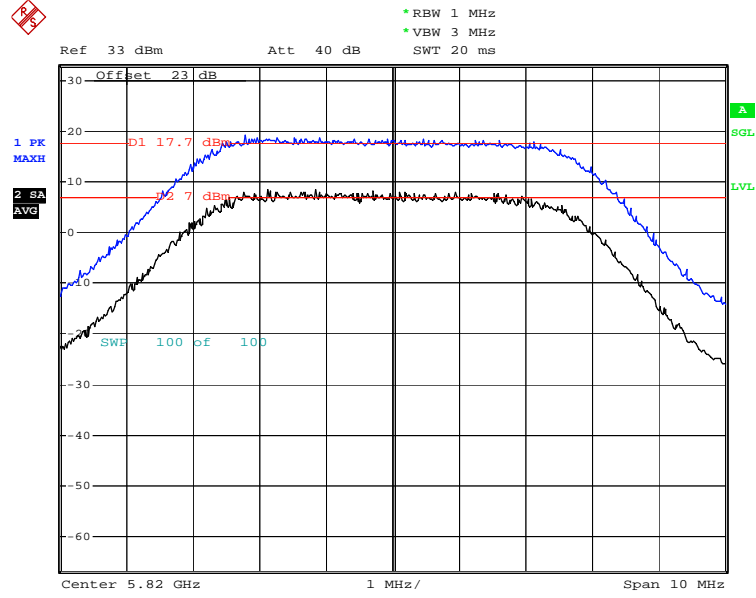
Date: 12.OCT.2005 20:23:59

5808MHz Peak Excursion



Date: 12.OCT.2005 20:22:33

5820MHz Peak Excursion



Date: 12.OCT.2005 20:25:02

Clause 15.407(g) Frequency Stability

Manufacturers of U-NII devices are responsible for ensuring frequency stability such that an emission is maintained within the band of operation under all conditions of normal operation as specified in the users manual.

Test Conditions:

Sample Number:	2,4,5,9	Temperature (°C):	21
Date:	Oct 13, 2005	Humidity (%):	50
Modification State:	0	Tester:	Xu Jin
		Laboratory:	Wireless

Test Results: Complies

Test Conditions Ambient Temperature: 21°C
 Extreme Temperature: -40°C to +60°C
 Extreme Voltage Conditions: +/-15% of 50VDC

Test Data: See Attached tables

Frequency Stability Test Data

Test Condition	Measured Frequency (MHz)	Frequency Drift (ppm)
+21°C, 50.0VDC	5801.9951064	----
+21°C, 57.5VDC	5801.9950823	-0.004ppm
+21°C, 42.5 VAC	5801.9950823	-0.004ppm
+50°C, 50.0VDC	5801.9943452	-0.13ppm
+50°C, 57.5VDC	5801.9943326	-0.13ppm
+50°C, 42.5 VAC	5801.9943427	-0.13ppm
+60°C, 50.0VDC	5801.9946632	-0.076ppm
+60°C, 57.5VDC	5801.9946745	-0.074ppm
+60°C, 42.5 VAC	5801.9946492	-0.078ppm
-30°C, 50.0VDC	5801.9995862	0.77ppm
-30°C, 57.5VDC	5801.9995432	0.76ppm
-30°C, 42.5 VAC	5801.9994782	0.75ppm
-40°C, 50.0VDC	5802.0051732	1.7ppm
-40°C, 57.5VDC	5802.0051684	1.7ppm
-40°C, 42.5 VAC	5802.0052167	1.7ppm

Clause 15.31 Power Supply Variation

15.31 (e) For intentional radiators, measurements of the variation of the input power or the radiated signal level of the fundamental frequency component of the emission, as appropriate, shall be performed with the supply voltage varied between 85% and 115% of the nominal rated supply voltage. For battery-operated equipment, the equipment tests shall be performed using a new battery.

Test Conditions:

Sample Number:	2,4,5,9	Temperature (°C):	21
Date:	Oct 13, 2005	Humidity (%):	50
Modification State:	0	Tester:	Xu Jin
		Laboratory:	Wireless

Test Method: Average was verified under voltage extreme conditions using a wideband power meter with thermocouple detector.

Extreme Voltage: ±15% of 50VDC voltage

Test Result: No major changed was noticed during the test.
Refer to the attached tables.

	50VDC	Low Voltage Extreme		High Voltage Extreme	
Frequency	Ave. Power	Ave. Power	Deviation	Ave. Power	Deviation
5808MHz	15.98dBm	16.03dBm	0.3%	16.05Bm	0.4%

Appendix B : Setup Photographs

Spurious Emissions Below 1GHz Setup:

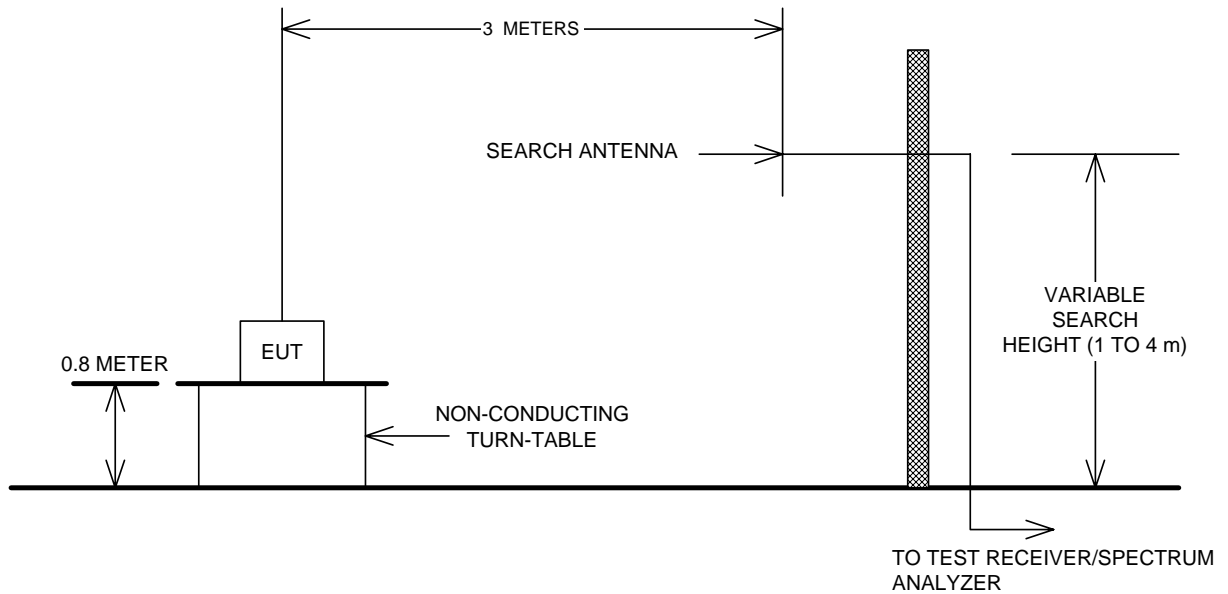


Spurious Emissions above 1GHz Setup:

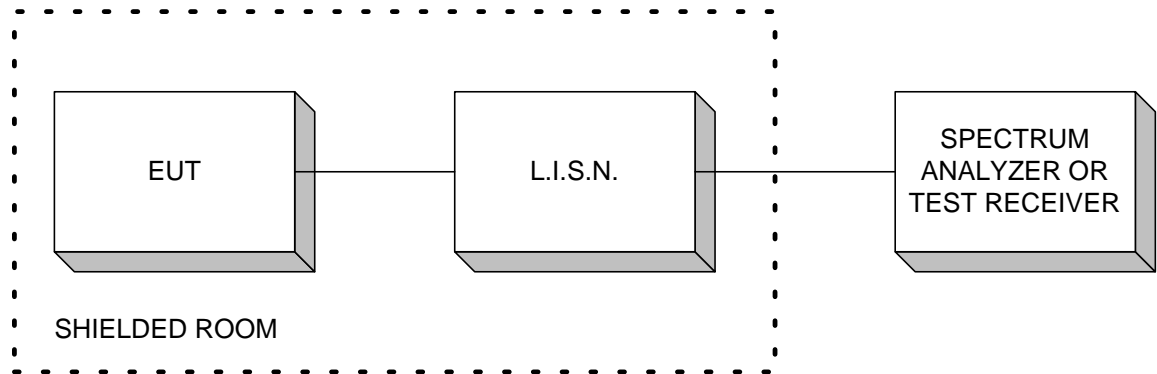


Appendix C : Block Diagram of Test Setups

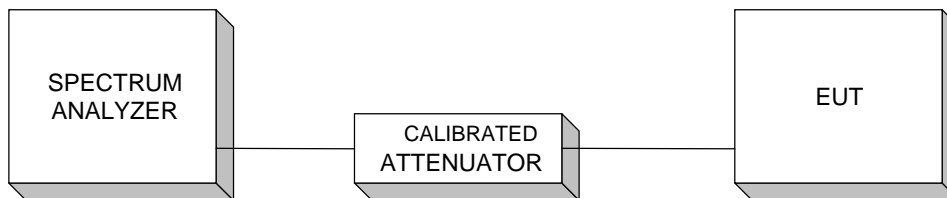
Test Site For Radiated Emissions



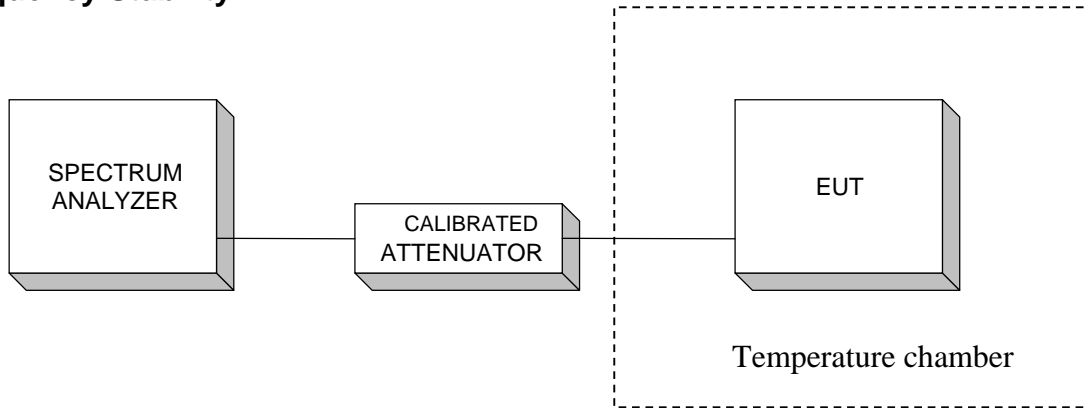
Conducted Emissions



Conducted Measurements



Frequency Stability



TIA/EIA 603, Signal Substitution Method

