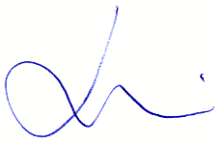
Test Report:	5W42639 Issue 2
Applicant:	Radio Frequency Systems 29 Research Parkway Wallingford, CT 06492 USA
Apparatus:	48760 Signal Booster
FCC ID:	IWD48760
In Accordance With:	FCC Part 90, Boosters Private Land Mobile Radio Services
Tested By:	Nemko Canada Inc. 303 River Road Ottawa, Ontario K1V 1H2
Authorized By:	 Jin Xu, Wireless Specialist
Date:	17 May 2005
Total Number of Pages:	28

Report Summary

These tests were conducted on a sample of the equipment for the purpose of demonstrating compliance with Part 90. Conducted measurements were performed in accordance with ANSI TIA-603-B-2002. Radiated tests were conducted is 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:	48760 Signal Booster
Specification:	FCC Part 90 Private Land Mobile Radio Services
Compliance Status:	Complies
Exclusions:	None
Non-compliances:	None
Report Release History:	Original Release

Author: Jason Nixon, Telecom 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.

TABLE OF CONTENTS

Section 1 : Equipment Under Test

1.1 Product Identification

The Equipment Under Test was identified as follows:

48760 Signal Booster

1.2 Samples Submitted for Assessment

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

Sample No.	Description	Serial No.
1	48760 Signal Booster	002
3	Performance Monitor (P/N: PM800-10)	——
4	DB15 M to F cable	——

The first samples were received on: April 28, 2005

1.3 Theory of Operation

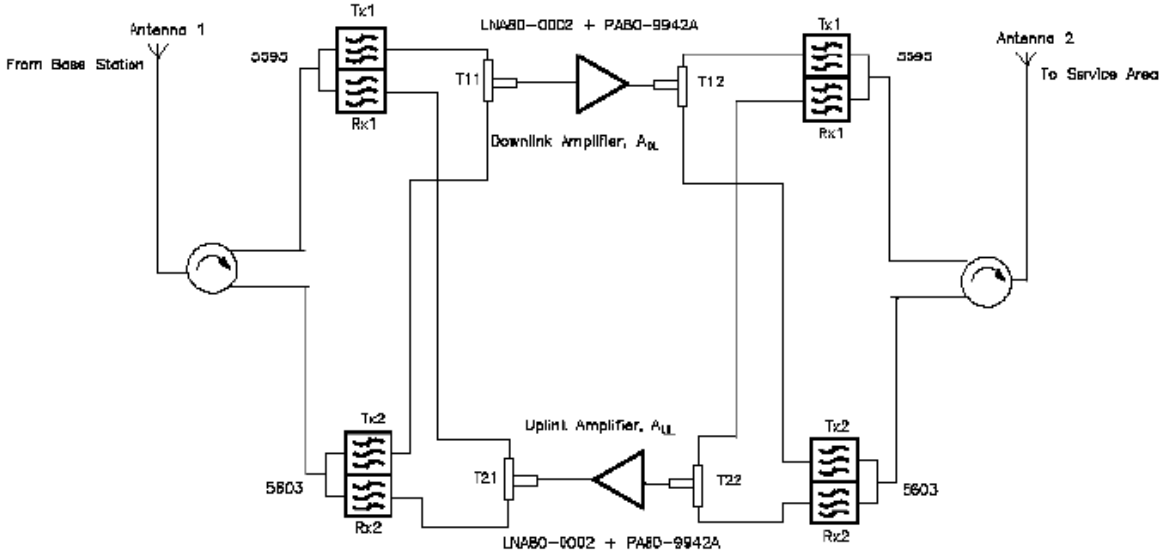
The 48760 BDA is designed to enhance radio communication in buildings; basements, tunnels and other RF shielded environments. The 48760 is a dual band BDA that will amplify both the 800 and 900 SMR as listed in the electrical specifications.

These units work by receiving and amplifying the base TX signals via a donor antenna directed at the desired base site. This RF path is called the downlink. The amplified base TX signal is re-radiated via antenna(s) or radiating cable into the Service Area. Subscriber mobile RF signals are received by the same service area radiating elements and amplified in the uplink RF path to be radiated back to the base via the donor antenna.

1.4 Technical Specifications of the EUT

Manufacturer:	Radio Frequency Systems	
Operating Frequency:	Uplink:	806-824MHz 896-902MHz
	Downlink:	851-869MHz 935-941MHz
Emission Designator:	GXW	
Rated Power:	Uplink: 0.5W Downlink: 0.5W	
Measured Power:	Uplink: 0.55W (27.38dBm) Downlink: 0.57W (27.57dBm)	
Rated Gain:	79dB	
Modulation:	iDEN	

1.5 Block Diagram of the EUT



Section 2 : Test Conditions

2.1 Specifications

The apparatus was assessed against the following specifications:

FCC Part 2 Subpart J, Equipment Authorization Procedures
FCC Part 90 Private Land Mobile Radio Services
FCC 2-11-04/EAB/RF Amplifier, Booster, and Repeater Reminder Sheet

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 ^{o}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	100101	Oct 15/04	Oct 15/05
Power Meter	HP	E4418B	FA001413	May 26/04	May 26/05
Power Sensor	HP	8487A	FA001741	June 9/04	June 9/05
Signal Generator	Rohde & Schwarz	SMIQ 06B	FA001878	May 18/04	May 18/05
Signal Generator	Rohde & Schwarz	SMIQ 03	FA001091	Aug 20/04	Aug 20/05
Receiver	Rohde & Schwarz	ESVS-30	FA001437	July 26/04	July 26/05
Biconical (1) Antenna	EMCO	3109	FA000805	April 22/05	April 22/06
Horn Antenna #1	EMCO	3115	FA000649	Dec. 22/04	Dec. 22/05
1.0 – 2.0 GHz Amplifier	JCA	12-400	FA001498	June 18/04	June 18/05
2.0 – 4.0 GHz Amplifier	JCA	24-600	FA001496	June 18/04	June 18/05
4.0 – 8.0 GHz Amplifier	JCA	48-600	FA001497	June 18/04	June 18/05

Section 3 : Observations

3.1 Modifications Performed During Assessment

No modifications were performed during assessment.

3.2 Record Of Technical Judgements

No technical judgements were made during the assessment.

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.

Section 4 : Results Summary

This section contains the following:

FCC Part 90 : 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 90 : Test Results

Clause	Test Method	Test Description	Required	Result
90.205	2.1046	Output power	Y	PASS
90.210	2.1051	Conducted spurious emissions	Y	PASS
90.210	2.1053	Radiated spurious emissions	Y	PASS
90.213	2.1055	Frequency stability	N (1)	
90.214	—	Transient Behavior	N (2)	
90.219	—	Use of boosters	Y	PASS
2-11-04/EAB/RF	2.1049	Occupied bandwidth	Y	PASS
2-11-04/EAB/RF	—	Out of band rejection	Y	PASS

Notes:

(1) The apparatus does not contain any frequency translating circuitry.

(2) The apparatus does not operate in the 150-174 MHz and 421-512 MHz frequency bands

Appendix A : Test Results

Criteria: Clause 90.205 Output Power

Applicants for licenses must request and use no more power than the actual power necessary for satisfactory operation. Except where otherwise specifically provided for, the maximum power that will be authorized for new stations authorized after August 16, 1995 is as follows in FCC Part 90.205(a) through (r).

Test Conditions:

Sample Number:	1	**Temperature:**	23
Date:	May 3, 2005	**Humidity:**	24
Modification State:	0	**Tester:**	Jason Nixon
		Laboratory:	Wireless

Test Results:

Band	Rated Power (dBm)	Measured Power (dBm)
Uplink 806-824MHz	27	27.22
Uplink 896-902MHz	27	27.38
Downlink 851-869MHz	27	27.57
Downlink 935-941MHz	27	27.37

Criteria: Clause 90.210 Conducted Spurious Emissions

Except as indicated elsewhere in this part, transmitters used in the radio services governed by this part must comply with the emission masks outlined in this section. Unless otherwise stated, per paragraphs (d)(4), (e)(4), and (m) of this section, measurements of emission power can be expressed in either peak or average values provided that emission powers are expressed with the same parameters used to specify the unmodulated transmitter carrier power. For transmitters that do not produce a full power unmodulated carrier, reference to the unmodulated transmitter carrier power refers to the total power contained in the channel bandwidth. Unless indicated elsewhere, the Table below specifies the emission masks for equipment operating in the frequency bands governed under this part.

Test Conditions:

Sample Number:	1	**Temperature:**	23
Date:	May 3, 2005	**Humidity:**	24
Modification State:	0	**Tester:**	Jason Nixon
		Laboratory:	Wireless

Test Results:

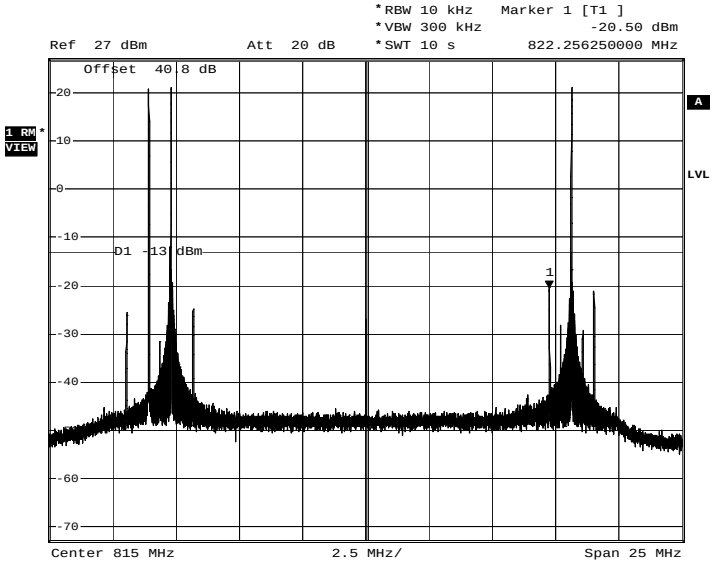
See Attached Plots.

Additional Observations:

Measurements for conducted emissions outside the operating band were performed at the low, mid and high channels and only the worst case from each band has been included.

The spectrum was searched from 30MHz to 10GHz.

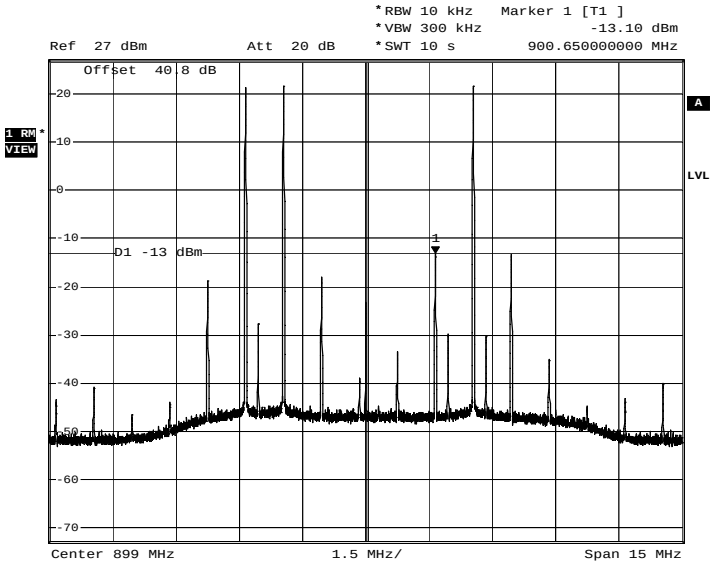
Uplink 3rd Order Intermodulation 806-824MHz Band



3rd Order Intermodulation Uplink 806-824MHz Band

Date: 3.MAY.2005 11:52:11

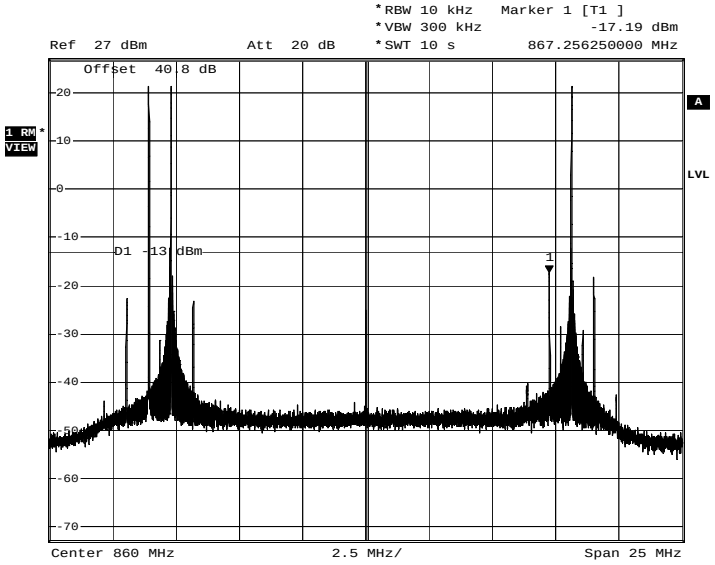
Uplink 3rd Order Intermodulation 896-902MHz Band



3rd Order Intermodulation Uplink 896-902MHz Band

Date: 3.MAY.2005 13:09:21

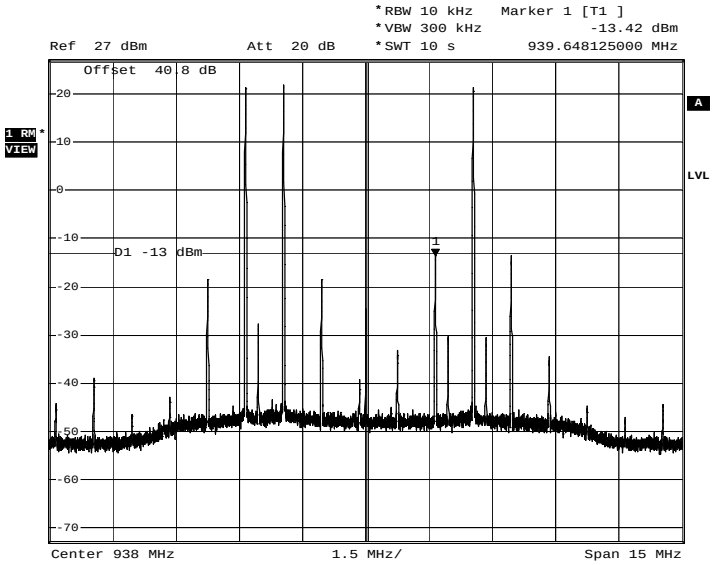
Downlink 3rd Order Intermodulation 851-869MHz Band



3rd Order Intermodulation Downlink 851-869MHz Band

Date: 3.MAY.2005 11:58:27

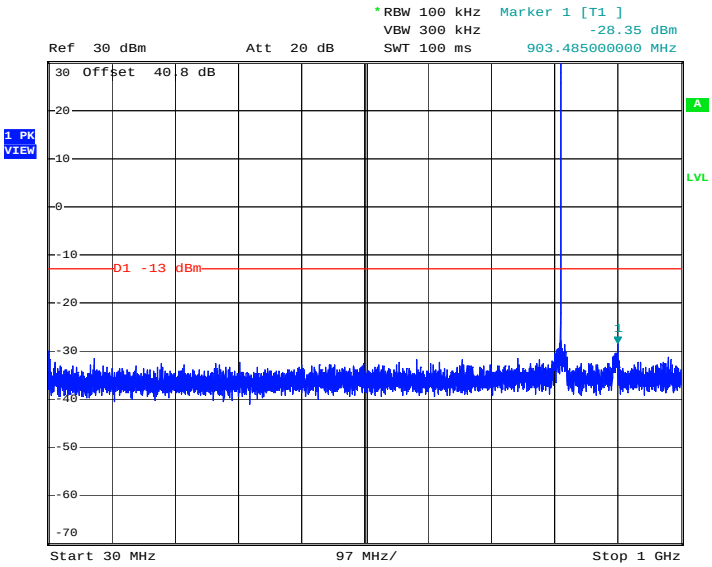
Downlink 3rd Order Intermodulation 935-941MHz Band



3rd Order Intermodulation Downlink 935-941MHz Band

Date: 3.MAY.2005 12:59:56

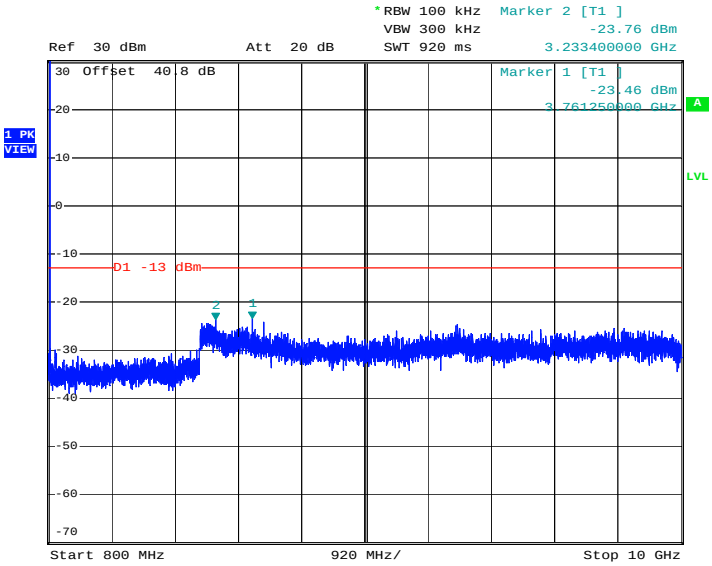
Conducted Spurious Emissions
Uplink 806-824MHz Band Conducted Emissions – Low



Uplink 806-824MHz Band Mid Channel - Conducted spurious

Date: 3.MAY.2005 14:42:47

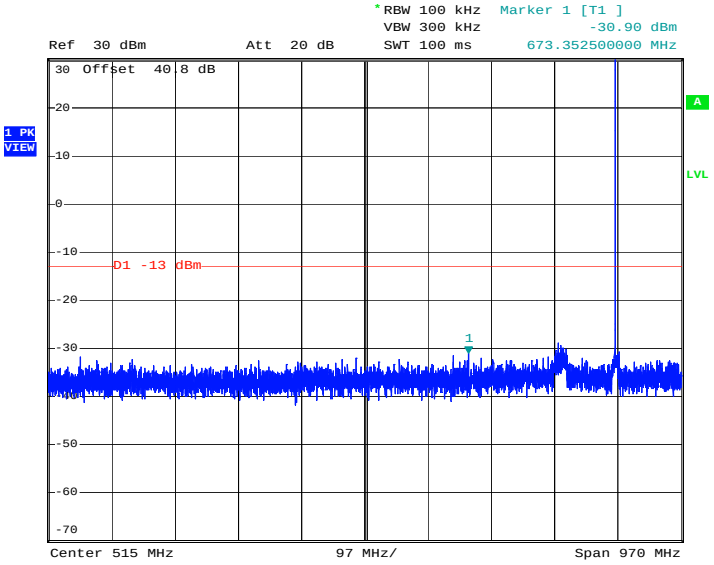
Uplink 806-824MHz Band Conducted Emissions - High



Uplink 806-824MHz Band Mid Channel - Conducted spurious

Date: 3.MAY.2005 14:55:13

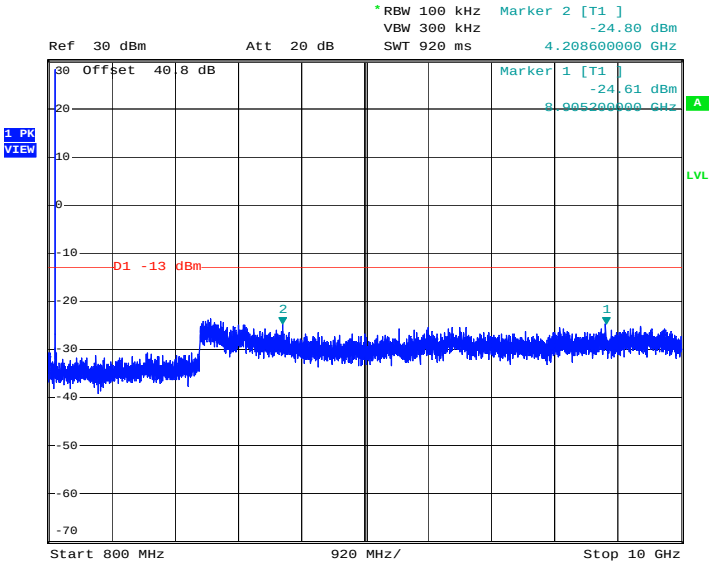
Uplink 896-902MHz Band Conducted Emissions - Low



Uplink 896-902MHz Band Mid Channel - Conducted spurious

Date: 3.MAY.2005 15:14:52

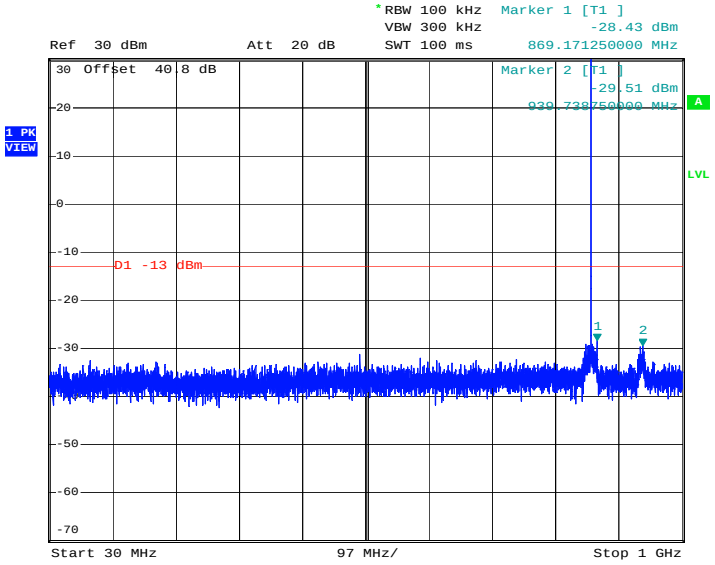
Uplink 896-902MHz Band Conducted Emissions - High



Uplink 896-902MHz Band Mid Channel - Conducted spurious

Date: 3.MAY.2005 15:03:33

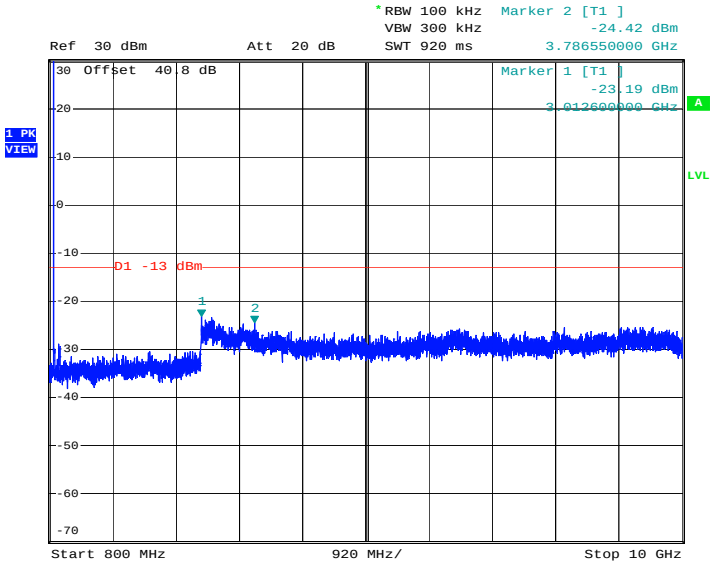
Downlink 851-869MHz Band Conducted Emissions - Low



Downlink 851-869MHz Band Mid Channel - Conducted spurious

Date: 3.MAY.2005 14:33:14

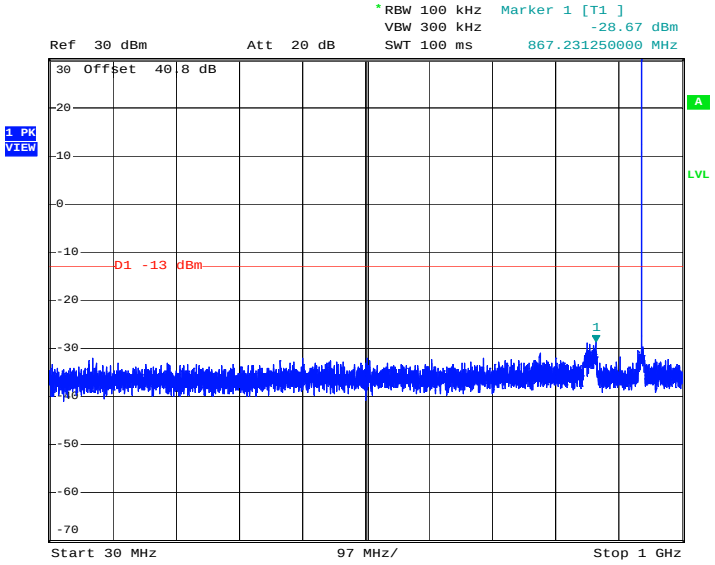
Downlink 851-869MHz Band Conducted Emissions - High



Downlink 851-869MHz Band Mid Channel - Conducted spurious

Date: 3.MAY.2005 14:24:10

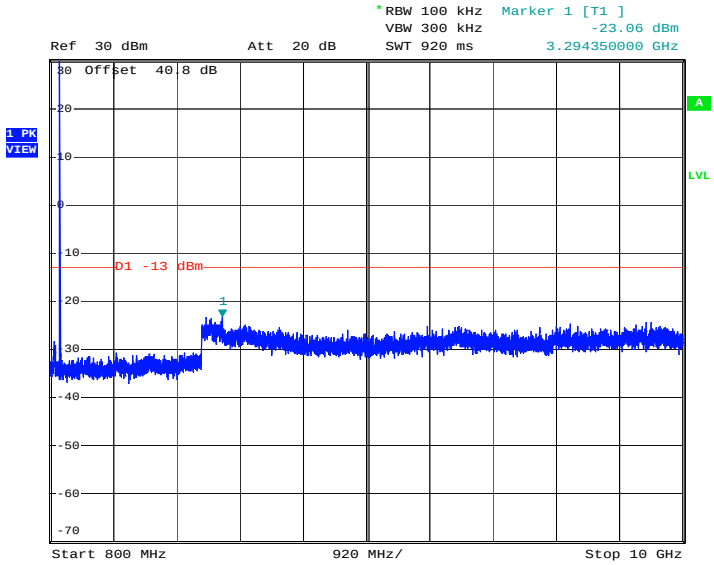
Downlink 935-941MHz Band Conducted Emissions - Low



Downlink 935-941MHz Band Mid Channel - Conducted spurious

Date: 3.MAY.2005 14:06:54

Downlink 935-941MHz Band Conducted Emissions - High



Downlink 935-941MHz Band Mid Channel - Conducted spurious

Date: 3.MAY.2005 14:17:00

Criteria: Clause 90.210 Radiated Spurious Emissions

Except as indicated elsewhere in this part, transmitters used in the radio services governed by this part must comply with the emission masks outlined in this section. Unless otherwise stated, per paragraphs (d)(4), (e)(4), and (m) of this section, measurements of emission power can be expressed in either peak or average values provided that emission powers are expressed with the same parameters used to specify the unmodulated transmitter carrier power. For transmitters that do not produce a full power unmodulated carrier, reference to the unmodulated transmitter carrier power refers to the total power contained in the channel bandwidth. Unless indicated elsewhere, the Table below specifies the emission masks for equipment operating in the frequency bands governed under this part.

Test Conditions:

Sample Number:	1	**Temperature:**	10
Date:	May 4, 2005	**Humidity:**	47
Modification State:	0	**Tester:**	Jason Nixon
		Laboratory:	OATS

Test Results:

No emissions were detected within 20dB below the limit.

The spectrum was searched from 30MHz to 10GHz using a low, mid and high channel.

Criteria: Clause 2-11-04/EAB/RF Occupied Bandwidth

Using an RBW of 300Hz or 1% of the emission bandwidth, The spectral shape of the output should look similar to the input for all modulations.

Test Conditions:

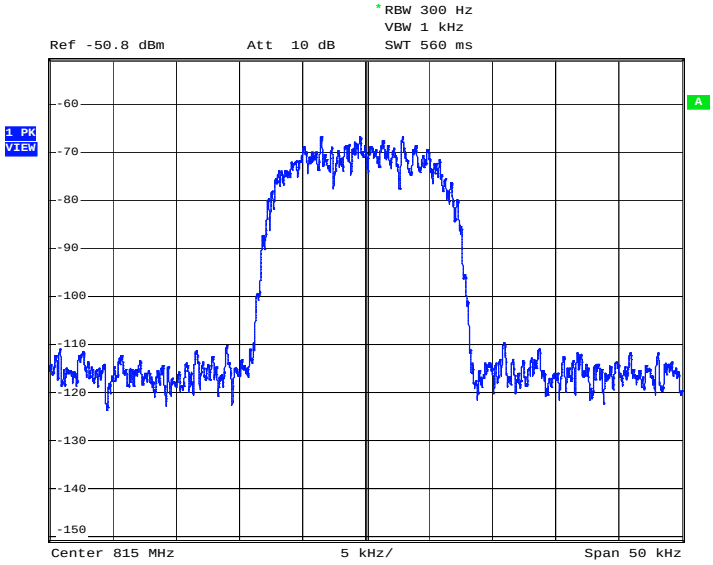
Sample Number:	1	**Temperature:**	23
Date:	May 3, 2005	**Humidity:**	24
Modification State:	0	**Tester:**	Jason Nixon
		Laboratory:	Wireless

Test Results:

See Attached Plots.

Additional Observations:

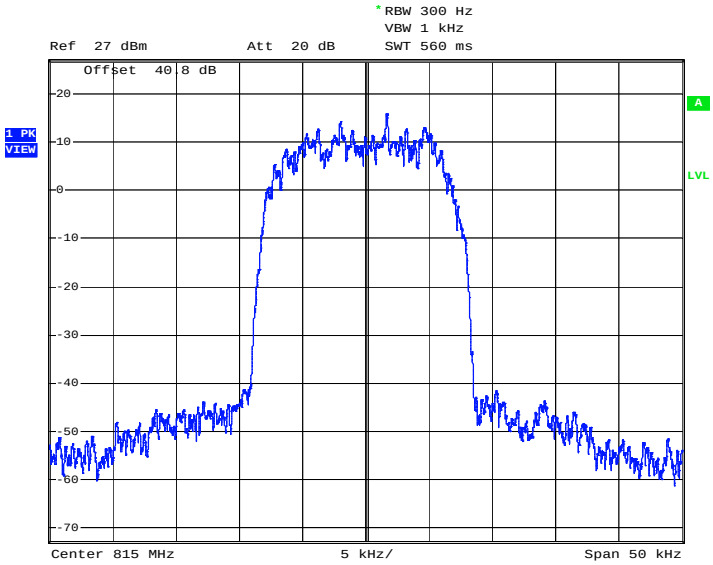
Uplink 806-824MHz Band Input



Uplink Input in 806-824MHz Band

Date: 3.MAY.2005 13:31:39

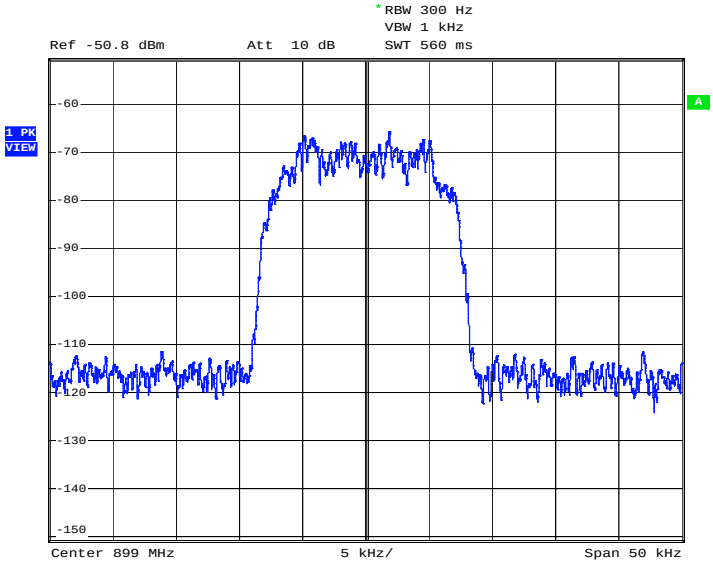
Uplink 806-824MHz Band Output



Uplink Output in 806-824MHz Band

Date: 3.MAY.2005 13:33:28

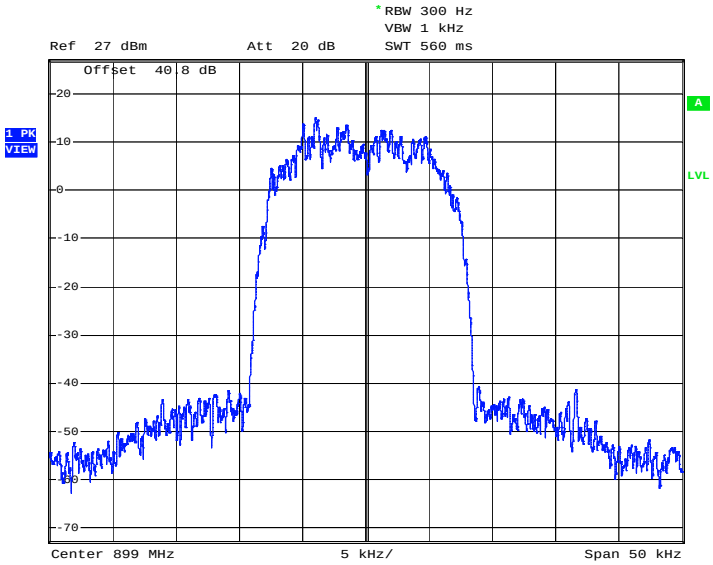
Uplink 896-902MHz Band Input



Uplink Input in 896-902MHz Band

Date: 3.MAY.2005 13:23:57

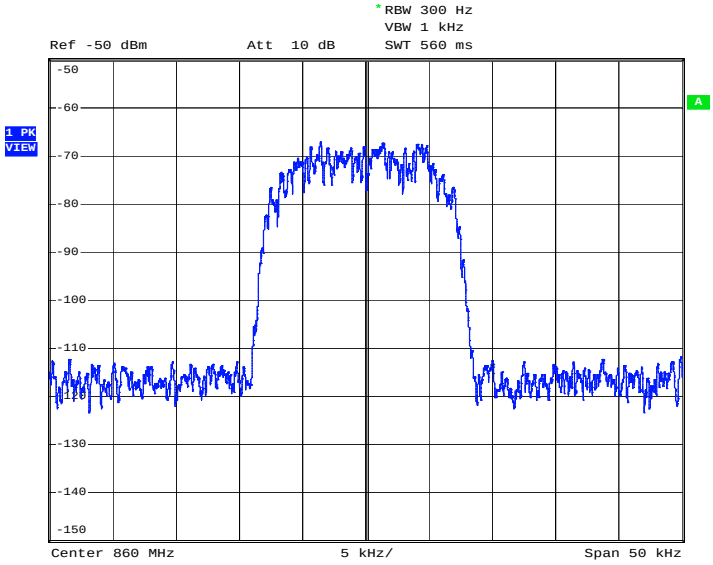
Uplink 896-902MHz Band Output



Uplink Output in 896-902MHz Band

Date: 3.MAY.2005 13:22:18

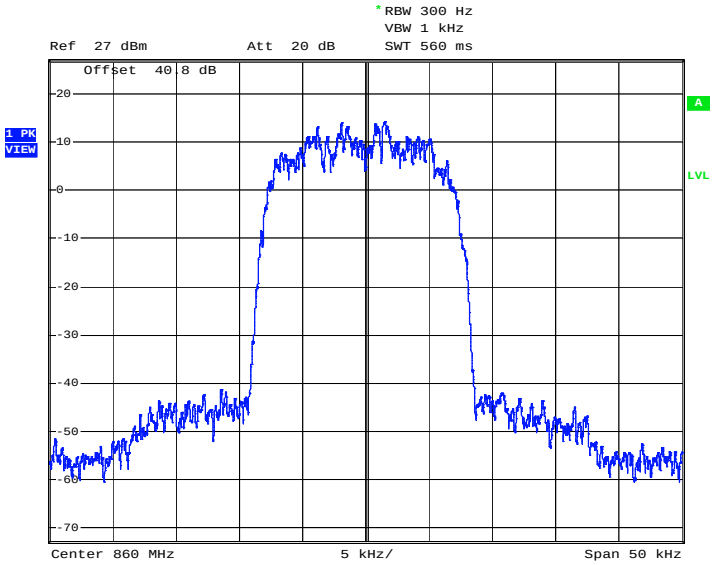
Downlink 851-869MHz Band Input



Downlink Input in 851-869MHz Band

Date: 3.MAY.2005 13:40:17

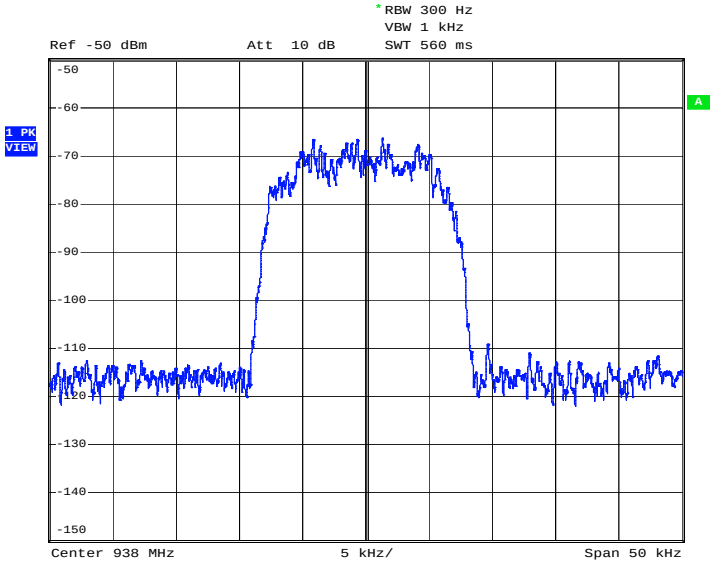
Downlink 851-869MHz Band Output



Downlink Output in 851-869MHz Band

Date: 3.MAY.2005 13:39:03

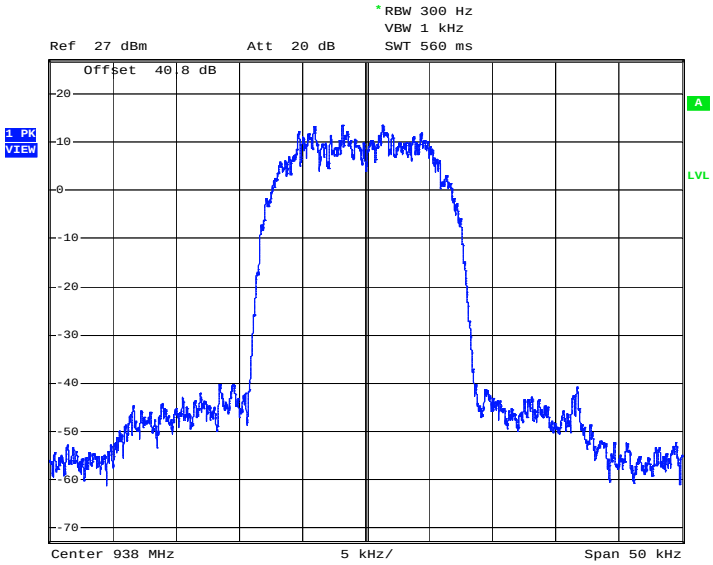
Downlink 935-941MHz Band Input



Downlink Input in 935-941MHz Band

Date: 3.MAY.2005 13:46:15

Downlink 935-941MHz Band Output



Downlink Output in 935-941MHz Band

Date: 3.MAY.2005 13:48:21

Criteria: Clause 2-11-04/EAB/RF Out of Band Rejection

Plots showing the filter frequency response.

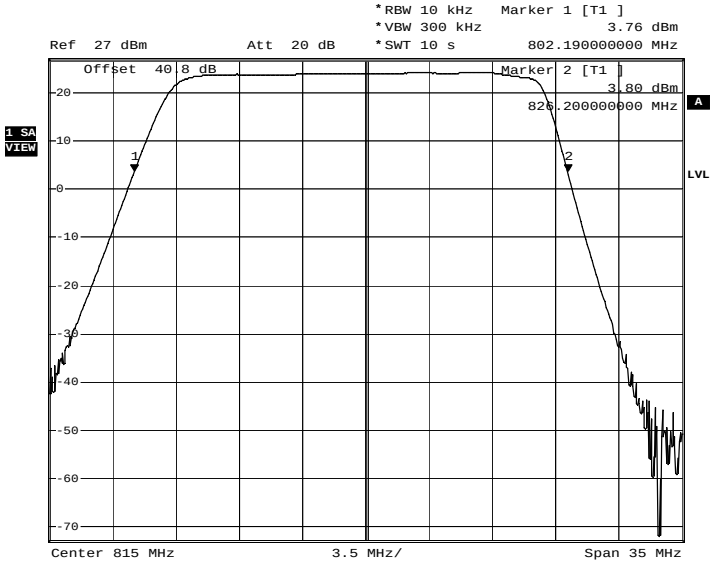
Test Conditions:

Sample Number:	1	**Temperature:**	23
Date:	May 3, 2005	**Humidity:**	24
Modification State:	0	**Tester:**	Jason Nixon
		Laboratory:	Wireless

Test Results:

See Attached Plots.

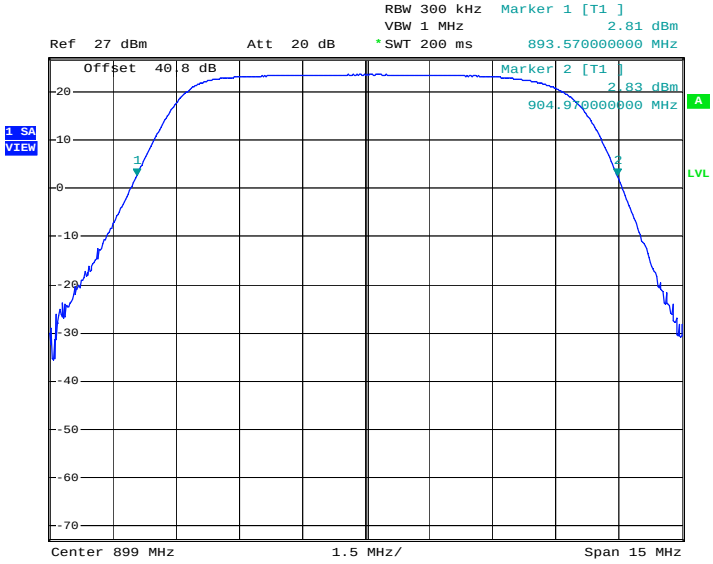
Uplink 806-824MHz Band 20dB Bandwidth



Uplink806-824MHz Band Filter Response

Date: 3.MAY.2005 16:07:48

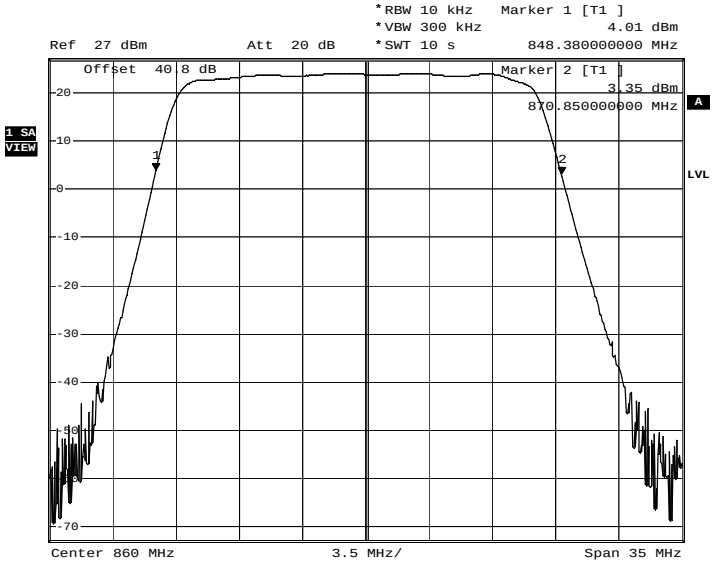
Uplink 896-902MHz Band 20dB Bandwidth



Uplink 896-902MHz Band filter response

Date: 3.MAY.2005 15:56:10

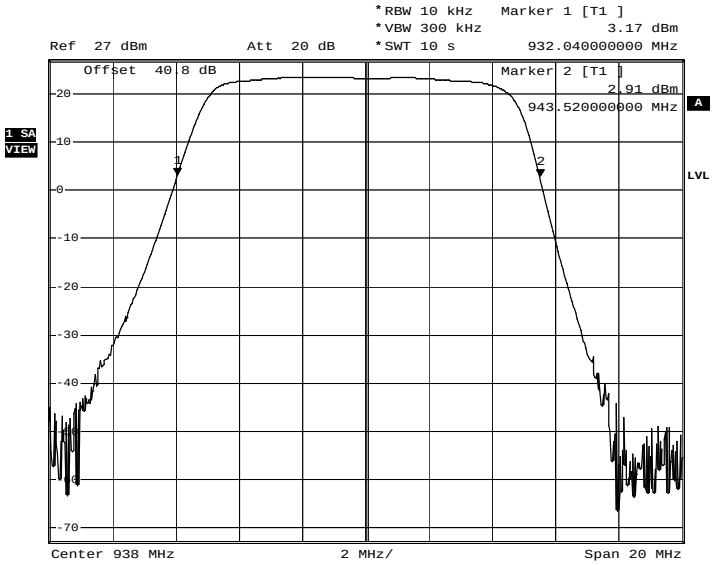
Downlink 851-869MHz Band 20dB Bandwidth



Downlink 851-869MHz Band Filter Response

Date: 3.MAY.2005 16:11:43

Downlink 935-941MHz Band 20dB Bandwidth

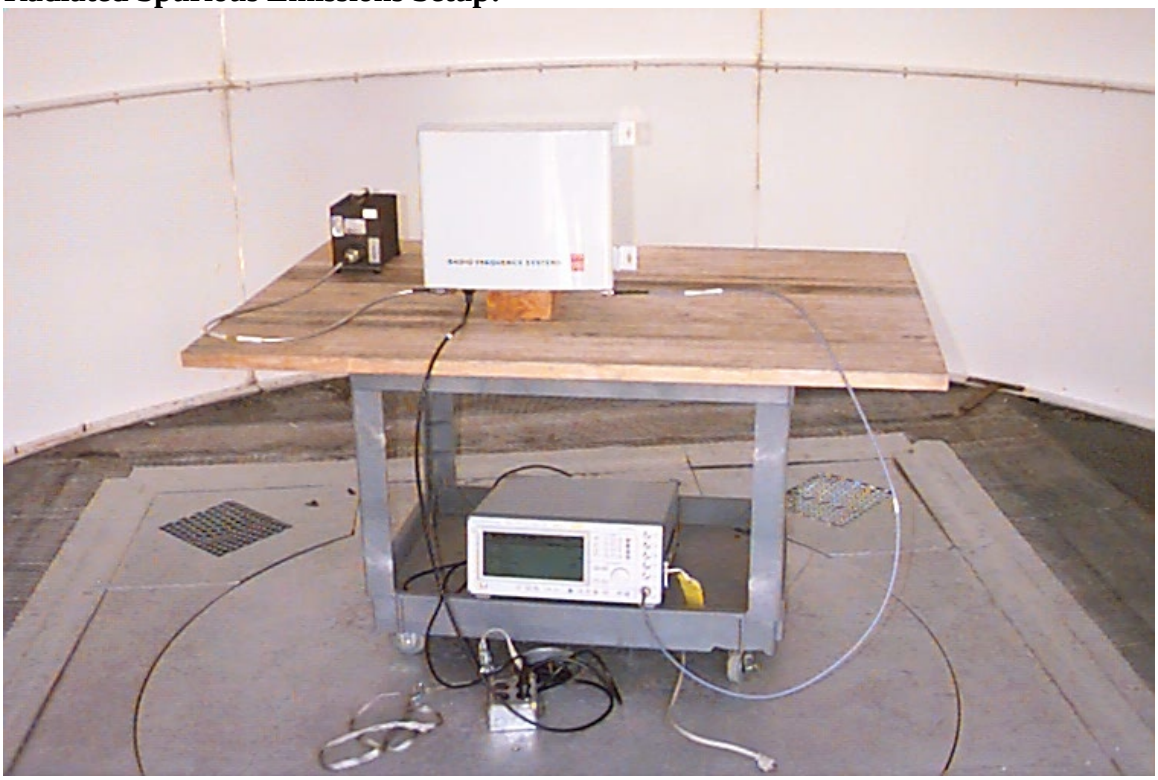


Downlink 935-941MHz Band Filter Response

Date: 3.MAY.2005 16:22:24

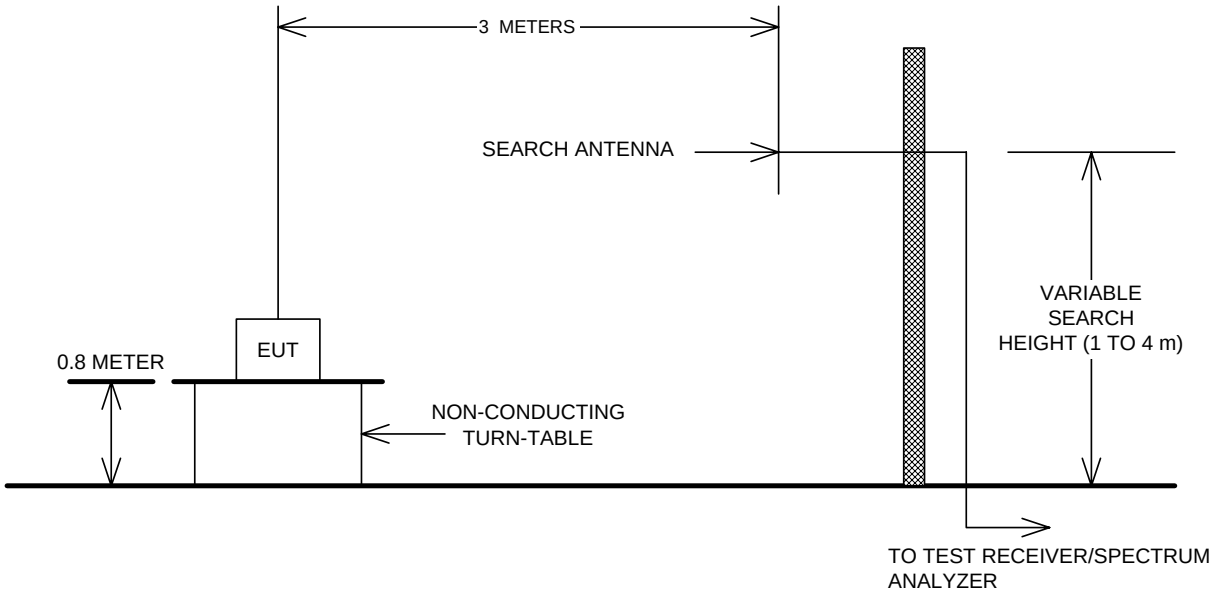
Appendix B : Setup Photographs

Radiated Spurious Emissions Setup:



Appendix C : Block Diagram of Test Setups

Test Site For Radiated Emissions



Conducted Emissions, Output power, Occupied Bandwidth and Out of Band Rejection