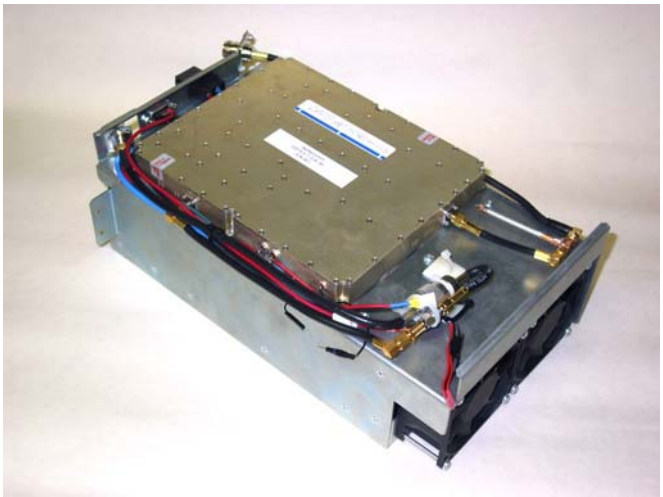
Assessment of Compliance

for

Measurement of Field Strength of Spurious Radiation in accordance with the FCC Rules & Regulations Part 2.1053 and 90.543 and 27.53

700 MHz band base station power amplifier Aethercomm

Dataradio.



October 2004

APREL Project No.: DATB-AETHERCOMM-5072

51 Spectrum Way Nepean ON K2R 1E6
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Engineering Report

Subject: **Measurement of Field Strength of Spurious Radiation in accordance with the FCC Rules & Regulations Part 2.1053, 90.543 and 27.53**

FCC ID: **EOTBDP3-AET**

Equipment: **700 MHz band base station power amplifier**

Model: **BDP3-87S-170502A-AET option**

Client: **Dataradio**
Suite 200, 5500 Royalmount Ave.
Town of Mount Royal, Quebec
CANADA, H4P 1H7

Project #: DATB-AETHERCOMM-5072

Prepared By: **APREL Laboratories,**
Regulatory Compliance Division
51 Spectrum Way
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Approved by: _____ Date: Dec. 9, 2004
Jay Sarkar:
Technical Director, Standards & Certification

Submitted by: _____ Date: Dec. 9, 2004
Jay Sarkar:
Technical Director, Standards & Certification

Released by: _____ Date: Dec 9/04
Dr. Jack J. Wojcik, P.Eng.

FCC ID: **EOTBDP3-AET**
Applicant: Dataradio
Equipment: 700 MHz band base station power amplifier
Model: **BDP3-87S-170502A-AET option**
Standard: FCC Rules and Regulations Part 2.1053, 90.543(c) and 27.53(d) (3)

ENGINEERING SUMMARY

This report contains the results of Field Strength of Spurious Radiation measurement performed on a Dataradio 700 MHz band base station power amplifier model **BDP3-87S-170502A-AET option**, in accordance with the FCC Rules and Regulations Parts 2.1053, 90.543(c) and 27.53(d)(3). The measurements were carried out using substitution method as radiated.

The product was evaluated for spurious radiation when it was set at the highest power.

Test configuration: BDP3-87S-170502A-AET option was tested as a stand-alone unit.

This report presents test data for frequency band 767.025-772.975 MHz & 762.025-763.925 MHz

The results presented in this report relate only to the sample tested.

Summary of the Results

Test Description	Page No.	Test Set-up Figure No.	Results Summary
Field Strength of Spurious Radiation Ref. Paragraph 2.1053 and 90.543 (c), 27.53(d)(3)	8	1	**Passed**

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INTRODUCTION

General

This report describes the results of the Field Strength of Spurious Radiation measurement conducted on a DATARADIO 700 MHz band base station power amplifier, model **BDP3-87S-170502A-AET option**, herein referred to as DUI (Device Under Investigation).

Test Facility

The tests were performed for Dataradio by APREL Laboratories at APREL's EMI facility located in Nepean, Ontario, Canada. The laboratory operates an (3m and 10m) Open Area Test Site (OATS). The measurement facility is calibrated in accordance with ANSI C63.4-1992.

A description of the measurement facility in accordance with the radiated and AC line conducted test site criteria per ANSI C63.4-1992 is on file with the Federal Communications Commission and is in compliance with the requirements of Section 2.948 of the Commissions rules and regulations. ***APREL's registration number is 90416. APREL'S Industry Canada Approval number for the OATS is IC2068.***

APREL is accredited by Standard Council of Canada under ISO 17025.

Standard

The evaluation and analysis were conducted in accordance with FCC Rules and Regulations Parts 2.1053, 90.543(c) and 27.53(d)(3).

Personnel: The equipment was tested by Roman Kuleba, EMC Engineer, methodology developed and the report was written by Jayanta (Jay) K. Sarkar, Technical Director, Standards and Certification.

Test Equipment

The test equipment used during the evaluation is listed in Appendix A with calibration due dates.

Environmental Conditions
Measurements were conducted in open area test site. Temperature: 24°C ± 2,
Relative Humidity: 30 - 50 % , Air Pressure: 101 kPa ± 3.

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FCC SUBMISSION INFORMATION

FCC ID:	**EOTBDP3-AET**
Equipment type:	**700 MHz band base station power amplifier**
Model:	**BDP3-87S-170502A-AET option**
For:	Certification
Applicant:	**Dataradio** Suite 200, 5500 Royalmount Ave. Town of Mount Royal, Quebec CANADA, H4P 1H7
Manufacturer:	**Dataradio** Suite 200, 5500 Royalmount Ave. Town of Mount Royal, Quebec CANADA, H4P 1H7
Evaluated by:	**APREL Laboratories** 51 Spectrum Way Nepean, Ontario Canada K2R 1E6

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MANUFACTURER'S DATA

FCC ID:	**EOTBDP3-AET**
Equipment Type:	700 MHz band base station power amplifier
Model:	**BDP3-87S-170502A-AET option**
Reference:	FCC Rules and Regulations Parts 2.1053, 90.543(c) and 27.53(d) (3)
Manufacturer:	Dataradio
Development Stage of Unit:	Pre-Production

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T*est:* **Field Strength of Spurious Radiation**

Ref: FCC Parts 2.1053 and 90.543 (c), 27.53(d) (3)

Frequency Band: **767.025-773.975 MHz (Part 90.543) and 762.025-764.925 MHz (Part 27.53(d))**

Criteria: The radiated spurious emissions shall be attenuated below the maximum level of Emissions of the carrier frequency in accordance with the following formula: Spurious attenuation in dB=43+10log10 (P). (Thus the effective limit is -13dBm)

Set-up: See Figure 1.a

Conditions: Voltage Supply: AC source.

Equipment: See Appendix A.

Methodology: **Measurement by Substitution Method (Radiated):**

The DUI was tested for spurious radiated emissions using the substitution method.

Test site: The radiated RF measurement was taken at APREL Laboratory's open area test site (OATS). This open area test site is calibrated to ANSI C63.4 document and a description of the measurement facility is on file with the Federal Communications Commission and is in compliance with the requirement of Section 2.948 of the Commissions rules and regulations. (FCC File No.: 90416)

The test was set-up as illustrated in Fig.1. The DUI was configured to operate at maximum power. The equipment under test was placed on a turntable positioned 3 m away from the calibrated receiving antenna, which in turn was connected to the spectrum analyzer.

A set of two reference dipoles, a horn antenna and a signal generator to duplicate the signal were used. Signals radiated from the DUI on the fundamental frequency as well as second and third harmonic were evaluated by comparing to the signals transmitted from the reference dipoles. For testing the higher frequencies, fourth to 10th harmonics, a calibrated horn antenna with known gain was used as a

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replacement source of radiation thus substituting the DUI. The duplicated reading (taken in dBm designated as ERP) was then referenced to the dipole.

For each transmitter frequency, the received signal was **maximised** by rotating the turntable and adjusting the height of the receiving antenna. To obtain the actual ERP, the DUI was replaced by a vertically polarised half-wave dipole antenna resonant to that frequency and fed by a RF power amplifier and signal generator. The center of the dipole antenna was placed precisely in the same location as the DUI. It was ensured that the orientation of the rotating table and the height of the receiving antenna were unmoved. The signal generator level was adjusted until the peak reading on the spectrum analyzer was identical to that obtained when the DUI was on the turntable. The two signals were matched by superimposing one signal to the other on the spectrum analyzer screen. The output of power amplifier was disconnected from the substitute dipole antenna and connected to a RF power meter. **The effective radiated power was read directly from the power meter**.

Criteria level: The criteria level was calculated to be: – 13.0 dBm in the frequency band 767.025 - 773.925 MHz.

This level was obtained by using the following expression:

$$\mathbf{Criteria_{Limit\ (dBm)} = ERP_{Carrier\ (dBm)} - [43 + 10*\log_{10} ERP_{(W)}]}$$

Example: $\mathbf{Criteria}_{Limit(dBm)} = 46.99\ dBm - [43 + 10*\log_{10}(50\ W)]$

$\mathbf{Criteria}_{Limit(dBm)} = 46.99\ dBm - (43 + 16.99)\ dB = -13.0\ dBm$

It can also be shown using the above calculation that the criteria level using substitution method is also –13.0 dBm in the frequency band 762.025 - 764.925 MHz.

Results: **Passed. See Tables 1 to 4.**

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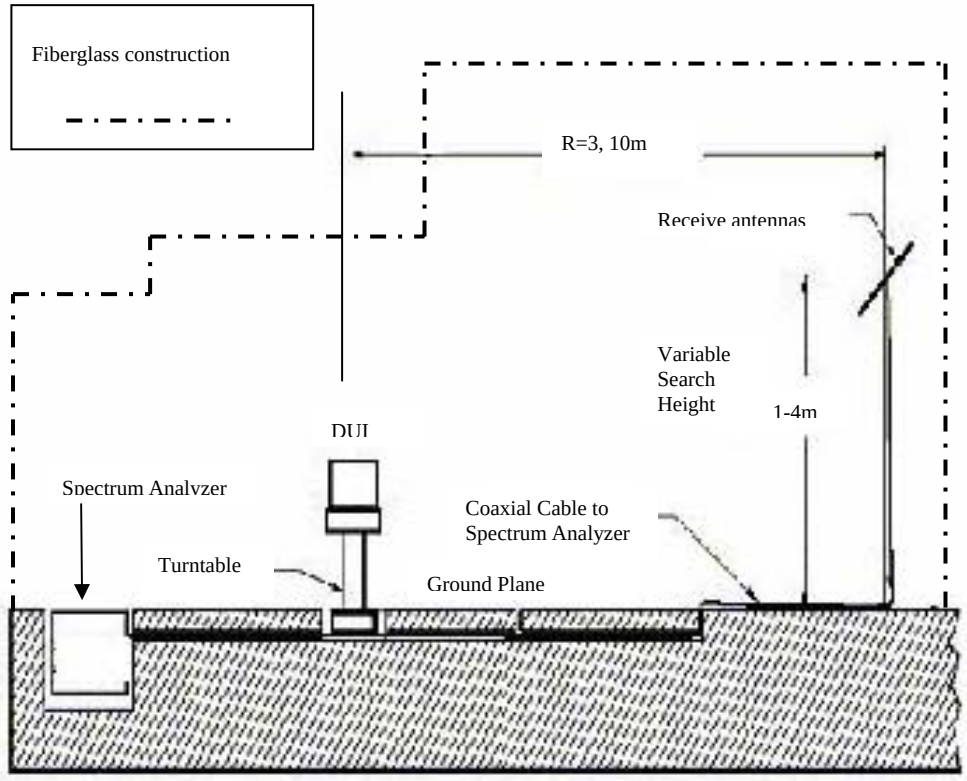

Figure 2.a: Test set up for the radiated emission measurement in OATS (not to scale)

Figure 2b: APREL Laboratories all season Open Area Test Site (OATS)

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Table 1

Field Strength of Spurious Radiation

Antenna Polarization: **Vertical**

Substitution Method as Radiated

Frequency	ERP_V	Limit	Margin
MHz	**dBm**	**dBm**	**dB**
Low Channel - Transmitting Frequency: 767.025 MHz (Fundamental)			
767.025	46.99	N/A	N/A
1534.050	-22.05	-13.0	9.05
2301.075	-17.32	-13.0	4.32
3068.100	-37.79	-13.0	24.79
3835.125	-27.21	-13.0	14.21
4602.150	-46.63	-13.0	33.63
5369.175	-52.09	-13.0	39.09
6136.200	-60.36	-13.0	47.36
6903.225	-55.86	-13.0	42.86
7670.250	-61.46	-13.0	48.46
Medium Channel - Transmitting Frequency: 770.025 MHz (Fundamental)			
770.025	46.65	N/A	N/A
1540.050	-20.85	-13.0	7.85
2310.075	-17.38	-13.0	4.38
3080.100	-45.64	-13.0	32.64
3850.125	-27.09	-13.0	14.09
4620.150	-49.45	-13.0	36.45
5390.175	-51.14	-13.0	38.14
6160.200	-55.03	-13.0	42.03
6930.225	-60.49	-13.0	47.49
7700.250	-65.99	-13.0	52.99
High Channel - Transmitting Frequency: 772.975 MHz (Fundamental)			
772.975	46.30	N/A	N/A
1545.950	-21.66	-13.0	8.66
2318.925	-17.92	-13.0	4.92
3091.900	-57.14	-13.0	44.14
3864.875	-33.93	-13.0	20.93
4637.850	-50.15	-13.0	37.15
5410.825	-47.90	-13.0	34.90
6183.800	-64.62	-13.0	51.62
6956.775	-66.22	-13.0	53.22
7729.750	-65.68	-13.0	52.68

*nf – noise floor

Test Performed by: Eric Robinson Date: October 2004

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Table 2

Field Strength of Spurious Radiation

Antenna Polarization: **Horizontal**

Substitution Method as Radiated

Frequency	ERP_V	Limit	Margin
MHz	dBm	dBm	dB
Low Channel - Transmitting Frequency: 767.025 MHz (Fundamental)			
767.025	31.88	N/A	N/A
1534.050	-30.99	-13.0	17.99
2301.075	-26.46	-13.0	13.46
3068.100	-40.76	-13.0	27.76
3835.125	-36.30	-13.0	23.30
4602.150	-48.62	-13.0	35.62
5369.175	-53.90	-13.0	40.90
6136.200	-64.84	-13.0	51.84
6903.225	-59.53	-13.0	46.53
7670.250	-68.92 nf	-13.0	55.92
Medium Channel - Transmitting Frequency: 770.025 MHz (Fundamental)			
770.025	32.08	N/A	N/A
1540.050	-30.41	-13.0	17.41
2310.075	-28.49	-13.0	15.49
3080.100	-46.81	-13.0	33.81
3850.125	-37.72	-13.0	24.72
4620.150	-52.26	-13.0	39.26
5390.175	-56.50	-13.0	43.50
6160.200	-65.46	-13.0	52.46
6930.225	-63.97	-13.0	50.97
7700.250	-69.72 nf	-13.0	56.72
High Channel - Transmitting Frequency: 772.975 MHz (Fundamental)			
772.975	31.78	N/A	N/A
1545.950	-30.07	-13.0	17.07
2318.925	-27.18	-13.0	14.18
3091.900	-49.74	-13.0	36.74
3864.875	-36.90	-13.0	23.90
4637.850	-50.27	-13.0	37.27
5410.825	-54.16	-13.0	41.16
6183.800	-63.93	-13.0	50.93
6956.775	-61.32	-13.0	48.32
7729.750	-67.98 nf	-13.0	54.98

*nf – noise floor

Test Performed by: Kristina Roman Date: October 2004

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Table 3

Field Strength of Spurious Radiation

Antenna Polarization: **Vertical**

Substitution Method as Radiated

Frequency	ERP_V	Limit	Margin
MHz	dBm	dBm	dB
Low Channel - Transmitting Frequency: 762.025 MHz (Fundamental)			
762.025	46.19	N/A	N/A
1524.050	-20.56	-13.0	7.56
2286.075	-17.18	-13.0	4.18
3048.100	-39.15	-13.0	26.15
3810.125	-24.96	-13.0	11.96
4572.150	-48.63	-13.0	35.63
5334.175	-54.18	-13.0	41.18
6096.200	-62.18	-13.0	49.18
6858.225	-56.79	-13.0	43.79
7620.250	-64.39	-13.0	51.39
Medium Channel - Transmitting Frequency: 763.025 MHz (Fundamental)			
763.025	46.77	N/A	N/A
1526.050	-20.73	-13.0	7.73
2289.075	-18.22	-13.0	5.22
3052.100	-38.74	-13.0	25.74
3815.125	-24.48	-13.0	11.48
4578.150	-48.59	-13.0	35.59
5341.175	-53.88	-13.0	40.88
6104.200	-62.60	-13.0	49.60
6867.225	-56.04	-13.0	43.04
7630.250	-63.75	-13.0	50.75
High Channel - Transmitting Frequency: 763.925 MHz (Fundamental)			
763.925	46.71	N/A	N/A
1527.850	-22.99	-13.0	9.99
2291.775	-17.50	-13.0	4.50
3055.700	-40.02	-13.0	27.02
3819.625	-24.76	-13.0	11.76
4583.550	-49.03	-13.0	36.03
5347.475	-54.10	-13.0	41.10
6111.400	-63.15	-13.0	50.15
6875.325	-55.66	-13.0	42.66
7639.250	-63.85	-13.0	50.85

*nf – noise floor

Test Performed by: [signature] Date: October 2004

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Table 4

Field Strength of Spurious Radiation

Antenna Polarization: **Horizontal**

Substitution Method as Radiated

Frequency	ERP_V	Limit	Margin
MHz	**dBm**	**dBm**	**dB**
Low Channel - Transmitting Frequency: 762.025 MHz (Fundamental)			
762.025	33.26	N/A	N/A
1524.050	-33.00	-13.0	20.00
2286.075	-28.53	-13.0	15.53
3048.100	-42.37	-13.0	29.37
3810.125	-32.88	-13.0	19.88
4572.150	-54.16	-13.0	41.16
5334.175	-60.24	-13.0	47.24
6096.200	-71.09	-13.0	58.09
6858.225	-63.54	-13.0	50.54
7620.250	-69.40 nf	-13.0	56.40
Medium Channel - Transmitting Frequency: 763.025 MHz (Fundamental)			
763.025	31.94	N/A	N/A
1526.050	-32.19	-13.0	19.19
2289.075	-27.71	-13.0	14.71
3052.100	-42.00	-13.0	29.00
3815.125	-32.28	-13.0	19.28
4578.150	-54.06	-13.0	41.06
5341.175	-59.73	-13.0	46.73
6104.200	-71.56	-13.0	58.56
6867.225	-63.14	-13.0	50.14
7630.250	-66.55	-13.0	53.55
High Channel - Transmitting Frequency: 763.925 MHz (Fundamental)			
763.925	32.18	N /A	N/A
1527.850	-37.12	-13.0	24.12
2291.775	-26.39	-13.0	13.39
3055.700	-43.34	-13.0	30.34
3819.625	-32.62	-13.0	19.62
4583.550	-54.62	-13.0	41.62
5347.475	-60.25	-13.0	47.25
6111.400	-72.23	-13.0	59.23
6875.325	-62.82	-13.0	49.82
7639.250	-68.68 nf	-13.0	55.68

*nf – noise floor

Test Performed by: Eric Robinson Date: October 2004

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APPENDIX A
List of Test Equipment

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Radiated Spurious Emissions
List of Equipment

Description	Range	Manufacturer	Model #	APREL Asset #	Cal. Due Date
Spectrum Analyzer	9 kHz - 3 GHz	Anritsu	MS2661C	301330	March 25, 2005
Spectrum Analyzer	9 kHz - 30 GHz	Anritsu	MS2667C	301386	Sept. 5, 2005
RF Signal Generator	10 MHz – 26.5 GHz	Hewlett Packard	HP 8340 B	100955	Oct 5, 2005
Low Noise Antenna Pre-amplifier	30-1000 MHz	APREL Inc.	LNA-1	301415	August 27,2005
High Pass Filter	3.0 GHz	Anaren	KPMC 03SJ0	301560	August 15, 2005
Attenuator	20 dB	NARDA	9779-20	301533	August 15, 2005
Notch Filter	DC - 6 GHz	Microwave filter Co.	6367	301055	CBT
RF Power Meter	10 MHz - 18 GHz	Giga-tronics	8541C	301393	Oct.16, 2005
RF Power Sensor	10 MHz - 18 GHz	Giga-tronics	80601A	301394	Oct.16, 2005
Biconical Antenna	20 MHz - 200 MHz	Eaton	94455-1	100890	July 18, 2005
Log - Periodic Antenna	200 MHz -1.0 GHz	Eaton	ALP-1	100063	July 31, 2005
Horn Antenna	1 – 18 GHz	APREL Inc.	AA – 118	100400	June 17, 2005
Anechoic Shielded Room	10 kHz - 10 GHz	APREL Inc.	ALP-AnSh	301329	May 22, 2007
Reference Half -wave Dipole Antenna	770 MHz	APREL Inc.	ALP-DA1/2W	100157	July 3, 2005
Reference Half -wave Dipole Antenna	2300.00 MHz	APREL Inc.	ALP-DA1/2W	301550	July 3, 2005
OATS	30 MHz – 1 GHz	APREL Inc.	3 m & 10 m	N/A	March 20, 2006

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APPENDIX B
PHOTOGRAPHS

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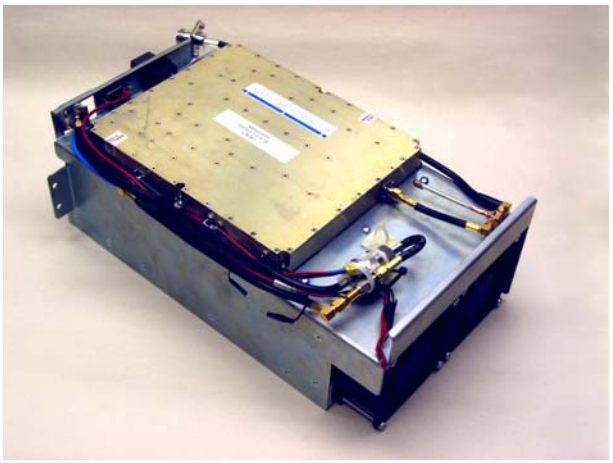

DataRadio Aethercomm 700 MHz Band Base Station
(system components used in test)

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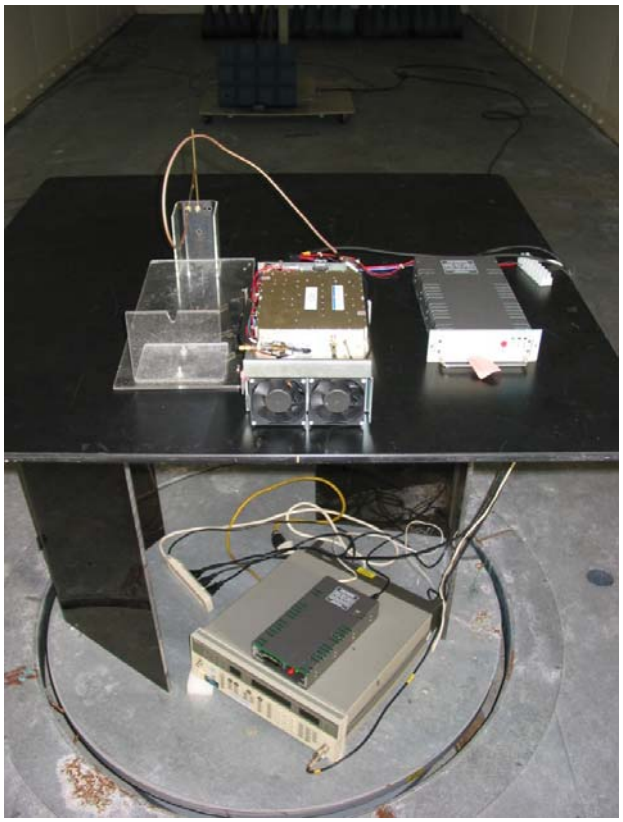

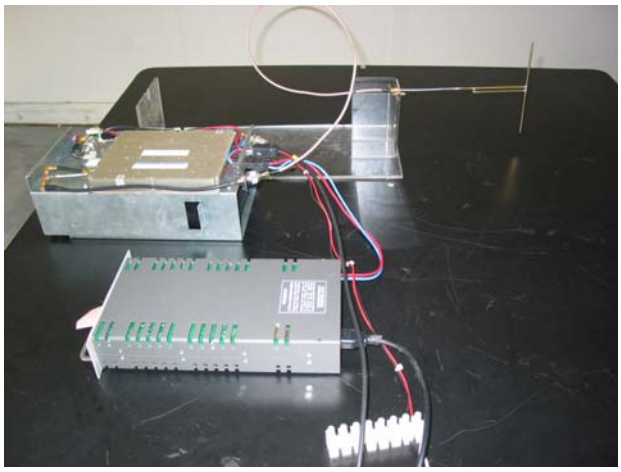

DataRadio Aethercomm 700 MHz Band Base Station
(system configuration tested for radiated spurious emissions)

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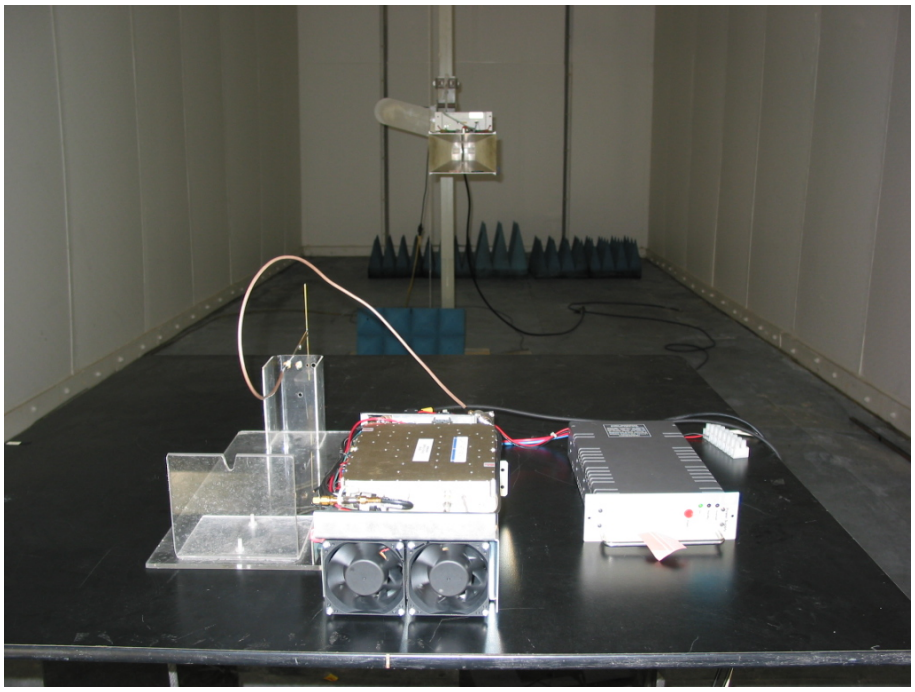

Dataradio Aethercomm 700 MHz band base station
tested for Spurious Emissions from Transmitter
Frequency Range: 30 MHz – 18 GHz

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