

**Engineering Exhibit in Support of  
Class II Permissive Change Request  
FCC Form 731**

**for the**

**Mobile Data Platform Transceiver (700MHz MDP)**

**With the**

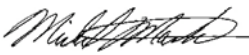
**Data Radio Gemini Modem**

**FCC ID: EOTGPD7  
Trade Name: GEMINI**

May 18, 2006

**AFFIDAVIT**

The technical data included in this report has been accumulated through tests that were performed by me or by engineers under my direction. To the best of my knowledge, all of the data is true and correct.

A rectangular box containing a handwritten signature in black ink. The signature appears to be "Michel Martin" written in a cursive style.

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Michel Martin  
Research and Development Director, Dataradio Inc.

Dataradio Cor.  
Waseca, MN

**ENGINEERING STATEMENT  
OF CHRIS LUDEWIG**

The application consisting of the attached engineering exhibit and associated FCC form 731 has been prepared in support of a request for a Class II Permissive Change for EOTGPD7.

The certification EOTGPD7 has been granted to Dataradio Inc for its Gemini radio modem. Gemini is comprised of the Dataradio COR Ltd. (DRL) Mobile Data Platform (MDP) 700MHz Transceiver with the Dataradio Inc Gemini G3 Modem. Dataradio Inc does the final assembly and markets the Gemini unit. The EOTGPD7 certificate has been granted for digital 16-level FSK type of modulation scheme over 50kHz channels. The MDP Transceiver RF power is continuously variable from 10-31 watts and its nominal power is 30W.

The change intends to document the replacement of an RF power transistor (active component) and its incumbent behavioral emissions of spurious. This change involves this component and its biasing passive circuitry only, with no change whatsoever occurring in the frequency determining circuitry or the maximum power rating of the MDP transceiver.

EXISTING CONDITIONS

The unit utilized for these RF spurious measurements was a prototype built from pilot MDP radios and production controllers G3 of EOTGPD7 used to create the modulation scheme. The transceiver is designed to operate on frequencies ranging from 792.000 MHz to 803.000 MHz. The frequency tolerance of the transceiver is .000125% or 1.25 parts per million. The frequency stability of the transceiver is controlled by a temperature compensated crystal oscillator (TCXO) operating at 17.5 MHz.

PROPOSED CONDITIONS

It is proposed to accept the request for the GEMINI, 792-803 MHz Transceiver/Modem/GPS for operation in the band of frequencies previously outlined. The applicant anticipates marketing the device for use in wireless transmission of data.

PERFORMANCE MEASUREMENTS

All measurements for Occupied Bandwidth and mask compliance as per 2.1043 (b)(2) were conducted in accordance with the Rules and Regulations Section 2.1041 and 2.1049 of Rules Service Co rev.2-172, Mar 15, 2005. Equipment performance measurements were made in the engineering laboratory and on the FCC certified Open Area Test Site of Dataradio COR located at 299 Johnson Avenue in Waseca, Minnesota. All measurements were made and recorded by myself or under my direction. The performance measurements were made between Mar 15 and Apr 30, 2006

CONCLUSION

Given the results of the measurements contained herein, the applicant requests to be applied a Class II Permissive Change for the Certificate EOTGPD7 to accept the replacement of the obsolete RF power transistor.



05/16/2006

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Chris Ludewig,  
Dataradio COR. LTD

**TABLE OF CONTENTS**

|  |    |
|--|----|
| AFFIDAVIT .....  | 2  |
| ENGINEERING STATEMENT.....   | 3  |
| TABLE OF CONTENTS.....   | 4  |
| QUALIFICATIONS OF ENGINEERING PERSONNEL .....  | 5  |
| CLASS II PERMISSIVE CHANGE INFORMATION REQUESTED BY GRANTEE - Rule part 2.1043 (b)(2).....   | 6  |
| GENERAL INFORMATION ABOUT THE GRANTEE AND CERTIFICATED EQUIPMENT -2.1043 (b)(2) .....  | 7  |
| DATA AND CHARACTERISTICS NOT AFFECTED BY THE CHANGE - Rule Part Number: 2.1033 (c).<br>(3),(4),(11),(12),(13),(14),(15),(16) ..... | 8  |
| Transmitter Rated Power Output .....   | 10 |
| Transmitter Spurious and Harmonic Outputs -conducted.....  | 11 |
| Field Strength of Spurious Radiation.....  | 14 |

### **QUALIFICATIONS OF ENGINEERING PERSONNEL**

**NAME:** Chris Ludewig

**TITLE:** Director of Engineering (Dataradio COR Ltd.)

**TECHNICAL EDUCATION:** Bachelor of Science in Electrical and Electronic Engineering  
(1984) From North Dakota State University

**TECHNICAL EXPERIENCE:** 22 years experience in design of portable and mobile radio equipment

**NAME:** Constantin Pintilei

**TITLE:** R&D Test Engineer

**TECHNICAL EDUCATION:** Bachelor of Science Degree in Radiotechnique Electronic Engineering  
(1993) Technical University of Iasi, Romania

**TECHNICAL EXPERIENCE:** Professional engineer since 2001  
12 Years experience in radio frequency measurements.

**NAME:** Daniel Hanson

**TITLE:** Electrical Engineer I

**TECHNICAL EDUCATION:** Bachelor of Science Degree in Electrical Engineering (2005)  
from Minnesota State University, Mankato

**TECHNICAL EXPERIENCE:** 1 year experience in RF design.

**CLASS II PERMISSIVE CHANGE INFORMATION REQUESTED BY GRANTEE - Rule part 2.1043 (b)(2)**

The certification EOTGPD7 has been granted to Dataradio Inc for its Gemini radio modem. Gemini is comprised of the Dataradio COR Ltd. (DRL) Mobile Data Platform (MDP) UHF (792 - 803 MHz Tx/ 762-773 MHz Rx) Transceiver with the Dataradio Inc Gemini GCU Modem. Dataradio Inc does the final assembly and markets the Gemini/PD unit.

The change consists of replacing the older, obsolete final transistors (Motorola MRF847) with new devices (Mitsubishi RD45HMF-1). The board layout did have to be modified for this change, but only to accommodate a slightly different transistor package, and some modifications to the bias circuitry. Matching component values and placement shifted a little as well but there are no changes regarding the functionality of the device or of the frequency-related characteristics of the unit. Dataradio is also going to be adding a cavity shield over the whole PA cavity to improve overall shielding.

There are no changes to the basic frequency determining and stabilizing circuitry (including clock or data rates), frequency multiplication stages, basic modulator circuit and the maximum power rating is preserved at 30W, as accepted at the certification. Therefore a Class II Permissive Change request has been considered.

The characteristics affected are :

|   |                |
|---|----------------|
| DC Voltages And Currents Into Final Amplifier                         | 2.1033 (c).(8) |
| Transmitter Spurious And Harmonic Outputs<br>(conducted and radiated) | 2.1051         |

They are entirely documented with the current report.

**GENERAL INFORMATION ABOUT THE GRANTEE AND CERTIFICATED EQUIPMENT -2.1043****(b)(2)**

(as per Rule Part Number: 2.1033 (c).(1),(2),(5),(6),(7))

APPLICANT/GRANTEE Dataradio Inc.,  
5500 Royalmount Ave, suite 200,  
Town of Mount Royal, Quebec, Canada, H4P 1H7

MANUFACTURER: Dataradio COR Ltd., Waseca, MN 56093 (MDP Transceiver)  
DATARADIO Inc., Town of Mount Royal, Quebec, Canada, H4P 1H7  
(Gemini modem and final assembly)

MODEL NUMBER: Gemini G3  
CATALOG NUMBER: GPG3-6077-xyz

SERIAL NUMBER ( S ): 255-03434-00x Gemini GCU III modem no S/N  
6077-102 S/N 10007 pilot MDP transceiver

FCC ID NUMBER: EOTGPD7  
FCC RULES AND REGS: FCC Part ( s ) 90, 27

FREQUENCY RANGE: 792.000 MHz - 803.000 MHz on 50kHz channels  
(762-764 MHz Rx/792-794MHz Tx as per Part 27 and  
767-773 MHz Rx / 797-803 MHz Tx as per Part 90 subpart R )

MAXIMUM POWER RATING: 30.00 Watts (10-30 watts variable).

NUMBER OF CHANNELS: 16 Channel Modem

INPUT IMPEDANCE: 50 ohms, Nominal

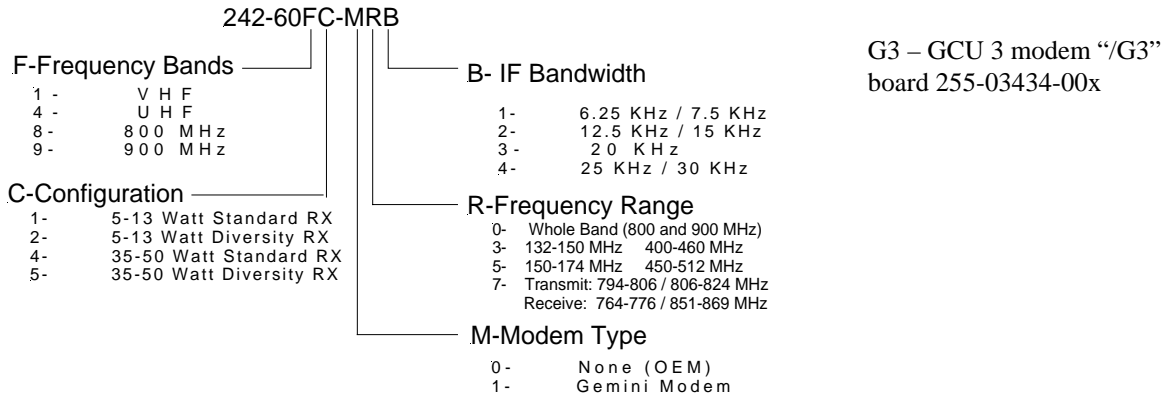
VOLTAGE REQUIREMENTS: 10.9-16.3VDC (13.6 VDC Nominal)

## EQUIPMENT IDENTIFICATION:

| <u>TRADE NAME</u> | <u>DESCRIPTION</u>      | <u>DRI PART NUMBER</u> |
|-------------------|-------------------------|------------------------|
| MDP6000           | 806-824/851-869MHz XCVR | 242-608C-MRB           |
| Gemini            | Modem                   | GPmm1                  |

**DRI** Part Number System for MDP: “mm”

**DRI** Part Number System for modem



**DATA AND CHARACTERISTICS NOT AFFECTED BY THE CHANGE - Rule Part Number: 2.1033 (c). (3),(4),(11),(12),(13),(14),(15),(16)**

|   |  |
|---|--|
| Instruction book                        | 2.1033 (c) (3)   |
| Type of emission:                       | 2.1033(c) (4)  |
| FCC Label                               | 2.1033 (c) (11)  |
| Photographs                             | 2.1033 (c) (12)  |
| Digital Modulation Techniques           | 2.1033.(c) (13)  |
| Data addressing Rule Part Number        | 2.1033(c) (15), (16): this unit is not designed for the mentioned purposes |
| Modulation Characteristic Part          | 2.1047 (d), 90.209 (b), 90.210(g,h):.                                      |
| Spectrum efficiency standard            | 90.203 (j)   |
| MPE limits compliance                   | 2.1091   |
| Test results not affected by the change | 2.1033(c) 14, 2.1041   |

Test data according to:

Part 2: 2.1046,2.1047,2.1049 and 2.1055

Part 90, Subpart I: 90.209, 90.210, 90.213 and 90.214

as follow:

Occupied Bandwidth and Emission designator 2.1047,2.1049, 90.209, 90.210

Frequency Stability and Frequency Tolerance 2.1055,90.213

Note. The power rating as per 2.1046 does not change, anyway the unit underwent it to have measured the DC currents.



## DATA AND CHARACTERISTICS AFFECTED BY THE CHANGE - Rule Part Number:2.1033(c) (8)(9)(10)

DC Voltages And Currents Into Final Amplifier 2.1033(C).(8)  
documented in the test report, see below

On the 4 occurrences below, there are only changes related to the proper denomination of the part. The change consists in the replacement of an obsolete RF transistor (Motorola MRF847) by a functionally identical one (Mitsubishi RD45HMF1). Therefore, except for documentation changes concerning the denomination of the part and its related biasing circuitry, all made of passive components, and slight PCB changes to accommodate the new footprint of the part, there are no other changes.

|                                     |                |
|-------------------------------------|----------------|
| Transmitter Tune Up Procedure       | 2.1033 C (9)   |
| Description Of Circuitry            | 2.1033 (C)(10) |
| Schematics                          | 2.1033 (C)(10) |
| Transistor, Diode, And IC Functions | 2.1033 C (10)  |

**Test data according to:**

Part 2: 2.1046, 2.105, 2.10531 and 2.1057  
as follow:

|   |        |
|---|--------|
| Transmitter Rated Power Output                          | 2.1046 |
| Transmitter's spurious emissions at antenna terminals   | 2.1051 |
| Field strength of spurious radiation of the transmitter | 2.1053 |

Note: Although the power ratings do not change, transmitter rated power output was tested to show the new DC currents into the part.

**TEST DATA 2.1033 (c)(14)**

All applicable test data as shown above are provided in next section of this Engineering Report

The following reports have been generated for Class II Permissive Change request for EOTGPDB, Gemini radio modem. Gemini is comprised of the Dataradio COR Ltd. (DRL) Mobile Data Platform (MDP) 700 MHz Transceiver with the Dataradio Inc Gemini GCU Modem. Dataradio Inc does the final assembly and markets the Gemini unit

Unless otherwise noted, all of the measurements were conducted following the procedures set forth in the TIA/EIA-603 standards.

## NAME OF TEST:

**Transmitter Rated Power Output**

RULE PART NUMBER: 2.1046 (a), 90.541, 27.50(a) (2)

TEST RESULTS: See results below

TEST CONDITIONS: Standard Test Conditions, 25 C

TEST EQUIPMENT: Attenuator, BIRD Model / 50-A-MFN-20 / 20 dB / 50 Watt  
 Attenuator, BIRD Model / 10-A-MFN-10 / 10 dB / 10 Watt  
 Digital Voltmeter, Fluke Model 8012A  
 Power Meter, Model HP437B  
 Power Meter, HP 436A

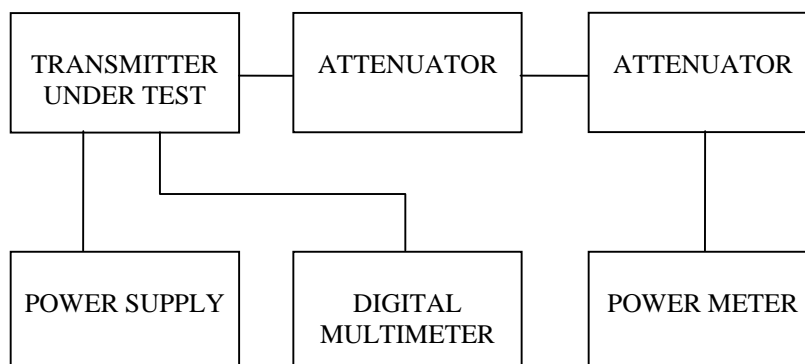
PERFORMED BY:



Daniel Hanson

DATE: 3/28/06

## TEST SET-UP:



## TEST RESULTS:

| <b>Frequency<br/>(MHz)</b> | <b>DC Voltage at<br/>Final (VDC)</b> | <b>DC Current into<br/>Final (ADC)</b> | <b>DC Power into<br/>Final (W)</b> | <b>RF Power<br/>Output (W)</b> |
|----------------------------|--------------------------------------|--|------------------------------------|--------------------------------|
| 800                        | 13.56                                | 6.33                                   | 85.83                              | 29.9                           |
| 800                        | 13.57                                | 3.62                                   | 49.12                              | 10.0                           |

NAME OF TEST:

**Transmitter Spurious and Harmonic Outputs -conducted**

RULE PART NUMBER: 2.1051, 90.543(c), 27.53(d) (3)

MINIMUM STANDARD: For 30 Watts:  
 $43 + 10 \log_{10}(30 \text{ Watts}) = 57.8 \text{ dBc}$   
 or 70 dBc whichever is the lesser attenuation.  
 For 10 Watts:  
 $43 + 10 \log_{10}(10 \text{ Watts}) = 53 \text{ dBc}$   
 or 70 dBc whichever is the lesser attenuation.

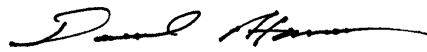
TEST RESULTS: Meets minimum standard (see data on the following page)

TEST CONDITIONS: Standard Test Conditions, 25 C  
 RF voltage measured at antenna terminals

TEST PROCEDURE: TIA/EIA - 603, 2.2.13

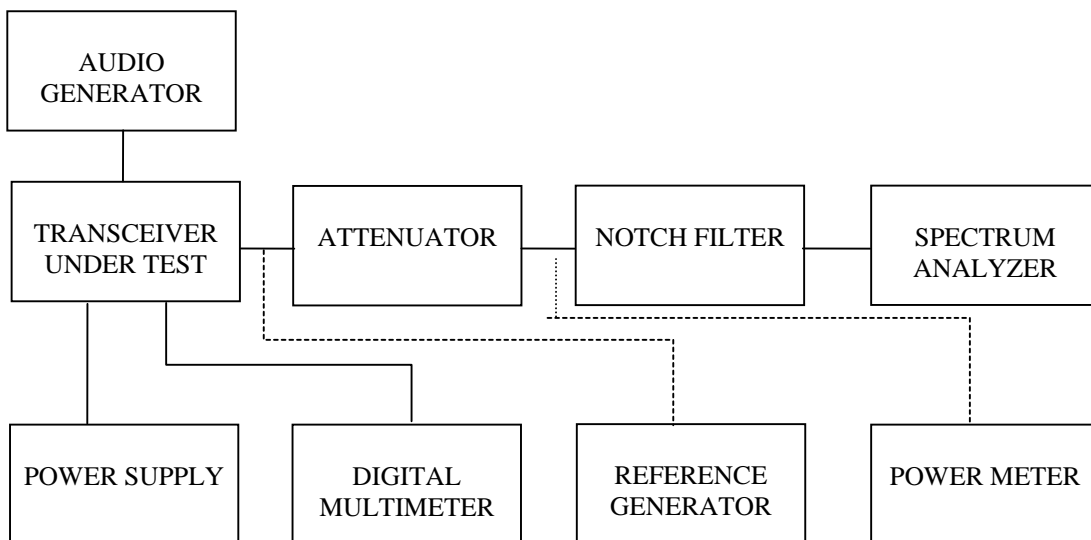
TEST EQUIPMENT: Attenuator, BIRD Model / 50-A-MFN-20 / 20 dB / 50 Watt  
 Attenuator, BIRD Model / 10-A-MFN-10 / 10 dB / 10 Watt  
 Digital Voltmeter, Fluke Model 8012A  
 DC Power Source, Model HP6024A  
 Spectrum Analyzer, Model HP8563E  
 Reference Generator, Model Agilent E8257D  
 Power Meter, Model HP437B  
 Audio Generator, Model HP8903B

PERFORMED BY:



Daniel Hanson

Date: 3/28/06



NAME OF TEST: Transmitter Spurious and Harmonic Outputs  
(Continued)

MEASUREMENT PROCEDURE:

1. The transmitter carrier output frequency is 800 MHz. The reference oscillator frequency is 17.5000 MHz.
2. After carrier reference was established on spectrum analyzer, the notch filter was adjusted to null the carrier Fc to extend the range of the spectrum analyzer for harmonic measurements.
3. At each spurious frequency, Generator substitution was used to establish the true spurious level.
4. The spectrum was scanned to the 10th harmonic.

TEST DATA: See following page.

| Frequency:               | 800                          | MHz            | Minimum Spec:             | 57.8                       | dBc |
|--------------------------|------------------------------|----------------|---------------------------|----------------------------|-----|
| Power:                   | 30                           | Watts          | Worst Case:               | 68.3                       | dBc |
|                          | 44.8                         | dBm            |                           |                            |     |
| Spurious Frequency (MHz) | Spec An Spurious Level (dBm) | Path Loss (dB) | Actual Spurious Lvl (dBm) | Spurious Attenuation (dBc) |     |
| 1600                     | -62.7                        | -7.5           | -55.2                     | -99.9                      |     |
| 2400                     | -70.2                        | -7.0           | -63.2                     | -107.9                     |     |
| 3200                     | -67.8                        | -8.5           | -59.3                     | -104.1                     |     |
| 4000                     | -56.8                        | -10.8          | -46.0                     | -90.8                      |     |
| 4800                     | -32.0                        | -8.5           | -23.5                     | -68.3                      |     |
| 5600                     | -37.5                        | -9.3           | -28.2                     | -72.9                      |     |
| 6400                     | -48.8                        | -9.0           | -39.8                     | -84.6                      |     |
| 7200                     | -39.5                        | -9.3           | -30.2                     | -74.9                      |     |
| 8000                     | -50.8                        | -18.2          | -32.7                     | -77.4                      |     |

| Frequency:               | 800                          | MHz            | Minimum Spec:             | 53.0                       | dBc |
|--------------------------|------------------------------|----------------|---------------------------|----------------------------|-----|
| Power:                   | 10                           | Watts          | Worst Case:               | 75.5                       | dBc |
|                          | 40.0                         | dBm            |                           |                            |     |
| Spurious Frequency (MHz) | Spec An Spurious Level (dBm) | Path Loss (dB) | Actual Spurious Lvl (dBm) | Spurious Attenuation (dBc) |     |
| 1600                     | -77.7                        | -7.5           | -70.2                     | -110.2                     |     |
| 2400                     | -70.2                        | -7.0           | -63.2                     | -103.2                     |     |
| 3200                     | -75.7                        | -8.5           | -67.2                     | -107.2                     |     |
| 4000                     | -79.5                        | -10.8          | -68.7                     | -108.7                     |     |
| 4800                     | -57.7                        | -8.5           | -49.2                     | -89.2                      |     |
| 5600                     | -67.7                        | -9.3           | -58.3                     | -98.3                      |     |
| 6400                     | -73.8                        | -9.0           | -64.8                     | -104.8                     |     |
| 7200                     | -67.8                        | -9.3           | -58.5                     | -98.5                      |     |
| 8000                     | -53.7                        | -18.2          | -35.5                     | -75.5                      |     |

**NAME OF TEST: Field Strength of Spurious Radiation**

**RULE PART NUMBER:** 2.1053, 90.543(c) (e)

**MINIMUM STANDARD:** For 30 Watts:  $43 + 10\log_{10}(30) = 57.8 \text{ dBc}$   
 For 10 Watts:  $43 + 10\log_{10}(10) = 53 \text{ dBc}$   
 90.543(e): in the band 1559 - 1610 MHz  
 -70 dBW/MHz EIRP for wideband signals, and  
 -80 dBW EIRP for discrete emissions of less than 700 Hz bandwidth

**TEST RESULTS:** Meets minimum standard (see data on the following page)

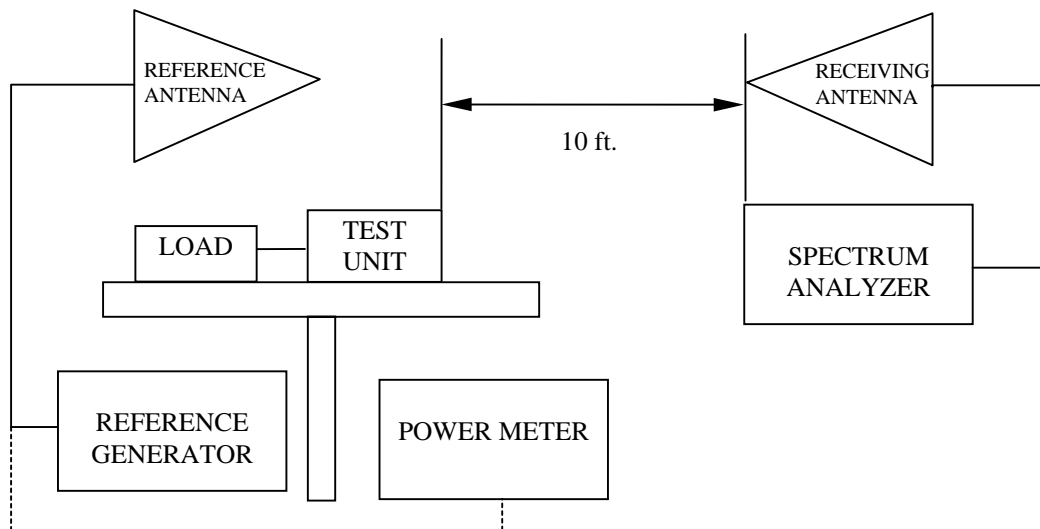
**TEST CONDITIONS:** Standard Test Conditions, 25 C

**TEST PROCEDURE:** TIA/EIA - 603, 2.2.12

**TEST EQUIPMENT:** Log Periodic Antenna, AIL TECH Model 9461  
 Horn Antenna, Model EMCO 3115  
 Reference Generator, Model Agilent E8257D  
 Attenuator, BIRD Model / 50-A-MFN-20 / 20 dB / 50 Watt  
 Attenuator, BIRD Model / 10-A-MFN-10 / 10 dB / 10 Watt  
 Spectrum Analyzer, Model HP8563E  
 Power Meter, Model HP437B  
 Power Supply, Model HP-6024A

**MEASUREMENT PROCEDURE:** Radiated spurious attenuation was measured according to  
 TIA/EIA Standard 603 Section 2.2.12

**TEST SET-UP:**



**PERFORMED BY:**

*Daniel Hanson*

Daniel Hanson

Date: 3/28/06

NAME OF TEST: Spurious Radiation Attenuation  
(Continued)

|                                |                             |                            |                                    |                       |                          |                                |
|--------------------------------|-----------------------------|----------------------------|------------------------------------|-----------------------|--------------------------|--------------------------------|
| Frequency:                     |                             | 800                        | MHz                                | Spec =                |                          | -57.8 dBc                      |
| Power:                         |                             | 30                         | Watts                              | Highest Spur =        |                          | -70.1 dBc                      |
|                                |                             | 44.8                       | dBm                                |                       |                          |                                |
| Spurious<br>Frequency<br>(MHz) | Polarization<br>(Horz/Vert) | Spurious<br>Level<br>(dBm) | Substitution<br>Generator<br>(dBm) | Cable<br>Loss<br>(dB) | Antenna<br>Gain<br>(dBd) | Spurious<br>Attenuation<br>dBc |
| 1600                           | H                           | -91.2                      | -54.2                              | 3.33                  | 3.65                     | -98.6                          |
|                                | V                           | -86.0                      | -49.8                              | 3.33                  | 3.65                     | -94.3                          |
| 2400                           | H                           | -83.7                      | -41.5                              | 4.50                  | 3.19                     | -87.6                          |
|                                | V                           | -82.8                      | -39.5                              | 4.50                  | 3.19                     | -85.6                          |
| 3200                           | H                           | -69.2                      | -23.8                              | 5.50                  | 3.46                     | -70.6                          |
|                                | V                           | -68.8                      | -23.3                              | 5.50                  | 3.46                     | -70.1                          |
| 4000                           | H                           | -89.0                      | -39.5                              | 5.83                  | 3.61                     | -86.5                          |
|                                | V                           | -81.5                      | -30.8                              | 5.83                  | 3.61                     | -77.8                          |
| 4800                           | H                           | -86.5                      | -33.5                              | 7.33                  | 3.64                     | -82.0                          |
|                                | V                           | -82.8                      | -29.2                              | 7.33                  | 3.64                     | -77.6                          |
| 5600                           | H                           | -81.3                      | -22.8                              | 8.50                  | 3.39                     | -72.7                          |
|                                | V                           | -81.2                      | -22.7                              | 8.50                  | 3.39                     | -72.5                          |
| 6400                           | H                           | -97.2                      | -37.2                              | 9.17                  | 3.61                     | -87.5                          |
|                                | V                           | -96.3                      | -36.3                              | 9.17                  | 3.61                     | -86.7                          |
| 7200                           | H                           | -93.8                      | -30.2                              | 10.50                 | 3.40                     | -82.0                          |
|                                | V                           | -95.2                      | -31.5                              | 10.50                 | 3.40                     | -83.4                          |
| 8000                           | H                           | -95.5                      | -28.5                              | 11.67                 | 4.66                     | -80.3                          |
|                                | V                           | -94.0                      | -26.8                              | 11.67                 | 4.66                     | -78.6                          |
|                                |                             |                            |                                    |                       |                          |                                |
| Frequency:                     |                             | 800                        | MHz                                | Spec =                |                          | -53.0 dBc                      |
| Power:                         |                             | 10                         | Watts                              | Highest Spur =        |                          | -65.4 dBc                      |
|                                |                             | 40.0                       | dBm                                |                       |                          |                                |
| Spurious<br>Frequency<br>(MHz) | Polarization<br>(Horz/Vert) | Spurious<br>Level<br>(dBm) | Substitution<br>Generator<br>(dBm) | Cable<br>Loss<br>(dB) | Antenna<br>Gain<br>(dBd) | Spurious<br>Attenuation<br>dBc |
| 1600                           | H                           | -86.6                      | -49.6                              | 3.33                  | 3.65                     | -89.3                          |
|                                | V                           | -86.7                      | -50.5                              | 3.33                  | 3.65                     | -90.2                          |
| 2400                           | H                           | -78.2                      | -36.0                              | 4.50                  | 3.19                     | -77.3                          |
|                                | V                           | -79.3                      | -36.0                              | 4.50                  | 3.19                     | -77.3                          |
| 3200                           | H                           | -68.7                      | -23.3                              | 5.50                  | 3.46                     | -65.4                          |
|                                | V                           | -69.3                      | -23.8                              | 5.50                  | 3.46                     | -65.9                          |
| 4000                           | H                           | -87.5                      | -38.0                              | 5.83                  | 3.61                     | -80.2                          |
|                                | V                           | -85.2                      | -34.5                              | 5.83                  | 3.61                     | -76.7                          |
| 4800                           | H                           | -95.0                      | -42.0                              | 7.33                  | 3.64                     | -85.7                          |
|                                | V                           | -93.8                      | -40.2                              | 7.33                  | 3.64                     | -83.9                          |
| 5600                           | H                           | -94.3                      | -35.8                              | 8.50                  | 3.39                     | -80.9                          |
|                                | V                           | -92.5                      | -34.0                              | 8.50                  | 3.39                     | -79.1                          |
| 6400                           | H                           | -96.8                      | -36.8                              | 9.17                  | 3.61                     | -82.4                          |
|                                | V                           | -97.7                      | -37.7                              | 9.17                  | 3.61                     | -83.2                          |
| 7200                           | H                           | -101.7                     | -38.0                              | 10.50                 | 3.40                     | -85.1                          |
|                                | V                           | -102.2                     | -38.5                              | 10.50                 | 3.40                     | -85.6                          |
| 8000                           | H                           | -102.7                     | -35.7                              | 11.67                 | 4.66                     | -82.7                          |
|                                | V                           | -102.3                     | -35.2                              | 11.67                 | 4.66                     | -82.2                          |

NAME OF TEST: Spurious Radiation Attenuation-with Antenna (90.543(e))

| Frequency:                  |                             | 800                     | MHz                             | Spec =             |                       | -50.0 dBm                   |
|-----------------------------|-----------------------------|-------------------------|---------------------------------|--------------------|-----------------------|-----------------------------|
| Power:                      |                             | 30                      | Watts                           | Highest Spur =     |                       | -53.2 dBm                   |
|                             |                             | 44.8                    | dBm                             |                    |                       |                             |
| Spurious Frequency<br>(MHz) | Polarization<br>(Horz/Vert) | Spurious Level<br>(dBm) | Substitution Generator<br>(dBm) | Cable Loss<br>(dB) | Antenna Gain<br>(dBd) | Spurious Attenuation<br>dBc |
| 1600                        | H                           | -93.2                   | -53.5                           | 3.33               | 3.65                  | <b>-53.2</b>                |
|                             | V                           | -92.7                   | -54.3                           | 3.33               | 3.65                  | -54.0                       |
| Frequency:                  |                             | 800                     | MHz                             | Spec =             |                       | -50.0 dBm                   |
| Power:                      |                             | 10                      | Watts                           | Highest Spur =     |                       | -55.7 dBm                   |
|                             |                             | 40.0                    | dBm                             |                    |                       |                             |
| Spurious Frequency<br>(MHz) | Polarization<br>(Horz/Vert) | Spurious Level<br>(dBm) | Substitution Generator<br>(dBm) | Cable Loss<br>(dB) | Antenna Gain<br>(dBd) | Spurious Attenuation<br>dBc |
| 1600                        | H                           | -95.7                   | -56.0                           | 3.33               | 3.65                  | <b>-55.7</b>                |
|                             | V                           | -96.5                   | -58.2                           | 3.33               | 3.65                  | -57.8                       |



## CALCULATIONS FOR FIELD STRENGTH OF SPURIOUS RADIATION TESTS:

The transmitter carrier frequency was set to 800.000 MHz. The reference oscillator frequency of all of the transceivers is 17.50 MHz. The output of the transceiver was searched from 17.50 MHz to the tenth harmonic of the carrier frequencies. The tests were conducted with the transceiver/modem/GPS inside of the enclosure.

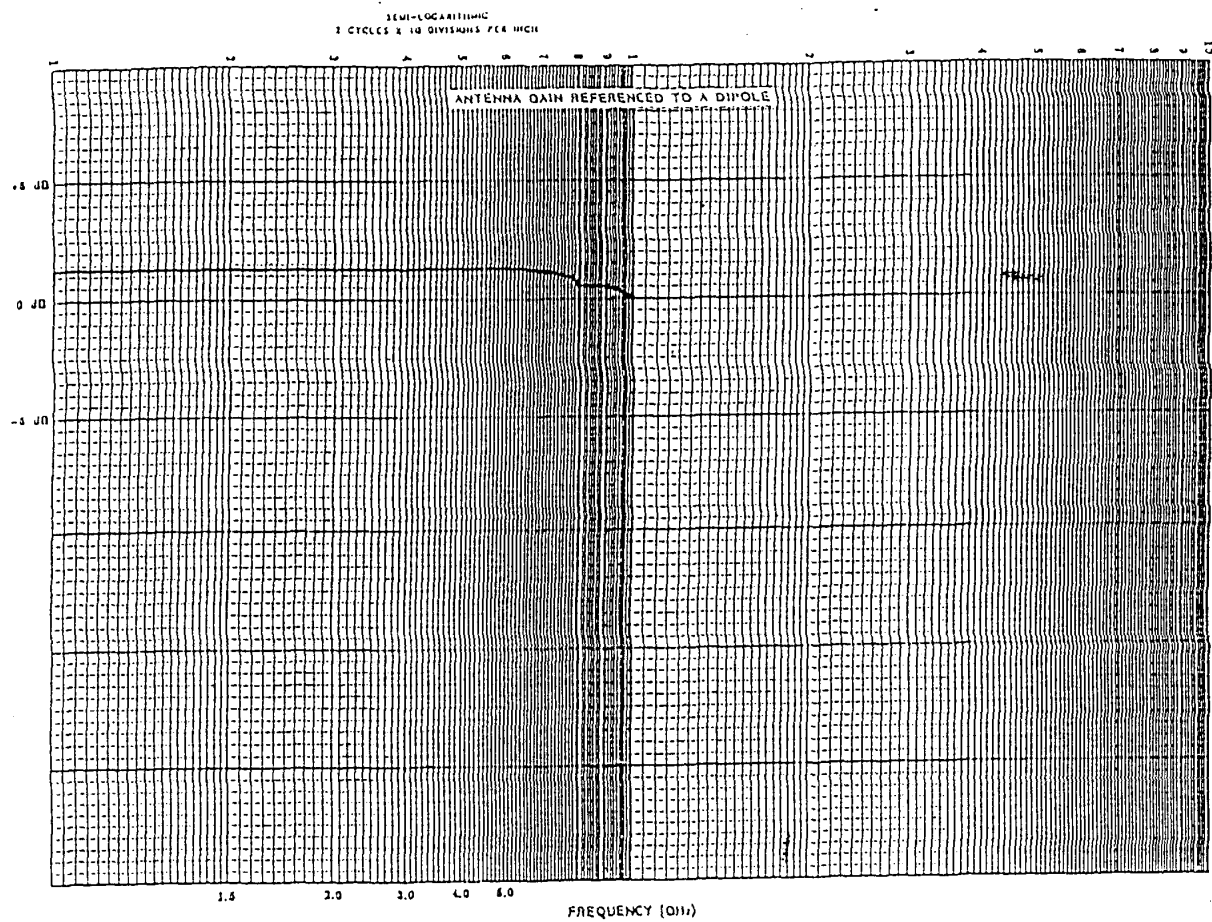
Because the antennas used for the measurements recorded above 1 GHz were not flat in gain and differed from a dipole, the generator output was corrected for gain at each spurious frequency. The cable loss in the measurements is the loss in the cable between the signal generator and the substitution antenna.

For part 90.543(e), the same procedure as above was used except a 0 dB mag-mount antenna (Maxrad Model: MUF4900 re-tuned to the 700MHz band) was connected to the transmitter port. A notch filter was used in front of the spectrum analyzer to notch the fundamental to extend the dynamic range of the spectrum analyzer.

## EXAMPLE:

At 1600 MHz (800 MHz tuned), 30 Watts and horizontal polarization.

|   |                                    |
|---|------------------------------------|
| r = Substitution Gen - Cable Loss             | -54.2 – 3.33 = -57.53              |
| R = Reference Generator (dBm)                 | -57.5                              |
| A = Antenna Gain (dBd)                        | 3.65                               |
| R' (Corrected Reference (dBm)) = R + A =>     | -57.5 + 3.65 = -53.85 dBm          |
| Po = Radiated Carrier Power (dBm)             | 30 Watts = 44.8 dBm                |
| Radiated Spurious Emission (dBc) = Po - R' => | 44.8 - (-53.85) = <b>98.65 dBc</b> |



**ANTENNA GAIN GRAPH OF SUBSTITUTION ANTENNA  
REFERENCED TO A DIPOLE**