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

for the

Mobile Data Platform Transceiver (800MHz MDP)

With the

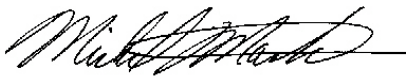
Data Radio Gemini Modem

FCC ID: EOTGPDB
Trade Name: GEMINI

July 27, 2005

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.



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 EOTGPDB.

The certification EOTGPDB has been granted to Dataradio Inc for its Gemini/PD radio modem. Gemini/PD is comprised of the Dataradio COR Ltd. (DRL) Mobile Data Platform (MDP) 800MHz Transceiver with the Dataradio Inc Gemini Modem. Dataradio Inc does the final assembly and markets the Gemini/PD unit. The EOTGPDB certificate has been granted for several bit rates at 2, 4, 8 and 16-level FSK type of modulation scheme with a total of 16 emission designators. 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 EOTGPDB used to create the modulation scheme. The transceiver operates on frequencies ranging from 806.000 MHz to 824.000 MHz. The frequency tolerance of the transceiver is .00015% or 1.5 parts per million as granted in EOTGPDB.

PROPOSED CONDITIONS

It is proposed to accept the request for the GEMINI, 806-824 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 2.1041and 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 od 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 June 15 and July 20, 2005

CONCLUSION

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

_____ 07/20/2005
Chris Ludewig,
Dataradio COR. LTD

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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:	**Ted Yoder**
TITLE:	Electrical Engineer II
TECHNICAL EDUCATION:	Bachelor of Science Degree in Electrical Engineering (2002) Minnesota State University (Mankato)
TECHNICAL EXPERIENCE:	3 years experience in RF design.

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

The certification EOTGPDB has been granted to Dataradio Inc for its Gemini/PD radio modem. Gemini/PD is comprised of the Dataradio COR Ltd. (DRL) Mobile Data Platform (MDP) UHF (806 MHz- 824 MHz) 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 40W, 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	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))

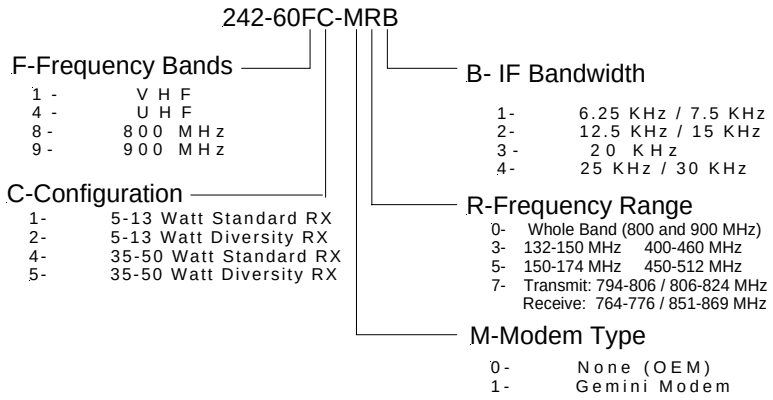
APPLICANT/GRANTEE	Dataradio Inc., 5500 Royalmount Ave, suite 200, Town of Mount Royal, Quebec, Canada, H4P 1H7
MANUFACTURER:	Dataradio COR Ltd., Waseca, MN 56093 (MDP Transceiver) DATARADIO Inc., Town of Mount Royal, Quebec, Canada, H4P 1H7 (Gemini modem and final assembly)
MODEL NUMBER:	Gemini/PD+, GeminiG3
CATALOG NUMBER:	GPDE / GPG3-6085-xyz
SERIAL NUMBER (S):	255-03434-00x Gemini GCU III modem no S/N 6085-102 S/N 15120 pilot MDP transceiver
FCC ID NUMBER:	EOTGPDB
FCC RULES AND REGS:	FCC Part (s) 90
FREQUENCY RANGE:	806.000 MHz - 824.000 MHz (806-821/851-866 and 821-824/866-869 MHz Bands)
MAXIMUM POWER RATING:	40.00 Watts (5-40 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:

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

DRL Part Number System for MDP: "mm"

DRI Part Number System for modem



DD – GCU modem "/PD" board 255-03322-00x
DE – GCU2modem "/PD+" board 255- 03332- 00x ,
G3 – GCU 3 modem "/G3" board 255-03434-00x

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) UHF (806-824 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: 2.1033 c (6)(7) and 2.1046 (a)

UNIT UNDER TEST SN: 15120

TEST RESULTS: Meets minimum standard, see data on following page

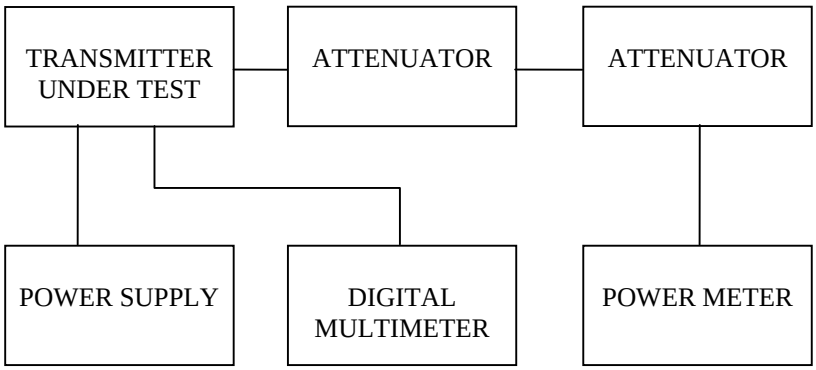
TEST CONDITIONS: Standard Test Conditions, 25 C

TEST EQUIPMENT: Attenuator, BIRD Model / 100-A-MFN-20 / 20 dB / 100 Watt
Attenuator, BIRD Model / 50-A-MFN-03 / 3 dB / 50 Watt
Digital Voltmeter, Fluke Model 8012A
DC Power Source, Model HP6652A
Power Meter, HP 8901B

PERFORMED BY:

_____ DATE: 07/05/2005
Ted Yoder

TEST SET-UP:



TEST RESULTS:

Frequency (MHz)	**DC Voltage at Final (VDC)**	**DC Current into Final (ADC)**	**DC Power into Final (W)**	**RF Power Output (W)**
813	13.4	9.0	120.6	40
813	13.4	2.9	38.9	5

NAME OF TEST:
Transmitter Spurious and Harmonic Outputs -conducted

RULE PART NUMBER: 2.1033 c (14), 2.1041, 2.1051, 90.210 (g)(3) and (h)(5)

MINIMUM STANDARD: For 40 Watt:
$43+10\text{Log}_{10}(40\text{ Watts}) = 59$ dBc
or 70 dBc whichever is the lesser attenuation.
For 5 Watt:
$43+10\text{Log}_{10}(5\text{ Watts}) = 50$ dBc
or 70 dBc whichever is the lesser attenuation.

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

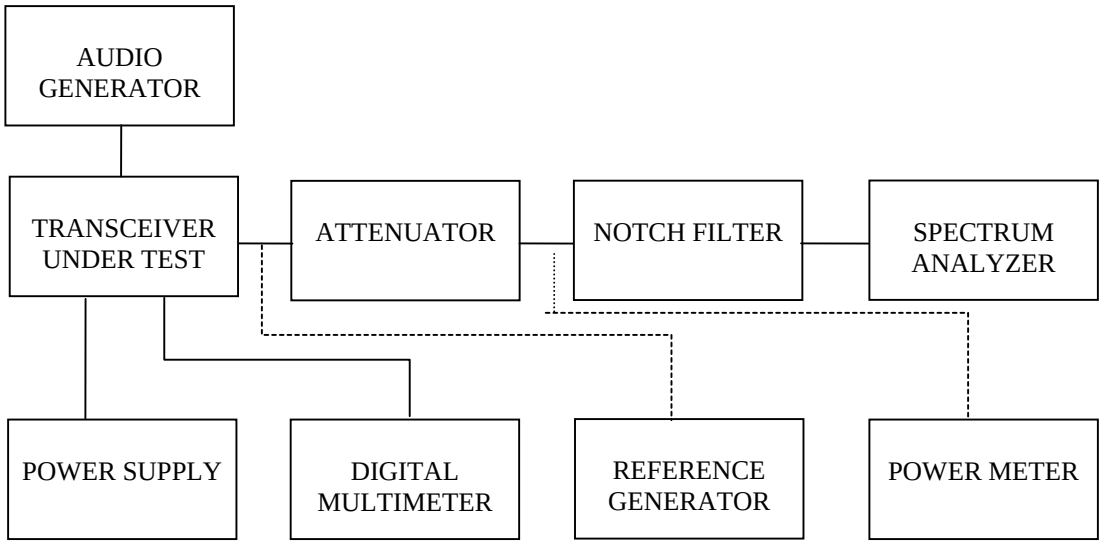
TEST CONDITIONS: Standard Test Conditions, 25 C
RF voltage measured at antenna terminals

TEST PROCEDURE: TIA/EIA - 603, 2.2.13

TEST EQUIPMENT:

Attenuator, BIRD Model / 50-A-MFN-20 / 20 dB / 50 Watt
Digital Voltmeter, Fluke Model 8012A
DC Power Source, Model HP6024A
Spectrum Analyzer, Model HP8563E
Reference Generator, Model Wiltron 6647A-40
Power Meter, Model HP 8901B
Audio Generator, Model HP8903B

PERFORMED BY: _____ Date:07/05/2005
Ted Yoder



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

MEASUREMENT PROCEDURE:

1. The transmitter carrier output frequency is 806 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.

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

Frequency	806	MHz		
Power	40	W	Spec (dBc)	-59
	46.0	dBm	Max (dBc)	-76.5

Frequency (MHz)	Spurious Level (dBm)	Path Loss (dB)	Substitution Generator (dBm)	Spurious Level (dBc)
1612	-82.1	38.1	-44.0	-90.1
2418	-95.0	25.7	-69.3	-115.3
3224	-77.9	25.7	-52.2	-98.2
4030	-76.9	46.4	-30.5	-76.5
4836	-77.1	45.6	-31.5	-77.6
5642	-66.3	30.4	-35.9	-81.9
6448	-95.6	37.2	-58.4	-104.4
7254	-88.0	44.6	-43.4	-89.5
8060	-88.0	26.6	-61.4	-107.5

Frequency	806	MHz		
Power	5	W	Spec (dBc)	-50
	37.0	dBm	Max (dBc)	-77.9

Frequency (MHz)	Spurious Level (dBm)	Path Loss (dB)	Substitution Generator (dBm)	Spurious Level (dBc)
1612	-91.3	38.1	-53.2	-90.2
2418	-101.5	25.7	-75.8	-112.8
3224	-85.3	25.7	-59.6	-96.6
4030	-94.3	46.4	-47.9	-84.9
4836	-93.0	45.6	-47.4	-84.4
5642	-71.3	30.4	-40.9	-77.9
6448	-101.8	37.2	-64.6	-101.6
7254	-98.6	44.6	-54.0	-91.0
8060	-92.4	26.6	-65.8	-102.8

NAME OF TEST:
Field Strength of Spurious Radiation

RULE PART NUMBER: 2.1033 c (14), 2.1041, 2.1053, 90.210 (g)(3) and (h)(5)

MINIMUM STANDARD: For 50 Watts: $43+10\text{Log}_{10}(40) = 59$ dBc
For 10 Watts: $43+10\text{Log}_{10}(10) = 53$ dBc

UNIT UNDER TEST

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

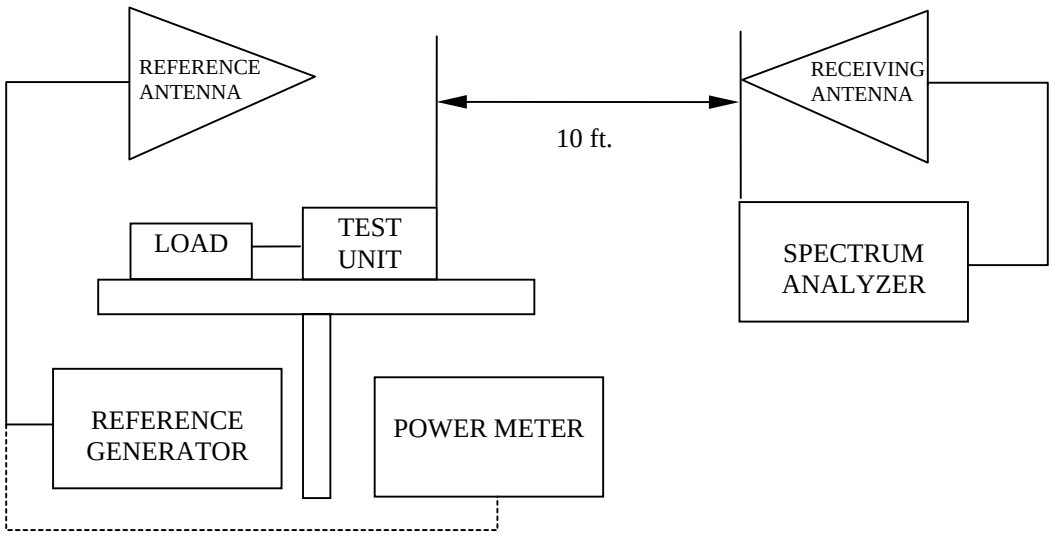
TEST CONDITIONS: Standard Test Conditions, 25 C

TEST PROCEDURE: TIA/EIA - 603, 2.2.12

TEST EQUIPMENT: Log Spiral Antenna, Model 93491-2
Horn Antenna, Model EMCO 3115
Reference Generator, Wiltron 6647A-40
Load, BIRD Model / 8053 / 50 ohms / 10 Watt
Attenuator, BIRD Model / 50-A-MFN-20 / 20 dB / 50 Watt
Spectrum Analyzer, Model HP8563E
Power Meter, Model HP8901B
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: _____ DATE: 07/06/2005
Ted Yoder

NAME OF TEST: Spurious Radiation Attenuation
(Continued)

Frequency:	806	MHz	Spec =	-59.0	dBc
Power:	40	Watts	Highest Spur =	-70.7	dBc
	46.0	dBm			

Spurious Frequency (MHz)	Polarization (Horz/Vert)	Spurious Level (dBm)	Substitution Generator (dBm)	Cable Loss (dB)	Antenna Gain (dBd)	Circular Polarization Correction (dB)	Spurious Attenuation dBc
1612	H	-88.2	-43.0	3.03	1.20	3.0	-93.8
	V	-86.5	-41.2	3.03	1.20	3.0	-92.0
2418	H	-75.7	-25.0	4.53	1.20	3.0	-77.4
	V	-69.8	-18.3	4.53	1.20	3.0	-70.7
3224	H	-72.8	-17.5	5.37	1.20	3.0	-70.7
	V	-75.0	-19.2	5.37	1.20	3.0	-72.4
4030	H	-90.3	-30.0	7.03	1.20	3.0	-84.9
	V	-87.2	-26.7	7.03	1.20	3.0	-81.5
4836	H	-96.3	-34.2	7.37	1.20	3.0	-89.4
	V	-96.8	-34.3	7.37	1.20	3.0	-89.5
5642	H	-94.2	-29.3	8.53	1.20	3.0	-85.7
	V	-97.3	-32.8	8.53	1.20	3.0	-89.2
6448	H	-99.2	-32.8	9.37	1.20	3.0	-90.0
	V	-98.3	-33.7	9.37	1.20	3.0	-90.9
7254	H	-100.2	-28.9	10.87	1.20	3.0	-87.6
	V	-99.3	-29.3	10.87	1.20	3.0	-88.0
8060	H	-100.2	-26.5	12.70	1.20	3.0	-87.1
	V	-101.3	-30.1	12.70	1.20	3.0	-90.7

Frequency:	806	MHz	Spec =	-50.0	dBc
Power:	5	Watts	Highest Spur =	-63.6	dBc
	37.0	dBm			

Spurious Frequency (MHz)	Polarization (Horz/Vert)	Spurious Level (dBm)	Substitution Generator (dBm)	Cable Loss (dB)	Antenna Gain (dBd)	Circular Polarization Correction (dB)	Spurious Attenuation dBc
1612	H	-90.7	-45.5	3.03	1.20	3.0	-87.3
	V	-83.8	-38.4	3.03	1.20	3.0	-80.3
2418	H	-74.3	-23.7	4.53	1.20	3.0	-67.0
	V	-71.8	-20.3	4.53	1.20	3.0	-63.6
3224	H	-79.8	-24.5	5.37	1.20	3.0	-68.7
	V	-81.6	-25.8	5.37	1.20	3.0	-69.9
4030	H	-86.3	-26.0	7.03	1.20	3.0	-71.8
	V	-89.8	-29.3	7.03	1.20	3.0	-75.1
4836	H	-105.6	-43.4	7.37	1.20	3.0	-89.6
	V	-105.4	-42.9	7.37	1.20	3.0	-89.1
5642	H	-103.6	-38.8	8.53	1.20	3.0	-86.1
	V	-105.3	-40.8	8.53	1.20	3.0	-88.1
6448	H	-105.9	-39.6	9.37	1.20	3.0	-87.7
	V	-105.3	-40.6	9.37	1.20	3.0	-88.8
7254	H	-102.6	-31.3	10.87	1.20	3.0	-80.9
	V	-102.4	-32.4	10.87	1.20	3.0	-82.1
8060	H	-101.8	-28.1	12.70	1.20	3.0	-79.6
	V	-104.3	-33.1	12.70	1.20	3.0	-84.6

CALCULATIONS FOR FIELD STRENGTH OF SPURIOUS RADIATION TESTS:

The transmitter carrier frequency was set to 806.000 MHz. The reference oscillator frequency of all of the transceivers is 17.50 MHz. The output of the transceivers 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. An additional 3 dB correction was also made to the spurious responses measured above 1 GHz to correct for the 3 dB polarization loss in the reference path.

EXAMPLE:

At 1612 MHz (806 MHz tuned), 40 Watts and horizontal polarization.

r = Substitution Gen - Cable Loss -43.0 – 3.03 = -46.03

R = Reference Generator (dBm) -46.03

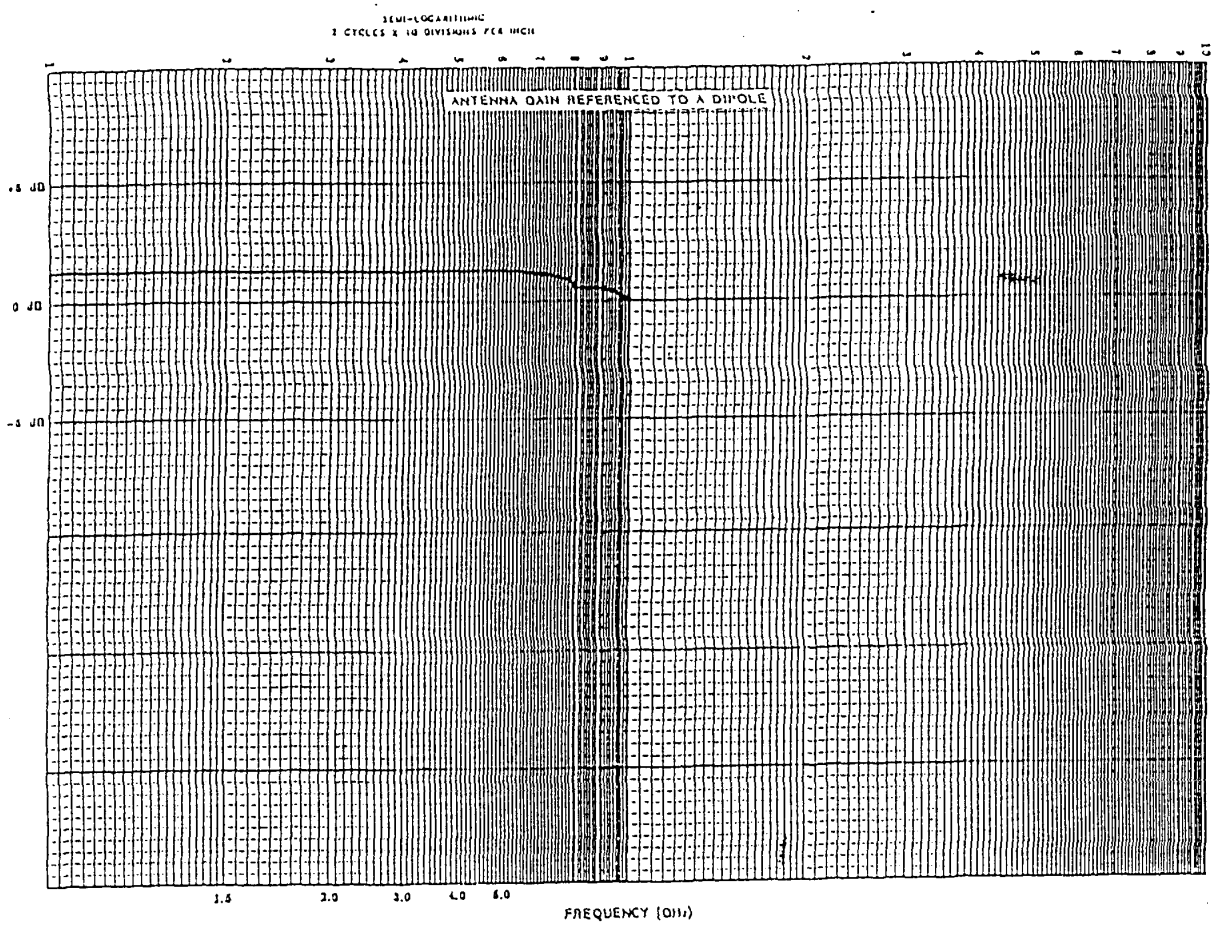
A = Antenna Gain (dB) 1.2

P = Polarization Correction Factor (dB) 3.0

R’ (Corrected Reference (dBm)) = R + A - P => -46.03+ 1.2 - 3.0 = -47.83 dBm

Po = Radiated Carrier Power (dBm) 40 Watts = 46.0 dBm

Radiated Spurious Emission (dBc) = Po - R’ => -48.63 - (+46.0) = **-93.83 dBc**



ANTENNA GAIN GRAPH OF SUBSTITUTION ANTENNA
REFERENCED TO A DIPOLE