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

for the

Mobile Data Platform Transceiver (UHF (403 MHz-512MHz) MDP)

With the

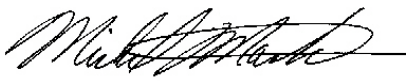
Data Radio Gemini Modem

FCC ID: EOTGPDA
Trade Name: GEMINI

July 26, 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
Director, Research and Development, 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 EOTGPDA.

The certification EOTGPDA 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 (403 MHz-512MHz) Transceiver with the Dataradio Inc Gemini Modem. Dataradio Inc does the final assembly and markets the Gemini/PD unit. The EOTGPDA certificate has been granted for several bit rates at 2, 4, 8 and 16-level FSK type of modulation scheme with a total of 14 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 EOTGPDA used to create the modulation scheme. The transceiver operates on frequencies ranging from 403.000 MHz to 512.000 MHz. The frequency tolerance of the transceiver is .00015% or 1.5 parts per million as granted in EOTGPDA.

PROPOSED CONDITIONS

It is proposed to accept the request for the GEMINI, 403-512 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 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 June 15, 2005 and July 05, 2005

CONCLUSION

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

_____ 07/06/2005

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:	**Dale Jordan**
TITLE:	Electrical Engineer II
TECHNICAL EDUCATION:	Masters 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 EOTGPDA 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 (403 MHz-512MHz) 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 MRF650) with new devices (Mitsubishi RD60HUF). 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 50W, 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)

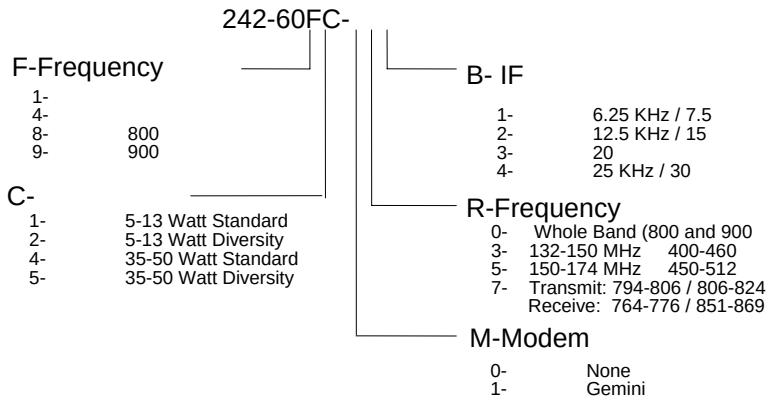
(as per Rule Part Number: 2.1033 (c).(1),(2),(5),(6),(7))

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: CATALOG NUMBER:	Gemini/PD+, GeminiG3 GPDE / GPG3-6045-xyz
SERIAL NUMBER (S):	255-03434-00x Gemini GCU III modem no S/N 6045- 134 s/n 11655 production MDP transceiver
FCC ID NUMBER: FCC RULES AND REGS:	EOTGPDA FCC Part (s) 90
FREQUENCY RANGE:	403.000 MHz - 512.000 MHz (406-406.1 MHz software blocked)
MAXIMUM POWER RATING:	50.00 Watts (10-50 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 Gemini	403-520 XCVR Modem	242-604C-MRB 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(c):.
Spectrum efficiency standard	90.203 (j)
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
Transient Frequency Behavior	90.214

Note. The power rating as per 2.1046 does not change, but power output was re-measured at the same time as 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 MRF650) by a functionally similar one (Mitsubishi RD60HUF). 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 EOTGPDA ,Gemini/PD radio modem. Gemini is comprised of the Dataradio COR Ltd. (DRL) Mobile Data Platform (MDP) UHF (403-512 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:

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

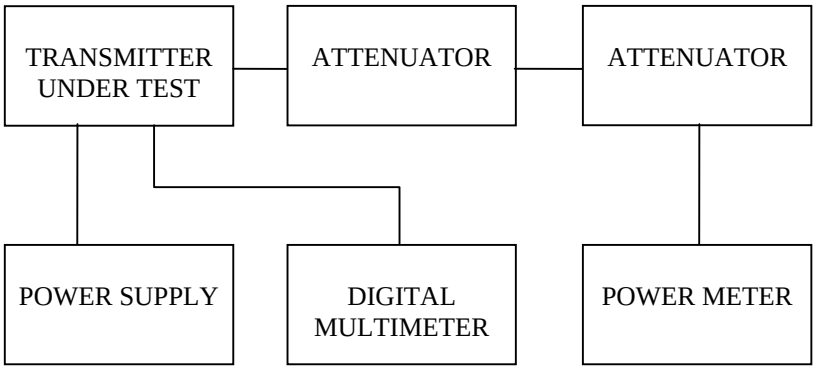
TEST CONDITIONS: Standard Test Conditions, 25 C

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 HP6024A
Power Meter, HP 8901B

PERFORMED BY:

_____ DATE: 07/05/2005
Dale Jordan

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)**
450	13.8	7.84	108	50
450	13.8	3.36	46.4	10

NAME OF TEST:
Transmitter Spurious and Harmonic Outputs -conducted

RULE PART NUMBER: 2.1033 c (14), 2.1041, 2.1051, 90.210 (d)(3)

MINIMUM STANDARD: For 50 Watt:
$50+10Log_{10}(50\ Watts) = 67$ dBc
or 70 dBc whichever is the lesser attenuation.
For 10 Watt:
$50+10Log_{10}(10\ Watts) = 60$ dBc
or 70 dBc whichever is the lesser attenuation.

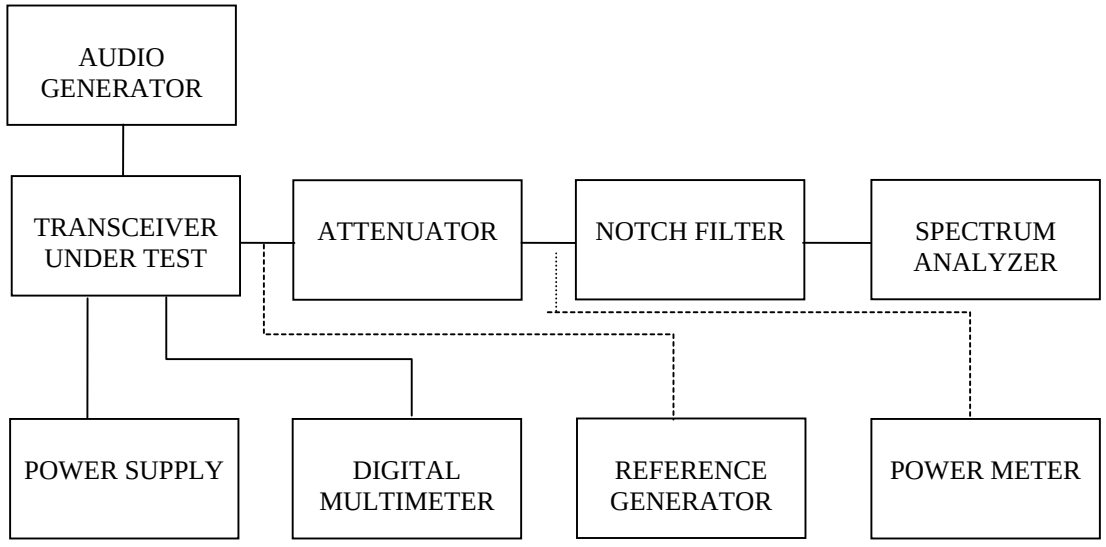
TEST RESULTS: Meets minimum standard (see data on the following page)

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 / 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 HP6038A
Spectrum Analyzer, Model HP8563E
Reference Generator, Model HP83732B
Power Meter, Model HP 8901B
Audio Generator, Model HP8903B

PERFORMED BY: _____ Date:07/12/2005
Dale Jordan



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

MEASUREMENT PROCEDURE:

1. The transmitter carrier output frequency is 450 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: 450 MHz Spec= **-67.0** dBc
Power = **50** Watts Highest Spur= -78.0
47.0 dBm

Relation to Fo	Frequency: (MHz)	Spurious Level (dBm)	Path Loss dB	Substitution Generator (dBm)	Spurious Level dBc
2	900	-83.7	27.7	-56.0	-103.0
3	1350	-105.0	74.0	-31.0	-78.0
4	1800	-107.3	32.3	-75.0	-122.0
5	2250	-102.0	25.0	-77.0	-124.0
6	2700	-98.9	30.9	-68.0	-115.0
7	3150	-92.6	24.6	-68.0	-115.0
8	3600	-80.2	29.2	-51.0	-98.0
9	4050	-101.2	30.2	-71.0	-118.0
10	4500	-80.7	26.7	-54.0	-101.0

Frequency: 450 MHz
Power = **10** Watts Spec= **-60.0** dBc
40.0 dBm Highest Spur= -83.0

Relation to Fo	Frequency: (MHz)	Spurious Level (dBm)	Path Loss dB	Substitution Generator (dBm)	Spurious Level dBc
2	900	-82.5	27.5	-55.0	-95.0
3	1350	-116.0	73.0	-43.0	-83.0
4	1800	-120.0	32.0	-88.0	-128.0
5	2250	-116.0	24.0	-92.0	-132.0
6	2700	-120.0	32.0	-88.0	-128.0
7	3150	-105.0	25.0	-80.0	-120.0
8	3600	-102.0	29.0	-73.0	-113.0
9	4050	-108.0	30.0	-78.0	-118.0
10	4500	-100.0	27.0	-73.0	-113.0

NAME OF TEST:

Field Strength of Spurious Radiation

RULE PART NUMBER: 2.1033 c (14), 2.1041, 2.1053, 90.210 (d)(3)

MINIMUM STANDARD: For 50 Watts: $50+10\text{Log}_{10}(50) = 67$ dBc
For 10 Watts: $50+10\text{Log}_{10}(10) = 60$ dBc

UNIT UNDER TEST

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

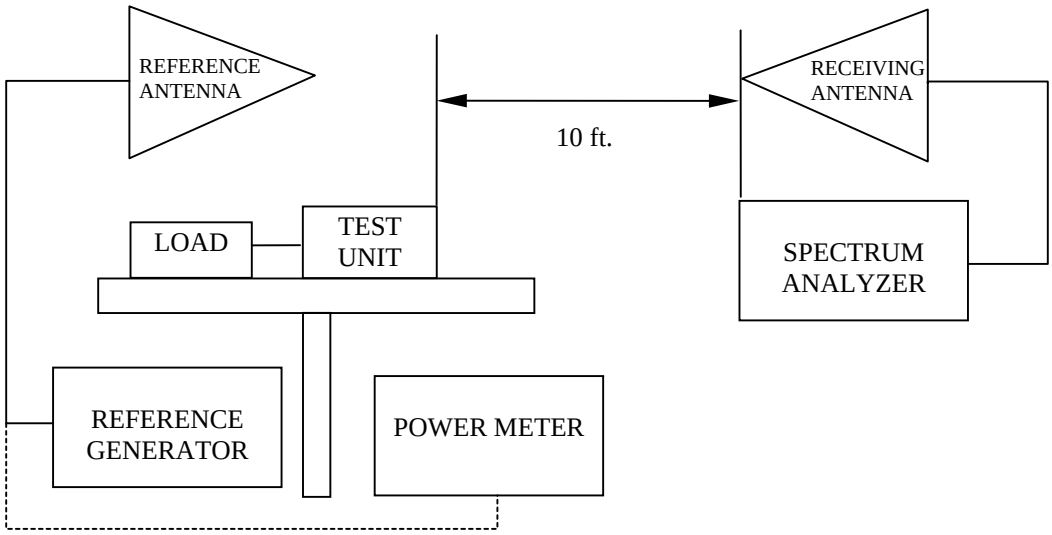
TEST CONDITIONS: Standard Test Conditions, 25 C

TEST PROCEDURE: TIA/EIA - 603, 2.2.12

TEST EQUIPMENT: Log Spiral Antenna, Model 93491-2
Horn Antenna, Model EMCO 3115
Reference Generator, Model HP83732A
Attenuator, BIRD Model / 100-A-MFN-20 / 20 dB / 100 Watt
Attenuator, BIRD Model / 50-A-MFN-03 / 3 dB / 50 Watt
Spectrum Analyzer, Model HP8563E
Power Meter, Model HP 8901B
Power Supply, Model HP6038A

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

TEST SET-UP:



PERFORMED BY: _____ DATE: 06/7/2005
Dale Jordan

NAME OF TEST: Spurious Radiation Attenuation
(Continued)

Freqency: 450 MHz Spec = -67.0 dBc
Power: 50 Watts Highest Spur = -70.5 dBc
47.0 dBm

Spurious Frequency (MHz)	Polarization (Horz/Vert)	Spurious Level (dBm)	Substitution Generator (dBm)	Cable Loss (dB)	Antenna Gain (dBd)	Circular Polarization Correction (dB	Path Loss dB	Spurious Attenuation dBc
900	H	-61.0	-24.0	4.50	1.60	0.0	37.0	-73.9
	V	-65.0	-25.8	4.50	1.60	0.0	39.2	-75.7
1350	H	-84.5	-41.8	4.83	1.20	3.0	42.7	-95.4
	V	-84.7	-42.7	4.83	1.20	3.0	42.0	-96.3
1800	H	-86.2	-39.0	5.17	1.20	3.0	47.2	-93.0
	V	-85.7	-39.3	5.17	1.20	3.0	46.3	-93.3
2250	H	-87.3	-38.3	6.33	1.20	3.0	49.0	-93.4
	V	-78.5	-28.0	6.33	1.20	3.0	50.5	-83.1
2700	H	-69.5	-17.2	7.00	1.20	3.0	52.3	-73.0
	V	-68.2	-15.0	7.00	1.20	3.0	53.2	-70.8
3150	H	-71.2	-16.5	8.00	1.20	3.0	54.7	-73.3
	V	-69.7	-13.7	8.00	1.20	3.0	56.0	-70.5
3600	H	-96.7	-39.0	9.50	1.20	3.0	57.7	-97.3
	V	-88.5	-30.3	9.50	1.20	3.0	58.2	-88.6
4050	H	-93.3	-33.5	10.83	1.20	3.0	59.8	-93.1
	V	-98.7	-38.5	10.83	1.20	3.0	60.2	-98.1
4500	H	-97.0	-35.2	10.33	1.20	3.0	61.8	-94.3
	V	-100.2	-38.2	10.33	1.20	3.0	62.0	-97.3

Freqency: 450 MHz Spec = -60.0 dBc
Power: 10 Watts Highest Spur = -68.7 dBc
40.0 dBm

Spurious Frequency (MHz)	Polarization (Horz/Vert)	Spurious Level (dBm)	Substitution Generator (dBm)	Cable Loss (dB)	Antenna Gain (dBd)	Circular Polarization Correction (dB	Path Loss dB	Spurious Attenuation dBc
900	H	-65.3	-28.3	4.50	1.60	0.0	37.0	-71.2
	V	-65.0	-25.8	4.50	1.60	0.0	39.2	-68.7
1350	H	-94.5	-51.8	4.83	1.20	3.0	42.7	-98.5
	V	-97.8	-55.8	4.83	1.20	3.0	42.0	-102.5
1800	H	-99.2	-52.0	5.17	1.20	3.0	47.2	-99.0
	V	-95.7	-49.3	5.17	1.20	3.0	46.3	-96.3
2250	H	-96.0	-47.0	6.33	1.20	3.0	49.0	-95.1
	V	-96.7	-46.2	6.33	1.20	3.0	50.5	-94.3
2700	H	-94.2	-41.8	7.00	1.20	3.0	52.3	-90.6
	V	-95.7	-42.5	7.00	1.20	3.0	53.2	-91.3
3150	H	-91.5	-36.8	8.00	1.20	3.0	54.7	-86.6
	V	-90.8	-34.8	8.00	1.20	3.0	56.0	-84.6
3600	H	-92.0	-34.3	9.50	1.20	3.0	57.7	-85.6
	V	-95.0	-36.8	9.50	1.20	3.0	58.2	-88.1
4050	H	-102.5	-42.7	10.83	1.20	3.0	59.8	-95.3
	V	-100.8	-40.6	10.83	1.20	3.0	60.2	-93.3
4500	H	-106.7	-44.9	10.33	1.20	3.0	61.8	-97.0
	V	-107.5	-45.5	10.33	1.20	3.0	62.0	-97.6

CALCULATIONS FOR FIELD STRENGTH OF SPURIOUS RADIATION TESTS:

The transmitter carrier frequency was set to 450.000 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 900 MHz (450 MHz tuned), 50 Watts and horizontal polarization.

r = Substitution Gen - Cable Loss -24.0 – 4.50 = -28.50

R = Reference Generator (dBm) -28.50

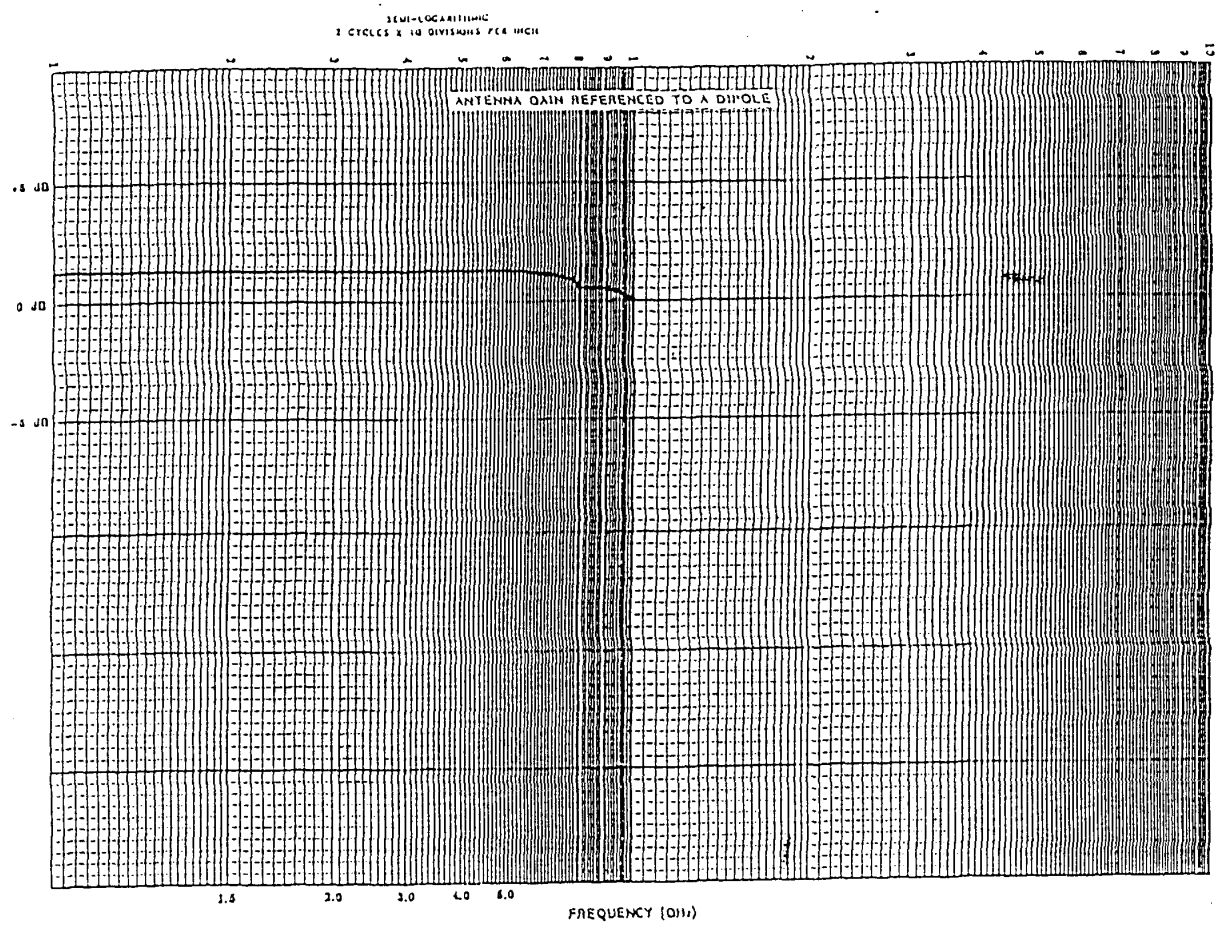
A = Antenna Gain (dB) 1.6

P = Polarization Correction Factor (dB) 0.0

R’ (Corrected Reference (dBm)) = R + A - P => -28.50+ 1.6 - 0.0 = -26.90 dBm

Po = Radiated Carrier Power (dBm) 50 Watts = 47.0 dBm

Radiated Spurious Emission (dBc) = Po - R’ => -26.90 - (+47.0) = **-73.9 dBc**



ANTENNA GAIN GRAPH OF SUBSTITUTION ANTENNA
REFERENCED TO A DIPOLE