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

for the

Mobile Data Platform Transceiver (800 MHz MDP)

With the

Dataradio Gemini Modem

FCC ID: EOTGPDB
Trade Name: GEMINI/PD+

December 5 , 2002

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.

_____
Norman D Pearl
Vice-president Engineering, Dataradio Inc.

Dataradio Inc.
Montreal, Canada

ENGINEERING STATEMENT
OF CONSTANTIN PINTILEI

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) 800 MHz 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 a 2-level FSK (DGMSK) and a 4-level FSK (xRC4FSK) types of modulation scheme together with associated maximum deviation levels at various rates. The change consist of the addition of a 8-level FSK modulation scheme with 4 new proposed rates. This change involves the firmware only, with no change whatsoever occurring in the hardware.

EXISTING CONDITIONS

The unit utilized for these occupied bandwidth and mask-compliance measurements was a prototype built from production EOTGPDB with a beta (prototype) firmware. 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/PD, 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 2.1041 and 2.1049 of Rules Service Co rev.2-163,Sep15,2002.   Equipment performance measurements were made in the engineering laboratory located at 5500 Royalmount ave, Montreal, Canada. All measurements were made and recorded by myself or under my direction. The performance measurements were made between Nov, 20 and Dec 2, 2002

CONCLUSION

Given the results of the measurements contained herein, the applicant requests to have appended the new emission designators 14K7F1D and 11K2F1D in the list of the Certificate EOTGPDB and to have accepted the use of 11K0F1D with a 8-FSK modulation following the Class II Permissive Change, as per FCC part 2.1043(b)(2).

_____12/05/02

Constantin Pintilei, Eng
R&D Test Engineer, Dataradio Inc.

TABLE OF CONTENTS

ANNEXES:

Annex A: Instruction Manual

QUALIFICATIONS OF ENGINEERING PERSONNEL

NAME:	**Norman Pearl**
TITLE:	Vice-president Engineering
TECHNICAL EDUCATION:	Bachelor of Engineering (Electrical) (1979) McGill University, Montreal, Canada.
TECHNICAL EXPERIENCE:	Professional engineer since 1979 25 Years experience in radio communications

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 8 Years experience in radio frequency measurements.

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) 800 MHz (806MHz-824MHz) Transceiver with the Dataradio Inc Gemini Modem. Dataradio Inc does the final assembly and markets the Gemini/PD unit.

The certificate, comprising its several Class II permissive changes already underwent, has been granted for:
 - 8K60, 15K0 and 15K3F1D for respectively 9.6, 16.0 and 19.2kbps DGMSK– Differential Gaussian Minimum Shift Keying digital modulation
-10K0, 10K2, 11K0, 11K5, 15K6 and 16K0 F1Dfor several 4-level FSK, xRC4FSK –Squared Root Raised Cosine 4-level Frequency Shift Keying.

The current Class II permissive change request asks for following four new 8-FSK modulations along with their emission designators: 14K7, 14K7, 11K2 and 11K0F1D for respectively 48.0, 43.2, 28.8 and 24.0 kbps 8-FSK SRRC digital modulations.

Only the 14K7, and 11K2F1D emission designators are suggested to be appended to the current list, 11K0F1D value is already in use for other above mentioned speeds.

Following the FCC part 2.1043(b)(2) rule, in order to market the proposed change we must obtain the acknowledgment of the Commission that the change is acceptable. Therefore a Class II Permissive Change request from the certificate granted on 12/04/2002 has been considered.

The characteristics affected are :
Digital Modulation Techniques   - part 2.1033.(c)(13)
Type of emission and Emission designators list   - part 2.1033 (c)(4), 90.209
Occupied bandwidth and mask compliance requirement - part 2.1049,90.210(g),(h)

They are entirely documented with the current report.

 Because this change is implemented in the operating firmware only, there are no change whatsoever occurring in schematics, part list, mechanical assembly, shape, label or any other hardware related issues. A preliminary version of the manual that contains appended service-related information for 8 level FSK modulation rates is provided as appendix of the 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- final assembly)

MODEL NUMBER: GEMINI/PD+
PART NUMBER: GPDD-6085-xyz

SERIAL NUMBER (S):   0000-prototype 8-level FSK Gemini modem
                                   6085- 13110 -154 production 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	050-03322-00x

DRL Part Number System for MDP:

242-60FC-MRB

F-Frequency Bands
  1 -   V H F
  4 -   U H F
  8 -   8 0 0   M H z
  9 -   9 0 0   M H z

C-Configuration
  1-   5-13 Watt Standard RX
  2-   5-13 Watt Diversity RX
  4-   35-50 Watt Standard RX
  5-   35-50 Watt Diversity RX

B- IF Bandwidth
  1-   6.25 KHz / 7.5 KHz
  2-   12.5 KHz / 15 KHz
  3-   20   KHz
  4-   25 KHz / 30 KHz

R-Frequency Range
  0-   Whole Band (800 and 900 MHz)
  3-   132-150 MHz   400-460 MHz
  5-   150-174 MHz   450-512 MHz
  7-   Transmit: 794-806 / 806-824 MHz
         Receive: 764-776 / 851-869 MHz

M-Modem Type
  0-   N o n e (O E M)
  1-   G e m i n i M o d e m

DATA AND CHARACTERISTICS NOT AFFECTED BY THE CHANGE - Rule Part Number: 2.1033 (c).(8),(9),(10),(11),(12),(15),(16)

Type Of Emission: 2.1033 (c).(4)

DC Voltages And Currents Into Final Amplifier   2.1033 (c).(8)

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)

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

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, 2.1051, 2.1053, and 2.1055
      Part 90, Subpart I: 90.213.
  as follow:

Transmitter Rated Power Output	2.1046
Transmitter Spurious And Harmonic Outputs	2.1051
Field Strength Of Spurious Radiation	2.1053
Frequency Stability and Frequency Tolerance	2.1055,90.213

DATA AND CHARACHERISTICS AFFECTED BY THE CHANGE - Rule Part Number:2.1033(c) (3)(4)(13)(14)

INSTRUCTION BOOK   2.1033 (c) (3)
Annex A . The attached Installation Guide for the GEMINI/PD Transceiver/Modem/GPS is a preliminary version.

TYPE OF EMISSION: 2.1033(c)(4)

For Class II Permissive Change 8levelFSK   25kHz ch spacing (16000baud, 8 FSK) **14K7F1D**
                                           25kHz ch spacing (14400baud, 8 FSK) **14K7F1D**
                                           12.5kHz ch spacing (9600baud, 8 FSK) **11K2F1D**
                                           12.5kHz ch spacing (8000baud, 8 FSK) **11K0F1D**

Previously granted for EOTGPDB   12.5KHz ch spacing (9.6kbps DGMSK) **8K60F1D**
                                           25KHz ch spacing (16.0kbps DGMSK) **15K3F1D**
                                           25KHz ch spacing (19.2kbps DGMSK) **15K0F1D**
                                           25kHz ch spacing (12800baud, 4 FSK) **15K6F1D**
                                           12.5kHz ch spacing (12800baud,4 FSK)**11K5F1D**
                                           25kHz ch spacing (9600baud, 4 FSK) **16K0F1D**
                                           12.5kHz ch spacing (9600baud,4 FSK) **10K2F1D**
                                           12.5kHz ch spacing (8000baud, 4 FSK) **10K0F1D**
                                           12.5kHz ch spacing (7200baud, 4 FSK) **11K0F1D**
                                           25kHz ch spacing (16000baud, 4 FSK) **15K6F1D**

DIGITAL MODULATION TECHNIQUES   2.1033 (c)(13)

The Gemini modem generates 2 level Differential Gaussian Frequency Shift Keying (DGFSK) and 2^n level family Raised Cosine Frequency Shift Keying. (xRC nFSK). 2-level DGFSK and 4-level xRC has been granted with the certificate EOTGPDB. This measurement concerns only 8-level xRC (raised cosine family) modulation, its description follows.

   This digital modulation scheme is produced by the main CPU in conjunction with the DSP. The main CPU processes incoming binary data, applying Forward Error Correction (FEC), interleaving and scrambling, and from it generates an NRZ signal that is fed to the DSP processor for encoding and pulse shaping. The DSP processor assigns to every incoming group of three bits a symbol recorded in a level of frequency shift. The mapping follows a Gray scheme:100-highest positive frequency, 101-next highest positive,etc, to 000-lowest negative, resulting signal being a 8-DC level digital.

   This 8-level signaling transmits three information bits per symbol (baud) which yields a bit rate of three times the on-air baud rate, hence the 28.8 kbps references in the Installation Guide correspond to a transmitter baud rate of 9600 baud. That digital signal is digitally filtered (Squared Root or pure Raised Cosine pulse shaping with roll off factor 0.4) by the DSP then fed to the CODEC for digital to analogue conversion. This xRC8FSK wave shape applied to the FM modulator will then produce a compact RF spectrum, when using proper frequency deviation, to fit inside the restrictive masks inherent to the intended channel bandwidth.

   The transmitter deviation level and digital filter cutoff frequency (which is based on the raised cosine filter equation) are set according to the bit rate selected and channel bandwidth as shown in page 10.

Modulation Characteristic Part 2.1047 (d), 90.209 (b) 90.210(c),(d): Other types of equipment: this equipment is not provided with hardware audio low-pass filters, the filtering is entirely result of DSP firmware.

The transmitter deviation level and digital filter cutoff frequency (which is based on the raised cosine filter equation) are set according to the bit rate selected and channel bandwidth as follows:

Bit rate	Baud rate	Raised Cosine filter's 3dB cut-off frequency	Deviation
48000 b/s	16000bauds	8.0 kHz	± 3.65 kHz
43200 b/s	14400bauds	7.2 kHz	± 4.15 kHz
28800 b/s	9600bauds	4.8 kHz	± 3.39 kHz
24000 b/s	8000bauds	4.0 kHz	± 3.57 kHz

TEST DATA Rule Part Number: 2.1033 (c)(14)
All applicable test data according to:
      -Part 2: 2.1043 (b)(2), 2.1049
      -Part 90, Subpart I: 90.209 and 90.210(g),(h)
are provided in next section of this Engineering Report

The following test reports have been generated for Class II Permissive Change notification for EOTGPDB, 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 measurements were conducted following the procedures set forth in the TIA/EIA-603 revA standards.

 NAME OF TEST:
Transmitter Occupied Bandwidth

RULE PART NUMBER: 2.201, 2.202, 2.1033 c (14), 2.1049 (h), 2.1041

Emission Designator Determination

Necessary Bandwidth Measurement (90.209.(b))

This radiomodem uses digital modulation signals, passing through a Raised Cosine α=0.4 DSP implemented low-pass filter to an FM transceiver. The necessary bandwidth calculation for this type of modulation (xRC4FSK) is not covered by paragraphs (1), (2) or (3) from 2.202(c), the result exceeding the real 99% necessary bandwidth obtained through simulations or measurement.

 Therefore, the approach outlined in (2.202(c)(4)) is applicable in this case.

The results of 99% Occupied Bandwidth measurement are:

Baud rate	Deviation	Occupied Bandwidth	Authorised Bandwidth	Proposed Emission Designator
48000b/s	± 3.65 kHz	14670 Hz	20000Hz	14K7F1D
43200b/s	± 4.15 kHz	14670 Hz	20000Hz	14K7F1D
28800 b/s	± 3.39 kHz	11170 Hz	20000Hz	11K2F1D
24000 b/s	± 3.57 kHz	11000 Hz	20000Hz	11K0F1D

The measurement theory and set-up explanations follow.

Occupied Bandwidth Measurement
        The Occupied Bandwidth measurement option of the instrument (8563EC spectrum analyzer from Agilent) calculates and provides the values used above for the emission designator.
        The percentage setting of the measurement has been set to 99% following the definition of the ***Occupied Bandwidth*** "the frequency bandwidth such that, below its lower and above its upper frequency limits, the mean powers radiated are each equal to 0.5 percent of the total mean power radiated by a given emission" (FCC 2.202)
        The measurement has been performed during the tests for compliance with mask G, the resulting value was recorded as Occupied Bandwidth.

        The measurement set-up is:
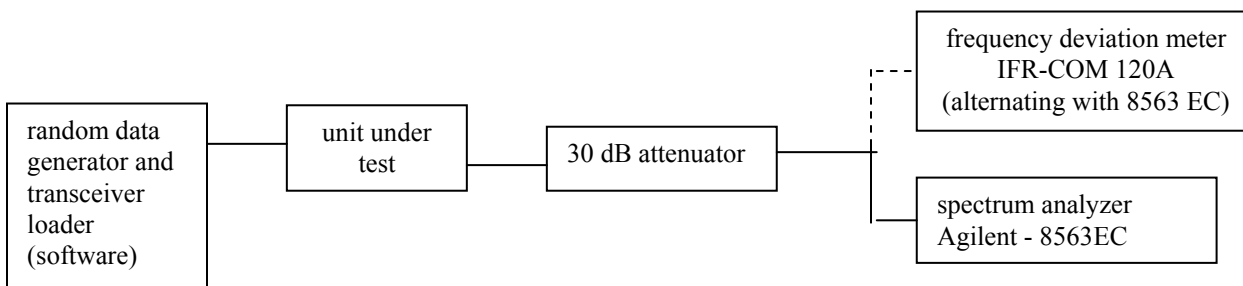
NAME OF TEST: Transmitter Occupied Bandwidth
                                 GEMINI Modem at 28800 bps, 9600bauds 8FSK

Mask compliance data in support of Emission Designator **11K2F1D**

RULE PART NUMBER: 2.201, 2.202, 2.1033 c (14), 2.1049 (h), 2.1041, 90.209 (b)(5), 90.210 (h)

MINIMUM STANDARD: Mask H
                            Sidebands and Spurious [Rule 90.210 (h)]
                            Authorized Bandwidth = 20 kHz [Rule 90.209(b) (5)]
                            Fo to 4.0 kHz   Attenuation = 0 dB
                            >4.0 kHz to 8.5 kHz   Attenuation= $107*\log(f_d /4)$ dB
                            >8.5 kHz to 15 kHz   Attenuation= $40.5*\log(f_d /1.16)$ dB
                            >15 kHz to 25kHz   Attenuation = $116*\log(f_d /6.1)$ dB
                            >25kHz $43 + 10*\log(P)$ dB
                            Corner Points:
                            Fo to 4.0 kHz   Attenuation = 0 dB
                            >4.0 kHz to 8.5 kHz   Attenuation= 0 dB to 35 dB
                            >8.5 kHz to 15 kHz   Attenuation = 35 dB to 45 dB
                            >15 kHz to 25 kHz   Attenuation =45 dB to 71 dB
                            >25 kHz   Attenuation =53dB (10W-generic)
                            The limits would read 59dB for 40W and 50dB for 5W output.

TEST RESULTS: Meets minimum standard (see data on the following pages)
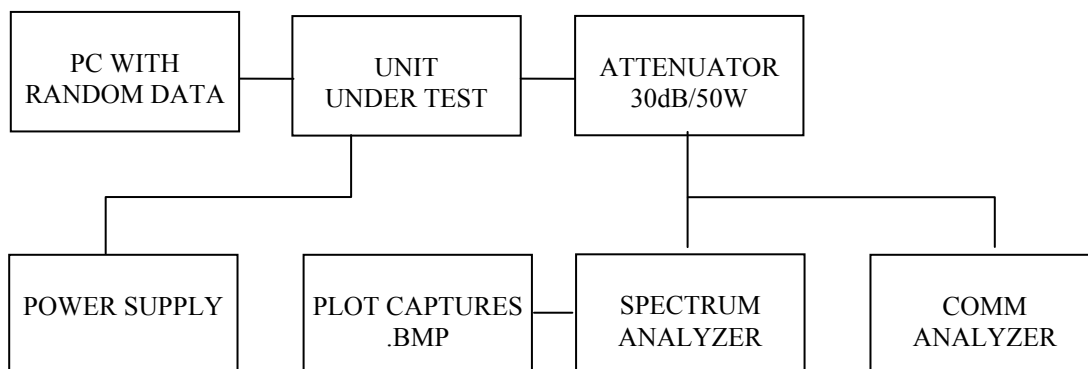
TEST CONDITIONS: Standard Test Conditions, 25 C
TEST EQUIPMENT: Attenuator, BIRD Model / 50-A-MFN-30 / 30 dB / 50 Watt
                            DC Power Source, Model Astron VS 20M
                            Communication Analyzer, Model IFR COM120A (deviation meter)
                            Spectrum Analyzer, Model HP E4401

PERFORMED BY: DATE: 12/02/02
                            Constantin Pintilei

TEST SET-UP:

NAME OF TEST: Transmitter Occupied Bandwidth (Continued)
                                     GEMINI Modem at 28800 bps, 9600bauds 8FSK

MODULATION SOURCE DESCRIPTION:

TX Data Test Pattern:

The transmit "test data" pattern command produces a 2047 bit pseudo-random pattern. This pattern is generated by the internal software using the polynomial $X^{11}+X^9+1$ form and a 12-bit shift register. Initial value of the register is 111111111110 (FFE hex). The 2047 bit sequence is repeated thereafter as long is necessary to complete the test duration (55 sec). This pattern is applied to the DSP processor data input for encoding and 4 FSK RC α=0.4 pulse shaping .

The 8-level signaling transmits three information bits per symbol (baud) which yields a bit rate of three times the on-air baud rate, hence the 28.8 kbps references in the Installation Guide correspond to a transmitter baud rate of 9600 baud. That digital signal is digitally filtered (Squared Root or pure Raised Cosine pulse shaping with α=0.4) by the DSP then fed to the CODEC for digital to analogue conversion as explained in previous submissions. This xRC8FSK wave shape applied to the FM modulator will then produce a compact RF spectrum, when using proper frequency deviation, to fit inside the restrictive masks inherent to the intended channel bandwidth.

For 28800 bit rate the deviation is set to 3.39kHz using a 1kHz tone to control the deviation level.

NECESSARY BANDWIDTH (Bn) COMPLIANCE

See Page 11 for Occupied Bandwidth data. 11200Hz < 20000Hz , Authorized Bandwidth

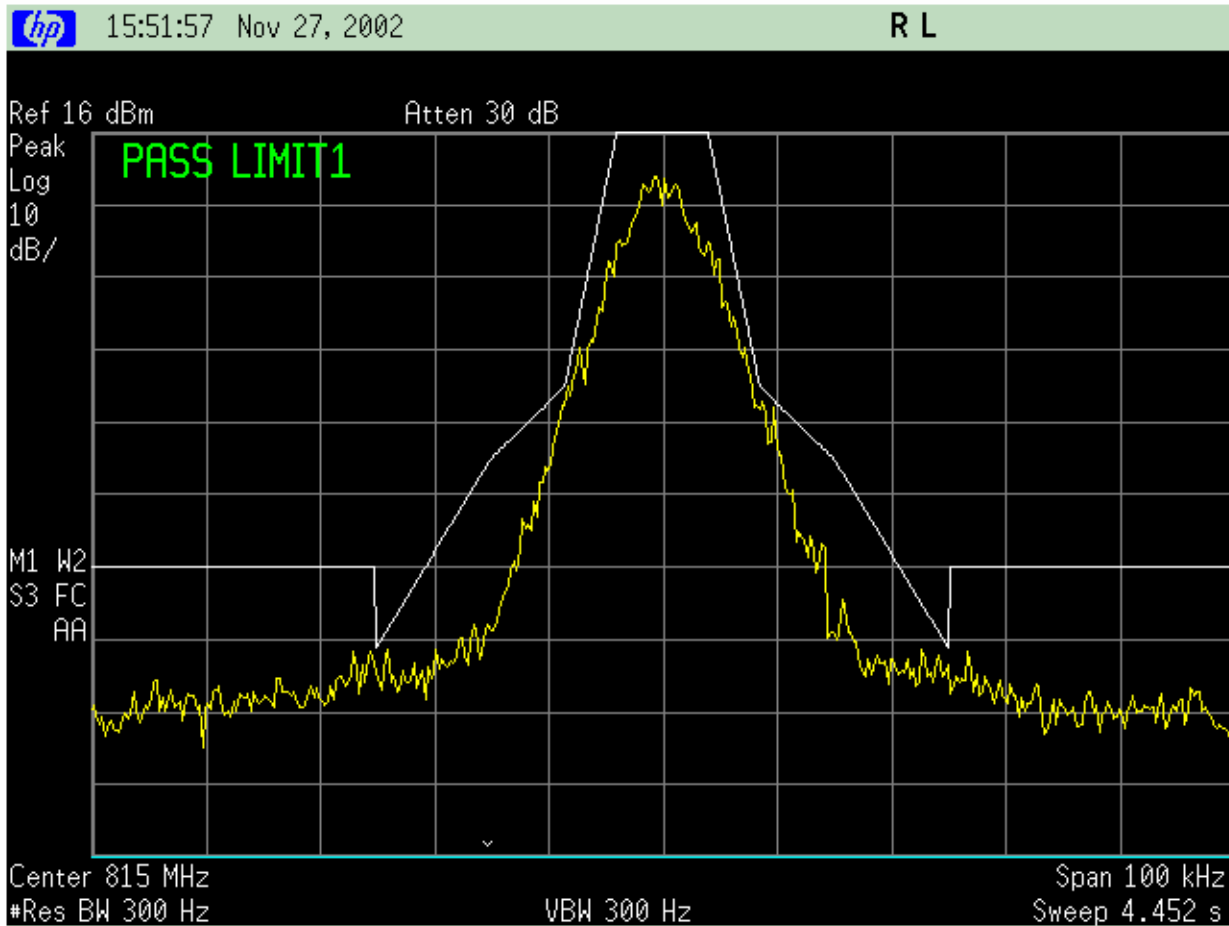TEST DATA: Refer to the following graphs:

MASK: H , 40W
SPECTRUM FOR EMISSION **11K2F1D**
OUTPUT POWER: 40 Watts
28800bps=9600 bauds 8 level FSK
PEAK DEVIATION = 3390 Hz
SPAN = 100 kHz
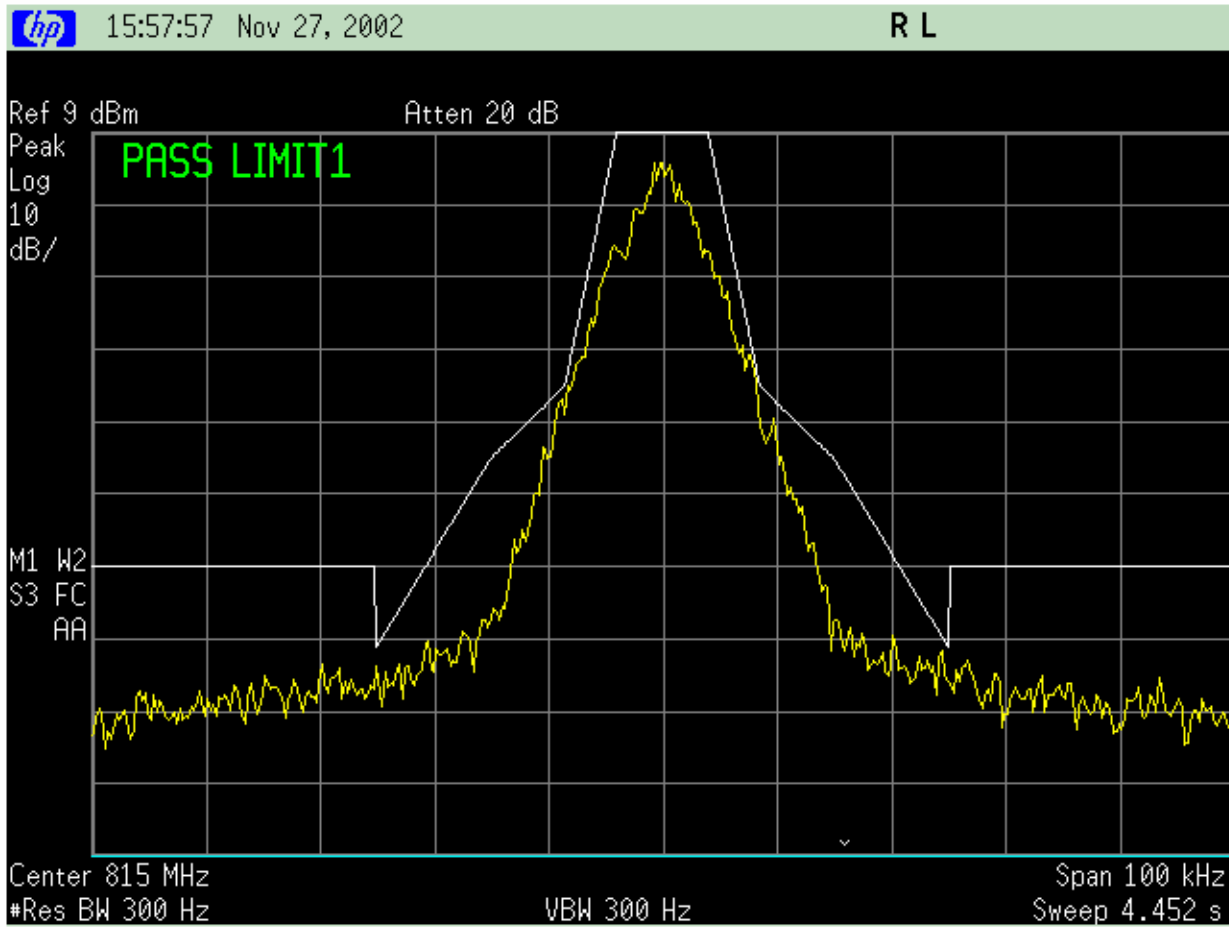
MASK: H , 5W
SPECTRUM FOR EMISSION **11K2F1D**
OUTPUT POWER: 5 Watts
9600 bauds 8 level FSK
PEAK DEVIATION = 3390 Hz
SPAN = 100 kHz

NAME OF TEST: Transmitter Occupied Bandwidth
                                      GEMINI Modem at 24000 bps, 8000bauds 8FSK

Mask compliance data in support of Emission Designator **11K0F1D**

RULE PART NUMBER: 2.201, 2.202, 2.1033 c (14), 2.1049 (h), 2.1041, 90.209 (b)(5), 90.210 (h)

MINIMUM STANDARD: Mask H
                                        Sidebands and Spurious [Rule 90.210 (h)]
                                        Authorized Bandwidth = 20 kHz [Rule 90.209(b) (5)]

Fo to 4.0 kHz	Attenuation = 0 dB
>4.0 kHz to 8.5 kHz	Attenuation= $107*\log(f_d/4)$ dB
>8.5 kHz to 15 kHz	Attenuation= $40.5*\log(f_d/1.16)$ dB
>15 kHz to 25kHz	Attenuation = $116*\log(f_d/6.1)$ dB
>25kHz	$43 + 10*\log(P)$ dB

Corner Points:

Fo to 4.0 kHz	Attenuation = 0 dB
>4.0 kHz to 8.5 kHz	Attenuation= 0 dB to 35 dB
>8.5 kHz to 15 kHz	Attenuation = 35 dB to 45 dB
>15 kHz to 25 kHz	Attenuation =45 dB to 71 dB
>25 kHz	Attenuation =53dB (10W-generic)

The limits would read 59dB for 40W and 50dB for 5W output.

TEST RESULTS: Meets minimum standard (see data on the following pages)
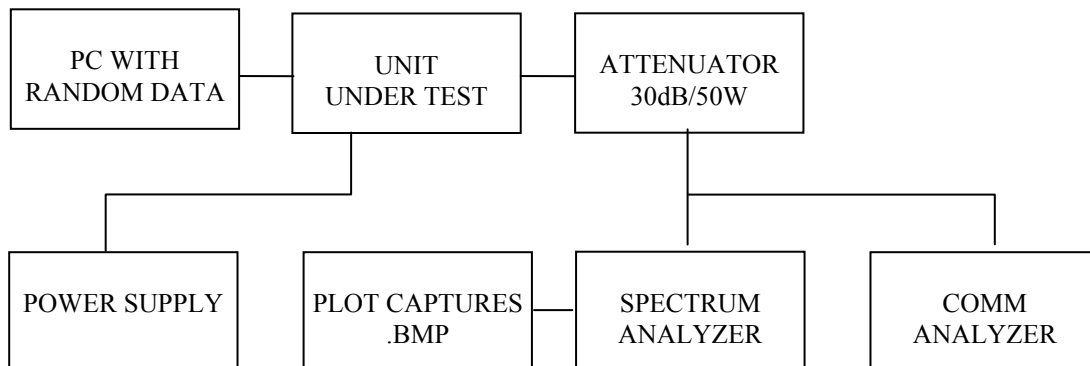
TEST CONDITIONS: Standard Test Conditions, 25 C
TEST EQUIPMENT: Attenuator, BIRD Model / 50-A-MFN-30 / 30 dB / 50 Watt
                                        DC Power Source, Model Astron VS 20M
                                        Communication Analyzer, Model IFR COM120A (deviation meter)
                                        Spectrum Analyzer, Model HP E4401

PERFORMED BY: _____   DATE: 12/02/02
                                    Constantin Pintilei

TEST SET-UP:

NAME OF TEST: Transmitter Occupied Bandwidth (Continued)
                                GEMINI Modem at 24000 bps, 8000bauds 8FSK

MODULATION SOURCE DESCRIPTION:

TX Data Test Pattern:

The transmit "test data" pattern command produces a 2047 bit pseudo-random pattern. This pattern is generated by the internal software using the polynomial $X^{11}+X^9+1$ form and a 12-bit shift register. Initial value of the register is 111111111110 (FFE hex). The 2047 bit sequence is repeated thereafter as long is necessary to complete the test duration (55 sec). This pattern is applied to the DSP processor data input for encoding and 4 FSK RC α=0.4 pulse shaping .

The 8-level signaling transmits three information bits per symbol (baud) which yields a bit rate of three times the on-air baud rate, hence the 28.8 kbps references in the Installation Guide correspond to a transmitter baud rate of 9600 baud. That digital signal is digitally filtered (Squared Root or pure Raised Cosine pulse shaping with α=0.4) by the DSP then fed to the CODEC for digital to analogue conversion as explained in previous submissions. This xRC8FSK wave shape applied to the FM modulator will then produce a compact RF spectrum, when using proper frequency deviation, to fit inside the restrictive masks inherent to the intended channel bandwidth.

For 24000 bit rate the deviation is set to 3.57kHz using a 1kHz tone to control the deviation level.

NECESSARY BANDWIDTH (Bn) COMPLIANCE

See Page 11 for Occupied Bandwidth data. 11000Hz < 20000Hz , Authorized Bandwidth

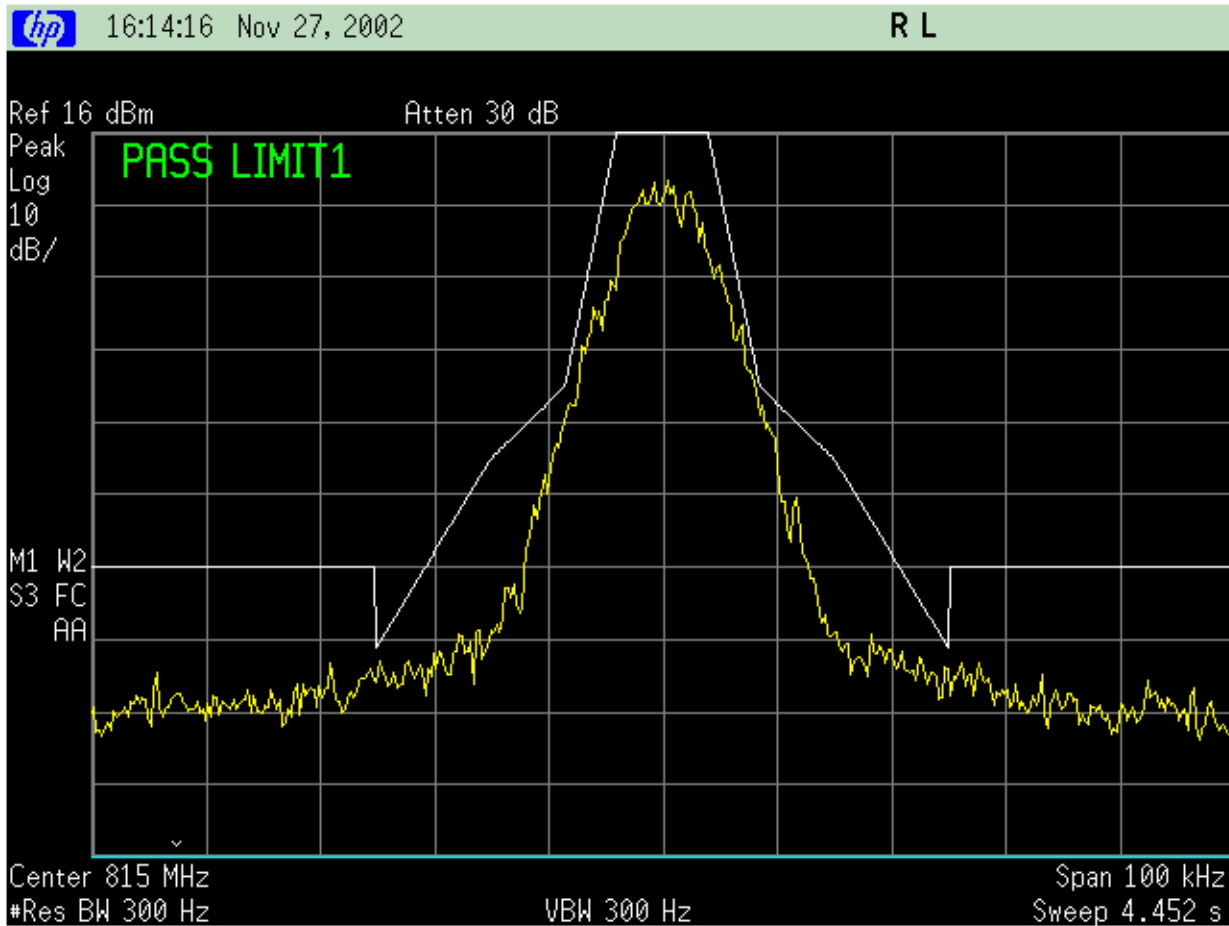TEST DATA: Refer to the following graphs:

MASK: H , 40W

SPECTRUM FOR EMISSION **11K0F1D**
OUTPUT POWER: 40 Watts
24000bps=8000 bauds 8 level FSK
PEAK DEVIATION = 3570 Hz
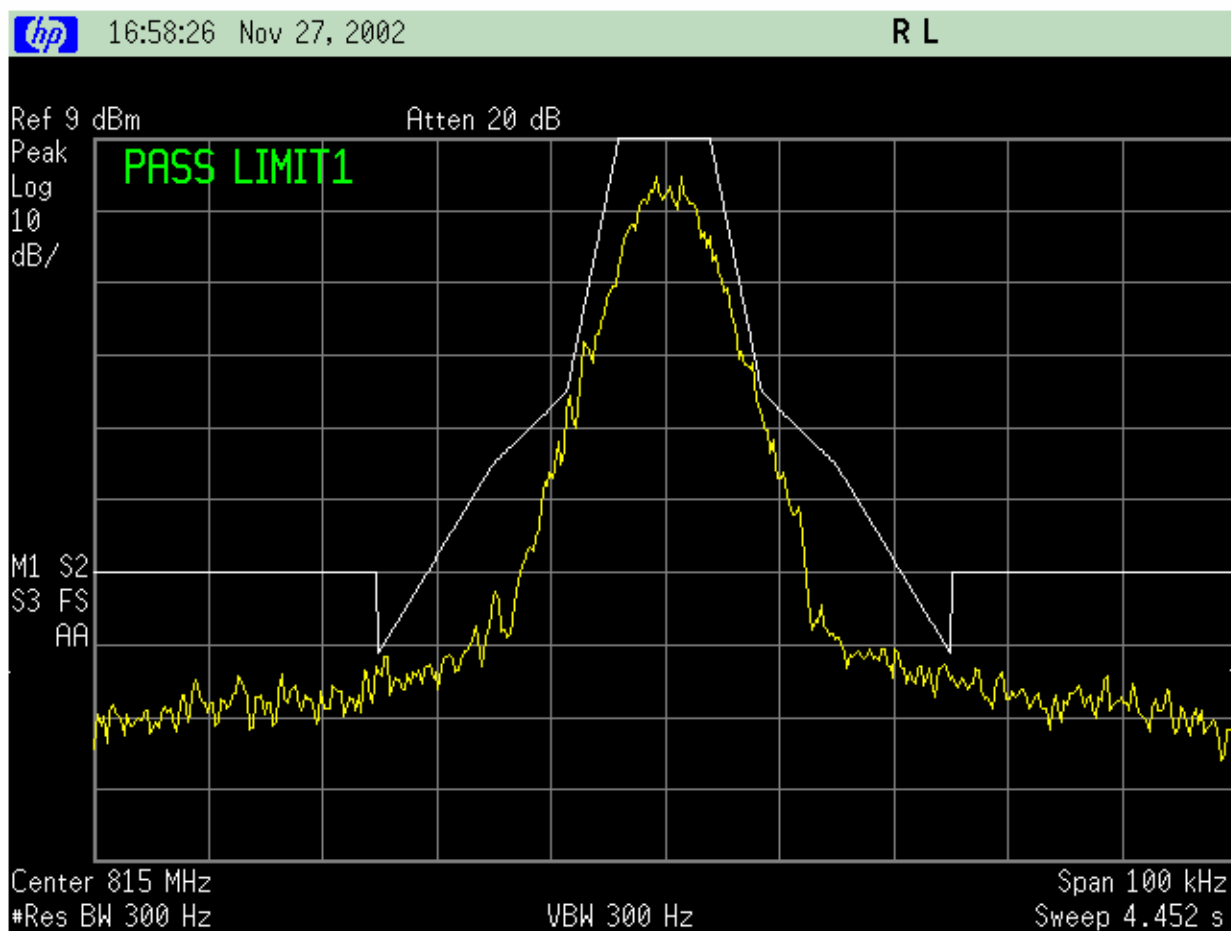SPAN = 100 kHz

MASK: H , 5W

SPECTRUM FOR EMISSION **11K0F1D**
OUTPUT POWER: 5 Watts
8000 bauds 8 level FSK
PEAK DEVIATION = 3570 Hz
SPAN = 100 kHz

NAME OF TEST: Transmitter Occupied Bandwidth
GEMINI Modem at 48000 bps, 16000bauds 8FSK

Mask compliance data in support Emission Designator **14K7F1D**

RULE PART NUMBER: 2.201, 2.202, 2.1033 c (14), 2.1041, 2.1049, 90.209 (b)(5), 90.210 (g)
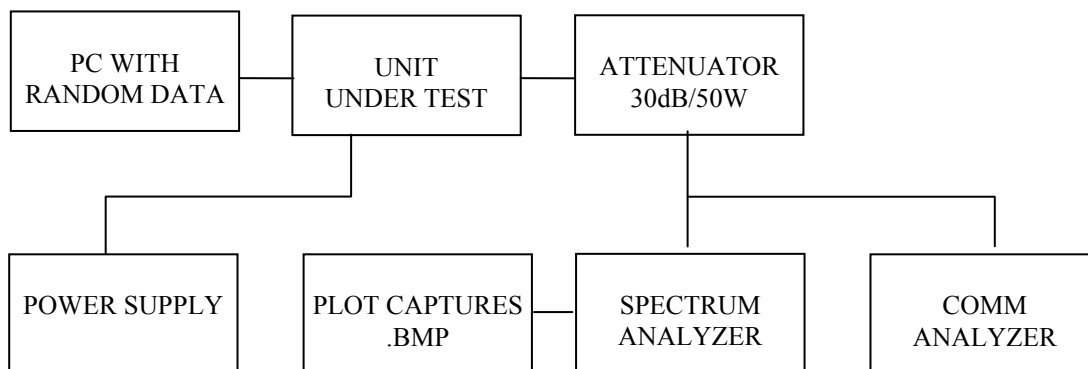
MINIMUM STANDARD: Mask G
Sidebands and Spurious [Rule 90.210 (g)]
Authorized Bandwidth = 20 kHz [Rule 90.209(b) (5)]
Fo to 5.0 kHz   Attenuation = 0 dB
>5.0 kHz to 10.0 kHz   Attenuation= $83*\log(f_d\,KHz\,/5)$ dB
>10.0 kHz to 250% Auth BW   Attenuation = Lesser of:
$116*\log(f_d\,KHz\,/6.1)$ dB,
$50+10\log_{10}(P)$ or 70dB

specifically:
10.0 kHz to 22.61 KHz Att = 24.9 dB to 66 dB (40W) then 66dB to ±50kHz
10.0 kHz to 18.91 KHz Att = 24.9 dB to 57 dB (5 W) then 57dB to ±50kHz
>250% Auth BW $43+10*\log(P)$dB =59dB(40W) or 50dB(5W)
Corner Points:
Fo to 5.0 kHz   Attenuation = 0 dB
>5.0 kHz to 10.0 kHz   Attenuation= 0 dB to 25 dB
>10.0 kHz to 15.0 KHz   Attenuation = 25 dB to 45 dB
>15 kHz to 25kHz   Attenuation =45dB to 70 dB
>25kHz to 50kHz   Attenuation =70dB
>250% Authorized BW   Attenuation = 53 dB

TEST RESULTS: Meets minimum standard (see data on the following pages)
TEST CONDITIONS: Standard Test Conditions, 25 C
TEST EQUIPMENT: Attenuator, BIRD Model / 100-A-MFN-30 / 30 dB / 100 Watt
Splitter Minicircuits model ZFSC-2-4
DC Power Source, Model Astron VS 20M
Communication Analyzer, Model IFR COM120B (deviation meter)
Spectrum Analyzer, Model HP E4401

PERFORMED BY: _____   DATE: 12/02/02
Constantin Pintilei

TEST SET-UP:

NAME OF TEST: Transmitter Occupied Bandwidth (Continued)
                                                  GEMINI Modem at 48000bps, 16000 bauds xRC8FSK

MODULATION SOURCE DESCRIPTION:

TX Data Test Pattern:

The transmit "test data" pattern command produces a 2047 bit pseudo-random pattern. This pattern is generated by the internal software using the polynomial $X^{11}+X^9+1$ form and a 12-bit shift register. Initial value of the register is 111111111110 (FFE hex). The 2047 bit sequence is repeated thereafter as long is necessary to complete the test duration (55 sec). This pattern is applied to the DSP processor data input for encoding and 4 FSK RC α=0.4 pulse shaping .

This data follows same modulation process as described in Digital Modulation Techniques (page 9) and the resulting base band signal feeds the modulator's input of the transceiver.

For 16000 baud rate the deviation is set to 3.65kHz using a 1kHz tone to control the deviation level.

NECESSARY BANDWIDTH (Bn) COMPLIANCE

See Page 11 for Occupied Bandwidth. 14670Hz < 20000Hz , Authorized Bandwidth

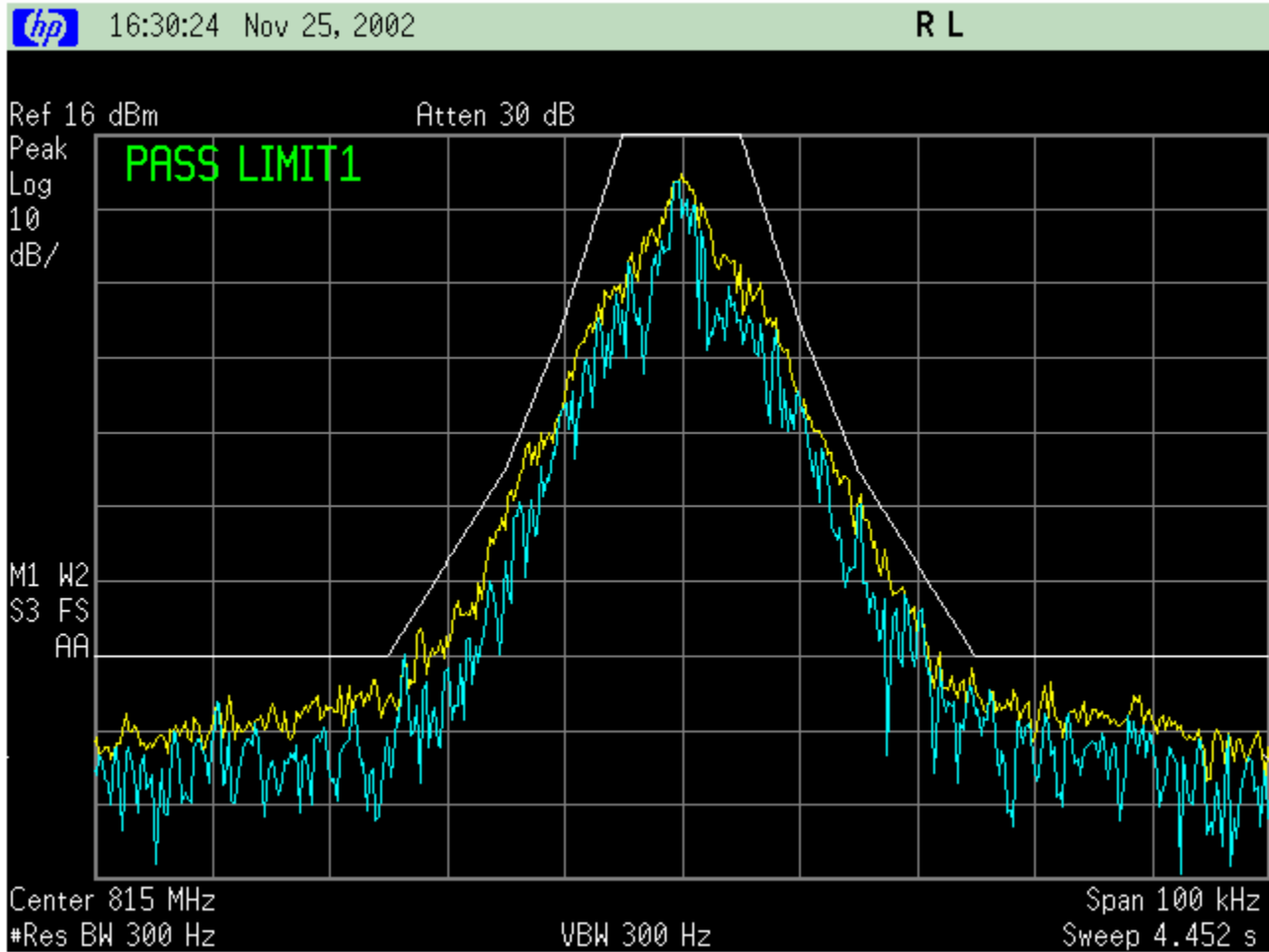TEST DATA: Refer to the following graphs:

MASK: G ,40W

OUTPUT POWER: 40 Watts
48000 bps /16000 bauds 8 level FSK
PEAK DEVIATION = 3650 Hz
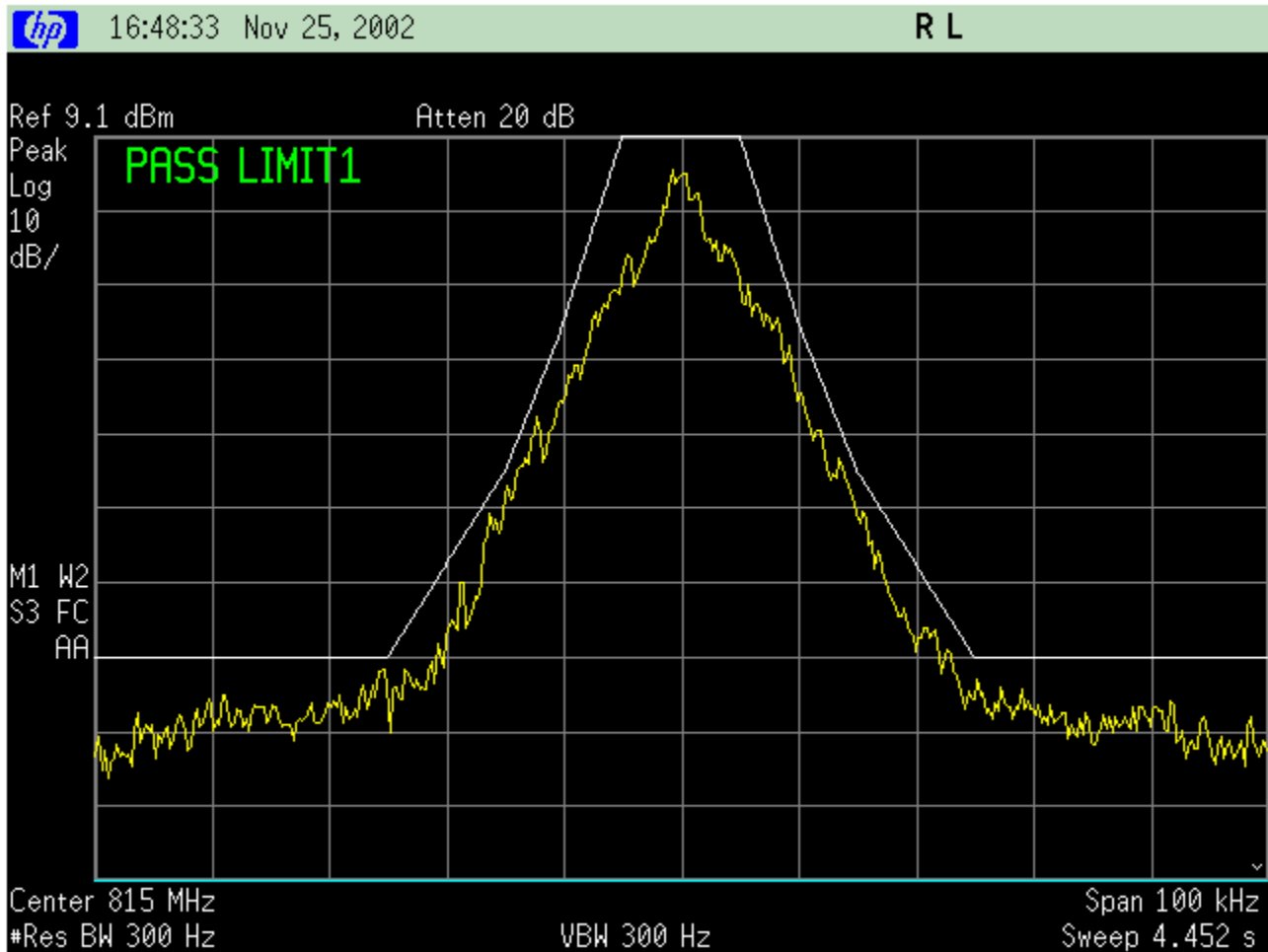SPAN = 100 kHz

MASK: G, 5W

OUTPUT POWER: 5 Watts
48000 bps /16000 bauds 8 level FSK
PEAK DEVIATION = 3650 Hz
SPAN = 100 kHz

NAME OF TEST: Transmitter Occupied Bandwidth
                          GEMINI Modem at 43200 bps, 14400bauds 8FSK

Mask compliance data in support of second Emission Designator **14K7F1D**

RULE PART NUMBER: 2.201, 2.202, 2.1033 c (14), 2.1041, 2.1049, 90.209 (b)(5), 90.210 (g)

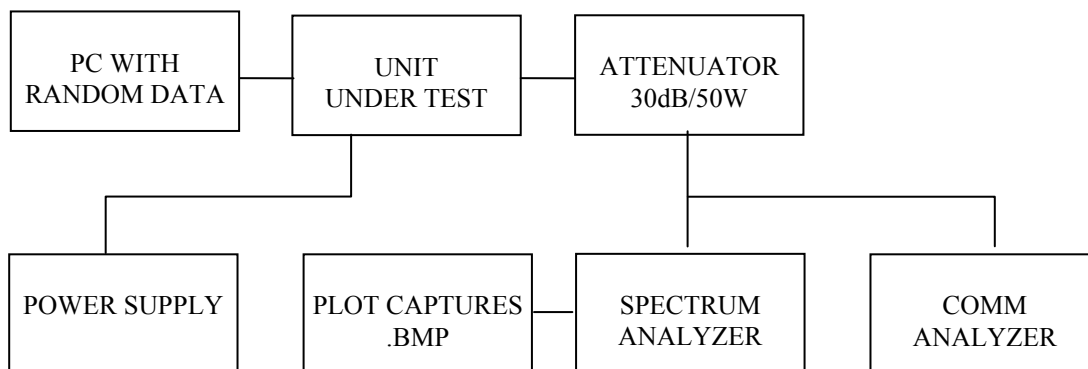MINIMUM STANDARD: Mask G
                          Sidebands and Spurious [Rule 90.210 (g)]
                          Authorized Bandwidth = 20 kHz [Rule 90.209(b) (5)]
                          Fo to 5.0 kHz   Attenuation = 0 dB
                          >5.0 kHz to 10.0 kHz   Attenuation= $83*\log(f_d \text{ KHz} /5)$ dB
                          >10.0 kHz to 250% Auth BW   Attenuation = Lesser of:
                                                               $116*\log(f_d \text{ KHz} /6.1)$ dB,
                                                               $50+10\log_{10}(P)$ or 70dB

                          specifically:
                          10.0 kHz to 22.61 KHz Att = 24.9 dB to 66 dB (40W) then 66dB to ±50kHz
                          10.0 kHz to 18.91 KHz Att = 24.9 dB to 57 dB (5 W) then 57dB to ±50kHz
                          >250% Auth BW $43+10*\log(P)$dB =59dB(40W) or 50dB(5W)
                          Corner Points:
                          Fo to 5.0 kHz   Attenuation = 0 dB
                          >5.0 kHz to 10.0 kHz   Attenuation= 0 dB to 25 dB
                          >10.0 kHz to 15.0 KHz   Attenuation = 25 dB to 45 dB
                          >15 kHz to 25kHz   Attenuation =45dB to 70 dB
                          >25kHz to 50kHz   Attenuation =70dB
                          >250% Authorized BW   Attenuation = 53 dB

TEST RESULTS: Meets minimum standard (see data on the following pages)
TEST CONDITIONS: Standard Test Conditions, 25 C
TEST EQUIPMENT: Attenuator, BIRD Model / 100-A-MFN-30 / 30 dB / 100 Watt
                          Splitter Minicircuits model ZFSC-2-4
                          DC Power Source, Model Astron VS 20M
                          Communication Analyzer, Model IFR COM120B (deviation meter)
                          Spectrum Analyzer, Model HP E4401

PERFORMED BY: _____   DATE: 12/02/02
                          Constantin Pintilei

TEST SET-UP:

NAME OF TEST: Transmitter Occupied Bandwidth (Continued)
                                 GEMINI Modem at 43200bps, 14400 bauds xRC8FSK

MODULATION SOURCE DESCRIPTION:

TX Data Test Pattern:

The transmit "test data" pattern command produces a 2047 bit pseudo-random pattern. This pattern is generated by the internal software using the polynomial $X^{11}+X^9+1$ form and a 12-bit shift register. Initial value of the register is 111111111110 (FFE hex). The 2047 bit sequence is repeated thereafter as long is necessary to complete the test duration (55 sec). This pattern is applied to the DSP processor data input for encoding and 4 FSK RC α=0.4 pulse shaping .

This data follows same modulation process as described in Digital Modulation Techniques (page 9) and the resulting base band signal feeds the modulator's input of the transceiver.

For 14400 baud rate the deviation is set to 4.15kHz using a 1kHz tone to control the deviation level.

NECESSARY BANDWIDTH (Bn) COMPLIANCE

See Page 11 for Occupied Bandwidth. 14670Hz < 20000Hz , Authorized Bandwidth

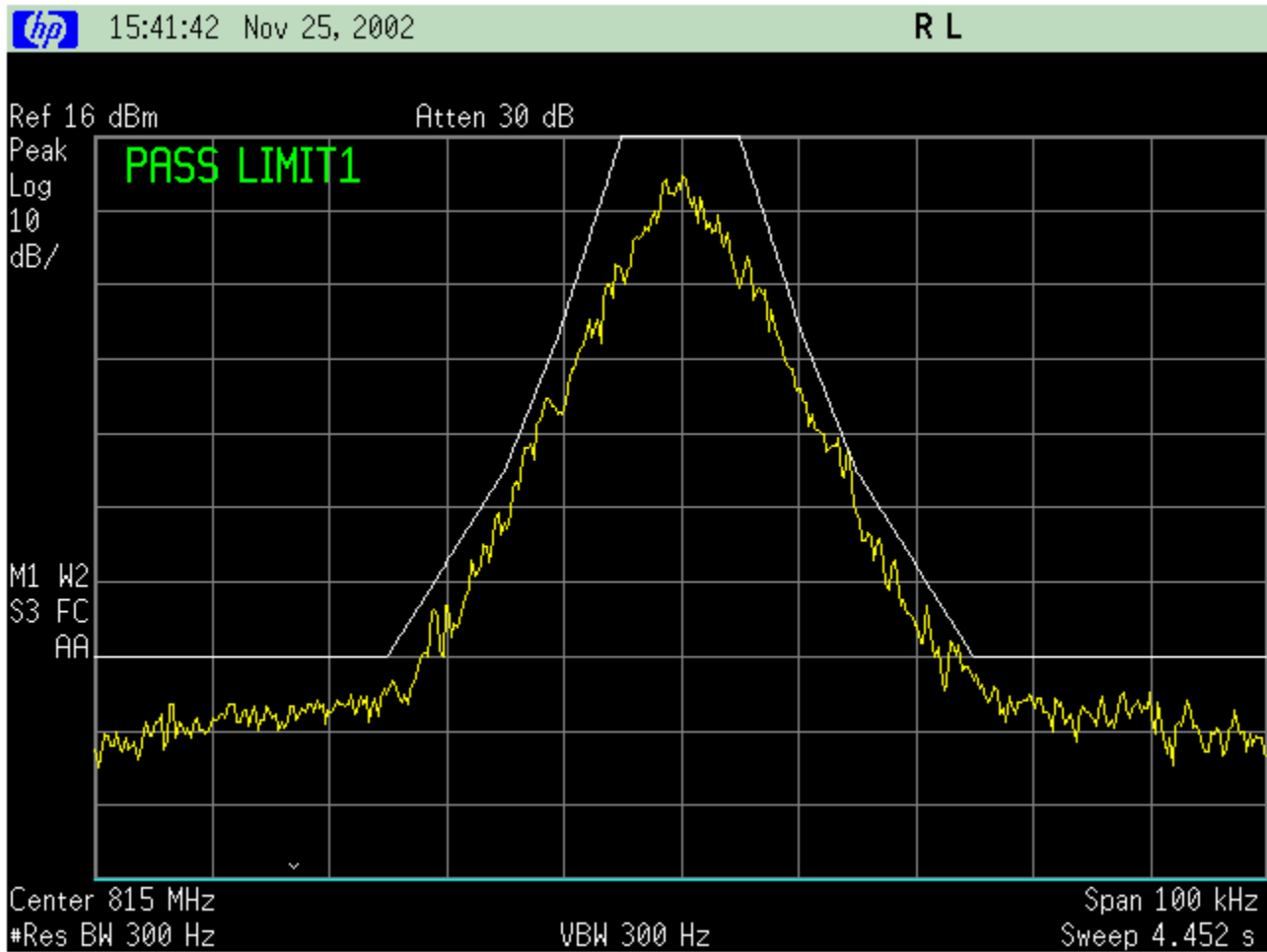TEST DATA: Refer to the following graphs:

MASK: G ,40W

OUTPUT POWER: 40 Watts
43200 bps /14400 bauds 8 level FSK
PEAK DEVIATION = 4150 Hz
SPAN = 100 kHz

MASK: G, 5W

OUTPUT POWER: 5 Watts
43200 bps /14400 bauds 8 level FSK
PEAK DEVIATION = 4150 Hz
SPAN = 100 kHz