

**ANNEX A****TEST DATA Section Rule Part Number: 2.1033 (c)(14), 2.1091,15.209**

All applicable test data according to:

-Part 2: 2.1046, 2.1047, 2.1049, 2.1051, 2.1053, 2.1057, and 2.1091

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

are provided in this section of the Engineering Report, as shown detailed below:

Data Contents	FCC parts
General.	2.1033 (14)
Emission Designator	2.201,2.202, 90.209
Mask compliance and Occupied Bandwidth measurement	2.1049,90.209,90.210
- 4-level increased maximum deviation following a tighter modulation balance production procedure	90.210(d)
- 8- FSK modulations for 12.5kHz channel (mask D)	90.210(d)
- 8-FSK modulations for 25 kHz channel (mask C)	90.210(c)

The following reports have been generated for Class II Permissive Change of FCC certificate EOTBDD4T85-3 granted to Dataradio. The measurements were conducted following the procedures set forth in the TIA/EIA-603 standards.

### Transmitter Occupied Bandwidth and Emission Designator Determination

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

#### Necessary Bandwidth Measurement (90.209.(b))

This radiomodem uses digital modulation signals, passing through a pulse shaping DSP implemented low-pass filter to an FM transceiver. The equations for the filter are Nyquist-based being driven by the data symbol rates, they are detailed in modulation source description paragraph. The necessary bandwidth calculation for this type of modulation is not covered by paragraphs (1), (2) or (3) from 2.202(c), the result exceeding by far the real 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:

Bit rate	Symbol rate	Pulse shaping filter equation	Deviation	Occupied Bandwidth	Emission designator
14400 bps	7200 bauds	SRRC4FSK $\alpha=0.4$	$\pm 2.21$ kHz	8000 Hz	8K00
16000 bps	8000 bauds	SRRC4FSK $\alpha=0.4$	$\pm 1.84$ kHz	7167 Hz	7K17
21600 bps	7200 bauds	xRC8FSK	$\pm 2.92$ kHz	8333 Hz	8K33
24000 bps	8000 bauds	xRC8FSK	$\pm 2.59$ kHz	8000 Hz	8K00
43200 bps	14400 bauds	xRC8FSK	$\pm 4.82$ kHz	14830 Hz	14K9
48000 bps	16000 bauds	xRC8FSK	$\pm 5.03$ kHz	16667 Hz	16K7

The measurement theory and set-up explanations follow.

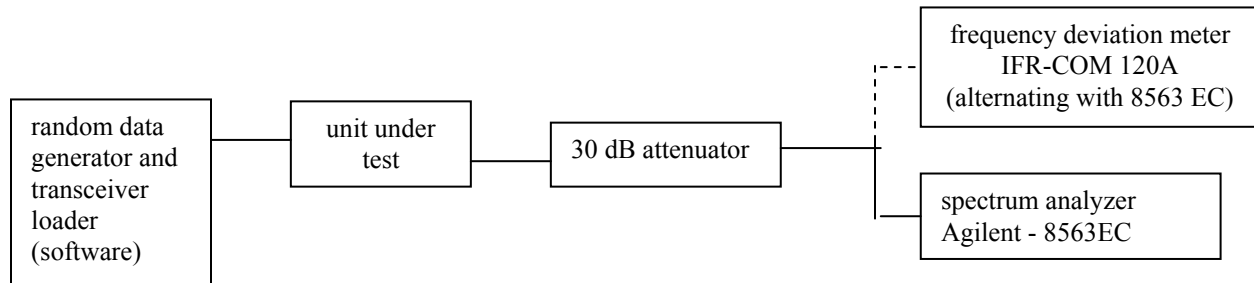
#### Occupied Bandwidth Measurement

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 the mask, the resulting value was recorded as Occupied Bandwidth. When different occupied bandwidth values were found at exciter output(0.85W), 20W and 100W power levels, the highest was recorded for Occupied Bandwidth data.

The measurement set-up is:



NAME OF TEST: Transmitter Occupied Bandwidth  
Paragon/PD Modem at 14400 bps 4 FSK

### Mask compliance data in support of Emission Designator **8K00F1D**

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

MINIMUM STANDARD: Mask D  
Sidebands and Spurious [Rule 90.210 (d)]  
Authorized Bandwidth = 11.25 kHz [Rule 90.209(b) (5)]  
Fo to 5.625 kHz Attenuation = 0 dB  
>5.625 kHz to 12.5 kHz Attenuation =  $7.27(f_d - 2.88\text{kHz})$  dB  
>12.5kHz Lesser of  $50 + 10 \cdot \log(P)$  dB or 70dB

#### Corner Points:

Fo to 5.625 kHz Attenuation = 0 dB  
>5.625 kHz to 12.5 kHz Attenuation = 20 dB to 70 dB  
>12.5 kHz Attenuation = 70dB (100W)

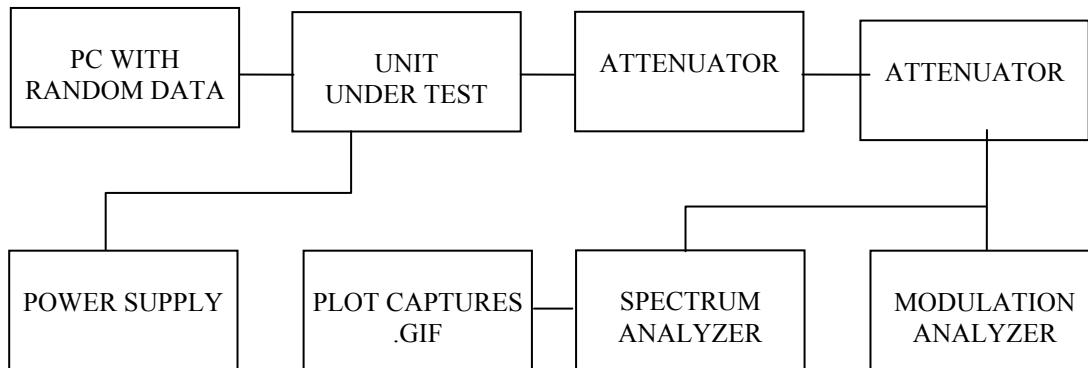
TEST RESULTS: Meets minimum standard (see data on the following pages)

TEST CONDITIONS: Standard Test Conditions, 25 C

TEST EQUIPMENT: Attenuator, BIRD Model / 100-A-MFN-30 / 30 dB / 100 Watt  
DC Power Supply, Astron Model VS-20M  
IFR COM-120B communication analyzer for deviation meter  
Spectrum Analyzer, Model HP8563E  
HP power meter model#E4418B  
HP Benchlink -software for plot captures.

PERFORMED BY: Constantin Pintilei DATE: 12/30/2002

TEST SET-UP:



NAME OF TEST: Transmitter Occupied Bandwidth (Continued)  
Paragon/PD Modem at 14400 bps 4 FSK

**MODULATION SOURCE DESCRIPTION:**

TX Data Pattern:

The transmit data pattern is DBA protocol- type of "idle" packets data pattern as it was described in the report for the permissive change EA100893 granted in 05/29/2001. Anyway for this test a higher deviation is achieved due to the fact that the exciter underwent the dual point modulation balance as shown in the production procedure attached.

For 14400 bps rate (4 FSK), the deviation is set to 2.21 kHz. For deviation readings it has been used the IF filter of 15 KHz

**NECESSARY BANDWIDTH (Bn) CALCULATION**

The corresponding emission designator prefix for necessary bandwidth  
**8K00F1D** for 14400 bps rate , 2.21 kHz deviation

**TEST DATA:** Refer to the following graphs:

MASK: D, 8K00F1D, 0.85 W (exciter output)

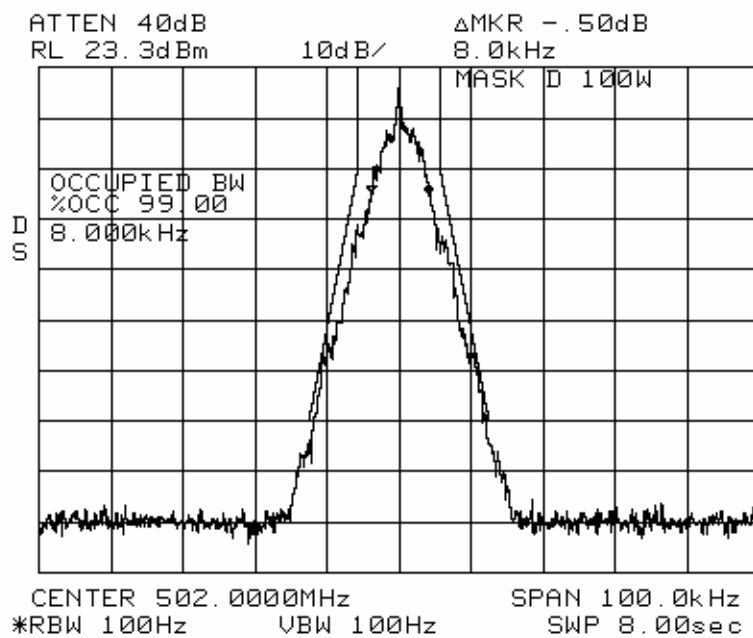
SPECTRUM FOR EMISSION 8K00F1D

OUTPUT POWER: 0.85 Watt

14400 bps, 4 level FSK

PEAK DEVIATION = 2210 Hz

SPAN = 100 KHz



MASK: D, 8K00F1D, 20 W

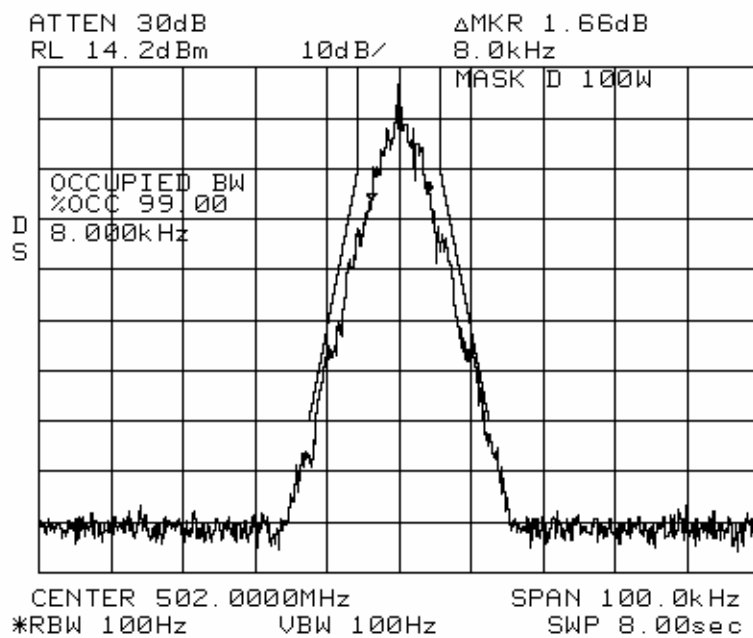
SPECTRUM FOR EMISSION 8K00F1D

OUTPUT POWER: 20 Watts

14400 bps, 4 level FSK

PEAK DEVIATION = 2210 Hz

SPAN = 100 KHz



MASK: D, 8K00F1D, 100 W

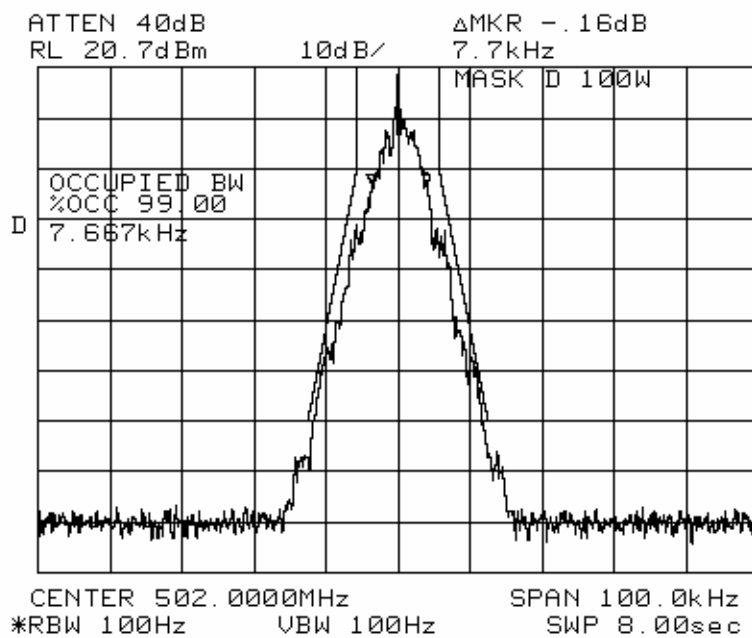
SPECTRUM FOR EMISSION 8K00F1D

OUTPUT POWER: 100 Watts

14400 bps, 4 level FSK

PEAK DEVIATION = 2210 Hz

SPAN = 100 KHz



NAME OF TEST: Transmitter Occupied Bandwidth  
Paragon/PD Modem at 16000 bps 4 FSK

### Mask compliance data in support of Emission Designator **7K17F1D**

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

MINIMUM STANDARD: Mask D  
Sidebands and Spurious [Rule 90.210 (d)]  
Authorized Bandwidth = 11.25 kHz [Rule 90.209(b) (5)]  
Fo to 5.625 kHz Attenuation = 0 dB  
>5.625 kHz to 12.5 kHz Attenuation =  $7.27(f_d - 2.88\text{kHz})$  dB  
>12.5kHz Lesser of  $50 + 10 \cdot \log(P)$  dB or 70dB

#### Corner Points:

Fo to 5.625 kHz Attenuation = 0 dB  
>5.625 kHz to 12.5 kHz Attenuation = 20 dB to 70 dB  
>12.5 kHz Attenuation = 70dB (100W)

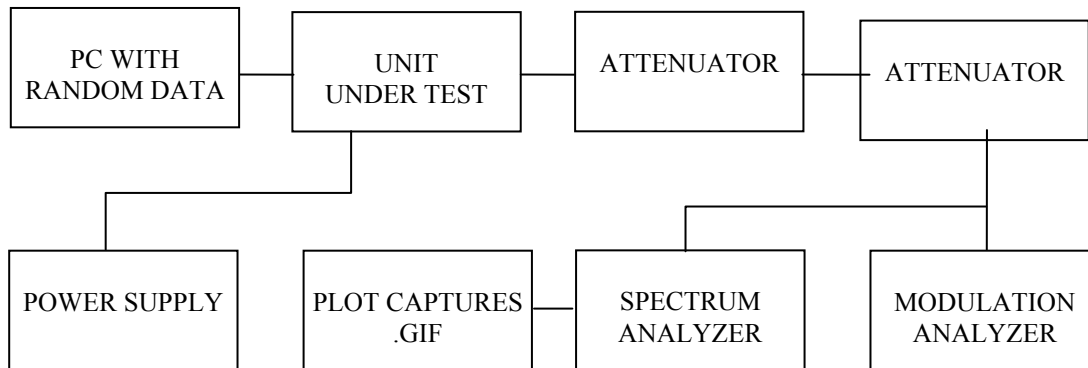
TEST RESULTS: Meets minimum standard (see data on the following pages)

TEST CONDITIONS: Standard Test Conditions, 25 C

TEST EQUIPMENT: Attenuator, BIRD Model / 100-A-MFN-30 / 30 dB / 100 Watt  
DC Power Supply, Astron Model VS-20M  
IFR COM-120B communication analyzer for deviation meter  
Spectrum Analyzer, Model HP8563E  
HP power meter model#E4418B  
HP Benchlink -software for plot captures.

PERFORMED BY: Constantin Pintilei DATE: 12/30/2002

TEST SET-UP:





NAME OF TEST: Transmitter Occupied Bandwidth (Continued)  
Paragon/PD Modem at 16000 bps 4 FSK

**MODULATION SOURCE DESCRIPTION:**

TX Data Pattern:

The transmit data pattern is DBA protocol- type of "idle" packets data pattern as it was described in the report for the permissive change EA100893 granted in 05/29/2001. Anyway for this tests a higher deviation is achieved due to the fact that the exciter underwent the dual point modulation balance as shown in the production procedure attached.

For 16000 bps rate (4 FSK), the deviation is set to 1.84 kHz. For deviation readings it has been used the IF filter of 15 KHz

**NECESSARY BANDWIDTH (Bn) CALCULATION**

The corresponding emission designator prefix for necessary bandwidth  
**7K67F1D** for 16000 bps rate , 1.84 kHz deviation

**TEST DATA:** Refer to the following graphs:

MASK: D, 7K17F1D, 0.85 W (exciter output)

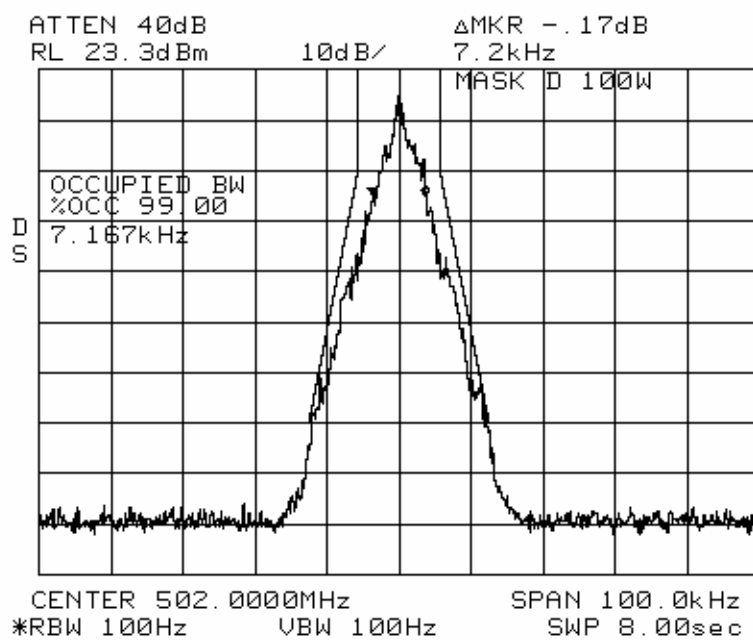
SPECTRUM FOR EMISSION 7K17F1D

OUTPUT POWER: 0.85 Watt

16000 bps, 4 level FSK

PEAK DEVIATION = 1840 Hz

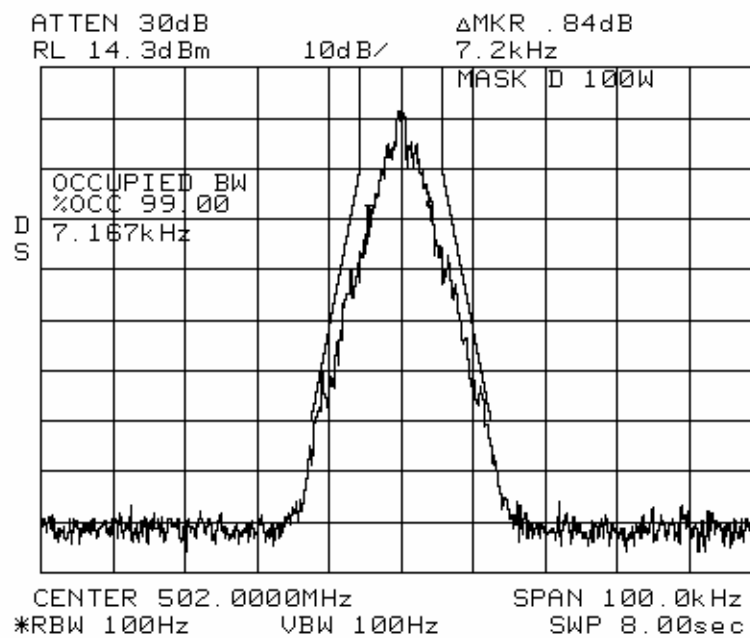
SPAN = 100 KHz



SPECTRUM FOR EMISSION 7K17F1D

16000 bps, 4 level FSK

SPAN = 100 KHz



MASK: D, 7K17F1D, 100 W

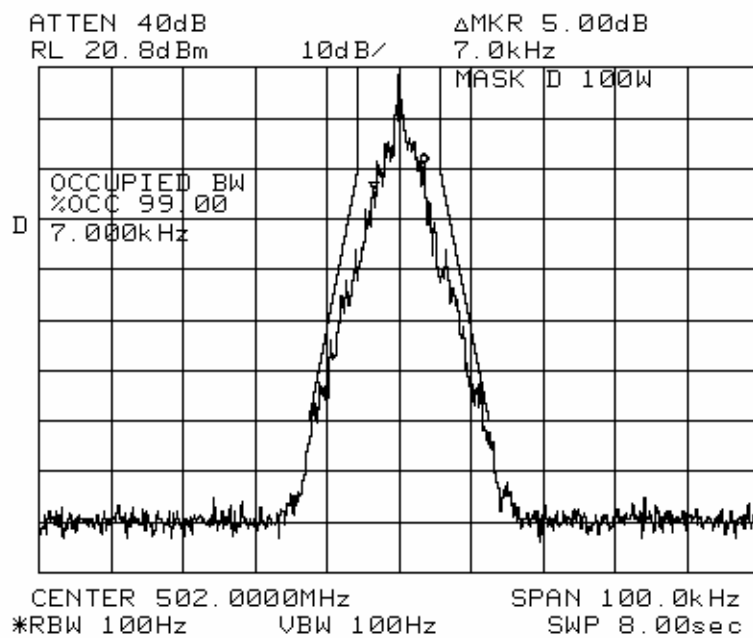
SPECTRUM FOR EMISSION 7K17F1D

OUTPUT POWER: 100 Watts

16000 bps, 4 level FSK

PEAK DEVIATION = 1840 Hz

SPAN = 100 KHz



NAME OF TEST: Transmitter Occupied Bandwidth  
Paragon/PD Modem at 21600 bps 8 FSK

### Mask compliance data in support of Emission Designator **8K33F1D**

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

MINIMUM STANDARD: Mask D  
Sidebands and Spurious [Rule 90.210 (d)]  
Authorized Bandwidth = 11.25 kHz [Rule 90.209(b) (5)]  
Fo to 5.625 kHz Attenuation = 0 dB  
>5.625 kHz to 12.5 kHz Attenuation =  $7.27(f_d - 2.88\text{kHz})$  dB  
>12.5kHz Lesser of  $50 + 10 \cdot \log(P)$  dB or 70dB

#### Corner Points:

Fo to 5.625 kHz Attenuation = 0 dB  
>5.625 kHz to 12.5 kHz Attenuation = 20 dB to 70 dB  
>12.5 kHz Attenuation = 70dB (100W)

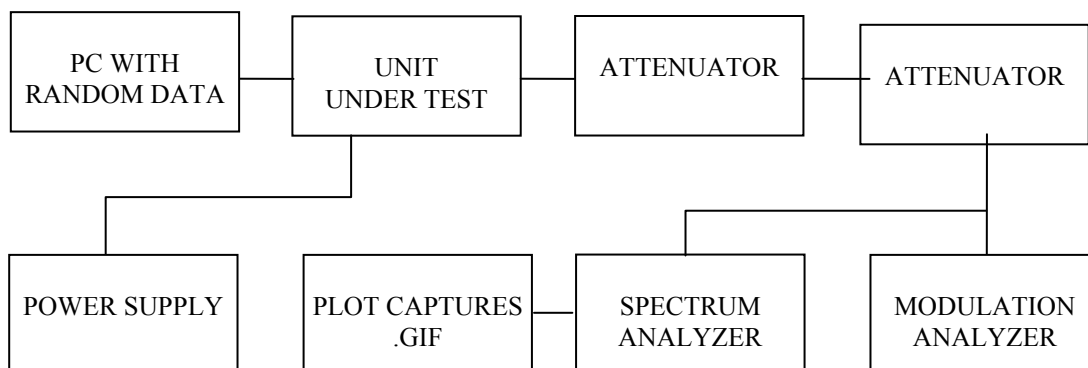
TEST RESULTS: Meets minimum standard (see data on the following pages)

TEST CONDITIONS: Standard Test Conditions, 25 C

TEST EQUIPMENT: Attenuator, BIRD Model / 100-A-MFN-30 / 30 dB / 100 Watt  
DC Power Supply, Astron Model VS-20M  
IFR COM-120B communication analyzer for deviation meter  
Spectrum Analyzer, Model HP8563E  
HP power meter model#E4418B  
HP Benchlink -software for plot captures.

PERFORMED BY: Constantin Pintilei DATE: 12/30/2002

TEST SET-UP:



NAME OF TEST: Transmitter Occupied Bandwidth (Continued)  
Paragon/PD Modem at 21600 bps 8 FSK

**MODULATION SOURCE DESCRIPTION:**

TX Data Pattern:

The transmit data pattern is DBA protocol- type of "idle" packets data pattern as described in "Digital Modulation Techniques" paragraph. After this data follows the modulation process described, the resulting base band signal feed the modulator's input of the Exciter.

For 216000 bps rate (8 FSK), the deviation is set to 2.92 kHz. For deviation readings it has been used the IF filter of 15 KHz

**NECESSARY BANDWIDTH (Bn) CALCULATION**

The corresponding emission designator prefix for necessary bandwidth  
**8K33F1D** for 21600 bps rate, 2.92 kHz deviation

**TEST DATA:** Refer to the following graphs:

MASK: D, 8K33F1D, 0.85 W (exciter output)

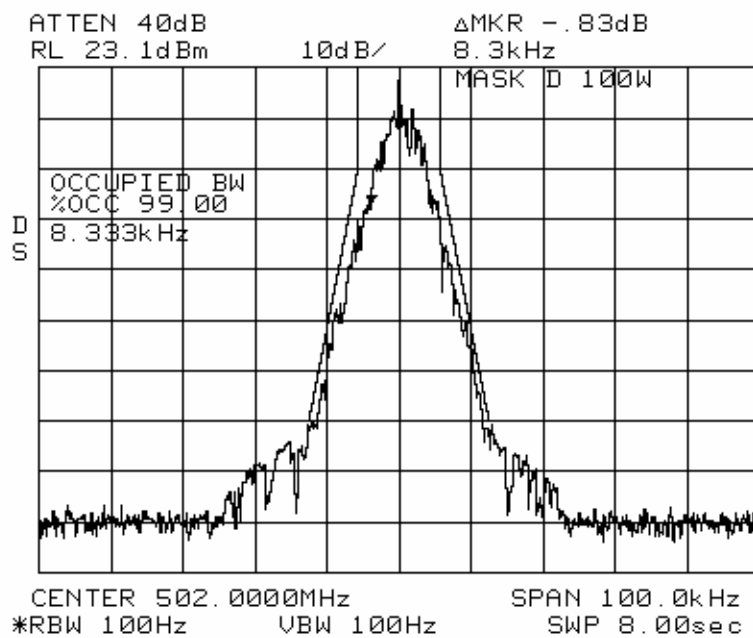
SPECTRUM FOR EMISSION 8K33F1D

OUTPUT POWER: 0.85 Watt

21600 bps, 8 level FSK

PEAK DEVIATION = 2920 Hz

SPAN = 100 KHz



MASK: D, 8K33F1D, 20 W

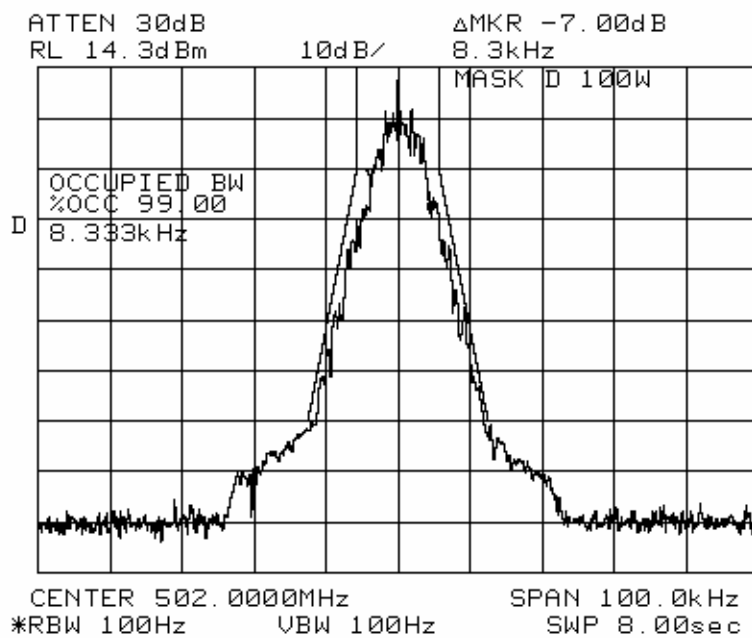
SPECTRUM FOR EMISSION 8K33F1D

OUTPUT POWER: 20 Watts

21600 bps, 8 level FSK

PEAK DEVIATION = 2920 Hz

SPAN = 100 KHz





MASK: D, 8K33F1D, 100 W

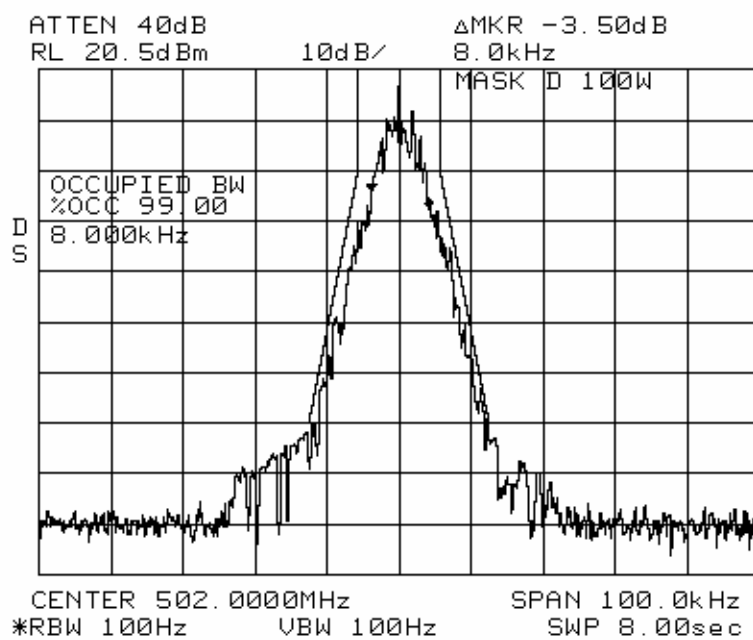
SPECTRUM FOR EMISSION 8K33F1D

OUTPUT POWER: 100 Watts

21600 bps, 8 level FSK

PEAK DEVIATION = 2920 Hz

SPAN = 100 KHz



NAME OF TEST: Transmitter Occupied Bandwidth  
Paragon/PD Modem at 24000 bps 8 FSK

### Mask compliance data in support of Emission Designator **8K00F1D**

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

MINIMUM STANDARD: Mask D  
Sidebands and Spurious [Rule 90.210 (d)]  
Authorized Bandwidth = 11.25 kHz [Rule 90.209(b) (5)]  
Fo to 5.625 kHz Attenuation = 0 dB  
>5.625 kHz to 12.5 kHz Attenuation =  $7.27(f_d - 2.88\text{kHz})$  dB  
>12.5kHz Lesser of  $50 + 10 \cdot \log(P)$  dB or 70dB

#### Corner Points:

Fo to 5.625 kHz Attenuation = 0 dB  
>5.625 kHz to 12.5 kHz Attenuation = 20 dB to 70 dB  
>12.5 kHz Attenuation = 70dB (100W)

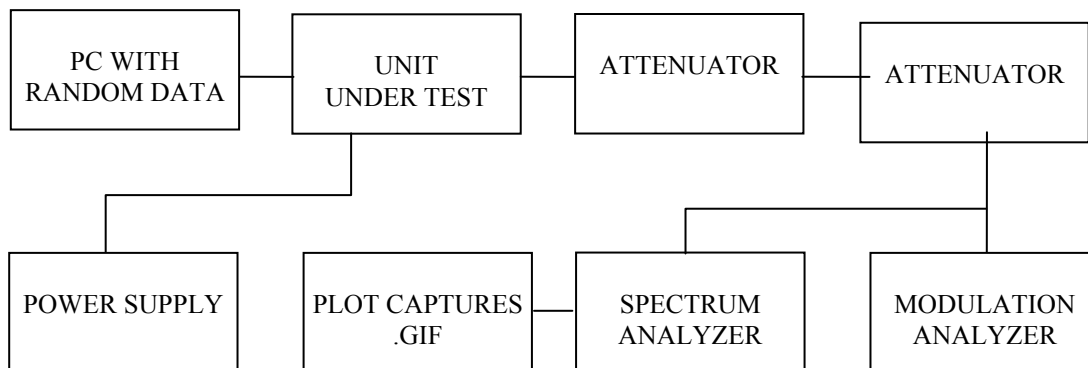
TEST RESULTS: Meets minimum standard (see data on the following pages)

TEST CONDITIONS: Standard Test Conditions, 25 C

TEST EQUIPMENT: Attenuator, BIRD Model / 100-A-MFN-30 / 30 dB / 100 Watt  
DC Power Supply, Astron Model VS-20M  
IFR COM-120B communication analyzer for deviation meter  
Spectrum Analyzer, Model HP8563E  
HP power meter model#E4418B  
HP Benchlink -software for plot captures.

PERFORMED BY: Constantin Pintilei DATE: 12/30/2002

TEST SET-UP:



NAME OF TEST: Transmitter Occupied Bandwidth (Continued)  
Paragon/PD Modem at 24000 bps 8 FSK

**MODULATION SOURCE DESCRIPTION:**

TX Data Pattern:

The transmit data pattern is DBA protocol- type of "idle" packets data pattern as described in "Digital Modulation Techniques" paragraph. After this data follows the modulation process described, the resulting base band signal feed the modulator's input of the Exciter.

For 24000 bps rate (8 FSK), the deviation is set to 2.59 kHz. For deviation readings it has been used the IF filter of 15 KHz

**NECESSARY BANDWIDTH (Bn) CALCULATION**

The corresponding emission designator prefix for necessary bandwidth  
**8K00F1D** for 24000 bps rate , 2.59 kHz deviation

**TEST DATA:** Refer to the following graphs:

MASK: D, 8K00F1D, 0.85 W (exciter output)

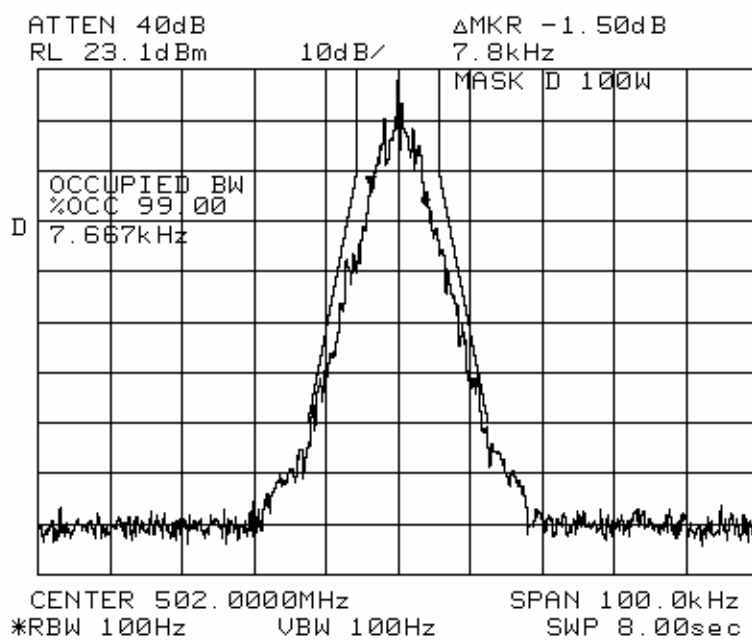
SPECTRUM FOR EMISSION 8K00F1D

OUTPUT POWER: 0.85 Watt

24000 bps, 8 level FSK

PEAK DEVIATION = 2590 Hz

SPAN = 100 KHz



MASK: D, 8K00F1D, 20 W

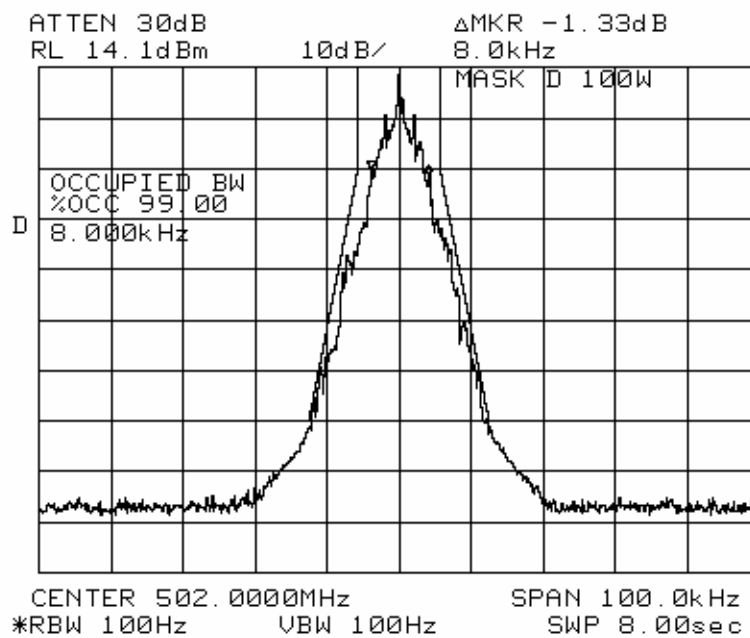
SPECTRUM FOR EMISSION 8K00F1D

OUTPUT POWER: 20 Watts

24000 bps, 8 level FSK

PEAK DEVIATION = 2590 Hz

SPAN = 100 KHz



MASK: D, 8K00F1D, 100 W

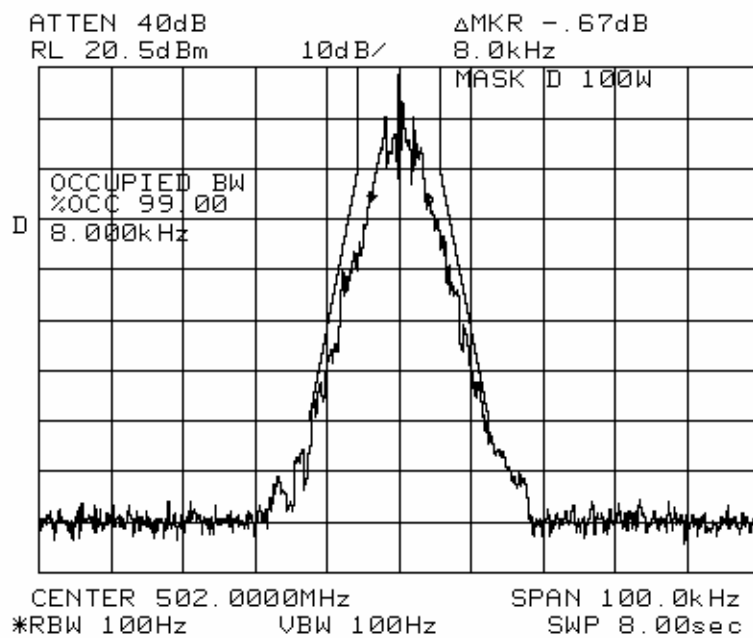
SPECTRUM FOR EMISSION 8K00F1D

OUTPUT POWER: 100 Watts

24000 bps, 8 level FSK

PEAK DEVIATION = 2590 Hz

SPAN = 100 KHz



NAME OF TEST: Transmitter Occupied Bandwidth  
Paragon/PD Modem at 43200 bps 8 FSK

### Mask compliance data in support of Emission Designator **14K9F1D**

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

MINIMUM STANDARD: Mask C  
Sidebands and Spurious [Rule 90.210 (c)]  
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 =  $83 \cdot \log(f_d \text{ KHz} / 5)$  dB  
>10.0 kHz to 250% Auth BW Attenuation = Lesser of: 50dB or  $29 \log(f_d / 11)$  dB,  
250% Auth BW  $43 + 10 \cdot \log(P)$   
**Corner Points:**  
 $f_0$  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 = 27.8 dB to 38 dB  
>15.0 kHz to 20.0 KHz Attenuation = 38 dB to 45.2 dB  
>20.0 kHz to 24.0 KHz Attenuation = 45.2 dB to 50 dB  
>24.0 kHz to 50.0 KHz Attenuation = 50 dB  
>250% Auth BW Attenuation = minimum 63 dB (100 W)

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

DC Power Supply , Astron Model VS-20M

IFR COM-120B- communication analyzer used for deviation meter

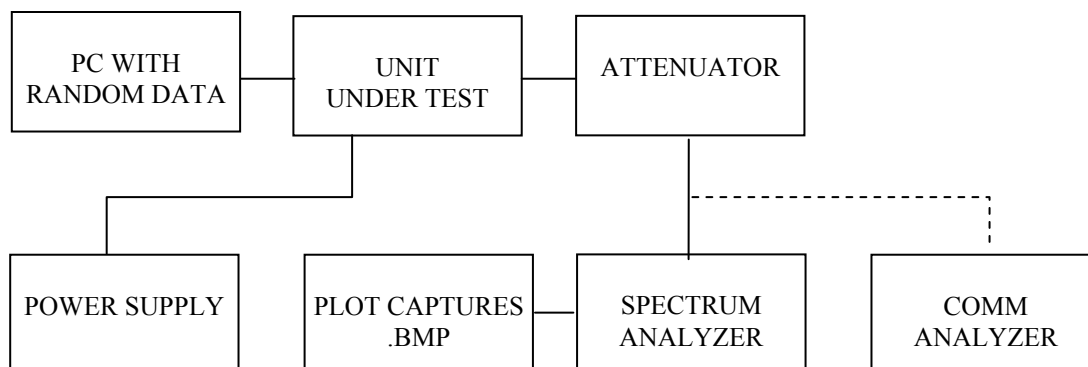
Spectrum analyzer HP E4001B

HP power meter model#E4418B

HP Benchlink -software for plot captures.

PERFORMED BY: Constantin Pintilei DATE: 12/30/2002

TEST SET-UP:



NAME OF TEST: Transmitter Occupied Bandwidth (Continued)  
Paragon/PD Modem at 25600 bps 4 FSK

**MODULATION SOURCE DESCRIPTION:**

TX Data Pattern:

The transmit data pattern is DBA protocol- type of "idle" packets data pattern as described in "Digital Modulation Techniques" paragraph. After this data follows the modulation process described, the resulting base band signal feed the modulator's input of the Exciter.

For 43200bps bit rate (8 FSK), the deviation is set to 4.82 kHz. For deviation readings it has been used the IF filter of 30 KHz

**NECESSARY BANDWIDTH (Bn) CALCULATION**

The corresponding emission designator prefix for necessary bandwidth  
**14K9F1D** for 14400 baud rate, 43200 bit rate , 4.82 kHz deviation

**TEST DATA:** Refer to the following graphs:



MASK: C, 14K9F1D, 0.85 W (exciter output)

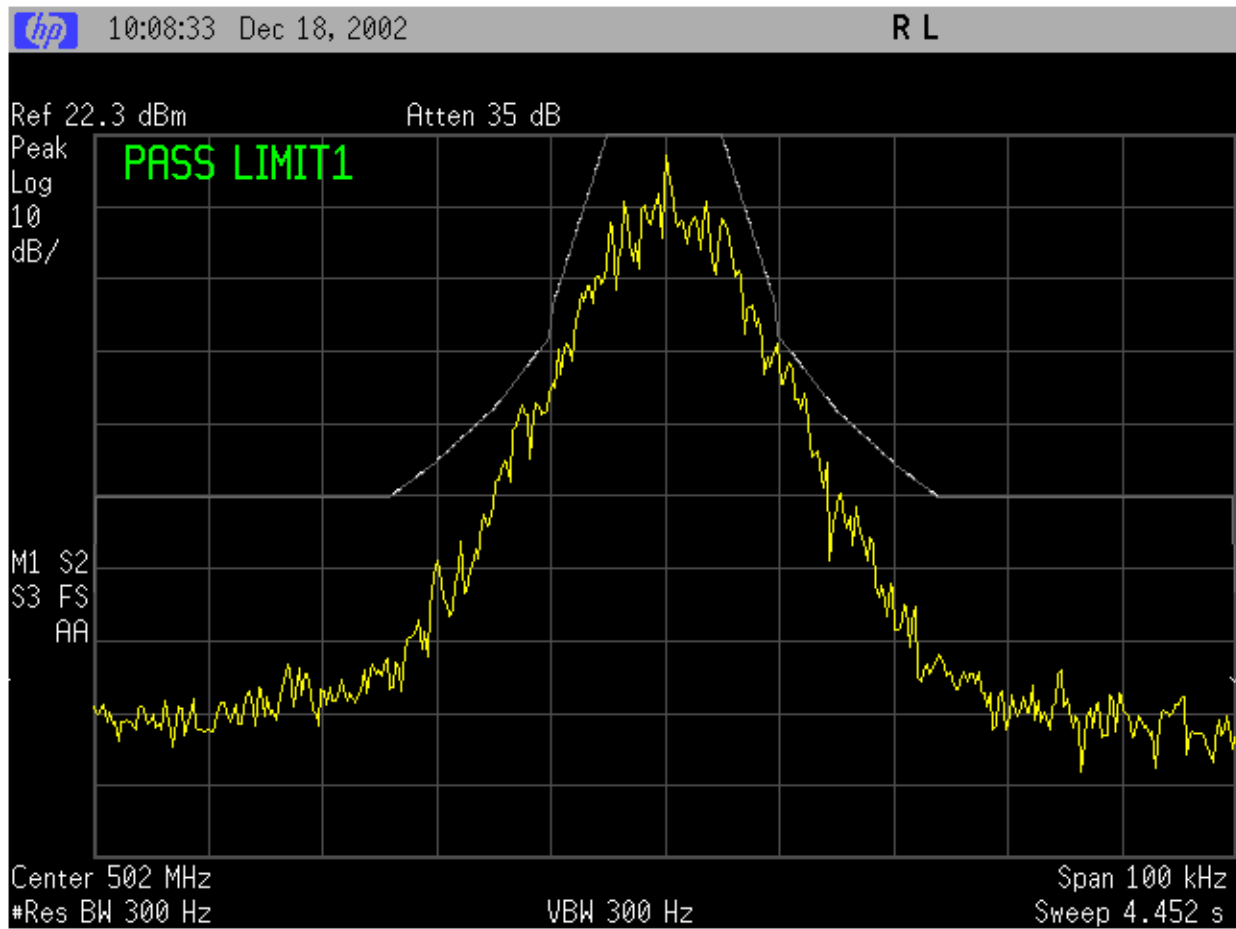
SPECTRUM FOR EMISSION **14K9F1D**

OUTPUT POWER: 0.85 Watt

43200 bps, 8 level FSK

PEAK DEVIATION = 4820 Hz

SPAN = 100 kHz



MASK: C, 14K9F1D, 20 W

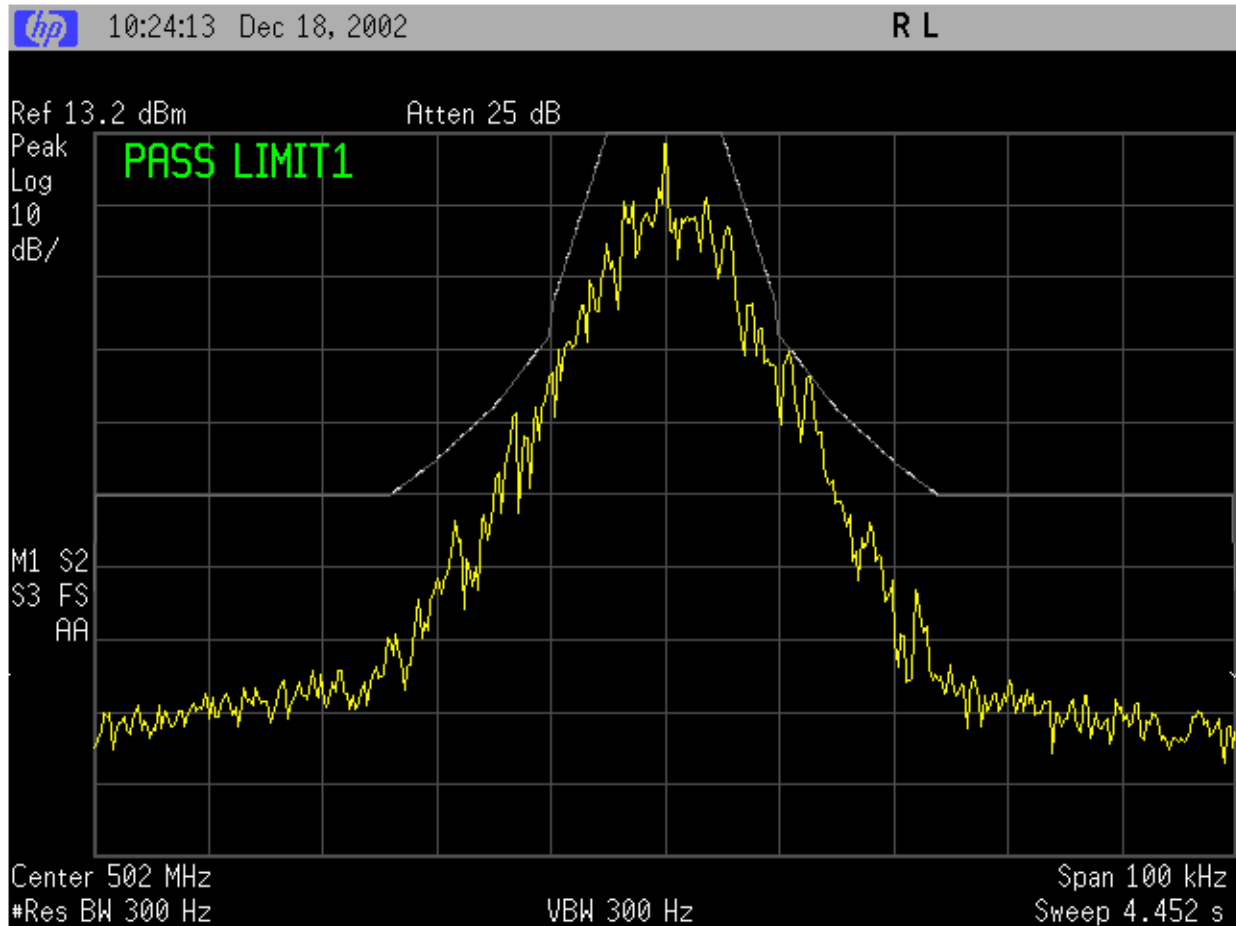
SPECTRUM FOR EMISSION 14K9F1D

OUTPUT POWER: 20 Watts

43200 bps, 8 level FSK

PEAK DEVIATION = 4820 Hz

SPAN = 100 kHz



MASK: C, 14K9F1D, 100 W

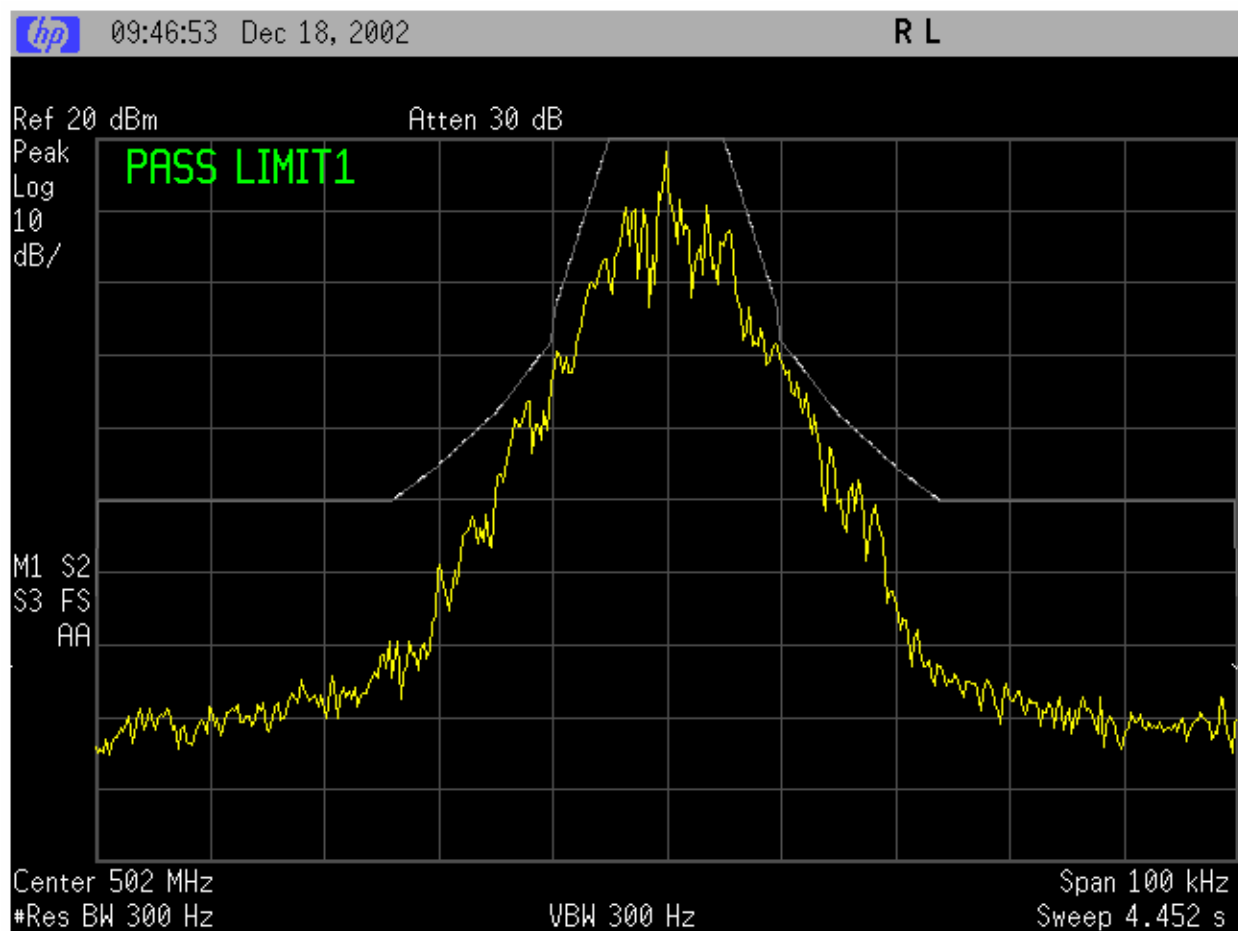
SPECTRUM FOR EMISSION **14K7F1D**

OUTPUT POWER: 100 Watts

43200 bps, 8 level FSK

PEAK DEVIATION = 4820 Hz

SPAN = 100 kHz



NAME OF TEST: Transmitter Occupied Bandwidth  
Paragon/PD Modem at 48000 bps 8 FSK

### Mask compliance data in support of Emission Designator **16K7F1D**

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

MINIMUM STANDARD: Mask C  
Sidebands and Spurious [Rule 90.210 (c)]  
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 =  $83 \cdot \log(f_d \text{ KHz} / 5)$  dB  
>10.0 kHz to 250% Auth BW Attenuation = Lesser of: 50dB or  $29 \log (fd/11)$ dB,  
43 +  $10 \cdot \log(P)$   
250% Auth BW  
**Corner Points:**  
 $f_0$  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 = 27.8 dB to 38 dB  
>15.0 kHz to 20.0 KHz Attenuation = 38 dB to 45.2 dB  
>20.0 kHz to 24.0 KHz Attenuation = 45.2 dB to 50 dB  
>24.0 kHz to 50.0 KHz Attenuation = 50 dB  
>250% Auth BW Attenuation = minimum 63 dB (100 W)

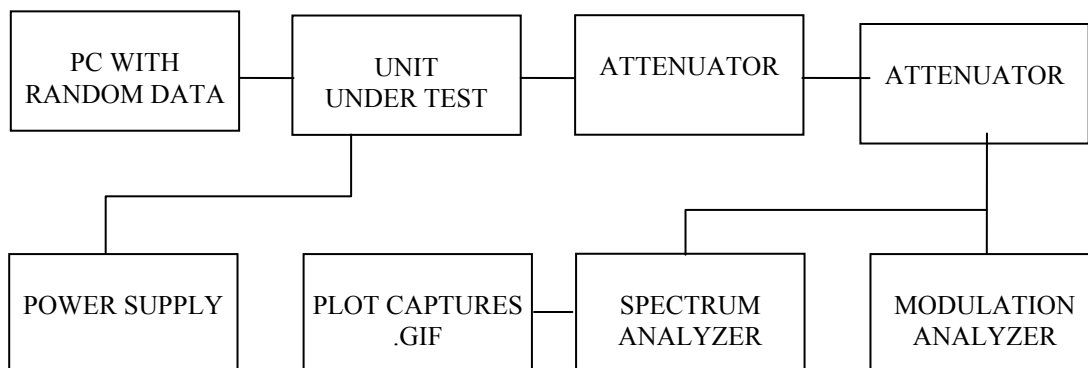
TEST RESULTS: Meets minimum standard (see data on the following pages)

TEST CONDITIONS: Standard Test Conditions, 25 C

TEST EQUIPMENT: Attenuator, BIRD Model / 100-A-MFN-30 / 30 dB / 100 Watt  
DC Power Supply , Astron Model VS-20M  
IFR COM-120B- communication analyzer used for deviation meter  
Spectrum analyzer HP E4001B  
HP power meter model#E4418B  
HP Benchlink -software for plot captures.

PERFORMED BY: Constantin Pintilei DATE: 12/30/2002

TEST SET-UP:



NAME OF TEST: Transmitter Occupied Bandwidth (Continued)  
Paragon/PD Modem at 48000 bps 8 FSK

**MODULATION SOURCE DESCRIPTION:**

TX Data Pattern:

The transmit data pattern is DBA protocol- type of "idle" packets data pattern as described in "Digital Modulation Techniques" paragraph. After this data follows the modulation process described, the resulting base band signal feed the modulator's input of the Exciter.

For 48000 bps rate (8 FSK), the deviation is set to 5.03 kHz. For deviation readings it has been used the IF filter of 30 KHz

**NECESSARY BANDWIDTH (Bn) CALCULATION**

The corresponding emission designator prefix for necessary bandwidth  
**16K7F1D** for 48000 bps rate , 5.03 kHz deviation

**TEST DATA:** Refer to the following graphs:

MASK: C, 16K7F1D, 0.85 W (exciter output)

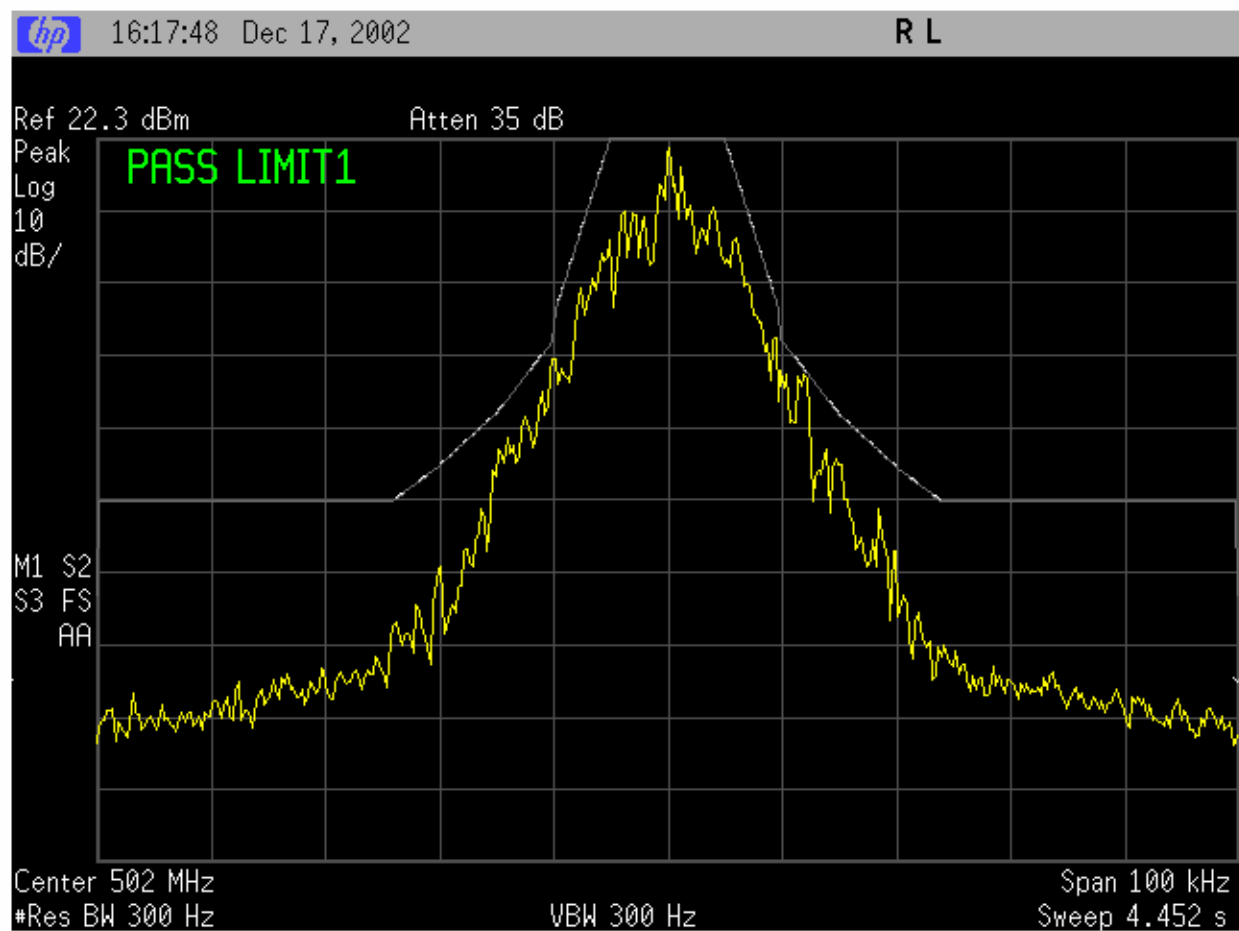
SPECTRUM FOR EMISSION **16K7F1D**

OUTPUT POWER: 0.85 Watt

48000 bps, 8 level FSK

PEAK DEVIATION = 5030 Hz

SPAN = 100 kHz



MASK: C, 16K7F1D, 20 W

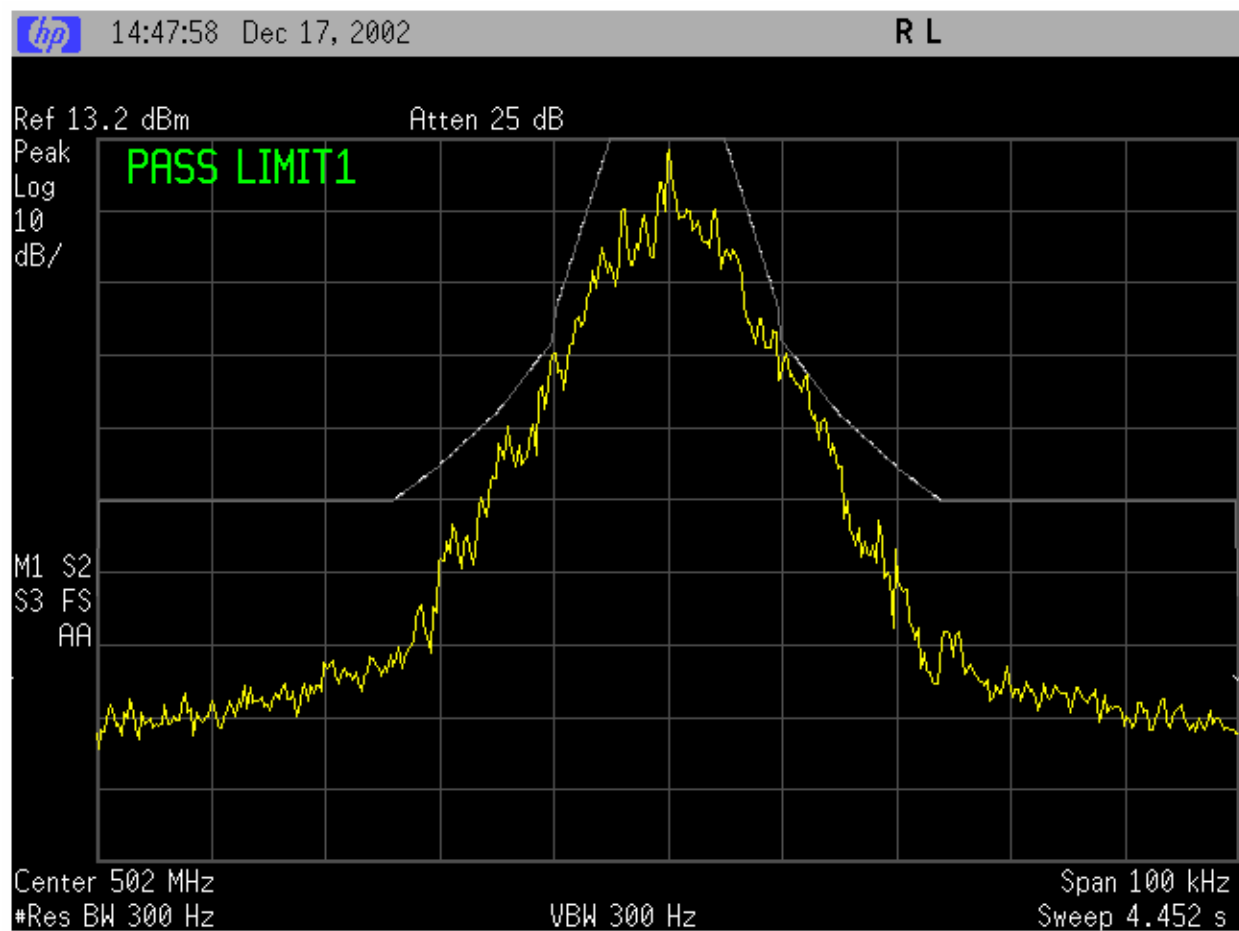
SPECTRUM FOR EMISSION 16K7F1D

OUTPUT POWER: 20 Watts

48000 bps, 8 level FSK

PEAK DEVIATION = 5030 Hz

SPAN = 100 kHz



MASK: C, 16K7F1D, 100 W

SPECTRUM FOR EMISSION **16K7F1D**

OUTPUT POWER: 100 Watts

48000 bps, 8 level FSK

PEAK DEVIATION = 5030 Hz

SPAN = 100 kHz

