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

for the

T881 Exciter module of Tait's T88x 800 MHz base station

modulated with

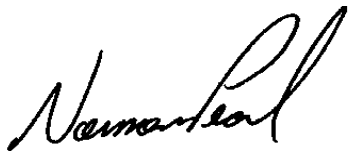
4 FSK digital modulation from Dataradio's Base Data Link Controller (BDLC)

FCC ID: EOTBDD4T881
Trade Name: Paragon/PD

April 27, 2001

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 EOTBDD4T881.

The certificate EOTBDD4T881 has been granted to Dataradio Inc. for the T881 Exciter module manufactured by Tait Electronics Ltd. as the T88M-XY (see page 6 for part# description) 800 MHz base station. Dataradio Inc. buys this base station and uses it to build Paragon/PD, a wireless data base station. Dataradio Inc. modifies the exciter for a new proposed digital modulation scheme, does the final assembly and markets the finished Paragon/PD unit.

The certificate EOTBDD4T881 is granted for the following list of emission designators 13K6,14K3, 15K9 and 16K0F1D; 13K6 and 16K0F3E; and 15K0F2D. The change consists in the addition of two new emission designators for the 4-FSK digital modulation source for which the compliance has been demonstrated for mask 90.210H. They accommodate two new speeds and their figures are 11K0 and 9K50 F1D. This Class II permissive change involves the two new speeds only and they are completely described with the current report.

EXISTING CONDITIONS

The unit utilized for these occupied bandwidth and mask-compliance measurements was a prototype built from production EOTBDD4T881 with beta-level firmware used to create the modulation scheme. The Exciter operates on frequencies ranging from 800.000 MHz to 960.000 MHz. The frequency tolerance of the exciter is .00015% or 1.5 parts per million and the output power is adjustable between 1-5W as granted in EOTBDD4T881.

PROPOSED CONDITIONS

It is proposed to accept the Class II permissive change request for the EOTBDD4T881 grant 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.2-154, Mar 15,2000. 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 Apr 20, 2001 and Apr 26,2001.

CONCLUSION

Given the results of the measurements contained herein, the applicant requests to be applied a Class II Permissive Change for the Certificate EOTBDD4T881 to add the two new emission designators 9K50F1D and 11K0F1D to the existing list.

Constantin Pintilei

04/27/01

Constantin Pintilei
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 24 Years experience in radio communications

NAME:	**Constantin Pintilei**
TITLE:	R&D Test Engineer
TECHNICAL EDUCATION:	Bachelor of Science Degree in Electronic Engineering specialization Radiotechnique (1993) Technical University of Iasi, Romania
TECHNICAL EXPERIENCE:	7 Years experience in radio frequency measurements.

Class II Permissive Change Information - Rule part 2.1043 (b)(2)

The certificate EOTBDD4T881 has been granted to Dataradio Inc. following an ID change request from CAS8IPT881. The original CAS8IPT881 has been granted to Tait Electronics Ltd. for its T881 Exciter module. It belongs to the T88M-XY (check at the page bottom for part# description) 800 MHz base station. Dataradio Inc. buys this base station and uses it to build Paragon/PD, a base station for wireless data networks. In order to market it under Dataradio logo the change in ID has been asked.

Further, 25.6kpbs and 19.2 kbps speeds using 4-FSK SRRC digital modulation was granted following a Class II permissive change request.

The emission designator list of the certificate has the following values:

- 13K6 and 16K0F1D
- 13K6 and 16K0F3E
- 13K6 and 15K0F2D, inherited from the original certificate CAS8IPT881 when the change in ID to EOTBDD4T881 was granted on 11/16/2000
- 14K3 and 15K9F1D for 25.6kpbs and 19.2 kbps 4-FSK SRRC digital modulation granted following a Class II permissive change request on 02/12/2001

The current Class II permissive change request asks for following two new values in the emission designator list:

- 9K50 and 11K0F1D,

used for 16.0 and 14.4 kbps 4-FSK SRRC digital modulation, and whose compliance is demonstrated for mask 90.210(H)

All modulator source signal-related issues as per 2.1033 (c) (4) and (13) are explained below on page 9. This Class II permissive change involves the code of the DSP-driven modulation source only, with no change occurring elsewhere in the circuitry.

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(h)

They are entirely documented with the current report.

Part Number of the Tait 800 MHz base station T88M-XY

M	Module Type	X	Freq Range	Y	Channel Bandwidth
1	Exciter (5W)	1	800-880 MHz	0	25 kHz
5	Receiver	2	850-960 MHz	5	12.5 kHz
9	Power Amplifier				

Part Number of the Paragon/PD 800 MHz data base station BDD4 -88XY PPPS

X	Freq Range	Y	Channel Bandwidth	PPP	Transmitted Power	S	Supply
1	800-880 MHz	0	25 KHz	005	5W	0	12VDC external
2	850-960 MHz	5	12.5 KHz	070	70W	2	dual 120V AC

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 and GRANTEE	Dataradio Inc., 5500 Royalmount Ave, suite 200, Town of Mount Royal, Quebec, Canada, H4P 1H7
MANUFACTURER:	Tait Electronics Ltd., Burnside Christchurch 5, New Zealand (T88x 800 MHz Base station) DATARADIO Inc., Town of Mount Royal, Quebec, Canada, H4P 1H7 (D212 BDLC and Paragon/PD- final assembly)
MODEL NUMBER:	Paragon/PD
PART NUMBER:	BDD4-88XY PPPS
SERIAL NUMBER (S):	D212 address 1.0 -prototype 4-level FSK BDLC T881-10 s.n 734549 Exciter module
FCC ID NUMBER:	EOTBDD4T881
FCC RULES AND REGS:	FCC Part (s) 90
FREQUENCY RANGE:	800 MHz -960 MHz as per EOTBDD4T881 certificate
MAXIMUM POWER RATING:	5Watts as per EOTBDD4T881 certificate.
NUMBER OF CHANNELS:	1 Channel selectable from 256 channels as per Tait's manual
OUTPUT IMPEDANCE:	50 ohms, Nominal
VOLTAGE REQUIREMENTS:	10.9-16.3VDC (13.6 VDC Nominal)
EQUIPMENT IDENTIFICATION:	

TRADE NAME	**DESCRIPTION**	**DRI PART NUMBER**
T88x	800 MHz Base Station	T88M-XY
D212	Base Data Link Controller (BDLC)	050-03330-00x
Paragon/PD	Assembly	BDD4-88XY PPPS

Data And Characteristics Not Affected By The Change-Rule Part Number: 2.1033 (c)(8),(9),(10),(11),(12),(15),(16)

DC Voltages And Currents Into Final Amplifier (T881)	2.1033(c).(8)
Transmitter Tune Up Procedure	2.1033 (c) (9)
Description Of Circuitry,Schematics and Transistor, Diode, and IC Functions	2.1033 (C)(10)
FCC Label	2.1033 (c) (11)
Internal/External Photographs	2.1033 (c) (12)
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 follows:

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 Characteristics Affected By The Change - Rule Part Number: 2.1033(c) (3),(4),(13),(14)

INSTRUCTION BOOK 2.1033 (c) (3)
Annex A . The attached Technical Manual for the Paragon/PD data base station using SRRC4FSK is a preliminary version.

TYPE OF EMISSION: 2.1033(c)(4)

For Class II Permissive Change 4levelFSK 12.5kHz ch. sp. (8000baud, 4 FSK) **9K50F1D**
12.5kHz ch. sp. (7200baud, 4 FSK) **11K0F1D**

Previously granted for EOTBDD4T881
25KHz ch. sp. **16K0F1D**
25KHz ch. sp. **15K0F2D**
25kHz ch. sp. **16K0F3E**
25kHz ch. sp. (12800baud, 4 FSK) **14K3F1D**
25kHz ch. sp. (9600baud, 4 FSK) **15K9F1D**
12.5kHz ch. sp. **13K6F1D**
12.5kHz ch. sp. **13K6F2D**
12.5kHz ch. sp. **13K6F3E**

DIGITAL MODULATION TECHNIQUES 2.1033 (c)(13)

The explanation provided with the previous Class II permissive change request (731 form number EA 99420) for 25.6kpbs and 19.2 kbps 4-FSK SRRC digital modulation still applies.
The only difference refers to the speeds which are 16.0kbps and 14.4 kbps. The cut-off frequencies of the SRRC digital filtering are provided in next page (page 10).

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(h)
are provided in next section of this Engineering Report

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

The following reports have been generated for Class II Permissive Change request for EOTBDD4T881 Exciter module. Paragon/PD is comprised of the Tait Electronics Ltd. T88x 800 MHz Base station with the Dataradio Inc D212 Base Data Link Controller (BDLC). Dataradio Inc does the changes to fit the T881 Exciter to digital modulation, does final assembly and markets the Paragon/PD 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 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 Exciter uses digital modulation signals, passing through a DSP implemented low-pass filter to an FM modulator. The necessary bandwidth calculation for this type of modulation (SRRC4FSK) 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:

Bitrate	4-FSK Baud rate	SRRC filter 3dB cut-off	Deviation	Occupied Bandwidth	Emission designator
16000bps	8000 bauds	4000 Hz	± 2.4 KHz	9500 Hz	9K50
14400bps	7200 bauds	3600 Hz	± 2.8 KHz	11000 Hz	11K0

The measurement theory and set-up explanations follow.

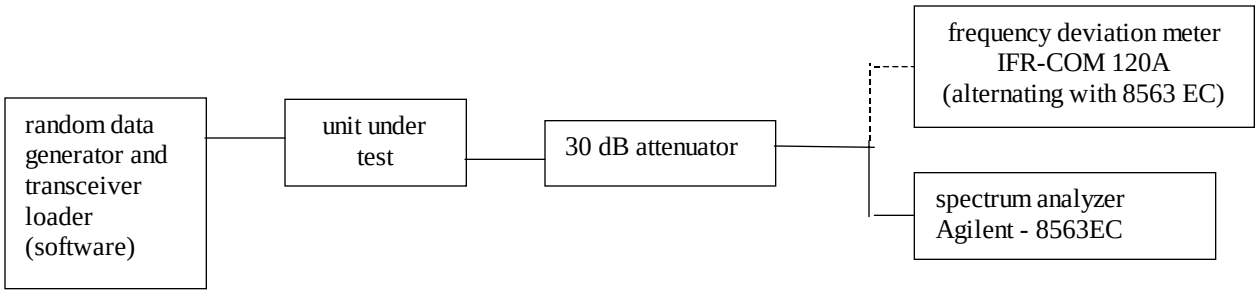
Occupied Bandwidth Measurement

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 H, the value occurred was recorded as Occupied Bandwidth.

The measurement set-up is:



NAME OF TEST: Transmitter Occupied Bandwidth
Paragon/PD Modem at 7200 and 8000 baud 4FSK

Mask compliance data in support of Emission Designator **9K50F1D and 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)

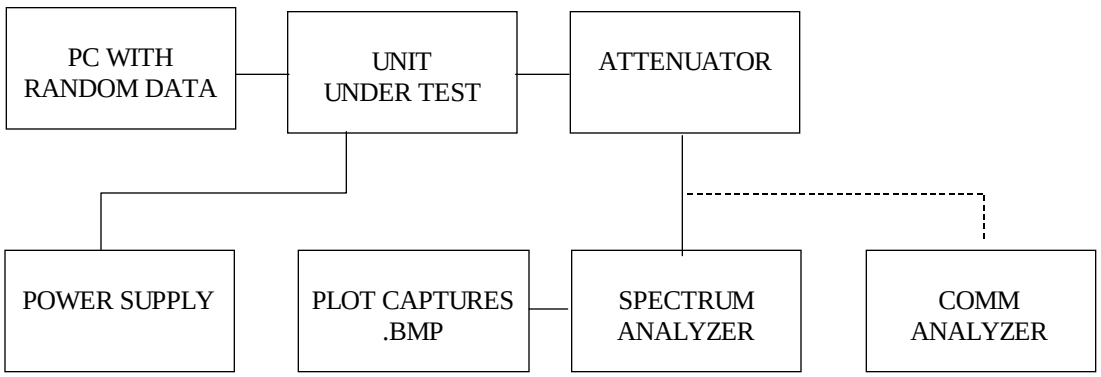
TEST RESULTS: Meets minimum standard (see data on the following pages)

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 Agilent (HP) 8563EC

PERFORMED BY: Constantin Pintilei DATE: 04/26/01

TEST SET-UP:



NAME OF TEST: Transmitter Occupied Bandwidth (Continued)
Paragon/PD Modem at 7200 and 8000 baud 4FSK
In Support of Emission Designators **11K0F1D and 9K50F1D**

MODULATION SOURCE DESCRIPTION:

TX Data Pattern:

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

For 7200 baud rate, the deviation is set to 2.8 kHz. For 8000 baud rate, the deviation is set to 2.4kHz. For deviation readings it has been used the IF filter of 30KHz

NECESSARY BANDWIDTH (Bn) CALCULATION

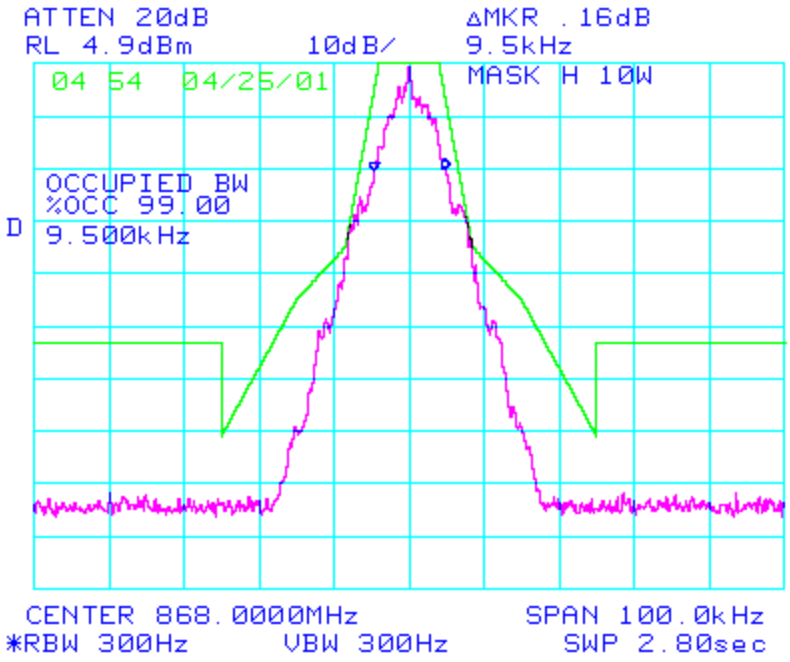
See Page 10 for emission designator determination.

The corresponding emission designator prefix for necessary bandwidth
11K0F1D for 7200 baud rate , 2.8 kHz deviation
9K50F1D for 8000 baud rate, 2.4 kHz deviation

TEST DATA: Refer to the following graphs:

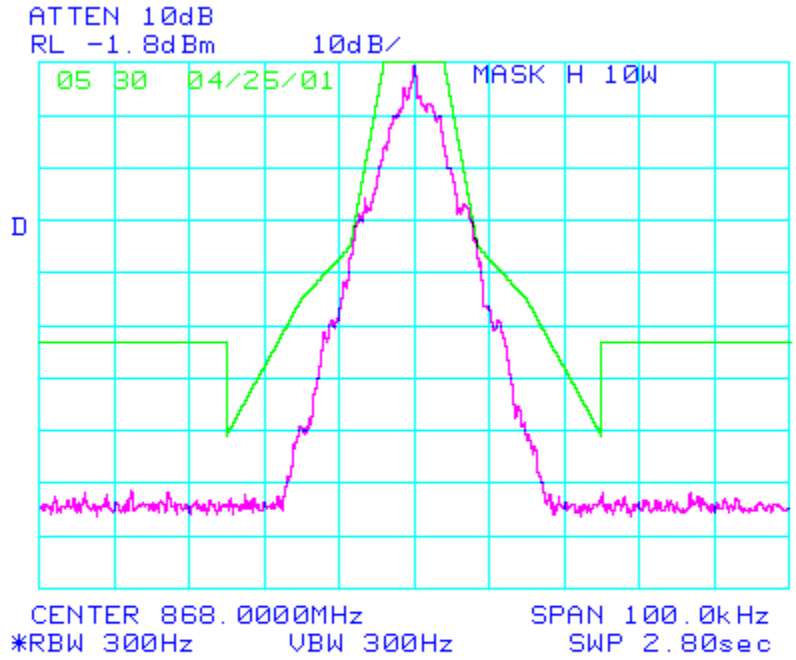
MASK: H, 9K50F1D, 5W and 1W

SPECTRUM FOR EMISSION **9K50F1D**
OUTPUT POWER: 5 Watts
8000 bauds, 4 level FSK
PEAK DEVIATION = 2400 Hz
SPAN = 100 kHz



Note: For frequencies spaced more than 25kHz from the central frequency the attenuation should read 50dBc at 5W.
The plot above reads 53dBc as indicated in the description of the set-up.

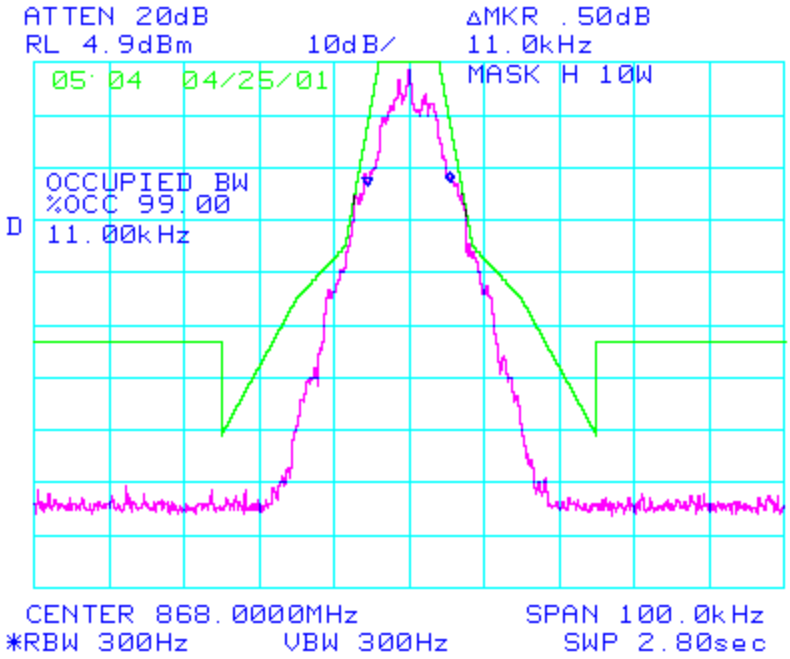
SPECTRUM FOR EMISSION **9K50F1D**
OUTPUT POWER: 1 Watt
8000 bauds, 4 level FSK
PEAK DEVIATION = 2400 Hz
SPAN = 100 kHz



Note: For frequencies spaced more than 25kHz from the central frequency the attenuation should read 43dBc at 1W.
The plot above reads 53dBc as indicated in the description of the set-up.

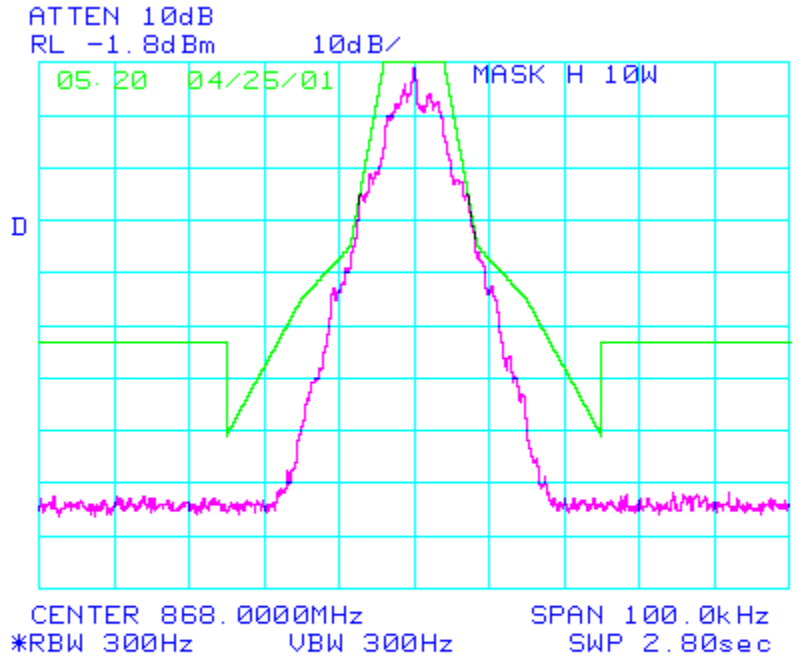
MASK: H , 11K0F1D, 5W and 1W

SPECTRUM FOR EMISSION **11K0F1D**
OUTPUT POWER: 5 Watts
7200 bauds, 4 level FSK
PEAK DEVIATION = 2800 Hz
SPAN = 100 kHz



Note: For frequencies spaced more than 25kHz from the central frequency the attenuation should read 50dBc at 5W.
The plot above reads 53dBc as indicated in the description of the set-up.

SPECTRUM FOR EMISSION **11K0F1D**
OUTPUT POWER: 1 Watt
7200 bauds, 4 level FSK
PEAK DEVIATION = 2800 Hz
SPAN = 100 kHz



Note: For frequencies spaced more than 25kHz from the central frequency the attenuation should read 43dBc at 1W.
The plot above reads 53dBc as indicated in the description of the set-up.