

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

**for the**

**Tait's T85x -1 (400-440MHz) base station**

**modulated with**

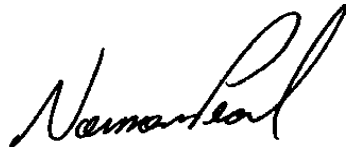
**8 FSK digital modulation from Dataradio's Base Data Link Controller  
(BDLC)**

**FCC ID: EOTBDD4T85-1  
Trade Name: Paragon/PD**

December 16, 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.

A handwritten signature in black ink, appearing to read "Norman Pearl". The signature is fluid and cursive, with a large initial "N" and "P".

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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 EOTBDD4T85-1. All changes involved fall under Class II Permissive Change types and they are entirely detailed within the current report.

The certificate EOTBDD4T85-1 has been granted to Dataradio for the transmitter (Exciter+PA modules) part of its UHF base station. They both belong to the T85M-XY (see page 6 for part# description) UHF base station which is itself part of Paragon/PD, a wireless data base station. Dataradio Inc. buys this UHF base station from Tait Electronics, modifies the exciter for the proposed digital modulation scheme, does the final assembly and markets the Paragon/PD unit. The Paragon/PD data base station serves the Dataradio Gemini/PD mobile family.

The Class II Permissive type of change demonstrated with this filing relates to the emission designators list. The certificate EOTBDD4T85-1 is granted for the following list of emission designators: 10K7 and 15K7F3E, and 14K3, 15K9, 7K00, 7K50 and 16K5F1D. The change has two parts. One consists in modification of the emission designators corresponding to 12.5kHz channel due to a higher attainable maximum deviation on the modulating input. The other asks for the addition of several new emission designators for another 8-FSK digital modulation source. For both claims the compliance has been demonstrated for mask 90.210C or D as required. Following this permissive change the emission designator list should be : 10K7 and 15K7F3E, and 14K3, 15K9, 7K17, 8K00, 16K5, 16K7, 14K9, 8K33 F1D . This Class II permissive change involves the modulation source only and it is completely described in the current report.

EXISTING CONDITIONS

The unit utilized for these occupied bandwidth and mask-compliance measurements was a prototype built from production EOTBDD4T85-1 with beta-level firmware used to create the modulation scheme. The exciter operates on frequencies ranging from 400.000 MHz to 440.000 MHz. The frequency tolerance of the exciter is .0001% or 1.0 parts per million and the output power of the PA is 100W as granted in EOTBDD4T85-1.

PROPOSED CONDITIONS

It is proposed to accept the Class II permissive change request for the EOTBDD4T85-1 certificate 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.2-154, Mar 15,2000. The 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 measurements were made between Oct 15, 2001 and Nov 12, 2001.

CONCLUSION

Given the results of the measurements contained herein, the applicant requests a Class II Permissive Change for the Certificate EOTBDD4T85-1 to add a new emission designators 16K5F1D to the existing list.



12/16/02

Constantin Pintilei  
R&D Test Engineer, Dataradio Inc.

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ANNEXES:

- Annex A: Compliance with the 90.210 (c),(d) Masks Test Report
- Annex B: Production Procedure
- Annex C: Technical 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 September 2001  
8 Years experience in radio frequency measurements.

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

The certificate EOTBDD4T85-1 has been granted to Dataradio Inc. following an ID change request from CASTEL0021. The certificate CASTEL0021 has been granted to Tait Electronics Ltd. for its transmitter comprised of T857 Exciter module and T859 PA module. It belongs to the T85M-XY (see page bottom for part# description) UHF 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 was done.

Further, several data speeds using 4-FSK SRRC digital modulation were granted following two Class II permissive change requests. The emission designator list of the certificate granted on 05/29/2001 has the following values:

- 10K7 and 15K7F3E inherited from the original certificate CASTEL0021 granted on 01/19/1999
- 14K3 and 15K9F1D for 25.6kpbs and 19.2 kbps 4-FSK SRRC digital modulation granted on 11/16/2000 following the ID change together with Class II permissive change request
- 7K50 and 7K00F1D,used for 16.0 and 14.4 kbps 4-FSK SRRC digital modulation granted on 07/12/2001 following a Class II permissive change request.
- 16K5F1D,used for 32.0 kbps 4-FSK RC digital modulation, granted on 01/24/2002 following a Class II permissive change request

The current Class II permissive change request asks for the following changes to be done to the emission designator list:

- replace 7K50F1D and 7K00F1D with 8K00F1D and 7K17F1D, the emission designators resulting with the increased deviation for 16.0kpbs and 14.4 kbps. The low-frequency content of the modulation input of the exciter is weighted through the attached production procedure (Annex B), superseding the default Tait’s setting. This allows a greater deviation under the limits of mask D through a more linear relationship baseband-FM modulated spectra. The compliance with mask D for the new maximum deviations is demonstrated in the test section appropriately.
- append to the emission designator list the 16K7F1D, 14K9F1D and 8K33F1D and accept 8K00F1D values required for 48.0, 43.2 21.6 and 24.0kpbs respectively using a 8-FSK Raised Cosine modulation scheme. The compliance with masks C or D respectively is further demonstrated in the test section.

The change above described involves the modulation source only therefore it fall under Class II Permissive Changes type as per 2.1043 (b)(2).No other changes occur elsewhere in the circuitry of the exciter module or of the PA module.

The characteristics affected by the first modification of above 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(c)(d)
- All this Class II permissive change data as per 2.1043 are completely described with the current report.

Part Number of the Tait UHF base station T85M-XY

M	Module Type	X	Freq Range	Y	Channel Bandwidth
7	Exciter (1W)	1	400-440 MHz	0	25 kHz
5	Receiver	2	440-480 MHz	5	12.5 kHz
9	Power Amplifier	3	480-520 MHz		

Part Number of the Paragon/PD UHF data base station BDD4 -85XY PPPS

X	Freq Range	Y	Channel Bandwidth	PPP	Transmitted Power	S	Supply
1	400-440 MHz	0	25 KHz	100	100W	0	12VDC external
2	440-480 MHz	5	12.5 KHz			2	dual 120V AC
3	480-520 MHz						

EQUIPMENT IDENTIFICATION:

<u>TRADE NAME</u>	<u>DESCRIPTION</u>	<u>Dataradio Inc PART NUMBER</u>
T85x	UHF Base Station	T85M-XY
D212	Base Data Link Controller (BDLC)	050-03330-00x
Paragon/PD	Assembly	BDD4-88XY PPPS

**General Information about the Grantee and Certified Equipment -2.1043 (B)(2)**

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

APPLICANT: Dataradio Inc.,  
5500 Royalmount Ave, suite 200,  
Town of Mount Royal, Quebec, Canada, H4P 1H7

MANUFACTURER: Tait Electronics Ltd., Burnside Christchurch 5, New Zealand  
(T85x UHF 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: BDD4-85XY PPS

SERIAL NUMBER ( S ): D212 address 1.0 -prototype 8-level FSK BDLC  
T857-16-0200 s.n 13007033 Exciter module  
T859-10-0005 s.n 13007042 PA module

FCC ID NUMBER: EOTBDD4T85-1 (following from a change in ID of CASTEL0021)

FCC RULES AND REGS: FCC Part (s) 22, 90

FREQUENCY RANGE: 400MHz -440 MHz as per EOTBDD4T85-1 certificate

MAXIMUM POWER RATING: 100Watts as per EOTBDD4T85-1 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:

<u>TRADE NAME</u>	<u>DESCRIPTION</u>	<u>DRI PART NUMBER</u>
T85x	UHF Base Station	T85M-XY
D212	Base Data Link Controller (BDLC)	050-03330-00x
Paragon/PD	Assembly	BDD4-85XY PPS

**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
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 C . 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

-increased maximum deviation following more accurate modulation balance production procedure

12.5kHz ch. (16.0kbps, 8000baud, 4 FSK) **7K17F1D**

12.5kHz ch. (14.4kbps, 7200baud, 4 FSK) **8K00F1D**

-emission designators for 8-FSK modulation scheme

25kHz ch. (48.0kbps, 16000baud, 8 FSK) **16K7F1D**

25kHz ch. (43.2kbps, 9600baud, 8 FSK) **14K9F1D**

12.5kHz ch. (24.0kbps,8000baud, 8 FSK) **8K00F1D**

12.5kHz ch. (21.6kbps, 7200baud, 8 FSK) **8K33F1D**

Previously granted for EOTBDD4T885-1:

25kHz ch voice. **15K7F3E**

25kHz ch. (25.6kbps, 12800baud, 4 FSK) **14K3F1D**

25kHz ch. (19.2kbps, 9600baud, 4 FSK) **15K9F1D**

25kHz ch. (32.0kbps, 16000baud, 4 FSK) **16K5F1D**

12.5kHz ch. voice **10K7F3E**

12.5kHz ch. (16.0kbps, 8000baud, 4 FSK) **7K00F1D**

12.5kHz ch. (14.4kbps,7200baud, 4 FSK) **7K50F1D**

**SPECTRUM EFFICIENCY STANDARD DATA 90.203 (j)(3)**

The unit transmits 48000 bps in 25 kHz channel bandwidth.

This is more than  $4800 \times 4 = 19200$  bps required for  $6.25 \times 4 = 25$  kHz channel bandwidth

The unit transmits 24000 bps in 12.5 kHz channel bandwidth.

This is more than  $4800 \times 2 = 9600$  bps required for  $6.25 \times 2 = 12.5$  kHz channel bandwidth

**DIGITAL MODULATION TECHNIQUES 2.1033 (c)(13)**

The explanation provided with the previous Class II permissive change request (731 form number EA 100895) for 25.6kbps and 19.2 kbps 4-FSK SRRC digital modulation still applies.

The two differences refer to the symbol rate, which now is 16.0,9.6,8.0 and 7.2 kbauds and to the digital filter implemented, which belongs to the Raised Cosine family for a 3-bit mapped symbols, while in the former were 2-bit mapped symbols. The cut-off frequencies of the RC digital filtering are always half the symbol rates.

**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(c),(d)

are provided in next section of this Engineering Report

**Modulation Characteristic Part 2.1047 (d), 90.209 (b), 90.210(c):** 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 EOTBDD4T85-1 Transmitter. Paragon/PD is comprised of the Tait Electronics Ltd. T85M -1Y UHF Base station with the Dataradio

Inc D212 Base Data Link Controller (BDLC). Dataradio Inc does the changes to fit the transmitter 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 revA standards.