



31040/SIT



C-1376



46390-2049



200093-0



00-034



SL2-IN-E-1119R



entela

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July 30, 2004

FEDERAL COMMUNICATIONS COMMISSION

7435 Oakland Mills Road
Columbia, MD 21046
USA

Subject: Type Acceptance Application – Class II Permissive Change under FCC CFR 47, Parts 2 and 90 (Subparts I, T & K) - Non-Broadcast Radio Transceivers Operating in the frequency bands 217-220 MHz and 220-222 MHz (12.5kHz Channel Spacing).

Applicant: Microwave Data Systems Inc.
Product: MDS ROR220 Data Transceiver
Model: MDS-ROR220
FCC ID: E5MDS-ROR220

Dear Sir/Madam,

As appointed agent for **Microwave Data Systems Inc.**, we would like to submit the application for FCC Class II Permissive Change for FCC Modular Approval to include the Portable application with the conditions as below:

- (1) Maximum RF Output Power of 2 Watts peak
- (2) Maximum Duty Cycle for Portable Application: 4.26% maximum
- (3) Maximum 0 dBi gain antenna
- (4) Minimum antenna separation distance of 5 cm as specified by the manufacturer which is much more than the minimum RF safety distance of 1.6 cm as evaluated.

Please review all files uploaded to FCC E-Filing database.

If you have any queries, please do not hesitate to contact us by our TOLL FREE number:

OUR TELEPHONE NO.: 1-877-765-4173

Yours truly,

Tri Minh Luu, P. Eng.,
V.P., Engineering

TML/DH

Encl.



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July 30, 2004

Microwave Data Systems Inc.

175 Science Parkway
Rochester, NY
USA, 14620-4261

Attn.: Mr. Dennis McCarthy

Subject: Type Acceptance Application – Class II Permissive Change under FCC CFR 47, Parts 2 and 90 (Subparts I, T & K) - Non-Broadcast Radio Transceivers Operating in the frequency bands 217-220 MHz and 220-222 MHz (12.5kHz Channel Spacing).

Applicant: Microwave Data Systems Inc.
Product: MDS ROR220 Data Transceiver
Model: MDS-ROR220
FCC ID: E5MDS-ROR220

Dear Mr. McCarthy,

Enclosed please find the engineering test report to cover new RF Exposure evaluation for portable application for the above modular transmitter with the following parameters:

- (1) Maximum RF Output Power of 2 Watts peak
- (2) Maximum Duty Cycle for Portable Application: 4.26% maximum
- (3) Maximum 0 dBi gain antenna
- (4) Minimum antenna separation distance of 5 cm as specified by the manufacturer which is much more than the minimum RF safety distance of 1.6 cm as evaluated.

Enclosed you will find copy of the engineering report. If you have any queries, please do not hesitate to contact us.

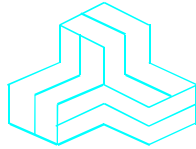
Yours truly,



Tri Minh Luu, P.Eng
Vice President - Engineering

Encl.

ENGINEERING TEST REPORT



MDS ROR220 Data Transceiver

Model No.: MDS-ROR220

FCC ID: E5MDS-ROR220

Applicant:

Microwave Data Systems

175 Science Parkway

Rochester, NY

USA, 14620-4261

Tested in Accordance With

Federal Communications Commission (FCC)

47 CFR, Parts 2 and 90 (Subparts I, T & K)

UltraTech's File No.: MIC-120FCC90

This Test report is Issued under the Authority of
Tri M. Luu, Professional Engineer,
Vice President of Engineering
UltraTech Group of Labs

Date: March 9, 2004



Report Prepared by: Anca Dobre

Tested by: Mr. Wayne Wu

Issued Date: Aug. 2004

Test Dates: July 29, 2004

- The results in this Test Report apply only to the sample(s) tested, and the sample tested is randomly selected.
- This report must not be used by the client to claim product endorsement by NVLAP or any agency of the US Government.

UltraTech

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EXHIBIT 1. INTRODUCTION

1.1. SCOPE

Reference:	FCC Parts 2 and 90 (Subparts I, T & K)
Title:	Telecommunication - Code of Federal Regulations, 47 CFR, Parts 2 and 90 (Subparts I, T & K)
Purpose of Test:	To obtain FCC Certification Authorization for Radio operating in the frequency bands 217-220 MHz (12.5kHz Channel Spacing, aggregated by 3 adjacent 5kHz OBW Channels).
Test Procedures:	Both conducted and radiated emissions measurements were conducted in accordance with TIA/EIA Standard TIA/EIA- 603 (01-Nov-2002) - Land Mobile FM or PM Communications Equipment Measurement and Performance Standards.

1.2. RELATED SUBMITTAL(S)/GRANT(S)

None.

1.3. NORMATIVE REFERENCES

Publication	Year	Title
FCC CFR Parts 0-19, 80-End	2003	Code of Federal Regulations – Telecommunication
ANSI C63.4	2003	American National Standard for Methods of Measurement of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the Range of 9 kHz to 40 GHz
CISPR 16-1	2003	Specification for Radio Disturbance and Immunity measuring apparatus and methods
TIA/EIA 603, Edition B	01-Nov-2002	Land Mobile FM or PM Communications Equipment Measurement and Performance Standards

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Ultratech File #: MIC-120FCC90
March 9, 2004

All test results contained in this engineering test report are traceable to National Institute of Standards and Technology (NIST)

EXHIBIT 2. PERFORMANCE ASSESSMENT

2.1. CLIENT INFORMATION

APPLICANT	
Name:	Microwave Data Systems Inc.
Address:	175 Science Parkway Rochester, NY USA, 14620-4261
Contact Person:	Mr. Dennis McCarthy Phone #: 585-242-8440 Fax #: 585-241-5590 Email Address: dmccarthy@microwavedata.com

MANUFACTURER	
Name:	Microwave Data Systems Inc.
Address:	175 Science Parkway Rochester, NY USA, 14620-4261
Contact Person:	Mr. Dennis McCarthy Phone #: 585-242-8440 Fax #: 585-241-5590 Email Address: dmccarthy@microwavedata.com

2.2. EQUIPMENT UNDER TEST (EUT) INFORMATION

The following information (with the exception of the Date of Receipt) has been supplied by the applicant.

Brand Name:	Microwave Data Systems
Product Name:	MDS ROR220 Data Transceiver
Model Name or Number:	MDS-ROR220
Serial Number:	Pre-production
Type of Equipment:	Licensed Non-Broadcast Station Transmitter
External Power Supply:	6 -12 VDC
Transmitting/Receiving Antenna Type:	Non-integral
Primary User Functions of EUT:	Wireless data transceiver in an industrial environment.

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2.3. EUT'S TECHNICAL SPECIFICATIONS

TRANSMITTER	
Equipment Type:	• Base Station • Mobile
Intended Operating Environment:	Commercial, industrial or business environment
Power Supply Requirement:	6–12 VDC
RF Average Output Power Rating:	• 2 Watts High and 0.5 Watts Low for Mobile & Base application • 0.066 mWatts High and 0.049 mWatts Low fro Portable application
Duty Cycle:	• 100% maximum for Mobile and Base application • 4.26% maximum fro Portable application
Operating Frequency Range:	217-222 MHz
RF Output Impedance:	50 Ohms
Channel Spacing:	12.5 kHz, aggregated by 3 adjacent 5 kHz OBW channels.
Occupied Bandwidth (99%):	7.43 kHz for 12.5 kHz Channelisation with maximum 1.83 kHz frequency deviation.
Emission Designation*:	8K46F1D
Antenna Connector Type:	MCX

* For an average case of commercial telephony, the Necessary Bandwidth is calculated as follows:

12.5 kHz Channel Spacing FM Digital Modulation:

$$B_n = 2M + 2DK$$

$$D = 1.83 \text{ kHz}, M = 4.8/2, K = 1$$

$$B_n = 2M + 2DK = 2(4.8/2) + 2(1.83)(1) = 8.46 \text{ kHz}$$

Emission designator: 8K46F1D

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2.4. LIST OF EUT'S PORTS

Port Number	EUT's Port Description	Number of Identical Ports	Connector Type	Cable Type (Shielded/Non-shielded)
1	Antenna	1	MCX-type	N/A
2	Data Interface	1	16-pin dual-row header connector	Direct plug into motherboard from OEM user

2.5. ANCILLARY EQUIPMENT

Ancillary Equipment # 1	
Description:	MDS Interface Board
Brand name:	Microwave Data Systems
Model Name or Number:	Evaluation PCB 03-4051A01
Serial Number:	Test Sample
Cable Type:	Ribbon cable
Connected to EUT's Port:	Data

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EXHIBIT 3. EUT OPERATING CONDITIONS AND CONFIGURATIONS DURING TESTS

3.1. CLIMATE TEST CONDITIONS

The climate conditions of the test environment are as follows:

Temperature:	21°C
Humidity:	51%
Pressure:	102 kPa
Power input source:	12 VDC

3.2. OPERATIONAL TEST CONDITIONS & ARRANGEMENT FOR TEST SIGNALS

Operating Modes:	The transmitter was operated at its maximum duty cycle of 50% and repeated continuously. The carrier was GMSK modulated, internal data source at 9.6 kb/s. The test frequencies were pre-set by the manufacturer at its maximum peak level and maximum frequency deviation (1.83 kHz peak)
Special Test Software:	N/A
Special Hardware Used:	N/A
Transmitter Test Antenna:	The EUT is tested with the transmitter antenna port terminated to a 50 Ohms RF Load.

Transmitter Test Signals	
Frequency Band(s):	217-220 MHz 220-222 MHz
Frequency(ies) Tested: (Near lowest, near middle & near highest frequencies in the frequency range of operation.)	217 and 219.9875 MHz 220 and 222 MHz
Transmitter Wanted Output Test Signals: - RF Power Output (measured maximum output power): - Normal Test Modulation: - Modulating signal source:	2 Watts High and 0.5 Watt Low GMSK Internal

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EXHIBIT 4. SUMMARY OF TEST RESULTS

4.1. APPLICABILITY & SUMMARY OF EMISSION TEST RESULTS

FCC Section(s)	Test Requirements	Applicability (Yes/No)
90.205 (e)&(f) and 90.259(a)(4) & 2.1046	RF Power Output	Yes
1.1307, 1.1310, 2.1091 & 2.1093	RF Exposure Limit	Yes
90.213 & 2.1055	Frequency Stability	Refer to original application
2.1047(a)	Audio Frequency Response	Not applicable
90.210 & 2.1047(b)	Modulation Limiting	Refer to original application
90.210 & 2.1049	Emission Limitation & Emission Mask	Refer to original application
90.210, 2.1057 & 2.1051	Emission Limits - Spurious Emissions at Antenna Terminal	Refer to original application
90.210, 2.1057 & 2.1053	Emission Limits - Field Strength of Spurious Emissions	Refer to original application
MDS ROR220 Data Transceiver, Model No.: MDS-ROR220 by Microwave Data Systems has also been tested and found to comply with FCC Part 15, Subpart B - Radio Receivers and Class B Digital Devices . The engineering test report has been documented and kept in file and it is available upon request.		

4.2. MODIFICATIONS INCORPORATED IN THE EUT FOR COMPLIANCE PURPOSES

None.

4.3. DEVIATION OF STANDARD TEST PROCEDURES

None.

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EXHIBIT 5. MEASUREMENTS, EXAMINATIONS & TEST DATA FOR EMC EMISSIONS

5.1. TEST PROCEDURES

This section contains test results only. Details of test methods and procedures can be found in Exhibit 8 of this report.

5.2. MEASUREMENT UNCERTAINTIES

The measurement uncertainties stated were calculated in accordance with requirements of UKAS Document NIS 81 with a confidence level of 95%. Please refer to Exhibit 7 for Measurement Uncertainties.

5.3. MEASUREMENT EQUIPMENT USED

The measurement equipment used complied with the requirements of the Standards referenced in the Methods & Procedures ANSI C63.4:1992 and CISPR 16-1.

5.4. ESSENTIAL/PRIMARY FUNCTIONS AS DECLARED BY THE MANUFACTURER

The essential function of the EUT is to correctly communicate data to and from radios over RF link.

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5.5. RF POWER OUTPUT [§§ 2.1046 & 90.205(e) & (f) and 90.259(a)(4)]

5.5.1. LIMITS

§ 90.205: (E) 217-220 MHz. Limitations on power and antenna heights are specified in § 90.259.
(F) 220-222 MHz. Limitations on power and antenna heights are specified in § 90.729.

§ 90.259(a)(4):

In the 217-220 MHz band, the maximum transmitter output power is 2 watts. The maximum antenna height above average terrain (HAAT) is 152m (500 feet).

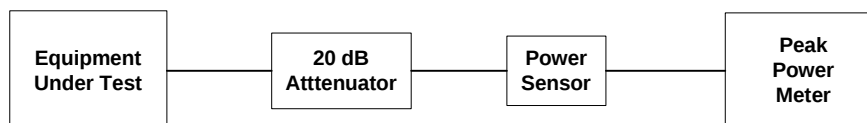
5.5.2. METHOD OF MEASUREMENTS

Refer to Exhibit 8, Section 8.1 (Conducted) and 8.2 (Radiated) of this report for measurement details

5.5.3. TEST EQUIPMENT LIST

Test Instruments	Manufacturer	Model No.	Serial No.	Frequency Range
Attenuator	Weinschel Corp	23-20-34	BH7876	DC – 18 GHz
Peak Power Meter	Hewlett Packard	8900D	2131A01044	100 MHz – 18 GHz, sensor dependent
Power Sensor	Hewlett Packard	84811A	2551A02902	100 MHz – 18 GHz

5.5.4. TEST ARRANGEMENT



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5.5.5. TEST DATA

Duty Cycle: 4.26% maximum for portable application.

Average-Peak Correction factor = $10 \cdot \log(0.0426) = -13.7$ dB

Transmitter RF Power at the Antenna Port for Portable Application

Operating Band (MHz)	Fundamental Frequency (MHz)	Measured Peak Power (Watts)	Measured (Average) Power (Watts)	Power Limit (Watts)
High Power Level				
217-220	217	1.82	-11.88	2
	219.9875	1.91	-11.79	2
220-222	220	1.92	-11.78	2
	222	1.91	-11.79	2
Low Power Level				
217-220	217	0.54	-13.16	2
	219.9875	0.56	-13.14	2
220-222	220	0.56	-13.14	2
	222	0.58	-13.12	2

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5.6. RF EXPOSURE REQUIREMENTS [§§ 1.1310 & 2.1091]

5.6.1. LIMITS

§1.1310: The criteria listed in the following table shall be used to evaluate the environmental impact of human exposure to radio frequency (RF) radiation as specified in 1.1307(b).

TABLE 1—LIMITS FOR MAXIMUM PERMISSIBLE EXPOSURE (MPE)

Frequency range (MHz)	Electric field strength (V/m)	Magnetic field strength (A/m)	Power density (mW/cm ²)	Averaging time (minutes)
(A) Limits for Occupational/Controlled Exposures				
0.3–3.0	614	1.63	*(100)	6
3.0–30	1842/f	4.89/f	*(900/f ²)	6
30–300	61.4	0.163	1.0	6
300–1500			f/300	6
1500–100,000			5	6
(B) Limits for General Population/Uncontrolled Exposure				
0.3–1.34	614	1.63	*(100)	30
1.34–30	824/f	2.19/f	*(180/f ²)	30
30–300	27.5	0.073	0.2	30
300–1500			f/1500	30
1500–100,000			1.0	30

f = frequency in MHz

* = Plane-wave equivalent power density

NOTE 1 TO TABLE 1: Occupational/controlled limits apply in situations in which persons are exposed as a consequence of their employment provided those persons are fully aware of the potential for exposure and can exercise control over their exposure. Limits for occupational/controlled exposure also apply in situations when an individual is transient through a location where occupational/controlled limits apply provided he or she is made aware of the potential for exposure.

NOTE 2 TO TABLE 1: General population/uncontrolled exposures apply in situations in which the general public may be exposed, or in which persons that are exposed as a consequence of their employment may not be fully aware of the potential for exposure or can not exercise control over their exposure.

5.6.2. METHOD OF MEASUREMENTS

Refer to §§1.1310, 2.1091.

- In order to demonstrate compliance with MPE requirements (see §2.1091), the following information is typically needed:
 - (1) Calculation that estimates the minimum separation distance (20 cm or more) between an antenna and persons required to satisfy power density limits defined for free space.
 - (2) Antenna installation and device operating instructions for installers (professional/unskilled users), and the parties responsible for ensuring compliance with the RF exposure requirement
 - (3) Any caution statements and/or warning labels that are necessary in order to comply with the exposure limits
 - (4) Any other RF exposure related issues that may affect MPE compliance

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Calculation Method of RF Safety Distance:

$$S = PG/4\pi r^2 = EIRP/4\pi r^2$$

Where: P: power input to the antenna in mW
EIRP: Equivalent (effective) isotropic radiated power.
S: power density mW/cm²
G: numeric gain of antenna relative to isotropic radiator
r: distance to centre of radiation in cm

$$r = \sqrt{PG/4\pi S}$$

- For portable transmitters (see §2.1093), or devices designed to operate next to a person's body, compliance is determined with respect to the SAR limit (define in the body tissues) for near-field exposure conditions. If the maximum average output power, operating condition configurations and exposure conditions are comparable to those of existing cellular and PCS phones, an SAR evaluation may be required in order to determine if such a device complies with SAR limit. When SAR evaluation data is not available, and the additional supporting information cannot assure compliance, the Commission may request that an SAR evaluation be performed, as provided for in §1.1307(d).

5.6.3. TEST DATA

Frequency (MHz)	Measured Average RF Conducted (dBm)	Calculated Average EIRP (mWatts)	*Laboratory's Recommended Minimum RF Safety Distance r (cm)	Manufacturer's Specified Minimum RF Safety Distance r (cm)
Antenna Gain: 0 dBi				
217 –222	-11.78	0.066	49	58

Note: RF EXPOSURE DISTANCE LIMITS: $r = (PG/4\pi S)^{1/2} = (EIRP/4\pi S)^{1/2}$

Sample calculation:

$$S = 0.2 \text{ mW/cm}^2, EIRP = 0.066 \text{ mWatts}$$

$$r = (EIRP/4\pi S)^{1/2} = ((0.066)/4\pi(0.2))^{1/2} = 0.16 \text{ cm}$$

Evaluation of RF Exposure Compliance Requirements for Portable Application	
RF Exposure Requirements	Compliance with IC Rules
Minimum Calculated separation distance between antenna and persons required: See above table.	Manufacturer' instruction for separation distance between antenna and persons required: 5 cm which is more than the minimum RF safety distance of 1.6 cm.

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