Dane Industries

Application
For Certification
433MHz Remote Control Transmitter

FCC ID: N2N600-041

August 18, 2003

ACCREDITED
CERT NO: 1427.01

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1.0 JENERAL DESCRIPTION

1.1 Related Submittals Grants

This is single application of the *Dane Industries 433MHz Remote Control Transmitter* for Certification under FCC Part 15, Subpart C.
There are no other simultaneous applications.
The Receiver portion will be verified under Declaration of Conformity.

1.2 Product Description

433MHz Remote Control Transmitter is a manually operated RF remote control transmitter which operates at 433.98MHz. The intended use of the *433MHz Remote Control Transmitter* is to generate and transmit a RF signal to control QuicKart 2000 Electric Utility Machine. The *433MHz Remote Control Transmitter* powered at 6VDC from four AA-size internal batteries.

Antenna Description:

9” wire from the PCB inside the device, no connector.

Sample Submitted: August 1, 2003
Test Work Started: August 1, 2003
Test Work Completed: August 8, 2003

1.3 Test Methodology

Emission measurements were performed according to the procedures in ANSI C63.4-2000. All field strength radiated emissions measurements were performed in the semi-anechoic chamber, and for each scan, the procedure for maximizing emissions in Appendices D and E were followed. All field strength radiated tests were performed at an antenna to EUT distance of 3 meters, unless stated otherwise in the "**Justification Section**" of this Application.

1.4 Test Facility

The test site facility used to collect the radiated and conducted measurement data is located at 7250 Hudson Blvd., Suite 100, Oakdale, Minnesota. This test facility has been fully described in a report dated on March 2003 submitted to FCC. Please reference the site registration number: 90706, dated April 18, 2003.

2.0 SYSTEM TEST CONFIGURATION

2.1 Justification

N/A

2.2 EUT Exercising Software

N/A

2.3 Special Accessories

There are no special accessories necessary for compliance of these products.

2.4 Equipment Modification

No modifications were installed during the testing.

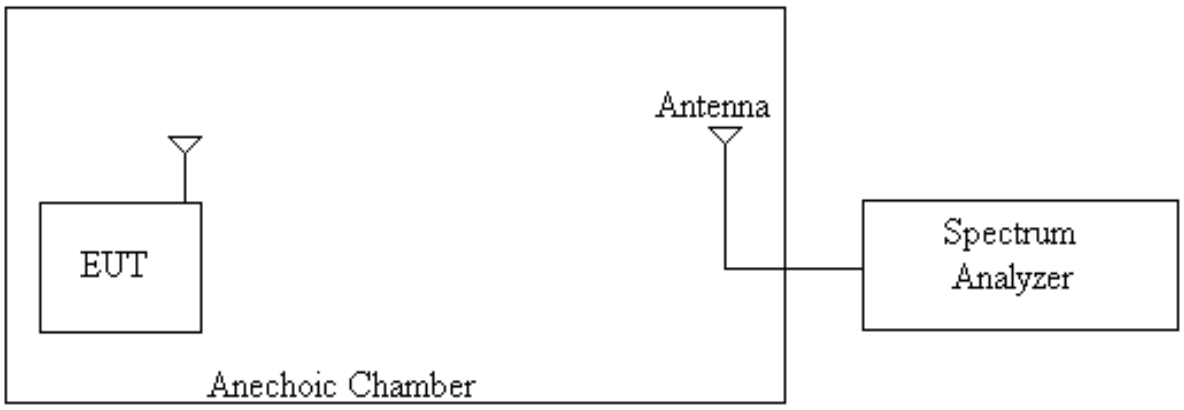
2.5 Support Equipment List and Description

N/A

2.6 Test Configuration Block Diagrams

The EUT was setup as tabletop equipment.
The EUT was powered at 6VDC from four AA-size fresh internal batteries.

Field Strength Measurements



3.0 TEST RESULTS

Data is included for the worst case configuration (the configuration which resulted in the highest emission levels). A sample calculation, configuration photographs, data tables and graphical representations of the emissions are included.

The EUT is intended for operation under the requirements of Part 15 Subpart C. Specific test requirements include the following:

47 CFR 15.231(a)(1)	Transmitting Time
47 CFR 15.231(b))	Field Strength of Fundamental and Spurious Emissions
47 CFR 15.231(c)	Bandwidth of Emissions

The EUT should comply with requirements of Part 15 Subpart B:

47 CFR 15.109, Class B	Radiated Emissions

Note: A Conducted emissions testing was not performed as battery powered equipment.

3.1 Transmitting Time, FCC 15.231(a)(1)

According to FCC Part 15.231(a)(1) a manually operated transmitter should stop transmitting within 5 sec after release the activation button. The transmitter was deactivates automatically in 0.1 sec after releasing the activation button.

3.2 Field Strength of Fundamental and Spurious Emissions, FCC 15.231(b)

Field Strength of Fundamental and Spurious Emissions measurements were made at Fundamental frequency of 433.98MHz, Spurious Emissions were tested up to 4.5GHz (10th harmonic.)

The Table 3-2-1 shows the Field Strength of Fundamental Radiation and Spurious Emissions.

Radiated Emissions from 433MHz to 5GHz **Date:** 08-01-2003
Company: Dane Industries
Model: 433 MHz Transmitter
Test Engineer: Norman Shpilsher
Special Info:
Standard: FCC Part 15.231(b)
Test Site: 3 m Anechoic Chamber
Note: Readings below 1GHz were taken with RBW 100kHz and 1MHz above 1GHz

Table # 3-2-1

Frequency MHz	Antenna Polarity	Antenna Factor(dB/m)	Amplifier Gain (dB)	Reading dBµV	Net at 3m. dBµV/m	Limit dBµV/m	Margin dB	Comments
433.98	V	19.96	0.0	59.16	79.12	80.83	-1.71	1, 2
868.24	V	27.0	0.0	20.3	47.3	60.8	-13.5	3
1303.30	V	28.5	37.3	56.1	47.2	60.8	-13.6	3
1736.80	V	30.6	36.1	53.7	48.2	60.8	-12.6	3
2171.00	V	32.8	34.3	49.3	47.8	60.8	-13.0	3
3038.60	V	35.3	33.3	39.6	41.6	60.8	-19.2	3
3475.70	V	36.8	32.9	45.0	48.8	60.8	-12.0	3
3907.70	V	38.7	32.6	32.8	38.9	60.8	-22.0	4
4483.50	V	39.2	32.3	36.2	43.1	60.8	-17.8	3
4634.50	V	39.7	32.3	36.2	43.6	60.8	-17.2	3
4983.50	V	40.9	32.1	35.2	44.0	60.8	-16.8	3
433.98	H	19.96	0.0	56.03	75.99	80.83	-4.84	1, 2
868.24	H	27.0	0.0	24.2	51.2	60.8	-9.6	3
1303.30	H	28.5	37.3	51.6	42.7	60.8	-18.1	3
1737.50	H	30.7	36.1	49.7	44.2	60.8	-16.6	3
2171.00	H	32.8	34.3	48.7	47.1	60.8	-13.7	3
2467.10	H	34.0	33.9	42.3	42.3	60.8	-18.5	3
3475.00	H	36.8	32.9	38.2	42.1	60.8	-18.8	3
3907.70	H	38.7	32.6	27.8	33.9	60.8	-27.0	4
4341.20	H	39.2	32.4	37.0	43.8	60.8	-17.0	3
4637.30	H	39.7	32.3	36.3	43.8	60.8	-17.1	3
4896.30	H	40.6	32.1	35.3	43.7	60.8	-17.1	3

Comments:
1. Fundamental Frequency
2. Quasi-Peak readings
3. Peak readings
4. Average Readings

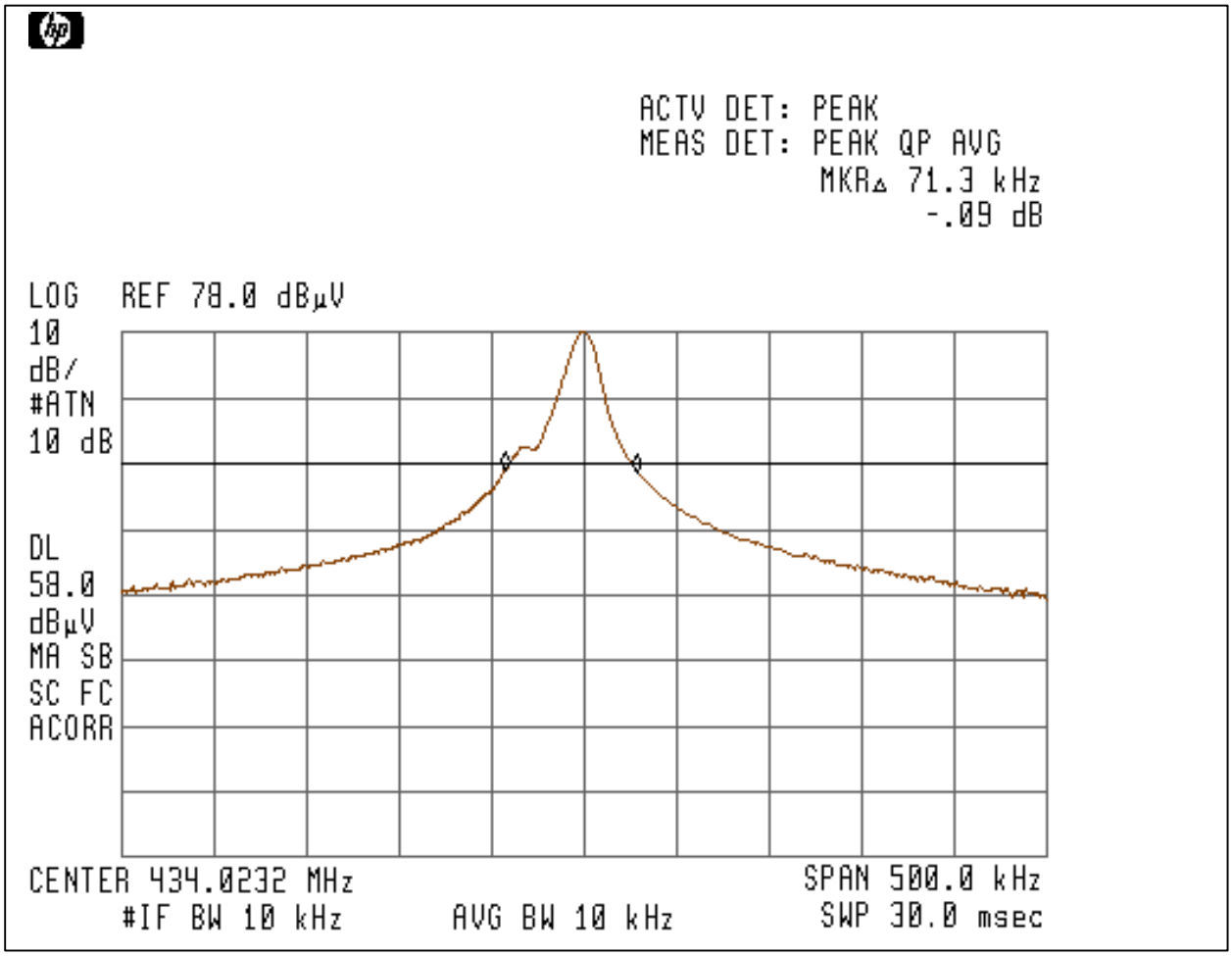
3.3 Bandwidth of Emissions, FCC 15.231(c)

Bandwidth of Emissions measurements was made for frequency of 433.98MHz.

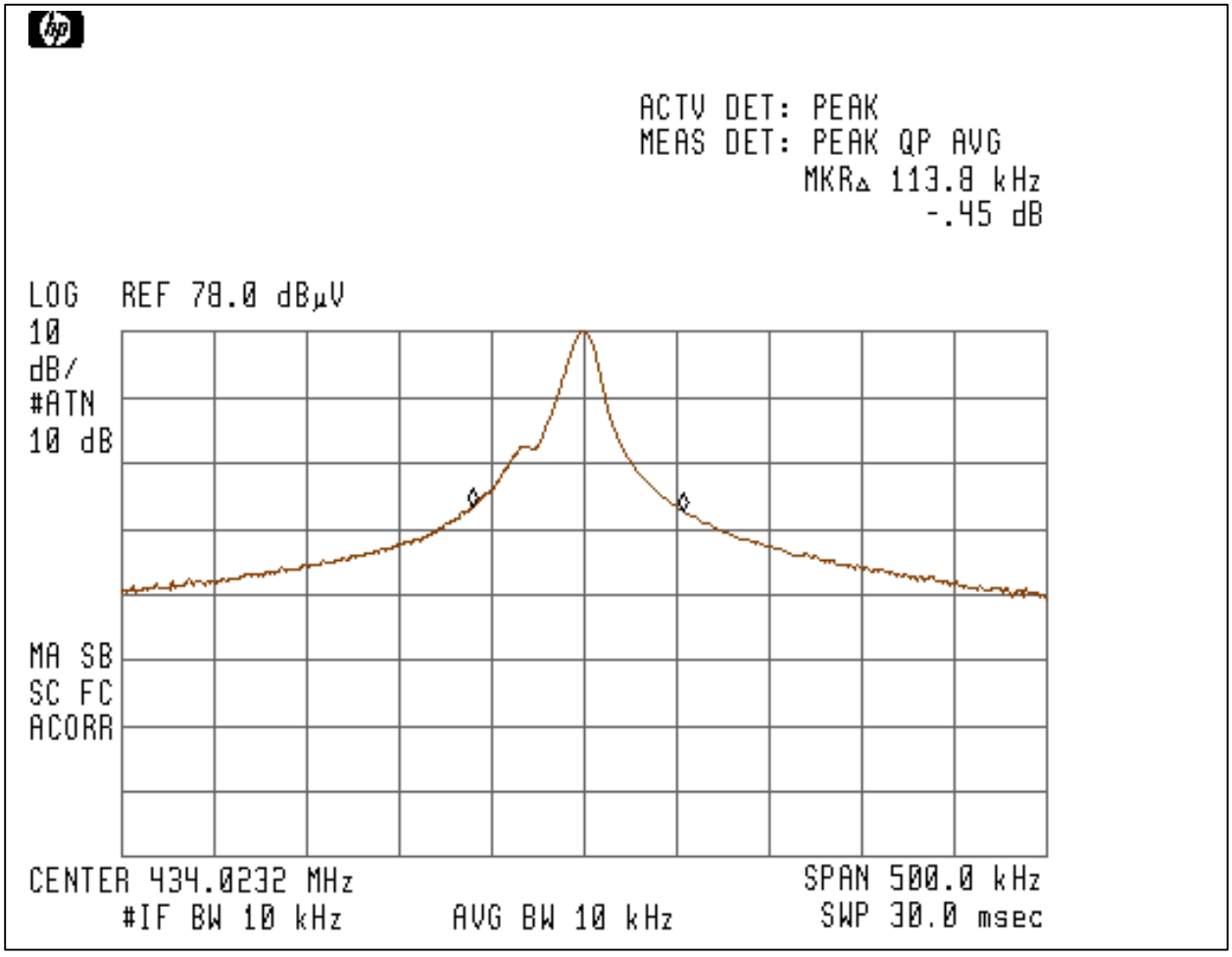
Bandwidth of Emissions at –20dB level was measured at 71.3kHz.
Bandwidth of Emissions at 99% power level was measured at 113.8kHz.
The maximum allowed level is 433.98MHz x 0.25% = 1085kHz

The # 3-3-1 shows the Bandwidth of Emissions at –20dB level.
The # 3-3-2 shows the Bandwidth of Emissions at 99% power level (for reference).

Graph 3-3-1



Graph 3-3-2

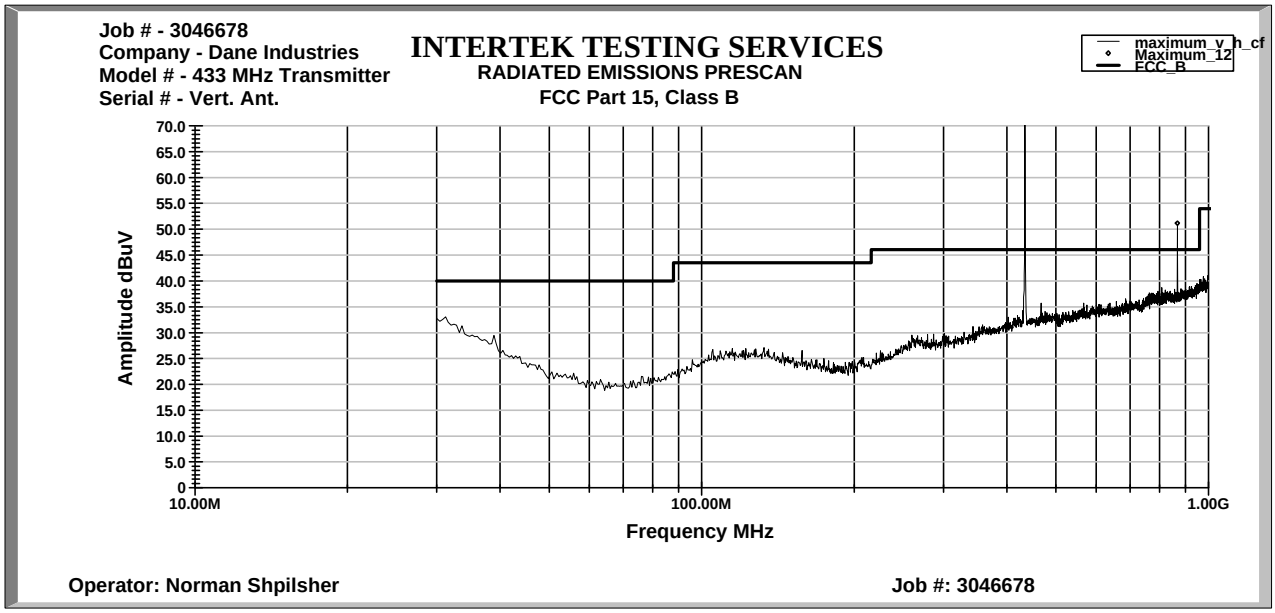

ACTV DET: PEAK
MEAS DET: PEAK QP AVG
MKRΔ 113.8 kHz
-.45 dB
LOG REF 78.0 dBµV
10
dB/
#ATN
10 dB
MA SB
SC FC
ACORR
CENTER 434.0232 MHz
SPAN 500.0 kHz
#IF BW 10 kHz
AVG BW 10 kHz
SWP 30.0 msec

3.4 Radiated Emissions, FCC 15.109, Class B

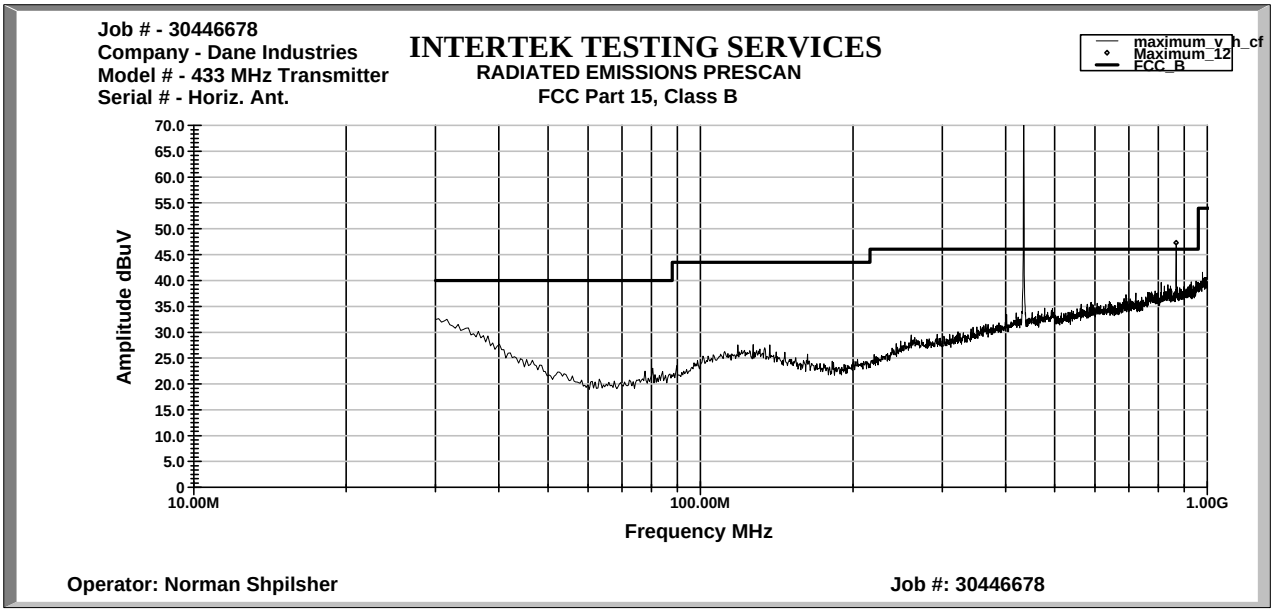
The EUT as a digital device was tested according to FCC Part 15.109, Class B in frequency range from 30MHz to 1GHz. No emissions above ambient were except emissions at fundamental frequency and 2nd harmonic were detected.

The Graphs 3-4-1 and 3-4-2 show the Radiated Emissions from 30MHz to 1GHz for Vertical and Horizontal Antenna Polarization

Graph 3-4-1



Graph 3-4-2



3.5 Test Procedure

Field Strength Measurements

The EUT was placed on a non-conductive table 0.8m above the ground plane inside the Anechoic Chamber. The table was centered on a motorized turntable, which allows 360-degree rotation. The measurement antenna was positioned at 3m distance. The Bicono-Log antenna was used in frequency range from 30MHz to 1GHz, and the Horn antenna was used in frequency range above 1GHz. The radiated emissions were maximized by configuring the EUT through its placement in three orthogonal axes, by rotating the EUT, by changing antenna polarization, and by changing antenna height from 1 to 4m. Method of the Field Strength Calculation is shown in Section 3.6.

3.6 Field Strength Calculation

The field strength is calculated by adding the Antenna Factor and Cable Factor, and subtracting the Amplifier Gain (if any) from the measured emissions reading on the EMI Receiver.
The basic equation with a sample calculation is as follows:

FS = RA + AF + CF - AG

Where: FS = Field Strength in dB(?V/m)
RA = Receiver Amplitude in dB(?V)
CF = Cable Attenuation Factor in dB
AF = Antenna Factor in dB(m^{-1})
AG = Amplifier Gain in dBi

Assume a receiver reading of 48.1 dB(?V) is obtained. The antenna factor of 7.4 dB(m^{-1}) and cable factor of 1.6 dB is added and amplifier gain of 16.0 dBi is subtracted giving field strength of 41.1 dB(?V/m).

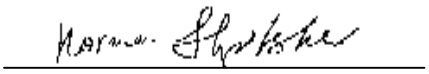
RA = 48.1 dB(?V)
AF = 7.4 dB(m^{-1})
CF = 1.6 dB
AG = 16.0 dBi
FS = RF + AF + CF - AG
FS = 48.1 + 7.4 + 1.6 – 16.0
FS = 41.1 dB(?V/m)

In the tables the Cable correction factors are included to the Antenna Factors.

Tested by:

Norman Shpilsher
Sr. EMC Engineer
Intertek

Signature



Date: August 18, 2003

4.0 TEST EQUIPMENT

Receivers/Spectrum Analyzers

DESCRIPTION	SERIAL NO.	LAST CAL	CAL DUE	USED
HP85462A Receiver RF Section	3325A00106	08/13/02	08/13/03	X
HP85460A RF Filter Section	3330A00109	08/13/02	08/13/03	X
HP85462A Receiver RF Section	3549A00306	12/02	12/03	
HP85460A RF Filter Section	3448A00276	12/02	12/03	
Advantest Spectrum Analyzer R3271A	55050084	06/03	06/04	X

Antennas/Pre-Amplifiers

DESCRIPTION	SERIAL NO.	LAST CAL	CAL DUE	USED
Schaffner-Chase Bicono-Log Antenna	2468	12/02	12/03	X
Schaffner-Chase Bicono-Log Antenna	2630	06/03	06/04	
EMCO Horn Antenna 3115	9507-4513	11/02	11/03	X
EMCO Horn Antenna 3115	6579	12/02	12/03	
HP 83017A Pre-Amplifier	3123A00475	11/02	11/03	X