

Radiated Testing Data

Part 15 and 90 Measurements

Control Design and Testing, Inc.
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Radiated Emissions Test Report
Prepared for ADRad Communications, Inc.
February 27, 2001

A. DEVICE UNDER TEST

The device is a VHF Repeater System operating under Part 90 of the FCC rules. The system consists of three metal cased, rack mountable units, powered from an external DC source of 13.8 volts, nominal. Each unit covers a different frequency range as listed below:

MX800A2A2HWSZ4CD	30 MHz. to 39 MHz.
MX800A3A3HWSZ4CD	39 MHz. to 50 MHz.
MX800BBHWSZ5CD	72 MHz. to 76 MHz.

B. MEASUREMENT PROCEDURE:

Radiation measurements were conducted according to the procedures set forth in ANSI C63.4 (1992). Each device was tested separately as follows:

Each unit was placed on the center of the turntable directly on top of the DC supply. A 50 ohm, 100 watt load termination was connected to the transmitter section output terminal and a low band biconical antenna (30 to 170 Mhz.) was connected to the receiver section input terminal. The test samples were provided with external, plug-in switches to select the channels and activate the transmitter section. The test was conducted with the device positioned as shown in the photographs. Each unit was tested the low, mid and high ends of its band.

Each device was scanned from 30 MHz. to 1 GHz. and all emissions within -30 dB. of the limit were noted. For transmitter cabinet radiation measurements, the tables below only record emissions up to the 10th harmonic. Although higher harmonic emissions were detected, all were more than 30 dB. below the limit. In this

case, the only transmitter emissions detected were those harmonically related to the fundamental transmit frequency.

For receiver section measurements, the units were checked in both the active and inactive states. A search was made specifically for emissions from the processor crystal and local oscillators but were nothing that could be related those frequencies was detected. The receiver emissions that are recorded in the tables were present in both states.

The field strength measurements were taken using an HP8596E spectrum analyzer, an EMCO 3121C dipole set and an Avantek UJ210 preamp. The devices were powered by an HP6264 power supply.

At each detected frequency of emission, the device was measured by rotating the turntable and adjusting the antenna height over a range of 1 to 4 meters to obtain the maximum emission level. This procedure was performed with both horizontal and vertical antenna polarizations. The peak reading for each frequency was recorded. The computed field strength for the readings appear in the tables below.

C. FACILITY

Radiated emissions testing for this device was conducted by Control Design & Testing, Inc. Testing was performed at the Hyak Laboratories three meter open area test site located in Spotsylvania, VA. Industry Canada # IC2052.

Table 1

RADIATED EMISSIONS DATA				CLIENT: ADRAD COMMUNICATIONS			
ANTENNA: DIPOLES				EUT: VHF REPEATER			
MODEL: MX800A2A2HWSZ4CD				TEST DATE: 24- FEB-01			
Channel 1: 30.100 MHz.				RECEIVE MODE CABINET RADIATION			
Frequency MHz.	Ant. H/V	Ant. Factor dB	Peak reading dBm	Duty cycle dB	Peak power uV/m@3m	Adjusted power uV/m@3m	FCC limit uV/m3m
89.142	V	7.9	-93.25		12		150
89.316	V	7.9	-94.65		10		150
89.412	V	7.9	-98.23		7		150
162.232	H	13.9	-101.93		9		150
Channel 1: 30.100 MHz.				TRANSMIT MODE CABINET RADIATION			
60.199	V	5.1	-87.65		17		7385
90.299	V	8.0	-86.97		25		7385
120.399	V	11.0	-88.85		29		7385
150.499	H	13.3	-97.54		14		7385
180.599	H	14.7	-102.27		9		7385
210.699	H	16.5	-103.38		10		7385
240.798	H	17.9	-105.22		10		7385
270.898	H	19.0	-96.00		32		7385
300.998	H	19.8	-101.67		18		7385

Table 2

RADIATED EMISSIONS DATA				CLIENT: ADRAD COMMUNICATIONS			
ANTENNA: DIPOLES				EUT: VHF REPEATER			
MODEL: MX800A2A2HWSZ4CD				TEST DATE: 24-FEB-01			
Channel 2: 34.500 MHz.				RECEIVE MODE CABINET RADIATION			
Frequency MHz.	Ant. H/V	Ant. Factor dB	Peak reading dBm	Duty cycle dB	Peak power uV/m@3m	Adjusted power uV/m@3m	FCC limit uV/m3m
89.255	V	7.9	-94.78		10		150
89.316	V	7.9	-94.39		11		150
89.529	V	7.9	-99.71		6		150
162.232	H	13.9	-100.02		11		150
Channel 2: 34.500 MHz.				TRANSMIT MODE CABINET RADIATION			
68.999	V	6.1	-88.49		17		7385
103.499	V	9.3	-87.30		28		7385
137.999	H	12.3	-85.11		51		7385
172.498	H	14.3	-98.67		14		7385
206.998	H	16.3	-105.33		8		7385
241.498	H	17.9	-100.37		17		7385
275.998	H	19.1	-97.58		27		7385
310.498	H	20.1	-91.29		62		7385
344.997	H	21.1	-102.90		18		7385

Table 3

RADIATED EMISSIONS DATA				CLIENT: ADRAD COMMUNICATIONS			
ANTENNA: DIPOLES				EUT: VHF REPEATER			
MODEL: MX800A2A2HWSZ4CD				TEST DATE: 24-FEB-01			
Channel 3: 38.900 MHz.				RECEIVE MODE CABINET RADIATION			
Frequency MHz.	Ant. H/V	Ant. Factor dB	Peak reading dBm	Duty cycle dB	Peak power uV/m@3m	Adjusted power uV/m@3m	FCC limit uV/m3m
89.300	V	7.9	-93.65		12		150
89.316	V	7.9	-95.11		10		150
89.589	V	7.9	-98.38		7		150
162.232	H	13.9	-102.44		8		150
Channel 3: 38.900 MHz.				TRANSMIT MODE CABINET RADIATION			
77.799	V	6.7	-83.01		34		7385
116.699	H	10.6	-84.29		46		7385
155.599	H	13.5	-90.47		32		7385
194.499	H	15.6	-100.03		13		7385
233.399	H	17.6	-102.37		13		7385
272.299	H	19.0	-97.85		26		7385
311.198	H	20.1	-91.88		58		7385
350.098	H	21.3	-103.15		18		7385
388.998	H	22.4	-109.54		10		7385

Table 4

RADIATED EMISSIONS DATA				CLIENT: ADRAD COMMUNICATIONS			
ANTENNA: DIPOLES				EUT: VHF REPEATER			
MODEL: MX800A3A3HWSZ4CD				TEST DATE: 26-FEB-01			
Channel 1: 39.100 MHz.				RECEIVE MODE CABINET RADIATION			
Frequency MHz.	Ant. H/V	Ant. Factor dB	Peak reading dBm	Duty cycle dB	Peak power uV/m@3m	Adjusted power uV/m@3m	FCC limit uV/m3m
86.003	V	7.6	-94.61		10		100
88.191	V	7.8	-89.37		19		150
89.836	V	8.0	-96.42		8		150
Channel 1: 39.100 MHz.				TRANSMIT MODE CABINET RADIATION			
78.199	V	6.7	-88.06		19		7385
117.299	V	10.7	-98.06		10		7385
156.391	H	13.6	-101.73		9		7385
195.499	H	15.6	-104.64		8		7385
243.599	H	17.6	-105.99		9		7385
273.699	H	19.1	-85.37		109		7385
312.799	H	20.1	-90.17		70		7385
351.899	H	21.3	-104.52		15		7385
390.998	H	22.4	-100.26		29		7385

Table 5

RADIATED EMISSIONS DATA				CLIENT: ADRAD COMMUNICATIONS			
ANTENNA: DIPOLES				EUT: VHF REPEATER			
MODEL: MX800A3A3HWSZ4CD				TEST DATE: 26-FEB-01			
Channel 2: 44.500 MHz.				RECEIVE MODE CABINET RADIATION			
Frequency MHz.	Ant. H/V	Ant. Factor dB	Peak reading dBm	Duty cycle dB	Peak power uV/m@3m	Adjusted power uV/m@3m	FCC limit uV/m3m
86.433	V	7.6	-96.27		8		100
88.626	V	7.8	-92.44		13		150
90.268	V	8.0	-98.03		7		150
Channel 2: 44.500 MHz.				TRANSMIT MODE CABINET RADIATION			
89.000	V	7.9	-90.84		16		7385
133.500	H	11.9	-94.36		17		7385
178.000	H	14.6	-97.13		17		7385
222.500	H	17.1	-103.87		10		7385
266.999	H	18.8	-81.20		170		7385
311.499	H	20.1	-94.25		44		7385
355.999	H	21.4	-106.69		12		7385
400.999	H	22.4	-97.38		40		7385
444.999	H	23.4	-94.21		64		7385

Table 6

RADIATED EMISSIONS DATA								CLIENT: ADRAD COMMUNICATIONS		
ANTENNA: DIPOLES				EUT: VHF REPEATER						
MODEL: MX800A3A3HWSZ4CD				TEST DATE: 26-FEB-01						
Channel 3: 49.900 MHz.				RECEIVE MODE CABINET RADIATION						
Frequency MHz.	Ant. H/V	Ant. Factor dB	Peak reading dBm	Duty cycle dB	Peak power uV/m@3m	Adjusted power uV/m@3m	FCC limit uV/m3m			
86.875	V	7.7	-95.52		9		100			
89.209	V	7.9	-96.55		8		150			
90.703	V	8.0	-97.06		8		150			
Channel 3: 49.900 MHz.				TRANSMIT MODE CABINET RADIATION						
99.800	V	8.9	-91.98		16		7385			
149.700	H	13.2	-103.02		7		7385			
199.600	H	15.9	-101.55		12		7385			
249.500	H	18.2	-101.86		15		7385			
299.399	H	19.8	-92.51		52		7385			
349.299	H	21.2	-90.32		78		7385			
399.199	H	22.4	-91.67		77		7385			
449.098	H	23.5	-86.25		163		7385			
498.998	H	24.5	-89.33		128		7385			

Table 7

RADIATED EMISSIONS DATA								CLIENT: ADRAD COMMUNICATIONS		
ANTENNA: DIPOLES				EUT: VHF REPEATER						
MODEL: MX800BBHWSZ5CD				TEST DATE: 26-FEB-01						
Channel 1: 72.020 MHz.				RECEIVE MODE CABINET RADIATION						
Frequency MHz.	Ant. H/V	Ant. Factor dB	Peak reading dBm	Duty cycle dB	Peak power uV/m@3m	Adjusted power uV/m@3m	FCC limit uV/m3m			
89.401	V	7.9	-94.75		10		150			
89.852	V	8.0	-90.05		18		150			
162.234	H	13.9	-94.27		21		150			
Channel 1: 72.020 MHz.				TRANSMIT MODE CABINET RADIATION						
144.039	H	12.7	-89.65		32		7385			
216.059	H	16.8	-106.43		7		7385			
288.079	H	19.4	-87.63		87		7385			
360.100	H	21.5	-92.66		62		7385			
432.120	H	23.2	-100.25		31		7385			
504.140	V	24.6	-111.39		10		7385			
576.160	H	26.1	-95.57		75		7385			
648.180	H	27.2	-102.61		38		7385			
720.200	V	28.0	-110.94		16		7385			

Table 8

RADIATED EMISSIONS DATA				CLIENT: ADRAD COMMUNICATIONS			
ANTENNA: DIPOLES				EUT: VHF REPEATER			
MODEL: MX800BBHWSZ5CD				TEST DATE: 26-FEB-01			
Channel 2: 74.000 MHz.				RECEIVE MODE CABINET RADIATION			
Frequency MHz.	Ant. H/V	Ant. Factor dB	Peak reading dBm	Duty cycle dB	Peak power uV/m@3m	Adjusted power uV/m@3m	FCC limit uV/m3m
89.498	V	7.9	-92.44		13		150
89.852	V	8.0	-91.78		14		150
162.234	H	13.9	-95.51		19		150
Channel 2: 74.000 MHz.				TRANSMIT MODE CABINET RADIATION			
148.000	H	13.1	-88.53		38		7385
222.000	H	17.1	-104.37		10		7385
296.000	H	19.7	-90.69		63		7385
370.000	H	21.7	-94.35		52		7385
444.000	H	23.4	-103.55		22		7385
518.000	V	24.8	-108.12		15		7385
592.000	H	26.5	-90.32		144		7385
666.000	H	27.5	-100.04		53		7385
740.000	V	28.5	-103.65		39		7385

Table 9

RADIATED EMISSIONS DATA				CLIENT: ADRAD COMMUNICATIONS			
ANTENNA: DIPOLES				EUT: VHF REPEATER			
MODEL: MX800BBHWSZ5CD				TEST DATE: 26-FEB-01			
Channel 3: 75.980 MHz.				RECEIVE MODE CABINET RADIATION			
Frequency MHz.	Ant. H/V	Ant. Factor dB	Peak reading dBm	Duty cycle dB	Peak power uV/m@3m	Adjusted power uV/m@3m	FCC limit uV/m3m
89.568	V	7.9	-91.73		14		150
89.852	V	8.0	-90.82		16		150
162.234	H	13.9	-93.01		25		150
Channel 3: 75.980 MHz.				TRANSMIT MODE CABINET RADIATION			
151.960	H	13.3	-86.34		50		7385
227.940	H	17.3	-102.88		12		7385
303.920	H	20.0	-88.05		89		7385
379.900	H	21.9	-102.95		20		7385
455.880	H	23.6	-100.92		30		7385
531.860	H	25.1	-106.03		20		7385
607.840	H	26.8	-87.17		215		7385
683.820	H	27.7	-96.05		86		7385
759.800	V	28.9	-105.29		34		7385



Receiver Testing Setup



Transmitter Radiated Testing Setup