

DNB ENGINEERING, INC.

CERTIFICATION
FOR
INTENTIONAL RADIATOR
902.2 – 927.5 MHz

per
Part 15 Subpart C
(CFR 47, 15.203, 15.249, 15.205, 15.207 & 15.209)

EUT: E-ZONE TOWER UNIT

PREPARED FOR APPLICANT:
E-Zone Research and Development Inc.
Suite 600, 520 – 5th Avenue SW
Calgary, AB T2P 3R7

REPORT # 86076-1
Test Date: June 9-11, 1998

Prepared By:
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Revision Letter	Number of Pages	Page No. of Rev.	Description	Date
A	37		Document Release	
				June 25, 1998

TRANSMITTAL SUMMARY

Unit tested: E-ZONE TOWER UNIT
FCC ID: NW3E9000A

Specifications: ANSI C63.4 (1992) and CFR 47 FCC part 15 Subpart C

Purpose of Report: This report was prepared to document the status of the E-ZONE TOWER UNIT with requirements of the standards listed above.

Requirements not applicable to EUT Part 15.37 - Not applicable
Emergency Broadcast System - Not applicable
Spread Spectrum Exhibit - Not applicable
Scanning Receiver - Not applicable

Test Summary The EUT's compliance status according to the tests performed is as follows.

REQUIREMENTS	STATUS
FCC part 15 Subpart C	
per 15.203, 15.249, 15.205, 15.207, & 15.209	COMPLIANT

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CERTIFICATION OF TEST DATA - per 2.911(d)

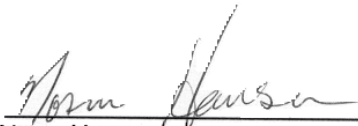
This report, containing emissions test data and evaluations, has been prepared by an independent electromagnetic compatibility laboratory, DNB ENGINEERING, in accordance with the applicable specifications and instructions required per the Introduction. DNB Engineering has been evaluated to do these tests by the American Association for Laboratory Accreditation, A2LA.



The data evaluation and equipment configuration presented herein are a true and accurate representation of the measurements of the test emissions characteristics as of the dates and at the times of the test under the conditions herein specified.

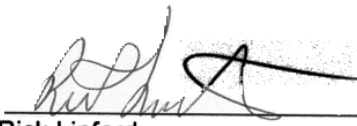
Equipment Tested: E-ZONE TOWER UNIT
FCC ID#: NW3E9000A
Dates of Test: June 9-11, 1998

Test Performed:


Norm Hansen
Test Technician

6/26/98
Date

Test Report Reviewed:


Rick Linford
Facility Manager
Regulatory Engineer

June 26/1998
Date

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1. INTRODUCTION

1.1 Administrative Data Per 2.1033(a) and 2.911(c)

1.1.1 REQUEST FOR CERTIFICATION Per 2.1033(b)1:

Applicant: **E-Zone Research and Development, Inc.**
Suite 600, 520 – 5th Avenue SW
Calgary, AB T2P 3R7

Contact: Don Lafont

Dates of Test: June 9-11, 1998

Equipment Under Test (EUT): E-ZONE TOWER UNIT
FCC ID: NW3E9000A

1.2 Related Authorizations

Verification to Digital Device Class B has been completed and passed.

1.3 Purpose of Tests

The purpose of this series of tests was to demonstrate the Electromagnetic Compatibility (EMC) characteristics of the EUT. The following tests were performed:

REQUIREMENTS	STATUS
FCC part 15 Subpart C	
per 15.203, <u>15.249</u> , 15.205, 15.207, & 15.209	COMPLIANT

2. TEST DESCRIPTION

2.1 Test Configuration

Unit Name – Processor, Monitor, Printer, Cable, etc. (indent for features of a unit)	Style/Model/ Part No.	Serial Number	Obj. of test	1 2 0 V	2 2 0 V	Comments/ FCC ID#
E-Zone Tower Unit			■	■		

- - Specific device(s) for which this test is being conducted.

2.2 Equipment Description

Compact Entertainment System for Fitness Industry. Audio/video system with self-contained audio CD, audio cassette tape, and television with wireless headphone. The audio channel of one of the three sources is transmitted to wireless headphones.

2.2.1 Mode of Operation

The EUT unit that was used during the testing contained special software that allowed the transmitter frequency to be changed manually. Other than allowing the transmit frequency to be selected manually, this special software allowed the EUT circuits and functions to behave as they would in normal operation. The frequency was selected using an on screen menu. In order to modulate the carrier of the transmitter a standard CD with music audio material was inserted into the tower unit. In order to simulate a video source a VCR was used to generate a TV channel 3 output that was connected to the input of the EUT.

2.3 Antenna Requirement - per 15.203

Antenna is internal and can not be removed or changed by operator.

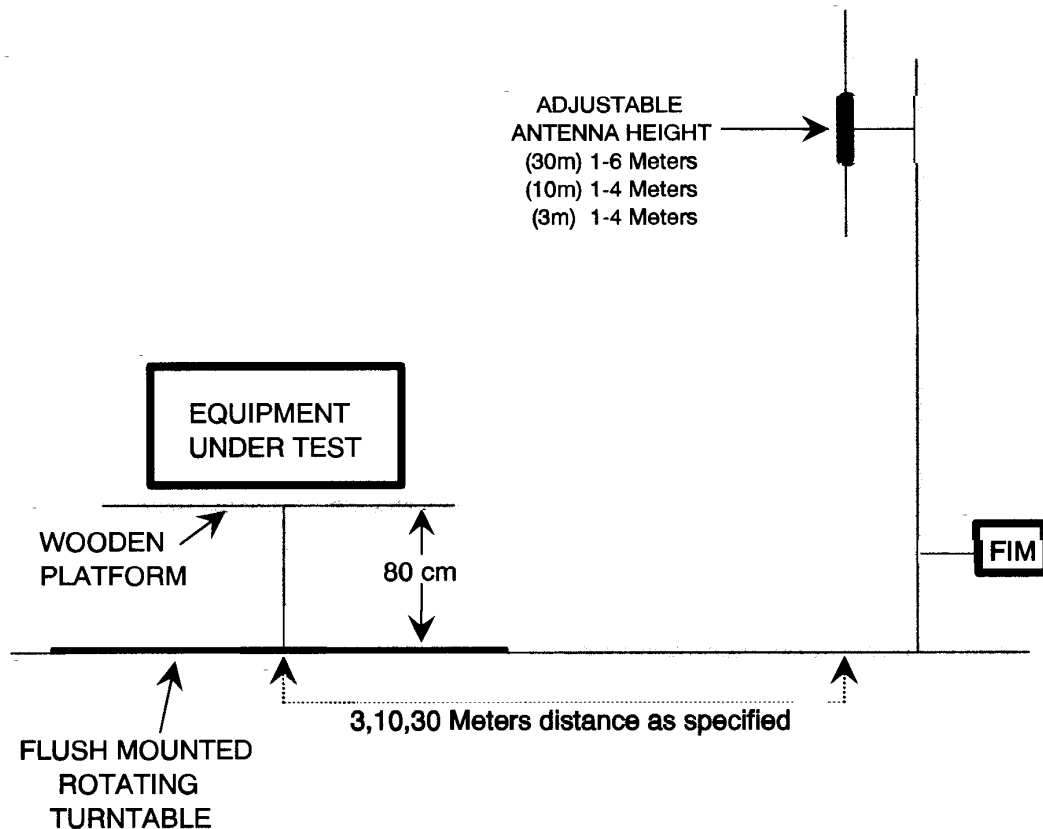
3. EMISSIONS FCC PART 15

per FCC part 15 Subpart C

3.1 Radiated Emissions Test Setup and Procedure - Per 2.1033(b)(6) Per 2.947(a)

The EUT was placed on a wooden table 1 meter wide and 1.5 meters long which rests on a flush mounted, steel-top turntable on the open area test site as shown in Section 3.1.1.1. The top of the table is 80 cm above the ground plane. The turntable can be rotated 360 degrees. Measuring antenna is set at the prescribed distance. Measurements are made with broad band antennas that have been correlated with tuned dipole antennas. The mast is 4.5 meters high and is self-supporting. The height of the antenna can be varied from 1 to 4 meters. Positioning of the antenna is controlled remotely.

3.1.1 Spurious Radiation Test Site Per 2.1033(b)6



Radiated Test Setup and Procedure - cont'd

The EUT is put into the operational test mode as stated in Section 2.2.1 is then started.

The spectrum analyzer is setup to store the peak emission over the band of the antenna. Peak EUT and ambient emissions are stored while the turntable is rotated 360°. Peak spectrum analyzer trace is then plotted with the addition of antenna and cable correction factors. The limit is plotted on the same graph. A receiver with CISPR Quasi Peak capabilities is then used on the frequencies identified as the highest with respect to the plotted limit. Ambients are noted on the graph along with EUT emissions. The highest EUT frequencies, with respect to the limit, are maximized.

To maximize emissions levels, the turntable is rotated and the antenna is raised and lowered to determine the point of maximum emanations. The cables are then manipulated at that point to maximize emissions. Measurements are made with the antennas in each horizontal and vertical polarization separately. The data obtained from these tests is corrected with the proper cable, preamplifier and antenna factors. The results are then transcribed onto tables that show the maximum emission levels. The highest emissions are listed in a Radiated Emissions Summary table.

If no emissions can be found, the lowest harmonics of the EUT clocks within the bands of the standard are tuned into with the receiver. If no emissions are found, the noise floor will be entered into the table and noted. A minimum of six frequencies will be logged. Summary results will reflect only actual emissions from the EUT.

Radiated Test Setup and Procedure - cont'd

The field intensity measurements are made using standard techniques with a spectrum analyzer or EMI receiver as the calibrated Field Intensity Meter (FIM). Preamplifiers and filters are used when required.

When using the Hewlett Packard Model 8568B Spectrum Analyzer as the FIM, the Analyzer is calibrated to read signal level in dBm. Where:

$$0 \text{ dBm (50 ohms)} = 107 \text{ dBuV (50 ohms)}$$

The signal level (dBuV) = indicated signal level (dBm) + 107 dB. To obtain the signal level in dBuV/m it is necessary to add the antenna factor in dB.

3.1.2 Example Of Typical Calculation Per 2.1033(b)6

Measurement Distance = 3 Meter		
Rohde and Schwarz reading @ 60 MHz	→	49.0 dBuV
Antenna Factor	+7.5 dBuV	
Cable Loss	+2.0 dBuV	
Preamplifier	-25.5 dBuV	
	-16.0 dBuV →	-16.0 dBuV
Field Strength dBuV/m at 3 Meter =	→	33.0 dBuV

The Following FCC limits for acceptance were used:

15.209

Limit 30 to 88 MHz:

$$100 \mu\text{V/M} = 20 \log (100) \text{ dB}\mu\text{V/M} = 40.0 \text{ dB}\mu\text{V/M} @ 3 \text{ Meters}$$

Limit 88 to 216 MHz:

$$150 \mu\text{V/M} = 20 \log (150) \text{ dB}\mu\text{V/M} = 43.5 \text{ dB}\mu\text{V/M} @ 3 \text{ Meters}$$

Limit 216 to 960 MHz:

$$200 \mu\text{V/M} = 20 \log (200) \text{ dB}\mu\text{V/M} = 46 \text{ dB}\mu\text{V/M} @ 3 \text{ Meters}$$

Limit >960 MHz:

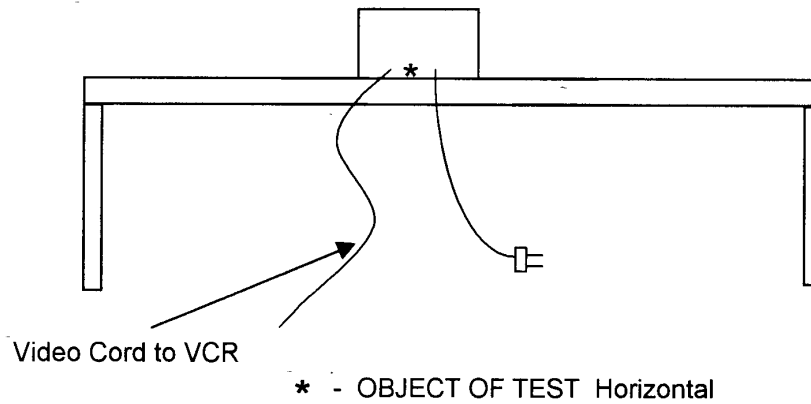
$$500 \mu\text{V/M} = 20 \log (500) \text{ dB}\mu\text{V/M} = 54.0 \text{ dB}\mu\text{V/M} @ 3 \text{ Meters}$$

15.249(a)

Limit 902 to 928 MHz (At the Carrier Frequency):

$$50,000 \mu\text{V/M} = 20 \log (50,000) \text{ dB}\mu\text{V/M} = 94.0 \text{ dB}\mu\text{V/M} @ 3 \text{ Meters}$$

3.1.3 Diagram of Test Setup - per 2.1033(b)5



3.1.4 Field Strength of Intentional Radiator Inside of Band

Measurements of radiated and conducted emission data were taken at low, mid and high end of the 902.2 to 927.5 MHz band. The test frequencies were: 902.1 MHz, 914 MHz, and 927.5 MHz.

The EUT was compliant with CFR 47, 15.249(a) field strength of intentional radiator.

Radiated Emissions at the edge of the Band Summary Test Data

per FCC part 15, Subpart C (15.249 (a) at 3 meters)

COMPANY EUT: E-ZONE TOWER UNIT			
Transmitter Field Strength Configuration A	Frequency MHz	Corrected Measurement (dBuV/m)	Limit (dBuV/m)
	902.00	77.8	94.0
	914.00	81.2	94.0
	927.50	82.8	94.0
Delta (dB)			
			-12.2
			-8.5
			-6.8

- Two highest frequencies relative to the Limit.
- Reference Appendix A for all data taken.

3.1.5 Emissions Radiated

The EUT was compliant with CFR 47, 15.249(c) radiated emissions requirements.

Measurements of radiated emission data were taken at low, mid and high end of the band to be used. The test frequencies were: 902.1 MHz, 914 MHz, and 927.5 MHz.

Radiated Emissions Summary Test Data

per FCC part 15, Subpart C (15.249 (c) at 3 meters

Table 3.1.5(1)

E-Zone Research & Development Inc.					EUT: E-Zone Tower Unit			
Freq. (MHz)	Meas'd (dBuV)	Amp Factors (dB)	Cable Factors (dB)	Antenna Factors (dB)	Total Factors (dB)	Corrected signal (dBuV/m)	Limit (dBuV/m)	Delta (dB)
9924.20	25.2	24.7	9.1	38.2	22.6	47.8	54.0	-6.2
8119.82	29.6	28.5	8.8	37.5	17.9	47.4	54.0	-6.6
9022.00	26.2	27.6	11.4	37.3	21.2	47.3	54.0	-6.7
9924.20	24.5	24.7	9.1	38.2	22.5	47.1	54.0	-6.9
9022.00	25.9	27.6	11.4	37.3	21.2	47.1	54.0	-6.9
8119.60	26.6	28.5	8.8	37.5	17.9	44.5	54.0	-9.5

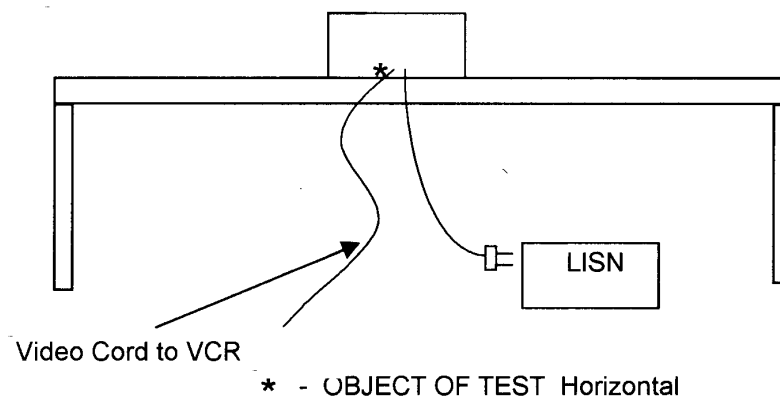
- Six highest frequencies relative to the Limit.
- Reference Appendix A for all data taken.

3.2 Conducted Emissions Test Setup and Procedure - Per 2.1033(b)(6) Per 2.947(a)

The EUT was in the Mode of Operation as stated in Section 2.2.1 and set up in the open area test site as shown in Section 3.2.1. The conducted tests are performed by inserting a 50 ohm, 50 uH LISN in series with the power line of the EUT. The tests are either performed on each unit individually or on several units at a time for each test configuration.

The spectrum analyzer is setup to store the peak emissions over the range stated in the applicable standard. Cables are then adjusted to maximize emissions. The peak spectrum analyzer trace and limits are plotted onto graph paper. A receiver (with CISPR quasi peak and average capability) is used to identify the highest frequencies with respect to the limit. Ambients are noted on the graph along with emissions from the EUT. EUT emissions with more than 10 dB margin may only have peak spectrum analyzer measurements taken. The highest levels are listed in the Conducted Emissions Summary Test Data.

3.2.1 *Diagram of Test Setup - per 2.1033(b)5*



3.2.2 Conducted Compliance Data - table #2

The EUT was compliant with FCC part 15 class B conducted emissions requirements.

Conducted Emission Summary Test Data per FCC part 15, Subpart C (15.207)

Configuration A	E-Zone Research & Development Inc.					E-Zone Tower Unit				
Equipment on LISN	Freq. MHz	Meas'd (dBuV)	LISN Factors	Cable Factors	Total Factors	Total (dBuV)	Limit (dBuV)	Delta	Detec. Mode	Line
902.1 MHz	14.318	40.10	0.70	1.20	1.90	42.00	48.0	-6.0	QP	p1
902.1 MHz	14.318	39.90	0.70	1.20	1.90	41.80	48.0	-6.2	QP	n
902.1 MHz	24.576	37.50	2.00	1.30	3.30	40.80	48.0	-7.2	QP	p1
914.0 MHz	6.494	39.70	0.30	0.70	1.00	40.70	48.0	-7.3	QP	n
914.0 MHz	6.861	39.60	0.30	0.80	1.10	40.70	48.0	-7.3	QP	n
927.5 MHz	6.805	39.30	0.30	0.80	1.10	40.40	48.0	-7.6	QP	n

- Reference Appendix A for all test data.
- Six highest frequencies relative to the Limit.
- P1 = Phase 1, P2 = Phase 2, P3 = Phase 3, N = Neutral

3.2.4 Spurious Band Edges

The test frequencies were: 902.2 MHz and 927.5 MHz.

Emissions at band edges showing compliance
with the lower limits.

Freq. (MHz)	Meas'd (dBuV)	Amp Factors (dB)	Cable Factors (dB)	Antenna Factors (dB)	Total Factors (dB)	Corrected signal (dBuV/m)	Limit (dBuV/m)	Delta (dB)
902.00	22.4	27.1	7.5	23.6	4.0	26.4	46.0	-19.6
928.00	23.5	27.0	7.6	23.8	4.4	27.9	46.0	-18.1

Client: _____ E-Zone _____
 Date: _____ File # 86076-1
 Rep.: Don Lafont
 System: E-Zone Tower Unit
 Engr: _____

Type	3 Meter										Comments			
	Freq. (MHz)	Meas'd (dBuV)	Amp Factors (dB)	Cable Factors (dB)	Antenna Factors (dB)	Total Factors (dBuV/m)	Total (dBuV/m)	FCC Limit	Hor/ Vert	Peak				
QP	902.100	77.8	27.1	7.5	23.6	4.0	81.80	94.0	301	1.00	Vert	R&S	QP	Run 3.1-Tune to frequency 902.1MHz
QP	902.100	75.0	27.1	7.5	23.6	4.0	79.00	94.0	328	2.88		R&S	QP	Run 3.1-Tune to frequency 902.1MHz
QP	914.000	81.2	27.0	7.6	23.7	4.3	85.50	94.0	0	1.00	Vert	R&S	QP	Run 2-Tune to frequency 914.0MHz
QP	914.000	79.3	27.0	7.6	23.7	4.3	83.60	94.0	0	1.75	Hor	R&S	QP	Run 2-Tune to frequency 914.0MHz
QP	927.500	82.8	27.0	7.6	23.8	4.4	87.20	94.0	360	1.00	Vert	R&S	QP	Run 2.1-Tune to frequency 927.5MHz
QP	927.500	79.6	27.0	7.6	23.8	4.4	84.00	94.0	360	1.00	Hor	R&S	QP	Run 2.1-Tune to frequency 927.5MHz

Data not valid for report unless signed by DNB personnel

Phone (801) 336-4433
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RADIATED EMISSIONS
Location #1 FCC Part 15 Class B

Client: E-Zone
Date: 11-Jun-98

File # 86076-1
Engr.: Norm Hansen

Rep.: Don La Font
System: E-Zone Tower Unit

Freq (MHz)	Meas'd (dBuV)	Amp Factors (dB)	Cable Factors (dB)	Antenna Factors (dB)	Total Factors (dBuV/m)	3 Meter			Height (m)	Azimuth (degree)	Delta (dB)	Hor/ Vert	HP/ R&S	Type	Comments
						Total	Limit	FCC							
9924.200	25.2	24.7	9.1	38.2	22.6	47.8	54.0	54.0	360	1.00	-6.2	Vert	HP/	Ave	Tune to frequency 902.2Mhz-nf
8119.920	29.6	28.5	8.8	37.5	17.9	47.4	54.0	54.0	323	1.00	-6.6	Vert	HP/	Ave	Tune to frequency 902.2Mhz
9022.840	26.2	27.6	11.4	37.3	21.2	47.3	54.0	54.0	360	2.00	-6.7	Hor/	HP/	Ave	Tune to frequency 902.2Mhz-nf
9924.200	24.5	24.7	9.1	38.2	22.6	47.1	54.0	54.0	360	2.00	-6.9	Hor/	HP/	Ave	Tune to frequency 902.2Mhz-nf
9022.100	25.9	27.6	11.4	37.3	21.2	47.1	54.0	54.0	360	1.00	-6.9	Vert	HP/	Ave	Tune to frequency 902.2Mhz-nf
8119.600	26.6	28.5	8.8	37.5	17.9	44.5	54.0	54.0	337	2.00	-9.5	Hor/	HP/	Ave	Tune to frequency 902.2Mhz
6315.800	28.1	30.3	7.2	35.7	12.6	40.7	54.0	54.0	349	1.00	-13.3	Hor/	HP/	Ave	Tune to frequency 902.2Mhz-nf
6315.320	27.7	30.3	7.2	35.7	12.6	40.4	54.0	54.0	314	1.75	-13.6	Hor/	HP/	Ave	Tune to frequency 902.2Mhz-nf
9924.200	35.8	24.7	9.1	38.2	22.6	58.4	54.0	54.0	360	1.00	4.4	Vert	HP/	Peak	Tune to frequency 902.2Mhz-nf
9924.200	34.2	24.7	11.4	37.3	21.2	57.1	54.0	54.0	360	2.00	3.1	Hor/	HP/	Peak	Tune to frequency 902.2Mhz-nf
9022.000	35.1	27.6	9.1	38.2	22.6	58.8	54.0	54.0	360	2.00	2.8	Hor/	HP/	Peak	Tune to frequency 902.2Mhz-nf
8119.820	37.5	28.5	8.8	37.5	17.9	56.3	54.0	54.0	360	1.00	2.3	Vert	HP/	Peak	Tune to frequency 902.2Mhz-nf
8119.680	34.9	28.5	8.8	37.5	17.9	55.4	54.0	54.0	323	1.00	1.4	Vert	HP/	Peak	Tune to frequency 902.2Mhz
7217.600	36.9	28.9	7.6	37.0	15.8	52.8	54.0	54.0	337	2.00	-1.2	Hor/	HP/	Peak	Tune to frequency 902.2Mhz
7217.600	35.8	28.9	7.6	37.0	15.8	52.7	54.0	54.0	0	1.50	-1.3	Hor/	HP/	Peak	Tune to frequency 902.2Mhz-nf
6315.400	37.7	30.3	7.2	35.7	12.6	51.6	54.0	54.0	0	1.00	-2.4	Vert	HP/	Peak	Tune to frequency 902.2Mhz-nf
6315.800	36.6	30.3	7.2	35.7	12.6	50.3	54.0	54.0	349	1.00	-3.7	Vert	HP/	Peak	Tune to frequency 902.2Mhz-nf
5413.184	35.1	29.0	6.0	34.0	10.9	48.2	54.0	54.0	314	1.75	-4.8	Hor/	HP/	Peak	Tune to frequency 902.2Mhz-nf
2706.586	39.8	27.7	4.1	29.5	5.9	45.7	54.0	54.0	349	1.00	-8.0	Vert	HP/	Peak	Tune to frequency 902.2Mhz
2706.604	38.1	27.7	4.1	29.5	5.9	45.7	54.0	54.0	332	2.00	-8.3	Hor/	HP/	Peak	Tune to frequency 902.2Mhz
3608.786	35.4	28.3	4.7	30.4	6.8	44.0	54.0	54.0	354	1.00	-10.0	Vert	HP/	Peak	Tune to frequency 902.2Mhz
5413.184	30.6	29.0	6.0	34.0	10.9	42.2	54.0	54.0	334	1.00	-11.8	Vert	HP/	Peak	Tune to frequency 902.2Mhz
3608.782	34.6	28.3	4.7	30.4	6.8	41.4	54.0	54.0	326	1.00	-12.5	Hor/	HP/	Peak	Tune to frequency 902.2Mhz
4510.988	31.6	29.3	5.9	32.2	8.8	40.4	54.0	54.0	325	1.75	-12.6	Hor/	HP/	Peak	Tune to frequency 902.2Mhz
4510.984	31.1	29.3	5.9	32.2	8.8	40.4	54.0	54.0	360	1.00	-13.6	Hor/	HP/	Peak	Tune to frequency 902.2Mhz
1804.500	34.8	26.5	3.4	27.3	4.2	39.9	54.0	54.0	360	1.00	-14.1	Vert	HP/	Peak	Tune to frequency 902.2Mhz
1804.480	31.6	26.5	3.4	27.3	4.2	39.0	54.0	54.0	343	1.00	-15.0	Vert	HP/	Peak	Tune to frequency 902.2Mhz
1804.480	31.6	26.5	3.4	27.3	4.2	35.8	54.0	54.0	343	2.50	-18.2	Hor/	HP/	Peak	Tune to frequency 902.2Mhz

1100 E. Chalk Creek Road.
 Coalville Utah, 84017

Data not valid for report unless signed by DNB personnel

Norm Hansen

Phone (801) 336-4433
 Fax (801) 336-4436

RADIATED EMISSIONS
Location #1 FCC Part 15 Class B

Client: E-Zone
Date: 11-Jun-98

File # 88076-1
Engr: _____

Rep.: Don La Font
System: E-Zone Tower Unit

Amp				Delta				Meas				n=noise floor	
Meas'd (dBuV)	Factors (dB)						Delta (dB)		Hor/ Vert	Type	Peak	Comments	
30.9	28.2	9.0	37.5	18.3	49.2	54.0	-4.8	352	1.00	Vert	HP/	Ave	i tune to frequency 914Mhz
26.7	27.5	10.9	37.5	20.9	47.7	54.0	-6.3	0	1.00	Vert	HP/	Ave	Tune to frequency 914Mhz
	27.5	10.9	37.5	20.9	46.2	54.0	-7.8	360	2.00	Hor/	HP/	Ave	Tune to frequency 914Mhz
	30.3	7.3	35.9	12.9	44.3	54.0	-9.7	345	1.00	Vert	HP/	Ave	Tune to frequency 914Mhz
	28.8	7.8	37.1	16.1	44.1	54.0	-9.9	330	1.00	Vert	HP/	Ave	Tune to frequency 914Mhz
	28.2	9.0	37.5	18.3	43.5	54.0	-10.5	2	2.20	Hor/	HP/	Ave	Tune to frequency 914Mhz
	28.8	7.8	37.1	16.1	41.4	54.0	-12.6	304	2.00	Hor/	HP/	Ave	Tune to frequency 914Mhz
	30.3	7.3	35.9	12.9	39.1	54.0	-14.9	0	2.20	Hor/	HP/	Ave	Tune to frequency 914Mhz
	28.2	9.0	37.5	18.3	57.3	54.0	3.3	352	1.00	Vert	HP/	Peak	Tune to frequency 914Mhz
	27.5	10.9	37.5	20.9	56.7	54.0	2.7	0	1.00	Vert	HP/	Peak	Tune to frequency 914Mhz
	27.5	10.9	37.5	20.9	56.7	54.0	2.7	360	2.00	Hor/	HP/	Peak	Tune to frequency 914Mhz
	28.8	7.8	37.1	16.1	53.6	54.0	-0.4	330	1.00	Vert	HP/	Peak	Tune to frequency 914Mhz
	28.2	9.0	37.5	18.3	53.5	54.0	-0.5	2	2.20	Hor/	HP/	Peak	Tune to frequency 914Mhz
	30.3	7.3	35.9	12.9	51.8	54.0	-2.2	345	1.00	Vert	HP/	Peak	Tune to frequency 914Mhz
	28.8	7.8	37.1	16.1	50.9	54.0	-3.1	304	2.00	Hor/	HP/	Peak	Tune to frequency 914Mhz
	30.3	7.3	35.9	12.9	48.6	54.0	-5.4	0	2.20	Hor/	HP/	Peak	Tune to frequency 914Mhz
	29.0	6.0	34.0	11.0	47.4	54.0	-6.6	346	1.00	Vert	HP/	Peak	Tune to frequency 914Mhz
	27.7	4.1	29.6	6.0	47.3	54.0	-6.7	8	1.00	Vert	HP/	Peak	Tune to frequency 914Mhz
	29.0	6.0	34.0	11.0	46.7	54.0	-7.3	360	1.50	Hor/	HP/	Peak	Tune to frequency 914Mhz
	28.3	4.8	30.5	7.0	44.9	54.0	-9.1	331	1.00	Vert	HP/	Peak	Tune to frequency 914Mhz
	29.3	5.9	32.5	9.1	43.2	54.0	-10.8	360	1.00	Vert	HP/	Peak	Tune to frequency 914Mhz-nf
	28.3	4.8	30.5	7.0	43.1	54.0	-10.9	360	2.00	Hor/	HP/	Peak	Tune to frequency 914Mhz
	29.3	5.9	32.5	9.1	43.1	54.0	-10.9	360	2.00	Hor/	HP/	Peak	Tune to frequency 914Mhz-nf
	27.7	4.1	29.6	6.0	41.9	54.0	-12.1	93	2.25	Hor/	HP/	Peak	Tune to frequency 914Mhz
	26.5	3.4	27.4	4.3	39.7	54.0	-14.3	319	1.00	Vert	HP/	Peak	Tune to frequency 914Mhz
	26.5	3.4	27.4	4.3	38.7	54.0	-15.3	346	2.00	Hor/	HP/	Peak	Tune to frequency 914Mhz

Meas
Type

nf=noise floor

1100 E. Chalk Creek Road,
Coalville Utah, 84017

Data not valid for report unless signed by LNB personnel

Wmman P. Davis

Phone (801) 336-4433
Fax (801) 336-4436

RADIATED EMISSIONS
Location #1 FCC Part 15 Class B

Client: _____
Date: _____

File # _____
Engr.: _____

Rep.: Don LaFont
System: E-Zone Tower Unit

3 Meter										Meas				
Meas'd (dBuV)	Amp Factors (dB)	Cable Factors (dB)	Antenna Factors (dB)	Total Factors (dBuV/m)	Total (dBuV/m)	FCC Limit (dBuV/m)	Delta (dB)	Height (m)	Hor/ Vert	HP/ R&S	Type	Comments		
													Ave	Peak
6492.680	31.0	30.3	7.4	36.2	13.3	44.3	54.0	-9.7	351	1.00	Vert	HP/	Ave	Tune to frequency 927.5Mhz
		30.3	7.4	36.2	13.3	42.3	54.0	-11.7	341	2.00	Hor/	HP/	Ave	Tune to frequency 927.5Mhz
		30.3	7.4	36.2	13.3	51.9	54.0	-2.1	351	1.00	Vert	HP/	Peak	Tune to frequency 927.5Mhz
		30.3	7.4	36.2	13.3	47.0	54.0	-7.0	341	2.00	Hor/	HP/	Peak	Tune to frequency 927.5Mhz
		28.3	4.9	30.6	7.2	44.5	54.0	-9.5	101	1.00	Vert	HP/	Peak	Tune to frequency 927.5Mhz
		28.3	4.9	30.6	7.2	43.5	54.0	-10.5	0	2.00	Hor/	HP/	Peak	Tune to frequency 927.5Mhz
		27.7	4.1	29.8	6.2	42.5	54.0	-11.5	178	1.00	Vert	HP/	Peak	Tune to frequency 927.5Mhz
36.2		27.7	4.1	29.7	6.2	42.4	54.0	-11.6	54	1.75	Hor/	HP/	Peak	Tune to frequency 927.5Mhz
		26.5	3.4	27.6	4.5	41.6	54.0	-12.4	30	1.00	Vert	HP/	Peak	Tune to frequency 927.5Mhz
		26.5	3.4	27.6	4.5	38.7	54.0	-15.3	326	2.00	Hor/	HP/	Peak	Tune to frequency 927.5Mhz

1100 E. Chalk Creek Road,
Coalville Utah, 84017

Data not valid for report unless signed by DNB personnel

Harman P. Kuse

Phone (801) 336-4433
Fax (801) 336-4436

CONDUCTED EMISSIONS
Location #1 FCC Part 15 Class B

Client: _____		E-Zone		File # 86076-1		Rep : Don Lafont						
Date : _____		Engr.: _____		Norm Hansen		System: E-Zone Tower Unit						
Freq. (MHz)	Meas'd (dBuV)	LISN Factors (dB)	Cable Factors (dB)	Total Factors (dB)	Total (dBuV)	FCC Limit (dBuV)	Delta (dB)	Meas		HP/ R&S	Comments	
								Type	Ave			
								Peak	QP	Phase N,P1,P2,P3		
14.318	40.10	0.7	1.2	1.9	42.00	48.0	-6.00	QP		p1	R&S	Run 3-Tune to frequency 902.1MHz
14.318	39.90	0.7	1.2	1.9	41.80	48.0	-6.20	QP		n	R&S	Run 3-Tune to frequency 902.1MHz
24.576	37.50	2.0	1.3	3.3	40.80	48.0	-7.20	QP		p1	R&S	Run 3-Tune to frequency 902.1MHz
6.494	39.70	0.3	0.7	1.0	40.70	48.0	-7.30	QP		n	R&S	Run 3-Tune to frequency 914.0MHz
6.861	39.60	0.3	0.8	1.1	40.70	48.0	-7.30	QP		n	R&S	Run 3-Tune to frequency 914.0MHz
6.805	39.30	0.3	0.8	1.1	40.40		-7.60	QP		n	R&S	Run 3-Tune to frequency 927.5MHz
6.861	39.20	0.3	0.8	1.1	40.30	48.0	-7.70	QP		p1	R&S	Run 3-Tune to frequency 914.0MHz
6.602	38.70	0.3	0.8	1.1	39.80	48.0	-8.20	QP		n	R&S	Run 3-Tune to frequency 902.1MHz
6.623	38.30	0.3	0.8	1.1	39.40	48.0	-8.60	QP		p1	R&S	Run 3-Tune to frequency 902.1MHz

1100 E. Chalk Creek Rd.
Coalville UT, 84017

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UNCERTAINTY TOLERANCE

DNB Engineering's Utah Facility is within acceptable uncertainty tolerances per ANSI C63.4 (1992) sections 5.4.6.1 and 5.4.6.2 as well as CISPR 16-1(1993) Annex M, section M.2.

ANSI C63.4 (1992)

5.4.6.1 Site Attenuation. A measurement site shall be considered acceptable for radiated electromagnetic field measurements if the horizontal and vertical NSA derived from measurements, i.e., the "measured NSA," are within ± 4 dB of the theoretical NSA (5.4.6.3) for an ideal site.

5.4.6.1 NSA Tolerance. The ± 4 dB tolerance in 5.4.6.1 includes instrumentation calibration errors, measurement technique errors, and errors due to site anomalies. These errors are analyzed in ANSI C63.6-1988 [3], wherein it is shown that the performance of a well-built site contributes only 1 dB of the total allowable tolerance.

CISPR 16-1 (1993)

M.2 Error analysis

... The total estimated errors are the basis for the ± 4 dB site acceptability criterion consisting of approximately 3 dB measurement uncertainty and an additional allowable 1 dB for site imperfections.



THE AMERICAN
ASSOCIATION
FOR LABORATORY
ACCREDITATION

ACCREDITED LABORATORY

A2LA has accredited

DNB ENGINEERING, INC.
Coalville, UT

for technical competence in the field of

Electrical (EMC) Testing

The accreditation covers the specific tests and types of tests listed on the agreed scope of accreditation. This laboratory meets the requirements of ISO/IEC Guide 25-1990 "General Requirements for the Competence of Calibration and Testing Laboratories" (equivalent to relevant requirements of the ISO 9000 series of standards) and any additional program requirements in the identified field of testing.

Presented this 9th day of July, 1997.



President
For the Accreditation Council
Certificate Number 844.01
Valid to August 31, 1999

For tests or types of tests to which this accreditation applies, please refer
to the laboratory's Electrical (EMC) Scope of Accreditation



American Association for Laboratory Accreditation

SCOPE OF ACCREDITATION TO ISO/IEC GUIDE 25-1990

DNB ENGINEERING, INC.
1100 East Chalk Creek Road
Coalville, UT 84017
Rick Linford Phone: 801 336 4433

ELECTRICAL (EMC)

Valid to: August 31, 1999

Certificate Number: 0844-01

In recognition of the successful completion of the A2LA evaluation process, accreditation is granted to this laboratory to perform the following electromagnetic compatibility tests:

<u>Tests:</u>	<u>Standard(s):</u>
RF Emission	FCC Part 15 (subpart B and C) using ANSI C63.4-1992, CISPR 11, CISPR 13, CISPR 14, CISPR 22, EN 55011, EN 55013, EN 55014, EN 55022, EN 60601-1-2, EN 50081-1, EN 50081-2, FCC Part 18, IEC 601-1-2, AS/NZS 1044, AS/NZS 1053, AS/NZS 3548, AS/NZS 4251.1
RF Immunity	EN 50082-1, EN 50082-2, AS/NZS 4251.1
Radiated Susceptibility	EN 61000-4-3, ENV 50140, ENV 50204, IEC 1000-4-3, IEC 801-3 EN 61000-4-2, IEC 1000-4-2, IEC 801-2 EN 61000-4-4, IEC 1000-4-4, IEC 801-4
Surge	EN 61000-4-5, ENV 50142, IEC 1000-4-5, IEC 801-5
Injected RF Immunity	EN 61000-4-6, ENV 50141, IEC 1000-4-6, IEC 801-6

Revised 08/22/97

Roxanne M. Robinson





Worldwide Testing and Certification

ELA 4

EMC Laboratory Authorization

Aut. No. : ELA 116

EMC Laboratory: **DNB Engineering, Inc.
1100 E. Chalk Creek Rd.
Coalville, UT 84017, USA**

Scope of Authorization: **All CENELEC standards [ENs] for EMC that are listed on the accompanying page, and, all of the corresponding CISPR, IEC, and ISO EMC standards that are listed on the accompanying page.**

This Authorization Document confirms that the above mentioned EMC Laboratory has been validated against EN 45001 and found to be compliant. The laboratory also fulfils the conditions described in Nemko Document ELA 10. During Nemko's visit to the laboratory on 05 October 1997, an assessment was made of the relevant parts of your organisation - i.e. facilities, personnel qualifications, test equipment, and testing practices. It was found that the EMC Laboratory is capable of performing tests within the Scope of Authorization given on the accompanying page. Accordingly, Nemko will accept your test reports as a basis for attesting conformity to these EMC Standards for the products in question under either the European Union EMC Directive or the European Union Automotive EMC Directive (as applicable).

In case of applications for Product Certification(s) to be issued by Nemko, your EMC Laboratory's test report(s) will be accepted by Nemko if they are enclosed with the Application Form submitted by the manufacturer.

In order to maintain the Authorization, the information given in the enclosed ELA-INFOs (if any) must be carefully followed. Nemko is to be promptly notified about any changes in the situation at your EMC Laboratory which may affect the basis for this Authorization. The Authorization may at any time be withdrawn if the conditions are no longer considered to be fulfilled.

The Authorization is valid through February 28, 1999.

Oslo, 04 mai 1998

For Nemko AS:

Kjell Bergh, Head of EMC Section

Postal address:

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N-0314 OSLO, NORWAY

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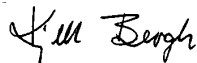
EMC Laboratory Authorization**Aut. No. : ELA 116****(Page 2 of 2)****SCOPE OF AUTHORIZATION****GENERIC & PRODUCT-FAMILY STANDARDS**

EN 50081-1 + EN 50081-2	EN 50082-1 + EN 50082-2	EN 50083-2
EN 50199	EN 55011	EN 55013
EN 55014-1 / -2	EN 55015	EN 55020
EN 55022	EN 60601-1-2	EN 60945
EN 61000-3-2, EN 60555-2	EN 61000-3-3, EN 60555-3	

BASIC STANDARDS

EN 61000-4-2, IEC 1000-4-2, IEC 801-2	EN 61000-4-3, ENV 50140, ENV 50204, IEC 1000-4-3, IEC 801-3	EN 61000-4-4, IEC 1000-4-4, IEC 801-4
EN 61000-4-5, ENV 50142, IEC 1000-4-5	EN 61000-4-6, ENV 50141, IEC 1000-4-6	EN 61000-4-8, IEC 1000-4-8
EN 61000-4-11, IEC 1000-4-11		

Oslo, 04 mai 1998


Kjell Bergh, Nemko EMC Services

SITE CHARACTERISTICS, CHALK CREEK EMI TEST SITE

General:

The DNB Engineering test facility is located in Chalk Creek Canyon near Coalville, Utah. Site characteristics were measured according to the procedures outlined in ANSI C63.4 (1992) "Characteristics of Open Field Test Site". The results of these characterizations indicate that the Chalk Creek site is an outstanding facility to perform accurate and repeatable EMI tests.

This facility has been FCC approved to perform class B certification testing since January, 1986. In October of 1996, according to the FCC requirement to re-apply every three years, the facility was recertified. Certification was granted for the 3, 10, and 30 meter positions for both ranges. Facility approval was granted by the FCC Oct. 15, 1996 under file number 31040/PRV 1300F2.

In July of 1997, **The American Association for Laboratory Accreditation, A2LA**, granted accreditation to this facility. Standards for which accreditation was granted: RF Emissions: ANSI C63.4 - 1992, FCC Part 15 subpart B and C, FCC Part 18 CISPR 11, CISPR 13, CISPR 14, CISPR 22, EN 55011, EN 55013, EN 55014, EN 55022, EN 60601-1-2, EN 50081-1, EN 50081-2, IEC 601-1-2; RF Immunity: EN 50082-1, EN 50082-2, Radiated Susceptibility: EN 61000-4-3, ENV 50140, ENV 50204, IEC 1000-4-3, IEC 801-3, ESD: EN 61000-4-2, IEC 1000-4-2, IEC 801-2, EFT: EN 61000-4-4, IEC 1000-4-4, IEC 801-4, Surge: EN 61000-4-5, ENV 50142, IEC 1000-4-5, IEC 801-5, Injected RF Immunity: EN 61000-4-6, ENV 50141, IEC 1000-4-6, IEC 801-6

In September, 1994 the National Certified Testing/Competent/ Notified Body for Norway and Scandinavian Countries (NEMKO) approved this test facility. DNB now offers the testing required for the CE Mark. **NEMKO EMC Laboratory Authorization No.: ELA 131** Standards for which accreditation was granted: RF Emission: EN 55011, EN 55022, EN 50081-1, EN 50081-2; RF Immunity: EN 50082-1, EN 50082-2

In September, 1994, the New Zealand Ministry of Commerce certified that DNB ENGINEERING, INC. EMC facilities meet their laboratory approval criteria for EMC testing and placed DNB ENGINEERING on their list of Ministry-Approved laboratories.

In August, 1995, VCCI certified that the Chalk Creek facility was acceptable to perform EMI test according to VCCI requirements. The certificate number is 715.

Ambient Emissions

Ambient emission measurements were made to determine the level of the ambient emanations at the DNB test facility. The results indicate that all ambient signals are below the FCC, and VCCI radiated emission limits or that each can easily be identified as an ambient signal.

Test Equipment for Emissions

Description	Manufacturer	Model	Serial	CalDue
Antenna Mast, site 2 (30m)	AH Systems	AMSC-6	2159-4C	
Plotter	HP	7475A	2517A20261	
Printer	HP	2671G	2520A31080	
PRE Amp (30m)	HP	8447D	2727A06182	3/4/99
PRE Amp (3,10m)	HP	8447D	2727A06180	6/20/98
CISPR Adapter site 2	HP	85650A	2043A00277	8/7/98
Computer desk top site 1	HP	9826A	2439A09175	
Spectrum Analyzer site 2	HP	8568B	1721A00113	8/7/98
Receiver site 2	R&S	ESH3	872842/045	1/27/99
Receiver site 2	R&S	ESVP	882402/005	1/27/99
Spectrum Monitor site 2	R&S site 1	EZM(3)	880 087/038	
Log Periodic Antenna site 2	SCH	UHAL09107	91071004(L10)	10/24/98
Biconical Antenna site 2	SCH	BBA9106	11	7/5/98
LISN	SCH	NSLK 8126	142	10/24/98
LISN	SCH	NNLA 8120	301	10/24/98
Bicon Antenna	AH SYS	SAS-200/543	183	
Log Periodic Antenna	AH SYS	SAS-200/512	322	
Horn Antenna, Double Rdg Gd	AH SYS	SAS-200/571	222	6/24/98
Horn Antenna	AR	AT4000	10801	
Antenna Mast, site 1(30m outside)	DNB	2159-2	AMS6	
Antenna Mast, site 1(10m inside)	EMCO 1	1050*	1236a	
Antenna Mast, site 1(3m inside)	EMCO1	1050*	1236b	
Printer	HP	2671G	2520A31883	
Computer desk top	HP	9826A	231A05633	
PRE Amp (3m)	HP	8447D	2727A06191	6/18/98
PRE Amp (30m) site 1	HP	8447D	2727A06181	6/20/98
CISPR Adapter site 1 (ref. only)	HP	85650A	2043A00124	10/24/98
Plotter	HP	7475A	2325A64445	
Spectrum Analyzer site 1	HP	8568B	2421A00516	10/24/98
RF/Preselector site 1 (ref. only)	HP	85685A	2724A00659	10/24/98
PRE Amp. (10m)	HP	8447D	2727A06184	6/18/98
Amplifier	Mini-Circuits	ZHL-1042J	N111496-6	
Amplifier (2-20 GHz, 22dB gain)	MITEQ	AFS6-02002000-18O-MP	428738	6/17/97
Receiver site 1	R&S	ESH3	882399/025	6/19/98
Spectrum Monitor site 1	R&S	EZM(3)	880 487/037	
Receiver site 1	R&S	ESVP	879807/048	6/19/98
LISN	SCH	NNLK 8121	218	10/23/98
Biconical Antenna site 1	SCH	BBA1906	13	10/24/98
Log Periodic Antenna	SCH	UJALP9107	2C	
LISN	SCH	NNLK 8121	156	10/23/98
Antenna Mast site 1 port. (10m outside)	Unisys	U-258	CC-300-5023	

