FCC PART 15 SUBPART C
CERTIFICATION REPORT

FOR

PORTABLE RFID TAG READER

MODEL: MOTHER TAG

FCC ID NO: HE7MTG

REPORT NO: 03U2096-1

ISSUE DATE: JULY 22, 2003

Prepared for

EXI WIRELESS SYSTEMS INC.
SUITE 100, 13551 COMMERCE PARKWAY
RICHMOND, BC
CANADA

Prepared by

COMPLIANCE CERTIFICATION SERVICES
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1. VERIFICATION OF COMPLIANCE

COMPANY NAME	:	EXI WIRELESS SYSTEMS INC. SUITE 100, 13551 COMMERCE PARKWAY RICHMOND BC, CANADA
EUT DESCRIPTION	:	PORTABLE RFID TAG READER
MODEL NO	:	MOTHER TAG
FCC ID	:	HE7MTG
DATE TESTED	:	7-22-2003
REPORT NUMBER	:	03U2096-1

TYPE OF EQUIPMENT	RF TAGS
EQUIPMENT TYPE	307KHz / 433.92MHz TRANSCEIVERS
MEASUREMENT PROCEDURE	ANSI C63.4 / 2001
LIMIT TYPE	CERTIFICATION
FCC RULE	CFR 47, PART 15

The above equipment was tested by Compliance Certification Services for compliance with the requirements set forth in the FCC CFR 47, PART 15. The results of testing in this report apply to the product/system which was tested only. Other similar equipment will not necessarily produce the same results due to production tolerance and measurement uncertainties. **Warning** : This document reports conditions under which testing was conducted and results of tests performed. This document may not be altered or revised in any way unless done so by Compliance Certification Services and all revisions are duly noted in the revisions section. Any alteration of this document not carried out by Compliance Certification will constitute fraud and shall nullify the document.

Tested By:

CHIN PANG
EMC TECHNICIAN
COMPLIANCE CERTIFICATION SERVICES

Approved & Released By:

THU CHAN
EMC SUPERVISOR
COMPLIANCE CERTIFICATION SERVICES

2. PRODUCT DESCRIPTION

Fundamental Frequency	**307KHz / 433.92 MHz**
Power Source	**3V Battery**
Transmitting Time	**Periodic ≥ 5 seconds**
Associated Receiver	**NA**
Manufacturer	**EXI Wireless Systems Inc.**

3. TEST FACILITY

The 3/10/30 meter open area test site and conducted measurement facility used to collect the radiated data is located at 561F Monterey Road, Morgan Hill, California, U.S.A. A detailed description of the test facility was submitted to the Commission on May 27,1994.

4. MEASUREMENT STANDARD

The site is constructed and calibrated in conformance with the requirements of ANSI C63.4/2001.

5. TEST METHODOLOGY

For an intentional radiator, the spectrum shall be investigated from the lowest radio frequency signal generated in the device, without going below 9 KHz, up to at least the tenth harmonic of the highest fundamental frequency or to 40 GHz, whichever is lower. (CFR 47 Section 15.33)

6. MEASUREMENT EQUIPMENT USED

TEST EQUIPMENT LIST

Name of Equipment	Manufacturer	Model No.	Serial No.	Due Date
Antenna, Loop 9 kHz ~ 30 MHz	EMCO	6502	9202-2722	4/23/2004
SA Display Section 2	HP	85662A	2816A16696	5/22/2004
SA RF Section, 1.5 GHz	HP	85680B	2732A03661	5/22/2004
Quasi-Peak Adaptor	HP	85650A	2811A01155	5/22/2004
Antenna, Bilog	Chase	CBL6112B	2586	3/6/2004
Spectrum Analyzer	Agilent	E4446A	NA	1/13/2004
Preamplifier, 1300 MHz	HP	8447D	2944A06589	8/22/2003
Antenna, Horn 1 ~ 18 GHz	EMCO	3115	6717	2/4/2004
Preamplifier, 1-26GHz MHz	Miteq	NSP10023988	63250761R	4/18/2004

7. POWERLINE RFI LIMIT

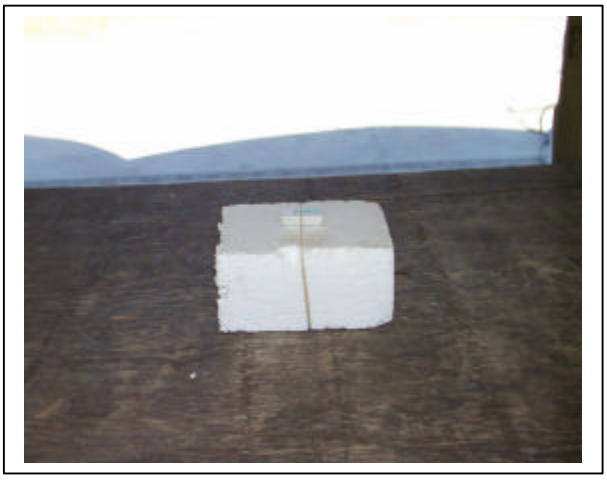
CONNECTED TO AC POWER LINE	SECTION 15.207
CARRIER CURRENT SYSTEM IN THE FREQUENCY RANGE OF 150 KHzTO 30 MHz	SECTION 15.205 AND SECTION 15.209, 15.221, 15.223, 15.225 OR 15.227, AS APPROPRIATE.
BATTERY POWER	NOT REQUIRED

8. RADIATED EMISSION LIMITS

GENERAL REQUIREMENTS	SECTION 15.209
RESTRICTED BANDS OF OPERATION	SECTION 15.205
PERIODIC OPERATION IN THE BAND 40.66 - 40.70 MHz AND ABOVE 70 MHz.	SECTION 15.231(e)

9. SYSTEM TEST CONFIGURATION

Use a block of foam and combined it with EUT wrapping rubber band around it. This way it can test X.Y, and Z axis. To activate continuous transmission, place a small plastic block between rubber band and EUT push button.



X-Axis

Y-Axis

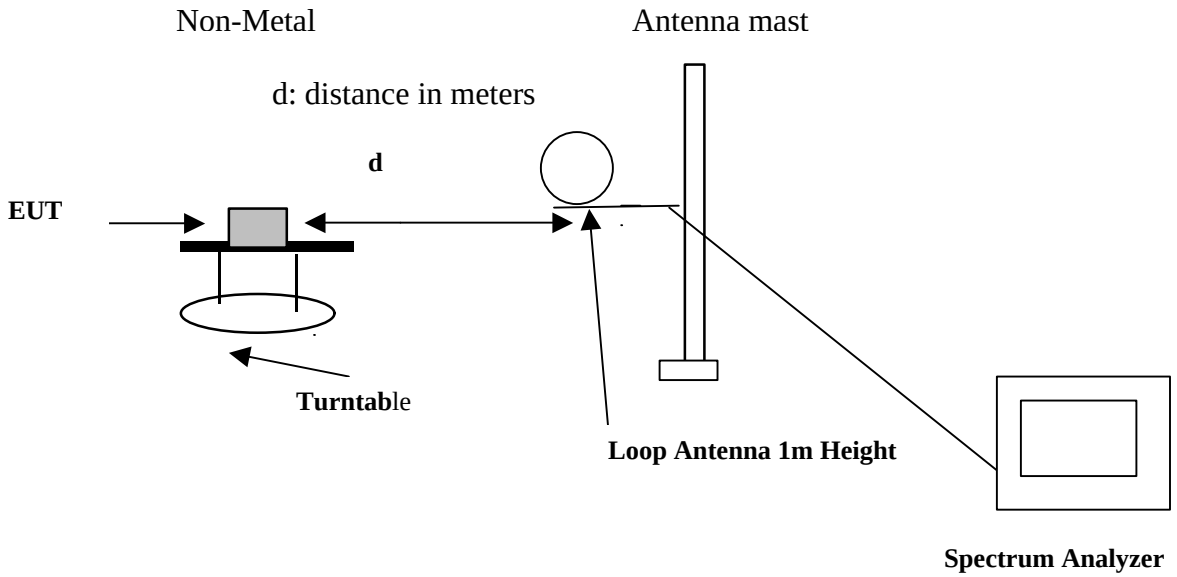
Z-Axis

Radiated Open Site Test Set-up

10. TEST PROCEDURE

Radiated Emissions, 15.209

Test Set-up for frequency range below 30 MHz



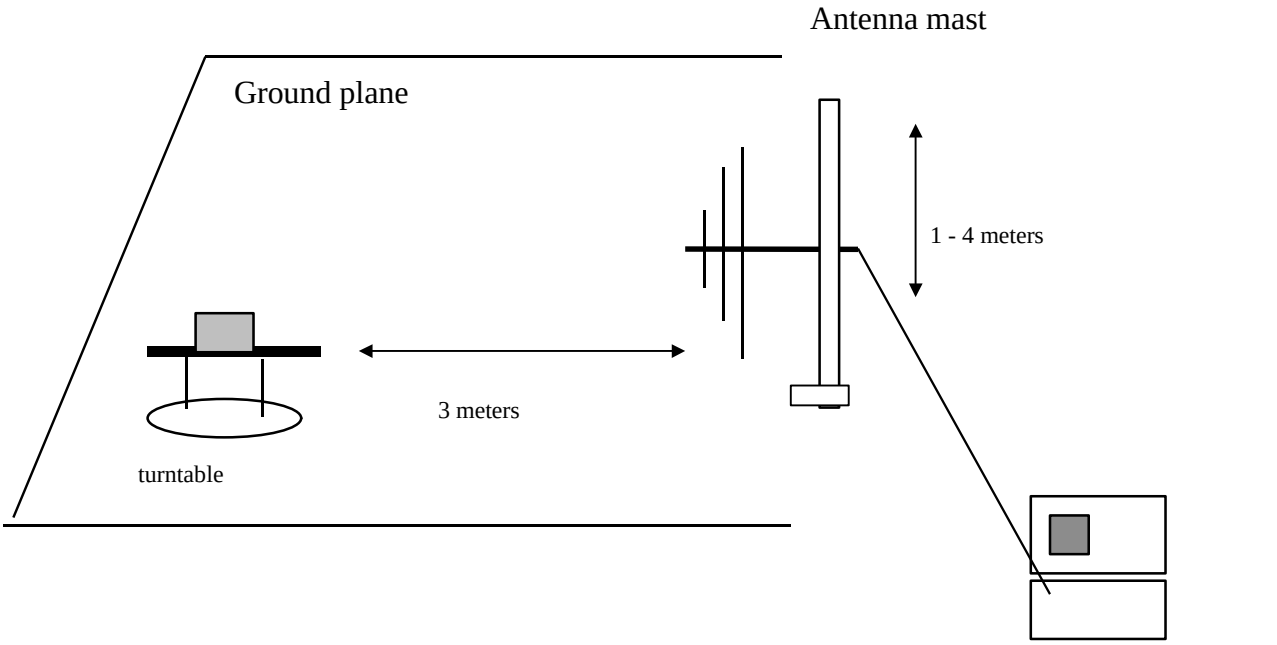
Test Procedure:

The measurement is made on open field test site, the H field produced by the EUT is measured using an active loop antenna, measurement is done at 3m distances from the EUT with an extrapolation of corrected distance factor. The loop antenna is rotated around it's axis to maximize the emission, the antenna of the EUT was placed at three different orientations, X, Y and Z to find the worst orientation, the worst orientation was found to be when the antenna of the EUT is in vertical position and the plane of the loop antenna is in parallel with the antenna of the EUT.

The RBW of the spectrum analyzer is set to 10kHz, VBW is set to 10kHz, reading on the analyzer in dBuV was added to cable loss and antenna factor in dBS/m to get the H field in dBuA/m.

Radiated Emissions, 15.231(4)(b)

Test Set-up for frequency range 30 – 1000 MHz

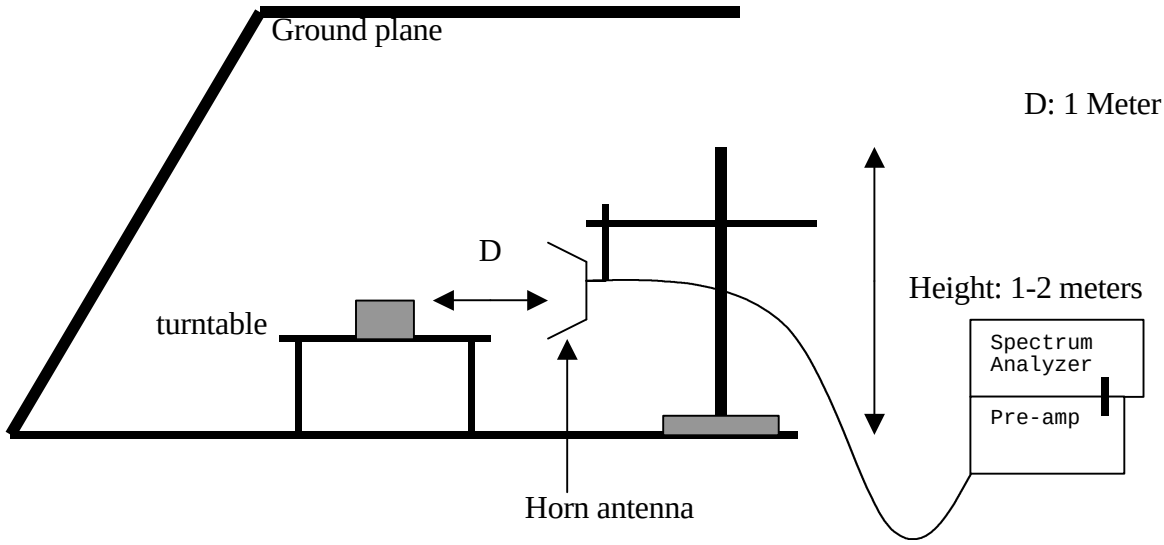


1. The EUT was placed on a wooden table on the outdoor ground plane. The search antenna was placed 3-meters from the EUT.

2. The turntable was slowly rotated to locate the direction of maximum emission at each emission falling in the restricted bands of 15.205. The EUT was moved throughout the XY, XZ, and YZ planes to maximize emissions received by the search antenna.

3. Once maximum direction was determined, the search antenna was raised and lowered in both vertical and horizontal polarizations. The maximum readings so obtained are recorded in the data listed below.

Test set-up for measurements above 1GHz



1. The EUT was placed on a wooden table on the outdoor ground plane. The search antenna was placed 1-meters from the EUT. The EUT antenna was mounted vertically as per normal installation.

2. The turntable was slowly rotated to locate the direction of maximum emission at each emission falling in the restricted bands of 15.205. The EUT was moved throughout the XY, XZ, and YZ planes to maximize emissions received by the search antenna.

3. Once maximum direction was determined, the search antenna was raised and lowered in both vertical and horizontal polarizations. The maximum readings so obtained are recorded in the data listed below.

11. EQUIPMENT MODIFICATIONS

To achieve compliance to FCC Section 15.231 technical limits, the following change(s) were made during compliance testing:

No changes were required in order to achieve compliance to Section 15.231 levels.

12. TEST RESULT

Powerline RFI Class B	Eut	Radiated Emission Limits	Eut
SECTION 15.207		SECTION 15.209	X
SECTION 15.205, 15.209, 15.221, 15.223, x 15.225 OR 15.227		SECTION 15.205	X
BATTERY POWER	X	SECTION 15.231 (e)	X

12.1 MAXIMUM MODULATION PERCENTAGE (M%)

CALCULATION:

Average Reading = Peak Reading (dBuV/m)+ 20log (Duty Cycle)

In order to determine possible Maximum Modulation percentage, alternations are made to the EUT. We measured:

WHERE 1 Period = 148.00ms
Long pulse = 0.5 ms
Short pulse =0.250 ms
No of Long pulse = 6
No of Short pulse = 54

Duty Cycle = (N1L1+N2L2+…+Nn-1Ln-1+NnLn)/100 or T

Duty Cycle = ((6x0.500)+(54x0.25))/100=0.165=.16.5%

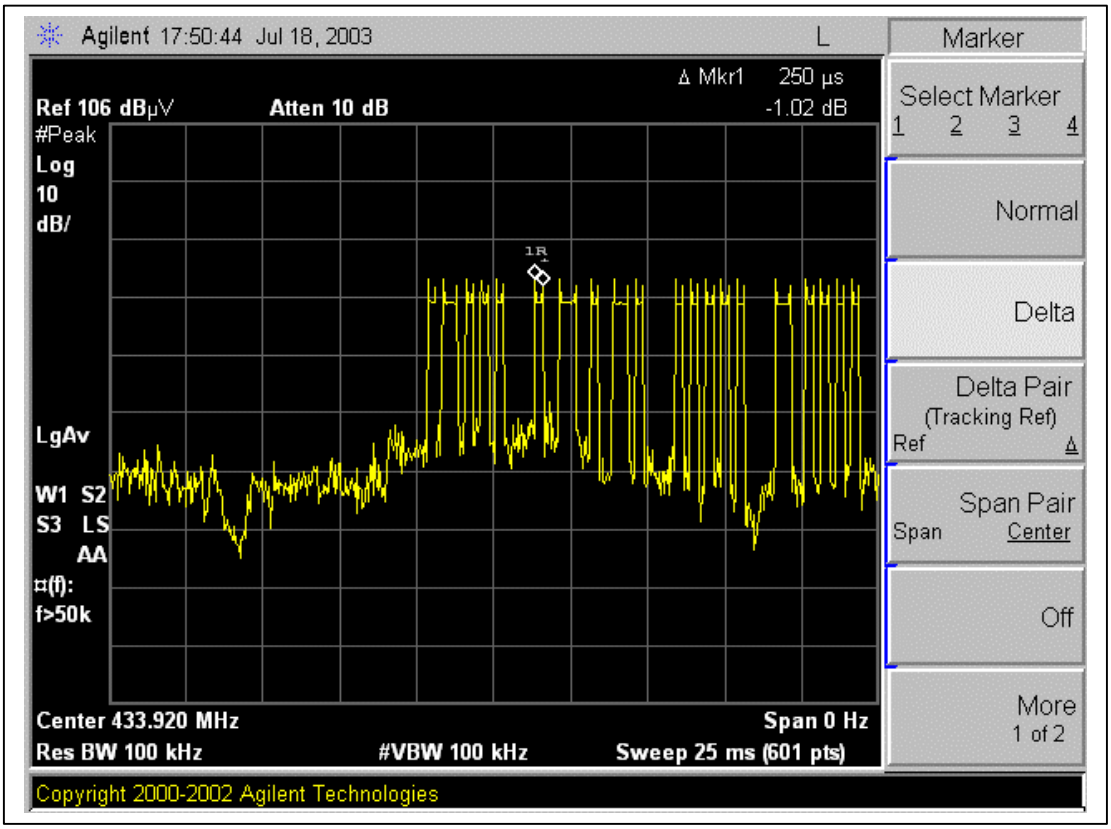
For duty cycle refer to plot #1, 2, 3,4, 5.

12.2 EMISSION BANDWIDTH

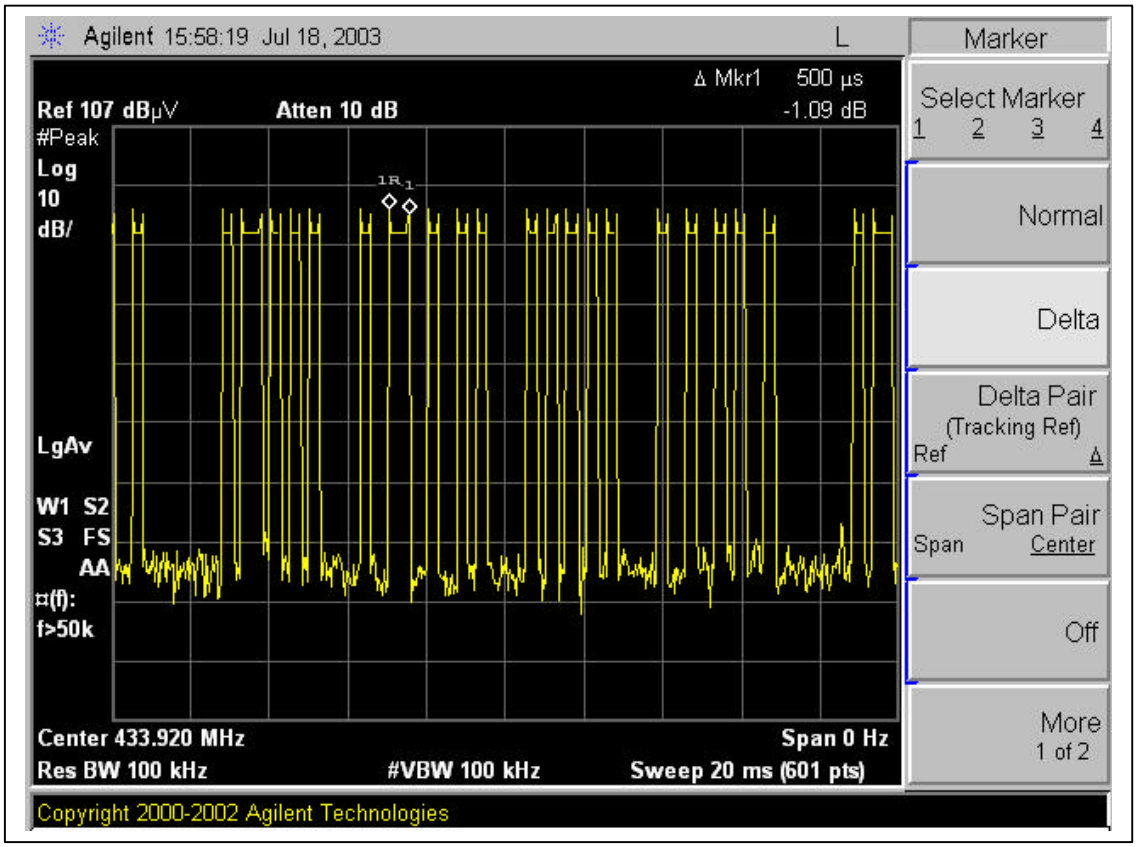
The bandwidth of the emissions were investigated per 15.231(c)

Center Frequency	Measured	Limits
433.92 MHz	**435 KHz (refer to plot)**	**433.92 x 0.25%= 1.0848MHz**

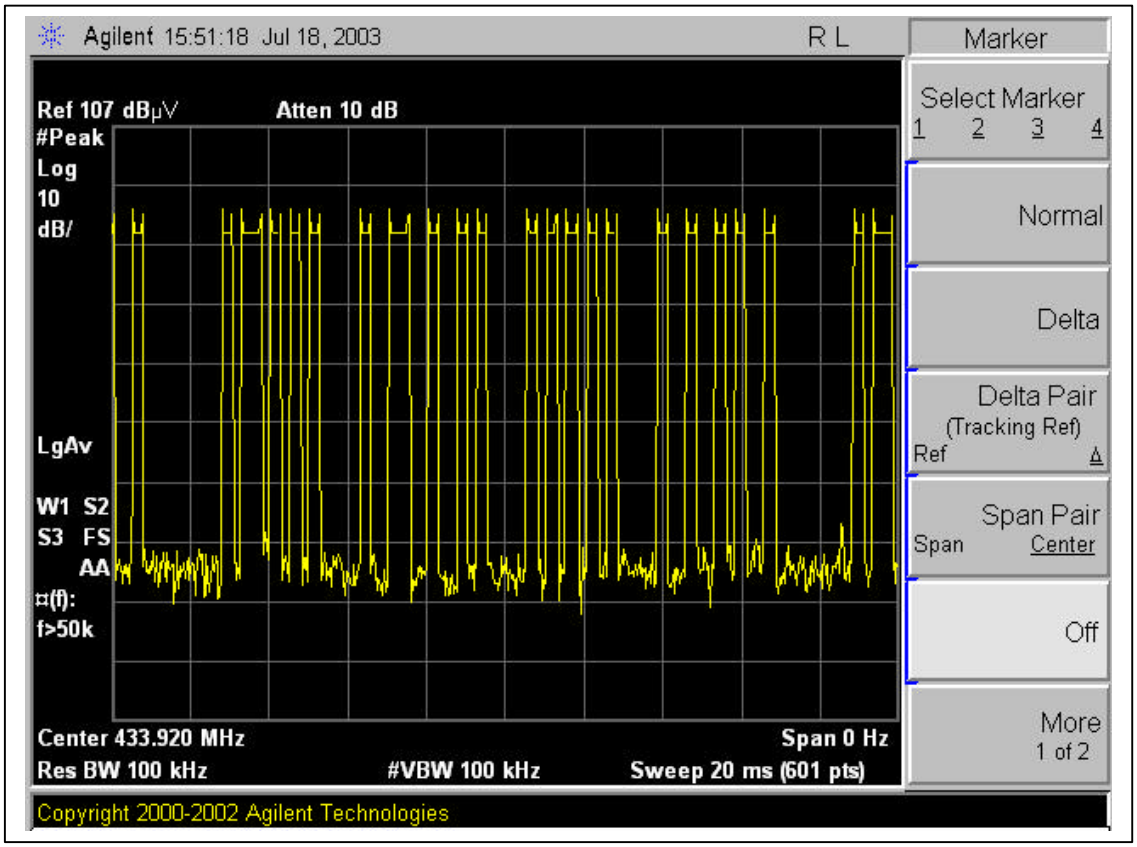
DUTY CYCLE 1



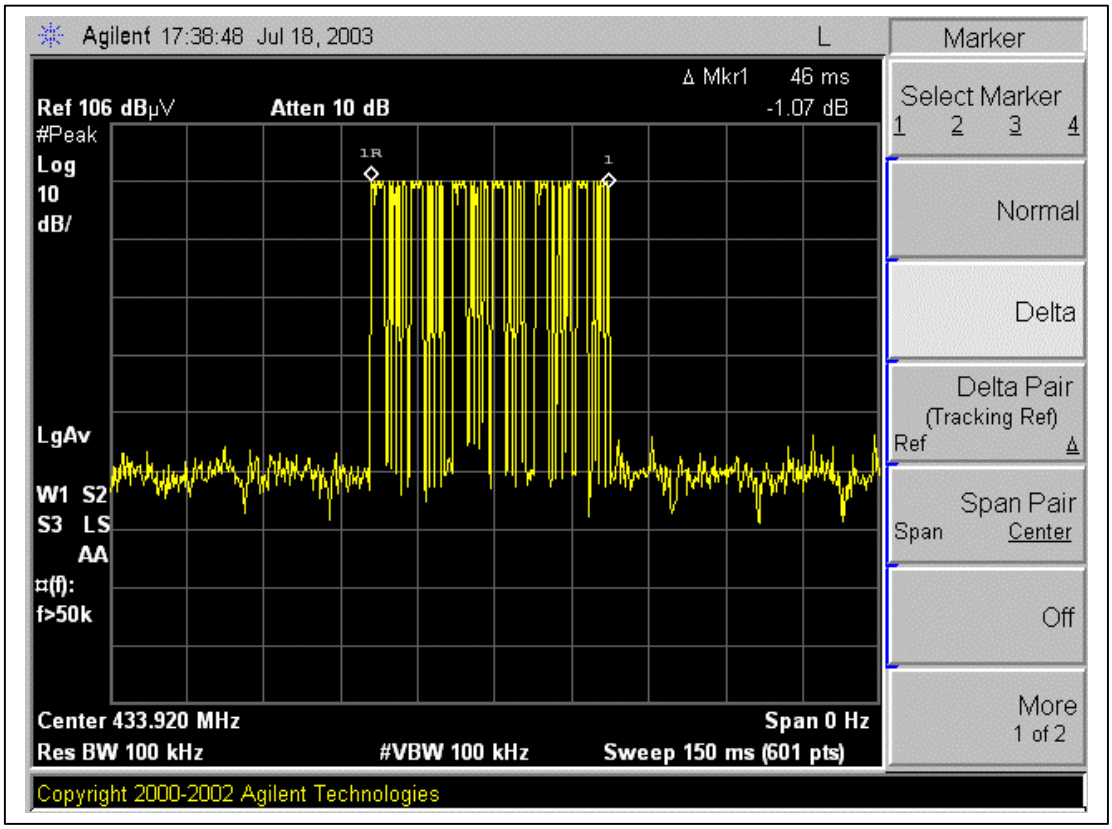
DUTY CYCLE 2



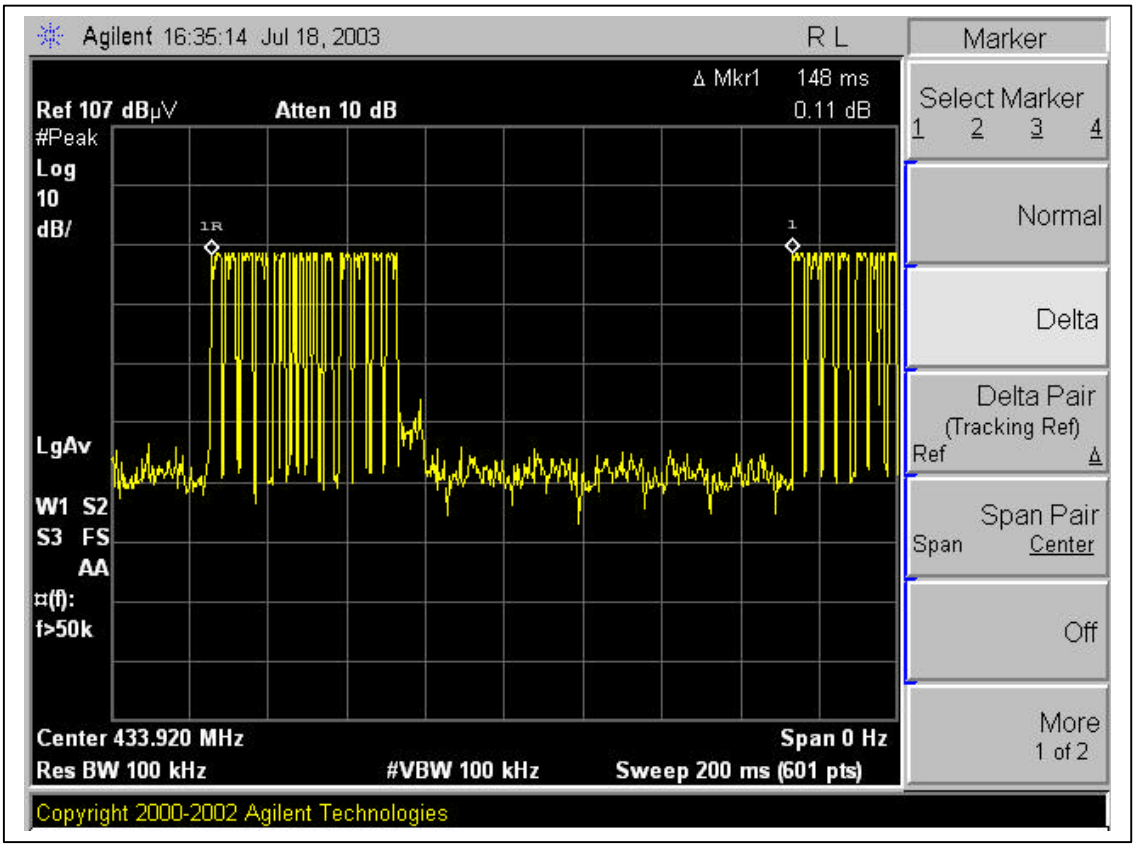
DUTY CYCLE 3



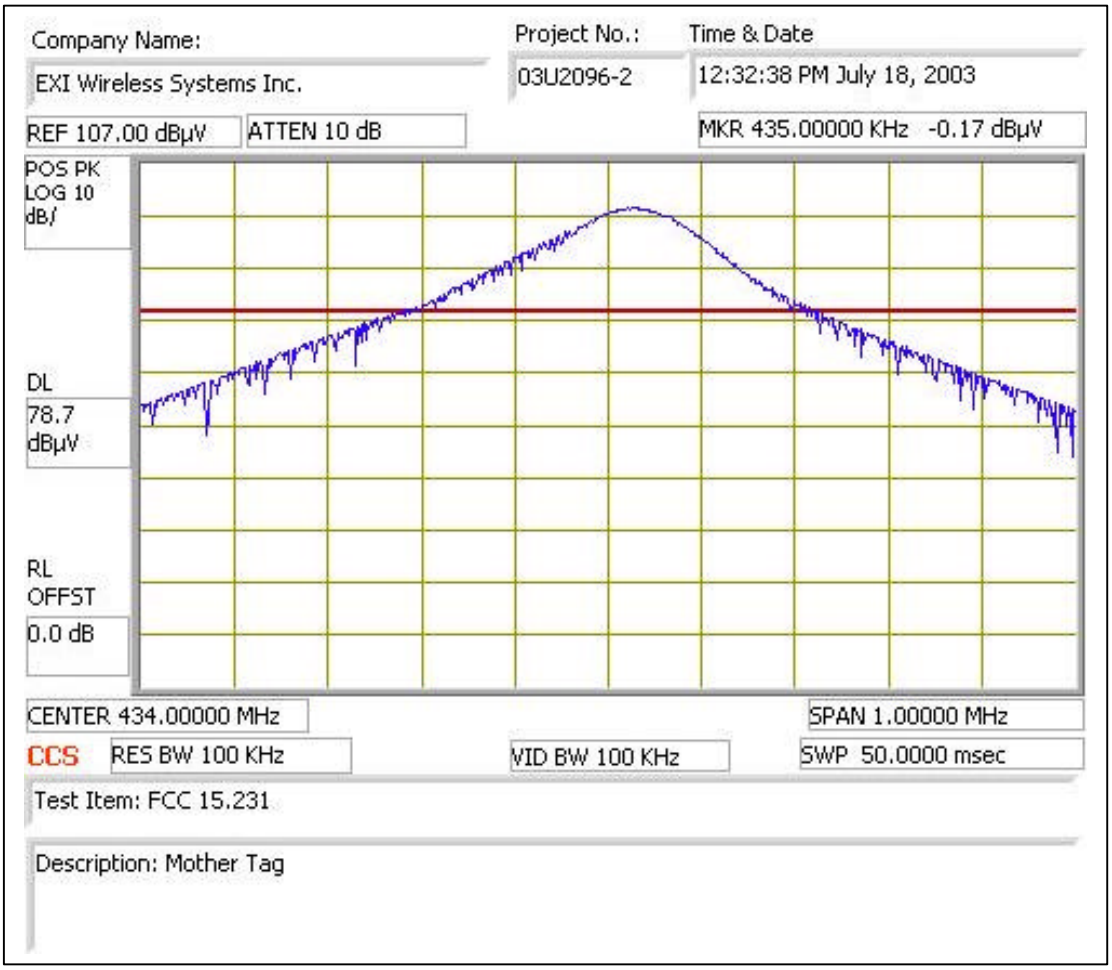
DUTY CYCLE 4



DUTY CYCLE 5



EMISSION BANDWIDTH



RADIATED DATA

COMPLIANCE Certification Services
FCC, VCCI, CISPR, CE, AUSTEL, NZ
UL, CSA, TUV, BSMI, DHHS, NVLAP

561F MONTEREY ROAD, SAN JOSE, CA 95037-9001
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Project #:	03U2096-1
Report #:	030723B1
Date& Time:	07/23/03 10:44 AM
Test Engr:	Chin Pang

Company:	EXI Wireless Systems Inc.
EUT Description:	Portable RFID Tag Reader (307KHz/433.92MHz Transceiver)
Test Configuration :	EUT Only
Type of Test:	FCC 15.209
Mode of Operation:	Tx

<< Main Sheet

Freq. (MHz)	Reading (dBuV)	AF (dB)	Closs (dB)	Pre-amp (dB)	Level (dBuV/m)	Limit FCC_B	Margin (dB)	Pol (H/V)	Az (Deg)	Height (Meter)	Mark (P/Q/A)
867.90	40.20	20.19	7.66	28.42	39.63	46.00	-6.37	3mV	0.00	1.00	P
867.90	39.50	20.19	7.66	28.42	38.93	46.00	-7.07	3mH	0.00	1.00	P
30.70	42.40	17.07	1.52	28.53	32.47	40.00	-7.53	3mV	0.00	1.00	P
32.20	42.30	16.46	1.55	28.53	31.79	40.00	-8.21	3mV	0.00	1.00	P
31.10	41.50	16.91	1.53	28.53	31.41	40.00	-8.59	3mV	0.00	1.00	P
37.20	43.20	15.07	1.62	28.51	31.38	40.00	-8.62	3mV	0.00	1.00	P
6 Worst Data											

Company:	EXI Wireless Systems Inc.
EUT Description:	RF Tag Reader (307KHz Transmitting)
Test Configuration :	EUT Only
Type of Test:	FCC 15.209
Mode of Operation:	TX

A-Site B-Site C-Site F-Site 6 Worst Data Descending

Freq. (KHz)	Reading (dBuV)	AF (dB)	Closs (dB)	Dist (dB)	Level (dBuV/m)	Limit FCC_B	Margin (dB)	Pol (H/V)	Az (Deg)	Height (Meter)	Mark (P/Q/A)
Test at worst position:											
307.00	53.00	10.80	0.30	80.00	-15.90	17.86	-33.76	3mV	0.00	1.00	P
307.00	48.40	10.80	0.30	80.00	-20.50	17.86	-38.36	3mH	0.00	1.00	P
614.00	47.90	10.60	0.30	40.00	18.80	31.84	-13.04	3mV	0.00	1.00	P
614.00	37.60	10.60	0.30	40.00	8.50	31.84	-23.34	3mH	0.00	1.00	P
921.00	35.80	10.60	0.30	40.00	6.70	28.32	-21.62	3mV	0.00	1.00	P
921.00	30.30	10.60	0.30	40.00	1.20	28.32	-27.12	3mH	0.00	1.00	P
No other emissions were found up to 30MHz.											
Total data #:6											

COMPLIANCE Certification Services
FCC, VCCI, CISPR, CE, AUSTEL, NZ
UL, CSA, TUV, BSMI, DHHS, NVLAP

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Project #:	03U2096-1
Report #:	030722B1
Date& Time:	07/22/03 1:53PM
Test Engr:	Chin Pang
Company:	EXI Wireless Systems Inc
EUT Description:	433.92MHz RFID Tag Reader (307KHz/433MHz Transceiver)
Test Configuration :	EUT only
Type of Test:	FCC 15.231
Mode of Operation:	Tx

M% = ((t1+t2+t3+…)/100% = 16.5%
RBW=100KHZ, VBW=100KHz

Av Reading = Pk Reading + 20*log(M%)
20*log(M%) = -15.65

Freq. (MHz)	Pk Rdg (dBuV)	Av Rdg (dBuV)	AF (dB)	Closs (dB)	Pre-amp (dB)	Level (dBuV/m)	Limit FCC_B	Margin (dB)	Pol (H/V)	Az (Deg)	Height (Meter)	Mark (P/Q/A)
433.92Mhz Fundamental frequency												
Y-Position (stand Up)												
433.92	76.20	60.55	16.22	5.19	28.63	53.33	72.86	-19.53	3mV	0.00	1.00	P
433.92	72.70	57.05	16.22	5.19	28.63	49.83	72.86	-23.03	3mH	0.00	1.00	P
X-Position (EUT Lay Down)												
433.92	75.10	59.45	16.22	5.19	28.63	52.23	72.86	-20.63	3mV	0.00	1.00	P
433.92	70.50	54.85	16.22	5.19	28.63	47.63	72.86	-25.23	3mH	0.00	2.00	P
Z-Position (EUT Place Side Way)												
433.92	75.50	59.85	16.22	5.19	28.63	52.63	72.86	-20.23	3mV	0.00	1.00	P
433.92	75.40	59.75	16.22	5.19	28.63	52.53	72.86	-20.33	3mH	0.00	1.50	P
The Data show Y-Position is the worst case												
868.60	45.00	29.35	20.19	7.66	28.63	28.57	52.86	-24.29	3mV	0.00	1.00	P
868.60	41.70	26.05	20.19	7.66	28.63	25.27	52.86	-27.59	3mH	0.00	1.50	P

RADIATED EMISSIONS (HARMONIC)

07/23/03 **High Frequency Measurement**

Compliance Certification Services, Morgan Hill Open Field Site

Test Engr: Chin Pang
Project #: 03U2096-1
Company: EXI Wireless Systems Inc.
EUT Descrip.: Portable RFID Tag Reader (307KHz/433.92MHz Transceiver)
EUT M/N: Mother Tag
Test Target: FCC Class B
Mode Oper: Tx

Test Equipment:

EMCO Horn 1-18GHz	Pre-amplifer 1-26GHz	Spectrum Analyzer	Horn > 18GHz
T73; S/N: 6717 @1m	T87 Miteq 924342	Agilent E4446A Analyzer	

Hi Frequency Cables

☐ (2 ft) ☑ (2 ~ 3 ft) ☐ (4 ~ 6 ft) ☑ (12 ft)

Peak Measurements:
1 MHz Resolution Bandwidth
1MHz Video Bandwidth

Average Measurements:
1 MHz Resolution Bandwidth
10Hz Video Bandwidth

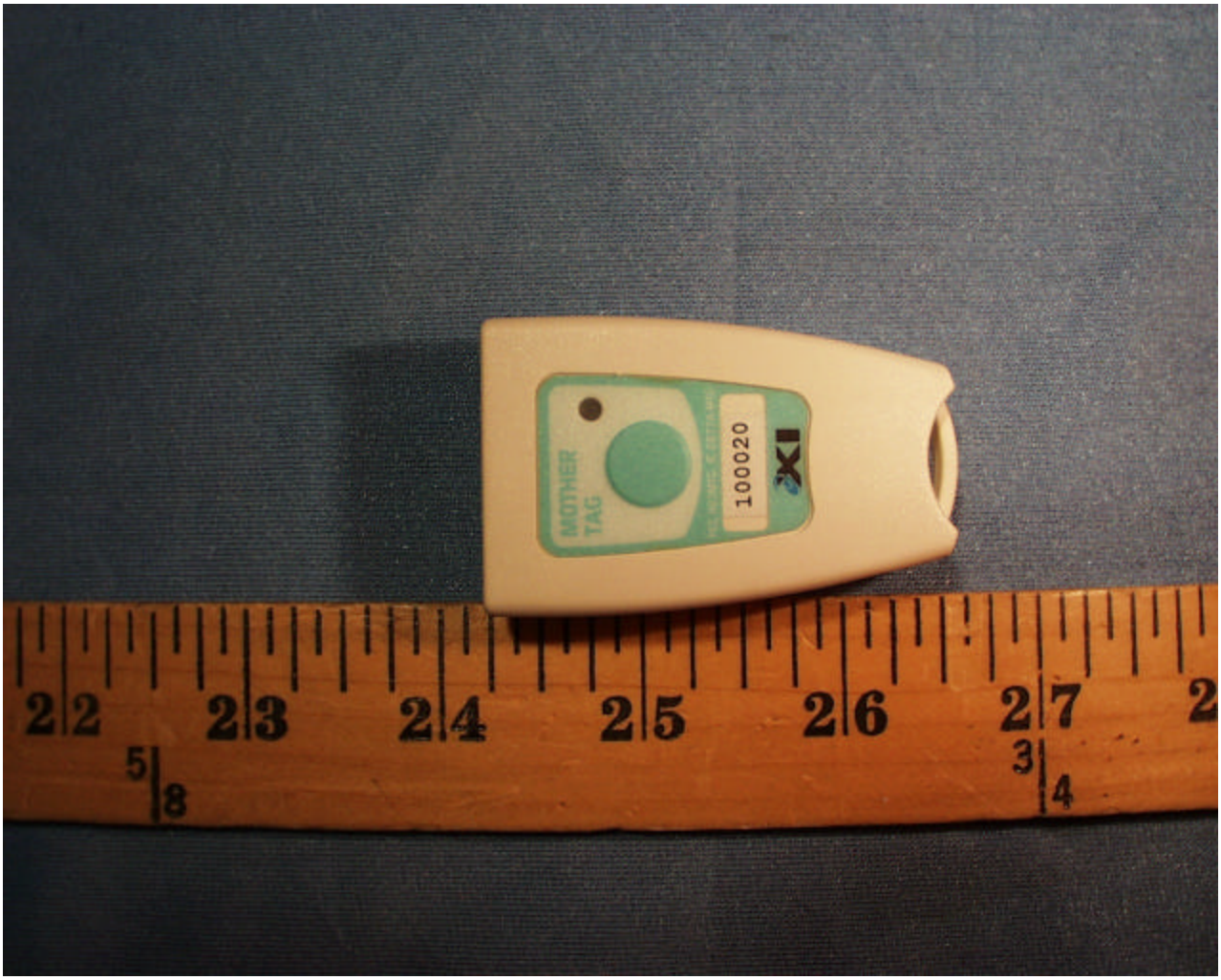
Average=Peak Duty Cycle

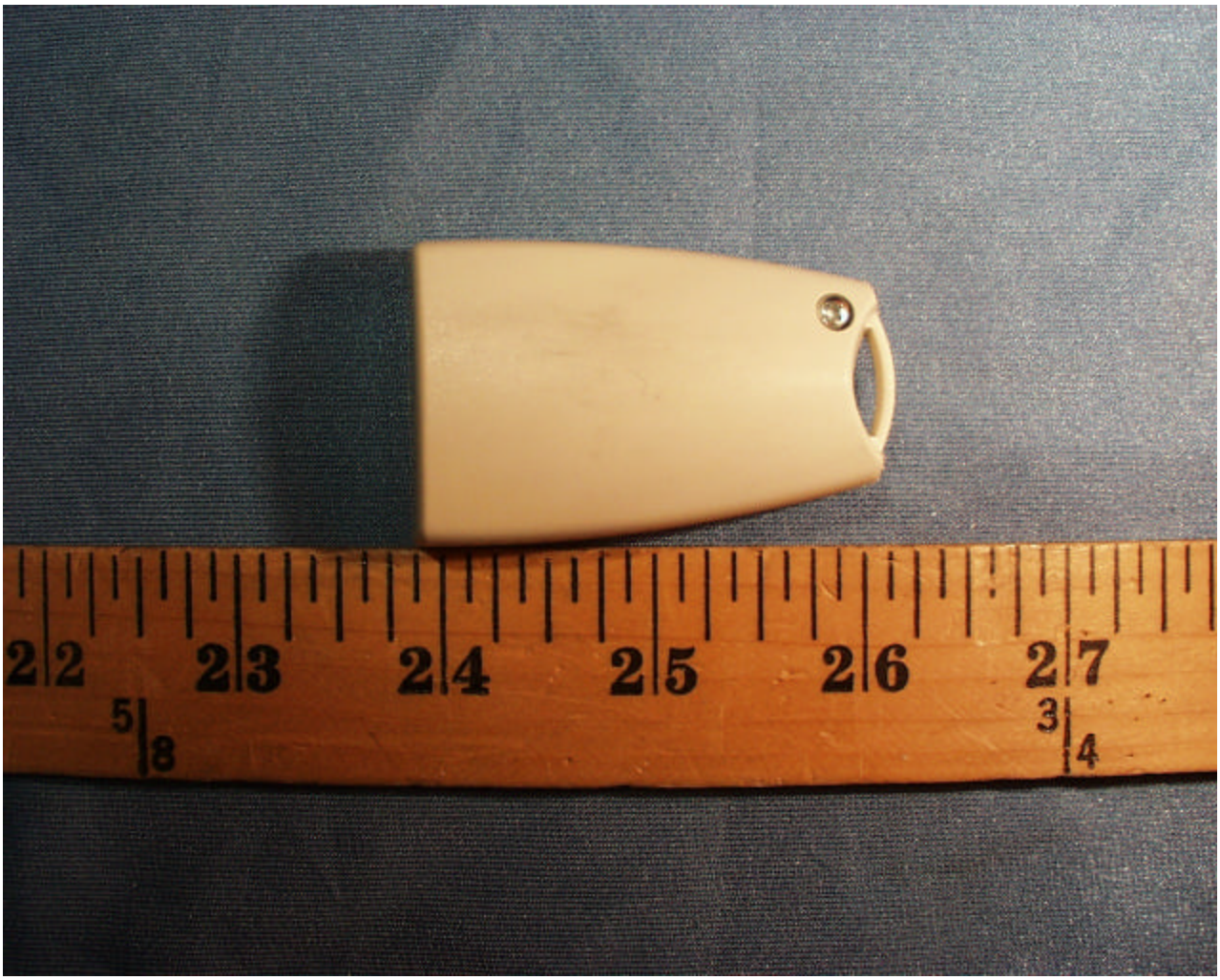
f GHz	Dist feet	Read Pk dBuV	Read Avg. dBuV	AF dB/m	CL dB	Amp dB	D Corr dB	HPF	Peak dBuV/m	Avg dBuV/m	Pk Lim dBuV/m	Avg Lim dBuV/m	Pk Mar dB	Avg Mar dB	Notes
1.302	3.3	60.6	45.0	25.4	1.5	-43.4	-9.5	0.0	34.6	19.0	74.0	54.0	-39.4	-35.0	V
1.735	3.3	56.0	40.4	27.4	1.9	-43.3	-9.5	1.0	33.5	17.8	74.0	54.0	-40.5	-36.2	V
2.169	3.3	51.6	36.0	29.1	2.3	-43.2	-9.5	1.0	31.3	15.6	74.0	54.0	-42.7	-38.4	V
2.603	3.3	50.0	34.4	30.4	2.7	-43.2	-9.5	1.0	31.4	15.8	74.0	54.0	-42.6	-38.2	V
3.037	3.3	50.9	35.3	31.6	3.1	-43.2	-9.5	1.0	33.9	18.3	74.0	54.0	-40.1	-35.7	V
1.302	3.3	58.7	43.1	25.4	1.5	-43.4	-9.5	1.0	33.7	18.1	74.0	54.0	-40.3	-35.9	H
1.735	3.3	55.3	39.7	27.4	1.9	-43.3	-9.5	1.0	32.8	17.1	74.0	54.0	-41.2	-36.9	H
2.169	3.3	49.4	33.8	29.1	2.3	-43.2	-9.5	1.0	29.1	13.4	74.0	54.0	-44.9	-40.6	H
2.603	3.3	49.8	34.2	30.4	2.7	-43.2	-9.5	1.0	31.2	15.6	74.0	54.0	-42.8	-38.4	H
3.037	3.3	48.8	33.2	31.6	3.1	-43.2	-9.5	1.0	31.9	16.2	74.0	54.0	-42.1	-37.8	H

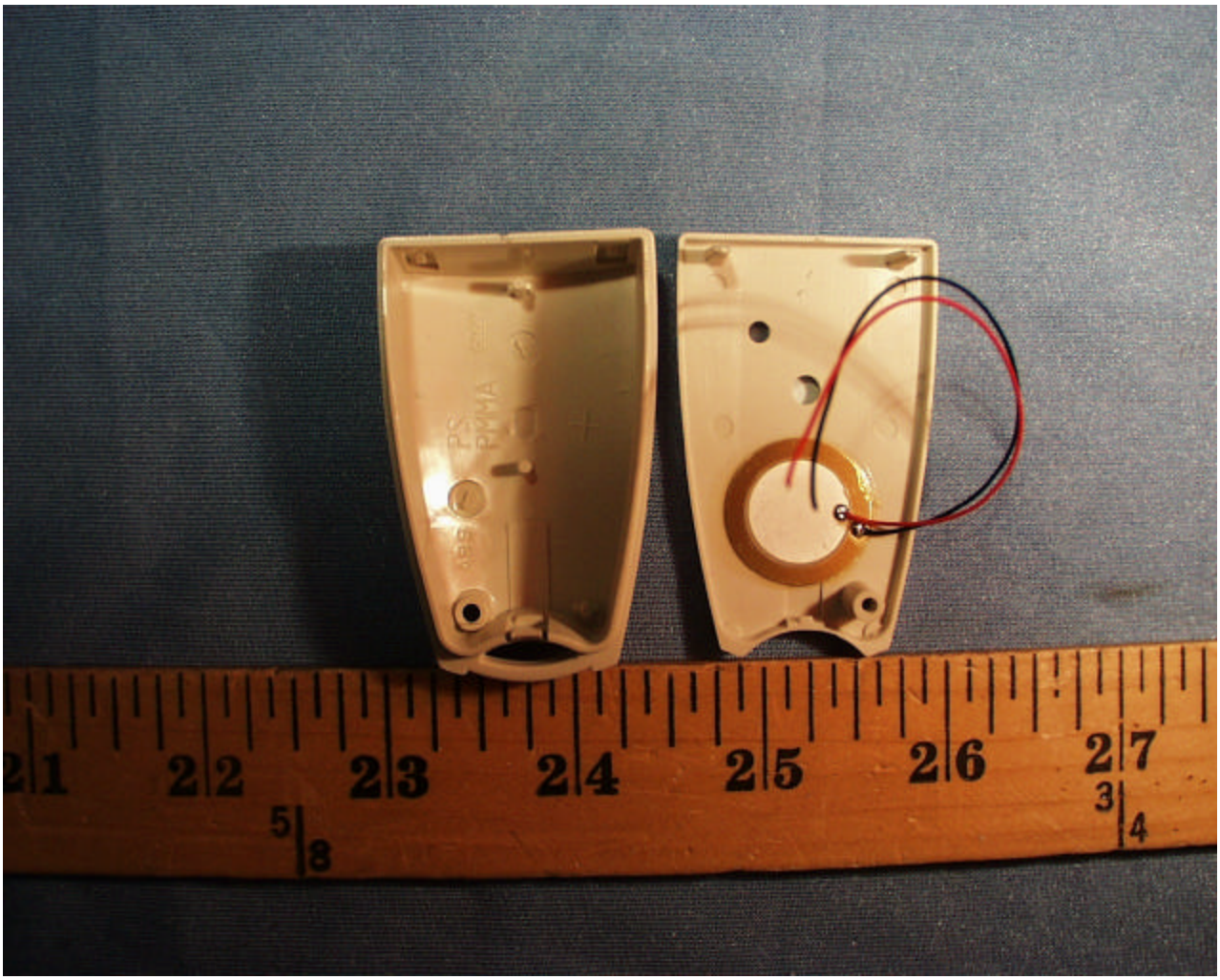
No other emissions were detected above system floor noise

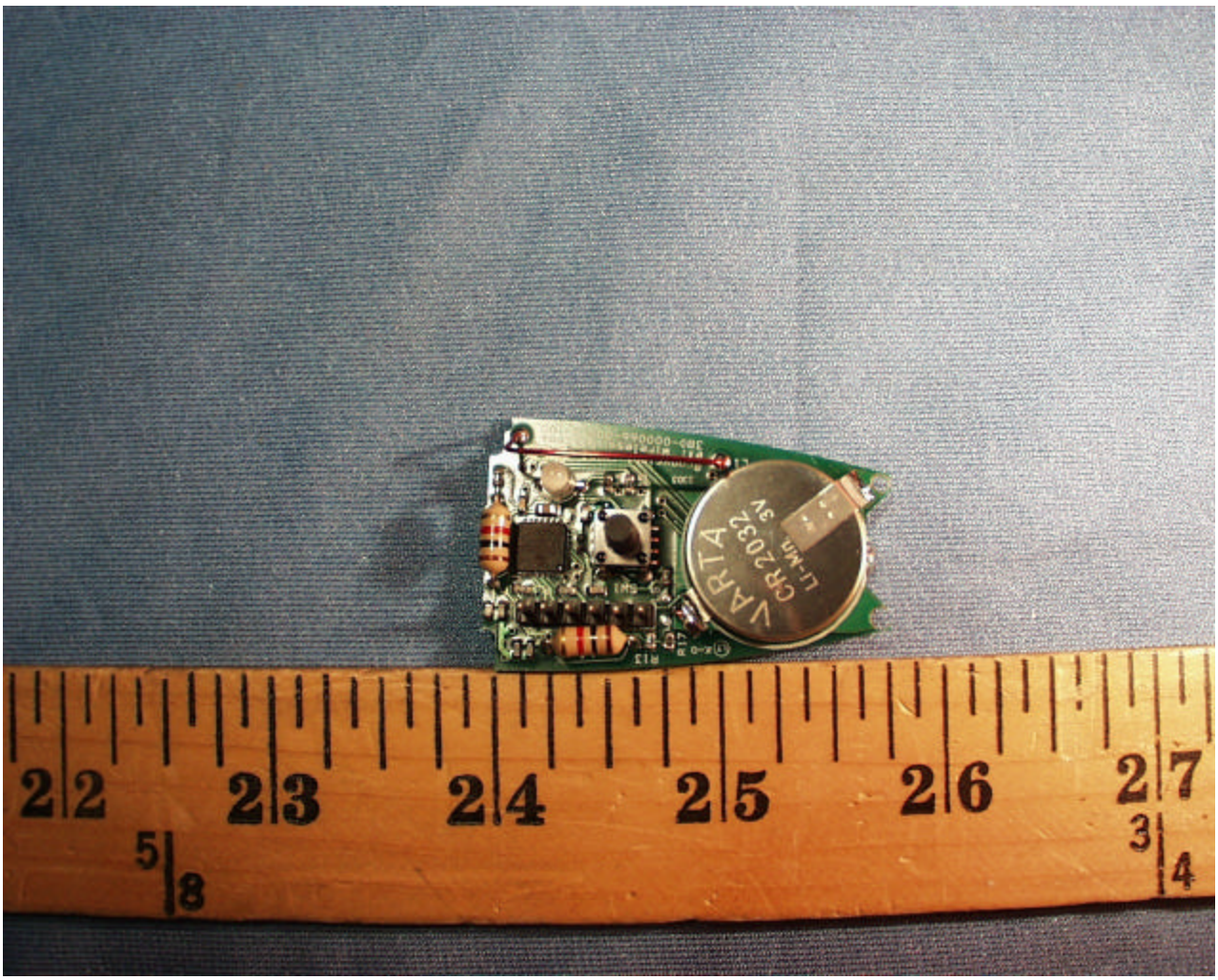
f	Measurement Frequency	Amp	Preamp Gain	Avg Lim	Average Field Strength Limit
Dist	Distance to Antenna	D Corr	Distance Correct to 3 meters	Pk Lim	Peak Field Strength Limit
Read	Analyzer Reading	Avg	Average Field Strength @ 3 m	Avg Mar	Margin vs. Average Limit
AF	Antenna Factor	Peak	Calculated Peak Field Strength	Pk Mar	Margin vs. Peak Limit
CL	Cable Loss	HPF	High Pass Filter		

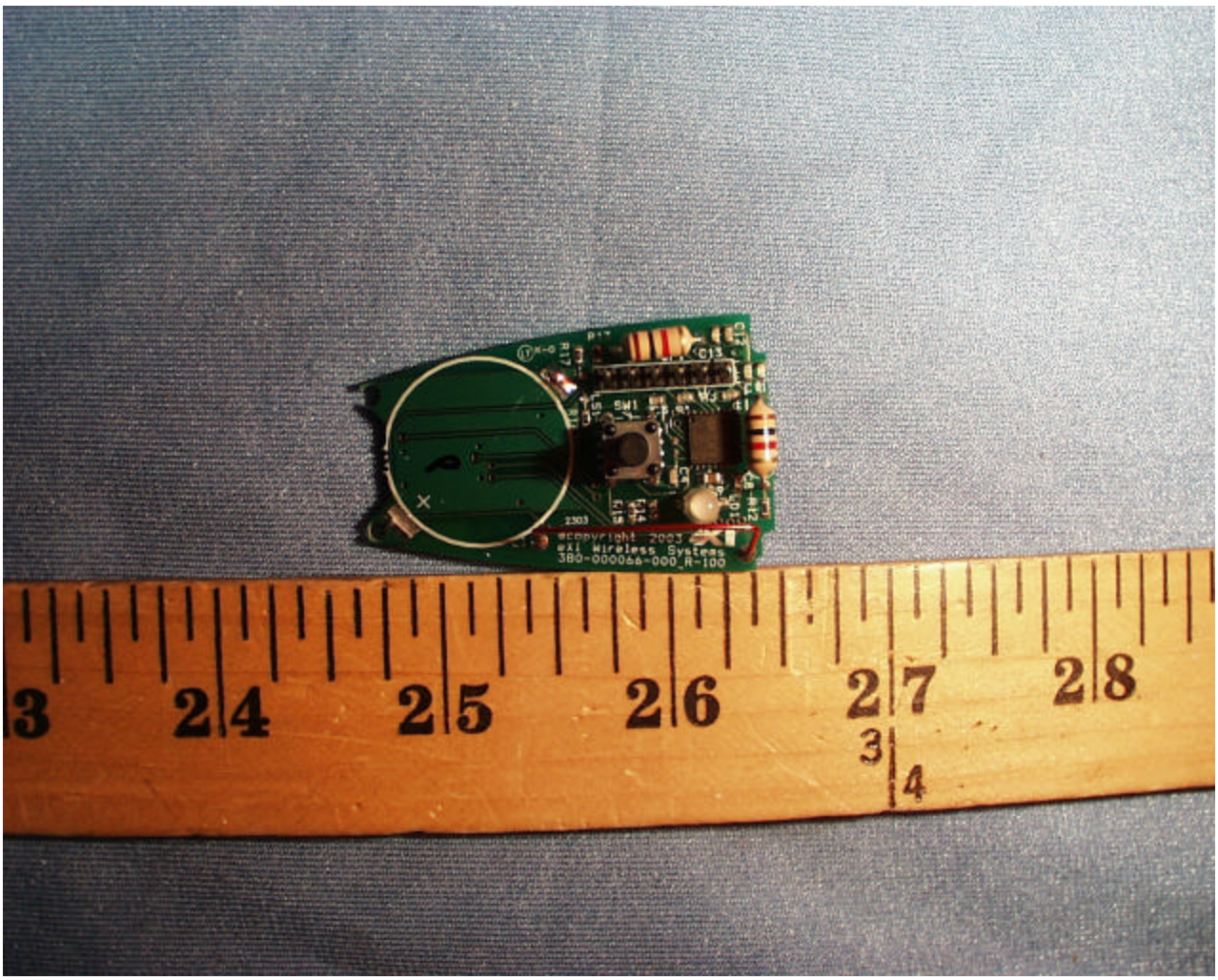
EUT PHOTOGRAPHS

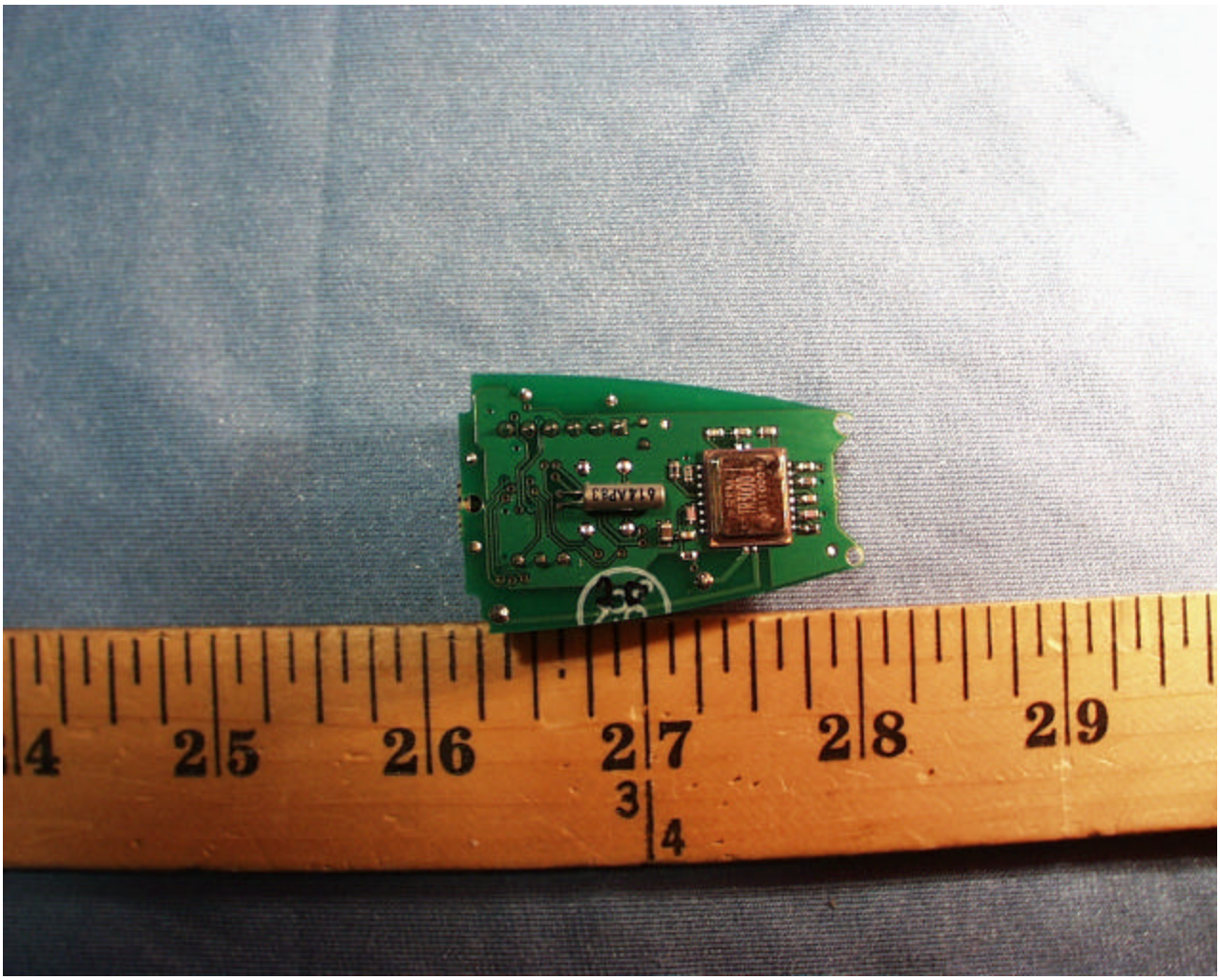












END OF REPORT