

# FCC PART 15 SUBPART C CERTIFICATION REPORT

FOR

307KHz/433.92 MHz Transceiver

MODEL: TAG LINK FCC ID NO: HE7TGL REPORT NO: 03U2119-1

**ISSUE DATE: AUGUST 04, 2003** 

Prepared for

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

Prepared by COMPLIANCE ENGINEERING SERVICES, INC. d.b.a. COMPLIANCE CERTIFICATION SERVICES 561F MONTEREY ROAD MORGAN HILL, CA 95037 USA TEL: (408) 463-0885 FAX: (408) 463-0888

#### **TABLE OF CONTENTS**

### PAGE

1.	VERIFICATION OF COMPLIANCE Error!	Bookmark :	not	defined.
3.	TEST FACILITY		•••	
4.	MEASUREMENT STANDARD		•••	4
5.	TEST METHODOLOGY		•••	4
6.	MEASUREMENT EQUIPMENT USED		•••	
7.	POWERLINE RFI LIMIT		•••	5
8.	RADIATED EMISSION LIMITS		•••	5
9.	SYSTEM TEST CONFIGURATION		•••	6
10.	TEST PROCEDURE		•••	7
11.	EQUIPMENT MODIFICATIONS		•••	9
12.	TEST RESULT		•••	10

#### TEST DATA

- Maximum Modulation Percentage Plot
- Emission Bandwidth Plot
- Radiated Emission Worksheet for Peak Measurement
- Radiated Emission Worksheet for Average Measurement

#### ATTACHMENT

• EUT Photographs

- Proposed FCC ID Label
- Schematics & Block Diagram
- User Manual

#### 1. VERIFICATION OF COMPLIANCE

COMPANY NAME	:	EXI WIRELESS SYSTEMS INC.
		SUITE 100, 13551 COMMERCE PARKWAY
		RICHMOND BC, V6V 2L1 CANADA
EUT DESCRIPTION	:	307KHz / 433.92 MHz TRANSCEIVER
MODEL NO	:	TAG LINK
FCC ID	:	HE7TGL
DATE TESTED	:	8-04-2003

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 Pany

CHIN PANG EMC TECHNICIAN COMPLIANCE CERTIFICATION SERVICES

Approved & Released By:

THU CHAN EMC SUPERVISOR COMPLIANCE CERTIFICATION SERVICES

Page 3 of 24

#### 2. PRODUCT DESCRIPTION

Fundamental Frequency	307KHz / 433.92 MHz
Power Source	9V Battery
Transmitting Time	Periodic <u>&gt;</u> 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

1	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

Page 4 of 24

## 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)

Page 5 of 24

## 9. SYSTEM TEST CONFIGURATION

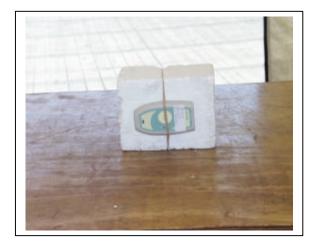
Use a block of foam and combined it with EUT wrapping rubber band around it. This way it can test X.Y, and Z axis. To activate continuous transmission, place a small plastic block between rubber band and EUT push button.



X-Axis



Y-Axis



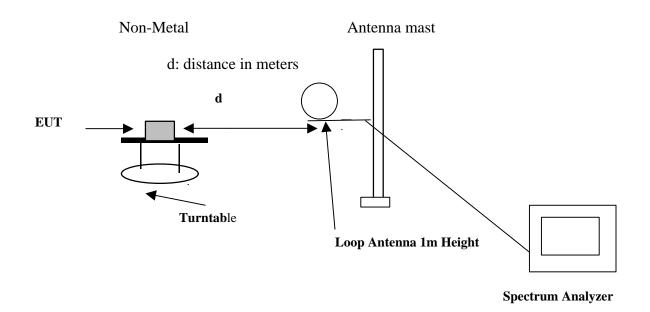
Z-Axis

Radiated Open Site Test Set-up

Page 6 of 24

## **10. TEST PROCEDURE**

## **Radiated Emissions**, 15.209



## Test Set-up for frequency range below 30 MHz

#### Test Procedure:

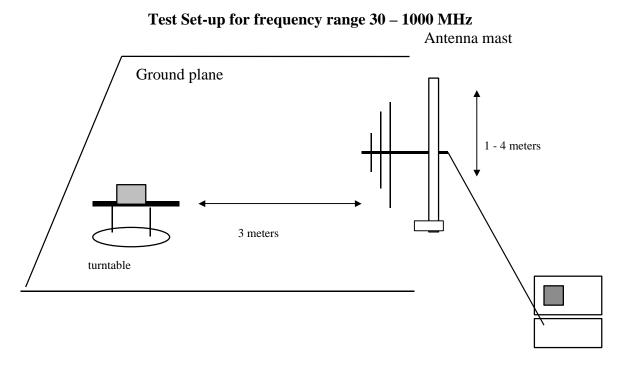
The measurement is made on open field test site, the H field produced by the EUT is measured using an active loop antenna, measurement is done at 3m distances from the EUT with an extrapolation of corrected distance factor. The loop antenna is rotated around it's axis to maximize the emission, the antenna 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.

COMPLIANCE CERTIFICATION SERVICESCCS DOCUMENT NO:CCSUP4020B561F MONTEREY RD., MORGAN HILL, CA 95037, USATEL:(408)463-0885 FAX:(408)463-0888This report shall not be reproduced except in full, without the written approval of CCS. This document may be<br/>altered or revised by Compliance Certification Services personnel only, and shall be noted in the revision<br/>section of the document.

Page 7 of 24

## Radiated Emissions, 15.231(4)(b)

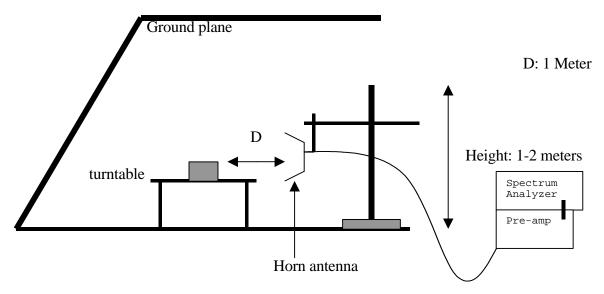


preamplifier/spectrum analyzer

- 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.

Page 8 of 24

## 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.

Page 9 of 24

## **12. TEST RESULT**

Powerline RFI Class B	Eut	Radiated Emission Limits	Eut
SECTION 15.207		SECTION 15.209	Х
SECTION 15.205, 15.209, 15.221, 15.223, x 15.225 OR 15.227		SECTION 15.205	Х
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:

1 Period	= 78.5ms
Long pulse	= 0.5  ms
Short pulse	=0.2333 ms
No of Long pulse	= 6
No of Short pulse	= 48
	Long pulse Short pulse No of Long pulse

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

Duty Cycle = ((6x0.500)+(48x0.2333))/78.50=0.219=.21.9%

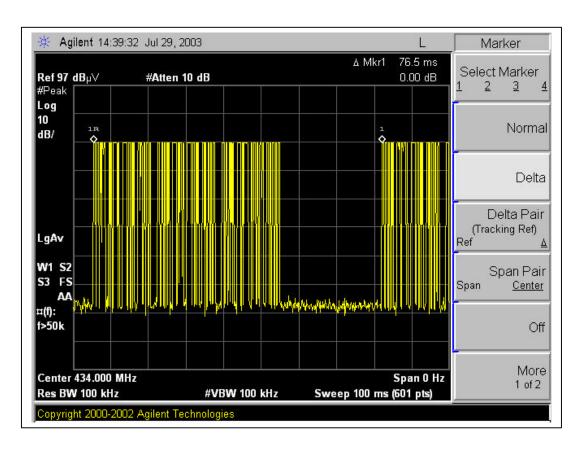
For duty cycle refer to plot #1, 2, 3,4, 5.

## **12.2 EMISSION BANDWIDTH**

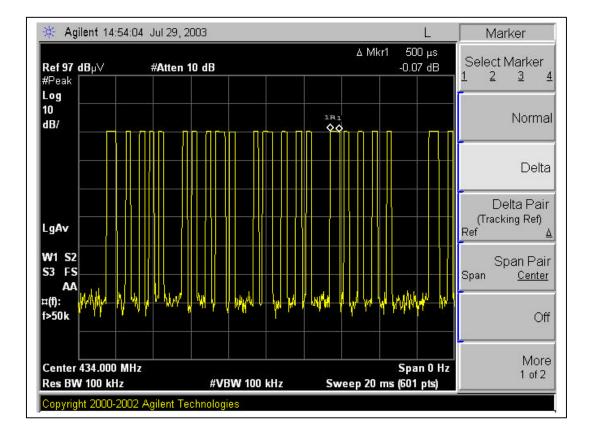
The bandwidth of the emissions were investigated per 15.231(c)

Center Frequency	Measured	Limits
433.92 MHz	513 KHz	433.92 x 0.25%= 1.0848MHz
	(refer to plot)	

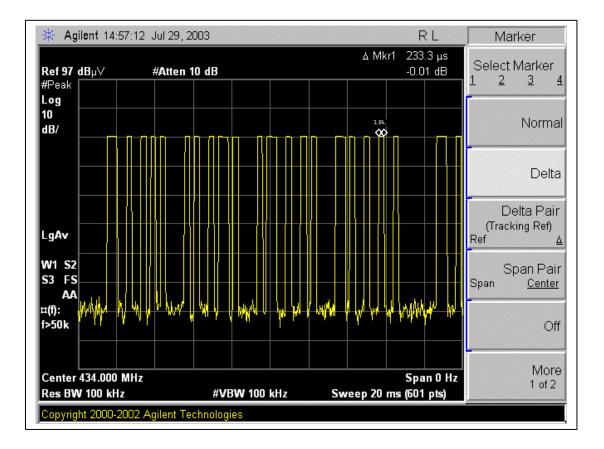
Page 10 of 24



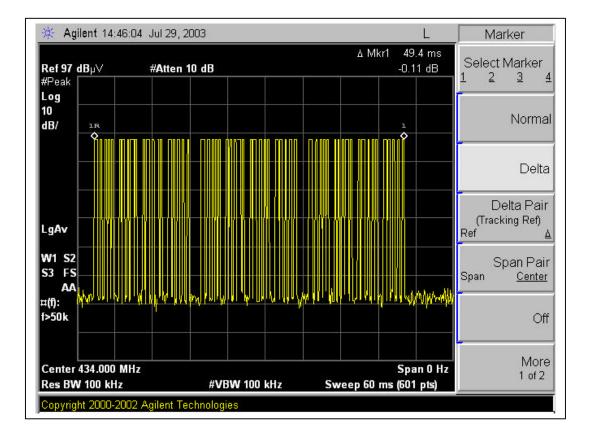
Page 11 of 24



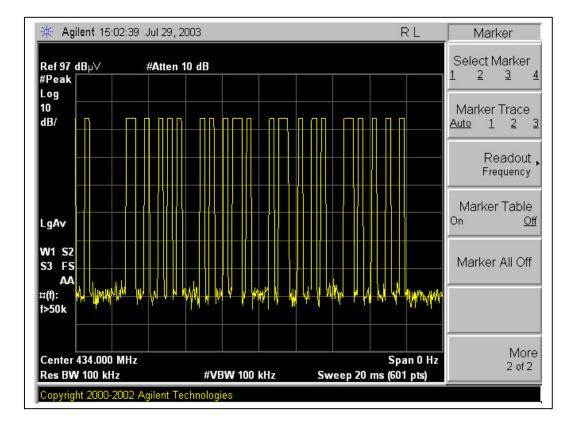
Page 12 of 24



Page 13 of 24

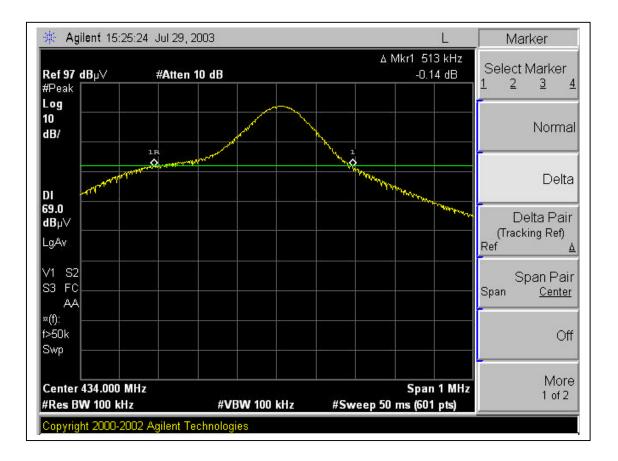


Page 14 of 24



Page 15 of 24

## EMISSION BANDWIDTH



Page 16 of 24

## RADIATED DATA

	FCC UL,	C, VCCI, C CSA, TUV EREY RO 98) 463-08	ISPR, CE, /, BSMI, D AD, SAN , 85 F/	AUSTEL, I HHS, NVLA	NZ NP 95037-9001	1	Proje Repo Date& T Test E	ort #: ïme:	03u2095- 030715C 07/15/03 Chin Pan	2 3:46 PM	
	Test Con	Type of	tion: tion: Test:	RF Tag I EUT Onl	eless Syste Reader ( 3 y 209 / 15.23	07KHz Tr	ansmittir	ng)			
C	A-Site		B-Site	C-:	Site	C F-Site		6 W orst Da	ata	Descending	
	Reading	AF	Closs	Dist	Level	Limit	Margin	Pol	Az	Height	Mark
(KHz) Test at w	(dBuV) /orst posi	(dB) tion:	(dB)	(dB)	(dBuV/m)	FCC_B	(dB)	(H/V)	(Deg)	(Meter)	(P/Q/A)
307.00	58.70	10.80	0.30	80.00	-10.20	17.86	-28.06	3mV	0.00	1.00	
614.00	56.40	10.60	0.30	40.00	27.30	31.84	-20.00	3mV	0.00	1.00	P
921.00	38.40	10.60	0.30	40.00	9.30	28.32	-19.02	3mV	0.00	1.00	Р
1228.00	50.80	10.60	0.30	40.00	21.70	25.82	-4.12	3mV	0.00	1.00	Р
1535.00	45.40	10.60	0.30	40.00	16.30	23.88	-7.58	3mV	0.00	1.00	Р
307.00	48.20	10.80	0.30	80.00	-20.70	17.86	-38.56	3mH	0.00	1.00	Р
614.00	50.10	10.60	0.30	40.00	21.00	31.84	-10.84	3mH	0.00	1.00	Ρ
921.00	34.10	10.60	0.30	40.00	5.00	28.32	-23.32	3mH	0.00	1.00	Р
1228.00	48.00	10.60	0.30	40.00	18.90	25.82	-6.92	3mH	0.00	1.00	Р
1535.00 No other		10.60 is were f	0.30 ound up	40.00 to 30MH:	7.70 z.	23.88	-16.18	3mH	0.00	1.00	Р

Page 17 of 24

		ertifi	catio	on Se				R Date 8	oject #: eport #: & Time:	03U2096-1 030722B1 07/22/03	1:53PM	
		VCCI, CISPR, SA, TUV, BSN						Tes	t Engr:	Chin Pang		
	561F MONTEI PHONE: (408)		AN JOSE, CA		3) 463-0888							
		Test	EUT Desci t Configui	ration : of Test:		ss Systems z RFID Tag 1		)7KHz/433№	1Hz Transc	eiver )		
	-t2+t3+…)/1 KHZ, VBW=		%				Av Reading 20*log(M%	g = Pk Read ) = -15.65	ling + 20*lo	g(M%)		
RBW=100ł Freq.	KHZ, VBŴ= Pk Rdg	100KHz Av Rdg	AF	Closs	Pre-amp	Level	20*log(M% Limit	) = -15.65 Margin	Pol	Az	Height	Mark
RBW=100 Freq. (MHz)	KHZ, VBW= Pk Rdg (dBuV)	100KHz Av Rdg (dBuV)	AF (dB)	Closs (dB)	Pre-amp (dB)		20*log(M%	) = -15.65	0		Height (Meter)	Mark (P/Q/A)
RBW=100F Freq. (MHz) 433.92Mhz	KHZ, VBŴ= Pk Rdg	100KHz Av Rdg (dBuV) tal frequenc	AF (dB)			Level	20*log(M% Limit	) = -15.65 Margin	Pol	Az		
RBW=100F Freq. (MHz) 433.92Mhz Y-Position	KHZ, VBW= Pk Rdg (dBuV) z Fundamen	100KHz Av Rdg (dBuV) tal frequenc	AF (dB)			Level	20*log(M% Limit	) = -15.65 Margin	Pol	Az		
RBW=1004 Freq. (MHz) 433.92Mhz 7-Position 433.92 433.92	KHZ, VBW= Pk Rdg (dBuV) Fundamen (stand Up) 76.20 72.70	100KHz Av Rdg (dBuV) tal frequenc 60.55 57.05	AF (dB) ÿ	(dB)	(dB)	Level (dBuV/m)	20*log(M% Limit FCC_B	) = -15.65 Margin (dB)	Pol (H/V)	Az (Deg)	(Meter)	(P/Q/A)
RBW=100 Freq. (MHz) 133.92Mhz 7-Position 133.92 133.92 (-Position	KHZ, VBW= Pk Rdg (dBuV) Fundamen (stand Up) 76.20 72.70 (EUT Lay E	Av Rdg (dBuV) (d	AF (dB) y 16.22 16.22	(dB) 5.19 5.19	(dB) 28.63 28.63	Level (dBuV/m) 53.33 49.83	20*log(M% Limit FCC_B 72.86 72.86	) = -15.65 Margin (dB) -19.53 -23.03	Pol (H/V) 3mV 3mH	Az (Deg) 0.00 0.00	(Meter) 1.00 1.00	(P/Q/A) P P
RBW=100ł Freq. (MHz) 433.92Mhz Y-Position 433.92 433.92 K-Position 433.92	KHZ, VBW= Pk Rdg (dBuV) Fundamen (stand Up) 76.20 72.70 (EUT Lay E 75.10	100KHz Av Rdg (dBuV) tal frequenc 60.55 57.05 Down ) 59.45	AF (dB) y 16.22 16.22 16.22	(dB) 5.19 5.19 5.19	(dB) 28.63 28.63 28.63	Level (dBuV/m) 53.33 49.83 52.23	20*log(M% Limit FCC_B 72.86 72.86 72.86	) = -15.65 Margin (dB) -19.53 -23.03 -20.63	Pol (H/V) 3mV 3mH 3mV	Az (Deg) 0.00 0.00 0.00	(Meter) 1.00 1.00 1.00	(P/Q/A) P P P
RBW=100ł Freq. (MHz) 433.92Mhz Y-Position 433.92 433.92 K-Position 433.92 433.92 433.92	KHZ, VBW= Pk Rdg (dBuV) Fundamen (stand Up) 76.20 72.70 (EUT Lay I 75.10 70.50	100KHz Av Rdg (dBuV) tal frequence 60.55 57.05 57.05 Down ) 59.45 54.85	AF (dB) y 16.22 16.22 16.22 16.22	(dB) 5.19 5.19	(dB) 28.63 28.63	Level (dBuV/m) 53.33 49.83	20*log(M% Limit FCC_B 72.86 72.86	) = -15.65 Margin (dB) -19.53 -23.03	Pol (H/V) 3mV 3mH	Az (Deg) 0.00 0.00	(Meter) 1.00 1.00	(P/Q/A) P P
RBW=100/ Freq. (MHz) 433.92Mhz Y-Position 433.92 433.92 X-Position 433.92 433.92 Z-Position	KHZ, VBW= Pk Rdg (dBuV) Fundamen (stand Up) 76.20 72.70 (EUT Lay E 75.10 70.50 (EUT Place	100KHz Av Rdg (dBuV) tal frequenc 60.55 57.05 59.45 59.45 54.85 side Way	AF (dB) :y 16.22 16.22 16.22 16.22 )	(dB) 5.19 5.19 5.19 5.19 5.19	(dB) 28.63 28.63 28.63 28.63	Level (dBuV/m) 53.33 49.83 52.23 47.63	20*log(M% Limit FCC_B 72.86 72.86 72.86 72.86 72.86	) = -15.65 Margin (dB) -19.53 -23.03 -20.63 -25.23	Pol (H/V) 3mV 3mH 3mV 3mH	Az (Deg) 0.00 0.00 0.00 0.00 0.00	(Meter) 1.00 1.00 1.00 2.00	(P/Q/A) P P P P
RBW=100/ Freq. (MHz) 433.92Mhz 7-Position 433.92 433.92 433.92 433.92 433.92 2-Position 433.92	KHZ, VBW= Pk Rdg (dBuV) Fundamen (stand Up) 76.20 72.70 (EUT Lay IC 75.10 70.50 (EUT Place 75.50	100KHz Av Rdg (dBuV) tal frequence 60.55 57.05 Down ) 59.45 54.85 Side Way 59.85	AF (dB) y 16.22 16.22 16.22 16.22 ) 16.22	(dB) 5.19 5.19 5.19 5.19 5.19 5.19	(dB) 28.63 28.63 28.63 28.63 28.63 28.63	Level (dBuV/m) 53.33 49.83 52.23 47.63 52.63	20*log(M% Limit FCC_B 72.86 72.86 72.86 72.86 72.86 72.86	) = -15.65 Margin (dB) -19.53 -23.03 -20.63 -25.23 -20.23	Pol (H/V) 3mV 3mH 3mV 3mH 3mV	Az (Deg) 0.00 0.00 0.00 0.00 0.00	(Meter) 1.00 1.00 1.00 2.00 1.00	(P/Q/A) P P P P
RBW=100H Freq. (MHz) 433.92Mhz 7-Position 433.92 433.92 433.92 7-Position 433.92 2-Position 433.92 433.92 433.92 433.92	KHZ, VBW= Pk Rdg (dBuV) Fundamen (stand Up) 76.20 72.70 (EUT Lay E 75.10 70.50 (EUT Place 75.50 75.40	100KHz Av Rdg (dBuV) tal frequence 60.55 57.05 59.45 59.45 54.85 5 Side Way 59.85 59.75	AF (dB) ry 16.22 16.22 16.22 16.22 ) 16.22 ) 16.22 16.22	(dB) 5.19 5.19 5.19 5.19 5.19	(dB) 28.63 28.63 28.63 28.63	Level (dBuV/m) 53.33 49.83 52.23 47.63	20*log(M% Limit FCC_B 72.86 72.86 72.86 72.86 72.86	) = -15.65 Margin (dB) -19.53 -23.03 -20.63 -25.23	Pol (H/V) 3mV 3mH 3mV 3mH	Az (Deg) 0.00 0.00 0.00 0.00 0.00	(Meter) 1.00 1.00 1.00 2.00	(P/Q/A) P P P P
RBW=100/ Freq. (MHz) 433.92Mhz Y-Position 433.92 433.92 X-Position 433.92 Z-Position 433.92 433.92	KHZ, VBW= Pk Rdg (dBuV) Fundamen (stand Up) 76.20 72.70 (EUT Lay IC 75.10 70.50 (EUT Place 75.50	100KHz Av Rdg (dBuV) tal frequence 60.55 57.05 59.45 59.45 54.85 5 Side Way 59.85 59.75	AF (dB) ry 16.22 16.22 16.22 16.22 ) 16.22 ) 16.22 16.22	(dB) 5.19 5.19 5.19 5.19 5.19 5.19	(dB) 28.63 28.63 28.63 28.63 28.63 28.63	Level (dBuV/m) 53.33 49.83 52.23 47.63 52.63	20*log(M% Limit FCC_B 72.86 72.86 72.86 72.86 72.86 72.86	) = -15.65 Margin (dB) -19.53 -23.03 -20.63 -25.23 -20.23	Pol (H/V) 3mV 3mH 3mV 3mH 3mV	Az (Deg) 0.00 0.00 0.00 0.00 0.00 0.00	(Meter) 1.00 1.00 1.00 2.00 1.00	(P/Q/A) P P P P

Page 18 of 24

#### RADIATED EMISSIONS (HARMONIC)

Test Eng	r:Chin I	Pang													
	#:03U211														
Compan	y:EXI W	ireless Syst	ems Inc.												
			92MHz Tran	sceiver											
	N:Tag L														
		C Class B													
Mode O	per: 1 x														
Test Eau	uipment:														
ЕМСС	) Horn 1-1	8GHz	Pre-amplife	r 1-26GH	Iz	5	Spectrum A	nalyzer			Horn > 18	RGHz			
			T87 Miteq 9	24242	_	Agile	ent 8564E A	nalvzer							
T60; S/	/N: 2238 (	@1m 👻	187 Miteq 9	24342	-	Agin		maryzer					<b>•</b>		
	quency Cab			-					Measureme			leasuremen			
(2	(ff)	(2 ~ 3 ft)	$(4 \sim 6 \text{ ft})$					1 MHz	Resolution B						
		a (=)	(4.011)	(1211)				11/11-1					lull		
				• (12 11)		J		1MHz V	Video Bandw		1 MHz Reso 10Hz Video		iuui		
Average=				(1211)		J		1MHz V					idui		
Average=			Read Avg.	AF	CL	Amp	D Corr	1MHz V	Video Bandw Peak	vidth Avg	10Hz Video Pk Lim	Bandwidth Avg Lim	Pk Mar	Avg Mar	Notes
Average=	Peak-Duty	Cycle				Amp dB	D Corr dB		Video Bandw	vidth	10Hz Video	Bandwidth		Avg Mar dB	Notes
Average= f GHz 1.302	Peak-Duty Dist feet 3.3	Cycle Read Pk dBuV 58.3	Read Avg. dBuV 45.1	AF dB/m 25.8	CL dB 1.5	dB -43.4	dB -9.5	HPF 0.0	Video Bandw Peak dBuV/m 32.7	Avg dBuV/m 19.5	10Hz Video Pk Lim dBuV/m 74.0	Bandwidth Avg Lim dBuV/m 54.0	Pk Mar dB -41.3	dB -34.5	v
Average= f GHz 1.302 1.736	Peak-Duty Dist feet 3.3 3.3	Cycle Read Pk dBuV 58.3 55.0	Read Avg. dBuV 45.1 41.8	AF dB/m 25.8 27.9	CL dB 1.5 1.9	dB -43.4 -43.3	dB -9.5 -9.5	HPF 0.0 1.0	Video Bandw Peak dBuV/m 32.7 33.0	Avg dBuV/m 19.5 19.8	10Hz Video Pk Lim dBuV/m 74.0 74.0	Bandwidth Avg Lim dBuV/m 54.0 54.0	Pk Mar dB -41.3 -41.0	dB -34.5 -34.2	V V V
Average= f GHz 1.302 1.736 2.170	Peak-Duty Dist feet 3.3 3.3 3.3	Cycle Read Pk dBuV 58.3 55.0 51.8	Read Avg. dBuV 45.1 41.8 38.6	AF dB/m 25.8 27.9 29.6	CL dB 1.5 1.9 2.3	dB -43.4 -43.3 -43.2	dB -9.5 -9.5 -9.5	HPF 0.0 1.0 1.0	Video Bandw Peak dBuV/m 32.7 33.0 31.9	Avg dBuV/m 19.5 19.8 18.7	10Hz Video Pk Lim dBuV/m 74.0 74.0 74.0	Bandwidth Avg Lim dBuV/m 54.0 54.0 54.0	Pk Mar dB -41.3 -41.0 -42.1	dB -34.5 -34.2 -35.3	V V V V
Average= f GHz 1.302 1.736	Peak-Duty Dist feet 3.3 3.3	Cycle Read Pk dBuV 58.3 55.0	Read Avg. dBuV 45.1 41.8	AF dB/m 25.8 27.9	CL dB 1.5 1.9	dB -43.4 -43.3	dB -9.5 -9.5	HPF 0.0 1.0	Video Bandw Peak dBuV/m 32.7 33.0	Avg dBuV/m 19.5 19.8	10Hz Video Pk Lim dBuV/m 74.0 74.0	Bandwidth Avg Lim dBuV/m 54.0 54.0	Pk Mar dB -41.3 -41.0	dB -34.5 -34.2	V V V
Average= f GHz 1.302 1.736 2.170 2.604	Peak-Duty Dist feet 3.3 3.3 3.3 3.3 3.3	Cycle Read Pk dBuV 58.3 55.0 51.8 50.9	Read Avg. dBuV 45.1 41.8 38.6 37.7	AF dB/m 25.8 27.9 29.6 30.5	CL dB 1.5 1.9 2.3 2.7	dB -43.4 -43.3 -43.2 -43.2	dB -9.5 -9.5 -9.5 -9.5	HPF 0.0 1.0 1.0 1.0	Video Bandw Peak dBuV/m 32.7 33.0 31.9 32.4	Avg dBuV/m 19.5 19.8 18.7 19.2	10Hz Video Pk Lim dBuV/m 74.0 74.0 74.0 74.0	Bandwidth Avg Lim dBuV/m 54.0 54.0 54.0 54.0	Pk Mar dB -41.3 -41.0 -42.1 -41.6	dB -34.5 -34.2 -35.3 -34.8 -37.8 -33.8	V V V V V
Average= f GHz 1.302 1.736 2.170 2.604 3.038 1.302 1.736	Peak-Duty Dist feet 3.3 3.3 3.3 3.3 3.3 3.3 3.3 3.3 3.3 3.	Cycle Read Pk dBuV 58.3 55.0 51.8 50.9 46.6 59.0 56.0	Read Avg. dBuV 45.1 41.8 38.6 37.7 33.4 45.8 42.8	AF dB/m 25.8 27.9 29.6 30.5 31.4 25.8 27.9	CL dB 1.5 1.9 2.3 2.7 3.1 1.5 1.9	dB -43.4 -43.3 -43.2 -43.2 -43.2 -43.2 -43.4 -43.3	dB -9.5 -9.5 -9.5 -9.5 -9.5 -9.5 -9.5 -9.5	HPF 0.0 1.0 1.0 1.0 0.0 1.0	Video Bandw Peak dBuV/m 32.7 33.0 31.9 32.4 29.4 33.4 33.4 34.0	Avg dBuV/m 19.5 19.8 18.7 19.2 16.2 20.2 20.8	10Hz Video Pk Lim dBuV/m 74.0 74.0 74.0 74.0 74.0 74.0 74.0	Bandwidth Avg Lim dBuV/m 54.0 54.0 54.0 54.0 54.0 54.0 54.0	Pk Mar dB -41.3 -41.0 -42.1 -41.6 -44.6 -40.6 -40.0	dB -34.5 -34.2 -35.3 -34.8 -37.8 -33.8 -33.2	V V V V V H H
Average= f GHz 1.302 1.736 2.170 2.604 3.038 1.302 1.736 2.170	Peak-Duty Dist feet 3.3 3.3 3.3 3.3 3.3 3.3 3.3 3.3 3.3 3.	Cycle Read Pk dBuV 58.3 55.0 51.8 50.9 46.6 59.0 556.0 52.4	Read Avg. dBuV 45.1 41.8 38.6 37.7 33.4 45.8 42.8 39.2	AF dB/m 25.8 27.9 29.6 30.5 31.4 25.8 27.9 29.6	CL dB 1.5 1.9 2.3 2.7 3.1 1.5 1.9 2.3	dB -43.4 -43.3 -43.2 -43.2 -43.2 -43.2 -43.4 -43.3 -43.2	dB -9.5 -9.5 -9.5 -9.5 -9.5 -9.5 -9.5 -9.5	0.0 1.0 1.0 1.0 1.0 1.0 1.0 1.0	Video Bandw Peak dBuV/m 32.7 33.0 31.9 32.4 29.4 33.4 33.4 34.0 32.5	Avg dBuV/m 19.5 19.8 18.7 19.2 16.2 20.2 20.8 19.3	10Hz Video Pk Lim dBuV/m 74.0 74.0 74.0 74.0 74.0 74.0 74.0 74.0	Bandwidth Avg Lim dBuV/m 54.0 54.0 54.0 54.0 54.0 54.0 54.0 54.0 54.0 54.0	Pk Mar dB -41.3 -41.0 -42.1 -41.6 -40.6 -40.0 -40.0 -41.5	dB -34.5 -34.2 -35.3 -34.8 -37.8 -33.8 -33.8 -33.2 -34.7	V V V V V H H H
Average= f GHz 1.302 1.736 2.170 2.604 3.038 1.302 1.736 2.170 2.604	Peak-Duty Dist feet 3.3 3.3 3.3 3.3 3.3 3.3 3.3 3.	Cycle Read Pk dBuV 58.3 55.0 51.8 50.9 46.6 59.0 56.0	Read Avg. dBuV 45.1 41.8 38.6 37.7 33.4 45.8 42.8	AF dB/m 25.8 27.9 29.6 30.5 31.4 25.8 27.9 29.6 30.5	CL dB 1.5 1.9 2.3 2.7 3.1 1.5 1.9 2.3 2.7	dB -43.4 -43.3 -43.2 -43.2 -43.2 -43.2 -43.4 -43.3 -43.2 -43.2	dB -9.5 -9.5 -9.5 -9.5 -9.5 -9.5 -9.5 -9.5	HPF 0.0 1.0 1.0 1.0 1.0 1.0 1.0 1.0	Video Bandw Peak dBuV/m 32.7 33.0 31.9 32.4 29.4 33.4 33.4 34.0	Avg dBuV/m 19.5 19.8 18.7 19.2 16.2 20.2 20.8	10Hz Video Pk Lim dBuV/m 74.0 74.0 74.0 74.0 74.0 74.0 74.0 74.0	Bandwidth Avg Lim dBuV/m 54.0 54.0 54.0 54.0 54.0 54.0 54.0	Pk Mar dB -41.3 -41.0 -42.1 -41.6 -44.6 -40.6 -40.0 -41.5 -41.2	dB           -34.5           -34.2           -35.3           -34.8           -37.8           -33.8           -33.2           -34.7	V V V V H H H H
Average= f GHz 1.302 1.736 2.170 2.604 3.038 1.302 1.736 2.170	Peak-Duty Dist feet 3.3 3.3 3.3 3.3 3.3 3.3 3.3 3.3 3.3 3.	Cycle Read Pk dBuV 58.3 55.0 51.8 50.9 46.6 59.0 56.0 56.0 52.4 51.3	Read Avg. dBuV 45.1 41.8 38.6 37.7 33.4 45.8 42.8 39.2 38.1	AF dB/m 25.8 27.9 29.6 30.5 31.4 25.8 27.9 29.6	CL dB 1.5 1.9 2.3 2.7 3.1 1.5 1.9 2.3	dB -43.4 -43.3 -43.2 -43.2 -43.2 -43.2 -43.4 -43.3 -43.2	dB -9.5 -9.5 -9.5 -9.5 -9.5 -9.5 -9.5 -9.5	0.0 1.0 1.0 1.0 1.0 1.0 1.0 1.0	Video Bandw Peak dBuV/m 32.7 33.0 31.9 32.4 29.4 33.4 33.4 33.4 33.5 32.5 32.8	Avg dBuV/m 19.5 19.8 18.7 19.2 16.2 20.2 20.8 19.3 19.6	10Hz Video Pk Lim dBuV/m 74.0 74.0 74.0 74.0 74.0 74.0 74.0 74.0	Bandwidth Avg Lim dBuV/m 54.0 54	Pk Mar dB -41.3 -41.0 -42.1 -41.6 -40.6 -40.0 -40.0 -41.5	dB -34.5 -34.2 -35.3 -34.8 -37.8 -33.8 -33.8 -33.2 -34.7	V V V V V H H H
Average= f GHz 1.302 1.736 2.170 2.604 3.038 1.302 1.736 2.170 2.604 3.038	Peak-Duty Dist feet 3.3 3.3 3.3 3.3 3.3 3.3 3.3 3.	Cycle Read Pk dBuV 58.3 55.0 51.8 50.9 46.6 59.0 46.6 59.0 56.0 52.4 51.3 47.3 were detecta	Read Avg. dBuV 45.1 41.8 38.6 37.7 33.4 45.8 42.8 42.8 39.2 38.1 34.1 4.1 4.1 4.1 4.1 4.1 4.1 4.1 4.1 4.1	AF dB/m 25.8 27.9 29.6 30.5 31.4 25.8 27.9 29.6 30.5 31.4 stem nois	CL dB 1.5 1.9 2.3 2.7 3.1 1.5 1.9 2.3 2.7 3.1	dB -43.4 -43.3 -43.2 -43.2 -43.2 -43.2 -43.2 -43.4 -43.3 -43.2 -43.2 -43.2	dB -9.5 -9.5 -9.5 -9.5 -9.5 -9.5 -9.5 -9.5	HPF 0.0 1.0 1.0 1.0 1.0 1.0 1.0 1.0	Video Bandw Peak dBuV/m 32.7 33.0 31.9 32.4 29.4 33.4 33.4 33.4 33.5 32.5 32.8	Avg dBuV/m 19.5 19.8 18.7 19.2 16.2 20.2 20.8 19.3 19.6	10Hz Video Pk Lim dBuV/m 74.0 74.0 74.0 74.0 74.0 74.0 74.0 74.0	Bandwidth Avg Lim dBuV/m 54.0 54	Pk Mar dB -41.3 -41.0 -42.1 -41.6 -44.6 -40.6 -40.6 -40.6 -40.5 -41.2 -41.2 -43.9	dB -34.5 -34.2 -35.3 -34.8 -37.8 -33.8 -33.2 -33.2 -34.7 -34.4 -37.1	V V V V H H H H H
Average= f GHz 1.302 1.736 2.170 2.604 3.038 1.302 1.736 2.170 2.604 3.038	Peak-Duty Dist feet 3.3 3.3 3.3 3.3 3.3 3.3 3.3 3.	Cycle Read Pk dBuV 58.3 55.0 51.8 50.9 46.6 59.0 46.6 59.0 56.0 52.4 51.3 47.3 were detecta	Read Avg. dBuV 45.1 41.8 38.6 37.7 33.4 45.8 42.8 39.2 38.1 34.1	AF dB/m 25.8 27.9 29.6 30.5 31.4 25.8 27.9 29.6 30.5 31.4 stem nois	CL dB 1.5 1.9 2.3 2.7 3.1 1.5 1.9 2.3 2.7 3.1	dB           -43.4           -43.3           -43.2           -43.2           -43.2           -43.4           -43.2           -43.2           -43.2           -43.2           -43.2           -43.2           -43.2           -43.2	dB -9.5 -9.5 -9.5 -9.5 -9.5 -9.5 -9.5 -9.5	<b>HPF</b> <ol> <li>0.0</li> <li>1.0</li> <li>1.0</li> <li>0.0</li> <li>1.0</li> <li>1.0</li> <li>1.0</li> <li>1.0</li> <li>5ain</li> </ol>	Video Bandw Peak dBuV/m 32.7 33.0 31.9 32.4 29.4 33.4 34.0 32.5 32.8 30.1	Avg dBuV/m 19.5 19.8 18.7 19.2 20.2 20.2 20.8 19.3 19.3 19.6 16.9	10Hz Video Pk Lim dBuV/m 74.0 74.0 74.0 74.0 74.0 74.0 74.0 74.0	Bandwidth Avg Lim dBuV/m 54.0 54	Pk Mar dB -41.3 -41.0 -42.1 -41.6 -44.6 -40.6 -40.0 -41.5 -41.2 -43.9 -43.9	dB -34.5 -34.2 -35.3 -34.8 -37.8 -33.8 -33.2 -34.7 -34.4 -37.1 -34.4 -37.1	V V V V H H H H H
Average= f GHz 1.302 1.736 2.170 2.604 3.038 1.302 1.736 2.170 2.604 3.038	Peak-Duty Dist feet 3.3 3.3 3.3 3.3 3.3 3.3 3.3 3.	Cycle Read Pk dBuV 58.3 55.0 51.8 50.9 46.6 59.0 46.6 59.0 56.0 52.4 51.3 47.3 were detecta	Read Avg. dBuV 45.1 38.6 37.7 33.4 45.8 42.8 39.2 38.1 34.1 d above the sysent Frequency	AF dB/m 25.8 27.9 29.6 30.5 31.4 25.8 27.9 29.6 30.5 31.4 stem nois	CL dB 1.5 1.9 2.3 2.7 3.1 1.5 1.9 2.3 2.7 3.1	dB           -43.4           -43.3           -43.2           -43.2           -43.2           -43.4           -43.2           -43.2           -43.2           -43.2           -43.2           -43.2           -43.2           -43.2	dB -9.5 -9.5 -9.5 -9.5 -9.5 -9.5 -9.5 -9.5	<b>HPF</b> <ol> <li>0.0</li> <li>1.0</li> <li>1.0</li> <li>0.0</li> <li>1.0</li> <li>1.0</li> <li>1.0</li> <li>1.0</li> <li>5ain</li> </ol>	Video Bandw Peak dBuV/m 32.7 33.0 31.9 32.4 29.4 33.4 33.4 33.4 33.5 32.5 32.8	Avg dBuV/m 19.5 19.8 18.7 19.2 20.2 20.2 20.8 19.3 19.3 19.6 16.9	10Hz Video Pk Lim dBuV/m 74.0 74.0 74.0 74.0 74.0 74.0 74.0 74.0	Bandwidth Avg Lim dBuV/m 54.0 54	Pk Mar dB -41.3 -41.0 -42.1 -41.6 -44.6 -40.6 -40.0 -41.5 -41.2 -43.9 -43.9	dB -34.5 -34.2 -35.3 -34.8 -37.8 -33.8 -33.2 -33.2 -34.7 -34.4 -37.1	V V V V H H H H H
Average= f GHz 1.302 1.736 2.170 2.604 3.038 1.302 1.736 2.170 2.604 3.038	Peak-Duty Dist feet 3.3 3.3 3.3 3.3 3.3 3.3 3.3 3.3 3.3 3.	Cycle Read Pk dBuV 58.3 55.0 51.8 50.9 46.6 59.0 56.0 56.0 56.0 51.3 51.3 47.3 were detect Measurem	Read Avg. dBuV 45.1 41.8 38.6 37.7 33.4 45.8 42.8 39.2 38.1 34.1 d above the system Frequency Antenna	AF dB/m 25.8 27.9 29.6 30.5 31.4 25.8 27.9 29.6 30.5 31.4 stem nois	CL dB 1.5 1.9 2.3 2.7 3.1 1.5 1.9 2.3 2.7 3.1	dB           -43.4           -43.3           -43.2           -43.2           -43.2           -43.4           -43.2           -43.2           -43.2           -43.2           -43.2           -43.2           -43.2           -43.2	dB -9.5 -9.5 -9.5 -9.5 -9.5 -9.5 -9.5 -9.5	<b>HPF</b> <ol> <li>0.0</li> <li>1.0</li> <li>1.0</li> <li>1.0</li> <li>1.0</li> <li>1.0</li> <li>1.0</li> <li>5.0</li> </ol>	Video Bandw Peak dBuV/m 32.7 33.0 31.9 32.4 29.4 33.4 34.0 32.5 32.8 30.1	Avg dBuV/m 19.5 19.8 18.7 19.2 16.2 20.2 20.8 19.3 19.3 19.3 19.3 16.9	10Hz Video Pk Lim dBuV/m 74.0 74.0 74.0 74.0 74.0 74.0 74.0 74.0	Bandwidth Avg Lim dBuV/m 54.0 54	Pk Mar dB -41.3 -41.0 -42.1 -41.6 -40.6 -40.0 -41.5 -41.5 -41.5 -43.9 Average I Peak Field	dB -34.5 -34.2 -35.3 -34.8 -37.8 -33.8 -33.2 -34.7 -34.4 -37.1 -34.4 -37.1	V V V V H H H H H
Average= f GHz 1.302 1.736 2.170 2.604 3.038 1.302 1.736 2.170 2.604 3.038	Peak-Duty Dist feet 3.3 3.3 3.3 3.3 3.3 3.3 3.3 3.3 3.3 3.	Cycle Read Pk dBuV 58.3 55.0 51.8 50.9 46.6 59.0 56.0 52.4 51.3 47.3 47.3 were detecto Measuremu Distance to	Read Avg. dBuV 45.1 41.8 38.6 37.7 33.4 45.8 42.8 39.2 38.1 34.1 ed above the sys ent Frequency o Antenna Reading	AF dB/m 25.8 27.9 29.6 30.5 31.4 25.8 27.9 29.6 30.5 31.4 stem nois	CL dB 1.5 1.9 2.3 2.7 3.1 1.5 1.9 2.3 2.7 3.1	dB           -43.4           -43.3           -43.2           -43.2           -43.2           -43.4           -43.2	dB -9.5 -9.5 -9.5 -9.5 -9.5 -9.5 -9.5 -9.5	<b>HPF</b> <ul> <li>0.0</li> <li>1.0</li> <li>1.0</li> <li>1.0</li> <li>1.0</li> <li>1.0</li> <li>1.0</li> <li>1.0</li> <li>5ain</li> <li>Correct</li> <li>Field S</li> </ul>	Peak           dBuV/m           32.7           33.0           31.9           32.4           29.4           33.4           34.0           32.5           32.8           30.1	Avg dBuV/m 19.5 19.8 18.7 19.2 16.2 20.2 20.8 19.3 19.6 16.9 20.8 19.3 19.6 16.9 20.8 19.3 19.6 16.9 20.8 19.3 19.5 19.5 19.5 19.8 18.7 19.2 16.2 20.8 19.3 19.5 19.8 18.7 19.5 19.8 18.7 19.5 19.8 18.7 19.5 19.8 18.7 19.2 16.2 20.8 19.3 19.3 19.3 19.5 19.8 18.7 19.2 16.2 20.8 19.3 19.3 19.3 19.3 19.3 19.5 19.8 19.5 19.8 19.7 19.2 16.2 20.8 19.3 19.3 19.3 19.3 19.5 19.8 19.5 19.8 19.5 19.8 19.7 19.7 19.7 19.7 19.7 19.7 19.7 19.7	10Hz Video Pk Lim dBuV/m 74.0 74.0 74.0 74.0 74.0 74.0 74.0 74.0	Bandwidth Avg Lim dBuV/m 54.0 54	Pk Mar           dB           -41.3           -41.0           -42.1           -41.6           -44.6           -40.0           -41.5           -41.2           -41.3           -41.2           -43.9           Average I           Peak Field           Margin vs	dB           -34.5           -34.2           -35.3           -34.8           -37.8           -33.2           -34.4           -37.1           Wield Strengt           J Strength L	V V V V H H H H h Limit imit

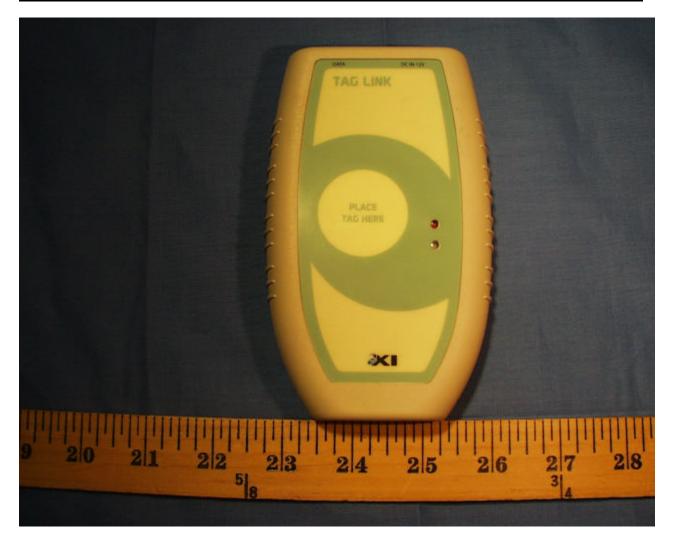
Page 19 of 24

# **EUT PHOTOGRAPHS**



Page 20 of 24

REPORT NO: 03U2119-1 EUT: 307KHz / 433.92 MHz Transceiver DATE: August 04, 2003 FCC ID: HE7TGL

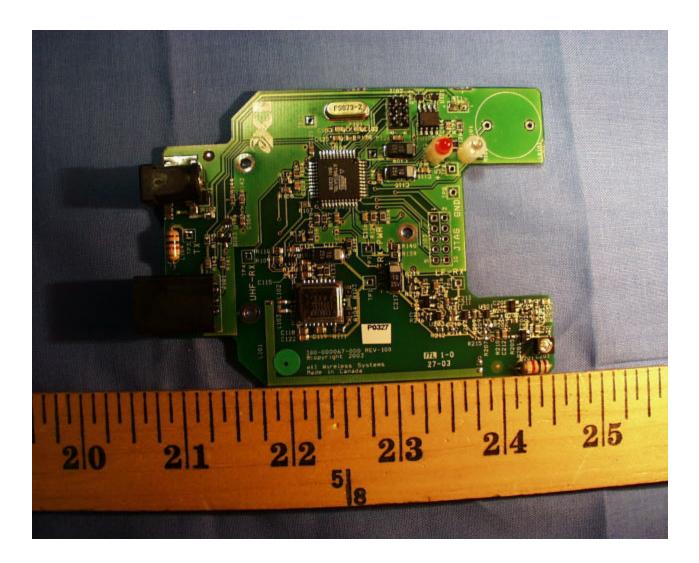


Page 21 of 24

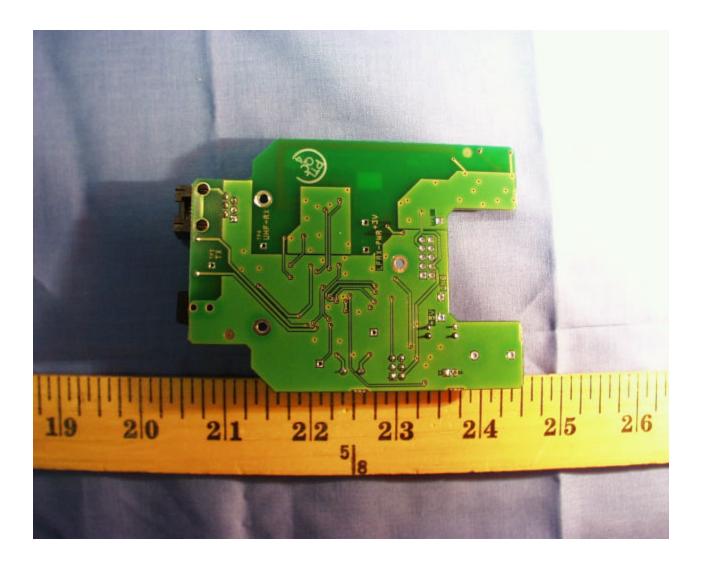
REPORT NO: 03U2119-1 EUT: 307KHz / 433.92 MHz Transceiver DATE: August 04, 2003 FCC ID: HE7TGL



Page 22 of 24



Page 23 of 24



# **END OF REPORT**

Page 24 of 24