EMC TEST REPORT

Test Report No.	**WC1010876**	Date of issue:	28 December 2010
Manufacturer	Recon Dynamics LLC		
Address	2300 Carillon Point		
	Kirkland WA 98033-7445		
Description of Equipment	Asset Tracker		
Name of Equipment	Asset Tracker		
Model No(s) Tested	P1-0001-00		
Serial No(s) Tested	18		

Test Result ■ **Compliant** ☐ **Non-compliant**

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REVISION RECORD

REVISION	TOTAL NUMBER OF PAGES	DATE	DESCRIPTION
	30	28 December 2010	Initial Release

TEST REPORT CONTENTS **Page(s)**

Sign Explanations:
☐ - not applicable
■ - applicable

EMC TEST REGULATIONS

The tests were performed according to the following regulations:

FCC Part 15 §15.247(d) & §15.207(a)

ENVIRONMENTAL CONDITIONS IN THE LAB

	Actual
Temperature:	: 20°C
Atmospheric pressure	: 100 kPa
Relative Humidity	: 3 %

POWER SUPPLY UTILIZED

Power supply system : 4 VDC battery and 120V / 60Hz to DC supply

§15.247(d) Radiated emissions which fall in the restricted bands

Test summary
The requirements are: ■ - MET ☐ - NOT MET
Testing performed in accordance with ANSI C63.4 2003, clause 8.3
Minimum margin of compliance is 3.52 dB at 3.64 GHz

Test location
■ - Wild River Lab Large Test Site (Open Area Test Site)
☐ - Wild River Lab Large Test Site - Tech area
☐ - Wild River Lab Small Test Site (Open Area Test Site)

Test distance
■ - 3 meters
☐ - 10 meters

Test equipment

TUV ID	Model	Manufacturer	Description	Serial	Cal Due
OWLE02074	3115	Electro-Mechanics (EMCO)	Ridge Guide Antenna	2504	09-Feb-11
OWLE03202	EM-6917B	Electro-Metrics	Biconicalog Periodic	101	28-May-11
WRLE10527	SL18B4020	Phase One Microwave	Preamplifier 1 – 18 GHz	0001	Code B 05-Oct-11
WRLE03934	F549B-1	Acronetics	2 – 4 GHz Bandpass Filter	010	Code B 05-Oct-11
WRLE02003	F550B1	Acronetics	4 – 8 GHz Bandpass Filter	010	Code B 05-Oct-11
NBLE03196	8566B	Hewlett-Packard	Spectrum Analyzer	2240A01856	19-Oct-11
WRLE10616	ZHL-1042J	Mini-Circuits	Preamplifier 10 - 3000 MHz	QA0746005	Code B 25-Oct-11

Cal Code B = Calibration verification performed internally.

Test limit (in restricted bands)

Frequency (MHz)	Field strength (μV/meter)	Field strength (dBμV/meter)
30 - 88	100 – QP	40.0
88 - 216	150 – QP	43.5
216 - 960	200 – QP	46.0
960-1000	500 – QP	54.0
>1000	500 – AV 5000 – PK	54.0 74.0

Test data
See following pages.

RADIATED EMISSIONS

Test Report #:	WC1010876 Run 9	Test Area:	LTS		
EUT Model #:	P1-0001-00	Date:	12/14/2010		
EUT Serial #:	18	EUT Power:	4 VDC	Temperature:	20.0 °C
Test Method:	FCC 15.247			Air Pressure:	100.0 kPa
Customer:	Recon Dynamics, LLC			Rel. Humidity:	3.0 %
EUT Description:	Asset Tracker (910 MHz)				
Notes:	Shield over U5. No external I/O cables. Removed 4 conductors on top side of board, ground to ground.				
Data File Name:	10876 r4 & up.dat			Page:	1 of 1

List of measurements for run #: 9

FREQ	LEVEL (dBuV)	CABLE / ANT / PREAMP / ATTEN (dB)	FINAL (dBuV / m)	POL / HGT / AZ (m)(DEG)	DELTA1 FCC 15.247 <1GHz 3m qp	DELTA2
Begin scan 30 - 1000 MHz for spurious emissions in the restricted bands of 15.205						
Device on its side, the orthogonal axis with the highest fundamental emission						
EUT rotated 360 degrees, measurement antenna vertical & horizontal, 1 - 4 meters high						
No significant emissions detected						
end scan 30 - 1000 MHz in restricted bands						

Tested by: Greg Jakubowski (Printed) — G Jakubowski (Signature)

Reviewed by: Joel T Schneider (Printed) — Joel T. Schneider (Signature)

RADIATED EMISSIONS

Test Report #:	WC1010876 Run 8	Test Area:	LTS		
EUT Model #:	P1-0001-00	Date:	12/14/2010		
EUT Serial #:	18	EUT Power:	4 VDC	Temperature:	20.0 °C
Test Method:	FCC 15.247			Air Pressure:	100.0 kPa
Customer:	Recon Dynamics, LLC			Rel. Humidity:	3.0 %
EUT Description:	Asset Tracker (910 MHz)				
Notes:	Shield over U5. No external I/O cables. Removed 4 conductors on top side of board, ground to ground.				
Data File Name:	10876 r4 & up.dat			Page:	1 of 3

List of measurements for run #: 8

FREQ	LEVEL (dBuV)	CABLE / ANT / PREAMP / ATTEN (dB)	FINAL (dBuV / m)	POL / HGT / AZ (m)(DEG)	DELTA1 FCC 15.247 >1GHz 3m av	DELTA2 FCC 15.247 >1G 3m pk
Device on its side (orthogonal axis with highest fundamental field strength)						
Begin scan 1 - 10 GHz for emissions in the restricted bands of 15.205						
Average measurements with 1 MHz RBW, 10 Hz VBW						
maximized						
2.73 GHz	65.9 Pk	5.38 / 29.1 / 43.59 / 0.3	57.09	H / 2.29 / 141	n/a	-16.91
2.73 GHz	56.63 Av	5.38 / 29.1 / 43.59 / 0.3	47.82	H / 2.29 / 141	-6.18	n/a
3.64 GHz	62.6 Pk	6.83 / 31.67 / 43.7 / 0.52	57.91	H / 2.07 / 130	n/a	-16.09
3.64 GHz	55.17 Av	6.83 / 31.67 / 43.7 / 0.52	50.48	H / 2.07 / 130	-3.52	n/a
4.55 GHz	58.05 Pk	8.28 / 32.59 / 43.36 / 0.38	55.94	H / 1.66 / 156	n/a	-18.06
4.55 GHz	45.84 Av	8.28 / 32.59 / 43.36 / 0.38	43.73	H / 1.66 / 156	-10.27	n/a
5.46 GHz	52.0 Pk	9.4 / 34.13 / 43.0 / 0.59	53.12	H / 1.55 / 87	n/a	-20.88
5.46 GHz	43.52 Av	9.4 / 34.13 / 43.0 / 0.59	44.64	H / 1.55 / 87	-9.36	n/a
No other significant emissions detected above 5.46 GHz						
End scan 1 - 10 GHz in restricted bands						
verify orthogonal axis with highest fundamental field strength						
maximized						
on its side						
910.0 MHz	103.48 Pk	3.09 / 22.43 / 0.0 / 0.0	129.0	H / 1.00 / 31	n/a	n/a
upright						
910.01 MHz	103.36 Pk	3.09 / 22.43 / 0.0 / 0.0	128.88	H / 1.00 / 31	n/a	n/a
laying flat						
910.01 MHz	102.1 Pk	3.09 / 22.43 / 0.0 / 0.0	127.62	H / 1.00 / 60	n/a	n/a

Tested by: Greg Jakubowski (Printed) — G Jakubowski (Signature)

Reviewed by: Joel T Schneider (Printed) — Joel T. Schneider (Signature)

RADIATED EMISSIONS

Test Report #:	WC1010876 Run 8	Test Area:	LTS		
EUT Model #:	P1-0001-00	Date:	12/14/2010		
EUT Serial #:	18	EUT Power:	4 VDC	Temperature:	20.0 °C
Test Method:	FCC 15.247			Air Pressure:	100.0 kPa
Customer:	Recon Dynamics, LLC			Rel. Humidity:	3.0 %
EUT Description:	Asset Tracker (910 MHz)				
Notes:	Shield over U5. No external I/O cables. Removed 4 conductors on top side of board, ground to ground.				
Data File Name:	10876 r4 & up.dat			Page:	2 of 3

Measurement summary for limit1: FCC 15.247 >1GHz 3m av (Av)

FREQ	LEVEL (dBuV)	CABLE / ANT / PREAMP / ATTEN (dB)	FINAL (dBuV / m)	POL / HGT / AZ (m)(DEG)	DELTA1 FCC 15.247 >1GHz 3m av
3.64 GHz	55.17 Av	6.83 / 31.67 / 43.7 / 0.52	50.48	H / 2.07 / 130	-3.52
2.73 GHz	56.63 Av	5.38 / 29.1 / 43.59 / 0.3	47.82	H / 2.29 / 141	-6.18
5.46 GHz	43.52 Av	9.4 / 34.13 / 43.0 / 0.59	44.64	H / 1.55 / 87	-9.36
4.55 GHz	45.84 Av	8.28 / 32.59 / 43.36 / 0.38	43.73	H / 1.66 / 156	-10.27

Measurement summary for limit2: FCC 15.247 >1G 3m pk (Pk)

FREQ	LEVEL (dBuV)	CABLE / ANT / PREAMP / ATTEN (dB)	FINAL (dBuV / m)	POL / HGT / AZ (m)(DEG)	DELTA2 FCC 15.247 >1G 3m pk
3.64 GHz	62.6 Pk	6.83 / 31.67 / 43.7 / 0.52	57.91	H / 2.07 / 130	-16.09
2.73 GHz	65.9 Pk	5.38 / 29.1 / 43.59 / 0.3	57.09	H / 2.29 / 141	-16.91
4.55 GHz	58.05 Pk	8.28 / 32.59 / 43.36 / 0.38	55.94	H / 1.66 / 156	-18.06
5.46 GHz	52.0 Pk	9.4 / 34.13 / 43.0 / 0.59	53.12	H / 1.55 / 87	-20.88

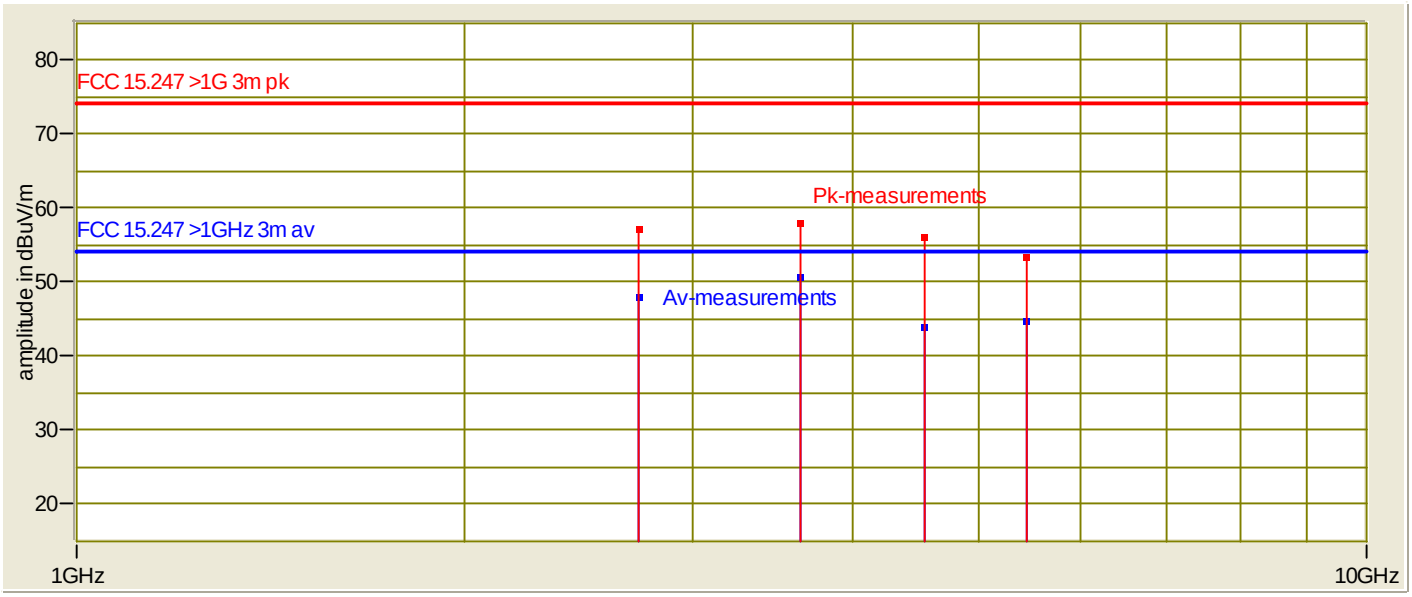
Tested by: Greg Jakubowski (Printed) — G Jakubowski (Signature)

Reviewed by: Joel T Schneider (Printed) — Joel T. Schneider (Signature)

RADIATED EMISSIONS

Test Report #:	WC1010876 Run 8	Test Area:	LTS		
EUT Model #:	P1-0001-00	Date:	12/14/2010		
EUT Serial #:	18	EUT Power:	4 VDC	Temperature:	20.0 °C
Test Method:	FCC 15.247			Air Pressure:	100.0 kPa
Customer:	Recon Dynamics, LLC			Rel. Humidity:	3.0 %
EUT Description:	Asset Tracker (910 MHz)				
Notes:	Shield over U5. No external I/O cables. Removed 4 conductors on top side of board, ground to ground.				
Data File Name:	10876 r4 & up.dat			Page:	3 of 3

Graph:



Tested by: Greg Jakubowski (Printed) _____ (Signature)

Reviewed by: Joel T Schneider (Printed) _____ (Signature)

§15.207(a) Conducted Emission Limits on AC power mains

Test summary
The requirements are: ■ - MET ☐ - NOT MET
Testing performed in accordance with ANSI C63.4 2003, clause 7.2
Tested the AC to DC charger. The device does not transmit while charging.
Minimum margin of compliance is 17.79 dB at 1.55 MHz

Test location
■ - Wild River Lab Large Test Site (Open Area Test Site)
☐ - Wild River Lab Large Test Site - Tech area
☐ - Wild River Lab Small Test Site (Open Area Test Site)

Test equipment

TUV ID	Model	Manufacturer	Description	Serial	Cal Due
WRLE02416	3825/2	Electro-Mechanics (EMCO)	50 Ω LISN	8812-1437	Code B 06-Jan-11
OWLE02532	ESHS-10	Rohde & Schwarz	EMI Receiver	828178/006	06-Oct-11

Cal Code B = Calibration verification performed internally.

Test limit

Frequency (MHz)	Conducted limit (dBµV)	
	Quasi-peak	Average
0.15 - 0.5	66 – 56*	56 – 46*
0.5 – 5	56	46
5 – 30	60	50

*Decreases with the logarithm of the frequency

Test data
See following pages.

CONDUCTED EMISSIONS

Test Report #:	WC1010876 Run 7	Test Area:	LTS		
EUT Model #:	P1-0001-00	Date:	12/14/2010		
EUT Serial #:	18	EUT Power:	120V / 60Hz to DC	Temperature:	20.0 °C
Test Method:	FCC 15.207			Air Pressure:	100.0 kPa
Customer:	Recon Dynamics, LLC			Rel. Humidity:	3.0 %
EUT Description:	Asset Tracker (910 MHz) with DC power supply				
Notes:					
Data File Name:	10876 r4 & up.dat			Page:	1 of 3

List of measurements for run #: 7

FREQ	LEVEL (dBuV)	CABLE / ANT / PREAMP / ATTEN (dB)	FINAL (dBuV)	EUT Lead	DELTA1 FCC 15.207 Qp	DELTA2 FCC 15.207 Avg
192.1 kHz	38.4 Qp	0.13 / 0.17 / 0.0 / 0.0	38.7	N	-25.24	n/a
192.1 kHz	19.2 Av	0.13 / 0.17 / 0.0 / 0.0	19.5	N	n/a	-34.44
387.0 kHz	34.9 Qp	0.16 / 0.1 / 0.0 / 0.0	35.16	N	-22.97	n/a
387.0 kHz	17.9 Av	0.16 / 0.1 / 0.0 / 0.0	18.16	N	n/a	-29.97
1.634 MHz	35.8 Qp	0.31 / 0.1 / 0.0 / 0.0	36.21	N	-19.79	n/a
1.634 MHz	20.9 Av	0.31 / 0.1 / 0.0 / 0.0	21.31	N	n/a	-24.69
264.4 kHz	36.9 Qp	0.14 / 0.12 / 0.0 / 0.0	37.16	N	-24.13	n/a
264.4 kHz	18.9 Av	0.14 / 0.12 / 0.0 / 0.0	19.16	N	n/a	-32.13
3.026 MHz	17.8 Qp	0.42 / 0.1 / 0.0 / 0.0	18.32	N	-37.68	n/a
3.026 MHz	5.7 Av	0.42 / 0.1 / 0.0 / 0.0	6.22	N	n/a	-39.78
28.69 MHz	7.7 Qp	1.29 / 0.37 / 0.0 / 0.0	9.37	N	-50.63	n/a
28.69 MHz	-0.4 Qp	1.29 / 0.37 / 0.0 / 0.0	1.27	N	-58.73	n/a
187.5 kHz	34.3 Qp	0.13 / 0.18 / 0.0 / 0.0	34.6	L1	-29.54	n/a
187.5 kHz	13.4 Av	0.13 / 0.18 / 0.0 / 0.0	13.7	L1	n/a	-40.44
258.5 kHz	37.2 Qp	0.14 / 0.13 / 0.0 / 0.0	37.47	L1	-24.01	n/a
258.5 kHz	20.1 Qp	0.14 / 0.13 / 0.0 / 0.0	20.37	L1	-41.11	n/a
387.3 kHz	34.4 Qp	0.16 / 0.1 / 0.0 / 0.0	34.66	L1	-23.46	n/a
387.5 kHz	21.4 Av	0.16 / 0.1 / 0.0 / 0.0	21.66	L1	n/a	-26.46
1.55 MHz	37.8 Qp	0.31 / 0.1 / 0.0 / 0.0	38.21	L1	-17.79	n/a
1.55 MHz	26.6 Av	0.31 / 0.1 / 0.0 / 0.0	27.01	L1	n/a	-18.99
2.959 MHz	22.4 Qp	0.42 / 0.1 / 0.0 / 0.0	22.92	L1	-33.08	n/a
2.959 MHz	10.6 Av	0.42 / 0.1 / 0.0 / 0.0	11.12	L1	n/a	-34.88
17.13 MHz	7.5 Qp	1.01 / 0.2 / 0.0 / 0.0	8.71	L1	-51.29	n/a
17.13 MHz	-1.8 Av	1.01 / 0.2 / 0.0 / 0.0	-0.59	L1	n/a	-50.59

Tested by: Greg Jakubowski (Printed) — G Jakubowski (Signature)

Reviewed by: Joel T Schneider (Printed) — Joel T. Schneider (Signature)

CONDUCTED EMISSIONS

Test Report #:	WC1010876 Run 7	Test Area:	LTS			
EUT Model #:	P1-0001-00	Date:	12/14/2010			
EUT Serial #:	18	EUT Power:	120V / 60Hz to DC	Temperature:	20.0	°C
Test Method:	FCC 15.207			Air Pressure:	100.0	kPa
Customer:	Recon Dynamics, LLC			Rel. Humidity:	3.0	%
EUT Description:	Asset Tracker (910 MHz) with DC power supply					
Notes:						
Data File Name:	10876 r4 & up.dat			Page:	2 of 3	

Measurement summary for limit1: FCC 15.207 Qp (Qp)

FREQ	LEVEL (dBuV)	CABLE / ANT / PREAMP / ATTEN (dB)	FINAL (dBuV)	EUT Lead	DELTA1 FCC 15.207 Qp
1.55 MHz	37.8 Qp	0.31 / 0.1 / 0.0 / 0.0	38.21	L1	-17.79
1.634 MHz	35.8 Qp	0.31 / 0.1 / 0.0 / 0.0	36.21	N	-19.79
387.0 kHz	34.9 Qp	0.16 / 0.1 / 0.0 / 0.0	35.16	N	-22.97
258.5 kHz	37.2 Qp	0.14 / 0.13 / 0.0 / 0.0	37.47	L1	-24.01
192.1 kHz	38.4 Qp	0.13 / 0.17 / 0.0 / 0.0	38.7	N	-25.24
2.959 MHz	22.4 Qp	0.42 / 0.1 / 0.0 / 0.0	22.92	L1	-33.08
3.026 MHz	17.8 Qp	0.42 / 0.1 / 0.0 / 0.0	18.32	N	-37.68
28.69 MHz	7.7 Qp	1.29 / 0.37 / 0.0 / 0.0	9.37	N	-50.63
17.13 MHz	7.5 Qp	1.01 / 0.2 / 0.0 / 0.0	8.71	L1	-51.29

Measurement summary for limit2: FCC 15.207 Avg (Av)

FREQ	LEVEL (dBuV)	CABLE / ANT / PREAMP / ATTEN (dB)	FINAL (dBuV)	EUT Lead	DELTA2 FCC 15.207 Avg
1.55 MHz	26.6 Av	0.31 / 0.1 / 0.0 / 0.0	27.01	L1	-18.99
1.634 MHz	20.9 Av	0.31 / 0.1 / 0.0 / 0.0	21.31	N	-24.69
387.5 kHz	21.4 Av	0.16 / 0.1 / 0.0 / 0.0	21.66	L1	-26.46
264.4 kHz	18.9 Av	0.14 / 0.12 / 0.0 / 0.0	19.16	N	-32.13
192.1 kHz	19.2 Av	0.13 / 0.17 / 0.0 / 0.0	19.5	N	-34.44
2.959 MHz	10.6 Av	0.42 / 0.1 / 0.0 / 0.0	11.12	L1	-34.88
3.026 MHz	5.7 Av	0.42 / 0.1 / 0.0 / 0.0	6.22	N	-39.78
17.13 MHz	-1.8 Av	1.01 / 0.2 / 0.0 / 0.0	-0.59	L1	-50.59

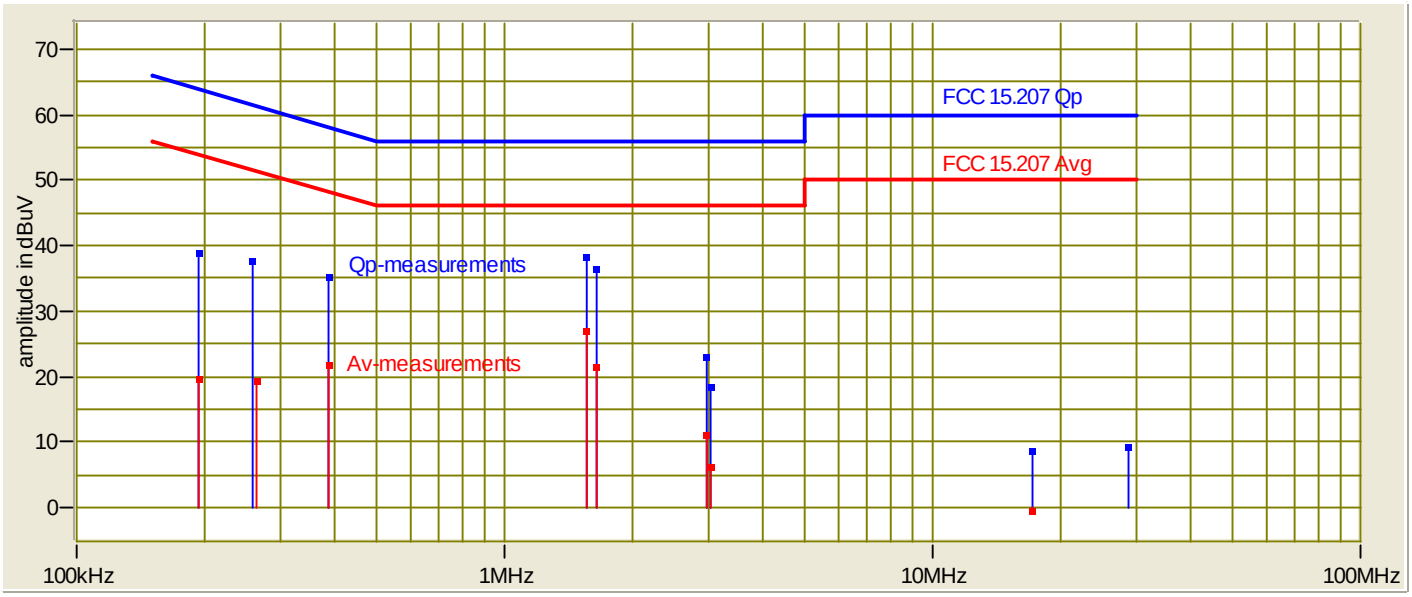
Tested by: Greg Jakubowski (Printed) — G Jakubowski (Signature)

Reviewed by: Joel T Schneider (Printed) — Joel T. Schneider (Signature)

CONDUCTED EMISSIONS

Test Report #:	WC1010876 Run 7	Test Area:	LTS		
EUT Model #:	P1-0001-00	Date:	12/14/2010		
EUT Serial #:	18	EUT Power:	120V / 60Hz to DC	Temperature:	20.0 °C
Test Method:	FCC 15.207			Air Pressure:	100.0 kPa
Customer:	Recon Dynamics, LLC			Rel. Humidity:	3.0 %
EUT Description:	Asset Tracker (910 MHz) with DC power supply				
Notes:					
Data File Name:	10876 r4 & up.dat			Page:	3 of 3

Graph:



Tested by: Greg Jakubowski (Printed) _____ (Signature)

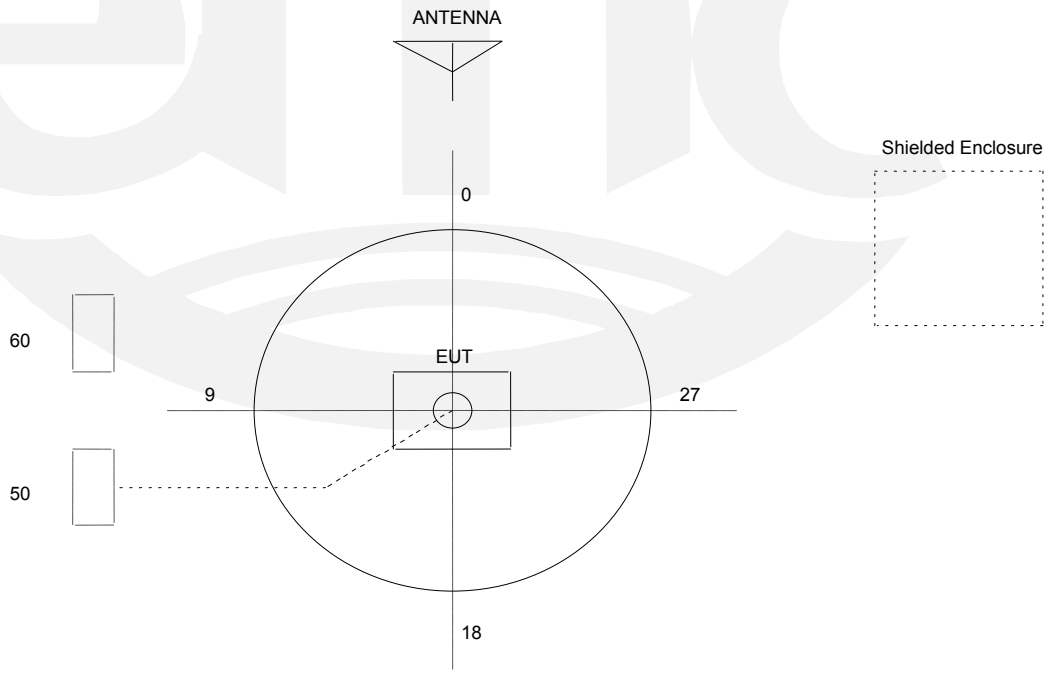
Reviewed by: Joel T Schneider (Printed) _____ (Signature)

TEST SETUP FOR EMISSIONS TESTING

WILD RIVER LAB
Large Test Site

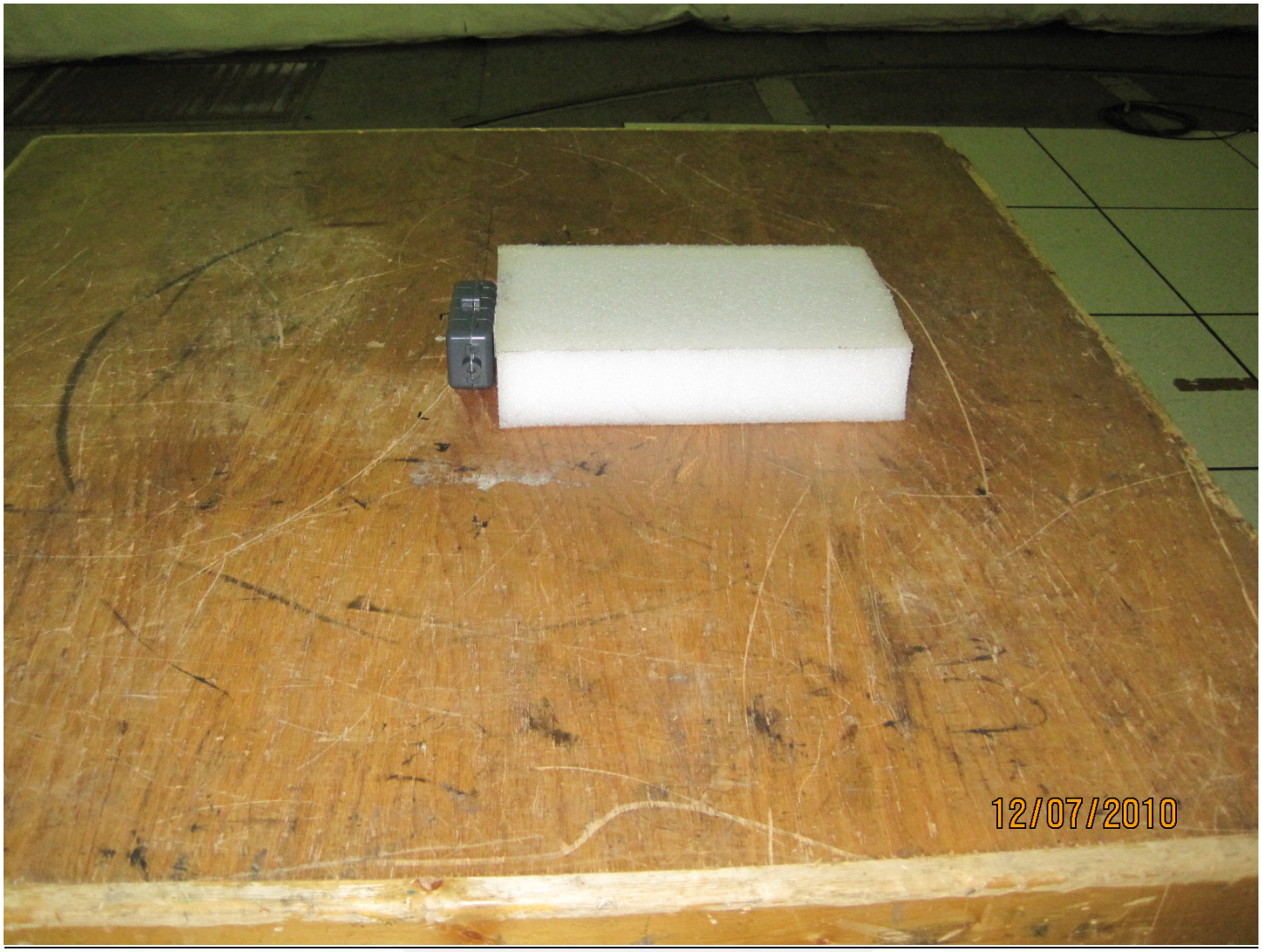
Notes:

1. Items shown in dotted lines are located on the floor below the test area. It is 5 meters vertically from the ground floor to the test area.
2. 50 Hz and 60 Hz are power panels for alternating current.
3. The antenna may be positioned horizontally 3 and 10 meters from the center of the turntable.
4. The circle is either a 6.7 meter or 1.2 meter diameter turntable.
5. A ground plane is in the plane of this sheet.
6. The test sample is shown in the azimuthal position representing zero degrees.



Test-setup photo(s):
Radiated emissions

Test-setup photo(s):
Radiated emissions



Test-setup photo(s):
Conducted emissions

Test-setup photo(s):
Conducted emissions

Equipment Under Test (EUT) Test Operation Mode:

The device under test was operated under the following conditions during immunity testing:

☐ - Standby

☐ - Test program (H - Pattern)

☐ - Test program (color bar)

☐ - Test program (customer specific)

☐ - Practice operation

☐ - Normal operating mode

■ - See Appendix A

Configuration of the device under test:

■ - See Appendix A and test setup photo(s)

☐ - See Product Information Form(s) in Appendix B

DEVIATIONS FROM STANDARD:

None.

GENERAL REMARKS:

Modifications required to pass:

☐ None

■ As indicated on the data sheet(s)

Test Specification Deviations: Additions to or Exclusions from:

■ None

☐ As indicated in the Test Plan

SUMMARY:

The requirements according to the technical regulations are

■ - met and the device under test does fulfill the general approval requirements.

☐ - **not** met and the device under test does **not** fulfill the general approval requirements..

EUT Received Date:	14 December 2010
Condition of EUT:	Normal
Testing Start Date:	14 December 2010
Testing End Date:	14 December 2010

TÜV SÜD AMERICA INC

Greg S Jakubowski
Senior EMC Technician

Joel T Schneider
Senior EMC Engineer

Appendix A

Constructional Data Form

and

Block Diagram

Form

EMC Test Plan and Constructional Data Form

PLEASE COMPLETE THIS DOCUMENT IN FULL, ENTERING N/A IF THE FIELD IS NOT APPLICABLE. IF TESTING RESULTS IN MODIFICATIONS TO THE EQUIPMENT, PLEASE SUBMIT A REVISED TP/CDF INDICATING THOSE MODIFICATIONS.
NOTE: This information will be input into your test report as shown below. Press the F1 key at any time to get HELP for the current field selected.

Company:	Recon Dynamics, LLC		
Address:	2300 Carillon Point		
	Kirkland, WA 98033-7445		
Contact:	Elliott Hoole	Position:	Head of Device Development and Manufacturing
Phone:	425-828-8051	Fax:	425-828-8060
E-mail Address:	ehoole@recondynamics.com		

General Equipment Description -- ***NOTE: This information will be input into your test report as shown below.***

EUT Description	Asset Tracker		
EUT Name	Asset Tracker		
Model No.:	P1-0001-00	Serial No.:	18
Product Options:			
Configurations to be tested:			

Equipment Modification (*If applicable, indicate modifications since EUT was last tested. If modifications are made during this testing, submit revised TP/CDF after testing is complete.)*

Modifications since last test:

Modifications made during test:

Test Objective(s): ***Please indicate the tests to be performed, entering the applicable standard(s) where noted.***

- ☐ EMC Directive 2004/108/EC (EMC) Std:
- ☐ Machinery Directive 89/392/EEC (EMC) Std:
- ☐ Medical Device Directive 93/42/EEC (EMC) Std:
- ☐ Vehicle Directive: ☐ 2001/3/EC (EMC) ☐ 2004/104/EC (EMC)
  ☐ Other Vehicle Std:
- ☐ FDA Reviewers Guidance for Premarket Notification Submissions (EMC)

☒ FCC:	Class	☐ A	☒ B	Part	247
☐ VCCI:	Class	☐ A	☐ B		
☐ BSMI:	Class	☐ A	☐ B	(Separate Report)	
☐ Canada:	Class	☐ A	☐ B		
☐ Australia:	Class	☐ A	☐ B		
☐ Other:					

Third Party Certification, if applicable (*Signature on Page 6 Required)

- ☐ Attestation of Conformity (AoC)*
- ☐ Certificate of Conformity (CoC)*
- ☐ EMC Certification (used with Octagon Mark)*
- ☐ Compliance Document*
- Protection Class (N/A for vehicles) ☐ Class I ☐ Class II ☐ Class III
  (Press **F1** when field is selected to show additional information on Protection Class.)
- ☐ FCC / TCB Certification
- ☐ Industry Canada / FCB Certification
- ☐ E-Mark Certification
- ☐ Taiwan Certification

EMC Test Plan and Constructional Data Form

Attendance

Test will be: ☒ Attended by the customer ☐ Unattended by the customer

Failure - *Complete this section if testing will not be attended by the customer.*

If a failure occurs, TÜV SÜD America should:

☐ Call contact listed above, if not available then stop testing. (After hrs phone): _____

☐ Continue testing to complete test series.

☐ Continue testing to define corrective action.

☐ Stop testing.

EUT Specifications and Requirements

Length: 10 cm Width: 6 cm Height: 3 cm Weight: 115 g

Power Requirements

Regulations require testing to be performed at typical power ratings in the countries of intended use. (i.e., European power is typically 230 VAC 50 Hz or 400 VAC 50 Hz, single and three phase, respectively)

Voltage: 120 (If battery powered, make sure battery life is sufficient to complete testing.)

# of Phases: 1

Current (Amps/phase(max)): .01 Current (Amps/phase(nominal)): .008

Other power supply not used during normal operation only when charging battery

Other Special Requirements

Typical Installation and/or Operating Environment

(ie. Hospital, Small Business, Industrial/Factory, etc.)
attached to doors, windows and assets needing tracking

EUT Power Cable

☐ Permanent OR ☒ Removable Length (in meters): 1.6

☐ Shielded OR ☐ Unshielded

☐ Not Applicable

Form

EMC Test Plan and Constructional Data Form

EUT Interface Ports and Cables

Type	Analog	Digital	During Test: Active	During Test: Passive	Qty	Shielding: Yes	Shielding: No	Shielding: Type	Termination	Connector Type	Port Termination	Length tested (in meters)	Removable	Permanent
EXAMPLE: *RS232*	☐	☒	☒	☐	*2*	☒	☐	*Foil over braid*	*Coaxial*	*Metallized 9-pin D-Sub*	*Characteristic Impedance*	*6*	☒	☐
Power	☒	☐	☒	☐	1	☐	☒	twin lead	dc	circular	DC	1.5	☒	☐
	☐	☐	☐	☐		☐	☐						☐	☐
	☐	☐	☐	☐		☐	☐						☐	☐
	☐	☐	☐	☐		☐	☐						☐	☐
	☐	☐	☐	☐		☐	☐						☐	☐
	☐	☐	☐	☐		☐	☐						☐	☐
	☐	☐	☐	☐		☐	☐						☐	☐
	☐	☐	☐	☐		☐	☐						☐	☐
	☐	☐	☐	☐		☐	☐						☐	☐
	☐	☐	☐	☐		☐	☐						☐	☐
	☐	☐	☐	☐		☐	☐						☐	☐
	☐	☐	☐	☐		☐	☐						☐	☐

EMC Test Plan and Constructional Data Form

EUT Software.

Revision Level: 2.19

Description: test mode diagnostic s/w

Equipment Under Test (EUT) Operating Modes to be Tested -- list the operating modes to be used during test. It is recommended the equipment be tested while operating in a typical operation mode. FCC testing of personal computers and/or peripherals requires that a simple program generate a complete line of upper case H's. Provide a general description of all software, firmware, and PLD algorithms used in the equipment. List all code modules as described above, with the revision level used during testing. Consult with your TÜV Product Service Representative if additional assistance is required.

1. Transmitter - 910 MHz radiated emissions per FCC part 15.247 requirements

2. Power supply conducted emissions per FCC part 15

3.

Equipment Under Test (EUT) System Components -- List and describe all components which are part of the EUT. For FCC & Taiwan testing a minimum configuration is required. (ie. Mouse, Printer, Monitor, External Disk Drive, Motherboard, etc)

Description	Model #	Serial #	FCC ID #

EMC Test Plan and Constructional Data Form

Support Equipment -- List and describe all support equipment which is not part of the EUT. (i.e. peripherals, simulators, etc) This information is required for FCC & Taiwan testing.

Description	*Model #*	*Serial #*	*FCC ID #*

Oscillator Frequencies

Manufacturer	*Frequency*	*Derived Frequency*	*Component # / Location*	*Description of Use*
NDK America	40 MHz	N	Y1	reference TCXO
Abracon	32.768 kHz	N	Y2	Basic clock system
Xilinx	10 MHz	Y	U9	Clock

Power Supply

Manufacturer	*Model #*	*Serial #*	*Type*
Cincon Electronics Co.	TRG513-1-A	N/A	☒ Switched-mode: (Frequency) 327 kHz ☐ Linear ☐ Other:
			☐ Switched-mode: (Frequency) ☐ Linear ☐ Other:

Power Line Filters

Manufacturer	*Model #*	*Location in EUT*

EMC Test Plan and Constructional Data Form

Critical EMI Components (Capacitors, ferrites, etc.)

Description	*Manufacturer*	*Part # or Value*	*Qty*	*Component # / Location*

EMC Critical Detail -- Describe other EMC Design details used to reduce high frequency noise.

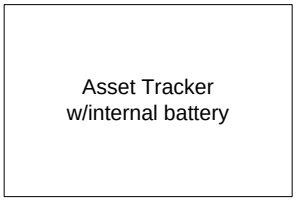
PLEASE ENTER NAMES BELOW (INSERT ELECTRONIC SIGNATURE IF POSSIBLE)

Authorization (Signature Required if a Third Party Certification is checked on pg 1)

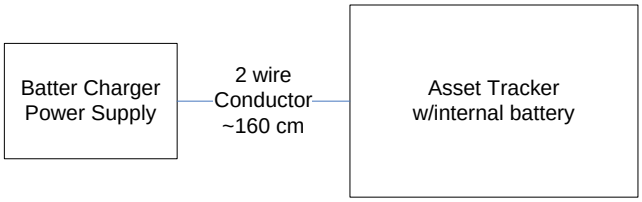
/s/ Tim Blom	12/14/2010
Customer authorization to perform tests according to this test plan.	Date
/s/s Tim Blom	12/14/2010
Test Plan/CDF Prepared By (please print)	Date

EMC Block Diagram Form

System Configuration Block Diagram -- Provide a line drawing identifying the EUT, simulators, support equipment, I/O cables, power cables, and any other pertinent components to be used during testing. Use a dashed line to separate the equipment in the testing field versus equipment outside testing field.



Radiated emissions test setup



Conducted Emissions Test Setup

Authorization Signatures

/s/ Tim Blom	12/14/2010
Customer authorization to perform tests according to this test plan.	Date
/s/ Tim Blom	12/14/2010
Test Plan/CDF Prepared By (please print)	Date

Appendix B

Measurement Protocol

MEASUREMENT PROTOCOL

GENERAL INFORMATION

Test Methodology

Emissions testing is performed according to the procedures in ANSI C63.4-2003.

Measurement Uncertainty

The test system for conducted emissions is defined as the LISN, tuned receiver or spectrum analyzer, and coaxial cable. The test system has a measurement uncertainty of ±1.8 dB. The test system for radiated emissions is defined as the antenna, the pre-amplifier, the spectrum analyzer and the coaxial cable. The test system has a measurement uncertainty of ±4.8 dB. The equipment comprising the test systems is calibrated on an annual basis.

Justification

The Equipment Under Test (EUT) is configured in a typical user arrangement in accordance with the manufacturer's instructions. A cable is connected to each available port and either terminated with a peripheral into its characteristic impedance or left unterminated. When appropriate, the cables are manually manipulated with respect to each other to obtain maximum emissions from the unit.

Conducted Emissions

The final level, expressed in dBμV, is arrived at by taking the reading directly from the EMI receiver. This level is compared directly to the limit.

To convert between dBμV and μV, the following conversions apply:

dBμV = 20(log μV)

μV = Inverse log (dBμV/20)

Radiated Emissions

The final level, in dBμV/m, equals the reading from the spectrum analyzer (Level dBμV), adding the antenna correction factor and cable loss factor (Factor dB) to it, and subtracting the preamp gain (and duty cycle correction factor, if applicable). This result then has the limit subtracted from it to provide the Delta, which gives the tabular data as shown in the data sheets in Attachment A. Intentional radiators are rotated through 3 orthogonal axes to determine the test position yielding the maximum emission levels.

Example:

FREQ (MHz)	LEVEL (dBuV)		CABLE (dB)	ANT (dB/m)	PREAMP (dB)		FINAL (dBuV/m)	POL	HGT (m)	AZ (deg)	DELTA1
60.80	42.5Qp	+	1.2	+ 10.9	- 25.5	=	29.1	V	1.0	0.0	-10.9

Test Equipment

All measurement instrumentation is traceable to the National Institute of Standards and Technology and is calibrated according to internal procedure.