Successor in interest to International Approval Laboratories

EMC EMISSIONS - TEST REPORT (In-Part)

Test Report No.	**3092807-1**	Issue Date:	**Friday, March 10, 2006**
Model / Serial No.	**MN: EN1550/SN: 01619484**		
Product Type	**Water Meter Transmitters.**		
Client	**Inovonics Wireless Corp.**		
Manufacturer	**Inovonics Wireless Corp.**		
License holder	**Inovonics Wireless Corp.**		
Address	**315 CTC Blvd**		
	Louisville, CO 80027		
Test Criteria Applied	**FCC CFR47 Part 15.247**		
Test Result	**PASS**		
Test Project Number	**3092807**	Title 47 CFR 15: RADIO FREQUENCY DEVICES	
References			
Total Pages Including Appendices:	36		

Reviewed By : Mike Spataro

Approved By :

Intertek ETL Semko and its professional staff hold government and professional organization certifications and are members of IEEE, NVLAP, and VCCI.

Lab Code:200264-0

D I R E C T O R Y

STATEMENT OF MEASUREMENT UNCERTAINTY

The data and results referenced in this document are true and accurate. The measurement uncertainty for Conducted Emissions in the frequency range of 150kHz – 30MHz is calculated to be ±2.30dB and for Radiated Emissions is calculated to be ±3.60dB in the frequency range of 30MHz – 200MHz and ±3.38dB in the frequency range of 200MHz – 1000MHz.

EUT Received Date: 28-Feb-2006

Testing Start Date: 28-Feb-2006

Testing End Date: 2-March-2006

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The tests were performed according to following regulations :

1. FCC CFR47 Part 15.205
2. FCC CFR47 Part 15.207
3. FCC CFR47 Part 15.209
4. FCC CFR47 Part 15.247
5. ICES-003

Emission Test Results:

Conducted Emissions, Powerline (15.207) - Not Applicable

Test Result

Minimum limit margin	NA	dB	at	NA MHz
Maximum limit exceeding		dB	at	MHz

Remarks:

Radiated Emissions (15.209) - PASS

Test Result

Minimum limit margin	-5.7	dB	at	1000.00 MHz
Maximum limit exceeding		dB	at	MHz

Remarks:

Radiated Emissions (15.205)/(15.247) (c) - PASS

Test Result

Minimum limit margin	-0.32	dB	at	2782.69 MHz
Maximum limit exceeding		dB	at	MHz

Remarks: Emissions is from model: ES1501 on the mid channel

Peak Output Power 15.247 (b)(2) - PASS

Test Result

Minimum limit margin	-5.3	dB	at	902.41 MHz
Maximum limit exceeding		dB	at	MHz

Remarks:

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GENERAL REMARKS:

The following remarks are to be considered as "where applicable" and are taken into account while completing any FCC/IC/ETSI radio tests at Intertek, ETL Semko.

Testing was performed in 3 different orthogonal axis to determine the worst case emissions from the device. The worst case emissions measurements are shown in this report.

FCC CFR47 Part 15.31: Measurement Standards: In any case where the device is powered off a battery, a fresh battery was used during test. In cases where the device is powered off an AC supply, voltage was varied per Part 15.31 to find worst case emissions.

FCC CFR47 Part 15.35: Measurement Detector Functions and Bandwidths: FCC Part 15.35 was utilized when performing the measurements within this report.

This test report is in-part, Intertek ETL Semko was asked to test only the field strength of the fundamental and harmonics as well as the unintentional radiated emissions and conducted emissions when applicable.

Modifications required to pass: None

Test Specification Deviations: Additions to or Exclusions from: None

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Required Information In Accordance to FCC CFR 47 Part 2.1033:

Rule Part 11, 15 & 18 Devices	*Other Rule Part Devices*	*Description*	*Comments*
2.1033(b)(1)	**2.1033(c)(1)**	*Manu. Contact*	See Page 1 of this report
2.1033(b)(2)	**2.1033(c)(2)**	*FCC Identifier*	
2.1033(b)(3)	**2.1033(c)(3)**	*Users Manual to include Operating, installation*	Attached as Exhibit
	2.1033(c)(4)	*Emissions Designator per 2.*	
	2.1033(c)(5)	*Frequency Range*	Not Applicable to Part 15 Devcies
	2.1033(c)(6)	*Power range and controls*	Not Applicable to Part 15 Devcies
	2.1033(c)(7)	*Maximum power ouput rating*	Not Applicable to Part 15 Devcies
	2.1033(c)(8)	*DC Voltage and Current suplying final RF stages*	Not Applicable to Part 15 Devcies
2.1033(b)(3)	**2.1033(c)(9)**	*Tune –up procedure*	Please refer to the users manual for applicability
2.1033(b)(4&5)	**2.1033(c)(10)**	*Complete Circuit Diagrams and circuit operation description*	Attached as Exhibit
2.1033(b)(7)	**2.1033(c)(11)**	*Photographs/drawings of the identification label & its location on the device*	Attached as Exhibit
2.1033(b)(7)	**2.1033(c)(12)**	*Photographs of the external and internal surfaces, and construction*	Attached as Exhibit
	2.1033(c)(13)	*Digital Modulation*	Not Applicable
2.1033(b)(6)	**2.1033(c)(14)**	*Report of Measurement Data Required by 2.1046 – 2.1057*	See Data Below (This report consists of the testing required under Part 15.231)
2.1033(b)(8)		*Description of publicly available support equipment used during test*	Refer to Exhibit B of this report (Client Test Plan)
2.1033(b)(9)		*Statement of Autorization to Part 15.37 of CFR47*	The equipment herein is being authorized in accordance to 15.37 of the CFR47 Rules.
2.1033(b)(10)		*Direct Sequence Spread Spectrum Devices (DSSS)*	Exhibit of compliance to 15.247(e)
2.1033(b)(10)		*Frequency Hopping Devices*	Exhibit of compliance to 15.247(a)(1)
2.1033(b)(11)		*Scanning receiver construction*	Exhibit stating compliance to construction in accordance to 15.121.
15.31	**15.31**	*Transmitter Supply Voltage*	Testing herein was completed in accordance to FCC CFR47 Part 15.31

Exhibits Including (where applicable):

1. Users Manual
2. Operation Description
3. Block Diagram
4. Report of Measurement
5. External & Internal Photographs
6. Schematic
7. Parts List
8. Tuning Procedure (if applicable)
9. Test Setup Photograph
10. Label Drawings and or Photograpghs
11. Description of Support Equipment (where Applicable)

Required Information in Accordance to Industry Canada Regulations (In addition to the above):

Information Required	*Description*	*Comments*
Modulation Type	(i.e. ASK, NON, FSK, DSSS, FHSS, etc.)	
Emissions Designator	Per TRC-49	
In Country Representative	Contact Information	
99% Bandwidth Measurement	Per RSS-210	

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Test-setup photo(s):
Conducted Emissions

Not Applicable

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Test-setup photo(s):
Radiated Intentional Emissions:

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Test-setup photo(s):
Radiated Unintentional Emissions:

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Test-setup photo(s):
Radiated Unintentional Emissions:

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Appendix A

Test Data Sheets

and

Test Equipment Used

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15.209 Test Data

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Radiated Electromagnetic Emissions

Test Report #:	**3092807 Run 02**	Test Area:	Pinewood Site 1 (3m)	Temperature:	18.0	°C
Test Method:	FCC Part 15.209	Test Date:	02-Mar-2006	Relative Humidity:	24	%
EUT Model #:	EN1550	EUT Power:	3 VDC	Air Pressure:	81	kPa
EUT Serial #:	01619484			Page:	12 of 36	
Manufacturer:	Inovonics					
EUT Description:	Integrated Water Meter with Transmitter					
Notes:						

Level Key	
Pk – Peak	Nb – Narrow Band
Qp – QuasiPeak	Bb – Broad Band
Av - Average	

FREQ (MHz)	LEVEL (dBuV)	CABLE / ANT / PREAMP (dB) (dB\m) (dB)	FINAL (dBuV)	POL / HGT / AZ (m) (DEG)	DELTA1 (dB) 15.209 <1GHz	DELTA2 (dB) 15.209 >1GHz
No significant emissions detected between 1 - 4 GHz, Vertical.						
The following are noise floor points.						
1000.00	34.6 Av	3.7 / 22.0 / 12.0	48.3	V / 1.0 / 0.0	N/A	-5.7
2000.00	35.7 Av	3.2 / 25.9 / 36.4	28.4	V / 1.0 / 0.0	N/A	-25.6
3000.00	36.0 Av	4.6 / 27.7 / 37.4	30.8	V / 1.0 / 0.0	N/A	-23.2
4000.00	35.5 Av	5.7 / 29.7 / 36.3	34.6	V / 1.0 / 0.0	N/A	-19.4
No significant emissions detected between 1 - 4 GHz, Horizontal.						
The following are noise floor points.						
1500.00	34.1 Av	2.9 / 23.7 / 37.3	23.4	H / 1.0 / 0.0	N/A	-30.6
2500.00	35.9 Av	4.0 / 26.3 / 38.4	27.8	H / 1.0 / 0.0	N/A	-26.2
3500.00	34.3 Av	4.8 / 28.6 / 37.7	30.0	H / 1.0 / 0.0	N/A	-24.0
4 - 8 GHz						
No significant emissions detected between 4 - 8 GHz, Horizontal.						
The following are noise floor points.						
4500.00	34.8 Av	6.6 / 30.1 / 40.5	31.0	H / 1.0 / 0.0	N/A	-23.0
5500.00	33.1 Av	6.7 / 32.0 / 40.3	31.5	H / 1.0 / 0.0	N/A	-22.5
6500.00	32.0 Av	8.5 / 32.0 / 40.3	32.2	H / 1.0 / 0.0	N/A	-21.8
7500.00	31.9 Av	8.2 / 34.2 / 39.9	34.4	H / 1.0 / 0.0	N/A	-19.6
No significant emissions detected between 4 - 8 GHz, Vertical.						
The following are noise floor points.						
5000.00	34.1 Av	7.6 / 31.4 / 40.4	32.7	V / 1.0 / 0.0	N/A	-21.3
6000.00	32.0 Av	7.7 / 32.2 / 39.6	32.3	V / 1.0 / 0.0	N/A	-21.7
7000.00	29.2 Av	8.1 / 33.1 / 40.5	29.9	V / 1.0 / 0.0	N/A	-24.1
8 - 10 GHz						
No significant emissions detected between 8 - 10 GHz, Vertical.						
The following are noise floor points.						
9000.00	43.1 Av	8.5 / 35.1 / 48.6	38.2	V / 1.0 / 0.0	N/A	-15.8
8000.00	39.2 Av	8.3 / 34.3 / 46.5	35.4	V / 1.0 / 0.0	N/A	-18.6
10000.0	44.7 Av	9.5 / 35.4 / 48.6	41.0	V / 1.0 / 0.0	N/A	-13.0
No significant emissions detected between 8 - 10 GHz, Horizontal.						

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FREQ	LEVEL	CABLE / ANT / PREAMP	FINAL	POL / HGT / AZ	DELTA1 (dB)	DELTA2 (dB)
(MHz)	(dBuV)	(dB) (dB\m) (dB)	(dBuV)	(m) (DEG)	15.209 <1GHz	15.209 >1GHz
The following are noise floor points.						
8500.00	43.0 Av	8.5 / 34.6 / 48.0	38.0	V / 1.0 / 0.0	N/A	-16.0
9500.00	44.0 Av	9.4 / 35.6 / 48.9	40.1	V / 1.0 / 0.0	N/A	-13.9
Fundamental reading for low channel						
902.39	78.5 Pk	3.6 / 23.2 / 0.0	105.2	V / 1.0 / 0.0	59.2 *	N/A
Band edges						
900.49	31.9 Pk	3.6 / 23.2 / 0.0	58.7	V / 1.0 / 0.0	12.7 *	N/A
898.50	23.2 Pk	3.6 / 23.2 / 0.0	50.0	V / 1.0 / 0.0	4.0 *	N/A
Band edges are 20 dB down from fundamental transmit power.						
902.40	76.2 Pk	3.6 / 23.2 / 0.0	103.0	H / 1.0 / 0.0	57.0 *	N/A
900.50	29.2 Pk	3.6 / 23.2 / 0.0	56.0	H / 1.0 / 0.0	10.0 *	N/A
898.50	20.7 Pk	3.6 / 23.2 / 0.0	47.5	H / 1.0 / 0.0	1.5 *	N/A
High Channel						
927.60	70.5 Pk	3.6 / 23.2 / 0.0	97.3	H / 1.0 / 0.0	51.3 *	N/A
929.70	25.2 Pk	3.6 / 23.3 / 0.0	52.2	H / 1.0 / 0.0	6.2 *	N/A
931.68	20.7 Pk	3.6 / 23.4 / 0.0	47.8	H / 1.0 / 0.0	1.8 *	N/A
927.70	82.2 Pk	3.6 / 23.2 / 0.0	109.0	V / 1.0 / 0.0	63.0 *	N/A
929.70	36.6 Pk	3.6 / 23.3 / 0.0	63.5	V / 1.0 / 0.0	17.5 *	N/A
931.71	24.7 Pk	3.6 / 23.4 / 0.0	51.8	V / 1.0 / 0.0	5.8 *	N/A
No significant emissions detected between 200 - 1000 MHz.						
The following are noise floor points.						
Vertical.						
225.00	23.6 Qp	1.6 / 11.1 / 27.2	9.1	V / 1.0 / 0.0	-36.9	N/A
350.00	19.1 Qp	2.1 / 15.2 / 27.3	9.0	V / 1.0 / 0.0	-37.0	N/A
475.18	19.9 Qp	2.5 / 18.0 / 28.3	12.3	V / 1.0 / 0.0	-33.7	N/A
602.50	19.9 Qp	2.9 / 19.5 / 28.4	14.0	V / 1.0 / 0.0	-32.0	N/A
727.50	19.5 Qp	3.2 / 21.4 / 28.2	15.9	V / 1.0 / 0.0	-30.1	N/A
900.36	19.2 Qp	3.6 / 23.2 / 27.7	18.3	V / 1.0 / 0.0	-27.7	N/A
Horizontal.						
249.90	19.0 Qp	1.7 / 12.3 / 27.1	5.9	H / 2.0 / 0.0	-40.1	N/A
374.91	19.2 Qp	2.1 / 15.7 / 27.5	9.5	H / 2.0 / 0.0	-36.5	N/A
500.14	19.6 Qp	2.6 / 18.8 / 28.4	12.6	H / 2.0 / 0.0	-33.4	N/A
625.14	19.7 Qp	3.0 / 19.8 / 28.4	14.0	H / 2.0 / 0.0	-32.0	N/A
750.15	19.6 Qp	3.2 / 21.3 / 28.2	15.8	H / 2.0 / 0.0	-30.2	N/A
975.00	18.9 Qp	3.7 / 23.8 / 27.4	18.9	H / 2.0 / 0.0	-35.1	N/A
No significant emissions detected between 30 - 200 MHz.						
The following are noise floor points.						
Vertical.						
30.00	27.9 Qp	0.5 / 13.1 / 28.2	13.3	V / 1.0 / 0.0	-26.7	N/A
108.84	25.2 Qp	1.1 / 10.4 / 28.0	8.7	V / 1.0 / 0.0	-34.8	N/A
173.49	22.2 Qp	1.4 / 12.5 / 27.6	8.5	V / 1.0 / 0.0	-35.0	N/A
Horizontal						
190.20	23.8 Qp	1.4 / 13.5 / 27.5	11.3	H / 2.0 / 0.0	-32.2	N/A
120.20	22.5 Qp	1.2 / 11.7 / 27.9	7.5	H / 2.0 / 0.0	-36.0	N/A
50.12	23.4 Qp	0.7 / 10.3 / 28.2	6.1	H / 2.0 / 0.0	-33.9	N/A

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FREQ	LEVEL	CABLE / ANT / PREAMP	FINAL	POL / HGT / AZ	DELTA1 (dB)	DELTA2 (dB)
(MHz)	(dBuV)	(dB) (dB\m) (dB)	(dBuV)	(m) (DEG)	15.209 <1GHz	15.209 >1GHz
No significant emissions detected between 10 kHz and 30 MHz.						
The following are noise floor points.						
Loop antenna is perpendicular						
0.0100	51.3 Qp	0.0 / 18.5 / 0.0	69.8	V / 1.0 / 0.0	-57.8	N/A
0.184	36.4 Qp	0.1 / 10.7 / 0.0	47.2	V / 1.0 / 0.0	-55.1	N/A
2.26	23.3 Qp	0.1 / 10.2 / 0.0	33.6	V / 1.0 / 0.0	-35.9	N/A
11.16	13.0 Qp	0.2 / 10.5 / 0.0	23.7	V / 1.0 / 0.0	-45.8	N/A
29.75	13.2 Qp	0.5 / 8.5 / 0.0	22.2	V / 1.0 / 0.0	-47.3	N/A
Loop antenna is parallel						
0.103	53.8 Qp	0.1 / 11.0 / 0.0	64.9	H / 1.0 / 0.0	-42.4	N/A
0.254	39.0 Qp	0.1 / 10.5 / 0.0	49.6	H / 1.0 / 0.0	-49.9	N/A
0.369	35.8 Qp	0.1 / 10.4 / 0.0	46.3	H / 1.0 / 0.0	-50.0	N/A
4.80	17.0 Qp	0.2 / 10.2 / 0.0	27.4	H / 1.0 / 0.0	-42.1	N/A
19.45	10.4 Qp	0.4 / 10.3 / 0.0	21.2	H / 1.0 / 0.0	-48.3	N/A
End of Run						

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FREQ	LEVEL	CABLE / ANT / PREAMP	FINAL	POL / HGT / AZ	DELTA1 (dB)	DELTA2 (dB)
(MHz)	(dBuV)	(dB) (dB\m) (dB)	(dBuV)	(m) (DEG)	15.209 <1GHz	15.209 >1GHz
********** Measurement Summary **********						
1000.00	34.6 Av	3.7 / 22.0 / 12.0	48.3	V / 1.0 / 0.0	N/A	-5.7
10000.0	44.7 Av	9.5 / 35.4 / 48.6	41.0	V / 1.0 / 0.0	N/A	-13.0
9500.00	44.0 Av	9.4 / 35.6 / 48.9	40.1	V / 1.0 / 0.0	N/A	-13.9
9000.00	43.1 Av	8.5 / 35.1 / 48.6	38.2	V / 1.0 / 0.0	N/A	-15.8
8500.00	43.0 Av	8.5 / 34.6 / 48.0	38.0	V / 1.0 / 0.0	N/A	-16.0
8000.00	39.2 Av	8.3 / 34.3 / 46.5	35.4	V / 1.0 / 0.0	N/A	-18.6
4000.00	35.5 Av	5.7 / 29.7 / 36.3	34.6	V / 1.0 / 0.0	N/A	-19.4
7500.00	31.9 Av	8.2 / 34.2 / 39.9	34.4	H / 1.0 / 0.0	N/A	-19.6
5000.00	34.1 Av	7.6 / 31.4 / 40.4	32.7	V / 1.0 / 0.0	N/A	-21.3
6000.00	32.0 Av	7.7 / 32.2 / 39.6	32.3	V / 1.0 / 0.0	N/A	-21.7
6500.00	32.0 Av	8.5 / 32.0 / 40.3	32.2	H / 1.0 / 0.0	N/A	-21.8
5500.00	33.1 Av	6.7 / 32.0 / 40.3	31.5	H / 1.0 / 0.0	N/A	-22.5
4500.00	34.8 Av	6.6 / 30.1 / 40.5	31.0	H / 1.0 / 0.0	N/A	-23.0
3000.00	36.0 Av	4.6 / 27.7 / 37.4	30.8	V / 1.0 / 0.0	N/A	-23.2
3500.00	34.3 Av	4.8 / 28.6 / 37.7	30.0	H / 1.0 / 0.0	N/A	-24.0
7000.00	29.2 Av	8.1 / 33.1 / 40.5	29.9	V / 1.0 / 0.0	N/A	-24.1
2000.00	35.7 Av	3.2 / 25.9 / 36.4	28.4	V / 1.0 / 0.0	N/A	-25.6
2500.00	35.9 Av	4.0 / 26.3 / 38.4	27.8	H / 1.0 / 0.0	N/A	-26.2
30.00	27.9 Qp	0.5 / 13.1 / 28.2	13.3	V / 1.0 / 0.0	-26.7	N/A
900.36	19.2 Qp	3.6 / 23.2 / 27.7	18.3	V / 1.0 / 0.0	-27.7	N/A
727.50	19.5 Qp	3.2 / 21.4 / 28.2	15.9	V / 1.0 / 0.0	-30.1	N/A
750.15	19.6 Qp	3.2 / 21.3 / 28.2	15.8	H / 2.0 / 0.0	-30.2	N/A
1500.00	34.1 Av	2.9 / 23.7 / 37.3	23.4	H / 1.0 / 0.0	N/A	-30.6
602.50	19.9 Qp	2.9 / 19.5 / 28.4	14.0	V / 1.0 / 0.0	-32.0	N/A
625.14	19.7 Qp	3.0 / 19.8 / 28.4	14.0	H / 2.0 / 0.0	-32.0	N/A
190.20	23.8 Qp	1.4 / 13.5 / 27.5	11.3	H / 2.0 / 0.0	-32.2	N/A
500.14	19.6 Qp	2.6 / 18.8 / 28.4	12.6	H / 2.0 / 0.0	-33.4	N/A
475.18	19.9 Qp	2.5 / 18.0 / 28.3	12.3	V / 1.0 / 0.0	-33.7	N/A
50.12	23.4 Qp	0.7 / 10.3 / 28.2	6.1	H / 2.0 / 0.0	-33.9	N/A
108.84	25.2 Qp	1.1 / 10.4 / 28.0	8.7	V / 1.0 / 0.0	-34.8	N/A
173.49	22.2 Qp	1.4 / 12.5 / 27.6	8.5	V / 1.0 / 0.0	-35.0	N/A
975.00	18.9 Qp	3.7 / 23.8 / 27.4	18.9	H / 2.0 / 0.0	-35.1	N/A
2.26	23.3 Qp	0.1 / 10.2 / 0.0	33.6	V / 1.0 / 0.0	-35.9	N/A
120.20	22.5 Qp	1.2 / 11.7 / 27.9	7.5	H / 2.0 / 0.0	-36.0	N/A
374.91	19.2 Qp	2.1 / 15.7 / 27.5	9.5	H / 2.0 / 0.0	-36.5	N/A
225.00	23.6 Qp	1.6 / 11.1 / 27.2	9.1	V / 1.0 / 0.0	-36.9	N/A
350.00	19.1 Qp	2.1 / 15.2 / 27.3	9.0	V / 1.0 / 0.0	-37.0	N/A
249.90	19.0 Qp	1.7 / 12.3 / 27.1	5.9	H / 2.0 / 0.0	-40.1	N/A
4.80	17.0 Qp	0.2 / 10.2 / 0.0	27.4	H / 1.0 / 0.0	-42.1	N/A
0.103	53.8 Qp	0.1 / 11.0 / 0.0	64.9	H / 1.0 / 0.0	-42.4	N/A
11.16	13.0 Qp	0.2 / 10.5 / 0.0	23.7	V / 1.0 / 0.0	-45.8	N/A
29.75	13.2 Qp	0.5 / 8.5 / 0.0	22.2	V / 1.0 / 0.0	-47.3	N/A
19.45	10.4 Qp	0.4 / 10.3 / 0.0	21.2	H / 1.0 / 0.0	-48.3	N/A
0.254	39.0 Qp	0.1 / 10.5 / 0.0	49.6	H / 1.0 / 0.0	-49.9	N/A

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FREQ	LEVEL	CABLE / ANT / PREAMP	FINAL	POL / HGT / AZ	DELTA1 (dB)	DELTA2 (dB)
(MHz)	(dBuV)	(dB) (dB\m) (dB)	(dBuV)	(m) (DEG)	15.209 <1GHz	15.209 >1GHz
0.369	35.8 Qp	0.1 / 10.4 / 0.0	46.3	H / 1.0 / 0.0	-50.0	N/A
0.184	36.4 Qp	0.1 / 10.7 / 0.0	47.2	V / 1.0 / 0.0	-55.1	N/A
0.0100	51.3 Qp	0.0 / 18.5 / 0.0	69.8	V / 1.0 / 0.0	-57.8	N/A

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15.247 (b)(2), (c)/15.205 Test Data

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Field Strength Measurements
Fundamental and Spurious of the Transmitter

Test Report #:	**3092807**	Test Area:	Pinewood Site 1 (3m)	Temperature:	19.0	°C
Test Method:	FCC Part 15.247	Test Date:	28-Feb-2006	Relative Humidity:	24	%
EUT Model #:	EN1550	EUT Power:	3 VDC	Air Pressure:	81	kPa
EUT Serial #:	01619484			Page:		
Manufacturer:	Inovonics					
EUT Description:	Water Meter Transmitter					
Notes:						

Level Key	
Pk – Peak	Nb – Narrow Band
Qp – QuasiPeak	Bb – Broad Band
Av - Average	

FREQ	LEVEL	CABLE / ANT / PREAMP	FINAL	POL / HGT / AZ	Duty Cycle Correction	Final Corrected	Limit	DELTA
(MHz)	(dBuV)	(dB) (dB\m) (dB)	(dBuV)	(m) (DEG)	(dB)	(dBuV/m)	(dBuV/m)	(dB)
The following duty cycle was declared by the manufacturer.								
"In this case, the maximum time that the carrier would dwell on any hopping channel is 18.8 mS in a 100 mS window. Therefore, the maximum Duty Factor correction factor of 14.52 dB was utilized in the calculations for the final measurement."								
Averaging method for pulsed signals and calculation in accordance to FCC CFR47 Part 15.35 utilized to calculate field strength emissions.								
The testing performed in accordance to FCC CFR47 Part 15.205 (restricted bands of operation) and 15.247 emissions and delta limits were calculated as follows:								
Final Corrected Peak Measurement – Duty Cycle Correction Factor* = Final Calculated Emission								
The Final Calculated Emission was then compared to the Limits in CFR47 Part 15.209 and 15.247 and the emission/limit delta was calculated.								
the DTCF is calculated as follows $20*\log_{10}$(duty cycle in 100mS) “not to exceed 20dB”								
Part 15.247 and 15.205 Respectively								
Determining worst case axis								
Axis 1								
Low Channel								
902.41	87.7 Pk	3.6 / 23.2 / 0.0	114.4	V / 1.0 / 8.0	0	114.4	119	-4.6
902.41	82.0 Pk	3.6 / 23.2 / 0.0	108.8	H / 1.2 / 10.0	0	108.8	119	-10.2
Mid Channel								
914.8	80.2 Pk	3.6 / 23.2 / 0.0	107	H / 1.3 / 221.0	0	107	119	-12
914.8	86.4 Pk	3.6 / 23.2 / 0.0	113.2	V / 1.0 / 14.0	0	113.2	119	-5.8
High Channel								
927.62	85.4 Pk	3.6 / 23.2 / 0.0	112.2	V / 1.0 / 15.0	0	112.2	119	-6.8
927.62	83.4 Pk	3.6 / 23.2 / 0.0	110.2	H / 1.1 / 7.0	0	110.2	119	-8.8
Axis 2								
High Channel								
927.62	83.1 Pk	3.6 / 23.2 / 0.0	109.9	H / 1.0 / 97.0	0	109.9	119	-9.1
927.62	86.1 Pk	3.6 / 23.2 / 0.0	112.9	V / 1.0 / 64.0	0	112.9	119	-6.1
Low Channel								
902.41	85.6 Pk	3.6 / 23.2 / 0.0	112.4	V / 1.0 / 75.0	0	112.4	119	-6.6
902.41	83.5 Pk	3.6 / 23.2 / 0.0	110.2	H / 1.0 / 77.0	0	110.2	119	-8.8
Mid Channel								
914.8	82.9 Pk	3.6 / 23.2 / 0.0	109.6	H / 1.0 / 71.0	0	109.6	119	-9.4
914.8	85.9 Pk	3.6 / 23.2 / 0.0	112.7	V / 1.0 / 67.0	0	112.7	119	-6.3
Axis 3								
Mid Channel								
914.8	83.5 Pk	3.6 / 23.2 / 0.0	110.3	V / 1.0 / 10.0	0	110.3	119	-8.7
914.8	82.5 Pk	3.6 / 23.2 / 0.0	109.2	H / 1.1 / 8.0	0	109.2	119	-9.8

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FREQ	LEVEL	CABLE / ANT / PREAMP	FINAL	POL / HGT / AZ	Duty Cycle Correction	Final Corrected	Limit	DELTA
(MHz)	(dBuV)	(dB) (dB\m) (dB)	(dBuV)	(m) (DEG)	(dB)	(dBuV/m)	(dBuV/m)	(dB)

The following duty cycle was declared by the manufacturer.

"In this case, the maximum time that the carrier would dwell on any hopping channel is 18.8 mS in a 100 mS window. Therefore, the maximum Duty Factor correction factor of 14.52 dB was utilized in the calculations for the final measurement."

Averaging method for pulsed signals and calculation in accordance to FCC CFR47 Part 15.35 utilized to calculate field strength emissions.

The testing performed in accordance to FCC CFR47 Part 15.205 (restricted bands of operation) and 15.247 emissions and delta limits were calculated as follows:

Final Corrected Peak Measurement – Duty Cycle Correction Factor* = Final Calculated Emission

The Final Calculated Emission was then compared to the Limits in CFR47 Part 15.209 and 15.247 and the emission/limit delta was calculated.

the DTCF is calculated as follows $20*\log_{10}$(duty cycle in 100mS) “not to exceed 20dB”

Part 15.247 and 15.205 Respectively								
High Channel								
927.62	83.2 Pk	3.6 / 23.2 / 0.0	110	H / 1.1 / 12.0	0	110	119	-9
927.62	84.4 Pk	3.6 / 23.2 / 0.0	111.2	V / 1.0 / 66.0	0	111.2	119	-7.8
Low Channel								
902.41	82.5 Pk	3.6 / 23.2 / 0.0	109.3	V / 1.0 / 24.0	0	109.3	119	-9.7
902.41	83.9 Pk	3.6 / 23.2 / 0.0	110.6	H / 1.2 / 353.0	0	110.6	119	-8.4
Axis 1 determined to be worst case.								
Changed R8 from 180 to 100 ohms to decrease the amplitude of the harmonics								
Remaximizing fundamental frequencies in the worst case axis.								
High Channel								
927.62	84.4 Pk	3.6 / 23.2 / 0.0	111.2	V / 1.0 / 90.0	0	111.2	119	-7.8
927.62	82.4 Pk	3.6 / 23.2 / 0.0	109.2	H / 1.1 / 10.0	0	109.2	119	-9.8
Low Channel								
902.41	80.4 Pk	3.6 / 23.2 / 0.0	107.1	H / 1.0 / 130.0	0	107.1	119	-11.9
902.41	87.0 Pk	3.6 / 23.2 / 0.0	113.7	V / 1.0 / 10.0	0	113.7	119	-5.3
Mid Channel								
914.8	85.7 Pk	3.6 / 23.2 / 0.0	112.4	V / 1.0 / 15.0	0	112.4	119	-6.6
914.8	81.0 Pk	3.6 / 23.2 / 0.0	107.8	H / 1.0 / 175.0	0	107.8	119	-11.2
Low Channel								
1804.74	63.1 Pk	3.1 / 25.9 / 35.1	57	H / 3.1 / 269.0	-14.52	42.48	99	-56.52
1804.74	62.0 Pk	3.1 / 25.9 / 35.1	55.8	V / 2.4 / 28.0	-14.52	41.28	99	-57.72
2707.1	65.6 Pk	4.2 / 28.8 / 37.5	61.1	H / 1.6 / 255.0	-14.52	46.58	54	-7.42
2707.1	63.8 Pk	4.2 / 28.8 / 37.5	59.3	V / 1.3 / 180.0	-14.52	44.78	54	-9.22
3609.44	59.2 Pk	5.0 / 31.1 / 37.9	57.4	H / 1.5 / 20.0	-14.52	42.88	54	-11.12
3609.44	55.0 Pk	5.0 / 31.1 / 37.9	53.1	V / 1.3 / 77.0	-14.52	38.58	54	-15.42
4511.79	56.5 Pk	6.6 / 32.1 / 38.7	56.6	V / 1.2 / 218.0	-14.52	42.08	54	-11.92
4511.79	54.3 Pk	6.6 / 32.1 / 38.7	54.4	H / 1.1 / 140.0	-14.52	39.88	54	-14.12
5414.12	55.2 Pk	6.9 / 32.8 / 39.2	55.7	V / 1.0 / 294.0	-14.52	41.18	54	-12.82
5414.12	54.2 Pk	6.9 / 32.8 / 39.2	54.7	H / 1.1 / 236.0	-14.52	40.18	54	-13.82
6316.37	54.5 Pk	8.2 / 34.5 / 39.4	57.8	V / 1.2 / 124.0	-14.52	43.28	99	-55.72
6316.37	57.7 Pk	8.2 / 34.5 / 39.4	61	H / 1.2 / 130.0	-14.52	46.48	99	-52.52
7218.73	48.6 Pk	8.1 / 35.4 / 38.3	53.9	V / 1.1 / 70.0	-14.52	39.38	99	-59.62
7218.73	50.1 Pk	8.1 / 35.4 / 38.3	55.4	H / 1.2 / 65.0	-14.52	40.88	99	-58.12
8121.07	43.1 Pk	8.3 / 36.5 / 46.8	41.2	H / 1.0 / 0.0	-14.52	26.68	54	-27.32
8121.07	44.1 Pk	8.3 / 36.5 / 46.8	42.2	V / 1.0 / 0.0	-14.52	27.68	54	-26.32
9023.4	46.8 Pk	8.5 / 37.3 / 48.5	44.1	H / 1.0 / 0.0	-14.52	29.58	54	-24.42
9023.4	46.1 Pk	8.5 / 37.3 / 48.5	43.4	V / 1.0 / 45.0	-14.52	28.88	54	-25.12
Mid Channel								
1829.54	64.4 Pk	3.1 / 26.0 / 35.8	57.7	V / 1.0 / 195.0	-14.52	43.18	99	-55.82
1829.54	70.1 Pk	3.1 / 26.0 / 35.8	63.4	H / 1.9 / 76.0	-14.52	48.88	99	-50.12
2744.28	69.7 Pk	4.3 / 28.9 / 37.7	65.2	V / 1.3 / 47.0	-14.52	50.68	54	-3.32
2744.28	70.9 Pk	4.3 / 28.9 / 37.7	66.4	H / 1.6 / 274.0	-14.52	51.88	54	-2.12
3659.05	56.5 Pk	5.1 / 31.2 / 37.7	55	V / 1.3 / 140.0	-14.52	40.48	54	-13.52
3659.05	59.4 Pk	5.1 / 31.2 / 37.7	58	H / 1.5 / 19.0	-14.52	43.48	54	-10.52
4573.78	55.6 Pk	6.7 / 32.1 / 38.6	55.8	H / 1.0 / 272.0	-14.52	41.28	54	-12.72
4573.78	57.0 Pk	6.7 / 32.1 / 38.6	57.2	V / 1.0 / 221.0	-14.52	42.68	54	-11.32

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FREQ	LEVEL	CABLE / ANT / PREAMP	FINAL	POL / HGT / AZ	Duty Cycle Correction	Final Corrected	Limit	DELTA
(MHz)	(dBuV)	(dB) (dB\m) (dB)	(dBuV)	(m) (DEG)	(dB)	(dBuV/m)	(dBuV/m)	(dB)

The following duty cycle was declared by the manufacturer.

"In this case, the maximum time that the carrier would dwell on any hopping channel is 18.8 mS in a 100 mS window. Therefore, the maximum Duty Factor correction factor of 14.52 dB was utilized in the calculations for the final measurement."

Averaging method for pulsed signals and calculation in accordance to FCC CFR47 Part 15.35 utilized to calculate field strength emissions.

The testing performed in accordance to FCC CFR47 Part 15.205 (restricted bands of operation) and 15.247 emissions and delta limits were calculated as follows:

Final Corrected Peak Measurement – Duty Cycle Correction Factor* = Final Calculated Emission

The Final Calculated Emission was then compared to the Limits in CFR47 Part 15.209 and 15.247 and the emission/limit delta was calculated.

the DTCF is calculated as follows $20*\log_{10}$(duty cycle in 100mS) “not to exceed 20dB”

Part 15.247 and 15.205 Respectively								
5488.52	56.1 Pk	6.7 / 32.9 / 39.4	56.3	H / 1.2 / 129.0	-14.52	41.78	99	-57.22
5488.52	52.1 Pk	6.7 / 32.9 / 39.4	52.4	V / 1.1 / 30.0	-14.52	37.88	99	-61.12
6403.18	55.0 Pk	8.3 / 34.5 / 39.3	58.5	H / 1.1 / 148.0	-14.52	43.98	99	-55.02
6403.18	50.8 Pk	8.3 / 34.5 / 39.3	54.3	V / 1.3 / 54.0	-14.52	39.78	99	-59.22
7317.93	55.1 Pk	8.2 / 35.7 / 37.9	61.1	H / 1.1 / 58.0	-14.52	46.58	54	-7.42
7317.93	52.0 Pk	8.2 / 35.7 / 37.9	57.9	V / 1.3 / 72.0	-14.52	43.38	54	-10.62
8232.66	57.6 Pk	8.4 / 36.4 / 47.1	55.3	V / 1.2 / 87.0	-14.52	40.78	54	-13.22
8232.66	58.1 Pk	8.4 / 36.4 / 47.1	55.9	H / 1.0 / 18.0	-14.52	41.38	54	-12.62
9147.39	55.6 Pk	8.8 / 37.5 / 48.1	53.9	V / 1.2 / 100.0	-14.52	39.38	54	-14.62
9147.39	54.6 Pk	8.8 / 37.5 / 48.1	52.8	H / 1.0 / 300.0	-14.52	38.28	54	-15.72
High Channel								
1855.15	69.8 Pk	3.1 / 26.1 / 35.8	63.2	H / 1.9 / 90.0	-14.52	48.68	99	-50.32
1855.15	66.1 Pk	3.1 / 26.1 / 35.8	59.5	V / 2.0 / 14.0	-14.52	44.98	99	-54.02
2782.69	72.6 Pk	4.3 / 29.0 / 37.7	68.2	H / 1.6 / 97.0	-14.52	53.68	54	-0.32
2782.69	71.5 Pk	4.3 / 29.0 / 37.7	67.1	V / 1.2 / 20.0	-14.52	52.58	54	-1.42
3710.23	60.2 Pk	5.2 / 31.3 / 37.5	59.2	H / 1.5 / 25.0	-14.52	44.68	54	-9.32
3710.23	58.6 Pk	5.2 / 31.3 / 37.5	57.6	V / 1.2 / 257.0	-14.52	43.08	54	-10.92
4637.77	59.5 Pk	6.9 / 32.2 / 38.6	60	V / 1.2 / 200.0	-14.52	45.48	54	-8.52
4637.77	57.1 Pk	6.9 / 32.2 / 38.6	57.6	H / 1.1 / 263.0	-14.52	43.08	54	-10.92
5565.31	56.4 Pk	6.8 / 33.2 / 39.6	56.7	V / 1.0 / 294.0	-14.52	42.18	99	-56.82
5565.31	58.4 Pk	6.8 / 33.2 / 39.6	58.7	H / 1.1 / 138.0	-14.52	44.18	99	-54.82
6492.77	54.6 Pk	8.5 / 34.4 / 38.7	58.7	V / 1.2 / 68.0	-14.52	44.18	99	-54.82
6492.77	57.6 Pk	8.5 / 34.4 / 38.7	61.8	H / 1.1 / 48.0	-14.52	47.28	99	-51.72
7420.33	55.1 Pk	8.2 / 35.9 / 37.4	61.8	V / 1.7 / 231.0	-14.52	47.28	54	-6.72
7420.33	56.2 Pk	8.2 / 35.9 / 37.4	62.9	H / 1.2 / 146.0	-14.52	48.38	54	-5.62
8347.86	57.2 Pk	8.4 / 36.4 / 47.6	54.4	H / 1.2 / 20.0	-14.52	39.88	54	-14.12
8347.86	56.5 Pk	8.4 / 36.4 / 47.6	53.7	V / 1.2 / 88.0	-14.52	39.18	54	-14.82
9275.41	55.4 Pk	9.0 / 37.8 / 48.5	53.7	H / 1.1 / 297.0	-14.52	39.18	99	-59.82
9275.41	57.4 Pk	9.0 / 37.8 / 48.5	55.7	V / 1.2 / 101.0	-14.52	41.18	99	-57.82
The following are spurious emissions of the fundamental at the band edges.								
low channel								
898.5	23.2 Pk	3.6 / 23.2 / 0.0	50	V / 1.0 / 0.0	0	50	99	-49
898.5	20.7 Pk	3.6 / 23.2 / 0.0	47.5	H / 1.0 / 0.0	0	47.5	99	-51.5
900.49	31.9 Pk	3.6 / 23.2 / 0.0	58.7	V / 1.0 / 0.0	0	58.7	99	-40.3
900.5	29.2 Pk	3.6 / 23.2 / 0.0	56	H / 1.0 / 0.0	0	56	99	-43
High Channel								
929.7	25.2 Pk	3.6 / 23.3 / 0.0	52.2	H / 1.0 / 0.0	0	52.2	99	-46.8
929.7	36.6 Pk	3.6 / 23.3 / 0.0	63.5	V / 1.0 / 0.0	0	63.5	99	-35.5
931.68	20.7 Pk	3.6 / 23.4 / 0.0	47.8	H / 1.0 / 0.0	0	47.8	99	-51.2
931.71	24.7 Pk	3.6 / 23.4 / 0.0	51.8	V / 1.0 / 0.0	0	51.8	99	-47.2

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Project Report

Begin Date: 2/28/2006 **End Date:** 3/2/2006

Technician Jordan Belliston **Project:** 3092807

Capital Asset ID	Manufacturer	Model #	Serial #	Description	Test Performed	Service Type	Service Date	Service Due
18880	Hewlett-Packard	85650A	2811A01300	Q.P Adapter	R Radiated Emissions	For Cal	11/8/2005	11/8/2006
18881	Hewlett-Packard	85662A	2403A08749	Display Section	R Radiated Emissions	For Cal	8/8/2005	8/8/2006
18882	Hewlett-Packard	8566B	2410A00154	Spectrum Analyzer (dc-22 GHz)	R Radiated Emissions	For Cal	8/8/2005	8/8/2006
18886	TENSOR	4105	2020	Ridged Guide Antenna 1-18GHz	R Radiated Emissions	For Cal	5/9/2005	5/9/2006
18888	EMCO	3146	9402-3775	Log Periodic Antenna (200-1000MHz)	R Radiated Emissions	For Cal	9/30/2005	9/30/2006
18900	Avantek	AFT97-8434-10F	1007	RF Pre-Amplifier (4-8 GHz)	R Radiated Emissions	For Ver	4/4/2005	4/4/2006
18901	Avantek	AWT-18037	1002	RF Pre-Amplifier (8-18 GHz)	R Radiated Emissions	For Ver	4/4/2005	4/4/2006
18906	Mini-Circuits Lab	ZHL-42	N052792-2	Amplifier	R Radiated Emissions	For Ver	5/6/2005	5/6/2006
18912	Hewlett-Packard	8447F	3113A05545	9 kHz- 1.3GHz Pre Amp	R Radiated Emissions	For Ver	5/6/2005	5/6/2006
18889	EMC TEST SYSTEMS	3109	3142	Biconical Antenna 30-300MHz	R Radiated Emissions	For Cal	9/30/2005	9/30/2006
18897	EMCO	6502	9205-2738	Magnetic loop	R Radiated Emissions	For Cal	7/13/2005	7/13/2006

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Appendix B

Test Plan

and

Constructional Data Form

Intertek ETL Semko
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INOVONICS®
WIRELESS CORPORATION
315 CTC Boulevard, Louisville, CO 80027 | ph. 303.939.9336 | fx. 303.939.8977 | www.inovonicswireless.com

July 13, 2004

Todd Seeley
IA Labs
5451 Central Ave.
Boulder, CO 80301

Dear Todd,

Pursuant to section 15.247 of the FCC rules Inovonics transmitters are limited to 0.25 Watts maximum transmitted power. These devices contain integrated antennas and it is therefore impossible to measure the transmitted power in a conducted manner without significantly modifying the devices.

At the test lab the field strength is measured using an antenna located 3 meters from the device under test. The rules do not explicitly state the field strength at 3 meters corresponding to 0.25 Watts, so it must be calculated as follows:

The test facility measures the transmitted field strength, E, having units of Volts/meter, or the logarithmic equivalent. The transmitted power density as measured by the antenna is then $\frac{E^2}{\eta}$, where η is the intrinsic impedance of free space.

Assuming isotropic radiation from the product, the Effective Isotropic Radiated Power (EIRP) is found by multiplying the above power density by the area of a sphere having a radius of 3 meters,

$$P_{EIRP} = \frac{E^2}{\eta} 4\pi R^2 \qquad (1)$$

Solving for E,

$$E = \frac{1}{2R}\left(\frac{\eta P_{EIRP}}{\pi}\right)^{1/2} \qquad (2)$$

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Given that P_{EIRP} = 0.25 Watts (FCC limit), R = 3 meters, and η = 377 Ohms, E = 0.913 V/m = 119.2 dB µV/m.

Remember the above assumption of isotropic radiation- all real antennas have non-isotropic radiation patterns. Using the 119.2 dB µV/m limit guarantees that the total RF power transmitted by the device is below the 0.25 Watt limit.

Also, according the part 15.35 we are allowed a relaxation of the general radiation limits found in 15.209 while using a peak detector, as applied to the harmonics of the fundamental. Inovonics EchoStream security transmitters have a transmission pulse duration of 20 ms, which corresponds to a duty cycle of 0.2 per 15.35(c). This duty cycle allows for a 14 dB relaxation of the general radiation limits from 54 dB µV/m (500 µV/m, per 15.209(a)) to 68 dB µV/m for peak measurements.

Sincerely,

Steven Dunbar
RF Engineer

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Intertek ETL SEMKO
Testing everywhere for markets anywhere.

Request for Estimate & Test Plan

Please contact with any questions:

Contact:	Todd Seeley
Title:	Principal Engineer (Business Development Manager)
Phone Number:	(303) 402-5272
Email Address:	Todd.Seeley@Intertek.com

Client Information:

License Holder:	Inovonics Wireless Corporation
Address:	315 CTC Boulevard, Louisville, CO 80027
Contact:	David Henke
Title:	Project Engineer
Phone Number:	303-209-7163
Fax Number:	303-939-8977
Email Address:	dave@inovonics.com

Please fill out the pertinent pages within this document and email this Form to Todd and Amy at Todd.Seeley@Intertek.com and Amy.Baumberger@Intertek.com for a quotation. Other pages that do not pertain to your device can be left blank.

I.E. EMC Quote – Pages 1,2 & 3, Add Safety – add Page 4, If a radio is part of the device add page 5 etc.

This document is compiled as a WORD FORM. To enable the FORM tool, right click on the tool bar and select FORMS. You will then be able to add attachments, drawings etc by clicking on the "Lock" Graphic to unlock the FORM document. To make all the check boxes work within the FORM, the "Lock" graphic must be selected. Thank you for all your time and effort on this matter.

Estimates Requested: (Required for all devices)

EMC Testing/Services	
☐ Requesting Estimate	☐ On-site/In-Situ Testing
☐ Pre-Compliance Scans / Engineering test	☐ TCF Compilation/Review Service

Radio Device Testing and Certification	
☒ FCC Certification (with Pass/Fail report)	☐ Industry Canada Certification (Receivers required)
☐ Class 2 Notification Under the R&TTED	☐ TCF Compilation/Review Service

Safety Testing and Certification	
☐ NRTL Listing	☐ 1 Day Pre-Assessment (conducted at your facility)
☐ Letter of Findings	☐ CB Report Covering all country Deviations
☐ CE Report to Cover the LVD/MDD	☐ CB Report Covering - Specify Countries:

Any Additional Interest(s)	
☐ ISO Certification (Another RFQ is required)	☐ Energy Star Compliance
☐ FDA 510K Services (Another RFQ is required)	☐ NEBS
☐ International Approvals Management	☐ Wire and Cable
☐ Product Verification and Integrity Testing	☐ Other:

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General Product Information: (Required for all Devices)

Product/Model Number(s):	EN1550
Description of product(s):	Integrated Water Meter with Transmitter
Intended Use:	☐ Household/Office ☒ Commercial ☒ Industrial ☐ Hospital ☐ Life Supporting
Intended Location:	☒ Dry ☒ Damp ☐ Wet ☐ Hazardous Location
Product Type:	☐ Prototype ☒ Production Sample ☐ Manufacturing Design Change: Please Describe
Is it a stand-alone device or part of a system?	☐ Stand Alone Device ☒ Component of a System

If part of a system, please describe system parts and accessories:
The water meter with transmitter sends periodic water meter usage information to a receiver that collects the data and sends it to a billing company via phone lines.

If there is more than one product/model what are the differences?

Is the Product Enclosure:	☐ Metal	☐ Plastic	☒ Both	
Size:	Length:8”	Width:4”	Height:6”	Weight:4 pounds

What Voltages/Current does the EUT run at? (AC/DC etc.) – if the unit runs off of DC though it is supplied with an AC/DC converter, please state the operating parameters of the converter.	Rated Voltage: 3VDC Rated Current: 5 uaDC (quiescent current) # of Phases/Conductors:none / # of Power Cords:none
Are their multiple suppliers of power supplies?	☐ Yes ☒ No If Yes Please Describe:

Are there Multiple Modes of Operation?
☒ Yes ☐ No If Yes Please Describe:
Normal Mode: Transmissions once per hour
Rapid TX Mode: Transmissions once per minute
Shipping Mode: No transmissions or microprocessor activity

Is there programmable software?
☒ Yes ☐ No

Can all modes of operation be operated simultaneously?
☐ Yes ☒ No Explain:

In which countries will you be selling the product?
USA

When can you supply samples of the device and all pertinent documentation (where applicable) to Intertek for testing?
2/28/06

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EMC Information: (Required only if EMC work is requested)

What EMC certifications are desired?	
☐ FCC/ICES (US & Canada) ☐ CE / EMC / MMD ☐ BSMI (Taiwan) ☐ VCCI (Japan)	☐ SII (Israel) ☐ AS/NZS (Australia/New Zealand) ☐ Korea MIC Certification / RRL ☐ Other: Please Specify

Highest frequency utilized for device operation:

List of Clock Frequencies:

What is the time that it takes for the device to complete a full cycle of operation? (time required to identify any degradation in performance) (please list per mode of operation)

Total Number of I/O Cables: # Greater than 3m (9.75 feet) in Length # Greater than 30m (97.5 feet) in Length # of cables at a longer length (specify)	

Number of Dedicated Earth Equalization Ports

Number of Ethernet and/or Telecommunications Ports

When the device is a compilation of subsystems (in separate chassis) how many interconnecting I/O's are greater than 1 meter in length between the Subsystem chassis?

CISPR11/EN 55011 Specific Devices:

1. Does the EUT use RF Energy to affect a material? ☐ Yes ☐ No If yes, state frequency of energy:

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General Safety Information: (Required only if Safety Listing/Certification/Testing is requested)

What Safety certifications are desired?	
☐ NRTL Listing US/Canada	☐ Limited Production Certification/Listing
☐ CB Certification (Worldwide – Outside US/Can)	☐ S Mark
☐ EU Investigation (EU – LVD/MDD)	☐ GS Mark
☐ Field Label (Onsite Inspection)	☐ Other: Please Specify

Please list all applicable safety standards that you would like your device certified under:

Has the device been tested and certified for product safety before? A. If it has been previously tested, to which standard and by which organization? B. Can you provide the test report?	☐ Yes ☐ No Standard tested to: Organization tested by: ☐ Yes ☐ No
Do manuals and installation instructions exist? (Not always a necessity for quoting but most useful for complex products)	☐ Yes ☐ No
Power Supply Safety Information: A. Is the power supply an approved "off-the-shelf" supply? B. Can you provide the test report/CB Report?	☐ Yes ☐ No Standard tested to: Organization tested by: ☐ Yes ☐ No

Does the device contain batteries?	What Type? How Many?
What technology is used? (i.e., lasers, X Ray, etc.)	

If Laser:	Class:	Output Power:	Beam Divergence Angle:	Wavelength:

Preferred testing location:	☐ Intertek Lab ☐ Customer site ☐ Intertek Local Lab (May increase turn around time and expense)

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Radio Information: (Required only if the device contains an intentional transmitter)

What Radio certifications are desired?	
☒ FCC (USA) (15.205, 15.209, 15.247) ☐ Industry Canada ☐ ETSI (R&TTE)	☐ Notified or Competent Body TCF Review ☐ Other: Please Specify

Please list the particular radio standards that apply.

Operating Frequency:	902-928 MHZ (US ISM band)
RF Output Power:	17 dBm
Is there an RF Conducted Port?	☐ Yes ☒No Description:
Number of Antennas & Description: (Internal, External, Known Gain, etc.)	Internal, inverted F
Modulation Technique:	FSK
Number of Channels/Number of Discrete frequencies per Channel:	25/1
Can the device be operated in CW Mode?	☐ Yes ☒ No (But can put in CW mode for testing)
What is the lowest utilized frequency within the device?	902 MHz

Notes: Please ensure to bring a notch filter covering your fundamental operating frequency.

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Additional Information:

This information is required to be filled in to act as a test plan and constructional data form required to be supplied as part of the test report in accordance to the required standards. This information is not required to obtain a quote but should be filled out to show a completed report under the applicable standards for EMC etc. Thank you for your time in effort in completing this section of the RFQ/Test Plan.

Support Equipment:

Intertek requires our customers provide all support equipment necessary to fully operate the device undergoing testing. This includes any filters required for testing radio devices, computer equipment, etc.

Item	Description	Manufacturer	Model No.
1	(We will bring high pass filter that you have already characterized.)		
2			
3			
4			

Cabling Information:

Cable	Function*	Type of Shield	Length	Connectors	Connection**
1					
2					
3					
4					
5					
6					

* Function examples (Ethernet, RS232, USB, Analog, physiological parameter, etc.)
** Connection examples (Outside Plant, Patient Coupled, Ring Voltage, etc.)

Monitoring the EUT:

Please provide instructions below on how to observe the EUT to verify proper operation in all modes. (including software revision)

Any other information required: (Notes, Photos, Block Diagrams, Drawings, etc.)

A minimum of a block diagram showing the equipment under test and its support equipment.

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For Intertek Internal Use Only
Please do not fill in the following Information.

Quoting Engineer: todd		
Emissions Testing Required ☐ **Class A** ☐ **Class B** ☒ **Radio Device** ☐ **Group 1** ☐ **Group 2**		
☒ FCC Part 15	☐ ICES-003	☐ VCCI
☐ FCC Part 18	☐ BSMI	☐ CISPR 22/EN 55022
☐ CISPR 11/EN 55011	☐ IEC/EN 61326	☐ IEC/EN61000-6-3
☐ IEC/EN61000-6-4	☐ CNS13438	☐ AS/NZS 3548
☐ IEC/EN61000-3-2	☐ IEC/EN61000-3-3	☐ ETSI/EN 301 489
☐ Other: .247 - follow doc - only do 15.209 once - regular mode of operation (fast TX)		
OATS Testing Voltages		
☐ 100VAC/50 Hz	☐ 120VAC/60Hz	☐ 230VAC/50Hz
☐ 110VAC/60Hz	☐ 220VAC/60Hz	☐ 240VAC/50Hz
☐ Other:		
Immunity Product Family Standard		
☐ CISPR24/EN 55024	☐ IEC/EN 61000-6-1	☐ IEC/EN 61000-6-2
☐ IEC/EN 60601-1-2 ☐ Art. Hand.	☐ IEC/EN 61326	☐ CISPR14/ EN 55014-2
☐ ETSI/EN 301 489	☐ Add Israel Frequencies	
☐ Other:		

Immunity Methods			
☐ EN61000-4-2	☐ 4kV/8kV ☐ 6kV/8kV	☐ 8kV ☐ 12kV ☐ 15kV	☐ Other:
☐ EN61000-4-3	☐ 3V/m ☐ 10V/m	☐ 1 kHz Modulation ☐ 400 Hz Modulation ☐ 2 Hz Modulation	☐ Other:
☐ EN61000-4-4	☐ 0.5 kV ☐ 1.0 kV	☐ 2.0 kV	☐ Other:
☐ EN61000-4-5	☐ 0.5 kV ☐ 1.0 kV	☐ 2.0 kV ☐ 4.0 kV	☐ Other:
☐ EN61000-4-6	☐ 3Vrms ☐ 10Vrms	☐ 1 kHz Modulation ☐ 400 Hz Modulation ☐ 2 Hz Modulation	☐ Other:
☐ EN61000-4-8	☐ 1A/m ☐ 30A/m	☐ 400A/m	☐ Other:
☐ EN61000-4-11	☐ >95% 0.5 Cycles ☐ 30% 0.5 Cycles ☐ 60% 5 Cycles ☐ 60% 50 Cycles	☐ 30% 25 Cycles ☐ >95% 250 Cycles ☐ >95% 1 Cycle	☐ Other:

Test Reports Requested		
EMC Reports: ☐ Emissions ☐ Immunity ☐ Engineering Data Only ☐ FCC/Industry Canada "Radio" ☐ ETSI "Radio"	**Safety Reports:** ☐ Product Evaluation ☐ Listing Report ☐ CB Certificate/Report	Misc. Deliverables: ☐ Other:
Overall Scheduling Time:		
Electromagnetic Compatibility: Emissions: Immunity: Radio:	**Safety:** **Testing/Reports:**	

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Appendix C

Measurement Protocol

And

Test Procedures

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MEASUREMENT PROTOCOL

GENERAL INFORMATION

Test Methodology

Conducted and radiated emission testing is performed according to the procedures in ANSI C63.4 & CNS13438.

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 it's 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 applicable 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, expressed in dBμV/m, is arrived at by taking the reading from the spectrum analyzer (Level dBμV) and adding the antenna correction factor and cable loss factor (Factor dB) to it. This result then has the applicable limit subtracted from it to provide the Delta which gives the tabular data as shown in the data sheets in Attachment B. The amplifier gain is automatically accounted for by using an analyzer offset.

Example: At a Test Frequency of 30 MHz, with a peak reading on the spectrum analyzer or measuring receiver of 14 dBμV:

Measured Level	+	Transducer & Cable Loss factor	=	Corrected Reading	Specification Limit	-	Corrected Reading	=	Delta Specification
(dBμV)		(dB)		(dBμV/m)	(dBμV/m)		(dBμV/m)		
14.0		**14.9**		**28.9**	**40.0**		**28.9**		**-11.1**

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DETAILS OF TEST PROCEDURES

General Standard Information

The test methods used comply with ANSI C63.4-2003- "Methods of Measurement of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the Range of 9 kHz to 40 GHz."

Conducted Emissions

Conducted emissions on the 50 Hz and/or 60 Hz power interface of the EUT are measured in the frequency range of 150 kHz to 30 MHz. The measurements are performed using a receiver, which has CISPR characteristic bandwidth and quasi-peak detection, and a Line Impedance Stabilization Network (LISN), with 50 Ω/50 μH (CISPR 16) characteristics. Table top equipment is placed on a non-conducting table 80 centimeters above the floor and is positioned 40 centimeters from the vertical ground plane (wall) of the screen room. In some cases, a pre-scan using a spectrum analyzer is initially performed on the units comprising the system under test to locate the highest emissions. If the minimum passing margin appears to be less than 20 dB with a peak mode measurement, the emissions are re-measured using a tuned receiver or spectrum analyzer with quasi-peak and average detection and recorded on the data sheets.

Radiated Emissions

Radiated emissions from the EUT are measured in the frequency range of 30 to 22GHz using a spectrum analyzer and appropriate broadband linearly polarized antennas. Measurements between 30 MHz and 1000 MHz are made with 120 kHz/6 dB bandwidth and quasi-peak detection and measurements above 1000 MHz are made with a 1 MHz/6 dB bandwidth and peak detection. Table top equipment is placed on a 1.0 X 1.5 meter non-conducting table 80 centimeters above the ground plane. Floor standing equipment is placed directly on the turntable/ground plane. Interface cables that are closer than 40 centimeters to the ground plane are bundled in the center in a serpentine fashion so they are at least 40 centimeters from the ground plane. Cables to simulators/testers (if used in this test) are routed through the center of the table and to a screen room located outside the test area. The antenna is positioned 3, 10 or 30 meters horizontally from the EUT. To locate maximum emissions from the test sample the antenna is varied in height from 1 to 4 meters, measurement scans are made with both horizontal and vertical antenna polarizations and the EUT are rotated 360 degrees.

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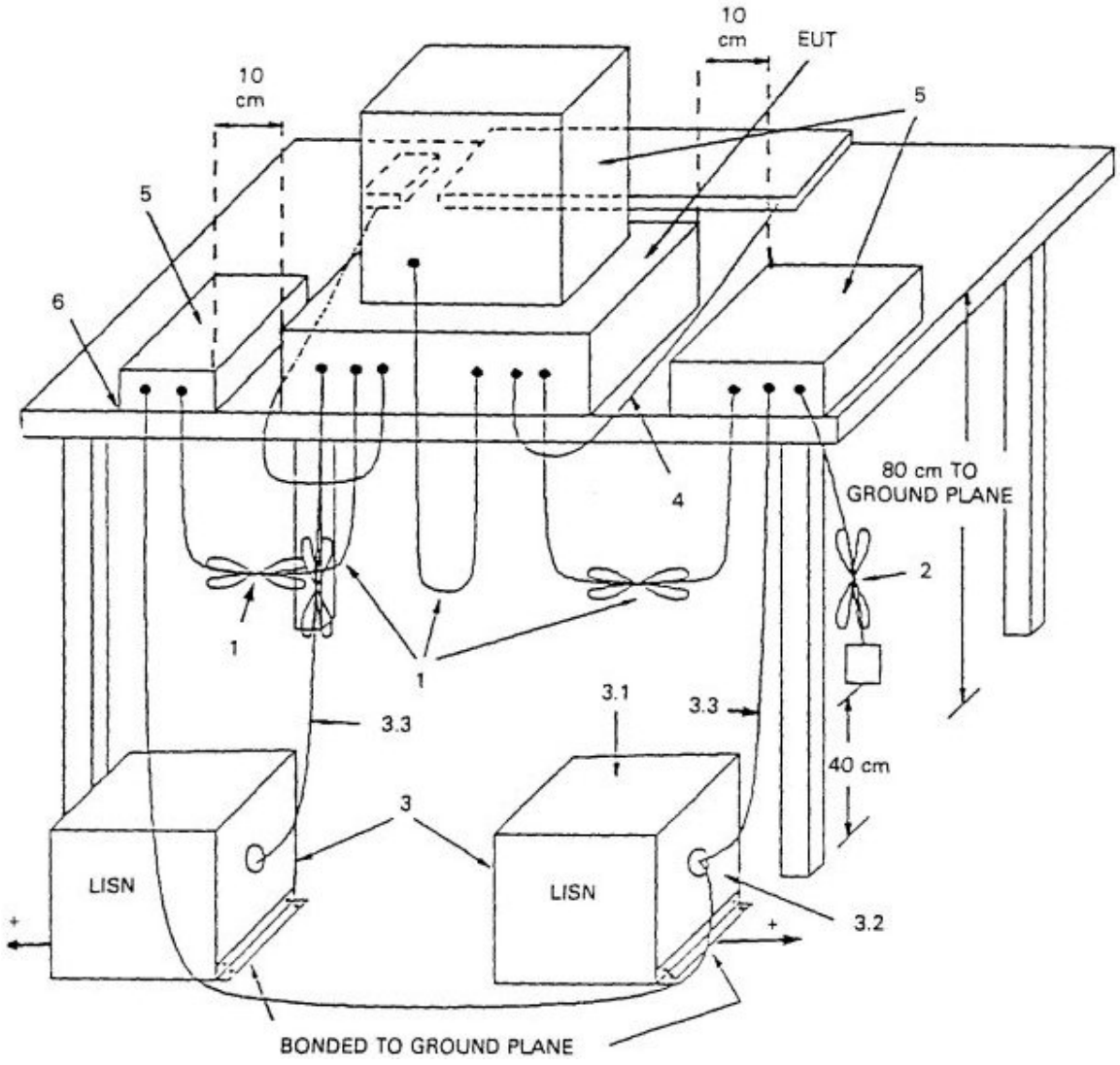
Conducted Emissions Diagram:



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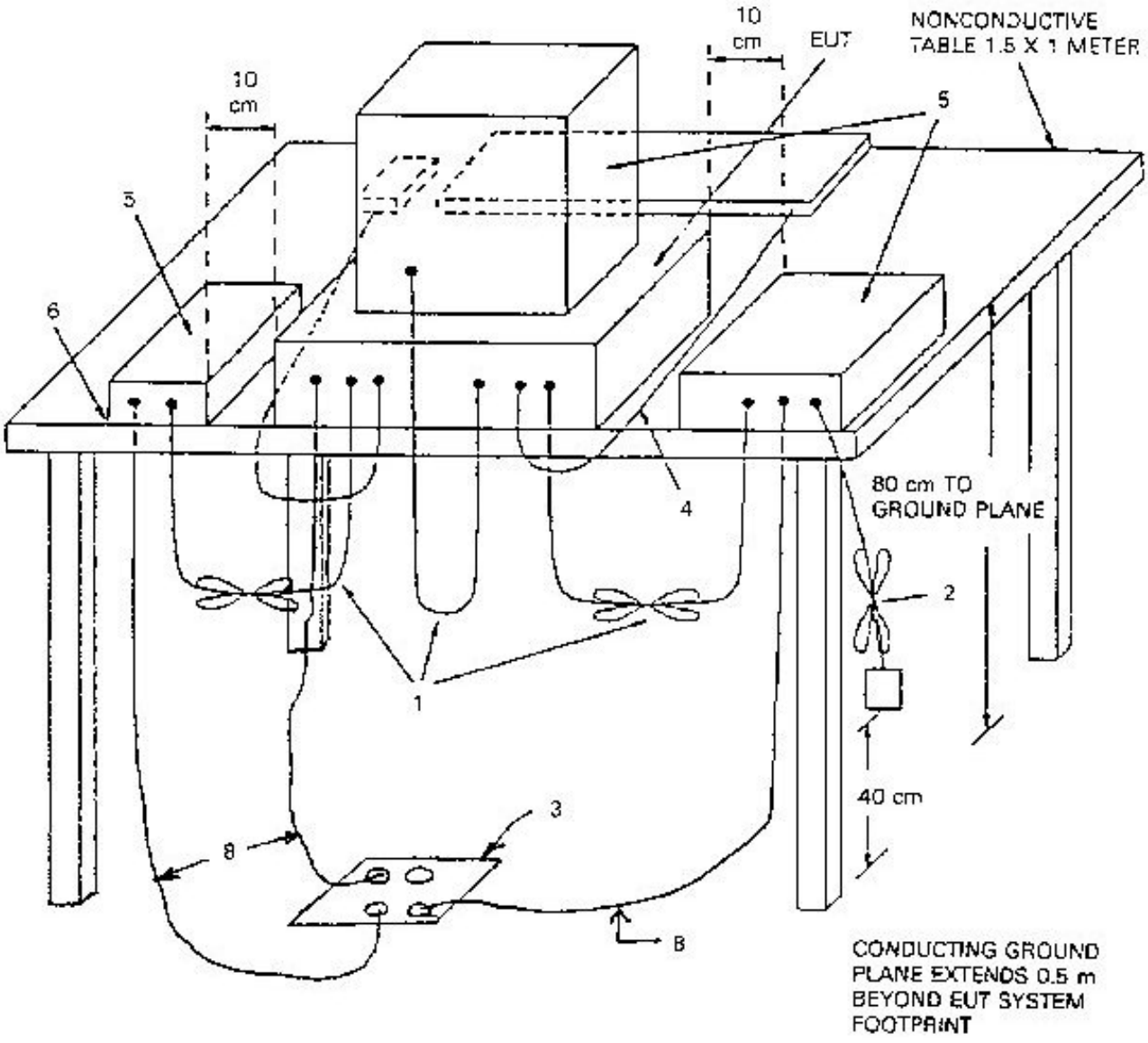
Radiated Emissions Diagram:



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