



849 NW State Road 45
Newberry, FL 32669 USA
Ph: 888.472.2424 or 352.472.5500
Fax: 352.472.2030
Email: info@timcoengr.com
Website: www.timcoengr.com

FCC Pt 15.249 LOW POWER DEVICE

TEST REPORT

Applicant	Ubisense Limited	
Address	St Andrews House 90 St. Andrews Road Chesterton, Cambridge CB4 1DL UK	
FCC ID	SEASENSOR20	
Model Number	UBISENSOR7020	
Product Description	Real-time Location Sensor (Low Power Transmitter)	
Date Sample Received	5/24/2007	
Date Tested	5/24/2007	
Tested By	Richard Block	
Approved By	Mario de Aranzeta	
Report Number	2155AUT7TestReport.pdf	
Test Results	<input checked="" type="checkbox"/> PASS	<input type="checkbox"/> FAIL

THE ATTACHED REPORT SHALL NOT BE REPRODUCED EXCEPT IN FULL
WITHOUT THE WRITTEN APPROVAL OF TIMCO ENGINEERING, INC.



Certificate # 0955-01



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ATTESTATION STATEMENT

This equipment has been tested in accordance with the standards identified in the referenced test report. To the best of my knowledge and belief, these tests were performed using the measurement procedures described in this report and demonstrate that the equipment complies with the appropriate standards. No modifications were made to the equipment during testing in order to demonstrate compliance with these standards.



Certificate # 0955-01

All Timco instrumentation and accessories used to test products for compliance to the indicated standards are calibrated regularly in accordance with ISO 17025 requirements.

I attest that the necessary measurements were made by me or under my supervision, at TIMCO ENGINEERING, INC. located at 849 N.W. State Road 45, Newberry, Florida 32669.

Authorized by: Mario de Aranzeta

Signature: On file

Function: Engineer

Date: June 6, 2007

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GENERAL INFORMATION

Disclaimer	The test results relate only to the items tested.
Purpose of Report	To demonstrate the DUT complies with FCC Pt 15.249 requirement for a low power unlicensed device.
Applicable Standard/Procedure	Part 15.249, ANSI C63.4: 2003
Related Report/Approval	R2340_1.pdf

TEST ENVIRONMENT

Test Facility	The test sites used by Timco Engineering Inc. are located at 849 NW State Road 45 Newberry, FL 32669 USA.
Test Environment	Temperature: 26°C; Humidity: 55%

TEST SETUP

Test Supporting Equipment	Description: N/A Manufactured by: Model or FCC ID: N/A
Test Exercise (e.g. software description, test signal, etc.)	The DUT was put in test mode by using applicant's software and instruction.
Deviation from the standard(s)	No deviation
Modification to the DUT	No modification

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DUT SPECIFICATION

Manufacturer:	Ubisense Limited
Product Description:	Real-time location sensor (Low Power Transmitter)
FCC ID:	SEASENSOR20
Model Number:	UBISENSOR7020
Brand Name:	Ubisense
Operating Frequency:	2402.50 - 2480.50 MHz
Emission Designator:	N/A
EUT Power Source:	Primary Power – 3 V Battery (coin type cell) Secondary Power – N/A
Test Item:	Prototype
Type of Equipment	Portable
Antennas	patch
Antenna Connector	permanently attached

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EMC EQUIPMENT LIST

Device	Manufacturer	Model	Serial Number	Cal/Char Date	Due Date
3/10-Meter OATS	TEI	N/A	N/A	Listed 3/27/07	3/26/10
3-Meter OATS	TEI	N/A	N/A	Listed 1/11/06	1/10/09
Antenna: Biconnical	Eaton	94455-1	1057	CAL 12/12/05	12/12/07
Antenna: Biconnical	Eaton	94455-1	1096	CAL 10/11/06	10/11/08
Antenna: Biconnical	Electro-Metrics	BIA-25	1171	CAL 4/29/07	4/29/09
Analyzer Tan Tower Spectrum Analyzer	HP	8566B Opt 462	3138A07786 3144A20661	CAL 12/7/05	12/7/07
Analyzer Tan Tower RF Preselector	HP	85685A	3221A01400	CAL 12/7/05	12/7/07
Analyzer Tan Tower Quasi-Peak Adapter	HP	85650A	3303A01690	CAL 12/8/05	12/8/07
Analyzer Tan Tower Preamplifier	HP	8449B-H02	3008A00372	CAL 12/8/05	12/8/07
LISN	Electro-Metrics	ANS-25/2	2604	CAL 10/5/06	10/5/08
LISN	Electro-Metrics	EM-7820	2682	CAL 4/28/07	4/28/09
Antenna: Log-Periodic	Eaton	96005	1243	CAL 12/14/05	12/14/07

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TEST PROCEDURE

Radiation Interference: The measurement was made per ANSI C63.4-2003 using an Agilent model 8566B spectrum analyzer, a model 85685A preselector, a model 85650A quasi-peak adapter, and an appropriate antenna. The analyzer was calibrated in dB above a microvolt at the output of the antenna. The resolution bandwidth was 100 kHz with an appropriate sweep speed and the video bandwidth was 300 kHz up to 1 GHz and 1 MHz with a VBW greater than or equal to the RBW above 1 GHz. When an emission was found, the table was rotated to produce the maximum signal strength. The antenna was placed in both the horizontal and vertical planes and the worse case emissions were reported. The spectrum was searched to at least the tenth (10) harmonic of the fundamental.

Formula Of Conversion Factors: The field strength at 3m was established by adding the meter reading of the spectrum analyzer (which is set to read in units of dBuV) to the antenna correction factor supplied by the antenna manufacturer. The antenna correction factors are stated in terms of dB. The gain of the preselector was accounted for in the spectrum analyzer meter reading.

Example:

$$\begin{array}{lllll}
 \text{Freq (MHz)} & \text{Meter Reading} & + \text{ACF} & + \text{CL} & = \text{FS} \\
 33 & 20 \text{ dBuV} & + 10.36 \text{ dB} & + 0.5 & = 30.86 \text{ dBuV/m @ 3m}
 \end{array}$$

Power Line Conducted Interference: The procedure used was ANSI C63.4-2003 using a 50uH LISN. Both lines were observed. The bandwidth of the spectrum analyzer was 10 kHz with an appropriate sweep speed. The spectrum was scanned from 0.15 to 30 MHz.

Occupied Bandwidth: A small sample of the transmitter output was fed into the spectrum analyzer and the attached plot was printed. The vertical scale is set to -10 dBm per division.

ANSI C63.4-2003 Measurement Procedures: The DUT was placed on a table 80 cm high and with dimensions of 1m by 1.5m. The DUT was placed in the center of the table (1.5m side). The table used for radiated measurements is capable of continuous rotation.

When an emission was found, the table was rotated to produce the maximum signal strength. At this point, the antenna was raised and lowered from 1m to 4m. The antenna was placed in both the horizontal and vertical planes.



RADIATION INTERFERENCE

Rules Part No.: Pt 15.249, Pt 15.209

Requirements:

Frequency	Limits
Part 15.209	
9 to 490 kHz	2400/F (kHz) μ V/m @ 300 meters
490 to 1705 kHz	24000/F (kHz) μ V/m @ 30 meters
1705 kHz to 30 MHz	29.54 dB μ V/m @ 30 meters
30 – 88	40.0 dB μ V/m @ 3 meters
80 – 216	43.5 dB μ V/m @ 3 meters
216 – 960	46.0 dB μ V/m @ 3 meters
Above 960	54.0 dB μ V/m @ 3 meters
Part 15.249	
Fundamental 902 – 928 MHz	94.0 dB μ V/m @ 3 meters
Fundamental 2.4 – 2.4835 MHz	94.0 dB μ V/m @ 3 meters
Harmonics	54.0 dB μ V/m @ 3 meters

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Test Data:

Tuned Frequency MHz	Emission Frequency MHz	Meter Reading dBuV	Ant. Polarity V/H	Coax Loss dB	Duty Cycle	Correction Factor dB	Field Strength dBuV/m	Margin dB	Notes
2,402.50	2,400.00	23.5	H	3.18	9.05	32.32	49.95	4.06	Avg
2,402.50	2,400.00	28.9	H	3.18	9.05	32.32	55.35	18.66	Peak
2,402.50	2,402.50	67.0	V	3.18	9.05	32.33	93.46	0.54	
2,402.50	2,402.50	67.4	H	3.18	9.05	32.33	93.86	0.14	
2,402.50	4,805.00	12.3	V	4.9	9.05	34.34	42.49	11.52	
2,402.50	4,805.00	16.7	H	4.9	9.05	34.34	46.89	7.11	
2,441.60	2,441.60	64.3	V	3.21	9.05	32.44	90.90	3.11	
2,441.60	2,441.60	65.7	H	3.21	9.05	32.44	92.30	1.71	
2,441.60	4,883.20	12.7	V	4.94	9.05	34.41	43.00	11.01	
2,441.60	4,883.20	18.1	H	4.94	9.05	34.41	48.40	5.61	
2,480.50	2,480.50	64.4	V	3.24	9.05	32.55	91.14	2.87	
2,480.50	2,480.50	64.5	H	3.24	9.05	32.55	91.24	2.77	
2,480.50	2,483.50	16.6	H	3.24	9.05	32.55	43.34	10.67	Ave
2,480.50	2,483.50	26.3	H	3.24	9.05	32.55	53.04	20.97	Peak
2,480.50	4,961.00	13.5	V	4.98	9.05	34.47	43.90	10.11	
2,480.50	4,961.00	16.0	H	4.98	9.05	34.47	46.40	7.61	

The spectrum was checked to the tenth harmonic.

Emissions below 1 GHz

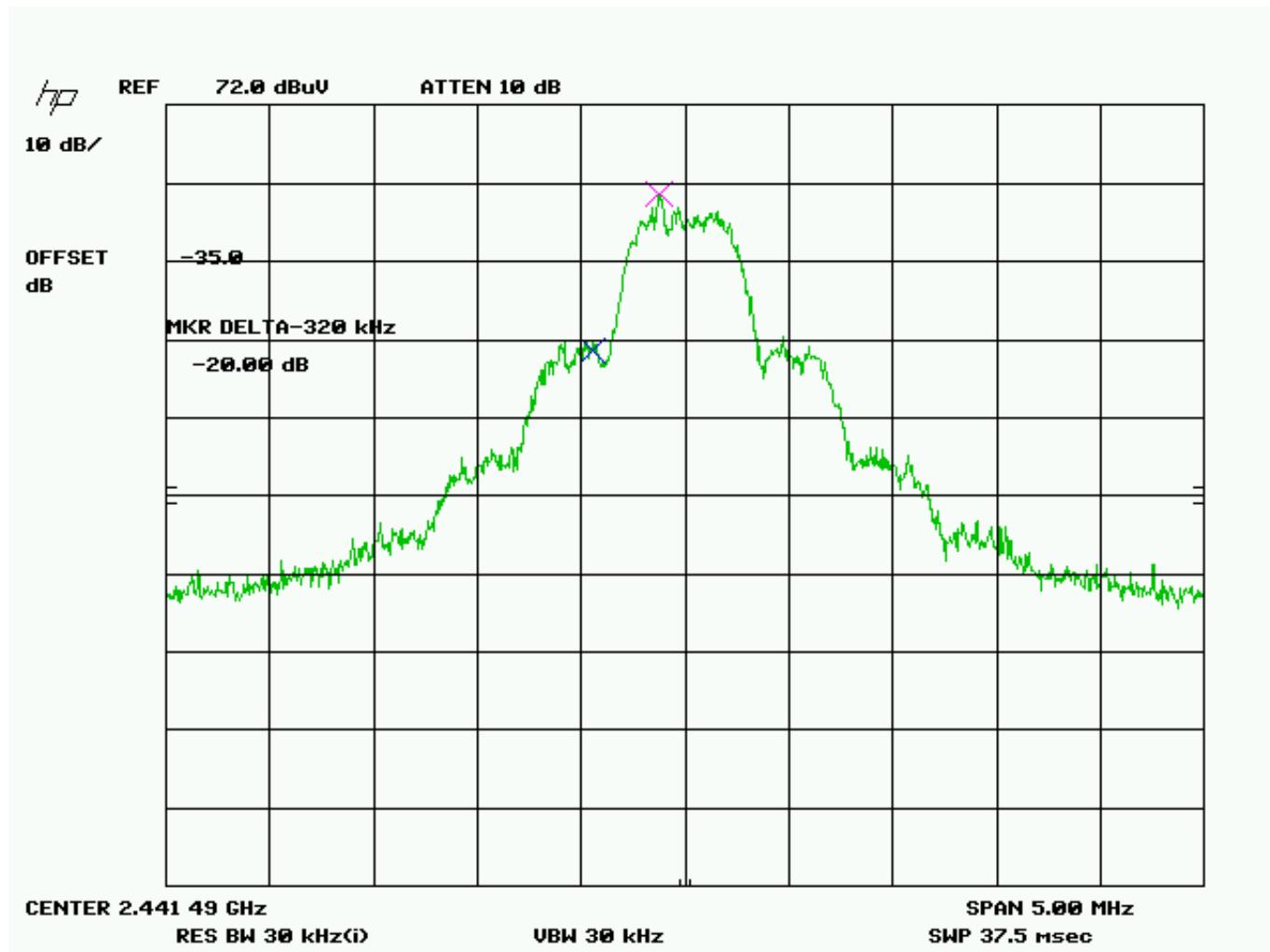
Emission Frequency MHz	Meter Reading dBuV	Ant. Polarity V/H	Coax Loss dB	Correction Factor dB/m	Field Strength dBuV/m	Margin dB
32.91	18.7	V	0.41	11.29	30.40	9.60
35.99	17.6	V	0.43	10.34	28.37	11.63
46.98	17.9	V	0.48	10.50	28.88	11.12
221.19	16.4	H	0.94	11.50	28.84	17.16
243.77	25.5	H	0.99	12.19	38.68	7.32
243.78	18.0	V	0.99	12.13	31.12	14.88
246.38	20.8	V	0.99	12.28	34.07	11.93
251.31	24.9	H	1.00	12.55	38.45	7.55
256.38	19.7	V	1.01	12.76	33.47	12.53
256.38	25.4	H	1.01	12.76	39.17	6.83
268.91	20.2	H	1.04	13.43	34.67	11.33
276.46	17.9	H	1.05	13.69	32.64	13.36
315.00	18.9	V	1.12	14.90	34.92	11.09
320.00	19.6	V	1.12	14.70	35.42	10.58
359.45	17.2	V	1.16	14.79	33.15	12.85
366.97	17.3	V	1.17	15.01	33.48	12.52
384.65	17.0	V	1.18	15.44	33.62	12.38
392.19	21.2	V	1.19	15.62	38.01	7.99
404.70	21.0	H	1.20	16.15	38.35	7.65
414.74	23.5	H	1.21	16.20	40.91	5.09
414.77	24.8	V	1.21	15.95	41.96	4.04
422.29	27.7	V	1.22	16.02	44.94	1.06
422.32	25.8	H	1.22	16.27	43.29	2.71
432.35	21.9	H	1.23	16.57	39.70	6.30
432.37	28.6	V	1.23	16.15	45.98	0.02
439.92	22.7	H	1.24	16.80	40.74	5.26
439.94	26.3	V	1.24	16.30	43.84	2.16
447.46	24.5	V	1.25	16.52	42.27	3.73
447.47	16.6	H	1.25	16.87	34.72	11.28
460.00	20.3	V	1.26	16.90	38.46	7.54
774.15	15.8	V	1.85	20.80	38.45	7.55
945.11	19.3	H	2.02	23.35	44.67	1.33

OCCUPIED BANDWIDTH

Rules Part No.: Pt 15.249 (d)

Requirements:

Test Data: The measured bandwidth is 925 kHz.

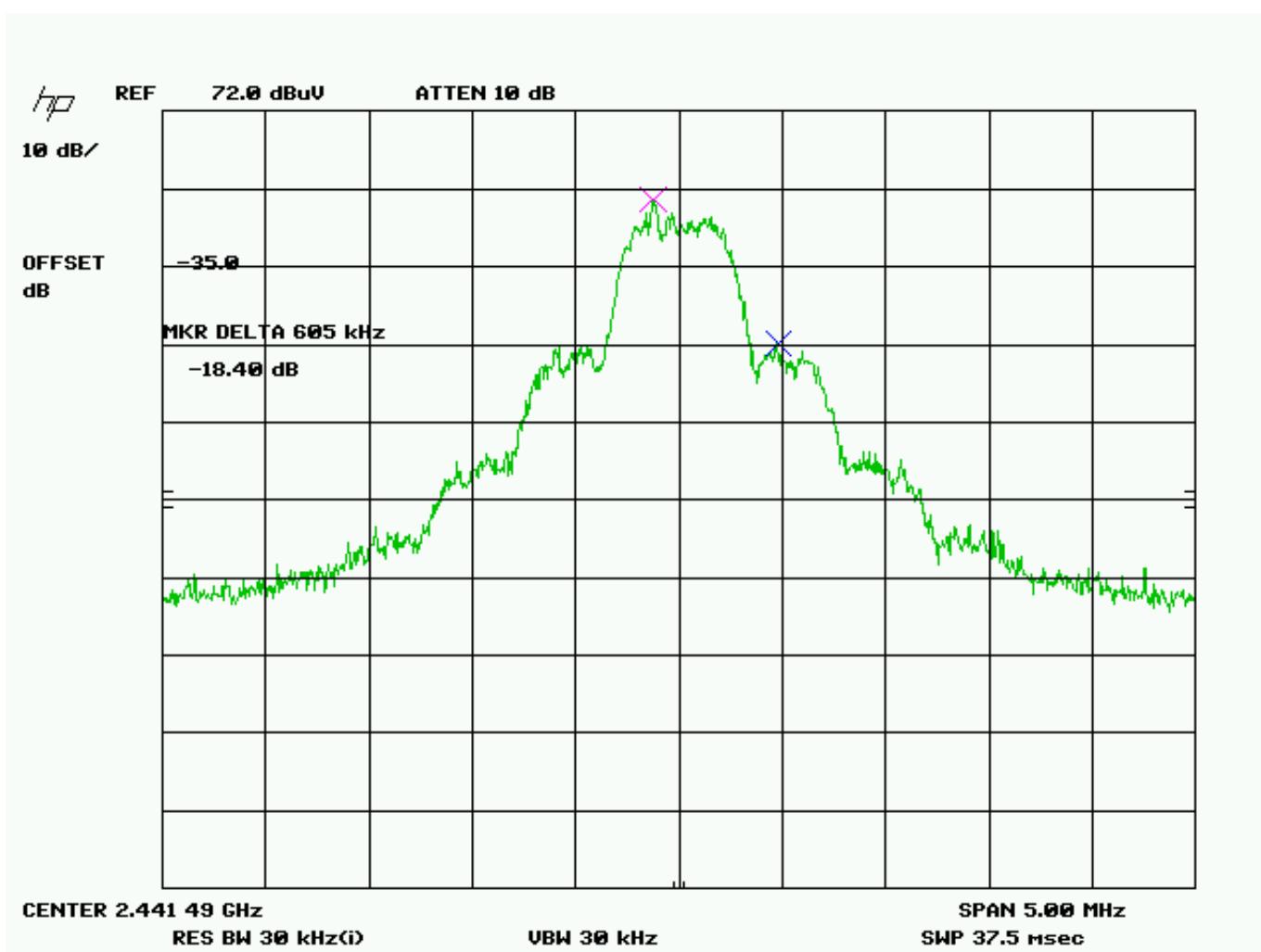


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POWER LINE CONDUCTED INTERFERENCE

Rules Part No.: Pt 15.207

Requirements:

Frequency (MHz)	Quasi Peak Limits (dBuV)	Average Limits (dBuV)
0.15 – 0.5	66 – 56	56 – 46
0.5 – 5.0	56	46
5.0 – 30	60	50

Test Data: Please refer to R2340-1.pdf.