TEST REPORT
FROM
RFI GLOBAL SERVICES LTD

Test of: Modular Ubitag V2.0HH

To: FCC Part 15.519: 2008 Subpart F

Test Report Serial No:
RFI/RPT1/RP75860JD06B

This Test Report Is Issued Under The Authority Of Brian Watson, Operations Director:	pp
Checked By:	R. Graham
Signature:	
Date of Issue:	12 November 2009

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Registered in England and Wales. Company number:2117901

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1. Customer Information

Company Name:	Ubisense Ltd
Address:	St Andrew's House St Andrew's Road Chesterton, Cambridge Cambridgeshire CB4 1DL United Kingdom

2. Summary of Testing

2.1. General Information

Specification Reference:	47CFR15.519 – Technical requirements for hand held UWB Devices
Specification Title:	Code of Federal Regulations Volume 47 (Telecommunications) 2008: Part 15 Subpart F (UltraWideband Operation) - Section 15.519
Specification Reference:	47CFR15.207 & 47CFR15.209
Specification Title:	Code of Federal Regulations Volume 47 (Telecommunications) 2008: Part 15 Subpart C (Radio Frequency Devices) - Sections 15.207 & 15.209
Site Registration:	FCC: 209735
Location of Testing:	RFI Global Services Ltd, Wade Road, Basingstoke, Hampshire, RG24 8AH.
Test Dates:	10 September to 25 September 2009

2.2. Summary of Test Results

FCC Reference (47CFR)	Measurement	Port Type	Result
Part 15.207	Transmitter AC Conducted Spurious Emissions	AC Mains	✓
Part 15.519(b)	Transmitter Ultra Wide Bandwidth (UWB)	Antenna	✓
Parts 15.519(c) & 15.209	Transmitter Radiated Spurious Emissions Below 960 MHz	Antenna	✓
Parts 15.519(c)(d)	Transmitter Radiated Spurious Emissions Above 960 MHz	Antenna	✓
Part 15.519(e)	Transmitter Emission Peak Level	Antenna	✓

Key to Results

✓ = Complied ✗ = Did not comply

2.3. Methods and Procedures

Reference:	ANSI C63.4 (2003)
Title:	American National Standard Methods of Measurement of Electromagnetic Emissions from Low Voltage Electrical and Electronic Equipment in the Range of 9 kHz to 40 GHz.

2.4. Deviations from the Test Specification

The device is a DC powered module which can be installed into hand held devices.
Standalone, during testing the device cannot be termed a hand held device in accordance with the requirements of 15.519(a), because it derives its power via an AC-DC power supply from the AC mains (a fixed infrastructure). However, the object of this report is to show compliance with the technical requirements of 15.519

3. Equipment Under Test (EUT)

3.1. Identification of Equipment Under Test (EUT)

Brand Name:	Ubisense
Description:	UWB Tag
Model Number:	Modular Ubitag V2.0HH
Serial Number:	10
FCC ID:	SEAMOD21HH

3.2. Description of EUT

The equipment under test was a location tag.

3.3. Modifications Incorporated in the EUT

No modifications were applied to the EUT during testing.

3.4. Additional Information Related to Testing

Tested Technology:	Ultra Wide Band (UWB)	
Type of Radio Device:	Transmitter	
Power Supply Requirement(s):	Nominal	3.3 V DC
Pulse Repetition Frequency:	6.5 MHz	
Band of Operation:	6 to 8.5 GHz	
Test Centre Frequency	7.2 GHz (approx) - single channel operation	

3.5. Support Equipment

The following support equipment was used to exercise the EUT during testing:

Description:	AC/DC Power Supply Unit
Brand Name:	Stontronics
Model Name or Number:	3A-061WP03
Serial Number:	T3915ST

4. Operation of the EUT during Testing

4.1. Operating Modes

The EUT was tested in the following operating mode(s):

- The EUT is normally operated with an extremely low duty cycle (<1%), therefore in order that measurements could be made satisfactorily the EUT was set to transmit with 100% duty cycle. This results in a worse-case scenario where the reported level is higher than that which would be obtained with any lower duty cycle.

4.2. Configuration and Peripherals

The EUT was tested in the following configuration(s):

- Connected to an external AC/DC Supply.
  The device is a DC powered module which can be installed into hand-held devices – for the purpose of standalone testing it derived its power via an AC/DC power supply from the AC mains.

5. Measurements, Examinations and Derived Results

5.1. General Comments

Measurement uncertainties are evaluated in accordance with current best practice. Our reported expanded uncertainties are based on standard uncertainties, which are multiplied by an appropriate coverage factor to provide a statistical confidence level of approximately 95%. Please refer to *Section 6. Measurement Uncertainties* for details.

Measurements above 1GHz used the RMS detector function on the spectrum analyzer, with a sweep time set to 500ms or less – the spectrum analyzer scan had 500 points, and so a sweep time of 500ms or less ensured that the averaging time per point was 1ms or less. The VBW was always greater than or equal to the RBW unless noted.

The operational requirement stated in part 15.519 states that a UWB device is limited solely for hand held use only. The client has supplied a declaration of conformance to this section in a separate exhibit, reference document FCC Part 15.519 (a)_26_10_09. This document is included in Appendix 2 of this report.

5.2. Test Results

5.2.1. Transmitter AC Conducted Spurious Emissions

Test Summary:

FCC Part:	15.207
Test Method Used:	As detailed in ANSI C63.4 Section 7 and relevant annexes

Environmental Conditions:

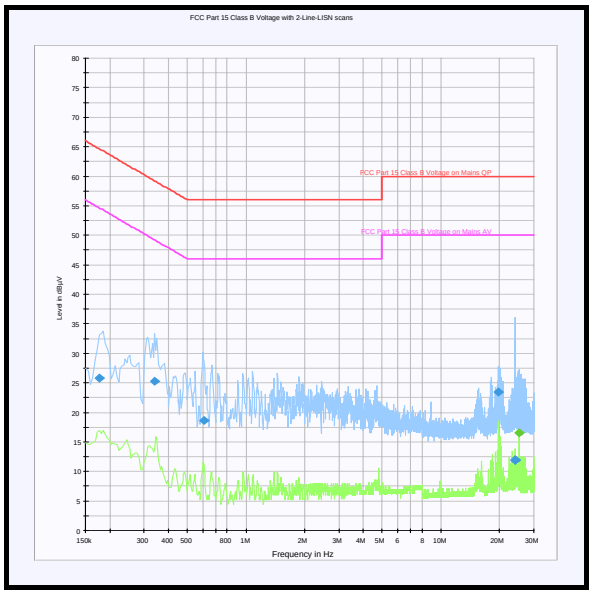
Temperature (°C):	28
Relative Humidity (%):	32

Results: Quasi Peak Detector Measurements

Frequency (MHz)	Line	Quasi Peak Level (dBµV)	Limit (dBµV)	Margin (dB)	Result
0.177000	Live	25.8	64.6	38.8	Complied
0.339000	Neutral	25.3	59.2	33.9	Complied
0.609000	Live	18.7	56.0	37.3	Complied
19.707000	Neutral	23.4	60.0	36.6	Complied
23.995500	Live	11.9	60.0	48.1	Complied
24.000000	Neutral	12.0	60.0	48.0	Complied

Results: Average Detector Measurements

Frequency (MHz)	Line	Average Level (dBµV)	Limit (dBµV)	Margin (dB)	Result
25.057500	Neutral	16.6	50.0	33.4	Complied



5.2.2. Transmitter Ultra Wide Bandwidth (UWB)

Test Summary:

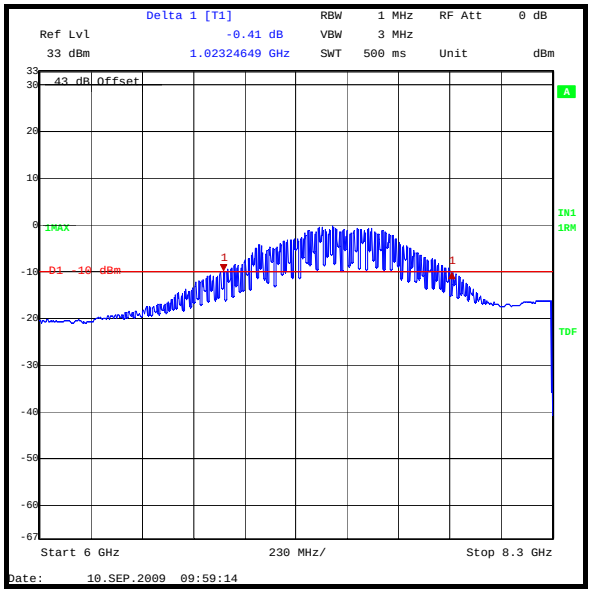
FCC Part:	15.519(b)
Test Method Used:	The Ultra Wide Bandwidth (UWB) was determined by measuring the -10dB bandwidth of the EUT with a spectrum analyser. The RBW was set to 1 MHz, VBW 3 MHz and an RMS Detector used. The sweep time was set to 500mS or less ensuring that an averaging time per point was 1mS or less.

Environmental Conditions:

Temperature (°C):	24
Relative Humidity (%):	33

Results:

Lower UWB Edge (MHz)	Upper UWB Edge (MHz)	Allowable Frequency Band (MHz)		Result
6825.050	7839.078	3100	10600	Complied



5.2.3. Transmitter Radiated Spurious Emissions Below 960 MHz

Test Summary:

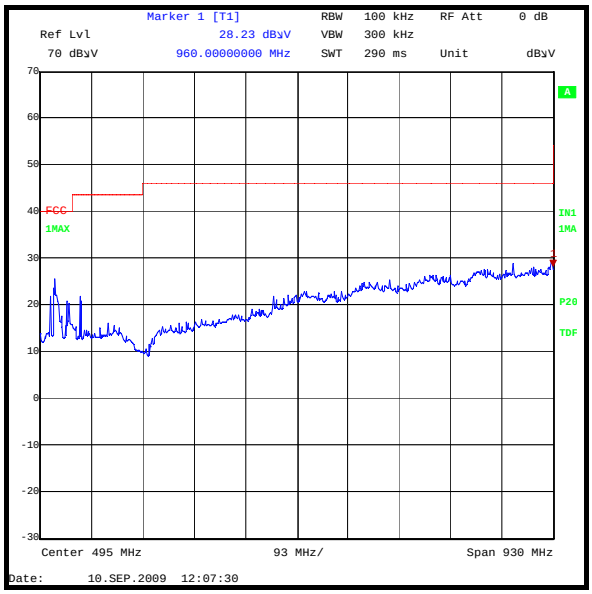
FCC Part:	15.519(c) and 15.209
Test Method Used:	As detailed in ANSI C63.4 Section 8 and relevant annexes referencing FCC Part 15.521

Environmental Conditions:

Temperature (°C):	28
Relative Humidity (%):	32

Note(s):

1. No spurious emissions were detected above the noise floor of the measuring receiver; therefore, the highest peak noise floor reading of the measuring receiver was recorded as shown in the table above.
2. The emissions observed below 100 MHz were ambients and did not emanate from the EUT.



30 MHz to 960 MHz

5.2.4. Transmitter Radiated Spurious Emissions Above 960 MHz

Test Summary:

FCC Part:	15.517(c)(d)
Test Method Used:	As detailed in ANSI C63.4 Section 8 and relevant annexes referencing FCC Part 15.521

Environmental Conditions:

Temperature (°C):	27
Relative Humidity (%):	29

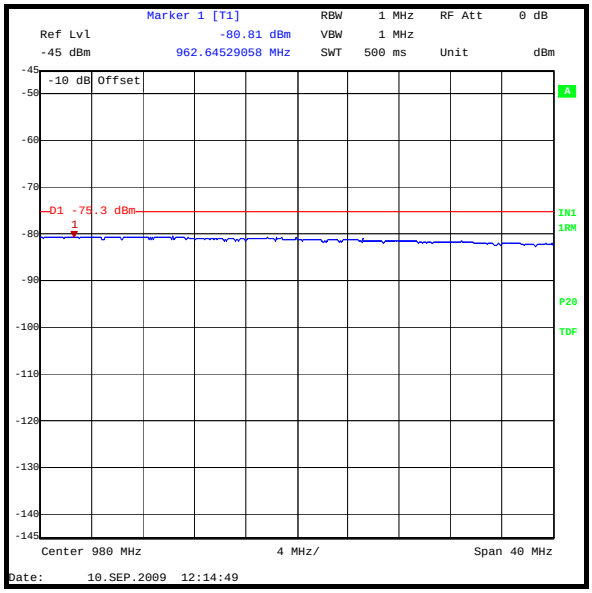
Results:

Frequency (MHz)	Antenna Polarity	Level (dBm/MHz)	Limit (dBm/MHz)	Margin (dB)	Result
962.642	Vertical	-80.8	-75.3	5.5	Complied
1576.994	Vertical	-81.4	-75.3	6.1	Complied
1978.577	Vertical	-73.8	-63.3	10.5	Complied
3093.327	Vertical	-71.8	-61.3	10.5	Complied
7488.778	Vertical	-44.8	-41.3	3.5	Complied
17466.132	Vertical	-64.1	-61.3	2.8	Complied

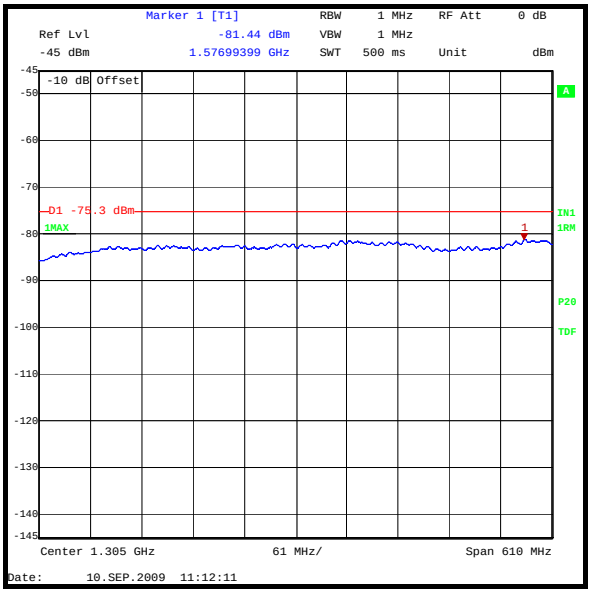
Bands 1164 to 1240 MHz & 1559 to 1610 MHz:

Frequency (MHz)	Antenna Polarity	Level (dBm/kHz)	Limit (dBm/KHz)	Margin (dB)	Result
1227.816	Vertical	-100.4	-85.3	15.1	Complied
1566.971	Vertical	-98.1	-85.3	12.8	Complied

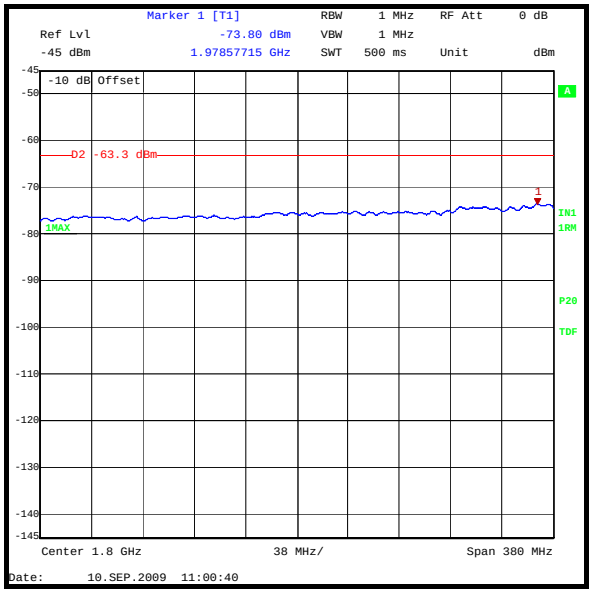
Transmitter Radiated Spurious Emissions Above 960 MHz (continued)



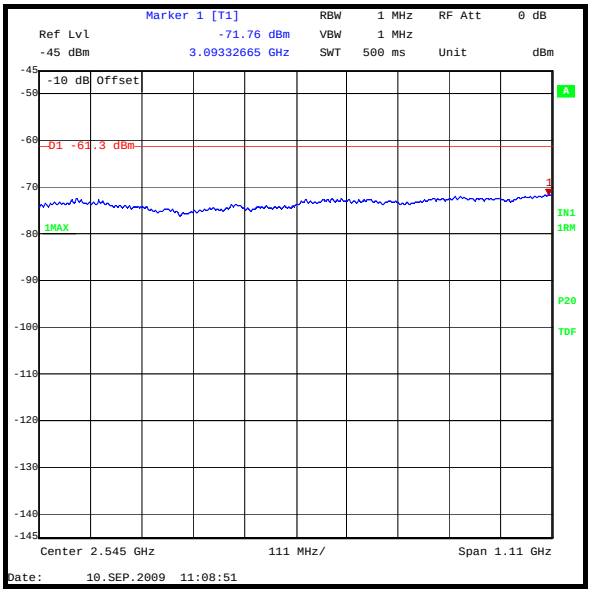
960 MHz to 1 GHz



1 GHz to 1.610 GHz

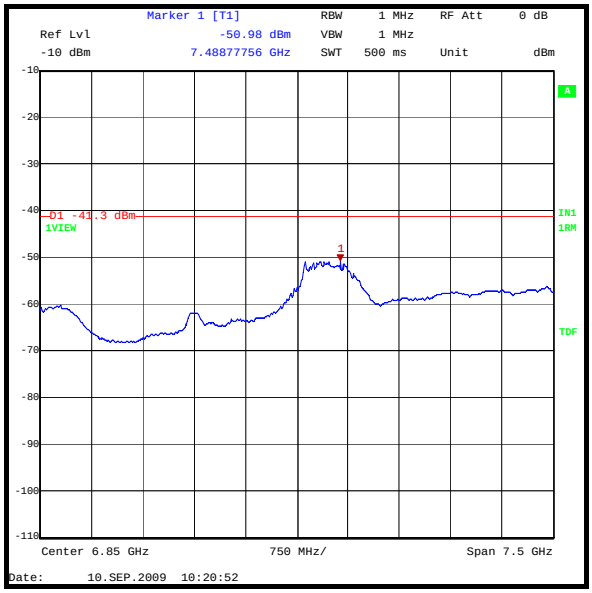


1.610 GHz to 1.990 GHz

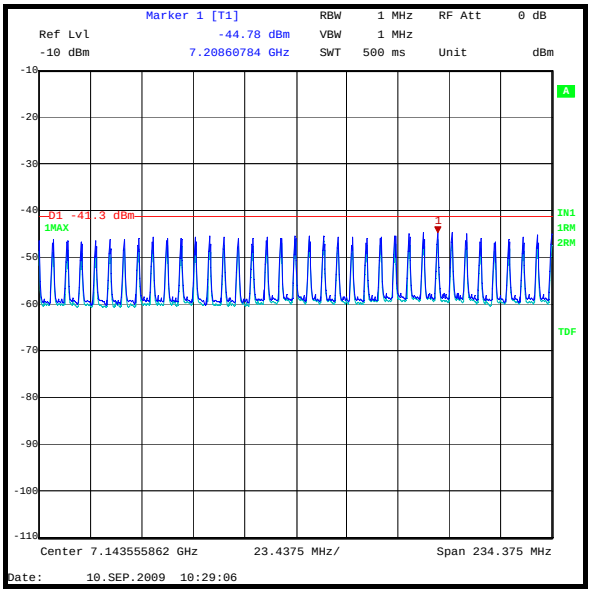


1.990 GHz to 3.1 GHz

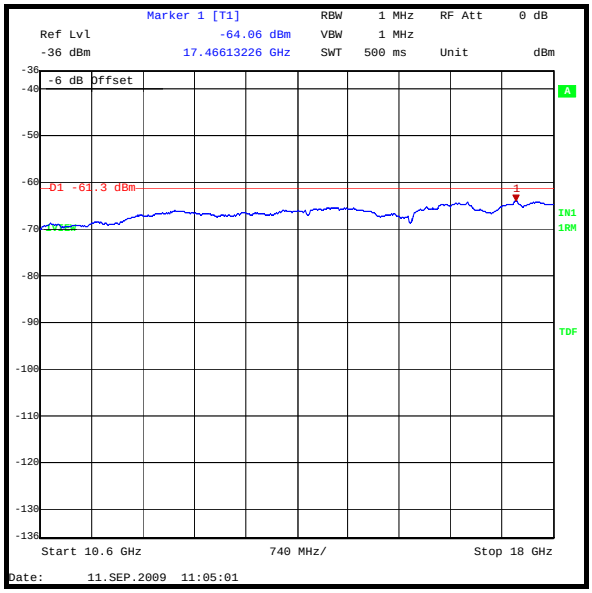
Transmitter Radiated Spurious Emissions Above 960 MHz (continued)



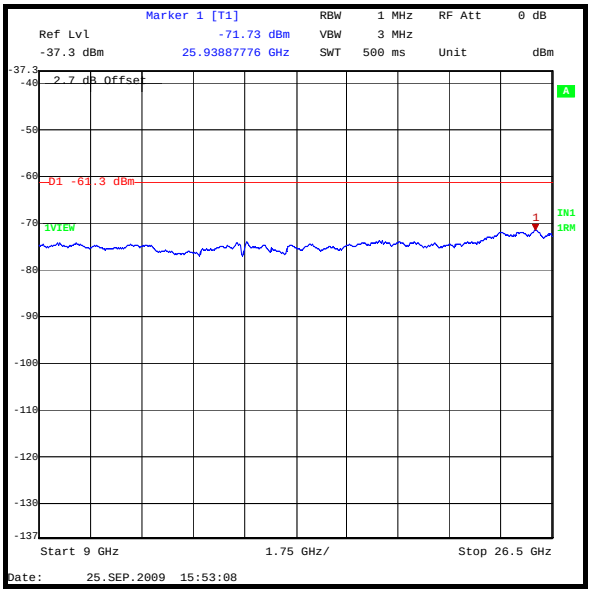
3.1 GHz to 10.6 GHz



Zoom into region of highest signal

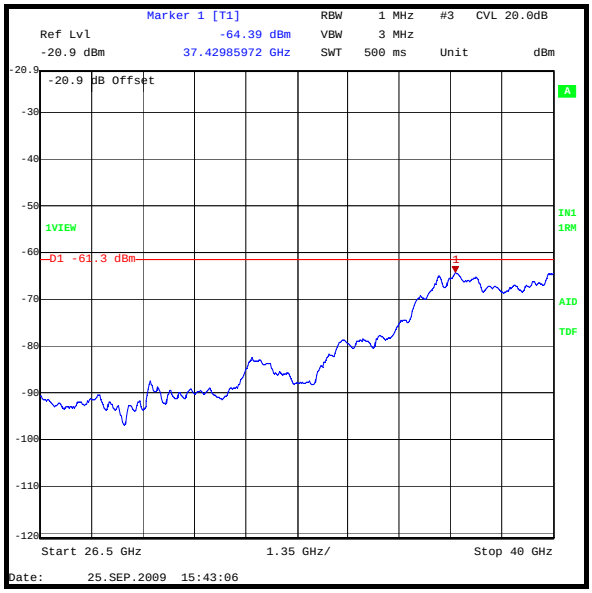


10.6 GHz to 18 GHz

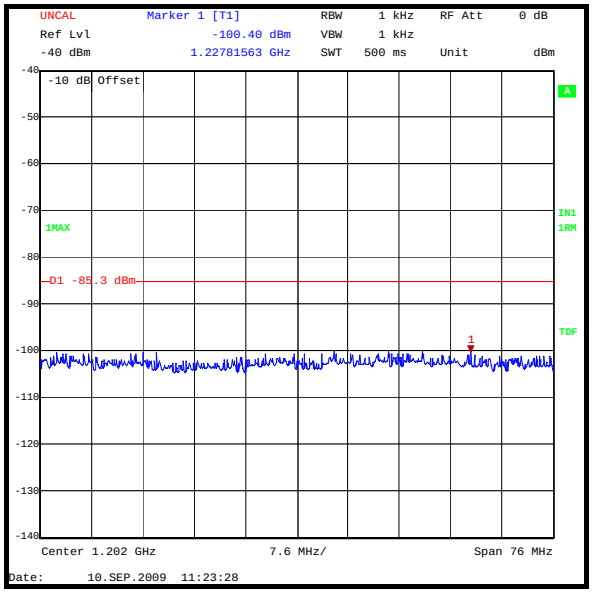


18 GHz to 26.5 GHz

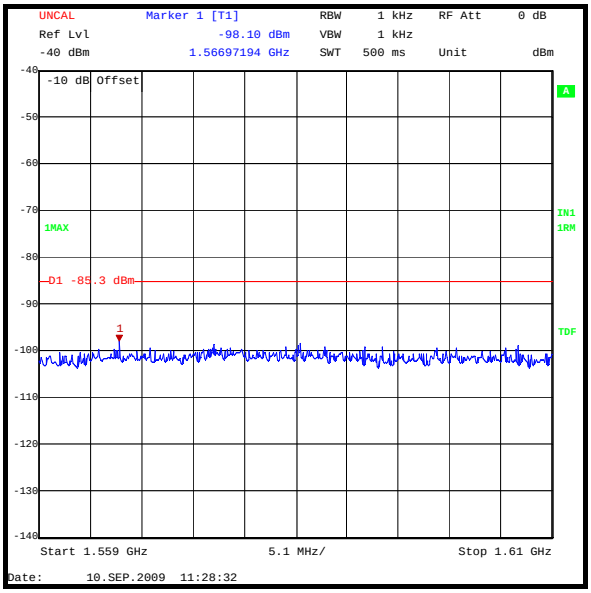
Transmitter Radiated Spurious Emissions Above 960 MHz (continued)



26.5 GHz to 40 GHz



Band 1164 MHz to 1240 MHz



Band 1559 MHz to 1610 MHz

5.2.5. Transmitter Emissions Peak Level

Test Summary:

FCC Part:	15.519(e)
Test Method Used:	As detailed in FCC Part 15.521(g)

Environmental Conditions:

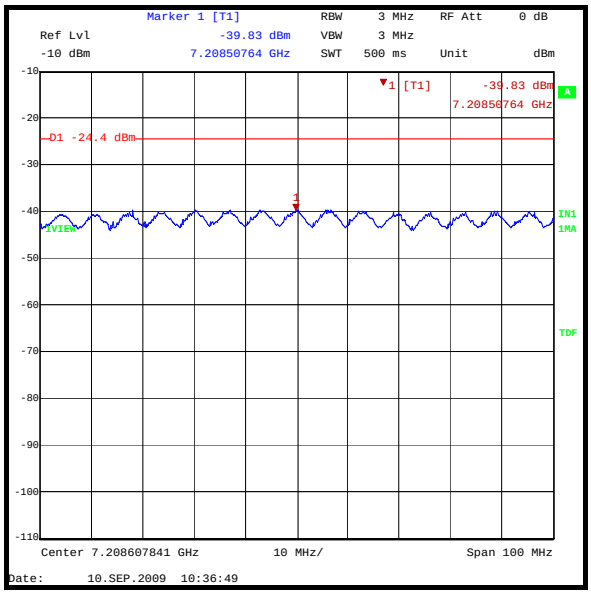
Temperature (°C):	27
Relative Humidity (%):	29

Results:

Frequency F_M (MHz)	Antenna Polarity	Level (dBm/3 MHz)	Limit (dBm/3 MHz)	Margin (dB)	Result
7208.508	Vertical	-39.8	-24.4*	15.4	Complied

Note(s):

1. * A resolution bandwidth (RBW) of 3 MHz was used and therefore the limit was calculated to be 20*log(3/50) = -24.4 dBm/3 MHz (which equates to 0 dBm in a 50 MHz measurement bandwidth).



6. Measurement Uncertainty

No measurement or test can ever be perfect and the imperfections give rise to error of measurement in the results. Consequently the result of a measurement is only an approximation to the value of the measurand (the specific quantity subject to measurement) and is only complete when accompanied by a statement of the uncertainty of the approximation.

The expression of uncertainty of a measurement result allows realistic comparison of results with reference values and limits given in specifications and standards.

The uncertainty of the result may need to be taken into account when interpreting the measurement results.

The reported expanded uncertainties below are based on a standard uncertainty multiplied by an appropriate coverage factor such that a confidence level of approximately 95% is maintained. For the purposes of this document “approximately” is interpreted as meaning “effectively” or “for most practical purposes”.

Measurement Type	Range	Confidence Level (%)	Calculated Uncertainty
Conducted Spurious Emissions	0.15 MHz to 30 MHz	95%	±3.72 dB
Transmitter Ultra Wide Bandwidth	N/A	95%	±0.92 ppm
Radiated Spurious Emissions	30 MHz to 40000 MHz	95%	±2.94 dB
Transmitter Emission Peak Level	N/A	95%	±2.94 dB

The methods used to calculate the above uncertainties are in line with those recommended within the various measurement specifications. Where measurement specifications do not include guidelines for the evaluation of measurement uncertainty the published guidance of the appropriate accreditation body is followed.

Appendix 1. Test Equipment Used

RFI No.	Instrument	Manufacturer	Type No.	Serial No.	Date Last Calibrated	Cal. Interval (Months)
A1534	Pre Amplifier	Hewlett Packard	8449B OPT H02	3008A00405	Calibrated before use	-
A1818	Antenna	EMCO	3115	00075692	25 Oct 2008	12
A1975	High Pass Filter	AtlanTecRF	AFH-03000	090424010	Calibrated before use	-
A288	Antenna	Chase	CBL6111A	1589	13 Mar 2009	12
A436	Antenna	Flann	20240-20	330	24 Apr 2009	36
K0002	3m RSE Chamber	Rainford EMC	N/A	N/A	01 Sep 2009	12
M1124	Spectrum Analyser	Rohde & Schwarz	ESIB26	100046K	09 Mar 2009	12

NB In accordance with UKAS requirements all the measurement equipment is on a calibration schedule.

Appendix 2. Ubisense Declaration - FCC Part 15.519 (a) 26_10_09

This appendix contains two pages and is not included in the total number of pages of this report.

Ubisense

Ubisense Limited, St Andrews House, St Andrews Road, Chesterton, Cambridge CB4 1DL

26 October 2009

Attn: Reviewing Engineer,
Federal Communications Commission,
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Columbia,
MD 21046

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RE: MODULAR UBITAG V2.0HH, FCC ID SEAMOD 21HH
REQUIREMENTS OF FCC PART 15.519(a)

To the Reviewing Engineer:

FCC Part 15.519(a) "Technical Requirements for hand-held UWB systems" states that:

UWB devices operating under the provisions of this section must be hand held, *i.e.*, they are relatively small devices that are primarily hand held while being operated and do not employ a fixed infrastructure.

(1) A UWB device operating under the provisions of this section shall transmit only when it is sending information to an associated receiver. The UWB intentional radiator shall cease transmission within 10 seconds unless it receives an acknowledgement from the associated receiver that its transmission is being received. An acknowledgment of reception must continue to be received by the UWB intentional radiator at least every 10 seconds or the UWB device must cease transmitting.

(2) The use of antennas mounted on outdoor structures, *e.g.*, antennas mounted on the outside of a building or on a telephone pole, or any fixed outdoors infrastructure is prohibited. Antennas may be mounted only on the hand held UWB device.

(3) UWB devices operating under the provisions of this section may operate indoors or outdoors.

Ubisense

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The applicant hereby declares that:

- The Modular Ubitag V2.0HH is a small, hand-held wireless device intended to be used for the real-time location of personnel and hand-held objects (applications include healthcare, workplace productivity, security and retail management), and will be marketed as such.
- The Modular Ubitag V2.0HH User's Guide (see Exhibits) also stresses the requirement for use that is primarily hand-held, and reiterates the technical requirements for hand-held UWB systems listed in §15.519.
- The Modular Ubitag V2.0HH will not transmit ultra-wideband signals unless it receives suitable trigger commands (over a separate §15.249 conventional radio link) from an associated base station. It is programmed to cease transmissions within 10 seconds unless it receives an acknowledgement from an associated receiver that its UWB transmission is being received.
- UWB antennas are mounted only on the Modular Ubitag V2.0HH hand-held UWB device. No antennas mounted on the outside of a building or on a telephone pole, or any fixed outdoors infrastructure are utilized.

Sincerely,

Dr Andy Ward
Chief Technology Officer