	Report No: <b>R2340</b> Issue No: <b>1</b>	FCC ID:SEASENSOR20	
	Test No: <b>T2236</b>	<b>Test Report</b>	Page: 1 of 17



**dB Technology**  
|----- ( Cambridge Ltd. ) -----|

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## REPORT ON ELECTROMAGNETIC COMPATIBILITY TESTS

Performed at:  
**TWENTY PENCE TEST SITE**

Twenty Pence Road,  
Cottenham,  
Cambridge  
U.K.  
CB24 8PS

on

Ubisense

Ubisensor V2b

dated


1 June 2007

### Document History

Issue	Date	Affected page(s)	Description of modifications	Revised by	Approved by
1	01/06/07		Initial release		

Based on report template:  
v061115

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	Report No: <b>R2340</b>	FCC ID:SEASENSOR20	
	Issue No: <b>1</b>		
	Test No: <b>T2236</b>	<b>Test Report</b>	Page: 2 of 17

Equipment Under Test (EUT):

Ubisensor V2b

Test Commissioned by:

Ubisense  
St. Andrews House  
90 St. Andrews Road  
Chesterton  
Cambridge  
CB4 1DL

Representative:

Andy Ward

Test Started:

21 May 2007

Test Completed:

21 May 2007

Test Engineer:

Dave Smith

Date of Report:

1 June 2007

Written by: \_\_\_\_\_ Dave Smith

Checked by: \_\_\_\_\_ Claire Arber

Signature:

*D. A. Smith*

Signature:

*C. Arber*

Date: \_\_\_\_\_ 1 June 2007

Date: \_\_\_\_\_ 1 June 2007


**dB Technology can only report on the specific unit(s) tested at its site. The responsibility for extrapolating this data to a product line lies solely with the manufacturer.**

## Test Standards Applied

CFR 47 : 2006

*Code of Federal Regulations: Pt 15 Subpart C - Radio Frequency Devices - Intentional Radiators*

**NOTE: Only ac power conducted emissions tests are covered by this report.**

	Report No: <b>R2340</b> Issue No: <b>1</b>	FCC ID:SEASENSOR20	
	Test No: <b>T2236</b>	<b>Test Report</b>	Page: 3 of 17


## Emissions Test Results Summary

CFR 47 : 2006

Test	Port	Method	Limit	PASS/FAIL	Notes
Conducted Emissions	ac power	ANSI C63.4:2003	CISPR22(B)	PASS	
Radiated Emissions		ANSI C63.4:2003	CISPR22(B)	N/T	#1


specs\_fccv070115

**#1 Not tested. This report covers conducted emissions only**

	Report No: <b>R2340</b>	FCC ID:SEASENSOR20	
	Issue No: <b>1</b>		
	Test No: <b>T2236</b>	<b>Test Report</b>	Page: 4 of 17

## Contents

<b>1 EUT Details</b>	5
1.1 General	5
1.2 Modifications to EUT and Peripherals	5
1.3 EUT Operating Modes	6
<i>Figure 1 General Arrangement of EUT and Peripherals</i>	7
<i>Photograph 1 Arrangement of EUT and Peripherals - Front</i>	8
<i>Photograph 2 Arrangement of EUT and Peripherals - Back</i>	8
<b>2 Test Equipment</b>	9
<b>3 Test Methods</b>	10
3.1 Conducted Emissions - ac power	10
<b>4 Test Results</b>	10
4.1 Conducted Emissions (Power) - Results	11
<i>PLOT 1 Conducted Emissions - Low Channel - Neutral Line</i>	12
<i>PLOT 2 Conducted Emissions - Low Channel - Live Line</i>	13
<i>PLOT 3 Conducted Emissions - Mid Channel - Live Line</i>	14
<i>PLOT 4 Conducted Emissions - Mid Channel - Neutral Line</i>	15
<i>PLOT 5 Conducted Emissions - High Channel - Neutral Line</i>	16
<i>PLOT 6 Conducted Emissions - High Channel - Live Line</i>	17

	Report No: <b>R2340</b> Issue No: <b>1</b>	FCC ID:SEASENSOR20	
	Test No: <b>T2236</b>	<b>Test Report</b>	Page: 5 of 17

## 1 EUT Details

### 1.1 General

The EUT was a Ubisensor V2.0. This device is a basestation for a precision location system. It is considered to be a composite device consisting of:

- o a transceiver operating in the 2402.5-2480.5MHz region (and its associated control circuitry)
- o a ultrawideband receiver (contained within the transceiver circuit)
- o a Class A digital device

The transmitter section of the 2402.5-2480.5MHz transceiver is subject to Certification Authorisation. The Class A digital device, the ultrawideband receiver, and the receiver section of the 2402.5-2480.5MHz transceiver are subject to Verification Authorisation (see section 15.101b of CFR 47).

For the purposes of testing, the Ubisensor was considered as an intentional radiator operating under the rules of section 15.249 of CFR 47. Conducted emissions were measured from the transmitter circuit, the wideband receiver and the active parts of the digital device.


Details of the EUT and associated peripherals used during the tests are listed below. Figure 1 shows the interconnections between the EUT and peripherals.

Item	Manufacturer	Model	Description	Serial No:	Notes
1	Ubisense	Ubisensor 2.0	EUT	00:11:CE:00:06:26	
2	Ubisense	Ubisensor 2.0	Slave	00:11:CE:00:06:21	
3	Stontronics Limited	EPA-121DA-12	PSU		
4	Netgear	FS108P	Hub	FS26151CA000801	
5	Dell	Latitude 810	PC	247-47-667-75	

### 1.2 Modifications to EUT and Peripherals

Details of any modifications that were required to achieve compliance are listed below. The modification numbers are referred to in the results sections as appropriate.

Mod No:	Details	Implemented for
0	Pre-production Rev C. No modifications were made during the course of testing.	

	Report No: <b>R2340</b> Issue No: <b>1</b>	FCC ID:SEASENSOR20	
	Test No: <b>T2236</b>	<b>Test Report</b>	Page: 6 of 17

### 1.3 EUT Operating Modes

The EUT was tested in the following operating mode or modes. Generally, operating modes are chosen that will exercise the functions of the EUT as fully as possible and in a manner likely to produce maximum emission levels or susceptibility. Individual test result sheets reference the operating mode of the EUT.

Operating Mode	Details
1	Ubitag V2 sensor in Master mode with 3 terminated timing cables. A fourth timing cable connected to an unpowered Ubitag V2 sensor. Ethernet link to remote PC.

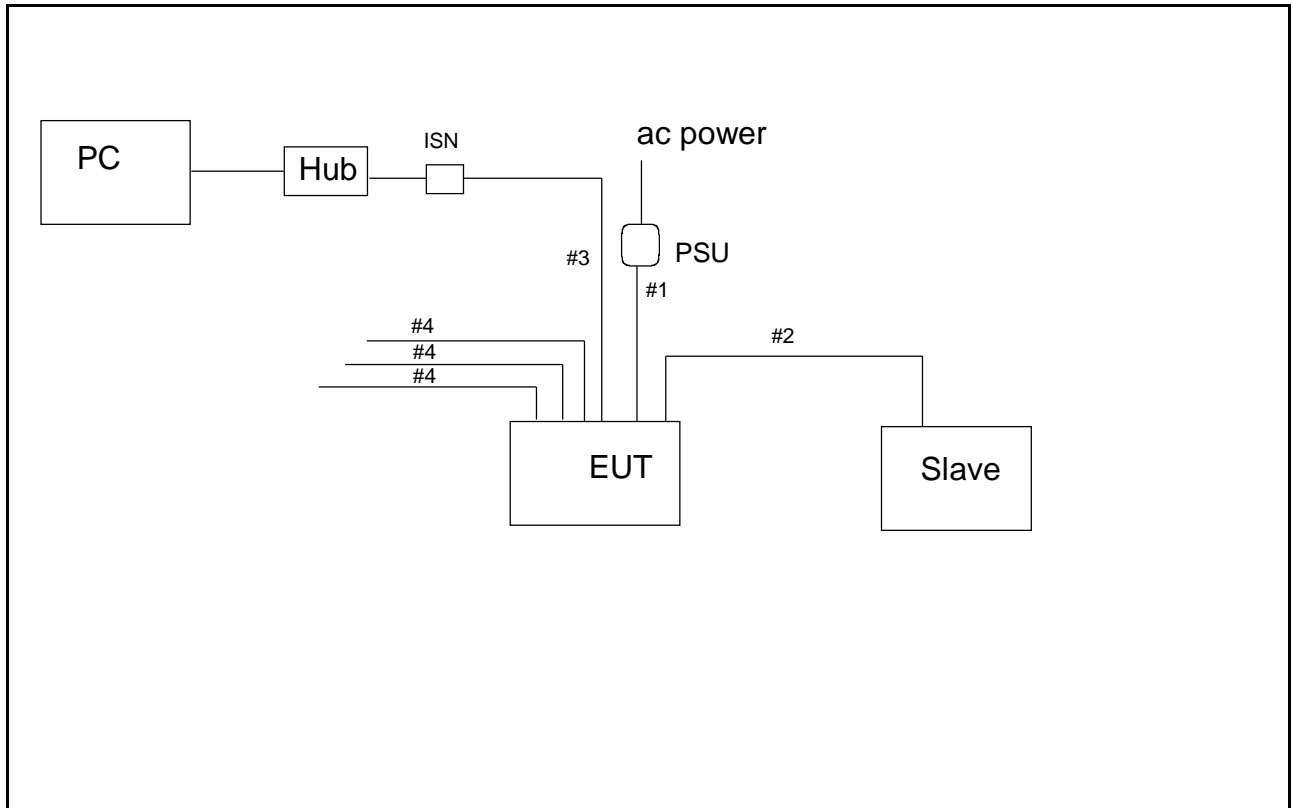
Note: Tests were performed with the intentional transmitter set at the following frequencies:

Low frequency=2402.5MHz

Mid frequency=2441.5MHz


High frequency=2480.5MHz

**Figure 1 General Arrangement of EUT and Peripherals**



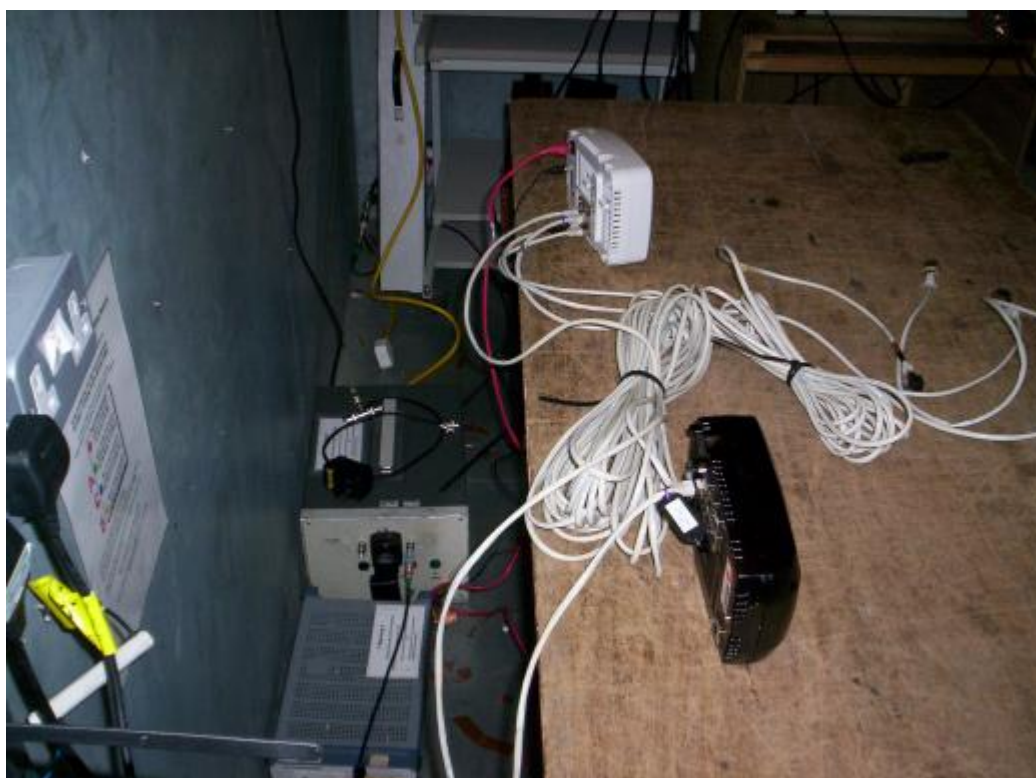
The Ethernet and Timing cables were connected so that the performance of both the Intentional Radiator and the Class A Digital device could be measured simultaneously.

	Description	Type	Length	Notes
#1	AC power	Unscreened	1m	
#2	Timing cable to slave	Screened twisted pair	10m	
#3	Ethernet	unscreened twisted pair	1m	
#4	Timing cable to resistive termination	Screened twisted pair	10m	

	Report No: <b>R2340</b>	FCC ID:SEASENSOR20	
	Issue No: <b>1</b>		
Test No: <b>T2236</b>	<b>Test Report</b>		Page: 8 of 17




**Photograph 1 Arrangement of EUT and Peripherals - Front**



**Photograph 2 Arrangement of EUT and Peripherals - Back**




	Report No: <b>R2340</b> Issue No: <b>1</b>	FCC ID:SEASENSOR20	
	Test No: <b>T2236</b>	<b>Test Report</b>	Page: 9 of 17

## 2 Test Equipment

The test equipment used during the tests was one or more of the items listed below. Individual test result sheets indicate which items were used.

Ref No:	Details	Cal Date	Serial Number
L1 R1	EMCO 3825/2 LISN CHASE LHR 7000	20 Mar 07 15 May 07	1358 1056

	Report No: <b>R2340</b> Issue No: <b>1</b>	FCC ID:SEASENSOR20	
	Test No: <b>T2236</b>	<b>Test Report</b>	Page: 10 of 17

### 3 Test Methods

#### 3.1 Conducted Emissions - ac power

This section describes the general method of performing this test. The specific method used and any deviations from this general method are listed in the appropriate results section.

Bench top EUTs and peripheral equipment are normally placed on a 0.8m high non-conducting bench, positioned 0.4m from one of the metallic walls of a screened room. Floor standing EUTs are normally placed 0.1m above the metallic floor of the screened room. Mains leads are bundled so as not to exceed 1m.


The EUT is powered using a 50ohm/50uH Line Impedance Stabilisation Network (LISN). Peripherals are powered using a second a 50ohm/50uH LISN. These LISNs are bonded to the screened room floor.

With the correct supply voltage applied to the EUT scans are performed on both the live and neutral line outputs of the LISN using quasi-peak detection over the specified frequency range. The results of these scans are shown in the plots section at the end of the report.

Significant emissions identified by the scans are measured and the results tabulated. The table of results is shown in the conducted emissions results section.

### 4 Test Results

The following sections contain tabulated test results. Plots of various scans are included at the back of this section.

	Report No: <b>R2340</b>	FCC ID:SEASENSOR20	
	Issue No: <b>1</b>		
	Test No: <b>T2236</b>	<b>Test Report</b>	
			Page: 11 of 17

## 4.1 Conducted Emissions (Power) - Results

Factor Set 1:	L1_04B	CSET001_04A	-	-
Factor Set 2:	-	-	-	-
Factor Set 3:	-	-	-	-
Test Equipment: R1 L1 CSET001 ISN1				

### Conducted Emissions (Power)

Company: Ubisense					Product: Ubisensor V2b								
Date: 21/05/07					Test Eng: Dave Smith								
Ports: ac power													
Test: ANSI C63.4:2003					using limits of				CISPR22(B)				
Ports:													
Test:					using limits of								
Plot	Op Mode	Mod State	Line (L/N)	Fact Set	Freq. MHz	Det qp/av	Rec. Level dBuV	Corr'n Factor dB	Total Level dBuV	Limit CISPR22(B) dBuV	Margin CISPR22(B) dB	Notes	
	115V												
1	1	0	N	1	0.164	qp	43.2	10.3	53.5	65.3	11.8		
1	1	0	N	1	0.164	av	35.5	10.3	45.8	55.3	9.5		
1	1	0	N	1	0.648	qp	32.6	10.3	42.9	56.0	13.1		
1	1	0	N	1	0.648	av	18.3	10.3	28.6	46.0	17.4		
1	1	0	N	1	1.131	qp	31.5	10.3	41.8	56.0	14.2		
1	1	0	N	1	1.131	av	16.3	10.3	26.6	46.0	19.4		
1	1	0	N	1	16.229	qp	32.1	11.0	43.1	60.0	16.9		
1	1	0	N	1	16.229	av	30.0	11.0	41.0	50.0	9.0		
2	1	0	L	1	0.159	qp	42.2	10.3	52.5	65.5	13.1		
2	1	0	L	1	0.159	av	33.2	10.3	43.5	55.5	12.1		
2	1	0	L	1	0.472	qp	32.1	10.2	42.3	56.5	14.1		
2	1	0	L	1	0.472	av	23.4	10.2	33.6	46.5	12.8		
2	1	0	L	1	1.133	qp	31.4	10.3	41.7	56.0	14.3		
2	1	0	L	1	1.133	av	16.0	10.3	26.3	46.0	19.7		
2	1	0	L	1	18.244	qp	31.6	11.0	42.6	60.0	17.4		
2	1	0	L	1	18.244	av	30.0	11.0	41.0	50.0	9.0		
Results										Minimum Margin PASS/FAIL		9.0 dB PASS	
Notes		Comments and Observations											
Results of scans shown in plots 1 to 6.  These tabulated measurements were made with the transmitter set to the low frequency. The scans show no significant changes with the transmitter set to the mid and upper frequencies.													

Chase EMS 6.21

Notes

Analyse 070521 C8N 115V Low channel

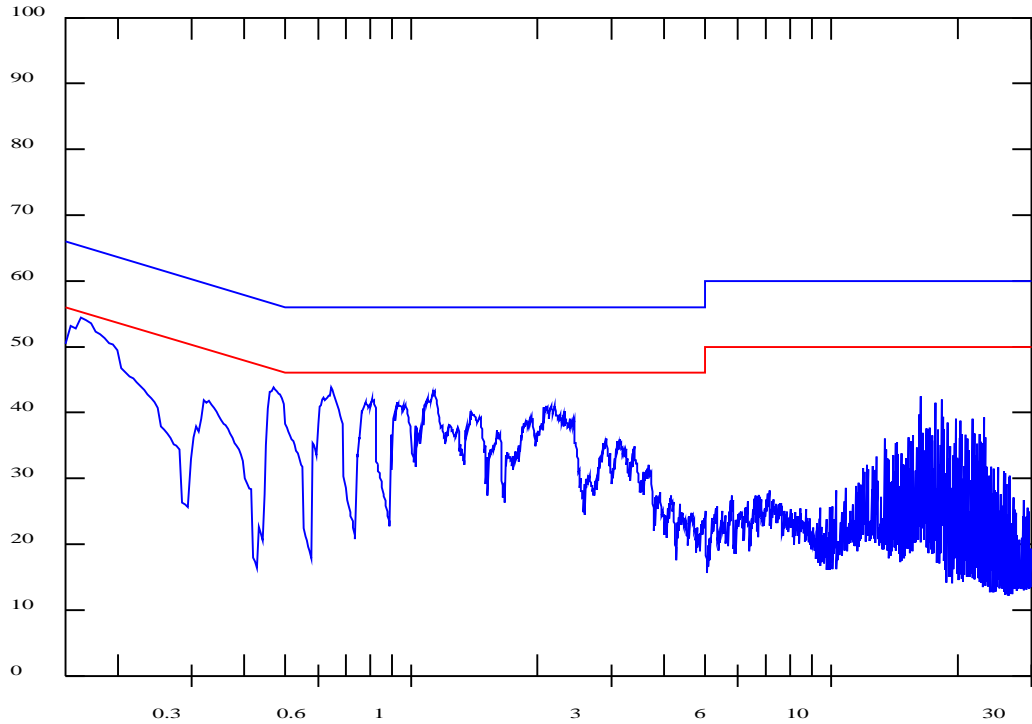
Test: 150kHz-30MHz (L1+CSET001) dBuV

RF level

dBuV

070521 C8N 1

Quasi-peak



Log Freq. (0.15 - 30)MHz

Limit CISPR22B (AV) AC POWER

## PLOT 1 Conducted Emissions - Low Channel - Neutral Line

Company:	Ubisense	Product:	Ubisensor V2.0
Date:	21 May 07	Test Engineer:	Dave Smith
Test:	CISPR22	Limit:	CISPR22(B)
Notes:			
115V. Low channel. One timing cable connected to unpowered slave.			
Three timing cables terminated with resistive loads.			
Ethernet connected to remote hub via ISN.			
Line:	Neutral	Attenuator:	10dB PAD
Detector:	QuasiPeak	Operating Mode:	1
LISN:	EMCO	Mod. State:	0
	Filename:	C7521524.plt	

## Frequency List ( MHz )


Chase EMS 6.21

Notes

Analyse 070521 C9L 115V low channel

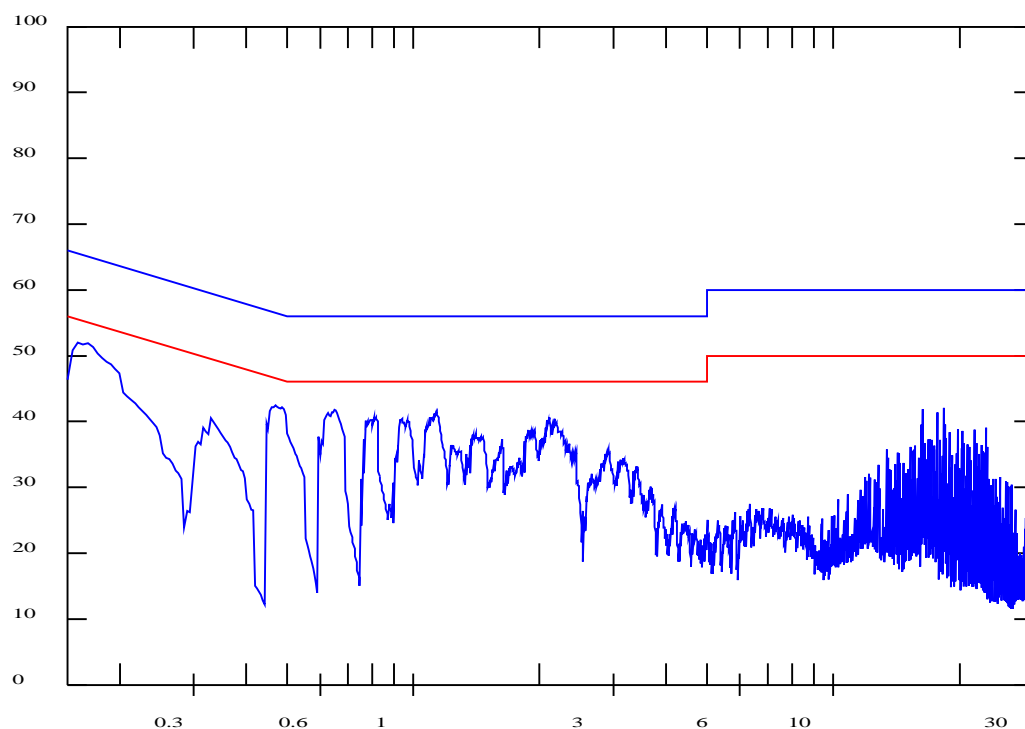
Test: 150kHz-30MHz (L1+CSET001) dBuV

RF level

dBuV

070521 C9L 1

Quasi-peak




Log Freq. (0.15 - 30)MHz

Limit CISPR22B (AV) AC POWER

## PLOT 2 Conducted Emissions - Low Channel - Live Line

Company:	Ubisense	Product:	Ubisensor V2.0
Date:	21 May 07	Test Engineer:	Dave Smith
Test:	CISPR22	Limit:	CISPR22(B)
Notes:			
115V. Low channel. One timing cable connected to unpowered slave.			
Three timing cables terminated with resistive loads.			
Ethernet connected to remote hub via ISN.			
Line:	Live	Attenuator:	10dB PAD
Detector:	QuasiPeak	Operating Mode:	1
LISN:	EMCO	Mod. State:	0
		Filename:	C752153D.plt

## Frequency List ( MHz )


	Report No: <b>R2340</b>	FCC ID:SEASENSOR20	
	Issue No: <b>1</b>		
	Test No: <b>T2236</b>	<b>Test Report</b>	Page: 14 of 17

Chase EMS 6.21

Notes

Analyse 070521 C10L 115V mid channel

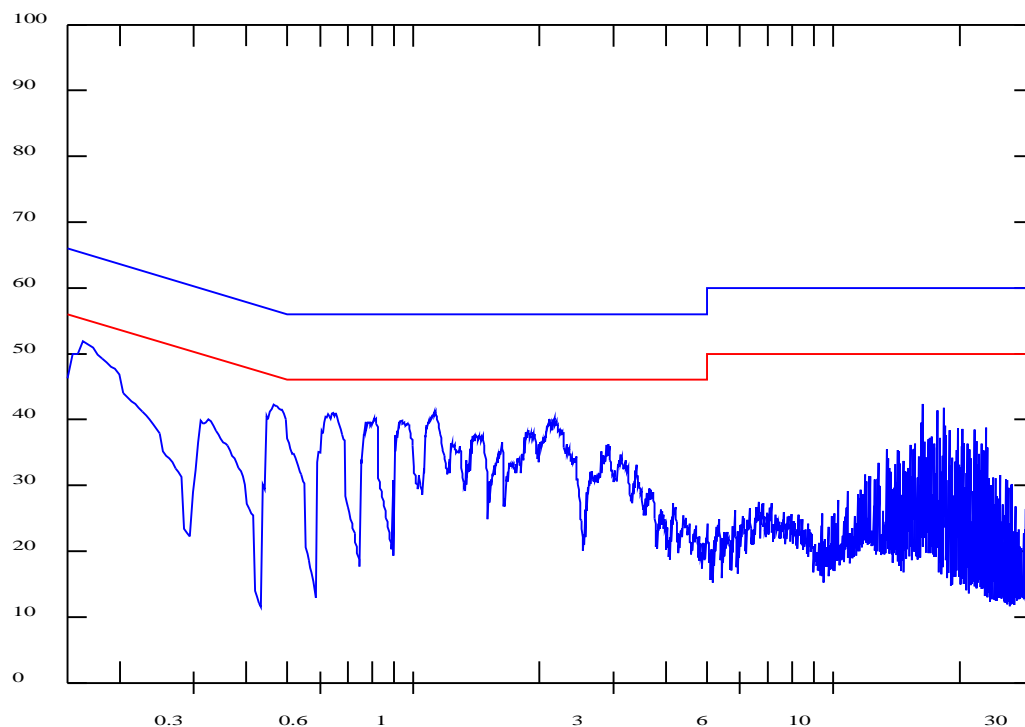
Test: 150kHz-30MHz (L1+CSET001) dBuV

RF level

dBuV

070521 C10L

Quasi-peak



Log Freq. (0.15 - 30)MHz

Limit CISPR22B (AV) AC POWER

## PLOT 3 Conducted Emissions - Mid Channel - Live Line

Company:	Ubisense	Product:	Ubisensor V2.0
Date:	21 May 07	Test Engineer:	Dave Smith
Test:	CISPR22	Limit:	CISPR22(B)
Notes:			
115V. Mid channel. One timing cable connected to unpowered slave.			
Three timing cables terminated with resistive loads.			
Ethernet connected to remote hub via ISN.			
Line:	Live	Attenuator:	10dB PAD
Detector:	QuasiPeak	Operating Mode:	1
LISN:	EMCO	Mod. State:	0
		Filename:	C7521552.plt

## Frequency List ( MHz )


Chase EMS 6.21

Notes

Analyse 070521 C11N 115V mid channel

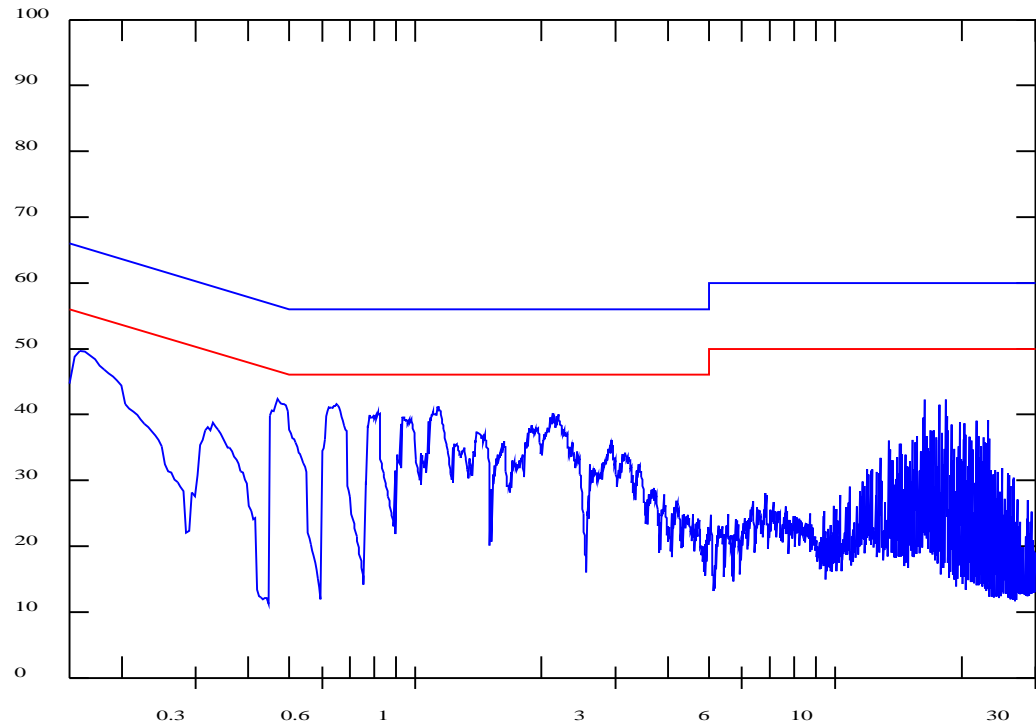
Test: 150kHz-30MHz (L1+CSET001) dBuV

RF level

dBuV

070521 C11N

Quasi-peak




Log Freq. (0.15 - 30)MHz

Limit CISPR22B (AV) AC POWER

#### PLOT 4 Conducted Emissions - Mid Channel - Neutral Line

Company:	Ubisense	Product:	Ubisensor V2.0
Date:	21 May 07	Test Engineer:	Dave Smith
Test:	CISPR22	Limit:	CISPR22(B)
Notes:			
115V. Mid channel. One timing cable connected to unpowered slave.			
Three timing cables terminated with resistive loads.			
Ethernet connected to remote hub via ISN.			
Line:	Neutral	Attenuator:	10dB PAD
Detector:	QuasiPeak	Operating Mode:	1
LISN:	EMCO	Mod. State:	0
		Filename:	C752155A.plt

#### Frequency List ( MHz )


	Report No: <b>R2340</b>	FCC ID:SEASENSOR20	
	Issue No: <b>1</b>		
	Test No: <b>T2236</b>	<b>Test Report</b>	Page: 16 of 17

Chase EMS 6.21

Notes

Analyse 070521 C12N 115V high channel

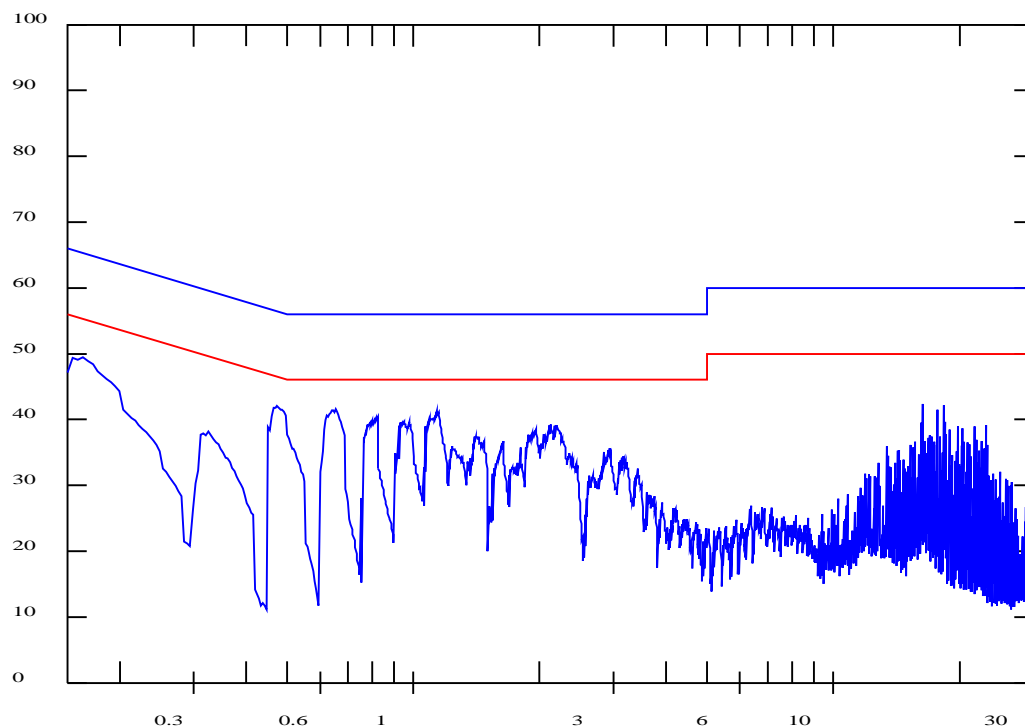
Test: 150kHz-30MHz (L1+CSET001) dBuV

RF level

dBuV

070521 C12N

Quasi-peak



Log Freq. (0.15 - 30)MHz

Limit CISPR22B (AV) AC POWER

## PLOT 5 Conducted Emissions - High Channel - Neutral Line

Company:	Ubisense	Product:	Ubisensor V2.0
Date:	21 May 07	Test Engineer:	Dave Smith
Test:	CISPR22	Limit:	CISPR22(B)
Notes:			
115V. High channel. One timing cable connected to unpowered slave.			
Three timing cables terminated with resistive loads.			
Ethernet connected to remote hub via ISN.			
Line:	Neutral	Attenuator:	10dB PAD
Detector:	QuasiPeak	Operating Mode:	1
LISN:	EMCO	Mod. State:	0
		Filename:	C7521569.plt

## Frequency List ( MHz )




Chase EMS 6.21

Notes

Analyse 070521 C13L 115V high channel

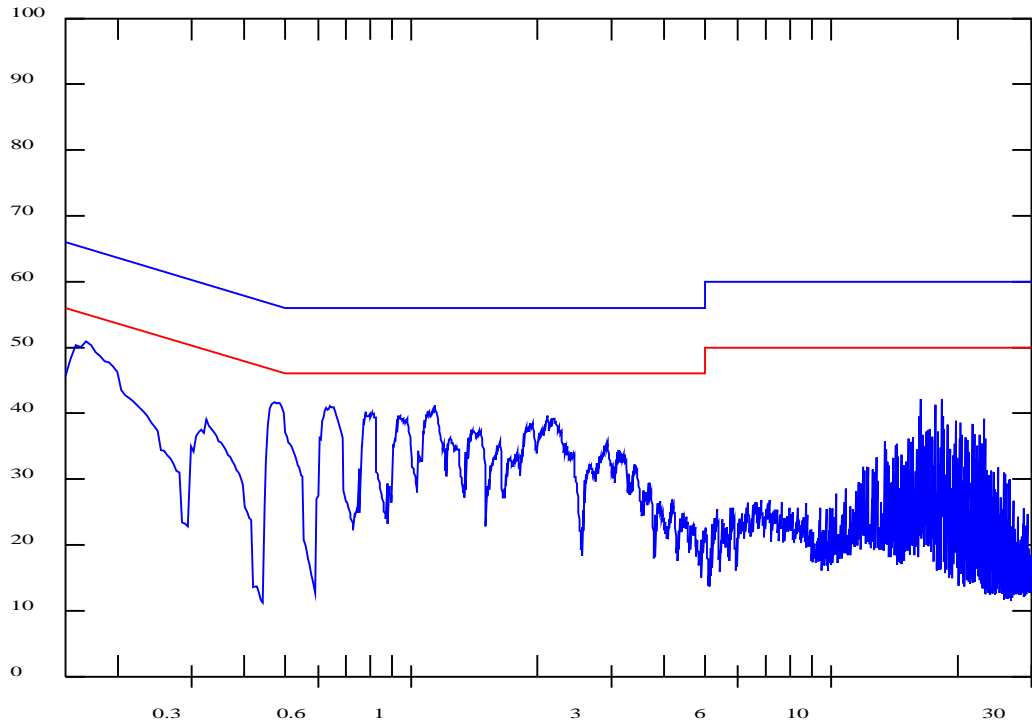
Test: 150kHz-30MHz (L1+CSET001) dBuV

RF level

dBuV

070521 C13L

Quasi-peak



Log Freq. (0.15 - 30)MHz

Limit CISPR22B (AV) AC POWER

## PLOT 6 Conducted Emissions - High Channel - Live Line

Company:	Ubisense	Product:	Ubisensor V2.0
Date:	21 May 07	Test Engineer:	Dave Smith
Test:	CISPR22	Limit:	CISPR22(B)
Notes:			
115V. High channel. One timing cable connected to unpowered slave.			
Three timing cables terminated with resistive loads.			
Ethernet connected to remote hub via ISN.			
Line:	Live	Attenuator:	10dB PAD
Detector:	QuasiPeak	Operating Mode:	1
LISN:	EMCO	Mod. State:	0
		Filename:	C752157B.plt

## Frequency List ( MHz )
