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**dB Technology**

[ Cambridge Ltd. ]

EMC  
Testing

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EMC  
Training

23, Headington Drive,  
Cambridge.  
CB1 9HE  
Tel : 01954 251974 (test site)  
or : 01223 241140 (accounts)  
Fax : 01954 251907  
web : [www.dbtechnology.co.uk](http://www.dbtechnology.co.uk)  
email: [mail@dbtechnology.co.uk](mailto:mail@dbtechnology.co.uk)

## 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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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: 

Signature: 

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	<i>Code of Federal Regulations: Pt 15 Subpart C - Radio Frequency Devices - Intentional Radiators</i>
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**NOTE: Only ac power conducted emissions tests are covered by this report.**

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## 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**

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## 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.	

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### 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:

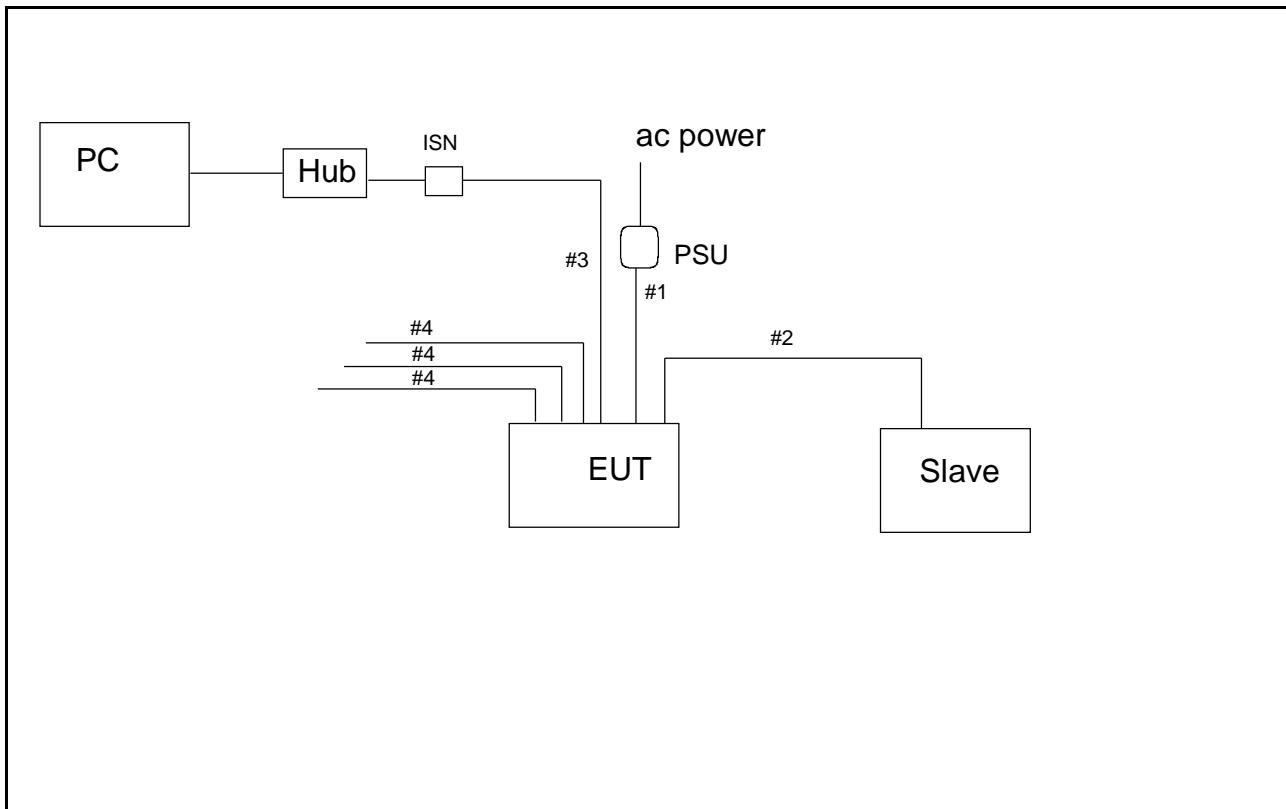
Low frequency=2402.5MHz

Mid frequency=2441.5MHz

High frequency=2480.5MHz

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



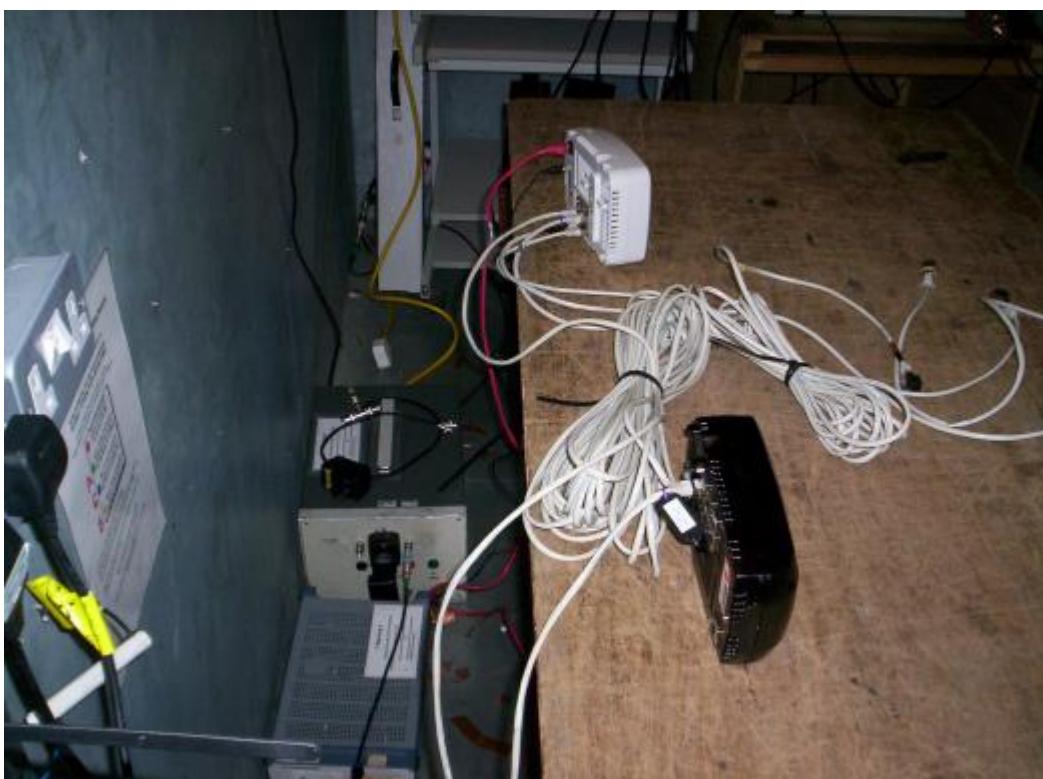
The Ethernet and Timing cables were connected so that the performance of both the Intentional Radiator and the Class A Digital device could be measured simultaneously.

	<b>Description</b>	<b>Type</b>	<b>Length</b>	<b>Notes</b>
#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	

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



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

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## 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	EMCO 3825/2 LISN	20 Mar 07	1358
R1	CHASE LHR 7000	15 May 07	1056

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### 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.

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## 4.1 Conducted Emissions (Power) - Results

Factor Set 1:	<b>L1_04B</b>	<b>CSET001_04A</b>	-	-			
Factor Set 2:	-	-	-	-			
Factor Set 3:	-	-	-	-			
Test Equipment: R1 L1 CSET001 ISN1							

### Conducted Emissions (Power)

Company:	<b>Ubisense</b>		Product:	<b>Ubisensor V2b</b>									
Date:	<b>21/05/07</b>		Test Eng:	<b>Dave Smith</b>									
Ports:	ac power												
Test:	<b>ANSI C63.4:2003</b>		using limits of	<b>CISPR22(B)</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	
	<b>115V</b>												
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		
<b>Results</b>					<b>Minimum Margin</b> <b>PASS/FAIL</b>			<b>9.0</b>	<b>dB</b>				
<b>Notes</b>		<b>Comments and Observations</b>											
		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.											

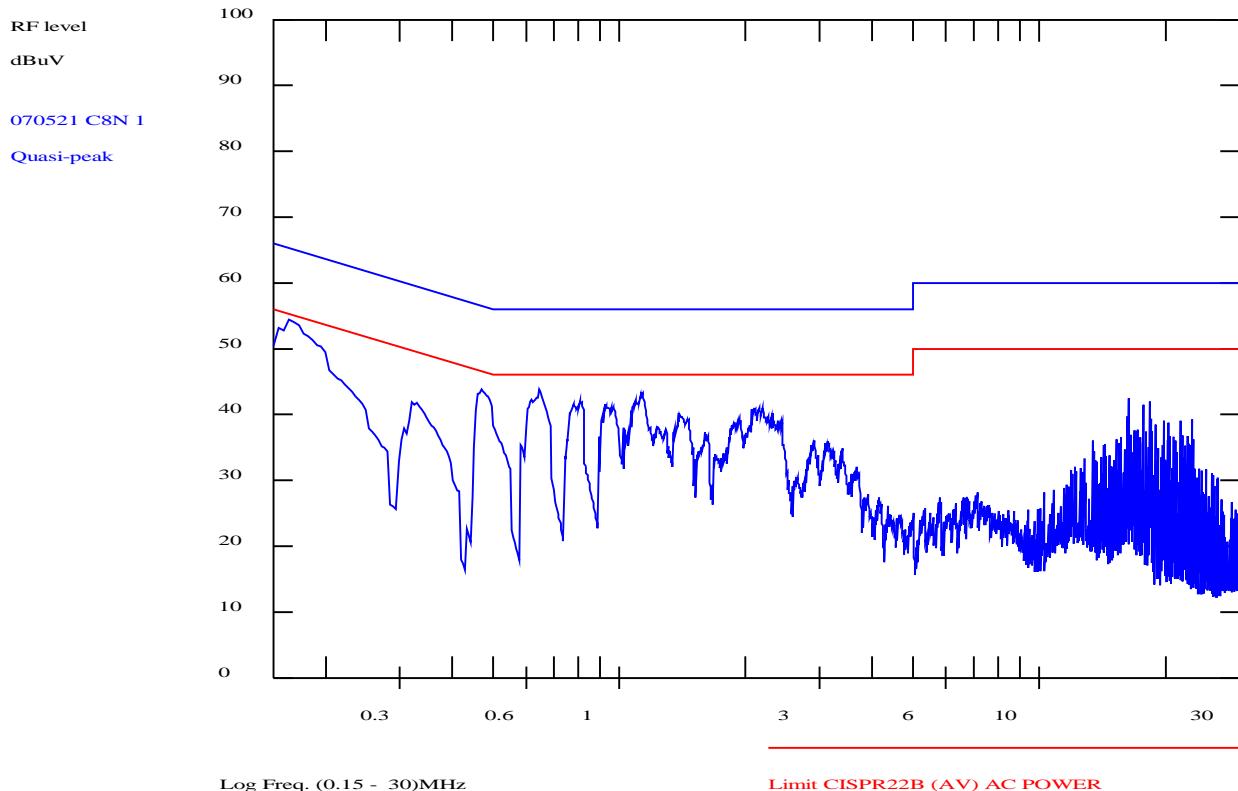
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Chase EMS 6.21

Notes

Analyse 070521 C8N 115V Low channel

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



### 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 Mod. State: 0
LISN:	EMCO	Filename:	C7521524.plt

### Frequency List ( MHz )

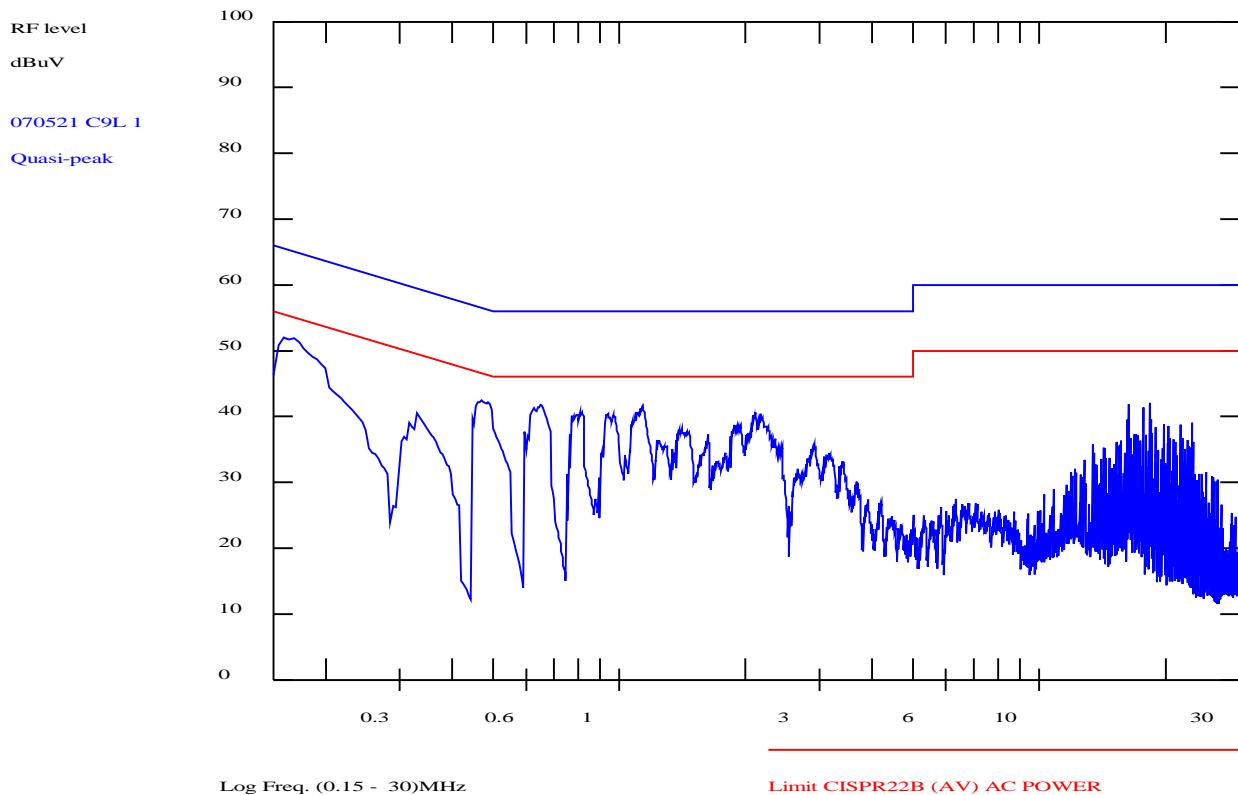

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Chase EMS 6.21

Notes

Analyse 070521 C9L 115V low channel

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



## 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 )

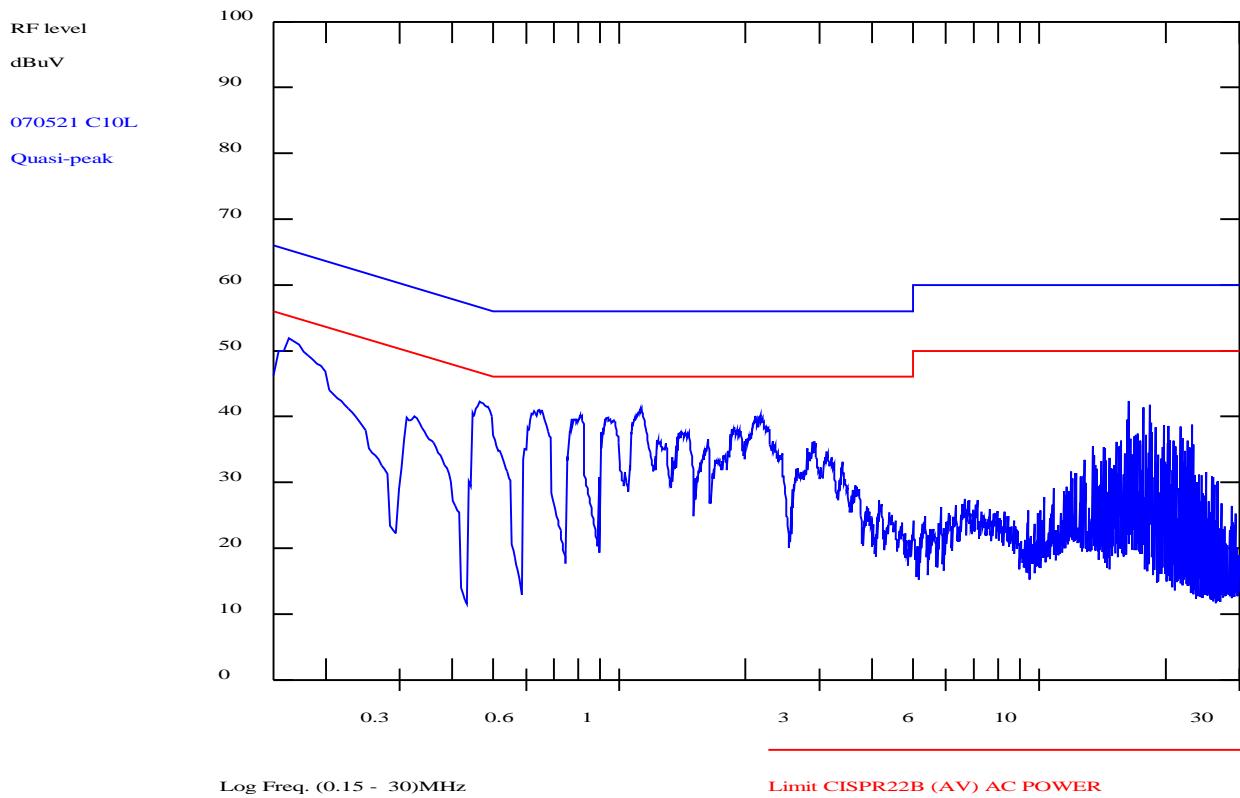

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Chase EMS 6.21

Notes

Analyse 070521 C10L 115V mid channel

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



### 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 Mod. State: 0
LISN:	EMCO	Filename:	C7521552.plt

### Frequency List ( MHz )

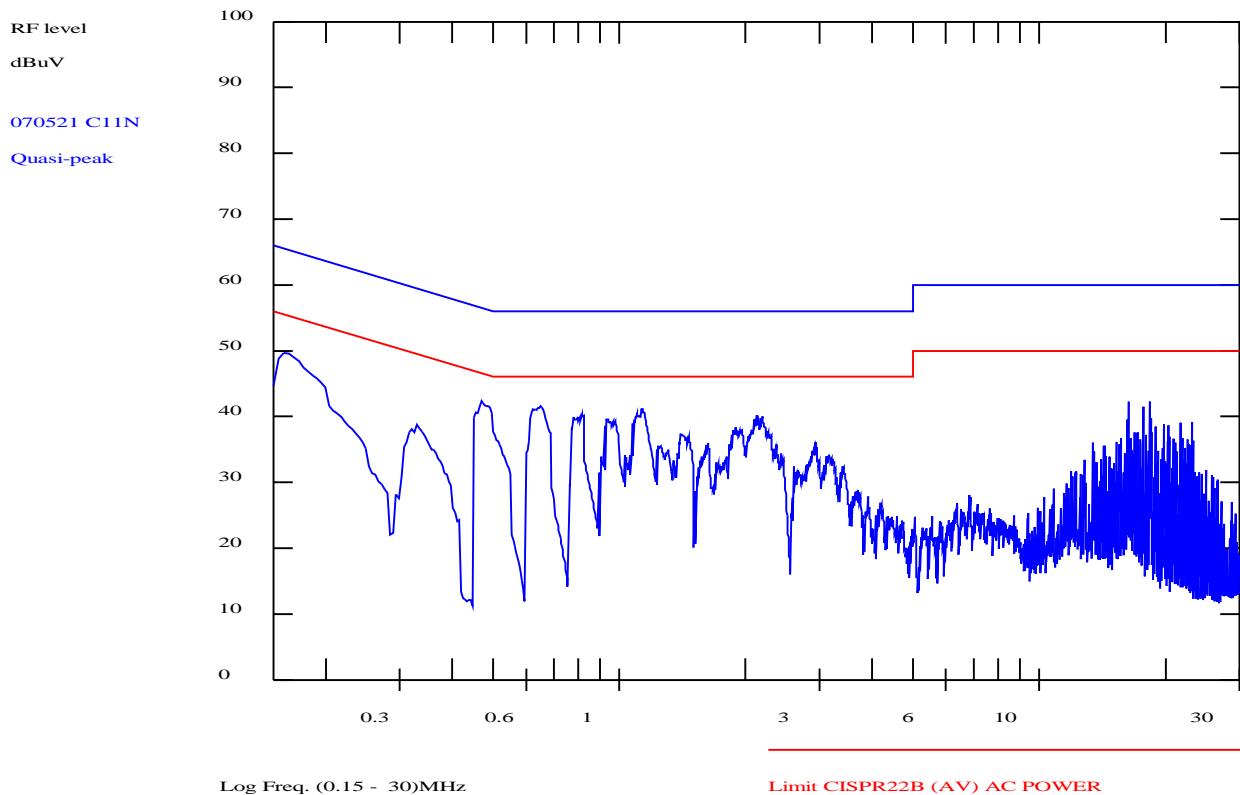

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Chase EMS 6.21

Notes

Analyse 070521 C11N 115V mid channel

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



#### 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 Mod. State: 0
LISN:	EMCO	Filename:	C752155A.plt

#### Frequency List ( MHz )

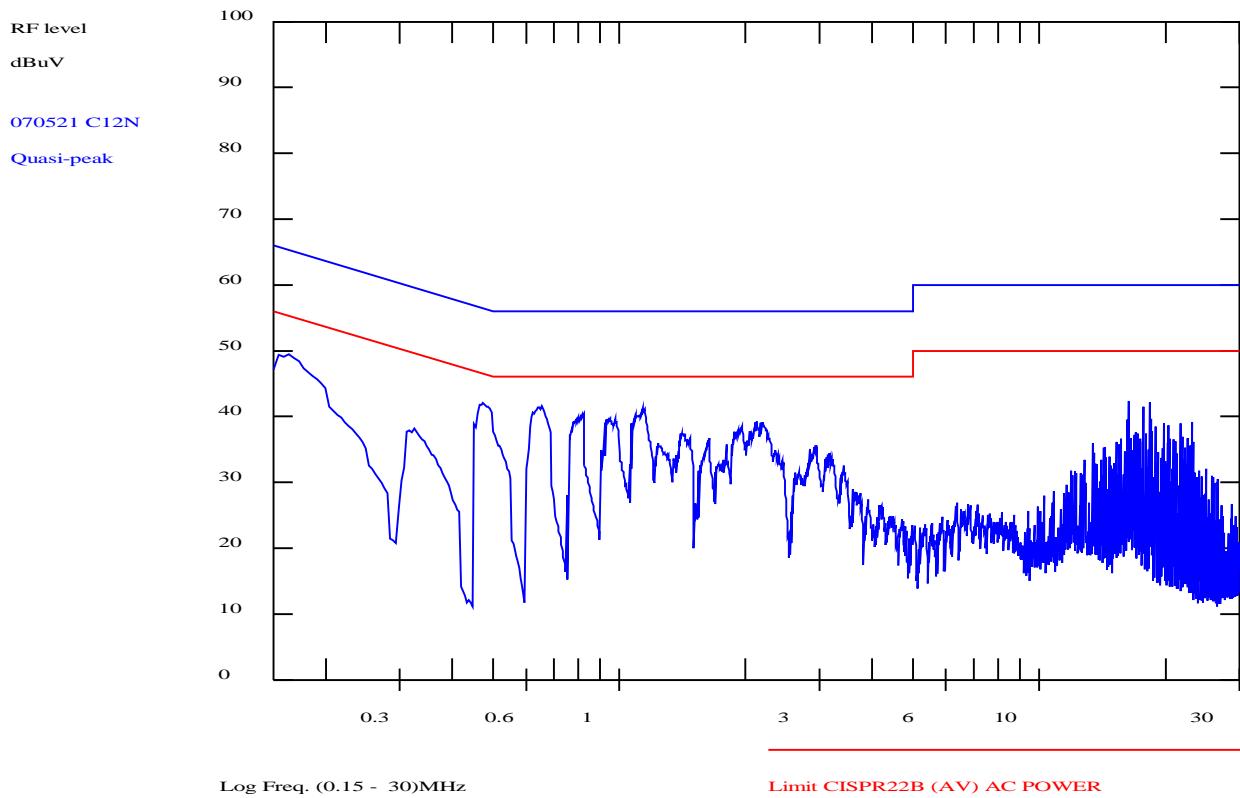

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Chase EMS 6.21

Notes

Analyse 070521 C12N 115V high channel

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



### 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 Mod. State: 0
LISN:	EMCO	Filename:	C7521569.plt

### Frequency List ( MHz )

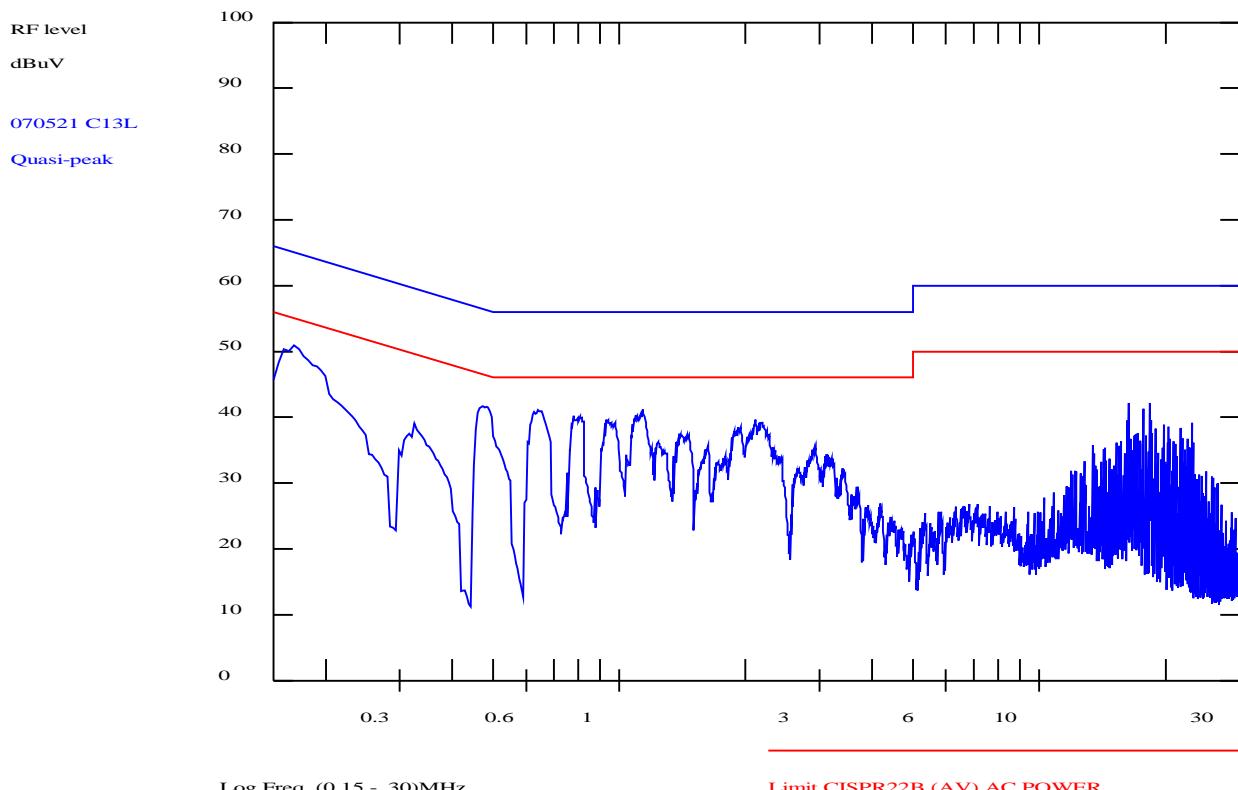

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Chase EMS 6.21

Notes

Analyse 070521 C13L 115V high channel

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



## 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 )
