

TEST REPORT FROM RFI GLOBAL SERVICES LTD

Test of: Net2Air USB Bridge

To: FCC Part 15.247: 2006 (Subpart C)

Test Report Serial No: RFI/RPT2/RP49357JD05A

Supersedes Test Report Serial No: RFI/RPT1/RP49357JD05A

This Test Report Is Issued Under The Authority Of Steve Flooks, Service Leader:	
pp Musirim.	
Musim.	Report Copy No: PDF01
Checked By: Nigel Davison	
Issue Date: 05 September 2008	Test Dates: 02 June 2008 to 17 June 2008

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1. Client Information

Company Name:	Paxton Access Ltd
Address:	Paxton House Home Farm Brighton BN1 9HU
Contact Name:	Mr Brett Glass

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2. Equipment Under Test (EUT)

The following information (with the exception of the Date of Receipt) has been supplied by the client:

2.1. Description of EUT

The equipment under test is a USB device that provides the communication link between the Net2 PC and the Net2 nano control units.

2.2. Identification of Equipment Under Test (EUT)

Description:	Wireless USB hub	
Brand Name:	Net2Air	
Model Name or Number:	Net2Air USB Bridge 477-268	
Unique Type Identification:	None Stated	
Serial Number:	None Stated	
Hardware Version:	z-nu01 Rev. 3, ppc-nau Rev. C	
Software Version:	None Stated	
FCC ID Number:	USE477268	
Country of Manufacture:	UK	
Date of Receipt:	02 June 2008	

2.3. Modifications Incorporated in EUT

It was not possible to test the EUT using the normal duty cycle as the transmitter on period is too small; therefore for the purposes of testing only, the EUT was configured by the Client to transmit continuously.

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2.4. Support Equipment

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

Description:	USB cable
Model Name or Number:	None stated
Serial Number:	None stated
Cable Length and Type:	1.8m / USB2 to USB
Connected to Port:	USB2

Description:	Laptop PC	
Model Name or Number:	Dell Latitude D610	
Serial Number:	RFI Asset No PC370NT	
Connected to Port:	USB cable	

Description:	Modified USB cable	
Model Name or Number:	Not marked	
Serial Number:	Not marked	
Cable Length and Type	1.8m / USB2 to USB	
Connected to Port:	USB2 and power supply	

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2.5. Additional Information Related to Testing

Power Supply Requirement:	V-Norm 4.25 V, V-Min 5.0 V, V-Max 5.75 V		
Intended Operating Environment:	Residential / Commercial / Light industry / Heavy industry		
Equipment Category:	Broadband wirele	ss Access	
Type of Unit:	Transceiver		
Channel Spacing:	5 MHz		
Modulation Type:	DSSS		
Data Rate:	Variable		
Transmit Frequency Range:	2405 MHz to 2475 MHz		
Transmit Channels Tested:	Channel ID	Channel Number	Channel Frequency (MHz)
	Bottom	11	2405
	Middle	18	2440
	Тор	25	2475
Receive Frequency Range:	2405 MHz to 2475 MHz		
Receive Channels Tested:	Channel ID	Channel Number	Channel Frequency (MHz)
	Bottom	11	2405
	Middle	18	2440
	Тор	25	2475
Maximum Peak Power Output (EIRP)	13.5 dBm		

2.6. Port Identification

Port	Description	Type/Length	Applicable
1	USB Cable	USB 2 / 1.8 m	Υ

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3. Test Results

Reference:	FCC Part 15.247: 2006 Subpart C
Title:	Code of Federal Regulations, Part 15.247 (47CFR22) (Intentional Radiators operating within the bands 902-928 MHz, 2400-2483.5 MHz and 5725-5850 MHz)

3.1. Methods and Procedures

The methods and procedures used were as detailed in:

ANSI/TIA-603-B-2003

Land Mobile Communications Equipment, Measurements and performance Standards

ANSI C63.2 (1987)

Title: American National Standard for Instrumentation - Electromagnetic noise and field strength.

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.

ANSI C63.5 (1988)

Title: American National Standard for the Calibration of antennas used for Radiated Emission measurements in Electromagnetic Interference (EMI) control.

ANSI C63.7 (1988)

Title: American National Standard Guide for Construction of Open Area Test Sites for performing Radiated Emission Measurements.

CISPR 16-1: (1999)

Title: Specification For Radio Disturbance and Immunity Measuring Apparatus and Methods. Part 1: Radio Disturbance and Immunity Measuring Apparatus.

3.2. Definition of Measurement Equipment

The measurement equipment used complied with the requirements of the standards referenced in the methods & procedures section above. Appendix 1 contains a list of the test equipment used.

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4. Deviations from the Test Specification

There is no standby or receive only mode as the EUT is designed to transmit and receive simultaneously. Standby or receiver tests were not performed at the request of the Client.

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5. Operation of the EUT during Testing

5.1. Operating Modes

The EUT was tested in the following operating modes, unless otherwise stated.

- Transmitting at maximum power on the bottom, centre and top channels.
- The longest packet payload size of 91 and packet shortest time interval of 1 was used as this
 resulted in the heaviest load on the EUT and was stated as being the worst case by the
 Client.

5.2. Configuration and Peripherals

The EUT was tested in the following configuration:

- Connected to a laptop PC via the USB port. The EUT is powered via the USB cable. The PC
 was used to configure the transmit power and frequency during the testing.
- AC conducted tests were performed with the EUT connected to the laptop PC via the USB cable and transmitting full power on the top channel. The support laptop was connected to the LISN for the duration of the test.
- The Client supplied a modified USB cable for testing at voltage extremes. This allowed connection to a variable power supply.

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6. Summary of Test Results

Range of Measurements	FCC Part 15 Reference	Port Type	Compliancy Status
Transmitter AC Conducted Emissions	15.207	AC Mains	Complied
Transmitter Minimum 6 dB Bandwidth	15.247(a)(2)	Antenna	Complied
Transmitter 20 dB Bandwidth	2.1049	Antenna	Complied
Transmitter Peak Power Spectral Density	15.247(e)	Antenna	Complied
Transmitter Maximum Peak Output Power	15.247(b)(3)	Antenna	Complied
Transmitter Radiated Emissions	15.247(d) & 15.209(a)	Antenna	Complied
Transmitter Band Edge Radiated Emissions	15.247(d) & 15.209(a)	Antenna	Complied

6.1. Location of Tests

All the measurements described in this report were performed at the premises of RFI Global Services Ltd, Ewhurst Park, Ramsdell, Basingstoke, Hampshire, RG26 5RQ.

6.2. Site Registration Numbers

FCC: 90895 IC: 3485

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7. Measurements, Examinations and Derived Results

7.1. General Comments

This section contains test results only.

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 8 for details of measurement uncertainties.

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7.2. Test Results

7.2.1. Transmitter AC Conducted Spurious Emissions (0.15 MHz to 30 MHz)

Ambient Temperature: 21°C Relative Humidity: 46%

Tests were performed using the test methods detailed in ANSI C63.4 Section 7.

Tests were performed to identify the maximum emission levels present on the ac mains line of the EUT.

Results:

Quasi-Peak Detector Measurements on Live and Neutral Lines

Frequency (MHz)	Line	Level (dBμV)	Limit (dB _µ V)	Margin (dB)	Result
4.906000	Live	47.7	56.0	8.3	Complied
5.562000	Live	48.9	60.0	11.1	Complied
6.634000	Live	50.8	60.0	9.2	Complied
6.742000	Live	51.8	60.0	8.2	Complied
6.850000	Live	51.6	60.0	8.4	Complied
6.938000	Live	50.2	60.0	9.8	Complied
7.042000	Live	48.8	60.0	11.2	Complied
7.278000	Live	50.6	60.0	9.4	Complied
7.386000	Live	51.3	60.0	8.7	Complied
7.578000	Live	49.2	60.0	10.8	Complied

Average Detector Measurements on Live and Neutral Lines

Frequency (MHz)	Line	Level (dBμV)	Limit (dB _µ V)	Margin (dB)	Result
0.322000	Live	48.1	49.7	1.6	Complied
4.906000	Live	41.6	46.0	4.4	Complied
5.994000	Live	43.9	50.0	6.1	Complied
6.098000	Live	39.4	50.0	10.6	Complied
6.206000	Live	40.0	50.0	10.0	Complied
6.634000	Live	41.4	50.0	8.6	Complied
6.742000	Live	43.3	50.0	6.7	Complied
6.850000	Live	43.5	50.0	6.5	Complied
6.938000	Live	42.1	50.0	7.9	Complied
7.278000	Live	43.7	50.0	6.3	Complied

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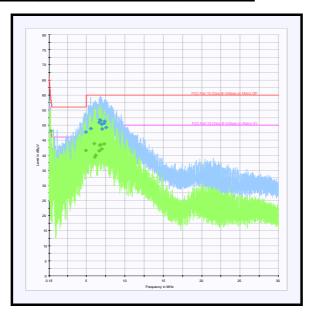
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Transmitter AC Conducted Spurious Emissions (Continued)



Note: This plot is a pre-scan and for indication purposes only. For final measurements, see accompanying tables.

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7.2.2. Transmitter Minimum 6 dB Bandwidth

Ambient Temperature: 15°C Relative Humidity: 91%

The peak level was then determined, and a reference established 6 dB below the peak level. The bandwidth was determined at the points where the 6 dB reference crossed the profile of the emission.

Results:

Channel	Transmitter 6 dB Bandwidth (MHz)	Limit (MHz)	Margin (MHz)	Result
Bottom	1.563126	<u>></u> 0.5	1.063126	Complied
Middle	1.412825	<u>></u> 0.5	0.912825	Complied
Тор	1.412825	<u>≥</u> 0.5	0.912825	Complied

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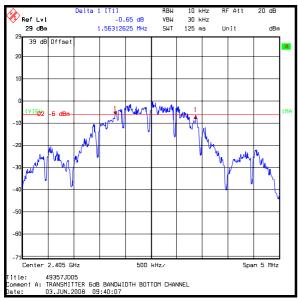
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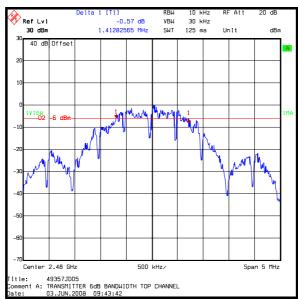
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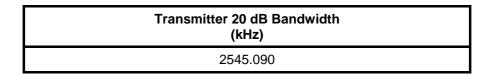
7.2.3. Transmitter 20 dB Bandwidth

Ambient Temperature: 15°C Relative Humidity: 91%

Tests were performed using the test methods detailed in Public Notice DA 00-705 (March 30, 2000).

Tests were performed to identify the 20 dB bandwidth.

Results:





Note: This plot is a pre-scan and for indication purposes only. For final measurements, see accompanying tables.

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7.2.4. Transmitter Peak Power Spectral Density

Ambient Temperature: 15°C Relative Humidity: 91%

Tests were performed using the test methods detailed in ANSI TIA-603-C-2004 and FCC CFR Part 2.

Tests were performed to identify the transmitter peak power spectral density.

Results:

Channel	Output Power (dBm/3 kHz)	Limit (dBm/3 kHz)	Margin (dB)	Result
Bottom	0.93	8.0	7.07	Complied
Middle	0.62	8.0	7.38	Complied
Тор	0.54	8.0	7.46	Complied

Note(s):

1. These tests were performed radiated; therefore the EUT antenna gain is encompassed in the final result and not measurable.

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7.2.5. Transmitter Maximum Peak Output Power

Ambient Temperature: 15°C to 19°C Relative Humidity: 48% to 91%

Tests were performed using the test methods detailed in ANSI TIA-603-C-2004 and FCC CFR Part 2.

Tests were performed to identify the transmitter maximum peak output power (EIRP) of the EUT.

Results:

DC Powered Devices

Channel	Input Voltage (DC)	EIRP (dBm)	Limit (dBm)	Margin (dB)	Result
Bottom	4.25	12.4	30.0	17.6	Complied
Bottom	5.0	12.9	30.0	17.1	Complied
Bottom	5.75	12.4	30.0	17.6	Complied
Middle	4.25	13.2	30.0	16.8	Complied
Middle	5.0	13.5	30.0	16.5	Complied
Middle	5.75	13.4	30.0	16.6	Complied
Тор	4.25	12.4	30.0	17.6	Complied
Тор	5.0	12.3	30.0	17.7	Complied
Тор	5.75	12.3	30.0	17.7	Complied

Note(s):

1. These tests were performed radiated; therefore the EUT antenna gain is encompassed in the final result and not measurable.

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7.2.6. Transmitter Radiated Emissions

Ambient Temperature: 19°C Relative Humidity: 56%

Tests were performed using the test methods detailed in ANSI C63.4 Section 8

Tests were performed to identify the maximum transmitter radiated emission levels.

Results:

Electric Field Strength Measurements: 30 to 1000 MHz

Top Channel

Frequency	Antenna	Q-P Level	Limit	Margin	Result
(MHz)	Polarity	(dBμV/m)	(dBμV/m)	(dB)	
998.671	Vertical	38.6	54.0	15.4	Complied

Note(s):

1. All emissions shown on the prescans were investigated and were found to be radiating from the support laptop PC which was used to power the EUT via the USB port and associated cables. No other 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. The peak level was compared to the average limit as opposed to being compared to the peak limit because this is the more onerous limit.

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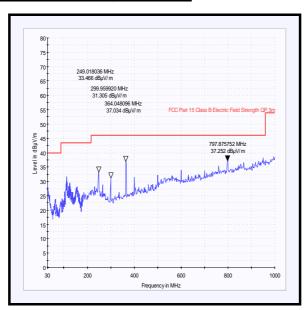
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7.2.7. Transmitter Radiated Emissions (Continued)



Note: This plot is a pre-scan and for indication purposes only. For final measurements, see accompanying tables.

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7.2.8. Transmitter Radiated Emissions (Continued)

Ambient Temperature: 15°C to 19°C Relative Humidity: 63% to 76%

Tests were performed using the test methods detailed in ANSI C63.4 Section 8

Tests were performed to identify the maximum transmitter radiated emission levels.

Results:

<u>Electric Field Strength Measurements (Frequency Range: 1 GHz to 26.5 GHz)</u> (emissions occurring in the restricted bands)

Highest Peak Level: Bottom Channel

Frequency (GHz)	Antenna Polarity	Detector Level (dB _µ V)	Transducer Factor (dB)	Actual Level (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Result
2.295839	Horizontal	61.7	-6.6	55.1	74.0	18.9	Complied
2.484502	Horizontal	65.3	-8.2	57.1	74.0	16.9	Complied
4.810030	Horizontal	60.0	-3.3	56.7	74.0	17.3	Complied
2.295839	Horizontal	61.7	-6.6	55.1	74.0	18.9	Complied

Highest Average Level: Bottom Channel

Frequency (GHz)	Antenna Polarity	Detector Level (dB _µ V)	Transducer Factor (dB)	Actual Level (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Result
2.295839	Horizontal	40.5	-6.6	33.9	54.0	20.1	Complied
2.484502	Horizontal	48.7	-8.2	40.5	54.0	13.5	Complied
4.810030	Horizontal	38.8	-3.3	35.5	54.0	18.5	Complied

Highest Peak Level: Middle Channel

Frequency (GHz)	Antenna Polarity	Detector Level (dBμV)	Transducer Factor (dB)	Actual Level (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Result
4.880040	Horizontal	56.9	-3.5	53.4	74.0	20.6	Complied
7.319844	Horizontal	70.8	-0.2	70.6	74.0	3.4	Complied

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Transmitter Radiated Emissions (Continued)

Highest Average Level: Middle Channel

Frequency (GHz)	Antenna Polarity	Detector Level (dB _µ V)	Transducer Factor (dB)	Actual Level (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Result
4.880040	Horizontal	37.5	-3.5	34.0	54.0	20.0	Complied
7.319844	Horizontal	47.8	-0.2	47.6	54.0	6.4	Complied

Highest Peak Level: Top Channel

Frequency (GHz)	Antenna Polarity	Detector Level (dB _µ V)	Transducer Factor (dB)	Actual Level (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Result
2.322856	Horizontal	58.2	-6.6	51.6	74.0	22.4	Complied
2.490401	Horizontal	71.0	-8.2	62.8	74.0	11.2	Complied
4.949899	Horizontal	60.4	-3.7	56.7	74.0	17.3	Complied
7.424938	Horizontal	71.0	-0.5	70.5	74.0	3.5	Complied

Highest Average Level: Top Channel

Frequency (GHz)	Antenna Polarity	Detector Level (dB _µ V)	Transducer Factor (dB)	Actual Level (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Result
2.322856	Horizontal	50.8	-6.6	44.2	54.0	9.8	Complied
2.490401	Horizontal	51.1	-8.2	42.9	54.0	11.1	Complied
4.949899	Horizontal	38.6	-3.7	34.9	54.0	19.1	Complied
7.424938	Horizontal	47.1	-0.5	46.6	54.0	7.4	Complied

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7.2.9. Transmitter Radiated Emissions (Continued)

Tests were performed using the test methods detailed in ANSI C63.4 Section 8

Tests were performed to identify the maximum transmitter radiated emission levels.

Results:

<u>Electric Field Strength Measurements (Frequency Range: 1 GHz to 26.5 GHz)</u> (emissions outside the restricted bands)

Highest Peak Level: Bottom Channel

Frequency (GHz)	Antenna Polarity	Detector Level (dB _µ V)	Transducer Factor (dB)	Actual Level (dBμV/m)	-20 dBc Limit (dBμV/m)	Margin (dB)	Result
7.214825	Horizontal	70.4	0.1	70.5	88.1	17.6	Complied

Highest Peak Level: Middle Channel

There were no emissions falling outside the restricted bands for the middle channel. Please refer to the tables above for emissions falling within the restricted bands.

Highest Peak Level: Top Channel

Frequency (GHz)	Antenna Polarity	Detector Level (dBμV)	Transducer Factor (dB)	Actual Level (dBμV/m)	-20 dBc Limit (dBμV/m)	Margin (dB)	Result
2.627002	Horizontal	59.6	-9.0	50.6	87.5	36.9	Complied

Note(s):

- 1. All emissions shown on the prescans were investigated and were found to be radiating from the support laptop PC which was used to power the EUT via the USB port and associated cables. No other 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. The peak level was compared to the average limit as opposed to being compared to the peak limit because this is the more onerous limit.
- 2. The large emission shown in the 2GHz to 4GHz plot is the carrier of the EUT and not spurious emissions. The carrier is shown on the above plot

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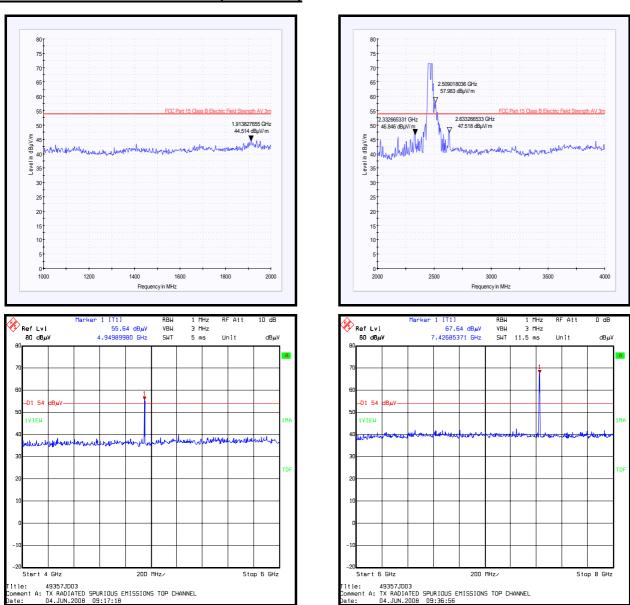
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Transmitter Radiated Emissions (Continued)



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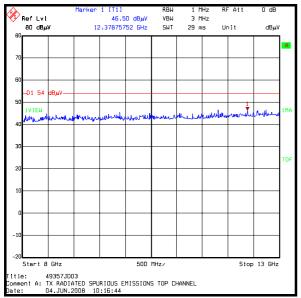
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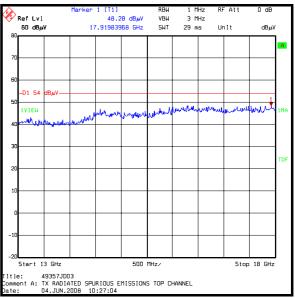
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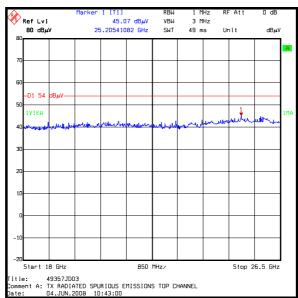
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7.2.10. Transmitter Band Edge Radiated Emissions

Ambient Temperature: 15°C Relative Humidity: 91%

Tests were performed using the test methods detailed in ANSI C63.4 Section 8 and Public Notice DA 00-705 (March 30, 2000).

Tests were performed to identify the maximum radiated band edge emissions.

Results:

Frequency (GHz)	Antenna Polarity	Detector Level (dB _µ V)	Transducer Factor (dB)	Actual Level (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Result
2.4000	Horizontal	72.7	-6.5	66.2	*85.0	18.8	Complied
2.4835	Horizontal	58.2	-6.5	51.7	74.0	22.3	Complied

Note(s):

^{* -20} dBc limit.

^{**} Peak measurements were performed on the band edge frequency 2.4835 GHz, as it lies within the restricted bands.

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7.2.11. Transmitter Band Edge Radiated Emissions (Continued)

Tests were performed using the test methods detailed in ANSI C63.4 Section 8 and Public Notice DA 00-705 (March 30, 2000).

Tests were performed to identify the average radiated band edge emissions.

Results:

Average Power Level:

Frequency (GHz)	Antenna Polarity	Detector Level (dB _µ V)	Transducer Factor (dB)	Actual Level (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Result
2.4835	Horizontal	48.3	-6.5	41.8	54.0	12.3	Complied

Note(s):

1. These tests were performed radiated; therefore the EUT antenna gain is encompassed in the final result and not measurable.

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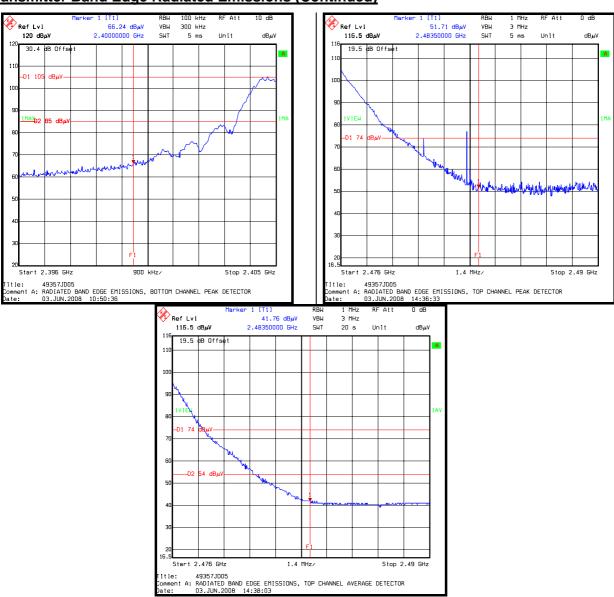
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Transmitter Band Edge Radiated Emissions (Continued)



Note: These plots are pre-scans and for indication purposes only. For final measurements, see accompanying tables.

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8. 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
AC Conducted Spurious Emissions	0.15 MHz to 30 MHz	95%	±3.72 dB
Transmitter Maximum Peak Output Power	Not applicable	95%	±2.94 dB
Spectral Power Density	Not applicable	95%	±0.27 dB
6 dB/20 dB Bandwidth	Not applicable	95%	±11.4 ppm
Radiated Spurious Emissions	30 MHz to 1000 MHz	95%	±4.64 dB
Radiated Spurious Emissions	1 GHz to 40 GHz	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.

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Appendix 1. Test Equipment Used

RFI No.	Instrument	Manufacturer	Type No.	Serial No.	Date Last Calibrated	Cal. Interval (months)
A028	Antenna	Eaton	91888-2	304	08 Jun 2006	36
A031	Antenna	Eaton	91889-2	557	08 Jun 2006	36
A1534	Pre Amplifier	Hewlett Packard	8449B OPT H02	3008A00405	Calibrated before use	-
A1829	Pulse Limiter	Rhode & Schwarz	ESH3-Z2	100671	16 Jan 2008	12
A253	Antenna	Flann Microwave	12240-20	128	17 Nov 2006	36
A254	Antenna	Flann Microwave	14240-20	139	17 Nov 2006	36
A255	Antenna	Flann Microwave	16240-20	519	17 Nov 2006	36
A256	Antenna	Flann Microwave	18240-20	400	17 Nov 2006	36
A436	Antenna	Flann	20240-20	330	24 Apr 2006	36
A490	Antenna	Chase	CBL6111A	1590	07 Feb 2008	12
A649	Single Phase LISN	Rohde & Schwarz	ESH3-Z5	825562/008	07 Mar 2008	12
C1025	Cable	Rosenberger	FA210A-1- 020m	FA00B 7564	Calibrated before use	-
C1080	Rosenberger Cable 3m	Rosenberger	FA210A1030 M5050	28464-1	Calibrated before use	-
C1155	Cable	Huber & Suhner	Sucoflex 104PA	1522/4PA	Calibrated before use	-
C1190	Cable	Rosenburg	FA210A1015 M3030	27141-05	Calibrated before use	-
C1262	Cable	Rosenberger	FA210A0075 008080	49356-2	Calibrated before use	-
C454	Cable	Rosenberger	RG142XX- 001-RFIB	C454- 10081998	Calibrated before use	-
G088	Power Supply Unit	Thurlby Thandar	CPX200	100700	Calibration not required	-
M1068	Thermometer	Iso-Tech	RS55	93102884	09 Jul 2008	12

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RFI No.	Instrument	Manufacturer	Type No.	Serial No.	Date Last Calibrated	Cal. Interval (months)
M1124	Spectrum Analyser	Rohde & Schwarz	ESIB26	100046K	19 Feb 2008	12
M1229	Digital Multimeter	Fluke	179	87640015	09 May 2008	12
M1242	Spectrum Analyser	Rohde & Schwarz, Inc.	FSEM30	845986/022	29 Nov 2007	12
M1379	Test Receiver	Rohde and Schwarz	ESIB7	100330	02 Aug 2007	12
S202	Site 2	RFI	2	S202- 15011990	28 Jan 2008	12
S207	Site 7	RFI	7	None	Calibration not required	-
S209	Anechoic Chamber	RFI	9	None	Verified before use	-

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

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Appendix 2. Test Configuration Drawings

This appendix contains the following drawings:

Drawing Reference Number	Title
DRG\49357JD05\EMICON	Test configuration for measurement of conducted emissions.
DRG\49357JD05\EMIRAD	Test configuration for measurement of radiated emissions.

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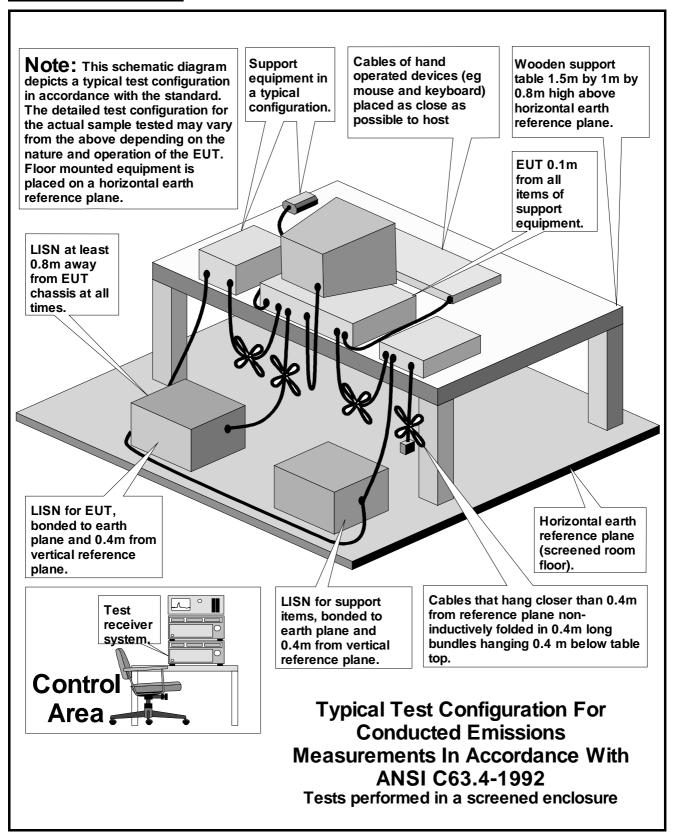
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