TEST REPORT
FROM
RADIO FREQUENCY
INVESTIGATION LTD.

Test Of: Red-M (Communications) Ltd.
Basic Access Point (BAP950AP)

To: F.C.C. Part 15 Subpart C: 2000
(Intentional Radiators)
Section 15.247

Test Report Serial No:
RFI/EMCB2/RP43844JD02A

Supersedes Test Report Serial No:
RFI/EMCB1/RP43844JD02A

This Test Report Is Issued Under The Authority Of Richard Jacklin, Operations Director:	**Checked By:**
Tested By: pp	**Release Version No:** **PDF01**
Issue Date: 29 May 2003	**Test Dates: 16 August 2002 to 27 August 2002**

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Table of Contents

Test Report Serial No: RFI/EMCB2/RP43844JD02A supersedes Test Report Serial No: RFI/EMCB1/RP43844JD02A

1. Client Information

Company Name:	Red-M (Communications) Ltd.
Address:	Neptune House Mercury Park Wycombe Lane Wooburn Green, Bucks HP10 0HH
Contact Name:	Mark Bailey

2. Equipment Under Test (EUT)

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

2.1. Identification Of Equipment Under Test (EUT)

Brand Name:	Red-M
Model Name or Number:	BAP(950AP)
Unique Type Identification:	000A1E8411AA
Serial Number:	158-284-01 (PCB)
Country of Manufacture:	Ireland
FCC ID Number:	PEY950AP
Date of Receipt:	16 August 2002

2.2. Description Of EUT

The equipment under test is a bluetooth transceiver.

2.3. Modifications Incorporated In EUT

The EUT has not been modified from what is described by the Model Name and Unique Type Identification stated above.

2.4. Additional Information Related To Testing

Power Supply Requirement:	Nominal 115V, 60 Hz AC Mains Supply
Intended Operating Environment:	Residential, Commercial (indoor)
Weight:	0.201 kg
Dimensions:	125 x 135 x 40mm
Interface Ports:	RJ45 Ethernet Port DC Input RS232

2.5. Support Equipment

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

Description:	Switched Mode Power Supply
Brand Name:	Power Solve
Model Name or Number:	PSE 15-312-AECNC
Serial Number:	S0001932-0221
Cable Length And Type:	2m Twin Core
Connected to Port:	DC Power

Description:	3000AS (Access Server)
Brand Name:	Red-M
Model Name or Number:	3000AS Access Server
Serial Number:	000281840198
Cable Length And Type:	Mains 2m, CAT 5 UTP 0.3m
Connected to Port:	Mains port, 10/1000 LAN Port

Description:	Ethernet Hub
Brand Name:	3Com
Model Name or Number:	OfficeConnect Dual Speed Hub 8
Serial Number:	0200/7P1F225008
Cable Length And Type:	Mains 2m
Connected to Port:	Mains Port

Support Equipment (continued)

Description:	Laptop PC
Brand Name:	DELL
Model Name or Number:	PPL
Serial Number:	12451
Cable Length And Type:	1.5M RS232
Connected to Port:	Mains, Hub

Description:	Bluetooth PC Card
Brand Name:	Motorola
Model Name or Number:	BTPCM101
Serial Number:	0050CD13A1B4
Cable Length And Type:	None applicable
Connected to Port:	PC

Description:	Ethernet PCMCIA NIC
Brand Name:	3COM
Model Name or Number:	3CCFE574BT
Serial Number:	HHL19BDF81
Cable Length And Type:	Fitted to laptop PC, 3m CAT 5 UTP
Connected to Port:	Ethernet Port of NIC

3. Test Specification, Methods And Procedures

3.1. Test Specification

Reference:	FCC Part 15 Subpart C: 2000 (Section 15.247)
Title:	Code of Federal Regulations, Part 15 (47CFR15) Radio Frequency Devices: Digital Devices.
Comments:	A description of the test facility used for this test is on file with, and has been accepted by, the Federal Communications Commission as required by Section 2.948 of Federal Rules.
Purpose of Test:	To determine whether the equipment complied with the requirements of the specification for the purposes of certification.

Reference:	FCC Part 15 Subpart B: 2000. (Section 15.107 and 15.109)
Title:	Code of Federal Regulations, Part 15 (47CFR15) Radio Frequency Devices: Radio Frequency Devices.
Comments:	A description of the test facility used for this test is on file with, and has been accepted by, the Federal Communications Commission as required by Section 2.948 of Federal Rules.
Purpose of Test:	To determine whether the equipment complied with the requirements of the specification for the purposes of certification.

3.2. Methods And Procedures

The methods and procedures used were as detailed in:

FCC Code of Federal Regulations 47.
Telecommunication. Parts 0 to 19, October 2000.

ANSI C63.2 (1987)
Title: American National Standard for Instrumentation - Electromagnetic noise and field strength.

ANSI C63.4 (2001)
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.

3.3. 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.

4. Deviations From The Test Specification

None

5. Operation Of The EUT During Testing

5.1. Operating Conditions

The EUT was tested in a normal laboratory environment.

During testing, the EUT was powered by a Nominal 115 V, 60 Hz AC Mains Supply 13 Amp (max).

5.2. Operating Modes

The EUT was tested in the following operating modes:

Transmit modes: 3 frequencies 2.404, 2.441 and 2.480 GHz and hopping enabled.

The reason for choosing these modes was that it was defined by the client as being likely to be the worst case with regards EMC.

5.3. Configuration And Peripherals

The EUT was tested in the following configuration:

Please refer to appendix 3 for Schematic diagram.

NB Section 2 of this report contains a full list of support equipment used and Appendix 3 contains a schematic diagram of the test configuration.

6. Summary Of Test Results

6.1. Emissions: Transmit Mode

Range Of Measurements	Specification Reference	Compliancy Status
Conducted AC Mains Emissions	C.F.R. 47 FCC Part 15: 2000. Section 15.207	Complied
Conducted Antenna Port Transmit Power	C.F.R. 47 FCC Part 15: 2000. Section 15.247 (b)	Complied
Conducted Peak Power Spectral Density	C.F.R. 47 FCC Part 15: 2000. Section 15.247 (d)	Complied
Conducted Antenna Port Spurious Emissions (30 to 26000 MHz)	C.F.R. 47 FCC Part 15: 2000. Section 15.247 (c)	Complied
Isotropic Effective Radiated Power (EIRP)	C.F.R. 47 FCC Part 15: 2000. Section 15.247 (b) (1)	Complied
Radiated Electric Field Strength Spurious Emissions (30 to 26000 MHz)	C.F.R. 47 FCC Part 15: 2000. Section 15.247 (c) (15.209)	Complied

6.2. Emissions: Receive Mode

Range Of Measurements	Specification Reference	Compliancy Status
Conducted AC Mains Emissions	C.F.R. 47 FCC Part 15: 2000. Section 15.107	Complied
Radiated Electric Field Strength Spurious Emissions (30 to 26000 MHz)	C.F.R. 47 FCC Part 15: 2000. Section 15.109	Complied

6.3. Location Of Tests

All the measurements described in this report were performed at the premises of Radio Frequency Investigation Ltd, Ewhurst Park, Ramsdell, Basingstoke, Hampshire, RG26 5RQ, England.

7. Measurements, Examinations And Derived Results

7.1. General Comments

7.1.1. This section contains test results only. Details of the test methods and procedures can be found in Appendix 2 of this report.

7.1.2. 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.

7.2. Test Results For AC Mains Conducted Emissions Hopping Mode

7.2.1. Quasi-Peak Detector Measurements On Live And Neutral Lines

7.2.1.1. Plots of the initial scans can be found in Appendix 4.

7.2.1.2. The following table lists frequencies at which emissions were measured using a Quasi-Peak detector:

Frequency (MHz)	Line	Q-P Level (dBµV)	Q-P Limit (dBµV)	Margin (dB)	Result
0.154	Live	53.62	65.81	12.19	Complied
0.231	Live	45.69	62.40	16.71	Complied
0.306	Live	40.39	60.08	19.69	Complied
0.385	Live	39.35	58.16	18.81	Complied
0.692	Neutral	45.11	56.00	10.89	Complied
0.770	Neutral	43.18	56.00	12.82	Complied
0.923	Neutral	41.86	56.00	14.14	Complied
1.384	Live	38.61	56.00	17.39	Complied
2.000	Live	36.50	56.00	19.50	Complied
3.614	Live	40.59	56.00	15.41	Complied
4.766	Live	41.00	56.00	15.00	Complied
13.761	Neutral	39.78	60.00	20.22	Complied

Test Results For AC Mains Conducted Emissions Hopping Mode Continued

7.2.2. Average Detector Measurements On Live And Neutral Lines

7.2.2.1. Plots of the initial scans can be found in Appendix 4.

7.2.2.2. The following table lists frequencies at which emissions were measured using a Average detector:

Frequency (MHz)	Line	Avg. Level (dBµV)	Avg. Limit (dBµV)	Margin (dB)	Result
0.154	Neutral	42.93	55.81	12.88	Complied
0.231	Neutral	37.52	52.40	14.88	Complied
0.308	Neutral	34.12	50.08	15.96	Complied
0.386	Neutral	36.17	48.16	11.99	Complied
0.461	Neutral	43.56	46.00	2.44	Complied
0.691	Neutral	40.46	46.00	5.54	Complied
0.769	Live	35.28	46.00	10.72	Complied
0.921	Live	36.50	46.00	9.50	Complied
1.613	Live	33.86	46.00	12.14	Complied
2.229	Neutral	40.24	46.00	5.76	Complied
3.074	Live	38.43	46.00	7.57	Complied
3.535	Neutral	35.23	50.00	14.77	Complied

7.3. Test Results For AC Mains Conducted Emissions Receive Mode

7.3.1. Quasi-Peak Detector Measurements On Live And Neutral Lines

7.3.1.1. Plots of the initial scans can be found in Appendix 4.

7.3.1.2. The following table lists frequencies at which emissions were measured using a Quasi-Peak detector:

Frequency (MHz)	Line	Q-P Level (dBµV)	Q-P Limit (dBµV)	Margin (dB)	Result
0.154	Live	52.40	65.79	13.39	Complied
0.231	Live	45.06	62.43	17.37	Complied
0.308	Live	40.11	60.03	19.92	Complied
0.386	Live	38.10	58.15	20.05	Complied
0.461	Neutral	36.76	56.67	19.91	Complied
0.691	Neutral	43.87	56.00	12.13	Complied
0.769	Neutral	41.40	56.00	14.60	Complied
0.921	Neutral	42.37	56.00	13.63	Complied
1.613	Live	39.24	56.00	16.76	Complied
2.229	Live	37.67	56.00	18.33	Complied
3.074	Live	38.08	56.00	17.92	Complied
3.535	Live	40.49	56.00	15.51	Complied
4.917	Live	40.26	56.00	15.74	Complied
15.825	Neutral	41.00	60.00	19.00	Complied

Test Results For AC Mains Conducted Emissions Receive Mode Continued

7.3.2. Average Detector Measurements On Live And Neutral Lines

7.3.2.1. Plots of the initial scans can be found in Appendix 4.

7.3.2.2. The following table lists frequencies at which emissions were measured using a Average detector:

Frequency (MHz)	Line	Avg. Level (dBµV)	Avg. Limit (dBµV)	Margin (dB)	Result
0.154	Neutral	41.91	55.79	13.88	Complied
0.231	Neutral	37.62	52.43	14.81	Complied
0.308	Neutral	33.89	50.03	16.14	Complied
0.386	Neutral	35.03	48.15	13.12	Complied
0.461	Neutral	34.98	46.67	11.69	Complied
0.691	Neutral	42.24	46.00	3.76	Complied
0.769	Neutral	39.88	46.00	6.12	Complied
0.921	Neutral	40.82	46.00	5.18	Complied
1.613	Live	37.59	46.00	8.41	Complied
2.229	Live	35.92	46.00	10.08	Complied
3.074	Live	35.66	46.00	10.34	Complied
3.535	Live	38.71	46.00	7.29	Complied
4.917	Live	37.92	46.00	8.08	Complied
15.825	Neutral	37.21	50.00	12.79	Complied

7.4. Test Results For AC Mains Conducted Emissions Bottom Channel

7.4.1. Quasi-Peak Detector Measurements On Live And Neutral Lines

7.4.1.1. Plots of the initial scans can be found in Appendix 4.

7.4.1.2. The following table lists frequencies at which emissions were measured using a Quasi-Peak detector:

Frequency (MHz)	Line	Q-P Level (dBµV)	Q-P Limit (dBµV)	Margin (dB)	Result
0.154	Live	55.36	65.84	10.48	Complied
0.231	Live	47.12	62.47	15.35	Complied
0.308	Live	42.47	60.08	17.61	Complied
0.386	Live	39.73	58.19	18.46	Complied
0.461	Neutral	44.96	56.00	11.04	Complied
0.691	Neutral	43.76	56.00	12.24	Complied
0.769	Neutral	39.91	56.00	16.09	Complied
0.921	Neutral	41.94	56.00	14.06	Complied
1.613	Live	38.18	56.00	17.82	Complied
2.229	Live	37.77	56.00	18.23	Complied
3.074	Live	37.26	56.00	18.74	Complied
3.535	Live	40.36	56.00	15.64	Complied
4.917	Live	41.02	56.00	14.98	Complied
15.825	Neutral	40.03	60.00	19.97	Complied

Test Results For AC Mains Conducted Emissions Bottom Channel Continued

7.4.2. Average Detector Measurements On Live And Neutral Lines

7.4.2.1. Plots of the initial scans can be found in Appendix 4.

7.4.2.2. The following table lists frequencies at which emissions were measured using a Average detector:

Frequency (MHz)	Line	Avg. Level (dBµV)	Avg. Limit (dBµV)	Margin (dB)	Result
0.154	Neutral	44.04	55.84	11.80	Complied
0.231	Neutral	38.13	52.47	14.34	Complied
0.308	Neutral	35.49	50.08	14.59	Complied
0.386	Neutral	35.92	48.19	12.27	Complied
0.461	Neutral	43.23	46.00	2.77	Complied
0.691	Neutral	41.17	46.00	4.83	Complied
0.769	Neutral	38.05	46.00	7.95	Complied
0.921	Live	34.85	46.00	11.15	Complied
1.613	Live	34.98	46.00	11.02	Complied
2.229	Live	34.70	46.00	11.30	Complied
3.074	Live	31.60	46.00	14.40	Complied
3.535	Live	36.96	46.00	9.04	Complied
4.917	Live	38.25	46.00	7.75	Complied
15.825	Neutral	34.85	50.00	15.15	Complied

7.5. Test Results For AC Mains Conducted Emissions Middle Channel

7.5.1. Quasi-Peak Detector Measurements On Live And Neutral Lines

7.5.1.1. Plots of the initial scans can be found in Appendix 4.

7.5.1.2. The following table lists frequencies at which emissions were measured using a Quasi-Peak detector:

Frequency (MHz)	Line	Q-P Level (dBµV)	Q-P Limit (dBµV)	Margin (dB)	Result
0.154	Live	53.76	65.81	12.05	Complied
0.231	Neutral	45.52	62.44	16.92	Complied
0.308	Live	41.50	60.05	18.55	Complied
0.386	Live	39.45	58.20	18.75	Complied
0.461	Neutral	44.98	56.00	11.02	Complied
0.691	Neutral	43.16	56.00	12.84	Complied
0.769	Neutral	41.68	56.00	14.32	Complied
0.921	Live	38.43	56.00	17.57	Complied
1.613	Live	36.35	56.00	19.65	Complied
2.229	Live	40.77	56.00	15.23	Complied
3.074	Live	41.00	56.00	15.00	Complied
3.535	Neutral	39.14	60.00	20.86	Complied

Test Results For AC Mains Conducted Emissions Middle Channel Continued

7.5.2. Average Detector Measurements On Live And Neutral Lines

7.5.2.1. Plots of the initial scans can be found in Appendix 4.

7.5.2.2. The following table lists frequencies at which emissions were measured using a Average detector:

Frequency (MHz)	Line	Avg. Level (dBµV)	Avg. Limit (dBµV)	Margin (dB)	Result
0.154	Neutral	42.98	55.81	12.83	Complied
0.231	Neutral	37.47	52.44	14.97	Complied
0.308	Neutral	35.00	50.05	15.05	Complied
0.386	Neutral	36.15	48.20	12.05	Complied
0.461	Neutral	43.43	46.00	2.57	Complied
0.691	Neutral	40.59	46.00	5.41	Complied
0.769	Live	34.98	46.00	11.02	Complied
0.921	Live	36.40	46.00	9.60	Complied
1.613	Live	29.75	46.00	16.25	Complied
2.229	Live	38.20	46.00	7.80	Complied
3.074	Live	38.51	46.00	7.49	Complied
3.535	Neutral	33.91	50.00	16.09	Complied

7.6. Test Results For AC Mains Conducted Emissions Top Channel

7.6.1. Quasi-Peak Detector Measurements On Live And Neutral Lines

7.6.1.1. Plots of the initial scans can be found in Appendix 4.

7.6.1.2. The following table lists frequencies at which emissions were measured using a Quasi-Peak detector:

Frequency (MHz)	Line	Q-P Level (dBµV)	Q-P Limit (dBµV)	Margin (dB)	Result
0.154	Live	53.43	65.80	12.37	Complied
0.231	Live	45.67	62.43	16.76	Complied
0.308	Live	41.25	60.04	18.79	Complied
0.386	Live	39.47	58.19	18.72	Complied
0.461	Neutral	45.16	56.00	10.84	Complied
0.691	Neutral	41.84	56.00	14.16	Complied
0.769	Neutral	41.63	56.00	14.37	Complied
0.921	Live	38.23	56.00	17.77	Complied
1.613	Live	40.41	56.00	15.59	Complied
2.229	Live	40.69	56.00	15.31	Complied
3.074	Neutral	38.20	60.00	21.80	Complied

Test Results For AC Mains Conducted Emissions Top Channel Continued

7.6.2. Average Detector Measurements On Live And Neutral Lines

7.6.2.1. Plots of the initial scans can be found in Appendix 4.

7.6.2.2. The following table lists frequencies at which emissions were measured using a Average detector:

Frequency (MHz)	Line	Avg. Level (dBµV)	Avg. Limit (dBµV)	Margin (dB)	Result
0.154	Neutral	42.75	55.80	13.05	Complied
0.231	Neutral	37.47	52.43	14.96	Complied
0.308	Neutral	34.85	50.04	15.19	Complied
0.386	Neutral	36.30	48.19	11.89	Complied
0.461	Neutral	43.66	46.00	2.34	Complied
0.691	Neutral	39.50	46.00	6.50	Complied
0.769	Neutral	35.79	46.00	10.21	Complied
0.921	Live	36.22	46.00	9.78	Complied
1.613	Live	37.49	46.00	8.51	Complied
2.229	Live	38.08	46.00	7.92	Complied
3.074	Neutral	32.31	50.00	17.69	Complied

7.7. Test Results for Conducted Transmitter Power: Transmit Mode.

7.7.1. Tests were performed to identify the maximum transmit power in accordance with FCC Part 15.247(b)(1) and FCC Public Notice DA 00-705.

7.7.2. The client has provided a temporary antenna port to allow a direct connection to be made.

7.7.3. The client has specified that the EUT employs frequency hopping with 79 hopping channels. Therefore the maximum transmitter power level under FCC Part 15.247(b)(1) is 1 Watt.

7.7.4. It can be confirmed from Plot GPH/43844JD02/002 Appendix 4 that the number of hopping channels employed by the EUT was 79.

7.7.5. Results are shown for the EUT set to Top, Middle and Bottom channels as stated in FCC Part 15.31 (m) and section 5.2 of this report.

7.7.6. Measurements were performed on the Top, Middle and Bottom channels for the specified extremes of input voltages:

Test Results for Conducted Transmitter Power: Transmit Mode (continued)

Channel	Input Voltage (AC)	Maximum Transmitter Output Level (Watts)	Limit (Watts)	Margin	Result
Bottom	93.5	0.046	1.0	0.954	Complied
Bottom	110.0	0.045	1.0	0.955	Complied
Bottom	126.5	0.045	1.0	0.955	Complied

Channel	Input Voltage (AC)	Maximum Transmitter Output Level (Watts)	Limit (Watts)	Margin	Result
Middle	93.5	0.067	1.0	0.933	Complied
Middle	110.0	0.067	1.0	0.933	Complied
Middle	126.5	0.067	1.0	0.933	Complied

Channel	Input Voltage (AC)	Maximum Transmitter Output Level (Watts)	Limit (Watts)	Margin	Result
Top	93.5	0.065	1.0	0.935	Complied
Top	110.0	0.065	1.0	0.935	Complied
Top	126.5	0.065	1.0	0.935	Complied

7.8. Peak Power Spectral Density For Direct Sequence Systems

7.8.1. The client has provided a temporary antenna port to allow a direct connection to be made.

7.8.2. Testing was performed on the Bottom, Middle and Top channels used for the accusation mode. Spectral power density in the 3 kHz bandwidth was then measured as specified in FCC Part 15.247(d).

Channel	Input Voltage (AC)	Maximum Transmitter Output Level (dBm/3kHz)	Limit (dBm/3kHz)	Margin	Result
Bottom	110.0	4.6	8.0	3.4	Complied

Channel	Input Voltage (AC)	Maximum Transmitter Output Level (dBm/3kHz)	Limit (dBm/3kHz)	Margin	Result
Middle	110.0	5.0	8.0	3.0	Complied

Channel	Input Voltage (AC)	Maximum Transmitter Output Level (dBm/3kHz)	Limit (dBm/3kHz)	Margin	Result
Top	110.0	4.4	8.0	3.6	Complied

7.9. Test Results for Conducted Antenna Port Spurious Emissions: Transmit Mode.

7.9.1. Spurious emissions tests on the antenna port were performed in accordance with FCC Part 15.247(c).

7.9.2. Section 15.247(c) specifies that all spurious emissions should be attenuated by at least 20 dB below the level of the highest fundamental level measured between the range of 2400 to 2483.5 MHz.

7.9.3. Scans were performed between 30 and 26000MHz with the EUT operating at the Top, Middle and Bottom channels, as specified within clause 15.31 (m) and with all channels active (transmitting data on pseudo random hopping channels) stated in section 5.2. Initial scans indicate that all spurious emissions were of an amplitude of at least 20dB below the reference limit line, therefore final measurements were not required.

7.9.4. Plots of all the all the initial scans can be found in Appendix 4.

7.10. Test Results for Occupied Bandwidth, Channel Separation and Time Occupancy.

7.10.1. Tests were performed to identify the Occupied Bandwidth, Channel Separation and Time Occupancy to FCC Part 15.247.

Occupied Bandwidth and Channel Separation:

7.10.2. Section 15.247 (a)(1) specifies that the channels should be separated by at least 25kHz or the 20dB bandwidth of the channel, and section 15.247 (a1)(ii) specifies that the maximum bandwidth of the channel should be 1MHz.

7.10.3. A graphical plot of the characteristics of two adjacent channels was performed. The following results were noted:

20 dB Bandwidth: 931.111 kHz. (Refer to Appendix 4 Plot GPH/43844JD02/005)

Channel Separation: 997.778 kHz. (Refer to Appendix 4 Plot GPH/43844JD02/001)

Time Occupancy:

7.10.4. The time occupancy of the system was tested on a single carrier. The maximum packet length was measured to be 2.88ms and can be seen in Appendix 4 (Plot GPH/43844JD02/003). The maximum time the carrier was used in a 30 second period was measured as 308.588 milliseconds and can be seen in Appendix 4 (Plot GPH/43844JD02/004).

7.11.Test Results for Radiated Transmitter Power: Transmit Mode

7.11.1.Effective Isotropic Radiated Power

Channel	Input Voltage (DC)	Maximum Transmitter Output Level (Watts)	Limit (Watts)	Margin	Result
Bottom	110.0	0.000032	1.0	0.999968	Complied

Channel	Input Voltage (DC)	Maximum Transmitter Output Level (Watts)	Limit (Watts)	Margin	Result
Middle	110.0	0.000016	1.0	0.999984	Complied

Channel	Input Voltage (DC)	Maximum Transmitter Output Level (Watts)	Limit (Watts)	Margin	Result
Top	110.0	0.000021	1.0	0.999979	Complied

7.12.Band Edge Compliance of RF Conducted Emissions FCC 15.247(c)

7.12.1.The EUT and spectrum analyser was configured as for conducted antenna port measurements, And as per FCC Public Notice DA 00-705, Filing and Measurement Guidelines for Frequency Hopping Spread Spectrum Systems.

7.12.2.A temporary antenna port was provided by the applicant to allow for conducted measurements.

7.12.3.To determine band-edge compliance, the analyser bandwidth resolution bandwidth was set to ≥1% of the analyser span. The video bandwidth was set to be no less than the resolution bandwidth. The sweep was set to auto and the detector to peak. The trace was set to max hold and a trace was produced.

7.12.4.A plot of the upper channel and the protected band closest to the upper channel was produced. A marker was set to the peak of the highest channel and a delta marker set to the highest out of band peak. (The specification states that either the band edge level must be measured or the highest out of band emission, whichever is greater). The plots show that the emission complies with the 20 dBc limit.

7.12.5.A plot of the lower channel and the protected band closest to the lower channel was produced. A marker was set to the peak of the lowest channel and a delta marker set to the highest out of band peak. (The specification states that either the band edge level must be measured or the highest out of band emission, whichever is greater). The plots show that the emission complies with the 20 dBc limit.

7.12.6.The above procedure was then repeated with the EUT set to its hopping mode.

7.12.7.Four graphs in total were produced, two with the device set to top and bottom channels and two with the device set to its hopping mode. The plots can be seen in appendix 4 of this report.

7.13. Test Results For Band Edge Radiated Emissions

7.13.1. Electric Field Strength Measurements

7.13.1.1. The EUT and spectrum analyser were configured for radiated measurements as per FCC Public Notice DA 00-705, Filing and Measurement Guidelines for Frequency Hopping Spread Spectrum Systems.

7.13.1.2. A plot of the protected band closest to the upper channel was produced with frequency hopping mode turned off and the device set to transmit on the top channel. A marker was set to the peak of the highest out of band emission. (The specification states that either the band edge level must be measured or the highest out of band emission, which ever is greater).

7.13.1.3. The highest noted emission was then measured as per the requirements of FCC Part 15.209 for electric field strength measurements.

7.13.1.4. Frequency hopping was then turned on and the process repeated.

7.13.1.5. A plot of the protected band closest to the lower channel was then produced with frequency hopping turned off and the device set to transmit on the bottom channel. A marker was set to the peak of the highest out of band emission. (The specification states that either the band edge level must be measured or the highest out of band emission, which ever is greater).

7.13.1.6. The highest noted emission was then measured as per the requirements of FCC Part 15.209 for electric field strength measurements.

7.13.1.7. Frequency hopping was then turned on and the process repeated.

7.13.1.8. Four graphs were produced in total showing the responses in the limited frequency bands. The plots can be seen in appendix 4 of this report.

7.13.2. Emissions in the protected band closest to the bottom channel

Highest Average Level:

Frequency (GHz)	Antenna Polarity (H/V)	Average Detector level (dBμV)	Antenna factor (dB)	Cable loss (dB)	Actual Average Level (dBμV/m)	Average Limit (dBμV/m)	Average Margin (dB)	Result
2.3899	Vert.	13.7	20.5	0.8	35.0	54.0	19.0	Complied
2.3899	Horiz.	13.7	20.5	0.8	35.0	54.0	19.0	Complied

Highest Peak Level:

Frequency (GHz)	Antenna Polarity (H/V)	Peak Detector level (dBμV)	Antenna factor (dB)	Cable loss (dB)	Actual Peak Level (dBμV/m)	Peak Limit (dBμV/m)	Peak Margin (dB)	Result
2.3899	Vert.	21.6	20.5	0.8	42.9	70.0	27.1	Complied
2.3899	Horiz.	21.6	20.5	0.8	42.9	70.0	27.1	Complied

7.13.3. Emissions in the protected band closest to the top channel.

Highest Average Level:

Frequency (GHz)	Antenna Polarity (H/V)	Average Detector level (dBμV)	Antenna factor (dB)	Cable loss (dB)	Actual Average Level (dBμV/m)	Average Limit (dBμV/m)	Average Margin (dB)	Result
2.4834	Vert.	15.4	20.5	0.8	36.7	54.0	17.3	Complied
2.4834	Horiz.	15.4	20.5	0.8	36.7	54.0	17.3	Complied

Highest Peak Level:

Frequency (GHz)	Antenna Polarity (H/V)	Peak Detector level (dBμV)	Antenna factor (dB)	Cable loss (dB)	Actual Peak Level (dBμV/m)	Peak Limit (dBμV/m)	Peak Margin (dB)	Result
2.4834	Vert.	28.2	20.5	0.8	49.5	70.0	20.5	Complied
2.4834	Horiz.	28.2	20.5	0.8	49.5	70.0	20.5	Complied

7.14. Test Results For Radiated Emissions: Transmit Mode.

7.14.1. Electric Field Strength Measurements: 30 to 1000 MHz.

7.14.1.1. Preliminary Radiated spurious scans were performed with the EUT set to Top, Middle and Bottom channels and with all channels active (transmitting data on pseudo random hopping channels) stated in section 5.2. These preliminary scans showed similar emission levels for each mode; therefore final Radiated emissions measurements were performed with the EUT set to pseudo random hopping mode.

7.14.1.2. Plots of the initial scans can be found in Appendix 4.

7.14.1.3. The following table lists frequencies at which emissions were measured using a Quasi-Peak detector at a test distance of 3m (results incorporate antenna factors and cable losses):

7.14.1.4. The following results are for the EUT configured with an internal antenna connected and operating.

Frequency (MHz)	Ant. Pol.	Q-P Level (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Result
35.596	Vert.	27.2	40.0	12.8	Complied
81.200	Vert.	37.0	40.0	3.0	Complied
115.210	Vert.	33.0	43.5	10.5	Complied
230.420	Horiz.	38.5	46.0	7.5	Complied
345.629	Horiz.	38.9	46.0	7.1	Complied
384.032	Horiz.	40.5	46.0	5.5	Complied
460.839	Horiz.	41.5	46.0	4.5	Complied
720.061	Horiz.	38.1	46.0	7.9	Complied
921.670	Horiz.	41.6	46.0	4.4	Complied

7.15. Test Results For Radiated Emissions: Receive Mode.

7.15.1. Electric Field Strength Measurements: 30 to 1000 MHz.

7.15.1.1. The following table specifies frequencies, which fall close to the restricted bands as specified in section 15.205.

7.15.1.2. Preliminary Radiated spurious scans were performed with the EUT set to Top, Middle and Bottom channels and with all channels active (transmitting data on pseudo random hopping channels) stated in section 5.2. These preliminary scans showed similar emission levels for each mode; therefore final Radiated emissions measurements were performed with the EUT set to pseudo random hopping mode.

7.15.1.3. Plots of the initial scans can be found in Appendix 4.

7.15.1.4. The following table lists frequencies at which emissions were measured using a Quasi-Peak detector at a test distance of 3m (results incorporate antenna factors and cable losses):

7.15.1.5. The following results are for the EUT configured with an internal antenna connected and operating.

Frequency (MHz)	Ant. Pol.	Q-P Level (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Result
32.596	Vert.	28.3	40.0	11.7	Complied
81.200	Vert.	37.3	40.0	2.7	Complied
115.210	Vert.	33.5	43.5	10.0	Complied
230.420	Horiz.	37.7	46.0	8.3	Complied
345.629	Horiz.	38.5	46.0	7.5	Complied
384.032	Horiz.	39.8	46.0	6.2	Complied
460.839	Horiz.	43.5	46.0	2.5	Complied
720.061	Horiz.	38.0	46.0	8.0	Complied
921.670	Horiz.	41.6	46.0	4.4	Complied

Note. Top, Bottom, middle and hopping modes all exhibited the same results.

7.16. Test Results For Radiated Emissions: Bottom Channel

7.16.1. Electric Field Strength Measurements (Frequency Range: 1.0 to 26.0 GHz)

7.16.1.1. The following table specifies frequencies, which fall within the bands as specified in section 15.205 and other frequencies that fell within 20 dBs of the limit.

7.16.1.2. The client has stated that the highest clock frequency for the EUT was 2.480 GHz. Therefore tests were performed up to 26 GHz.

7.16.1.3. Preliminary Radiated spurious scans were performed with the EUT set to Bottom, Middle, Top Channels and a pseudo random hopping mode as stated in section 5.2.

7.16.1.4. Due to dynamic range limitations of the measuring receiver, scans at high frequencies above 12 GHz were performed at 1 metre measurement distances, with an corrected limit line for the reduced test distance.

7.16.1.5. Plots of all the initial scans can be found in Appendix 4.

7.16.1.6. The following results are for the EUT configured with an internal antenna connected and operating.

Highest Average Level:

Frequency (GHz)	Antenna Polarity (H/V)	Average Detector level (dBμV)	Antenna factor (dB)	Cable loss (dB)	Actual Average Level (dBμV/m)	Average Limit (dBμV/m)	Average Margin (dB)	Result
2.65788	Vert.	17.4	20.0	1.9	39.3	54.0	14.7	Complied
2.65788	Horiz.	21.7	20.0	1.9	43.6	54.0	10.4	Complied
2.69110	Vert.	18.8	20.0	1.9	40.7	54.0	13.3	Complied
2.69110	Horiz.	25.4	20.0	1.9	47.3	54.0	6.7	Complied
2.78660	Vert.	16.6	20.0	1.9	38.5	54.0	15.5	Complied
2.78660	Horiz.	27.0	20.0	1.9	48.9	54.0	5.1	Complied

Electric Field Strength Measurements: 1.0 to 26.0 GHz Bottom Channel (Continued)

Highest Peak Level:

Frequency (GHz)	Antenna Polarity (H/V)	Peak Detector level (dBμV)	Antenna factor (dB)	Cable loss (dB)	Actual Peak Level (dBμV/m)	Peak Limit (dBμV/m)	Peak Margin (dB)	Result
2.65788	Vert.	28.4	20.0	1.9	50.3	74.0	44.0	Complied
2.65788	Horiz.	31.9	20.0	1.9	53.8	74.0	20.2	Complied
2.69110	Vert.	29.3	20.0	1.9	51.2	74.0	22.8	Complied
2.69110	Horiz.	36.3	20.0	1.9	58.2	74.0	15.8	Complied
2.78660	Vert.	27.1	20.0	1.9	49.0	74.0	25.0	Complied
2.78660	Horiz.	35.4	20.0	1.9	57.3	74.0	16.7	Complied

7.17. Test Results For Radiated Emissions: Middle Channel

7.17.1. Electric Field Strength Measurements (Frequency Range: 1.0 to 26.0 GHz)

7.17.1.1. The following table specifies frequencies, which fall within the bands as specified in section 15.205 and other frequencies that fell within 20 dBs of the limit.

7.17.1.2. The client has stated that the highest clock frequency for the EUT was 2.480 GHz. Therefore tests were performed up to 26 GHz.

7.17.1.3. Preliminary Radiated spurious scans were performed with the EUT set to Bottom, Middle, Top Channels and a pseudo random hopping mode as stated in section 5.2.

7.17.1.4. Due to dynamic range limitations of the measuring receiver, scans at high frequencies above 12 GHz were performed at 1 metre measurement distances, with an corrected limit line for the reduced test distance.

7.17.1.5. Plots of all the initial scans can be found in Appendix 4.

7.17.1.6. The following results are for the EUT configured with an internal antenna connected and operating.

Highest Average Level:

Frequency (GHz)	Antenna Polarity (H/V)	Average Detector level (dBμV)	Antenna factor (dB)	Cable loss (dB)	Actual Average Level (dBμV/m)	Average Limit (dBμV/m)	Average Margin (dB)	Result
2.7288	Vert.	19.3	20.0	1.9	41.2	54.0	12.8	Complied
2.7288	Horiz.	24.6	20.0	1.9	46.5	54.0	7.5	Complied
2.8266	Vert.	18.5	20.0	1.9	40.4	54.0	13.6	Complied
2.8266	Horiz.	23.4	20.0	1.9	45.3	54.0	8.7	Complied

Electric Field Strength Measurements: 1.0 to 26.0 GHz Middle Channel (Continued)

Highest Peak Level:

Frequency (GHz)	Antenna Polarity (H/V)	Peak Detector level (dBμV)	Antenna factor (dB)	Cable loss (dB)	Actual Peak Level (dBμV/m)	Peak Limit (dBμV/m)	Peak Margin (dB)	Result
2.7288	Vert.	30.3	20.0	1.9	52.2	74.0	21.8	Complied
2.7288	Horiz.	35.3	20.0	1.9	57.2	74.0	16.8	Complied
2.8266	Vert.	28.4	20.0	1.9	50.3	74.0	23.7	Complied
2.8266	Horiz.	33.2	20.0	1.9	55.1	74.0	18.9	Complied

7.18. Test Results For Radiated Emissions: Top Channel

7.18.1. Electric Field Strength Measurements (Frequency Range: 1.0 to 26.0 GHz)

7.18.1.1. The following table specifies frequencies, which fall within the bands as specified in section 15.205 and other frequencies that fell within 20 dBs of the limit.

7.18.1.2. The client has stated that the highest clock frequency for the EUT was 2.480 GHz. Therefore tests were performed up to 26 GHz.

7.18.1.3. Preliminary Radiated spurious scans were performed with the EUT set to Bottom, Middle, Top Channels and a pseudo random hopping mode as stated in section 5.2.

7.18.1.4. Due to dynamic range limitations of the measuring receiver, scans at high frequencies above 12 GHz were performed at 1 metre measurement distances, with an corrected limit line for the reduced test distance.

7.18.1.5. Plots of all the initial scans can be found in Appendix 4.

7.18.1.6. The following results are for the EUT configured with an internal antenna connected and operating.

Highest Average Level:

Frequency (GHz)	Antenna Polarity (H/V)	Average Detector level (dBμV)	Antenna factor (dB)	Cable loss (dB)	Actual Average Level (dBμV/m)	Average Limit (dBμV/m)	Average Margin (dB)	Result
2.2888	Vert.	21.0	20.0	1.9	42.9	54.0	11.1	Complied
2.2888	Horiz.	28.2	20.0	1.9	50.1	54.0	3.9	Complied
2.6733	Vert.	24.2	20.0	1.9	46.1	54.0	7.9	Complied
2.6733	Horiz.	30.5	20.0	1.9	52.4	54.0	1.6	Complied
2.7688	Vert.	22.2	20.0	1.9	44.1	54.0	9.9	Complied
2.7688	Horiz.	22.2	20.0	1.9	46.8	54.0	7.2	Complied

Electric Field Strength Measurements: 1.0 to 26.0 GHz Top Channel (Continued)

Highest Peak Level:

Frequency (GHz)	Antenna Polarity (H/V)	Peak Detector level (dBμV)	Antenna factor (dB)	Cable loss (dB)	Actual Peak Level (dBμV/m)	Peak Limit (dBμV/m)	Peak Margin (dB)	Result
2.2888	Vert.	32.3	20.0	1.9	54.2	74.0	19.8	Complied
2.2888	Horiz.	37.9	20.0	1.9	59.8	74.0	14.2	Complied
2.6733	Vert.	34.5	20.0	1.9	56.4	74.0	17.6	Complied
2.6733	Horiz.	38.5	20.0	1.9	60.4	74.0	13.6	Complied
2.7688	Vert.	31.5	20.0	1.9	53.4	74.0	20.6	Complied
2.7688	Horiz.	35.9	20.0	1.9	57.8	74.0	16.8	Complied

7.19. Test Results For Radiated Emissions: Hopping Mode

7.19.1. Electric Field Strength Measurements (Frequency Range: 1.0 to 26.0 GHz)

7.19.1.1. The following table indicates measured results with the EUT operated in Hopping mode.

7.19.1.2. Plots of all the initial scans can be found in Appendix 4.

Highest Average Level:

Frequency (GHz)	Antenna Polarity (H/V)	Average Detector level (dBμV)	Antenna factor (dB)	Cable loss (dB)	Actual Average Level (dBμV/m)	Average Limit (dBμV/m)	Average Margin (dB)	Result
2.8000	Vert.	21.0	20.0	1.9	42.9	54.0	11.1	Complied
2.8000	Horiz.	20.9	20.0	1.9	42.8	54.0	11.2	Complied

Electric Field Strength Measurements: 1.0 to 26.0 GHz Hopping Mode (Continued)

Highest Peak Level:

Frequency (GHz)	Antenna Polarity (H/V)	Peak Detector level (dBμV)	Antenna factor (dB)	Cable loss (dB)	Actual Peak Level (dBμV/m)	Peak Limit (dBμV/m)	Peak Margin (dB)	Result
2.8000	Vert.	30.9	20.0	1.9	52.8	74.0	21.2	Complied
2.8000	Horiz.	31.3	20.0	1.9	53.2	74.0	20.8	Complied

8. Measurement Uncertainty

8.1. 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.

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

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

8.4. 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 Emissions	0.15 MHz to 30 MHz	95%	+/- 3.25 dB
Time Occupancy	Not applicable	95%	+/- 10 %
Channel Separation	Not applicable	95%	+/- 10 %
Occupied Bandwidth	Not applicable	95%	+/- 2.5 kHz
Effective Isotropic Radiated Power	1.0 GHz to 26 GHz	95%	+/- 1.78 dB
Radiated Emissions at 3.0 metres	30 MHz to 1000 MHz	95%	+/- 1.78 dB
Radiated Emissions at 3.0 metres	1 GHz to 26 GHz	95%	+/- 1.78 dB
Conducted Emissions	9.0 kHz to 26 GHz	95%	+/- 0.72 dB

8.5. 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	Maker	Type No.	Serial No.
A027	Horn Antenna	Eaton	9188-2	301
A031	2 to 4 GHz Eaton Horn Antenna	Eaton	91889-2	557
A1069	ESH3-Z5	Rohde & Schwarz	ESH3-Z5	837469/012
A201	WG 20 Horn Antenna	Flann Microwave Ltd	20240-20	266
A243	20 dB Attenuator	Schaffner	6820-17-B	None
A253	WG 12 Microwave Horn	Flann Microwave	12240-20	128
A254	WG 14 Microwave Horn	Flann Microwave	14240-20	139
A255	WG 16 Microwave Horn	Flann Microwave	16240-20	519
A256	WG 18 Microwave Horn	Flann Microwave	18240-20	400
A259	Bilog Antenna	Chase	CBL6111	1513
A490	Bilog Antenna	Chase	CBL6111A	1590
A559	Pulse Limiter	Rohde & Schwarz	ESH3-Z2	357881052
A649	LISN	Rohde & Schwarz	ESH3-Z5	825562/008
C1061	Rosenberger	Rosenberger	FB311A1050M5050	180226043-1
C305	Cable	Rosenberger	UFA 210A-1-0787-50x50	2681
C453	Cable	Rosenberger	RG142XX-001-RFIB	C453-10081998
C457	Cable	Rosenberger	RG142XX-002-RFIB	C457-10081998
C574	C574-N-N-2	Rosenberger	UFA210A-1-788-50x50	97E0937
G013	SMHU Signal Generator	Rohde & Schwarz	SMHU	894 055/003
G051	Signal Generator	Gigatronics	7100/.01-20	749472

Test Equipment Used (continued)

RFI No.	Instrument	Maker	Type No.	Serial No.
M003	Spectrum Monitor	Rohde & Schwarz	EZM	883 580/008
M069	ESMI Spectrum Analyser / Receiver	Rohde & Schwarz	ESMI	829 808/007 (DU) / 827 063/008 (RU)
M088	Receiver / Spectrum Analyser System	Rohde & Schwarz	ESBI	DU:835862/018 RU:835387/006
M105	Fluke 77 DVM	Fluke	77	963580770
M127	Spectrum Analyser	Rohde & Schwarz	FSEB 30	842 659/016
M170	Thermometer/Barometer/ Hydrometer	Oregan Scientific	BA-116	None
M198	Thermal Power Sensor	Rohde & Schwarz	NRV-Z52	827 191/003
M199	Power Meter	Rohde & Schwarz	NRVS	827023/075
M244	Thermometer/Barometer/ Hygrometer	Oregan Scientific	BA 116	None
M505	Analyser Display Unit	Rohde & Schwarz	ESAI-D	825316/010
M506	RF unit	Rohde & Schwarz	ESBI-RF	827060/004
S003	Power Control	Zen	E08	736699
S201	Site 1	RFI	1	
S212	Site 12	RFI	12	
S215	Site 15	RFI	15	

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

Appendix 2. Measurement Methods

AC Mains Conducted Emissions

AC mains conducted emissions measurements were performed in accordance with the standard, against appropriate limits for each detector function.

The test was performed in a shielded enclosure with the equipment arranged as detailed in the standard on a wooden bench using the floor of the screened enclosure as the ground reference plane and with the EUT powered via a 60 Hz AC mains supply.

Initial measurements in the form of swept scans covering the entire measurement band were performed in order to identify frequencies on which the EUT was generating interference. In order to minimise the time taken for these swept measurements, a Peak detector was used in conjunction with the appropriate detector IF measuring bandwidths (see table below). Repetitive scans were performed to allow for emissions with low repetition rates, and the duty cycle of the EUT. The test configuration was the same for the initial scans as for the final measurements.

Following the initial scans, a graph was produced giving an overview of the emissions from the EUT plotted against the appropriate specification limit. A tolerance line was set 6 dB below the specification limit and levels above the tolerance line were re-tested (at individual frequencies) using the appropriate detector function.

The test equipment settings for conducted emissions measurements were as follows:

Receiver Function	**Initial Scan**	**Final Measurements**
Detector Type:	Peak	Quasi-Peak (CISPR)*
Mode:	Max Hold	Not applicable
Bandwidth:	9 kHz	9 kHz
Amplitude Range:	60 dB	20 dB
Measurement Time:	Not applicable	> 1 s
Observation Time:	Not applicable	> 15 s
Step Size:	Continuous sweep	Not applicable
Sweep Time:	Coupled	Not applicable

* In some instances an Average detector function may also have been used.

Radiated Field Strength Emissions

Radiated emissions measurements were performed in accordance with the standard, against appropriate limits for each detector function.

Initial measurements covering the entire measurement band in the form of swept scans in a shielded enclosure were performed in order to identify frequencies on which the EUT was generating interference. This determined the frequencies on which the EUT should be re-measured in full on the open area test site. In order to minimise the time taken for the swept measurements, a Peak detector was used in conjunction with the appropriate detector IF measuring bandwidth (see table below). Repetitive scans were performed to allow for emissions with low repetition rates, and for the duty cycle of the EUT. The test configuration was the same for the initial scans as for the final measurements.

The initial scans were performed using an antenna height of 1.5 m and a measurement distance of 3 m. Following the initial scans; graphs were produced giving an overview of the emissions from the EUT plotted against the appropriate specification limit. A tolerance line was set 6 dB below the specification limit and levels above the tolerance line were re-tested on the open area test site, at the appropriate distance, using a measuring receiver with a Quasi-Peak (below 1000 MHz), Average and Peak (above 1000 MHz) detector, where applicable.

For the main (final) measurements the EUT was arranged on a non-conducting table on an open area test site, as detailed in the specification.

All measurements on the open area test site were performed using broadband antennas.

On the open area test site, at each frequency where a signal was found, the levels were maximised by initially rotating the turntable through 360°. For frequencies below 1000 MHz, the antenna was varied in height between 1 m and 4 m. For frequencies above 1000 MHz, the antenna was fixed at a height of 1.5m. At this point, any signals found to be between the limit and a level 6 dB below it were further maximised by changing the configuration of the EUT, e.g. re-routing cables to peripherals and moving peripherals with respect to the EUT.

The test equipment settings for radiated emissions measurements were as follows:

Receiver Function	**Initial Scan Below 1000 MHz**	**Final Measurements Below 1000 MHz**
Detector Type:	Peak	Quasi-Peak (CISPR)
Mode:	Max Hold	Not applicable
Bandwidth:	100 kHz	120 kHz
Amplitude Range:	60 dB	20 dB
Measurement Time:	Not applicable	> 1 s
Observation Time:	Not applicable	> 15 s
Step Size:	Continuous sweep	Not applicable
Sweep Time:	Coupled	Not applicable

Receiver Function	**Initial Scan Above 1000 MHz**	**Final Measurements Above 1000 MHz**
Detector Type:	Peak	Peak/Average
Mode:	Max Hold	Not applicable
Bandwidth:	1 MHz	1 MHz
Amplitude Range:	60 dB	20 dB (typical)
Measurement Time:	Not applicable	> 1 s
Observation Time:	Not applicable	> 15 s
Step Size:	Continuous sweep	Not applicable
Sweep Time:	Coupled	Not applicable

Conducted Antenna Port Emissions

Conducted Antenna Port Emissions measurements were performed in accordance with the standard, against appropriate limits for each detector function.

Prior to testing being performed a suitable RF attenuator and cable were calibrated for the required frequency range. For each measurement range performed, the calibrated level of the attenuator and cable were entered as an offset into the spectrum analyser to compensate for the measurement set-up.

Initial measurements covering the entire measurement band in the form of swept scans were performed in order to identify frequencies on which the EUT was generating interference. This determined the frequencies on which measurements were performed. In order to minimise the time taken for the swept measurements, a Peak detector was used in conjunction with the appropriate detector IF measuring bandwidth (see table below). Repetitive scans were performed to allow for emissions with low repetition rates, and for the duty cycle of the EUT. The test configuration was the same for the initial scans as for the final measurements.

Due to the design of the EUT, conducted antenna port measurements were common for both the internal and external antenna connection.

To determine the transmitter output power, the EUT was operated as intended with the spectrum analyser operated in a maximum hold mode over the full operating frequency range of the EUT to identify the highest emission within the band.

To determine spurious emissions levels, the EUT was operated as intended with the spectrum analyser operated in a maximum hold mode over selected frequency ranges between 30 MHz and 26 GHz. A reference limit line of 20dB below the maximum output of the transmitter was noted. Levels within 20dB of this limit line were then recorded.

Channel Separation FCC 15.247(1)

The EUT and spectrum analyser was configured as for conducted antenna port measurements, And as per FCC Public Notice DA 00-705, Filing and Measurement Guidelines for Frequency Hopping Spread Spectrum Systems.

To determine the bandwidth and separation of each transmission channel the analyser was configured to measure two adjacent channels.

To determine the occupied bandwidth, A resolution bandwidth of 10 kHz was used, which is greater than 1% of the 20 dB bandwidth. A video bandwidth of a least the same value was used. The analyser was set for a maximum hold scan to capture the profile of the signal. The peak level was then determined, and a reference line was drawn 20dB below the peak level. The bandwidth was determined at the points where the 20dB reference crossed the profile of the emission.

Occupied Bandwidth FCC 15.247(1)

For channel separation, the analyser was configured with a resolution bandwidth and video bandwidth of at least 1% of the frequency span set on the analyser. A setting of 50 kHz was used.

The EUT was operated as intended and the analyser set to a maximum hold mode scan to capture the profile of the signals.

The peak points on the two adjacent channels were noted and the separation between them recorded.

The channel separation was then determined as the greater of 25kHz or the 20dB bandwidth.

Average Time of Occupancy FCC 15.247(1)(ii)

The EUT and spectrum analyser was configured as for conducted antenna port measurements

To determine the maximum packet length on any given channel, the analyser was configured in the time domain mode and the EUT was configured to operate as intended.

To determine the average occupancy time on any given channel the analyser was configured in the time domain and a 30 second sweep carried out. The number of times the channel was occupied in any 30 second period multiplied by the maximum packet length will give the total time on the given channel.

Number Of Hopping Frequencies FCC 15.247(a)(1)(ii)

The EUT and spectrum analyser was configured as for conducted antenna port measurements, And as per FCC Public Notice DA 00-705, Filing and Measurement Guidelines for Frequency Hopping Spread Spectrum Systems.

To determine the number of hopping frequencies the EUT was set to operate in its normal mode of operation, hopping over all channels that it is intended to operate on.

The spectrum analyser had a span set to cover the frequency band of operation. The resolution bandwidth was set to >= 1% of the span. The video bandwidth was set to be no less than the resolution bandwidth. The sweep was set to auto, the detector function to peak and trace to max hold. This test was also performed with the span set to the lower half the operating frequency range and then to the upper half of the operating frequency range for better resolution.

Peak Output Power FCC 15.247(b)

The EUT and spectrum analyser was configured as for conducted antenna port measurements, And as per FCC Public Notice DA 00-705, Filing and Measurement Guidelines for Frequency Hopping Spread Spectrum Systems.

A temporary antenna port was provided by the applicant to allow for conducted measurements.

As the frequency range of operation was greater than 10 MHz, The test was performed on the BOTTOM, MIDDLE and TOP channels as per FCC 15.31(m).

The tests were performed at extremes of voltage of +/- 15%. The test was also performed at 240 Volts + 15% at the applicants request.

The analyser was set-up as per FCC Public Notice DA 00-705.

Peak Power Spectral Density For Direct Sequence Systems FCC Part 15.247(d).

The EUT and spectrum analyser was configured as for conducted antenna port measurements.

A temporary antenna port was provided by the applicant to allow for conducted measurements.

As the frequency range of operation was greater than 10 MHz, The test was performed on the BOTTOM, MIDDLE and TOP channels as per FCC 15.31(m).

The tests were performed with a fully charged battery as specified in FCC Part 15.31(e) for battery operated devices:

Testing was performed on the Bottom, Middle and Top channels used for the accusation mode. Spectral power density in the 3 kHz bandwidth was then measured as specified in FCC Part 15.247(d).

Band Edge Compliance of RF Conducted Emissions FCC 15.247(c)

The EUT and spectrum analyser was configured as for conducted antenna port measurements, And as per FCC Public Notice DA 00-705, Filing and Measurement Guidelines for Frequency Hopping Spread Spectrum Systems.

A temporary antenna port was provided by the applicant to allow for conducted measurements.

To determine band-edge compliance, the analyser bandwidth resolution bandwidth was set to >= the analyser span. The video bandwidth was set to be no less than the resolution bandwidth. The sweep was set to auto and the detector to peak. The trace was set to max hold and a trace was produced.

A Plot of the upper channel and the protected band closest to the upper channel was produced. A marker was set to the peak of the highest channel and a delta marker set to the highest out of band peak. (The specification states that either the band edge level must be measured or the highest out of band emission. Which ever is greater). The plots show that the emission complies with the 20 dBc limit.

A Plot of the lower channel and the protected band closest to the lower channel was produced. A marker was set to the peak of the lowest channel and a delta marker set to the highest out of band peak. (The specification states that either the band edge level must be measured or the highest out of band emission. Which ever is greater). The plots show that the emission complies with the 20 dBc limit.

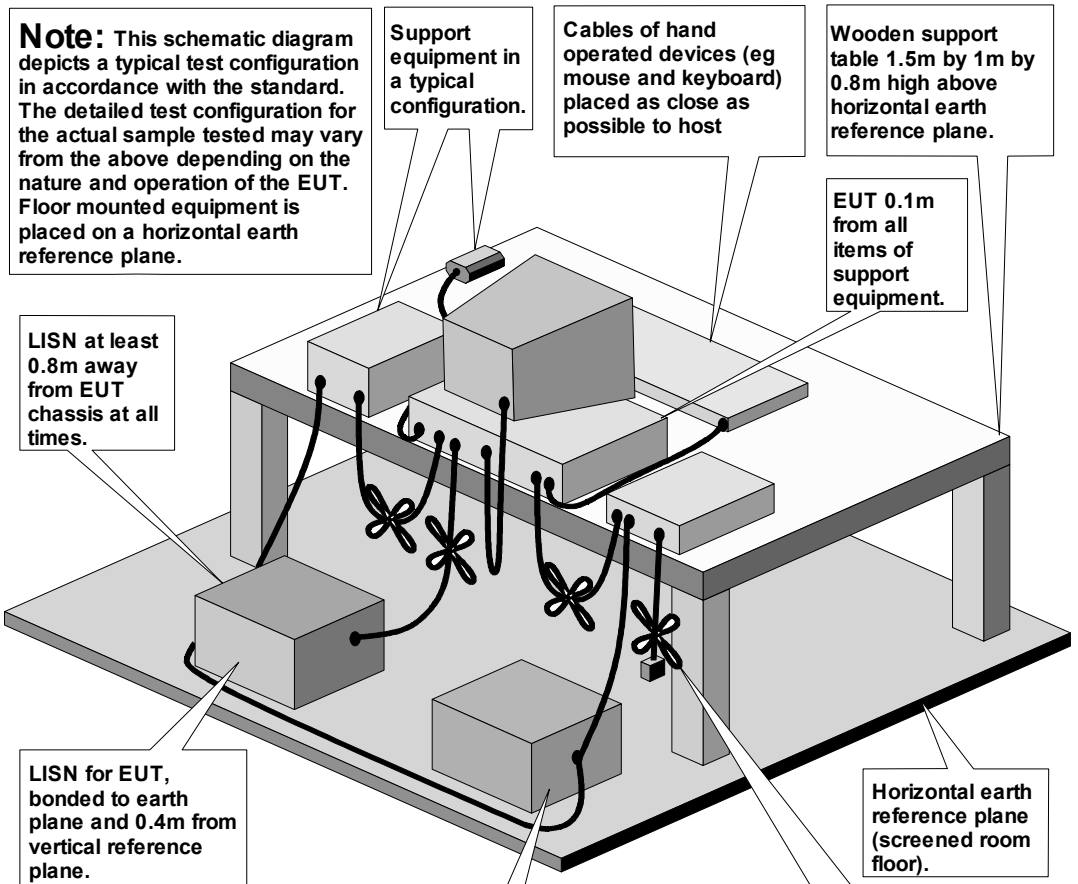
Four plots were produced; Two times top and bottom channels with hopping on and two time top and bottom channels with hopping off.

Appendix 3. Test Configuration Drawings

This appendix contains the following drawings:

Drawing Reference Number	Title
DRG\43844JD02\EMICON	Test configuration for measurement of conducted emissions
DRG\43844JD02\EMIRAD	Test configuration for measurement of radiated emissions
DRG\43844JD02\001	Test configuration for Conducted RF Antenna Port
DRG\43844JD02\002	Schematic diagram of the EUT, support equipment and interconnecting cables used for the test

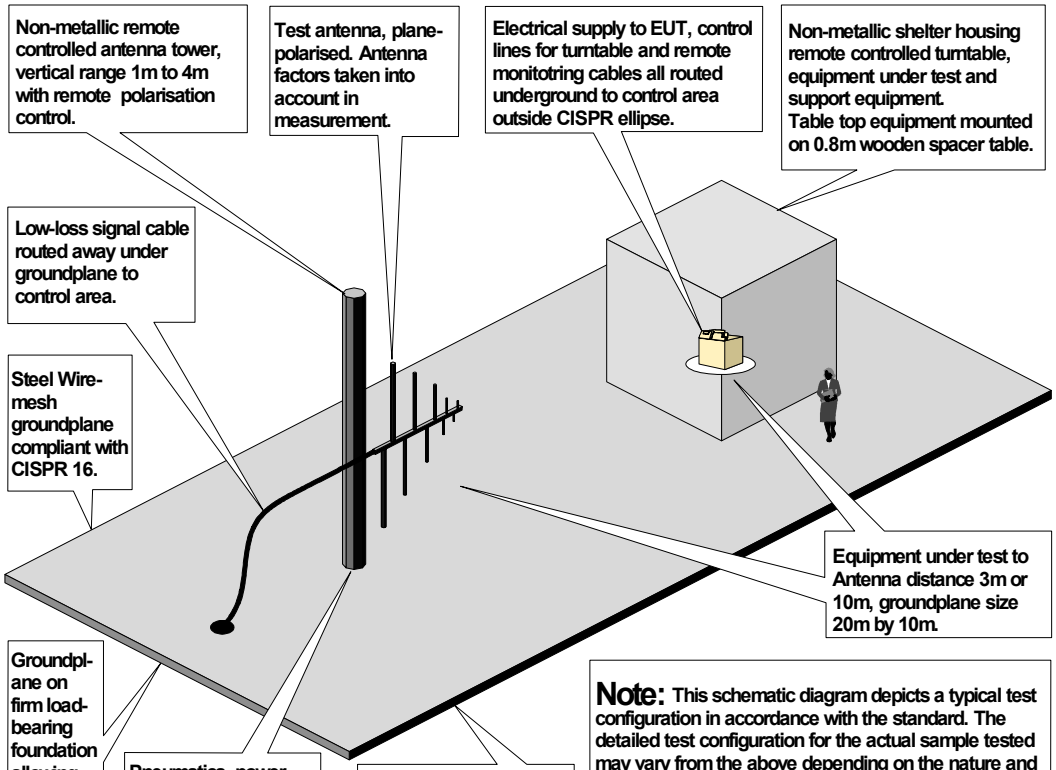
DRG\43844JD02\EMICON



Typical Test Configuration For Conducted Emissions Measurements In Accordance With ANSI C63.4-1992
Tests performed in a screened enclosure

Test Of: **Red-M (Communications) Ltd.**
Basic Access Point (BAP950AP)
To: **F.C.C. Part 15 Subpart C: 2000 (Intentional Radiators) Section 15.247**

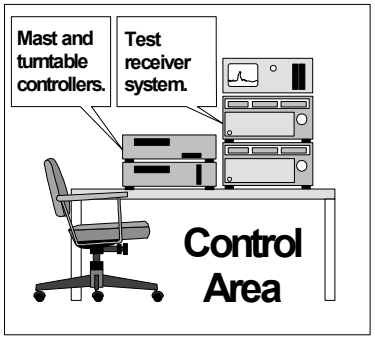
DRG\43844JD02\EMIRAD



Note: This schematic diagram depicts a typical test configuration in accordance with the standard. The detailed test configuration for the actual sample tested may vary from the above depending on the nature and operation of the EUT.
The test site used by RFI is nominally at ground level.
All electrical cables run underground.
All other dimensions in accordance with the standard.

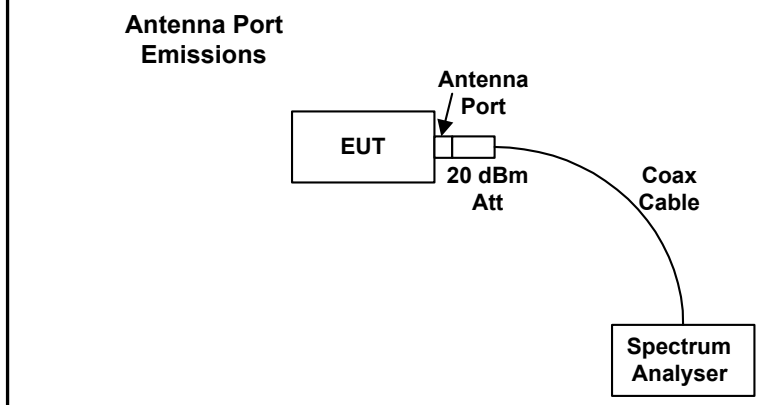
Test Configuration For Radiated Emissions Measurements

Reflection-free area: >60m by 52m (CISPR ellipse)
Groundplane Earthed
Control room outside CISPR ellipse

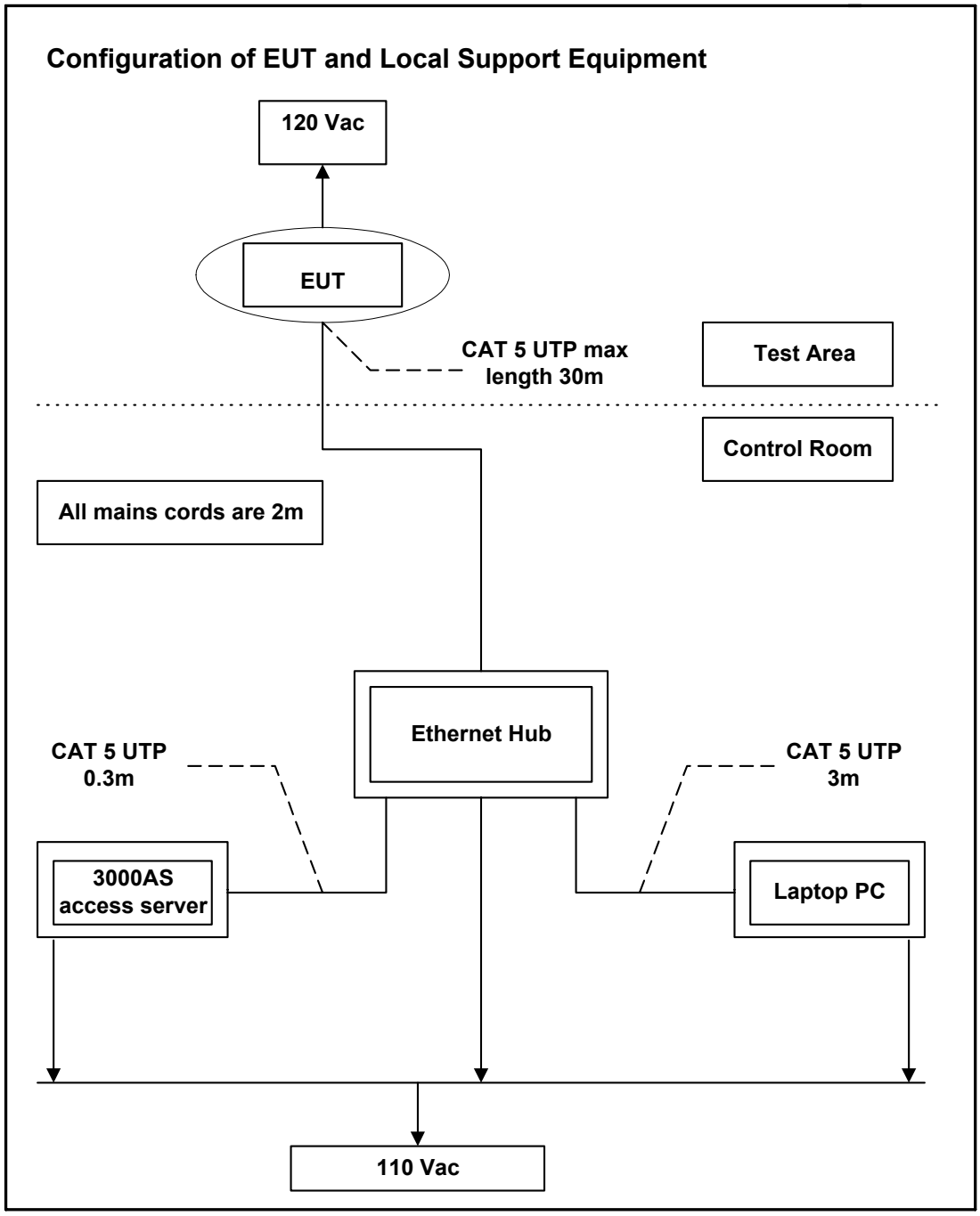


DRG\43844JD02\001

Conducted RF Antenna Port Configuration



DRG\43844JD02\002



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