
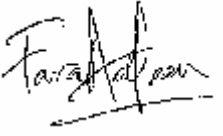



TEST REPORT FROM RFI GLOBAL SERVICES LTD

Test of: Coronis Systems.
Wavetherm.

To: FCC Part 15.247

Test Report Serial No:
RFI/MPTE3/RP46762JD06A
Supersedes Test Report Serial No:
RFI/MPTE2/RP46762JD06A

This Test Report Is Issued Under The Authority Of Andrew Brown, Operations Manager: 	
Tested By: Steve Wong  pp	Checked By: Nigel Davison 
Report Copy No: PDF01	
Issue Date: 14 March 2005	Test Dates: 08 February 2005 to 11 February 2005

This report is issued in Adobe Acrobat portable document format (PDF). It is only a valid copy of the report if it is being viewed in PDF format with the following security options not allowed: Changing the document, Selecting text and graphics, Adding or changing notes and form fields. Furthermore, the date of creation must match the issue date stated above.

This report may be copied in full. The results in this report apply only to the sample(s) tested.

RFI Global Services Ltd

Pavilion A, Ashwood Park, Ashwood Way, Basingstoke, Hampshire RG23 8BG

Telephone: +44 (0)1256 312000 Facsimile: +44 (0)1256 312001

Email: info@rfi-global.com Website: www.rfi-global.com

Registered in England and Wales. Company number: 2117901

Test of: **Coronis Systems.**
 Wavetherm.
To: **FCC Part 15.247**

This page has been left intentionally blank.

Test of: Coronis Systems.
 Wavetherm.
To: FCC Part 15.247

Table of Contents

1. Client Information4

2. Equipment Under Test (EUT)5

3. Test Specification, Methods and Procedures8

4. Deviations from the Test Specification9

5. Operation of the EUT During Testing10

6. Summary of Test Results11

7. Measurements, Examinations and Derived Results12

8. Measurement Uncertainty26

9. Measurement Methods27

Appendix 1. Test Equipment Used34

Appendix 2. Test Configuration Drawings.....35

Test of: Coronis Systems.
Wavetherm.
To: FCC Part 15.247

1. Client Information

Company Name:	Coronis Systems.
Address:	290 rue Alfred Nobel 3400 Montpellier France
Contact Name:	Fabien Bonjour

Test of: Coronis Systems.
Wavetherm.
To: FCC Part 15.247

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:	Coronis Systems
Model Name or Number:	Wavetherm
Unique Type Identification:	US
Serial Number:	013304600006
FCC ID Number:	S28 WFL
Country of Manufacture:	China and France
Date of Receipt:	02 December 2004

2.2. Description of EUT

The equipment under test is a Telemetry wireless product suited for monitoring applications.

2.3. Modifications Incorporated in the EUT

During the course of testing the EUT was not modified.

Test of: Coronis Systems.
Wavetherm.
To: FCC Part 15.247

2.4. Additional Information Related to Testing

Power Supply Requirement:	Internal battery supply of 3.6 V		
Intended Operating Environment:	Residential , Commercial and Light Industry		
Equipment Category:	Short Range (Low Power)		
Type of Unit:	Portable (Standalone battery powered devise)		
Interface Ports:	Enclosure		
Transmit Frequency Range:	907.0272 MHz to 921.4848 MHz		
Transmit Channels Tested:	Channel ID	Channel Number	Channel Frequency (MHz)
	Bottom	01	907.0272
	Middle	79	913.9392
	Top	FA	921.3696
Highest Unintentionally Generated Frequency:	1842.9696 MHz		
Receive Frequency Range:	907.0272 MHz to 921.4848 MHz		
Receive Channels Tested:	Channel ID	Channel Number	Channel Frequency (MHz)
	Bottom	01	907.0272
	Middle	79	913.9392
	Top	FA	921.3696
Highest Unintentionally Generated Frequency:	1842.3000 MHz		
Highest Fundamental Frequency:	921.3696 MHz		
Occupied Bandwidth:	40 kHz		

Test of: Coronis Systems.
To: Wavetherm.
FCC Part 15.247

2.5. Support Equipment

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

Description:	Waveport
Brand Name:	Coronis Systems
Model Name or Number:	Waveport
Serial Number:	013E04600003
Cable Length and Type:	RS232 Link <3m
Connected to Port:	RF Link (Air)

Description:	AC / DC Adaptor
Brand Name:	Mascot
Model Name or Number:	5013455002
Serial Number:	None Stated
Cable Length and Type:	Female Jack, 1.5m
Connected to Port:	DC supply of waveport

Description:	Serial Cable
Brand Name:	None Stated
Model Name or Number:	None Stated
Serial Number:	None Stated
Cable Length and Type:	9 Pin Serial, 1.5m
Connected to Port:	Serial Port of Waveport

Test of: **Coronis Systems.**
 Wavetherm.
To: **FCC Part 15.247**

3. Test Specification, Methods and Procedures

3.1. Test Specifications

Reference:	FCC Part 15 Subpart C: 2004 (Sections 15.247).
Title:	Code of Federal Regulations, Part 15 (47CFR215) Radio Frequency Devices.

3.2. 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 (1996)

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.

DA00-705 (2000)

Title: Filing and Frequency Measurement Guidelines for Frequency Hopping Spread Spectrum Systems.

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.

Test of: Coronis Systems.
Wavetherm.
To: FCC Part 15.247

4. Deviations from the Test Specification

None.

Test of: Coronis Systems.
Wavetherm.
To: FCC Part 15.247

5. Operation of the EUT During Testing

5.1. Operating Modes

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

The EUT was set to maximum power on top, bottom and middle channels and hopping mode.

5.2. Configuration and Peripherals

The EUT was tested in the following configuration:

Standalone.

Test of: Coronis Systems.
Wavetherm.
To: FCC Part 15.247

6. Summary of Test Results

Range of Measurements	Specification Reference	Port Type	Compliance Status
Receiver Radiated Spurious Emissions	C.F.R. 47 FCC Part 15: 2004 Section 15.109	Antenna	Complied
Transmitter 20 dB Bandwidth	C.F.R. 47 FCC Part 2: 2004 Section 2.1049	Antenna	Complied
Transmitter Carrier Frequency Separation	C.F.R. 47 FCC Part 15: 2004 Section 15.247(a)(1)(i)	Antenna	Complied
Transmitter Average Time of Occupancy	C.F.R. 47 FCC Part 15: 2004 Section 15.247(a)(1)(i)	Antenna	Complied
Transmitter Maximum Peak Output Power	C.F.R. 47 FCC Part 15: 2004 Section 15.247(b)(3)	Antenna	Complied
Transmitter Radiated Emissions	C.F.R. 47 FCC Part 15: 2004 Sections 15.247(c) & 15.209(a)	Antenna	Complied
Transmitter Band Edge Radiated Emissions	C.F.R. 47 FCC Part 15: 2004 Sections 15.247(c) & 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, England.

Test of: Coronis Systems.
Wavetherm.
To: FCC Part 15.247

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.

Test of: Coronis Systems.
Wavetherm.
To: FCC Part 15.247

7.2. Receiver Radiated Spurious Emissions: Section 15.109

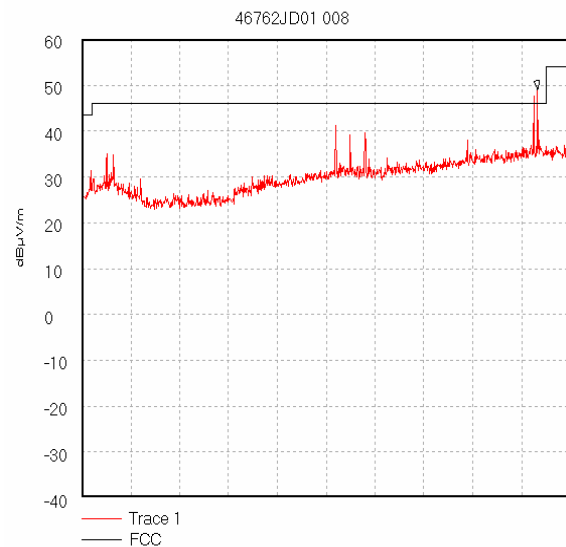
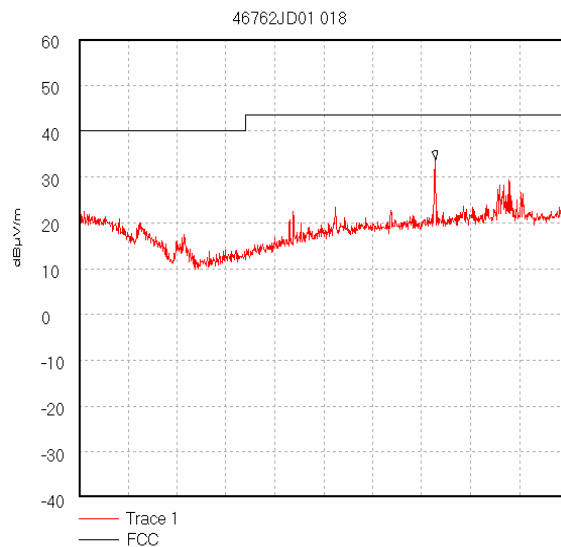
7.2.1. Electric Field Strength Measurements (Frequency Range: 30 to 1000 MHz)

The EUT was configured as for radiated emissions testing as described in Section 8 of this report.

Tests were performed to identify the maximum receiver or standby radiated emissions levels.

Results:

Frequency (MHz)	Antenna Polarity	Q-P Level (dB μ V/m)	Limit (dB μ V/m)	Margin (dB)	Result
153.294	Vert.	33.2	43.5	10.3	Complied



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

Test of: Coronis Systems.
Wavetherm.
To: FCC Part 15.247

Receiver Radiated Emissions: Section 15.109 (Continued)

7.2.2. Electric Field Strength Measurements (Frequency Range: 1 to 9.5 GHz)

Results:

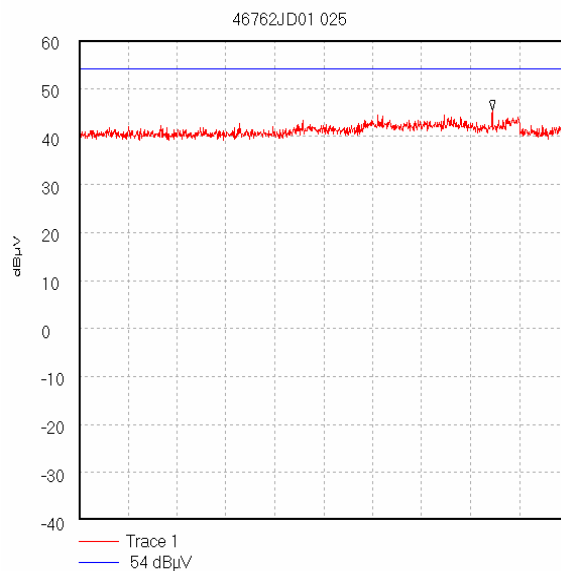
Highest Peak Level:

Frequency (GHz)	Antenna Polarity	Peak Detector Level (dBμV)	Antenna Factor (dB)	Cable Loss (dB)	Actual Peak Level (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Result
9.495*	Vert.	14.0	30.4	1.8	46.2	54.0	7.8	Complied

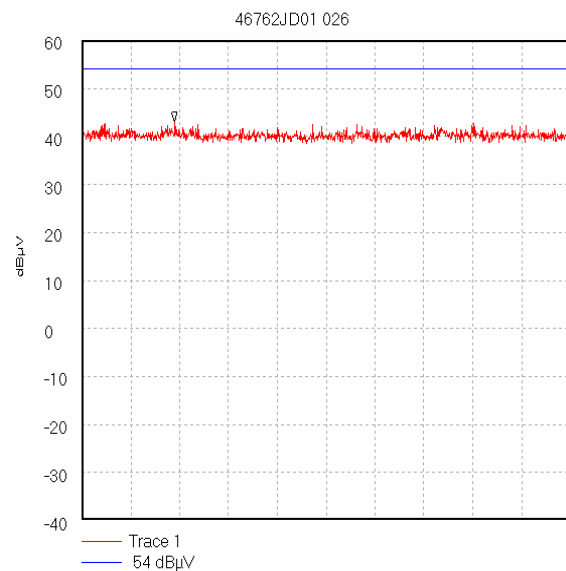
Note(s):

The peak level was compared to the average limit as opposed to being compared to the peak limit because this is the more ominous limit.

** No spurious emissions were detected above the noise floor of the measuring receiver therefore, the highest peak noise floor reading of the measuring receiver was recorded as shown in the table above.*



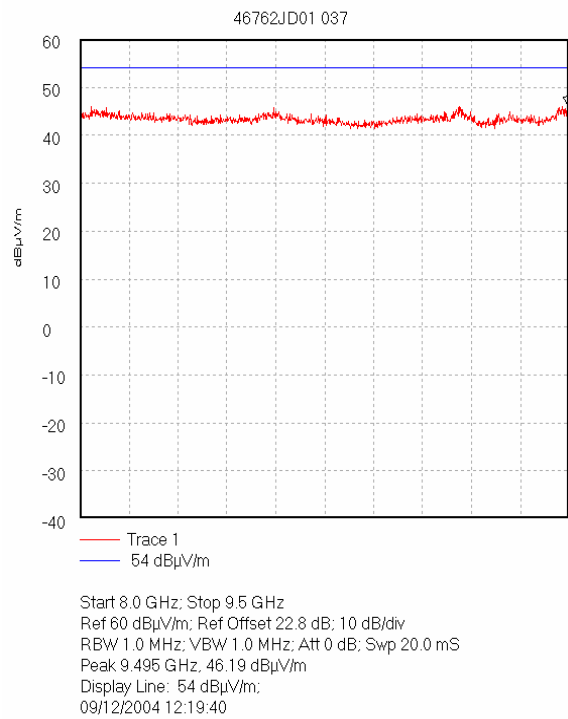
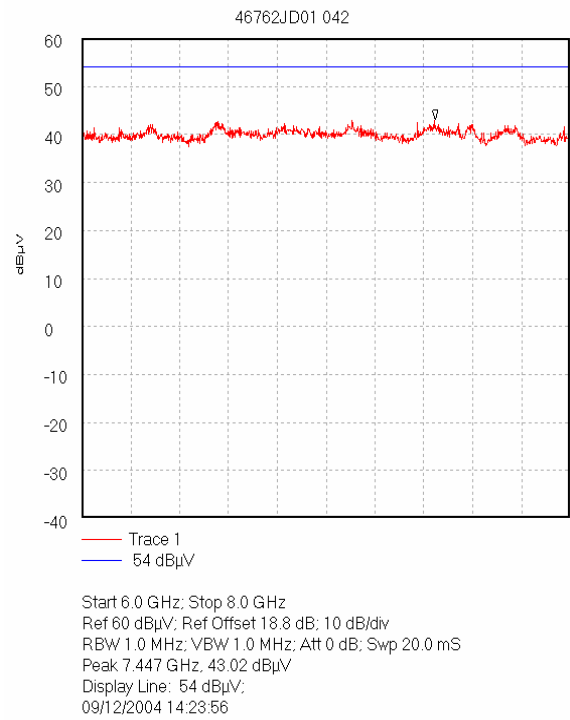
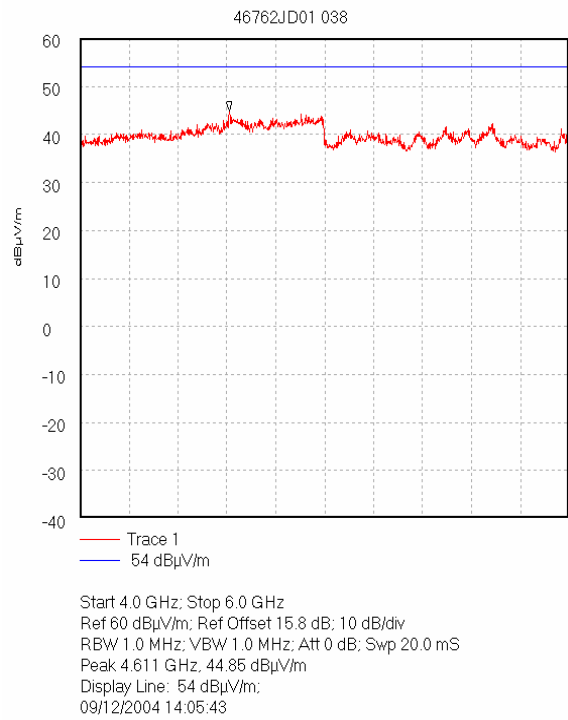
Start 1.0 GHz; Stop 2.0 GHz
Ref 60 dBμV; Ref Offset 0.0 dB; 10 dB/div
RBW 1000.0 kHz; VBW 1.0 MHz; Att 0 dB; Swp 20.0 mS
Peak 1.845556 GHz, 45.43 dBμV
Display Line: 54 dBμV; ; Limit Test Passed
02/12/2004 14:40:43



Start 2.0 GHz; Stop 4.0 GHz
Ref 60 dBμV; Ref Offset 0.0 dB; 10 dB/div
RBW 1000.0 kHz; VBW 1.0 MHz; Att 0 dB; Swp 20.0 mS
Peak 2.38 GHz, 43.07 dBμV
Display Line: 54 dBμV; ; Limit Test Passed
02/12/2004 14:42:16

Test of: Coronis Systems.
Wavetherm.
To: FCC Part 15.247

Receiver Radiated Emissions: Section 15.109 (Continued)



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

Test of: Coronis Systems.
 Wavetherm.
To: FCC Part 15.247

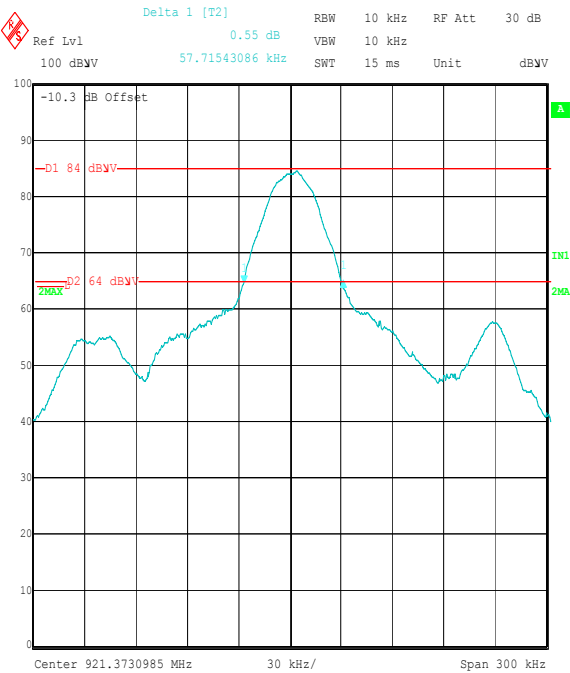
7.3. Transmitter 20 dB Bandwidth: Section 2.1049

The EUT was configured as for 20 dB bandwidth measurements as described in Section 8 of this report.

Tests were performed to identify the 20 dB bandwidth.

Results:

Transmitter 20 dB Bandwidth (kHz)	Limit (kHz)
57.715	≤500



Title: Coronis Systems EUT: Wavetherm. FCC P15.247. 20 dB Bandwidth
Comment A: 46762JD02 hopping
Date: 10.DEC.2004 10:54:21

Test of: Coronis Systems.
Wavetherm.
To: FCC Part 15.247

7.4. Transmitter Carrier Frequency Separation: Section 15.247(a)(1)(i)

The EUT was configured as for carrier frequency separation measurements as described in Section 8 of this report.

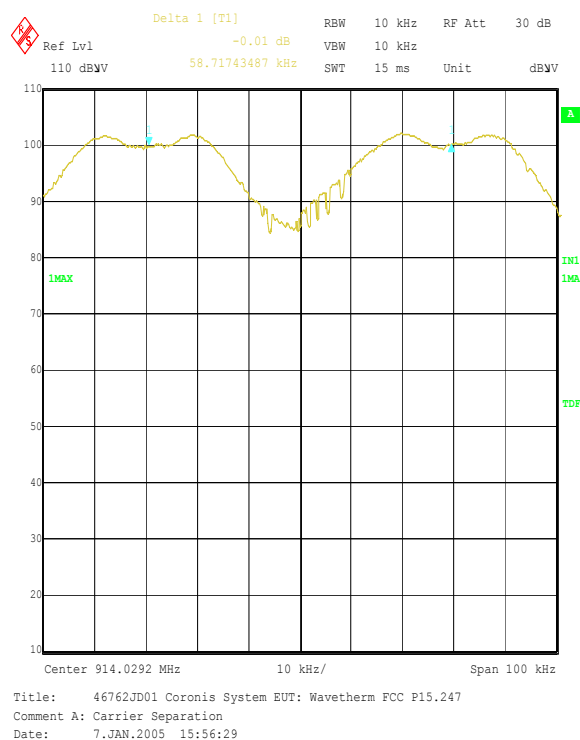
Tests were performed to identify the carrier frequency separation.

Results:

Transmitter Carrier Frequency Separation (kHz)	Limit* (> 20 dB BW) (kHz)	Margin (kHz)	Result
58.717	57.715	1.002	Complied

Note(s):

*Limit is > 20 dB bandwidth or 25 kHz whichever is the greater.



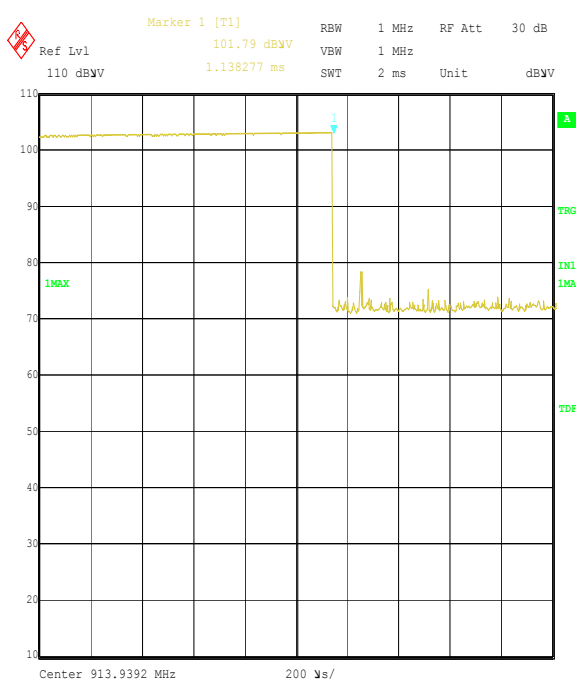
Test of: Coronis Systems.
 Wavetherm.
To: FCC Part 15.247

7.5. Transmitter Average Time of Occupancy: Section 15.247(a)(1)(i)

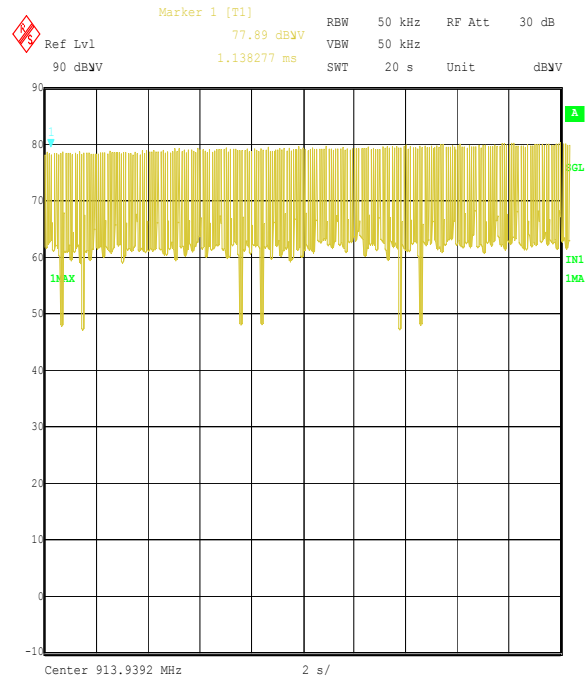
The EUT was configured as for average time of occupancy measurements as described in Section 8 of this report.

Results:

Emission Width (μs)	Number of Hops in 20 Seconds	Average Time of Occupancy (s)	Limit (s)	Margin (s)	Result
1138.277	231	0.263	≤0.4	0.137	Complied



Title: 46762JD01 Coronis System EUT: Wavetherm FCC P15.247
Comment A: Emission Width
Date: 7.JAN.2005 15:59:11



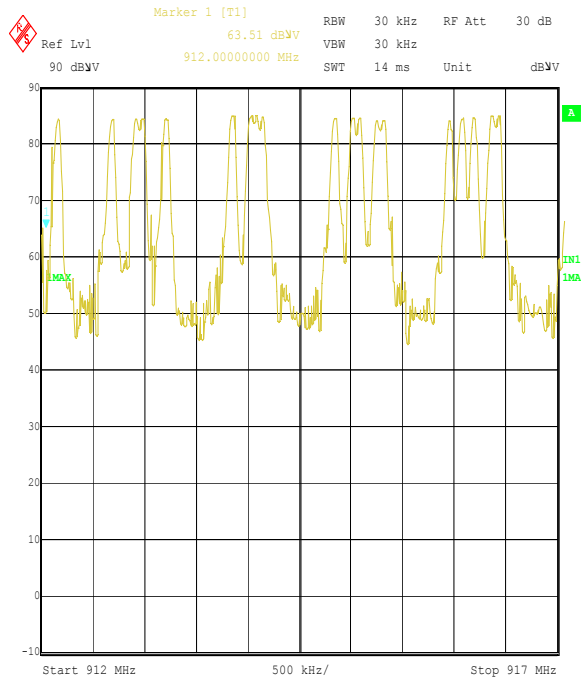
Title: 46762JD01 Coronis System EUT: Wavetherm FCC P15.247
Comment A: Number of Hops in 20 seconds
Date: 7.JAN.2005 16:01:17

Test of: Coronis Systems.
Wavetherm.
To: FCC Part 15.247

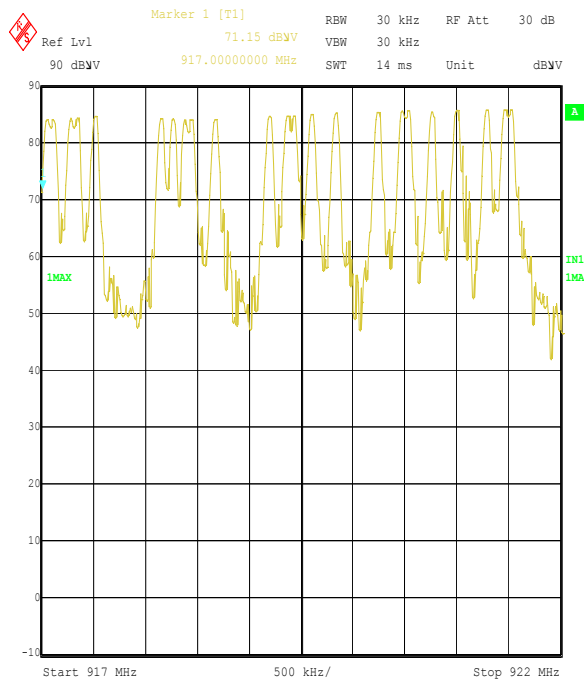
Transmitter Average Time of Occupancy: Section 15.247(a)(1)(i) (Continued)



Title: 46762JD01 Coronis System EUT: Wavetherm FCC P15.247
Comment A: Number of Hopping Channels
Date: 7.JAN.2005 16:06:09



Title: 46762JD01 Coronis System EUT: Wavetherm FCC P15.247
Comment A: Number of Hopping Channels
Date: 7.JAN.2005 16:07:26



Title: 46762JD01 Coronis System EUT: Wavetherm FCC P15.247
Comment A: Number of Hopping Channels
Date: 7.JAN.2005 16:08:40

Test of: Coronis Systems.
Wavetherm.
To: FCC Part 15.247

7.6. Transmitter Maximum Peak Output Power: (EIRP) Section 15.247(b)(3)

The EUT was configured as for transmitter peak output power measurements as described in Section 8 of this report.

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

The effective isotropic radiated power (EIRP) was calculated by adding the manufacturer's declared antenna gain to the figure measured for conducted RF output power.

Results:

Channel	EIRP (dBm)	Limit (dBm)	Margin (dB)	Result
Bottom	3.4	30.0	26.6	Complied
Middle	3.1	30.0	26.9	Complied
Top	1.5	30.0	28.5	Complied

Note(s):

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

Test of: Coronis Systems.
Wavetherm.
To: FCC Part 15.247

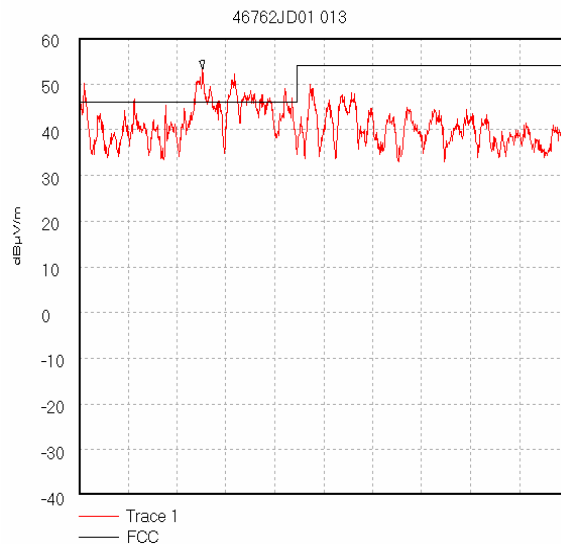
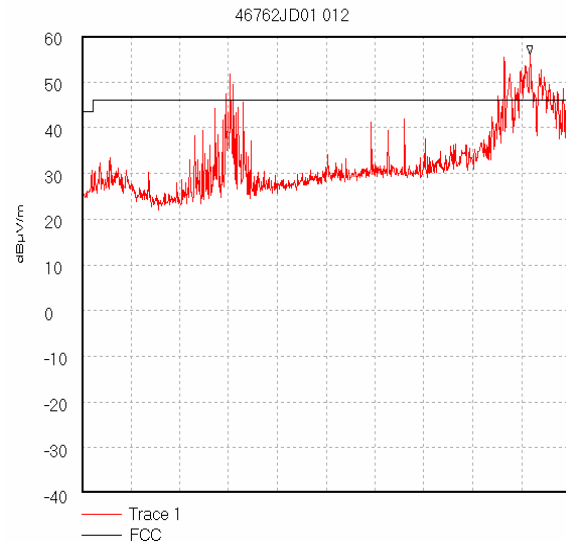
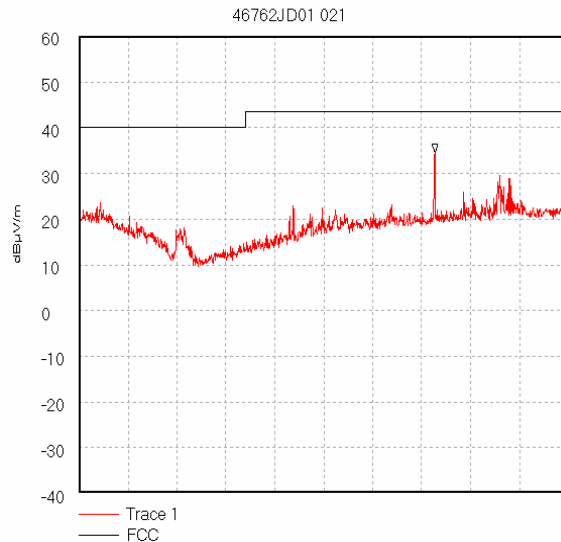
7.7. Transmitter Radiated Emissions: Section 15.247(c) and 15.209(a)**7.7.1. Electric Field Strength Measurements: 30 to 1000 MHz (emissions outside the restricted bands)****Results:****Top Channel**

Frequency (MHz)	Antenna Polarity	Peak Level (dB μ V/m)	-20 dBc Limit (dB μ V/m)	Margin (dB)	Result
153.294	Vert.	34.0	80.8	46.8	Complied
176.024	Horiz.	30.9	80.8	49.9	Complied
179.266	Vert.	35.1	80.8	45.7	Complied
412.881	Vert.	36.7	80.8	44.1	Complied
807.092	Vert.	49.9	80.8	30.9	Complied
844.032	Vert.	44.8	80.8	36.0	Complied
928.628	Vert.	49.8	80.8	31.0	Complied
950.783	Vert.	46.6	80.8	34.2	Complied

Note(s):

The preliminary scans showed similar emission levels for each mode below 1 GHz, therefore final radiated emissions measurements were performed with the EUT set to the top channel only.

Test of: Coronis Systems.
Wavetherm.
To: FCC Part 15.247

Transmitter Radiated Emissions: Section 15.247(c) and 15.209(a) (Continued)

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

Test of: Coronis Systems.
Wavetherm.
To: FCC Part 15.247

Transmitter Radiated Emissions: Section 15.247(c) and 15.209(a) (Continued)

Electric Field Strength Measurements (Frequency Range: 1 to 9.5 GHz) (emissions occurring in the restricted bands)

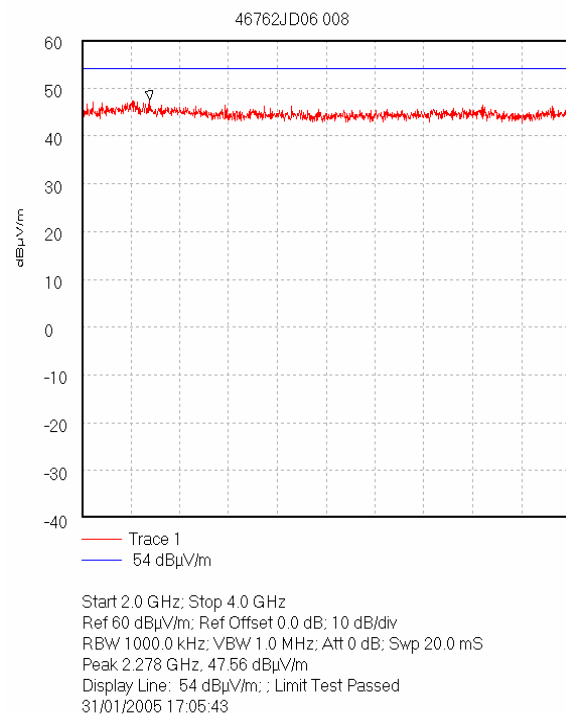
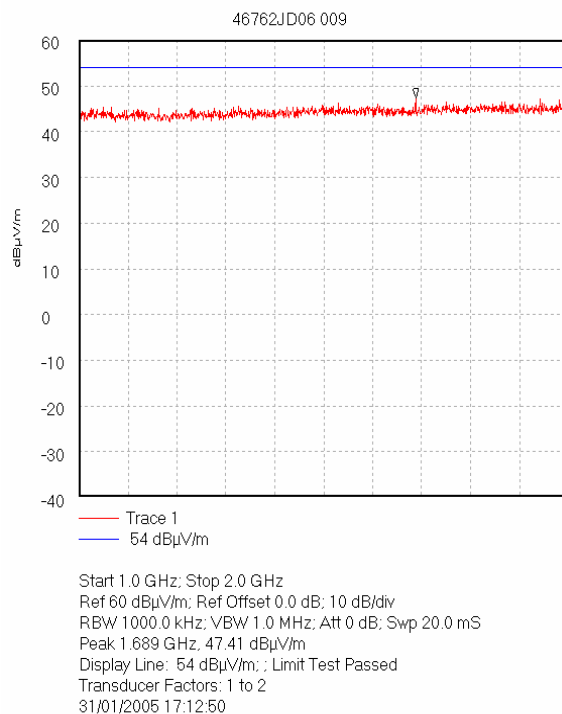
Highest Peak Level: Top Channel

Frequency (GHz)	Antenna Polarity	Detector Level (dBμV)	Antenna Factor (dB)	Cable Loss (dB)	Actual Peak Level (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Result
5.687*	Vert.	14.4	24.4	1.97	40.8	54.0	13.2	Complied

Note(s):

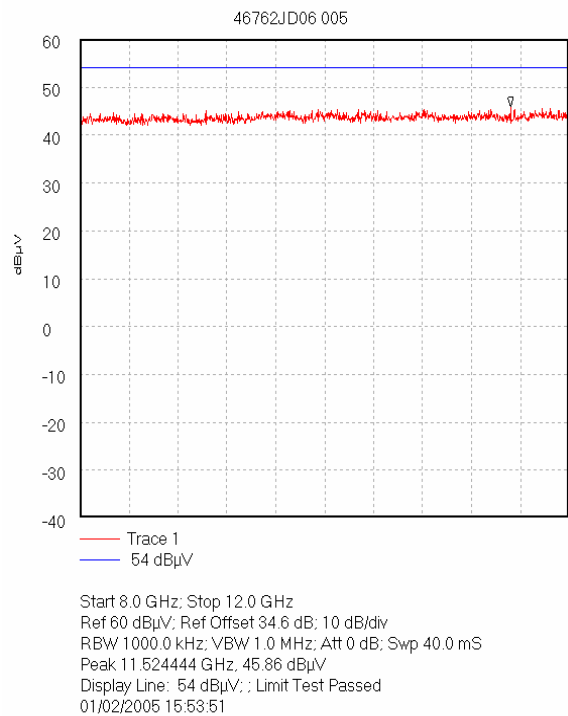
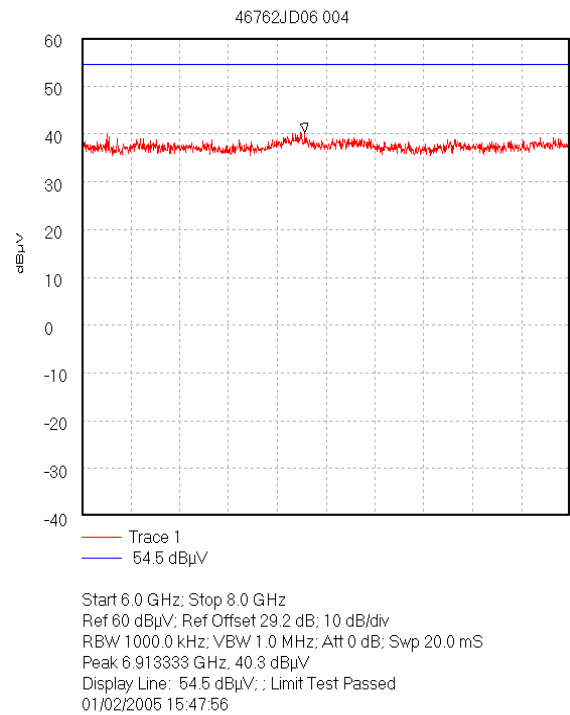
The peak level was compared to the average limit as opposed to being compared to the peak limit because this is the more ominous limit.

* No spurious emissions were detected above the noise floor of the measuring receiver therefore, the highest peak noise floor reading of the measuring receiver was recorded as shown in the table above.



Test of: Coronis Systems.
Wavetherm.
To: FCC Part 15.247

Transmitter Radiated Emissions: Section 15.247(c) and 15.209(a) (Continued)



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

Test of: Coronis Systems.
Wavetherm.
To: FCC Part 15.247

7.8. Transmitter Band Edge Radiated Emissions: Section 15.247(c) & 15.209(a)

7.8.1. Electric Field Strength Measurements

The EUT was configured as for transmitter conducted emissions measurements as described in Section 9 of this report.

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

Results:

Peak Power Level Hopping Mode:

Frequency (MHz)	Antenna Polarity	Detector Level (dB μ V)	Antenna Factor (dB)	Cable Loss (dB)	Actual Level (dB μ V/m)	Limit (dB μ V/m)	Margin (dB)	Result
902	Vert.	27.6	23.0	4.4	55.0	80.8*	25.8	Complied
928	Vert.	25.6	23.0	4.4	53.0	78.9*	25.9	Complied

Peak Power Level Static Mode:

Frequency (MHz)	Antenna Polarity	Detector Level (dB μ V)	Antenna Factor (dB)	Cable Loss (dB)	Actual Level (dB μ V/m)	Limit (dB μ V/m)	Margin (dB)	Result
902	Vert.	31.6	23.0	4.4	59.0	80.8*	21.8	Complied
928	Vert.	30.9	23.0	4.4	58.3	78.9*	20.6	Complied

Note(s):

* -20 dBc limit.

Test of: Coronis Systems.
Wavetherm.
To: FCC Part 15.247

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
Transmitter Maximum Peak Output Power	Not applicable	95%	+/- 1.78 dB
Transmitter Carrier Frequency Separation	Not applicable	95%	+/- 0.01 dB
20 dB Bandwidth	Not applicable	95%	+/- 0.12 dB
Transmitter Average Time of Occupancy	Not applicable	95%	+/- 10 %
Radiated Spurious Emissions	30 MHz to 1000 MHz	95%	+/- 5.26 dB
Radiated Spurious Emissions	1 GHz to 40 GHz	95%	+/- 1.78 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.

Test of: Coronis Systems.
Wavetherm.
To: FCC Part 15.247

9. Measurement Methods

9.1. Radiated 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.

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. Any emission within 20 dB of the limit were then measured on the open area test site, except in cases where the noise floor was within 20 dB of the limit, in these cases the highest point of the noise floor was measured.

Where an emission fell inside a restricted band, measurements were made at the appropriate test distance using a measuring receiver with a Quasi-Peak detector for measurements below 1000 MHz and an Average and Peak detector for measurements above 1000 MHz. A peak detector was used for all other measurements.

For the final measurements the EUT was arranged on a non-conducting turn table on a standard test site compliant with ANSI C63.4 – 2001 Clause 5.4.

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 to be measured, the trace was maximised by rotating a turntable through 360°. The angle at which the maximum signal was observed was locked out. For frequencies below 1000 MHz the test antenna was varied in height between 1 m and 4 m in order to further maximise the target emission.

For frequencies above 1000 MHz where a horn antenna was used, height searching was performed to locate the optimal height of the horn with respect to the EUT. At this point the horn was locked off and the turntable was again rotated through 360° to maximise the target signal. It should be noted that the received signal from the EUT would diminish very quickly after it exits the beam width of the horn antenna, for this reason it may not be necessary to fully height search with the horns.

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.

Test of: Coronis Systems.
Wavetherm.
To: FCC Part 15.247

Radiated Emissions (Continued)

Scans were performed to the upper frequency limits as stated in Section 15.33

The final field strength was determined as the indicated level in dB μ V plus cable loss and antenna factor.

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

Receiver Function	Initial Scan	Final Measurements Below 1 GHz	Final Measurements Above 1 GHz
Detector Type:	Peak	Quasi-Peak (CISPR)	Peak / Average
Mode:	Max Hold	Not applicable	Max Hold
Bandwidth:	(120 kHz < 1 GHz) (1 MHz > 1 GHz)	120 kHz	1 MHz
Amplitude Range:	100 dB	100 dB	100 dB
Step Size:	Continuous sweep	Not applicable	Not applicable
Sweep Time:	Coupled	Not applicable	Not applicable

Test of: Coronis Systems.
Wavetherm.
To: FCC Part 15.247

9.2. Carrier Frequency Separation / 20 dB Bandwidth

The EUT and spectrum analyser was configured as for radiated 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 measurement analyser was configured to measure two adjacent channels whilst the EUT was in hopping mode. The spectrum analyser was configured with a resolution bandwidth and video bandwidth greater than 1% of the frequency span.

The analyser was set for a maximum hold scan to capture the profile of the signal. The peak points on the two adjacent channels were noted and the separation between them recorded.

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, at 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 20 dB below the peak level.

The bandwidth was determined at the points where the 20 dB reference line intercepted the power envelope of the emission.

Test of: Coronis Systems.
Wavetherm.
To: FCC Part 15.247

9.3. Average Time of Occupancy

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

First the maximum packet length was determined on the centre channel.

The measurement analyser was configured to the time domain mode by setting the span to zero with a sweep time sufficiently wide enough to measure one pulse.

The EUT was configured to operate in normal mode of operation. The pulse width of one transmission was then recorded. The measurement analyser was then configured in zero span i.e. in the time domain and the sweep time was set to 20 seconds.

The number of transmissions within this period was noted and multiplied by the pulse width recorded earlier. This gives the maximum occupancy over 20 seconds.

Test of: Coronis Systems.
Wavetherm.
To: FCC Part 15.247

9.4. Effective Isotropic Radiated Power (EIRP)

EIRP measurements were performed in accordance with the standard, against appropriate limits.

The EIRP was measured with the EUT arranged on a non-conducting turn table on a standard test site compliant with ANSI C63.4 – 2001 Clause 5.4. The transmitter was fitted with an integral antenna; therefore all radiated tests were performed with the unit operating into the integral antenna.

The level of the EIRP was measured using a spectrum analyser.

The test antenna was positioned in the horizontal plane. The EUT was oriented in the X plane. The test antenna was then raised and lowered until a maximum peak was observed. The turntable was then rotated through 360 degrees and the maximum peak reading obtained. The height search was then repeated to take into consideration the new angular position of the turntable. The maximum reading observed was then recorded. This procedure was then repeated with the EUT oriented in the Y and Z planes. The highest reading taken in all 3 planes was recorded. The entire procedure was then repeated with the test antenna set in the Vertical polarity.

Once the final amplitude (maximised) had been obtained, the EUT was substituted with a horn antenna. The centre of the substitution antenna was set to approximately the same centre location as the EUT. The substitution antenna was set to the horizontal polarity. The substitution antenna was matched into a signal generator using a 6 dB or greater attenuator. The signal generator was tuned to the EUT's frequency under test.

The test antenna was then raised and lowered to obtain a maximum reading on the spectrum analyser. The level of the signal generator output was then adjusted until the maximum recorded EUT level was observed. The signal generator level was noted. This procedure was repeated with both test antenna and substitution antenna vertically polarised. The EIRP was calculated as:-

$$\text{EIRP} = \text{Signal Generator Level} - \text{Cable Loss} + \text{Antenna Gain}$$

Test of: Coronis Systems.
Wavetherm.
To: FCC Part 15.247

Effective Isotropic Radiated Power (EIRP) (Continued)

Circumstances where the signal generator could not produce the desired power substitution was performed with the signal generator set to 0 dBm. The radiated signal was maximised as previously described. The level indicated on the measuring receiver was noted. The delta between this level and the maximum level for the EUT was calculated and also noted. The EIRP of the signal generator was calculated using the above formulae. The recorded delta was added to the calculated EIRP to obtain the substituted EUT EIRP.

$$\text{Delta (dB)} = \text{EUT} - \text{SG}$$

where :

EUT = spectrum analyser indicated EUT raw level

SG = spectrum analyser indicated signal generator raw level

The signal generator actual EIRP is calculated as:

$$\text{EIRP SG} = \text{Signal Generator Level} - \text{Cable Loss} + \text{Antenna Gain}$$

The EUT EIRP is calculated as:

$$\text{EIRP EUT} = \text{EIRP SG} + \text{Delta.}$$

The test equipment settings for EIRP measurements were as follows:

Receiver Function	Setting
Detector Type:	Peak
Mode:	Not applicable
Bandwidth:	1 MHz
Amplitude Range:	100 dB
Sweep Time:	Coupled

Test of: Coronis Systems.
Wavetherm.
To: FCC Part 15.247

9.5. Band Edge Compliance of RF Radiated Emissions

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

To determine band edge compliance, the receiver resolution bandwidth was set to $\geq 1\%$ of the analyser span. The sweep time was set to auto and the detector to peak. The trace was set to max hold and a trace was produced.

The lower band edge of the allocated frequency band was selected and a marker was set to the level of the highest in band emission with a limit line set to 20 dB below this. The marker was then placed on 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, whichever is the greater). A table was produced showing the recorded data. The above was repeated for the upper band edge.

Test of: Coronis Systems.
Wavetherm.
To: FCC Part 15.247

Appendix 1. Test Equipment Used

RFI No.	Instrument	Manufacturer	Type No.	Serial No.
A027	Horn Antenna	Eaton	9188-2	301
A059	3146 Log Periodic Antenna	EMCO	3146	8902-2378
A091	EMCO 3110 Biconical Antenna	EMCO	3110	9008-1182
A1362	Eaton	Stoddart Aircraft Radio Co., Inc.	91889-1	N/A
A253	WG 12 Microwave Horn	Flann Microwave	12240-20	128
A255	WG 16 Microwave Horn	Flann Microwave	16240-20	519
A259	Bilog Antenna	Chase	CBL6111	1513
A427	WG 14 horn	Flann	14240-20	150
C1023	Rosenberger Cable	Rosenberger	FA210A-1-020m	FA00B 7567
C1065	Rosenberger	Rosenberger	UFA210-1-7872	0985
C1079	Rosenberger 1m Cable	Rosenberger	FA210A1010M5050	28462-1
M003	Spectrum Monitor	Rohde & Schwarz	EZM	883 580/008
M028	FSB Spectrum Analyser	Rohde & Schwarz	FSB	860 001/009 (RF), 860 161/007 (Display)
M044	ESVP Receiver	Rohde & Schwarz	ESVP	891 845/026
M069	ESMI Spectrum Analyser / Receiver	Rohde & Schwarz	ESMI	829 808/007 (DU) / 827 063/008 (RU)
M1124	Rohde & Schwarz	Rohde & Schwarz	ESIB26	100046K
M506	RF unit	Rohde & Schwarz	ESBI-RF	827060/004
S201	Site 1	RFI	1	
S202	Site 2	RFI	2	S202-15011990

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

Test of: Coronis Systems.
 Wavetherm.
To: FCC Part 15.247

Appendix 2. Test Configuration Drawings

This appendix contains the following drawings:

Drawing Reference Number	Title
DRG\46762JD06\EMIRAD	Test configuration for measurement of radiated emissions.

Test of: Coronis Systems.
Wavetherm.
To: FCC Part 15.247

DRG\46762JD06\EMIRAD

