

## TEST REPORT

Report Number: EM08035695ATL

January 21, 2009

**Product Designation: Controller 142622 and Remote A349**

Standard: FCC 15.249 - Operation within the bands 902-928 MHz, 2400-2483.5 MHz, 5725-5875 MHz, and 24.0-24.25 GHz.

**Tested by:**

Intertek Testing Services NA Inc.  
1950 Evergreen Blvd., Suite 100  
Duluth, GA 30096

**Client:**

Aqualisa Products Limited  
The Flyer's Way  
Westerham  
Kent  
TN16 1DE  
Contact: Sue Ross  
Phone: 01959 560719

**Tests performed by:**

A handwritten signature in blue ink, appearing to read "Richard C. Bianco".

Richard C. Bianco  
EMC Project Engineer

**Report reviewed by:**

A handwritten signature in blue ink, appearing to read "Jeremy O. Pickens".

Jeremy O. Pickens  
EMC Department Manager

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## 1.0 Introduction and Conclusion

The tests indicated in section 2.0 were performed on the product constructed as described in section 3.0. The remaining test sections are the verbatim text from the actual data sheets used during the investigation. These test sections include the test name, the specified test Method, a list of the actual Test Equipment Used, documentation Photos, Results and raw Data. No additions, deviations, or exclusions have been made from the standard(s) unless specifically noted.

Based on the results of our investigation, we have concluded the product tested complies with the requirements of the standard(s) indicated. The results obtained in this test report pertain only to the item(s) tested.

## 2.0 Test Summary

Section	Test Full Name	Test Date	Result
4.0	System setup including cable interconnection details, support equipment and simplified block diagram. (System Setup)		
5.0	Overview of EUT (Low Power Transmitters) (FCC 15C - EUT Overview)		
6.0	Radiated emissions (E-field) for low power intentional radiators. (Radiated Emissions LPD)	01/20/2009	PASS
7.0	Additional provisions to the general radiated emission limitations. (FCC 15C - 15.215)	01/20/2009	PASS

### 3.0 Description of Equipment Under Test

Equipment Under Test			
Description	Manufacturer	Model Number	Serial Number
Controller	Aqualisa	14622	None
Mixing Vavle	Aqualisa	IPX4	53380133208
Remote	Aqualisa	A349	None

EUT receive date:	January 20, 2009
EUT receive condition:	Good

#### Description of EUT provided by Client:

The Aqualisa products limited bath (Rome Tub) Controller 142622 and Remote Control Unit A349 Remote Transmitter is a system for remotely controlling the water flow and temperature of the Bath (Rome Tub). The controller communicates with the water mixing valve via a 12C bus and derives its power from the mixing valve. The bath controller communicates with the remote controller it is paired with, using Quadrature phased shift keying (O-QPSK). Both of these devices transmit and receive.

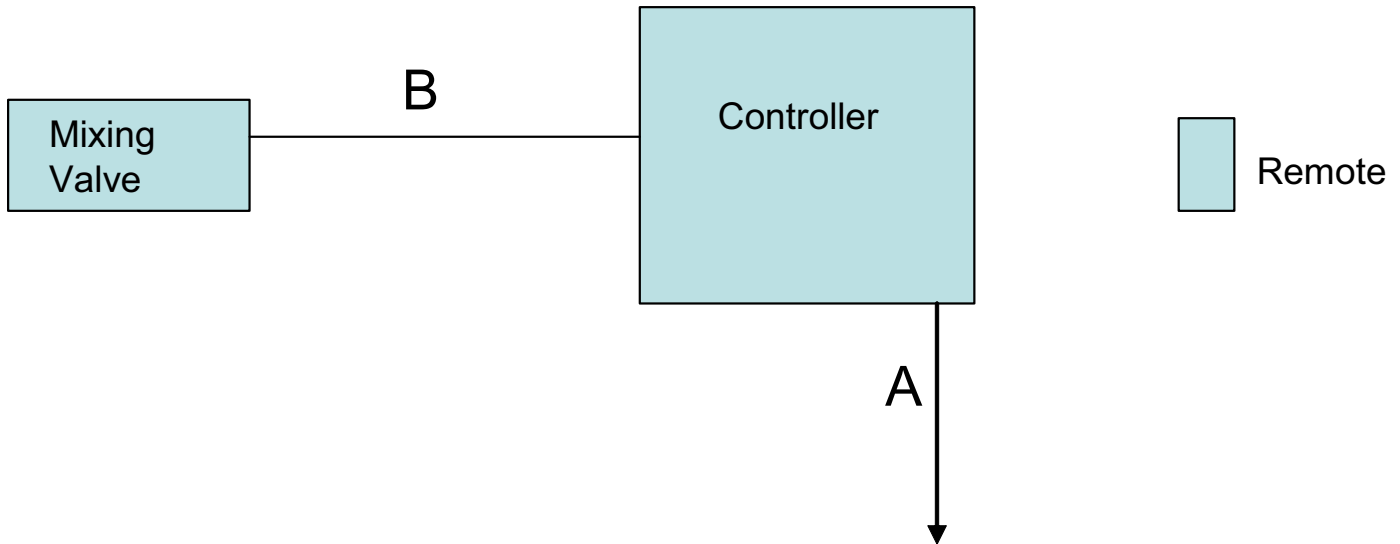
#### Description of EUT exercising:

The remote transmitter is powered by internal batteries, and operates at a fixed frequency of 2.404GHz. The Bath (Roman Tub) controller transmitter is powered by 120VAC, 60Hz and responds to the Remote controller with a short response signal.

#### 4.0 System setup including cable interconnection details, support equipment and simplified block diagram. (System Setup)

**Method:**

Record the details of EUT cabling, document the support equipment, and show the interconnections in a block diagram.

**Drawing:**

Block Diagram

#### 4.0 System setup including cable interconnection details, support equipment and simplified block diagram. (System Setup)

**Data:**

EUT Cabling						
ID	Description	Length	Shielding	Ferrites	Connection	
					From	To
A	AC Power	3m	No	No	Controller	AC Mains
B	Wired I2C Cable	10m	No	No	Controller	Mixing Valve

Support Equipment			
Description	Manufacturer	Model Number	Serial Number
None			

**5.0 Overview of EUT (Low Power Transmitters) (FCC 15C - EUT Overview)****Method:**

Complete the overview spreadsheet.

Related Submittal(s) Grants: This report is for use with an application for certification of a low power transmitter. One transmitter is included in the application.

**Data:**

Applicant	Aqualisa Products Limited
	The Fyvers Way, Westeram
	Kent, TN16 1DE
Trade Name & Model No.	Bath (Roman Tub) Controller 142622 and Remote Control Unit A349
FCC Identifier	WUZIOCAPLUSA and WUZIORAPLUSA
Frequency Range (MHz)	2.404GHz
Antenna Type (15.203)	internal
Manufacturer name & address	Aqualisa Products Limited
	The Fyers Way, Westeram
	Kent, TN16 1DE

Related Submittals and Grants:	This report is for use with an application for certification of a low power transmitter. One transmitter is included in the application.
Additions, deviations and exclusions from standards	None

## 6.0 Radiated emissions (E-field) for low power intentional radiators. (Radiated Emissions LPD)

### Method:

Measurements shall be performed with a quasi-peak detector instrument that meets the requirements of Section One of CISPR 16.

#### Bandwidths:

30 MHz to 1000 MHz: 120 kHz RBW and 1 MHz VBW

Above 1000 MHz: 1 MHz RBW and 3 MHz VBW

#### Detectors:

Equal to or less than 1000 MHz: CISPR quasi-peak detector (alternative: peak detector)

Above 1000 MHz: Average detector (applies to average limit)

Above 1000 MHz: Peak detector (applies to peak limit)

#### Limits:

Equal to or less than 1000 MHz, the limits are specified as quasi-peak. If a peak detector is used, the limit does not change.

Above 1000 MHz, the limits are specified as average. The peak limit is 20 dB above the average limit. Both peak and average measurements are required to be reported.

#### Frequency range of radiated measurements

For an intentional radiator, the spectrum shall be investigated from the lowest radio frequency signal generated in the device, without going below 9 kHz, up to at least the frequency shown in this paragraph:

(1) If the intentional radiator operates below 10 GHz: to the tenth harmonic of the highest fundamental frequency or to 40 GHz, whichever is lower.

(2) If the intentional radiator operates at or above 10 GHz and below 30 GHz: to the fifth harmonic of the highest fundamental frequency or to 100 GHz, whichever is lower.

(3) If the intentional radiator operates at or above 30 GHz: to the fifth harmonic of the highest fundamental frequency or to 200 GHz, whichever is lower, unless specified otherwise elsewhere in the rules.

(4) If the intentional radiator contains a digital device, regardless of whether this digital device controls the functions of the intentional radiator or the digital device is used for additional control or function purposes other than to enable the operation of the intentional radiator, the frequency range shall be investigated up to the range specified in paragraphs (a)(1) through (a)(3) of this section or the range applicable to the digital device, as shown in paragraph (b)(1) of this section, whichever is the higher frequency range of investigation.

#### Measurement antenna requirements:

Below 30 MHz - Loop antenna

30 to 1000 MHz - Biconical, Log Periodic, or equivalent

Above 1000 MHz - Horn or equivalent

Measurements of the radiated field are made with the antenna located at a distance of 3 or 10 meters from the EUT. The limit applied to the measurement shall be appropriate for the test distance. The test distance shall be indicated in the results section.

The EUT shall be arranged and connected with cables terminated in accordance with the product specification.

Exploratory tests should be carried out while varying the cable positions to determine the maximum or near-maximum emission level. During manipulation, cables shall not be placed under or on top of the system test components unless such placement is required by the inherent equipment design.

The antenna shall be adjusted between 1m and 4m in height above the ground plane for maximum meter reading at each test frequency.

The antenna-to-EUT azimuth shall be varied during the measurement to find the maximum field-strength readings.

The antenna-to-EUT polarization (horizontal and vertical) shall be varied during the measurements to find the maximum field-strength readings.

If the EUT is handheld, it shall be oriented in each of its orthogonal axes.

If the EUT is intended for tabletop use, it shall be placed on a table whose top is 0.8m above the ground plane. The table shall be constructed of non-conductive materials. Its dimensions are at least 1m by 1.5m, but may be extended for larger EUT.

If EUT is floor standing, the EUT was placed on a horizontal metal ground plane and isolated from the ground plane by up to 12 mm of insulating material.

Equipment setup for radiated disturbance tests shall follow the guidelines of ANSI C63.4:2003.

#### TEST SITE

The test site for radiated emissions is located at 1950 Evergreen Blvd, Suite 100, Duluth, Georgia 30096.

### Test Equipment Used:

Description:	Manufacturer:	Model:	Asset Number:	Cal Date:	Cal Due:
Antenna, Horn, <18 GHz	EMCO	3115	213061	04/18/2008	04/18/2009

**6.0 Radiated emissions (E-field) for low power intentional radiators. (Radiated Emissions LPD)****Test Equipment Used:**

Description:	Manufacturer:	Model:	Asset Number:	Cal Date:	Cal Due:
Cable E05, <18GHz	Huber-Suhner	Sucoflex 104PEA	E05	05/05/2008	05/05/2009
Cable E07, <18GHz	Huber-Suhner	Sucoflex 104PE	E07	06/04/2008	06/04/2009
Cable E11, <18GHz	Huber-Suhner	Sucoflex 104PEA	E11 211266	06/18/2008	06/18/2009
Cable MP3, 18 GHz, N, 10m	Megaphase	G919-NKNK-394	MP3	05/05/2008	05/05/2009
EMI Receiver	Hewlett Packard	8546A	213109	09/29/2008	09/29/2009
EMI Receiver, Preselector section	Hewlett Packard	85460A	213108	09/29/2008	09/29/2009
Excel spreadsheet for radiated emissions	Software	Excel - RE Worksh	SW004	12/08/2008	12/08/2009
Preamplifier, 20 MHz to 18 GHz, 40 dB	A.H. Systems	PAM-0118	200108	03/27/2008	03/27/2009

**Results: The sample tested was found to Comply.**

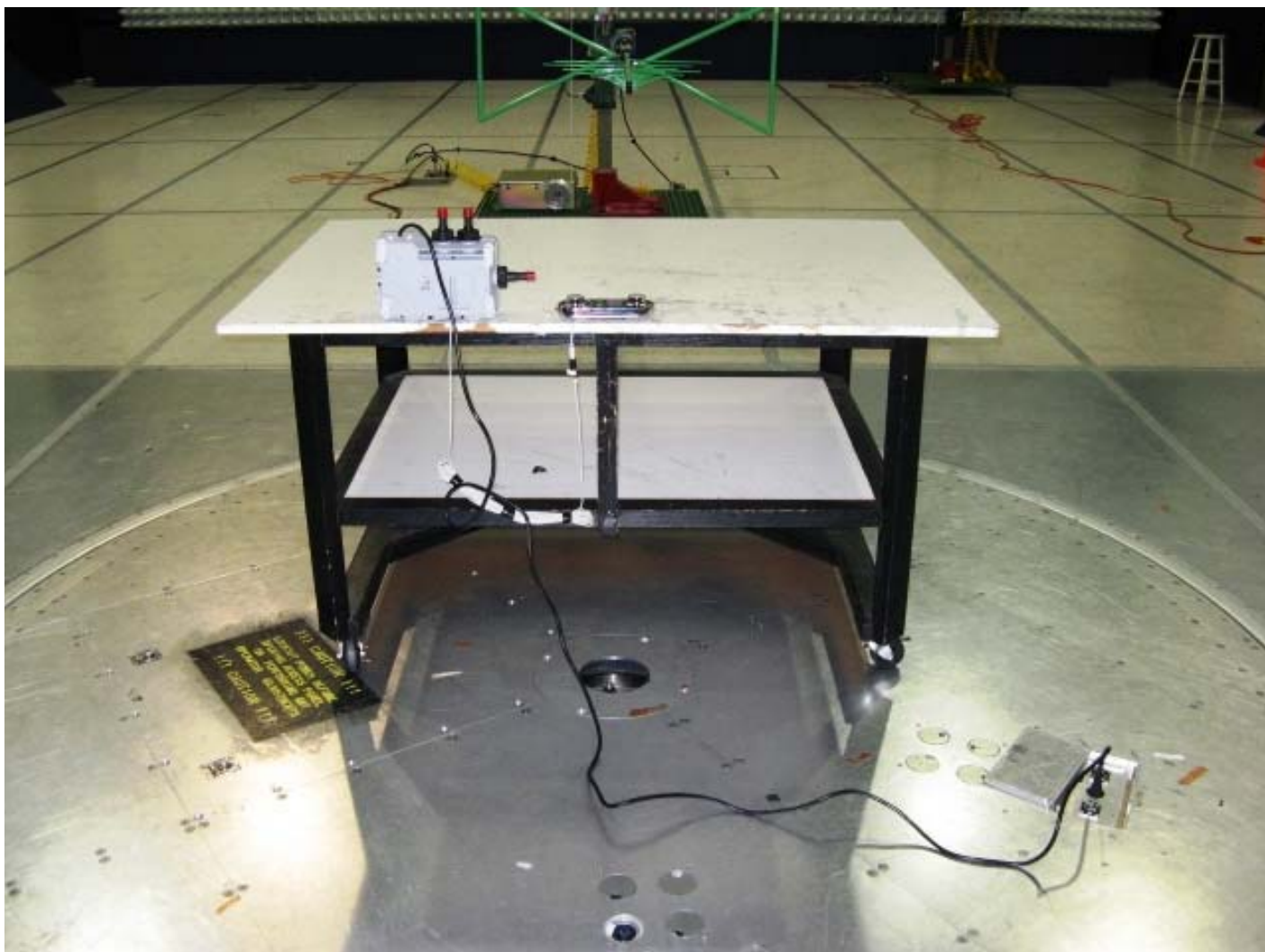
**Photo:**

Test Setup



## 6.0 Radiated emissions (E-field) for low power intentional radiators. (Radiated Emissions LPD)

Photo:



Test Setup

**6.0 Radiated emissions (E-field) for low power intentional radiators. (Radiated Emissions LPD)****Photo:**

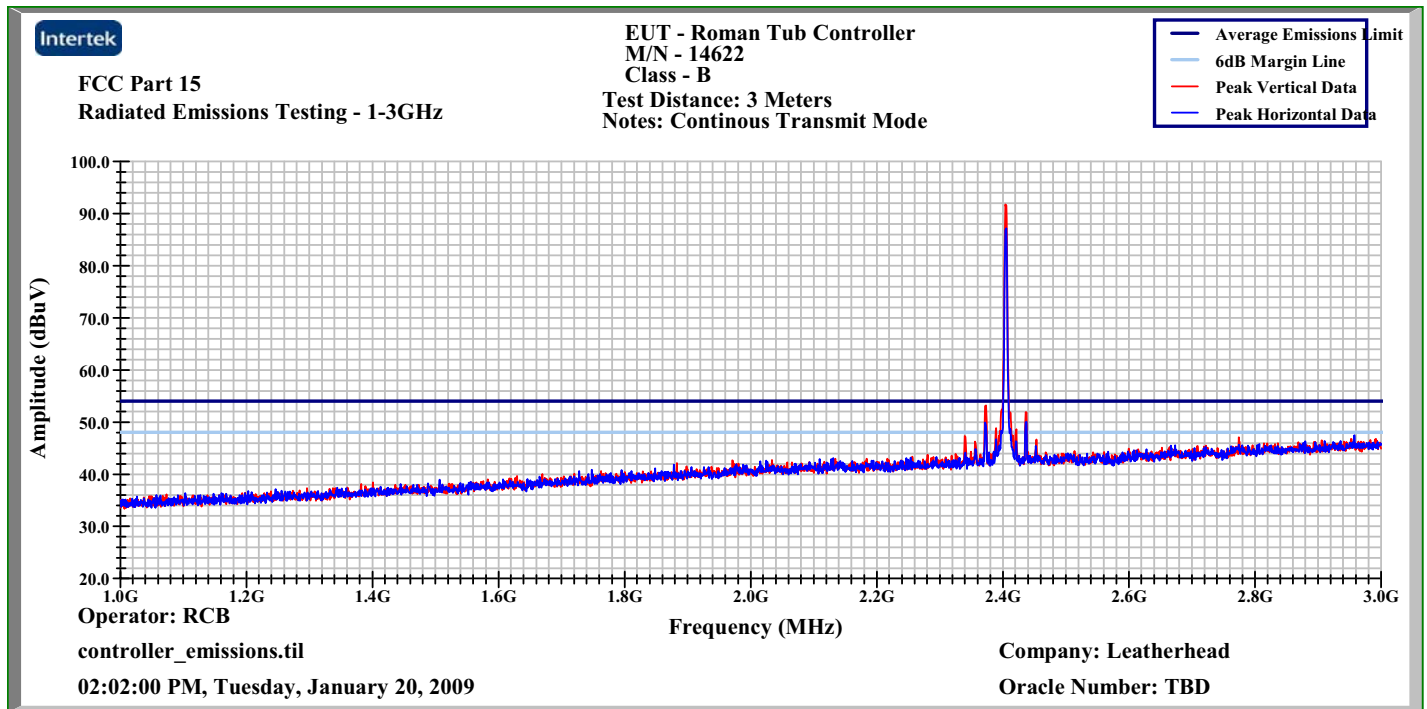
Test Setup

**6.0 Radiated emissions (E-field) for low power intentional radiators. (Radiated Emissions LPD)****Photo:**

Test Setup

## 6.0 Radiated emissions (E-field) for low power intentional radiators. (Radiated Emissions LPD)

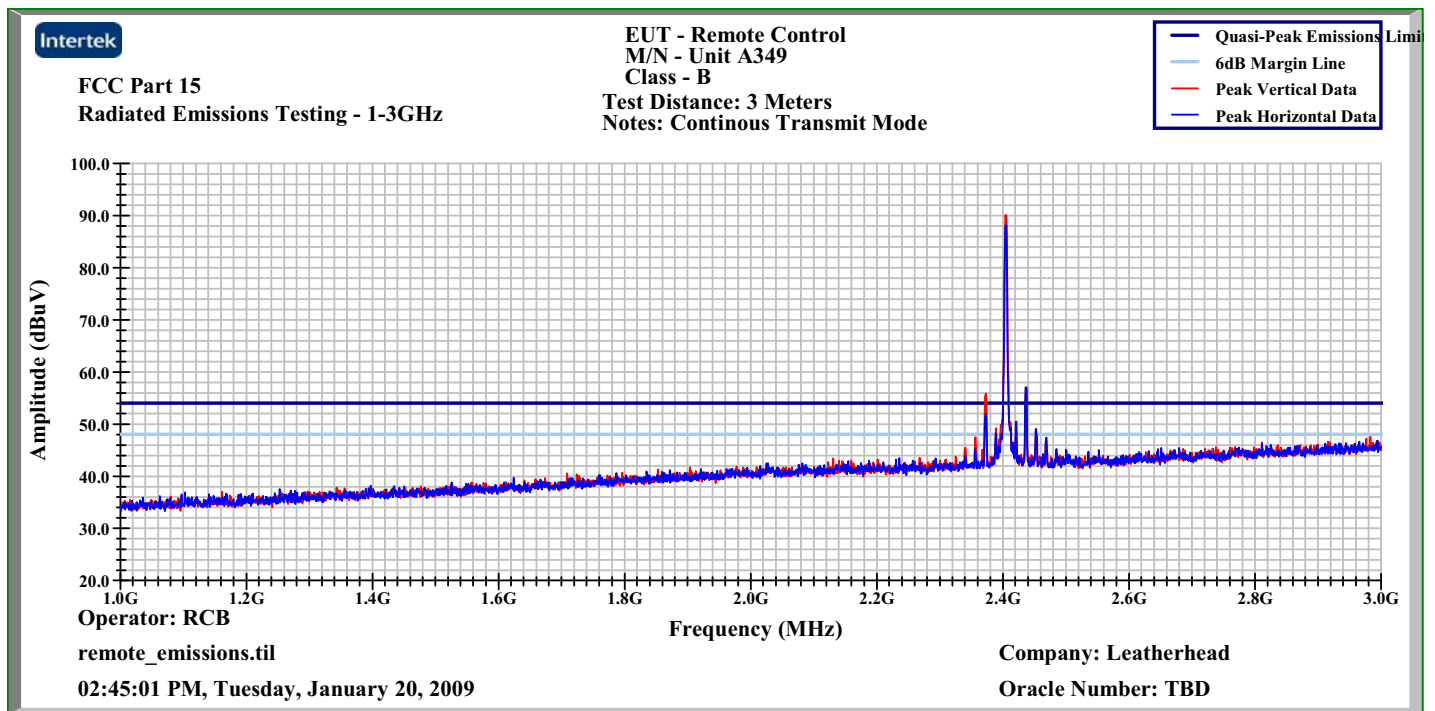
Plot:



Radiated emissions plot

## 6.0 Radiated emissions (E-field) for low power intentional radiators. (Radiated Emissions LPD)

Plot:



Radiated emissions plot



**6.0 Radiated emissions (E-field) for low power intentional radiators. (Radiated Emissions LPD)****Data:****Client:** Aqualisa Products Limited**Receiver:** HP 8546A**Model Number:** 14622**Antenna:** EMCO 3115**Project Number:** TBD**Cables:** E11+MP3+E05+TT1**Tested By:** RCB**Preamp:** AH PAM-0118**Date:** 01/20/2009**Frequency Range (MHz):** 1000-3000**Test Distance (m):** 3**Input power:** 120/60**Limit:** FCC15 Class B-3m**Modifications for compliance (y/n):** n

A	B	C	D	E	F	G	H	I	J
Ant. Pol. (V/H)	Frequency MHz	Reading dB(uV)	Antenna Factor dB(1/m)	Cable Loss dB	Pre-amp Factor dB	Net dB(uV/m)	3m Limit dB(uV/m)	Margin dB	Detectors / Bandwidths Det/RBW/VBW
V	2373.250	51.8	27.9	10.7	40.8	49.6	54.0	-4.4	Av/1M/1M
V	2373.250	58.8	27.9	10.7	40.8	56.5	74.0	-17.5	Pk/1M/3M
V	2404.475	88.0	27.9	10.8	40.9	85.9	94.0	-8.1	Av/1M/3M
V	2404.475	93.7	27.9	10.8	40.9	91.6	114.0	-22.4	Pk/1M/3M
V	2436.487	46.7	28.0	10.9	40.9	44.7	54.0	-9.3	Av/1M/3M
V	2436.487	54.8	28.0	10.9	40.9	52.8	74.0	-21.2	Pk/1M/3M
<b>Calculations</b>		G=C+D+E-F		I=G-H					

Radiated emissions data - Controller

**6.0 Radiated emissions (E-field) for low power intentional radiators. (Radiated Emissions LPD)****Data:****Client:** Aqualisa Products Limited**Receiver:** HP 8546A**Model Number:** A349**Antenna:** EMCO 3115**Project Number:** TBD**Cables:** E11+MP3+E05+TT1**Tested By:** RCB**Preamp:** AH PAM-0118**Date:** 01/20/2009**Frequency Range (MHz):** 1000-3000**Test Distance (m):** 3**Input power:** 120/60**Limit:** FCC15 Class B-3m**Modifications for compliance (y/n):** n

A	B	C	D	E	F	G	H	I	J
Ant. Pol. (V/H)	Frequency MHz	Reading dB(uV)	Antenna Factor dB(1/m)	Cable Loss dB	Pre-amp Factor dB	Net dB(uV/m)	3m Limit dB(uV/m)	Margin dB	Detectors / Bandwidths Det/RBW/VBW
V	2372.443	53.6	27.9	10.7	40.8	51.4	54.0	-2.6	Av/1M/1M
V	2372.443	60.8	27.9	10.7	40.8	58.6	74.0	-15.4	Pk/1M/3M
V	2404.443	84.6	27.9	10.8	40.9	82.5	94.0	-11.5	Av/1M/3M
V	2404.443	90.3	27.9	10.8	40.9	88.2	114.0	-25.8	Pk/1M/3M
V	2436.425	52.3	28.0	10.9	40.9	50.3	54.0	-3.7	Av/1M/3M
V	2436.425	59.5	28.0	10.9	40.9	57.5	74.0	-16.5	Pk/1M/3M
<b>Calculations</b>		G=C+D+E-F		I=G-H					

Radiated emissions data - Remote

**7.0 Additional provisions to the general radiated emission limitations. (FCC 15C - 15.215)****Method:**

§ 15.215 Additional provisions to the general radiated emission limitations.

(a) The regulations in §§15.217 through 15.257 provide alternatives to the general radiated emission limits for intentional radiators operating in specified frequency bands. Unless otherwise stated, there are no restrictions as to the types of operation permitted under these sections.

(b) In most cases, unwanted emissions outside of the frequency bands shown in these alternative provisions must be attenuated to the emission limits shown in §15.209. In no case shall the level of the unwanted emissions from an intentional radiator operating under these additional provisions exceed the field strength of the fundamental emission.

(c) Intentional radiators operating under the alternative provisions to the general emission limits, as contained in §§15.217 through 15.257 and in Subpart E of this part, must be designed to ensure that the 20 dB bandwidth of the emission, or whatever bandwidth may otherwise be specified in the specific rule section under which the equipment operates, is contained within the frequency band designated in the rule section under which the equipment is operated. The requirement to contain the designated bandwidth of the emission within the specified frequency band includes the effects from frequency sweeping, frequency hopping and other modulation techniques that may be employed as well as the frequency stability of the transmitter over expected variations in temperature and supply voltage. If a frequency stability is not specified in the regulations, it is recommended that the fundamental emission be kept within at least the central 80% of the permitted band in order to minimize the possibility of out-of-band operation.

**Test Equipment Used:**

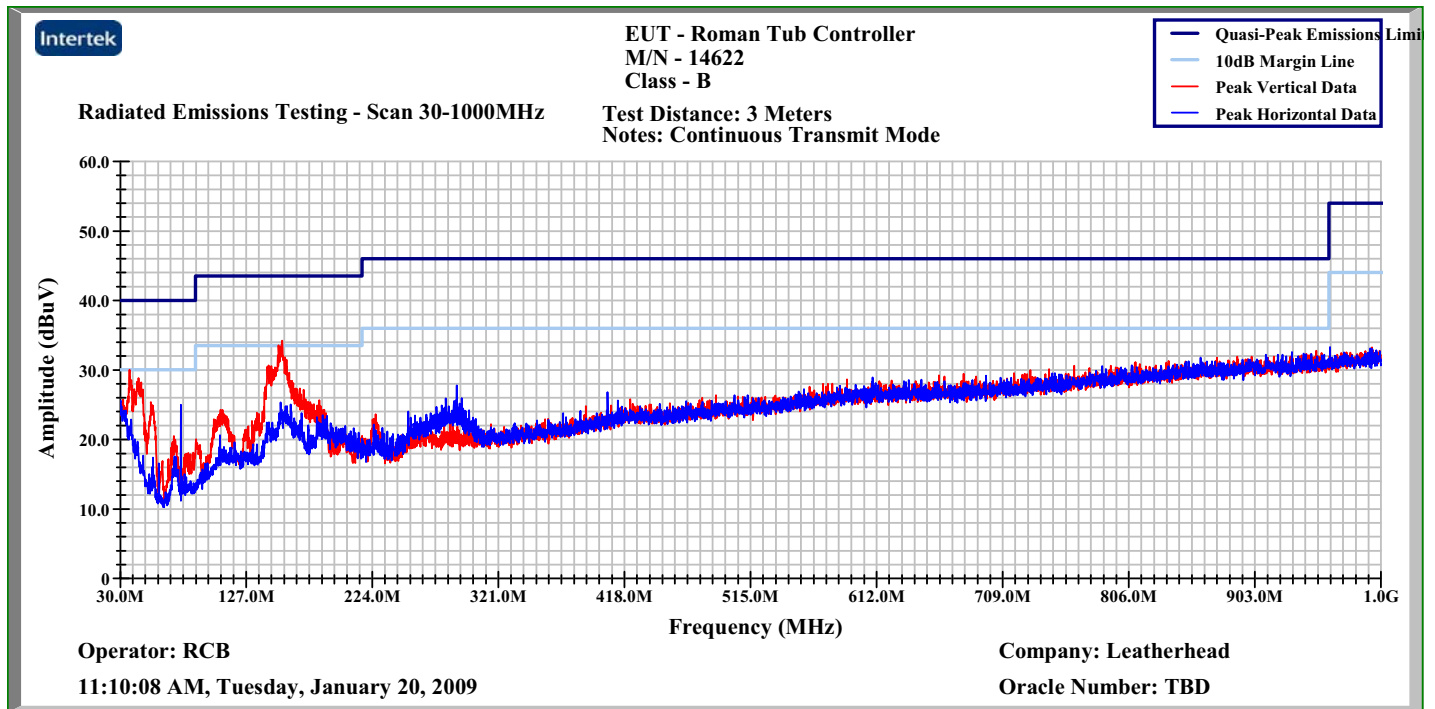
Description:	Manufacturer:	Model:	Asset Number:	Cal Date:	Cal Due:
Antenna, BiLog, 20-2000MHz	Chase	CBL6112B	211386	09/26/2008	09/26/2009
Cable E01, <18GHz	Pasternack	RG214/U	E01	05/05/2008	05/05/2009
Cable E05, <18GHz	Huber-Suhner	Sucoflex 104PEA	E05	05/05/2008	05/05/2009
Cable MP3, 18 GHz, N, 10m	Megaphase	G919-NKNK-394	MP3	05/05/2008	05/05/2009
Cable TT1, 6ft, N(Male) to N(Male)	Mini-Circuits	CBL-6FT-NMNM	TT1	05/05/2008	05/05/2009
EMI Receiver	Hewlett Packard	8546A	213109	09/29/2008	09/29/2009
EMI Receiver, Preselector section	Hewlett Packard	85460A	213108	09/29/2008	09/29/2009
Preamplifier, 20 MHz to 18 GHz, 40 dB	A.H. Systems	PAM-0118	200108	03/27/2008	03/27/2009

**Results: The sample tested was found to Comply.**

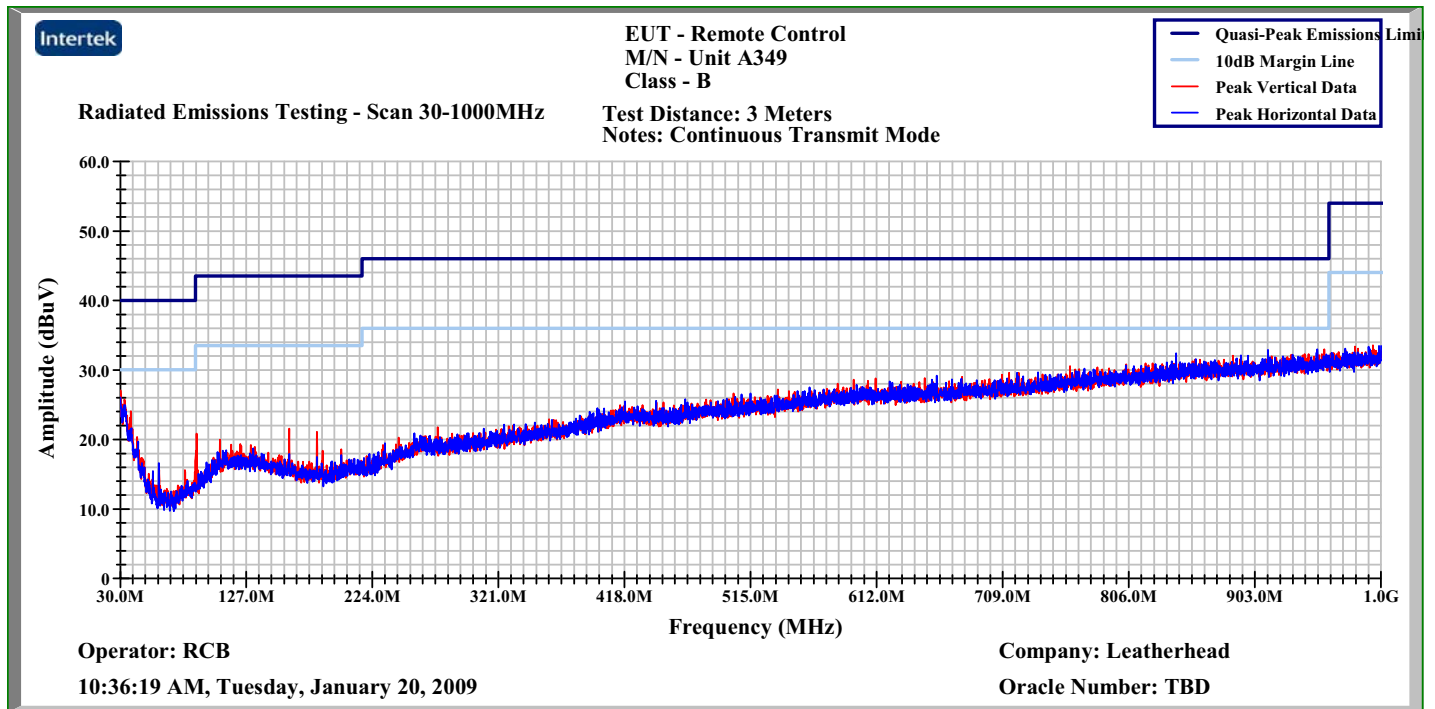


## 7.0 Additional provisions to the general radiated emission limitations. (FCC 15C - 15.215)

Plot:



Radiated emissions plot

**7.0 Additional provisions to the general radiated emission limitations. (FCC 15C - 15.215)****Plot:**

Radiated emissions plot

## 7.0 Additional provisions to the general radiated emission limitations. (FCC 15C - 15.215)

**Data:**

**Client:** Aqualisa Products Limited

**Model Number:** A349

**Project Number:** TBD

**Tested By:** RCB

**Date:** 01/20/2009

**Frequency Range (MHz):** 30-1000

**Input power:** 120/60

**Receiver:** HP 8546A

**Antenna:** Chase 2622

**Cables:** E01+E05+MP3+E201

**Preamp:** ZKL-2 D011105

**Test Distance (m):** 3

**Limit:** FCC15 Class B-3m

**Modifications for compliance (y/n):** n

A	B	C	D	E	F	G	H	I	J
Ant. Pol. (V/H)	Frequency MHz	Reading dB(uV)	Antenna Factor dB(1/m)	Cable Loss dB	Pre-amp Factor dB	Net dB(uV/m)	3m Limit dB(uV/m)	Margin dB	Detectors / Bandwidths Det/RBW/VBW
V	31.449	31.2	19.2	1.4	28.0	23.8	40.0	-16.2	QP/120k/300k
V	88.899	38.9	9.2	1.9	28.0	22.0	43.5	-21.5	QP/120k/300k
V	160.041	35.8	10.7	2.5	27.8	21.1	43.5	-22.4	QP/120k/300k
V	181.206	34.6	9.9	2.7	27.8	19.4	43.5	-24.1	QP/120k/300k
<b>Calculations</b>		G=C+D+E-F		I=G-H					

Radiated emissions data

**7.0 Additional provisions to the general radiated emission limitations. (FCC 15C - 15.215)****Data:**

**Client:** Aqualisa Products Limited  
**Model Number:** 14622  
**Project Number:** TBD  
**Tested By:** RCB  
**Date:** 01/20/2009

**Receiver:** HP 8546A  
**Antenna:** Chase 2622  
**Cables:** E01+E05+MP3+E201  
**Preamp:** ZKL-2 D011105

**Frequency Range (MHz):** 30-1000  
**Input power:** 120/60

**Test Distance (m):** 3  
**Limit:** FCC15 Class B-3m

**Modifications for compliance (y/n):** n

A	B	C	D	E	F	G	H	I	J
Ant. Pol. (V/H)	Frequency MHz	Reading dB(uV)	Antenna Factor dB(1/m)	Cable Loss dB	Pre-amp Factor dB	Net dB(uV/m)	3m Limit dB(uV/m)	Margin dB	Detectors / Bandwidths Det/RBW/VBW
V	38.038	37.0	15.5	1.4	28.0	26.0	40.0	-14.0	QP/120k/300k
V	43.715	38.9	12.3	1.5	28.0	24.7	40.0	-15.3	QP/120k/300k
V	149.688	40.2	11.3	2.4	27.9	26.0	43.5	-17.5	QP/120k/300k
V	153.688	44.0	11.1	2.5	27.9	29.7	43.5	-13.8	QP/120k/300k
<b>Calculations</b>		G=C+D+E-F		I=G-H					

Radiated emissions data