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Intertek Testing Services Hong Kong Limited

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HOKLAS 005
TEST

TEST REPORT

Report No.: 15020115HKG-001

Dyson Ltd.

Application
For
Certification
(Original Grant)
(FCC ID: QVHAM10US01)

Humidifier

Prepared and Checked by:

Lam Hon Ming, Kenneth
Senior Lead Engineer

Approved by:

Chow Chi Ming, Billy
Manager
Date: February 12, 2015

GENERAL INFORMATION

Grantee:	Dyson Ltd.
Grantee Address:	Tetbury Hill, Malmesbury, United Kingdom SN16 0RP
Contact Person:	Fabio Scalon
Tel:	+44 (0) 1666 834433 Ext: 4433
Fax:	+44 (0) 1666 827299
e-mail:	fabio.scalon@dyson.com
Manufacturer:	Dyson Ltd
Manufacturer Address:	Tetbury Hill, Malmesbury, United Kingdom SN16 0RP
Brand Name:	Dyson
Model:	AM10
Type of EUT:	Ultrasonic Humidifier
Description of EUT:	Humidifier
Serial Number:	N/A
FCC ID:	QVHAM10US01
Date of Sample Submitted:	February 03, 2015
Date of Test:	February 03, 2015 to February 11, 2015
Report No.:	15020115HKG-001
Report Date:	February 12, 2015
Environmental Conditions:	Temperature: +10 to 40°C Humidity: 10 to 90%

Intertek Testing Services Hong Kong Ltd.
2/F., Garment Centre, 576 Castle Peak Road, Kowloon, Hong Kong.
Tel: (852) 2173 8888 Fax: (852) 2785 5487 Website: www.hk.intertek-etlsemko.com

SUMMARY OF TEST RESULT

TEST SPECIFICATION	REFERENCE	RESULTS
Field Strength Limit	18.305	Pass
Conduction limit	18.307	Pass

The equipment under test is found to be complying with the following standards:
FCC Part 18, October 1, 2013 Edition

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1.0 General Description

1.1 Product Description

The Equipment Under Test (EUT) is an ultrasonic humidifier with UV light operating at 1.68MHz and 120kHz respectively. The EUT is powered by an AC/DC adaptor.

For electronic filing, the brief circuit description is saved with filename: descri.pdf.

1.2 Related Submittal(s) Grants

This is a single application for certification of an ultrasonic humidifier.

1.3 Test Methodology

Both AC mains line-conducted and radiated emission measurements were performed according to the FCC procedures in MP-5, "Methods of Measurements of Radio Noise Emissions form ISM equipment" 1986". All radiated measurements were performed in an Open Area Test Site . Preliminary scans were performed in the Open Area Test Site only to determine worst case modes. All radiated tests were performed at an antenna to EUT distance of 3 meters, unless stated otherwise in the **"Justification Section"** of this Application.

1.4 Test Facility

The open area test site facility used to collect the radiated data is located at Garment Centre, 576 Castle Peak Road, Kowloon, Hong Kong and conducted measurement collect the conducted data is located at Workshop No. 3, G/F., World-Wide Industrial Centre, 43-47 Shan Mei Street, Fo Tan, Sha Tin, N.T., Hong Kong. This test facility and site measurement data have been placed on file with the FCC.

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2.0 System Test Configuration

2.1 Justification

The system was configured for testing in a typical fashion (as a customer would normally use it), and in the confines as outlined in MP5-1986.

The device was powered by 120VAC 60Hz.

For maximizing emissions, the EUT was rotated through 360°, the antenna height was varied from 1 meter to 4 meters above the ground plane, and the antenna polarization was changed. This step by step procedure for maximizing emissions led to the data reported in Exhibit 3.0.
The rear of unit shall be flushed with the rear of the table.

The equipment under test (EUT) was configured for testing in a typical fashion (as a customer would normally use it).

2.2 EUT Exercising Software

There was no special software to exercise the device. Once the unit is powered up, it emits the RF signal continuously.

2.3 Special Accessories

There are no special accessories necessary for compliance of this product.

2.4 Measurement Uncertainty

When determining of the test conclusion, the Measurement Uncertainty of test has been considered.

Uncertainty and Compliance - Unless the standard specifically states that measured values are to be extended by the measurement uncertainty in determining compliance, all compliance determinations are based on the actual measured value.

2.5 Support Equipment List and Description

AC/DC Adaptor (Provided by applicant)
Model: 116801-05
Input: 120VAC 60Hz
Output: 19.2VDC 3.02A

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3.0 Emission Results

Data is included of the worst case configuration (the configuration which resulted in the highest emission levels). A sample calculation, configuration photographs and data tables of the emissions are included.

3.1 Field Strength Calculation

The field strength is calculated by adding the Antenna Factor and Cable Factor, and subtracting the Amplifier Gain (if any), Distance Factor from the measured reading. The basic equation with a sample calculation is as follows:

FS = RA + AF + CF - AG - DF

where FS = Field Strength in dBµV/m
RA = Receiver Amplitude (including preamplifier) in dBµV
CF = Cable Attenuation Factor in dB
AF = Antenna Factor in dB
AG = Amplifier Gain in dB
DF = Distance Factor in dB = 20 log 3/30 = -20dB (3m to 30m)

In the following table(s), the reading shown on the data table reflects the preamplifier gain. An example for the calculations in the following table is as follows:

FS = RR + LF

where FS = Field Strength in dBµV/m
RR = RA - AG - DF in dBµV
LF = CF + AF in dB

Assume a receiver reading of 52.0 dBµV is obtained. The antenna factor of 7.4 dB and cable factor of 1.6 dB are added. The amplifier gain of 29 dB and distance factor of 20 dB are subtracted, giving a field strength of 12 dBµV/m. This value in dBµV/m was converted to its corresponding level in µV/m.

Level in µV/m = Common Antilogarithm [(12 dBµV/m)/20] = 3.98 µV/m

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3.2 Radiated Emission Configuration Photograph

The worst case in radiated emission was found at 233.156 MHz

For electronic filing, the worst case radiated emission configuration photographs are saved with filename: radiated photos.pdf.

3.3 Radiated Emission Data

The data on the following page lists the significant emission frequencies, the limit and the margin of compliance. Numbers with a minus sign are below the limit.

Judgment: Passed by 2.3 dB

3.4 Conducted Emission Configuration Photograph

The worst case in line-conducted emission was found at 3.354 MHz

For electronic filing, the worst case line-conducted configuration photographs are saved with filename: conducted photo.pdf.

3.5 Conducted Emission Data

With reference to Part 18.307(f) For ultrasonic equipment, compliance with the conducted limits shall preclude the need to show compliance with the field strength limits below 30 MHz. So it is not necessary to perform the radiated emission test below 30MHz.

Judgment: Pass by 7.65 dB

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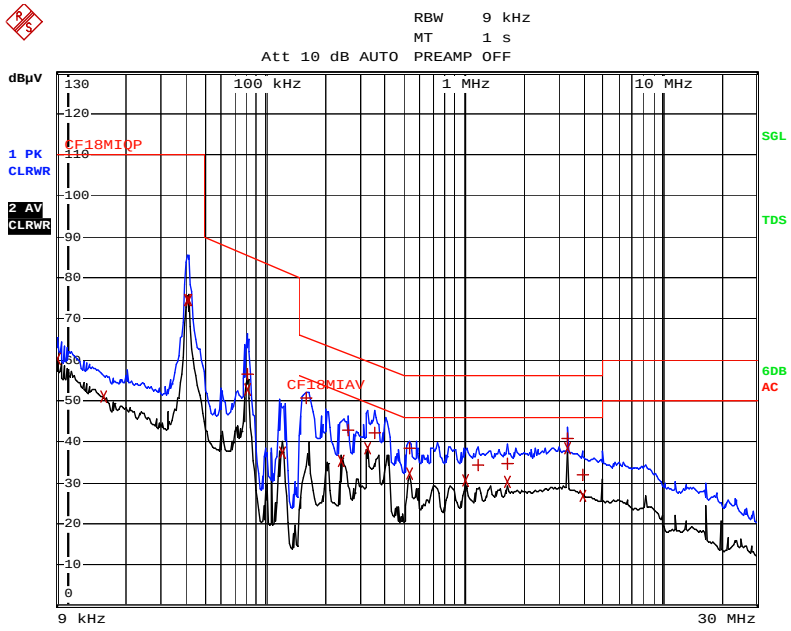
Worst-Case Operating Mode: On 1 & 70% (Ultrasonic)



EDIT PEAK LIST (Final Measurement Results)

Trace1: CF18MIQP
Trace2: CF18MIAV
Trace3: ---

	TRACE	FREQUENCY	LEVEL dBµV		DELTA LIMIT dB
2	CISPR Average	9 kHz	60.10	N	
2	CISPR Average	15.3 kHz	50.86	N	
2	CISPR Average	40.9 kHz	74.42	L1	
2	CISPR Average	41.2 kHz	74.47	N	
1	Quasi Peak	81.5 kHz	56.35	N	-29.19
2	CISPR Average	81.8 kHz	52.82	L1	
2	CISPR Average	122 kHz	37.46	N	
1	Quasi Peak	163.5 kHz	50.56	L1	-14.72
2	CISPR Average	240 kHz	35.18	L1	-16.91
1	Quasi Peak	258 kHz	42.86	L1	-18.62
2	CISPR Average	325.5 kHz	38.23	L1	-11.32
1	Quasi Peak	352.5 kHz	42.18	L1	-16.72
1	Quasi Peak	532.5 kHz	38.21	L1	-17.78
2	CISPR Average	532.5 kHz	32.33	L1	-13.67
2	CISPR Average	1.0275 MHz	30.49	L1	-15.50
1	Quasi Peak	1.1805 MHz	34.40	L1	-21.59
2	CISPR Average	1.6755 MHz	30.15	L1	-15.84
1	Quasi Peak	1.68 MHz	34.46	L1	-21.53
1	Quasi Peak	3.354 MHz	40.72	N	-15.27
2	CISPR Average	3.354 MHz	38.34	N	-7.65

Note: Measurement Uncertainty is ±4.2dB at a level of confidence of 95%.

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Worst-Case Operating Mode: On 1 & 70% (Ultrasonic)

EDIT PEAK LIST (Final Measurement Results)

Trace1: CF18MIQP
Trace2: CF18MIAV
Trace3: ---

TRACE		FREQUENCY	LEVEL dBµV		DELTA LIMIT dB
2	CISPR Average	3.9795 MHz	26.87	L1	-19.13
1	Quasi Peak	4.02 MHz	32.07	L1	-23.92

Note: 1. Measurement Uncertainty is ±4.2dB at a level of confidence of 95%.

2. This product may cause interference to radio equipment and should not be installed near maritime safety communications equipment or other critical navigation or communication equipment operating between 0.45–30 MHz.

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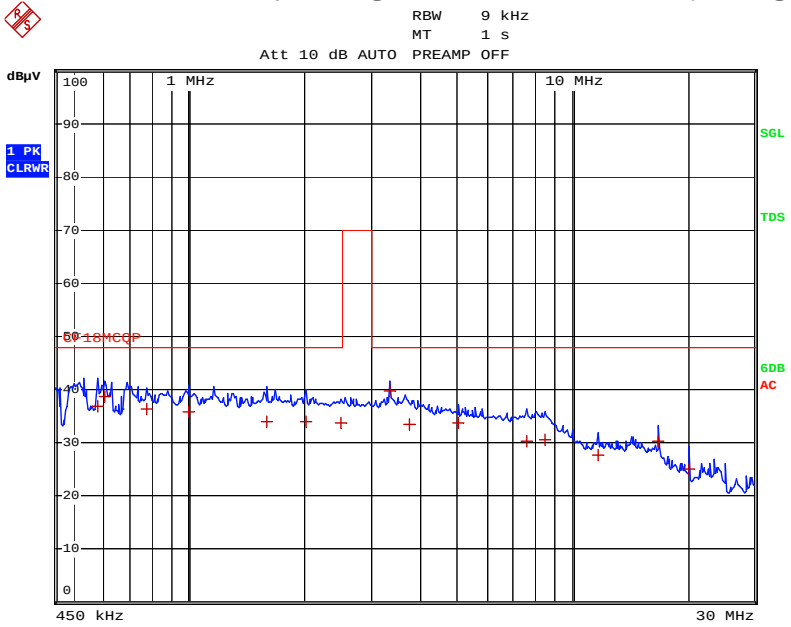
Worst-Case Operating Mode: On 10 & 70% (UV Light)



EDIT PEAK LIST (Final Measurement Results)

Trace1: CF18MCQP
Trace2: ---
Trace3: ---

TRACE		FREQUENCY	LEVEL dBµV		DELTA LIMIT dB
1	Quasi Peak	576 kHz	36.79	L1	-11.20
1	Quasi Peak	598.5 kHz	38.82	L1	-9.17
1	Quasi Peak	774 kHz	36.41	L1	-11.58
1	Quasi Peak	999 kHz	35.76	L1	-12.23
1	Quasi Peak	1.5975 MHz	34.10	L1	-13.89
1	Quasi Peak	2.016 MHz	33.91	L1	-14.08
1	Quasi Peak	2.502 MHz	33.61	N	-14.38
1	Quasi Peak	3.357 MHz	39.64	N	-8.35
1	Quasi Peak	3.753 MHz	33.43	L1	-14.56
1	Quasi Peak	5.0355 MHz	33.72	N	-14.28
1	Quasi Peak	7.6095 MHz	30.39	L1	-17.60
1	Quasi Peak	8.4915 MHz	30.59	N	-17.40
1	Quasi Peak	11.7405 MHz	27.76	N	-20.23
1	Quasi Peak	16.776 MHz	30.31	N	-17.68
1	Quasi Peak	20.133 MHz	25.15	N	-22.84

Note: Measurement Uncertainty is ±4.2dB at a level of confidence of 95%.

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Applicant: Dyson Ltd. Date of Test: February 11, 2015
Model: AM10
Worst-Case Operating Mode: On (UV Light)

Table 1

Radiated Emissions
Pursuant to FCC Part 18 Section 18.305 Requirement

Polarization	Frequency (MHz)	Net at 3m (dBµV/m)	Distance Factor (-dB)	Calculated at 30m (dBµV/m)	Limit at 30m (dBµV/m)	Margin (dB)
V	35.245	34.5	20	14.5	20.0	-5.5
V	45.128	34.8	20	14.8	20.0	-5.2
V	66.387	34.0	20	14.0	20.0	-6.0
H	118.402	33.9	20	13.9	23.5	-9.6
H	233.156	41.2	20	21.2	26.0	-4.8
H	254.265	42.6	20	22.6	26.0	-3.4
H	266.381	42.8	20	22.8	26.0	-3.2
H	308.659	35.2	20	15.2	26.0	-10.8

NOTES: 1. CISPR quasi-peak data unless otherwise stated.

2. All measurements were made at 3 meters. Harmonic emissions not detected at the 3-meter distances were measured at 0.3-meter and an inverse proportional extrapolation was performed to compare the signal level to the 3-meter limit. No other harmonic emissions than those reported were detected at a test distance of 0.3-meter.

3. Negative sign in the column shows value below limit.

4. Measurement Uncertainty is ±5.3dB at a level of confidence of 95%.

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4.0 Equipment Photographs

For electronic filing, the photographs are saved with filename: external photos.pdf and internal photos.pdf.

5.0 Product Labelling

For electronics filing, the FCC ID label artwork and the label location are saved with filename: label.pdf.

6.0 Technical Specifications

For electronic filing, the block diagram and schematic of the tested EUT are saved with filename: block.pdf and circuit.pdf respectively.

7.0 Instruction Manual

For electronic filing, a preliminary copy of the Instruction Manual is saved with filename: manual.pdf.

This manual will be provided to the end-user with each unit sold/leased in the United States.

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8.0 Emissions Test Procedures

The following is a description of the test procedure used by Intertek Testing Services Hong Kong Ltd. in the measurements of Industrial, Scientific and Medical equipment operating under FCC methods of measurements of radio noise emissions from industrial, scientific and medical equipment.

Radiated emissions measurement

Initial measurements are made near the EUT with the measuring antenna 3 meters from the nearest part of the EUT. The dummy load specified in Sections 4.1 or 4.2 is used, as applicable. The EUT is rotated about its vertical axis on the turntable, and the polarization and height of the receiving antenna are varied to obtain the highest field strength on the particular frequency under observation. Measurements at the 3 meter distance are made in a large room or outdoors; with the equipment and antenna located so as to minimize effects due to reflections from the building structure or other items in the field. For measurements above ICE: and at 3 meters, an antenna of small aperture (i.e. , a small horn, without its reflector) is used, because the field over the area of a large antenna would be non-uniform, and such an antenna would not have the gain normally expected.

At each test frequency, the reading of the field strength meter is observed during the heating cycle as the following factors are varied:

(1) EUT orientation;
(2) antenna orientation;
(3) antenna polarization

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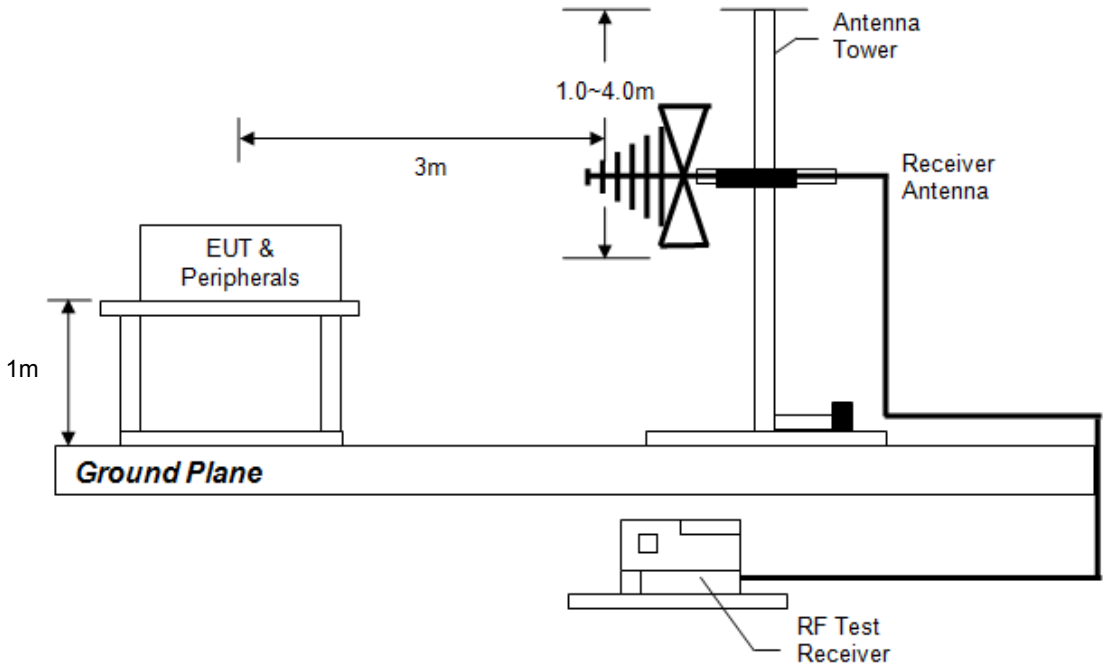
8.1 Radiated Emission Test Setup

The figure below shows the test setup, which is utilized to make these measurements.



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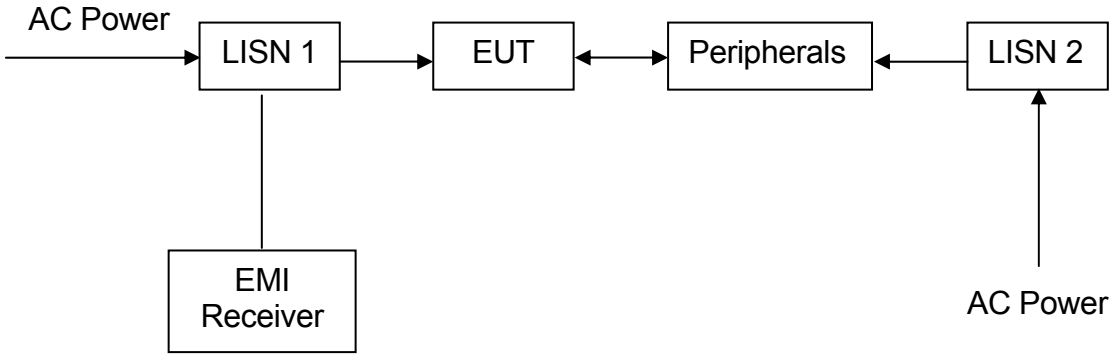
8.2 Conducted Emission Test Configuration

Conducted emissions tests

Measurements of powerline conducted radio noise shall be expressed as the voltage developed across the 50-ohm port terminated by a 50-ohm measuring instrument. All voltage measurements shall be made at the plug end of the EUT power cord, e.g. , by the use of mating plugs and receptacles on the EUT and LISN.

8.3 Conducted Emission Test Setup



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9.0 **Equipment List**

1) Radiated Emissions Test

Equipment	Log Periodic Antenna	EMI Test Receiver	Spectrum Analyzer
Registration No.	EW-0446	EW-2500	EW-2188
Manufacturer	EMCO	R&S	AGILENTTECH
Model No.	3146	ESCI	E4407B
Calibration Date	Nov. 10, 2014	Nov. 06, 2014	Apr. 16, 2014
Calibration Due Date	May 10, 2016	Nov. 06, 2015	Apr. 16, 2015

Equipment	Biconical Antenna
Registration No.	EW-0954
Manufacturer	EMCO
Model No.	3104C
Calibration Date	Nov. 14, 2014
Calibration Due Date	May 14, 2016

2) Conducted Emissions Test

Equipment	EMI Test Receiver	LISN	Pulse Limiter
Registration No.	EW-2251	EW-0192	EW-0700
Manufacturer	R&S	R&S	R&S
Model No.	ESCI	ESH3-Z5	ESH3-Z2
Calibration Date	Dec. 04, 2014	Jul. 24, 2014	Jan. 15, 2014
Calibration Due Date	Dec. 04, 2015	Apr. 15, 2015	Jul. 15, 2015

END OF TEST REPORT

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