Report On

FCC Testing of the
Dyson Limited
Vacuum Cleaner RF Remote Control

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FCC ID: QVHDC22TXUS

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REPORT ON

FCC Testing of the
Dyson Limited
Vacuum Cleaner RF Remote Control

Document 75906198 Report 02 Issue 1

May 2009

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M Jenkins
Authorised Signatory

DATED

07 May 2009

07 May 2009

ENGINEERING STATEMENT

The measurements shown in this report were made in accordance with the procedures described on test pages. All reported testing was carried out on a sample equipment to demonstrate limited compliance with FCC CFR 47: Parts 15 C. The sample tested was found to comply with the requirements defined in the applied rules.

Test Engineer(s);

J Holcombe

S Bennett

Product Service

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Product Service

SECTION 1

REPORT SUMMARY

FCC Testing of the
Dyson Limited
Vacuum Cleaner RF Remote Control

1.1 INTRODUCTION

The information contained in this report is intended to show verification of the Dyson Limited Vacuum Cleaner RF Remote Control to the requirements of FCC CFR 47 Part 15C.

Objective	To perform FCC Testing to determine the Equipment Under Test's (EUT's) compliance with the Test Specification, for the series of tests carried out.
Manufacturer	Dyson Limited
PCB Part Number	14181-01-05
Serial Number	TSR003 (Modified Continuous Transmit. TUV Serialised for testing purposes)
Number of Samples Tested	1
Test Specification/Issue/Date	FCC CFR 47 Part 15C: 2007
Incoming Release Date	Declaration of Build Status 28 April 2009
Disposal Reference Number Date	Held Pending Disposal Not Applicable Not Applicable
Order Number Date	4500016918 20 March 2009
Start of Test	08 April 2009
Finish of Test	20 April 2009
Name of Engineer(s)	J Holcombe S Bennett
Related Document(s)	ANSI 63.4 : 2001

1.2 BRIEF SUMMARY OF RESULTS

A brief summary of results for each configuration, in accordance with FCC CFR 47 Part 15C, is shown below.

Configuration 1 - Transmitter attached to handle only						
Section	Spec Clause	Test Description	Mode	Mod State	Result	Base Standard
2.1	15.209	Radiated Emissions (Enclosure Port)	Transmitter Operating	0	Pass	ANSI 63.4
2.2	15.231(c)	Occupied Bandwidth	Transmitter Operating	0	Pass	ANSI 63.4
2.3	15.231(a)	Transmission Time	Transmitter Operating	0	Pass	ANSI 63.4

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1.3 DECLARATION OF BUILD STATUS

Manufacturer	Dyson Ltd
Country of origin	Malaysia
UK Agent	Dyson Ltd
Technical Description	Vacuum cleaner with RF remote control
Model No	DC22 Motor-Head
Part No	16624-01
Serial No	522-US-A-11255
Declared Variant	DC22 Turbine Head
Build Status	Fully assembled
Software/Hardware Issue	See section 1.4.2, Test Configuration and BOM List Transmitter DC22 315M00 TX 3 Buttons - PCB Assembly Parts List 14181-01-05 Receiver DC22 Control MTH/Receiver - PCB Assembly Parts List 16212-01-01
FCC ID	QVHDC22TXUS
Signature	Jon Robinson (Approvals and Support Manager)
Date	28 April 2009
D of B S Serial No	75906198

Note: This document has been prepared to enable manufacturers with no mechanism for producing their own Declaration of Build Status, to declare the build state of the equipment submitted for test.

No responsibility will be accepted by TÜV Product Service as to the accuracy of the information declared in this document by the manufacturer.

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1.4 PRODUCT INFORMATION

1.4.1 Technical Description

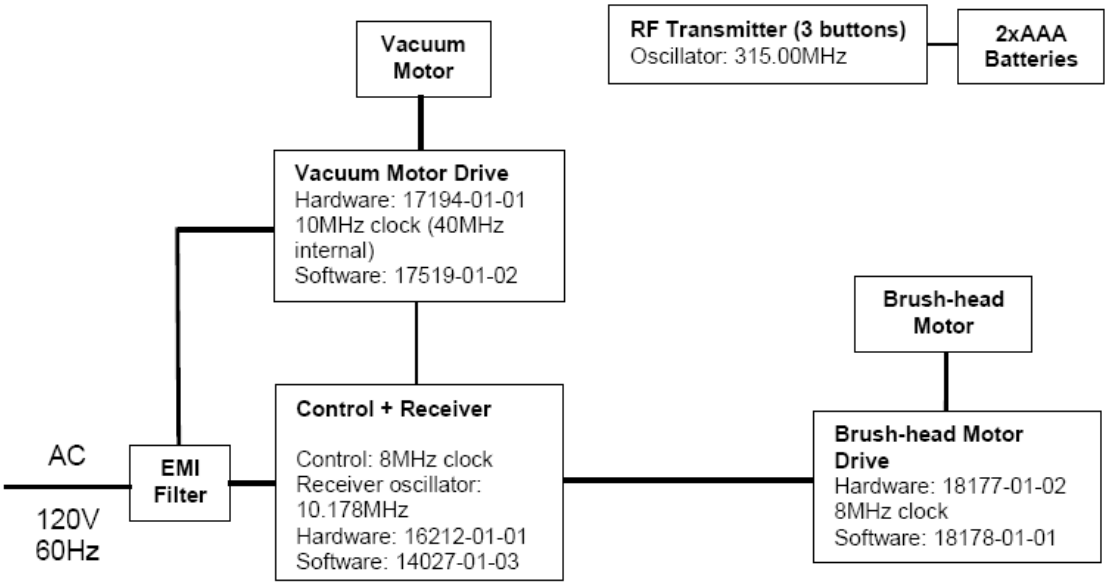
The Equipment Under Test (EUT) was a Dyson Limited Vacuum Cleaner RF Remote Control as shown in the photograph below. A full technical description can be found in the Manufacturers documentation.

Equipment Under Test

Product Service

1.4.2 Test Configuration

Configuration 1: Transmitter attached to handle only



1.4.3 EUT Cable / Port Identification

Port	Max Cable Length specified	Usage	Type	Screened
AC Power	5m	Mains Lead	2 core	No

1.4.4 Modes of Operation

Modes of operation of each EUT during testing were as follows:

Mode 1 - Transmitter Operating

Information on the specific test modes utilised are detailed in the test procedure for each individual test.

1.5 TEST CONDITIONS

For all tests the EUT was set up in accordance with the relevant test standard and to represent typical operating conditions. Tests were applied with the EUT situated in a shielded enclosure, test laboratories or an open test area as appropriate.

The EUT transmitter was powered by batteries.

FCC Accreditation
90987 Octagon House, Fareham Test Laboratory

1.6 DEVIATIONS FROM THE STANDARD

No deviations from the applicable test standards or test plan were made during testing.

1.7 MODIFICATION RECORD

No modifications were made to the EUT during testing.

Product Service

SECTION 2

TEST DETAILS

FCC Testing of the
Dyson Limited
Vacuum Cleaner RF Remote Control

2.1 RADIATED EMISSIONS (ENCLOSURE PORT)

2.1.1 Specification Reference

FCC CFR 47 Part 15C, Clause 15.209

2.1.2 Equipment Under Test

Vacuum Cleaner RF Remote Control, S/N: TSR003

2.1.3 Date of Test and Modification State

08 to 09 April 2009 - Modification State 0

2.1.4 Test Equipment Used

The major items of test equipment used for the above tests are identified in Section 3.1.

2.1.5 Test Method and Operating Modes

The test was applied in accordance with the test method requirements of ANSI 63.4

The test was performed with the EUT in the following configurations and modes of operation:

Configuration 1 - Mode 1

2.1.6 Environmental Conditions

	08 April 2009	09 April 2009
Ambient Temperature	21°C	21°C
Relative Humidity	32%	49%
Atmospheric Pressure	1024mbar	998mbar

Product Service

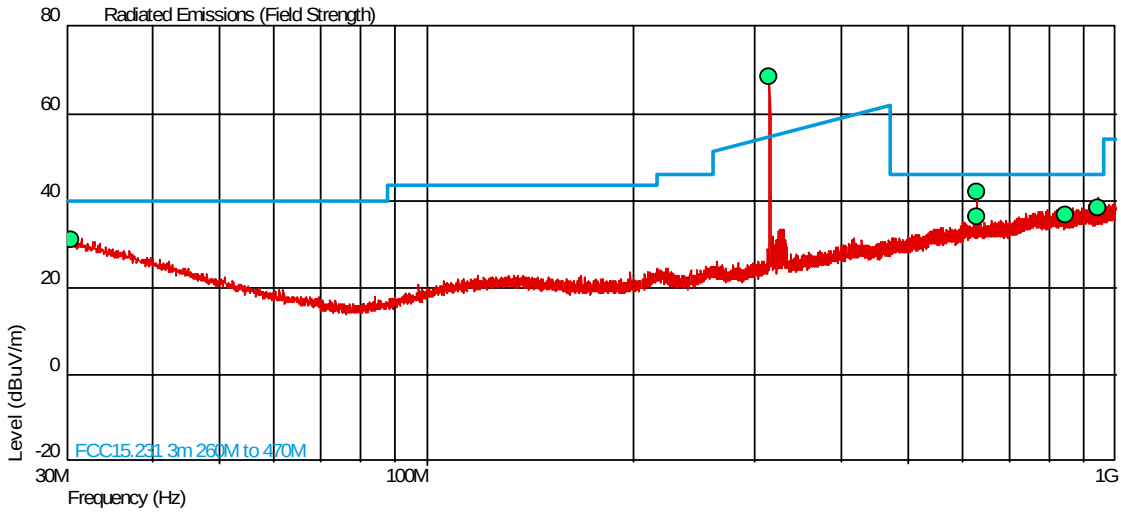
2.1.7 Test Results

For the period of test the EUT met the requirements of FCC CFR 47 Part 15C for Radiated Emissions (Enclosure Port).

The test results are shown below.

Configuration 1 - Mode 1

30MHz to 1GHz

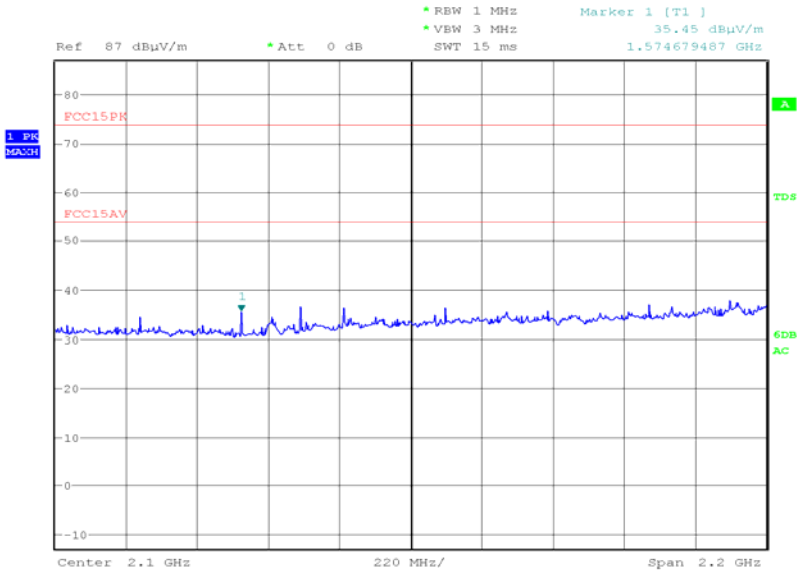


Frequency (MHz)	QP Level (dBuV/m)	QP Level (uV/m)	QP Limit (dBuV/m)	QP Limit (uV/m)	QP Margin (dBuV/m)	QP Margin (uV/m)	Angle (Deg)	Height (m)	Polarity
30.457	30.8	34.7	40.0	100	-9.2	-65.3	261	1.00	Horizontal
315.065	68.4	2630.3	74.9	5559	-6.4	-2928.7	104	1.02	Horizontal
630.091	36.3	65.3	46.0	200	-9.7	-134.7	207	1.00	Vertical
630.099	42.0	125.9	46.0	200	-4.0	-74.1	97	1.21	Horizontal
846.352	36.6	67.6	46.0	200	-9.4	-132.4	217	1.00	Horizontal
945.134	38.2	81.3	46.0	200	-7.8	-118.7	243	1.00	Horizontal

The emission detected at 315.065MHz is the carrier. It has been measured for the required carrier field strength emission measurement. The limit for this emission is 20dB higher than the limit displayed and therefore complies with the requirement of the specification.

1GHz to 3.2GHz

Vertical



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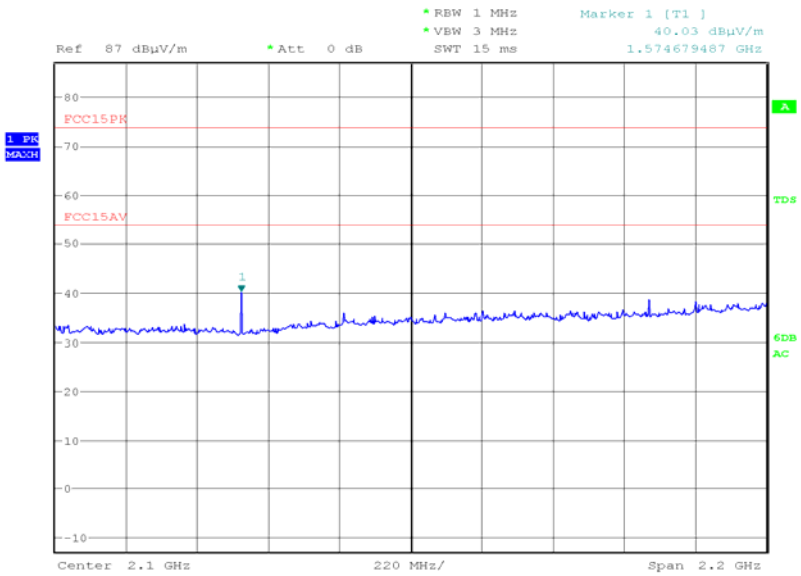
Horizontal



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No emissions were detected within 14.97dB of the Average limit. Therefore no formal measurements made as the EUT was deemed to meet the specification limits.

2.2 OCCUPIED BANDWIDTH

2.2.1 Specification Reference

FCC CFR 47 Part 15C, Clause 15.231(c)

2.2.2 Equipment Under Test

Vacuum Cleaner RF Remote Control, TSR003

2.2.3 Date of Test and Modification State

17 April 2009 - Modification State 0

2.2.4 Test Equipment Used

The major items of test equipment used for the above tests are identified in Section 3.1.

2.2.5 Test Method and Operating Modes

The test was applied in accordance with the test method requirements of ANSI 63.4

The EUT was set to continuously transmit at maximum power with modulation. The EUT was positioned on a test jig to couple the RF power to a Spectrum Analyser. Using a resolution bandwidth of 100Hz the -20dBc points were established as defined in 15.231(c), and the emission bandwidth determined.

The plot on the following page shows the resultant display from the Spectrum Analyser.

The test was performed with the EUT in the following configurations and modes of operation:

Configuration 1 - Mode 1

2.2.6 Environmental Conditions

	17 April 2009
Ambient Temperature	24°C
Relative Humidity	41%

Product Service

2.2.7 Test Results

The EUT met the requirements as defined in 15.231(c), Occupied Bandwidth, as defined by the -20dBc points.

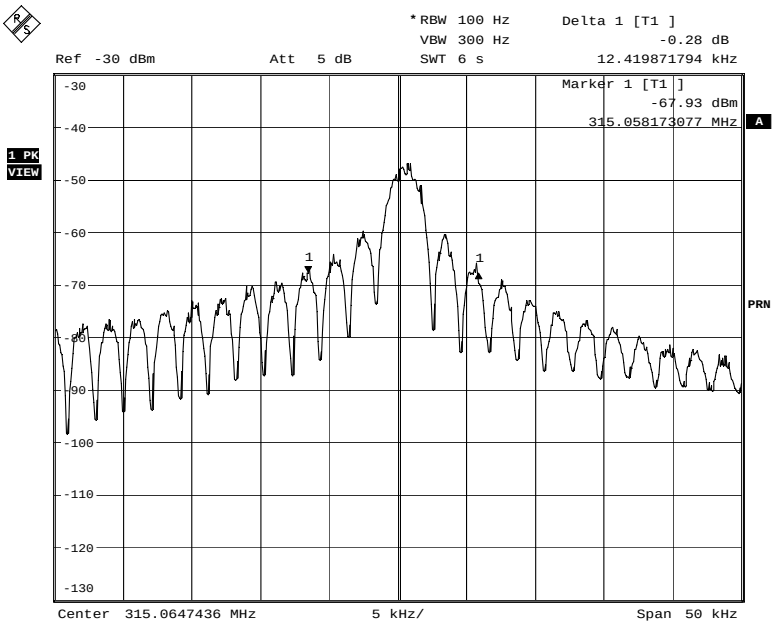
The test results are shown below.

Configuration 1 - Mode 1

20dB Bandwidth	12.719871 kHz

Limit

0.25% of F_c
315.065 MHz = 787.6625 kHz



2.3 TRANSMISSION TIME

2.3.1 Specification Reference

FCC CFR 47 Part 15C, Clause 15.231(a)

2.3.2 Equipment Under Test

Vacuum Cleaner RF Remote Control, TSR003

2.3.3 Date of Test and Modification State

20 April 2009 - Modification State 0

2.3.4 Test Equipment Used

The major items of test equipment used for the above tests are identified in Section 3.1.

2.3.5 Test Method and Operating Modes

The test was applied in accordance with the test method requirements of ANSI 63.4

The EUT has three buttons which operate various functions on the vacuum cleaner remotely. The EUT only transmits when manually activated. An automatic, periodic transmission is not possible. The buttons can be depressed in two manners. One is to press the button and release, the other is to pres the button and hold. This does affect the transmission time, but the requirements defined in 15.231(a) are still met.

The plot on the following page shows the transmission time for both modes of button operation.

The test was performed with the EUT in the following configurations and modes of operation:

Configuration 1 - Mode 1

2.3.6 Environmental Conditions

	20 April 2009
Ambient Temperature	21°C
Relative Humidity	42%

Product Service

2.3.7 Test Results

The EUT met the requirements as defined in 15.231(a), Transmission Time. Under all circumstances, the EUT does not transmit for more than 5 seconds.

The test results are shown below.

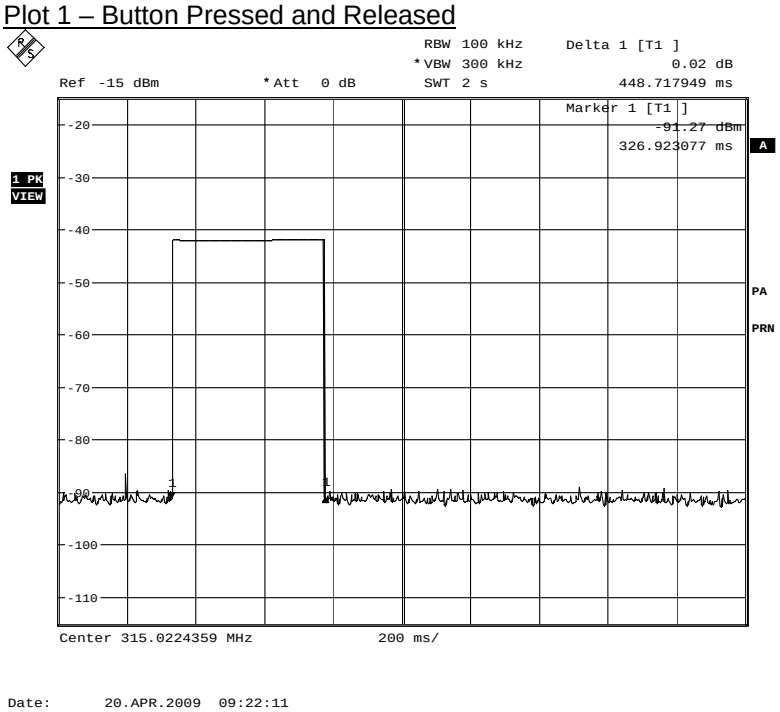
Configuration 1 - Mode 1

Plot 1 - Transmission Time with button is depressed momentarily	448.718 ms
Plot 2 - Transmission Time with button is depressed depressed	884.615 ms

Limit

< 5 seconds

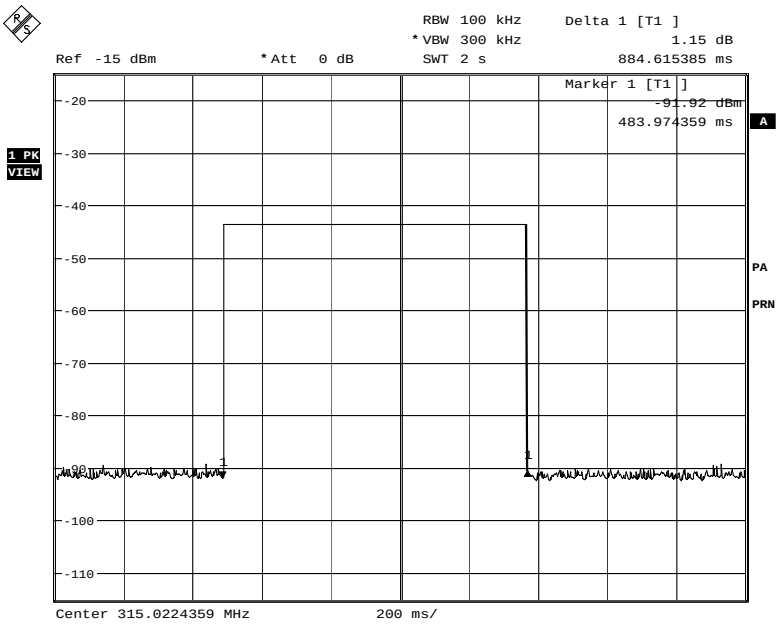
Plot 1 – Button Pressed and Released



Date: 20.APR.2009 09:22:11

Product Service

Plot 2 – Button Pressed and Held



Date: 20.APR.2009 09:23:12

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SECTION 3

TEST EQUIPMENT USED

Product Service

3.1 TEST EQUIPMENT USED

List of absolute measuring and other principal items of test equipment.

Instrument	Manufacturer	Type No.	TE No.	Calibration Period (months)	Calibration Due
Section 2.1 EMC - Radiated Emissions					
Antenna (Double Ridge Guide, 1GHz-18GHz)	EMCO	3115	234	12	6-Sep-2009
Pre-Amplifier	Phase One	PS04-0085	1532	12	15-Sep-2009
Screened Room (5)	Rainford	Rainford	1545	36	11-Feb-2011
Mast Controller	Inn-Co GmbH	CO 1000	1606	-	TU
Turntable/Mast Controller	EMCO	2090	1607	-	TU
Antenna (Bilog)	Chase	CBL6143	2904	24	28-Nov-2009
EMI Test Receiver	Rohde & Schwarz	ESU40	3506	12	20-Aug-2009
Section 2.2 Radio (Tx) - Occupied Bandwidth					
RF Coupler	TUV	RFC1	414	-	TU
Hygromer	Rotronic	A1	2138	12	13-May-2009
Programmable Power Supply	Iso-tech	IPS 2010	2437	12	19-Sep-2009
Spectrum Analyser	Rohde & Schwarz	FSU26	2747	12	3-Jun-2009
Multimeter	Fluke	77 Series II	3067	12	15-May-2009
Section 2.3 Radio (Tx) - Transmission Time					
RF Coupler	TUV	RFC1	414	-	TU
Hygromer	Rotronic	A1	2138	12	13-May-2009
Programmable Power Supply	Iso-tech	IPS 2010	2437	12	19-Sep-2009
Spectrum Analyser	Rohde & Schwarz	FSU26	2747	12	3-Jun-2009
Multimeter	Fluke	77 Series II	3067	12	15-May-2009

TU – Traceability Unscheduled

Product Service

3.2 MEASUREMENT UNCERTAINTY

For a 95% confidence level, the measurement uncertainties for defined systems are:-

Test Discipline	Frequency / Parameter	MU
Radiated Emissions, Bilog Antenna, AOATS	30MHz to 1GHz Amplitude	5.1dB*
Radiated Emissions, Horn Antenna, AOATS	1GHz to 40GHz Amplitude	6.3dB*
Conducted Emissions, LISN	150kHz to 30MHz Amplitude	3.2dB*
Conducted Emissions, ISN	150kHz to 30MHz Amplitude	2.1dB
Substitution Antenna, Radiated Field	30MHz to 18GHz Amplitude	2.6dB
Discontinuous Interference	150kHz to 30MHz Amplitude	3.0dB*
Interference Power	30MHz to 300MHz Amplitude	3.0dB*
Radiated E-Field Susceptibility	26MHz to 2.5GHz Test Amplitude	1.4dB†
Conducted Susceptibility	100kHz to 250MHz Amplitude	1.8dB†
DC Input Ripple Immunity	Current Voltage	0.45% 0.91%
Power Frequency Magnetic Field	50Hz/60Hz Amplitude	0.45%
Magnetic Emissions	9kHz to 30MHz Amplitude	3.4dB*
Magnetic Field/Flux iaw EN 50366	10Hz to 400kHz	2.64%
Harmonics and Flicker	The test was applied using proprietary equipment that meets the requirements of EN 61000-3-2 and EN 61000-3-3	—
Mains Voltage Variations and Interrupts	The test was applied using proprietary equipment that meets the requirements of EN 61000-4-11	—
Fast Transient Burst	The test was applied using proprietary equipment that meets the requirements of EN 61000-4-4	—
Electrostatic Discharge	The test was applied using proprietary equipment that meets the requirements of EN 61000-4-2	—
Surge	The test was applied using proprietary equipment that meets the requirements of EN 61000-4-5	—
Vehicle Transients	The test was applied using proprietary equipment that meets the requirements of ISO 7637-1 and 2	—
Compass Safe Distance	Azimuth Accuracy	0.10°

Worst case error for both Time and Frequency measurement 12 parts in 10^6.

* In accordance with CISPR 16-4
† In accordance with UKAS Lab 34

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SECTION 4

PHOTOGRAPHS

4.1 TEST SET UP PHOTOGRAPHS

Radiated Emissions (Enclosure Port)

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SECTION 5

ACCREDITATION, DISCLAIMERS AND COPYRIGHT

5.1 ACCREDITATION, DISCLAIMERS AND COPYRIGHT

This report relates only to the actual item/items tested.

Our UKAS Accreditation does not cover opinions and interpretations and any expressed are outside the scope of our UKAS Accreditation.

Results of tests not covered by our UKAS Accreditation Schedule are marked NUA (Not UKAS Accredited).