



TEST REPORT

Test Report No. : UL-RPT-RP11906202-1316A

Manufacturer : Dyson Technology Limited
Model No. / PMN : DBWIFIBLE01
HVIN : DBWIFIBLE01
FCC ID : QVHDBWIFIBLE01
ISED Certification No. : IC: 7986A-DBWIFIBLE01
Test Standard(s) : FCC Part 15.207 &
ISED Canada RSS-Gen Issue 4 November 2014 Section 8.8

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2. The results in this report apply only to the sample(s) tested.
3. The sample tested is in compliance with the above standard(s).
4. The test results in this report are traceable to the national or international standards.
5. Version 1.0

Date of Issue: 12 January 2018

Checked by: 
Sarah Williams
Senior Test Engineer, Radio Laboratory

Company Signatory: 
Ian Watch
Senior Test Engineer, Radio Laboratory
UL VS LTD



This laboratory is accredited by UKAS.
The tests reported herein have been
performed in accordance with its terms
of accreditation.

UL VS LTD

Pavilion A, Ashwood Park, Ashwood Way, Basingstoke, Hampshire, RG23 8BG, UK
Telephone: +44 (0)1256 312000
Facsimile: +44 (0)1256 312001

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1. Customer Information

Company Name:	Dyson Technology Limited
Address:	Tetbury Hill Malmesbury Swindon SN16 0RP United Kingdom

2. Summary of Testing

2.1. General Information

Specification Reference:	47CFR15.207
Specification Title:	Code of Federal Regulations Volume 47 (Telecommunications): Part 15 Subpart C (Intentional Radiators) - Section 15.207
Specification Reference:	ISED Canada RSS-Gen Issue 4 November 2014
Specification Title:	General Requirements for Compliance of Radio Apparatus
Location of Testing:	UL VS LTD, Unit 3 Horizon, Wade Road, Kingsland Business Park, Basingstoke, Hampshire, RG24 8AH, United Kingdom
Test Date:	11 January 2018

2.2. Summary of Test Results

FCC Reference (47CFR)	ISED Canada Reference	Measurement	Result
Part 15.207	RSS-Gen 8.8	Transmitter AC Conducted Emissions	
Key to Results  = Complied  = Did not comply			

2.3. Methods and Procedures

Reference:	ANSI C63.10-2013
Title:	American National Standard of Procedures for Compliance Testing of Unlicensed Wireless Devices
Reference:	KDB 174176 D01 Line Conducted FAQ v01r01 June 3, 2015
Title:	AC Power-Line Conducted Emissions Frequently Asked Questions

2.4. Deviations from the Test Specification

For the measurements contained within this test report, there were no deviations from, additions to, or exclusions from the test specification identified above.

3. Equipment Under Test (EUT)

3.1. Identification of Equipment Under Test (EUT)

Brand Name:	Dyson
Model Name / PMN:	DBWIFIBLE01
HVIN:	DBWIFIBLE01
Test Sample Serial Number:	26 (<i>Radiated sample</i>)
Hardware Version:	259866-01/05 (EB2.2)
Software Version:	MFG SDK 442.1
FCC ID:	QVHDBWIFIBLE01
ISED Certification Number:	IC: 7986A-DBWIFIBLE01

3.2. Description of EUT

The Equipment Under Test was a *Bluetooth* Low Energy and WLAN module operating in the 2.4 & 5 GHz bands.

3.3. Modifications Incorporated in the EUT

No modifications were applied to the EUT during testing.

3.4. Additional Information Related to Testing

Technology Tested:	Bluetooth Low Energy (Digital Transmission System)		
Type of Unit:	Transceiver		
Power Supply Requirement(s):	Nominal	3.3 VDC	
Channel Spacing:	2 MHz		
Modulation:	GFSK		
Data Rate:	1 Mbps		
Transmit Frequency Range:	2402 MHz to 2480 MHz		
Transmit Channels Tested:	Channel ID	RF Channel	Channel Frequency (MHz)
	Middle	19	2440

Technology Tested:	WLAN (IEEE 802.11b,g,n) / Digital Transmission System		
Type of Unit:	Transceiver		
Modulation Type:	DBPSK		
Data Rates:	802.11b	1 Mbps	
Channel Spacing:	20 MHz		
Transmit Frequency Range:	2412 MHz to 2462 MHz		
Transmit Channels Tested:	Channel Number	Channel Frequency (MHz)	
	6	2437	

Technology Tested:	WLAN (IEEE 802.11a,n) / U-NII		
Type of Unit:	Transceiver		
Modulation:	BPSK		
Data rates:	802.11a	6 Mbps	
Channel Spacing:	20 MHz		
Transmit Frequency Band:	5470 MHz to 5725 MHz		
Transmit Channels Tested:	Channel ID	Channel Number	Channel Frequency (MHz)
	Middle	116	5580

3.5. Support Equipment

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

Description:	Laptop PC
Brand Name:	Lenovo
Model Name or Number:	T420
Serial Number:	R8-VM66D

Description:	USB Micro-B Cable. Length 1.5 metres
Brand Name:	Not stated or marked
Model Name or Number:	Not stated or marked
Serial Number:	Not stated or marked

Description:	Test Jig
Brand Name:	Not stated or marked
Model Name or Number:	Not stated or marked
Serial Number:	Not stated or marked

4. Operation and Monitoring of the EUT during Testing

4.1. Operating Modes

The EUT was tested in the following operating mode(s):

- The EUT was tested in the following operating mode(s): Pre-scans were performed with the EUT transmitting in *Bluetooth* LE, 2.4 GHz WLAN and 5.0 GHz WLAN modes. The worst case mode was found to be *Bluetooth* LE. Final measurements were performed in this configuration.

4.2. Configuration and Peripherals

The EUT was tested in the following configuration(s):

- The test setup instructions were supplied in a file "*Radio Test Mode Instructions.pdf*" -08/18/2017. This is archived on the UL VS LTD IT network and is available for inspection if required.
- Controlled using a software application on the laptop PC supplied by the customer. The application was used to enable continuous transmission and to select the test channels and required configurations as required.
- The EUT was powered from a 3.3 VDC bench power supply. The power supply was monitored throughout the testing with a calibrated multimeter.

5. Measurements, Examinations and Derived Results

5.1. General Comments

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 6 Measurement Uncertainty for details.

In accordance with UKAS requirements all the measurement equipment is on a calibration schedule. All equipment was within the calibration period on the date of testing.

5.2. Test Results

5.2.1. Transmitter AC Conducted Spurious Emissions

Test Summary:

Test Engineer:	Andrew Edwards	Test Date:	11 January 2018
Test Sample Serial Number:	26		

FCC Reference:	Part 15.207
ISED Canada Reference:	RSS-Gen 8.8
Test Method Used:	ANSI C63.10 Section 6.2 / FCC KDB 174176 and notes below

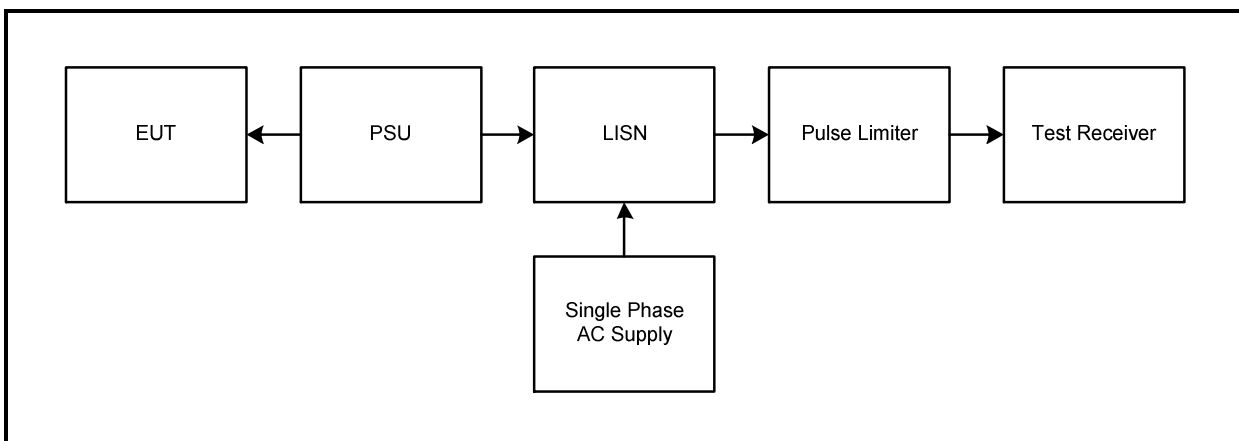
Environmental Conditions:

Temperature (°C):	23
Relative Humidity (%):	38

Note(s):

1. The EUT was powered by to a bench power supply which was connected to a 120 VAC 60 Hz single phase supply via a LISN.
2. In accordance with FCC KDB 174176 Q4, tests were performed with a 240 VAC 60 Hz single phase supply as this was within the voltage range marked on the AC/DC Adaptor.
3. A pulse limiter was fitted between the LISN and the test receiver.
4. Pre-scans were performed and markers placed on the highest live and neutral measured levels. Final measurements were performed on the marker frequencies and the results entered into the tables below.
5. Pre-scans at 120 VAC 60 Hz for Live and Neutral were performed with the EUT transmitting on the middle channel of *Bluetooth* LE, 2.4 GHz WLAN and 5 GHz WLAN modes. The worst case mode was found to be *Bluetooth* LE and final measurements were performed in this configuration at both 120 and 240 VAC. Pre-scans for all other modes are archived on the UL VS LTD IT server and available for inspection if required.

Test setup:



Transmitter AC Conducted Spurious Emissions (continued)**Results: Live / Quasi Peak / 120 VAC 60 Hz**

Frequency (MHz)	Line	Level (dBμV)	Limit (dBμV)	Margin (dB)	Result
0.150	Live	43.7	66.0	22.3	Complied
0.164	Live	43.0	65.3	22.3	Complied
0.609	Live	8.9	56.0	47.1	Complied
5.289	Live	10.6	60.0	49.4	Complied
15.504	Live	11.3	60.0	48.7	Complied
17.237	Live	12.2	60.0	47.8	Complied

Results: Live / Average / 120 VAC 60 Hz

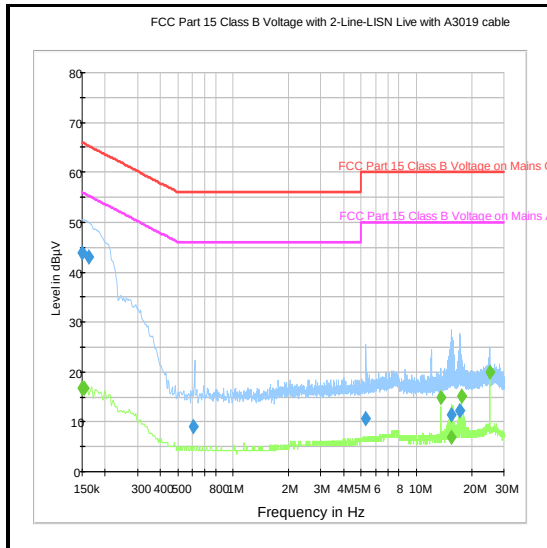
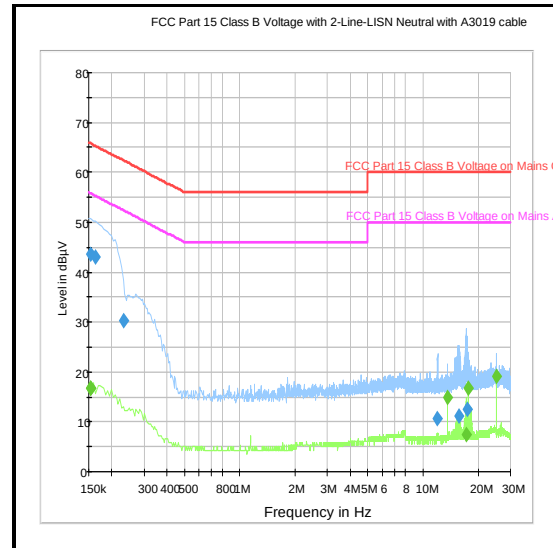
Frequency (MHz)	Line	Level (dBμV)	Limit (dBμV)	Margin (dB)	Result
0.150	Live	16.6	56.0	39.4	Complied
0.155	Live	16.7	55.8	39.1	Complied
13.560	Live	14.9	50.0	35.1	Complied
15.387	Live	6.9	50.0	43.1	Complied
17.696	Live	15.1	50.0	34.9	Complied
25.058	Live	19.8	50.0	30.2	Complied

Results: Neutral / Quasi Peak / 120 VAC 60 Hz

Frequency (MHz)	Line	Level (dBμV)	Limit (dBμV)	Margin (dB)	Result
0.155	Neutral	43.6	65.8	22.2	Complied
0.164	Neutral	43.0	65.3	22.3	Complied
0.231	Neutral	30.4	62.4	32.0	Complied
11.994	Neutral	10.7	60.0	49.3	Complied
15.581	Neutral	11.1	60.0	48.9	Complied
17.322	Neutral	12.4	60.0	47.6	Complied

Results: Neutral / Average / 120 VAC 60 Hz

Frequency (MHz)	Line	Level (dBμV)	Limit (dBμV)	Margin (dB)	Result
0.155	Neutral	16.7	55.8	39.1	Complied
13.560	Neutral	15.0	50.0	35.0	Complied
17.210	Neutral	7.4	50.0	42.6	Complied
17.696	Neutral	16.7	50.0	33.3	Complied
25.058	Neutral	19.2	50.0	30.8	Complied

Transmitter AC Conducted Spurious Emissions (continued)**Results: 120 VAC 60 Hz****Live****Neutral**

Transmitter AC Conducted Spurious Emissions (continued)**Results: Live / Quasi Peak / 240 VAC 60 Hz**

Frequency (MHz)	Line	Level (dBμV)	Limit (dBμV)	Margin (dB)	Result
0.155	Live	31.7	65.8	34.1	Complied
0.236	Live	18.7	62.3	43.6	Complied
11.999	Live	10.5	60.0	49.5	Complied
15.734	Live	11.3	60.0	48.7	Complied
17.219	Live	11.8	60.0	48.2	Complied
25.058	Live	21.9	60.0	38.1	Complied

Results: Live / Average / 240 VAC 60 Hz

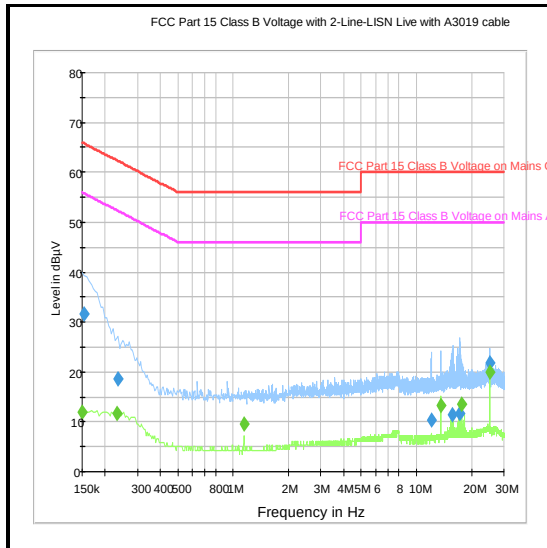
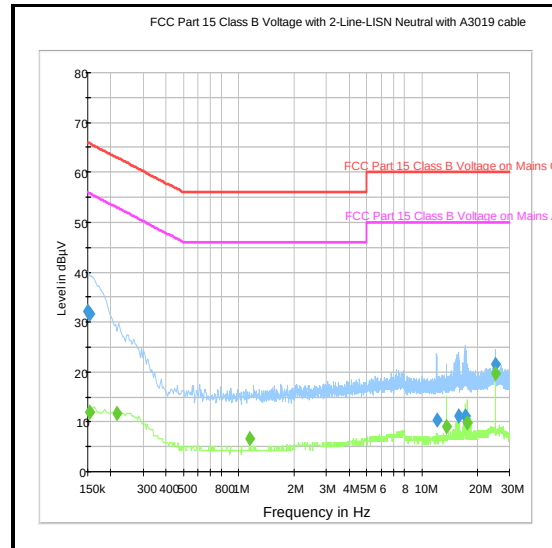
Frequency (MHz)	Line	Level (dBμV)	Limit (dBμV)	Margin (dB)	Result
0.150	Live	12.0	56.0	44.0	Complied
0.231	Live	11.6	52.4	40.8	Complied
1.149	Live	9.5	46.0	36.5	Complied
13.560	Live	13.3	50.0	36.7	Complied
17.696	Live	13.6	50.0	36.4	Complied
25.058	Live	20.0	50.0	30.0	Complied

Results: Neutral / Quasi Peak / 240 VAC 60 Hz

Frequency (MHz)	Line	Level (dBμV)	Limit (dBμV)	Margin (dB)	Result
0.150	Neutral	32.1	66.0	33.9	Complied
0.155	Neutral	31.6	65.8	34.2	Complied
11.999	Neutral	10.3	60.0	49.7	Complied
15.797	Neutral	11.1	60.0	48.9	Complied
17.219	Neutral	11.2	60.0	48.8	Complied
25.058	Neutral	21.5	60.0	38.5	Complied

Results: Neutral / Average / 240 VAC 60 Hz

Frequency (MHz)	Line	Level (dBμV)	Limit (dBμV)	Margin (dB)	Result
0.155	Neutral	12.0	55.8	43.8	Complied
0.218	Neutral	11.7	52.9	41.2	Complied
1.149	Neutral	6.6	46.0	39.4	Complied
13.556	Neutral	9.0	50.0	41.0	Complied
17.691	Neutral	9.7	50.0	40.3	Complied
25.058	Neutral	19.6	50.0	30.4	Complied

Transmitter AC Conducted Spurious Emissions (continued)**Results: 240 VAC 60 Hz****Live****Neutral**

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

Test Equipment Used:

Asset No.	Instrument	Manufacturer	Type No.	Serial No.	Date Calibration Due	Cal. Interval (Months)
M2013	Thermohygrometer	Testo	608-H1	45046419	20 Jun 2018	12
M1263	Test Receiver	Rohde & Schwarz	ESIB7	100265	13 Nov 2018	12
A649	LISN	Rohde & Schwarz	ESH3-Z5	825562/008	31 May 2018	12
A1830	Pulse Limiter	Rohde & Schwarz	ESH3-Z2	100668	09 May 2018	12
M1229	Multimeter	Fluke	179	87640015	12 May 2018	12
A2953	240 VAC Power Supply	Tacima	SC 5467	Not stated	Calibrated before use	-
S0529	DC Power Supply	ISO-Tech	IPS2302A	504E005G2	Calibrated before use	-

6. 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
AC Conducted Spurious Emissions	0.15 MHz to 30 MHz	95%	±4.69 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.

7. Report Revision History

Version Number	Revision Details		
	Page No(s)	Clause	Details
1.0	-	-	Initial Version

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