



TEST REPORT

Test Report No. : UL-RPT-RP11456397JD13F V2.0

Manufacturer : Neeo AG
Model No. / PMN : 6336-REMOTE
HVIN : 6336-REMOTE
FCC ID : 2AKK7-RM633601
ISED Certification No. : IC: 22300-RM633601
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. This 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 2.0 supersedes all previous versions.

Date of Issue: 24 May 2017

Checked by:

Ian Watch
Senior Engineer, Radio Laboratory

Company Signatory:

Sarah Williams
Senior 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.

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1. Customer Information

Company Name:	Neeo AG
Address:	Ritterquai 8 4500 Solothurn Switzerland

2. Summary of Testing

2.1. General Information

Specification Reference:	FCC 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:	26 April 2017

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:	Neeo
Model No. / PMN:	6336-REMOTE
HVIN:	6336-REMOTE
Test Sample Serial Number:	Not marked or stated (<i>Radiated sample</i>)
Hardware Version:	Hardware Rev. 10
Software Version:	0.18.5
FCC ID:	2AKK7-RM633601
ISED Certification Number:	IC: 22300-RM633601

Description:	AC/DC Adaptor
Brand Name:	Liteon
Model Name or Number:	PA-1100-25
Serial Number:	KPO1003005 6088111EPE03

Description:	Docking station
Brand Name:	Neeo
Model Name or Number:	Not marked or stated
Serial Number:	Not marked or stated

3.2. Description of EUT

The Equipment Under Test was a Thinking Remote for home automation. It contains IEEE 802.15.4 and WLAN transceivers. It is powered from a 3.7 Volt rechargeable battery.

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:	IEEE 802.15.4 / Digital Transmission System	
Type of Unit:	Transceiver	
Modulation Type:	O-QPSK	
Data Rate:	250 kbps	
Transmit Frequency Range:	2405 MHz to 2480 MHz	
Transmit Channels Tested:	Channel Number	Channel Frequency (MHz)
	18	2440

Technology Tested:	WLAN (IEEE 802.11b) / Digital Transmission System	
Type of Unit:	Transceiver	
Modulation Type:	DBPSK	
Data Rate:	802.11b	2 Mbps
Channel Spacing:	20 MHz	
Transmit Frequency Range:	2412 MHz to 2462 MHz	
Transmit Channels Tested:	Channel Number	Channel Frequency (MHz)
	6	2437

3.5. Support Equipment

None

4. Operation and Monitoring of the EUT during Testing

4.1. Operating Modes

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

- Pre-scans were performed with the EUT transmitting on the centre channel of IEEE 802.15.4 and WLAN modes individually and simultaneously. The worst case mode was found to be 2.4 GHz WLAN 802.11b and final measurements were performed in this configuration.
- The 6336-REMOTE was simultaneously transmitting and charging.

4.2. Configuration and Peripherals

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

- The EUT was placed into a docking station that was powered from an AC/DC power adaptor, which was in turn connected to a LISN. The LISN input was connected to a 120/240 VAC 60 Hz single phase power supply.
- The customer had pre-loaded their own test application to the EUT. The test application was configured by using a combination of the EUT front panel and touch screen display. The application was used to enable a continuous transmission mode at full power and to select the test channels, data rates and modulation schemes as required. The procedure to set up and control the EUT was supplied by the customer in a document titled 'userManual-Radio.txt' dated 12/12/2016.

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:	26 April 2017
Test Sample Serial Number:	Not marked or stated (<i>Radiated sample</i>)		

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

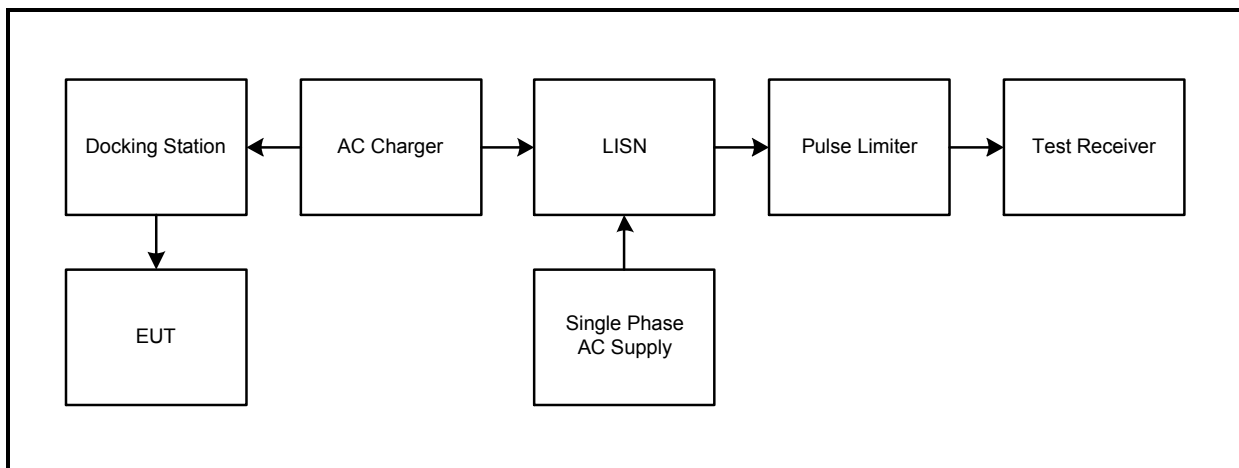
Environmental Conditions:

Temperature (°C):	22
Relative Humidity (%):	34

Note(s):

1. The EUT was connected to the AC/DC Adaptor output. The AC/DC Adaptor input 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 centre channel of IEEE 802.15.4 and WLAN modes individually and simultaneously. The worst case mode was found to be 2.4 GHz WLAN 802.11b and final measurements were performed in this configuration at both 120 and 240 VAC. Pre-scan result plots 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
0.155	Live	46.1	65.8	19.7	Complied
0.177	Live	43.4	64.6	21.2	Complied
0.452	Live	31.2	56.8	25.6	Complied
0.650	Live	30.5	56.0	25.5	Complied
0.857	Live	24.7	56.0	31.3	Complied
1.149	Live	24.0	56.0	32.0	Complied

Results: Live / Average / 120 VAC 60 Hz

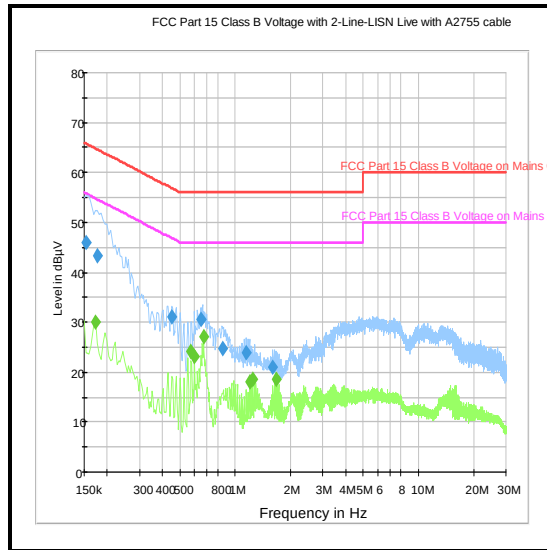
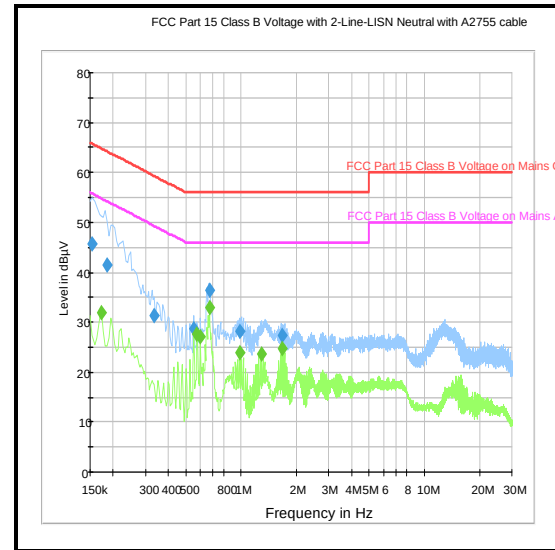
Frequency (MHz)	Line	Level (dBμV)	Limit (dBμV)	Margin (dB)	Result
0.173	Live	30.1	54.8	24.7	Complied
0.573	Live	24.2	46.0	21.8	Complied
0.600	Live	23.2	46.0	22.8	Complied
0.672	Live	27.2	46.0	18.8	Complied
1.248	Live	18.5	46.0	27.5	Complied
1.676	Live	18.5	46.0	27.5	Complied

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

Frequency (MHz)	Line	Level (dB μ V)	Limit (dB μ V)	Margin (dB)	Result
0.155	Neutral	45.8	65.8	20.0	Complied
0.186	Neutral	41.4	64.2	22.8	Complied
0.335	Neutral	31.4	59.3	27.9	Complied
0.551	Neutral	28.6	56.0	27.4	Complied
0.672	Neutral	36.3	56.0	19.7	Complied
0.978	Neutral	28.3	56.0	27.7	Complied

Results: Neutral / Average / 120 VAC 60 Hz

Frequency (MHz)	Line	Level (dB μ V)	Limit (dB μ V)	Margin (dB)	Result
0.573	Neutral	27.7	46.0	18.3	Complied
0.600	Neutral	27.2	46.0	18.8	Complied
0.672	Neutral	33.1	46.0	12.9	Complied
0.978	Neutral	23.9	46.0	22.1	Complied
1.298	Neutral	23.5	46.0	22.5	Complied
1.676	Neutral	24.6	46.0	21.4	Complied

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

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

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

Frequency (MHz)	Line	Level (dB μ V)	Limit (dB μ V)	Margin (dB)	Result
0.150	Live	40.0	66.0	26.0	Complied
0.425	Live	29.6	57.4	27.8	Complied
0.672	Live	31.2	56.0	24.8	Complied
0.875	Live	25.5	56.0	30.5	Complied
2.675	Live	24.6	56.0	31.4	Complied
4.151	Live	25.3	56.0	30.7	Complied

Results: Live / Average / 240 VAC 60 Hz

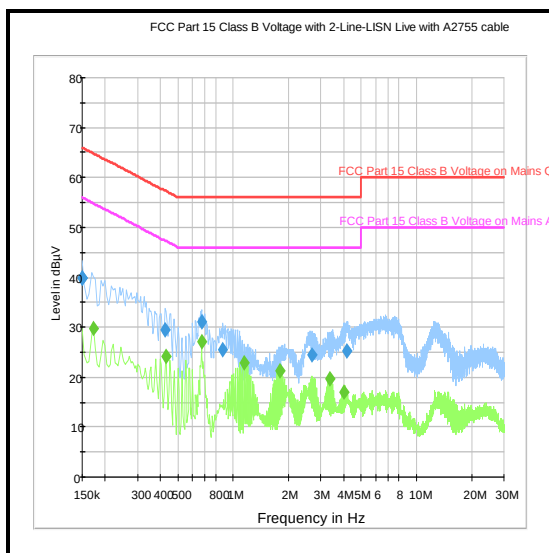
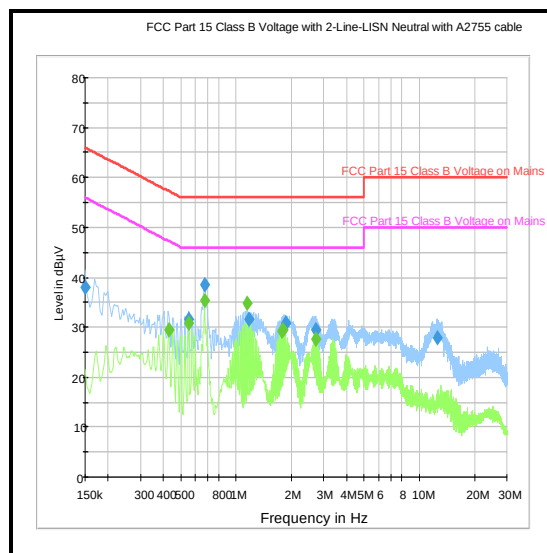
Frequency (MHz)	Line	Level (dB μ V)	Limit (dB μ V)	Margin (dB)	Result
0.173	Live	29.8	54.8	25.0	Complied
0.429	Live	24.1	47.3	23.2	Complied
0.672	Live	27.1	46.0	18.9	Complied
1.149	Live	22.9	46.0	23.1	Complied
1.797	Live	21.2	46.0	24.8	Complied
3.377	Live	19.8	46.0	26.2	Complied

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

Frequency (MHz)	Line	Level (dBμV)	Limit (dBμV)	Margin (dB)	Result
0.150	Neutral	38.0	66.0	28.0	Complied
0.551	Neutral	31.6	56.0	24.4	Complied
0.672	Neutral	38.5	56.0	17.5	Complied
1.176	Neutral	31.6	56.0	24.4	Complied
1.874	Neutral	30.8	56.0	25.2	Complied
2.724	Neutral	29.5	56.0	26.5	Complied

Results: Neutral / Average / 240 VAC 60 Hz

Frequency (MHz)	Line	Level (dBμV)	Limit (dBμV)	Margin (dB)	Result
0.429	Neutral	29.6	47.3	17.7	Complied
0.551	Neutral	30.9	46.0	15.1	Complied
0.672	Neutral	35.5	46.0	10.5	Complied
1.149	Neutral	34.7	46.0	11.3	Complied
1.775	Neutral	29.3	46.0	16.7	Complied
1.797	Neutral	29.5	46.0	16.6	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	10 Jun 2017	12
A067	LISN	Rohde & Schwarz	ESH3-Z5	890603/002	20 Jul 2017	12
A1830	Pulse Limiter	Rohde & Schwarz	ESH3-Z2	100668	22 Mar 2018	12
M1263	Test Receiver	Rohde & Schwarz	ESIB7	100265	07 Nov 2017	12
M1818	Multimeter	Fluke	79 Series III	71811580	11 Apr 2018	12

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
2.0	8 & 10	-	Updated Page 8, Section 4.1, Bullet 1 and Page 10, Note 5

--- END OF REPORT ---