TEST REPORT

Test Report No. : UL-RPT-RP11456397JD18J

Manufacturer	:	Neeo AG
Model No.	:	6336-BRAIN
FCC ID	:	2AKK7-BR633601
Technology	:	*Bluetooth* – Low Energy
Test Standard(s)	:	FCC Parts 15.209(a) & 15.247

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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: 18 April 2017

Checked by:

Ian Watch
Senior Engineer, Radio Laboratory

Company Signatory:

Sarah Williams
Senior Engineer, Radio Laboratory
UL VS LTD

0644

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

UL VS LTD

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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:	47CFR15.247
Specification Title:	Code of Federal Regulations Volume 47 (Telecommunications): Part 15 Subpart C (Intentional Radiators) - Section 15.247
Specification Reference:	47CFR15.209
Specification Title:	Code of Federal Regulations Volume 47 (Telecommunications): Part 15 Subpart C (Intentional Radiators) - Section 15.209
Site Registration:	209735
Location of Testing:	UL VS LTD, Unit 3 Horizon, Wade Road, Kingsland Business Park, Basingstoke, Hampshire, RG24 8AH, United Kingdom
Test Dates:	19 December 2016 to 12 April 2017

2.2. Summary of Test Results

FCC Reference (47CFR)	Measurement	Result
Part 15.247(a)(2)	Transmitter Minimum 6 dB Bandwidth	✓
Part 15.35(c)	Duty Cycle	Note 1
Part 15.247(e)	Transmitter Power Spectral Density	✓
Part 15.247(b)(3)	Transmitter Maximum Peak Output Power	✓
Part 15.247(d)/15.209(a)	Transmitter Radiated Emissions	✓
Part 15.247(d)/15.209(a)	Transmitter Band Edge Radiated Emissions	✓

Key to Results

✓ = Complied ✗ = Did not comply

Note(s):

1. The measurement was performed to assist in the calculation of the level of emissions. The EUT cannot transmit continuously and sweep triggering/signal gating cannot be implemented.

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 558074 D01 DTS Meas Guidance v03r05 April 8, 2016
Title:	Guidance for Performing Compliance Measurements on Digital Transmission Systems (DTS) Operating Under §15.247

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 Name or Number:	6336-BRAIN
Test Sample Serial Number:	Not marked or stated *(Radiated sample)*
Hardware Version:	Hardware Rev. 5
Software Version:	0.23.0
FCC ID:	2AKK7-BR633601

Brand Name:	Neeo
Model Name or Number:	6336-BRAIN
Test Sample Serial Number:	Not marked or stated *(Conducted sample with RF port)*
Hardware Version:	Hardware Rev. 5
Software Version:	0.23.0
FCC ID:	2AKK7-BR633601

3.2. Description of EUT

The Equipment Under Test was a base station for home automation. It contains Z-Wave, *Bluetooth* BR/EDR/ LE, IEEE 802.15.4 and WLAN transceivers. It is powered from an AC/DC adaptor.

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		
Channel Spacing:	2 MHz		
Modulation:	GFSK		
Data Rate:	1 Mbps		
Power Supply Requirement(s):	Nominal	5.2 VDC via 120 VAC 60 Hz adaptor	
Antenna Gain:	0.5 dBi		
Transmit Frequency Range:	2402 MHz to 2480 MHz		
Transmit Channels Tested:	**Channel ID**	**RF Channel**	**Channel Frequency (MHz)**
	Bottom	0	2402
	Middle	19	2440
	Top	39	2480

3.5. Support Equipment

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

Description:	Laptop PC
Brand Name:	Dell
Model Name or Number:	E5400
Serial Number:	01160

Description:	USB to TTL Serial Cable. Length 1.8 metres
Brand Name:	FTDI Chip
Model Name or Number:	TTL-232R-3V3-AJ
Serial Number:	Not marked or stated

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

Description:	HDMI Cable. Length 3 metres
Brand Name:	Not marked or stated
Model Name or Number:	Not marked or stated
Serial Number:	Not marked or stated

Description:	Now TV Box for HDMI Termination
Brand Name:	Sky
Model Name or Number:	2400SK
Serial Number:	1MM4DE006281

Description:	Infra-Red Sensor
Brand Name:	Neeo
Model Name or Number:	Not marked or stated
Serial Number:	Not marked or stated

4. Operation and Monitoring of the EUT during Testing

4.1. Operating Modes

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

- Transmitting at maximum power in *Bluetooth* LE mode with modulation, maximum possible data length available and Pseudorandom Bit Sequence 9.

4.2. Configuration and Peripherals

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

- A Laptop PC with an open source terminal application Tera Term V4.83 was used to place the EUT into test mode. The procedure to set up and control the EUT was supplied by the customer in a document titled “userManual-Radio.pdf” dated 12/12/2016. A power setting of 63 was used.
- The EUT was powered from an AC/DC Adaptor. The AC/DC Adaptor input was connected to a 120 VAC 60 Hz single phase supply.
- Radiated spurious emissions were performed with the EUT in the worst case position for radiated spurious emissions. Tests were performed with the EUT connected to the AC/DC adaptor and USB cable. All other ports were terminated with suitable terminations.
- The radiated sample was used for radiated spurious emissions tests.
- The conducted sample was used for all other tests.

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 Minimum 6 dB Bandwidth

Test Summary:

Test Engineer:	David Doyle	**Test Date:**	19 December 2016
Test Sample Serial Number:	Not marked or stated *(Conducted sample with RF port)*		

FCC Reference:	Part 15.247(a)(2)
Test Method Used:	FCC KDB 558074 Section 8.1 Option 2

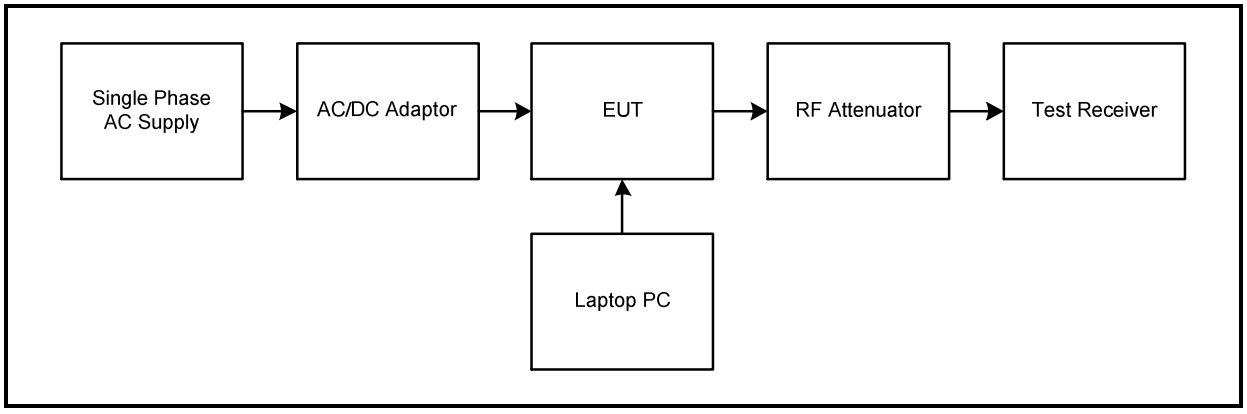
Environmental Conditions:

Temperature (°C):	22
Relative Humidity (%):	43

Note(s):

1. 6 dB DTS bandwidth tests were performed using a test receiver in accordance with FCC KDB 558074 Section 8.1 Option 2 measurement procedure. The test receiver resolution bandwidth was set to 100 kHz and video bandwidth 300 kHz. A peak detector was used, sweep time was set to auto and the trace mode was Max Hold. The DTS bandwidth was measured at 6 dB down from the peak of the signal.
2. The test receiver was connected to the RF port on the EUT using suitable attenuation and RF cable.

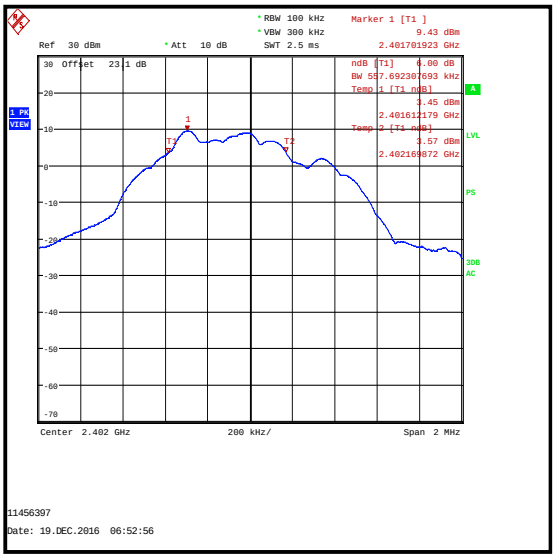
Test setup:



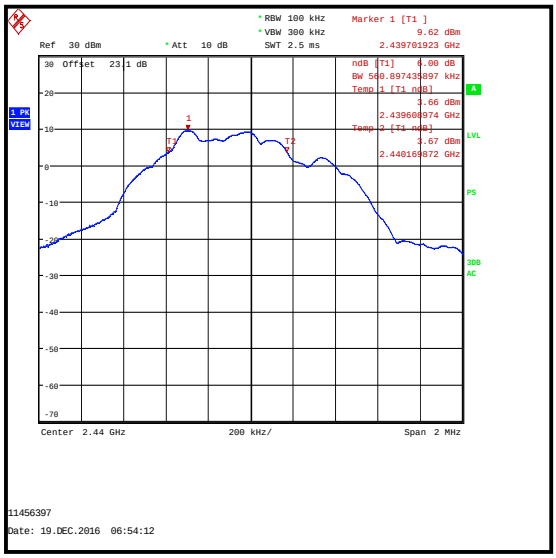
Transmitter Minimum 6 dB Bandwidth (continued)

Results:

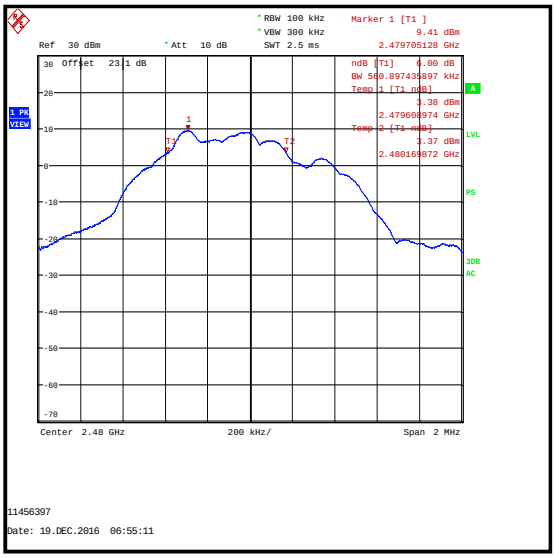
Channel	6 dB Bandwidth (kHz)	Limit (kHz)	Margin (kHz)	Result
Bottom	557.692	≥500	57.692	Complied
Middle	560.897	≥500	60.897	Complied
Top	560.897	≥500	60.897	Complied



Bottom Channel



Middle Channel



Top Channel

Transmitter Minimum 6 dB Bandwidth (continued)

Test Equipment Used:

Asset No.	Instrument	Manufacturer	Type No.	Serial No.	Date Calibration Due	Cal. Interval (Months)
M1659	Thermohygrometer	JM Handelspunkt	30.5015.13	Not stated	02 Apr 2017	12
M1874	Test Receiver	Rohde & Schwarz	ESU26	100553	28 Oct 2017	12
A2526	Attenuator	AtlanTecRF	AN18W5-20	832828#1	Calibrated before use	-
M260	Signal Generator	Rohde & Schwarz	SMP02	829076/008	09 May 2017	12
M199	Power Meter	Rohde & Schwarz	NRVS	827023/075	11 Apr 2018	24
M1267	Power Sensor	Rohde & Schwarz	NRV-Z52	100155	15 Apr 2018	24

5.2.2. Transmitter Duty Cycle

Test Summary:

Test Engineer:	David Doyle	**Test Date:**	02 February 2017
Test Sample Serial Number:	Not marked or stated *(Conducted sample with RF port)*		

FCC Reference:	Part 15.35(c)
Test Method Used:	FCC KDB 558074 Section 6.0

Environmental Conditions:

Temperature (°C):	24
Relative Humidity (%):	36

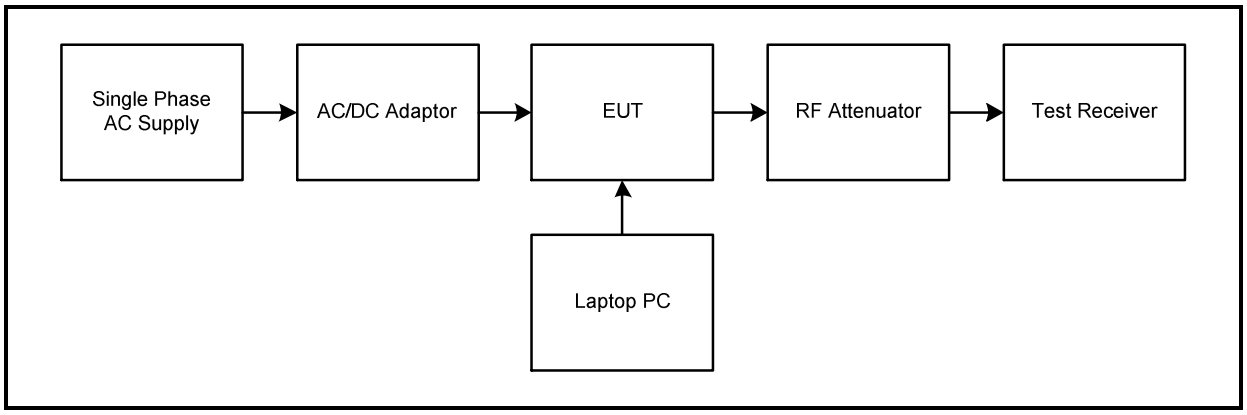
Note(s):

1. In order to assist with the determination of the average level of spurious emissions field strength, measurements were made of duty cycle to determine the transmission duration and the silent period time of the transmitter. The transmitter was measured using a test receiver in the time domain and calculated as shown below:

10 log (1 / (On Time / [Period or 100 ms whichever is the lesser])).

*10 log (1 / (*245.673 / 447.596*)) = 2.6 dB*

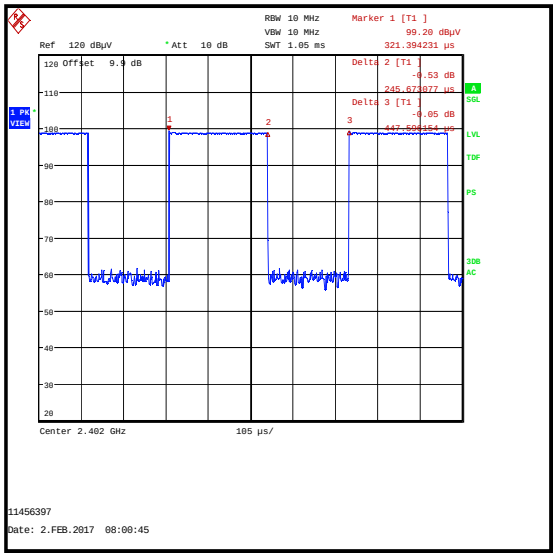
Test setup:



Transmitter Duty Cycle (continued)

Results:

Pulse Duration (µs)	Period (µs)	Duty Cycle (dB)
245.673	447.596	2.6



Test Equipment Used:

Asset No.	Instrument	Manufacturer	Type No.	Serial No.	Date Calibration Due	Cal. Interval (Months)
M1659	Thermohygrometer	JM Handelspunkt	30.5015.13	Not stated	02 Apr 2017	12
M1874	Test Receiver	Rohde & Schwarz	ESU26	100553	28 Oct 2017	12
A2526	Attenuator	AtlanTecRF	AN18W5-20	832828#1	Calibrated before use	-
M260	Signal Generator	Rohde & Schwarz	SMP02	829076/008	09 May 2017	12
M199	Power Meter	Rohde & Schwarz	NRVS	827023/075	11 Apr 2018	24
M1267	Power Sensor	Rohde & Schwarz	NRV-Z52	100155	15 Apr 2018	24

5.2.3. Transmitter Power Spectral Density

Test Summary:

Test Engineer:	David Doyle	**Test Date:**	19 December 2016
Test Sample Serial Number:	Not marked or stated *(Conducted sample with RF port)*		

FCC Reference:	Part 15.247(e)
Test Method Used:	FCC KDB 558074 Section 10.2

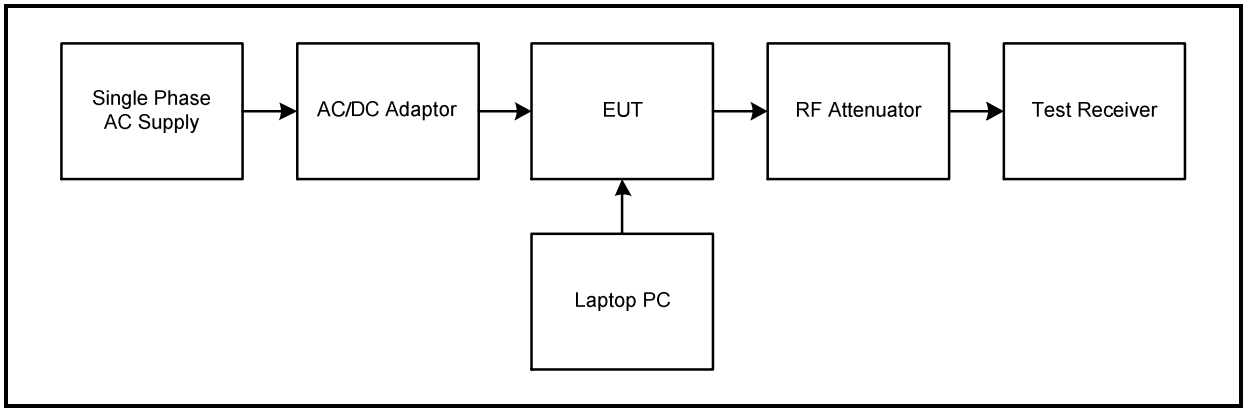
Environmental Conditions:

Temperature (°C):	22
Relative Humidity (%):	43

Note(s):

1. Transmitter Power Spectral Density tests in all bands were performed using a test receiver in accordance with FCC KDB 558074 Section 10.2.
2. The test receiver resolution bandwidth was set to 30 kHz and video bandwidth of 100 kHz. A peak detector was used, sweep time was set to auto and trace mode was Max Hold. The span was set to 1.5 times the measured DTS bandwidth. A marker was placed at the peak of the signal and the results recorded in the table below.
3. The test receiver was connected to the RF port on the EUT using suitable attenuation and RF cable. An RF level offset was entered on the test receiver to compensate for the loss of the attenuator and RF cable.

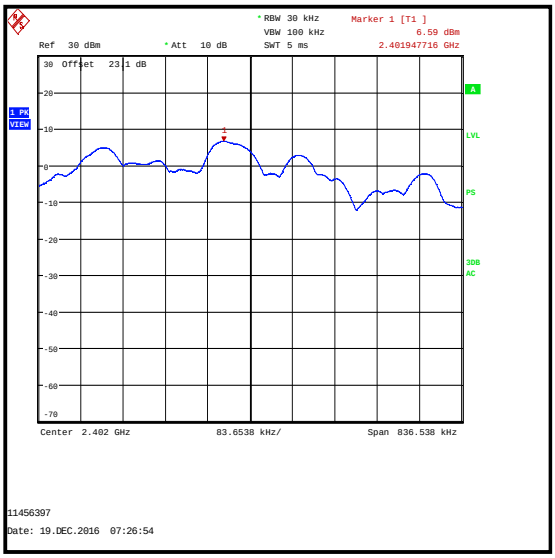
Test setup:



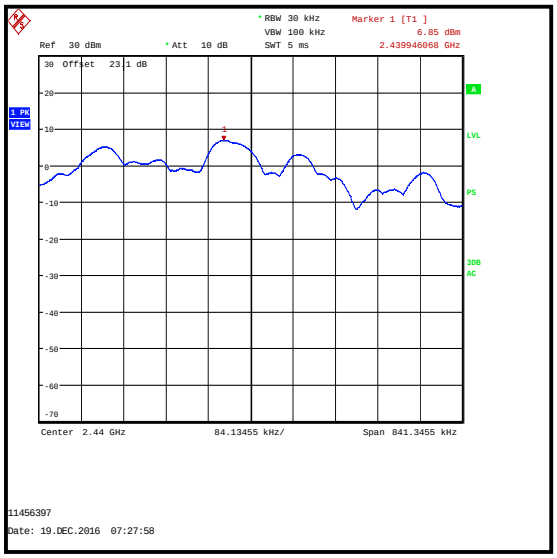
Transmitter Power Spectral Density (continued)

Results:

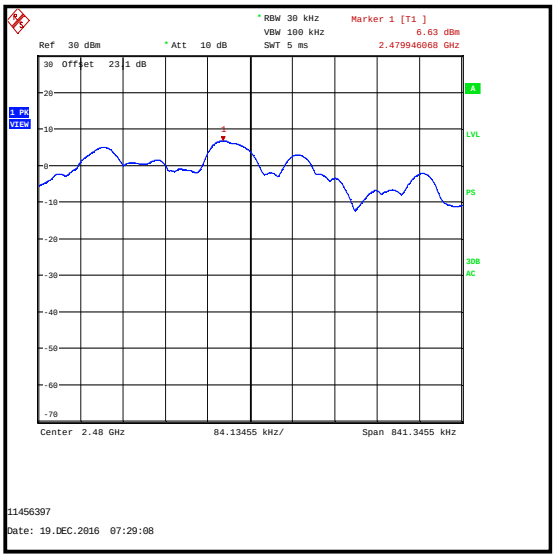
Channel	Output Power (dBm / 30 kHz)	Limit (dBm / 3 kHz)	Margin (dB)	Result
Bottom	6.6	8.0	1.4	Complied
Middle	6.9	8.0	1.1	Complied
Top	6.6	8.0	1.4	Complied



Bottom Channel



Middle Channel



Top Channel

Transmitter Power Spectral Density (continued)

Test Equipment Used:

Asset No.	Instrument	Manufacturer	Type No.	Serial No.	Date Calibration Due	Cal. Interval (Months)
M1659	Thermohygrometer	JM Handelspunkt	30.5015.13	Not stated	02 Apr 2017	12
M1874	Test Receiver	Rohde & Schwarz	ESU26	100553	28 Oct 2017	12
A2526	Attenuator	AtlanTecRF	AN18W5-20	832828#1	Calibrated before use	-
M260	Signal Generator	Rohde & Schwarz	SMP02	829076/008	09 May 2017	12
M199	Power Meter	Rohde & Schwarz	NRVS	827023/075	11 Apr 2018	24
M1267	Power Sensor	Rohde & Schwarz	NRV-Z52	100155	15 Apr 2018	24

5.2.4. Transmitter Maximum Peak Output Power

Test Summary:

Test Engineer:	David Doyle	**Test Date:**	19 December 2016
Test Sample Serial Number:	Not marked or stated *(Conducted sample with RF port)*		

FCC Reference:	Part 15.247(b)(3)
Test Method Used:	FCC KDB 558074 Section 9.1.1

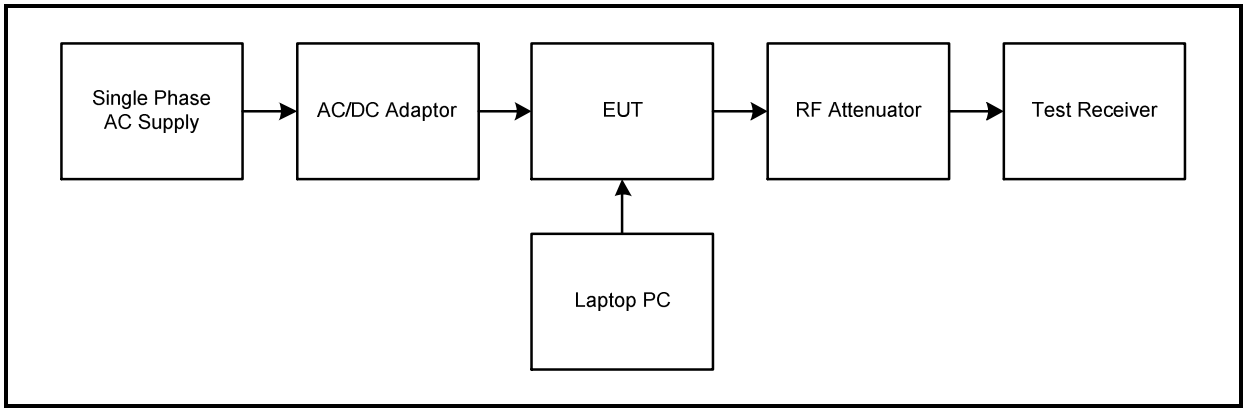
Environmental Conditions:

Temperature (°C):	22
Relative Humidity (%):	43

Note(s):

1. Conducted power tests were performed using a test receiver in accordance with FCC KDB 558074 Section 9.1.1 with the RBW > *DTS bandwidth* procedure.
2. The test receiver resolution bandwidth was set to 1 MHz and video bandwidth of 3 MHz. A peak detector was used, sweep time was set to auto and trace mode was Max Hold. The span was set to 5 MHz. A marker was placed at the peak of the signal and the results recorded in the table below.
3. The test receiver was connected to the RF port on the EUT using suitable attenuation and RF cable. An RF level offset was entered on the test receiver to compensate for the loss of the attenuator and RF cable.
4. The conducted power was added to the declared antenna gain to obtain the EIRP.

Test setup:



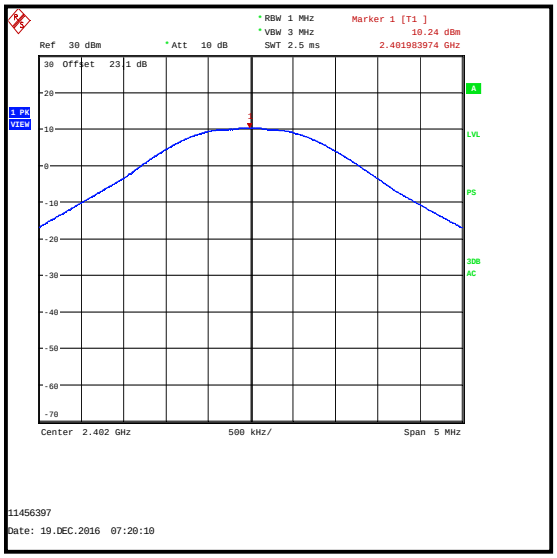
Transmitter Maximum Peak Output Power (continued)

Results:

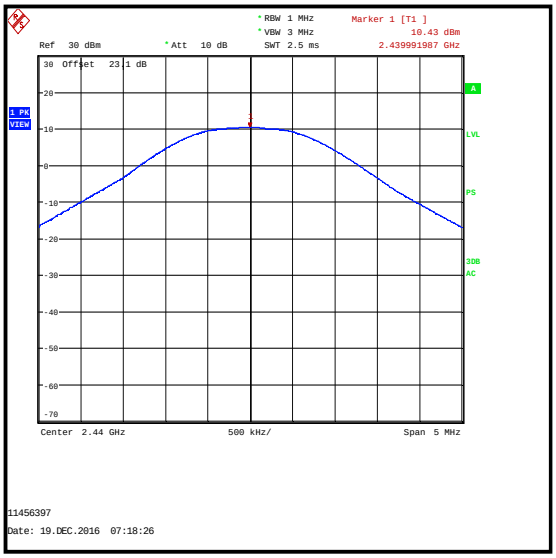
Channel	Conducted Peak Power (dBm)	Conducted Peak Power Limit (dBm)	Margin (dB)	Result
Bottom	10.2	30.0	19.8	Complied
Middle	10.4	30.0	19.6	Complied
Top	10.3	30.0	19.7	Complied

Channel	Conducted Peak Power (dBm)	Declared Antenna Gain (dBi)	EIRP (dBm)	De Facto EIRP Limit (dBm)	Margin (dB)	Result
Bottom	10.2	0.5	10.7	36.0	25.3	Complied
Middle	10.4	0.5	10.9	36.0	25.1	Complied
Top	10.3	0.5	10.8	36.0	25.2	Complied

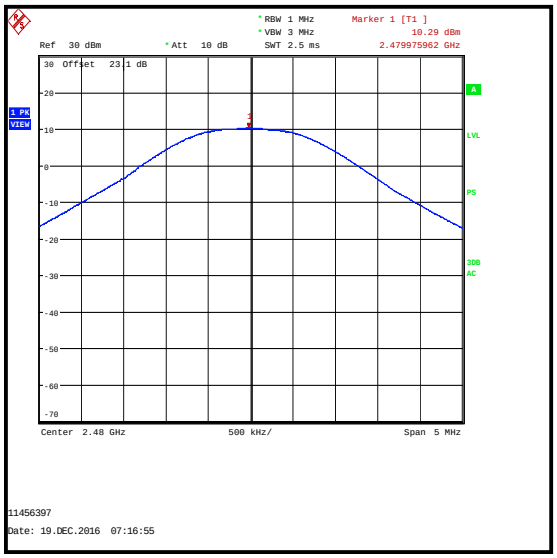
Transmitter Maximum Peak Output Power (continued)



Bottom Channel



Middle Channel



Top Channel

Test Equipment Used:

Asset No.	Instrument	Manufacturer	Type No.	Serial No.	Date Calibration Due	Cal. Interval (Months)
M1659	Thermohygrometer	JM Handelspunkt	30.5015.13	Not stated	02 Apr 2017	12
M1874	Test Receiver	Rohde & Schwarz	ESU26	100553	28 Oct 2017	12
A2526	Attenuator	AtlanTecRF	AN18W5-20	832828#1	Calibrated before use	-
M260	Signal Generator	Rohde & Schwarz	SMP02	829076/008	09 May 2017	12
M199	Power Meter	Rohde & Schwarz	NRVS	827023/075	11 Apr 2018	24
M1267	Power Sensor	Rohde & Schwarz	NRV-Z52	100155	15 Apr 2018	24

5.2.5. Transmitter Radiated Emissions

Test Summary:

Test Engineer:	David Doyle	**Test Date:**	03 February 2017
Test Sample Serial Number:	Not marked or stated *(Radiated sample)*		

FCC Reference:	Parts 15.247(d) & 15.209(a)
Test Method Used:	ANSI C63.10 Sections 6.3 and 6.5
Frequency Range	30 MHz to 1000 MHz

Environmental Conditions:

Temperature (°C):	23
Relative Humidity (%):	39

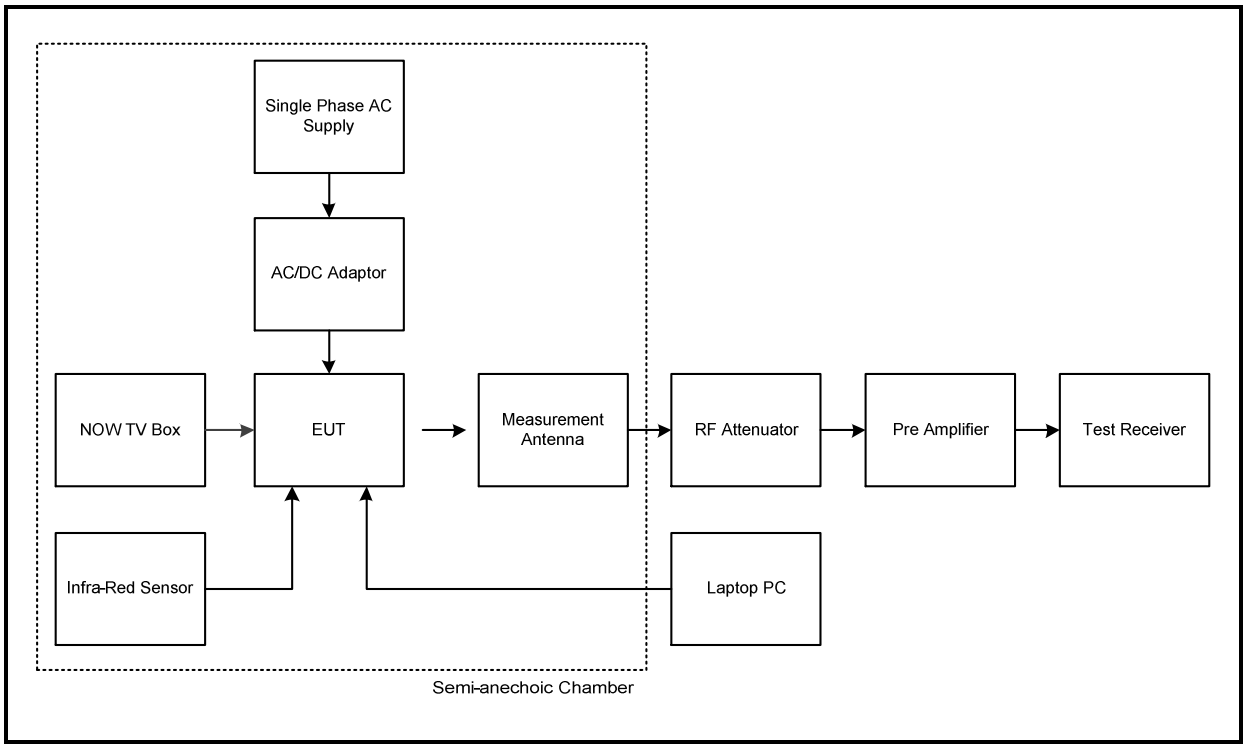
Note(s):

1. The final measured value, for the given emission, in the table below incorporates the calibrated antenna factor and cable loss.
2. The preliminary scans showed similar emission levels below 1 GHz, for each channel of operation. Therefore final radiated emissions measurements were performed with the EUT set to the middle channel only.
3. All emissions shown on the pre-scans were investigated and found to be ambient, or > 20 dB below the appropriate limit or below the noise floor of the measurement system. Therefore the highest peak noise floor reading of the measuring receiver was recorded in the table below.
4. Measurements below 1 GHz were performed in a semi-anechoic chamber (Asset Number K0001) at a distance of 3 metres. The EUT was placed at a height of 80 cm above the reference ground plane in the centre of the chamber turntable. Maximum emission levels were determined by height searching the measurement antenna over the range 1 metre to 4 metres.
5. Pre-scans were performed and markers placed on the highest measured levels. The test receiver resolution bandwidth was set to 100 kHz and video bandwidth 300 kHz. A peak detector was used, sweep time was set to auto and trace mode was Max Hold.

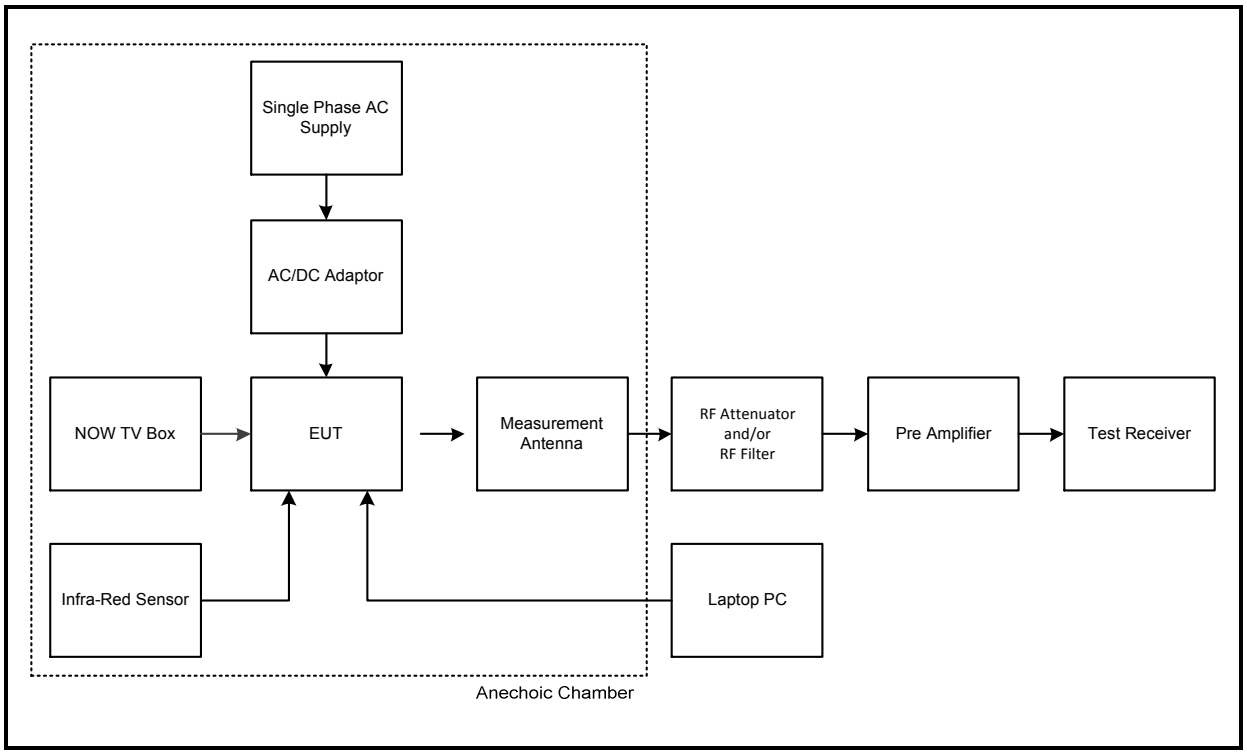
Transmitter Radiated Emissions (continued)

Test setup for radiated measurements:

Semi-anechoic chamber



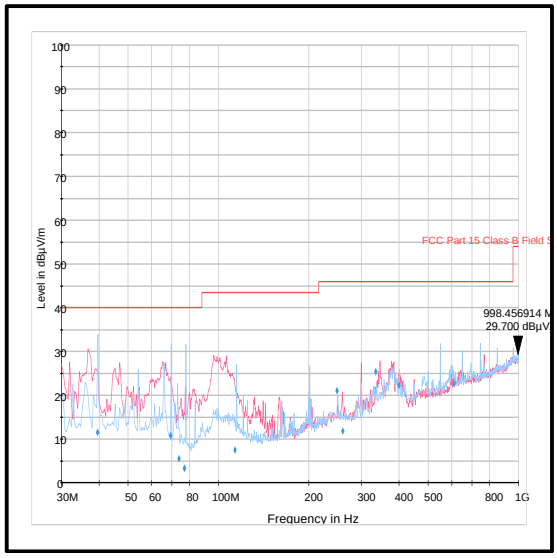
Anechoic chamber



Transmitter Radiated Emissions (continued)

Results: Middle Channel

Frequency (MHz)	Antenna Polarity	Level (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Result
998.457	Vertical	29.7	54.0	24.3	Complied



Test Equipment Used:

Asset No.	Instrument	Manufacturer	Type No.	Serial No.	Date Calibration Due	Cal. Interval (Months)
M2014	Thermohygrometer	Testo	608-H1	45046246	10 Jun 2017	12
K0001	5 m RSE Chamber	Rainford EMC	N/A	N/A	07 Dec 2017	12
M1273	Test Receiver	Rohde & Schwarz	ESIB26	100275	11 Apr 2017	12
A2959	Antenna	Schwarzbeck	VULB 9163	9163-967	08 Sep 2017	12
G0543	Amplifier	Sonoma	310N	230801	09 Jun 2017	6
A1834	Attenuator	Hewlett Packard	8491B	10444	30 Mar 2017	12

Transmitter Radiated Emissions (continued)

Test Summary:

Test Engineer:	David Doyle	**Test Date:**	12 April 2017
Test Sample Serial Number:	Not marked or stated *(Radiated sample)*		

FCC Reference:	Parts 15.247(d) & 15.209(a)
Test Method Used:	KDB 558074 Sections 12.2.4 & 12.2.5.2 referencing ANSI C63.10 Sections 6.3 and 6.6
Frequency Range	1 GHz to 25 GHz

Environmental Conditions:

Temperature (°C):	24
Relative Humidity (%):	35

Note(s):

1. The final measured value, for the given emission, in the table below incorporates the calibrated antenna factor and cable loss.
2. All other emissions shown on the pre-scan plot were investigated and found to be ambient or >20 dB below the applicable limit or below the measurement system noise floor.
3. The emission shown on the 1 GHz to 3 GHz plot is the EUT fundamental.
4. Measurements above 1 GHz were performed in a fully anechoic chamber (Asset Number K0017) at a distance of 3 metres. The EUT was placed at a height of 1.5 metres above the reference ground plane in the centre of the chamber turntable. Maximum emission levels were determined by height searching the measurement antenna over the range 1 metre to 4 metres.
5. Pre-scans were performed and a marker placed on the highest measured level of the appropriate plot. The test receiver resolution bandwidth was set to 1 MHz and video bandwidth 3 MHz. The sweep time was set to auto.
6. *In accordance with ANSI C63.10 Section 6.6.4.3, Note 1, if the peak measured value complies with the average limit, it is unnecessary to perform an average measurement.

Transmitter Radiated Emissions (continued)

Results: Peak / Bottom Channel

Frequency (MHz)	Antenna Polarity	Level (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Result
2321.752	Horizontal	53.9	54.0*	0.1	Complied

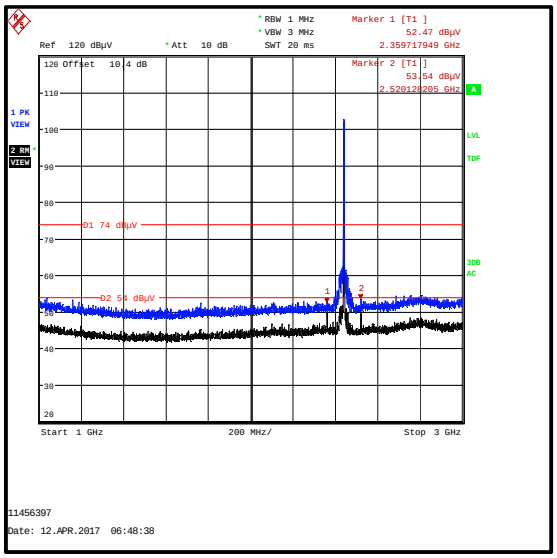
Results: Peak / Middle Channel

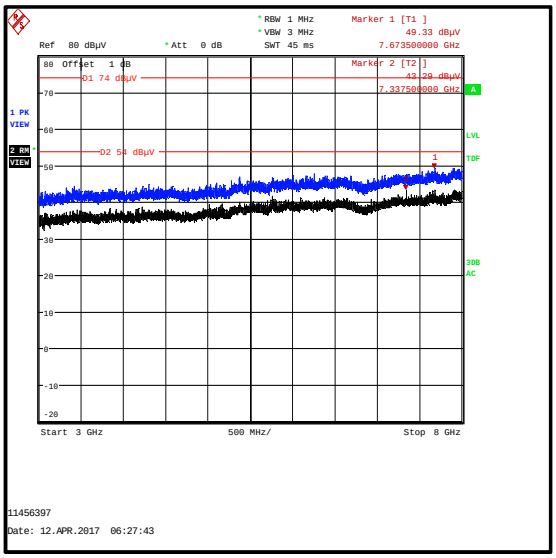
Frequency (MHz)	Antenna Polarity	Level (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Result
2360.173	Horizontal	56.4	74.0	17.6	Complied

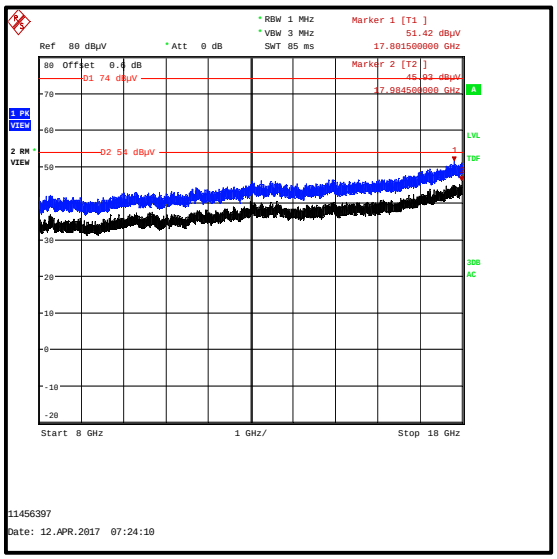
Results: Average / Middle Channel

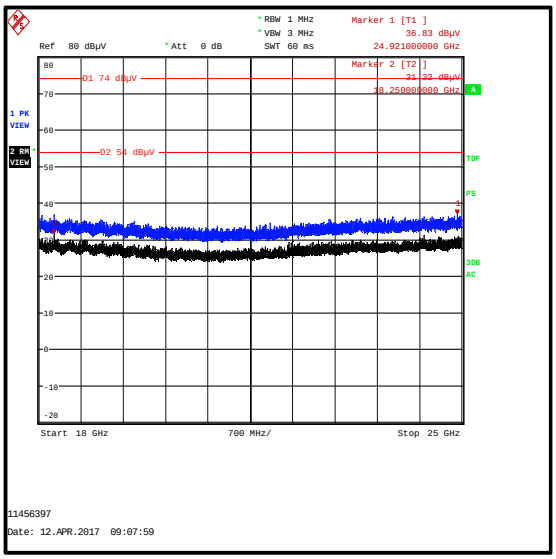
Frequency (MHz)	Antenna Polarity	Level (dBµV/m)	Correction Factor (dB)	Corrected Level (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Result
2359.994	Horizontal	42.5	2.6	45.1	54.0	8.9	Complied

Transmitter Radiated Emissions (continued)









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

Transmitter Radiated Emissions (continued)

Test Equipment Used:

Asset No.	Instrument	Manufacturer	Type No.	Serial No.	Date Calibration Due	Cal. Interval (Months)
M2003	Thermohygrometer	Testo	608-H1	45046641	22 Feb 2018	12
K0017	3m RSE Chamber	Rainford EMC	N/A	N/A	18 May 2017	12
M1630	Test Receiver	Rohde & Schwarz	ESU40	100233	23 Feb 2018	12
A2863	Pre Amplifier	Agilent	8449B	3008A02100	11 Apr 2018	12
A2891	Pre Amplifier	Schwarzbeck	BBV 9718	9718-306	11 Apr 2018	12
A2893	Pre Amplifier	Schwarzbeck	BBV 9721	9721-021	11 Apr 2018	12
A2889	Antenna	Schwarzbeck	BBHA 9120 B	BBHA 9120 B 653	11 Apr 2018	12
A2890	Antenna	Schwarzbeck	HWRD 750	014	06 May 2017	12
A2892	Antenna	Schwarzbeck	BBHA 9170	9170-727	11 Apr 2018	12
A2916	Attenuator	AtlanTecRF	AN18W5-10	832827#1	03 Mar 2018	12
A2914	High Pass Filter	AtlanTecRF	AFH-03000	2155	06 Mar 2018	12
A2947	High Pass Filter	AtlanTecRF	AFH-07000	1601900001	01 Jun 2017	12

5.2.6. Transmitter Band Edge Radiated Emissions

Test Summary:

Test Engineer:	David Doyle	**Test Dates:**	22 December 2016 & 22 February 2017
Test Sample Serial Number:	Not marked or stated *(Radiated sample)*		

FCC Reference:	Parts 15.247(d) & 15.209(a)
Test Method Used:	KDB 558074 Section 11.1 and Section 12.2.5.1referencing ANSI C63.10 Sections 6.10.4 and 6.10.5

Environmental Conditions:

Temperature (°C):	23 to 26
Relative Humidity (%):	36 to 40

Note(s):

1. The final measured value, for the given emission, in the table below incorporates the calibrated antenna factor and cable loss.
2. The maximum peak conducted output power was previously measured. In accordance with FCC KDB 558074 Section 11.1(a), the lower band edge measurement was performed with a peak detector and the -20 dBc limit applied.
3. As the lower band edge is adjacent to a non-restricted band, only peak measurements are required. In accordance with FCC KDB 558074 Section 11.1, the test method in Section 11.3 was followed: the test receiver resolution bandwidth was set to 100 kHz and video bandwidth 300 kHz. A peak detector was used, sweep time was set to auto and trace mode was Max Hold. The test receiver was left to sweep for a sufficient length of time in order to maximise the carrier level and out-of-band emissions. A marker and corresponding reference level line were placed on the peak of the carrier. As the maximum peak conducted output power was measured using a peak detector in accordance with FCC KDB 558074 Section 9.1.1 an out-of-band limit line was placed 20 dB below the peak level (FCC KDB 558074 Section 11.1(a)). A marker was placed on the band edge spot frequencies and a second marker placed on the highest emission level in the adjacent non-restricted band of operation (where a higher level emission was present). Marker frequencies and levels were recorded.
4. As the upper band edge is adjacent to a restricted band, both peak and average measurements were recorded by placing a marker at the edge of the band. For peak measurements the test receiver bandwidth was set to 1 MHz and the video bandwidth 3 MHz. A peak detector was used, sweep time was set to auto and trace mode was Max Hold. For average measurements the signal analyser resolution bandwidth was set to 1 MHz and the video bandwidth 3 MHz. An RMS detector was used, sweep time was set to auto and trace mode was trace averaging over 300 sweeps. A marker was placed on the band edge spot frequencies and a second marker placed on the highest emission level in the adjacent restricted band of operation (where a higher level emission was present). Marker frequencies and levels were recorded.
5. There is a restricted band 10 MHz below the lower band edge. The test receiver was set up as follows: the RBW set to 1 MHz, the VBW set to 3 MHz, with the sweep time set to auto couple. Peak and average measurements were performed with their respective detectors. Markers were placed on the highest point on each trace.

Transmitter Band Edge Radiated Emissions (continued)

Results: : Lower Band Edge

Frequency (MHz)	Level (dBµV/m)	-20 dBc Limit (dBµV/m)	Margin (dB)	Result
2400.000	54.9	82.7	27.8	Complied

Results: Upper Band Edge / Peak

Frequency (MHz)	Level (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Result
2483.500	62.1	74.0	11.9	Complied

Results: Upper Band Edge / Average

Frequency (MHz)	Level (dBµV/m)	Duty Cycle Correction (dB)	Corrected Level (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Result
2483.500	47.1	2.6	49.7	54.0	4.3	Complied

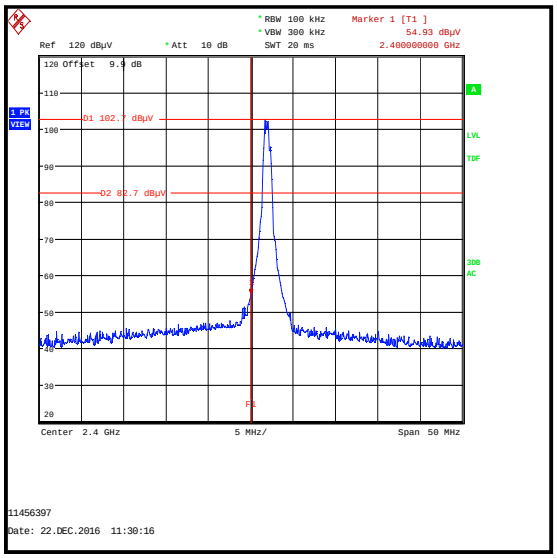
Results: 2310 to 2390 MHz Restricted Band / Peak

Frequency (MHz)	Peak Level (dBµV/m)	Peak Limit (dBµV/m)	Margin (dB)	Result
2322.179	55.0	74.0	19.0	Complied
2361.795	54.5	74.0	19.5	Complied

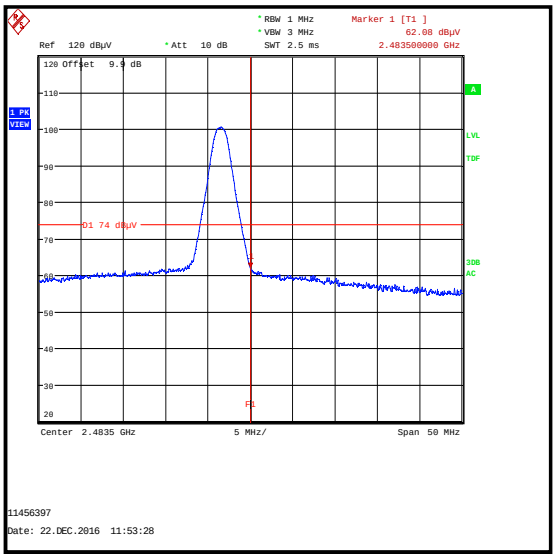
Results: 2310 to 2390 MHz Restricted Band / Average

Frequency (MHz)	Level (dBµV/m)	Duty Cycle Correction (dB)	Corrected Level (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Result
2321.667	44.7	2.6	47.3	54.0	6.7	Complied
2361.923	43.3	2.6	45.9	54.0	8.1	Complied

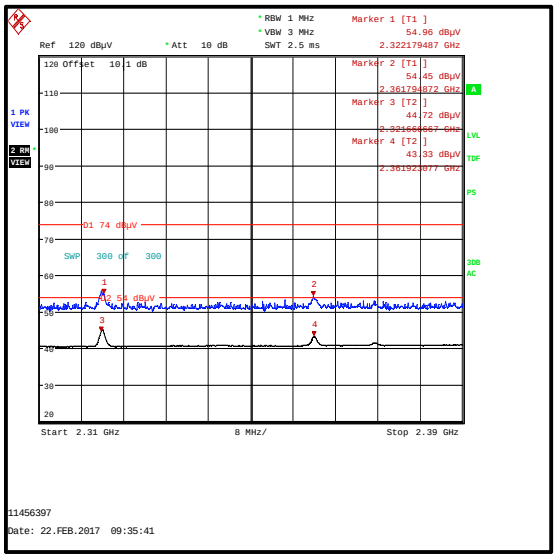
Transmitter Band Edge Radiated Emissions (continued)



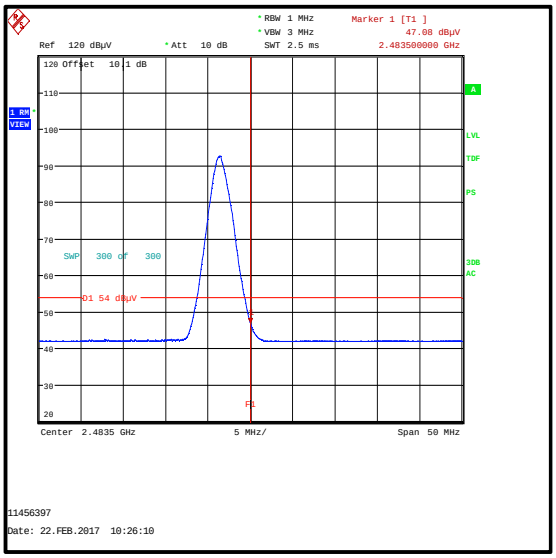
Lower Band Edge



Upper Band Edge Peak



2310 MHz to 2390 MHz Restricted Band



Upper Band Edge Average

Transmitter Band Edge Radiated Emissions (continued)

Test Equipment Used:

Asset No.	Instrument	Manufacturer	Type No.	Serial No.	Date Calibration Due	Cal. Interval (Months)
M2003	Thermohygrometer	Testo	608-H1	45046641	22 Apr 2017	12
K0017	3m RSE Chamber	Rainford	N/A	N/A	17 May 2017	12
M1995	Test Receiver	Rohde & Schwarz	ESU40	100428	21 Mar 2017	12
A2863	Pre-Amplifier	Agilent	8449B	3008A02100	07 Apr 2017	12
A2889	Antenna	Schwarzbeck	BBHA 9120 B	BBHA 9120 B 653	07 Apr 2017	12
A2916	Attenuator	AtlanTecRF	AN18W5-10	832827#1	19 May 2017	12
M1656	Thermohygrometer	JM Handelspunkt	30.5015.13	None stated	02 Apr 2017	12
K0002	3m RSE Chamber	Rainford EMC	N/A	N/A	16 Nov 2017	12
M1886	Test Receiver	Rohde & Schwarz	ESU26	100554	21 Mar 2017	12
A1534	Pre Amplifier	Hewlett Packard	8449B	3008A00405	09 Nov 2017	12
A1818	Antenna	EMCO	3115	00075692	08 Nov 2017	12
A1396	Attenuator	Huber & Suhner	6810.17.B	757987	26 Apr 2017	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 measured (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
Conducted Maximum Peak Output Power	2.4 GHz to 2.4835 GHz	95%	±1.13 dB
Spectral Power Density	2.4 GHz to 2.4835 GHz	95%	±2.94 dB
Minimum 6 dB Bandwidth	2.4 GHz to 2.4835 GHz	95%	±4.59 %
Duty Cycle	2.4 GHz to 2.4835 GHz	95%	±1.14 %
Radiated Spurious Emissions	30 MHz to 1 GHz	95%	±5.65 dB
Radiated Spurious Emissions	1 GHz to 25 GHz	95%	±2.94 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

--- END OF REPORT ---