



TEST REPORT

Test Report No. : UL-RPT-RP11265626JD02A V2.0

Manufacturer : Snuza (Pty) Ltd
Model No. : 4.2
FCC ID : 2AI3601
Technology : *Bluetooth – Low Energy*
Test Standard(s) : FCC Parts 15.207, 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 2.0 supersedes all previous versions.

Date of Issue: 15 September 2016

Checked by:

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Company Signatory:

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Senior Engineer, Radio Laboratory
UL VS LTD



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1. Customer Information

Company Name:	Snuza (Pty) Ltd
Address:	Unit 11 Roeland Square Roeland Street Cape Town 8001 Western Cape South Africa

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:	47CFR15.207 and 47CFR15.209
Specification Title:	Code of Federal Regulations Volume 47 (Telecommunications): Part 15 Subpart C (Intentional Radiators) - Sections 15.207 and 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:	15 August 2016 to 05 September 2016

2.2. Summary of Test Results

FCC Reference (47CFR)	Measurement	Result
Part 15.207	Transmitter AC Conducted Emissions	✓
Part 15.247(a)(2)	Transmitter Minimum 6 dB Bandwidth	✓
Part 15.247(e)	Transmitter Power Spectral Density	Note 1
Part 15.247(b)(3)	Transmitter Maximum Peak Output Power	✓
15.247(d)/15.209(a)	Duty Cycle	Note 2
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. In accordance with FCC KDB 558074 Section 10.1, PSD testing is not required if the maximum conducted output power is less than the PSD limit of 8 dBm / 3 kHz. The PSD level is therefore deemed to be equal to measured total output power.
2. The measurement was performed to assist in the calculation of the average spurious emissions.

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
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:	Snuza Pico
Model Name or Number:	4.2
Test Sample Serial Number:	Not marked or stated (<i>Radiated sample</i>)
Hardware Version:	4.2 (<i>Bluetooth</i> Hardware Version: 3.1)
Software Version:	4.101 (<i>Bluetooth</i> Firmware Version: 7.1)
FCC ID:	2AI3601

Brand Name:	Snuza Pico
Model Name or Number:	4.2
Test Sample Serial Number:	Not marked or stated (<i>Conducted sample with RF port</i>)
Hardware Version:	4.2 (<i>Bluetooth</i> Hardware Version: 3.1)
Software Version:	4.101 (<i>Bluetooth</i> Firmware Version: 7.1)
FCC ID:	2AI3601

Brand Name:	Snuza Pico
Model Name or Number:	4.2
Test Sample Serial Number:	Not marked or stated (<i>Unmodified sample</i>)
Hardware Version:	4.2 (<i>Bluetooth</i> Hardware Version: 3.1)
Software Version:	4.101 (<i>Bluetooth</i> Firmware Version: 7.1)
FCC ID:	2AI3601

3.2. Description of EUT

The Equipment Under Test was a baby breathing monitor containing *Bluetooth* LE functionality. The function of the radio is to connect the breathing monitor to a smart device (phone or tablet) via *Bluetooth* 4 low energy (BLE).

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 Mbit/s				
Power Supply Requirement(s):	Nominal	3.0 VDC (via Motherboard) or 5.0 VDC (via Switching adaptor)			
Maximum Conducted Output Power:	7.2 dBm				
Antenna Gain:	2.3 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:	Latitude D610
Serial Number:	8XMVV1X

Description:	RF Motherboard
Brand Name:	STMicroelectronics
Model Name or Number:	RF Motherboard V3.0
Serial Number:	Not marked or stated

Description:	USB Cable
Brand Name:	Not marked or stated
Model Name or Number:	Not marked or stated
Serial Number:	Not marked or stated

Description:	Tablet
Brand Name:	Apple
Model Name or Number:	iPad
Serial Number:	F4ML1K1YF196

Description:	Switching Adaptor
Brand Name:	Shenzhen Fujia Appliance
Model Name or Number:	FJ-SW116050200DN
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.
- Normal mode of operation.

4.2. Configuration and Peripherals

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

- The EUT was connected to Port J3 on the STMicroelectronics RF Motherboard. The USB port on the RF Motherboard was connected via USB cable to the USB port on a laptop PC. Power to the EUT was provided via the RF Motherboard and USB connection.
- Controlled using STMicroelectronics BlueNRG V 1.9.0 application on the laptop PC supplied by the customer. Channels, packet lengths and other parameters were set from the RF Test tab within this application as required. The transmitter power setting was set to High Power / 7 (8 dBm), Length of Data 0x25 and Packet Payload 0x00 Pseudo-Random bit sequence 9. These settings were stated as worst case by the customer and used for all tests.
- The radiated sample was used for radiated spurious emissions tests. The conducted sample was used for all other tests apart from AC conducted emissions.
- For AC conducted tests, the EUT was controlled using a Snuza application on the Apple tablet device supplied by the customer. The Snuza application (v0.91.7704) was used to enable transmission on the EUT via a radio link. EUT was first placed into the charging cradle, then using the Snuza application on the Apple tablet device, refresh button was pressed and EUT was set to transmit in its normal operating mode.

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:	Stefan Ho	Test Date:	05 September 2016
Test Sample Serial Number:	Not marked or stated (<i>Unmodified sample</i>)		

FCC Reference:	Part 15.207
Test Method Used:	ANSI C63.10 Section 6.2 / FCC KDB 174176 and notes below

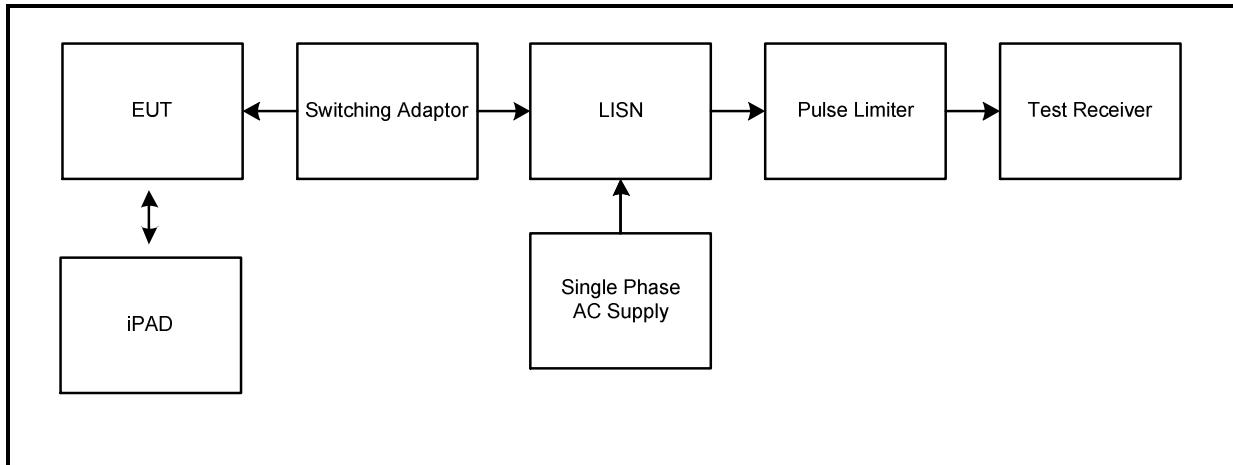
Environmental Conditions:

Temperature (°C):	24
Relative Humidity (%):	44

Note(s):

1. The EUT was connected to the switching adaptor via USB cable. The switching adaptor was connected to a 120 VAC 60 Hz single phase supply via a LISN.
2. A pulse limiter was fitted between the LISN and the test receiver.
3. 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.

Test setup:



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

Frequency (MHz)	Line	Level (dB μ V)	Limit (dB μ V)	Margin (dB)	Result
0.370500	Live	29.7	58.5	28.8	Complied
0.379500	Live	29.2	58.3	29.1	Complied
0.618000	Live	22.3	56.0	33.7	Complied
0.996000	Live	19.9	56.0	36.1	Complied
1.738500	Live	11.0	56.0	45.0	Complied
2.211000	Live	16.0	56.0	40.0	Complied
3.021000	Live	13.9	56.0	42.1	Complied

Results: Live / Average / 120 VAC 60 Hz

Frequency (MHz)	Line	Level (dB μ V)	Limit (dB μ V)	Margin (dB)	Result
0.411000	Live	22.9	47.6	24.8	Complied
0.595500	Live	17.1	46.0	28.9	Complied
0.708000	Live	13.8	46.0	32.2	Complied
1.167000	Live	10.6	46.0	35.4	Complied
1.833000	Live	5.1	46.0	40.9	Complied
3.156000	Live	8.9	46.0	37.1	Complied

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

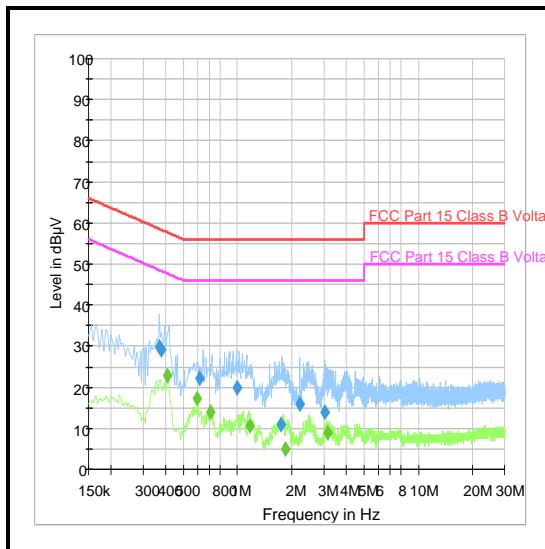
Frequency (MHz)	Line	Level (dB μ V)	Limit (dB μ V)	Margin (dB)	Result
0.150000	Neutral	29.5	66.0	36.5	Complied
0.411000	Neutral	33.5	57.6	24.2	Complied
0.631500	Neutral	28.6	56.0	27.4	Complied
1.261500	Neutral	23.1	56.0	32.9	Complied
2.184000	Neutral	21.3	56.0	34.7	Complied
3.268500	Neutral	20.5	56.0	35.5	Complied

Results: Neutral / Average / 120 VAC 60 Hz

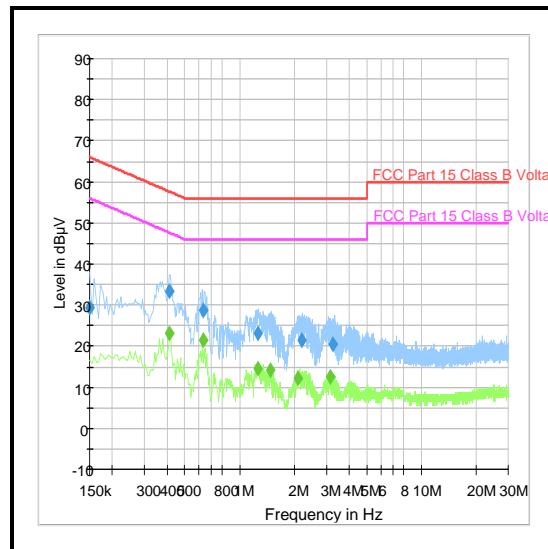
Frequency (MHz)	Line	Level (dB μ V)	Limit (dB μ V)	Margin (dB)	Result
0.411000	Neutral	23.2	47.6	24.4	Complied
0.631500	Neutral	21.6	46.0	24.4	Complied
1.266000	Neutral	14.4	46.0	31.6	Complied
1.482000	Neutral	14.3	46.0	31.7	Complied
2.094000	Neutral	12.3	46.0	33.7	Complied
3.151500	Neutral	12.5	46.0	33.5	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.

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
A004	LISN	Rohde & Schwarz	ESH3-Z5	890604/027	08 Feb 2017	12
A1829	Pulse Limiter	Rohde & Schwarz	ESH3-Z2	100671	05 May 2017	12
M1273	Test Receiver	Rohde & Schwarz	ESIB26	100275	11 Apr 2017	12

5.2.2. Transmitter Minimum 6 dB Bandwidth

Test Summary:

Test Engineer:	Sandeep Bharat	Test Date:	15 August 2016
Test Sample Serial Number:	Not marked or stated (<i>Conducted sample</i>)		

FCC Reference:	Part 15.247(a)(2)
Test Method Used:	FCC KDB 558074 Section 8.2 Option 2

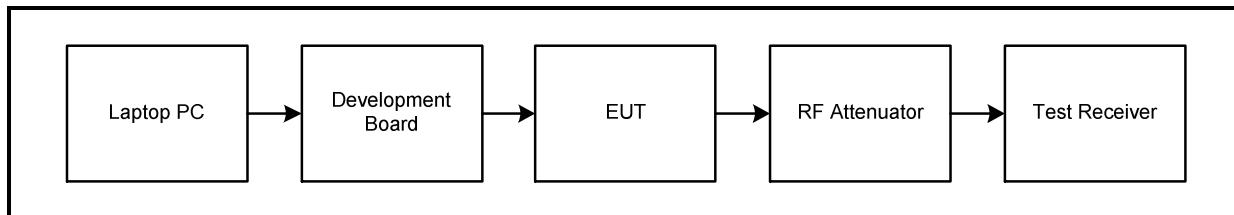
Environmental Conditions:

Temperature (°C):	24
Relative Humidity (%):	54

Note(s):

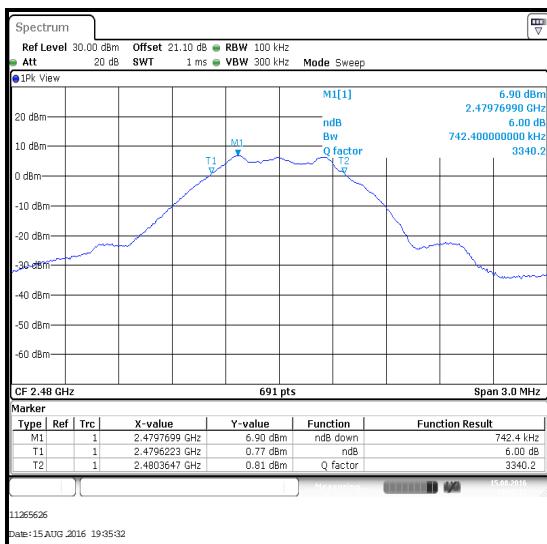
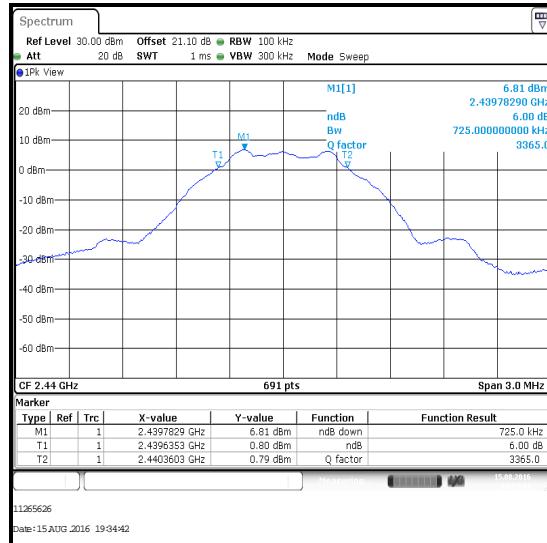
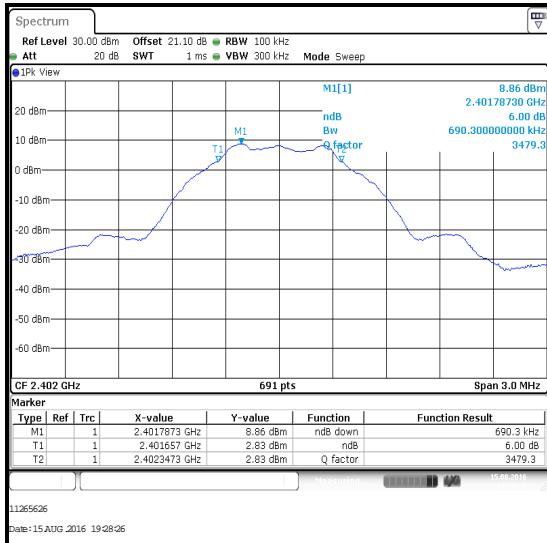
1. 6 dB DTS bandwidth tests were performed using a spectrum analyser in accordance with FCC KDB 558074 Section 8.2 Option 2 measurement procedure. The spectrum analyser resolution bandwidth was set to 100 kHz and video bandwidth 300 kHz. A peak detector was used, sweep time was set to auto and the trace mode was Max Hold. The DTS bandwidth was measured at 6 dB down from the peak of the signal.
2. The spectrum analyser 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	690.3	≥500	190.3	Complied
Middle	725.0	≥500	225.0	Complied
Top	742.4	≥500	242.4	Complied



Transmitter Minimum 6 dB Bandwidth (continued)**Test Equipment Used:**

Asset No.	Instrument	Manufacturer	Type No.	Serial No.	Date Calibration Due	Cal. Interval (Months)
M2002	Thermohygrometer	JM Handelpunkt	608-H1	45041825	02 Apr 2017	12
L1179	Signal Analyser	Rohde & Schwarz	FSV40	101324	06 Jun 2017	12
A2946	Attenuator	AtlanTecRF	AN18W5-20	208146#1	Calibrated before use	-
G0628	Signal Generator	Rohde & Schwarz	SMBV100A	261847	25 Jan 2017	12

5.2.3. Transmitter Maximum Peak Output Power

Test Summary:

Test Engineer:	Sandeep Bharat	Test Date:	15 August 2016
Test Sample Serial Number:	Not marked or stated (<i>Conducted sample</i>)		

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

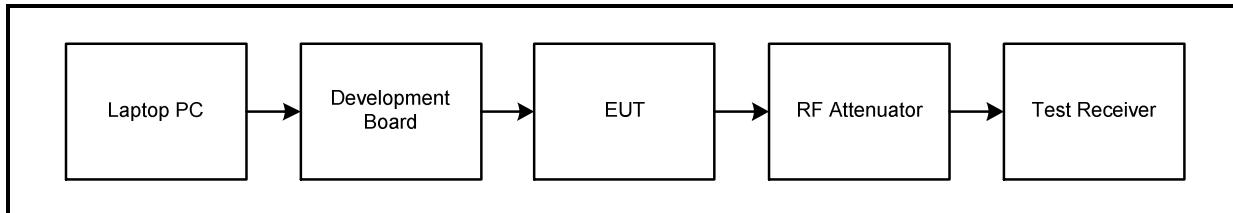
Environmental Conditions:

Temperature (°C):	24
Relative Humidity (%):	54

Note(s):

1. Conducted power tests were performed using a spectrum analyser in accordance with FCC KDB 558074 Section 9.1.1 with the RBW > DTS bandwidth procedure. A resolution bandwidth of 1 MHz was used and the video bandwidth was set to 3 MHz.
2. The spectrum analyser was connected to the RF port on the EUT using suitable attenuation and RF cable. An RF level offset was entered on the spectrum analyser to compensate for the loss of the attenuator and RF cable.
3. The conducted power was added to the declared antenna gain to obtain the EIRP.

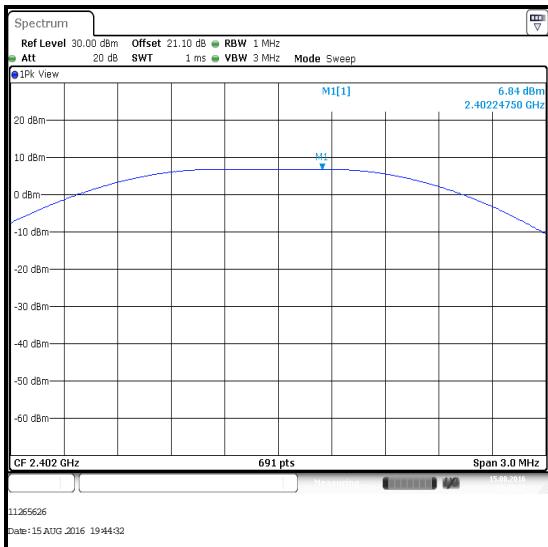
Test setup:



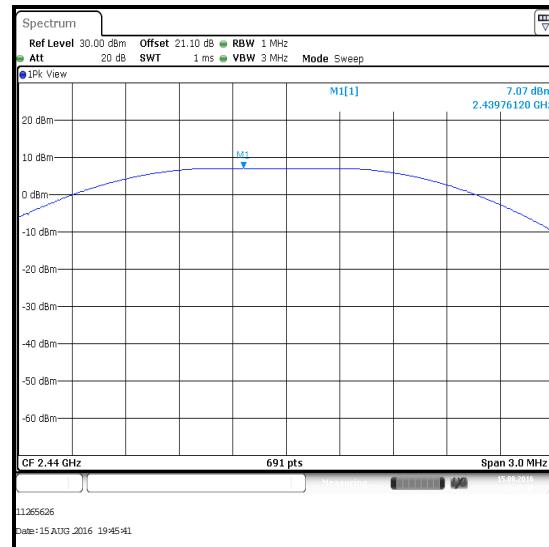
Transmitter Maximum Peak Output Power (continued)**Results:**

Channel	Conducted Peak Power (dBm)	Conducted Peak Power Limit (dBm)	Margin (dB)	Result
Bottom	6.8	30.0	23.2	Complied
Middle	7.1	30.0	22.9	Complied
Top	7.2	30.0	22.8	Complied

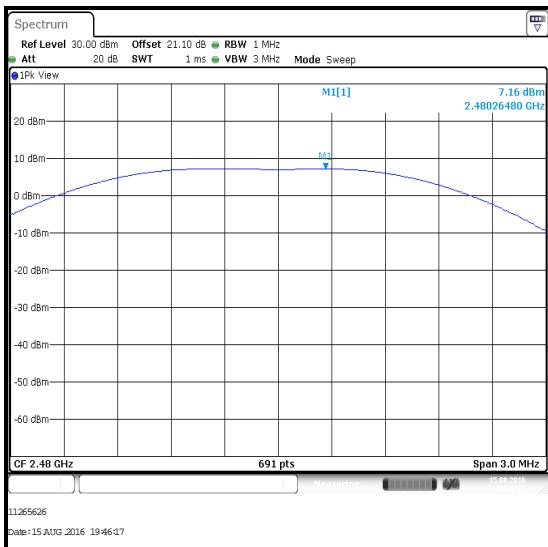
Channel	Conducted Peak Power (dBm)	Declared Antenna Gain (dBi)	EIRP (dBm)	De Facto EIRP Limit (dBm)	Margin (dB)	Result
Bottom	6.8	2.3	9.1	36.0	26.9	Complied
Middle	7.1	2.3	9.4	36.0	26.6	Complied
Top	7.2	2.3	9.5	36.0	26.5	Complied

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)
M2002	Thermohygrometer	JM Handelpunkt	608-H1	45041825	02 Apr 2017	12
L1179	Signal Analyser	Rohde & Schwarz	FSV40	101324	06 Jun 2017	12
A2946	Attenuator	AtlanTecRF	AN18W5-20	208146#1	Calibrated before use	-
G0628	Signal Generator	Rohde & Schwarz	SMBV100A	261847	25 Jan 2017	12

5.2.4. Transmitter Duty Cycle

Test Summary:

Test Engineer:	David Doyle	Test Date:	19 August 2016
Test Sample Serial Number:	Not marked or stated (<i>Conducted sample</i>)		

FCC Part:	15.247(d) & 15.209(a)
Test Method Used:	ANSI C63.10 Section 7.5

Environmental Conditions:

Temperature (°C):	25
Relative Humidity (%):	42

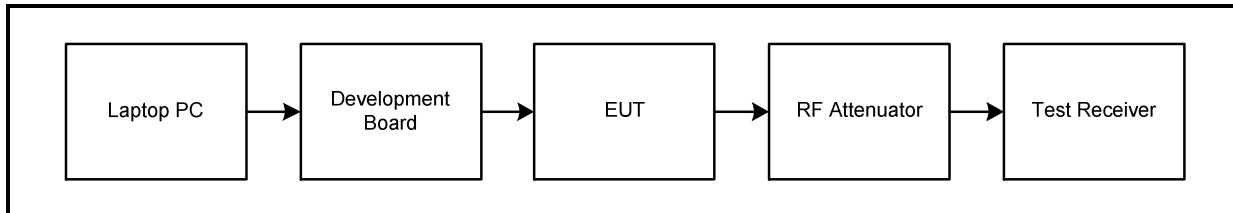
Results:

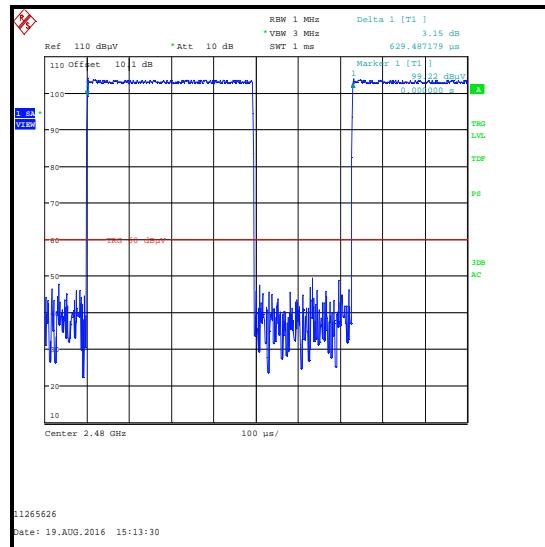
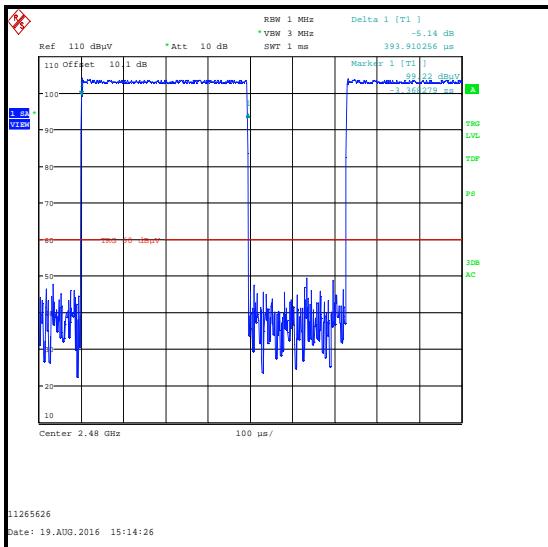
Pulse Duration (μs)	Pulse Period (μs)	Duty Cycle Correction Factor (dB)
393.9	629.5	2.0

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 period of the transmitter. The EUT was configured to transmit PRBS9 packets with a length of 0x25.
2. The EUT repeatedly transmits bursts of equal duration and period.
3. The calculation for the duty cycle correction factor is $10 \log_{10}(1/(393.9/629.5)) = 2.0 \text{ dB}$.

Test setup:



Transmitter Duty Cycle (continued)**Test Equipment Used:**

Asset No.	Instrument	Manufacturer	Type No.	Serial No.	Date Calibration Due	Cal. Interval (Months)
M1656	Thermohygrometer	JM Handelspunkt	30.5015.13	None Stated	02 Apr 2017	12
K0002	3m RSE Chamber	Rainford EMC	N/A	N/A	21 Dec 2016	12
A1534	Pre Amplifier	Hewlett Packard	8449B	3008A00405	19 Dec 2016	12
M1886	Test Receiver	Rohde & Schwarz	ESU26	100554	21 Mar 2017	12
A1818	Antenna	EMCO	3115	00075692	17 Dec 2016	12
A1396	Attenuator	Huber & Suhner	6810.17.B	757987	Calibrated before use	-

5.2.5. Transmitter Radiated Emissions

Test Summary:

Test Engineer:	Ian Watch	Test Date:	19 August 2016
Test Sample Serial Number:	Not marked or stated (<i>Radiated sample</i>)		

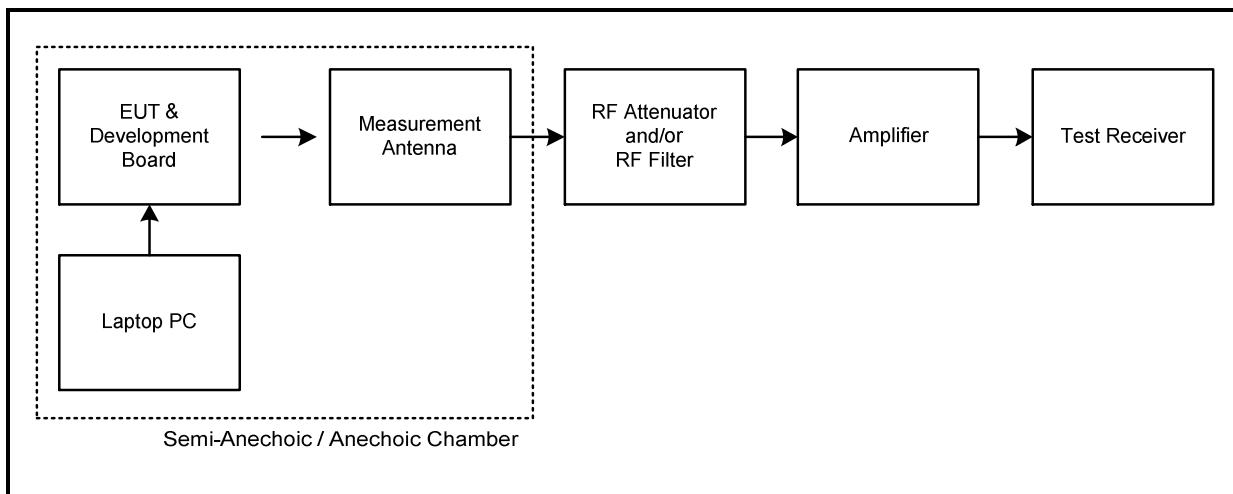
FCC Reference:	Parts 15.247(d) & 15.209(a)
Test Method Used:	ANSI C63.10 Sections 6.3 and 6.5
Frequency Range	30 MHz to 1000 MHz

Environmental Conditions:

Temperature (°C):	25
Relative Humidity (%):	42

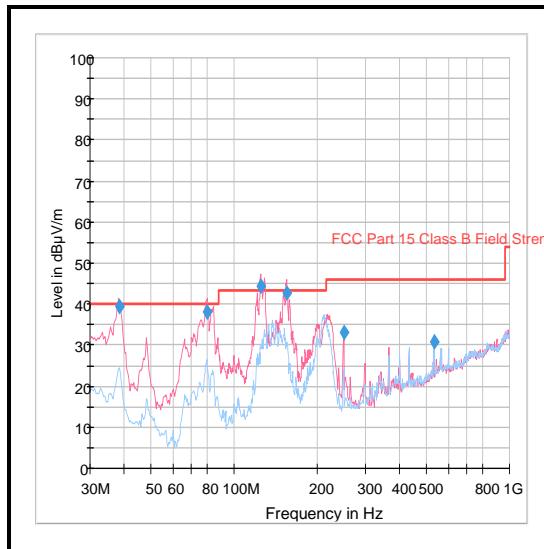
Note(s):

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 other emissions shown on the pre-scan plots were investigated and found to be ambient, or >20 dB below the applicable limit or below the measurement system noise floor and therefore not recorded.
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.
6. Final measurements were performed on the marker frequencies and the results entered into the table below. The test receiver resolution bandwidth was set to 120 kHz, using a CISPR quasi-peak detector and span wide enough to see the whole emission.

Transmitter Radiated Emissions (continued)**Test setup for radiated measurements:**

Transmitter Radiated Emissions (continued)**Results: Middle Channel**

Frequency (MHz)	Antenna Polarity	Level (dB μ V/m)	Limit (dB μ V/m)	Margin (dB)	Result
38.315	Vertical	39.4	40.0	0.6	Complied
80.053	Vertical	38.0	40.0	2.0	Complied
124.655	Vertical	43.3	43.5	0.2	Complied
155.220	Vertical	42.6	43.5	0.9	Complied
249.992	Vertical	33.1	46.0	12.9	Complied
533.055	Horizontal	30.9	46.0	15.1	Complied



Note: This plot is a pre-scan and for indication purposes only. For final measurements, see accompanying table.

Test Equipment Used:

Asset No.	Instrument	Manufacturer	Type No.	Serial No.	Date Calibration Due	Cal. Interval (Months)
M1945	Thermohygrometer	JM Handelspunkt	30.5015.01	0112	10 Jun 2017	12
K0001	5m RSE Chamber	Rainford EMC	N/A	N/A	12 Jan 2017	12
G0543	Amplifier	Sonoma	310N	230801	09 Dec 2016	6
M1273	Test Receiver	Rohde & Schwarz	ESIB 26	100275	11 Apr 2017	12
A2959	Antenna	Schwarzbeck	VULB 9163	9163-967	22 Apr 2017	12
A1834	Attenuator	Hewlett Packard	8491B	10444	30 Mar 2017	12

Transmitter Radiated Emissions (continued)**Test Summary:**

Test Engineer:	David Doyle	Test Dates:	25 August 2016 & 26 August 2016
Test Sample Serial Number:	Not marked or stated (<i>Radiated sample</i>)		

FCC Reference:	Parts 15.247(d) & 15.209(a)
Test Method Used:	FCC KDB 558074 Sections 11 & 12 referencing ANSI C63.10 Sections 6.3 and 6.6
Frequency Range	1 GHz to 25 GHz

Environmental Conditions:

Temperature (°C):	26
Relative Humidity (%):	47 to 48

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 4 GHz plot is the EUT fundamental.
4. Pre-scans above 1 GHz were performed in a fully anechoic chamber (Asset Number K0002) at a distance of 3 metres. The EUT was placed at a height of 1.5 metres above the test chamber floor in the centre of the chamber turntable. All measurement antennas were placed at a fixed height of 1.5 metres above the test chamber floor, in line with the EUT. Final measurements above 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 1.5 m 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. The laptop PC was placed in a metal box on the test chamber floor below the EUT during testing.
6. 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.
7. *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.
8. The reference level for the emission in the non-restricted band was established by following KDB 558074 Section 11.2 procedure.
9. **-20 dBc limit applies in non-restricted band as the conducted output power measurements were performed using a peak detector.
10. In accordance with KDB 558074 Section 12.2.5.2, for average measurements, the duty cycle correction factor calculated in Section 5.2.4 of this test report was added to the measured result.

Transmitter Radiated Emissions (continued)**Results: Peak / Bottom Channel**

Frequency (MHz)	Antenna Polarity	Level (dB μ V/m)	Limit (dB μ V/m)	Margin (dB)	Result
4708.926	Vertical	47.2	54.0*	6.8	Complied
4723.770	Vertical	47.4	54.0*	6.6	Complied
4803.574	Vertical	59.9	74.0	14.1	Complied
4868.590	Vertical	47.0	54.0*	7.0	Complied
7206.673	Vertical	48.6	54.0*	5.4	Complied
12008.678	Vertical	46.9	54.0*	7.1	Complied
14413.490	Vertical	62.9	82.5**	19.6	Complied
19842.104	Vertical	55.9	74.0	18.1	Complied

Results: Average / Bottom Channel

Frequency (MHz)	Antenna Polarity	Level (dB μ V/m)	Limit (dB μ V/m)	Margin (dB)	Result
4803.742	Vertical	49.7	54.0	4.3	Complied
19838.194	Vertical	46.5	54.0	7.5	Complied

Results: Peak / Middle Channel

Frequency (MHz)	Antenna Polarity	Level (dB μ V/m)	Limit (dB μ V/m)	Margin (dB)	Result
4723.798	Vertical	47.9	54.0*	6.1	Complied
4880.425	Vertical	57.5	74.0	16.5	Complied
4906.835	Vertical	48.0	54.0*	6.0	Complied
5027.011	Vertical	47.9	54.0*	6.1	Complied
7320.769	Vertical	50.5	54.0*	3.5	Complied
12199.055	Vertical	49.4	54.0*	4.6	Complied
14638.510	Vertical	61.5	80.9**	19.4	Complied
19522.131	Vertical	58.3	74.0	15.7	Complied

Results: Average / Middle Channel

Frequency (MHz)	Antenna Polarity	Level (dB μ V/m)	Limit (dB μ V/m)	Margin (dB)	Result
4879.663	Vertical	48.5	54.0	5.5	Complied
19518.221	Vertical	48.1	54.0	5.9	Complied

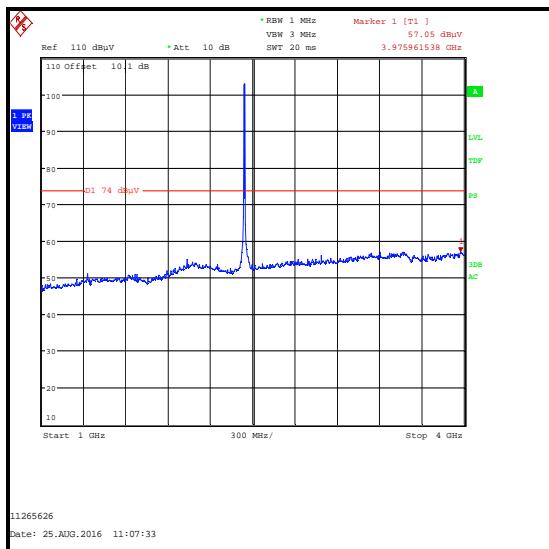
Transmitter Radiated Emissions (continued)**Results: Peak / Top Channel**

Frequency (MHz)	Antenna Polarity	Level (dB μ V/m)	Limit (dB μ V/m)	Margin (dB)	Result
4723.718	Vertical	47.8	54.0*	6.2	Complied
4947.973	Vertical	47.5	54.0*	6.5	Complied
4959.511	Vertical	45.8	54.0*	8.2	Complied
4982.187	Vertical	48.1	54.0*	5.9	Complied
7440.865	Vertical	55.0	74.0	19.0	Complied
12401.146	Vertical	50.8	54.0*	3.2	Complied
19837.885	Vertical	56.0	74.0	18.0	Complied
22317.837	Vertical	57.1	74.0	16.9	Complied

Results: Average / Top Channel

Frequency (MHz)	Antenna Polarity	Level (dB μ V/m)	Limit (dB μ V/m)	Margin (dB)	Result
4959.944	Vertical	47.8	54.0	6.2	Complied
7439.551	Vertical	43.6	54.0	10.4	Complied
19838.157	Vertical	46.0	54.0	8.0	Complied
22317.837	Vertical	47.2	54.0	6.8	Complied

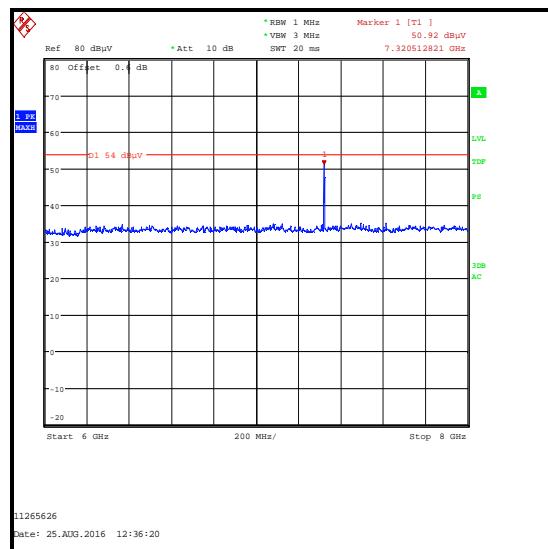
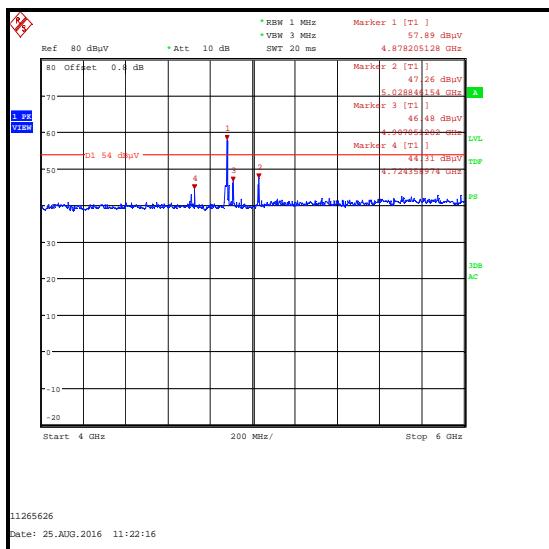
Transmitter Radiated Emissions (continued)



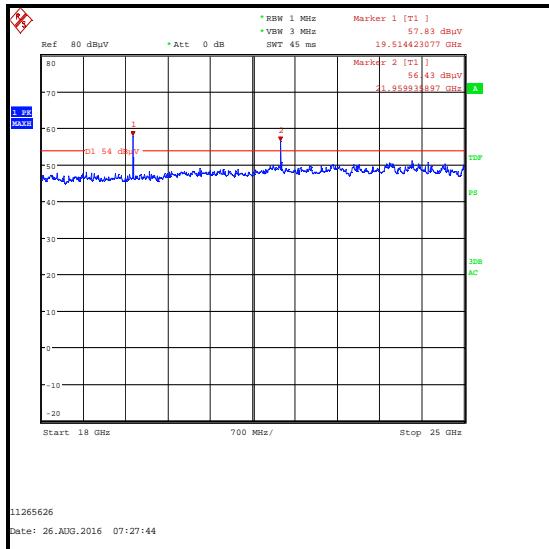
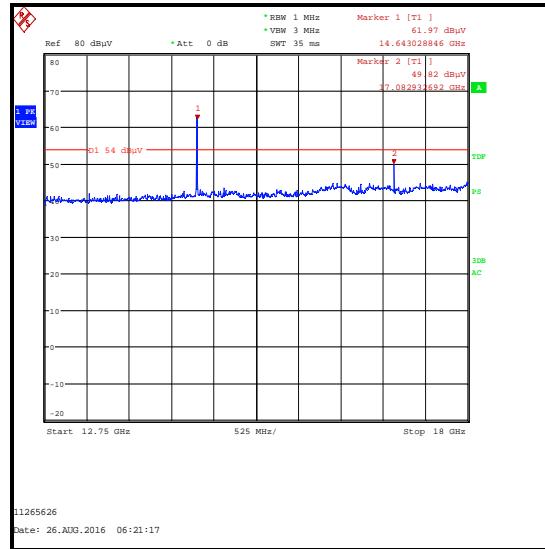
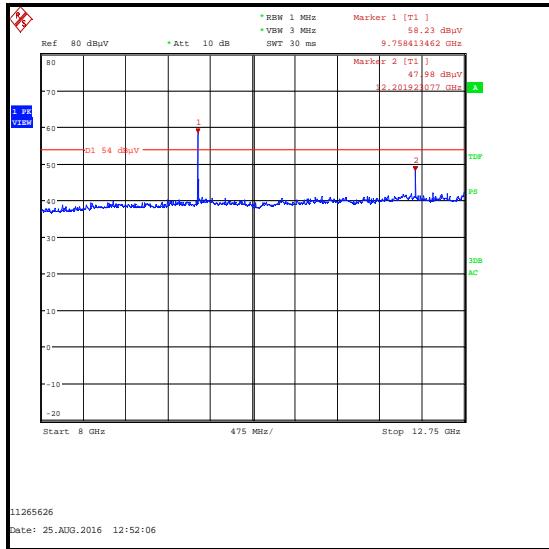
Peak Detector



Average Detector



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)
M1656	Thermohygrometer	JM Handelpunkt	30.5015.13	None stated	02 Apr 2017	12
K0002	3m RSE Chamber	Rainford EMC	N/A	N/A	21 Dec 2016	12
M1886	Test Receiver	Rohde & Schwarz	ESU26	100554	21 Mar 2017	12
A1534	Pre Amplifier	Hewlett Packard	8449B	3008A00405	19 Dec 2016	12
A1818	Antenna	EMCO	3115	00075692	17 Dec 2016	12
A253	Antenna	Flann Microwave	12240-20	128	17 Dec 2016	12
A254	Antenna	Flann Microwave	14240-20	139	17 Dec 2016	12
A255	Antenna	Flann Microwave	16240-20	519	17 Dec 2016	12
A256	Antenna	Flann Microwave	18240-20	400	17 Dec 2016	12
A436	Antenna	Flann Microwave	20240-20	330	19 Dec 2016	12
A1396	Attenuator	Huber & Suhner	6810.17.B	757987	26 Apr 2017	12
A1975	High Pass Filter	AtlanTecRF	AFH-03000	090424010	26 Apr 2017	12

5.2.6. Transmitter Band Edge Radiated Emissions**Test Summary:**

Test Engineer:	David Doyle	Test Date:	25 August 2016
Test Sample Serial Number:	Not marked or stated (<i>Radiated sample</i>)		

FCC Reference:	Parts 15.247(d) & 15.209(a)
Test Method Used:	ANSI C63.10 Sections 6.10.4, 6.10.5 & KDB 558074 Section 11

Environmental Conditions:

Temperature (°C):	26
Relative Humidity (%):	47

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. 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.
4. * -20 dBc limit.
5. The test receiver reference level was set to 120 dB μ V in order to achieve sufficient headroom.
6. In accordance with KDB 558074 Section 12.2.5.2, for upper band edge and restricted band average measurements, the duty cycle correction factor calculated in Section 5.2.4 of this test report was added to the measured level.

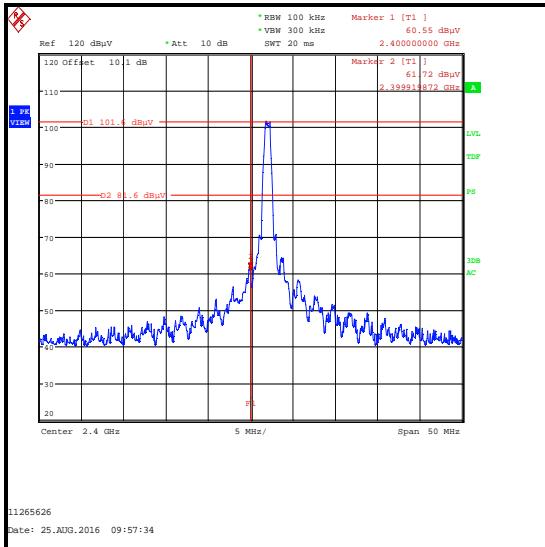
Transmitter Band Edge Radiated Emissions (continued)**Results: Peak**

Frequency (MHz)	Level (dB μ V/m)	Limit (dB μ V/m)	Margin (dB)	Result
2389.744	60.9	74.0	13.1	Complied
2399.920	61.7	81.6*	19.9	Complied
2400.0	60.6	81.6*	21.0	Complied
2483.5	67.6	74.0	6.4	Complied
2483.740	68.6	74.0	5.4	Complied

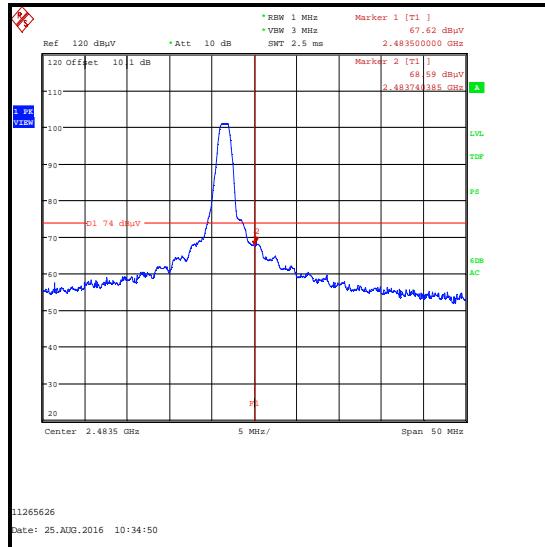
Results: Average

Frequency (MHz)	Measured Level (dB μ V/m)	Duty Cycle Correction (dB)	Corrected Level (dB μ V/m)	Limit (dB μ V/m)	Margin (dB)	Result
2389.744	46.2	2.0	48.2	54.0	5.8	Complied
2483.5	46.2	2.0	48.2	54.0	5.8	Complied
2483.580	46.7	2.0	48.7	54.0	5.3	Complied

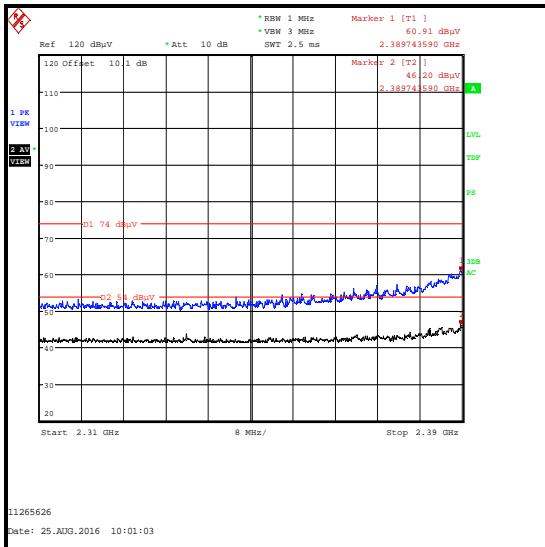
Transmitter Band Edge Radiated Emissions (continued)



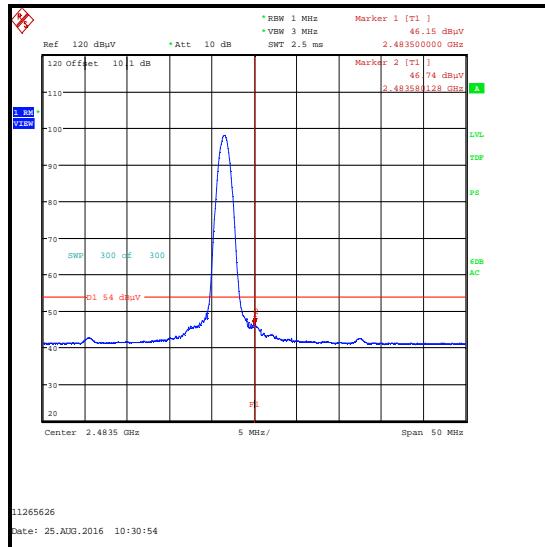
Lower Band Edge Peak Measurement



Upper Band Edge Peak Measurement



2310 MHz to 2390 MHz Restricted Band



Upper Band Edge Average Measurement

Test Equipment Used:

Asset No.	Instrument	Manufacturer	Type No.	Serial No.	Date Calibration Due	Cal. Interval (Months)
M1656	Thermohygrometer	JM Handelspunkt	30.5015.13	None Stated	02 Apr 2017	12
K0002	3m RSE Chamber	Rainford EMC	N/A	N/A	21 Dec 2016	12
A1534	Pre Amplifier	Hewlett Packard	8449B	3008A00405	19 Dec 2016	12
M1886	Test Receiver	Rohde & Schwarz	ESU26	100554	21 Mar 2017	12
A1818	Antenna	EMCO	3115	00075692	17 Dec 2016	12
A1396	Attenuator	Huber & Suhner	6810.17.B	757987	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 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
AC Conducted Spurious Emissions	0.15 MHz to 30 MHz	95%	±4.69 dB
Conducted Maximum Peak Output Power	2.4 GHz to 2.4835 GHz	95%	±1.13 dB
Duty Cycle	2.4 GHz to 2.4835 GHz	95%	±1.14 %
Minimum 6 dB Bandwidth	2.4 GHz to 2.4835 GHz	95%	±4.59 %
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
2.0	1 & 7 7	-	Corrected FCC ID, Brand name and Model Modified Description of EUT

--- END OF REPORT ---