TEST REPORT

Test Report No. : UL-RPT-RP-12654480-116- FCC

Applicant	:	Playbrush Ltd.
Model No.	:	A116
FCC ID	:	2AF47A116
Technology	:	Bluetooth – Low Energy
Test Standard(s)	:	FCC Parts 15.207, 15.209(a) & 15.247
		For details of applied tests refer to test result summary

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2. The results in this report apply only to the sample tested.
3. The test results in this report are traceable to the national or international standards.
4. Test Report Version 1.0
5. Result of the tested sample: **PASS**

Prepared by: Abdoufataou, Salifou
Title: Laboratory Engineer
Date: 11.April.2019

Approved by: Ajit, Phadtare
Title: Lead Test Engineer
Date: 11.April.2019

Deutsche Akkreditierungsstelle
D-PL-19381-02-00

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

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1. Customer Information

1.1.Applicant Information

Company Name:	Playbrush Ltd.
Company Address:	68 Edith Villas, West Kensington Court, W14 9AB London, UK
Company Phone No.:	--
Company E-Mail:	--
Contact Person:	Patrick Diem
Contact E-Mail Address:	patrick@playbrush.com
Contact Phone No.:	+43 6769243820

1.2.Manufacturer Information

Company Name:	Trisa AG
Company Address:	Kantonsstrasse 31, CH-6234 Triengen, SWITZERLAND
Company Phone No.:	+41 41 935 3475
Company E-Mail:	info@trisa.ch
Contact Person:	Martin Neubauer
Contact E-Mail Address:	Martin.neubauer@trisa.ch
Contact Phone No.:	+41 41 935 3475

2. Summary of Testing

2.1. General Information

Applied Standards

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
Test Firm Registration:	399704

Location

Location of Testing:	UL International Germany GmbH Hedelfinger Str. 61 70327 Stuttgart Germany

Date information

Order Date:	14 December 2018
EUT arrived:	5 February 2019 & 21 February 2019
Test Dates:	19 February 2019 to 22 February 2019
EUT returned:	-/-

2.2. Summary of Test Results

Clause	Measurement	Complied	Did not comply	Not performed	Not applicable
Part 15.207	Transmitter AC Conducted Emissions	☒	☐	☐	☐
Part 15.247(a)(2)	Transmitter Minimum 6 dB Bandwidth	☒	☐	☐	☐
Part 15.35(c)	Transmitter Duty Cycle	☒	☐	☐	☐
Part 15.247(e)	Transmitter Power Spectral Density [1]	☐	☐	☒	☐
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	☒	☐	☐	☐

Note:

1. In accordance with FCC KDB 558074 refering ANSI C63.10 Section 11.10.1, PSD 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 the measured total output power.

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 v05r01 February11, 2019
Title:	Guidance for Performing Compliance Measurements on Digital Transmission Systems (DTS) Operating Under §15.247 of the FCC rules
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:	Playbrush
Model Name or Number:	A116
Test Sample Serial Number:	Conducted Test Sample
Hardware Version Number:	1.4x
Firmware Version Number:	1.04
FCC ID:	2AF47A116

Brand Name:	Playbrush
Model Name or Number:	A116
Test Sample Serial Number:	Radiated Test Sample
Hardware Version Number:	1.4x
Firmware Version Number:	1.04
FCC ID:	2AF47A116

3.2. Description of EUT

The equipment under test was a Powered toothbrush for kids with Bluetooth Low Energy functionality.

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	1.2 V NiMH battery	
Power Supply Type(s):	Internal Rechargebale Battery via WPT AC /DC Charger		
Internal Rechargebale Battery Detail(s):	1.2 V NiMH battery		
WPT AC /DC Charger Detail(s):	TRT | Type:4680 | 100-240 V/50-60Hz 0.9W		
Maximum Conducted Output Power:	-1.8 dBm		
Antenna Gain:	0.0 dBi		
Antenna Type:	PCB antenna		
Antenna Details:	PCB whip antenna		
Transmit Frequency Range:	2402 MHz to 2480 MHz		
Transmit Channels Tested:	**Channel ID**	**RF Channel Index**	**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:

A. Support Equipment (In-house)

Item	Description	Brand Name	Model Name or Number	Serial Number
1	--	--	--	--

B. Support Equipment (Manufacturer supplied)

Item	Description	Brand Name	Model Name or Number	Serial Number
1	Wirless (WPT) AC/DC Charger	TRT	Type:4680 100-240 V/50-60Hz 0.9W	Not 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):

- The customer supplied a document containing the setup instructions “PBe- DUT description UL 2019 Feb.pdf”.
- All tests were performed with fully charged internal battery.
- Following test modes were activated during testing; by pressing the Play button on the device.
    - mode 4 (indicated with blue LED): Tx on channel 0 (PRBS9)
    - mode 5 (indicated with turquoise LED): Tx on channel 19 (PRBS9)
    - mode 6 (indicated with yellow LED): Tx on channel 39 (PRBS9)
- The EUT was transmitting with 100% duty cycle therefore no duty cycle correction was required.
- The EUT conducted sample was used for 6 dB bandwidth, 99% emission bandwidth, power spectral density and maximum peak output power.
- The EUT radiated sample was used for AC conducted emissions and radiated spurious emissions tests.
- EMC32 V10.1.0 Software was used for the Radiated spurious emission measurement.
- AC conducted emissions tests was performed with empty battery charging mode by placing tooth brush on it’s wireless (WPT) charger.

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 DAkkS 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:	Asim Shahzad	**Test Date:**	21 February 2019
Test Sample Serial Number:	Radiated Test Sample		
Test Site Identification	SR 7/8		

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

Environmental Conditions:

Temperature (°C):	20
Relative Humidity (%):	31

Settings of the Instrument

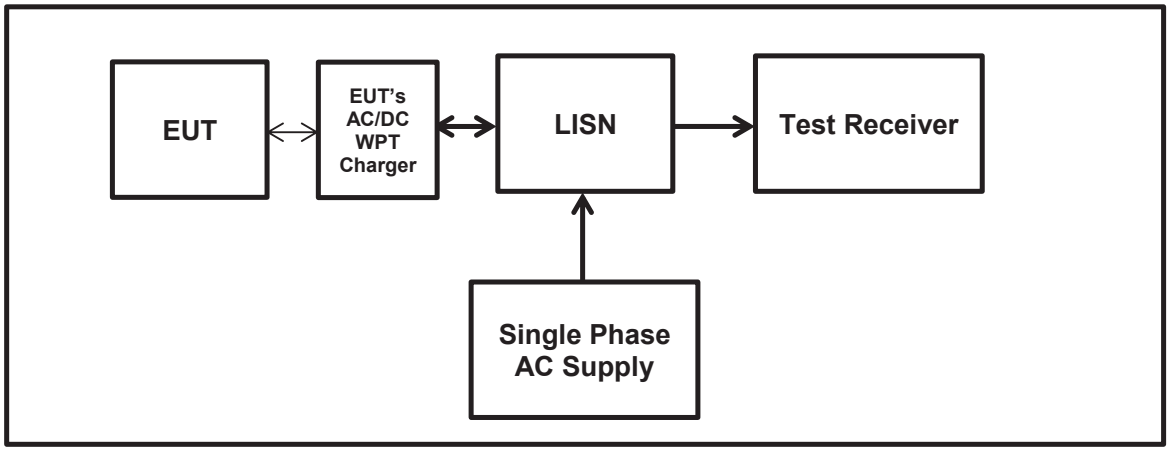
Detector	Quasi Peak/ Average Peak

Note(s):

1. The EUT was plugged onto a wireless (WPT) AC/DC charger. The AC charger was connected to 120 VAC 60 Hz single phase supply via a LISN.
2. The final measured value, for the given emission, in the table below incorporates the cable loss.
3. 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.
4. Measurements were performed in shielded room (SR7/ 8 Asset Number 1603671). The EUT was placed at a height of 80 cm above the reference ground plane and in a distance of 40 cm from the vertical ground plane at the edge of the table.
5. The EUT was operating in mode 4 (indicated with blue LED): Tx on channel 0 (PRBS9).

Transmitter AC Conducted Spurious Emissions (continued)

Test setup :



Results: Live / Quasi Peak (QP) Detector / 120 VAC 60 Hz

Frequency (MHz)	Line	QP Level (dBµV)	QP Limit (dBµV)	QP Margin (dB)	Result
0.18858	Live	53.6	64.1	10.5	Complied
0.37745	Live	42.4	58.3	15.9	Complied
0.56834	Live	39.5	56.0	16.5	Complied
0.66152	Live	40.6	56.0	15.4	Complied
0.75471	Live	40.5	56.0	15.5	Complied
0.84890	Live	39.5	56.0	16.5	Complied

Results: Live / Average (AV) Detector / 120 VAC 60 Hz

Frequency (MHz)	Line	AV Level (dBµV)	AV Limit (dBµV)	AV Margin (dB)	Result
0.18858	Live	39.4	54.1	14.7	Complied
0.37745	Live	34.4	48.3	13.9	Complied
0.56834	Live	32.6	46.0	13.4	Complied
0.66152	Live	31.7	46.0	14.3	Complied
0.75471	Live	34.2	46.0	11.8	Complied
0.84890	Live	33.1	46.0	12.9	Complied

Results: Neutral / Quasi Peak (QP) Detector / 120 VAC 60 Hz

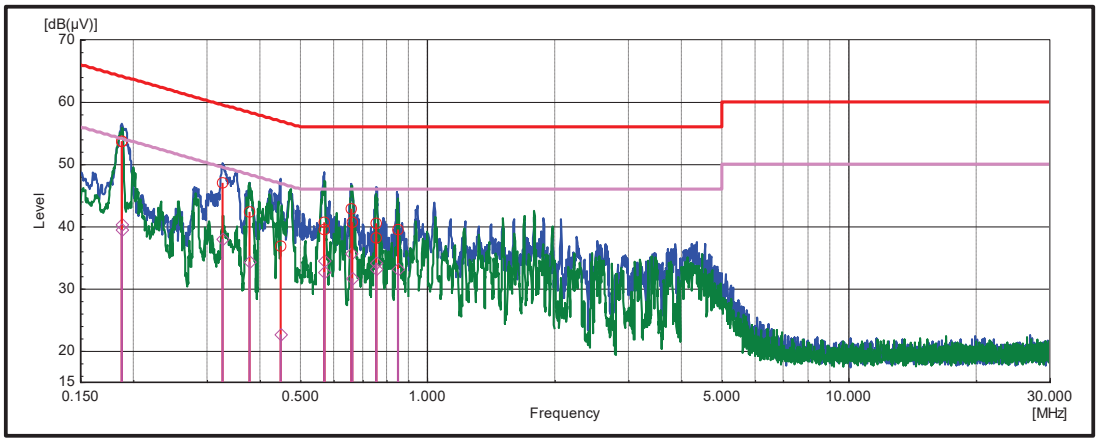
Frequency (MHz)	Line	QP Level (dBµV)	QP Limit (dBµV)	QP Margin (dB)	Result
0.18808	Neutral	53.7	64.1	10.4	Complied
0.32685	Neutral	47	59.5	12.5	Complied
0.44709	Neutral	36.8	56.9	20.1	Complied
0.56834	Neutral	40.6	56.0	15.4	Complied
0.65952	Neutral	42.8	56.0	13.2	Complied
0.75671	Neutral	38.2	56.0	17.8	Complied

Results: Neutral / Average (AV) Detector / 120 VAC 60 Hz

Frequency (MHz)	Line	AV Level (dBµV)	AV Limit (dBµV)	AV Margin (dB)	Result
0.18808	Neutral	40.3	54.1	13.8	Complied
0.32685	Neutral	38	49.5	11.5	Complied
0.44709	Neutral	22.7	46.9	24.2	Complied
0.56834	Neutral	34.5	46.0	11.5	Complied
0.65952	Neutral	35.7	46.0	10.3	Complied
0.75671	Neutral	33.2	46.0	12.8	Complied

Result: Pass

Plot: Live and Neutral Line



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

5.2.2. Transmitter Minimum 6 dB Bandwidth

Test Summary:

Test Engineer:	Abdoufataou Salifou	**Test Date:**	22 February 2019
Test Sample Serial Number:	Conducted Test Sample		
Test Site Identification	SR 9		

FCC Reference:	Part 15.247(a)(2)
Test Method Used:	FCC KDB 558074 Section 8.2 referring ANSI C63.10:2013 Section 11.8.1 Option 1

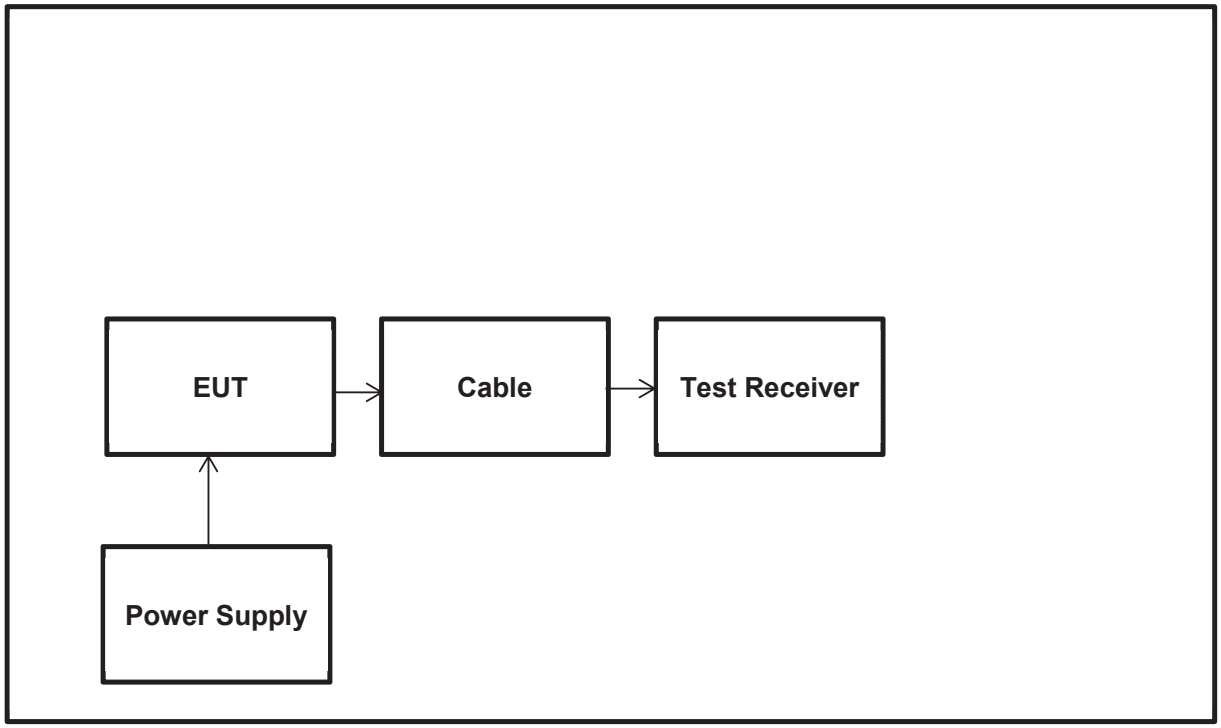
Environmental Conditions:

Temperature (°C):	21.9
Relative Humidity (%):	30

Notes:

1. 6 dB DTS bandwidth tests were performed using a spectrum analyser in accordance with FCC KDB 558074 Section 8.2 referring ANSI C63.10 Section 11.8 (11.8.1 Option 1 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 RF port on the EUT was connected to the spectrum analyser using suitable attenuation and RF cable. The measured values takes into consideration the external attenuation correction factors. The RF cable attenuation (maximum 0.4 dB@2.4GHz) from the EUT to Analyzer including the 10 dB attenuation at the Spectrum Analyzer input was added as a reference level offset (10.4 dB) to each of the conducted plots.

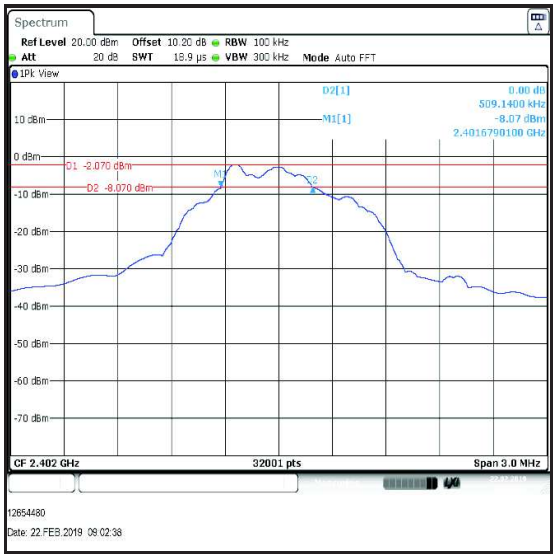
Test Setup:



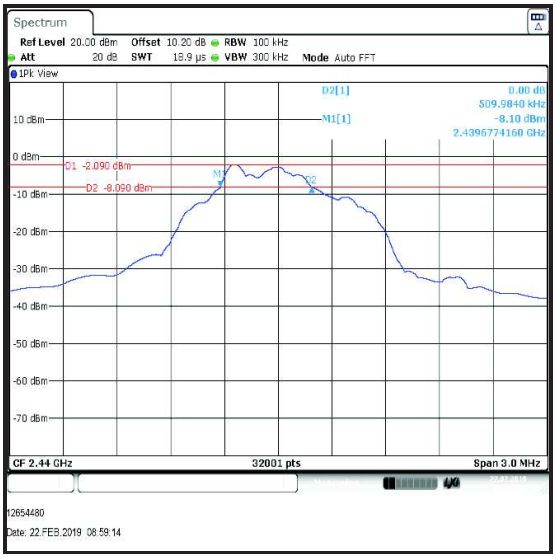
Transmitter Minimum 6 dB Bandwidth (continued)

Results:

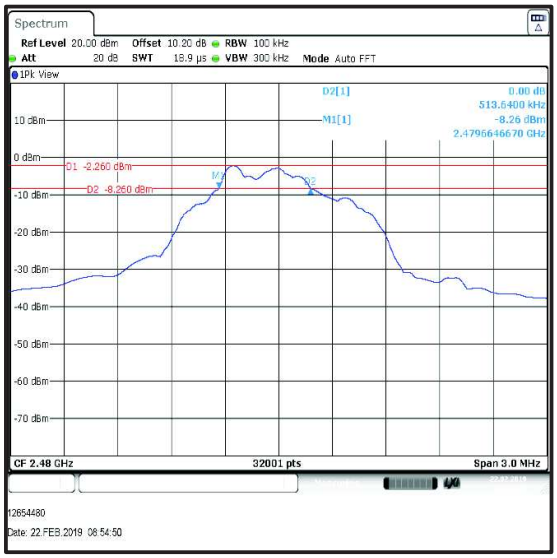
Test Channel	6 dB Bandwidth (kHz)	Limit (kHz)	Margin (kHz)	Result
Bottom	509.140	≥500	9.140	Complied
Middle	509.984	≥500	9.984	Complied
Top	513.640	≥500	13.640	Complied



Bottom Channel



Middle Channel



Top Channel

Result: Pass

5.2.3.Transmitter Duty Cycle

Test Summary:

Test Engineer:	Abdoufataou Salifou	**Test Date:**	22 February 2019
Test Sample Serial Number:	Conducted Test Sample		
Test Site Identification	SR 9		

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

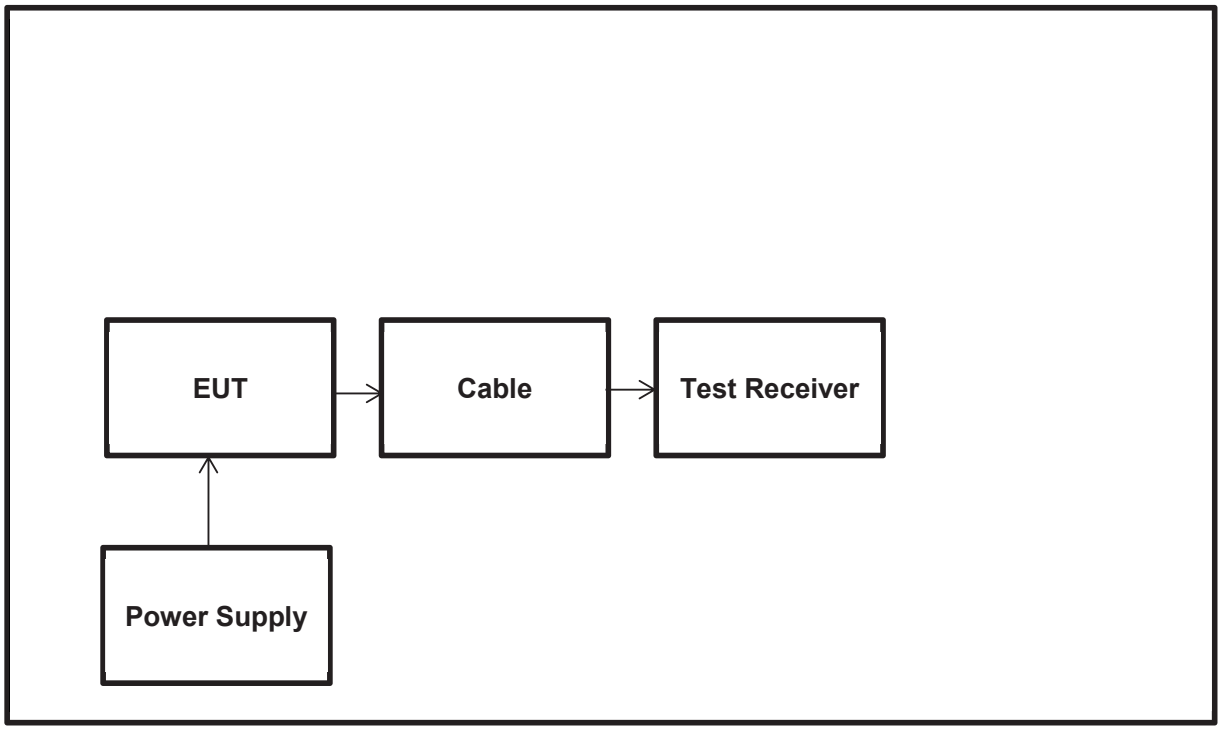
Environmental Conditions:

Temperature (°C):	22.8
Relative Humidity (%):	26

Note:

The transmitter duty cycle was observed several times & measured using a spectrum analyser in the time domain. It was found that EUT transmitting continuously (i.e., with a duty cycle of greater than or equal to 98 %). As the EUT was transmitting with 100% duty cycle therefore no duty cycle correction was required.

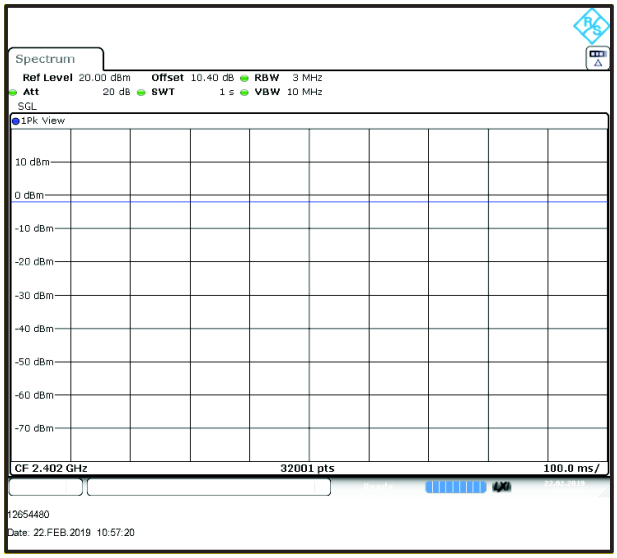
Test Setup:



Transmitter Duty Cycle (continued)

Results:

Pulse Duration (µs)	Period (µs)	Duty Cycle Correction (dB)
--	--	Not Applicable (Refer Note)



5.2.4. Transmitter Maximum Peak Output Power

Test Summary:

Test Engineer:	Abdoufataou Salifou	**Test Date:**	22 February 2019
Test Sample Serial Number:	Conducted Test Sample		
Test Site Identification	SR 9		

FCC Reference:	Part 15.247(b)(3)
Test Method Used:	FCC KDB 558074 Section 8.3.1.1 referring ANSI C63.10 Section 11.9.1.1

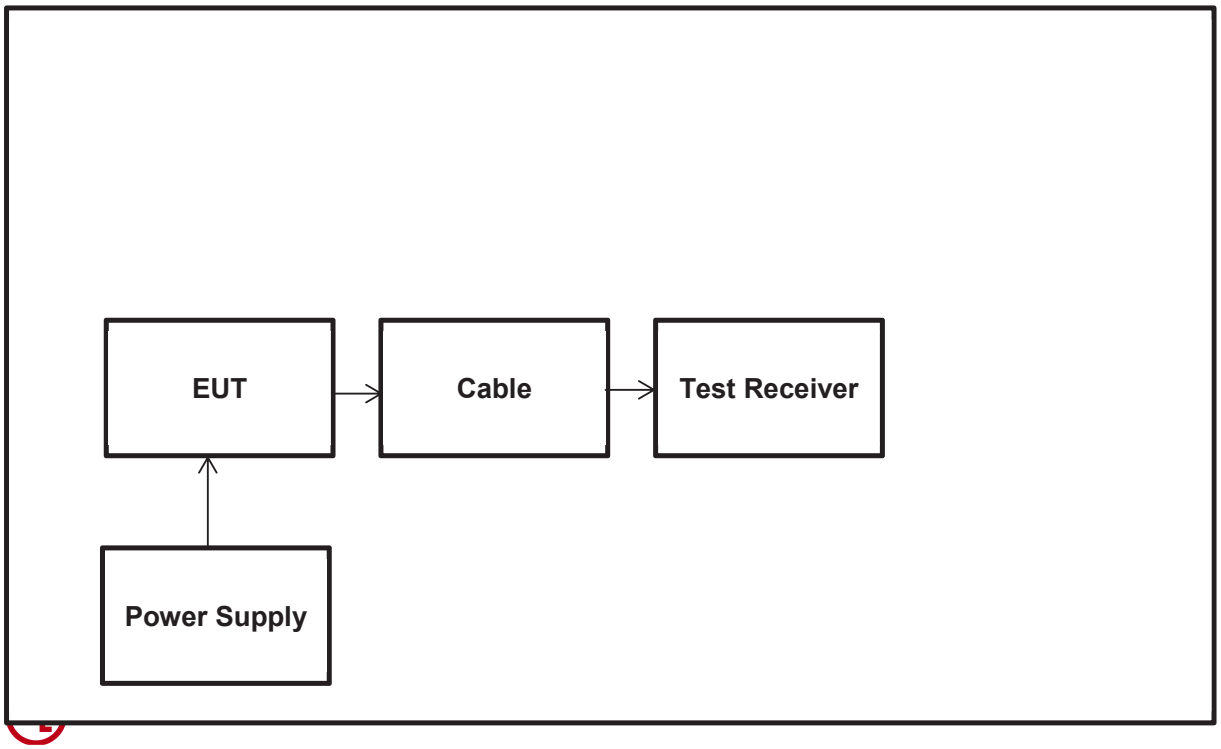
Environmental Conditions:

Temperature (°C):	22.1
Relative Humidity (%):	29

Notes:

1. Conducted power tests were performed using a spectrum analyser in accordance with FCC KDB 558074 Section 8.3.1.1 with the RBW ≥ *DTS bandwidth* referring ANSI C63.10 Section 11.9.1.1.
2. The signal analyser resolution bandwidth was set to 3 MHz and video bandwidth of 10 MHz. A peak detector was used, sweep time was set to auto and trace mode was Max Hold. The span was set to 10 MHz. A marker was placed at the peak of the signal and the results recorded in the table below.
3. The RF port on the EUT was connected to the spectrum analyser using suitable attenuation and RF cable. The measured values takes into consideration the external attenuation correction factors. The RF cable attenuation (maximum 0.4 dB@2.4GHz) from the EUT to Analyzer including the 10 dB attenuation at the Spectrum Analyzer input was added as a reference level offset (10.4 dB) to each of the conducted plots.
4. The EUT was transmitting with 100% duty cycle.
5. The declared antenna gain was added to conducted power to obtain the EIRP.

Test setup:



Transmitter Maximum Peak Output Power (continued)

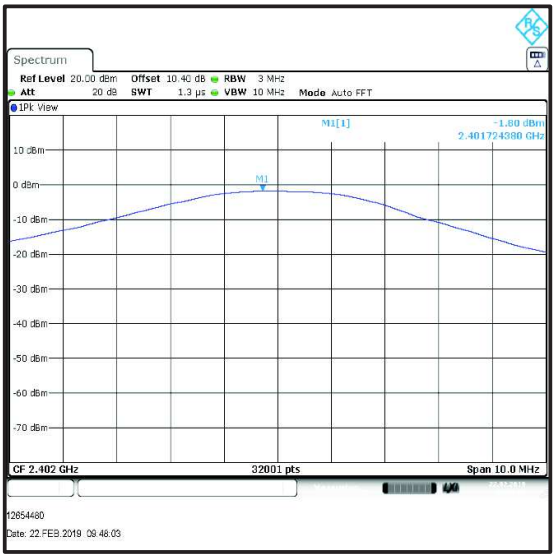
Results:

Test Channel	Conducted Peak Power (dBm)	Conducted Peak Power Limit (dBm)	Margin (dB)	Result
Bottom	-1.8	30.0	31.8	Complied
Middle	-1.8	30.0	31.8	Complied
Top	-2.0	30.0	32.0	Complied

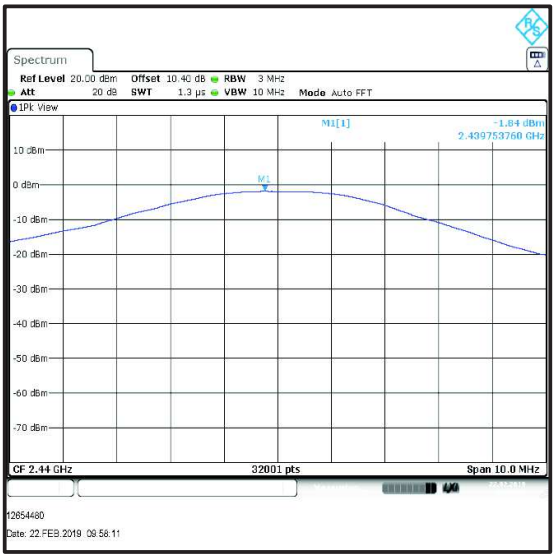
Test Channel	Conducted Peak Power (dBm)	Declared Antenna Gain (dBi)	Peak EIRP (dBm)	De Facto EIRP Limit (dBm)	Margin (dB)	Result
Bottom	-1.8	0.0	-1.8	36.0	37.8	Complied
Middle	-1.8	0.0	-1.8	36.0	37.8	Complied
Top	-2.0	0.0	-2.0	36.0	38.0	Complied

Result: Pass

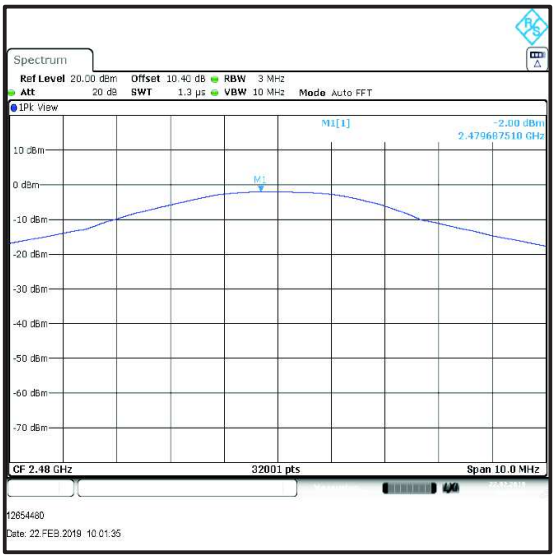
Transmitter Maximum Peak Output Power (continued)



Bottom Channel



Middle Channel



Top Channel

5.2.5. Transmitter Radiated Emissions

Test Summary:

Test Engineer:	Segun Adeniji	**Test Date:**	19 February 2019
Test Sample Serial Number:	Radiated Test Sample		
Test Site Identification	SR 1/2		

FCC Reference:	Parts 15.247(d) & 15.209(a)
Test Method Used:	FCC KDB 558074 Sections 8.5 & 8.6 referring ANSI C63.10 Sections 11.11 and 11.12 ANSI C63.10:2013 Sections 6.3 and 6.5
Frequency Range	30 MHz to 1000 MHz

Environmental Conditions:

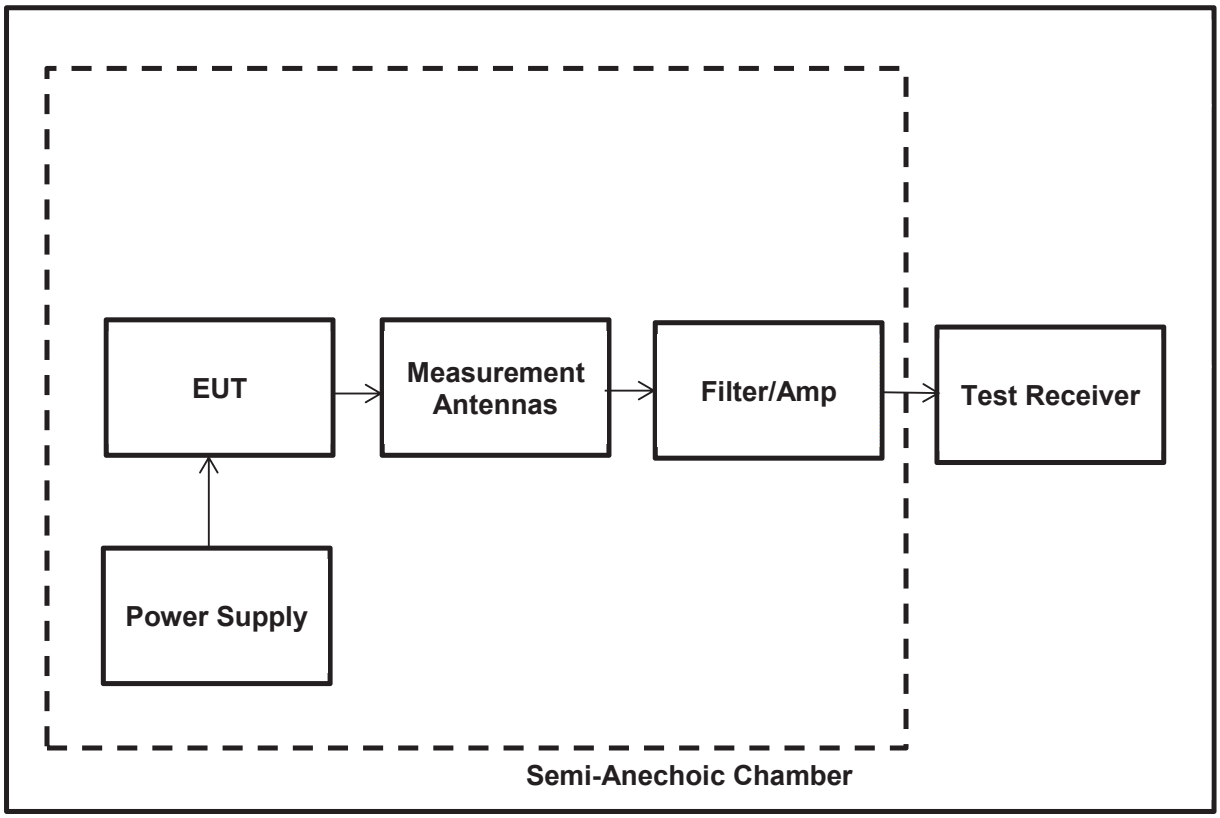
Temperature (°C):	23
Relative Humidity (%):	35

Note(s):

1. The final measured value, for the given emission, in the table below incorporates the calibrated antenna factor and cable loss.
2. 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 worst case i.e. middle channel only.
3. Measurements below 1 GHz were performed in a semi-anechoic chamber 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.
4. 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.
5. 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 big enough to see the whole emission.
6. The EUT was transmitting with 100% duty cycle.

Transmitter Radiated Emissions (continued)

Test Setup:

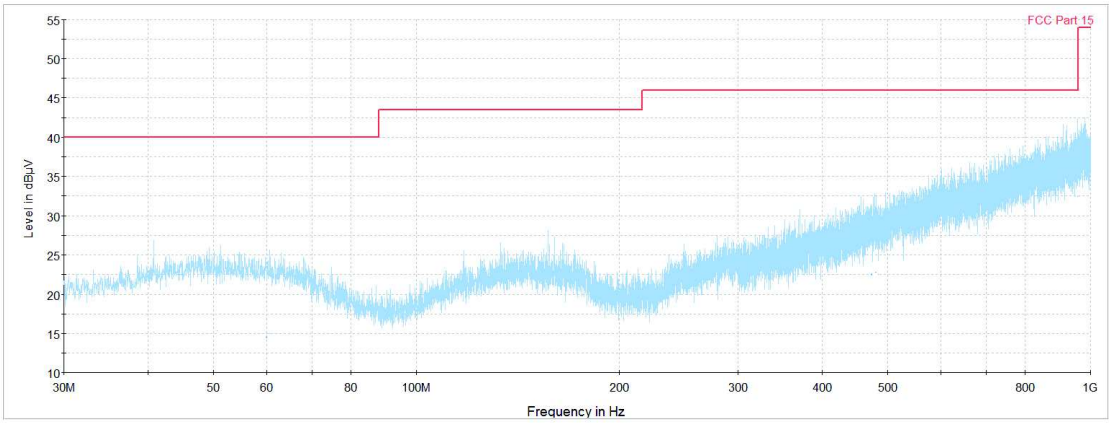


Transmitter Radiated Emissions (continued)

Results: Middle Channel

Frequency (MHz)	Antenna Polarization	Peak Level (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Result
No critical spurious was found					

Plot: 30 MHz – 1GHz (Midlle channel) with Peak detector



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

Result: Pass

Test Summary:

Test Engineer:	Segun Adeniji	**Test Date:**	19 & 22 February 2019
Test Sample Serial Number:	Radiated Test Sample		
Test Site Identification	SR 1/2		

FCC Reference:	Parts 15.247(d) & 15.209(a)
Test Method Used:	FCC KDB 558074 Sections 8.5 & 8.6 referring ANSI C63.10 Sections 11.10 and 11.12 ANSI C63.10:2013 Sections 6.3 and 6.6
Frequency Range	1 GHz to 25 GHz

Environmental Conditions:

Temperature (°C):	23 & 22.6
Relative Humidity (%):	35 & 30

Notes:

1. The final measured value, for the given emission, in the table below incorporates the calibrated antenna factor and cable loss.
2. All the spurious emissions detected were re-investigated and re-measured with an average detector and in this case the emission was compared to the peak limit. For frequency range between 18 GHz and 25 GHz, no critical emission was found so only the measurement receiver noise floor level has been measured and recorded in the table The peak level was compared to the average limit as opposed to being compared to the peak limit because this is the more onerous limit. Only the middle channel plot was included in the report as similar result was obtained on both bottom and top channels.
3. The emission shown around the 2.4 GHz is the EUT fundamental.
4. Measurements above 1 GHz were performed in a semi-anechoic chamber 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. 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.
7. The EUT was transmitting with 100% duty cycle therefore no duty cycle correction was required.

Transmitter Radiated Emissions (continued)

Results: Peak (PK) Detector / Bottom Channel

Frequency (MHz)	Antenna Polarization	PK Level (dBµV/m)	PK Limit (dBµV/m)	Margin (dB)	Result
No critical spurious was found					

Results: Peak (PK) Detector / Middle Channel

Frequency (MHz)	Antenna Polarization	PK Level (dBµV/m)	PK Limit (dBµV/m)	Margin (dB)	Result
No critical spurious was found					

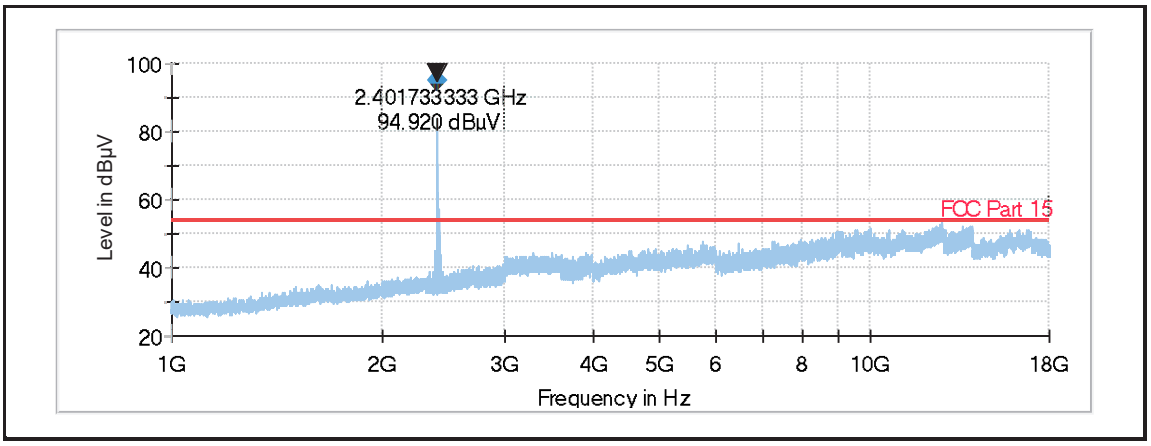
Results: Peak (PK) Detector / Top Channel

Frequency (MHz)	Antenna Polarization	PK Level (dBµV/m)	PK Limit (dBµV/m)	Margin (dB)	Result
No critical spurious was found					

Result: Pass

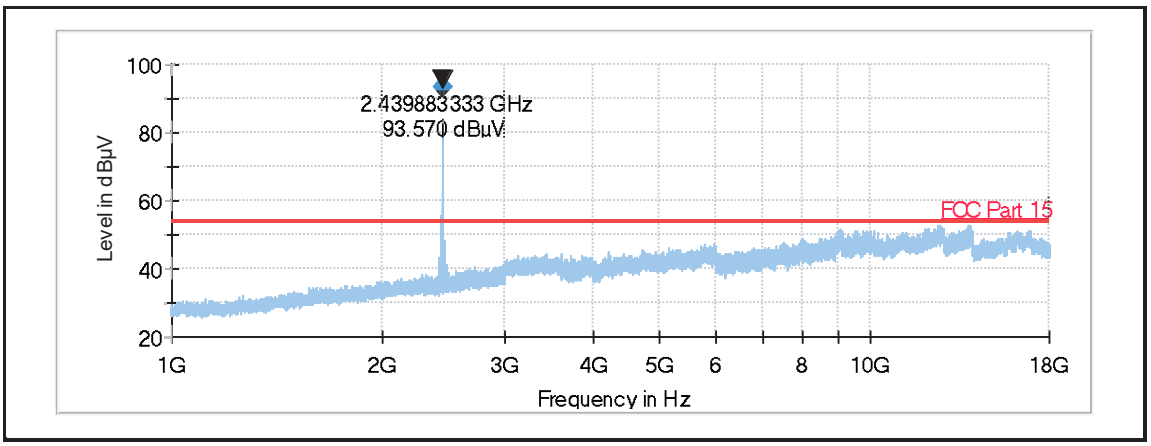
Transmitter Radiated Emissions (continued)

Plot: 1 GHz – 18GHz (Bottom channel) with Peak detector



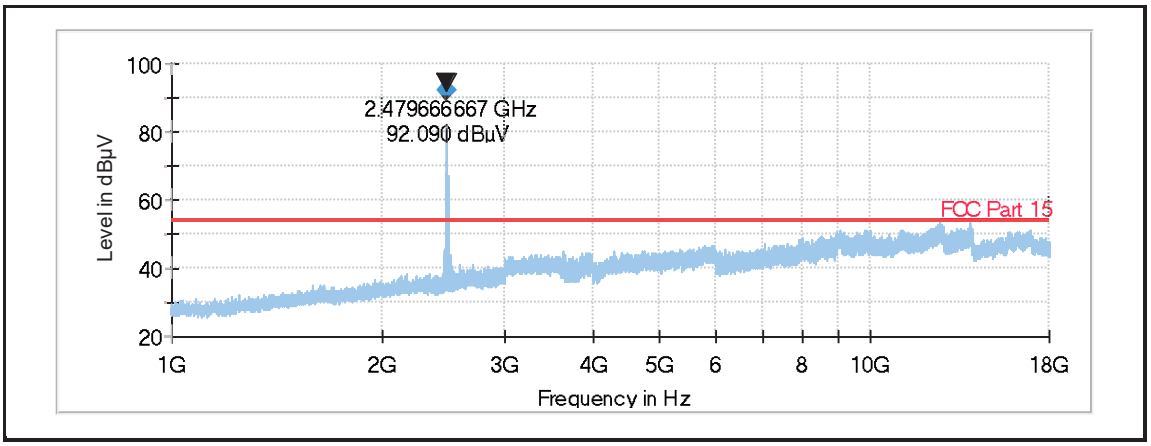
Note: This plot is a pre-scan and for indication purposes only. For final measurements, see accompanying table.

Plot: 1 GHz – 18GHz (Middle channel) with Peak detector



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

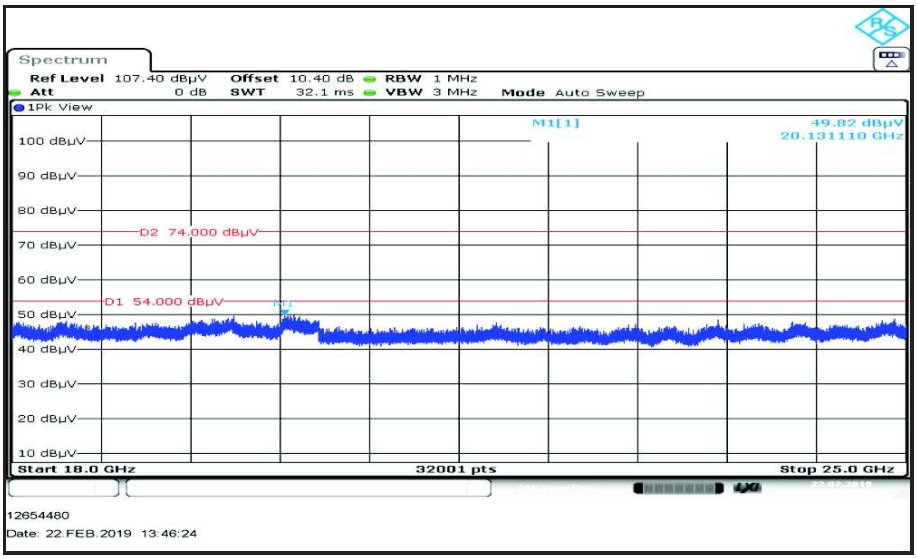
Plot: 1 GHz – 18GHz (Top channel) with Peak detector



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

Transmitter Radiated Emissions (continued)

Plot: 18 GHz – 25GHz (Middle channel) with Peak detector



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

5.2.6. Transmitter Band Edge Radiated Emissions

Test Summary:

Test Engineer:	Segun Adeniji	**Test Date:**	19 February 2019
Test Sample Serial Number:	Radiated Test Sample		
Test Site Identification	SR 1/2		

FCC Reference:	Parts 15.247(d) & 15.209(a)
Test Method Used:	FCC KDB 558074 Sections 8.7 ANSI C63.10:2013 Section 6.10.4, 6.10.5 & Section 11.11

Environmental Conditions:

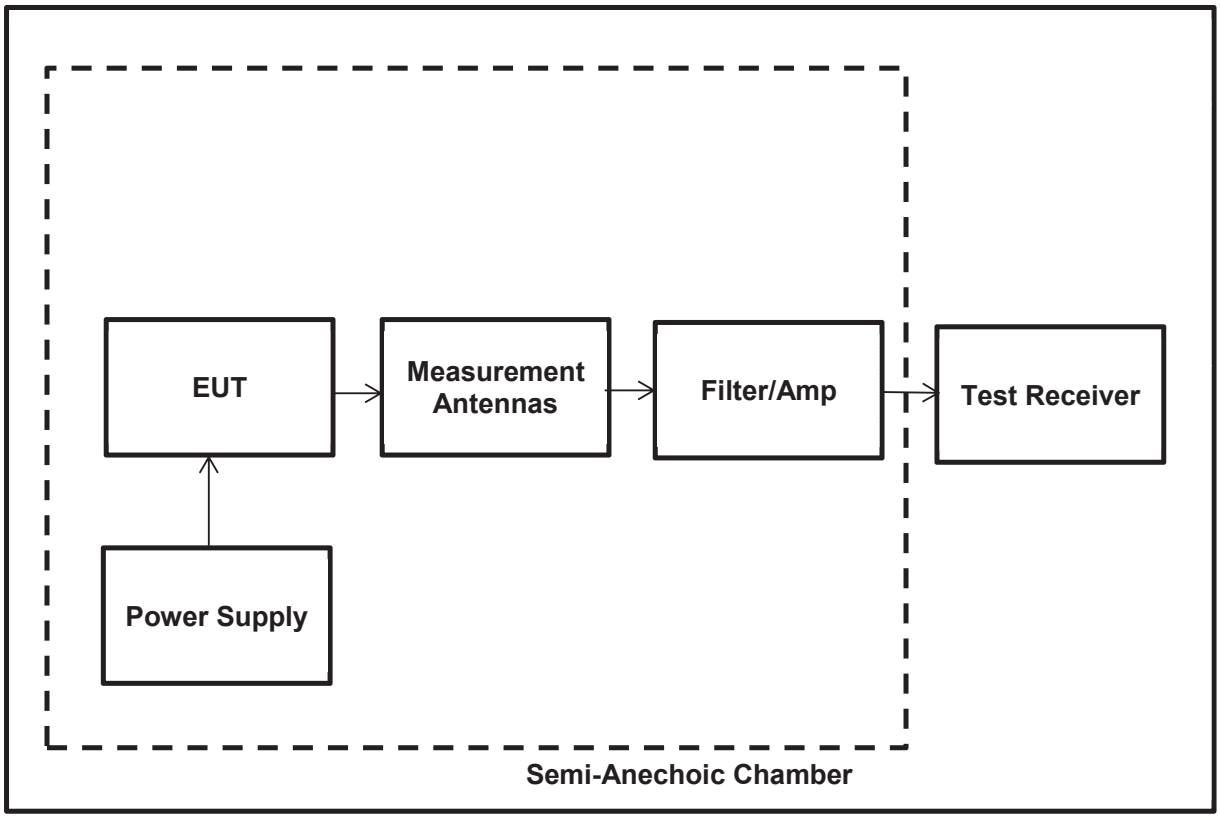
Temperature (°C):	23
Relative Humidity (%):	35

Notes:

1. As the band edges fall within non-restricted bands, only peak measurements are required. In accordance with ANSI C63.10 Section 11.11.1, the test method in Section 11.11.3 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 ANSI C63.10 Section 11.9.1.1 an out-of-band limit line was placed 20 dB below the peak level (ANSI C63.10 Section 11.11.1(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.
2. 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.
3. As the upper band edge falls within 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 resolution 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 test receiver resolution bandwidth was set to 1 MHz and the video bandwidth 3 MHz. An average 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 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. The Top channel final measurement was performed with measurement method as provided by ANSI C63.10:2013 Section 6.10.5
4. *Emissions in restricted bands: In accordance with ANSI C63.10:2013 Section 6.6.4.3, Note 1, where the peak detected amplitude was shown to comply with the average limit, an average measurement was not performed.
5. The EUT was transmitting with 100% duty cycle therefore no duty cycle correction was required.

Transmitter Band Edge Radiated Emissions (continued)

Test Setup:



Transmitter Band Edge Radiated Emissions (continued)

Results: Lower Band Edge/Peak (PK) Detector

Frequency (MHz)	PK Level (dBµV/m)	-20 dBc Limit (dBµV/m)	Margin (dB)	Result
2394.50	53.4	71.2	17.8	Complied
2400.00	52.9	71.2	18.3	Complied

Results: Upper Band Edge / Restricted Band / Peak(PK) Detector

Frequency (MHz)	PK Level (dBµV/m)	PK Limit (dBµV/m)	Margin (dB)	Result
2483.50	67.2	74.0	6.8	Complied

Results: Upper Band Edge / Restricted Band / RMS Detector

Frequency (MHz)	Measured Average Level (dBµV/m)	Duty Cycle Correction (dB)	Corrected Average Level (dBµV/m)	Average Limit (dBµV/m)	Margin (dB)	Result
2483.50	44.5	0.0	44.5	54.0	9.5	Complied

Results: 2310 to 2390 MHz Restricted Band / Peak(PK) Detector

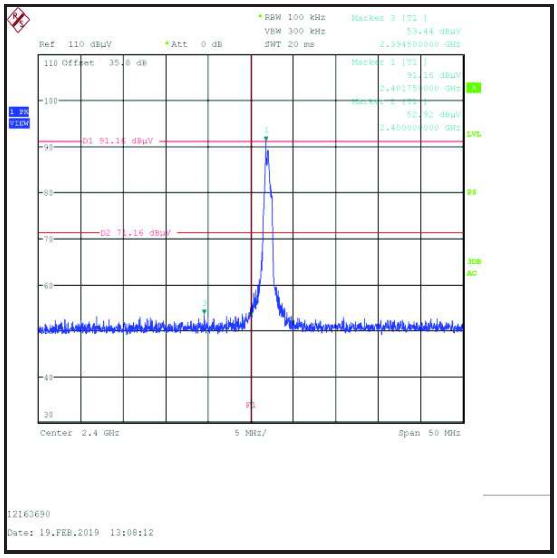
Frequency (MHz)	PK Level (dBµV/m)	PK Limit (dBµV/m)	Margin (dB)	Result
2390.00	59.6	74.0	14.4	Complied

Results: 2310 to 2390 MHz Restricted Band / RMS Detector

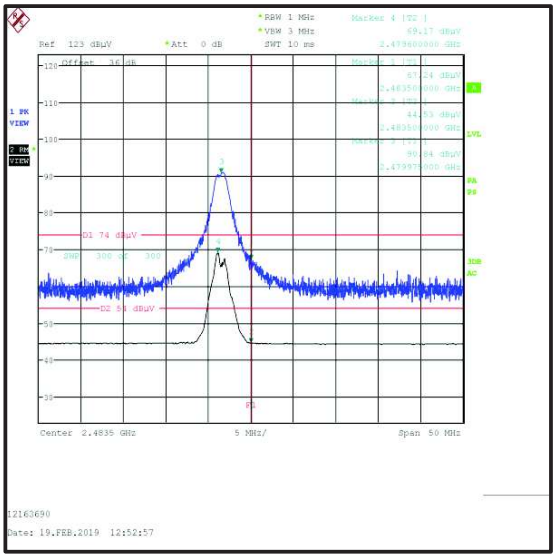
Frequency (MHz)	Measured Average Level (dBµV/m)	Duty Cycle Correction (dB)	Corrected Average Level (dBµV/m)	Average Limit (dBµV/m)	Margin (dB)	Result
2355.00	48.0	0.0	48.0	54.0	6.0	Complied

Result: Pass

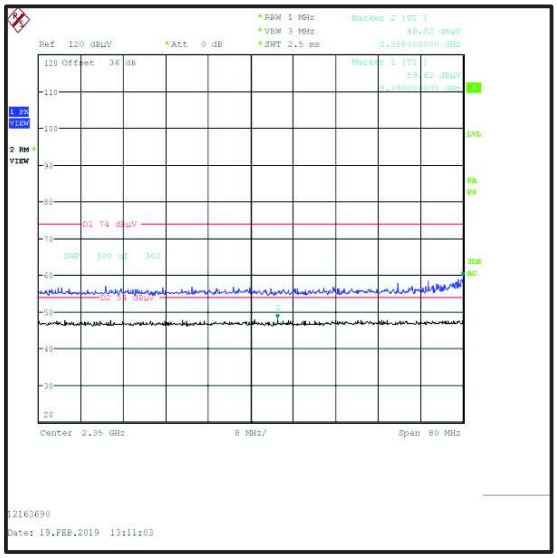
Transmitter Band Edge Radiated Emissions (continued)



Lower Band Edge Peak Measurement



Upper Band Edge Peak & Average Measurement



2310 - 2390 MHz Restricted Band Peak & Average Measurement

6. Measurement Uncertainty

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	Confidence Level (%)	Calculated Uncertainty
AC Conducted Spurious Emissions	95%	±2.49 dB
Conducted Maximum Peak Output Power	95%	±0.59 dB
Radiated Spurious Emissions	95%	±3.10 dB
Band Edge Radiated Emissions	95%	±3.10 dB
Minimum 6 dB Bandwidth	95%	±0.87 %

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. Used equipment

Test site: SR 1/2

ID	Manufacturer	Type	Model	Serial No.	Calibration Date	Cal. Cycle
377	BONN Elektronik	Amplifier, Low Noise Pre	BLMA 0118-1A	025294B	7/12/2018	12
383	Rohde & Schwarz	Antenna, Rod	HFH2-Z1	890151/11	7/14/2017	24
424	EMCO	Antenna, Horn	EMCO 3116	00046537	7/28/2016	36
460	Deisl	Turntable	DT 4250 S		n/a	n/a
465	Schwarzbeck	Antenna, Trilog Broadband	VULB 9168	9168-240	8/8/2016	36
496	Rohde & Schwarz	Antenna, log. - periodical	HL050	100297	7/20/2016	36
587	Maturo	antenna mast, tilting	TAM 4.0-E	011/7180311	n/a	n/a
588	Maturo	Controller	NCD	029/7180311	n/a	n/a
591	Rohde & Schwarz	Receiver	ESU 40	100244/040	7/12/2018	12
608	Rohde & Schwarz	Switch Matrix	OSP 120	101227	4/8/2014	60
615	Wainwright Instruments	Highpass Filter 1GHz	WHKX12-	3	Lab verification	n/a
628	Maturo	Antenna mast	CAM 4.0-P	224/19590716	n/a	n/a
629	Maturo	Kippeinrichtung	KE 2.5-R-M	MAT002	n/a	n/a

Test site: SR 9

ID	Manufacturer	Type	Model	Serial No.	Calibration Date	Cal. Cycle
635	Rohde & Schwarz	Signal generator	SMB100A	179875	7/10/2018	12
637	Rohde & Schwarz	Spectrum Analyzer	FSV40	101587	7/11/2018	12
423	Bonn Elektronik	Amplifier, Low Noise Pre	BLMA 1840-1A	55929	7/12/2018	24
216	Agilent	Multimeter	34401A	US36017458	7/11/2017	24

Test site: SR 7/8

ID	Manufacturer	Type	Model	Serial No.	Calibration Date	Cal. Cycle
22	Rohde & Schwarz	Artificial Mains	50 Ohm// 50uH	831767/014	7/11/2018	12
215	Rohde & Schwarz	Artificial Mains Network	9 kHz - 30 MHz; 3 phase	879675/002	7/11/2018	12
349	Rohde & Schwarz	Receiver, EMI Test	20 Hz - 7 GHz	836697/009	7/10/2018	12
616	Rohde & Schwarz	ISN	8 wire ISN for CAT6	101656	7/12/2018	12

8. Report Revision History

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

--- END OF REPORT ---