



TEST REPORT

Test Report No. : UL-RPT-RP12122204-116A V3.0

Manufacturer : Philips Lifeline Systems Inc.
Model No. : 324PHB
FCC ID : BDZ324PHB
Technology : SRD
Test Standard(s) : FCC Parts 15.209(a) & 15.231

1. This test report shall not be reproduced in full or partial, without the written approval of UL VS LTD.
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 3.0 supersedes all previous versions.

Date of Issue: 13 AUGUST 2018

Checked by:

Ian Watch
Senior Test Engineer, Radio Laboratory

Company Signatory:

Sarah Williams
Senior Test Engineer, Radio Laboratory
UL VS LTD



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

UL VS LTD

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1. Customer Information

Company Name:	Philips Lifeline Systems Inc.
Address:	111 Lawrence Street, Framingham MA 01702 - USA

2. Summary of Testing

2.1. General Information

Specification Reference:	47CFR15.231
Specification Title:	Code of Federal Regulations Volume 47 (Telecommunications): Part 15 Subpart C (Radio Frequency Devices) - Section 15.231
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:	12 April 2018 to 27 June 2018

2.2. Summary of Test Results

FCC Reference (47CFR)	Measurement	Result
Part 15.231(a) & (b)	Transmitter Fundamental Field Strength	
Part 15.231(c)	Transmitter 20 dB Bandwidth	
Part 15.231(a)	Periodic Operation	
Part 15.35(c)	Transmitter Duty Cycle	
Part 15.231(b) & 15.209	Transmitter Radiated Emissions	
Key to Results  = Complied  = Did not comply		

2.3. Methods and Procedures

Reference:	ANSI C63.10-2013
Title:	American National Standard of Procedures for Compliance Testing of Unlicensed Wireless Devices

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:	Philips Lifeline
Model Name or Number:	324PHB
Test Sample Serial Number:	00180322000325 (<i>Radiated sample #1</i>)
Hardware Version:	PHB_V1.0
Software Version:	324PHB_1005
FCC ID:	BDZ324PHB

Brand Name:	Philips Lifeline
Model Name or Number:	324PHB
Test Sample Serial Number:	0018033000319 (<i>Radiated sample #2</i>)
Hardware Version:	PHB_V1.0
Software Version:	324PHB_1005
FCC ID:	BDZ324PHB

3.2. Description of EUT

The Equipment Under Test was a Personal Help Button. It is a signal initiating device for emergency alarm systems and contains a 312 MHz transmitter. It is powered from an internal 3.0 Volt battery.

3.3. Modifications Incorporated in the EUT

No modifications were applied to the EUT during testing.

3.4. Additional Information Related to Testing

Power Supply Requirement:	Nominal	3.0 Volt lithium battery
Type of Unit:	Transmitter	
Modulation	Amplitude-shift keying (ASK) / On-Off Keying (OOK)	
Transmit Frequency Range:	312 MHz	

3.5. Support Equipment

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

Description:	3.0 Volt lithium battery
Brand Name:	Panasonic
Model Name or Number:	CR 2032
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 test modes, unless otherwise stated:

- Transmitting with a modulated carrier at maximum output power on a fixed frequency of 312 MHz.

4.2. Configuration and Peripherals

The EUT was tested in the following configuration:

- Continuous transmit tests: The customer supplied a modified sample that continuously transmits as soon as a battery is connected.
- Normal Mode: The button on the EUT was held down for 4 seconds and the EUT transmitted.
- The EUT was fitted with an internal 3 Volt battery. A fully charged battery was fitted for all tests.
- All measurements were performed as radiated tests.
- Fundamental field strength, 20 dB emission bandwidth and radiated emissions tests were performed using a modified sample that was supplied continuously transmitting (Serial Number: 00180322000325).
- Periodic operation and duty cycle tests were performed using an unmodified sample (Serial Number: 0018033000319).
- The customer supplied a document named 'Lynx Device description' dated 28th March 2018. This contained the operational description of the EUT.
- As a result of FCC KDB correspondence, additional testing has been carried out to support the worst-case duty cycle.

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 Fundamental Field Strength

Test Summary:

Test Engineer:	Andrew Edwards	Test Date:	12 April 2018
Test Sample Serial Number:	00180322000325		

FCC Reference:	Part 15.231(a) & Part 15.231(b)
Test Method Used:	ANSI C63.10 Section 7.6.1 and Sections 6.3 & 6.5 (see note below)

Environmental Conditions:

Temperature (°C):	24
Relative Humidity (%):	34

Note(s):

- The EUT has a manually operated transmitter that ceases to transmit in less than 5 seconds as required by §15.231(a)(1). The EUT also automatically transmits a status message 500 ms in length every 85 minutes $\pm$ 1 minute. The total transmission is therefore less than two seconds per hour as required by §15.231(a)(3).
- To obtain the average limit at the fundamental frequency of 312 MHz (which is not in a restricted band), the $\mu\text{V/m}$ field strength values shown in §15.231(b) were linearly interpolated and then converted to $\text{dB}\mu\text{V/m}$. The limit at 260 MHz (f_{lower}) is 3,750 $\mu\text{V/m}$ and at 470 MHz (f_{upper}) it is 12,500 $\mu\text{V/m}$. The limit at 312 MHz was calculated following the procedure shown in ANSI C63.10 Section 7.6.2:

$$\text{Limit } [\mu\text{V/m}] = \text{Lim}_{\text{lower}} + \Delta F [(\text{Lim}_{\text{upper}} - \text{Lim}_{\text{lower}}) / (f_{\text{upper}} - f_{\text{lower}})]$$

$$\text{where } \Delta F = f_c - f_{\text{lower}} = 312 - 260 = 52$$

$$\text{Limit} = 3750 + 52 * [(12500 - 3750) / (470 - 260)]$$

$$= 3750 + 52 * [8750 / 210]$$

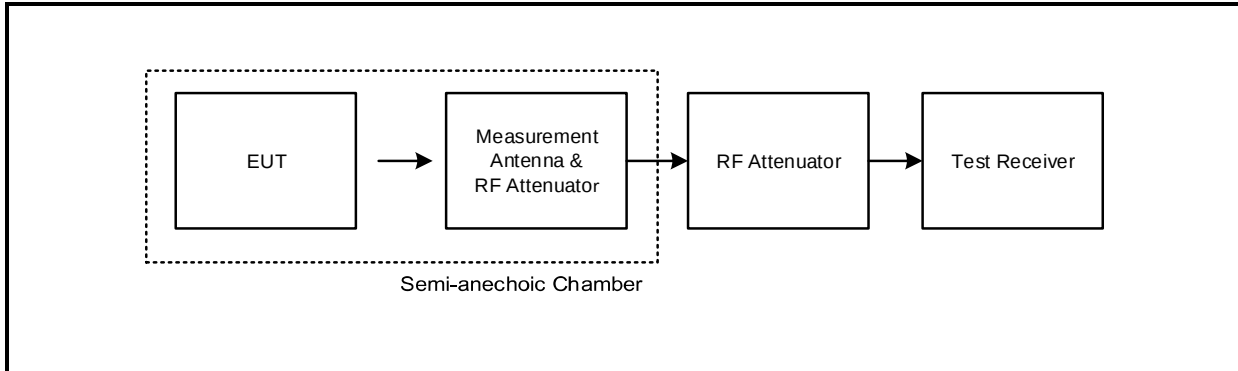
$$= 5916.7 \mu\text{V/m}$$

$$\text{dB}\mu\text{V/m} = 20 * \log (\mu\text{V/m})$$

$$= 20 * \log (5916.7 \mu\text{V})$$

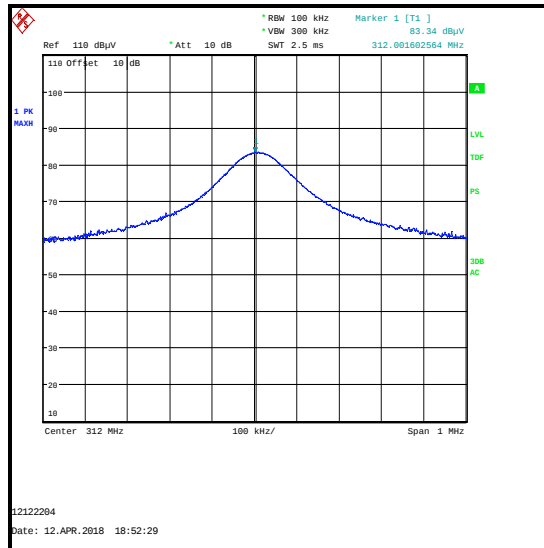
$$\text{Average Limit at 312 MHz} = 75.4 \text{ dB}\mu\text{V/m}$$

- The average level of the fundamental was determined by subtracting the duty cycle correction factor from the measured peak level.
- Radiated measurements were made with the test antenna in the horizontal and vertical planes and the EUT in the X, Y and Z planes. The highest level was recorded in the table below.

Transmitter Fundamental Field Strength (continued)**Test setup:**

Transmitter Fundamental Field Strength (continued)**Results:**

Frequency (MHz)	Peak Level (dB μ V/m)	Duty Cycle Correction (dB)	Average Level (dB μ V/m)	Average Limit (dB μ V/m)	Margin (dB)	Result
312.000	83.3	-8.0	75.3	75.4	0.1	Complied

**Test Equipment Used:**

Asset No.	Instrument	Manufacturer	Type No.	Serial No.	Date Calibration Due	Cal. Interval (Months)
M2003	Thermohygrometer	Testo	608-H1	45046641	27 Feb 2019	12
K0017	3m RSE Chamber	Rainford EMC	N/A	N/A	21 Feb 2019	12
M1630	Test Receiver	Rohde & Schwarz	ESU40	100233	03 Aug 2018	12
A2888	Antenna	Schwarzbeck	VULB 9163	9163-941	25 Apr 2018	12
A2147	Attenuator	AtlanTecRF	AN18-06	09020206-06	25 Apr 2018	12
A2916	Attenuator	AtlanTecRF	AN18W5-10	832827#1	21 Feb 2019	12

5.2.2. Transmitter 20 dB Bandwidth**Test Summary:**

Test Engineer:	Ian Watch	Test Date:	27 June 2018
Test Sample Serial Number:	00180322000325		

FCC Reference:	Part 15.231(c)
Test Method Used:	ANSI C63.10 Section 6.9.2

Environmental Conditions:

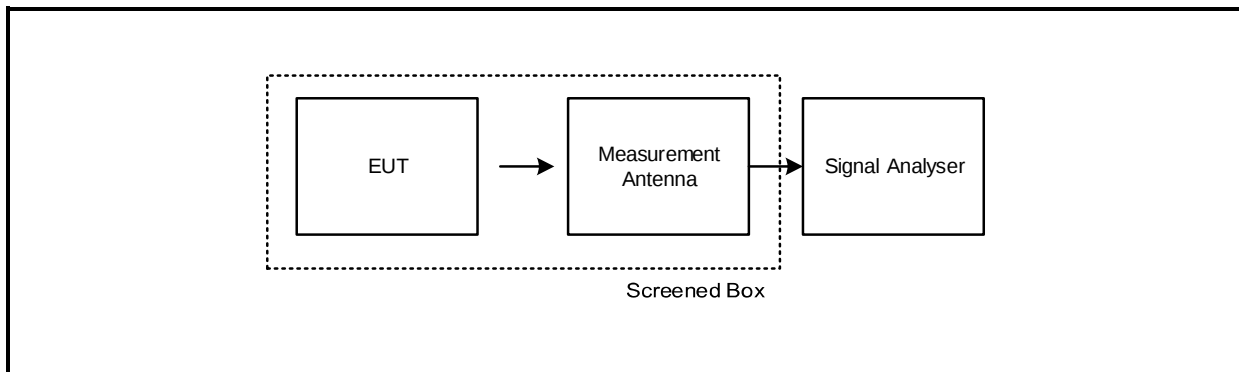
Temperature (°C):	21
Relative Humidity (%):	40

Note(s):

1. The 20 dB bandwidth of the emission shall be no wider than 0.25% of the centre frequency of the EUT.
2. The limit has been calculated as:

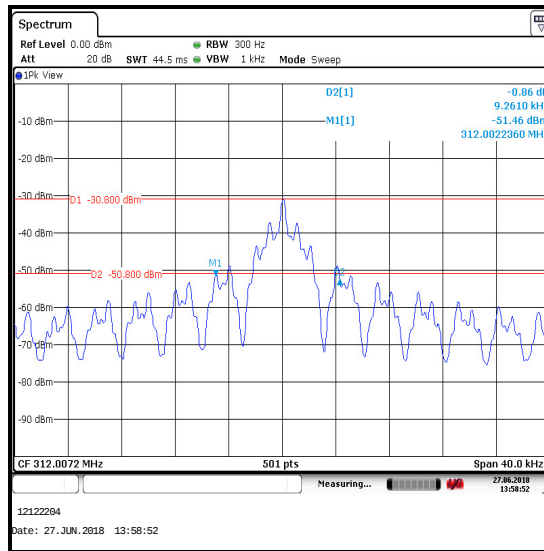
$$0.0025 * 312 \text{ MHz} = 0.78 \text{ MHz}$$

3. During measurements, the RBW was set to 300 Hz which is between 1 and 5% of the occupied bandwidth. The VBW was set to 1 kHz which is as close to 3 x RBW as the signal analyser allowed without being below 3 x RBW.

Test setup:

Transmitter 20 dB Bandwidth (continued)**Results:**

Transmitter 20 dB Bandwidth (kHz)	Limit (kHz)	Margin (kHz)	Result
9.261	780	770.379	Complied

**Test Equipment Used:**

Asset No.	Instrument	Manufacturer	Type No.	Serial No.	Date Calibration Due	Cal. Interval (Months)
M2038	Thermohygrometer	Testo	608-H1	45124919	27 Mar 2019	12
M2033	Signal Analyser	Rohde & Schwarz	FSV13	101667	31 May 2019	12

5.2.3. Periodic Operation**Test Summary:**

Test Engineer:	Ian Watch	Test Dates:	26 June 2018 & 27 June 2018
Test Sample Serial Number:	0018033000319		

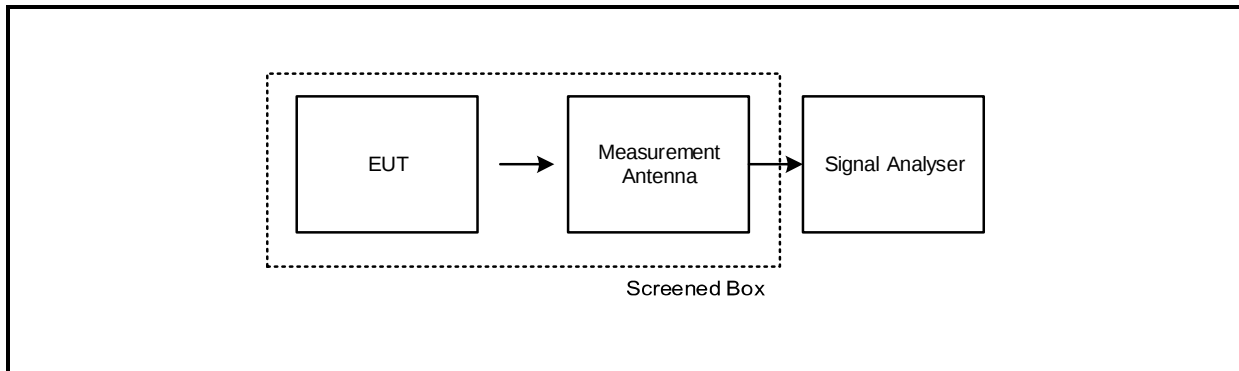
FCC Reference:	Part 15.231(a)
Test Method Used:	ANSI C63.10 Section 7.4

Environmental Conditions:

Temperature (°C):	23 to 24
Relative Humidity (%):	42 to 51

Note(s):

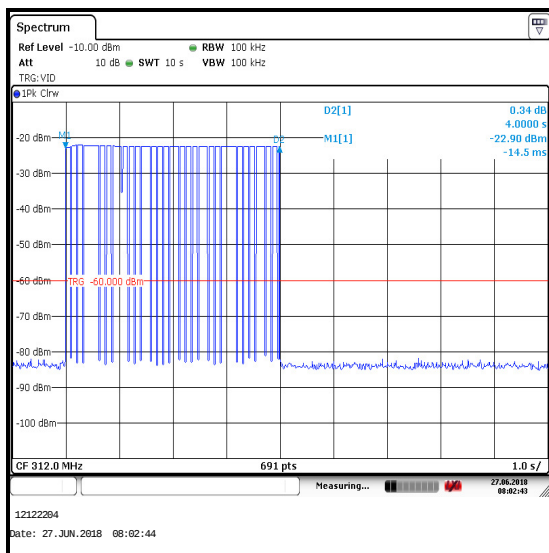
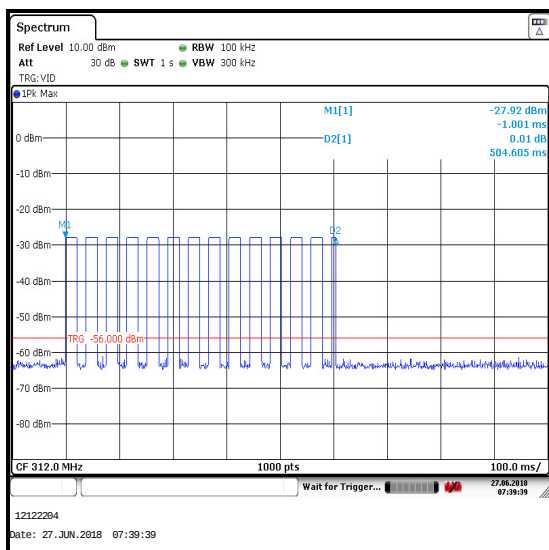
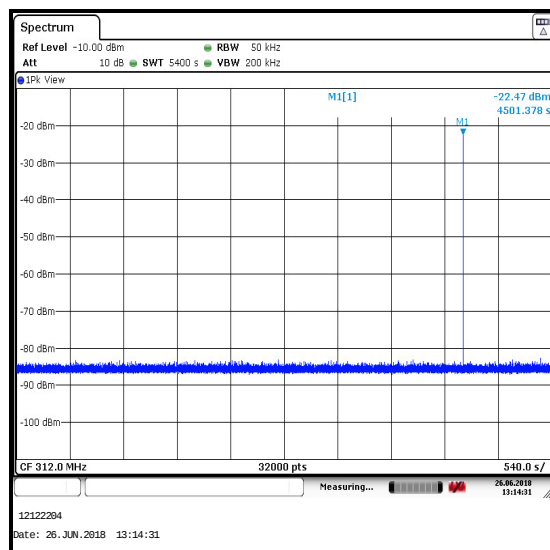
1. The customer declared an emergency transmission period of maximum 4 seconds duration when the user button is manually pressed and an automatic periodic status message transmission of 500 ms duration every 85 minutes.
2. Tests were performed to verify the declared transmission periods.
3. One periodic transmission of 0.505 seconds duration (assuming worst-case 100 % duty cycle) was observed within an 85 minute measurement period.

Test setup:

Periodic Operation (continued)**Results:**

Emergency Transmission Duration (seconds)	§15.231(a)(1) Limit (seconds)	Margin (seconds)	Result
4.000	<5.0	1.000	Complied

Periodic Status Transmission Duration (seconds)	§15.231(a)(3) Limit (seconds/hour)	Margin (seconds)	Result
0.505	<2.0	1.495	Complied

**Emergency transmission duration****Periodic Status transmission duration****Amount of Periodic Status transmissions within an 85 minute period**

Periodic Operation (continued)**Test Equipment Used:**

Asset No.	Instrument	Manufacturer	Type No.	Serial No.	Date Calibration Due	Cal. Interval (Months)
M2038	Thermohygrometer	Testo	608-H1	45124919	27 Mar 2019	12
M2033	Signal Analyser	Rohde & Schwarz	FSV13	101667	31 May 2019	12

5.2.4. Transmitter Duty Cycle**Test Summary:**

Test Engineer:	Ian Watch	Test Dates:	24 April 2018 to 19 June 2018
Test Sample Serial Number:	0018033000319		

FCC Reference:	Part 15.35(c)
Test Method Used:	ANSI C63.10 Sections 7.5 & 7.6

Environmental Conditions:

Temperature (°C):	23
Relative Humidity (%):	46

Note(s):

- The EUT uses Amplitude-shift keying (ASK) / On-Off Keying (OOK) during transmissions therefore the duty cycle depends on the binary data contained within an RF packet. The EUT supplied for testing transmits RF packets containing random data therefore the duty cycle varies between packets.
- Three RF packets are transmitted within a 100 ms period. Each RF packet contains 20 bits and each bit is sub-divided into three sub-bits. A logic '0' is a '011' sequence of sub-bits and a logical '1' is a '001' sequence of sub-bits. When a sub-bit is '1' the transmitter is on and when a sub-bit is '0' the transmitter is off. Therefore, the maximum transmitter on time within an RF packet (worst-case) is when a sync bit followed by 19 logical '0' bits and one identifier bit are sent. Tests were performed to confirm three RF packets are transmitted within 100 ms period during an emergency transmission initiated by a user button press. Tests were performed to measure the '0' and '1' bit transmission times. It was confirmed by measurement that '0' has an on time of 666 μ s and '1' has an on time of 333 μ s. As it was not possible to measure an RF packet containing all '0' bits preceded by a sync bit (333 μ s duration) and bit 10 set to logic '1' (333 μ s identifier), the worst case on time during a 20 ms RF packet was calculated as:

$$19 \text{ bits} * 666 \mu\text{s} + 1 * 333 \mu\text{s} (\text{sync bit}) + 1 * 333 \mu\text{s} (\text{identifier bit}) = 13.32 \text{ ms}$$

- The total transmitter maximum on time within 100 ms was:

$$13.32 \text{ ms} * 3 \text{ RF packets} = 39.96 \text{ ms}$$

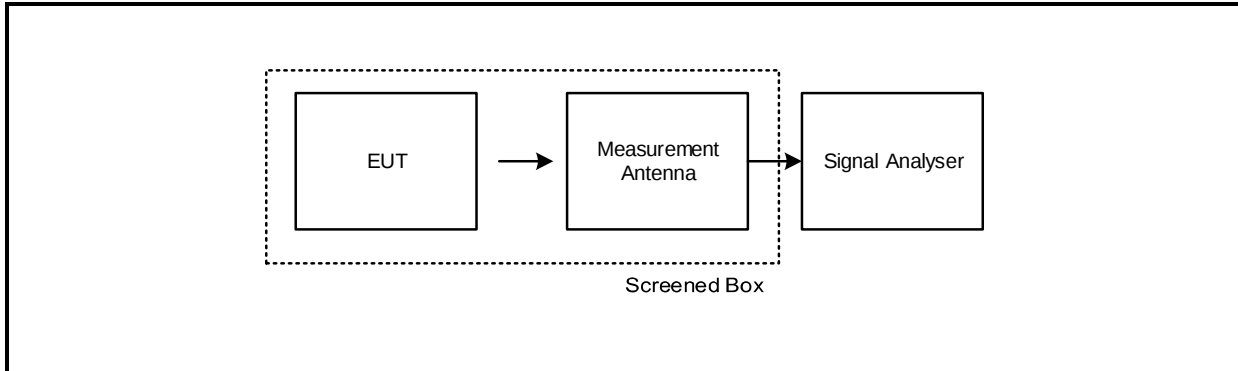
- The worst-case duty cycle was calculated as:

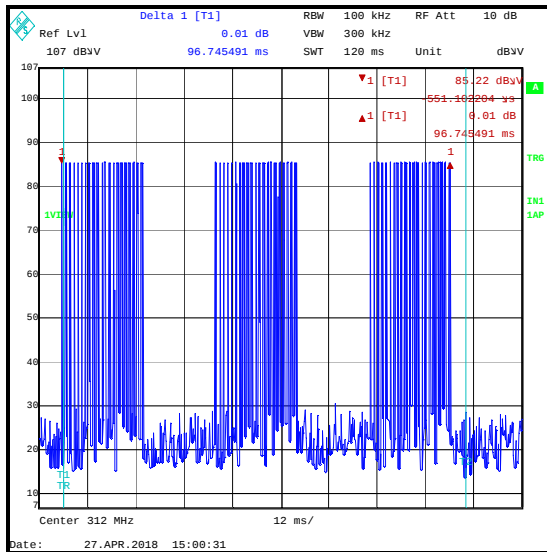
$$\text{Duty Cycle} = 20 \text{ Log } ((n1t1 + n2t2 + n3t3)/T)$$

$$\text{Duty Cycle} = 20 \text{ Log } ((39.96 / 100 \text{ ms}))$$

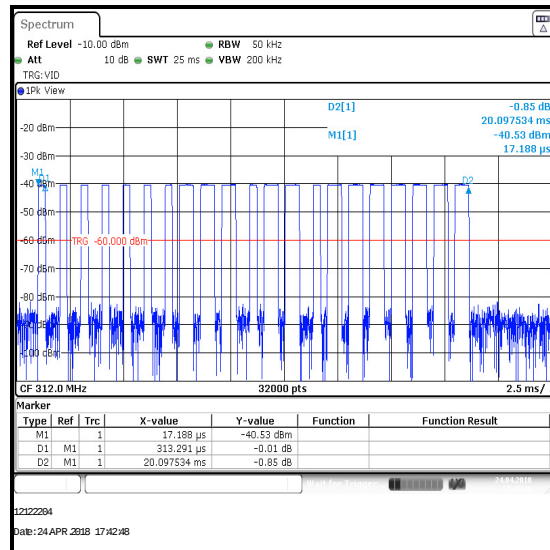
$$\text{Duty Cycle} = 20 \text{ Log } (0.3996)$$

$$\text{Duty Cycle} = -8.0 \text{ dB}$$

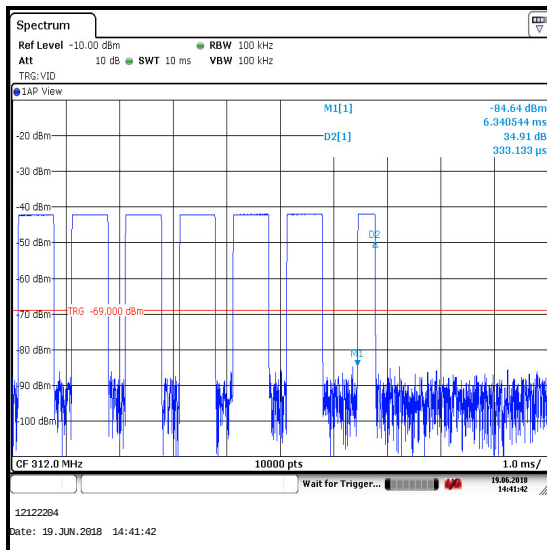
Transmitter Duty Cycle (continued)**Test setup:**

Transmitter Duty Cycle (continued)**Results:**

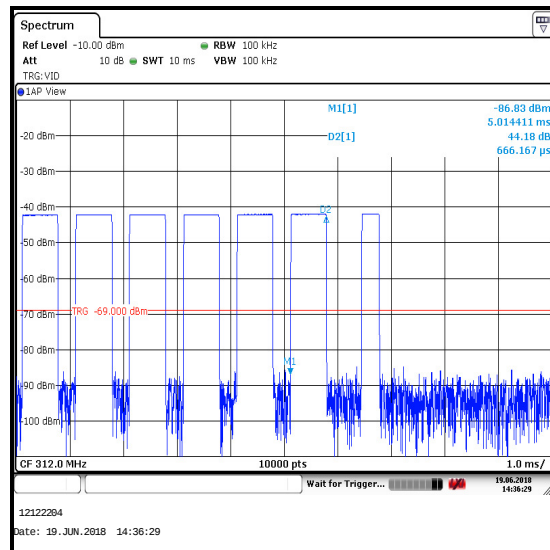
Three 20 ms RF packets transmitted during a 100 ms period



Typical RF packet containing random data (for information only)



Duration of logical 1 transmission during an RF packet (333 us)



Duration of logical 0 transmission during an RF packet (666 us)

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

Asset No.	Instrument	Manufacturer	Type No.	Serial No.	Date Calibration Due	Cal. Interval (Months)
M2003	Thermohygrometer	Testo	608-H1	45046641	27 Feb 2019	12
M2038	Thermohygrometer	Testo	608-H1	45124919	27 Mar 2019	12
K0017	3m RSE Chamber	Rainford EMC	N/A	N/A	21 Feb 2019	12
M1630	Test Receiver	Rohde & Schwarz	ESU40	100233	03 Aug 2018	12
A2888	Antenna	Schwarzbeck	VULB 9163	9163-941	25 Apr 2018	12
M2033	Signal Analyser	Rohde & Schwarz	FSV13	101667	31 May 2019	12
A2147	Attenuator	AtlanTecRF	AN18-06	09020206-06	25 Apr 2018	12
A2916	Attenuator	AtlanTecRF	AN18W5-10	832827#1	21 Feb 2019	12

NOTE: All test equipment was within the current calibration period on the date of testing

5.2.5. Transmitter Radiated Emissions**Test Summary:**

Test Engineer:	Andrew Edwards	Test Date:	12 April 2018
Test Sample Serial Number:	00180322000325		

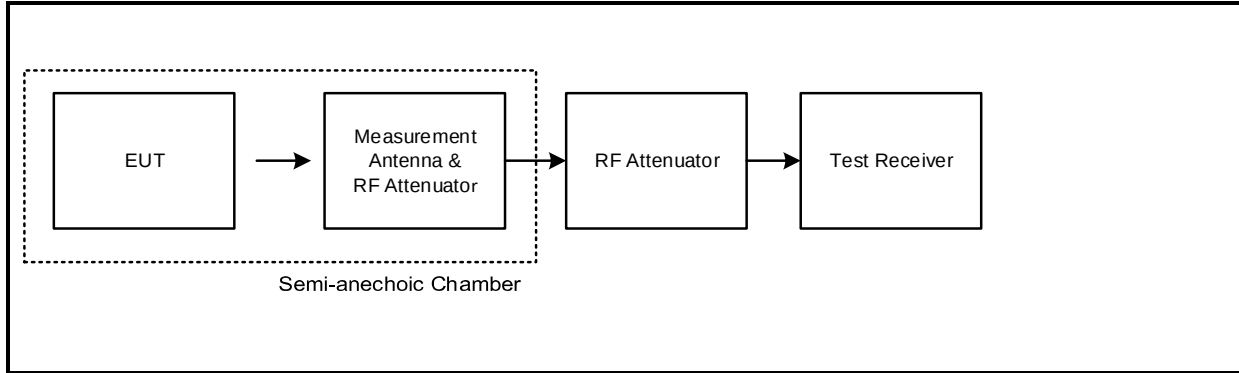
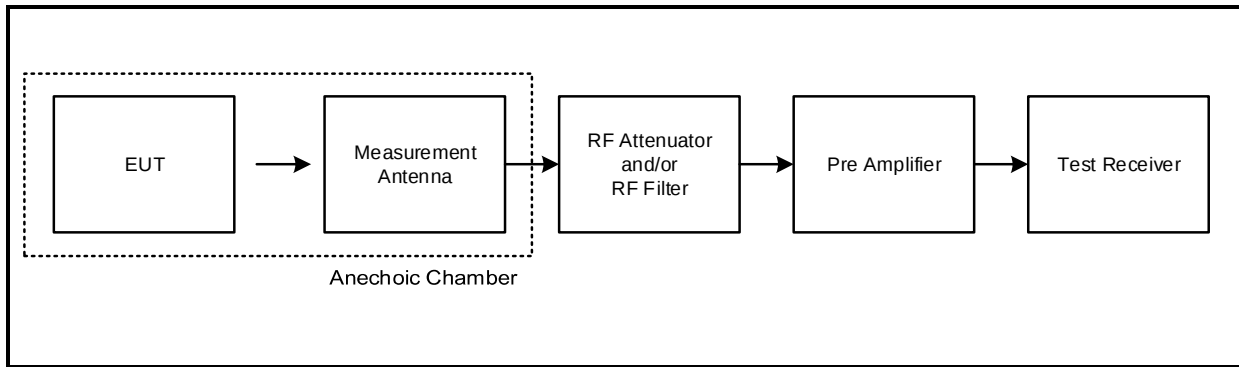
FCC Reference:	Parts 15.231(b) & 15.209
Test Method Used:	ANSI C63.10 Sections 6.3 and 6.5
Frequency Range	30 MHz to 1 GHz

Environmental Conditions:

Temperature (°C):	23
Relative Humidity (%):	45

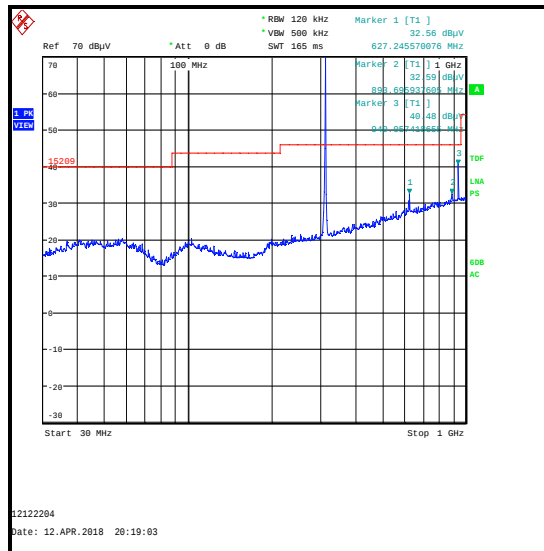
Note(s):

1. The final measured value, for the given emission, in the table below incorporates the calibrated antenna factor and cable loss.
2. FCC Part 15.209 general limits are shown on the pre-scan plot.
3. All other emissions were at least 20 dB below the appropriate limit or below the noise floor of the measurement system.
4. The emission shown on the 312 MHz is the EUT fundamental.
5. Measurements below 1 GHz were performed in a semi-anechoic chamber (Asset Number K0017) 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.
6. Pre-scans were performed and markers placed on the highest measured levels. The test receiver resolution bandwidth was set to 120 kHz and video bandwidth 500 kHz. A peak detector was used, sweep time was set to auto and trace mode was Max Hold.
7. 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:****Semi-anechoic chamber****Anechoic chamber**

Transmitter Radiated Emissions (continued)**Results: Quasi-Peak**

Frequency (MHz)	Antenna Polarity	Level (dB μ V/m)	Limit (dB μ V/m)	Margin (dB)	Result
624.024	Horizontal	35.0	54.0	19.0	Complied
936.020	Horizontal	41.2	54.0	12.8	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)
M2003	Thermohygrometer	Testo	608-H1	45046641	27 Feb 2019	12
K0017	3m RSE Chamber	Rainford EMC	N/A	N/A	21 Feb 2019	12
M1630	Test Receiver	Rohde & Schwarz	ESU40	100233	03 Aug 2018	12
A2888	Antenna	Schwarzbeck	VULB 9163	9163-941	25 Apr 2018	12
A2147	Attenuator	AtlanTecRF	AN18-06	09020206-06	25 Apr 2018	12

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

Test Engineer:	Andrew Edwards	Test Date:	13 April 2018
Test Sample Serial Number:	00180322000325		

FCC Reference:	Parts 15.231(b) & 15.209
Test Method Used:	ANSI C63.10 Sections 6.3 and 6.6
Frequency Range	1 GHz to 3.3 GHz

Environmental Conditions:

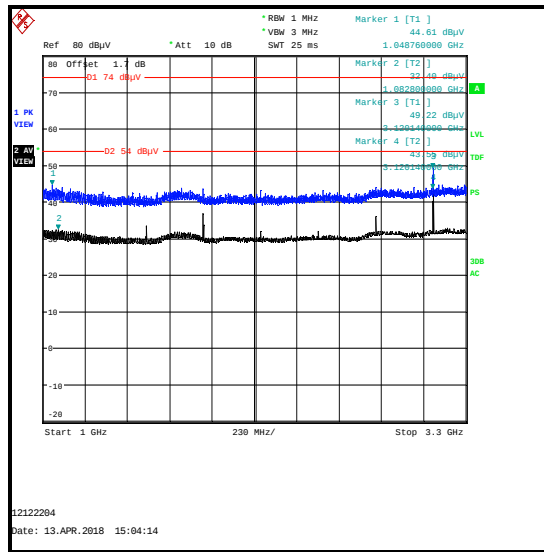
Temperature (°C):	23
Relative Humidity (%):	46

Note(s):

1. The final measured value, for the given emission, in the table below incorporates the calibrated antenna factor and cable loss.
2. FCC Part 15.209 general limits are shown on the pre-scan plot.
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. All final measurements above 1 GHz were tested 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.
5. 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.
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.

Results:

Frequency (MHz)	Antenna Polarity	Peak Level (dBµV/m)	Average Limit (dBµV/m)	Margin (dB)	Result
1872.050	Horizontal	44.9	54.0	9.1	Complied
2807.778	Vertical	45.8	54.0	8.2	Complied
3120.301	Vertical	49.8	54.0	4.2	Complied

Transmitter Radiated Spurious Emissions (continued)

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)
M2003	Thermohygrometer	Testo	608-H1	45046641	27 Feb 2019	12
K0017	3m RSE Chamber	Rainford EMC	N/A	N/A	21 Feb 2019	12
M1630	Test Receiver	Rohde & Schwarz	ESU40	100233	03 Aug 2018	12
A2683	Pre Amplifier	Agilent	8449B	3008A02100	19 Feb 2019	12
A2889	Antenna	Schwarzbeck	BBHA 9120 B	BBHA 9120 B 653	19 Feb 2019	12
A2908	High Pass Filter	Wainwright Instruments	WHJE5-920-1000-4000-60EE	3	22 Feb 2019	12

6. Measurement Uncertainty

No measurement or test can ever be perfect and the imperfections give rise to error of measurement in the results. Consequently the result of a measurement is only an approximation to the value of the measurand (the specific quantity subject to measurement) and is only complete when accompanied by a statement of the uncertainty of the approximation.

The expression of uncertainty of a measurement result allows realistic comparison of results with reference values and limits given in specifications and standards.

The uncertainty of the result may need to be taken into account when interpreting the measurement results.

The reported expanded uncertainties below are based on a standard uncertainty multiplied by an appropriate coverage factor such that a confidence level of approximately 95% is maintained. For the purposes of this document “approximately” is interpreted as meaning “effectively” or “for most practical purposes”.

Measurement Type	Range	Confidence Level (%)	Calculated Uncertainty
Fundamental Field Strength	312 MHz	95%	±4.65 dB
20 dB Bandwidth	312 MHz	95%	±4.59 dB
Duty Cycle / Periodic Operation	312 MHz	95%	±1.14 %
Radiated Spurious Emissions	30 MHz to 1 GHz	95%	±4.65 dB
Radiated Spurious Emissions	1 GHz to 3.3 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 & 4	-	Changed company name and address at the request of the customer
	12 & 13	-	Corrected 20 dB bandwidth limit and margin
3.0	17	-	At the request of the TCB, changed test method 'ANSI C63.10 Section 7.6' to 'ANSI C63.10 Sections 7.5 & 7.6'

--- END OF REPORT ---