



TEST REPORT

Test Report No. : UL-RPT-RP11167236JD01A

Manufacturer : MiX Telematics Europe Ltd
Model No. : 440FT0962 Type 9
FCC ID : 2AFMS-B59B
Technology : FHSS
Test Standard(s) : FCC Parts 15.209(a) & 15.247

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2. The results in this report apply only to the sample(s) tested.
3. The sample tested is in compliance with the above standard(s).
4. The test results in this report are traceable to the national or international standards.
5. Version 1.0.

Date of Issue: 12 April 2016

Checked by:

Sarah Williams
Engineer, Radio Laboratory

Company Signatory:

Steven White
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UL VS LTD



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

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1. Customer Information









Company Name:	MiX Telematics Europe Ltd
Address:	Unit 39-40 Cherry Orchard North Kembrey Park Swindon Wiltshire SN2 8UH United Kingdom

2. Summary of Testing

2.1. General Information

Specification Reference:	47CFR15.247
Specification Title:	Code of Federal Regulations Volume 47 (Telecommunications): Part 15 Subpart C (Intentional Radiators) - Section 15.247
Specification Reference:	47CFR15.209
Specification Title:	Code of Federal Regulations Volume 47 (Telecommunications): Part 15 Subpart C (Intentional Radiators) – Section 15.209
Site Registration:	FCC: 209735
Location of Testing:	UL VS LTD, Unit 3 Horizon, Wade Road, Kingsland Business Park, Basingstoke, Hampshire, RG24 8AH, United Kingdom
Test Dates:	22 March 2016 to 24 March 2016

2.2. Summary of Test Results

FCC Reference (47CFR)	Measurement	Result
Part 15.247(a)(1)(i)	Transmitter 20 dB Bandwidth	
Part 15.247(a)(1)	Transmitter Carrier Frequency Separation	
Part 15.247(a)(1)(i)	Transmitter Number of Hopping Frequencies and Average Time of Occupancy	
Part 15.35(c)	Transmitter Duty Cycle	Note 1
Part 15.247(b)(2)	Transmitter Maximum Peak Output Power	
Part 15.247(d) / 15.209(a)	Transmitter Radiated Emissions	
Part 15.247(d) / 15.209(a)	Transmitter Band Edge Radiated Emissions	
Key to Results		
 = Complied  = Did not comply		

Note(s):

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

2.3. Methods and Procedures

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

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:	Tabs Beacon Type 9
Model Name or Number:	440FT0962 Type 9
Test Sample Serial Number:	0962BA000105 (<i>Conducted RF sample</i>)
Hardware Version:	V1
Software Version:	V1.2E
FCC ID:	2AFMS-B59B

Brand Name:	Tabs Beacon Type 9
Model Name or Number:	440FT0962 Type 9
Test Sample Serial Number:	0962BA000101 (<i>Radiated RF sample</i>)
Hardware Version:	V1
Software Version:	V1.2E
FCC ID:	2AFMS-B59B

3.2. Description of EUT

The Equipment Under Test was an asset tracking device. It contains an FHSS radio transceiver and is powered from 2 x AA batteries. It has an internal helical PCB antenna soldered to the main PCB, it is not accessible by the end user.

3.3. Modifications Incorporated in the EUT

No modifications were applied to the EUT during testing.

3.4. Additional Information Related to Testing

Tested Technology:	Frequency hopping system operating in the ISM band with a 20 dB bandwidth of less than 250 kHz and hopping on at least 50 frequencies		
Power Supply Requirement:	Nominal	3.6 VDC	
Type of Unit:	Transceiver		
Channel Spacing:	400 kHz		
Modulation:	FSK		
Data Rate:	19.2 kbit/s		
Antenna Gain:	-5 dBi		
Maximum Conducted Output Power:	20.1 dBm		
Transmit Frequency Range:	902 MHz to 928 MHz		
Transmit Channels Tested:	Channel ID	Channel Number	Channel Frequency (MHz)
	Bottom	0	902.2
	Middle	32	915.0
	Top	63	927.4

3.5. Support Equipment

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

Description:	Pico Base Station Type 9
Brand Name:	MiX Telematics
Model Name or Number:	440FT0964
Hardware Version:	V3
Software Version:	V1-18
Serial Number:	0964TE000050

Description:	Laptop PC
Brand Name:	Dell
Model Name or Number:	LATITUDE E6540
Serial Number:	Not marked or stated

Description:	USB – Serial I/F cable. Length 2 metres
Brand Name:	MiX Telematics
Model Name or Number:	Not marked or stated
Serial Number:	Not marked or stated

4. Operation and Monitoring of the EUT during Testing

4.1. Operating Modes

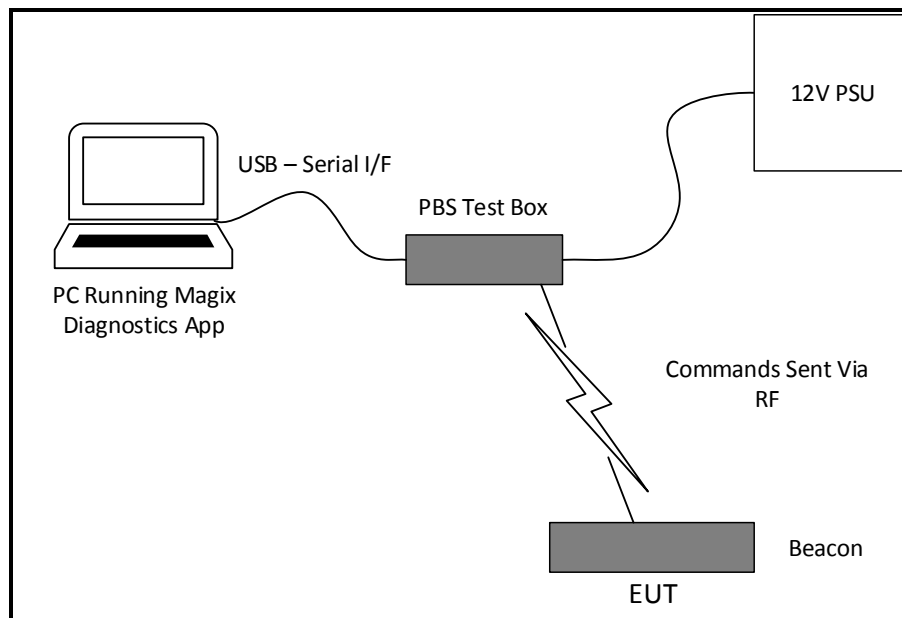
The EUT was tested in the following operating mode(s):

- Transmitting at full power with a modulated carrier.
- Transmitting on the bottom, middle or top channels as required or frequency hopping across the band of operation.

4.2. Configuration and Peripherals

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

- Fully charged AA batteries were fitted before testing commenced and the charge status was regularly checked during testing.
- The test set up requires a Pico Base Station test box (MiX Telematics supplied) connected via a serial interface to a laptop PC running “Magix_Diagnostics” application Version: V1.1.0 Date: August 2015 (MiX Telematics supplied). The application communicates with the PBS Test Box to send commands to the EUT via the RF link. The test application allows the test laboratory to put the EUT into different test modes required for carrying out FCC tests. The EUT was removed from the PBS Test Box once configured as required. A diagram of the test setup is shown below.



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 20 dB Bandwidth

Test Summary:

Test Engineer:	Ian Watch	Test Date:	22 March 2016
Test Sample Serial Number:	0962BA000105		

FCC Reference:	Part 15.247(a)(1)(i)
Test Method Used:	ANSI C63.10 Section 6.9.2

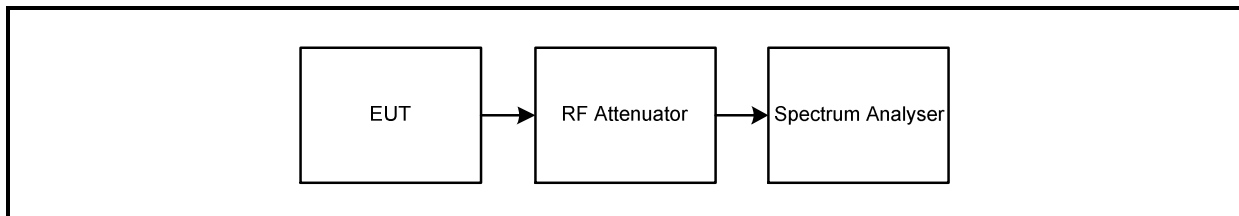
Environmental Conditions:

Temperature (°C):	25
Relative Humidity (%):	31

Note(s):

1. The spectrum analyser resolution bandwidth was set to 1 kHz and video bandwidth 3 kHz. A peak detector was used, sweep time was set to auto and the trace mode was Max Hold. The span was set to 200 kHz. Normal and delta markers were placed 20 dB down from the peak of the carrier. These results are documented in the table below.
2. The spectrum analyser was connected to the RF port on the EUT using a 30 dB attenuator.

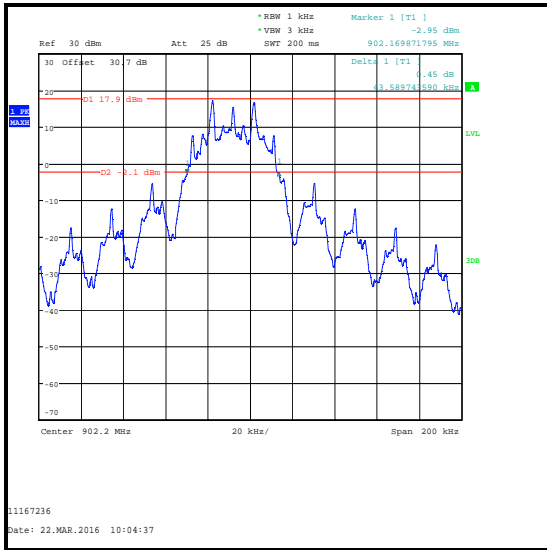
Test setup:



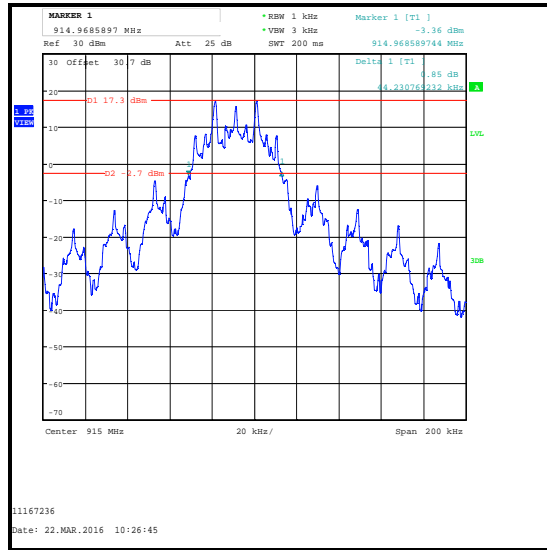
Transmitter 20 dB Bandwidth (continued)

Results:

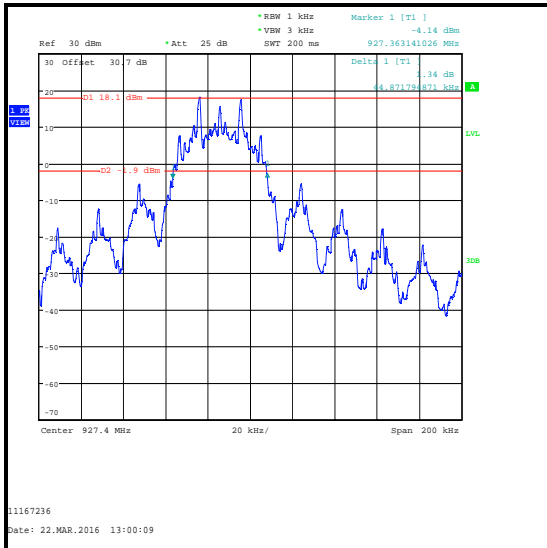
Channel	20 dB Bandwidth (kHz)	Limit (kHz)	Margin (kHz)	Result
Bottom	43.590	250	206.410	Complied
Middle	44.231	250	205.769	Complied
Top	44.872	250	205.128	Complied



Bottom Channel



Middle Channel



Top Channel

Transmitter 20 dB Bandwidth (continued)**Test Equipment Used:**

Asset No.	Instrument	Manufacturer	Type No.	Serial No.	Date Calibration Due	Cal. Interval (Months)
M1659	Thermohygrometer	JM Handelspunkt	30.5015.13	None stated	23 Apr 2016	12
M1794	Spectrum Analyser	Rohde & Schwarz	FSU	100027	09 Feb 2018	24
A2000	Attenuator	Huber & Suhner	6830.7.B	301623	17 Apr 2016	12

5.2.2. Transmitter Carrier Frequency Separation**Test Summary:**

Test Engineer:	Ian Watch	Test Date:	22 March 2016
Test Sample Serial Number:	0962BA000105		

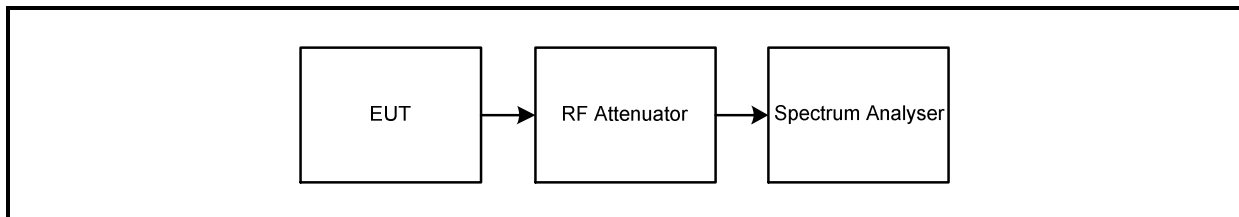
FCC Reference:	Part 15.247(a)(1)
Test Method Used:	ANSI C63.10 Section 7.8.2

Environmental Conditions:

Temperature (°C):	25
Relative Humidity (%):	31

Note(s):

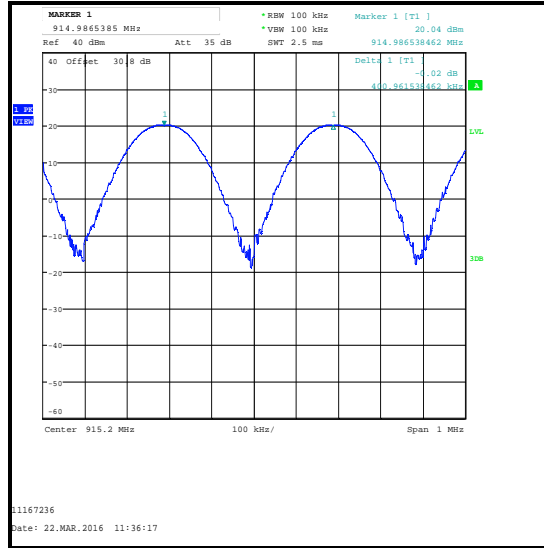
- *The limit is a minimum of 25 kHz or the 20 dB bandwidth of the hopping channel, whichever is greater.
- The 20 dB bandwidth measured for the middle channel was used as the limit as the measurement was performed around the centre of the operating band.
- The spectrum analyser resolution bandwidth was set to 100 kHz and video bandwidth of 100 kHz. A peak detector was used, sweep time was set to auto and trace mode was Max Hold. The span was set to 1 MHz. A marker was placed at the centre of one signal and then a delta marker was placed in the same place on the second signal, the results are recorded in the table below.
- The spectrum analyser was connected to the RF port on the EUT using a 30 dB attenuator.

Test setup:

Transmitter Carrier Frequency Separation (continued)

Results:

Carrier Frequency Separation (kHz)	Limit* (kHz)	Margin (kHz)	Result
400.962	44.200	356.762	Complied



Test Equipment Used:

Asset No.	Instrument	Manufacturer	Type No.	Serial No.	Date Calibration Due	Cal. Interval (Months)
M1659	Thermohygrometer	JM Handelspunkt	30.5015.13	None stated	23 Apr 2016	12
M1794	Spectrum Analyser	Rohde & Schwarz	FSU	100027	09 Feb 2018	24
A2000	Attenuator	Huber & Suhner	6830.7.B	301623	17 Apr 2016	12

5.2.3. Transmitter Number of Hopping Frequencies and Average Time of Occupancy**Test Summary:**

Test Engineer:	Ian Watch	Test Date:	22 March 2016
Test Sample Serial Number:	0962BA000105		

Test Summary:

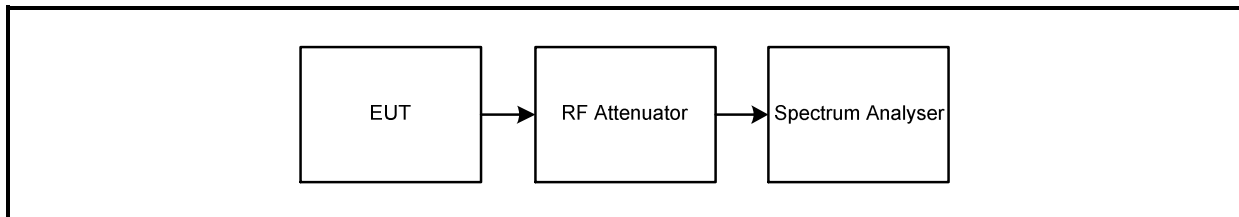
FCC Reference:	Part 15.247(a)(1)(i)
Test Method Used:	ANSI C63.10 Sections 7.8.3 and 7.8.4

Environmental Conditions:

Temperature (°C):	25
Relative Humidity (%):	31

Note(s):

1. Number of hopping frequencies test: The spectrum analyser was connected to the RF port on the EUT using a 30 dB attenuator. The spectrum analyser RBW was set to 50 kHz which is approximately the 20 dB bandwidth and the VBW was set to 50 kHz. The EUT was configured to transmit in hopping mode and the trace was left to sweep until transmissions on all channels were observed.
2. For a hopping channel 20 dB bandwidth of less than 250 kHz.
3. In a 20 second period.

Test setup:**Results: Number of Hopping Frequencies:**

Number of Hops	Limit (Hops)	Note	Result
64	≥50	2	Complied

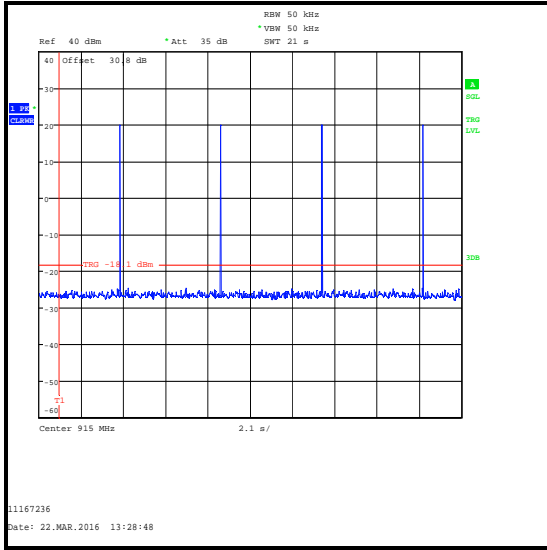
Results: Average Time of Occupancy

Emission Width (ms)	Average Time of Occupancy (s)	Limit (s)	Margin (s)	Note	Result
11.9	0.048	0.4	0.352	3	Complied

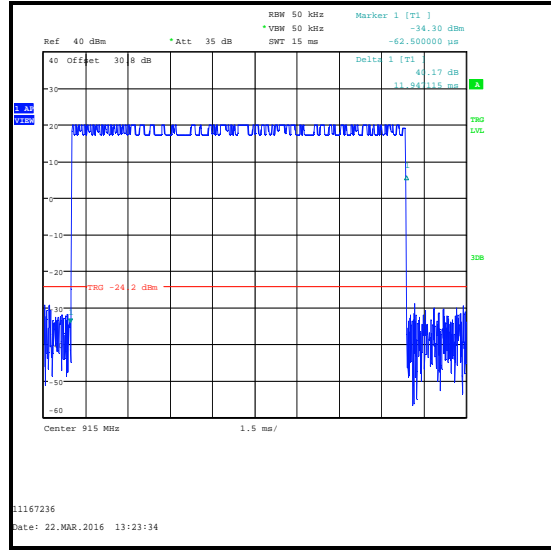
Limit:

If the 20 dB bandwidth of the hopping channel is less than 250 kHz, the system shall use at least 50 hopping frequencies and the average time of occupancy on any frequency shall not be greater than 0.4 seconds within a 20 second period.

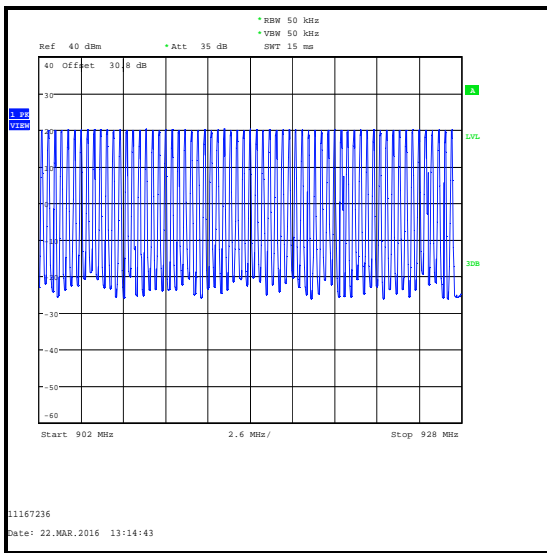
Transmitter Number of Hopping Frequencies and Average Time of Occupancy (continued)



TX on time in a 20 second period



TX on period



Number Of Hopping Channels

Test Equipment Used:

Asset No.	Instrument	Manufacturer	Type No.	Serial No.	Date Calibration Due	Cal. Interval (Months)
M1659	Thermohygrometer	JM Handelpunkt	30.5015.13	None stated	23 Apr 2016	12
M1794	Spectrum Analyser	Rohde & Schwarz	FSU	100027	09 Feb 2018	24
A2000	Attenuator	Huber & Suhner	6830.7.B	301623	17 Apr 2016	12

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

Test Engineer:	Ian Watch	Test Date:	22 March 2016
Test Sample Serial Number:	0962BA000105		

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

Environmental Conditions:

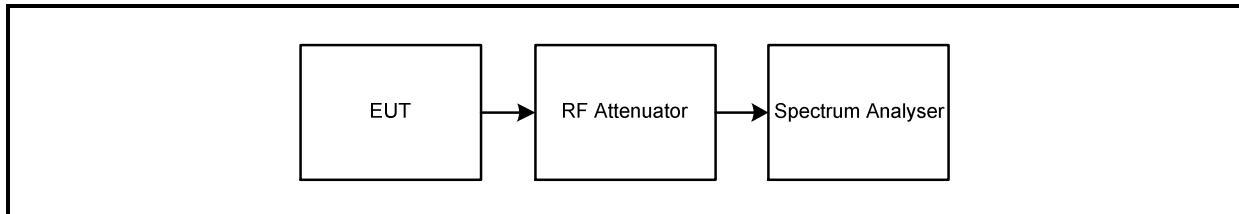
Temperature (°C):	26
Relative Humidity (%):	30

Note(s):

1. The EUT was configured to transmit with the worst case duty cycle, i.e. the longest transmitter on period within a periodic pulse train. The transmit burst in this mode is always approximately 12 ms duration and the period (T) is always approximately 78 ms duration.
2. In order to calculate the average level of spurious emissions field strength, measurements were made of duty cycle to determine the transmission duration and the silent period time of the transmitter. The transmitter duty cycle was measured using a spectrum analyser in the time domain and calculated as shown below:

$$20 \log (\text{On Time} / [\text{Period or } 100 \text{ ms whichever is the lesser}]).$$

$$20 \log (11.9/78.6) = -16.4 \text{ dB}$$

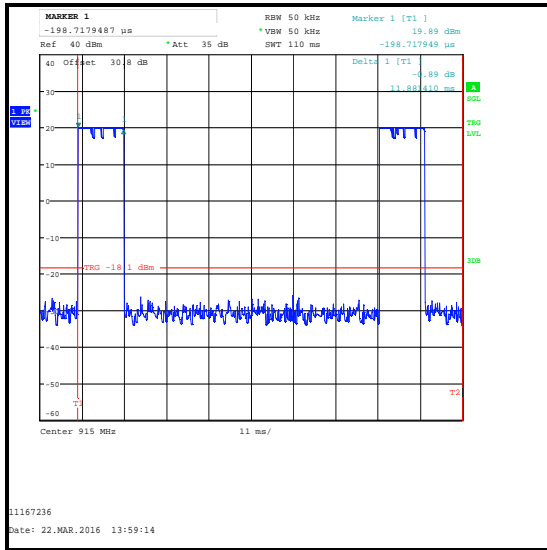
Test setup:

Transmitter Duty Cycle (continued)

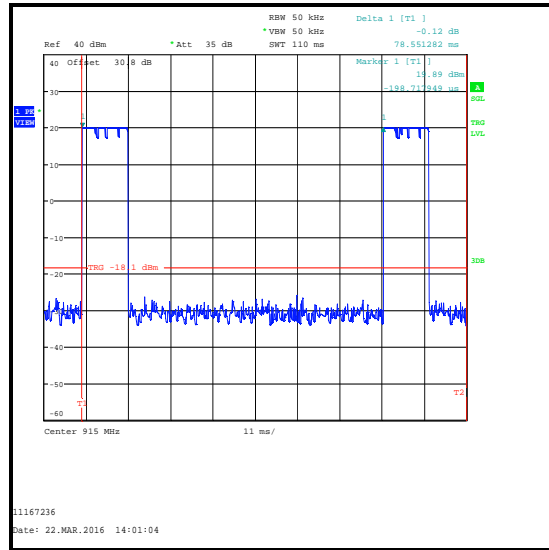
Results:

Pulse Duration (ms)	Duty Cycle (dB)
11.9	-16.4

Period (ms)
78.6



TX on time



TX on + off time

Test Equipment Used:

Asset No.	Instrument	Manufacturer	Type No.	Serial No.	Date Calibration Due	Cal. Interval (Months)
M1659	Thermohygrometer	JM Handelpunkt	30.5015.13	None stated	23 Apr 2016	12
M1794	Spectrum Analyser	Rohde & Schwarz	FSU	100027	09 Feb 2018	24
A2000	Attenuator	Huber & Suhner	6830.7.B	301623	17 Apr 2016	12

5.2.5. Transmitter Maximum Peak Output Power**Test Summary:**

Test Engineer:	Ian Watch	Test Date:	22 March 2016
Test Sample Serial Number:	0962BA000105		

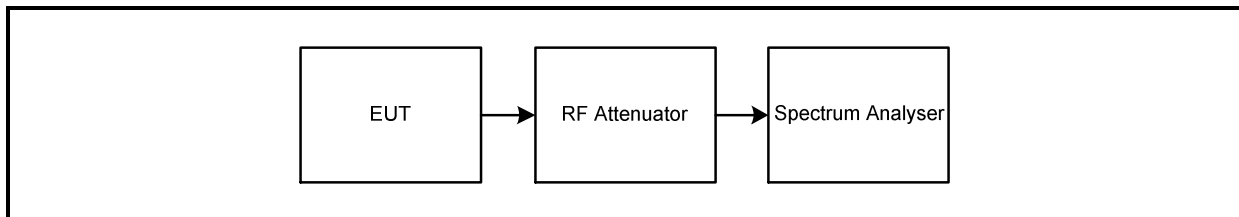
FCC Reference:	Part 15.247(b)(2)
Test Method Used:	ANSI C63.10 Section 7.8.5

Environmental Conditions:

Temperature (°C):	25
Relative Humidity (%):	31

Note(s):

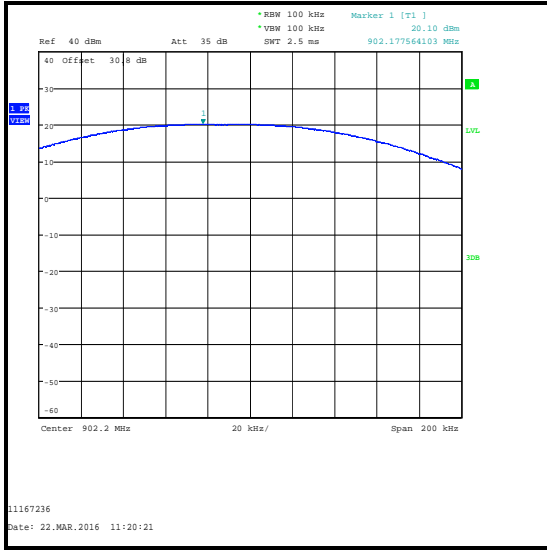
1. For frequency hopping systems employing at least 50 hopping channels.
2. The customer declared the insertion loss of the temporary RF cable and connector as 0.1 dB. This value has been included in the RF level offset in addition to the loss of the 30 dB attenuator. An RF level offset of 30.8 dB was used.
3. The customer stated a maximum antenna gain of -5.0 dBi.
4. The test receiver resolution bandwidth was set to 100 kHz and video bandwidth to 100 kHz. A peak detector was used, sweep time was set to auto and trace mode was Max Hold. The span was set to 200 kHz. A marker was placed at the peak of the signal and the results recorded in the table below.

Test setup:**Results:**

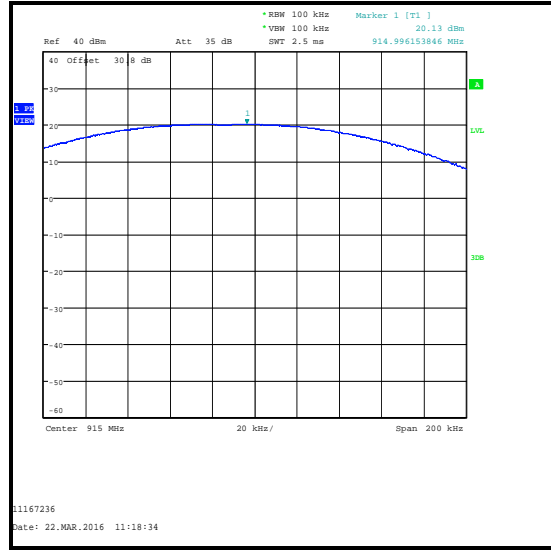
Channel	Conducted Peak Power (dBm)	Conducted Peak Power Limit (dBm)	Margin (dB)	Note	Result
Bottom	20.1	30.0	9.9	1	Complied
Middle	20.1	30.0	9.9	1	Complied
Top	20.0	30.0	10.0	1	Complied

Channel	Conducted Peak Power (dBm)	Declared Antenna Gain (dBi)	EIRP (dBm)	De Facto EIRP Limit (dBm)	Margin (dB)	Note	Result
Bottom	20.1	-5.0	15.1	36.0	20.9	1	Complied
Middle	20.1	-5.0	15.1	36.0	20.9	1	Complied
Top	20.0	-5.0	15.0	36.0	21.0	1	Complied

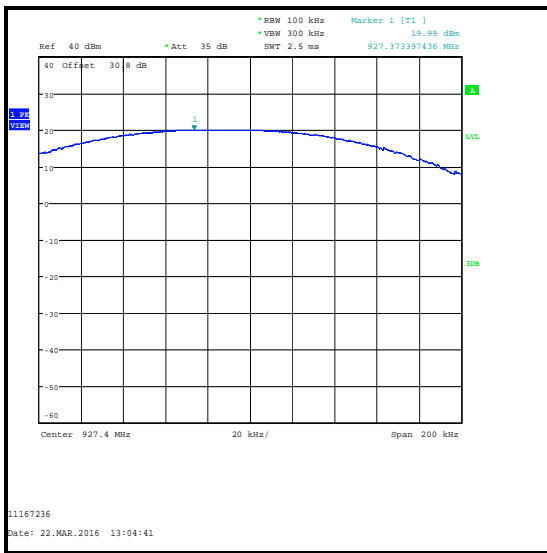
Transmitter Maximum Peak Output Power (continued)



Bottom Channel



Middle Channel



Top Channel

Test Equipment Used:

Asset No.	Instrument	Manufacturer	Type No.	Serial No.	Date Calibration Due	Cal. Interval (Months)
M1659	Thermohygrometer	JM Handelspunkt	30.5015.13	None stated	23 Apr 2016	12
M1794	Spectrum Analyser	Rohde & Schwarz	FSU	100027	09 Feb 2018	24
A2000	Attenuator	Huber & Suhner	6830.7.B	301623	17 Apr 2016	12

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

Test Engineer:	David Doyle	Test Date:	24 March 2016
Test Sample Serial Number:	0962BA000101		

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:

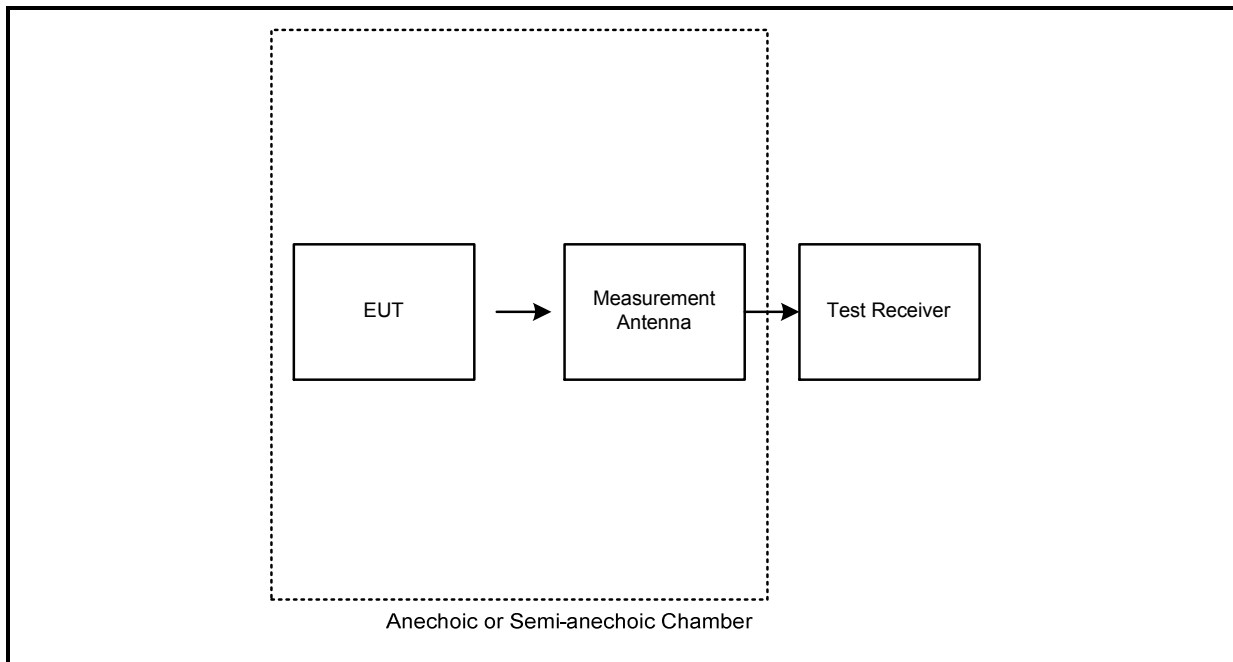
Temperature (°C):	21
Relative Humidity (%):	31

Note(s):

1. The emission at approximately 915 MHz shown on the 30 MHz to 1 GHz plot is the EUT fundamental.
2. The final measured value, for the given emission, in the table below incorporates the calibrated antenna factor and cable loss.
3. All 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. Therefore the highest peak noise floor reading of the measuring receiver was recorded in the table below.
4. Measurements below 1 GHz were performed in a semi-anechoic chamber (Asset Number K0001) at a distance of 3 metres. The EUT was placed at a height of 80 cm above the reference ground plane in the centre of the chamber turntable. Maximum emission levels were determined by height searching the measurement antenna over the range 1 metre to 4 metres.
5. Pre-scans were performed and markers placed on the highest measured levels. The test receiver resolution bandwidth was set to 100 kHz and video bandwidth 300 kHz. The sweep time was set to auto. 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 big enough to see the whole emission.

Transmitter Radiated Emissions (continued)

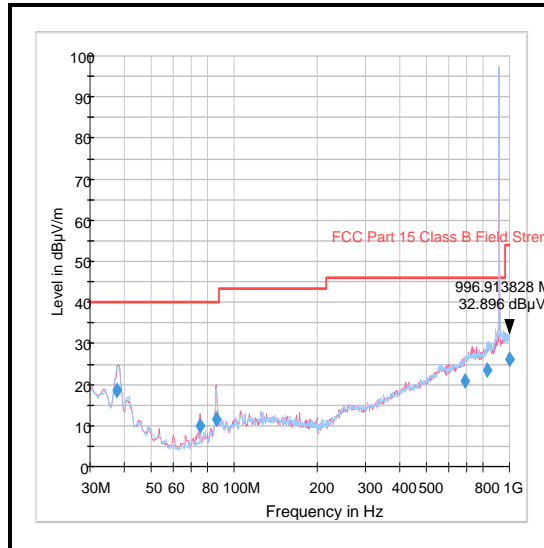
Test setup for radiated measurements:



Transmitter Radiated Emissions (continued)

Results: Peak

Frequency (MHz)	Antenna Polarity	Level (dB μ V/m)	Limit (dB μ V/m)	Margin (dB)	Result
996.913	Horizontal	32.9	54.0	21.1	Complied



Test Equipment Used:

Asset No.	Instrument	Manufacturer	Type No.	Serial No.	Date Calibration Due	Cal. Interval (Months)
M1945	Thermohygrometer	JM Handelspunkt	30.5015.01	None stated	23 Apr 2016	12
K0001	5m RSE Chamber	Rainford EMC	N/A	N/A	12 Jan 2017	12
A259	Antenna	Chase	CBL6111	1513	09 Apr 2016	12
M1124	Test Receiver	Rohde & Schwarz	ESIB 26	100046	18 Nov 2016	12
G0543	Amplifier	Sonoma	310N	230801	29 May 2016	3
A1834	Attenuator	Hewlett Packard	8491B	10444	30 Mar 2017	12

Transmitter Radiated Emissions**Test Summary:**

Test Engineer:	David Doyle	Test Date:	24 March 2016
Test Sample Serial Number:	0962BA000101		

FCC Reference:	Parts 15.247(d) & 15.209(a)
Test Method Used:	ANSI C63.10 Sections 6.3 and 6.6
Frequency Range	1 GHz to 9.3 GHz

Environmental Conditions:

Temperature (°C):	22
Relative Humidity (%):	32

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 plots were investigated and found to be ambient or >20 dB below the applicable limit or below the measurement system noise floor.
3. 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.
4. As the EUT operates below 10 GHz Transmitter Radiated Spurious Emissions pre-scans were performed up to the 10th harmonic frequency (9.3 GHz).
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. Peak and average measurements were performed with their own appropriate detectors during the pre-scan measurements.
6. *Duty cycle correction can be applied to a peak measurement in order to calculate the average emission level. Duty cycle was calculated as 16.4 dB (see section 5.2.4). Therefore 16.4 dB has been subtracted from the measured peak levels in order to obtain the average emission levels stated in the result tables below.

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
3608.814	Horizontal	61.8	74.0	12.2	Complied
5413.176	Horizontal	55.2	74.0	18.8	Complied

Results: Average / Bottom Channel

Frequency (MHz)	Antenna Polarity	Peak Level (dB μ V/m)	Duty cycle correction (dB)	Corrected Average Level (dB μ V/m)	Limit (dB μ V/m)	Margin (dB)	Result
3608.814	Horizontal	61.8	16.4	45.4*	54.0	8.6	Complied
5413.176	Horizontal	55.2	16.4	38.8*	54.0	15.2	Complied

Results: Peak / Middle Channel

Frequency (MHz)	Antenna Polarity	Level (dB μ V/m)	Limit (dB μ V/m)	Margin (dB)	Result
3660.080	Horizontal	62.3	74.0	11.7	Complied
4574.888	Horizontal	56.4	74.0	17.6	Complied

Results: Average / Middle Channel

Frequency (MHz)	Antenna Polarity	Peak Level (dB μ V/m)	Duty cycle correction (dB)	Corrected Average Level (dB μ V/m)	Limit (dB μ V/m)	Margin (dB)	Result
3660.080	Horizontal	62.3	16.4	45.9*	54.0	8.1	Complied
4574.888	Horizontal	56.4	16.4	40.0*	54.0	14.0	Complied

Results: Peak / Top Channel

Frequency (MHz)	Antenna Polarity	Level (dB μ V/m)	Limit (dB μ V/m)	Margin (dB)	Result
3709.463	Horizontal	61.9	74.0	12.1	Complied
4636.944	Horizontal	57.9	74.0	16.1	Complied

Results: Average / Top Channel

Frequency (MHz)	Antenna Polarity	Peak Level (dB μ V/m)	Duty cycle correction (dB)	Corrected Average Level (dB μ V/m)	Limit (dB μ V/m)	Margin (dB)	Result
3709.463	Horizontal	61.9	16.4	45.5*	54.0	8.5	Complied
4636.944	Horizontal	57.9	16.4	41.5*	54.0	12.5	Complied

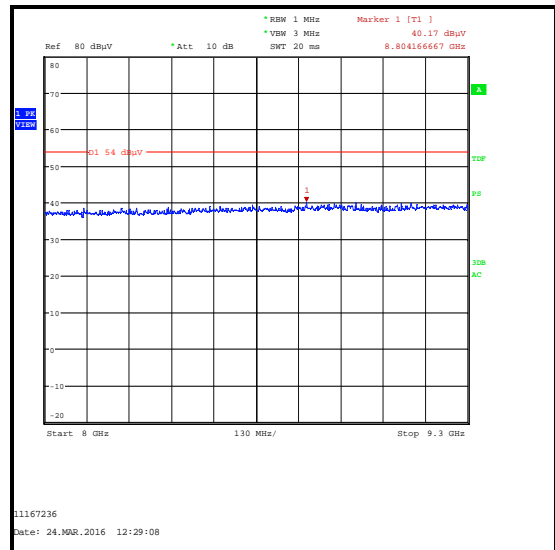
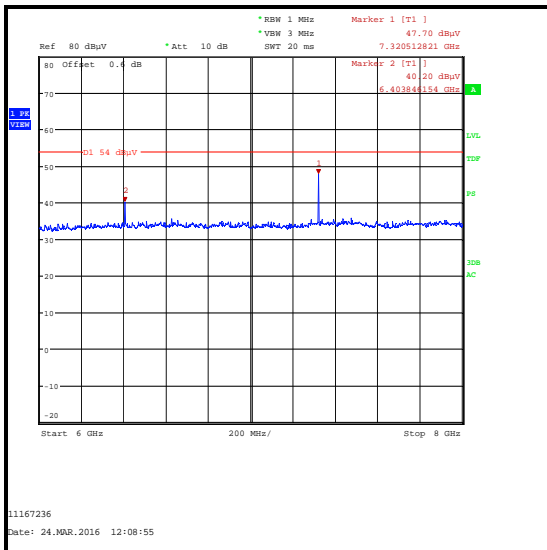
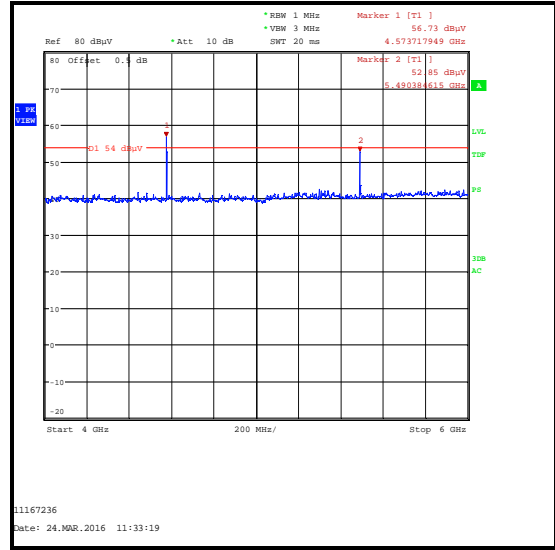
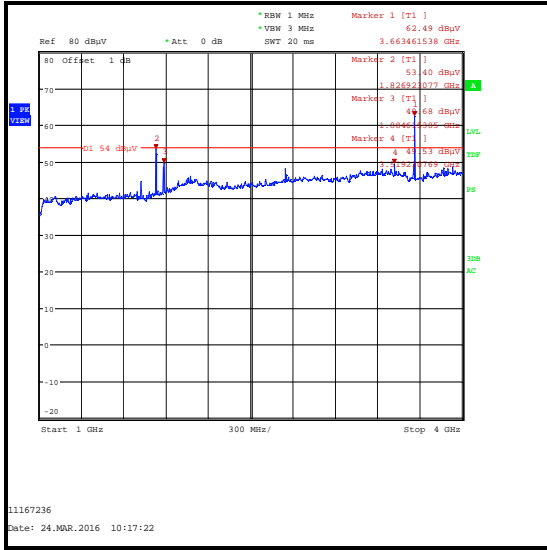
Transmitter Radiated Emissions (continued)**Results: Peak / Hopping Mode**

Frequency (MHz)	Antenna Polarity	Level (dB μ V/m)	Limit (dB μ V/m)	Margin (dB)	Result
3680.850	Horizontal	63.3	74.0	10.7	Complied
4632.933	Horizontal	57.7	74.0	16.3	Complied
5425.158	Horizontal	54.6	74.0	19.4	Complied

Results: Average / Hopping Mode

Frequency (MHz)	Antenna Polarity	Peak Level (dB μ V/m)	Duty cycle correction (dB)	Corrected Average Level (dB μ V/m)	Limit (dB μ V/m)	Margin (dB)	Result
3680.850	Horizontal	63.3	16.4	46.9*	54.0	7.1	Complied
4632.933	Horizontal	57.7	16.4	41.3*	54.0	12.7	Complied
5425.158	Horizontal	54.6	16.4	38.2*	54.0	15.8	Complied

Transmitter Radiated Emissions (continued)



Note: These 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 Handelspunkt	30.5015.13	Not stated	23 Apr 2016	12
K0002	3m RSE Chamber	Rainford EMC	N/A	N/A	21 Dec 2016	12
M1874	Test Receiver	Rohde & Schwarz	ESU26	100553	12 Jun 2016	12
A1534	Pre Amplifier	Hewlett Packard	8449B	3008A00405	19 Dec 2016	12
A1818	Antenna	EMCO	3115	75692	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
A148	High pass Filter	Filtronic	5H036	32218	17 Apr 2017	24
A1975	High Pass Filter	AtlanTecRF	AFH-03000	90424010	17 Apr 2016	12

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

Test Engineer:	David Doyle	Test Date:	24 March 2016
Test Sample Serial Number:	0962BA000101		

FCC Reference:	Parts 15.247(d) & 15.209(a)
Test Method Used:	ANSI C63.10 Section 6.10

Environmental Conditions:

Temperature (°C):	22
Relative Humidity (%):	32

Note(s):

1. The final measured value, for the given emission, in the table below incorporates the calibrated antenna factor and cable loss.
2. As both band edges fall within the non-restricted band, only peak measurements are required. 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. A marker was placed on the band edge spot frequencies and a second marker placed on the highest emission level in the adjacent band (where a higher level emission was present). Marker frequencies and levels were recorded.

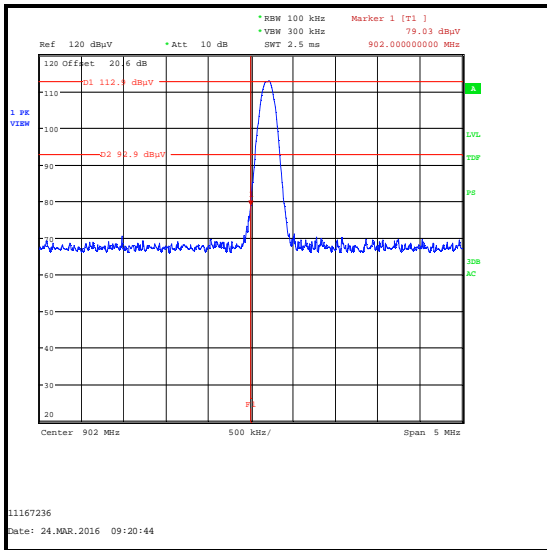
Results: Static Mode

Frequency (MHz)	Peak Level (dB μ V/m)	-20 dBc Limit (dB μ V/m)	Margin (dB)	Result
902	79.0	92.9	13.9	Complied
928	68.5	90.6	22.1	Complied
929.058	70.5	90.6	20.1	Complied

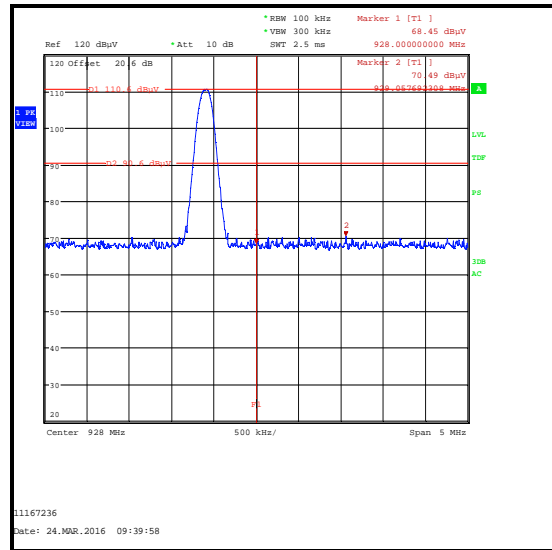
Results: Hopping Mode

Frequency (MHz)	Peak Level (dB μ V/m)	-20 dBc Limit (dB μ V/m)	Margin (dB)	Result
901.992	77.6	93.1	15.5	Complied
902	77.5	93.1	15.6	Complied
928	68.0	90.6	22.6	Complied
928.657	70.3	90.6	20.3	Complied

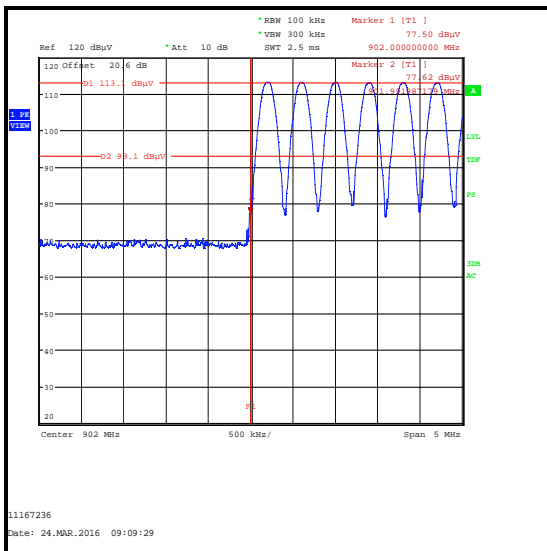
Transmitter Band Edge Radiated Emissions (continued)



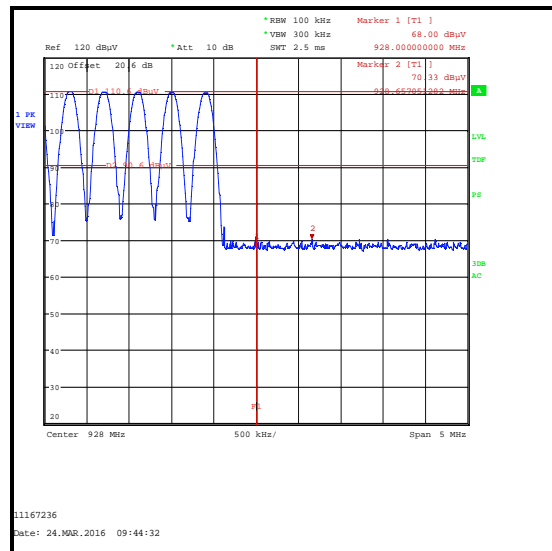
Lower Band Edge / Static Mode



Upper Band Edge / Static Mode



Lower Band Edge / Hopping Mode



Upper Band Edge / Hopping Mode

Test Equipment Used:

Asset No.	Instrument	Manufacturer	Type No.	Serial No.	Date Calibration Due	Cal. Interval (Months)
M1656	Thermohygrometer	JM Handelpunkt	30.5015.13	Not stated	23 Apr 2016	12
K0002	3m RSE Chamber	Rainford EMC	N/A	N/A	21 Dec 2016	12
M1874	Test Receiver	Rohde & Schwarz	ESU26	100553	12 Jun 2016	12
A259	Antenna	Chase	CBL6111	1513	09 Apr 2016	12
A1393	Attenuator	Huber & Suhner	6820.17.B	757456	05 May 2016	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
Conducted Maximum Peak Output Power	902 MHz to 928 MHz	95%	±1.13 dB
Carrier Frequency Separation	902 MHz to 928 MHz	95%	±3.92 %
Average Time of Occupancy	902 MHz to 928 MHz	95%	±3.53 ns
Duty Cycle	902 MHz to 928 MHz	95%	±1.14 %
20 dB Bandwidth	902 MHz to 928 MHz	95%	±3.92 %
Radiated Spurious Emissions	30 MHz to 1 GHz	95%	±5.65 dB
Radiated Spurious Emissions	1 GHz to 9.3 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

--- END OF REPORT ---