



TEST REPORT

Test Report No. : UL-RPT-RP10295211JD01 V5.0

Manufacturer : CA Traffic Ltd
Model No. : 030057
FCC ID : 2AB86-030057
IC Certification No. : 11965A-030057
Test Standard(s) : FCC Parts 15.207 & 15.209;
Industry Canada RSS-Gen 6.6, 6.12, 6.13, 8.8 & 8.9

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 5.0 supersedes all previous versions.

Date of Issue: 04 December 2014

Checked by:

Ian Watch
Senior Engineer, Radio Laboratory

Issued by :

pp

John Newell
Quality Manager,
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

Pavilion A, Ashwood Park, Ashwood Way, Basingstoke, Hampshire, RG23 8BG, UK
Telephone: +44 (0)1256 312000
Facsimile: +44 (0)1256 312001

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1. Customer Information







Company Name:	CA Traffic Ltd
Address:	Griffin Lane Aylesbury HP19 8BP United Kingdom

2. Summary of Testing

2.1. General Information

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
Specification Reference:	RSS-Gen Issue 4, November 13, 2014
Specification Title:	General Requirements for Compliance of Radio Apparatus
Site Registration:	FCC: 209735; Industry Canada: 3245B-2
Location of Testing:	UL VS LTD, Unit 3 Horizon, Wade Road, Kingsland Business Park, Basingstoke, Hampshire, RG24 8AH, United Kingdom
Test Dates:	21 May 2014 to 04 December 2014

2.2. Summary of Test Results

FCC Reference (47CFR)	IC Reference	Measurement	Result
Part 15.207	RSS-Gen 8.8	Transmitter AC Conducted Emissions	
Part 15.209	RSS-Gen 6.12 & 8.9	Transmitter Fundamental Field Strength	
Part 15.209	RSS-Gen 6.13 & 8.9	Transmitter Radiated Emissions	
N/A	RSS-Gen 6.6	Transmitter 99% Occupied Bandwidth	
Key to Results  = Complied  = Did not comply			

2.3. Methods and Procedures

Reference:	ANSI C63.4-2009
Title:	American National Standard for Methods of Measurement of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the Range of 9 kHz to 40 GHz
Reference:	ANSI C63.10-2013
Title:	American National Standard of Procedures for Compliance Testing of Unlicensed Wireless Devices
Reference:	FCC KDB Publication Number 937606 Date: 10/10/2014
Title:	Test Site Requirements for Part 15 and 18 Devices Operating Below 30 MHz

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:	Black Cat
Model Name or Number:	030057
Test Sample Serial Number:	2014040001
Hardware Version Number:	01
Software Version Number:	2.1.4
FCC ID:	2AB86-030057
Industry Canada Certification Number:	11965A-030057

3.2. Description of EUT

The Equipment Under Test was a loop detector module containing a 50 kHz to 90 kHz transmitter. It is part of a 19" rack mounted traffic classifier unit (host unit with model number 080010). The device employs a 2 x 2 metre external loop antenna which would be embedded in a highway surface to detect and monitor traffic.

3.3. Modifications Incorporated in the EUT

No modifications were applied to the EUT during testing.

3.4. Additional Information Related to Testing

Type of Radio Device:	Transmitter	
Power Supply Requirement(s):	120 VAC 60 Hz	
Transmit Frequency Range:	50 kHz to 90 kHz	
Transmit Channels Tested:	Channel ID	Channel Frequency (kHz)
	Single channel	76.270

3.5. Support Equipment

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

Description:	Vehicle Traffic Simulator
Brand Name:	CA Traffic
Model Name or Number:	Not marked or stated

Description:	Laptop PC
Brand Name:	Dell
Model Name or Number:	Vostro 1500

Description:	Laptop PC
Brand Name:	Dell
Model Name or Number:	Latitude D690

Description:	USB to RS232 Converter
Brand Name:	Not marked or stated
Model Name or 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):

- Continuously transmitting a modulated carrier at full power.

4.2. Configuration and Peripherals

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

- The EUT was inserted into a 19" rack mounted host unit which was powered from a 120 VAC 60 Hz single phase supply. The EUT is powered from the host unit.
- The EUT/host unit was connected to a traffic simulator rack unit (support equipment) through communication cables which populated 1 port. Additional cables were added to similar ports on the EUT and were seen to have little effect on any emissions. The EUT was therefore tested with one set of communication cables. This enabled simulation of road traffic and made the EUT transmit through the 2 x 2 metre test loop antenna.
- The EUT/host unit and traffic simulator were connected to a test PC through RJ45 & RS232 cables. A test application was used on the PC to make the EUT transmit as required. The customer supplied a test mode procedure 'Operating Instructions_Black CAT - Arizona Test document Issue 0_2'. This procedure was followed to place the EUT into test mode.
- For AC conducted tests, the EUT/host unit and test laptops were placed on a non-conductive table 0.8 m from the ground while the EUT test loop antenna, simulator and all communication cables were placed on the chamber floor.
- During radiated tests in a semi-anechoic chamber, the EUT/host unit and the EUT test loop antenna were placed on a non-conductive table, 0.8 metres above the test chamber floor. The test PC, which also exercised some ports of the EUT, was placed 10 cm away from the EUT in the emissions chamber, while the simulator was placed on the ground plane inside the chamber. Any other support equipment used to terminate the EUT cables was placed on the test chamber floor.
- Refer to Appendix 1 of this test report for details of radiated tests on an open field test site.

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:	Sandeep Bharat	Test Date:	21 May 2014
Test Sample Serial Number:	2014040001		

FCC Reference:	Part 15.207
Industry Canada Reference:	RSS-Gen 8.8
Test Method Used:	As detailed in ANSI C63.10 Section 6.2 referencing ANSI C63.4

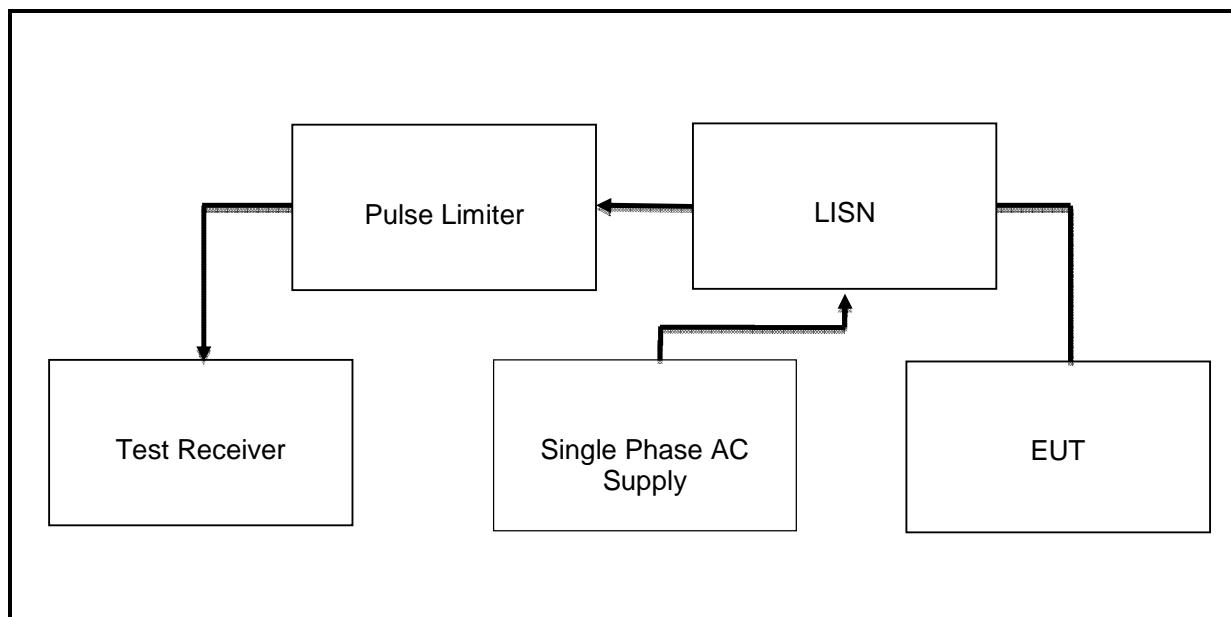
Environmental Conditions:

Temperature (°C):	23
Relative Humidity (%):	38

Note(s):

1. The EUT was connected to 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 on the following pages.

Test setup for AC conducted spurious emissions measurements:



Transmitter AC Conducted Spurious Emissions (continued)**Results: Live / Quasi Peak**

Frequency (MHz)	Line	Level (dBμV)	Limit (dBμV)	Margin (dB)	Result
16.935	Live	26.3	60.0	33.7	Complied
22.745	Live	26.1	60.0	33.9	Complied
23.829	Live	32.0	60.0	28.0	Complied
23.915	Live	32.0	60.0	28.0	Complied
24.009	Live	47.2	60.0	12.8	Complied
29.063	Live	32.4	60.0	27.6	Complied

Results: Live / Average

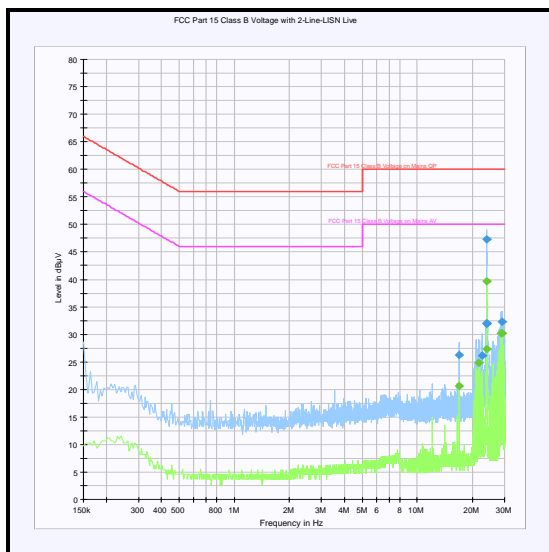
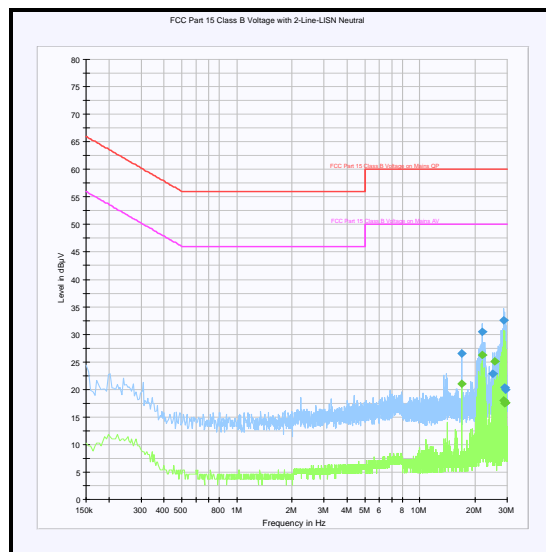
Frequency (MHz)	Line	Level (dBμV)	Limit (dBμV)	Margin (dB)	Result
16.935	Live	20.6	50.0	29.4	Complied
21.741	Live	24.8	50.0	25.2	Complied
23.960	Live	27.3	50.0	22.7	Complied
24.009	Live	39.6	50.0	10.4	Complied
28.563	Live	30.2	50.0	19.8	Complied
29.067	Live	30.3	50.0	19.7	Complied

Transmitter AC Conducted Spurious Emissions (continued)**Results: Neutral / Quasi Peak**

Frequency (MHz)	Line	Level (dBμV)	Limit (dBμV)	Margin (dB)	Result
16.935	Neutral	26.6	60.0	33.4	Complied
21.980	Neutral	30.5	60.0	29.5	Complied
25.013	Neutral	22.9	60.0	37.1	Complied
28.806	Neutral	32.6	60.0	27.4	Complied
29.054	Neutral	20.3	60.0	39.7	Complied
29.301	Neutral	20.0	60.0	40.0	Complied

Results: Neutral / Average

Frequency (MHz)	Line	Level (dBμV)	Limit (dBμV)	Margin (dB)	Result
16.935	Neutral	21.1	50.0	28.9	Complied
21.978	Neutral	26.2	50.0	23.8	Complied
25.517	Neutral	25.1	50.0	24.9	Complied
28.802	Neutral	18.0	50.0	32.0	Complied
29.054	Neutral	17.4	50.0	32.6	Complied
29.306	Neutral	17.6	50.0	32.4	Complied

Transmitter AC Conducted Spurious Emissions (continued)**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)
M1625	Thermohygrometer	JM Handelspunkt	30.5015.06	None stated	31 Dec 2014	12
A004	LISN	Rohde & Schwarz	ESH3-Z5	890604/027	18 Nov 2014	12
A1830	Pulse Limiter	Rohde & Schwarz	ESH3-Z2	100668	27 Feb 2015	12
M1263	Test Receiver	Rohde & Schwarz	ESIB7	100265	14 Oct 2014	12

5.2.2. Transmitter Fundamental Field Strength**Test Summary:**

Test Engineer:	Georgios Vrezas	Test Date:	14 November 2014
Test Sample Serial Number:	2014040001		

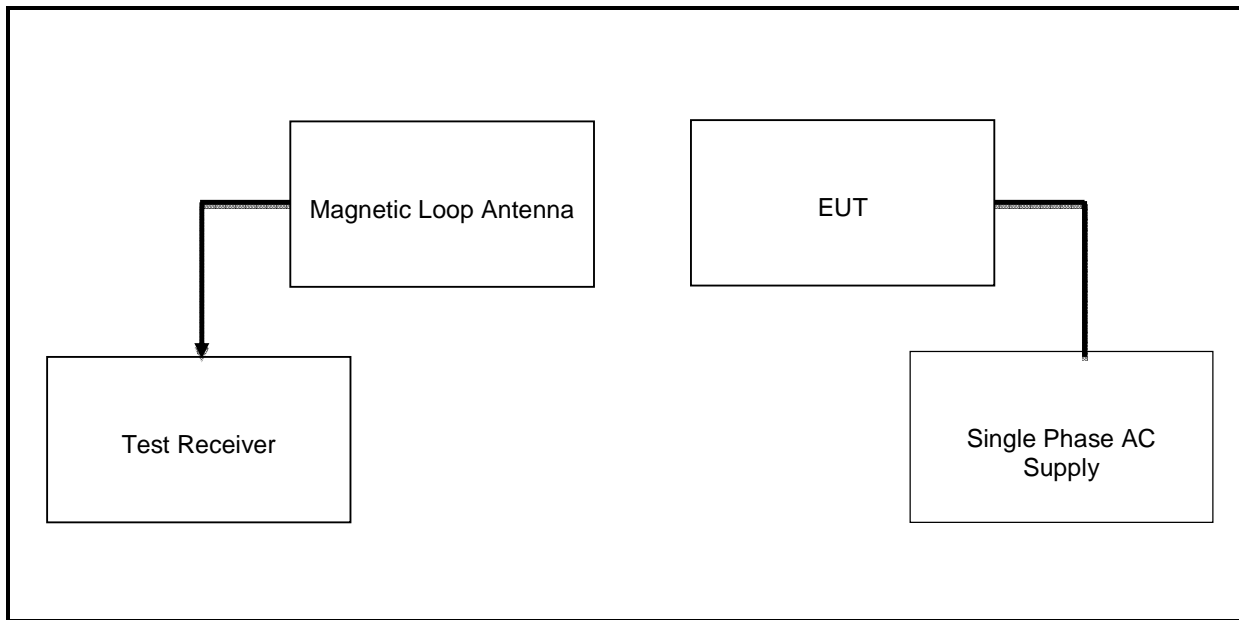
FCC Reference:	Part 15.209(d)
Industry Canada Reference:	RSS-Gen 6.12 & 8.9
Test Method Used:	ANSI C63.4 Section 6.4, FCC KDB 937606, Notes below and Appendix 1

Environmental Conditions:

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

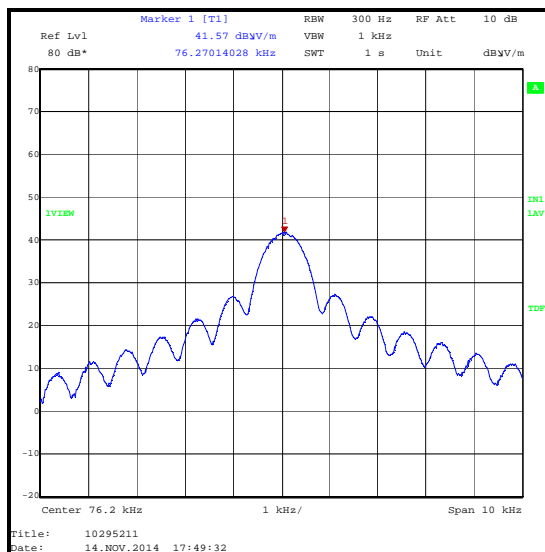
Note(s):

1. The limit is specified at a test distance of 300 metres. However, as specified by FCC Part 15.31(f)(2) and Industry Canada RSS-Gen 6.4, measurements may be performed at a closer distance and the measured level corrected to the specified measurement distance by using the square of an inverse linear distance extrapolation factor (40 dB/decade).
2. A transducer factor on the measuring instrument was used to extrapolate the semi-anechoic chamber results at 3 metres to a distance of 30 metres. A maximum level of 41.6 dBµV/m (at 3 metres extrapolated to 30 metres) was obtained as shown in the result plot below. An additional 40 dB was subtracted to obtain the level at 300 metres. Therefore $41.6 - 40.0 = 1.6$ dBµV/m.
3. Final measurements were performed with an average detector as stated in FCC Part 15.209(d) and Industry Canada RSS-Gen 8.9 Table 5.
4. In accordance with FCC KDB 937606, a *bona fide* attempt was made to perform measurements at the distances specified in Part 15.209(a). It was not possible to determine the emission value at the test distances specified below 30 MHz on an open field test site, therefore in accordance with 47 CFR 15.31(f), measurements were made at closer distances. Attempts were made to measure the fundamental at 3, 30 and 300 metres on an open field test site on 05 November and 06 November 2014. Unfortunately the emission could not be seen above the ambient emissions or the noise floor of the measurement system. Therefore the results from the semi-anechoic chamber tests on 14 November 2014 are shown in this section of the test report. Background scans of the open field test site are shown in Appendix 1 of this test report.

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

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

Frequency (kHz)	Measurement Antenna Position	Level at 300 m (dB μ V/m)	Limit at 300 m (dB μ V/m)	Margin (dB)	Result
76.270	Tip 90° to EUT	1.6	30.1	28.5	Complied

**Test Equipment Used:**

Asset No.	Instrument	Manufacturer	Type No.	Serial No.	Date Calibration Due	Cal. Interval (Months)
M1622	Thermohygrometer	JM Handelspunkt	30.5015.06	None stated	31 Dec 2014	12
K0001	5m RSE Chamber	Rainford EMC	N/A	N/A	26 Nov 2014	12
M1273	Test Receiver	Rohde & Schwarz	ESIB 26	100275	15 Feb 2015	12
M1568	Magnetic Loop Antenna	Rohde & Schwarz	HFH2-Z2	879284/2	26 Feb 2015	12

5.2.3. Transmitter Radiated Spurious Emissions**Test Summary:**

Test Engineers:	Sandeep Bharat & Georgios Vrezas	Test Dates:	27 June 2014, 05 November 2014 & 06 November 2014
Test Sample Serial Number:	2014040001		

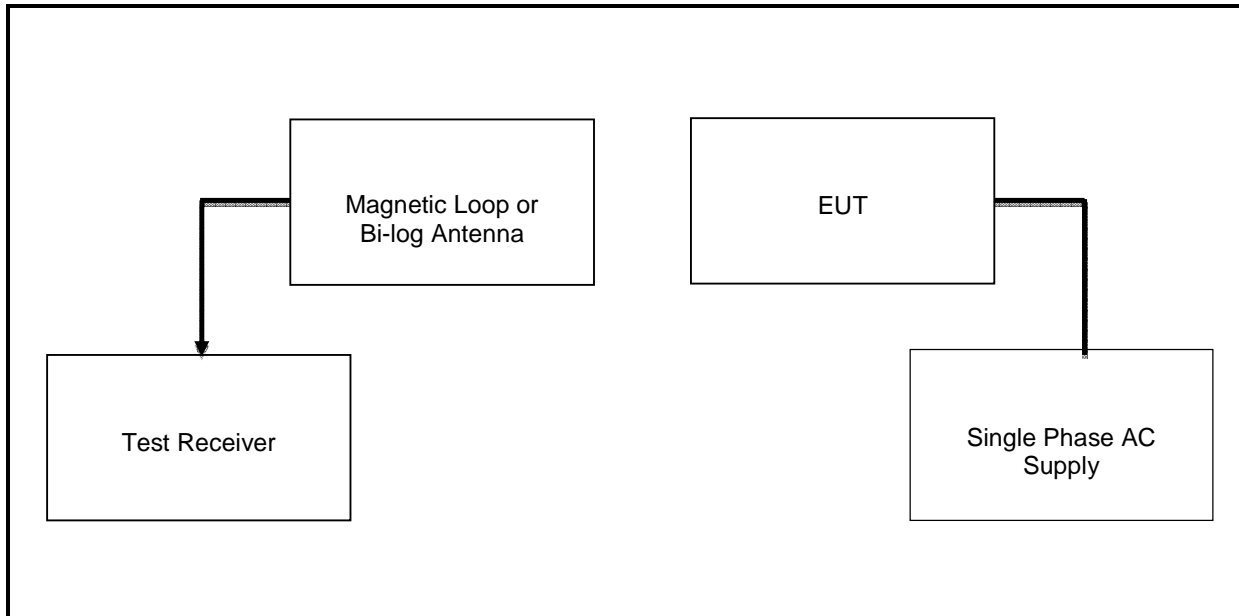
FCC Reference:	Part 15.209
Industry Canada Reference:	RSS-Gen 6.13 & 8.9
Test Method Used:	ANSI C63.4 Section 8, FCC KDB 937606, Notes below and Appendix 1
Frequency Range:	9 kHz to 1 GHz

Environmental Conditions:

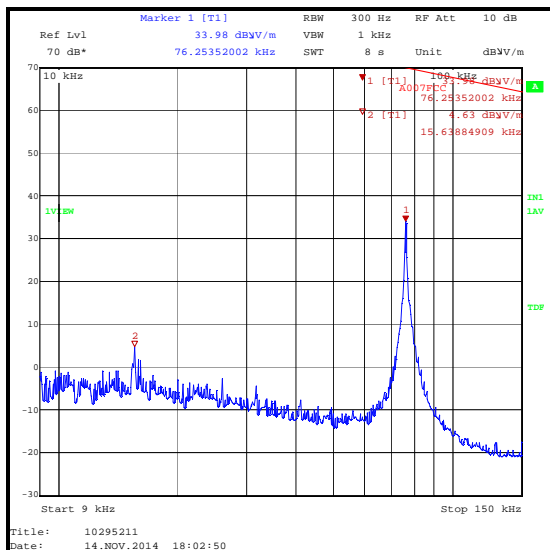
Temperature (°C):	5 to 25
Relative Humidity (%):	35 to 99

Note(s):

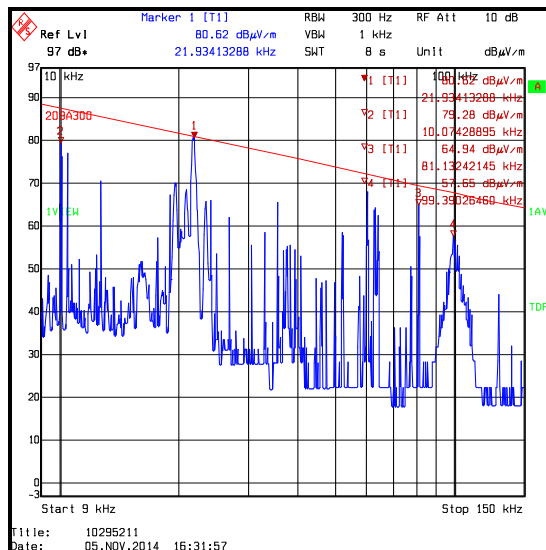
1. The final measured value, for the given emission, in the table below incorporates the calibrated antenna factor and cable loss. Only spurious emissions in the range 30 MHz to 1 GHz were recorded. Markers were placed on the peaks of the prescan plot and final measurements were performed using a quasi peak detector.
2. All other emissions were greater than 20 dB below the applicable limit, below the noise floor of the measurement system or ambient.
3. Measurements were performed in a semi-anechoic chamber (UL VS LTD Asset Number K0001) at a distance of 3 metres. The EUT loop was placed at a height of 80 cm above the reference ground plane in the centre of the chamber turntable. Between 30 MHz & 1 GHz, maximum emission levels were determined by height searching the measurement antenna over the range 1 metre to 4 metres.
4. In accordance with FCC KDB 937606, a *bona fide* attempt was made to perform measurements at the distances specified in Part 15.209(a) on an open field test site. It was not possible to determine the spurious emission values at the test distances specified below 30 MHz on an open field test site, therefore in accordance with 47 CFR 15.31(f), measurements were made at closer distances. Attempts were made to measure spurious emissions at 3, 30 and 300 metres on an open field test site on 05 November and 06 November 2014. Unfortunately, spurious emissions from the EUT could not be seen above the ambient emissions present at the open field test site or the noise floor of the measurement system. Final measurement results from the semi-anechoic chamber tests on 14 November 2014 are shown in this section. In addition, the open field test result plots for measurements between 9 kHz and 30 MHz are also shown. These measurement plots are identical to background scan plots of the open field test site. Background scans of the open field test site and further information are shown in Appendix 1 of this test report.
5. Measurement plots in this section for tests between 9 kHz and 30 MHz on an open field test site have markers placed on the highest level ambient emissions. This is for information only.
6. Limit lines shown on open field test site plots from 9 kHz to 490 kHz have been extrapolated using a factor of 40 dB/decade to a test distance of 30 metres and are for indication only.
7. A transducer factor was used on the spectrum analyser during open field tests. This factor includes correction between the fixed gain of the magnetic loop antenna and the calibration values. It also includes the value of the RF cable used to connect the antenna to the spectrum analyser which was incorporated into the annual calibration of the magnetic loop antenna.

Transmitter Radiated Spurious Emissions (continued)**Test setup Transmitter Radiated Spurious Emissions measurements:****Results: Quasi Peak**

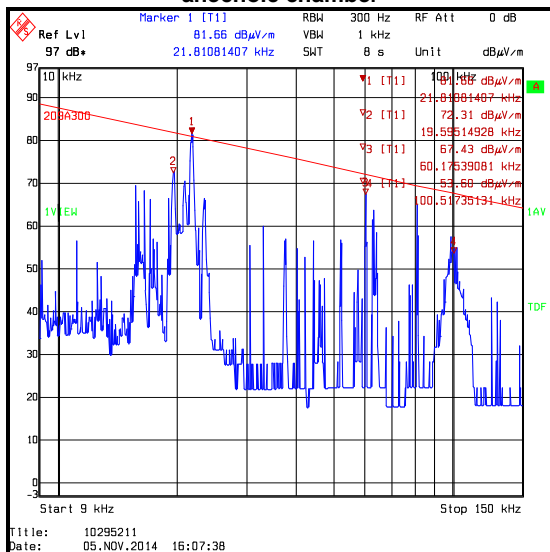
Frequency (MHz)	Antenna Polarity	Level (dB μ V/m)	Limit (dB μ V/m)	Margin (dB)	Result
132.701	Horizontal	24.1	43.5	19.4	Complied
221.163	Horizontal	26.0	46.0	20.0	Complied
349.984	Vertical	26.7	46.0	19.3	Complied
449.979	Vertical	29.1	46.0	16.9	Complied
550.003	Horizontal	28.1	46.0	17.9	Complied

Transmitter Radiated Spurious Emissions (continued)

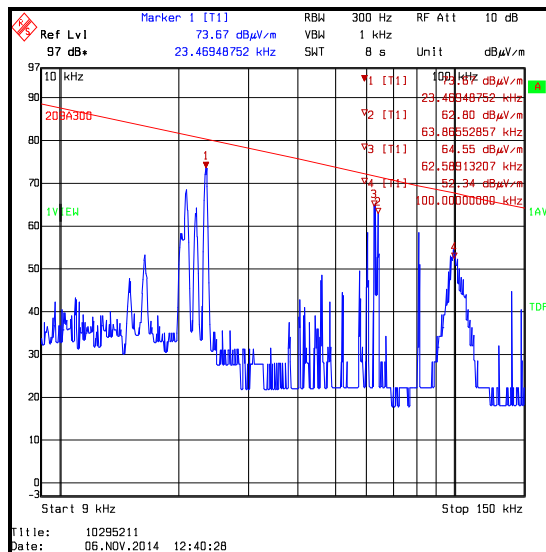
9 kHz to 150 kHz / average detector / measured at 3 metres extrapolated to 30 metres / measured in a semi-anechoic chamber



9 kHz to 150 kHz / average detector / EUT operating / measured at 3 metres on an open field test site

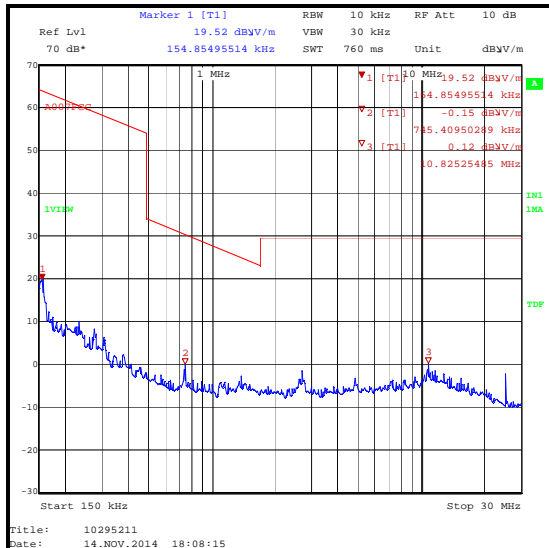


9 kHz to 150 kHz / average detector / EUT operating / measured at 30 metres on an open field test site

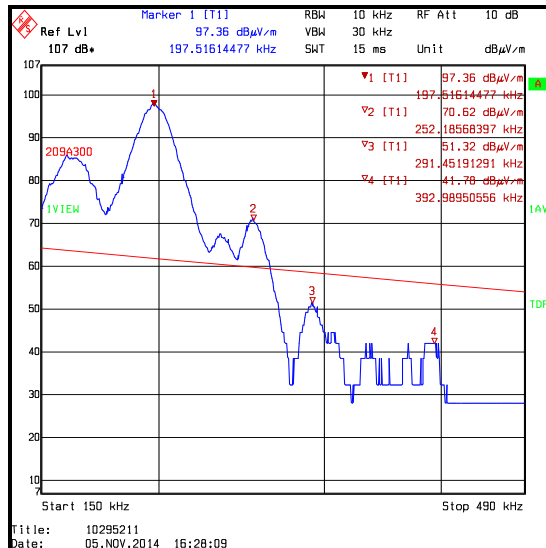


9 kHz to 150 kHz / average detector / EUT operating / measured at 300 metres on an open field test site

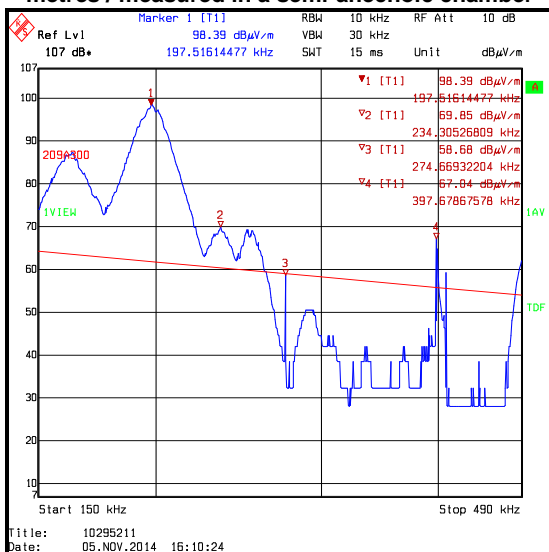
Note: These plots are pre-scans and for indication purposes only. For final measurements, see accompanying table.

Transmitter Radiated Spurious Emissions (continued)

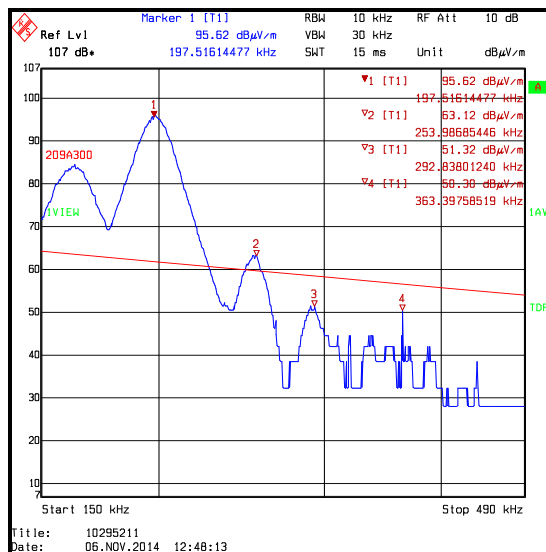
150 kHz to 30 MHz / peak detector (worst case) / EUT operating / measured at 3 metres extrapolated to 30 metres / measured in a semi-anechoic chamber



150 kHz to 490 kHz / average detector / EUT operating / measured at 3 metres on an open field test site



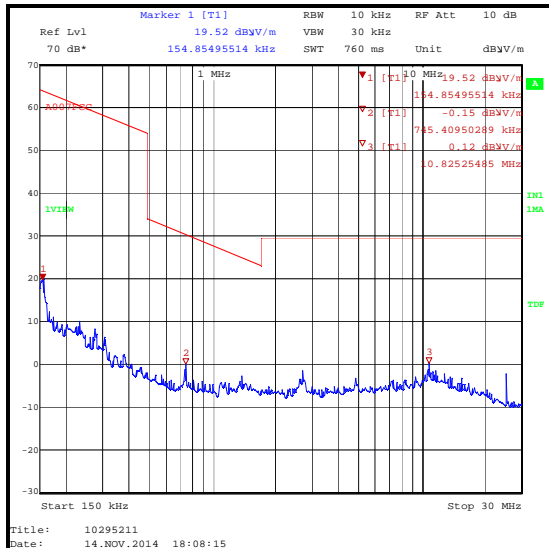
150 kHz to 490 kHz / average detector / EUT operating / measured at 30 metres on an open field test site



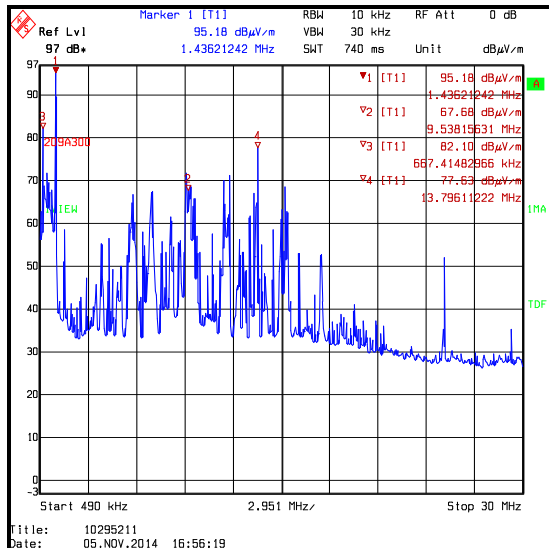
150 kHz to 490 kHz / average detector / EUT operating / measured at 300 metres on an open field test site

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

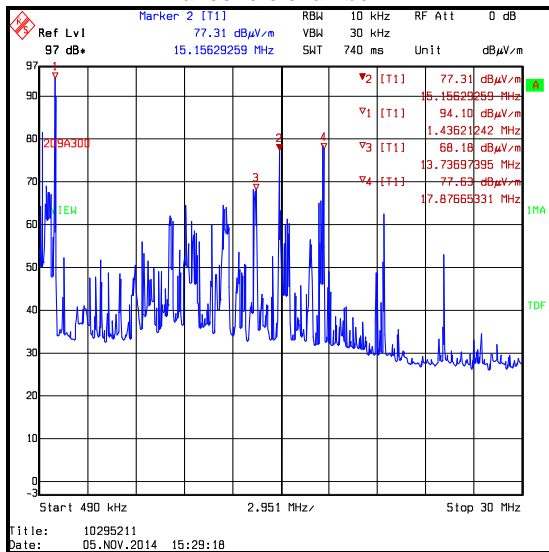
Transmitter Radiated Spurious Emissions (continued)



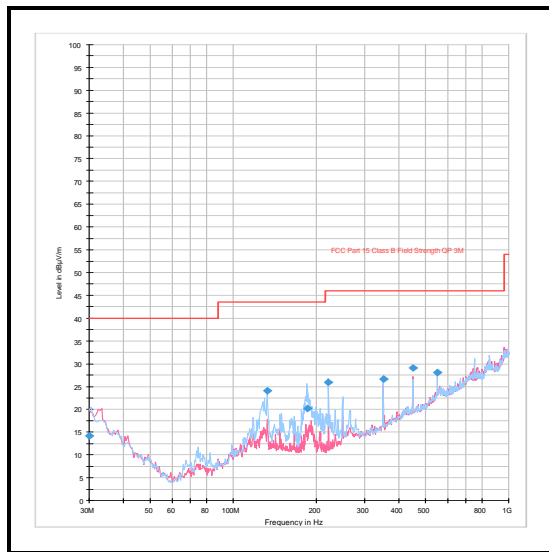
150 kHz to 30 MHz / peak detector / measured at 3 metres extrapolated to 30 metres / measured in a semi-anechoic chamber



490 kHz to 30 MHz / peak detector / EUT operating /
measured at 3 metres on an open field test site



**490 kHz to 30 MHz / peak detector / EUT operating /
measured at 30 metres on an open field test site**



30 MHz to 1 GHz / peak detector (worst case) /
measured at 3 metres in a semi-anechoic chamber

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

Transmitter Radiated Spurious Emissions (continued)**Test Equipment Used:**

Asset No.	Instrument	Manufacturer	Type No.	Serial No.	Date Calibration Due	Cal. Interval (Months)
M1782	Thermohygrometer	JM Handelspunkt	30.5015.06	None stated	21 Mar 2015	12
M1622	Thermohygrometer	JM Handelspunkt	30.5015.06	None stated	31 Dec 2014	12
K0001	5m RSE Chamber	Rainford EMC	N/A	N/A	26 Nov 2014	12
G0543	Amplifier	Sonoma	310N	230801	19 Aug 2014	3
M127	Spectrum Analyser	Rohde & Schwarz	FSEB	842659/016	30 Sep 2015	12
M1273	Test Receiver	Rohde & Schwarz	ESIB 26	100275	15 Feb 2015	12
A259	Antenna	Chase	CBL6111	1513	01 Apr 2015	12
A1834	Attenuator	Hewlett Packard	8491B	10444	15 Nov 2014	12
M1568	Magnetic Loop Antenna	Rohde & Schwarz	HFH2-Z2	879284/2	26 Feb 2015	12

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

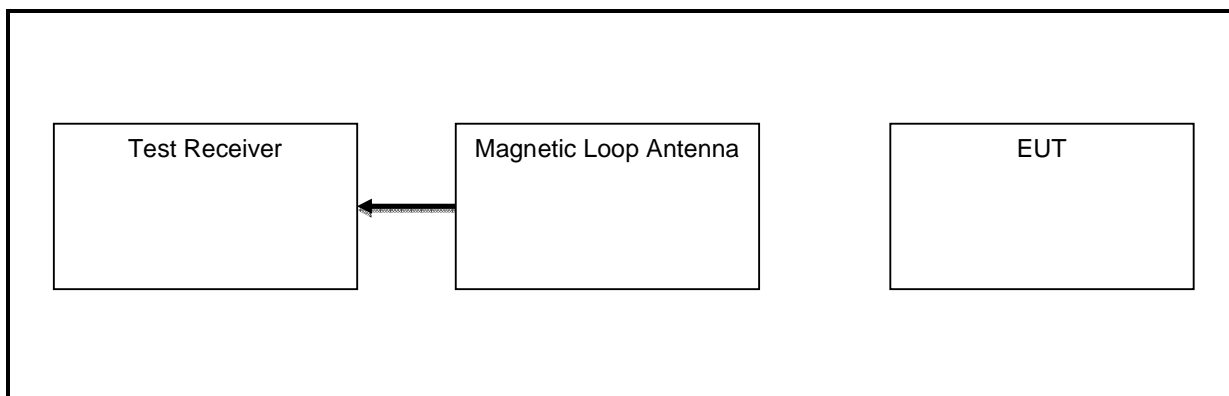
5.2.4. Transmitter 99% Occupied Bandwidth**Test Summary:**

Test Engineer:	Georgios Vrezas	Test Date:	04 December 2014
Test Sample Serial Number:	2014040001		

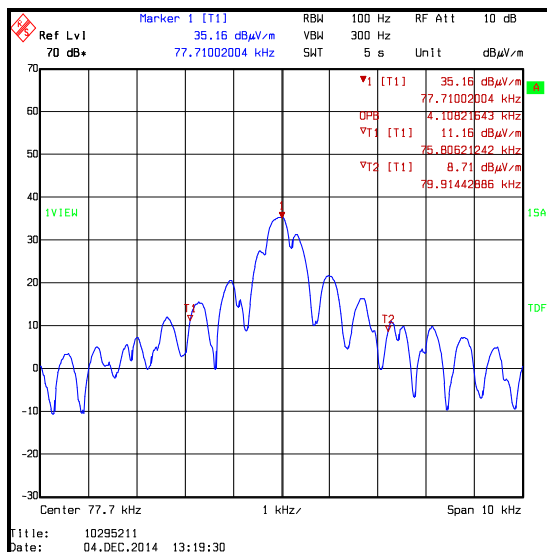
Industry Canada Reference:	RSS-Gen 6.6
Test Method Used:	RSS-Gen 6.6 and 99% occupied bandwidth function of a spectrum analyser

Environmental Conditions:

Temperature (°C):	20
Relative Humidity (%):	33

Test setup for transmitter 99% occupied bandwidth measurements:**Results:**

99% Emission Bandwidth (kHz)
4.108

Transmitter 99% occupied bandwidth (continued)**Test Equipment Used:**

Asset No.	Instrument	Manufacturer	Type No.	Serial No.	Date Calibration Due	Cal. Interval (Months)
M1622	Thermohygrometer	JM Handelspunkt	30.5015.06	None stated	31 Dec 2014	12
K0001	5m RSE Chamber	Rainford EMC	N/A	N/A	26 Dec 2014	12
M1568	Magnetic Loop Antenna	Rohde & Schwarz	HFH2-Z2	879284/2	26 Feb 2015	12
M127	Spectrum Analyser	Rohde & Schwarz	FSEB	842659/016	30 Sep 2015	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
AC Conducted Spurious Emissions	0.15 MHz to 30 MHz	95%	±4.69 dB
Radiated Spurious Emissions	9 kHz to 30 MHz	95%	±3.73 dB
Radiated Spurious Emissions	30 MHz to 1 GHz	95%	±5.65 dB
99% Occupied Bandwidth	9 kHz to 30 MHz	95%	±3.92 %

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, 6 & 8	-	Changed model number and description of EUT
3.0	All	-	Added measurement data from open field test site and Appendix 1. Added additional notes as required. Test setup information added. RSS-Gen references updated. Test results updated as required.
4.0	14	-	Clarified Note 2 at the request of the TCB.
5.0	23, 24 & 25	-	Added 99% occupied bandwidth results and measurement uncertainty at the request of the TCB.